

“BEYOND CONFORMITY”

Beyond Conformity is a project funded by the Maryland Department of the Environment (MDE) with the staff support of MWCOG and the District Department of the Environment (DDOE) to develop draft recommendations for potential **Proposed Long-Range Environmental Goals for Transportation Planning**. The work products of the project may be presented to the Metropolitan Washington Air Quality Committee Technical Advisory Committee (MWAQC-TAC) for input and then to MWAQC for policy consideration.

The Washington DC-MD-VA region and much of the eastern half of the United States remains in nonattainment of the national ambient air quality standards (NAAQS) for 8-hour ozone. The MWAQC Work Plan includes the preparation of a base year emissions inventory for submittal to EPA to meet the 2008 8-hour NAAQS requirements. The region also agreed to begin work to develop a 15% Reasonable Further Progress (RFP) State Implementation Plan (SIP) to meet the NAAQS in case (and in all likelihood that) the region fails to attain the 2008 NAAQS by the attainment deadline in 2015. A more stringent 8-hour ozone standard of between 60 and 70 parts per billion (ppb) is anticipated in 2014, with a potential attainment deadline of 2020. The purpose of the NO_x discussion is to propose NO_x reduction goals to meet future ozone standards.

The 2008 National Capital Regional Climate Change Report set regional greenhouse gas reduction goals for short-term, intermediate, and long-term targets consistent with international scientific consensus. The regional goals are: to reduce greenhouse gas emissions by 10 percent below Business as Usual (BAU) levels by 2012, 20 percent below 2005 levels by 2020, and 80 percent below 2005 levels by 2050, as shown in Figure 3. These greenhouse gas emission reduction goals are also Sustainability Target Two of the Region Forward Vision, which was endorsed by the Council of Governments, local jurisdictions, businesses, nonprofits, and other civic groups in 2010. Maryland and Virginia have both set statewide greenhouse gas reduction goals, and several localities in the region have established their own targets comparable to the MWCOG goal. (A full list of regional greenhouse gas reduction targets can be found in Appendix 1). The purpose of the CO₂ white paper is to propose reduction goals to meet COG’s adopted regional greenhouse gas reduction targets.

“Beyond Conformity” Objective

Development of the MWAQC Work Plan for 2013 to 2014 resulted in the establishment of a “Special Project” (“Beyond Conformity”) that would lead to three primary products: white papers on NO_x and CO₂ proposed goals for future years, a 2014 Plan identifying reduction strategies, and a communications plan that identifies the gap between future environmental proposed goals and current projections.

The goal of the “2014 Plan” is to identify potential emission reduction options in the transportation sector that could be implemented to reduce gaps between the projected emissions in future years and proposed environmental emission goals. Potential projects will be considered for inclusion in MWAQC’s “Gold Book.”

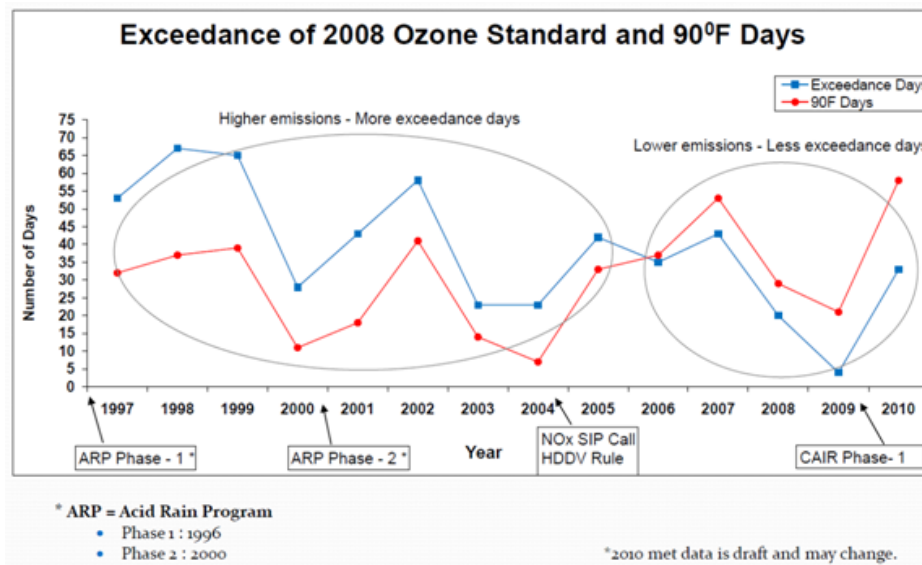
NO_x White Paper

This paper describes modeling most recently completed by the Ozone Transport Commission (OTC) and U.S. Environmental Protection Agency (EPA) in an effort to articulate what NO_x emissions levels are needed to reach ozone attainment in the DC-MD-VA regions by two relevant years: 2015, the attainment year for areas in marginal nonattainment of the 2008 8-hour ozone national ambient air quality standard (NAAQS); and 2020, the potential attainment deadline for an anticipated standard, as recommended by the scientific community to protect public health. The focus of this paper is NO_x emissions from the transportation sector.

BACKGROUND:

NO_x Emissions Trends and Control Strategies to Date

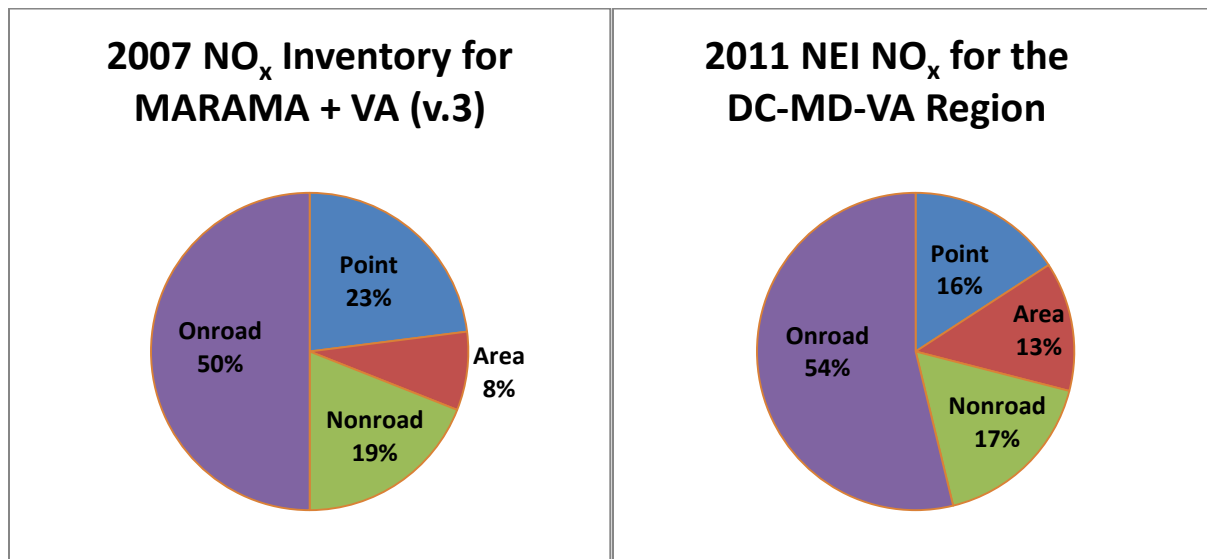
The number of 8-hour ozone exceedance days has generally dropped in the Washington DC-MD-VA region since 1997. A 90-degree day was a good indicator of an exceedance until 2006, indicating that emitted pollutants were reliably mixing to create ozone. Federal programs to control electric generating unit (EGU) emissions (such as the NO_x SIP Call and the Clean Air Interstate Rule, or CAIR) were implemented, and by 2006 there was a shift in the trend. A 90-degree day is no longer considered an indicator of an ozone exceedance, suggesting that emissions reductions in the point source sector have resulted in less ozone production at high temperatures.



Nonetheless, the DC-MD-VA region continues to remain in nonattainment of federal ozone standards. Key contributors of NO_x pollution in the DC-MD-VA nonattainment area are:

- Transport – EPA modeling has indicated that contributions of up to several parts per billion (ppb) of ground-level ozone pollution may come from upwind states (see Technical Support Documents for the proposed Cross-State Air Pollution Rule, or CSAPR). Participants of the OTC, a regional group, are expending significant resources to explore and use several regulatory and legislative tools to address the NO_x transport problem:

- Clean Air Act (CAA) Section 126 – Allows states to petition EPA to address emissions from a specific upwind stationary source or group of sources.
 - CAA Sections 176a and 184 – Allows states to petition EPA to establish a new transport region.
 - CAA 107(d) and EPA guidance – Allows states to recommend that EPA establish a larger nonattainment area that covers more jurisdictions.
 - 5 U.S.C. 553(e) – Provides states with the right to petition EPA for the issuance, amendment, or repeal of a rule because they are technically unable to comply with the CAA and are therefore “suffering a legal wrong”.
 - States are in the beginning stages of establishing a technical collaborative, similar to the Ozone Transport Assessment Group (OTAG) of the mid-1990s.
- Transportation sector – Of pollution emitted within the Mid-Atlantic region in 2007, roughly half was from onroad mobile sources. Similar trends were seen in the DC-MD-VA area in 2011.



ATTAINMENT MODELING:

Air quality planners generally look to attainment modeling to evaluate strategies to meet attainment standards. The following describes three runs completed by the OTC based on three different control strategy scenarios. It also looks at a run completed by EPA in support of the proposed Tier 3 Vehicle Emission and Fuel Standards (“Tier 3”) program.

OTC Future Year Scenarios – Controls in Other Sectors

Since 2010, OTC has been conducting modeling in “screening” phases as they work towards attainment modeling that is acceptable for inclusion in 2008 8-hour ozone state implementation plans (SIPs). OTC’s runs to date were designed to meet the 2008 standard of 75 parts per billion (ppb):

- Scenario 4 – A preliminary sensitivity run to 2020.
- On-the-books/On-the-way (OTB/W) – Refined projections in 2020 that include programs currently adopted or committed to by the federal government and states.

- On-the-books/On-the-way with Tier 3 (OTB/W w/T3) – The 2020 OTB/W run plus reductions from EPA’s proposed Tier 3 rulemaking (assumed as an additional 11.1 percent in mobile source NO_x).

All three runs were developed using the Community Multi-scale Air Quality model (CMAQ , Version 4.7.1) and the Weather Research and Forecasting Model (WRF) for meteorological input, with 2007 as the base year and 2020 as the target year. Emission inventories were developed through the Mid-Atlantic Regional Air Management Association (MARAMA). Earlier inventories (from 2005 or 2008) were used as proxies for information that was unavailable at the time of analysis. OTC obtained emissions inventories from neighboring Regional Planning Organizations (RPOs) to complete the CMAQ runs. Emissions data were converted to a format usable in CMAQ using a tool called SMOKE. All of the modeling platforms were tested and performance was deemed acceptable prior to the completion of each final screening run. With each subsequent run, improvements were made to the emission inventories, meteorological boundary conditions, and other data inputs.

Initial runs were made to approximate OTC’s recommendations for national reductions combined with regional measures. The following were included in the 2007 baseline inventory, in addition to any controls already built into the models used:

MOBILE	Tier 2 Rule
	2007 Onroad Heavy-Duty Rule
	MSAT2
	Renewable Fuel Standard
	National LEV
	OTC LEV
	Clean Air Nonroad Diesel Final Rule – Tier 4
	“Pentathlon Rule”
AREA	Municipal Waste Landfills
	Gasoline Stage 2 Vapor Recovery
	Portable Fuel Containers

The differences in the 2020 OTC runs to date are the inclusion of control measures as follows:

Source Sector	Scenario 4	OTB/W	OTB/W w/T3
EGU Point	NO _x RACT on power plants in the east	CSAPR caps <i>(now remanded)</i>	CSAPR caps <i>(now remanded)</i>
Non-EGU Point	NO _x RACT on ICI boilers and large stationary sources in the east	Federal controls	Federal controls
Area	VOC controls similar to those currently in place (industrial adhesives and sealants, degreasers, glass manufacturing)	Federal controls	Federal controls
Offroad mobile & MAR (marine, air, rail)	EPA rule controls on locomotives and marine engines	Federal controls	Federal controls
Onroad mobile	Tier 2; CALEV in the east (w/out low sulfur fuel)	Tier 2	Tier 3 & low sulfur fuel

Additional control measures considered in 2020 modeling by OTC address the following source categories:

- POINT (EGU and non-EGU) – Utility MACT, ICI boilers, cement kilns, stationary reciprocating engines (RICE) and distributed generation, asphalt production and paving, glass manufacturing, smelters; municipal waste combustors
- AREA – OTC Model Rules – large above-ground storage tanks; natural gas-fired small boilers, steam generators, and process and water heaters; AIM coatings; consumer products; industrial adhesives and sealants; solvent cleaning operations (degreasers); adhesives, sealants, primers and solvents
- OFFROAD – new off-highway engine and tailpipe standards, offroad sources (especially for high emitters); lightering; drayage
- ONROAD – aftermarket catalysts

All of these measures have been recommended to EPA as Federal measures¹ or are being developed by OTC for adoption by member states.

Percent Reductions

Total projected reductions in NO_x from 2007 to 2020 for the Scenario 4 run were based on proxy adjustments. For the OTC OTB/W run, they were based on 2020 inventories of projected emissions developed by states (with state-specific control scenarios). The highest reductions are expected in the EGU Point, nonroad, and mobile sectors:

Source Sector	2020 Scenario 4	2020 OTB/W	2020 OTB/W w/Tier 3
EGU Point	65% NO _x (all) + 5% (OTR only)	63%	63%
Non-EGU Point	5% (OTR only)	(5%)	(5%)
Area	5% (OTR)	(5%)	(5%)
Nonroad & MAR	65% NO _x (CAT 3 Marine only),	51%	51%
MAR	+5% (OTR except CAT 3 marine); +35% NO _x (non-OTR MAR & NR)	16%	16%
Mobile	70% NO _x (all) + 5% (OTR only)	59%	64%

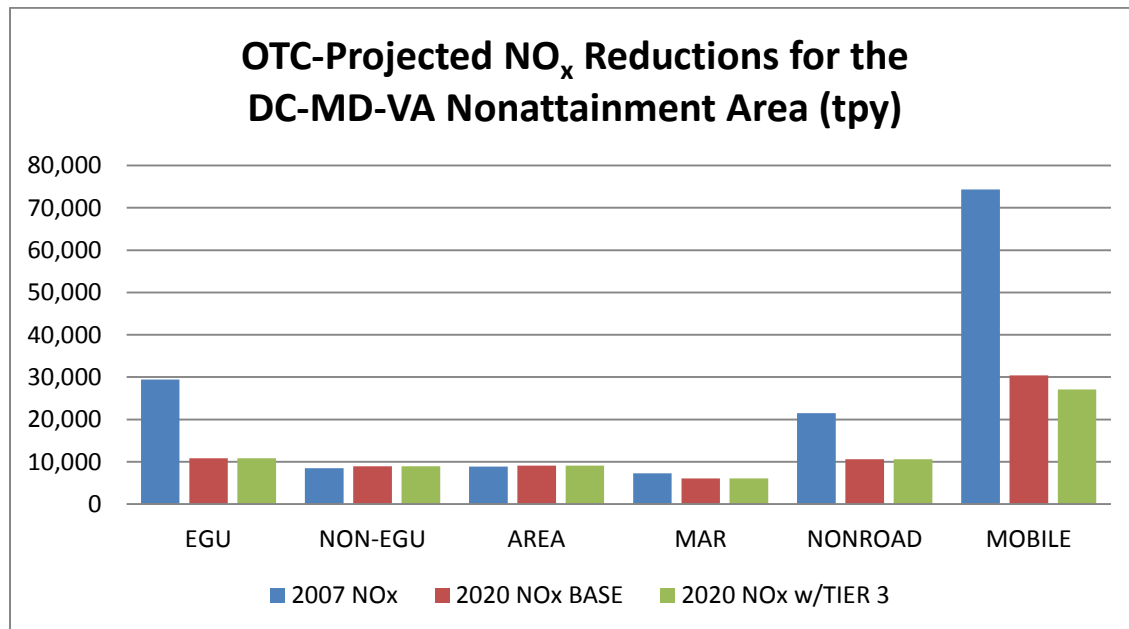
In general, EGU NO_x reductions are due to pollution controls, facility shutdowns, and a massive conversion to the use of natural gas. (Note that actual EGU emissions reductions are questionable, since CSAPR was vacated and remanded in 2012. Additional control efforts are well underway as discussed above.) Any anticipated nonroad and onroad mobile reductions are likely due to fleet turnover to meet federal standards.

OTC Modeling Projections

All three OTC modeling scenarios led to attainment of the 75 ppb standard, but not of the 70-to-60 ppb range recommended by EPA’s Clean Air Scientific Advisory Committee (CASAC) to protect public health.

¹ An “OTC National Ask” to EPA focused on six source categories that represent about 75 percent of the NO_x that is left to regulate: EGUs, Portland cement plants, onroad mobile sources, locomotives, marine engines, and ICI boilers.

The following chart shows the difference in 2020 NO_x projections in the DC-MD-VA region between the various runs:



** Nonroad calculations are based on ton-per-day estimates.*

** Scenario 4 run results were preliminary, so are not included in the chart.*

Based on OTC projections, it is clear that even with the proposed Tier 3 program in place, onroad vehicles will continue to be the leading source of NO_x emissions. (VOCs are not a current focus in the DC-MD-VA region because of the dominance of biogenic emissions compared to anthropogenic contributions.)

EPA Modeling

EPA also conducted modeling for the Tier 3 program, proposed in March 2013, with new standards planned to start in 2017. They used the same CMAQ model as OTC (Version 4.7.1) but with a different set of meteorology – instead of WRF, they used PSU/NCAR mesoscale model (MM5) inputs. Because EPA's modeling was conducted for a different purpose than the OTC's, EPA's runs were based on a different emissions inventory base year (2005) and two different future years (2017 and 2030). EPA projected that Tier 3 will reduce mobile source NO_x emissions by approximately 8.2 percent in 2017, and by approximately 27.8 percent by 2030. Deeper reductions were assumed in 2030 due to fleet turnover.

GAP ANALYSIS:

Percent reductions from attainment modeling can be applied to business-as-usual NO_x projections developed and used by the Transportation Planning Board (TPB) for conformity purposes to establish a range of future year emissions targets for the mobile source sector. A range can reflect uncertainties in attainment modeling. As and when additional modeling results or revised NO_x projections become available, NO_x targets can be re-evaluated.

CLRP NO_x Projections

Regionally significant transportation projects are included in the region’s Constrained Long-Range Plans (CLRPs) and Transportation Improvement Plans (TIPs). CLRPs and TIPs must conform to mobile vehicle emission budgets (MVEBs) included in a nonattainment area’s air quality SIP (Clean Air Act § 176). Once a budget is considered “adequate” by EPA, it may be used to determine a CLRP and TIP’s “conformity” with the SIP.

Mobile source NO_x projections are developed annually for the DC-MD-VA region’s transportation sector for specific analysis years based on projects included in the region’s CLRP and TIP. The following table includes regional NO_x emissions projections that were used to evaluate conformity of the 2013 CLRP with existing SIPs:

NO_x Mobile Source Projections Used for 2013 Conformity Determination								
Ozone SIP*	2009	2010	2015	2017	2020	2025	2030	2040
NO _x MVEB (tpd)	146.1	144.3						
2013 CLRP NO_x Projections			133.8	110.5	87.7	72.1	66.9	68.2
2013 CLRP: Air Quality Conformity Determination of the 2013 Constrained Long-Range Plan and FY2013-2018 TIP for the Washington Metropolitan Region, July 17, 2013								
*Ozone SIP for Metropolitan Washington, DC-MD-VA submitted in 2007, Mobile6 model; MVEB found adequate in 2013								

Currently, the MVEBs found adequate by EPA for use in conformity assessments are budgets that were submitted to EPA in 2007 as part of the ozone SIP to meet the 1997 ozone standard of 84 ppb. The budgets were set using the MOBILE6 emissions model, which is now out-dated for regulatory purposes. EPA has not approved more current NO_x MVEBs proposed in the PM_{2.5} Maintenance Plan submitted in May 2013. While the NO_x projection levels indicate that the DC-MD-VA region will meet CAA conformity requirements, they are not representative of mobile source reductions necessary to attain existing and future NAAQS.

Developing Mobile Source NO_x Targets

To develop 2015 NO_x goals for the mobile sector, reductions based on attainment modeling can be applied to 2020 CLRP NO_x projections. The reductions would represent control levels in 2015 that would be necessary to meet the 75 ppb standard; they would loosely represent the approximate removal of a program from the initial 2020 attainment modeling scenario to get to a 2015 scenario.

2020 Run	2020 Emissions from 2013 CLRP (tpd)	Reduction from 2020 Needed to Attain the 75 ppb Standard		Calculation to Get to a 2015 Goal	Potential 2015 Goal (tpd)
Scenario 4	87.7	10%	= Removal of CALEV benefits; still w/Tier 2	$88 * 0.90$	80
OTB/W	87.7	Base case (0%)	Base case	$88 * 1.0$	88
OTB/W w/Tier 3	87.7	11.1%	= Removal of Tier 3 benefits	$88 * 0.89$	78
<i>EPA Tier 3 (2017)</i>	<i>110.5 (2017 MVEB)</i>	<i>8.2% (2017 estimate)</i>	<i>= Removal of Tier 3 benefits</i>	<i>111 * 0.92</i>	<i>102*</i>

* Note that EPA's run did not lead to attainment in all DC-MD-VA jurisdictions by 2017, so it is not included as part of the range of options.

The 2020 goals would represent controls needed from the transportation sector to meet an anticipated ozone standard of 60 to 70 ppb. Since none of the OTC runs resulted in emissions that were low enough to meet a more stringent standard, only the EPA Tier 3 modeling is a viable source of emission reduction estimates. A lower bound estimate is proposed as a reduction of five percent from the upper bound estimate.

2030 Run	2030 Emissions from 2013 CLRP (tpd)	Reduction from 2030 Needed to Attain a 60-70 ppb Standard		Calculation to get to a 2020 Goal	Potential 2020 Goal (tpd)
<i>EPA Tier 3</i>	<i>67</i>	<i>27.8%</i>	<i>= Removal of T3</i>	<i>67 * 0.72</i>	<i>48</i>
<i>EPA Tier 3 + 5%</i>	<i>67</i>	<i>27.8%</i>	<i>= Removal of T3</i>	<i>48 - (48 * 0.05)</i>	<i>46</i>

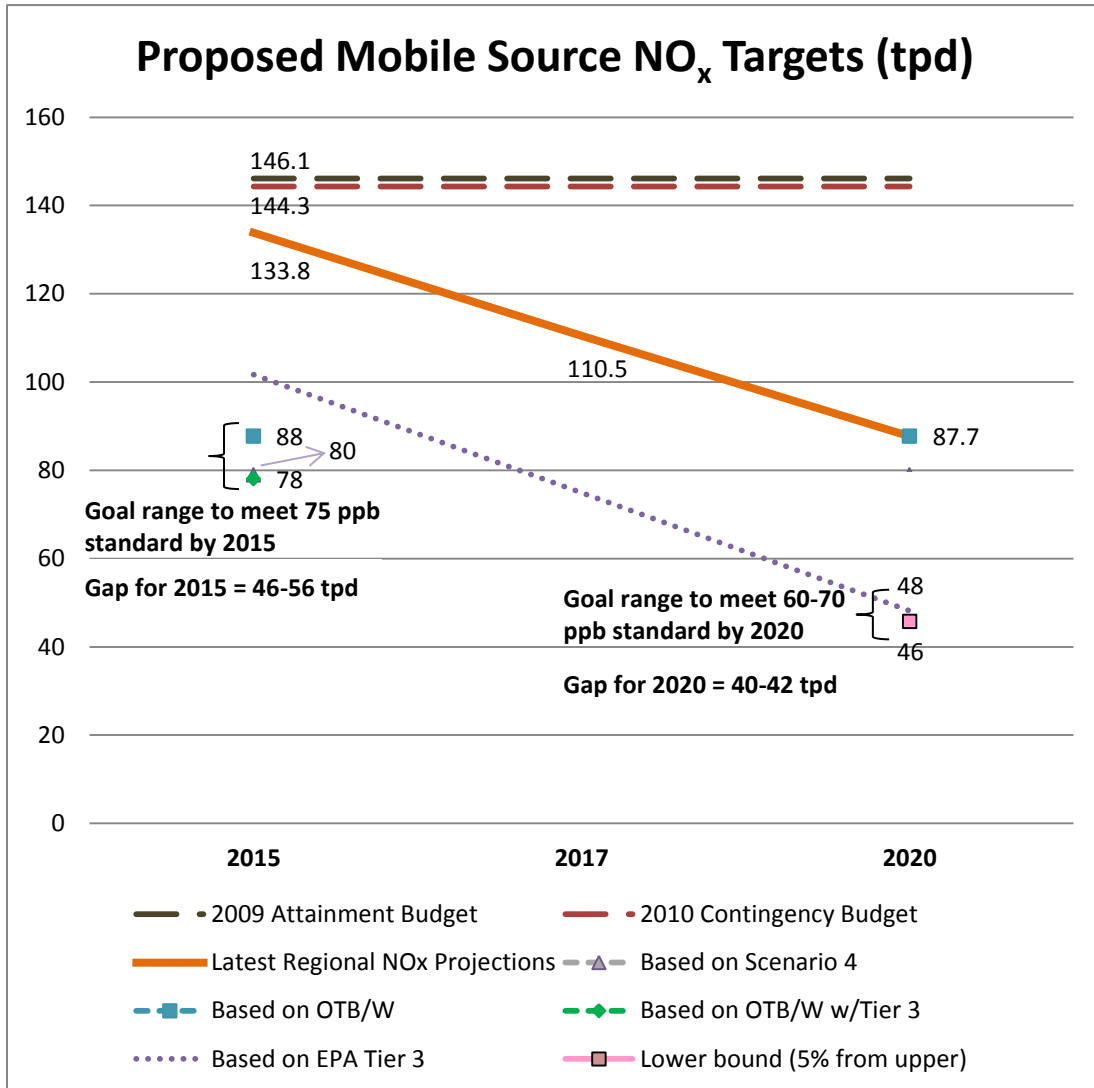
The resulting proposed goals for the transportation sector represent a range of mobile source emissions levels necessary to meet the 75 ppb standard by 2015 and to meet anticipated long-term air quality requirements by 2020.

	2015	2020
Current CLRP Projections	134 tpd	88 tpd
Range for Proposed NO _x Goal	78 to 88 tpd*	46 to 48 tpd*
GAP	56 to 46 tpd	42 to 40 tpd

* May be updated with better data

CONCLUSION:

Mobile source NO_x reductions are recommended to meet current air quality goals of reaching attainment of the 8-hour ozone NAAQS in the DC-MD-VA region. The following presents the proposed goals compared to the 2013 CLRP NO_x projections and existing MVEBs for the 85 ppb standard.



While the region is doing what is required to meet conformity requirements under the CAA, more is needed to attain the 8-hour ozone NAAQS in 2015 and possibly more stringent air quality standards in 2020. The mobile sector is the largest source of NO_x emissions. Additional reductions from the transportation sector that go beyond “adequate” conformity requirements should be explored.