

## BREEZE ROADS (CALINE4, CAL3QHC, CAL3QHCr)

BREEZE ROADS is an air dispersion modeling suite that predicts air quality impacts of carbon monoxide (CO), nitrogen dioxide (NO<sub>2</sub>), particulate matter (PM), and other inert pollutant concentrations from moving and idling motor vehicles at or alongside roadways and roadway intersections.

BREEZE ROADS can be used in conjunction with the MOBILE5 or EMFAC emission models or other emission data to demonstrate compliance with National Ambient Air Quality Standards (NAAQS), Federal Conformity Rules, the UK's National Air Quality Strategy, and modeling for highway site and design selection.

BREEZE ROADS contains the **CALINE series of models**.



### Overview

BREEZE ROADS contains several well-accepted dispersion models that vary in their applicability.

### CALINE4

Includes similar model theory as is in CAL3QHC, but has an advanced method for calculating NO<sub>2</sub> concentrations using the Discrete Parcel Method.

### CAL3QHC

A roadway model that predicts air pollutant concentrations near highways and arterial streets due to emissions from motor vehicles operating under free-flow conditions and idling vehicles. In addition, CAL3QHC incorporates methods for estimating traffic queue lengths at roadway intersections.

### CAL3QHCR

An enhanced version of CAL3QHC, this version can process up to a year of hourly meteorological, vehicular emissions, and traffic volume and signalization data in one model run. In addition, 1-hour and running 8-hour averages of CO or 24-hour and annual block averages of PM can be calculated.

In addition to the mobile source dispersion models (CAL3QHC, CAL3QHCR, and CALINE4), BREEZE ROADS also includes a fully integrated GIS and can display DXF files, aerial photos, or other basemaps (.BMP files).

Due to the flexibility of BREEZE ROADS, users can enter model input data manually, by import, by pasting in table view, model object drag-n-drop, or point-n-click.

## Overview

BREEZE ROADS allows your productivity to skyrocket because it uses a streamlined approach.

Whether you're entering links or receptors, you enter it only **once**. What's more, you can visualize your project right on your computer screen, allowing you to easily quality check your data and see your work. There is no better software tool to simplify this aspect of your job.

BREEZE ROADS improves productivity by offering users the following advantages:

- Intuitive graphical interface with full-screen data entry
- Rapid project development using base map file formats including AutoCAD .DXF and Windows .BMP
- 2D visualization of model input data
- Expert technical support
- Comprehensive online documentation
- Enhanced output for creating concentration contours

The easy-to-use visual desktop offers direct access to entering data, running the model, and generating graphics. The visual desktop offers the ability to edit and visualize model data as you create a project.

BREEZE features CAD-like drawing tools that make it easy to edit, move, and delete sources and receptors. You can view model input data in 2D. Intuitive form and table views of data also provide for easy data entry and customization of units. All model parameters are supplemented with complete online help, which provides definitions and acceptable ranges.

BREEZE makes it easy to create and execute projects and avoid costly data entry mistakes. You can easily import and use an AutoCAD .DXF file of a plot plan, facility map, or a digital line graph (DLGs) of local transportation and hydrography features; or, a bitmap image of an aerial photograph as project base maps. This makes it easy to digitize source, building, and property line locations within BREEZE.

BREEZE ROADS has the option of creating separate source and receptor files to save you time and give you flexibility when making multiple runs. You can also share model input data with other applications using AutoCAD .DXF and Windows bitmap image (.BMP) files or standard Windows "cut and paste" capabilities.

The professional staff of modelers, meteorologists, and software engineers at BREEZE are available to assist you with our software. We provide extensive online documentation, operating instructions, sample applications, and technical appendices. The EPA technical guides are also provided online for a more detailed discussion of the model development and application.

BREEZE ROADS offers many features to tailor your analyses for a wide variety of sources and scenarios.

- **Sources:** Up to 120 links may be entered and modeled in CALINE4 and CAL3QHC. Up to 200 links are allowed in CAL3QHCR.
- **Receptors:** Up to 200 discrete receptors can be defined by entering them individually or by drawing lines of receptors on the desktop in CALINE4 and CAL3QHC. Up to 1000 discrete receptors are allowed in CAL3QHCR.
- **Background Concentrations:** Background concentrations can be included or excluded from a given model run. In a Tier II approach, background concentrations can be varied by hour of the day. If modeling NO<sub>2</sub> in CAL3QHCR, an external ambient background file is required that contains ambient concentrations of O<sub>3</sub>, NO, and NO<sub>2</sub>. A tool is included in BREEZE ROADS to generate this file.
- **Meteorological Data:** BREEZE ROADS calculates concentrations from historical hourly or user-specified meteorological data. The program accepts hourly meteorological data preprocessed by PCRAMMET in ASCII or binary format.
- **Two-Tiered Approach:** The CAL3QHCR module allows for a two-tiered approach. Emissions, traffic volume, and signalization data can be varied by day of the week in a Tier II approach.

Other productivity tools include:

- Built in text editor
- Windows Explorer-type interface
- Customizable display and toolbars
- Context sensitive help
- 2D, top down and 3D view

- Backup files for automatic save during power failure
- Network capable
- Unlimited undo option
- Shift object tools
- Rotate object tools
- Latitude/Longitude conversion tool
- Search capabilities

## Technical

BREEZE ROADS is designed to estimate carbon monoxide (CO), particulate matter (PM), nitrogen dioxide (NO<sub>2</sub>), and other inert pollutant concentrations from motor vehicles at roadway intersections. The model includes the CALINE4, CAL3QHC and CAL3QHCR line source dispersion models and a traffic algorithm for estimating vehicular queue lengths at signalized intersections. CAL3QHC and CAL3QHCR are enhanced versions of the CALINE3 model that incorporates methods for estimating queue lengths and the contribution of emissions from idling vehicles. BREEZE ROADS will estimate the total air pollution concentrations from both moving and idling vehicles.

BREEZE ROADS incorporates three modules; two for modeling a single hour of user-defined meteorological data (CAL3QHC and CALINE4) and a third for modeling historic, hourly meteorological data (CAL3QHCR). The latter module has the capability of processing a year of hourly meteorological data, carbon monoxide (CO), particulate matter (PM), or nitrogen dioxide (NO<sub>2</sub>) emissions, traffic, and signalization data. In addition, the CAL3QHCR module incorporates the Industrial Source Complex (ISC) mixing height algorithm. The BREEZE ROADS version of CAL3QHCR has additional enhancements to account for NO<sub>x</sub> to NO<sub>2</sub> conversion. These enhancements are based on the algorithms in the CALINE4 model.

Flexibility has been built into the CAL3QHCR module of BREEZE ROADS to allow for a two-tiered approach. In the first approach, called Tier I, a full year of hourly meteorological data are entered into CAL3QHCR in place of the single hour of artificial meteorological data that are commonly entered into the CAL3QHC and CALINE4 modules. One hour of emissions traffic volume (ETS) data is also entered, just as in the CAL3QHC module. In the second approach, called Tier II, the same meteorological data is used as in a Tier I approach. The ETS data, however, are more detailed and reflect traffic condition for each hour of a week.

CAL3QHCR reads the ETS data as up to 7 sets of hourly ETS data (in the form of diurnal patterns) and processes the data into a week of hourly ETS data. The weekly ETS data are synchronized to the day of the week of the meteorological data year. The weekly traffic conditions are assumed to be the same for each week throughout the modeled period.

While the CAL3QHC and CALINE4 modules only print maximum hourly averages, CAL3QHCR calculates 1-hour and running 8-hour averaged CO, 24-hour, period, and annual block averaged PM concentrations, and 1-hour, period, and annual block averages for NO<sub>2</sub>. In addition, CAL3QHCR output contains: a table of calm wind durations with their respective frequencies, identification of truncated queues due to queues exceeding the physical constraints of the intersection, optional link contribution results for each printed average, and optional use of variable ambient background concentration data in calculating the various maxima concentrations.

Additional features of BREEZE ROADS are:

- Met Viewer for meteorological data viewing
- O3 Method
- Unlimited receptor grids - Cartesian or polar
- Unlimited sources and source groupings
- Multiple pollutant data repository
- Options for culpability analyses
- Integrated Error trapping
- Integrated contouring
- Integrated unit conversion
- Onsite receptor removal option
- Simplified building generation mode

## Models

BREEZE ROADS runs three separate models: CALINE4, CAL3QHC, and CAL3QHCR. Each model has different functions and capabilities.

| AVERAGING PERIODS      | CALINE4 | CAL3QHC    | CAL3QHCR                              |
|------------------------|---------|------------|---------------------------------------|
| CO                     | 1 hr    | 30-60 min. | 1 hr and Running 8 hr                 |
| PM                     | 1 hr    | 30-60 min. | 1 hr, 24 hr, Period, and Annual Block |
| NO <sub>2</sub>        | 1 hr    | N / A      | 1 hr and Annual Block                 |
| Other inert pollutants | 1 hr    | 1 hr       | .                                     |

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| AVAILABLE FEATURES  | CALINE4                             | CAL3QHC                             | CAL3QHCR                            |
|---|-------------------------------------|-------------------------------------|-------------------------------------|
| One and two tier approaches   |                                     |                                     | <input checked="" type="checkbox"/> |
| Can be used as an analysis tool for high concentration episodes or for examining the effects changing meteorology and traffic conditions have on concentrations |                                     |                                     | <input checked="" type="checkbox"/> |
| ISC CALMPRO algorithm included  |                                     |                                     | <input checked="" type="checkbox"/> |
| Urban and rural modes   |                                     |                                     | <input checked="" type="checkbox"/> |
| Options to use ISCST3 meteorological data files   |                                     |                                     | <input checked="" type="checkbox"/> |
| Can specify range of dates to model   |                                     |                                     | <input checked="" type="checkbox"/> |
| Requires external background concentration file for computing NO <sub>2</sub> concentrations  |                                     |                                     | <input checked="" type="checkbox"/> |
| Can process up to 120 roadway links   | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| Can process up to 200 receptors   | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| At-grade roadways   | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| Depressed roadways  | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| Fill (raised roof) roadways   | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |

|                            |                                     |                                     |                                     |
|----------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| Bridges                    | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| Intersection/Queuing links | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| Street canyons and bluffs  | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| Parking lots               | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |

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