Wyoming Department of Environmental Quality/Air Quality Division
Guidance for Conducting Near-Field Modeling Analyses for Minor Sources
(Including Coalbed Methane Facilities)

This guidance document describes dispersion modeling techniques that are acceptable for evaluating near-field (within 50 kilometers) air quality impacts from minor air pollution sources in Wyoming, including Coalbed Methane (CBM) facilities. This guidance also specifies the modeling information which should be included in a permit application to the Wyoming Air Quality Division (AQD).

1. Model Selection

All analyses should be conducted with the latest version of the EPA AERMOD model.

2. Receptor Grid

A. Generate a base receptor grid using UTM coordinates in rectangular Cartesian arrays as follows:

- ≤50-meter (m) spacing along the ambient boundary/facility fenceline
- 100-m spacing from the ambient boundary to a distance of 1.0 kilometer (km) from the grid origin (the grid origin should be centered at the approximate mid-point of the modeled sources at the facility in question)
- 500-m spacing from 1.0 km to 5.0 km
- 1000-m spacing from 5.0 km to 10.0 km

B. AERMAP processing should make use of the number of NED or 7.5-minute DEM files needed to fully determine the hill height scale for each receptor (10% slope). If available, the Division prefers that applicants use NED files, either 1 arc-second/30-meter resolution files or 1/3 arc-second/10-meter resolution files. Electronic copies of the NED/DEM files as well as the AERMAP input and output files should be provided with the application.

3. Meteorological Data

The AQD has developed AERMET-derived meteorological data for several locations in Wyoming. Contact the AQD for available data sets and guidance on AERMET processing for other locations in the state.

Note: Applicants should use the EPA's AERSURFACE tool to determine surface characteristics for input to AERMET for surface meteorological data processing.

4. Modeling Approach

A. Model all sources from the facility applying for an air quality permit using the base receptor grid and determine the radius of impact (ROI) for each pollutant, averaging period, and meteorological year. The ROI should be based on the most distant receptor at which the proposed facility produces a predicted impact that equals or exceeds the Class II area modeling significance level(s). If the modeling analysis demonstrates that the proposed facility (including new and existing sources) produces modeled concentrations that are less than the Class II modeling significance level(s) for a particular pollutant and all applicable averaging periods, then no further modeling analyses are required for that pollutant.

If a significant impact is predicted, proceed to a full-impact analysis to determine compliance with the Wyoming Ambient Air Quality Standards (WAAQS) and Prevention of Significant Deterioration (PSD) increments. For multi-year analyses, use the year of meteorology that yields the largest ROI to determine the reduced receptor grid to use in the WAAQS/increment analyses. The modeling receptor grid for the WAAQS/increment analyses should consist of only those base grid receptors that fall within the ROI from the facility in question. Each year of meteorology should be applied to the reduced receptor grid to determine compliance with the WAAQS/increments. A table listing the Class II modeling significance levels and WAAQS is included with this guidance.

Note: When determining the ROI in a NO_x modeling analysis, the maximum modeled NO_x concentration should not be corrected to represent an equivalent NO_2 concentration. For determining compliance with the annual WAAQS or PSD increment for NO_2, use the annual national default ratio of 0.75 to convert the maximum predicted concentration of NO_x to an equivalent NO_2 concentration [i.e., Ambient Ratio Method: ($0.75 * NO_x = NO_2$)].

B. For the WAAQS analysis, obtain inventories of nearby/regional sources and background concentrations from the AQD.

C. All applicants must include building downwash into the modeling analysis for the proposed facility, and should include downwash from any facility that is located directly adjacent to the facility undergoing review. Electronic copies of the building downwash analysis files (input and output files) should be provided with the application.

D. The AQD will identify all facilities that have been constructed, permitted, or proposed to date within 20 km of any proposed facility for possible inclusion into the modeling analysis. The applicant should provide a table in the modeling report that lists the UTM locations of all facilities that were included in the modeling, along with the associated emission rates and stack parameters.

Note: The AQD has been requiring that the exhaust stacks of all compressor engines be at least 1.5 times higher than the dominant downwash structure for each given source. This requirement provides for improved dispersion characteristics with respect to building downwash influences, and will help to allow for future development in a given geographic area. To avoid delays in the Division's review, this design component should be incorporated into the modeling analysis.

5. Data Submission

A. Provide a plot plan for the facility in question that is drawn to scale and depicts the fence line, emission sources, and downwash structures (buildings). The plot should be labeled with tick marks, referenced to the UTM coordinate system, and geo-referenced to a common horizontal datum [e.g., North American Datum (1927), or NAD27]. Applicants should make sure that all coordinates input to the model (receptor locations, source locations, and building corners) are based on a common datum, and the application should clearly state which datum was used.

B. Submit a table which provides the emission rates for each emission source and the corresponding stack parameters for the operational scenarios proposed in the permit application.

C. Submit the following plots:

- A plot showing all receptor locations (full base grid and any reduced grids used for full-impact modeling) and the facility fenceline.
- Plots which identify the maximum predicted impacts for each pollutant and respective averaging period.

D. Send three hard copies of the modeling analysis report along with one electronic copy of all input/output files (AERMET/AERSURFACE, AERMAP, BPIP, and AERMOD). Provide a table which lists the file names along with a description of what each file represents. Include the Surfer file (*.bln) used to create the facility fenceline, or a listing of the coordinates that depict the complete shape and extent of the fenceline.

6. Coalbed Methane (CBM) Analyses

A. Model all sources from the proposed facility using the base receptor grid and determine the ROI, based on the most distant receptor at which the proposed facility produces a predicted annual impact of 1.0 $\mu g/m^3$ or more of NO_x.

B. Model the complete inventory of sources for NO_x and formaldehyde, including the proposed facility and any nearby/regional sources, using the ROI receptor grid.

C. Provide a summary of the model-predicted impacts, showing compliance with the annual WAAQS for NO_2 of 100 $\mu g/m^3$ and the annual NO_2 increment of 25 $\mu g/m^3$. The analysis should quantify the magnitude and location of the maximum annual concentrations of NO_2 and formaldehyde.

D. For each CBM application, the AQD is evaluating the associated incremental cancer risk due to long-term exposure to formaldehyde emissions. There is no regulatory standard for formaldehyde. However, the AQD recommends that the applicant conduct a cumulative formaldehyde risk assessment due to emissions from all sources associated with their particular facility and the nearby/regional sources. Report the calculated incremental cancer risk based on the maximum AERMOD-predicted annual formaldehyde impact and a project longevity factor of 0.286 (20 years/70 years), which is based on the Division's current understanding of CBM facility lifetimes. The dose-response value for formaldehyde should be taken from the most current version of the EPA Office of Air Quality Planning and Standards (OAQPS) table

that lists dose-response values for use in risk assessments of hazardous air pollutants [*Table 1. Prioritized Chronic Dose-Response Values,* (http://www.epa.gov/ttn/atw/toxsource/summary.html)].

For questions related to CBM analyses, contact Don Watzel at (307) 777-8576. For general modeling guidance, contact Josh Nall at (307) 777-7816.

Wyoming Ambient Air Quality Standards (WAAQS) and Modeling Significance Levels

Pollutant	Averaging Period	WAAQS ($\mu g/m^3$)	Modeling Significance Levels ($\mu g/m^3$)
Particulate Matter	Annual	50	1
	24-hour	150	5
Sulfur Dioxide	Annual	60	1
	24-hour	260	5
	3-hour	1,300	25
Nitrogen Dioxide	Annual	100	1[3]
Ozone	8-hour	0.08 (ppm)	----
Carbon Monoxide	8-hour	10,000	500
	1-hour	40,000	2,000
Lead	Calendar Quarter	1.5	----
Hydrogen Sulfide	1-hour	40/70[1]	----
Fluorides	24-hour	----[2]	----

[1] Wyoming's standards for H_2S are 40 $\mu g/m^3$ (½ hour average not to be exceeded more than two times in any five consecutive day period), and 70 $\mu g/m^3$ (½ hour average not to be exceeded more than two times per year).

[2] Wyoming has statewide and regional ambient air standards for fluorides, measured as hydrogen fluoride. Consult Wyoming's Air Quality Standards & Regulations (WAQSR) Chapter 2, Section 9(a)(i) & (a)(ii).

[3] Class II significance level for NO_x applies to the maximum modeled NO_x concentration, which should not be corrected to represent an equivalent NO_2 concentration.