

Appendix A to Appendix W of Part 51—Summaries of Preferred Air Quality Models

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A.0 Introduction and Availability

(1) This appendix summarizes key features of refined air quality models preferred for specific regulatory applications. For each model, information is provided on availability, approximate cost (where applicable), regulatory use, data input, output format and options, simulation of atmospheric physics, and accuracy. These models may be used without a formal demonstration of applicability provided they satisfy the recommendations for regulatory use; not all options in the models are necessarily recommended for regulatory use.

(2) Many of these models have been subjected to a performance evaluation using comparisons with observed air quality data. Where possible, several of the models contained herein have been subjected to evaluation exercises, including (1) statistical performance tests recommended by the American Meteorological Society and (2) peer scientific reviews. The models in this appendix have been selected on the basis of the results of the model evaluations, experience with previous use, familiarity of the model to various air quality programs, and the costs and resource requirements for use.

(3) With the exception of EDMS, codes and documentation for all models listed in this appendix are available from EPA's Support Center for Regulatory Air Models (SCRAM) Web site at <http://www.epa.gov/scram001>. Documentation is also available from the National Technical Information Service (NTIS), <http://www.ntis.gov> or U.S. Department of Commerce, Springfield, VA 22161; phone: (800) 553-6847. Where possible, accession numbers are provided.

A.1 Buoyant Line and Point Source Dispersion Model (BLP)

Reference

Schulman, Lloyd L. and Joseph S. Scire, 1980. Buoyant Line and Point Source (BLP) Dispersion Model User's Guide. Document P-7304B. Environmental Research and Technology, Inc., Concord, MA. (NTIS No. PB 81-164642)

Availability

The computer code is available on EPA's Internet SCRAM website and also on diskette (as PB 2002-500051) from the National

Technical Information Service (see Section A.0).

Abstract

BLP is a Gaussian plume dispersion model designed to handle unique modeling problems associated with aluminum reduction plants, and other industrial sources where plume rise and downwash effects from stationary line sources are important.

a. Recommendations for Regulatory Use

(1) The BLP model is appropriate for the following applications:

- Aluminum reduction plants which contain buoyant, elevated line sources;
- Rural areas;
- Transport distances less than 50 kilometers;
- Simple terrain; and
- One hour to one year averaging times.

(2) The following options should be selected for regulatory applications:

- (i) Rural (IRU=1) mixing height option;
- (ii) Default (no selection) for plume rise wind shear (LSHEAR), transitional point source plume rise (LTRANS), vertical potential temperature gradient (DTHTA), vertical wind speed power law profile exponents (PEXP), maximum variation in number of stability classes per hour (IDELS), pollutant decay (DECFA), the constant in Briggs' stable plume rise equation (CONST2), constant in Briggs' neutral plume rise equation (CONST3), convergence criterion for the line source calculations (CRIT), and maximum iterations allowed for line source calculations (MAXIT); and
- (iii) Terrain option (TERAN) set equal to 0.0, 0.0, 0.0, 0.0, 0.0, 0.0

(3) For other applications, BLP can be used if it can be demonstrated to give the same estimates as a recommended model for the same application, and will subsequently be executed in that mode.

(4) BLP can be used on a case-by-case basis with specific options not available in a recommended model if it can be demonstrated, using the criteria in Section 3.2, that the model is more appropriate for a specific application.

b. Input Requirements

(1) Source data: point sources require stack location, elevation of stack base, physical stack height, stack inside diameter, stack gas exit velocity, stack gas exit temperature, and pollutant emission rate. Line sources require coordinates of the end points of the line, release height, emission rate, average line source width, average building width, average spacing between buildings, and average line source buoyancy parameter.

(2) Meteorological data: Hourly surface weather data from punched cards or from the preprocessor program PCRAMMET which provides hourly stability class, wind direction, wind speed, temperature, and mixing height.

(3) Receptor data: Locations and elevations of receptors, or location and size of receptor grid or request automatically generated receptor grid.

c. Output

(1) Printed output (from a separate post-processor program) includes:

(2) Total concentration or, optionally, 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 run) average concentrations at each receptor;

(3) Five highest 1-, 3-, and 24-hour average concentrations at each receptor; and

(4) Fifty highest 1-, 3-, and 24-hour concentrations over the receptor field.

d. Type of Model

BLP is a gaussian plume model.

e. Pollutant Types

BLP may be used to model primary pollutants. This model does not treat settling and deposition.

f. Source-Receptor Relationship

(1) BLP treats up to 50 point sources, 10 parallel line sources, and 100 receptors arbitrarily located.

(2) User-input topographic elevation is applied for each stack and each receptor.

g. Plume Behavior

(1) BLP uses plume rise formulas of Schulman and Scire (1980).

(2) Vertical potential temperature gradients of 0.02 Kelvin per meter for E stability and 0.035 Kelvin per meter are used for stable plume rise calculations. An option for user input values is included.

(3) Transitional rise is used for line sources.

(4) Option to suppress the use of transitional plume rise for point sources is included.

(5) The building downwash algorithm of Schulman and Scire (1980) is used.

h. Horizontal Winds

(1) Constant, uniform (steady-state) wind is assumed for an hour.

Straight line plume transport is assumed to all downwind distances.

(2) Wind speeds profile exponents of 0.10, 0.15, 0.20, 0.25, 0.30, and 0.30 are used for stability classes A through F, respectively. An option for user-defined values and an option to suppress the use of the wind speed profile feature are included.

i. Vertical Wind Speed

Vertical wind speed is assumed equal to zero.

j. Horizontal Dispersion

(1) Rural dispersion coefficients are from Turner (1969), with no adjustment made for variations in surface roughness or averaging time.

(2) Six stability classes are used.

k. Vertical Dispersion

(1) Rural dispersion coefficients are from Turner (1969), with no adjustment made for variations in surface roughness.

(2) Six stability classes are used.

(3) Mixing height is accounted for with multiple reflections until the vertical plume standard deviation equals 1.6 times the mixing height; uniform mixing is assumed beyond that point.

(4) Perfect reflection at the ground is assumed.