2023 Climate Strategy Report

North Carolina Department of Transportation (NCDOT)

Submitted October 1, 2023; Covers July 1, 2022 – June 30, 2023

Introduction

About the North Carolina Department of Transportation (NCDOT)

NCDOT's multi-faceted mission is to *"connect people, products, and places safely and efficiently with customer focus, accountability and environmental sensitivity to enhance the economy and vitality of North Carolina*." Transportation is the backbone of North Carolina's economy, connecting manufacturers with supply chains, consumers with products and tourism, and people with their workplaces, homes, and communities across urban, suburban, and rural landscapes. NCDOT is responsible for the second highest number of state-owned highway miles in the country. The state contributes financial support to elements of non-highway improvements which can integrate resilience into transportation planning and measure resilience related outcomes across multiple modes.

NCDOT's Vulnerabilities to Climate Change

High impact weather events and natural hazards disrupt the safety and reliability of North Carolina's multimodal transportation network. These weather events also stress resources needed to keep pace with the costs of infrastructure damage inflicted by intense and frequent storm and flood events. The main hazard types found in North Carolina include meteorological (temperature, fog, precipitation, storms, hurricane, tornado, severe wind), climatological (drought, wildfire, sea level rise), hydrological (coastal storm/flood, inland flood, storm surge, saltwater intrusion, riverine flood) and geological (landslide, rockslides/mudslides, sinkholes).

NCDOT's Approach to Fulfilling the Strategies in the Climate Risk Assessment and Resilience Plan

NCDOT is constantly implementing the strategies identified in the Climate Risk Assessment and Resilience Plan. Following the adoption of its resilience policy in September 2021, the agency worked to enhance resilience in all day-to-day organizational activities and deployed a coordinated approach to manage risk to business operations. The enactment of this policy helped NCDOT manage risks from natural and man-made hazards and strengthen the transportation system's overall resilience and ability to maintain a safe, reliable, and efficient transportation infrastructure. This policy supports the agency's alignment with the U.S. Department of Transportation (USDOT) Climate Action Plan. In addition, NCDOT is exploring opportunities available through the Infrastructure Investment and Jobs Act (IIJA), also known as Bipartisan Infrastructure Law (BIL) and the Promoting Resilient Operations for Transformative, Efficient, and Cost-saving Transportation Program (PROTECT) Program (formula and discretionary grants), to pursue resilience efforts to reduce system vulnerabilities from climate change. The department's resilience policy and IIJA opportunities have aided NCDOT in incorporating and achieving new actions and strategies related to climate change resilience. In addition, the agency is consistently evaluating and testing our Flood Warning System (Transportation Surge Analysis Predictive Program (T-

SAPP), BridgeWatch and Flood Inundation Alert Network for Transportation (FIMAN-T)) in preparation for extreme weather events and associated training.

As part of these initiatives, NCDOT is currently working on the development of the statewide Resilience Improvement Plan (RIP) to identify areas of concern due to exposure to natural threats (in particular flooding) and develop a criticality map to identify the criticality of its highway network. The plan will be aligned with existing state, regional and local plans such as the State Hazard Mitigation Plan.

Recently, three NCDOT projects received the regional 2023 America's Transportation Awards. The Southern Association of State Highway Transportation Officials (SASHTO) chose this year's regional winners from a pool of 19 projects nominated by nine states in the region. NCDOT submitted one project for each of the three contest groups and size categories, and all three won – the Rodanthe "Jug Handle" Bridge project (Operations Excellence, medium-sized project); the advanced flood-warning system for transportation (Best Use of Technology & Innovation, small category) and the East End Connector, I-885 project (Quality of Life/Community Development, large category).

Reducing Energy Use

NCDOT and the North Carolina State Port Authority (NCSPA) occupy 2,164 buildings totaling 9,500,271 gross square feet. Fiscal Year (FY) 2022 utility costs for those buildings totaled $11,411,289, and energy consumption per square foot is 29% less than during the baseline FY 2004 and a 5% improvement from FY 21. At the conclusion of FY 2022, energy savings programs have resulted in a total energy cost avoidance of $34,681,106 and a water cost avoidance of $14,029,206 - totaling $48,710,312 over the last 18 years. By the end of FY 22, cost savings measures have reduced energy and water usage per square foot in NCDOT facilities by 34% and 6% respectively, as measured from the baseline fiscal year of 2004. NCDOT estimates this trend continued through 2023 and estimates to see another 2% reduction in energy consumption resulting in a total 36% reduction in energy usage / square foot.

Addressing Environmental Injustices and Inequities

In 2022, Deputy Secretary Ebony Pittman was appointed as the environmental justice (EJ) lead for NCDOT. An environmental justice policy advisor role was created and filled, by recommendation of the Andrea Harris Equity Task Force in response to the USDOT Justice40 initiative and the USDOT Equity Action Plan, to develop and implement an environmental justice strategy within the agency. In addition, The Integrated Mobility Division (IMD) developed and released an Environmental Justice and Transportation Disadvantage tool and training session. This equity tool is currently being used for project prioritization and has also been used recently to aid in distribution of funding, and further tools are being developed. NCDOT's Research and Development team has increased emphasis on research projects investigating equity and environmental justice concerns. There are several ongoing research projects addressing the Department's history and future with environmental and racial justice.

Public Participation Plan

As a part of Executive Order 246 (EO 246), Section 8, each Cabinet agency "shall develop an agency public participation plan informed by stakeholder input. The plan shall include best practices for community engagement, meaningful dialogue, and efficient mechanisms to receive and incorporate public input into agency decision-making."

NCDOT released its agency plan, known as the Statewide Public Involvement Plan, back in 2020. As a result of EO 246, the department updated the plan to strengthen language around Environmental Justice (EJ) and Limited English Proficiency (LEP) engagement and updates were released for public review in early June 2022. The plan and link to the survey were posted on the department's website under the following link: Statewide Public Involvement Plan Survey.

Over the last 20 years, NCDOT has provided fair, accessible, and meaningful opportunities for all interested and affected parties to engage in its outreach efforts. To increase this outreach, the Statewide Public Improvement Plan recommends that individual Public Improvement Plans be developed for every plan and project.

As part of the process for developing a Public Involvement Plan, once a project-specific or a plan area study has been proposed, the NCDOT's Community Studies team develops a Demographic Study Area (DSA) that encompasses all residential areas near the project. The Demographic Snapshot Tool is used to pull Block Group level data on minorities, race, ethnicity, low income, zero car households, under 18 and over 65, disabled persons, and adults who speak English less than very well. If needed, Block Group level data can also be filtered by race and disability status. Language is determined using Tract level data. These DSA Block Groups are compared with the county average for EJ and Title VI populations. Language groups are noted for each Block Group with a "less than very well" population, with LEP thresholds determined by the DSA total.

In addition to Census data, EJ and LEP populations are further assessed through site visits, satellite image review and consultations with the Local Area Resource Contacts (LARCs). These practices can identify concentrations too small to stand out at the Block Group level – affordable housing complexes, independent living facilities, disabled group homes, ethnic enclaves – as well as help locate important resources, such as religious facilities, cultural centers, ethnic goods and services, etc.

These data are provided to the Public Involvement team and project managers to aid in developing public involvement plans. A Public Involvement Practitioners (PIP) Guide was published as a resource to project teams to provide better community and public engagement in project decisions. When working with underserved communities, a best practice is to identify and reach out to a LARC. This includes a local/community leader (i.e., reverend/pastor/priest/rabbi/imam, business owner, community activist, city/county commissioner, etc.). Local/community leaders can aid in organizing small group meetings, door-to-door community outreach efforts, disseminate information, and gathering input. This helps to bring trust into the process because of the LARC's relationship with the community.

The NCDOT Statewide PIP serves as a critical framework for enhancing community engagement, meaningful dialogue, and transparent decision-making in our operations. It ensures that our agency effectively incorporates stakeholder input and fosters relationships with all members of the public, including underserved communities and populations with limited English proficiency.

This year, NCDOT has thoroughly reviewed the plan in light of any changes at the legislative, regulatory, or policy levels, both at the state and federal levels, that might necessitate updates. As a result, it was assessed that there have been no substantial modifications or amendments to legislation, regulations, or transportation bills that directly impact the NCDOT Statewide PIP. Hence, the plan remains aligned with the relevant guidelines and objectives set forth by Executive Order (EO) 246.

In line with the requirement to update and publish the plan annually, NCDOT acknowledge their commitment to maintaining its relevancy and effectiveness. While this year did not warrant significant changes, the agency remains vigilant in the commitment to transparent, inclusive, and effective public engagement, and will continue to review and update the plan as needed in the future.

NCDOT believes that its ongoing efforts in community engagement and our dedication to transparency reflect our commitment to the principles outlined in EO 246. NCDOT remains fully prepared to adapt the plan whenever circumstances necessitate and are committed to ensuring that our stakeholders have ample opportunities to participate in the decision-making processes related to our agency's plans, projects, studies, and actions.

1.0. Reduce greenhouse gas emissions

1.1 Reduce energy consumption per square foot in state-owned buildings by at least 40% from fiscal year 2002-2003 levels

1.1.1 Establish energy savings programs

Status: Ongoing
Expected Completion Date: Ongoing

NCDOT has established energy savings programs to reduce the energy consumption in NCDOT and NCSPA occupied buildings. By the end of FY 22, these programs have accomplished a reduction in energy usage per square foot in NCDOT facilities by 36% and 9% respectively, as measured from the baseline fiscal year of 2003-04. Some of these initiatives include monitoring and support of two guaranteed energy saving performance contracts projects in Raleigh (five of NCDOT's largest buildings) and across the state (roadway lighting and building lighting upgrades).

Within the next 12 months, the agency will finalize collecting utility data collection to update energy consumption between July 1, 2022-June 30, 2023. However, based upon the trend in prior percent change in energy consumption / square foot for DOT buildings - not including

North Carolina State Port Authority (NCSPA) buildings - from the baseline year, it is estimated that the agency may see another 2% reduction in energy consumption resulting in a total 36% reduction in energy usage / square foot.

NCDOT will continue to implement these programs to continue reducing energy consumption and costs in their buildings.

1.1.2 Implement Energy Conservation Measures (ECMs) in all new building and repair and renovation projects

Status: Ongoing
Expected Completion Date: Ongoing

NCDOT is implementing ECMs in new or renovated NCDOT buildings as per the 2018 NC State Building Code: Energy Conservation. NCDOT also specifies in plans other ECMs that a project's budget can support, and which do not add to the user's workload or require extensive maintenance to repair.

Within the next 12 months, the agency will continue to implement these efforts.

1.1.3 Improve the electrical infrastructure across NC supporting the Roadway Lighting Project

Status: Ongoing
Expected Completion Date: Ongoing

A roadway lighting policy was developed by the end of 2020. In response to this policy, NCDOT is planning multiple projects to improve the electrical infrastructure across NC to support energy efficient roadway lighting for interchanges and along roadways. NCDOT completed six lighting designs over the past 12 months.

Within the next 12 months, the agency will complete another seven lighting design projects that have been currently approved.

1.1.4 Upgrade, replace, and repair existing HVAC equipment to improve energy savings

Status: Ongoing
Expected Completion Date: Ongoing

NCDOT is planning multiple projects to improve existing HVAC equipment to increase energy savings. Some of these efforts include:

- Replacing chillers and split systems.
- Installing more energy efficient roofs as they are repaired or replaced (many NCDOT buildings are over 40 years old).
- Replacing /upgrading existing windows with more energy efficient models.
- Programmable thermostats, building automation and monitoring systems as appropriate and affordable.
- Lighting upgrades.

Some of the particular efforts include a new chiller and windows in the Transportation Building at 1 S. Wilmington Street. It is the agency's preference to install or upgrade to

programmable thermostats for building unless a life-cycle-cost analysis shows that installing a centralized HVAC control system is cost effective. The goal is to avoid installing a HVAC control system that adds to time and expense of maintaining those systems nor connecting to existing remote NCDOT monitoring and control systems given the time and expense of obtaining approval by NC Department of Information Technology (NCDIT).

Within the next 12 months, the agency will continue to implement these efforts.

1.1.5 Performing energy audits to identify Energy Conservation Measures (ECMs)

Status: Ongoing
Expected Completion Date: Ongoing

NCDOT is performing energy audits to identify ECMs that can generate enough cost savings that can pay for the cost of work within 2 to 3 years – sometimes in less than one year. An audit was completed for the Transportation Building during the last fiscal year, but the agency will continue to identify other facilities where energy audits will be cost effective.

Within the next 12 months, the agency will continue to implement these efforts.

1.1.6 Implementation of sustainable construction materials

Status: Ongoing
Expected Completion Date: Ongoing

NCDOT is currently implementing more sustainable paving materials that reduce emissions. Warm Mix Asphalt (WMA) technology reduces energy consumption due to the use of an additive that reduces the temperatures at which asphalt mixes are produced and placed. This means less fuel required at the production plant to heat the aggregates to the traditional hot mix asphalt (HMA) temperatures. With the decreased production temperature comes the additional benefit of reduced emissions at the plant and during lay down.

During the next 12 months, NCDOT will continue implementing the use of WMA where feasible.

1.1.7 Use energy rebates funded by utility companies

Status: Ongoing
Expected Completion Date: Ongoing

NCDOT is planning to use energy rebates funded by utility companies to offset the cost of new construction and repair and renovation work. Note that NCDOT has used utility rebates in the past to reduce project costs.

Some rebate funds were used to pay for improvement to roadway lighting infrastructure work and reduce project costs. Additional rebates received from new or renovated buildings will be used to support ECMs as identified.

Within the next 12 months, the agency will begin to implement these efforts.

1.1.8 Identify and support efforts to obtain funding for Energy Conservation Measures (ECMs)

Status: Ongoing
Expected Completion Date: Ongoing

NCDOT is continuously working on identifying funding to support energy conservation measures.

NCDOT will work with the Department of Environmental Quality (DEQ) and others to identify funding over the next fiscal year for ECM projects – particularly those that involve improving, replacing, or retro-commissioning HVAC controls – in particular, a setback schedule to reduce cooling / heating loads when building are not occupied. Funding from the Volkswagen (VW) Settlement has been earmarked for the construction and installation of Zero Emission Vehicles (ZEV) recharging stations at the Transportation Building, Mann's Harbor, and in Division 14.

Within the next 12, months the agency will continue to implement these efforts.

1.1.9 Complete programming changes in System Application Programs (SAP) to the invoice payment system

Status: Complete
Completion Date: November 2022

NCDOT worked on completing programming changes in SAP to the invoice payment system to make better leverage existing utility bill payment data to generate reports to track energy usage across the state, county, highway division, and down to individual buildings.

Existing utility use and cost entry screens were updated along with changes identified to improve the consistency of units recorded. However, NCDOT expects to modify existing reports to improve their usefulness and correct any errors identified, and to create new reports as the need arises to support energy audits, retro commissioning, and tracking before and after savings and usage for new construction and renovation projects.

This work will greatly help identify energy reduction opportunities and monitor the effectiveness and savings of installed ECMs.

1.2 Support the use and expansion of energy efficient and clean energy resources

This section is also covered in multiple other sections/actions throughout the report.

1.3 Increase the number of registered Zero Emission Vehicles (ZEV) to at least 1,250,000 by 2030 so that 50% of in-state sales of new vehicles are zero-emission by 2030

1.3.1 Publish a progress update to the 2019 ZEV Plan

Status: Completed
Completion Date: August 2022

As part of Executive Order 80 (EO80), NCDOT published the NC ZEV Plan Version 1.0 in 2019 and identified 20 recommendations to support ZEV adoption in the state. This plan was updated in August 2022 to provide a summary of the status of the 20 recommendations and set the stage for the next phase of work in the North Carolina Clean Transportation Plan. The recommendations and progress updates from the ZEV Plan were used to inform the NC Clean Transportation Plan, which was submitted to the Governor's Office by April 7, 2023.

1.3.2 Support local transit agency to increase the use of Electric Vehicles (EV)

Status: Ongoing
Completion Date: Depending on contract with FHWA

The North Carolina Department of Transportation, on behalf of the Boone and Watauga County's Public Transportation Authorities, AppalCART, will receive $2,207,758 in funding from the Federal Transit Administration (FTA)'s FY23 Low- and No-Emission and Bus facilities programs to purchase battery electric buses, charging equipment and to develop a training program for maintenance workers. The new buses will help improve service reliability and air quality for residents of Boone and Watauga Counties in the Appalachian Mountains of western North Carolina.

During the next 12 months, NCDOT will work to finalize contract to distribute the funds.

1.3.3 Develop and implement the North Carolina Electric Vehicle (EV) Infrastructure Deployment Plan

Status: Underway
Expected Completion Date: August 2026

As part of the federal National EV Infrastructure (NEVI) program, NCDOT was required to submit an EV Infrastructure Deployment Plan to provide a framework for the deployment of charging infrastructure along the state's Alternative Fuel Corridors (AFCs). NCDOT developed the plan in partnership with other agencies and external partners and submitted the plan to the Federal Highway Administration on August 1, 2022. The annual update was submitted August 1, 2023. The plan outlines the deployment of infrastructure in two phases. Phase 1 is focused on the build out of NEVI-compliant stations along the designated AFCs, and Phase 2 will focus on community-based public EV charging and other critical infrastructure needs to support EO246 ZEV goals and other clean transportation priorities. Since the approval of the August 2022 Plan, NCDOT has provided several networking opportunities and coordinated with stakeholders. The NEVI plan has been developed with a Justice40 and equity focus.

During the next 12 months, NCDOT will continue to do extensive public engagement to ensure the EV infrastructure deployment is done in an equitable way to expand public access to reliable EV charging. It is expected that the RFP will be released by the end of 2023 with the first sites selected for funding in 2024.

1.3.4 Perform need assessment for the electrification of medium- and heavy-duty sectors.

Status: Underway
Expected Completion Date: September 2023

In support of both EO 271, "Growing NC's Zero Emission Vehicle Markey", and NEVI, NCDOT is performing a needs assessment for the electrification of the medium- and heavy-duty sectors.

1.3.5 Install EV chargers for aircrafts

Status: Underway
Expected Completion Date: December 2023

NCDOT partnered with BETA Technologies to install EV chargers for aircrafts. BETA is currently pursuing installation of charges at Raleigh Executive Airport.

Within the next 12 months, BETA will finalize installation of the chargers.

1.3.6 Establish Best Practices and Technical Guidance for Planning and Developing an EV Infrastructure Network (NCDOT Research Project Number: 2024-10)

Status: Underway
Expected Completion Date: June 2025

NCDOT is sponsoring a project to develop a series of planning and policy best practices and technical guidance for siting EV charging infrastructure to support the expansion of the charging network and its management in North Carolina. This research will assess local planning policies and power utility considerations to develop guidance that informs the efficient and equitable development of a statewide EV charging network plan. The policy and planning research tasks will result in a practice-ready guidance document. This document will include guidance for local agencies, draft policies that can be locally adopted to simplify EV infrastructure permitting and approvals at the municipal and county level, and guidance that highlights opportunities for NCDOT to collaborate and support external partners in improving statewide EV infrastructure. Additionally, the technical guidance derived from models for siting EV charging infrastructure will support the charging network's expansion and provide insights on charger deployments given geographical limitations, travel demand constraints, electric power grid requirements, and equity considerations.

The research results will be practice-ready, implementable guidance on EV network sitting and development. The policy and planning best practice and EV development guidance can be used to support metropolitan planning organizations (MPOs), rural planning organizations (RPO) and local planning agencies for siting local EV infrastructure and developing planning policy that encourages the establishment of an equitable and technically sound EV charging infrastructure.

During the next 12 months, researchers will conduct research of neighboring states to help with stations that will be deployed once the Alternative Fuel Corridors (AFCs) to help with the discretionary grants.

1.3.7 Conduct Wave Transit Zero Emissions Vehicles Transition Study

Status: Underway
Expected Completion Date: October 2023

This study was initiated in November 2022 and will assist Cape Fear Public Transportation Authority with the creation of a Zero-Emission Fleet Transition Plan and the engineering and design of infrastructure for charging stations.

The study aims to identify a zero-emission strategy and develop a Fleet Transition Roadmap to incorporate battery electric vehicles (BEV) and/or hydrogen fuel cell electric vehicles (FCEV) into CFPTA's fixed route paratransit services and facilities.

The study will also perform a review focused on advancing the development of a Fleet Transition Roadmap using a phased-in approach that takes into consideration regulatory requirements and changing technology. The analysis will incorporate market availability of comparable fleet vehicles, energy modeling to determine operational feasibility, key site modifications and energy delivery and infrastructure requirements, and associated forecast capital costs.

The project is in the deliverable review phase. Finalized documents should be in place by Fall 2023. Once complete, the Cape Fear Public Transportation Authority will be eligible to apply for FTS Low or No Emission grant programs.

1.3.8 Develop the Light-Duty ZEV Action Plan as part of the North Carolina Clean Transportation Plan (NCCTP) stakeholder process

Status: Completed
Completion Date: April 2023

As part of EO246, NCDOT was directed to develop North Carolina's Clean Transportation Plan (NCCTP), a broad stakeholder process focused on the development of near-term strategies to decarbonize the transportation sector. Five work groups, including a group focused on the transition to Light-Duty ZEVs, met monthly since May 2022 to develop action plans to be used in the final NCCTP report. The Light-Duty ZEV work group will outline strategies to help the state achieve the EO246 ZEV goals by 2030.

The Light-Duty ZEV action plan has been updated while tracking of ZEV registrations continues. NCDOT has also partnered with Atlas Policy to create an EV dashboard of ZEV data for the state.

1.3.9 Helping Obtain Prosperity for Everyone (HOPE) Project – "Mountains to Sea: Electrifying North Carolina's Transit Fleets"

Status: Complete
Completion Date: May 2023

The Center for Transportation and the Environment (CTE) assisted NCDOT's Integrated Mobility Division with a project funded through the FTA's HOPE program to develop zero-emission transit vehicle (ZETV) deployment plans for two transit systems located in high

poverty counties in the western and eastern parts of the state – AppalCART in Watauga County and the Hoke Area Transit Service (HATS) in Hoke County. CTE also delivered workshops regarding ZETV deployment in the state.

During the planning process, CTE coordinated with the two transit systems to complete service, fleet, fuel, maintenance, facility, and total cost of ownership assessments as the basis for their transition plans for project completion. Both electrification transition plans, HATS and AppalCART, were adopted in March 2023.

1.3.10 Support agencies to develop EV fleet transition plans

Status: Underway
Expected Completion Date: June 2024

The NCDOT Integrated Mobility Division (IMD) is currently working with multiple transit agencies to develop their EV transition plans. The transit agencies working on their transition plans include Wilson, Buncombe, Johnston, and Duplin Counties.

Within the next 12 months, the agencies will have the kickoff meetings (September 2023) and finalize the plans by March 2024. NCDOT is encouraging communication and collaboration with other agencies to maximize resources and knowledge sharing.

In addition, within the fiscal year, NCDOT plans to refine the scope of work, set up core teams to guide the study process and prepare the studies. The studies are expected to be completed in time to submit federal grant applications for Low and No Emission programs in spring 2024.

1.3.11 Develop a database for EV chargers

Status: Planned
Expected Completion Date: N/A

NCDOT is planning the development of a database to keep track of EV charging stations for transit locations.

Within the next 12 months, NCDOT will start collecting the information and developing the database.

1.3.12 Improve ZEV registration data

Status: Ongoing
Expected Completion Date: Ongoing

The ZEV registration data is now updated and posted monthly rather than quarterly. This data is available to external stakeholders and can be used to track progress on the EO80 and EO246 ZEV goals as well as determine density of EV ownership to aid in the sitting of EV charging stations.

In the next 12 months, NCDOT will continue updating the registration data. The data is posted by-monthly.

1.3.13 Host Ride and Drive events/ educational outreach

Status: Ongoing

Expected Completion Date: Ongoing

NCDOT Partners (NC Clean Energy Technology Center (NCCETC), Plug-in NC, Clean Cities, etc.) are hosting several ride and drive events and vehicle expos.

NCDOT continues to sponsor the Sustainable Fleets Conference that was hosted on August 14-16, 2023. Many Ride and Drive events are planned throughout the state.

1.4 Prioritize Zero Emission Vehicles (ZEVs) in the purchase or lease of new vehicles and for agency business travel

1.4.1 Identify NCDOT motor fleet vehicles for conversion to ZEV

Status: Ongoing
Expected Completion Date: Ongoing

Each year, the NC Department of Administration (NCDOA) identifies agency motor fleet vehicles that are candidates for replacement by zero emission or reduced emission vehicles. In July 2022, NCDOA recommended four of NCDOT's fleet vehicles as suitable for replacement with a ZEV and 93 vehicles as candidates for a replacement with hybrid vehicles.

The availability of charging infrastructure at NCDOT facilities remains a barrier in the conversion of replacement vehicles to ZEV or hybrid alternatives. The agency is working to use grant funding from the Volkswagen (VW) settlement and is considering other funding options. NCDOT purchased all-electric F150 Lightning and Chevy Bolt at the Highway Building during this past year.

Within the next 12 months, NCDOT will look for additional vehicles that will need replacement.

1.4.2 Support the installation of electric vehicle charging stations for ZEV at NCDOT buildings

Status: Underway
Expected Completion Date: Spring/Summer 2024

NCDOT is currently working on increasing the number of EV charging stations in the state for plug-in hybrid and battery electric vehicles. Through the solicitation for projects from the Volkswagen Settlement, NCDOT applied for EV charging stations at four NCDOT owned buildings- Highway Building, Century Center, the Hatteras ferry facility and the Division 14 office. Applications included one portable solar charger and three permanent installations of Level II charging that would be open to the public. NCDOT was awarded three of the four applications submitted: Highway Building, Hatteras Ferry, and Division 1.

Within the next 12 months, NCDOT expects to install awarded electric vehicle supply equipment (EVSE). NCDOT also plans to apply for additional EVSE infrastructure through the last round of Volkswagen Settlement funding.

1.4.3 Purchase electric transit buses

Status: Underway
Expected Completion Date: Winter 2023

NCDOT committed $6.3M in Congestion Mitigation and Air Quality (CMAQ) funds to help leverage VW settlement funds for transit electrification. This will result in 19 additional all electric transit buses added to transit agencies across NC.

Within the next few months, NCDOT will work on the contracting and procurement of buses.

1.4.4 Investigate vessel electrification for the NCDOT Ferry Division fleet

Status: Underway
Expected Completion Date: October 2023

Beginning July 2021, this research study focused its ferry vessel and infrastructure investigation on the Ferry Division's short haul routes which include Bayview/Aurora, Southport/Fort Fisher, Cherry Branch/Minnesott Beach, and Currituck/Knotts Island although findings can be applied throughout the system.

Within the next few months, a formal report will be created to assist the Ferry Division in considering and planning for an electric fleet. The report will include assessments of vessels, shoreside infrastructure needs, workforce requirements, emissions reduction information and other funding opportunities.

1.5 Initiate other initiatives to decarbonize the transportation sector

1.5.1 Facilitate the North Carolina Clean Transportation Plan (NCCTP) stakeholder process

Status: Completed
Completion Date: April 2023

As part of EO246, NCDOT was directed to develop North Carolina's Clean Transportation Plan, a broad stakeholder process focused on the development of near-term strategies to decarbonize the transportation sector. NCDOT brought together a broad and diverse set of stakeholders to help identify and assess opportunities, challenges, and considerations with creating a more equitable clean transportation system. Five work groups – Light-Duty ZEVs, Medium- and Heavy-Duty ZEVs, Fleet Transition, Vehicle Miles Traveled (VMT) Reduction, and Clean Transportation Infrastructure - met to develop Action Plans that will be used in the final NCCTP report. The final plan and workgroup action plans were submitted to the Governor's Office on April 6, 2023.

NCDOT completed this activity and is working on implementing the Clean Transportation.

1.5.2 Conducted Vehicle Miles Traveled (VMT) studies

Status: Complete
Completion Date: Complete

In August 2019, NCDOT began the facilitation of a VMT reduction task force and a VMT Reduction Study. This study identified strategies to reduce VMT in urban, rural, and regional areas of NC. The VMT Reduction Study was released in April 2021 and provides summary pages as a comprehensive introductory resource to organizations considering methods to reduce VMT in their areas. Following this study, NCDOT developed the VMT Reduction Study Toolkit. The toolkit is an interactive document with information about Transportation Demand Management (TDM) measures that reduce VMT and the potential funding sources available to implement these measures.

Within the next 12 months, NCDOT will establish a VMT target. In addition, the agency will be sharing the toolkit with MPOs and RTOs and encourage the use of the tool.

1.5.3 Quantify and Assess Ferry Vessel Emissions (NCDOT Research Project Number: 2024-08)

Status: Underway
Expected Completion Date: July 2024

The Ferry Division has a long-term goal to move toward green, sustainable technology and operations. A baseline emission inventory is needed to assess which ferry vessels, routes and engine emission-reducing interventions would be the most beneficial. However, there are no empirical data based on representative and actual operations upon which to quantify baseline main and auxiliary engine emission rates for existing NCDOT ferry fleet. NCDOT is sponsoring a project to address these issues.

The objectives of this project are to: (1) establish a methodological framework to measure real-world ferry main and auxiliary engine exhaust concentrations; (2) quantify real-world ferry engine energy use and exhaust emissions; (3) develop a baseline emission inventory for NC ferry vessel engine fleet; and (4) identify and recommend opportunities to reduce emissions.

During the next 12 months the research team will: (1) develop procedures and scheduling for field measurements of vessel engine emissions; (2) instrument preparation and calibration; (3) measurement of real-world engine emissions under actual operations; (4) data quality assurance; (5) develop baseline emission inventory for vessel engine fleet; and (6) assess emission reductions from upgrading or replacing older vessel engines.

1.6 Initiate other projects aimed at reducing statewide greenhouse emissions

1.6.1 Track agency decarbonization effort

Status: Ongoing
Expected Completion Date: Ongoing

As part of the NC Clean Transportation Plan, NCDOT conducted an internal survey to document a preliminary inventory of known decarbonization efforts that have been achieved by the agency. This included reduced emissions from transportation-related activities, as well as building related activities, such as energy efficiency or deployment of renewable energy. The results from the survey will help summarize NCDOT's decarbonization efforts across all its divisions and units.

Within the next 12 months, progress on NCDOT's decarbonization efforts will continue to be tracked (annually).

1.6.2 Develop a NCDOT Carbon Reduction Program project selection guidance document

Status: Complete
Completion Date: December 2022

NCDOT is currently developing a carbon reduction guidance document and training for rural planning organizations (RPOs) and metropolitan planning organizations (MPOs). The project was completed in December 2022.

FHWA has assigned funds to the different distributions, and within the next 12 months, NCDOT we will begin awarding projects. In addition, the agency is planning to redistribute funds based on the new planning area boundary lines released by FHWA.

1.6.3 Develop Carbon Reduction Program (CRP) strategy report (FHWA program)

Status: Ongoing
Expected Completion Date: November 2023

IIJA establishes the Carbon Reduction Program (CRP), "which provides funds for projects designed to reduce transportation emissions, defined as carbon dioxide emissions from on-road highway sources." The CRP requires each state to develop a carbon reduction strategy with updates at least every four years. NCDOT has funding available for the next five years to complete projects under this plan.

Within the next few months, NCDOT will finalize the development of the CRP strategy report, using strategies recommended in the NCCTP, to incorporate the efforts and strategies to reduce carbon consumption.

1.6.4 Apply for grant for construction funding for the Raleigh to Richmond segment of the Southeast Corridor along the S-Line

Status: Complete
Completion Date: January 2023

In concert with Amtrak and the Virginia Passenger Rail Authority, NCDOT's Rail Division submitted a grant application to the Federal 2023– State Partnership for Intercity Passenger

Rail Program to pursue funding to purchase right of way and construct the Raleigh to Wake Forest segment of the Southeast Corridor, which generally follows the CSX S-Line in North Carolina.

The application builds on previous federal awards to purchase the active portion of the CSX S-Line, prepare preliminary designs and plan mobility hubs along the corridor. Currently, construction cannot be completed without the requested federal funds. However, if funds are provided, NCDOT anticipates constructing the corridor in increments, delivering the new service by 2030.

The Raleigh to Richmond segment of the Southeast Corridor will provide high performance intercity passenger rail between Charlotte and Washington, DC. Six or more roundtrips per day with speeds up to 110-125 mph are planned. The project will help divert highway trips to rail, reducing greenhouse gas emissions.

Withing the next few months, NCDOT should get news regarding funding approval and begin construction.

1.6.5 Develop a Transportation Demand Management Plan for The Greater Charlotte Region

Status: Underway
Expected Completion Date: September 2024

The project was initiated in March 2023. This initiative will involve partnering with the Centralina Regional Council to develop a regional TDM plan and outline immediate steps for starting up a regional program for the greater Charlotte region.

Within the next 12 months, the project team will develop vision/goals, conduct stakeholder engagement, assess prime TDM focus locations, and develop an existing regional TDM conditions report. These efforts will then support developing recommendations for a TDM program support structure, establishing program performance metrics, developing a prioritized list of actionable TDM strategies, creating a marketing and branding framework, and preparing a TDM program implementation guidebook.

2.0. Increase statewide resilience to the impacts of climate change

2.1 Evaluate the impacts of climate change on cabinet agencies' programs and operations

2.1.1 Conduct multimodal vulnerability assessment on Strategic Transportation Corridor (STC)

Status: Underway
Expected Completion Date: December 2024

NCDOT is currently conducting vulnerability assessments including resilience considerations on multiple strategic corridors. Some of these corridors include U.S. 70 and U.S. 74. The objectives of the U.S. 74 pilot study were to determine goals and objectives for future U.S. 74 resiliency; identify and define any vulnerabilities to future extreme weather events, develop and stress-test potential mitigation and adaptation scenarios against future conditions; and quantify benefits relative to goals and objectives. Similarly, the U.S. 70 pilot study assessed the vulnerability of routes to airports, ports, and The North Carolina Railroad Company rail line adjacent to the corridor including stakeholder engagements, and other agency expertise/resources.

Within the next 12 months, these studies will be almost finalized. In addition, the team will develop a story map of the projects to make available to the public.

2.1.2 Develop a statewide Resilience Improvement Plan (RIP)

Status: Underway
Expected Completion Date: December 2023

NCDOT engaged a consultant to help with the development of the statewide resilience improvement plan (RIP). This plan includes the development of a statewide criticality map to identify the criticality of the state major routes. In addition, it will identify areas vulnerable to flood and geohazards based on existing data and tools such as Flood Warning System (TSAPP, BridgeWatch and FIMAN-T). In addition, it will include outcomes for previous pilot vulnerability assessments for I-95/I-40 east, U.S. 70, and U.S. 74. The RIP will also include a prioritization process to select potential projects for improving the resilience of the corridors/system to the identified threats. The development of the RIP will allow NCDOT to apply for project match reductions of up to 10 % under the PROTECT program for those projects identified and prioritized on the plan.

During the next few months, the consultant team will finalize the RIP report.

2.1.3 Develop a web-based geospatial analytics tool for quantifying freight risk and resilience in transportation (NCDOT Research Project Number: 2022-18)

Status: Underway
Expected Completion Date: December 2023

In June 2021, NCDOT embarked on a comprehensive study of the risk and resiliency profiles of North Carolina public roads, specifically primary and secondary freight routes. The objective of the study was to establish a geospatial analytics platform for transportation data integration and modeling. This platform, Geo-FRIT, provides a web-based geospatial analytics tool for quantifying freight risk and resilience in transportation. Geo-FRIT will allow for data collection and sharing among NCDOT divisions and allow for routing analytics and advanced modeling of disaster data for risk-based freight routing through spatial simulation-driven scenario analysis. This project will enhance freight management and safety via web-based data access, integration, and automation, which also promotes transportation resiliency. The Geo-FRIT tool will provide solid support for risk-based freight routing analysis that can lead to significant labor and operational cost savings for NCDOT and enhance highway safety, emergency management, community transportation planning and public health. The research team has finalized the development of the spatial simulation of alternative extreme events for

scenario analysis. In addition, the team has completed a web GIS-based dashboard to support data management.

Within the next few months, the research team will continue the improvement of a risk cost framework to support the analysis of freight routing to optimize the risks and costs caused by disruptive event road closures. The team will also continue the geo-visual analytics and mapping of spatial data for this project. In addition, the research team will deliver a resilience analysis of NC transportation networks.

2.1.4 Assess the vulnerability of the Ferry Division's infrastructure assets, including waterway channels, with respect to natural hazards (NCDOT Research Project Number: 2023-14)

Status: Underway
Expected Completion Date: July 2024

In August 2022, the agency began a project to address the strategy of assessing the vulnerability of the Ferry Division's infrastructure assets. . The scope of the study will (a) assess the vulnerability of the Ferry Division's infrastructure assets with respect to natural hazards (from the present and forecasting to the 2040 and 2060 planning horizons); (b) assess the condition of ferry channels at present, as well as potential climate impacts; (c) prioritize assets for adaptation measures where needed; and (d) provide recommendations on potential adaptation options as well as timeframes for implementation and ballpark cost estimates. The research team has completed a literature and best practices review along with collecting state and federal data to be used to develop the vulnerability index.

Within the next 12 months, the research team will conduct a field data collection site visit. In addition, a vulnerability, risk and criticality assessment will be developed, and results will be incorporated into the Ferry Division's decision-making processes. The team will deliver a final report along with an implementation plan.

2.1.5 Predict roadway washouts during extreme rainfall events (NCDOT Research Project Number: 2021-03)

Status: Underway
Expected Completion Date: December 2023

In January 2021, NCDOT partnered with NC State University to research project utilizing available high quality statewide elevation data, historical rainfall records and advances in computer processing to modify and develop programs to predict where washouts are likely to occur during extreme rainfall events. The purpose of this project is to develop models and test several approaches for predicting crossing washouts based on forecasted rainfall. The results will help determine if existing hydrologic models can be leveraged to accurately predict potential washout locations and to evaluate if machine learning technology can be employed for accurate flood prediction.

This project has the potential to identify the most cost-effective resilient routes. The project is expected to be completed by the end of the year. Results will be disseminated in NCDOT meetings, a training workshop for NCDOT personnel, and through extension factsheets and academic publications.

2.1.6 Evaluate road network resilience to natural hazards using network analysis (NCDOT Research Project Number: 2023-16)

Status: Underway
Expected Completion Date: December 2024

The objective of this project is to improve predictions of roadway vulnerability by using network science and network analysis to understand the connectivity of road networks during extreme events. By treating road intersections as 'nodes and road segments as 'edges', it is possible to successively remove nodes based on some criteria (such as increasing elevations, akin to flooding or another extreme event) to identify the threshold where the entire network begins to fail. The network analysis proposed in this project is focused on coastal settings, and specifically flood hazards, but the methodology is broadly applicable to other regions of North Carolina and additional natural hazards (e.g., landslides). More broadly, this project will lead to a more holistic framework for identifying roadway and network vulnerability to a range of hazards and inform resilient management of roadway networks in a changing climate. The research team has developed a new network model for the Downeast region of Carteret County. The team has installed a camera/sensor and are monitoring flooding at sea level. The camera monitors a flood hotspot and water has been identified on the roadway 21 times since installation. The research team has also finalized solar-powered camera design and manufactured new cameras. The team has also completed a literature search and obtained permits to install cameras in Cedar Island and Davis, NC.

Within the next 12 months, researchers will continue developing and enhancing the network and analysis model and focus on other inland locations. The research team will complete a distance to shoreline model and complete the ADCIRC (a system of computer programs for solving time dependent, free surface circulation and transport problems) data analysis for the barrier islands. Other camera locations will be explored and new machine-learning models to automate roadway flood detection.

2.1.7 Evaluate North Carolina bridge vulnerability and resilience feasibility to coastal storms and sea level rise (NCDOT Research Project Number: 2024-17)

Status: Underway
Expected Completion Date: July 2025

NCDOT is currently sponsoring a research project to assess the status of North Carolina bridge vulnerability to coastal storms and a projected sea level rise in the next 50 to 100 years and identify possible solutions to enhance bridge resilience to coastal hazards.

The project consists of three major steps: assessing vulnerability, defining resilience criteria, and identifying improvement options. We will start by determining bridge vulnerability to coastal storms and sea level rise. This project will utilize simulated design water levels and wave parameters from the US Army Corps of Engineers (USACE) South Atlantic Coastal Study (SACS) to calculate wave loads. In addition, the project will use the USDOT FHWA HEC-25 3rd edition "Highways in the Coastal Environment" to determine wave loads on structures. Based on this, bridge resilience criteria to coastal storms and sea level rise based on engineering practice in North Carolina and other coastal states in the USA will be determined. In addition, the project will identify potential solutions or recommendations for NCDOT for project

implementation. The outcomes of this project will assist NCDOT in planning for bridge upgrading and maintenance as well as helping the agency and its stakeholders make an informed decision on infrastructure planning and development in order to adopt appropriate climate change policies in response to long-term sea level rise.

In the next 12 months the research team will develop: 1) design guide on bridge vulnerability to coastal storms and a sea level rise corresponding to USACE high scenario projection for 2070 and USACE intermediate scenario projection for 2120, 2) a bridge resilience feasibility study defining NC bridge resilience criteria and providing site-specific recommendations for possible improvement options.

Following the 12 months, the research team will develop and host a 2-day technology transfer training workshop on coastal bridge vulnerability analysis facilitating NCDOT to implement project products.

2.1.8 Identify and prioritize vulnerable roadway segments for proactive resilience planning and response (NCDOT Research Project Number: 2024-13)

Status: Underway
Expected Completion Date: July 2025

During Hurricane Florence there were more than 2,730 pavement sites that were damaged where hydraulic structures were not involved. To improve the resilience of these pavements, it is important to conduct an engineering informed assessment, which requires a detailed understanding of the particular design features and the variation thereof inherent to the infrastructure element or system in question and pathways by which that infrastructure can fail. In light of these issues, NCDOT is sponsoring a research study to: 1) Provide a better understanding of the failure pathways and factors contributing to pavement failures during past events 2) Identify gaps and critical data linkages that hinder the use of existing NCDOT information to support resilience-based planning with respect to pavements 3) Develop a framework for identifying and prioritizing road segments as part of resilience-based improvement plans/programs 4) Develop a design feature selection and repair strategy decision tree that considers specific features, planned needs, sustainability considerations, and possible extreme event stressors at a given pavement site, and 5) Identify data gaps and critical data linkages that hinder the use of existing NCDOT information to support this effort and provide recommendations to improve data collection and information to support resiliency efforts. This research will provide NCDOT personnel with the tools necessary to take a proactive approach to inform pavement resilience project identification and prioritization based upon the as built and current condition of roadway segments.

During the next 12 months the research team will: 1) conduct an extensive literature review to identify studies on resilience (in general) and pavements (specifically). This review will supplement and not duplicate the efforts of other ongoing and completed studies, 2) identify the defining characteristics that affect pavement vulnerability, 3) develop a decision analysis framework for assessment and adaption of specific projects.

The team will develop a final report summarizing the methodology, results, and recommendations will be prepared.

2.2 Integrate climate change adaptation practices and resiliency planning into cabinet agencies' policies and operations

2.2.1 Incorporate resilience in long-range plans

Status: Ongoing
Expected Completion Date: Ongoing

Following the Fixing America's Surface Transportation Act in 2015, and FHWA and FTA metropolitan and statewide transportation planning regulations requiring agencies to take resiliency into consideration during the transportation planning process, NCDOT has been working on multiple efforts to incorporate resilience into long-range plans.

Within the next 12 months, NCDOT will continue the efforts to increase collaboration with local and regional agencies by sharing the flood inundation tools it has developed in the past years to help the MPOs and Regional Planning Organizations with this process.

In addition, NCDOT is currently participating in a National Cooperative Highway Transportation Research Board (NCHRP) Synthesis for incorporating greenhouse gases and climate resilience into long range planning and statewide transportation improvement program. As a part of the synthesis all state DOTs were surveyed to understand the state of practice. This study will be completed by the end of the year.

Moreover, NCDOT is currently developing a document to incorporate resilience into Long-Range Transportation Planning (LRTP).

2.2.2 Investigate incorporating resilience into design guidance

Status: Ongoing
Expected Completion Date: Ongoing

NCDOT is currently implementing resilience design considerations into projects. Examples include State Transportation Improvement Plan project number I-6064, the widening of I-95 in Robeson County, which also includes road elevation, improved hydraulic conveyance through bridge elevation and lengthening, as well as drilled holes in a concrete median to facilitate faster roadway water runoff. In addition, the HB-0001 Alligator River Bridge replacement is considering resilient construction materials with a design life through 2100 that also requires projected sea level rise (SLR) and storm activity to be considered in the design year. Similarly, the SLR analysis for Wilmington, Beaufort and Manteo areas is for future design and planning support. The Alligator River Bridge was awarded a $110 million federal grant this year for replacement.

Currently, NCDOT is working on the express design of I-40 between mile markers (MM) 385 and 420 to incorporate resilience criteria to meet the 100-year flood event plus 1.5 feet of freeboard. Flood resilient alternatives are being assessed near Burgaw and Rockfish Creek as well as other locations identified in the I-95/I-40 Flood Resiliency Feasibility Study.

2.2.3 Incorporate resilience within Integrated Project Delivery (IPD)

Status: Ongoing

Expected Completion Date: Ongoing

The current objective for incorporating resilience within IPD will require an inventory of products and map resiliency outputs for NCDOT system-wide planning, project prioritization and programming, and individual project planning and development. To facilitate this objective there will be a survey conducted to better understand how our business units and partners are using NCDOT products and information and how they could better use them in the future. The overall goal of IPD is to streamline how projects move from planning to construction, a crucial part of which is having appropriate resiliency information readily available where relevant in the process.

Risk assessment criteria and benefit-cost-analysis (BCA) are some of the factors that are being considered in the U.S. 74 and U.S. 70 pilot vulnerability studies. The results of these studies will help determine how these factors can be utilized by specific Project Development Networks within the IPD.

Current resilience projects in planning and design phases (I-6064 and HB-0001) are also provide examples of how and when resilience may be considered within IPD.

2.2.4 Expansion of Flood Warning Tools

Status: Ongoing
Expected Completion Date: Ongoing

NCDOT, in collaboration with NC emergency management, has developed multiple flood monitoring tools including TSAPP, BridgeWatch and FIMAN-T. These tools help detect, prepare for, alert, and record potentially destructive flooding events that affect structures. They also allow NCDOT to proactively monitor, in real time, bridge and roadway infrastructure to better react to against hazardous, costly, and potentially catastrophic events. The agency is constantly evaluating, testing and improving these tools in preparation for extreme weather events. In addition, training on these tools is continuously provided. Training was conducted in June 2023, to 120 NCDOT staff on all flood warning tools. In 2022-2023, an additional 16 stream gauges were installed across the state using BUILD Grant funds. These sites have also been added into FIMAN-T to bring the total sites with mapped road impacts up to 64. These sites have been added to BridgeWatch. In addition, 23 new stream gauges were installed along the US-74 corridor from Charlotte to Wilmington as part of an Infra grant.

Within the next 12 months, the 23 new gauges will be surveyed and will have the road impact flood mapping developed so they can be added to FIMAN-T and BridgeWatch. 50 existing sites without road impact data will be evaluated for expansion into FIMAN-T.

2.2.5 Expand the Geotechnical Asset Management (GAM) database

Status: Underway
Expected Completion Date: Spring 2025

NCDOT Geotechnical Engineering Unit has been rating slopes of known concern for several years, while also performing geotechnical subsurface investigations and design of Transportation Improvement Plan (TIP) projects. The GAM database includes a rating system for embankments, rockfalls, rockslides, and landslides in NCDOT right-of-way. The expansion

2.2.6 Continue development of flood inundation tools

Status: Planned
Expected Completion Date: N/A

NCDOT, in collaboration with other agencies, has developed multiple flood inundation tools. Some of the inundation tools already developed include the Coastal Roadway Inundation Simulator (CRIS), the Roadway Inundation Tool (RIT), and Wave Analysis Tool. These tools allow planners and emergency managers to simulate predicted roadway inundation from coastal and inland flooding, quantify potential effects of inundation, and see potential overtopping depths on the roadway system.

The roadway inundation tool represents the entire state. However, there are gaps in the tool that need to be addressed due to the limited amount of available data in Western NC. Within the next 12 months, NCDOT will continue to develop the data that is needed to continue the development of the tool this includes leveraging the pluvial flood modeling completed by the NC Floodplain Mapping Program (NCFMP) by greatly expanding the RIT to now include pluvial, impacts to a 1/5 of the state. This area will be expanding as additional modeling is completed. Currently, NCFMP is conducting modeling of the French Broad basin.

of the GAM database would allow for more sites to be analyzed, slopes to be rated, and preliminary investigations and designs to be made to mitigate potential disruptions.

Within the next 12 months, NCDOT will finalize contracting with supporting consultant and begin field data collection to take place this fall/winter when vegetation dies down, and slopes are easier to evaluate. The first phase of evaluation will concentrate in Division 14 where the bulk of sites exist. Next Fall/Winter 2024 work will be conducted for Division 11 and 13 combined.

2.3 Assist the communities served by each cabinet agency to implement climate change adaptation practices and resiliency planning

2.3.1 Implement N.C. Highway 12 (N.C. 12) Task Force Plan

Status: Ongoing
Expected Completion Date: Ongoing

The primary mission of the N.C. 12 Task Force is to collaboratively develop a long-term, prioritized transportation plan for N.C. 12 that identifies vulnerable highway locations (a.k.a. “hotspots”), projects future challenges related to erosion, storms, and sea level rise, refines and recommends location-specific solutions, and identifies funding strategies and a timeline for implementation. The N.C. 12 Task Force stakeholders developed a plan designed to accomplish the following:

- Recognize the need for safe, reliable routine and emergency transportation for the thousands of residents in communities in Dare and Hyde counties and the millions of visitors that travel to the area from around the world.
- Incorporate information on climate change and sea level rise which may exacerbate existing transportation challenges and present new ones.

- Recognize the missions of the Refuge, Seashore, and other public lands within the project area and balance ecological values and the restoration of barrier island processes while maintaining public access.
- Be collaborative and include substantial opportunities for input from stakeholder agencies, organizations, and the public.
- Utilize existing NCDOT transportation feasibility studies and other information as important, foundational information that contributes to a regional plan.
- Evaluate the economic impacts associated with the status quo and other transportation options.
- Develop a strategic financial plan that leverages existing funding and identifies new funding sources.
- Be designed to help overcome barriers to coastal resilience and adaptation planning and support a proactive and sustainable approach to resilient transportation planning and project implementation.

Within the next 12 months, NCDOT will apply for a PROTECT discretionary grant to conduct a planning and environmental study.

2.3.2 Assist Pender County with N.C. Highway 210 Hurricane Evacuation Route Resiliency Analysis

Status: Underway
Expected Completion Date: Fall 2023

NCDOT is assisting Pender County with conducting a resilience analysis of the N.C 210 Hurricane Evacuation Route corridor that has historically experienced significant flooding in multiple locations after hurricanes or large storms events. The deficiencies of N.C. 210 affect the most densely populated areas in the County and about 29% of all Pender County residents.

Within the next few months, the project will be completed.

2.3.3 Assist Town of Leland with transportation infrastructure resilient routes project

Status: Underway
Expected Completion Date: December 2023

NCDOT is assisting the Town of Leland with the Leland Resilient Routes Project which will identify critical routes within and surrounding Town limits. These routes could include evacuation routes, NCDOT-owned roadways, Town-owned roadways, and privately owned roadways. The routes will be analyzed to determine how resilient each route is to coastal hazards such as flooding and storm surge. For routes that exhibit vulnerabilities to coastal hazards, potential solutions to mitigate the vulnerability will be identified.
The project is in the final process of developing a project prioritization matrix and generating the final modelling. Within the next few months, the project will be completed, and the information will be used to generate a listing of resilient routes.

2.4 Help complete initiatives in the Natural and Working Lands Action Plan

2.4.1 NCDOT Land Stewardship Program - Restoration

Status: Ongoing
Expected Completion Date: Ongoing

NCDOT completed construction on a 312-acre mitigation project located in New Hanover County adjacent to the future Hampstead bypass project (R-3300) in the Spring of 2023. The project will restore 121 acres of wetlands to offset impacts associated with transportation projects in the region. The project is in a key re-charge area for the Castle Hayne aquifer, a major source of freshwater in the Wilmington area.

Over the next 12 months, NCDOT will begin seven years of hydrologic and vegetation monitoring. Once monitoring is completed, the site will continue to be protected through annual site inspection assessments.

2.4.2 NCDOT Land Stewardship Program - Protection

Status: Ongoing
Expected Completion Date: Ongoing

The NCDOT Land Stewardship Program is responsible for the long-term monitoring and protection of stream and wetland mitigation lands statewide. The Program currently manages over 38,000 acres of forested stream, wetland and/or riparian buffer properties statewide. These lands are protected through acquisition or conservation easement. The stewardship and protection of these forested lands assists with floodplain protection, carbon sequestration, and mitigation of GHG emissions.

Over the next 12 months, approximately 380 site inspection assessments will occur to ensure the continued protection of these forested lands.

2.4.3 NCDOT Land Stewardship Program – Property Transfers

Status: Ongoing
Expected Completion Date: Ongoing

The NCDOT Land Stewardship Program is responsible for the transfer of legacy mitigation properties to appropriate third parties for assistance with long-term land protection. To date, NCDOT has transferred 11,048 acres to the NC Wildlife Resources Commission (NCWRC), 1300 acres to NC State Parks, and 68 acres to Wake County. The transfer of these properties increases recreation and tourism opportunities for the citizens and visitors to North Carolina.

Over the next 12 months, the transfer of an additional 586 acres to NCWRC will occur that will provide boating and fishing opportunities adjacent to the Tar River in Grimesland, NC. This area of Pitt County is classified by USDOT as an Area of Persistent Poverty (APP) and a Historically Disadvantaged Community (HDC).

2.5 Initiate other projects aimed at increasing statewide resilience to the impacts of climate change

2.5.1 Quantify future precipitation extremes within NC for resilient design (NCDOT Research Project Number: 2020-57)

Status: Underway
Expected Completion Date: June 2025

In June 2020, NCDOT partnered with NC State University to conduct a study to improve confidence in climate change projections by quantifying future precipitation extremes within North Carolina for resilient design (e.g., precipitation intensity, duration, frequency curves). This project incorporates guidance developed for the National Cooperative Highway Transportation Research Board, NCHRP 15-61, with additional methods and numerical model experiments to improve confidence in future precipitation extremes, and to inform design concepts for potential future events. The research team has developed a co-production framework to guide the project and is continuing to improve confidence in future precipitation data. Researchers have completed initial simulations of Hurricane Floyd, Matthew and Florence for future conditions. The team is finalizing development of ATLAS 14 scale factors for future precipitation and working on future hurricane simulations for the mountains of North Carolina.

Within the next 12 months, researchers will assist NCDOT with a climate resilience summit, continue analyzing model simulations for eastern NC as well as continue developing production quality simulations for western NC. Future high flows and hydrology modeling will be developed to produce tailored high-resolution climate model projections.

2.5.2 Improve the resilience of transportation infrastructure to hurricane damage (NCDOT Research Project Number: 2021-08)

Status: Underway
Expected Completion Date: August 2023

In January 2021, NCDOT partnered with NC State University to conduct a research project to study the effectiveness of repairs and design strategies after damage from hurricanes. This project has four objectives: 1) evaluate the design process for roadway infrastructure that was repaired following Hurricanes Matthew and Florence; 2) identify the specific elements of the new infrastructure that positively contributed to improved performance during Hurricane Florence; and 3) develop recommendations on design elements that improve the resilience of NCDOT roadways.

The guidelines that result from this research will allow NCDOT engineers to deploy design strategies that are proven to be more resilient and cost effective in the long run.

Researchers are currently preparing the final report for this project.

2.5.3 Conduct a State DOT Promoting Resilient Operations for Transformative, Efficient, and Cost-saving Transportation (PROTECT) Program survey and Resilience Peer Exchange

Status: Completed
Completion Date: May 2023

NCDOT conducted a survey as part of an initiative to identify the application and use of the PROTECT Formula Program by other peer agencies, the type of resilience initiatives being selected, and the funding justification process in place, and allocation of funds.

The survey results were used to develop and host a resilience peer exchange where agencies had the opportunity to share information related to this topic. Multiple state DOTs, FHWA and State Highway and Transportation Officials (AASHTO) members participated at this event.

2.5.4 Develop a geospatial map for consolidating resilience initiatives

Status: Planned
Expected Completion Date: Fall 2024

During the past five years NCDOT has invested in numerous resilience, vulnerability and climate change initiatives.

Within the next 12 months, the department, in coordination with a consultant, will complete a project to develop a geospatial map to consolidate past, current and planned resilience initiatives. This map will help the agency to showcase its resilience efforts in a more visual way and will help with the development of the agency's Resilience Business Case to help justify future resilience investments.

2.5.5 Increase consideration of resilience in freight rail programs

Status: Planned
Expected Completion Date: N/A

NCDOT's Rail Division will revise its Freight Rail and Rail Crossing Safety Improvement (FRRCSI) program criteria to reflect resilience when evaluating proposed projects. Under the Short line Infrastructure Assistance (SIAP) arm of FRRCSI, the Rail Divisions is working to include a new Resiliency question and scoring metric in time for the SFY2024 SIAP Call for Projects. The SFY2024 SIAP Call for Projects cannot occur until the state budget gets passed. Under the new Freight Rail Diversion arm of FRRCSI, projects that connect and/or divert freight from highways to rail provide resiliency in the event one mode is blocked by a climate or human-induced event.

Within the next 12 months, the Rail Planning group will be working with NCDOT IT/EBS group to program a Resiliency question and scoring metric into our online EBS application update.

2.5.6 Incorporate Resilience into statewide multimodal freight plan

Status: Complete
Completion Date: February 2023

In 2017, NCDOT created a Statewide Multimodal Freight Plan that set goals and strategies to improve economic competitiveness, increase jobs and enhance quality of life. While progress has been made on the freight-specific recommendations outlined in that plan, the 2022 NC Statewide Multimodal Freight Plan Update included resilience and looks to the future by:

- Addressing recent changes in the freight market.
- Identifying ways to enhance economic development opportunities and competitiveness through more streamlined freight movement.
- Improving freight system efficiency and reliability while enhancing safety and security.
- Identifying and implementing new freight technologies to improve reliability and efficiency.
- Meeting new federal requirements identified in the latest Bipartisan Infrastructure Law (BIL), as well as the previous requirements under the Fixing America's Surface Transportation (FAST) Act which ensures that North Carolina can utilize National Freight Program funds.

2.5.7 Increase consideration of resilience in freight rail programs

Status: Planned
Expected Completion Date: N/A

NCDOT's Rail Division will revise its Freight Rail and Rail Crossing Safety Improvement (FRRCSI) program criteria to reflect resilience when evaluating proposed projects. Under the Short line Infrastructure Assistance (SIAP) arm of FRRCSI, the Rail Divisions is working to include a new Resiliency question and scoring metric in time for the SFY2024 SIAP Call for Projects. The SFY2024 SIAP Call for Projects cannot occur until the state budget gets passed. Under the new Freight Rail Diversion arm of FRRCSI, projects that connect and/or divert freight from highways to rail provide resiliency in the event one mode is blocked by a climate or human-induced event.

Within the next 12 months, the Rail Planning group will be working with NCDOT IT/EBS group to program a Resiliency question and scoring metric into our online EBS application update.

2.5.8 Predict resilience and reduce failure of Stormwater Control Measures (SCMs) to extreme storm events (NCDOT Research Project Number: 2023-15)

Status: Underway
Expected Completion Date: December 2024

Due to multiple failures of stormwater infrastructure (including but not limited to Stormwater Control Measures (SCMs)) from several extreme rainfall events during the past few years. NCDOT is conducting a project to better understand at what storm size do typically designed SCMs no longer provided hydrologic mitigation and are thus likely to fail with significant structural degradation that would lead to costly reconstructive repair. Moreover, the study will identify if there are simple retrofits to existing SCMs (or design features for to-be-built SCMs) that can enhance or extend hydrologic mitigation and reduce the chances of failure. Researchers have completed a literature review and selected four sites determined to be undersized bioretention basins and formatting data to determine the best models for determining undersized basins.

Within the next 12 months, the research team will determine and acquire the best predictive rainfall models available, continue to obtain the best understanding of the rainfall data collected during field monitoring and begin selecting storm events and creating synthetic storms for analysis. Models will be tailored to determine SCM breaking points and enhance design selection criteria.

2.5.9 Explore retrofit and ongoing treatments to withstand future high impact events

Status: Ongoing
Expected Completion Date: Ongoing

NCDOT is exploring resilience alternatives to adapt and recover quickly from storm disruptions other than raising infrastructure. Some of the projects where retrofits have been designed and implemented include projects B-4636, and M-0540A.

For B-4636, in Sampson County, a geogrid embankment reinforcement was designed to protect the roadway embankment in the event of overtopping.

The M-0540A project has completed construction of an 850-foot living shoreline which included approximately 900 linear feet of granite and oyster structure sills, embankment stabilization and planting of a 0.25 acre salt marsh along the NC-24 causeway island in Swansboro, NC. Construction began in December 2022 and was completed in June 2023. Monitoring of the living shoreline will continue over the next 5 years. The project is part of a larger 3 site project through a National Fish and Wildlife Foundation grant in which NCDOT was awarded in partnership with the NC Coastal Federation (NCCF). NCCF is managing the other two sites located along NC-24 in Cedar Point. The first site, 300 linear feet of living shoreline, was constructed in September 2022. The remaining site, an additional 500 feet of living shoreline will be constructed this Fall 2023.

NCDOT will continue to explore the incorporation of retrofits and treatments of sites to withstand the future high impacts events.

2.5.10 Explore Resilience Funding Opportunities

Status: Ongoing
Expected Completion Date: Ongoing

During 2021, NCDOT cooperated with and supported state and local government partners on multiple Building Resilient Infrastructure and Communities (BRIC) and Resilient Coastal Communities grant applications. While NCDOT did not have any specific resilience allocations in its 2021 state budget, several cabinet agencies (The North Carolina Department of Environmental Quality (NCDEQ), North Carolina Emergency Management (NCEM), The North Carolina Division of Mitigation Services (NCDMS), and others received funding mandates that will require NCDOT collaboration and will benefit from NCDOT data and technical input.

NCDOT is actively exploring funding opportunities from IIJA, in particular under the PROTECT program, focusing on resilience planning and making improvements to existing transportation infrastructure and evacuation routes. In addition, NCDOT is working with local entities to prioritize transportation and emergency response improvements and address vulnerabilities.

We actively going after other grant opportunities beyond PROTECT such as The National Oceanic and Atmospheric Administration (NOAA), Rebuilding American Infrastructure with

Sustainability and Equity (RAISE), National Culvert Removal, Replacement & Restoration grants (Culvert Aquatic Organism Passage (AOP) Program), FEMA Building Resilient Infrastructure in Communities (BRIC) grants, etc.

Recently, NCDOT received a $472,000 FHWA AOP grant to replace an aging culvert over a Chowan County creek, improving fish and wildlife passage through an important eastern North Carolina watershed.

2.5.11 Improve Landslide Spatiotemporal Mapping, Monitoring and Change Detection at Howard Gap slide (NCDOT Research Project Number: 2023-04)

Status: Underway
Expected Completion Date: July 2025

NCDOT partnered with NC A&T State University to conduct a research study to create an effective 3D-geospatial framework by integrating field monitoring data with high-resolution remote sensing data (from UAV optical, LiDAR and SAR) using machine learning methods to assist in further understanding the mechanics of this large debris slide, and to remotely monitor other landslides that impact North Carolina transportation corridors and the citizens of NC. The study will leverage freely available satellite imagery to improve the Howard Landslide monitoring by expanding the spatial extent from point sampling to whole area characterizations while reducing associated time and cost compared to the current techniques. In addition, a predictive model using machine learning methods will be developed to hindcast over the last few years and forecast the occurrence and extent of future debris – flow and slope failure. The research methods and outcome (codes and spatiotemporal tools) can be used by NCDOT to monitor landslides at other locations in North Carolina establish an early warning system for the area to predict the landslide displacement and quantify the uncertainties. Researchers have conducted two flights to gather data across the Howard Gap Road region. In addition, the team has created a landslides susceptibility map for the area and an ArcGIS online portal has been developed as well as a data management plan.

During the next 12 months, the research team will continue data collection and geospatial database development and data processing. A technology evaluation will be completed to evaluate the appropriateness, effectiveness and impact of different geospatial data options to identify the most suitable geospatial data and processes.

3.0. Address the public health impacts of climate change

3.1 Increase understanding and awareness of the health impacts of climate change

This section is not applicable.

3.2 Advance health equity

3.2.1 Strengthen access to N.C. ferries to support coastal communities' resiliency, health and mobility (NCDOT Research Project Number: 2022-20)

Status: Underway
Expected Completion Date: July 2023

The N.C. Ferry System faces challenges such as declining ridership, keeping pace with evolving technology, operations affected by extreme weather events, and a lack of sustainable funding sources. Prior studies have examined N.C. ferry operations and made recommendations regarding ways in which future passenger ferries can enhance ridership and improve operations, including such things as building connections to existing shuttle terminals and extending transit services. These studies have been oriented to tourism and existing business owner interests and do not fully account for the broader community goals related to economic opportunities, health and transportation access, nor do they account for the unique needs of marginalized populations. In this project, NCDOT's transdisciplinary team is investigating ways in which innovations related to walking, bicycling, micro mobility, transit operations, and mobility on demand (MOD) services may be employed to support NCDOT's work to ensure that transportation projects provide far-reaching and equitable benefits to communities, the economy, and the quality of life and health of North Carolinians. Researchers have completed a literature review and listening sessions with peer states and NC stakeholders. The team also completed a spatial data analysis with regards to residential, business and government services to create a "walkability" profile for each of the ferry sites.

Currently, researchers are preparing the final report for the project as well as a short and long-term plan for the Ferry Division's improvement goals.

3.2.2 Utilize better construction materials that withstand climate change and improve working health conditions

Status: Ongoing
Expected Completion Date: Ongoing

NCDOT is always exploring the use of more advanced materials that are sustainable and resilient. The agency is currently using Warm Mix Asphalt (WMA) when feasible. WMA typically incorporates the use of an additive to allow a reduction in the temperatures at which asphalt mixes are produced and placed. Thus, asphalt can be placed in cooler temperature conditions often found at night, early and late in the paving season, and during changing weather conditions. The application of this type of asphalt provides much healthier working conditions at both production plans and construction sites, making workers inhale far less smoke and dust.

In addition, NCDOT is also using more resilient materials such as stainless-steel reinforcing, carbon fiber, etc. in the construction of costal bridges to provide better structure integrity.

During the next 12 months, NCDOT will continue to implement WMA when feasible.

3.3 Initiate other projects aimed at addressing the public health impacts of climate change

This section is not applicable.

4.0. Invest in historically underserved communities

4.1 Increase affordability for low- and moderate-income households

This section is not applicable.

4.2 Create jobs and economic growth

4.2.1 Increase On-the-Job Training program capacity for the clean energy sector

Status: Ongoing
Expected Completion Date: Ongoing

The NCDOT Office of Civil Rights (OCR) is continuing to develop policies and programs to provide opportunities for North Carolina's workforce and businesses. The On-the-Job Training (OJT) Supportive Services Unit is working with various non-profit organizations, community colleges, and local governments to include training that is focused on clean energy. In the past 12 months, presentations were made to three cohorts of the STEPS4GROWTH (S4G) Clean Energy Program at Edgecombe, Wilson, and Nash Community Colleges. An Introduction to current and emerging transportation careers in clean energy has been added to Highway Construction Trade Academy and Transportation Summer Accelerator curricula. Research and development work continues on the addition of EV charging station installation/maintenance/repair training to course content.

Within the next 12 months, NCDOT will continue to find opportunities to provide training in this sector.

4.2.2 Establish the Transportation Partnership program (TAP+)

Status: Ongoing
Expected Completion Date: Ongoing

NCDOT established the Transportation Partnership Program (TAP+). The program provides individuals with the ability to gain the skills and experience needed to succeed in careers in transportation engineering and construction. Launched in 2023, NCDOT's TAP+ program is a federally registered apprenticeship program currently recruiting apprentices as transportation workers and engineering technicians. The one- and two-year programs prepare apprentices for 21st century transportation and construction leadership. Apprentices are hired at the start of the program and continue as full-time employees after apprenticeship completion, ensuring job stability, benefits, and a pathway to a leading career with NCDOT.

NCDOT also provides TAP+ pre-apprenticeships through our On-the-Job Training and Transportation Summer Accelerator programs. The 2023-24 TAP+ goal is to deliver 100 apprenticeships & pre-apprenticeships and challenge industry partners to meet 10X NCDOT's performance.

4.2.3 Establish the Transportation Summer Accelerator Program

Status: Ongoing
Expected Completion Date: Ongoing

NCDOT's Transportation Summer Accelerator Program, offered through the Office of Civil Rights OJT and Supportive Services Unit, delivers a compact summer program to high school youth across North Carolina to engage, immerse, and inspire them about careers in transportation construction and engineering. The current 2- week program delivers 5 industry-valued credentials including OSHA 10 safety certification, flagger certification, CPR/First Aid certification, Defensive Driving Certification, and the National Center for Construction Education and Research (NCCER) Introduction to Transportation Certificate. It is also a federally registered pre-apprenticeship that delivers classroom and hands-on learning. In the 2023 pilot program, NCDOT had 21 students graduate from the program and plans to rapidly expand the program in 2024 including a year-round component.

4.2.4 Increase Disadvantaged Business Enterprise (DBE) Certified Businesses in the Clean Energy Program

Status: Ongoing
Expected Completion Date: Ongoing

The NCDOT OCR is continuing to develop policies and programs to increase the number of Disadvantaged Business Enterprise (DBE) Certified Businesses in the Clean Energy Program. DBE Companies that are using innovative research to develop energy efficient and clean energy technologies receive support from OCR's Business Opportunity Workforce Development (BOWD) program. Training, webinars and research are provided to those DBE firms to increase their opportunities to compete and/or be part of larger prime companies as a sub-contractor. The BOWD program will continue to partner with the OJT program to facilitate connections among training providers and organizations that are interested in collaborating with NCDOT's workforce development and training programs. This effort is in accordance with the Clean Energy & Clean Transportation in NC: A Workforce Assessment report.

In June 2023, NCDOT developed and approved a Small Professional Services Firms (SPSF) Procurement Policy. Through this policy and the SPSF Procurement Procedures, NCDOT will administer the Small Business Program to foster growth of small firms where they can build capacity and manage projects as primes.

Those areas that utilize professional consultants for delivering projects and services, including the Chief Engineer for the Division of Highways, the Deputy Secretary for Business Administration, the Deputy Secretary for Multi-Modal Transportation, and the Executive Director for the Turnpike Authority, will ensure that procurement of Small Professional Services Firms is considered. At a minimum, a yearly report will be prepared, coordinated

between the Chief Engineers Office and the Office of Civil Rights on the utilization of SPSF firms.

Within the 12 months, the agency will continue its efforts to increase DBE opportunities.

4.2.5 Incorporate clean energy components into the STEM program

Status: Planned
Expected Completion Date: N/A

NCDOT's Office of Historically Black Colleges and Universities (HBCU) Outreach manages the National Summer Transportation Institute for middle and high school students. The institute provides students with hands-on experience in transportation.

Beginning in summer 2024, HBCU Outreach will encourage NSTI program coordinators to incorporate a clean energy component into the curriculum to encourage students to consider clean energy programs of study in college.

4.2.6 Collaborate with agency partners to offer internships and fellowships focused on clean energy

Status: Planned
Expected Completion Date: N/A

NCDOT's Office of HBCU Outreach manages the NCDOT HBCU/Minority Serving Institution (MSI) internship program for undergraduate students and fellowship program for graduates/graduate students. These programs provide opportunities for students attending a historically black college or university or a minority serving institution to explore career opportunities in transportation to diversify the department's workforce and enhance workforce development efforts.

During summer 2023, HBCU Outreach with a consortium of other state agencies (DEQ, DHHS, DPS, and DNCR visited DEQ for an information session on sustainability and the agency. Additionally, the interns and fellows were able to meet other HBCU/MSI interns from the agency consortium.

Continuing in summer 2024, HBCU Outreach will work with the consortium on planning a visit to DEQ. HBCU Outreach will incorporate educational experiences within NCDOT for all interns and fellows on clean energy.

4.2.7 Business and Workforce Development as a Recovery Support Function in State Disaster Framework

Status: Planned
Expected Completion Date: N/A

The Office of Civil Rights has included its programs in a recovery support function in the Department of Commerce's State Disaster Framework. The Business Opportunities and Workforce Development unit has created and will maintain a database of contractors who are qualified and capable of mobilizing for emergency event cleanup efforts, including waste removal/hazmat, and hauling, to respond to disasters across the state. The On-the-Job Training and Supportive Services unit will be able to quickly launch "pop-up" versions of its

programs in impacted areas. Programs can include OSHA-10, Flagger, and CPR-First Aid credentials plus a focus on erosion control, snow and ice removal, basic work zone safety, and use of hand-held/ power tools. Additional training opportunities could be offered according to specific disasters (I.e., debris removal, trenching, excavation, bridge carpentry/rebar, etc.).

4.3 Alert residents and businesses, particularly those in underserved communities, of state and federal grant opportunities

4.3.1 Host several webinars to bring together a wide and varied group of people and business, albeit over the internet

Status: Ongoing
Expected Completion Date: Ongoing

The webinars consist of participation from subject matter experts to increase the content available for interested parties. Webinars address common questions and concerns harbored by the residents and businesses. Webinars recordings can be converted to blog posts or Q & A articles and videos can be viewed later. A collection of Q & A, as well as poll data information is used to build a profile for future grant topics. This effort can also provide a demographic of the audience for future marketing strategies.

NCDOT, hosted webinars related to NEVI and created an online database for companies that are interested in working together on EV charging efforts.

4.3.2 Develop a stakeholder list for awareness of state and federal grant opportunities

Status: Underway
Expected Completion Date: Fall 2023

In Fall 2022, NCDOT develop a statewide list including stakeholders from all municipalities, counties, MPOs, RPOs, the NC Rural Center, the NC Metro Mayors, and transit providers to make them aware of state and federal grant opportunities.

Within the next 12 months, NCDOT will update the stakeholder list.

4.4 Initiate other projects aimed at investing in underserved communities

4.4.1 Enhance the strategic prioritization process with socioeconomic geospatial analysis (NCDOT Research Project Number: 2021-17)

Status: Underway
Expected Completion Date: December 2022

In 2021, NCDOT partnered with NC State University to conduct a research project to enable the agency to incorporate data into the Prioritization Process that has been historically challenging to integrate, including geo-located socio-economic (social, health, economic, etc.) datasets. The results of this approach will provide NCDOT with a simplified method for

assessing the potential socio-economic impacts associated with a given transportation process and will normalize these impacts to enable the comparison of impacts between projects.

To help ensure appropriate application and implementation, the research team will coordinate with NCDOT to gather expert input from NCDOT staff, the Prioritization Workgroup, and other key stakeholders to inform the research process and the development of socio-economic impact factors.

Currently, the research team has submitted a draft final report which is under review.

4.4.2 Pilot FHWA Environmental Justice Training Course

Status: Underway
Completion Date: September 2023

NCDOT is participating in a pilot course of forthcoming FHWA-NHI-142095: Environmental Justice Analysis in the National Environmental Policy Act (NEPA) In-Person Training. The purpose of the training is to provide participants with the methodology to conduct an Environmental Justice analysis and document it within the NEPA process. The goal of the pilot is to collect input from an expert audience about the user experience with the training content and exercises, identify any areas needing modification.

4.4.3 Implementation of Environmental Justice / Transportation Disadvantage Index (TDI) Tools

Status: Underway
Expected Completion Date: Spring 2024

Interactive mapping and data tools have been created to help NCDOT staff and external partners understand and visualize potential transportation disadvantages and the disproportionate impact of transportation barriers on certain populations. These tools also help inform policies, planning and project development decision making. NCDOT has conducted internal and external agency training on these tools as well as advertising the capabilities and potential uses of these tools.

NCDOT NCSU completed the development of an Environmental Justice (EJ) Geospatial Tool. In addition, NCDOT updated the TDI tool to include new census data. The tool now uses 5-year ACS 2016-2020 data, which was updated from the previous 2015-2019 dataset.

Withing the next 12 months, The TDI tool is expected to be updated to include LEP (Limited English Proficiency) data as an additional metric of transportation disadvantage. This will bring the total variables to 7 total (Disabled population, poverty status, youth population, Elderly, BIPOC, Carless households, and now LEP population) that calculates a block group's TDI score. In addition, the TDI is slated for an update to its methodology of score calculation to change minimum scores for each variable to be zero instead of 1, so scores will range from 0-21 (updated from 6-18 previously). In addition to releasing the new data, this goal also includes updating the online resources that describe the tool metadata and methodologies for users.

Moreover, the EJ geospatial tool will be coordinated with the existing Demographic Snapshot Tool. Once process changes have been determined, training will be provided for both

practitioners and non-practitioners. This will likely occur around the same time as America Community Survey data is updated in both tools in early 2024.

Feedback gained from training and engagements will inform the further refinement of the tools. In addition, NCDOT is working on increasing the marketing and visibility of the tools to internal and external agency users.

NCDOT has also initiated a supporting project to create a statewide GIS map package that supports equity analysis, to prepare a technical summary memo of data and statistics, and to create a report describing various equity characteristics and outcomes.

4.4.4 Include equity in benefit-cost analysis (BCA) (NCDOT Research Project Number: 2022-17)

Status: Underway
Expected Completion Date: August 2023

In 2021, NCDOT started a project to establish user-friendly approaches to integrate equity into NCDOT's BCA processes. This involves the development of two cross-modal measures, air quality and physical health, that can be included in NCDOT's strategic planning and prioritization processes. As a key component of this project, cross-modal measures will be validated through three hypothetical project prioritization scenarios. These scenarios will discuss the potential changes in transportation project scoring outcomes based on the benefits and costs selected for analysis.

As part of this project, the research team has conducted a two-part workshop, conducted a literature and data review, developed Physical Health and Air Quality measures, and a prototype of a GIS tool.

The project will be finalized by the end of August and researchers will submit a draft final report and deliverables for NCDOT review.

4.4.5 Assess environmental justice & historical transportation impacts in North Carolina (NCDOT Research Project Number: 2023-29)

Status: Underway
Expected Completion Date: March 2024

To establish consistent, evidence-based processes for identifying communities impacted by inequitable transportation construction, policies, and investments, NCDOT is currently sponsoring a research project to develop an implementable methodology based on best practices to analyze inequitable transportation impacts and provide a path forward for addressing and mitigating inequitable transportation outcomes. This method will be designed to capture before-and-after impacts at the community level, including a consistent collection of current and historical data at the community scale with a statewide coverage area.

The research team has developed a plan that will establish a methodological framework NCDOT can use to identify and address transportation inequity at the community level. The research team proposes an approach that includes:

- Conducting a comprehensive literature and state of the practice review to inform a matrix of best practices.

- Developing a definition for “transportation inequity”.
- Performing an extensive data review and gap analysis to capture existing data and geospatial coverage.
- Conducting case studies of communities impacted by transportation inequity.
- Developing a methodological framework that can be implemented to identify and address both historical and potential transportation inequities.

Researchers have completed a State of Practice Review, inequity definition, data review and gap analysis as well as analyzing case studies.

During the next few months, researchers will continue working on integrating needs and indicators into an ArcGIS platform to include a full ArcGIS storyboard. In addition, the team will complete the case study analysis and formulate the draft final report.

4.4.6 Analyze incorporation of equity for Long-Range Transportation Planning (LRTP) (NCDOT Research Project Number: 2023-12)

Status: Underway
Expected Completion Date: May 2024

The gaps in transportation planning, implementation of projects, and resulting differences in service opportunities for certain population groups and for people living in certain areas with access limitations for quicker delivery has become even more evident during the COVID-19 pandemic. The objectives of this research are: 1) to review the recent developments in transportation equity related research, the ongoing research initiative “RP 2022-17: Including Equity in Benefit-Cost Analysis" and identify the best practices, existing gaps, limitations and challenges; 2) to survey the staff of MPOs, RPOs, and other state departments of transportation (DOTs) as well as conduct focus group meetings and gather information on how equity can best be addressed in the early stages of long-range transportation planning as well as for timely delivery of perishable necessary goods to all; 3) to identify data, data sources, specific performance measures and evaluation tools for equity analysis in long range transportation planning; and 4) to develop guidelines and propose a complementary methodology that can be applied to ensure equity is appropriately addressed during project proposal development/ alternatives analysis for long range transportation planning in North Carolina. Researchers have completed a literature review, completed a review of deliverable for RP2022-17, surveyed MPOs, RPOs and other agencies in NC to identify equity needs and practices, surveyed other state DOTs to identify equity practices and conducted focus group meetings.

Within the next 12 months, the researchers will develop guidance to address equity in long-range transportation planning, develop and illustrate the equity assessment tool and prepare the final report.

4.4.7 Develop Statewide Local Area Resource Contacts (LARC) stakeholder database within PublicInput CRM

Status: Underway
Expected Completion Date: Fall 2023

NCDOT teamed with a consultant to source contact information for development of a Local Area Resource Contact (LARC) database for local stakeholders and community organizations throughout the state. Proposed contacts that PublicInput (contracted firm) will source and maintain include:

- Ethnic and Minority Organizations
- Local news outlets
- Apartment complexes
- Churches, synagogues and other faith communities
- Homeowner Associations (HOAs)
- Senior communities
- Community colleges
- Universities
- Deaf and blind advocacy groups
- Civic Associations (Rotary, Shriners, Lions etc.)

Within the next 12 months, consultants will complete importing this information into the PublicInput.com CRM application to allow planners and consultants reference to contacts in their project's area and documentation of this step as part of their public involvement process.

4.4.8 Work with stakeholders on strategic NCDOT projects within the state to create opportunities in underserved communities

Status: Ongoing
Expected Completion Date: Ongoing

The OCR through its BOWD and OJT is coordinating with NCDOT's projects and programs to connect communities to opportunities. Current projects in collaboration with OCR include:

- Rail Division, Virginia DOT S-Line Corridor-Eastern Region development,
- Toyota Battery Plant
- Central Region I-26 in Ashville, NC
- Western NC, and NC Clean Transportation and
- Equitable outcomes in NEVI Plan development and implementation.

In service to these projects and programs OCR has developed public information sessions and partnerships to provide training that should allow for participation in Department activities. A research project was recently completed (July 2023) that will enable OCR to understand qualitatively and quantitatively the best ways to measure the impacts of NCDOT projects on communities of color that can inform policy and project decisions.

4.4.9 Assess metrics and indicators for the Office of Civil Rights

Status: Completed
Expected Completion Date: July 2023

The NCDOT OCR recently completed an extensive state of the practice review and documented its applicable findings to assess metrics and indicators for the Office of Civil Rights.

The findings revealed limited availability of literature on civil rights KPIs in transportation, indicating a need for comprehensive and sound indicators to be developed across agencies. In OCR, there is a need for data collection, indicator use, and testing for disproportionate impacts. This study sets groundwork for how programs can be better assessed and how KPIs can potentially be implemented within each program across OCR.

4.4.10 Cemetery Mapping for Indigenous and Enslaved People's Remains

Status: Underway
Expected Completion Date: Subject to proposal selection

NCDOT's OCR is championing a research project which will aim to document the locations of burial sites for historically marginalized groups, particularly indigenous and enslaved peoples. NC was the historic home of many indigenous tribes, as well as the location of many plantations prior to emancipation. In 1860, one-third of the population of NC was enslaved. Gravesites belonging to these groups are often abandoned, unmarked, or forgotten. This can lead to accidental impacts during land development efforts. Access to geospatial data identifying these cemetery and burial site locations would enhance the ability of planners and developers to consider the preservation of these important cultural resources. This proposed research and resulting resources will be crucial to the advancement of environmental justice goals, as it seeks to document and preserve the cultural heritage of these historically marginalized groups. An RFP has been distributed to academia, and a principal investigator will be selected in Fall 2023.

In the next 12 months the agency will select the best proposal and begin the project.

4.4.11 Create an Environmental Justice (EJ) Public Involvement Plan (PIP) for STIP projects R-5876 and U-4434

Status: Underway
Expected Completion Date: June 2024

NCDOT is working on developing EJ Public Involvement Plans for the R-5876 and U-4434 projects.

For project R-5876 NCDOT, in collaboration with SCDOT, is proposing to extend the Carolina Bays Parkway from S.C. 9 in Horry County, SC across the North Carolina state line to U.S. 17 in Brunswick County, NC. The purpose of the project is to improve the transportation network in the study area. The goal is to enhance mobility and connectivity for traffic moving in and through the project study area. A draft Environmental Impact Statement (EIS) is being prepared for the Carolina Bays Parkway Extension Project. Public input collected during the development of the draft EIS has indicated that there could be impacts to some low-income and minority communities in the project study area. An EJ Public Involvement Plan was created in 2022 to engage these communities in discussing alternatives and ways of reducing possible harm.

Due to anticipated impacts to EJ communities, additional outreach was conducted to ensure that they were aware of the project and to get feedback on the proposed alternatives. This outreach effort and the EJ Outreach Plan will be included in the EIS for the project.

Similarly, for project U-4434, NCDOT is proposing to construct a multi-lane facility at a new location in New Hanover County, NC. Located within the urban core of the City of Wilmington, the proposed 1.7-mile-long project would be an extension of the existing Independence Boulevard (SR 1209). As part of this project an EJ Public Involvement Plan was also developed.

Within the next 12 months, the agency will update the PIPs for U-4434 and R-5876.

Additional Information

The North Carolina 2021 Appropriations Act S.L. 2021-180, Section 5.9 titled Disaster Relief and Recovery/Mitigation/Resiliency, established or expanded several programs in which the Department of Transportation was a participant. Those sections are listed below.

- Intergovernmental Coordination on stream management and flooding reduction. Section 5.9.(p)
- Interagency Coordination on stream management and flooding reduction. Section 5.9.(p)
- Flood Resiliency Blueprint. Section 5.9.(c)
- Transportation Infrastructure Resiliency Fund Grant Program. Section 5.9.(h)