Technical Support Document (TSD) for 2008 Ozone NAAQS Designations

Massachusetts
Area Designations for the
2008 Ozone National Ambient Air Quality Standards
Dukes County, Massachusetts

The table below identifies the area/ county in Massachusetts that EPA is designating as nonattainment for the 2008 ozone national ambient air quality standards (2008 ozone NAAQS). In accordance with section 107(d) of the Clean Air Act (CAA), EPA must designate an area (county or part of a county) "nonattainment" if it is violating the 2008 ozone NAAQS or if it is contributing to a violation of the 2008 ozone NAAQS in a nearby area. The technical analysis supporting the boundary for the nonattainment area is shown below.

Final Nonattainment Area in Massachusetts

Area	Massachusetts Recommended Nonattainment County	EPA's Nonattainment County
Dukes County, MA[1]	Dukes County, MA	Dukes County, MA

EPA is designating the remaining counties in Massachusetts, that are not listed in the table above, as "unclassifiable/attainment" for the 2008 ozone NAAQS.

The analysis below provides the basis for the Dukes County nonattainment area boundary. It relies on our analysis of whether and which monitors are violating the 2008 ozone NAAQS, based on certified air quality monitoring data from 2009 through 2011 and an evaluation of whether nearby areas are contributing to such violations. The analysis excludes other areas in Massachusetts, since certified air quality monitoring data from 2009 through 2011 show the rest of the ozone monitors in Massachusetts have air quality better than the 2008 ozone NAAQS. EPA has evaluated contributions from nearby areas based on a weight of evidence analysis considering the factors identified below, in our designation of Dukes County as nonattainment. EPA issued guidance on December 4, 2008 that identified these factors as ones EPA would consider in determining nonattainment area boundaries and recommended that states consider these factors in making their designations recommendations to EPA.[2]

1. Air quality data (including the design value calculated for each FRM or FEM monitor in the area);
2. Emissions and emissions-related data (including location of sources and population, amount of emissions and emissions controls, and urban growth patterns);
3. Meteorology (weather/transport patterns);
4. Geography and topography (mountain ranges or other basin boundaries);
5. Jurisdictional boundaries (e.g., counties, air districts, existing nonattainment areas, Indian country, metropolitan planning organizations (MPOs))

[1] Dukes County is a multijurisdictional nonattainment area that includes an area of Indian Country.

[2] The December 4, 2008 guidance memorandum "Area Designations for the 2008 Revised Ozone National Ambient Air Quality Standards" refers to 9 factors. In this technical support document we have grouped the emissions-related factors together under the heading of "Emissions and Emissions-Related Data," which results in 5 categories of factors.

Ground-level ozone is not emitted directly into the air, but is created by chemical reactions between oxides of nitrogen (NO_x) and volatile organic compounds (VOC) in the presence of sunlight. Because NO_x and VOC emissions from a broad range of sources over a wide area typically contribute to violations of the ozone standards, EPA believes it is important to consider whether there are contributing emissions from a broad geographic area. Accordingly, EPA chose to examine the 5 factors with respect to the larger of the Combined Statistical Area (CSA) or Core Based Statistical Area (CBSA) associated with the violating monitor(s).[3] All data and information used by EPA in this evaluation are the latest available to EPA and/or provided to EPA by Massachusetts.

In EPA's designations guidance for the 2008 ozone NAAQS, EPA recommended examining CSA/CBSAs because certain factors used to establish CSAs and CBSAs are similar to the factors EPA is using in this technical analysis to determine if a nearby area is contributing to a violation of the 2008 ozone NAAQS. EPA used the same basic approach in the designation process for the 1997 ozone NAAQS. Where a violating monitor is not located in a CSA or CBSA, EPA's guidance recommended using the boundary of the county containing the violating monitor as the starting point for considering the nonattainment area's boundary.

Technical Analysis for Dukes County, MA

Figure 1 is a map of the Dukes County, MA nonattainment area. The map identifies the location and design value of the air quality monitor and other jurisdictional boundaries.

For purposes of the 1997 8-hour ozone NAAQS, Dukes County was included as part of the Eastern Massachusetts nonattainment area and was designated nonattainment. The 1997 8-hour ozone Eastern Massachusetts nonattainment area consists of Barnstable, Bristol, Dukes, Essex, Middlesex, Nantucket, Norfolk, Plymouth, Suffolk and Worcester Counties.

In November 2011, Massachusetts recommended that Dukes County, MA be designated as nonattainment for the 2008 ozone NAAQS based on certified air quality data from 2009 and 2010 and preliminary 2011 ozone data. Massachusetts recommended all other counties in Massachusetts be designated as attainment for the 2008 ozone NAAQS, based on these same ozone data. These ozone data are from Federal Reference Method monitors, sited and operated in accordance with 40 CFR Part 58. (See letter from Massachusetts Department of Environmental Protection (MassDEP) dated November 8, 2011.)

After considering these recommendations, the final ozone air quality from 2008-2011 and based on EPA's technical analysis described below, EPA is designating Dukes County, MA as "nonattainment" for the 2008 ozone NAAQS. The rest of Massachusetts will be designated as attainment/unclassifiable.

[3] Lists of CBSAs and CSAs and their geographic components are provided at www.census.gov/population/www/metroareas/metrodef.html . The lists are periodically updated by the Office of Management and Budget. EPA used the most recent update, based on 2008 population estimates, issued on December 1, 2009 (OMB Bulletin No. 10-02).

Table 1. State's Recommended and EPA's Final Designated Nonattainment County for Dukes County, MA

Area	State-Recommended Nonattainment County	EPA Nonattainment County
Dukes County, MA[1]	Dukes County, MA	Dukes County, MA

Factor Assessment

Factor 1: Air Quality Data

For this factor, we considered 8-hour ozone design values (in parts per million (ppm)) for air quality monitors in the Dukes County, MA nonattainment area based on data for the 2009-2011 period (i.e., the 2011 design value, or DV). Massachusetts based their November 8, 2011 recommendation on 2009-2011 data. A monitor's DV is the metric or statistic that indicates whether that monitor attains a specified air quality standard. The 2008 ozone NAAQS are met when the annual fourth-highest daily maximum 8-hour average concentration, averaged over 3 years is 0.075 ppm or less. A DV is only valid if minimum data completeness criteria are met. See 40 CFR part 50 Appendix P. Where several monitors are located in a county (or a designated nonattainment area or maintenance area), the DV for the county or area is determined by the monitor with the highest level.

The 2011 DV for the ozone NAAQS for Dukes County, MA is 0.076 ppm, which is above the 2008 ozone NAAQS. Since Dukes County shows a violation of the 2008 ozone NAAQS, and is the only ozone monitor in Massachusetts that violates the 2008 standard based on 2009-2011 data, EPA agrees with the MassDEP recommendation. The Dukes County monitor is on the Indian country of the Wampanoag Tribe. The ozone monitor is operated by the Wampanoag Tribe, in cooperation with the Massachusetts Department of Environmental Protection.

Table 2. Air Quality Data

County	State Recommended Nonattainment?	2009-2011 Design Value (ppm)
Dukes County, MA	Yes	0.076

Factor 2: Emissions and Emissions-Related Data

EPA evaluated emissions of ozone precursors (NO_x and VOC) and other emissions-related data that provide information on nearby areas contributing to violating monitors.

Emissions Data

EPA evaluated county-level emission data for NO_x and VOC derived from the 2008 National Emissions Inventory (NEI), version 1.5. This is the most recently available NEI. (See http://www.epa.gov/ttn/chief/net/2008inventory.html.) Significant emissions levels in a nearby area would indicate the potential for the area to contribute to observed violations.

Table 3 shows emissions of NO_x and VOC (given in tons per year (tpy)) for Dukes County.

Table 3. Total 2008 NO_x and VOC Emissions.

County	State Recommended Nonattainment?	NO_x (tpy)	VOC (tpy)
Dukes, MA	Yes	1,298	1,789

Population density and degree of urbanization

EPA evaluated the population and vehicle use characteristics and trends of the area as indicators of the probable location and magnitude of non-point source emissions. These include ozone-creating emissions from on-road and off-road vehicles and engines, consumer products, residential fuel combustion, and consumer services. Areas of dense population or commercial development are an indicator of area source and mobile source NO_x and VOC emissions that may contribute to ozone formation. Rapid population or VMT growth (see below) in a county on the urban perimeter signifies increasing integration with the core urban area, and indicates that the associated area source and mobile source emissions may be appropriate to include in the nonattainment area. Table 4 shows the population, population density, and population growth information for Dukes County. Note, Dukes County is not part of any CSA or CBSA.

Table 4. Population and Growth.

County	State Recommended Nonattainment?	2010 Population	2010 Population Density (1000 pop/sq mi))	Absolute change in population (2000-2010)	Population % change (2000-2010)
Dukes, MA	Yes	16,535	0.14	1,459	+10

Sources: U.S. Census Bureau population estimates for 2010 as of August 4, 2011

Traffic and commuting patterns

EPA evaluated the total Vehicle Miles Traveled (VMT) for Dukes County. A county with high VMT and/or a high number of commuters is generally an integral part of an urban area and indicates the presence of motor vehicle emissions that may contribute to ozone formation. Rapid population or VMT growth in a county on an urban perimeter signifies increasing integration with the core urban area, and indicates that the associated area source and mobile source emissions may be appropriate to include in the nonattainment area. Table 5 shows 2008 VMT. As noted above, Dukes County is not part of any CSA or CBSA. Dukes County consists of several islands the largest of which is Martha's Vineyard. The county is only accessible by boat, ferry or plane. There are no bridges to the mainland.

Table 5. Vehicle Miles Traveled (VMT) for Dukes County

County	State Recommended Nonattainment?	2008 VMT* (million miles)
Dukes, MA	Yes	79

* MOBILE model VMTs are those inputs into the NEI version 1.5.

Factor 3: Meteorology (weather/transport patterns)

EPA evaluated meteorological data to help determine how meteorological conditions, such as weather, transport patterns and stagnation conditions, would affect the fate and transport of precursor emissions contributing to ozone formation.

The prevailing winds during the ozone season have a strong southwesterly component, indicating that the ozone source region is most likely Connecticut, New York and New Jersey, all of which are included in other ozone nonattainment areas for the 2008 ozone NAAQS.

In addition, back trajectories on days with elevated ozone in Dukes County show the source region to likely be the New York City area. (See two examples, shown below as Figures 2 and 3.)

Factor 4: Geography/topography (mountain ranges or other air basin boundaries)

The geography/topography analysis evaluates the physical features of the land that might affect the airshed and, therefore, the distribution of ozone over the area.

The Dukes County, MA area does not have any geographical or topographical barriers significantly limiting air pollution transport within its air shed. Therefore, this factor did not play a significant role in this evaluation. As noted above, however, Dukes County consists of several islands.

Factor 5: Jurisdictional boundaries

Once the general areas to be included in the nonattainment area were determined, EPA considered existing jurisdictional boundaries for the purposes of providing a clearly defined legal boundary and carrying out the air quality planning and enforcement functions for nonattainment areas. Examples of jurisdictional boundaries include existing/prior nonattainment areas for ozone or other urban-scale pollutants, counties, air districts, townships, metropolitan planning organizations, state lines, areas of Indian country, urban growth boundary, etc. Where existing jurisdictional boundaries are not adequate to describe the nonattainment area, other clearly defined and permanent landmarks or geographic coordinates were considered.

The Eastern Massachusetts area has previously established nonattainment boundaries associated with the 1-hour, and 1997 8-hour ozone NAAQS. The state has recommended a different boundary for the 2008 ozone NAAQS. The only county in either the 1-hour or 8-hour Eastern Massachusetts nonattainment area that is violating the 2008 ozone standard based on 2009-2011 data and will remain nonattainment is Dukes County.

The Dukes County, MA area also includes an area of Indian country. As defined at 18 U.S.C. 1151, "Indian country" refers to: "(a) all land within the limits of any Indian reservation under the jurisdiction of the United States Government, notwithstanding the issuance of any patent, and, including rights-of-way running through the reservation, (b) all dependent Indian communities within the borders of the United States whether within the original or subsequently acquired territory thereof, and whether within or without the limits of a state, and (c) all Indian allotments, the Indian titles to which have not been extinguished, including rights-of-way running through the same." EPA recognizes the sovereignty of tribal governments, and has attempted to take the desires of the tribe into account in establishing

appropriate nonattainment area boundaries. The Wampanoag Tribe of Gay Head (Aquinnah) of Massachusetts is located in this nonattainment area. The tribe did not submit a designation recommendation. EPA is designating all of Dukes County, including the Indian country of the Wampanoag Tribe of Gay Head (Aquinnah) of Massachusetts, as nonattainment for the 2008 ozone NAAQS.

Conclusion

Based on the assessment of factors described above, EPA has concluded that only Dukes County meets the Clean Air Act criteria for inclusion in the intended Dukes County, MA nonattainment area. The rest of the State is designated as unclassifiable/ attainment.

Figure 1. Map of the Dukes County Nonattainment area

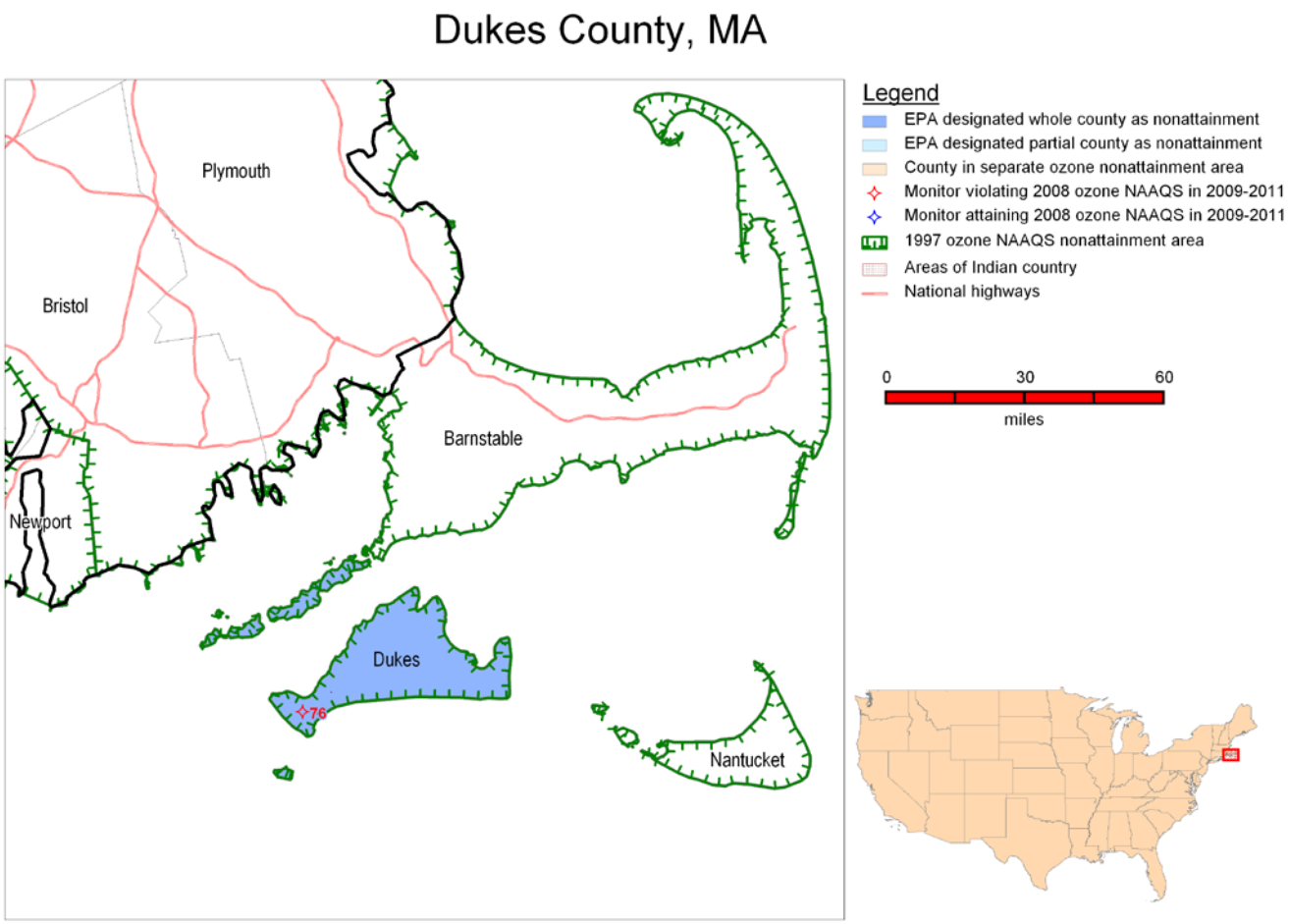

Figure 2: Back Trajectory of Dukes County Ozone Monitor for July 22, 2011 8-hour ozone value at monitor was 113 ppb.

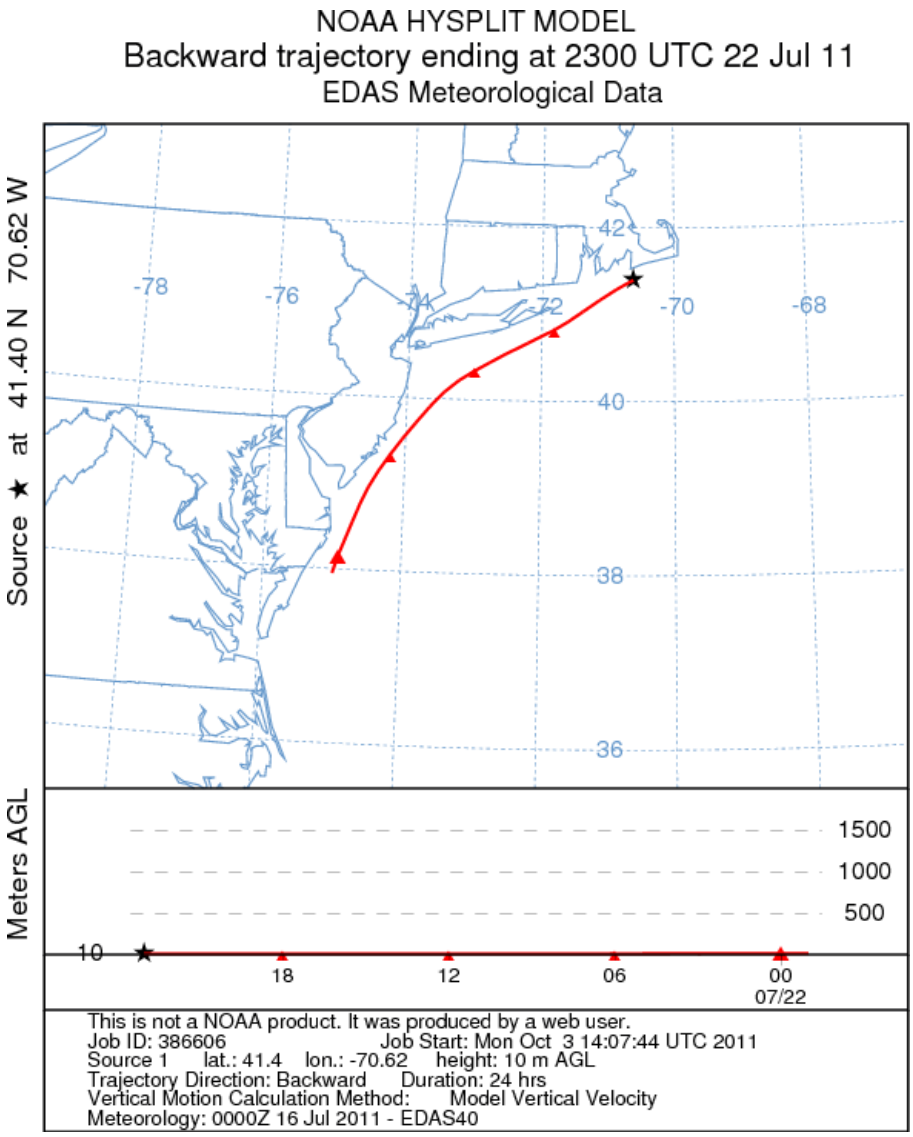

Figure 3: Back Trajectory of Dukes County Ozone Monitor for June 8, 2011 8-hour ozone value at monitor was 93 ppb.