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Report No. FAA-AEQ-77-14A

⑫

CONCORDE AIR QUALITY MONITORING AND ANALYSIS PROGRAM AT DULLES INTERNATIONAL AIRPORT

D.G. Smith, R.J. Yamartino, C. Benkley
R. Isaacs, J. Lee, D. Chang

December 1977
FINAL REPORT
VOLUME II
APPENDIXES

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16. Abstract

On February 4, 1976, the Secretary of Transportation ordered the FAA to monitor Concorde emissions at Dulles International Airport during its initial 16 month trial period. To comply with this order, it was necessary to measure the ambient pollution levels (background) in and around Dulles Airport and to trace the dispersion of emissions from a single Concorde aircraft. While the more conventional background measurements could be easily performed, there was no known case where the vertical and horizontal profile of the emission plume from a single aircraft had been identified. Special instruments were required to measure the discrete, non-steady nature of the dispersion of the aircraft plume. The final measurement system, which consisted of continuously recording electro-chemical sensors coupled with high-speed chart recorders, successfully detected CO emissions from a single aircraft.

Results of this measurement program on and around Dulles Airport show:

- Concorde CO emissions from taxiing aircraft dilute to background levels within 2,000 ft and do not reach the terminal in measurable amounts.
- Emissions from the airport property could not be detected at Sterling Park, or several more distant communities, even when the winds were blowing toward them from the airport.
- Actual Concorde operations ere less polluting than had been indicated in the Final Environmental Impact Statement (FEIS).

NOTE: THIS REPORT IN TWO VOLUMES - VOLUME I - Main Body of Report (FAA-AEQ-14)

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APPENDIX A

DOCUMENTATION OF AIR QUALITY AND SUPPORTING METEOROLOGICAL DATA SETS -- CONCORDE MONITORING PROGRAM

APPENDIX A

A.1 Overview

This appendix describes in detail the air quality and supporting meteorological data obtained at Dulles International Airport (IAD) during intermittant periods between 15 May 1976 and 27 July 1977. These data were acquired as part of the monitoring program established by the Federal Aviation Administration in response to the requirements for air quality and noise monitoring during the period of test flights by the Concorde into Dulles International Airport.

The air quality data consists of the following data sets:

- Hourly averaged background (May, 1976-September, 1976)
- "Single Event" aircraft CO emissions during taxi (May, 1976-August, 1976)
- "Single Event" aircraft NO_x emissions during takeoff (September, 1976-April, 1977)
- Multipoint single-tower measurements of CO emissions for taxi (November, 1976)
- Multipoint two-tower measurements of CO emissions for taxi (February, 1976-April, 1977)
- Multipoint three-tower measurements of CO emissions for taxi (June-July 1977)

Supporting meteorological data (other than wind speed and wind direction obtained on-site, temperature and temperature gradient for the two-tower and three-tower experiment) include the following sets:

- Hourly surface observations as reported by NOAA at the airport
- Twice daily rawinsonde ascents made at the NOAA upper air station near the airport.

Additional supporting air quality data were obtained from the network of monitoring stations established by agencies of the states of Virginia and Maryland, and by the National Institute of Health. These data are included in the hourly-averaged background data set.

All of the data were obtained either as strip chart recordings or as written log entries. The strip charts were subsequently digitized, and the information formatted, coded and put on computer punch cards to facilitate machine analysis and processing. In the following sections of this document, the content and format of these data sets are discussed. The locations of the monitoring sites in the vicinity of the airport, and the characteristics of these sites are presented in Figure A-1 and Table A-1.

A.2 Hourly Averaged Background Data Set

A.2.1 Station Set

This set of data consists primarily of measurements from

- Site #1 - Sterling Park
- Site #6 - South Ramp

and the stations from the states of Virginia and Maryland, and the National Institute of Health. These stations are identified as follows:

State	Station Name
Virginia	Herndon
	Massey
	Xerox Training School
	Club Run
	Lewinsville
	Douglas Elementary School
	Seven Corners
Maryland	Burning Tree
	Gaithersburg High School
	Poolesville Elementary School
	Rockville
	National Institute of Health - Bethesda

The location of these regional stations, relative to Dulles International Airport is shown in Figure A-2. Table A-2 summarizes the parameters measured at each site. The units used to specify the parameters are identified in Table A-3.

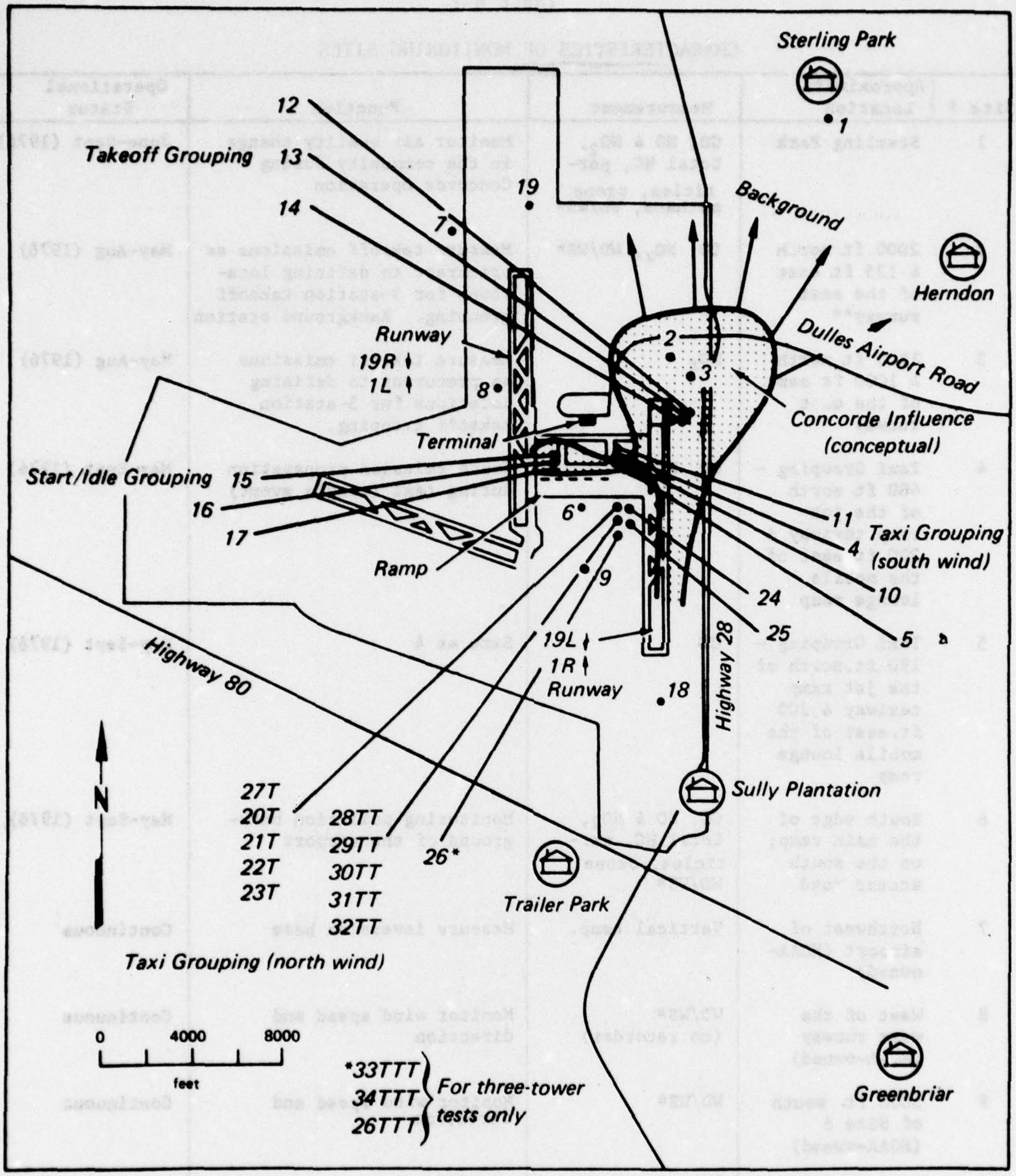

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Figure A-1 Air Monitoring Sites - Dulles Airport

TABLE A-1

CHARACTERISTICS OF MONITORING SITES

Site #	Approximate Location	Measurement	Function	Operational Status
1	Sterling Park	CO, NO & NO_2, total HC, particles, ozone methane, WD/WS*	Monitor air quality change in the community during Concorde operation	June-Sept (1976)
2	2000 ft. north & 125 ft. east of the east runway**	CO, NO_x, WD/WS*	Measure takeoff emissions as precursor to defining locations for 3-station takeoff grouping. Background station	May-Aug (1976)
3	1100 ft. north & 1000 ft east of the east runway	NO_x	Measure takeoff emissions as precursor to defining locations for 3-station takeoff grouping.	May-Aug (1976)
4	Taxi Grouping - 480 ft. north of the jet ramp taxiway & 200 ft. east of the mobile lounge ramp	CO, WD/WS*	Trace emission propagation during taxi (single event)	May-Sept (1976)
5	Taxi Grouping - 190 ft. north of the jet ramp taxiway & 200 ft. east of the mobile lounge ramp	CO	Same as 4	May-Sept (1976)
6	South edge of the main ramp; on the south access road	CO, NO & NO_2, total HC, particles, ozone WD/WS*	Monitoring pollution background of the airport	May-Sept (1976)
7	Northwest of airport (NOAA-owned)	Vertical temp.	Measure inversion base	Continuous
8	West of the west runway (NOAA-owned)	WD/WS* (no recorder)	Monitor wind speed and direction	Continuous
9	3000 ft. south of Site 6 (NOAA-owned)	WD/WS*	Monitor wind speed and direction	Continuous
10	Taxi Grouping - midway between Sites 4 & 5	CO	Same as 4	June-July (1976)

*WD/WS-Wind direction/Wind speed

**All dimensions are measured from centerline of ramp, runway or taxiway unless otherwise needed.

TABLE A-1 (Continued)

Site #	Approximate Location	Measurement	Function	Operational Status
11	Taxi Grouping - 200 ft. north of Site 4	CO	Same as 4	July-Sept (1976)
12	Takeoff Grouping - 285 ft east and 100 ft. north of Site 13	CO, NO & NO_2, total HC, ozone, WD/WS*	Trace emission propagation during takeoff (single event)	Oct 76-May 1976
13	Takeoff Grouping - 185 ft. east & 140 ft. north of Site 14	CO, NO_x	Same as 12	Sept 76-May 1976
14	Takeoff Grouping 450 ft. east of the east runway & 1040 ft. south of its north end	CO, NO_x	Same as 12	Sept 76-May 1976
15 16 17	Start/idle Grouping - north of the west & of the jet ramp taxiway	CO, WD/WS*, (at one site)	Trace emission propagation during engine start/idle (single event)	Spot check
18	South of the east runway	NO_x	Monitor takeoff emissions	Spot check
19	North of the west runway	NO_x	Monitor landing emissions	Spot check
20T	South edge of main ramp 1700 ft*** west of Runway 19L, 56-ft. elevation on tower	-	Air intake position (tower)	November (1976)
21T	41-ft. elevation on tower	-	Same as 20T	November (1976)
22T	26-ft. elevation on tower	-	Same as 20T	November (1976)

TABLE A-1 (Continued)

Site #	Approximate Location	Measurement	Function	Operational Status
23T	14-ft. elevation on tower	-	Same as 20T	November (1976)
24	South edge of main ramp ** 1665 ft.*** west of Runway 19L	CO, WS/WD*	Tower measurements	November (1976)
25	1665 ft*** west of Runway 19L 164 ft south of Site 24	CO	Tower measurements	November (1976)
26	1700 ft*** west of Runway 19L 164 ft. south of Site 25	-	Air intake position (Surface)	November (1976)
27T	Same as 20T 80-ft. elevation on tower	-	Same as 20T	Feb-March (1977)
28TT	164 ft. south of 20T. 80-ft. elevation on tower	-	Same as 20T	Feb-April (1977)
29TT	Same as 28TT 56-ft. elevation on tower	-	Same as 20T	Feb-April (1977)
30TT	41-ft. elevation on tower	-	Same as 20T	Feb-April (1977)
31TT	26-ft. elevation on tower	-	Same as 20T	Feb-April (1977)
32TT	14-ft. elevation on tower	-	Same as 20T	Feb-April (1977)

***215 ft. south of south jet ramp centerline

****South end centerline

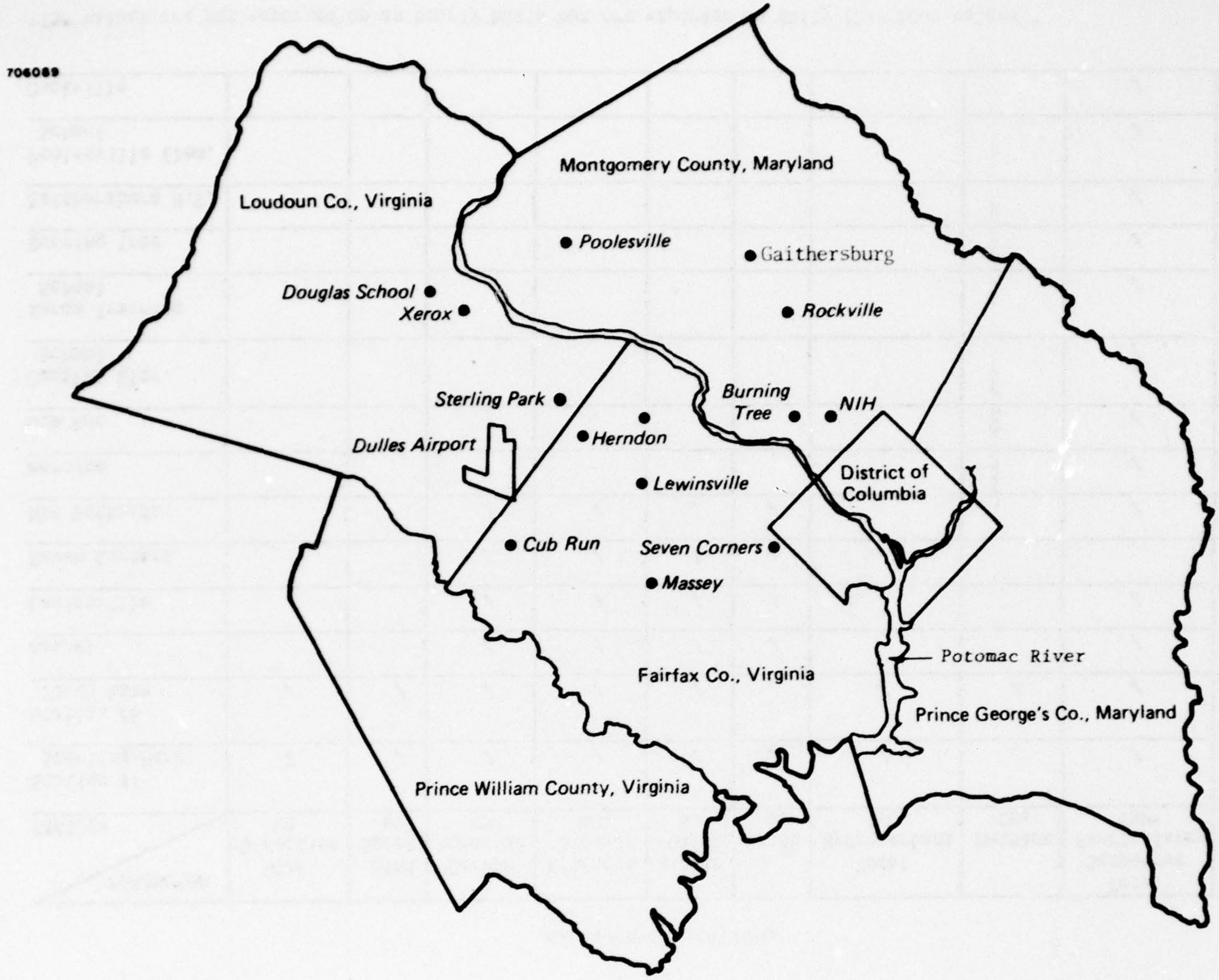


Figure A-2 Regional Air Quality Monitoring Stations

TABLE A-2

BACKGROUND STATIONS

STATION \ PARAMETER	Wind Direction WD	Wind Speed WS	Carbon Monoxide CO	Nitrogen Dioxide NO_2	Nitric Oxide NO	Ozone O_2	Total Hydrocarbons THC	Methane CH_4	Total Suspended Particulates TSP*	Sulphur Dioxide
Station #1 Sterling Park	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Station #6 South Ramp	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Massey			✓	✓	✓	✓			✓	
Lewinsville			✓	✓	✓	✓			✓	
Seven Corners			✓	✓	✓	✓	✓			
NIH Bethesda			✓	✓	✓	✓			✓	✓
Herndon									✓	
Cub Run									✓	
Douglas Elem. School									✓	
Xerox Training School									✓	
Burning Tree									✓	
Gaithersburg H.S.									✓	
Poolesville Elem. School									✓	
Rockville									✓	

*TSP values are not reported on an hourly basis but are reported as daily (24) hour values.

TABLE A-3

UNIT SPECIFICATIONS FOR BACKGROUND STATION DATA SET

Parameter	Units		
	Sterling Park & South Ramp	Virginia	Maryland
Wind Direction (WD)	Degrees (N=360°)		
Wind Speed (WS)	MPH		
Carbon Monoxide (CO)	ppm	mg/m^3	ppm
Nitrogen Dioxide (NO_2)	ppm	$\mu g/m^3$	ppm
Nitric Oxide (NO)	ppm	$\mu g/m^3$	ppm
Ozone (O_3)	ppm	$\mu g/m^3$	none
Total Hydrocarbons (THC)	ppm	mg/m^3	none
Total Suspended Particulates $\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$	$\mu g/m^3$

A.2.2 Data Formats

A.2.2.1 Sterling Park and South Ramp

The outputs of the sensors were recorded by means of strip chart recorders running at a speed of 1 inch per hour. These charts were returned to ERT's Concord facilities where they were digitized automatically. The output of the digitizer was fed into a computer where a tape of hourly-averaged values, in the proper units, was created for each of the parameters. The card-image format of the final data set as shown in Table A-4. Examples of the information content of the background data set are shown in Figures A-3 and A-4. In Figure A-3, the data have been stratified by site, parameter (NO_2), month (August and September), day of month, and hour of day. In Figure A-3, the stratification is by stability class and wind direction. With the parameters contained in the data set, other kinds of stratified analyses are possible.

A.2.2.2 State Agency Data Set

These data, received by ERT through the FAA, consists of hand-entry tabulation sheets in the standard SAROAD format used by the Environmental Protection Agency (EPA). An example of this entry form is shown in Figure A-5. The format is already set up for computer processing. The data were put on computer punch cards following the SAROAD format using the parameter specifications as entered in the data sheets. A data tape was prepared for this data set.

A.2.2.3 National Institute of Health

The data received from the National Institute of Health consisted of computer printouts of hourly-averaged values similar in format to that shown as Figure A-3. An example of the print out is shown in Figure A-6. The computer tabulated data were put on computer punch cards in a format identical to that used for the Sterling Park and South Ramp data set.

TABLE A-4

EXTENDED ENVIROMAP ARCHIVE FORMAT

Field	Cols	Variable	Format	Description
Experiment Description	1-2	IFORM	A2	Dataset Indentification
	3-4	IEXP (1)	A2	Experiment ID
	5	(2)	I1	Experiment Mode
	6	(3)	I1	Data Type
	7	(4)	I1	Interval Units
	8-9	(5)	I2	Integration Interval
	10	(6)	A1	Process Option
Date & Time	11-12	IYEAR	I2	Year (YY)
	13-15	IDAY	I3	Day (DDD)
	16-17	IHOUR	I2	Hour (HH)
	18-19	IMINUTE	I2	Minute (MM)
Data	20	INCNT	I1	Data Item Count
	21-24	KODE(1)	A4	Sensor ID Code: 1st Sensor
	25-34	VAL(1)	1PE10.3	Data Value
	35-37	KCT(1)	0PI3	Sample Count
	38	KFG(1)	A1	Flag Character
	39-40		2X	Reserved for Future
	41-60	--	--	2nd Sensor
	61-80	--	--	3rd Sensor

Figure A-3 Example of Background Data Output Format

```
                                                DULLES
 SOUTH RAMP                               NITROGEN DIOXIDE            ( PPM  )                                  DATA FOR AUGUST      1976

                                                     HOURS  (LST)
 HR-BEG 00   01   02   03   04   05   06   07   08   09   10   11   12   13   14   15   16   17   18   19   20   21   22   23
 HR-END 01   02   03   04   05   06   07   08   09   10   11   12   13   14   15   16   17   18   19   20   21   22   23   24
 DAY                                                                                                                        AVG
  16  .002 .005 .005 .003 .005 .015 .013 .011 .011 .008 .013 .010 .011 .007 .016 .015 .011 .012 .013 .022 .022 .017 .010 .024 .012
  17  .012 .007 .007 .007 .008 .006 .013 .009 .014 .019 .020 .009 .011 .009 .013 .015 .017 .009 .007 .015 .022 .011 .013 .012 .012
  18  .013 .017 .013 .009 .006 .007 .010 .011 .011 .008 .011 .006 .007 .010 .013 .018 .020 .016 .019 .021 .035 .044 .049 .039 .015
  19  .015 .013 .014 .013 .014 .011 .011 .011 .010 .009 .013 .013 .012 .012 .014 .013 .019 .015 .026 .034 .036 .030 .030 .023 .018
  20  .033 .037 .030 .024 .016 .024 .013 .015 .019 .014 .016 .013 .015 .018 .018 .022 .022 .025 .024 .034 .038 .029 .035 .045 .024
  21  .057 .034 .034 .024 .028 .021 .015 .013 .014 .013 .018 .017 .017 .017 .018 .017 .016 .019 .019 .037 .027 .015 .035 .035 .022
  22  .031 .034 .023 .023 .017 .015 .024 .013 .010 .014 .008 .013 .017 .010 .010 .013 .017 .016 .012 .010 .020 .042 .040 .029 .019
  23  .013 .011 .009 .007 .007 .014 .008 .005 .009 .009 .006 .015 .009 .007 .013 .011 .011 .013 .012 .026 .044 .037 .026 .015 .014
  24  .024 .013 .999 .999 .999 .999 .999 .018 .013 .016 .016 .014 .012 .011 .013 .016 .016 .022 .030 .044 .033 .021 .017 .013 .019
  25  .011 .008 .008 .007 .007 .009 .018 .015 .009 .007 .007 .009 .011 .014 .018 .013 .015 .018 .016 .020 .016 .019 .016 .011 .013
  26  .009 .007 .006 .008 .010 .016 .015 .017 .014 .008 .014 .006 .012 .004 .007 .004 .007 .006 .012 .020 .018 .010 .013 .009 .010
  27  .039 .006 .005 .005 .005 .005 .025 .032 .015 .010 .019 .019 .018 .018 .020 .020 .020 .017 .015 .024 .036 .037 .035 .026 .018
  28  .034 .036 .031 .016 .015 .003 .009 .002 .003 .004 .012 .010 .010 .007 .008 .009 .008 .011 .015 .019 .036 .032 .015 .007 .015
  29  .037 .014 .013 .013 .008 .009 .009 .006 .009 .009 .007 .006 .005 .008 .012 .007 .020 .025 .022 .015 .018 .016 .014 .008 .012
  30  .008 .004 .005 .006 .006 .008 .007 .004 .008 .008 .009 .014 .008 .009 .011 .013 .010 .014 .018 .020 .028 .035 .035 .027 .013
  31  .018 .025 .017 .012 .016 .015 .017 .015 .017 .021 .015 .012 .009 .006 .010 .018 .006 .007 .017 .040 .037 .025 .035 .041 .019

 SOUTH RAMP                               NITROGEN DIOXIDE            ( PPM  )                                  DATA FOR SEPTEMBER   1976

                                                     HOURS  (LST)
 HR-BEG 00   01   02   03   04   05   06   07   08   09   10   11   12   13   14   15   16   17   18   19   20   21   22   23
 HR-END 01   02   03   04   05   06   07   08   09   10   11   12   13   14   15   16   17   18   19   20   21   22   23   24
 DAY                                                                                                                        AVG
   1  .036 .019 .017 .013 .015 .012 .018 .013 .014 .015 .010 .006 .005 .006 .005 .999 .999 .999 .999 .999 .999 .999 .999 .999 .999
   2  .999 .999 .999 .999 .999 .999 .999 .999 .999 .999 .006 .005 .009 .005 .013 .006 .014 .013 .019 .015 .020 .015 .022 .027 .999
   3  .021 .016 .014 .012 .018 .017 .018 .017 .028 .020 .017 .015 .017 .015 .016 .025 .020 .023 .026 .035 .038 .035 .030 .026 .022
   4  .025 .023 .015 .014 .011 .010 .015 .006 .006 .007 .011 .008 .015 .012 .012 .007 .007 .009 .014 .020 .020 .020 .013 .011 .013
   5  .013 .014 .007 .004 .018 .011 .012 .010 .010 .011 .005 .002 .002 .014 .014 .010 .018 .010 .007 .018 .018 .011 .010 .004 .011
   6  .006 .006 .007 .008 .007 .009 .009 .009 .011 .007 .007 .007 .006 .008 .006 .007 .013 .008 .012 .031 .030 .035 .023 .026 .012
   7  .025 .015 .018 .015 .014 .009 .013 .023 .016 .009 .007 .011 .007 .006 .009 .006 .007 .007 .014 .019 .040 .033 .032 .026 .015
   8  .024 .030 .023 .019 .019 .018 .020 .017 .016 .013 .006 .006 .005 .008 .013 .010 .021 .028 .041 .057 .055 .044 .054 .046 .025
   9  .047 .030 .023 .018 .016 .024 .021 .012 .020 .017 .018 .019 .028 .027 .023 .023 .023 .041 .044 .043 .035 .028 .027 .026 .026
  10  .018 .017 .015 .015 .012 .014 .016 .017 .015 .007 .007 .006 .006 .004 .006 .006 .006 .009 .018 .012 .015 .008 .010 .004 .011
  11  .004 .005 .006 .007 .004 .009 .010 .008 .005 .007 .004 .002 .002 .003 .004 .006 .006 .008 .009 .009 .008 .011 .014 .011 .007
  12  .012 .013 .015 .011 .009 .008 .011 .009 .010 .010 .006 .006 .006 .013 .012 .004 .009 .009 .023 .034 .038 .029 .029 .036 .015
  13  .033 .023 .031 .017 .014 .018 .016 .012 .014 .007 .016 .008 .007 .006 .008 .008 .015 .016 .033 .034 .030 .041 .043 .041 .020
  14  .031 .018 .017 .013 .012 .013 .015 .019 .017 .012 .014 .006 .007 .009 .009 .009 .012 .024 .027 .028 .031 .023 .024 .020 .017
  15  .015 .017 .014 .012 .013 .016 .025 .031 .032 .044 .048 .047 .036 .024 .014 .017 .033 .030 .025 .021 .017 .021 .009 .065 .024

 NOTE :  999 - MISSING VALUE INDICATOR
```

```
99 1039     WIND VS STABILITY VS CONCENTRATION  PLOT          VERSION  1.3  (770201)                8 JUN 1977              PAGE  6
**********************************************************************************************************************************
                                                   DULLES

                      MASSEY                       OZONE                        ( 0343 )                     O3

                                          JUNE          1976  - AUGUST       1976

STABILITY SPEED(MPH)            N    NNE   NE   ENE    E   ESE   SE   SSE    S   SSW   SW   WSW    W   WNW   NW   NNW   VAR
----------------------------------------------------------------------------------------------------------------------------------

UNSTABLE      <  2 CONC.=      0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.   49.
                   POP. =       0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     5

UNSTABLE     2 - 5 CONC.=     77.  100.  104.   79.   82.  140.  119.   58.   74.  109.  112.  132.  126.   92.  114.   92.   39.
                   POP. =      31     9    11     4     8     3    12    13    28    39    23    18    19     9    19    30     3

UNSTABLE     6 -12 CONC.=    105.  131.  159.  152.  152.  111.  172.  201.  133.  141.  164.  150.  145.  123.  152.  125.  225.
                   POP. =      39    21    11    15    12     3     1    13    23    57    30    21    26    26    47    58     1

UNSTABLE     > 12  CONC.=      0.  132.  152.  123.  152.    0.    0.  145.  250.  153.    0.    0.    0.  110.  125.  137.    0.
                   POP. =       0     2     3     1     1     0     0     2     1     4     0     0     0     6    18     8     0
----------------------------------------------------------------------------------------------------------------------------------

NEUTRAL       <  2 CONC.=      0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.   43.
                   POP. =       0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     6

NEUTRAL      2 - 5 CONC.=     45.   95.   64.   16.   87.   55.   62.   94.   92.   82.   74.   80.   72.  216.   33.   54.    0.
                   POP. =      11    16     4     3     6     6     5    15    24    10     9     7    10     1     8    15     0

NEUTRAL      6 -12 CONC.=     65.   74.  106.   83.   53.   60.  113.  167.  102.   94.   77.   86.   67.  106.   55.   80.    0.
                   POP. =      24    16     5    15    10     3     7    11    21    37     7     7     5    12    22    25     0

NEUTRAL      > 12  CONC.=     42.    0.    0.    0.    0.    0.    0.    0.  233.  132.    0.   82.   39.  113.  107.   97.    0.
                   POP. =       3     0     0     0     0     0     0     0     2     3     0     3     1    11    26    12     0
----------------------------------------------------------------------------------------------------------------------------------

STABLE        <  2 CONC.=      0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.   28.
                   POP. =       0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0    40

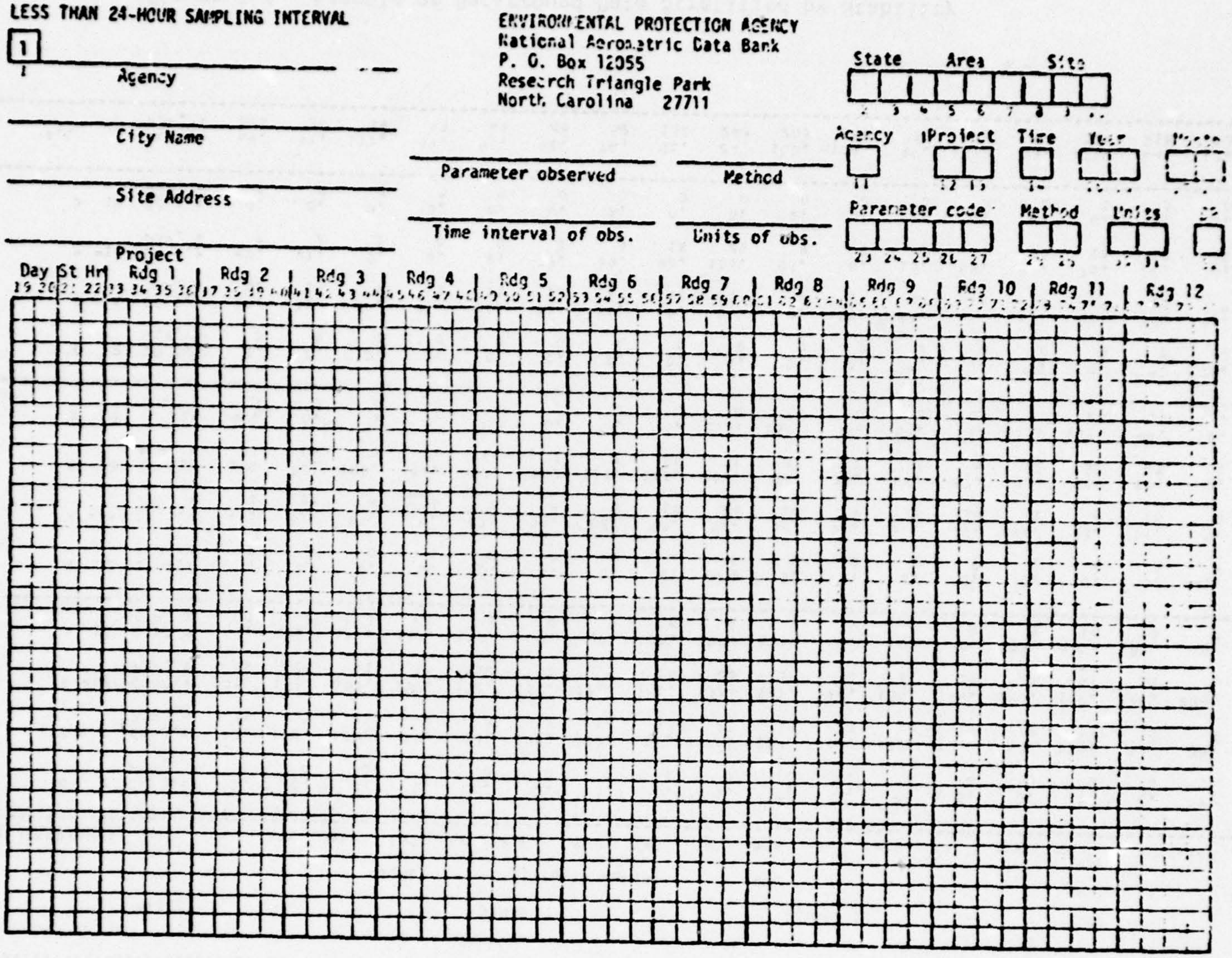
STABLE       2 - 5 CONC.=     30.   36.   36.   47.   61.   31.   46.   66.   64.   54.   51.   38.   40.   43.   39.   34.   82.
                   POP. =      50    15     5     5    11    12    24    60   117    46    29    20    12    19    19    55     7

STABLE       6 -12 CONC.=     60.   47.    0.    0.    0.   78.   39.   92.  106.   97.    0.   15.   69.   92.   78.   74.    0.
                   POP. =       7     2     0     0     0     1     3    18    25     9     0     1     1    10    15    12     0

STABLE       > 12  CONC.=      0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
                   POP. =       0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
----------------------------------------------------------------------------------------------------------------------------------

ALL          ALL   CONC.=     54.   87.  111.   99.   91.   61.   76.   95.   84.  102.  104.   95.  107.   99.  106.   64.   47.
                   POP. =     165    86    39    43    48    26    52   132   242   208    98    77    74    94   174   216    53
----------------------------------------------------------------------------------------------------------------------------------
```

Figure A-4   Example of Background Data Stratified by Stability



LESS THAN 24-HOUR SAMPLING INTERVAL

1

Agency

City Name

Site Address

Project

ENVIRONMENTAL PROTECTION AGENCY
National Aerometric Data Bank
P. O. Box 12055
Research Triangle Park
North Carolina 27711

Parameter observed

Method

Time interval of obs.

Units of obs.

State Area Site

Agency Project Time Year Month

Parameter code Method Units

Day | St Hr | Rdg 1 | Rdg 2 | Rdg 3 | Rdg 4 | Rdg 5 | Rdg 6 | Rdg 7 | Rdg 8 | Rdg 9 | Rdg 10 | Rdg 11 | Rdg 12

Figure A-5 SAROAD Format

THIS PAGE IS BEST QUALITY PRACTICABLE
FROM COPY FURNISHED TO DDC

```
                              NIH BETHESDA                                         LOCATED IN OPEN FIELD AIRMON

                1976  C O NONDISPERSIVE INFRA RED PPM                          INTERVAL - 1 POLLUTANT - 42101-11    U/M - 07    DECIMAL - 0

                  .    .    .    .    .    .    .    .    .    . HOUR BEGINNING AT .    .    .    .    .    .    .    .    .    .    . MAXIMUM          DAILY
DAY ....      .  00   01   02   03   04   05   06   07   08   09   10   11   12   13   14   15   16   17   18   19   20   21   22   23  HOUR 8-HR         AVER

01               2.        2.   2.   1.   1.   1.   0.   0.   0.   0.   0.   0.   0.   0.   1.   1.   0.   0.   0.   0.   0.   0.   0.   2.   1.           0.
02               1.   2.   2.   0.   0.   0.   0.   0.   0.   0.   1.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   2.   0.           0.
03               1.   1.   0.   0.   0.   1.   1.   0.   0.   0.   0.   0.   0.   0.   0.   1.   0.   0.   0.   0.   0.   1.   1.   1.   1.   0.           0.
04               1.   0.   0.   0.   0.   0.   1.   1.   1.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   1.   1.   1.   1.   1.   0.           0.
05               2.   2.   1.   1.   1.   1.   1.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   1.   1.   2.   3.   3.   3.   1.           1.
06               2.   2.   2.   2.   2.   1.   1.   1.   1.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   1.   1.   1.   1.   2.   1.           1.
07               1.   0.   0.   0.   0.   0.   0.   1.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   1.   2.   3.   2.   2.   1.   3.   2.           1.
08               0.   1.   0.   1.   1.   1.   2.   3.   1.   0.   0.   0.   0.   0.        1.   1.   0.   0.   2.   2.   2.   1.   2.   3.   1.           1.
09               2.   2.   2.   2.   1.   1.   1.   0.   0.   0.   0.   0.   0.   0.   0.   1.   1.   0.   1.   2.   2.   2.   2.   1.   2.   1.           1.
10               2.   2.   3.   2.   2.   2.   2.   1.   1.   0.   0.   0.   1.   1.   1.                  0.   0.   1.   0.   0.   1.   3.   2.           1.
11               2.   2.   2.   2.   1.   1.   0.   0.   0.   0.   1.   1.   2.   2.             1.   1.   1.   1.   1.   1.   2.   2.   2.   1.           1.
12               1.   0.   1.   2.   1.   1.   0.   0.   0.   0.   0.   0.   1.   2.   2.   1.   0.   0.   0.   0.   0.   0.   0.   1.   2.   1.           1.
13               1.   0.   0.   0.   1.   0.   0.   0.   0.   0.   0.   1.   1.   2.   2.   1.   1.   0.   0.   0.   0.   0.   0.   1.   2.   1.           0.
14               2.   2.   2.   2.   1.   1.   0.   0.   0.        0.   0.   0.   0.   0.   1.   1.   0.   0.   0.   0.   0.   0.   2.   2.   1.           1.
15               2.   2.   2.   2.   1.   0.   0.   0.   0.   1.   2.   2.   2.        0.                                                  2.   1.           1.
16                                                            0.   0.   0.   0.   0.   0.   1.   0.   0.   0.   0.   0.   1.   2.   2.   2.   0.           0.
17               2.   1.        1.   1.   0.   0.        0.   2.   2.   2.   2.   2.   2.   2.   1.   0.   0.   0.   1.   2.   3.   3.   3.   1.           1.
18               2.   2.   0.   1.   1.   1.   0.   0.   0.   0.   0.   1.   1.   1.   1.   1.   0.   0.   0.   0.   1.   2.   2.   2.   2.   1.           1.
19               2.   2.   2.   2.   1.   0.   0.   0.   0.   1.   1.   1.   1.   1.   1.   1.   1.   0.   0.   0.   0.   0.   1.   1.   2.   1.           1.
20               2.   2.   1.   0.   0.   0.   0.   0.   0.   1.   1.   1.   1.   1.   1.   1.   1.   1.   3.                           3.   1.           1.
21
22                                                                           0.   0.   0.                                               0.   0.           0.
23                                                            7.   0.   0.   0.   0.   0.                            9.   0.   0.   9.   1.           2.
24               0.   0.   0.                  0.   1.   1.   0.   0.   0.   0.   0.   1.   0.   0.   0.   0.   0.   1.   0.   1.   2.   2.   0.           0.
25               2.   2.   2.   2.   0.   0.   0.   0.   0.   1.   2.   2.   2.   2.   2.   2.   2.   0.   0.   0.   0.   0.   1.   0.   2.   1.           1.
26               0.   2.   2.   2.   0.   0.   0.   0.   0.   0.   0.   0.   1.   2.   2.   1.   0.   0.   0.   0.   1.                  2.   1.           1.
27
28                                                       0.   0.   0.   1.   1.   0.   1.   1.   1.   1.   0.   0.   0.   0.   0.   0.   1.   0.           0.
29               2.   2.   2.   1.   0.   0.   0.   0.   1.   1.   2.   2.   2.   1.   2.   2.                       1.   2.   3.   3.   3.   1.           1.
30               2.   2.   2.   2.   2.   1.   0.   0.   2.   1.   1.   0.   0.   1.   1.   1.   2.   0.   0.   0.   1.   1.   1.   2.   2.   1.           1.

ARITH. AVER      1.   1.   1.   1.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   1.   1.   1.

MAXIMUM HR.      2.   2.   3.   2.   2.   2.   2.   3.   2.   7.   2.   2.   2.   2.   2.   2.   2.   1.   3.   3.   3.   9.   3.   3.

PEAK READ        2.   2.   3.   2.   2.   2.   2.   3.   2.   7.   2.   2.   2.   2.   2.   2.   2.   1.   3.   3.   3.   9.   3.   3.

MONTHLY  ARITHMETIC AVER- 00.753                                         HOURLY RECORD COUNT-584   PERCENT AVAILABLE DATA-   81

STD. DEV.    .943    GEO-MEAN    .585    GEO STD DEV   2.469    HOUR MAX RD.-  9.    PEAK MAX RD.-  9.    8-HR MAXIMUM READ-   2.
```

Figure A-6   Example of the NIH Data

A.3 Single Event and Multi-Point Data Set Description

A.3.1 Measuring and Recording Techniques

The data from these series of experiments consist of the following:

a. High speed (2 cm/min) strip chart recordings of the outputs of each sensor

b. Observer log of events and the instantaneous wind speed and direction at the time of an event, where an event is defined as the taxi of an aircraft in front of the line of CO monitors.

Figure A-7 shows an example of the typical 3-pen trace recorded on the high speed chart recorder for an event.

The following information was digitized from the strip charts for each sensor output and for each event:

- Background Concentration (ppm)
- Peak Concentration (above background) (ppm)
- Event pulse half width (secs)
- Peak time (secs)
- 1/2 peak time (secs)

The definition of these parameters are shown schematically in Figure A-8. Note that the half width time and peak time is measured relative to the event time. Event time is the time recorded by the observer in the observer log as the time that the aircraft visually passes in front of the CO monitoring shelters. The recording of these times are not of sufficient precision to be used to determine the transport time of the plane from the source to the monitoring. The times proivde a measure of reconstructing the pulse shape should this be a desirable parameter.

The above set of parameters together with observer records of

- Date
- Event time (LST)
- Aircraft type

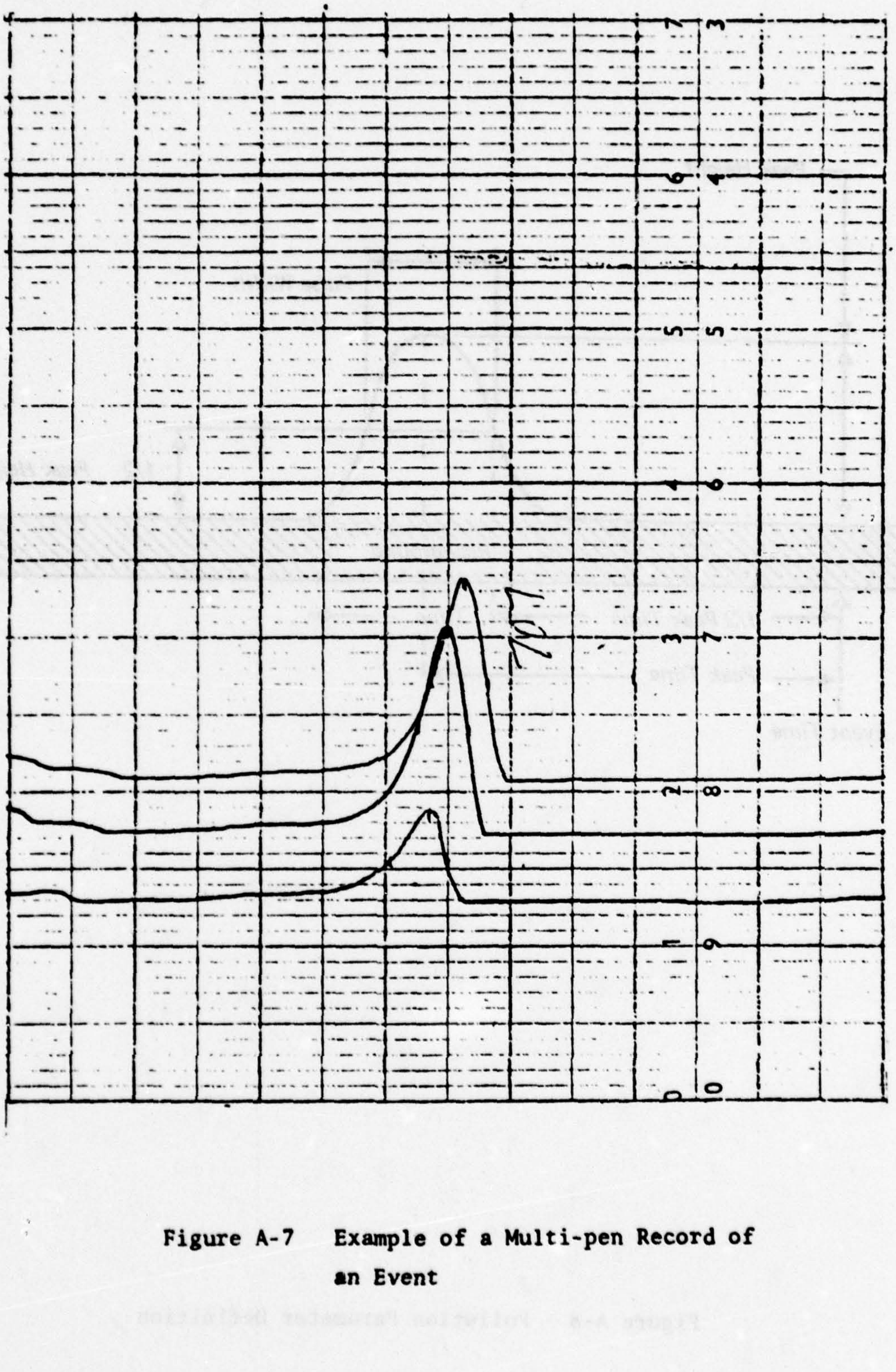


Figure A-7 Example of a Multi-pen Record of an Event

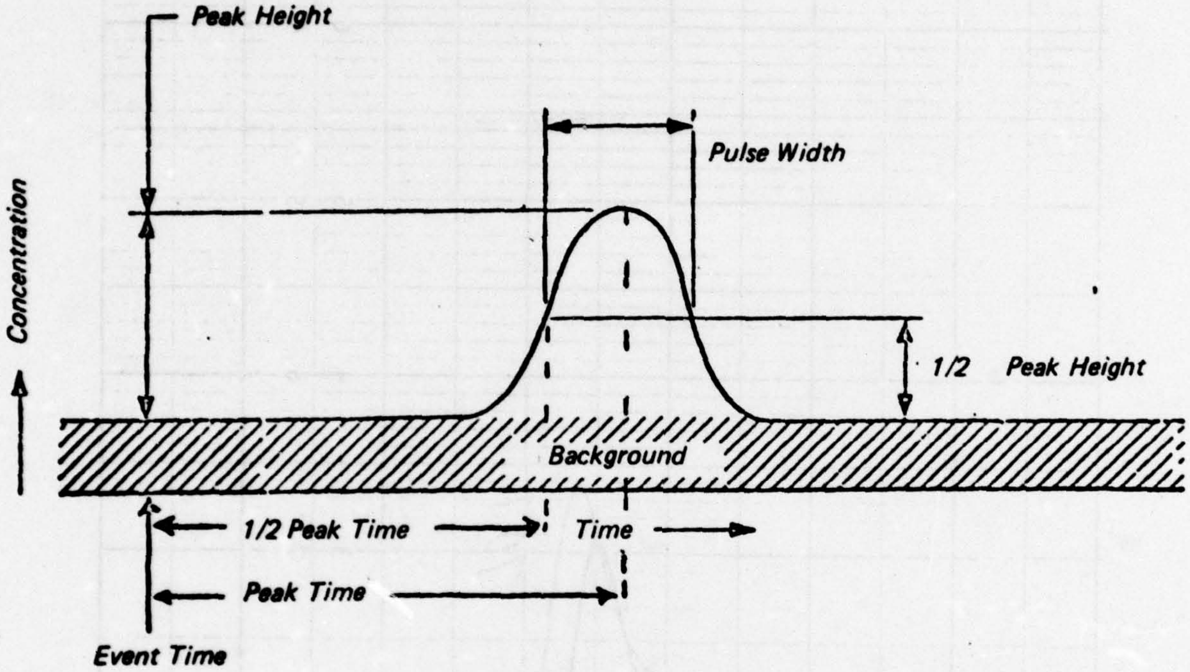


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Figure A-8 Pollution Parameter Definition

- Direction of aircraft movement
- Aircraft operation mode
- Wind speed and direction

form the basis of the data card of an event.

A general computer card format was designed as shown in Figure A-9 to incorporate the digitized strip chart values of CO, NO_x and THC, and the field observer logged information pertaining to the passage of each aircraft. The following is a description of the data identification fields used on the punched cards:

Card Column	Parameter Name	Code or Range	Description and Comment
1, 2	Event No.	01-99, 00-nn.	Event 100 is coded as 00, however they are numbered chronologically within each experiment series.
3-10	Time Period	MO	Month
		DY	Day
		HR	Hour (1-24)
		MN	Min
11	Aircraft Type	1	B-707
		2	B-727
		3	B-747
		4	DC-8
		5	L1011
		6	Concorde
		7	Turbo
		8	DC-10
		8	B737 (three tower only)
		9	DC9
		0 (zero)	DC-10 (three tower only)
		b̸ (blank)	Cessna (three tower only)
12	Mode of Operation	1	ENGINE start
		2	Take off
		3	Landing
		4	Taxi
13	Direction of Operation	1	East } Omitted in one-tower set
		2	West
		3	North
		4	South

Card Column	Parameter Name	Code or Range	Description and Comment
14, 15	Instantaneous Wind Speed	00-98	Miles per hour Note: 99 is missing value indicator
16, 17, 18	Instantaneous Wind Direction	50.0-99.0	Percent scale on strip chart recorder (100% = 540° 50% = 0°) Note: 99.9 is missing value indicator
19, 20	50 meter timing	0.0-9.8	(tenths of seconds) (omitted in one-tower set) Note: 9.9 is missing value indicator

The first 20 card columns are repeated within each set of cards corresponding to a specific event for each experiment series. Any exceptions appear in the above 'Description and Comments' column. In Figure A-9, the computer card format is shown. The fields from card columns 21 through 80 contain the digitized strip chart values of air quality data, and are described by sensor location within the next two subsections of Singe Event and Multipoint experiment descriptions.

A.3.2 Single Event Experiment Description

Outputs of 3 CO sensors arranged in a N-S direction to the north of the taxiway to Runway 19L and 3 NO_x sensors arranged in a SW-NE line to the east side of the end of Runway 19L constitute the data base for the two "Single Event" experiments. Since only 3 sensors were operative during each experiment, the digitized values obtained from the strip chart recorders are contained on a single card per event.

A.3.3 Tower Demonstration Data

A.3.3.1 Experiment Description

Three series of experiments were conducted using meteorological towers. The first made use of a single tower located near the south edge of the main ramp, west of Runway 19L. Two additional "ground level" CO sensors were arranged inline southward from the tower, involving a total of 6 CO sensors. The ground level tower sensor also recorded

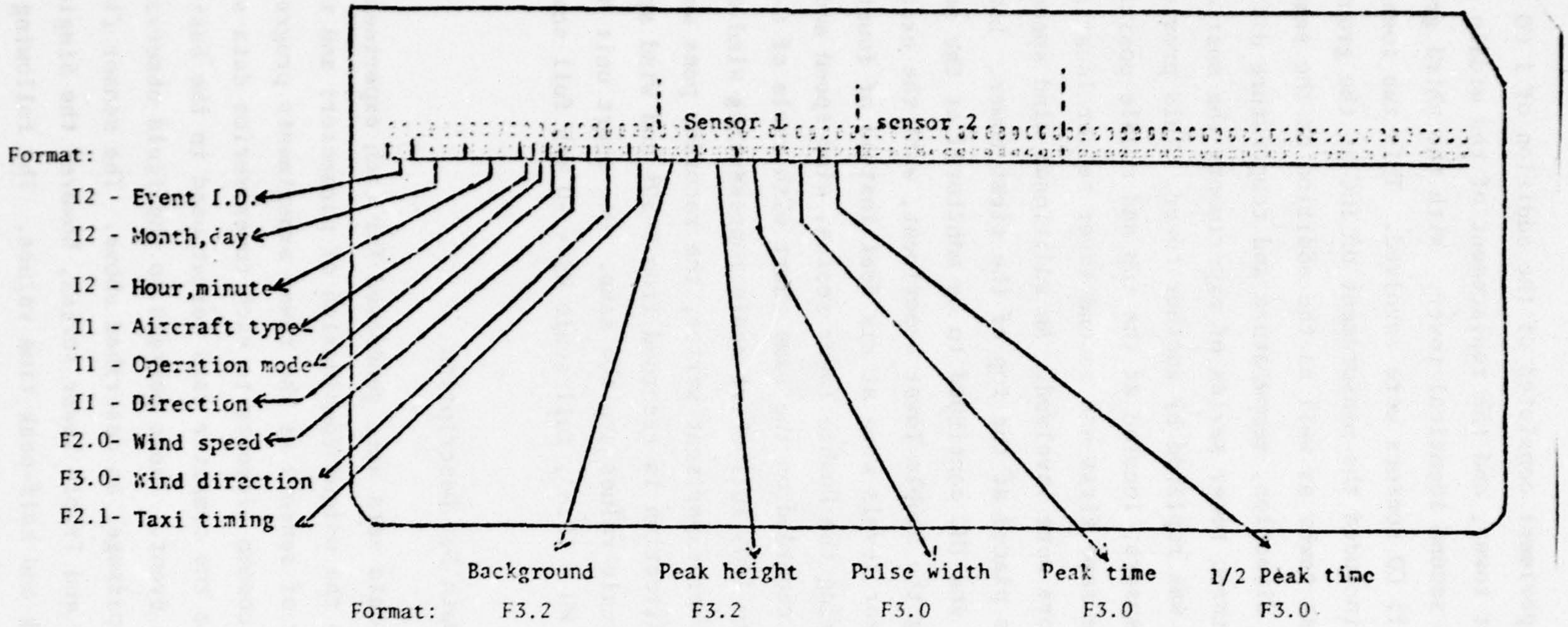

Figure A-9 Data Card Format

THC. The second experiment consisted of the addition of 1 CO sensor at the top of the first tower, and the replacement of the middle ground level sensor with a second identical tower. With the third ground level sensor, a total of 11 CO sensors were involved. This two tower experiment grouping also included the measurement of THC at the ground level position of the first tower as well as the addition at the same location of wind speed, wind direction, temperature and temperature differential.

For the final three tower series of experiments the most distant ground level sensor was replaced by another tower. This provided an additional two CO sensors, located at the top and middle positions corresponding to the same first and second tower sensor locations. A total of 13 CO sensors were involved. An additional wind speed and wind direction sensor was placed at the top of the first tower. Lower level meteorological data and THC continued to be monitored at the same locations as used during the Double Tower experiment, with the exception that the lowest sensor levels were at six feet instead of fourteen feet. Important note: during the Double Tower series, wind speed and wind direction data were recorded on the same chart with scale of 0-50% = wind speed, and 50 to 100% full chart scale representing wind direction. During the Triple Tower experiment series, the recorder pens were reversed, and wind direction is recorded from 0-50% and wind speed from 50 to 100%. [Both scale values are the same. One chart unit WS = 1 mph, 1 chart unit WD = 10.8°, full scale WS = 50 mph full scale WD = 540°.]

A.3.3.2 Data Set Description

Three separate data sets were generated for each experiment grouping. This is due to the unique combination of parameters and their increase in quantity of sensors as the tower experiments progressed. There are, however, common elements to each tower series data set which are incorporated into the computer card format used in the basis of the identification of an event. These pertain to the field observers records of aircraft passage, as described above. The sensor fields are valid for the Double and Triple Tower series, however the Single Tower data omitted the peak and half-peak time values. The following describes the air quality and meteorological data as coded on computer punch cards:

1) ONE TOWER DATA - CO (one card/event)

Card Column	Sensor ID	Parameter
21-23	20T	-divisions above background (F3.1)
24-26		-pulse width @ half peak (sec) (F3.0)
27-29	21T	Repeated as for 20T
30-32		
33-35	22T	Repeated as for 20T
36-38		
39-41	23T	Repeated as for 20T
42-44		
45-47	25G	Repeated as for 20T
48-50		
51-53	26G	Repeated as for 20T
54-56		
57	none	Blank
58-60		Background

2) TWO TOWER DATA (four cards per event)

a. CO data -

Since, as shown in Figure A-9, there are four allowable sensors per card, the following comprise the data set:

Card 1: Sensors 27T, 20T, 21T, 22T.

Card 2: Sensors 23T, 28TT, 29TT, 30TT.

Card 3: Sensors 31TT, 32TT, 26G, 23THC.

b. Met data -

Card 4 - The first 20 card columns are identical to the first three cards. The remaining columns contain measured and digitized wind speed, direction and turbulence data according to the following format:

Card Columns	Parameters
21-25	3 min. ave. wind speed, $\overline{u}$, (mph), for time centered upon event
26-30	3 min. ave. wind direction, θ, (deg) for time centered upon event
31-35	σ_θ (deg) for 3 min. sample of 6-sec averaged values
36-40	σ_v (mph) = $\sigma_\theta \cdot \overline{u} \cdot$ (1 rad/57.3 deg)
41-45	ΔT = temperature difference and first tower between 14 and 67 ft. 3 min average starting at clock interval closest to event time
46-50	ΔT_2 = same as ΔT, but 18° min average centered on events 3 min. period
51-55	$\overline{T}$ ambient air temperature, hourly average estimate.
56-60	Pasquill Turner stability class (4 = neutral)

c. THREE TOWER DATA SET - CO data (4 cards per event)

Card 1: Sensors 27T, 20T, 21T, 22T
Card 2: Sensors 23T, 28TT, 29TT, 30TT
Card 3: Sensors 31TT, 32TT, 34TTT, 33TTT
Card 4: Sensors 26TTT, 23THC

A.3.3.3 Strip-Chart Data Summary for Tower Experiments

Available are 4 volumes containing xerox reductions of strip chart images categorized by aircraft event, separated by date corresponding to each series of tower experiments. Table A-5 is a summary by aircraft types. Tables A-6(a) - A-6(c) provide a distribution of events by date for the Single, Double and Triple Tower experiment series. Contained within each volume is a listing of each event number, time and type of aircraft passage.

TABLE A-5

SUMMARY BY AIRCRAFT TYPE
FOR
ONE, TWO AND THREE TOWER EXPERIMENTS

Aircraft Type	One Tower	Two Tower	Three Tower	Total
B 707	46	31	49	126
B 727	15	34	27	76
B 747	15	3	8	26
DC-8	11	5	12	28
L 1011	17	0	15	32
SST	9	1	9	19
Turbo	0	0	1	1
B 737	0	0	5	5
DC-9	2	0	3	5
DC-10	21	0	18	39
Cessna	0	0	3	3
A-37	0	0	21	21
Total	136	74	173	383

Table A-6 a

DISTRIBUTION OF EVENTS BY DATE

I Single Tower

	Date	Event No.
1	11/1/76	1 - 15
2	11/4/76	16 - 20
3	11/5/76	21 - 33
4	11/7/76	34 - 45
5	11/8/76	46 - 59
6	11/10/76	60 - 86
7	11/11/76	87 - 99
8	11/12/76	100 - 123
9	11/13/76	124 - 137
10	11/15/76	(2 unnumbered)

Table A-6 b

DISTRIBUTION OF EVENTS BY DATE

II Double Tower

	Date	Event No.
1	2/21/77	1 - 4
2	2/26/77	5 (6 & 7)
3	2/28/77	8 - 12
4	3/2/77	13 - 19
5	3/4/77	20 - 32
6	3/7/77	33 - 45
7	3/8/77	46 - 50
8	3/15/77	51 - 62
9	3/19/77	63 - 66
10	3/23/77	67
11	3/24/77	68,69,70
12	3/26/77	71 - 78
13	3/31/77	79,80

Table A-6 c

DISTRIBUTION OF EVENTS BY DATE

III Triple Tower

	Date	Event No.
1	6/27/77	1 - 18
2	7/6/77	19 - 23
3	7/14/77	24 - 50
4	7/15/77	51 - 58
5	7/22/77	59 - 75
6	7/26/77	76 - 129
7	7/27/77	130 - 160
8	7/22/77	161 - 174 (A-37 only)

APPENDIX B

SINGLE EVENT MODELING METHODS

B. SINGLE EVENT IMPACT MODELING

B.1 Statistical/Empirical Models

The advantage of statistical models is that they summarize the observational data in an informative manner as well as suggesting the relative importance of measured variables, without relying upon elaborate knowledge of the mechanisms producing the results. Statistical methods are most efficiently employed when a specific hypothesis is first formulated for testing. When statistical methods are used to "explore" the data for meaningful relations, there is always a finite chance that a "statistically significant" correlation or regression will be found where none actually exists. It is thus best to examine the physical relationships of the variable chosen for correlation or regression analysis so that highly cross-correlated variables can be excluded, to avoid confusing the analysis.

The single event twin-tower experiments have been summarized, (Appendix C) stratified according to aircraft type, to compare the means, standard deviations, and ranges of the most important variables. Simple linear correlations and cross plotting of measured concentrations and estimated doses vs. wind and turbulence variables and aircraft speed are carried out to provide the initial insights into the strengths of expected trends or relationships. The multilinear regression process makes efficient use of each measurement by allowing it to contribute information about the effects of several variables simultaneously. As in Section _ a relation of the form:

$$E(y) = \beta_o + \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_m x_m \qquad \text{(B-1)}$$

where $E(y)$ is the expected value of the dependent variable y, and x_1, $x_2 \ldots x_m$ are the values of the m independent variables, is sought.

For the development of a single event model, the dependence of concentrations and doses upon the wind speed and direction and turbulence intensities examined initially. As expected, the plume transport path geometry and factors affecting plume rise were important when a sufficient number of cases were examined. Since aircraft type is a variable that does not have a continuous scale of values, stratification of the data set by that variable helped to maintain regression model sensitivity.

B.2 Transport Models

As discussed in Section 7, pollutant transport and dispersion models which attempt to describe the pathway and/or concentration distribution of materials downwind of their source are frequently employed as alternatives to statistical interpretations of experimental results. Both the Gaussian models and numerical advection diffusion calculations, described below, derive from the differential equation describing the conservation of mass under advection and diffusion:

$$\left(\frac{\partial}{\partial t} + u\frac{\partial}{\partial x} + v\frac{\partial}{\partial y} + w\frac{\partial}{\partial z}\right)\chi = k\nabla^2\chi \qquad \text{(B-2)}$$

where χ is the pollutant concentration and u, v and w are the components of the mean wind velocity in the x, y and z directions, respectively. The Gaussian form of the solution was seen by Gifford (1960) to be analogous to the empirical diffusion equations used by Sutton (1932) and Pasquill (1959), and it is that form that has come into most frequent use. As presented in the <u>Turner's Workbook of Atmospheric Dispersion Estimates</u> (1970), the general form of the equation for estimating pollutant concentrations from a continuous point source is:

$$\chi(x,y,z,H) = \frac{Q}{2\pi\sigma_y\sigma_z u}\exp\left[-1/2\left(\frac{y}{\sigma_y}\right)^2\right]\cdot$$

$$\left[\exp\left[-1/2\left(\frac{z-H}{\sigma_z}\right)^2\right] + \exp\left[-1/2\left(\frac{z+H}{\sigma_z}\right)^2\right]\right] \qquad \text{(B-3)}$$

where

(x,y,z) are the (along wind, cross-wind, and vertical) components of a Cartesian coordinate system

χ is the pollutant concentration (mass/volume)

H is the effective height (stack height plus plume rise) of emission, and therefore the centerline height of the plume (length)

Q is the source strength (mass/time)

σ_y, σ_z are dispersion coefficients that are measures of crosswind and vertical plume spread. These two parameters are functions of downwind distance and atmospheric stability (length)

u is average wind speed (length/time)

The source base is at $z = 0$ in the coordinate system, and the plume centerline reaches the equilibrium height H (plume rise plus stack height) at some distance downwind from the source. The most important assumptions upon which the equation is based are the following:

1) The wind speed and direction are constant throughout the period of interest.
2) The plume rises until it reaches an equilibrium altitude; thereafter the plume centerline height remains constant at all further downwind distances.
3) The distribution of concentration values off the centerline is given by the product of two Gaussian distributions, one in the y-direction and one in the z-direction.
4) The concentration profiles described by the Gaussian form are not "instantaneous" plume profiles; they represent concentrations averaged over one hour. Consequently, they incorporate the normal variability of wind flow for this time period.
5) None of the effluent is lost from the plume. Therefore, when the plume intersects the ground surface, it is assumed that all material is reflected back above the ground.
6) The effluent rate is constant, and the meteorological parameters determining plume geometry are constant; (i.e., the equation represents steady state conditions).

Because this form of the Gaussian model is not entirely appropriate for emissions from a single aircraft traveling down a taxiway or a runway, the next three sections describe each of three modified, or quasi-instantaneous, approaches to this Gaussian form of model. Also described is a numerical advection method for solving the same original transport equation. All of these approaches are expected to be more appropriate than equation (B-3) for modeling the concentrations in the near field of a taxiway or runway.

B.2.1 Quasi-Instantaneous Gaussian Models

When single-event concentrations are to be predicted, the instantaneous line source form appears immediately to be the most correct form, since we are concerned with the passage of a single source (the airplane) along a line (the runway). When many airplanes are in continuous transit along the runway with only negligible spacing in between, it is normal to sum up their contributions and arrive at the usual "continuous" line source" form of the Gaussian equation commonly used in highway modeling. In the analysis of the single-event data (Section 6), three different modeling methods have been compared against measurement data obtained at Dulles Airport.

These methods differ only in the derivation of plume spread parameters σ_x and σ_z. In each case, the derived parameters are utilized with a single "instantaneous line source" form of the Gaussian diffusion equation to determine the expected peak concentration at each sensor. The instantaneous line source equation is derived below.

Instantaneous Line Source Gaussian Equation

In order to derive the Gaussian diffusion equation for an instantaneous line source at height, H, it is convenient to rearrange Equation B-3:

$$\chi(x,y,z,H) = \frac{Q}{u}\,\frac{1}{\sqrt{2\pi}\,\sigma_y}\left\{\exp - \frac{1}{2}\left(\frac{y}{\sigma_y}\right)^2\right\}$$

$$\cdot\ \frac{1}{\sqrt{2\pi}\,\sigma_z}\left\{\exp - \frac{1}{2}\left(\frac{z-H}{\sigma_z}\right)^2 + \exp - \frac{1}{2}\left(\frac{z+H}{\sigma_z}\right)^2\right\} \qquad \text{(B-4)}$$

where χ is the pollutant concentration in g/m^3, Q is the source strength in g/sec, u is the mean wind speed in m/sec, and σ_y and σ_z are the standard deviations of plume spread in the lateral and vertical directions, respectively.

This form of Gaussian equation allows for "perfect reflection" of pollutants by folding over the vertical distribution at ground level. The result is a doubling of the surface concentration through the second of the curly bracket terms, as can be shown by setting the height, z, to zero.

The two curly bracketed terms are, respectively, the "probability densities" of pollutant mass in the y and z directions. The area under each probability density curve is, by definition, unity.

The conversion from the continuous point source form to the instantaneous line source form of the Gaussian equation is straightforward. The continuous point source distribution is Gaussian along the y-axis, and constant along the x-axis. Conversely, for the instantaneous line source, the distribution is Gaussian along the x-axis (normal-to-the-runway axis), and constant along the y-axis (runway axis). The probability density along the x-axis may be written as

$$P(x) = \frac{1}{\sqrt{2\pi}\,\sigma_x} \left\{ \exp - \frac{1}{2} \quad \frac{Xm}{\sigma_x} \quad ^2 \right\} \qquad \text{(B-5)}$$

where Xm is the distance along the normal from the plume centerline or parallel to the mean wind component normal to the runway. Since the distance, Xm, is measured along the normal wind axis from the plume centerline, we have to take into account the motion of the plume centerline as advected by the wind normal to the runway. If x is measured in a stationary coordinate system from the runway centerline to a sensor at distance d_2, then the transformation to the moving coordinate system (Xm) yields:

$$X_m = d_2 - u_n t \qquad \text{(B-6)}$$

Where u_n is again the component of the mean wind normal to the runway. When θ is the angle between the mean wind direction and the normal to the source line, then $u_n = u\cos\theta$. The coordinate system outlined above is depicted in Figure (B-1). The probability density along the x-axis now coincides with that given by Sutton (1932), as used by Turner (1970) in equation 5.21:

$$P(x) = \frac{1}{\sqrt{2\pi}\,\sigma_x}\left[\exp - \frac{1}{2}\left(\frac{d_2 - u_n t}{\sigma_x}\right)^2\right] \qquad \text{(B-7)}$$

Here, $P(x)$ reaches a maximum when $d_2 = u_n t$, or the centerline of the plume blows over a sensor at distance, d_2, from the runway centerline.

The only remaining problem is that of defining the proper line source emission term, g [gm/m]. The term Q/u in the continuous point source equation does have the proper units, but we must redefine the velocity u in the transformation to the instantaneous line source form. Three velocity vector components along the runway axis can serve to stretch and compress the plume and alter the emission rate per unit meter. They are: (1) the component of the mean wind speed, $u_p = \bar{u} \cdot \sin\theta$, parallel to the runway (along the y-axis); (2) the jet exhaust velocity u_j (y); and (3) the aircraft taxi speed, s.

Lacking satisfactory knowledge of the jet exhaust velocity as a function of down-runway distance, only the effects of s and u_p have been considered in this analysis; so that

$$q = \frac{Q}{s + u_p} \qquad \text{(B-8)}$$

rather than

$$q = Q/(s + u_j\ (y) + u_p) \qquad \text{(B-9)}$$

Substituting $P(x)$ (Equation B-7) for

$$\frac{1}{\sqrt{2\pi}\,\sigma_y} \exp\ (-1/2\ \frac{y^2}{\sigma_y{}^2}) = P(y) \qquad \text{(B-10)}$$

in Equation B-3 and using the redefined source term (B-8), the resultant form of the instantaneous line source equation, as used in the preliminary analysis is:

$$\chi(x,y,z,H) = \frac{q}{2\pi\,\sigma_x\sigma_z}\,\exp\left[-\frac{1}{2}\left(\frac{x-u_n t}{\sigma_x}\right)^2\right]$$

$$\cdot\left\{\exp\left[-\frac{1}{2}\left(\frac{z-H}{\sigma_z}\right)^2\right]+\exp\left[-\frac{1}{2}\left(\frac{z+H}{\sigma_z}\right)^2\right]\right\} \qquad \text{(B-11)}$$

In trial analyses, plume rise was characterized by three different methods. The first characterization assumes no plume rise, so that the mean plume height stays at the mean exhaust emission height. The other two characterizations are the expressions fit statistically by R. J. Yammartino (March 1977) to the data from the November 1976 single-tower experiment. His first expression is based on a mean plume height, the second on a Gaussian plume height.

At the first tower, the three plume rise characterizations express the plume centerline height as

$$H = A_{1,2} + B_{1,2}/\sqrt{u}$$

where u(mph) is the wind speed for each single event. The subscripts 1 and 2 refer to two sets of aircraft types (see Table 7-2). Values for the parameters are:

	No Plume Rise	Mean Height	Gaussian Centerline
A_1(ft)	mean exhaust height	24.7	-2.6
A_2(ft)	mean exhaust height	29.7	9.1
B_1(ft mph$^{1/2}$)	0	20.5	65
B_2(ft mph$^{1/2}$)	0	9.9	43

In the analysis, plume rise was assumed to be complete by the time the plume reaches the first tower. Thus, H was assumed to be identical at all sensor distances downwind of the taxiway or runway.

Modeling Approaches Used to Define Sigmas

In order to evaluate the Gaussian diffusion equation, the standard deviations of plume growth, σ_x and σ_z, must be known. This analysis explores the methods used to quantify σ_x and σ_z through three methods: (1) a method suggested by Turner using Pasquill-Gifford-Turner dispersion parameters, (2) a method based on the measured turbulence data at Dulles airport during the experiment, and (3) a circular jet method. The first two methods are chosen because of their frequent usefulness in obtaining estimates of concentrations or doses from Gaussian models. The 3rd method, the circular jet approach, is chosen in order to realistically model the physical process of jet engine wake dispersion (see Lin, 1958).

At time, t = 0, all three methods assume an instantaneous line source centered along the runway, as indicated in Figure (B-1). At the aircraft itself, the plume is assumed to have an initial volume based on the engine geometry of the particular aircraft being modelled. Behind the aircraft, the volume of the plume grows in direct proportion to the growth rates of σ_x and σ_z. When the initial size of the plume is greater than zero, the usual course is to describe a virtual source distance, S_v, at which the plume dimensions extrapolate to a zero source volume. Thus, σ_x and σ_z will be always proportional to the distance from the virtual source.

Dispersion parameters at any down-plume distance can then be expressed as functions:

$$\sigma_x = f\left(d_2\sqrt{1 + \left(\frac{s + u_p}{u_n}\right)^2} + S_v\right)$$

$$\sigma_z = g\left(d_2\sqrt{1 + \left(\frac{s + u_p}{u_n}\right)^2} + S_v\right) \qquad \text{(B-12)}$$

where d_z is the distance of the sensor normal to the runway at which σ_x and σ_z are to be quantified.

From the plume's initial location along the runway at time, t = 0, the plume is advected by the component of the mean wind, u_n, normal to the runway. Figure (B-1) illustrates this process as the plume is advected by $u_n = \overline{u}\cos\theta$ from the runway to the sensor at $d_z = 165.5\text{m} = u_n t$. During this same time t, the portion of the plume at the sensor has travelled a distance from the plane, parallel to the runway, $d_1 = (s + u_p)t$, where $u_p = \bar{u}\sin\theta$ is the component of the mean wind parallel to the runway (neglecting the contribution of the jet exhaust velocity, $u_j(y)$ in transporting plume mass away from the aircraft). Therefore, the distance that exhaust is transported from the aircraft to the sensor is:

$$D = \sqrt{d_1^2 + d_2^2} = d_2 \sqrt{1 + \frac{s + \bar{u}\sin\theta}{\bar{u}\cos\theta}^{2}} \qquad \text{(B-13)}$$

so that, in equation (B-12) above

$$\begin{aligned} s_x &= f\,(D + S_v) \\ s_z &= g\,(D + S_v) \end{aligned} \qquad \text{(B-14)}$$

where the functions f and g depend on the method used. A description of each method and the critical assumptions necessary in their use follows.

Pasquill-Turner Method

The initial volume of the plume is taken so that 4.72 σ_x equals the exhaust span and 4.72 σ_z equals twice the height of the highest engine above ground. Thus, the initial plume width in each dimension is taken as two pulse widths (one pulse width at half peak height equals 2.36σ). This is the same as saying that 99% of the plume mass is contained between the two most widely spaced exhaust jets in the horizontal and between the ground surface and twice the height of the highest exhaust jet in the vertical. These initial source dimensions are described pictorally in Figure (B-1). Observations of aircraft exhaust plumes closely support these choices of initial source dimensions. Two virtual source distances are described, one based on the initial σ_x at the aircraft, and one based on the initial σ_z at the aircraft. (See equation B-12.) The sigmas are then quantified at sensor distances d_2 = 65, 115, 165 meters by the look-up tables in Turner (1970, Figures 3.2 and 3.3).

Critical assumptions to this method are:

a) The growth rate of the standard deviation normal to the runway, σ_x, can be described by σ_y growth curves from Turner (1970).

b) Although a quasi-instantaneous line source is being modeled, the σ_x's and σ_z's chosen are those used to describe spread from continuous sources. This choice is based upon the fact that the source is somewhat more persistent than a puff-like source.

c) The only contribution of the jet exhaust dynamics is to "advect" pollutant mass parallel to the runway. This approach assumes that jet exhaust dynamics plays no role in diffusing the plume normal to the runway.

d) The effect of wake caused by the body of the aircraft, as it obstructs the mean wind flow, can be entirely taken into consideration by the choice of the above mentioned initial source volume.

e) At the runway centerline, the plume is assumed to have a Gaussian distribution, although one might expect the plume to be composed of the superimposed Gaussian distributions of spread from each individual engine exhaust.

f) The plume does not grow appreciably in the time its width from $+2\sigma$ to -2σ passes the sensor. This assumption has no effect on the centerline plume prediction but will cause errors in off-centerline predictions and derived pulse lengths. An allowance for plume spread during transit past a sensor should be made in order to compare predicted pulse lengths to observed pulse lengths. Experimental data suggests that the plume grows appreciably as it passes a sensor; many of the pulses on the strip chart are log-normal.

g) The taxi path of the aircraft is sufficiently long to allow a steady-state situation to develop. The model will be in error if the aircraft turns at the end of the taxiway while it is still contributing pollutant mass to any sensor. Such cases should be analyzed in a different manner, as by the Argonne Line Source Model.

<u>Turbulence Measurement Data Method</u>

The standard deviations of plume growth σ_x and σ_z, can be derived at any downwind distance by knowing either the standard deviation of the azimuthal wind angle, σ_θ, or the turbulence intensity, σ_u/u.

Based on σ_θ, the relationships are:

$$\sigma_x = a\sigma_\theta \, (D + S_{v_x})^b$$

$$\sigma_z = c\sigma_\theta \, (D + S_{v_z})^d \qquad \text{(B-15)}$$

where a, b, c, and d are coefficients tabulated in Slade, 1965 (page 134, Table 4.7).

Based on σ_u/u, the relationships are (Pasquill, 1974):

$$\sigma_x = \sigma_u (D + S_{v_x})/u \qquad \text{(B-16)}$$

$$\sigma_z = 0.6\ \sigma_x \quad \text{for neutral conditions}$$

$$= \sigma_x \quad \text{for moderately unstable conditions}$$

Both of these approaches were tested in the analysis. The parameters σ_θ and σ_u/u were derived from the measured turbulence data, and $D+S_{v_{x\ \text{or}\ z}}$ was computed as in the Pasquill-Turner method. Critical assumptions a) and c) through g) from the Pasquill-Turner method also apply here.

Axisymmetric Jet Method

It is well documented (see Lin, 1958) that an axisymmetric (circular) jet in a boundary-free medium growing in width, D_e, with respect to downwind distance can be described by:

$$2\sigma_x = D_e = 2d \tan \phi \qquad \text{(B-17)}$$

where d is the downplume distance from the source, and $\phi = 5°$ is the radial growth angle.

The modeling method here is still quite similar to the Pasquill-Turner method and can also be described by Figure (B-1). The only real difference here is that the above linear growth formula is used to derive σ_x instead of Turner's sigma curves. Also, since the growth is circular in the circular jet approach, $\sigma_z = \sigma_x$ is assumed.

The virtual source distance S_v, can be defined through trigonometry as:

$$S_v = \frac{L_H}{2 \tan \phi} \qquad \text{(B-18)}$$

where L_H is the exhaust span in the horizontal.

Only one virtual source distance is described here and it is dependent only on the horizontal exhaust span and independent of the height of the exhaust jets. This is critical to the circular jet method since the method is based on the assumption that the plume always has equal horizontal and vertical dimensions and it is not, therefore, theoretically correct to describe the plume as anything but circular. Thus, the horizontal exhaust span depicted for the Pasquill-Turner and Turbulence Data Measurement Methods in Figure (B-2) is, for the Circular Jet Method, also taken as the initial vertical width.

The complete formula for σ_x and σ_z is:

$$\sigma_x = \sigma_z = \tan\phi \left(d_2 \sqrt{1 + \frac{s^2}{u^2}} + \frac{L_H}{2\tan\phi} \right) \qquad \text{(B-19)}$$

The concentration, χ, is computed as before. The critical assumptions to this approach are:

a) Diffusion is a consequence of only the dynamics of the jet exhaust plume itself. The contribution of mixing due to turbulence in the ambient air has been considered small, in this preliminary analysis. In later analysis, ambient turbulence may be shown to become important after some down-plume distance where jet-generated turbulence has decayed to such an extent as to have comparable intensity or eddy diffusity as the situation in the ambient air.

b) A basic assumption is that we are, indeed, describing a circular jet, even though the horizontal exhaust span, L_H, is much longer than the vertical exhaust span, L_V. Indeed, the approximation of a plane jet (very long width, very short height) may be more valid. In this case, Lin (1958) suggests using a half-width growth angle in the horizontal of 6-1/2° rather than 5°. The half-width growth angle in the vertical, however, is not well documented, since few experiments can sufficiently match the plane jet in its theoretical limit: infinite width, zero height.

Assumptions (e), (f) and (g) from the Pasquill-Turner method above also apply to this approach.

B.2.2 Quasi-Continuous Gaussian Models

The transport model utilized in the AVAP program is based upon the Argonne Puff Line Model approximation to the continuous Gaussian form of line source model identified at the beginning of the previous section. The Puff Line Model is conventionally used in AVAP with source and meteorological data and dispersion parameters that most nearly represent hourly average behavior of a continuous source. In the current model development effort, the basic Puff Line Model has been modified to incorporate "instantaneous" (three minutes) meteorological data and dispersion parameters. The assumption of a continuous rate of emission over the length of the source aircraft's path is made here, but the assumption is also made that the period of emission is short compared to the transport time to the sensor receptors. A more approximate assumption that accompanies use of this form for analysis is that the period of peak concentration passage (or dose accumulation) is small compared with the (three minute) averaging time for the meteorology. The advantage of the Gaussian Puff Line Model is its ability to accurately calculate dispersion rates for wind angles which are nearly parallel to the taxiway, and the ability to handle accelerating or decelerating sources. A detailed description follows.*

To treat long thin sources and, in particular, mobile sources such as aircraft and motor vehicles, a general line source model has been developed. The basic theory of the Line Source Model is presented in this section. For further discussion of the theory the interested reader is referred to (Wang and Rote, 1975; Rote and Wangen, 1975).

The basic line source equations can be derived using an approach similar to that used in the Puff Model. We begin by assuming that the effluent emitted over a time duration τ, from a finite straight line segment, can be treated as a sequence of long thin "puffs" or "linear puffs" extending over the length of the line segment. In other words, if the average concentration at the receptor is given by:

$$\overline{\chi} = \frac{1}{\tau} \int C(t)dt, \qquad \text{(B-20)}$$

where C(t) is the time dependent concentration, then we are assuming that this expression can be replaced by the alternative expression:

$$\overline{\chi} = \sum_i \overline{\chi}_i = \sum_i \frac{1}{\tau} \int C_i(t)dt \qquad \text{(B-21)}$$

where $C_i(t)$ represents the contribution to the receptor concentration from the ith linear puff as a function of the time. The duration τ is taken to be the averaging time (= 1 hour) over which the meteorological parameters are considered constant. It is further assumed that the

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*This description has been prepared by the original authors of the Puff Line Model, D. M. Rote and L. E. Wangen.

time of formation τ_i of each puff is short compared to the averaging time t and that each puff rapidly comes to rest relative to the ambient air mass. The effect of the penetration of a jet exhaust plume into the ambient air due to the high exhaust velocity is discussed in Appendix B.

With these assumptions, it is convenient to treat the transport of a linear puff of pollutant using the Green's function technique. For a ground-level horizontal line source at an angle ϕ relative to the wind, we can write the concentration due the release of such a puff, at the receptor point (x,y,z) averaged over the period τ as:

$$\overline{\chi}_i = \frac{1}{\tau} \int_o^\tau dt \int_o^L d\,\xi\; K\,(x,y,z;\xi,t)\; q_i \qquad \text{(B-22)}$$

where q_i is the linear mass density of the puff, and L is the length of the straight line segment.

In general, the linear mass density q will be a function of position along a particular line source. For the present, only uniform linear mass densities will be considered. (The topic of non-uniform emission densities will be discussed in detail later.) For the special case of constant density,

$$q_i \left[\frac{\text{Mass}}{\text{Length}}\right] = \frac{Q_i\ (\text{Mass})}{L(\text{Length})}$$

where Q_i = the total mass of the puff. K (x,y,z;ξ,t) is known as the transport kernel and can be expressed as

$$K\,(x,y,z;\xi,t) = (2\pi)^{-3/2}\,\sigma_h^{-2}\,\sigma_z^{-1}\,\cdot$$

$$\exp - \left[\frac{(x - \xi\cos\phi - ut)^2 + (y - \xi\sin\phi)^2}{2\sigma_h^2} + \frac{z^2}{2\sigma_z^2}\right] \qquad \text{(B-23)}$$

where ϕ is the angle of the line relative to the x-axis. In writing down the above expression, we have temporarily ignored ground reflection and lid effects and chosen the x-axis of the coordinate system along the wind vector $\underset{\sim}{u}$ with the origin of the coordinates at one end of the line. Furthermore, we have assumed that the turbulent diffusion of pollutant about the centerline drawn downwind from each infinitesimal line element $d\xi$ can be represented in terms of the usual Gaussian horizontal and vertical dispersion coefficients σ_h and σ_z, respectively. These coefficients are assumed to be functions of the stability and travel time.

If $\overline{t}$ = the travel time for a puff, then, since we have assumed that τ_i is short compared to t, it follows that the exposure time of the receptor to the puff will be limited to the time interval from $\overline{t} - s_i/2$ to $\overline{t} + s_i/2$, where the exposure time duration (s_i) is less than τ. In other words, the transport kernel K $(x,y,z;\xi,t)$ is highly peaked in the neighborhood of $\overline{t}$ so that one can effectively rewrite the integral in Equation B-22 as

$$\overline{\chi}_i = \frac{1}{\tau}\int_{-\infty}^{\infty} dt \int_{0}^{L} d\xi \; q_i \; K\,(x,y,z;\xi,t). \qquad \text{(B-24)}$$

Furthermore, provided K $(x\ y,z;\xi,t)$ is sufficiently peaked at $t = \overline{t}$, it is permissible to replace the functions $\sigma_h\,(t)$ and $\sigma_z\,(t)$ by their values at $t = \overline{t}$, i.e., $\overline{\sigma}_h = \sigma_h\,(\overline{t})$, $\overline{\sigma}_z = \sigma_z\,(\overline{t})$ inside the integral. Consequently, for uniform emission density, the average concentration can be approximated by

$$\overline{\chi}_i = 2^{-1}\,(2\pi)^{-1/2}\left(\frac{q_i}{u\tau}\right)(\sin\phi\,\overline{\sigma}_z)^{-1}\exp\left(-\frac{z^2}{2\overline{\sigma}_z^2}\right)\cdot$$

$$\operatorname{erf}\left(\frac{L\sin\phi - y}{\sqrt{2}\,\overline{\sigma}_h}\right) + \operatorname{erf}\left(\frac{y}{\sqrt{2}\,\overline{\sigma}_h}\right). \qquad \text{(B-25)}$$

The division of a long line into short segments to insure the criterion $s_i < \tau$ is performed automatically within the line source dispersion model computer program. However, no attempt is made within the computer program to subdivide the width of the line. Hence, for a line of width W, after a sufficiently long travel time T, the condition $s_i > \tau$ will be violated. In other words, assuming that the downwind plume dimension is given by $2 * \sigma_h (J, T + T_W)$ where J is the stability, $T + T_W$ is the total travel time from a pseudo upwind zero width line source, a value of T exists such that, for greater travel times,

$$2 * \sigma_h (J, T + T_W) > \tau * WS. \tag{B-26}$$

For the extreme conditions of stability J = 1, τ = 1 hour, and WS = 1 m/sec, we find that, using the dispersion curves of Figure 13, $s_i > \tau$ when $T + T_W > 3{,}000$ sec. Under such conditions an approximation to the hourly average concentration could be computed for any given hour during the exposure of the receptor to the plume by multiplying χ_i by τ / s_i.

When the line is elevated to height H and ground reflection is taken into consideration the z dependent factor

$\exp\left(-\frac{z^2}{2\overline{\sigma}_z^2}\right)$ should be replaced by

$$\exp\left(-\frac{(z - H)^2}{2\overline{\sigma}_z^2}\right) + \exp\left(-\frac{(z + H)^2}{2\overline{\sigma}_z^2}\right) \tag{B-27}$$

When one end of the line is at the origin and the other extends essentially out to infinity, the first error function in Equation (B-25) goes to 1, and Equation (B-25) reduces to the form

$$\overline{\chi}_i = 2^{-1} (2\pi)^{-1/2} \frac{q_i}{u\tau} (\sin \phi \; \overline{\sigma}_z)^{-1} \exp\left(-\frac{z^2}{2\overline{\sigma}_z^2}\right) \left\{1 + \mathrm{erf}\left(+\frac{Y^2}{2\overline{\sigma}_h^{\,2}}\right)\right\}. \tag{B-28}$$

The dispersion coefficients σ_y (J,T) and σ_z (J,T) already defined in connection with the short-term point and area source model are also used for σ_h and σ_z, respectively. The initial width Δy and height Δz of a physical line source are treated in analogy with the physical point and area sources by first assigning initial values of horizontal and vertical dispersion σ_{yo} and σ_{zo} and then computing the corresponding positions of pseudo upwind line sources. Returning to the total contribution due to a train of linear puffs, one can regard the train of puffs as resulting from a sequence of discrete events such as the movement of a number of aircraft or in the case of a continuous stream of automotive traffic as simply a mathematical artifice. In the former case, to compute the total $\bar{\chi}$, one can simply multiply $\bar{\chi}_i$ by the number of aircraft movements provided that they occur within the appropriate time period. In the latter case, Q_i is replaced by the total emission Q for the line segment for the time period.

When the angle between the wind and the line becomes small and the line is short (see below), Equation B-28 can be approximated by its limiting expression at $\phi = 0$,

$$\bar{\chi}_{io} = 2^{-1} (2\pi)^{-1/2} \left(\frac{q_i L}{u\tau}\right) (\bar{\sigma}_h \ \bar{\sigma}_z)^{-1} \exp \left(- \frac{z^2}{2\bar{\sigma}_z^2} - \frac{y^2}{2\bar{\sigma}_h^2}\right) \quad \text{(B-29)}$$

The general expression for an inclined line source with angle of inclination θ is derived by Rote and Wangen, 1975.

In applying the above formulas to actual situations, it is important to bear in mind that the line geometry must be such that an instantaneous release from each line segment i must contribute to the receptor significantly only during an interval small compared to τ, i.e., $s_i < \tau$. Thus, for a long line source at small angles relative to the wind one should divide the line into shorter segments and evaluate effective $\bar{\sigma}_h$ and $\bar{\sigma}_z$ for each segment separately. It is precisely these considerations that prevent one from writing down a simple expression such as Equation B-25 for the long line in the small angle case. If a line segment is above the lid or if an inclined line penetrates the lid, that portion above the lid is excluded by the calculation.

B.3 Dispersion Parameter Averaging Times

According to Pasquill (1974) the relationship between the appropriate averaging time for wind and turbulence parameters and plume puff travel time is:

$$S = {}^{T}/\beta = {}^{X}/\bar{u}\beta$$

where S is the averaging time, T is the puff travel time to the receptor (monitor) at distance X, and β is the ratio of the Eulerian (measured at a fixed point) to the Lagrangian scale (moving with the mean wind $\bar{u}$).* As an example, for a puff moving at $\bar{u}$= 3 m/sec (∿7 mph) the appropriate averaging time for measuring the lateral speed of a puff at a monitor 60 m away is (60/4.5) = 5 sec as long as the sampling (or emissions) time is at least five times the 20 sec travel time. Selection of the optimum sampling and averaging times for standard reporting of wind parameters is complicated however, by four factors; (1) the times are functions of wind speed, (2) they are functions of monitors distance from the source, (3) the time period of release is difficult to determine (it may range from ∿1 to 30 sec for moving aircraft, while it may be virtually continuous in a cueing situation), (4) the use of chart speeds of 1-2 cm/min makes it difficult to accurately digitize data for averaging periods less than 6 sec, and finally, (5) the value of β is not known to have a constant value for all atmospheric stabilities.** Consideration of all of these factors, and the relatively large data base of research results that exist for sampling times of 3 min leads to the conclusion that fixed sampling and averaging times should be used for the estimation of turbulence parameters in the present analysis program. The present analysis results were based on the use of high speed wind charts will have wind direction and speed digitized every 6 sec for the 3 min period centered upon the passing of a monitored aircraft. This will enable calculation of $\sigma_\sigma \cdot x = \sigma_y$ and ${}^{\sigma u}/u \cdot x = \sigma_x$. These values can be used to estimate σ_z, the vertical dispersion parameter from;

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*Pasquill has established that β = 4 is a good estimate by its mean value.

**The Hay Pasquill measurements of β cover a range of 1.1 to 8.5.

$$\sigma_z \simeq z\ \sigma_y \quad z\ \sigma_x$$

These estimates of lateral dispersion parameters will be directly comparable to the Pasquill-Turner estimate for the 50 to 200 m distances over which continuous concentrations monitored. For greater distances these parameters should optimally be calculated according to the most recent recommendations of Pasquill (1976).

B.4 MINUIT* Program Used in Multiparameter Fitting Models

The CERN program MINUIT was used in the parameterization model. This program will minimize a function of N variables, compute the covariance matrix, and find at $\chi^2 = \chi^2_{MIN} + 1$ true errors. Three types of minimization methods are available to the user. They may be briefly characterized as follows:

1) Search for the minimum using a Monte Carlo method. This may be used at the beginning of a fit when no reasonable starting point is known, or when it is suspected that there are several minima. It does not converge in the usual sense.

2) Minimize using the simplex method of Nelder and Mead.** This is a "safe" and reasonably fast method when far from the minimum. It does not compute the covariance matrix, but it gives some estimate of its diagonal elements.

3) Minimize using a variable metric method by Davidon.† This is extremely fast near a minimum or in any "nearly-quadratic" region but slower if the function is badly behaved. It fails completely in regions where the covariance matrix is not positive-definite.

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*F. James and M. Roos, MINUIT, CERN D506, D516 1971.

**J. A. Nelder and R. Mead, The Computer Journal, 7, 308 (1967).

†W. C. Davidon, The Computer Journal, 10, 406 (1968).

APPENDIX C

SUPPLEMENTARY STATISTICAL SUMMARIES AND CROSS VARIABLE ANALYSES FOR SINGLE EVENT DATA

STATISTICAL SUMMARY OF SST ONE TOWER

		KEY			VAR NO	MEAN	S.D.	S.E. OF MEAN	SAMPLE	MAXIMUM	MINIMUM	RANGE
		1	WS	(mph)	1	13.3333	6.3246	2.1082	9	21.0000	2.0000	19.0000
		2	WD	(deg)	2	315.9995	16.5831	5.5277	9	346.0000	302.0000	44.0000
Tower #1	56'	3	X	(ppm)	3	2.2750	1.3615	0.4538	9	5.2500	1.0000	4.2500
		4	T	(sec)	4	36.0000	6.0000	2.0000	9	48.0000	30.0000	18.0000
	41'	5	X		5	2.1056	0.9342	0.3114	9	3.8750	1.1000	2.7750
		6	T		6	38.6666	7.4162	2.4721	9	54.0000	30.0000	24.0000
	26'	7	X		7	2.5361	1.3736	0.4579	9	5.1250	0.9500	4.1750
		8	T		8	38.0000	5.1961	1.7320	9	48.0000	30.0000	18.0000
	14'	9	X		9	2.2000	2.0298	0.6766	9	5.7500	0.2500	5.5000
		10	T		10	44.6666	13.4536	4.4845	9	72.0000	30.0000	42.0000
Sensor	25	11	X		11	0.5300	0.7362	0.3292	5	1.5000	0.0	1.5000
		12	T		12	20.4000	28.6496	12.8125	5	60.0000	0.0	60.0000
Sensor	26	13	X		13	0.2700	0.4353	0.1947	5	1.0000	0.0	1.0000
		14	T		14	31.2000	42.9325	19.2000	5	84.0000	0.0	84.0000
Tower #1	56'	15	dose		15	77.9833	37.3318	12.4439	9	157.5000	36.0000	121.5000
	41'	16	dose		16	78.2000	28.9433	9.6478	9	139.5000	46.2000	93.3000
	26'	17	dose		17	93.7666	46.6715	15.5572	9	184.5000	39.9000	144.6000
	14'	18	dose		18	87.9500	69.8802	23.2934	9	215.2500	9.0000	206.2500
Sensor	25	19	dose		19	27.6600	40.6433	18.1762	5	90.0000	0.0	90.0000
Sensor	26	20	dose		20	21.8400	36.4215	16.2882	5	84.0000	0.0	84.0000

STATISTICAL SUMMARY (ONE TOWER CO TESTS) FOR B - 707

KEY			VAR NO	MEAN	S.D.	S.E. OF MEAN	SAMPLE	MAXIMUM	MINIMUM	RANGE
		1 WS (mph)	1	12.8000	5.8914	0.8782	45	25.0000	0.0	25.0000
		2 WD (deg)	2	298.5842	80.2655	11.8345	46	356.0000	0.0	356.0000
Tower #1	56'	3 χ (ppm)	3	0.9739	0.7205	0.1062	46	2.7500	0.0	2.7500
		4 Γ (sec)	4	43.3042	23.1486	3.4131	46	108.0000	0.0	108.0000
	41'	5 χ	5	1.1500	0.9439	0.1392	46	4.2000	0.0	4.2000
		6 Γ	6	47.7390	21.7239	3.2030	46	102.0000	0.0	102.0000
	26'	7 χ	7	1.5489	1.0223	0.1507	46	4.5750	0.2000	4.3750
		8 Γ	8	47.3476	19.1928	2.8298	46	96.0000	24.0000	72.0000
	14'	9 χ	9	1.5929	1.1254	0.1659	46	4.7000	0.0	4.7000
		10 Γ	10	50.8694	21.1939	3.1249	46	102.0000	0.0	102.0000
Sensor	25	11 χ	11	0.4941	0.8142	0.1396	34	2.7000	0.0	2.7000
		12 Γ	12	25.9999	38.3797	6.6810	33	132.0000	0.0	132.0000
Sensor	26	13 χ	13	0.4353	0.5650	0.0969	34	2.0000	0.0	2.0000
		14 Γ	14	47.2499	57.6457	10.1904	32	210.0000	0.0	210.0000
Tower #1	56'	15 dose	15	49.6466	42.9522	6.3330	46	148.5000	0.0	148.5000
	41'	16 dose	16	60.1792	54.8697	8.0901	46	201.5999	0.0	201.5999
	26'	17 dose	17	72.6846	50.7853	7.4879	46	219.5999	6.0000	213.5999
	14'	18 dose	18	82.7868	62.3324	9.1904	46	281.9998	0.0	281.9998
Sensor	25	19 dose	19	31.9635	61.7809	10.7547	33	296.3999	0.0	296.3999
Sensor	26	20 dose	20	51.0186	100.2800	17.7272	32	409.4998	0.0	409.4998

STATISTICAL SUMMARY OF B727 ONE TOWER

KEY					VAR NO	MEAN	S.D.	S.E. OF MEAN	SAMPLE	MAXIMUM	MINIMUM	RANGE
		1	WS	(mph)	1	13.3333	6.8937	1.7800	15	25.0000	1.0000	24.0000
		2	WD	(deg)	2	317.5325	18.2793	4.7197	15	356.0000	292.0000	64.0000
Tower #1	56'	3	χ	(ppm)	3	0.4633	0.5697	0.1471	15	2.1250	0.1250	2.0000
		4	Γ	(sec)	4	52.0000	31.4779	8.1275	15	150.0000	24.0000	126.0000
	41'	5	χ		5	0.7867	1.7556	0.4533	15	6.7500	0.0	6.7500
		6	Γ		6	43.5999	42.3333	10.9304	15	144.0000	0.0	144.0000
	26'	7	χ		7	0.8400	1.1075	0.2860	15	4.2500	0.1250	4.1250
		8	Γ		8	50.7999	34.1576	8.8195	15	150.0000	18.0000	132.0000
	14'	9	χ		9	0.7467	1.0417	0.2690	15	4.0000	0.1250	3.8750
		10	Γ		10	52.3999	30.9672	7.9957	15	138.0000	24.0000	114.0000
Sensor	25	11	χ		11	0.1208	0.2481	0.0716	12	0.7500	0.0	0.7500
		12	Γ		12	9.8182	23.2801	7.0192	11	72.0000	0.0	72.0000
Sensor	26	13	χ		13	0.1375	0.3009	0.0868	12	1.0000	0.0	1.0000
		14	Γ		14	17.0000	32.4457	9.3663	12	90.0000	0.0	90.0000
Tower #1	56'	15	dose		15	22.1900	23.5866	6.0900	15	89.2500	3.0000	86.2500
	41'	16	dose		16	35.8600	57.5847	14.8683	15	202.5000	0.0	202.5000
	26'	17	dose		17	43.2899	56.7702	14.6580	15	206.2500	3.0000	203.2500
	14'	18	dose		18	39.8100	51.4786	13.2917	15	165.6000	3.0000	162.6000
Sensor	25	19	dose		19	6.5455	16.6395	5.0170	11	54.0000	0.0	54.0000
Sensor	26	20	dose		20	9.8750	22.1976	6.4079	12	72.0000	0.0	72.0000

STATISTICAL SUMMARY OF B747 ONE TOWER

KEY					VAR NO	MEAN	S.D.	S.E. OF MEAN	SAMPLE	MAXIMUM	MINIMUM	RANGE
		1	WS	(mph)	1	13.8667	4.4540	1.1500	15	23.0000	7.0000	16.0000
		2	WD	(deg)	2	318.8657	19.8526	5.1259	15	351.0000	270.0000	81.0000
Tower #1	56'	3	x	(ppm)	3	1.0617	1.1197	0.2891	15	3.5000	0.0	3.5000
		4	Γ	(sec)	4	60.3999	24.6831	6.3732	15	114.0000	24.0000	90.0000
	41'	5	x		5	1.4183	1.4358	0.3707	15	4.5500	0.2000	4.3500
		6	Γ		6	57.2000	27.2008	7.0232	15	108.0000	24.0000	84.0000
	26'	7	x		7	1.8333	1.4710	0.3798	15	5.0000	0.2500	4.7500
		8	Γ		8	54.0000	31.0115	8.0071	15	150.0000	30.0000	120.0000
	14'	9	x		9	1.9183	1.3006	0.3358	15	4.5000	0.3750	4.1250
		10	Γ		10	54.8000	31.0833	8.0257	15	150.0000	24.0000	126.0000
Sensor	25	11	x		11	0.5000	1.0426	0.3144	11	3.3500	0.0	3.3500
		12	Γ		12	26.7272	35.4319	10.6831	11	108.0000	0.0	108.0000
Sensor	26	13	x		13	0.4864	0.6353	0.1915	11	2.0000	0.0	2.0000
		14	Γ		14	41.4545	41.7812	12.5975	11	132.0000	0.0	132.0000
Tower #1	56'	15	dose		15	70.2399	79.9558	20.6445	15	204.7500	0.0	204.7500
	41'	16	dose		16	85.7499	96.1233	24.8189	15	272.9998	7.2000	265.7996
	26'	17	dose		17	106.8400	104.5437	26.9931	15	306.0000	11.2500	294.7500
	14'	18	dose		18	102.6199	82.8730	21.3977	15	297.0000	11.2500	285.7500
Sensor	25	19	dose		19	33.7909	68.3393	20.6051	11	180.9000	0.0	180.9000
Sensor	26	20	dose		20	40.5818	77.1588	23.2643	11	264.0000	0.0	264.0000

STATISTICAL SUMMARY OF DC 8 ONE TOWER

KEY					VAR NO	MEAN	S.D.	S.E. OF MEAN	SAMPLE	MAXIMUM	MINIMUM	RANGE
		1	WS	(mph)	1	17.1818	6.5547	1.9763	11	28.0000	5.0000	23.0000
		2	WD	(deg)	2	313.4539	13.1937	3.9780	11	334.0000	297.0000	37.0000
Tower #1	56'	3	χ	(ppm)	3	1.1295	0.6956	0.2097	11	2.3750	0.2500	2.1250
		4	Γ	(sec)	4	54.0000	24.2981	7.3262	11	102.0000	24.0000	78.0000
	41'	5	χ		5	1.1045	0.8490	0.2560	11	3.0000	0.1250	2.8750
		6	Γ		6	59.4545	23.1532	6.9810	11	102.0000	30.0000	72.0000
	26'	7	χ		7	1.2886	0.9890	0.2982	11	3.7500	0.3750	3.3750
		8	Γ		8	59.4545	27.5549	8.3081	11	120.0000	24.0000	96.0000
	14'	9	χ		9	1.0023	0.8016	0.2417	11	2.7500	0.0	2.7500
		10	Γ		10	73.0909	50.1866	15.1318	11	162.0000	0.0	162.0000
Sensor	25	11	χ		11	0.6000	0.7701	0.2567	9	1.9000	0.0	1.9000
		12	Γ		12	32.0000	40.1373	13.3791	9	90.0000	0.0	90.0000
Sensor	26	13	χ		13	0.7500	1.3229	0.4410	9	4.0000	0.0	4.0000
		14	Γ		14	32.6666	40.3732	13.4577	9	90.0000	0.0	90.0000
Tower #1	56'	15	dose		15	66.2863	54.0508	16.2969	11	168.0000	6.0000	162.0000
	41'	16	dose		16	69.8318	62.3492	18.7990	11	191.2500	5.2500	186.0000
	26'	17	dose		17	84.0136	77.6467	23.4113	11	240.0000	9.0000	231.0000
	14'	18	dose		18	88.1454	79.0833	23.8445	11	214.5000	0.0	214.5000
Sensor	25	19	dose		19	40.6666	50.6316	16.8772	9	114.0000	0.0	114.0000
Sensor	26	20	dose		20	58.6666	116.4516	38.8172	9	360.0000	0.0	360.0000

STATISTICAL SUMMARY OF DC 9 ONE TOWER

		KEY		VAR NO	MEAN	S.D.	S.E. OF MEAN	SAMPLE	MAXIMUM	MINIMUM	RANGE
		1	WS (mph)	1	10.5000	10.6066	7.5000	2	18.0000	3.0000	15.0000
		2	WD (deg)	2	315.0000	9.8995	7.0000	2	322.0000	308.0000	14.0000
Tower #1	56'	3	x (ppm)	3	0.2500	0.3536	0.2500	2	0.5000	0.0	0.5000
		4	Γ (sec)	4	45.0000	63.6396	45.0000	2	90.0000	0.0	90.0000
	41'	5	x	5	0.3125	0.2652	0.1875	2	0.5000	0.1250	0.3750
		6	Γ	6	66.0000	33.9411	24.0000	2	90.0000	42.0000	48.0000
	26'	7	x	7	0.3375	0.0530	0.0375	2	0.3750	0.3000	0.0750
		8	Γ	8	48.0000	8.4853	6.0000	2	54.0000	42.0000	12.0000
	14'	9	x	9	0.2125	0.0530	0.0375	2	0.2500	0.1750	0.0750
		10	Γ	10	105.0000	80.6102	57.0000	2	162.0000	48.0000	114.0000
Sensor	25	11	x	11	0.0	0.0	0.0	2	0.0	0.0	0.0
		12	Γ	12	0.0	0.0	0.0	2	0.0	0.0	0.0
Sensor	26	13	x	13	0.1250	0.1768	0.1250	2	0.2500	0.0	0.2500
		14	Γ	14	15.0000	21.2132	15.0000	2	30.0000	0.0	30.0000
Tower #1	56'	15	dose	15	22.5000	31.8198	22.5000	2	45.0000	0.0	45.0000
	41'	16	dose	16	25.1250	28.1075	19.8750	2	45.0000	5.2500	39.7500
	26'	17	dose	17	16.4250	5.4094	3.8250	2	20.2500	12.6000	7.6500
	14'	18	dose	18	24.4500	22.6981	16.0500	2	40.5000	8.4000	32.1000
Sensor	25	19	dose	19	0.0	0.0	0.0	2	0.0	0.0	0.0
Sensor	26	20	dose	20	3.7500	5.3033	3.7500	2	7.5000	0.0	7.5000

STATISTICAL SUMMARY OF DC 10 ONE TOWER

		KEY			VAR NO	MEAN	S.D.	S.E. OF MEAN	SAMPLE	MAXIMUM	MINIMUM	RANGE
		1	WS	(mph)	1	11.7619	3.4191	0.7461	21	18.0000	6.0000	12.0000
		2	WD	(deg)	2	318.9988	15.5626	3.3960	21	346.0000	292.0000	54.0000
Tower #1	56'	3	χ	(ppm)	3	0.8250	0.5495	0.1199	21	1.9500	0.0750	1.8750
		4	Γ	(sec)	4	62.5714	24.0428	5.2466	21	102.0000	24.0000	78.0000
	41'	5	χ		5	0.8881	0.9466	0.2066	21	3.2000	0.0	3.2000
		6	Γ		6	58.2856	28.7213	6.2675	21	120.0000	0.0	120.0000
	26'	7	χ		7	1.2333	1.5009	0.3275	21	6.7500	0.2500	6.5000
		8	Γ		8	54.8571	33.4758	7.3050	21	156.0000	30.0000	126.0000
	14'	9	χ		9	1.0512	1.4230	0.3105	21	6.6250	0.0	6.6250
		10	Γ		10	52.8571	28.4996	6.2191	21	120.0000	0.0	120.0000
Sensor	25	11	χ		11	0.1684	0.3845	0.0882	19	1.5000	0.0	1.5000
		12	Γ		12	13.5789	25.7559	5.9088	19	72.0000	0.0	72.0000
Sensor	26	13	χ		13	0.2368	0.3022	0.0693	19	1.0000	0.0	1.0000
		14	Γ		14	33.1578	40.9570	9.3962	19	150.0000	0.0	150.0000
Tower #1	56'	15	dose		15	54.5571	46.6961	10.1899	21	198.9000	3.1500	195.7500
	41'	16	dose		16	53.8714	69.6731	15.2039	21	307.2000	0.0	307.2000
	26'	17	dose		17	63.8427	82.4666	17.9957	21	318.7500	9.7500	309.0000
	14'	18	dose		18	57.6142	76.5806	16.7112	21	280.5000	0.0	280.5000
Sensor	25	19	dose		19	9.4105	21.4989	4.9322	19	81.0000	0.0	81.0000
Sensor	26	20	dose		20	16.9421	27.1098	6.2194	19	96.0000	0.0	96.0000

STATISTICAL SUMMARY OF L 1011 ONE TOWER

KEY					VAR NO	MEAN	S.D.	S.E. OF MEAN	SAMPLE	MAXIMUM	MINIMUM	RANGE
		1	WS	(mph)	1	11.6471	3.0402	0.7373	17	16.0000	7.0000	9.0000
		2	WD	(deg)	2	313.6460	16.0893	3.9022	17	346.0000	289.0000	57.0000
Tower #1	56'	3	χ	(ppm)	3	0.8544	0.6493	0.1575	17	2.4750	0.0	2.4750
		4	Γ	(sec)	4	45.5294	27.2537	6.6100	17	120.0000	0.0	120.0000
	41'	5	χ		5	0.8294	0.7142	0.1732	17	2.5000	0.0	2.5000
		6	Γ		6	46.5882	30.5595	7.4118	17	132.0000	0.0	132.0000
	26'	7	χ		7	1.2868	1.0545	0.2557	17	4.7000	0.2500	4.4500
		8	Γ		8	48.7058	21.7249	5.2691	17	90.0000	24.0000	66.0000
	14'	9	χ		9	1.3721	1.6122	0.3910	17	7.2500	0.2500	7.0000
		10	Γ		10	45.6470	22.9373	5.5631	17	114.0000	8.0000	106.0000
Sensor	25	11	χ		11	1.3706	4.8225	1.1696	17	20.0000	0.0	20.0000
		12	Γ		12	15.8823	30.5161	7.4012	17	84.0000	0.0	84.0000
Sensor	26	13	χ		13	0.2353	0.4111	0.0997	17	1.5000	0.0	1.5000
		14	Γ		14	15.5294	22.8531	5.5427	17	60.0000	0.0	60.0000
Tower #1	56'	15	dose		15	40.2176	33.0553	8.0171	17	120.0000	0.0	120.0000
	41'	16	dose		16	41.3117	33.8831	8.2179	17	105.0000	0.0	105.0000
	26'	17	dose		17	65.2058	60.4728	14.6668	17	222.6000	6.0000	216.6000
	14'	18	dose		18	61.3058	79.2434	19.2193	17	348.0000	9.0000	339.0000
Sensor	25	19	dose		19	14.5235	36.0891	8.7529	17	117.6000	0.0	117.6000
Sensor	26	20	dose		20	10.9941	22.5057	5.4584	17	90.0000	0.0	90.0000

STATISTICAL SUMMARY (TWO TOWER CO TESTS) FOR B - 707

KEY			VAR NO	MEAN	S.D.	S.E. OF MEAN	SAMPLE	MAXIMUM	MINIMUM	RANGE
		1 Instaneous WS(mph)	1	12.2903	8.3434	1.4985	31	34.0000	3.0000	31.0000
		2 Instaneous WD(deg)	2	323.4000	47.2000	8.4774	31	151.0000	243.0000	92.0000
		3 A/C timing (sec)	3	5.4516	1.2593	0.2262	31	9.4000	3.9000	5.5000
		4 χ(ppm)	4	0.5716	0.6275	0.1127	31	2.1100	0.0	2.1100
	80'	5 Γ(sec)	5	21.1935	19.8013	3.5564	31	74.0000	0.0	74.0000
	56'	6 χ	6	0.9968	0.9446	0.1696	31	3.3700	0.0	3.3700
1st Tower		7 Γ	7	27.4515	27.6138	4.9596	31	143.0000	0.0	143.0000
		8 χ	8	1.4374	1.0958	0.1968	31	4.0000	0.0	4.0000
	41'	9 Γ	9	31.6451	25.9442	4.6597	31	138.0000	0.0	138.0000
		10 χ	10	1.8571	1.2196	0.2190	31	4.4300	0.0	4.4300
	26'	11 Γ	11	27.6451	13.0883	2.3507	31	67.0000	0.0	67.0000
		12 χ	12	1.9529	1.2037	0.2162	31	4.2500	0.1200	4.1300
	14'	13 Γ	13	28.9031	21.4372	3.8502	31	137.0000	15.0000	122.0000
		14 χ	14	0.5194	0.5190	0.0932	31	1.9700	0.0	1.9700
	80'	15 Γ	15	55.4193	33.3294	5.9861	31	140.0000	0.0	140.0000
		16 χ	16	0.6994	0.5481	0.0984	31	1.8700	0.0	1.8700
2nd Tower	56'	17 Γ	17	43.7418	34.4818	6.1931	31	180.0000	0.0	180.0000
		18 χ	18	0.8945	0.6787	0.1219	31	2.3700	0.0	2.3700
	41'	19 Γ	19	39.5805	37.8345	6.7953	31	195.0000	0.0	195.0000
		20 χ	20	1.0945	0.8912	0.1601	31	3.2000	0.0	3.2000
	26'	21 Γ	21	28.7741	20.8737	3.7490	31	86.0000	0.0	86.0000
	14'	22 χ	22	0.8874	1.0428	0.1873	31	3.8000	0.0	3.8000
		23 Γ	23	41.9998	62.8954	11.2963	31	355.0000	0.0	355.0000
Last Sensor		24 χ	24	0.5558	0.5013	0.0900	31	1.7700	0.0	1.7700
		25 Γ	25	27.1289	12.9865	2.3324	31	53.0000	0.0	53.0000
THC Sensor		26 χ	26	0.9716	0.6023	0.1082	31	2.1900	0.0400	2.1500
		27 Γ	27	53.3870	47.4472	8.5218	31	270.0000	10.0000	260.0000
		28 3-min average WS	28	12.5613	8.1187	1.4582	31	29.8000	0.6000	29.2000
		29 3-min average WD	29	319.6594	23.0249	4.1354	31	397.2000	280.0999	117.1001
		30 σ_o (deg)	30	13.2451	9.2790	1.6665	31	48.5000	1.8000	46.7000
		31 σ_u (mph)	31	2.0581	1.0993	0.1974	31	3.8000	0.2000	3.6000
		32 σ_v (mph)	32	2.2645	1.1842	0.2127	31	4.9000	0.1000	4.8000
		33 T (°F)	33	44.8870	16.3878	2.9433	31	65.0000	0.0	65.0000
		34 ΔT inst. (°F/53ft)	34	-14.8806	11.9384	2.1442	31	-0.0	-49.1000	49.1000
		35 ΔT Average (°F/53ft)	35	-14.7193	11.4817	2.0622	31	-0.0	-45.0000	45.0000
		36 Pasquill - Turner Stability	36	3.4516	0.7676	0.1379	31	4.0000	2.0000	2.0000
	80'	37 dose	37	19.8790	26.9041	4.8321	31	109.7200	0.0	109.7200
1st Tower	56'	38 dose	38	29.9786	32.4765	5.8329	31	110.1100	0.0	110.1100
	41'	39 dose	39	42.9151	33.7878	6.0685	31	120.8400	0.0	120.8400
	26'	40 dose	40	47.6750	32.3669	5.8133	31	123.6000	0.0	123.6000
	14'	41 dose	41	48.1712	29.2884	5.2603	31	119.9700	2.0400	117.9300
	80'	42 dose	42	19.8976	19.3955	3.4835	31	81.0000	0.0	81.0000
	56'	43 dose	43	24.3467	17.2801	3.1036	31	69.7500	0.0	69.7500
2nd Tower	41'	44 dose	44	26.7683	18.8857	3.3920	31	70.5000	0.0	70.5000
	26'	45 dose	45	28.9931	20.0388	3.5991	31	79.3000	0.0	79.3000
	14'	46 dose	46	25.8302	24.0232	4.3147	31	86.2500	0.0	86.2500
Last Sensor		47 dose	47	16.8957	15.8102	2.8396	31	56.0000	0.0	56.0000
THC Sensor		48 dose	48	21.5138	14.3162	2.5713	31	65.7000	0.8800	64.8200

STATISTICAL SUMMARY OF B727 TWO TOWER

KEY			VAR NO	MEAN	S.D.	S.E. OF MEAN	SAMPLE	MAXIMUM	MINIMUM	RANGE
		1 Instaneous WS(mph)	1	10.7647	6.8890	1.1814	34	34.0000	2.0000	32.0000
		2 Instaneous WD(deg)	2	331.9000	21.9000	3.7558	34	18.0000	292.0000	86.0000
		3 A/C timing (sec)	3	4.9353	0.5851	0.1003	34	6.4000	3.9000	2.5000
	80'	4 χ(ppm)	4	0.2526	0.3043	0.0522	34	1.2500	0.0	1.2500
		5 Γ(sec)	5	27.0293	25.0302	4.2926	34	100.0000	0.0	100.0000
	56'	6 χ	6	0.3503	0.2795	0.0479	34	1.1800	0.0	1.1800
1st Tower		7 Γ	7	32.1764	23.6046	4.0482	34	130.0000	0.0	130.0000
		8 χ	8	0.3800	0.2819	0.0484	34	1.2200	0.0	1.2200
	41'	9 Γ	9	32.0293	24.5276	4.2065	34	148.0000	0.0	148.0000
		10 χ	10	0.3912	0.2776	0.0476	34	1.1800	0.0	1.1800
	26'	11 Γ	11	38.5293	47.1907	8.0931	34	265.0000	0.0	265.0000
		12 χ	12	0.3676	0.3185	0.0546	34	1.2000	0.0	1.2000
	14'	13 Γ	13	35.5881	51.0274	8.7511	34	290.0000	0.0	290.0000
		14 χ	14	0.1991	0.1855	0.0318	34	0.7000	0.0	0.7000
	80'	15 Γ	15	36.9116	34.5098	5.9184	34	167.0000	0.0	167.0000
		16 χ	16	0.2574	0.1750	0.0300	34	0.6400	0.0	0.6400
2nd Tower	56'	17 Γ	17	59.2940	65.1851	11.1791	34	307.0000	0.0	307.0000
		18 χ	18	0.2303	0.1685	0.0289	34	0.6000	0.0	0.6000
	41'	19 Γ	19	41.1175	37.2874	6.3947	34	187.0000	0.0	187.0000
		20 χ	20	0.3124	0.2210	0.0379	34	0.9000	0.0	0.9000
	26'	21 Γ	21	39.4117	36.6458	6.2847	34	180.0000	0.0	180.0000
	14'	22 χ	22	0.1371	0.1920	0.0329	34	0.6500	0.0	0.6500
		23 Γ	23	31.7058	45.0081	7.7188	34	206.0000	0.0	206.0000
Last Sensor		24 χ	24	0.2303	0.3220	0.0552	34	1.4700	0.0	1.4700
		25 Γ	25	34.7352	42.4373	7.2779	34	250.0000	0.0	250.0000
THC Sensor		26 χ	26	0.1165	0.1611	0.0276	34	0.6800	0.0	0.6800
		27 Γ	27	22.5293	21.0327	3.6071	34	90.0000	0.0	90.0000
		28 3-min average WS	28	10.2588	6.6081	1.1333	34	31.1000	1.8000	29.3000
		29 3-min average WD	29	324.7949	31.3490	5.3763	34	570.5999	186.0000	184.5999
		30 σ_o (deg)	30	14.6118	14.3032	2.4530	34	90.4000	4.7000	85.7000
		31 σ_u (mph)	31	1.7118	0.9729	0.1668	34	4.1000	0.2000	3.9000
		32 σ_v (mph)	32	2.1441	1.3406	0.2299	34	7.3000	0.3000	7.0000
		33 T (°F)	33	49.7499	6.1030	1.0467	34	63.5000	39.5000	24.0000
		34 ΔT inst. (°F/53ft)	34	-9.5706	10.3444	1.7741	34	-0.0	-37.8000	37.8000
		35 ΔT Average (°F/53ft)	35	-9.4412	10.2740	1.7620	34	-0.0	-35.3000	35.3000
		36 Pasquill - Turner Stability	36	3.3235	1.0652	0.1827	34	4.0000	-0.0	4.0000
	80'	37 dose	37	10.5556	13.3201	2.2844	34	50.0000	0.0	50.0000
1st Tower	56'	38 dose	38	12.4061	13.2144	2.2662	34	51.0300	0.0	51.0300
	41'	39 dose	39	13.1141	12.9316	2.2178	34	45.1400	0.0	45.1400
	26'	40 dose	40	14.4982	15.1613	2.6001	34	58.3000	0.0	58.3000
	14'	41 dose	41	12.2614	14.2424	2.4425	34	60.0000	0.0	60.0000
	80'	42 dose	42	9.9491	10.4964	1.8001	34	41.7500	0.0	41.7500
	56'	43 dose	43	15.1067	18.5121	3.1748	34	96.2400	0.0	96.2400
2nd Tower	41'	44 dose	44	11.3306	12.3212	2.1131	34	59.8400	0.0	59.8400
	26'	45 dose	45	14.0964	14.8851	2.5528	34	54.0000	0.0	54.0000
	14'	46 dose	46	8.8403	13.1946	2.2628	34	41.2000	0.0	41.2000
Last Sensor		47 dose	47	11.1065	18.8767	3.2373	34	87.5000	0.0	87.5000
THC Sensor		48 dose	48	3.2635	5.2957	0.9082	34	25.1600	0.0	25.1600

STATISTICAL SUMMARY OF B747 TWO TOWER

		KEY	VAR NO	MEAN	S.D.	S.E. OF MEAN	SAMPLE	MAXIMUM	MINIMUM	RANGE
		1 Instaneous WS(mph)	1	15.0000	6.2450	3.6056	3	22.0000	10.0000	12.0000
		2 Instaneous WD(deg)	2	303.6665	14.5717	8.4130	3	319.0000	290.0000	29.0000
		3 A/C timing (sec)	3	7.2333	1.2220	0.7055	3	8.3000	5.9000	2.4000
	80'	4 χ(ppm)	4	1.2200	1.3074	0.7548	3	2.6000	0.0	2.6000
		5 Γ(sec)	5	21.0000	19.3132	11.1505	3	58.0000	0.0	38.0000
	56'	6 χ	6	1.9167	1.1686	0.6747	3	3.2500	1.0700	2.1800
1st Tower		7 Γ	7	26.6667	12.0139	6.9362	3	39.0000	15.0000	24.0000
		8 χ	8	2.1967	1.2719	0.7343	3	3.6000	1.1200	2.4800
	41'	9 Γ	9	26.3333	13.6504	7.8811	3	42.0000	17.0000	25.0000
		10 χ	10	2.8300	1.7514	1.0112	3	4.6200	1.1200	3.5000
	26'	11 Γ	11	29.6667	12.3423	7.1258	3	40.0000	16.0000	24.0000
		12 χ	12	2.8800	2.0708	1.1956	3	4.5700	0.5700	4.0000
	14'	13 Γ	13	30.6667	13.0512	7.5351	3	41.0000	16.0000	25.0000
		14 χ	14	0.4800	0.6894	0.3980	3	1.2700	0.0	1.2700
	80'	15 Γ	15	25.0000	22.9129	13.2288	3	45.0000	0.0	45.0000
		16 χ	16	1.1833	1.1751	0.6784	3	2.3500	0.0	2.3500
2nd Tower	56'	17 Γ	17	16.3333	15.1767	8.7623	3	30.0000	0.0	30.0000
		18 χ	18	1.4800	1.5380	0.8879	3	3.0700	0.0	3.0700
	41'	19 Γ	19	15.6667	15.0444	8.6859	3	30.0000	0.0	30.0000
		20 χ	20	1.7400	1.4869	0.8584	3	3.0000	0.1000	2.9000
	26'	21 Γ	21	19.0000	6.9282	4.0000	3	27.0000	15.0000	12.0000
	14'	22 χ	22	1.5567	1.5600	0.9007	3	3.1200	0.0	3.1200
		23 Γ	23	16.5333	15.1767	8.7623	3	30.0000	0.0	30.0000
Last Sensor		24 χ	24	1.0800	0.9789	0.5652	3	1.9500	0.0200	1.9300
		25 Γ	25	23.0000	10.3923	6.0000	3	35.0000	17.0000	18.0000
THC Sensor		26 χ	26	0.9667	0.6521	0.3765	3	1.4700	0.2300	1.2400
		27 Γ	27	23.3333	12.6623	7.3106	3	37.0000	12.0000	25.0000
		28 3-min average WS	28	14.3000	5.2374	3.0238	3	20.2000	10.2000	10.0000
		29 3-min average WD	29	302.8330	13.2032	7.6229	3	312.0000	287.7000	24.3000
		30 σ_o (deg)	30	17.7333	4.1186	2.3779	3	20.5000	13.0000	7.5000
		31 σ_u (mph)	31	2.5333	1.2014	0.6936	3	3.7000	1.3000	2.4000
		32 σ_v (mph)	32	4.2000	0.6083	0.3512	3	4.6000	3.5000	1.1000
		33 T (°F)	33	32.6667	28.3078	16.3435	3	50.0000	0.0	50.0000
		34 ΔT inst. (°F/53ft)	34	-6.6333	7.1459	4.1257	3	-0.0	-14.2000	14.2000
		35 ΔT Average (°F/53ft)	35	-7.6667	7.1675	4.1382	3	-0.0	-14.2000	14.2000
		36 Pasquill - Turner Stability	36	3.3333	0.5774	0.3333	3	4.0000	3.0000	1.0000
	80'	37 dose	37	35.0933	32.8089	18.9422	3	65.0000	0.0	65.0000
1st Tower	56'	38 dose	38	52.1067	34.3717	19.8445	3	84.5000	16.0500	68.4500
	41'	39 dose	39	50.2767	20.2995	11.7199	3	72.0000	31.7900	40.2100
	26'	40 dose	40	80.4200	62.3897	36.0207	3	152.4600	44.0000	108.4600
	14'	41 dose	41	79.7733	71.3260	41.1801	3	159.9500	23.3700	136.5800
	80'	42 dose	42	15.2500	20.1549	11.6365	3	38.1000	0.0	38.1000
	56'	43 dose	43	31.1000	35.9754	20.7704	3	70.5000	0.0	70.5000
2nd Tower	41'	44 dose	44	38.4633	47.8881	27.6482	3	92.1000	0.0	92.1000
	26'	45 dose	45	38.1000	40.1227	23.1648	3	81.0000	1.5000	79.5000
	14'	46 dose	46	41.0167	47.8600	27.6320	3	93.6000	0.0	93.6000
Last Sensor		47 dose	47	25.9800	22.9124	13.2285	3	44.4500	0.3400	44.1100
THC Sensor		48 dose	48	17.9267	11.5897	6.6913	3	30.8700	8.5100	22.3600

STATISTICAL SUMMARY OF DC 8 TWO TOWER

KEY			VAR NO	MEAN	S.D.	S.E. OF MEAN	SAMPLE	MAXIMUM	MINIMUM	RANGE
		1 Instaneous WS(mph)	1	10.0000	5.9582	2.6646	5	16.0000	2.0000	14.0000
		2 Instaneous WD(deg)	2	333.6000	13.2000	5.9032	5	356.0000	324.0000	32.0000
		3 A/C timing (sec)	3	4.9600	0.6427	0.2874	5	5.0000	4.0000	1.0000
1st Tower	80'	4 χ(ppm)	4	1.6880	1.9968	0.8930	5	4.8400	0.0	4.8400
		5 Γ(sec)	5	22.4000	14.9288	8.4652	5	52.0000	0.0	52.0000
	56'	6 χ	6	2.9640	1.7379	0.7772	5	5.5000	1.2200	4.2800
		7 Γ	7	25.8000	9.1761	4.1037	5	40.0000	18.0000	22.0000
		8 χ	8	4.0100	1.8439	0.8246	5	6.3300	2.2500	4.0800
	41'	9 Γ	9	25.6000	9.5551	4.2732	5	37.0000	18.0000	19.0000
		10 χ	10	4.1060	1.8650	0.8340	5	6.8200	2.5000	4.3200
	26'	11 Γ	11	23.6000	6.5422	2.9258	5	32.0000	17.0000	15.0000
		12 χ	12	3.2940	1.7244	0.7712	5	6.3000	2.0000	4.3000
	14'	13 Γ	13	20.4000	7.1972	3.2187	5	33.0000	15.0000	18.0000
2nd Tower		14 χ	14	1.4440	1.5816	0.7073	5	3.9200	0.0600	3.8600
	80'	15 Γ	15	25.6000	11.5239	5.1536	5	45.0000	17.0000	28.0000
		16 χ	16	1.5760	1.1980	0.5357	5	3.6200	0.7000	2.9200
	56'	17 Γ	17	21.6000	5.8991	2.6382	5	30.0000	15.0000	15.0000
		18 χ	18	1.5520	1.1427	0.5111	5	3.3100	0.7100	2.6000
	41'	19 Γ	19	20.8000	4.3818	1.9596	5	27.0000	15.0000	12.0000
		20 χ	20	1.5020	0.9921	0.4437	5	3.0500	0.6200	2.4300
	26'	21 Γ	21	41.6000	34.2243	15.3056	5	96.0000	17.0000	79.0000
	14'	22 χ	22	0.8040	0.6450	0.2885	5	1.8000	0.0500	1.7500
		23 Γ	23	67.8000	58.5807	26.1981	5	165.0000	19.0000	146.0000
Last Sensor		24 χ	24	0.5100	0.1673	0.0748	5	0.7200	0.3200	0.4000
		25 Γ	25	48.0000	43.9602	19.6596	5	120.0000	15.0000	105.0000
THC Sensor		26 χ	26	1.8340	0.7607	0.3402	5	3.1000	1.2000	1.9000
		27 Γ	27	17.6000	4.5607	2.0396	5	25.0000	13.0000	12.0000
		28 3-min average WS	28	9.9000	5.0185	2.2443	5	15.9000	3.5000	12.4000
		29 3-min average WD	29	333.9995	9.4744	4.2371	5	344.5999	320.5999	24.0000
		30 σ_o (deg)	30	14.3400	4.5170	2.0200	5	21.1000	10.0000	11.1000
		31 σ_u (mph)	31	2.0400	0.7162	0.3203	5	3.3000	1.6000	1.7000
		32 σ_v (mph)	32	2.5200	1.9267	0.8616	5	5.8000	1.0000	4.8000
		33 T (°F)	33	49.8000	5.6414	2.5229	5	59.5000	46.0000	13.5000
		34 ΔT inst. (°F/53ft)	34	-10.2000	9.2073	4.1176	5	-0.0	-22.7000	22.7000
		35 ΔT Average (°F/53ft)	35	-8.6000	8.5857	3.8397	5	-0.0	-22.4000	22.4000
		36 Pasquill - Turner Stability	36	3.2000	1.0954	0.4899	5	4.0000	2.0000	2.0000
1st Tower	80'	37 dose	37	66.4020	106.2324	47.5086	5	251.6799	0.0	251.6799
	56'	38 dose	38	86.7340	79.1349	35.3902	5	220.0000	24.4000	195.6000
	41'	39 dose	39	103.0640	64.0432	28.6410	5	207.2000	45.0000	162.2000
	26'	40 dose	40	94.3900	42.9184	19.1937	5	149.3500	52.5000	96.8500
	14'	41 dose	41	64.5300	32.6667	14.6090	5	119.7000	35.5500	84.1500
2nd Tower	80'	42 dose	42	36.7160	40.7671	18.2316	5	93.1500	1.6200	91.5300
	56'	43 dose	43	32.3160	22.2259	9.9397	5	68.7800	13.3000	55.4800
	41'	44 dose	44	31.2420	24.1285	10.7906	5	72.8200	15.2000	57.6200
	26'	45 dose	45	50.2440	27.1310	12.1334	5	73.9200	10.5400	63.3800
	14'	46 dose	46	40.3740	32.0067	14.3139	5	85.0000	3.0000	82.0000
Last Sensor		47 dose	47	28.5600	29.8749	13.3604	5	74.4000	4.8000	69.6000
THC Sensor		48 dose	48	30.9040	10.1589	4.5432	5	46.5000	20.4000	26.1000

STATISTICAL SUMMARY OF INFIELD CO TESTS FOR B - 707

KEY

	1	Event #
	2	A/C Type
	3	u (mph)
	4	θ (deg)
Station #4	5	x_1 (ppm)
	6	τ_1 (sec)
Station #5	7	x_2 (ppm)
	8	τ_2 (sec)
Station #11	9	x_3 (ppm)
	10	τ_3 (sec)
Station #4	11	$Dose_1$ (ppm,sec)
Station #5	12	$Dose_2$ (ppm,sec)
Section #11	13	$Dose_3$ (ppm,sec)

VAR NO	MEAN	S.D.	S.E. OF MEAN	SAMPLE	MAXIMUM	MINIMUM	RANGE
1	21,0833	12,2062	3,5236	12	38,0000	2,0000	36,0000
2	1,0000	0,0	0,0	12	1,0000	1,0000	0,0
3	24,0000	35,1257	10,1399	12	99,0000	5,0000	94,0000
4	195,5000	21,2720	6,7268	10	225,0000	165,0000	60,0000
5	5,1500	2,5713	0,7423	12	10,8000	2,0000	8,8000
6	31,6666	5,3654	1,5489	12	40,0000	25,0000	15,0000
7	1,2000	0,4775	0,1440	11	2,0000	0,4000	1,6000
8	43,1818	23,2672	7,0153	11	90,0000	5,0000	85,0000
9	0,5125	0,6312	0,2232	8	1,5000	0,0	1,5000
10	26,6667	2,8867	1,6667	3	30,0000	25,0000	5,0000
11	155,6666	69,3195	20,0108	12	323,9998	63,0000	260,9998
12	47,6817	34,9487	10,5374	11	143,9999	7,5000	136,4999
13	28,0000	16,4545	9,5000	3	37,5000	9,0000	28,5000

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STATISTICAL SUMMARY OF INFIELD CO TESTS FOR B - 727

VAR NO	MEAN	S.D.	S.E. OF MEAN	SAMPLE	MAXIMUM	MINIMUM	RANGE
1	24.1667	14.9722	6.1124	6	41.0000	1.0000	40.0000
2	2.0000	0.0	0.0	6	2.0000	2.0000	0.0
3	38.5000	46.9287	19.1585	6	99.0000	6.0000	93.0000
4	202.0000	25.8715	12.9357	4	230.0000	168.0000	62.0000
5	1.4000	0.7266	0.2966	6	2.6000	0.8000	1.8000
6	25.0000	6.3246	2.5820	6	30.0000	15.0000	15.0000
7	0.7833	0.4665	0.1905	6	1.3000	0.0	1.3000
8	27.6667	21.1345	8.6281	6	45.0000	0.0	45.0000
9	0.3000	0.2160	0.1080	4	0.5000	0.0	0.5000
10	13.3333	11.5470	6.6667	3	20.0000	0.0	20.0000
11	37.5000	25.7507	10.5127	6	78.0000	12.0000	66.0000
12	26.6333	22.3858	9.1390	6	52.0000	0.0	52.0000
13	4.6667	4.1633	2.4037	3	8.0000	0.0	8.0000

KEY

	1	Event #
	2	A/C Type
	3	u (mph)
	4	θ (deg)
Station #4	5	x_1 (ppm)
	6	τ_1 (sec)
Station #5	7	x_2 (ppm)
	8	τ_2 (sec)
Station #11	9	x_3 (ppm)
	10	τ_3 (sec)
Station #4	11	$Dose_1$ (ppm,sec)
Station #5	12	$Dose_2$ (ppm,sec
Section #11	13	$Dose_3$ (ppm,sec

STATISTICAL SUMMARY OF INFIELD CO TESTS FOR B - 747

KEY

	1	Event #
	2	A/C Type
	3	u (mph)
	4	θ (deg)
Station #4	5	x_1 (ppm)
	6	τ_1 (sec)
Station #5	7	x_2 (ppm)
	8	τ_2 (sec)
Station #11	9	x_3 (ppm)
	10	τ_3 (sec)
Station #4	11	$Dose_1$ (ppm,sec)
Station #5	12	$Dose_2$ (ppm,sec)
Section #11	13	$Dose_3$ (ppm,sec)

```
VAR NO      MEAN        S.D.     S.E. OF MEAN  SAMPLE       MAXIMUM      MINIMUM       RANGE

     1     23,2000     10,2323       4,5760      5          36,0000      12,0000      24,0000
     2      3,0000      0,0          0,0         5           3,0000       3,0000       0,0
     3     44,8000     49,5197      22,1459      5          99,0000       7,0000      92,0000
     4    211,6667     16,0727       9,2796      3         230,0000     200,0000      30,0000
     5      6,4800      5,3002       2,3703      5          15,8000       2,9000      12,9000
     6     28,0000      7,5829       3,3912      5          40,0000      20,0000      20,0000
     7      1,5600      1,2973       0,5802      5           3,6000       0,0          3,6000
     8     39,0000     27,4773      12,2882      5          75,0000       0,0         75,0000
     9      0,5333      0,8386       0,4842      3           1,5000       0,0          1,5000
NUMBER OF CASE FOR VARIABLE   10 IS LESS OR EQUAL TO 1,   PROGRAM GOES ON TO THE NEXT VARIABLE
    11    159,9999     90,3236      40,3940      5         315,9998      87,5000     228,4998
    12     66,8999     42,1699      18,8589      5         108,0000       0,0        108,0000
NUMBER OF CASE FOR VARIABLE   13 IS LESS OR EQUAL TO 1,   PROGRAM GOES ON TO THE NEXT VARIABLE
```

STATISTICAL SUMMARY OF INFIELD CO TESTS FOR DC 8

	KEY		VAR NO	MEAN	S.D.	S.E. OF MEAN	SAMPLE	MAXIMUM	MINIMUM	RANGE
	1	Event #	1	20.1667	17.2675	7.0494	6	43.0000	3.0000	40.0000
	2	A/C Type	2	4.0000	0.0	0.0	6	4.0000	4.0000	0.0
	3	u (mph)	3	9.8333	2.6394	1.0775	6	13.0000	6.0000	7.0000
	4	θ (deg)	4	188.0000	19.5448	7.9791	6	210.0000	165.0000	45.0000
Station #4	5	x_1 (ppm)	5	4.0667	0.5354	0.2186	6	5.0000	3.5000	1.5000
	6	τ_1 (sec)	6	26.6666	6.0553	2.4721	6	35.0000	20.0000	15.0000
Station #5	7	x_2 (ppm)	7	1.4333	1.0172	0.4153	6	3.0000	0.2000	2.8000
	8	τ_2 (sec)	8	35.0000	9.4868	3.8730	6	45.0000	25.0000	20.0000
Station #11	9	x_3 (ppm)	9	0.4500	0.4041	0.2021	4	1.0000	0.1000	0.9000
	10	τ_3 (sec)	10	30.0000	21.2132	15.0000	2	45.0000	15.0000	30.0000
Station #4	11	$Dose_1$ (ppm,sec)	11	110.2500	37.5256	15.3198	6	175.0000	70.0000	105.0000
Station #5	12	$Dose_2$ (ppm,sec)	12	48.7500	30.3805	12.4028	6	90.0000	5.0000	85.0000
Section #11	13	$Dose_3$ (ppm,sec)	13	12.7500	13.7886	9.7500	2	22.5000	3.0000	19.5000

STATISTICAL SUMMARY OF INFIELD CO TESTS FOR DC 10

	KEY	
	1	Event #
	2	A/C Type
	3	u (mph)
	4	θ (deg)
Station #4	5	χ_1 (ppm)
	6	τ_1 (sec)
Station #5	7	χ_2 (ppm)
	8	τ_2 (sec)
Station #11	9	χ_3 (ppm)
	10	τ_3 (sec)
Station #4	11	$Dose_1$ (ppm,sec)
Station #5	12	$Dose_2$ (ppm,sec)
Section #11	13	$Dose_3$ (ppm,sec)

VAR NO	MEAN	S.D.	S.E. OF MEAN	SAMPLE	MAXIMUM	MINIMUM	RANGE
1	25.6667	18.2300	10.5251	3	42.0000	6.0000	36.0000
2	8.0000	0.0	0.0	3	8.0000	8.0000	0.0
3	38.6667	52.3100	30.2012	3	99.0000	6.0000	93.0000
4	166.5000	2.1213	1.5000	2	168.0000	165.0000	3.0000
5	1.6667	0.3786	0.2186	3	2.1000	1.4000	0.7000
6	21.6667	5.7735	3.3333	3	25.0000	15.0000	10.0000
7	0.1667	0.2082	0.1202	3	0.4000	0.0	0.4000
8	23.3333	22.5462	13.0171	3	45.0000	0.0	45.0000
9	0.3500	0.2121	0.1500	2	0.5000	0.2000	0.3000
10	22.5000	10.6066	7.5000	2	30.0000	15.0000	15.0000
11	36.6667	15.0693	8.7002	3	52.5000	22.5000	30.0000
12	6.8333	9.7511	5.6298	3	18.0000	0.0	18.0000
13	9.0000	8.4853	6.0000	2	15.0000	3.0000	12.0000

STATISTICAL SUMMARY OF INFIELD CO TESTS FOR L 1011

KEY

	1	Event #
	2	A/C Type
	3	v (mph
	4	θ deg
Station #4	5	c_1 (ppm)
	6	τ_1 (sec
Station #5	7	c_2 (ppm)
	8	τ_2 (sec)
Station #11	9	c_3 (ppm)
	10	τ_3 (sec
Station #4	11	$Dose_1$ (ppm,sec)
Station #5	12	$Dose_2$ (ppm,sec)
Section #11	13	$Dose_3$ (ppm,sec)

```
 VAR NO      MEAN        S.D.     S.E. OF MEAN  SAMPLE       MAXIMUM      MINIMUM       RANGE

      1     24.0000     11.3137      8.0000       2          32.0000      16.0000      16.0000
      2      5.0000      0.0         0.0          2           5.0000       5.0000       0.0
      3     54.0000     63.6396     45.0000       2          99.0000       9.0000      90.0000
      4    588.5000    577.7063    408.5000       2         997.0000     180.0000     817.0000
      5      3.2500      0.7778      0.5500       2           3.8000       2.7000       1.1000
      6     30.0000      7.0711      5.0000       2          35.0000      25.0000      10.0000
      7      0.8000      0.5657      0.4000       2           1.2000       0.4000       0.8000
      8     40.0000     14.1421     10.0000       2          50.0000      30.0000      20.0000
      9      0.2500      0.3536      0.2500       2           0.5000       0.0          0.5000
 NUMBER OF CASE FOR VARIABLE     10 IS LESS OR EQUAL TO 1.  PROGRAM GOES ON TO THE NEXT VARIABLE
     11     94.7500      0.3535      0.2500       2          95.0000      94.5000       0.5000
     12     36.0000     33.9411     24.0000       2          60.0000      12.0000      48.0000
 NUMBER OF CASE FOR VARIABLE     13 IS LESS OR EQUAL TO 1.  PROGRAM GOES ON TO THE NEXT VARIABLE
```

STATISTICAL SUMMARY OF TAKEOFF NO_x TESTS FOR B - 707

KEY

	1	Event #
	2	A/C Type
	3	u (mph)
	4	θ (deg)
Station #4	5	χ_1 (ppm)
	6	τ_1 (sec)
Station #5	7	χ_2 (ppm)
	8	τ_2 (sec)
Station #11	9	χ_3 (ppm)
	10	τ_3 (sec)
Station #4	11	$Dose_1$ (ppm.sec)
Station #5	12	$Dose_2$ (ppm.sec)
Section #11	13	$Dose_3$ (ppm.sec)

VAR NO	MEAN	S.D.	S.E. OF MEAN	SAMPLE	MAXIMUM	MINIMUM	RANGE
1	24.0000	12.7181	4.2394	9	39.0000	3.0000	36.0000
2	1.0000	0.0	0.0	9	1.0000	1.0000	0.0
3	7.6667	4.1533	1.3844	9	14.0000	2.0000	12.0000
4	231.1111	34.8010	11.6003	9	280.0000	180.0000	100.0000
5	0.3329	0.1638	0.0546	9	0.5300	0.0360	0.4940
6	31.1111	23.8193	7.9398	9	90.0000	10.0000	80.0000
7	0.1524	0.0938	0.0313	9	0.2700	0.0220	0.2480
8	27.7778	20.7833	6.9278	9	80.0000	15.0000	65.0000
9	0.1135	0.0996	0.0352	8	0.2900	0.0010	0.2890
10	33.1250	22.6680	8.0144	8	75.0000	15.0000	60.0000
11	8.6943	6.1079	2.0360	9	21.2000	2.8500	18.3500
12	3.2900	2.2388	0.7463	9	8.7500	1.5000	7.2500
13	2.9431	3.1585	1.1167	8	10.1500	0.0250	10.1250

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STATISTICAL SUMMARY OF TAKEOFF NO_x TESTS FOR B - 727

KEY

	1	Event #
	2	A/C Type
	3	u (mph)
	4	θ (deg)
Station #4	5	x_1 (ppm)
	6	T_1 (sec)
Station #5	7	x_2 (ppm)
	8	T_2 (sec)
Station #11	9	x_3 (ppm)
	10	T_3 (sec)
Station #4	11	$Dose_1$ (ppm,sec)
Station #5	12	$Dose_2$ (ppm,sec)
Section #11	13	$Dose_3$ (ppm,sec)

VAR NO	MEAN	S.D.	S.E. OF MEAN	SAMPLE	MAXIMUM	MINIMUM	RANGE
1	19.3571	11.9525	3.1944	14	37.0000	2.0000	35.0000
2	2.0000	0.0	0.0	14	2.0000	2.0000	0.0
3	9.0714	4.1780	1.1166	14	16.0000	3.0000	13.0000
4	234.2857	27.3761	7.3166	14	270.0000	190.0000	80.0000
5	0.2513	0.1393	0.0372	14	0.5000	0.0700	0.4300
6	19.2857	13.1350	3.5105	14	60.0000	10.0000	50.0000
7	0.1724	0.1174	0.0314	14	0.4200	0.0300	0.3900
8	21.7857	15.2678	4.0805	14	60.0000	10.0000	50.0000
9	0.0747	0.0604	0.0168	13	0.1600	0.0	0.1600
10	25.5000	24.4324	7.7262	10	70.0000	0.0	70.0000
11	4.1779	2.0194	0.5397	14	7.5000	0.7000	6.8000
12	2.8546	1.4421	0.3854	14	5.6000	0.4500	5.1500
13	1.3070	1.0941	0.3460	10	3.0000	0.0	3.0000

STATISTICAL SUMMARY OF TAKEOFF NO_x TESTS FOR DC 8

	KEY	
	1	Event #
	2	A/C Type
	3	u (mph)
	4	θ (deg)
Station #4	5	χ_1 (ppm)
	6	τ_1 (sec)
Station #5	7	χ_2 (ppm)
	8	τ_2 (sec)
Station #11	9	χ_3 (ppm)
	10	τ_3 (sec)
Station #4	11	$Dose_1$ (ppm,sec)
Station #5	12	$Dose_2$ (ppm,sec)
Section #11	13	$Dose_3$ (ppm,sec)

VAR NO	MEAN	S.D.	S.E. OF MEAN	SAMPLE	MAXIMUM	MINIMUM	RANGE
1	18.3333	11.8771	4.8488	6	33.0000	4.0000	29.0000
2	4.0000	0.0	0.0	6	4.0000	4.0000	0.0
3	9.1667	2.9269	1.1949	6	14.0000	6.0000	8.0000
4	221.6666	16.0208	6.5405	6	230.0000	190.0000	40.0000
5	0.2060	0.0792	0.0323	6	0.2700	0.0760	0.1940
6	27.5000	10.3682	4.2328	6	45.0000	15.0000	30.0000
7	0.0913	0.0576	0.0235	6	0.1600	0.0180	0.1420
8	33.3333	23.5938	9.6321	6	80.0000	15.0000	65.0000
9	0.0447	0.0500	0.0204	6	0.1200	0.0	0.1200
10	36.0000	34.5326	15.4434	5	90.0000	0.0	90.0000
11	5.2383	1.9230	0.7851	6	7.8000	2.2800	5.5200
12	2.6783	1.5628	0.6380	6	4.8000	0.2700	4.5300
13	1.3980	1.2773	0.5712	5	2.7000	0.0	2.7000

STATISTICAL SUMMARY OF TAKEOFF NO_x TESTS FOR DC 9

KEY

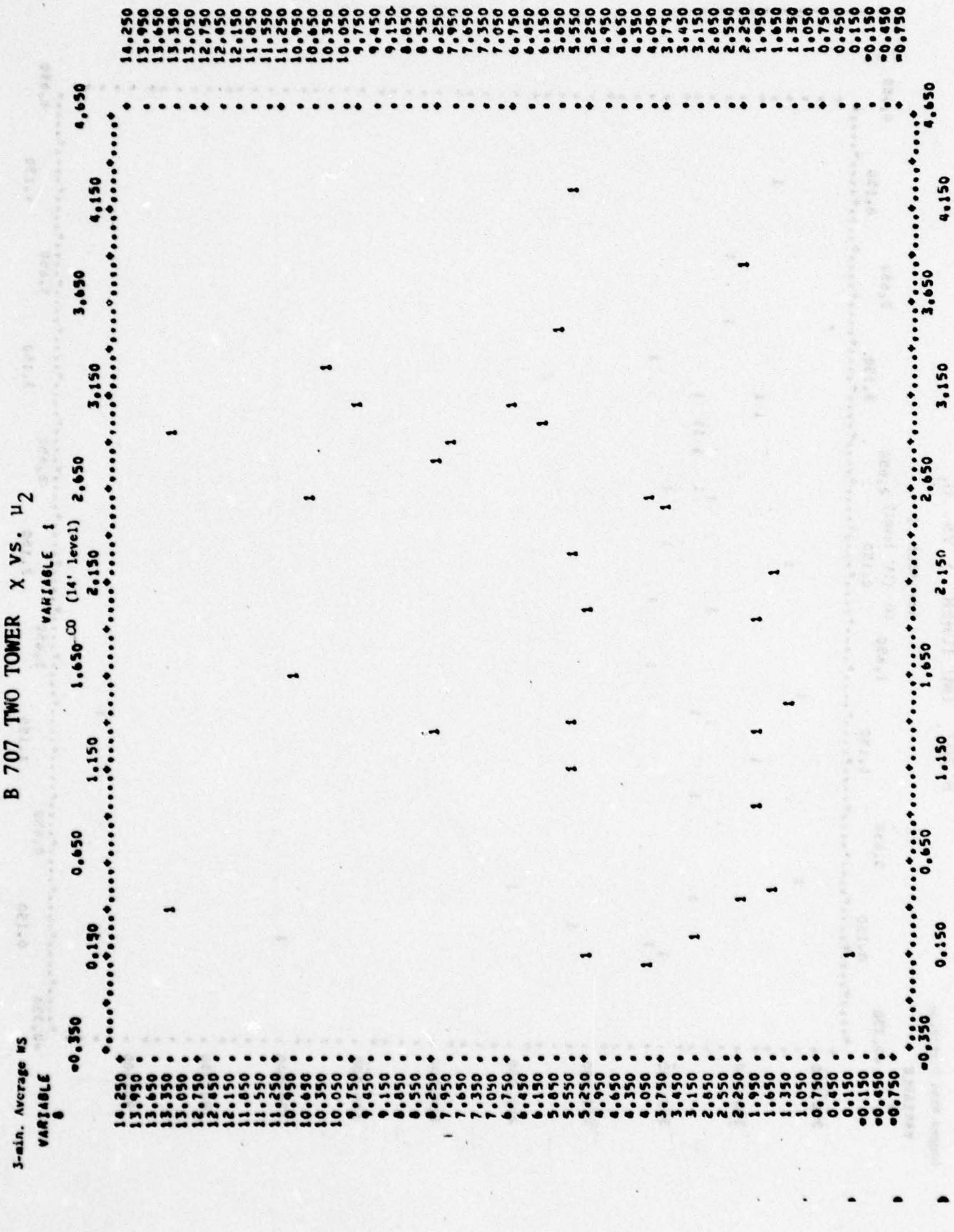
	1	Event #
	2	A/C Type
	3	u (mph)
	4	θ (deg)
Station #4	5	χ_1 (ppm)
	6	τ_1 (sec)
Station #5	7	χ_2 (ppm)
	8	τ_2 (sec)
Station #11	9	χ_3 (ppm)
	10	τ_3 (sec)
Station #4	11	$Dose_1$ (ppm,sec)
Station #5	12	$Dose_2$ (ppm,sec)
Section #11	13	$Dose_3$ (ppm,sec)

VAR NO	MEAN	S.D.	S.E. OF MEAN	SAMPLE	MAXIMUM	MINIMUM	RANGE
1	16.2500	8.0667	2.8520	8	26.0000	1.0000	25.0000
2	9.0000	0.0	0.0	8	9.0000	9.0000	0.0
3	7.1250	3.9799	1.4071	8	14.0000	1.0000	13.0000
4	233.7500	20.6588	7.3040	8	260.0000	200.0000	60.0000
5	0.1602	0.0805	0.0284	8	0.2700	0.0500	0.2200
6	18.7500	9.5431	3.3740	8	40.0000	10.0000	30.0000
7	0.0652	0.0527	0.0186	8	0.1500	0.0100	0.1400
8	21.8750	15.5695	5.5047	8	55.0000	10.0000	45.0000
9	0.0243	0.0319	0.0121	7	0.0700	0.0010	0.0690
10	26.4286	11.4434	4.3252	7	45.0000	10.0000	35.0000
11	2.8787	1.6273	0.5753	8	5.6800	0.5000	5.1800
12	1.2950	0.9028	0.3192	8	2.4500	0.1000	2.3500
13	0.4779	0.6636	0.2508	7	1.7500	0.0300	1.7200

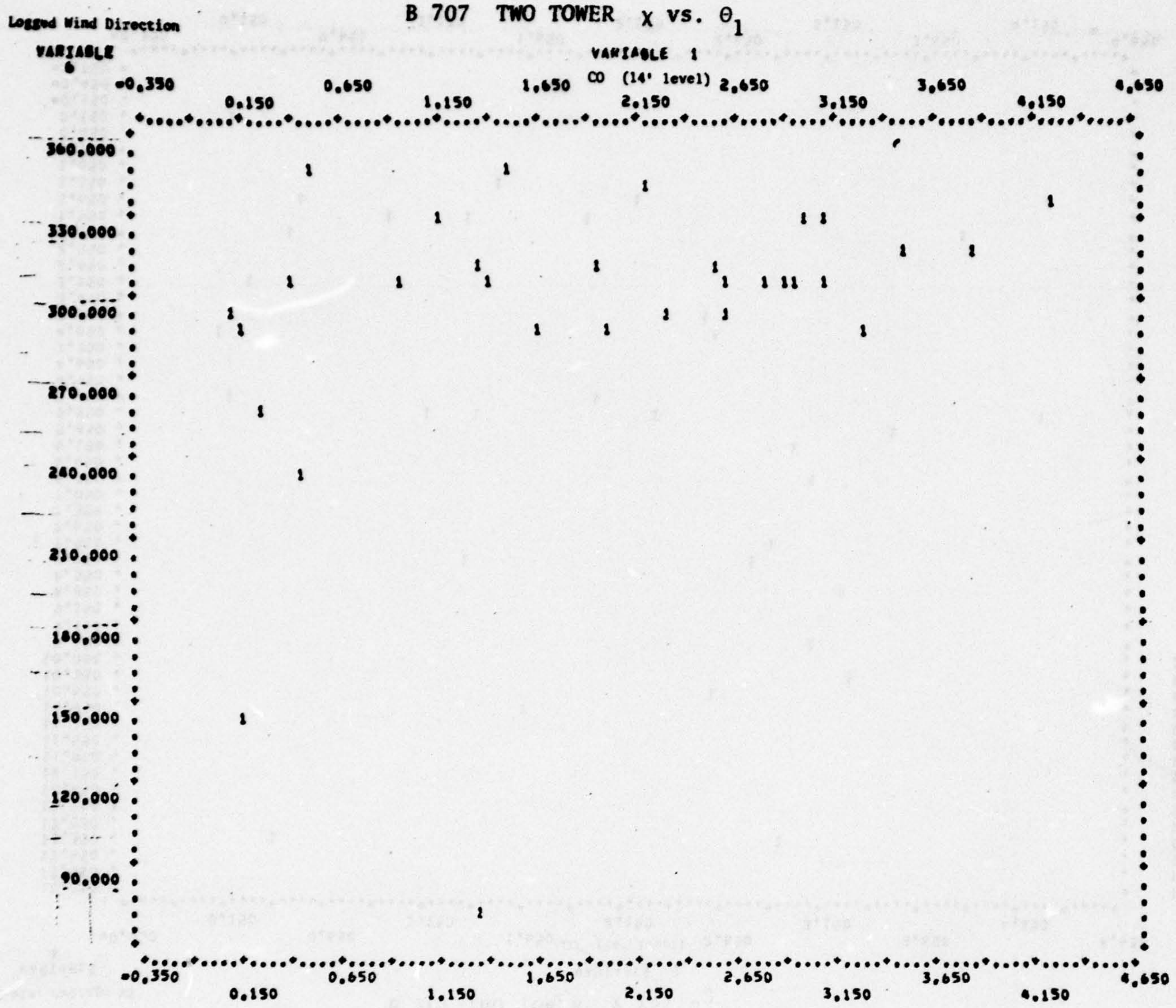
C-1

Correlation of Concentrations with Meteorological Variables: B 707 Aircraft/14 ft Level CO Measurements

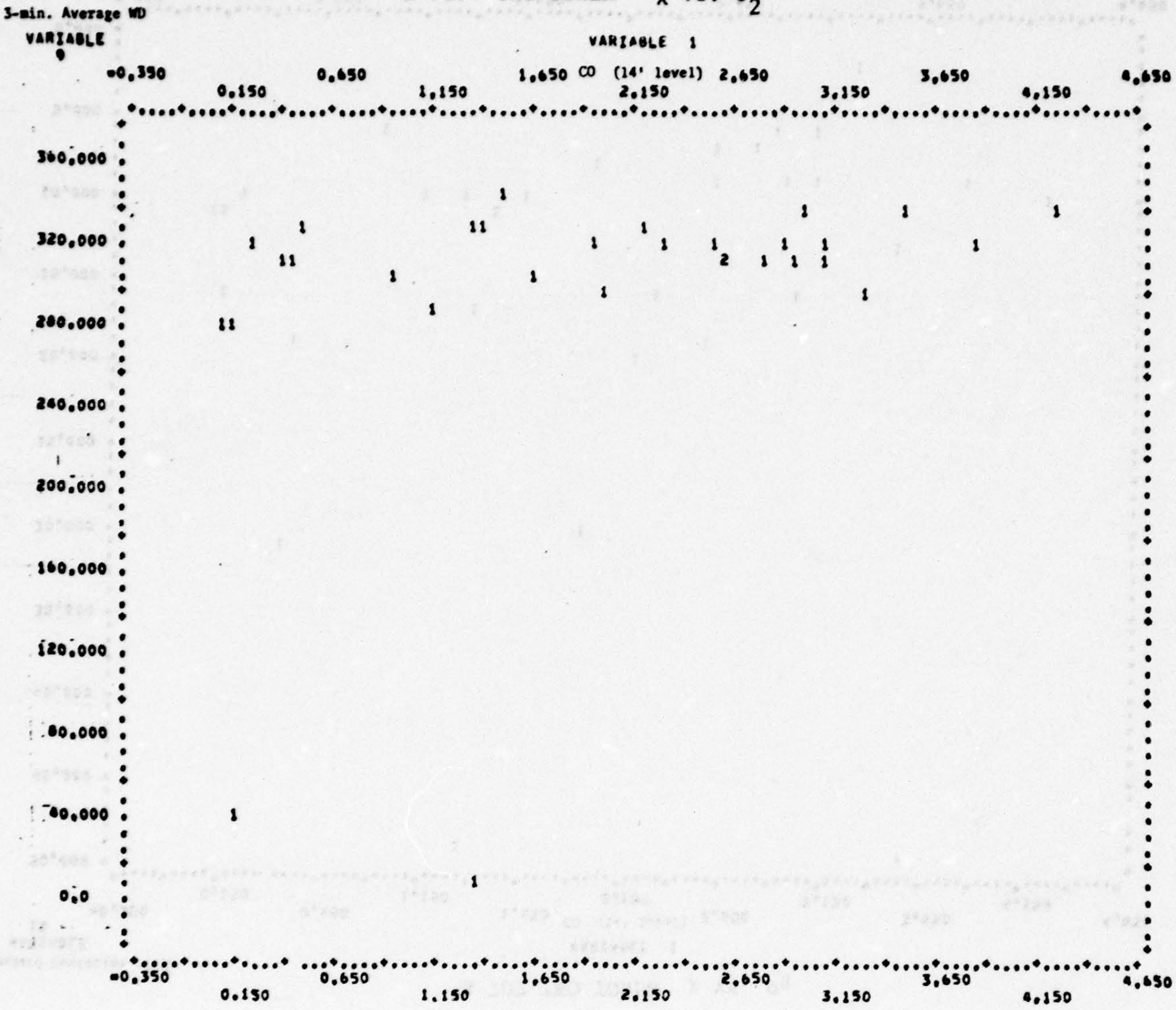
B 707 TWO TOWER X VS. u_2

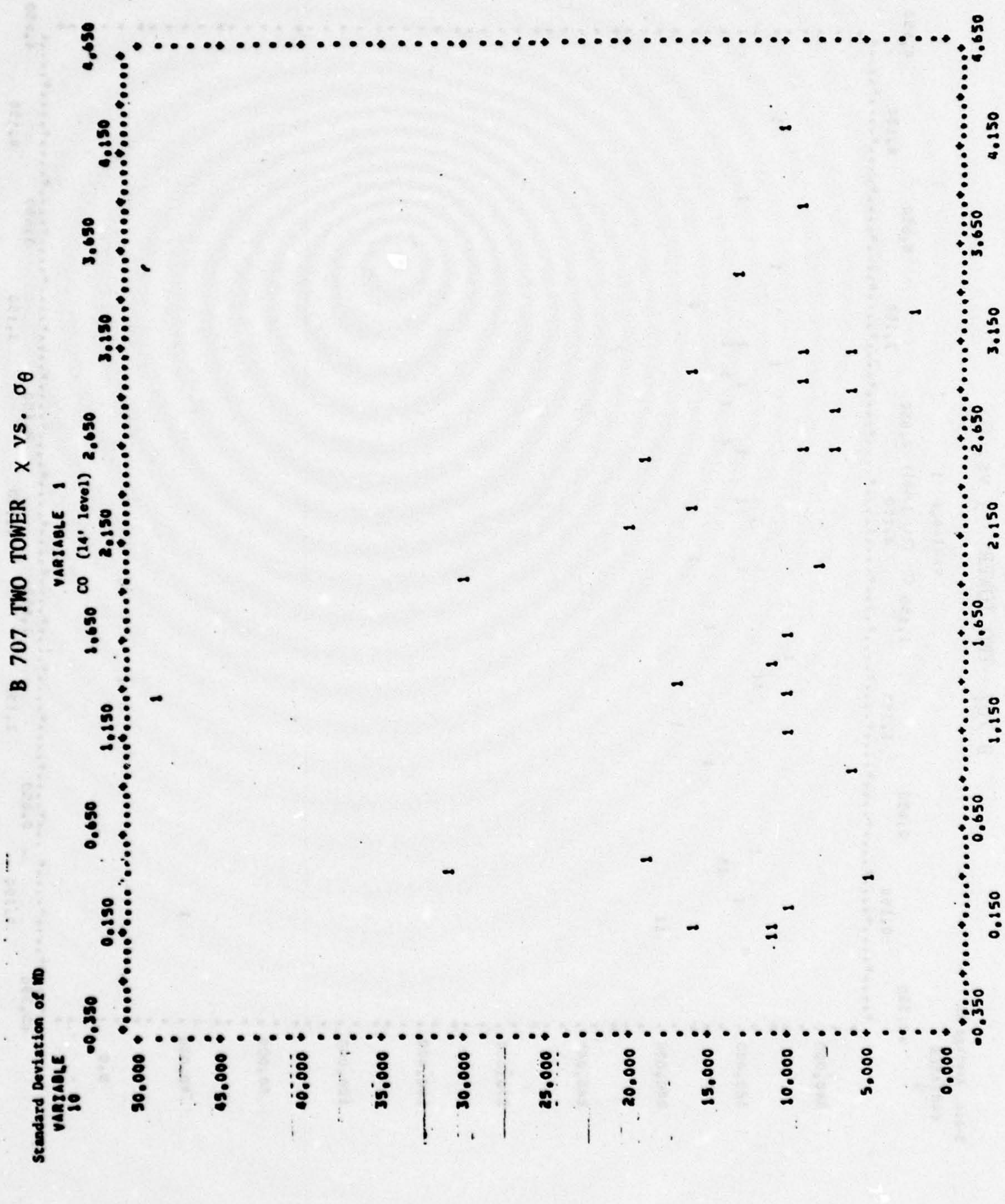


B 707 TWO TOWER χ vs. θ_1



B 707 TWO TOWER χ vs. θ_2

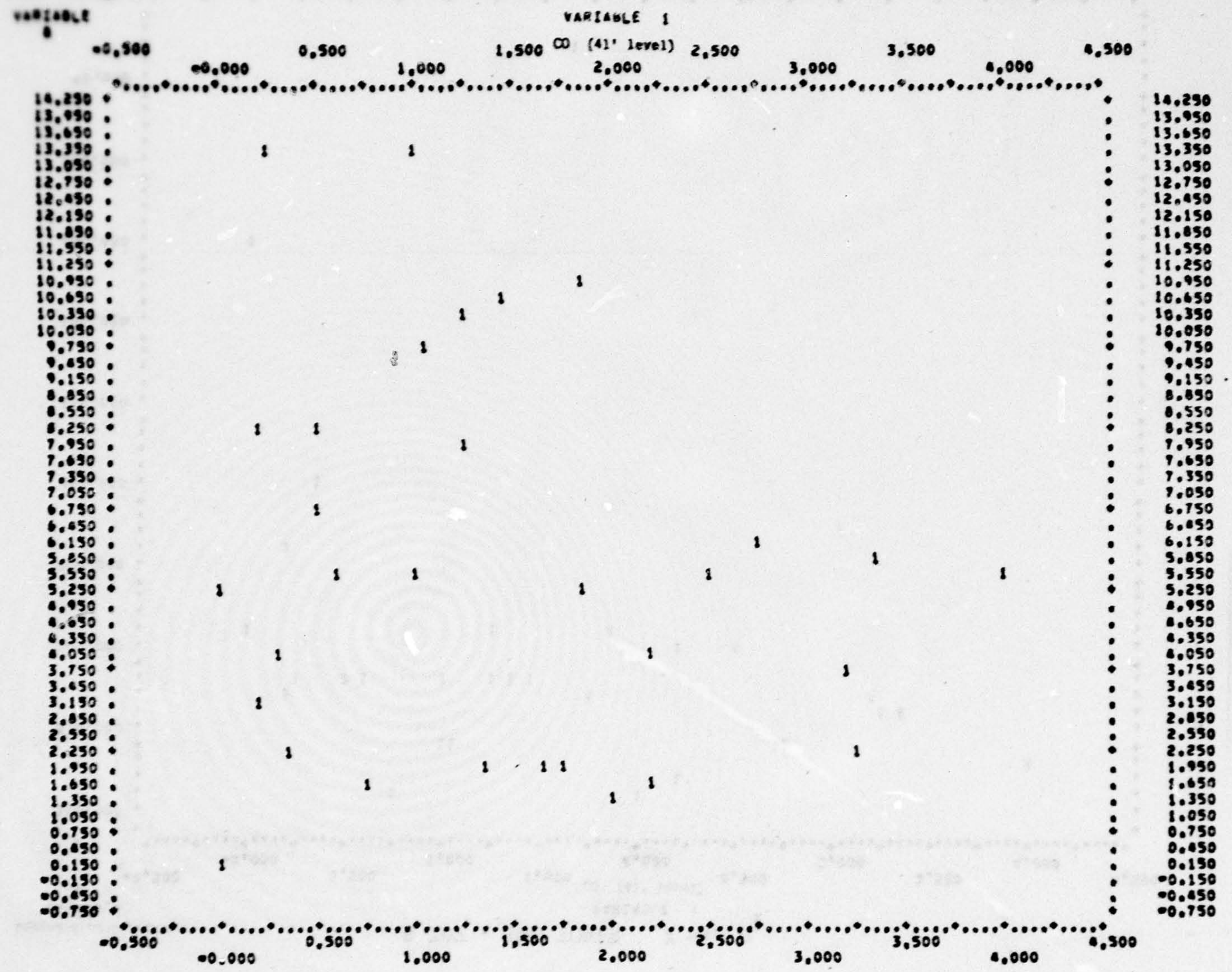


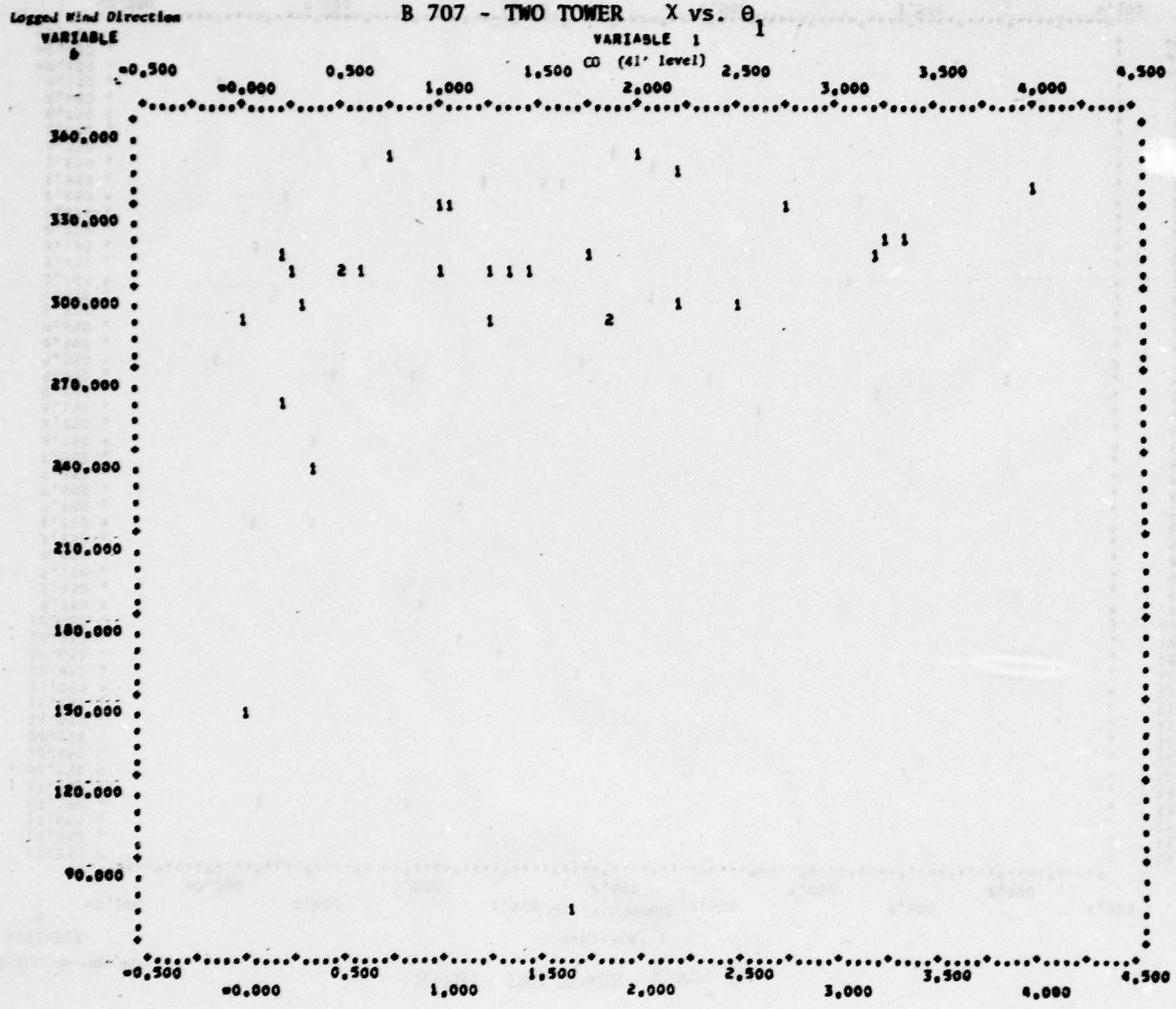

B 707 TWO TOWER X VS. σ_θ
VARIABLE 1
CO (14' level)
Standard Deviation of WD
VARIABLE 10
-0.350
0.150
0.650
1.150
1.650
2.150
2.650
3.150
3.650
4.150
4.650
50.000
45.000
40.000
35.000
30.000
25.000
20.000
15.000
10.000
5.000
0.000

C-2

Correlation of Concentrations with Meteorological Variables: B 707 Aircraft/41 ft Level CO Measurements

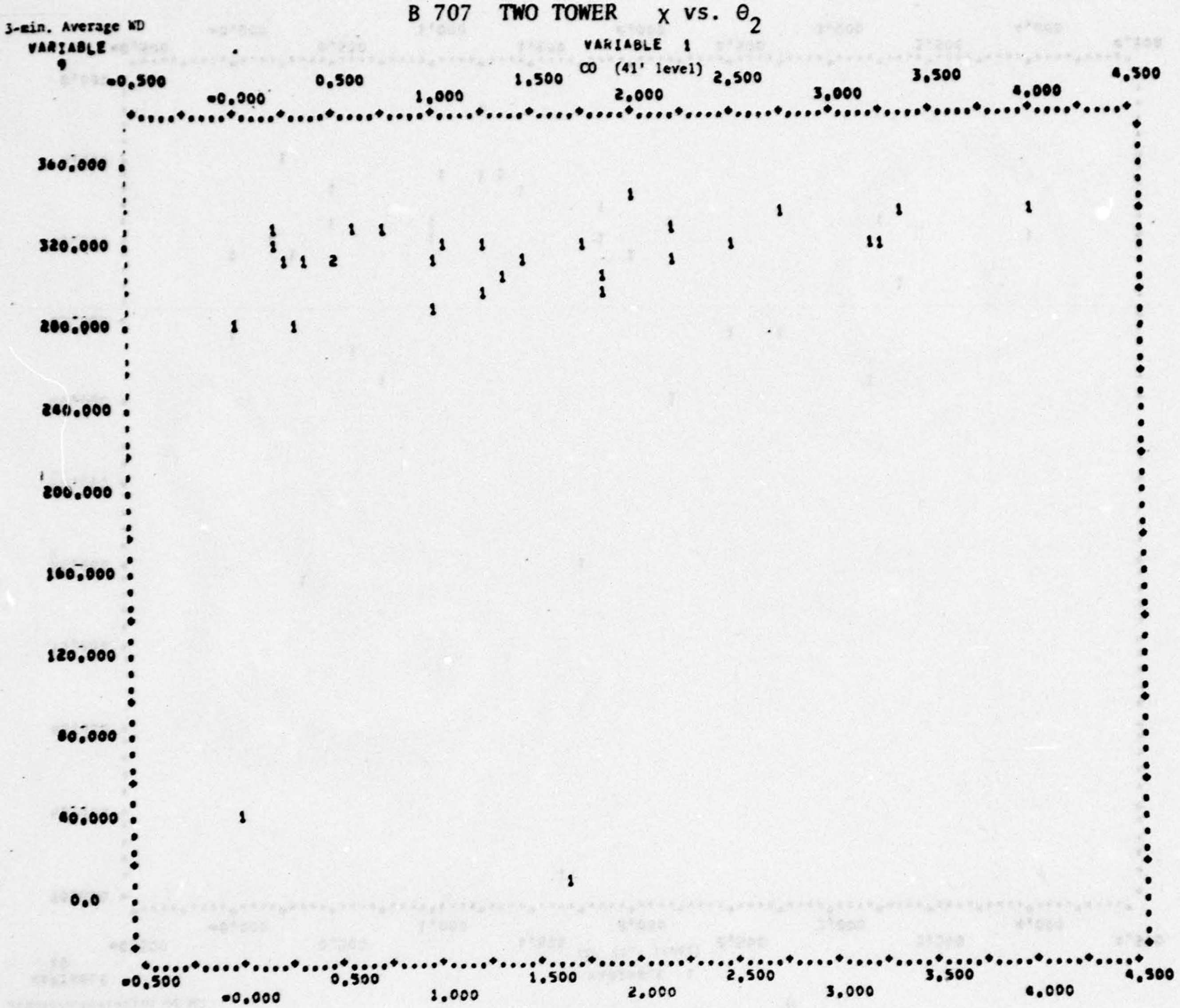
B 707 TWO TOWER χ vs. μ_2

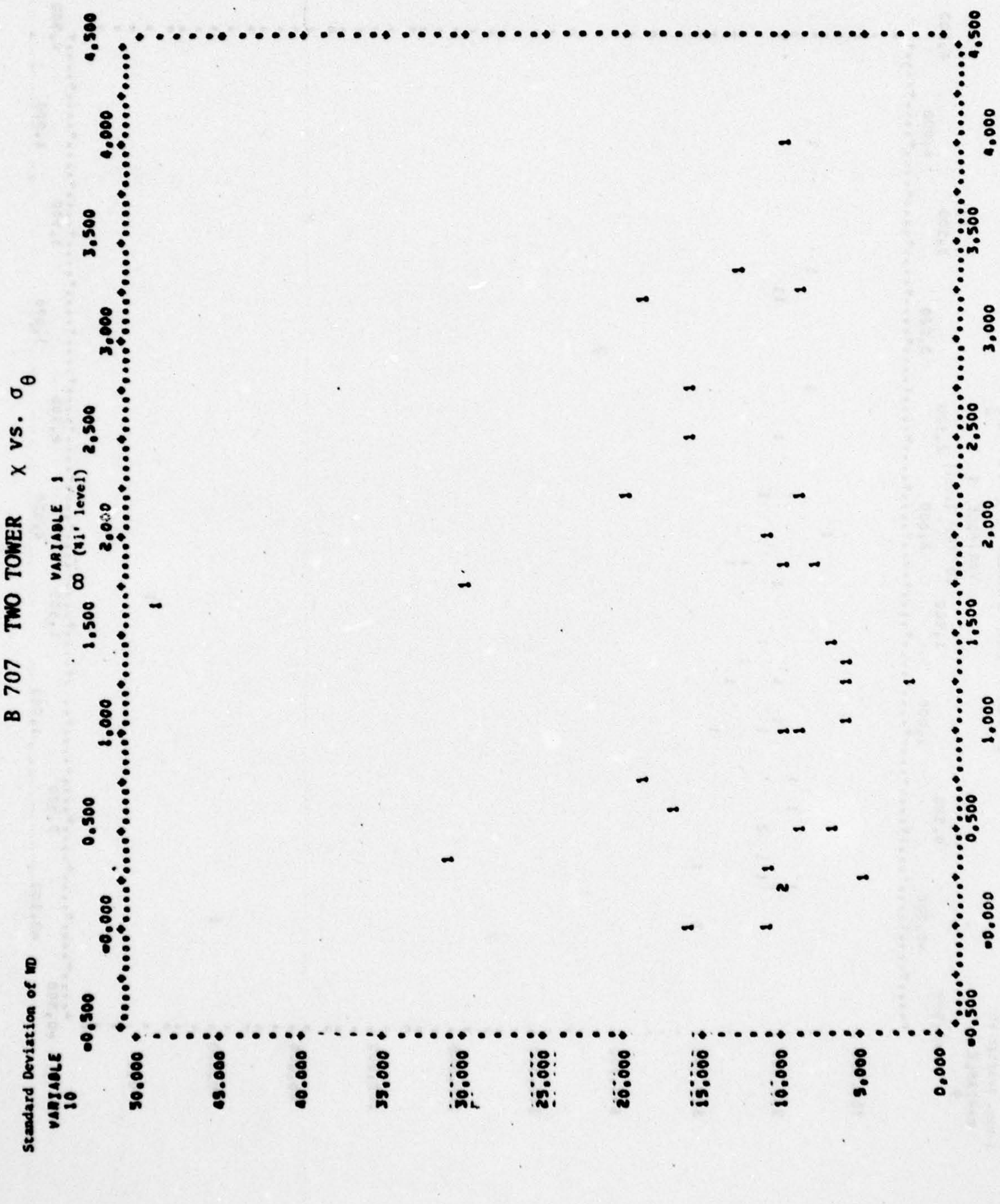




B 707 - TWO TOWER X vs. θ_1

B 707 TWO TOWER χ VS. θ_2

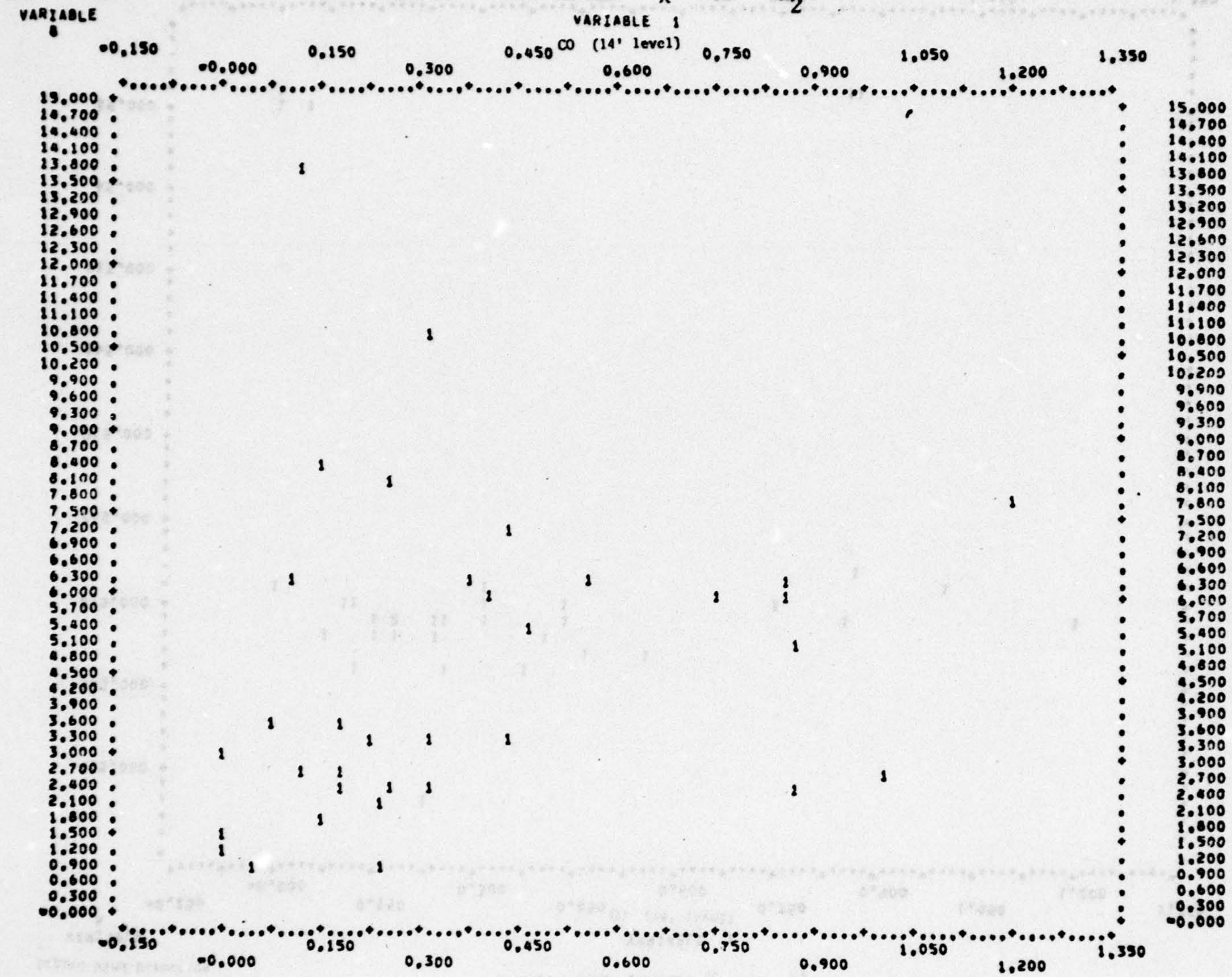



B 707 TWO TOWER X VS. σ_θ

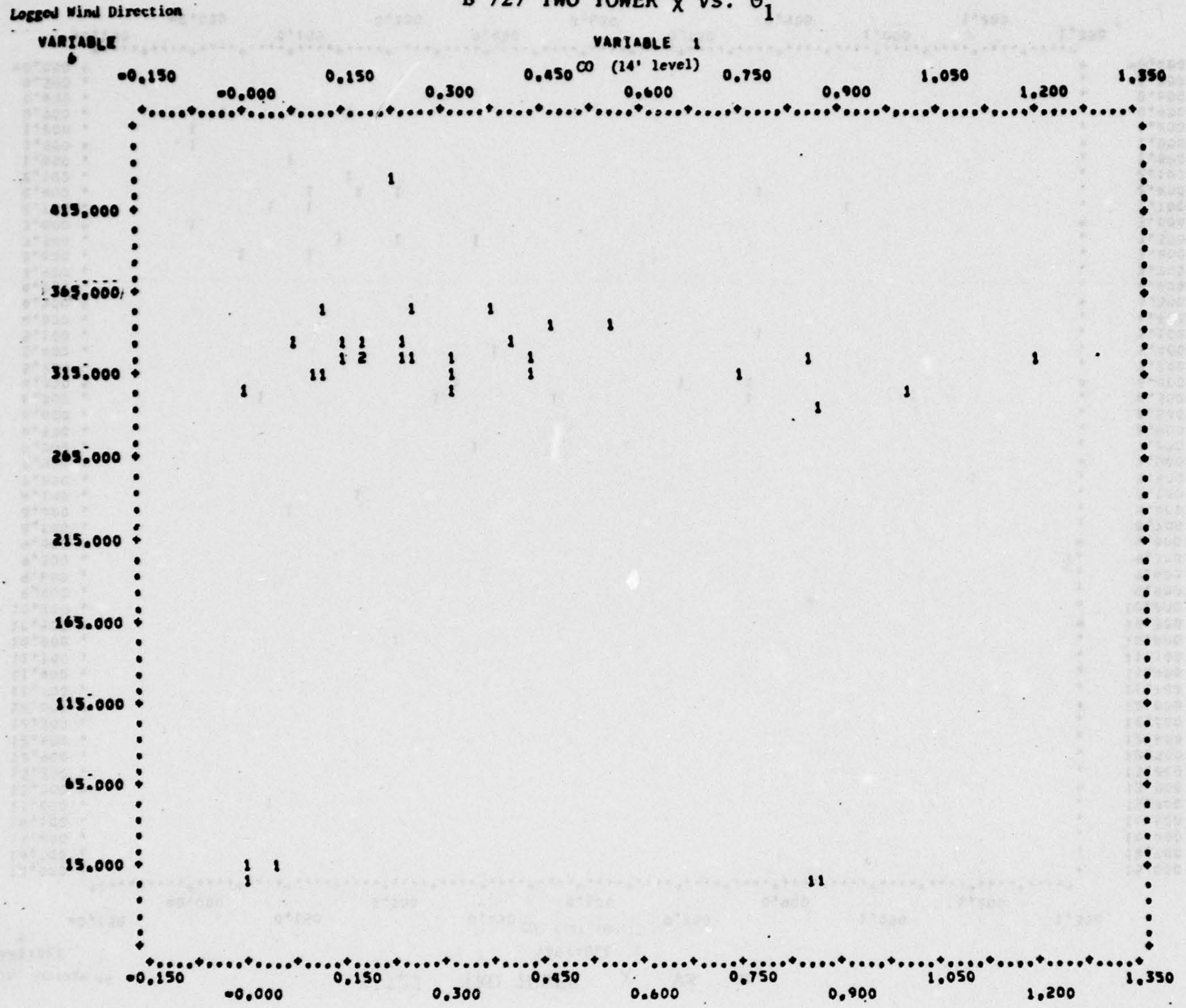
C-3

Correlation of Concentrations with Meteorological Variables: B 727 Aircraft/14 ft Level CO Measurements

B 727 TWO TOWER χ vs u_2



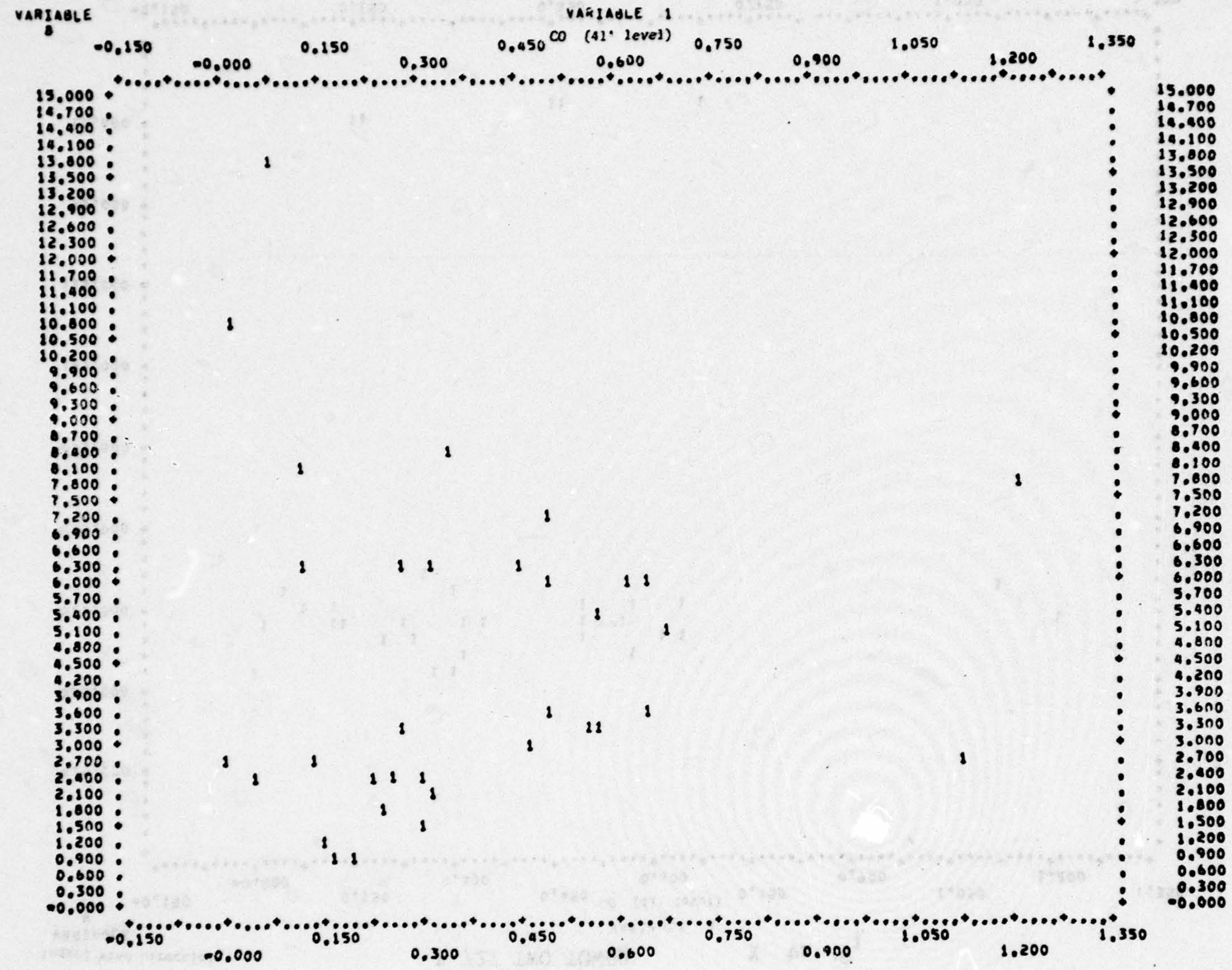
B 727 TWO TOWER χ vs. Θ_1



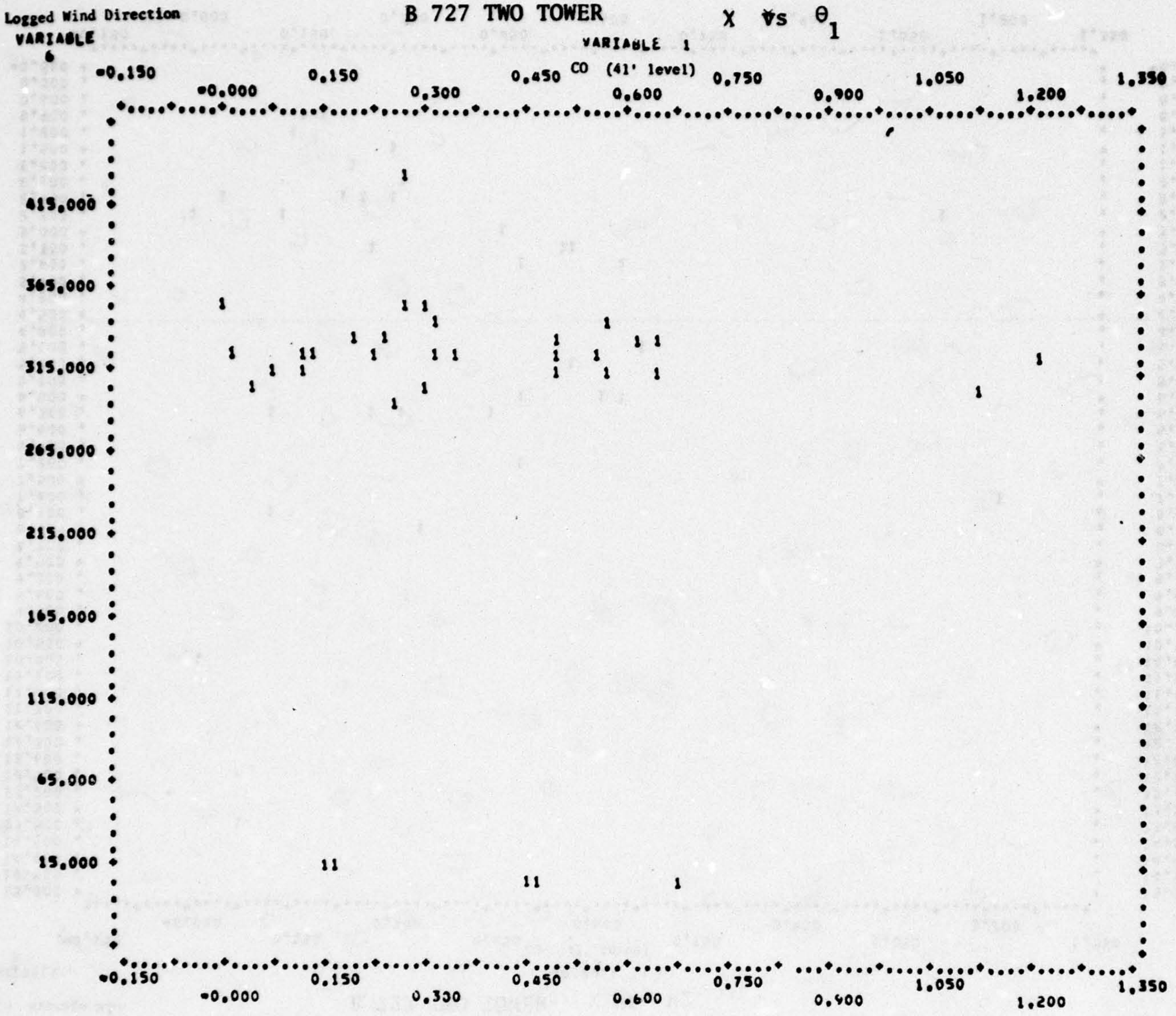
C-4

Correlation of Concentrations with Meteorological Variables: B 727 Aircraft/41 ft Level CO Measurements

B 727 TWO TOWER χ VS. μ_2



B 727 TWO TOWER X vs θ_1

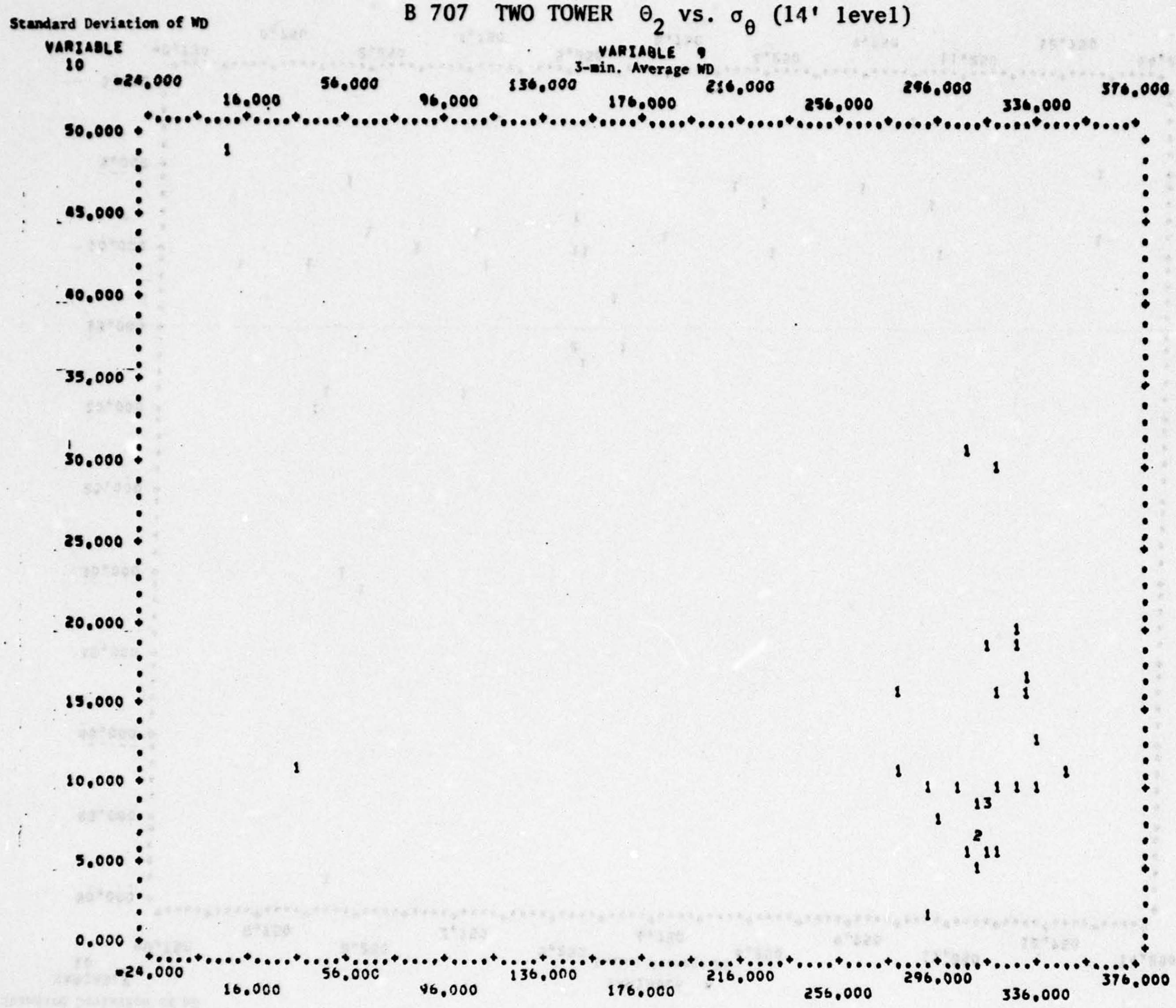


C-5

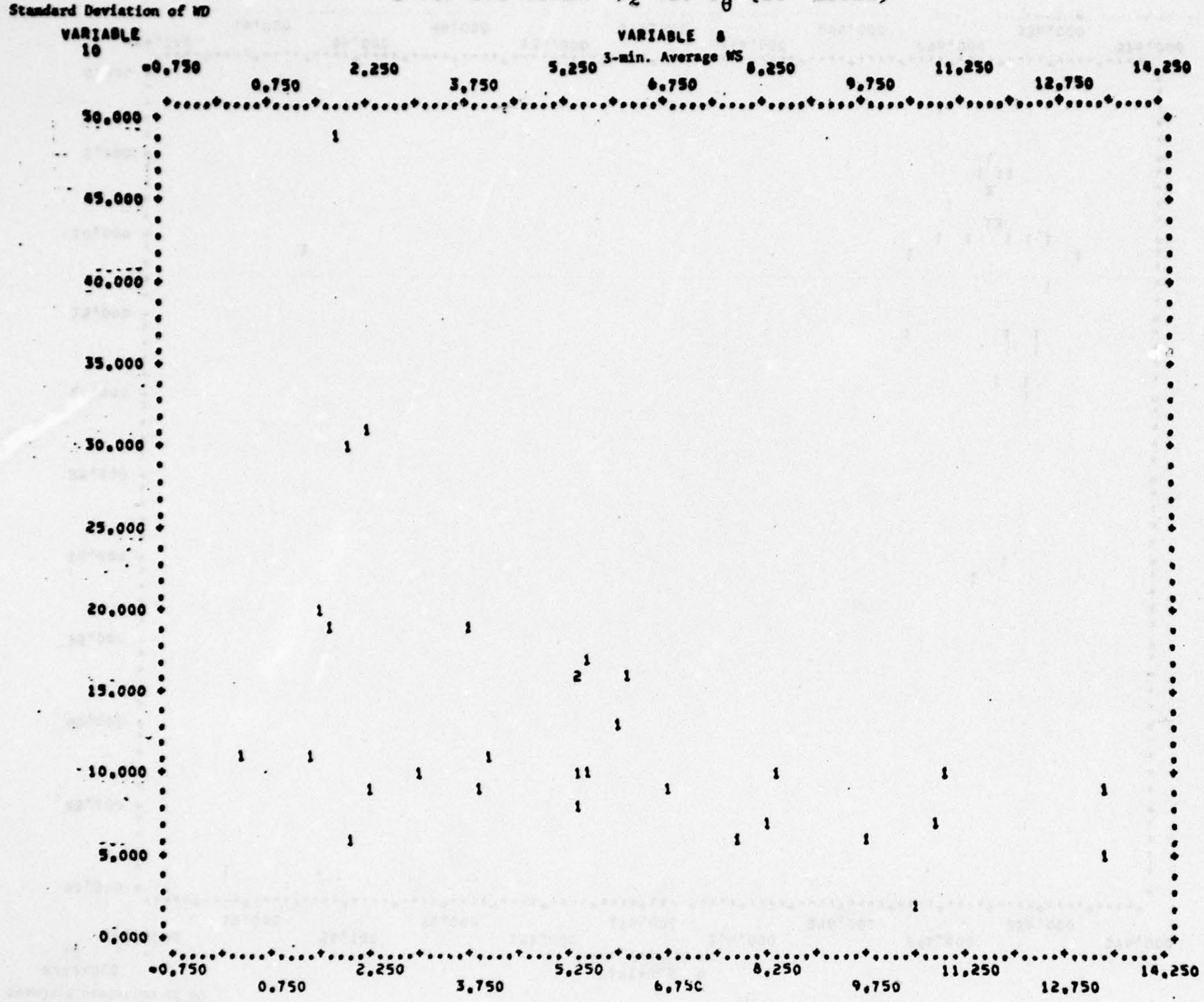
Cross Correlation of Meteorological Variables

14 ft Level

B 707 TWO TOWER Θ_2 vs. σ_θ (14' level)



B 707 TWO TOWER μ_2 vs. σ_θ (14' Level)



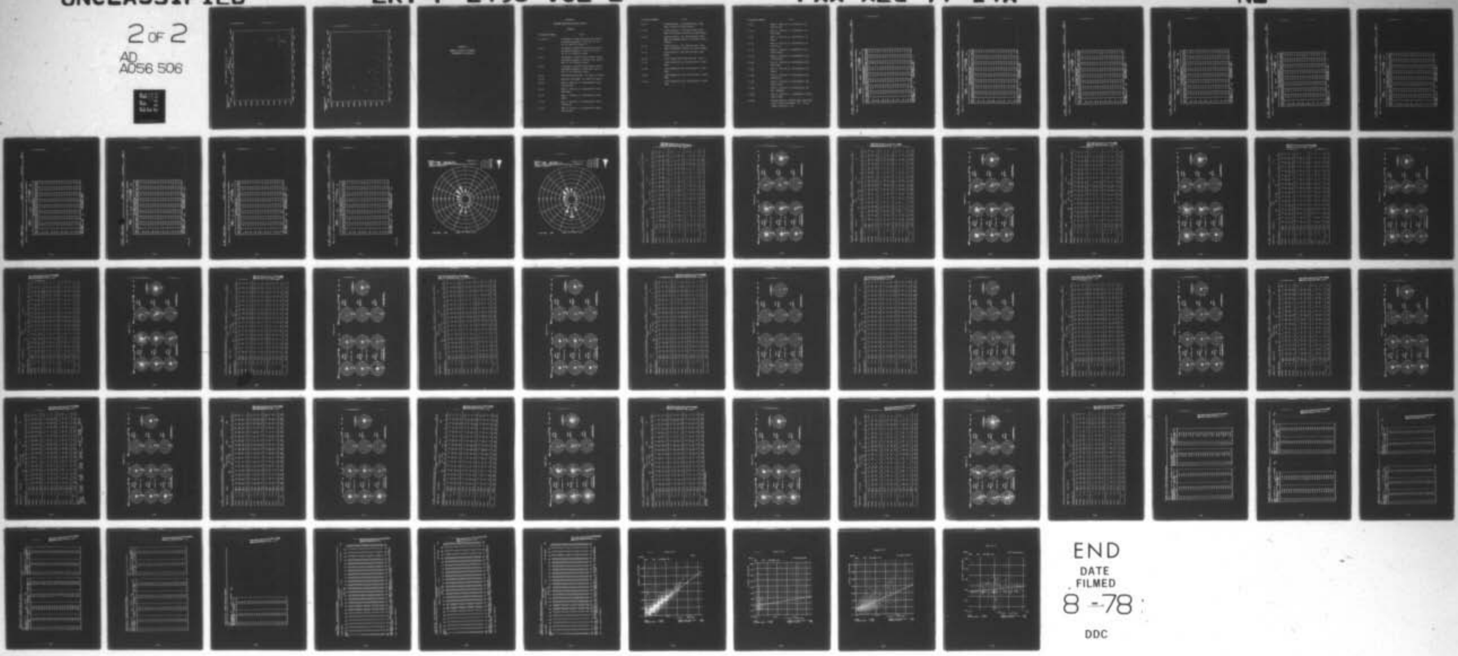
C-6

Cross Correlation of Meteorological Variables

41 ft Level

AD-A056 506 ENVIRONMENTAL RESEARCH AND TECHNOLOGY INC CONCORD MASS F/G 1/3
CONCORDE AIR QUALITY MONITORING AND ANALYSIS PROGRAM AT DULLES --ETC(U)
DEC 77 D G SMITH, R J YAMARTINO, C BENKLEY DOT-FA-76WA-3816
UNCLASSIFIED ERT-P-2495-VOL-2 FAA-AEQ-77-14A NL

2 OF 2
AD
A056 506



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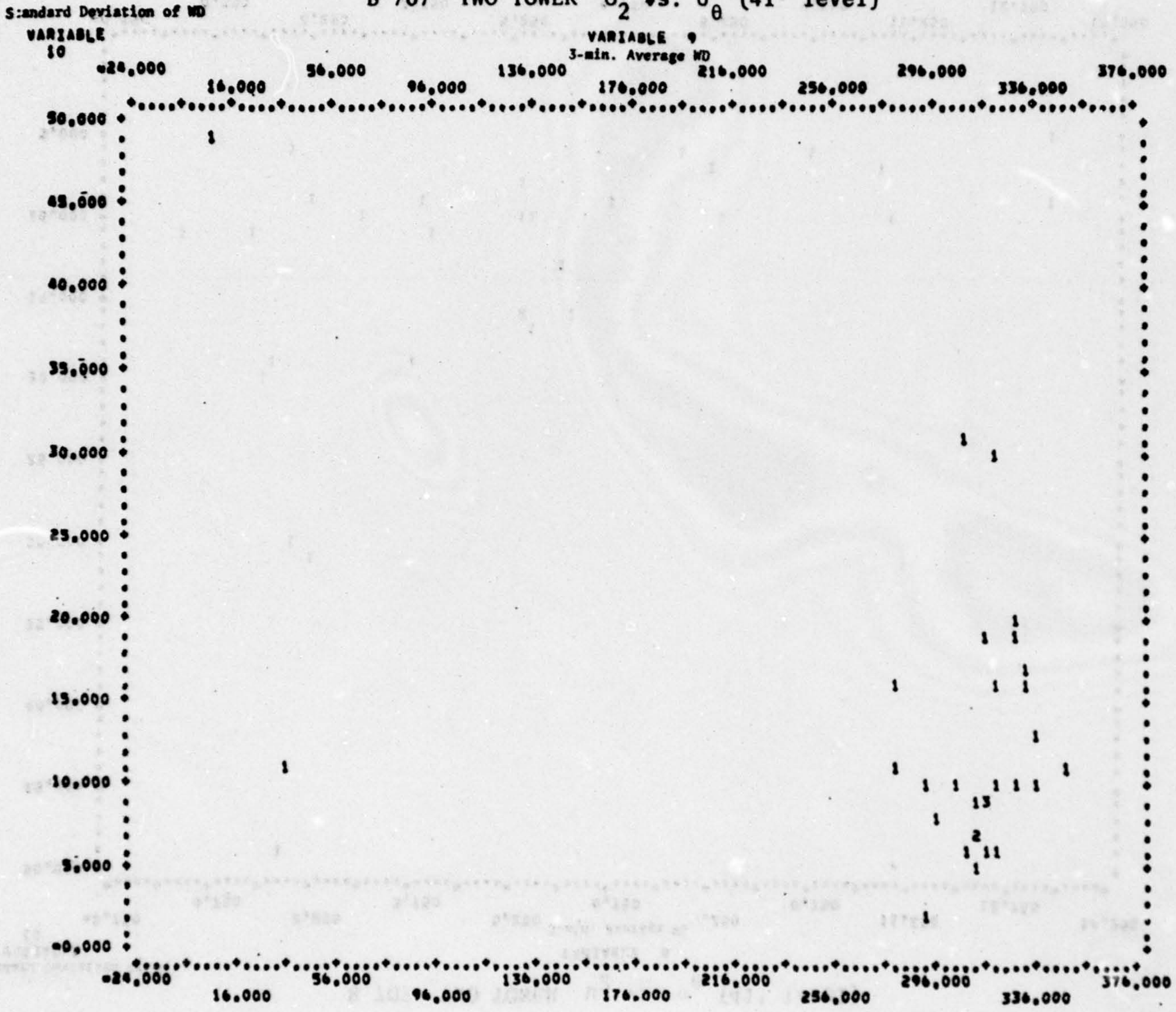
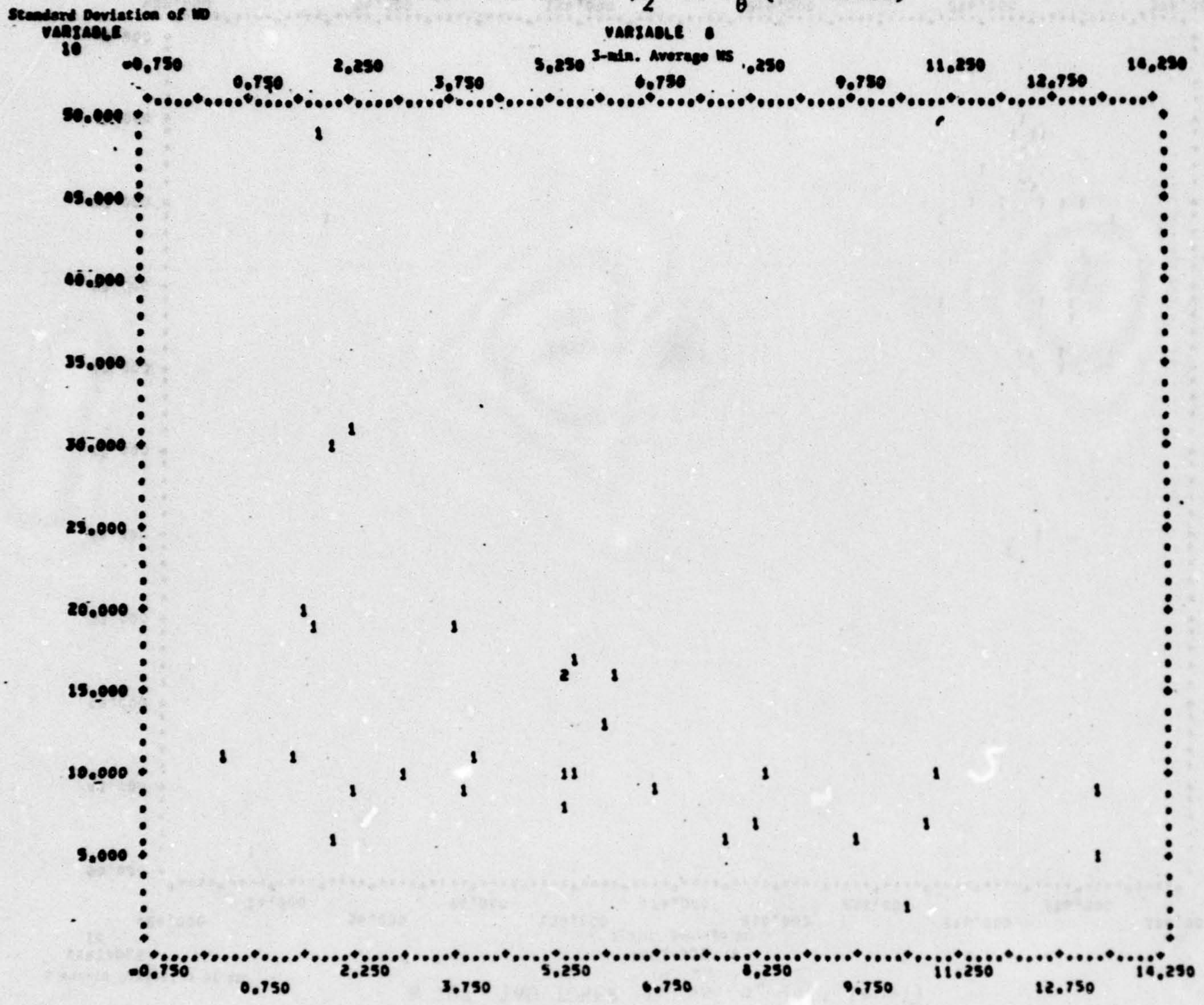
B 707 TWO TOWER θ_2 vs. σ_θ (41' level)



B 707 TWO TOWER μ_2 vs. σ_θ (41' level)



APPENDIX D

COMPLETE RESULTS OF REGIONAL BACKGROUND DATA ANALYSES

APPENDIX D

REGIONAL MONITORING ANALYSIS RESULTS

CONTENTS

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40 3004     PROGRAM DIRWIN                                   VERSION  3.7  (770801)          20 MAY 1977          PAGE   3
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Table D1.1

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% FREQUENCY OF WIND DIRECTIONS WITHIN VARIOUS WIND SPEED CATEGORIES *

            DULLES                                 DULLES AIRPORT
            STABILITY   01    JANUARY     1976    * DECEMBER     1976

*****************************************************************************
I                         WIND SPEED CATEGORY(MPH)                          I
*****************************************************************************
I DIR.   I(02-03) (04-07) (08-11) (12-15) (16-18) (19-24) ( >24 ) (TOTAL)I
I--------I--------I--------I--------I--------I--------I--------I--------I--------I
I        I        I        I        I        I        I        I        I
I N      I   0.0  I  14.3  I   0.0  I   0.0  I   0.0  I   0.0  I   0.0  I  14.3  I
I        I        I        I        I        I        I        I        I
I NNE    I   0.0  I   0.0  I   0.0  I   0.0  I   0.0  I   0.0  I   0.0  I   0.0  I
I        I        I        I        I        I        I        I        I
I NE     I   0.0  I   0.0  I   0.0  I   0.0  I   0.0  I   0.0  I   0.0  I   0.0  I
I        I        I        I        I        I        I        I        I
I ENE    I   0.0  I   0.0  I   0.0  I   0.0  I   0.0  I   0.0  I   0.0  I   0.0  I
I        I        I        I        I        I        I        I        I
I E      I   0.0  I   9.5  I   0.0  I   0.0  I   0.0  I   0.0  I   0.0  I   9.5  I
I        I        I        I        I        I        I        I        I
I ESE    I   0.0  I   0.0  I   0.0  I   0.0  I   0.0  I   0.0  I   0.0  I   0.0  I
I        I        I        I        I        I        I        I        I
I SE     I   0.0  I   4.8  I   0.0  I   0.0  I   0.0  I   0.0  I   0.0  I   4.8  I
I        I        I        I        I        I        I        I        I
I SSE    I   0.0  I   4.8  I   0.0  I   0.0  I   0.0  I   0.0  I   0.0  I   4.8  I
I        I        I        I        I        I        I        I        I
I S      I   0.0  I   9.5  I   0.0  I   0.0  I   0.0  I   0.0  I   0.0  I   9.5  I
I        I        I        I        I        I        I        I        I
I SSW    I   0.0  I   9.5  I   0.0  I   0.0  I   0.0  I   0.0  I   0.0  I   9.5  I
I        I        I        I        I        I        I        I        I
I SW     I   0.0  I   9.5  I   0.0  I   0.0  I   0.0  I   0.0  I   0.0  I   9.5  I
I        I        I        I        I        I        I        I        I
I WSW    I   0.0  I   0.0  I   0.0  I   0.0  I   0.0  I   0.0  I   0.0  I   0.0  I
I        I        I        I        I        I        I        I        I
I W      I   0.0  I   4.8  I   0.0  I   0.0  I   0.0  I   0.0  I   0.0  I   4.8  I
I        I        I        I        I        I        I        I        I
I WNW    I   0.0  I   9.5  I   0.0  I   0.0  I   0.0  I   0.0  I   0.0  I   9.5  I
I        I        I        I        I        I        I        I        I
I NW     I   0.0  I   4.8  I   0.0  I   0.0  I   0.0  I   0.0  I   0.0  I   4.8  I
I        I        I        I        I        I        I        I        I
I NNW    I   0.0  I  14.3  I   0.0  I   0.0  I   0.0  I   0.0  I   0.0  I  14.3  I
I        I        I        I        I        I        I        I        I
I VAR    I   0.0  I   0.0  I   0.0  I   0.0  I   0.0  I   0.0  I   0.0  I   0.0  I
*****************************************************************************
 CALM HOURS =           1                CALM PERCENT =    4.76
*TOTAL OBSERVATIONS =        21          MISSING OBSERVATIONS  =      0
```

Table D1.2

```
 % FREQUENCY OF WIND DIRECTIONS WITHIN VARIOUS WIND SPEED CATEGORIES *

              DULLES                                DULLES AIRPORT
              STABILITY   02    JANUARY     1976     - DECEMBER     1976

*************************************************************************
I                          WIND SPEED CATEGORY(MPH)                     I
*************************************************************************
I DIR.   I(02-03) (04-07) (08-11) (12-15) (16-18) (19-24) ( >24 ) (TOTAL)I
I-------I-------I-------I-------I-------I-------I-------I-------I-------I
I       I       I       I       I       I       I       I       I       I
I N     I   0.0 I   6.4 I   2.3 I   0.0 I   0.0 I   0.0 I   0.0 I   8.7 I
I       I       I       I       I       I       I       I       I       I
I NNE   I   0.0 I   0.9 I   0.9 I   0.0 I   0.0 I   0.0 I   0.0 I   1.8 I
I       I       I       I       I       I       I       I       I       I
I NE    I   0.0 I   1.4 I   0.5 I   0.5 I   0.0 I   0.0 I   0.0 I   2.3 I
I       I       I       I       I       I       I       I       I       I
I ENE   I   0.0 I   1.8 I   0.0 I   0.0 I   0.0 I   0.0 I   0.0 I   1.8 I
I       I       I       I       I       I       I       I       I       I
I E     I   0.0 I   0.9 I   0.9 I   0.0 I   0.0 I   0.0 I   0.0 I   1.8 I
I       I       I       I       I       I       I       I       I       I
I ESE   I   0.0 I   0.5 I   0.0 I   0.0 I   0.0 I   0.0 I   0.0 I   0.5 I
I       I       I       I       I       I       I       I       I       I
I SE    I   0.0 I   1.8 I   1.4 I   0.5 I   0.0 I   0.0 I   0.0 I   3.7 I
I       I       I       I       I       I       I       I       I       I
I SSE   I   0.0 I   1.4 I   1.8 I   0.0 I   0.0 I   0.0 I   0.0 I   3.2 I
I       I       I       I       I       I       I       I       I       I
I S     I   0.0 I   5.0 I   2.7 I   0.9 I   0.0 I   0.0 I   0.0 I   8.7 I
I       I       I       I       I       I       I       I       I       I
I SSW   I   0.0 I   4.6 I   4.1 I   0.0 I   0.0 I   0.0 I   0.0 I   8.7 I
I       I       I       I       I       I       I       I       I       I
I SW    I   0.0 I   1.4 I   2.7 I   0.5 I   0.0 I   0.0 I   0.0 I   4.6 I
I       I       I       I       I       I       I       I       I       I
I WSW   I   0.0 I   1.4 I   0.9 I   0.5 I   0.0 I   0.0 I   0.0 I   2.7 I
I       I       I       I       I       I       I       I       I       I
I W     I   0.0 I   4.1 I   1.8 I   0.9 I   0.0 I   0.0 I   0.0 I   6.8 I
I       I       I       I       I       I       I       I       I       I
I WNW   I   0.0 I   3.2 I   2.7 I   0.9 I   0.0 I   0.0 I   0.0 I   6.8 I
I       I       I       I       I       I       I       I       I       I
I NW    I   0.0 I   5.9 I   5.9 I   0.9 I   0.0 I   0.0 I   0.0 I  12.8 I
I       I       I       I       I       I       I       I       I       I
I NNW   I   0.0 I   5.0 I   1.8 I   0.5 I   0.0 I   0.0 I   0.0 I   7.3 I
I       I       I       I       I       I       I       I       I       I
I VAR   I   0.0 I   0.0 I   0.0 I   0.0 I   0.0 I   0.0 I   0.0 I   0.0 I
*************************************************************************
  CALM HOURS =          39              CALM PERCENT =  17.81
 *TOTAL OBSERVATIONS =       219        MISSING OBSERVATIONS  =      0
```

```
40  3004     PROGRAM DIRWIN                                   VERSION  3.7  (770201)                 24 MAY 1977               PAGE   9
*************************************************************************************************************************************
```

Table D1.3 % FREQUENCY OF WIND DIRECTIONS WITHIN VARIOUS WIND SPEED CATEGORIES *

```
                 DULLES                                       DULLES AIRPORT
                 STABILITY   03    JANUARY        1976     - DECEMBER      1976

        *------------------------------------------------------------------------*
        I                        WIND SPEED CATEGORY(MPH)                        I
        *------------------------------------------------------------------------*
        I DIR.   I(02-03) (04-07) (08-11) (12-15) (16-18) (19-24) ( >24 ) (TOTAL)I
        I--------I--------I--------I--------I--------I--------I--------I--------I
        I        I        I        I        I        I        I        I        I
        I N      I   0.0  I   2.8  I   1.0  I   0.8  I   0.0  I   0.0  I   0.0  I   4.5  I
        I        I        I        I        I        I        I        I        I
        I NNE    I   0.0  I   0.8  I   0.0  I   0.3  I   0.0  I   0.0  I   0.0  I   1.0  I
        I        I        I        I        I        I        I        I        I
        I NE     I   0.0  I   1.3  I   0.8  I   1.5  I   0.0  I   0.0  I   0.0  I   3.3  I
        I        I        I        I        I        I        I        I        I
        I ENE    I   0.0  I   1.8  I   0.0  I   0.0  I   0.0  I   0.0  I   0.0  I   1.8  I
        I        I        I        I        I        I        I        I        I
        I E      I   0.0  I   1.5  I   0.5  I   0.3  I   0.0  I   0.0  I   0.0  I   2.0  I
        I        I        I        I        I        I        I        I        I
        I ESE    I   0.0  I   0.5  I   0.8  I   0.5  I   0.0  I   0.0  I   0.0  I   1.8  I
        I        I        I        I        I        I        I        I        I
        I SE     I   0.0  I   1.8  I   0.8  I   0.5  I   0.0  I   0.0  I   0.0  I   3.0  I
        I        I        I        I        I        I        I        I        I
        I SSE    I   0.0  I   2.5  I   1.0  I   0.8  I   0.0  I   0.0  I   0.0  I   4.0  I
        I        I        I        I        I        I        I        I        I
        I S      I   0.0  I   6.3  I   4.8  I   4.0  I   0.0  I   0.3  I   0.0  I  15.3  I
        I        I        I        I        I        I        I        I        I
        I SSW    I   0.0  I   3.5  I   2.5  I   2.3  I   0.0  I   0.0  I   0.0  I   8.3  I
        I        I        I        I        I        I        I        I        I
        I SW     I   0.0  I   2.0  I   3.0  I   1.0  I   0.0  I   0.0  I   0.0  I   6.0  I
        I        I        I        I        I        I        I        I        I
        I WSW    I   0.0  I   2.0  I   1.0  I   0.8  I   0.0  I   0.3  I   0.0  I   4.0  I
        I        I        I        I        I        I        I        I        I
        I W      I   0.0  I   2.8  I   2.5  I   4.5  I   0.5  I   0.5  I   0.0  I  10.5  I
        I        I        I        I        I        I        I        I        I
        I WNW    I   0.0  I   1.0  I   2.3  I   6.0  I   0.0  I   0.5  I   0.0  I   9.8  I
        I        I        I        I        I        I        I        I        I
        I NW     I   0.0  I   3.8  I   3.0  I   3.5  I   0.3  I   0.5  I   0.3  I  11.3  I
        I        I        I        I        I        I        I        I        I
        I NNW    I   0.0  I   4.8  I   2.0  I   0.5  I   0.0  I   0.0  I   0.0  I   7.3  I
        I        I        I        I        I        I        I        I        I
        I VAR    I   0.0  I   0.0  I   0.0  I   0.0  I   0.0  I   0.0  I   0.0  I   0.0  I
        *------------------------------------------------------------------------*
          CALM HOURS =         25                 CALM PERCENT =    6.27
        *TOTAL OBSERVATIONS =     399             MISSING OBSERVATIONS  =    0
```

Table D1.4

```
% FREQUENCY OF WIND DIRECTIONS WITHIN VARIOUS WIND SPEED CATEGORIES *

           DULLES                                 DULLES AIRPORT
           STABILITY   06    JANUARY     1976    * DECEMBER     1976

*-------------------------------------------------------------------------*
I                         WIND SPEED CATEGORY(MPH)                        I
*-------------------------------------------------------------------------*
I DIR.  I(02-03) (04-07) (08-11) (12-15) (16-18) (19-24) ( >24 ) (TOTAL)I
I-------I-------I-------I-------I-------I-------I-------I-------I-------I
I       I       I       I       I       I       I       I       I       I
I N     I   0.0 I   2.9 I   0.9 I   0.2 I   0.0 I   0.0 I   0.1 I   4.1 I
I       I       I       I       I       I       I       I       I       I
I NNE   I   0.0 I   0.7 I   0.7 I   0.7 I   0.0 I   0.0 I   0.0 I   2.2 I
I       I       I       I       I       I       I       I       I       I
I NE    I   0.0 I   1.0 I   0.6 I   0.4 I   0.0 I   0.1 I   0.0 I   2.0 I
I       I       I       I       I       I       I       I       I       I
I ENE   I   0.0 I   0.8 I   0.3 I   0.3 I   0.0 I   0.0 I   0.0 I   1.4 I
I       I       I       I       I       I       I       I       I       I
I E     I   0.0 I   1.2 I   1.0 I   0.2 I   0.2 I   0.0 I   0.0 I   2.6 I
I       I       I       I       I       I       I       I       I       I
I ESE   I   0.0 I   1.5 I   0.7 I   0.4 I   0.1 I   0.0 I   0.0 I   2.6 I
I       I       I       I       I       I       I       I       I       I
I SE    I   0.0 I   2.0 I   1.7 I   0.8 I   0.0 I   0.0 I   0.1 I   4.6 I
I       I       I       I       I       I       I       I       I       I
I SSE   I   0.0 I   1.7 I   2.7 I   1.4 I   0.2 I   0.0 I   0.0 I   6.0 I
I       I       I       I       I       I       I       I       I       I
I S     I   0.0 I   4.1 I   5.4 I   7.4 I   1.4 I   0.4 I   0.0 I  18.7 I
I       I       I       I       I       I       I       I       I       I
I SSW   I   0.0 I   2.0 I   1.4 I   2.6 I   0.8 I   0.8 I   0.1 I   7.7 I
I       I       I       I       I       I       I       I       I       I
I SW    I   0.0 I   1.0 I   0.4 I   0.7 I   0.4 I   0.1 I   0.0 I   2.7 I
I       I       I       I       I       I       I       I       I       I
I WSW   I   0.0 I   0.5 I   0.4 I   0.3 I   0.1 I   0.0 I   0.0 I   1.3 I
I       I       I       I       I       I       I       I       I       I
I W     I   0.0 I   0.9 I   1.7 I   3.3 I   1.3 I   1.5 I   0.5 I   9.2 I
I       I       I       I       I       I       I       I       I       I
I WNW   I   0.0 I   1.0 I   1.0 I   3.9 I   2.7 I   4.0 I   1.0 I  13.6 I
I       I       I       I       I       I       I       I       I       I
I NW    I   0.0 I   1.9 I   1.5 I   3.9 I   2.8 I   1.7 I   0.1 I  12.0 I
I       I       I       I       I       I       I       I       I       I
I NNW   I   0.0 I   2.4 I   1.4 I   0.9 I   0.7 I   0.1 I   0.0 I   5.5 I
I       I       I       I       I       I       I       I       I       I
I VAR   I   0.0 I   0.0 I   0.0 I   0.0 I   0.0 I   0.0 I   0.0 I   0.0 I
*-------------------------------------------------------------------------*
  CALM HOURS =          49              CALM PERCENT =     3.63
 *TOTAL OBSERVATIONS =    1350          MISSING OBSERVATIONS  =      0
```

Table D1.5

```
60  3004      PROGRAM DIRWIN                                         VERSION  3.7  (770201)                   24 MAY 1977              PAGE  7
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              % FREQUENCY OF WIND DIRECTIONS WITHIN VARIOUS WIND SPEED CATEGORIES *

                   DULLES                                            DULLES AIRPORT
                   STABILITY    05     JANUARY         1976    * DECEMBER       1976

             ---------------------------------------------------------------------------
             I                        WIND SPEED CATEGORY(MPH)                         I
             ---------------------------------------------------------------------------
             I DIR.   I(02-03) (04-07) (08-11) (12-15) (16-18) (19-24) ( >24 ) (TOTAL)I
             I--------I--------I--------I--------I--------I--------I--------I--------I--------I
             I        I        I        I        I        I        I        I        I
             I N      I    0.0 I    0.8 I    1.2 I    0.4 I    0.0 I    0.0 I    0.0 I    2.3 I
             I        I        I        I        I        I        I        I        I
             I NNE    I    0.0 I    0.8 I    0.4 I    0.0 I    0.0 I    0.0 I    0.0 I    1.2 I
             I        I        I        I        I        I        I        I        I
             I NE     I    0.0 I    2.7 I    1.6 I    0.0 I    0.0 I    0.0 I    0.0 I    4.3 I
             I        I        I        I        I        I        I        I        I
             I ENE    I    0.0 I    1.6 I    0.0 I    0.0 I    0.0 I    0.0 I    0.0 I    1.6 I
             I        I        I        I        I        I        I        I        I
             I E      I    0.0 I    1.2 I    1.6 I    0.0 I    0.0 I    0.0 I    0.0 I    2.7 I
             I        I        I        I        I        I        I        I        I
             I ESE    I    0.0 I    3.5 I    0.4 I    0.0 I    0.0 I    0.0 I    0.0 I    3.9 I
             I        I        I        I        I        I        I        I        I
             I SE     I    0.0 I    7.0 I    2.7 I    0.0 I    0.0 I    0.0 I    0.0 I    9.7 I
             I        I        I        I        I        I        I        I        I
             I SSE    I    0.0 I    4.7 I    4.7 I    1.2 I    0.0 I    0.0 I    0.0 I   10.5 I
             I        I        I        I        I        I        I        I        I
             I S      I    0.0 I    9.3 I    8.9 I    1.9 I    0.0 I    0.0 I    0.0 I   20.2 I
             I        I        I        I        I        I        I        I        I
             I SSW    I    0.0 I    3.1 I    1.2 I    1.2 I    0.0 I    0.0 I    0.0 I    5.4 I
             I        I        I        I        I        I        I        I        I
             I SW     I    0.0 I    0.8 I    0.8 I    0.0 I    0.0 I    0.0 I    0.0 I    1.6 I
             I        I        I        I        I        I        I        I        I
             I WSW    I    0.0 I    1.2 I    1.2 I    0.0 I    0.0 I    0.0 I    0.0 I    2.3 I
             I        I        I        I        I        I        I        I        I
             I W      I    0.0 I    1.2 I    4.7 I    1.2 I    0.0 I    0.0 I    0.0 I    7.0 I
             I        I        I        I        I        I        I        I        I
             I WNW    I    0.0 I    0.8 I    5.4 I    7.0 I    0.0 I    0.0 I    0.0 I   13.2 I
             I        I        I        I        I        I        I        I        I
             I NW     I    0.0 I    1.9 I    5.8 I    3.5 I    0.0 I    0.0 I    0.0 I   11.3 I
             I        I        I        I        I        I        I        I        I
             I NNW    I    0.0 I    2.3 I    0.0 I    0.4 I    0.0 I    0.0 I    0.0 I    2.7 I
             I        I        I        I        I        I        I        I        I
             I VAR    I    0.0 I    0.0 I    0.0 I    0.0 I    0.0 I    0.0 I    0.0 I    0.0 I
             ---------------------------------------------------------------------------
               CALM HOURS =            0          CALM PERCENT =     0.0
              *TOTAL OBSERVATIONS =     257        MISSING OBSERVATIONS =     0
```

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40  3004     PROGRAM DIRWIN                          VERSION  3.7  (770201)             24 MAY 1977          PAGE   8
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Table D1.6

```
% FREQUENCY OF WIND DIRECTIONS WITHIN VARIOUS WIND SPEED CATEGORIES *

          DULLES                               DULLES AIRPORT
          STABILITY   06    JANUARY     1976    - DECEMBER     1976

*******************************************************************************
I                              WIND SPEED CATEGORY(MPH)                        I
*******************************************************************************
I DIR.   I(02-03)  (04-07)  (08-11)  (12-15)  (16-18)  (19-24)  ( >24 )  (TOTAL)I
I--------I--------I--------I--------I--------I--------I--------I--------I--------I
I        I        I        I        I        I        I        I        I        I
I N      I   0.0  I   5.4  I   0.6  I   0.0  I   0.0  I   0.0  I   0.0  I   6.0  I
I        I        I        I        I        I        I        I        I        I
I NNE    I   0.0  I   0.6  I   0.3  I   0.0  I   0.0  I   0.0  I   0.0  I   0.9  I
I        I        I        I        I        I        I        I        I        I
I NE     I   0.0  I   1.4  I   0.0  I   0.0  I   0.0  I   0.0  I   0.0  I   1.4  I
I        I        I        I        I        I        I        I        I        I
I ENE    I   0.0  I   2.6  I   0.3  I   0.0  I   0.0  I   0.0  I   0.0  I   2.9  I
I        I        I        I        I        I        I        I        I        I
I E      I   0.0  I   3.4  I   0.0  I   0.0  I   0.0  I   0.0  I   0.0  I   3.4  I
I        I        I        I        I        I        I        I        I        I
I ESE    I   0.0  I   4.0  I   0.6  I   0.0  I   0.0  I   0.0  I   0.0  I   4.6  I
I        I        I        I        I        I        I        I        I        I
I SE     I   0.0  I   5.4  I   0.9  I   0.0  I   0.0  I   0.0  I   0.0  I   6.3  I
I        I        I        I        I        I        I        I        I        I
I SSE    I   0.0  I   6.0  I   2.6  I   0.0  I   0.0  I   0.0  I   0.0  I   8.6  I
I        I        I        I        I        I        I        I        I        I
I S      I   0.0  I  12.3  I   4.3  I   0.0  I   0.0  I   0.0  I   0.0  I  16.6  I
I        I        I        I        I        I        I        I        I        I
I SSW    I   0.0  I   4.3  I   0.0  I   0.0  I   0.0  I   0.0  I   0.0  I   4.3  I
I        I        I        I        I        I        I        I        I        I
I SW     I   0.0  I   3.2  I   0.6  I   0.0  I   0.0  I   0.0  I   0.0  I   3.7  I
I        I        I        I        I        I        I        I        I        I
I WSW    I   0.0  I   2.3  I   0.6  I   0.0  I   0.0  I   0.0  I   0.0  I   2.9  I
I        I        I        I        I        I        I        I        I        I
I W      I   0.0  I   3.4  I   1.4  I   0.0  I   0.0  I   0.0  I   0.0  I   4.9  I
I        I        I        I        I        I        I        I        I        I
I WNW    I   0.0  I   4.9  I   1.4  I   0.0  I   0.0  I   0.0  I   0.0  I   6.3  I
I        I        I        I        I        I        I        I        I        I
I NW     I   0.0  I   5.7  I   0.9  I   0.0  I   0.0  I   0.0  I   0.0  I   6.6  I
I        I        I        I        I        I        I        I        I        I
I NNW    I   0.0  I   5.4  I   0.3  I   0.0  I   0.0  I   0.0  I   0.0  I   5.7  I
I        I        I        I        I        I        I        I        I        I
I VAR    I   0.0  I   0.0  I   0.0  I   0.0  I   0.0  I   0.0  I   0.0  I   0.0  I
*******************************************************************************
  CALM HOURS =         52          CALM PERCENT =   14.90
 *TOTAL OBSERVATIONS =      349    MISSING OBSERVATIONS  =       0
```

```
40  3004      PROGRAM DIRWIN                                  VERSION  3.7  (770201)              24 MAY 1977              PAGE   9
************************************************************************************************************************************
```

Table D1.7

```
% FREQUENCY OF WIND DIRECTIONS WITHIN VARIOUS WIND SPEED CATEGORIES *

              DULLES                                 DULLES AIRPORT
              STABILITY   07     JANUARY      1976    - DECEMBER     1976

     *************************************************************************
     I                          WIND SPEED CATEGORY(MPH)                      I
     *************************************************************************
     I DIR.   I(02-03) (04-07) (08-11) (12-15) (16-18) (19-24) ( >24 ) (TOTAL)I
     I--------I-------I-------I-------I-------I-------I-------I-------I-------I
     I        I       I       I       I       I       I       I       I       I
     I N      I   0.0 I   1.8 I   0.0 I   0.0 I   0.0 I   0.0 I   0.0 I   1.8 I
     I        I       I       I       I       I       I       I       I       I
     I NNE    I   0.0 I   0.6 I   0.0 I   0.0 I   0.0 I   0.0 I   0.0 I   0.6 I
     I        I       I       I       I       I       I       I       I       I
     I NE     I   0.0 I   1.2 I   0.0 I   0.0 I   0.0 I   0.0 I   0.0 I   1.2 I
     I        I       I       I       I       I       I       I       I       I
     I ENE    I   0.0 I   0.6 I   0.0 I   0.0 I   0.0 I   0.0 I   0.0 I   0.6 I
     I        I       I       I       I       I       I       I       I       I
     I E      I   0.0 I   1.2 I   0.0 I   0.0 I   0.0 I   0.0 I   0.0 I   1.2 I
     I        I       I       I       I       I       I       I       I       I
     I ESE    I   0.0 I   2.7 I   0.0 I   0.0 I   0.0 I   0.0 I   0.0 I   2.7 I
     I        I       I       I       I       I       I       I       I       I
     I SE     I   0.0 I   4.2 I   0.0 I   0.0 I   0.0 I   0.0 I   0.0 I   4.2 I
     I        I       I       I       I       I       I       I       I       I
     I SSE    I   0.0 I   4.2 I   0.0 I   0.0 I   0.0 I   0.0 I   0.0 I   4.2 I
     I        I       I       I       I       I       I       I       I       I
     I S      I   0.0 I   7.8 I   0.0 I   0.0 I   0.0 I   0.0 I   0.0 I   7.8 I
     I        I       I       I       I       I       I       I       I       I
     I SSW    I   0.0 I   4.2 I   0.0 I   0.0 I   0.0 I   0.0 I   0.0 I   4.2 I
     I        I       I       I       I       I       I       I       I       I
     I SW     I   0.0 I   2.7 I   0.0 I   0.0 I   0.0 I   0.0 I   0.0 I   2.7 I
     I        I       I       I       I       I       I       I       I       I
     I WSW    I   0.0 I   3.9 I   0.0 I   0.0 I   0.0 I   0.0 I   0.0 I   3.9 I
     I        I       I       I       I       I       I       I       I       I
     I W      I   0.0 I   2.1 I   0.0 I   0.0 I   0.0 I   0.0 I   0.0 I   2.1 I
     I        I       I       I       I       I       I       I       I       I
     I WNW    I   0.0 I   1.5 I   0.0 I   0.0 I   0.0 I   0.0 I   0.0 I   1.5 I
     I        I       I       I       I       I       I       I       I       I
     I NW     I   0.0 I   3.6 I   0.0 I   0.0 I   0.0 I   0.0 I   0.0 I   3.6 I
     I        I       I       I       I       I       I       I       I       I
     I NNW    I   0.0 I   3.3 I   0.0 I   0.0 I   0.0 I   0.0 I   0.0 I   3.3 I
     I        I       I       I       I       I       I       I       I       I
     I VAR    I   0.0 I   0.0 I   0.0 I   0.0 I   0.0 I   0.0 I   0.0 I   0.0 I
     *************************************************************************
      CALM HOURS =        181            CALM PERCENT =  54.35
     *TOTAL OBSERVATIONS =     333       MISSING OBSERVATIONS  =      0
```

```
40 3004      PROGRAM DIRWIN                                   VERSION  3.7  (770201)              24 MAY 1977              PAGE  11
************************************************************************************************************************************
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Table D1.8

```
 % FREQUENCY OF WIND DIRECTIONS WITHIN VARIOUS WIND SPEED CATEGORIES *

              DULLES                                  DULLES AIRPORT
              STABILITY    ALL    JANUARY       1976    - DECEMBER     1976

*******************************************************************************
I                          WIND SPEED CATEGORY(MPH)                           I
*******************************************************************************
I DIR.   I(02-03) (04-07) (08-11) (12-15) (16-18) (19-24) ( >24 ) (TOTAL)I
I--------I--------I--------I--------I--------I--------I--------I--------I--------I
I        I        I        I        I        I        I        I        I        I
I N      I   0.0  I   3.2  I   0.9  I   0.2  I   0.0  I   0.0  I   0.1  I   4.4  I
I        I        I        I        I        I        I        I        I        I
I NNE    I   0.0  I   0.7  I   0.5  I   0.4  I   0.0  I   0.0  I   0.0  I   1.6  I
I        I        I        I        I        I        I        I        I        I
I NE     I   0.0  I   1.3  I   0.5  I   0.4  I   0.0  I   0.0  I   0.0  I   2.2  I
I        I        I        I        I        I        I        I        I        I
I ENE    I   0.0  I   1.3  I   0.2  I   0.1  I   0.0  I   0.0  I   0.0  I   1.6  I
I        I        I        I        I        I        I        I        I        I
I E      I   0.0  I   1.5  I   0.7  I   0.1  I   0.1  I   0.0  I   0.0  I   2.5  I
I        I        I        I        I        I        I        I        I        I
I ESE    I   0.0  I   1.9  I   0.5  I   0.2  I   0.0  I   0.0  I   0.0  I   2.7  I
I        I        I        I        I        I        I        I        I        I
I SE     I   0.0  I   3.1  I   1.3  I   0.5  I   0.0  I   0.0  I   0.0  I   4.9  I
I        I        I        I        I        I        I        I        I        I
I SSE    I   0.0  I   2.8  I   2.2  I   0.9  I   0.1  I   0.0  I   0.0  I   6.0  I
I        I        I        I        I        I        I        I        I        I
I S      I   0.0  I   6.4  I   4.6  I   4.2  I   0.6  I   0.2  I   0.0  I  16.1  I
I        I        I        I        I        I        I        I        I        I
I SSW    I   0.0  I   3.1  I   1.4  I   1.6  I   0.4  I   0.4  I   0.0  I   6.9  I
I        I        I        I        I        I        I        I        I        I
I SW     I   0.0  I   1.7  I   1.0  I   0.5  I   0.2  I   0.1  I   0.0  I   3.4  I
I        I        I        I        I        I        I        I        I        I
I WSW    I   0.0  I   1.4  I   0.5  I   0.3  I   0.1  I   0.0  I   0.0  I   2.4  I
I        I        I        I        I        I        I        I        I        I
I W      I   0.0  I   1.9  I   1.8  I   2.3  I   0.6  I   0.7  I   0.2  I   7.7  I
I        I        I        I        I        I        I        I        I        I
I WNW    I   0.0  I   1.7  I   1.6  I   3.3  I   1.3  I   1.9  I   0.5  I  10.3  I
I        I        I        I        I        I        I        I        I        I
I NW     I   0.0  I   3.1  I   2.2  I   2.7  I   1.3  I   0.9  I   0.1  I  10.2  I
I        I        I        I        I        I        I        I        I        I
I NNW    I   0.0  I   3.4  I   1.1  I   0.5  I   0.3  I   0.0  I   0.0  I   5.5  I
I        I        I        I        I        I        I        I        I        I
I VAR    I   0.0  I   0.0  I   0.0  I   0.0  I   0.0  I   0.0  I   0.0  I   0.0  I
*******************************************************************************
  CALM HOURS =        347                     CALM PERCENT =  11.85
 *TOTAL OBSERVATIONS =   2928                 MISSING OBSERVATIONS  =  5856

END OF JOB
```

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40 3002     PROGRAM DIRWIN                          VERSION   3.7  (770201)              11 MAY 1977          PAGE   3
*******************************************************************************************************************
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Table D1.9

```
% FREQUENCY OF WIND DIRECTIONS WITHIN VARIOUS WIND SPEED CATEGORIES *

             DULLES                                     STERLING PARK
             STABILITY   ALL   JUNE          1976     * SEPTEMBER   1976

***************************************************************************
I                      WIND SPEED CATEGORY(MPH)                           I
***************************************************************************
I DIR.   I(02-03) (04-07) (08-11) (12-15) (16-18) (19-24) ( >24 ) (TOTAL)I
I--------I-------I-------I-------I-------I-------I-------I-------I-------I
I        I       I       I       I       I       I       I       I       I
I N      I   1.9 I   3.7 I   1.5 I   0.1 I   0.0 I   0.0 I   0.0 I   7.2 I
I        I       I       I       I       I       I       I       I       I
I NNE    I   0.8 I   1.7 I   0.5 I   0.1 I   0.0 I   0.0 I   0.0 I   3.0 I
I        I       I       I       I       I       I       I       I       I
I NE     I   0.4 I   1.4 I   0.7 I   0.0 I   0.0 I   0.0 I   0.0 I   2.5 I
I        I       I       I       I       I       I       I       I       I
I ENE    I   0.3 I   1.0 I   0.4 I   0.0 I   0.0 I   0.0 I   0.0 I   1.7 I
I        I       I       I       I       I       I       I       I       I
I E      I   0.3 I   0.9 I   0.2 I   0.1 I   0.0 I   0.0 I   0.0 I   1.4 I
I        I       I       I       I       I       I       I       I       I
I ESE    I   0.4 I   1.2 I   0.1 I   0.2 I   0.0 I   0.0 I   0.0 I   1.8 I
I        I       I       I       I       I       I       I       I       I
I SE     I   0.7 I   1.9 I   0.2 I   0.0 I   0.0 I   0.0 I   0.0 I   2.8 I
I        I       I       I       I       I       I       I       I       I
I SSE    I   0.9 I   3.3 I   0.9 I   0.0 I   0.0 I   0.0 I   0.0 I   5.1 I
I        I       I       I       I       I       I       I       I       I
I S      I   3.8 I   6.7 I   1.1 I   0.1 I   0.0 I   0.0 I   0.0 I  11.7 I
I        I       I       I       I       I       I       I       I       I
I SSW    I   3.8 I   6.3 I   2.8 I   0.0 I   0.0 I   0.0 I   0.0 I  12.9 I
I        I       I       I       I       I       I       I       I       I
I SW     I   1.8 I   3.4 I   0.6 I   0.1 I   0.0 I   0.0 I   0.0 I   5.9 I
I        I       I       I       I       I       I       I       I       I
I WSW    I   0.7 I   2.0 I   0.5 I   0.1 I   0.0 I   0.0 I   0.0 I   3.2 I
I        I       I       I       I       I       I       I       I       I
I W      I   0.9 I   2.1 I   0.6 I   0.2 I   0.0 I   0.0 I   0.0 I   3.8 I
I        I       I       I       I       I       I       I       I       I
I WNW    I   1.1 I   2.5 I   1.5 I   0.2 I   0.4 I   0.0 I   0.0 I   5.6 I
I        I       I       I       I       I       I       I       I       I
I NW     I   1.7 I   3.7 I   2.4 I   1.1 I   0.4 I   0.0 I   0.0 I   9.3 I
I        I       I       I       I       I       I       I       I       I
I NNW    I   2.9 I   4.7 I   3.1 I   0.7 I   0.1 I   0.0 I   0.0 I  11.5 I
I        I       I       I       I       I       I       I       I       I
I VAR    I   9.0 I   0.1 I   0.0 I   0.0 I   0.0 I   0.0 I   0.0 I   9.1 I
***************************************************************************
 CALM HOURS =          30             CALM PERCENT =     1.56
*TOTAL OBSERVATIONS =    1925         MISSING OBSERVATIONS   =  1003
```

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40  3002      PROGRAM DIRWIN                                      VERSION   3.7  (770201)            11 MAY 1977           PAGE   6
***********************************************************************************************************************************

Table D1.10  % FREQUENCY OF WIND DIRECTIONS WITHIN VARIOUS WIND SPEED CATEGORIES =

                  DULLES                                   SOUTH RAMP
                  STABILITY    ALL    JUNE         1976    - SEPTEMBER    1976

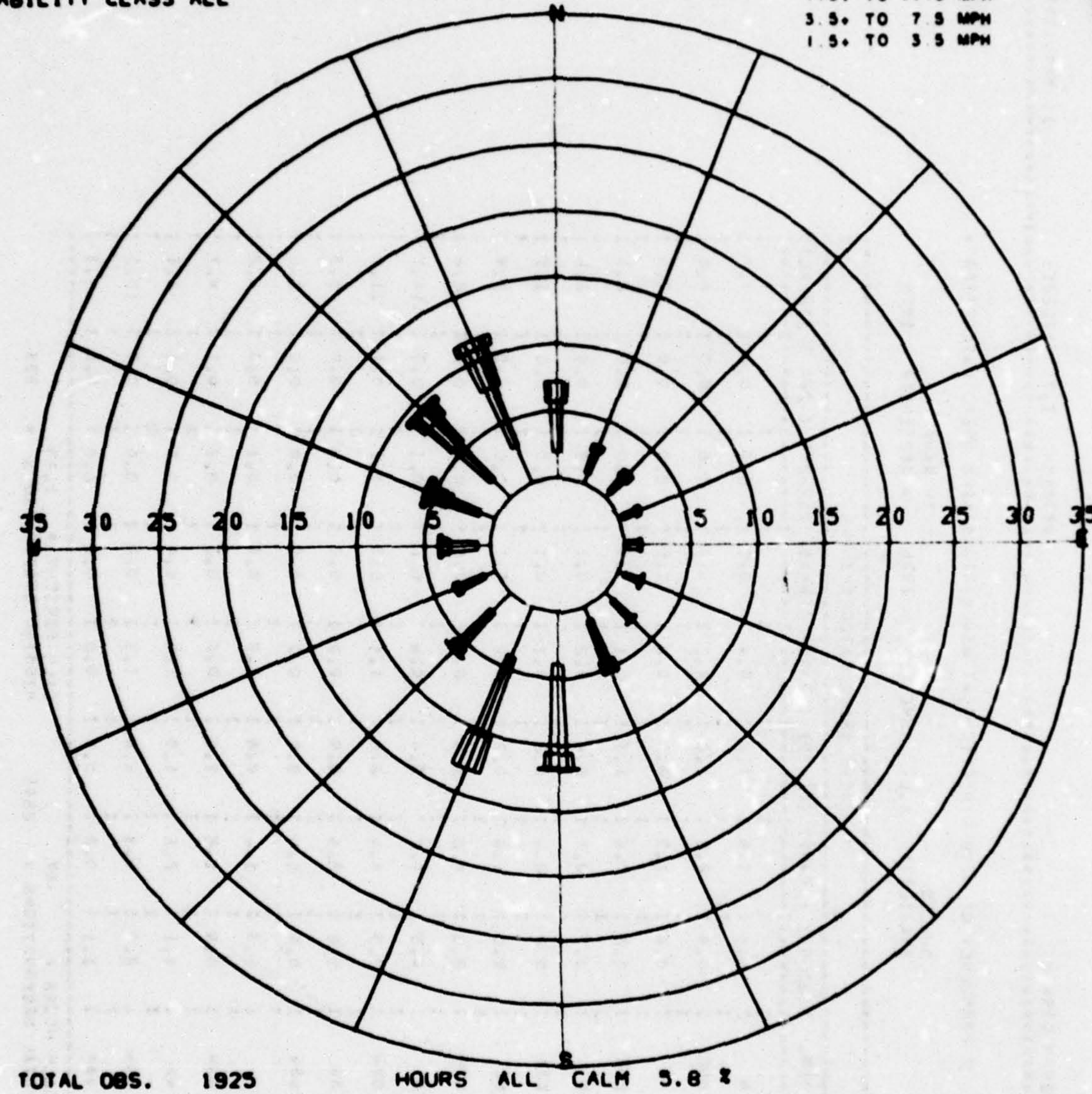
         ------------------------------------------------------------------------------
         I                              WIND SPEED CATEGORY(MPH)                      I
         ------------------------------------------------------------------------------
         I DIR.   I(02-03) (04-07) (08-11) (12-15) (16-18) (19-24) ( >24 ) (TOTAL)I
         I--------I--------I--------I--------I--------I--------I--------I--------I--------I
         I        I        I        I        I        I        I        I        I
         I N      I    2.0 I    3.9 I    1.4 I    0.4 I    0.0 I    0.2 I    0.0 I    7.8 I
         I        I        I        I        I        I        I        I        I
         I NNE    I    0.9 I    2.3 I    1.0 I    0.2 I    0.0 I    0.0 I    0.0 I    4.4 I
         I        I        I        I        I        I        I        I        I
         I NE     I    0.4 I    1.3 I    0.5 I    0.2 I    0.0 I    0.0 I    0.0 I    2.5 I
         I        I        I        I        I        I        I        I        I
         I ENE    I    0.3 I    0.6 I    1.3 I    0.1 I    0.0 I    0.0 I    0.0 I    2.5 I
         I        I        I        I        I        I        I        I        I
         I E      I    0.7 I    0.7 I    0.8 I    0.2 I    0.1 I    0.0 I    0.0 I    2.4 I
         I        I        I        I        I        I        I        I        I
         I ESE    I    0.6 I    0.6 I    0.2 I    0.1 I    0.1 I    0.0 I    0.0 I    1.7 I
         I        I        I        I        I        I        I        I        I
         I SE     I    1.0 I    1.4 I    0.2 I    0.2 I    0.1 I    0.0 I    0.0 I    2.9 I
         I        I        I        I        I        I        I        I        I
         I SSE    I    2.5 I    4.0 I    1.5 I    0.4 I    0.0 I    0.1 I    0.0 I    8.6 I
         I        I        I        I        I        I        I        I        I
         I S      I    4.5 I    7.7 I    3.4 I    0.6 I    0.2 I    0.3 I    0.0 I   16.7 I
         I        I        I        I        I        I        I        I        I
         I SSW    I    2.3 I    4.9 I    2.9 I    1.1 I    0.3 I    0.2 I    0.1 I   11.7 I
         I        I        I        I        I        I        I        I        I
         I SW     I    1.6 I    2.6 I    0.9 I    0.2 I    0.0 I    0.0 I    0.0 I    5.3 I
         I        I        I        I        I        I        I        I        I
         I WSW    I    0.9 I    1.9 I    0.5 I    0.2 I    0.0 I    0.0 I    0.0 I    3.6 I
         I        I        I        I        I        I        I        I        I
         I W      I    1.3 I    1.6 I    0.8 I    0.3 I    0.1 I    0.1 I    0.0 I    4.2 I
         I        I        I        I        I        I        I        I        I
         I WNW    I    0.9 I    1.5 I    1.0 I    0.7 I    0.3 I    0.2 I    0.1 I    4.7 I
         I        I        I        I        I        I        I        I        I
         I NW     I    1.1 I    2.6 I    1.9 I    1.5 I    0.4 I    0.5 I    0.1 I    8.1 I
         I        I        I        I        I        I        I        I        I
         I NNW    I    2.0 I    4.3 I    2.4 I    1.3 I    0.2 I    0.0 I    0.0 I   10.1 I
         I        I        I        I        I        I        I        I        I
         I VAR    I    1.1 I    0.2 I    0.0 I    0.0 I    0.0 I    0.0 I    0.0 I    1.3 I
         ------------------------------------------------------------------------------
          CALM HOURS =         47                    CALM PERCENT =   1.85
         =TOTAL OBSERVATIONS =    2545           MISSING OBSERVATIONS   =    383


END OF JOB
```

DULLES
STATION NUMBER STERLING PARK
JUNE 1976 - SEPTEMBER 1976
GRID VALUES REPRESENT WIND DISTRIBUTION IN PERCENT
STABILITY CLASS ALL

Figure D1.11

LEGEND
OVER 18.5 MPH
15.5+ TO 18.5 MPH
11.5+ TO 15.5 MPH
7.5+ TO 11.5 MPH
3.5+ TO 7.5 MPH
1.5+ TO 3.5 MPH

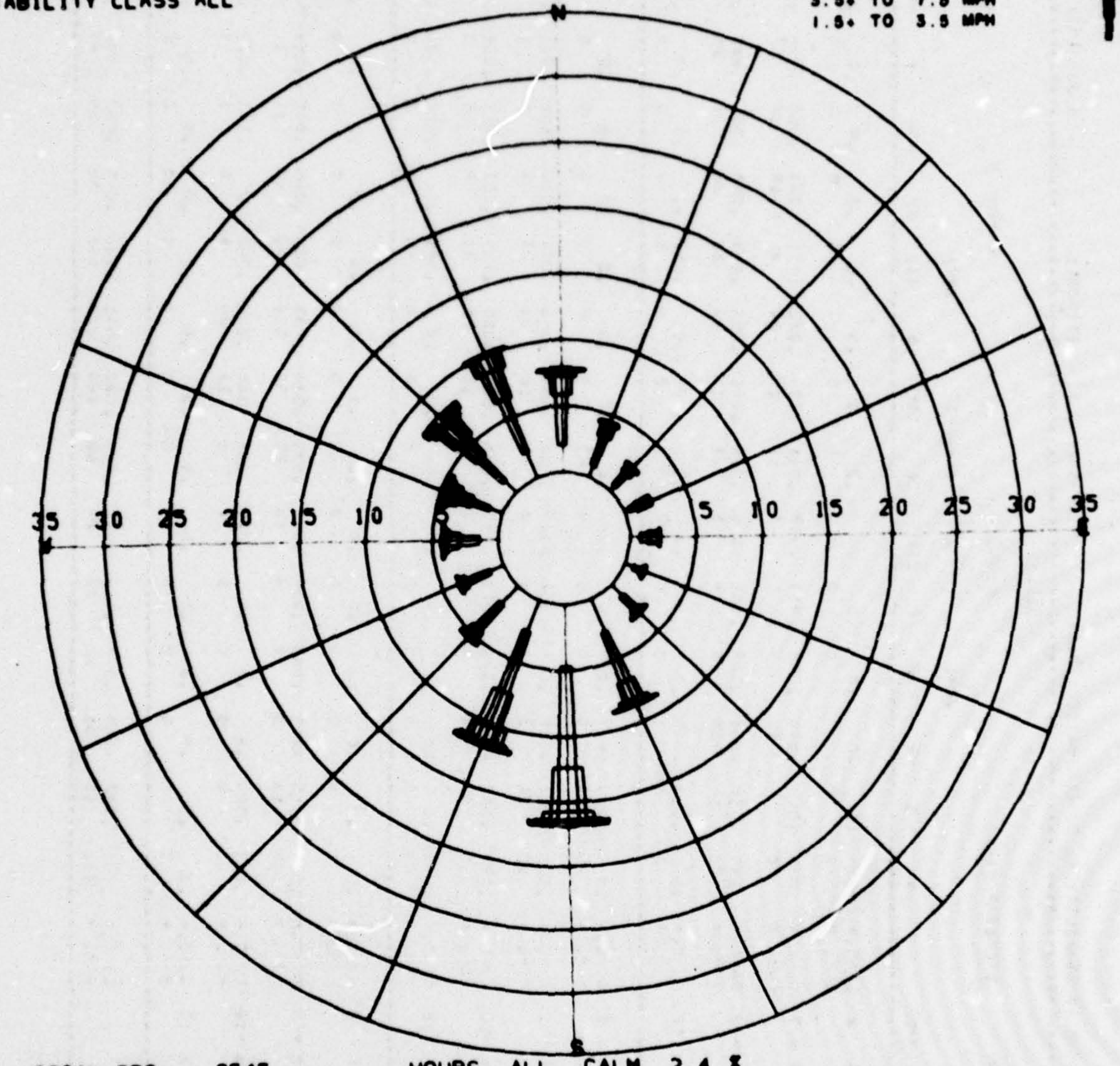


TOTAL OBS. 1925 HOURS ALL CALM 5.8 %

DULLES
STATION NUMBER SOUTH RAMP
JUNE 1976 - SEPTEMBER 1976
GRID VALUES REPRESENT WIND DISTRIBUTION IN PERCENT
STABILITY CLASS ALL

Figure D1.12

LEGEND
OVER 18.5 MPH
15.5+ TO 18.5 MPH
11.5+ TO 15.5 MPH
7.5+ TO 11.5 MPH
3.5+ TO 7.5 MPH
1.5+ TO 3.5 MPH



TOTAL OBS. 2545 HOURS ALL CALM 2.4 %

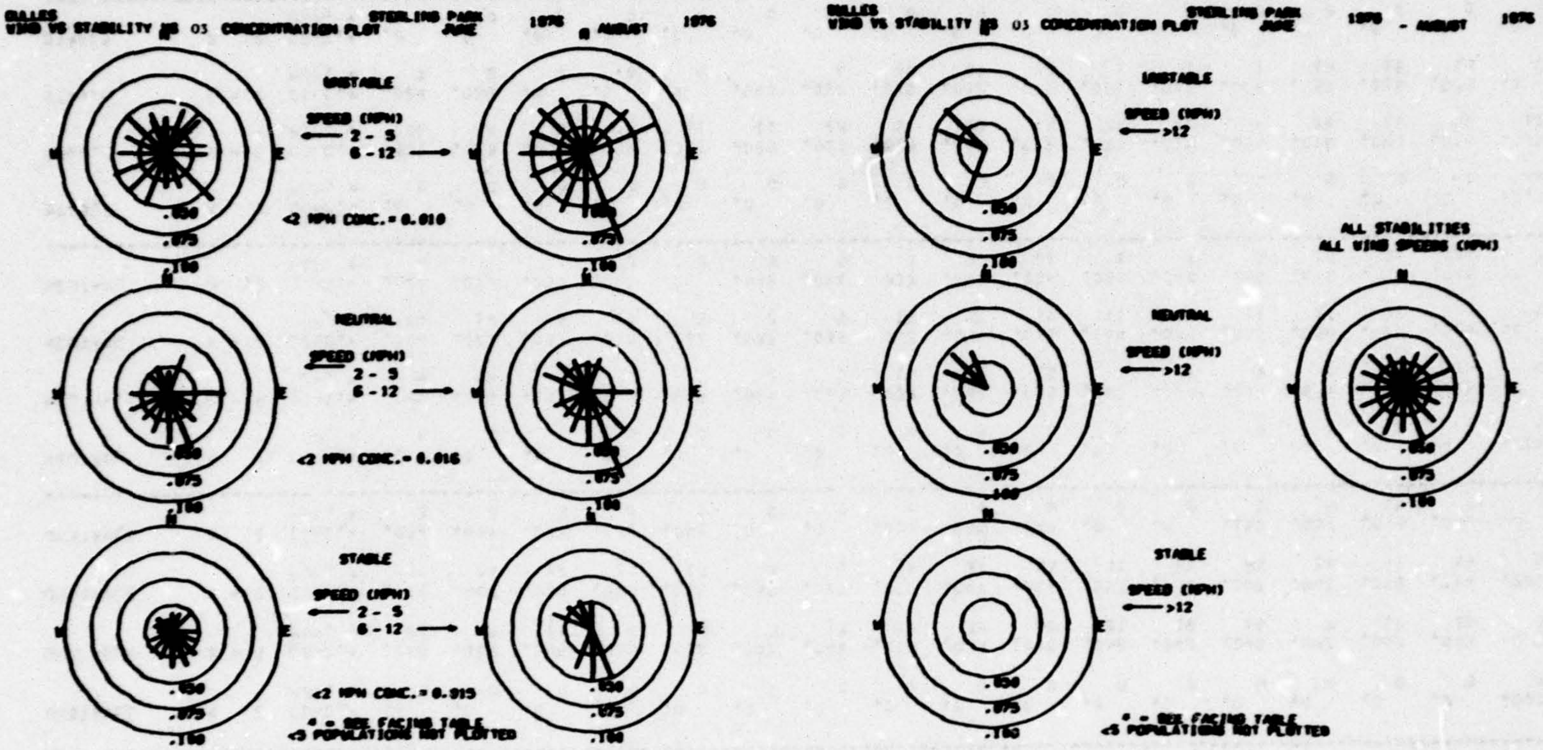
DULLES

Table D1.13 STERLING PARK OZONE (PPM) 03

JUNE 1976 - AUGUST 1976

STABILITY	SPEED(MPH)		N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VAR
UNSTABLE	< 2	CONC.=	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.016
		POP.=	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
UNSTABLE	2 - 5	CONC.=	.035	.045	.044	.042	.038	.059	.051	.034	.032	.051	.049	.052	.044	.040	.053	.034	.021
		POP.=	22	9	10	4	7	3	12	10	24	34	19	14	17	9	15	28	2
UNSTABLE	6 -12	CONC.=	.045	.052	.058	.073	.101	.082	.079	.091	.058	.059	.068	.054	.062	.054	.059	.057	.0
		POP.=	32	16	10	8	4	1	1	15	24	63	26	13	25	24	42	50	0
UNSTABLE	> 12	CONC.=	.0	.053	.045	.0	.0	.0	.0	.075	.0	.053	.0	.0	.0	.047	.055	.040	.0
		POP.=	0	2	1	0	0	0	0	2	0	5	0	0	0	6	17	4	0
NEUTRAL	< 2	CONC.=	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.016
		POP.=	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
NEUTRAL	2 - 5	CONC.=	.030	.036	.037	.016	.052	.026	.034	.054	.046	.025	.032	.036	.035	.073	.025	.027	.0
		POP.=	10	10	3	2	6	6	5	16	23	6	9	6	4	1	7	17	0
NEUTRAL	6 -12	CONC.=	.028	.033	.045	.046	.043	.047	.047	.085	.050	.039	.031	.033	.032	.045	.039	.032	.0
		POP.=	20	12	4	4	6	3	6	11	25	31	9	6	3	12	22	23	0
NEUTRAL	> 12	CONC.=	.021	.0	.0	.0	.0	.0	.0	.0	.0	.029	.0	.029	.025	.043	.047	.034	.0
		POP.=	3	0	0	0	0	0	0	0	0	1	0	3	1	11	25	14	0
STABLE	< 2	CONC.=	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.015
		POP.=	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	[illegible]
STABLE	2 - 5	CONC.=	.018	.019	.025	.053	.026	.025	.031	.036	.035	.025	.026	.020	.018	.017	.019	.013	.021
		POP.=	35	15	5	4	9	10	21	52	109	40	23	11	11	18	19	46	3
STABLE	6 -12	CONC.=	.027	.024	.0	.0	.0	.069	.058	.049	.049	.040	.0	.031	.029	.039	.031	.024	.0
		POP.=	7	2	0	0	0	1	1	13	20	9	0	1	1	10	15	12	0
STABLE	> 12	CONC.=	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
		POP.=	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ALL	ALL	CONC.=	.030	.037	.045	.054	.046	.057	.045	.052	.041	.046	.045	.042	.043	.041	.044	.036	.015
		POP.=	130	66	33	22	32	24	46	124	226	192	86	55	67	91	162	141	32

Figure D1.13


DALLES
WIND VS STABILITY VS O3 CONCENTRATION PLOT
STERLING PARK
JUNE 1976 AUGUST 1976
UNSTABLE
SPEED (MPH)
2 - 5
6 - 12
<2 MPH CONC. = 0.010
NEUTRAL
SPEED (MPH)
2 - 5
6 - 12
<2 MPH CONC. = 0.016
STABLE
SPEED (MPH)
2 - 5
6 - 12
<2 MPH CONC. = 0.015
* = SEE FACING TABLE
<5 POPULATIONS NOT PLOTTED
N
E
W
.050
.075
.100
DALLES
WIND VS STABILITY VS O3 CONCENTRATION PLOT
STERLING PARK
JUNE 1976 - AUGUST 1976
UNSTABLE
SPEED (MPH)
>12
NEUTRAL
SPEED (MPH)
>12
STABLE
SPEED (MPH)
>12
ALL STABILITIES
ALL WIND SPEEDS (MPH)
* = SEE FACING TABLE
<5 POPULATIONS NOT PLOTTED

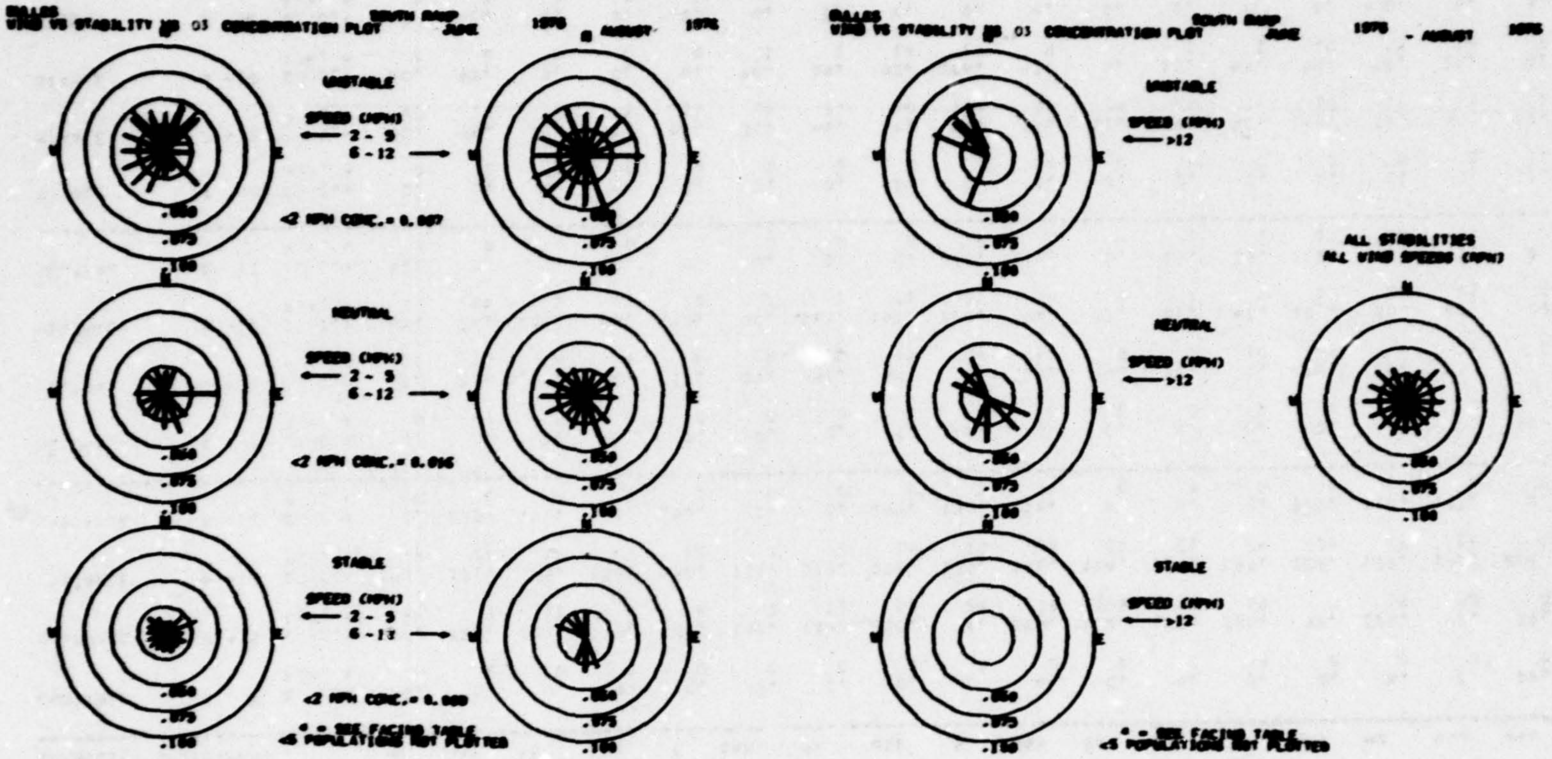
DULLES

Table D1.14 SOUTH RAMP OZONE (PPM) O3

JUNE 1976 - AUGUST 1976

STABILITY	SPEED(MPH)		N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VAR
UNSTABLE	< 2	CONC.=	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.007
		POP.=	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
UNSTABLE	2 - 5	CONC.=	.030	.045	.045	.035	.026	.047	.044	.018	.023	.040	.042	.042	.040	.042	.043	.035	.014
		POP.=	29	9	11	4	8	3	13	12	32	38	21	18	16	9	19	30	3
UNSTABLE	6 -12	CONC.=	.031	.042	.050	.050	.055	.040	.077	.071	.067	.044	.055	.052	.047	.045	.055	.049	.060
		POP.=	37	24	12	15	12	3	1	17	37	63	51	21	25	26	47	53	1
UNSTABLE	> 12	CONC.=	.074	.052	.043	.036	.041	.0	.0	.061	.095	.049	.0	.0	.100	.054	.044	.046	.0
		POP.=	3	2	3	1	1	0	0	2	1	6	0	0	1	9	19	8	0
NEUTRAL	< 2	CONC.=	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.015
		POP.=	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
NEUTRAL	2 - 5	CONC.=	.021	.025	.031	.015	.049	.026	.025	.039	.032	.025	.027	.024	.027	.075	.025	.025	.0
		POP.=	9	18	4	2	[illegible]	2	3	16	31	15	9	7	5	1	8	15	0
NEUTRAL	6 -12	CONC.=	.026	.025	.037	.030	.031	.037	.033	.048	.036	.031	.026	.038	.041	.036	.036	.028	.0
		POP.=	24	14	6	15	5	2	9	19	59	39	11	8	11	13	22	25	0
NEUTRAL	> 12	CONC.=	.038	.070	.055	.050	.0	.042	.041	.037	.041	.036	.029	.040	.086	.035	.037	.040	.0
		POP.=	4	1	1	3	0	5	5	3	20	21	1	4	4	13	25	16	[illegible]
STABLE	< 2	CONC.=	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.009
		POP.=	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	26
STABLE	2 - 5	CONC.=	.011	.013	.024	.032	.017	.020	.017	.019	.016	.016	.017	.016	.016	.016	.023	.016	.026
		POP.=	42	14	5	5	11	11	23	57	112	44	27	20	9	16	16	56	10
STABLE	6 -12	CONC.=	.024	.025	.0	.0	.0	.049	.017	.030	.032	.025	.050	.023	.024	.030	.025	.035	.0
		POP.=	7	2	0	0	0	1	4	26	39	13	1	1	1	10	15	13	0
STABLE	> 12	CONC.=	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
		POP.=	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ALL	ALL	CONC.=	.027	.031	.041	.035	.035	.032	.029	.033	.029	.055	.035	.036	.040	.037	.040	.033	.014
		POP.=	155	84	42	45	45	27	60	152	332	240	101	79	78	97	176	220	62

Figure D1.14


DALLAS
WIND VS STABILITY BY O3 CONCENTRATION PLOT
SOUTH RAMP
JUNE 1976 - AUGUST 1976
UNSTABLE
SPEED (MPH)
2 - 5
6 - 12
<2 MPH CONC.= 0.087
NEUTRAL
SPEED (MPH)
2 - 5
6 - 12
<2 MPH CONC.= 0.016
STABLE
SPEED (MPH)
2 - 5
6 - 12
<2 MPH CONC.= 0.000
* = SEE FACING TABLE
<5 POPULATIONS NOT PLOTTED
N
E
S
W
.050
.075
.100
DALLAS
WIND VS STABILITY BY O3 CONCENTRATION PLOT
SOUTH RAMP
JUNE 1976 - AUGUST 1976
UNSTABLE
SPEED (MPH)
>12
NEUTRAL
SPEED (MPH)
>12
STABLE
SPEED (MPH)
>12
* = SEE FACING TABLE
<5 POPULATIONS NOT PLOTTED
ALL STABILITIES
ALL WIND SPEEDS (MPH)

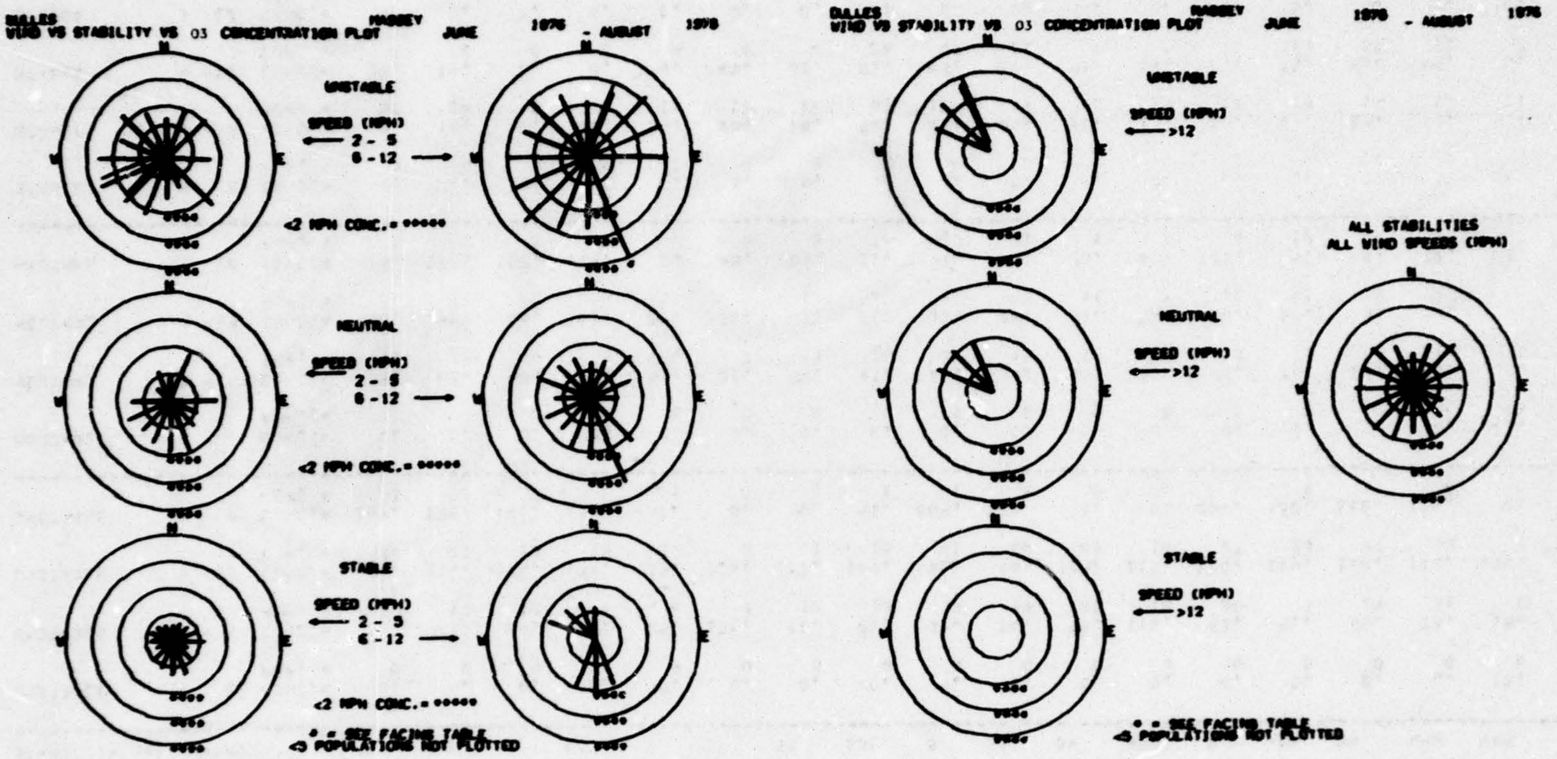
DULLES

Table D1.15 MASSEY OZONE (UG/M3) 33

JUNE 1976 - AUGUST 1976

STABILITY	SPEED(MPH)		N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VAR
UNSTABLE	< 2	CONC.,*	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	49.
		POP.,*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
UNSTABLE	2 - 5	CONC.,*	77.	100.	104.	79.	82.	140.	119.	58.	74.	109.	112.	132.	126.	92.	114.	92.	39.
		POP.,*	31	9	11	4	8	3	12	13	28	39	23	18	19	9	19	30	3
UNSTABLE	6 -12	CONC.,*	105.	131.	159.	152.	152.	111.	172.	201.	133.	141.	164.	150.	145.	128.	152.	120.	225.
		POP.,*	35	21	11	15	12	3	1	13	23	57	30	21	26	25	47	56	1
UNSTABLE	> 12	CONC.,*	0.	132.	152.	123.	152.	0.	0.	145.	250.	153.	0.	0.	0.	110.	125.	137.	0.
		POP.,*	0	2	3	1	1	0	0	2	1	4	0	0	0	6	18	8	0
NEUTRAL	< 2	CONC.,*	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	43.
		POP.,*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
NEUTRAL	2 - 5	CONC.,*	45.	93.	64.	16.	67.	55.	62.	98.	92.	82.	74.	80.	72.	216.	33.	54.	0.
		POP.,*	11	19	4	5	6	6	5	15	24	10	9	7	10	1	8	15	0
NEUTRAL	6 -12	CONC.,*	65.	74.	108.	83.	53.	60.	115.	167.	102.	94.	77.	88.	67.	106.	85.	80.	0.
		POP.,*	21	16	5	15	10	3	7	11	21	37	7	7	5	12	22	25	0
NEUTRAL	> 12	CONC.,*	42.	0.	0.	0.	0.	0.	0.	0.	233.	132.	0.	82.	39.	113.	107.	47.	0.
		POP.,*	3	0	0	0	0	0	0	0	2	3	0	3	1	11	26	13	0
STABLE	< 2	CONC.,*	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	28.
		POP.,*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40
STABLE	2 - 5	CONC.,*	30.	36.	36.	87.	61.	31.	46.	66.	64.	54.	51.	32.	40.	43.	35.	34.	82.
		POP.,*	50	18	5	5	11	12	24	60	117	48	29	20	12	19	19	55	7
STABLE	6 -12	CONC.,*	60.	47.	0.	0.	0.	78.	39.	92.	106.	97.	0.	15.	69.	92.	78.	74.	0.
		POP.,*	7	2	0	0	0	1	3	18	25	9	0	1	1	10	15	12	0
STABLE	> 12	CONC.,*	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		POP.,*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ALL	ALL	CONC.,*	64.	87.	111.	99.	91.	61.	76.	95.	84.	102.	104.	95.	107.	99.	105.	84.	47.
		POP.,*	165	86	39	43	48	28	52	132	242	208	98	77	74	94	174	216	55

Figure D1.15


DULLES
WIND VS STABILITY VS O3 CONCENTRATION PLOT
MASSEY
JUNE 1976 - AUGUST 1976
UNSTABLE
SPEED (MPH)
2 - 5
6 - 12
<2 MPH CONC.
NEUTRAL
SPEED (MPH)
2 - 5
6 - 12
<2 MPH CONC.
STABLE
SPEED (MPH)
2 - 5
6 - 12
<2 MPH CONC.
* = SEE FACING TABLE
<5 POPULATIONS NOT PLOTTED
N
E
W
DULLES
WIND VS STABILITY VS O3 CONCENTRATION PLOT
MASSEY
JUNE 1976 - AUGUST 1976
UNSTABLE
SPEED (MPH)
>12
NEUTRAL
SPEED (MPH)
>12
STABLE
SPEED (MPH)
>12
ALL STABILITIES
ALL WIND SPEEDS (MPH)
* = SEE FACING TABLE
<5 POPULATIONS NOT PLOTTED

99 1039 WIND VS STABILITY VS CONCENTRATION PLOT VERSION 1.3 (770201) 8 JUN 1977 PAGE 2

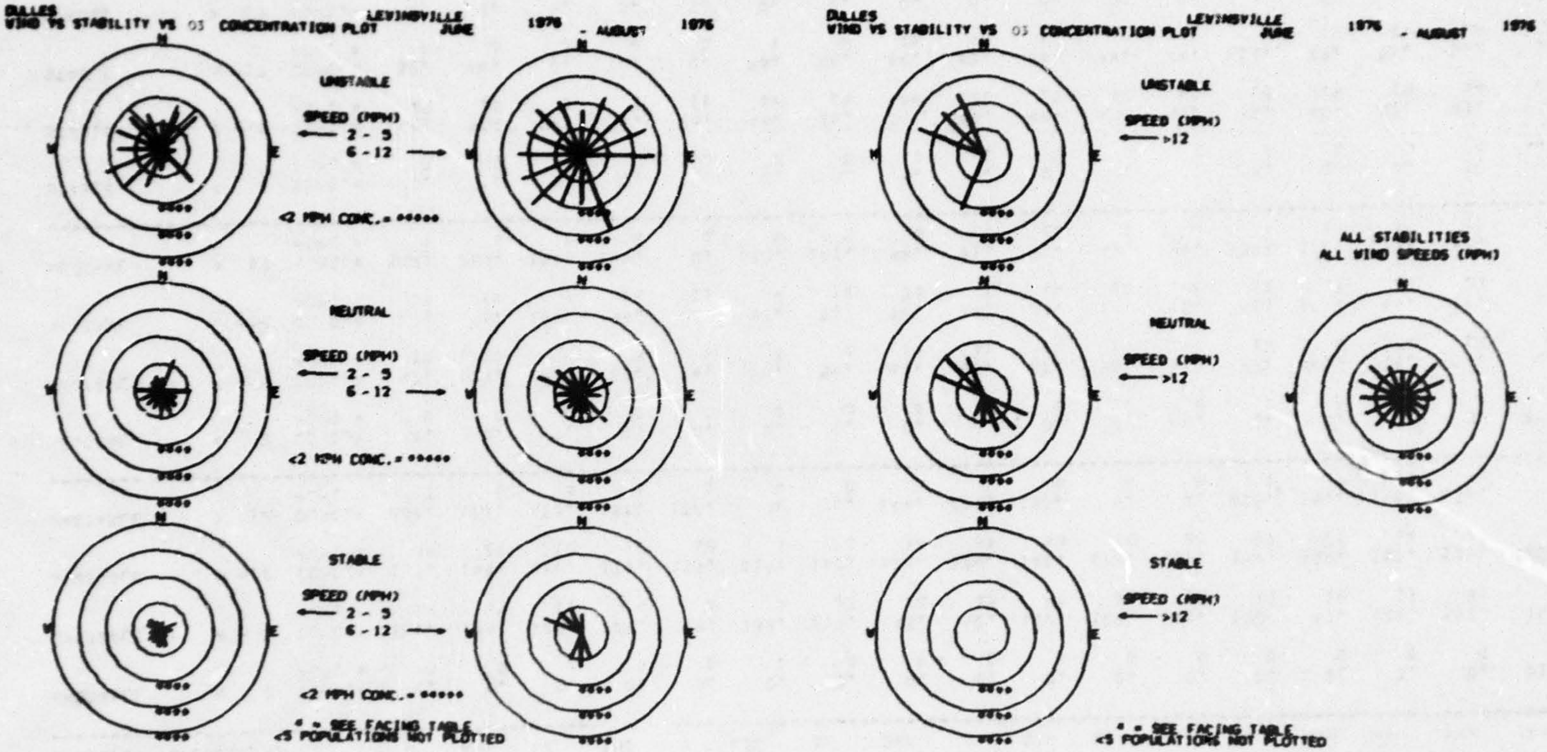
DULLES

Table D1.16 LEWINSVILLE OZONE (UGM3) O3

JUNE 1976 - AUGUST 1976

STABILITY	SPEED(MPH)		N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VAR
UNSTABLE	< 2	CONC.=	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	16.
		POP. =	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
UNSTABLE	2 - 5	CONC.=	55.	77.	85.	77.	25.	106.	62.	21.	37.	74.	95.	113.	83.	91.	65.	73.	15.
		POP. =	32	10	12	8	8	3	12	13	34	39	23	18	20	9	19	31	2
UNSTABLE	6 -12	CONC.=	86.	119.	134.	133.	139.	116.	137.	148.	91.	98.	129.	119.	120.	110.	122.	110.	196.
		POP. =	34	24	13	15	12	3	1	18	41	64	25	18	27	26	47	55	1
UNSTABLE	> 12	CONC.=	189.	123.	141.	157.	137.	0.	0.	83.	205.	109.	0.	0.	206.	132.	112.	126.	0.
		POP. =	3	2	3	1	1	0	0	1	1	5	0	0	1	9	19	8	0
NEUTRAL	< 2	CONC.=	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	21.
		POP. =	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
NEUTRAL	2 - 5	CONC.=	23.	83.	60.	7.	55.	31.	38.	47.	45.	34.	35.	40.	49.	74.	25.	23.	0.
		POP. =	11	18	4	3	6	7	5	16	32	15	10	7	10	1	8	16	0
NEUTRAL	6 -12	CONC.=	66.	45.	56.	63.	37.	36.	67.	51.	51.	46.	34.	54.	64.	67.	63.	53.	0.
		POP. =	24	17	7	16	11	4	12	35	67	45	11	7	11	11	22	25	0
NEUTRAL	> 12	CONC.=	75.	176.	152.	116.	0.	88.	84.	71.	57.	80.	20.	65.	137.	99.	98.	77.	0.
		POP. =	4	1	1	3	0	5	5	6	20	21	1	4	4	12	27	15	0
STABLE	< 2	CONC.=	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	16.
		POP. =	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	[illegible]
STABLE	2 - 5	CONC.=	13.	15.	7.	32.	24.	13.	18.	32.	32.	25.	27.	13.	10.	24.	27.	15.	63.
		POP. =	50	18	5	5	11	12	26	67	129	49	25	19	12	19	15	53	11
STABLE	6 -12	CONC.=	39.	52.	0.	0.	0.	49.	35.	45.	63.	52.	93.	39.	33.	75.	53.	49.	0.
		POP. =	7	2	0	0	0	1	4	26	44	12	1	1	1	10	15	13	0
STABLE	> 12	CONC.=	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		POP. =	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ALL	ALL	CONC.=	48.	69.	90.	83.	61.	46.	49.	51.	49.	59.	70.	74.	79.	85.	86.	63.	27.
		POP. =	165	92	45	47	49	35	65	182	368	251	99	74	86	97	176	218	65

Figure D1.16


DULLES
WIND VS STABILITY VS O3 CONCENTRATION PLOT
LEVINSVILLE
JUNE 1976 - AUGUST 1976
N
W
E
UNSTABLE
SPEED (MPH)
⟵ 2 - 5
6 - 12 ⟶
<2 MPH CONC. = *****
NEUTRAL
STABLE
* = SEE FACING TABLE
<5 POPULATIONS NOT PLOTTED
⟵ >12
ALL STABILITIES
ALL WIND SPEEDS (MPH)

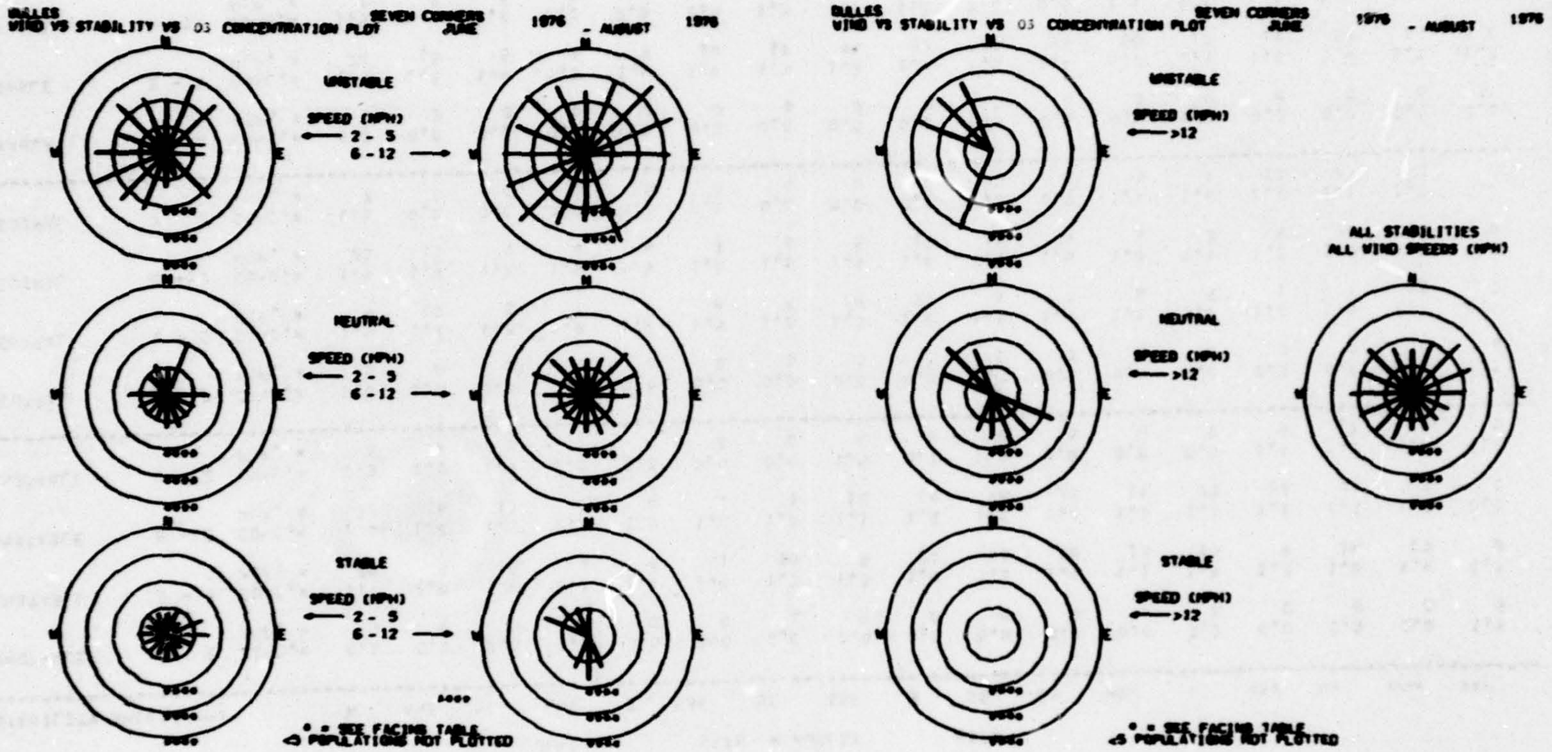
DULLES

Table D1.17 SEVEN CORNERS OZONE (UGM3) 03

JUNE 1976 - AUGUST 1976

STABILITY	SPEED(MPH)		N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VAR
UNSTABLE	< 2	CONC.=	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	31.
		POP. =	-0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
UNSTABLE	2 - 5	CONC.=	101.	133.	129.	109.	70.	132.	114.	43.	62.	112.	120.	148.	133.	97.	128.	111.	14.
		POP. =	29	9	11	4	8	3	13	12	35	34	24	18	20	10	17	31	1
UNSTABLE	6 -12	CONC.=	119.	149.	160.	176.	159.	119.	167.	173.	124.	140.	172.	155.	154.	139.	157.	139.	250.
		POP. =	38	24	12	12	12	3	1	18	37	68	30	21	27	25	44	54	1
UNSTABLE	> 12	CONC.=	238.	123.	170.	157.	172.	0.	0.	144.	274.	155.	0.	0.	255.	151.	140.	134.	0.
		POP. =	3	2	3	1	1	0	0	3	1	6	0	0	1	9	19	5	0
NEUTRAL	< 2	CONC.=	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	27.
		POP. =	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
NEUTRAL	2 - 5	CONC.=	47.	103.	73.	13.	78.	55.	54.	65.	60.	47.	50.	55.	72.	181.	49.	53.	0.
		POP. =	10	18	4	3	6	7	5	15	31	15	10	7	10	1	6	16	0
NEUTRAL	6 -12	CONC.=	67.	75.	104.	99.	80.	53.	78.	76.	66.	73.	53.	72.	61.	106.	54.	77.	0.
		POP. =	22	18	7	16	11	4	12	35	49	44	10	6	11	13	22	25	0
NEUTRAL	> 12	CONC.=	107.	225.	191.	184.	0.	122.	101.	96.	81.	71.	44.	96.	137.	102.	119.	88.	0.
		POP. =	4	1	1	3	0	5	5	6	20	21	1	4	4	13	28	16	0
STABLE	< 2	CONC.=	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	44.
		POP. =	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	35
STABLE	2 - 5	CONC.=	42.	50.	32.	70.	76.	48.	36.	51.	49.	40.	49.	41.	54.	40.	51.	43.	50.
		POP. =	45	18	5	5	11	12	25	68	131	50	30	20	12	19	19	54	11
STABLE	6 -12	CONC.=	52.	49.	0.	0.	0.	78.	46.	64.	83.	64.	49.	44.	113.	59.	78.	52.	0.
		POP. =	7	2	0	0	0	1	4	26	44	13	1	1	1	10	15	13	0
STABLE	> 12	CONC.=	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		POP. =	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ALL	ALL	CONC.=	61.	103.	128.	119.	99.	76.	68.	73.	68.	90.	101.	103.	110.	104.	113.	89.	61.
		POP. =	160	92	43	44	49	35	65	165	339	255	135	79	66	100	172	216	65

Figure D1.17


DULLES
WIND VS STABILITY VS O3 CONCENTRATION PLOT
SEVEN CORNERS
JUNE 1976 - AUGUST 1976
UNSTABLE
SPEED (MPH)
← 2 - 5
6 - 12 →
NEUTRAL
SPEED (MPH)
← 2 - 5
6 - 12 →
STABLE
SPEED (MPH)
← 2 - 5
6 - 12 →
N
E
W
* = SEE FACING TABLE
<5 POPULATIONS NOT PLOTTED
DULLES
WIND VS STABILITY VS O3 CONCENTRATION PLOT
SEVEN CORNERS
JUNE 1976 - AUGUST 1976
UNSTABLE
SPEED (MPH)
← >12
NEUTRAL
SPEED (MPH)
← >12
STABLE
SPEED (MPH)
← >12
ALL STABILITIES
ALL WIND SPEEDS (MPH)
* = SEE FACING TABLE
<5 POPULATIONS NOT PLOTTED

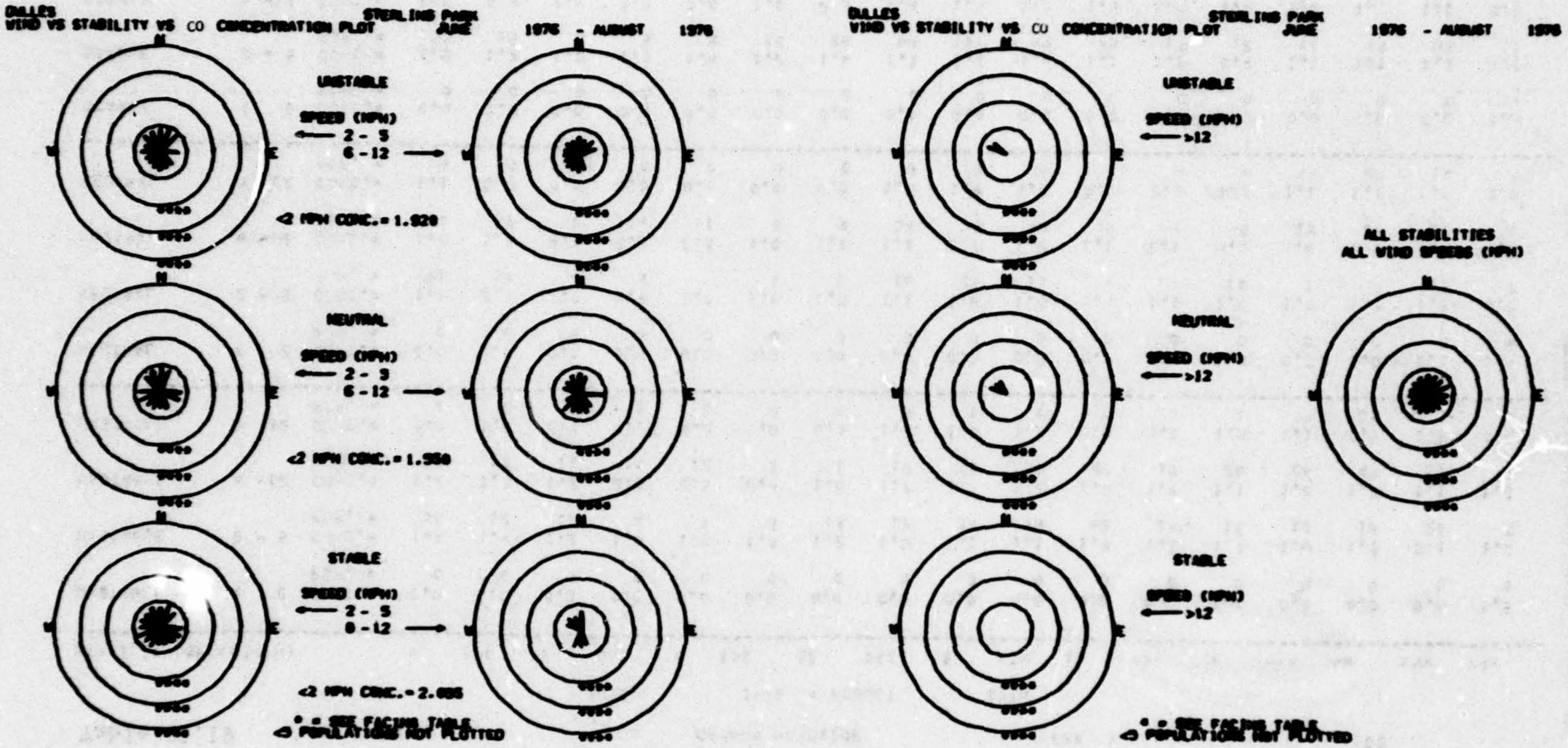
DULLES

Table D1.18 STERLING PARK CARBON MONOXIDE (PPM) CO

JUNE 1976 - AUGUST 1976

STABILITY	SPEED(MPH)		N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VAR
UNSTABLE	< 2	CONC.=	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.9
		POP. =	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
UNSTABLE	2 - 5	CONC.=	1.7	2.0	1.8	2.4	1.8	1.0	1.3	1.3	1.4	1.3	1.1	1.1	1.4	1.2	1.6	1.6	1.7
		POP. =	20	[illegible]	10	4	8	1	10	9	20	35	20	15	15	9	14	27	2
UNSTABLE	6 -12	CONC.=	1.4	1.2	1.5	1.4	1.0	1.0	1.0	1.1	1.3	1.1	1.2	1.1	1.1	1.1	1.3	1.2	0.0
		POP. =	32	16	10	9	4	1	1	12	19	46	25	18	25	23	38	48	0
UNSTABLE	> 12	CONC.=	0.0	1.0	1.4	0.0	0.0	0.0	0.0	1.0	0.0	1.0	0.0	0.0	0.0	1.4	1.2	1.0	0.0
		POP. =	0	2	1	0	0	0	0	1	0	2	0	0	0	6	17	4	0
NEUTRAL	< 2	CONC.=	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5
		POP. =	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
NEUTRAL	2 - 5	CONC.=	[illegible]	1.7	1.2	1.9	1.6	1.5	1.2	1.3	1.2	1.3	1.4	1.5	1.6	1.0	1.6	1.7	0.0
		POP. =	9	10	3	1	6	6	4	12	20	8	7	6	9	1	7	13	0
NEUTRAL	6 -12	CONC.=	1.5	1.4	1.7	1.8	1.9	1.5	1.1	1.4	1.4	1.8	1.6	1.0	1.1	1.2	1.3	1.5	0.0
		POP. =	20	11	4	4	6	3	6	6	19	30	9	6	3	9	22	23	0
NEUTRAL	> 12	CONC.=	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.1	0.0	1.9	1.0	1.2	1.1	[illegible]	0.0
		POP. =	3	0	0	0	0	0	0	0	0	1	0	3	1	10	23	13	0
STABLE	< 2	CONC.=	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.1
		POP. =	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31
STABLE	2 - 5	CONC.=	1.5	1.8	1.6	1.7	1.6	1.6	1.5	1.3	1.3	1.5	1.4	1.7	1.4	1.5	1.4	1.7	1.2
		POP. =	34	15	5	4	9	10	17	46	95	59	24	10	10	18	19	46	2
STABLE	6 -12	CONC.=	1.5	1.1	0.0	0.0	0.0	2.5	1.0	1.1	1.2	1.3	0.0	1.1	1.0	1.1	1.4	1.1	0.0
		POP. =	7	2	0	0	0	1	1	14	12	9	0	1	1	10	15	12	0
STABLE	> 12	CONC.=	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		POP. =	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ALL	ALL	CONC.=	1.5	1.6	1.6	1.7	1.5	1.5	1.3	1.3	1.3	1.5	1.3	1.3	1.3	1.2	1.3	1.4	1.5
		POP. =	125	65	33	21	33	22	39	100	[illegible]	108	65	59	64	66	155	[illegible]	[illegible]

Figure D1.18


DULLES
WIND VS STABILITY VS CO CONCENTRATION PLOT
STERLING PARK
JUNE 1976 - AUGUST 1976
N
W
E
UNSTABLE
SPEED (MPH)
2 - 5
6 - 12
<2 MPH CONC.= 1.920
NEUTRAL
SPEED (MPH)
2 - 5
6 - 12
<2 MPH CONC.= 1.550
STABLE
SPEED (MPH)
2 - 5
6 - 12
<2 MPH CONC.= 2.085
* = SEE FACING TABLE
<3 POPULATIONS NOT PLOTTED
DULLES
WIND VS STABILITY VS CO CONCENTRATION PLOT
STERLING PARK
JUNE 1976 - AUGUST 1976
UNSTABLE
SPEED (MPH)
>12
NEUTRAL
SPEED (MPH)
>12
STABLE
SPEED (MPH)
>12
ALL STABILITIES
ALL WIND SPEEDS (MPH)
* = SEE FACING TABLE
<3 POPULATIONS NOT PLOTTED

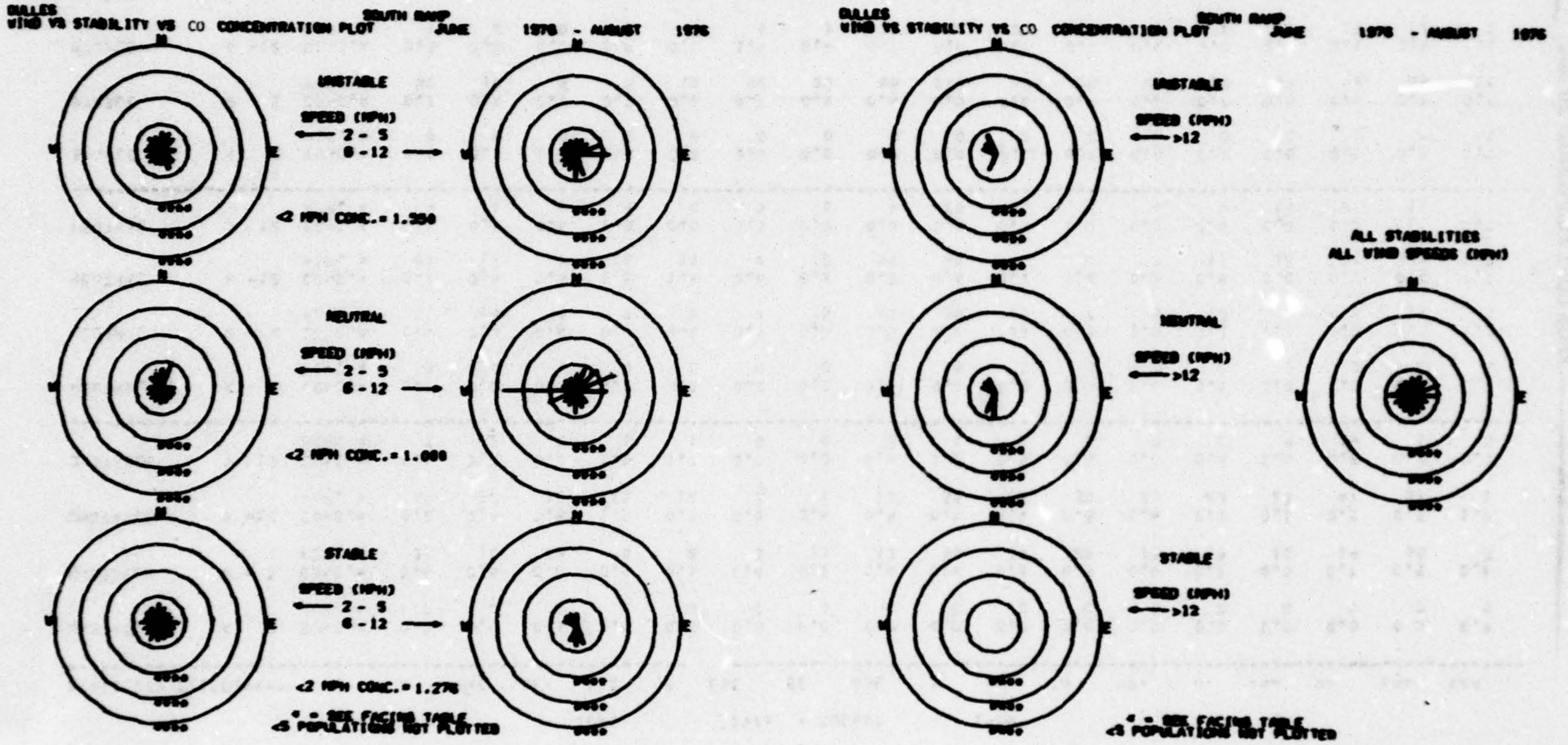
DULLES

Table D1.19 SOUTH RAMP CARBON MONOXIDE (PPM) CO

JUNE 1976 - AUGUST 1976

STABILITY	SPEED(MPH)		N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VAR
UNSTABLE	< 2	CONC.=	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5
		POP.=	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
UNSTABLE	2 - 5	CONC.=	1.4	1.4	1.2	1.0	1.0	1.0	1.2	1.5	1.1	1.1	1.2	1.2	1.3	1.0	1.3	1.1	1.0
		POP.=	50	10	12	4	7	3	13	12	34	59	22	18	15	10	18	28	3
UNSTABLE	6 -12	CONC.=	1.2	1.3	1.2	2.0	2.5	2.4	1.0	1.7	1.6	1.2	1.2	1.2	1.1	1.2	1.2	1.1	1.0
		POP.=	37	16	11	15	12	3	1	19	35	69	28	19	26	26	47	57	1
UNSTABLE	> 12	CONC.=	0.0	1.0	2.7	3.2	3.2	0.0	0.0	1.2	1.5	1.2	0.0	0.0	1.0	1.1	1.1	1.6	0.0
		POP.=	0	2	3	1	1	0	0	3	1	6	0	0	1	9	15	5	0
NEUTRAL	< 2	CONC.=	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.[illegible]
		POP.=	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	[illegible]
NEUTRAL	2 - 5	CONC.=	1.5	2.1	1.7	1.9	1.0	1.0	1.0	1.1	1.2	1.0	1.0	1.1	1.0	1.0	1.2	1.3	0.0
		POP.=	11	17	4	3	[illegible]	6	[illegible]	16	25	15	7	7	10	1	8	15	0
NEUTRAL	6 -12	CONC.=	1.2	1.8	2.2	3.2	2.3	1.0	1.2	1.3	1.7	1.2	1.1	2.1	5.5	1.0	1.1	1.0	0.0
		POP.=	24	17	7	16	11	3	9	24	53	42	9	7	8	13	22	25	0
NEUTRAL	> 12	CONC.=	1.1	0.0	0.0	0.0	0.0	0.0	0.0	1.5	1.9	1.5	0.0	2.0	1.5	1.1	1.1	1.1	0.0
		POP.=	2	0	0	0	0	0	0	3	5	5	0	4	4	12	27	14	0
STABLE	< 2	CONC.=	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3
		POP.=	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	37
STABLE	2 - 5	CONC.=	1.5	1.3	1.0	1.0	1.5	1.2	1.4	1.3	1.4	1.4	1.1	1.2	1.4	1.1	1.1	1.3	2.2
		POP.=	50	15	5	5	9	12	26	64	127	49	25	13	12	18	19	53	11
STABLE	6 -12	CONC.=	1.0	0.7	0.0	0.0	0.0	1.0	2.3	1.4	1.5	1.2	1.5	1.0	1.0	1.0	1.1	1.1	0.0
		POP.=	6	2	0	0	0	1	4	25	29	11	1	1	1	10	15	12	0
STABLE	> 12	CONC.=	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		POP.=	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ALL	ALL	CONC.=	1.3	1.6	1.5	2.2	1.9	1.3	1.4	1.4	1.8	1.2	1.1	1.3	1.7	1.1	1.2	1.2	1.4
		POP.=	160	81	42	[illegible]	46	25	56	176	320	237	94	49	77	99	174	215	64

Figure D1.19


DULLES
WIND VS STABILITY VS CO CONCENTRATION PLOT
SOUTH RAMP
JUNE 1976 - AUGUST 1976
N
W
E
UNSTABLE
SPEED (MPH)
2 - 5
6 - 12
<2 MPH CONC. = 1.350
NEUTRAL
SPEED (MPH)
2 - 5
6 - 12
<2 MPH CONC. = 1.000
STABLE
SPEED (MPH)
2 - 5
6 - 12
<2 MPH CONC. = 1.276
* = SEE FACING TABLE
<5 POPULATIONS NOT PLOTTED
DULLES
WIND VS STABILITY VS CO CONCENTRATION PLOT
SOUTH RAMP
JUNE 1976 - AUGUST 1976
UNSTABLE
SPEED (MPH)
>12
NEUTRAL
SPEED (MPH)
>12
STABLE
SPEED (MPH)
>12
* = SEE FACING TABLE
<5 POPULATIONS NOT PLOTTED
ALL STABILITIES
ALL WIND SPEEDS (MPH)

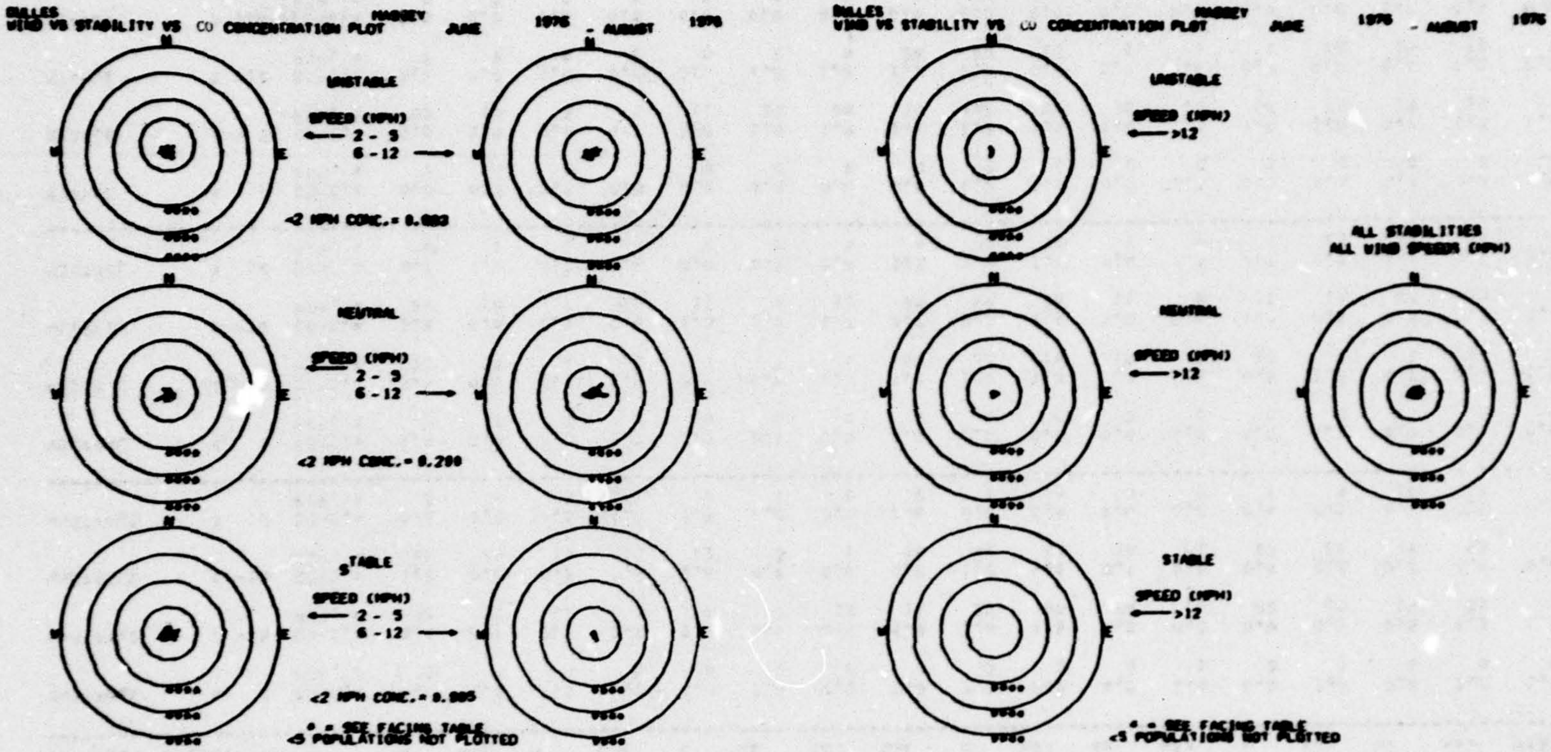
DULLES

Table D1.20 MASSEY CARBON MONOXIDE (UGMS) CC

JUNE 1976 - AUGUST 1976

STABILITY	SPEED(MPH)		N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VAR
UNSTABLE	< 2	CONC.=	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9
		POP. =	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
UNSTABLE	2 - 5	CONC.=	0.6	0.5	0.8	0.6	0.5	0.8	0.8	0.6	0.4	0.5	0.3	0.4	0.7	0.5	0.7	0.5	0.6
		POP. =	31	10	12	4	8	3	15	13	34	39	22	17	19	10	19	50	3
UNSTABLE	6 -12	CONC.=	0.2	0.4	0.8	1.0	0.7	0.8	0.6	0.5	0.4	0.4	0.3	0.6	0.4	0.1	0.5	0.3	1.2
		POP. =	39	22	12	15	12	3	1	13	33	63	30	29	23	23	47	57	1
UNSTABLE	> 12	CONC.=	0.4	0.3	0.4	0.0	1.7	0.0	0.0	0.6	1.7	0.5	0.0	0.0	0.0	0.0	0.2	0.3	0.0
		POP. =	3	2	3	1	1	0	0	2	1	6	0	0	1	9	19	5	0
NEUTRAL	< 2	CONC.=	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
		POP. =	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
NEUTRAL	2 - 5	CONC.=	0.4	0.3	0.4	0.4	0.5	0.4	0.6	0.6	0.2	0.6	0.3	1.2	0.2	0.6	0.7	0.7	0.0
		POP. =	11	16	4	3	6	7	5	15	30	15	7	5	10	1	8	15	3
NEUTRAL	6 -12	CONC.=	0.4	0.6	1.3	0.8	1.4	0.6	0.3	0.2	0.3	0.2	0.3	0.5	0.8	0.0	0.1	0.4	0.0
		POP. =	29	17	7	16	11	4	12	34	68	44	10	7	11	12	22	25	6
NEUTRAL	> 12	CONC.=	0.1	0.6	0.6	1.0	0.0	0.5	0.2	0.0	0.5	0.3	0.0	0.0	0.4	0.2	0.3	0.1	0.0
		POP. =	4	1	1	3	0	5	5	6	20	21	1	4	4	13	28	15	2
STABLE	< 2	CONC.=	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
		POP. =	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
STABLE	2 - 5	CONC.=	0.7	0.4	0.1	0.9	0.6	0.7	0.8	0.4	0.5	0.6	0.7	1.0	0.7	0.5	0.6	0.7	0.4
		POP. =	50	16	5	5	11	12	25	65	120	48	28	20	12	19	14	55	11
STABLE	6 -12	CONC.=	0.3	0.0	0.0	0.0	0.0	1.7	0.4	0.7	0.4	0.2	0.0	0.0	0.0	0.3	0.1	0.3	0.0
		POP. =	7	2	0	0	0	1	3	20	40	13	1	1	1	10	15	13	0
STABLE	> 12	CONC.=	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		POP. =	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ALL	ALL	CONC.=	0.5	0.4	0.5	0.5	0.8	0.7	0.6	0.4	0.4	0.4	0.3	0.7	0.5	0.2	0.4	0.5	0.4
		POP. =	169	90	44	37	49	35	64	168	346	250	98	74	81	57	177	220	57

Figure D1.20


DULLES
WIND VS STABILITY VS CO CONCENTRATION PLOT
HAGREY
JUNE 1976 - AUGUST 1976
UNSTABLE
SPEED (MPH)
2 - 5
6 - 12
<2 MPH CONC.= 0.083
NEUTRAL
SPEED (MPH)
2 - 5
6 - 12
<2 MPH CONC.= 0.290
STABLE
SPEED (MPH)
2 - 5
6 - 12
<2 MPH CONC.= 0.905
* = SEE FACING TABLE
<5 POPULATIONS NOT PLOTTED
DULLES
WIND VS STABILITY VS CO CONCENTRATION PLOT
HAGREY
JUNE 1976 - AUGUST 1976
UNSTABLE
SPEED (MPH)
>12
NEUTRAL
SPEED (MPH)
>12
STABLE
SPEED (MPH)
>12
ALL STABILITIES
ALL WIND SPEEDS (MPH)
* = SEE FACING TABLE
<5 POPULATIONS NOT PLOTTED
N
E
W

99 1042 WIND VS STABILITY VS CONCENTRATION PLOT VERSION 1.5 (770201) 9 JAN 1977 PAGE 4

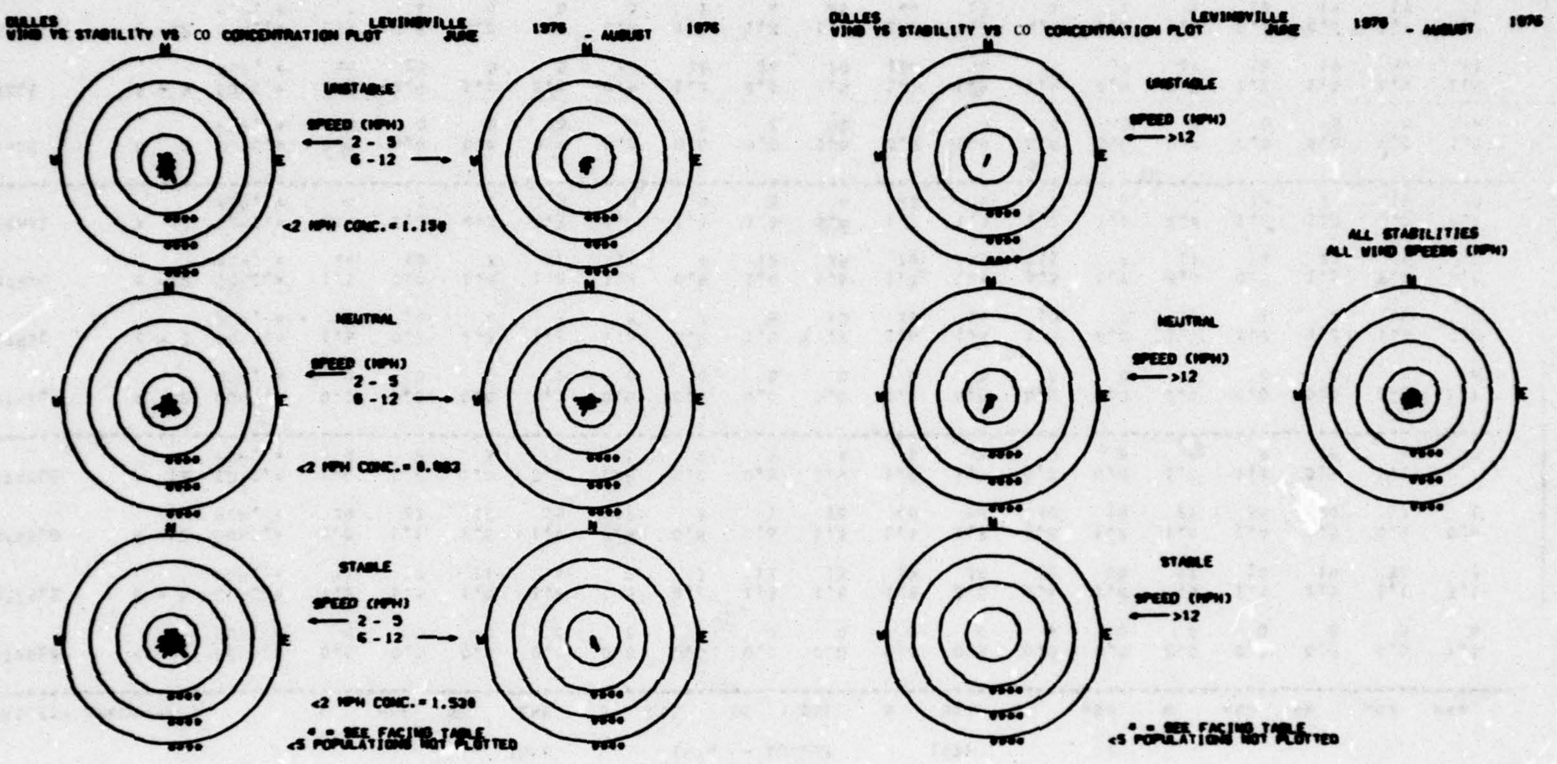
DULLES

Table D1.21 LEWINSVILLE CARBON MONOXIDE (PPM) CO

JUNE 1976 - AUGUST 1976

STABILITY	SPEED(MPH)		N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VAR
UNSTABLE	< 2	CONC.=	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1
		POP. =	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
UNSTABLE	2 - 5	CONC.=	0.7	0.7	0.7	0.9	0.7	0.4	0.9	1.9	1.6	1.5	1.0	0.3	0.5	0.1	0.8	0.5	1.7
		POP. =	32	10	12	4	6	3	13	13	35	40	24	16	20	10	19	31	3
UNSTABLE	6 -12	CONC.=	0.2	0.2	0.3	0.6	0.6	0.8	0.6	0.7	1.2	1.1	0.7	0.6	0.4	0.2	0.2	0.1	0.0
		POP. =	36	24	13	15	12	3	1	18	41	68	30	21	27	26	48	58	1
UNSTABLE	> 12	CONC.=	0.4	0.0	0.0	0.0	1.2	0.0	0.0	0.6	0.8	0.9	0.0	0.0	0.6	0.1	0.1	0.1	0.0
		POP. =	3	2	3	1	1	0	0	2	1	6	0	0	1	9	19	4	0
NEUTRAL	< 2	CONC.=	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5
		POP. =	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
NEUTRAL	2 - 5	CONC.=	0.5	0.5	0.9	1.2	0.7	0.8	1.3	1.2	1.0	1.3	1.0	1.4	0.5	1.2	0.7	0.1	0.0
		POP. =	11	18	4	3	[illegible]	7	5	16	32	16	19	7	10	1	6	16	0
NEUTRAL	6 -12	CONC.=	0.3	0.6	0.5	0.6	1.0	1.2	0.7	0.7	0.7	1.4	1.0	0.9	1.3	0.3	0.3	0.3	0.0
		POP. =	24	18	7	16	11	4	12	35	69	46	11	8	11	13	22	25	0
NEUTRAL	> 12	CONC.=	0.1	0.8	0.0	0.6	0.0	0.5	0.8	0.2	1.0	1.4	0.6	1.0	0.7	0.3	0.1	0.1	0.0
		POP. =	4	1	1	3	0	5	5	6	20	20	1	4	4	13	28	16	0
STABLE	< 2	CONC.=	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5
		POP. =	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40
STABLE	2 - 5	CONC.=	0.8	1.0	0.8	1.1	1.2	1.2	1.9	1.1	1.2	1.5	1.2	1.3	1.0	1.0	0.7	1.0	1.4
		POP. =	50	18	5	5	11	12	26	70	131	50	30	20	12	19	19	55	11
STABLE	6 -12	CONC.=	0.2	0.0	0.0	0.0	0.0	1.2	1.2	1.1	0.7	0.4	1.7	0.6	0.0	0.2	0.1	0.3	0.0
		POP. =	7	2	0	0	0	1	4	26	44	13	1	1	1	10	15	13	0
STABLE	> 12	CONC.=	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		POP. =	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ALL	ALL	CONC.=	0.5	0.5	0.5	0.7	0.9	0.9	1.3	1.0	1.1	1.3	1.0	0.8	0.8	0.4	0.3	0.4	1.2
		POP. =	167	93	45	67	49	35,	66	166	374	260	107	79	66	101	178	223	67

Figure D1.21


DULLES
WIND VS STABILITY VS CO CONCENTRATION PLOT
LEVINSVILLE
JUNE 1976 - AUGUST 1976
N
W
E
UNSTABLE
SPEED (MPH)
2 - 5
6 - 12
<2 MPH CONC. = 1.150
NEUTRAL
SPEED (MPH)
2 - 5
6 - 12
<2 MPH CONC. = 0.883
STABLE
SPEED (MPH)
2 - 5
6 - 12
<2 MPH CONC. = 1.530
* = SEE FACING TABLE
<5 POPULATIONS NOT PLOTTED
DULLES
WIND VS STABILITY VS CO CONCENTRATION PLOT
LEVINSVILLE
JUNE 1976 - AUGUST 1976
UNSTABLE
SPEED (MPH)
>12
NEUTRAL
SPEED (MPH)
>12
STABLE
SPEED (MPH)
>12
ALL STABILITIES
ALL WIND SPEEDS (MPH)
* = SEE FACING TABLE
<5 POPULATIONS NOT PLOTTED

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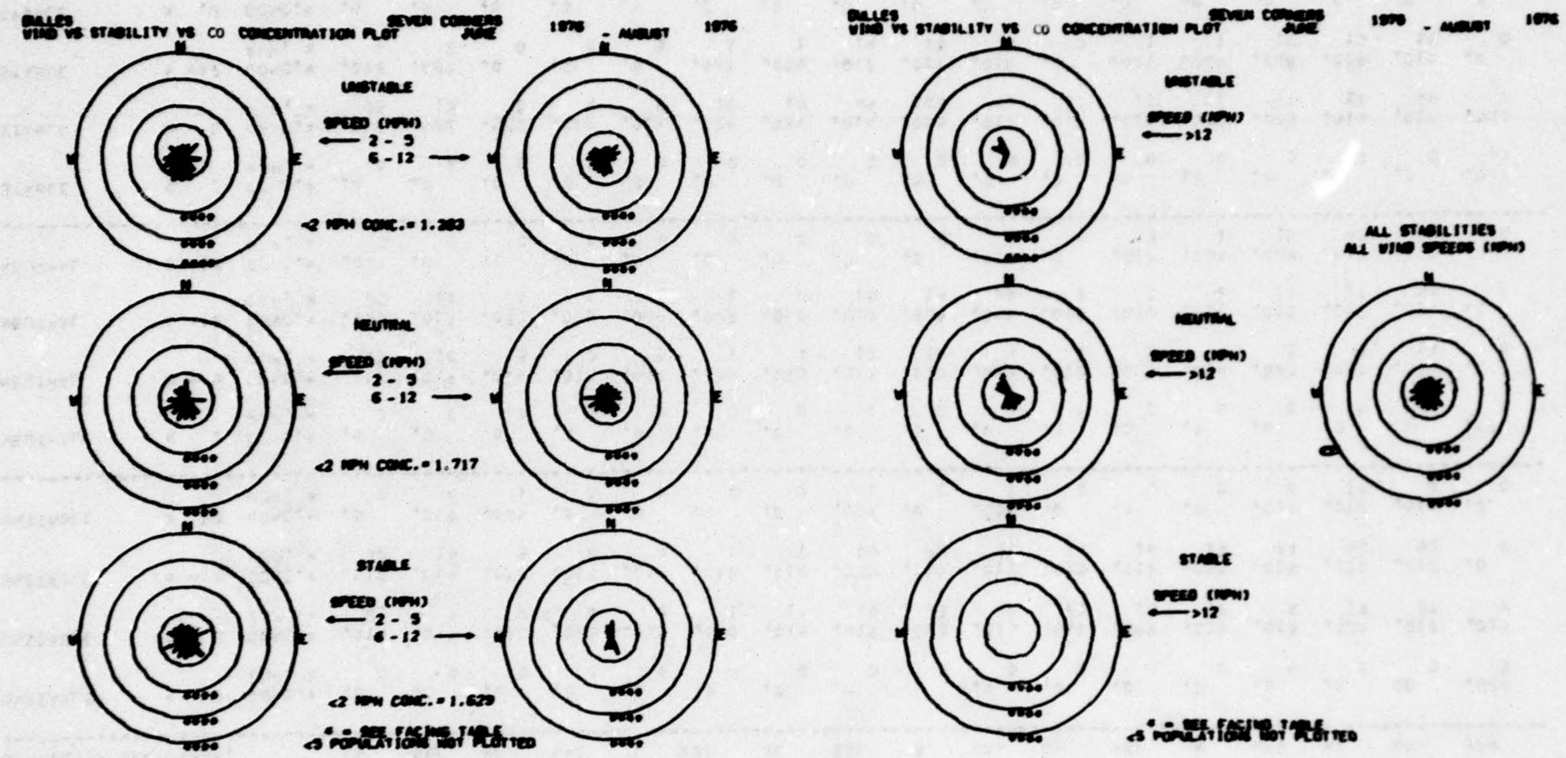
DULLES

Table D1.22 SEVEN CORNERS CARBON MONOXIDE (PPM) CO

JUNE 1976 - AUGUST 1976

STABILITY	SPEED(MPH)		N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VAR
UNSTABLE	< 2	CONC.=	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3
		POP.=	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
UNSTABLE	2 - 5	CONC.=	1.2	1.3	1.8	1.7	1.5	0.2	1.3	1.8	1.9	2.0	1.6	1.8	1.5	1.1	1.5	1.1	3.1
		POP.=	31	10	11	4	8	3	13	13	35	39	22	18	17	10	19	30	3
UNSTABLE	6 -12	CONC.=	1.0	1.1	1.5	1.4	0.9	0.8	0.6	1.3	1.4	1.3	1.2	1.2	1.5	1.4	1.3	0.4	0.8
		POP.=	39	23	13	15	12	3	1	16	40	63	30	19	25	25	44	57	1
UNSTABLE	> 12	CONC.=	1.4	1.2	1.0	0.6	1.2	0.0	0.0	1.9	1.2	1.3	0.0	0.0	1.7	1.3	0.5	1.5	0.0
		POP.=	3	2	3	1	1	0	0	3	1	5	0	0	1	9	19	5	0
NEUTRAL	< 2	CONC.=	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7
		POP.=	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
NEUTRAL	2 - 5	CONC.=	1.6	0.7	1.7	1.2	1.6	0.5	1.5	1.7	1.6	1.8	1.5	2.0	1.5	1.2	1.2	1.3	0.0
		POP.=	10	16	4	3	6	7	5	15	31	16	10	7	10	1	8	16	0
NEUTRAL	6 -12	CONC.=	1.3	1.0	1.0	1.2	1.2	0.9	1.4	1.6	1.3	1.1	1.3	1.7	2.0	0.9	1.1	1.2	0.0
		POP.=	24	16	7	16	11	4	12	35	70	45	11	7	11	15	20	25	0
NEUTRAL	> 12	CONC.=	1.0	2.3	2.3	2.3	0.0	1.3	1.2	1.4	1.2	1.3	1.2	1.1	2.5	1.2	1.2	1.7	0.0
		POP.=	4	1	1	3	0	5	5	6	20	21	1	4	[illegible]	13	20	15	0
STABLE	< 2	CONC.=	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5
		POP.=	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	38
STABLE	2 - 5	CONC.=	1.2	0.9	1.1	2.0	0.9	1.2	2.0	1.5	1.5	1.6	1.4	2.0	0.9	1.7	1.5	1.3	1.8
		POP.=	50	15	5	5	10	12	26	70	130	50	30	19	12	16	19	52	11
STABLE	6 -12	CONC.=	1.4	2.9	0.0	0.0	0.0	1.2	1.3	1.7	1.1	1.2	4.6	1.2	0.0	0.3	0.0	1.0	0.0
		POP.=	7	2	0	0	0	1	4	26	44	13	1	1	1	10	15	13	0
STABLE	> 12	CONC.=	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		POP.=	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ALL	ALL	CONC.=	1.2	1.0	1.5	1.4	1.2	0.9	1.6	1.6	1.5	1.4	1.4	1.7	1.5	1.2	1.2	1.2	1.7
		POP.=	166	89	44	47	46	35	66	166	372	259	105	75	61	99	172	220	65

Figure D1.22


DALLES
WIND VS STABILITY VS CO CONCENTRATION PLOT
SEVEN CORNERS
JUNE 1976 - AUGUST 1976
UNSTABLE
SPEED (MPH)
2 - 5
6 - 12
<2 MPH CONC.= 1.283
NEUTRAL
SPEED (MPH)
2 - 5
6 - 12
<2 MPH CONC.= 1.717
STABLE
SPEED (MPH)
2 - 5
6 - 12
<2 MPH CONC.= 1.629
* = SEE FACING TABLE
<5 POPULATIONS NOT PLOTTED
N
E
W
DALLES
WIND VS STABILITY VS CO CONCENTRATION PLOT
SEVEN CORNERS
JUNE 1976 - AUGUST 1976
UNSTABLE
SPEED (MPH)
>12
NEUTRAL
SPEED (MPH)
>12
STABLE
SPEED (MPH)
>12
ALL STABILITIES
ALL WIND SPEEDS (MPH)
* = SEE FACING TABLE
<5 POPULATIONS NOT PLOTTED

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FROM COPY FURNISHED TO DDC

Table D1.23

```
99  1057     WIND VS STABILITY VS CONCENTRATION  PLOT          VERSION   1.3  (770201)              6 JUN 1977            PAGE   4
******************************************************************************************************************************
                                                         DULLES
              STERLING PARK                          NITROGEN DIOXIDE               ( PPM  )                        NO2
                                         JUNE          1976  - AUGUST          1976
STABILITY SPEED(MPH)           N    NNE   NE    ENE   E    ESE   SE    SSE   S     SSW   SW    WSW   W     WNW   NW    NNW   VAR
------------------------------------------------------------------------------------------------------------------------------
UNSTABLE     <  2  CONC.=  .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .026
                   POP. =     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     5
UNSTABLE     2 - 5 CONC.=  .018  .017  .020  .023  .013  .010  .015  .015  .013  .015  .012  .009  .015  .013  .020  .017  .016
                   POP. =    21     9     9     4     8     1    11    10    23    34    20    15    17     9    13    27     2
UNSTABLE     6 -12 CONC.=  .014  .014  .013  .013  .012  .012  .014  .009  .011  .011  .013  .012  .010  .009  .011  .012  .0
                   POP. =    32    16     9     8     4     1     1    10    20    56    24    16    23    24    42    50     0
UNSTABLE     > 12  CONC.=  .0    .009  .005  .0    .0    .0    .0    .009  .0    .008  .0    .0    .0    .007  .010  .010  .0
                   POP. =     0     2     1     0     0     0     0     1     0     2     0     0     0     6    17     6     0
------------------------------------------------------------------------------------------------------------------------------
NEUTRAL      <  2  CONC.=  .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .020
                   POP. =     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     6
NEUTRAL      2 - 5 CONC.=  .018  .019  .014  .015  .017  .036  .010  .013  .012  .015  .012  .021  .014  .023  .017  .014  .0
                   POP. =    10    10     3     2     5     1     3    13    18     9     4     5     9     1     7    13     0
NEUTRAL      6 -12 CONC.=  .015  .017  .030  .016  .022  .009  .010  .010  .009  .009  .015  .010  .010  .011  .012  .014  .0
                   POP. =    20    11     1     1     1     1     6    10    19    24     4     5     2    12    21    23     0
NEUTRAL      > 12  CONC.=  .009  .0    .0    .0    .0    .0    .0    .0    .0    .009  .0    .007  .006  .009  .010  .009  .0
                   POP. =     3     0     0     0     0     0     0     0     0     1     0     3     1    11    25    14     0
------------------------------------------------------------------------------------------------------------------------------
STABLE       <  2  CONC.=  .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .024
                   POP. =     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0    35
STABLE       2 - 5 CONC.=  .018  .022  .020  .022  .018  .024  .021  .014  .015  .017  .017  .021  .020  .020  .014  .018  .006
                   POP. =    35    15     5     4     9    10    19    49   105    41    21    11    11    17    18    46     3
STABLE       6 -12 CONC.=  .012  .007  .0    .0    .0    .027  .006  .012  .011  .010  .0    .011  .008  .008  .009  .013  .0
                   POP. =     7     2     0     0     0     1     1    14    13     8     0     1     1    10    15    11     0
STABLE       > 12  CONC.=  .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0
                   POP. =     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
------------------------------------------------------------------------------------------------------------------------------
ALL          ALL   CONC.=  .016  .017  .017  .018  .016  .022  .017  .013  .012  .013  .014  .013  .014  .012  .012  .014  .022
                   POP. =   128    65    28    19    27    15    41   107   199   175    73    56    64    90   156   189    51
------------------------------------------------------------------------------------------------------------------------------
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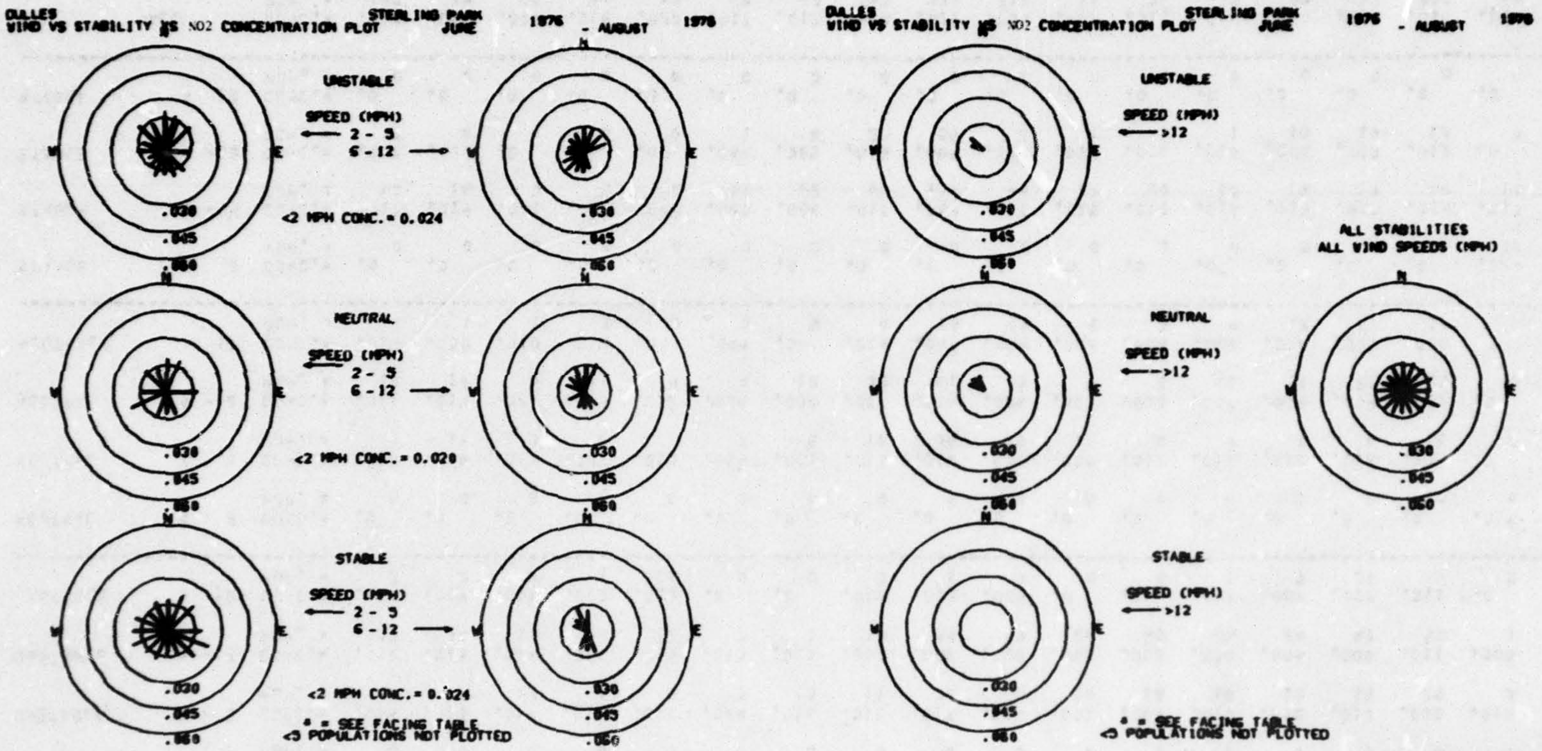
Figure D1.23


DULLES
WIND VS STABILITY VS NO2 CONCENTRATION PLOT
STERLING PARK
JUNE 1976 - AUGUST 1978
UNSTABLE
SPEED (MPH)
2 - 5
6 - 12
<2 MPH CONC.= 0.024
NEUTRAL
SPEED (MPH)
2 - 5
6 - 12
<2 MPH CONC.= 0.020
STABLE
SPEED (MPH)
2 - 5
6 - 12
<2 MPH CONC.= 0.324
* = SEE FACING TABLE
<3 POPULATIONS NOT PLOTTED
N
E
W
.030
.045
.060
DULLES
WIND VS STABILITY VS NO2 CONCENTRATION PLOT
STERLING PARK
JUNE 1976 - AUGUST 1978
UNSTABLE
SPEED (MPH)
>12
NEUTRAL
SPEED (MPH)
>12
STABLE
SPEED (MPH)
>12
* = SEE FACING TABLE
<3 POPULATIONS NOT PLOTTED
ALL STABILITIES
ALL WIND SPEEDS (MPH)

```
99  1037      WIND VS STABILITY VS CONCENTRATION  PLOT          VERSION   1.5  (770201)            8 JUN 1977          PAGE   6
****************************************************************************************************************************
                                                   DULLES
Table D1.24        SOUTH RAMP                     NITROGEN DIOXIDE               ( PPM  )                         NO2

                                            JUNE          1976  - AUGUST          1976

STABILITY SPEED(MPH)       N     NNE   NE    ENE   E     ESE   SE    SSE   S     SSW   SW    WSW   W     WNW   NW    NNW   VAR
-------------------------------------------------------------------------------------------------------------------------------

UNSTABLE      <  2 CONC.=  .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .019
                   POP. =     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     5

UNSTABLE      2 - 5 CONC.= .015  .013  .017  .016  .017  .024  .016  .012  .012  .009  .007  .009  .010  .010  .013  .010  .014
                   POP. =    27     9    12     4     8     3    13    11    33    40    24    18    18    10    16    29     3

UNSTABLE      6 -12 CONC.= .012  .013  .014  .016  .015  .013  .013  .007  .007  .008  .006  .006  .008  .008  .009  .011  .005
                   POP. =    32    24    13    15    12     3     1    16    34    59    26    20    25    24    47    53     1

UNSTABLE      > 12 CONC.=  .006  .008  .009  .013  .018  .0    .0    .003  .005  .005  .0    .0    .007  .007  .007  .011  .0
                   POP. =     3     2     2     1     1     0     0     3     1     3     0     0     1     9    19     7     0
-------------------------------------------------------------------------------------------------------------------------------

NEUTRAL       <  2 CONC.=  .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .015
                   POP. =     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     6

NEUTRAL       2 - 5 CONC.= .014  .016  .015  .007  .015  .014  .011  .013  .010  .010  .008  .012  .012  .012  .012  .009  .0
                   POP. =     8    11     3     2     3     7     5    16    30    10    10     6     9     1     6    11     0

NEUTRAL       6 -12 CONC.= .014  .015  .021  .023  .032  .012  .008  .007  .006  .006  .007  .008  .007  .009  .009  .011  .0
                   POP. =    19    14     4    11     9     4    12    32    61    31     7     8    10    13    21    23     0

NEUTRAL       > 12 CONC.=  .011  .009  .010  .010  .0    .006  .005  .004  .005  .004  .002  .005  .007  .008  .009  .010  .0
                   POP. =     4     1     1     3     0     5     5     6    16    19     1     3     4    12    27    15     0
-------------------------------------------------------------------------------------------------------------------------------

STABLE        <  2 CONC.=  .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .024
                   POP. =     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0    36

STABLE        2 - 5 CONC.= .017  .019  .011  .022  .021  .023  .026  .017  .017  .017  .015  .017  .018  .016  .010  .015  .013
                   POP. =    40    16     5     5    10    11    22    62   114    44    27    20    10    19    17    49    11

STABLE        6 -12 CONC.= .007  .006  .0    .0    .0    .034  .025  .015  .009  .006  .011  .006  .004  .005  .009  .012  .0
                   POP. =     7     2     0     0     0     1     4    22    39     8     1     1     1    10    14    12     0

STABLE        > 12 CONC.=  .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0    .0
                   POP. =     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
-------------------------------------------------------------------------------------------------------------------------------

ALL           ALL  CONC.=  .014  .014  .015  .018  .020  .017  .017  .013  .011  .009  .009  .010  .010  .010  .010  .011  .020
                   POP. =   140    79    40    41    46    54    62   168   331   214    96    76    78    98   167   200    64
-------------------------------------------------------------------------------------------------------------------------------
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  56.250000    , 78.750000    , 101.25000    , 123.75000    , 146.25000    , 168.75000    , 191.25000    , 213.75000    ,
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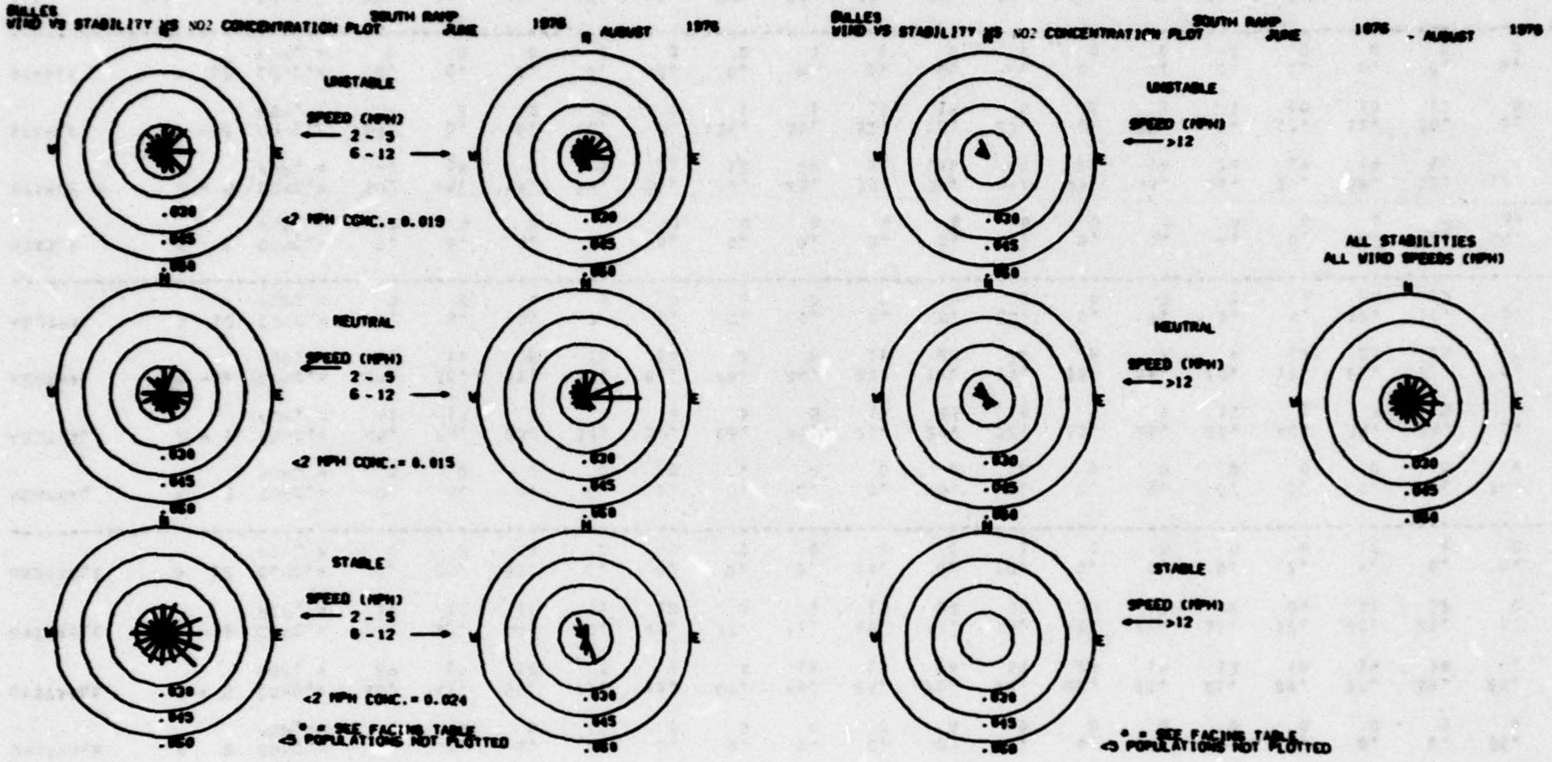
Figure D1.24



DULLES SOUTH RAMP
WIND VS STABILITY VS NO2 CONCENTRATION PLOT JUNE 1976 AUGUST 1976

DULLES SOUTH RAMP
WIND VS STABILITY VS NO2 CONCENTRATION PLOT JUNE 1976 - AUGUST 1976

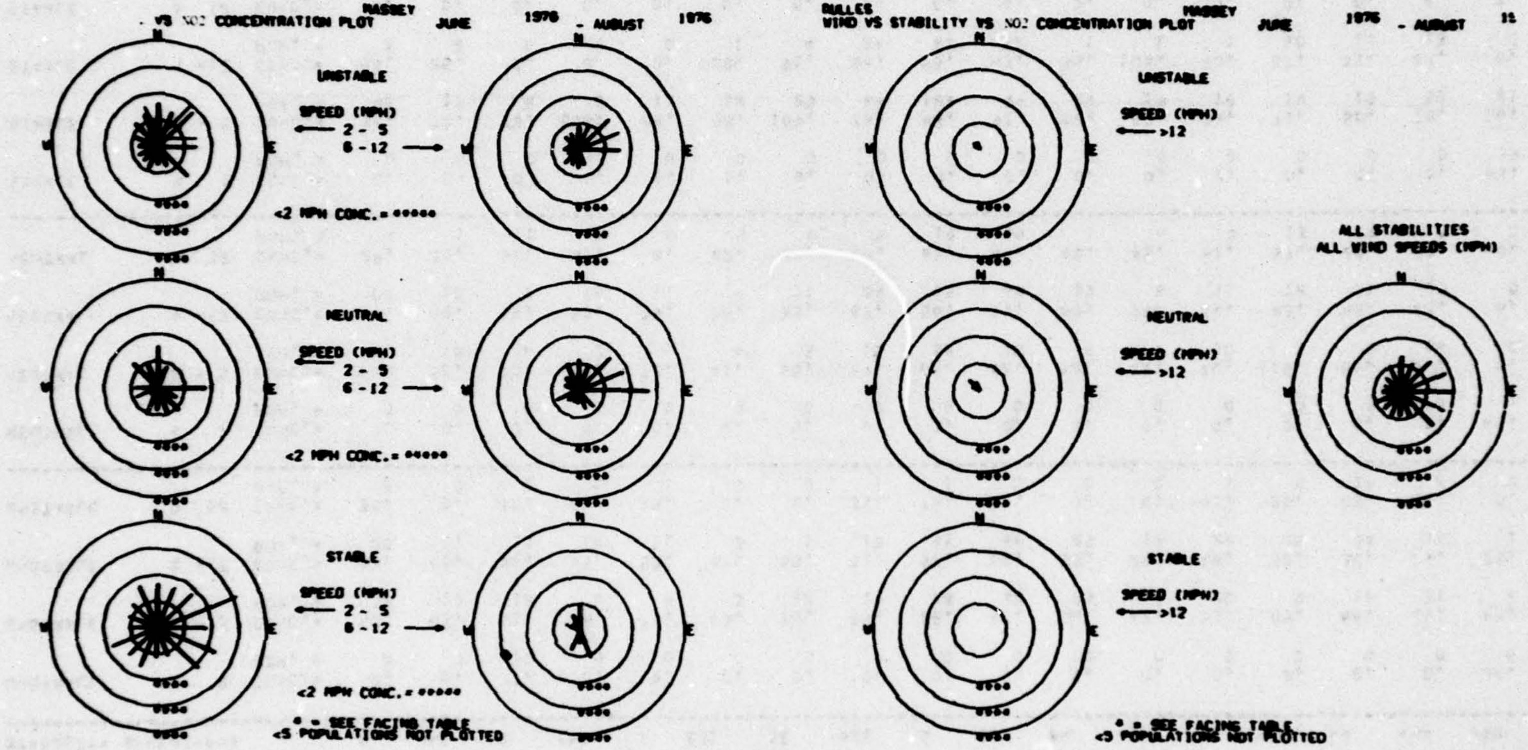
DULLES

Table D1.25 MASSEY NITROGEN DIOXIDE (UGM3) NO2C

JUNE 1976 - AUGUST 1976

STABILITY	SPEED(MPH)		N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VAR
UNSTABLE	< 2	CONC.=	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	35.
		POP. =	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
UNSTABLE	2 - 5	CONC.=	48.	42.	55.	33.	43.	40.	46.	23.	21.	26.	22.	23.	21.	29.	37.	39.	25.
		POP. =	29	10	12	3	8	3	12	13	28	39	23	18	19	10	16	28	2
UNSTABLE	6 -12	CONC.=	26.	30.	49.	50.	46.	37.	75.	18.	21.	18.	22.	12.	16.	12.	20.	20.	0.
		POP. =	36	17	11	15	10	3	1	15	22	56	30	17	22	26	41	52	0
UNSTABLE	> 12	CONC.=	0.	25.	33.	0.	0.	0.	0.	13.	0.	10.	0.	0.	0.	7.	9.	8.	0.
		POP. =	0	2	3	0	0	0	0	2	0	1	0	0	0	6	17	6	0
NEUTRAL	< 2	CONC.=	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	34.
		POP. =	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
NEUTRAL	2 - 5	CONC.=	45.	26.	23.	33.	54.	23.	34.	31.	24.	32.	10.	25.	26.	40.	39.	28.	0.
		POP. =	11	17	4	3	6	6	5	16	23	10	9	7	10	1	8	15	0
NEUTRAL	6 -12	CONC.=	34.	30.	51.	55.	81.	48.	26.	22.	14.	13.	15.	26.	10.	17.	20.	32.	0.
		POP. =	24	16	5	15	10	3	6	11	20	28	6	7	4	12	22	25	0
NEUTRAL	> 12	CONC.=	3.	0.	0.	0.	0.	0.	0.	0.	0.	20.	0.	7.	0.	9.	17.	10.	0.
		POP. =	3	0	0	0	0	0	0	0	0	2	0	3	1	11	26	12	0
STABLE	< 2	CONC.=	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	69.
		POP. =	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	39
STABLE	2 - 5	CONC.=	50.	49.	54.	94.	55.	70.	65.	33.	33.	48.	43.	55.	31.	34.	38.	52.	17.
		POP. =	46	18	5	5	11	12	24	61	116	48	27	14	12	19	19	51	3
STABLE	6 -12	CONC.=	29.	0.	0.	0.	0.	130.	30.	33.	14.	23.	0.	55.	0.	17.	11.	20.	0.
		POP. =	7	2	0	0	0	1	1	17	16	6	0	1	1	10	15	12	0
STABLE	> 12	CONC.=	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		POP. =	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ALL	ALL	CONC.=	39.	34.	48.	55.	57.	53.	52.	29.	27.	27.	26.	27.	21.	19.	22.	32.	57.
		POP. =	156	82	40	41	45	28	49	135	226	191	95	67	69	95	164	202	56

Figure D1.25


VS NO2 CONCENTRATION PLOT
MASSEY JUNE 1976 - AUGUST 1976
UNSTABLE
SPEED (MPH)
2 - 5
6 - 12
<2 MPH CONC. = *****
NEUTRAL
SPEED (MPH)
2 - 5
6 - 12
<2 MPH CONC. = *****
STABLE
SPEED (MPH)
2 - 5
6 - 12
<2 MPH CONC. = *****
* = SEE FACING TABLE
<5 POPULATIONS NOT PLOTTED
BULLES
WIND VS STABILITY VS NO2 CONCENTRATION PLOT
MASSEY JUNE 1976 - AUGUST 1976
UNSTABLE
SPEED (MPH)
>12
NEUTRAL
SPEED (MPH)
>12
STABLE
SPEED (MPH)
>12
ALL STABILITIES
ALL WIND SPEEDS (MPH)
* = SEE FACING TABLE
<5 POPULATIONS NOT PLOTTED
N
E
W

77 1037 WIND VS STABILITY VS CONCENTRATION PLOT VERSION 1.3 (770201) 8 JUN 1977 PAGE 10

DULLES

Table D1.26 LEWINSVILLE NITROGEN DIOXIDE (UGM3) NO2C

JUNE 1976 - AUGUST 1976

STABILITY	SPEED(MPH)		N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VAR
UNSTABLE	< 2	CONC.=	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	68.
		POP. =	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
UNSTABLE	2 - 5	CONC.=	53.	63.	61.	85.	71.	73.	78.	63.	82.	87.	62.	47.	53.	49.	66.	46.	65.
		POP. =	32	10	12	4	8	3	12	13	34	38	23	18	20	9	18	31	2
UNSTABLE	6 -12	CONC.=	35.	40.	51.	55.	52.	47.	65.	71.	67.	64.	59.	44.	46.	32.	36.	29.	20.
		POP. =	38	21	13	14	11	3	1	18	41	66	28	17	26	25	48	56	1
UNSTABLE	> 12	CONC.=	30.	0.	30.	40.	45.	0.	0.	30.	75.	49.	0.	0.	45.	24.	23.	26.	0.
		POP. =	2	0	1	1	1	0	0	1	1	5	0	0	1	6	17	7	0
NEUTRAL	< 2	CONC.=	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	66.
		POP. =	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
NEUTRAL	2 - 5	CONC.=	65.	51.	70.	78.	72.	41.	65.	89.	66.	82.	72.	96.	70.	115.	66.	56.	0.
		POP. =	11	18	4	3	5	6	5	15	30	15	9	7	10	1	8	16	0
NEUTRAL	6 -12	CONC.=	44.	42.	54.	57.	79.	56.	55.	63.	56.	66.	63.	79.	84.	43.	49.	43.	0.
		POP. =	24	18	7	16	11	4	11	34	68	45	10	6	11	12	21	25	0
NEUTRAL	> 12	CONC.=	29.	30.	30.	57.	0.	42.	34.	45.	65.	64.	40.	45.	61.	37.	28.	27.	0.
		POP. =	4	1	1	3	0	5	4	5	19	19	1	4	4	13	27	15	0
STABLE	< 2	CONC.=	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	83.
		POP. =	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	39
STABLE	2 - 5	CONC.=	71.	73.	78.	106.	84.	98.	109.	76.	63.	91.	72.	92.	74.	71.	58.	70.	76.
		POP. =	48	17	5	5	11	12	25	69	122	49	29	19	12	19	19	52	11
STABLE	6 -12	CONC.=	53.	25.	0.	0.	0.	160.	91.	83.	55.	47.	95.	105.	20.	37.	33.	43.	0.
		POP. =	7	2	0	0	0	1	4	24	41	12	1	1	1	10	13	13	0
STABLE	> 12	CONC.=	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		POP. =	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ALL	ALL	CONC.=	52.	51.	58.	65.	71.	70.	83.	75.	70.	73.	65.	66.	60.	44.	42.	46.	78.
		POP. =	166	87	43	46	48	34	62	179	357	250	101	72	65	97	167	216	65

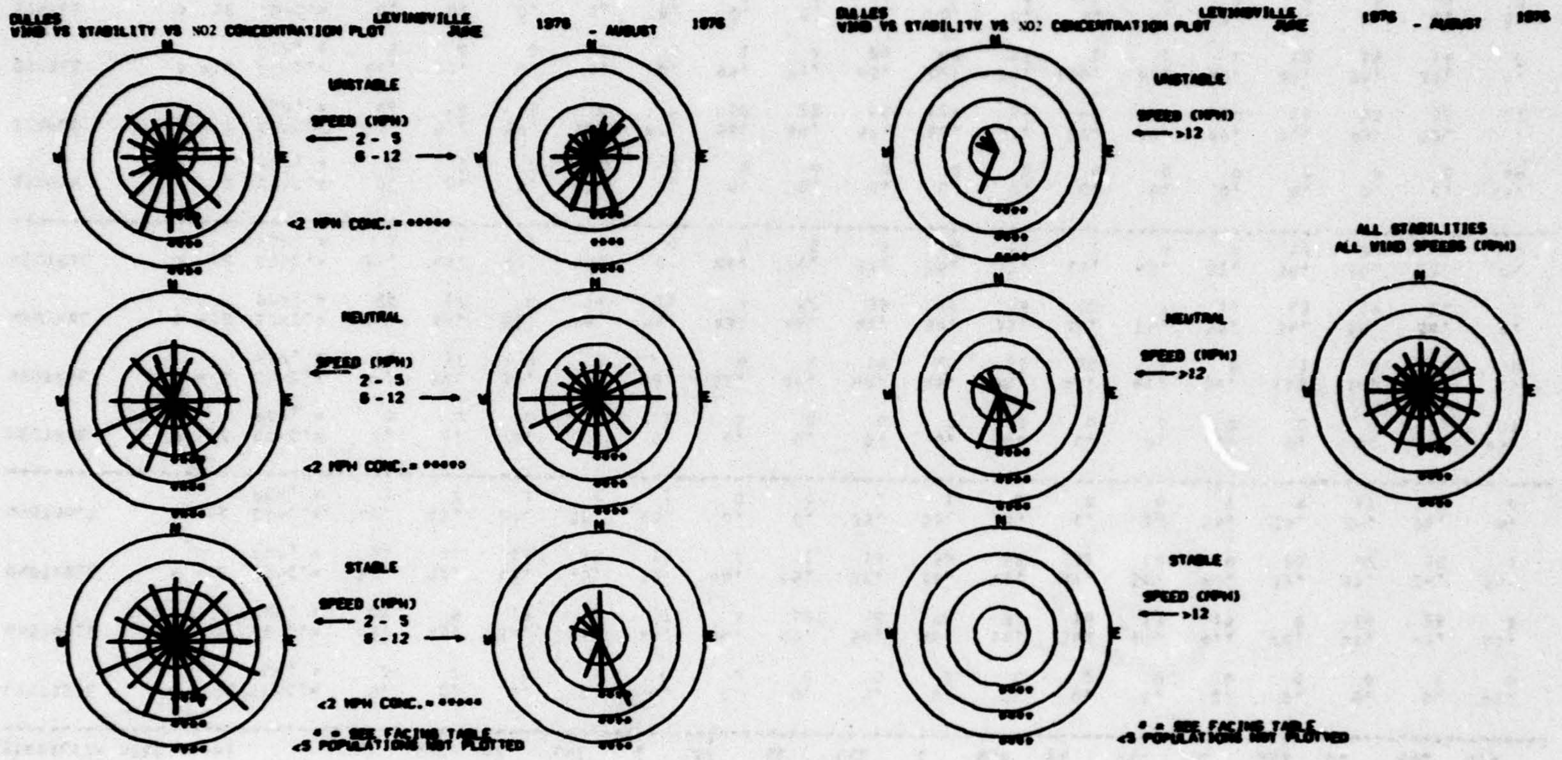

DULLES
WIND VS STABILITY VS NO2 CONCENTRATION PLOT
LEVINSVILLE
JUNE
1976 - AUGUST 1976
UNSTABLE
SPEED (MPH)
2 - 5
6 - 12
<2 MPH CONC. = *****
NEUTRAL
SPEED (MPH)
2 - 5
6 - 12
<2 MPH CONC. = *****
STABLE
SPEED (MPH)
2 - 5
6 - 12
<2 MPH CONC. = *****
* = SEE FACING TABLE
<5 POPULATIONS NOT PLOTTED
N
E
W
DULLES
WIND VS STABILITY VS NO2 CONCENTRATION PLOT
LEVINSVILLE
JUNE
1976 - AUGUST 1976
UNSTABLE
SPEED (MPH)
>12
NEUTRAL
SPEED (MPH)
>12
STABLE
SPEED (MPH)
>12
ALL STABILITIES
ALL WIND SPEEDS (MPH)
* = SEE FACING TABLE
<5 POPULATIONS NOT PLOTTED

Figure D1.26

Table D1.27

```
9S  1037     WIND VS STABILITY VS CONCENTRATION  PLOT          VERSION   1.5  (770201)            8 JUN 1977           PAGE  12
**********************************************************************************************************************
                                                         DULLES

                      SEVEN CORNERS                            NITROGEN DIOXIDE               ( UGM3 )                     NO2C

                                                  JUNE            1976  - AUGUST          1976

STABILITY SPEED(MPH)              N    NNE   NE   ENE    E   ESE   SE    SSE    S    SSW   SW   WSW    W    WNW   NW   NNW   VAR
--------------------------------------------------------------------------------------------------------------------------------

UNSTABLE     <  2 CONC.=    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.   41.
                  POP. =     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     6

UNSTABLE     2 - 5 CONC.=   42.   41.   54.   55.   48.   44.   60.   50.   46.   58.   56.   47.   43.   40.   47.   42.   40.
                  POP. =    27     9     9     2     7     3    12    12    31    30    18    13    15     9    16    28     3

UNSTABLE     6 -12 CONC.=   29.   37.   43.   45.   39.   44.   55.   37.   38.   41.   37.   36.   40.   32.   37.   26.   35.
                  POP. =    34    21    13    15    12     3     1    13    34    58    31    16    24    23    42    55     1

UNSTABLE     > 12 CONC.=    40.   15.   27.   30.   40.    0.    0.   33.   50.   38.    0.    0.   55.   34.   26.   26.    0.
                  POP. =     3     2     3     1     1     0     0     3     1     6     0     0     1     9    17     8     0
--------------------------------------------------------------------------------------------------------------------------------

NEUTRAL      <  2 CONC.=    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.   43.
                  POP. =     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     1

NEUTRAL      2 - 5 CONC.=   42.   37.   33.   49.   68.   32.   44.   60.   45.   58.   43.   61.   56.   40.   36.   38.    0.
                  POP. =    10    17     2     3 [illegible] 6     4    16    25    10    10     6     6     1     6    15     0

NEUTRAL      6 -12 CONC.=   35.   36.   52.   48.   55.   43.   46.   40.   34.   37.   36.   56.   59.   34.   36.   34.    0.
                  POP. =    24    17     6    16    11     4    12    33    68    43    10     7    11    13    19    24     0

NEUTRAL      > 12 CONC.=    25.   40.   40.   40.    0.   28.   31.   23.   39.   33.   10.   43.   61.   36.   30.   23.    0.
                  POP. =     4     1     1     3     0     5     5     6    20    21     1     4     4    12    25    15     0
--------------------------------------------------------------------------------------------------------------------------------

STABLE       <  2 CONC.=    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.   56.
                  POP. =     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0    34

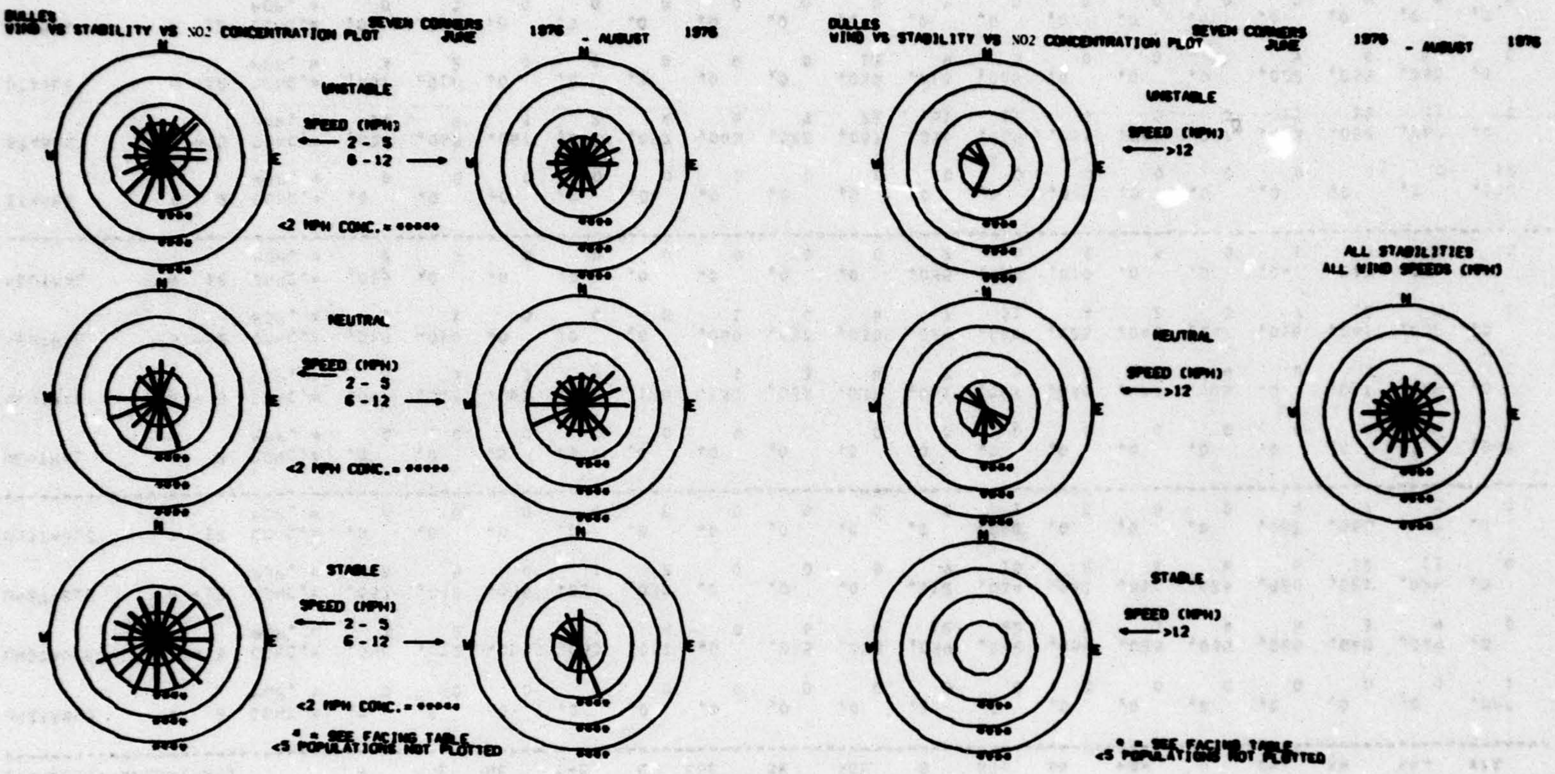
STABLE       2 - 5 CONC.=   53.   50.   59.   78.   60.   58.   69.   57.   62.   67.   60.   70.   49.   51.   43.   52. [illegible]
                  POP. =    46    14     5     5     7    12    23    65   114    35    28    17    10    16    18    52    11

STABLE       6 -12 CONC.=   41.   10.    0.    0.    0.   95.   71.   63.   42.   28.  150.   65.   20.   34.   28.   39.    0.
                  POP. =     5     2     0     0     0     1     4    20    43    13     1     1     1    10    15    13     0

STABLE       > 12 CONC.=    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.    0.
                  POP. =     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
--------------------------------------------------------------------------------------------------------------------------------

ALL          ALL       CONC.=   41.   39.   47.   50.   51.   46.   58.   51.   47.   46.   48.   52.   49.   37.   35.   37.   56.
                       POP. =  153    83    39    45    42    34    61   168   341   220    99    66    74    93   158   211    56
--------------------------------------------------------------------------------------------------------------------------------
$$$$$$$$$$          13 PLOTS PRODUCED  $$$$$$$$$$
END OF JOB
```

Figure D1.27


DULLES
WIND VS STABILITY VS NO2 CONCENTRATION PLOT
SEVEN CORNERS
JUNE
1976 - AUGUST 1976
UNSTABLE
SPEED (MPH)
2 - 5
6 - 12
<2 MPH CONC. = *****
NEUTRAL
SPEED (MPH)
2 - 5
6 - 12
<2 MPH CONC. = *****
STABLE
SPEED (MPH)
2 - 5
6 - 12
<2 MPH CONC. = *****
* = SEE FACING TABLE
<5 POPULATIONS NOT PLOTTED
N
E
W
DULLES
WIND VS STABILITY VS NO2 CONCENTRATION PLOT
SEVEN CORNERS
JUNE
1976 - AUGUST 1976
UNSTABLE
SPEED (MPH)
>12
NEUTRAL
SPEED (MPH)
>12
STABLE
SPEED (MPH)
>12
ALL STABILITIES
ALL WIND SPEEDS (MPH)
* = SEE FACING TABLE
<5 POPULATIONS NOT PLOTTED

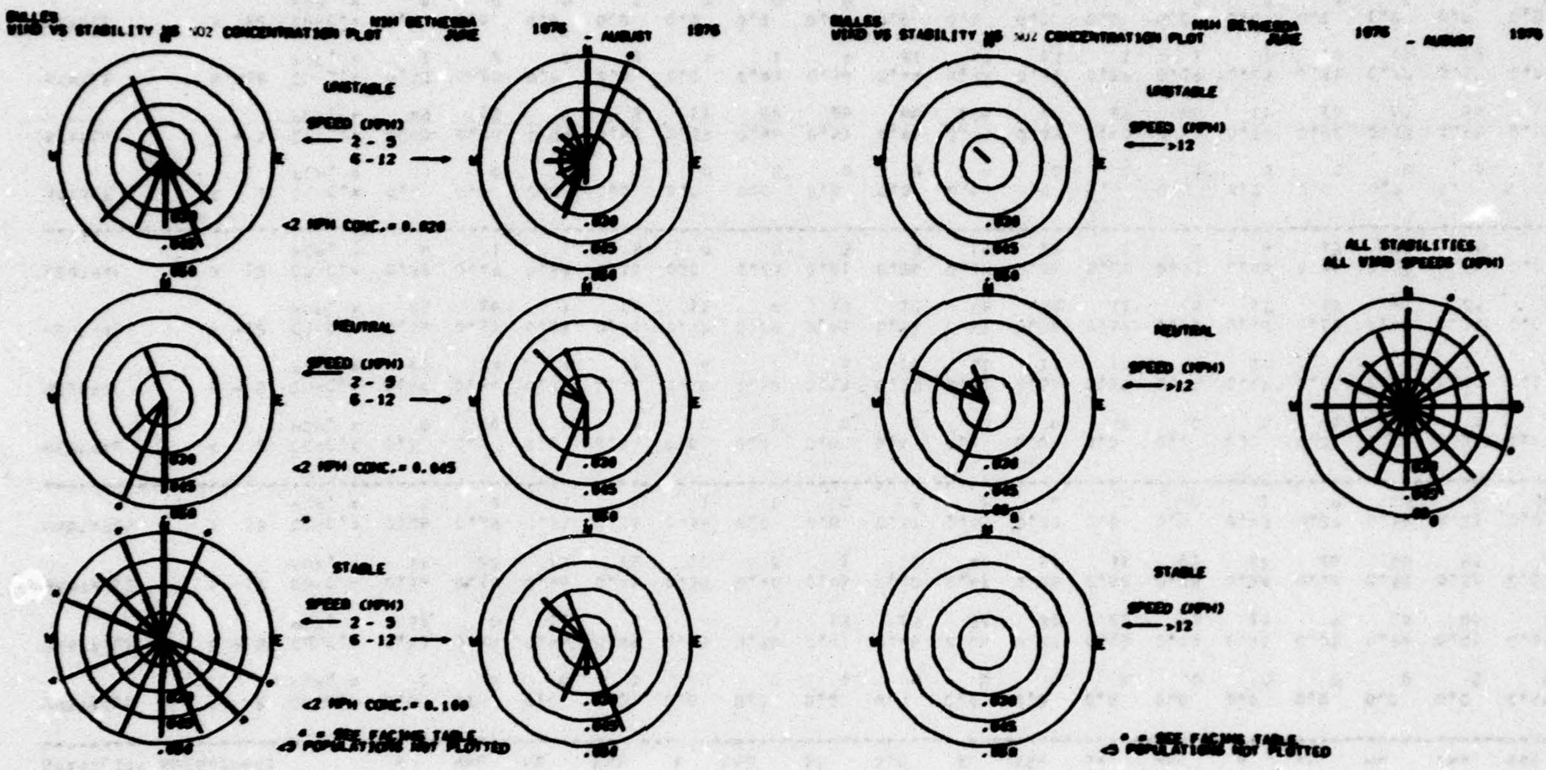
DULLES

Table D1.28 NIH BETHESDA NITROGEN DIOXIDE (PPM) NO2

JUNE 1976 - AUGUST 1976

STABILITY	SPEED(MPH)		N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VAR
UNSTABLE	< 2	CONC.=	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.020
		POP. =	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
UNSTABLE	2 - 5	CONC.=	.060	.070	.050	.080	.037	.0	.035	.053	.039	.042	.050	.023	.035	.026	.040	.049	.0
		POP. =	3	2	3	1	4	0	6	6	12	22	5	3	4	5	3	9	0
UNSTABLE	6 -12	CONC.=	.057	.092	.045	.050	.030	.0	.0	.0	.012	.034	.027	.017	.023	.020	.021	.026	.0
		POP. =	8	5	4	1	2	0	0	0	9	10	6	8	6	6	10	13	0
UNSTABLE	> 12	CONC.=	.0	.0	.0	.0	.0	.0	.0	.0	.0	.010	.0	.0	.0	.087	.011	.017	.0
		POP. =	0	0	0	0	0	0	0	0	0	1	0	0	0	4	7	3	0
NEUTRAL	< 2	CONC.=	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.065
		POP. =	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
NEUTRAL	2 - 5	CONC.=	.047	.043	.067	.030	.120	.130	.033	.037	.051	.067	.050	.072	.065	.0	.077	.029	.0
		POP. =	4	3	3	1	.	1	3	4	7	5	6	4	4	0	3	7	0
NEUTRAL	6 -12	CONC.=	.010	.010	.0	.0	.0	.060	.037	.030	.024	.040	.025	.040	.147	.016	.041	.032	.0
		POP. =	1	1	0	0	0	1	4	4	7	11	4	2	3	7	12	6	0
NEUTRAL	> 12	CONC.=	.015	.0	.0	.0	.0	.0	.0	.0	.035	.040	.010	.0	.0	.047	.017	.022	.0
		POP. =	2	0	0	0	0	0	0	0	2	8	1	0	0	6	7	8	0
STABLE	< 2	CONC.=	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.100
		POP. =	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12
STABLE	2 - 5	CONC.=	.059	.063	.067	.045	.097	.065	.082	.057	.056	.059	.051	.080	.027	.065	.052	.067	.0
		POP. =	19	9	3	2	4	6	9	22	51	17	9	5	3	11	11	31	0
STABLE	6 -12	CONC.=	.057	.010	.0	.0	.0	.0	.0	.055	.018	.036	.0	.0	.0	.022	.035	.030	.0
		POP. =	3	2	0	0	0	0	0	12	9	5	0	0	0	9	8	10	0
STABLE	> 12	CONC.=	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
		POP. =	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ALL	ALL	CONC.=	.054	.060	.056	.050	.065	.072	.055	.052	.043	.045	.037	.045	.055	.040	.034	.043	[illegible]
		POP. =	40	22	13	5	11	6	22	48	98	80	31	22	20	48	61	27	17

Figure D1.28


DULLES
WIND VS STABILITY VS SO2 CONCENTRATION PLOT
NIH BETHESDA
JUNE 1976 - AUGUST 1976
UNSTABLE
SPEED (MPH)
2 - 5
6 - 12
<2 MPH CONC.= 0.020
NEUTRAL
SPEED (MPH)
2 - 5
6 - 12
<2 MPH CONC.= 0.045
STABLE
SPEED (MPH)
2 - 5
6 - 12
<2 MPH CONC.= 0.100
* = SEE FACING TABLE
<5 POPULATIONS NOT PLOTTED
N
E
S
W
.030
.065
.080
DULLES
WIND VS STABILITY VS SO2 CONCENTRATION PLOT
NIH BETHESDA
JUNE 1976 - AUGUST 1976
UNSTABLE
SPEED (MPH)
>12
NEUTRAL
SPEED (MPH)
>12
STABLE
SPEED (MPH)
>12
ALL STABILITIES
ALL WIND SPEEDS (MPH)
* = SEE FACING TABLE
<5 POPULATIONS NOT PLOTTED

** .C#? WIND VS STABILITY VS CONCENTRATION PLOT VERSION 1.3 (770201) 5 [illegible] 1977 PAGE 2

DULLES

Table D1.29 SEVEN CORNERS HC-CH4 (UGM3) THR

JUNE 1976 - AUGUST 1976

STABILITY	SPEED(MPH)		N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VAR
UNSTABLE	< 2	CONC.=	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.66
		POP. =	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
UNSTABLE	2 - 5	CONC.=	0.42	0.44	0.46	0.49	0.43	0.50	0.47	0.46	0.36	0.37	0.45	0.40	0.41	0.39	0.48	0.41	0.66
		POP. =	32	10	12	3	8	3	13	13	32	37	21	15	15	9	14	28	3
UNSTABLE	6 -12	CONC.=	0.36	0.38	0.46	0.41	0.39	0.40	0.46	0.60	0.41	0.33	0.36	0.38	0.36	0.36	0.38	0.22	0.33
		POP. =	38	25	13	15	12	3	1	13	40	66	31	21	27	26	46	57	1
UNSTABLE	> 12	CONC.=	0.45	0.29	0.36	0.56	0.36	0.0	0.0	0.37	0.43	0.33	0.0	0.0	0.43	0.37	0.34	0.31	0.0
		POP. =	3	2	3	1	1	0	0	2	1	5	0	0	1	9	13	5	0
NEUTRAL	< 2	CONC.=	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.43
		POP. =	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
NEUTRAL	2 - 5	CONC.=	0.46	0.34	0.39	0.32	0.46	0.30	0.39	0.45	0.60	0.52	0.37	0.47	0.44	0.39	0.35	0.37	0.0
		POP. =	13	14	4	3	6	7	5	16	31	11	16	7	10	1	6	16	0
NEUTRAL	6 -12	CONC.=	0.56	0.38	0.47	0.49	0.42	0.29	0.41	0.51	0.57	0.35	0.37	0.40	0.42	0.35	0.39	0.34	0.0
		POP. =	24	18	7	16	11	4	10	12	45	42	11	8	11	13	22	25	0
NEUTRAL	> 12	CONC.=	0.32	0.49	0.39	0.34	0.0	0.25	0.21	0.26	0.32	0.36	0.45	0.32	0.49	0.36	0.32	0.26	0.0
		POP. =	4	1	1	3	0	5	5	3	19	21	1	4	4	13	27	16	0
STABLE	< 2	CONC.=	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	[illegible]
		POP. =	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40
STABLE	2 - 5	CONC.=	0.40	0.43	0.44	0.55	0.39	0.46	0.57	0.46	0.46	0.49	0.45	0.32	0.36	0.42	0.53	[illegible]	0.45
		POP. =	49	18	5	5	11	12	26	66	125	47	29	20	11	16	15	55	11
STABLE	6 -12	CONC.=	0.33	0.20	0.0	0.0	0.0	0.43	0.36	0.44	0.43	0.31	0.79	0.39	0.23	0.31	0.50	[illegible]	0.0
		POP. =	7	2	0	0	0	1	4	21	37	15	1	1	1	10	15	13	0
STABLE	> 12	CONC.=	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		POP. =	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ALL	ALL	CONC.=	0.39	0.38	0.45	0.42	0.41	0.37	0.47	0.45	0.41	0.41	0.41	0.42	0.40	0.37	0.36	0.35	0.67
		POP. =	167	92	45	46	49	35	63	146	351	244	104	76	63	99	176	218	67

Figure D1.30 Diurnal Analysis Program

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DULLES

DIURNAL AVERAGE FOR  JUNE 1976  - SEPTEMBER  1976  DIURNAL AVERAGE FOR  JANUARY 1976  - DECEMBER 1976
WIND SPEED-MILES                ( MPH  )           WIND SPEED-MILES           ( MPH  )STABILITY
*************************************************  ****************************     ****************************
IHOURISTERLING PARK          ISOUTH RAMP         I IHOURIDULLES AIRPORT        I     IHOURIDULLES AIRPORT        I
I    I         01            I         01        I I    I         01           I     I    I          1A          I
*************************************************  ****************************     ****************************
I    I                       I                   I I    I                      I     I    I                      I
I 01 I          3.637        I          4.830    I I 01 I          99.900      I     I 01 I          999.000     I
I    I                       I                   I I    I                      I     I    I                      I
I 02 I          3.605        I          4.561    I I 02 I           6.205      I     I 02 I            5.366     I
I    I                       I                   I I    I                      I     I    I                      I
I 03 I          3.608        I          4.374    I I 03 I          99.900      I     I 03 I          999.000     I
I    I                       I                   I I    I                      I     I    I                      I
I 04 I          3.600        I          4.187    I I 04 I          99.900      I     I 04 I          999.000     I
I    I                       I                   I I    I                      I     I    I                      I
I 05 I          3.337        I          4.065    I I 05 I           6.100      I     I 05 I            5.421     I
I    I                       I                   I I    I                      I     I    I                      I
I 06 I          3.136        I          4.196    I I 06 I          99.900      I     I 06 I          999.000     I
I    I                       I                   I I    I                      I     I    I                      I
I 07 I          3.563        I          4.692    I I 07 I          99.900      I     I 07 I          999.000     I
I    I                       I                   I I    I                      I     I    I                      I
I 08 I          4.573        I          6.065    I I 08 I           6.425      I     I 08 I            3.475     I
I    I                       I                   I I    I                      I     I    I                      I
I 09 I          5.817        I          7.505    I I 09 I          99.900      I     I 09 I          999.000     I
I    I                       I                   I I    I                      I     I    I                      I
I 10 I          6.531        I          8.252    I I 10 I          99.900      I     I 10 I          999.000     I
I    I                       I                   I I    I                      I     I    I                      I
I 11 I          6.802        I          8.670    I I 11 I          10.289      I     I 11 I            3.180     I
I    I                       I                   I I    I                      I     I    I                      I
I 12 I          7.049        I          8.924    I I 12 I          99.900      I     I 12 I          999.000     I
I    I                       I                   I I    I                      I     I    I                      I
I 13 I          7.450        I          9.238    I I 13 I          99.900      I     I 13 I          999.000     I
I    I                       I                   I I    I                      I     I    I                      I
I 14 I          7.667        I          9.462    I I 14 I          11.483      I     I 14 I            3.292     I
I    I                       I                   I I    I                      I     I    I                      I
I 15 I          7.506        I          9.453    I I 15 I          99.900      I     I 15 I          999.000     I
I    I                       I                   I I    I                      I     I    I                      I
I 16 I          7.525        I          9.632    I I 16 I          99.900      I     I 16 I          999.000     I
I    I                       I                   I I    I                      I     I    I                      I
I 17 I          7.100        I          9.311    I I 17 I          10.779      I     I 17 I            3.713     I
I    I                       I                   I I    I                      I     I    I                      I
I 18 I          6.605        I          8.132    I I 18 I          99.900      I     I 18 I          999.000     I
I    I                       I                   I I    I                      I     I    I                      I
I 19 I          5.272        I          6.868    I I 19 I          99.900      I     I 19 I          [illegible].000     I
I    I                       I                   I I    I                      I     I    I                      I
I 20 I          4.593        I          5.736    I I 20 I           7.777      I     I 20 I            5.098     I
I    I                       I                   I I    I                      I     I    I                      I
I 21 I          4.500        I          5.462    I I 21 I          99.900      I     I 21 I          999.000     I
I    I                       I                   I I    I                      I     I    I                      I
I 22 I          4.173        I          5.132    I I 22 I          99.900      I     I 22 I          999.000     I
I    I                       I                   I I    I                      I     I    I                      I
I 23 I          3.950        I          4.953    I I 23 I           6.690      I     I 23 I            5.333     I
I    I                       I                   I I    I                      I     I    I                      I
I 24 I          3.593        I          4.491    I I 24 I          99.900      I     I 24 I          999.000     I
I    I                       I                   I I    I                      I     I    I                      I
*************************************************  ****************************     ****************************
```

Figure D1.31 Diurnal Analysis Program

```
*************************************************************************
DULLES

DIURNAL AVERAGE FOR  MAY               1976  - SEPTEMBER        1976
OZONE                               ( UGM3 )                      03
*************************************************
IHOURILEWINSVILLE           ISEVEN CORNERS       I
I    I       36             I       36           I
*************************************************
I    I                      I                    I
I 01 I        33.709        I        47.327      I
I    I                      I                    I
I 02 I        37.387        I        49.173      I
I    I                      I                    I
I 03 I        36.673        I        51.687      I
I    I                      I                    I
I 04 I        36.340        I        53.960      I
I    I                      I                    I
I 05 I        31.993        I        50.287      I
I    I                      I                    I
I 06 I        19.713        I        36.493      I
I    I                      I                    I
I 07 I        15.967        I        31.833      I
I    I                      I                    I
I 08 I        25.440        I        40.507      I
I    I                      I                    I
I 09 I        45.740        I        64.354      I
I    I                      I                    I
I 10 I        66.646        I        87.163      I
I    I                      I                    I
I 11 I        85.806        I       108.500      I
I    I                      I                    I
I 12 I       101.373        I       125.938      I
I    I                      I                    I
I 13 I       108.181        I       135.673      I
I    I                      I                    I
I 14 I       113.816        I       141.561      I
I    I                      I                    I
I 15 I       112.888        I       139.232      I
I    I                      I                    I
I 16 I       107.721        I       134.185      I
I    I                      I                    I
I 17 I        97.351        I       123.263      I
I    I                      I                    I
I 18 I        77.819        I       105.099      I
I    I                      I                    I
I 19 I        50.147        I        81.007      I
I    I                      I                    I
I 20 I        31.409        I        60.184      I
I    I                      I                    I
I 21 I        25.993        I        44.638      I
I    I                      I                    I
I 22 I        25.762        I        40.362      I
I    I                      I                    I
I 23 I        24.741        I        39.612      I
I    I                      I                    I
I 24 I        26.336        I        42.618      I
I    I                      I                    I
*************************************************
```

```
*************************************************************************
DULLES

DIURNAL AVERAGE FOR  JUNE              1976  - SEPTEMBER        1976
OZONE                               ( PPM  )                      03
*************************************************
IHOURISTERLING PARK         ISOUTH RAMP          I
I    I       36             I       38           I
*************************************************
I    I                      I                    I
I 01 I        0.027         I        0.018       I
I    I                      I                    I
I 02 I        0.025         I        0.018       I
I    I                      I                    I
I 03 I        0.025         I        0.017       I
I    I                      I                    I
I 04 I        0.024         I        0.017       I
I    I                      I                    I
I 05 I        0.021         I        0.016       I
I    I                      I                    I
I 06 I        0.017         I        0.015       I
I    I                      I                    I
I 07 I        0.018         I        0.015       I
I    I                      I                    I
I 08 I        0.023         I        0.022       I
I    I                      I                    I
I 09 I        0.033         I        0.031       I
I    I                      I                    I
I 10 I        0.044         I        0.039       I
I    I                      I                    I
I 11 I        0.053         I        0.046       I
I    I                      I                    I
I 12 I        0.058         I        0.030       I
I    I                      I                    I
I 13 I        0.064         I        0.052       I
I    I                      I                    I
I 14 I        0.065         I        0.053       I
I    I                      I                    I
I 15 I        0.067         I        0.055       I
I    I                      I                    I
I 16 I        0.066         I        0.054       I
I    I                      I                    I
I 17 I        0.063         I        0.050       I
I    I                      I                    I
I 18 I        0.059         I        0.049       I
I    I                      I                    I
I 19 I        0.051         I        0.042       I
I    I                      I                    I
I 20 I        0.041         I        0.033       I
I    I                      I                    I
I 21 I        0.035         I        0.026       I
I    I                      I                    I
I 22 I        0.032         I        0.023       I
I    I                      I                    I
I 23 I        0.030         I        0.021       I
I    I                      I                    I
I 24 I        0.028         I        0.019       I
I    I                      I                    I
*************************************************
```

Table D1.32 Diurnal Analysis Program

DULLES

DIURNAL AVERAGE FOR MAY 1976 - SEPTEMBER 1976
CARBON MONOXIDE CO

HOUR	NIH BETHESDA (ppm)	LEWINSVILLE mg/m³	SEVEN CORNERS mg/m³
01	2.853	0.790	1.423
02	3.204	0.591	1.306
03	3.045	0.484	1.183
04	2.828	0.416	1.076
05	1.833	0.462	1.161
06	1.297	0.827	1.426
07	1.636	1.232	1.678
08	1.900	1.057	1.708
09	1.806	0.691	1.588
10	1.465	0.521	1.463
11	2.238	0.486	1.422
12	2.613	0.449	1.414
13	2.742	0.404	1.404
14	2.500	0.489	1.381
15	2.705	0.504	1.395
16	2.725	0.691	1.435
17	2.928	0.729	1.531
18	1.875	0.830	1.573
19	1.833	0.970	1.676
20	2.026	1.303	1.869
21	2.096	1.568	1.979
22	2.493	1.530	1.882
23	2.523	1.404	1.697
24	2.625	1.157	1.577

DULLES

DIURNAL AVERAGE FOR JUNE 1976 - SEPTEMBER 1976
CARBON MONOXIDE (PPM) CO

HOUR	STERLING PARK 30	SOUTH RAMP 30
01	1.503	1.342
02	1.259	1.262
03	1.266	1.257
04	1.321	1.274
05	1.455	1.261
06	1.851	1.275
07	1.824	1.294
08	1.513	1.274
09	1.378	1.230
10	1.321	1.245
11	1.242	1.298
12	1.187	1.308
13	1.129	1.260
14	1.108	1.254
15	1.121	1.271
16	1.156	1.258
17	1.223	1.295
18	1.267	1.292
19	1.393	1.309
20	1.509	1.347
21	1.656	1.501
22	1.624	1.346
23	1.554	1.390
24	1.478	1.344

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Table D1.33 Diurnal Analysis Program

DULLES

DIURNAL AVERAGE FOR MAY 1976 - SEPTEMBER 1976
NITRIC OXIDE (MGM3) NO

HOUR	NW BETHESDA SP	MASSEY SP	LEWINSVILLE SP	SEVEN CORNERS SP
01	0.104	999.000	30.717	29.930
02	0.030	999.000	28.553	25.034
03	0.030	999.000	21.349	18.097
04	0.042	999.000	13.882	16.131
05	0.017	999.000	13.987	18.579
06	0.026	999.000	29.770	34.261
07	0.023	999.000	55.395	49.972
08	0.037	999.000	46.023	67.950
09	0.035	999.000	24.040	34.000
10	0.025	999.000	13.980	26.043
11	0.033	999.000	10.304	21.972
12	0.026	999.000	8.435	20.100
13	0.031	999.000	7.740	18.075
14	0.037	999.000	7.403	19.043
15	0.007	999.000	7.828	19.139
16	0.070	999.000	9.392	20.722
17	0.072	999.000	10.600	23.264
18	0.025	999.000	11.812	24.259
19	0.021	999.000	20.671	30.729
20	0.020	999.000	42.100	39.826
21	0.037	999.000	62.853	48.931
22	0.026	999.000	74.267	40.972
23	0.027	999.000	50.890	45.020
24	0.032	999.000	50.867	34.252

DULLES

DIURNAL AVERAGE FOR JUNE 1976 - SEPTEMBER 1976

HOUR	SOUTH RAMP Nitric Oxide (ppm)	STERLING PARK Nitric Oxide (ppm)
01	0.006	0.005
02	0.005	0.005
03	0.005	0.006
04	0.004	0.004
05	0.004	0.006
06	0.005	0.011
07	0.009	0.011
08	0.007	0.008
09	0.006	0.007
10	0.005	0.006
11	0.005	0.006
12	0.005	0.006
13	0.006	0.005
14	0.004	0.005
15	0.004	0.005
16	0.004	0.006
17	0.005	0.006
18	0.004	0.004
19	0.004	0.007
20	0.005	0.007
21	0.005	0.007
22	0.006	0.007
23	0.008	0.006
24	0.007	0.005

Table D1.34 Diurnal Analysis Program

DULLES

DIURNAL AVERAGE FOR MAY 1976 - SEPTEMBER 1976
NITROGEN DIOXIDE (UG-3) NO2

HOUR	NIH BETHESDA SC	MASSEY SC	LEWINSVILLE SC	SEVEN CORNERS SC
01	0.051	33.963	62.533	44.936
02	0.043	29.037	52.252	41.319
03	0.036	25.667	45.625	37.702
04	0.031	28.108	42.270	32.773
05	0.027	23.993	40.230	31.830
06	0.034	31.493	50.624	33.426
07	0.035	40.597	61.324	34.879
08	0.049	40.954	61.842	37.199
09	0.046	34.109	55.364	56.995
10	0.035	30.214	46.711	35.153
11	0.032	28.643	41.608	33.411
12	0.040	26.590	40.574	32.179
13	0.032	25.602	40.485	31.781
14	0.049	25.076	41.844	31.800
15	0.038	25.265	44.897	33.582
16	0.050	28.259	52.168	38.500
17	0.049	30.187	59.768	42.111
18	0.042	37.630	70.960	50.196
19	0.058	52.704	85.067	57.403
20	0.064	66.148	98.400	64.125
21	0.080	69.185	100.541	64.778
22	0.066	62.667	93.265	62.167
23	0.062	52.778	85.548	56.729
24	0.058	43.259	73.920	54.204

DULLES

DIURNAL AVERAGE FOR JUNE 1976 - SEPTEMBER 1976

HOUR	Nitrogen Dioxide SOUTH RAMP (ppm)	Nitrogen Dioxide STERLING PARK (ppm)
01	0.015	0.016
02	0.013	0.014
03	0.012	0.013
04	0.010	0.012
05	0.010	0.013
06	0.011	0.017
07	0.013	0.018
08	0.011	0.015
09	0.011	0.014
10	0.010	0.012
11	0.010	0.012
12	0.009	0.011
13	0.008	0.011
14	0.009	0.011
15	0.010	0.011
16	0.010	0.012
17	0.012	0.013
18	0.013	0.014
19	0.014	0.017
20	0.018	0.019
21	0.021	0.019
22	0.020	0.019
23	0.019	0.018
24	0.018	0.017

Figure D1.35   Diurnal Analysis Program

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**************************************************************************************************************
DULLES

DIURNAL AVERAGE FOR  JUNE           1976  - SEPTEMBER      1976
TOTAL HYDROCARBONS                 ( PPM  )                  THC
***********************************************
IHOURISTERLING PARK       ISOUTH RAMP           I
I    I        SL          I         SL          I
***********************************************
I    I                    I                     I
I 01 I        1.701       I        2.084        I
I    I                    I                     I
I 02 I        1.687       I        2.081        I
I    I                    I                     I
I 03 I        1.660       I        2.075        I
I    I                    I                     I
I 04 I        1.667       I        2.096        I
I    I                    I                     I
I 05 I        1.691       I        2.121        I
I    I                    I                     I
I 06 I        1.742       I        2.152        I
I    I                    I                     I
I 07 I        1.752       I        2.199        I
I    I                    I                     I
I 08 I        1.740       I        2.124        I
I    I                    I                     I
I 09 I        1.712       I        2.120        I
I    I                    I                     I
I 10 I        1.692       I        2.084        I
I    I                    I                     I
I 11 I        1.667       I        2.054        I
I    I                    I                     I
I 12 I        1.649       I        2.043        I
I    I                    I                     I
I 13 I        1.646       I        2.015        I
I    I                    I                     I
I 14 I        1.635       I        2.012        I
I    I                    I                     I
I 15 I        1.650       I        2.018        I
I    I                    I                     I
I 16 I        1.633       I        2.016        I
I    I                    I                     I
I 17 I        1.639       I        2.039        I
I    I                    I                     I
I 18 I        1.653       I        2.021        I
I    I                    I                     I
I 19 I        1.665       I        2.022        I
I    I                    I                     I
I 20 I        1.683       I        2.076        I
I    I                    I                     I
I 21 I        1.733       I        2.112        I
I    I                    I                     I
I 22 I        1.743       I        2.111        I
I    I                    I                     I
I 23 I        1.715       I        2.118        I
I    I                    I                     I
I 24 I        1.706       I        2.105        I
I    I                    I                     I
***********************************************
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Table D1.36a Data Reduction Program

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*****************************************************************************************************************************
                                                        DULLES AIRPORT
 DULLES AIRPORT                                 AIRCRAFT ACTIVITIES DATA      ( TACH )                 DATA FOR JUNE      1976
                                                          HOURS  (LST)
HR-BEG 00  01  02  03  04  05  06  07  08  09  10  11  12  13  14  15  16  17  18  19  20  21  22  23
HR-END 01  02  03  04  05  06  07  08  09  10  11  12  13  14  15  16  17  18  19  20  21  22  23  24
DAY                                                                                                   AVG
  1    0.  0.  0.  1.  0.  2. 23. 24. 32. 35. 43. 46. 26. 20. 30. 24. 43. 30. 37. 36. 53.  0.  9.  7.  22.
  2    6.  0.  0.  1.  0.  2. 23. 24. 32. 35. 43. 46. 26. 20. 30. 24. 43. 30. 37. 36. 53.  0.  9.  7.  22.
  3    6.  0.  0.  1.  0.  2. 23. 24. 32. 35. 43. 46. 26. 20. 30. 24. 43. 30. 37. 36. 53.  0.  9.  7.  22.
  4    6.  0.  0.  1.  0.  2. 23. 24. 32. 35. 43. 46. 26. 20. 30. 24. 43. 30. 37. 36. 53.  0.  9.  7.  22.
  5    4.  3.  1.  1.  0.  1.  5.  8. 19. 20. 28. 27. 21. 19. 18. 21. 30. 31. 23. 15. 16. 15. 11.  8.  14.
  6    4.  3.  1.  1.  0.  1.  5.  8. 19. 20. 28. 27. 21. 19. 18. 21. 30. 31. 23. 15. 16. 15. 11.  8.  14.
  7    6.  0.  0.  1.  0.  2. 23. 24. 32. 35. 43. 46. 26. 20. 30. 24. 43. 30. 37. 36. 53.  0.  9.  7.  22.
  8    6.  0.  0.  1.  0.  2. 23. 24. 32. 35. 43. 46. 26. 20. 30. 24. 43. 30. 37. 36. 53.  0.  9.  7.  22.
  9    6.  0.  0.  1.  0.  2. 23. 24. 32. 35. 43. 46. 26. 20. 30. 24. 43. 30. 37. 36. 53.  0.  9.  7.  22.
 10    6.  0.  0.  1.  0.  2. 23. 24. 32. 35. 43. 46. 26. 20. 30. 24. 43. 30. 37. 36. 53.  0.  9.  7.  22.
 11    6.  0.  0.  1.  0.  2. 23. 24. 32. 35. 43. 46. 26. 20. 30. 24. 43. 30. 37. 36. 53.  0.  9.  7.  22.
 12    4.  3.  1.  1.  0.  1.  5.  8. 19. 20. 28. 27. 21. 19. 18. 21. 30. 31. 23. 15. 16. 15. 11.  8.  14.
 13    4.  3.  1.  1.  0.  1.  5.  8. 19. 20. 28. 27. 21. 19. 18. 21. 30. 31. 23. 15. 16. 15. 11.  8.  14.
 14    6.  0.  0.  1.  0.  2. 23. 24. 32. 35. 43. 46. 26. 20. 30. 24. 43. 30. 37. 36. 53.  0.  9.  7.  22.
 15    6.  0.  0.  1.  0.  2. 23. 24. 32. 35. 43. 46. 26. 20. 30. 24. 43. 30. 37. 36. 53.  0.  9.  7.  22.
 16    6.  0.  0.  1.  0.  2. 23. 24. 32. 35. 43. 46. 26. 20. 30. 24. 43. 30. 37. 36. 53.  0.  9.  7.  22.
 17    6.  0.  0.  1.  0.  2. 23. 24. 32. 35. 43. 46. 26. 20. 30. 24. 43. 30. 37. 36. 53.  0.  9.  7.  22.
 18    6.  0.  0.  1.  0.  2. 23. 24. 32. 35. 43. 46. 26. 20. 30. 24. 43. 30. 37. 36. 53.  0.  9.  7.  22.
 19    4.  3.  1.  1.  0.  1.  5.  8. 19. 20. 28. 27. 21. 19. 18. 21. 30. 31. 23. 15. 16. 15. 11.  8.  14.
 20    4.  3.  1.  1.  0.  1.  5.  8. 19. 20. 28. 27. 21. 19. 18. 21. 30. 31. 23. 15. 16. 15. 11.  8.  14.
 21    6.  0.  0.  1.  0.  2. 23. 24. 32. 35. 43. 46. 26. 20. 30. 24. 43. 30. 37. 36. 53.  0.  9.  7.  22.
 22    6.  0.  0.  1.  0.  2. 23. 24. 32. 35. 43. 46. 26. 20. 30. 24. 43. 30. 37. 36. 53.  0.  9.  7.  22.
 23    6.  0.  0.  1.  0.  2. 23. 24. 32. 35. 43. 46. 26. 20. 30. 24. 43. 30. 37. 36. 53.  0.  9.  7.  22.
 24    6.  0.  0.  1.  0.  2. 23. 24. 32. 35. 43. 46. 26. 20. 30. 24. 43. 30. 37. 36. 53.  0.  9.  7.  22.
 25    6.  0.  0.  1.  0.  2. 23. 24. 32. 35. 43. 46. 26. 20. 30. 24. 43. 30. 37. 36. 53.  0.  9.  7.  22.
 26    4.  3.  1.  1.  0.  1.  5.  8. 19. 20. 28. 27. 21. 19. 18. 21. 30. 31. 23. 15. 16. 15. 11.  8.  14.
 27    4.  3.  1.  1.  0.  1.  5.  8. 19. 20. 28. 27. 21. 19. 18. 21. 30. 31. 23. 15. 16. 15. 11.  8.  14.
 28    6.  0.  0.  1.  0.  2. 23. 24. 32. 35. 43. 46. 26. 20. 30. 24. 43. 30. 37. 36. 53.  0.  9.  7.  22.
 29    6.  0.  0.  1.  0.  2. 23. 24. 32. 35. 43. 46. 26. 20. 30. 24. 43. 30. 37. 36. 53.  0.  9.  7.  22.
 30    6.  0.  0.  1.  0.  2. 23. 24. 32. 35. 43. 46. 26. 20. 30. 24. 43. 30. 37. 36. 53.  0.  9.  7.  22.

AVG    5.  1.  0.  1.  0.  2. 18. 20. 29. 31. 39. 41. 25. 20. 27. 23. 40. 30. 33. 30. 43.  4. 10.  7.  20.
DAYS  30  30  30  30  30  30  30  30  30  30  30  30  30  30  30  30  30  30  30  30  30  30  30  30  720

TOTAL HOURS =   720    NUMBER OF GOOD HOURS =   720   NUMBER OF MISSING HOURS =     0   DATA CAPTURE =  100.00  ( PERCENT  )
ABOVE THREE RUNS ARE TOTAL WEIGHTED HOURLY AVERAGES,NUMBER OF AVERAGES/MONTH FOR INDICATED HOUR, AND DATA CAPTURE STATISTICS
TOTAL AVERAGE =1195.667          MAXIMUM HOURLY VALUE =    53.000   STANDARD DEVIATION =     15.5347

NOTE :  999 = MISSING VALUE INDICATOR
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Table D1.36b Data Reduction Program

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*****************************************************************************************************************************
                                                      DULLES AIRPORT
 DULLES AIRPORT                          AIRCRAFT ACTIVITIES DATA        ( TACH )                         DATA FOR JULY        1976

                                                       HOURS   (LST)
HR-BEG 00   01   02   03   04   05   06   07   08   09   10   11   12   13   14   15   16   17   18   19   20   21   22   23
HR-END 01   02   03   04   05   06   07   08   09   10   11   12   13   14   15   16   17   18   19   20   21   22   23   24
DAY                                                                                                                          AVG
   1   6.   0.   0.   1.   0.   2.  23.  24.  32.  35.  43.  46.  26.  20.  30.  24.  43.  30.  37.  36.  53.   0.   9.   7.  22.
   2   6.   0.   0.   1.   0.   2.  23.  24.  32.  35.  43.  46.  26.  20.  30.  24.  43.  30.  37.  36.  53.   0.   9.   7.  22.
   3   4.   3.   1.   1.   0.   1.   5.   8.  19.  20.  28.  27.  21.  19.  18.  21.  30.  31.  23.  15.  16.  15.  11.   8.  14.
   4   4.   3.   1.   1.   0.   1.   5.   8.  19.  20.  28.  27.  21.  19.  18.  21.  30.  31.  23.  15.  16.  15.  11.   8.  14.
   5   6.   0.   0.   1.   0.   2.  23.  24.  32.  35.  43.  46.  26.  20.  30.  24.  43.  30.  37.  36.  53.   0.   9.   7.  22.
   6   6.   0.   0.   1.   0.   2.  23.  24.  32.  35.  43.  46.  26.  20.  30.  24.  43.  30.  37.  36.  53.   0.   9.   7.  22.
   7   6.   0.   0.   1.   0.   2.  23.  24.  32.  35.  43.  46.  26.  20.  30.  24.  43.  30.  37.  36.  53.   0.   9.   7.  22.
   8   6.   0.   0.   1.   0.   2.  23.  24.  32.  35.  43.  46.  26.  20.  30.  24.  43.  30.  37.  36.  53.   0.   9.   7.  22.
   9   6.   0.   0.   1.   0.   2.  23.  24.  32.  35.  43.  46.  26.  20.  30.  24.  43.  30.  37.  36.  53.   0.   9.   7.  22.
  10   4.   3.   1.   1.   0.   1.   5.   8.  19.  20.  28.  27.  21.  19.  18.  21.  30.  31.  23.  15.  16.  15.  11.   8.  14.
  11   4.   3.   1.   1.   0.   1.   5.   8.  19.  20.  28.  27.  21.  19.  18.  21.  30.  31.  23.  15.  16.  15.  11.   8.  14.
  12   6.   0.   0.   1.   0.   2.  23.  24.  32.  35.  43.  46.  26.  20.  30.  24.  43.  30.  37.  36.  53.   0.   9.   7.  22.
  13   6.   0.   0.   1.   0.   2.  23.  24.  32.  35.  43.  46.  26.  20.  30.  24.  43.  30.  37.  36.  53.   0.   9.   7.  22.
  14   6.   0.   0.   1.   0.   2.  23.  24.  32.  35.  43.  46.  26.  20.  30.  24.  43.  30.  37.  36.  53.   0.   9.   7.  22.
  15   6.   0.   0.   1.   0.   2.  23.  24.  32.  35.  43.  46.  26.  20.  30.  24.  43.  30.  37.  36.  53.   0.   9.   7.  22.
  16   6.   0.   0.   1.   0.   2.  23.  24.  32.  35.  43.  46.  26.  20.  30.  24.  43.  30.  37.  36.  53.   0.   9.   7.  22.
  17   4.   3.   1.   1.   0.   1.   5.   8.  19.  20.  28.  27.  21.  19.  18.  21.  30.  31.  23.  15.  16.  15.  11.   8.  14.
  18   4.   3.   1.   1.   0.   1.   5.   8.  19.  20.  28.  27.  21.  19.  18.  21.  30.  31.  23.  15.  16.  15.  11.   8.  14.
  19   6.   0.   0.   1.   0.   2.  23.  24.  32.  35.  43.  46.  26.  20.  30.  24.  43.  30.  37.  36.  53.   0.   9.   7.  22.
  20   6.   0.   0.   1.   0.   2.  23.  24.  32.  35.  43.  46.  26.  20.  30.  24.  43.  30.  37.  36.  53.   0.   9.   7.  22.
  21   6.   0.   0.   1.   0.   2.  23.  24.  32.  35.  43.  46.  26.  20.  30.  24.  43.  30.  37.  36.  53.   0.   9.   7.  22.
  22   6.   0.   0.   1.   0.   2.  23.  24.  32.  35.  43.  46.  26.  20.  30.  24.  43.  30.  37.  36.  53.   0.   9.   7.  22.
  23   6.   0.   0.   1.   0.   2.  23.  24.  32.  35.  43.  46.  26.  20.  30.  24.  43.  30.  37.  36.  53.   0.   9.   7.  22.
  24   4.   3.   1.   1.   0.   1.   5.   8.  19.  20.  28.  27.  21.  19.  18.  21.  30.  31.  23.  15.  16.  15.  11.   8.  14.
  25   4.   3.   1.   1.   0.   1.   5.   8.  19.  20.  28.  27.  21.  19.  18.  21.  30.  31.  23.  15.  16.  15.  11.   8.  14.
  26   6.   0.   0.   1.   0.   2.  23.  24.  32.  35.  43.  46.  26.  20.  30.  24.  43.  30.  37.  36.  53.   0.   9.   7.  22.
  27   6.   0.   0.   1.   0.   2.  23.  24.  32.  35.  43.  46.  26.  20.  30.  24.  43.  30.  37.  36.  53.   0.   9.   7.  22.
  28   6.   0.   0.   1.   0.   2.  23.  24.  32.  35.  43.  46.  26.  20.  30.  24.  43.  30.  37.  36.  53.   0.   9.   7.  22.
  29   6.   0.   0.   1.   0.   2.  23.  24.  32.  35.  43.  46.  26.  20.  30.  24.  43.  30.  37.  36.  53.   0.   9.   7.  22.
  30   6.   0.   0.   1.   0.   2.  23.  24.  32.  35.  43.  46.  26.  20.  30.  24.  43.  30.  37.  36.  53.   0.   9.   7.  22.
  31   4.   3.   1.   1.   0.   1.   5.   8.  19.  20.  28.  27.  21.  19.  18.  21.  30.  31.  23.  15.  16.  15.  11.   8.  14.

AVG    5.   1.   0.   1.   0.   2.  18.  19.  28.  31.  39.  40.  25.  20.  27.  23.  39.  30.  33.  30.  42.   4.  10.   7.  20.
DAYS   31   31   31   31   31   31   31   31   31   31   31   31   31   31   31   31   31   31   31   31   31   31   31   31  744

TOTAL HOURS =    744   NUMBER OF GOOD HOURS =    744   NUMBER OF MISSING HOURS =     0   DATA CAPTURE =  100,00  (  PERCENT  )
ABOVE THREE ROWS ARE TOTAL WEIGHTED HOURLY AVERAGES,NUMBER OF AVERAGES/MONTH FOR INDICATED HOUR, AND DATA CAPTURE STATISTICS
TOTAL AVERAGE =1185,403        MAXIMUM HOURLY VALUE =   53,000   STANDARD DEVIATION =     15,4046

NOTE :  999 = MISSING VALUE INDICATOR
```

Table D1.36c   Data Reduction Program

```
**************************************************************************************************************************
                                                      DULLES AIRPORT
DULLES AIRPORT                              AIRCRAFT ACTIVITIES DATA         ( TACH )                     DATA FOR AUGUST      1976

                                                      HOURS  (LST)
HR-BEG 00   01   02   03   04   05   06   07   08   09   10   11   12   13   14   15   16   17   18   19   20   21   22   23
HR-END 01   02   03   04   05   06   07   08   09   10   11   12   13   14   15   16   17   18   19   20   21   22   23   24
DAY                                                                                                                          AVG
   1   4.   3.   1.   1.   0.   1.   5.   8.  19.  20.  28.  27.  21.  19.  18.  21.  30.  31.  23.  15.  16.  15.  11.   8.  14.
   2   6.   0.   0.   1.   0.   2.  23.  24.  32.  35.  43.  46.  26.  20.  30.  24.  43.  30.  37.  36.  53.   0.   9.   7.  22.
   3   6.   0.   0.   1.   0.   2.  23.  24.  32.  35.  43.  46.  26.  20.  30.  24.  43.  30.  37.  36.  53.   0.   9.   7.  22.
   4   6.   0.   0.   1.   0.   2.  23.  24.  32.  35.  43.  46.  26.  20.  30.  24.  43.  30.  37.  36.  53.   0.   9.   7.  22.
   5   6.   0.   0.   1.   0.   2.  23.  24.  32.  35.  43.  46.  26.  20.  30.  24.  43.  30.  37.  36.  53.   0.   9.   7.  22.
   6   6.   0.   0.   1.   0.   2.  23.  24.  32.  35.  43.  46.  26.  20.  30.  24.  43.  30.  37.  36.  53.   0.   9.   7.  22.
   7   4.   3.   1.   1.   0.   1.   5.   8.  19.  20.  28.  27.  21.  19.  18.  21.  30.  31.  23.  15.  16.  15.  11.   8.  14.
   8   4.   3.   1.   1.   0.   1.   5.   8.  19.  20.  28.  27.  21.  19.  18.  21.  30.  31.  23.  15.  16.  15.  11.   8.  14.
   9   6.   0.   0.   1.   0.   2.  23.  24.  32.  35.  43.  46.  26.  20.  30.  24.  43.  30.  37.  36.  53.   0.   9.   7.  22.
  10   6.   0.   0.   1.   0.   2.  23.  24.  32.  35.  43.  46.  26.  20.  30.  24.  43.  30.  37.  36.  53.   0.   9.   7.  22.
  11   6.   0.   0.   1.   0.   2.  23.  24.  32.  35.  43.  46.  26.  20.  30.  24.  43.  30.  37.  36.  53.   0.   9.   7.  22.
  12   6.   0.   0.   1.   0.   2.  23.  24.  32.  35.  43.  46.  26.  20.  30.  24.  43.  30.  37.  36.  53.   0.   9.   7.  22.
  13   6.   0.   0.   1.   0.   2.  23.  24.  32.  35.  43.  46.  26.  20.  30.  24.  43.  30.  37.  36.  53.   0.   9.   7.  22.
  14   4.   3.   1.   1.   0.   1.   5.   8.  19.  20.  28.  27.  21.  19.  18.  21.  30.  31.  23.  15.  16.  15.  11.   8.  14.
  15   4.   3.   1.   1.   0.   1.   5.   8.  19.  20.  28.  27.  21.  19.  18.  21.  30.  31.  23.  15.  16.  15.  11.   8.  14.
  16   6.   0.   0.   1.   0.   2.  23.  24.  32.  35.  43.  46.  26.  20.  30.  24.  43.  30.  37.  36.  53.   0.   9.   7.  22.
  17   6.   0.   0.   1.   0.   2.  23.  24.  32.  35.  43.  46.  26.  20.  30.  24.  43.  30.  37.  36.  53.   0.   9.   7.  22.
  18   6.   0.   0.   1.   0.   2.  23.  24.  32.  35.  43.  46.  26.  20.  30.  24.  43.  30.  37.  36.  53.   0.   9.   7.  22.
  19   6.   0.   0.   1.   0.   2.  23.  24.  32.  35.  43.  46.  26.  20.  30.  24.  43.  30.  37.  36.  53.   0.   9.   7.  22.
  20   6.   0.   0.   1.   0.   2.  23.  24.  32.  35.  43.  46.  26.  20.  30.  24.  43.  30.  37.  36.  53.   0.   9.   7.  22.
  21   4.   3.   1.   1.   0.   1.   5.   8.  19.  20.  28.  27.  21.  19.  18.  21.  30.  31.  23.  15.  16.  15.  11.   8.  14.
  22   4.   3.   1.   1.   0.   1.   5.   8.  19.  20.  28.  27.  21.  19.  18.  21.  30.  31.  23.  15.  16.  15.  11.   8.  14.
  23   6.   0.   0.   1.   0.   2.  23.  24.  32.  35.  43.  46.  26.  20.  30.  24.  43.  30.  37.  36.  53.   0.   9.   7.  22.
  24   6.   0.   0.   1.   0.   2.  23.  24.  32.  35.  43.  46.  26.  20.  30.  24.  43.  30.  37.  36.  53.   0.   9.   7.  22.
  25   6.   0.   0.   1.   0.   2.  23.  24.  32.  35.  43.  46.  26.  20.  30.  24.  43.  30.  37.  36.  53.   0.   9.   7.  22.
  26   6.   0.   0.   1.   0.   2.  23.  24.  32.  35.  43.  46.  26.  20.  30.  24.  43.  30.  37.  36.  53.   0.   9.   7.  22.
  27   6.   0.   0.   1.   0.   2.  23.  24.  32.  35.  43.  46.  26.  20.  30.  24.  43.  30.  37.  36.  53.   0.   9.   7.  22.
  28   4.   3.   1.   1.   0.   1.   5.   8.  19.  20.  28.  27.  21.  19.  18.  21.  30.  31.  23.  15.  16.  15.  11.   8.  14.
  29   4.   3.   1.   1.   0.   1.   5.   8.  19.  20.  28.  27.  21.  19.  18.  21.  30.  31.  23.  15.  16.  15.  11.   8.  14.
  30   6.   0.   0.   1.   0.   2.  23.  24.  32.  35.  43.  46.  26.  20.  30.  24.  43.  30.  37.  36.  53.   0.   9.   7.  22.
  31   6.   0.   0.   1.   0.   2.  23.  24.  32.  35.  43.  46.  26.  20.  30.  24.  43.  30.  37.  36.  53.   0.   9.   7.  22.

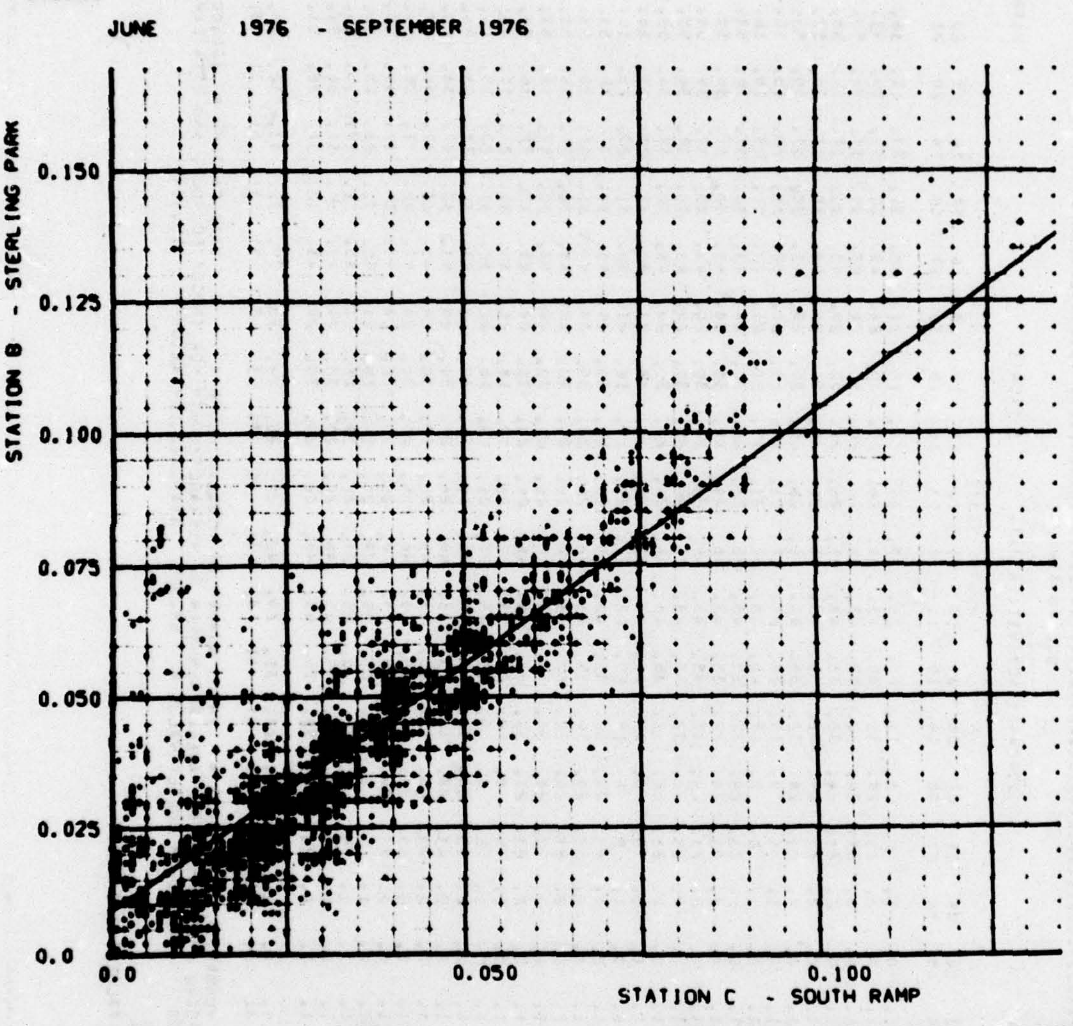
AVG    5.   1.   0.   1.   0.   2.  18.  19.  28.  31.  39.  40.  25.  20.  27.  23.  39.  30.  33.  30.  42.   8.  10.   7.  20.
DAYS   31   31   31   31   31   31   31   31   31   31   31   31   31   31   31   31   31   31   31   31   31   31   31   31  744

TOTAL HOURS =   744   NUMBER OF GOOD HOURS =   744   NUMBER OF MISSING HOURS =    0   DATA CAPTURE =  100.00  (  PERCENT  )
ABOVE THREE ROWS ARE TOTAL WEIGHTED HOURLY AVERAGES,NUMBER OF AVERAGES/MONTH FOR INDICATED HOUR, AND DATA CAPTURE STATISTICS
TOTAL AVERAGE =1185.403       MAXIMUM HOURLY VALUE =   53.000   STANDARD DEVIATION =    15.4065

NOTE :  999 - MISSING VALUE INDICATOR
```

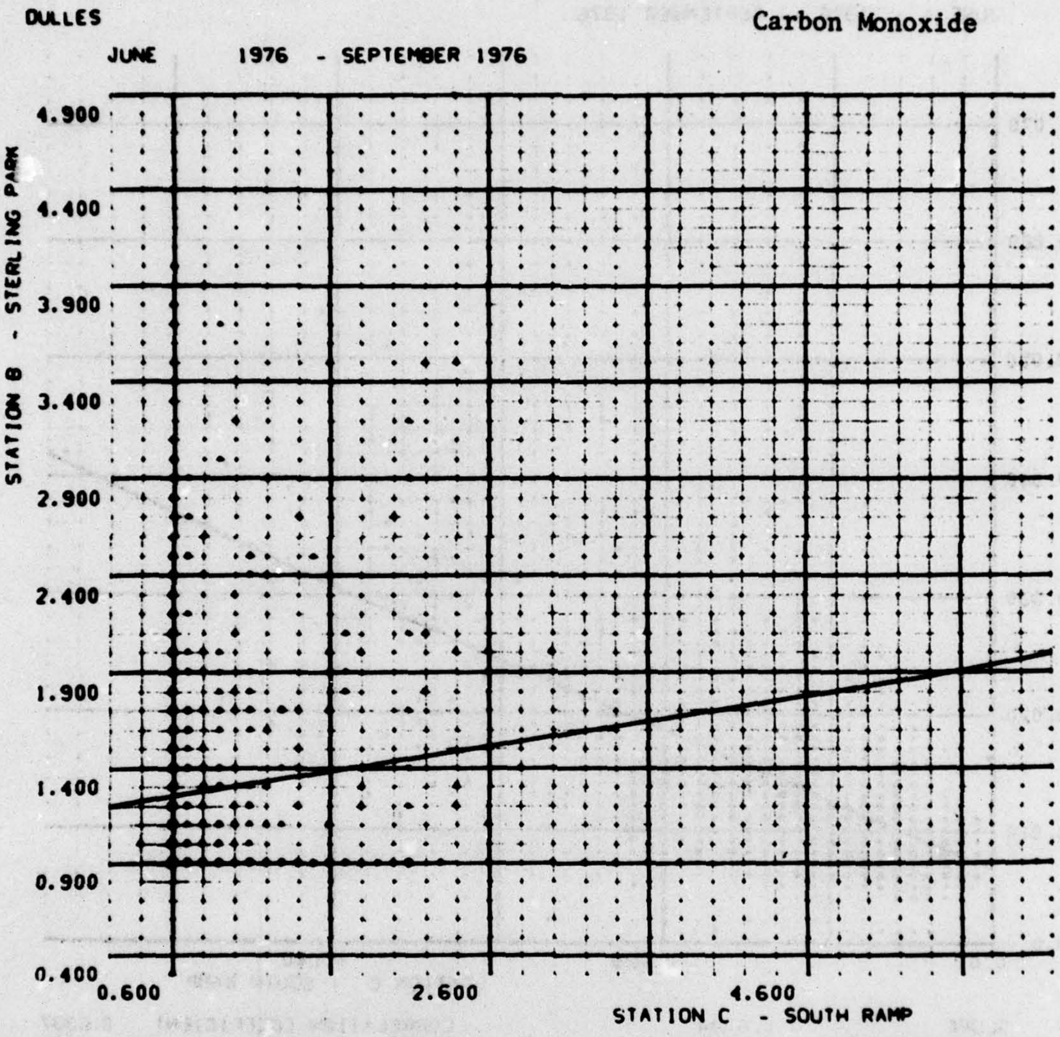
Figure D1.37

Ozone



SLOPE 0.9542
STANDARD ERROR 0.0139
CORRELATION COEFFICIENT 0.8428
NUMBER OF POINTS 1825

Figure D1.38

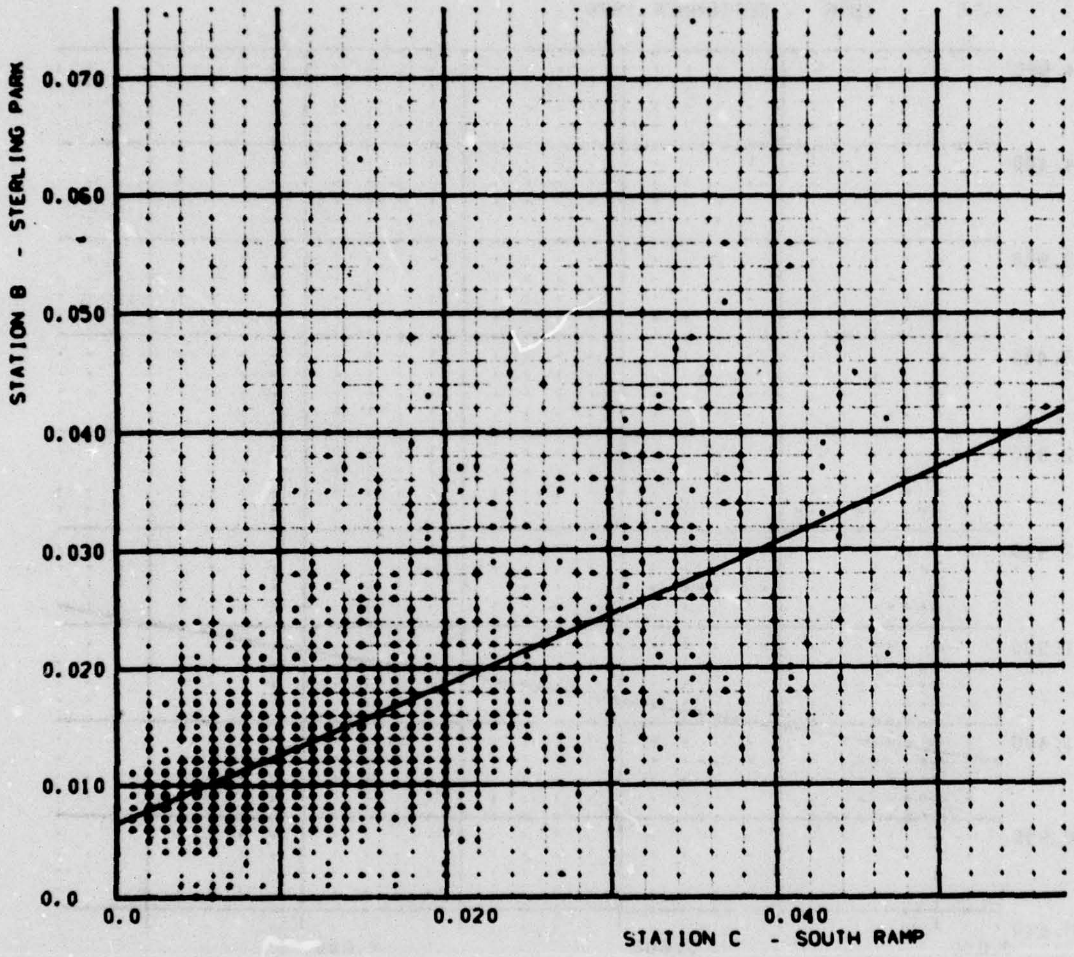


SLOPE	0.1320	CORRELATION COEFFICIENT	0.0882
STANDARD ERROR	0.5609	NUMBER OF POINTS	1786

Figure D1.39

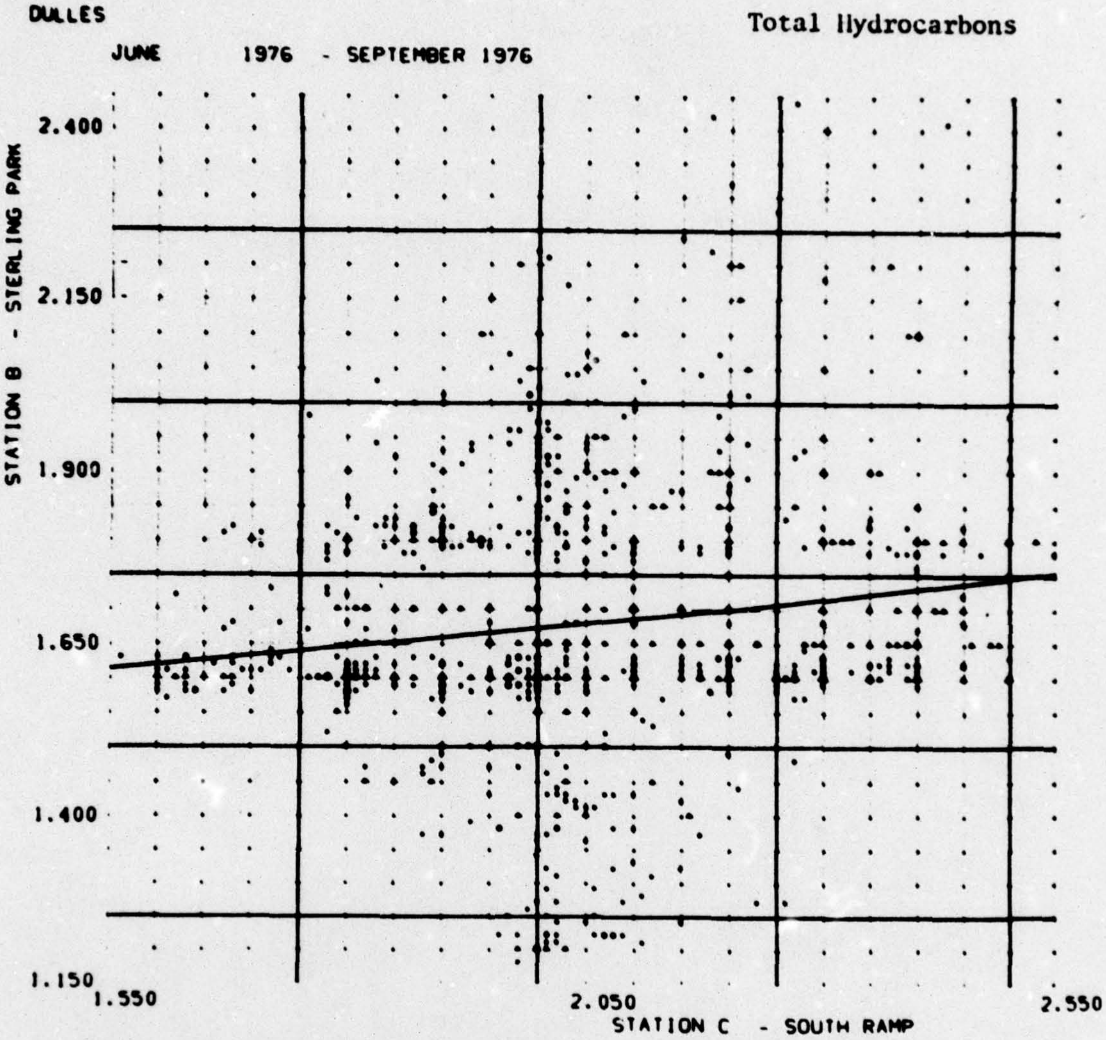
DULLES Nitrogen Dioxide

JUNE 1976 - SEPTEMBER 1976



SLOPE	0.6084	CORRELATION COEFFICIENT	0.6337
STANDARD ERROR	0.0065	NUMBER OF POINTS	1761

Figure D1.40



SLOPE	0.1400	CORRELATION COEFFICIENT	0.1559
STANDARD ERROR	0.1919	NUMBER OF POINTS	907