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Prepared for

The Aluminum Association, Inc.  
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# Buoyant line and point source (BLP) dispersion model user's guide

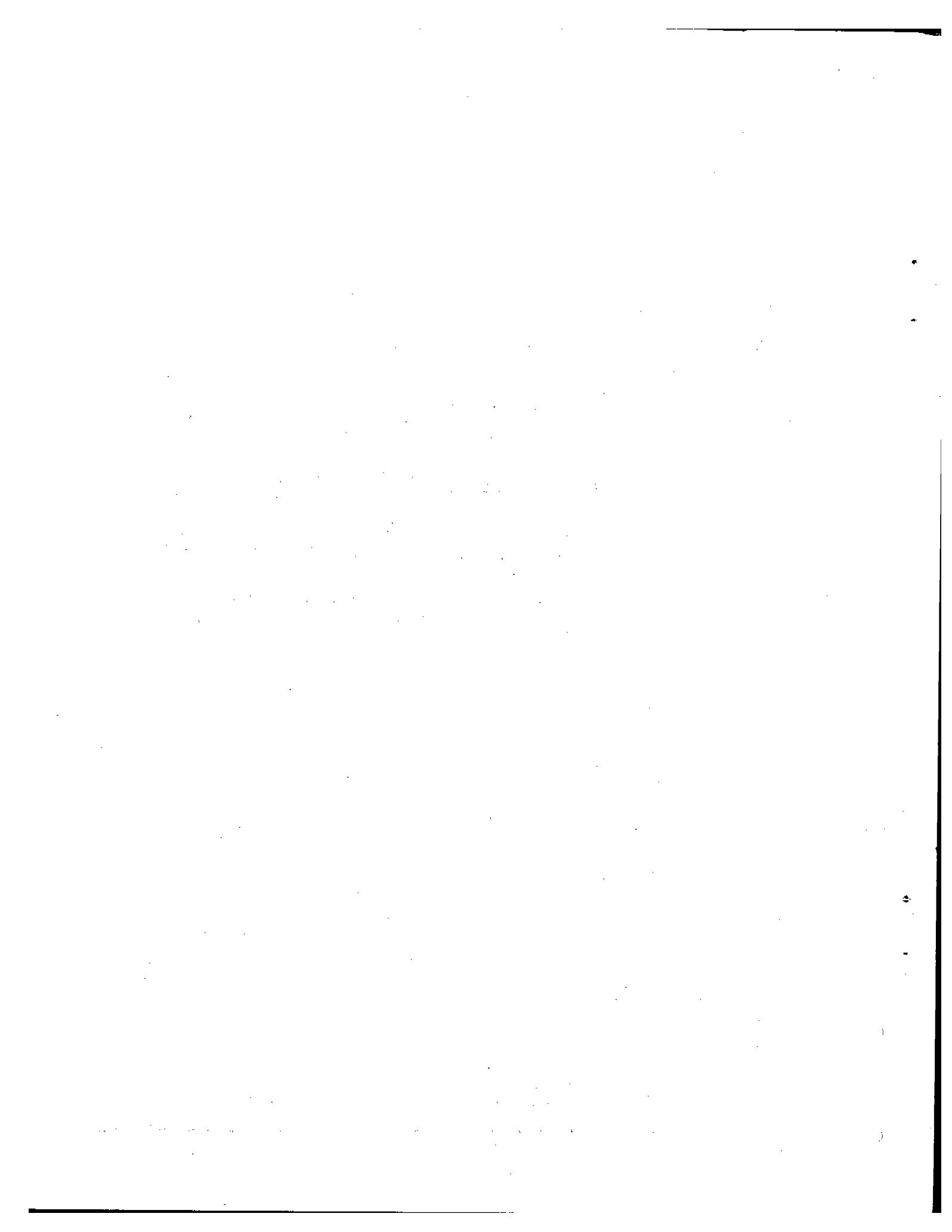
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FORT COLLINS, CO • BILLINGS, MT • HOUSTON • CHICAGO



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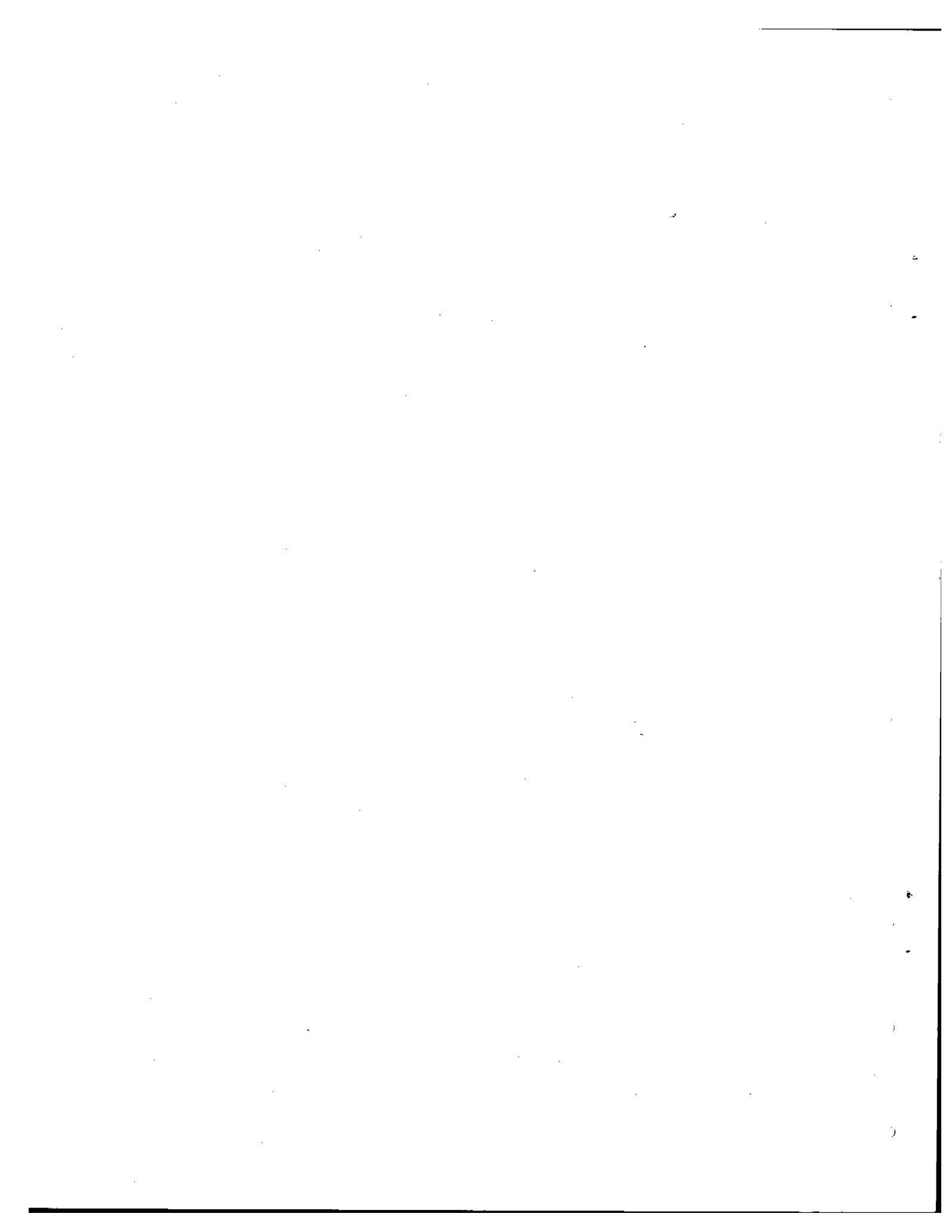
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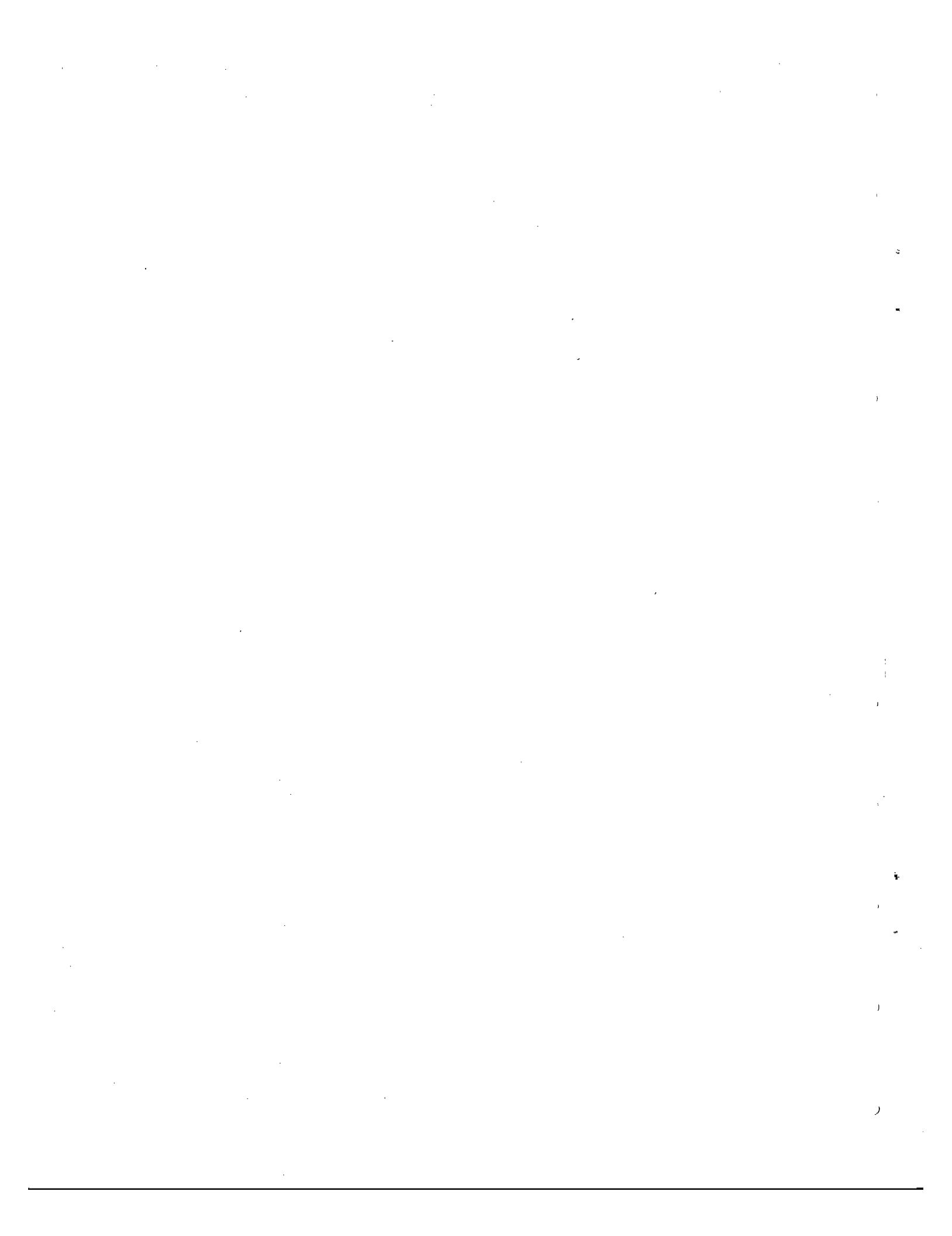
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## 1. INTRODUCTION

### 1.1 Project Objective

Environmental Research & Technology, Inc. (ERT) was retained by The Aluminum Association, Inc. to develop an air quality dispersion model to simulate the transport and diffusion of emissions from aluminum reduction plants. Aluminum reduction plants are a complex arrangement of emission sources, composed of parallel, low-level, buoyant line sources called potrooms interspersed, typically, by short point sources. Alumina is reduced through electrolysis to aluminum in the potrooms. A reduction facility usually consists of 2 to 20 potroom buildings about 500 meters long. Some of the buoyant emissions from the reduction process escape through a continuous ridge ventilator, which is a few meters wide running the length of the potroom. Most of the emissions, however, are collected by hooding above the reduction cells and are treated and exhausted through nearby stacks. There are typically 2 to 20 point sources, usually low-level, for each potroom primary control system.

Since a buoyant line source has one less degree of freedom than an isolated point source in entraining ambient air, the plume rise will be enhanced. In addition, the line source rise will be dependent on wind direction, line length, the number of parallel lines, and their spacing. Both the line source and the short point sources are subject initially to building downwash effects. The dispersion of effluents from aluminum reduction plants, because of these complexities, is not correctly handled by currently available air quality models. The model developed during this project, the Buoyant Line and Point Source (BLP) model, is in direct response to this need. BLP can simulate the complexities of aluminum reduction plants, but, importantly, also has the flexibility to duplicate point source contributions predicted by the CRSTER model.

## 1.2 Model Applications

The BLP dispersion model was developed specifically for aluminum reduction plants and, in addition to theoretical considerations, is based on extensive wind tunnel simulations of two reduction plants and an SF<sub>6</sub> field study tracer program at one of the plants. The model has been verified using two years of SO<sub>2</sub> measurements at the second reduction plant. (Refer to the companion document P-7304A for a description of the project and the model verification results.)

The complex source configuration of an aluminum reduction facility dictated that many innovative modeling techniques be developed. The major features of the BLP dispersion model are illustrated in Table 1-1. Plume rise from multiple finite buoyant line sources and the effects of vertical wind shear and building downwash on the plume rise of both line and point sources are the key innovative features.

Line source plume rise is determined analytically and is dependent on line length, wind direction, initial building downwash effects, the number of parallel lines, and line spacing. Plume rise is increased as the line length decreases, the wind direction becomes parallel to the line, and as the number of lines increases. If the building downwash effect is neglected, then as the line length approaches zero, the plume rise relationships reduces to the conventional Briggs formulations.

Because both the line and point sources of an aluminum reduction facility are low-level sources, the wind speeds encountered by the rising plumes are typically much greater than the wind speed at release height. Since current plume rise formulations assume the release height wind speed is constant with height, the resulting plume rise can be greatly overestimated. The BLP model contains an option that analytically determines the reduced plume rise that results when the effects of vertical wind speed shear are considered. Once again, as the wind speed shear approaches zero, the plume rise relationship reduces to the familiar Briggs formulation.

TABLE 1-1  
MAJOR FEATURES OF THE BLP MODEL

- UTM or line source oriented (SCS) coordinate system.
- Multiple point source and finite buoyant line source capability.
- Finite buoyant line source plume rise.
- Plume enhancement due to multiple line sources.
- Vertical wind shear in plume rise formulations for both point and line sources.
- Transitional plume rise.
- Incorporation of building downwash in both dispersion and plume rise calculations for point and line sources.
- Terrain adjustment plume path coefficients.
- Time-dependent pollutant decay.
- Source contribution concentrations.
- Flexible post-processing package.

Although the BLP model was specifically developed and verified for aluminum reduction plants, its analytical, theoretically based treatment of buoyant line source plume rise, building downwash, and vertical wind speed shear effects readily lends BLP to similar complex sources where these effects may be important.

### 1.3 BLP Modeling Package

The BLP modeling package is schematically illustrated in Figure 1-1. The BLP dispersion model accepts processed meteorological data from the CRSTER meteorological preprocessor program. The preprocessor requires hourly surface data and twice daily mixing height data (for further information about the preprocessor program, consult the Handbook for the Single Source (CRSTER) Model (EPA 1977)). For short-term runs up to 24 hours of card-image type user-specified meteorological data may be input. Source, receptor, and program control data are also input by card deck. All BLP concentration output is stored on a disk or tape file for further processing by the BLP post-processing program, POSTBLP. The user inputs POSTBLP program control parameters by card deck. Printouts of the appropriate processed concentration and meteorological data are generated by POSTBLP.

### 1.4 Summary of Input Data and Program Options

Four types of input data are required for the BLP dispersion model:

- meteorological data,
- source data,
- receptor data, and
- program control parameters.

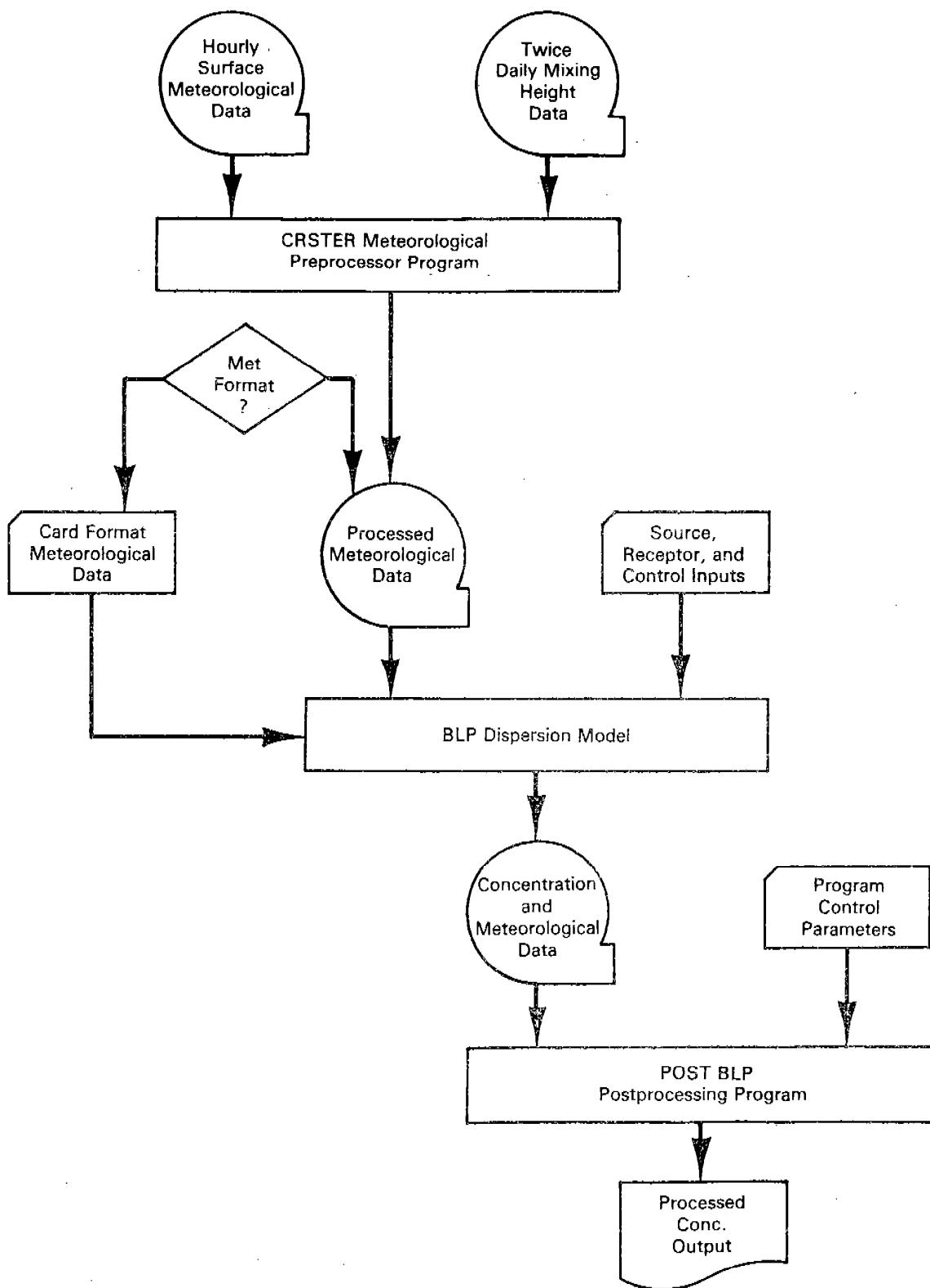


Figure 1-1 BLP Modeling Package

#### 1.4.1 Meteorological Data

The BLP model will accept two types of meteorological data: preprocessor data or user-specified card-image meteorological input. The preprocessor data is generated by the CRSTER meteorological preprocessor program from hourly surface observations and twice daily mixing height data. The preprocessor data includes for each hour:

- PGT stability class,
- wind speed in meters per second,
- wind direction in degrees,
- randomized wind direction in degrees,
- mixing height (urban and rural) in meters, and
- ambient air temperature in degrees Kelvin.

For further information on the output and input requirements of the CRSTER preprocessor program, refer to the Handbook for the Single Source (CRSTER) Model (EPA 1977).

The other possible format of meteorological input data is user-specified hourly card-image type data. Up to 24 hours of meteorological data may be specified in this format and should include hourly values of:

- PGT stability class,
- wind speed in meters per second,
- wind direction in degrees,
- ambient air temperature in degrees Kelvin, and
- mixing height in meters.

#### 1.4.2 Source Data

The BLP program is intended to model both buoyant line and point sources. The required point source data requirements are:

- stack location X and Y coordinates in meters,
- stack base elevation in meters,

- physical stack height in meters,
- pollutant emission rate in grams per second,
- stack inner diameter in meters,
- stack gas exit velocity in meters per second, and
- stack gas temperature in degrees Kelvin.

Up to 50 point sources are allowed.

The required input data for the buoyant line sources consist of a set of averaged parameters for use in the buoyant line sources plume rise calculations and a more detailed set of parameters used in the dispersion calculations. To calculate line source plume rise, it is assumed that there are up to 10 parallel lines of equal length and width equally spaced with identical buoyancy fluxes and release heights. If all these conditions are not satisfied, it may be necessary for the user to calculate appropriately averaged values for the following parameters:

- line length in meters,
- release height in meters,
- line source width in meters,
- building width in meters,
- spacing between buildings in meters, and
- buoyancy parameter in  $m^4/s^3$  (Note: the buoyancy parameter,  $F'$ , differs from the buoyancy flux defined by Briggs.)

Although the height of an individual plume element is determined from the above averaged information, no restriction is made on the symmetry or spacing of the line sources for the dispersion calculations. The following input parameters, used in the dispersion calculations, are required for each line source:

- X and Y coordinates of start of line in meters,
- X and Y coordinates of end of line in meters,
- building height in meters,

- pollutant emission rate in grams per second, and
- building base elevation in meters.

A maximum of 10 line sources is allowed.

#### 1.4.3 Receptor Data

The user has the option of either specifying the X and Y coordinates and the elevation of each receptor location or generating a rectangular grid of receptors by specifying the endpoints and X and Y spacing of the proposed receptor grid. If the receptors are generated by BLP, the elevations of all receptors are zero. With either option, up to 100 receptors are allowed.

#### 1.4.4 Program Control Parameters

The BLP dispersion model has several optional features that the user may select through the program control parameters. The default values of the program control parameters are discussed in the user's instructions section.

- Coordinate system option--allows the coordinates of all sources and receptors to be specified in Universal Transverse Mercator (UTM) coordinates or in an internal (line source oriented) source coordinate system (SCS).
- Source contribution option--specifies whether the contribution of any particular line or point source is to be separately written to the output file for analysis with the POSTBLP program. (Note: Because of the enhanced plume rise effects of multiple line sources, the source contribution of any single line source implicitly contains the effects of the buoyancy of the other line sources. The addition or removal of line sources will change the contributions of existing line sources.)

- Wind shear option--specifies whether the effect of vertical wind speed shear in determining plume rise from the buoyant point and line sources is to be estimated. The stability-dependent wind speed power law exponents can be changed from the default values by the user.
- Point source downwash option--specifies whether the effects of building downwash are to be estimated for those points within two building heights of any line source. The line sources are assumed to always downwash.
- Transitional plume rise option--specifies whether transitional point source plume rise is to be calculated. Transitional line source plume rise is always calculated.
- Vertical potential temperature gradient option--allows the user to input site-specific vertical potential temperature gradient values for PGT stability classes E and F different from the default values.
- Wind speed power law exponent option--allows the user to change the stability-dependent default power law exponents to more appropriate site-specific values. These exponents are used to calculate wind speed at stack height for use in the dispersion equation and also in the wind shear plume rise formulas. The measurement height of the mean wind speed can also be specified by the user.
- Stability class restriction option--restricts vertical variation of the PGT stability class to a user-specified number of classes per hour. (Note: the CRSTER meteorological preprocessor program may restrict the stability class variation to one class per hour, so if a different variation rate is more appropriate, some modification to the CRSTER preprocessor may also be required.)
- Mixing height option--allows the user to specify whether urban or rural mixing heights are to be used in the dispersion calculations.
- Pollutant decay option--allows for pollutant removal by a linear approximation to a exponential decay process.

- Background concentration option--allows the user to specify a background concentration value.
- Terrain adjustment option--allows the user to specify plume path coefficients for use in plume height calculations.

## 2. TECHNICAL DESCRIPTION

### 2.1 Introduction

The source and meteorological data requirements of BLP and a brief summary of the meteorological data generated by the CRSTER meteorological preprocessor program are presented in Section 2.2. A detailed description of the BLP model dispersion equations and assumptions is contained in Section 2.3. Section 2.4 describes the line and point source plume rise equations used in the BLP model. The BLP post-processing program, POSTBLP, is described in Section 2.5.

### 2.2 Model Input Requirements

#### 2.2.1 Meteorological Inputs

The BLP dispersion model requires hourly values of the following meteorological parameters: PGT stability class, wind speed, wind direction, ambient air temperature, and mixing height. There are two input modes for meteorological data: (1) CRSTER meteorological preprocessor (unformatted) input and (2) card-image type (formatted) meteorological input. Up to 366 days of hourly CRSTER preprocessor data or up to 24 hours of formatted meteorological data can be input to the BLP model.

The stability classification scheme is based on the work of Pasquill (1974), Gifford (1961), and Turner (1964). Six stability categories (Classes A through F) are permitted by BLP. Stability Class G is not allowed; occurrences of stability class G are changed to stability class F by BLP. The CRSTER meteorological preprocessor program calculates hourly values of PGT stability class, and restricts stability class variations to one class per hour. It is possible, however, that the dispersive characteristics of the atmosphere change more rapidly than one class change per hour, especially in the lowest layer of the atmosphere. BLP, therefore, allows the user to specify a maximum stability class variation greater than one class per hour. This option with the CRSTER preprocessor meteorological data requires

modification to the CRSTER preprocessor program to remove the one stability class per hour restriction. In formatted card-image input mode, BLP uses the stability classes as specified in the input, with no stability class variation restriction.

The mean wind speed,  $U_1$ , at measurement height,  $Z_1$ , must be specified hourly. The wind speed variation wind height is assumed to follow a stability dependent power law:

$$U_z = U_1 (Z/Z_1)^P \quad (2-1)$$

where  $U_z$  is the wind speed at height  $Z$  and  $P$  is a stability dependent wind shear exponent. The user may specify site-specific values of the wind shear exponent or use the default values provided (see Table 2-1). The wind speed measurement height,  $Z_1$ , can also be specified by the user. A default value of 7 meters is assumed. Because the Gaussian dispersion equation contains a  $1/U$  dependence, a minimum measurement height wind speed of 1 meter per second (m/s) is assumed by the CRSTER preprocessor program.

Wind direction is specified in terms of the direction toward which the wind is blowing. The CRSTER preprocessor program converts the National Weather Service (NWS) wind observations (direction from which the wind is blowing) to the proper format by shifting the direction by  $180^\circ$ . The NWS observations, reported only in  $10^\circ$  increments, are randomized by the preprocessor within the  $10^\circ$  sectors to eliminate wind directional bias.

Hourly ambient air temperatures are used in the point source plume rise equation in the calculation of buoyancy flux (the line source buoyancy parameter for aluminum reduction plants has generally been assumed to be independent of ambient temperature). In preprocessor input mode, a missing temperature value defaults to 293°K (68°F). The vertical potential temperature gradients used in the stable plume rise calculations have the default values specified in Table 2-2. The user may specify more appropriate site-specific values if they are available.

The CRSTER meteorological preprocessor computes hourly mixing heights by interpolation of the twice daily estimated mixing height data. For the details of the interpolation scheme, refer to the

TABLE 2-1  
DEFAULT VALUES FOR THE WIND SHEAR EXPONENT, P

<u>PGT Stability Class</u>	<u>P</u>
A	0.10
B	0.15
C	0.20
D	0.25
E	0.30
F	0.30

TABLE 2-2  
DEFAULT VALUES FOR THE VERTICAL POTENTIAL  
TEMPERATURE GRADIENT,  $\partial\theta/\partial z$

<u>PGT Stability Class</u>	<u><math>\partial\theta/\partial z</math>(°K/m)</u>
E	0.020
F	0.035

Handbook for the Single Source (CRSTER) Model (EPA 1977) The preprocessor calculates two mixing heights for each hour: one primarily representative of an urban environment and the other for a rural environment. The user must specify which mixing height (rural or urban) is most appropriate for a particular application of the BLP model.

### 2.2.2 Source Inputs

The BLP program can be used to model multiple buoyant line and point sources. Table 2-3 summarizes the source data requirements of BLP. For each point source, the stack location, base elevation, physical stack height, inside stack diameter, stack gas exit velocity, stack gas temperature, and pollutant emission rate must be included as input. Up to 50 point sources are allowed. For the line sources, two sets of source parameters must be included. For each line source, the coordinates of the line endpoints, base elevation, release height, and pollutant emission rate are required. A maximum of 10 line sources is allowed. This detailed information is used in the dispersion calculations (see Section 2.3.2). Each line can be a different length, height, and so forth. The plume rise formulation for multiple buoyant finite line sources (described in Section 2.4.2), however, assumes the line sources are equally spaced, with identical heights, widths, buoyancy parameters, and line lengths (see Figure 2-1). These assumptions allow evaluation of the plume rise enhancement effects of multiple line sources. For the plume rise calculations, therefore, a set of averaged line source characteristics must be input. No restriction is placed on the symmetry of the line sources for the dispersion calculation. The averaged parameters determine only the height of individual line source plume elements; for rows of lines with reasonably similar characteristics, the use of averaged parameters is probably not a critical approximation.

All source and receptor locations can be specified as UTM coordinates or in a line-source oriented (SCS) Cartesian coordinate system. The SCS coordinate system has an origin at the endpoint of the first line source, and is oriented with the X-axis parallel to the

TABLE 2-3  
REQUIRED SOURCE INPUT DATA

<u>Parameters</u>	<u>Required Point Source Data</u>	<u>Units</u>
X	X coordinate of the stack	m
Y	Y coordinate of the stack	m
E <sub>p</sub>	Elevation of the stack base above a reference height (such as sea level)	m
H <sub>s</sub>	physical stack height	m
d	stack inner diameter	m
W	stack gas exit velocity	m/s
T <sub>s</sub>	stack gas temperature	°K
Q	pollutant emission rate	g/s

Required Line Sources Data - Dispersion Calculations

<u>Parameters</u>	<u>Definition</u>	<u>Units</u>
X <sub>B</sub>	X coordinate of the most westerly end of the line source	m
Y <sub>B</sub>	Y coordinate of the most westerly end of the line source	m
X <sub>E</sub>	X coordinates of the most easterly end of the line source	m
Y <sub>E</sub>	Y coordinate of the most easterly end of the line source	m
H <sub>L</sub>	release height of the line source	m
Q <sub>L</sub>	pollutant emission rate of the line source	g/s

TABLE 2-3 (Continued)

## Required Line Source Data - Plume Rise Calculations

<u>Parameters</u>	<u>Definition</u>	<u>Units</u>
L	average line length	m
H <sub>B</sub>	average building height	m
W <sub>m</sub>	average line source width	m
W <sub>B</sub>	average building width	m
δx	average spacing between buildings	m
F'	average line source buoyancy parameter (Note: the buoyancy parameter, F', differs from the buoyancy flux defined by Briggs by a factor of $\pi$ - see Equation 2-47)	m <sup>4</sup> /s <sup>3</sup>

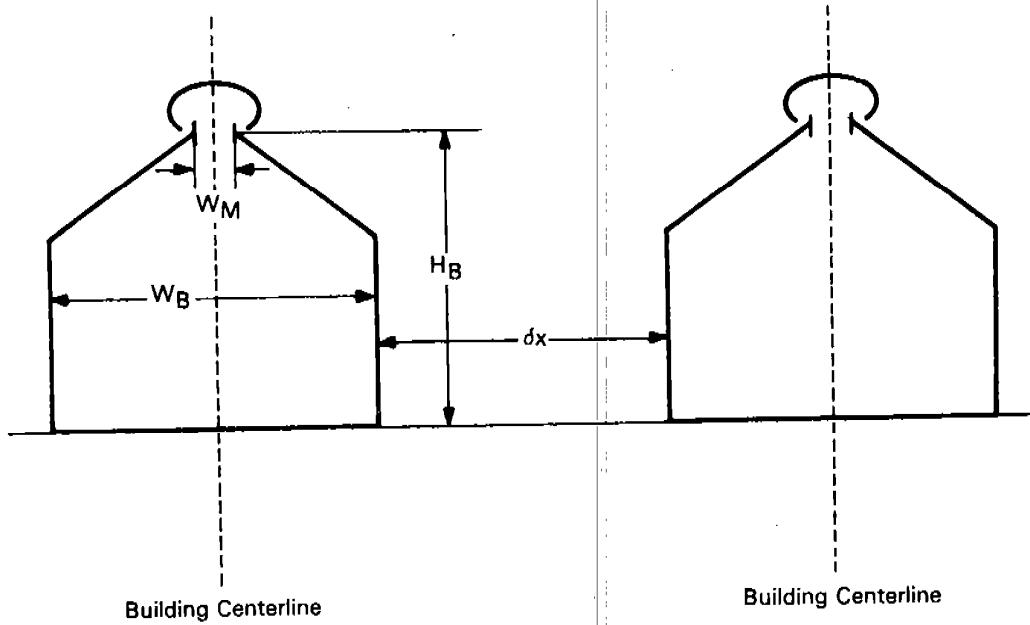


Figure 2-1 Cross-Sectional View of Line Sources

lines. Figure 2-2(a) illustrates the SCS coordinate system. With SCS coordinates, an orientation angle, TCOR, must also be specified. Figure 2-2(b) shows the TCOR variation with different line source orientations.

### 2.2.3 Receptor Inputs

The BLP model allows the user to either specify a grid of arbitrarily spaced receptor locations or select an option to automatically generate a rectangular grid of receptors, with the boundaries and receptor spacing determined by the user. The location and elevation of each receptor must be specified for arbitrarily located receptors. If the option to generate a rectangular grid is chosen, all receptor elevations are set equal to zero. Figure 2-3 illustrates this receptor generation option. In this example, a grid of 58 receptors, specified in SCS coordinates, are generated. The user must input the SCS coordinates of two points ( $X_B, Y_B$ ) and ( $X_E, Y_E$ ), along with the X and Y grid spacing,  $\delta X$  and  $\delta Y$ . No receptors are allowed within the "line source rectangle," defined in Figure 2-3 by the dashed lines encompassing the four line sources. It should be noted that because the Pasquill-Gifford Gaussian dispersion parameter curves are defined only for distances greater than 100 meters, the receptor grid should be defined so that no receptor is located within 100 meters of a line or point source.

## 2.3 Gaussian Modeling Approach

The BLP model calculates ambient air concentrations due to emission from multiple buoyant line and point sources based on the well-known Gaussian plume equation. Adjustments for the effects of limited mixing, and optionally, pollutant decay, downwash, and terrain features are incorporated into the model. For line sources, the point source Gaussian plume equation is numerically integrated over the finite length of the line. The Gaussian dispersion equation and its application to point and line sources are discussed in this section.

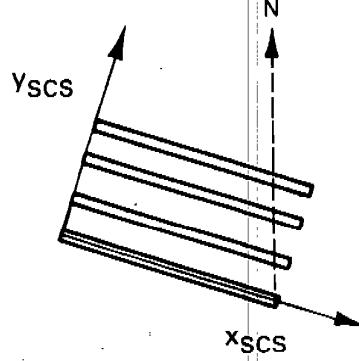


Figure 2-2(a) SCS Coordinate System

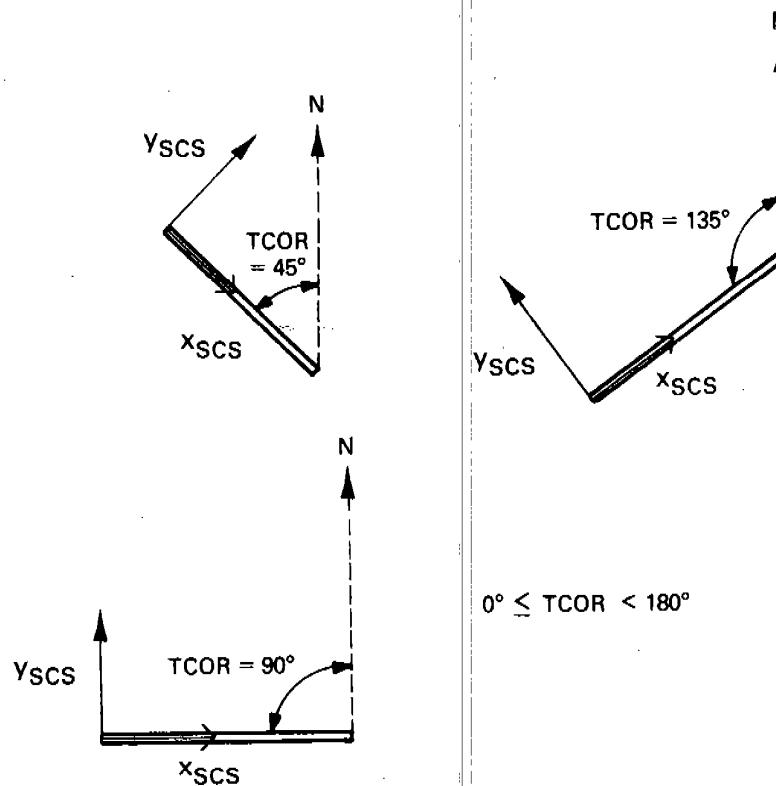


Figure 2-2(b) SCS Orientation Angle, TCOR

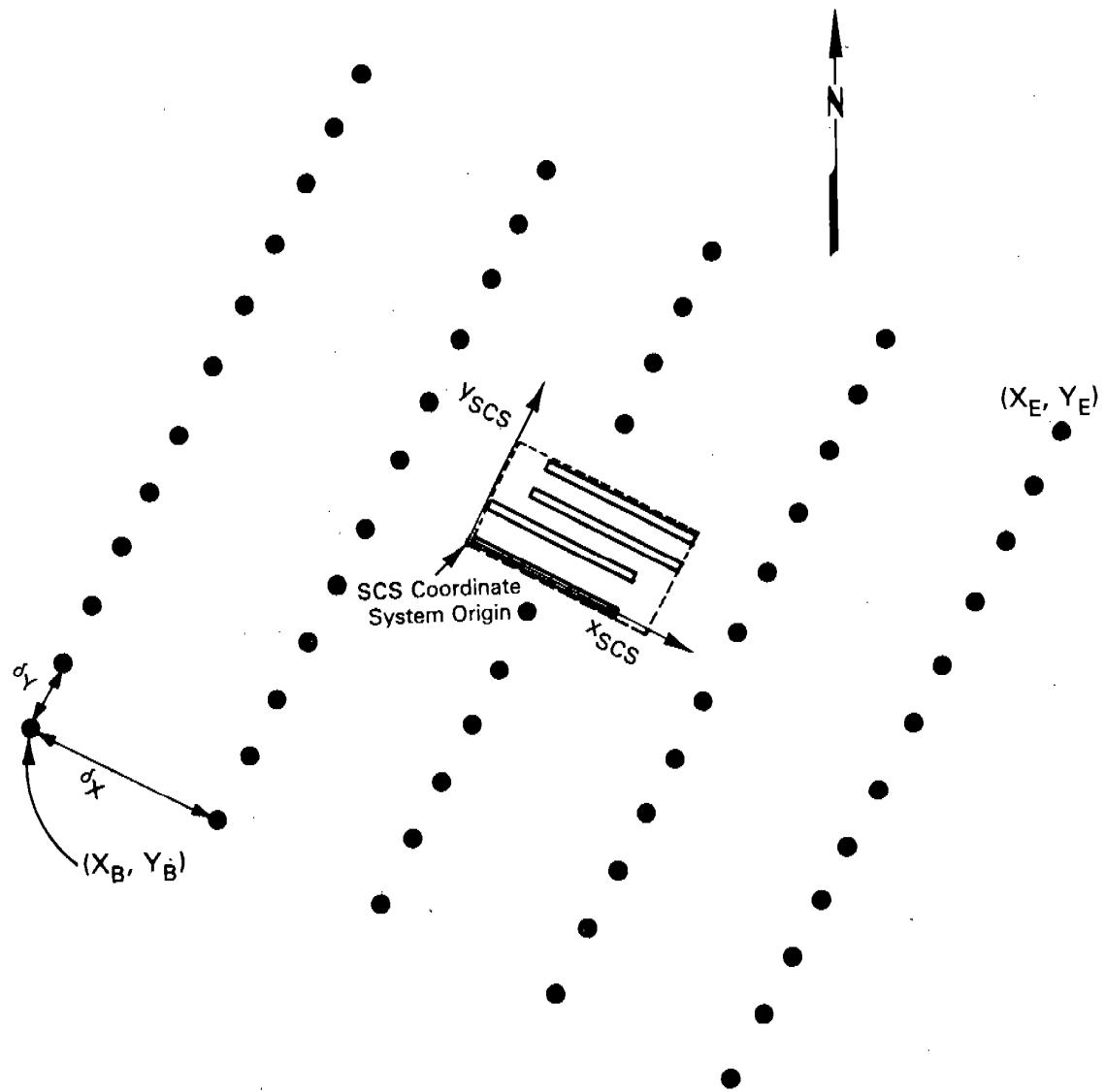


Figure 2-3 Receptor Generation Option

### 2.3.1 Gaussian Plume Equations for Point Sources

The basic Gaussian plume equation for the concentration, at a ground-level receptor is given by:

$$x = \frac{Q}{\pi \sigma_y \sigma_z U_s} \exp \left[ -\frac{y^2}{2 \sigma_y^2} \right] \exp \left[ -\frac{H^2}{2 \sigma_z^2} \right] \quad (2-2)$$

where

$x$  is concentration ( $\text{g}/\text{m}^3$ )

$y$  is crosswind distance (m)

$Q$  is pollutant emission rate ( $\text{g}/\text{s}$ )

$U_s$  is mean wind speed (m/s) at stack height

$\sigma_y$  is crosswind standard deviation of the concentration distribution (m)

$\sigma_z$  is vertical standard deviation of the concentration distribution (m)

$H$  is effective stack height (m)

The empirical dispersion coefficients,  $\sigma_y$  and  $\sigma_z$ , used in the BLP model are piecewise fits to the stability and distance dependent curves in Turner (1970). The effective stack height,  $H$ , is the sum of the physical stack height,  $H_s$ , and the plume rise,  $\Delta h$ . The equations used to calculate the plume rise are described in Section 2.4. The mean wind speed used in Equation 2-2 is the stack height wind speed as calculated by the stability dependent power law wind speed profile equation (Equation 2-1).

In the neutral atmospheric boundary layer, the vertical diffusion of a plume is sometimes limited by a stably stratified inversion layer above the mixed layer. The plume is assumed to be reflected at this interface as well as at the ground. The method of image sources is used to model these reflections (Turner 1970). The Gaussian equation for a ground-level receptor, with multiple reflections is:

$$X = \frac{Q}{\pi \sigma_y \sigma_z U_s} \exp \left[ \frac{-y^2}{2 \sigma_y^2} \right] \left\{ \sum_{n=-\infty}^{\infty} \exp \left[ -\frac{1}{2} \left( \frac{H+2nD}{\sigma_z} \right)^2 \right] \right\} \quad (2-3)$$

where D is the height of the base of the inversion (mixing height).

Equation 2-3 is used only for PGT stability classes A-D. The multiple reflector terms,  $F_1$ ,

$$F_1 = \sum_{N=-\infty}^{\infty} \exp \left[ -\frac{1}{2} \left( \frac{H+2nD}{\sigma_z} \right)^2 \right] \quad (2-4)$$

rapidly converge for small values of  $T = (\sigma_z/D)^2$ .

For large values of T, however, more terms of the summation are needed. To optimize the computational efficiency of evaluating the infinite series, it is possible to express the series in an equivalent form, which converges rapidly for large values of T, using a Fourier series:

$$F_1 = \frac{\sigma_z}{D} \left( \frac{\pi}{2} \right)^{1/2} \left[ 1 + \sum_{j=1}^{\infty} 2 \cos(j \pi h) \exp(-j^2 \pi^2 T/2) \right] \quad (2-5)$$

where  $h = H/D$ . Equation 2-4 converges quickly for small values of T and Equation 2-5 converges quickly for large T. For  $T = T^* \approx 0.6$ , both equations converge at about the same rate. For  $T < T^*$ , therefore, Equation 2-4 is used, and for  $T > T^*$ , Equation 2-5 is used. For these restricted values of T, only a few terms are needed to evaluate the series. Keeping a sufficient number of terms to obtain a high degree of accuracy (about eight decimal places), the equations for  $F_1$ , become:

$$F_1 = \begin{cases} \exp[-h^2/(2T)] \left\{ 1 + \exp[-2(1-h)/T] + \exp[-2(1+h)/T] \right. \\ \quad \left. + \exp[-4(2-h)] + \exp[-4(2+h)/T] \right\} & T < 0.6 \\ \frac{\sigma_z}{D} \left(\frac{\pi}{2}\right)^{1/2} \left\{ 1 + 2 \cos(\pi h) \exp[-\pi^2 T/2] \right. \\ \quad \left. + 2 \cos(2\pi h) \exp[-2\pi^2 T] \right\} & T \geq 0.6 \end{cases} \quad (2-6)$$

to optimize even further, it is possible to compute the exponential terms of Equation 2-6 by:

$$\exp(-a) = \begin{cases} 1-a & a < a_{\min} \\ \exp(-a) & a_{\min} \leq a \leq a_{\max} \\ 0 & a > a_{\max} \end{cases} \quad (2-7)$$

where  $a_{\min} = 0.0512$  and  $a_{\max} = 9.21$  will give an accurate estimate of the exponential to within about three decimal places.

As the ratio ( $\sigma_z/D$ ) becomes larger, the vertical concentration distribution becomes more and more uniform. For values of ( $\sigma_z/D$ ) greater than 1.6, the vertical distribution can be assumed to be uniform; Equation 2-8 is then used to calculate concentrations:

$$= \frac{Q}{\sqrt{2\pi} \sigma_y D u} \exp\left[\frac{-y^2}{2\sigma_y^2}\right] \quad (2-8)$$

For stable conditions, or for very high mixing heights ( $D > 5,000$  m), the multiple reflection terms can be ignored, and Equation 2-2 is used. For any stability condition, if the effective height of the plume,  $H$ , is greater than the mixed layer height,  $D$ , the ground-level concentration is assumed to be zero.

### 2.3.2 Point Source Building Downwash

Typically, aluminum reduction plants consist of rows of parallel line sources potrooms with point sources (scrubber stacks) located between the lines. In many cases, the scrubber stacks are not sufficiently tall to avoid building downwash. The BLP model, therefore, allows the effects of building downwash to be evaluated for sources within two building heights of the line sources. The point source downwash modeling is based upon an initial dilution of the plume,  $R_o$ , caused by the high entrainment rate associated with the building wake region. The initial plume dilution radius is used to calculate an enhanced initial vertical dispersion parameter,  $\sigma_{zo}$ , and possibly an enhanced horizontal dispersion parameter,  $\sigma_{yo}$  as well (depending upon the degree to which the plume downwashes). Dispersion coefficients are then increased using the method of virtual sources. At any downwind distance,  $X$ , the virtual distance,  $X_v$ , is added to the actual distance (i.e.,  $X$ ) in the computation of the distance dependent dispersion parameters,  $\sigma_y$  and  $\sigma_z$ . The initial virtual distance for  $\sigma_{yo}$  (i.e.,  $X_v(\sigma_{yo})$ ) is usually not equal to the virtual distance for  $\sigma_{zo}$  ( $X_v(\sigma_{zo})$ ), so each is calculated independently. The effect of the initial plume dilution on reducing plume buoyancy is also included in the plume rise modeling (see Section 2.4.1.2).

If point source building downwash effects are not to be considered, the user must request this in the input data (see Section 3). The BLP model will otherwise determine which point sources are within the region of influence of the buildings (within two building heights of any line source). For those point sources, the following four step procedure is followed to evaluate building downwash effects.

- 1) Evaluate effective stack height due to momentum rise at a downwind distance of two building heights using Equations 2-9 to 2-13.

$$H_e \text{ (momentum)} = H_s + \Delta H_m \quad (2-9)$$

$$\Delta H_m = \left( \frac{3 F_m X}{\beta_m^2 U_s^2} \right)^{1/2} \quad (2-10)$$

$$X = 2H_B \quad (2-11)$$

$$F_m = \frac{T_a}{T_s} \frac{w_s^2 d^2}{4} \quad (2-12)$$

$$\beta_m = \frac{1}{3} + \frac{U_s}{w_s} \quad (2-13)$$

where

$\beta_m$  is momentum entrainment coefficient

$d$  is stack diameter (m)

$F_m$  is momentum flux ( $m^4/s^2$ )

$H_B$  is building height (m)

$H_e$  is effective stack height (m)

$\Delta H_m$  is plume rise due to momentum (m)

$T_a$  is ambient air temperature ( $^{\circ}$ K)

$T_s$  is stack gas temperature ( $^{\circ}$ K)

$U_s$  is mean wind speed at stack height (m/s)

$w_s$  is stack gas exit velocity (m/s)

$X$  is downwind distance (m)

2) Determine initial dilution radii,  $R_{yo}$  and  $R_{zo}$ :

$$A = H_e/H_B \quad (2-14)$$

$$(a) \text{ if } A \geq 3.0, \quad R_{yo} = 0.0 \quad (2-15)$$

$$R_{zo} = 0.0$$

(no enhancement of  $\sigma_y$  or  $\sigma_z$ )

(b) if  $1.2 < A < 3.0$ ,

$$R_{yo} = 0.0 \quad (2-16)$$

$$R_{zo} = (H_B/2)(3-A)$$

(only  $\sigma_z$  is enhanced)

(c) if  $A \leq 1.2$ ,

$$R_{yo} = (H_B/2)(6-5A) \quad (2-17)$$

$$R_{zo} = (H_B/2)(3-A) \text{ and } A = \text{maximum}(1.0, A)$$

(both  $\sigma_z$  and  $\sigma_y$  are enhanced).3) From  $R_{yo}$  and  $R_{zo}$ , calculate  $\sigma_{yo}$  and  $\sigma_{zo}$ :

$$\sigma_{yo} = \sqrt{\frac{2}{\pi}} R_{yo} \quad (2-18)$$

$$\sigma_{zo} = \sqrt{\frac{2}{\pi}} R_{zo}$$

4) Calculate virtual distances,  $x_v (\sigma_{yo})$  and  $x_v (\sigma_{zo})$ :

$$x_v (\sigma_{yo}) = \left( \frac{\sigma_{yo}}{a_y} \right)^{b_y} \quad (2-19)$$

$$x_v (\sigma_{zo}) = \left( \frac{\sigma_{zo}}{a_z} \right)^{b_z} \quad (2-20)$$

where  $a_y$ ,  $b_y$ ,  $a_z$ ,  $b_z$  are stability-dependent coefficients (see Tables 2-4, 2-5). The coefficients  $b_y$  and  $b_z$  are related to  $\sigma_z = A_z x^{B_z}$  and  $\sigma_y = A_y x^{B_y}$  by  $b_z = 1/B_z$  and  $b_y = 1/B_y$ .

TABLE 2-4  
COEFFICIENTS USED TO CALCULATE VIRTUAL DISTANCE,  $x_v$  ( $\sigma_{yo}$ )

<u>PGT Stability Class</u>	<u>a<sub>y</sub></u>	<u>b<sub>y</sub></u>
A	213.0	1.1148
B	155.0	1.0970
C	103.0	1.0920
D	68.0	1.0760
E	50.0	1.0860
F	33.5	1.0830

TABLE 2-5  
COEFFICIENTS USED TO CALCULATE VIRTUAL DISTANCE,  $X_v$  ( $\sigma_{zo}$ )

PGT Stability Class	$\sigma_{zo}$	$a_z$	$b_z$
A	$0 < \sigma_{zo} \leq 13.95$	122.80	1.0585
	$13.95 < \sigma_{zo} \leq 21.40$	158.08	0.9486
	$21.40 < \sigma_{zo} \leq 29.30$	170.22	0.9147
	$29.30 < \sigma_{zo} \leq 37.67$	179.52	0.8879
	$37.67 < \sigma_{zo} \leq 47.44$	217.41	0.7909
	$47.44 < \sigma_{zo} \leq 71.16$	258.89	0.7095
	$71.16 < \sigma_{zo} \leq 104.65$	346.75	0.5786
B	$104.65 < \sigma_{zo}$	453.85	0.4725
	$0 < \sigma_{zo} \leq 20.23$	90.673	1.0730
	$20.23 < \sigma_{zo} \leq 40.00$	98.483	1.0170
C	$40.00 < \sigma_{zo}$	109.300	0.9115
	$0 < \sigma_{zo}$	61.141	1.0933
D	$0 < \sigma_{zo} \leq 12.09$	34.459	1.1498
	$12.09 < \sigma_{zo} \leq 32.09$	32.093	1.2336
	$32.09 < \sigma_{zo} \leq 65.12$	32.093	1.5527
	$65.12 < \sigma_{zo} \leq 134.90$	33.504	1.6533
	$134.90 < \sigma_{zo} \leq 251.20$	36.650	1.7671
	$251.20 < \sigma_{zo}$	44.053	1.9539
E	$0 < \sigma_{zo} \leq 3.534$	24.260	1.1953
	$3.534 < \sigma_{zo} \leq 8.698$	23.331	1.2202
	$8.698 < \sigma_{zo} \leq 21.628$	21.628	1.3217
	$21.628 < \sigma_{zo} \leq 33.489$	21.628	1.5854
	$33.489 < \sigma_{zo} \leq 49.767$	22.534	1.7497
	$49.767 < \sigma_{zo} \leq 79.070$	24.703	1.9791
	$79.070 < \sigma_{zo} \leq 109.300$	26.970	2.1407
	$109.300 < \sigma_{zo} \leq 141.860$	35.420	2.6585
	$141.860 < \sigma_{zo}$	47.618	3.3793
F	$0 < \sigma_{zo} \leq 4.093$	15.209	1.2261
	$4.093 < \sigma_{zo} \leq 10.930$	14.457	1.2754
	$10.930 < \sigma_{zo} \leq 13.953$	13.953	1.4606
	$13.953 < \sigma_{zo} \leq 21.627$	13.953	1.5816
	$21.627 < \sigma_{zo} \leq 26.976$	14.823	1.8348
	$26.976 < \sigma_{zo} \leq 40.000$	16.187	2.1510
	$40.000 < \sigma_{zo} \leq 54.890$	17.836	2.4092
	$54.890 < \sigma_{zo} \leq 68.840$	22.651	3.0599
	$68.840 < \sigma_{zo} \leq 83.250$	27.074	3.6448
	$83.250 < \sigma_{zo}$	34.219	4.6049

The point source building downwash model presented above is appropriate only for squat buildings (aluminum reduction plant potlines are always long squat buildings). The height of the plume centerline based on only the momentum plume rise, as suggested by Huber and Snyder (1976), is used to determine if building downwash effects are important. If the ratio of effective stack height to building height, A, is greater than 3, the plume is assumed not to downwash; otherwise,  $\sigma_z$  is enhanced. If A is less than 1.2,  $\sigma_y$  is enhanced as well. The maximum  $\sigma_y$  and  $\sigma_z$  enhancement is:

$$\sigma_{zo} \text{ (maximum)} = 0.80 H_B \quad (2-21)$$

$$\sigma_{yo} \text{ (maximum)} = 0.40 H_B \quad (2-22)$$

$$\text{at } A = H_e/H_B = 1.0.$$

For values of A between 1.0 and 3.0,  $\sigma_{zo}$  is linearly interpolated between  $0.80 H_B$  and zero;  $\sigma_{yo}$  is similarly interpolated between  $H_B$  and zero for values of A between 1.0 and 1.2 (personnel communication, Huber 1980). The initial dilution radius,  $R_{zo}$  (step 2) is also used in the plume rise calculations (see Section 3).

### 2.3.3 Decay Mechanism

The BLP model simulates pollutant decay mechanisms with a constant pollutant decay rate,  $\kappa$ . At any receptor i, the travel time from source, j, to the receptor,  $\tau_{ij}$ , is calculated assuming a constant transport wind  $(U_s)_j$ .

$$\tau_{ij} = \frac{x_{ij}}{(U_s)_j} \quad (2-23)$$

where  $x_{ij}$  is the downwind distance from source j to receptor i. The new source contribution,  $x'_{ij}$ , is:

$$x'_{ij} = (1 - \tau_{ij} \kappa) x_{ij} \quad (2-24)$$

where  $x'_{ij}$  is the source contribution predicted with the Gaussian equation assuming no decay. For example, if the decay rate is 10% per hour,

$$\kappa = \frac{0.10}{hr} \quad \frac{1}{3600 \text{ s/hr}} = 2.78 \times 10^{-5} \text{ s}^{-1}$$

if  $\tau_{ij} = 0.5 \text{ hr} = 1800 \text{ sec}$ ,

$$x'_{ij} = 0.95 x_{ij}.$$

The BLP model also allows the user to specify a constant background concentration which is not subject to decay.

#### 2.3.4 Terrain Correction

The effects of terrain elevation on the height of the plume centerline are calculated using stability-dependent plume path coefficients. Table 2-6 contains the default values for the plume path coefficients in the BLP model. For neutral and unstable conditions with the default plume path coefficients, the plume is lifted one-half of the difference between the elevation of the receptor and the elevation of the stack base, with the additional restriction that the plume always be at least half the height above the ground that it would be with no topography. With stable conditions, the default plume path coefficient is 0.3, indicating the plume is lifted only about one-third of the difference between receptor elevation and stack elevation and is restricted to be at least one-third the height above the ground that it would be with no topography. The plume path coefficients can be changed by the user, however, to simulate a constant elevation plume (as with the CRSTER model) by setting the plume path coefficients equal to zero.

TABLE 2-6  
DEFAULT VALUES FOR THE PLUME PATH COEFFICIENT

<u>PGT Stability Class</u>	<u>Plume Path Coefficient, T</u>
A	0.5
B	0.5
C	0.5
D	0.5
E	0.3
F	0.3

The terrain adjusted plume centerline height is calculated with Equations 2-25 to 2-26.

$$h_c = (1-T) (\text{minimum} \{ h_s + \Delta h, E_R - E_p \}) \quad (2-25)$$

$$H = H_o - h_c \quad (2-26)$$

where

$E_R$  is receptor elevation

$E_p$  is stack base elevation

$h_c$  is plume height correction factor

$\Delta h$  is plume rise

$H$  is terrain corrected effective stack height

$H_o$  is effective stack height above stack base elevation

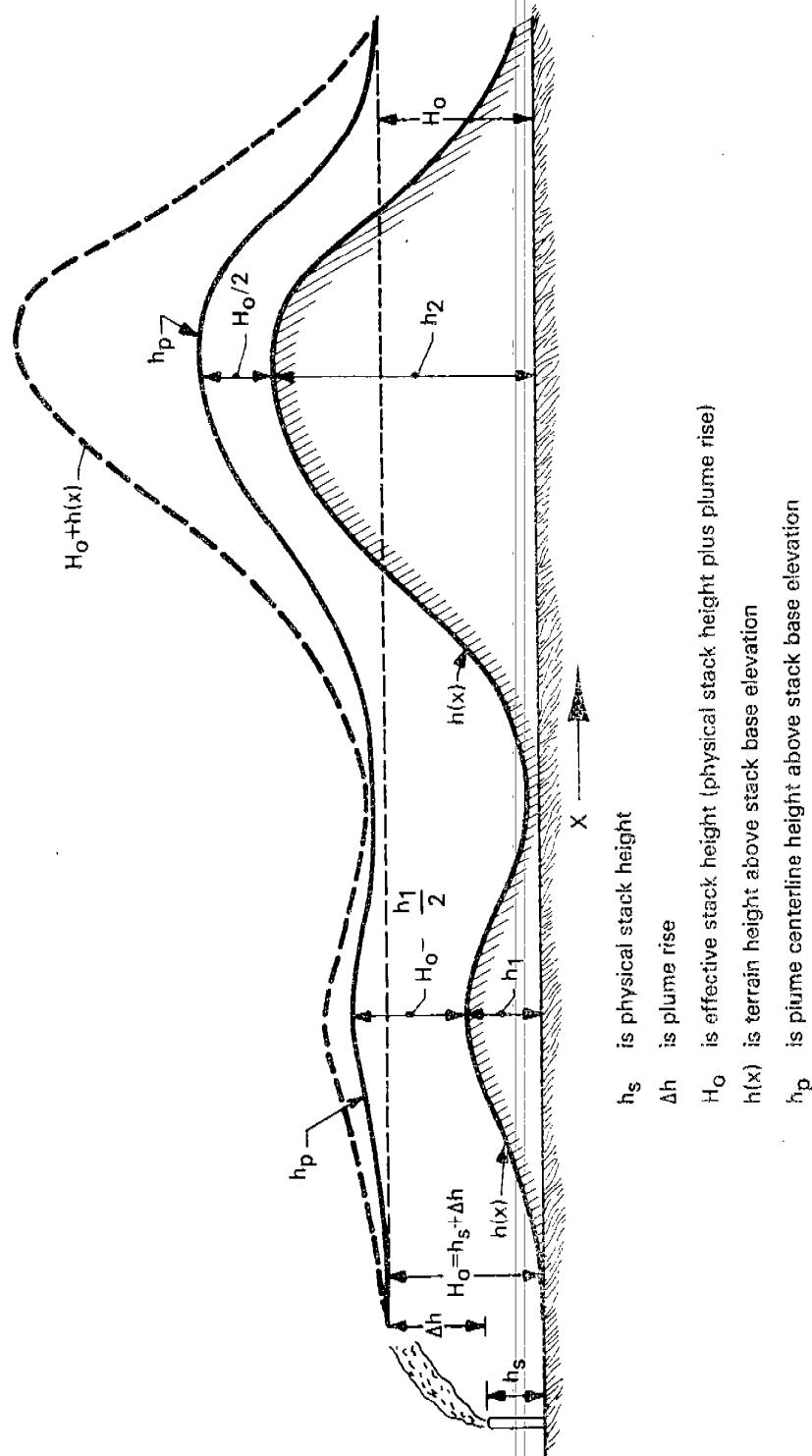
$T$  is plume path coefficient

The plume height adjustment is illustrated in Figure 2-4 for  $T = 0.5$ .

### 2.3.5 Plume Width Considerations

To eliminate unnecessary computations, the BLP model calculates concentrations only at downwind receptors within  $4\sigma_y$  of the plume centerline. Defining the plume edge to be  $4\sigma_y$  from the plume centerline allows virtually all of the source contributions to be evaluated. For a plume with a Gaussian distribution, the concentration at a crosswind distance  $4\sigma_y$  from the plume centerline is three hundredths of one percent (0.0003) of the centerline concentration. Figure 2-5 illustrates the plume width-receptor location considerations in calculating concentrations. Concentrations are calculated only for the receptors within the shaded area; the source contribution for any of the other receptors is assumed to be zero.

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- $h_s$  is physical stack height
- $\Delta h$  is plume rise
- $H_o$  is effective stack height (physical stack height plus plume rise)
- $h(x)$  is terrain height above stack base elevation
- $h_p$  is plume centerline height above stack base elevation

Figure 2-4 Terrain Plume Height Adjustment (for  $T = 0.5$ )

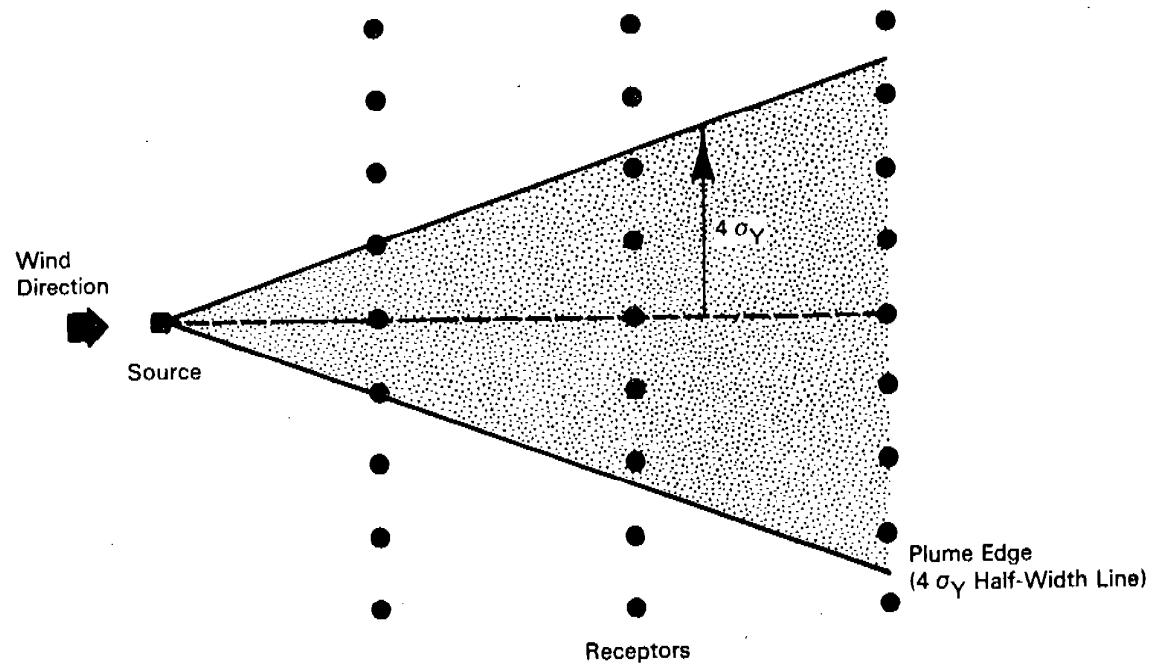


Figure 2-5 Point Source Plume Width - Receptor Location Considerations

### 2.3.6 Gaussian Plume Equation for Line Sources

To calculate concentrations due to line source emissions, the BLP model numerically integrates the Gaussian point source equation over the finite extent of the line.

The integral of the Gaussian plume equation can be written as:

$$X = \frac{(q_L)}{U} \int_0^L g dl \quad (2-27)$$

where

$q_L$  is emission rate per unit length of the line,  $g s^{-1} m^{-1}$   
 $L$  is line length,  $m$   
 $g$  is dispersion function,  $m^{-2}$

The dispersion function,  $g$ , consists of the lateral and vertical dispersion terms of the Gaussian point source equation (see Equation 2-2 to 2-8). For stable conditions, or if the mixing height is greater than 5,000 m,

$$g = \frac{1}{\pi \sigma_y \sigma_z} \exp \left[ \frac{-y^2}{2 \sigma_y^2} \right] \exp \left[ \frac{-H^2}{2 \sigma_z^2} \right] \quad (2-28)$$

For unstable or neutral conditions,

$$g = \frac{1}{\pi \sigma_y \sigma_z} \exp \left[ \frac{-y^2}{2 \sigma_y^2} \right] F_1 \quad (2-29)$$

(the function  $F_1$  is given in Equation 2-6),

unless the ratio  $\sigma_z/D$  is greater than 1.6,

$$g = \frac{1}{\sqrt{2\pi}\sigma_y D} \exp\left[\frac{-y^2}{2\sigma_y^2}\right] \quad (2-30)$$

The effective plume height is determined with the line source plume rise equation in Section 2.4.2.

Using the trapezoidal rule to approximate the integral in Equation 2-27, the equation becomes:

$$x = \frac{q_L \Delta l}{U} \left[ \frac{1}{2} (g_0 + g_N) + \sum_{i=1}^{N-1} g_i \right] \quad (2-31)$$

where

$N$  is number of points used to approximate the line

$\Delta l$  is  $L/N$

The number of points (or line segments) needed for Equation 2-31 to give a good estimate of the integral depends on atmospheric stability, line length, and the line segment-receptor distance. For each receptor, therefore, Equation 2-31 is initially solved with  $N = 3$  and then  $N = 5$ . The value of  $N$  increases with each iteration (see Table 2-7) until all of the following criteria are satisfied:

- 1) at least one point (line segment) is within one  $\sigma_y$  of the receptor;
- 2) at least two line segments contribute to the concentration at the receptor (i.e., two line segments are within  $4\sigma_y$  of the receptor);
- 3) two successive iterations yield  $x$  estimates which differ by less than a user's input convergence criterion (default value is 2%) OR the difference between two successive estimates is less than  $0.1 \mu\text{g}/\text{m}^3$ .

TABLE 2-7  
ITERATIVE INTEGRATION OF THE GAUSSIAN PLUME  
EQUATION FOR LINE SOURCES

<u>Number of Line Segments</u>	<u>Number of New Line Segments</u>	<u>Iteration</u>
3	-	1
5	2	2
9	4	3
17	8	4
33	16	5
65	32	6
129	64	7

A minimum of two iterations is always required, that is, the line will be divided into at least five points (line segments). The first criterion is not applied if the receptor is not directly downwind of the line source because the crosswind distance to the nearest part of the line may be greater than  $\sigma_y$ . The concentration at each receptor is obtained by breaking the line source into as many segments as is necessary to satisfy the criteria above. All receptors upwind of the line source, or outside the  $4\sigma_y$  plume width are assigned concentration contributions of zero. Receptors 1, 6, and 7 in Figure 2-6 are in this category. The concentration at Receptor 2, which is not directly downwind of any part of the line, but is within the line source plume, is determined by applying Equation 2-31 through as many iterations as is required to satisfy criteria 2 and 3. The first criterion is waived because the receptor is not directly downwind of the line source. The iteration procedure at Receptors 3, 4, and 5 must satisfy all the criteria.

All dispersion calculations are done in a "relative (RCS) coordinate system." The RCS X-axis is aligned parallel to the wind direction; the RCS Y-axis is perpendicular to the wind direction. This allows the downwind and crosswind distances needed in the Gaussian plume equation to be computed as a difference of two numbers. The RCS coordinates of each possible line segment (up to 129 segments per line), point source, and receptor are calculated once per simulated hour. Thus, even if the line source calculations require many iterations at each receptor, the predetermined line segments with the line segment-receptor geometry already calculated are utilized at each receptor. This allows the concentrations at many receptors to be calculated efficiently.

In some cases, seven iterations of the line source calculations may still be insufficient to allow convergence of the integral. This may be due to the following circumstances:

- a receptor is located very close to the line source or
- the line source is very long (such that  $L/128 \geq \sigma_y$  at the receptor).

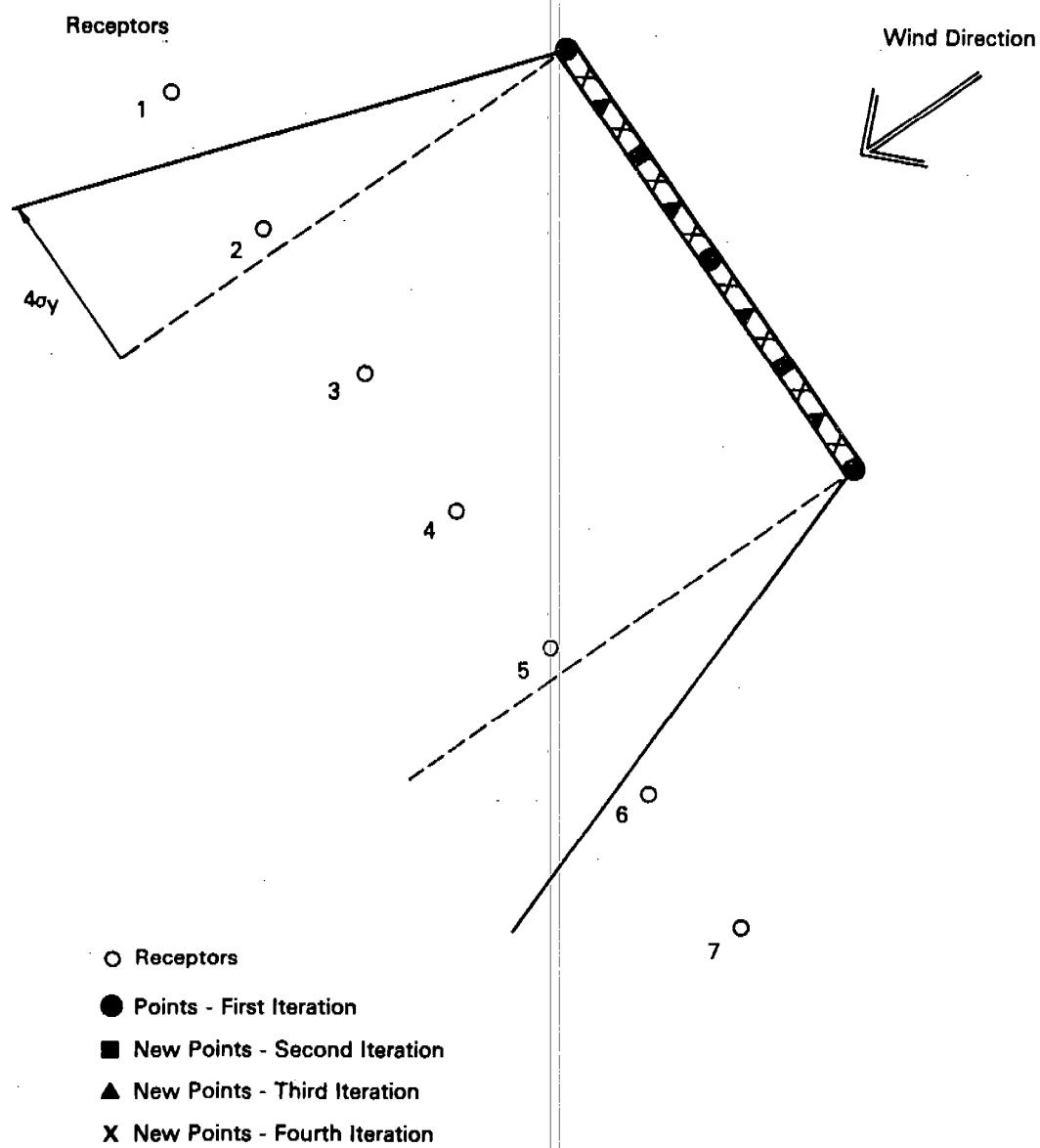


Figure 2-6 Line Source Plume Width - Receptor Location Considerations

The BLP model will continue to iterate a special high resolution algorithm until convergence is achieved or up to a user specified iteration maximum (default value = 14 iterations). With each iteration over seven, new line segments are generated, but only over the portion of the line source contributing to the concentration at the receptor of interest. If the iteration maximum is reached without convergence, execution will continue using the latest X value generated. Execution will terminate, however, if the iteration maximum is exceeded more than 100 times and an error message indicating this has occurred will be printed. It should be noted that under most conditions, the execution of this high resolution loop will not be required for proper convergence of the integral--only when a receptor is located very close to the line source (and  $\sigma_y$  values at the receptor are  $\leq \Delta x$ ) will it be necessary. Anyway, receptors should not be located within 100 meters of a source because the PGT dispersion curves are defined only for downwind distances greater than 100 meters.

#### 2.4 Plume Rise

Plume rise from tall, buoyant point sources has been extensively studied and is well represented by the equations of Briggs (1969, 1970, 1975). Plume rise from low-level sources, however, can be affected by vertical wind shear and downwash. These effects are generally not important for taller stacks and are not treated by the Briggs equations. The BLP model uses a set of plume rise equations developed to incorporate the effects of vertical wind shear and downwash on plume rise. These equations are consistent with and reduce to the Briggs point source plume rise equations when there is no vertical wind shear or downwash.

Observational studies of rows of point sources (e.g., Briggs 1974) and wind tunnel studies of line sources (Hoydysh et al. 1975, 1979) indicate that the plume rise from closely spaced point sources or line sources is substantially different than that from an isolated point source. Plumes from line sources tend to rise higher when the wind is aligned along the long axis of the line source than when the

wind is perpendicular to the line. Also, line source plumes exhibit dependencies on the buoyancy, mean wind speed, and distance different from those of a point source plume. Multiple rows of closely spaced line sources (the typical configuration of aluminum reduction plant line sources) can result in significant plume rise enhancement over that of an isolated line source plume. Roof-level line source releases, however, are susceptible to building downwash, which tends to reduce plume rise. Also, vertical wind shear is often important for these low-level sources. The plume rise relationships used in the study of tall, isolated point sources are not adequate to represent these complex low-level line sources.

A new set of line source plume rise equations has been developed for the BLP model. These equations incorporate the following important effects: multiple-line plume rise enhancement, plume rise wind direction dependence, vertical wind shear, and building downwash. In the limit as the line length approaches zero, the line source plume rise equations reduce to the point source equations; if wind shear and downwash effects are neglected, the line source plume rise equations will reduce to the Briggs point source plume rise equations.

#### 2.4.1 Point Source Plume Rise

Many of the point source emissions from complex industrial facilities, such as aluminum reduction plants, are released in the lowest layer of the atmosphere. These low-level plumes may be subjected to the effects of building downwash and vertical wind shear. Plume rise equations separately incorporating both these effects are presented in Section 2.4.1.1 and 2.4.1.2. Because both shear and downwash may be important in reducing plume rise, the BLP model will use the minimum of the shear plume rise and the downwash plume rise prediction if both the shear and downwash options are chosen.

## 2.4.1.1 Point Source Plume Rise with Vertical Wind Shear

The power law wind speed profile (Equation 2-1) can be rewritten in terms of a vertical coordinate system with the origin at stack top:

$$U_z = U_s \left[ (z' + z_s)/z_s \right]^p \quad (2-32)$$

where

$z_s$  is stack height  
 $z'$  is  $z - z_s$

The wind speed at stack height  $U_s$  can be determined from the measured wind speed with Equation 2-1. For short stacks, a good approximation of Equation 2-32 is:

$$U_s \approx U_s (z'/z_s)^p \quad (2-33)$$

Integrating the entrainment equation and conservation equations described by Briggs (1970) for a bent-over plume and using the approximate vertical wind speed equation, it is possible to arrive at the following analytic solution for the neutral and unstable plume rise,  $z'$ :

$$z' = \left\{ \frac{\epsilon^2}{2(3+p)} \left( \frac{F z_s^{3p}}{\beta^2 U_s^3} \right) \right\}^{1/\epsilon} (x')^{2/\epsilon} \quad (2-34)$$

$$\epsilon = 3 + 3p \quad (2-35)$$

$$F = \frac{g w d^2}{4} \frac{(T_s - T_a)}{T_s} \quad (2-36)$$

$$x' = \begin{cases} x & x \leq 3.5 x^* \\ 3.5 x^* & x > 3.5 x^* \end{cases} \quad (2-37)$$

$$x^* = \begin{cases} 14 F^{5/8} & F \leq 55 \text{ m}^4/\text{s}^3 \\ C_3 F^{2/5} & F > 55 \text{ m}^4/\text{s}^3 \end{cases} \quad (2-38)$$

where

- $C_3$  is a constant (default value 34.49)
- $\beta$  is entrainment parameter (0.6)
- $F$  is buoyancy flux ( $m^4/s^3$ )
- $g$  is acceleration due to gravity ( $9.8 m/s^2$ )
- $w$  is stack gas exit velocity ( $m/s$ )
- $T_a$  is ambient air temperature ( $^{\circ}K$ )
- $T_s$  is stack gas temperature ( $^{\circ}K$ )
- $d$  is stack inner diameter (m)

With  $P = 0$  (i.e., constant wind speed with height), the shear plume rise equation reduces to the Briggs expression:

$$Z'_B = \left( \frac{3F}{2\beta^2 U_s^3} \right)^{1/3} X^{2/3} \quad (2-39)$$

where  $Z'_B$  is the Briggs plume rise.

Because the approximate form of the power law wind speed profile equation becomes invalid for  $Z'/Z_s \lesssim 1$ , the following restriction must be imposed:

$$Z' = \text{minimum } \{ Z', Z'_B \} \quad (2-40)$$

For neutral and unstable conditions, terminal plume rise is reached at a downwind distance of  $3.5 X^*$  (Briggs 1970). The constant,  $C_3$ , in Equation 2-38 has a default value of 34.49 in the BLP model instead of 34.0 (which is assumed in some models) to allow a matching of the two equation for  $X^*$  at  $F = 55 m^4/s^3$ .

Transitional plume rise is an option in the BLP model; if desired, only final plume rise will be calculated.

For stable atmosphere conditions (PGT stability classes E and F), a similar analysis will yield the following plume rise equation for final rise with vertical wind shear:

$$Z'_{\text{final}} = \left\{ \frac{2(3+P)Z_s^P F}{\beta^2 U_s s} \right\}^{1/(3+P)} \quad (2-41)$$

$$s = \frac{g}{T_a} \frac{\partial \theta}{\partial Z}$$

where

$\frac{\partial \theta}{\partial Z}$  is the vertical potential temperature gradient ( $^{\circ}\text{K}/\text{m}$ ) and

s is a stability parameter.

If there is no vertical wind shear ( $P = 0$ ), Equation 2-41 reduces to the Briggs stable point source plume rise equation for final rise:

$$Z'_B \text{ (final)} = \left\{ \frac{6F}{\beta^2 U_s s} \right\}^{1/3} \quad (2-42)$$

Transitional plume rise (i.e.,  $Z' < Z'_{\text{final}}$ ) as defined by Equation 2-41 is calculated with Equation 2-34 for stable conditions.

#### 2.4.1.2 Point Source Plume Rise with Building Downwash

If an emission source is located in the vicinity of a building, the plume may experience greatly enhanced dispersion in the wake region of the building. The intense turbulence in the building wake region causes the enhanced dispersion and a rapid decrease in the buoyancy of the plume, which will decrease the rise of the plume. As pointed out by Huber and Snyder (1976), however, the turbulence rapidly decays downwind of the building; in the far wake, plume dispersion is determined by the background atmospheric turbulence. In the calculation of plume rise, the initially large entrainment of

ambient air into the plume can be represented with an initial "downwash" plume radius,  $R_o$ . Thus, the plume buoyancy is immediately decreased, but the subsequent entrainment rate is not modified.

The initial plume dilution is a function of the degree to which the plume downwashes. The downwash dilution radius,  $R_o$ , is assumed equal to  $R_{zo}$ , used in dispersion coefficient calculation (Equation 2-9 to 2-17). Once  $R_o$  is determined, the plume rise including downwash effects,  $Z'_D$ , is calculated by the following equation:

$$(Z'_D)^3 + \frac{3R_o}{\beta} (Z'_D)^2 + \frac{3R_o^2}{\beta^2} Z'_D = \frac{\frac{3F}{2} X'}{2\beta^2 U_s^3} \quad (2-43)$$

This cubic equation is relatively easy to solve for  $Z'_D$  by standard mathematical techniques (see subroutine CUBIC).

With stable atmospheric conditions, the maximum stable plume rise is given by:

$$(Z'_D)^3 + \frac{3R_o}{\beta} (Z'_D)^2 + \frac{3R_o^2}{\beta^2} Z'_D = \frac{6F}{\beta^2 U_s^3} \quad (2-44)$$

Transitional plume rise for stable conditions is calculated with Equation 2-43. Both Equations 2-43 and 2-44 reduce to the Briggs point source plume rise equations when the downwash radius,  $R_o$ , approaches zero.

If both the building downwash and vertical wind shear options have been requested in a BLP run, the plume rise used is the minimum of that given by the shear and downwash plume rise formulations. As

noted by Briggs (1970), the stable vertical plume formulation of Morton, Taylor, and Turner (Equation 2-45) is more appropriate than the bent-over plume rise equation with very light winds.

$$Z' \text{ (maximum)} = \frac{5 F^{1/4}}{s^{3/8}} \quad (2-45)$$

Equation 2-45 is used if it yields a lower plume rise estimate than Equation 2-44.

#### 2.4.2 Line Source Plume Rise

The plume from a buoyant line source can be expected to show different behavior than that from an isolated point source. The proximity of adjacent plume elements of a line source plume tends to block entrainment of ambient air. The initial buoyancy, however, is spread over the length of the line instead of being concentrated at one point. Also, the "effective" line length of a line source depends on the wind direction relative to the line, leading to a wind direction dependence of the plume rise. The line source emissions, such as those from aluminum reduction facility potrooms, may experience building downwash. Finally, multiple rows of closely spaced line sources tend to enhance the plume rise. These considerations indicate that a point source plume rise equation is not adequate to represent the plume rise behavior of a line source plume, especially for aluminum reduction facilities where all these factors are important.

##### 2.4.2.1 Line Source Plume Rise with Vertical Wind Shear

The plume rise of a rectangular plume from a finite line source of length L in a neutral atmosphere is:

$$Z' = \left( \frac{F'}{2 \beta L U_s^3} \right)^{1/2} X' \quad (2-46)$$

$$F' = \frac{g L W_m w (T_s - T_a)}{T_s} \quad (2-47)$$

where

$F'$  is the average line source buoyancy parameter ( $m^4/s^3$ )

$g$  is the acceleration of gravity ( $9.81 m/s^2$ )

$L$  is the line source length (m)

$W_m$  is the line source width (m)

$w$  is the exit velocity (m/s)

$T_s$  is the exit temperature ( $^{\circ}$ K)

$T_a$  is the ambient air temperature ( $^{\circ}$ K)

(Note: For multiple line sources of comparable buoyancy flux, the buoyancy parameter is calculated for each line source and then averaged to obtain  $F'$ .)

Equation 2-46 neglects horizontal entrainment of ambient air at the edges of the plume (i.e., the plume width remains to be  $L$ , but the plume's vertical dimension grows). The linear  $X$  dependence of the line (versus  $X^{2/3}$  for a point source) reflects the decreased ability of the plume to entrain ambient air.

Integrating the rectangular plume equation and analytically incorporating vertical wind speed variation with the approximate power law relationship, Equation 2-33, the following solution is obtained:

$$z' = \left\{ \left( \frac{\epsilon_L}{2} \right)^2 \left( \frac{F' z_s^{3P}}{(2+P) \beta L U_s^3} \right) \right\}^{1/\epsilon_L} X^{2/\epsilon_L} \quad (2-48)$$

where  $\epsilon_L$  is  $2 + 3P$ .

With  $P = 0$ , Equation 2-48 reduces to the line source plume rise without wind shear, Equation 2-44. It is assumed that the distance of final plume rise for PGT stability classes A through D can be obtained with the point source expressions, Equation 2-37 and 2-38, with  $F = F'/\pi$ .

In the BLP model, the effect of the wind speed variation with height on line source plume rise is estimated by using an "effective" wind speed,  $U_e$ , in the generalized line source plume rise equations in Section 2.4.2.2 rather than the stack height wind speed,  $U_s$ . (The equations in Section 2.4.2.2 include building downwash, plume rise enhancement, and wind direction dependencies, but do not implicitly incorporate wind shear effects. Wind shear effects which are included in Equation 2-48 are explicitly included in the generalized line source equations by using the "effective" wind speed (which is always greater than or equal to the stack height wind speed) in these equations.) The effective wind speed,  $U_e$ , is calculated by matching Equations 2-46 and 2-48 at the final rise distance,  $X_F$ . This matching procedure consists of (1) calculating  $Z'$  (shear) at  $X = X_F$  with Equation 2-48 and (2) solving Equation 2-46 for wind speed using  $Z' = Z'$  (shear) and  $X = X_F$ . This effective wind speed is then used in the generalized line source plume rise equations. Stack height wind speed, however, is used in the Gaussian dispersion equation.

For stable atmospheric conditions, the rectangular plume rise equation (without wind shear) is:

$$Z' = \left( \frac{F'}{\beta L U_s s} \right)^{1/2} \left\{ 1 - \cos \left( \frac{\sqrt{s} X}{U_s} \right) \right\}^{1/2} \quad (2-49)$$

Final rise is reached at a distance  $X = \frac{U_s \pi}{\sqrt{s}}$ ,

so the final plume rise is:

$$Z' (\text{final}) = \left( \frac{2 F'}{\beta L U_s s} \right)^{1/2} \quad (2-50)$$

The appropriate stable rectangular plume equation including vertical wind shear is:

$$z' \text{ (final)} = \left( \frac{(2+p) Z_s^p F'}{\beta L U_s} \right)^{\frac{1}{2+p}} \quad (2-51)$$

The effective wind speed is calculated by matching Equation 2-50 and 2-51 subject to the constraint  $U_e = \min(U_e, U_s)$ .

#### 2.4.2.2 Line Source Plume Rise with Downwash and Wind Direction Dependence

Although a linear distance dependence of plume rise from a buoyant line source is reasonable in the near field with perpendicular winds, it would be expected that the plume would eventually approach an  $x^{2/3}$  point source dependence as the plume height approaches and exceeds the line length. Figure 2-7 illustrates a rectangular (line source) plume with half-circular (entrained) edges. This edge entrainment is relatively unimportant in the near field, but grows in importance with distance (and plume height). Figure 2-8 illustrates the increasing importance of the entrained edges of the initially rectangular plume. In the near field, the plume height,  $Z'$ , is small, and because  $R = \beta Z' = 0.6 Z'$ , the half-circular plume edges compose a relatively small portion of the plume's cross-sectional area (see Figures 2-8a and b). With increasing distance, however,  $Z'$  and therefore  $R$  become larger; the ratio  $R/L$  increases (see Figure 2-8c, d, e) until eventually the plume cross section begins to look more and more circular. For a short line source or for winds parallel to the line source, the effective length of the line source is small. The ratio  $R/L$  may be large even in the near field (Figure 2-8d and e). It is apparent that as the line source length approaches zero, the plume cross section becomes circular (as with a point source). In fact, the line source plume can be visualized as being composed of circular cross-sectional plumes originating from an infinite number of point

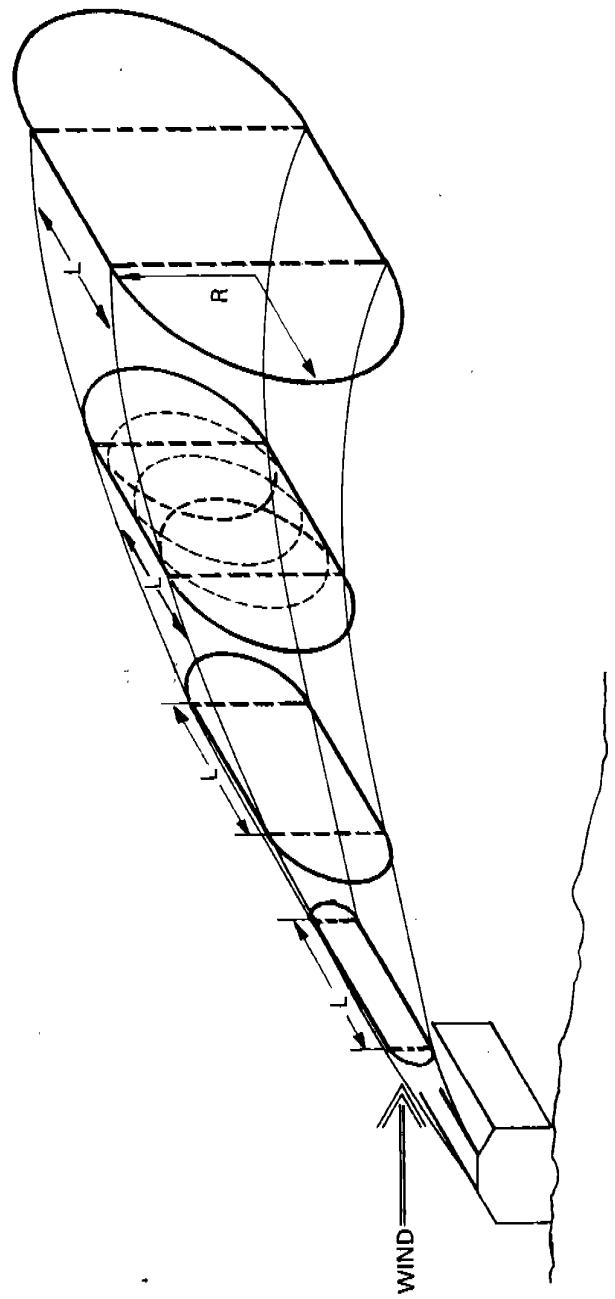


Figure 2-7      Rectangular (Line Source) Plume Rise Half-Circular  
(Entrained) Edges

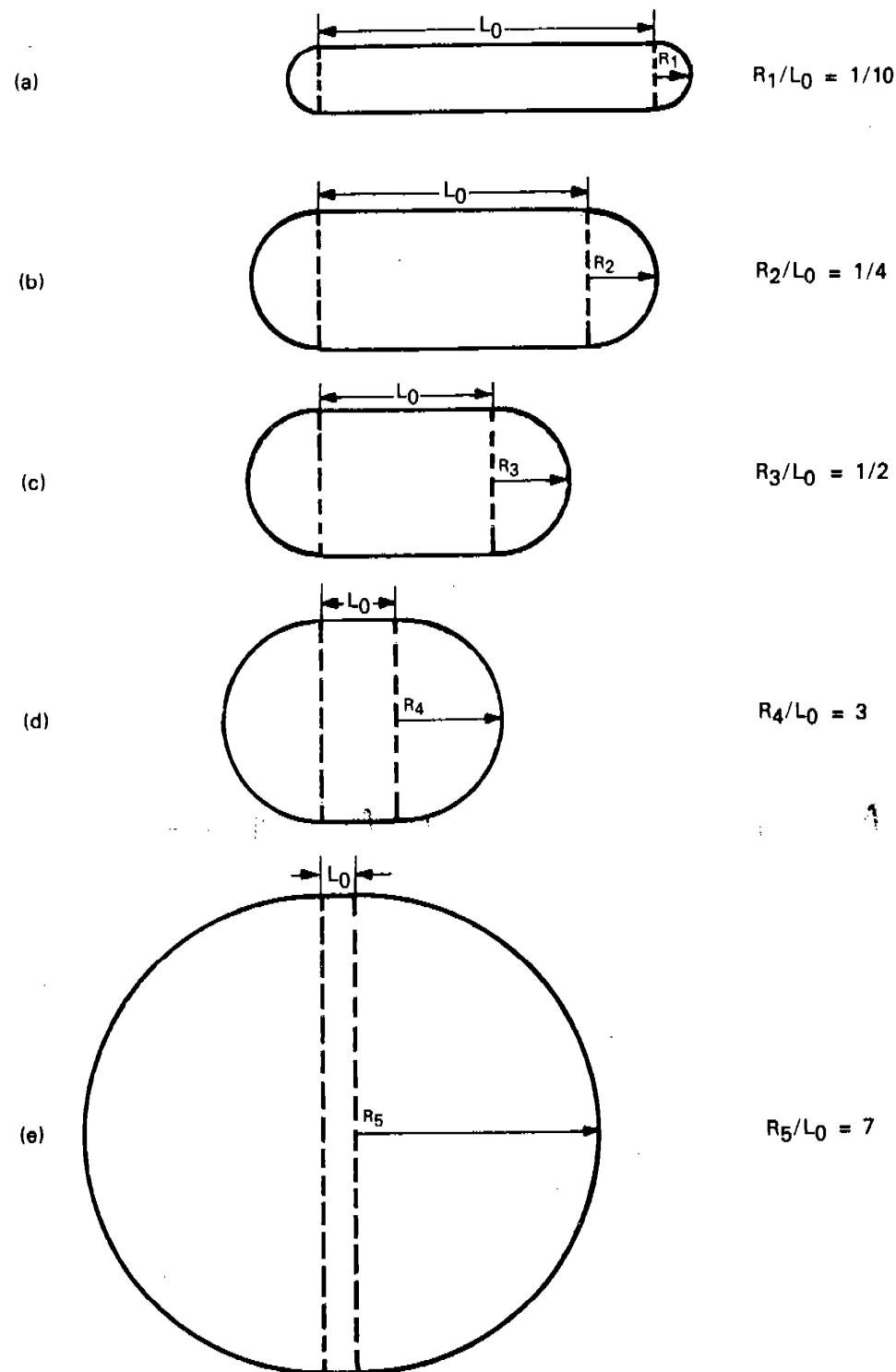


Figure 2-8 Cross Section of Line Source Plume at Various Distances Downwind

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sources along the length of the line source (see Figures 2-7 and 2-9). This formulation for the line source plume will result in the approach to the  $X^{2/3}$  dependency at large X. The solution of the neutral line source plume rise equation with entrainment at the edges of the plume is:

$$(z'_L)^3 + \frac{3L}{\pi\beta} (z'_L)^2 = \frac{3 F' X^2}{2 \pi \beta^2 U_e^3} \quad (2-52)$$

where  $z'_L$  is the line source plume rise and  $U_e$  is the effective wind speed (see Section 2.4.2.1). With  $L = 0$ , Equation 2-52 reduces to the Briggs point source equation. The line source buoyancy parameter,  $F'$ , divided by  $\pi$  is the point source buoyancy flux,  $F$ , defined by Equation 2-36. If the edge effects are neglected [ $(z'_L)^3 \approx 0$ ], the linear X dependence is obtained.

Designating the first term of Equation 2-52 as the point source term (because it is responsible for the  $X^{2/3}$  component of the equation) and the second term as the line source term (because it is responsible for the X component), it can be seen that the line source term initially dominates the equation, but gradually (depending on L, F', and  $U_e$ ) the point source term will become increasingly important.

Observational and wind tunnel studies indicate that the line source plume rise equation should contain a wind direction dependence. For winds aligned parallel to the long axis of a line source, consider the path of a plume element originating from the upwind end of the line source. As the plume element rises and travels along the length of the line, it merges with other buoyant elements. At the downwind edge of the line source, the input of buoyant plume elements stops. Figure 2-9 is a cross section of the plume at the downwind edge of the line source. The plume elements originating from the most upwind section of the line source have risen substantially more than the plume elements near the downwind edge of the line source. The integration of the Gaussian plume equation over the length of the line source consists of breaking the line source into a number of points or line segments; this approach allows different

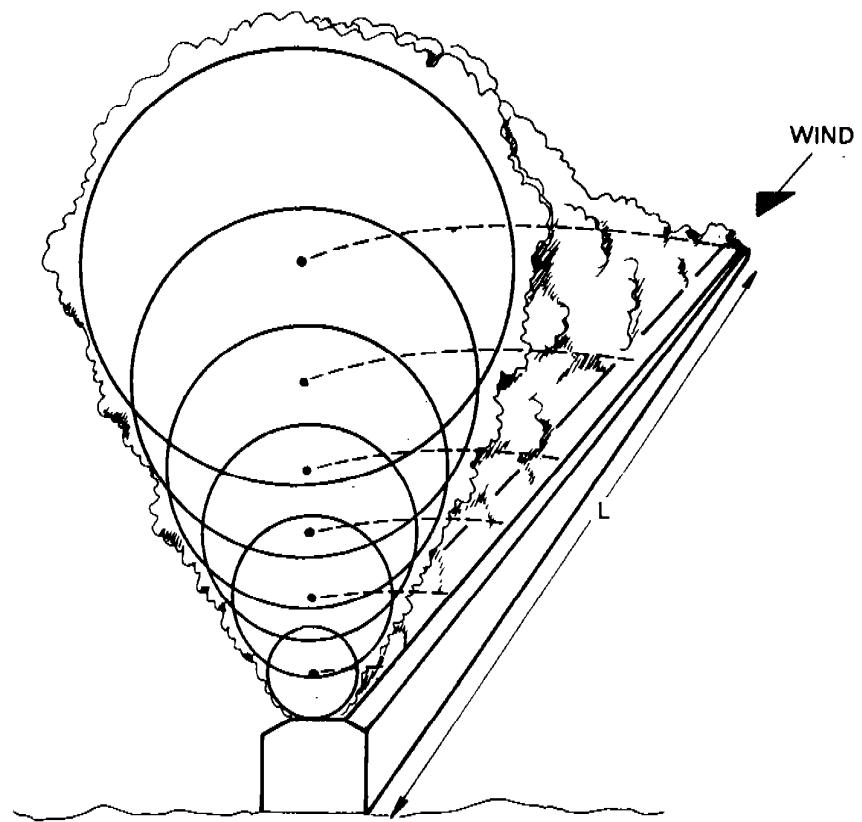


Figure 2-9 Cross Section of Line Source at  $X = X_{FB}$  with Parallel Winds

plume elements to have different effective stack heights. If a linear variation in  $F'$  along the line is assumed, the value of the buoyancy parameter at any downwind distance,  $X$ , is given by:

$$F'(X) = \begin{cases} F' - \frac{(X)}{X_{FB}} & X < X_{FB} \\ F' & X \geq X_{FB} \end{cases} \quad (2-53)$$

where  $X_{FB}$  is the distance of the release of the last buoyant plume element ( $X_{FB} = L$  for parallel winds and  $X_{FB} = 0$  for perpendicular winds), and  $F'$  is the buoyancy parameter for the entire line source, as given by Equation 2-47. Equation 2-52, now predicting the height of the plume element originating from the most upwind end of the line source, becomes:

$$\left( \frac{z'_L}{L} \right)^3 + \left( \frac{3L_e}{\pi\beta} \right) \left( \frac{z'_L}{L} \right)^2 = \begin{cases} \frac{F' X^3}{2\pi\beta^2 X_{FB} U_e^3} & X < X_{FB} \\ \frac{3 F'}{2\pi\beta^2 U_e^3} \left[ \frac{X_{FB}^2}{3} + X^2 - X_{FB} X \right] & X \geq X_{FB} \end{cases} \quad (2-54)$$

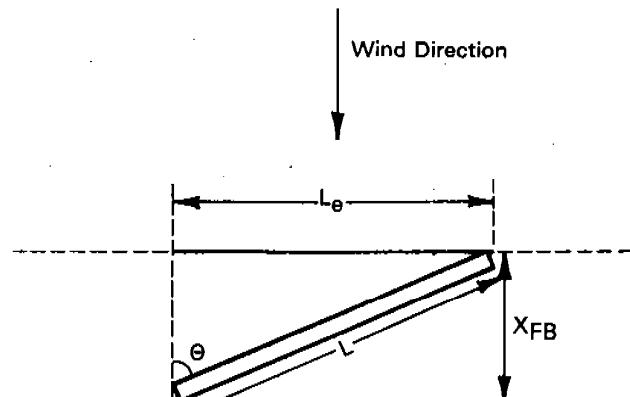
where the effective line length,  $L_e$ , replaces  $L$ .

For a single line source,

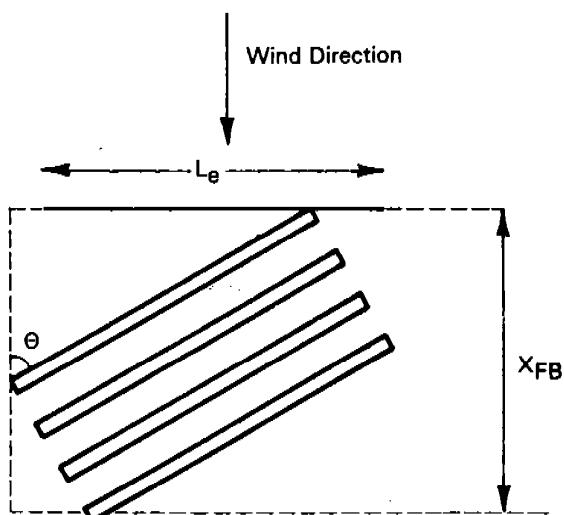
$$L_e = |L \sin\theta| + W_m |\cos\theta| \quad (2-55)$$

$$X_{FB} = |L \cos\theta| + W_m |\sin\theta| \quad (2-56)$$

where  $\theta$  is the angle between the line source and the wind direction (see Figure 2-10).



(a)



(b)

Figure 2-10 Calculation of the Effective Line Length,  $L_e$ , and the Downwind Distance of Full Buoyancy,  $X_{FB}$

In most cases, the width of the line source,  $W_m$ , is much less than the length of the line, so  $L_e \approx L \sin \theta$  and  $X_{FB} \approx L \cos \theta$ . For  $N$  line sources of equal length and separated by a distance of  $\delta X_m$ , the buoyancy parameter is the sum of the buoyancy parameters of the individual lines, and the equation for  $X_{FB}$  becomes:

$$X_{FB} = L \cos \theta + (N-1) \delta X_m \sin \theta \quad (2-57)$$

$$F'_T = \sum_{i=1}^N (F')_i \quad (2-58)$$

The effective line length for multiple line sources is a weighting of  $L_e$  for perpendicular winds (i.e.,  $L$ ) and  $L_v$  for parallel winds,  $L_v$ .

$$L_e = L \sin \theta + L_v \cos \theta \quad (2-59)$$

To calculate the effective line length for parallel winds,  $L_v$ , the following three step procedure is used.

- 1) Determine the height at which plumes from adjacent lines interact,  $Z_I$ . With  $R = \beta Z$ ,  $R$  must be equal to  $\delta X_m / 2$  for interaction, so  $Z_I = \delta X_m / (2\beta)$ .
- 2) Determine the downwind distance,  $X_I$ , at which the plumes interact (i.e.,  $X$  such that  $Z_L' = Z_I$ ), by solving Equation 2-54 for  $X$  with  $L_e = W_m$  and  $F_T =$  buoyancy parameter of one line. First assume  $X < X_{FB}$  and solve for  $X$ ; if this estimate of  $X$  is greater than  $X_{FB}$ , solve again for  $X$  assuming  $X \geq X_{FB}$ .
- 3) Calculate the effective line length,  $L_v$ , that will yield  $Z_L' = Z_I$  at  $X' = X_I$  with  $F_T$  equal to  $N$  times the buoyancy flux of one line, again using Equation 2-54.

The distance of final rise,  $X_F$ , for neutral and unstable conditions is calculated by Equations 2-37 and 2-38 with  $F = F_T'/\pi$ .

Building downwash effects can be incorporated in the line source plume rise equation using the same "downwash radius" approach used in the point source plume rise formulation. The line source emission of aluminum reduction facilities are roof-level releases with negligible momentum rise. The line source plume rise downwash radius,  $R_o$ , is determined from Equation 2-17 with  $A = 1.0$  to be:

$$R_o = R_{zo} = H_B \quad (2-60)$$

With an initial dilution plume radius, the line source plume rise equation becomes:

$$\left\{ \begin{array}{l} \left( Z'_L \right)^3 + \frac{3L_e}{\pi\beta} \left( Z'_L \right)^2 + \left( \frac{3R_o}{\beta} Z'_L + \frac{6R_o L_d}{\pi\beta^2} + \frac{3R_o^2}{\beta^2} \right) Z'_L = \\ \frac{F'_T x^3}{2\pi\beta^2 X_{FB} U_e^3} \quad X < X_{FB} \\ \frac{3 F'_T}{2\pi\beta^2 U_e^3} \left[ X_{FB}^2/3 + X^2 - X_{FB}X \right] \quad X \geq X_{FB} \end{array} \right. \quad (2-61)$$

where  $L_d$  is an effective downwash length. In the BLP model  $L_d$  is:

$$L_d = L_e \sin \theta \quad (2-62)$$

The third term in parentheses of Equation 2-61 containing  $R_o$  and  $L_d$  is the downwash term.

Equation 2-61 is a simple cubic equation that is solved in the BLP model by subroutine CUBIC. This line source plume rise expression reduces to the Briggs point source plume rise equation when the line length and downwash effects are negligible (i.e.,  $L_e$ ,  $L_d$ , and  $R_o$  approach zero).

For stable atmospheric conditions, final line source plume rise is calculated with the following equation.

$$\left( \frac{z'_L}{L_e} \right)^3 + \frac{3L_e}{\pi\beta} \left( \frac{z'_L}{L_e} \right)^2 + \left\{ \frac{3R_o}{\beta} z'_L + \frac{6R_o L_d}{\pi\beta^2} + \frac{3R_o^2}{\beta^2} \right\} z'_L = \frac{6 F' T}{\pi\beta^2 U_e s} \quad (2-63)$$

Transitional plume rise for stable conditions is calculated with Equation 2-61. The stable line source plume rise equations reduces to the Briggs stable plume rise equation for final rise when  $L_e$ ,  $L_d$ , and  $R_o$  approach zero.

To save the computation time required to solve the cubic line source plume rise equation many times, the BLP model calculates line source plume rise each simulated hour at six downwind distances:

$X_{FB}$ ,  $X_F$ , and four intermediate distances. The plume rise at distances other than these six distances are interpolated linearly. This allows the plume trajectory to be accurately approximated in a computationally efficient manner. As illustrated in Figure 2-9, the plume element originating from the most upwind end of the line source rises higher than plume elements released at other portions of the line. The plume rise equations in this section predict the height of the plume element originating from the most upwind part of the line source. To find the heights of other plume elements, the BLP model uses a linear interpolation scheme. The entire line source plume rise algorithm is summarized below with the aid of Figure 2-11.

- 1) Calculate the heights of the plume elements originating from the most upwind portion of the line source (line segment No. 1) at  $X_{FB}$ ,  $X_F$ , and four intermediate distances.
- 2) Find the height,  $z_X^1$ , of this plume element (plume element No. 1) at a downwind distance  $X_d$  by linear interpolation of the results of Step 1.

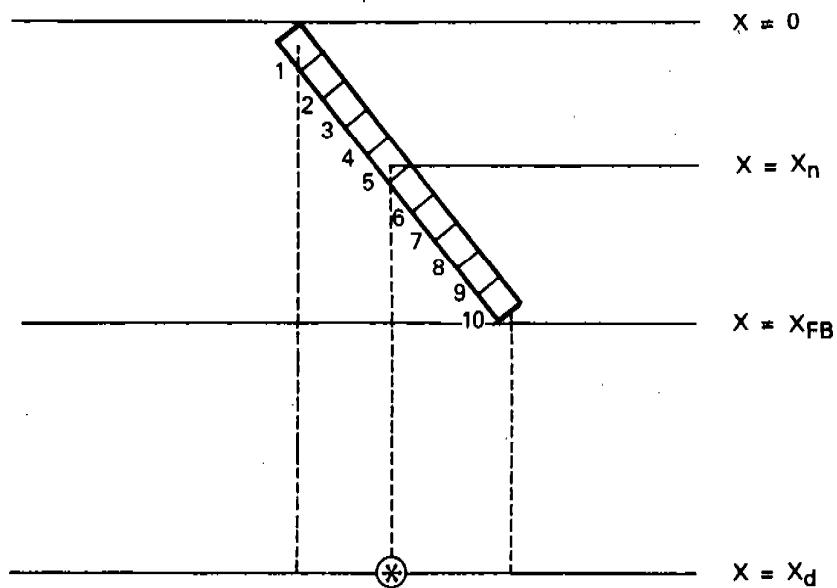


Figure 2-11 Calculation of Plume Rise of Individual Plume Elements of the Line Source Plume

- 3) Because the height of plume element No. 10 is zero at  $X_{FB}$ , the height,  $z_{X_{FB}}^n$ , of plume element No. n at  $X = X_{FB}$  can be obtained by interpolation:

$$z_{X_{FB}}^n = z_{X_{FB}}^1 \left[ 1 - \frac{X_n}{X_{FB}} \right]$$

- 4) The height,  $z_{X_d}^n$ , of plume element No. n at a downwind distance,  $X_d$ , is:

$$z_{X_d}^n = z_{X_{FB}}^n + \left[ z_{X_d}^1 - z_{X_{FB}}^1 \right]$$

## 2.5 BLP Postprocessing Capabilities (POSTBLP)

As indicated in the BLP modeling package flowchart, Figure 1-1, all analysis of the concentration output of the BLP model is done with the BLP postprocessing program, POSTBLP. The use of a separate program for averaging and analysis operations decreases the computer time and computer memory requirements of the BLP model. Because computer costs are associated with the amount of memory required as well as the computer time used, the use of a separate postprocessing program can be very cost effective.

The capabilities of the POSTBLP program are outlined in Table 2-8. The user has the option of analyzing total concentration data or the source contribution of any single line or point source (or any combination of line and point sources) that have been specified as source contribution sources in the original BLP run. The POSTBLP program will always generate tables of the top fifty 1-, 3-, and 24-hour average concentrations, five highest 1-, 3-, and 24-hour average concentrations at each receptor, and the average concentrations over the length of the BLP run for the concentration data (total or source contribution) selected by the user. The table of the top fifty 1-hour average concentrations include the wind speed, wind direction, stability class, and mixing height for those hours.

TABLE 2-8  
MAJOR FEATURES OF THE POSTBLP PROGRAM

- Total concentration or source contribution analysis.
- Monthly and annual frequency distributions for 1-, 3-, and 24-hour average concentrations.
- Tables of 1-, 3-, and 24-hour average concentrations at each receptor.
- Table of the annual (or length of the BLP run) average concentrations at each receptor.
- Five highest 1-, 3-, and 24-hour average concentrations at each receptor.
- Fifty highest 1-, 3-, and 24-hour average concentration over the receptor field.

Optional POSTBLP output consists of monthly and annual frequency distributions for 1-, 3-, and 24-hour average concentrations (total or source contribution) at a user-specified receptor. Also, tables of 1-, 3-, and 24-hour average concentrations at each receptor for any (or every) 24-hour period of the BLP run can be printed.

The BLP model results are stored on a magnetic tape or disk file which can be repeatedly accessed by the POSTBLP program. Multiple runs of the POSTBLP program can be made, first in only a screening mode to scan the concentration output data to determine the time periods and receptors with the highest predicted concentrations; the results at these time periods can be examined more closely with subsequent POSTBLP runs. Typically, the days with the highest total concentrations can be obtained with an initial POSTBLP screening run; the contributions of sources of interest for these days be generated with subsequent POSTBLP runs.

### 3. USERS INSTRUCTIONS

#### 3.1 BLP Users Instructions

A detailed description of all the card-image input requirements of the BLP model is contained in this section. Figure 3-1 is a flowchart of the main program of the BLP model. All BLP concentration output is written (unformatted) to Logical Unit 20. Unformatted CRSTER preprocessor program meteorological data, if used, is read from Logical Unit 2; otherwise, card-image user input meteorological data, along with all other card-image inputs, are read from Logical Unit 5. Printout of the data entered into the BLP program is obtained through Logical Unit 6. The card-image input deck setup is shown in Figure 3-2. Some of the cards need to be included only if certain options have been requested. A description of all the 12 types of card-image inputs with the default values provided for the program control parameters is presented below.

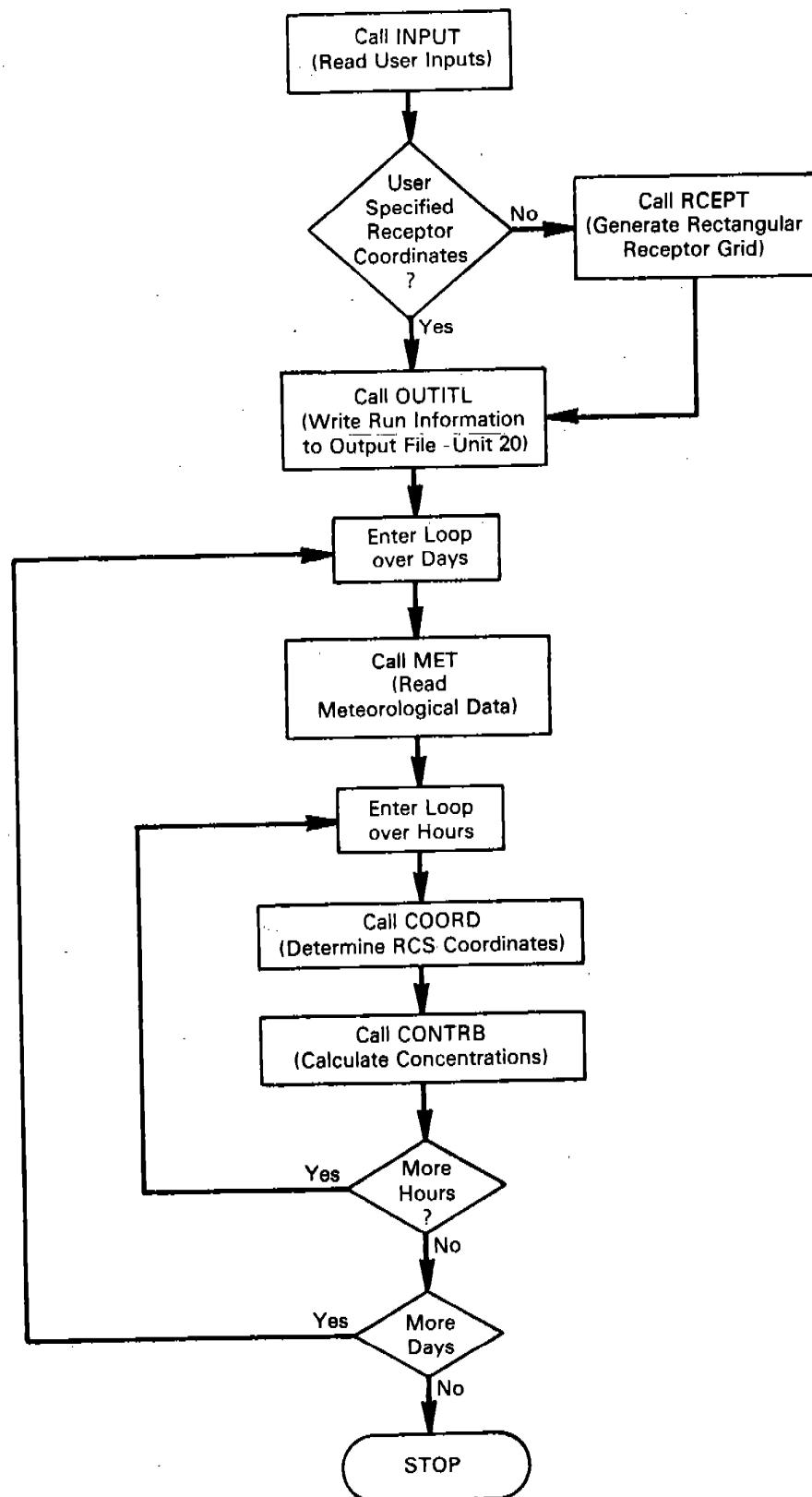


Figure 3-1 Flow Chart of the BLP Model Main Program

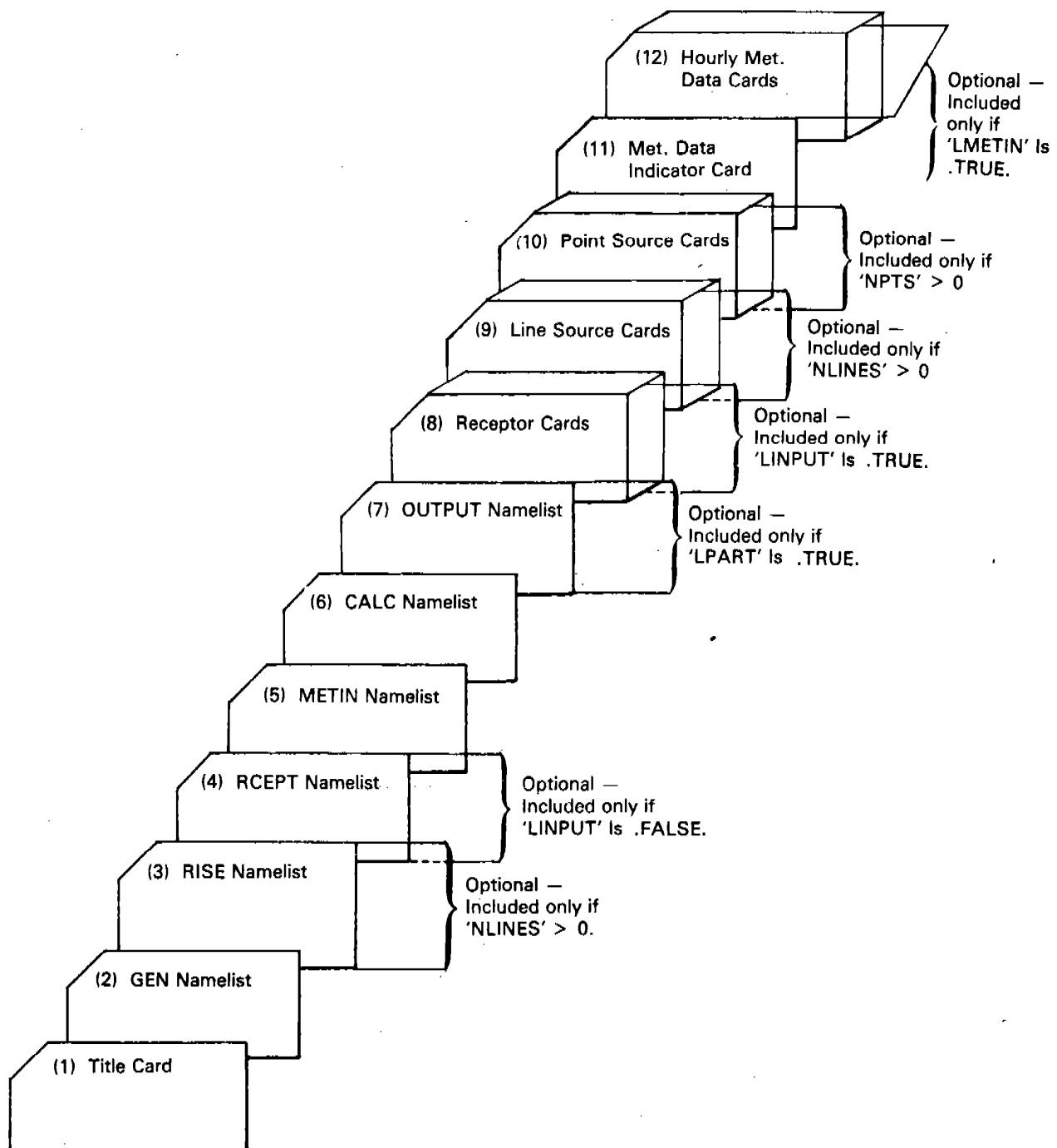


Figure 3-2 Input Deck Setup for BLP Dispersion Model

- 1) Title Card (up to 80 characters) (always included)

Namelist Inputs

- |                    |  |
|--------------------|--|
| 2) GEN Namelist    | (always included)                      |
| 3) RISE Namelist   | (included only if 'NLINES' > 0)        |
| 4) RCEPT Namelist  | (included only if 'LINPUT' is .FALSE.) |
| 5) METIN Namelist  | (always included)                      |
| 6) CALC Namelist   | (always included)                      |
| 7) OUTPUT Namelist | (included only if 'LPART' is .TRUE.)   |

Formatted Input

- |  |                                       |
|--|---------------------------------------|
| 8) One card for each receptor  | (included only if 'LINPUT' is .TRUE.) |
| 9) One card for each line source   | (included only if 'NLINES' > 0)       |
| 10) One card for each point source   | (included only if 'NPTS' > 0)         |
| 11) One card indicating the number<br>of hours of formatted meteoro-<br>logical data to follow | (included only if 'LMETIN' is .TRUE.) |
| 12) One card of formatted meteoro-<br>logical data for each hour                               | (included only if 'LMETIN' is .TRUE.) |

Title-Run Identification Card

<u>Columns</u>	<u>Format</u>	<u>Variable</u>	<u>Description</u>
1-80	20A4	TITLE	Any title or run identification information up to 80 characters in length.

Namelist--GEN

GEN assigns values to the number of sources and receptors and initializes control variables.

<u>Variable</u>	<u>Type</u>	<u>Description</u>	<u>Default</u>
NLINES	Integer	Number of line sources. 'NLINES' $\leq 10$ .	0
NPTS	Integer	Number of point sources. 'NPTS' $\leq 50$ .	0
NREC	Integer	Number of receptors (input only if 'LINPUT' is .TRUE., otherwise, 'NREC' is calculated by BLP. 'NREC' $\leq 100$ ).	0
LINPUT	Logical	Control variable for receptor input option. If 'LINPUT' is .TRUE., the user will input the X and Y coordinates and elevation of each receptor; if .FALSE., a rectangular receptor grid will be generated by BLP using user input boundary coordinates and X and Y spacings (see RCEPT Namelist).	.FALSE.
LUTMS	Logical	Control variable for the coordinate system used to input all source and receptor coordinates. If 'LUTMS' is .TRUE., all input coordinates are specified in UTM coordinates. If .FALSE., an internal, line source oriented (SCS) coordinate system is assumed.	.FALSE.
LPART	Logical	Control variable for the source contribution option. If 'LPART' is .TRUE., source contributions of user specified sources are included in the output file (see OUTPUT Namelist); otherwise, no source contributions are included.	.FALSE.
LDOWNW	Logical	Control variable for the point source building downwash option. If 'LDOWNW' is .TRUE., the effects of building downwash are evaluated. If .FALSE., point source building downwash effects are not computed.	.TRUE.
LSHEAR	Logical	Control variable for plume rise wind shear option. If 'LSHEAR' is .TRUE., wind shear is included in point and line source plume rise calculations, otherwise, wind shear is not included.	.TRUE.

<u>Variable</u>	<u>Type</u>	<u>Description</u>	<u>Default</u>
LTRANS	Logical	Control variable for the transitional point source plume rise option. If 'LTRANS' is .TRUE., transitional-point source plume rise is calculated, otherwise, only final point source plume rise is calculated.	.TRUE.
TCOR	Real	Line source orientation angle. 'TCOR' is the angle (in degrees) between the Y-axis of the UTM coordinate system and the X-axis of the SCS coordinate system - see Figure 2-2 (input only if 'LUTMS' is .FALSE., otherwise, 'TCOR' is calculated by BLP). $0^\circ \leq \text{TCOR} < 180^\circ$ .	90.0

Namelist--RISE

This namelist is included only if 'NLINES' >0 (see GEN Namelist). RISE assigns values to the parameters used in the buoyant line source plume rise calculations.

<u>Variable</u>	<u>Type</u>	<u>Description</u>	<u>Default*</u>
L	Real	Average Building Length (m).	-
HB	Real	Average Building Height (m) (see Figure 2-1).	-
WB	Real	Average Building Width (m) (see Figure 2-1).	-
WM	Real	Average Line Source Width (m) (see Figure 2-1).	-
DX	Real	Average Building Separation (m) (see Figure 2-1).	-
FPRIME	Real	Average Buoyancy Parameter ( $m^4/s^3$ ) (see Equation 2-47).	-

\*A dash indicates that no default value is provided.

Name list--RCEPT

This namelist is included only if 'LINPUT' is .FALSE. (See GEN Namelist). RCEPT defines the rectangular receptor grid to be generated by BLP (see Figure 2-3).

<u>Variable</u>	<u>Type</u>	<u>Description</u>	<u>Default</u>
RXBEG	Real	X-coordinate of lower left corner of receptor grid.	0.0
RYBEG	Real	Y-coordinate of lower left corner of receptor grid.	0.0
RXEND	Real	X-coordinate of upper right corner of receptor grid.	0.0
RYEND	Real	Y-coordinate of upper right corner of receptor grid.	0.0
RDX	Real	Incremental X-spacing of receptors.	0.0
RDY	Real	Incremental Y-spacing of receptors.	0.0

Namelist--METIN

METIN initializes meteorological parameters and assigns values to the array which determines which days are to be modeled.

<u>Variable</u>	<u>Type</u>	<u>Description</u>	<u>Default*</u>
LMETIN	Logical	Meteorological input data control variable. If 'LMETIN' is .TRUE., up to 24 hours of card-image formatted meteorological data is read; if .FALSE., up to 366 days of CRSTER meteorological preprocessor output is read.	.FALSE.
LMETOT	Logical	Meteorological output control parameter-used only if 'LMETIN' is .FALSE. If 'LMETOT' is .TRUE., the hourly meteorology is printed for each day the model is run; if .FALSE., hourly meteorology is not printed. (Note: If 'LMETIN' is .TRUE., hourly meteorology is always printed.)	.FALSE.
IDSURF	Integer	NWS surface station number-used only if 'LMETIN' is .FALSE. 'IDSURF' must be the same as the surface station number input to the CRSTER preprocessor.	-
IYSURF	Integer	Year of record for the surface meteorological data-used only if 'LMETIN' is .FALSE. 'IYSURF' must be the same as the year of the surface data input to the CRSTER preprocessor.	-
IDUPER	Integer	NWS upper air station number-used only if 'LMETIN' is .FALSE. 'IDUPER' must be the same as the upper air station number input to the CRSTER preprocessor.	-
IYUPER	Integer	Year of record for the upper air meteorological data-used only if 'LMETIN' is .FALSE. 'IYUPER' must be the same as the year of the upper air (mixing height) data input to the CRSTER preprocessor.	-
ZMEAS	Real	Measurement height of mean wind speed (m).	7.0
DTHTA(2)	Real Array	Vertical potential temperature gradient for PGT stability classes E and F (Deg. K/m).	0.020, 0.035

<u>Variable</u>	<u>Type</u>	<u>Description</u>	<u>Default*</u>
PEXP (6)	Real Array	Vertical wind speed power law profile exponents for PGT stabilities A-F.	0.10, 0.15, 0.20, 0.25, 0.30, 0.30
IDEELS	Integer	Maximum variation in the number of stability classes per hour (used only if 'LMETIN' is .FALSE.). (Note: the CRSTER meteorological preprocessor already may have restricted stability class variations to 1 class/hour.)	5
IRU	Integer	Rural/urban mixing height selector (used only if 'LMETIN' is .FALSE.). 'IRU' is 1 for rural mixing heights and 'IRU' is 2 for urban mixing heights.	1
IDAYS(366)	Integer Array	Array of 366 elements with each element corresponding to a Julian day of the year (used only if 'LMETIN' is .FALSE.). A '1' in element N indicates that Julian day N is to be modeled. A '0' in element N indicates that Julian day N is <u>not</u> to be modeled.	366*0

\*A dash indicates that no default is provided.

Namelist--CALC

CALC initializes certain computational, terrain adjustment, decay, and background concentration parameters.

<u>Variable</u>	<u>Type</u>	<u>Description</u>	<u>Default</u>
TERAN (6)	Real Array	Plume path coefficients for PGT stabilities A-F.	0.5, 0.5, 0.5, 0.5 0.3, 0.3
DECFACT	Real	Pollutant decay rate ( $s^{-1}$ )	0.0
XBACKG	Real	Background concentration ( $\mu g/m^3$ )	0.0
CONST2	Real	Constant in Briggs stable point source plume rise equation of the form $\Delta h = CONST2*(F/(U*S))^{1/3}$ . (Used only if 'LSHEAR' is .FALSE.)	2.6
CONST3	Real	Constant in Briggs neutral final plume rise distance equation of the form $X_{(final)} = CONST3*3.5*F^{0.4}$ , where $F > 55$ . $m^{0.4}/s^{0.3}$ .	34.49
CRIT	Real	Convergence criterion for the line source calculations.	0.02
MAXIT	Integer	Maximum number of iterations allowed in the line source calculations.	14

Namelist--OUTPUT

This namelist is included only if 'LPART' is .TRUE. (See GEN Namelist). OUTPUT defines which sources are to have source contributions included in the output file.

<u>Variable</u>	<u>Type</u>	<u>Description</u>	<u>Default</u>
IPCL (11)	Integer Array	Array of 11 elements with each of the first 10 elements corresponding to a line source. For $N \leq 10$ , a '1' in element N signifies that the source contribution of line source N is to be written in the output file; A '0' signifies that the source contribution of line source N is <u>not</u> to be written in the output file. The value of element 11 has the same meaning applied to the sum of the source contributions of lines 1 to 'NLINES'.	11*0
IPCP (51)	Integer Array	Array of 51 elements with each of the first 50 elements corresponding to a point source. for $N \leq 50$ , a '1' in element N signifies that the source contribution of point source N is to be written in the output file; a '0' signifies that the source contribution of point source N is <u>not</u> to be written in the output file. The value of element 51 has the same meaning applied to the sum of the source contributions of points 1 to 'NPTS'.	51*0

The following formatted input follow the Namelist inputs described above.

Receptor Information (included only if 'LINPUT' is .TRUE.). One card must be included for each receptor.

<u>Columns</u>	<u>Format</u>	<u>Variable</u>	<u>Description</u>
1-10	F10.1	XRSCS	X-coordinate of receptor (m).
11-20	F10.1	YRSCS	Y-coordinate of receptor (m).
21-30	F10.1	RELEV	Receptor elevation (m).

Line Source Information-used in dispersion calculations (included only if 'NLINES' > 0). One card must be included for each line source.

<u>Columns</u>	<u>Format</u>	<u>Variable</u>	<u>Description</u>
1-10	F10.1	XLBEG	X-coordinate of beginning of line source (m).
11-20	F10.1	YLBEG	Y-coordinate of beginning of line source (m).
21-30	F10.1	XLEND	X-coordinate of end of line source (m).
31-40	F10.1	YLEND	Y-coordinate of end of line source (m).
41-50	F10.4	HS	Release height of line source (m).
51-60	F10.4	QT	Pollutant emission rate of line source (g/s).
61-70	F10.1	LELEV	Line source base elevation (m).

Point Source Information (including only if 'NPTS' > 0). One card must be included for each point source.

<u>Columns</u>	<u>Format</u>	<u>Variable</u>	<u>Description</u>
1-10	F10.1	XCOORD	X-coordinate of point source (m).
11-20	F10.1	YCOORD	Y-coordinate of point source (m).
21-30	F10.4	PHS	Stack height of point source (m).
31-40	F10.4	PQ	Pollutant emission rate of point source (g/s).
41-50	F10.4	D	Inner stack diameter (m).
51-60	F10.4	W	Exit velocity (m/s).
61-70	F10.4	TSTACK	Stack exit temperature ( $^{\circ}$ K).
71-80	F10.1	PELEV	Point source base elevation (m).

Formatted Meteorological Input Data (included only if 'LMETIN' is .TRUE.) The formatted meteorological input data consists of one card indicating the number of hours of meteorological data followed by one card for each hour (up to 24 hours).

<u>Columns</u>	<u>Format</u>	<u>Variable</u>	<u>Description</u>
1-2	I2	IHRMAX	Number of hours of formatted meteorological data to follow.

One card with the following format for each of the 'IHRMAX' hours of formatted meteorological data must be included.

<u>Columns</u>	<u>Format</u>	<u>Variable</u>	<u>Description</u>
1	I1	KST	PGT stability class
11-20	F10.2	SPEED	Mean wind speed (m/s)
21-30	F10.2	RANDWD	Wind direction in degrees
31-40	F10.2	TEMP	Ambient air temperature (°K)
41-50	F10.2	HMX	Mixing height (m)

### 3.2 POSTBLP User's Instructions

The POSTBLP program is used to process all the BLP concentration output. POSTBLP reads the unformatted BLP output from Logical Unit 20. All POSTBLP output is routed to the line printer (Logical Unit 6). All POSTBLP inputs are specified in Namelist OPTS, which is the only card-image input required by the program. The card-image input is read from Logical Unit 5. A detailed description of Namelist OPTS inputs follows.

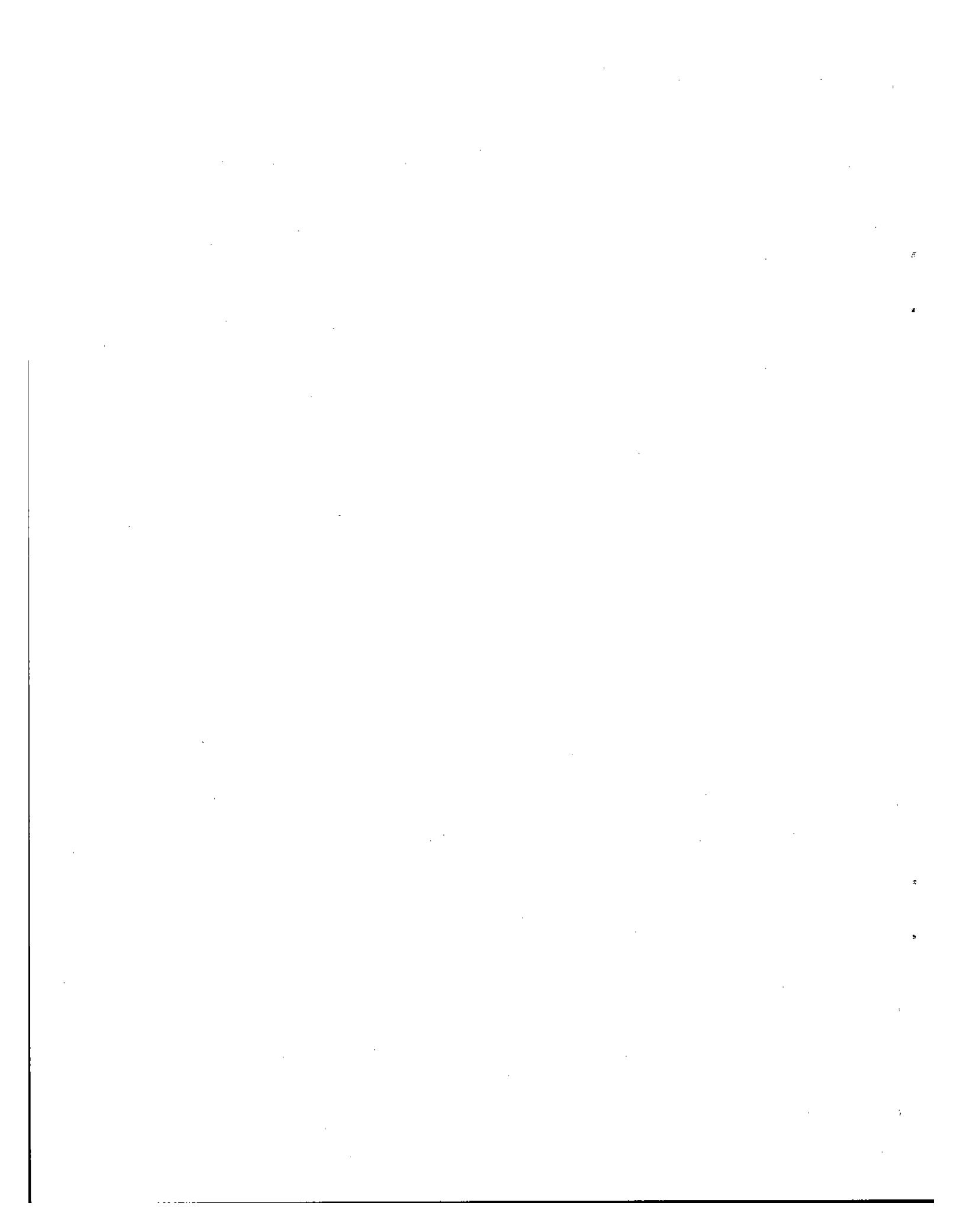
Namelist--OPTS

<u>Variable</u>	<u>Type</u>	<u>Description</u>	<u>Default</u>
IJCODE	INTEGER	Coded integer specifying the concentration output (source contribution or summed concentrations) to be processed in this run (not used if 'LSUM' is .TRUE.)	.999
		If 'IJCODE' is 1 to 10, the concentration output to be processed is the source contribution of line number 'IJCODE'. If 'IJCODE' is 11, the concentration output is the source contribution of the sum of all the line sources. If 'IJCODE' is 101 to 150, the concentration output is the source contribution of point source 'IJCODE'. If 'IJCODE' is 151, the concentration input is the source contribution of the sum of all the point sources. If 'IJCODE' is 999, the concentration output is the total concentration resulting from the sum of all the line and point sources.	
LECH1	Logical	Control variable for output of 1-hour average concentrations. If 'LECH1' is .TRUE., the 1-hour average concentration at each receptor is printed for each day with '1' indicated in the corresponding element of the 'IECHO' array; if .FALSE., no 1-hour average concentrations are printed.	.FALSE.
LECH3	Logical	Control variable for output of 3-hour average concentrations. If 'LECH1' is .TRUE., the 3-hour average concentration at each receptor is printed for each day with '1' indicated in the corresponding element of the 'IECHO' array; if .FALSE., no 3-hour average concentrations are printed.	.FALSE.
LECH24	Logical	Control variable for output of 24-hour average concentrations. If 'LECH24' is .TRUE., the 24-hour average concentration at each receptor is printed for	.FALSE.

<u>Variable</u>	<u>Type</u>	<u>Description</u>	<u>Default</u>
		each day with a '1' indicated in the corresponding element of the 'IECHO' array, if .FALSE., no 24-hour average concentrations are printed.	
IECHO(366)	Integer	Array of 366 elements with each element corresponding to a Julian day (used only if 'LECH1', or 'LECH3', or 'LECH24' is .TRUE.). IECHO controls output of the 1-, 3-, and 24-hour average concentrations. The concentrations at each receptor will be printed for each Julian day with a '1' in the corresponding element or the 'IECHO' array. For each day with a '0' in the corresponding element, no concentrations will be printed.	366*0
LFRQ1	Logical	Control variable for 1-hour average concentration frequency distributions. If 'LFRQ1' is .TRUE., a frequency distribution of 1-hour averaged concentrations at receptor 'IRECEP' with concentration intervals specified in the 'XINT' array will be produced; otherwise, no distribution will be produced.	.FALSE.
XINT (25)	Real Array	Array containing the concentration intervals used in the 1-hour averaged concentration frequency distribution (used only if 'LFRQ1' is .TRUE.).	25*0.0
NINT	Integer	Number of concentration intervals specified in the 'XINT' array (used only if 'LFRQ1' is .TRUE.). NINT<25.	0
LFRQ3	Logical	Control variable for 3-hour averaged concentration frequency distributions. If 'LFRQ3' is .TRUE., a frequency distribution of 3-hour average concentration at receptor 'IRECEP' with concentration intervals specified in the 'XINT3' array will be produced; otherwise, no distribution will be printed.	.FALSE.
XINT3(25)	Real Array	Array containing the concentration intervals used in the 3-hour averaged concentration frequency distribution (used only if 'LFRQ3' is .TRUE.).	25*0.0

<u>Variable</u>	<u>Type</u>	<u>Description</u>	<u>Default</u>
NINT3	Integer	Number of concentration intervals specified in the 'XINT3' array (used only if 'LFRQ3' is .TRUE.). NINT3 $\leq$ 25.	0
LFRQ24	Logical	Control variable for 24-hour averaged concentration frequency distributions. If 'LFRQ24' is .TRUE., a frequency distribution of 24-hour averaged concentrations at receptor 'IRECEP' with concentration intervals specified in the 'XINT24' array will be produced; otherwise, no distribution will be produced.	.FALSE.
XINT24(25)	Real	Array containing the concentrations intervals used in the 24-hour averaged concentration frequency distribution (used only if 'LFRQ24' is .TRUE.).	25*0.0
NINT24	Integer	Number of concentration intervals specified in the 'XINT24' array (used only if 'LFRQ24' is .TRUE.). NINT24 $\leq$ 25.	0

<u>Variable</u>	<u>Type</u>	<u>Description</u>	<u>Default</u>
IRECEP	Integer	Number of the receptor used in the frequency distribution calculations (used only if LFRQ1, LFRQ3, or LFRQ34 is .TRUE.).	1
LSUM	Logical	Control variable for source contribution summing option. If 'LSUM' is .TRUE., the source contributions of the sources specified in the array 'ISCODE' are summed; if .FALSE., no source contributions are summed.	.FALSE.
ISCODE(62)	Integer Array	Array containing up to 62 coded integers specifying the source concentrations to be summed (used only if 'LSUM' is .TRUE.). Also see description of 'IJCODE'.	62*0
NSUM	Integer	Number of source contributions specified in 'ISCODE' to be summed (used only if 'LSUM' is .TRUE.). <u>'NSUM'≤62.</u>	0



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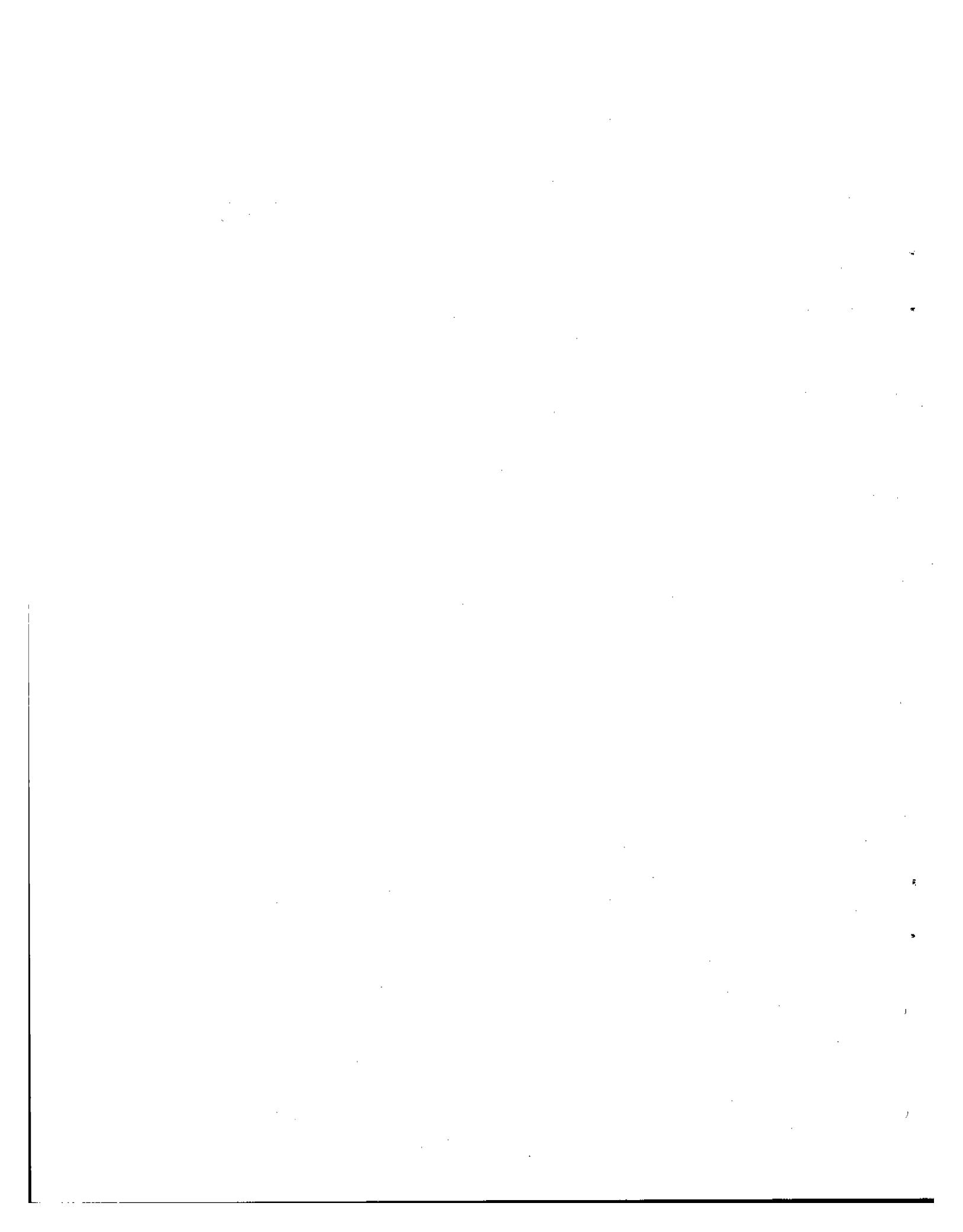
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**APPENDIX A**  
**FORTRAN SOURCE LISTING OF BLP**



```

C          00000010
C***** 00000020
C          00000030
C          00000040
C          00000050
C          00000060
C          00000070
C          00000080
C          00000090
C          00000100
C          00000110
C          00000120
C          00000130
C          00000140
C          00000150
C          00000160
C          00000170
C          00000180
C          00000190
C          00000200
C          00000210
C          00000220
C          00000230
C          00000240
C          00000250
C          00000260
C          00000270
C          00000280
C          00000290
C          00000300
C          00000310
C          00000320
C          00000330
C          00000340
C          00000350
C          00000360
C          00000370
C          00000380
C          00000390
C          00000400
C          00000410
C          00000420
C          00000430
C          00000440
C          00000450
C          00000460
C          00000470
C          00000480
C          00000490
C          00000500
C          00000510
C          00000520
C          00000530
C          00000540
C          00000550
C          00000560
C          00000570
C          00000580
C          00000590
C          00000600
C          00000610
C          00000620
C          00000630
C
C***** 00000000
C
C      RLP -- MULTIPLE BUOYANT LINE AND POINT SOURCE
C      DISPERSION MODEL
C
C      RLP    VERSION 1.1    LEVEL 800702      MAIN
C
C      DEVELOPED BY:
C
C      JOE SCIRE AND LLOYD SCHULMAN
C      ENVIRONMENTAL RESEARCH AND TECHNOLOGY
C      696 VIRGINIA ROAD
C      CONCORD, MASSACHUSETTS 01742
C
C***** 00000000
C
C      REAL TITLE(20)
C      REAL L,LEFF,L0,LELEV
C      INTEGER*2 IDAYS
C      LOGICAL RTNPUT,LSHEAR,RDOWNW
C      LOGICAL LMFTIN,LMETOT,LTRANS
C      COMMON/SOURCE/NLINES,XLBEG(10),XLEND(10),DEL(10),YSCS(10),OT(10),
C      1 HS(10),XRCS(10,129),YRCS(10,129),TCOR,LELEV(10),
C      2 NPTS,XPSCS(50),YPSCS(50),PD(50),PHS(50),XPXCS(50),YPXCS(50),
C      3 TSTACK(50),APTS(50),RPTS(50),VEXIT(50),PFLEV(50),TDOWNW(50)
C      COMMON/RCEPT/RXREG,RYBEG,RXFND,RYEND,RDX,RDY,XRSCS(100),
C      1 YRSCS(100),XRRCS(100),YRRCS(100),RFLEV(100),NRFC
C      COMMON/PR/L,HR,AB,WM,FPRIME,FP,XMATCH,DY,AFACT,TWTHR,N,LSHEAR,
C      1 LTRANS
C      COMMON/PRLS/XFR,LFFF,L0,R0,XFINAL,XFS
C      COMMON/RINTP/XDIST(7),DH(7)
C      COMMON/METO/ZMEAS,WS,HD,ISTAB,TDEGK,OPRL,THFTA,S,P,TYR,JDAY,IHOUR
C      COMMON/METO24/KST(24),SPEED(24),RANDOM(24),HMIX(24),TEMP(24),
C      1 DTHTA(2),PEXP(6),TDFLS,IDSURF,IYSURF,IDUPER,TYUPER,TFRAN(6),
C      2 IRU,IHRMAX,LMFTIN,LMETOT,TDAYS(366)
C      COMMON/PHLDAT/TWOPRL,PBL1P6
C      COMMON/OUTPT/IPCL(11),IPCP(51)
C      COMMON/PARM/CRIT,TER1,DECIFAC,XBACKG,CONST2,CONST3,MAXIT
C      COMMON/QA/VERSON,LEVEL
C      DATA PI/3.1415927/
C
C      IDENTIFY VERSION AND LEVEL NUMBERS OF RLP -- MAIN PROGRAM
C
C      VERSION=1.1
C      LEVEL=800702
C
C      READ INPUTS
C
C      CALL INPUT(RINPUT,RDOWNN,TITLE)
C      IF(.NOT.RINPUT)CALL RECEPT
C
C      WRITE RUN INFORMATION TO RECORD #1 OF OUTPUT FILE (20)
C
C      CALL OUTITL(TITLE,NREC,NPTS,NLINES,IPCL,IPCP,TYR,TDAYS)
C      IF(NLINES.LT.1)GO TO 21
C      DO 20 I=1,NLINES
C      20 DEL(I)=XLEND(I)-XLBEG(I)
C      COUNTNMF
C      IF(NPTS.LE.0)GO TO 520
C
C      IF THE POINT SOURCE DOWNWASH OPTION IS REQUESTED,
C      DEFINE THE RECTANGLE OF INFLUENCE (IN SCS COORDINATES)

```

```

C FOR THE DOWNWASH CALCULATIONS 00000640
C IF (.NOT.RDWNW) GO TO 520 00000650
THREHR=3.*HB 00000660
TWOHR=2.*HB 00000665
HALFWR=WR/2. 00000670
XAMIN=-TWOHR 00000680
XAMAX=L+TWOHR 00000690
YAMIN=-HALFWR-TWOHR 00000700
YAMAX=(NLINES-1)*(DX+WR)+HALFWR+TWOHR 00000710
C FOR THOSE POINTS WITHIN THE REGION OF BUILDING DOWNWASH 00000720
C EFFECTS AND WITH STACK HEIGHTS < .3*HB, SET 00000730
C TDOWNW (POINT #) = 1 00000740
C TDOWNW (POINT #) = 1 00000741
DO 505 I=1,NPTS 00000750
IF (PHS(I).GE.THREHR) GO TO 505 00000755
IF (XPSCS(I).LT.XAMIN.OR.XPSCS(I).GT.XAMAX) GO TO 505 00000760
IF (YPSCS(I).LT.YAMIN.OR.YPSCS(I).GT.YAMAX) GO TO 505 00000770
TDOWNW(I)=1 00000780
00000790
505 CONTINUE 00000800
520 CONTINUE 00000810
IF (LMFTIN) GO TO 1212 00000820
C READ STATION CODES AND YEAR OF METEOROLOGICAL DATA 00000830
READ(2)IDS,IYS,IDU,IYU 00000840
IF (IDS.EQ.IDSURF.AND.IYS.EQ.IYSURF.AND.IDU.EQ.IDUPFR.AND. 00000850
I YU.EQ.IYUPER)GO TO 1212
WRITE(6,1211)IDSURF,IYSURF,IDS,IYS,IDIUPER,IYUPER,IDU,IYU 00000860
1211 FORMAT('1','REQUESTED STATION ID OR YEAR DOES NOT MATCH ', 00000870
1 'THAT READ FROM THE MET. DATA FILE -- RUN TERMINATED'/
1 'THAT READ FROM THE MET. DATA FILE -- RUN TERMINATED'/
2 '0',2X,'REQUESTED SURFACE DATA: ID = ',I4,3X,'YEAR = ',I4/ 00000880
3 10X,'MET. DATA READS: ID = ',I4,3X,'YEAR = ',I4/ 00000890
4 '0',2X,'REQUESTED UPPER AIR DATA: ID = ',I4,3X,'YEAR = ',I4/ 00000900
5 10X,'MET. DATA FILE READS: ID = ',3X,'YEAR = ',I4) 00000910
5 10X,'MET. DATA FILE READS: ID = ',3X,'YEAR = ',I4) 00000920
5 STOP 00000930
00000940
1212 CONTINUE 00000950
C CALCULATE DISTANCE (FROM XFA) TO FINAL NEUTRAL PLUME RISE 00000960
C ASSUMING PLUMES INTERACT BEFORE REACHING TERMINAL RISE 00000970
FRGRG=N*FPRIME/PI 00000980
IF (FRGRG.GT.55.)GO TO 10 00000990
C THE CONSTANT 49 = 3.5*14. 0001000
XFINAL=49.*FRGRG**0.625 0001010
GO TO 15 0001020
10 XFINAL=3.5*CONST3*FRGRG**0.4 0001030
15 CONTINUE 0001040
XMATCH=XFINAL 0001050
C ENTER MAIN LOOP 0001060
C
C ISTART=1 0001070
DO 135 I=1,366 0001080
II=367-I 0001090
IF (IDAYS(II).NE.1)GO TO 135 0001100
LASTDY=II 0001110
GO TO 137 0001120
0001130
0001140
0001150
135 CONTINUE 0001160
WRITE(6,136) 0001170
136 FORMAT(//101,'EXECUTION TERMINATING -- NO ELEMENTS OF ', 0001180
1 'IDAYS ARRAY ARE EQUAL TO ONE') 0001190
STOP 0001200
137 CONTINUE 0001210
IF (LMETIN)LASTDY=1 0001220
WRITE(6,1401) 0001230
1401 FORMAT('1')
DO 1002 TODAY=ISTART,LASTDY

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JDAY=IDAY          00001240
C READ METEOROLOGICAL DATA 00001250
C CALL MFT 00001260
C IF (IDAYS(IDAY).NE.1) GO TO 1002 00001270
C
C DO 1000 IHR=1,IHRMAX 00001280
C
C IHOUR=IHR 00001290
C ISTAR=KST(IHR) 00001300
C TER1=1.-TERAN(ISTAR) 00001310
C P=PEXP(ISTAR) 00001320
C TDEGK=TEMP(IHR) 00001330
C IF (ISTAH.GT.4) S=9.80616*DHTA(ISTAR-4)/TDEGK 00001340
C WS=SPEED(IHR) 00001350
C WD=RANDWD(IHR) 00001360
C
C CONVERT WD (FROM PREPROCESSOR) TO WD IN THE REGULAR 00001370
C METEOROLOGICAL SENSE (I.E., 0=NORTH WIND, 90=EAST WIND, 00001380
C 180=SOUTH WIND, 270=WEST WIND) 00001390
C WD1=WD+180. 00001400
C WD1=AMOD(WD1,360.) 00001410
C THETA=360.-(WD1+TCOR) 00001420
C IF (THETA.LT.0.0) THETA=360.+THETA 00001430
C THETA=AMOD(THETA,360.) 00001440
C DPBL=HMIX(IHR) 00001450
C TAOPBL=2.*DPBL 00001460
C PBL1P6=1.6*DPBL 00001470
C CALL COORD(THETA,ISTAR) 00001480
C CALL CONTRH 00001490
1000 CONTINUE 00001500
1002 CONTINUE 00001510
WRITE(6,1005)JDAY 00001520
1005 FORMAT(////'0',30X,'LAST DAY PROCESSED = ',T3) 00001530
STOP 00001540
END 00001550
00001560
SUBROUTINE INPUT(RINPUT,RDOWNW,TITLE) 00001570
C BLP VERSION 1.1 LEVEL 800212 TINPUT 00001580
REAL*8 RXBEG,RYBEG,RXEND,RYEND,XBASE,YBASE,XCOORD,YCOORD 00001590
REAL*8 XLBEG,XLEND,YLBEG,YLEND 00001600
REAL YLBEG1(10),YLEND1(10) 00001610
REAL L,LELEV 00001620
REAL TITLE(20) 00001630
INTEGER*2 IDAYS,NDYS 00001640
LOGICAL RINPUT,LINPUT,LUTMS,LPART,LSHEAR,RDOWNW,LDOWNW,LFALSE 00001650
LOGICAL LMETOT,LMETIN,LTRANS 00001660
00001670
C
C COMMON BLOCKS 00001680
C
COMMON/SOURCE/NLINES,XLBEG1(10),XLEND1(10),DEL(10),YSCS(10), 00001690
1 GT(10),HS(10),XRCS(10,129),YRCS(10,129),TCOR,LFLEV(10), 00001700
2 NPTS,XPSCS(50),YPSCS(50),PO(50),PHS(50),XPRCS(50),YPRCS(50), 00001710
3 TSTACK(50),APTS(50),BPTS(50),VEXIT(50),PFLEV(50),IDOWNW(50) 00001720
COMMON/RCEPT/RXBEG1,RYBEG1,RXEND1,RYEND1,RDX,RDY,XRSCS(100), 00001730
1 YRSCS(100),XPPCS(100),YRRCSCS(100),RELEV(100),NRFC 00001740
COMMON/PR/L,HB,NB,WM,FPRIME,FP,XMATCH,DY,AVFACT,TNOHR,N,ISHEAR, 00001750
1 LTRANS 00001760
COMMON/OUTPT/IPCL(11),IPCP(51) 00001770
00001780
COMMON/PARM/CRIT,TER1,DFCFAC,XBACKG,CONST2,CONST3,MAXIT 00001790
COMMON/METO24/KST(24),SPEED(24),RANDOM(24),HMIX(24),TEMP(24), 00001800
1 DHTA(2),PEXP(6),TOELS,IDSURF,TYSURF,JDUPER,TYUPFR,TFRAN(6), 00001810
2 IRU,IHRMAX,LMETTTN,LMETOT,IDAYS(366) 00001820
COMMON/METO/ZMEAS,WS,WD,ISTAR,TDEGK,DPBL,THETA,S,P,JYR,JDAY,IHOUR 00001830
COMMON/QA/VERSION,LEVEL 00001840
00001850
C

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C   NAMELIST STATEMENTS                               00001870
C   NAMELIST/GEN/NLINES,NPTS,NREC,LINPUT,LUTMS,LPART,LDOWNW,LSHEAR, 00001880
1  LTRANS,TCOR.                                     00001890
    NAMELIST/RISE/L,HR,WB,WM,FPRIME,DX               00001910
    NAMELIST/METIN/ZMEAS,DTHTA,PEXP,IDSURF,IYSURF, 00001920
    IDUPER,IYUPER,LMFTOT                           00001930
1  IDELS,IRU,IDAYS,LMETIN,LMFTOT                 00001940
    NAMELIST/CALC/CHIT,TERAN,DECFACT,XBACKG,CONST2, 00001950
    CONST3,MAXIT                                     00001960
    NAMELIST/OUTPUT/IPCL,IPCIP                      00001970
    NAMELIST/RCEPT/RXBEG,RYBEG,RXEND,RYEND,RDX,RDY
C   DATA LINPUT/.FALSE./,LUTMS/.FALSE./,LPART/.FALSE./ 00001980
    DATA LDOWNW/.TRUE./,LFALSE/.FALSE./              00001990
    DATA ALPYES/'YES'/,ALP1/'NO'/                  00002000
    DATA ALP2/'NO'/,ALP3/'NO'/,ALP4/'NO'/,ALP5/'NO'/ 00002010
    DATA PI/3.1415927/,RAD/0.017453293/            00002020
    DATA MAXL/10/,MAXP/50/,MAXR/100/                00002030
    DATA TEN6/1.E6/                                  00002040
C   READ TITLE CARD                                 00002050
C   READ(5,7)TITLE                                00002060
C   FORMAT(20A4)                                    00002070
7   WRITE(6,1400)VVERSION,LEVEL                   00002080
1400 FORMAT('1',11X,'BLP -- MULTIPLE BUOYANT LINE AND POINT ', 00002090
1 'SOURCE DISPERSION MODEL      VERSION ',F4.1,3X,'LEVEL ',I6/ 00002100
2 '0',13('*****'))                                00002110
    WRITE(6,8)TITLE                                00002120
8   FORMAT(/'0',20A4)                            00002130
C   READ NUMBER OF SOURCES AND FORMAT OF INPUTS -(GEN NAMELIST) 00002140
C   READ(5,GEN)                                    00002150
C   WRITE(6,GEN)                                 00002160
C   NLINES                                         00002170
C   RINPUT=LINPUT                                00002180
C   IF(NLINES.LE.0)LDOWNW=LFALSE                 00002190
    RDOWNW=LDOWNW                                00002200
    IF(NLINES.GT.MAXL)GO TO 700                  00002210
    IF(NPTS.GT.MAXP)GO TO 702                  00002220
    IF(NREC.GT.MAXR)GO TO 704                  00002230
C   READ PARAMETERS USED IN LINE SOURCE PLUME RISE 00002240
C   CALCULATIONS (RISE NAMELIST)                00002250
C   IF(NLINES.LT.1)GO TO 49                      00002260
    READ(5,RISE)                                00002270
    WRITE(6,RTSE)                                00002280
C   READ RECEPTOR INFORMATION (RCFPT NAMELIST) 00002290
C   IF(RINPUT .EQ. .TRUE.) , INPUT COORDINATES OF EACH RECEPTOR 00002300
C   OTHERWISE, INPUT RECEPTOR GRID BOUNDARIES AND SPACING AND A 00002310
C   RECTANGULAR RECEPTOR GRID WILL BE GENERATED (UP TO 100 RECEPTORS) 00002320
C   CONTINUE.                                     00002330
49  IF(RINPUT)GO TO 25                          00002340
    READ(5,RCEPT)                                00002350
    WRITE(6,RCEPT)                                00002360
    XBASE=0.0                                     00002370
    YBASE=0.0                                     00002380
    IF(.NOT.LUTMS)GO TO 61                      00002390
    XBASE=RXBEG                                  00002400
    YBASE=RYBEG                                  00002410

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61    CCONTINUE
      RXBEG1=RXBEG-XBASE
      RYBEG1=RYBEG-YBASE
      RXEND1=RXEND-XBASE
      RYEND1=RYEND-YBASE
25    CCONTINUE
C
C     READ MET. DATA PARAMETERS (METIN NAMFLIST)
C
      READ(5,METIN)
      WRITE(6,METIN)
      IF(IYSURF.EQ.IYUPER)GO TO 55
      WRITE(6,56)IYSURF,IYUPER
      56    FORMAT('1','RUN TERMINATED -- YEAR REQUESTED FOR SURFACE AND ',1,
      2 ' UPPER AIR MET. DATA DO NOT MATCH'/'0','IYSURF = ',I4,
      2 ' IYUPER = ',I4)
      STOP
55    CCONTINUE
      IYR=IYSURF
      IF(LMETIN)IDAYS(1)=1
      IF(MOD(IYSURF,4).NE.0)IDAYS(366)=0
C
C     READ DECAY RATE, TERRAIN CORRECTION FACTOR, CONVERGENCE
C     CRITERION, ITERATION LIMIT (CALC NAMFLIST)
C
      READ(5,CALC)
      WRITE(6,CALC)
C
C     READ WHICH SOURCES (IF ANY) TO HAVE PARTIAL
C     CONCENTRATION OUTPUT (OUTPUT NAMLTST)
C
      IF(.NOT.LPART)GO TO 118
      READ(5,OUTPUT)
      WRITE(6,OUTPUT)
118   CCONTINUE
C
C     READ COORDINATES OF USER SPECIFIED RECEPTORS
C
      IF(.NOT.RINPUT)GO TO 40
      IF(LUTMS)GO TO 36
C     READ RECEPTOR COORDINATES IN SCS UNITS
      DO 27 I=1,NREC
27    READ(5,28)XRSCS(I),YRSCS(I),RELLEV(I)
28    FORMAT(3F10.1)
      XBASE=0.0
      YBASE=0.0
      GO TO 40
C     READ RECEPTOR COORDINATES IN UTM UNITS
36    READ(5,28)XBASE,YBASE,RELLEV(1)
      XRSCS(1)=0.0
      YRSCS(1)=0.0
      IF(NREC.LE.1)GO TO 40
      DO 37 I=2,NREC
37    READ(5,28)XCOORD,YCOORD,RELLEV(I)
      XRSCS(I)=XCOORD-XBASE
      YRSCS(I)=YCOORD-YBASE
      CONTINUE
40    CONTINUE
C
C     READ LINE SOURCE PARAMETERS USED IN DISPERSION CALCULATIONS
C
      IF(NLINES.LT.1)GO TO 59
      DO 46 I=1,NLINES

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      READ(5,48)XLREG,YLREG,XLEND,YLEND,HS(I),QT(I),LELEV(I)      00003130
48   FORMAT(4F10.1,2F10.4,F10.1)                                     00003140
C   CHANGE EMISSION RATE TO MICROGRAMS/SECOND                   00003150
      QT(I)=QT(I)*TEN6                                              00003160
      IF(XLREG.GT.XLEND)GO TO 706                                    00003170
      XLREG1(I)=XLREG-XBASE                                         00003180
      YLREG1(I)=YLREG-YBASE                                         00003190
      XLEND1(I)=XLEND-XBASE                                         00003200
      YLEND1(I)=YLEND-YBASE                                         00003210
      YSCS(I)=YLREG1(I)                                             00003220
46   CONTINUE                                                       00003230
59   CONTINUE                                                       00003240
C   READ POINT SOURCE INFORMATION                                00003250
C   READ POINT SOURCE INFORMATION                                00003260
C   READ POINT SOURCE INFORMATION                                00003270
      IF(NPTS.LT.1)GO TO 22                                         00003280
      DO 15 I=1,NPTS                                              00003290
      READ(5,14)XCOORD,YCOORD,PHS(I),PN(I),D,W,TSTACK(I),PELEV(I) 00003300
14   FORMAT(2F10.1,5F10.4,F10.1)                                     00003310
C   CHANGE EMISSION RATE TO MICROGRAMS/SECOND                   00003320
      PN(I)=PN(I)*TEN6                                              00003330
      XPSCS(I)=XCOORD-XBASE                                         00003340
      YPSCS(I)=YCOORD-YBASE                                         00003350
C   CONSTANT 2.45154 = G/4. (9.80616/4.)                           00003360
      APTS(I)=2.45154*D*D*W/TSTACK(I)                               00003370
C   WHEN MULTIPLIED BY THE AMBIENT TEMPERATURE, BPTS GIVES 3. * FM 00003380
C   CONSTANT 0.75 = 3./(2.*2.)                                      00003390
      BPTS(I)=0.75*W*D*D/TSTACK(I)                                 00003400
      VEXIT(I)=W                                                   00003410
15   CONTINUE                                                       00003420
22   CONTINUE                                                       00003430
C   WRITE INPUT PARAMETERS                                       00003440
C   WRITE INPUT PARAMETERS                                       00003450
C   WRITE INPUT PARAMETERS                                       00003460
      WRITE(6,1400)VERSL,LEVEL                                     00003470
      WRITE(6,8)TITLE                                            00003480
      NDYS=0                                                       00003490
      DO 135 I=1,366                                             00003500
135  NDYS=NDYS+IDAYS(I)                                         00003510
      WRITE(6,136)NDYS,JDAYS                                     00003520
136  FORMAT(//'0','TOTAL NUMBER OF DAYS INCLUDED IN THIS RUN: ',I3// 00003530
      1 1X,'(0=NOT INCLUDED,1=INCLUDED)'//                         00003540
      2 3('0',10(10I1,3X)/), '0',6(10I1,3X),6I1)                 00003550
      NT=NPTS+NLINES                                              00003560
      WRITE(6,112)NT,NLINES,NPTS                                 00003570
112  FORMAT(//'0','TOTAL NUMBER OF SOURCES: ',I3//12X,'LINE SOURCES: ',00003580
      1 I3/11X,'POINT SOURCES: ',I3)                             00003590
      IF(LPART)ALP1=ALPYFS                                         00003600
      WRITE(6,113)ALP1                                           00003610
113  FORMAT(//'0','PARTIAL CONCENTRATIONS REQUESTED FOR ANY LINE OR ', 00003620
      1 'POINT SOURCES? ',A3)                                     00003630
      IF(LDOWNIN)ALP2=ALPYES                                         00003640
      WRITE(6,1110)ALP2                                           00003650
1110 FORMAT('0','POINT SOURCE BUILDING DOWNWASH OPTION REQUESTED? ', 00003660
      1 A3)                                                 00003670
      IF(LSHFAR)ALP3=ALPYFS                                         00003680
      WRITE(6,1111)ALP3                                           00003690
1111 FORMAT('0','VERTICAL WTND SHEAR (IN PLUME RTSF) REQUESTED? ',A3) 00003700
      IF(LTRANS)ALP5=ALPYES                                         00003710
      WRITE(6,1212)ALP5                                           00003720
1212 FORMAT('0','TRANSITIONAL POINT SOURCE PLUME RTSF REQUESTED? ',A3) 00003730
      IF(LMFTOT)ALP4=ALPYFS                                         00003740
      WRITE(6,1112)ALP4                                           00003750

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1112 FORMAT('0','OUTPUT OF METEOROLOGICAL DATA REQUESTED ? ',A5)      00003760
C
C   WRITE THE LINE SOURCE PLUME RISE PARAMETERS                           00003770
C
C     TF(NLTNES,LT,1)GO TO 122                                           00003780
C     DX=DX+WR
C     WRITE(6,50)HR,WB,L,DX,DXM,WM,FPRIME                               00003790
50   FORMAT(//'0','PARAMETERS USED IN THE LINE SOURCE PLUME RTSF ',      00003800
1  'CALCULATIONS'
1  '0','BUILDING DIMENSIONS: HEIGHT = ',F7.2,1X,'(M)'/                 00003810
2  '24X,'WIDTH = ',F7.2,1X,'(M)'/                                         00003820
3  '23X,'LENGTH = ',F7.2,1X,'(M)'/                                         00003830
4  '0','BX,'BUILDING SEPARATION = ',F7.2,1X,'(M)'/                         00003840
5  '0','6X,'LINE SOURCE SEPARATION = ',F7.2,1X,'(M)'/                      00003850
6  '0','11X,'LINE SOURCE WIDTH = ',F7.2,1X,'(M)'/                          00003860
7  '0','BIODIENCY FLUX PER LINE (FPRIME) = ',F7.1,1X,'(M**4/S**3)')       00003870
122  CONTINUE                                                               00003880
C
C   WRITE THE METEOROLOGICAL PARAMETERS                                     00003890
C
C     WRITE(6,1400)VERSON,LEVEL                                            00003900
C     WRITE(6,1120)
1120  FORMAT('0','METEOROLOGICAL PARAMETERS')                                00003910
      WRITE(6,1121)MEAS,PEXP,DTHTA                                         00003920
1121  FORMAT('0','MEAN WIND SPEED MEASUREMENT HEIGHT = ',F4.1,' (M)'/      00003930
1  '0','WIND SPEED POWER LAW EXPONENTS (STABILITIES 1-6) = ',          00003940
2  '6(F4.2,2X)/*0','VERTICAL POTENTIAL TEMPERATURE GRADIENT = ',        00003950
3  '5,F5.3,1X,'DEG K/M (STABILITY 5)',5X,F5.3,1X,'DEG K/M ',            00003960
4  '(STABILITY 6)')                                                       00003970
      IF(LMETIN)WRITE(6,1122)
1122  FORMAT('0','METEOROLOGICAL DATA -- FORMATTED USER INPUT')             00003980
      IF(.NOT.LMETIN)WRITE(6,1123)TDFLS,IPIU,IDSURF,IYSURF,IDIUPER,IYUPER 00003990
1123  FORMAT('0','METEOROLOGICAL DATA -- PREPROCESSOR FORMAT')
1  '0','STABILITY CLASS VARIATION RESTRICTED TO ',T1,' CLASSES',          00004000
2  'HOUR'/*0',1X,'MIXING HEIGHTS USED: ',J1,2X,'(1=RURAL,2=URBAN)'/      00004010
3  ' SURFACE STATION ID: ',IS,SX,'YEAR: ',T2/                            00004020
4  '1X,'UPPER AIR STATION TD: ',IS,SX,'YEAR: ',I2)                         00004030
C
C   WRITE THE COMPUTATIONAL PARAMETERS                                     00004040
C
C     WRITE(6,1130)CRIT,MAXIT                                              00004050
1130  FORMAT(//'*0','COMPUTATIONAL PARAMETERS'/*0','CONVERGENCE ',        00004060
1  'THRESHOLD FOR LINE SOURCE CALCULATIONS = ',F6.3,1X,                  00004070
2  '(MICROGRAMS/M**3)')                                                 00004080
3  '0','MAXIMUM NUMBER OF ITERATIONS IN LINE SOURCE CALCULATIONS = ' 00004090
4,12)
      IF(.NOT.LSHEAR)WRITE(6,1131)CONST2
1131  FORMAT('0','STABLE POINT SOURCE PLUME RISE CONSTANT (CONST2) = ',    00004100
1  F4.2)
      WRITE(6,1131)CONST3
1131  FORMAT('0','FINAL NEUTRAL PLUME RISE CONSTANT (CONST3) = ',        00004110
1  F5.2)
      WRITE(6,1132)XBACK,DECDFAC,TERAN                                     00004120
1132  FORMAT('0','BACKGROUND CONCENTRATION = ',F8.2,1X,'(MICROGRAMS/'),   00004130
1  'M**3)'/*0','POLLUTANT DECAY FACTOR = ',E12.5,1X,' (1/SEC)')/        00004140
2  '0','TERRAIN ADJUSTMENT FACTORS (STABILITIES 1-6) = ',                00004150
3  '6(F4.2,2X))'
C
C   WRITE THE RECEPTOR INFORMATION                                     00004160
C
C     WRITE(6,1400)VERSON,LEVEL                                            00004170
      IF(RINPUT)GO TO 85
      WRITE(6,114)

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114  FORMAT(//'0','RECEPTOR LOCATIONS GENERATED FROM USER DEFINED ',      00004780
1  'RECEPTOR RECTANGLE')                                              00004400
115  WRITE(6,70)RXSEG,RYEND,RXEND,RYREG,RYREG,RXEND,RYBEG,PDX,RDY00004410
    FORMAT(//'0',10X,'RECEPTOR NETWORK DEFINED BY THE FOLLOWING ',      00004420
116  1 'RECTANGLE'
2 '0',10X,'(',F10.1,',',F10.1,')',5X,'(',F10.1,',',F10.1,')'/
3 '0',10X,'(',F10.1,',',F10.1,')',5X,'(',F10.1,',',F10.1,')'/
4 '40',40X,'X GRID SPACING = ',F7.2/                                00004430
5 '0',10X,'Y GRID SPACING = ',F7.2)                                    00004440
    GO TO 99
85   WRITE(6,115)NREC
115  FORMAT(//'0','ALL RECEPTOR LOCATIONS SPECIFIED BY THE USER -- ', 00004500
1  'TOTAL NUMBER OF RECEPTOR: ',T3)                                     00004510
    WRITE(6,89)NREC
89   FORMAT(//'0',10X,'RECEPTOR NETWORK (USER INPUT)'/
1  '0','NUMBER OF RECEPTORS: ',I4//1X,'RECEPTOR NUMBER',10X,        00004520
2 'X',14X,'Y',10X,'ELEVATION'/25X,'(M)',12X,'(M)',12X,'(M)')/       00004530
    DO 92 I=1,NREC
      XCOORD=XRSCS(I)+XBASE
      YCOORD=YRSCS(I)+YBASE
    WRITE(6,93)I,XCOORD,YCOORD,RELEV(I)                                 00004540
93   FORMAT(7X,I3,11X,F10.1,5X,F10.1,2X,F10.1)                         00004550
99   CONTINUE
    TF(.NOT.LUTMS)WRITE(6,116)TCUR
116  FORMAT('0','SOURCE AND RECEPTOR LOCATIONS SPECIFIED IN SCS ', 00004560
1  'COORDINATES -- TCUR = ',F6.2,' DEGREES')
    TF(LUTMS)WRITE(6,117)
117  FORMAT('0','SOURCE AND RECEPTOR LOCATIONS SPECIFIED IN UTM ', 00004570
1  'COORDINATES')
C
C   WRITE THE LINE SOURCE PARAMETERS
C
IF(NLINES.LT.1)GO TO 1133
60   WRITE(6,1400)VPERSON,LEVEL
    WRITE(6,60)NLINES
    FORMAT(//'0','LINE SOURCE PARAMETERS'//,'NUMBER OF LINES: ',I4 00004580
1  //1X,'LINE NUMBER',4X,'X START',6X,'Y START',9X,'X END',9X, 00004590
2 'Y END',11X,'0',10X,'HEIGHT',5X,'PARTIAL CHI OUTPUT',          00004600
2 3X,'ELEVATION'
3 18X,'(M)',10X,'(M)',12X,'(M)',11X,'(M)',8X,'(GM/SEC)',9X, 00004610
4 '(M)',8X,'(0=NO,1=YES)',10X,'(M)')
    DO 65 I=1,NLINES
      XLREG=XLBEG1(I)+XBASE
      YLBEG=YLBEG1(I)+YBASE
      XLEND=XLEND1(I)+XBASE
      YLEND=YLEND1(I)+YBASE
      QGMS=QT(I)/TEN6
      WRITE(6,62)I,XLBEG,YLBEG,XLFND,YLEND,QGMS,HS(I),IPCL(I),LELEV(I) 00004620
62   FORMAT(4X,I3,7X,4(F10.1,4X),2X,F7.2,6X,F7.2,13X,I1,8X,F10.1) 00004630
    WRITE(6,212)
212  FORMAT(//'0','SOURCE CONTRIBUTIONS FROM THE FOLLOWING ',      00004640
1  'LINE SOURCES ARE AVAILABLE: '//0,'(0=NOT AVAILABLE; ',        00004650
2 '1=AVAILABLE)'//0,'LINE SOURCE NUMBER',5X,'AVAILABILITY')        00004660
    DO 219 J=1,NLINES
      WRITE(6,215)I,IPCL(I)
215  FORMAT('0',7X,IP,19X,I1)                                         00004670
219  CONTINUE
    WRITE(6,216)NLINES,IPCL(I)                                         00004680
216  FORMAT('0',5X,'I = ',12,17X,I1)                                    00004690
1133 CONTINUE
C
C   WRITE THE POINT SOURCE PARAMETERS
C

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160 IF(.NOT.LUTMS)RETURN
161 WRITE(6,1400)VERSION,LEVEL
162 NWRITE(6,160)NPTS
163 FORMAT('/'0','POINT SOURCE PARAMETERS'// '/'0','NUMBER OF POINTS: ',I4//1X,'POINT NUMBER',8X,'X',14X,'Y',11X,'D',10X,'HEIGHT',4X,
164 'VOL. FLUX',5X,'STACK TEMP.',5X,'PARTIAL CHI OUTPUT',
165 '3X,'ELEVATION'/'
166 20X,'(M)',12X,'(M)',6X,'(GM/SEC)',9X,'(M)',5X,'(M**3/SEC)',4X,
167 '6X,'(DEG K)',9X,'(0=NO,1=YES)',10X,'(M)')
168 DO 132 I=1,NPTS
169 XCOORD=XPSCS(I)+XBASE
170 YCOORD=YPSCS(I)+YBASE
171 VFLUX=APTS(I)*TSTACK(I)*PI/9.8
172 QGMS=PD(I)/TEN6
173 WRITE(6,133)I,XCOORD,YCOORD,QGMS,PHS(I),VFLUX,TSTACK(I),IPCP(I),
174 PELEV(I)
175 FORMAT(5X,I3,8X,F10.1,5X,F10.1,4X,F7.2,6X,F7.2,4X,F10.0,7X,
176 1,FS.1,16X,J1,8X,F10.1)
177 WRITE(6,222)
178 FORMAT('/'0','SOURCE CONTRIBUTIONS FROM THE FOLLOWING ',
179 'POINT SOURCES ARE AVAILABLE: '/'0','(0=NOT AVAILABLE; ',
180 '1=AVAILABLE)'/'0','POINT SOURCE NUMBER',5X,'AVAILABILITY')
181 DO 239 I=1,NPTS
182 WRITE(6,235)I,IPCP(I)
183 FORMAT('0',8X,I2,19X,I1)
184 CONTINUE
185 WRITE(6,236)NPTS,IPCP(51)
186 FORMAT('0',6X,'1 - ',I2,17X,I1)
187 CONTINUE
C
C CALCULATE SCS COORDINATES FROM UTM COORDINATES
C
188 IF(.NOT.LUTMS)RETURN
189 IF(NLINES.LE.0)RETURN
190 XBEG1=XLBEG1(1)
191 YBEG1=YLBEG1(1)
192 XOR=XLEND1(1)-XBEG1
193 YOR=YLEND1(1)-YBEG1
194 ANGRAD=ATAN2(YOR,XOR)
195 TCOR=90.+ANGRAD/RAD
196 SINT=SIN(ANGRAD)
197 COST=COS(ANGRAD)
198 WRITE(6,189)
199 FORMAT('1')
200
C
C TRANSLATE ORIGIN AND ROTATE COORDINATES
C
201 LINE SOURCE COORDINATES
202 DO 260 I=1,NLINES
203 XBEG1(I)=XLBEG1(I)-XOR
204 XLEND1(I)=XLEND1(I)-XOR
205 YLBEG1(I)=YLBEG1(I)-YOR
206 YLEND1(I)=YLEND1(I)-YOR
207 YLBEG1(I)=-XLBEG1(I)*SINT+YLBEG1(I)*COST
208 XLBEG1(I)=(XLBEG1(I)+YLBEG1(I)*SINT)/COST
209 YSCS(I)=XLEND1(I)*SINT+YLEND1(I)*COST
210 XLEND1(I)=(XLEND1(I)+YSCS(I)*SINT)/COST
211 CONTINUE
212
C
C POINT SOURCE COORDINATES
213 IF(NPTS.LT.1)GO TO 275
214 DO 270 I=1,NPTS
215 XPSCS(I)=XPSCS(I)-XOR
216 YPSCS(I)=YPSCS(I)-YOR

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YPSCS(I)=-XPSCS(I)*SINT+YPSCS(I)*COST          00005420
XPSCS(I)=(XPSCS(I)+YPSCS(I)*SINT)/COST        00005430
270 CONTINUE                                     00005440
275 CONTINUE                                     00005450
C      RFCFPTR COORDINATES                     00005460
IF(LINPUT)GO TO 290                           00005470
RXBEG1=RXBEG1-XOR                            00005480
RXEND1=RXEND1-XOR                            00005490
RYBEG1=RYBEG1-YOR                            00005500
RYEND1=RYEND1-YOR                            00005510
RYBEG1=-RXBEG1*SINT+RYBEG1*COST            00005520
RXREG1=(RXBEG1+RYBEG1*SINT)/COST           00005530
RYEND1=-RXEND1*SINT+RYEND1*COST           00005540
RXEND1=(RXEND1+RYEND1*SINT)/COST           00005550
GO TO 299                                     00005560
290 DO 295 I=1,NREC                         00005570
  XRSCS(I)=XRSCS(I)-XOR                      00005580
  YRSCS(I)=YRSCS(I)-YOR                      00005590
  YRSCS(I)=-XRSCS(I)*SINT+YRSCS(I)*COST    00005600
  XRSCS(I)=(XRSCS(I)+YRSCS(I)*SINT)/COST   00005610
295 CONTINUE                                     00005620
299 CONTINUE                                     00005630
RETURN                                         00005640
700 WRITE(6,701)NLINES,MAXI                   00005650
701 FORMAT('1','NUMBER OF LINE SOURCES INPUT EXCEEDS MAXIMUM NUMBER ',00005660
1 'ALLOWED'/'0','NUMBER OF LINE SOURCES INPUT (NLINES): ',I5/00005670
2 '0','MAXIMUM NUMBER OF LINE SOURCES ALLOWED: ',I5) 00005680
2 '0','MAXIMUM NUMBER OF LINE SOURCES ALLOWED: ',I5) 00005690
STOP                                           00005700
702 WRITE(6,703)NPTS,MAXP                   00005710
703 FORMAT('1','NUMBER OF POINT SOURCES INPUT EXCEEDS MAXIMUM ',00005720
1 'NUMBER ALLOWED'/'0','NUMBER OF POINT SOURCES INPUT (NPTS): ',I5/00005730
2 '0','MAXIMUM NUMBER OF POINT SOURCES ALLOWED: ',I5) 00005740
STOP                                           00005750
704 WRITE(6,705)NREC,MAXR                   00005760
705 FORMAT('1','NUMBER OF RECEPTORS INPUT EXCEEDS MAXIMUM NUMBER ',00005770
1 'ALLOWED'/'0','NUMBER OF RECEPTORS INPUT (NREC): ',I5/00005780
2 '0','MAXIMUM NUMBER OF RECEPTORS ALLOWED: ',I5) 00005790
STOP                                           00005800
706 WRITE(6,707)XLBEG,XLEND                 00005810
707 FORMAT('1','ENTER COORDINATES OF THE LINE SOURCE ENDPOINTS FROM ',00005820
1 'WEST TO EAST -- /1X,I.E., XLBEG MUST BE LESS THAN OR EQUAL ',00005830
2 'TO XLEND'/'0','XLBEG INPUT AS ',F10.1/'0','XLEND INPUT AS ',00005840
3 F10.1)                                         00005850
STOP                                           00005860
END                                            00005870
SURROUNTING RECEPTE
C      BLP VERSION 1.1 LEVEL 800702      RECEPTE 00005880
REAL LELEV                                     00005890
COMMON/SOURCE/NLINES,XLBEG(10),XLEND(10),REL(10),YSCS(10),QT(10), 00005900
COMMON/SOURCE/XRCS(10,129),YRCS(10,129),TCOP,LELEV(10), 00005910
1 HS(10),XRCS(10,129),YRCS(10,129),TCOP,LELEV(10), 00005920
2 NPTS,XPSCS(50),YPSCS(50),PA(50),PHS(50),XPRCS(50),YPRCS(50), 00005930
3 TSTACK(50),APTS(50),BPTS(50),VFXTT(50),PELEV(50),IDOWNW(50) 00005940
COMMON/RCEPT/RXREG,RYREG,RXFND,RYFND,RDX,RDY,XRSCS(100), 00005950
1 YRSCS(100),XRHCS(100),YRHCS(100),RELEV(100),NRFC 00005955
COMMON/QA/VERSON,LEVEL                         00005960
IF(NLINES.LE.0)GO TO 151                       00005970
YLMAX=YSCS(1)                                    00005980
YLMIN=YSCS(NLINES)                            00005990
XLMAX=XLEND(1)                                    00006000
XLMIN=XLBEG(1)                                    00006010
DO 5 I=1,NLINES                                00006020
XLMIN=AMIN1(XLMIN,XLBEG(I))                  00006030
XLMAX=AMAX1(XLMAX,XLEND(I))

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      YLMIN=XMIN1(YLMIN,YSCS(1))
      YLMAX=XMAX1(YLMAX,YSCS(1))                                00006040
5      CONTINUE                                                 00006050
C      DEFINE THE SOURCE RECTANGLE                                00006060
      WRITE(6,105)XLMIN,YLMAX,XLMAX,YLMAX,XLMIN,YLMIN,XLMAX,YLMIN 00006070
105    FORMAT('0','THE SOURCE RECTANGLE IS DEFINED BY THE FOLLOWING ', 00006080
         1 'POINTS:'
         2 /'0','(',F10.2,',',',',F10.2,')',10X,'(',F10.2,',',',',F10.2,')'
         3 /'0','(',F10.2,',',',',F10.2,')',10X,'(',F10.2,',',',',F10.2,')')
         GO TO 161                                              00006090
00006100
00006110
00006120
C      IF THERE ARE NO LINE SOURCES, SOURCE RECTANGLE IS        00006130
C      UNDEFINED -- ASSIGN VALUES TO XLMIN,XLMAX,YLMIN,YLMAX 00006140
C      SUCH THAT NO RESTRICTION IS PLACED ON THE LOCATIONS OF 00006150
C      RECEPTORS                                               00006160
151    CONTINUE                                                 00006170
         XLMIN=1.E10                                         00006180
         XLMAX=-1.E10                                         00006190
         YLMIN=1.E10                                         00006200
         YLMAX=-1.E10                                         00006210
161    CONTINUE                                                 00006220
         NRINX=(RXEND-RXBEG)/RDX+1                           00006230
         NRINY=(RYEND-RYBEG)/RDY+1                           00006240
C         NTHTOT IS THE NUMBER OF RECEPTORS BEFORE ELIMINATING 00006250
C         THOSE IN THE SOURCE RECTANGLE                         00006260
         NTHTOT=NRINX*NRINY                                     00006270
         NREC=0                                                 00006280
         DO 10 I=1,NRINX                                     00006290
         RXSAVE=RXBEG+(I-1)*RDX                            00006300
         DO 10 J=1,NRINY                                     00006310
         RYSAVE=RYBEG+(J-1)*RDY                            00006320
C         IF A RECEPTOR IS OUTSIDE THE SOURCE RECTANGLE, RECORD ITS 00006330
C         X AND Y COORDINATES, OTHERWISE, IGNORE IT           00006340
         IF(RYSAVE.GT.YLMAX.OR.RYSAVE.LT.YLMIN)GO TO 9       00006350
         IF(RXSAVE.GT.XLMAX.OR.RXSAVE.LT.XLMIN)GO TO 9       00006360
         GO TO 10                                             00006370
9        NREC=NREC+1                                         00006380
         IF(NREC.GT.100)GO TO 200                           00006390
         XRSCE(XNREC)=RXSAVE                               00006400
         YRSCE(XNREC)=RYSAVE                               00006410
10      CONTINUE                                                 00006420
         WRITE(6,1400)VERSON,LEVEL                           00006430
1400    FORMAT('1',1IX,'BLP -- MULTIPLE BUOYANT LINE AND POINT ', 00006431
         1 'SOURCE DISPERSION MODEL          VERSION ',F4.1,3X,'LEVEL ',I6/ 00006433
         2 '0',13('*****'))
         WRITE(6,26)                                         00006435
26        FORMAT('//0','RECEPTOR NO.',1IX,'LOCATION',19X,'RECEPTOR NO.',1IX,00006440
         1 'LOCATION'/16X,'X',16X,'Y',32X,'X',16X,'Y')        00006445
         IH=NREC/2                                         00006450
         DO 30 I=1,IH                                     00006460
         IP=IH+1                                         00006470
         WRITE(6,29)I,XRSCE(I),YRSCE(I),IP,XRSCE(IP),YRSCE(IP) 00006480
29        FORMAT(3X,I3,10X,F6.0,10X,F6.0,13X,I3,10X,F6.0,10X,F6.0) 00006490
30        CONTINUE                                                 00006500
         IEVEN=MOD(NREC,2)                                 00006510
         IF(IEVEN.NE.0)WRITE(6,33)NREC,XRSCE(NREC),YRSCE(NREC) 00006520
33        FORMAT(51X,I3,10X,F6.0,10X,F6.0)                00006530
         WRITE(6,35)NTHTOT,NREC                           00006540
35        FORMAT(//1X,'NUMBER OF POSSIBLE RECEPTOR LOCATIONS = ',I5/ 00006550
         1 '0','NUMBER OF ACTUAL RECEPTOR LOCATIONS = ',I5)    00006560
         RETURN                                              00006570
200      WRITE(6,205)RXBEG,RYBEG,RXEND,RYEND,RDX,RDY        00006580
205      FORMAT('0','TOO MANY RECEPTOR LOCATIONS REQUESTED.',//0', 00006590
         1 'RECEPTORS AT: (',E13.6,',',',E13.6,',')',2X,'TO (',E13.6,',',', 00006600
                                         00006610
                                         00006620

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2 E13.6,10X,'WITH (UX,DY) = ('',E13.6,'','E13.6,''))'
00006630
STOP
00006640
END
00006650
SUBROUTINE OUTITLE(TITLE,NREC,NPTS,NLTNES,IPCL,IPCP,IYR,TDAYS)
00006660
    BLP VERSION 1.1 LEVEL 800212 OUTITLE
00006670
    REAL TITLE(20)
00006680
    INTEGER IPCL(11),IPCP(51)
00006690
    INTEGER IDAYS(366)
00006700
00006710
C THIS SUBROUTINE WRITES THE TITLE CARD AND OTHER RUN
00006720
C INFORMATION TO RECORD #1 OF THE OUTPUT FILE (UNIT 20)
00006730
C
00006740
C WRTTE(20)TITLE,NREC,NPTS,NLTNFS,IPCL,IPCP,IYR,TDAYS
00006750
C RETURN
00006760
C END
00006770
C SUBROUTINE MET
00006780
    BLP VERSION 1.1 LEVEL 800212 MET
00006790
LOGICAL LMETIN,LMETOT
00006800
INTEGER IDM(12,2)/0,31,60,91,121,152,182,213,244,274,305,335,
00006810
1 0,31,59,90,120,151,181,212,243,273,304,334/
00006820
INTEGER IDAYS
00006830
DIMENSION REPWD(24),HLH(2,24)
00006840
COMMON/METD24/KST(24),SPEED(24),RANDWD(24),HMIX(24),TEMP(24),
00006850
1 DTHTA(2),PEXP(6),TDELS,JOSURF,IYSURF,JDUPER,IYUPPER,TFRAN(6),
00006860
2 IRU,IHRMAX,LMETIN,LMETOT,TDAYS(366)
00006870
COMMON/QA/VERSION,LEVEL
00006880
DATA KSTOLD/5/
00006890
00006900
C READ PROCESSED UNFORMATTED METEOROLOGICAL DATA
00006910
C
00006920
C IF(LMETIN)GO TO 185
00006930
READ(2)IYR,TM0,DAY,KST,SPEED,TEMP,REPWD,RANDWD,HLH
00006940
1 DAY=DAY+0.01
00006950
C CALCULATE JULIAN DAY
00006960
00006970
C ILEAP=1 FOR A LEAP YEAR
00006980
C ILEAP=2 FOR A NON-LEAP YEAR
00006990
C
00007000
ILEAP=2
00007010
IF(MOD(IYR,4).EQ.0)ILEAP=1
00007020
1 DAY=IDM(TM0,ILEAP)+1DAY
00007030
C IRU=1 FOR RURAL MIXING HEIGHTS, IRU=2 FOR URBAN MIXING HEIGHTS
00007040
IRU=1 FOR RURAL MIXING HEIGHTS, IRU=2 FOR URBAN MIXING HEIGHTS
00007050
00 5 I=1,24
00007060
HMIX(I)=HLH(IRU,I)
00007070
CONTINUE
00007080
00007090
C ALLOW ONLY STABILITIES 1 TO 6 AND
00007100
C RESTRICT STABILITY VARIATION TO 'TDELS' CLASSES/HOUR
00007120
C
00007130
DO 75 I=1,24
00007140
ISTAB=KST(I)
00007150
ISTAB=MIN0(ISTAB,6)
00007160
IUSTAB=ISTAB-KSTOLD
00007170
IF(IABS(IUSTAB).GT.IDELS)ISTAB=KSTOLD+ISIGN(IDELS,IUSTAB)
00007180
KSTOLD=ISTAB
00007190
KST(I)=ISTAB
00007200
C IF AMBIENT TEMPERATURE IS MISSING, ASSUME T=293.0 DEG. K
00007210
IF(TEMP(I).LE.0.0)TEMP(I)=293.
00007220
CONTINUE
00007230
C IF LMETOT = .TRUE., WRITE HOURLY METEOROLOGY
00007240
00007250

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      IF (.NOT.LMETOT)RETURN          00007260
      IF (TODAYS(TODAY).NE.1)RETURN 00007270
      WRITTF(6,12)IYR,IMD,DAY,(NH,NH=1,24),KST,SPEED,TEMP,RFPWD,RANDWD,
1  (HLH(1,N),N=1,24),(HLH(2,NP),NP=1,24) 00007280
12   FORMAT('0','IYR = ',12,3X,'IMD = ',T2,3X,'DAY = ',F4.0/
1  4X,'HR= ',3X,T4,23I5/ 00007290
1  4X,'ISTAR= ',I4,23I5/4X,'WS= ',24F5.1/4X,'TEMP= ',24F5.0/
2  4X,'WD-A= ',24F5.0/4X,'WD-R= ',24F5.0/4X,'H-RURAL= ',12F6.0/
3  12X,12F6.0/4X,'H-URBAN= ',12F6.0/12X,12F6.0) 00007300
      RETURN 00007310
185  CONTINUE 00007320
C 00007330
C  READ UP TO 24 HOURS OF FORMATTED METEOROLOGICAL DATA 00007340
C  FROM UNIT 5 00007350
C 00007360
      READ(5,110)IHRMAX 00007370
110  FORMAT(I2) 00007380
      IF(IHRMAX.LE.24.AND.IHRMAX.GE.1)GO TO 161 00007390
      WRITE(6,159)IHRMAX 00007400
159  FORMAT(//10X,'EXECUTION TERMINATING -- IHRMAX MUST ',
1  'BE SPECIFIED BY THE USER TO BE ''0'',9X,'RETWFFN ',
2  '1 AND 24 WHEN THE FORMATTED METEOROLOGICAL USER INPUT ',
3  '0',9X,'OPTION IS REQUESTED -- (IHRMAX = ',
4  '15,')) 00007410
      STOP 00007420
161  CONTINUE 00007430
      WRITE(6,1400)VERSON,LEVEL 00007440
1400 FORMAT(1X,11X,'BLP -- MULTIPLE BUOYANT LINE AND POINT ',
1  'SOURCE DTSERSION MODEL      VERSION ',F4.1,3X,'LEVEL ',I6/
2  '0',13('*****')) 00007450
      WRITE(6,171) 00007460
171  FORMAT(/'0',20X,'USER INPUT FORMATTED METEOROLOGICAL DATA'//
1  '0',5X,'HOUR',3X,'STABILITY',3X,'WIND SPEED',3X,'WIND ',
2  'DIRECTION',3X,'TEMPERATURE',3X,'MIXING HEIGHT'/
3  15X,'CLASS',8X,'(M/S)',8X,'(DEGREES)',6X,'(DEG. K)',9X,
4  '(M)') 00007470
      DO 100 I=1,IHRMAX 00007480
      READ(5,112)KST(I),SPEED(I),RANDWD(I),TEMP(I),HMIX(I) 00007490
112  FORMAT(I1,9X,F10.2,F10.2,F10.2,F10.2) 00007500
      WRITE(6,114)I,KST(I),SPEED(I),RANDWD(I),TEMP(I),HMIX(I) 00007510
114  FORMAT('0',6X,12,8X,I1,9X,F5.2,10X,F5.1,11X,F5.1,9X,F5.0) 00007520
100  CONTINUE 00007530
      RETURN 00007540
      END 00007550
      SUBROUTINE COORD(THETA,ISTAR) 00007560
C  BLP VERSION 1.1 LEVEL 800212      COORD 00007570
      DIMENSION XSCTS(10,129) 00007580
      REAL L,LLEV 00007590
      REAL TCHK(4)/90.,180.,270.,360./ 00007600
      INTEGER TL(4)/4*1/,ISFG(4)/1,129,129,1/ 00007610
      COMMON/SOURCE/NLTNES,XLRFG(10),XLEND(10),DEL(10),YSCTS(10),AT(10),
1  HS(10),XRCS(10,129),YRCS(10,129),TCOR,LLEV(10), 00007620
2  NPTS,XPSCS(50),YPSCS(50),PD(50),FHS(50),XPRCS(50),YPRCS(50), 00007630
3  TSTACK(50),APTS(50),BPTS(50),VEXIT(50),PFLFV(50),IDOWNW(50) 00007640
      COMMON/RCEFT/RXHEG,RYHEG,RXFEND,RYEND,RDY,RDY,XRSCS(100),
1  YRSCS(100),XRRCS(100),YRRCS(100),RELEV(100),NRFC 00007650
      EQUIVALENCE (XRCS(1,1),XSCTS(1,1)) 00007660
      DATA RAD/57.29578/ 00007670
      TRAD=THETA/RAD 00007680
      CUST=COS(TRAD) 00007690
      SINT=SIN(TRAD) 00007700
      IF(NLINES.LT.1)GO TO 250 00007710
C 00007720

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CALCULATE SOURCE COORDINATES FOR EACH SOURCE LINE SEGMENT      00007890
DO 25 I=1,NLINES
DXX=DEL(I)/128.
XSCS(I,1)=XLBEG(I)
DO 25 J=2,129
XSCS(I,J)=XSCS(I,J-1)+DXX
CONTINUE
IL(3)=NLINES
IL(4)=NLTNES

15. CALCULATE XN, YN (ORIGINS OF TRANSLATED COORDINATE SYSTEM      00007900
IN TERMS OF THE SCS COORDINATES                                00007910
                                                               00007920
                                                               00007930
                                                               00007940
                                                               00007950
                                                               00007960
                                                               00007970
                                                               00007980
                                                               00007990
                                                               00008000
                                                               00008010
                                                               00008020
                                                               00008030
                                                               00008040
                                                               00008050
                                                               00008060
                                                               00008070
                                                               00008080
                                                               00008090
                                                               00008100
                                                               00008110
                                                               00008120
                                                               00008130
                                                               00008140
                                                               00008150
                                                               00008160
                                                               00008170
                                                               00008180
                                                               00008190
                                                               00008200
                                                               00008210
                                                               00008220
                                                               00008230
                                                               00008240
                                                               00008250
                                                               00008260
                                                               00008270
                                                               00008280
                                                               00008290
                                                               00008300
                                                               00008310
                                                               00008320
                                                               00008330
                                                               00008340
                                                               00008350
                                                               00008360
                                                               00008370
                                                               00008380
                                                               00008390
                                                               00008400
                                                               00008410
                                                               00008420
                                                               00008430
                                                               00008440
                                                               00008450
                                                               00008460
                                                               00008470
                                                               00008480
                                                               00008490
                                                               00008500
                                                               00008510

5.   DO 5 I=1,4
IF(THETA.GE.TCHK(I))GO TO 5
TSAVE=I
ILINE=IL(I)
ISEGN=ISEG(I)
XN=XSCS(ILINE,ISEGN)
YN=YSCS(ILINE)
GO TO 6
CONTINUE
CONTINUE

6.   C TRANSLATE COORDINATES
C TRANSLATE LINE SOURCE SEGMENT COORDINATES
DO 10 I=1,NLINES
DO 10 J=1,129
XRCS(I,J)=XSCS(I,J)-XN
YRCS(I,J)=YSCS(I,J)-YN
CONTINUE
C TRANSLATE POINT SOURCE COORDINATES
DO 11 I=1,NPTS
XPRCS(I)=XPSCS(I)-XN
YPRCS(I)=YPSCS(I)-YN
CONTINUE
C TRANSLATE RECEPTOR COORDINATES
DO 12 I=1,NREC
XRCS(I)=XRSCS(I)-XN
YRCS(I)=YRSCS(I)-YN
CONTINUE
C ROTATE COORDINATE SYSTEM
C ROTATE LINE SOURCE SEGMENT COORDINATES
DO 20 I=1,NLTNES
DO 20 J=1,129
XSAVE=XRCS(I,J)
YSAVE=YRCS(I,J)
XRCS(I,J)=XSAVE*CUST+YSAVE*SINT
YRCS(I,J)=YSAVE*CUST-XSAVE*SINT
CONTINUE
IF(NPTS.LT.1)GO TO 260
C ROTATE POINT SOURCE COORDINATES
DO 21 I=1,NPTS
XSAVE=XPRCS(I)
YSAVE=YPRCS(I)
XPRCS(I)=XSAVE*CUST+YSAVE*SINT
YPRCS(I)=YSAVE*CUST-XSAVE*SINT
CONTINUE
CONTINUE
260 CONTINUE

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C   ROTATE RECEPTOR COORDINATES          00008520
DO 22 T=1,NREC                         00008530
  XSAVE=XRCS(1)                          00008540
  YSAVE=YRCS(1)                          00008550
  XRCS(T)=XSAVE*COST+YSAVE*STNT        00008560
  YRCS(T)=YSAVE*COST-XSAVE*STNT        00008570
22  CONTINUE                            00008580
      RETURN                             00008590
250  CONTINUE                            00008600
C   WITH NO LINE SOURCES, JUST ROTATE THE POINT SOURCE AND    00008610
C   RECEPTOR COORDINATES                00008620
C   IF(NPTS.LT.1)GO TO 360                00008630
C   ROTATE POINT SOURCE COORDINATES      00008640
DO 321 T=1,NPTS                         00008650
  XSAVE=XPSCS(1)                         00008660
  YSAVE=YPSCS(1)                         00008670
  XPSCS(T)=XSAVE*COST+YSAVE*STNT       00008680
  YPSCS(T)=YSAVE*COST-XSAVE*STNT       00008690
321  CONTINUE                            00008700
360  CONTINUE                            00008710
C   ROTATE RECEPTOR COORDINATES          00008720
DO 322 T=1,NREC                         00008730
  XSAVE=XRCS(1)                          00008740
  YSAVE=YRCS(1)                          00008750
  XRCS(T)=XSAVE*COST+YSAVE*STNT        00008760
  YRCS(T)=YSAVE*COST-XSAVE*STNT        00008770
322  CONTINUE                            00008780
      RETURN                             00008790
END
SUBROUTINE CONTRP
C   RIP VERSION 1.1 LEVEL 800702 CONTRP 00008800
REAL CHT(100),PARTCH(100),CHTL(100),FTSAVE(129) 00008810
REAL L,LEFF,L0,LELEV 00008820
INTEGER NSEGA(7)/3,5,0,17,33,65,129/ 00008830
LOGICAL LSHEAR,LTRANS 00008840
COMMON/PRLS/XFH,LEFF,L0,R0,XFINAL,XFS 00008850
COMMON/SOURCE/PLINES,XLRFG(10),XLENG(10),PFI(10),YSCS(10),OT(10), 00008860
1 HS(10),XRCS(10,129),YRCS(10,129),TCOR,LELEV(10), 00008870
2 NPTS,XPSCS(50),YPSCS(50),PHS(50),XPSCS(50),YPSCS(50), 00008880
3 1STACK(50),APTS(50),APTS(50),VEXTT(50),PELEV(50),IDOWNW(50) 00008890
COMMON/RECEP/RXREG,RYREG,RXEND,RYEND,RDX,RDY,XRSCS(100), 00008900
1 YRSCS(100),YRRC(100),RFLLEV(100),NREC 00008910
COMMON/RINTP/YNST(7),DH(7) 00008920
COMMON/MFTD/ZMFAS,WS,IO,TSTAR,TDEGK,DPHL,THETA,S,P,TYP,JDAY,IHOUR 00008930
COMMON/PRCL,HR,ZH,WB,EPRTMP,FP,XMATCH,DX,AVFACT,TWCHR,N,LSHEAR, 00008940
1 LTRANS 00008950
COMMON/PRLDAT/TWOPBL,PRL1R6 00008960
COMMON/DUTPT/IPCL(11),IPCP(51) 00008970
COMMON/PAHM/CRIT,TE<1,DECFAC,XBACKS,CONST2,CONST3,MAXIT 00008980
DATA PI/3.1415927/,SRTPOP/0.7978846/,TAPHI/0/,JTICT/0/ 00008990
DO 5 T=1,NREC
  CHI(T)=0.0 00009000
5   CHI(T)=0.0 00009010
  IF(NLINES.LT.1)GO TO 2000 00009020
  THETA=THETA+0.5 00009030
  WSST=WS*(HR/SEAS)**P 00009040
C   SET EFFECTIVE WIND SPEED USED IN PLUME RISE 00009100
C   CALCULATIONS, D, 10 STACK HEIGHT WIND SPEED, WSST -- 00009110
C   IF USING WIND SHEAR OPTION IN PLUME RTSE, D WILL BE 00009120
C   CALCULATED IN SUBROUTINE MSC 00009130
  D=WSST 00009140

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IF(LSHEAR)CALL WSC(ISTAB,WSST,U,S,P)          00009150
CALL UENG(THETA,U)                            00009160
C
C   CALCULATE DISTANCE TO FINAL RISE           00009170
C
C   IF(ISTAB.LE.4)GO TO 6                      00009180
C   CALCULATE DISTANCE TO FINAL RISE FOR STABLE CONDITIONS 00009190
C   UNSRT=16.*U*U/S-XFB*XFB/3.                  00009200
C   IF(UNSRT.LE.0.0)GO TO 105                   00009210
C   XFS=0.5*(XFB+SQRT(UNSRT))                 00009220
C   GO TO 106                                  00009230
105  XFS=(12.*XFB*U*U/S)**0.3333333            00009240
106  IF(XFS.GT.XFB)GO TO 7                     00009250
DO 18 I=2,7
18   XDIST(I)=XFS                           00009260
GO TO 10
10   XFS=XFB+XFINAL                         00009270
CONTINUE
C   FIND 5 INTERMEDIATE DOWNWIND DISTANCES (IN ADDITION TO XFB) 00009280
C   AT WHICH PLUME RISE WILL BE CALCULATED      00009290
DO 9 I=2,7
9    RI=FLOAT(I)
     XDYST(I)=XFS-(XFS-XFB)*(7.-RI)/5.        00009300
CONTINUE
10   CONTINUE
CONTINUE
10   CALL RISE(U,THETA,ISTAB,S)                00009310
C
C   CALCULATE PARTIAL CONCENTRATIONS DUE TO THE LINE SOURCES 00009320
C
C   LOOP OVER LINES                           00009330
C
C   DO 1000 LNUM=1,NLINES                      00009340
C   DLMIN=DEL(LNUM)/128.
C   ZB=LELEV(LNUM)                            00009350
C   ZLINE=HS(LNUM)                            00009360
C   WSST=WS*(ZLINE/ZMEAS)**P                 00009370
C   CUQ=QT(LNUM)/((NSEGA(1)-1)*WSST)         00009380
C   SRT2DP = SQRT(2./PI)                      00009390
C   SZ0=R0*SRT2DP                            00009400
C   ZV=1000.*XVZ(SZ0,ISTAB)                  00009410
C   SY0=SZ0/2.
C   YV=1000.*XVY(SY0,ISTAB)                  00009420
C   XB=XRC(S(LNUM,1)                         00009430
C   YB=YRC(S(LNUM,1)                         00009440
C   XE=XRC(S(LNUM,129)                       00009450
C   YE=YRC(S(LNUM,129)                       00009460
C   XMAXL=AMAX1(XB,XE)                      00009470
C   XMINL=A MIN1(XB,XE)                     00009480
C   YMAXL=AMAX1(YB,YE)                      00009490
C   YMINL=A MIN1(YB,YE)                     00009500
C   DXEL=XE-XB                            00009510
C   DYEL=YE-YB                            00009520
C
C   LOOP OVER RECEPTORS                      00009530
C
C   DO 500 I=1,NRFC                          00009540
C   SUM=0.0                                 00009550
C   PARTCH(I)=0.0                            00009560
C   NSEG=0                                  00009570
C   NCONTR=0                                00009580
C   XRECEP=XRRCS(I)                         00009590
C   THt=RELFLV(I)-ZB                         00009600
C

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C TF RECEPTOR IS DOWNWIND OF THE LINE, DHT > 6.0 00009786  
 C 00009790  
 C TF(YRECFP,LT,XMIN)GO TO 500 00009800  
 YRECFP=YRRCOS(1) 00009810  
 C TF(STG) KEEPS TRACK OF WHETHER ANY LINE SEGMENT IS WITHIN 00009820  
 ONE SIGMA Y OF THE CURRENT RECEPTOR (DENO,1EYES)  
 C TADSTG=0 00009830  
 C DEFTIME REGION OF INFLUENCE 00009840  
 C MAX DISTANCE FROM ANY SOURCE SEGMENT TO CURRENT RECEPTOR 00009850  
 C IS EQUAL TO (XRECFP-XMTNL) 00009860  
 XMAXKME=(XRECFP-XMTNL)/1000. 00009870  
 CALL STGMAY(XMAXKME,TSTAR,SYC) 00009880  
 YL=SYMTNL+4.\*SYC 00009890  
 YHIGH=SYMAXL+4.\*SYC 00009900  
 TF(YRECFP,LT,YLOW,DR,YRECFP,GT,YHIGH)GO TO 500 00009910  
 YLOW=YLOW+1E-10 00009920  
 YHIGH=YHIGH-1E-10 00009930  
 TF(YRECFP,LT,YLOW,DR,YRECFP,GT,YHIGH)GO TO 500 00009940  
 CHECK IF RECEPTOR IS DIRECTLY DOWNWIND OF 00009950  
 THE LINE (IDW=0EN0, IDW=1EYES)  
 IDW=1 00009960  
 TF(YRECFP,LT,YMIN,DR,YRECFP,GT,YMAXL)IDW=0 00009970  
 CHECK IF RECEPTOR IS ON THE DOWNWIND SIDE OF THE LINE 00009980  
 TF(XRECFP,GE,XMAXL)GO TO 477 00010010  
 TF(MOD(TTHETA,90),EQ,0)GO TO 477 00010020  
 FMDYFL=1/XE1 00010030  
 RZYE=EM\*XF 00010040  
 TF(XRECFP,LT,(YRECFP-B)/EM)MCNTRE=999 00010050  
 477 CONTINUE 00010060  
 NSEG=ENSEGA(1) 00010070  
 NNEGENSEG0 00010080  
 TTER=0 00010090  
 TNOL=1 00010100  
 TDELTAT=12A/(NSEG-1) 00010110  
 498 CONTINUE 00010120  
 NSEG=ENSEG+NNE 00010130  
 C LOOP OVER LINE SEGMENTS 00010140  
 C 00 499 ISF6=1,NMFW 00010150  
 FTSAVE(TNOL)=0.0 00010160  
 C TF CURRENT RECEPTOR IS UPWIND OF A SOURCE SEGMENT, THEN 00010170  
 C THIS SOURCE SEGMENT DOES NOT CONTRIBUTE 00010180  
 TF(XRCS(LNM,TNL),GE,XRECFP)GO TO 495 00010190  
 DOWNX=XRECFP-XRCS(LNM,TNL) 00010200  
 CROSSY=YRECFP-YRCS(LNM,TNL) 00010210  
 CROSSE=YRECFP-YRCS(LNM,TNL) 00010220  
 VIRTXY=DOWNX+ZV 00010230  
 VIRTXY=DOWNX+YY 00010240  
 VXXKM=VTRIXX/1000. 00010250  
 VXXKM=VTRIXX/1000. 00010260  
 CALL DHTSTG(VXZKN,VXXKM,TSTAR,SYG,STGZ) 00010270  
 00010280  
 C TF CROSSWTND DISTANCE > 4 \* SIGY, THEN THIS SOURCE SEGMENT 00010290  
 C DOES NOT CONTRIBUTE 00010300  
 TF(4.\*SYG,LT,ABS(CROSSY))GO TO 495 00010310  
 TF(ABS(CROSSY),LT,SYG)TDSIGE=1 00010320  
 CALL ZRTSE(LNM,TNL,TZ) 00010330  
 00010340  
 C INCLUDE TERRAIN CORRECTION IN DETERMINING THE PLUME HEIGHT 00010350  
 C 00010360  
 C HNT=Z+ZL(THE 00010370  
 C TER1=1.+TERAN(1STAR)); THTELELEM(T)-ELEV(LNM) 00010380  
 C TERRAN=TER1\*AVAL1(RHT,THT) 00010390  
 00010400

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H=HNIT-TERRAN          00010410
IF(H.GT.,DPHL)GO TO 495 00010420
C
C   SOLVE THE GAUSSIAN POINT SOURCE EQUATION 00010430
C
C   CALL GAUSS(CROSSY,SIGY,SIGZ,H,FT) 00010440
C   INCLUDE DECAY IN DETERMINING CHT 00010450
C   DELTAT=DOWNX/WSST 00010460
C   FT=FT*(1.-DELTAT*DECFFAC) 00010470
C   FTSAVE(INDL)=FT 00010480
C   NCONTR=NCONTR+1 00010490
495  INDL=INDL+IDELTA 00010500
499  CONTINUE 00010510
C
C   FIRST TIME THROUGH LOOP, CALCULATE THE FIRST CHI ESTIMATE 00010520
C
C   IF(NNEW.NE.NSEG0)GO TO 714 00010530
C   TNDL=1 00010540
C   NSEGMI=NSEG0-1 00010550
C   SUM=(FTSAVE(1)+FTSAVE(129))/2. 00010560
DO 712 ISEG2=2,NSEGMI 00010570
C   INDL=TNDL+IDELTA 00010580
C   SUM=SUM+FTSAVE(INDL) 00010590
712  CONTINUE 00010600
C   IF RECEPTOR IS WITHIN REGION OF INFLUENCE BUT NOT DIRECTLY 00010610
C   DOWNWIND OF ANY PART OF THE LINE, AND SUM=0.0, CHI=0.0 00010620
C   IF(SUM.LE.0.0.AND.IDW.NF.1)GO TO 500 00010630
C
C   CALCULATE THE REFINED CHI ESTIMATE 00010640
C
C   713  CONTINUE 00010650
ITER=ITER+1 00010660
IDIV=MIN0(ITER,2) 00010670
IDELTA=IDELTA/IDIV 00010680
INDL=1+IDELTA/2 00010690
C
C   INDL IS THE SUBSCRIPT OF THE FIRST NEW LINE SEGMENT 00010700
C   (SAVE AS INDLSV) 00010710
C   INDLSV=INDL 00010720
NNEW=NSEGMI**ITER+0.1 00010730
C
C   IF MORE THAN 129 LINE SEGMENTS (I.F., 64 NEW SEGMENTS) 00010740
C   ARE REQUIRED, CONTINUE TO INCREASE THE NUMBER OF 00010750
C   SEGMENTS BUT ONLY OVER THE SECTION OF THE LINE 00010760
C   WHICH IS CONTRIBUTING 00010770
C   IF(NNEW.GT.64)GO TO 759 00010780
C   GO TO 498 00010790
714  CONTINUE 00010800
C
C   SUBSCRIPT OF THE FIRST NEW LINE SEGMENT IS INDLSV 00010810
C   SUBSCRIPT OF THE LAST NEW LINE SEGMENT IS INDLLN 00010820
C   INDLLN=129-IDELTA/2 00010830
C
C   SUM THE FIRST AND LAST NEW LINE SEGMENTS 00010840
C   SUM2=FTSAVE(INDLSV)+FTSAVE(INDLLN) 00010850
C
C   IF THERE ARE ONLY 2 NEW LINE SEGMENTS, SKIP THIS LOOP 00010860
C   IF(NNEW.LE.2)GO TO 717 00010870
C   INDL=INDLSV 00010880
C   I2=NNEW-1 00010890
C
C   FIND THE SUM OF ALL THE NEW LINE SEGMENTS 00010900
C
C   DO 715 ISEG3=2,I2 00010910
C   INDL=INDL+IDELTA 00010920
C   SUM2=SUM2+FTSAVE(INDL) 00010930
715  CONTINUE 00010940
717  CONTINUE 00010950
C
C   00010960
C
C   00010970
C   00010980
C
C   00010990
C
C   00011000
C   00011010
C   00011020
C
C   00011030

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C      COMPARE THE NEW ESTIMATE WITH THE PREVIOUS ESTIMATE          00011040
C
C      SUM2=SUM/2.+SUM2/(2.*ITER)                                     00011050
C      AT LEAST ONE LINE SEGMENT MUST BE WITHIN ONE SIGMA Y OF        00011060
C      THE LINE (IF THE RECEPTOR IS DIRECTLY DOWNWIND OF ANY PART      00011070
C      OF THE LINE)                                                 00011080
C      IF(IDW.EQ.1.AND.IWOSIG.NE.1)GO TO 758                         00011090
C      DIFF=ABS(SUM2-SUM)                                         00011100
C      IF(DIFF*CHQ.LT.0.1)GO TO 720                         00011110
C      CORR=DIFF/SUM2                                         00011120
C      IF(CORR.LT.CRIT)GO TO 720                         00011130
C      CONTINUE                                         00011140
758    SUM2=SUM2                                         00011150
      GO TO 713                                         00011160
C      IF 129 SOURCE SEGMENTS NOT SUFFICIENT, CONTINUE             00011170
C      TO INCREASE NUMBER OF SEGMENTS, BUT ONLY OVER THE           00011180
C      SECTION OF LINE WHICH IS CONTRIBUTING                      00011190
759    CONTINUE                                         00011200
      CALL SORT(FTSAVE,TRMIN,TBMAX,TWPBL)                         00011210
      IF(IWPBL.NE.999)GO TO 4949                         00011220
      IWPBL=0                                         00011230
      PARTCH(T)=0.0                                         00011240
      GL TO 500                                         00011250
      CONTINUE                                         00011260
4949   IBMAX1=IBMAX-1                                         00011270
      IH=0                                         00011280
      IGMAX1=1                                         00011290
      CONTINUE                                         00011300
      SUM2=0.0                                         00011310
      XGMAX1=IGMAX+1                                         00011320
      DO 940 IG=IBMIN,IBMAX1                         00011330
C      XCLN = X COORDINATE (RCS) OF CURRENT (NEWEST) LINE SEGMENT 00011340
C      YCLN = Y COORDINATE (RCS) OF CURRENT (NEWEST) LINE SEGMENT 00011350
      XSEG1=XRCS(LNUM,IG)                                         00011360
      XDIFF=XRCS(LNUM,IG+1)-XSEG1                         00011370
      YSEG1=YRCS(LNUM,IG)                                         00011380
      YDIFF=YRCS(LNUM,IG+1)-YSSEG1                         00011390
      DO 940 IGSUB=1,IGMAX                         00011400
      WEIGHT=FLOAT(IGSUB)/XGMAX1                         00011410
      XCLN=XSEG1+WEIGHT*XDIFF                         00011420
      YCLN=YSSEG1+WEIGHT*YDIFF                         00011430
      DOWNX=XRECEP-XCLN                                         00011440
      CROSSY=YRECEP-YCLN                                         00011450
      VIRTXY=DOWNX+ZV                                         00011460
      VIRTXY=DOWNX+YY                                         00011470
      VXYKM=VIRTXY/1000.                                         00011480
      VXZKM=VIRTXY/1000.                                         00011490
      CALL DBTSIG(VXZKM,VXYKM,ISTAB,SIGY,SIGZ)           00011500
      CALL TRISE(LNUM,IG,1,Z)                                         00011510
      C      INCLUDE TERRAIN CORRECTION IN DETERMINING THE PLUME HEIGHT 00011520
      HNT=Z+ZLINE                                         00011530
      TER1=(1.-TERAN(ISTAB)); THt=RELEV(I)-LELEV(LNUM)       00011540
      TERRAN=TER1*AMIN1(HNT,THt)                         00011550
      H=HNT-TERRAN                                         00011560
      CALL GAUSS(CROSSY,SIGY,STGZ,H,FT)                   00011570
      C      INCLUDE DECAY IN DETERMINING CHT                  00011580
      DELTATE=DOWNX/XSST                                         00011590
      FT=FT*(1.-DELTAT*DFCFAC)                         00011600
      SUM2=SUM2+FT                                         00011610
      NCONTR=NCONTR+1                                         00011620
      CONTINUE                                         00011630
940    C      COMPARE THE NEW ESTIMATE WITH THE PREVIOUS ESTIMATE 00011640
      CONTINUE                                         00011650
      CONTINUE                                         00011660

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    SUM2=SUM/2.+SUM2/(2.*ITER)          00011670
    DIFF=ABS(SUM2-SUM)                 00011680
    IF(DIFF*CU0.LT.0.1)GO TO 720      00011690
    CORR=DIFF/SUM2                   00011700
    IF((CORR.LT.CRT1)GO TO 720       00011710
    SUM=SUM2                         00011720
    ITER=ITER+1                      00011730
    IF(ITER.GE.MAXIT)GO TO 599        00011740
    IH=IH+1                          00011750
    IGMAX=2**IH                      00011760
    GO TO 939                         00011770
720  CONTINUE                        00011780
    SUM=SUM2                         00011790
C     TEST TO MAKE SURF AT LEAST TWO LINE SEGMENTS CONTRIBUTED 00011800
C     TO THE CHI ESTIMATE                                     00011810
C     (UNLESS RECEPTOR IS ON THE UPWIND SIDE OF THE LINE WITH 00011820
C     SOME SOURCE SEGMENTS DOWNWIND AND SOME SOURCE SEGMENTS 00011830
C     UPWIND -- IN THAT CASE JUST USE THE TEST FOR CONVERGENCE) 00011840
    IF(NCONTR.LT.2)GO TO 713          00011850
C     CALCULATE CONCENTRATION (IN MICROGRAMS)                00011860
C     USE STACK HEIGHT WIND SPEED FOR DILUTION                  00011870
    PARTCH(I)=CU0*SUM                      00011880
    CHIL(I)=CHIL(I)+PARTCH(I)            00011890
    GO TO 500                         00011900
599  WRITE(6,600)MAXIT,I,LNUM,CORR,CRT,ITER,IHOUR,I DAY,IYR   00011910
600  FORMAT(//'0','TOO MANY ITERATIONS IN LINE SOURCE CALCULATIONS', 00011920
1  ' -- MAXIT = ',I2/1X,'RECEPTOR ',I3,                    00011930
1  ' PROBABLY TOO CLOSE TO LINE ',I2/ 00011940
2  1X,'CORR = ',F6.2/1X,'CRT = ',F6.2/1X,'ITER = ',I3/ 00011950
3  1X,'(IHOUR, IDAY, IYR) = ',I2,',',I3,',',I2,')')        00011960
    JITCT=JITCT+1                     00011970
    IF(JITCT.GT.100)GO TO 6491         00011980
    SUM=SUM2                         00011990
    PARTCH(I)=CU0*SUM                  00012000
    CHIL(I)=CHIL(I)+PARTCH(I)        00012010
    GO TO 500                         00012020
6491 WRITE(6,6492)                   00012030
6492 FORMAT(//'0','TOO MANY EXCEDENCES OF LINE SOURCE ', 00012040
1  'ITERATION MAXIMUM -- EXECUTION TERMINATING')           00012050
    STOP                            00012060
500  CONTINUE                        00012070
    IF(IPCL(LNUM).EQ.1)CALL OUTPUT(LNUM,PARTCH,NREC)        00012080
1000 CONTINUE                        00012090
    IF(IPCL(11).EQ.1)CALL OUTPUT(11,CHIL,NREC)              00012100
C     CALCULATE PARTIAL CONCENTRATIONS DUE TO THE POINT SOURCES 00012110
C     LOOP OVER POINTS                           00012120
C                                         00012130
C                                         00012140
C                                         00012150
2000 IF(NPTS.LT.1)GO TO 9949        00012160
    IF(TSTAR.GT.4)SQR1S=SQR1(S)          00012170
    DO 2100 NUMPT=1,NPTS               00012180
    ZB=PELEV(NUMPT)                   00012190
    XSTACK=XPRCS(NUMPT)                00012200
    YSTACK=YPRCS(NUMPT)                00012210
    ZSTACK=PHS(NUMPT)                 00012220
    WSST=WS*(ZSTACK/ZMEAS)**P          00012230
    CU0=PA(NUMPT)/WSST                00012240
    RUDYFX=APTS(NUMPT)*(TSTACK(NUMPT)-TDEGK) 00012250
    IF(TSTAR.GT.4)GO TO 7150          00012260
C     CALCULATE DISTANCE TO FINAL RISEF             00012270
    IF(RUDYFX.GT.55.)GO TO 7010        00012280
C     THE CONSTANT 49. = 3.5*14.          00012290

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XSMT=49.*RHOYFX**0.625          00012300
GO TO 7015                      00012310
7010 XSMT=3.5*CONST3*RHOYFX**0.4 00012320
GO TO 7015                      00012330
7150 XSMT=3.14159*WSST/SNRTS    00012340
7015 CONTINUE                     00012350
C                                     00012360
C IF THE POINT SOURCE BUILDING DOWNWASH OPTION IS REQUESTED, 00012370
C DETERMINE THE EFFECTS (IF ANY) OF BUILDING DOWNWASH      00012380
C                                     00012390
C                                     00012400
ZV=0.0                           00012410
YY=0.0                           00012420
IF (IDOWNNW(NUMPT).NE.1) GO TO 512 00012430
C CALCULATE THE MOMENTUM RISE AT A DOWNWIND DISTANCE OF 2.*HB 00012440
C FM3 = 3.*FM (I.E., 3.*VERTICAL MOMENTUM FLUX TERM)        00012450
FM3=RHTS(NUMPT)*TDFGK           00012460
BETAM=0.3333333+WSST/VEXIT(NUMPT) 00012470
IF (ISTAH.GT.4) GO TO 509         00012480
EFFHT=ZSTACK+(FM3*TWOHB/(BETAM*BETAM*WSST*WSST))**0.333333 00012490
GO TO 511                         00012500
509 EFFHT=ZSTACK+(FM3*SIN(SNRTS*TWOHB/WSST)/
1 (BETAM*BETAM*WSST*SNRTS))**0.333333 00012510
511 CONTINUE                        00012520
RATIO=EFFHT/HB                   00012530
RATIO=AMAX1(RATIO,1.0)            00012540
C IF RATIO GE 3.0, SIGY AND SIGZ ARE NOT MODIFIED            00012550
C IF RATIO LT 3.0 AND GT 1.2, ONLY SIGZ IS MODIFIED        00012560
C IF RATIO LE 1.2, BOTH SIGY AND SIGZ ARE MODIFIED        00012570
IF (RATIO.GE.3.0) GO TO 512       00012580
R0Z=HB*(1.5-RATIO/2.)             00012590
SZ0=SRT2DP*R0Z                  00012600
ZV=1000.*XVZ(SZ0,ISTAH)          00012610
A=5.0*R0Z                        00012620
B=8.3333333*R0Z*R0Z              00012630
IF (RATIO.GT.1.2) GO TO 512       00012640
ROY=HB*(6.-5.*RATIO)/2.          00012650
SY0=SRT2DP*ROY                  00012660
YY=1000.*XVY(SY0,ISTAH)          00012670
512 CONTINU                         00012680
C                                     00012690
C LOOP OVER RECEPTORS             00012700
C                                     00012710
DO 2050 I=1,NREC                00012720
PARTCH(I)=0.0                     00012730
DOWNX=XRRC(1)-XSTACK              00012740
IF (DOWNX.LT.0.0) GO TO 2050       00012750
CROSSY=YRRC(1)-YSTACK              00012760
VIRTXZ=DOWNX+ZV                  00012770
VIRTXY=DOWNX+YY                  00012780
VXZKM=VIRTXZ/1000.                 00012790
VXYKM=VIRTXY/1000.                 00012800
CALL DBTSIG(VXZKM,VXYKM,ISTAB,SIGY,SIGZ) 00012810
IF (4.*SIGY.LT.ABS(CROSSY)) GO TO 2050 00012820
IF (IDOWNNW(NUMPT).NE.1) GO TO 1517 00012830
ZSAVE=9999.                         00012840
C                                     00012850
C IF THE SHEAR AND DOWNWASH OPTIONS ARE BOTH REQUESTED, 00012860
C USE THE MINIMUM OF Z(SHEAR) AND Z(DOWNWASH)        00012870
C                                     00012880
C                                     00012890
1 LTRANS                            00012900
IF (ISTAH.GT.4) GO TO 1515          00012910
1514 CONTINUE                       00012920

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EXR=AMIN1(DOWNX,XSM1)          00012930
IF(.NOT.LTRANS)EXREXSMT        00012940
C=-4.1666667*BUOYFX*EXR*EXR/WSST**3 00012950
GO TO 1516                      00012960
1515 IF(DOWNX.LT.2.*SGRT(WSST/S))GO TO 1514 00012970
C=-16.666667*BUOYFX/(WSST*S)    00012980
1516 CONTINUE                     00012990
CALL CUBIC(A,B,C,Z)            00013000
Z=AMIN1(Z,ZSAVE)               00013010
GO TO 1518                      00013020
1517 CONTINUE                     00013030
CALL PTRISF(BUOYFX,ZSTACK,XSMT,DOWNX,WSST,Z,LSHEAR,LTRANS) 00013040
1518 CONTINUE                     00013050
HNT=Z+ZSTACK                   00013060
THT=RELEV(I)-ZR               00013070
C   TER1=(1.-TERAN(ISTAB))      00013080
TERAN=TER1*AMIN1(HNT,THT)     00013090
H=HNT-TERAN                   00013100
IF(H.GT.DPBL)GO TO 2050       00013110
CALL GAUSS(CROSSY,SIGY,SIGZ,H,FT) 00013120
C   INCLUDE DECAY IN DETERMINING CHI 00013130
DELTAT=DOWNX/WSST              00013140
FT=FT*(1.-DELTAT*DECFC)       00013150
PARTCH(I)=C00*FT              00013160
CHI(I)=CHI(I)+PARTCH(I)       00013170
00013180
2050 CONTINUE                     00013190
ICODE=100+NUMPT               00013200
IF(IPCP(NUMPT).EQ.1)CALL OUTPUT(ICODE,PARTCH,NREC) 00013210
2100 CONTINUE                     00013220
IF(IPCP(51).EQ.1)CALL OUTPUT(151,CHI,NREC) 00013230
9999 CONTINUE                     00013240
DO 9050 I=1,NREC               00013250
CHI(I)=CHI(I)+CHIL(I)+XHACKG 00013260
9050 CONTINUE                     00013270
CALL OUTPUT(999,CHI,NREC)      00013280
RETURN                         00013290
END
SUBROUTINE GAUSS(CROSSY,SIGY,SIGZ,H,FT) 00013300
C   BLP VERSION 1.1 LEVEL 800212 GAUSS 00013310
COMMON/METD/ZMEAS,WS,WD,ISTAB,TDEGK,DPBL,THETA,S,P,IYR,JDAY,IHOUR 00013320
COMMON/PBLDAT/TWOPBL,PRL1P6 00013330
DATA TMIN/0.0512/,TMAX/9.21/ 00013340
T01=3.1415927*SIGY*SIGZ 00013350
YPSIG=CROSSY/SIGY 00013360
EXPYP=0.5*YPSIG*YPSIG 00013370
C   PREVENT UNDERFLOWS 00013380
IF(EXPY.PT.50.)GO TO 495 00013390
F=EXP(-FPYP) 00013400
GO TO 496 00013410
495 F=0.0 00013420
GO TO 443 00013430
496 CONTINUE 00013440
C   IF SIGZ GT 1.6*DPBL, ASSUME A UNIFORM VERTICAL DISTRIBUTION 00013450
IF(SIGZ.GT.PRL1P6)GO TO 460 00013460
C   IF MIXING HEIGHT (DPBL) GE 5000 M OR FOR STABLE CONDITIONS, 00013470
C   NEGLECT THE REFLECTION TERMS 00013480
C   IF(ISTAB.GE.5,OR.DPBL.GT.5000.)GO TO 451 00013490
C   CALCULATE MULTIPLE EDDY REFLECTIONS TERMS 00013500
C   USING A FOURIER SERIES METHOD -- SEE FRT MEMO CS 093 00013510
C   F1#1 00013520
T=(SIGZ/DPBL)**2 00013530
H2=H/DPBL 00013540
IF(T.GE.0.6)GO TO 500 00013550

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ARG=2.*(1.-H2)/T          00013560
IF(ARG.GE.TMAX)GO TO 400  00013570
IF(ARG.LT.TMIN)F1=F1+1.-ARG 00013580
IF(ARG.GE.TMIN)F1=F1+EXP(-ARG) 00013590
ARG=2.*(1.+H2)/T          00013600
IF(ARG.GE.TMAX)GO TO 400  00013610
F1=F1+EXP(-ARG)          00013620
ARG=4.*(2.-H2)/T          00013630
IF(ARG.GE.TMAX)GO TO 400  00013640
F1=F1+EXP(-ARG)          00013650
ARG=4.*(2.+H2)/T          00013660
IF(ARG.LT.TMAX)F1=F1+EXP(-ARG) 00013670
ARG=-0.5*H2*H2/T          00013680
IF(ARG.LT.-90.)F1=0.0      00013690
C CONSTANT 0.797885 = SQRT(2./PI) 00013700
IF(ARG.GE.-90.)F1=0.797885*F1*EXP(ARG)/SIGZ 00013710
IF(F1.LT.1.E-30)F1=0.0    00013720
GO TO 1500                00013730
C CONSTANT 4.934802 = PI*PI/2. 00013740
500 ARG=4.934802*1         00013750
IF(ARG.GE.TMAX)GO TO 900  00013760
F1=F1+2.*EXP(-ARG)*COS(3.141593*H2) 00013770
C CONSTANT 19.759209 = 2.*PI*PI 00013780
ARG=19.759209*T           00013790
IF(ARG.LT.TMAX)F1=F1+2.*EXP(-ARG)*COS(6.283185*H2) 00013800
900 F1=F1/DPBL             00013810
IF(F1.LT.1.E-30)F1=0.0    00013820
1500 CONTINUE               00013830
C THE CONSTANT 1.25331414 = SQRT(PI/2.) 00013840
F1=1.25331414*SIGZ*F1   00013850
GO TO 445                 00013860
451 CONTINUE               00013870
HPSIG=H/SIGZ              00013880
EXPHP=0.5*HPSIG*HPSIG    00013890
IF(EXPHP.GT.50)GO TO 443  00013900
F1=EXP(-EXPHP)            00013910
GO TO 445                 00013920
443 F1=0.0                  00013930
445 CONTINUE               00013940
C FIND PRODUCT OF EXPONENTIAL TERMS DIVIDED BY (PI*SIGY*SIGZ) 00013950
FT=F*F1/TD1                00013960
GO TO 470                 00013970
460 CONTINUE               00013980
C VERTICAL DISTRIBUTION ASSUMED UNIFORM 00013990
C THE CONSTANT 2.5066283 = SQRT(2.*PI) 00014000
FT=F/(2.5066283*SIGY*OPBL) 00014010
470 RETURN                 00014020
FND
SUBROUTINE SORT(FTSAVE,IBMIN,IBMAX,IWPBL) 00014030
C BLP VERSION 1.1 LEVEL 800212 SORT 00014040
REAL FTSAVE(129)             00014050
ISAFE=0                      00014060
IB=0                         00014070
IF(FTSAVE(129).NE.0.0)IB=129 00014080
IF(FTSAVE(1).NE.0.0)IB=1    00014090
IF(IB.NE.0)GO TO 970        00014100
DO 950 ILEVFL=1,7           00014110
NEACHL=2**(ILFVEL-1)        00014120
INCR=2**(8-TLEVFL)          00014130
INDFX=1+INCR/2              00014140
DO 945 NC=1,NEACHL          00014150
IF(FTSAVE(INDEX).EQ.0.0)GO TO 944 00014160
IB=INDEX                      00014170
00014180

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GO TO 970          00014190
944 INDEX=INDEX+INCR 00014200
945 CONTINUE        00014210
950 CONTINUE        00014220
IF (IR.NE.0) GO TO 970 00014230
TWPAL=999           00014240
RETURN             00014250
970 IIRMIN=IR-1     00014260
IIRMAX=IR+1         00014270
IIRMIN=AAMAX0(IIRMIN,1) 00014280
IIRMAX=AAMIN0(IIRMAX,129) 00014290
975 CONTINUE        00014300
INCRM=0             00014310
INCRP=0             00014320
IF (FTSAVE(IIRMIN).NE.0.0) INCRM=1 00014330
IF (IIRMIN.FQ.1) INCRM=0 00014340
IF (FTSAVE(IIRMAX).NE.0.0) INCRP=1 00014350
IF (IIRMAX.EQ.129) INCRP=0 00014360
IIRMIN=IIRMIN-INCRM 00014370
IIRMAX=IIRMAX+INCRP 00014380
IF (INCRM.EQ.0.AND.INCRP.EQ.0) GO TO 980 00014390
ISAFE=ISAFE+1       00014400
IF (ISAFE.GT.129) GO TO 980 00014410
GO TO 975           00014420
980 CONTINUE        00014430
RETURN             00014440
END                00014450
SUBROUTINE OUTPUT(ICODE,CHIS,NREC) 00014460
C      BLP   VERSION 1.1  LEVEL 800212      OUTPUT 00014470
REAL CHIS(NREC)    00014480
COMMON/METO/ZMEAS,WS,WD,ISTAR,TDEGK,DPBL,THETA,S,P,IYR,JDAY,IHOUR 00014490
00014500
C      THIS SUBROUTINE OUTPUTS ALL CHI ARRAYS TO TAPE (OR DISK) 00014510
C      TCODE IDENTIFIES THE CHI ARRAY TO FOLLOW: 00014520
C      ICODE = 1 TO 10 IMPLIES THE CHI ARRAY IS THE PARTIAL 00014530
C      CONTRIBUTION OF LINE NUMBER "TCODE" AT EACH RECEPTOR 00014540
00014550
C      ICODE = 11 IMPLIES THE CHI ARRAY IS THE PARTIAL 00014560
C      CONTRIBUTION OF ALL THE LINES AT EACH RECEPTOR 00014570
00014580
C      ICODE = 101 TO 150 IMPLIES THE CHI ARRAY IS THE PARTIAL 00014590
C      CONTRIBUTION OF POINT SOURCE NUMBER "ICODE - 100" AT 00014600
C      EACH RECEPTOR 00014610
00014620
C      ICODE = 151 IMPLIES THE CHI ARRAY IS THE PARTIAL 00014630
C      CONTRIBUTION OF ALL THE POINT SOURCES AT EACH RECEPTOR 00014640
00014650
C      ICODE = 999 IMPLIES THE CHI ARRAY IS THE TOTAL 00014660
C      CONCENTRATION SUMMED OVER ALL THE POINT AND LINE SOURCES AT 00014670
C      EACH RECEPTOR 00014680
C      IDAYHR=JDAY*100+IHOUR 00014690
C      ROUND THE WS (NEAREST TENTHS OF M/S) AND 00014700
C      THE DPBL (NEAREST METER) 00014710
C      IWS=(WS+0.05)*10 00014720
C      IDPBL=DPBL+0.5 00014730
C      IW0=WD 00014740
C      ICD=IWS*10000+ISTAR*1000+ICODE 00014750
C      IMET2=IW0*10000+IDPBL 00014760
C      WRITE(20) IDAYHR,ICD,IMET2,CHIS 00014770
C      RETURN 00014780
C      END 00014790
00014800
00014810

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C      SUBROUTINE PIRISE(BUOYFX,ZSTACK,XSMT,DOWNX,WSST,Z,LSHEAR,LTRANS) 00014820
C          BLP VERSION 1.1 LEVEL 800212          PIRISE                00014830
C      REAL LELFV                                00014840
C      LOGICAL LSHEAR,LTRANS                    00014850
C      COMMON/METD/ZMEAS,WS,ND,ISTAB,TDEGK,DPRL,THETA,S,P,TYR,JDAY,IHOUR 00014860
C      COMMON/PARM/CRIT,TER1,DECFACT,XBACKG,CONST2,CONST3,MAXIT        00014870
C
C      THIS SUBROUTINE CALCULATES POINT SOURCE PLUME RISE             00014880
C      WITH AN OPTIONAL VERTICAL WIND SPEED SHEAR CORRECTION FOR       00014890
C      BOTH NEUTRAL AND STABLE PLUME RISE                            00014900
C
C      A VALUE OF 0.6 IS ASSUMED FOR THE ENTRAINMENT                  00014910
C      PARAMETER (BETA)                                         00014920
C
C      X=DOWNX                                         00014930
C      TF(.NOT.LSHEAR)GO TO 145                         00014940
C      CONSTANT 2.777778 = 1. / (BETA*BETA) WITH BETA=0.6           00014950
C      CS=2.777778*BUOYFX                           00014960
C      CS2=ZSTACK**P                                 00014970
C      EP=3.* (1.+P)                               00014980
C      P3=3.*P                                     00014990
C      TP3=2.*P3                                  00015000
C
145    CONTINUE
C      X=A MIN(X,XSMT)                           00015010
C      IF(.NOT.LTRANS)X=XSMT                      00015020
C      IF(ISTAB.GT.4)GO TO 150                     00015030
C      IF(.NOT.LSHEAR)GO TO 170                   00015040
C
C      NEUTRAL-UNSTABLE PLUME RISE WITH SHEAR            00015050
C
C
16     CONTINUE
C      BETA (ENTRAINMENT PARAMETER) IS ASSUMED TO BE 0.6           00015060
C      A1=CS*X*X/WSST**3                                00015070
C      CONSTANT 0.8735805 = (2./3.)** (1./3.)               00015080
C      RMULT=0.8735805*(EP*EP*CS2**3/(TP3*A1**P))** (1./EP) 00015090
C      RMULT=AMIN1(RMULT,1.0)                          00015100
C      Z=RMULT*(1.5*A1)**0.333333                   00015110
C      IF(ISTAB.LE.4)GO TO 39                         00015120
C      Z=A MIN(Z,(6./CSV1)**0.333333)                 00015130
C      Z=A MIN(Z,5.0*BUOYFX**0.25/S**0.375)          00015140
C
39    CONTINUE
C      RETURN                                         00015150
C
C      NEUTRAL-UNSTABLE PLUME RISE -- NO SHEAR            00015160
C
C
170   CONTINUE
C      Z=1.6*(BUOYFX*X*X)**0.333333/WSST              00015170
C      IF(ISTAB.GT.4)Z=A MIN(Z,ZB)                     00015180
C      RETURN                                         00015190
C
C      STABLE PLUME RISE -- NO SHEAR                  00015200
C
C
175   CONTINUE
C      ZMTT=5.0*BUOYFX**0.25/S**0.375               00015210
C      CONST2 HAS A DEFAULT VALUE OF 2.6 (BRIGGS, 1975) 00015220
C      ZB=CONST2*(BUOYFX/(WSST*S))**0.333333         00015230
C      ZB=A MIN(ZB,ZMTT)                            00015240
C      IF(X.LT.XSMT)GO TO 170                        00015250
C      Z=ZB                                         00015260
C      RETURN                                         00015270
C
C      STABLE PLUME RISE WITH SHEAR                  00015280
C
C

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150 CONTINUE
1 IF(.NOT.LSHEAR)GO TO 175
1 XPFSSQRT((TP3*CS2*CS/(WSST*S))**FP/P3)*TP3*WSST**3/(EP*EP*CS2**300015470
1 *CS))
1 CSV1=WSST*CS/CS
1 IF(XLT,XPFSS)GO TO 16
1 CONSTANT .5503212=(1./6.)**(1./3.)
1 RMULT=0.5503212*CSV1**P/(3.*P3)*(TP3*CS2)**(1./P3)
1 RMULTEAMIN1(RMULT,1.0)
1 Z=RMULT*(6./CSV1)**0.333333
1 Z=AMIN1(Z,5.0*BUOYFX**0.25/S**0.375)
1 RETURN
1 END
1 SUBROUTINE CUBIC(A,B,C,Z)
1 BLP VERSION 1.1 LEVEL 800212 CUBIC
1
1 SOLVES FOR ONE ROOT OF THE CUBIC EQUATION:
1 Z**3 + A*Z**2 + B*Z + C = 0
1
1 DATA ONE/1.0/
1 A3=A/3.
1 AP=B-A*A3
1 BP=2.*A3**3-A3*B+C
1 AP3=AP/3.
1 BP2=BP/2.
1 TROOT=BP2*BP2+AP3*AP3*AP3
1 IF(TROOT.LE.0.0)GO TO 50
1 TR=SQRT(TROOT)
1 APP=(-BP2+TR)**0.333333
1 BSV=-BP2-TR
1 SGN=SIGN(ONE,BSV)
1 RPP=SGN*(ABS(BSV))**0.333333
1 Z=APP+RPP-A3
1 RETURN
50 CM=2.*SQRT(-AP3)
1 ALPHA=ACOS(BP/(AP3*CM))/3.
1 Z=CM*COS(ALPHA)-A3
1 RETURN
1 END
1 SUBROUTINE WSC(ISTAB,UM,U,S,P)
1 BLP VERSION 1.1 LEVEL 800212 WSC
1 REAL L
1 LOGICAL LSHEAR,LTRANS
1 COMMON/PR/L,HB,WB,WM,FPRIME,FP,XMATCH,DX,AFACT,TWOB,N,LSHEAR,
1 LTRANS
1 CALCULATES AN EFFECTIVE U USING THE LINE SOURCE PLUME
1 RISE EQUATION (LINE SOURCE TERM ONLY)
1 MATCHED AT X = XF (FINAL RISE)
1 IF(ISTAB.GT.4)GO TO 50
1
1 NEUTRAL (OR UNSTABLE) CONDITIONS
1
1 P3=3.*P
1 EP=2.+P3
1 FPI=1./FP
1 CONSTANT 2.4=4.*BFTA WITH BFTA=0.6
1 T1=(EP*EP*N*FPRIME*HB**P3/(2.4*(P.+P)*L*UM**3))**EPI
1 Z=T1*XMATCH**2.*EPI
1 CONSTANT 1.2 = 2.*BFTA WITH BETA=0.6
1 U=(N*FPRIME/(1.2*L)*(XMATCH/Z)**2)**0.333333
1 U=AMAX1(U,UM)
1 RETURN
50 CONTINUE

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C          00016080
C          STARFL CONDITIONS 00016090
C          00016100
C          P2=P+.+P 00016110
C          CONSTANT 0.6 = 4BETA 00016120
C          Z=(P2*HB**F*N*FPRIIME/(0.6*L*UM*S))**((1./P2) 00016130
C          CONSTANT 3.3333333 = 2./BETA WITH BETA=0.6 00016140
C          U=3.3333333*N*FPRIIME/(L*S*Z*Z) 00016150
C          U=A MAX1(U,UM) 00016160
C          RETURN 00016170
C          END 00016180
C          SUBROUTINE LENG(THETA,U) 00016190
C          BLP VERSION 1.1 LEVEL 800212 LENG 00016200
C          REAL L,LEFF,LD,LEFF1,LEFFV 00016210
C          LOGICAL LSHEAR,LTRANS 00016220
C          COMMON/PR/L,HB,WB,WM,FPRIIME,FP,XMATCH,DX,AFACT,TWOHB,N,LSHEAR, 00016230
C          1 LTRANS 00016240
C          COMMON/PRLS/XFB,LEFF,LD,R0,XFINAL,XFS 00016250
C          DATA PI/3.1415927/,RAD/0.0174533/ 00016260
C          00016270
C          THIS SUBROUTINE CALCULATES XFB,LEFF,LD,R0 00016280
C          00016290
C          FPRIIME IS THE BUOYANCY FLUX OF ONE LINE; FP IS THE EFFECTIVE 00016300
C          BUOYANCY FLUX OF N LINES 00016310
C          FF=N*FPRIIME 00016320
C          TRAD=THETA*RAD 00016330
C          SINT=ABS(SIN(TRAD)) 00016340
C          COST=ABS(COS(TRAD)) 00016350
C          CALCULATE DISTANCE OF FULL BUOYANCY (XFB) 00016360
C          DXM=DX+WB 00016370
C          XFB=L*COST+(N-1)*DXM*SINT 00016380
C          CALCULATE EFFECTIVE LINE SOURCE LENGTH (LEFF) AND 00016390
C          EFFECTIVE DOWNWASH LINE LENGTH (LD) 00016400
C          LEFF1=L*SINT 00016410
C          IF(N.EQ.1)GO TO 112 00016420
C          CONSTANT 0.8333333 = 1./(2.*BETA) WITH BETA=0.6 00016430
C          ZI=0.8333333*DXM 00016440
C          CONSTANT 2.2619467 = 2.*PI*BETA*BFTA WITH BFTA=0.6 00016450
C          CONSTANT 1.5915494 = 3./(PI*BETA) WITH BETA=0.6 00016460
C          T1=(2.2619467*U**3/FPRIIME)*ZI*ZI*(ZI+1.5915494*WM) 00016470
C          XI=(T1*L)**0.333333 00016480
C          IF(XI.LE.L)GO TO 55 00016490
C          XI=L/2.+SQRT(12.*T1-3.*L*L)/6. 00016500
C          CONSTANT 1.2 = 2.*BETA WITH BFTA=0.6 00016510
C          CONSTANT 0.6283185 = PI*BETA/3. WITH BETA=0.6 00016520
C          LEFFFV=FP*(L*L/3.+XI*(XI-L))/(1.2*U**3*ZI*ZI)-0.6283185*ZI 00016530
C          GO TO 110 00016540
C          55 CONTINUE 00016550
C          CONSTANT 3.6 = 6.*BETA WITH BETA=0.6 00016560
C          CONSTANT 0.6283185 = PI*BETA/3. WITH BETA=0.6 00016570
C          LEFFFV=FP/(3.6*L*ZI*ZI)*(XI/U)**3-0.6283185*ZI 00016580
C          110 LEFF=LEFF1+LEFFFV*COST 00016590
C          LD=LEFF*SINT 00016600
C          CALCULATE DOWNWASHED EDGE RADIUS 00016610
C          R0=A MIN1(HB,LD)/AFAC 00016620
C          RETURN 00016630
C          IF N = 1, NO INTERACTION AT ANY Y, I.E., 00016640
C          LEFFFV = WM; FP = FPRIIME; XFB = L * COST + WM * SINT 00016650
C          112 LEFFFV=WM 00016660
C          FP=FPRIIME 00016670
C          XFB=XFB+WM*SINT 00016680
C          GO TO 110 00016690
C          END 00016700

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C SUBROUTINE ZRISE(U,THETA,ISTAR,S)          .00016710
C   BLP  VERSION 1.1  LEVEL 800212    ZRISE      .00016720
C   REAL LEFF,LD          .00016730
C   LOGICAL LSHEAR,LTRANS      .00016740
C   COMMON/PRI/LVMB,WB,WM,FPRIME,FP,XMATCH,DY,AFACT,TWOBH,N,LSHEAR,  .00016750
C   LTRANS      .00016760
C   COMMON/PRLS/XFB,LEFF,LD,R0,XFINAL,XFS      .00016770
C   COMMON/RINTP/XDIST(7),DH(7)      .00016780
C   COMMON/RINTP/XDIST(7),DH(7)      .00016790
C
C THIS SUBROUTINE CALCULATES LINE SOURCE PLUME RISE      .00016800
C USING AN OPTIONAL VERTICAL WIND SHEAR CORRECTED 'EFFECTIVE' WIND      .00016810
C SPEED FOR BOTH NEUTRAL AND STABLE CONDITIONS      .00016820
C      .00016830
C
C CONSTANT 1.5915494 = 3. / (PI * BETA) WITH BETA=0.6      .00016840
C CONSTANT 5.0 = 3. / BETA WITH BETA=0.6      .00016850
C A=1.5915494*LEFF+5.*R0      .00016860
C CONSTANT 5.3051648 = 6. / (PI * BETA * BETA) WITH BETA=0.6      .00016870
C CONSTANT 8.3333333 = 3. / (BETA * BETA) WITH BETA=0.6      .00016880
C R=R0*(5.3051648*LD+8.3333333*R0)      .00016890
D0 1000 I=2,7      .00016900
X=XDIST(I)      .00016910
IF(ISTAR.LE.4)GO TO 90      .00016920
WITH STABLE CONDITIONS, USE NEUTRAL RISE EQUATION      .00016930
FOR TRANSITIONAL RISE CALCULATIONS, BUT CALCULATE      .00016940
FINAL RISE BASED ON THE FINAL STABLE RISE EQUATION      .00016950
00016960
IF(X.LT.XFS)GO TO 90      .00016970
CALCULATE FINAL (STABLE) PLUME RISE      .00016980
CONSTANT 5.3051648 = 6. / (PI * BETA * BETA) WITH BETA=0.6      .00016990
92 C=-5.3051648*FP/(U*S)      .00017000
GU TO 8      .00017010
CONTINUE      .00017020
IF(X.LE.XFB)GO TO 80      .00017030
CONTINUE      .00017040
CONSTANT 1.3262912 = 3. / (2. * PI * RETA * BETA) WITH BETA=0.6      .00017050
C=-1.3262912*FP*(XFB*XFB/3.+X*X-XFB*X)/U**3      .00017060
8 CONTINUE      .00017070
CALL CURIC(A,B,C,Z)      .00017080
12 CONTINUE      .00017090
DH(I)=Z      .00017100
GO TO 1000      .00017110
CONSTANT 0.4420971 = 1. / (2. * PI * RETA * BETA) WITH BETA=0.6      .00017120
80 C=-0.4420971*(FP/XFB)*(X/U)**3      .00017130
GU TO 8      .00017140
1000 CONTINUE      .00017150
RETURN      .00017160
END      .00017170
SUBROUTINE ZRISE(IL,IS,IR,Z)      .00017180
C   BLP  VERSION 1.1  LEVEL 800212    ZRISE      .00017190
C   REAL LEFF,LD,LELEV      .00017200
C   COMMON/RCEPT/RXBEG,RYBEG,RXEND,RYEND,RDX,RDY,XRSCS(100),  .00017210
1 YRSCS(100),XRRCS(100),YRRC(100),RFLEV(100),NRFC      .00017220
COMMON/SOURCE/NLINES,XLBEG(10),XLEND(10),DEL(10),YSCS(10),QT(10),  .00017230
1 HS(10),XRCS(10,129),YRCS(10,129),TCOR,LFLEV(10),      .00017240
2 NPTS,XPSCS(50),YPSCS(50),PO(50),PHS(50),XPRCS(50),YPRCS(50),  .00017250
3 TSTACK(50),APTS(50),BPTS(50),VEXIT(50),PELEV(50),IDOWNW(50)      .00017260
COMMON/PRLS/XFB,LEFF,LD,R0,XFINAL,XFS      .00017270
COMMON/RINTP/XDIST(7),DH(7)      .00017280
C
C Z1 IS THE PLUME HEIGHT OF THE HIGHEST PLUME SEGMENT AT X = XFB      .00017290
C (EXCEPT IN THE SPECIAL CASE OF STABLE CONDITIONS WITH      .00017300
C THE DISTANCE TO FINAL RISE (XFS) LESS THAN XFB -- IN      .00017310
C THAT CASE, Z1 IS THE HEIGHT OF THE HIGHEST PLUME ELEMENT      .00017320
C AT X=XFS)      .00017330

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C XI IS THE DISTANCE OF THE CURRENT LINE SEGMENT TO XFB          00017340
C                                                               00017350
C                                                               00017360
C Z1=DH(2)                                                       00017370
C XFXFB=XDIST(2)                                                 00017380
C XI=XFXFB-XRCS(IL,IS)                                         00017390
C ZXFB=Z1+(1.-(XFXFB-XI))/XFXFB                                00017400
C Z2 IS THE PLUME HEIGHT OF THE HIGHEST SEGMENT AT X             00017410
C CALL INTRSE(XRCS(IR),Z2)                                         00017420
C DELTAZ=Z2-Z1                                                 00017430
C Z=ZXFB+DELTAZ                                              00017440
C RETURN                                                       00017450
C END
C SUBROUTINE INTRSE(X,Z)                                         00017460
C   BLP   VERSION 1.1  LEVEL 800212      INTRSE                  00017470
C   REAL LEFF,LD                                                 00017480
C   COMMON/PRLS/XFB,LEFF,LD,R0,XFINAL,XFS                      00017490
C   COMMON/RJNTP/XDIST(7),DH(7)                                 00017500
C
C THIS SUBROUTINE INTERPOLATES THE PLUME RISE OF THE TOP (HIGHEST) 00017520
C PLUME ELEMENT AT ANY DISTANCE X USING THE CALCULATED              00017530
C PLUME RISE AT SEVEN POINTS (XDIST(1-7))                           00017540
C                                                               00017550
C
C IF (X.GT.XDIST(7))GO TO 55                                     00017560
C DO 10 I=2,6
C IF(X.GT.XDIST(I))GO TO 10
C INDEX=1                                                       00017590
C GO TO 11                                                       00017600
C 10 CONTINUE                                                       00017610
C INDEX=5                                                       00017620
C 11 CONTINUE                                                       00017630
C INDEX1=INDEX-1                                                 00017640
C Z=DH(INDEX)-(DH(INDEX)-DH(INDEX1))*(XDIST(INDEX)-X)/        00017650
C 1 (XDIST(INDEX)-XDIST(INDEX1))                                00017660
C RETURN                                                       00017670
C 55 CONTINUE                                                       00017680
C PLUME REACHES FINAL RISE                                     00017690
C Z=DH(7)
C RETURN                                                       00017710
C END
C SUBROUTINE DBTSIG (X,XY,KST,SY,SZ)                               00017730
C   BLP   VERSION 1.1  LEVEL 800212      DBTSIG                  00017740
C   DIMENSION XA(7),XR(2),XD(5),XE(8),XF(9),AA(8),BA(8),AB(3),BB(3),
C 1 AD(6),BD(6),AE(9),BE(9),AF(10),BF(10)                      00017750
C   DATA XX/.5,.4,.3,.25,.2,.15,.1/                            00017760
C   DATA XB/.4,.2/
C   DATA XD /30.,10.,3.,1.,.3/
C   DATA XE /40.,20.,10.,4.,2.,1.,.3.,.1/
C   DATA XF /60.,30.,15.,7.,3.,2.,1.,.7.,.2/
C   DATA AA /453.85,346.75,258.89,217.41,179.52,170.22,158.08,122.8/
C   DATA BA /2.1166,1.7283,1.4094,1.2644,1.1262,1.0932,1.0542,.9447/
C   DATA AB /109.30,98.483,90.673/
C   DATA BB /1.0971,0.98332,0.93198/
C   DATA AD /44.053,36.650,33.504,32.093,32.093,34.459/
C   DATA BD /0.51179,0.56589,0.60486,0.64403,0.81066,0.86974/
C   DATA AE /47.618,35.420,26.970,24.703,22.534,21.628,21.628,23.331,
C 1 24.26/
C   DATA BE /0.29592,0.37615,0.46713,0.50527,0.57154,0.63077,0.75660,
C 1 0.81956,0.8366/
C   DATA AF /34.219,27.074,22.651,17.836,16.187,14.823,13.953,13.953,
C 1 14.457,15.209/
C   DATA BF /0.21716,0.27436,0.32681,0.41507,0.46490,0.54503,0.63227,
C 1 0.68465,0.78407,0.81558/
C   GO TO (10,20,30,40,50,60),KST                                00017960

```

```

C      STABILITY A (10)          00017970
10 TH = (24.167 - 2.5334*ALOG(XY))/57.2958 00017980
    IF (X.GT.3.11) GO TO 69 00017990
    DO 11 ID = 1,7 00018000
    IF (X.GE.XA(ID)) GO TO 12 00018010
11 CONTINUE 00018020
    ID = 8 00018030
12 SZ = AA(ID) * X ** RA(ID) 00018040
    GO TO 71 00018050
C      STABILITY B (20)          00018060
20 TH = (18.333 - 1.8096*ALOG(XY))/57.2958 00018070
    IF (X.GT.35.) GO TO 69 00018080
    DO 21 ID = 1,2 00018090
    IF (X.GE.XB(ID)) GO TO 22 00018100
21 CONTINUE 00018110
    ID = 3 00018120
22 SZ = AB(ID) * X ** RB(ID) 00018130
    GO TO 70 00018140
C      STABILITY C (30)          00018150
30 TH = (12.5 - 1.0857*ALOG(XY))/57.2958 00018160
    SZ = 61.141 * X ** 0.91465 00018170
    GO TO 70 00018180
C      STABILITY D (40)          00018190
40 TH = (8.3333-0.72382*ALOG(XY))/57.2958 00018200
    DO 41 ID = 1,5 00018210
    IF (X.GE.XD(ID)) GO TO 42 00018220
41 CONTINUE 00018230
    ID = 6 00018240
42 SZ = AD(ID) * X ** RD(ID) 00018250
    GO TO 70 00018260
C      STABILITY E (50)          00018270
50 TH = (6.25 - 0.54287*ALOG(XY))/57.2958 00018280
    DO 51 ID = 1,8 00018290
    IF (X.GE.XE(ID)) GO TO 52 00018300
51 CONTINUE 00018310
    ID = 9 00018320
52 SZ = AE(ID) * X ** RE(ID) 00018330
    GO TO 70 00018340
C      STABILITY F (60)          00018350
60 TH = (4.1667 - 0.36191*ALOG(XY))/57.2958 00018360
    DO 61 ID = 1,9 00018370
    IF (X.GE.XF(ID)) GO TO 62 00018380
61 CONTINUE 00018390
    ID = 10 00018400
62 SZ = AF(ID) * X ** RF(ID) 00018410
    GO TO 70 00018420
69 SZ = 5000. 00018430
    GO TO 71 00018440
70 IF (SZ.GT.5000.) SZ = 5000. 00018450
71 SY = 1000. * XY * SIN(TH)/(P.15 * COS(TH)) 00018460
    RETURN 00018470
    END 00018480
    SUBROUTINE SIGMAY(XKM,KST,SY) 00018490
    BLP VERSION 1.1 LEVEL 800212 SIGMAY 00018500
C      THIS SUBROUTINE CALCULATES SIGMA Y 00018510
C      GO TO (10,20,30,40,50,60),KST 00018520
10 TH=(24.167-2.5334*ALOG(XKM))/57.2958 00018530
    GO TO 70 00018540
20 TH=(18.333-1.8096*ALOG(XKM))/57.2958 00018550
    GO TO 70 00018560
30 TH=(12.5-1.0857*ALOG(XKM))/57.2958 00018570
    GO TO 70 00018580
30 TH=(12.5-1.0857*ALOG(XKM))/57.2958 00018590

```

```

        GO TO 70                                00018600
40      TH=(8.3333-0.72385*ALOG(XKM))/57.2958   00018610
        GO TO 70                                00018620
50      TH=(6.25-0.54287*ALOG(XKM))/57.2958   00018630
        GO TO 70                                00018640
60      TH=(4.1667-0.36191*ALOG(XKM))/57.2958   00018650
70      SY=1000.*XKM*SIN(TH)/(2.15*COS(TH))    00018660
        RETURN                                 00018670
        END                                    00018680
        FUNCTION XVZ (SZ0,KST)                 00018690
C       BLP VERSION 1.1 LEVEL 800212      XVZ          00018700
        DIMENSION SA(7),SB(2),SD(5),SE(8),SF(9),AA(8),AB(3),AD(6),AE(9), 00018710
* AF(10),CA(8),CH(3),CD(6),CE(9),CF(10)  00018720
        DATA SA /13.95,21.40,29.3,37.67,47.44,71.16,104.65/ 00018730
        DATA SB /20.23,40./                         00018740
        DATA SD /12.09,32.09,65.12,134.9,251.2/ 00018750
        DATA SE /3.534,8.698,21.628,33.489,49.767,79.07,109.3,141.86/ 00018760
        DATA SF /4.093,10.93,13.953,21.627,26.976,40.,54.89,68.84,83.25/ 00018770
        DATA AA /122.8,158.08,170.22,179.52,217.41,258.89,346.75,453.85/ 00018780
        DATA AB /90.673,98.483,109.3/                00018790
        DATA AD /34.459,32.093,32.093,33.504,36.650,44.053/ 00018800
        DATA AE /24.26,23.331,21.628,21.628,22.534,24.703,26.97,35.42, 00018810
* 47.618/                                     00018820
        DATA AF /15.209,14.457,13.953,13.953,14.823,16.187,17.836,22.651, 00018830
* 27.074,34.219/                            00018840
        DATA CA /1.0585,.9486,.9147,.8879,.7909,.7095,.5786,.4725/ 00018850
        DATA CB /1.073,1.017,.9115/                  00018860
        DATA CD /1.1498,1.2336,1.5527,1.6533,1.7671,1.9539/ 00018870
        DATA CE /1.1953,1.2202,1.3217,1.5854,1.7497,1.9791,2.1407,2.6585, 00018880
* 3.3793/                                     00018890
        DATA CF /1.2261,1.2754,1.4606,1.5816,1.8348,2.151,2.4092,3.0599, 00018900
* 3.6448,4.6049/                            00018910
        GO TO (10,20,30,40,50,60),KST            00018920
C       STABILITY A(10)                      00018930
10      DO 11 ID = 1,7                        00018940
        IF(SZ0.LE.SA(ID)) GO TO 12              00018950
11      CONTINUE                               00018960
        ID = 8                                  00018970
12      XVZ =(SZ0/AA(ID))**CA(ID)           00018980
        RETURN                                 00018990
C       STABILITY B (20)                      00019000
20      DO 21 ID = 1,2                        00019010
        IF(SZ0.LE.SB(ID)) GO TO 22              00019020
21      CONTINUE                               00019030
        ID = 3                                  00019040
22      XVZ =(SZ0/AB(ID))**CB(ID)           00019050
        RETURN                                 00019060
C       STABILITY C (30)                      00019070
30      XVZ =(SZ0/61.141)**1.0933           00019080
        RETURN                                 00019090
C       STABILITY D (40)                      00019100
40      DO 41 ID = 1,5                        00019110
        IF(SZ0.LE.SD(ID)) GO TO 42              00019120
41      CONTINUE                               00019130
        ID = 6                                  00019140
42      XVZ =(SZ0/AD(ID))**CD(ID)           00019150
        RETURN                                 00019160
C       STABILITY E (50)                      00019170
50      DO 51 ID = 1,8                        00019180
        IF(SZ0.LE.SE(ID)) GO TO 52              00019190
51      CONTINUE                               00019200
        ID = 9                                  00019210
52      XVZ =(SZ0/AF(ID))**CE(ID)           00019220

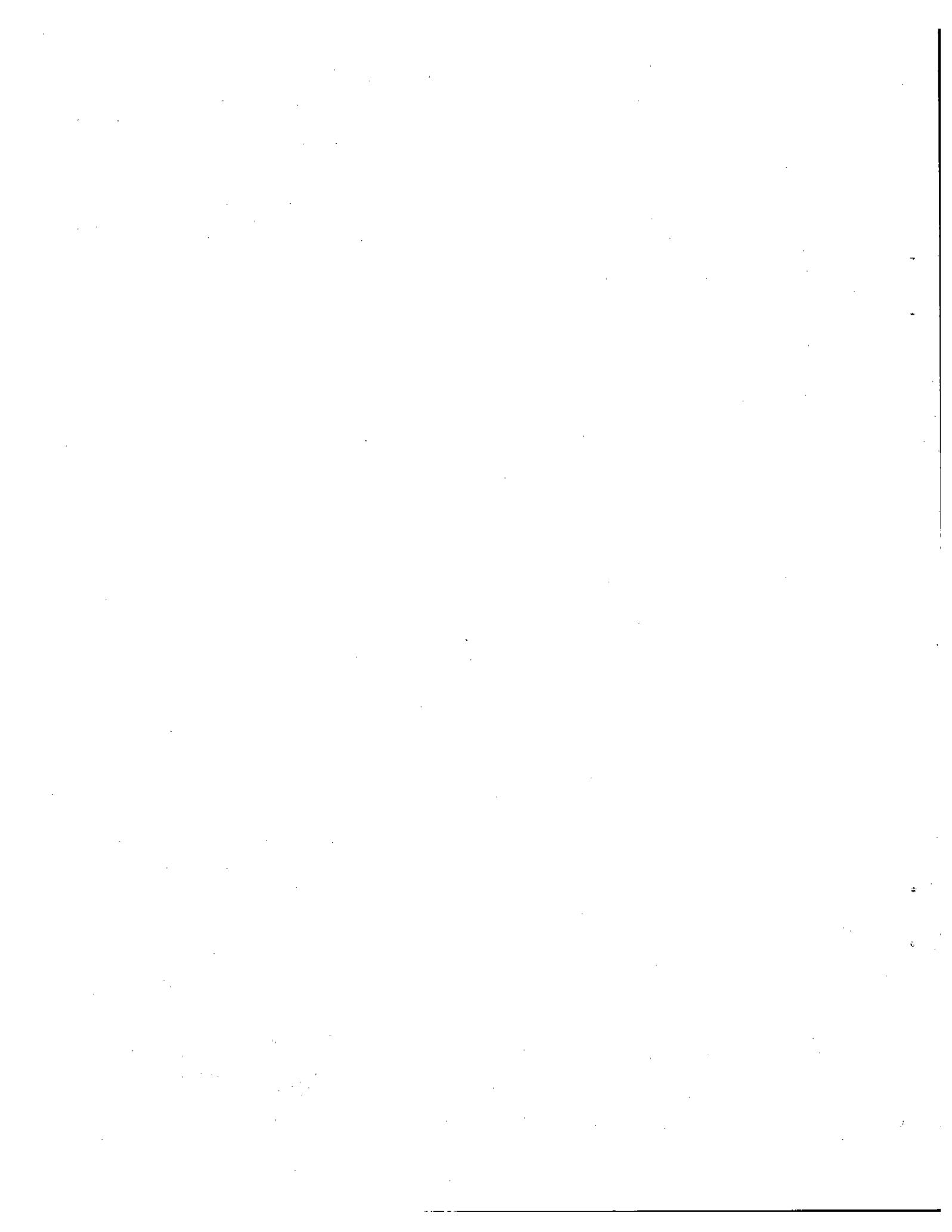
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      RF TURN          00019230
C       STARTL TTY F(60)          00019240
60      DO 61 IP = 1,9          00019250
       IF (SZ0.LE.SF (ID)) GO TO 62          00019260
61      CONTINUE          00019270
       ID = 10          00019280
62      XVZ = (SZ0/AF (ID))*CF (ID)          00019290
       RETURN          00019300
       END          00019310
       FUNCTION XXY (SY0,KST)          00019320
C       BLP  VERSTON 1.1  LEVEL 800212      XXY          00019330
       GO TO (1,2,3,4,5,6),KST          00019340
1      XXY = (SY0/213.)**1.1148          00019350
       RETURN          00019360
2      XXY = (SY0/155.)**1.097          00019370
       RETURN          00019380
3      XXY = (SY0/103.)**1.092          00019390
       RETURN          00019400
4      XXY = (SY0/68.)**1.076          00019410
       RETURN          00019420
5      XXY = (SY0/50.)**1.086          00019430
       RETURN          00019440
6      XXY = (SY0/33.5)**1.083          00019450
       RETURN          00019460
       END          00019470
       BLOCK DATA          00019480
C       BLP  VERSION 1.1  LEVEL 800212      BLOCK DATA          00019490
       REAL L,LELEV          00019500
       INTEGER*I? IDAYS          00019510
       LOGICAL LSHFAR,LMETIN,LMETOT,LTRANS          00019520
       COMMON/PR/L,HB,WH,WN,FPRIME,FP,XMATCH,DY,AVFACT,TWOHB,N,LSHFAR, 00019530
1      LTRANS          00019540
       COMMON/METO/ZMEAS,WS,WD,ISTAR,TDEGK,DPBL,THETA,S,P,IYR,JOAY,IHOUR 00019550
       COMMON/SOURCE/NLINES,XLHEG(10),XLEND(10),DEL(10),YSCS(10),QT(10), 00019560
1      HS(10),XRCS(10,129),YRCS(10,129),TCOR,LELEV(10),          00019570
2      NPTS,XPSCS(50),YPSCS(50),PD(50),PHS(50),XPHCS(50),YPRCS(50), 00019580
3      TSTACK(50),APTS(50),BPTS(50),VFXIT(50),PELEV(50),IDOWNNW(50) 00019590
       COMMON/RCFPT/RXHEG,RYREG,RXEND,RYEND,RDX,RDY,XRSCS(100),          00019600
1      YRSCS(100),XRSCS(100),YRSCS(100),RELFW(100),NREC          00019610
       COMMON/RINTP/XDIST(7),DH(7)          00019620
       COMMON/OUTPT/IPCL(11),IPCP(51)          00019630
       COMMON/PARM/CRIT,TER1,DECFC,BACKG,CONST2,CONST3,MAXIT          00019640
       COMMON/METO24/KST(24),SPEED(24),RANDWD(24),HMIX(24),TEMP(24), 00019650
1      DTHTA(2),PEXP(6),IDELS,IOSURF,IYSURF,IDUPER,IYUPER,TERAN(6), 00019660
2      IRU,IHRMAX,LMETIN,LMETOT,TDAYS(366)          00019670
       DATA AVFACT/1.0/          00019680
       DATA NLINES/0/,NPTS/0/,NREC/0/,TCOR/90.0/          00019690
       DATA ZMEAS/7.0/,DTHTA/0.02,0.035/,IDELS/5/,TDAYS/366*0/          00019700
       DATA IRU/1/,IHRMAX/24/          00019710
       DATA LSHEAR/.TRUE./,LMETIN/.FALSE./,LMETOT/.FALSE./,LTRANS/.TRUE./ 00019720
       DATA PEXP/0.10,0.15,0.20,0.25,0.30,0.30/          00019730
       DATA IYSURF/0/,IYUPER/0/          00019740
       DATA CRIT/0.02/,DECFC/0.0/,BACKG/0.0/,CONST2/2.6/,CONST3/34.49/ 00019750
1      TERAN/0.5,0.5,0.5,0.5,0.30,0.30/,MAXIT/14/          00019760
       DATA IPCL/11*0/,IPCP/51*0/          00019770
       DATA RXHEG/0.0/,RYREG/0.0/,RXEND/0.0/,RYEND/0.0/,RDX/0.0/,RDY/0.0/ 00019780
       DATA XRSCS/100*0.0/,YRSCS/100*0.0/,PELEV/100*0.0/          00019790
       DATA XLREG/10*0.0/,XLEND/10*0.0/,YSCS/10*0.0/,          00019800
1      HS/10*0.0/,QT/10*0.0/,LFLEV/10*0.0/          00019810
       DATA XPSCS/50*0.0/,YPSCS/50*0.0/,PHS/50*0.0/,PD/50*0.0/ 00019820
1      APTS/50*0.0/,TSTACK/50*0.0/,PELEV/50*0.0/,IDOWNNW/50*0/ 00019830
       END          00019840

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**APPENDIX B**  
**POSTBLP FORTRAN SOURCE LISTING**



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C                                         00000010
C***** 00000020
C                                         00000030
C      POSTBLP -- MULTIPLE BUOYANT LINE AND POINT SOURCE 00000040
C          DISPERSION MODEL (BLP) POST-PROCESSOR 00000050
C                                         00000060
C      POSTBLP   VERSION 1.1   LEVEL 800702      MATN 00000070
C                                         00000080
C      DEVELOPED BY: 00000090
C                                         00000100
C      JOE SCIRE AND LLOYD SCHULMAN 00000110
C      ENVIRONMENTAL RESEARCH AND TECHNOLOGY 00000120
C      696 VIRGINIA ROAD 00000130
C      CONCORD, MASSACHUSETTS 01742 00000140
C                                         00000150
C***** 00000160
C                                         00000170
C      REAL CHIS(100),CHJ3(100),CHT24(100),CHTANN(100) 00000180
C      REAL T50C1(50),T5RC1(100,5) 00000190
C      REAL T50C3(50),T5RC3(100,5) 00000200
C      REAL T50C24(50),T5RC24(100,5) 00000210
C      REAL TITLE(20) 00000220
C      INTEGER ISOC1(50),JSOC1(50),KSOC1(50) 00000230
C      INTEGER ISKC1(100,5) 00000240
C      INTEGER ISOC3(50),ISRC3(100,5) 00000250
C      INTEGER ISOC24(50),ISRC24(100,5) 00000260
C      INTEGER IPCL(11),IPCP(51) 00000270
C      INTEGER KDAY(5),KHR(5) 00000280
C      INTEGER IDM(12,2),TFM(12) 00000290
C      INTEGER IJAYS(366),NDYS,IFCHO(366) 00000300
C      INTEGER INTM,INTY,INTM3,INTY3,INTM24,INTY24,IREFCEP 00000310
C      INTEGER ISCODE 00000320
C      LOGICAL LFRQ1,LFRQ3,LFRQ24 00000330
C      LOGICAL LECH1,LECH3,LECH24 00000340
C      LOGICAL LSUM 00000350
C      LOGICAL LEND/.FALSE./ 00000360
C      LOGICAL LFRD/.FALSE./,LTRUF/.TRUE./ 00000370
C      EQUIVALENCE (CHILOW,T50C1(50)),(CHTL3,T50C3(50)) 00000380
C      EQUIVALENCE (CHIL24,T50C24(50)) 00000390
C      COMMON/ACODE/IYR,IDAY,IHOUR,ICODE,ISTAB,WS,IWD,IPRPL 00000400
C      COMMON/BCODE/TCD,IMET2,ICD1,ICD3,IDAYHR 00000410
C      COMMON/FRDIST/XINT(25),XTNT3(25),XINT24(25),NTNT,NINT3,NINT24, 00000420
1 INTM(25,12),INTY(25),INTM3(25,12),INTY3(25),INTM24(25,12), 00000430
2 INTY24(25),IREFCEP 00000440
COMMON/CHIPRT/NTA,NSUM,TS CODE(62),LSUM,IJCODE 00000450
NAMELTST/OPTS/XINT,XINT3,XINT24,NTNT,NINT3,NINT24, 00000460
1 LFRQ1,LFRQ3,LFRQ24,IREFCEP,IFCHO,LECH1,LECH3,LECH24, 00000470
2 NSUM,ISCODE,LSUM,IJCODE 00000480
DATA T50C1/50*0.0/,T5RC1/500*0.0/ 00000490
DATA T50C1/50*0/,JSOC1/50*0/,KSOC1/50*0/ 00000500
DATA T50C3/50*0.0/,T5RC3/500*0.0/ 00000510
DATA T50C3/50*0/,ISRC3/500*0/ 00000520
DATA T50C24/50*0.0/,T5RC24/500*0.0/ 00000530
DATA T50C24/50*0/,ISRC24/500*0/ 00000540
DATA CHIANN/100*0.0/,IDANN/0/ 00000550
DATA IDM/31,60,91,121,152,182,213,244,274,305,335,366, 00000560
1 31,59,90,120,151,181,212,243,273,304,334,365/ 00000570
DATA IFCHO/366*0/,IFM/12*0/ 00000580
DATA LFRQ1/.FALSE./,LFRQ3/.FALSE./,LFRQ24/.FALSE./ 00000590
DATA LECH1/.FALSE./,LECH3/.FALSE./,LECH24/.FALSE./ 00000600
DATA ALP1/'YES'/,ALP1/'NO'/,ALP2/'NO'/,ALP3/'NO'/ 00000610
DATA ALP4/'NO'/,ALP5/'NO'/,ALP6/'NO'/ 00000620
DATA ALPAR/(''/

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C IDENTIFY VERSION AND LEVEL NUMBERS OF BLP POSTPROCESSOR          00000640
C                                                               00000650
C                                                               00000660
C                                                               00000670
C                                                               00000680
C                                                               00000690
C                                                               00000700
1400  WRITE(6,1400)VERSION,LEVEL          FORMAT('1',40X,'BLP POSTPROCESSOR VERSION ',F4.1,3X,'LEVEL ',I6/00000700
C                                                               00000710
1     1 '0',13('*'*'*'*'*')           00000720
C                                                               00000730
C READ BLP POSTPROCESSOR USER INPUTS          00000740
C                                                               00000750
C                                                               00000760
C                                                               00000770
1402  READ(5,OPTS)          FORMAT(///)
C                                                               00000780
1402  WRITE(6,OPTS)          WRITE(6,1400)VERSION,LEVFL          00000790
C                                                               00000800
C                                                               00000810
C READ TITLE CARD AND OTHER GENERAL INFORMATION          00000820
C ON RECORD #1 OF THE OUTPUT FILE (20)          00000830
C                                                               00000840
C                                                               00000850
C READ(20)TITLE,NREC,NPTS,NLINES,IPCL,IPCPL,IYR,TDAYS          00000860
C                                                               00000870
8     WRITE(6,8)TITLE,IYR          FORMAT('0',20A4,SX,'YEAR: ',I2)
C                                                               00000880
C ILEAP = 1 (LEAP YEAR); ILEAP = 2 (NON-LEAP YEAR)          00000890
C                                                               00000900
C TLEAP=2          TF(MOD(IYR,4).EQ.0)ILEAP=1          00000910
NPH=MINO(NREC,50)          NRP=NREC/2          00000920
NPL=0          00000930
DO 121 I=1,11          NPL=NPL+IPCL(I)          00000940
NPP=0          00000950
DO 122 I=1,51          00000960
122  NPP=NPP+IPCPL(I)          00000970
C NTA IS THE NUMBER OF RECORDS FOR EACH HOUR          00000980
C                                                               00000990
NTA=1+NPL+NPP          00001000
NDYS=0          00001010
DO 135 I=1,366          00001020
135  NDYS=NDYS+TDAYS(I)          00001030
WRITE(6,136)NDYS,TDAYS          00001040
136  FORMAT(//'0','TOTAL NUMBER OF DAYS INCLUDED IN THIS RUN: ',T3//          00001050
1     1X,'(0=NOT INCLUDED; 1=INCLUDED)'//          00001060
2     3('0',10(I1,3X)/,'0',6(10I1,3X),6T1)          00001070
NT=NPTS+NLINES          00001080
WRITE(6,112)NT,NLINES,NPTS,NREC          00001090
112  FORMAT(//'0','TOTAL NUMBER OF SOURCES: ',T3//12X,'LINE SOURCES: ',00001100
1     T3//11X,'POINT SOURCES: ',T3///1X,'TOTAL NUMBER OF RECEPTORS: ',I3)00001110
IF(NLINES.LE.0)GO TO 57          00001120
WRITE(6,212)          00001130
212  FORMAT(//'0','SOURCE CONTRIBUTIONS FROM THE FOLLOWING LINE ',          00001140
1     'SOURCES ARE AVAILABLE: '/'0',(0=NOT AVAILABLE; 1=AVAILABLE)'//          00001150
2     '0','LINE SOURCE NUMBER',SX,'AVAILABILITY')
DO 219 I=1,NLINES          00001160
WRITE(6,215)I,IPCL(I)          00001170
215  FORMAT('0',7X,I2,19X,I1)          00001180
219  CONTINUE          00001190
WRITE(6,216)NLINES,IPCL(I)          00001200
216  FORMAT('0',5X,'1 = ',I2,17X,I1)          00001210
57   CONTINUE          00001220
IF(NPTS.LE.0)GO TO 58          00001230
WRITE(6,1400)VERSION,LEVEL          00001240
WRITE(6,222)          00001250
222  FORMAT(//'0','SOURCE CONTRIBUTIONS FROM THE FOLLOWING ',          00001260

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1 'POINT SOURCES ARE AVAILABLE: '/'0','(0=NOT AVAILABLE; ',          00001270
2 '1=AVAILABLE) '/'0','POINT SOURCE NUMBER',5X,'AVAILABILITY')      00001280
DO 239 I=1,NPTS
  WRITE(6,235)I,IPCP(I)
235  FORMAT('0',8X,I2,19X,I1)                                         00001290
239  CONTINUE
  WRITE(6,236)NPTS,IPCP(51)
236  FORMAT('0',6X,'1 = ',I2,17X,I1)                                     00001300
58   CONTINUE
  WRITE(6,1400)VERSON,LEVEL
  IF(.NOT.LSUM)WRITE(6,2000)IJCODE
2000 FORMAT(//'0',9X,'IJCODE = ',I3)                                       00001310
  IF(.NOT.LSUM)WRITE(6,2001)
2001 FORMAT('0','(IJCODE SPECIFIES THE BLP CONCENTRATION ',
1 'OUTPUT DATA USED IN THIS RUN OF POSTBLP.'/2X,'THE ',
1 'CONCENTRATION DATA ASSOCIATED WITH IJCODE IS AS FOLLOWS: ',
2 '0',9X,'IJCODE',
2 18X,'CONCENTRATION DATA'/'0',10X,'1-10',5X,'SOURCE CONTRIBUTION ',
3,'- LINE SOURCE NUMBER "IJCODE"/'12X,'11',6X,'SOURCE ',
4 'CONTRIBUTION - ALL LINE SOURCES'/10X,'101-150',3X,'SOURCE ',
5 'CONTRIBUTION - POINT SOURCE NUMBER "IJCODE = 100"/',
6 11X,'151',6X,'SOURCE CONTRIBUTION - ALL POINT SOURCES'/
7 11X,'999',6X,'TOTAL CONCENTRATION')
  IF(LSUM)WRITE(6,2012)NSUM,(ALPAR,NXX,ISCODE(NXX),NXX=1,NSUM)
2012 FORMAT(//'0','THE BLP CONCENTRATION DATA USED IN THIS RUN OF ',
1 'POSTBLP IS THE SUM OF THE FOLLOWING ',I3,' SETS'/2X,'OF ',
2 'SOURCE CONTRIBUTION DATA: '/'0',I3,3X),6(/9X,10(A1,I2,''),I3,2X))
  IF(LSUM)WRITE(6,2013)
2013 FORMAT(/9X,'WHERE THE CONCENTRATION DATA ASSOCIATED WITH EACH ',
1 'ISCODE IS IDENTIFIED AS FOLLOWS: '/'0',9X,'ISCODE',
2 18X,'CONCENTRATION DATA'/'0',10X,'1-10',5X,'SOURCE CONTRIBUTION ',
3,'- LINE SOURCE NUMBER "ISCODE"/'12X,'11',6X,'SOURCE ',
4 'CONTRIBUTION - ALL LINE SOURCES'/10X,'101-150',3X,'SOURCE ',
5 'CONTRIBUTION - POINT SOURCE NUMBER "ISCODE = 100"/',
6 11X,'151',6X,'SOURCE CONTRIBUTION - ALL POINT SOURCES'/
7 11X,'999',6X,'TOTAL CONCENTRATION')
  IF(LFRQ1)ALP1=ALPYES
  IF(LFRQ3)ALP2=ALPYES
  IF(LFRQ4)ALP3=ALPYES
  WRITE(6,2005)ALP1,ALP2,ALP3
2005 FORMAT(///'0','FREQUENCY DISTRIBUTIONS REQUESTED IN THIS',
1 ' POSTBLP RUN: '/'0',4X,'1-HOUR AVERAGES ? ',A3/5X,
2 '3-HOUR AVERAGES ? ',A3/4X,'24-HOUR AVERAGES ? ',A3)
  TF(LFRQ1.OR.LFRQ3.OR.LFRQ24)LFRQ=LTRUE
  IF(LFRQ)WRITE(6,2010)IRECFFP
2010 FORMAT('0','FREQUENCY DISTRIBUTION(S) FOR RECEPTOR NUMBER ',
1 I3)
  WRITE(6,1400)VERSON,LEVEL
  IF(LECH1)ALP4=ALPYES
  IF(LECH3)ALP5=ALPYES
  IF(LECH24)ALP6=ALPYFS
  WRITE(6,2015)IECHO
2015 FORMAT(//'0','CONCENTRATIONS AT EACH RECEPTOR ARE PRINTED ',
1 'FOR THE FOLLOWING DAYS: '/'0','(0=NOT PRINTED; 1=PRINTED) '
2 //3('0',10(I1,3X)),',0',6(10I1,3X),6I1)
  WRITE(6,2016)ALP4,ALP5,ALP6
2016 FORMAT('/0','AND FOR THE FOLLOWING AVERAGING TIMES: '
1 '0',4X,'1-HOUR AVERAGES ? ',A3/5X,'3-HOUR AVERAGES ? ',A3/
2 '4X,'24-HOUR AVERAGES ? ',A3)
  IMOLST=1
  IMD=1
  DO 1000 JDAY=1,366

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IF (TIDAYS(JDAY),NE,1)GO TO 1000          00001900
IF (JDAY.LE.TDN(1MOLST,1LEAP))GO TO 285  00001910
1MOLST=1MOLST+1                          00001920
DO 282 IJ=1MOLST,1E2                     00001930
IF (JDAY,LE,1DMC1MOLST,1LEAP))GO TO 283  00001940
1MOLST=1MOLST+1                          00001950
282 CONTINUE                               00001960
283 IMO=1MOLST                           00001970
285 CONTINUE                               00001980
IFM(IMO)=1                                00001990
MPERIO=0                                  00002000
DO 900 JHR=1,24                           00002010
CALL GETDAT(NREC,CHIS,LEND)                00002020
IF (LEND)GO TO 1001                         00002030
C
C   ONE HOUR AVERAGES
C
IF (LFR01)CALL FR01(CHIS,IMO,1)           00002040
IF (LFCH1.AND.IECHO(JDAY).EN,1)CALL OUTDAT(CHIS,IYR,JDAY,JHR,1,
1 NREC,NR2)                                00002050
00002060
00002070
00002080
00002090
00002100
C
C   FIND THE TOP 50 ONE HOUR CONCENTRATIONS
C
DO 310 J=1,NREC                         00002110
CHILOW HAS BEEN EQUIVALENCEED TO T50C1(50) 00002120
IF (CHIS(J).LE.CHTLOW)GO TO 310            00002130
CHIV=CHIS(J)
ICD2=ICD1*1000+J
T50C1 IS THE ARRAY OF THE TOP 50 HOURLY CONCENTRATIONS 00002140
T50C1 IS A CORRESPONDING ARRAY CONTAINING THE WS, STAR., AND 00002150
RECEPTOR NUMBER
J50C1 IS ANOTHER ARRAY CONTAINING THE WIND DIR. AND DPRL 00002160
INSERT THE NEW VALUE IN THE ARRAY OF TOP 50 VALUES (T50C1) AND 00002170
INCREMENT THE APPROPRIATE PORTION OF THE ARRAY UP BY ONE
DO THE SAME FOR THE ARRAYS J50C1 AND J50C1
00002180
00002190
00002200
00002210
00002220
00002230
00002240
00002250
00002260
00002270
00002280
00002290
00002300
00002310
00002320
00002330
00002340
00002350
00002360
00002370
00002380
00002390
00002400
00002410
00002420
00002430
00002440
00002450
00002460
00002470
00002480
00002490
00002500
00002510
00002520
350 CONTINUE                               00002400
IL=IP-2
TH=TP+3
DO 360 I=IL,TH
IF (CHIV.LT.T50C1(IP))ISGN=-1
IP=IP+ISGN*MAG
CONTINUE
360 CONTINUE
IRPLAC=I
GO TO 361
360 CONTINUE
IRPLAC=50
IF (CHIV.GE.T50C1(49))IRPLAC=49
CONTINUE
INDEX=50-IRPLAC
IF (INDEX.EQ.0)GO TO 375
DO 370 I=1,INDEX
II=50-I
T50C1(II+1)=T50C1(II)
T50C1(II+1)=T50C1(II)
J50C1(II+1)=J50C1(II)
K50C1(II+1)=K50C1(II)
370 CONTINUE
375 CONTINUE

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T50C1(IRPLAC)=CHIV          00002530
I50C1(IRPLAC)=ICD2          00002540
J50C1(IRPLAC)=IMET2         00002550
K50C1(IRPLAC)=IDAYHR        00002560
310  CONTINUE                00002570
C                                     00002580
C   FIND THE 5 HIGHEST HOURLY CONCENTRATIONS AT EACH RECEPTOR 00002590
C                                     00002600
C   DO 410 J=1,NREC           00002610
IF(CHIS(J).LE.TSRC1(J,5))GO TO 410          00002620
CHIV=CHIS(J)                      00002630
DO 415 J=1,4           00002640
IF(CHIV.LT.TSRC1(J,1))GO TO 415          00002650
IRPLAC=1                      00002660
GO TO 420                      00002670
415  CONTINUE                00002680
IRPLAC=5                      00002690
420  CONTINUE                00002700
INDEX=5-IRPLAC          00002710
TF(TINDEX.EQ.0)GO TO 435          00002720
DO 430 I=1,INDEX           00002730
II=5-I                      00002740
TSRC1(J,II+1)=TSRC1(J,II)          00002750
TSRC1(J,II+1)=ISRC1(J,II)          00002760
430  CONTINUE                00002770
435  CONTINUE                00002780
TSRC1(J,IRPLAC)=CHIV          00002790
TSRC1(J,IRPLAC)=IDAYHR        00002800
410  CONTINUE                00002810
C                                     00002820
C   3-HOUR AVERAGES          00002830
C                                     00002840
IF(MOD(JHR,3).EQ.1)GO TO 502          00002850
DO 501 NR=1,NREC           00002860
501  CHI3(NR)=CHI3(NR)+CHIS(NR)          00002870
GO TO 504                      00002880
502  CONTINUE                00002890
MPERID=MPERID+1          00002900
DO 503 NR=1,NREC           00002910
503  CHI3(NR)=CHIS(NR)          00002920
GO TO 599                      00002930
504  CONTINUE                00002940
TF(MOD(JHR,3).NE.0)GO TO 599          00002950
DO 505 NR=1,NREC           00002960
505  CHI3(NR)=CHI3(NR)/3.          00002970
TC04=IDAY*10+MPERID          00002980
IF(LFR03)CALL FRF0(CHI3,T04,3)          00002990
IF(LECH3.AND.IECHO(JDAY).EQ.1)CALL OUTDAT(CHI3,IYR,TDAY,MPERID,3, 00003000
1 NREC,NR2)
C                                     00003010
C   FIND THE TOP 50 3-HOUR AVERAGE CONCENTRATIONS          00003020
C                                     00003030
C   DO 510 J=1,NREC           00003040
C     CHI3 HAS BEEN ENOUTVALENED TO T50C3(50)          00003050
C     IF(CHI3(J).LT.CHIL3)GO TO 510          00003060
C     CHIV=CHI3(J)                      00003070
C     IPDATE=ICD4*1000+J          00003080
C     IP=24                      00003090
C     MAG=24                      00003100
C     DO 550 I=1,3           00003110
C     MAG=MAG/2                      00003120
C     ISGN=1                      00003130
C     IF(CHIV.GT.T50C3(IP))ISGN=-1          00003140
C                                     00003150

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IP=IP+ISGN*MAG          00003160
550 CONTINUE              00003170
    IL=IP+2                00003180
    TH=IP+3                00003190
    DO 560 T=IL,TH          00003200
    IF (CHIV.LT.T50C3(1)) GO TO 560 00003210
    IRPLACE=1               00003220
    GO TO 561               00003230
560 CONTINUE               00003240
    IRPLACE=50              00003250
    IF (CHIV.GE.T50C3(49)) IRPLACE=49 00003260
561 CONTINUE               00003270
    INDEX=50-IRPLACE        00003280
    IF (INDEX.EQ.0) GO TO 575 00003290
    DO 570 I=1,INDEX        00003300
    II=50-I                00003310
    T50C3(I,I+1)=T50C3(II) 00003320
    T50C3(II,I+1)=T50C3(II) 00003330
570 CONTINUE               00003340
575 CONTINUE               00003350
    T50C3(IRPLACE)=CHIV   00003360
    T50C3(IRPLACE)=IPDATE 00003370
510 CONTINUE               00003380
C FIND THE 5 HIGHEST 3-HOUR AVERAGE CONCENTRATIONS AT EACH RECEPTOR 00003390
C
    DO 590 J=1,NRFC         00003400
    IF (CHI3(J).LE.TSRC3(J,5)) GO TO 590 00003410
    CHIV=CHI3(J)            00003420
    DO 515 I=1,4             00003430
    IF (CHIV.LT.TSRC3(J,I)) GO TO 515 00003440
    IRPLACE=I               00003450
    GO TO 520               00003460
515 CONTINUE               00003470
    IRPLACE=5               00003480
520 CONTINUE               00003490
    INDEX=5-IRPLACE         00003500
    IF (INDEX.EQ.0) GO TO 535 00003510
    DO 530 I=1,INDEX        00003520
    II=5-I                 00003530
    TSRC3(J,II+1)=TSRC3(J,II) 00003540
    TSRC3(J,II+1)=TSRC3(J,II) 00003550
530 CONTINUE               00003560
535 CONTINUE               00003570
    TSRC3(J,IRPLACE)=CHIV  00003580
    TSRC3(J,IRPLACE)=IC04  00003590
590 CONTINUE               00003600
599 CONTINUE               00003610
C 24-HOUR AVERAGES          00003620
C
    IF (JHR.NE.1) GO TO 605  00003630
    DO 602 NR=1,NREC         00003640
    CHI24(NR)=CHIS(NR)       00003650
    GO TO 699               00003660
602 CONTINUE               00003670
    DO 604 NR=1,NREC         00003680
    CHI24(NR)=CHI24(NR)+CHIS(NR) 00003690
    GO TO 699               00003700
604 CONTINUE               00003710
    DO 606 NR=1,NREC         00003720
    CHI24(NR)=CHI24(NR)/24.  00003730
    TF(LER024)CALL FREN(CHI24,IM0,24) 00003740
    TF(LECH24.AND.IECHO(JDAY).EQ.1)CALL OUTDAT(CHI24,TYR,IDAY,0,24, 00003750
    TF(LECH24.AND.IECHO(JDAY).EQ.1)CALL OUTDAT(CHI24,TYR,IDAY,0,24, 00003760
                                            00003770
                                            00003780

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      1 NRFC,NR2)          00003790
C   FIND THE TOP 50 24-HOUR AVERAGE CONCENTRATIONS 00003800
C
C   DO 610 J=1,NREC          00003810
C   CHIL24 HAS BEEN EQUIVALENTED TO TSOC24(50)          00003820
C   IF(CHI24(J).LE.CHIL24)GO TO 610          00003830
C   CHIV=CHI24(J)          00003840
C   IPDAY=JDAY*1000+J          00003850
C   IP=24          00003860
C   MAG=24          00003870
C   DO 650 I=1,3          00003880
C   MAG=MAG/2          00003890
C   ISGN=1          00003900
C   IF(CHIV.GT.TSOC24(IP))ISGN=-1          00003910
C   IP=IP+ISGN*MAG          00003920
650  CONTINUE          00003930
C   IL=TP-?          00003940
C   TH=IP+3          00003950
C   DO 660 T=IL,IH          00003960
C   IF(CHIV.LT.TSOC24(I))GO TO 660          00003970
C   IRPLAC=I          00003980
C   GO TO 651          00003990
660  CONTINUE          00004000
C   IRPLAC=50          00004010
C   IF(CHIV.GE.TSOC24(49))IRPLAC=49          00004020
651  CONTINUE          00004030
C   INDEX=50-IRPLAC          00004040
C   IF(INDEX.EQ.0)GO TO 675          00004050
C   DO 670 I=1,INDEX          00004060
C   TI=50-I          00004070
C   TSOC24(TI+1)=TSOC24(TI)          00004080
C   TSOC24(TI+1)=ISOC24(TI)          00004090
670  CONTINUE          00004100
675  CONTINUE          00004110
C   TSOC24(IRPLAC)=CHIV          00004120
C   ISOC24(IRPLAC)=IPDAY          00004130
610  CONTINUE          00004140
C
C   FIND THE 5 HIGHEST 24-HOUR AVERAGE CONCENTRATIONS AT EACH RECEPTOR 00004150
C
C   DO 690 J=1,NREC          00004160
C   IF(CHI24(J).LE.TSRC24(J,5))GO TO 690          00004170
C   CHIV=CHI24(J)
C   DO 615 I=1,4          00004180
C   IF(CHIV.LT.TSRC24(J,I))GO TO 615          00004190
C   IRPLAC=I          00004200
C   GO TO 620          00004210
615  CONTINUE          00004220
620  CONTINUE          00004230
C   INDEX=5-IRPLAC          00004240
C   IF(INDEX.EQ.0)GO TO 635          00004250
C   DO 630 T=1,INDEX          00004260
C   TI=5-I          00004270
C   TSR24(J, TI+1)=TSRC24(J, TI)          00004280
C   TSR24(J, TI+1)=ISRC24(J, TI)          00004290
630  CONTINUE          00004300
635  CONTINUE          00004310
C   TSR24(J, IRPLAC)=CHIV          00004320
C   ISRC24(J, IRPLAC)=IDAY          00004330
690  CONTINUE          00004340
699  CONTINUE          00004350

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C ANNUAL AVERAGES
C
705 DO 705 J=1,NREC
    CHIANN(J)=CHIANN(J)+CHIS(J)
    IDANN=IDANN+1
900  CONTINUE
1000 CONTINUE
1001 CONTINUE
C WRITE THE ANNUAL AVERAGE CONCENTRATIONS AT EACH RECEPTOR
C
XHRS=IDANN
XDAYS=XHRS/24.
WRITE(6,1020)XDAYS,IDANN
1020 FORMAT('1',35X,F5.1,' DAY (',I4,', HR) AVERAGE CONCENTRATIONS ',00004420
1 'AT EACH RECEPTOR')00004430
IF(NRFC.EQ.1)GO TO 103000004440
WRITE(6,1021)XDAYS,XDAYS00004450
1021 FORMAT('/0',14X,'RECEPTOR',5X,F5.1,' DAY AVERAGE CONCENTRATION',00004460
1 15X,'RECEPTOR',5X,F5.1,' DAY AVERAGE CONCNTRATION'/
2 39X,'(UG/M**3)',50X,'(UG/M**3)')00004470
DO 1025 I=1,NR2000004480
I2=NR2+J00004490
CHI1=CHIANN(I)/XHRS00004500
CHI2=CHIANN(I2)/XHRS00004510
WRITE(6,1024)I,CHI1,I2,CHI200004520
1024 FORMAT(17X,13,18X,F9.1,29X,T3,18X,F9.1)00004530
1025 CONTINUE00004540
IF(MOD(NREC,2).EQ.0)GO TO 104000004550
WRITE(6,1026)NREC,CHIANN(NREC)00004560
1026 FORMAT(76X,T3,18X,F9.1)00004570
GO TO 104000004580
1030 CONTINUE00004590
WRITE(6,1031)XDAYS00004600
1031 FORMAT('/0',44X,'RECEPTOR',5X,F5.1,' DAY AVERAGE ',00004610
1 'CONCNTRATION'/69X,'(UG/M**3)')00004620
CHI1=CHIANN(1)/XHRS00004630
WRITE(6,1046)NREC,CHI100004640
1046 FORMAT(47X,T3,18X,F9.1)00004650
1040 CONTINUE00004660
C WRITE THE TOP 5 1-HOUR AVERAGE CONCENTRATIONS AT EACH RECEPTOR
C
1120 WRITE(6,1120)00004670
FORMAT('1',38X,'5 HIGHEST 1-HOUR AVERAGE CONCNTRATIONS AT ',00004680
1 'EACH RECEPTOR'/'0',16X,'RECEPTOR',5X,'HIGHEST',15X,00004690
2 '2ND HIGHEST',10X,'3RD HIGHEST',10X,'4TH HIGHEST',10X,00004700
3 '5TH HIGHEST'/'0',15X,3('(UG/M**3)',12X),'(UG/M**3)')00004710
4 29X,'(UG/M**3)',15X,3('(UG/M**3)',12X),'(UG/M**3)')00004720
DO 1126 I=1,NPH00004730
DO 1124 NN=1,500004740
JDAYHR=TSRC1(I,NN)00004750
KDAY(NN)=JDAYHR/KDAY(NN)00004760
KHR(NN)=JDAYHR-KDAY(NN)*1000004770
1124 CONTINUE00004780
WRITE(6,1125)I,(TSRC1(I,N),KDAY(N),KHR(N),N=1,5)00004790
1125 FORMAT(19X,T3,4X,5(F9.1,1X,'(',I3,',',I2,',)',3X))00004800
1126 CONTINUE00004810
TF(NREC.LF.50)GO TO 114000004820
WRITE(6,1120)00004830
DO 1136 I=51,NREC00004840
DO 1134 NN=1,500004850

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TDAYHRE=TSRC1(T,NN) 00005040
KDAY(NN)=JDAYHR/100 00005050
KHR(NN)=JDAYHR+KDAY(NN)*100 00005060
1134 CONTINUE 00005070
    WRITE(6,1125)I,(TSRC1(I,N),KDAY(N),KHR(N),N=1,5) 00005080
1136 CONTINUE 00005090
1140 CONTINUE 00005100
C 00005110
C     WRITE THE TOP 5 3-HOUR AVERAGE CONCENTRATIONS AT EACH RECEPTOR 00005120
C 00005130
    WRITE(6,1220) 00005140
1220 FORMAT('1',38X,'5 HIGHEST 3-HOUR AVERAGE CONCENTRATIONS AT ', 00005150
1 'EACH RECEPTOR'/'0',16X,'RECEPTOR',5X,'HIGHEST',14X, 00005160
2 '2ND HIGHEST',9X,'3RD HIGHEST',9X,'4TH HIGHEST',9X,'5TH HIGHEST'/'00005170
3 29X,1'(UG/M**3)',14X,31'(UG/M**3)',11X,1'(UG/M**3)' 00005180
DO 1226 I=1,NPH 00005190
DO 1224 NN=1,5 00005200
JPDATC=TSRC3(T,NN) 00005210
KDAY(NN)=JPDATC/10 00005220
C MPERID IS STORED IN THE KHR ARRAY 00005230
KHR(NN)=JPDATC-KDAY(NN)*10 00005240
1224 CONTINUE 00005250
    WRITE(6,1225)I,(TSRC3(I,N),KDAY(N),KHR(N),N=1,5) 00005260
1225 FORMAT(19X,13,4X,5(F9.1,1X,1',13,1',11,1',3X)) 00005270
1226 CONTINUE 00005280
    IF(NREC.LE.50)GO TO 1240 00005290
    WRITE(6,1220) 00005300
    DO 1236 I=51,NREC 00005310
    DO 1234 NN=1,5 00005320
    JPDATC=TSRC3(I,NN) 00005330
    KDAY(NN)=JPDATC/10 00005340
    KHR(NN)=JPDATC-KDAY(NN)*10 00005350
1234 CONTINUE 00005360
    WRITE(6,1225)I,(TSRC3(I,N),KDAY(N),KHR(N),N=1,5) 00005370
1236 CONTINUE 00005380
1240 CONTINUE 00005390
C 00005400
C     WRITE THE TOP 5 24-HOUR AVERAGE CONCENTRATIONS AT EACH RECEPTOR 00005410
C 00005420
    WRITE(6,1320) 00005430
1320 FORMAT('1',37X,'5 HIGHEST 24-HOUR AVERAGE CONCENTRATIONS AT ', 00005440
1 'EACH RECEPTOR'/'0',16X,'RECEPTOR',5X,'HIGHEST',14X, 00005450
2 '2ND HIGHEST',9X,'3RD HIGHEST',9X,'4TH HIGHEST',9X,'5TH HIGHEST'/'00005460
3 29X,1'(UG/M**3)',14X,31'(UG/M**3)',11X,1'(UG/M**3)' 00005470
DO 1326 I=1,NPH 00005480
    WRITE(6,1325)I,(TSRC24(I,N),JSRC24(I,N),N=1,5) 00005490
1325 FORMAT(19X,13,4X,5(F9.1,1X,1',13,1',5X)) 00005500
1326 CONTINUE 00005510
    IF(NREC.LE.50)GO TO 1340 00005520
    WRITE(6,1320) 00005530
    DO 1336 I=51,NREC 00005540
    WRITE(6,1325)I,(TSRC24(I,N),JSRC24(I,N),N=1,5) 00005550
1336 CONTINUE 00005560
1340 CONTINUE 00005570
C 00005580
C     WRITE THE TOP 50 1-HOUR CONCENTRATIONS 00005590
C 00005600
    WRITE(6,1100) 00005610
1100 FORMAT('1',40X,'TOP 50 1-HOUR AVERAGE CONCENTRATIONS') 00005620
    WRITE(6,1101) 00005630
1101 FORMAT('1',10X,'DAY',3X,'HOUR',3X,'WIND SPEED',3X,'WIND DIRECTION', 00005640
1 ',3X,'STABILITY',3X,'MIXING HEIGHT',3X,'RECEPTOR',4X,'1-HOUR ', 00005650
2 'CONCENTRATION'/26X,'(M/S)',9X,'(DEGREES)',19X,'(METERS)', 00005660

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3 22X,'(UG/M**3)'          00005670
DO 1110 I=1,50              00005680
JCDP=ISOC1(I)               00005690
JMFT2=JSOC1(I)              00005700
JDAYHR=KSOC1(I)              00005710
JWS=JCDP/10000               00005720
JSTAR=JCDP/1000-10*JWS       00005730
JRECEP=JCDP-JSTAR*1000-JWS*10000 00005740
XWS=FLOAT(JWS)/10.           00005750
JWD=JMFT2/10000               00005760
JDPBL=JMFT2-10000*JWD        00005770
JDAY=JDAYHR/100              00005780
JHR=JDAYHR-JDAY*100          00005790
WRTTE(6,1105)JDAY,JHR,XWS,JWD,JSTAR,JDPBL,JRECEP,TSOC1(I) 00005800
1105 FORMAT(11X,I3,4X,I2,6X,F4.1,13X,I3,12X,I1,10X,I5,10X,I3,10X,F9.1) 00005810
1110 CONTINUE                  00005820
C                               00005830
C                               WRITE THE TOP 50 3-HOUR CONCENTRATIONS
C                               00005840
C                               00005850
C                               WRITE(6,1200)
1200 FORMAT('1',48X,'TOP 50 3-HOUR AVERAGE CONCENTRATIONS') 00005870
WRITE(6,1201)                  00005880
1201 FORMAT('/0',40X,'DAY',3X,'TIME PERIOD',3X,'RECEPTOR',3X,
1 '3-HOUR CONCENTRATION'/75X,'(UG/M**3)')
DO 1210 I=1,50                00005910
JPDATE=TSOC3(I)               00005920
JDAY=JPDATE/10000              00005930
JTIME=JPDATE/1000-JDAY*10      00005940
JRECEP=JPDATE-JDAY*10000-JTIME*1000 00005950
WRITE(6,1215)JDAY,JTIME,JRECEP,TSOC3(I) 00005960
1215 FORMAT(41X,I3,8X,11,10X,I3,8X,F9.1) 00005970
1210 CONTINUE                  00005980
C                               00005990
C                               WRITE THE TOP 50 24-HOUR CONCENTRATIONS
C                               00006000
C                               00006010
C                               WRITE(6,1300)
1300 FORMAT('1',41X,'TOP 50 24-HOUR AVERAGE CONCENTRATIONS') 00006030
WRITE(6,1301)                  00006040
1301 FORMAT('/0',40X,'DAY',3X,'RECEPTOR',3X,'24-HOUR ',
1 'CONCENTRATION'/63X,'(UG/M**3)')
DO 1310 I=1,50                00006070
JPDAY=TSOC24(I)               00006080
JDAY=JPDAY/1000                00006090
JRECEP=JPDAY-JDAY*1000          00006100
WRITE(6,1315)JDAY,JRECEP,TSOC24(I) 00006110
1315 FORMAT(41X,I3,5X,I3,8X,F9.1) 00006120
1310 CONTINUE                  00006130
C                               00006140
C                               WRITE THE MONTHLY FREQUENCY DISTRIBUTIONS
C                               00006150
C                               00006160
C                               IF(.NOT.LFRQ1)GO TO 1491
C                               WRITE THE MONTHLY SUMMARIES FOR THE 1-HOUR AVERAGES 00006170
C                               00006180
DO 1490 IJ=1,12                00006190
IF(TFM(IJ).NE.1)GO TO 1490      00006200
WRTTE(6,1480)IRECEP,IJ          00006210
1480 FORMAT('1',15X,'RECEPTOR: ',I3,6X,'FREQUENCY DISTRIBUTION FOR ',
1 'MONTH: ',I2,6X,
1 '1-HOUR AVERAGE CONCENTRATIONS (UG/M**3)///' 00006220
2 '0',24X,'INTERVAL NO.',38X,'HOURS',5X,'PERCENT',5X,'CUMULATIVE') 00006230
00006240
2 '0',24X,'INTERVAL NO.',38X,'HOURS',5X,'PERCENT',5X,'CUMULATIVE') 00006250
IF(IJ.EQ.1)GO TO 1420          00006260
XHRM=24.*((IDM(IJ,TLEAP)-IDM(IJ-1,TLEAP)) 00006270
GO TO 1425                      00006280
1420 XHRM=744.                  00006290

```

```

1425 CONTINUE
    CALL FRQOUT(NINT, IJ, XHRM, INTM, XINT)          00006300
1490 CONTINUE                                         00006310
1491 CONTINUE                                         00006320
        IF(.NOT.LFRQ3)GO TO 1591                     00006330
C      WRITE THE MONTHLY SUMMARIES FOR THE 3-HOUR AVERAGES 00006340
DO 1590 IJ=1,12                                     00006350
IF(IFM(IJ).NE.1)GO TO 1590                         00006360
WHITE(6,1580)IRECEP,IJ                            00006370
1580 FORMAT('1',15X,'RECEPTOR: ',I3,6X,'FREQUENCY DISTRIBUTION FOR ', 00006380
1 'MONTH: ',I2,6X,                                     00006390
1 '3-HOUR AVERAGE CONCENTRATIONS (UG/M**3)''// 00006400
2'0',24X,'INTERVAL NO.',37X,'PERIODS',4X,'PERCENT',5X,'CUMULATIVE') 00006410
IF(IJ.EQ.1)GO TO 1520                           00006420
XHRM=8.* (IDM(IJ,ILFAP)-IDM(IJ-1,ILFAP))       00006430
GO TO 1525                                         00006440
1520 XHRM=248.                                      00006450
1525 CONTINUE                                         00006460
    CALL FRQOUT(NINT3, IJ, XHRM, INTM3, XINT3)      00006470
1590 CONTINUE                                         00006480
1591 CONTINUE                                         00006490
C      WRITE THE MONTHLY SUMMARIES FOR THE 24-HOUR AVERAGES 00006500
IF(.NOT.LFRQ24)GO TO 1691                         00006510
C      WRITE THE MONTHLY SUMMARIES FOR THE 24-HOUR AVERAGES 00006520
DO 1690 IJ=1,12                                     00006530
IF(IFM(IJ).NE.1)GO TO 1690                         00006540
WHITE(6,1680)IRECEP,IJ                            00006550
1680 FORMAT('1',15X,'RECEPTOR: ',I3,6X,'FREQUENCY DISTRIBUTION FOR ', 00006560
1 'MONTH: ',I2,6X,                                     00006570
1 '24-HOUR AVERAGE CONCENTRATIONS (UG/M**3)''// 00006580
2 '0',24X,'INTERVAL NO.',39X,'DAYS',5X,'PERCENT',5X,'CUMULATIVE') 00006590
IF(IJ.EQ.1)GO TO 1620                           00006600
XHRM=IDM(IJ,ILFAP)-IDM(IJ-1,ILFAP)             00006610
GO TO 1625                                         00006620
1620 XHRM=31.                                       00006630
1625 CONTINUE                                         00006640
    CALL FRQOUT(NINT24, IJ, XHRM, INTM24, XINT24) 00006650
1690 CONTINUE                                         00006660
1691 CONTINUE                                         00006670
C      WRITE THE ANNUAL FREQUENCY DISTRIBUTIONS          00006680
C
XHRSY=8760.
IF(ILFAP.EQ.1)XHRSY=8784.
IF(.NOT.LFRQ1)GO TO 1791                         00006690
C      WRITE THE ANNUAL SUMMARY FOR THE 1-HOUR AVERAGES 00006700
WRITE(6,1780)IRECEP,IYR                          00006710
1780 FORMAT('1',15X,'RECEPTOR: ',I3,6X,'FREQUENCY DISTRIBUTION FOR ', 00006720
1 'YEAR: ',I2,6X,                                     00006730
1 '1-HOUR AVERAGE CONCENTRATIONS (UG/M**3)''// 00006740
2 '0',724X,'INTERVAL NO.',38X,'HOURS',5X,'PERCENT',5X,'CUMULATIVE') 00006750
CALL FRQOUT(NINT,1,XHRSY,INTY,XINT)              00006760
1791 CONTINUE                                         00006770
IF(.NOT.LFRQ3)GO TO 1891                         00006780
C      WRITE THE ANNUAL SUMMARY FOR THE 3-HOUR AVERAGES 00006790
WRITE(6,1880)IRECEP,IYR                          00006800
1880 FORMAT('1',15X,'RECEPTOR: ',I3,6X,'FREQUENCY DISTRIBUTION FOR ', 00006810
1 'YEAR: ',I2,6X,                                     00006820
1 '3-HOUR AVERAGE CONCENTRATIONS (UG/M**3)''// 00006830
2 '0',24X,'INTERVAL NO.',37X,'PERIODS',4X,'PERCENT',5X,'CUMULATIVE') 00006840
X3=XHRSY/3.                                         00006850
CALL FRQOUT(NINT3,1,X3,INTY3,XINT3)              00006860
1891 CONTINUE                                         00006870
                                                00006880
                                                00006890
                                                00006900
                                                00006910
                                                00006920

```

```

      IF(.NOT.LFRQ24)GO TO 1991          00006930
C      WRITE THE ANNUAL SUMMARY FOR THE 24-HOUR AVERAGES 00006940
      WRITE(6,1980)IRECFP,IYR           00006950
1980  FORMAT('1',15X,'RECEPTOR: ',I3,6X,'FREQUENCY DISTRIBUTION FOR ', 00006960
      1 'YEAR: ',I2,6X,               00006970
      1 '24-HOUR AVERAGE CONCENTRATIONS (UG/M**3)//// 00006980
      2 '0',24X,'INTERVAL NO.',39X,'DAYS',5X,'PERCENT',5X,'CUMULATIVE') 00006990
      2 X24=XHRSY/24.                  00007000
      CALL FRROUT(NINT24,1,X24,INTY24,XINT24)             00007010
1991  CONTINUE                         00007020
      STOP                           00007030
      END                           00007040
      SUBROUTINE GETDAT(NREC,CHIS,LEND) 00007050
C      POSTBLP  VERSION 1.1  LEVEL 800212      GETDAT 00007060
      REAL CHIA(100)                   00007070
      REAL CHTS(NREC)                 00007080
      INTEGER*2 ISCODE                00007090
      LOGICAL LSUM                     00007100
      LOGICAL LEND,LTRUE              00007110
      COMMON/ACODE/IYR,IDAY,IHOUR,ICODE,ISTAR,WS,IWD,10PBL 00007120
      COMMON/RCODE/ICD,IMET2,ICD1,ICD3,IDADYHR 00007130
      COMMON/CHIPRT/NTA,NSUM,TSCODE(62),LSUM,IJCODE 00007140
      DATA LTRUE/.TRUE./
      IF(.NOT.LSUM)GO TO 50            00007150
      INDEX=1                          00007160
C      NTA IS THE NUMBER OF RECORDS PER HOUR 00007170
      DO 10 I=1,NTA                   00007180
      READ(20,END=999)IDAYHR,ICD,IMET2,CHIS 00007190
      ICD1=ICD/1000                  00007200
      ICODE=ICD-1000*ICD1             00007210
      IF(ICODE.NE.ISCODE(INDEX))GO TO 10 00007220
      INDEX=INDEX+1                  00007230
      IF(INDEX.NE.2)GO TO 8           00007240
      DO 7 J=1,NREC                  00007250
      CHIA(J)=CHIS(J)                00007260
      GO TO 10                        00007270
      DO 9 J=1,NREC                  00007280
      CHIA(J)=CHIA(J)+CHIS(J)        00007290
      9                               00007300
      10    CONTINUE                   00007310
      IF(INDEX.EQ.NSUM+1)GO TO 15    00007320
      WRITE(6,12)NSUM,INDEX,TSCODE   00007330
      12    FORMAT(/////'0','EXECUTION TERMINATING -- ERROR IN SPECIFICATION '00007340
      1 , 'OF NSUM OR ISCODE'/'0','NSUM = ',I5,5X,'INDEX = ',I5,5X, 00007350
      2 6(/'0',10(I5,2X))/'0',2(I5,2X)) 00007360
      STOP                           00007370
      15    CONTINUE                   00007380
      DO 17 J=1,NREC                  00007390
      CHTS(J)=CHIA(J)                00007400
      GO TO 60                        00007410
      50    CONTINUE                   00007420
      DO 55 I=1,NTA                   00007430
      READ(20,END=999)IDAYHR,ICD,IMET2,CHIS 00007440
      ICD1=ICD/1000                  00007450
      ICODE=ICD-1000*ICD1             00007460
      IF(ICODE.NE.IJCODE)GO TO 55    00007470
      NTA2=NTA-I                      00007480
      IF(NTA2.EQ.0)GO TO 60           00007490
      DO 54 J=1,NTA2                  00007500
      READ(20)                         00007510
      54    CONTINUE                   00007520
      GO TO 60                        00007530
      55    CONTINUE                   00007540
      WRITE(6,56)IJCODE              00007550

```

```

56   FORMAT(////'0','EXECUTION TERMINATING -- ERROR IN ',      00007560
1 'THE SPECIFICATION OF IJCODE'/'0','IJCODE = ',IJ)          00007570
     STOP
60   CONTINUE
C
C   DECODE IDAYHR
C
C   IDAY=IDAYHR/100                                         00007580
C   ITHOUR=IDAYHR-IDAY*100                                     00007590
C
C   DECODE ICD
C
C   IWS=ICD1/10                                              00007600
C   WS=FLOAT(IWS)/10.                                         00007610
C   ISTAB=ICD1-10*IWS                                         00007620
C   ICD3=IDAYHR*10+ISTAB                                      00007630
C
C   DECODE TMET2
C
C   IWD=IMET2/10000                                         00007640
C   IDPBL=IMET2-IWD*10000                                    00007650
C   RETURN
999  LEND=LTRUE
C   RETURN
C   END
SUBROUTINE OUTDAT(CHI,IYR,IDAY,ITM,IAVG,NREC,NR2)           00007660
C   POSTBLP VERSION 1.1 LEVEL 800212 OUTDAT                  00007670
REAL CHI(100)
IF(NREC.LT.40)GO TO 1000
IF(IAVG.EQ.1)WRITE(6,100)IYR,IDAY,ITM,IAVG                00007680
100  FORMAT('1',24X,'YEAR: ',I2,3X,'DAY: ',I3,3X,'HOUR: ',I2,10X,
     1 I2,' HOUR AVERAGE CONCENTRATIONS AT EACH RECEPTOR')    00007690
IF(IAVG.EQ.3)WRITE(6,101)IYR,IDAY,ITM,IAVG                00007700
101  FORMAT('1',23X,'YEAR: ',I2,3X,'DAY: ',I3,3X,'PERIOD: ',I2,10X,
     1 I2,' HOUR AVERAGE CONCENTRATIONS AT EACH RECEPTOR')    00007710
IF(IAVG.EQ.24)WRITE(6,102)IYR,IDAY,IAVG                  00007720
102  FORMAT('1',28X,'YEAR: ',I2,3X,'DAY: ',I3,12X,
     1 I2,' HOUR AVERAGE CONCENTRATIONS AT EACH RECEPTOR')    00007730
120  CONTINUE
        WRITE(6,121)IAVG,IAVG                                00007740
121  FORMAT('0',14X,'RECEPTOR',9X,I2,' HR AVERAGE CONCENTRATION',
     1 15X,'RECEPTOR',9X,I2,' HR AVERAGE CONCENTRATION'
     2 39X,'(UG/M**3)',50X,'(UG/M**3)')                     00007750
DO 125 I=1,NR2
125  I2=NR2+I
        WRITE(6,124)I,CHI(I),I2,CHI(I2)                      00007760
124  FORMAT(17X,I3,18X,F9.1,29X,I3,18X,F9.1)              00007770
125  CONTINUE
        IF(MOD(NREC,2).EQ.0)RETURN
        WRITE(6,126)NREC,CHI(NREC)                            00007780
126  FORMAT(76X,I3,18X,F9.1)
        RETURN
1000 CONTINUE
        IF(IAVG.EQ.1)WRITE(6,200)IYR,IDAY,ITM,IAVG          00007790
200  FORMAT(//'0',24X,'YEAR: ',I2,3X,'DAY: ',I3,3X,'HOUR: ',I2,10X,
     1 I2,' HOUR AVERAGE CONCENTRATIONS AT EACH RECEPTOR')    00007800
IF(IAVG.EQ.3)WRITE(6,201)IYR,IDAY,ITM,IAVG                00007810
201  FORMAT(//'0',23X,'YEAR: ',I2,3X,'DAY: ',I3,3X,'PERIOD: ',I2,10X,
     1 I2,' HOUR AVERAGE CONCENTRATIONS AT EACH RECEPTOR')    00007820
IF(IAVG.EQ.24)WRITE(6,202)IYR,IDAY,IAVG                  00007830
202  FORMAT(//'0',28X,'YEAR: ',I2,3X,'DAY: ',I3,12X,
     1 I2,' HOUR AVERAGE CONCENTRATIONS AT EACH RECEPTOR')    00007840
IF(NREC.NE.1)GO TO 120

```

```

      WRITE(6,131)IAVG          00008190
      FORMAT('0',4X,'RECEPDR',8X,I2,' HP AVERAGE CONCENTRATION'/
131     1.69X,'(UG/M**3)')    00008200
      WRITE(6,146)NREC,CHI(1)   00008210
146     FORMAT(47X,1B,18X,F9.1) 00008220
      RETURN                   00008230
      END                      00008240
      SUBROUTINE FREQ(CHI,IMO,IAVG) 00008250
C      POSTBLP VERSION 1.1 LEVEL 800212      FREQ
      REAL CHI(100)
      INTEGER*2 INTM,INTY,INTM3,INTY3,INTM24,INTY24,IRECEP
      COMMON/FRDIST/XINT(25),XINT3(25),XINT24(25),NINT,NINT3,NINT24,
1 INTM(25,12),INTY(25),INTM3(25,12),INTY3(25),INTM24(25,12),
2 INTY24(25),IRECEP
      XCHI=CHI(IRECEP)
      IF(IAVG.NE.1)GO TO 50
      DO 10 J=2,NINT
      IF(XCHI.GE.XINT(J))GO TO 10
      JM1=J-1
      INTM(JM1,IMO)=INTM(JM1,IMO)+1
      INTY(JM1)=INTY(JM1)+1
      GO TO 15
10     CONTINUE
      INTM(NINT,IMO)=INTM(NINT,IMO)+1
      INTY(NINT)=INTY(NINT)+1
15     CONTINUE
      RETURN
50     CONTINUE
      IF(IAVG.NE.3)GO TO 100
      DO 60 J=2,NINT3
      IF(XCHI.GE.XINT3(J))GO TO 60
      JM1=J-1
      INTM3(JM1,IMO)=INTM3(JM1,IMO)+1
      INTY3(JM1)=INTY3(JM1)+1
      GO TO 65
60     CONTINUE
      INTM3(NINT3,IMO)=INTM3(NINT3,IMO)+1
      INTY3(NINT3)=INTY3(NINT3)+1
65     CONTINUE
      RETURN
100    CONTINUE
      IF(IAVG.NE.24)RETURN
      DO 110 J=2,NINT24
      IF(XCHI.GE.XINT24(J))GO TO 110
      JM1=J-1
      INTM24(JM1,IMO)=INTM24(JM1,IMO)+1
      INTY24(JM1)=INTY24(JM1)+1
      GO TO 115
110    CONTINUE
      INTM24(NINT24,IMO)=INTM24(NINT24,IMO)+1
      INTY24(NINT24)=INTY24(NINT24)+1
115    CONTINUE
      RETURN
      END
      SUBROUTINE FRQOUT(NLEVEL,IMO,XHRS,INT,XINT) 00008730
C      POSTBLP VERSION 1.1 LEVEL 800212      FRQOUT
      REAL XINT(25)               00008740
      INTEGER*2 INT(25,12)        00008750
      NLM1=NLEVEL-1               00008760
      PCNT=100./XHRS             00008770
      PERCNT=PCNT*INT(1,IMO)     00008780
      CP=PERCNT                  00008790
      WRITE(6,1481)XINT(2),INT(1,IMO),PERCNT,CP 00008800
                                         00008810

```

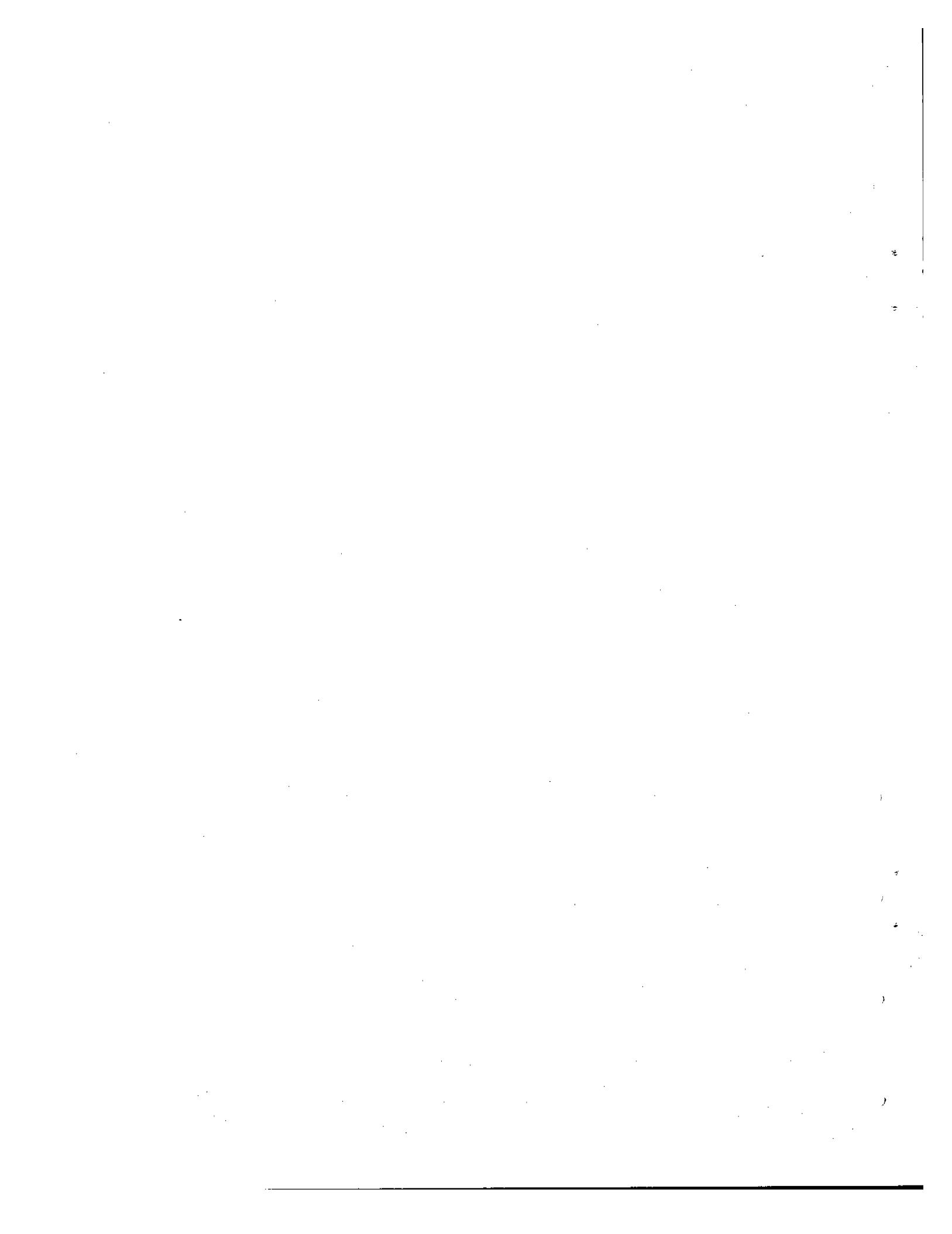
```

1481  EFORMAT(31X,'1',21X,'CHT LT ',F9.1,6X,I4,6X,F6.2,7X,F6.2)      00008820
      DD 1485 I=2,NLM1                                              00008830
      PERCNT=PCNT+INT(I,IMO)                                         00008840
      CP=CP+PERCNT                                               00008850
      WRITE(6,1484)I,XINT(I),XINT(I+1),INT(I,IMO),PERCNT,CP      00008860
1484  FORMAT(29X,I3,7X,F9.1,2X,'LE CHT LT ',F9.1,6X,I4,6X,F6.2,7X,F6.2) 00008870
1485  CONTINUE                                              00008880
      PERCNT=PCNT*INT(NLEVEL,IMO)                                     00008890
      CP=CP+PERCNT                                               00008900
      WRITE(6,1489)NLEVEL,XINT(NLEVFL),INT(NLEVEL,IMO),PERCNT,CP  00008910
1489  FORMAT(29X,I3,7X,F9.1,2X,'LE CHI',19X,I4,6X,F6.2,7X,F6.2) 00008920
      RETURN                                                 00008930
      END                                                   00008940
      BLOCK DATA
C       POSTBLP   VERSION 1.1  LEVFL 800212      BLOCK DATA          00008955
      INTEGER*2 INTM,INTY,INTM3,INTY3,INTM24,INTY24,IRECEP
      INTEGER*2 ISCODE
      LOGICAL LSUM
      COMMON/FRDIST/XINT(25),XINT3(25),XINT24(25),NINT,NINT3,NINT24,
1     INTM(25,12),INTY(25),INTM3(25,12),INTY3(25),INTM24(25,12),
2     INTY24(25),IRECEP
      COMMON/CHTPRT/NTA,NSUM,ISCODE(62),LSUM,IJCODE
      DATA XINT/25*0.0/,XINT3/25*0.0/,XINT24/25*0.0/
      DATA NINT/0/,NINT3/0/,NINT24/0/
      DATA INTM/300*0/,INTY/25*0/,INTM3/300*0/,INTY3/25*0/,
1     INTM24/300*0/,INTY24/25*0/
      DATA IRECEP/1/
      DATA NSUM/0/,ISCODE/62*0/,IJCODE/999/
      DATA LSUM/.FALSE./
      END

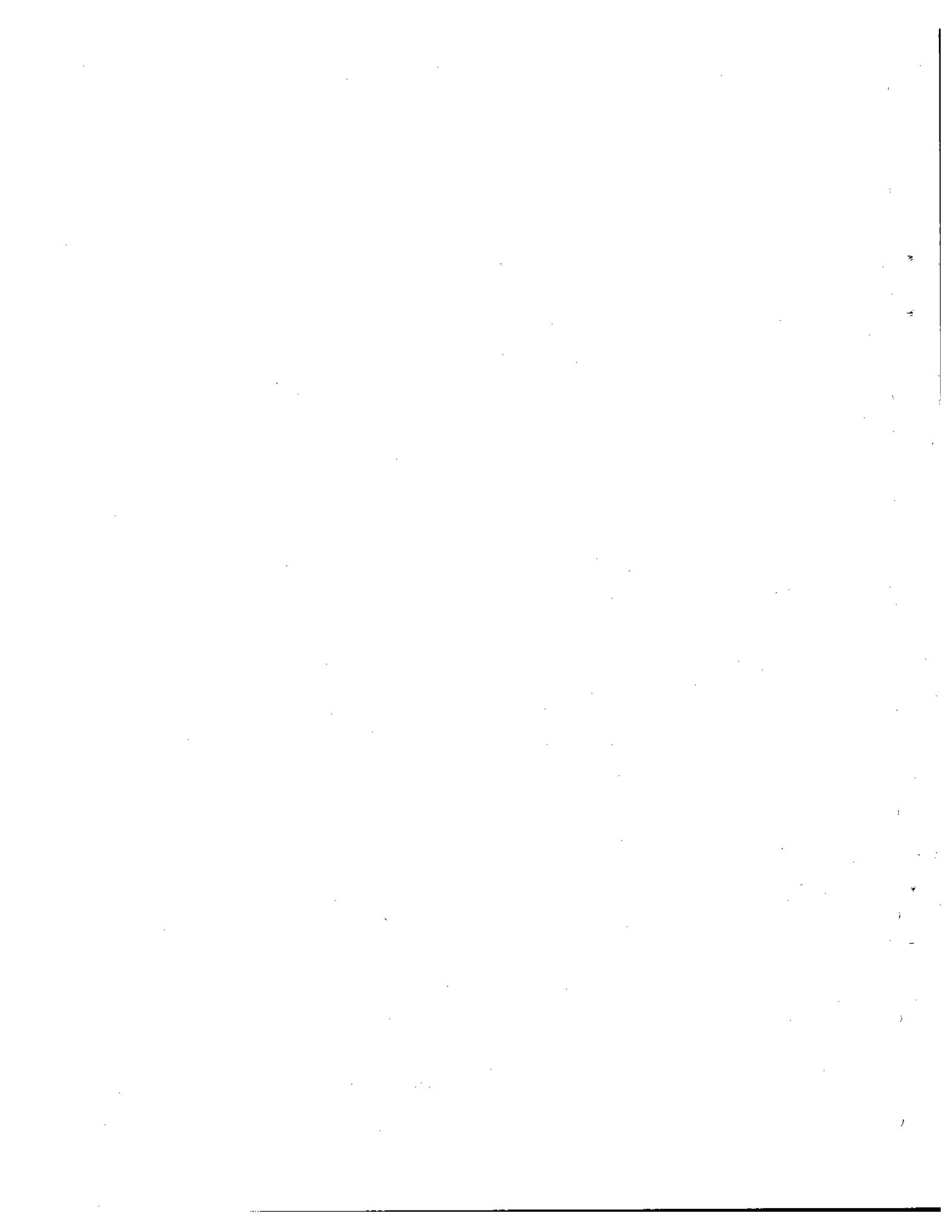
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**APPENDIX C**  
**BLP TEST CASE**



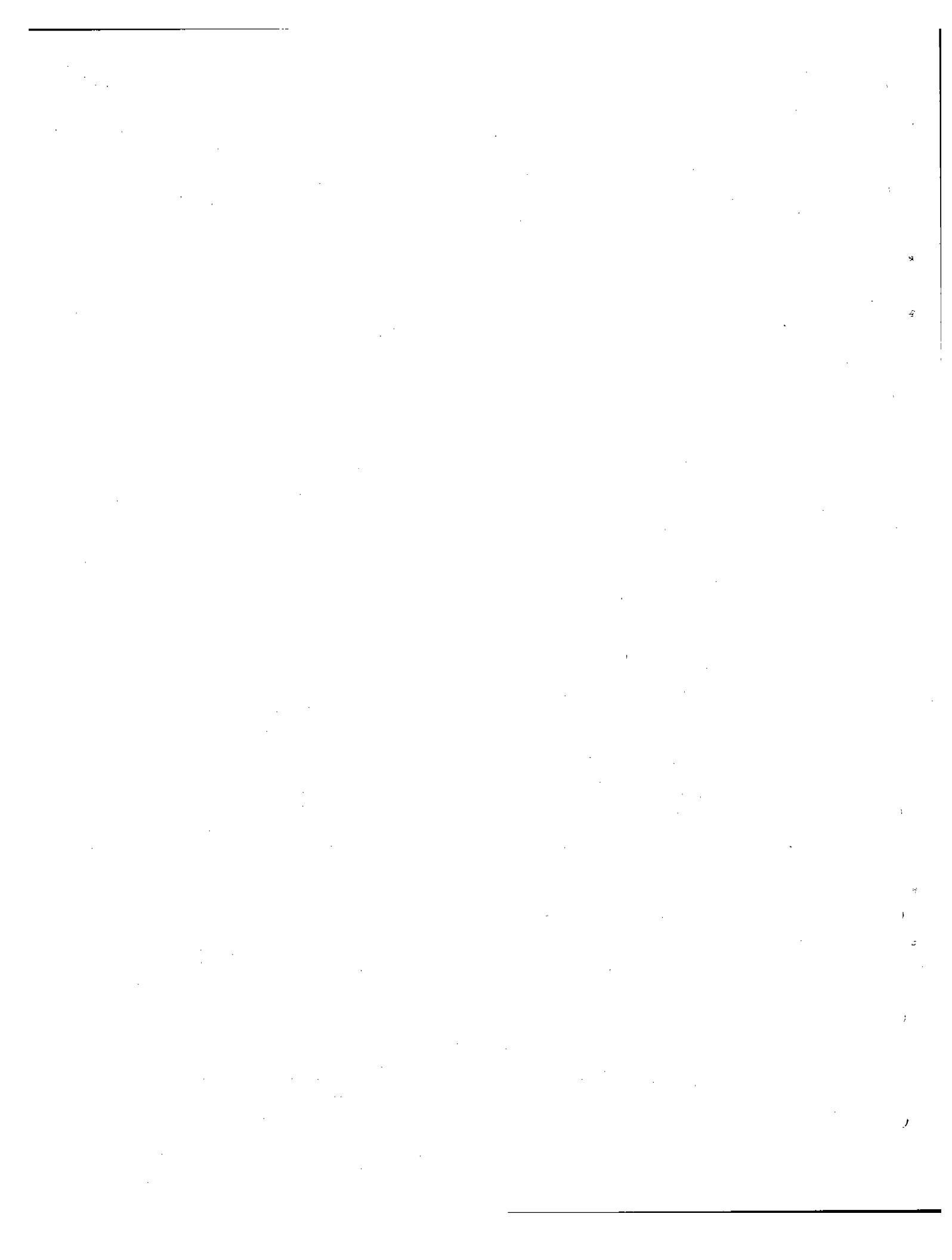
**INPUT DATA**



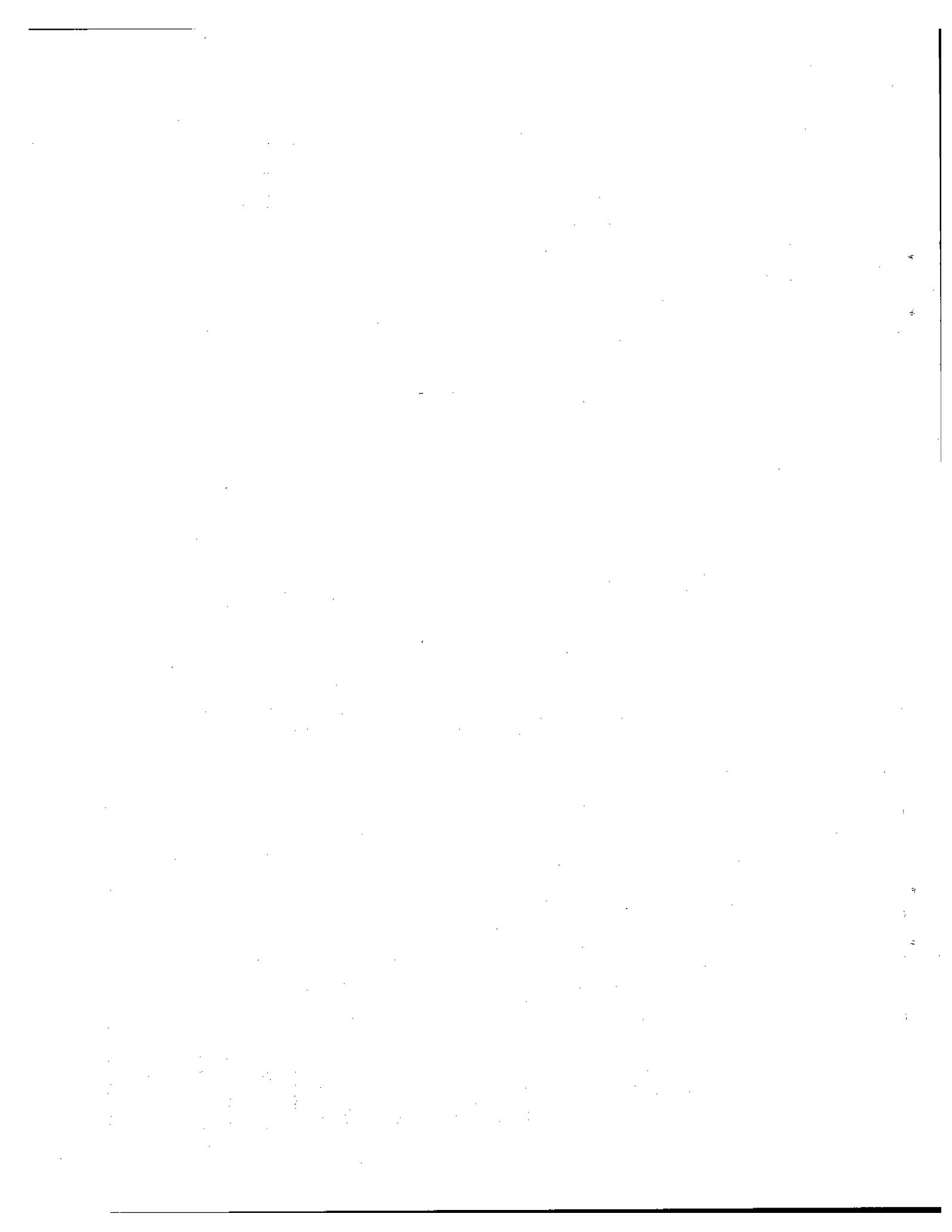
BLP USER'S GUIDE TEST CASE  
&GEN NLINES=4,NPTS=2,LPART=.TRUE.,TCUR=90.0,&END  
&RISE L=500.,HB=15.,WB=20.,WM=2.5,DX=30.0,FPRIME=300.,&END  
&RCEPT RXBEG=-1000.,RYBEG=-1000.,RXEND=1500.,RYEND=1000.,RDY=500.,  
RDY=1000.,&END

&METIN LMETIN=.TRUE.,ZMEAS=10.0,&END  
&CALC XBACKG=15.0,DECFACT=4.167E-5,&END  
&OUTPUT IPCL=1,1,1,1,6\*0,1,IPCP=1,1,48\*0,1,&END

0.0	0.0	500.	0.0	15.	25.5	0.0
0.0	50.0	500.	50.0	15.	25.5	0.0
0.0	100.0	500.	100.0	15.	30.0	0.0
0.0	150.0	500.	150.0	15.	30.0	0.0
156.7	75.0	15.0	75.0	3.5	12.0	340.0
333.3	75.0	25.0	80.0	4.0	15.0	350.0
24						
6	1.5	201.	263.	251.		
6	2.1	176.	261.	251.		
6	2.1	214.	262.	251.		
6	2.1	223.	262.	251.		
6	3.1	233.	261.	251.		
6	2.6	232.	261.	251.		
5	3.1	235.	261.	251.		
4	3.6	213.	261.	267.		
4	4.1	197.	263.	371.		
4	5.8	221.	265.	475.		
4	8.5	234.	265.	579.		
4	10.2	226.	266.	683.		
3	2.1	3.	267.	787.		
2	2.1	349.	268.	891.		
1	1.0	312.	269.	891.		
2	3.1	324.	270.	891.		
3	1.5	11.	270.	891.		
6	1.5	7.	269.	825.		
6	2.1	24.	267.	703.		
6	1.5	17.	267.	582.		
6	2.1	220.	265.	460.		
6	1.5	222.	265.	338.		
6	3.1	230.	264.	216.		
5	4.1	220.	265.	94.		



**OUTPUT DATA**





\*\*\* TURBULENT PLUME SOURCE POINT SOURCE DISPERSION MODEL VERSION 1.1 LFUEL 800702  
\*\*\*\*\*

ALP USER'S GUIDE TEST CASE

TOTAL NUMBER OF DAYS INCLUDED IN THIS RUN: 1

(0=NO) INCLUDED, 1=INCLUDED

100000000	0000000000	0000000000	0000000000	0000000000	0000000000	0000000000	0000000000
000000000	0000000000	0000000000	0000000000	0000000000	0000000000	0000000000	0000000000
000000000	0000000000	0000000000	0000000000	0000000000	0000000000	0000000000	0000000000
000000000	0000000000	0000000000	0000000000	0000000000	0000000000	0000000000	0000000000

TOTAL NUMBER OF SOURCES: 0

LINE SOURCES: 4

POINT SOURCES: 2

PARTIAL CONCENTRATIONS REQUESTED FOR ANY LINE OR POINT SOURCES? YES

POINT SOURCE BUILDING DOWNWASH OPTION REQUESTED? YES

VERTICAL WIND SHEAR LIN PLUME RISE REQUESTED? YES

TRANSITIONAL POINT SOURCE PLUME RISE REQUESTED? YES

OUTPUT OF METEOROLOGICAL DATA REQUESTED? NO

PARAMETERS USED IN THE LINE SOURCE PLUME RISE CALCULATIONS

BUILDING DIMENSIONS: HEIGHT = 15.00 (M)  
WIDTH = 20.00 (M)  
LENGTH = 500.00 (M)

BUILDING SEPARATION = 50.00 (M)  
LINE SOURCE SEPARATION = 50.00 (M)

LIN SOURCE ELEV = 2.50 (M)

QUALITY FLOW PER LINE (FIRST) = 400.0 (M\*\*3/S\*\*3)

ALR --- 04111-1000001 1.1st Rev 1.1st PNL PUBLIC SOURCE DISPERSSION MODEL VERSION 1.1 LFVFL A00702

REFERENCE MATERIAL FAKETS

MEAN WIND SPEED AT 10 METERS = 10.0 (m)

WIND SPEED POWER LAW EXPONENT (STABILITIES 1-6) = 0.10 0.15 0.20 0.25 0.30 0.30

VERTICAL POTENTIAL TEMPERATURE GRADIENT = 0.020 DEG K/m (STABILITY 5) 0.035 DEG K/m (STABILITY 6)

NETTURBULENT DATA == FURNISHED USW INPUT

CALCULATIONAL PARAMETERS

CONVERGENCE THRESHOLD FOR LINE SOURCE CALCULATIONS = 0.020 (MICROGRAMS/M\*\*3)

MAXIMUM NUMBER OF ITERATIONS IN LINE SOURCE CALCULATIONS = 14

FINAL NEUTRAL PLATE RISE CONSTANT (CONST3) = 34.49

BACKGROUND CONCENTRATION = 15.00 (MICROGRAMS/M\*\*3)

POLLUTANT DECAY FACTOR = 0.41670E-04 (1/SEC)

TERMINAL ADJUSTMENT FACTOR (STABILITIES 1-6) = 0.50 0.50 0.50 0.50 0.50 0.50

VERSION 1.1 LFVFL R00702

SLR = (S111111) (1101011111 AND POINT SOURCE DISPERSION MOUNT \*\*\*\*\*

RECEPTION LOCATIONS (X,Y,Z) FROM LIST OF LIST RECEPTION RECTANGLE

RECEPTION NETWORK DEFINED BY THE FOLLOWING RECTANGLE

{	-1600.0,	1600.0)	{	1500.0,	1000.0)
{	-1600.0,	-1600.0)	{	1500.0,	-1000.0)

X GRID SPACING = 500.00

Y GRID SPACING = 1600.00

SOURCE AND RECEPTION LOCATIONS SPECIFIED IN SCS COORDINATES -- TCUR = 90.00 DEGREES

1) P --- POINT LINE. 2) VERTICAL LINE. 3) HORIZONTAL LINE. 4) DIAGONAL LINE. 5) SHORTEST DISTANCE RULE. VERSION 1.1 LEVEL 800702

\*\*\*\*\*

LINt SOURCE NUMBER: 1

NUMBER OF LINES: 4

LINE NUMBER	X START (m)	Y START (m)	X END (m)	Y END (m)	Q (GM/SEC)	HEIGHT (m)	PARTIAL CHI OUTPUT (0=NO, 1=YES)	ELEVATION (m)
1	0.0	0.0	500.0	0.0	25.50	15.00	1	0.0
2	0.0	50.0	500.0	50.0	25.50	15.00	1	0.0
3	0.0	100.0	500.0	100.0	30.00	15.00	1	0.0
4	0.0	150.0	500.0	150.0	30.00	15.00	1	0.0

SOURCE CONTRIBUTIONS FROM THE FOLLOWING LINE SOURCES ARE AVAILABLE:

(0=NOT AVAILABLE; 1=AVAILABLE)

LINE SOURCE NUMBER AVAILABILITY

1	1
2	1
3	1
4	1
1 - 4	1

## POINT SOURCE PARAMETERS

NUMBER OF POINTS: 2

POINT NUMBER	X (m)	Y (m)	Z (GM/SEC)	HEIGHT (m)	VOL. FLUX (M**3/SEC)
1	166.7	75.0	75.00	15.00	116.
2	353.3	75.0	80.00	25.00	189.

POINT NUMBER	X (m)	Y (m)	Z (GM/SEC)	HEIGHT (m)	VOL. FLUX (M**3/SEC)	STACK TEMP. (DEG K)	PARTIAL CHI OUTPUT (0=NO, 1=YES)	ELEVATION (m)
1	166.7	75.0	75.00	15.00	116.	340.0	1	0.0
2	353.3	75.0	80.00	25.00	189.	350.0	1	0.0

SOURCE CONTRIBUTIONS FROM THE FOLLOWING POINT SOURCES ARE AVAILABLE:

(0=NO, 1=AVAILABLE)

POINT SOURCE NUMBER AVAILABILITY

1 1

2 1

1 &amp; 2 1

THE SOURCE VECTOR(S) IS OBTAINED BY THE FOLLOWING POINTS:

{ 0.0 , 150.00 )	{ 500.00 , 150.00 )
{ 0.0 , 0.0 )	{ 500.00 , 0.0 )

\*\*\*\*\* DIFFUSION MODEL, DOWNGRAD LWT, AGG PWDL, SMOKE DISPERSION MODEL \*\*\*\*\*

VERSION 1.1 LEVEL 800702

RECEPTION NO.	X	LOCATION	Y	RECEPTION NO.	X	LOCATION	Y
1	-1000.		-1000.	9	500.		-1000.
2	-1000.		0	10	500.		1000.
3	-1000.		1000.	11	1000.		-1000.
4	-500.		-1000.	12	1000.		0.
5	-500.		0	13	1000.		1000.
6	-500.		1000.	14	1500.		-1000.
7	0.		-1000.	15	1500.		0.
8	0.		1000.	16	1500.		1000.

NUMBER OF POSSIBLE RECEPTION LOCATIONS = 16

NUMBER OF ACTUAL RECEPTION LOCATIONS = 16

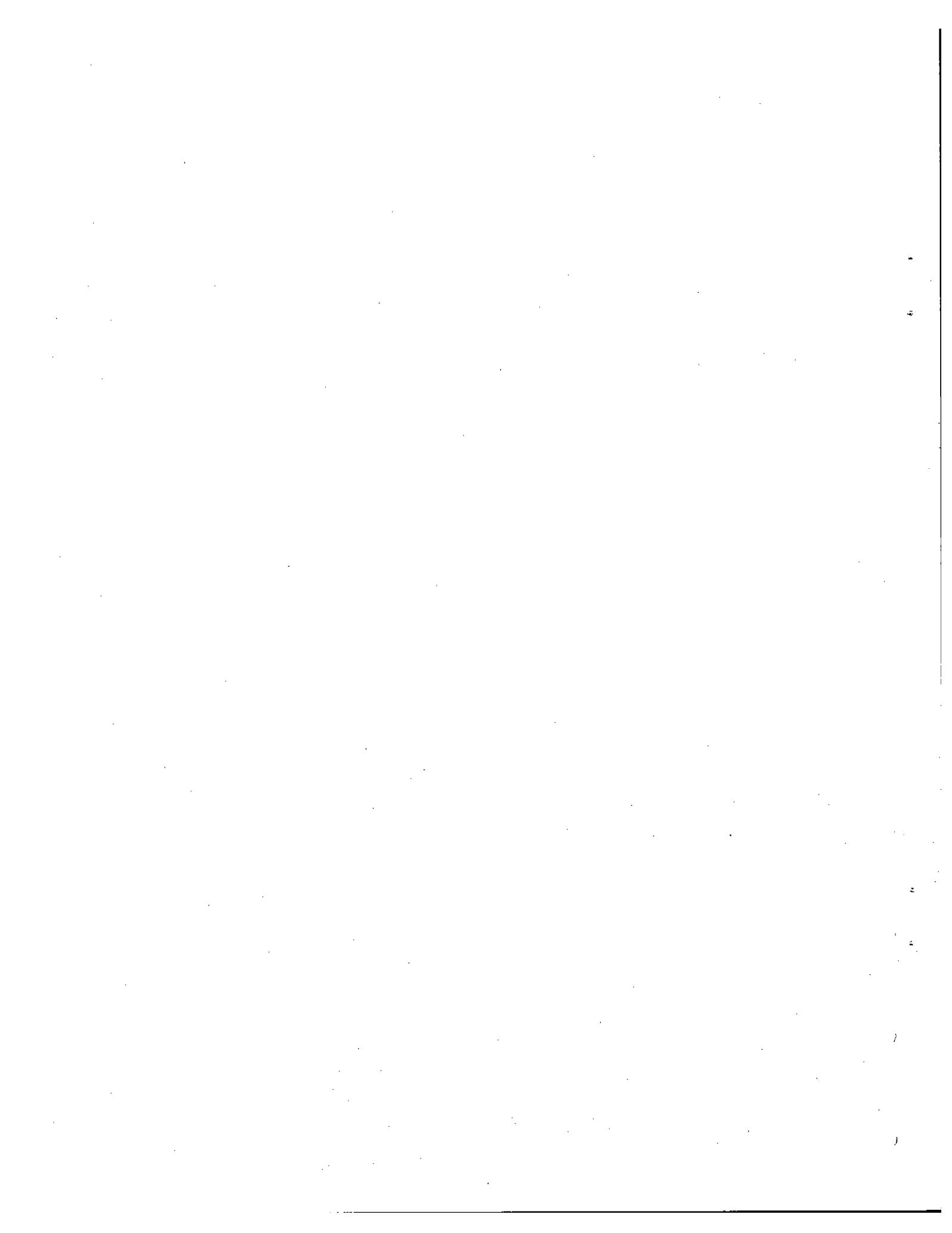
LEVEL B00702  
VERSION 1-1  
DISPATCHER HIGH  
STRUCTURE LOW  
LEVEL B00701

### **INPUT FOR ALL THE THERMODYNAMICAL DATA**

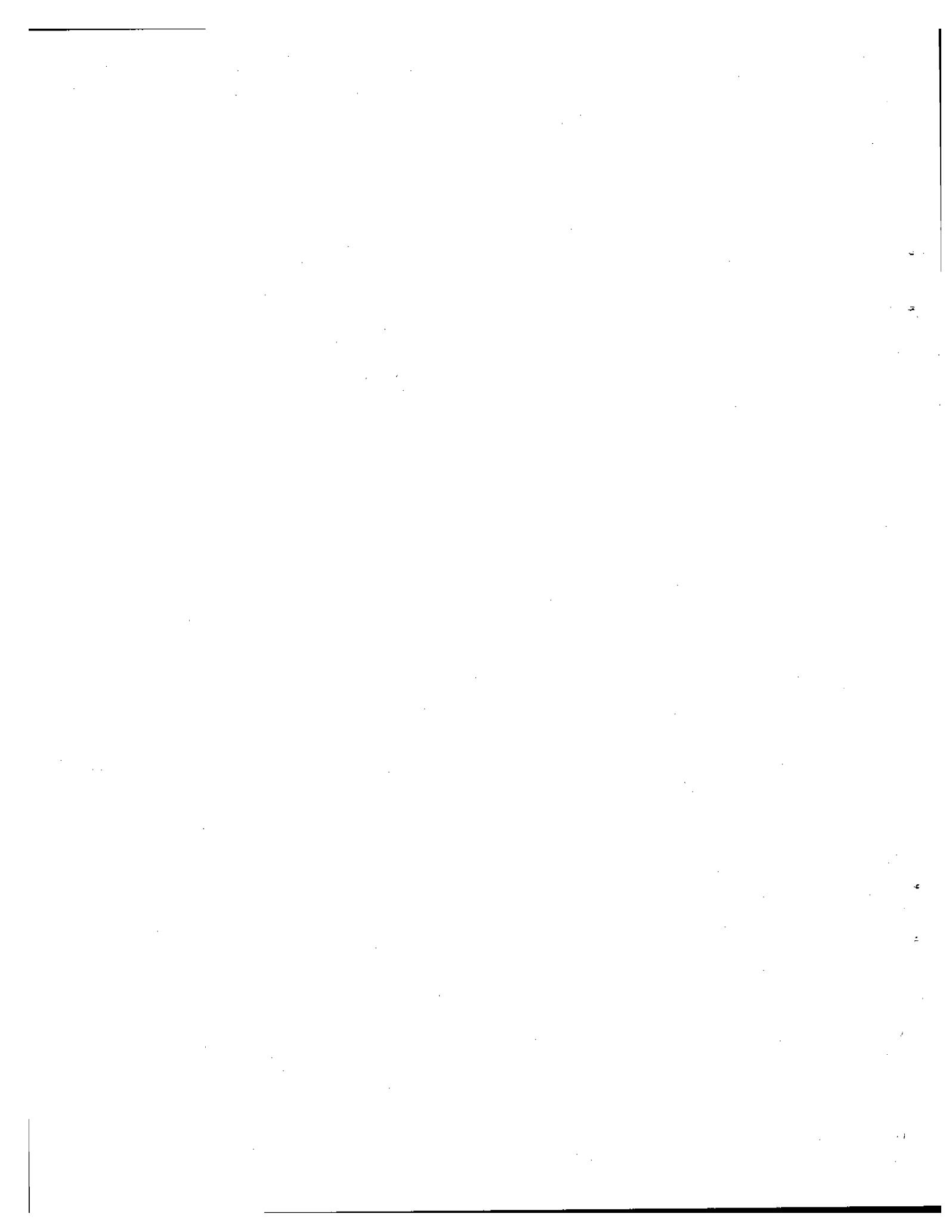
HOUR	STABILITY CLASS	WIND SPEED (m/s)	WIND DIRECTION (DEGREES)	TEMPERATURE (DEG. K)	MIXING HEIGHT (m)
1	6	1.50	201.0	263.0	251.
2	6	2.10	176.0	261.0	251.
3	6	2.10	214.0	262.0	251.
4	6	2.10	223.0	262.0	251.
5	6	3.10	233.0	261.0	251.
6	6	2.60	232.0	261.0	251.
7	5	3.10	235.0	261.0	251.
8	4	3.60	213.0	261.0	267.
9	4	4.10	197.0	263.0	371.
10	4	3.80	221.0	265.0	475.
11	4	6.50	234.0	265.0	579.
12	4	10.20	226.0	266.0	685.
13	3	2.10	5.0	267.0	747.
14	2	2.10	349.0	268.0	891.
15	1	1.60	312.0	269.0	891.
16	2	1.10	524.0	270.0	891.
17	3	1.50	11.0	270.0	891.
18	6	1.50	7.0	269.0	825.
19	6	2.10	24.0	267.0	703.
20	6	1.50	17.0	267.0	582.
21	6	2.10	220.0	265.0	460.
22	6	1.50	222.0	265.0	538.
23	6	1.10	250.0	264.0	216.
24					265.0

C-14

LAST DAY PROCESSED = 1

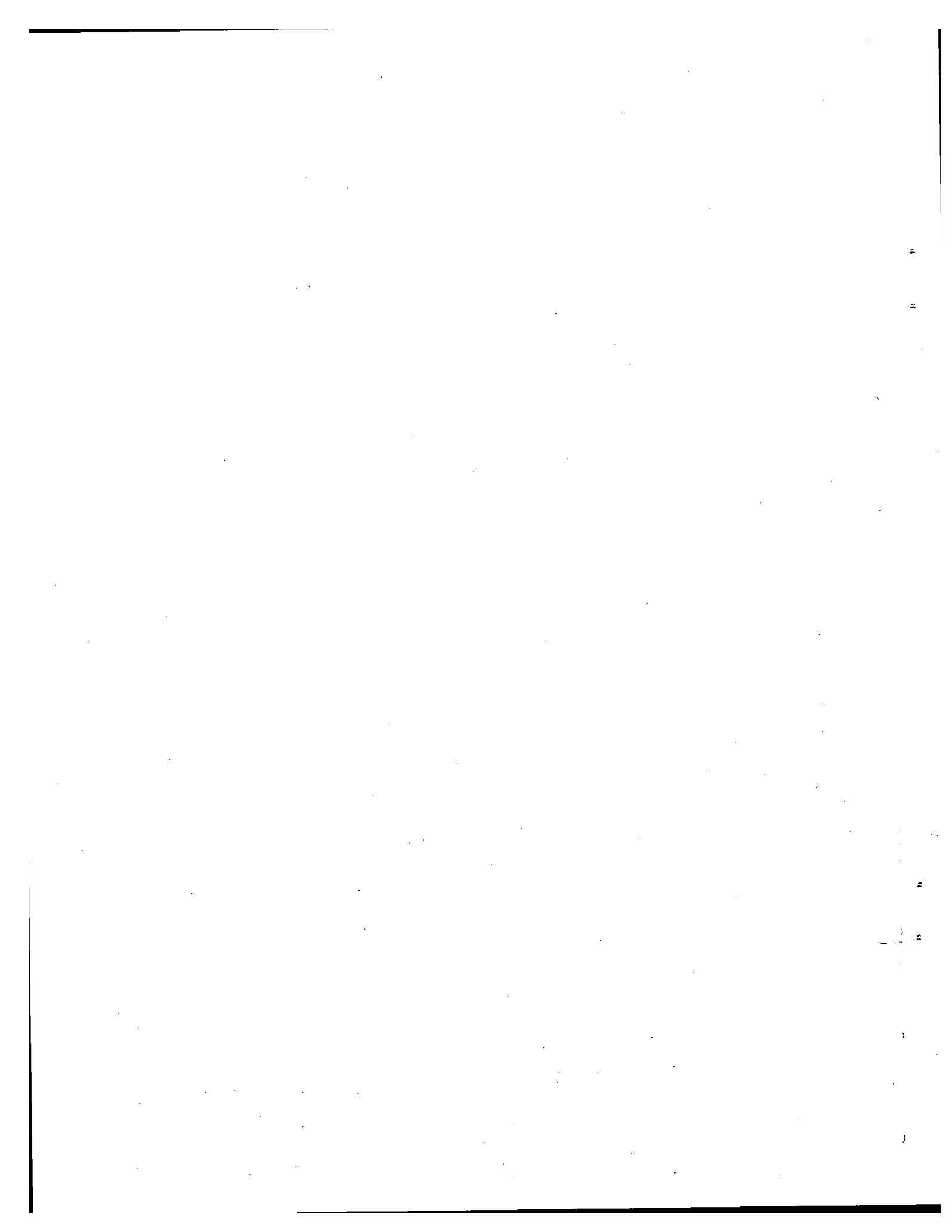


**APPENDIX D**  
**POSTBLP TEST CASES**



**INPUT DATA FOR POSTBLP**

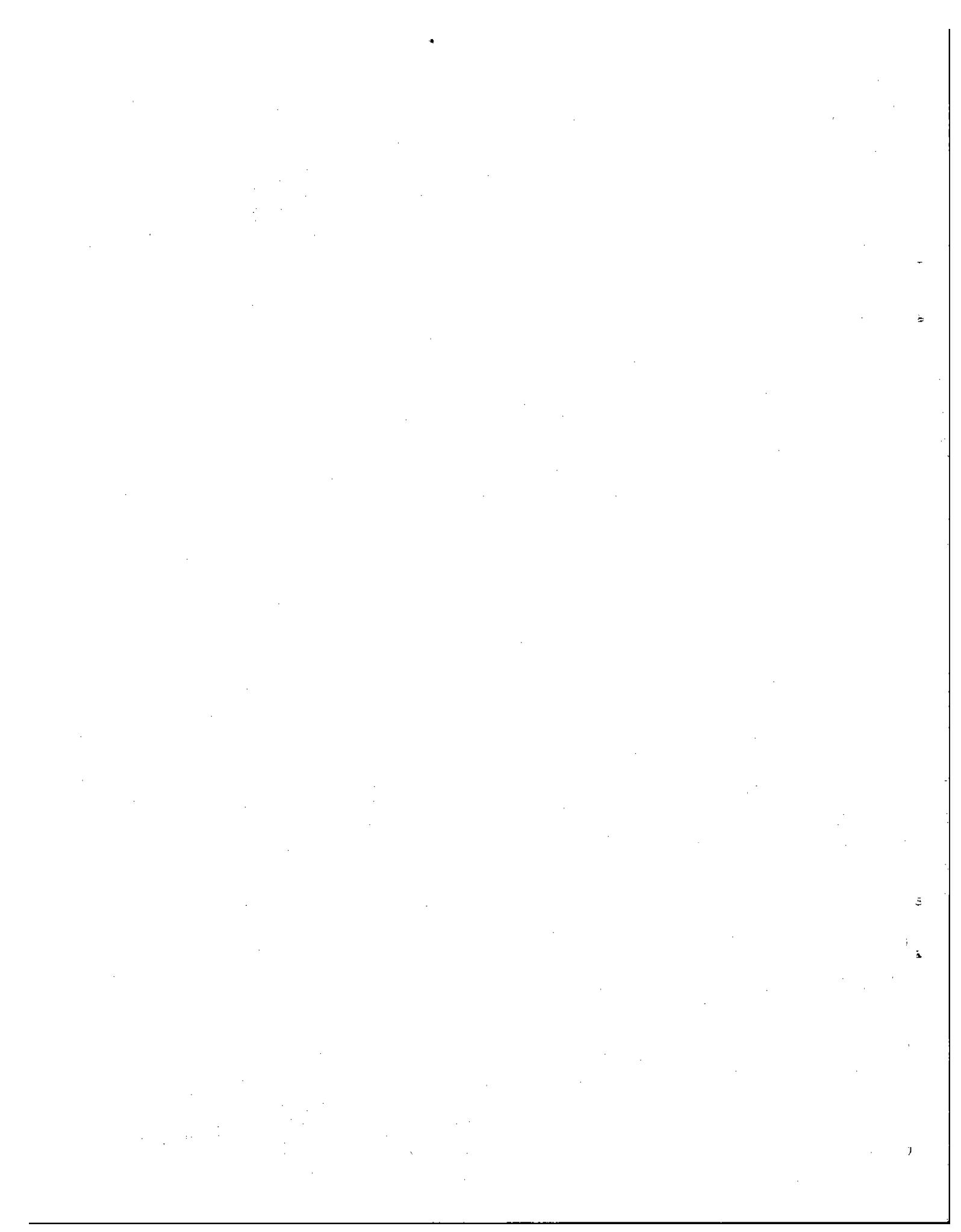
**TEST CASE NO. 1**



60FTS 1JC05E=999,LECH3=.TRUE.,LECH24=.TRUE.,IECHO=1,365\*0,&END



**OUTPUT DATA FOR POSTBLP**  
**TEST CASE NO. 1**



HTTP PROTOCOL SIGN VERSION 1.1 LEVFL 800702

אלה רשותה לשלוט בלאו צ'אלט

YEAR: 0

TOTAL NUMBER OF DAYS INCLUDED IN THIS ROW: 1

(v=none) INCLUDE0; i=INCLUDE0)

TOTAL NUMBER OF SUBJECTS: 6

LINE SOURCES: 4  
POINT SOURCES: 2

INITIAL NUMBER OF TEST PUFFS: 16

SOURCE CONTRIBUTIONS FROM THE FOLLOWING LINE SOURCES ARE AVAILABLE:

GENOLOGY

AVAILABILITY

- 1 -

2

110

3

PLP POSITIONSTAR VERSION 1.1 LEVEL 800702

\*\*\*\*\* SUBJECT CONTRIBUTIONS FROM THE FOLLOWING POINT SOURCES ARE AVAILABLE:

(0=NOT AVAILABLE; 1=AVAILABLE)

POINT SOURCE	MINUTE	AVAILABILITY
1		1
2		1
1 - 2		1

IJCONT = 999

(IJCONT SPECIFIES THE PLP CONCENTRATION OUTPUT DATA USED IN THIS RUN OF POSTPLP.  
THE CONCENTRATION DATA ASSOCIATED WITH IJCONT IS AS FOLLOWS:

IJCONT CONCENTRATION DATA

1-10	SOURCE CONCENTRATION = LINE SOURCE NUMBER "IJCONT"
11	SOURCE CONCENTRATION = ALL LINE SOURCES
101-150	SOURCE CONCENTRATION = POINT SOURCE NUMBER "IJCONT" = 100*
151	SOURCE CONCENTRATION = ALL POINT SOURCES
999	ICIAL CONCENTRATION)

FREQUENCY DISTRIBUTIONS REQUESTED IN THIS POSTPLP RUN:

1-HOUR AVERAGES ? NO  
3-HOUR AVERAGES ? NO  
24-HOUR AVERAGES ? NO

L-LP PUSI PRODUCTIVE VERSIM 1.1 LEVEL A00702

\* \* \* \* \* CONCENTRATIONS AT EACH RECEPTOR ARE PRINTED FOR THE FOLLOWING DAYS:

(NUMBER PRINTED PER DAY)

1000000000	0000000000	0000000000	0000000000	0000000000	0000000000	0000000000	0000000000
0000000000	0000000000	0000000000	0000000000	0000000000	0000000000	0000000000	0000000000
0000000000	0000000000	0000000000	0000000000	0000000000	0000000000	0000000000	0000000000
0000000000	0000000000	0000000000	0000000000	0000000000	0000000000	0000000000	0000000000
0000000000	0000000000	0000000000	0000000000	0000000000	0000000000	0000000000	0000000000

AND FOR THE FOLLOWING AVERAGING TIMES:

1-HOUR AVERAGES ? NO  
3-HOUR AVERAGES ? YES  
24-HOUR AVERAGES ? YES

D-11

YEAR	DAY	PERIOD	3 HR AVERAGE CONCENTRATION ( $\mu$ g/m $^3$ )	RECEPTOR	3 HOUR AVERAGE CONCENTRATIONS AT EACH RECEPTOR ( $\mu$ g/m $^3$ )
1	1	1	15.1	9	342.6
2	2	1	15.0	10	15.0
3	3	1	15.0	11	15.0
4	4	1	102.5	12	15.0
5	5	1	15.0	13	15.0
6	6	1	15.0	14	15.0
7	7	1	35.7	15	15.0
8	8	1	15.0	16	15.0

D-11

YEAR	DAY	PERIOD	3 HR AVERAGE CONCENTRATION ( $\mu$ g/m $^3$ )	RECEPTOR	3 HOUR AVERAGE CONCENTRATIONS AT EACH RECEPTOR ( $\mu$ g/m $^3$ )
1	1	1	150.5	9	15.0
2	2	1	15.0	10	15.0
3	3	1	15.0	11	15.0
4	4	1	229.9	12	15.0
5	5	1	15.0	13	15.0
6	6	1	15.0	14	15.0
7	7	1	15.0	15	15.0
8	8	1	15.0	16	15.0

YEAR	DAY	PERIOD	3 HR AVERAGE CONCENTRATION ( $\mu$ g/m $^3$ )	RECEPTOR	3 HOUR AVERAGE CONCENTRATIONS AT EACH RECEPTOR ( $\mu$ g/m $^3$ )
1	1	1	15.0 <sup>2</sup>	9	15.0 <sup>2</sup>
2	2	1	15.0 <sup>2</sup>	10	15.0 <sup>2</sup>
3	3	1	15.0 <sup>2</sup>	11	15.0 <sup>2</sup>
4	4	1	229.9 <sup>2</sup>	12	15.0 <sup>2</sup>
5	5	1	15.0 <sup>2</sup>	13	15.0 <sup>2</sup>
6	6	1	15.0 <sup>2</sup>	14	15.0 <sup>2</sup>
7	7	1	15.0 <sup>2</sup>	15	15.0 <sup>2</sup>
8	8	1	15.0 <sup>2</sup>	16	15.0 <sup>2</sup>

2	15.0	10
5	15.0	11
4	15.0	12
5	15.0	13
6	15.0	13
7	15.0	14
6	15.0	15
8	15.0	16

YEAR: 0 DAY: 1 PERIOD: 4

RECEIPTOR 3 HR AVERAGE CONCENTRATION  
( $\mu$ G/M\*\*3)

1	297.2	9
2	15.0	10
3	15.0	11
4	90.2	12
5	15.0	13
6	15.0	14
7	15.0	15
8	15.0	16

3 HOUR AVERAGE CONCENTRATIONS AT EACH RECEPTOR

RECEPTION 3 HR AVERAGE CONCENTRATION  
( $\mu$ G/M\*\*3)

1	15.0	9
2	15.0	10
3	15.0	11
4	15.0	12
5	15.0	13
6	15.0	14
7	15.0	15
8	15.0	16

YEAR: 0 DAY: 1 PERIOD: 5

RECEIPTOR 3 HR AVERAGE CONCENTRATION  
( $\mu$ G/M\*\*3)

1	15.0	9
2	15.0	10
3	15.0	11
4	15.0	12
5	15.0	13
6	19.9	14
7	15.0	15
8	121.0	16

3 HOUR AVERAGE CONCENTRATIONS AT EACH RECEPTOR

RECEPTION 3 HR AVERAGE CONCENTRATION  
( $\mu$ G/M\*\*3)

1	15.0	9
2	15.0	10
3	32.4	11
4	15.0	12
5	15.0	13
6	160.2	14
7	15.0	15
8	90.5	16

YEAR: 0 DAY: 1 PERIOD: 6

RECEIPTOR 3 HR AVERAGE CONCENTRATION  
( $\mu$ G/M\*\*3)

1	15.0	9
2	15.0	10
3	32.4	11
4	15.0	12
5	15.0	13
6	160.2	14
7	15.0	15
8	90.5	16

3 HOUR AVERAGE CONCENTRATIONS AT EACH RECEPTOR

RECEPTION 3 HR AVERAGE CONCENTRATION  
( $\mu$ G/M\*\*3)

1	16.0	9
2	15.0	10
3	15.0	11
4	15.0	12

YEAR: 0 DAY: 1 PERIOD: 7

RECEIPTOR 3 HR AVERAGE CONCENTRATION  
( $\mu$ G/M\*\*3)

1	16.0	9
2	15.0	10
3	15.0	11
4	15.0	12

3 HOUR AVERAGE CONCENTRATIONS AT EACH RECEPTOR

RECEPTION 3 HR AVERAGE CONCENTRATION  
( $\mu$ G/M\*\*3)

1	15.0	9
2	1120.0	10
3	15.0	11
4	15.0	12

5	15.0	13	44.3
6	15.0	14	15.0
7	15.0	15	15.0
8	15.0	16	15.0

YEAR: 0 DAY: 1 PERIOD: 6

5 HR AVERAGE CONCENTRATION (UG/M\*\*3)

RECEPTOR	9	10	11	12	13	14	15	16
1	1260.1							
2	15.0							
3	15.0							
4	586.9							
5	15.0							
6	15.0							
7	15.0							
8	15.0							

3 HOUR AVERAGE CONCENTRATIONS AT EACH RECEPTOR

RECEPATOR

3 HR AVERAGE CONCENTRATION (UG/M\*\*3)

YEAR: 0 DAY: 1

24 HOUR AVERAGE CONCENTRATIONS AT EACH RECEPTOR

RECEPATOR

24 HR AVERAGE CONCENTRATION (UG/M\*\*3)

RECEPTOR	9	10	11	12	13	14	15	16
1	414.0							
2	15.0							
3	29.7							
4	277.9							
5	15.0							
6	46.3							
7	64.7							
8	31.4							

24 HOUR AVERAGE CONCENTRATIONS AT EACH RECEPTOR

RECEPATOR

24 HR AVERAGE CONCENTRATION (UG/M\*\*3)

1.0 DAY ( 24 HR) AVERAGE CONCENTRATIONS AT EACH RECEPTOR

RECEPtor	1.0 DAY AVERAGE CONCENTRATION (UG/M <sup>3</sup> )	RECEPtor	1.0 DAY AVERAGE CONCENTRATION (UG/M <sup>3</sup> )
1	414.0	9	55.9
2	15.0	10	243.1
3	24.7	11	15.0
4	277.9	12	15.0
5	15.0	13	18.7
6	46.3	14	15.0
7	84.7	15	15.0
8	31.4	16	15.0

5 HIGHEST 1-HOUR AVERAGE CONCENTRATIONS AT EACH RECEPTOR

Receptor	Highest S1 (UG/M**3)	2ND HIGHEST (UG/M**3)	3RD HIGHEST (UG/M**3)	4TH HIGHEST (UG/M**3)	5TH HIGHEST (UG/M**3)
1	2024.0 ( 1, 2 )	1842.7 ( 1, 4 )	1556.5 ( 1, 25 )	1386.9 ( 1, 6 )	941.4 ( 1, 5 )
2	15.0 ( 1, 5 )	15.0 ( 1, 4 )	15.0 ( 1, 5 )	15.0 ( 1, 2 )	15.0 ( 1, 1 )
3	316.4 ( 1, 15 )	67.5 ( 1, 16 )	15.0 ( 1, 5 )	15.0 ( 1, 4 )	15.0 ( 1, 3 )
4	2806.9 ( 1, 5 )	1517.2 ( 1, 21 )	1162.6 ( 1, 22 )	659.6 ( 1, 4 )	581.2 ( 1, 24 )
5	15.0 ( 1, 15 )	15.0 ( 1, 5 )	15.0 ( 1, 4 )	15.0 ( 1, 3 )	15.0 ( 1, 2 )
6	450.5 ( 1, 16 )	324.5 ( 1, 15 )	20.5 ( 1, 14 )	15.0 ( 1, 5 )	15.0 ( 1, 4 )
7	1592.1 ( 1, 13 )	129.0 ( 1, 9 )	43.9 ( 1, 2 )	17.1 ( 1, 8 )	15.1 ( 1, 3 )
8	294.1 ( 1, 14 )	84.5 ( 1, 16 )	33.4 ( 1, 15 )	30.4 ( 1, 15 )	16.3 ( 1, 18 )
9	997.7 ( 1, 2 )	15.0 ( 1, 5 )	15.0 ( 1, 4 )	15.0 ( 1, 3 )	15.0 ( 1, 1 )
10	2187.6 ( 1, 20 )	2113.7 ( 1, 18 )	11157.2 ( 1, 19 )	49.3 ( 1, 13 )	36.7 ( 1, 14 )
11	12.0 ( 1, 3 )	15.0 ( 1, 4 )	15.0 ( 1, 5 )	15.0 ( 1, 2 )	15.0 ( 1, 1 )
12	15.0 ( 1, 5 )	15.0 ( 1, 4 )	15.0 ( 1, 3 )	15.0 ( 1, 2 )	15.0 ( 1, 1 )
13	102.9 ( 1, 19 )	15.0 ( 1, 17 )	15.0 ( 1, 5 )	15.0 ( 1, 4 )	15.0 ( 1, 3 )
14	12.0 ( 1, 5 )	15.0 ( 1, 4 )	15.0 ( 1, 3 )	15.0 ( 1, 2 )	15.0 ( 1, 1 )
15	15.0 ( 1, 5 )	15.0 ( 1, 4 )	15.0 ( 1, 3 )	15.0 ( 1, 2 )	15.0 ( 1, 1 )
16	15.0 ( 1, 5 )	15.0 ( 1, 4 )	15.0 ( 1, 3 )	15.0 ( 1, 2 )	15.0 ( 1, 1 )

5 HIGHEST 5-HOUR AVERAGE CONCENTRATIONS AT EACH RECEPTOR

RECEPTOR NUMBER	5 HIGHEST (UG/M <sup>3</sup> *5)	2ND HIGHEST		3RD HIGHEST		4TH HIGHEST		5TH HIGHEST	
		(UG/M <sup>3</sup> *5)							
1	1.540 ± 5	1.72	1.260 ± 1	1.78	297.2	1.4	160.8	1.7	158.2 ( 1.3 )
2	1.520 ± 5	1.75	1.52 ± 0	1.4	15.0	1.5	15.0	1.2	15.0 ( 1.1 )
3	1.12 ± 5	1.75	3.2 ± 4	1.6	15.0	1.4	15.0	1.3	15.0 ( 1.2 )
4	6.62 ± 5	1.71	5.86 ± 9	1.6	449.1	1.7	229.9	1.2	90.2 ( 1.4 )
5	1.5 ± 0	1.75	1.5 ± 0	1.4	15.0	1.5	15.0	1.2	15.0 ( 1.1 )
6	1.60 ± 2	1.63	1.19 ± 9	1.5	15.0	1.4	15.0	1.3	15.0 ( 1.2 )
7	5.35 ± 7	1.13	5.3 ± 7	1.3	15.0	1.4	15.0	1.5	15.0 ( 1.2 )
8	1.21 ± 0	1.53	4.0 ± 3	1.6	15.0	1.4	15.0	1.3	15.0 ( 1.2 )
9	5.42 ± 6	1.71	1.5 ± 0	1.5	15.0	1.4	15.0	1.3	15.0 ( 1.2 )
10	1.12 ± 0	1.77	7.15 ± 8	1.6	33.6	1.5	15.0	1.4	15.0 ( 1.3 )
11	1.5 ± 0	1.75	1.5 ± 0	1.4	15.0	1.3	15.0	1.2	15.0 ( 1.1 )
12	1.5 ± 0	1.75	1.5 ± 0	1.4	15.0	1.3	15.0	1.2	15.0 ( 1.1 )
13	4.4 ± 3	1.77	1.5 ± 0	1.6	15.0	1.5	15.0	1.4	15.0 ( 1.3 )
14	1.5 ± 0	1.75	1.5 ± 0	1.4	15.0	1.3	15.0	1.2	15.0 ( 1.1 )
15	1.5 ± 0	1.75	1.5 ± 0	1.4	15.0	1.3	15.0	1.2	15.0 ( 1.1 )
16	1.5 ± 0	1.75	1.5 ± 0	1.4	15.0	1.3	15.0	1.2	15.0 ( 1.1 )

Receptor Line	SIGHTS & SF (Ug/m**3)	5 HIGHEST 1-4-MIN AVERAGE CONCENTRATIONS AT EACH RECEPTOR															
		2ND HIGHEST				3RD HIGHEST				4TH HIGHEST				5TH HIGHEST			
		(Ug/m**3)		(Ug/m**3)		(Ug/m**3)		(Ug/m**3)		(Ug/m**3)		(Ug/m**3)		(Ug/m**3)		(Ug/m**3)	
3	41.4*0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	15.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	29.7	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	27.4*9	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	15.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	46.8	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	64.7	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	51.4	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	55.9	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12	243.1	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13	15.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	15.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15	15.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16	15.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

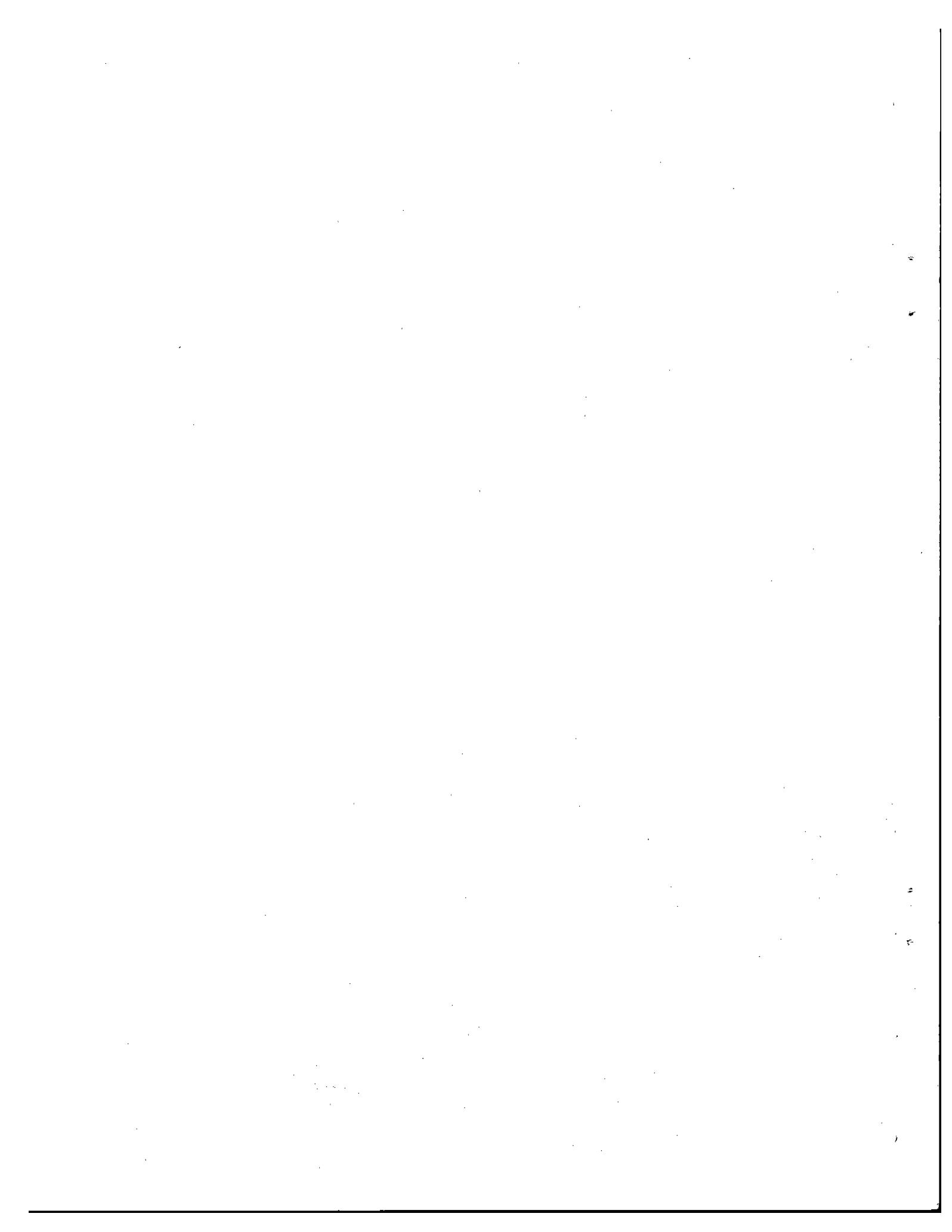
## 16P 50 1-HOUR AVERAGE CONCENTRATIONS

DAY	HOUR	WIND SPEED (m/s)	WIND DIRECTION (DEGREES)	STABILITY	MIXING HEIGHT (METERS)	RECEPTOR	1-HOUR CONCENTRATION (UG/M <sup>3</sup> )	
1	3	2.1	214	b	251	4	2208.9	
1	6	1.5	17	b	582	10	2187.8	
1	10	1.5	7	b	825	10	2113.7	
1	12	1.5	222	b	338	1	2024.0	
1	14	2.1	223	b	251	1	1842.7	
1	17	3.1	239	b	216	1	1556.5	
1	21	1.5	261	b	251	7	1542.1	
1	6	2.6	232	b	251	1	1386.9	
1	21	2.1	220	b	460	4	1317.2	
1	22	1.5	222	b	338	4	1162.6	
1	19	2.1	24	b	703	10	1157.2	
1	21	2.1	176	b	251	9	997.7	
1	5	3.1	233	b	251	1	941.4	
1	7	3.1	235	b	251	1	659.6	
1	4	2.1	225	b	251	4	581.2	
1	24	4.1	220	b	94	4	524.5	
1	12	10.2	226	b	683	1	452.4	
1	21	2.1	220	b	460	1	450.5	
1	16	5.1	324	b	891	0	444.3	
1	7	3.1	235	b	251	1	324.3	
1	15	1.0	312	b	891	6	316.4	
1	1	1.5	312	b	891	3	299.1	
1	14	2.1	349	b	891	8	259.6	
1	11	6.5	234	b	579	1	199.9	
1	24	4.1	226	b	94	1	182.9	
1	1	1.5	201	b	251	4	163.2	
1	10	5.8	221	b	475	4	129.0	
1	9	4.1	197	b	371	7	107.6	
1	10	5.8	221	b	475	1	102.9	
1	19	2.1	24	b	703	13	91.3	
1	12	10.2	226	b	683	4	89.3	
1	16	5.1	324	b	691	8	71.2	
1	6	3.6	213	b	267	4	67.3	
1	16	5.1	324	b	891	3	49.3	
1	13	2.1	3	b	767	10	43.9	
1	17	2.1	176	b	251	7	36.7	
1	14	2.1	349	b	891	10	33.4	
1	1	1.5	13	b	787	8	30.4	
1	15	2.1	3	b	891	8	20.5	
1	14	1.0	312	b	891	6	18.8	
1	16	1.5	349	b	891	10	17.4	
1	11	4.5	241	b	371	4	17.1	
1	17	1.5	11	b	267	7	16.8	
1	1	9	4.1	147	b	216	4	16.3
1	6	3.6	213	b	825	8	16.1	
1	23	3.1	230	b	579	4	15.3	
1	16	1.5	7	b	891	6	15.2	
1	11	4.5	234	b	267	1	15.1	
1	17	1.5	11	b	251	4	15.1	
1	1	8	3.6	213	b	251	4	15.1
1	3	2.1	214	b	891	6	15.1	
1	7	5.1	235	b	251	4	15.1	
1	1	6	232	b	251	4	15.1	

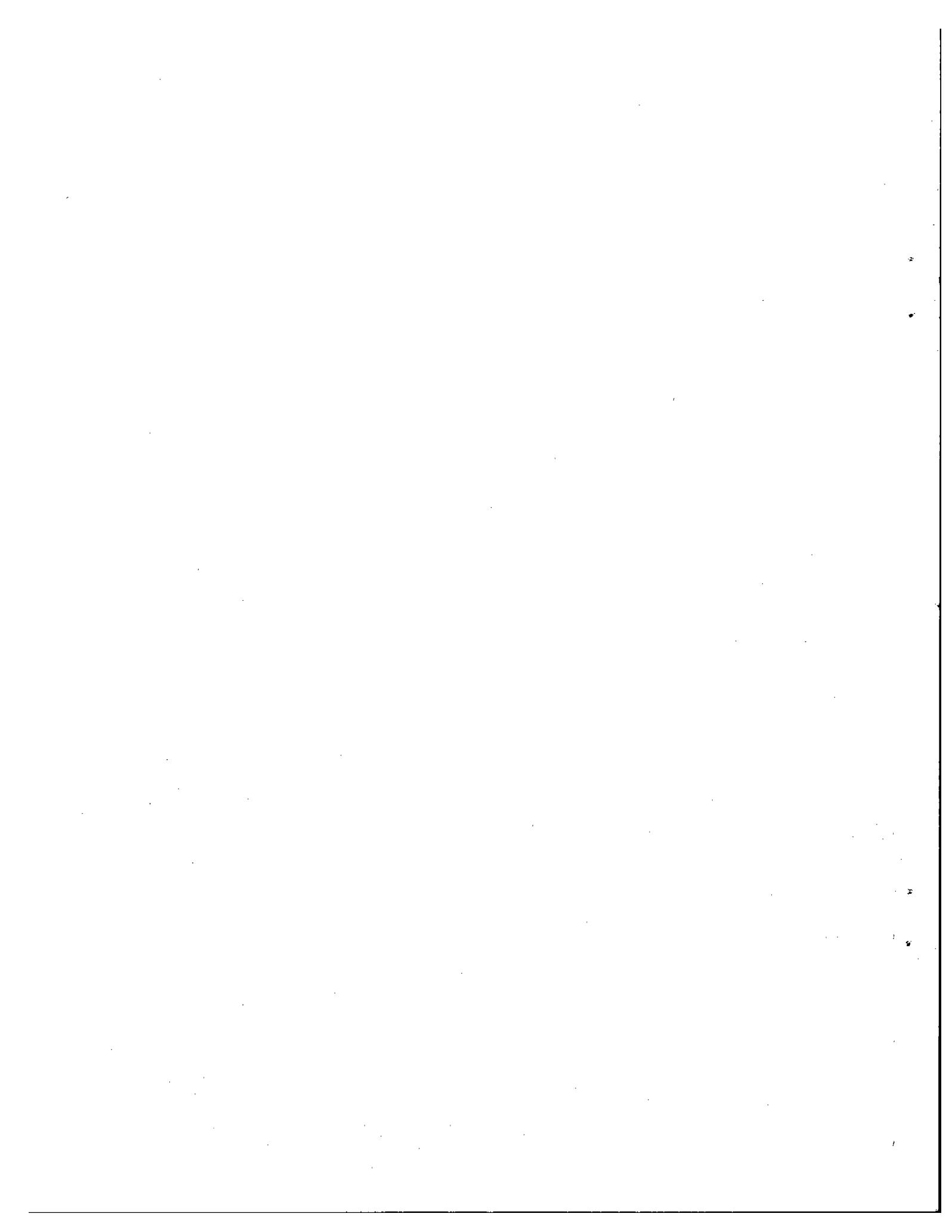
DAY	LINE PERIOD	RECEPTOR	3-HOUR CONCENTRATIONS ( $\mu\text{g/m}^3$ )	
			1	2
1	4	1	1390.5	
1	7	1	169.1	
1	10	10	1120.0	
1	4	4	802.3	
1	10	10	715.6	
1	6	4	586.9	
1	7	7	535.7	
1	4	4	449.1	
1	9	9	342.6	
1	1	1	297.2	
1	4	4	229.9	
1	7	1	160.8	
1	6	6	160.2	
1	3	1	158.2	
1	5	6	121.0	
1	5	5	114.9	
1	5	6	115.5	
1	4	4	90.2	
1	3	3	53.7	
1	7	7	49.3	
1	6	6	40.3	
1	3	4	39.6	
1	10	5	33.6	
1	6	5	32.4	
1	1	1	15.1	
1	5	5	15.9	
1	4	7	15.0	
1	3	13	15.0	
1	6	6	15.0	
1	5	5	15.0	
1	12	12	15.0	
1	11	11	15.0	
1	10	10	15.0	
1	5	5	15.0	
1	8	8	15.0	
1	2	2	15.0	
1	2	1	15.0	
1	16	16	15.0	
1	15	15	15.0	
1	14	14	15.0	
1	2	2	15.0	
1	7	7	15.0	
1	6	6	15.0	
1	5	5	15.0	
1	13	13	15.0	
1	3	3	15.0	
1	14	14	15.0	
1	13	13	15.0	
1	12	12	15.0	
1	11	11	15.0	

#### **100% 24-HOUR AVERAGE CONCENTRATIONS**

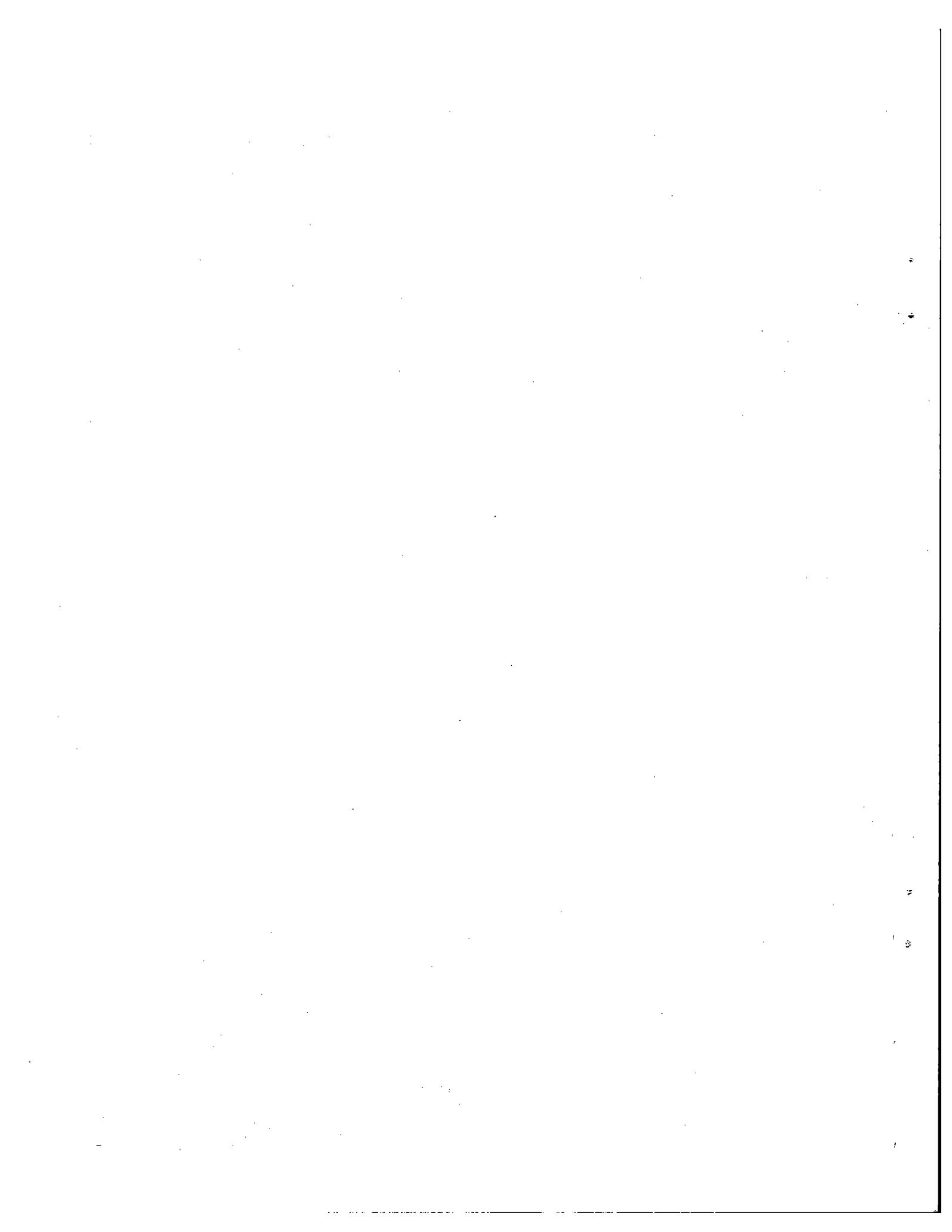
**INPUT DATA FOR POSTBLP**  
**TEST CASE NO. 2**



&OPTS LEV15=,TRUE.,LEV124=,TRUE.,IECHO=1,365\*0,  
LSUM=,TRUE.,NSUM=6,ISUM0E=1,2,3,4,101,102,56\*0,&END



OUTPUT DATA FOR POSTBLP  
TEST CASE NO. 2



ELF DISTRIBUTORSHIP VERSION 1.1 - LEVEL 800702

תלמוד בבלי מס' קב' ע' ۱۷۴

YEAR : 0

TOTAL NUMBER OF DAYS SPENT IN THIS STATE:

(define (inert-obj? i) (= (taclet-type i) 0))

TOTAL NUMBER OF SUBJECTS: 6

卷之四

INTRODUCTION 19

SOURCE: CONTACTS WITH FEDERAL LINE SOURCES ARE AVAILABLE.

{ $v \in v_0$  | AVAILABLE( $E^{\dagger}$ ,  $v$ ) =  $\{v\}$  }

LINE SOURCE MODELS Availability

- 1 -

2

M

四

441 P PROJECT ASSISTANT VERSION 1.1 LEVEL A00702

卷之三

(*UZIN*) *AVANTAGE* (RIST)

卷之三

1

The RPL Configuration Data (RCD) in THIS RCD IS THE STATE OF THE FOLLOWING 6 SEIS OF SCOUT Configuration DATA:

SCOUT = (1) 1 (2) 2 (3) 3 (4) 4 (5) 5 (6) 6  
Where The Configuration DATA ASSOCIATED WITH EACH SCOUT IS IDENTIFIED AS FOLLOWS:

SCOUT

CONCENTRATION DATA

1-10	Source Concentration = Line Source Number "1SCOUT"
11	Source Concentration = All List Sources
101-150	Source Concentration = Point Source Number "1SCOUT" = 100
151	Source Concentration = All Point Sources
999	Total Concentration

PREDICTION DISTRIBUTIONS REQUESTED IN THIS PREDICTION:

1-HOUR AVERAGES	2
3-HOUR AVERAGES	2
24-HOUR AVERAGES	2

WPS PRESCRIBER'S SITE VERSION 1.1 LEVEL 00702

\*\*\*\*\*  
CUMULATIVE AND BULK AVERAGE AT EACH RECEPTOR FOLLOWING DAYS:  
\*\*\*\*\*

DAY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1-HOUR AVERAGES	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
3-HOUR AVERAGES	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
24-HOUR AVERAGES	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000

Avg FOR THE FOLLOWING AVERAGING PERIODS:

1-HOUR AVERAGES 2 HR  
3-HOUR AVERAGES 2 HR  
24-HOUR AVERAGES 2 HR

PERIOD	YEAR:	DAY:	1 PERIOD:	3 HOUR AVERAGE CONCENTRATIONS AT EACH RECEPTOR		
				RECEPTOR	3 HR AVERAGE CONCENTRATION (UG/M <sup>3</sup> )	REF PERIOD
1			0.4	9	327.6	
2			0.0	10	0.0	
3			0.0	11	0.0	
4			181.5	12	0.0	
5			0.0	13	0.0	
6			0.0	14	0.0	
7			181.7	15	0.0	
8			0.0	16	0.0	

PERIOD	YEAR:	DAY:	1 PERIOD:	3 HOUR AVERAGE CONCENTRATIONS AT EACH RECEPTOR		
				RECEPTOR	3 HR AVERAGE CONCENTRATION (UG/M <sup>3</sup> )	REF PERIOD
1			157.5	9	0.0	
2			0.0	10	0.0	
3			0.0	11	0.0	
4			214.9	12	0.0	
5			0.0	13	0.0	
6			0.0	14	0.0	
7			214.9	15	0.0	
8			0.0	16	0.0	

PERIOD	YEAR:	DAY:	1 PERIOD:	3 HOUR AVERAGE CONCENTRATIONS AT EACH RECEPTOR		
				RECEPTOR	3 HR AVERAGE CONCENTRATION (UG/M <sup>3</sup> )	REF PERIOD
1			157.5	9	0.0	

RECEPTOR	EFFECT	RAY:	EFFECTIVE CONCENTRATION ( $\mu$ G/M**3)	3 HR AVERAGE CONCENTRATIONS AT EACH RECEPTOR		
				RECEPTOR	3 HR AVERAGE CONCENTRATION ( $\mu$ G/M**3)	3 HR AVERAGE CONCENTRATION ( $\mu$ G/M**3)
1	2hr <sup>a</sup> C	0	9	9	0.0	0.0
2	0.0	1	1.0	1.0	0.0	0.0
3	0.0	1	1.1	1.1	0.0	0.0
4	75 <sup>a</sup> C	1	1.2	1.2	0.0	0.0
5	0.0	1	1.3	1.3	0.0	0.0
6	0.0	1	1.4	1.4	0.0	0.0
7	0.0	1	1.5	1.5	0.0	0.0
8	0.0	1	1.6	1.6	0.0	0.0

RECEPTOR	YIELD:	0 DAY:	1 PERIOD:	5 PERIODS:	3 HR AVERAGE CONCENTRATIONS AT EACH RECEPTOR	
					3 HR AVERAGE CONCENTRATION ( $\mu\text{g}/\text{m}^3 \times 3$ )	3 HR AVERAGE CONCENTRATION ( $\mu\text{g}/\text{m}^3 \times 3$ )
1	1	0.0	0.0	0.0	9	0.0
2	2	0.0	0.0	0.0	10	18.6
3	3	1.0	0.5	0.5	11	0.0
4	4	0.0	0.0	0.0	12	0.0
5	5	0.0	0.0	0.0	13	0.0
6	6	1.9	1.9	1.9	14	0.0
7	7	0.0	0.0	0.0	15	0.0
8	8	0.0	0.0	0.0	16	0.0

RECEPTOR NUMBER	YR.AGE	0 DAY	1 RELEASER	6 RELEASE CONCENTRATION ( $\mu$ G/M*3)	3 HOUR AVERAGE CONCENTRATIONS AT EACH RECEPTOR	
					RECEPTOR	3 HR AVERAGE CONCENTRATION ( $\mu$ G/M*3)
1	0	0	0	0	9	0
2	0	0	0	0	10	0
3	0	0	0	0	11	0
4	0	0	0	0	12	0
5	0	0	0	0	13	0
6	0	0	0	0	14	0
7	0	0	0	0	15	0
8	0	0	0	0	16	0

TREATMENT	DAY	TEST CONCENTRATION ( $\mu$ g/ml)	HOUR AVERAGE CONCENTRATIONS AT EACH RECEPTOR		
			RECEPTOR	HR	AVERAGE CONCENTRATION ( $\mu$ g/ml*3)
1	1	1	1	9	0.0
2	1	1	1	16	0.0
3	1	1	1	11	0.0
4	1	1	1	12	0.0

1  
 2  
 3  
 4  
 5  
 6  
 7  
 8  
 9  
 10  
 11  
 12  
 13  
 14  
 15  
 16

1.5  
 29.3  
 0.0  
 0.0  
 0.0  
 0.0  
 0.0

RECEPtor	YEAR:	DAY:	PERIOD:	3 HOUR AVERAGE CONCENTRATIONS AT EACH RECEPTOR		
				1 HR AVERAGE CONCENTRATION (UG/M**3)	8 HR AVERAGE CONCENTRATION (UG/M**3)	24 HR AVERAGE CONCENTRATION (UG/M**3)
1				9		
2				10		
3				11		
4				12		
5				13		
6				14		
7				15		
8				16		
				0.0		

RECEPtor	YEAR:	DAY:	PERIOD:	24 HOUR AVERAGE CONCENTRATIONS AT EACH RECEPTOR		
				1 HR AVERAGE CONCENTRATION (UG/M**3)	8 HR AVERAGE CONCENTRATION (UG/M**3)	24 HR AVERAGE CONCENTRATION (UG/M**3)
1				9		
2				10		
3				11		
4				12		
5				13		
6				14		
7				15		
8				16		
				0.0		

## 1.0 DAY (24 hr) AVERAGE CONCENTRATIONS AT EACH RECEPTOR

RECEPTOR	1.0 DAY AVERAGE CONCENTRATION ( $\mu\text{g}/\text{m}^3$ )
1	599.0
2	0.0
3	1.9*7
4	21.9*9
5	0.0
6	31.3
7	6.9*7
8	16.4
9	1.9
10	11
11	1.2
12	1.5
13	1.4
14	1.5
15	1.6

### **RESULTS OF 1-HOUR AURKAL CONCENTRATIONS AT EACH RECEPTOR**

L	L <sub>1</sub>	L <sub>2</sub>	L <sub>3</sub>	L <sub>4</sub>	5TH HIGHEST		4TH HIGHEST		3RD HIGHEST	
					(U/G/M**3)	(U/G/M**3)	(U/G/M**3)	(U/G/M**3)	(U/G/M**3)	(U/G/M**3)
1	2.0*9.0	(1.0*2.0)	1.0*2.0	1.0*2.0	1.541.3	(1.0*2.0)	1.571.9	(1.0*2.0)	926.4	(1.0*2.0)
2	0.0	(0.0*0.0)	0.0	0.0	0.0	(0.0*0.0)	0.0	(0.0*0.0)	0.0	(0.0*0.0)
3	5.0*1.0	(1.0*1.0)	5.0*1.0	5.0*1.0	1.147.0	(1.0*2.0)	6.06.6	(1.0*2.0)	566.2	(1.0*2.0)
4	2.0*5.0	(1.0*3.0)	1.602.2	(1.0*2.0)	0.0	(0.0*0.0)	0.0	(0.0*0.0)	0.0	(0.0*0.0)
5	0.0*0.0	(1.0*1.0)	0.0	0.0	0.0	(0.0*0.0)	0.0	(0.0*0.0)	0.0	(0.0*0.0)
6	4.0*5.0	(1.0*1.0)	3.09.3	(1.0*1.0)	5.5	(1.0*1.0)	0.0	(0.0*0.0)	0.0	(0.0*0.0)
7	1.0*7.0	(1.0*1.0)	1.14.0	(1.0*1.0)	26.9	(1.0*1.0)	0.0	(0.0*0.0)	0.0	(0.0*0.0)
8	2.0*4.0	(1.0*1.0)	7.04.3	(1.0*1.0)	1.0.4	(1.0*1.0)	2.1	(1.0*1.0)	0.1	(1.0*1.0)
9	0.0*2.0	(1.0*1.0)	0.0	0.0	0.0	(0.0*0.0)	15.4	(1.0*1.0)	1.3	(1.0*1.0)
10	2.0*7.0	(1.0*2.0)	2.0*7.0	(1.0*2.0)	0.0	(0.0*0.0)	0.0	(0.0*0.0)	0.0	(0.0*0.0)
11	0.0*0.0	(0.0*0.0)	0.0	0.0	0.0	(0.0*0.0)	34.3	(1.0*1.0)	21.7	(1.0*1.0)
12	0.0*0.0	(0.0*0.0)	0.0	0.0	0.0	(0.0*0.0)	0.0	(0.0*0.0)	0.0	(0.0*0.0)
13	0.0*0.0	(1.0*1.0)	0.0	0.0	0.0	(0.0*0.0)	0.0	(0.0*0.0)	0.0	(0.0*0.0)
14	0.0*0.0	(0.0*0.0)	0.0	0.0	0.0	(0.0*0.0)	0.0	(0.0*0.0)	0.0	(0.0*0.0)
15	0.0*0.0	(0.0*0.0)	0.0	0.0	0.0	(0.0*0.0)	0.0	(0.0*0.0)	0.0	(0.0*0.0)
16	0.0*0.0	(0.0*0.0)	0.0	0.0	0.0	(0.0*0.0)	0.0	(0.0*0.0)	0.0	(0.0*0.0)

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SUMMARY 3-HOUR AVERAGE CONCENTRATIONS AT EACH receptor

Receptor	1ST HIGHEST (UG/M**3)	2ND HIGHEST (UG/M**3)	3RD HIGHEST (UG/M**3)	4TH HIGHEST (UG/M**3)	5TH HIGHEST (UG/M**3)
1	1.657*4 (1.67)	1.642*3 (1.65)	1.622*2 (1.64)	1.458 (1.7)	1.432 (1.73)
2	1.575*4 (1.60)	1.616 (1.60)	1.600 (1.60)	0.0 (0.0)	0.0 (0.0)
3	1.01*5 (1.57)	1.174 (1.62)	1.162 (1.62)	0.0 (0.0)	0.0 (0.0)
4	1.671*5 (1.61)	1.719 (1.8)	1.701 (1.77)	2.149 (1.2)	2.152 (1.4)
5	0.99 (1.55)	0.99 (0.9)	0.99 (0.9)	0.0 (0.0)	0.0 (0.0)
6	1.62*2 (1.66)	1.649 (1.55)	1.630 (1.55)	0.0 (0.0)	0.0 (0.0)
7	2.15*7 (1.61)	2.16.7 (1.55)	2.15.7 (1.55)	0.0 (0.0)	0.0 (0.0)
8	1.06*0 (1.51)	2.5*3 (1.66)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
9	3.27*6 (1.11)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
10	1.105*0 (1.67)	1.105*6 (1.66)	1.105*6 (1.66)	1.105*6 (1.66)	1.105*6 (1.66)
11	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
12	0.9 (0.9)	0.9 (0.9)	0.9 (0.9)	0.0 (0.0)	0.0 (0.0)
13	2.9*3 (1.7)	0.9 (1.6)	0.9 (1.6)	0.0 (0.0)	0.0 (0.0)
14	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
15	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
16	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)

SUBSTRATE 4-METHYL AVERAGE CONCENTRATIONS AT EACH REACTION

	1st HIGHEST	2nd HIGHEST	3rd HIGHEST	4th HIGHEST
	(UG/M**3)	(UG/M**3)	(UG/M**3)	(UG/M**3)
1	0.0 ( 0 )	0.0 ( 0 )	0.0 ( 0 )	0.0 ( 0 )
2	0.0 ( 0 )	0.0 ( 0 )	0.0 ( 0 )	0.0 ( 0 )
3	0.0 ( 0 )	0.0 ( 0 )	0.0 ( 0 )	0.0 ( 0 )
4	0.0 ( 0 )	0.0 ( 0 )	0.0 ( 0 )	0.0 ( 0 )
5	0.0 ( 0 )	0.0 ( 0 )	0.0 ( 0 )	0.0 ( 0 )
6	0.0 ( 0 )	0.0 ( 0 )	0.0 ( 0 )	0.0 ( 0 )
7	0.0 ( 0 )	0.0 ( 0 )	0.0 ( 0 )	0.0 ( 0 )
8	0.0 ( 0 )	0.0 ( 0 )	0.0 ( 0 )	0.0 ( 0 )
9	0.0 ( 0 )	0.0 ( 0 )	0.0 ( 0 )	0.0 ( 0 )
10	0.0 ( 0 )	0.0 ( 0 )	0.0 ( 0 )	0.0 ( 0 )
11	0.0 ( 0 )	0.0 ( 0 )	0.0 ( 0 )	0.0 ( 0 )
12	0.0 ( 0 )	0.0 ( 0 )	0.0 ( 0 )	0.0 ( 0 )
13	0.0 ( 0 )	0.0 ( 0 )	0.0 ( 0 )	0.0 ( 0 )
14	0.0 ( 0 )	0.0 ( 0 )	0.0 ( 0 )	0.0 ( 0 )
15	0.0 ( 0 )	0.0 ( 0 )	0.0 ( 0 )	0.0 ( 0 )
16	0.0 ( 0 )	0.0 ( 0 )	0.0 ( 0 )	0.0 ( 0 )

Table 50: 1-Hour Average Concentrations

DAY	TIME	SO <sub>2</sub> (ppm)	AVERAGE DILUTIONS (INTERFERS)	STABILITY (INTERFERS)	FITTING HEIGHT (INTERFERS)	RECEPTOR	1-HOUR CONCENTRATION (UG/M <sup>3</sup> )	
							214	251
1	5	2.1	214	4	251	4	2193.9	2193.9
1	1.5	1.5	17	6	582	10	2172.6	2172.6
1	1.5	1.5	17	6	425	10	2098.7	2098.7
1	1.5	1.5	7	6	358	1	2009.0	2009.0
1	1.5	1.5	222	6	251	1	1827.7	1827.7
1	1.5	1.5	224	6	216	1	1541.5	1541.5
1	1.5	1.5	230	6	251	7	1527.1	1527.1
1	1.5	1.5	261	6	251	1	1371.9	1371.9
1	1.5	1.5	252	6	460	4	1302.2	1302.2
1	1.5	1.5	220	6	358	4	1147.6	1147.6
1	1.5	1.5	222	6	703	10	1142.2	1142.2
1	1.5	1.5	224	6	251	9	982.7	982.7
1	1.5	1.5	176	6	251	1	926.4	926.4
1	1.5	1.5	220	6	460	6	435.5	435.5
1	1.5	1.5	233	2	891	6	429.3	429.3
1	1.5	1.5	223	6	251	1	309.3	309.3
1	1.5	1.5	224	5	891	6	301.4	301.4
1	1.5	1.5	226	4	891	3	284.1	284.1
1	1.5	1.5	226	6	891	6	244.6	244.6
1	1.5	1.5	226	6	579	1	184.9	184.9
1	1.5	1.5	324	4	94	1	167.9	167.9
1	1.5	1.5	220	5	251	4	148.2	148.2
1	1.5	1.5	312	1	201	6	114.0	114.0
1	1.5	1.5	312	1	891	7	92.6	92.6
1	1.5	1.5	344	2	891	5	87.9	87.9
1	1.5	1.5	234	4	475	1	76.3	76.3
1	1.5	1.5	220	5	703	13	74.3	74.3
1	1.5	1.5	201	6	463	4	56.2	56.2
1	1.5	1.5	201	6	475	4	52.3	52.3
1	1.5	1.5	221	4	891	5	34.3	34.3
1	1.5	1.5	221	4	891	10	28.9	28.9
1	1.5	1.5	24	2	787	7	21.7	21.7
1	1.5	1.5	226	4	251	10	18.4	18.4
1	1.5	1.5	12	2	891	6	15.4	15.4
1	1.5	1.5	324	2	267	4	11.8	11.8
1	1.5	1.5	213	3	891	8	5.5	5.5
1	1.5	1.5	324	2	891	6	3.8	3.8
1	1.5	1.5	212	3	891	10	2.4	2.4
1	1.5	1.5	344	2	891	4	2.1	2.1
1	1.5	1.5	216	7	891	4	1.8	1.8
1	1.5	1.5	216	7	891	6	1.3	1.3
1	1.5	1.5	11	3	891	6	1.1	1.1
1	1.5	1.5	116	6	371	4	0.3	0.3
1	1.5	1.5	349	2	891	6	0.3	0.3
1	1.5	1.5	497	4	267	7	0.3	0.3
1	1.5	1.5	213	3	216	4	0.2	0.2
1	1.5	1.5	210	6	825	6	0.1	0.1
1	1.5	1.5	349	7	579	4	0.1	0.1
1	1.5	1.5	249	11	891	4	0.1	0.1
1	1.5	1.5	11	5	267	1	0.1	0.1
1	1.5	1.5	214	4	251	4	0.1	0.1
1	1.5	1.5	214	6	251	4	0.1	0.1
1	1.5	1.5	255	7	251	4	0.1	0.1
1	1.5	1.5	252	7	251	4	0.1	0.1

TABLE 5-HOUR AVERAGE CONCENTRATIONS

DAY	TIME PERIOD	KINETIC	5-HOUR CONCENTRATION (lb./m**3)						
			1	2	3	4	5	6	7
1	1	1	1	1	1	1	1	1	1
1	2	1	1	1	1	1	1	1	1
1	3	7	10	10	10	10	10	10	10
1	4	1	1	1	1	1	1	1	1
1	5	6	10	10	10	10	10	10	10
1	6	6	4	4	4	4	4	4	4
1	7	7	7	7	7	7	7	7	7
2	1	1	1	1	1	1	1	1	1
2	2	1	1	1	1	1	1	1	1
2	3	4	4	4	4	4	4	4	4
2	4	4	4	4	4	4	4	4	4
2	5	5	5	5	5	5	5	5	5
2	6	5	5	5	5	5	5	5	5
2	7	5	5	5	5	5	5	5	5
3	1	1	1	1	1	1	1	1	1
3	2	1	1	1	1	1	1	1	1
3	3	1	1	1	1	1	1	1	1
3	4	1	1	1	1	1	1	1	1
3	5	1	1	1	1	1	1	1	1
3	6	1	1	1	1	1	1	1	1
3	7	1	1	1	1	1	1	1	1
4	1	1	1	1	1	1	1	1	1
4	2	1	1	1	1	1	1	1	1
4	3	1	1	1	1	1	1	1	1
4	4	1	1	1	1	1	1	1	1
4	5	1	1	1	1	1	1	1	1
4	6	1	1	1	1	1	1	1	1
4	7	1	1	1	1	1	1	1	1
5	1	1	1	1	1	1	1	1	1
5	2	1	1	1	1	1	1	1	1
5	3	1	1	1	1	1	1	1	1
5	4	1	1	1	1	1	1	1	1
5	5	1	1	1	1	1	1	1	1
5	6	1	1	1	1	1	1	1	1
5	7	1	1	1	1	1	1	1	1
6	1	1	1	1	1	1	1	1	1
6	2	1	1	1	1	1	1	1	1
6	3	1	1	1	1	1	1	1	1
6	4	1	1	1	1	1	1	1	1
6	5	1	1	1	1	1	1	1	1
6	6	1	1	1	1	1	1	1	1
6	7	1	1	1	1	1	1	1	1
7	1	1	1	1	1	1	1	1	1
7	2	1	1	1	1	1	1	1	1
7	3	1	1	1	1	1	1	1	1
7	4	1	1	1	1	1	1	1	1
7	5	1	1	1	1	1	1	1	1
7	6	1	1	1	1	1	1	1	1
7	7	1	1	1	1	1	1	1	1
8	1	1	1	1	1	1	1	1	1
8	2	1	1	1	1	1	1	1	1
8	3	1	1	1	1	1	1	1	1
8	4	1	1	1	1	1	1	1	1
8	5	1	1	1	1	1	1	1	1
8	6	1	1	1	1	1	1	1	1
8	7	1	1	1	1	1	1	1	1
9	1	1	1	1	1	1	1	1	1
9	2	1	1	1	1	1	1	1	1
9	3	1	1	1	1	1	1	1	1
9	4	1	1	1	1	1	1	1	1
9	5	1	1	1	1	1	1	1	1
9	6	1	1	1	1	1	1	1	1
9	7	1	1	1	1	1	1	1	1
10	1	1	1	1	1	1	1	1	1
10	2	1	1	1	1	1	1	1	1
10	3	1	1	1	1	1	1	1	1
10	4	1	1	1	1	1	1	1	1
10	5	1	1	1	1	1	1	1	1
10	6	1	1	1	1	1	1	1	1
10	7	1	1	1	1	1	1	1	1
11	1	1	1	1	1	1	1	1	1
11	2	1	1	1	1	1	1	1	1
11	3	1	1	1	1	1	1	1	1
11	4	1	1	1	1	1	1	1	1
11	5	1	1	1	1	1	1	1	1
11	6	1	1	1	1	1	1	1	1
11	7	1	1	1	1	1	1	1	1
12	1	1	1	1	1	1	1	1	1
12	2	1	1	1	1	1	1	1	1
12	3	1	1	1	1	1	1	1	1
12	4	1	1	1	1	1	1	1	1
12	5	1	1	1	1	1	1	1	1
12	6	1	1	1	1	1	1	1	1
12	7	1	1	1	1	1	1	1	1
13	1	1	1	1	1	1	1	1	1
13	2	1	1	1	1	1	1	1	1
13	3	1	1	1	1	1	1	1	1
13	4	1	1	1	1	1	1	1	1
13	5	1	1	1	1	1	1	1	1
13	6	1	1	1	1	1	1	1	1
13	7	1	1	1	1	1	1	1	1
14	1	1	1	1	1	1	1	1	1
14	2	1	1	1	1	1	1	1	1
14	3	1	1	1	1	1	1	1	1
14	4	1	1	1	1	1	1	1	1
14	5	1	1	1	1	1	1	1	1
14	6	1	1	1	1	1	1	1	1
14	7	1	1	1	1	1	1	1	1
15	1	1	1	1	1	1	1	1	1
15	2	1	1	1	1	1	1	1	1
15	3	1	1	1	1	1	1	1	1
15	4	1	1	1	1	1	1	1	1
15	5	1	1	1	1	1	1	1	1
15	6	1	1	1	1	1	1	1	1
15	7	1	1	1	1	1	1	1	1
16	1	1	1	1	1	1	1	1	1
16	2	1	1	1	1	1	1	1	1
16	3	1	1	1	1	1	1	1	1
16	4	1	1	1	1	1	1	1	1
16	5	1	1	1	1	1	1	1	1
16	6	1	1	1	1	1	1	1	1
16	7	1	1	1	1	1	1	1	1
17	1	1	1	1	1	1	1	1	1
17	2	1	1	1	1	1	1	1	1
17	3	1	1	1	1	1	1	1	1
17	4	1	1	1	1	1	1	1	1
17	5	1	1	1	1	1	1	1	1
17	6	1	1	1	1	1	1	1	1
17	7	1	1	1	1	1	1	1	1
18	1	1	1	1	1	1	1	1	1
18	2	1	1	1	1	1	1	1	1
18	3	1	1	1	1	1	1	1	1
18	4	1	1	1	1	1	1	1	1
18	5	1	1	1	1	1	1	1	1
18	6	1	1	1	1	1	1	1	1
18	7	1	1	1	1	1	1	1	1
19	1	1	1	1	1	1	1	1	1
19	2	1	1	1	1	1	1	1	1
19	3	1	1	1	1	1	1	1	1
19	4	1	1	1	1	1	1	1	1
19	5	1	1	1	1	1	1	1	1
19	6	1	1	1	1	1	1	1	1
19	7	1	1	1	1	1	1	1	1
20	1	1	1	1	1	1	1	1	1
20	2	1	1	1	1	1	1	1	1
20	3	1	1	1	1	1	1	1	1
20	4	1	1	1	1	1	1	1	1
20	5	1	1	1	1	1	1	1	1
20	6	1	1	1	1	1	1	1	1
20	7	1	1	1	1	1	1	1	1
21	1	1	1	1	1	1	1	1	1
21	2	1	1	1	1	1	1	1	1
21	3	1	1	1	1	1	1	1	1
21	4	1	1	1	1	1	1	1	1
21	5	1	1	1	1	1	1	1	1
21	6	1	1	1	1	1	1	1	1
21	7	1	1	1	1	1	1	1	1
22	1	1	1	1	1	1	1	1	1
22	2	1	1	1	1	1	1	1	1
22	3	1	1	1	1	1	1	1	1
22	4	1	1	1	1	1	1	1	1
22	5	1	1	1	1	1	1	1	1
22	6	1	1	1	1	1	1	1	1
22	7	1	1	1	1	1	1	1	1
23	1	1	1	1	1	1	1	1	1
23	2	1	1	1	1	1	1	1	1
23	3	1	1	1	1	1	1	1	1
23	4	1	1	1	1	1	1	1	1
23	5	1	1	1	1	1	1	1	1
23	6	1	1	1	1	1	1	1	1
23	7	1	1	1	1	1	1	1	1
24	1	1	1	1	1	1	1	1	1
24	2	1	1	1	1	1	1	1	1
24	3	1	1	1	1	1	1	1	1
24	4	1	1	1	1	1	1	1	1
24	5	1	1	1	1	1	1	1	1
24	6	1	1	1	1	1	1	1	1

