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October 1977
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GUIDELINE SERIES

USERS MANUAL FOR PREPARATION OF AIR POLLUTION ISOPLETH PROFILES AND POPULATION EXPOSURE ANALYSIS

U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Air and Waste Management
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

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Monitoring and Reports Branch
Monitoring and Data Analysis Division

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OAQPS GUIDELINE SERIES

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The computer programs contained in this manual were developed through the efforts of many individuals. Two of the computer programs, LPEM and SPEM were developed by Yuji Horie, Technology Service Corporation, Santa Monica, California. Conversion of LPEM and SPEM to the U.S.E.P.A. UNIVAC 1100 was made possible through the efforts of Jim Capel, Monitoring and Reports Branch. The computer graphics program, HYBRID, was developed by Neil Frank. The computer graphics program, TRICON, was developed by Martin Cohen, Technology Service Corporation. The use of the computer graphics package, SYMAP for the display air quality information was provided by the efforts of Margaret Swann and Jim Capel of the Monitoring and Reports Branch.

USERS MANUAL FOR ISOPLETH/POPULATION EXPOSURE TREND ANALYSIS

1.0 INTRODUCTION

This Users Manual is a companion document to the "Guideline on Procedures for Construction Air Pollution Isopleth Profiles and Population Exposure Analysis." The Manual contains an overview of the analysis procedures and documentation for computer software.

Three programs (SYMAP, Tricon, Hybrid) can be used to produce computer-drawn maps for isopleth analysis. Basic inputs to each program are digitized study area boundries, data values and spatial coordinates. SYMAP is a computer package which produces character printed maps on a line printer. Tricon and Hybrid are computer programs which produce maps on a CALCOMP pen plotter or a Textronix cathode ray tube display device. A description of these procedures is found in Section 2.4 of the Guideline document.

Two programs (LPEM,SPEM) are used in the analysis of population exposure and isopleth analysis. LPEM designates Long-Term Population Exposure Model, SPEM designates Short-Term Population Exposure Model. The programs establish long-and-short-term population exposure statistics. from air quality information obtained from a network of monitors. The details of these models are discussed in Section 3.3 of the Guideline document.

As an analysis procedure, the development of useable isopleth maps from exisiting air quality information is a necessary prequisite to the estimation of population exposure. From an operational point of view, however, the user may elect to first execute the population exposure programs prior to executing the computer graphics. This is because the population exposure programs offers some interesting features which are applicable to the development of an isopleth map. For this reason, the population exposure programs will be discussed first in this manual.

For each computer program, the manual will contain a general description of the run procedure, required data inputs with specified formats, operating instructions, sample input and sample output. For all programs except SYMAP, a source listing of the program statements is also provided.

The remainder of this report is divided into four sections which describe the analysis procedure and the computer software. The four sections are:

2.0 Overview of the Isopleth/Population Exposure Analysis

3.0 Estimation of Exposure

- 3.1 LPEM: Long-Term Population Exposure Model
- 3.2 SPEM: Short-Term Population Exposure Model

4.0 Computer Graphics

- 4.1 HYBRID
- 4.2 SYMAP
- 4.3 TRICON

5.0 Program Listings

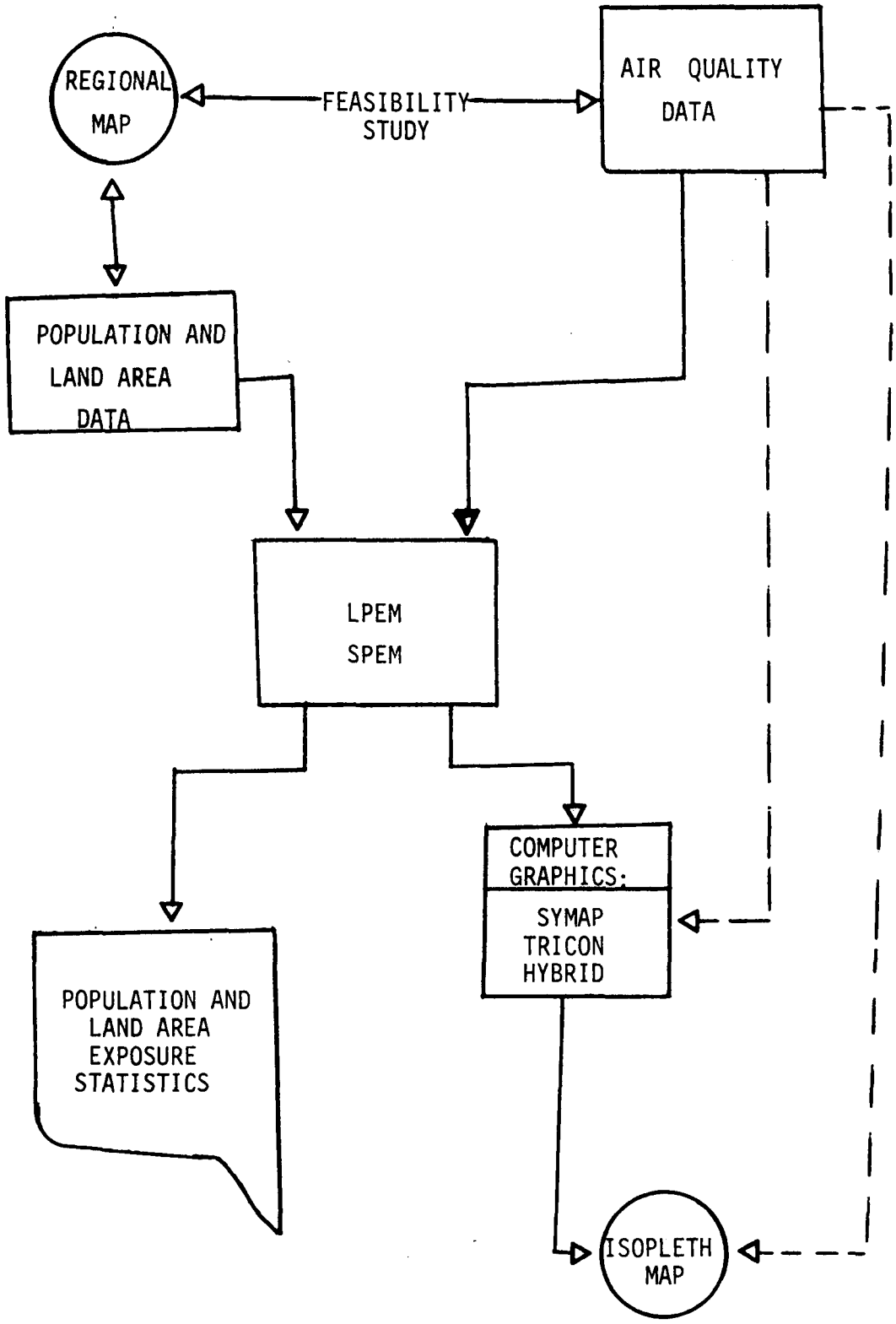
2.0 OVERVIEW OF THE ISOPLETH/POPULATION EXPOSURE ANALYSIS

The first step in the analysis is the selection of a regional map and air quality monitoring or modeling information for the proposed study area. The next step is determining the feasibility of the proposed analysis based on available information. This involves locating the air quality data points on the map and examining the spatial coverage, as well as the temporal coverage of available data. This investigation will yield tentative boundries of the study area and determine if air monitoring or dispersion estimates shall be used. Once these steps have been completed, a hand drawn isopleth map might be developed from the air quality information at this time. These items are discussed in Section 2.1, 2.2 and 2.3 of the Guideline document.

If population/land area exposure analysis or refined computer drawn isopleth maps are desired, then some additional steps are necessary. This involves setting up a network of artifical receptor or grid points of the regional map. For exposure analysis, population and land area information is also required. (See Section 3.1 and 3.2 of the Guideline.) The network of receptors is used to approximate the spatial distribution of population and land area. The spatial coordinates for air quality data points and receptor points are determined. In addition, the boundries of the study area are numerically specified. A Rectangular coordinate system with the origin at lower left is preferred. All data are then prepared as computer input data sets. The computer models, LPEM and SPEM calculate air quality values at each of the receptor points by interpolation from the existing air quality data. These estimated values serve two purposes. First, they provide the basis for estimating exposure. Second, they provide a convenient spatially refined data base for preparation of a computer generated isopleth map. (See Section 2.4 of the Guideline.) This map can be produced by one of three computer programs: SYMAP, TRICON or HYBRID.

Figure 2-1 shows a simple schematic of the analysis procedure.

FIGURE 2-1. SCHEMATIC OF ISPOLETH/POPULATION EXPOSURE ANALYSIS



3.0 ESTIMATION OF EXPOSURE

The computer programs, LPEM and SPEM, estimate exposure to air pollution by interfacing the spatial distributions of air quality, population and land area. The air quality information can be defined by a network of air quality monitors or an output grid from a dispersion model. The population and land area information is approximated by a network of artificial receptor points. Each point is used to represent a portion of the total population and land area. The programs estimate air quality values at the network of receptors by the use of an interpolation formula. Thus, a specific air quality value is associated with a particular population and land area; this establishes the exposure estimates. (See Section 3.3 of the Guideline.)

Both models require a variety of basic input data sets relating to the spatial distribution of the population density within the study region. These are specified by spatial coordinates of a receptor network, associated populations and land areas. Another basic input common to both models is the spatial coordinates of the monitoring sites. Concerning the air quality parameters from which exposure is established, LPEM uses average concentration at the network of stations, while SPEM is based on the use of percentiles of pollutant concentrations. As will be shown on the use of LPEM, it can also estimate short-term population exposure by using the percent of excursions above an air quality standard at each site (in place of average concentration).

3.1 LPEM Long-Term Population Exposure Model

A. General Description

Average concentrations are estimated at a network of receptor points form average concentrations at a network of monitoring sites. For each receptor, the program calculates the average concentration from the nearest 3 stations by the use of an interpolation formula. A penalty distance can be imposed to account for the influence of barriers such as mountains.

Once the air quality estimates are established at the receptor points exposure statistics are calculated for land area, total population and sub-populations (such as school age and elderly).

B. Input Card for Output Description

1. Title Card for output tables - Card 1
2. Parameter cards - Card 2,3
3. Barriers - When barriers are included, the following are required: One card for number of barriers and number of nodes per barrier. One card for each node and penalty distance associated with the node. Up to 20 barriers are allowed. Penalty distance is interpolated between nodes and is added to distance between receptors and monitors for spatial interpolations. If barriers are not used, no cards are needed.
4. Charcteristics of Statistical Areas - One card or record for each statistical area. (A statistical area is an area for which area and population data is defined. It contains one or more receptor points.) Each record contains a 2 part ID code for each statistical area, values for total area and up to 4 subpopulations expressed in percent. These values are optional and can be left blank. The first part of the ID code should be a sequenced index value for each area. The second part of the ID code is not used by the program, but can be used to specify a geographic subregion such as county for the users convenience. Up to 300 statistical areas are allowed.

5. Receptor Coordinates - One card or record for each receptor point. Each record contains a 2 part ID code and x,y coordinates for each receptor. The first part of the ID code should correspond to the number of the statistical area in which it resides. The second part of the ID code is not used by the program but can be used for the users convience. Up to 300 receptor points are allowed.

6. Number of Receptors per Statistical Area - One card is required for every 16 areas. Values may be zero, designating a statistical area excluded from the study, or greater than zero. Usual values are 1 for a single receptor per statistical area.

7. Site Coordinates - One card or record for each site. Each record contains a 2 part ID code and x,y coordinates. The first part of the 2 part ID should be a sequenced index variable, for each site. The second part of the ID code is not used by the program, but can specify a geographic subregion such as county for the users convenience. These records can designate the entire monitoring network even if a specific site did not produce any data for the analysis. Up to 200 sites are allowed by the program.

8. Concentration Data - One card or record for each site. Each record contains a 2 part site ID code and one air quality value (e.g., annual mean) for each year. Up to 7 years can be input on each record. Only records for sites with data need be included.

9. Population Data - One card or record for each statistical area. Each record contains a 2 part ID code for statistical area and a population value for total population and total employment. Employment data is optional and can be left blank.

NOTE: It is preferable that coordinate systmes be sent up so that origin is at lower left.

C. LPEM Input Data - List of parameters and record format description.

LPEM DATA ITEMS - all fields should be right justified.

It is not necessary to zero fill any fields.

Card Column 1-78	Variable Type	
		1. Title Card - any parintable character can be used.
		2. Control Card No. 1 (input parameters)
1-5	I	NRECEP - No. of receptor points
6-10	I	NMONT - No. of monitoring stations with coordinates
11-15	I	NSITES - No. of monitoring stations with data ($3 \leq$ NSITES $\leq$ NMONT)
16-20	I	NRSA - NO. of statistical areas with population data (NRSA $\leq$ NRECEP)
21-25	I	(not used)
26-30	I	NPOPL - No. of population classes such as school age, elderly (1 to 7) See Note.
31-35	I	NHOUR - 1 for hour data; 24 for 24 hour data (not used for LPEM)
36-40	I	NYEAR - No. of years of air quality data
41-50	F	SYEAR - Initial year
51-60	F	DELYR - Incremental year
61-70	F	AQSTD - Air quality standard
71-75	I	NPDIST - Penalty distance - if penalty distance is used, NPDIST = 1
		Control Card No. 2 (parameters for exposure distributions)
1-10	F	XLOW - Lowest concentration value
11-20	F	XINCR - Incremental value
21-25	I	NINCR - No. of increments

NOTE: If percent working population is included in Characteristics of Statistical Areas, then setting NPOPL = 6 will generate exposure information for workers at place of residence and non-workers at place of residence. If employment data is included in data item no. 9 (Population Data), then setting NPOPL = 7 will generate exposure information for workers at place of employment.

Card Column	Variable Type	LPEM DATA ITEMS
		3. Barriers
		First Card
1-2	I	Mountn - No. of barriers
3-5	I	MNODE (1) - No. of Nodes for barrier 1.
6-8	I	MNODE (2) - No. of Nodes for barrier 2.
...		MNODE (MOUNT) - No. of Nodes for "MOUNTN"
		Subsequent Cards
1-8	F	x (I,J): x coordinate of Jth node of Ith barrier
9-16	F	y (I,J): y coordinate of Jth node of Ith barrier
17-24	F	P(I,J): Penalty distance assigned to Jth node of I-th barrier
		4. Characteristics of Statistical Areas One record for each statistical area, I
1-10	I	IDRSA (I,1)-first part of 2 part identification code.
11-20	I	IDRSA (I,2)-second part of 2 part identification code
21-30	F	AREA(I)-land area of each statistical area
31-40	F	POPCNT(I,1)-percent of total population for sub-population class 1
41-50	F	POPCNT(I,2)-percent of total population for sub-population class 2
51-60	F	POPCNT(I,3)-percent of total population for sub-population class 3
61-70	F	POPCNT(I,4)-percent of total population for sub-population class 4

NOTE: If workers by place of residence is used, put this data item into sub-population class 4.

Card Column	Variable Type	
		5. Receptor Coordinates - One for each receptor point, I
1-10	I	IRECEP(I,1)-first part of 2 part receptor ID code
11-20	I	IRECEP(I,2)-second part of 2 part receptor ID code
21-30	F	RECEP(I,1)-x coordinate of receptor point
31-40	F	RECEP(I,2)-y coordinate of receptor point
		6. No. of Receptors Per Statistical Area - One record for 16 statistical areas
1-5	I	IRSA(1) - No. of receptors in Statistical area 1
6-10	I	IRSA(2) - No. of receptors in Statistical area 2
11-15	I	IRSA(3) - No. of receptors in Statistical area 3
.	.	
.	.	
.	.	
.	.	
.	.	
70-75	I	IRSA(15) - No. of receptors in Statistical area 15
76-80	I	IRSA(16) - No. of receptors in Statistical area 16
1-5	I	IRSA(17) - No. of receptors in Statistical area 17
.	.	
.	.	
.	.	
	I	IRSA(NRSA)-No. of receptors in Statistical area NRSA
		7. Site Coordinates - One record for each site, I parameters
5-10	I	ISITE(I,1)-first part of 2 part ID code
16-20	I	ISITE(I,2)-second part of 2 part ID code
21-30	F	SITE (I,1)-x coordinate
31-40	F	SITE (I,2)-y coordinate

Card Column	Variable Type	
		8. Monitoring Air Quality Data - One record for each monitoring site with data parameters
1-5	I	INSITE - first part of 2 part ID code
6-10	I	KSITE - second part of 2 part ID code
11-20	F	CM(INSITE,1) - air quality value for year 1
21-30	F	CM(INSITE,2) - air quality value for year 2
31-40	F	CM(INSITE,3) - air quality value for year 3
41-50	F	CM(INSITE,4) - air quality value for year 4
51-60	F	CM(INSITE,5) - air quality value for year 5
61-70	F	CM(INSITE,6) - air quality value for year 6
71-80	F	CM(INSITE,7) - air quality value for year 7
		9. Population Data - One record for each statistical area parameters
1-10	I	IDRSA (I,1)-first part of 2 part ID code for statistical area I
11-20	I	IDRSA (I,2)-second part of 2 part ID code for statistical area, I
21-30	F	POPL (I,1) - total population for statistical area I
31-40	F	POPL (I,2) - total employment for statistical area I

D. Sample Run Stream on UNIVAC for LPEM

```
@ ASG,A  TRRP*POPEXP
@ XQT    TRRP*POPEXP.LPEM                executable version of program
@ ADD    TRR*POPEXP.LPEM-DATA/NY         sample data

@ ELT,ISL  user file.element 1  }        saves monitoring air quality data
@ ADD 7.                        }        with x y coordinates
@ EOF                           }        user file (OPTIONAL)

@ ELT,ISL user file.element 2   }        saves estimated air quality data at
@ ADD 8.                        }        receptor points with x y coordinates
@ EOF                           }        on user file (OPTIONAL)

@ ELT,ILS user file.element 3   }        saves population density at receptor
@ ADD 9.                        }        points on user file
@ EOF                           }        (OPTIONAL)

@ FIN
```

E. Description of Temporary Output Data Files Created by LPEM

1. Monitoring Air Quality Data with x y Coordinates - output on unit 7

The first record specifies the number of monitoring sites, n_1 with data for the first year of input data. The next n_1 records contain information for those n_1 sites. For each additional year of input data, the above pattern is repeated.

Record Formats

Column	Type	Parameters	
1-3	I	No. of sites with data for specific year	- first record
1-10	F	Concentration value	one record for each site with input data for the year
11-20	F	X Coordinate	
21-30	F	Y coordinate	
31-40	I	Monitor number-first part of 2 part ID code	
41-50	F	Year	

2. Estimated Air Quality Data at Receptor Points with x y Coordinates - Output on unit 8

The first record specifies the number of receptor points, r, included in the analysis. The next r records contain air quality information for those r points. For each additional year of input data, the above pattern is repeated.

Record formats are the same as Monitoring Data.

3. Population Density at TReceptor Points - outputoon unit 9.

The first record specifies the number of receptor points r, included in the analysis. The next r records contain population density information for those r points. The population density is calculated by the program for each point that has a defined land area.

Record formats are the same as Monitoring Data.

F. Description of LPEM Output

1. Several tables are produced which describe the input data. These include characteristics of the statistical areas, population data, receptor specification data and air quality monitoring data. The yearly average of all stations is given.

2. For each year of input data, a table is provided with the interpolated/extrapolated concentrations at the receptor points.

3. For each year of input data, tables of exposure distributions are provided for total population and each subpopulation. Population class 1 refers to the total population and population class i refers to subpopulation i-1. Cumulative frequency distributions and frequency functions are provided for population and land area exposure. Population and land area weighted averages are also given. The value of the frequency distribution for air quality value D* is defined as the fraction of land area or people exposed to air quality values greater than or equal to D*. The value of the frequency function for air quality value D* is defined as the fraction of land area or people exposed to air quality values greater than or equal to D* but less than D* + increment. Increment is the difference between successive table values of D* as defined in the LPEM input.

LONG-TERM POPULATION EXPOSURE MODEL - N.Y., N.J., CONN. AREA

NRECEP = 215 NRSA = 215 NMONT = 182 NSITES= 103 NPOPL = 9
NYEAR = 2 SYEAR = 1971.0 DELYR = 3.0 ABSTD = 75.0

CHARACTERISTICS OF STATISTICAL AREAS

NO.= 1	SA= 1	11	AREA =192.70	SUBPOP A,B,C,D (IN %) =	27.0	9.0	1.5	.0	RECEPTORS PER SA =	1
NO.= 2	SA= 2	11	AREA =193.20	SUBPOP A,B,C,D (IN %) =	25.0	9.5	8.0	.0	RECEPTORS PER SA =	1
NO.= 3	SA= 3	11	AREA =130.20	SUBPOP A,B,C,D (IN %) =	29.0	11.0	1.0	.0	RECEPTORS PER SA =	1
NO.= 4	SA= 4	11	AREA = 85.90	SUBPOP A,B,C,D (IN %) =	27.0	8.0	1.5	.0	RECEPTORS PER SA =	1
NO.= 5	SA= 5	11	AREA =127.60	SUBPOP A,B,C,D (IN %) =	31.0	6.5	1.5	.0	RECEPTORS PER SA =	1
NO.= 6	SA= 6	11	AREA =130.20	SUBPOP A,B,C,D (IN %) =	29.0	9.0	1.5	.0	RECEPTORS PER SA =	1
NO.= 7	SA= 7	11	AREA =158.90	SUBPOP A,B,C,D (IN %) =	31.0	8.0	1.5	.0	RECEPTORS PER SA =	1
NO.= 8	SA= 8	11	AREA = 96.90	SUBPOP A,B,C,D (IN %) =	27.0	9.5	.8	.0	RECEPTORS PER SA =	1
NO.= 9	SA= 9	11	AREA = 32.60	SUBPOP A,B,C,D (IN %) =	29.0	10.5	1.0	.0	RECEPTORS PER SA =	1
NO.= 10	SA= 10	11	AREA = 32.60	SUBPOP A,B,C,D (IN %) =	29.0	8.0	1.0	.0	RECEPTORS PER SA =	1
NO.= 11	SA= 11	11	AREA = 32.60	SUBPOP A,B,C,D (IN %) =	31.0	7.5	1.0	.0	RECEPTORS PER SA =	1
NO.= 12	SA= 12	11	AREA = 32.60	SUBPOP A,B,C,D (IN %) =	31.0	6.5	1.0	.0	RECEPTORS PER SA =	1
NO.= 13	SA= 13	11	AREA = 23.90	SUBPOP A,B,C,D (IN %) =	31.0	8.0	1.0	.0	RECEPTORS PER SA =	1
NO.= 14	SA= 14	11	AREA = 99.50	SUBPOP A,B,C,D (IN %) =	25.0	9.0	7.0	.0	RECEPTORS PER SA =	1
NO.= 15	SA= 15	11	AREA = 32.60	SUBPOP A,B,C,D (IN %) =	31.0	8.0	3.5	.0	RECEPTORS PER SA =	1

NO.=200	SA= 200	39	AREA =125.80	SUBPOP A,B,C,D (IN %) =	27.0	8.0	10.0	.0	RECEPTORS PER SA =	1
NO.=201	SA= 201	39	AREA =125.80	SUBPOP A,B,C,D (IN %) =	31.0	7.0	5.0	.0	RECEPTORS PER SA =	1
NO.=202	SA= 202	39	AREA =190.90	SUBPOP A,B,C,D (IN %) =	30.0	9.0	15.0	.0	RECEPTORS PER SA =	1
NO.=203	SA= 203	39	AREA =199.70	SUBPOP A,B,C,D (IN %) =	27.0	9.5	10.0	.0	RECEPTORS PER SA =	1
NO.=204	SA= 204	39	AREA = 67.90	SUBPOP A,B,C,D (IN %) =	30.0	8.0	8.0	.0	RECEPTORS PER SA =	1
NO.=205	SA= 205	39	AREA =100.60	SUBPOP A,B,C,D (IN %) =	24.0	12.5	7.5	.0	RECEPTORS PER SA =	1
NO.=206	SA= 206	37	AREA =106.10	SUBPOP A,B,C,D (IN %) =	26.0	12.0	.4	.0	RECEPTORS PER SA =	1
NO.=207	SA= 207	36	AREA =107.90	SUBPOP A,B,C,D (IN %) =	29.0	11.0	.7	.0	RECEPTORS PER SA =	1
NO.=208	SA= 208	39	AREA = 10.10	SUBPOP A,B,C,D (IN %) =	30.0	6.0	3.5	.0	RECEPTORS PER SA =	1
NO.=209	SA= 209	25	AREA = 25.60	SUBPOP A,B,C,D (IN %) =	19.2	12.4	14.7	.0	RECEPTORS PER SA =	1
NO.=210	SA= 210	28	AREA = 6.80	SUBPOP A,B,C,D (IN %) =	27.0	12.0	7.5	.0	RECEPTORS PER SA =	1
NO.=211	SA= 211	28	AREA = 17.80	SUBPOP A,B,C,D (IN %) =	30.0	8.0	10.0	.0	RECEPTORS PER SA =	1
NO.=212	SA= 212	29	AREA = 13.70	SUBPOP A,B,C,D (IN %) =	29.0	8.0	4.0	.0	RECEPTORS PER SA =	1
NO.=213	SA= 213	29	AREA = 20.60	SUBPOP A,B,C,D (IN %) =	29.0	8.0	4.0	.0	RECEPTORS PER SA =	1
NO.=214	SA= 214	29	AREA = 95.80	SUBPOP A,B,C,D (IN %) =	29.0	8.0	4.0	.0	RECEPTORS PER SA =	1
NO.=215	SA= 215	29	AREA = 95.80	SUBPOP A,B,C,D (IN %) =	29.0	8.0	10.0	.0	RECEPTORS PER SA =	1

LONG-TERM POPULATION EXPOSURE MODEL - N.Y., N.J., CONN. AREA

NRECEP = 215 NRSA = 215 NMONT = 182 NSITES= 103 NPOPL = 4
NYEAR = 2 SYEAR = 1971.0 DELYR = 3.0 AGSTD = 75.0

POPULATION DATA - TOTAL POPULATION AND ALL WORKERS BY WORK PLACE (1971.0)/

NO.= 1	SA= 1	11	TOTAL POP.=	20639.	ALL WKRS BY WK-PLACE=	0.
NO.= 2	SA= 2	11	TOTAL POP.=	638014.	ALL WKRS BY WK-PLACE=	0.
NO.= 3	SA= 3	11	TOTAL POP.=	15195.	ALL WKRS BY WK-PLACE=	0.
NO.= 4	SA= 4	11	TOTAL POP.=	10029.	ALL WKRS BY WK-PLACE=	0.
NO.= 5	SA= 5	11	TOTAL POP.=	25585.	ALL WKRS BY WK-PLACE=	0.
NO.= 6	SA= 6	11	TOTAL POP.=	9219.	ALL WKRS BY WK-PLACE=	0.
NO.= 7	SA= 7	11	TOTAL POP.=	58315.	ALL WKRS BY WK-PLACE=	0.
NO.= 8	SA= 8	11	TOTAL POP.=	46387.	ALL WKRS BY WK-PLACE=	0.
NO.= 9	SA= 9	11	TOTAL POP.=	135166.	ALL WKRS BY WK-PLACE=	0.
NO.= 10	SA= 10	11	TOTAL POP.=	24921.	ALL WKRS BY WK-PLACE=	0.
NO.= 11	SA= 11	11	TOTAL POP.=	24921.	ALL WKRS BY WK-PLACE=	0.
NO.= 12	SA= 12	11	TOTAL POP.=	9743.	ALL WKRS BY WK-PLACE=	0.
NO.= 13	SA= 13	11	TOTAL POP.=	9693.	ALL WKRS BY WK-PLACE=	0.
NO.= 14	SA= 14	11	TOTAL POP.=	15616.	ALL WKRS BY WK-PLACE=	0.
NO.= 15	SA= 15	11	TOTAL POP.=	6999.	ALL WKRS BY WK-PLACE=	0.
[illegible]	16	11	TOTAL POP.=	[illegible]	[illegible] BY WK-PLACE=	0.
[illegible]	17	11	TOTAL POP.=	[illegible]	[illegible] BY WK-PLACE=	0.
[illegible]	18	11	TOTAL POP.=	[illegible]	[illegible] BY WK-PLACE=	0.
[illegible]	19	11	TOTAL POP.=	[illegible]	[illegible] BY WK-PLACE=	0.
[illegible]	20	11	TOTAL POP.=	[illegible]	[illegible] BY WK-PLACE=	0.
[illegible]	21		TOTAL POP.=	[illegible]	[illegible] BY WK-PLACE=	0.
[illegible]	22		TOTAL POP.=	[illegible]	[illegible] BY WK-PLACE=	0.
[illegible]	23		TOTAL POP.=	[illegible]	[illegible] BY WK-PLACE=	0.
[illegible]	24		TOTAL POP.=	[illegible]	[illegible] BY WK-PLACE=	0.
[illegible]	25		TOTAL POP.=	[illegible]	[illegible] BY WK-PLACE=	0.
[illegible]	26		TOTAL POP.=	[illegible]	[illegible] BY WK-PLACE=	0.
[illegible]	[illegible]		[illegible]	[illegible]	[illegible] BY WK-PLACE=	0.
NO.=199	SA= 199	39	TOTAL POP.=	45834.	ALL WKRS BY WK-PLACE=	0.
NO.=200	SA= 200	39	TOTAL POP.=	18667.	ALL WKRS BY WK-PLACE=	0.
NO.=201	SA= 201	39	TOTAL POP.=	17560.	ALL WKRS BY WK-PLACE=	0.
NO.=202	SA= 202	39	TOTAL POP.=	14426.	ALL WKRS BY WK-PLACE=	0.
NO.=203	SA= 203	39	TOTAL POP.=	4146.	ALL WKRS BY WK-PLACE=	0.
NO.=204	SA= 204	39	TOTAL POP.=	9482.	ALL WKRS BY WK-PLACE=	0.
NO.=205	SA= 205	39	TOTAL POP.=	21877.	ALL WKRS BY WK-PLACE=	0.
NO.=206	SA= 206	37	TOTAL POP.=	22001.	ALL WKRS BY WK-PLACE=	0.
NO.=207	SA= 207	36	TOTAL POP.=	7955.	ALL WKRS BY WK-PLACE=	0.
NO.=208	SA= 208	39	TOTAL POP.=	1549.	ALL WKRS BY WK-PLACE=	0.
NO.=209	SA= 209	25	TOTAL POP.=	181590.	ALL WKRS BY WK-PLACE=	0.
NO.=210	SA= 210	28	TOTAL POP.=	39096.	ALL WKRS BY WK-PLACE=	0.
NO.=211	SA= 211	28	TOTAL POP.=	24791.	ALL WKRS BY WK-PLACE=	0.
NO.=212	SA= 212	29	TOTAL POP.=	14484.	ALL WKRS BY WK-PLACE=	0.
NO.=213	SA= 213	29	TOTAL POP.=	9600.	ALL WKRS BY WK-PLACE=	0.
NO.=214	SA= 214	29	TOTAL POP.=	21333.	ALL WKRS BY WK-PLACE=	0.
NO.=215	SA= 215	29	TOTAL POP.=	21333.	ALL WKRS BY WK-PLACE=	0.

LONG-TERM POPULATION EXPOSURE MODEL - N.Y., N.J., CONN. AREA

NRECEP = 215 NRSA = 215 NMONT = 182 NSITES= 103 NPOPL = 4
NYEAR = 2 SYEAR = 1971.0 DELYR = 3.0 AQSTD = 75.0

AIR MONITORING STATIONS

NO.=	1	STATION NO.=	1	11	X-Y COORDINATE =	124.00	116.50
NO.=	2	STATION NO.=	2	11	X-Y COORDINATE =	124.00	116.50
NO.=	3	STATION NO.=	3	11	X-Y COORDINATE =	123.50	114.50
NO.=	4	STATION NO.=	4	11	X-Y COORDINATE =	106.00	135.50
NO.=	5	STATION NO.=	5	11	X-Y COORDINATE =	118.50	116.50
NO.=	6	STATION NO.=	6	11	X-Y COORDINATE =	92.00	100.50
NO.=	7	STATION NO.=	7	11	X-Y COORDINATE =	94.50	103.50
NO.=	8	STATION NO.=	8	11	X-Y COORDINATE =	91.00	99.00
NO.=	9	STATION NO.=	9	11	X-Y COORDINATE =	87.50	107.00
NO.=	10	STATION NO.=	10	11	X-Y COORDINATE =	91.50	105.50
NO.=	11	STATION NO.=	11	11	X-Y COORDINATE =	94.50	102.50
NO.=	12	STATION NO.=	12	11	X-Y COORDINATE =	108.50	111.00
NO.=	13	STATION NO.=	13	11	X-Y COORDINATE =	109.00	112.00
NO.=	14	STATION NO.=	14	11	X-Y COORDINATE =	99.50	104.50
NO.=	162	STATION NO.=	162	26	X-Y COORDINATE =	72.50	62.50
NO.=	163	STATION NO.=	163	25	X-Y COORDINATE =	77.00	57.50
NO.=	164	STATION NO.=	164	26	X-Y COORDINATE =	66.00	62.00
NO.=	165	STATION NO.=	165	11	X-Y COORDINATE =	124.00	115.00
NO.=	166	STATION NO.=	166	11	X-Y COORDINATE =	106.00	135.50
NO.=	167	STATION NO.=	167	11	X-Y COORDINATE =	95.00	102.00
NO.=	168	STATION NO.=	168	11	X-Y COORDINATE =	99.50	105.50
NO.=	169	STATION NO.=	169	11	X-Y COORDINATE =	98.50	106.50
NO.=	170	STATION NO.=	170	33	X-Y COORDINATE =	61.00	90.00
NO.=	171	STATION NO.=	171	32	X-Y COORDINATE =	55.00	68.00
NO.=	172	STATION NO.=	172	32	X-Y COORDINATE =	55.00	68.00
NO.=	173	STATION NO.=	173	33	X-Y COORDINATE =	61.00	90.00
NO.=	174	STATION NO.=	174	32	X-Y COORDINATE =	61.00	77.00
NO.=	175	STATION NO.=	175	38	X-Y COORDINATE =	32.00	57.00
NO.=	176	STATION NO.=	176	38	X-Y COORDINATE =	45.00	57.00
NO.=	177	STATION NO.=	177	38	X-Y COORDINATE =	47.00	55.00
NO.=	178	STATION NO.=	178	33	X-Y COORDINATE =	52.00	72.00
NO.=	179	STATION NO.=	179	28	X-Y COORDINATE =	52.00	72.50
NO.=	180	STATION NO.=	180	37	X-Y COORDINATE =	15.00	42.00
NO.=	181	STATION NO.=	181	28	X-Y COORDINATE =	97.50	72.50
NO.=	182	STATION NO.=	182	11	X-Y COORDINATE =	129.00	115.00

LONG-TERM POPULATION EXPOSURE MODEL - N.Y., N.J., CONN. AREA

NRECEP = 215 NRSA = 215 NMONT = 182 NSITES= 103 NPOPL = 4
NYEAR = 2 SYEAR = 1971.0 DELYR = 1.0 AQSTD = 75.0

RECEPTOR SPECIFICATION DATA

NO.=	1	RECEPT NO. =	1	11	X-Y COORD =	105.00	145.00	TPOPL - WKRPL =	20639.	0.	AREA =	192.70
NO.=	2	RECEPT NO. =	2	11	X-Y COORD =	105.00	135.00	TPOPL - WKRPL =	638014.	0.	AREA =	143.20
NO.=	3	RECEPT NO. =	3	11	X-Y COORD =	115.00	135.00	TPOPL - WKRPL =	15195.	0.	AREA =	130.20
NO.=	4	RECEPT NO. =	4	11	X-Y COORD =	125.00	135.00	TPOPL - WKRPL =	10029.	0.	AREA =	85.90
NO.=	5	RECEPT NO. =	5	11	X-Y COORD =	105.00	125.00	TPOPL - WKRPL =	25585.	0.	AREA =	127.60
NO.=	6	RECEPT NO. =	6	11	X-Y COORD =	115.00	125.00	TPOPL - WKRPL =	9219.	0.	AREA =	130.20
NO.=	7	RECEPT NO. =	7	11	X-Y COORD =	125.00	125.00	TPOPL - WKRPL =	58315.	0.	AREA =	158.90
NO.=	8	RECEPT NO. =	8	11	X-Y COORD =	127.50	117.50	TPOPL - WKRPL =	96387.	0.	AREA =	46.90
NO.=	9	RECEPT NO. =	9	11	X-Y COORD =	122.50	117.50	TPOPL - WKRPL =	135166.	0.	AREA =	32.60
NO.=	10	RECEPT NO. =	10	11	X-Y COORD =	117.50	117.50	TPOPL - WKRPL =	24421.	0.	AREA =	32.60
NO.=	11	RECEPT NO. =	11	11	X-Y COORD =	112.50	117.50	TPOPL - WKRPL =	24421.	0.	AREA =	32.60
NO.=	12	RECEPT NO. =	12	11	X-Y COORD =	107.50	117.50	TPOPL - WKRPL =	9743.	0.	AREA =	32.60
NO.=	13	RECEPT NO. =	13	11	X-Y COORD =	102.50	117.50	TPOPL - WKRPL =	4643.	0.	AREA =	23.40
NO.=	14	RECEPT NO. =	14	11	X-Y COORD =	97.50	112.50	TPOPL - WKRPL =	15616.	0.	AREA =	49.50
NO.=	15	RECEPT NO. =	15	11	X-Y COORD =	102.50	112.50	TPOPL - WKRPL =	6449.	0.	AREA =	32.60

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NO.=	200	RECEPT NO. =	200	39	X-Y COORD =	55.00	25.00	TPOPL - WKRPL =	18667.	0.	AREA =	125.80
NO.=	201	RECEPT NO. =	201	39	X-Y COORD =	45.00	25.00	TPOPL - WKRPL =	17560.	0.	AREA =	125.80
NO.=	202	RECEPT NO. =	202	39	X-Y COORD =	35.00	24.00	TPOPL - WKRPL =	14426.	0.	AREA =	140.90
NO.=	203	RECEPT NO. =	203	39	X-Y COORD =	25.00	18.00	TPOPL - WKRPL =	4146.	0.	AREA =	149.70
NO.=	204	RECEPT NO. =	204	39	X-Y COORD =	47.00	18.00	TPOPL - WKRPL =	9487.	0.	AREA =	67.90
NO.=	205	RECEPT NO. =	205	39	X-Y COORD =	55.00	17.00	TPOPL - WKRPL =	21877.	0.	AREA =	100.60
NO.=	206	RECEPT NO. =	206	37	X-Y COORD =	18.50	71.50	TPOPL - WKRPL =	22001.	0.	AREA =	106.10
NO.=	207	RECEPT NO. =	207	36	X-Y COORD =	7.50	82.00	TPOPL - WKRPL =	7955.	0.	AREA =	107.80
NO.=	208	RECEPT NO. =	208	39	X-Y COORD =	69.00	46.00	TPOPL - WKRPL =	1549.	0.	AREA =	10.10
NO.=	209	RECEPT NO. =	209	25	X-Y COORD =	75.00	56.50	TPOPL - WKRPL =	181590.	0.	AREA =	25.60
NO.=	210	RECEPT NO. =	210	28	X-Y COORD =	88.00	57.50	TPOPL - WKRPL =	39096.	0.	AREA =	6.80
NO.=	211	RECEPT NO. =	211	28	X-Y COORD =	105.00	59.50	TPOPL - WKRPL =	24791.	0.	AREA =	17.80
NO.=	212	RECEPT NO. =	212	29	X-Y COORD =	120.00	61.50	TPOPL - WKRPL =	14484.	0.	AREA =	13.70
NO.=	213	RECEPT NO. =	213	29	X-Y COORD =	132.00	64.50	TPOPL - WKRPL =	9600.	0.	AREA =	20.60
NO.=	214	RECEPT NO. =	214	29	X-Y COORD =	135.00	92.00	TPOPL - WKRPL =	21333.	0.	AREA =	45.80
NO.=	215	RECEPT NO. =	215	29	X-Y COORD =	145.00	92.00	TPOPL - WKRPL =	21333.	0.	AREA =	45.80

LONG-TERM POPULATION EXPOSURE MODEL - N.Y., N.J., CONN. AREA

AIR QUALITY MONITORING DATA

				YEAR : 1971.	1974.
2	ST.ID.NO. =	2	11	58.0	45.0
5	ST.ID.NO. =	5	11	68.0	38.0
6	ST.ID.NO. =	6	11	55.0	44.0
7	ST.ID.NO. =	7	11	61.0	51.0
8	ST.ID.NO. =	8	11	58.0	53.0
10	ST.ID.NO. =	10	11	46.0	44.0
11	ST.ID.NO. =	11	11	75.0	65.0
12	ST.ID.NO. =	12	11	60.0	53.0
13	ST.ID.NO. =	13	11	73.0	48.0
15	ST.ID.NO. =	15	11	125.0	36.0
16	ST.ID.NO. =	16	11	46.0	46.0
18	ST.ID.NO. =	18	11	58.0	36.0
20	ST.ID.NO. =	20	32	90.0	65.0
151	ST.ID.NO. =	151	27	80.0	63.0
152	ST.ID.NO. =	152	27	90.0	74.0
153	ST.ID.NO. =	153	27	71.0	61.0
154	ST.ID.NO. =	154	24	90.0	60.0
155	ST.ID.NO. =	155	23	95.0	65.0
156	ST.ID.NO. =	156	23	88.0	62.0
157	ST.ID.NO. =	157	25	123.0	99.0
158	ST.ID.NO. =	158	25	105.0	74.0
159	ST.ID.NO. =	159	25	112.0	72.0
160	ST.ID.NO. =	160	25	77.0	59.0
161	ST.ID.NO. =	161	26	70.0	57.0
162	ST.ID.NO. =	162	26	83.0	69.0
	STATION AVERAGE =			79.20	61.15

LONG-TERM POPULATION EXPOSURE MODEL - N.Y., N.J., CONN. AREA

NRECEP = 215 NRSA = 215 NMONT = 182 NSITES= 103 NPOPL = 4
NYEAR = 2 SYEAR = 1971.0 DELYR = 3.0 AQSTD = 75.0

INTERPOLATED - EXTERPOLATED CONCENRATIONS AT RECEPTOR SITES YEAR = 1971.0
NO. OF VALID MONITORING STATIONS= 103

RECEPT NO. =	1	11	67.2
RECEPT NO. =	2	11	67.2
RECEPT NO. =	3	11	61.8
RECEPT NO. =	4	11	60.8
RECEPT NO. =	5	11	67.2
RECEPT NO. =	6	11	66.2
RECEPT NO. =	7	11	60.1
RECEPT NO. =	8	11	58.4
RECEPT NO. =	9	11	59.5
RECEPT NO. =	10	11	67.7
RECEPT NO. =	11	11	67.7
RECEPT NO. =	12	11	67.5
RECEPT NO. =	13	11	60.2
RECEPT NO. =	14	11	64.9
RECEPT NO. =	15	11	56.4

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RECEPT NO. =	200	39	74.4
RECEPT NO. =	201	39	65.6
RECEPT NO. =	202	39	55.3
RECEPT NO. =	203	39	52.7
RECEPT NO. =	204	39	67.1
RECEPT NO. =	205	39	74.3
RECEPT NO. =	206	37	65.2
RECEPT NO. =	207	36	59.7
RECEPT NO. =	208	39	82.9
RECEPT NO. =	209	25	79.9
RECEPT NO. =	210	28	84.2
RECEPT NO. =	211	28	82.1
RECEPT NO. =	212	29	64.8
RECEPT NO. =	213	29	59.1
RECEPT NO. =	214	29	71.6
RECEPT NO. =	215	29	60.7

LONG-TERM POPULATION EXPOSURE MODEL - N.Y., N.J., CONN. AREA

NRECEP = 215 NRSA = 215 NMONT = 182 NSITES= 103 NPOPL = 4
NYEAR = 2 SYEAR = 1971.0 DELYR = 3.0 AQSTD = 75.0

EXPOSURE DISTRIBUTIONS FOR YEAR = 1971.0 POPL CL = 1 TPOPL = 17982208. TAREA = 11828.

POPULATION AND LAND AREA EXPOSURE DISTRIBUTIONS

AIR QUALITY VALUE	DISTRIBUTION FUNCTIONS AREA	DISTRIBUTION FUNCTIONS POPULATION	FREQUENCY FUNCTIONS AREA	FREQUENCY FUNCTIONS POPULATION
115.0	.0121	.0836	.0121	.0836
110.0	.0192	.1138	.0071	.0302
105.0	.0249	.1590	.0057	.0451
100.0	.0363	.1951	.0114	.0361
95.0	.0527	.2620	.0164	.0669
90.0	.0762	.3445	.0235	.0825
85.0	.1016	.4156	.0254	.0711
80.0	.1225	.4659	.0209	.0503
75.0	.1856	.5786	.0631	.1127
70.0	.3245	.6744	.1389	.0958
65.0	.5034	.7945	.1789	.1201
60.0	.6056	.8619	.1022	.0673
55.0	.8225	.9353	.2169	.0735
50.0	.9368	.9785	.1143	.0431
45.0	.9886	.9989	.0519	.0205
40.0	1.0000	1.0000	.0114	.0011
35.0	1.0000	1.0000	.0000	.0000
30.0	1.0000	1.0000	.0000	.0000

SPATIAL AVERAGE CONCENTRATION = 66.7623
POPULATION AVERAGE CONCENTRATION= 83.0952

LONG-TERM POPULATION EXPOSURE MODEL - N.Y., N.J., CONN. AREA

NRECEP = 215 NRSA = 215 NMONT = 182 NSITES= 103 NPOPL = 4
NYEAR = 2 SYEAR = 1971.0 DELYR = 3.0 AQSTD = 75.0

EXPOSURE DISTRIBUTIONS FOR YEAR = 1971.0 POPL CL = 2 TPOPL = 9278015. TAREA = 11828.

POPULATION AND LAND AREA EXPOSURE DISTRIBUTIONS

AIR QUALITY VALUE	DISTRIBUTION FUNCTIONS AREA	DISTRIBUTION FUNCTIONS POPULATION	FREQUENCY FUNCTIONS AREA	FREQUENCY FUNCTIONS POPULATION
115.0	.0121	.0775	.0121	.0775
110.0	.0192	.1009	.0071	.0234
105.0	.0249	.1314	.0057	.0305
100.0	.0363	.1644	.0114	.0330
95.0	.0527	.2232	.0164	.0588
90.0	.0762	.3029	.0235	.0797
85.0	.1016	.3710	.0254	.0681
80.0	.1225	.4205	.0209	.0495
75.0	.1856	.5277	.0631	.1071
70.0	.3245	.6323	.1389	.1046
65.0	.5034	.7633	.1789	.1310
60.0	.6056	.8384	.1022	.0751
55.0	.8225	.9210	.2169	.0825
50.0	.9368	.9734	.1143	.0524
45.0	.9886	.9987	.0519	.0253
40.0	1.0000	1.0000	.0114	.0013
35.0	1.0000	1.0000	.0000	.0000
30.0	1.0000	1.0000	.0000	.0000

SPATIAL AVERAGE CONCENTRATION = 66.7623
POPULATION AVERAGE CONCENTRATION= 80.9489

LONG-TERM POPULATION EXPOSURE MODEL - N.Y., N.J., CONN. AREA

NRECEP = 215 NRSA = 215 NMONT = 182 NSITES= 103 NPOPL = 4
NYEAR = 2 SYEAR = 1971.0 DELYR = 3.0 AQSTD = 75.0

EXPOSURE DISTRIBUTIONS FOR YEAR = 1971.0 POPL CL = 3 TPOPL = 1843945. TAREA = 11828.

POPULATION AND LAND AREA EXPOSURE DISTRIBUTIONS

AIR QUALITY VALUE	DISTRIBUTION FUNCTIONS AREA	DISTRIBUTION FUNCTIONS POPULATION	FREQUENCY FUNCTIONS AREA	FREQUENCY FUNCTIONS POPULATION
115.0	.0121	.0937	.0121	.0937
110.0	.0192	.1317	.0071	.0379
105.0	.0249	.1920	.0057	.0604
100.0	.0363	.2321	.0114	.0401
95.0	.0527	.3081	.0164	.0760
90.0	.0762	.3953	.0235	.0872
85.0	.1016	.4704	.0254	.0751
80.0	.1225	.5220	.0209	.0516
75.0	.1856	.6434	.0631	.1214
70.0	.3245	.7301	.1389	.0867
65.0	.5034	.8309	.1789	.1008
60.0	.6056	.8907	.1022	.0598
55.0	.8225	.9537	.2169	.0630
50.0	.9368	.9839	.1143	.0302
45.0	.9886	.9994	.0519	.0155
40.0	1.0000	1.0000	.0114	.0006
35.0	1.0000	1.0000	.0000	.0000
30.0	1.0000	1.0000	.0000	.0000

SPATIAL AVERAGE CONCENTRATION = 66.7623
POPULATION AVERAGE CONCENTRATION= 85.7902

LONG-TERM POPULATION EXPOSURE MODEL - N.Y., N.J., CONN. AREA

NRECEP = 215 NRSA = 215 NMONT = 182 NSITES= 103 NPOPL = 4
NYEAR = 2 SYEAR = 1971.0 DELYR = 3.0 AQSTD = 75.0

EXPOSURE DISTRIBUTIONS FOR YEAR = 1971.0 POPL CL = 4 TPOPL = 2684941. TAREA = 11828.

POPULATION AND LAND AREA EXPOSURE DISTRIBUTIONS

AIR QUALITY VALUE	DISTRIBUTION FUNCTIONS AREA	DISTRIBUTION FUNCTIONS POPULATION	FREQUENCY FUNCTIONS AREA	FREQUENCY FUNCTIONS POPULATION
115.0	.0121	.1317	.0121	.1317
110.0	.0192	.1769	.0071	.0452
105.0	.0249	.2577	.0057	.0808
100.0	.0363	.2882	.0114	.0305
95.0	.0527	.3778	.0164	.0896
90.0	.0762	.4858	.0235	.1080
85.0	.1016	.5668	.0254	.0810
80.0	.1225	.6222	.0209	.0554
75.0	.1856	.7557	.0631	.1335
70.0	.3245	.8036	.1389	.0479
65.0	.5034	.9111	.1789	.1076
60.0	.6056	.9562	.1022	.0450
55.0	.8225	.9798	.2169	.0237
50.0	.9368	.9950	.1143	.0152
45.0	.9886	.9998	.0519	.0047
40.0	1.0000	1.0000	.0114	.0002
35.0	1.0000	1.0000	.0000	.0000
30.0	1.0000	1.0000	.0000	.0000

SPATIAL AVERAGE CONCENTRATION = 66.7623
POPULATION AVERAGE CONCENTRATION= 91.2631

LONG-TERM POPULATION EXPOSURE MODEL - N.Y., N.J., CONN. AREA

NRECEP = 215 NRSA = 215 NMONT = 182 NSITES= 103 NPOPL = 4
NYEAR = 2 SYEAR = 1971.0 DELYR = 3.0 AQSTD = 75.0

INTERPOLATED - EXTERPOLATED CONCENRATIONS AT RECEPTOR SITES YEAR = 1974.0
NO. OF VALID MONITORING STATIONS= 103

RECEPT NO. =	1	11	45.9
RECEPT NO. =	2	11	46.1
RECEPT NO. =	3	11	39.6
RECEPT NO. =	4	11	39.9
RECEPT NO. =	5	11	46.9
RECEPT NO. =	6	11	42.1
RECEPT NO. =	7	11	39.9
RECEPT NO. =	8	11	38.3
RECEPT NO. =	9	11	43.4
RECEPT NO. =	10	11	38.5
RECEPT NO. =	11	11	45.3
RECEPT NO. =	12	11	48.5
RECEPT NO. =	13	11	49.0
RECEPT NO. =	14	11	43.4
RECEPT NO. =	15	11	48.9
RECEPT NO. =	16	11	50.1

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RECEPT NO. =	200	39	53.9
RECEPT NO. =	201	39	59.4
RECEPT NO. =	202	39	58.7
RECEPT NO. =	203	39	56.9
RECEPT NO. =	204	39	53.6
RECEPT NO. =	205	39	54.1
RECEPT NO. =	206	37	50.0
RECEPT NO. =	207	36	46.2
RECEPT NO. =	208	39	70.5
RECEPT NO. =	209	25	67.3
RECEPT NO. =	210	28	64.1
RECEPT NO. =	211	28	53.4
RECEPT NO. =	212	29	50.2
RECEPT NO. =	213	29	42.2
RECEPT NO. =	214	29	44.9
RECEPT NO. =	215	29	39.2

LONG-TERM POPULATION EXPOSURE MODEL - N.Y., N.J., CONN. AREA

NRECEP = 215 NRSA = 215 NMONT = 182 NSITES= 103 NPOPL = 4
NYEAR = 2 SYEAR = 1971.0 DELYR = 3.0 AQSTD = 75.0

EXPOSURE DISTRIBUTIONS FOR YEAR = 1974.0 POPL CL = 1 TPOPL = 17982208. TAREA = 11828.

POPULATION AND LAND AREA EXPOSURE DISTRIBUTIONS

AIR QUALITY VALUE	DISTRIBUTION FUNCTIONS AREA	DISTRIBUTION FUNCTIONS POPULATION	FREQUENCY FUNCTIONS AREA	FREQUENCY FUNCTIONS POPULATION
115.0	.0000	.0000	.0000	.0000
110.0	.0000	.0000	.0000	.0000
105.0	.0000	.0000	.0000	.0000
100.0	.0000	.0000	.0000	.0000
95.0	.0000	.0000	.0000	.0000
90.0	.0051	.0247	.0051	.0247
85.0	.0064	.0309	.0013	.0062
80.0	.0151	.1074	.0086	.0765
75.0	.0360	.1700	.0210	.0627
70.0	.0773	.2802	.0412	.1102
65.0	.1190	.3668	.0417	.0865
60.0	.2191	.5034	.1002	.1367
55.0	.3929	.6912	.1737	.1877
50.0	.5861	.8024	.1932	.1112
45.0	.8377	.9328	.2517	.1304
40.0	.9329	.9807	.0952	.0479
35.0	1.0000	1.0000	.0671	.0193
30.0	1.0000	1.0000	.0000	.0000

SPATIAL AVERAGE CONCENTRATION = 53.7042
POPULATION AVERAGE CONCENTRATION= 61.7273

LONG-TERM POPULATION EXPOSURE MODEL - N.Y., N.J., CONN. AREA

NRECEP = 215 NRSA = 215 NMONT = 182 NSITES= 103 NPOPL = 4
NYEAR = 2 SYEAR = 1971.0 DELYR = 3.0 AQSTD = 75.0

EXPOSURE DISTRIBUTIONS FOR YEAR = 1974.0 POPL CL = 2 TPOPL = 9274015. TAREA = 11828.

POPULATION AND LAND AREA EXPOSURE DISTRIBUTIONS

AIR QUALITY VALUE	DISTRIBUTION FUNCTIONS AREA	DISTRIBUTION FUNCTIONS POPULATION	FREQUENCY FUNCTIONS AREA	FREQUENCY FUNCTIONS POPULATION
115.0	.0000	.0000	.0000	.0000
110.0	.0000	.0000	.0000	.0000
105.0	.0000	.0000	.0000	.0000
100.0	.0000	.0000	.0000	.0000
95.0	.0000	.0000	.0000	.0000
90.0	.0051	.0168	.0051	.0168
85.0	.0064	.0218	.0013	.0050
80.0	.0151	.0865	.0086	.0647
75.0	.0360	.1412	.0210	.0547
70.0	.0773	.2468	.0412	.1056
65.0	.1190	.3325	.0417	.0857
60.0	.2191	.4634	.1002	.1309
55.0	.3929	.6481	.1737	.1847
50.0	.5861	.7736	.1932	.1256
45.0	.8377	.9215	.2517	.1479
40.0	.9329	.9764	.0952	.0549
35.0	1.0000	1.0000	.0671	.0236
30.0	1.0000	1.0000	.0000	.0000

SPATIAL AVERAGE CONCENTRATION = 53.7042
POPULATION AVERAGE CONCENTRATION= 60.4740

LONG-TERM POPULATION EXPOSURE MODEL - N.Y., N.J., CONN. AREA

NRECEP = 215 NRSA = 215 NMONT = 182 NSITES= 103 NPOPL = 4
NYEAR = 2 SYEAR = 1971.0 DELYR = 3.0 AQSTD = 75.0

EXPOSURE DISTRIBUTIONS FOR YEAR = 1974.0 POPL CL = 3 TPOPL = 1893995. TAREA = 11828.

POPULATION AND LAND AREA EXPOSURE DISTRIBUTIONS

AIR QUALITY VALUE	DISTRIBUTION FUNCTIONS AREA	DISTRIBUTION FUNCTIONS POPULATION	FREQUENCY FUNCTIONS AREA	FREQUENCY FUNCTIONS POPULATION
115.0	.0000	.0000	.0000	.0000
110.0	.0000	.0000	.0000	.0000
105.0	.0000	.0000	.0000	.0000
100.0	.0000	.0000	.0000	.0000
95.0	.0000	.0000	.0000	.0000
90.0	.0051	.0330	.0051	.0330
85.0	.0064	.0405	.0013	.0075
80.0	.0151	.1327	.0086	.0922
75.0	.0360	.2034	.0210	.0707
70.0	.0773	.3197	.0412	.1163
65.0	.1190	.4052	.0417	.0855
60.0	.2191	.5491	.1002	.1438
55.0	.3929	.7384	.1737	.1893
50.0	.5861	.8332	.1932	.0949
45.0	.8377	.9431	.2517	.1099
40.0	.9329	.9842	.0952	.0410
35.0	1.0000	1.0000	.0671	.0158
30.0	1.0000	1.0000	.0000	.0000

SPATIAL AVERAGE CONCENTRATION = 53.7042
POPULATION AVERAGE CONCENTRATION= 63.1477

LONG-TERM POPULATION EXPOSURE MODEL - N.Y., N.J., CONN. AREA

NRECEP = 215 NRSA = 215 NMONT = 182 NSITES= 103 NPOPL = 4
NYEAR = 2 SYEAR = 1971.0 DELYR = 3.0 AQSTD = 75.0

EXPOSURE DISTRIBUTIONS FOR YEAR = 1974.0 POPL CL = 4 TPOPL = 26869911. TAREA = 11828.

POPULATION AND LAND AREA EXPOSURE DISTRIBUTIONS

AIR QUALITY VALUE	DISTRIBUTION FUNCTIONS AREA	DISTRIBUTION FUNCTIONS POPULATION	FREQUENCY FUNCTIONS AREA	FREQUENCY FUNCTIONS POPULATION
115.0	.0000	.0000	.0000	.0000
110.0	.0000	.0000	.0000	.0000
105.0	.0000	.0000	.0000	.0000
100.0	.0000	.0000	.0000	.0000
95.0	.0000	.0000	.0000	.0000
90.0	.0051	.0429	.0051	.0429
85.0	.0064	.0490	.0013	.0061
80.0	.0151	.1835	.0086	.1346
75.0	.0360	.2470	.0210	.0635
70.0	.0773	.3979	.0412	.1509
65.0	.1190	.4729	.0417	.0749
60.0	.2191	.6674	.1002	.1945
55.0	.3929	.8558	.1737	.1884
50.0	.5961	.9131	.1932	.0573
45.0	.8377	.9816	.2517	.0686
40.0	.9329	.9960	.0952	.0144
35.0	1.0000	1.0000	.0671	.0040
30.0	1.0000	1.0000	.0000	.0000

SPATIAL AVERAGE CONCENTRATION = 53.7092
POPULATION AVERAGE CONCENTRATION= 66.1102

3.2 SPEM: Short-Term Population Exposure Model

A. Description

Concentrations at 8 percentiles are estimated at a network of receptor points from the same percentile concentrations at a network of monitoring sites. For each receptor, the program calculates the concentrations from the nearest 3 stations by use of an interpolation formula. A penalty distance can be imposed to account for the influence of barriers such as mountains.

After the percentile concentration distribution is estimated at each receptor point, the fraction of time above a specified threshold concentration is estimated. This is termed risk frequency. Given the risk frequency at each receptor point, exposure statistics are calculated for land area; total population and subpopulations (such as schoolage and elderly).

B. Input Data - General Description

1. Title Card for output tables - Card 1

2. Parameter cards - Card 2,3

3. Percentile concentrations specifies 7 percentiles P2,...P8 for concentration input data. Another percentile, P1 corresponds to the maximum observation and is calculated by the program as 100/(NOBS + 1). Number of observations (NOBS) = 8720 for hourly data and NOBS = 365 for 24 hour data. Percentile values should be selected so that concentration values bracket the threshold value. If possible set P2, P5 and P7 to interesting percentiles such as 1, 10, 50 because of tabulated statistics (See 3.2F). Note that percentiles are defined as percent of observations greater than the specified concentration.

4. Barriers - When barriers are included, the following are required: One card for number of barriers and number of nodes per barrier. One card for each node and penalty distance associated with the node. Up to 20 barriers are allowed. Penalty distance is interpolated between nodes and is added to distance between receptors and monitors for spatial interpolations. If barriers are not used, no cards are needed.

5. Characteristics of Statistical areas - same as input data for LPEM (no.4)

6. Receptor coordinates - same as input data for LPEM (no. 5).

7. No. of receptors per statistical area - same as input data for LPEM (no.6).

8. Site coordinates - same as input data for LPEM (no.7)

9. Population Data - same as input data for LPEM (no. 9).

10. Concentration Data - One card or record for each site. Each record contains a 2 part site ID code and concentrations values for 8 specified percentiles. Only records for sites with data need be included.

11. If additional air quality data are to be analyzed, repeat SPEM items 9 and 10.

C. SPEM Input Data - List of parameters and record format description

Card Column	Variable Type	
		4. Percentile values-defined as percent of observations above specific concentration value parameters
1-5	F	P TILE (2)-percentile corresponding to highest concentration value (<Max.)
6-10	F	P TILE (3)
11-15	F	P TILE (4)
16-20	F	P TILE (5) (if possible set equal to 10)
21-25	F	P TILE (6)
26-30	F	P TILE (7) (if possible set equal tp 50)
31-35	F	P TILE (8)- percentile corresponding to lowest concentration

(P TILE (4) through P TILE (7): intermmediate percentiles in ascending order)

		10. Concentration data-one card or record for each site with data. parameters
1-5	I	IN - first part of 2 part ID code
6-10	I	KN - second part of 2 part ID code
11-16		(not used)
17-24	F	CMF(IN,1) - maximum concentration
25-32	F	CMF(IN,2) - concentration corresponding to PTILE(2)
33-40	F	CMF(IN,3) - concentration corresponding to PTILE(3)
41-48	F	CMF(IN,4) - concentration corresponding to PTILE(4)
49-56	F	CMF(IN,5) - concentration corresponding to PTILE(5)
57-64	F	CMF(IN,6) - concentration corresponding to PTILE(6)
65-72	F	CMF(IN,7) - concentration corresponding to PTILE(7)
73-80	F	CMF(IN,8) - lowest concentration corresponding to PTILE(8)

D. Sample Run Stream on UNIVAC for SPEM

```
@ ASG,A  TRRP*POPEXP.
@ XQT  TRRP*POPEXP.SPEM            executable version of program
@ ADD  TRRP*POPEXP.SPEM-DATA/LA    sample data
@ ELT,ISL  user file.element  }
@ ADD  8.                     }    saves estimated risk frequency at
@ EOF                         }    receptor sites with x y coordinates
                              }    on user file (OPTIONAL)
@ FIN
```

E. Description of Temporary Output Data Files Created by SPEM

1. Estimated Risk Frequency at Receptor Points - output on unit 8

The first record specifies the number of receptor points, r, included in the analysis. The next r records contain information for these r points. Each of these records contain a value for estimated risk frequency, x and y coordinates for the point, receptor number and year. For each additional year of input data, the above pattern is repeated.

Record formats are the same as Monitoring Data from LPEM.

F. Description of SPEM Output

1. The first table describes the input data for characteristics of the statistical areas in terms of land areas, percent of subpopulations and number of receptors per statistical areas.

2. The second table is a printout of the input x y coordinates for all monitoring stations.

3. Then for each year of input data, the following tables are produced.

a. As a description of the report data, tables are provided for total population per statistical area, receptor specification data, input monitoring percentile data.

b. A table is provided for interpolated-extrapolated percentile concentrations at the receptor sites.

c. A table is provided for percent of time (risk) that receptor concentrations exceed multipls of threshold concentration.

4. For each year of input data, tables of exposure distribution are provided for total population and each subpopulation. Population class 1 refers to the total population, and population class i refers to subpopulation i-1.

a. For three percentile concentrations, cumulative frequency distributions and frequency functions are provided for population and land area exposure. Spatial and population weighted average concentrations are also provided for the three percentiles.

b. Risk frequency distribution and frequency functions are provided for each total population and each subpopulation. These indicate the fraction of population exposed to levels above multiples of the threshold concentration for various percentages of the time. Spatial and population weighted average frequency of exposure are also provided.

SHORT-TERM POPULATION EXPOSURE MODEL - LOS ANGELES AREA

NRECEP = 58 NRSA = 55 NMONT = 10 NSITES = 10 NPOPL = 1
NYEAR = 1 SYEAR = 1973.0 DELYR = 2.0 AQSTD = 8.0

CENSUS DATA - PER CENT OF TOTAL POPULATION

NO. = 1	SA = 1	0	AREA = 919.0	SUBPOP A,B,C,D (IN%) =	21.3	10.7	2.4	33.6	RECEPTORS PER SA =	0
NO. = 2	SA = 2	0	AREA = 325.0	SUBPOP A,B,C,D (IN%) =	25.7	11.2	1.9	39.3	RECEPTORS PER SA =	0
NO. = 3	SA = 3	0	AREA = 194.0	SUBPOP A,B,C,D (IN%) =	29.4	5.3	8.1	35.7	RECEPTORS PER SA =	0
NO. = 4	SA = 4	0	AREA = 137.0	SUBPOP A,B,C,D (IN%) =	36.0	2.9	1.3	35.3	RECEPTORS PER SA =	0
NO. = 5	SA = 5	0	AREA = 150.0	SUBPOP A,B,C,D (IN%) =	32.9	3.9	1.4	38.5	RECEPTORS PER SA =	0
NO. = 6	SA = 6	0	AREA = 139.0	SUBPOP A,B,C,D (IN%) =	27.3	9.6	2.2	41.2	RECEPTORS PER SA =	0
NO. = 7	SA = 7	0	AREA = 92.2	SUBPOP A,B,C,D (IN%) =	31.0	3.9	1.4	40.7	RECEPTORS PER SA =	1
NO. = 8	SA = 8	0	AREA = 379.0	SUBPOP A,B,C,D (IN%) =	29.5	4.7	2.8	37.7	RECEPTORS PER SA =	0
NO. = 9	SA = 9	0	AREA = 974.0	SUBPOP A,B,C,D (IN%) =	28.6	7.8	4.8	39.3	RECEPTORS PER SA =	0
NO. = 10	SA = 10	0	AREA = 678.0	SUBPOP A,B,C,D (IN%) =	29.9	7.7	5.2	35.3	RECEPTORS PER SA =	0
NO. = 11	SA = 11	0	AREA = 527.0	SUBPOP A,B,C,D (IN%) =	18.9	8.7	6.1	34.5	RECEPTORS PER SA =	0
NO. = 12	SA = 12	0	AREA = 144.8	SUBPOP A,B,C,D (IN%) =	25.8	6.4	1.5	45.0	RECEPTORS PER SA =	3
NO. = 13	SA = 13	0	AREA = 39.9	SUBPOP A,B,C,D (IN%) =	19.3	10.2	2.0	48.8	RECEPTORS PER SA =	2
NO. = 14	SA = 14	0	AREA = 76.5	SUBPOP A,B,C,D (IN%) =	31.3	5.3	8.5	39.1	RECEPTORS PER SA =	2
NO. = 15	SA = 15	0	AREA = 86.9	SUBPOP A,B,C,D (IN%) =	24.9	5.4	1.8	46.1	RECEPTORS PER SA =	1
NO. = 16	SA = 16	0	AREA = 74.4	SUBPOP A,B,C,D (IN%) =	17.4	11.1	8.6	48.7	RECEPTORS PER SA =	2
NO. = 17	SA = 17	0	AREA = 97.1	SUBPOP A,B,C,D (IN%) =	17.2	14.5	39.6	48.1	RECEPTORS PER SA =	5
NO. = 18	SA = 18	0	AREA = 67.9	SUBPOP A,B,C,D (IN%) =	22.7	6.9	14.1	47.4	RECEPTORS PER SA =	3
NO. = 19	SA = 19	0	AREA = 95.2	SUBPOP A,B,C,D (IN%) =	27.7	5.5	8.7	39.2	RECEPTORS PER SA =	3
NO. = 20	SA = 20	0	AREA = 60.6	SUBPOP A,B,C,D (IN%) =	19.2	12.5	7.2	41.9	RECEPTORS PER SA =	3
NO. = 21	SA = 21	0	AREA = 101.0	SUBPOP A,B,C,D (IN%) =	27.3	8.4	36.4	35.8	RECEPTORS PER SA =	5
NO. = 22	SA = 22	0	AREA = 120.0	SUBPOP A,B,C,D (IN%) =	28.1	5.7	2.0	41.5	RECEPTORS PER SA =	3
NO. = 23	SA = 23	0	AREA = 6.2	SUBPOP A,B,C,D (IN%) =	10.9	16.4	16.8	44.0	RECEPTORS PER SA =	1
NO. = 24	SA = 24	0	AREA = 71.4	SUBPOP A,B,C,D (IN%) =	20.2	13.0	6.8	45.0	RECEPTORS PER SA =	3
NO. = 25	SA = 25	0	AREA = 146.0	SUBPOP A,B,C,D (IN%) =	22.5	12.0	9.2	43.1	RECEPTORS PER SA =	4
NO. = 26	SA = 26	0	AREA = 170.0	SUBPOP A,B,C,D (IN%) =	33.2	4.3	3.6	38.4	RECEPTORS PER SA =	3
NO. = 27	SA = 27	0	AREA = 60.0	SUBPOP A,B,C,D (IN%) =	27.4	9.6	9.0	38.9	RECEPTORS PER SA =	1
NO. = 28	SA = 28	0	AREA = 236.0	SUBPOP A,B,C,D (IN%) =	29.0	7.2	3.6	37.6	RECEPTORS PER SA =	2
NO. = 29	SA = 29	0	AREA = 231.0	SUBPOP A,B,C,D (IN%) =	26.6	11.2	8.1	34.8	RECEPTORS PER SA =	2
NO. = 30	SA = 30	0	AREA = 806.0	SUBPOP A,B,C,D (IN%) =	26.0	10.1	1.0	38.6	RECEPTORS PER SA =	0
NO. = 31	SA = 31	0	AREA = 9484.0	SUBPOP A,B,C,D (IN%) =	21.4	3.0	9.8	20.9	RECEPTORS PER SA =	0
NO. = 32	SA = 32	0	AREA = 3034.0	SUBPOP A,B,C,D (IN%) =	28.4	7.4	7.9	31.0	RECEPTORS PER SA =	0
NO. = 33	SA = 33	0	AREA = 3452.0	SUBPOP A,B,C,D (IN%) =	17.4	20.2	4.2	21.1	RECEPTORS PER SA =	0
NO. = 34	SA = 34	0	AREA = 2880.0	SUBPOP A,B,C,D (IN%) =	25.9	11.4	8.1	39.4	RECEPTORS PER SA =	0
NO. = 35	SA = 35	0	AREA = 28.8	SUBPOP A,B,C,D (IN%) =	33.1	3.4	2.5	38.9	RECEPTORS PER SA =	1
NO. = 36	SA = 36	0	AREA = 45.6	SUBPOP A,B,C,D (IN%) =	28.4	5.8	2.4	42.7	RECEPTORS PER SA =	1
NO. = 37	SA = 37	0	AREA = 49.8	SUBPOP A,B,C,D (IN%) =	28.4	5.7	2.3	42.7	RECEPTORS PER SA =	2
NO. = 38	SA = 38	0	AREA = 62.4	SUBPOP A,B,C,D (IN%) =	29.2	7.1	2.4	38.4	RECEPTORS PER SA =	2
NO. = 39	SA = 39	0	AREA = 100.0	SUBPOP A,B,C,D (IN%) =	21.7	13.2	1.7	42.5	RECEPTORS PER SA =	0
NO. = 40	SA = 40	0	AREA = 71.1	SUBPOP A,B,C,D (IN%) =	22.7	14.0	2.4	36.2	RECEPTORS PER SA =	0
NO. = 41	SA = 41	0	AREA = 101.0	SUBPOP A,B,C,D (IN%) =	33.6	3.2	1.8	37.1	RECEPTORS PER SA =	1
NO. = 42	SA = 42	0	AREA = 52.2	SUBPOP A,B,C,D (IN%) =	27.2	6.9	4.4	41.4	RECEPTORS PER SA =	2
NO. = 43	SA = 43	0	AREA = 205.0	SUBPOP A,B,C,D (IN%) =	31.4	2.4	1.5	36.5	RECEPTORS PER SA =	0
NO. = 44	SA = 44	0	AREA = 90.4	SUBPOP A,B,C,D (IN%) =	20.1	10.0	6.4	19.3	RECEPTORS PER SA =	0
NO. = 45	SA = 45	0	AREA = 61.1	SUBPOP A,B,C,D (IN%) =	28.3	9.0	8.9	34.6	RECEPTORS PER SA =	0
NO. = 46	SA = 46	0	AREA = 354.0	SUBPOP A,B,C,D (IN%) =	28.0	7.5	6.4	36.3	RECEPTORS PER SA =	0
NO. = 47	SA = 47	0	AREA = 289.0	SUBPOP A,B,C,D (IN%) =	20.2	30.0	11.1	22.4	RECEPTORS PER SA =	0

NO. = 48	SA =	48	0	AREA = 129.0	SUBPOP A,B,C,D (IN%) =	17.5	32.1	2.2	28.3	RECEPTORS PER SA = 0
NO. = 49	SA =	49	0	AREA = 504.0	SUBPOP A,B,C,D (IN%) =	22.2	24.0	8.1	30.0	RECEPTORS PER SA = 0
NO. = 50	SA =	50	0	AREA = 238.0	SUBPOP A,B,C,D (IN%) =	23.5	22.2	9.3	31.1	RECEPTORS PER SA = 0
NO. = 51	SA =	51	0	AREA = 709.0	SUBPOP A,B,C,D (IN%) =	21.1	17.4	2.4	34.6	RECEPTORS PER SA = 0
NO. = 52	SA =	52	0	AREA = 478.0	SUBPOP A,B,C,D (IN%) =	17.3	22.1	5.1	39.1	RECEPTORS PER SA = 0
NO. = 53	SA =	53	0	AREA = 347.0	SUBPOP A,B,C,D (IN%) =	31.2	5.5	8.6	39.9	RECEPTORS PER SA = 0
NO. = 54	SA =	54	0	AREA = 4070.0	SUBPOP A,B,C,D (IN%) =	29.8	6.9	9.6	36.8	RECEPTORS PER SA = 0
NO. = 55	SA =	55	0	AREA = 4241.0	SUBPOP A,B,C,D (IN%) =	32.1	7.5	6.1	33.9	RECEPTORS PER SA = 0

SHORT-TERM POPULATION EXPOSURE MODEL - LOS ANGELES AREA

NREGP = 58 NRSA = 55 NMONT = 10 NSITES = 10 NPOPL = 1
NYEAR = 1 SYEAR = 1973.0 DELYR = 2.0 AGSTD = 8.0

AIR MONITORING STATIONS

NO.=	1	STATION NO.=	1	0	X-Y COORDINATE =	1824.	1340.
NO.=	2	STATION NO.=	2	0	X-Y COORDINATE =	1819.	1634.
NO.=	3	STATION NO.=	3	0	X-Y COORDINATE =	1520.	1681.
NO.=	4	STATION NO.=	4	0	X-Y COORDINATE =	1470.	1446.
NO.=	5	STATION NO.=	5	0	X-Y COORDINATE =	1610.	1346.
NO.=	6	STATION NO.=	6	0	X-Y COORDINATE =	1570.	1552.
NO.=	7	STATION NO.=	7	0	X-Y COORDINATE =	1900.	1554.
NO.=	8	STATION NO.=	8	0	X-Y COORDINATE =	1347.	1699.
NO.=	9	STATION NO.=	9	0	X-Y COORDINATE =	2315.	1602.
NO.=	10	STATION NO.=	10	0	X-Y COORDINATE =	1426.	1550.

SHORT-TERM POPULATION EXPOSURE MODEL - LOS ANGELES AREA

NREDEP = 58 NRSA = 55 NMONT = 10 NSTYES = 10 NPOPL = 1
NYEAR = 1 SYEAR = 1973.0 DELYR = 2.0 AQSTD = 8.0

POPULATION DATA - TOTAL POPULATION AND ALL WORKERS BY WORK PLACE (1973.0)/

NO. = 1	SA = 1	0	TOTAL POP =	355.	ALL WKRS BY WK-PLACE =	98.
NO. = 2	SA = 2	0	TOTAL POP =	119774.	ALL WKRS BY WK-PLACE =	40183.
NO. = 3	SA = 3	0	TOTAL POP =	149709.	ALL WKRS BY WK-PLACE =	61380.
NO. = 4	SA = 4	0	TOTAL POP =	74430.	ALL WKRS BY WK-PLACE =	3499.
NO. = 5	SA = 5	0	TOTAL POP =	66284.	ALL WKRS BY WK-PLACE =	15668.
NO. = 6	SA = 6	0	TOTAL POP =	10708.	ALL WKRS BY WK-PLACE =	3389.
NO. = 7	SA = 7	0	TOTAL POP =	25209.	ALL WKRS BY WK-PLACE =	9781.
NO. = 8	SA = 8	0	TOTAL POP =	56448.	ALL WKRS BY WK-PLACE =	7522.
NO. = 9	SA = 9	0	TOTAL POP =	54467.	ALL WKRS BY WK-PLACE =	15441.
NO. = 10	SA = 10	0	TOTAL POP =	32907.	ALL WKRS BY WK-PLACE =	14977.
NO. = 11	SA = 11	0	TOTAL POP =	1868.	ALL WKRS BY WK-PLACE =	1108.
NO. = 12	SA = 12	0	TOTAL POP =	556784.	ALL WKRS BY WK-PLACE =	204112.
NO. = 13	SA = 13	0	TOTAL POP =	259230.	ALL WKRS BY WK-PLACE =	137308.
NO. = 14	SA = 14	0	TOTAL POP =	268969.	ALL WKRS BY WK-PLACE =	58558.
NO. = 15	SA = 15	0	TOTAL POP =	14347.	ALL WKRS BY WK-PLACE =	2951.
NO. = 16	SA = 16	0	TOTAL POP =	310499.	ALL WKRS BY WK-PLACE =	138268.
NO. = 17	SA = 17	0	TOTAL POP =	91609 7.	ALL WKRS BY WK-PLACE =	44189.
NO. = 18	SA = 18	0	TOTAL POP =	520256.	ALL WKRS BY WK-PLACE =	257245.
NO. = 19	SA = 19	0	TOTAL POP =	424463.	ALL WKRS BY WK-PLACE =	152043.
NO. = 20	SA = 20	0	TOTAL POP =	421396.	ALL WKRS BY WK-PLACE =	194816.
NO. = 21	SA = 21	0	TOTAL POP =	790942.	ALL WKRS BY WK-PLACE =	480927.
NO. = 22	SA = 22	0	TOTAL POP =	608702.	ALL WKRS BY WK-PLACE =	163721.
NO. = 23	SA = 23	0	TOTAL POP =	85296.	ALL WKRS BY WK-PLACE =	32791.
NO. = 24	SA = 24	0	TOTAL POP =	407124.	ALL WKRS BY WK-PLACE =	141102.
NO. = 25	SA = 25	0	TOTAL POP =	659353.	ALL WKRS BY WK-PLACE =	297002.
NO. = 26	SA = 26	0	TOTAL POP =	461752.	ALL WKRS BY WK-PLACE =	122408.
NO. = 27	SA = 27	0	TOTAL POP =	150059.	ALL WKRS BY WK-PLACE =	66336.
NO. = 28	SA = 28	0	TOTAL POP =	24693 7.	ALL WKRS BY WK-PLACE =	7619.
NO. = 29	SA = 29	0	TOTAL POP =	302942.	ALL WKRS BY WK-PLACE =	36378.
NO. = 30	SA = 30	0	TOTAL POP =	22697.	ALL WKRS BY WK-PLACE =	6211.
NO. = 31	SA = 31	0	TOTAL POP =	7597.	ALL WKRS BY WK-PLACE =	4121.
NO. = 32	SA = 32	0	TOTAL POP =	80062.	ALL WKRS BY WK-PLACE =	29191.
NO. = 33	SA = 33	0	TOTAL POP =	26783.	ALL WKRS BY WK-PLACE =	9811.
NO. = 34	SA = 34	0	TOTAL POP =	5896.	ALL WKRS BY WK-PLACE =	2522.
NO. = 35	SA = 35	0	TOTAL POP =	169018.	ALL WKRS BY WK-PLACE =	38316.
NO. = 36	SA = 36	0	TOTAL POP =	180940.	ALL WKRS BY WK-PLACE =	93682.
NO. = 37	SA = 37	0	TOTAL POP =	319294.	ALL WKRS BY WK-PLACE =	113979.
NO. = 38	SA = 38	0	TOTAL POP =	271683.	ALL WKRS BY WK-PLACE =	54943.
NO. = 39	SA = 39	0	TOTAL POP =	188173.	ALL WKRS BY WK-PLACE =	91194.
NO. = 40	SA = 40	0	TOTAL POP =	54049.	ALL WKRS BY WK-PLACE =	13340.
NO. = 41	SA = 41	0	TOTAL POP =	49087.	ALL WKRS BY WK-PLACE =	11208.
NO. = 42	SA = 42	0	TOTAL POP =	289769.	ALL WKRS BY WK-PLACE =	121713.
NO. = 43	SA = 43	0	TOTAL POP =	33064.	ALL WKRS BY WK-PLACE =	6134.
NO. = 44	SA = 44	0	TOTAL POP =	29591.	ALL WKRS BY WK-PLACE =	26656.
NO. = 45	SA = 45	0	TOTAL POP =	39304.	ALL WKRS BY WK-PLACE =	7687.
NO. = 46	SA = 46	0	TOTAL POP =	239475.	ALL WKRS BY WK-PLACE =	83206.
NO. = 47	SA = 47	0	TOTAL POP =	26579.	ALL WKRS BY WK-PLACE =	8114.
NO. = 48	SA = 48	0	TOTAL POP =	41499.	ALL WKRS BY WK-PLACE =	10738.

NO. = 49	SA =	49	0	TOTAL POP.=	13649.	ALL WKRS BY WK-PLACE =	3120.				
NO. = 50	SA =	50	0	TOTAL POP.=	27655.	ALL WKRS BY WK-PLACE =	6270.				
NO. = 51	SA =	51	0	TOTAL POP.=	3646.	ALL WKRS BY WK-PLACE =	922.				
NO. = 52	SA =	52	0	TOTAL POP.=	60708.	ALL WKRS BY WK-PLACE =	19630.				
NO. = 53	SA =	53	0	TOTAL POP.=	40902.	ALL WKRS BY WK-PLACE =	15287.				
NO. = 54	SA =	54	0	TOTAL POP.=	16489.	ALL WKRS BY WK-PLACE =	7075.				
NO. = 55	SA =	55	0	TOTAL POP.=	80623.	ALL WKRS BY WK-PLACE =	30171.				

SHORT-TERM POPULATION EXPOSURE MODEL - LOS ANGELES AREA

NPREC = 58 NRSA = 55 NMONT = 10 NSITES = 10 NPOPL = 1
NYEAR = 1 SYEAR = 1973.0 DELYR = 2.0 AGSTD = 8.0

RECEPTOR SPECIFICATION DATA FOR 1973.0

NO.=	1	RECEPT NO. =	7 2071	X-Y COORD =	1285.	1610.	TPOPL - WKRPL =	25209.	9781.	AREA =	92.2
NO.=	2	RECEPT NO. =	12 2121	X-Y COORD =	1361.	1670.	TPOPL - WKRPL =	185595.	680 37.	AREA =	48.0
NO.=	3	RECEPT NO. =	12 2122	X-Y COORD =	1351.	1720.	TPOPL - WKRPL =	185595.	680 37.	AREA =	48.0
NO.=	4	RECEPT NO. =	12 2123	X-Y COORD =	1400.	1630.	TPOPL - WKRPL =	185595.	680 37.	AREA =	48.0
NO.=	5	RECEPT NO. =	13 2131	X-Y COORD =	1485.	1645.	TPOPL - WKRPL =	129615.	6865 9.	AREA =	20.0
NO.=	6	RECEPT NO. =	13 2132	X-Y COORD =	1521.	1650.	TPOPL - WKRPL =	129615.	6865 9.	AREA =	20.0
NO.=	7	RECEPT NO. =	14 2141	X-Y COORD =	1421.	1730.	TPOPL - WKRPL =	134484.	2927 9.	AREA =	38.2
NO.=	8	RECEPT NO. =	14 2142	X-Y COORD =	1510.	1710.	TPOPL - WKRPL =	134484.	2927 9.	AREA =	38.2
NO.=	9	RECEPT NO. =	15 2151	X-Y COORD =	1221.	1550.	TPOPL - WKRPL =	14397.	2951.	AREA =	86.9
NO.=	10	RECEPT NO. =	16 2161	X-Y COORD =	1380.	1570.	TPOPL - WKRPL =	155249.	6913 8.	AREA =	37.2
NO.=	11	RECEPT NO. =	16 2162	X-Y COORD =	1430.	1465.	TPOPL - WKRPL =	155249.	6913 4.	AREA =	37.2
NO.=	12	RECEPT NO. =	17 2171	X-Y COORD =	1521.	1510.	TPOPL - WKRPL =	183219.	8823 8.	AREA =	19.4
NO.=	13	RECEPT NO. =	17 2172	X-Y COORD =	1521.	1550.	TPOPL - WKRPL =	183219.	8823 8.	AREA =	19.4
NO.=	14	RECEPT NO. =	17 2173	X-Y COORD =	1521.	1590.	TPOPL - WKRPL =	183219.	8823 8.	AREA =	19.4
NO.=	15	RECEPT NO. =	17 2174	X-Y COORD =	1480.	1530.	TPOPL - WKRPL =	183219.	8823 8.	AREA =	19.4
NO.=	16	RECEPT NO. =	17 2175	X-Y COORD =	1480.	1580.	TPOPL - WKRPL =	183219.	8823 8.	AREA =	19.4
NO.=	17	RECEPT NO. =	18 2181	X-Y COORD =	1521.	1440.	TPOPL - WKRPL =	173419.	8574 8.	AREA =	22.6
NO.=	18	RECEPT NO. =	18 2182	X-Y COORD =	1475.	1460.	TPOPL - WKRPL =	173419.	8574 8.	AREA =	22.6
NO.=	19	RECEPT NO. =	18 2183	X-Y COORD =	1500.	1410.	TPOPL - WKRPL =	173419.	8574 8.	AREA =	22.6
NO.=	20	RECEPT NO. =	19 2191	X-Y COORD =	1505.	1320.	TPOPL - WKRPL =	141488.	5068 1.	AREA =	31.7
NO.=	21	RECEPT NO. =	19 2192	X-Y COORD =	1505.	1365.	TPOPL - WKRPL =	141488.	5068 1.	AREA =	31.7
NO.=	22	RECEPT NO. =	19 2193	X-Y COORD =	1545.	1350.	TPOPL - WKRPL =	141488.	5068 1.	AREA =	31.7
NO.=	23	RECEPT NO. =	20 2201	X-Y COORD =	1595.	1330.	TPOPL - WKRPL =	140465.	6493 9.	AREA =	20.2
NO.=	24	RECEPT NO. =	20 2202	X-Y COORD =	1650.	1320.	TPOPL - WKRPL =	140465.	6493 9.	AREA =	20.2
NO.=	25	RECEPT NO. =	20 2203	X-Y COORD =	1625.	1390.	TPOPL - WKRPL =	140465.	6493 9.	AREA =	20.2
NO.=	26	RECEPT NO. =	21 2211	X-Y COORD =	1565.	1420.	TPOPL - WKRPL =	158188.	9618 5.	AREA =	20.2
NO.=	27	RECEPT NO. =	21 2212	X-Y COORD =	1565.	1470.	TPOPL - WKRPL =	158188.	9618 5.	AREA =	20.2
NO.=	28	RECEPT NO. =	21 2213	X-Y COORD =	1565.	1520.	TPOPL - WKRPL =	158188.	9618 5.	AREA =	20.2
NO.=	29	RECEPT NO. =	21 2214	X-Y COORD =	1610.	1520.	TPOPL - WKRPL =	158188.	9618 6.	AREA =	20.2
NO.=	30	RECEPT NO. =	21 2215	X-Y COORD =	1610.	1470.	TPOPL - WKRPL =	158188.	9618 5.	AREA =	20.2
NO.=	31	RECEPT NO. =	22 2221	X-Y COORD =	1660.	1420.	TPOPL - WKRPL =	202901.	5457 4.	AREA =	40.0
NO.=	32	RECEPT NO. =	22 2222	X-Y COORD =	1690.	1480.	TPOPL - WKRPL =	202901.	5457 4.	AREA =	40.0
NO.=	33	RECEPT NO. =	22 2223	X-Y COORD =	1725.	1435.	TPOPL - WKRPL =	202901.	5457 4.	AREA =	40.0
NO.=	34	RECEPT NO. =	23 2231	X-Y COORD =	1555.	1545.	TPOPL - WKRPL =	85296.	3272 91.	AREA =	6.2
NO.=	35	RECEPT NO. =	24 2241	X-Y COORD =	1561.	1585.	TPOPL - WKRPL =	135708.	4703 4.	AREA =	23.8
NO.=	36	RECEPT NO. =	24 2242	X-Y COORD =	1561.	1640.	TPOPL - WKRPL =	135708.	4703 4.	AREA =	23.8
NO.=	37	RECEPT NO. =	24 2243	X-Y COORD =	1595.	1595.	TPOPL - WKRPL =	135708.	4703 4.	AREA =	23.8
NO.=	38	RECEPT NO. =	25 2251	X-Y COORD =	1641.	1625.	TPOPL - WKRPL =	164838.	6175 0.	AREA =	36.5
NO.=	39	RECEPT NO. =	25 2252	X-Y COORD =	1660.	1560.	TPOPL - WKRPL =	164838.	6175 0.	AREA =	36.5
NO.=	40	RECEPT NO. =	25 2253	X-Y COORD =	1710.	1555.	TPOPL - WKRPL =	164838.	6175 0.	AREA =	36.5
NO.=	41	RECEPT NO. =	25 2254	X-Y COORD =	1730.	1620.	TPOPL - WKRPL =	164838.	6175 0.	AREA =	36.5
NO.=	42	RECEPT NO. =	26 2261	X-Y COORD =	1765.	1520.	TPOPL - WKRPL =	153917.	4080 3.	AREA =	56.7
NO.=	43	RECEPT NO. =	26 2262	X-Y COORD =	1810.	1595.	TPOPL - WKRPL =	153917.	4080 3.	AREA =	56.7
NO.=	44	RECEPT NO. =	26 2263	X-Y COORD =	1840.	1500.	TPOPL - WKRPL =	153917.	4080 3.	AREA =	56.7
NO.=	45	RECEPT NO. =	27 2271	X-Y COORD =	1900.	1580.	TPOPL - WKRPL =	150059.	6633 6.	AREA =	60.0
NO.=	46	RECEPT NO. =	35 3351	X-Y COORD =	1710.	1355.	TPOPL - WKRPL =	169018.	3831 6.	AREA =	28.8
NO.=	47	RECEPT NO. =	36 3361	X-Y COORD =	1800.	1410.	TPOPL - WKRPL =	180990.	9368 2.	AREA =	45.6

NO.=	48	RECEPT	NO. =	37	3371	X-Y	COORD =	1765.	1320.	TPOPL - WKRPL =	159647.	56989.	AREA =	29.9
NO.=	49	RECEPT	NO. =	37	3372	X-Y	COORD =	1785.	1355.	TPOPL - WKRPL =	159647.	56989.	AREA =	29.9
NO.=	50	RECEPT	NO. =	38	3381	X-Y	COORD =	1708.	1280.	TPOPL - WKRPL =	135841.	27471.	AREA =	31.2
NO.=	51	RECEPT	NO. =	38	3382	X-Y	COORD =	1750.	1250.	TPOPL - WKRPL =	135841.	27471.	AREA =	31.2
NO.=	52	RECEPT	NO. =	41	3411	X-Y	COORD =	1911.	1390.	TPOPL - WKRPL =	49087.	11208.	AREA =	101.0
NO.=	53	RECEPT	NO. =	42	3421	X-Y	COORD =	1825.	1285.	TPOPL - WKRPL =	144884.	60856.	AREA =	26.1
NO.=	54	RECEPT	NO. =	42	3422	X-Y	COORD =	1840.	1335.	TPOPL - WKRPL =	144884.	60856.	AREA =	26.1
NO.=	55	RECEPT	NO. =	28	4281	X-Y	COORD =	1960.	1490.	TPOPL - WKRPL =	122968.	38109.	AREA =	118.0
NO.=	56	RECEPT	NO. =	28	4282	X-Y	COORD =	2000.	1590.	TPOPL - WKRPL =	122968.	38109.	AREA =	118.0
NO.=	57	RECEPT	NO. =	29	4291	X-Y	COORD =	2190.	1625.	TPOPL - WKRPL =	151471.	18189.	AREA =	115.5
NO.=	58	RECEPT	NO. =	29	4292	X-Y	COORD =	2335.	1555.	TPOPL - WKRPL =	151471.	18189.	AREA =	115.5

SHORT-TERM POPULATION EXPOSURE MODEL - LOS ANGELES AREA

NREGP = 58 NRSA = 55 NMONY = 10 NSITES = 10 NPOPL = 1
NYEAR = 1 SYEAR = 1973.0 DELYR = 2.0 AGSTD = 8.0

FREQUENCY DISTRIBUTION OF MONITORED CONCENTRATION YEAR = 1973.0

P1 P2 P3 P4 P5 P6 P7 P8 = 100/(N+1)									1.0	3.0	5.0	10.0	25.0	50.0	75.0
1	ST.ID.NO. =	1	0	MAX.P2.P3.P4.P5.P6.P7.P8 %ILE =	25.2	18.0	16.0	14.0	10.0	6.4	4.0	2.4			
2	ST.ID.NO. =	2	0	MAX.P2.P3.P4.P5.P6.P7.P8 %ILE =	42.0	34.5	29.0	27.5	24.5	17.5	9.0	4.0			
3	ST.ID.NO. =	3	0	MAX.P2.P3.P4.P5.P6.P7.P8 %ILE =	32.0	26.0	22.0	20.0	17.0	12.5	7.0	3.5			
4	ST.ID.NO. =	4	0	MAX.P2.P3.P4.P5.P6.P7.P8 %ILE =	19.5	12.0	9.0	8.0	6.0	5.0	3.0	2.5			
5	ST.ID.NO. =	5	0	MAX.P2.P3.P4.P5.P6.P7.P8 %ILE =	18.5	14.0	9.5	8.5	7.0	5.0	3.0	2.0			
6	ST.ID.NO. =	6	0	MAX.P2.P3.P4.P5.P6.P7.P8 %ILE =	38.5	27.0	20.0	18.0	15.0	11.0	6.5	3.0			
7	ST.ID.NO. =	7	0	MAX.P2.P3.P4.P5.P6.P7.P8 %ILE =	31.5	30.5	25.5	24.0	20.5	14.5	7.0	3.0			
8	ST.ID.NO. =	8	0	MAX.P2.P3.P4.P5.P6.P7.P8 %ILE =	28.3	23.6	22.0	19.5	17.0	13.0	7.0	3.5			
9	ST.ID.NO. =	9	0	MAX.P2.P3.P4.P5.P6.P7.P8 %ILE =	33.6	28.8	25.6	23.2	19.2	15.2	5.6	2.4			
10	ST.ID.NO. =	10	0	MAX.P2.P3.P4.P5.P6.P7.P8 %ILE =	29.0	18.5	14.0	12.5	10.5	8.0	5.5	3.5			

SHORT-TERM POPULATION EXPOSURE MODEL - LOS ANGELES AREA

NREC P = 58 NRSA = 55 NMONT = 10 NSITES = 10 NPOPL = 1
NYEAR = 1 SYEAR = 1973.0 DELYR = 2.0 AGSTD = 8.0

INTERPOLATED - EXTERPOLATED PERCENTILE CONCENRATIONS AT RECEPTOR SITES YEAR = 1973.0

P1 P2 P3 P4 P5 P6 P7 P8 = 100/(N+1) 1.0 3.0 5.0 10.0 25.0 50.0 75.0

NO. OF VALID MONITORING STATIONS= 10

NO.= 1	MAX,P2,P3,P4,P5,P6,P7,P8 P-TILE =	28.9	22.4	19.6	17.5	15.1	11.5	6.6	3.5
NO.= 2	MAX,P2,P3,P4,P5,P6,P7,P8 P-TILE =	28.5	23.4	21.6	19.2	16.7	12.7	6.9	3.5
NO.= 3	MAX,P2,P3,P4,P5,P6,P7,P8 P-TILE =	28.4	23.6	21.9	19.4	16.9	12.9	7.0	3.5
NO.= 4	MAX,P2,P3,P4,P5,P6,P7,P8 P-TILE =	29.3	21.9	18.6	16.6	14.2	10.8	6.4	3.5
NO.= 5	MAX,P2,P3,P4,P5,P6,P7,P8 P-TILE =	32.3	25.0	20.6	18.7	15.8	11.7	6.7	3.4
NO.= 6	MAX,P2,P3,P4,P5,P6,P7,P8 P-TILE =	32.3	25.7	21.5	19.5	16.6	12.2	6.9	3.5
NO.= 7	MAX,P2,P3,P4,P5,P6,P7,P8 P-TILE =	29.5	23.7	21.1	18.8	16.3	12.3	6.8	3.5
NO.= 8	MAX,P2,P3,P4,P5,P6,P7,P8 P-TILE =	32.1	26.0	21.9	19.9	16.9	12.5	7.0	3.5
NO.= 9	MAX,P2,P3,P4,P5,P6,P7,P8 P-TILE =	26.7	19.2	16.2	14.4	12.2	9.4	5.6	3.3
NO.= 10	MAX,P2,P3,P4,P5,P6,P7,P8 P-TILE =	28.1	18.5	14.5	12.9	10.9	8.3	5.5	3.4
NO.= 11	MAX,P2,P3,P4,P5,P6,P7,P8 P-TILE =	22.4	14.1	10.6	9.4	7.4	5.9	3.7	2.7
NO.= 12	MAX,P2,P3,P4,P5,P6,P7,P8 P-TILE =	30.8	20.7	15.4	13.8	11.3	8.6	5.2	2.9
NO.= 13	MAX,P2,P3,P4,P5,P6,P7,P8 P-TILE =	34.4	23.6	17.5	15.7	13.1	9.7	5.9	3.0
NO.= 14	MAX,P2,P3,P4,P5,P6,P7,P8 P-TILE =	35.0	25.1	19.3	17.4	14.6	10.8	6.4	3.2
NO.= 15	MAX,P2,P3,P4,P5,P6,P7,P8 P-TILE =	28.6	18.6	14.0	12.5	10.3	7.9	5.1	3.1
NO.= 16	MAX,P2,P3,P4,P5,P6,P7,P8 P-TILE =	31.9	22.0	16.9	15.2	12.8	9.6	6.0	3.4
NO.= 17	MAX,P2,P3,P4,P5,P6,P7,P8 P-TILE =	21.9	14.2	10.5	9.4	7.3	5.8	3.5	2.5
NO.= 18	MAX,P2,P3,P4,P5,P6,P7,P8 P-TILE =	19.9	12.3	9.2	8.2	6.2	5.1	3.1	2.5
NO.= 19	MAX,P2,P3,P4,P5,P6,P7,P8 P-TILE =	20.8	13.3	9.8	8.8	6.8	5.4	3.3	2.5
NO.= 20	MAX,P2,P3,P4,P5,P6,P7,P8 P-TILE =	21.0	14.7	10.4	9.3	7.5	5.6	3.4	2.3
NO.= 21	MAX,P2,P3,P4,P5,P6,P7,P8 P-TILE =	21.1	14.3	10.3	9.2	7.3	5.6	3.4	2.4
NO.= 22	MAX,P2,P3,P4,P5,P6,P7,P8 P-TILE =	20.2	14.5	10.2	9.1	7.4	5.4	3.3	2.2
NO.= 23	MAX,P2,P3,P4,P5,P6,P7,P8 P-TILE =	18.7	14.1	9.6	8.6	7.1	5.1	3.0	2.0
NO.= 24	MAX,P2,P3,P4,P5,P6,P7,P8 P-TILE =	19.0	14.2	9.9	8.8	7.2	5.1	3.1	2.0
NO.= 25	MAX,P2,P3,P4,P5,P6,P7,P8 P-TILE =	19.8	14.7	10.1	9.1	7.4	5.4	3.2	2.1
NO.= 26	MAX,P2,P3,P4,P5,P6,P7,P8 P-TILE =	22.8	15.8	11.4	10.2	8.2	6.2	3.7	2.4
NO.= 27	MAX,P2,P3,P4,P5,P6,P7,P8 P-TILE =	28.4	19.5	14.4	12.9	10.5	7.9	4.7	2.6
NO.= 28	MAX,P2,P3,P4,P5,P6,P7,P8 P-TILE =	36.8	25.6	19.0	17.1	14.2	10.5	6.2	3.0
NO.= 29	MAX,P2,P3,P4,P5,P6,P7,P8 P-TILE =	35.4	24.7	18.3	16.4	13.6	10.0	5.9	2.9
NO.= 30	MAX,P2,P3,P4,P5,P6,P7,P8 P-TILE =	28.9	20.2	14.8	13.3	10.9	8.1	4.8	2.6
NO.= 31	MAX,P2,P3,P4,P5,P6,P7,P8 P-TILE =	23.6	17.2	12.6	11.3	9.1	6.4	3.9	2.3
NO.= 32	MAX,P2,P3,P4,P5,P6,P7,P8 P-TILE =	28.6	20.5	15.5	13.8	11.1	7.9	4.7	2.5
NO.= 33	MAX,P2,P3,P4,P5,P6,P7,P8 P-TILE =	25.5	18.4	14.4	12.8	9.9	6.8	4.1	2.4
NO.= 34	MAX,P2,P3,P4,P5,P6,P7,P8 P-TILE =	38.1	26.6	19.7	17.8	14.8	10.9	6.4	3.0
NO.= 35	MAX,P2,P3,P4,P5,P6,P7,P8 P-TILE =	37.4	26.5	19.9	17.9	15.0	11.0	6.5	3.1
NO.= 36	MAX,P2,P3,P4,P5,P6,P7,P8 P-TILE =	33.5	25.7	20.8	18.8	15.9	11.7	6.7	3.4
NO.= 37	MAX,P2,P3,P4,P5,P6,P7,P8 P-TILE =	36.9	26.3	19.9	17.9	15.0	11.0	6.5	3.1
NO.= 38	MAX,P2,P3,P4,P5,P6,P7,P8 P-TILE =	37.1	28.0	22.1	20.2	17.2	12.6	7.1	3.3
NO.= 39	MAX,P2,P3,P4,P5,P6,P7,P8 P-TILE =	38.1	28.2	21.9	20.0	17.0	12.4	7.0	3.3
NO.= 40	MAX,P2,P3,P4,P5,P6,P7,P8 P-TILE =	38.5	30.8	24.8	23.2	20.1	14.4	7.6	3.4
NO.= 41	MAX,P2,P3,P4,P5,P6,P7,P8 P-TILE =	39.7	32.5	26.8	25.2	22.2	15.9	8.2	3.7
NO.= 42	MAX,P2,P3,P4,P5,P6,P7,P8 P-TILE =	34.9	29.8	25.2	23.6	20.2	14.2	7.3	3.3

NO.= 43	MAX,P2,P3,P4,P5,P6,P7,P8 P-TILE =	40.5	33.8	28.3	26.8	23.7	16.9	8.7		3.8
NO.= 44	MAX,P2,P3,P4,P5,P6,P7,P8 P-TILE =	32.8	29.9	24.8	23.2	19.7	13.9	7.0		3.1
NO.= 45	MAX,P2,P3,P4,P5,P6,P7,P8 P-TILE =	32.1	30.6	25.6	24.1	20.7	14.6	7.1		3.1
NO.= 46	MAX,P2,P3,P4,P5,P6,P7,P8 P-TILE =	22.9	16.7	13.0	11.5	8.9	6.1	3.7		2.2
NO.= 47	MAX,P2,P3,P4,P5,P6,P7,P8 P-TILE =	25.4	19.3	16.6	14.8	11.1	7.4	4.3		2.4
NO.= 48	MAX,P2,P3,P4,P5,P6,P7,P8 P-TILE =	24.6	18.0	15.6	13.7	10.1	6.6	4.0		2.4
NO.= 49	MAX,P2,P3,P4,P5,P6,P7,P8 P-TILE =	25.0	18.2	15.9	14.0	10.2	6.6	4.0		2.4
NO.= 50	MAX,P2,P3,P4,P5,P6,P7,P8 P-TILE =	21.3	15.5	12.1	10.7	8.2	5.6	3.4		2.2
NO.= 51	MAX,P2,P3,P4,P5,P6,P7,P8 P-TILE =	23.7	17.7	14.8	13.1	9.9	6.6	3.9		2.3
NO.= 52	MAX,P2,P3,P4,P5,P6,P7,P8 P-TILE =	25.9	18.9	16.4	14.6	10.9	7.1	4.3		2.5
NO.= 53	MAX,P2,P3,P4,P5,P6,P7,P8 P-TILE =	25.1	18.2	16.0	14.0	10.2	6.6	4.1		2.4
NO.= 54	MAX,P2,P3,P4,P5,P6,P7,P8 P-TILE =	25.2	18.0	16.0	14.0	10.0	6.4	4.0		2.4
NO.= 55	MAX,P2,P3,P4,P5,P6,P7,P8 P-TILE =	32.7	30.4	25.5	24.0	20.5	14.5	7.1		3.1
NO.= 56	MAX,P2,P3,P4,P5,P6,P7,P8 P-TILE =	34.0	31.3	26.3	24.7	21.3	15.2	7.3		3.2
NO.= 57	MAX,P2,P3,P4,P5,P6,P7,P8 P-TILE =	34.1	29.6	25.9	23.7	19.9	15.3	6.1		2.6
NO.= 58	MAX,P2,P3,P4,P5,P6,P7,P8 P-TILE =	33.7	28.9	25.6	23.3	19.3	15.2	5.7		2.9

SHORT-TERM POPULATION EXPOSURE MODEL - LOS ANGELES AREA

NREC P = 58 NRSA = 55 NMONT = 10 NSITES = 10 NPOPL = 1
NYEAR = 1 SYEAR = 1973.0 DELYR = 2.0 AQSTD = 8.0

RISK OF RECEPTOR CONCENTRATION EXCEEDING MULTIPLES OF AQSTD YEAR = 1973.0

RECEPTOR NO. = 1	1 STD RISK = 40.8	2 STD RISK = 7.7	3 STD RISK = .3	4 STD RISK = .0
RECEPTOR NO. = 2	1 STD RISK = 44.0	2 STD RISK = 11.7	3 STD RISK = .6	4 STD RISK = .0
RECEPTOR NO. = 3	1 STD RISK = 44.4	2 STD RISK = 12.3	3 STD RISK = .7	4 STD RISK = .0
RECEPTOR NO. = 4	1 STD RISK = 38.7	2 STD RISK = 6.0	3 STD RISK = .3	4 STD RISK = .0
RECEPTOR NO. = 5	1 STD RISK = 41.8	2 STD RISK = 9.5	3 STD RISK = 1.3	4 STD RISK = .0
RECEPTOR NO. = 6	1 STD RISK = 43.3	2 STD RISK = 11.3	3 STD RISK = 1.6	4 STD RISK = .0
RECEPTOR NO. = 7	1 STD RISK = 43.1	2 STD RISK = 10.6	3 STD RISK = .8	4 STD RISK = .0
RECEPTOR NO. = 8	1 STD RISK = 44.0	2 STD RISK = 12.1	3 STD RISK = 1.7	4 STD RISK = .0
RECEPTOR NO. = 9	1 STD RISK = 32.3	2 STD RISK = 3.2	3 STD RISK = .1	4 STD RISK = .0
RECEPTOR NO. = 10	1 STD RISK = 27.0	2 STD RISK = 2.0	3 STD RISK = .1	4 STD RISK = .0
RECEPTOR NO. = 11	1 STD RISK = 8.1	2 STD RISK = .4	3 STD RISK = .0	4 STD RISK = .0
RECEPTOR NO. = 12	1 STD RISK = 28.1	2 STD RISK = 2.7	3 STD RISK = .2	4 STD RISK = .0
RECEPTOR NO. = 13	1 STD RISK = 34.0	2 STD RISK = 4.6	3 STD RISK = .8	4 STD RISK = .0
RECEPTOR NO. = 14	1 STD RISK = 38.9	2 STD RISK = 7.1	3 STD RISK = 1.2	4 STD RISK = .0
RECEPTOR NO. = 15	1 STD RISK = 23.9	2 STD RISK = 1.9	3 STD RISK = .1	4 STD RISK = .0
RECEPTOR NO. = 16	1 STD RISK = 34.0	2 STD RISK = 4.0	3 STD RISK = .4	4 STD RISK = .0
RECEPTOR NO. = 17	1 STD RISK = 7.9	2 STD RISK = .4	3 STD RISK = .0	4 STD RISK = .0
RECEPTOR NO. = 18	1 STD RISK = 5.4	2 STD RISK = .1	3 STD RISK = .0	4 STD RISK = .0
RECEPTOR NO. = 19	1 STD RISK = 6.5	2 STD RISK = .2	3 STD RISK = .0	4 STD RISK = .0
RECEPTOR NO. = 20	1 STD RISK = 8.3	2 STD RISK = .4	3 STD RISK = .0	4 STD RISK = .0
RECEPTOR NO. = 21	1 STD RISK = 6.8	2 STD RISK = .3	3 STD RISK = .0	4 STD RISK = .0
RECEPTOR NO. = 22	1 STD RISK = 7.8	2 STD RISK = .3	3 STD RISK = .0	4 STD RISK = .0
RECEPTOR NO. = 23	1 STD RISK = 6.5	2 STD RISK = .2	3 STD RISK = .0	4 STD RISK = .0
RECEPTOR NO. = 24	1 STD RISK = 7.1	2 STD RISK = .2	3 STD RISK = .0	4 STD RISK = .0
RECEPTOR NO. = 25	1 STD RISK = 7.9	2 STD RISK = .3	3 STD RISK = .0	4 STD RISK = .0
RECEPTOR NO. = 26	1 STD RISK = 11.0	2 STD RISK = .9	3 STD RISK = .0	4 STD RISK = .0
RECEPTOR NO. = 27	1 STD RISK = 23.9	2 STD RISK = 2.1	3 STD RISK = .1	4 STD RISK = .0
RECEPTOR NO. = 28	1 STD RISK = 37.4	2 STD RISK = 6.5	3 STD RISK = 1.3	4 STD RISK = .1
RECEPTOR NO. = 29	1 STD RISK = 35.3	2 STD RISK = 5.6	3 STD RISK = 1.1	4 STD RISK = .0
RECEPTOR NO. = 30	1 STD RISK = 25.4	2 STD RISK = 2.3	3 STD RISK = .1	4 STD RISK = .0
RECEPTOR NO. = 31	1 STD RISK = 14.5	2 STD RISK = 1.3	3 STD RISK = .0	4 STD RISK = .0
RECEPTOR NO. = 32	1 STD RISK = 24.3	2 STD RISK = 2.7	3 STD RISK = .1	4 STD RISK = .0
RECEPTOR NO. = 33	1 STD RISK = 17.7	2 STD RISK = 1.9	3 STD RISK = .0	4 STD RISK = .0
RECEPTOR NO. = 34	1 STD RISK = 39.1	2 STD RISK = 7.5	3 STD RISK = 1.5	4 STD RISK = .1
RECEPTOR NO. = 35	1 STD RISK = 39.6	2 STD RISK = 7.8	3 STD RISK = 1.5	4 STD RISK = .1
RECEPTOR NO. = 36	1 STD RISK = 41.9	2 STD RISK = 9.8	3 STD RISK = 1.5	4 STD RISK = .0
RECEPTOR NO. = 37	1 STD RISK = 39.8	2 STD RISK = 7.9	3 STD RISK = 1.5	4 STD RISK = .1
RECEPTOR NO. = 38	1 STD RISK = 44.5	2 STD RISK = 12.7	3 STD RISK = 2.1	4 STD RISK = .1
RECEPTOR NO. = 39	1 STD RISK = 44.1	2 STD RISK = 12.2	3 STD RISK = 2.1	4 STD RISK = .2
RECEPTOR NO. = 40	1 STD RISK = 48.2	2 STD RISK = 19.3	3 STD RISK = 3.9	4 STD RISK = .5
RECEPTOR NO. = 41	1 STD RISK = 51.0	2 STD RISK = 24.5	3 STD RISK = 6.6	4 STD RISK = 1.1
RECEPTOR NO. = 42	1 STD RISK = 46.6	2 STD RISK = 19.1	3 STD RISK = 4.4	4 STD RISK = .1
RECEPTOR NO. = 43	1 STD RISK = 52.9	2 STD RISK = 27.0	3 STD RISK = 9.4	4 STD RISK = 1.4
RECEPTOR NO. = 44	1 STD RISK = 45.1	2 STD RISK = 18.0	3 STD RISK = 3.9	4 STD RISK = .0
RECEPTOR NO. = 45	1 STD RISK = 46.0	2 STD RISK = 20.3	3 STD RISK = 5.1	4 STD RISK = .0
RECEPTOR NO. = 46	1 STD RISK = 13.4	2 STD RISK = 1.2	3 STD RISK = .0	4 STD RISK = .0
RECEPTOR NO. = 47	1 STD RISK = 21.4	2 STD RISK = 3.6	3 STD RISK = .0	4 STD RISK = .0

RECEPTOR NO.= 48	1 STD RISK = 17.2	2 STD RISK = 2.5	3 STD RISK = .0	4 STD RISK = .0	
RECEPTOR NO.= 49	1 STD RISK = 17.4	2 STD RISK = 2.9	3 STD RISK = .0	4 STD RISK = .0	
RECEPTOR NO.= 50	1 STD RISK = 10.6	2 STD RISK = .7	3 STD RISK = .0	4 STD RISK = .0	
RECEPTOR NO.= 51	1 STD RISK = 16.9	2 STD RISK = 1.9	3 STD RISK = .0	4 STD RISK = .0	
RECEPTOR NO.= 52	1 STD RISK = 20.2	2 STD RISK = 3.4	3 STD RISK = .0	4 STD RISK = .0	
RECEPTOR NO.= 53	1 STD RISK = 17.5	2 STD RISK = 3.0	3 STD RISK = .0	4 STD RISK = .0	
RECEPTOR NO.= 54	1 STD RISK = 16.8	2 STD RISK = 3.0	3 STD RISK = .0	4 STD RISK = .0	
RECEPTOR NO.= 55	1 STD RISK = 46.1	2 STD RISK = 19.9	3 STD RISK = 4.9	4 STD RISK = .0	
RECEPTOR NO.= 56	1 STD RISK = 47.2	2 STD RISK = 22.3	3 STD RISK = 5.8	4 STD RISK = .3	
RECEPTOR NO.= 57	1 STD RISK = 43.3	2 STD RISK = 21.8	3 STD RISK = 4.7	4 STD RISK = .1	
RECEPTOR NO.= 58	1 STD RISK = 42.2	2 STD RISK = 20.9	3 STD RISK = 4.3	4 STD RISK = .1	

SHORT-TERM POPULATION EXPOSURE MODEL - LOS ANGELES AREA

NREGP = 58 NRSA = 55 NMONT = 10 NSITES = 10 NPOPL = 1
NYEAR = 1 SYEAR = 1973.0 DELYR = 2.0 AGSTD = 8.0

CONCENTTATION FUNCTIONS FOR DATA SET YEAR = 1973.0 POPLCL = 1 TPOPL = 8709147. TAREA = 2316.
P1 P2 P3 P4 P5 P6 P7 P8 = 100/(N+1) 1.0 3.0 5.0 10.0 25.0 50.0 75.0

POPULATION AND LAND AREA EXPOSURE FUNCTIONS

	LAND AREA						POPULATION					
	DISTRIBUTION FUNCTION			FREQUENCY FUNCTION			DISTRIBUTION FUNCTION			FREQUENCY FUNCTION		
	PERCENTILE			PERCENTILE			PERCENTILE			PERCENTILE		
CONCENTRATION	P2	P5	P7	P2	P5	P7	P2	P5	P7	P2	P5	P7
D* = 59.0	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
D* = 57.0	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
D* = 55.0	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
D* = 53.0	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
D* = 51.0	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
D* = 49.0	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
D* = 47.0	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
D* = 45.0	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
D* = 43.0	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
D* = 41.0	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
D* = 39.0	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
D* = 37.0	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
D* = 35.0	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
D* = 33.0	.000	.000	.024	.000	.000	.024	.000	.000	.018	.000	.000	.018
D* = 31.0	.000	.000	.091	.000	.000	.067	.000	.000	.051	.000	.000	.033
D* = 29.0	.000	.000	.283	.000	.000	.191	.000	.000	.154	.000	.000	.103
D* = 27.0	.000	.000	.364	.000	.000	.081	.000	.000	.209	.000	.000	.055
D* = 25.0	.000	.000	.448	.000	.000	.084	.000	.000	.350	.000	.000	.141
D* = 23.0	.000	.024	.523	.000	.024	.075	.000	.018	.447	.000	.018	.097
D* = 21.0	.000	.091	.592	.000	.067	.069	.000	.051	.492	.000	.033	.045
D* = 19.0	.000	.332	.693	.000	.241	.100	.000	.171	.596	.000	.120	.105
D* = 17.0	.000	.348	.863	.000	.016	.160	.000	.190	.772	.000	.019	.177
D* = 15.0	.000	.516	.887	.000	.168	.035	.000	.346	.825	.000	.156	.053
D* = 13.0	.000	.584	.990	.000	.068	.103	.000	.471	.980	.000	.125	.155
D* = 11.0	.000	.675	1.000	.000	.091	.010	.000	.559	1.000	.000	.088	.020
D* = 9.0	.000	.853	1.000	.000	.178	.000	.000	.772	1.000	.000	.213	.000
D* = 7.0	.240	.980	1.000	.240	.128	.000	.157	.960	1.000	.157	.188	.000
D* = 5.0	.663	1.000	1.000	.423	.020	.000	.554	1.000	1.000	.397	.040	.000
D* = 3.0	1.000	1.000	1.000	.337	.000	.000	1.000	1.000	1.000	.446	.000	.000
D* = 1.0	1.000	1.000	1.000	.000	.000	.000	1.000	1.000	1.000	.000	.000	.000

SPATIAL AVERAGE AIR QUALITY = 5.73 14.78 23.54
POPULATION WEIGHTED AVERAGE AIR QUALITY = 5.36 13.08 21.83

SHORT-TERM POPULATION EXPOSURE MODEL - LOS ANGELES AREA

NREP = 58 NRSA = 55 NMONT = 10 NSITES = 10 NPOPL = 1
NYEAR = 1 SYEAR = 1973.0 DELYR = 2.0 AQSTD = 8.0

RISK FUNCTIONS FOR DATA SET YEAR = 1973.0 POPL OL = 1 TPOPL = 8709147. TAREA = 2316.

DISTRIBUTION AND FREQUENCY FUNCTIONS OF RISK AREA AND RISK POPULATION

% TIME ABOVE THRESHOLD	LAND AREA DISTRIBUTION FUNCTION THRESHOLD 1 STD	2 STD	3 STD	4 STD	LAND AREA FREQUENCY FUNCTION THRESHOLD 1 STD	2 STD	3 STD	4 STD	POPULATION DISTRIBUTION FUNCTION THRESHOLD 1 STD	2 STD	3 STD	4 STD	POPULATION FREQUENCY FUNCTION THRESHOLD 1 STD	2 STD	3 STD	4 STD
F* =100.0	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
F* = 90.0	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
F* = 80.0	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
F* = 70.0	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
F* = 60.0	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
F* = 50.0	.040	.000	.000	.000	.040	.000	.000	.000	.037	.000	.000	.000	.037	.000	.000	.000
F* = 45.0	.233	.000	.000	.000	.192	.000	.000	.000	.136	.000	.000	.000	.100	.000	.000	.000
F* = 40.0	.506	.000	.000	.000	.273	.000	.000	.000	.331	.000	.000	.000	.194	.000	.000	.000
F* = 35.0	.576	.000	.000	.000	.070	.000	.000	.000	.450	.000	.000	.000	.120	.000	.000	.000
F* = 30.0	.630	.000	.000	.000	.054	.000	.000	.000	.494	.000	.000	.000	.044	.000	.000	.000
F* = 25.0	.663	.024	.000	.000	.033	.024	.000	.000	.551	.018	.000	.000	.057	.018	.000	.000
F* = 20.0	.761	.217	.000	.000	.098	.192	.000	.000	.640	.103	.000	.000	.089	.085	.000	.000
F* = 15.0	.835	.332	.000	.000	.075	.116	.000	.000	.749	.171	.000	.000	.109	.068	.000	.000
F* = 12.5	.865	.348	.000	.000	.030	.016	.000	.000	.792	.190	.000	.000	.043	.019	.000	.000
F* = 10.0	.887	.447	.000	.000	.022	.099	.000	.000	.825	.297	.000	.000	.034	.107	.000	.000
F* = 7.5	.963	.529	.024	.000	.076	.082	.024	.000	.928	.372	.018	.000	.103	.074	.018	.000
F* = 5.0	1.000	.576	.117	.000	.037	.047	.093	.000	1.000	.450	.068	.000	.072	.079	.050	.000
F* = 3.0	1.000	.704	.332	.000	.000	.129	.215	.000	1.000	.537	.171	.000	.000	.087	.103	.000
F* = 1.0	1.000	.865	.457	.040	.000	.161	.125	.040	1.000	.792	.368	.037	.000	.254	.197	.037
F* = .8	1.000	.874	.482	.040	.000	.009	.025	.000	1.000	.810	.405	.037	.000	.018	.036	.000
F* = .5	1.000	.887	.523	.056	.000	.013	.041	.016	1.000	.825	.447	.056	.000	.016	.043	.019
F* = .3	1.000	.963	.572	.107	.000	.076	.048	.051	1.000	.928	.471	.070	.000	.103	.024	.014
F* = .1	1.000	1.000	.635	.176	.000	.037	.064	.069	1.000	1.000	.573	.151	.000	.072	.102	.081
F* = .0	1.000	1.000	1.000	1.000	.000	.000	.365	.824	1.000	1.000	1.000	1.000	.000	.000	.427	.849

AVERAGE LAND AREA RISK (IN%) = 33.31 10.25 2.00 .17

AVERAGE POPULATION RISK (IN%) = 28.71 7.14 1.39 .15

IN

4.0 COMPUTER GRAPHICS

This section will discuss the use of three computer programs which can be used to produce computer drawn isopleth maps.

4.1 HYBRID Computer Mapping Procedure

A. Description

Hybrid generates a map drawn by a CALCOMP plotter. It also allows the user to preview this map on a Tektronix terminal. The program sorts data values into interval classes and directs the graphics device to plot a corresponding symbol at each data point. The boundries and subregions within the study area are represented by polygons.

B. Input - General Description

1. Control parameters - Card 1
2. Symbols - Card 2
3. Interval classes - Card 3
4. Geographic boundries - The boundries and subareas of the study area are described by polygons. The first card or record specifies the total number of polygons and the number of vertices per polygon. The next cards or records specify the x y coordinates of each polygon. The

Hybrid Data Items

Card Column	Variable Type	4. Geographic Boundries parameters	
1-2	I	NPOLYG - no. of polygrons	First Card
3-4	I	NPTS(1) - no. of points for polygon 1	
5-6	I	NPTS(2) - no. of points for polygon 2	
7-8	I	NPTS(3) - no. of points for polygon 3	
.	.	. .	
.	.	. .	
.	.	. .	
	I	NPTS(NCNTY) - no. of points for polygon NCNTY	
1-10	F	XPOLYG(I, J)-x coordinate for vertex I in polygon J	subsequent cards
11-20	F	XPOLYG(I, J)-y coordinate for vertex I in polygon J	

C. HYBRID Input Data - List of parameters and record format description

Card Column	Variable Type	Hybrid Data Items
		1. Control parameters
	F	XFACT - multiplicative scaling factor which converts input data to inches
6-10	F	XOFF - transforms x coordinate to x = x - XOFF
11-15	F	YOFF - transforms y coordinate to y = y - YOFF
16-20	F	XWIDTH - width of map in original data units
21-25	F	CHAR - scaling factor for character symbols } may be left blank, default=1
26-30	I	NPLOT1-no. of first data set to be plotted } used for multiple plots may be left blank for single plot
31-35	I	NPLOT2-no. of last data set to be plotted
		2. Symbols - used to display classes of data values
		parameters
1	A	SYMBOL(1) - Symbol corresponding to class interval 1
2	A	(2) - 2
3	A	(3) 3
4	A	(4) 4
5	A	(5) 5
6	A	(6) 6
7	A	(7) 7
8	A	(8) 8
9	A	(9) 9
10	A	(10) 10
		3. Class intervals - defines categories of data values
		parameters
1-5	F	Range(1)-defines class interval 1 as x ≥ Range (1)
6-10	F	(2) " " " 2 as Range(2) ≤ x < Range(1)
11-15	F	(3) " " " 3 (3) ≤ x < (2)
16-20	F	(4) " " " 4 (4) ≤ x < (3)
21-25	F	(5) " " " 5 (5) ≤ x < (4)
26-30	F	(6) " " " 6 (6) ≤ x < (5)
31-35	F	(7) " " " 7 (7) ≤ x < (6)
36-40	F	(8) " " " 8 (8) ≤ x < (7)
41-45	F	(9) " " " 9 (9) ≤ x < (8)
		defines class interval 10 as x < Range (9)

Hybrid Data Items

Card Column	Variable Type	
		4. Geographic Boundries parameters
1-2	I	NPOLYG - no. of polygrons
3-4	I	NPTS(1) - no. of points for polygon 1
5-6	I	NPTS(2) - no. of points for polygon 2
7-8	I	NPTS(3) - no. of points for polygon 3
.	.	. .
.	.	. .
.	.	. .
	I	NPTS(NCNTY) - no. of points for polygon NCNTY
		} First Card
1-10	F	XPOLYG(I, J)-x coordinate for vertex I in polygon J
11-20	F	XPOLYG(I, J)-y coordinate for vertex I in polygon J
		} subsequent cards
		5. Display Variable-This data can be provided by output files of LPEM and SPEM
		parameters
1-3	I	no. of points — first card or record
1-10	F	data value
11-20	F	x coordinate
21-30	F	y coordinate
		} one card or record for each point

D. Sample Run Streams

1. Sample run stream for CALCOMP generated map on UNIVAC

```
@ ASG,CP    user plot file
@ ASG,A     TRRP*POPEXP.
@ PLOT      user plot file
@ XQT       TRRP*POPEXP.HYBRID/CAL
@ ADD       TRRP*POPEXP.HYBRID-DATA/LA
@ FREE      user plot file.
@ SYM       user plot file.,,PLOT
@ FIN
```

2. Sample Run Stream for Tektronix Generated Map on UNIVAC

Enter the following commands at your terminal:

```
@ ASG,A  TRRP*POPEXP.

@ XQT    TRRP*POPEXP.HYBRID/TEK
@ ADD    TRRP*POPEXP.HYBRID-DATA /LA
```

You will now be in CALCOMP Preview Mode.

CALCOMP preview on Tektronix requires the use of Tektronix supplied previewing routines. These are referenced in "Preview Routines for CALCOMP Plotters, Users Manual." The following input statements will allow the user to preview the sample map on Tektronix. The questions are generated by CALCOMP preview software.

```
OPTION?
1  (press Return)
OPTION?
W  (press Return)
WHERE WOULD YOU LIKE ORIGIN(X,Y)
-3.,1.  (press Return)  (or  -6,0)
ENTER SIZE (WIDTH,HEIGHT)
7.,5.7                  (or  14, 11.4)
OPTION?
C   (press Return)
```

Usual values of the origin (x,y) are 0,0. Negative values are used here because the data coordinates became negative through re-scaling by the program. The size (width, height) specifies the portion of the apparent calcomp plot that is to be viewed on the tektronix screen. The ratio of width and height must match the actual CRT viewing dimensions.

F. Application of HYBRID Maps

It is recommended that HYBRID be applied once to the air quality data observed at the monitoring sites and separately to air quality data estimated at a receptor network. The combined use of both of these generated maps will facilitate the development of a suitable isopleth map. The monitoring data map will show actual observed values while the receptor data map will provide estimates for areas between the monitoring sites. A suggested approach is to overlay the monitoring data map on top of the receptor data map, so that both maps can be visually combined. The use of two separate maps will allow the user to easily discriminate between actual monitoring data and the interpolated estimates from the monitoring data. The values estimated at the receptor network reflect an averaging process and may therefore be quite different than the monitoring data in areas of variable air quality. This apparent discrepancy may be viewed as a localized condition and may require the inclusion of a separate isopleth on the map.

For the preparation of the isopleth map from the HYBRID generated map, it is suggested that 5 or less isopleth levels be used. This will produce a visually pleasing map. Usually, an isopleth corresponding to the NAAQS is used. The selection of additional isopleth values is guided by the observed data values. Isopleth lines are manually drawn between symbols which denote data class intervals above and below the particular isopleth level. Suppose that symbol 7 denotes values of 70-79 $\mu g/m^3$, symbol 8 denotes values of 80-89 $\mu g/m^3$ and symbol 9 denotes values of 90-99 $\mu g/m^3$. An isopleth line for 80 $\mu g/m^3$ would be drawn so that it is equidistant between adjacent symbols 7 and 8. If symbols 7 and 9 are adjacent, the isopleth lines would be placed one third the distance between 7 and 9.

4.2 SYMAP

A. SYMAP allows the user to generate printed maps on a line printer with overprint capability. The SYMAP computer graphics program allows even those with limited experience in programming to produce several types of maps by using basic SYMAP packages with various electives. Directions for the programming of these maps may be obtained from the "SYMAP User's Reference Manual" developed at Harvard University. However, a beginning user of SYMAP may find it helpful to see other examples of SYMAP. The following material contains basic run commands and instructions for six example maps produced by SYMAP. Each map uses 1972 annual geometric mean TSP concentrations produced by 122 monitors in the N.Y.-N.J.-Ct AQCR to illustrate potentially useful spatial displays of air quality. These examples may be aids in setting up your own SYMAP package.

References:

1. "EPA GRAPHICS USERS GUIDE HARVARD GRAPHICS USER INFORMATION", Rodney H. Allen, Comp-Aid Inc., July 1975, revised January 1976.

2. "SYMAP User's Reference Manual", James A. Dougenik and David E. Sheehan, Laboratory for Computer Graphics and Spatial Analysis, Graduate School of Design, Harvard University, 1975, revised May 1976.

B. Generation of Sample SYMAP examples

```
@ ASG,A  GRAPH* HARVARD
@ ASG,A  TRRP* SYMAP-DATA
@ ASG,A  TRRP* POPEXP.

@ HDG, NX  X·M, 66, 0, 0

@ XQT  GRAPH* HARVARD·SYMAP
@ ADD TRRP* POPEXP:SYMAP1

@ XQT GRAPH* HARVARD:SYMAP
@ ADD TRRP* POPEXP. SYMAP2

@ XQT  GRAPH* HARVARD.SYMAP
@ ADD  TRRP* POPEXP. SYMAP3

@ XQT GRAPH* HARVARD.SYMAP
@ ADD TRRP*  POPEXP.SYMAP4
```

(1) TRRP * POPEXP. SYMAP1 contains the data statements required to generate conformant maps (example 1 and 2)

(2) TRRP * POPEXP. SYMAP2 contains the data statements required to generate contour maps (example maps 3,4)

(3) TRRP * POPEXP. SYMAP3 contains the data statements required to generate a contour map with Barriers (example Map 5)

(4) TRRP*POPEXP. SYMAP4 contains the data statements required to generate a proximal map. (example map 6)

C. Preparation of Data

The boundary of the study region can be represented by a polygon. Seperate subareas such as counties can be included. After the specific area and boundries have been established, the map should be placed on a coordinate system with the origin in the upper left corner. An example base map is shown in Figure 4.2-1. The vertices of each "subarea" are then put on cards or into a file. They will be used in the A-OUTLINE and A-CONFORMOLINES package according to the format specifications.

Data points must then be selected which will be used for the location of values. The coordinates for these points should be determined. These points will be used in the B-DATA POINTS package and may also be put on cards or into a file.

After the data points are chosen, values must be assigned for each point. The values will be used in the E-VALUES package.

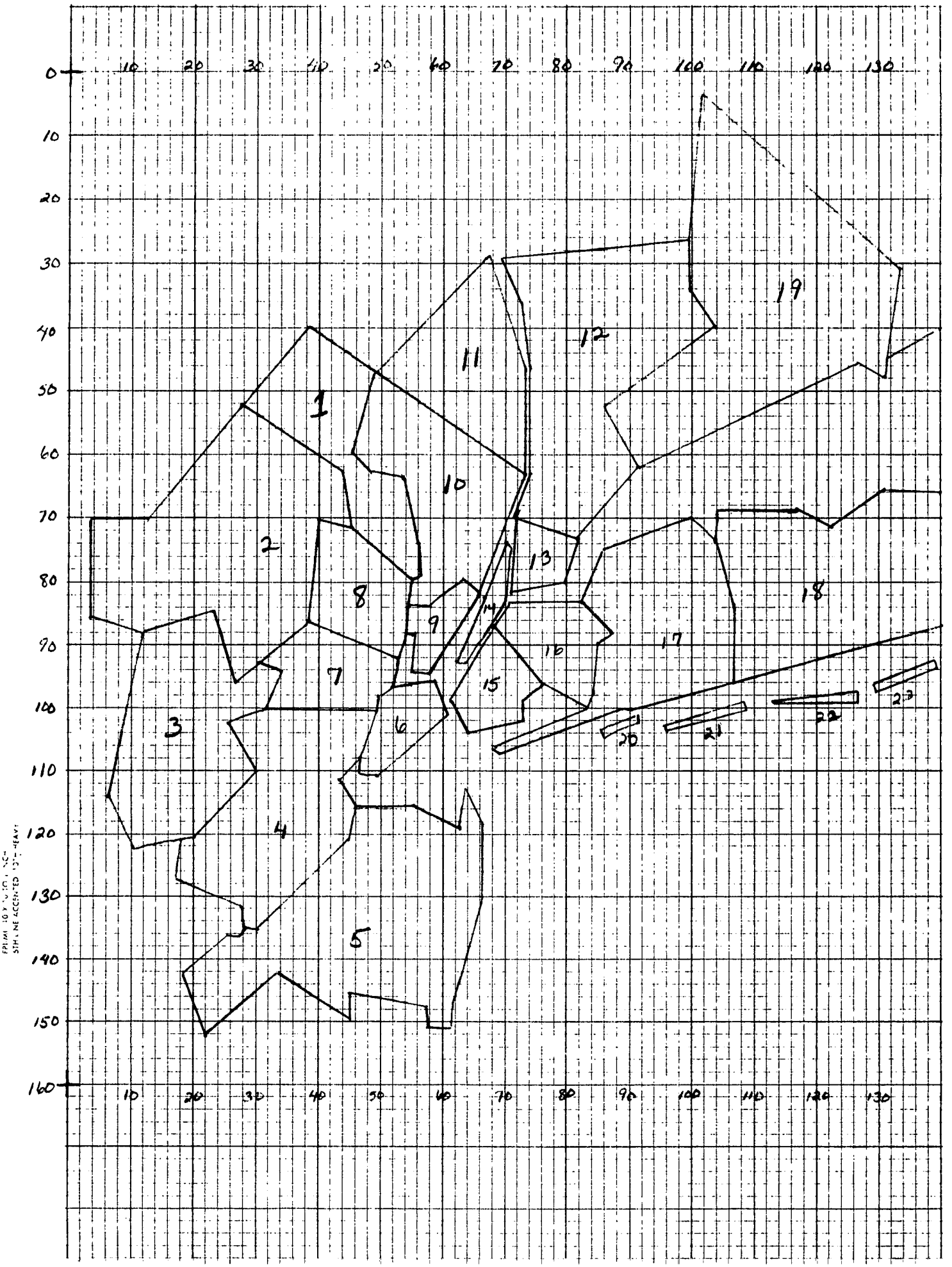
Three other packages: C-OTOLEGENDS, D-BARRIERS, AND F-MAP will be described with the example maps. For additional detail and the use of other packages, see the SYMAP manual.

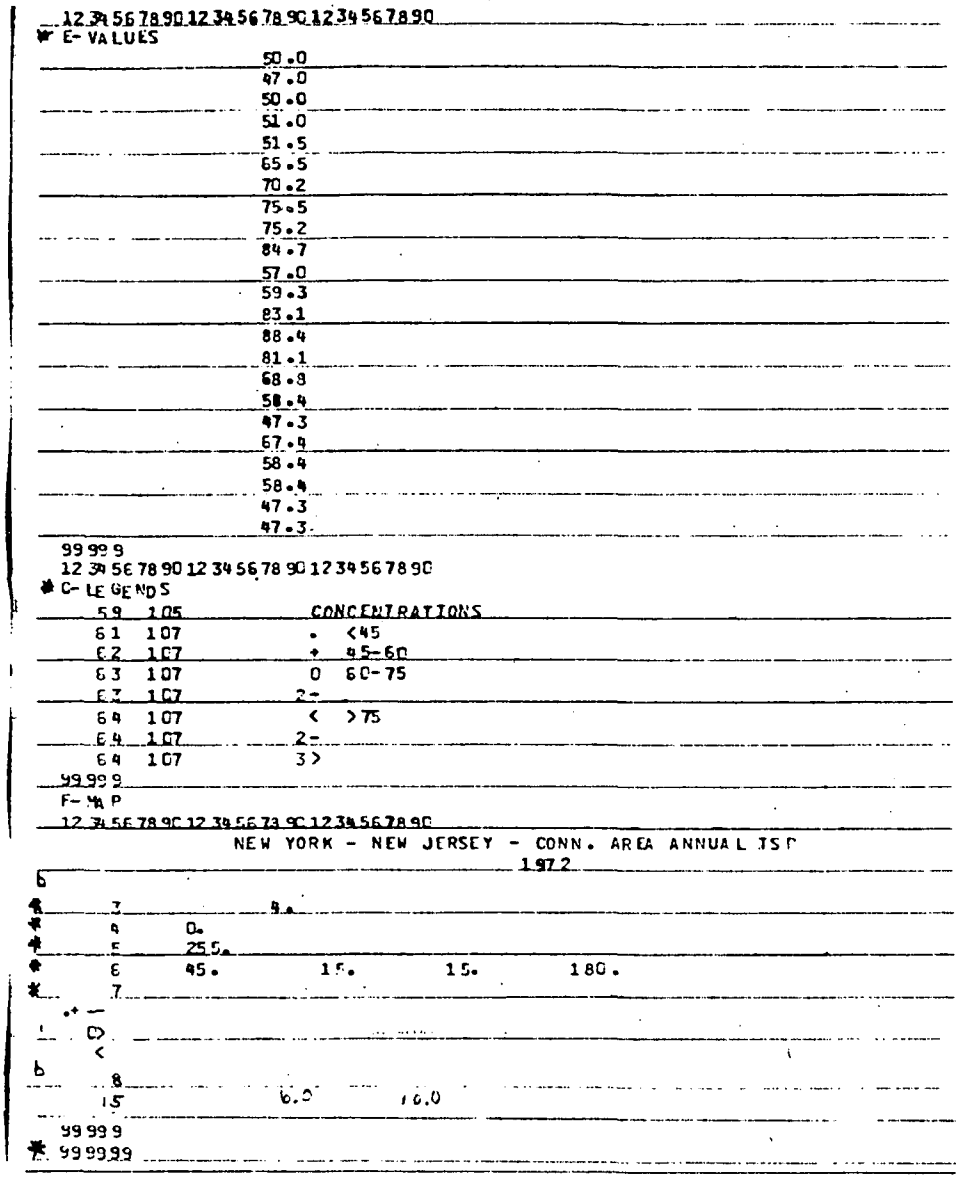
D. Example Maps

There are three basic types of maps shown in the following examples Conformant, Contour; and Proximal. The conformant map is based on the "subareas" set up in the A-CONFORMOLINES package and displays a single value for each subarea. The other examples here, contour and proximal, use the A-OUTLINE package. Contour maps are of a continous nature. The values at each data point are used to produce continous interval patterns which are displayed as contours or isopleths. Proximal maps are produced so that the value assigned to each point is chosen from the nearest data point (monitoring site).

The maps in the following example show the outline of the New York New Jersey Connecticut Air Quality Control Region. The area was divided into sections by counties and islands. Total Suspended Particulate (TSP) monitoring locations are the data points and TSP annual mean concentrations in 1972 are the values used. (See Section 4.2-E)

Figure 4.2-1 Map Used to Find Coordinates for Various Packages in this Program





2. Conformant map which assigns a single value to each county (average TSP from the monitors in each county). Produced in the same run as the previous map. Packages are repeated for each new map until a new one is found in the program.

*1234567890...are column numbers placed in the list for your convenience. Do not put these in program.

*E-VALUES are averages from each county or island. They are listed in the same sequence as the counties and islands.

*C-LEGENDS are in row-column coordinates. An over-printed character was created by placing a "2" or "3" in column 20.

*Elective 3 designates the number of class intervals.

*Elective 4 sets a minimum value for range.

*Elective 5 sets a maximum value for range.

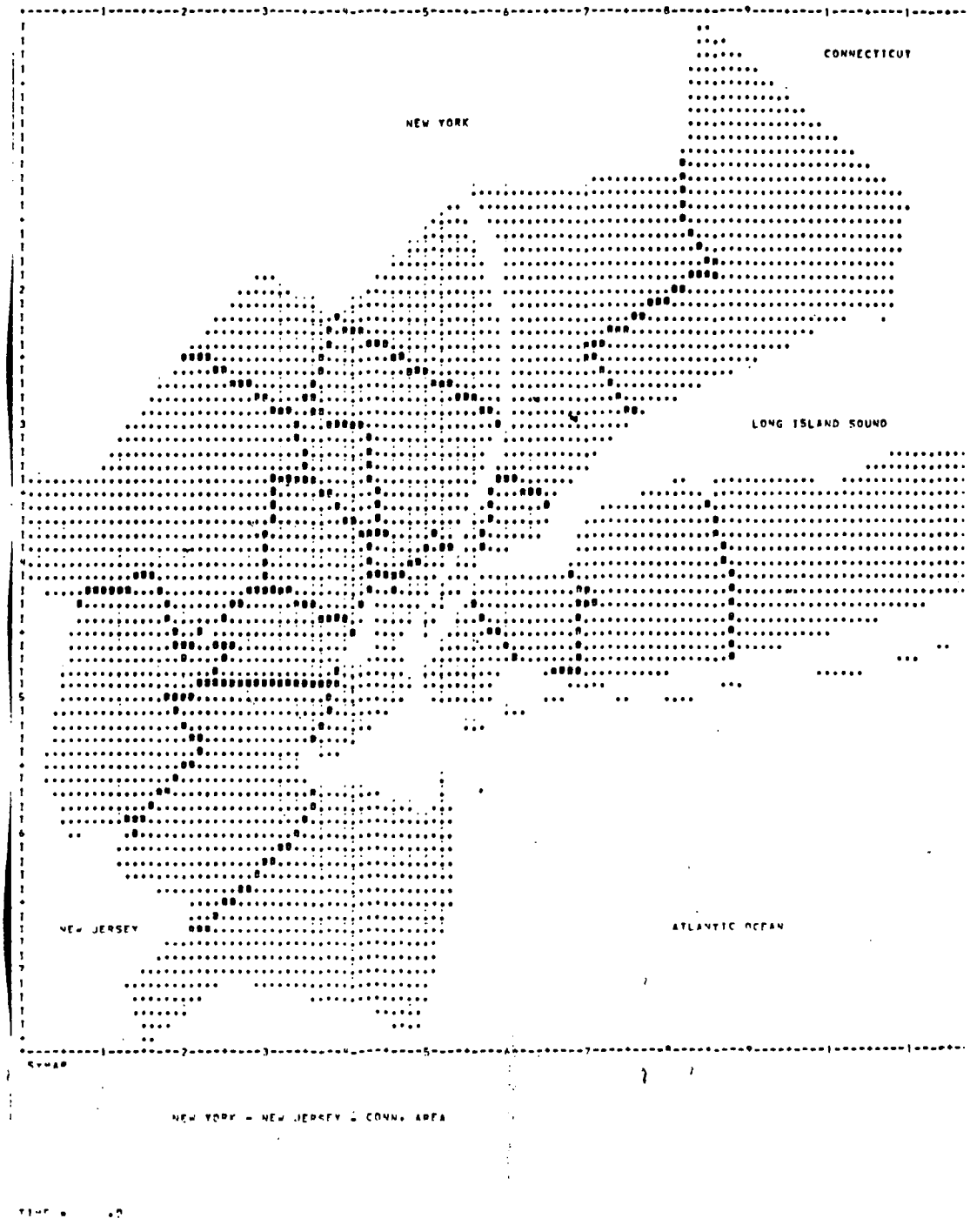
*Elective 6 sets the class intervals. In this example, the intervals will be 0-45, 46-60, 61-75, 76-255.

*Elective 7 defines character symbols for each interval.

*999999 must be placed at the end of each run to finish the program.

bBlank card

Map 1. Conformant Base Map



```
   12 34 56 78 90 12 34 56 78 90 12 34 56 78 90
   A-CONFORMOLINES
*  DATA SYMAP-DATA.NY-BDRY
*  99999
*  12 34 56 78 90 12 34 56 78 90 12 34 56 78 90
*  C-OTOLEGENDS
      11     P          10.0        120.0
   CONNECTICUT
       8     P          20.0         60.0
   NEW YORK
      10     P         135.0         10.0
   NEW JERSEY
      17     P62.          109.55
   LONG ISLAND SOUND
      14     P134.40      98.4
   ATLANTIC OCEAN
   99999
*  F-MAP
   12 34 56 78 90 12 34 56 78 90 12 34 56 78 90
*                    NEW YORK - NEW JERSEY - CONN. AREA
b
b
*     7
      .          .                 0
                 0                 0
b
b
*     15              6.0         10.0
   99999
```

Example 1. Simple conformant map showing county boundaries.

*1234567890...are placed in the list for your convenience. Column numbers--do not put these in program.

*SYMAP-DATA.NY-BDRY is a file containing the vertices of each sub-area polygon. (See 4.2.E)

*99999 must be placed after all packages.

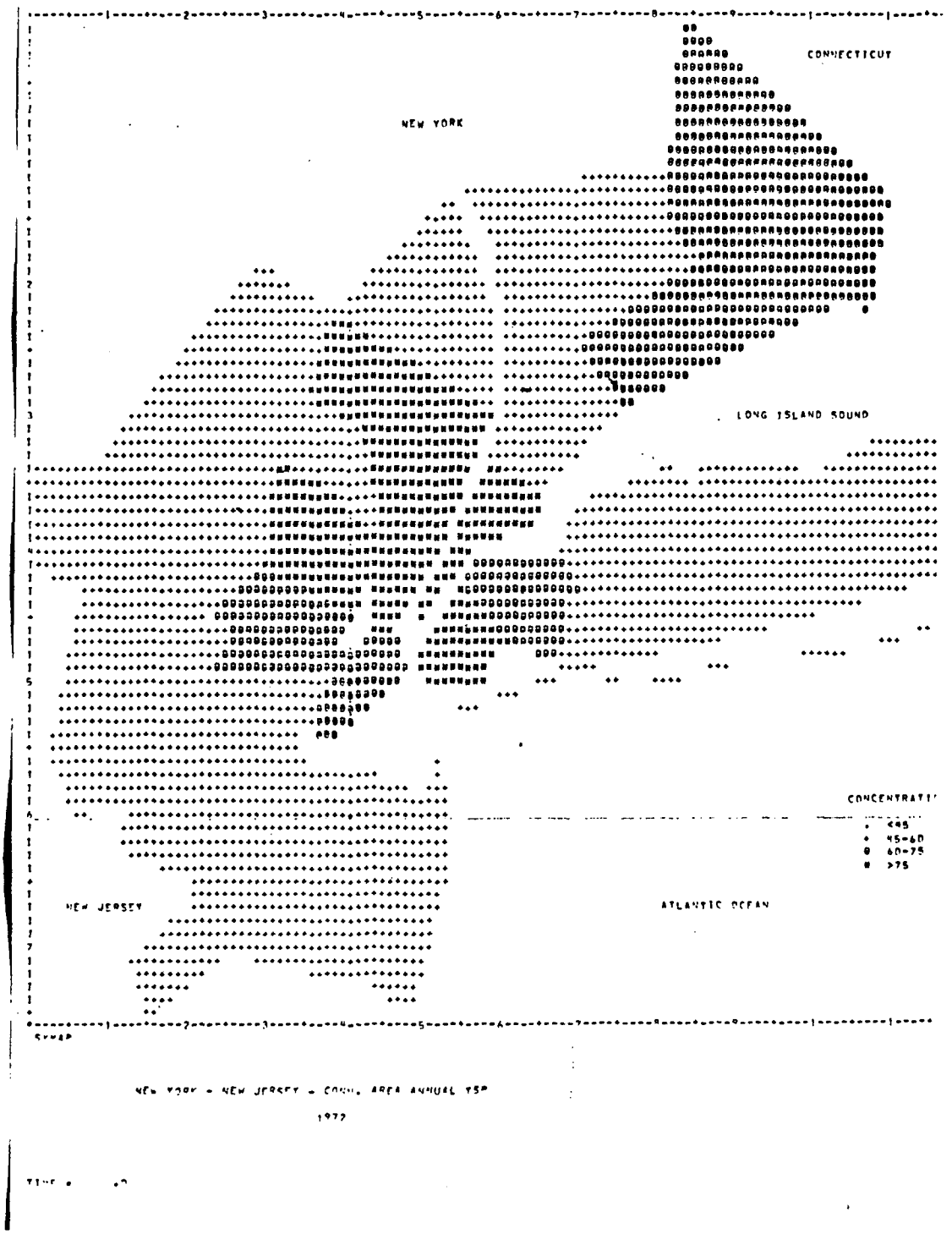
*The C-OTOLEGENDS package is used here to place labels for states and bodies of water on the map. Specifications on the cards include the number of spaces required for the label, type of oto-legend ('P', point), and the coordinates for the first character in the label. Use map coordinates. The F-MAP package specifies map options or electives. After the heading F-MAP, three title cards are inserted. Any of these may be blank.

*Elective 7 specifies symbols (single or overprint characters) which are used for boundaries and interior of the map.

*Elective 15 notifies the program of the number of lines to be printed per inch. The default is 8 rows per inch and 10 columns per inch; however, all printers are not set to print this way. Check your printer to see if changes need to be made.

bBlank card

Map 2. Conformant Map



```
A- OUTLINE                X
 LOAD SYMAP-DATA.NY-8 DRY
 99999
B- DATA POINTS            XX
 LOAD SYMAP-DATA.NY-726-8
 99999
C- CONTOLEGENDS           X
   11    P        10.0       120.C
CONNECTICUT
    8    P        20.0        60.C
NEW YORK
   10    P       135.0        10.C
NEW JERSEY
   17    P62.       109.55
LONG ISLAND SOUND
   19    P139.40     98.9
ATLANTIC OCEAN
 99999
C- LEGENDS                XX
   72  105                CONCENTRATIONS
   74  107                .  <45
   75  107                +  45-60
   76  107                O  60-75
   76  107               2-
   77  107                <  >75
   77  107               2-
   77  107               3>
 99999
E- VALUES                 X
 LOAD SYMAP-DATA.NY-726-E
 99999
F- MAP
 1234567890123456789012345678 90
                NEW YORK - NEW JERSEY - CONN. AREA ANNUAL TSP
                                          1972
b
    3
    4    0.
    5    255.
    6    45.        15.        15.        180.
    7
         1234
    D
    <
b
    8
    9
   17
   36    3.         3.
 99999
```

The next two maps will use basically the same format, therefore, only the changes will be specified for the second map.

3. Contour map with four class intervals.

   *1234567890...are column numbers placed in the list for your convenience. Do not put in program.

   *A-OUTLINE--used for contour and proximal maps. A character (x) in columns 21-30 will delete print-out of the package.

   *B-DATA POINTS are also on a file.

   *E-VALUES are on a file. (See 4.2-E)

   *Elective 7 defines characters for each interval and numbers the intervals at the data points on the map. In column 27(-) will not be used in this map, but in the next map.

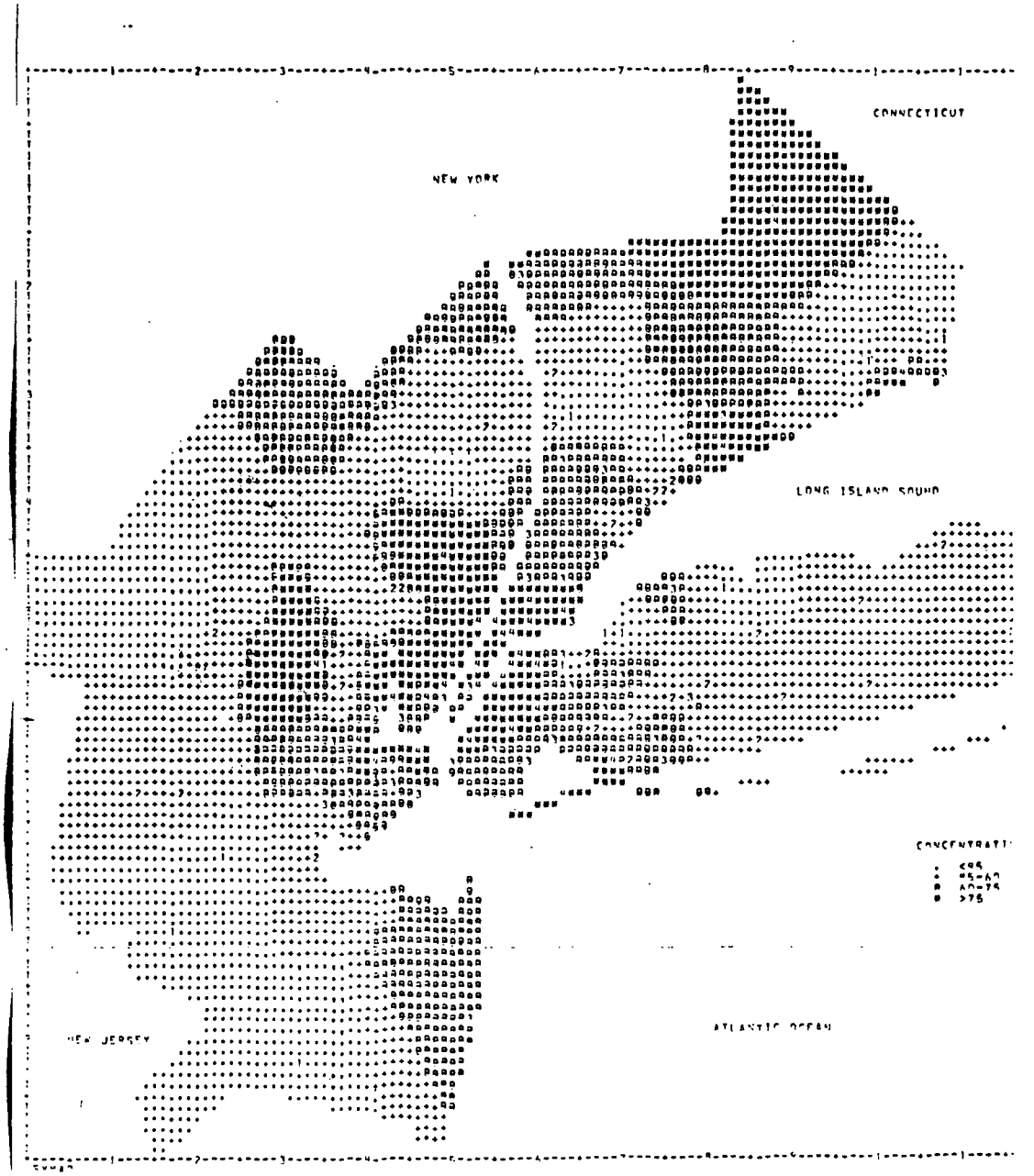
   *Elective 8 allows continuous contours to be produced. Otherwise, a blank space indicating a contour line would appear between class intervals.

   *Elective 9 suppresses a histogram which will be printed after each map showing the distribution of values within each interval.

   *Elective 17 stops a printout of data point information preceding the map. This information is of little value after it has been printed out once.

   *Elective 36 sets the number of values one wiches to have for interpolation at each data point.

Map 3. Contour Map



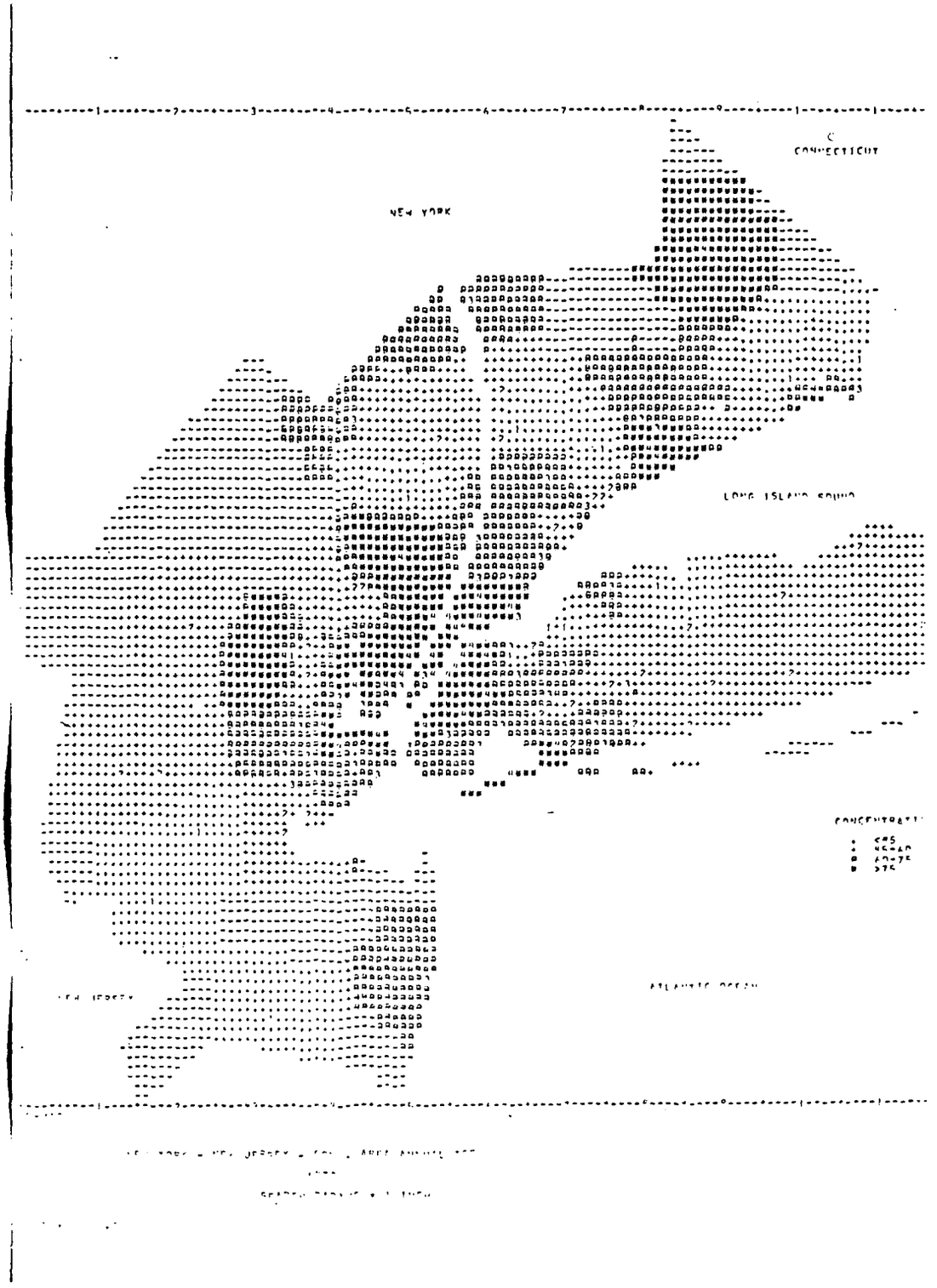
-Example 4 Contour Map with Search Radius

```
F-MAP
1234567890123456789012345678900
              NEW YORK - NEW JERSEY - CONN. AREA ANNUAL TSP
                                  1972
                          SEARCH RADIUS = 1 INCH
*   12
*   35          12.0
99999
```

4. This map is the same as the previous map with the exception of Elective 35 and is produced by adding another F-MAP package with elective 12 (repeats electives of previous map)and elective 35 which defines a one-inch search radius. The program will not go beyond one inch from each data point to search for data. The symbol (-) will appear outside of the search radius range.

1234567890...are column numbers placed in the list for your convenience. Do not put these in your program.

Map 4. Countour Map with 1 Inch Search Radius



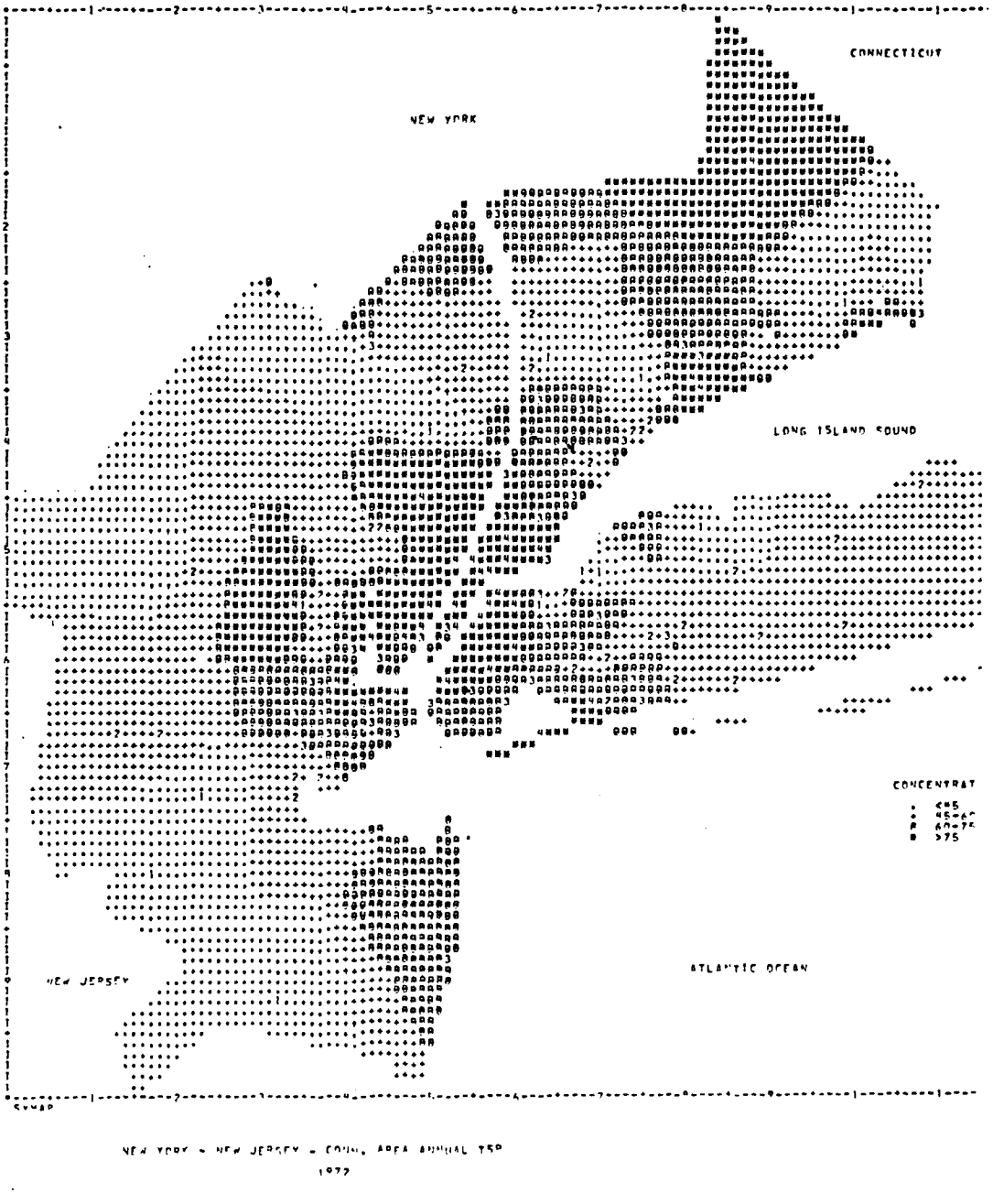
```
A-OUTLINE                X
@ADD SYMAP-DATA.NY-BDRY
99999
B-DATA POINTS            XX
@ADD SYMAP-DATA.NY-72G-B
99999
C-CONTOLEGENDS           X
   11    P      10.0      120.0
CONNECTICUT
    8    P      20.0      60.0
NEW YORK
   10    P     135.0      10.0
NEW JERSEY
   17    P62.     109.55
LONG ISLAND SOUND
   14    P134.40    98.4
ATLANTIC OCEAN
99999
C-LEGENDS                XX
   72  105               CONCENTRATIONS
   74  107               .  <45
   75  107               +  45-60
   76  107               0  60-75
   76  107              2-
   77  107               <  >75
   77  107              2-
   77  107              3>
99999
1234567890123456789012345678 90
D-BARRIERS                 XX
            40.0        38.0       -1.0
            62.         72.        -1.0
            67.         72.        -1.0
            72.         71.        -1.0
            89.         63.        -1.0
            94.         60.        -1.0
99999
E-VALUES                 X
@ADD SYMAP-DATA.NY-72G-E
99999
F-MAP
1234567890123456789012345678 90
                NEW YORK - NEW JERSEY - CONN. AREA ANNUAL TSP
                                        1972
b
      3              4.
      4      0.
      5      255.
      6      45.        15.        15.        180.
      7
      *      1234                  -
      D
      <
b
      8
      9
     17
     36      3.         3.
99999
99999
```

5. This map uses the same package as the previous map as well as the same electives with the exception of elective 35 (no search radius used). However, a new package, D-BARRIERS, has been added. The barrier is along the New York-New Jersey state line so that the values in either state close to the barrier will not effect the interpolated values in the other state. The first two columns of numbers are the coordinates for the vertices of the barrier. This is an impermeable barrier and is designated as such by (-1.0).

1234567890...are column numbers placed in the list for your convenience. Do not put these in your program.

[b]Blank card

Map 5. Contour Map with Barrier



```
 A-OUTLINE                X
 @ADD SYMAP-DATA.NY-BDRY
 99999
 B-DATA POINTS            XX
 @ADD SYMAP-DATA.NY-72G-B
 99999
 1234567890123456789012345678 90
 C-OTOLEGENDS             X
    11    P       10.0      120.0
 CONNECTICUT
     8    P       20.0       60.0
 NEW YORK
    10    P      135.0       10.0
 NEW JERSEY
    17    P62.            109.55
 LONG ISLAND SOUND
    14    P134.40         98.4
 ATLANTIC OCEAN
 99999
 123456789012345678901234567890
 C-LEGENDS                XX
    72  105               CONCENTRATIONS
    74  107               .  <45
    75  107               +  45-60
    76  107               0  60-75
    7E  107              2-
    77  107               <  >75
    77  107              2-
    77  107              3>
 99999
 E-VALUES                 X
 @ADD SYMAP-DATA.NY-72G-E
 99999
 F-MAP
 123456789012345678901234567890
                 NEW YORK - NEW JERSEY - CONN. AREA ANNUAL TSP
                                          1972
b
      3             4.
      4    0.
      5    255.
      6    45.         15.        15.        180.
      7
  .+ -     1234          -
    D
    <
D
      8
      9
     17
*    31
*    36
*    37
 99999
 999999
```

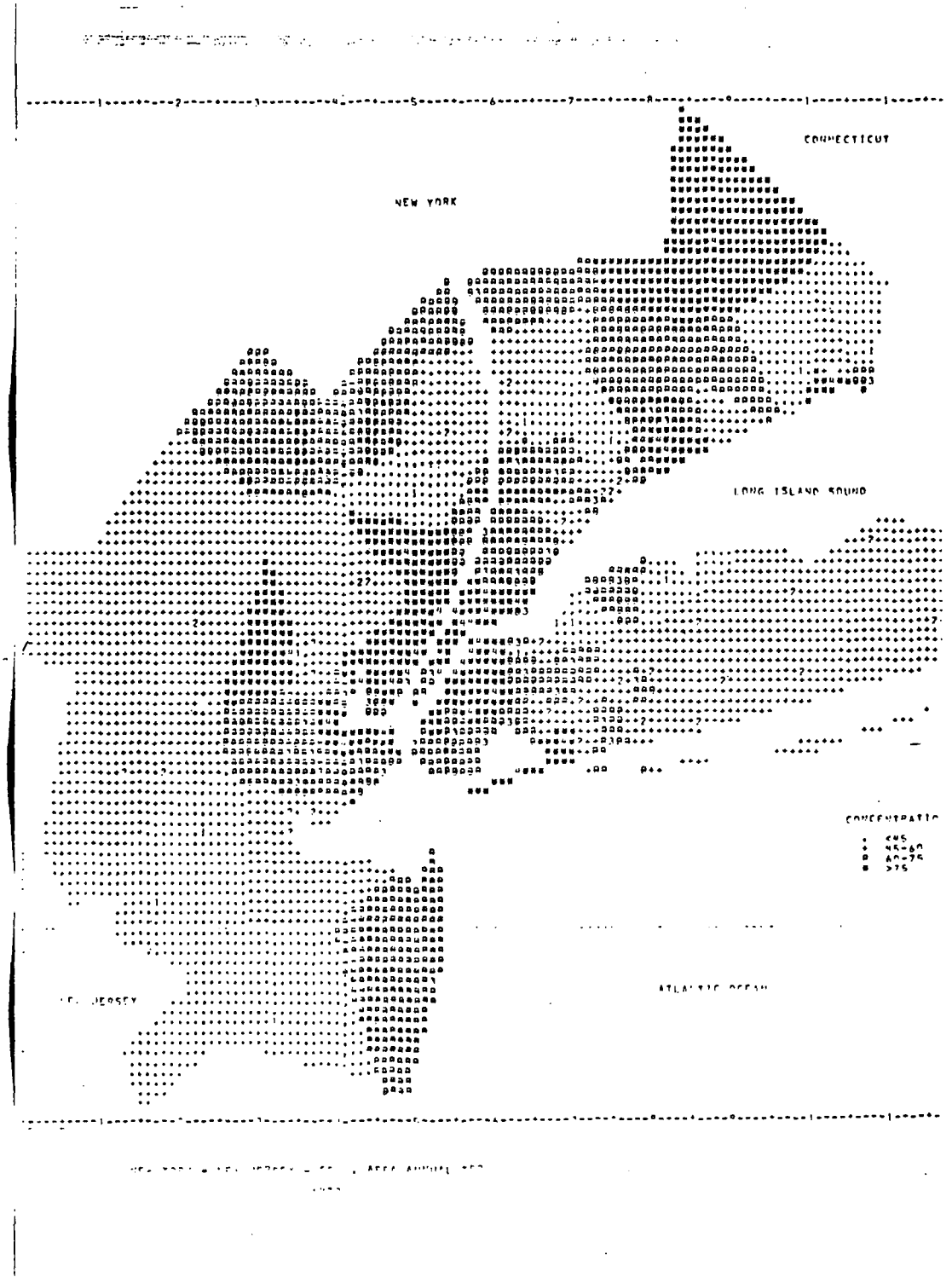
6. Essentially the same package used as for a contour map. Because actual instead of interpolated data values are used, proximal maps give some detail which contour maps do not show.

*1234567890...are column numbers placed in the list for your convenience. <u>Do not</u> put these in your program.

*Electives 31, 36, and 37 are required for a proximal map, but no specifications for each one are necessary.

bBlank card

Map 6. Proximal



4.2-E Data Listings for SYMAP Examples

TRRP*SYMAP-DATA.NY-BDRY			
1	A	40.0	38.5
2		52.0	27.5
3		62.4	43.4
4		71.0	45.3
5		79.0	54.5
6		78.5	56.0
7		63.7	53.2
8		62.3	48.0
9		59.8	45.1
10		47.4	48.8
11		40.0	38.5
12	A	52.0	27.5
13		69.6	13.8
14		70.0	4.0
15		85.1	4.0
16		87.6	11.6
17		84.0	23.0
18		95.0	26.8
19		85.2	38.7
20		70.0	40.3
21		71.0	45.3
22		62.4	43.4
23		52.0	27.5
24	A	95.0	26.8
25		84.0	23.0
26		87.6	11.6
27		113.0	6.6
28		121.3	10.8
29		119.4	20.8
30		109.0	30.0
31		101.7	25.0
32		99.9	31.0
33		93.9	34.0
34		92.2	30.4
35		95.0	26.8
36	A	99.9	31.0
37		101.7	25.0
38		109.0	30.0
39		119.4	20.8
40		120.0	18.0
41		126.3	17.7
42		130.9	28.0
43		134.8	28.0
44		134.4	30.2
45		119.6	45.0
46		114.2	45.6
47		110.5	43.1
48		107.0	46.3
49		100.0	49.1
50		99.9	51.0
51	A	114.2	45.6
52		119.6	45.0
53		134.4	30.2
54		135.2	26.0
55		142.2	18.6
56		151.5	21.6

col 11-20 21-30

Note that for each area, A, the first and last vertices are the same.

57		141.3	33.0
58		144.0	44.9
59		146.8	56.9
60		149.5	56.9
61		149.5	61.0
62		129.5	66.0
63		117.0	66.0
64		112.0	64.0
65		118.4	62.7
66		114.8	55.5
67		114.2	45.6
68	A	100.0	49.1
69		107.0	46.3
70		110.0	46.7
71		110.0	49.0
72		100.5	60.5
73		95.0	59.0
74		96.2	50.2
75		97.2	49.4
76		100.0	49.1
77	A	85.2	38.7
78		92.2	30.4
79		93.9	34.0
80		99.9	31.0
81		100.0	49.1
82		97.2	49.4
83		96.2	50.2
84		91.7	52.6
85		85.2	38.7
86	A	70.0	40.3
87		85.2	38.7
88		91.7	52.6
89		79.0	58.5
90		71.0	45.3
91		70.0	40.3
92	A	83.3	54.0
93		87.2	53.4
94		87.5	55.0
95		94.0	55.0
96		94.0	58.0
97		81.0	65.3
98		78.9	63.5
99		85.0	58.0
100		83.3	54.0
101	A	47.4	48.8
102		59.8	45.1
103		62.3	48.0
104		63.7	53.2
105		78.5	56.0
106		79.0	54.5
107		83.3	54.0
108		85.0	58.0
109		78.9	63.5
110		81.0	65.3
111		62.3	72.8
112		47.4	48.8
113	A	47.4	48.8

114		62.3	72 .8
115		46.8	72 .8
116		30.0	67 .0
117		47.4	48 .8
118	A	29.8	68 .5
119		36.2	72 .9
120		50.7	74 .5
121		61.9	74 .2
122		69.7	72 .0
123		74.0	80 .0
124		62.0	92 .0
125		52.9	85 .5
126		40.5	1 03 .5
127		34.0	99 .0
128		26.6	99 .0
129		29.8	68 .5
130	A	69.7	72 .0
131		81.0	70 .0
132		79.5	79 .0
133		74.0	80 .0
134		69.7	72 .0
135	A	81.7	66 .3
136		89.5	62 .0
137		92.0	61 .8
138		92.0	63 .0
139		81.0	70 .0
140		69.7	72 .0
141		81.7	66 .3
142	A	99.0	61 .0
143		103.0	64 .0
144		102.0	72 .2
145		98.2	72 .3
146		95.9	75 .3
147		87.0	68 .0
148		92.8	64 .0
149		99.0	61 .0
150	A	87.0	68 .0
151		95.9	75 .3
152		98.7	81 .0
153		97.0	84 .0
154		89.0	84 .0
155		87.8	86 .4
156		83.0	82 .0
157		83.0	70 .1
158		87.0	68 .0
159	A	83.0	82 .0
160		87.8	86 .4
161		89.0	84 .0
162		97.0	84 .0
163		98.7	81 .0
164		100.0	83 .0
165		105.6	67 .5
166		106.5	68 .0
167		99.7	88 .5
168		95.9	1 06 .0
169		84.0	1 06 .0
170		73.9	1 03 .0

171		70.0	99.0
172		75.2	85.5
173		83.0	82.0
174	A	73.9	103.0
175		84.0	106.0
176		95.9	106.0
177		82.5	155.0
178		67.1	155.0
179		65.5	130.5
180		72.0	120.0
181		69.0	116.0
182		69.0	103.0
183		73.9	103.0
184	A	26.6	99.0
185		34.0	99.0
186		40.5	103.5
187		52.4	85.5
188		62.0	92.0
189		46.0	126.0
190		48.0	129.0
191		31.0	132.0
192		4.8	101.0
193		26.6	99.0
194	A	100.9	91.0
195		102.0	91.2
196		103.5	86.0
197		103.0	84.9
198		100.9	91.0
199	A	99.0	107.1
200		100.0	107.9
201		103.0	95.0
202		102.0	95.0
203		99.0	107.1
204	A	97.0	126.0
205		99.0	125.7
206		99.5	115.0
207		98.0	115.0
208		97.0	126.0
209	A	93.0	137.8
210		94.0	138.0
211		97.3	128.7
212		96.3	128.0
213		93.0	137.8

TRKP *SYMAP-DATA.NY-72G-B

1	43.5	124.0
2	43.5	124.0
3	45.5	123.5
4	24.5	106.0
5	43.5	118.5
6	59.5	92.0
7	56.5	94.5
8	61.0	91.0
9	54.5	91.5
10	57.5	94.5
11	49.0	108.5
12	48.0	109.0
13	55.5	99.5
14	54.0	98.5
15	51.0	99.5
16	50.0	96.5
17	41.0	129.0
18	94.5	49.5
19	88.5	60.5
20	90.0	52.0
21	132.0	64.0
22	101.5	24.5
23	101.5	48.5
24	85.0	43.0
25	85.0	45.0
26	79.0	65.0
27	86.0	68.5
28	88.0	47.5
29	87.0	60.5
30	88.5	58.5
31	98.5	47.0
32	121.0	23.5
33	139.0	41.5
34	80.5	29.5
35	88.5	53.5
36	110.5	31.0
37	83.5	47.5
38	75.0	55.5
39	75.0	54.0
40	108.0	44.0
41	99.0	44.0
42	94.5	45.5
43	102.5	19.5
44	110.5	43.0
45	84.5	61.5
46	62.0	62.5
47	80.0	76.5
48	88.5	107.0
49	95.0	95.5
50	89.0	92.0
51	74.0	92.0
52	97.5	91.0
53	92.5	86.5
54	97.0	87.0
55	89.0	95.0
56	97.5	84.0

col	11-20	21-30
	↑	↑
	Y	X

57	80.0	83.5
58	66.0	84.5
59	87.5	96.5
60	94.5	103.5
61	75.0	99.5
62	81.0	104.0
63	69.5	81.5
64	84.5	68.0
65	84.5	68.0
66	53.0	76.0
67	45.5	75.5
68	33.0	71.5
69	61.0	89.5
70	53.0	67.0
71	95.0	90.5
72	62.5	88.5
73	71.0	160.0
74	49.5	54.5
75	69.0	129.5
76	81.0	139.0
77	87.0	119.0
78	76.5	118.0
79	51.5	78.5
80	84.5	77.5
81	81.0	85.0
82	56.5	77.5
83	59.0	82.5
84	67.0	73.0
85	78.5	68.0
86	76.0	72.0
87	87.0	78.0
88	85.0	65.5
89	73.0	72.5
90	82.5	77.0
91	79.5	78.5
92	94.5	64.0
93	87.5	68.0
94	81.0	69.0
95	83.5	80.5
96	86.5	85.5
97	87.0	66.0
98	93.0	70.5
99	90.5	73.5
100	79.0	73.0
101	96.0	68.0
102	95.5	76.5
103	94.0	82.0
104	97.5	51.5
105	96.5	58.0
106	100.5	54.5
107	102.0	57.5
108	108.5	46.5
109	88.0	64.0
110	77.0	77.0
111	73.0	77.0
112	83.0	71.5
113	84.5	74.0
114	84.5	70.5
115	90.5	83.0
116	97.0	62.5
117	97.5	72.5
118	102.5	77.0
119	70.0	61.0
120	92.0	55.0
121	103.0	45.0
122	45.0	129.0

TRRP•SYMAP-DATA.NY-72G-E

1	51.0
2	56.1
3	91.7
4	84.1
5	43.4
6	56.9
7	60.6
8	56.4
9	38.6
10	70.4
11	54.3
12	63.0
13	127.1
14	112.5
15	74.1
16	68.3
17	44.5
18	79.0
19	72.0
20	66.0
21	68.0
22	54.0
23	63.0
24	114.0
25	34.0
26	81.0
27	113.0
28	48.0
29	83.0
30	75.0
31	70.0
32	41.0
33	35.0
34	47.0
35	134.0
36	37.0
37	57.0
38	56.0
39	56.0
40	56.0
41	66.0
42	66.0
43	47.0
44	58.0
45	80.0
46	42.0
47	95.0
48	52.0
49	54.0
50	52.0
51	68.0
52	73.0
53	56.0
54	57.0
55	60.0
56	80.0

↑
col 11-20

57	43.0
58	57.0
59	49.0
60	58.0
61	43.0
62	45.0
63	64.0
64	76.0
65	83.0
66	47.0
67	49.0
68	74.0
69	53.0
70	54.0
71	73.0
72	64.0
73	34.0
74	60.0
75	57.0
76	47.0
77	47.0
78	47.0
79	41.0
80	30.0
81	43.0
82	67.0
83	64.0
84	72.0
85	79.0
86	98.0
87	60.0
88	83.0
89	73.0
90	67.0
91	68.0
92	87.0
93	102.0
94	94.0
95	57.0
96	67.0
97	87.0
98	82.0
99	79.0
100	90.0
101	73.0
102	64.0
103	58.0
104	78.0
105	84.0
106	60.0
107	71.0
108	59.0
109	73.0
110	94.0
111	72.0
112	78.0
113	76.0
114	90.0
115	65.0
116	70.0
117	67.0
118	81.0
119	131.0
120	66.0
121	60.0
122	60.3

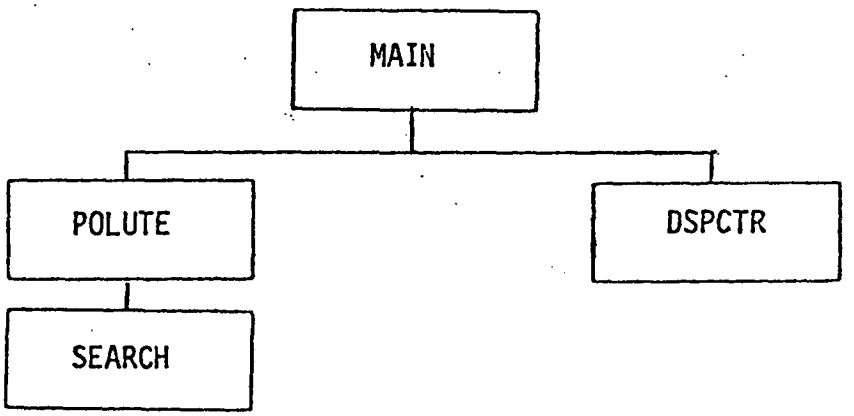
4.3 TRICON

TRICON is not available on the UNIVAC at this time. The use of TRICON will be documented in an update to this manual.

5.0 PROGRAM LISTINGS

Long-Term Population Exposure Model (LPEM)

Subroutine Hierarchy



MAIN: Reads program control parameters and input data.
Calls subroutine POLUTE and DSPCTR

POLUTE: Computes a spatially interpolated annual mean concentration at each receptor point.
Calls subroutine SEARCH.

DSPCTR: Computes a distribution of area and that of the population exposed to various levels of annual mean concentration.
Computes a spatial average concentration and a population weighted average concentration.

SEARCH: Finds the three monitoring stations nearest to each receptor point.

```
TRAPOPEXPOLPEM
      COMMON  AGSTD,NRECEP,NMONT,EPS,RECEP(300,2),NSITE(200),RANK(200),
     1SITE(200,2),CMG(200),RPOPL(300,2),AWT(300),DENSTY(300),TAREA,TPOPL
     2,CFRQ(300,8),F(300,4),NOBS,CPOLU(300),XLOW,XINCR,NINCR
      DIMENSION AREA(300),POPCNT(300,4),IRECEP(300,2),IRSA(300),POPL(30
     35,2),IOBS(9),ISITE(200,2)
      DIMENSION IDRSA(300,2)
      DIMENSION STAAVG(10),KVALID(10),YY(10)
C
C --- STORAGE FOR MEAN CONCENTRATIONS FOR ALL YEARS.
      DIMENSION CM(200,10)
      DIMENSION TITLE(13)
      COMMON MNODE(100),X(10,100),Y(10,100),P(10,100),MOUNTN,NPOIST
C
      DATA IOBS/8760,6257,2503,2868,5892,3389,365,261,104/
      EPS = 1.E-10
C
C
C
C                    EXPLANATION OF PARAMETERS
C     AGSTD = AIR QUALITY STANDARD (ANY UNIT)
C     NRECEP = NO. OF RECEPTOR POINTS  (GE.1)
C     NHOUR = SAMPLING INTERVAL IN HOURS (1 OR 24)
C     NSITES  = NO. OF AIR MONITORING STATIONS (GE.3) WITH DATA
C     NMONT  =  NO. OF AIR MONITORING STATIONS WITH COORDINATES (GE. NMONT)
C     NYEAR  = NO. OF YEARS TO ANALIZE (EACH YEAR MUST HAVE BOTH POPLATI
C              ON AND AIR QUALITY DATA) (GE.1)
C     SYEAR  = INITIAL YEAR
C     DELYR  = INCREMENTAL YEAR
C     NTIME  = NO. OF TIME CATEGORIES SUCH AS WEEKDAY AND WEEKEND (1 TO
C              6)
C     NRSA   = NO. OF REGIONAL STATISTICAL AREAS IN WHICH CURRENT OR PRO
C              -JECTED POPULATION STATISTICS ARE AVAILABLE (GE.1)
C     NPOPL  = NO. OF POPULATION CLASS SUCH AS SCHOOL-AGE AND ELDERLY (
C              1 TO 7)
C     NOBS     = NO. OF POSSIBLE OBSERVATIONS, E.G., 8760 FOR ANNUAL HOUR
C     -LY CONCENTRATION PERCENTILI STATISTICS
C      XLOW = LOWEST CONCENTRATION VALUE FOR DISTRIBUTIONS
C     XINCR = INCREMENTAL VALUE FOR DISTRIBUTIONS
C     NINCR = NO. OF INCREMENTS FOR DISTRIBUTIONS
```

```
      C
      C
      C                    EXPLANATION OF INPUT DATA
      C
      C     AREA(I) = AREA OF EACH RSA IN SQ. MI.
      C     POPCNT(I,J) =  SUBPOPLATION PER CENT OF TOTAL PORULATION AT EACH
      C                    RSA IN 1970 OR OTHER CENCUS YEAR
      C     IRECEP(I,J) = RECEPTOR IDENTIFICATION NUMBER
      C     RECEP (I,J) = X-Y COORDINATE OF EACH RECEPTOR
      C     IRSA (I,J) = NO. OF RECEPTOR POINTS ASSIGNED TO A GIVEN RSA
      C     ISITE(I)   = AIR MONITORING STATION I.D. NUMBER
      C     SITE (I,J) = X-Y COORDINATE OF EACH STATION
      C     POPL (I,J) =  TOTAL POPULATION AND TOTAL EMPLOYMENT AT EACH RSA
      C                      IN EACH YEAR
      C
      C
      C --- WHEN PENALTY DISTANCE IS USED (NPDIST=1) THE FOLLOWING
      C     ARE REQUIRED -
      C     MOUNTN = NO. OF GEOGRAPHICAL BARRIERS TO BE INCLUDED IN
      C     SPATIAL INTERPOLATION
      C     MNODE(I) = NO. OF NODES USED TO APPROXIMATE LOCATION OF EACH
      C                GEOGRAPHICAL BARRIER
      C     X(I,J) AND Y(I,J) = X AND Y COORDINATES OF J-TH NODE OF I-TH
      C              MOUNTAIN
      C     P(I,J) = PENALTY DISTANCE ASSIGNED TO THE J-TH NODE OF I-TH
      C            MOUNTAIN.
      C
      C
      C
            NT=0
      C*************************************************************
            READ(5,216)(TITLE(I),I=1,13)
        216 FORMAT(13A6)
        100 FORMAT(1H1,25X,13A6///)
            READ(5,210)NRECEP,NMONT,NSITES,NRSA,NTIME,NPOPL,NHOUR,NYEAR,SYEAR,
           3DELYR,AQSTD,NPDIST
        210 FORMAT(8I5,3F10.1,I5)
            READ(5,211)XLOW,XINCR,NINCR
        211 FORMAT(2F10.0,I5)
        200 FORMAT(5X,8HNRECEP =,I5,3X,6HNRSA =,I5,3X,7HNMONT =,I5,3X,7HNSITES
           1=,I5,3X,7HNPOPL =,I3,3X,7/,5X,7HNYEAR =,I5,5X,
```

```
      2 7 HS YE AR = ,F 8. 1, 5X ,7 HD EL YR = ,F 5. 1, 5X ,7 HA GSTD = ,F 7. 1/ )
C
      IF (NPD IST. EQ. 0) GO TO 1 11 1
      RE AD (5 ,1001) MOUNTN, (MNO DE (I), I= 1, MO UN TN)
 1001 FORMAT (I 2, 20 I3)
      DO 33 I=1, MOUNTN
      MND=MNOD E(I)
      DO 32 J=1, MND
      RE AD (5 ,2001) X (I ,J), Y( I, J) ,P (I ,J)
 2001 FORMAT (3F8.2)
      P( I, J) =10. * P (I ,J)
 32   CONT INUE
 33   CONT INUE
 11 11 CONT INUE
      WR ITE (6 ,100) (TI TL E( ID) ,I =1 ,1 3)
      WR ITE( 6, 200) NR EC EP ,NR SA, NH ONT, NS IT ES ,N PO PL ,N YE AR ,S YE AR ,D EL YR ,
     + AGSTD
      WR ITE( 6, 215)
  215 FORMAT (2X, ' CH AR AC TE RI ST ICS OF STA TI ST IC AL ARE AS' // )
      DO 10 I=1, NRSA
C*********************************************** ** ** ** ** ** ** ** ** ** ** *
      RE AD (5 ,2 20) ( IDRSA( I, J) ,J =1 ,2) , AR EA (I), (P OP ON T( I, J) ,J =1 ,4 )
  220 FORMAT ( 2I 10 ,1 0X ,5 F1 0. 2)
   10 CONT INUE
C*********************************************** ** ** ** ** ** ** ** ** ** ** *
      DO 20 I = 1, NREC EP
      RE AD (5 ,2 30) (IRE CEP( I, J) ,J =1 ,2 ), (R EC EP (I ,J ), J= 1, 2)
  230 FORMAT (2I 10, 2F 10 .2)
   20 CONT INUE
C*********************************************** ** ** ** ** ** ** ** ** ** ** *
      RE AD (5 ,2 40) (IRS A( I) ,I =1 ,NRS A)
 240  FORMAT ( ( 16 I5) )
      DO 11 I=1, NRSA
      WR ITE( 6, 225) I, (I DRSA (I ,J), J= 1, 2) ,A RE A( ID ,( PO PC NT (I ,J), J= 1, 4) ,I RS A(
     1I)
  225 FORMAT (2X, 'NO. =' ,I 3, 3X ,' SA =' ,2 I5 ,5 X, 'A RE A =' ,F 6. 2, 5X ,
     3 'SUBPOP A, B, C, D (IN %) = ', 4F 7. 1, 8X ,' RE CE PT ORS PE R SA = ', I3
     1 )
  11  CONT INUE
      DO 30 I = 1, NHONT
```

```
      READ(5,250) (ISITE(I,J), J=1,2),(SITE(I,J), J=1,2)
  250 FORMAT (2I10,2F10.2)
   30 CONTINUE
C
C --- READ MEAN CONCENTRATIONS FOR ALL YEARS
C**********************************************
      DO 34 I=1,NSITES
      READ(5,257)INSITE,KSITE,(CMK(INSITE,J), J=1,NYEAR)
257   FORMAT(2I5,7F10.2)
34    CONTINUE
C
C     END TIME INDEPENDENT INPUT DATA AND START YEAR LOOP
C
      YEAR = SYEAR
      WRITE (6,100)(TITLE(I),I=1,13)
      WRITE(6,200)NRECEP,NRSA,NMONT,NSITES,NPOPL,NYEAR,SYEAR,DELYR,
     + AQSTD
      WRITE (6,265) YEAR
  265 FORMAT (20X,' POPULATION DATA - TOTAL POPULATION AND ALL WORKERS B
     3Y WORK PLACE (',F8.1,3H )//)
        DO 50 I=1,NRSA
C*************************************************
        READ (5,260) (IDRSA(I,J),J=1,2),   (POPL(I,J),J = 1,2)
  260   FORMAT(2I10,2F10.0)
        WRITE (6,275) I,(IDRSA(I,J), J=1,2),(POPL(I,J), J=1,2)
  275 FORMAT (1X,'NO.=',I3,2X,'SA=',2I6,10X,'TOTAL POP.=',F10.0,10X,'ALL
     3   WKRS BY',' WK-PLACE=',F10.0)
   50   CONTINUE
      WRITE(6,100) (TITLE(K), K=1,13)
      WRITE(6,200)NRECEP,NRSA,NMONT,NSITES,NPOPL,NYEAR,SYEAR,DELYR,
     + AQSTD
      WRITE(6,245)
C*************************************************
  245 FORMAT(30X,' AIR MONITORING STATIONS '//)
      DO 31 K=1,NMONT
      WRITE(6,255) K,(ISITE(K,J),J=1,2),(SITE(K,J),J=1,2)
  255 FORMAT (2X,4HNO.=,I4,5X,'STATION NO.=',2I5,10X,'X-Y COORDINATE =',
     3 2F10.2)
   31 CONTINUE
      WRITE (6,100)(TITLE(I),I=1,13)
```

```
      WRITE(6,200)NRECEP,NRSA,NMONT,NSITES,NPOPL,NYEAR,SYEAR,DELYR,
     + AQSTD
        WRITE (6,285)
  285 FORMAT (30X,'RECEPTOR SPECIFICATION DATA'//)
        TAREA =0.
C******   WRITE NUMBER OF RECEPTORS ON FILE 9.   ********
      WRITE(9,101)NRECEP
        DO 60 I= 1,NRECEP
      KRSA = IRECEP(I,1)
        NN = IRSA(KRSA)
        IF (NN.LE.0) GO TO 60
   61   AWT(I) = AREA(KRSA)/NN
      RPOPL(I,1) = POPL(KRSA,1)/NN
      RPOPL(I,2) = POPL(KRSA,2)/NN
      TAREA = TAREA + AWT(I)
      WRITE(6,295)I,(IRECEP(I,J),J=1,2),(RECEP(I,J),J=1,2),(RPOPL(I,J),
     3  J=1,2),AWT(I)
  295 FORMAT(2X,4HNO =,I5,3X,'RECEPT NO. =',2I6,5X,'X-Y COORD =',2F7.2,
     3 5X,'TPOPL - WKRPL',2H =,2F8.0,5X,'AREA =',F8.2)
C******   WRITE POPULATION DENSITIES ON FILE 9.   ********
      IF(AWT(I).EQ.0)GO TO 59
      D=RPOPL(I,1)/AWT(I)
      WRITE(9,102) D,(RECEP(I,J),J=1,2),I,YEAR
   59 CONTINUE
   60   CONTINUE
      WRITE(6,100)(TITLE(I),I=1,13)
C
      DO 79 J=1,NYEAR
      YY(J)=SYEAR+(J-1)*DELYR
      STAAVG(J)=0.
      KVALID(J)=0
   79 CONTINUE
      WRITE(6,314)(YY(J),J=1,NYEAR)
  314 FORMAT(//54X,'AIR QUALITY MONITORING DATA',//,44X,'YEAR :',/,34X,
     1'FID.0')
      DO 80 I=1,NMONT
      K=0
      DO 81 NY=1,NYEAR
      IF(CM(I,NY).EQ.0.)GO TO 81
```

```
      K=1
      STAAVG(NY)=STAAVG(NY)+CM(I,NY)
      KVALID(NY)=KVALID(NY)+1
   81 CONTINUE
      IF(K.EQ.1)WRITE(6,315) I,(ISITE(I,J),J=1,2),
     1      (CM(I,NY),NY=1,NYEAR)
   80 CONTINUE
      DO 82 NY=1,NYEAR
      STAAVG(NY)=STAAVG(NY)/KVALID(NY)
   82 CONTINUE
  315 FORMAT(2X,I3,3X,'ST. ID NO. =',2I5,5X,7F10.1)
      WRITE(6,313)(STAAVG(NY),NY=1,NYEAR)
  313 FORMAT(5(/),7X,'STATION AVERAGE =',10X,7F10.2)
      DO 40 NY=1,NYEAR
C  **PUT SITE STATISTICS ON FILE 7  **
      WRITE(7,101)KVALID(NY)
  101 FORMAT(I3)
      DO 41 I=1,NMONT
      CMG(I)=CM(I,NY)
      IF(CMG(I).GT.0.)WRITE(7,102)CMG(I),(SITE(I,J),J=1,2),I,YEAR
  102 FORMAT(3F10.2,I10,F10.1)
   41 CONTINUE
C       START COMPUTING PERCENTILE CONCENTRATION AT EACH RECEPTOR BY
C       USING AN INTERPOLATION FORMULA
C
      WRITE(6,100)(TITLE(I),I=1,13)
      WRITE(6,200)NREC,NRSA,NMONT,NSITES,NPOPL,NYEAR,SYEAR,DELYR,
     + AQSTD
      WRITE(6,325)YEAR
  325 FORMAT(20X,'INTERPOLATED - EXTERPOLATED CONCEN',
     3 'RATIONS AT RECEPTOR SITES',5X,6HYEAR =,F7.1)
      CALL POLUTE
C
C
C       START POPULATION CLASS LOOP
C
C       POPULATION CLASS = 1  FOR TOTAL POPULATION
C       POPULATION CLASS = 2 FOR SCHOOL AGE POPULATION
C       POPULATION CLASS = 3   FOR ELDERLY POPULATION
C       POPULATION CLASS = 4   FOR NON-WHITE POPULATION
```

```
C        POPULATION CLASS = 5   ALL WORKERS BY RESIDENCE
C        POPULATION CLASS = 6   ALL NON-WORKERS BY RESIDENCE
C        POPULATION CLASS = 7   ALL WORKERS BY WORK PLACE
C
89     M=MINO(7,NPOPL)
         DO 90  NP = 1,M
         TPOPL = 0.
           DO 95 I = 1,NRECEP
           K = IRECEP(I,1)
           TOTALP = RPOPL(I,1)
           GO TO (91,92,93,94,97,98,99),NP
91         DENSTY(I) = TOTALP
           GO TO 96
92         DENSTY(I) = TOTALP * POPENT(K,1)/100.
           GO TO 96
93         DENSTY(I) = TOTALP * POPENT(K,2)/100.
           GO TO 96
94         DENSTY(I) = TOTALP *POPCNT(K,3)/100.
           GO TO 96
97         DENSTY(I)=TOTALP*POPCNT(K,4)/100.
           GO TO 96
98         DENSTY(I)=TOTALP*(100.-POPCNT(K,4))/100.
           GO TO 96
99         DENSTY(I)=RPOPL(I,2)
96         TPOPL = TPOPL + DENSTY(I)
95         CONTINUE
         WRITE (6,100)(TITLE(I),I=1,13)
       WRITE(6,200)NRECEP,NRSA,NMONT,NSITES,NPOPL,NYEAR,SYEAR,DELYR,
     + AQSTD
         WRITE (6,345) YEAR,NP,TPOPL,TAREA
345    FORMAT (20X,'EXPOSURE DISTRIBUTIONS FOR    ',6HYEAR =,F8.1,3X,
     3 3HPOPL CL =,I2,3X,4HTPOPL =,F10.0,5X,4HAREA
     3 3HA =,F10.0//)
         CALL DSPCTR
90       CONTINUE
       YEAR = YEAR + DELYR
40   CONTINUE
       WRITE(6,100)(TITLE(I),I=1,13)
       STOP
       SUBROUTINE POLUTE
```

```
      COMMON   AQSTD,NRECEP,NMONT,EPS,RECEP(300,2),NSITE(200),RANK(200),
     1SITE(200,2),CMG(200),RPOPL(300,2),AWT(300),DENSTY(300),TAREA,TPOPL
     2,CFRQ(300,8),F(300,4),NOBS,CPOLU(300),XLOW,XINCR,NINCR
      DIMENSION S(2),R(2)                                                FO    13
      DIMENSION SS(2),CORD(2),CORD1(2),XS(200),YS(200),XN(10,100),YN(10, FO    14
     1 100)                                                              FO    14
      COMMON MNODE(100),X(10,100),Y(10,100),P(10,100),MOUNTN,NPDIST      FO    15
      DIMENSION XX(10,100),YY(10,100)                                    FO    17
      DIMENSION XM(300),YM(300)
      MVALID=0
      DO 10 I=1,NMONT
      XM(I)=SITE(I,1)
      YM(I)=SITE(I,2)
   10 CONTINUE
C***********    WRITE NUMBER RECEPTORS ON FILE 8.    ***********
      WRITE(8,101)NRECEP
  101 FORMAT(I3)
      DO 20 N=1,NRECEP
      XR=RECEP(N,1)
      YR=RECEP(N,2)
      R(1)=XR                                                            FO    26
      R(2)=YR                                                            FO    27
      IF(NPDIST.EQ.0)GO TO 1111                                          FO    28
C     DO(I=1,MOUNTN)                                                     IF    29
      DO 19999 I=1,MOUNTN                                                      29
        MND=MNODE(I)                                                     FO 1  30
C       DO(J=1,MND)                                                      IF 1  31
        DO 19998 J=1,MND                                                       31
          CORD(1)=X(I,J)                                                 FO 2  32
          CORD(2)=Y(I,J)                                                 FO 2  33
          CALL TRNSLT(CORD,R,CORD1)                                      FO 2  34
          XX(I,J)=CORD1(1)                                               FO 2  35
          YY(I,J)=CORD1(2)                                               FO 2  36
C       END DO                                                           IF 1  37
19998   CONTINUE                                                               37
C     END DO                                                             IF    38
19999 CONTINUE                                                                 38
1111  CONTINUE                                                           FO    39
      DO 30 I=1,NMONT
      CHECK=CMG(I)
```

```
320             IF(CHECK) 51,51,52
321          51 DIST=9.9E10
322             GO TO 53
323          52 XDIST=XM(I)-XR
324             YDIST=YM(I)-YR
325             DIST=SQRT(XDIST*XDIST+YDIST*YDIST)
326       C INSERT 6
327             IF(NPDIST.EQ.0)GO TO 11112                                  FO     48
328             S(1)=XM(I)                                                  FO     49
329             S(2)=YM(I)                                                  FO     50
330             CALL TRNSLT(S,R,SS)                                         FO     51
331       C AFTER ROTATION THE STATION POINT IS ON THE X DOUBLE PRIME AXIS   FO     52
332             XS(I)=DIST                                                  FO     53
333             YS(I)=0.0                                                   FO     54
334       C FIND THE COORDINATE OF EACH MOUNTAIN NODE IN THE DOUBLE PRIMED SYSTEM FO 55
335             THETA=ATAN2(SS(2),SS(1))                                    FO     56
336       C     DO(J=1,MOUNTN)                                              IF     57
337             DO 19997 J=1,MOUNTN                                                57
338               MND=MNODE(J)                                              FO  1  58
339       C       DO(K=1,MND)                                               IF  1  59
340               DO 19996 K=1,MND                                                 59
341                 XN(J,K)=XX(J,K)*COS(THETA)+YY(J,K)*SIN(THETA)           FO  2  60
342                 YN(J,K)=-XX(J,K)*SIN(THETA)+YY(J,K)*COS(THETA)          FO  2  61
343       C       END DO                                                    IF  1  62
344       19996   CONTINUE                                                         62
345       C     END DO                                                      IF     63
346       19997 CONTINUE                                                           63
347       C TEST WHETHER EACH MOUNTAIN NODE IS ON THE X DOUBLE PRIME AXIS AND BETWFO 64
348       C STATION AND RECEPTOR POINTS                                     FO     65
349       C     DO(J=1,MOUNTN)                                              IF     66
350             DO 19995 J=1,MOUNTN                                                66
351               MND=MNODE(J)                                              FO  1  67
352       C       DO(K=1,MND)                                               IF  1  68
353               DO 19994 K=1,MND                                                 68
354       C         IF(YN(J,K).EQ.0.0.AND.XN(J,K).LE.DIST.AND.XN(J,K).GT.0.0)  IF 2  69
355                 IF(                                                            69
356            *      YN(J,K).EQ.0.0.AND.XN(J,K).LE.DIST.AND.XN(J,K).GT.0.0       69
357            *      ) GO TO 19991                                               69
358                 GO TO 19992                                                    69
359       19991     CONTINUE                                                     69
```

```
360                     DIST=DIST+P(J,K0                                    FO 3   70
361     C             END IF                                                IF 2   71
362     19992         CONTINUE                                                     71
363     19993         CONTINUE                                                     71
364     C           END DO                                                  IF 1   72
365     19994       CONTINUE                                                     72
366     C         END DO                                                    IF     73
367     19995 CONTINUE                                                           73
368     C TEST WHETHER THE STATION-RECEPTOR LINE CROSS ANY MOUNTAIN REGION   FO     74
369     C         DO(J=1,MOUNTN)                                            IF     75
370               DO 19990 J=1,MOUNTN                                              75
371                 M1=MNODE(J)-1                                           FO 1   76
372     C           DO(K=1,M1)                                              IF 1   77
373                 DO 19989 K=1,M1                                                77
374     C             IF(XN(J,K).EQ.XN(J,K+1))                              IF 2   78
375                   IF(XN(J,K).EQ.XN(J,K+1)) GO TO 19986                         78
376                   GO TO 19987                                                  78
377     19986         CONTINUE                                                     78
378     C               IF(XN(J,K).LE.XS(I))                                IF 3   79
379                     IF(XN(J,K).LE.XS(I)) GO TO 19983                           79
380                     GO TO 19984                                                79
381     19983           CONTINUE                                                   79
382     C                 IF(YN(J,K)*YN(J,K+1).LT.0.0)                      IF 4   80
383                       IF(YN(J,K)*YN(J,K+1).LT.0.0) GO TO 19980                 80
384                       GO TO 19981                                              80
385     19980             CONTINUE                                                 80
386                         PENL=P(J,K)+(P(J,K+1)-P(J,K))*ABS(YN(J,K))/(ABS(YN(J,K)) FO 5   81
387           **ABS(YN(J,                                                        81
388           1                 K+1)))                                         FO     81
389                         DIST=DIST+PENL                                      FO 5   82
390     C                 END IF                                                IF 4   83
391     19981             CONTINUE                                                 83
392     19982             CONTINUE                                                 83
393     C               END IF                                                  IF 3   84
394     19984           CONTINUE                                                   84
395     19985           CONTINUE                                                   84
396     C             ELSE                                                      IF 2   85
397                   GO TO 19988                                                  85
398     19987         CONTINUE                                                     85
399     C               IF(YN(J,K)*YN(J,K+1).LT.0.0)                          IF 3   86
```

```
400                     IF(YN(J,K)*YN(J,K+1).LT.0.0) GO TO 19977                    86
401                     GO TO 19978                                                 86
402     19977           CONTINUE                                                    86
403                       SLOPE=(YN(J,K)-YN(J,K+1))/(XN(J,K)-XN(J,K+1))      FO 4   87
404     C                 IF(SLOPE.NE.0.0)                                   IF 4   88
405                       IF(SLOPE.NE.0.0) GO TO 19974                              88
406                       GO TO 19975                                               88
407     19974             CONTINUE                                                  88
408                         XINTCP=XN(J,K)-YN(J,K)/SLOPE                     FO 5   89
409     C                   IF(XINTCP.LE.XS(I).AND.XINTCP.GT.0.0)            IF 5   90
410                         IF(XINTCP.LE.XS(I).AND.XINTCP.GT.0.0) GO TO 19971       90
411                         GO TO 19972                                             90
412     19971               CONTINUE                                                90
413                           PENL=P(J,K)+(P(J,K+1)-P(J,K))*ABS(YN(J,K))/(ABS(YN(J,K FO 6   91
414           *))+ABS(YN(J,                                                         91
415           1                 K+1)))                                        FO      91
416                           DIST=DIST+PENL                                  FO 6   92
417     C                   END IF                                            IF 5   93
418     19972               CONTINUE                                                93
419     19973               CONTINUE                                                93
420     C                 END IF                                              IF 4   94
421     19975             CONTINUE                                                  94
422     19976             CONTINUE                                                  94
423     C               END IF                                                IF 3   95
424     19978           CONTINUE                                                    95
425     19979           CONTINUE                                                    95
426     C             END IF                                                  IF 2   96
427     19988       CONTINUE                                                        96
428     C         END DO                                                      IF 1   97
429     19989     CONTINUE                                                          97
430     C       END DO                                                        IF     98
431     19990   CONTINUE                                                            98
432     1112    CONTINUE                                                    FO      99
433             IF (N.NE.1) GO TO 53
434             MVALID=MVALID+1
435          53 RANK(I)=DIST
436             NSITE(I)=I
437          50 CONTINUE
438             IF(N.NE.1) GO TO 99
439             WRITE(6,190) MVALID
```

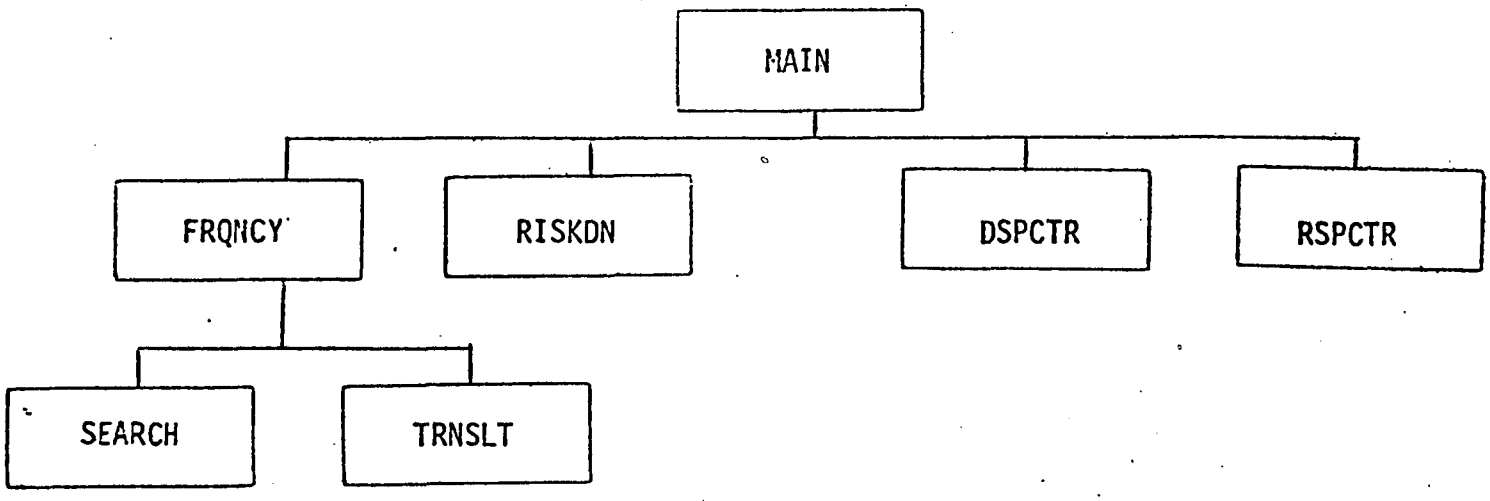
```
      190 FORMAT(5X,'NO. OF VALID MONITORING STATIONS=',I4,/)
       99 CALL SEARCH
          TD=0.
          TC=0.
          DO 50 K=1,3
          M=NSITE(K)
          D=RANK(K)
          IF(D.LT.EPS) GO TO 55
          FWT=1./D**2
          TD=TD+FWT
          TC=TC+FWT*CMG(M)
       50 CONTINUE
          CPOLU(N)=TC/TD
          GO TO 40
   55     CPOLU(N)=CMG(M)
       40 CONTINUE
          WRITE(6,110) (RECEP(N,J),J=1,2), CPOLU(N)
C********    PUT RECEPTOR STATISTICS ON FILE 8.    **********
          WRITE(8,102) CPOLU(N),(RECEP(N,J),J=1,2), N,YEAR
      102 FORMAT(3F10.2,I10,F10.1)
      110 FORMAT(2X,'RECEPT NO. =',2I5,1X,F10.1)
       20 CONTINUE
          RETURN
C
          SUBROUTINE TRNSLT(CORD1,ORIGIN,CORD2)
          DIMENSION CORD1(2),ORIGIN(2),CORD2(2)
          DO 100 I=1,2
          CORD2(I)=CORD1(I)-ORIGIN(I)
      100 CONTINUE
          RETURN
          SUBROUTINE SEARCH
          COMMON  AQSTD,NRECEP,NMONT,EPS,RECEP(300,2),NSITE(200),RANK(200),
         1SITE(200,2),CMG(200),RPOPL(300,2),AWT(300),DENSTY(300),TAREA,TPOPL
         2,CFRQ(300,8),F(300,4),NOBS,CPOLU(300),XLOW,XINCR,NINCR
          M=NMONT-1
          DO 100 I=1,M
          K=I+1
          DO 100 J=K,NMONT
          IF(RANK(I)-RANK(J)) 100,100,10
C         SORT THE DISTANCES TO MONITORING STATIONS IN ASCENDING ORDER
```

```
      10 ADJUST=RANK(I)
         RANK(I)=RANK(J)
         RANK(J)=ADJUST
C        ORDER THE MONITORING STATION NUMBERS ACCORDINGLY
         IAJUST=NSITE(I)
         NSITE(I)=NSITE(J)
         NSITE(J)=IAJUST
     100 CONTINUE
         RETURN
         SUBROUTINE DSPCTR
         COMMON / LUPLCM / LUPLT
         COMMON   AQSTD,NRECEP,NMONT,EPS,RECEP(300,2),NSITE(200),RANK(200),
        1SITE(200,2),CMG(200),RPOPL(300,2),AWT(300),DENSTY(300),TAREA,TPOPL
        2,CFRQ(300,8),F(300,4),NOBS,CPOLU(300),XLOW,XINCR,NINCR
         DIMENSION DTHR(40)
         DO 25 I=1,NINCR
         DTHR(I)=XLOW+XINCR*(NINCR-I)
      25 CONTINUE
         WRITE(6,215)
     215 FORMAT(25X,'POPULATION AND LAND AREA EXPOSURE DISTRIBUTIONS'/)
         WRITE(6,214)
     214 FORMAT (33X,'DISTRIBUTION FUNCTIONS',23X,'FREQUENCY FUNCTIONS')
C         AWT(I)  =  AREA OF RECEPTOR I
C        DENSTY(I) = POPULATION OF RECEPTOR (I)
         AQS =0.
         PQS =0.
         PSAR =0.
         PSPP = 0.
         AREAVG = 0.
         POPAVG = 0.
      10 CONTINUE
         PTHR = DTHR(I)+XINCR
         WRITE(6,219)
     219 FORMAT(11X,'AIR QUALITY VALUE',8X,'AREA',11X,'POPULATION',
        117X,'AREA',12X,'POPULATION')
C        END INITIALIZATION AND START D* LOOP
         DO 20 J =1,NINCR
           DA =0.
           DP=0.
C        END INITIALIZATION AND START RECEPTOR LOOP
```

```
      C
            DO 40 I=1,NRECEP
   34     CHEK=CPOLU(I)-DTHR(J)
            IF (CHEK) 41,42,42
   41       SIGN = 0.
            GO TO 43
   42       SIGN = 1.
   43       DA = DA + SIGN * AWT(I)
            DP = DP + SIGN * DENSTY(I)
   40     CONTINUE
          DELC = PTHR - DTHR(J)
        DSAR = DA/TAREA
          DSPP = DP/TPOPL
          ASPC = DSAR - PSAR
          PSPC = DSPP - PSPP
          AQS = AQS + 0.5*(DSAR+PSAR)*DELC
          PQS = PQS + 0.5*(DSPP+PSPP)*DELC
          PSAR = DSAR
          PSPP = DSPP
          PTHR = DTHR(J)
        WRITE(6,220)DTHR(J),DSAR,DSPP,ASPC,PSPC
  220   FORMAT(1X,F20.1,4F20.4,/)
     20 CONTINUE
      C
      C     END RECEPTOR LOOP
      C
          DO 30 I=1,NRECEP
          POPAVG=POPAVG + CPOLU(I)*DENSTY(I)
          AREAVG=AREAVG + CPOLU(I)*AWT(I)
     30 CONTINUE
          AQS = AQS+DTHR(NINCR)
          PQS = PQS+DTHR(NINCR)
          POPAVG = POPAVG/TPOPL
          AREAVG = AREAVG/TAREA
          WRITE(6,240)AREAVG
          WRITE(6,250)POPAVG
  240   FORMAT(/20X,'SPATIAL AVERAGE CONCENTRATION = ',F10.4)
  250   FORMAT(20X,'POPULATION AVERAGE CONCENTRATION = ',F10.4)
          RETURN
          END
```

Short-Term Population Exposure Model (SPEM)

Subroutine Hierarchy



MAIN: Reads program control parameters and input data. Calls subroutines FRQNCY, RISKDN, DSPCTR, and RSPCTR.

FRQNCY: Computer interpolated percentile concentrations at each receptor point.

Calls subroutine SEARCH.

Calls TRNSLT too when geographical barriers are used.

RISKDN: Computes risk frequencies at each receptor point for concentration thresholds equal to 1, 2, 3, and 4 times the air quality standard.

DSPCTR: Computes a distribution of area and that of the population exposed to various levels of percentile concentration at the 50th, 90th, and 99th percentiles.

Computes both spatial average and population weighted average concentrations at the 50th, 90th, and 99th percentiles.

RSPCTR: Computes a distribution of area and that of the population exposed above the air quality standard at various percentages of the time. Computes the spatial average and the population weighted average of risk frequencies.

(Continued)

SEARCH: Finds the three monitoring stations nearest to each receptor point.

TRNSLT: Translates the coordinate origin to a given receptor point.

```
TRRP *POPEXP.SPEM
      1            COMMON  AQSTD,NRECEP,NMONT,EPS,RECEP(300,2),NSITE(200),RANK(200),
      2           1SITE(200,2),CMF(200,8),RPOPL(300,2),AWT(300),DENSTY(300),TAREA,TPO
      3           2PL,CFRQ(300,8),F(300,4),NOBS, XLOW, XINCR, NINCR,PTILE(8)
      4            DIMENSION AREA(300), POPCNT(300,4),IRECP(300,2),IRSA(300),POPL(21
      5           3,2),TITLE(13),IOBS(9),ISITE(200,2), IDRSA(300,2)
      6            COMMON MNODE(100),X(10,100),Y(10,100),P(10,100),MOUNTN,NPDIST
      7            DATA IOBS/8760,6257,2503,2868,5892,3389,365,261,104/
      8            EPS = 1.E-10
      9       C
     10       C
     11       C
     12       C                    EXPLANATION OF PARAMETERS
     13       C      AQSTD = AIR QUALITY STANDARD (ANY UNIT)
     14       C      NRECEP = NO. OF RECEPTOR POINTS  (GE.1)
     15       C      NHOUR = SAMPLING IERVAL IN HOURS (1 OR 24)
     16       C      NMONT  = NO. OF AIR MONITORING STATIONS (GE.3)
     17       C      NSITES = NO. OF STATIONS WITH DATA
     18       C      NYEAR  = NO. OF YEARS TO ANALIZE (EACH YEAR MUST HAVE BOTH POPLATI
     19       C               ON AND AIR QUALITY DATA) (GE.1)
     20       C      SYEAR  = INITIAL YEAR
     21       C      DELYR  = INCREMEAL YEAR
     22       C      NTIME  = NO. OF TIME CATEGORIES SUCH AS WEEKDAY AND WEEKEND (1 TO
     23       C               6)
     24       C      NRSA   = NO. OF REGIONAL STATISTICAL AREAS IN WHICH CURRE OR PRO
     25       C               -JECTED POPULATION STATISTICS ARE AVAILABLE (GE.1)
     26       C      NPOPL  = NO. OF POPULATION CLASS SUCH AS SCHOOL-AGE AND ELDERLY (
     27       C               1 TO 7)
     28       C      NOBS     = NO. OF POSSIBLE OBSERVATIONS, E.G., 8760 FOR ANNUAL HOUR
     29       C      -LY CONCENTRATION PERCENTILI STATISTICS
     30       C
     31       C
     32       C                    EXPLANATION OF INPUT DATA
     33       C
     34       C      AREA(I) = AREA OF EACH RSA IN SQ. MI.
     35       C      POPCNT(I,J) =  SUBPOPLATION PER CENT OF TOTAL POPULATION AT EACH
     36       C                     RSA IN 1970 OR OTHER CENSUS YEAR
     37       C      IRECEP(I,J) = RECEPTOR IDENTIFICATION NUMBER
     38       C      RECEP (I,J) = X-Y COORDINATE OF EACH RECEPTOR
     39       C      IRSA (I,J) = NO. OF RECEPTOR POINTS ASSIGNED TO A GIVEN RSA.
```

```
      C     ISITE(I)  = AIR MONITORING STATION I.D. NUMBER
      C     SITE (I,J) = X-Y COORDINATE OF EACH STATION
      C     POPL (I,J) =  TOTAL POPULATION AND TOTAL EMPLOYMENT AT EACH RSA
      C                        IN EACH YEAR
      C     CMF (I,J)  = PERCENTTIME CONCENTRATIONS OBSERBED AT EACH STATION
      C                      IN EACH YEAR OR IN EACH TIME CATEGORY (SAME UNIT AS
      C                      USED IN AQSTD)
      C
      C
      C
      C -- WHEN PENALTY DISTANCE IS USED (NPDIST=1) THE FOLLOWING
      C     ARE REQUIRED -
      C     MOUNTN = NO. OF GEOGRAPHICAL BARRIERS TO BE INCLUDED IN
      C     SPATIAL INTERPOLATION
      C     MNODE(I) = NO. OF NODES USED TO APPROXIMATE LOCATION OF EACH
      C                  GEOGRAPHICAL BARRIER
      C     X(I,J) AND Y(I,J) = X AND Y COORDINATES OF J-TH NODE OF I-TH
      C              MOUNTAIN
      C     P(I,J) = PENALTY DISTANCE ASSIGNED TO THE J-TH NODE OF I-TH
      C            MOUNTAIN.
      C
      C
  100 FORMAT(1H1,25X,13A6///)
      READ(5,214)(TITLE(I),I=1,13)
  214 FORMAT(13A6)
      READ(5,210)NRECEP,NMONT,NSITES,NRSA,NPOPL,NHOUR,NYEAR,SYEAR,
     3DELYR,AQSTD,NPDIST
  210 FORMAT(4I5,5X,3I5,3F10.1,I5)
  200 FORMAT (5X,8HNRECEP =,I5,3X,6HNRSA =,I5,3X,7HNMONT =,I5,3X,
     1 8HNSITES =,I5,3X,7HNPOPL =,I3,3X,/,5X,7HNYEAR =,I5,5X,
     2 7HSYEAR =,F8.1,5X,7HDELYR =,F5.1,5X,7HAQSTD =,F7.1/)
      READ(5,211)XLOW,XINCR,NINCR
  211 FORMAT(2F10.0,I5)
      READ(5,216)(PTILE(I),I=2,8)
  216 FORMAT(7F5.1)
      WRITE (6,100)(TITLE(I), I=1,13)
      WRITE(6,200)NRECEP,NRSA,NMONT,NSITES,NPOPL,NYEAR,SYEAR,DELYR,
     + AQSTD
      WRITE(6,215)
  215 FORMAT (2X,' CENSUS DATA - PERCENT OF TOTAL POPULATION '//)
```

```
      DO 10 I=1,NRSA
      READ(5,220)(IDRSA(I,J),J=1,2),   AREA(I),(POPCNT(I,J),J=1,4)
  220 FORMAT (2I10,10X,5F10.1)
   10 CONTINUE
      DO 20 I = 1,NRECEP
      READ(5,230)  (IRECEP(I,J),J=1,2),(RECEP(I,J),J=1,2)
  230 FORMAT(2I10,2F10.0)
   20 CONTINUE
      READ(5,240)  (IRSA(I),I=1,NRSA)
  240 FORMAT((16I5))
      DO 11 I=1,NRSA
      WRITE(6,225)  I,(IDRSA(I,J),J=1,2),AREA(I),(POPCNT(I,J),J=1,4),
     1IRSA(I)
  225 FORMAT(2X,'NO. =',I3,3X,'SA =',2I5,5X,'AREA =',F7.1,5X,
     1 'SUBPOP  A, B, C, D (IN%) =',4F7.1,8X,'RECEPTORS PER SA =',I3)
   11 CONTINUE
      WRITE(6,100)(TITLE(I),I=1,13)
      WRITE(6,200)NRECEP,NRSA,NMONT,NSITES,NPOPL,NYEAR,SYEAR,DELYR,
     + AGSTD
      WRITE(6,245)
  245 FORMAT(30X,'* AIR MONITORING STATIONS *'//)
      DO 30 I = 1,NMONT
      READ(5,250)  (ISITE(I,J),J=1,2),(SITE(I,J),J=1,2)
  250 FORMAT (2I10,2F10.0)
      WRITE(6,255) I,(ISITE(I,J),J=1,2),(SITE(I,J),J=1,2)
  255 FORMAT(2X,4HNO.=,I4,5X,'STATION NO =',2I5,10X,'X-Y COORDINATE =',
     3 2F10.0)
   30 CONTINUE
      IF(NPDIST.EQ.0)GO TO 1111
      READ(5,1001) MOUNTN,(MNODE(I),I=1,MOUNTN)
 1001 FORMAT(I2,20I3)
      DO 33 I=1,MOUNTN
      MND=MNODE(I)
      DO 32 J=1,MND
      READ(5,2001) X(I,J),Y(I,J),P(I,J)
 2001 FORMAT(3F8.2)
      P(I,J)=10. * P(I,J)
   32 CONTINUE
   33 CONTINUE
 1111 CONTINUE
```

```
      C
      C     END TIME INDEPENDE INPUT DATA AND START YEAR LOOP
      C
            YEAR = SYEAR
            DO 40  NY = 1,NYEAR
            WRITE (6,100)(TITLE(I),I=1,13)
            WRITE(6,200)NRECEP,NRSA,NMONT,NSITES,NPOPL,NYEAR,SYEAR,DELYR,
           + AQSTD
            WRITE (6,265) YEAR
        265 FORMAT (20X,' POPULATION DATA - TOTAL POPULATION AND ALL WORKERS B
           3Y WORK PLACE (',F8.1,3H )//)
              DO 50 I=1,NRSA
              READ (5,260)(IDRSA(I,J),J=1,2),  (POPL(I,J),J= 1,2)
        260   FORMAT(2I10,2F10.0)
              WRITE (6,275) I,(IDRSA(I,J),J=1,2),(POPL(I,J),J=1,2)
        275   FORMAT(3X,'NO. =',I3,5X,'SA =',2X,2I3,5X'TOTAL POP =',F10.0,10X,
           3'ALL WKRS BY',  ' WK-PLACE=',F10.0)
         50   CONTINUE
              WRITE (6,100)(TITLE(I),I=1,13)
              WRITE(6,200)NRECEP,NRSA,NMONT,NSITES,NPOPL,NYEAR,SYEAR,DELYR,
           + AQSTD
              WRITE (6,285) YEAR
        285  FORMAT (30X,'RECEPTOR SPECIFICATION DATA FOR ',F6.1//)
              TAREA =0.
              DO 60 I= 1,NRECEP
              KRSA = IRECEP(I,1)
              NN = IRSA(KRSA)
              IF (NN.LE.0) GO TO 60
         61   AWT(I) = AREA(KRSA)/NN
              RPOPL(I,1) = POPL(KRSA,1)/NN
              RPOPL(I,2) = POPL(KRSA,2)/NN
              TAREA = TAREA + AWT(I)
              WRITE (6,295)I,KRSA,IRECEP(I,2),(RECEP(I,J),J=1,2),(RPOPL(I,J),
           3  J=1,2),AWT(I)
        295   FORMAT (2X,4HNO.=,I5,3X,'RECEPT NO. =',2I5,5X,'X-Y COORD =',
           2F10.0,5X,'POPL - WRPL'
           3  ,2H =,F10.0,F7.0,3X,'AREA =',F10.1)
         60   CONTINUE
      C
      C     START TIME CATEGORY LOOP
```

```
      C
            IF(NHOUR.EQ.1)GO TO 441
            IF(NHOUR.EQ.24)GO TO 442
      441   NH=0
            GO TO 443
      442   NH=6
        443 CONTINUE
            NH=NH+1
            NOBS=IOBS(NH)
              WRITE (6,100)(TITLE(I),I=1,13)
            WRITE(6,200)NRECEP,NRSA,NMONT,NSITES,NPOPL,NYEAR,SYEAR,DELYR,
           + AQSTD
              WRITE (6,305) YEAR,(PTILE(I),I=2,8)
        305   FORMAT (20X,'FREQUENCY DISTRIBUTION OF MONITORED CONCENTRATION '
           3  ,5X,6HYEAR =,F7.1,/,1X,'P1 P2 P3 P4 P5 P6 P7 P8 = 100/(N+1)'
           4 ,7F5.1/)
      C
      C       START READING AIR QUALITY DATA
      C
            DO 80 I=1,NSITES
            READ(5,270)IN,KN,(CMF(IN,J),J=1,8)                                  C
      270   FORMAT(I5,I5,6X,8F8.2)                                               C
              WRITE (6,315) I,(ISITE(IN,J),J=1,2),(CMF(IN,J),J=1,8)
        315   FORMAT (2X,I3,3X,'ST. ID NO. =',2I5,5X,'MAX,P2,P3,P4,P5,P6,P7,P8
           3  ,' =',8F8.1)
         80     CONTINUE
      C
      C       START COMPUTING PERCENTILE CONCENTRATION AT EACH RECEPTOR BY
      C       USING AN INTERPOLATION FORMULA
      C
              WRITE(6,100)(TITLE(I),I=1,13)
            WRITE(6,200)NRECEP,NRSA,NMONT,NSITES,NPOPL,NYEAR,SYEAR,DELYR,
           + AQSTD
              WRITE(6,325) YEAR
        325   FORMAT (20X,'INTERPOLATED - EXTERPOLATED PERCENTILE CONCEN',
           3  'RATIONS AT RECEPTOR SITES',5X,6HYEAR =,F7.1,5X//)
              CALL FRQNCY
      C
      C       START COMPUTING RISK PROBABILITIES AT EACH RECEPTOR ASSOCIATED
      C       WITH AIR QUALITY STANDARDS
```

```
      WRITE(6,100) (TITLE(I), I=1,13)
      WRITE(6,200)NRECEP,NRSA,NMONT,NSITES,NPOPL,NYEAR,SYEAR,DELYR,
     + AQSTD
      WRITE(6,335)  YEAR
  335 FORMAT (15X,'RISK OF RECEPTOR CONCENTRATION EXCEEDING ',
     3  'MULTIPLES OF AQSTD',5X,'IN YEAR =',F7.1,5X//)
      CALL RISKDN
C
C     START POPULATION CLASS LOOP
C
C     POPULATION CLASS = 1  FOR TOTAL POPULATION
C     POPULATION CLASS = 2 FOR SCHOOL AGE POPULATION
C     POPULATION CLASS = 3  FOR ELDERLY POPULATION
C     POPULATION CLASS = 4  FOR NON-WHITE POPULATION
C     POPULATION CLASS = 5  ALL WORKERS BY RESIDENCE.
C     POPULATION CLASS = 6  ALL NON-WORKERS BY RESIDENCE
C     POPULATION CLASS = 7  ALL WORKERS BY WORK PLACE
C
81    M=MINO(7,NPOPL)
        DO 90  NP = 1,M
        TPOPL = 0.
          DO 95 I = 1,NRECEP
          K = IRECEP(I,1)
          TOTALP = RPOPL(I,1)
          GO TO (91,92,93,94,97,98,99),NP
91          DENSTY(I) = TOTALP
            GO TO 96
92          DENSTY(I) = TOTALP * POPCNT(K,1)/100.
            GO TO 96
93          DENSTY(I) = TOTALP * POPCNT(K,2)/100.
            GO TO 96
94          DENSTY(I) = TOTALP *POPCNT(K,3)/100.
            GO TO 96
97          DENSTY(I)=TOTALP*POPCNT(K,4)/100.
            GO TO 96
98          DENSTY(I)=TOTALP*(100.-POPCNT(K,4))/100.
            GO TO 96
99          DENSTY(I)=RPOPL(I,2)
96          TPOPL = TPOPL + DENSTY(I)
95          CONTINUE
```

```
      WRITE (6,100)(TITLE(I),I=1,13)
      WRITE(6,200)NRECEP,NRSA,NMONT,NSITES,NPOPL,NYEAR,SYEAR,DELYR,
     + AQSTD
      WRITE (6,345) YEAR,NP,TPOPL,TAREA,(PTILE(I),I=2,8)
  345 FORMAT (10X,'CONCENTRATION FUNCTIONS FOR DATA SET   ',6HYEAR =,
     3 F8.1,3X,9HPOPOPL =,I2,3X,7HTPOPL =,F10.0,5X,4HTAREA
     3 3HA =,F10.0,/,1X,' P1 P2 P3 P4 P5 P6 P7 P8 = 100/(N+1)',7F5.1)
      CALL DSPCTR
      WRITE (6,100)(TITLE(I),I=1,13)
      WRITE(6,200)NRECEP,NRSA,NMONT,NSITES,NPOPL,NYEAR,SYEAR,DELYR,
     + AQSTD
      WRITE (6,355) YEAR,NP,TPOPL,TAREA
  355 FORMAT (10X,'RISK FUNCTIONS FOR DATA SET   ',6HYEAR =,F8.1,3X,
     3 9HPOPOPL =,I2,3X,7HTPOPL =,F10.0,5X,4HTAREA,
     3 3HA =,F10.0//)
      CALL RSPCTR
C                                                                  POTS
   90 CONTINUE
   70 CONTINUE                                                          104
      YEAR = YEAR + DELYR
   40 CONTINUE
      STOP
      SUBROUTINE SEARCH
      COMMON  AQSTD,NRECEP,NMONT,EPS,RECEP(300,2),NSITE(200),RANK(200),
     1 SITE(200,2),CMF(200,8),RPOPL(300,2),AWT(300),DENSTY(300),TAREA,TPO
     2PL,CFRQ(300,8),F(300,4),NOBS,XLOW,XINCR,NINCR,PTILE(8)
      M=NMONT-1
      DO 100 I=1,M
      K=I+1
      DO 100 J=K,NMONT
      IF(RANK(I)-RANK(J)) 100,100,10
C     SORT THE DISTANCES TO MONITORING STATIONS IN ASCENDING ORDER
   10 ADJUST=RANK(I)
      RANK(I)=RANK(J)
      RANK(J)=ADJUST
C     ORDER THE MONITORING STATION NUMBERS ACCORDINGLY
      IAJUST=NSITE(I)
      NSITE(I)=NSITE(J)
      NSITE(J)=IAJUST
  100 CONTINUE
```

```
      RETURN
      SUBROUTINE RSPCTR
      COMMON   AQSTD,NRECEP,NMONT,EPS,RECEP(300,2),NSITE(200),RANK(200),
     1SITE(200,2),CMFI(200,8),RPOPL(300,2),AWT(300),DENSTY(300),TAREA,TPO
     2PL,CFRQ(300,8),F(300,4),NOBS ,  XLOW,XINCR,NINCR,PTILE(8)
      DIMENSION RTHR(30),RI(4),PRI(4),PRKA(4),PRKP(4),RKASR(4),RKPSR(4)
     3,SASR(4),SPSR(4)
      DATA RTHR /100.,90.,80.,70.,60.,50.,45.,40.,35.,30.,
     3              25.,20.,15.,12.5,10.,7.5,5.,3.,1.,.75,.5,.3,.1,0.0/
      NRTHR = 24
      WRITE (6,200)
  200 FORMAT(10X,'DISTRIBUTION AND FREQUENCY FUNCTIONS
     1' OF RISK AREA AND RISK POPULATION'//)
      WRITE(6,209)
  209 FORMAT(40X,'LAND AREA',4OX,'POPULATION',/,2X,'% TIME',14X,2('DISTR
     1IBUTION FUNCTION',5X,'FREQUENCY FUNCTION',5X),/,2X,'ABOVE',18X,4(
     2'THRESHOLD',17X))
  210 FORMAT(1X,'THRESHOLD',8X,4(5H1 STD,1X,5H2 STD,1X,5H3 STD,1X,5H4 ST
     1D,3X)/)
      WRITE (6,210)
      DO 20 J=1,4
      RI(J) = 0.
      PRI(J) = 0.
      PRKA(J) = 0.
      PRKP(J) = 0.
   20 CONTINUE
      PTHR = 100.
C
C     END INITIALIZATION AND START F* LOOP
      DO 30 K=1,NRTHR
      DELF = PTHR - RTHR(K)
C
C     START FS LOOP
C
        DO 40 J = 1,4
        RA = 0.
        RP = 0.
          DO 50 I = 1,NRECEP
          IF(F(I,J).LT.RTHR(K)) GO TO 50
          RA = RA + AWT(I)
```

```
320                 RP = RP + DENSTY(I)
321          50     CONTINUE
322                 RKASR(J) = RA/TAREA
323                 RKPSR(J) = RP/TPOPL
324                 SASR(J) = (RKASR(J)-PRKA(J))
325                 SPSR(J) = (RKPSR(J)-PRKP(J))
326                 RI(J) = RI(J) + 0.5*(RKASR(J) + PRKA(J))*DELF
327                 PRI(J) = PRI(J) + 0.5*(RKPSR(J)+ PRKP(J))*DELF
328                 PRKA(J) = RKASR(J)
329                 PRKP(J) = RKPSR(J)
330          40     CONTINUE
331                 WRITE(6,221)RTHR(K),(RKASR(J),J=1,4),(SASR(J),J=1,4),(RKPSR(J),J=1
332               1,4),(SPSR(J),J=1,4)
333          221 FORMAT(2X,'F* =',F5.1,5X,4(4F6.3,2X))
334          C                                                    )1(RSPKR),K(RHTR)51(ETIRW
335                 PTHR = RTHR(K)
336          30 CONTINUE
337          C
338          C      END F* LOOP
339          C
340                 WRITE (6,240) (RI(J),J=1,4), (PRI(J),J=1,4)
341          240 FORMAT(//11X,'AVERAGE LAND AREA RISK (IN%) =',4F6.2,/,62X,'AVERAGE
342            2 POPULATION RISK (IN%) =',4F6.2)
343          C      ENDFILE OUTPUT AFTER A BUNCH OF CURVES
344                 RETURN
345                 SUBROUTINE FRQNCY
346                 COMMON   AQSTD,NRECEP,NMONT,EPS,RECEP(300,2),NSITE(200),RANK(200),
347               1SITE(200,2),CMF(200,8),RPOPL(300,2),AWT(300),DENSTY(300),TAREA,TPO
348               2PL,CFRQ(300,8),F(300,4),NOBS,  XLOW,XINCR,NINCR,PTILE(8)
349                 DIMENSION XM(300),YM(300)
350                 DIMENSION S(2),R(2)                                          F0      13
351                 DIMENSION SS(2),CORD(2),CORDII(2),XS(200),YS(200),XN(10,100),YN(10, F0      14
352               1 100)                                                         F0      14
353                 COMMON MNODE(100),X(10,100),Y(10,100),P(10,100),MOUNTN,NPDIST  F0      15
354                 DIMENSION XX(10,100),YY(10,100)                              F0      17
355                 MVALID=0
356                 DO 10 I=1,NMONT
357                 XM(I)=SITE(I,1)
358                 YM(I)=SITE(I,2)
359          10 CONTINUE
```

```
      WRITE(6,101) (PTILE(I), I=2,8)
  101 FORMAT(/1X,'P1 P2 P3 P4 P5 P6 P7 P8 = ',7F5.1/)
      DO 20 N=1,NRECEP
      XR=RECEP(N,1)
      YR=RECEP(N,2)
      R(1)=XR                                                          FO     26
      R(2)=YR                                                          FO     27
      IF(NPOIST.EQ.0)GO TO 1111                                        FO     28
C     DO(I=1,MOUNTN)                                                   IF     29
      DO 19998 I=1,MOUNTN                                                     29
        MND=MNODE(I)                                                   FO 1   30
C       DO(J=1,MND)                                                    IF 1   31
        DO 19998 J=1,MND                                                      31
          CORD(1)=X(I,J)                                               FO 2   32
          CORD(2)=Y(I,J)                                               FO 2   33
          CALL TRNSLT(CORD,R,CORD1)                                    FO 2   34
          XX(I,J)=CORD1(1)                                             FO 2   35
          YY(I,J)=CORD1(2)                                             FO 2   36
C       END DO                                                         IF 1   37
19998   CONTINUE                                                              37
C     END DO                                                           IF     38
19999 CONTINUE                                                                38
1111  CONTINUE                                                         FO     39
      DO 30 I=1,NMONT
      CHECK=CHF(I,1)
      IF(CHECK) 51,51,52
   51 DIST=9.9E10
      GO TO 53
   52 XDIST=XM(I)-XR
      YDIST=YM(I)-YR
      DIST=SQRT(XDIST*XDIST+YDIST*YDIST)
      IF(NPOIST.EQ.0)GO TO 1112                                        FO     48
      S(1)=XM(I)                                                       FO     49
      S(2)=YM(I)                                                       FO     50
      CALL TRNSLT(S,R,SS)                                              FO     51
C AFTER ROTATION THE STATION POINT IS ON THE X DOUBLE PRIME AXIS        FO     52
      XS(I)=DIST                                                       FO     53
      YS(I)=0.0                                                        FO     54
C FIND THE COORDINATE OF EACH MOUNTAIN NODE IN THE DOUBLE PRIMED SYSTEM FO     55
      THETA=ATAN2(SS(2),SS(1))                                         FO     56
```

```
      C      DO(J=1,MOUNTN)                                                    IF      57
             DO 19997 J=1,MOUNTN                                                       57
               MND=MNODE(J)                                                    FO 1    58
      C        DO(K=1,MND)                                                     IF 1    59
               DO 19996 K=1,MND                                                        59
                 XN(J,K)=XX(J,K)*COS(THETA)+YY(J,K)*SIN(THETA)                 FO 2    60
                 YN(J,K)=-XX(J,K)*SIN(THETA)+YY(J,K)*COS(THETA)                FO 2    61
      C        END DO                                                          IF 1    62
      19996    CONTINUE                                                                 62
      C      END DO                                                            IF      63
      19997  CONTINUE                                                                  63
      C TEST WHETHER EACH MOUNTAIN NODE IS ON THE X DOUBLE PRIME AXIS AND BETWFO      64
      C STATION AND RECEPTOR POINTS                                           FO      65
      C      DO(J=1,MOUNTN)                                                    IF      66
             DO 19995 J=1,MOUNTN                                                       66
               MND=MNODE(J)                                                    FO 1    67
      C        DO(K=1,MND)                                                     IF 1    68
               DO 19994 K=1,MND                                                        68
      C          IF(YN(J,K).EQ.0.0.AND.XN(J,K).LE.DIST.AND.XN(J,K).GT.0.0)     IF 2    69
                 IF(                                                                   69
             *   YN(J,K).EQ.0.0.AND.XN(J,K).LE.DIST.AND.XN(J,K).GT.0.0                 69
             *   ) GO TO 19991                                                         69
                 GO TO 19992                                                           69
      19991      CONTINUE                                                              69
                   DIST=DIST+P(J,K)                                            FO 3    70
      C          END IF                                                        IF 2    71
      19992      CONTINUE                                                              71
      19993      CONTINUE                                                              71
      C        END DO                                                          IF 1    72
      19994    CONTINUE                                                                 72
      C      END DO                                                            IF      73
      19995  CONTINUE                                                                  73
      C TEST WHETHER THE STATION-RECEPTOR LINE CROSS ANY MOUNTAIN REGION       FO      74
      C      DO(J=1,MOUNTN)                                                    IF      75
             DO 19990 J=1,MOUNTN                                                       75
               M1=MNODE(J)-1                                                   FO 1    76
      C        DO(K=1,M1)                                                      IF 1    77
               DO 19989 K=1,M1                                                         77
      C          IF(XN(J,K).EQ.XN(J,K+1))                                      IF 2    78
                 IF(XN(J,K).EQ.XN(J,K+1)) GO TO 19986                                  78
```

```
                    GO TO 19987                                                    78
19986               CONTINUE                                                       78
C                     IF(XN(J,K).LE.XS(I))                                IF 3     79
                      IF(XN(J,K).LE.XS(I)) GO TO 19983                             79
                      GO TO 19984                                                  79
19983                 CONTINUE                                                     79
C                       IF(YN(J,K)*YN(J,K+1).LT.0.0)                      IF 4     80
                        IF(YN(J,K)*YN(J,K+1).LT.0.0) GO TO 19980                   80
                        GO TO 19981                                                80
19980                   CONTINUE                                                   80
                          PENL=P(J,K)+(P(J,K+1)-P(J,K))*ABS(YN(J,K))/(ABS(YN(J,KFO 5   81
     **ABS(YN(J,                                                                   81
     1                K+1)))                                             FO       81
                          DIST=DIST+PENL                                   FO 5     82
C                       END IF                                             IF 4     83
19981                   CONTINUE                                                   83
19982                 CONTINUE                                                     83
C                     END IF                                               IF 3     84
19984                 CONTINUE                                                     84
19985                 CONTINUE                                                     84
C                   ELSE                                                   IF 2     85
                    GO TO 19988                                                    85
19987               CONTINUE                                                       85
C                     IF(YN(J,K)*YN(J,K+1).LT.0.0)                        IF 3     86
                      IF(YN(J,K)*YN(J,K+1).LT.0.0) GO TO 19977                     86
                      GO TO 19978                                                  86
19977                 CONTINUE                                                     86
                        SLOPE=(YN(J,K)-YN(J,K+1))/(XN(J,K)-XN(J,K+1))    FO 4     87
C                       IF(SLOPE.NE.0.0)                                 IF 4     88
                        IF(SLOPE.NE.0.0) GO TO 19974                               88
                        GO TO 19975                                                88
19974                   CONTINUE                                                   88
                          XINTCP=XN(J,K)-YN(J,K)/SLOPE                     FO 5     89
C                         IF(XINTCP.LE.XS(I).AND.XINTCP.GT.0.0)            IF 5     90
                          IF(XINTCP.LE.XS(I).AND.XINTCP.GT.0.0) GO TO 19971        90
                          GO TO 19972                                              90
19971                     CONTINUE                                                 90
                            PENL=P(J,K)+(P(J,K+1)-P(J,K))*ABS(YN(J,K))/(ABS(YN(J,KFO 6   91
     *))*ABS(YN(J,                                                                 91
     1                K+1)))                                             FO       91
```

```
480                        DIST=DIST+PENL                                  FO 6   92
481      C                   END IF                                         IF 5   93
482      19972               CONTINUE                                              93
483      19973               CONTINUE                                              93
484      C                 END IF                                           IF 4   94
485      19975             CONTINUE                                                94
486      19976             CONTINUE                                                94
487      C               END IF                                             IF 3   95
488      19978           CONTINUE                                                  95
489      19979           CONTINUE                                                  95
490      C             END IF                                               IF 2   96
491      19988         CONTINUE                                                    96
492      C           END DO                                                 IF 1   97
493      19989       CONTINUE                                                    97
494      C         END DO                                                   IF     98
495      19990   CONTINUE                                                        98
496      1112    CONTINUE                                                   FO     99
497              IF (N.NE.1) GO TO 53
498              MVALID=MVALID+1
499         53   RANK(I)=DIST
500              NSITE(I)=I
501         30   CONTINUE
502              IF(N.NE.1) GO TO 99
503              WRITE(6,190) MVALID
504        190   FORMAT(5X,'NO. OF VALID MONITORING STATIONS=',I4/)
505         99   CALL SEARCH
506              DO 40 J=1,8
507              TD=0.
508              TC=0.
509              DO 50 K=1,3
510              M=NSITE(K)
511              D=RANK(K)
512              IF(D.LT.EPS) GO TO 55
513              FWT=1./D**2
514              TD=TD+FWT
515              TC=TC+FWT*CHF(M,J)
516         50   CONTINUE
517              CFRQ(N,J) = TC/TD
518              GO TO 40
519         55   CFRQ(N,J)=CHF(M,J)
```

```
      40 CONTINUE
         WRITE(6,110) N,(CFRQ(N,J), J=1,8)
      110 FORMAT(2X,'NO. =',I4,5X,' MAX,P2,P3,P4,P5,P6,P7,P8 P-FILE =',
        38F10.1)
      20 CONTINUE
         RETURN
         SUBROUTINE TRNSLT(CORD1,ORIGIN,CORD2)
         DIMENSION CORD1(2),ORIGIN(2),CORD2(2)
         DO 100 I=1,2
         CORD2(I)=CORD1(I)-ORIGIN(I)
      100 CONTINUE
         RETURN
         SUBROUTINE DSPCTR
         COMMON / LUPLCM / LUPLT
         COMMON  AQSTD,NRECEP,NMONTE,PS,RECEP(300,2),NSITE(200),RANK(200),
        1SITE(200,2),CMF(200,8),RPOPL(300,2),AWT(300),DENSTY(300),TAREA,TPO
        2PL,CFRQ(300,8),F(300,4),NOBS , XLOW,XINCR,NINCR,PTILE(8)
         DIMENSION DTHR(40),AQS(3),PQS(3),PSAR(3),PSPP(3),DA(3),DP(3),CHEK
        3(3), POPAVG(3), AREAVG(3),DSAR(3),DSPP(3),ASPC(3),PSPC(3)
         DO 25 I= 1, NINCR
      25 DTHR(I) = XLOW + XINCR * (NINCR-I)
         WRITE(6,215)
      215 FORMAT(/20X,'POPULATION AND LAND AREA EXPOSURE FUNCTIONS',//,40X,
        1'LAND AREA',40X,'POPULATION'/,22X,2('DISTRIBUTION FUNCTION',5X)
        2'FREQUENCY FUNCTION',5X),/,17X,4(13X,'PERCENTILE'),/1X,'CONCENT'
        3,'RATION',13X,4('P2      P5      P7',7X))
C
C      COMPUTE A(D*), P(D*), SA(D*), SP(D*) FOR 50TH, 90TH, 99TH PERCENTI
C      LE
         DO 10  N=1,3
         AQS(N) =0.
         PQS(N) =0.
         PSAR(N) =0.
         PSPP(N) = 0.
      10 CONTINUE
         PTHR = DTHR(1) + XINCR
C      END INITIALIZATION AND START D* LOOP
         DO 20 J =1,NINCR
           DO 30 N = 1,3
           DA(N) =0.
```

```
      DP(N)=0.
   30 CONTINUE
C     END INITIALIZATION AND START RECEPTOR LOOP
C
      DO 40 I=1,NRECEP
        DO 50 N=1,3
        GO TO (31,32,33),N
   31   K=7
        GO TO 34
   32   K=5
        GO TO 34
   33   K=2
   34   CHEK(N) = OFRQ(I,K)- DTHR(J)
        IF (CHEK(N)) 41,42,42
   41   SIGN = 0.
        GO TO 43
   42   SIGN = 1.
   43   DA(N) = DA(N) + SIGN * AWT(I)
        DP(N) = DP(N) + SIGN * DENSTY(I)
   50 CONTINUE
   40 CONTINUE
      DELC = PTHR - DTHR(J)
      DO 60 N=1,3
      DSAR(N) = DA(N)/TAREA
      DSPP(N) = DP(N)/TPOPL
      ASPC(N) = DSAR(N) - PSAR(N)
      PSPC(N) = DSPP(N) - PSPP(N)
      AQS(N) = AQS(N) + 0.5*(DSAR(N)+PSAR(N))*DELC
      PQS(N) = PQS(N) + 0.5*(DSPP(N)+PSPP(N))*DELC
      PSAR(N) = DSAR(N)
      PSPP(N) = DSPP(N)
   60 CONTINUE
      PTHR = DTHR(J)
      WRITE(6,221)DTHR(J),(DSAR(N),N=1,3),(ASPC(N),N=1,3),(DSPP(N),N=1,3
     1),(PSPC(N),N=1,3)
  221 FORMAT(2X,'D* =',F6.1,10X,4(3F7.3,2X))
   20 CONTINUE
      DO 21 I=1,3
      AQS(I) = AQS(I) + DTHR(NINCR)
   21 PQS(I) = PQS(I) + DTHR(NINCR)
```

```
      DO 23 J= 1,3
      POPAVG(J) = 0.
      AREAVG (J) = 0.
      GO TO (51,52,53),J
   51 K = 7
      GO TO 54
   52 K = 5
      GO TO 54
   53 K = 2
   54 CONTINUE
      DO 22 I = 1,NRECEP
      POPAVG(J) = POPAVG(J) + CFRQ(I,K) * DENSTY(I)
      AREAVG(J) = AREAVG(J) + CFRQ(I,K) * AMT(I)
   22 CONTINUE
      POPAVG(J) = POPAVG(J)/TPOPL
      AREAVG(J) = AREAVG(J)/TAREA
   23 CONTINUE
      WRITE (6,240) (AREAVG(N), N= 1,3), (POPAVG(N),N=1,3)
C
C     END RECEPTOR LOOP
C
  240 FORMAT(/17X,'SPATIAL AVERAGE AIR QUALITY = ',3F7.2,/,51X,'POPULAT
     1','ION WEIGHTED AVERAGE AIR QUALITY = ',3F7.2)
      RETURN
      SUBROUTINE RISKDN
      COMMON  AQSTD,NRECEP,NMONT,EPS,RECEP(300,2),NSITE(200),RANK(200),
     1SITE(200,2),CMF(200,8),RPOPL(300,2),AMT(300),DENSTY(300),TAREA,TPO
     2PL,CFRQ(300,8),F(300,4),NOBS, XLOW, XINCR, NINCR,PTILE(8)
      DIMENSION STD(4)
      STD(1) = AQSTD
      STD(2) = AQSTD * 2.
      STD(3) = AQSTD * 3.
      STD(4) = AQSTD * 4.
      DO 10 I=1,NRECEP
C
C     COMPUTE FS FOR A GIVEN CS AT EACH RECEPTOR POINT
C
      DO 20 J=1,4
        K = 1
        IF (STD(J) - CFRQ(I,K))  12,11,11
```

```
      11    F(I,J) = 0.
            GO TO 20
      12    CHECK = (CFRQ(I,K) -STD(J)) * (CFRQ(I,K+1) - STD (J))
            IF(CHECK) 30,30,21
      21    K = K + 1
            IF (K - 8) 12,22,22
      22    F(I,J) = 100.
            GO TO 20
      30    CU = CFRQ (I,K)
            CL = CFRQ (I,K+1)
            IF(K.EQ.1) GO TO 42
      41 PU=FLOAT(PTILE(K))
            GO TO 43
      42 PU=100./NOBS
      43 PL=FLOAT(PTILE(K+1))
            IF (CU - CL) 32,31,32
      31    F(I,J) = (PL + PU)/2.
            GO TO 20
      32 ROGF=((CU-STD(J))*ALOG(PL) + (STD(J) - CL)*ALOG(PU))/(CU - CL)
            F(I,J) = EXP(ROGF)
      20    CONTINUE
            X=RECEP(I,1)
            Y=RECEP(I,2)
            Z=F(I,1)
            WRITE(8,88) F(I,1),RECEP(I,1),RECEP(I,2)
      88 FORMAT(3F10.1)
            WRITE (6,200)  I,(F(I,J),J=1,4)
     200 FORMAT (2X,'RECEPTOR NO.=',I4,5X,'1 STD RISK = ',F5.1,5X,'2 STD RI
        3SK = ',F5.1,5X,'3 STD RISK = ',F5.1,5X,'4 STD RISK = ',F5.1)
      10 CONTINUE
            RETURN
            END
```

```
TRRP*POPEXP.HYBRID
      1            DIMENSION IBUF(1000),XPOLYG(60,25),YPOLYG(60,25),NPTS(25)
      2            DIMENSION X(60),Y(60)
      3            DIMENSION SYMBL(10),RANGE(9)
      4            DIMENSION DATA(247,10),XX(247,10),YY(247,10)
      5            DIMENSION NRECPT(10)
      6            READ (5,94) XFACT, XOFF,YOFF, XWIDTH,CHAR,NPLOT1,NPLOT2
      7           94 FORMAT(5F5.1,3I5)
      8            IF(NPLOT1.EQ.0)NPLOT1=1
      9            IF(NPLOT2.EQ.0)NPLOT2=1
     10            IF(CHAR.EQ.0.)CHAR=1.
     11            SIZE=0.10*CHAR/XFACT
     12            READ(5,6)(SYMBL(I),I=1,10)
     13            6 FORMAT(10A1)
     14            READ(5,4)(RANGE(I),I=1,9)
     15            READ(5,1)NPOLYG,(NPTS(I),I=1,NPOLYG)
     16            DO 10 J=1,NPOLYG
     17            N=NPTS(J)
     18            READ(5,2)((XPOLYG(I,J),YPOLYG(I,J)),I=1,N)
     19            DO 15 I=1,N
     20            XPOLYG(I,J) = XPOLYG(I,J)-XOFF
     21            YPOLYG(I,J) = YPOLYG(I,J)-YOFF
     22           15 CONTINUE
     23           10 CONTINUE
     24            1 FORMAT(40I2)
     25            2 FORMAT(2F10.1)
     26            4 FORMAT(9F5.1)
     27            DO 20 K=1,NPLOT2
     28            READ(5,5)NRECPT(K)
     29            NK=NRECPT(K)
     30            5 FORMAT(I3)
     31            READ(5,3)((DATA(I,K),XX(I,K),YY(I,K)),I=1,NK)
     32            DO 20 I=1,NK
     33            XX(I,K) = XX(I,K)-XOFF+.10*CHAR
```

```
 20 YY(I,K) = YY(I,K)-YOFF-.10*CHAR
    CALL PLOTS(IBUF,1000,14)
    CALL FACTOR (XFACT)
    CALL PLOT(0.0,0.,-3)
    DO 260 K=NPLOT1,NPLOT2
     NK=NRECPT(K)
    DO 100 J=1,NPOLYG
    N=NPTS(J)
    CALL PLOT(XPOLYG(1,J),YPOLYG(1,J),3)
    DO 105 I=1,N
    X(I)=0.
    Y(I)=0.
    X(I)=XPOLYG(I,J)
    Y(I)=YPOLYG(I,J)
120 CALL PLOT(X(I),Y(I),2)
105 CONTINUE
    CALL PLOT(X(1),Y(1),2)
100 CONTINUE
  3 FORMAT(3F10.1)
    DO 250 I=1,NK
    IF(DATA(I,K).LT.RANGE(9))Z=SYMBL(10)
    DO 251 J=9,1
    IF(DATA(I,K).GE.RANGE(J))Z=SYMBL(J)
251 CONTINUE
    CALL SYMBOL(XX(I,K),YY(I,K),SIZE,Z,0.,1)
250 CONTINUE
    CALL PLOT(XWIDTH,0.0,-3)
260 CONTINUE
110 CALL PLOT(XWIDTH,0.0,999)
    STOP
    END
```

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16. ABSTRACT

This report is a companion document to the "Guideline on Procedures for constructing Air Pollution Isopleth Profiles and Population Exposure Analysis (OAQPS No. 1.2-083)." It contains an overview of the analysis procedures and documentation for computer software. Three programs (SYMAP, Tricon and Hybrid) can be used to produce computer - drawn maps for isopleth analysis. Two programs (LPEM and SPEM) are used for spatial interpolation and population exposure analysis.

17. KEY WORDS AND DOCUMENT ANALYSIS

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