

**Delaware Particulate Matter (PM)
Advance Program**

Path Forward Plan



**Delaware Department of Natural Resources
and Environmental Control**

Division of Air Quality

September 2, 2015

Section 1 - Overview and Summary

1.1 Introduction and Background

In January of 2013, the United States Environmental Protection Agency (EPA) announced the Particulate Matter (PM) Advance program, which continues and expands the U.S. Environmental Protection Agency's (EPA) cooperative work with states, tribes, and local governments to reduce air pollution. PM Advance is a collaborative and voluntary effort to encourage fine particulate matter (PM_{2.5}) attainment or maintenance areas to reduce emissions of PM_{2.5} and its precursors, so they can continue to meet both current and future National Ambient Air Quality Standards (NAAQS) for PM_{2.5}. PM Advance encourages the use of local strategies to reduce PM_{2.5} and its precursors, with results expected to:

- help ensure continued health protection over the long term
- provide state, tribal, and local governments with a margin against potential future violations of the PM_{2.5} NAAQS
- better position an area to achieve air quality concentrations that enable it to avoid a nonattainment designation with respect to any future revised NAAQS
- allow for greater ability to choose from control measures and programs that make the most sense for the area and that are cost-effective, and
- result in multi-pollutant benefits; for example, reductions of nitrogen oxides can lead to lower ambient fine particulate matter levels as well as lower ambient ozone levels, and energy efficiency programs can reduce greenhouse gases.

On July 30, 2013 the State of Delaware Department of Natural Resources and Environmental Control (DNREC), Division of Air Quality (DAQ) sent a letter to EPA requesting acceptance of the entire State's participation in the PM Advance Program. EPA responded with a letter to Delaware on August 13, 2013 accepting Kent and Sussex Counties into the Advance program, but not New Castle County, because at that time New Castle County was designated as nonattainment under the 1997 and 2006 PM_{2.5} NAAQS.

On August 5, 2014, EPA finalized rulemaking that re-designated New Castle County as attaining the 1997 and 2006 PM_{2.5} NAAQS, with an effective date of September 4, 2014.¹ Consequently, the DAQ received a letter from EPA on September 5, 2014 that included New Castle County, and thus *all* of Delaware, into the PM Advance program. Furthermore, EPA designated all of Delaware as attainment for the 2012 annual PM_{2.5} NAAQS on December 18, 2014.

EPA allows states up to a year to submit their PM Advance Path Forward (the Plan), which makes September 5, 2015 the due date for this Plan. This plan will be in effect for five years, and yearly updates will be provided to EPA, and the option to renew or discontinue will be exercised after five years.

¹ 79 Federal Register 45350

1.2 EPA Guidance- General Framework

The EPA set forth guidance on the development and implementation of a PM Advance program on January 17, 2013.² PM Advance provides a framework for local actions to reduce PM_{2.5} and its precursors in attainment and maintenance areas. The program provides a means for states to take the initiative in maintaining and improving their air quality but it does not create or remove any statutory or regulatory requirements. As a first step toward minimizing the potential for PM_{2.5} levels to exceed the NAAQS the EPA suggests that participating areas should evaluate a variety of voluntary and mandatory control options and other programs. No later than one year after signing up for the program, the area should submit a Plan to the EPA. The Plan should fully describe the measures and/or programs the area will implement and provide a schedule for the implementation. The Plan should also include existing measures.³ Accordingly, the objectives of this Plan are:

- 1 To characterize Delaware with respect to its air quality and emissions
- 2 To document the progress the State of Delaware has made in air quality improvements and the many efforts that have been made to realize those improvements, and
- 3 To present a plan for future efforts to further improve Delaware's air quality in order to meet EPA's requirement for a "Path Forward" plan within its PM Advance Program.

1.3 Stakeholder and Public Outreach

The DNREC DAQ (lead) will identify partners and form allied relationships in order to establish a process that builds stakeholder input throughout the Plan's development over the next five years. Because this Plan is a living document, over the next five years new stakeholders will be added to this plan as newer measures are assessed and developed. The plan relies on stakeholder engagement and involvement to identify and implement measures to reduce PM_{2.5} and its precursors.

1.3.1 Existing Stakeholders

All areas in Delaware have at one time or another been designated as nonattainment for ozone and/or PM_{2.5}. As part of DAQ's efforts to attain the ozone and PM_{2.5} NAAQS, DAQ has a long history of collaboration with various stakeholders. They included the Delaware Department of Transportation (DelDOT), the [Wilmington Area Planning Council](#) (WILMAPCO), [Dover/Kent Metropolitan Planning Organization](#) (MPO), [The Air Quality Partnership of Delaware](#), the Port of Wilmington and other stakeholder groups for voluntary and regulatory measures. The DAQ

² <http://epa.gov/ozoneadvance/pdfs/20130107PMmemo-guidance.pdf>

³ The EPA Guidance states, "If the area developed an action plan (see Attachment A), the area can submit the [action] plan to EPA in lieu of a path forward." Under the section, [Description of Measures to be Implemented and Responsible Parties](#), the guidance states, "The measures and programs may be mandatory or voluntary, and may be existing/established or emerging/new."

will engage these stakeholders in this new process, and will identify and engage additional stakeholders as part of the PM Advance Path Forward.

1.3.2 Next Steps for New Stakeholders

While the authority of decision-making on specific policies and air quality regulatory actions remains within the purview of DNREC, a forum for communication and establishing partnerships among local governments, industry, civic associations and others in the private sector will help inform the decisions and overall process. Shared knowledge about how to implement clean air actions will help various stakeholders to become more efficient and better able to adapt to necessary changes. DAQ's strategy for Plan-Years 1-4 will:

- **Engage and Educate the Community:** Effective training and education is the cornerstone of acceptance within the community and therefore the success of the strategy. Whether the change affects commuting patterns, wood burning, or consumer choices; an educated community is vital to achieving cleaner air in Delaware.
- **Harness the Forces of the Free Market:** Market forces provide a vehicle for addressing the clean air issues in Delaware. The availability of innovative clean technology can be influenced by the purchasing decisions of city and county governments, citizens and businesses. Considering air quality in purchasing decisions can spur suppliers to invest in clean energy infrastructure and products. Harnessing market forces also includes working with the private sector and the associations representing them (such as civic associations, environmental groups, the Chamber of Commerce and large organizations such as DuPont, the Port of Wilmington, and others) to share innovative ideas, technologies, and methods that will encourage investment in clean air.
- **Build Community Partnerships:** Developing partnerships with existing organizations and state/local agencies that have similar goals will increase efficiency, effectiveness, and facilitate more discussion on innovative approaches to addressing regional air pollution. Expanding existing partnerships can reduce duplication of effort on specific actions and provide a better outreach mechanism to educate more individuals on their role in maintaining good air quality.
- **Public Access to the Plan:** Upon successful submittal of this document to the EPA, DAQ will establish and then post the plan on a webpage dedicated to PM.

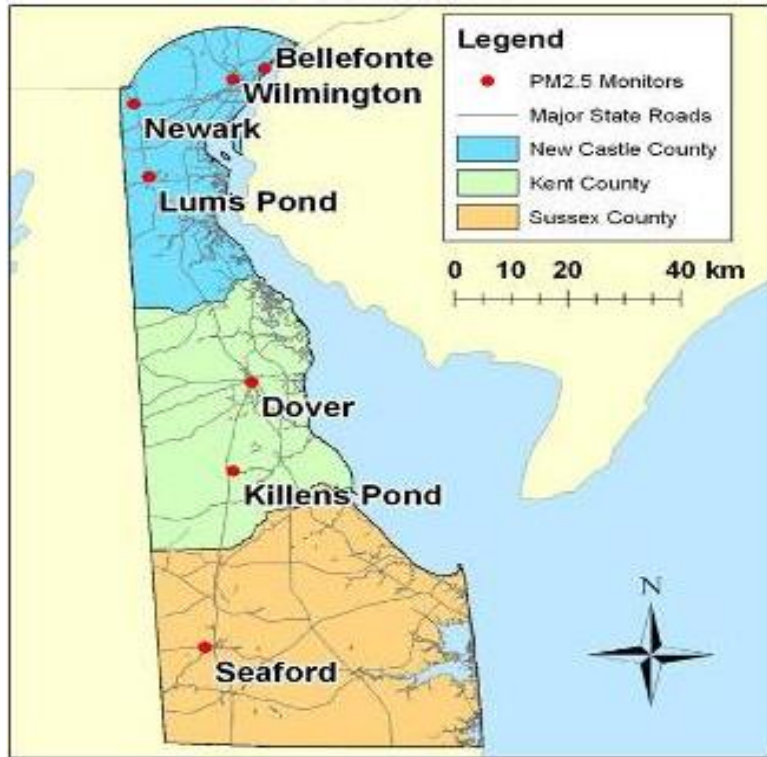
Section 2 - PM_{2.5} Air Quality

2.1 Delaware's Air Monitoring Network

Delaware began official PM_{2.5} monitoring in 1999. Delaware's PM_{2.5} network consists of seven (7) monitoring sites. There are four (4) sites in New Castle County, two (2) in Kent County and one (1) in Sussex County, as shown in Figure 2.1. All data from these monitors are measured

using EPA approved federal reference methods (FRM). All PM_{2.5} monitoring sites are located appropriately and are eligible for comparison to the annual and daily PM_{2.5} NAAQS.

Figure 2.1 - Delaware PM_{2.5} Air Monitoring Locations



2.2 PM_{2.5} Background

Fine particulate matter is defined as particles that are smaller than 2.5 microns in diameter. Also called PM_{2.5}, the small particles penetrate more deeply into the lungs than larger particles (2.5-10 microns) and are more likely to contribute to negative health effects. Health effects associated with particulate matter pollution include premature death and increased hospital admissions and emergency room visits, primarily by the elderly and individuals with cardiopulmonary disease, increased respiratory symptoms and disease in children and individuals with cardiopulmonary disease, and decreased lung function and alterations in lung tissue and structure, particularly in children and people with asthma. Because these health effects are severe EPA has set standards for which any PM_{2.5} reading above those standards represents a “violation.” The EPA PM_{2.5} National Ambient Air Quality Standards (NAAQS) are expressed in units of micrograms per cubic meter (ug/m³), and are protective of long and short-term exposures:

- Annual PM_{2.5} NAAQS: 12 ug/m³ (yearly averages averaged over three years).
- 24-Hour PM_{2.5} NAAQS: 35 ug/m³ (98th percentile averaged over three years)

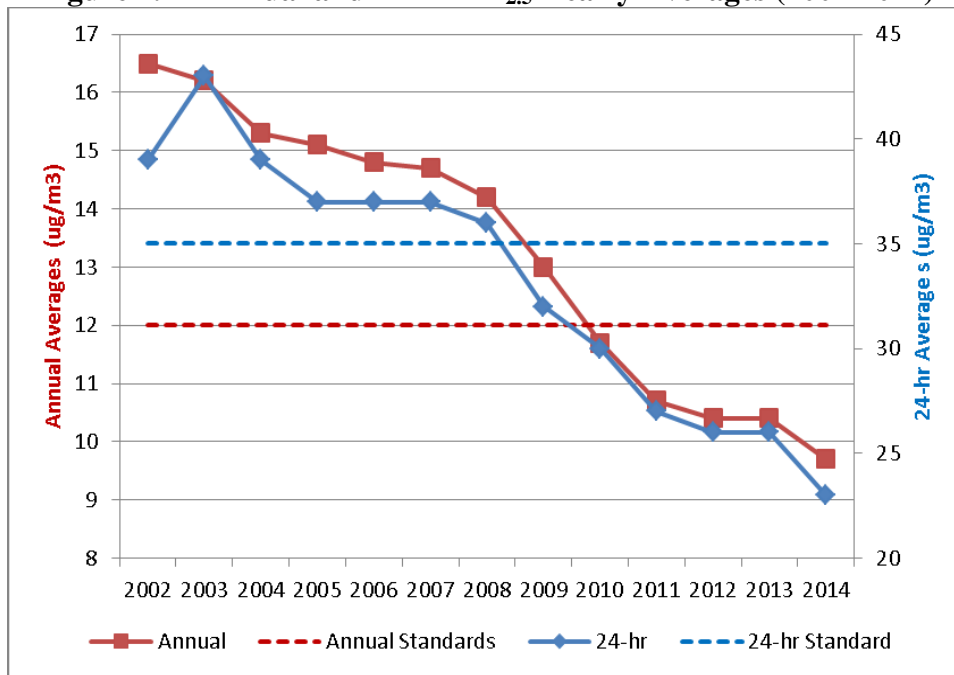
PM_{2.5} is emitted from combustion activities (such as power plants, industrial, commercial and residential fuel burning, and motor vehicles), and dust generating activities such as construction

and agricultural tilling and harvesting. PM_{2.5} also forms in the atmosphere from precursor compounds, such as sulfur dioxide and oxides of nitrogen, through various physical and chemical processes. Both local and regional sources of fine particulate matter and its precursors contribute to PM_{2.5} concentrations observed in Delaware.

2.3 Delaware PM_{2.5} Air Quality

PM_{2.5} air quality in Delaware has improved significantly over the last 12 years. Figure 2.2 shows the year-by-year annual averages and 98th percentile daily averages since 2002, as recorded at the Martin Luther King monitor (MLK), which historically has seen the highest recorded concentrations of all sites in Delaware.⁴ It is readily evident from the graph that there is a significant downward trend showing continued air quality improvement over the years.

Figure 2.2 - Annual and 24-hr PM_{2.5} Yearly Averages (2002-2014)



“Design Values” (DV) are used to compare monitored PM_{2.5} levels to the NAAQS for purposes of determining whether an area is attainment or nonattainment for that NAAQS. Calculations of DVs are based on the average of 3-years of data for the annual and 24-hr. PM_{2.5} values. The highest county-level DVs based upon 2012-2014 monitoring data are 9.8, 8.2 and 8.4 µg/m³ for New Castle, Kent and Sussex counties, respectively. The highest county-level design values for the 24-hr standard are 24, 22 and 21 µg/m³ for New Castle, Kent and Sussex counties, respectively. The data in Table 2.1 clearly demonstrate that PM_{2.5} concentrations in Delaware’s air are significantly below the annual and 24-hr NAAQS throughout the State. However, based

⁴ The y-axis is truncated to better illustrate differences in monitored trends.

upon historical EPA NAAQS reviews, in which many criteria air pollutant (CAP) standards were tightened,⁵ there is a high probability within five years the EPA will lower the standards under the PM_{2.5} NAAQS. Therefore, tighter standards could significantly close the gap between current Delaware monitored levels vs. a future PM_{2.5} NAAQS.⁶ This PM Advance Plan will help ensure Delaware maintains PM_{2.5} attainment well into the future.

Table 2.1 - 2012–2014 PM_{2.5} Highest Design Values per County

County	Site	Annual DV NAAQS=12 ug/m3	24-hr DV NAAQS=35 ug/m3
New Castle	Wilmington	9.8	24
Kent	Dover	8.2	22
Sussex	Seaford	8.4	21

2.4 PM_{2.5} Speciation

To understand the nature of fine particle pollution and possible sources, EPA initiated a program to monitor the major components, or “species” that make up PM_{2.5}, i.e., crustal material (soil and some metals), ammonium, ammonium nitrates, elemental carbon, organic carbon and ammonium sulfate. DAQ has collected speciation data at its MLK site in Wilmington, and at its site in Dover.⁷

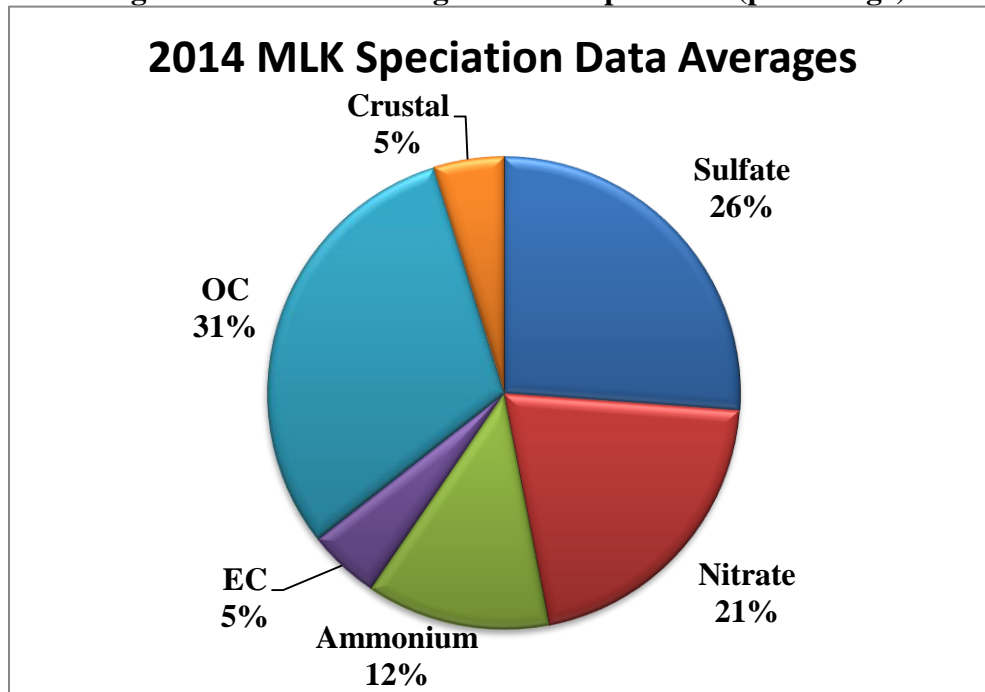
The main objectives of the PM_{2.5} speciation monitoring program are to provide information to 1) characterize the sources of PM_{2.5}, 2) determine the temporal and spatial aspects of PM_{2.5}, 3) detect and track trends in aerosol component concentrations, and 4) provide information to develop and evaluate emission control programs. Figure 2.3 shows the major components of PM_{2.5} monitored at the MLK monitoring station. As the figure illustrates, three species dominate its make-up. By order of rank, they are organic carbon (OC), sulfates and nitrates, followed by relatively minor contributions from ammonium, elemental carbon (EC) and crustal materials.

⁵ The U.S. Clean Air Act [CAA 109(d)(1)] requires that at 5-year intervals the Administrator shall complete a thorough review of the national ambient air quality standards.

⁶ Future meteorological conditions favorable to PM_{2.5} formation (e.g. very hot summers) may increase PM_{2.5} levels, further decreasing the gap between Delaware’s monitored values and the current or future PM_{2.5} NAAQS.

⁷ Speciation monitoring at the Dover site was discontinued in 2013

Figure 2.3 2014 Wilmington/MLK Speciation (percentage)



Each species include the following attributes and emission sources:

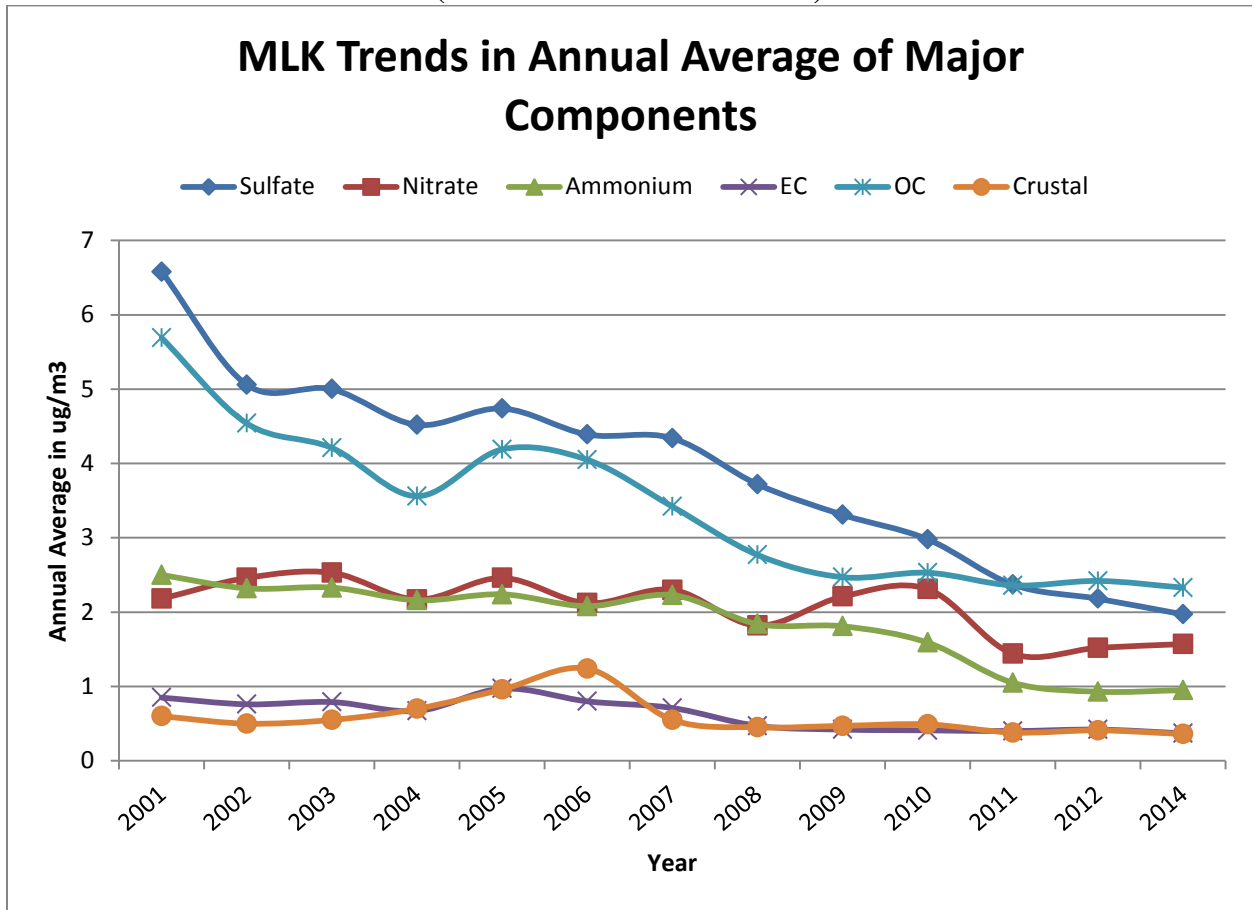
- OC is the fraction of ambient PM_{2.5} with the most diverse chemical composition, containing potentially thousands of different organic compounds (*i.e.*, those compounds containing carbon) composed primarily of carbon, hydrogen, oxygen and nitrogen. Both primary particles and secondary particles contribute to ambient OC concentrations, with combustion sources being the dominant type of emissions sources. Another portion of primary OC particles results from direct emissions of organic compounds from sources of incomplete combustion, such as gas and diesel engines. Secondary OC particle formation involves oxidation of both anthropogenic and biogenic (plant-derived) volatile organic compounds (VOC), and can involve other, more complex chemical reactions.
- Ammonium sulfate particulate forms from a chemical reaction in the atmosphere between sulfur dioxide (SO₂) and ammonia present in the atmosphere. Reducing SO₂ may reduce ambient PM_{2.5} as sulfur compounds may be the limiting reactant. Sulfur dioxide is largely a result of fossil fuel combustion, particularly from coal and diesel fuel combustions. Electric generation utilities (EGUs) and petroleum refineries are by far the largest SO₂ emission sources in Delaware.
- Ammonium nitrate particulate forms from a chemical reaction in the atmosphere between oxides of nitrogen (NO_x) and ammonia present in the atmosphere. NO_x is formed during high-temperature burning of fuels. Sources of NO_x include motor vehicles and stationary sources that burn fossil fuels such as power plants and industrial

boilers.

- Crustal PM is comprised of particles of soil and oxides of metals from some industrial processes. Compounds comprised of elements such as silicon, aluminum, iron, calcium, titanium, magnesium and potassium, as well as oxygen, are major components. Sources of crustal PM_{2.5} include windblown dust, dust from mechanical re-suspension (*e.g.* dust from construction activities or vehicles driving on unpaved roads) and some forms of combustion, especially of coal. Crustal PM_{2.5} comprised of elements, like iron, and their oxides can also be emitted from industrial sources.
- Ammonium is the NH₄ salt of anions other than sulfate or nitrate, such as: chloride in sea salt, industrial hydrochloric acid, road salt, marine gases (dimethyl sulfide), hydrogen sulfide from biological decay, volcanoes, soil dust, phosphate, biogenic aerosols absorbed on sea salt, burning vegetation, fertilizer and bicarbonate ion.
- EC refers to particulate carbon that has a graphitic molecular structure, and is sometimes referred to as "black carbon" (BC). It is emitted directly from emission sources and does not undergo any significant reactions with other gases in the atmosphere. EC particles result from primary emissions involving combustion, especially from diesel-fueled vehicles, but also from other processes involving the burning of fossil fuels. The latter includes anthropogenic sources such as boilers and waste disposal. In addition, some EC particles originate from biomass combustion such as from prescribed fires, wildfires and residential wood combustion.

Figure 2.4 shows the 2001- 2014 speciated data trends. Other than nitrate, there has been over a 40% decrease for each species since 2001.

Figure 2.4 Speciated Data Trends from 2001 to 2014*
 (*2013 had insufficient data)



Section 3 – Emissions Inventory

3.1 Summary

The emission inventory is a tool used to determine the amount of air pollutants released from various air emission sources in a given geographic area. The inventory identifies the source types present in an area, the amount of each pollutant emitted, the types of processes and control devices employed, and other information. The following PM_{2.5} inventory discussion is based on the DAQ’s adjusted periodic 2011 National Emissions Inventory (NEI) version 2 data. The NEI is a comprehensive, detailed estimate of criteria and hazardous air emissions sources. The periodic NEI is prepared every three years by the EPA based primarily upon emission estimates and emission model inputs provided by State, Local, and Tribal air agencies for sources in their jurisdictions, and supplemented by data developed by EPA.

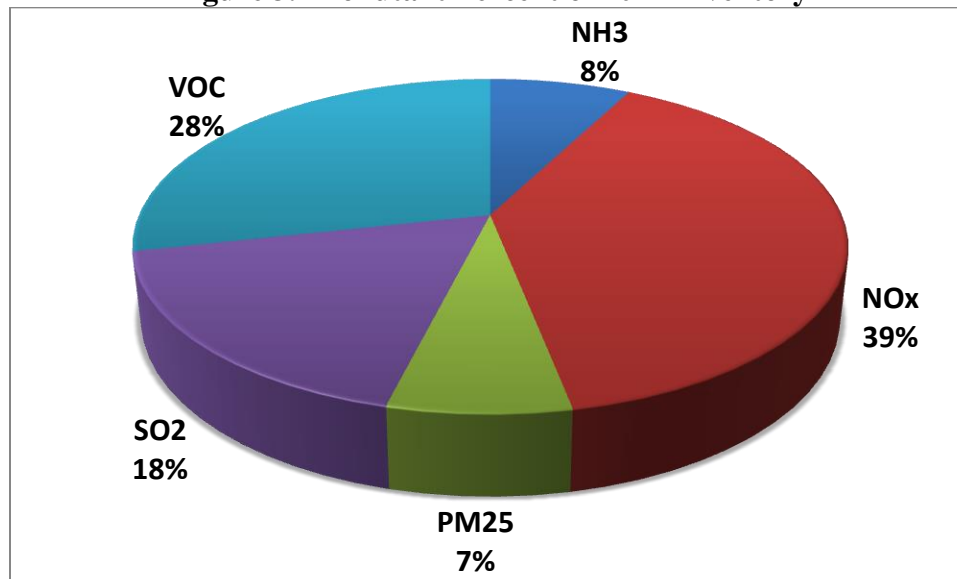
3.2 2011 Emissions

The emission summaries in Table 3.1 and Figures 3.1 and 3.2 present the 2011 statewide emission inventory for PM_{2.5}, SO₂, NO_x, NH₃, and VOCs. Emissions are broken down by source sector per pollutant, and percentage of total emissions for each pollutant.⁸ Figure 3.2 illustrates a pollutant-by-pollutant source sector percentage.

Table 3.1 - 2011 Annual Emissions by Sector (tpy)

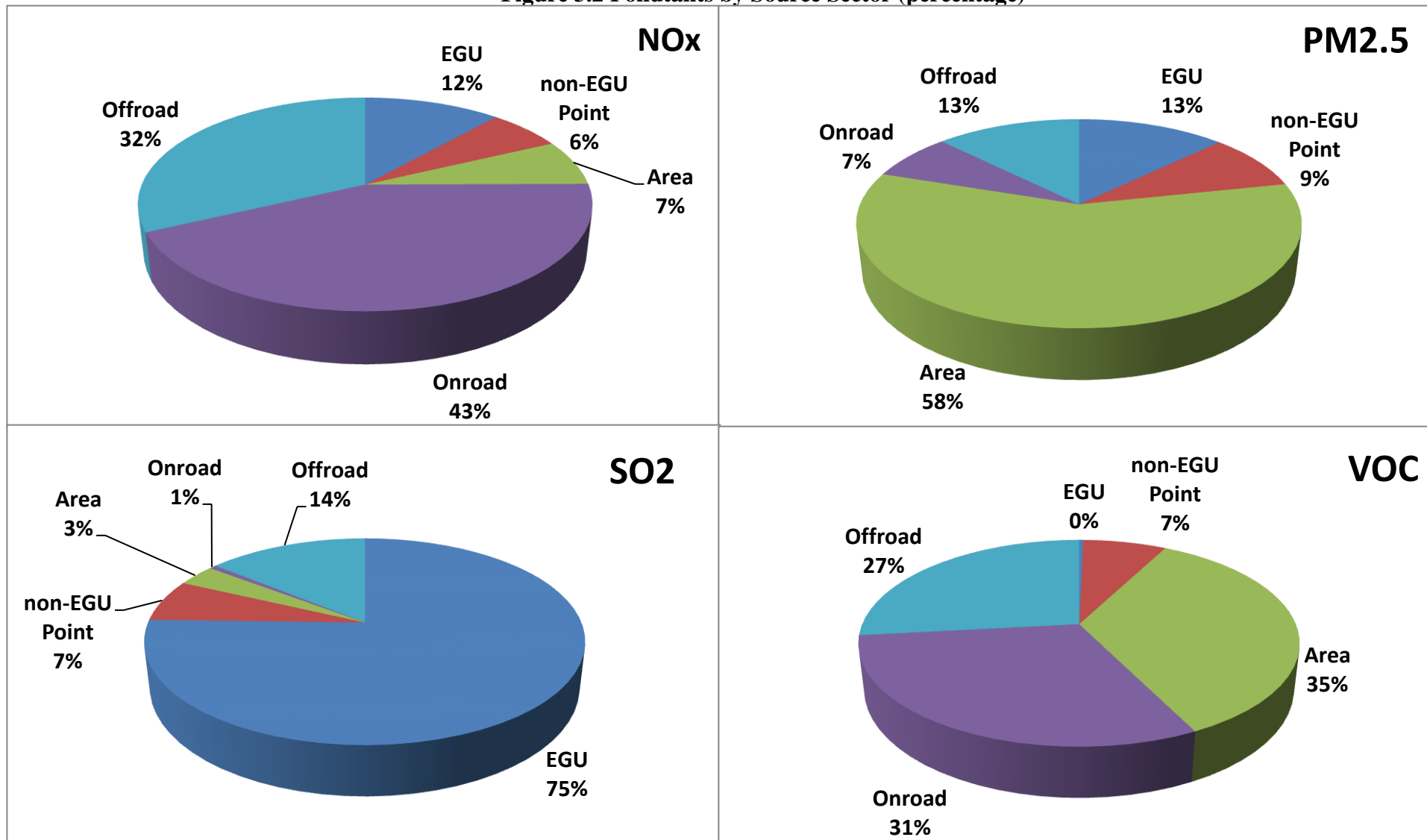
Source Sector	NH ₃	NO _x	PM _{2.5}	SO ₂	VOC
EGU Point	26	3,624	713	10,565	83
nonEGU Point	74	1,971	493	920	1,646
Area	5,632	2,171	3,253	470	7,911
Nonroad	1	9,992	699	1,964	6,041
Onroad	326	13,441	408	85	6,916
Total	6,060	31,199	5,566	14,004	22,598
<i>Percent of Total</i>	8%	39%	7%	18%	28%

Figure 3.1 Pollutant Percent of 2011 Inventory



⁸ The totals may not match the sum of the individual values due to independent rounding.

Figure 3.2 Pollutants by Source Sector (percentage)



Based on the data in Table 3.1 and Figures 3.1 and 3.2 it is evident that:

1. NO_x and VOC represent the largest emissions from combined sources
2. EGUs are the largest source of SO₂, followed by off-road
3. On- and off-road mobile have the largest percentage of NO_x and VOC emissions by far (75% of NO_x and 58% of VOC)
4. Area sources have a large VOC and direct PM_{2.5} component.⁹ The PM_{2.5} component dominates area sources due to dust categories and because a transport fraction was not applied.

3.2 Source Sector Emissions Analysis

By ranking emissions per category, we can look at which sources are most favorable for regulatory or voluntary control measures. The following sections discuss each source category in more detail.

3.2.1 EGU and non-EGU Point Sources

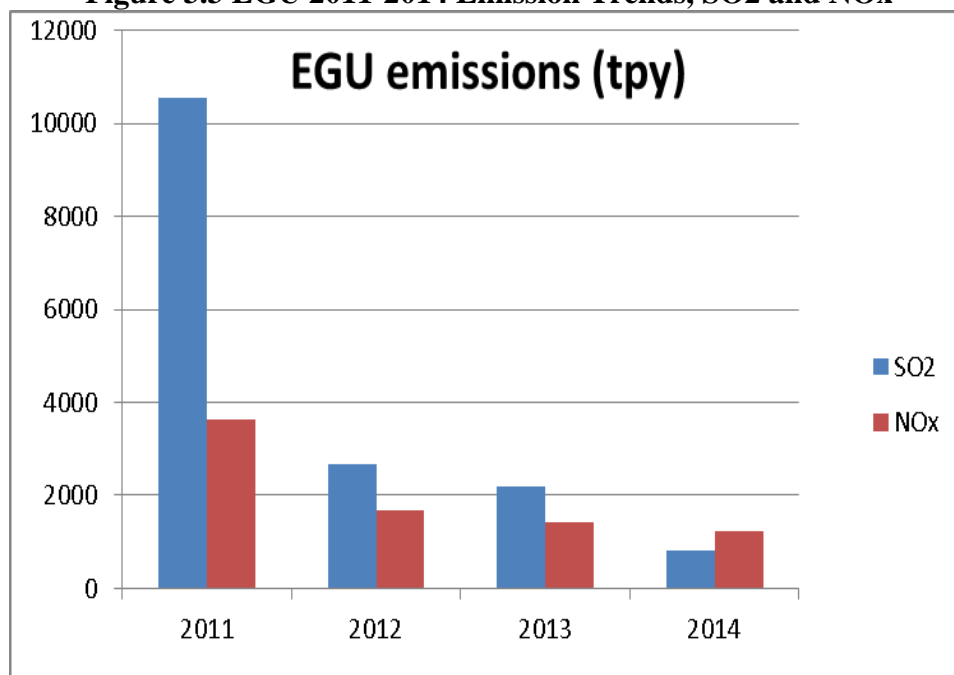
EGUs and non-EGUs are subsets of “point” sources. Point sources are individually inventoried by DAQ and are defined for emission inventory purposes as industrial, commercial, or institutional plants/operations that emit a minimum of 10 tons per year (tpy) or greater, of any of the EPA criteria pollutants. Owners or operators of about 60 such sources in Delaware are required to report annually the quantity and type of emissions. Refineries, petroleum transporting facilities, chemical manufacturing facilities, power plants, solid waste landfills, food processing plants, and large building heating systems are examples included in this sector. Manufacturing facilities, within the industrial sector, comprise the majority of all reporting point sources. The institutional sector includes hospitals, universities, prisons, military bases, landfills, and wastewater treatment plants.

As Table 3.1 indicates, the 2011 EGU point sub-sector dominates SO₂ and to a lesser extent, NO_x. However, since 2011, SO₂ and NO_x have decreased significantly as shown in Figure 3.3.¹⁰ These post-2011 reductions are due to emission controls, fuel switches and source shutdowns. Similar reductions have taken place for non-EGUs as well.

⁹ Because primary PM_{2.5} is emitted directly, it has a greater impact on monitored values than its secondary aerosols, e.g., precursors like VOC and NO_x can become unavailable for PM_{2.5} formation as a result of being consumed in ozone formation or other reactions in the atmosphere. Therefore, primary PM_{2.5} reductions are still very important regardless of their emissions compared to total inventory of other pollutants..

¹⁰ Source: 2011 NEI and 2012, 2013 and 2014 data from EPA's *Air Market Program Data* webpage

Figure 3.3 EGU 2011-2014 Emission Trends, SO₂ and NO_x



3.2.2 Area Sources

Area sources include those sources that are inventoried collectively because they are too small in magnitude or too numerous to inventory as individual point sources, and which can often be estimated more accurately as a single aggregate source (e.g., residential heating, print shops, dry cleaners, painting operations, degreasing, etc.). To prioritize which sub-sectors emit the most PM_{2.5} and precursors, ranking is in order. Table 3.2 presents a breakdown of the area source grouped sub-categories. Observe that 1) solvents, gasoline marketing and residential wood combustion easily dominate VOC emissions, 2) agriculture represents over 92% of NH₃ emissions,¹¹ 3) fuel combustion dominates NO_x and SO₂¹² and 4) direct PM_{2.5} is predominately due to residential wood combustion, paved roads and other fugitive dusts.

Table 3.2 Area Source Emissions by Sub-Sector

Source Category	NH ₃	NO _x	PM _{2.5}	SO ₂	VOC
Solvent Use	0	0	0	0	4191
Open Burning	3	21	90	4	54
Gasoline Marketing	0	0	0	0	1433
Fuel Combustion	92	2142	994	465	1305
Construction	0	0	523	0	0

¹¹ Emissions due almost exclusively due to concentrated animal feeding operations, such as ammonia from manure and fertilizer operations

¹² Delaware's new sulfur-in-fuels regulation begins to take effect in 2016, which will significantly reduce SO₂ emissions from fuel combustion from both area and point sectors.

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Commercial Cooking	0	0	233	0	33
Misc. Ammonia Sources	352	0	0	0	0
Paved Road Dust	0	0	1001	0	0
Agricultural	5185	8	411	0	896
Grand Total	5,632	2,171	3,253	470	7,911

3.2.3 On-road Mobile Sources

On-road mobile sources include emissions from vehicles found on roads and highways (cars, trucks, buses). Emissions are estimated from vehicle tailpipes and evaporation of fuels. In order to identify which onroad vehicles emit the most pollutants, Table 3.3 and Table 3.4 ranks the vehicles by type and fuel, thereby helping to assess which control measure to target.¹³

Table 3.3 On-Road Emissions by Vehicle Type and Diesel Fuel

Vehicle Type/Diesel	NH3	NOx	PM25	SO2	VOC
Combination Long-haul Truck	3	1,367	63	2	104
Combination Short-haul Truck	5	1,968	102	3	117
Intercity Bus	1	643	30	1	38
Light Commercial Truck	1	169	9	0	50
Motor Home	0	6	0	0	1
Passenger Car	0	14	0	0	15
Passenger Truck	1	150	7	0	42
Refueling	0	0	0	0	34
Refuse Truck	0	37	2	0	2
School Bus	0	75	5	0	12
Single Unit Long-haul Truck	0	23	2	0	3
Single Unit Short-haul Truck	1	320	21	0	47
Diesel Subtotals	14	4,936	251	7	478

Table 3.4 On-Road Emissions by Vehicle Type and Gasoline

Vehicle Type/Diesel	NH3	NOx	PM25	SO2	VOC
Combination Short-haul Truck	0	0	0	0	0
Light Commercial Truck	40	1440	22	11	853
Motor Home	0	8	0	0	4
Motorcycle	4	71	2	1	189
Passenger Car	140	2815	66	29	2693
Passenger Truck	127	4067	66	37	2452

¹³ Vehicle types for which any pollutant's emissions did not exceed >10 tpy were excluded from these summary tables in the interest of clarity and brevity.

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Refueling					203
Refuse Truck	0	1	0	0	0
School Bus	0	2	0	0	2
Single Unit Long-haul Truck	0	9	0	0	3
Single Unit Short-haul Truck	1	92	1	0	41
Transit Bus	0	1	0	0	0
Gasoline Subtotals	313	8,505	156	78	6,439

EPA has initiated many rules related to mobile sources.¹⁴ However, the U.S. Clean Air Act Amendments (CAAA) do not allow states to regulate on-road emissions, *unless* they adopt California Air Resources Board (CARB) standards. DAQ had adopted one of those measures implemented through DE Admin Code 1140 - Delaware Low Emission Vehicle Program and is actively pursuing other CARB measures. Due to EPA's passage of stringent vehicle emission standards emissions have decreased significantly in the past twenty years due to cleaner and more fuel-efficient cars and trucks, as well as new and more effective controls. However, there is more to be done for compliance with future, stricter PM_{2.5} NAAQS (and ozone and greenhouse gas reductions). Regardless of the CAAA restrictions on regulating onroad sources, the significance of this category in the 2011 inventory makes the on-road category a good candidate for investigating new *voluntary* measures and CARB-type regulatory measures.

3.2.4 Off-Road Sources

Off-road mobile sources include commercial, military, and general aircraft, marine vessels, recreational boats, railroad locomotives, and a very broad subcategory that includes everything from construction equipment, forklifts, and farm tractors to lawn mowers, chain saws, and leaf blowers. Like on-road sources, off-road sources are primarily regulated by EPA. Nonetheless, like onroad mobile, off-road sources also have significant emissions and are a good candidate for voluntary measures in this Plan.

Table 3.5 Off-Road Emissions by Sub-Sector

NONROAD SOURCES	NH3	NOx	PM_{2.5}	SO2	VOC
NONROAD Equipment	-	4,386	405	14	5,484
Aircraft	-	1,861	39	121	418
Commercial Marine Vessels	1	3,443	244	1,825	114
Locomotives	0	302	12	4	24
Total	1	9,992	699	1,964	6,041

¹⁴ <http://www.epa.gov/otaq/>

Section 4 Past and Existing/Ongoing Control Measures

Although EPA's PM Advance program stresses the importance of new and voluntary measures, it is helpful to provide a summary of existing measures, in order to assist stakeholders when evaluating future control programs. Delaware's regulatory measures are contained in its State Implementation Plan (SIP), which is a state plan that identifies how Delaware will attain and maintain air quality that conforms to each primary and secondary NAAQS, as well as controlling GHGs. The EPA approved Delaware's initial SIP in 1972. Since this initial approval, the Delaware SIP was revised numerous times to address air quality non-attainment and maintenance issues, by updating plans and inventories, and adding new and revised regulatory control requirements. Delaware's SIP is compiled at [40 C.F.R. Part 52 Subpart I](#). Delaware ozone, PM_{2.5} and regional haze plans can be found on DNREC's [Proposed Plans and Regulations](#) website.

In addition, Delaware has already undertaken many voluntary measures as part of its effort to primarily reduce Greenhouse Gases (which have co-benefits for PM_{2.5} reductions), but also to address current ozone nonattainment and previous PM_{2.5} nonattainment. Examples are provided in the following discussion.

4.1 Delaware Energy Office

[DNREC's Division of Energy & Climate](#) has developed many renewable/energy efficiency programs over the years, which involved the inclusion of many stakeholders and include the following programs:

- [Delaware Energy Efficiency Potential Study](#)
- [Delaware Utility Providers](#)
- [Driver Hour Waivers](#)
- [Energize Delaware](#)
- [Energy Efficiency Advisory Council](#)
- [Evaluating Energy Efficiency Programs](#)
- [Energy Saving Tips](#)
- [Gov. Markell's Executive Order 18](#)
- [Green Energy Program](#)
 - [Delmarva Power - Green Energy Program Incentives](#)
 - [DEMEC Member Utilities - Green Energy Program Incentives \(8 utilities\)](#)
 - [Delaware Electric Cooperative - Green Energy Program Incentives](#)
 - [Dover Public Utilities - Green Energy Program Incentives](#)
- [Regional Greenhouse Gas Initiative \(RGGI\)](#)
- [Renewable Energy Task Force](#)
- [State Energy Program](#)
- [Sustainable Energy Utility](#)
- [Task Forces and Workgroups](#)
- [Weatherization Assistance Program](#)

- [Delaware Climate Impact Assessment](#)
- [Governor Markell's Climate Framework for Delaware](#)

4.2 The Air Quality Partnership of Delaware (AQP)

The mission of the [Air Quality Partnership of Delaware](#) (AQP), a public/private coalition of businesses, agencies, and individuals interested in clean air, is to raise awareness and inform Delawareans about practices that improve air quality and citizen health. Partners include [American Lung Association in DE](#), [Bayshore Ford](#), [Chesapeake Utilities](#), [Clean Air Council](#), [DART First State](#), [Delaware Ecumenical Council](#), [Delmarva Broadcasting](#), [DE Division of Public Health](#), [DNREC](#), [Dover/Kent County MPO](#), [RideShare Delaware](#), and [WILMAPCO](#). Besides providing background information on air quality, the AQP also provides access to:

- [EnviroFlash](#) for email notifications with up-to-date information on air quality forecasts. EnviroFlash is a partnership between the US EPA and state and local air quality agencies.
- Link to [Air Quality Partnership of the Delaware Valley](#), which provides teaching resources, pollution forecasts and other links of interest related to air pollution

4.3 Delaware Authority for Regional Transit (DART) – *Rideshare*©

DART's [RideShare](#) Delaware is a service of DART First State dedicated to aiding commuters with finding and using alternative modes of transportation. Funded with a combination of Federal Congestion, Mitigation & Air Quality (CMAQ) and State dollars, the goal of the program is to reduce the number of single occupant vehicles traveling on Delaware's roadways, which also provides a co-benefit air quality improvement due to less VMT (vehicle miles traveled).

4.4 Non-motorized Modes of Transportation

4.4.1 First State Trails and Pathways Initiative

The focus of [First State Trails and Pathways Initiative](#) is a public outreach for bicycling, walking, and providing safe and convenient ways to reach local work, shops, schools, recreational sites and transit. This program will reduce VMT with associated air quality benefits. Partners are DNREC and DelDOT. **This project is ongoing.**

4.4.2 CMAQ Funds: Bicycle, Pedestrian and Other Improvements. This project is part of Delaware's Transportation Improvement (TIP) program (see [FY 2016-2019 TIP](#)). It supports completion of a statewide network of pedestrian and bicycle pathways, bicycle routes and pedestrian connections, and promotes travel by non-motorized modes for reduced congestion, active transportation choices, access to recreation, and reduced vehicle emissions. **This project is ongoing and funded through FY19.**

4.5 Fleet Link - State Employees

OMB's Fleet Services administers [Fleet Link](#), a statewide commuter program for State employees.¹⁵ Vanpools operate on a statewide basis and provide a shared-cost alternative to commuting to work in privately owned vehicles. Fleet Link is a convenient, environmentally friendly program that conserves energy by reducing traffic, parking congestion and air pollution.

4.6 Diesel Reduction Program

Since 2008, Delaware has participated in the [National Clean Diesel Campaign](#) through its funding to install clean diesel technology. These technologies include emissions and idle control devices (to include truck stop electrification), aerodynamic equipment, engine and vehicle replacements, and alternative fuel options. Projects have included:

1. **Port Of Wilmington**
 - 2 Ship To Shore Cranes
 - i. Diesel Oxidation Catalyst
 - 4 Product Loading Vehicles
 - i. Engine Replacements
2. **56 School Bus Retrofits**
 - Diesel Particulate Filters
 - Closed Crankcase Ventilation
3. **32 Municipal Public Works Trucks**
 - Diesel Particulate Filters
4. **Smyrna Rest Area**
 - 24 Electrified Parking Spaces
5. **Fort Delaware**
 - 2 Piston Generators Replaced With 1 Micro turbine Generator
6. **Wilmington Tug**
 - 2 Propulsion Engines Replaced
7. **37 DeIDOT Dump Trucks**
 - Diesel Particulate Filters
8. [Mid-Atlantic Diesel Collaborative](#) Delaware participates in MARAMA's (Mid-Atlantic Region Air Management Association) Alternative Power Unit grant program, which provides funds to small business trucking companies to purchase alternative power units.
9. **Biodiesel:** Soy biodiesel is a clean-burning alternative fuel produced from soybeans, a domestic renewable resource and one of Delaware's chief agricultural crops. Delaware fleets using Soy Biodiesel include:
 - DeIDOT
 - Delaware Electric Cooperative, Inc.
 - Delaware Department of Agriculture

¹⁵ <http://gss.omb.delaware.gov/fleet/#f1>

- Delaware Solid Waste Authority
- Sussex County Conservation District
- Dover Air Force Base
- Conectiv Power Delivery
- University of Delaware Agriculture Experimental Station

4.7 Delaware Regulation 1145 - Excessive Idling Of Heavy Duty Vehicles¹⁶

First established in 2005, this regulation requires “No on-road heavy duty motor vehicle shall be allowed to operate for more than three consecutive minutes when the vehicle is not in motion.”

Section 5 New Projects/Control Measures

The following sections provide information on new measures that will provide additional emission reduction benefits to Delaware beginning in mid-late 2015. These control measures will not only reduce primary PM_{2.5} and its precursors, but many of these measures will also reduce ozone precursors (Delaware is nonattainment for the 2008 8-hr ozone standard), and help Delaware in reducing greenhouse gases. Reductions from the control measures will be quantified, where possible.

As discussed in Section 2, DAQ will identify partners that share our priorities, form allied relationships and establish a process that builds robust stakeholder input throughout the development of control measures, as appropriate and necessary.

5.1 Develop and Launch a PM Advance Webpage

The DNREC maintains an online [webpage](#) for new and recurring events, including one for DAQ to provide various reports, regulations and other topics for public outreach. As part of the DAQ public outreach for PM_{2.5}, DAQ will include a summary of Delaware’s PM_{2.5} Advance Plan as a separate webpage, which then will contain links to other materials for current and future year projects. Two programs are in the development stages for the PM_{2.5} Advance webpage and will be up and running during year one:

- **Residential Wood Burning Webpage:** According to EPA PM Advance guidance on control measures, “*public education and awareness programs may be considered as well.*” As shown in Section 3.2.2, PM_{2.5} and VOC emissions from residential wood combustion are substantial. To help reduce residential wood combustion emissions, DAQ is developing a new webpage to assist citizens in learning to burn wood more cleanly and efficiently. The website will also refer the reader to EPA’s “Burn Wise” website.

¹⁶ <http://regulations.delaware.gov/AdminCode/title7/1000/1100/1145.shtml#TopOfPage>

- **Wood Burning Brochure:** A brochure will be adapted from current materials developed by EPA and other states. It will be available as a downloadable PDF file from the DAQ PM_{2.5} Advance webpage. It will also be formatted for distribution by 1) DNREC Enforcement Officers responding to chimney smoke complaints, 2) State Fair and other public activities, and 3) will be evaluated for inclusion in educator packages.

5.2 Diesel Emission Reduction Programs

In the first year of the PM Advance Program, DAQ will scope out DERA project(s) and evaluate/develop a list of diesel-emission reduction projects. The “Street Sweeper” (below) has already been completed since Delaware was accepted into the PM Advance program. And, the following two DERA projects are expected to be in place by summer 2016.

5.2.1 Street Sweeper

On April 19, 2015, the DAQ and the Delaware Department of Transportation signed a Memorandum of Understanding (MOU) to memorialize an agreement between the Division of Air Quality and the Department of Transportation concerning funding for the partial purchase of a street sweeper in the City of Wilmington.

The staff of the Delaware Department of Transportation (DelDOT), Maintenance Division, will administer the street sweeper project. The purpose of the project is to reduce diesel emissions in the Wilmington metropolitan area, which is located in New Castle County, a PM_{2.5} Maintenance Area. The project resulted in the replacement of a model year 2002 Schwarze diesel powered street sweeper with a model year 2014 sweeper that operates in the Wilmington area. This beneficial project, in keeping with the goal of the DERA, will result in on-going reductions of emissions of the following pollutants: PM_{2.5} particulate matter, nitrogen oxides, volatile organic compounds, sulfur dioxide, and carbon monoxide.

5.2.2 Wilmington Tug Gensets.

The proposed project is the replacement of an existing diesel propulsion engine with an auxiliary diesel powered electric generator (genset) on the vessel “Tug Sally”.

The replaced engines for the marine vessel, Tug Sally, proposed in this project represent a cost-effective mechanism for achieving significant reductions in diesel emissions in a densely populated and highly polluted area. Non-road diesel emissions contribute significantly to two major pollutants impacting air quality. Diesel engine’s emissions consist mostly of particulate matter and nitrogen oxides, along with other toxic gases in smaller amounts.

Table 5.1 Projected Emission Reductions for Tug Retrofit

Pollutant	Tons/Year	Tons/Useful Life
NOx	0.42	8.71
PM	0.02	0.48
HC	0.01	0.17
CO	0.08	1.74

In October 2015, DAQ will sign a contract between the Department of Natural Resources and Environmental Control and Wilmington Tug Inc., memorializing an agreement that requires Wilmington Tug Inc. to administer the entire genset replacement project, including request for proposals, purchase order and invoice processing as well as overseeing the installations. The contract will provide a process by which the Department will release up to \$26,000 for purchase and installation of the two gensets for the Tug Sally to Wilmington Tug Inc. This amount will be funded from a federal fiscal year 2015 DERA allocation. The project is expected to be completed in April 2016.

5.2.3 Norfolk-Southern Locomotive Idle Reduction. The proposed project is to install a shore air system¹⁷ to maintain the brake system air pressure while the freight train is waiting to deliver to the refinery. This system will eliminate up to 20 hours of locomotive idling per day for up to 9 months in Bear, DE.

Locomotives spend a substantial amount of time idling, during which they emit harmful pollutants, consume fuel, create noise, and increase maintenance costs. The current EPA regulations focus on the application of automatic idle reduction technologies to the locomotives themselves rather than on directly regulating when railroads may allow locomotives to idle. This project aims to further reduce the amount of idling from locomotives while they wait to be cleared to deliver to the Delaware City Refinery.

The idling of these locomotives in New Castle County occurs near residential units resulting in numerous air quality complaints. Of particular concern are particulate matter (PM) and nitrogen oxides (NOx), a key precursor to ozone and secondary PM formation. As mentioned above – New Castle County is designated as non-attainment with the 8-hour ozone standard and is a participant in the PM Advance program. This project proposes to reduce diesel locomotive idle emissions at the Middle Tasker Siding of the Norfolk-Southern Railroad (NS) in Wilmington, DE, which will reduce emissions and conserve diesel fuel.

¹⁷ A shore air system is an air compressor station installed adjacent to the siding track, and used to maintain brake air pressure when train engine is not running.

Table 5.2 Projected Emission Reductions for NS Locomotive Idle Reduction

Pollutant	Tons/Year	Tons/Useful Life
NO _x	3.32	66.47
PM	0.05	1.09
HC	0.21	4.26
CO	0.67	10.17

In October 2015, DAQ will sign a contract between the Department of Natural Resources and Environmental Control and Norfolk-Southern memorializing an agreement that requires Norfolk-Southern to administer the entire idle reduction project, including request for proposals, purchase order and invoice processing as well as overseeing the installations. The contract also provides a process by which the Department will release up to \$240,000 for purchase and installation of the Train Air Compressor Station to Norfolk-Southern. This amount will be funded from a federal fiscal year 2015 DERA allocation. The project is expected to be completed in April, 2016.

5.3 Adopt/Amend Air Regulations

Delaware remains in non-attainment of federal ground-level ozone requirements and additional emission reductions of VOC are needed. Since VOC is also a precursor of PM_{2.5}, VOC reductions obtained from ozone control measures will assist in meeting the goals of the PM Advance Plan. The Division has proposed to revise Section 33.0 of Delaware 7 DE Admin Code 1124 - Solvent Cleaning and Drying and 7 DE Admin Code 1141 – Consumer Products.

5.3.1 Consumer Products Regulation Based On an Updated OTC Model Rule

The DAQ has proposed to revise Section 2.0 of DE Admin Code 1141- Consumer Products. DAQ has estimated this rule revision will yield 0.7 tons per day of VOC reductions in Delaware. A hearing was held in early August 2015 and the final rule is expected to become effective later this year.

5.3.2 Solvent Degreasing Regulation Based on an Updated OTC Model Rule

This regulation was based originally upon the 2001 Ozone Transport Commission (OTC) Model Rule for Solvent Cleaning. In 2010, OTC revised the 2001 model rule which was approved in 2013. The OTC Model Rule determined that a VOC emission reduction of 89 tons per day would result in the Ozone Transport Region (OTR) in 2014. Based on population, a VOC emission reduction of about one ton per day will result in Delaware upon adopting the OTC rule. DAQ expects the amendment will have a published rule in 2016.

5.3.3 AIM Coatings Regulation Based On an Updated OTC Model Rule

Evaluate and revise Section 1 of Regulation 1141 (Architectural and Industrial Maintenance Coatings) to conform to the most recent OTC model rule, which is expected to yield up to one ton per day VOC reductions. The expected start date for this regulation revision is in late 2016.

5.4 Mobile Measures

5.4.1 California ZEV requirements: DAQ is currently evaluating Delaware's adoption of the CARB Zero Emission Vehicle program, and to support Delaware becoming a signatory state to the ZEV MOU.

5.4.2 Delaware's Electrified Truck Stops: Evaluate the low utilization of the two electrified truck stops in Delaware and develop a proposal to increase usage.

5.4.3 Evaluate I/M for Diesel Trucks

5.4.4 Anti-Idling: Evaluate the need for and benefits of adopting a regulation to reduce idling emissions from nonroad vehicles, based on an approved OTC rule.

5.4.5 Become a SmartWay® Affiliate

The [SmartWay](#) Program is a public-private initiative between EPA, large and small trucking companies, rail carriers, logistics companies, commercial manufacturers, retailers, and other federal and state agencies. Its purpose is to improve fuel efficiency and the environmental performance (reduction of both greenhouse gas emissions and air pollution) of the goods movement supply chains. SmartWay aims to accelerate the availability, adoption and market penetration of advanced fuel-efficient technologies and operational practices in the freight supply chain, while helping companies save fuel, lower costs and reduce adverse environmental impacts. EPA helps SmartWay Partners move more goods, more miles with lower emissions and less energy.

Delaware will evaluate the benefits of becoming a SMARTWAY Affiliate in the first year of the PM Advance program.

Section 6 Monitoring

6.1 DAQ's Mobile Monitoring Platform (MMP) Use the MMP to monitor particulate concentrations in areas where high PM_{2.5} events have been observed, and in communities with disparate air pollution impacts.

Section 7 Stakeholder Engagement

As described in Section 1.3 of this plan, stakeholder engagement and collaboration will be an important aspect of accomplishing PM_{2.5} emission reductions through voluntary and regulatory measure under the PM Advance program. As such, DAQ will do the following activities in Year 1 of PM Advance.

- As noted in Section 5.1, DAQ will develop, maintain and promote a PM Advance website to inform stakeholders and the public of the PM Advance program. The website will be maintained and updated, as new projects are developed and existing project

progress. The website will also serve as a resource for the citizens of Delaware to understand the adverse health effects of fine particulate matter, and to know the sources of PM_{2.5} that impact Delaware air quality.

- Engage with DelDOT and the metropolitan planning organizations within Delaware to identify PM emission reducing projects in the context of transportation planning.
- Meet with health and environmental advocacy groups throughout the state to obtain concerns they have regarding emissions of and exposure to PM_{2.5} in Delaware. Solicit ideas on approaches that DAQ could implement to reduce emissions and exposure.
- Meet with the Delaware Chamber of Commerce to ensure businesses that are attracted to Delaware enhance air quality, so that Delaware remains in attainment of current and future particulate standards.
- As DAQ assesses disparate air quality impacts on certain communities within Delaware as part of its on-going strategic plan, it will be prepared to work with communities to find solutions when the impacts are a result of fine particulates.

Section 8 PM Advance Reporting Requirements

As part of the 5-year Plan, DAQ will report annually to EPA on the programs contained within this document, as well as new programs developed during each year and anticipated in the subsequent year. As such, this document will be updated and revised accordingly, including updated emissions and air quality data, as available.