

APPENDIX

AIR

Emission Estimation Approach

Point Sources

A point source is defined as a stationary source facility that emits 10 tons per year or more of volatile organic compounds or 100 tons or more of oxides of nitrogen or carbon monoxide, sulfur dioxide, particulate matter smaller than 10 microns in diameter, total suspended particulates, or lead. The point source inventory represents estimated actual emissions from these facilities.

In general, one of three estimation methods is used. In order of preference, the estimation methods are (1) stack testing or continuous emissions monitoring, (2) material balance calculations, and (3) emission factor calculations based on units of throughput or activity. All data necessary to make the emissions estimations are collected by means of annual reporting by the facility. All point source data are entered into a computer data base called *i-STEPS*®.

Stationary Area Sources

Area source emissions are compiled once every three years for the Ozone State Implementation Plan Inventory. The pollutants covered are volatile organic compounds, nitrogen oxides, and carbon monoxide. Area source emissions are estimated by multiplying an emission factor by a known indicator of collective activity for each source category within the inventory area. An indicator is any parameter associated with the activity level of a source, such as production, employment, or population that can be correlated with the air pollutant emission from that source.

In general, one of four emission estimation approaches was used to calculate area source emissions:

- ◆ per capita emission factors,
- ◆ employment-related emission factors,
- ◆ commodity consumption-related emission factors, or
- ◆ level-of-activity-based emission factors.

A major portion of the work involved in creating an area source inventory is in collecting the information defining the collective activity for the source category. Several methods are available for estimating area source activity levels and emissions. Estimates can be derived by:

- ◆ treating area sources as point sources,
- ◆ surveying local activity levels,
- ◆ apportioning national or statewide activity totals to local inventory areas,
- ◆ using per capita emission factors, or
- ◆ using emission-per-employee factors.

Sources activity may fluctuate significantly on a seasonal basis. Because area emissions are generally a direct function of source activity, seasonal changes in activity levels were examined closely. Emissions were calculated on a tons-per-year basis and were seasonally adjusted for peak ozone season daily emissions.

On-Road Mobile Source Emissions

On-road mobile emissions are compiled once every three years beginning with 1990 for the Ozone State Implementation Plan Emissions Inventory. The pollutants covered are volatile organic compounds, nitrogen oxides, and carbon monoxide emitted by vehicles traveling on the Delaware highway system.

The mobile source emissions inventory provides estimates of statewide emissions through the application of a network-based travel demand model. Two models of Delaware's highway system are available: one that represents New Castle County and one that represents Kent and Sussex counties. These travel-demand models have been updated to 1993. They are adaptable to estimating vehicle-miles traveled for various temporal and seasonal conditions, and they have an extensive capability for forecasting future vehicle-miles traveled based on changes in land use and in the transportation system. The model networks include federal highway functional classes and local collector roads.

The New Castle County travel-demand models estimated for 1993 were derived from the traditional four-step trip generation, trip distribution, model split, and trip assignment process. The Kent and Sussex counties' model is similar to New Castle County's, except for the model split component.

Both models generate 24-hour volumes representative of average annual daily traffic. The models were modified to also produce morning and evening peak-period traffic data with travel speeds representative of these periods. The off-peak hour data (20 hours) were generated by subtracting the total peak-period data from the 24-hour data. Further adjustments were made to represent the typical ozone day. The traffic data were adjusted to August for New Castle and Kent counties and to July for Sussex County.

The emission factors were developed by the Delaware Department of Natural Resources and Environmental Control (the Department) using MOBILE5a. MOBILE5a is the EPA's computer model used to calculate volatile organic compounds, nitrogen oxides, and carbon monoxide vehicle emission factors. These emission factors take into account numerous parameters that affect vehicle emissions, such as county-specific vehicle registration age distribution, an inspection and maintenance program, ambient temperatures appropriate for the ozone season, gasoline Reid Vapor Pressure, operating mode, and vehicle speeds.

Off-Road Mobile Sources

Off-road mobile sources inventories are compiled once every three years beginning with the 1990 Ozone State Implementation Plan Emissions Inventory. The pollutants covered are volatile organic compounds, nitrogen oxides, and carbon monoxide. Off-road mobile sources are not calculated with the same methods as on-road mobile source emissions. The off-road mobile source categories are aircraft, marine vessels, railroad locomotives, auto racing, and other off-road sources. The other off-road sources category includes miscellaneous equipment such as construction equipment, farm equipment, industrial equipment, lawn and garden equipment, motorcycles, and recreational vehicles. All emissions were estimated on an annual basis and on a peak ozone season daily basis.

Progress Toward Attainment of the NAAQS for Ozone for Delaware

The 1990 Clean Air Act Amendments contain provisions for the attainment and maintenance of the National Ambient Air Quality Standards (NAAQS). Control plans must be developed in designated non-attainment areas. Plan requirements vary depending on the severity of the individual area's air pollution problem. The Piedmont Basin is located in New Castle County, Delaware, which is considered to be a severe non-attainment area for ozone.

One key requirement of the Clean Air Act Amendments for moderate and above ozone non-attainment areas, of which the Piedmont Basin is one, involves the achievement of Reasonable Further Progress toward the attainment of the NAAQS. States must demonstrate Reasonable Further Progress by achieving at least a 15% reduction of peak ozone-season daily volatile organic compounds (VOC) emissions from 1990 levels by 1996. In addition, states must offset any net growth projected from 1990 to 1996. A 9% reduction of VOC or NO_x is required for every three years between 1997 and 2005. 2005 is the year for which severe non-attainment areas must demonstrate attainment

through computer modeling. Modeling results may indicate that reductions greater than the Reasonable Further Progress reductions are required to achieve attainment of the ozone NAAQS.

Progress toward attainment of the NAAQS in the year 2005 is measured by periodic emission inventories conducted every three years, beginning in 1993. Actual air emission data are inventoried for reactive VOCs, oxides of nitrogen (NO_x), and carbon monoxide (CO) from point, area, and mobile sources.

Point sources, as defined for the 1990 base year and successive inventories, are those facilities/plants/activities that have actual emissions greater than or equal to at least one of the following 10 tons per year VOC, 100 tons per year NO_x, or 100 tons per year CO. Detailed plant, point, and process data is maintained by each point source. Area sources represent collections of many small air-pollutant emitters existing within a specified geographical area. Because area sources are too small and/or too numerous to be surveyed and characterized individually, area source emissions must be estimated collectively. Mobile sources are represented by all forms of transportation (commercial, recreational, and private), as well as portable implements and tools powered by internal combustion engines. Emissions for mobile sources are estimated through primary data, computer modeling, and collective estimates.

In 1994, DNREC submitted a 15% VOC reduction plan for 1996 to the EPA; it targeted reductions through multiple control strategies including gasoline vapor collection, low-volatility coatings and solvents, and the controlling of leaks in manufacturing processes. There is a summertime ban on open burning. Further reductions in VOCs will be achieved through the use of reformulated gasoline.

Delaware must produce three more rate-of-progress plans for target years 1999, 2002, and 2005, producing an additional 9% reduction in VOCs. In addition, a year 2005 model attainment demonstration must be completed. Many new emission control strategies must be developed and implemented to attain the ozone standard by 2005.