

# Drones for Recovery Operations after Natural disaster Events (DRONE)

FY 2023 Strengthening Mobility and Revolutionizing Transportation (SMART) Grants Program



North Carolina Department of Transportation

Submitted by:



October 2023

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## Application Information

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**Supplemental Materials are available online at:**

<https://connect.ncdot.gov/resources/SMART2023-DRONE/Pages/default.aspx>

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**Application Type:** Planning Grant

# Project Narrative

## Project Description

Dating back to the landmark flight taken by the Wright brothers on the Outer Banks, North Carolina has played a pivotal role in aviation. The North Carolina Department of Transportation (NCDOT) continues to lead in aviation advancements – most recently exploring strategies to leverage drone-in-a-box (DIAB) technology to support agency operations.

NCDOT will lead **Drones for Recovery Operations after Natural disaster Events (DRONE, or “the Project”)** to pilot the use of DIAB systems for emergency management services along NC Highway 12 (NC 12) following natural disasters and extreme weather events. The Project will plan for and test the deployment of six (6) DIABs in areas of the North Carolina Outer Banks that are vulnerable to natural hazards such as hurricanes and storm surges. DRONE will include a process to identify specific locations for the DIAB placements, and the systems are intended to survey areas around the Canal Zone, Pea Island Visitor Center, and Ocracoke Ferry Dock, which are identified as disadvantaged by the [Climate and Economic Justice Screening Tool \(CEJST\)](#) due to the low-income households, flood risk, and high building and population loss rates.



Image courtesy of Visitob.com

In addition to natural hazard vulnerabilities, as a series of barrier islands, the Outer Banks also has limited access to the mainland of North Carolina. NC 12 is the major route to the mainland but is frequently inundated and overtopped with sand and water ([NC 12 Hot Spots Report](#)). With DRONE, NCDOT will explore opportunities to leverage technology to more efficiently and safely conduct surveying at critical locations.

**SMART Funding Request: \$815,000**

**NCDOT Match: \$815,000**

**Project Total: \$1,630,000**

## DRONE aligns with the SMART Grants Program priorities:



### Safety and Reliability

Provide rapid surveying to assess conditions before and after weather events to quickly support evacuations, emergency management, and infrastructure repairs.



### Resiliency

Routinely survey the changing physical landscape and climate conditions to proactively identify infrastructure improvement needs.



### Equity and Access

Frequently survey NC 12 to ensure safe access to employment, healthcare, food, education, recreation, and other key community sites.



### Climate

Reduce GHG emissions by decreasing or eliminating trips by car to conduct on-site surveying. Survey travel conditions to direct traffic and reduce congestion.



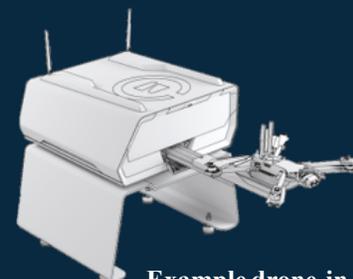
### Partnerships

Collaborate with other State agencies and the private sector to leverage innovative technology solutions that meet the needs of local communities.



### Integration

Integrate data collected by DIAB systems with DriveNC.gov, Public Street Information Database, and other government and private sector asset management and emergency management systems. Partner with NCDOT's Transportation Systems Management and Operations Center for 24/7 support to deploy the DIABs remotely and in real-time, as needed.



Example drone-in-a-box system

The remote launching and beyond visual line of sight (BVLOS) capabilities of DIABs will support NCDOT in carrying out rapid, cost-effective, coordinated, and equitable data collection to improve the safety, mobility, prosperity, and quality of life for vulnerable communities on the Outer Banks. The findings from DRONE can inform scaled operations to support other surveying challenges in locations across North Carolina.



**After completion of Stage 1, Stage 2 will scale the locations and use cases for the DIAB systems (e.g., to survey rockslide impacts in western North Carolina). The Stage 2 desired outcome is to establish a seamless and replicable process to deploy DIAB systems for emergency management services and recovery responses across the state. This would also lay the foundation for DIABs to be leveraged for additional innovative applications.**

**DRONE proposes the following process to plan for, test, and refine a scalable DIAB implementation plan:**

### **Proposed Project Process**

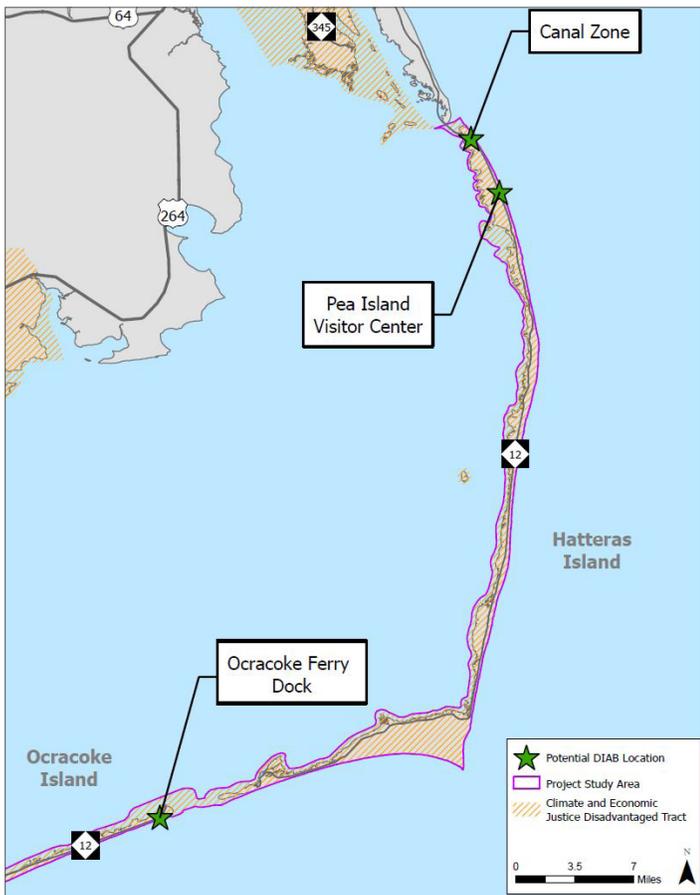
- 1. Develop the Plan (Months 1-2)**
  - Explore available DIAB technology and capabilities.
  - Establish performance measures and data collection, management, and sharing structures.
  - Create selection criteria to evaluate various DIAB vendors.
  - Identify locations to place DIABs and any security needs.
  - Establish agreements, roles, and responsibilities with Project partners such as Climavision (see **Partnerships**).
  - **Create Evaluation and Data Management Plan (within 3 months of grant award).**
- 2. Prepare for Testing (Months 3-4)**
  - Secure waiver for BVLOS/DIAB operations related to disaster and hazard recovery and resilience.
  - Select most applicable DIAB vendor.
  - Purchase DIAB equipment and install at identified locations.
  - Train NCDOT staff on BVLOS operations.
  - Coordinate as needed with Project partners.
- 3. Test Period (Months 5-16)**
  - Coordinate with partners and deploy DIABs for testing, and pre- and post-weather event surveying.
  - Conduct routine volumetric surveying of hot spots and area conditions.
  - **Create Draft Implementation Report (within 12 months of grant award).**
- 4. Evaluation Period (Months 17-18)**
  - Assess DIAB performance and impacts against identified baseline metrics and needs.
  - Document lessons learned (challenges, best practices), needs, and refinements based on Stage 1 outcomes.
  - **Create Final Implementation Report (within grant award period).**
- 5. Stage 2 Scaled Project and Operations to Carry Out Implementation Plan**



# Project Location

NC Highway 12 connects communities on North Carolina’s Outer Banks, a barrier island approximately 175 miles in length. The DRONE Project area includes Hatteras Island to the north and Ocracoke Island to the south. Hatteras Island is part of Dare County, and as of the 2020 census, is **home to 4,300 full-time residents**, spread out amongst communities that include Rodanthe, Buxton and Hatteras. **The entire population of Hatteras Island is within census tract 37055970502, which is recognized as disadvantaged by the CEJST.** Ocracoke Island is part of Hyde County, and **the island’s 800 full-time residents live in census tract 37095920100, which is also disadvantaged.** The Hatteras and Ocracoke Islands are not directly connected to the mainland and rely on access using ferries and NC 12.

The DRONE Project locations were selected as these islands are particularly susceptible to storm surges that breach the seaward dunes and inundate NC 12 - a critical route for routine and emergency travel.



Project Location Map

The Canal Zone, Pea Island Visitor Center, and Ocracoke Ferry Dock have been identified as potential areas for DIAB placements to survey this vulnerable but critical stretch of NC 12.

# Community Impact

Deployment of DIAB technology for use in surveying conditions before and after extreme weather events will directly benefit the disadvantaged communities within the Project area by building long-term infrastructure resilience and expediting maintenance and repair times (see **Expected Benefits**). Faster disaster response rates will benefit residents waiting to return home while sheltering elsewhere. In addition, the Hatteras and Ocracoke Island communities are socioeconomically vulnerable, ranking **above the 75th percentile for proportion of low-income households**, and many residents are not likely to have the resources necessary to evacuate. Residents who do not have the means to evacuate will also benefit from faster recovery and infrastructure maintenance to return to their daily lives.

Disadvantaged communities of mainland Hyde and Dare Counties, as well as other coastal counties, benefit from expedited disaster recovery at these locations along NC 12. According to 2019 LEHD data, **55% of residents of the two islands left the area for work**, commuting up or across the sound to communities such as Fairfield and Engelhard.

Specific DRONE community impact performance measures will be determined in the Phase 1 Plan Development process (see **Proposed Project Process**); potential measures could include:

- Fewer and shorter closures of NC 12
- Faster NCDOT response and maintenance times
- Faster EMS response times
- Decrease in injuries or fatalities on NC 12 associated with natural disasters and weather events
- Less money spent on sheltering elsewhere due to NC 12 access challenges

No negative externalities are expected as a result of DRONE, but if discovered during the testing phase, they will be documented and assessed prior to moving into Stage 2.



# Technical Merit Overview

## Identification and Understanding of the Problem to Be Solved

The Outer Banks of North Carolina and its citizens are exposed and at risk. The increased frequency and intensity of storms fueled by climate change have created dangerous situations for residents of North Carolina and first responders accessing the area after a disaster. NC 12 is a lifeline for communities on Hatteras and Ocracoke Islands, yet there are many challenges given the remote location and limited access.

## Safety and Reliability

DRONE will assess the Hatteras and Ocracoke Islands, which are only accessible to the mainland using NC 12 or ferries. The CEJST indicates that this area is in the **98th percentile for expected population loss rate related to fatalities and injuries resulting from natural hazards** each year (census tracts 37055970502 and 37095920100). The census tracts within the Project area are also in the **98th percentile of tracts nationwide for risk of flooding to properties** within the next thirty years, and the **98th percentile for expected annual building loss rate to natural disasters**. Since 1993, hurricanes have already required twelve evacuations of the islands.

In these instances, the only option is for residents to travel north on NC 12 to reach Nag's Head for evacuation via US Route 64 and US Route 158. Flooding, strong winds, and sand displacement from storms can cause extensive infrastructure damage that impedes travel for disaster response teams, such as when Hurricane Sandy left NC 12 under several feet of water in 2012. In addition to road inundation and access problems following major storm events (see map right and image below), NC 12 is routinely flooded from heavy rainfall.



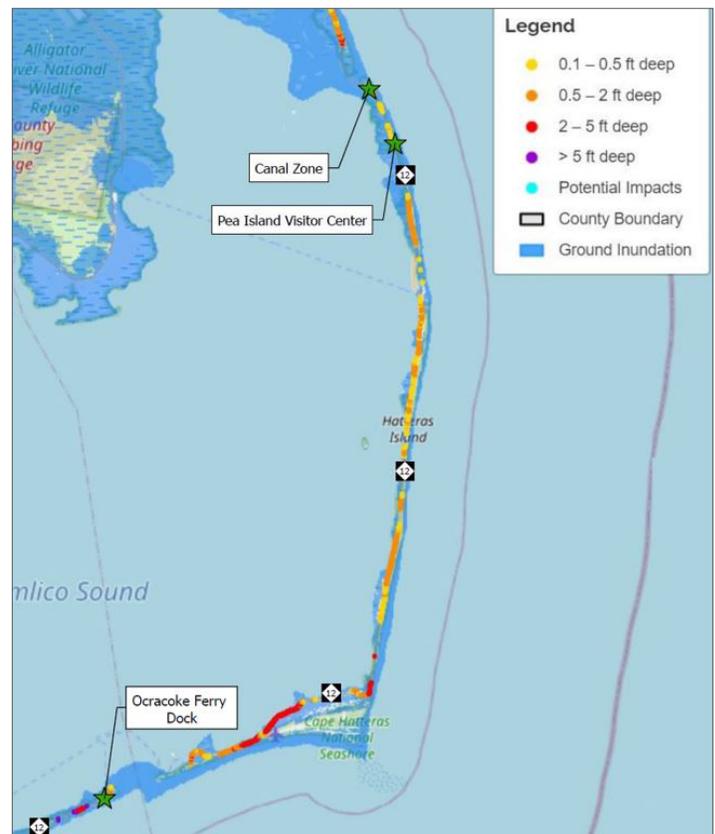
NC 12 on Ocracoke Island after Hurricane Dorian.

One of the key underlying problems that NCDOT and emergency management experience during flooding events on this segment of NC 12 is the ability to help evacuate or otherwise reach these isolated communities to provide them with food, water, medical, and other life-saving care.

## Resiliency

This segment of NC 12 is also located within census tracts that the CEJST identifies as being in the **98th (census tract 37055970502) and 99th (census tract 37095920100) percentiles for expected building loss rates due to natural hazards** each year. The USDOT Equitable Transportation Community (ETC) Explorer that is part of the Justice40 initiative further anticipates that **climate change impacts in the Project area will only increase in frequency and severity**.

The Project area is notable for the sand dunes that run parallel to NC 12 and serve as a physical barrier between the roadway and the ocean. Major storms can displace materials from the dunes and block transportation access (see image on p.5).



NC 12 Inundation at the FEMA 100-year Flood Interval (NCDOT Roadway Inundation Tool).

## Appropriateness of Proposed Solution

Globally, drones are widely used for remote applications. Drones have been proven to provide reliable support and connect geographically isolated areas and people to improve healthcare, access, and recovery.

Having remotely deployed DIABs on site and close to heavily impacted areas along NC 12 will simultaneously: **reduce time to survey the area and identify needs; improve the ability to find victims by using noise, vibration, and heat sensing; provide aerial images of the impacted area; measure and quantify water damage to inform early estimates of needed equipment; and integrate findings into existing traffic data to measure and quantify damage to multi-modal transportation facilities.**

Currently, deploying certified pilots to impacted areas and completing the above tasks is onerous and costly - both in terms of the financial cost and risk of sending surveyors and teams into hazardous areas. Remotely deployed DIABs not only reduce costs related to delivering crews to dangerous areas, but they also allow many tasks to be completed at once and by one piece of equipment.

The application for DRONE is unique and impactful because the Project will leverage DIAB systems, so the drones can be deployed remotely and on-demand. The aircraft themselves will be housed in weather-tight containers on State-owned land and the data they gather will be integrated with DriveNC.gov, Public Street Information Database, and other government and private sector asset management and emergency management systems for additional applications.

## Expected Benefits

### Safety and Reliability

DRONE will improve community safety by quickly surveying and assessing conditions along NC 12 leading up to and immediately following a natural disaster or extreme weather event. DRONE will collaborate with emergency management services to leverage the DIAB systems to efficiently assess post-natural hazard impacts and for evacuation and emergency response services to minimize injury or loss of life. In alignment with the USDOT's National Road Safety Strategy (NRSS), the DIAB systems will also allow NCDOT to identify repair and safety needs to reduce potential fatalities on

NC 12 as a result of infrastructure damage after a storm.

### Resiliency

DRONE will build resiliency for communities that are among the most vulnerable to the impacts of climate change by actively surveying the changing conditions to proactively identify infrastructure improvement needs. The DIAB systems can be deployed not only in emergency situations but also for scheduled routine surveying, which allows NCDOT to conduct more frequent assessments to measure changes in vulnerable areas and along critical infrastructure such as NC 12.



**Sand displacement from the dunes near the Pea Island Visitor Center following a storm.**

DRONE will also build the resiliency of NCDOT operations through routine assessments of the conditions near the agency's facilities. NCDOT's Ferry Division previously lost stacking lanes due to erosion following a storm and are more recently losing septic fields for restroom facilities. DIAB surveying will be conducted regularly to monitor changes and ensure the necessary improvements and reinforcements are made to protect NCDOT facilities.

### Equity and Access

DRONE will support equity and access by reducing the time spent on maintenance of infrastructure disaster recovery for remote and rural areas that may be otherwise difficult for regular or emergency surveying. By more quickly assessing storm damage, NCDOT will be able to mobilize and repair damage in less time, providing earlier access after natural disaster and extreme weather events. The Project will help ensure roadways are safe to navigate during evacuation and following a storm



to access employment, healthcare, education, food, recreation, and other essential destinations.

## Climate

DRONE will reduce air pollution as the DIAB systems will be placed on-site and deployed remotely, reducing greenhouse gas emissions from car travel to the area for surveying. Quicker response times as a result of the DIAB surveying can lead to faster repairs and maintenance, reducing the GHG emissions from delays and lengthy detours.

## Partnerships

DRONE will leverage existing and build new partnerships with State agencies and the private sector (see **Community Engagement and Partnerships**). Private sector partners include entities such as Climavision and others who are experienced in drone technology and in disaster recovery efforts (see **Leadership and Qualifications**). DRONE will be mutually beneficial for partners, offering synergies related to data sharing and coordinated efforts to serve constituents and clients (see **Integration**). Project partners will work with NCDOT to identify performance metrics, test the DIAB application, and assess best practices before deployment of the technology to additional locations and use cases in Stage 2.

## Integration

DRONE will support the connectivity of infrastructure through DIABs strategically placed along NC 12. The DIABs can be simultaneously deployed to survey the corridor, which will help NCDOT and partner agencies to have a comprehensive understanding of repair, maintenance, and other recovery needs for safe and seamless travel along NC 12.

DRONE will also integrate data collected by DIAB systems with DriveNC.gov, Public Street Information Database, and other government and private sector asset management and emergency management systems. DRONE will also work with NCDOT's Transportation Systems Management and Operations Center to have around the clock capacity to deploy the DIABs.

# Project Readiness Overview

## Feasibility of Workplan

The DRONE workplan leverages existing successful NCDOT programs to use next generation Advanced Air Mobility (AAM) technology and data integration to scale recovery solutions for climate-impacted regions.

NCDOT's AAM team has secured a BVLOS waiver to operate DIAB systems on construction sites and is familiar with the application process and requirements to obtain a BVLOS waiver for DRONE.

DRONE will execute early deployments in frequently flooded locations; this will enable the team to be prepared to deploy at a moment's notice for higher intensity weather events. The proposed timeline allows procurement of the additional weather-proof DIABs, installation of the equipment, integration of DIAB data with existing data, and program impact analysis.

In addition, DRONE could apply for a [Special Government Interest waiver](#) from the Federal Aviation Administration (FAA). These waivers authorize real-time requests to operate Uncrewed Aircraft Systems (UAS) to address natural disasters and other emergency situations.

## Community Engagement and Partnerships

DRONE will attract new talent to NCDOT and cultivate a workforce interested in cutting-edge solutions. Staff trained for DRONE will have the skills necessary to use BVLOS drones in other applications for NCDOT and other State agencies.

NCDOT currently partners with a community college in North Carolina to utilize their facilities for the Department's hurricane response training. This training includes two days to prepare for flight missions and other protocols. North Carolina Emergency Management (NCEM) currently participates in the the training and NCDOT anticipates that Civil Air Patrol (CAP) and the Federal Emergency Management Agency (FEMA) will join next year. Training for DRONE and BVLOS operations of DIAB systems will build on this existing training structure.



## Leadership and Qualifications

NCDOT is participating in the Federal Aviation Administration's BEYOND initiative. As part of this program, NCDOT has strengthened the agency's UAS capabilities and achieved notable milestones, including developing the U.S.'s first and only permitting system for commercial and government drone operations.

The BEYOND program identifies a need to further explore drone integration with BVLOS operations, stating priorities for:

“Beyond Visual Line of Sight operations that are repeatable, scalable and economically viable with specific emphasis on infrastructure inspection, public operations and small package delivery.”



Led by experts that include Rebecca Gallas – NCDOT's Division of Aviation Director – and Riley Beaman – NCDOT's UAS Program Manager – DRONE will expand upon NCDOT's robust UAS and BEYOND program to explore scalable new applications for BVLOS DIAB systems. Furthermore, NCDOT's BEYOND program is an undertaking with many stakeholders and partnerships. Building on this experience, DRONE leadership is well-equipped to manage Project partnerships – many of which already exist as part of NCDOT's UAS work.



Climavision is a partner in NCDOT's BEYOND program and has a strong knowledge of NCDOT's existing UAS efforts. Climavision provides expertise in forecasting weather conditions as well as real-time information through radars placed in traditionally under-observed but vulnerable communities. Climavision also leverages radars that observe weather at low altitudes - and at the level where drones would operate. This approach makes Climavision a strong partner to DRONE and efforts to employ DIABs to proactively respond to weather events in vulnerable communities.



# **Appendix I: Resumes**

# Team Resumes



## **Rebecca Gallas, P.E.**

### **Director, N.C. Department of Transportation Division of Aviation**

NCDOT Aviation Director Rebecca Gallas, P.E., leads initiatives that promote a safe and robust air transportation system and vibrant economy in North Carolina. Under her direction, the Division annually manages more than \$270 million in state and federal funding for 300 + infrastructure improvement projects at the state's 72 public airports, operates a nationally acclaimed unmanned aircraft systems program, and provides planning and engineering assistance for airports and professional development for airport personnel.

Gallas leads the air mobility component of Advance Mobility NC, which leverages the work of NCDOT's aviation, integrated mobility and rail divisions to create a multimodal transportation system that improves the mobility of people and freight. She also works closely with N.C. airports, companies and state economic and workforce development partners to promote public and private investment that creates jobs and economic opportunity, including managing the N.C. Airports Economic Development Fund. This performance-based program has provided more than \$224 million to general aviation airports for time-sensitive capital improvement projects expected to create more than 1,000 jobs.

Gallas holds a B.S. degree in civil engineering from the Massachusetts Institute of Technology and is a registered professional engineer in North Carolina.



## **Riley Beaman**

### **Unmanned Aircraft Systems (UAS) Program Manager, N.C. Department of Transportation Division of Aviation**

Riley Beaman leads NCDOT's award-winning UAS Program, which directs advances in commercial and government use of drones in North Carolina. That includes managing North Carolina's participation in the Federal Aviation Administration's BEYOND Program, working to enable advanced air mobility.

Beaman serves on North Carolina's FEMA Working Group, ensuring tight coordination and broad UAS support for the state's disaster emergency response. He brings to this work 18 years of experience building and managing programs and partnerships that serve the needs of the community, industry and the state.

Prior to joining NCDOT, Beaman served as director of health and public safety at Montgomery Community College, working collaboratively with partners to build, operate and recruit students and participants to programs that met the talent needs of emerging industries and the community.

**Appendix II:  
Summary  
Budget Narrative**

## Appendix II: Summary Budget Narrative

NCDOT is requesting \$815,000 in SMART Grants Program funding for this Project. The SMART Grants Program funding request equals 50% of the Project’s cost. NCDOT has committed a non-Federal match of \$815,000 to the Project. The estimated total Project cost is \$1,630,000. Table 1 summarizes the costs by project component and Table 2 identifies funding sources for each project component.

Table 1. Detailed Costs for Project

Project Component	Cost	% of Total
Personnel	\$410,000	25%
Fringe Benefits	\$270,000	17%
Travel	\$30,000	2%
Equipment	\$490,000	30%
Supplies	\$90,000	6%
Contractual	\$340,000	21%
Construction	\$-	0%
Other	\$-	0%
Indirect Charges	\$-	0%
<b>Total</b>	<b>\$1,630,000</b>	<b>100%</b>

Table 2. Project Funding (2023\$)

Project Component	SMART Grants Program		Other Federal		Non-Federal		Total
	\$	%	\$	%	\$	%	\$
Personnel	\$205,000	50%	\$-	0%	\$205,000	50%	\$410,000
Fringe Benefits	\$135,000	50%	\$-	0%	\$135,000	50%	\$270,000
Travel	\$15,000	50%	\$-	0%	\$15,000	50%	\$30,000
Equipment	\$245,000	50%	\$-	0%	\$245,000	50%	\$490,000
Supplies	\$45,000	50%	\$-	0%	\$45,000	50%	\$90,000
Contractual	\$170,000	50%	\$-	0%	\$170,000	50%	\$340,000
Construction	\$-	-	\$-	-	\$-	-	\$-
Other	\$-	-	\$-	-	\$-	-	\$-
Indirect Charges	\$-	-	\$-	-	\$-	-	\$-
<b>Total</b>	<b>\$815,000</b>	<b>50%</b>	<b>\$-</b>	<b>0%</b>	<b>\$815,000</b>	<b>50%</b>	<b>\$1,630,000</b>

### Personnel

Personnel costs were calculated for the team assembled specifically for this Project and are based on the estimated staff hours needed for successful completion of Phase 1. This estimate includes staff time for data and performance reporting. Staff resources will be required to effectively engage Project partners, establish performance measures and data collection, train staff on BVLOS operations, and conduct surveying work among other Project tasks. Personnel costs are approximately \$410,000.

### Fringe Benefits

NCDOT's fringe benefits rate of 66.544% was applied to the raw labor cost to calculate fringe benefits, which are approximately \$270,000.

Table 3 shows the estimated hours, labor cost, and fringe costs (unrounded) for the Project team.

Table 3. Project Funding (2023\$)

Position	Hourly Rate	Weekly Hours	Project Weeks	Total Project Hours	Labor Cost	Fringe Multiplier	Fringe Cost
Director	\$68.80	5	81	405	\$27,865.88	66.544%	\$18,543.07
HR	\$41.40	10	81	810	\$33,534.38	66.544%	\$22,315.12
UAS Manager	\$55.16	40	81	3,240	\$178,707.37	66.544%	\$118,919.03
UAS Specialist	\$43.26	40	81	3,240	\$140,168.36	66.544%	\$93,273.64
Finance/Grant Administrator	\$41.40	5	81	405	\$16,767.19	66.544%	\$11,157.56
Administrative Assistant	\$24.37	5	81	405	\$9,870.63	66.544%	\$6,568.32
<b>Total</b>		<b>100</b>	<b>405</b>	<b>8,100</b>	<b>\$406,913.82</b>		<b>\$270,776.73</b>

### Travel

Expenses for travel to the Project locations on the North Carolina Outer Banks and two in-person meetings in Washington, DC were included in the Project budget and total \$30,000. These costs were estimated according to approved NCDOT unit costs for direct expenses. Twenty trips to the Project locations were assumed and are necessary to confirm the placement locations for DIABs, perform testing, provide training, and evaluate the effectiveness of the Project. Each trip to the Outer Banks would include a two-night stay and four staff. A one-night stay was assumed for the Washington, DC trips.

### Equipment

Estimated costs for purchasing six DIAB systems consisting of the drones, docks, and remote operation enablement were included in the equipment category. These estimated costs were based on a quote from a drone vendor; however, NCDOT would acquire equipment consistent with procurement standards under 2 CFR Part 200 per the NOFO. Equipment costs are estimated to be \$490,000. Of this amount, approximately \$130,000 would be for six drones and docks, \$90,000 for BVLOS enablement, and \$270,000 for remote operations software.

### Supplies

Several supplies with unit costs less than \$5,000 are necessary for implementation of this Project, including supplies in the event of natural disasters and hazards such as generators, given the unique objective of this Project. Costs were estimated based on actual retail prices for the following items:

- Dock controllers for droners (\$24,000)
- Generators and gasoline (\$15,000)

- Internet (\$22,000)
- Security/weather camera for each site (\$9,000)
- Storage media (\$700)
- Trailers (\$10,000)
- WiFi equipment at each site (\$9,000)

Supply costs are estimated to total approximately \$90,000.

#### Contractual

As part of this Project, NCDOT would require the following contractual support and subscription-based software:

- Climavision (Project Partner) (\$30,000)
- Drone software including fleet management (\$155,000)
- Insurance for drones and equipment (\$9,000)
- Training from equipment vendor(s) (\$130,000)
- Warranty and damage replacement (\$15,000)

Costs for these items were estimated based on quotes from vendors; however, NCDOT would acquire equipment consistent with procurement standards under 2 CFR Part 200 per the NOFO. Insurance for drones and equipment could be purchased through the North Carolina Department of Insurance. A cost for this insurance was estimated based on recent costs for equipment of similar monetary value. Total contractual costs are estimated to be \$340,000.

#### Construction

No construction activities are anticipated for this Project.

#### Other

No costs in addition to those already discussed and included in the previous categories are anticipated for this Project.

#### Indirect Charges

Please refer to the Fringe Benefits section for how fringe costs were estimated. No other indirect costs are anticipated for this Project.

**Appendix III:  
Letters of  
Commitment**



October 6, 2023

The Honorable Pete Buttigieg  
U.S. Department of Transportation  
1200 New Jersey Avenue, SE  
Washington, DC 20590

Dear Secretary, Buttigieg:

The North Carolina Department of Transportation (NCDOT) is applying for a planning grant under the U.S. Department of Transportation's SMART Grants Program to leverage drone-in-a-box (DIAB) technology to support agency operations. Climavision commits to working with NCDOT on this Project to pilot the use of DIABs for emergency management services in coastal locations following natural disasters and extreme weather events. The Project will plan for and test the deployment of DIAB systems in targeted communities that are historically disadvantaged and vulnerable to natural hazards such as hurricanes and flooding. The remote launching and beyond visual line of sight (BVLOS) capabilities will support NCDOT in carrying out rapid, cost-effective, coordinated, and equitable surveying to meet the diverse needs of communities in North Carolina.

To support the Project, Climavision commits to partnering with NCDOT to plan for, test, and evaluate the application of DIAB technology in post-disaster recovery and emergency management scenarios. Climavision will collaborate with NCDOT on efforts that include establishing detailed partner roles, identifying performance metrics, and establishing data reporting and sharing structures. Climavision will also participate in the evaluation of lessons learned, testing, and assessment phases to refine approaches moving into a scaled Stage 2 of the Project that explores additional DIAB applications in relevant locations across the state.

Climavision is installing commercial weather radars in vulnerable communities across the country that currently are under-observed by the nation's weather radar network. The Climavision network includes three installed radars in the Piedmont region of North Carolina and a planned installation in 2024 in eastern North Carolina to support coastal resilience. In order to provide time critical, geographically specific information on severe weather hazards,



Climavision's radars focus their scanning on the lowest levels of the atmosphere where observations are lacking. The added advantage of this is that the radars are observing weather exactly at the low altitudes where drones are operating (under 1,000 feet). This makes the radars ideal for supporting BVLOS operations of DIAB systems following severe weather i.e. in addition to providing real-time observations of the atmosphere to pinpoint areas likely most in need of emergency response, the data from the radars will help guide the safe remote deployment of drones so they don't encounter weather hazards. Climavision will also provide automated weather forecast products for integration into DIAB operations and support from its meteorologists as needed.

This Project and Climavision's commitment to assist in the testing of DIAB systems will further NCDOT's efforts to utilize new technologies for innovative applications that improve the safety, mobility, prosperity, and quality of life for coastal and other North Carolina communities as the Stage 2 Project is scaled and implemented in new locations.

I hope you will favorably consider this funding request.

Sincerely,

A handwritten signature in blue ink that reads "Chris Goode".

Chris Goode  
CEO, Climavision



**Appendix IV:  
Project Location File  
(Attached)**