NC Division of Air Quality

Ozone and Particulate Matter Advance Programs

Annual Report

FFY 2019-2020

October 2020

NORTH CAROLINA
Department of Environmental Quality

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Executive Summary

The North Carolina Division of Air Quality (NC DAQ) joined the U.S. Environmental Protection Agency's (EPA) Advance program in September 2017. The NC DAQ has proactively worked to reduced ozone precursors and particulate matter emissions for years. The NC DAQ Advance program leverages the NC Air Awareness program for staff and funding. The NC Air Awareness program is the Division's education and outreach effort that serves all 100 NC counties but focuses on areas previously designated non-attainment or counties that have specific air quality challenges.

The NC DAQ experienced several challenges in Federal Fiscal Year (FFY) 2019-2020 that impacted the EPA Advance program; they include changes to staff, funding, and the coronavirus (COVID) pandemic.

Over the last 20 years, emissions of ozone and PM2.5 precursors have continued to decline which has led to steady declines in ambient air concentrations for these pollutants. As a result, the entire state of North Carolina is currently in attainment for the ozone and PM2.5 standards. The statewide average ambient concentration for ozone[1] is 13% below the 2015 8-hr standard. The statewide average ambient concentration for PM2.5 is below the current NAAQS; 57% for the 24-hr standard and 36% for the annual standard.

While there were challenges to overcome in FFY 2019-2020, NC DAQ made progress on two Plans in the Path Forward. In PLAN 1-Phase 1 we successfully integrated the *It's Our Air* high school program into Mecklenburg County and in other key counties across the state. We were able to provide virtual teacher's workshops and curriculum for educators even in the face of the coronavirus pandemic. In addition, we successfully launched *Driving Choices* to Driver's Education classes, had tremendous outreach for Earth Month, and reached hundreds of people online with tips to improve air quality during Air Quality Awareness week. In Phase 2 of PLAN 1, NC DAQ began the Air Quality Learning Station (AQLS) project with Mecklenburg County Air Quality (MCAQ). The project has received funding, and technical expertise from NC Air Awareness staff. The AQLS is like EPA's Village Green project but will utilize newer sensors and instruments as well as connect with universities, libraries, the public-school system, and citizens who interact with it in person.

In PLAN 2 we were able to begin providing outreach to commuters focusing on reducing single occupancy travel to reduce air pollution. We worked closely with our local Air Awareness programs and Triangle J Council of Governments (TJCOG) to move more drivers into ride sharing opportunities in their areas. TJCOG helped us determine which partners to collaborate with to reach more drivers. In February 2020, a partnership was started with Share the Ride NC (STRNC) to promote their program and work began to best integrate their platform into our outreach efforts.

PLANS 3 and 4 have not yet begun. We originally anticipated starting them in January 2021 and have determined that starting in January 2022 is a more realistic time frame. The NC DAQ continues to work proactively through partnerships, community projects, and education to further reduce air pollution and maintain improvements already seen in many of our counties.

[1] Statewide ambient ozone average is based on the ozone design value calculated using the 4th highest certified ozone concentrations for 2017-2019 for all monitors across NC.

Introduction

The NC DAQ joined the EPA Advance program in September 2017 and has been proactive in successfully reducing ozone precursor and particulate matter emissions for years. The entire state of North Carolina is currently in attainment for ozone and PM2.5. It is critical over the next few years that ozone precursors and PM2.5 emissions continue to decline so that attainment can be maintained, and violations avoided should the NAAQS be revised in the future. It is NC DAQ's objective to continue to maintain the NAAQS for ozone and PM2.5 in perpetuity.

We also realize that regulatory actions in combination with voluntary actions are the best strategy for successfully reducing emissions. The NC Air Awareness program provides ways in which voluntary actions can result in improved air quality. Developing meaningful relationships with communities, organizations and governments will help strengthen the commitment to clean air, thereby protecting human health.

This report describes the status of the plans in NC DAQ's Path Forward and the challenges NC DAQ has faced in the last year.

Challenges

The NC DAQ experienced several challenges in FFY 2019-2020 that impact the EPA Advance program; they include changes to staff, funding, and the coronavirus pandemic.

In May 2019 NC DAQ NC Air Awareness staff experienced staffing changes, losing two temporary employees who were instrumental in providing education and outreach to the communities in NC. These staff were not replaced until the end of August 2019. The new staff were hired as temporary employees. In January 2020, one of the temporary staff was hired as a permanent employee. In April 2020, NC DAQ terminated the remaining temporary staff person because of funding constraints.

The NC Air Awareness program, including staff, is funded 80% by Congestion Mitigation and Air Quality Improvement (CMAQ) funds. The NC DAQ Advance program leverages the NC Air Awareness program for staff and funding. In October 2019 NC DAQ began requesting CMAQ funds authorization from the NC Department of Transportation (DOT) and continued this request until March 2020. In March 2020, the NC DOT informed the NC DAQ that no additional CMAQ funding would be available for the remainder of 2020. The NC DAQ will pursue future CMAQ funding for 2021 and future years and began drafting project plans in September 2020. Additionally, other funding streams, normally available to NC DAQ through fuel taxes and Motor Vehicle Emissions Inspection and Maintenance (I&M) Program fees, have been adversely impacted by the coronavirus pandemic.

On March 14, 2020, Governor Roy Cooper issued Executive Order 117 in response to the coronavirus (COVID) pandemic. In this order mass gatherings of more than 100 people were banned, including parades, fairs and festivals; and K-12 schools were closed statewide. On March 27, 2020, Governor Cooper issued Executive Order 121 which directed all NC citizens to stay at home and limited gatherings to 10 people or less. This order also included many business closings. The NC DAQ acted accordingly and implemented teleworking for staff. Since March, with the increase of COVID cases across the state, K-12 schools remained closed and NC DAQ employees continued to telework. In August 2020, schools began reopening on a limited basis, most however continue to offer distance learning or virtual

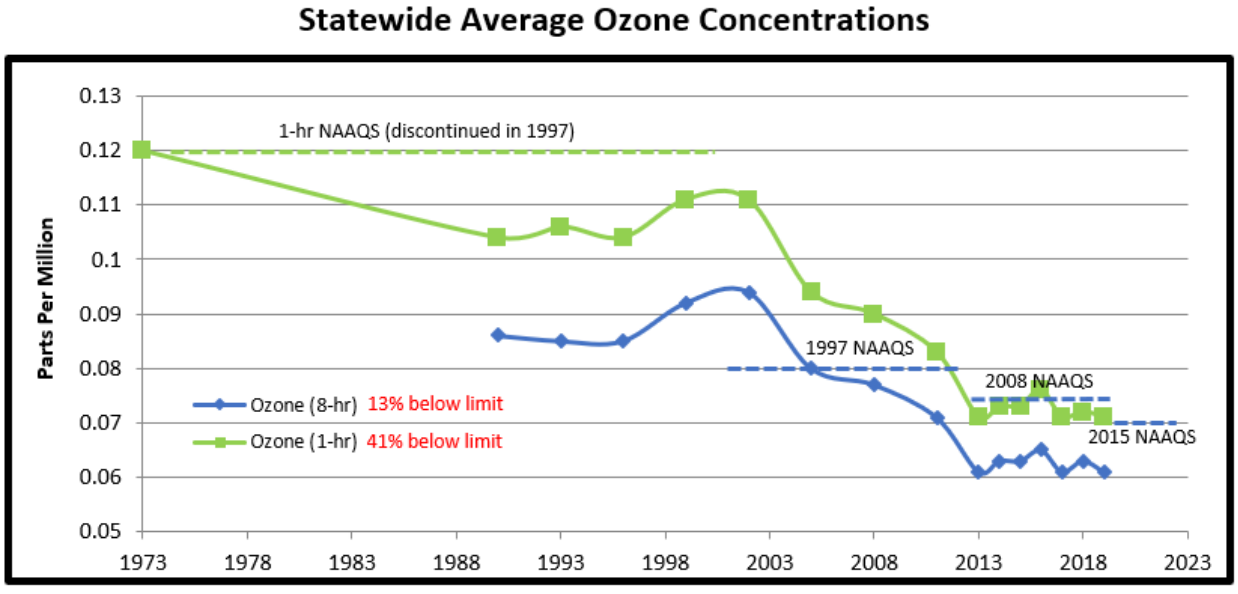
classroom instruction. The NC DAQ is still operating in a telework mode, which will continue until December 2020 at a minimum. This is an important change in the way in which the NC Air Awareness program operates. Many of the in-person events we attend and promote were cancelled and have not resumed. Regardless, NC DAQ continues to support the Advance goals as staff work remotely even though face-to-face meetings are most effective for our programs.

Update to Air Quality Trends and Emission Reductions in North Carolina

Ambient air concentrations of ozone and PM2.5 precursor emissions have been declining over time because of regulatory, legislative, and voluntary actions.

Ambient ozone concentrations have been monitored and reported in NC since 1973. The following figure shows that statewide ambient ozone concentrations have significantly declined over the past 20 years and NC has continued to demonstrate attainment with the current 2015 8-hour ozone NAAQS. EPA designated NC attainment of the standard on November 16, 2017. Based on an average of the design values calculated using certified ozone monitoring data for 2017-2019, NC's statewide average design value is 13% below the current 8-hour standard and over 40% below the former 1-hour NAAQS.

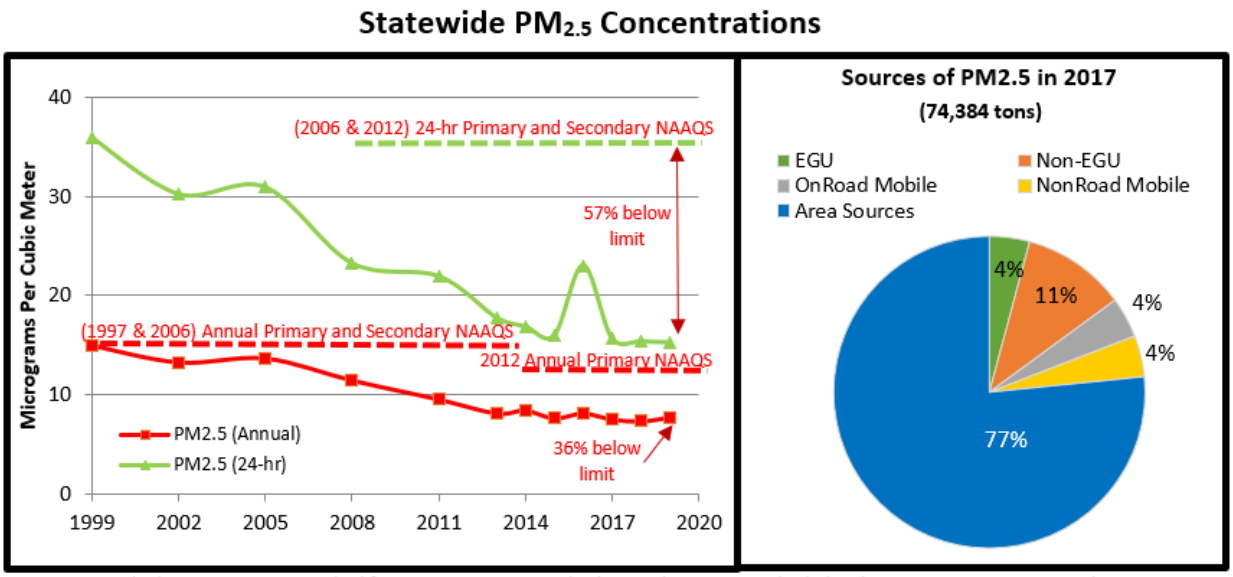
The Charlotte Metropolitan Area remains a focus area as monitors there have recorded exceedances of the 2015 8-hour ozone NAAQS in recent years (although the design value for the area is in attainment of the 2015 ozone NAAQS). The exceedance events have become increasingly localized rather than being widespread across multiple metropolitan areas and surrounding regions of the state as was historically the case. The NC DAQ continues to evaluate each event to determine how best to minimize or eliminate exceedances in the future and is coordinating the Mecklenburg County Air Quality (MCAQ) agency to leverage the Advance Program to help mitigate ozone exceedances in the area.



Source: Air Quality Trends in North Carolina 2020

Ambient PM2.5 concentrations have been monitored and reported in NC since 1999. The following figure shows the decline in ambient PM2.5 concentrations as compared to the associated NAAQS. This figure also shows that statewide the average ambient concentration for PM2.5 is below the current NAAQS. Based on an average of the design values calculated using certified monitoring data for

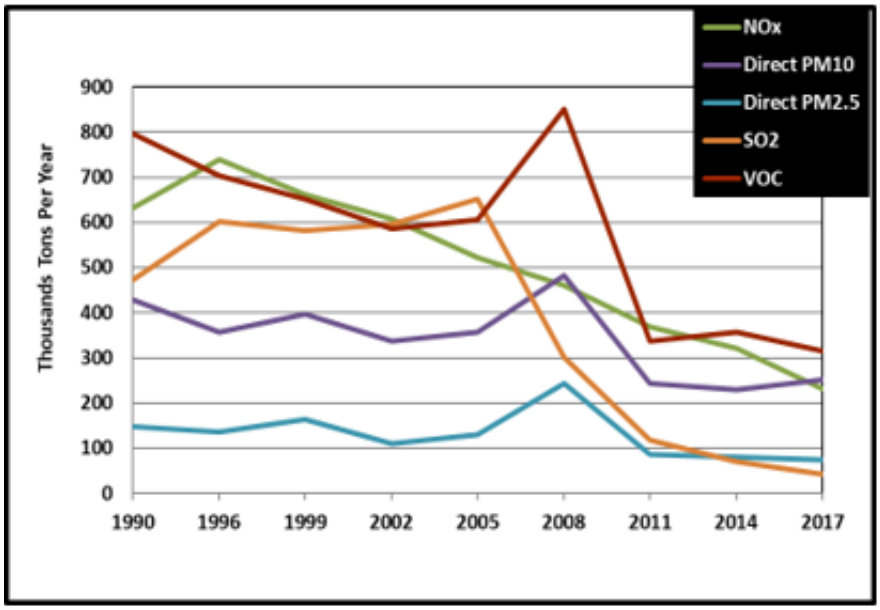
regulatory monitors for 2017-2019, NC's statewide average design value is 57% below the PM2.5 24-hour standard and 36% below the PM2.5 annual standard.



Note: To provide the most accurate method for comparing monitored values to the $PM_{2.5}$ standard, the above $PM_{2.5}$ concentration values reflect only data from regulatory monitors.

Source: Air Quality Trends in North Carolina 2020

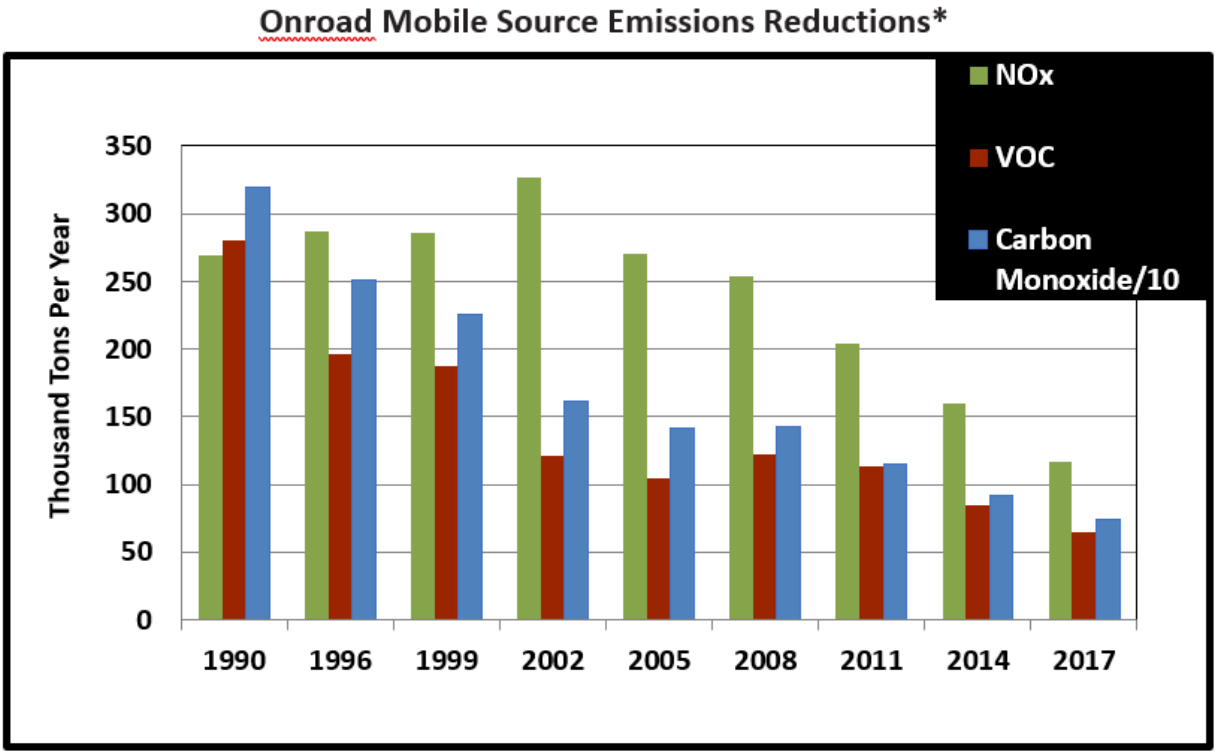
State-wide ozone precursors and PM2.5 emissions have been declining over time in NC because of regulatory and legislative actions. The following chart shows statewide emissions data from the EPA National Emission Inventory from 1990-2017. Note: The spike in VOC emissions in 2008 is a result of an extreme fire event that occurred in NC during the months of July and August.



Source: Air Quality Trends in North Carolina 2020

Transportation is the biggest contributor to ozone precursor emissions in NC; however, emissions

associated with everyday operation of passenger vehicles and trucks have also declined significantly. The decline in on-road emissions is associated with several on-the-books national rules that have been phased in over time, starting with the federal Tier 1 emissions standards from 1994-1999, national low-emissions vehicle standards from 1999-2003, Tier 2 emissions standards from 2004-2010 and heavy-duty vehicle standards from 2007-2010. Further reductions are expected to occur in the future under the Tier 3 vehicle emissions and fuel standards from 2017-2025. As a result of these standards, North Carolina's vehicle fleet has become cleaner as newer low-emitting vehicles replace older higher-emitting vehicles, and the emissions controls on the vehicles are more technologically advanced - thus lasting longer and less prone to malfunctions or failures.



** The NOx emissions spike in 2002 is attributed to EPA adjusting the onroad emissions model.*
*** CO emissions represented in this chart were divided by a factor of 10 for comparability purposes.*

Source: Air Quality Trends in North Carolina 2020

Local Air Quality Partners

In August 2017, the MCAQ agency joined the EPA Advance program with the support of NC DAQ. We continue to support the efforts in MCAQ by partnering with them on a variety of projects. We were able to financially support the Local Air Awareness coordinator until June 2020. We are also technically and financially supporting the planning, construction, and deployment of an AQLS until March 2020; and we continue to support this effort with our technical expertise. The AQLS unveiling has been delayed due to construction delays because of COVID and funding.

NC DAQ also partners with the Forsyth County Office of Environmental Assistance and Protection (Forsyth County). We were able to financially support a Local Air Awareness coordinator in Forsyth

County until June 2020. We continue our partnership with Forsyth County regarding K-12 education collaborations.

Future funding for these key "boots on the ground" coordinators will be sought in 2021 with CMAQ funding proposals.

NC Air Awareness

The NC Air Awareness program began in 2008. The purpose of the NC Air Awareness program is to advocate for voluntary actions which aid in relieving traffic congestion, reducing tailpipe emissions (e.g. by reducing idling, increasing ride sharing and Driver's education programs), achieving and maintaining the NAAQS. The NC Air Awareness program also uses ambient monitoring information to inform the public about air quality across the state. NC Air Awareness maintains projects and partnerships which aim to reduce transportation-related emissions through education, community outreach and partnerships statewide. The primary goals of the NC Air Awareness program are to: 1) inform and provide information about air quality issues, 2) provide tools to educators about air quality and health topics, and 3) empower citizens to take actions now and in the future to reduce air pollution and congestion.

Update - The Path Forward

The continuing challenge for the state is maintaining the NAAQS in key areas should the standards become more stringent over time. Also, more robust strategies for PM2.5 emission reductions for diesel vehicles is desired, while continuing to reduce NOx emissions from cars and trucks. NC DAQ foresees that new strategies for reducing air emissions voluntarily will be preferred over regulatory options. To implement these strategies, we leverage the NC Air Awareness program because the new projects and established partnerships align well with the goals of the Advance program.

The projects described below include plans to leverage the Advance program in key areas and network with partners in those areas. We find that working regionally or locally achieves more significant emission reductions than working statewide because of the ongoing relationship with key partners. Specifically, we will work in regions that are currently in attainment for the ozone[2] and PM2.5[3] NAAQS; starting first with those areas in the greater Charlotte area where ozone levels are closest to the standard. These plans range from PLAN 1, which can be implemented quickly without significant staffing resources or funding, to PLAN 4 that will require creating new partners using new technology and may also require additional funding.

PLAN 1 – WORKING WITH LOCAL AIR POLLUTION CONTROL AGENCIES + PARTNERS

Overview: In this plan we will build on our relationship with existing local partners like MCAQ, Forsyth County, and possibly the Buncombe County air control agencies, as well as Sustainable Sandhills (Cumberland Co.).

Phase 1 – describes promoting a combined project (like It's Our Air) within key counties such as Mecklenburg, Forsyth, Buncombe, and Cumberland.

[2] https://files.nc.gov/ncdeq/Air%20Quality/planning/attainment/mapping/NC_Designation_O3.pdf
[3] https://files.nc.gov/ncdeq/Air%20Quality/planning/attainment/mapping/NC_Designation_PM_25.pdf

Phase 2 – describes encouraging our existing partners to pursue a project of their own that best matches their goals and interests. The role of NC DAQ would be as a technical advisor and collaborator. Either phase could use current and future NC Air Awareness funding.

Status and Update for Plan 1:

Phase 1

The *It's Our Air* high school curriculum was expanded into Mecklenburg and Forsyth counties in 2019-2020. We provided in-person teacher workshops in the Charlotte area in January 2020. Across the state we provided three full day workshops, with 33 attendees, and seven part-day workshops with 154 attendees. In March 2020, we quickly pivoted and created an online version of our in-person teacher workshop to address the needs of teachers during COVID stay-at-home orders. Key staff from our partners in Mecklenburg and Forsyth counties participated in the both types of workshops. To date 17 teachers have participated in the online workshops, and 20 more are in process. We expect that this effort will continue in 2020-2021 due to the increase in online learning.

The Driving Choices part of the *It's Our Air* curriculum was presented to 20 driver's education high school classes at 5 different high schools in FFY 2019-2020. All the high schools are in the Raleigh area. In these presentations we discussed driving choices, good driving habits, car maintenance, and environmental impacts of cars and trucks on air quality with high school driver's education classes. We showcase the fuel economy website[4] to show students the differences in vehicles and how what they choose can make a difference in air quality. We also show them how to calculate their miles per gallon of fuel consumed as a good rule of thumb for car maintenance. We have also established a partnership with key staff at the NC Department of Instruction and Jordan Driving school, who will be instrumental in (1) getting the relationship between cars and air quality inserted into the NC state-wide driver's education curriculum, and (2) distributing our messages, presentations, and virtual presence state-wide over the next few years.

Regional partnerships are vital to the NC DAQ's success. The Asheville Regional Office Air Awareness program has been working closely with the Land of Sky Regional Council of Governments for over twenty years. The Clean Air Campaign is the education and outreach component of the Land of Sky Clean Vehicles Coalition. The Clean Air Campaign brings together business, agencies, and non-profits to coordinate efforts in education and outreach about clean air.

The NC DAQ provides resources and materials, helps in planning, and supports the regional activities, which allows us to provide air quality education at multiple events. For instance, on the Saturday after Earth Day in 2019, we had: educational booths at the Mountain Science Festival, two different community events, the Mother Earth News Fair, and supported the Blue Ridge Electric Vehicle Club on one of their spring Try and Drive events. Diverse partners are also a part of the Annual Air Quality Update Press Conference. The press conference combines regulatory updates with industry updates about how to keep the air clean specifically for citizens in and around the Asheville, NC area.

[4] Collaboration between the Department of Energy's Energy Efficiency and Renewable Energy Office and the EPA Office of Transportation and Air Quality. https://www.fueleconomy.gov/feg/Find.do?action=sbsSelect

We successfully collaborated with our partners in Mecklenburg and Forsyth counties during Earth Month and Air Quality Awareness week. Given that COVID interrupted all our in-person events we quickly pivoted our outreach to online sources.

During Earth Month we posted on our blog, FaceBook site and Twitter feeds about the history of Earth Day, the history of the NC DAQ, the NC Air Awareness program, AQ-IQ videos, Helpful Tips, and much more. All our posts and tweets were reshared by our partners for the whole month of April. We, in-kind, reshared all the information provided by our partners. We shared our posts with sister agencies in southeastern states and with the Association of Air Pollution Control Agencies (AAPCA).

For Air Quality Awareness week, we posted several times a day, with videos, about: wildfires and illegal burning; asthma and your health; air quality forecasting; sources of air pollution and trends in NC; new distance learning resources. We mostly follow the EPA topics, with a NC twist. We also collaborated with Mecklenburg and Forsyth counties for information distribution during this week. In addition to sharing information about these topics, our online efforts focus on practical, and actionable, things citizens can do to reduce air pollution and protect their health.

Phase 2

As described in the Local Partners section, NC DAQ began the AQLS project with MCAQ. The project has received funding, and technical expertise from NC Air Awareness staff. This project is a pilot and we hope to build more AQLS across NC in the future.

The AQLS is to be an interactive learning hub where citizen's and student groups can learn about the air quality in their area. It is like the EPA Village Green projects across the country. It is designed to be a free-standing, publicly-accessible structure with both ozone and particulate matter sensors. It will also be equipped with weather sensors and communications systems. It will be inviting and visually appealing in order to encourage engagement. The station will provide a controlled environment for accurate, precise, and interesting citizen science projects. The station software also provides data interpretation and analysis capability and can give the public information on the differences between personal sensors and traditional regulatory monitors. The robust project team includes MCAQ employee(s), NC DAQ employee(s), local university researcher(s) and students, a citizen science representative, and a local school representative.

The AQLS will be installed at First Ward Park in Charlotte, North Carolina. This site was chosen to increase public engagement due to high foot traffic, wide visibility, and being within walking distance to multiple educational and child-development centers.

The AQLS is packaged into a small cabinet sensor suite known as an Airpointer. This suite will monitor for ozone and PM 2.5 using scientific-quality sensors. Both MCAQ and NC DAQ are most interested in ozone and PM2.5, as these are the two pollutants of most concern in the Charlotte region. However, the Airpointer system is modular, so there is room for addition of a third sensor (e.g. CO2) in the future for other pollutants. The modular design was critical for our team to help proof future projects and provide flexibility. To ensure the highest-quality data, a federal equivalent method (FEM) and near-FEM quality air pollution sensors will be included.

The sensors are a MetOne E-BAM continuous beta-attenuation mass monitor for PM2.5 and a Teledyne T400 single-pass UV absorption analyzer for ozone. Electricity for the system will be offset by using a

Smartflower solar system; a flower-shaped series of solar panels that track the sun's position in the sky through the day. This provides an emissions-free power source while also being an attractive way to grab the public's attention.

Presently, construction is partially complete. Given the impacts of COVID and funding, construction has been delayed considerably. Installation of the sensors is anticipated for early October 2020. The AQLS project has already convened a learning team which will continue to work with local partners, K-12 schools, libraries, and local universities to maximize usage of the instruments for outreach and scientific study. The team continues to meet, discussing ways in which to promote and include new partners.

Plan 2 - Working with Council of Governments (COGs): Ride Sharing / Alternative Commuting Programs

There are 16 COGs in North Carolina. Several of these organizations have worked with NC Air Awareness in the past. Plan 2 focuses on reaching out to key COGs like the TJCOG, Piedmont Triad Regional Council (Piedmont Triad), Centralina Regional Council (Centralina), and Land of Sky Regional Council (Land of Sky) to re-establish working relationships and give local government entities an opportunity to be involved in voluntary actions to improve their community and the regional air quality. In coordination with NC DAQ, the COGs would select commuter-based projects that they may be involved in currently or are interested in executing in the future. We envision NC DAQ could provide some level of funding[5] for this Plan; funding would support the purchase of marketing material and / or purchase of a commuting platform that the COGs would then promote. Many COGs already have robust Transportation Demand workgroups and planning groups that work on congestion and traffic issues. COGs would be ultimately responsible for marketing, staffing, disseminating and collecting data, providing feedback on project success, and submitting an annual report for their COG. NC DAQ would collect the various annual activity reports to combine them into the Advance report.

Status and Update for Plan 2:

In early 2020, NC DAQ began interacting with TJCOG about providing outreach to commuters and how to best get more single occupancy vehicles into ride share. We met several times to discuss collaboration opportunities with partners in the area. For example, we met with organizers of STRNC (partially funded by TJCOG) to discuss how to integrate their program that into our outreach efforts.

STRNC is a statewide program that has created a website to help form carpools and vanpools. Access to the website is provided free of charge in support of the effort to improve air quality and reduce single occupancy vehicles (SOV). Funding is secured by the NC DOT, Charlotte Area Transit System (CATS), GoTriangle, Land of Sky, Piedmont Authority for Regional Transportation (PART), and Go Coast.[6] Funds are used to support the website and make updates and to provide gift cards for people using alternative transportation. The gift card amounts are based upon the amount of vehicle miles avoided and are input by the user.

In our initial meetings with STRNC we listened to proposed updates to their system, making it more compatible with mobile phones and like technology and discussed ways in which we could possibly fund

[5] NC DAQ funding for this project is contingent upon continuation of CMAQ funding.
[6] Share the Ride NC
https://www.sharetheridenc.org/Public/PublicPage.aspx?ItemName=AboutRTA&FileType=HTML

some of the incentives that they provide. Using their research and analysis from TJCOG, we determined that the best reward for choosing alternative transportation over SOV was a monetary incentive (instead of prizes, trips, or other promotional items). We would offer 10 cents per mile for new commuters and 5 cents per mile for exiting commuters who increased their alternative modes of transportation by 10 percent over the time of the pilot. While STRNC is used the most in the Raleigh-Durham, NC area; we hope to conduct a pilot in the Winston-Salem/Greensboro area.

This project is currently at a standstill due to COVID and funding constraints.

Plan 3 – Forming New Partnerships: University Transportation Initiatives

Plan three would differ from Plans 1 and 2 with regard to established relationships and would focus on new partnerships. This project would take longer to get off the ground than Plans 1 and 2. It is dependent on finding university partners willing to participate in the Advance program. Many universities have sustainability projects and energy efficiency projects on their campus that will realize emission reductions. Projects to reduce energy usage have been used in other states as part of Advance. This phase would need to include a research and learning phase to access what is currently happening on campuses and what types of projects could be included. The initial phase would focus on education and outreach which would share information about transportation options that would reduce air pollution from mobile sources.

Initially, we would build or tap into an existing stakeholder group of university transportation leaders or sustainability leaders. We would focus on communicating to faculty, staff and community members near the universities. The project emphasis includes working with staff and faculty to promote commuting alternatives and idle reduction campaigns on campus. We envision partnering with student organizations, such as Net Impact[7], and other sustainability focused groups to launch a grassroots social marketing campaign focused on driving less, alternative commuting or idle reduction (projects may vary depending on campus partner's interests). Further marketing through "TED" talks hosted by staff, faculty and students would broaden the reach of NC Air Awareness messages. Talks would focus on the experiences of commuters using alternative transportation, ride sharing, etc. and would be used to both share information about the topics but also encourage positive behavior change. The project could also include using a commuter platform with NC DAQ funding[8], as described in Plan 2. University employees could compete against each other or other universities in competitions with the goal of reducing harmful emissions.

Status and Update for Plan 3:

This project is not started. In the Path Forward we anticipated starting this project in January 2021. Given the impacts of COVID on universities in NC and that many of them have sent students home, we do not anticipate that this project will start until 2022. Initiating this project is also dependent upon staffing and funding resources.

Plan 4 - Forming New Partnerships: University Sustainability Initiatives

Plan four continues to utilize existing relationships developed in Plan 3 by building or tapping into an existing stakeholder group of university sustainability leaders that coordinate green building projects,

[7] Net Impact https://www.netimpact.org/

[8] NC DAQ funding for this project is contingent upon continuation of CMAQ funding.

energy efficiency projects, or other projects that have a positive impact on air quality. We would likely contact Georgia Tech and Fayetteville State University partners who already submitted their plans as part of Advance projects for guidance. The stakeholder group would then put forward projects to include in a portfolio of projects to submit under the Advance program. NC DAQ would coordinate the annual Advance report based on reports provided by university partners. We would work with select universities in the UNC system (such as NC State, UNC-Charlotte, UNC-Greensboro or Winston-Salem State) that are interested in participating.

Status and Update for Plan 4:

This project is not started. In the Path Forward we anticipated starting this project in January 2021. Given the impacts of COVID on universities in NC and that many of them have sent students home, we do not anticipate that this project will start until 2022. Initiating this project is also dependent upon staffing and funding resources.

Updated Projected Timeline