Appendix G. Phase III WIP Air Deposition Strategy

Estimates from the 2010 Chesapeake Bay TMDL showed atmospheric deposition contributing approximately one third of nitrogen loads to the Chesapeake Bay. Reductions in atmospheric deposition of nitrogen have already been a major driver of reductions in nitrogen loadings to the bay. Programs to reduce NOx emissions—put in place to address acid rain and ground level ozone—have had substantial water quality impacts going back decades.

The pace of nitrogen reductions from air pollution sources has slowed in recent years. Many emission sources have been regulated to within current technological limitations and most areas are in attainment with national standards. To continue to make progress, and offset population growth (which comes with its own challenges), Bay jurisdictions should integrate water and air quality planning to systematically address the various interdependent environmental issues facing the state.

Concurrent with the Bay TMDL, Maryland's Phase I WIP included three air sector strategies which targeted NOx emissions from in-State sources. The most substantial of these, the Maryland Healthy Air Act, required additional NOx reductions from coal burning power plants. The estimated annual impact in total nitrogen loads to the bay was a reduction of 300,000 pounds. Maryland has built on that success.

The state continues to lead on air quality related issues including addressing climate change. With 3,100 miles of tidal shoreline, many of which include sensitive ecosystems, Maryland is disproportionally vulnerable to climate change. In response, the state has developed a framework to address the issues. Historically, credit for implementation of federal (national) programs has been the primary driver for water quality improvements from nitrogen deposition in the WIPs. Maryland believes that other state reduction programs, including programs that reduce nitrogen as a co-benefit (such as programs aimed at GHG reductions), should be credited as well. Many state-only air quality programs help the Chesapeake Bay Partnership make significant progress towards meeting Chesapeake Bay TMDL goals through reductions in the nitrogen deposition from NOx pollution.

Maryland is working hard to integrate air, water and land best management practices into state programs to better account for co-benefits. These actions will help the state protect resources, improve water quality, and continue to meet national air quality standards. Sharing the burden of program design, funding procurement and implementation will have significant cost savings for the state in the effort to restore the bay and improve air quality.

Appendix L of the 2010 Chesapeake Bay TMDL report established four steps to determine what nutrient reduction credit can be given to states for air emission controls. First, a state must establish whether a given air emission control is already included in its State Implementation Plans (SIPs). Credit may not be given to states for programs already in their SIPs. The last three steps involve modeling how emissions reductions should be translated into reductions of delivered load. A description of how Maryland performed this modeling is provided at the end of this section.

Listed below are eight strategies with the potential to reduce atmospheric deposition of nitrogen to the bay and its watershed. These strategies are preliminary, and reductions are not being applied to Maryland's WIP at this time. While bay restoration is not the primary driver for any of these efforts, the water quality benefit of successful implementation would be substantial. Of these strategies, only Air Strategy 1, Maryland's 2016 126 Petition to EPA, has a calculated nitrogen load reduction at this time. For this and for Air Strategy 6, Maryland will not claim reductions toward its WIP. As the petitions explain, the reductions should already be occurring based on power plants in upwind states operating their emissions controls in accordance with the Clean Air Act. As such, according to the Atmospheric Deposition crediting process established under the Chesapeake Bay TMDL, these reductions cannot be given as WIP credit for any particular state. Maryland is including them as narrative strategies in the WIP to highlight their potential impact as drivers of water quality improvement.

As part of the adaptive management strategy in the Phase III WIP, Maryland will look to expand this list and better estimate potential co-benefits, including a creditable reduction in nitrogen loads to tidal waters of the bay. Many of the practices that are used in each of these strategies will be the same as those used in the other listed strategies, so in quantifying the benefits, it will be important to avoid double-counting reductions.

Air Strategy 1: Maryland's 2016 126 Petition to EPA

Maryland petitioned EPA in 2016, pursuant to section 126(b) of the Clean Air Act, to abate emissions from 36 power plants in five upwind states that are not running their existing control equipment effectively on days that the controls are needed most for NOx reductions. In 2018, EPA denied this petition; however, Maryland is now seeking judicial review in the United States Court of Appeals for the D.C. Circuit. Maryland has estimated that the actions requested in the complaint would result in NOx emissions reductions of 38,700 tons per year, leading to nitrogen deposition reductions in the bay watershed of 3.4 million pounds per year, resulting in a total nitrogen reduction of 263,000 pounds per year to tidal waters of the bay (this includes delivered loads to the bay and nitrogen deposited on the bay surface). As this reduction is based on the correct application of federal Clean Air Act regulations, these reductions cannot be credited toward Maryland's WIP.

Air Strategy 2: Greenhouse Gas Reduction Act

In 2009, Maryland passed the Greenhouse Gas Reductions Act which calls for a 25% reduction in greenhouse gas emissions by 2020 from a 2006 baseline. In 2016, the Maryland general assembly passed an update to the law requiring a 40% reduction by 2030. Maryland is on target to exceed the 2020 emission reduction goal and is currently engaged in modeling for the 40 by 30 Plan. Potential programs to be part of the 2030 GGRA Plan include EmPower Maryland, CARES, RGGI, numerous transportation measures, enhanced forest and soil management initiatives, and land use development programs like smart growth. Several of the programs are described below. Preliminary results indicate that Maryland will meet 2030 goals. Meeting the goals of the 2030 GGRA Plan will have significant co-benefits for the bay.

Air Strategy 3: Regional Greenhouse Gas Initiative

The Regional Greenhouse Gas Initiative (RGGI) is a cooperative effort by Maryland and eight other eastern states to reduce CO2 emissions from the electricity generation sector. Maryland joined RGGI in 2007, and its participation is managed by MDE. Secretary Grumbles chairs the program. RGGI is a "cap and invest" program with a declining emissions cap (2.5% per year) until 2020, and another 30% from 2020 to 2030. Modeling indicated that Maryland EGUs coal consumption decreased by 39% from 2017 through 2031. The reduction efforts necessary to meet the cap will significantly reduce NOx emissions1. Many of the practices covered by the RGGI are the same as those used in the 40 by 30 Plan.

Air Strategy 4: Clean and Renewable Energy Standard (CARES)

The Clean and Renewable Energy Standard (CARES) is a strategy to reduce greenhouse gas emissions from electricity generation. The program requires that an increasingly large share of Maryland's electricity be generated by zero- and low-carbon resources. CARES would build upon the existing Renewable Portfolio Standard (RPS), and require that 100% of Maryland's electricity come from clean sources by 2040. CARES would draw upon a broad set of clean energy technologies to achieve Maryland's clean energy goals at lowest cost.

Air Strategy 5: Transportation Initiatives

To address mobile source emissions, Maryland participates in the Transportation Climate Initiative with the goal of developing the clean energy economy and reducing greenhouse gas emissions in the transportation sector. Maryland is a member of the multi-state zero-emission vehicle (ZEV) Task Force and has a goal of having 60,000 ZEVs on the road by 2020 and 300,000 ZEVs on the road by 2025. The Maryland Clean Cars Program, adopted in 2007, commits the state to follow California's Low Emission Vehicle Standards.

Air Strategy 6: Maryland's 2019 Petition to the Ozone Transport Commission

In May 2019, Maryland petitioned the Ozone Transport Commission (OTC) under Section 184c of the Clean Air Act (CAA) to make recommendations for additional NOx emission control requirements on several coal-fired energy generating units (EGU) in Pennsylvania. The coal fired EGUs significantly contribute to ozone formation in Maryland and other downwind states. The results of air dispersion modeling indicate that the coal fired EGUs in Pennsylvania with existing control equipment are not being operated in an optimal manner during the summer ozone season causing significant NOx impacts in Maryland. This analysis is very similar to the 126 petition analysis which indicated that significant nitrogen reductions would occur with optimization of EGUs upwind of the bay. As this reduction is based on the correct application of federal Clean Air Act regulations, these reductions cannot be credited toward Maryland's WIP.

Air Strategy 7: Maryland EmPOWER Energy Efficiency Program

Maryland EmPower charges electricity customers a monthly fee to fund programs designed to reduce energy consumption through energy efficiency and curb power sector emissions. Programs eligible for funding include lighting and appliance rebates for homeowners, energy efficiency services for industrial

facilities, home energy assessments, and various other types of incentives. This program was put in place in 2008.

Air Strategy 8: Volkswagen Clean Air Act Civil Settlement for Diesel Vehicles

On September 18, 2015, the EPA issued Notice of Violation of the Clean Air Act to Volkswagen alleging that their model year 2009-2015 diesel cars were equipped software that circumvents EPA emissions standards for NOx. Approximately 16,000 vehicles in the Maryland had "defeat devices" installed. The "defeat devices" increased vehicle emissions of NOx, resulting in adverse effects on air quality. In 2016, a Partial Consent Decree was issued establishing a trust of $2.925 billion to fully remediate the excess NOx emissions from the vehicles. Maryland is eligible for $75.7 to implement NOx mitigation projects.

On August 1, 2018, Maryland released its draft "Volkswagen Mitigation Plan" that focuses on reducing NOx emissions with the VW funds. Maryland is targeting high emitting sectors that are projected to grow through the next decade or longer. This will help Maryland make progress towards meeting air and water quality goals for many years to come.

A Simplified Method for Quantifying Nitrogen Loads from Air Deposition

Modeling ambient air quality impacts can be complex, usually requiring sophisticated dispersion models and extensive data inputs. Maryland uses computationally intense air quality models to examine dispersion, meteorology, and photochemical processes for SIP development and analysis. States and jurisdictions need a more basic tool to assess the air quality impacts of individual programs outside of SIP development, in particular when integrating air, water and land management co-benefits. The methods described below could provide planners with an alternative methodology for evaluating co-benefits of airborne NOx reduction programs when complex dispersion models are not available.

Local and regional NOx reductions result in reduced nitrogen deposition to the land and ultimately to the water. In the case of the Chesapeake Bay Watershed, atmospheric deposition contributes more than a third of all nitrogen loads to tidal waters. Maryland is developing methodologies to capture the co-benefits of existing air pollution reduction programs and quantify the benefits of future/additional programs to earn credit for their WIP III obligations.

Maryland's approach to evaluate water quality benefits from air quality improvement programs and initiatives uses the CMAQ and the Phase 6 watershed models3. Maryland uses CMAQ scenario outputs to calculate the magnitude of the change in nitrogen deposition by county due to specific programs and initiatives, and then uses Phase 6 land-use specific sensitivities and transport factors to quantify edge-of-tide nitrogen loads.

Our approach allows us to determine the spatial impact of a NOx reduction program within the bay watershed. The only input required is the change in NOx deposition occurring as a result of that program(s). The land-use specific sensitivities and transport factors can be aggregated to approximately determine edge-of-tide nitrogen loads. For example, if a program resulted in an annual NOx deposition reduction to the watershed of 100 pounds, it is estimated, based on transport and attenuation factors, that approximately 96% of the nitrogen is attenuated by the land and river transport and 4% enters the bay (between 2-5 pounds based on the location of the deposition reduction).

Maryland is putting effort into enhancing their analytical capabilities and using more sophisticated tools like CMAQ and Phase 6 to get more detailed estimates of nitrogen deposition from regional changes in NOx emissions and its impact on water quality.