



Federal Aviation
Administration

Final Programmatic Environmental Assessment, Mitigated Finding of No Significant Impact, and Record of Decision for Drone Package Delivery in North Carolina

July 2024

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DEPARTMENT of TRANSPORTATION

Federal Aviation Administration

Washington, D.C.

Notice of Availability of the Final Programmatic Environmental Assessment and Mitigated Finding of No Significant Impact and Record of Decision for Drone Package Delivery in North Carolina

The Federal Aviation Administration (FAA) is announcing the availability of the final programmatic environmental assessment (PEA) that evaluates the potential environmental impacts of Unmanned Aircraft Systems (UAS) package delivery operations in the state of North Carolina. The FAA is also announcing the availability of a Mitigated Finding of No Significant Impact and Record of Decision (Mitigated FONSI/ROD) for UAS package delivery operations in North Carolina based on the final PEA.

The proposed action analyzed in the PEA is UAS operators conducting commercial drone package deliveries under 14 Code of Federal Regulations (CFR) Part 135 in North Carolina. The North Carolina Department of Transportation is the project proponent.

The FAA prepared the PEA in accordance with the National Environmental Policy Act (NEPA) (42 United States Code §§ 4321 et seq.), the Council on Environmental Quality NEPA Implementing Regulations (40 CFR Parts 1500–1508), and FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*. This final PEA reflects the consideration of comments received during the public comment period from April 30, 2024, through May 30, 2024.

The final PEA and Mitigated FONSI/ROD are available to view and download electronically at:

https://www.faa.gov/uas/advanced_operations/nepa_and_drones/.

CONTACT INFORMATION: For any questions or to request a copy of the final PEA, please e-mail 9-FAA-Drone-Environmental@faa.gov.

Responsible FAA Official:

Date: _____

Derek Hufty
Manager, General Aviation and Commercial Branch
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DEPARTMENT OF TRANSPORTATION
Federal Aviation Administration
Mitigated Finding of No Significant Impact and Record of Decision
for
Drone Package Delivery Operations in North Carolina

SUMMARY

This document serves as the Federal Aviation Administration’s (FAA) Mitigated Finding of No Significant Impact and Record of Decision (Mitigated FONSI/ROD) and provides final agency determinations and approvals for the federal actions necessary to implement commercial drone package deliveries under 14 Code of Federal Regulations Part 135 (Part 135) in the operational areas identified in the attached final programmatic environmental assessment (PEA). This Mitigated FONSI/ROD is based on the information and analysis contained in the final PEA. The FAA, in coordination with the North Carolina Department of Transportation (NCDOT) as the project proponent, prepared the PEA to evaluate the potential environmental impacts from Unmanned Aircraft Systems (UAS) operators conducting commercial drone package deliveries under Part 135 in North Carolina. The FAA prepared the PEA in accordance with the National Environmental Policy Act (NEPA) (42 United States Code [U.S.C.] § 4321 et seq.), the Council on Environmental Quality (CEQ) NEPA Implementing Regulations (40 CFR Parts 1500–1508), and FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*.

After reviewing and analyzing available data and information on existing conditions and potential impacts, as well as the noise mitigation identified in the PEA which operators must implement to avoid significant noise impacts, the FAA has determined the proposed action would not significantly affect the quality of the human environment. Therefore, the preparation of an Environmental Impact Statement (EIS) is not required, and the FAA is issuing this Mitigated FONSI/ROD. The FAA has made this determination in accordance with applicable environmental laws and FAA regulations. The PEA is incorporated by reference into this Mitigated FONSI/ROD.

PURPOSE AND NEED

The proposed action analyzed in the PEA is UAS operators conducting commercial drone package deliveries under Part 135 in North Carolina, as described in PEA Section 2.2. The *purpose* of the proposed action is to provide commercial drone package delivery service to customers, including businesses and households, in North Carolina. The proposed action is *needed* to provide businesses with another option—in addition to using an automobile—of delivering goods and products to other businesses and consumers. The introduction of drone technology to provide package delivery services has created another transportation option.

FAA ROLE AND FEDERAL ACTION

In general, Congress has charged the FAA with the safety of air commerce in the United States and to encourage the development of civil aeronautics. The FAA provides multiple approvals associated with

package delivery proposals, such as a waiver of 14 CFR § 91.113(b) to enable beyond visual line of sight (BVLOS) operations, and a Certificate of Waiver or Authorization; however, the FAA’s issuance of an Operations Specifications (OpSpec) to include package delivery flights in a specified operating area is the approval that ultimately enables drone operations.

As described in PEA Section 1.2, the FAA has specific statutory and regulatory obligations related to its issuance of a Part 135 certificate and the related OpSpec. The FAA is required to issue an operating certificate to an air carrier when it finds, after investigation, that the person properly and adequately is equipped and able to operate safely.

PROPOSED ACTION

The proposed action is the operation of commercial drone package deliveries from takeoff and landing areas (referred to as “hubs” in the PEA) based on NCDOT’s maximum forecasted Part 135 operations in the state of North Carolina out to year 2030. The proposed action includes the implementation of shared access UAS surveillance systems in communities. Refer to PEA Section 2.2 for a complete description of the proposed action, including information on the characteristics of the UAS considered in the analysis, description of operations, and the operating areas. Table 2 in the PEA provides a breakdown of the estimated deliveries per operating area in 2030 and Figures 2 through 9 in the PEA identify the location of each proposed operating area.

ALTERNATIVES

Alternatives analyzed in detail in the PEA include the proposed action and the no action alternative. Under the no action alternative, there would be no change to current Part 135 operations in North Carolina and UAS operators would continue conducting drone package delivery operations in North Carolina according to existing approvals and without the implementation of a shared access UAS traffic management system in communities. Under the no action alternative, operators would be able to conduct package delivery operations according to 14 CFR Part 107, which limits drone package delivery operations to visual line of sight. Refer to PEA Section 2.1 for more information on the no action alternative.

ENVIRONMENTAL IMPACTS

As documented in the PEA, the proposed action and no action alternative were evaluated for potential impacts to all environmental impact categories identified in FAA Order 1050.1.F. Chapter 3 of the PEA describes the affected environment and regulatory setting and identifies environmental impact categories that are not analyzed in detail. The environmental impact categories not analyzed in detail include air quality; biological resources (fish and plants only); climate; coastal resources; farmlands; hazardous materials, solid waste, and pollution prevention; land use; natural resources and energy supply; socioeconomics and children’s environmental health and safety risks; and water resources (including wetlands, floodplains, surface waters, and groundwater). Refer to PEA Section 3.2 for the rationale of dismissing these impact categories from detailed analysis.

Chapter 3 of the PEA also provides detailed evaluations of the potential environmental consequences for each of the remaining environmental impact categories and documents the finding that the

proposed action is not expected to result in significant environmental impacts. Regarding noise and noise-compatible land use, this finding is based on operators implementing mitigation to avoid significant noise impacts (refer to the Mitigation section below).

A summary of the environmental analysis for each environmental impact category analyzed in detail is presented below.

- **Noise and Noise-Compatible Land Use**, PEA Section 3.3 and Appendix D. Noise impacts would be greatest at the hubs where the drones takeoff and land. Tables 15 and 16 of the noise assessment report (PEA Appendix D) provide the extent of the day-night average sound level (DNL) contours under the flight path for any one hub. Table 4 in the PEA summarizes the extent of the estimated DNL noise exposure for hub locations in 2030, assuming up to 500 average daily deliveries. Table 4 shows the proposed action's DNL 65-dB contour extending 38 feet or 150 feet, depending on the size or sound level of the drone. To avoid significant noise impacts from hub operations, drone operators must site a hub a sufficient distance away from a noise sensitive area (refer to the Mitigation section below).

For noise estimation under en route conditions, the drones are conservatively assumed to fly the same outbound flight path between the hub and the delivery point and inbound flight path back to the hub. The maximum number of annual average daily deliveries forecast to occur in any operating area is approximately 5,000 for the Charlotte Metro and Research Triangle operating areas. Using an average daily DNL equivalent deliveries of up to 5,000, which is up to 1,825,000 annual DNL equivalent deliveries, the estimated DNL noise exposure for under en route deliveries in 2030 is DNL 59.6 dB. Refer to Table 17 of the noise assessment report (PEA Appendix D) for the estimated DNL for average daily overflights ranging from 1 to 5,000 for different drone sound exposure levels. Noise levels from overflights are not expected to generate a significant noise impact.

The noise exposure for delivery location operations includes the noise exposure for all flight activity occurring at and around the delivery point. The maximum potential number of daily deliveries to individual delivery locations is unknown, but the FAA expects that more than one or two deliveries per day over the course of a year at the same location would be atypical. Thus, the analysis assumed five deliveries per day at the same delivery location. Table 18 of the noise assessment report (PEA Appendix D) provides the noise exposure for any one delivery point. Table 6 in the PEA summarizes the estimated DNL noise exposure for delivery locations in 2030 assuming up to five average daily deliveries to a location. At 125 feet, the estimated delivery DNL is 38.3 dB or 46.0 dB, depending on the size and sound level of the drone. Noise levels from deliveries are not expected to generate a significant noise impact.

With implementation of the noise mitigation described below in the Mitigation section, the proposed action is not expected to result in significant noise impacts.

- **Visual Effects**, PEA Section 3.4. Visual effects from drone package delivery flights could occur during all flight phases. When making a delivery, the drone would depart from a hub and travel

en route at an altitude less than 400 feet above ground level and therefore could be visible by someone looking for a drone in the sky. The FAA estimates the drone en route would be observable for approximately 6 to 8 seconds by an observer on the ground based on speed and altitude, thus limiting the potential for visual effects to occur from overflights.

The density of deliveries would range from 1.4 deliveries per square mile per day to 4.8 deliveries per square mile per day. Because most package deliveries would be to residences, more than one or two package deliveries to the same location each day would be atypical. Therefore, the potential for visual effects to occur at any given delivery location is limited.

The highest concentrations of overflights would occur in proximity to each hub, which are primarily located in commercial areas, such as parking lots and commercial buildings, that have high amounts of ambient lighting. Current FAA-issued exemptions for drone package delivery require operators to have operable anti-collision lights on for all flight operations. These lights would be more visible before sunrise and after sunset during operating hours. However, because hubs are expected to be located in areas that are not visually sensitive, operations at the hub are not expected to affect the nature of the visual character of the area or contrast with visual resources and/or the visual character of these developed areas. Additionally, hub operations would not block or obstruct the views of visual resources given the small size of the drones.

In summary, the proposed action is not expected to result in significant visual effects.

- **Historical, Architectural, Archeological, and Cultural Resources**, PEA Section 3.5 and Appendix E. Given the size of the drones and predicted sound levels, operations would not produce vibrations that could impact the architectural structure or contents of any historic property in the study area. While a drone is not expected to generate significant noise levels at or within any historic property, the FAA considered drone delivery noise and potential visual effects on historic properties where a quiet setting or visually unimpaired sky might be a key attribute of the property's significance. The highest concentration of flights would occur around hubs where drones takeoff and land. As a result, noise and visual impacts are expected to be the highest in close proximity to hubs. Based upon the assessment, in accordance with Section 106 of the National Historic Preservation Act, the FAA proposed a *finding of no adverse effect* on historic properties and consulted the State Historic Preservation Officer (SHPO). The SHPO concurred with the FAA's finding. See PEA Appendix E for correspondence related to Section 106 consultation with the SHPO. The SHPO identified mitigation regarding the siting of hubs near historic properties (refer to the Mitigation section below).

In accordance with Executive Order 13175, *Consultation and Coordination with Indian Tribal Governments*, the FAA sent a letter to the Eastern Band of Cherokee Indians, the only federally recognized tribe in North Carolina. The FAA did not receive a response from the tribe.

In summary, the proposed action is not expected to result in significant impacts on historical, architectural, archeological, and cultural resources.

- **Department of Transportation Act Section 4(f)**, PEA Section 3.6. The proposed action would not result in a physical *use* of any Section 4(f) property because there would not be any physical occupation or alteration of a Section 4(f) property or any portion of a Section 4(f) property. Existing policies in place by agencies such as the National Park Service (NPS), U.S. Forest Service (USFS), and the North Carolina Department of Natural and Cultural Resources (NCDNR) prohibit or limit drone operations within properties they manage, which can be Section 4(f) properties.

Due to the limited duration that a drone could be seen or heard from a Section 4(f) property and existing federal and state policies that limit drone operations within the boundaries of Section 4(f) properties, the proposed action is not expected to result in substantial impairment of a Section 4(f) resource to the degree that the protected activities, features, or attributes of the resource that contribute to its significance or enjoyment are substantially diminished and therefore would not result in a constructive use of a Section 4(f) property. Therefore, the proposed action is not expected to result in significant impacts on Section 4(f) properties.

- **Water Resources (Wild and Scenic Rivers)**, PEA Section 3.7. There are no Wild and Scenic Rivers in the study area. There are eleven segments of rivers that are on the Nationwide Rivers Inventory (NRI), most of which are within or near urban areas. The proposed action would not physically impact a river or river segment on the NRI. Although drones might fly over NRI river segments during package delivery operations, the FAA does not expect drones would overfly NRI river segments at an intensity that could cause any detrimental impacts to the character or values of these resources. At the altitude and speed at which a drone would fly en route to or from a hub, the drone may not be detected by an observer recreating at a river on the NRI. If it is detected, the duration for which the drone would be visible would be short. Therefore, the proposed action would not result in significant impacts to Wild and Scenic Rivers or rivers on the NRI.
- **Biological Resources (Wildlife)**, PEA Section 3.8 and Appendix H. The proposed action would not involve any construction or ground disturbance. Hubs are expected to be located in a business's parking lot, rooftop, or other previously developed/disturbed area. Deliveries would occur at residences or other places of business. Therefore, the proposed action would not physically alter any wildlife habitat.

Drone noise, visual presence, and the potential for airborne strikes with flying species are the proposed action's potential stressors or threats to wildlife. Flight operations would take place mostly in an urban or suburban environment, within airspace, and typically remain well above the tree line while en route to and from a hub. The duration of exposure by wildlife on the ground to visual or noise impacts from the drone would be of very short duration (less than 60 seconds during takeoff/landing, up to 90 seconds during delivery, and a few seconds during the en route phase as the drone flies by).

The proposed action is not expected to adversely affect wildlife populations in the study area. While there is potential that drone package delivery operations could impact bald eagles, due to the short duration of potential nuisance and small chance of strike, the proposed action is not expected to result in any bald eagle mortality. Operators are required to comply with the Bald and Golden Eagle Protection Act (BGEPA), which requires identifying active bald eagle nests within the operating area. Operations that require an eagle permit would have to comply with permit conditions intended to avoid or minimize bald eagle disturbance.

The FAA evaluated the potential for the proposed action to affect species listed and habitat designated under the Endangered Species Act (ESA) and consulted the U.S. Fish and Wildlife Service (USFWS) in accordance with Section 7 of the ESA. The FAA determined the proposed action would have *no effect* on designated critical habitat and critical habitat proposed for designation. The FAA determined the proposed action would have *no effect* on some ESA-listed species and *may affect, but is not likely to adversely affect*, other ESA-listed species. The USFWS concurred with the FAA's *may affect* determinations. Refer to PEA Appendix H for documentation and correspondence related to the ESA consultation.

In summary, the proposed action is not expected to result in significant impacts on wildlife.

- **Environmental Justice**, PEA Section 3.9. The proposed action would not result in significant impacts in any other environmental impact category. As documented in the PEA, drone sound levels could be perceptible in areas within the operating areas but would stay below the level determined to constitute a significant impact, assuming operators site their hubs in accordance with the setbacks described in the PEA and noted below in the Mitigation section. Drone package deliveries would provide additional access to small goods, such as groceries and medicine, which could present a positive effect on low-income and minority communities where individuals may not have reliable access to personal vehicles and/or other modes of transportation.

The proposed action would not create impacts that exceed thresholds of significance in other environmental impacts, nor would it generate impacts on the physical or natural environment that affect an environmental justice population in a way that the FAA determines are unique to that population and significant to that population.

In summary, the proposed action is not expected to result in significant environmental justice impacts.

Chapter 4 of the PEA provides an analysis of the potential cumulative impacts of the proposed action when added to other past, present, and reasonably foreseeable actions. The FAA has determined the proposed action would not result in significant cumulative impacts in any environmental impact category. Please refer to PEA Chapter 4 for a discussion of potential cumulative impacts.

In evaluating Part 135 drone package delivery applications for operations in North Carolina, the FAA would use the checklist in PEA Appendix B to determine if additional environmental review is necessary.

MITIGATION

Chapter 3 of the PEA includes recommended mitigation measures, as well as noise-related mitigation that is required to avoid significant noise impacts. The environmental finding in this Mitigated FONSI/ROD is based on operators implementing that noise mitigation. If operators would not implement the noise mitigation, additional environmental review would be required, including potentially the preparation of an EIS. The mitigation included in the final PEA is presented below for applicable environmental impact categories.

Noise and Noise-Compatible Land Use

The FAA requests that UAS operators conducting drone package delivery operations locate hubs a certain setback distance from noise-sensitive land use to avoid significant noise impacts. Assuming the maximum number of daily operations, 500 deliveries per day, from a single hub, the requested setbacks are as follows:

- If the hub is located outside the surface areas of Class B, C, or D airspace, the setback distance from noise-sensitive land use is at least 89 feet for Group 1 drones and 254 feet for Group 2 drones.
- If the hub is located inside the surface areas of Class B, C, or D airspace, the setback distance from noise-sensitive land use is at least 913 feet for Group 1 drones and 1,147 feet for Group 2 drones.

As described in PEA Section 3.3, Group 1 drones are lighter drones and Group 2 drones are heavier drones.

The setback distances for UAS operators that propose to conduct fewer than 500 daily deliveries per day at a hub would be less than those identified for 500 deliveries per day and are presented Tables 15 and 16 of the noise assessment report (PEA Appendix D).

UAS operators that propose to locate drone package delivery operation hubs within the requested setback distances for the relevant number of daily deliveries are required to complete a detailed noise analysis specific to the proposed activity to evaluate the potential for significant noise impacts.

Visual Effects

Visual effects would be avoided or minimized by the mitigation identified below for historical, architectural, archeological, and cultural resources, as well as mitigation identified for Department of Transportation Act Section 4(f).

Historical, Architectural, Archeological, and Cultural Resources

To avoid effects on historic properties, the SHPO recommends a 0.5-mile buffer around historic properties that have been identified as sensitive to drone package delivery operations (refer to PEA

Table 8). If an operator proposed to place a hub within the 0.5-mile buffer of one of these properties, additional consultation with the SHPO would be required.

Drone package delivery operators would not be allowed to takeoff from, land in, or fly over the Pinehurst Historic District and Guilford Courthouse National Military Park. Additionally, if the FAA received an application that involved drones flying over the Blue Ridge Parkway (Asheville operating area), the FAA would coordinate further with NPS to identify specific corridor crossings that avoid noise sensitive habitat, critical infrastructure, and areas of concentrated visitor use.

Additionally, the FAA expects UAS operators conducting drone package delivery operations to comply with existing policies regarding drone use associated with any of the historic properties that have been identified as sensitive to drone package delivery operations (PEA Table 8). For example:

- According to the NPS, launching a drone from or landing a drone on lands and waters administered by the NPS within the boundaries of the park is prohibited except as approved in writing by the park superintendent. This includes the Blue Ridge Parkway and Guilford Courthouse National Military Park.
- Launching a drone from or landing a drone on Biltmore property is prohibited.
- Drone operators are prohibited from ascending or taking off within or upon any state park area or state park water surface without consent or a Special Activity Permit. This includes the Flume House in Crowders Mountain State Park and Crabtree Creek Recreational Demonstration Area Historic District (William B. Umstead State Park).

Department of Transportation Act Section 4(f)

In addition to the mitigation identified above for noise and historic properties, if an operator were to fly its drone within a section of the Pisgah National Forest in the Asheville operating area, the FAA recommends UAS operators abide by USFS guidance related to UAS operations within USFS property boundaries, including keeping drones away from populated and noise-sensitive areas, such as campgrounds, trail heads, and visitor centers.

Also, as noted above, the North Carolina Department of Natural and Cultural Resources prohibits drone operators from ascending or taking off within or upon any state park area or state park water surface without consent or a Special Activity Permit.

Biological Resources (Wildlife)

The FAA developed the following measures as part of the ESA consultation with the USFWS to lead to avoidance and minimization of effects to ESA-listed species to assist in the conservation of these resources.

- The FAA will inform UAS operators about the potential presence of ESA-listed species in the operating area and each operator's obligation to comply with environmental laws (e.g., ESA, BGEPA, and Migratory Bird Treaty Act)
- The FAA will recommend each UAS operator provide an environmental awareness briefing to all personnel as part of its operational plans for purposes of advising personnel about the potential

presence of ESA-listed species in the operating area and identifying where such species may be present in the operating area.

- The FAA will contact the North Carolina Wildlife Resources Commission bat biologist to obtain statewide bat roost and hibernacula data. The FAA will provide this data to Part 135 package delivery operators and request operators prohibit hovering, taking off, and landing within 150 feet of the bat roost or hibernacula. In the case of roosts in bridges or culverts, the 150-foot buffer applies to any point on the structure.
- The FAA will recommend to operators operating in the Greenville and Wilmington operating areas from June to October to conduct en route flights at an altitude of 350 feet over potential manatee habitat.

In addition to the mitigation measures identified as part of the ESA consultation, the FAA recommends drone package delivery operations that cross rivers, streams, or other linear waterbodies, such as the Atlantic Intracoastal Waterway, be flown in a perpendicular fashion to avoid or minimize potential effects to wildlife that use aquatic or riparian habitat. Flight paths should not run parallel to or along a stream, river, or other waterbody.

PUBLIC INVOLVEMENT

As part of developing the draft PEA, the FAA solicited comments from city managers of major cities within the study area for the purpose of obtaining feedback from local governments regarding potential environmental concerns. The FAA received two responses (see PEA Appendix C).

The FAA created a Notice of Availability (NOA) with information about the draft PEA and provided it to local, state (including the North Carolina State Environmental Review Clearinghouse), and federal officials, interest groups, and federally recognized tribes. The FAA also announced availability of the draft PEA for public review via the FAA's social media accounts and advertisements in the following newspapers: Asheville Citizen Times, Charlotte Observer, Fayetteville Observer, Greenville Daily Reflector, Raleigh News & Observer, Wilmington Star News, and The Chronicle (Winston-Salem). The NOA provided information about the proposed action and requested public review and comments on the draft PEA, which was published on the FAA's website for a 30-day comment period. Interested parties were invited to submit comments on any environmental concerns related to the proposed action. In addition, the NOA included information on the virtual public meeting held by the FAA on Tuesday, May 21, 2024, at 6:00 p.m. Eastern Time.

The FAA conducted a virtual public meeting via Zoom webinar. The FAA provided an overview of the project and its potential impacts, responded to questions from meeting participants, and provided an opportunity for participants to deliver oral comments to be included in the project record. Approximately 33 individuals not affiliated with the FAA or its consultant team participated in the meeting. These individuals include stakeholders, industry representatives, and the public. No one provided oral comments during the virtual public meeting.

The FAA received six written comment submissions during the public comment period. Appendix I contains copies of these submissions and the FAA's responses.

FINDING

The FAA finding is based on a comparative examination of environmental impacts for each of the alternatives studied during the environmental review process. The PEA discloses the potential environmental impacts for each of the alternatives and provides a full and fair discussion of those impacts. Based on FAA's review and analysis and consideration of comments, it has determined that, with implementation of the noise mitigation measures identified above, there would be no significant impacts to the natural environment or surrounding population as a result of the proposed action.

The FAA believes the proposed action best fulfills the purpose and need identified in the PEA. An FAA decision to take the required actions and approvals is consistent with its statutory mission and policies supported by the findings and conclusions reflected in the environmental documentation and this Mitigated FONSI/ROD.

After careful and thorough consideration of the facts contained herein and following consideration of the environmental impacts described, the undersigned finds the proposed federal action is consistent with existing national environmental policies and objectives as set forth in Section 101(a) of NEPA and other applicable environmental requirements and will not significantly affect the quality of the human environment or otherwise include any condition requiring consultation pursuant to Section 102(2)(C) of NEPA.

DECISION AND ORDER

The FAA recognizes its responsibilities under NEPA, CEQ regulations, and its own directives. Recognizing these responsibilities, I have carefully considered the FAA's goals and objectives in reviewing the environmental aspects of the proposed action to approve drone package delivery operations to customers, including businesses and households, in North Carolina. Based upon the above analysis, the FAA has determined the proposed action meets the purpose and need.

The environmental review included the purpose and need to be served by the proposed action, alternatives to achieving them, the environmental impacts of these alternatives, and conditions to preserve and enhance the human environment. This decision is based on a comparative examination of the environmental impacts for each of these alternatives. The PEA provides a fair and full discussion of the impacts of the proposed action. The NEPA process included appropriate consideration for avoidance and minimization of impacts, as required by NEPA, the CEQ regulations, and other special purpose environmental laws, and appropriate FAA environmental orders and guidance.

The FAA has determined that environmental concerns presented by interested agencies and the general public have been addressed in the PEA. The FAA believes that, with respect to the proposed action, the NEPA requirements have been met. FAA approval of this environmental review document indicates that applicable federal requirements for environmental review of the proposed action have been met.

Having carefully considered and being properly advised as to the anticipated environmental impacts of the proposal as described in the PEA and the Mitigated FONSI/ROD, under the authority delegated by the Administrator of the FAA, I find the proposed action is consistent with existing national

environmental policies and objectives as set forth in Section 101 of NEPA and other applicable environmental requirements, and will not significantly affect the quality of the human environment or otherwise include any condition requiring consultation pursuant to Section 102(2)(C) of NEPA. In addition, the action is the type of action that does not require an EIS under NEPA.

Issued on: _____

Derek Hufty
Manager, General Aviation and Commercial Branch
Emerging Technologies Division
Office of Safety Standards, Flight Standards Service

RIGHT OF APPEAL

This Mitigated FONSI/ROD constitutes a final agency action and a final order taken pursuant to 49 U.S.C. §§ 40101 et seq. and constitutes a final order of the FAA Administrator which is subject to exclusive judicial review by the Courts of Appeals of the United States in accordance with the provisions of 49 U.S.C. § 46110. Any party having substantial interest in this order may apply for a review of the decision by filing a petition for review in the appropriate United States Court of Appeals no later than 60 days after the order is issued in accordance with the provisions of 49 U.S.C. § 46110.

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**Federal Aviation
Administration**

Final Programmatic Environmental Assessment for Drone Package Delivery in North Carolina

July 2024

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Appendix I	Public Involvement Comments and Responses

Acronyms & Abbreviations

5W4	P K Airpark Airport
ACS	American Community Survey
AGL	above ground level
APE	Area of Potential Effects
AVL	Asheville Regional Airport
BGEPA	Bald and Golden Eagle Protection Act
BVLOS	beyond visual line of sight
CAA	Clean Air Act
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CLT	Charlotte Douglas International Airport
dB	decibel
dba	A-weighted decibel
DNL	Day-Night Average Sound Level
DOE	eligible for NRHP listing
DOT	U.S. Department of Transportation
EA	environmental assessment
EIS	environmental impact statement
EJ	environmental justice
EO	Executive Order
EQY	Charlotte Monroe Executive Airport
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FAY	Fayetteville Regional Airport
FONSI	Finding of No Significant Impact
GSO	Piedmont Triad International Airport
HHS	Department of Health and Human Services
IGX	Horace Williams Airport
ILM	Wilmington International Airport

INT	Smith Reynolds Airport
IPaC	Information for Planning and Consultation
IPP	UAS Integration Pilot Program
JQF	Concord Padgett Regional Airport
MBTA	Migratory Bird Treaty Act
MTOW	maximum takeoff weight
NAS	national airspace system
NCDOT	North Carolina Department of Transportation
NCWRC	North Carolina Wildlife Resources Commission
NEPA	National Environmental Policy Act of 1969, as amended
NHL	National Historic Landmark
NMFS	National Marine Fisheries Service
NOA	Notice of Availability
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
NRHP	National Register of Historic Places
NRHD	National Register Historic District
NRI	Nationwide Rivers Inventory
OpSpec	Operations Specifications
Part 135	14 CFR Part 135
PEA	programmatic environmental assessment
PGV	Pitt-Greenville Airport
RDU	Raleigh-Durham International Airport
RUQ	Mid-Carolina Regional Airport
SEL	sound exposure level
SHPO	State Historic Preservation Officer
SL	state listed
SLDOE	eligible for listing on State Register
SOP	Moore County Airport
UA	unmanned aircraft
UAS	unmanned aircraft systems

U.S.	United States
U.S.C.	United States Code
USEPA	United States Environmental Protection Agency
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
UTM	UAS Traffic Management System
VO	visual observer

Chapter 1

Introduction

The National Environmental Policy Act (NEPA)¹ is the United States' basic national charter for protection of the environment. It is intended to ensure federal agencies consider the environmental impacts of their actions in the decision-making process. NEPA established the Council on Environmental Quality (CEQ) within the Executive Office of the President to ensure federal agencies meet their obligations under NEPA. CEQ oversees NEPA implementation, principally through issuing guidance and interpreting regulations that implement NEPA's procedural requirements. CEQ's NEPA-implementing regulations are found at 40 Code of Federal Regulations (CFR) Parts 1500–1508. The Federal Aviation Administration's (FAA) policies and procedures for compliance with NEPA and CEQ's regulations are contained in FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*.²

NEPA requires federal agencies to assess the environmental effects of proposed major federal actions prior to making decisions. Major FAA actions include authorizations issued to operators of Unmanned Aircraft Systems (UAS) to enable unmanned aircraft (UA; also referred to as a drone) operations in the national airspace system (NAS). One type of UAS operation is using drones to deliver goods to customers (referred to as package delivery). In 2019, the FAA began issuing air carrier certificates to UAS operators in accordance with 14 CFR Part 135 (Part 135) so that operators could conduct package delivery flights. Generally, these approvals were primarily associated with amendments to Part 135 air carrier Operations Specifications (OpSpec)³ as the operative approval. The FAA has completed 17 environmental assessments (EAs) in accordance with FAA Order 1050.1F for individual package delivery proposals. Each EA resulted in a finding of no significant impact (FONSI).⁴

To support the environmental review process for UAS package delivery proposals in the state of North Carolina, the FAA, in coordination with the North Carolina Department of Transportation (NCDOT) as the project proponent, has prepared this programmatic EA (PEA) in accordance with NEPA, CEQ NEPA-implementing regulations, and FAA Order 1050.1F. A programmatic environmental review assists decisionmakers and the public in understanding the environmental impact from proposed large scope federal actions and activities. A programmatic NEPA document may be prepared to cover (1) a broad group of related actions; or (2) a program, policy, plan, system, or national level proposal that may later lead to individual actions, requiring subsequent NEPA analysis.⁵ A programmatic document is useful in analyzing the cumulative impacts of a group of related actions. When the proposed actions are adequately analyzed, the programmatic document can serve as the NEPA review for those actions. Programmatic documents may also be useful in providing the basis for subsequent project-level specific environmental reviews. A programmatic NEPA document may contain a broader, less specific analysis compared to what is performed for a specific proposed project.

¹ 42 U.S.C. §§ 4321 et seq.

² See: https://www.faa.gov/about/office_org/headquarters_offices/apl/enviro_policy_guidance/policy/faq_nepa_order.

³ An Operations Specifications is a document that defines the scope of aircraft operations that the FAA has authorized.

⁴ See: https://www.faa.gov/uas/advanced_operations/nepa_and_drones.

⁵ FAA Order 1050.1F, Paragraph 3-2.

A programmatic review can also be used to establish boundaries for analyses, documentation, and decisions of subsequent project-level decisions to minimize repetition and delay. Programmatic reviews and documentation can identify best management practices or mitigation measures to avoid environmental impacts on resources and alleviate the need for subsequent reviews. When a programmatic NEPA document is prepared, the FAA may still require project- or operational-specific NEPA documents for individual actions where more detailed analyses are warranted.

The FAA intends to use this PEA to comply with its NEPA requirements for subsequent requests for authorizations from individual UAS operators proposing to conduct package delivery operations in North Carolina. Upon receiving an authorization request, the FAA will evaluate the proposal against this PEA to determine if the proposal and its potential environmental consequences fall within the scope of this PEA. If the proposal falls outside the scope of this PEA, the FAA will conduct further environmental review, which could include preparing another NEPA document that tiers from this PEA.

1.1 Background

In 2012, the United States (U.S.) Congress first charged the FAA with integrating UAS into the NAS.⁶ The FAA has engaged in a phased, incremental approach to integrating drones into the NAS and continues to work toward full integration of drones into the NAS. From 2017 through 2020, the UAS Integration Pilot Program (IPP)⁷ focused on testing and evaluating the integration of drone operations into the NAS. This work continues under the UAS BEYOND program⁸ which focuses on the remaining challenges of UAS integration, including beyond visual line of sight (BVLOS) operations, societal and economic benefits of UAS operations, and community engagement. Participants in these programs are among the first to prove their concepts, including package delivery by drone through Part 135 air carrier certification. Part 135 certification is currently the only path for drones to carry the property of another for compensation or hire BVLOS. Along with issuing a Part 135 certificate to a UAS operator, the FAA issues an OpSpec to identify the scope of operations allowed under the certificate.

Drone package delivery operators are standard Part 135 operators. This means the certificate holder does not have pre-set limits on the available size or scope of their operations. The certificate holder must apply, qualify, and be granted FAA authorization through amendments to their OpSpec for each type of operation they wish to conduct. When certificate holders change the scope of their operations—including expanding operations to add new delivery areas, using new distribution centers or hubs for launch and landing UA, modifying operation times, or other changes—the operator must apply for an amendment to its OpSpec.

The NCDOT has been a lead partner in the FAA's drone integration partnership programs since 2017, first as a partner in the IPP and then continuing as a partner in the BEYOND program. In this role, the NCDOT is collaborating with partners to test and prove operations that can gain FAA approvals to expand BVLOS and other complex operations in the state. Within the state of North Carolina, the NCDOT has the authority to implement and manage regulations pertaining to state laws as set by the North Carolina State General Assembly concerning drone operations.

⁶ 49 U.S.C. 44802; FAA Modernization and Reform Act of 2012, Pub. L. No. 112-95, Sec. 332. 126 Stat. 11, 73 (2012).

⁷ See: https://www.faa.gov/uas/programs_partnerships/completed/integration_pilot_program.

⁸ See: https://www.faa.gov/uas/programs_partnerships/beyond.

To support the development of this PEA, NCDOT developed a forecast for future Part 135 UAS package delivery operations in North Carolina. The NCDOT provided its forecast to the FAA for use in this PEA. The FAA used the forecast to identify operating areas where UAS package delivery operations are likely to occur between 2024 and 2030 and to define the levels of UAS activities that may be expected based on existing and future market analyses.

The NCDOT developed two forecast scenarios: a 2030 baseline scenario and a 2030 UAS traffic management system (UTM) scenario.⁹ The 2030 baseline scenario estimates Part 135 drone package deliveries that are likely to be in effect in North Carolina by 2030 with only proprietary, operator-specific air traffic management systems in use. The 2030 UTM scenario envisions the implementation of a shared-access UAS surveillance system in communities that would alleviate many of the challenges of operating BVLOS within airspace shared by multiple operators. The UTM scenario considers the operational effects of all operators having access to shared, real-time aircraft position enabling more robust air traffic deconfliction. NCDOT's forecast contains low, medium, and high estimates for daily operations for each scenario. For conservative purposes, the FAA is using the high estimate for the UTM scenario for evaluation in this PEA.

1.2 FAA Role and Federal Action

In general, Congress has charged the FAA with the safety of air commerce in the U.S. and to encourage the development of civil aeronautics.¹⁰ The FAA provides multiple approvals associated with package delivery proposals, such as a waiver of 14 CFR § 91.113(b) to enable BVLOS operations, and a Certificate of Waiver or Authorization;¹¹ however, the FAA's issuance of an OpSpec (or amended OpSpec) to include package delivery flights in a specified operating area is the approval that ultimately enables UA operations.

The FAA has specific statutory and regulatory obligations related to its issuance of a Part 135 certificate and the related OpSpec. The FAA is required to issue an operating certificate to an air carrier when it "finds, after investigation, that the person properly and adequately is equipped and able to operate safely under this part and regulations and standards prescribed under this part."¹² An operating certificate also specifies "terms necessary to ensure safety in air transportation; and (2)...the places to and from which, and the airways of the United States over which, a person may operate as an air carrier."¹³ Also included in air carrier certificates is a stipulation that the air carrier's operations must be conducted in accordance with the conditions and limitations specified in the OpSpec.¹⁴ The regulations also specify that a Part 135 certificate holder may not operate in a geographical area unless its OpSpec specifically authorizes the certificate holder to operate in that area.¹⁵ The regulations implementing 49 U.S.C. § 44705 specify that an air carrier's approved OpSpec must include, among other things, "authorization and limitations for routes and areas of operations."¹⁶ An air carrier's OpSpec may be amended at the request of an operator if the FAA "determines

⁹ For more information on UTM, see: https://www.faa.gov/uas/advanced_operations/traffic_management.

¹⁰ 49 U.S.C. § 40104.

¹¹ A Certificate of Waiver or Authorization is an authorization issued by the Air Traffic Organization to an operator for a specific UA activity.

¹² 49 U.S.C. § 44705.

¹³ Id.

¹⁴ 14 CFR § 119.5 (g), (l).

¹⁵ 14 CFR § 119.5(j).

¹⁶ 14 CFR § 119.49(a)(6).

that safety in air commerce and the public interest allows the amendment.”¹⁷ After making this determination, the FAA must take an action on the OpSpec amendment.

As noted above, the FAA has been preparing EAs for individual operator requests to conduct drone package delivery. Since issuing the first Part 135 approval for UAS to deliver cargo for compensation or hire in 2019 (FAA 2023b), Part 135 approvals have become increasingly important in the FAA’s strategy to regulate the development of commercial UAS package delivery services. Interest in UAS delivery services is rapidly rising, with the number of non-model registrations of small UAS increasing from 12,093 to 726,936 registrations between 2016 and 2023 (FAA 2023b). Because Part 135 approvals require a federal action, they must undergo environmental reviews to comply with NEPA. The purpose of this PEA is to streamline the NEPA process for multiple repetitive actions by broadly analyzing direct, indirect, and cumulative impacts that may occur as a result of Part 135 approvals for UAS operators in North Carolina.

1.3 Purpose and Need

The proposed action analyzed in this PEA is UAS operators conducting commercial drone package deliveries under Part 135 in North Carolina as described in **Section 2.2**. The *purpose* of the proposed action is to provide commercial drone package delivery service to customers, including businesses and households. The proposed action is *needed* to provide businesses with another option—in addition to using an automobile—of delivering goods and products to other businesses and consumers. The introduction of drone technology to provide package delivery services has created another transportation option.

1.4 Scope of the PEA

This PEA analyzes the potential environmental impacts associated with UAS package delivery in North Carolina on a programmatic level in accordance with FAA Order 1050.1F. It considers the NCDOT-identified types, frequency, and locations of UAS activities. The purpose of this PEA is to:

1. Streamline the NEPA process for multiple repetitive actions by broadly analyzing direct, indirect, and cumulative impacts that may occur as a result of the proposed action; and
2. Provide programmatic-level recommendations for mitigation measures to avoid significant impacts, if necessary, and alleviate the need for subsequent individual reviews.

The study area evaluated for potential impacts to the environment is defined as the area surrounding UAS activities on the ground and the airspace in which UA are flown. Analyses in this PEA are based on UA in use by Part 135 operators at time of the forecast within the operating areas identified in the forecast (see **Section 3.3** for a list of operators and UA). The FAA will evaluate Part 135 applications as they are received, compare them to the scope of the PEA, and determine whether any additional environmental review is needed. The FAA will use the checklist in **Appendix B** to assist in making this determination.

¹⁷ 14 CFR § 119.51(a); see also 49 U.S.C. § 44709.

1.5 Public Involvement

As part of developing the draft PEA, the FAA solicited comments from city managers of major cities within the study area for the purpose of obtaining feedback from local governments regarding potential environmental concerns. The FAA received two responses (see **Appendix C**).

The FAA created a Notice of Availability (NOA) with information about the draft PEA and provided it to local, state (including the North Carolina State Environmental Review Clearinghouse), and federal officials, interest groups, and federally recognized tribes.¹⁸ The FAA also announced availability of the draft PEA for public review via the FAA's social media accounts¹⁹ and advertisements in the following newspapers: Asheville Citizen Times, Charlotte Observer, Fayetteville Observer, Greenville Daily Reflector, Raleigh News & Observer, Wilmington Star News, and The Chronicle (Winston-Salem).

The NOA provided information about the proposed action and requested public review and comments on the draft PEA, which was published on the FAA's website²⁰ for a 30-day comment period. Interested parties were invited to submit comments on any environmental concerns related to the proposed action. In addition, the NOA included information on the virtual public meeting held by the FAA on Tuesday, May 21, 2024, at 6:00 p.m. Eastern Time.

The FAA conducted a virtual public meeting via Zoom webinar. The FAA provided an overview of the project and its potential impacts, responded to questions from meeting participants, and provided an opportunity for participants to deliver oral comments to be included in the project record. Approximately 33 individuals not affiliated with the FAA or its consultant team participated in the meeting. These individuals include stakeholders, industry representatives, and the public. No one provided oral comments during the virtual public meeting.

The FAA received six written comment submissions during the public comment period. **Appendix I** contains copies of these submissions and the FAA's responses. The FAA did not make substantive changes to the draft PEA when preparing the final PEA.

¹⁸ See: <https://www.bia.gov/service/tribal-leaders-directory/federally-recognized-tribes>.

¹⁹ X (formerly Twitter), Instagram, LinkedIn, and Facebook.

²⁰ See: https://www.faa.gov/uas/advanced_operations/nepa_and_drones.

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Description of Proposed Action and Alternatives

FAA Order 1050.1F, Paragraph 6-2.1(d) states “[a]n EA may limit the range of alternatives to the proposed action and no action alternative when there are no unresolved conflicts concerning alternative uses of available resources.” The FAA has not identified any unresolved conflicts concerning alternative uses of available resources associated with this proposal. Therefore, this PEA only considers the no action alternative and the proposed action.

2.1 No Action Alternative

CEQ’s NEPA-implementing regulations require consideration of a no action alternative (40 CFR §§ 1501.9 and 1502.14). In instances involving federal decisions on proposals for projects, “no action” means the proposed activity would not take place, and the resulting environmental effects from taking no action are compared with the effects of authorizing the proposed activity to go forward.²¹

In the context of this PEA, the no action alternative means there would be no change to current Part 135 operations in North Carolina. This alternative assumes UA operators would continue conducting drone package delivery operations in North Carolina according to existing approvals and without the implementation of a shared access UAS traffic management system in communities. The no action alternative also includes potential future Part 135 operations as defined in any future applications received by the FAA; however, because the scale and intensity of future applications are not yet defined, only existing Part 135 operations are analyzed as part of the no action alternative for this PEA.

The FAA previously conducted environmental assessments for drone package delivery operations in North Carolina for three operators:

- UPS Flight Forward in Winston-Salem (FAA 2021, 2022)
 - The most recent EA (FAA 2022) for UPS Flight Forward package delivery operations in Winston-Salem considered up to 112 deliveries per day from one distribution center.
- Causey Aviation Unmanned, Inc. in Fayetteville, Holly Springs, Raeford, and Pinehurst (FAA 2022)
 - The EA (FAA 2022) for Causey Aviation Unmanned, Inc. package delivery operations considered up to 104, 79, 45, and 60 deliveries per day in Fayetteville,²² Holly Springs, Pinehurst, and Raeford, respectively.
- Zipline International, Inc. in Kannapolis (FAA 2022)

²¹ CEQ Memorandum to Agencies: *Forty Most Asked Questions Concerning CEQ’s National Environmental Policy Act Regulations*. 46 FR 18026 (March 23, 1981), as amended in 1986.

²² Causey has decommissioned drone package delivery operations in Fayetteville, North Carolina.

- The EA (FAA 2022) for Zipline International, Inc. package delivery operations in Kannapolis considered up to 20 deliveries per day.²³

Also, under the no action alternative, operators would be able to conduct package delivery operations according to 14 CFR Part 107,²⁴ which limits drone package delivery operations to visual line of sight.

The no action alternative is carried forward for analysis in the PEA to provide a comparison of existing conditions to the proposed action, as required by the CEQ NEPA-implementing regulations. The no action alternative reflects the status quo and serves as a benchmark against which effects of the proposed action can be evaluated.

2.2 Proposed Action

The proposed action evaluated in this PEA is the operation of commercial drone package deliveries from takeoff and landing areas (referred to as “hubs” in this PEA) based on NCDOT’s maximum forecasted operations for conservative purposes. The NCDOT has projected Part 135 drone package delivery operations for the state of North Carolina out to year 2030 with the implementation of shared access UAS surveillance systems in communities and provided that projection to the FAA for analysis in this PEA.

2.2.1 Descriptions of UA Considered in this PEA

The type, size, and weight of aircraft used to deliver packages could vary, but the NCDOT anticipates multi-copter and hybrid (rotary and fixed-wing) platforms will be the primary type of UA used to deliver small packages in the foreseeable future. While NCDOT’s forecast considered fixed-wing platforms, the only fixed-wing operator in service in North Carolina at the time NCDOT developed the forecast has since decommissioned its operations.

Drone delivery distances depend on the UA’s battery duration, which can be influenced by weather and other factors. Delivery distances for a multi-copter UA typically range from 3–10 miles one-way or 6–20 miles roundtrip, with a duration of around 5–20 minutes one-way or 10–40 minutes roundtrip. Cruising altitudes for drone package deliveries are typically 150–375 feet above ground level (AGL) and would not exceed 400 feet AGL.²⁵ The characteristics of the UAS considered in this PEA are displayed in **Table 1**. Applications involving proposed operations that deviate from the characteristics listed in **Table 1** may require additional environmental review.

²³ Zipline has decommissioned operation of its fixed-wing drone in Kannapolis, North Carolina.

²⁴ Operation and Certification of Small Unmanned Aircraft Systems, 81 FR 42064 (June 28, 2016); Operation of Small Unmanned Aircraft Systems over People, 86 FR 4314 (January 15, 2021).

²⁵ Current FAA exemptions for drone package delivery include a condition and limitation that states the altitude of the aircraft must not exceed 400 feet AGL.

Table 1. UAS Characteristics

Characteristic	Criteria
Platform/Vehicle Type	Multi-copters (2 to 8 propellers), fixed-wing, and hybrid aircraft (vertical lift w/fixed-wing cruise)
Power	Electric Motor
Delivery Mechanism Types	Drop off, tethered (wire/cable), customer unloads, ground drop, parachute
Maximum Aircraft Weight	Approximately 87 pounds
Maximum Payload (Package) Weight	Approximately 5 pounds
Maximum Aircraft Takeoff Weight	Approximately 92 pounds
Typical Cruise Altitude	150 to 375 feet above ground level
Maximum Cruise Altitude	400 feet above ground level
Typical Cruise Speed	30–60 knots (35–70 miles per hour)
Hours of Operation	7:00 a.m. to 10:00 p.m.
Operation Days	7 days per week, 365 days per year
Range of Anticipated Daily Operations from One Hub	10 to 500 deliveries

2.2.2 General Description of Operations

While UA come in varying sizes with varying flight capabilities, the flight operations can generally be categorized into the following five phases: 1) takeoff and climb, 2) en route outbound, 3) delivery, 4) en route inbound, and 5) descent and landing. In general, based on previous proposals for drone package delivery operations, package delivery operators partner with established businesses and identify a location for a hub at the business's parking lot, rooftop, or other area where it is not disruptive to the business and does not present a safety hazard. This allows the drone operator to conduct operations with minimal infrastructure requirements and no ground disturbance activities. Prior to takeoff, packages are manually loaded onto the UA by a ground crew at the hub. The UA then climbs and performs aerial deliveries. After delivery, the UA returns to its hub via a predetermined flight path. The five phases of operation for a typical multi-copter or hybrid UA are described below. **Figure 1** shows a typical flight profile. Drone package deliveries would occur 7 days per week between the hours of 7:00 a.m. and 10:00 p.m.

Takeoff and Climb

The takeoff and climb phase is described as the portion of the flight in which a fully loaded UA takes off from the hub and climbs vertically. The UA may then hover briefly as it conducts various systems checks to ensure it is functioning properly. With a multi-copter design, the UA can take off and descend vertically, as well as hover. Typical flights begin with the UA departing from a hub and ascending vertically to no more than 400 feet AGL.

En Route Outbound

The en route outbound phase is defined as the part of the flight in which the fully loaded UA flies a pre-programmed route from its hub to a delivery point. During this flight phase, typical normal cruising

speeds range from 30–60 knots (35–70 miles per hour), and typical cruising altitudes range from 150–375 feet AGL.

Delivery

The delivery phase is defined by descent from the en route outbound phase to a delivery point to deliver a package. Upon arrival at the delivery point, the UA descends vertically to deliver the package. The UA may hover at an altitude that varies in height. Most UA use a tether to lower the package from the UA to the ground while the drone hovers. Once the UA releases the package from the tether, it climbs vertically to the cruise altitude and begins the en route inbound phase. The delivery process typically takes 30–90 seconds, depending on the operator (NCDOT 2023).

En Route Inbound

Upon completion of a delivery, the UA flies from the delivery point back to a hub.

Descent and Landing

Upon reaching the hub, the UA vertically descends, lands, and turns off.

Typical Flight Profile

Typical Flight Duration: 10–40 minutes round-trip

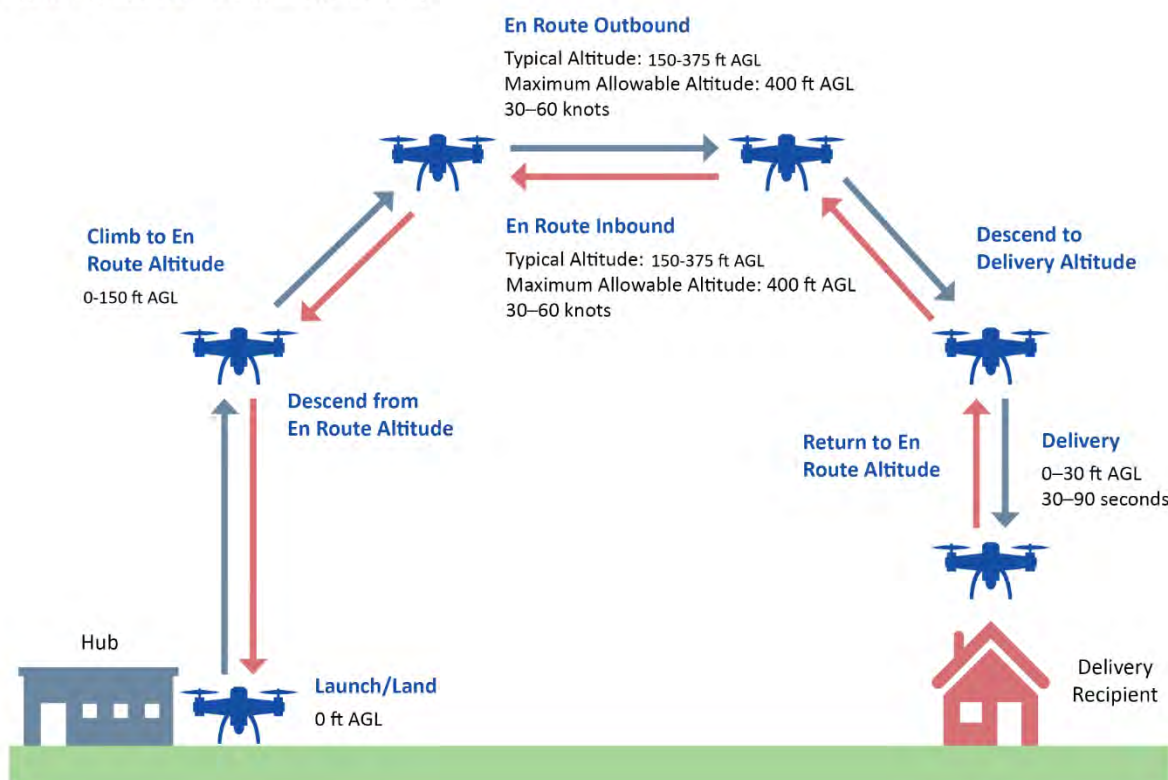


Figure 1. Typical Flight Profile

2.2.3 Operating Areas

According to NCDOT’s forecast, in general, Part 135 UAS package delivery operators prefer areas where they can serve the most customers while flying a minimal amount of distance. Also, operators look for communities with sufficient space to operate (e.g., communities or homes with enough landing space to deliver packages) and look for areas with minimal amounts of controlled airspace that might restrict UA flight (e.g., the operator may have to fly around restricted airspace). Based upon these parameters, as well as existing UAS package delivery operations in North Carolina (see **Section 2.1**), the NCDOT identified seven regions within North Carolina as likely operating areas for UAS package deliveries through the year 2030. These operating areas include Asheville, Charlotte Metro (including Kannapolis), Piedmont Triad (Winston-Salem, High Point, and Greensboro), Research Triangle (Raleigh, Durham, Chapel Hill, and adjacent communities), Sandhills (Pinehurst, Raeford, and Fayetteville), Greenville, and Wilmington (see **Figure 2**). The operating areas exclude special use airspace because drone package delivery operations would not be allowed in these areas.

Table 2 displays the forecasted daily operations for each operating area in 2030. As shown in the table, the geographic distribution of NCDOT’s proposed UAS drone package delivery operations centers heavily in the Charlotte Metro and Research Triangle operating areas.

Table 2. Estimated Daily Deliveries per Operating Area in 2030

Operating Area Name	Approximate Size (square miles)	Estimated Number of Hubs	Estimated Range of Daily Deliveries
Asheville	220	1	164 – 478
Charlotte Metro	3,524	6	1,649 – 4,801
Piedmont Triad	713	5	413 – 1,201
Research Triangle	1,039	6	1,704 – 4,960
Sandhills	209	2	328 – 955
Greenville	137	1	164 – 478
Wilmington	129	1	164 – 478

Source: NCDOT 2023

2.2.3.1 Asheville

The Asheville operating area is approximately 220 square miles in size and contains the Asheville metro area (see **Figure 3**). This operating area includes one airport: the Asheville Regional Airport (AVL).

2.2.3.2 Charlotte Metro

The Charlotte Metro operating area is approximately 3,524 square miles in size and contains the cities of Charlotte and Kannapolis, along with the surrounding unincorporated areas (see **Figure 4**). This operating area includes four airports: Charlotte Douglas International Airport (CLT), Charlotte-Monroe Executive Airport (EQY), Concord-Padgett Regional Airport (JQF), and Mid-Carolina Regional Airport (RUQ).

2.2.3.3 Piedmont Triad

The Piedmont Triad operating area is approximately 713 square miles in size and includes the cities of Winston-Salem, High Point, and Greensboro (see **Figure 5**). This operating area includes two airports: the Smith Reynolds Airport (INT) and the Piedmont Triad International Airport (GSO).

2.2.3.4 Research Triangle

The Research Triangle operating area is approximately 1,039 square miles in size and includes the cities of Raleigh, Durham, and Chapel Hill, as well as adjacent communities (see **Figure 6**). This operating area includes one active airport—Raleigh-Durham International Airport (RDU)—and the former Horace Williams Airport (IGX).

2.2.3.5 Sandhills

The Sandhills operating area is approximately 209 square miles in size and contains the cities of Pinehurst, Raeford, and Fayetteville (see **Figure 7**). This operating area contains the P K Airpark Airport (5W4) and a portion of Pope Field Airport (POB). Fayetteville Regional Airport (FAY), Moore County Airport (SOP), and Special Use Airspace R-5311A are located outside this operating area.

2.2.3.6 Greenville

The Greenville operating area is approximately 137 square miles in size and contains the Greenville metro area (see **Figure 8**). This operating area includes one airport: Pitt-Greenville Airport (PGV).

2.2.3.7 Wilmington

The Wilmington operating area is approximately 129 square miles in size and consists of the Wilmington metro along the Atlantic Coast (see **Figure 9**). This operating area includes one airport: Wilmington International Airport (ILM).

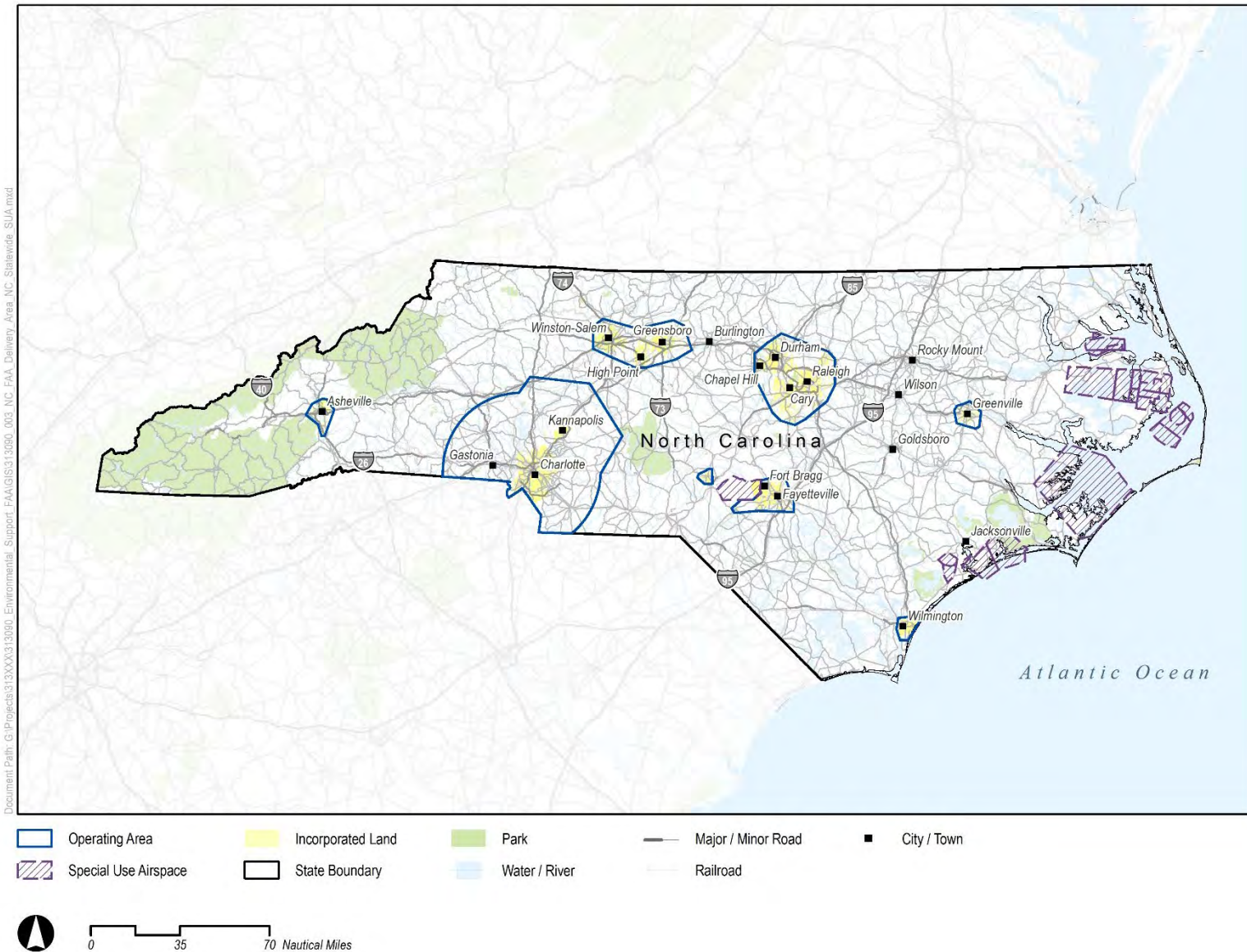


Figure 2. Operating Areas – Statewide

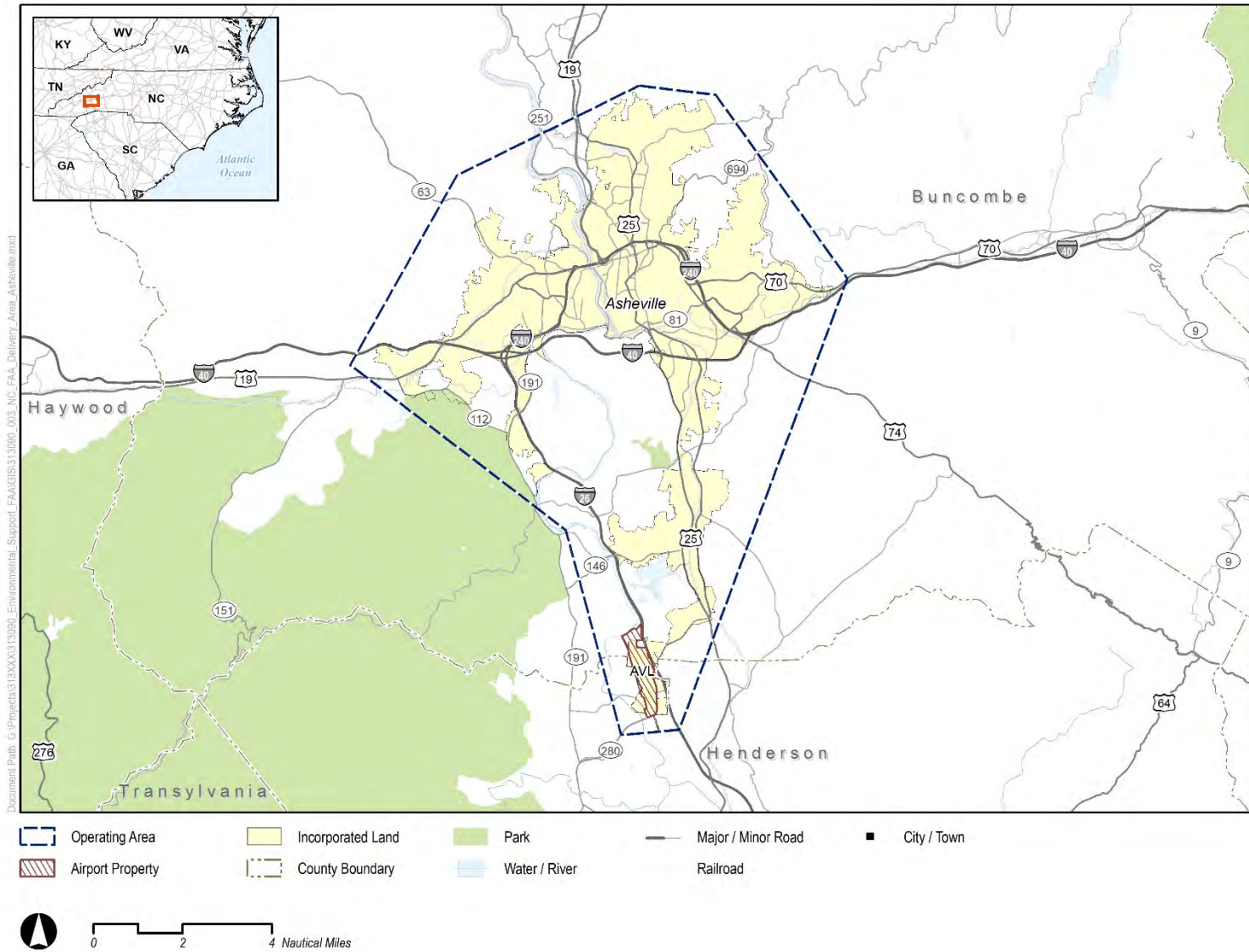


Figure 3. Asheville Operating Area

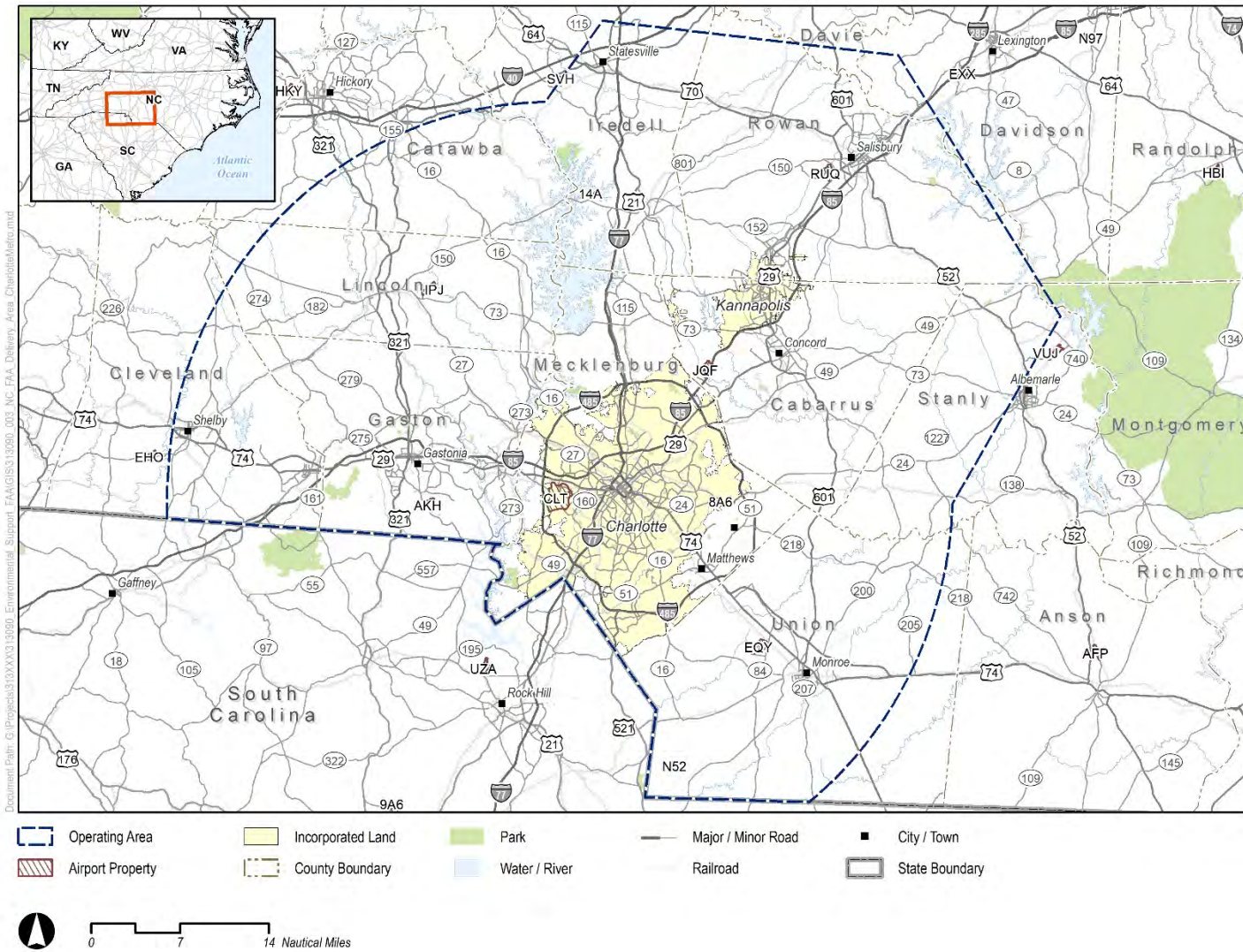


Figure 4. Charlotte Metro Operating Area

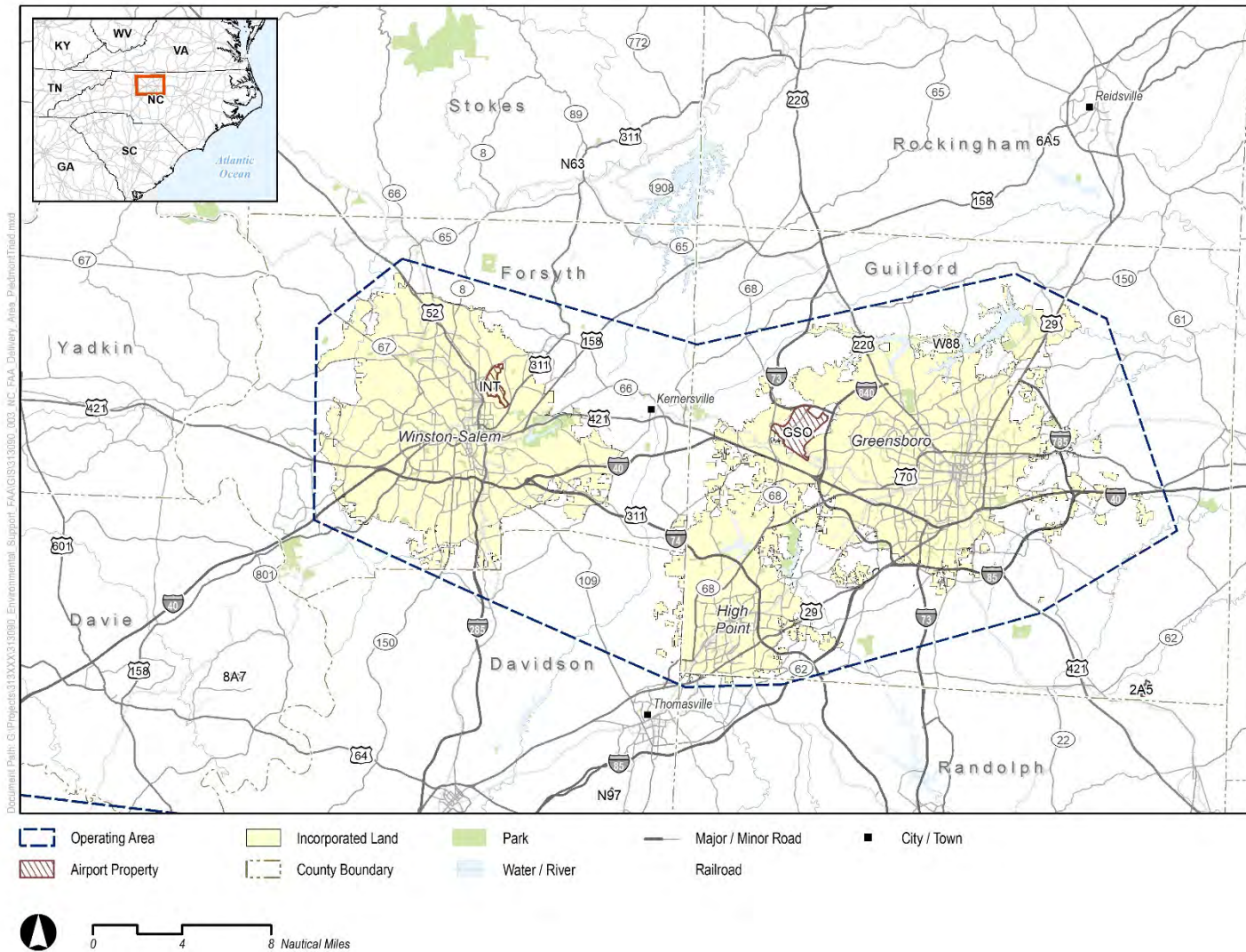


Figure 5. Piedmont Triad Operating Area

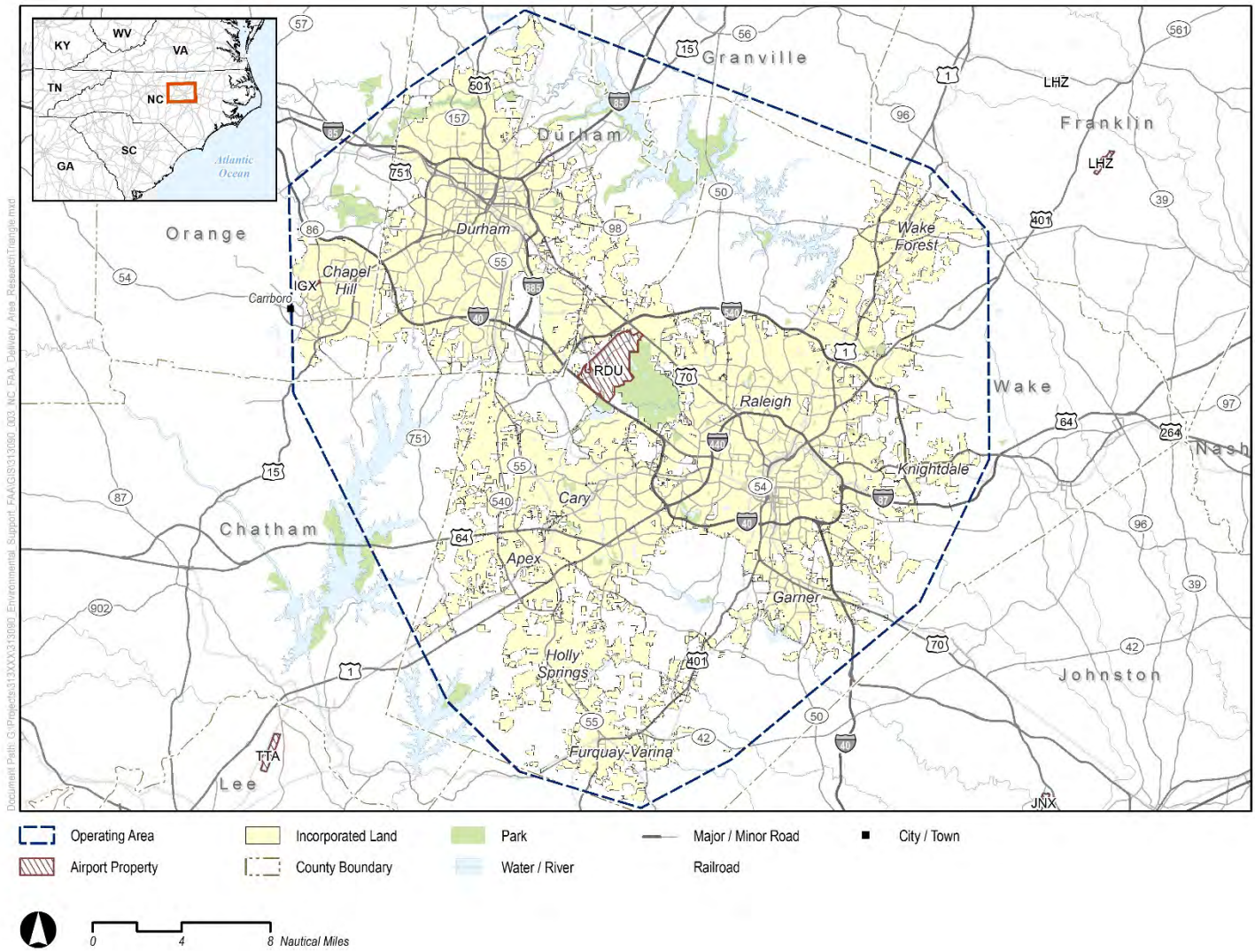


Figure 6. Research Triangle Operating Area

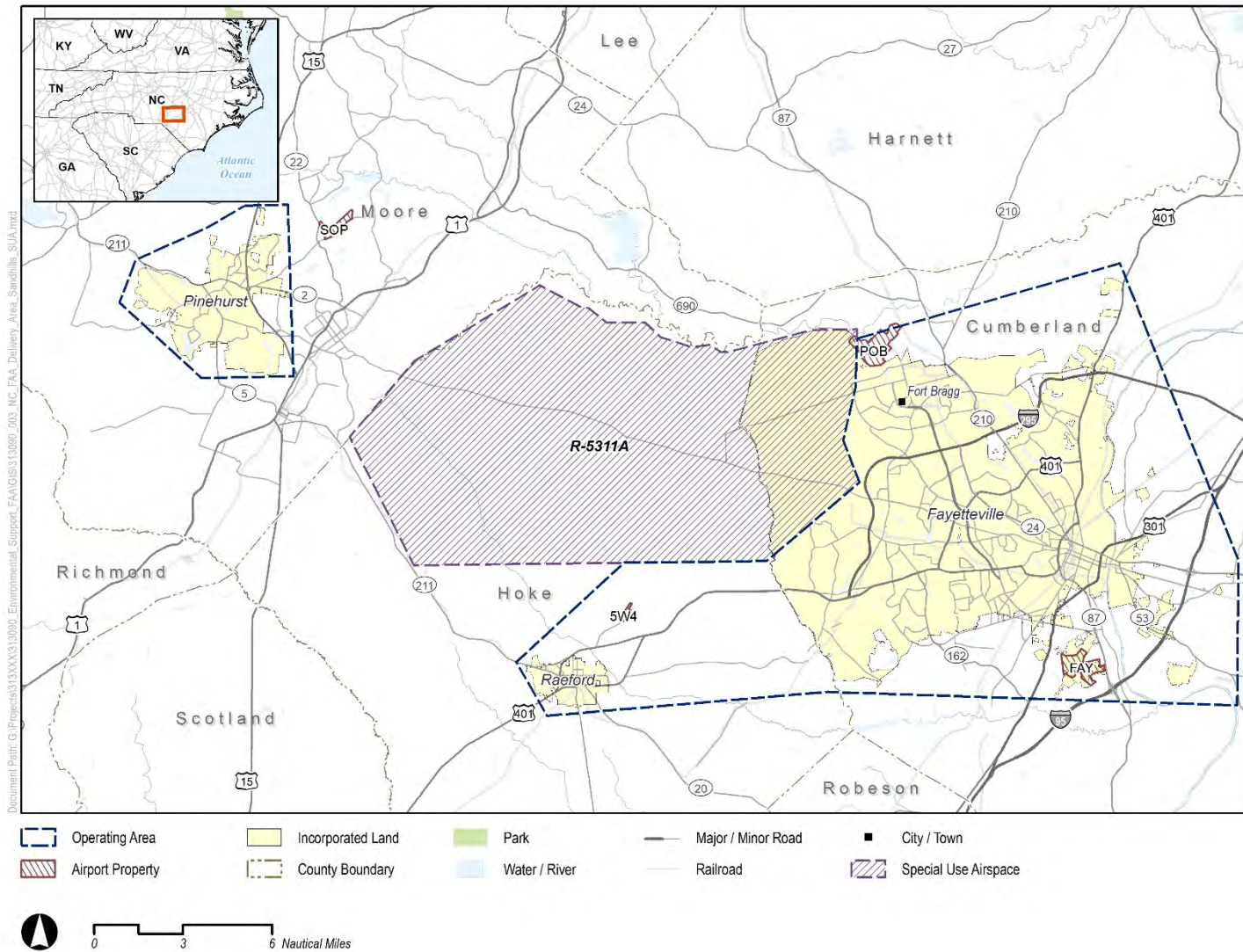


Figure 7. Sandhills Operating Area

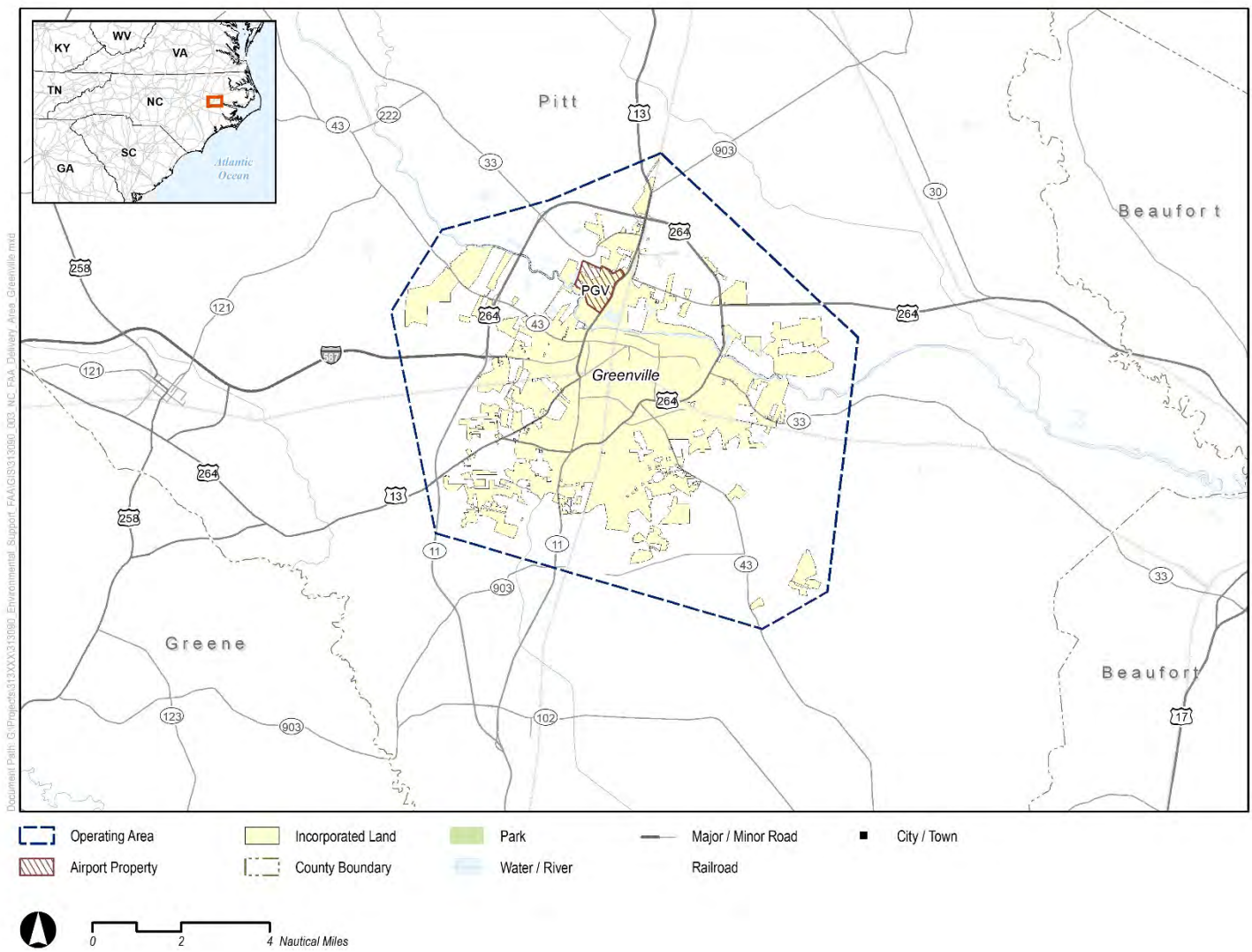
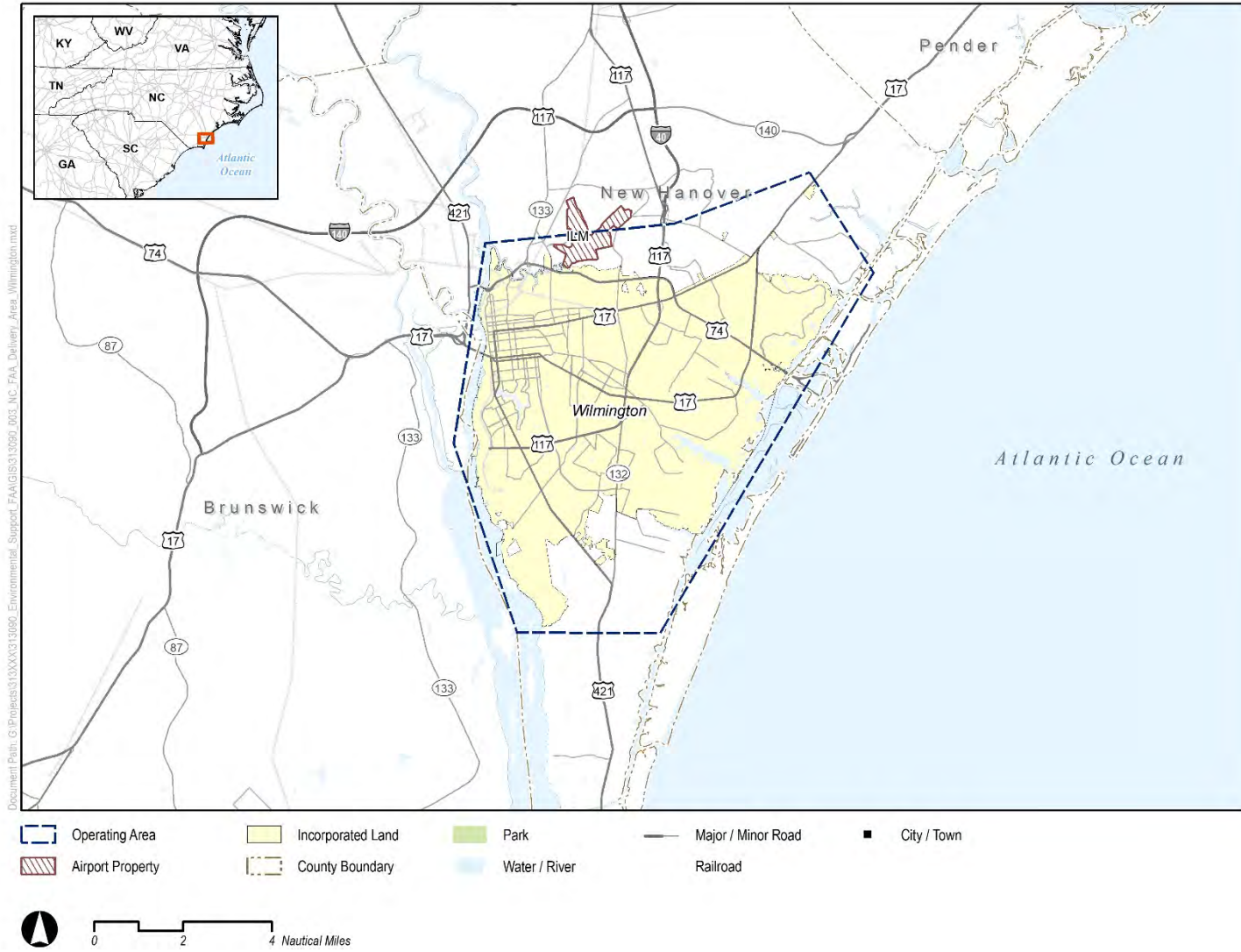


Figure 8. Greenville Operating Area



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Figure 9. Wilmington Operating Area

Chapter 3

Affected Environment and Environmental Consequences

3.1 Introduction

This chapter provides a description of the affected environment and potential environmental effects for the environmental impact categories that have the potential to be affected by the no action alternative and proposed action. As required by FAA Order 1050.1F, the environmental impact categories assessed in this PEA include:

- Air quality
- Biological resources (including fish, wildlife, and plants)
- Climate
- Coastal resources
- Department of Transportation Act, Section 4(f)
- Farmlands
- Hazardous materials, solid waste, and pollution prevention
- Historical, architectural, archeological, and cultural resources
- Land use
- Natural resources and energy supply
- Noise and noise-compatible land use²⁶
- Socioeconomics, environmental justice, and children’s environmental health and safety risks
- Visual effects (including light emissions)
- Water resources (including wetlands, floodplains, surface waters, groundwater, and Wild and Scenic Rivers).

The study area evaluated for potential impacts is defined as the operating areas where UA would take off, fly, land, and deliver packages, as described in **Sections 2.2.2 and 2.2.3** and shown on **Figures 2 through 9**.

The level of detail provided in this chapter is commensurate with the importance of the potential impact on the resources (40 CFR § 1502.15). EAs are intended to be concise documents that focus on aspects of

²⁶ Noise and noise-compatible land use is discussed as the first environmental impact category in this analysis because noise plays a role in several other impact categories.

the human environment that may be affected by the proposed action. Given the programmatic nature of this assessment and the size of the study area, the description of the affected environment is provided at a high level, and site-specific descriptions are not provided.

The FAA uses thresholds that serve as specific indicators of significant impact for some environmental impact categories (FAA Order 1050.1F, Paragraph 4-3). Proposed actions that would result in impacts at or above these thresholds require the preparation of an environmental impact statement (EIS), unless impacts can be reduced below threshold levels. The FAA has not established significance thresholds for all impact categories; for those impact categories without a significance threshold, the FAA has identified factors to consider in evaluating the significance of potential environmental impacts. If these factors exist, there is not necessarily a significant impact. After consideration of all relevant factors, the FAA determines whether there would be a significant impact.

3.2 Environmental Impact Categories Not Analyzed in Detail

This PEA does not analyze potential impacts on the following environmental impact categories in detail, because the proposed action would not affect the resources included in the category, as stated below (see FAA Order 1050.1F, Paragraph 4-2.c):

- **Air Quality and Climate** – Based on NCDOT’s forecast, the UA considered in this analysis are battery-powered and would not generate emissions that could result in air quality impacts or climate impacts. Electricity consumed for battery charging and operation of any hubs would be minimal. Electricity consumed for UAS operations would come from the existing power grid. Operators may have backup generators on site in the event of a power outage. These emissions would be minimal and are not expected to cause pollutant concentrations to exceed one or more of the National Ambient Air Quality Standards, as established by the U.S. Environmental Protection Agency (USEPA) under the Clean Air Act, nor would they increase the frequency or severity of any such existing violations.

Research suggests that drone-based package delivery could reduce greenhouse gas emissions and energy use in the freight sector (Lyon-Hill et al. 2020, Rodrigues et al. 2022, Stolaroff et al. 2018). Decreased emissions would have beneficial effects on climate change.

UA operations in North Carolina are not expected to be impacted by climate change impacts (e.g., rising sea levels, increasing temperatures). Therefore, the proposed action would neither affect nor be affected by the impacts of climate change, and it is consistent with the January 9, 2023, *CEQ NEPA Guidance on Consideration of Greenhouse Gas Emissions and Climate Change*.²⁷

- **Biological Resources (Fish and Plants)** – The proposed action does not involve development or disturbance of any land or aquatic habitat. Hubs are expected to be located in a business’s parking lot, rooftop, or other previously developed/disturbed area. Any overflight of fish or

²⁷ 88 Federal Register 1196.

plants would not affect them. A drone landing (either on purpose or accident) and recovery²⁸ in a vegetative area would have little, if any, impact on vegetation due to the small size of the drones and operations occurring in urban areas. Therefore, the proposed action is not expected to affect fish or plants. **Section 3.8** addresses wildlife.

- **Coastal Resources** – The proposed action does not involve development or disturbance of any land or aquatic habitat. Hubs are expected to be located in a business’s parking lot, rooftop, or other previously developed/disturbed area. The proposed action would not result in activities that would be inconsistent with North Carolina’s Coastal Management Program (NCDEQ 2016). It would not impact a coastal barrier resources system unit.²⁹ It would not pose an impact on coral reef ecosystems, nor would it cause an unacceptable risk to human safety or property or cause adverse impacts on the coastal environment. Each UA operator is responsible for complying with the Coastal Zone Management Act, including ensuring its operations are conducted in accordance with state laws.
- **Farmlands** – The proposed action would not involve the development or disturbance of any land regardless of use, nor would it have the potential to convert any important farmlands to non-agricultural uses. Therefore, the proposed action would not affect important farmlands, such as pastureland, cropland, and forest considered to be prime, unique, or statewide or locally important land.
- **Hazardous Materials, Solid Waste, and Pollution Prevention** – The proposed action does not include any construction or physical ground disturbance. The proposed action does not include any activities that would use hazardous materials or impact any resources related to hazardous materials, such as disturbance of a contaminated site. The proposed operations would not generate an amount of solid waste that exceeds local capacity of landfills. UA are made primarily from recoverable materials, and operators are expected to properly manage UA at the end of their operating life in accordance with applicable laws and regulations, including 14 CFR § 43.10, *Disposition of Life-limited Aircraft Parts*. The proposed action would not violate any federal, state, tribal, or local laws or regulations regarding hazardous materials, solid waste, or pollution prevention. Operators are expected to dispose of any hazardous materials in accordance with applicable laws and regulations, including 40 CFR Part 273, *Standards for Universal Waste Management*. Therefore, the proposed action would not result in impacts related to hazardous materials, solid waste, and pollution prevention.
- **Land Use** – The proposed action does not involve any changes to existing, planned, or future land uses. Hubs are expected to be located in a business’s parking lot, rooftop, or other previously developed/disturbed area. Land use and zoning are typically governed by local and state laws. Operators are responsible for complying with any such applicable laws relevant to establishing their operations (e.g., siting drone nests and related infrastructure). Operators are expected to site hubs in accordance with all local land use ordinances and zoning requirements.

²⁸ In accordance with 14 CFR Part 135.23(d), an operator is required to locate and secure any downed aircraft pending guidance from the FAA or National Transportation Safety Board.

²⁹ Coastal barrier resources system units consist of a system of protected coastal areas that include ocean-front land and other protected areas. Coastal barriers are important buffers between coastal storms and inland areas, often protecting properties on land from serious flood damage. For more information, visit <https://www.fws.gov/program/coastal-barrier-resources-act>.

Local jurisdictions in the study area may vary in the scope of their review and approval of commercial operations. For example, as part of the FAA's initial outreach to major cities in the study area, the City of Winston-Salem stated the city does not currently have a land use listed in its Unified Development Ordinances related to UA and therefore would have to develop one for drone package delivery (see **Appendix C**). Because local jurisdictions would be involved in the approval of commercial operations to ensure land use compatibility, the proposed action would not affect land use. Refer to **Section 3.3** regarding noise and noise-compatible land use.

- **Natural Resources and Energy Supply** – This impact category provides an evaluation of a project's consumption of natural resources (such as water, asphalt, aggregate, wood, etc.) and use of energy supplies (such as coal for electricity, natural gas for heating, and fuel for aircraft). The proposed action would not require the need for substantial natural resources or materials, or those in short supply. The proposed action does not include any construction. The UA considered in this analysis are battery powered and would not directly consume fuel (e.g., gasoline or aviation fuel) resources. Operators are expected to charge their batteries using the existing energy grid at the location of the hub. Research suggests that drone-based package delivery could reduce energy use in the freight sector (Lyon-Hill et al. 2020, Rodrigues et al. 2022, Stolaroff et al. 2018). Therefore, the proposed action would not result in impacts to natural resources and energy supply.
- **Socioeconomics and Children's Environmental Health and Safety Risks** – The proposed action would not induce economic growth in an area, disrupt or divide the physical arrangement of an established community, cause relocation of residents or community businesses, disrupt local traffic patterns or reduce the levels of service of roads, or produce a change in the community tax base. Therefore, the proposed action would not result in socioeconomic impacts.

Executive Order (EO) 13045, *Protection of Children from Environmental Health Risks and Safety Risks*, requires federal agencies to ensure children do not suffer disproportionately from environmental or safety risks. The proposed action would not affect products or substances that a child would be likely to come into contact with, ingest, use, or be exposed to, and would not result in environmental health and safety risks that could disproportionately affect children. The FAA does not anticipate the proposed action posing a greater health and safety risk to children than package delivery by other means (e.g., truck, mail, personal automobile trips). To date, UA operators have not sited hubs near schools and restrict operations near schools. UA operators have also restricted operations near schools (Monday – Friday) during school hours, thereby limiting the potential for environmental health or safety impacts to children. Current FAA-issued exemptions for drone package delivery include a condition and limitation that states flight operations must minimize ground risk and not overfly open-air assemblies of people and schools during times of operations (e.g., elementary, middle, high, preschool, and daycare facilities). The FAA expects these conditions and limitations to be maintained for future operations. Further, the proposed action is expected to result in a reduction in miles driven locally by automobiles (Lyon-Hill et al. 2020, Rodrigues et al. 2022, Stolaroff et al. 2018), which would reduce local noxious emissions generated by automobiles. Therefore, the proposed action would not result in disproportionate environmental health and safety risks to children.

- **Water Resources (Wetlands, Floodplains, Surface Waters, and Groundwater)** – The proposed action would not result in the construction of facilities and would therefore not encroach upon areas designated as navigable waters, wetlands, or floodplains. Any overflight of these resources would not affect them. The FAA recommends that drone operators cross rivers, streams, or other linear waterbodies, such as the Atlantic Intracoastal Waterway, in a perpendicular fashion. Flight paths should not run parallel to or along a stream, river, or other waterbody. The proposed action would not result in any changes to existing discharges to waterbodies, create a new discharge that would result in impacts to surface waters, or modify a waterbody. The proposed action would not degrade water quality or contaminate public drinking water supply. The proposed action does not involve activities that would withdraw groundwater from underground aquifers or reduce infiltration or recharge to ground water resources through the introduction of new impervious surfaces. Therefore, the proposed action would not affect wetlands, floodplains, surface waters, and groundwater. **Section 3.7** addresses Wild and Scenic Rivers and rivers on the Nationwide Rivers Inventory (NRI).

3.3 Noise and Noise-Compatible Land Use

3.3.1 Definition of Resource and Regulatory Setting

Noise is considered any unwanted sound that interferes with normal activities (such as sleep, conversation, student learning) and can cause annoyance. Aircraft noise is often the most noticeable environmental effect associated with any aviation project. Several federal laws, including the Aviation Safety and Noise Abatement Act of 1979, as amended,³⁰ regulate aircraft noise. The FAA regulates noise from aircraft through 14 CFR Part 36.

FAA Order 1050.1F, Appendix B, Paragraph B-1.3 requires the FAA to identify the location and number of noise sensitive areas that could be significantly impacted by noise. As defined in FAA Order 1050.1F, Paragraph 11-5b, a noise sensitive area is “[a]n area where noise interferes with normal activities associated with its use. Normally, noise sensitive areas include residential, educational, health, and religious structures and sites, and parks, recreational areas, areas with wilderness characteristics, wildlife refuges, and cultural and historical sites.”

Sound is measured in terms of the decibel (dB), which is the ratio between the sound pressure of the sound source and 20 micropascals, which is nominally the threshold of human hearing. Various weighting schemes have been developed to collapse a frequency spectrum into a single dB value. The A-weighted decibel, or dBA, corresponds to human hearing accounting for the higher sensitivity in the mid-range frequencies.

To comply with NEPA requirements, the FAA has issued requirements for assessing aircraft noise in FAA Order 1050.1F, Appendix B. FAA’s primary noise metric for aviation noise analysis is the yearly Day-Night Average Sound Level (DNL) metric. The DNL noise metric is used to reflect a person’s cumulative exposure to sound over a 24-hour period, expressed as the noise level for the average day of the year on the basis of annual aircraft operations. DNL accounts for the amount of noise from each aircraft

³⁰ 49 U.S.C. §§ 47501–47507.

operation as well as the total number of operations throughout the day and applies an additional 10 dB weighting for nighttime flights between 10 p.m. and 7 a.m.

More information about this environmental impact category is presented in Chapter 11 of the FAA Order 1050.1F Desk Reference (FAA 2023a).

3.3.2 Affected Environment

The study area consists of the seven operating areas defined in **Section 2.2.3** covering a total land area of 5,971 square miles with a total estimated population of 6,651,757. Noise sensitive areas within the study area include residential, educational, health, and religious structures, along with parks, recreational areas, and cultural and historic sites.

The ambient (or background) sound level in the operating areas varies and depends on the uses in the immediate vicinity. For example, the ambient sound level in an urban center is higher than the ambient sound level within a residential neighborhood. Existing sound sources in the operating areas are primarily those from anthropogenic sources associated with commercial, industrial, transportation (e.g., highways, rail, and air travel), and residential land uses in an urban and city environment (e.g., vehicles, construction equipment, and aircraft). Except for areas close to airports, existing aviation noise levels in the operating areas are expected to be well below the FAA's threshold for significant noise exposure (DNL 65 dB). **Figure 10** presents the surface areas of Class B, C, and D airspace³¹ in the vicinity of each operating area. These surface areas include the DNL 65 dB and 60 dB contours for existing airport noise. Refer to **Appendix D** for figures showing these surface areas for each operating area.

³¹ Class B, C, and D airspace are classes of controlled airspace. In this airspace, aircraft are under control by air traffic controllers. It represents airspace having the greatest density of aircraft activity and associated noise from the aircraft.

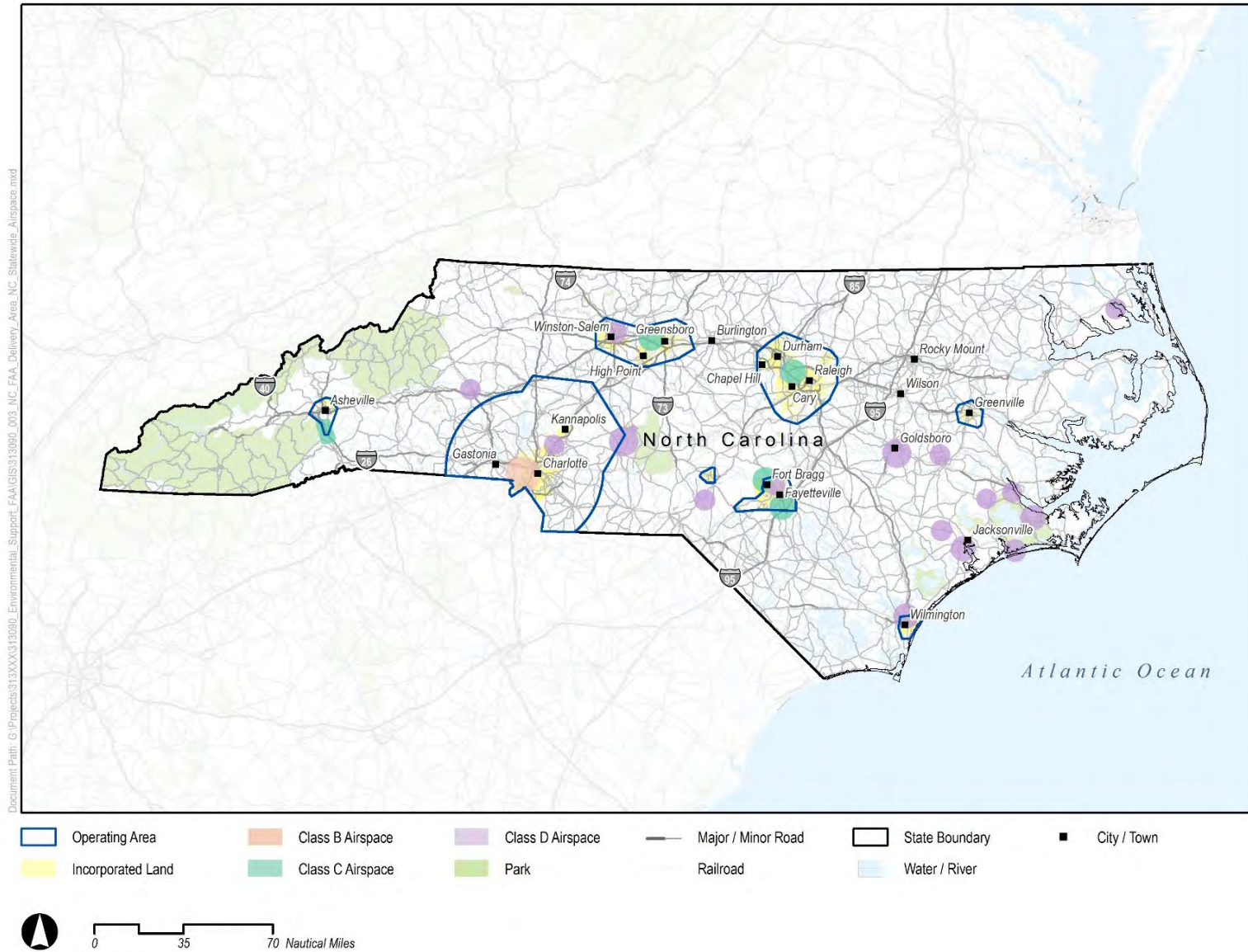


Figure 10. Class B, C, and D Airspace in North Carolina

3.3.3 Environmental Consequences

FAA Order 1050.1F states noise impacts would be significant if the action would increase noise by DNL 1.5 dB or more for a noise sensitive area that is exposed to noise at or above the DNL 65 dB noise exposure level, or that will be exposed at or above the DNL 65 dB level due to a DNL 1.5 dB or greater increase, when compared to the no action alternative for the same timeframe. For example, an increase from DNL 65.5 dB to 67 dB is considered a significant impact, as is an increase from DNL 63.5 dB to 65 dB.

Human perception of noise depends on a number of factors, including overall noise level, number of noise events, the extent of audibility above the background ambient noise level, and acoustic frequency content (pitch). UA noise generally has high frequency acoustic content, which can often be more discernable from other typical noise sources.

The FAA analyzed the proposed action's potential noise exposure to determine whether it would cause a significant impact to any residential land uses or noise sensitive areas within the study area.

3.3.3.1 No Action Alternative

The no action alternative assumes UA operators would continue to operate under the existing Part 135 approvals listed in **Section 2.1**, as well as Part 107 approvals which require operations to remain within visual line of sight. The previous EAs for Part 135 commercial drone package delivery in North Carolina resulted in FONSI (see **Section 2.1**). Currently approved Part 135 package delivery operations forecast to continue under the no action alternative are those from Causey and UPS Flight Forward.³² In general, the maximum noise levels generated by UA package delivery operations occur at the hubs due to those locations having the greatest concentration of flight activity. Based on the noise analyses conducted for those operators and the NCDOT's forecast level of operations for 2030, the DNL 65 dB contours for those hubs would extend to a very limited range of 50 feet or less from the landing and takeoff pads and would likely be fully contained within the facility property.

The no action alternative also includes potential future Part 135 drone package delivery operations as defined in future applications. Potential noise impacts from these operations are expected to be similar as those disclosed in the previous EAs; however, at this time, the FAA is not able to identify the context and intensity of potential future operations. Since drone operators have the ability to mitigate potential significant noise impacts (e.g., by moving the location of the hub or reducing the number of operations at a hub), future drone package delivery operations under the no action alternative are not expected to result in significant impacts related to noise or noise-compatible land use. If an operator was unwilling to mitigate a significant noise impact identified in a future environmental review of a Part 135 application, an EIS would be required.

3.3.3.2 Proposed Action

Based on NCDOT's forecast, operations under the proposed action would range from 10 to 500 average daily deliveries from individual hubs and from 150 to 4,801 total average daily deliveries within the

³² As noted in Section 2.1, Zipline has decommissioned operation of its fixed-wing drone in Kannapolis, North Carolina.

operating areas identified in **Section 2.2** (see **Tables 1 and 2**). The proposed action considered in this PEA assumes that deliveries could occur up to 7 days per week for a conservative total of 365 days per year. However, some operators may not operate on holidays or on days with severe weather, resulting in potentially less than 365 days of operations per year. The FAA developed a methodology to evaluate the potential noise exposure in the proposed study area that could result from the proposed action (**Appendix D**).

Estimation of potential noise exposure resulting from the proposed action is based on four data sets consisting of the available noise data for all currently operating Part 135 multi-copter UA in the U.S. The four multi-copter UA currently in use for Part 135 package deliveries and their associated maximum takeoff weights (MTOW) are the Amazon Prime Air MK27-2 (91.5 pounds MTOW), Wing Hummingbird 7000W-B (15 pounds MTOW), Causey Flytrex FTX-M600P (33.4 pounds MTOW), and UPS Flight Forward Matternet M2 (29.1 pounds MTOW). The FAA previously analyzed each of these UA in separate noise studies as part of EAs, presented in **Table 3**, for package delivery operations at various locations across the United States.³³

Table 3. Part 135 Multi-copter UA Package Delivery Environmental Assessments

Operator and UA	MTOW (lbs)	Environmental Assessment	Date
Wing Hummingbird 7000W-B	15	Final EA and FONSI/ROD for Wing Aviation, LLC Proposed Drone Package Delivery Operations in Dallas–Fort Worth, Texas	November 2023
		Final EA and FONSI/ROD Wing Aviation Drone Package Delivery Operations Frisco and Little Elm, TX	February 2022
		FONSI/ROD for EA for Wing Aviation Drone Package Delivery Operations Christiansburg, Virginia	December 2021
Causey Flytrex FTX-M600P	33.4	Final EA and FONSI/ROD Causey Aviation Unmanned, Inc. Drone Package Delivery Operations in Granbury and Rowlett, Texas	August 2023
		Final EA and FONSI/ROD for Causey Aviation Unmanned, Inc. Drone Package Delivery Operations in Fayetteville, Holly Springs, Raeford, and Pinehurst, North Carolina	November 2022
UPS Flight Forward Matternet M2	29.1	Final EA and FONSI/ROD UPS Flight Forward, Inc. Drone Package Delivery Operations Columbus, Ohio	March 2023
		Final EA and FONSI/ROD UPS Flight Forward, Inc. Drone Package Delivery Operations Winston-Salem, NC	December 2022
		Final EA and FONSI/ROD UPS Flight Forward, Inc. Drone Package Delivery Operations The Villages, FL	November 2022
		Final EA and FONSI/ROD UPS Flight Forward, Inc. Drone Flight Training Operations at Fisherville, KY	August 2022
		Final EA and FONSI/ROD UPS Flight Forward Drone Package Delivery Operations Wake Forest Baptist Health (WFBH) Routes, Winston-Salem, NC	December 2021
		Final EA and FONSI/ROD UPS Flight Forward Drone Package Delivery Operations Lake Sumter Landing Route, Villages, FL	November 2021

³³ See: https://www.faa.gov/uas/advanced_operations/nepa_and_drones.

Operator and UA	MTOW (lbs)	Environmental Assessment	Date
Amazon MK27-2	91.5	Final EA and FONSI/ROD Amazon Prime Air Drone Package Delivery Operations in College Station, Texas	December 2022
		Final EA and FONSI/ROD Impact/Record of Decision Amazon Prime Air Drone Package Delivery Operations in Lockeford, California	November 2022
		EA for Amazon Prime Air Drone Package Delivery Test Operations in Pendleton, Oregon	November 2022

Notes: lbs = pounds; MTOW = maximum takeoff weight; UA = unmanned aircraft

UA package delivery operations considered in this EA could be from any combination of the four currently operating UA or other UA with similar characteristics and operating procedures as those described in **Section 2.2**. Because of this, noise exposure estimates are based on an aggregate representation of all currently operating Part 135 package delivery UA.

The four UA were assessed in two groupings: UA ranging from approximately 15–34 pounds MTOW (Group 1) and UA ranging from approximately 15–92 pounds MTOW (Group 2). For each grouping, the FAA estimated potential noise exposure for distances ranging from 32.8 feet to 2,500 feet radially out from both hubs and delivery points. The distance of 32.8 feet was the closest common distance for which measurement data was available for most UA, and 2,500 feet was the distance determined where UA en route flight noise would be the dominant noise source for receivers directly beneath the UA flight path (see Figures 7 and 8 in **Appendix D**).

The FAA expects the majority of package delivery UA to fall into the 14 CFR Part 107 small UA classification of under 55 pounds MTOW and are likely to have noise levels similar to the lighter group (Group 1). Further details regarding the development of aggregate noise exposure data for the two groups are presented in **Appendix D**.

The FAA used this analysis to define the potential for the proposed action to result in significant impacts. The FAA assessed noise for hub operations, en route operations, and delivery operations, as discussed in detail in the following sections.

Using the projected operations identified in **Section 2.2.3**, the FAA used the noise analysis methodology detailed in **Appendix D** to estimate the DNL levels for the proposed action. Noise levels were calculated for each flight phase and are presented in the following sub-sections: noise exposure for hub operations, noise exposure for en route operations, and noise exposure for delivery operations.

Noise Exposure for Hub Operations

The noise exposure for hub operations includes the noise exposure for all flight activity occurring at and around the hub. The flight activity includes takeoff, landing, and transitions to and from en route flight. The estimated noise exposure values assume the UA passes directly over the receiver during all flight activity except vertical ascent and descent. According to NCDOT's forecast, the maximum forecast daily deliveries from an individual hub is 500 (NCDOT 2023). The extent of DNL contours under the flight path for any one hub is provided in Table 15 of **Appendix D** and summarized in **Table 4** for 45 dB through 75 dB

Table 4. Estimated DNL Noise Exposure for Hub Locations in 2030

Average Daily DNL Equivalent Deliveries	Annual DNL Equivalent Deliveries	UA Group	45 DNL Extent Feet	50 DNL Extent Feet	55 DNL Extent Feet	60 DNL Extent Feet	65 DNL Extent Feet	70 DNL Extent Feet	75 DNL Extent Feet
≤500	≤182,500	Group 1	>2,500	913	243	89	38	<33	<33
		Group 2	>2,500	1,147	462	254	150	88	42

Notes:

">2,500": Refers to en route noise DNL table for distances greater than 2,500 feet in Appendix D.

"<33": Limit of available data, see Appendix D.

Noise Exposure for En Route Operations

For noise estimation under en route conditions, the UA are conservatively assumed to fly the same outbound flight path between the hub and the delivery point and inbound flight path back to the hub. Therefore, each location under the en route path would be overflown twice for each delivery served by the respective overhead en route path. Among different operators, the actual en route flight path procedures could vary, and the same locations may not be overflown multiple times. Based on NCDOT's forecast, en route flight altitude would typically range from approximately 150 feet to 375 feet AGL. Typical en route altitudes for the UA currently operating under Part 135 range from 150 feet AGL to 250 feet AGL.

For the proposed action, the exact location of all potential hubs and their applicable delivery ranges is not known. As such, this analysis conservatively evaluates the potential noise exposure of all forecast UA operations overflying a single location using the highest en route sound exposure level³⁴ (SEL) (approximately 72 dB) of all currently operating Part 135 package delivery UA. The maximum number of annual deliveries forecast to occur in any operating area is approximately 5,000 for the Charlotte Metro and Research Triangle operating areas. The potential en route overflight noise exposure is provided in Table 17 of **Appendix D** and summarized in **Table 5**.

Table 5. Estimated DNL Noise Exposure for Under En Route Flight Paths in 2030

Average Daily DNL Equivalent Deliveries	Annual DNL Equivalent Deliveries	UA Group	Estimated DNL Under Flight Path
≤5,000	≤1,825,000	Groups 1 & 2	59.6

Due to the generally expected limitations of UA delivery area ranges and required collision avoidance plans,³⁵ it is highly unlikely that it would be possible for 100 percent of deliveries occurring within any of the operating areas to overfly the same location as would be required to result in the estimated level.

³⁴ Sound exposure level is a single event metric that takes into account both the noise level and duration of the event, referenced to a standard duration of one second.

³⁵ Current FAA exemptions for drone package delivery include a condition and limitation that requires operators to prepare a collision avoidance plan that specifies how the operator will manage conflicts with other UA and another condition and limitation that requires operators to maintain a conflict management capability to ensure the UA remains clear of any manned aircraft and other UA.

Table 17 of **Appendix D** provides estimated DNL for average daily overflights ranging from 1 to 5,000 for different UA SELs.

Noise Exposure for Delivery Location Operations

The noise exposure for delivery location operations includes the noise exposure for all flight activity occurring at and around the delivery point. The flight activity includes the UA approaching at en route altitude, descending for delivery, delivering the package, ascending back to en route altitude, and departing the area. The estimated noise exposure values assume the UA passes directly over the receiver during all flight activity except vertical ascent and descent. The maximum potential number of daily deliveries to individual delivery locations is unknown, but most deliveries would be of goods and products to residential locations and other businesses, and the FAA expects that more than one or two deliveries per day over the course of a year at the same location would be atypical. Thus, this analysis conservatively assumes five deliveries per day at the same delivery location. The noise exposure for any one delivery point is provided in Table 18 of **Appendix D** and summarized in **Table 6** for various distances.

Table 6. Estimated DNL Noise Exposure for Delivery Locations in 2030

Average Daily DNL Equivalent Deliveries	Annual DNL Equivalent Deliveries	UA Group	Estimated Delivery DNL at 32.8 Feet ¹	Estimated Delivery DNL at 50 Feet	Estimated Delivery DNL at 75 Feet	Estimated Delivery DNL at 100 Feet	Estimated Delivery DNL at 125 Feet
≤5	≤1,825	Group 1	45.6	42.5	40.9	39.2	38.3
		Group 2	54.2	53.1	51.3	48.5	46.0

3.3.4 Mitigation

The FAA would request that operators locate their hubs a certain distance from noise-sensitive land use to avoid significant noise impacts (**Table 7**). The setback distances depend on whether the operator is locating a hub within or outside the surface areas of Class B, C, or D airspace. Assuming the maximum number of daily operations from a hub (500 deliveries per day), if the hub is located outside the surface areas of Class B, C, or D airspace, the setback distance from noise-sensitive land use is 89 feet for Group 1 UA and 254 feet for Group 2 UA based on the 60 dB DNL extent. If the hub is located within the surface areas of Class B, C, or D airspace, the setback distance from noise-sensitive land use is 913 feet for Group 1 UA and 1,147 feet for Group 2 UA based on the 50 dB DNL extent. Based on this approach, any noise increases associated with activity at hubs and aviation noise should not exceed the significance threshold for noise.

Table 7. Hub Setback Distances (Feet) from Noise-Sensitive Land Use for 500 Deliveries Per Day

UA Group	Outside the Surface Area of Class B, C, or D Airspace	Within the Surface Area of Class B, C, or D Airspace
Group 1	89	913
Group 2	254	1,147

The setback distances for operators that propose to conduct fewer than 500 daily deliveries per day at a hub would be less than those identified above and are presented in Tables 15 and 16 of **Appendix D**. For

circumstances in which an operator wants to site a hub *within* the distances indicated in Tables 15 and 16 of **Appendix D** for the relevant number of daily deliveries, the FAA would require a more detailed noise analysis specific to the proposed activity to evaluate the potential for significant noise impacts.

Based on the noise analysis, and the above mitigation, the proposed action is not expected to result in a significant noise impact.

3.4 Visual Effects

3.4.1 Definition of Resource and Regulatory Setting

Visual effects deal broadly with the extent to which the project would either: 1) produce light emissions that create annoyance or interfere with activities; or 2) contrast with, or detract from, the visual resources and/or the visual character of the existing environment. Visual effects can be difficult to define and assess because they involve subjectivity. Proposed aerospace actions do not commonly result in adverse visual effects, but these effects may occur in certain circumstances.

For clarity and uniformity, visual effects are broken into two categories: 1) light emission effects; and 2) visual resources and visual character. *Light emissions* include any light that emanates from a light source into the surrounding environment. Examples of sources of light emissions include UA safety lighting.³⁶ Visual resources include buildings, sites, traditional cultural properties, and other natural or manmade landscape features that are visually important or have unique characteristics. In unique circumstances, the nighttime sky may be considered a visual resource. *Visual character* refers to the overall visual makeup of the existing environment where the project would be located. For example, areas near densely populated areas generally have a visual character that could be defined as urban, whereas less developed areas could have a visual character defined by the surrounding landscape features, such as open grass fields, forests, mountains, and deserts.

Some visual resources are protected under federal, state, or local regulations. Protected visual resources generally include, but are not limited to, federal, state, or local scenic roadways/byways; Wild and Scenic Rivers; national scenic areas; scenic easements; trails protected under the National Trails System Act or similar state or local regulations; biological resources; and features protected under other federal, state, or local regulations.

Although there are no federal special purpose laws or requirements specific to light emissions and visual effects, there are special purpose laws and requirements that may be relevant. Laws protecting resources that may be affected by visual effects include Section 106 of the National Historic Preservation Act (see **Section 3.5**), Section 4(f) of the Department of Transportation (DOT) Act (see **Section 3.6**), and the Wild and Scenic Rivers Act (see **Section 3.7**), the Coastal Zone Management Act, and state and regional coastal protection acts.

³⁶ Current FAA exemptions for drone package delivery include a condition and limitation that requires anti-collision lights be on for all flight operations, except when the pilot determines that, because of operating conditions, it would be in the interest of safety to turn the lights off.

More information about this environmental impact category is presented in Chapter 13 of the FAA Order 1050.1F Desk Reference (FAA 2023a).

3.4.2 Affected Environment

The proposed action would take place over urban and suburban residential areas, rural farmland, natural areas, and commercially developed properties, with the majority of operations occurring in and immediately surrounding metro areas between the hours of 7:00 a.m. and 10:00 p.m. Nighttime lighting in the operating areas varies, depending on the land use. Existing light emissions are greatest at the hubs (businesses), with less light emissions occurring in areas beneath the UA's flight path and at individual residences. Visually sensitive historic properties and Section 4(f) properties are discussed in **Sections 3.5 and 3.6**, respectively.

3.4.3 Environmental Consequences

The FAA has not established a significance threshold for light emissions or visual resources/visual character. FAA Order 1050.1F includes factors to consider when assessing the significance of potential visual effects, including the degree to which the action would have the potential to:

- Create annoyance or interfere with normal activities from light emissions
- Affect the visual character of the area due to the light emissions, including the importance, uniqueness, and aesthetic value of the affected visual resources
- Affect the nature of the visual character of the area, including the importance, uniqueness, and aesthetic value of the affected visual resources
- Contrast with the visual resources and/or visual character in the study area
- Block or obstruct the views of visual resources, including whether these resources would still be viewable from other locations

3.4.3.1 No Action Alternative

The no action alternative assumes UA operators would continue to operate under the existing Part 135 approvals listed in **Section 2.1**, as well as Part 107 approvals which require operations to remain within visual line of sight. The previous EAs for Part 135 commercial drone package delivery in North Carolina resulted in FONSI (see **Section 2.1**). Currently approved Part 135 package delivery operations forecast to continue under the no action alternative are those from Causey and UPS Flight Forward. Due to the limited number of operations allowed under the existing approvals and the fact the operations approved to date do not occur during nighttime hours, the no action alternative is not expected to result in significant visual effects.

3.4.3.2 Proposed Action

Drone package delivery flights would occur over urban and suburban residential areas, rural farmland, natural areas, and commercially developed properties between the hours of 7:00 a.m. and 10:00 p.m. Visual effects could occur during all flight phases. A six-foot radius clear of obstacles is required for

delivery, such as a driveway, parking lot, field, common area, patio, or clear spaces surrounding multi-family dwellings, as determined during the delivery request process.

When making a delivery, the UA would depart from a hub and travel en route at an altitude less than 400 feet AGL (most likely between 150 and 375 feet AGL) and therefore could be visible by someone looking for a drone in the sky (see **Figure 1**). The duration of delivery from the time the customer approves the delivery to the transition back to en route flight mode is expected to range from 30 to 90 seconds. The FAA estimates the UA en route would be observable for approximately 6 to 8 seconds by an observer on the ground based on speed (30–60 knots [35–70 miles per hour]) and altitude, thus limiting the potential for visual effects to occur from overflights.

The density of deliveries for the study area would range from 1.4 deliveries per square mile per day to 4.8 deliveries per square mile per day, with the Charlotte Metro operating area having the lowest density and the Research Triangle operating area having the highest density. Because most package deliveries would be to residences, more than one or two package deliveries to the same location each day would be atypical. Therefore, the potential for visual effects to occur at any given delivery location is limited.

Each operator uses flight planning software to vary flight paths in order to minimize overflights of any given location and to deconflict paths that might overlap with other aircraft. The highest concentrations of overflights would occur in proximity to each hub, which are primarily located in commercial areas, such as parking lots and commercial buildings, that have high amounts of ambient lighting. Current FAA-issued exemptions for drone package delivery require operators to have operable anti-collision lights on for all flight operations. These lights would be more visible before sunrise and after sunset during operating hours. However, because hubs are expected to be located in areas that are not visually sensitive, operations at the hub are not expected to affect the nature of the visual character of the area or contrast with visual resources and/or the visual character of these developed areas. Additionally, hub operations would not block or obstruct the views of visual resources given the small size of UA.

As noted in **Sections 3.5 and 3.6**, there are some historic resources and public parks that could be valued for aesthetic attributes within the study area. Refer to those sections for a description of potential effects to those properties. As noted above, current FAA-issued exemptions for drone package delivery require each UA operator to avoid overflights of open-air assemblies of people.³⁷ This may include public parks and other public properties protected under Section 4(f) at certain times.

Based upon FAA requirements to avoid overflights of open-air assemblies of people (which may include public parks or other Section 4(f) properties at certain times), limitations in place for public land such as parks (see **Section 3.6** for more details on these policies), and an expected low number of daily overflights of any given location, combined with the limited amount of time a UA would be visible to an observer on the ground and the en route altitude between 150 to 375 feet AGL, the proposed action is

³⁷ The FAA employs a case-by-case approach in determining how to apply the term “open-air assembly.” Potential examples of open-air assemblies may include sporting events, concerts, parades, protests, political rallies, community festivals, or parks and beaches during certain events. Some potential examples that might not be considered open-air assemblies include individual persons or families exiting a shopping center, athletes participating in friendly sports in an open area without spectators, individuals or small groups taking leisure in a park or on a beach, or individuals walking or riding a bike along a bike path. Whether an open-air assembly exists depends on a case-by-case determination based on the facts and circumstances of each case.

not expected to create annoyance or interfere with normal activities from light emissions; affect the visual character of the area due to light emissions; or affect the nature of the visual character of the area. In addition, due to the relatively small size of the UA, the en route altitude of 150 to 375 feet AGL, and the fact that the UA will operate within airspace that already contains various light sources, the proposed action is not expected to contrast with the visual resources and/or visual character in the study area, nor is it expected to block or obstruct the views of visual resources. Therefore, the proposed action is not expected to result in significant visual effects.

3.4.4 Mitigation

Refer to **Sections 3.5.4 and 3.6.4** for mitigation measures that would avoid or minimize impacts to properties protected by the National Historic Preservation Act and DOT Act, respectively.

3.5 Historical, Architectural, Archeological, and Cultural Resources

3.5.1 Definition of Resource and Regulatory Setting

Cultural resources encompass a range of sites, properties, and physical resources relating to human activities, society, and cultural institutions. Such resources include past and present expressions of human culture and history in the physical environment, such as prehistoric and historic archeological sites, structures, objects, and districts that are considered important to a culture or community. Cultural resources also include aspects of the physical environment, namely natural features and biota that are a part of traditional ways of life and practices and are associated with community values and institutions.

The major law that protects cultural resources is the National Historic Preservation Act. Cultural resources listed on or determined eligible for the National Register of Historic Places (NRHP) are properly known as *historic properties*. Section 106 of the National Historic Preservation Act requires a federal agency to consider the effects of its action (referred to as the *undertaking*³⁸) on historic properties. The Section 106 process is outlined in 36 CFR part 800. Compliance with Section 106 requires consultation with the State Historic Preservation Officer (SHPO), Indian tribes, Tribal Historic Preservation Officer (if the undertaking occurs on or may affect historic properties on any tribal lands), and any other interested parties. Major steps in the Section 106 process include identifying the Area of Potential Effects (APE),³⁹ identifying and evaluating any historic properties within the APE, and assessing the effect of the undertaking on any historic properties. If a historic property would be adversely affected by the undertaking, the Section 106 process includes continuing consultation to resolve adverse effects.

³⁸ *Undertaking* means a project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a federal agency, including those carried out by or on behalf of a federal agency; those carried out with federal financial assistance; and those requiring a federal permit, license, or approval. (36 CFR § 800.16(y))

³⁹ The APE is the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. (36 CFR § 800.16(d))

More information about this environmental impact category is presented in Chapter 8 of the FAA Order 1050.1F Desk Reference (FAA 2023a).

3.5.2 Affected Environment

In accordance with 36 CFR § 800.4(a)(1), the FAA, in consultation with the SHPO, determined an APE for consideration of the undertaking's potential effects. The APE (or study area) is defined as the geographic area covered by the seven operating areas depicted in **Figures 2 through 9**. The operating areas were selected as the APE because they capture all possible flight routes to the delivery areas and where potential effects (e.g., visual and/or auditory) to historic properties could occur. By letter dated November 13, 2023, the FAA requested concurrence from the SHPO on the APE. By letter dated December 18, 2023, the SHPO concurred with the APE. A copy of this correspondence is included in **Appendix E**.

The proposed undertaking does not have the potential to affect below-ground or archeological resources because the undertaking does not include ground disturbance. Therefore, the FAA focused its identification efforts on above-ground historic properties. To identify historic properties within the APE, the FAA's consultant, on behalf of the FAA, reviewed GIS data generated from previously completed architectural studies and surveys available on the North Carolina SHPO's HPOweb — the SHPO's online GIS database.⁴⁰ In accordance with SHPO recommendations in their December 18, 2023, letter, this effort focused on resources considered to be the most sensitive historic resources to drone package delivery operations, including battlefields, memorials, cemeteries, landmarks, museums, places of worship, and sites with an associated cultural/natural/scenic landscape, particularly those with minimum modern disturbances in their present viewsheds and generally associated with the nineteenth century or earlier.

Table 8 includes the properties identified as sensitive to drone package delivery operations within the APE by operating area. **Appendix E** contains more detailed information on these properties, including maps showing the locations of the properties.

Table 8. Sensitive Historic Properties within the APE

Operating Area	Site Number	Name	Description
Asheville	NC0001	Blue Ridge Parkway (Blue Ridge Parkway - Highlands District/DOE)	1936 National Parkway
	BN0004/BN1835	Biltmore Estate (NHL)	1889-1895 French Chateau-style Vanderbilt Estate
	BN0010	Grove Park Inn (NRHP)	1913 Rustic/Craftsman Stone Inn
	BN0057	Riverside Cemetery (NRHD)	Circa 1885 cemetery
	BN0141	Biltmore Industries (NRHP)	Early 20 th century crafts complex
	BN1825	Municipal Golf Course (NRHP)	1927, Donald Ross-designed golf course
	BN2482	Biltmore Forest Historic District (SLDOE)	Early 20 th century planned suburb

⁴⁰ See: <https://nc.maps.arcgis.com/home/item.html?id=d2d04d8d7e03403f889419526e682529>. Accessed October 2023.

Operating Area	Site Number	Name	Description
Asheville	BN6304	Lutheridge (DOE)	1949 Lutheran Church Conference Center and Camp of Rustic Revival and Modernist-style Buildings
	BN0898	Bent Creek Campus, Appalachian Forest Experiment Station (NRHP)	1925-1934 Forest Service facility
	BN6497	South Asheville Cemetery and St. John 'A' Baptist Church (NRHP)	Circa 1850-1943 African American cemetery and 1929 front-gable church
Piedmont Triad	FY0006	Graylyn Estate (NRHP)	1929-1932 Normal Revival estate and retreat center
	FY0009	Old Salem Historic District, Winston-Salem (NHL)	Moravian settlement founded in 1766
	FY0013	Salem Tavern (NHL)	1784 Moravian tavern
	FY0016	Single Brothers House (NHL)	1768 Moravian building constructed of half-timber and brick
	FY0024	Reynolda Historic District (NRHP)	1913 -1917 house and estate
	FY0048	Bethabara Historic District (NHL)	18th century Moravian Settlement
	FY0060	God's Acre Cemetery (NRHD)	1759 cemetery
	FY050	Waughtown Community Cemetery (NRHD)	Circa 1816 cemetery
	FY2101	African Methodist Episcopal Zion Church Graveyard (NRHP)	1845 cemetery
	FY2558	Salem Cemetery (DOE)	18th and 19th century cemetery
	FY3916	Hope-Fraternity Historic District (SL)	1752-2009 Moravian and Brethren farms, cemetery, and churches
	FY8772	Bethania Historic District (NHL)	Eighteenth-century Moravian Settlement
	FY9134	Winston Lake Golf Course (NRHP)	1956, 1964 golf course constructed for African American residents
	GF0001	Blandwood (NHL)	1844 Italianate house of Governor John Morehead
	GF0006	Guilford Courthouse National Military Park (NHL)	1781 Revolutionary War Battle site
	GF0022	Buffalo Presbyterian Church and Cemetery (NRHP)	1827 brick church and cemetery
	GF0504	Deep River Friends Meeting House and Cemetery (NRHP)	1875 front-gable Quaker Meeting House and Cemetery
GF0597	Green Hill Cemetery	1877 public cemetery	
GF1141	Alamance Presbyterian Church and Cemetery (DOE)	1955 Colonial Revival Church, founded 1764	

Operating Area	Site Number	Name	Description
Piedmont Triad	GF1224	New Garden Friends Cemetery (DOE)	Circa 1950 cemetery
	GF1263	Union Cemetery (NRHP)	1882-1940 African American cemetery
	GF1583	Oakwood Cemetery (SL)	19th century cemetery
	GF3020	Pleasant Grove Baptist Church (DOE)	Circa 1800-present rural community cemetery
Charlotte Metro	CA0004	Reed Gold Mine, Concord vicinity (NHL)	19 th century gold mine and State Historic Site
	CA0571	Saint John's Evangelical Lutheran Church Cemetery (SL)	1771 church and cemetery
	CL0288	Shiloh Presbyterian Church Cemetery (NRHP)	1780-1916 cemetery, 108 gravestones
	GS0020	Belmont Abbey Historic District	1876 and later Catholic monastery/college
	GS0265	Flume House in Crowders Mountain State Park	Historic resource within State Park boundaries
	GS0542	Oakwood Cemetery (NRHD)	Circa 1856 cemetery within the York-Chester Historic District
	ID1753	Mooreville Colored Cemetery (Green Acres Cemetery/SL)	Late 19 th century to 1959 cemetery
	LN0515	Machpelah Cemetery (SLDOE)	19 th century cemetery
	MK0026	Providence Presbyterian Church and Cemetery (NRHP)	1858 and later frame church complex; cemetery
	MK0072	Elmwood and Pinewood Cemetery (DOE)	1853 public cemetery
	MK1687	Paw Creek Presbyterian Church (DOE)	1882 brick church and cemetery (from 1810)
	RW1678	Mount Zion Reformed Church (DOE)	Gothic Revival church and cemetery
Research Triangle	DH0008	Duke Homestead and Tobacco Factory (NHL)	1852 Duke Family farm complex and tobacco factory.
	DH0010	W.T. Balckwell and Co. (Bull Durham) Tobacco Factory (NHL)	1875 Victorian-Italianate brick tobacco factory
	DH0014	Mechanics Farm and Bank (NHL)	1921 six-story brick commercial building; keystone of Durham's Black Wallstreet
	DH1252	Pauli Murray Family Home (Robert G. Fitzgerald House) (NHL)	1890 frame house
	DH1287	Maplewood Cemetery (SL)	1872 to present cemetery

Operating Area	Site Number	Name	Description
Research Triangle	DH2169	Bennehan-Cameron Historic District (DOE)	Rural historic district containing at least three early-nineteenth century Georgian and Federal houses and agricultural outbuildings including the individually listed Stagville (DH0007), a 1799 frame house representative of the Georgian style.
	OR0013	Old East, Cameron Avenue, Chapel Hill (NHL)	1795 core of UNC Chapel Hill campus
	OR0016	Playmakers Theatre (NHL)	1850 Greek Revival, temple-form theater
	OR0496	Old Chapel Hill Cemetery (NRHP)	1798-1944 town cemetery; 1,621 marked graves
	WA0007	North Carolina State Capitol (NHL)	1848-1852 Gothic Revival stone Episcopal church
	WA0009	Christ Church (NHL)	1833-40 Greek Revival, stone church, State Historic Site
	WA0094	Oakwood Cemetery (NRHD)	1867 cemetery
	WA0721	Crabtree Creek Recreational Demonstration Area Historic District (William B. Umstead State Park) (NRHP)	4912.16-acre State Park constructed by the Civilian Conservation Corp between 1936 and 1941. Completed in 1940 with two 25-acre lake and four group camps with 92 cabins and 4 lodges.
	WA1670	Samaria Baptist Church (DOE)	1930 church with 1950s education and office wings partially constructed with discarded Raleigh streets paving stones; 1880 cemetery
	WA1847	Dix Hill (Dorothea Dix State Hospital)	1856-1939 state mental hospital complex
	WA2484	Oak Grove Cemetery (Method Community Cemetery)	1891-present African American cemetery w/ 76 numbered plots
	WA3792	Mount Hope Cemetery (NRHP)	1872-1950s African American cemetery
	WA3905	City Cemetery (NRHP)	1798-1900; Raleigh's oldest public cemetery
	WA6388	Oberlin Cemetery (NRHP)	1873-1971 2.93-acre African American cemetery
Sandhills (Pinehurst)	MR0006/MR0615	Pinehurst Historic District and Boundary Expansion (NHL)	1895 resort village and golf course
	MR0069	Lloyd-Hower House (NRHP)	9.27-acre rustic-style resort house developed in 1929
	MR0504	Pinehurst Racetrack (NRHP)	48.4-acre equestrian complex developed in 1915

Operating Area	Site Number	Name	Description
Sandhills (Fayetteville- Raeford)	CD0001	Market House (NHL)	1832 brick arcaded market house
	CD0199	Confederate Breastworks (NRHP)	1865 Civil War earthworks located within the NRHP-boundary of the Fayetteville Veterans Administration Hospital Historic District
	CD0636	Cross Creek Cemetery No. 2 (SLDOE)	50.9-acre section of Cross Creek cemetery on the north side of Grove Street
	CD0535	Old Post Historic District (DOE)	790-acre district containing officer housing and infrastructure related to the Fort Liberty military installation
Greenville	PT0049	Red Banks Primitive Baptist Church (NRHP)	1893 front-gable frame church with 1985 cemetery
Wilmington	NH0004	USS North Carolina (NHL)	1937 WWII Battleship located within the USS North Carolina Battleship Memorial State Historic Site
	NH0160	Oakdale Cemetery (NC Study List)	65-acre Victorian-era cemetery containing known burials dating from 1855. Including the enclosed Hebrew Cemetery, Masonic Section, and Front Street methodist plot
	NH1634	Wilmington National Cemetery (NRHP)	5.1-acre cemetery containing roughly 6,000 known burials from 1867 to 2005. Roughly bounded by Chestnut Street, N 20th Street, Burnt Mill Creek, and Market Street (NC-17)

Source: HPOWeb. Accessed October 2023.

Notes: NRHP = Listed on National Register of Historic Places; NHL = National Historic Landmark; NRHD = National Register Historic District; NC Study List = on list to be further evaluated for NRHP eligibility; SL = State Listed; SLDOE = Eligible for listing on State Register; DOE = Eligible for NRHP listing

3.5.3 Environmental Consequences

The FAA has not established a significance threshold for historical, architectural, archeological, and cultural resources. FAA Order 1050.1F includes factors to consider when assessing the significance of potential impacts on these resources, including whether the action would result in a *finding of adverse effect* through the Section 106 process. However, an adverse effect finding does not automatically trigger preparation of an EIS.

3.5.3.1 No Action Alternative

The no action alternative assumes UA operators would continue to operate under the existing Part 135 approvals listed in **Section 2.1**, as well as Part 107 approvals which require operations to remain within visual line of sight. The previous EAs for Part 135 commercial drone package delivery in North Carolina resulted in FONSIs (see **Section 2.1**). Currently approved Part 135 package delivery operations forecast to continue under the no action alternative are those from Causey and UPS Flight Forward. The FAA did

not identify any adverse effects to historic properties during the previous assessments. The no action alternative is not expected to result in significant impacts on historical, architectural, archeological, or cultural resources.

3.5.3.2 Proposed Action

Given the size of the UA and predicted sound levels, UA operations would not produce vibrations that could impact the architectural structure or contents of any historic property in the APE. While the UA is not expected to generate significant noise levels at or within any historic property, the FAA considered drone delivery noise and potential visual effects on historic properties where a quiet setting or visually unimpaired sky might be a key attribute of the property's significance. The highest concentration of flights would occur around hubs where drones takeoff and land. As a result, noise and visual impacts are expected to be the highest in close proximity to hubs. Based upon the assessment described in the following paragraphs, the FAA proposed a ***finding of no adverse effect*** on historic properties. Any potential visual or auditory intrusion from drone operations would not diminish the integrity of the property's significant historic features. The SHPO concurred with the FAA's finding by letter dated April 8, 2024. See **Appendix E** for correspondence related to Section 106 consultation with the SHPO.

Operations at Hubs

The FAA recommends a 0.5-mile buffer around the historic properties identified in **Table 8** when siting a hub to avoid adverse effects on historic properties. Noise levels from a maximum proposed 500 daily deliveries at a hub are predicted to not exceed DNL 49.6 dB at 0.5 mile (see **Appendix D**). Additionally, given that hubs would be located in business districts, drones are not likely to be visible from a historic property 0.5 mile away due to the small size of the UA and structures obstructing the view. The FAA recommends a 0.5-mile buffer around the historic properties identified in **Table 8** when siting a hub to avoid adverse effects on historic properties. With this measure in place, operations at the hub would not adversely affect historic properties.

En Route Operations

Drone noise levels under en route flight paths are predicted to be less than DNL 59.6 dB. For noise estimation under en route conditions, the UA are conservatively assumed to fly the same outbound flight path between the hub and the delivery point and inbound flight path back to the hub. As such, each location under the en route path would be overflown twice for each delivery served by the respective overhead en route path. Among different operators, the actual en route flight path procedures could vary, and the same locations may not be overflown multiple times. The exact locations of all potential hubs and their applicable delivery ranges are not known, so this estimation also conservatively assumes all forecast delivery operations overfly the same location. However, due to the generally expected limitations of drone delivery area ranges, it is highly unlikely that it would be possible for 100 percent of deliveries occurring within any operating area to overfly the same location which would be required to result in the estimated level. The estimated DNL of 59.6 dB is based on the Charlotte Metro operating area which had the maximum forecast daily deliveries totaling approximately 5,000.

Based upon previous consultation with the SHPO, commercial package delivery operators will not be allowed to operate within or over the Pinehurst Historic District (MR0006/MR0615). In collaboration

with the National Park Service (NPS), the FAA has also identified the Guilford Courthouse National Military Park (GF0006) as an avoidance area. In other words, this assessment assumes that commercial drone package delivery operators will not fly within or over this property during delivery operations. Additionally, if the FAA received an application that involved UA flying over the Blue Ridge Parkway (Asheville operating area), the FAA would coordinate further with NPS to identify specific corridor crossings that avoid noise sensitive habitat, critical infrastructure, and areas of concentrated visitor use. The FAA also expects operators to comply with existing policies regarding drone use associated with any of the historic properties listed in **Table 8** (see examples in **Section 3.5.4**).

Delivery Operations

The maximum potential number of daily deliveries to individual delivery locations is unknown, but most deliveries would be of goods and products to residential locations and other businesses, and the FAA expects that more than one or two deliveries per day over the course of a year at the same location would be atypical. Thus, the noise estimation for deliveries conservatively assumes five deliveries per day at the same delivery location. Based on five daily deliveries, the predicted DNL at 125 feet from the delivery location would be up to 46 dB. The distance of 125 feet corresponds to an average residential lot size.

3.5.4 Mitigation

To avoid effects on historic properties, the SHPO recommends a 0.5-mile buffer around the properties identified in **Table 8** when siting a hub. If an operator proposed to place a hub within the 0.5-mile buffer of one of these properties, additional consultation with the SHPO would be required.

This analysis assumes that drone package delivery operators would not takeoff from, land in, or fly over the Pinehurst Historic District and Guilford Courthouse National Military Park. If an operator proposed to conduct operations within or over these two properties, additional environmental review and consultation with the SHPO and NPS would be required. Additionally, if the FAA received an application that involved UA flying over the Blue Ridge Parkway (Asheville operating area), the FAA would coordinate further with NPS to identify specific corridor crossings that avoid noise sensitive habitat, critical infrastructure, and areas of concentrated visitor use.

The FAA also expects operators to comply with existing policies regarding drone use associated with any of the historic properties listed in **Table 8**. For example:

- According to the NPS, launching a UA from or landing a UA on lands and waters administered by the NPS within the boundaries of the park is prohibited except as approved in writing by the park superintendent.⁴¹ This includes the Blue Ridge Parkway (NC0001) and Guilford Courthouse National Military Park (GF0006).
- Launching a UA from or landing a UA on Biltmore property (BN0004/BN1835) is prohibited.⁴²

⁴¹ See: https://www.nps.gov/subjects/policy/upload/PM_14-05.pdf.

⁴² See: <https://www.biltmore.com/faq/do-you-allow-drones-or-aerial-photography/>.

- Drone operators are prohibited from ascending or taking off within or upon any state park area or state park water surface without consent or a Special Activity Permit.⁴³ This includes the Flume House in Crowders Mountain State Park (GS0265) and Crabtree Creek Recreational Demonstration Area Historic District (William B. Umstead State Park) (WA0721).

3.6 Department of Transportation Act Section 4(f)

3.6.1 Definition of Resource and Regulatory Setting

Section 4(f) of the DOT Act⁴⁴ protects significant publicly owned parks, recreational areas, wildlife and waterfowl refuges, and public and private historic sites. Section 4(f) provides that the Secretary of Transportation may approve a transportation program or project requiring the *use* of publicly owned land of a public park, recreation area, or wildlife or waterfowl refuge of national, state, or local significance, or land of a historic site of national, state, or local significance, only if there is no feasible and prudent alternative to using that land and the program or project includes all possible planning to minimize harm resulting from the *use*.

The term *use* includes both direct or physical and indirect or *constructive* impacts to Section 4(f) resources. Direct use is the physical occupation or alteration of a Section 4(f) property or any portion of a Section 4(f) property. A *constructive use* does not require direct physical impacts or occupation of a Section 4(f) resource. A *constructive use* would occur when a proposed action would result in substantial impairment of a resource to the degree that the protected activities, features, or attributes of the resource that contribute to its significance or enjoyment are substantially diminished. The determination of use must consider the entire property and not simply the portion of the property used for a proposed project.

Section 4(f) resources where a quiet setting is a generally recognized feature or attribute receive special consideration. Parks, recreation areas, and wildlife and waterfowl refuges that are privately owned are not subject to Section 4(f) provisions.

More information about this environmental impact category is presented in Chapter 5 of the FAA Order 1050.1F Desk Reference (FAA 2023a).

3.6.2 Affected Environment

The FAA identified potential Section 4(f) properties within the study area, including public parks and historic sites. In addition to the historic sites noted in **Section 3.5** (see **Table 8**), the FAA identified a total of 596 public parks and recreation areas within the study area (**Appendix F**).

Section 4(f) properties operated by the NPS or the U.S. Forest Service (USFS) within the study area include the Blue Ridge Parkway and Pisgah National Forest in the Asheville operating area (see **Figure 11**) and Guilford Courthouse National Military Park in the Piedmont Triad operating area (see **Figure 12**). The study area also includes six state parks, two areas designated as “recreation areas,” six areas

⁴³ See: [https://www.ncparks.gov/about-us/permits#:~:text=Park%20visitors%20are%20prohibited%20from,Ridge%20State%20Park\)%2C%20or%20other.](https://www.ncparks.gov/about-us/permits#:~:text=Park%20visitors%20are%20prohibited%20from,Ridge%20State%20Park)%2C%20or%20other.)

⁴⁴ 49 U.S.C. § 303(c).

designated as “nature preserves,” and 30 areas designated as “natural areas” (see **Appendix F**). The FAA did not identify any wildlife or waterfowl refuges within the study area.

3.6.3 Environmental Consequences

FAA Order 1050.1F states a significant impact would occur if the proposed action involves more than a minimal physical use of a Section 4(f) resource or constitutes a *constructive use* based on an FAA determination that the aviation project would substantially impair the Section 4(f) resource.

3.6.3.1 No Action Alternative

The no action alternative assumes UA operators would continue to operate under the existing Part 135 approvals listed in **Section 2.1**, as well as Part 107 approvals which require operations to remain within visual line of sight. The previous EAs for Part 135 commercial drone package delivery in North Carolina resulted in FONSI (see **Section 2.1**). Currently approved Part 135 package delivery operations forecast to continue under the no action alternative are those from Causey and UPS Flight Forward. The FAA did not identify a *use* of any Section 4(f) property during the previous assessments. The no action alternative is not expected to result in significant impacts on properties protected by Section 4(f) of the DOT Act.

3.6.3.2 Proposed Action

The proposed action would not result in a physical use of any Section 4(f) property because there would not be any physical occupation or alteration of a Section 4(f) property or any portion of a Section 4(f) property. Hubs are expected to be located in a business’s parking lot, rooftop, or other previously developed/disturbed area and not within a Section 4(f) property. Any increase in sound level at a Section 4(f) property or potential visual effect from a drone flying over or near a Section 4(f) property would be minimal and only last seconds as the drone flies by en route to or from a hub. Also, repeated daily overflights of a Section 4(f) property are not expected because operators vary their flight paths. As described in **Section 3.3**, noise levels from drone operations are not expected to result in a significant impact. To avoid significant noise impacts, operators would be required to site their hubs a sufficient distance away from noise sensitive areas, which include properties protected by Section 4(f) (refer to **Section 3.3** for more information regarding noise-related mitigation).

Existing policies in place by agencies such as NPS, USFS, and the North Carolina Department of Natural and Cultural Resources – Division of Parks and Recreation prohibit or limit drone operations within properties they manage, which are considered Section 4(f) properties. NPS prohibits launching, landing, or operating UAS from or on lands and waters within the boundaries of properties administered by NPS unless the operator has approval in writing from the NPS superintendent.⁴⁵ The USFS recommends keeping UA away from populated and noise-sensitive areas, such as campgrounds, trail heads, and visitor centers; and not flying over congressionally designated wilderness and/or primitive areas.⁴⁶ The North Carolina Department of Natural and Cultural Resources prohibits drone operators from ascending or taking off within or upon any state park area or state park water surface without consent or a Special

⁴⁵ See: https://www.nps.gov/subjects/policy/upload/PM_14-05.pdf.

⁴⁶ See: <https://www.fs.usda.gov/visit/know-before-you-go/recreational-drone-tips>.

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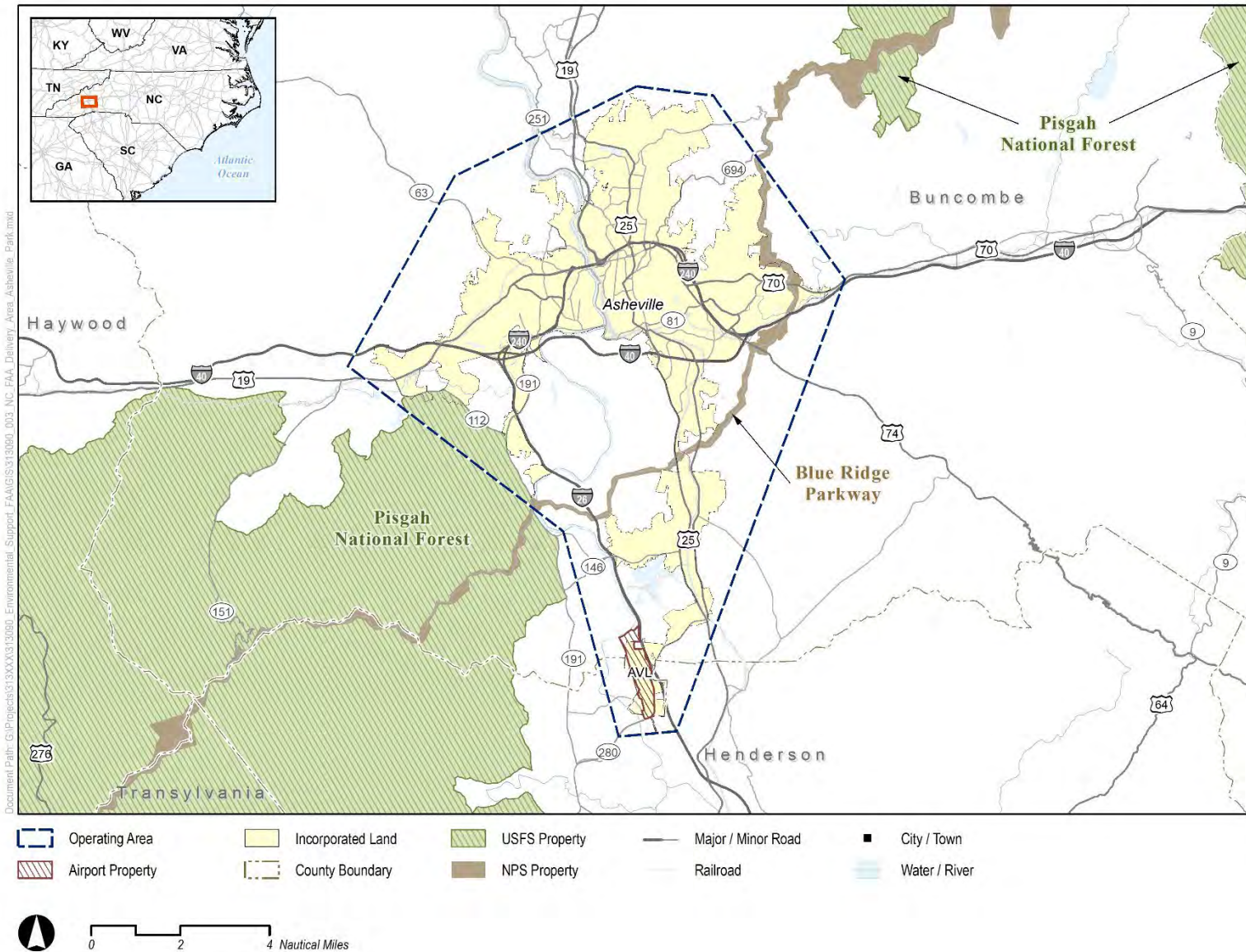


Figure 11. Property Managed by NPS and USFS in the Asheville Operating Area

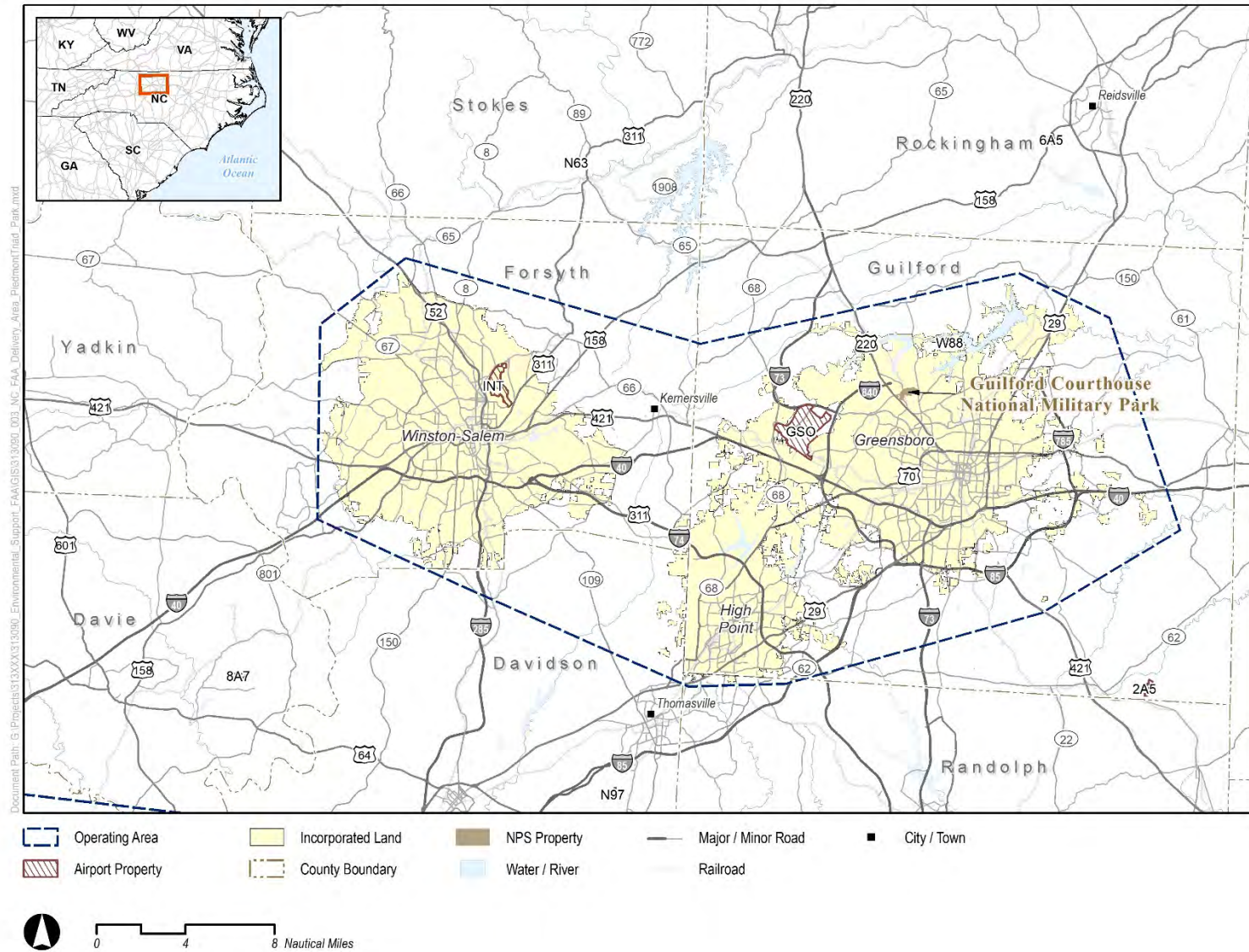


Figure 12. Property Managed by the NPS in the Piedmont Triad Operating Area

Activity Permit.⁴⁷ Some municipalities, such as the cities of Raleigh and Kannapolis, also have restrictions for UAS operations within public parks and recreation areas.⁴⁸ Additionally, as noted above, current FAA-issued exemptions for drone package delivery require each UA operator to avoid overflights of open-air assemblies of people, which may include parks and other properties protected by Section 4(f) during certain times.

Given the limited duration that a drone could be seen or heard from a Section 4(f) property and existing federal and state policies that limit drone operations within the boundaries of Section 4(f) properties, the proposed action is not expected to result in substantial impairment of a Section 4(f) resource to the degree that the protected activities, features, or attributes of the resource that contribute to its significance or enjoyment are substantially diminished.

The FAA solicited input from the NPS, USFS, and North Carolina Department of Natural and Cultural Resources regarding potential impacts to Section 4(f) properties (**Appendix C**). The FAA heard back from NPS. The FAA met with the NPS on February 29, 2024, and received written feedback from the NPS (see **Appendix C**). In collaboration with the NPS, the FAA identified measures to avoid or minimize potential effects to the Guilford Courthouse National Military Park and Blue Ridge Parkway (see **Sections 3.5.3.2** and **3.5.4**).

Given the proposed action is not expected to result in substantial impairment of any Section 4(f) properties, as well as the identified mitigation, the FAA does not expect the proposed action would result in a *use*, including a *constructive use*, of a Section 4(f) property and therefore would not result in a significant impact on Section 4(f) properties. As part of evaluating an operator's Part 135 application, the FAA will review for potential effects to Section 4(f) properties. If the FAA determines there is a potential for *constructive use* of a Section 4(f) property, the FAA will consult with the official(s) having jurisdiction over the property to address the effects and identify mitigation measures. If the FAA determines a *constructive use* would occur, and the impacts cannot be mitigated such that the property would not be substantially impaired, an EIS would be required for that particular application.

3.6.4 Mitigation

As described in **Section 3.3.4**, to avoid significant noise impacts on noise-sensitive areas, which can include Section 4(f) properties, hubs must be located at sufficient standoff distances from noise-sensitive land use.

⁴⁷ See: [https://www.ncparks.gov/about-us/permits#:~:text=Park%20visitors%20are%20prohibited%20from,Ridge%20State%20Park\)%2C%20or%20other.](https://www.ncparks.gov/about-us/permits#:~:text=Park%20visitors%20are%20prohibited%20from,Ridge%20State%20Park)%2C%20or%20other.)

⁴⁸ See: <https://cityofraleigh0drupal.blob.core.usgovcloudapi.net/drupal-prod/COR24/uav-drone-policy-parks.pdf> and <https://uavs.insct.org/wp-content/uploads/2016/04/Kannapolis-NC-Code-of-Ordinances-12-31.pdf>.

Refer to **Section 3.5.4** for mitigation measures pertaining to those Section 4(f) properties that are historic properties (e.g., Guilford Courthouse National Military Park and Blue Ridge Parkway).

If an operator were to fly its drone within the small section of the Pisgah National Forest in the Asheville operating area, the FAA recommends that UAS operators abide by USFS guidance related to UAS operations within USFS property boundaries, including keeping UA away from populated and noise-sensitive areas, such as campgrounds, trail heads, and visitor centers.

The North Carolina Department of Natural and Cultural Resources prohibits drone operators from ascending or taking off within or upon any state park area or state park water surface without consent or a Special Activity Permit.

3.7 Water Resources (Wild and Scenic Rivers)

3.7.1 Definition of Resource and Regulatory Setting

The primary federal law governing Wild and Scenic Rivers is the Wild and Scenic Rivers Act.⁴⁹ This Act was created by Congress to preserve rivers with these characteristics in a free-flowing condition for the enjoyment of present and future generations. The Act established the National Wild and Scenic River System (National System), which consists of those rivers and river segments deemed by Congress to have one or more “outstandingly remarkable” scenic, recreational, geologic, fish and wildlife, historic, or cultural values. Rivers in the system are classified based on the degree of development present along the river, and whether the river is wild, scenic, or recreational.

The Nationwide Rivers Inventory (NRI), which is maintained by NPS, lists more than 3,400 rivers or river segments that appear to meet the Act’s minimum eligibility requirements based on their free-flowing status and resource values. The development of the NRI resulted, in part, from Section 5(d)(1) in the Act, which directed federal agencies to consider *potential* Wild and Scenic Rivers in their comprehensive land management processes. Rivers on the NRI list may or may not be recommended for addition to the National System. Federal agencies with a project that could affect an NRI-listed river must coordinate with the respective agency that has jurisdiction over that river. Consultation with NPS is only necessary for water resources projects that could impact an NRI river segment.

More information about this environmental impact category is presented in Chapter 14 of the FAA Order 1050.1F Desk Reference (FAA 2023a).

3.7.2 Affected Environment

No Wild and Scenic River segments exist within the study area (NPS 2023b). Eleven NRI river segments occur within the study area (NPS 2023a), most of which are within or near urban areas (**Table 9**). Maps showing the NRI segment locations are contained in **Appendix G**.

⁴⁹ Public Law 90-542; 16 U.S.C. §§ 1271-1287.

Table 9. Nationwide Rivers Inventory Segments by Operating Area

Operating Area Name	NRI River Segment	Outstandingly Remarkable Value	Length (miles) within Operating Area	Total Length (miles) of NRI Segment
Asheville	French Broad River	Cultural, Fish, Geologic, Historic, Recreational, Scenic, Wildlife	13.7	99.1
Charlotte Metro	Mountain Creek	Cultural, Fish, Historic, Recreational, Scenic, Wildlife	3.3	14.7
	Yadkin River	Cultural, Fish, Geologic, Historic, Recreational, Scenic, Wildlife	5.3	90.7
Piedmont Triad	Uwharrie River	Cultural, Historic, Scenic	0.5	62.7
Research Triangle	Neuse River	Cultural, Fish, Geologic, Historic, Recreational, Scenic, Wildlife	8.6	125.6
Sandhills	Cape Fear River	Cultural, Fish, Historic, Recreational, Scenic, Wildlife	10.5	58.5
Greenville	---	---	---	---
Wilmington	Cape Fear River	Cultural, Fish, Historic, Recreational, Scenic, Wildlife	0.6	33.2
	Town Creek	Fish, Recreational, Scenic, Wildlife	0.1	33.2

Source: NPS 2023a

3.7.3 Environmental Consequences

The FAA has not established a significance threshold for Wild and Scenic Rivers. FAA Order 1050.1F includes factors to consider when assessing the significance of potential impacts on Wild and Scenic Rivers, including whether the action would have an adverse impact on the values for which a river was designated (or considered for designation) through:

- Destroying or altering a river's free-flowing nature,
- A direct and adverse effect on the values for which a river was designated (or under study for designation),
- Introducing a visual, audible, or other type of intrusion that is out of character with the river or would alter outstanding features of the river's setting,
- Causing the river's water quality to deteriorate,

- Allowing the transfer or sale of property interests without restrictions needed to protect the river or the river corridor (which cannot exceed an average of 320 acres per mile, which, if applied uniformly along the entire designated segment, is one-quarter of a mile on each side of the river), or
- Any of the above impacts preventing a river on the NRI or a Section 5(d) river that is not included in the NRI from being included in the Wild and Scenic River System or causing a downgrade in its classification (such as from wild to recreational).

3.7.3.1 No Action Alternative

The no action alternative assumes UA operators would continue to operate under the existing Part 135 approvals listed in **Section 2.1**, as well as Part 107 approvals which require operations to remain within visual line of sight. The previous EAs for Part 135 commercial drone package delivery in North Carolina resulted in FONSI (see **Section 2.1**). Currently approved Part 135 package delivery operations forecast to continue under the no action alternative are those from Causey and UPS Flight Forward. The FAA did not identify any adverse impacts to Wild and Scenic Rivers or NRI river segments during the previous assessments. Currently, UA operations can occur over these river segments under existing regulatory authorities. However, flights conducted under the no action alternative would not overfly NRI river segments at an intensity that could cause detrimental impacts to the values of these resources. The no action alternative is not expected to result in significant impacts on Wild and Scenic Rivers.

3.7.3.2 Proposed Action

The proposed action would not physically impact a river or river segment on the NRI. UA might fly over NRI river segments during package delivery operations. However, the NRI river segments are located within or in close proximity to urban areas where visual and auditory sources are common. The FAA recommends that drone operators cross rivers, streams, or other linear waterbodies in a perpendicular fashion. Flight paths should not run parallel to or along a stream, river, or other waterbody.

The FAA does not expect UA would overfly NRI river segments at an intensity that could cause any detrimental impacts to the character or values of these resources. Typical cruise altitude is 150 to 375 feet AGL and typical cruise speed is 30–60 knots (35–70 miles per hour). At this altitude and speed, a drone en route to or from a hub may not be detected by an observer recreating at a river on the NRI. If it is detected, the duration for which the drone would be visible would be short.

The proposed action would not destroy or alter a river's free-flowing nature; would not result in a direct and adverse effect on the values for which a river was designated (or under study for designation); would not introduce a visual, audible, or other type of intrusion that is out of character with the river or alter outstanding features of the river's setting; would not cause the river's water quality to deteriorate; would not allow the transfer or sale of property interests without restrictions needed to protect the river or the river corridor; and would not result in impacts preventing a river on the NRI or a Section 5(d) river that is not included in the NRI from being included in the National System or cause a downgrade in its classification (such as from wild to recreational). Therefore, the proposed action would not result in significant impacts to Wild and Scenic Rivers or rivers on the NRI.

3.8 Biological Resources (Wildlife)

3.8.1 Definition of Resource and Regulatory Setting

Biological resources include fish, wildlife, plants, and their respective habitats. They are valued for their intrinsic, aesthetic, economic, and recreational qualities. Typical categories of biological resources include terrestrial and aquatic plant and animal species and their associated habitat, special status species (state or federally listed threatened or endangered species, marine mammals, or species of concern, such as species proposed for listing, candidate species, and migratory birds, including Bald and Golden Eagles), and environmentally sensitive or critical habitats. As described in **Section 3.2**, fish and plants were dismissed from detailed analysis. Therefore, this section focuses on wildlife.

Section 7(a)(2) of the Endangered Species Act (ESA)⁵⁰ requires that each federal agency—in consultation with the U.S. Fish and Wildlife Service (USFWS) or National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS)—ensures that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat. The FAA is required to consult the USFWS or NMFS if an action may affect a federally listed species or critical habitat.

The Migratory Bird Treaty Act (MBTA)⁵¹ protects migratory birds by prohibiting the taking, killing, or possessing of migratory birds (including their eggs, nests, and feathers). The MBTA applies to migratory birds identified in 50 CFR § 10.13 (referred to hereafter as “migratory birds”). Each UA operator is responsible for compliance with the MBTA.

The Bald and Golden Eagle Protection Act (BGEPA) prohibits anyone from “taking” a bald or golden eagle, including their parts, nests, or eggs, without a permit issued by the USFWS. Implementing regulations (50 CFR Part 22) and USFWS guidelines as published in the National Bald Eagle Management Guidelines (USFWS 2007) provide for additional protections against “disturbances.” Similar to take, “disturb” means to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, injury to an eagle or causes either a decrease in its productivity or nest abandonment due to a substantial interference with breeding, feeding, or sheltering. A permitting process provides limited exceptions to BGEPA’s prohibitions (50 CFR Part 22). Permits are only needed when avoidance of incidental take is not possible. According to the National Bald Eagle Management Guidelines, if conservation measures can be implemented such that no aircraft are flown within 1,000 feet of a nest, incidental take of bald eagles is unlikely to occur, and no permit is needed. Each UA operator is responsible for compliance with BGEPA.

On February 12, 2024, the USFWS published a final rule creating new permitting pathways and revising existing regulations for the take of bald and golden eagles. The final rule, which takes effect on April 12, 2024, establishes new general permits for qualifying activities resulting in take to eagles, known as general permits. The four general permit categories are for wind energy infrastructure, power line infrastructure, bald eagle disturbance, and bald eagle nest take. Regarding bald eagle disturbance,

⁵⁰ 16 U.S.C. § 1531 et seq.

⁵¹ 16 U.S.C. §§ 703–712.

aircraft operation (e.g., helicopters and fixed-wing aircraft) within 1,000 feet of an in-use bald eagle nest is eligible for a general permit.⁵²

More information about this environmental impact category is presented in Chapter 2 of the FAA Order 1050.1F Desk Reference (FAA 2023a).

3.8.2 Affected Environment

The operating areas (**Figures 2 through 9**) are located around metro areas. Most of the land surface within the study area is developed and consistent with land uses found in urban and suburban areas. The study area contains uplands, parks, open spaces, lakes, rivers, and other waterbodies, and vacant lands that support a variety of insects, reptiles, amphibians, mammals, and birds.

Special Status Species

ESA-Listed Species and Critical Habitat

The study area for ESA consultation is referred to as the *action area*. The action area is defined as the seven operating areas. The FAA used the USFWS Information for Planning and Consultation (IPaC) online system (USFWS 2023) to identify ESA-listed species and critical habitat in the action area (**Appendix H**). In total, there are 40 species listed or proposed to be listed, and one candidate species for listing, in the action area. Of the 40 listed or proposed to be listed species, 11 have the potential to be affected. **Table 10** lists these 11 species and identifies their occurrence within each of the seven operating areas. There is designated critical habitat for five species and proposed critical habitat for one species in the action area. Refer to **Appendix H** for the complete list of species and critical habitat.

Table 10. ESA-Listed Species and Critical Habitat with the Potential to be Affected in the Action Area

Class	Scientific Name	Common Name	Federal Listing	Asheville	Charlotte Metro	Piedmont Triad	Research Triangle	Sandhills	Greenville	Wilmington
Mammals (n=4)	<i>Myotis grisescens</i>	Gray bat	E	X						
	<i>Myotis septentrionalis</i>	Northern long-eared bat	E	X					X	X
	<i>Perimyotis subflavus</i>	Tricolored bat	PE	X	X	X	X	X	X	X
	<i>Trichechus manatus</i>	West Indian manatee	T						X	X
Birds (n=3)	<i>Charadrius melodus</i>	Piping plover	T							X
	<i>Calidris canutus rufa</i>	Red knot	T							X
	<i>Picoides borealis</i>	Red-cockaded woodpecker	E		X		X	X		X
Reptiles (n=4)	<i>Chelonia mydas</i>	Green sea turtle	T							X

⁵² 89 FR 9964 (February 12, 2024).

Class	Scientific Name	Common Name	Federal Listing	Asheville	Charlotte Metro	Piedmont Triad	Research Triangle	Sandhills	Greenville	Wilmington
Reptiles (n=4)	<i>Lepidochelys kempii</i>	Kemp's ridley sea turtle	E							X
	<i>Dermochelys coriacea</i>	Leatherback sea turtle	E							X
	<i>Caretta caretta</i>	Loggerhead sea turtle	T							X

Notes: E = endangered; PE = proposed endangered; T = threatened

Source: USFWS 2023, IPaC report dated August 31, 2023

State Species of Concern

The North Carolina Wildlife Resources Commission (NCWRC) lists 248 species of amphibians, birds, fish, mammals, reptiles, and mollusks as endangered, threatened, or of special concern within the state of North Carolina (NCWRC 2021). While these species are listed in the state, it does not automatically mean they have the potential to occur in the operating areas. In addition to the state species of concern, the NCWRC's *Wildlife Action Plan* (NCWRC 2020) identifies 483 Species of Greatest Conservation Need, which are species that are declining or rare and need attention and conservation measures to recover or to prevent the need to be listed under state or federal regulations. The *Wildlife Action Plan* identifies potential stressors to the Species of Greatest Conservation Need and strategies to protect and conserve habitat that supports these species, so they do not become state-listed or federally listed protected species (NCWRC 2020).

Migratory Birds

Migratory bird species present in the study area vary throughout the year. Migratory birds likely to be present in the study area include the Bald Eagle, Black-billed Cuckoo, Bobolink, Canada Warbler, Cerulean Warbler, Chimney Swift, Eastern Whippoorwill, Golden-winged Warbler, Henslow's Sparrow, Kentucky Warbler, Northern Saw-whet Owl, Prairie Warbler, Prothonotary Warbler, Red-headed Woodpecker, Rusty Blackbird, and Wood Thrush. More information on these species, their breeding seasons, and the likelihood of their occurrence in the study area is presented in the USFWS IPaC report in **Appendix H**.

Bald and Golden Eagles

Bald eagles may be found year-round along the coastal areas of North Carolina or throughout the state during non-breeding times of the year (Cornell Lab n.d., USFWS 2023). The bald eagle prefers habitat near lakes, large rivers, and shorelines of sounds and bays. It requires tall, isolated trees for perching and nesting. Bald eagles are present across the state, mainly near large bodies of water. They are a common sight at Jordan and Falls lakes (NCWRC 2018), both of which are located in the Research Triangle operating area.

Golden eagles favor partially or completely open country, especially mountainous regions, hills, and cliffs. They inhabit diverse lands, including tundra, shrublands, grasslands, coniferous forests, farmland, and along rivers and streams. The golden eagle is mostly present in the western half of the United States (Cornell Lab n.d.). In this species' eastern range, golden eagles nest in Canada during the summer months and migrate south in the winter (NCWRC 2014). Some use the mountains in western North Carolina as their home. This area is outside of the study area.

3.8.3 Environmental Consequences

FAA Order 1050.1F states a significant impact on biological resources would occur if the USFWS or NMFS determines the action would be likely to jeopardize the continued existence of a federally listed threatened or endangered species or would result in the destruction or adverse modification of federally designated critical habitat. The FAA has not established a significance threshold for unlisted species. FAA Order 1050.1F includes factors to consider when assessing the significance of potential impacts on unlisted species, including whether the action would have the potential for:

- A long-term or permanent loss of unlisted plant or wildlife species (e.g., extirpation of the species from a large project area, such as from a new commercial service airport),
- Adverse impacts on special status species or their habitats,
- Substantial loss, reduction, degradation, disturbance, or fragmentation of native species' habitats or their populations, or
- Adverse impacts on a species' reproductive success rates, natural mortality rates, non-natural mortality (e.g., road kills and hunting), or ability to sustain the minimum population levels required for population maintenance

3.8.3.1 No Action Alternative

The no action alternative assumes UA operators would continue to operate under the existing Part 135 approvals listed in **Section 2.1**, as well as Part 107 approvals which require operations to remain within visual line of sight. The previous EAs for Part 135 commercial drone package delivery in North Carolina resulted in FONSI (see **Section 2.1**). Currently approved Part 135 package delivery operations forecast to continue under the no action alternative are those from Causey and UPS Flight Forward. The FAA did not identify any adverse effects to ESA-listed species or designated critical habitat during the previous assessments. Operations would occur in predominantly urban or suburban environments, typically well above the tree line and away from sensitive habitats. Given the short duration of increased noise levels, operations are not expected to significantly influence wildlife in the area. The no action alternative is not expected to result in significant impacts on biological resources.

3.8.3.2 Proposed Action

The proposed action does not involve any construction or ground disturbance. Hubs are expected to be located in a business's parking lot, rooftop, or other previously developed/disturbed area. Deliveries would occur at residences or other places of business. Therefore, the proposed action would not alter any wildlife habitat.

UA noise, visual presence, and the potential for airborne strikes with flying species are the proposed action's potential stressors or threats to wildlife. Flight operations would take place mostly in an urban or suburban environment, within airspace, and typically remain well above the tree line while en route to and from a hub. The duration of exposure by wildlife on the ground to visual or noise impacts from the UA would be of very short duration (less than 60 seconds during takeoff/landing, up to 90 seconds during delivery, and a few seconds during the en route phase as the UA flies by).

Common Species

Strikes

The proposed action would involve drone operation from zero feet at takeoff and landing to a maximum cruising altitude of 400 feet AGL (with typical cruising altitude ranging from 150–375 feet AGL); therefore, the potential for a drone to strike a flying species (bat, bird, or insect) exists. The FAA has maintained a Wildlife Strike Database since 1990 that contains all recorded wildlife strikes,⁵³ but strike reporting is voluntary. As of October 1, 2023, there have been thousands of commercial drone small package delivery flights throughout the country. The FAA Wildlife Strike Database does not have documented reports of drone package delivery operations striking wildlife in the United States; though, as noted, strike reporting is voluntary.

Although public data is lacking for this airframe (small drones) specifically, it is important to evaluate available wildlife strike data because the flight profile of the UA will place operations in similar altitudes that have been evaluated by the FAA since 1990. The FAA produces an annual serial report in cooperation with the U.S. Department of Agriculture, Wildlife Services, that analyzes reported wildlife strike data from 1990 to 2022. Roughly 70 percent of bird strikes occurred at or below 500 feet AGL during this timeframe for commercial transport and general aviation aircraft (Dolbeer et al. 2023). The majority of local movements of birds occur below 500 feet AGL, as birds take the lowest altitude available to them to expend the least amount of energy.

Visual Presence

In addition to a potential strike, studies have shown varying responses from animals to the presence of drones. Some have shown changes in behavior such as fleeing, changing foraging or course (McEvoy et al. 2016), aggression (Rebolo-Ifrán et al. 2019), and temporary or permanent nest or young abandonment (Cantu de Leija et al., 2023). Studies showing nest abandonment involved using drone technology for wildlife population surveys, animal detection, and animal behavior survey and subsequent response to drone presence (Mo and Bonatakis 2022). Type of drone, size, and wing attachment were all found to affect disturbance to wildlife as well, with fixed-wing drones being more likely to elicit a response due to their shape and shadow resembling predators and larger drones causing more disruption (Rebolo-Ifrán et al. 2019, McEvoy et al. 2016, Kuhlmann et al. 2022). One study found that, in most instances, drones within four meters of birds did not cause a behavioral response (Vas et al. 2015). In another study, drones barely elicited behavioral responses in terrestrial mammals (Mulero-Pázmány et al. 2017).

⁵³ See: <https://wildlife.faa.gov/home>.

Visual presence of the UA will be greatest at the hubs, where the UA takeoff and land. Hubs are expected to be located in commercial business areas or parking lots, which are areas unlikely to sustain abundant wildlife populations. The delivery locations will be residences (yards, sidewalks, driveways, or other cleared areas) or other businesses (parking lots, rooftops, or other cleared areas at the business).

Noise

Wildlife could be exposed to UA noise during all flight phases. A wide range of studies have been conducted concerning noise effects on animals (Manci et al. 1988; Dufour 1980; McKechnie and Gladwin 1993; Bradley et al. 1990; Lee and Fleming 2002; Bowles 1995). Natural factors which affect reaction include season, group size, age and sex composition, on-going activity, motivational state, reproductive condition, terrain, weather, and temperament (Bowles 1995). Individual animal response to a given noise event or series of events can also vary widely due to a variety of factors, including time of day, physical condition of the animal, physical environment, the experience of the individual animal with noise, and whether other physical stressors (e.g., drought) are present (Manci et al. 1988). Consequently, it is difficult to generalize animal responses to noise disturbances across species.

One result of the Manci et al. (1988) literature review was the conclusion that, while behavioral observation studies were relatively limited, a general behavioral reaction in animals from exposure to aircraft noise is the startle response. The intensity and duration of the startle response appears to be dependent on which species is exposed, whether there is a group or an individual, and whether there have been some previous exposures. Responses range from flight, trampling, stampeding, jumping, or running, to movement of the head in the apparent direction of the noise source. Manci et al. (1988) reported that the literature indicated that avian species may be more sensitive to aircraft noise than mammals.

A noise descriptor for noise effects on wildlife has not been universally adopted, but some research indicates SEL is the most useful predictor of responses. Characteristic of the bulk of research to date has been lack of systematic documentation of the source noise event. Many studies report “sound levels” without specifying the frequency spectrum or duration. A notable exception is a study sponsored by U.S. Air Force that identifies SEL as the best descriptor for response of domestic turkey poults to low-altitude aircraft overflights (Bradley et al. 1990). This study identified a threshold of response for disturbance of domestic turkeys (“100 percent rate of crowding”) as SEL 100 dB. As noted in **Section 3.3**, the estimated maximum SEL for all flight phases of the heavier UA group is 96.6 dB occurring at 32.8 feet from a delivery point. Noise from the lighter UA group would be lower, with a maximum SEL of 87.9 dB at the same location. The maximum en route SEL of 67.8 dB would occur at distances of 2,500 feet or greater for receivers directly under the UA flight path. For context, the noise level of a diesel truck at 50 feet or a noisy urban environment during the day is estimated to be between 80 to 90 dB; the sound level of an air conditioning unit at 100 feet is approximately 60 dB.

In summary, given that 1) operations would occur mostly in an urban and suburban environment, 2) UA would cruise at an altitude of 150–375 feet AGL, 3) any increase in sound levels experienced by wildlife from drones would be low and of short duration, and 4) the low likelihood of a UA striking an individual animal, the proposed action is not expected to adversely affect wildlife populations in the study area. The proposed action is not expected to result in a long-term or permanent loss of wildlife species; substantial loss, reduction, degradation, disturbance, or fragmentation of native species’ habitats or

their populations; or adverse impacts on a species' reproductive success rates, natural mortality rates, non-natural mortality, or ability to sustain the minimum population levels required for population maintenance. Therefore, the proposed action is not expected to result in significant impacts on common (unlisted) wildlife species.

ESA-Listed Species and Critical Habitat

The FAA evaluated the potential for the proposed action to affect ESA-listed species and critical habitat. Based upon the FAA's Biological Evaluation contained in **Appendix H**, the FAA determined the proposed action would have *no effect* on designated critical habitat and critical habitat proposed for designation. The FAA determined the proposed action would have *no effect* on the listed amphibians, fish, clams, mussels, snails, insects, plants, and lichens in the action area.

For the listed or proposed to be listed species with the potential to be affected by the proposed action (**Table 10**), the FAA determined the proposed action *may affect but is not likely to adversely affect* these species (**Table 11**). In addition, the proposed action is not expected to adversely affect the monarch butterfly, a candidate species for federal listing. The USFWS concurred with the FAA's *may affect* determinations on February 2, 2024. Refer to **Appendix H** for the complete evaluation of potential effects to ESA-listed species and critical habitat.

Table 11. Effect Determinations for ESA-Listed Species and Species Proposed for Listing

Species	Effect Determination
Mammals	
Gray bat	May affect, not likely to adversely affect
Northern long-eared bat	May affect, not likely to adversely affect
Tricolored bat	May affect, not likely to adversely affect
West Indian manatee	May affect, not likely to adversely affect
Birds	
Piping plover	May affect, not likely to adversely affect
Red knot	May affect, not likely to adversely affect
Red-cockaded woodpecker	May affect, not likely to adversely affect
Reptiles	
Green sea turtle	May affect, not likely to adversely affect
Kemp's ridley sea turtle	May affect, not likely to adversely affect
Leatherback sea turtle	May affect, not likely to adversely affect
Loggerhead sea turtle	May affect, not likely to adversely affect

State Species of Concern

Out of the 248 species listed by the state as threatened, endangered, or special concern in North Carolina, 171 are fully or semi-aquatic: amphibians, crustacea, fish, mollusks, and reptiles (sea turtles). Literature suggests drones are much less likely to impact aquatic species (Rebolo-Ifran 2019). The FAA recommends that operators fly across streams, rivers, and other linear waterbodies perpendicular to the banks of the river/waterway to minimize UA exposure over aquatic and riparian habitat.

The remaining state-listed species are birds, mammals, and reptiles (snakes, lizards, turtles, and alligators), all of which inhabit a variety of environments and have the potential to occur in one or

multiple operating areas. As described above, the duration of exposure by wildlife on the ground to visual or noise impacts from the UA would be of very short duration (less than 60 seconds during takeoff/landing, up to 90 seconds during delivery, and a few seconds during the en route phase as the UA flies by). Studies show terrestrial species react differently to drones. Some escape, attack, curiously approach, or observe on high alert (Rebolo-Ifran 2019, Mo & Bonatakis 2022), while others found drone approach toward certain waterfowl produced no behavioral response (McEvoy *et.al.* 2016, Vas *et.al.* 2015). In contrast, a specific study on a small whiptail lizard, showed a potential physiological stress response to low-flying military aircraft (Kepas et al. 2023).

Given that 1) operations would occur mostly in an urban and suburban environment, 2) UA would cruise at an altitude of 150–375 feet AGL, 3) any increase in sound levels experienced by wildlife from drones would be low and of short duration, and 4) the low likelihood of a UA striking an individual animal, the proposed action is not expected to adversely affect state species of concern.

Migratory Birds

The MBTA makes it unlawful to take, possess, buy, sell, purchase, or barter any migratory bird species, including feathers or other parts, nests, eggs, or products, without prior authorization by the USFWS. Disturbance that causes nest abandonment and/or loss of reproductive effort (e.g., killing or abandoning eggs or young) may also be considered a “take” under the MBTA. Birds experiencing disturbance would be expected to leave the area and return once the disruption ends. Studies demonstrating nest abandonment or reduced reproductive success due to UA have been associated with drone usage intended for bird population assessment and bird surveys, not package delivery services. While there is potential that UA operations could impact migratory birds, due to the short duration of potential nuisance and small chance of strike, the proposed action is anticipated to be compliant with the MBTA and USFWS requirements for Birds of Conservation Concern. It is ultimately the operator’s responsibility to comply with the MBTA. Migratory bird species may display disturbance behaviors towards drones, such as fleeing or attacking maneuvers (Rebelo-Ifran et al. 2019); however, due to the limited scale of operations, the altitude of overflights (cruising between 150 and 375 feet AGL), and minimal anticipated noise and visual impacts from the action, the proposed action is not expected to result in significant impacts to migratory birds.

Bald and Golden Eagles

The proposed action is not expected to affect golden eagles because golden eagles are not known to inhabit the study area. Regarding bald eagles, any actions that are likely to disturb a bald eagle require a permit from the USFWS. Disturbance of nesting Bald Eagles may result in nest abandonment, flushing of adults, or premature flushing of nestlings (USFWS 2007). As noted in **Section 3.8.1**, aircraft operation within 1,000 feet of an in-use bald eagle nest is eligible for a general permit. Thus, if an operator were to site a hub within 1,000 feet of a bald eagle nest, the FAA recommends the operator contact the USFWS to discuss obtaining a permit.

Studies demonstrating nest abandonment or reduced reproductive success due to UA operations have been associated with bird surveys, with drones focused on assessing bird populations, not package delivery services. While there is potential that drone package delivery operations could impact bald eagles, due to the short duration of potential nuisance and small chance of strike, the proposed action is

not expected to result in any bald eagle mortality. Operators are required to comply with the BGEPA, which requires identifying active bald eagle nests within the operating area. Operations that require a USFWS-issued permit would have to comply with permit conditions intended to avoid or minimize bald eagle disturbance. In summary, the proposed action is not expected to result in significant impacts on bald eagles.

In conclusion, based on the analysis above and the USFWS's concurrence that the proposed action is not likely to adversely affect ESA-listed species or critical habitat, the proposed action is not expected to result in significant impacts on biological resources.

3.8.4 Mitigation

As described in **Section 3.8.3**, the FAA does not expect the proposed action to result in any adverse effects to ESA-listed species or critical habitat. Nonetheless, the FAA has developed the following measures as part of the ESA consultation with the USFWS to avoid or minimize effects to ESA-listed species in the study area to assist in the conservation of these resources.

Education

The FAA will inform UAS operators about the potential presence of ESA-listed species in the operating area and each operator's obligation to comply with environmental laws (e.g., ESA, BGEPA, and MBTA).

The FAA will recommend each UAS operator provide an environmental awareness briefing to all personnel as part of its operational plans for purposes of advising personnel about the potential presence of ESA-listed species in the operating area and identifying where such species may be present in the operating area.

Bat-Specific Measure

The FAA will contact the NCWRC bat biologist to obtain statewide bat roost and hibernacula data. The FAA will provide this data to Part 135 package delivery operators and request operators prohibit hovering, taking off, and landing within 150 feet of the bat roost or hibernacula. In the case of roosts in bridges or culverts, the 150-foot buffer applies to any point on the structure.

West Indian Manatee-Specific Measure

The FAA will request operators operating in the Greenville and Wilmington operating areas from June to October to conduct en route flights at an altitude of 350 feet over potential manatee habitat.

In addition to the mitigation measures identified as part of the ESA consultation, the FAA recommends that operators cross rivers, streams, or other linear waterbodies, such as the Atlantic Intracoastal Waterway, in a perpendicular fashion to avoid or minimize potential effects to wildlife that use aquatic or riparian habitat. Flight paths should not run parallel to or along a stream, river, or other waterbody.

3.9 Environmental Justice

3.9.1 Definition of Resource and Regulatory Setting

Environmental justice (EJ) is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people should bear a disproportionate share of the negative environmental consequences resulting from industrial, governmental, and commercial operations or policies. Meaningful Involvement means that people have an opportunity to participate in decisions about activities that may affect their environment and/or health; the public's contribution can influence the regulatory agency's decision; their concerns will be considered in the decision-making process; and the decision makers seek out and facilitate the involvement of those potentially affected.

EO 14096, *Revitalizing Our Nation's Commitment to Environmental Justice for All*, was enacted on April 21, 2023. EO 14096 on EJ does not rescind EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, which has been in effect since February 11, 1994, and is currently implemented through DOT Order 5610.2C, *U.S. Department of Transportation Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*. This implementation will continue until further guidance is provided regarding the implementation of the new EO 14096 on EJ.

EO 12898 directs each federal agency to “make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations.” Subsequent orders at the federal level—including DOT Order 5610.2C—have reinforced the directives outlined in EO 12898. CEQ also developed guidelines (CEQ 1997) to assist federal agencies in incorporating the goals of EO 12898 into the NEPA process.

DOT Order 5610.2C defines a minority person as a person who is Black, Hispanic or Latino, Asian American, American Indian or Alaska Native, or Native Hawaiian or Other Pacific Islander. The DOT Order defines a minority population as any readily identifiable group of minority persons who live in geographic proximity, and if circumstances warrant, geographically dispersed/transient persons (such as migrant workers or Native Americans) who will be similarly affected by a proposed DOT program, policy, or activity.

DOT Order 5610.2C defines a low-income person as a person whose median household income is at or below the Department of Health and Human Services (HHS) poverty guidelines. It defines a low-income population as any readily identifiable group of low-income persons who live in geographic proximity, and, if circumstances warrant, geographically dispersed/transient persons (such as migrant workers or Native Americans) who would be similarly affected by a proposed DOT program, policy, or activity.

More information about this environmental impact category is presented in Chapter 14 of the FAA Order 1050.1F Desk Reference (FAA 2023a).

3.9.2 Affected Environment

The study area includes 25 counties: Buncombe, Henderson, Cleveland, Catawba, Iredell, Lincoln, Rowan, Gaston, Cabarrus, Mecklenburg, Stanly, Union, Pitt, Forsyth, Davidson, Guilford, Orange, Durham, Granville, Chatham, Wake, Moore, Cumberland, Hoke, and New Hanover.

DOT Order 5610.2C accounts for both race and ethnicity in addressing EJ impacts. The FAA identified minority populations, classified by both race and ethnicity,⁵⁴ using the Decennial Census down to the county level. Separate data is provided for racial minority and Hispanic populations; therefore, this analysis identifies these populations by both classifications. The FAA identified low-income populations using 2020 American Community Survey (ACS) 5-year estimates from the U.S. Census Bureau. The FAA compared the ACS 5-year estimates to the HHS Poverty Guidelines for the 48 contiguous states and the District of Columbia to calculate the percentage of households below the poverty threshold for each county.

The FAA selected a “Reference Community” to provide a benchmark by which the individual counties could be compared to identify areas of EJ concern within the study area. Due to the size and population of the study area, the FAA used the aggregate of the 25 counties as the Reference Community for this analysis.⁵⁵ This regional Reference Community allows the demographics of localized populations (i.e., counties) to be compared to the total population within the overall study area.⁵⁶

The FAA considered communities (i.e., counties) where EJ demographics exceed those of the Reference Community by a “meaningfully greater” amount to be areas of EJ concern. The FAA selected a threshold value of 0 percent or greater than the average of the Reference Community to define the “meaningfully greater” amount to ensure that any potential EJ communities were identified. As a result, any county with a percentage of minority and/or low-income populations greater than the Reference Community are considered an area of EJ concern for the purpose of this EJ analysis.

For reference, the FAA also included data for the state of North Carolina as a reference to provide additional context. The FAA used the comparison between the 25-county aggregate Reference Community and the individual county to identify areas of EJ concern.

Tables 12 and 13 show the demographic information of each county within the study area, the Reference Community, and the state of North Carolina.

⁵⁴ As defined by the U.S. Census Bureau.

⁵⁵ Per *Promising Practices for EJ Methodologies in NEPA Reviews* (March 2016), a product of the Federal Interagency Working Group on EJ, a larger scale reference community (e.g., municipal, state, or regional) may be required under this circumstance to obtain results that accurately reflect the existence of a minority population in the geographic unit of analysis (e.g., census block) being analyzed. Available: <https://www.epa.gov/environmentaljustice/ej-iwg-promising-practices-ej-methodologies-nepa-reviews>.

⁵⁶ See *Community Guide to Environmental Justice and NEPA Methods* (March 2019), a product of the Federal Interagency Working Group on EJ, for more information on the importance of selecting an appropriate Reference Community and its use in meaningfully greater analyses. Available: <https://www.energy.gov/sites/default/files/2019/05/f63/NEPA%20Community%20Guide%202019.pdf>.

Table 12. Selected Demographic Characteristics (Race and Ethnicity) by County

Geographic Area	Total Population	White	% White	All Other Races	% All Other Races	% Hispanic	Meaningfully Greater by Race?	Meaningfully Greater by Ethnicity?
Reference Community	6,651,757	3,948,617	59.4%	2,703,140	40.6%	11.5%	N/A	N/A
North Carolina	10,439,388	6,488,459	62.2%	3,950,929	37.8%	10.7%	N/A	N/A
Asheville Operating Area								
Buncombe County	269,452	218,867	81.2%	50,585	18.8%	8.1%	No	No
Henderson County	116,281	94,151	81.0%	22,130	19.0%	12.9%	No	Yes
Charlotte Metro Operating Area								
Cleveland County	99,519	71,076	71.4%	28,443	28.6%	4.1%	No	No
Catawba County	160,610	118,946	74.1%	41,664	25.9%	10.8%	No	No
Iredell County	186,693	139,369	74.7%	47,324	25.3%	8.5%	No	No
Lincoln County	86,810	72,716	83.8%	14,094	16.2%	7.4%	No	No
Rowan County	146,875	102,693	69.9%	44,182	30.1%	10.9%	No	No
Gaston County	227,943	156,794	68.8%	71,149	31.2%	8.8%	No	No
Cabarrus County	225,804	137,756	61.0%	88,048	39.0%	12.1%	No	Yes
Mecklenburg County	1,115,482	520,567	46.7%	594,915	53.3%	15.2%	Yes	Yes
Stanly County	62,504	49,149	78.6%	13,355	21.4%	4.9%	No	No
Union County	238,267	165,562	69.5%	72,705	30.5%	12.6%	No	Yes
Greenville Operating Area								
Pitt County	170,243	88,790	52.2%	81,453	47.8%	7.6%	Yes	No
Piedmont Triad Operating Area								
Forsyth County	382,590	214,877	56.2%	167,713	43.8%	14.3%	Yes	Yes
Davidson County	168,930	131,922	78.1%	37,008	21.9%	8.2%	No	No
Guilford County	541,299	263,428	48.7%	277,871	51.3%	9.6%	Yes	No
Research Triangle Operating Area								
Orange County	148,696	99,091	66.6%	49,605	33.4%	10.6%	No	No
Durham County	324,833	139,231	42.9%	185,602	57.1%	15.4%	Yes	Yes
Granville County	60,992	34,579	56.7%	26,413	43.3%	10.2%	Yes	No
Chatham County	76,285	54,431	71.4%	21,854	28.6%	13.6%	No	Yes
Wake County	1,129,410	663,832	58.8%	465,578	41.2%	11.4%	Yes	No
Sandhills Operating Area								
Moore County	99,727	77,010	77.2%	22,717	22.8%	7.4%	No	No

Geographic Area	Total Population	White	% White	All Other Races	% All Other Races	% Hispanic	Meaningfully Greater by Race?	Meaningfully Greater by Ethnicity?
Cumberland County	334,728	141,912	42.4%	192,816	57.6%	11.8%	Yes	Yes
Hoke County	52,082	21,031	40.4%	31,051	59.6%	14.8%	Yes	Yes
Wilmington Operating Area								
New Hanover County	225,702	170,837	75.7%	54,865	24.3%	7.7%	No	No

Source: U.S. Census Bureau 2020

Note: **Bolded** percentages indicate those that exceed Reference Community percentages.

Table 13. Selected Demographic Characteristics (Poverty) by County

Geographic Area	Number of Households	Average Household Size	2021 HHS Poverty Guideline	% Households Below Poverty	Meaningfully Greater?
Reference Community	2,554,124	2.5	\$19,690	12.6%	N/A
North Carolina	4,034,684	2.5	\$19,690	14.5%	N/A
Asheville Operating Area					
Buncombe County	103,575	2.5	\$19,690	14.1%	Yes
Henderson County	48,519	2.4	\$19,236	12.2%	No
Charlotte Metro Operating Area					
Cleveland County	36,665	2.7	\$20,598	21.3%	Yes
Catawba County	63,386	2.5	\$19,690	15.4%	Yes
Iredell County	70,654	2.6	\$20,144	11.1%	No
Lincoln County	33,863	2.5	\$19,690	13.3%	Yes
Rowan County	55,485	2.6	\$20,144	17.0%	Yes
Gaston County	88,710	2.5	\$19,690	16.0%	Yes
Cabarrus County	74,967	2.9	\$21,506	11.2%	No
Mecklenburg County	435,562	2.5	\$19,690	10.2%	No
Stanly County	23,633	2.5	\$19,690	15.9%	Yes
Union County	78,473	3.0	\$21,960	8.2%	No
Greenville Operating Area					
Pitt County	71,134	2.3	\$18,782	18.7%	Yes
Forsyth County	150,651	2.5	\$19,690	15.9%	Yes
Davidson County	66,986	2.5	\$19,690	15.2%	Yes
Guilford County	209,602	2.5	\$19,690	14.8%	Yes
Piedmont Operating Area					
Forsyth County	150,651	2.5	\$19,690	15.9%	Yes
Davidson County	66,986	2.5	\$19,690	15.2%	Yes
Guilford County	209,602	2.5	\$19,690	14.8%	Yes
Research Triangle Operating Area					
Orange County	54,783	2.5	\$19,690	12.4%	No
Durham County	132,762	2.3	\$18,782	11.1%	No
Granville County	21,132	2.7	\$20,598	15.6%	Yes
Chatham County	30,128	2.5	\$19,690	11.1%	No
Wake County	422,144	2.6	\$20,144	8.0%	No
Sandhills Operating Area					
Moore County	40,595	2.4	\$19,236	12.0%	No
Cumberland County	125,158	2.5	\$19,690	18.0%	Yes
Hoke County	17,705	2.9	\$21,506	21.3%	Yes
Wilmington Operating Area					
New Hanover County	97,852	2.2	\$18,328	13.6%	Yes

Sources: U.S. Census Bureau 2021; HHS 2021

Note: **Bolded** percentages indicate those that exceed Reference Community percentages.

Table 12 shows the racial and ethnicity demographic information for the Reference Community and the 25 counties in the study area. The percentage of racial minorities, collected by the Census as “All Other

Races,” residing within the Reference Community is approximately 40.6 percent.⁵⁷ This is slightly higher than that of the state of North Carolina. The percentage of ethnic minorities, those identifying as Hispanic, residing in the Reference Community is 11.5 percent, which is slightly higher than the state average. For purposes of identifying a “meaningfully greater” threshold, the FAA identified any county whose percentage of “All Other Races” equals or exceeds 40.6 percent and/or whose percentage of Hispanic population equals or exceeds 11.5 percent as an area of EJ concern.

The FAA also considered communities where EJ populations predominate (i.e., the minority population is equal to or greater than 50 percent) as areas of EJ concern.

Table 13 presents the income and poverty data for each geography, along with the HHS Poverty Guidelines. The poverty threshold is proportional to the household size, which is also presented in **Table 13**. Overall, the Reference Community has a poverty level of 12.6 percent, a value lower than the state. Similar to what was done for race and ethnicity, the FAA applied a zero percent threshold. Therefore, the FAA identified any county whose percentage of households below poverty equals or exceeds 12.6 percent as an area of EJ concern.

Table 14 shows the counties identified as areas of EJ concern compared to the Reference Community.

Table 14. Areas of EJ Concern

County	% All Other Races	% Hispanic	% Households Below Poverty
Reference Community	40.6%	11.5%	12.6%
Henderson	X	12.9%	X
Cleveland	X	X	21.3%
Catawba	X	X	15.4%
Lincoln	X	X	13.3%
Rowan	X	X	17.0%
Gaston	X	X	16.0%
Cabarrus	X	12.1%	X
Mecklenburg	53.3%	15.2%	X
Stanly	X	X	15.9%
Union	X	12.6%	X
Pitt	51.3%	X	18.7%
Forsyth	43.8%	14.3%	15.9%
Davidson	X	X	15.2%
Guilford	51.3%	X	14.8%
Durham	57.1%	15.4%	X
Granville	43.3%	X	15.6%
Chatham	X	13.6%	X
Wake	41.2%	X	X
Cumberland	57.6%	11.8%	18.0%
Hoke	59.6%	14.8%	21.3%
New Hanover	X	X	13.6%

Sources: U.S. Census Bureau 2020; U.S. Census Bureau 2021; HHS 2021

Note: X = Does not meet the threshold to be considered an area of EJ concern

⁵⁷ This data is defined by the U.S. Census Bureau; for the purposes of this analysis, the FAA uses the racial categories defined by the U.S. Census Bureau.

In summary, of the 25 counties, nine are considered areas of EJ concern with respect to race because they have higher percentages of racial minorities compared to the Reference Community. Six of those counties are predominately minority (greater than 50 percent). Nine counties are considered areas of EJ concern with respect to ethnicity because they have higher percentages of ethnic minorities than the Reference Community. Fourteen counties are considered areas of EJ concern with respect to poverty because they have higher percentages of households below poverty than the Reference Community.

3.9.3 Environmental Consequences

The FAA has not established a significance threshold for EJ. FAA Order 1050.1F includes factors to consider when assessing the significance of potential EJ impacts, including whether the action would have the potential to lead to a disproportionately high and adverse impact to an EJ population (i.e., a low-income or minority population) due to 1) significant impacts in other environmental impact categories or 2) impacts on the physical or natural environment that affect an EJ population in a way that the FAA determines is unique to the EJ population and significant to that population. If a significant impact would adversely affect a low-income or minority population at a disproportionately higher level than other populations, then an EJ issue is likely.

A disproportionately high and adverse effect on a minority or low-income population means an adverse effect that is 1) predominately borne by a minority population and/or a low-income population or 2) will be suffered by the minority population and/or low-income population and is appreciably more severe or greater in magnitude than adverse effects that will be suffered by the non-minority population and/or low-income population.

EJ populations can also receive positive benefits from a proposed action, which should be considered in conducting an EJ analysis.

3.9.3.1 No Action Alternative

The no action alternative assumes UA operators would continue to operate under the existing Part 135 approvals listed in **Section 2.1**, as well as Part 107 approvals which require operations to remain within visual line of sight. The previous EAs for Part 135 commercial drone package delivery in North Carolina resulted in FONSI (see **Section 2.1**). Currently approved Part 135 package delivery operations forecast to continue under the no action alternative are those from Causey and UPS Flight Forward. Existing and new operations would not result in adverse effects on low-income or minority populations as noise levels from these operations would be below levels considered to constitute a significant impact (HMMH 2023). Drone operators would be able to provide on-demand access to small goods, including medicine and groceries, so that recipients would not be dependent on personal vehicles or other modes of transportation to obtain these items, which is a benefit of drone package deliveries. This additional access to small goods could result in decreased traffic congestion and greenhouse gas emissions, which would represent positive impacts to EJ communities. For these reasons, the no action alternative is not expected to result in significant impacts on EJ communities.

3.9.3.2 Proposed Action

As described in the sections above, the proposed action would not result in significant impacts in any other environmental impact category. As noted in **Section 3.3**, the UA sound levels could be perceptible in areas within the operating areas but would stay below the level determined to constitute a significant impact (HMMH 2023). As part of the environmental review of individual Part 135 applications, the FAA will review the applicant's proposal to ensure the proposal would not result in land use compatibility issues with respect to noise. If the FAA identifies concerns, the FAA will work with the applicant to avoid the issue (see **Section 3.3**).

Drone package deliveries would provide additional access to small goods, such as groceries and medicine, which could present a positive effect on low-income and minority communities where individuals may not have reliable access to personal vehicles and/or other modes of transportation. For these reasons, the proposed action may result in a benefit to low-income and minority communities by providing additional and on-demand access to small goods.

The proposed action would not create impacts that exceed thresholds of significance in other environmental impacts, nor would it generate impacts on the physical or natural environment that affect an EJ population in a way that the FAA determines are unique to the EJ population and significant to that population. Therefore, the proposed action would not result in significant EJ impacts, including disproportionately high and adverse effects on minority and/or low-income populations.

Chapter 4

Cumulative Effects

The CEQ NEPA-implementing regulations define cumulative effects as “effects on the environment that result from the incremental effects of the action when added to the effects of other past, present, and reasonably foreseeable actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time.” (40 CFR § 1508.1(g)(3))

Because the majority of impacts discussed in Chapter 3 of this PEA were found to be minimal and because drone flights have limited opportunities to interact with other non-related actions due to the flights’ short durations and spread over a large geographic area, the FAA anticipates the proposed action’s potential for cumulative effects would be limited to the following impact categories: noise and biological resources.

4.1 Noise

The noise analysis presented in **Appendix D** and summarized in **Section 3.3** considers cumulative noise impacts associated with drone package deliveries that are forecast to occur as part of the proposed action. UA operations under the proposed action would occur in areas that are subject to other aviation noise sources. Therefore, it is necessary to evaluate the cumulative noise exposure that could result from the combination of drone package deliveries and other aviation noise sources in the operating areas. Scenarios where these combinations could occur include drone package delivery operations in the vicinity of an airport where the flight paths may overlap. Twelve active airports exist within the operating areas. The potential for cumulative effects associated with noise and noise compatible land use would occur when UA and manned aircraft simultaneously operate within the surface areas of Class B, C, and D airspace.

The potential for cumulative effects would be minimized because hubs would be placed at the appropriate standoff distances from noise-sensitive land uses, as discussed in **Section 3.3.4**, dependent on their locations being within or outside of the controlled surface areas of Class B, C, and D airspace. The operation of multiple hubs within any of the identified operating areas is not expected to result in cumulative effects from concurrent Part 135 UAS operations and Part 107 operations. Part 135 operators are required to have airspace route planning and deconfliction systems in place that would help mitigate the concentration of flight activity over any area. Additionally, hubs would be in areas zoned for commercial activities and away from noise-sensitive areas. Part 135 operators would be required to work with the FAA to complete environmental reviews for each proposed hub location before beginning operations, ensuring that any potential cumulative effects are properly analyzed and disclosed.

As the number of operators within a given area increases, the potential for cumulative noise impacts also increases. Operators would be required to coordinate with one another and the FAA to deconflict operations and mitigate potential cumulative impacts. Therefore, the proposed action is not expected to result in significant cumulative noise impacts.

4.2 Biological Resources

The FAA evaluated the potential for the effects of the proposed action's stressors (noise, visual presence, potential strike) to wildlife species to result in additive effects due to chronic stress or cumulative effects. The drone package delivery operations considered in this PEA would occur in the operating areas described in **Section 2.2.3**. Each of the stressors were determined to have effects that would not result in adverse effects to wildlife populations in the study area or adverse effects to individual ESA-listed species. The possibility of the proposed action's effects to wildlife overlapping in time and space and having a cumulative effect to wildlife in the study area does not seem plausible considering the limited time operations occur outside the commercial area where the hub is located. Therefore, the proposed action is not expected to result in significant cumulative effects on wildlife.

List of Preparers and Agencies and Persons Consulted

5.1 List of Preparers

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Jackie Tyson, Cultural Resources Specialist, New South Associates, Inc., 12 years of cultural resources experience.

5.2 List of Agencies and Persons Consulted

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Tracy Swartout, National Park Service, Blue Ridge Parkway

Kathy Matthews, U.S. Fish and Wildlife Service, Raleigh Ecological Services Field Office

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State Agencies

Luan Cao, State Historic Preservation Office, North Carolina Department of Natural and Cultural Resources

Renee Gledhill-Earley, State Historic Preservation Office, North Carolina Department of Natural and Cultural Resources

Federally Recognized Tribes

Principal Chief Michell Hicks, Eastern Band of Cherokee Indians

Local Governments

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APPENDIX A

REFERENCES

References

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APPENDIX B
PROGRAMMATIC EA CHECKLIST

Federal Aviation Administration Environmental Checklist for the Programmatic Environmental Assessment for Drone Package Delivery in North Carolina

Purpose of this Checklist

The following checklist is to be used to determine if a commercial drone operator's proposal to conduct drone package delivery operations under 14 Code of Federal Regulations (CFR) Part 135 in the state of North Carolina is covered under the scope of the Federal Aviation Administration's (FAA) 2024 *Programmatic Environmental Assessment for Drone Package Delivery in North Carolina* (PEA). If a drone operator's proposed action is outside the scope of the PEA, or if the operator would like to deviate from the mitigation measures contained in the PEA, additional environmental review may be required, including, as needed, preparation of an environmental document in accordance with the National Environmental Policy Act of 1969 (NEPA), the Council on Environmental Quality NEPA-implementing regulations (40 CFR Parts 1500–1508), and FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*.

The FAA, as the lead federal agency, makes the determination whether additional environmental review is required. Based on the responses in this checklist and the supporting documentation, and further coordination with the applicant as needed, the FAA will determine whether additional environmental review is required before the FAA authorizes the proposed operations.

Federal Aviation Administration Environmental Checklist for Drone Package Delivery Proposals in North Carolina

Date: _____

Applicant/Operator Name: _____

Instructions: Complete Parts I and II. For all questions where “no” is selected, provide information explaining the “no” response in the corresponding comments section.

Part I – Proposed Action			
	Yes	No	Comments
Operating Area			
1. Does the applicant propose to operate within one of the seven operating areas evaluated in the PEA (see PEA Section 2.2.3)? <i>If “yes,” please specify the operating area in the comments. List latitude and longitude coordinates of each proposed hub in the comments.</i> <i>If the answer is “no,” at a minimum, Determination #3 at the end of this checklist applies.</i>	<input type="checkbox"/>	<input type="checkbox"/>	
Unmanned Aircraft			
2. Does the applicant propose to operate an electric multi-copter (2 to 8 propellers), fixed wing, or hybrid aircraft (vertical lift with fixed-wing cruise) as described in the PEA (see PEA Table 1)? <i>Describe aircraft type and characteristics in comments.</i>	<input type="checkbox"/>	<input type="checkbox"/>	
Operations			
3. Is the applicant’s typical cruise altitude at least 150 feet above ground level?	<input type="checkbox"/>	<input type="checkbox"/>	
4. Does the applicant propose to operate only between the hours of 7:00 a.m. and 10:00 p.m. (PEA Table 1)?	<input type="checkbox"/>	<input type="checkbox"/>	
5. Is the applicant’s proposed number of daily deliveries from any hub less than or equal to 500 (PEA Table 1)?	<input type="checkbox"/>	<input type="checkbox"/>	
6. Will the aircraft be operated consistent with the operational profiles described in the noise assessment report (PEA Appendix D)?	<input type="checkbox"/>	<input type="checkbox"/>	

Noise Level Measurements			
7. Has the FAA received and accepted noise measurement data provided by the applicant? <i>List date of acceptance in comments.</i>	<input type="checkbox"/>	<input type="checkbox"/>	
8. Has the FAA received and accepted a noise assessment report provided by the applicant? The purpose of the noise assessment report is to determine whether the applicant's noise profile associated with its proposed operations falls within the scope of the PEA. <i>List date of acceptance in comments.</i>	<input type="checkbox"/>	<input type="checkbox"/>	
9. Is the applicant's aircraft noise exposure associated with the applicant's proposed action within the estimated noise exposure for Group 1 UA and/or Group 2 UA in the noise assessment report (PEA Appendix D)?	<input type="checkbox"/>	<input type="checkbox"/>	
<i>If the answer to any question in Part I is "no," further environmental review may be needed. Determinations #2 and #3 at the end of this checklist may apply. Proceed to Part II.</i>			

Part II – Mitigation			
	Yes	No	Comments
Does the applicant agree to implement or comply with the mitigation measures listed in the PEA (see below for the applicable impact categories)?	<input type="checkbox"/>	<input type="checkbox"/>	
Noise and Noise-Compatible Land Use (PEA Section 3.3.4)			
1. Locate hubs in accordance with Tables 15 and 16 in the noise assessment report (PEA Appendix D; see also PEA Table 7).	<input type="checkbox"/>	<input type="checkbox"/>	
Historic, Architectural, Archeological, and Cultural Resources (PEA Section 3.5.4)			
2. Apply 0.5-mile buffer around historic properties identified in PEA Table 7 when siting a hub.	<input type="checkbox"/>	<input type="checkbox"/>	
3. No operations within or over the Pinehurst Historic District.	<input type="checkbox"/>	<input type="checkbox"/>	
4. No operations within or over the Guilford Courthouse National Military Park.	<input type="checkbox"/>	<input type="checkbox"/>	
5. If proposed operations include flying over the Blue Ridge Parkway, coordination with the National Park Service has occurred to identify specific corridor crossings that avoid noise sensitive habitat, critical infrastructure, and areas of concentrated visitor use.	<input type="checkbox"/>	<input type="checkbox"/>	
6. No taking off from or landing aircraft on lands or waters administered by the National Park Service.	<input type="checkbox"/>	<input type="checkbox"/>	
7. No taking off from or landing aircraft on any state park area or state park water surface without authorization from the North Carolina Division of Parks and Recreation.	<input type="checkbox"/>	<input type="checkbox"/>	
8. No taking off from or landing aircraft on Biltmore property unless approved by the property owner.	<input type="checkbox"/>	<input type="checkbox"/>	
DOT Act Section 4(f) (PEA Section 3.6.4)			
9. In addition to the measures above for historic properties, if operating above the Pisgah National Forest, abide by U.S. Forest Service (USFS) guidance related to drone operations within USFS property boundaries, including keeping drones away from populated and noise-sensitive areas, such as campgrounds, trail heads, and visitor centers.	<input type="checkbox"/>	<input type="checkbox"/>	
Biological Resources (PEA Section 3.8.4)			
10. The operator is aware of the potential presence of threatened and endangered species and its obligation to avoid <i>taking</i> these species.	<input type="checkbox"/>	<input type="checkbox"/>	

11. As applicable, operator will prohibit hovering, taking off, and landing within 150 feet of a known bat roost or hibernacula (data to be provided by the FAA). In the case of roosts in bridges or culverts, the 150-foot buffer applies to any point on the structure.	<input type="checkbox"/>	<input type="checkbox"/>	
12. If operating in the Greenville and Wilmington operating areas from June to October, conduct en route flights at an altitude of 350 feet above ground level over potential manatee habitat.	<input type="checkbox"/>	<input type="checkbox"/>	
13. Operator will cross rivers, streams, or other linear waterbodies in a perpendicular fashion. Flight paths should not run parallel to or along a stream, river, or other waterbody.	<input type="checkbox"/>	<input type="checkbox"/>	
<i>If the answer to any question in Part II is "no," further environmental review may be needed.</i>			

FAA Determination

Based on an examination and review of the application, I determine that (*check all that apply*):

1. No further environmental review or NEPA documentation is required. The applicant's proposed action falls within the scope of the PEA and associated consultations, and the potential environmental impacts of the proposed action are fully addressed in the PEA and associated consultations.

2. No further NEPA documentation is required. However, consultation with the following entity or entities is required before authorizing the operation.
 - Endangered Species Act Section 7 consultation with the U.S. Fish and Wildlife Service
 - National Historic Preservation Act Section 106 consultation with the State Historic Preservation Officer
 - Department of Transportation Act Section 4(f) consultation with _____

3. An EA that tiers from and incorporates the findings of the PEA is required for the following reason(s):
 - The applicant proposes to operate in an area not addressed in the PEA.
 - The applicant proposes to use a platform/aircraft not addressed in the PEA.
 - The applicant's proposed operations are not fully addressed in the PEA.
 - The applicant's planned number of daily operations per hub exceeds the maximum number addressed in the PEA.
 - Additional noise data and analysis is needed to determine whether the proposed action would result in significant impacts.
 - The operator will not incorporate one or more of the mitigation measures identified in the PEA.

The EA should focus on those aspects of the proposed action and/or environmental impact that was not adequately addressed in the PEA.

4. The proposed action has the potential to cause one or more significant impacts that cannot be mitigated to levels below significance and therefore requires initiation and preparation of an environmental impact statement.

Responsible FAA Official

Date

APPENDIX C
EARLY COORDINATION AND
OUTREACH

Local Officials

*(Note: project description and maps were the same for all local
Official letters, so only one copy is contained in the appendix)*



U.S. Department
of Transportation
**Federal Aviation
Administration**

Aviation Safety

800 Independence Ave., SW.
Washington, DC 20591

Via Email

Debra Campbell
City Manager
P.O. Box 7148
Asheville, NC 28802
Email: dcampbell@ashevillenc.gov

Dear Ms. Campbell:

The purpose of this letter is to inform you of a proposal under consideration by the Federal Aviation Administration (FAA) and solicit your feedback. In accordance with the National Environmental Policy Act, the FAA is preparing a programmatic environmental assessment (EA) to assess the potential environmental impacts of the FAA's action of authorizing commercial Unmanned Aircraft Systems operators to deliver goods to customers (referred to as package delivery) using unmanned aircraft (also referred to as drones) in accordance with 14 Code of Federal Regulations Part 135 in the state of North Carolina. The North Carolina Department of Transportation (NCDOT) is the proponent of the project. NCDOT has identified the City of Asheville as a potential location where drone package delivery flights might occur in the future. For your reference, a project description is enclosed with this letter.

As we develop the draft EA, we wish to solicit your views regarding potential environmental impacts in the City of Asheville. When preparing EAs, the FAA considers 14 impact categories (e.g., biological resources, cultural resources, noise, environmental justice) when assessing potential impacts. The full list of impact categories is presented in FAA Order 1050.1F, Paragraph 4-1.¹ Please consider these 14 impact categories when providing feedback.

Your timely response over the next 30 days will greatly assist us in incorporating your comments into our environmental review of the operation. Please contact Nicholas Baker via email at 9-AWA-AVS-AFS-ENVIRONMENTAL@faa.gov within 30 days of the receipt of this letter with any feedback. You will also have another opportunity to provide comments when the FAA publishes a draft EA for public review.

Sincerely,

Jay Kinser
Manager, Strategic Programs Branch
UAS Integration Office

¹ See:

https://www.faa.gov/about/office_org/headquarters_offices/apl/environ_policy_guidance/policy/faa_nepa_order

Enclosure: Attachment 1 – Project Description

Cc: Riley Beaman
UAS Program Manager
North Carolina Department of Transportation
Division of Aviation



U.S. Department
of Transportation
**Federal Aviation
Administration**

Aviation Safety

800 Independence Ave., SW.
Washington, DC 20591

Via Email

Chris Blue
Town Manager
405 Martin Luther King Jr Blvd.
Chapel Hill, NC 27514
Email: info@townofchapelhill.org

Dear Mr. Blue:

The purpose of this letter is to inform you of a proposal under consideration by the Federal Aviation Administration (FAA) and solicit your feedback. In accordance with the National Environmental Policy Act, the FAA is preparing a programmatic environmental assessment (EA) to assess the potential environmental impacts of the FAA's action of authorizing commercial Unmanned Aircraft Systems operators to deliver goods to customers (referred to as package delivery) using unmanned aircraft (also referred to as drones) in accordance with 14 Code of Federal Regulations Part 135 in the state of North Carolina. The North Carolina Department of Transportation (NCDOT) is the proponent of the project. NCDOT has identified the Town of Chapel Hill as a potential location where drone package delivery flights might occur in the future. For your reference, a project description is enclosed with this letter.

As we develop the draft EA, we wish to solicit your views regarding potential environmental impacts in the Town of Chapel Hill. When preparing EAs, the FAA considers 14 impact categories (e.g., biological resources, cultural resources, noise, environmental justice) when assessing potential impacts. The full list of impact categories is presented in FAA Order 1050.1F, Paragraph 4-1.¹ Please consider these 14 impact categories when providing feedback.

Your timely response over the next 30 days will greatly assist us in incorporating your comments into our environmental review of the operation. Please contact Nicholas Baker via email at 9-AWA-AVS-AFS-ENVIRONMENTAL@faa.gov within 30 days of the receipt of this letter with any feedback. You will also have another opportunity to provide comments when the FAA publishes a draft EA for public review.

Sincerely,

Jay Kinser
Manager, Strategic Programs Branch
UAS Integration Office

¹ See:

https://www.faa.gov/about/office_org/headquarters_offices/apl/environ_policy_guidance/policy/faa_nepa_order

Enclosure: Attachment 1 – Project Description

Cc: Riley Beaman
UAS Program Manager
North Carolina Department of Transportation
Division of Aviation



U.S. Department
of Transportation
**Federal Aviation
Administration**

Aviation Safety

800 Independence Ave., SW.
Washington, DC 20591

Via Email

Marcus D. Jones
City Manager
600 E. Fourth Street
Charlotte, NC 28202
Email: Marcus.Jones@charlottenc.gov

Dear Mr. Jones:

The purpose of this letter is to inform you of a proposal under consideration by the Federal Aviation Administration (FAA) and solicit your feedback. In accordance with the National Environmental Policy Act, the FAA is preparing a programmatic environmental assessment (EA) to assess the potential environmental impacts of the FAA's action of authorizing commercial Unmanned Aircraft Systems operators to deliver goods to customers (referred to as package delivery) using unmanned aircraft (also referred to as drones) in accordance with 14 Code of Federal Regulations Part 135 in the state of North Carolina. The North Carolina Department of Transportation (NCDOT) is the proponent of the project. NCDOT has identified the City of Charlotte as a potential location where drone package delivery flights might occur in the future. For your reference, a project description is enclosed with this letter.

As we develop the draft EA, we wish to solicit your views regarding potential environmental impacts in the City of Charlotte. When preparing EAs, the FAA considers 14 impact categories (e.g., biological resources, cultural resources, noise, environmental justice) when assessing potential impacts. The full list of impact categories is presented in FAA Order 1050.1F, Paragraph 4-1.¹ Please consider these 14 impact categories when providing feedback.

Your timely response over the next 30 days will greatly assist us in incorporating your comments into our environmental review of the operation. Please contact Nicholas Baker via email at 9-AWA-AVS-AFS-ENVIRONMENTAL@faa.gov within 30 days of the receipt of this letter with any feedback. You will also have another opportunity to provide comments when the FAA publishes a draft EA for public review.

Sincerely,

Jay Kinser
Manager, Strategic Programs Branch
UAS Integration Office

¹ See:

https://www.faa.gov/about/office_org/headquarters_offices/apl/environ_policy_guidance/policy/faa_nepa_order

Enclosure: Attachment 1 – Project Description

Cc: Riley Beaman
UAS Program Manager
North Carolina Department of Transportation
Division of Aviation



U.S. Department
of Transportation
**Federal Aviation
Administration**

Aviation Safety

800 Independence Ave., SW.
Washington, DC 20591

Via Email

Wanda Page
City Manager
101 City Hall Plaza
Durham, NC 27701
Email: Wanda.Page@durhamnc.gov

Dear Ms. Page:

The purpose of this letter is to inform you of a proposal under consideration by the Federal Aviation Administration (FAA) and solicit your feedback. In accordance with the National Environmental Policy Act, the FAA is preparing a programmatic environmental assessment (EA) to assess the potential environmental impacts of the FAA's action of authorizing commercial Unmanned Aircraft Systems operators to deliver goods to customers (referred to as package delivery) using unmanned aircraft (also referred to as drones) in accordance with 14 Code of Federal Regulations Part 135 in the state of North Carolina. The North Carolina Department of Transportation (NCDOT) is the proponent of the project. NCDOT has identified the City of Durham as a potential location where drone package delivery flights might occur in the future. For your reference, a project description is enclosed with this letter.

As we develop the draft EA, we wish to solicit your views regarding potential environmental impacts in the City of Durham. When preparing EAs, the FAA considers 14 impact categories (e.g., biological resources, cultural resources, noise, environmental justice) when assessing potential impacts. The full list of impact categories is presented in FAA Order 1050.1F, Paragraph 4-1.¹ Please consider these 14 impact categories when providing feedback.

Your timely response over the next 30 days will greatly assist us in incorporating your comments into our environmental review of the operation. Please contact Nicholas Baker via email at 9-AWA-AVS-AFS-ENVIRONMENTAL@faa.gov within 30 days of the receipt of this letter with any feedback. You will also have another opportunity to provide comments when the FAA publishes a draft EA for public review.

Sincerely,

Jay Kinser
Manager, Strategic Programs Branch
UAS Integration Office

¹ See:

https://www.faa.gov/about/office_org/headquarters_offices/apl/environ_policy_guidance/policy/faa_nepa_order

Enclosure: Attachment 1 – Project Description

Cc: Riley Beaman
UAS Program Manager
North Carolina Department of Transportation
Division of Aviation



U.S. Department
of Transportation
**Federal Aviation
Administration**

Aviation Safety

800 Independence Ave., SW.
Washington, DC 20591

Via Email

Doug Hewett
City Manager
433 Hay Street
Fayetteville, NC 28301
Email: DougHewett@FayettevilleNC.gov

Dear Mr. Hewett:

The purpose of this letter is to inform you of a proposal under consideration by the Federal Aviation Administration (FAA) and solicit your feedback. In accordance with the National Environmental Policy Act, the FAA is preparing a programmatic environmental assessment (EA) to assess the potential environmental impacts of the FAA's action of authorizing commercial Unmanned Aircraft Systems operators to deliver goods to customers (referred to as package delivery) using unmanned aircraft (also referred to as drones) in accordance with 14 Code of Federal Regulations Part 135 in the state of North Carolina. The North Carolina Department of Transportation (NCDOT) is the proponent of the project. NCDOT has identified the City of Fayetteville as a potential location where drone package delivery flights might occur in the future. For your reference, a project description is enclosed with this letter.

As we develop the draft EA, we wish to solicit your views regarding potential environmental impacts in the City of Fayetteville. When preparing EAs, the FAA considers 14 impact categories (e.g., biological resources, cultural resources, noise, environmental justice) when assessing potential impacts. The full list of impact categories is presented in FAA Order 1050.1F, Paragraph 4-1.¹ Please consider these 14 impact categories when providing feedback.

Your timely response over the next 30 days will greatly assist us in incorporating your comments into our environmental review of the operation. Please contact Nicholas Baker via email at 9-AWA-AVS-AFS-ENVIRONMENTAL@faa.gov within 30 days of the receipt of this letter with any feedback. You will also have another opportunity to provide comments when the FAA publishes a draft EA for public review.

Sincerely,

Jay Kinser
Manager, Strategic Programs Branch
UAS Integration Office

¹ See:

https://www.faa.gov/about/office_org/headquarters_offices/apl/environ_policy_guidance/policy/faa_nepa_order

Enclosure: Attachment 1 – Project Description

Cc: Riley Beaman
UAS Program Manager
North Carolina Department of Transportation
Division of Aviation



U.S. Department
of Transportation
**Federal Aviation
Administration**

Aviation Safety

800 Independence Ave., SW.
Washington, DC 20591

Via Email

Taiwo Jaiyeoba
City Manager
P.O. Box 3136
Greensboro, NC 27401
Email: taiwo@greensboro-nc.gov

Dear Mr. Jaiyeoba:

The purpose of this letter is to inform you of a proposal under consideration by the Federal Aviation Administration (FAA) and solicit your feedback. In accordance with the National Environmental Policy Act, the FAA is preparing a programmatic environmental assessment (EA) to assess the potential environmental impacts of the FAA's action of authorizing commercial Unmanned Aircraft Systems operators to deliver goods to customers (referred to as package delivery) using unmanned aircraft (also referred to as drones) in accordance with 14 Code of Federal Regulations Part 135 in the state of North Carolina. The North Carolina Department of Transportation (NCDOT) is the proponent of the project. NCDOT has identified the City of Greensboro as a potential location where drone package delivery flights might occur in the future. For your reference, a project description is enclosed with this letter.

As we develop the draft EA, we wish to solicit your views regarding potential environmental impacts in the City of Greensboro. When preparing EAs, the FAA considers 14 impact categories (e.g., biological resources, cultural resources, noise, environmental justice) when assessing potential impacts. The full list of impact categories is presented in FAA Order 1050.1F, Paragraph 4-1.¹ Please consider these 14 impact categories when providing feedback.

Your timely response over the next 30 days will greatly assist us in incorporating your comments into our environmental review of the operation. Please contact Nicholas Baker via email at 9-AWA-AVS-AFS-ENVIRONMENTAL@faa.gov within 30 days of the receipt of this letter with any feedback. You will also have another opportunity to provide comments when the FAA publishes a draft EA for public review.

Sincerely,

Jay Kinser
Manager, Strategic Programs Branch
UAS Integration Office

¹ See:

https://www.faa.gov/about/office_org/headquarters_offices/apl/environ_policy_guidance/policy/faa_nepa_order

Enclosure: Attachment 1 – Project Description

Cc: Riley Beaman
UAS Program Manager
North Carolina Department of Transportation
Division of Aviation



U.S. Department
of Transportation
**Federal Aviation
Administration**

Aviation Safety

800 Independence Ave., SW.
Washington, DC 20591

Via Email

Michael Cowin
City Manager
200 West Fifth Street
Greenville, NC 27834
Email: mcowin@greenvillenc.gov

Dear Mr. Cowin:

The purpose of this letter is to inform you of a proposal under consideration by the Federal Aviation Administration (FAA) and solicit your feedback. In accordance with the National Environmental Policy Act, the FAA is preparing a programmatic environmental assessment (EA) to assess the potential environmental impacts of the FAA's action of authorizing commercial Unmanned Aircraft Systems operators to deliver goods to customers (referred to as package delivery) using unmanned aircraft (also referred to as drones) in accordance with 14 Code of Federal Regulations Part 135 in the state of North Carolina. The North Carolina Department of Transportation (NCDOT) is the proponent of the project. NCDOT has identified the City of Greenville as a potential location where drone package delivery flights might occur in the future. For your reference, a project description is enclosed with this letter.

As we develop the draft EA, we wish to solicit your views regarding potential environmental impacts in the City of Greenville. When preparing EAs, the FAA considers 14 impact categories (e.g., biological resources, cultural resources, noise, environmental justice) when assessing potential impacts. The full list of impact categories is presented in FAA Order 1050.1F, Paragraph 4-1.¹ Please consider these 14 impact categories when providing feedback.

Your timely response over the next 30 days will greatly assist us in incorporating your comments into our environmental review of the operation. Please contact Nicholas Baker via email at 9-AWA-AVS-AFS-ENVIRONMENTAL@faa.gov within 30 days of the receipt of this letter with any feedback. You will also have another opportunity to provide comments when the FAA publishes a draft EA for public review.

Sincerely,

Jay Kinser
Manager, Strategic Programs Branch
UAS Integration Office

¹ See:

https://www.faa.gov/about/office_org/headquarters_offices/apl/environ_policy_guidance/policy/faa_nepa_order

Enclosure: Attachment 1 – Project Description

Cc: Riley Beaman
UAS Program Manager
North Carolina Department of Transportation
Division of Aviation



U.S. Department
of Transportation
**Federal Aviation
Administration**

Aviation Safety

800 Independence Ave., SW.
Washington, DC 20591

Via Email

Tasha Logan Ford
City Manager
P.O. Box 230
High Point, NC 27261
Email: tloganford@highpointnc.gov

Dear Ms. Ford:

The purpose of this letter is to inform you of a proposal under consideration by the Federal Aviation Administration (FAA) and solicit your feedback. In accordance with the National Environmental Policy Act, the FAA is preparing a programmatic environmental assessment (EA) to assess the potential environmental impacts of the FAA's action of authorizing commercial Unmanned Aircraft Systems operators to deliver goods to customers (referred to as package delivery) using unmanned aircraft (also referred to as drones) in accordance with 14 Code of Federal Regulations Part 135 in the state of North Carolina. The North Carolina Department of Transportation (NCDOT) is the proponent of the project. NCDOT has identified the City of High Point as a potential location where drone package delivery flights might occur in the future. For your reference, a project description is enclosed with this letter.

As we develop the draft EA, we wish to solicit your views regarding potential environmental impacts in the City of High Point. When preparing EAs, the FAA considers 14 impact categories (e.g., biological resources, cultural resources, noise, environmental justice) when assessing potential impacts. The full list of impact categories is presented in FAA Order 1050.1F, Paragraph 4-1.¹ Please consider these 14 impact categories when providing feedback.

Your timely response over the next 30 days will greatly assist us in incorporating your comments into our environmental review of the operation. Please contact Nicholas Baker via email at 9-AWA-AVS-AFS-ENVIRONMENTAL@faa.gov within 30 days of the receipt of this letter with any feedback. You will also have another opportunity to provide comments when the FAA publishes a draft EA for public review.

Sincerely,

Jay Kinser
Manager, Strategic Programs Branch
UAS Integration Office

¹ See:

https://www.faa.gov/about/office_org/headquarters_offices/apl/environ_policy_guidance/policy/faa_nepa_order

Enclosure: Attachment 1 – Project Description

Cc: Riley Beaman
UAS Program Manager
North Carolina Department of Transportation
Division of Aviation



U.S. Department
of Transportation
**Federal Aviation
Administration**

Aviation Safety

800 Independence Ave., SW.
Washington, DC 20591

Via Email

Marchell Adams-David
City Manager
222 W. Hargett Street
Raleigh, NC 27601
Email: Marchell.David@raleighnc.gov; citymanager@raleighnc.gov

Dear Ms. Adams-David:

The purpose of this letter is to inform you of a proposal under consideration by the Federal Aviation Administration (FAA) and solicit your feedback. In accordance with the National Environmental Policy Act, the FAA is preparing a programmatic environmental assessment (EA) to assess the potential environmental impacts of the FAA's action of authorizing commercial Unmanned Aircraft Systems operators to deliver goods to customers (referred to as package delivery) using unmanned aircraft (also referred to as drones) in accordance with 14 Code of Federal Regulations Part 135 in the state of North Carolina. The North Carolina Department of Transportation (NCDOT) is the proponent of the project. NCDOT has identified the City of Raleigh as a potential location where drone package delivery flights might occur in the future. For your reference, a project description is enclosed with this letter.

As we develop the draft EA, we wish to solicit your views regarding potential environmental impacts in the City of Raleigh. When preparing EAs, the FAA considers 14 impact categories (e.g., biological resources, cultural resources, noise, environmental justice) when assessing potential impacts. The full list of impact categories is presented in FAA Order 1050.1F, Paragraph 4-1.¹ Please consider these 14 impact categories when providing feedback.

Your timely response over the next 30 days will greatly assist us in incorporating your comments into our environmental review of the operation. Please contact Nicholas Baker via email at 9-AWA-AVS-AFS-ENVIRONMENTAL@faa.gov within 30 days of the receipt of this letter with any feedback. You will also have another opportunity to provide comments when the FAA publishes a draft EA for public review.

Sincerely,

Jay Kinser
Manager, Strategic Programs Branch
UAS Integration Office

¹ See:

https://www.faa.gov/about/office_org/headquarters_offices/apl/environ_policy_guidance/policy/faa_nepa_order

Enclosure: Attachment 1 – Project Description

Cc: Riley Beaman
UAS Program Manager
North Carolina Department of Transportation
Division of Aviation



U.S. Department
of Transportation
**Federal Aviation
Administration**

Aviation Safety

800 Independence Ave., SW.
Washington, DC 20591

Via Email

Tony Caudle
City Manager
P.O. Box 1810
Wilmington, NC 28402
Email: tony.caudle@wilmingtonnc.gov

Dear Mr. Caudle:

The purpose of this letter is to inform you of a proposal under consideration by the Federal Aviation Administration (FAA) and solicit your feedback. In accordance with the National Environmental Policy Act, the FAA is preparing a programmatic environmental assessment (EA) to assess the potential environmental impacts of the FAA's action of authorizing commercial Unmanned Aircraft Systems operators to deliver goods to customers (referred to as package delivery) using unmanned aircraft (also referred to as drones) in accordance with 14 Code of Federal Regulations Part 135 in the state of North Carolina. The North Carolina Department of Transportation (NCDOT) is the proponent of the project. NCDOT has identified the City of Wilmington as a potential location where drone package delivery flights might occur in the future. For your reference, a project description is enclosed with this letter.

As we develop the draft EA, we wish to solicit your views regarding potential environmental impacts in the City of Wilmington. When preparing EAs, the FAA considers 14 impact categories (e.g., biological resources, cultural resources, noise, environmental justice) when assessing potential impacts. The full list of impact categories is presented in FAA Order 1050.1F, Paragraph 4-1.¹ Please consider these 14 impact categories when providing feedback.

Your timely response over the next 30 days will greatly assist us in incorporating your comments into our environmental review of the operation. Please contact Nicholas Baker via email at 9-AWA-AVS-AFS-ENVIRONMENTAL@faa.gov within 30 days of the receipt of this letter with any feedback. You will also have another opportunity to provide comments when the FAA publishes a draft EA for public review.

Sincerely,

Jay Kinser
Manager, Strategic Programs Branch
UAS Integration Office

¹ See:

https://www.faa.gov/about/office_org/headquarters_offices/apl/environ_policy_guidance/policy/faa_nepa_order

Enclosure: Attachment 1 – Project Description

Cc: Riley Beaman
UAS Program Manager
North Carolina Department of Transportation
Division of Aviation



U.S. Department
of Transportation
**Federal Aviation
Administration**

Aviation Safety

800 Independence Ave., SW.
Washington, DC 20591

Via Email

W. Patrick Pate
City Manager
P.O. Box 2511
Winston-Salem, NC 27101
Email: ppate@cityofws.org

Dear Mr. Pate:

The purpose of this letter is to inform you of a proposal under consideration by the Federal Aviation Administration (FAA) and solicit your feedback. In accordance with the National Environmental Policy Act, the FAA is preparing a programmatic environmental assessment (EA) to assess the potential environmental impacts of the FAA's action of authorizing commercial Unmanned Aircraft Systems operators to deliver goods to customers (referred to as package delivery) using unmanned aircraft (also referred to as drones) in accordance with 14 Code of Federal Regulations Part 135 in the state of North Carolina. The North Carolina Department of Transportation (NCDOT) is the proponent of the project. NCDOT has identified the City of Winston-Salem as a potential location where drone package delivery flights might occur in the future. For your reference, a project description is enclosed with this letter.

As we develop the draft EA, we wish to solicit your views regarding potential environmental impacts in the City of Winston-Salem. When preparing EAs, the FAA considers 14 impact categories (e.g., biological resources, cultural resources, noise, environmental justice) when assessing potential impacts. The full list of impact categories is presented in FAA Order 1050.1F, Paragraph 4-1.¹ Please consider these 14 impact categories when providing feedback.

Your timely response over the next 30 days will greatly assist us in incorporating your comments into our environmental review of the operation. Please contact Nicholas Baker via email at 9-AWA-AVS-AFS-ENVIRONMENTAL@faa.gov within 30 days of the receipt of this letter with any feedback. You will also have another opportunity to provide comments when the FAA publishes a draft EA for public review.

Sincerely,

Jay Kinser
Manager, Strategic Programs Branch
UAS Integration Office

¹ See:

https://www.faa.gov/about/office_org/headquarters_offices/apl/environ_policy_guidance/policy/faa_nepa_order

Enclosure: Attachment 1 – Project Description

Cc: Riley Beaman
UAS Program Manager
North Carolina Department of Transportation
Division of Aviation

Attachment 1 – Project Description

Background

In 2012, the U.S. Congress first charged the Federal Aviation Administration (FAA) with integrating Unmanned Aircraft Systems (UAS) into the national airspace system (NAS). The FAA has engaged in a phased, incremental approach to integrating drones into the NAS and continues to work toward full integration of drones into the NAS. From 2017 through 2020, the UAS Integration Pilot Program focused on testing and evaluating the integration of drone operations into the NAS. This work continues under the UAS BEYOND program, which focuses on the remaining challenges of UAS integration, including beyond visual line of sight operations, societal and economic benefits of UAS operations, and community engagement. Participants in these programs are among the first to prove their concepts, including package delivery by drone through air carrier certification in accordance with 14 Code of Federal Regulations (CFR) Part 135. Part 135 certification is currently the only path for drones to carry the property of another for compensation beyond visual line of sight.

In 2019, the FAA began issuing air carrier certificates to UAS operators in accordance with Part 135 so that operators can conduct package delivery flights. Generally, these approvals are associated with issuing a new or amended Part 135 air carrier Operations Specifications² as the operative approval. The FAA has completed 17 environmental assessments (EAs) in accordance with the National Environmental Policy Act (NEPA), Council on Environmental Quality NEPA Implementing Regulations (40 CFR Parts 1500–1508), and FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*³ for individual package delivery proposals. Each EA resulted in a finding of no significant impact.⁴

The North Carolina Department of Transportation (NCDOT) has been a lead partner in the FAA's drone integration partnership programs since 2017, first as a partner in the Integration Pilot Program and then continuing as a partner in the BEYOND program. In this role, NCDOT is collaborating with partners to test and prove operations that can gain FAA approvals to expand beyond visual line of sight and other complex operations in the state. Within the state of North Carolina, NCDOT has the authority to implement and manage regulations pertaining to state laws as set by the North Carolina State General Assembly concerning drone operations.

To support the development of a programmatic EA, NCDOT developed a forecast for future Part 135 UAS package delivery operations in North Carolina and shared it with the FAA. The FAA used the forecast to identify operating areas where UAS package delivery operations are likely to occur between 2024 and 2030 and to define the levels of UAS activities that may be expected based on existing and future market analyses. The NCDOT selected 2030 as the future year for evaluation in the forecast because it is a reasonable timeframe in which UAS market and fleet predictions can be made.

Proposed Action

The proposed action includes the various FAA approvals associated with authorizing drone package delivery under Part 135. NCDOT has projected Part 135 drone package delivery operations for the state

² An Operations Specifications is a document that defines the scope of aircraft operations the FAA has authorized.

³ FAA Order 1050.1F serves as the FAA's policy and procedures for compliance with NEPA and CEQ's NEPA-implementing regulations. See:

https://www.faa.gov/about/office_org/headquarters_offices/apl/enviro_n_policy_guidance/policy/faq_nepa_order

⁴ See: https://www.faa.gov/uas/advanced_operations/nepa_and_drones.

of North Carolina out to year 2030 and provided that projection to the FAA for environmental analysis. The proposed action includes commercial drone package deliveries from takeoff and landing areas (referred to as hubs) based on NCDOT’s maximum forecasted operations for conservative purposes.

The type, size, and weight of aircraft used to deliver packages could vary, but NCDOT anticipates multi-copter platforms will be the primary type of unmanned aircraft (UA) used to deliver small packages in the foreseeable future. The characteristics of the UAS considered in the EA are displayed in **Table 1**.

Table 1. UAS Characteristics

Characteristic	Criteria
Platform/Vehicle Type	Multi-copters (2 to 8 propellers), fixed wing, and hybrid aircraft (vertical lift with fixed-wing cruise)
Power	Electric motor
Delivery Mechanism Types	Drop off, tethered (wire/cable), customer unloads, ground drop, parachute
Maximum Aircraft Weight	Approximately 87 pounds
Maximum Payload (Package) Weight	Approximately 5 pounds
Maximum Aircraft Takeoff Weight	Approximately 92 pounds
Typical Cruise Altitude	150–375 feet above ground level
Maximum Cruise Altitude	400 feet above ground level
Hours of Operation	7:00 a.m. – 10:00 p.m.
Operation Days	7 days per week, 365 days per year

While UA come in varying sizes with varying flight capabilities, the flight operations can generally be categorized into the following five phases: 1) takeoff and climb, 2) en route outbound, 3) delivery, 4) en route inbound, and 5) descent and landing. In general, package delivery operators partner with established businesses and identify the location for a hub at the business’s parking lot, rooftop, or other area where it is not disruptive to the business and does not present a safety hazard. This allows the drone operator to conduct operations with minimal infrastructure requirements and no ground disturbance activities. Prior to takeoff, packages are manually loaded onto the UA by a ground crew at the hub. The UA then climbs and performs aerial deliveries following a predetermined flight path that is set using software that assigns, deconflicts, and routes each flight. After delivery, the UA returns to its hub via a predetermined flight path.

In general, Part 135 UAS package delivery operators prefer areas where they can serve the most customers while flying the least distance. In addition, operators look for communities with median incomes sufficient to support spending extra money on drone package delivery services. Finally, operators need enough unrestricted airspace to operate with minimal physical restrictions. Based upon these parameters, as well as existing UAS package delivery operations in North Carolina, NCDOT identified seven regions within North Carolina as likely operating areas for UAS package deliveries in the next seven years. These operating areas include Asheville, Charlotte Metro (including Kannapolis), Piedmont Triad (Winston-Salem, High Point, and Greensboro), Research Triangle (Raleigh, Durham, Chapel Hill, and adjacent communities), Sandhills (Pinehurst, Raeford, and Fayetteville), Greenville, and Wilmington (see **Figures 1–8**).

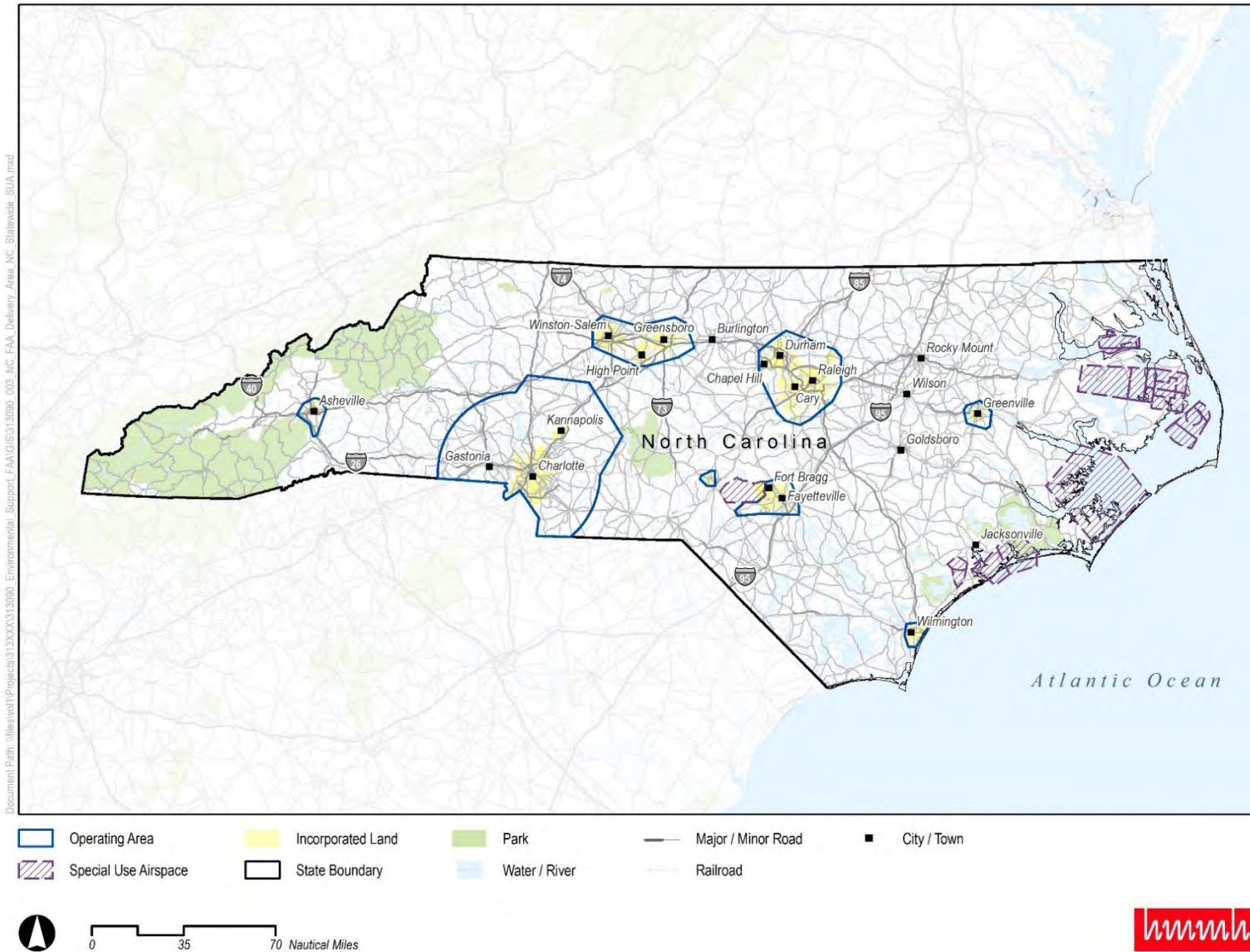


Figure 1. Operating Areas – Statewide



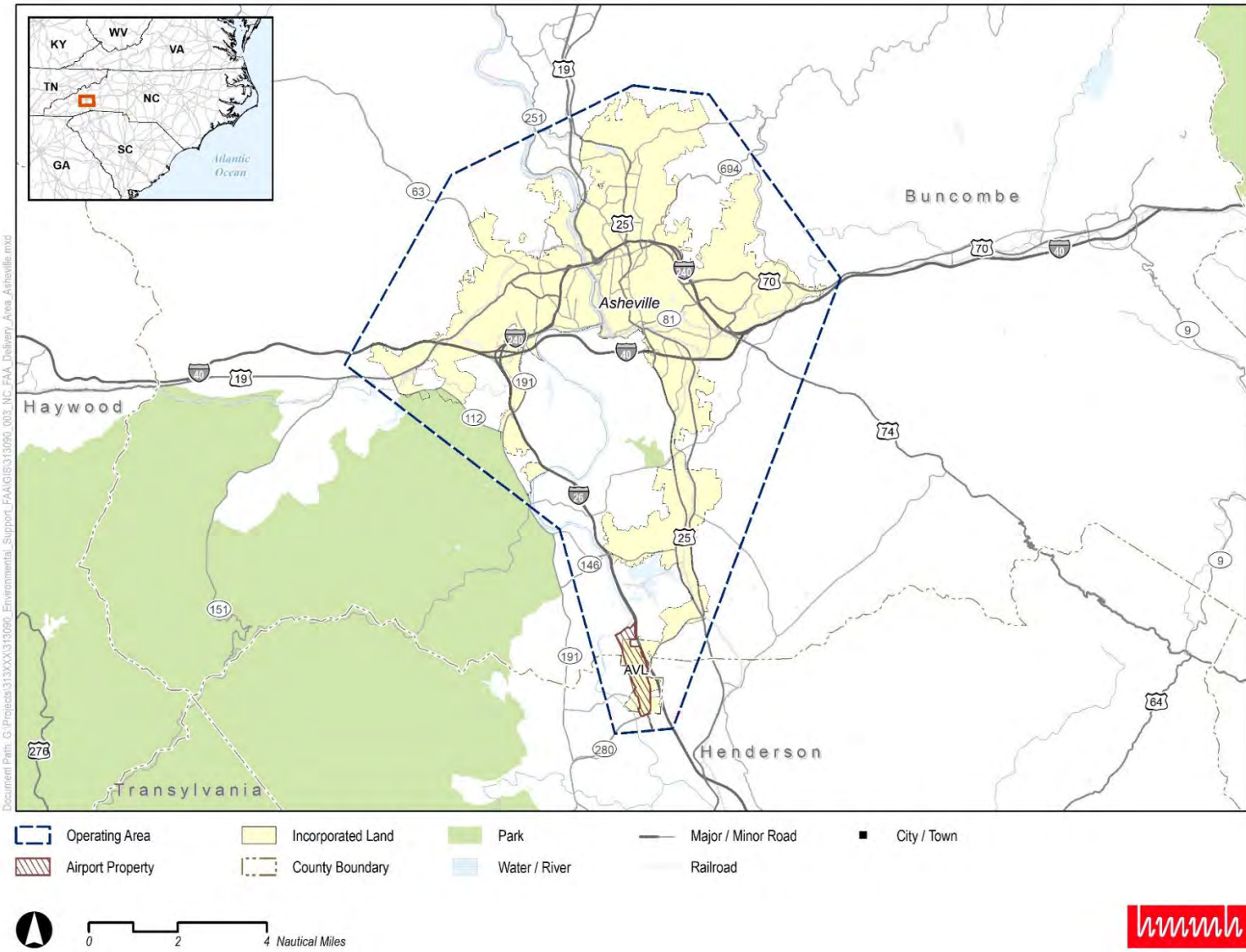
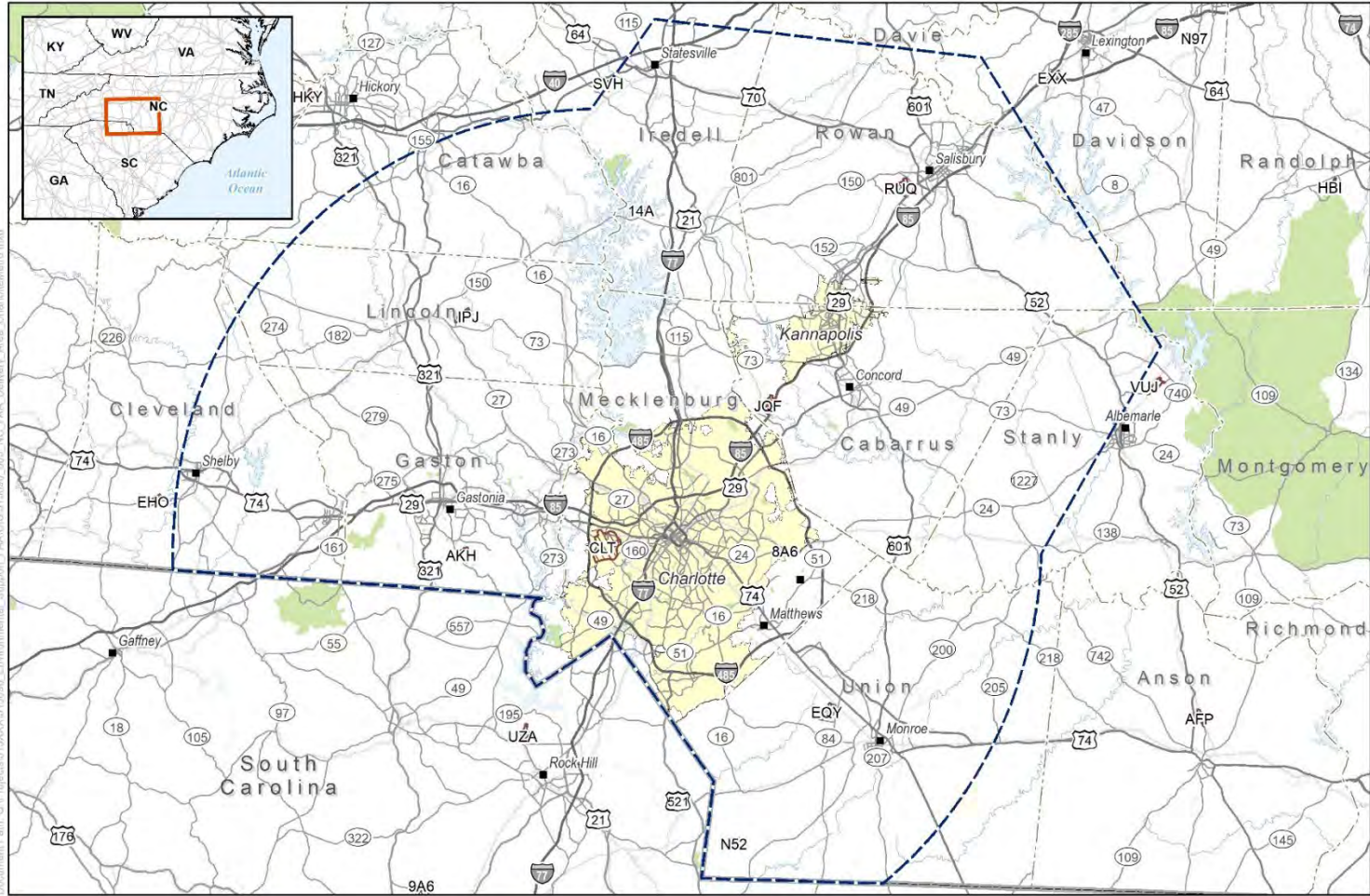


Figure 2. Asheville Operating Area



Document Path: G:\Projects\13XXXX\13XXXX_Environmental_Support\244\GIS\201808_005_NC_044_Duplicate_Areas_Chronicle\main.mxd

- Operating Area
- Incorporated Land
- Park
- Major / Minor Road
- City / Town
- Airport Property
- County Boundary
- Water / River
- Railroad
- State Boundary

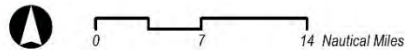


Figure 3. Charlotte Metro Operating Area

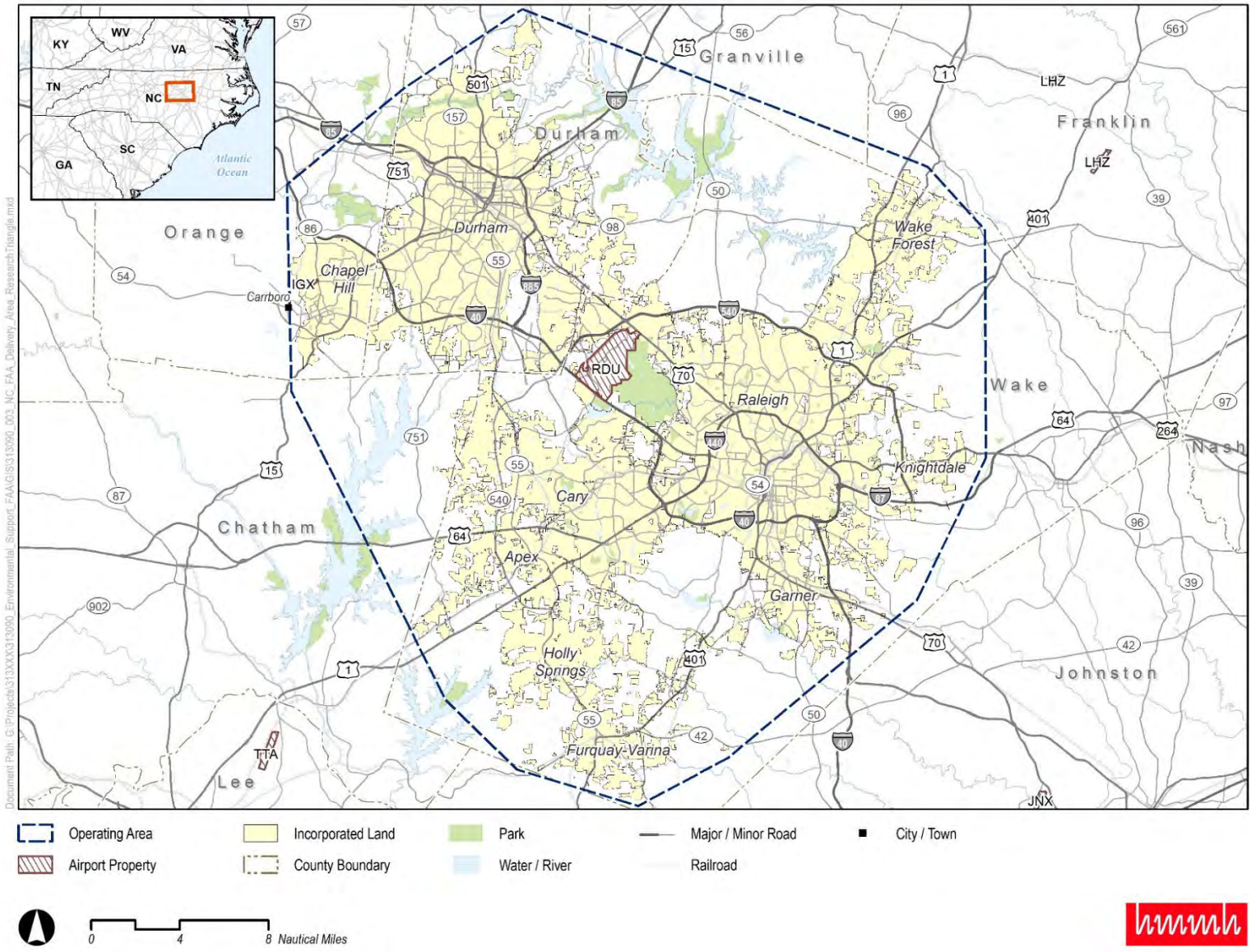


Figure 5. Research Triangle Operating Area



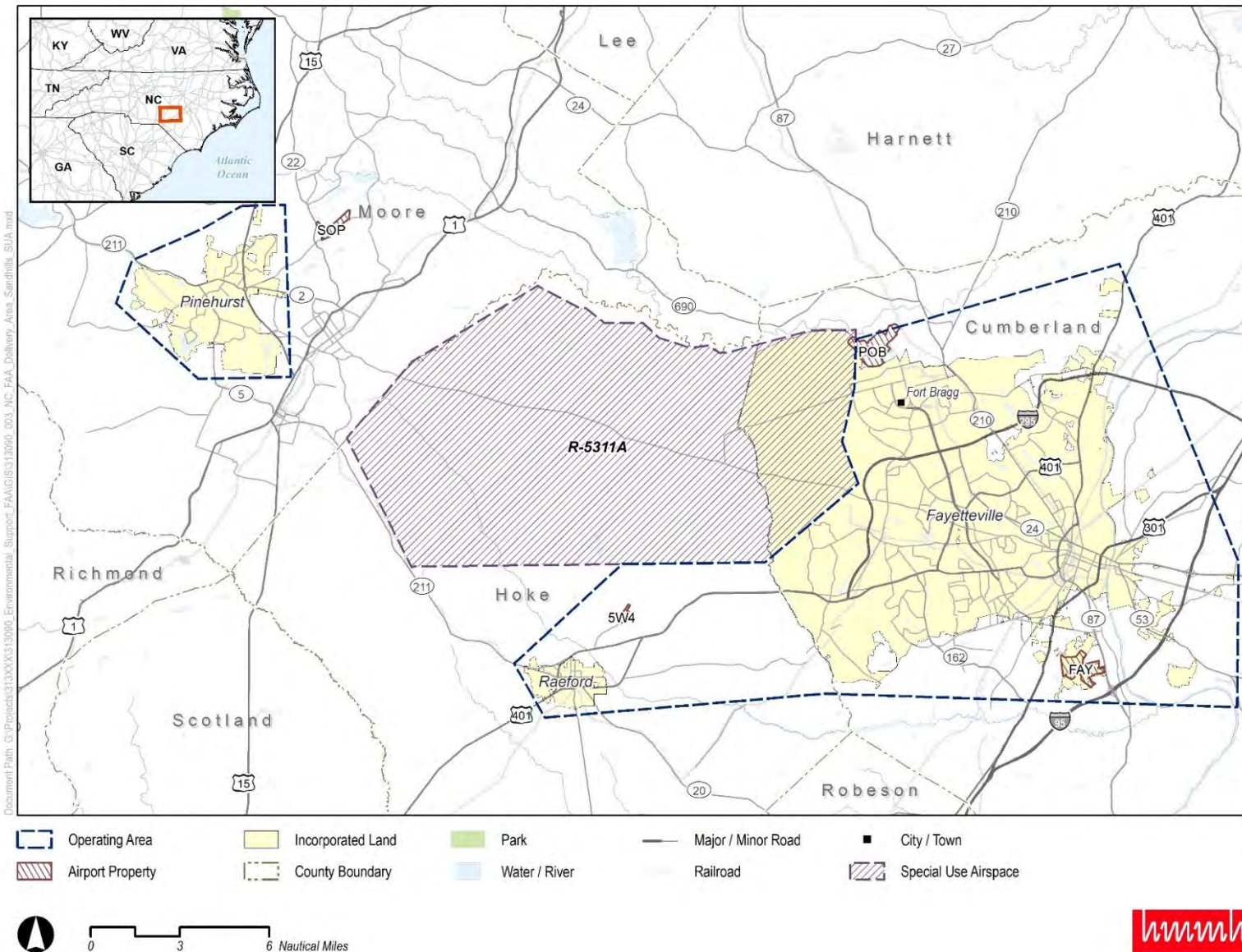


Figure 6. Sandhills Operating Area

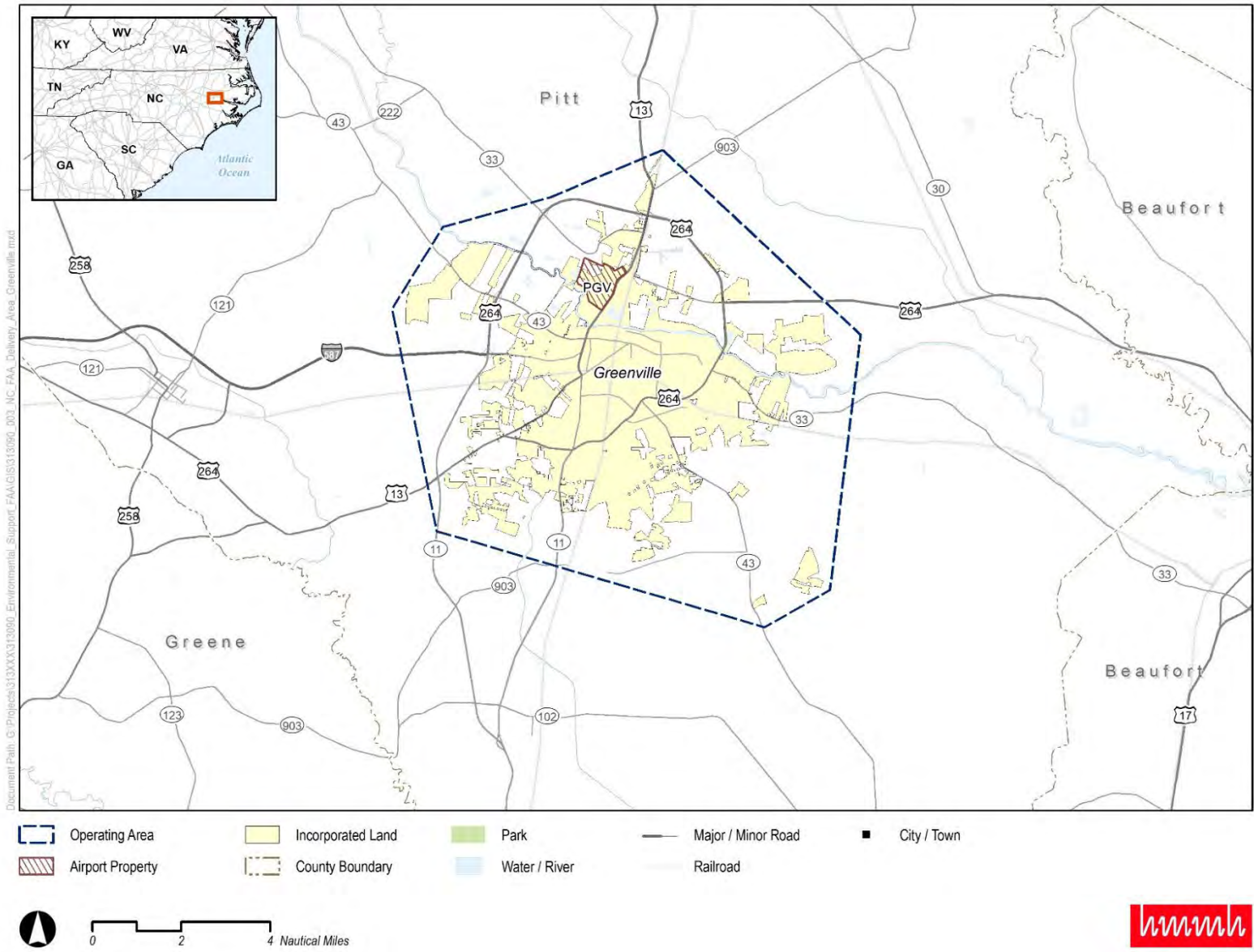


Figure 7. Greenville Operating Area

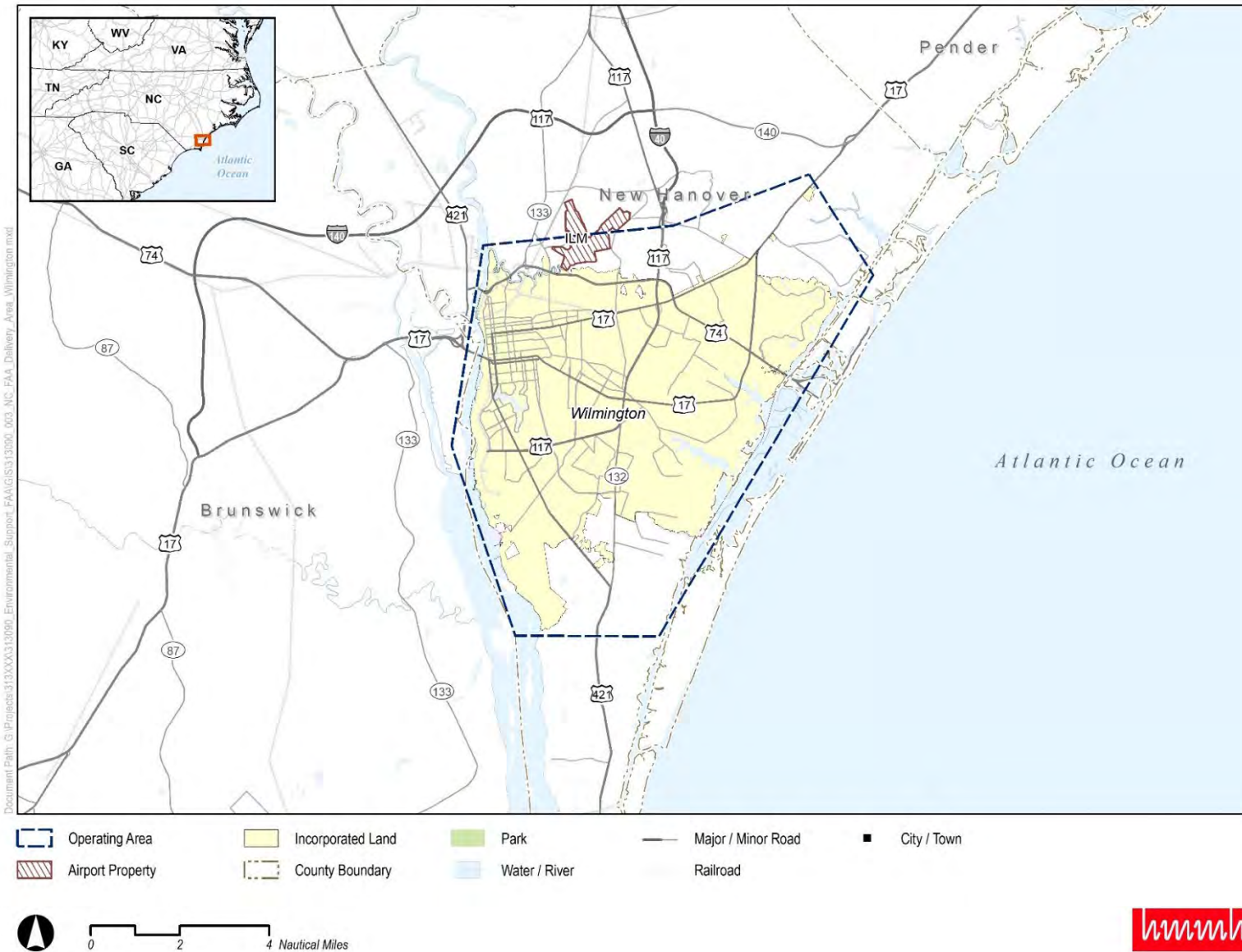


Figure 8. Wilmington Operating Area

OFFICE OF ASSISTANT CITY MANAGER
Damon Dequenne



14 December 2023

Nick Baker
Environmental Protection Specialist
Federal Aviation Administration
UAS Integration Office
Safety & Integration Division
Strategic Programs Branch (AUS-430)

Mr. Baker,

The City of High Point appreciates the opportunity to comment on the potential environmental impacts associated with the FAA's authorizing commercial Unmanned Aircraft Systems operators to deliver goods to customers using unmanned aircraft (drones) in accordance with 14 Code of Federal Regulations, Part 135 in the state of North Carolina. We have noted some general concerns below associated with three of the fourteen environmental impact categories.

- **Noise and compatible land uses** – The City of High Point lies south of the Piedmont Triad International Airport (PTIA). The northern part of High Point has a variety of land uses including residential, industrial, office, and commercial. This part of High Point also lies within the flight path of aircraft arriving and departing from PTIA. Noise impacts to the residential areas of High Point is a concern depending on noise levels and potential delivery corridors of these drones.
- **Visual effects (including light emissions)** – Negative visual impacts of drones on the urban environment. Disruption of night sky and/or conflict with outdoor events such as professional, scholastic, and youth sporting events.
- **Water resources (including wetlands, floodplains, surface waters, groundwater, and wild and scenic rivers)** – Potential impact to the City of High Point water supply system is a concern. Since these drones are powered by an electric motor, potential impacts to High Point's water supply should a battery powered drone were to crash into one of High Point's water supply lakes.

As stated above, these are general concerns on a few of the environmental impact categories. We may have additional comments once the draft EA is ready for public review.

Sincerely,

A handwritten signature in black ink, appearing to read "Damon Dequenne", written over a light blue horizontal line.

Damon Dequenne



211 South Hamilton St. High Point, NC 27260



336.883.3111



HighPointNC.gov



Memorandum



Office of the
City Manager

W. Patrick Pate
City Manager

101 N. Main Street
P.O. Box 2511
Winston-Salem, NC 27102

Tel 336.747.7380
Fax 336.748.3060
ppate@cityofws.org

www.cityofws.org

TO: Jay Kinser, Manager, Strategic Programs Branch, UAS Integration Office
FROM: W. Patrick Pate, City Manager
DATE: December 20, 2023
SUBJECT: **Unmanned Aircraft Systems Operators in North Carolina**
CC: Tiffany Oliva, Director of Intergovernmental Affairs & Strategic Initiatives
Riley Beaman, UAS Program Manager, NCDOT

City of Winston-Salem staff have reviewed the proposal under consideration by the Federal Aviation Administration (FAA) and the programmatic environmental assessment (EA) to assess the potential environmental impacts of the FAA's action of authorizing Unmanned Aircraft Systems operators to deliver goods to customers (referred to as package delivery) using unmanned aircraft (also referred to as drones) in the state of North Carolina, given that NCDOT has identified the City of Winston-Salem as a potential location for the same. Staff reviewed aspects under the FAA's 14 impact categories, as well as some considerations outside of the listed categories.

Air Quality, Climate, Natural resources and energy supply

The City of Winston-Salem and its Sustainability Department believes based on preliminary research that drone package delivery could pose potential positive impacts in the impact categories of air quality, climate, natural resources and energy supply.

Noise and compatible land use

Given that the FAA anticipates package delivery operators partnering with established businesses and identifying the location for a hub at the business's parking lot, rooftop, or other area, the UA could pose potential nuisance issues, even though the FAA states in the letter that they hope to locate a nondisruptive location. Further, to conduct delivery in routes will still require flying and landing in many residential areas. The City does not currently have a land use listed in its Unified Development Ordinances related to UA, and it would need to develop one in anticipation of this need.

Non-categorical

The Winston-Salem Police Department did express one concern with regard to public safety. Many law enforcement agencies across the country, including the Winston-Salem Police Department and Forsyth County Sheriff's Office, are beginning to implement Drone as a First Responder programs. Given that the proposed package delivery drones would operate in the same air space, the City would want to ensure that law enforcement/first-response continues to receive priority flight status. Deconfliction of those flights are essential. It is also essential to avoid any alterations in the airspace that might impose additional restrictions, thereby ensuring seamless coexistence with the current shared airspace.

W. Patrick Pate

YOUR LINK TO CITY SERVICES



CALL: 311 [336-727-8000]
TEXT: 855-481-LINK [5465]
citylink@cityofws.org

City Council: Mayor Allen Joines; Denise D. Adams, Mayor Pro Tempore, North Ward; Barbara Haues Burke, Northeast Ward; Robert C. Clark, West Ward; John C. Larson, South Ward; Jeff MacIntosh, Northwest Ward; Kevin Mundy, Southwest Ward; Annette Scipio, East Ward; James Taylor, Jr., Southeast Ward; City Manager: W. Patrick Pate

**North Carolina Department of Natural
and Cultural Resources, Division of Parks
and Recreation**



U.S. Department
of Transportation

**Federal Aviation
Administration**

Aviation Safety

800 Independence Ave., SW.
Washington, DC 20591

Via Email

Brian Strong
Director
Division of Parks and Recreation
North Carolina Department of Natural and Cultural Resources
Email: brian.strong@ncparks.gov

Dear Mr. Strong:

The purpose of this letter is to inform you of a proposal under consideration by the Federal Aviation Administration (FAA) and solicit your feedback. In accordance with the National Environmental Policy Act, the FAA is preparing a programmatic environmental assessment (EA) to assess the potential environmental impacts of commercial Unmanned Aircraft Systems operators delivering goods to customers (referred to as package delivery) using unmanned aircraft (also referred to as drones) in accordance with 14 Code of Federal Regulations Part 135 in the state of North Carolina. The North Carolina Department of Transportation (NCDOT) is the proponent of the project. NCDOT has identified specific metropolitan areas in North Carolina as potential locations where drone package delivery flights might occur in the future. For your reference, a project description is enclosed with this letter.

When preparing EAs, the FAA considers 14 impact categories, one of which is the Department of Transportation Act, Section 4(f). The full list of impact categories is presented in FAA Order 1050.1F, Paragraph 4-1.¹ As we develop the draft EA, we wish to seek your input regarding identification of potential Section 4(f) properties² under your jurisdiction in the study area and solicit your views regarding potential environmental impacts on those properties, as well as potential best management practices or mitigation measures to avoid or minimize any potential impacts.

While we are not currently evaluating specific applications for drone package delivery in the proposed operating areas (refer to **Figures 2–9**, attached), and while we do not expect an applicant to propose to locate a “hub”³ within a park or recreation area, there could be instances of drones flying over a park or recreation area periodically as the drones fly to and from a hub as part of package delivery operations. Typical cruise altitude as the drone flies to and from a hub is 150–375 feet above ground level and typical cruise speed ranges from 30–60 knots (35–75 miles per hour).

¹ See:

https://www.faa.gov/about/office_org/headquarters_offices/apl/enviro_n_policy_guidance/policy/faa_nepa_order

² Section 4(f) properties include significant publicly owned parks, recreational areas, wildlife and waterfowl refuges, and public and private historic sites.

³ Refer to the attached project description for a description of a hub and expected locations for hubs.

Your timely response over the next 30 days will greatly assist us in incorporating your comments into our environmental review of the operation. Please contact Nicholas Baker via email at 9-faa-drone-environmental@faa.gov within 30 days of the receipt of this letter with any feedback. You will also have another opportunity to provide comments when the FAA publishes a draft EA for public review.

Sincerely,

Jay Kinser
Manager, Strategic Programs Branch
UAS Integration Office

Enclosure: Attachment 1 – Project Description

Attachment 1 – Project Description

Background

In 2012, the U.S. Congress first charged the Federal Aviation Administration (FAA) with integrating Unmanned Aircraft Systems (UAS) into the national airspace system (NAS). The FAA has engaged in a phased, incremental approach to integrating drones into the NAS and continues to work toward full integration of drones into the NAS. From 2017 through 2020, the UAS Integration Pilot Program focused on testing and evaluating the integration of drone operations into the NAS. This work continues under the UAS BEYOND program, which focuses on the remaining challenges of UAS integration, including beyond visual line of sight operations, societal and economic benefits of UAS operations, and community engagement. Participants in these programs are among the first to prove their concepts, including package delivery by drone through air carrier certification in accordance with 14 Code of Federal Regulations (CFR) Part 135. Part 135 certification is currently the only path for drones to carry the property of another for compensation beyond visual line of sight.

In 2019, the FAA began issuing air carrier certificates to UAS operators in accordance with Part 135 so that operators can conduct package delivery flights. Generally, these approvals are associated with issuing a new or amended Part 135 air carrier Operations Specifications⁴ as the operative approval. The FAA has completed 17 environmental assessments (EAs) in accordance with the National Environmental Policy Act (NEPA), Council on Environmental Quality NEPA Implementing Regulations (40 CFR Parts 1500–1508), and FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*⁵ for individual package delivery proposals. Each EA resulted in a finding of no significant impact.⁶

The North Carolina Department of Transportation (NCDOT) has been a lead partner in the FAA’s drone integration partnership programs since 2017, first as a partner in the Integration Pilot Program and then continuing as a partner in the BEYOND program. In this role, NCDOT is collaborating with partners to test and prove operations that can gain FAA approvals to expand beyond visual line of sight and other complex operations in the state. Within the state of North Carolina, NCDOT has the authority to implement and manage regulations pertaining to state laws as set by the North Carolina State General Assembly concerning drone operations.

To support the development of a programmatic EA, NCDOT developed a forecast for future Part 135 UAS package delivery operations in North Carolina and shared it with the FAA. The FAA used the forecast to identify operating areas where UAS package delivery operations are likely to occur between 2024 and 2030 and to define the levels of UAS activities that may be expected based on existing and future market analyses.

Proposed Action

The proposed action is commercial drone package deliveries from takeoff and landing areas (referred to as “hubs”) based on NCDOT’s maximum forecasted operations for conservative purposes. NCDOT has

⁴ An Operations Specifications is a document that defines the scope of aircraft operations the FAA has authorized.

⁵ FAA Order 1050.1F serves as the FAA’s policy and procedures for compliance with NEPA and CEQ’s NEPA-implementing regulations. See:

https://www.faa.gov/about/office_org/headquarters_offices/apl/enviro_nepa_guidance/policy/faa_nepa_order

⁶ See: https://www.faa.gov/uas/advanced_operations/nepa_and_drones.

projected Part 135 drone package delivery operations for the state of North Carolina out to year 2030 and provided that projection to the FAA for environmental analysis.

The type, size, and weight of aircraft used to deliver packages could vary, but NCDOT anticipates multi-copter platforms will be the primary type of unmanned aircraft (UA) used to deliver small packages in the foreseeable future. The characteristics of the UAS considered in the EA are displayed in **Table 1**.

Table 1. UAS Characteristics

Characteristic	Criteria
Platform/Vehicle Type	Multi-copters (2 to 8 propellers), fixed wing, and hybrid aircraft (vertical lift with fixed-wing cruise)
Power	Electric motor
Delivery Mechanism Types	Drop off, tethered (wire/cable), customer unloads, ground drop, parachute
Maximum Aircraft Weight	Approximately 87 pounds
Maximum Payload (Package) Weight	Approximately 5 pounds
Maximum Aircraft Takeoff Weight	Approximately 92 pounds
Typical Cruise Altitude	150–375 feet above ground level
Maximum Cruise Altitude	400 feet above ground level
Hours of Operation	7:00 a.m. – 10:00 p.m.
Operation Days	7 days per week, 365 days per year

While UA come in varying sizes with varying flight capabilities, the flight operations can generally be categorized into the following five phases: 1) takeoff and climb, 2) en route outbound, 3) delivery, 4) en route inbound, and 5) descent and landing (see **Figure 1**). In general, package delivery operators partner with established businesses and identify the location for a hub at the business’s parking lot, rooftop, or other area where it is not disruptive to the business and does not present a safety hazard. This allows the drone operator to conduct operations with minimal infrastructure requirements and no ground disturbance activities. Prior to takeoff, packages are manually loaded onto the UA by a ground crew at the hub. The UA then climbs and performs aerial deliveries following a predetermined flight path that is set using software that assigns, deconflicts, and routes each flight. After delivery, the UA returns to its hub.

According to NCDOT’s forecast, in general, Part 135 UAS package delivery operators prefer areas where they can serve the most customers while flying the least distance. Also, operators need enough unrestricted airspace to operate with minimal physical restrictions. Based upon these parameters, as well as existing UAS package delivery operations in North Carolina, NCDOT identified seven regions within North Carolina as likely operating areas for UAS package deliveries in the next seven years. These operating areas include Asheville, Charlotte Metro (including Kannapolis), Piedmont Triad (Winston-Salem, High Point, and Greensboro), Research Triangle (Raleigh, Durham, Chapel Hill, and adjacent communities), Sandhills (Pinehurst, Raeford, and Fayetteville), Greenville, and Wilmington (see **Figures 2–9**).

Table 2 displays NCDOT’s forecasted daily operations for each operating area in 2030. As shown in the table, the geographic distribution of NCDOT’s proposed UAS drone package delivery operations center heavily in the Charlotte Metro and Research Triangle operating areas.

Table 2. Estimated Daily Deliveries per Operating Area in 2030

Operating Area Name	Approximate Size (square miles)	Estimated Number of Hubs	Estimated Range of Daily Deliveries
Asheville	220	1	164 – 478
Charlotte Metro	3,524	6	1,649 – 4,801
Piedmont Triad	713	5	413 – 1,201
Research Triangle	1,039	6	1,704 – 4,960
Sandhills	209	2	328 – 955
Greenville	137	1	164 – 478
Wilmington	129	1	164 – 478

Source: NCDOT 2024

Typical Flight Profile

Typical Flight Duration: 10–40 minutes round-trip

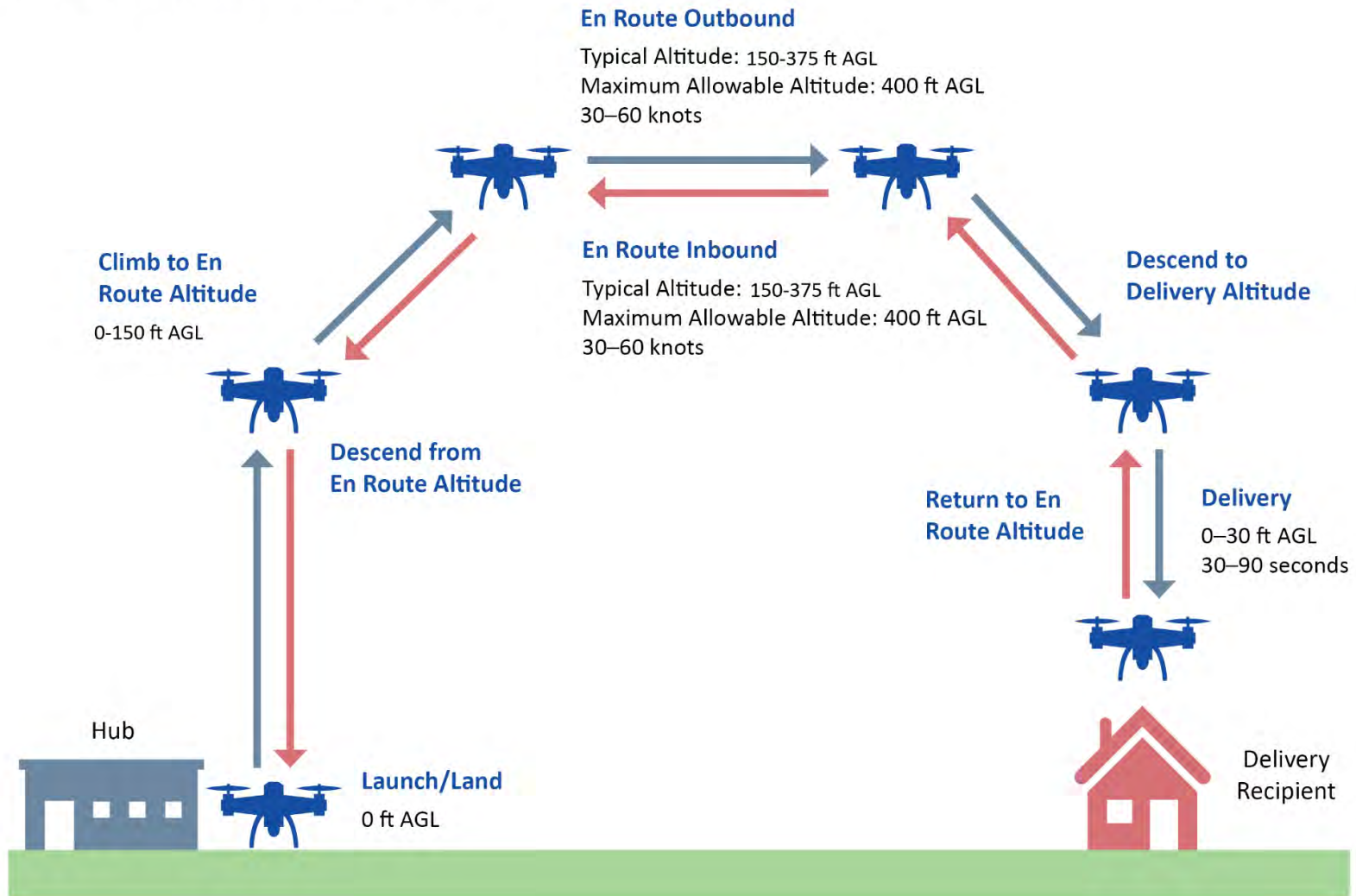


Figure 1. Typical Flight Profile

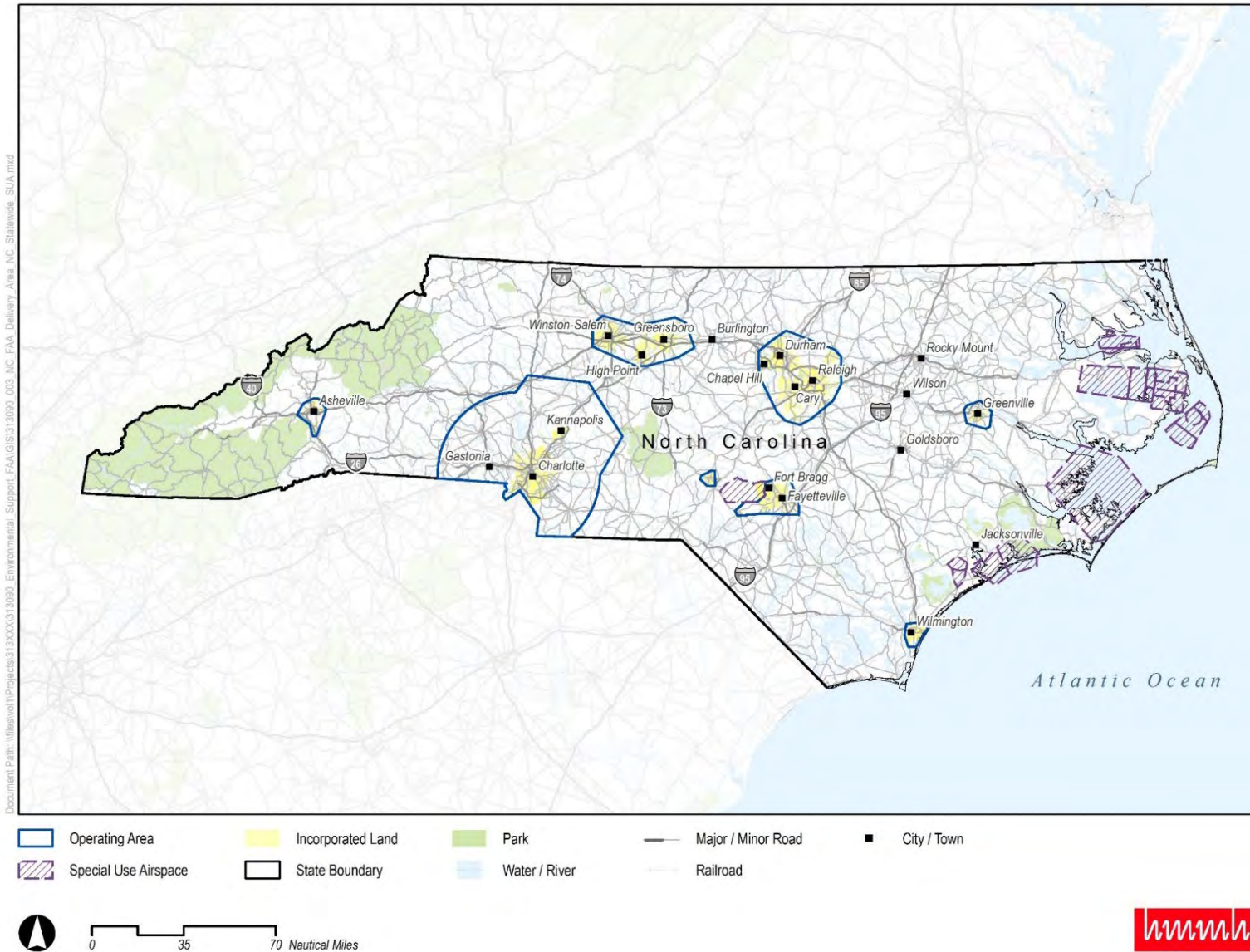


Figure 2. Operating Areas – Statewide

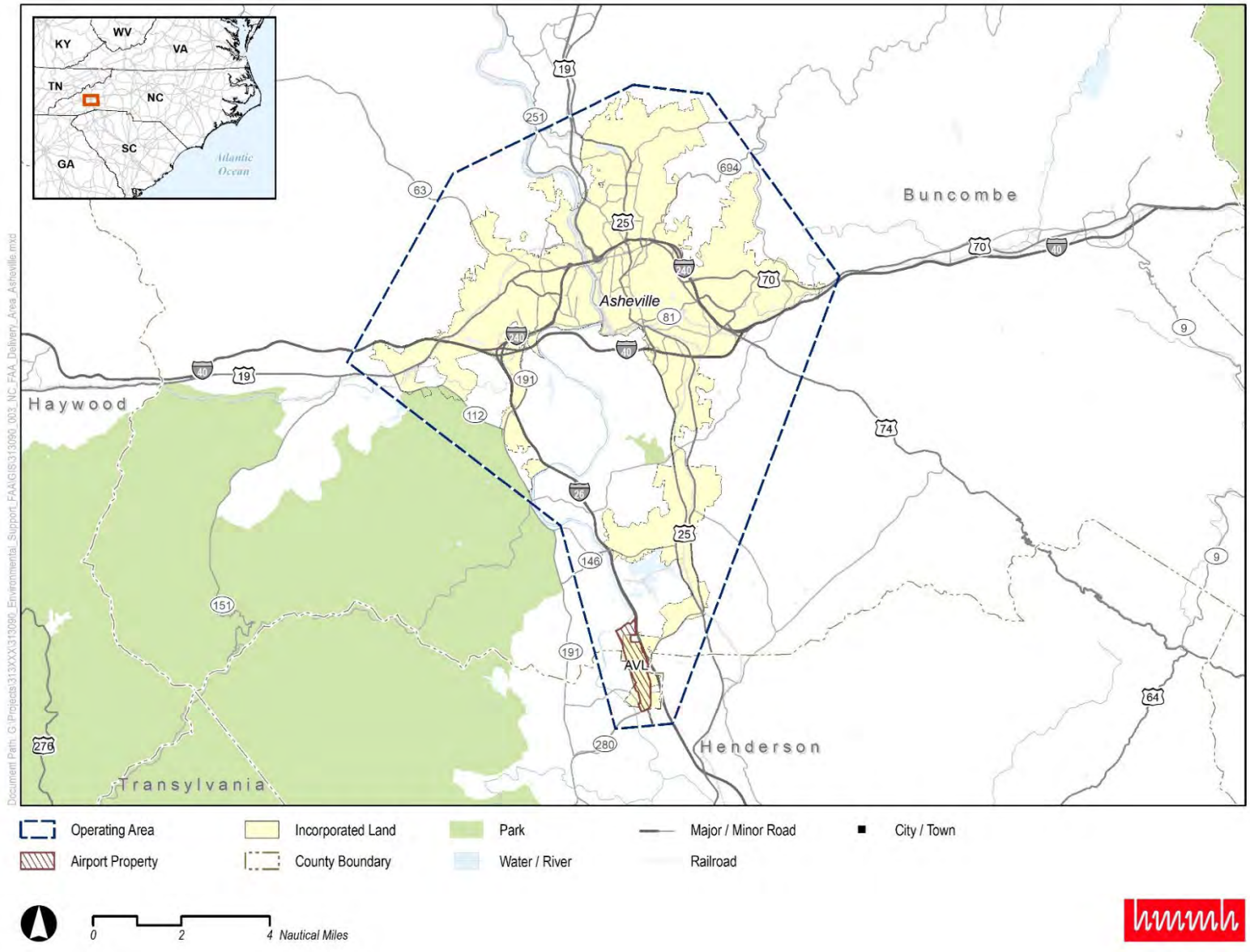
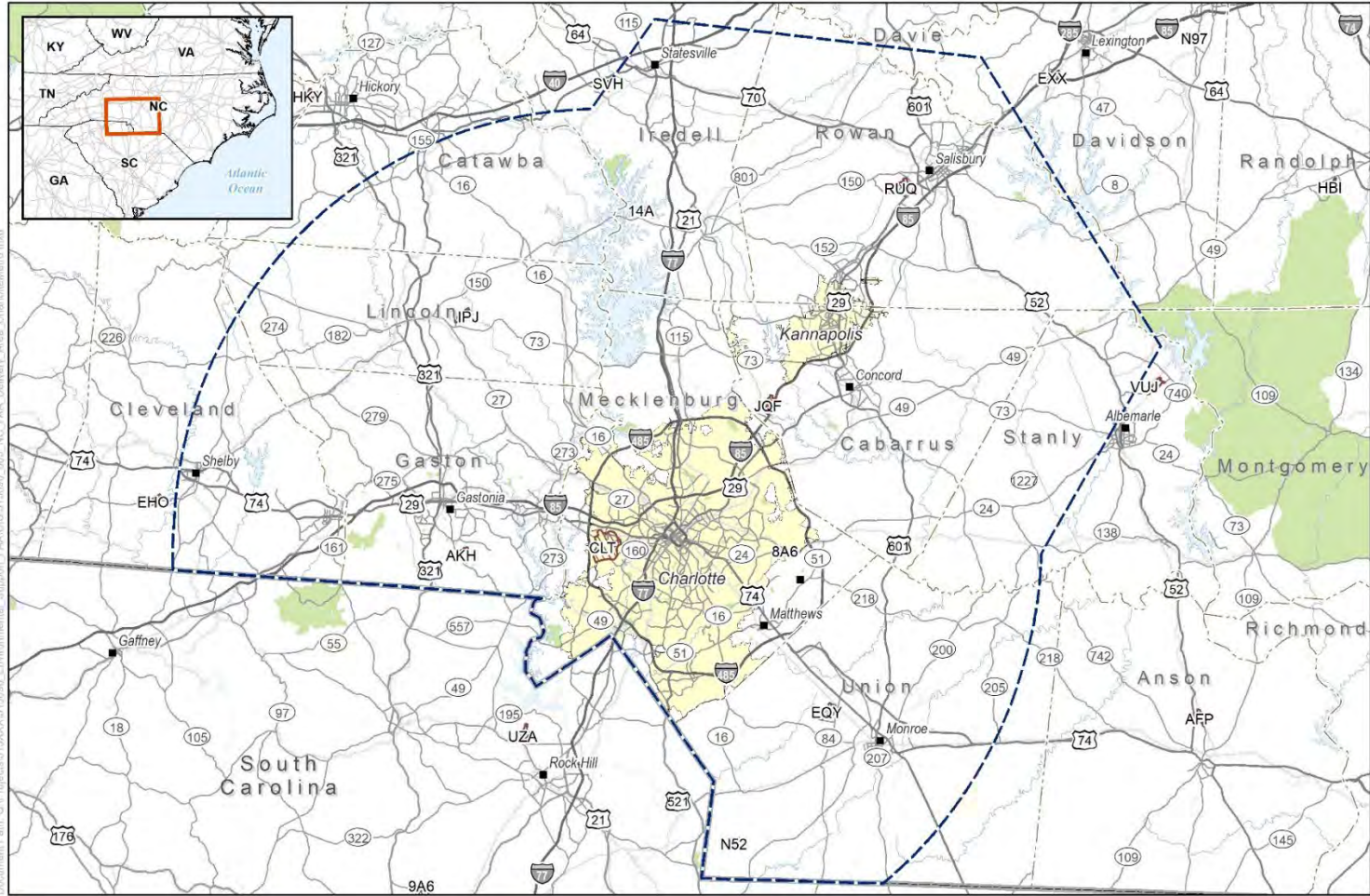


Figure 3. Asheville Operating Area



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- Operating Area
- Incorporated Land
- Park
- Major / Minor Road
- City / Town
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- County Boundary
- Water / River
- Railroad
- State Boundary

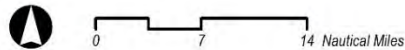
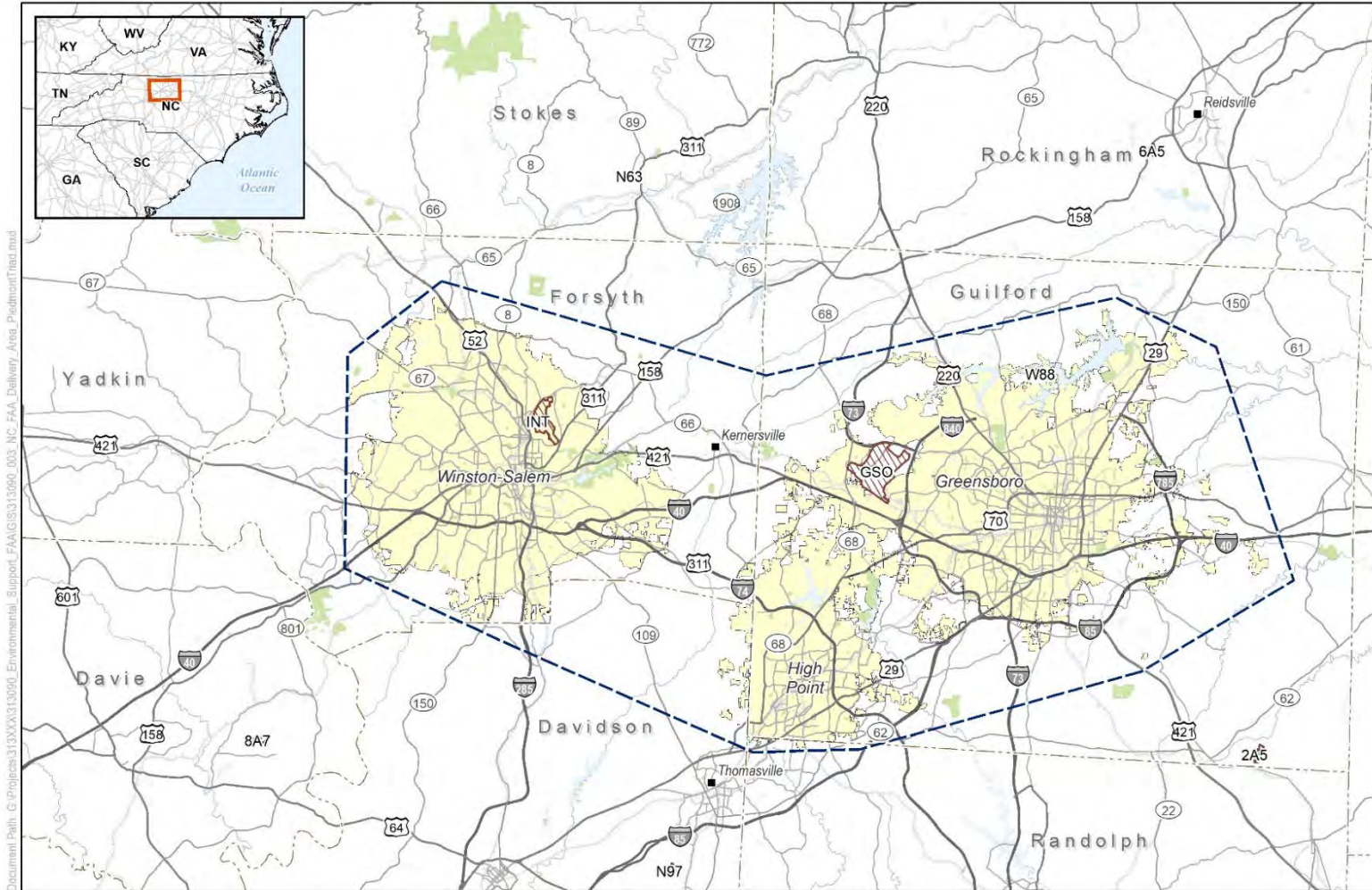


Figure 4. Charlotte Metro Operating Area



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|------------------|-------------------|---------------|--------------------|-------------|
| Operating Area | Incorporated Land | Park | Major / Minor Road | City / Town |
| Airport Property | County Boundary | Water / River | Railroad | |

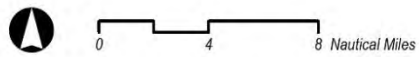


Figure 5. Piedmont Triad Operating Area

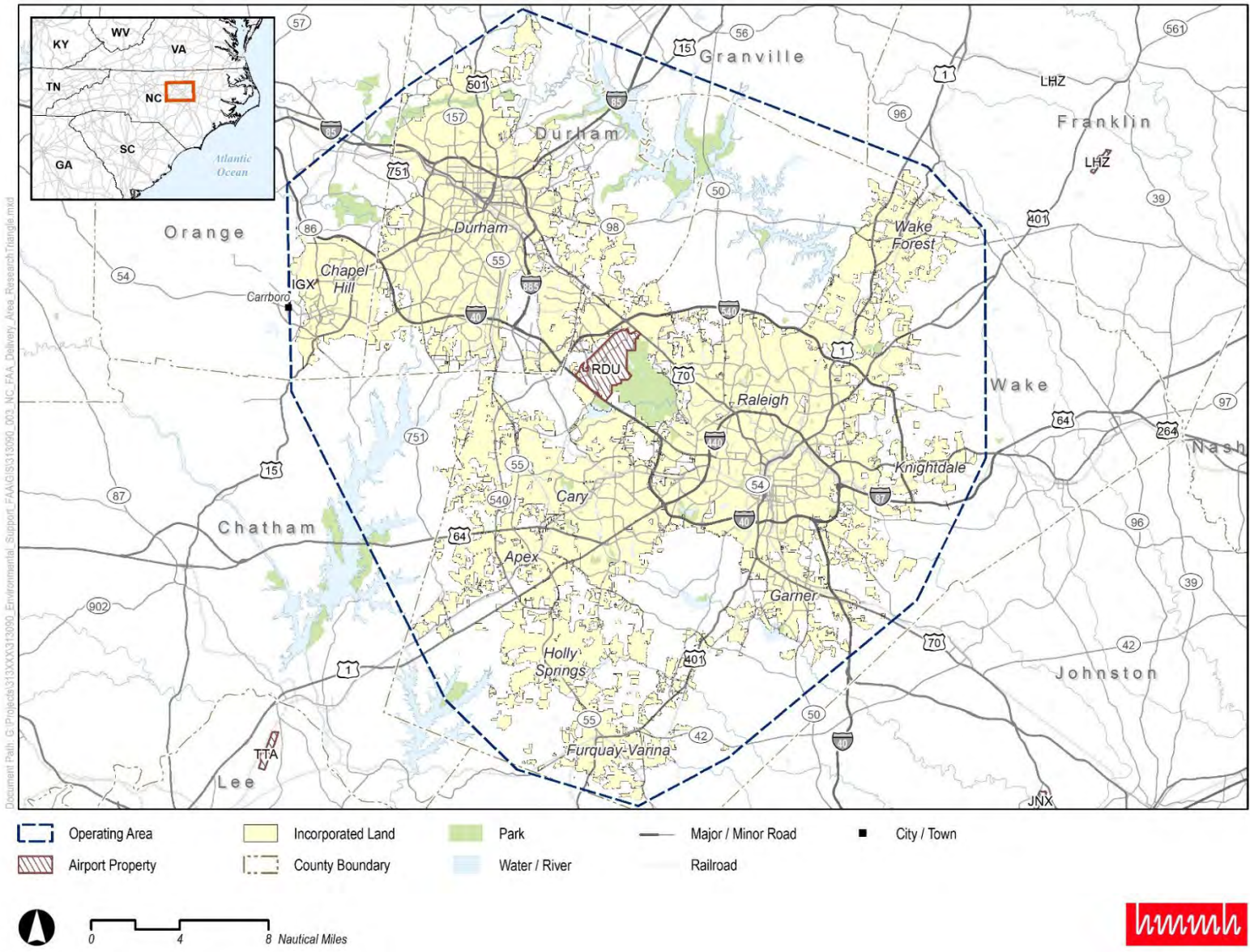


Figure 6. Research Triangle Operating Area



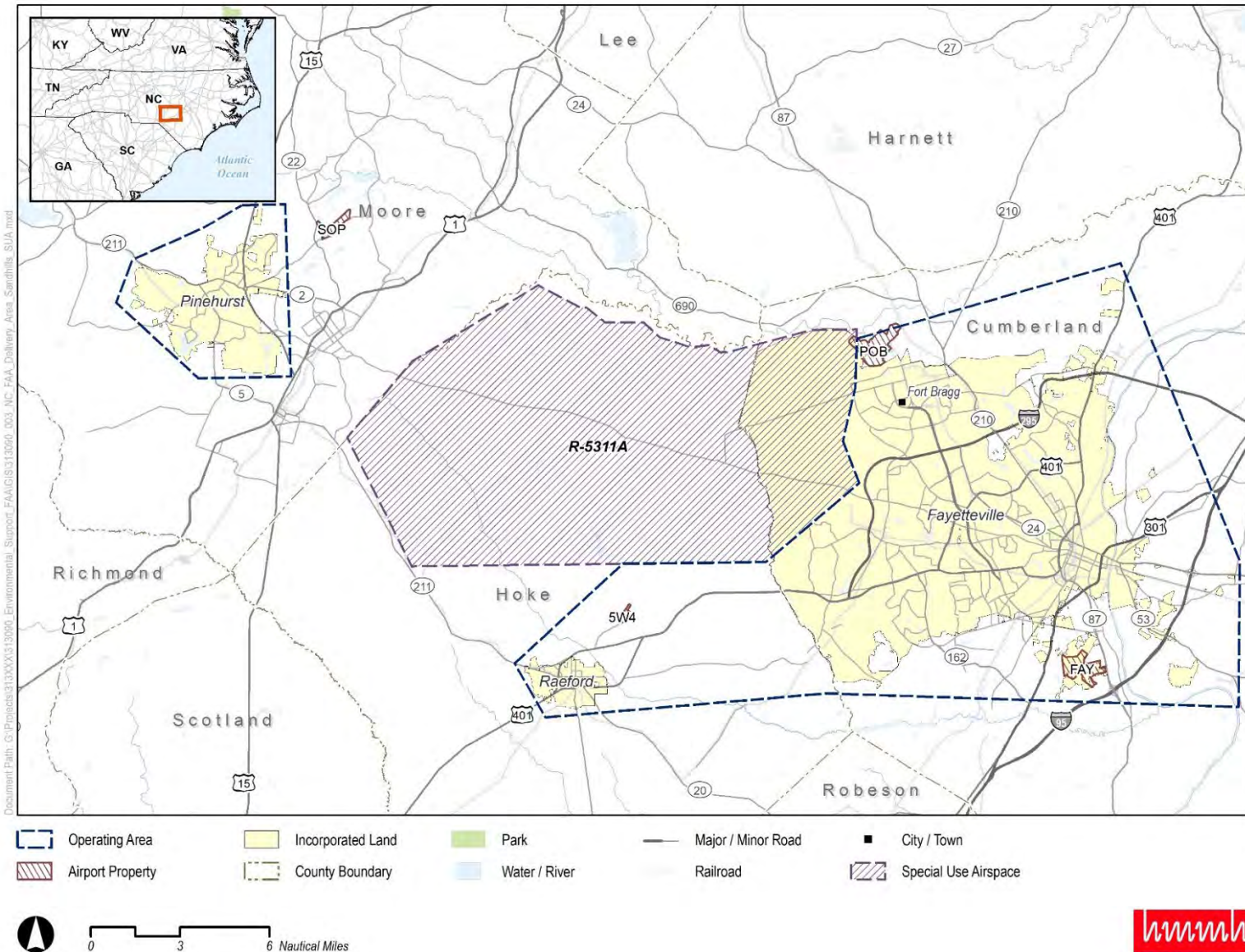
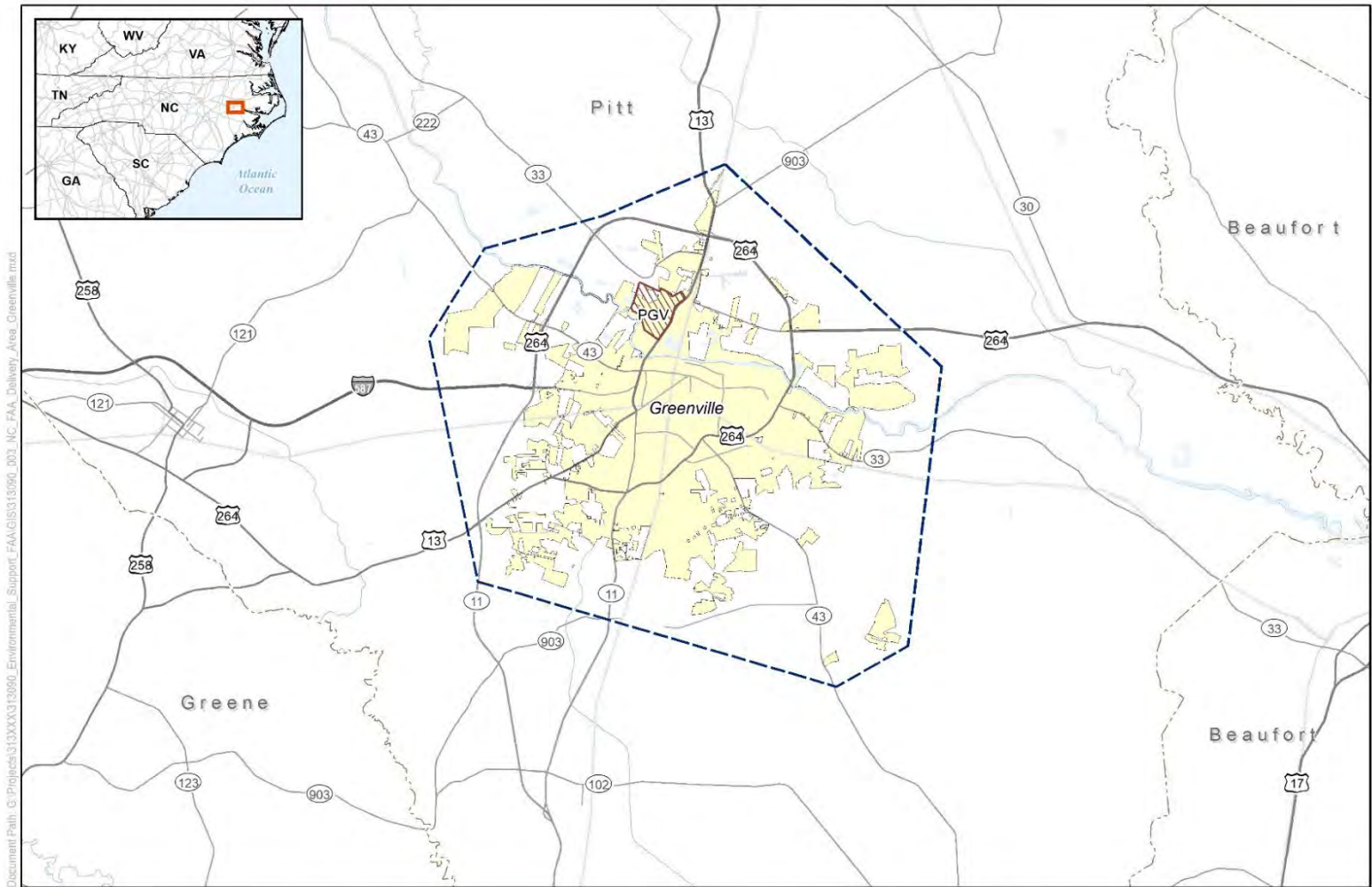


Figure 7. Sandhills Operating Area



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- Operating Area
- Incorporated Land
- Park
- Major / Minor Road
- City / Town
- Airport Property
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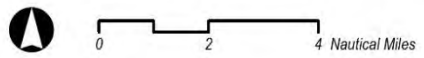


Figure 8. Greenville Operating Area

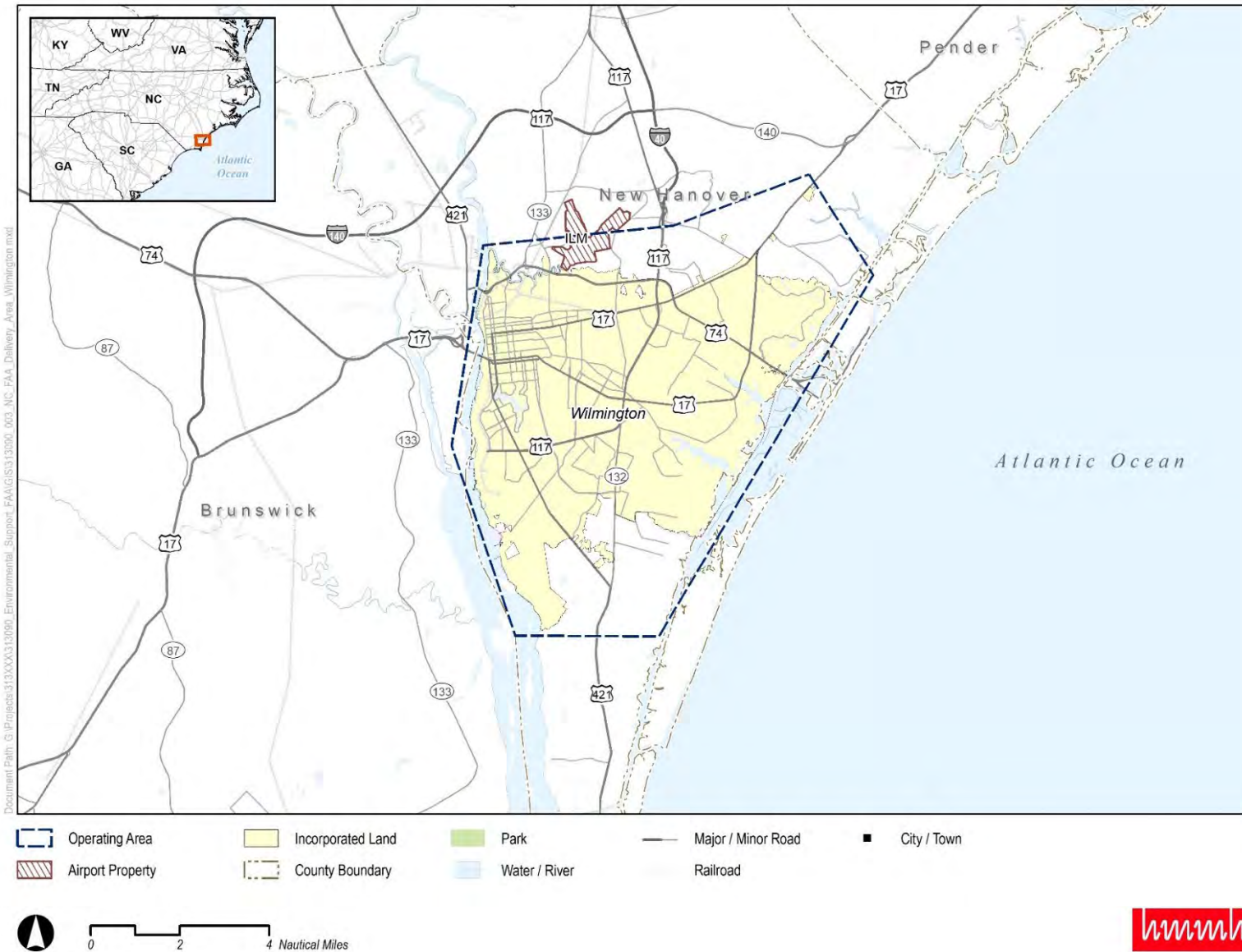


Figure 9. Wilmington Operating Area

National Park Service



U.S. Department
of Transportation
**Federal Aviation
Administration**

Aviation Safety

800 Independence Ave., SW.
Washington, DC 20591

Via Email

Tracy Swartout
Superintendent
Blue Ridge Parkway
National Park Service
Email: tracy_swartout@nps.gov

Dear Ms. Swartout:

The purpose of this letter is to inform you of a proposal under consideration by the Federal Aviation Administration (FAA) and solicit your feedback. In accordance with the National Environmental Policy Act, the FAA is preparing a programmatic environmental assessment (EA) to assess the potential environmental impacts of commercial Unmanned Aircraft Systems operators delivering goods to customers (referred to as package delivery) using unmanned aircraft (also referred to as drones) in accordance with 14 Code of Federal Regulations Part 135 in the state of North Carolina. The North Carolina Department of Transportation (NCDOT) is the proponent of the project. NCDOT has identified the City of Asheville as a potential location where drone package delivery flights might occur in the future. For your reference, a project description is enclosed with this letter.

When preparing EAs, the FAA considers 14 impact categories, one of which is the Department of Transportation Act, Section 4(f). The full list of impact categories is presented in FAA Order 1050.1F, Paragraph 4-1.¹ As we develop the draft EA, we wish to solicit your views regarding potential environmental impacts on the Blue Ridge Parkway, which is a property protected by Section 4(f), as well as potential best management practices or mitigation measures to avoid or minimize any potential impacts.

The FAA is aware of the National Park Service's policy regarding drone use at national parks and national parkways, including the Blue Ridge Parkway. According to the National Park Service, launching, landing, and operating an unmanned aircraft from or on lands and waters administered by the National Park Service within the boundaries of the Blue Ridge Parkway is prohibited.² The FAA expects drone package delivery operators to comply with this policy. However, there could be instances of drones flying over a section of the parkway within the Asheville operating area (see **Figure 3**, attached) periodically as the drone is flying to and from a hub as part of package delivery operations. Typical cruise altitude as the drone flies to and from a hub is 150–375 feet above ground level and typical cruise speed ranges from 30–60 knots (35–75 miles per hour).

¹ See:

https://www.faa.gov/about/office_org/headquarters_offices/apl/enviro_policy_guidance/policy/faa_nepa_order

² <https://www.nps.gov/blri/faqs.htm>

Your timely response over the next 30 days will greatly assist us in incorporating your comments into our environmental review of the operation. Please contact Nicholas Baker via email at 9-faa-drone-environmental@faa.gov within 30 days of the receipt of this letter with any feedback. You will also have another opportunity to provide comments when the FAA publishes a draft EA for public review.

Sincerely,

Jay Kinser
Manager, Strategic Programs Branch
UAS Integration Office

Enclosure: Attachment 1 – Project Description

Attachment 1 – Project Description

Background

In 2012, the U.S. Congress first charged the Federal Aviation Administration (FAA) with integrating Unmanned Aircraft Systems (UAS) into the national airspace system (NAS). The FAA has engaged in a phased, incremental approach to integrating drones into the NAS and continues to work toward full integration of drones into the NAS. From 2017 through 2020, the UAS Integration Pilot Program focused on testing and evaluating the integration of drone operations into the NAS. This work continues under the UAS BEYOND program, which focuses on the remaining challenges of UAS integration, including beyond visual line of sight operations, societal and economic benefits of UAS operations, and community engagement. Participants in these programs are among the first to prove their concepts, including package delivery by drone through air carrier certification in accordance with 14 Code of Federal Regulations (CFR) Part 135. Part 135 certification is currently the only path for drones to carry the property of another for compensation beyond visual line of sight.

In 2019, the FAA began issuing air carrier certificates to UAS operators in accordance with Part 135 so that operators can conduct package delivery flights. Generally, these approvals are associated with issuing a new or amended Part 135 air carrier Operations Specifications³ as the operative approval. The FAA has completed 17 environmental assessments (EAs) in accordance with the National Environmental Policy Act (NEPA), Council on Environmental Quality NEPA Implementing Regulations (40 CFR Parts 1500–1508), and FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*⁴ for individual package delivery proposals. Each EA resulted in a finding of no significant impact.⁵

The North Carolina Department of Transportation (NCDOT) has been a lead partner in the FAA’s drone integration partnership programs since 2017, first as a partner in the Integration Pilot Program and then continuing as a partner in the BEYOND program. In this role, NCDOT is collaborating with partners to test and prove operations that can gain FAA approvals to expand beyond visual line of sight and other complex operations in the state. Within the state of North Carolina, NCDOT has the authority to implement and manage regulations pertaining to state laws as set by the North Carolina State General Assembly concerning drone operations.

To support the development of a programmatic EA, NCDOT developed a forecast for future Part 135 UAS package delivery operations in North Carolina and shared it with the FAA. The FAA used the forecast to identify operating areas where UAS package delivery operations are likely to occur between 2024 and 2030 and to define the levels of UAS activities that may be expected based on existing and future market analyses.

Proposed Action

The proposed action is commercial drone package deliveries from takeoff and landing areas (referred to as “hubs”) based on NCDOT’s maximum forecasted operations for conservative purposes. NCDOT has

³ An Operations Specifications is a document that defines the scope of aircraft operations the FAA has authorized.

⁴ FAA Order 1050.1F serves as the FAA’s policy and procedures for compliance with NEPA and CEQ’s NEPA-implementing regulations. See:

https://www.faa.gov/about/office_org/headquarters_offices/apl/enviro_nepa_guidance/policy/faa_nepa_order

⁵ See: https://www.faa.gov/uas/advanced_operations/nepa_and_drones.

projected Part 135 drone package delivery operations for the state of North Carolina out to year 2030 and provided that projection to the FAA for environmental analysis.

The type, size, and weight of aircraft used to deliver packages could vary, but NCDOT anticipates multi-copter platforms will be the primary type of unmanned aircraft (UA) used to deliver small packages in the foreseeable future. The characteristics of the UAS considered in the EA are displayed in **Table 1**.

Table 1. UAS Characteristics

Characteristic	Criteria
Platform/Vehicle Type	Multi-copters (2 to 8 propellers), fixed wing, and hybrid aircraft (vertical lift with fixed-wing cruise)
Power	Electric motor
Delivery Mechanism Types	Drop off, tethered (wire/cable), customer unloads, ground drop, parachute
Maximum Aircraft Weight	Approximately 87 pounds
Maximum Payload (Package) Weight	Approximately 5 pounds
Maximum Aircraft Takeoff Weight	Approximately 92 pounds
Typical Cruise Altitude	150–375 feet above ground level
Maximum Cruise Altitude	400 feet above ground level
Hours of Operation	7:00 a.m. – 10:00 p.m.
Operation Days	7 days per week, 365 days per year

While UA come in varying sizes with varying flight capabilities, the flight operations can generally be categorized into the following five phases: 1) takeoff and climb, 2) en route outbound, 3) delivery, 4) en route inbound, and 5) descent and landing (see **Figure 1**). In general, package delivery operators partner with established businesses and identify the location for a hub at the business’s parking lot, rooftop, or other area where it is not disruptive to the business and does not present a safety hazard. This allows the drone operator to conduct operations with minimal infrastructure requirements and no ground disturbance activities. Prior to takeoff, packages are manually loaded onto the UA by a ground crew at the hub. The UA then climbs and performs aerial deliveries following a predetermined flight path that is set using software that assigns, deconflicts, and routes each flight. After delivery, the UA returns to its hub.

According to NCDOT’s forecast, in general, Part 135 UAS package delivery operators prefer areas where they can serve the most customers while flying the least distance. Also, operators need enough unrestricted airspace to operate with minimal physical restrictions. Based upon these parameters, as well as existing UAS package delivery operations in North Carolina, NCDOT identified seven regions within North Carolina as likely operating areas for UAS package deliveries in the next seven years. These operating areas include Asheville, Charlotte Metro (including Kannapolis), Piedmont Triad (Winston-Salem, High Point, and Greensboro), Research Triangle (Raleigh, Durham, Chapel Hill, and adjacent communities), Sandhills (Pinehurst, Raeford, and Fayetteville), Greenville, and Wilmington (see **Figures 2–9**).

Table 2 displays NCDOT’s forecasted daily operations for each operating area in 2030. As shown in the table, the geographic distribution of NCDOT’s proposed UAS drone package delivery operations center heavily in the Charlotte Metro and Research Triangle operating areas. Regarding Asheville, NCDOT estimates there could be one hub with up to 478 deliveries per day throughout the operating area.

Table 2. Estimated Daily Deliveries per Operating Area in 2030

Operating Area Name	Approximate Size (square miles)	Estimated Number of Hubs	Estimated Range of Daily Deliveries
Asheville	220	1	164 – 478
Charlotte Metro	3,524	6	1,649 – 4,801
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Sandhills	209	2	328 – 955
Greenville	137	1	164 – 478
Wilmington	129	1	164 – 478

Source: NCDOT 2024

Typical Flight Profile

Typical Flight Duration: 10–40 minutes round-trip

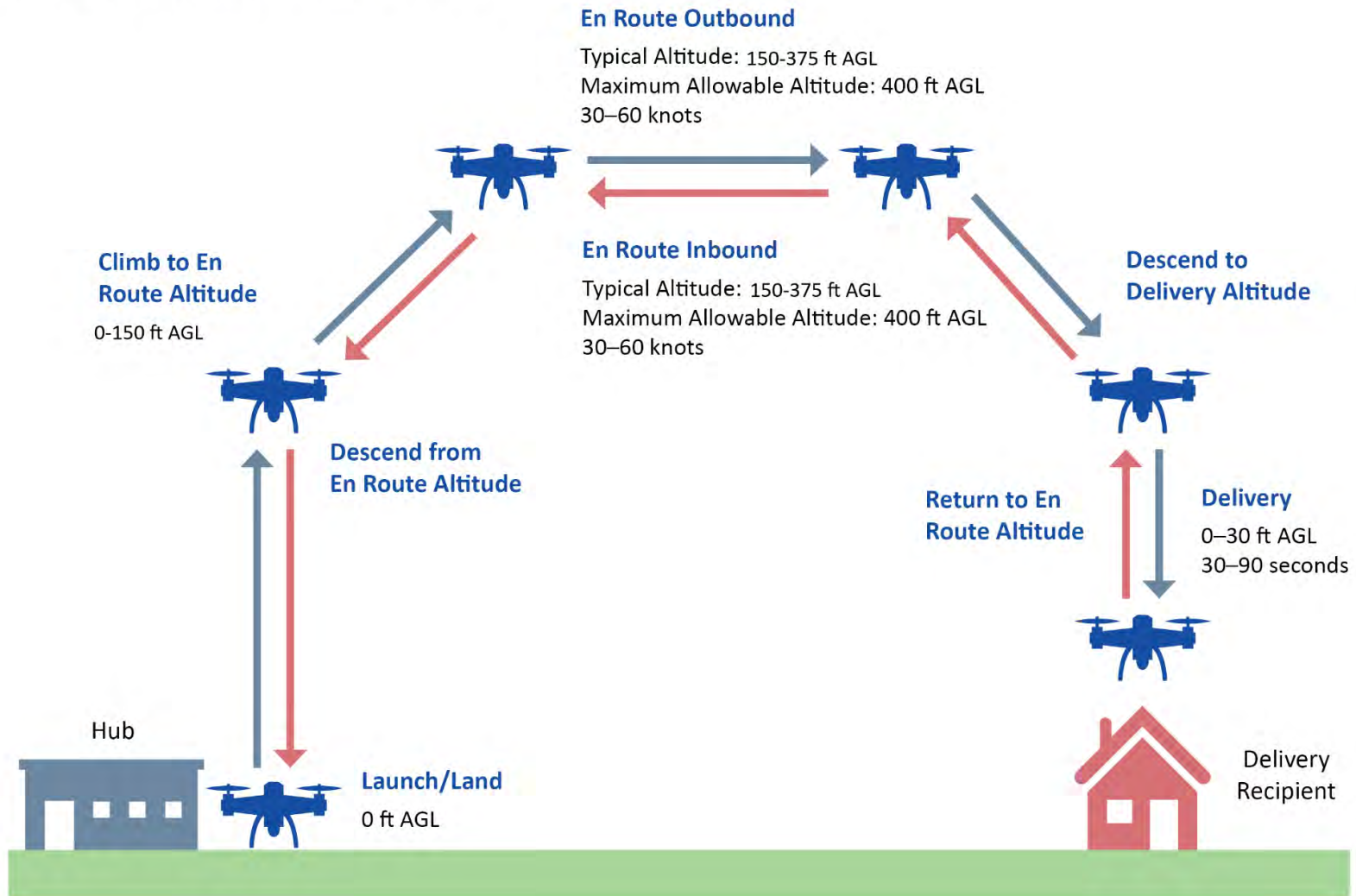


Figure 1. Typical Flight Profile

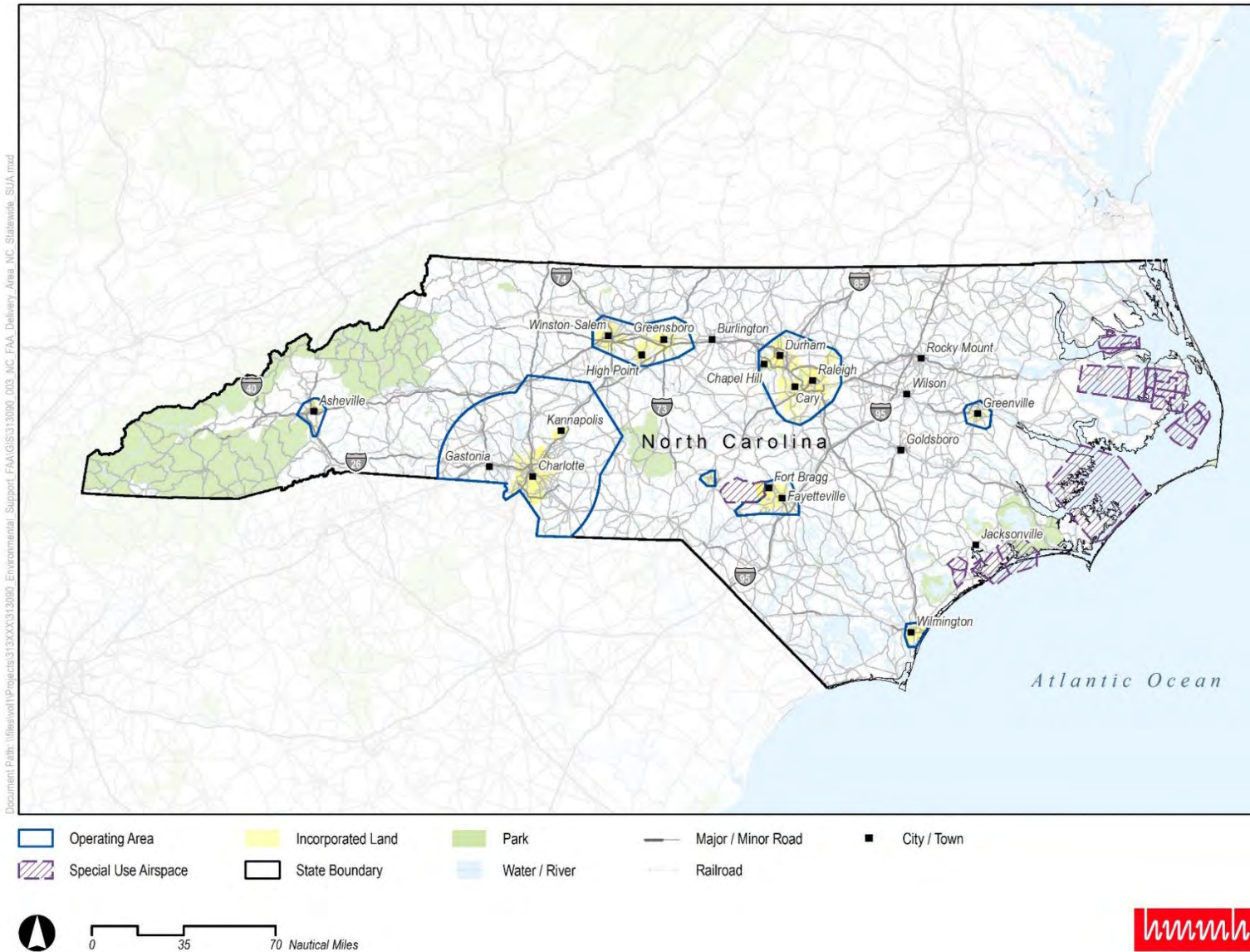


Figure 2. Operating Areas – Statewide

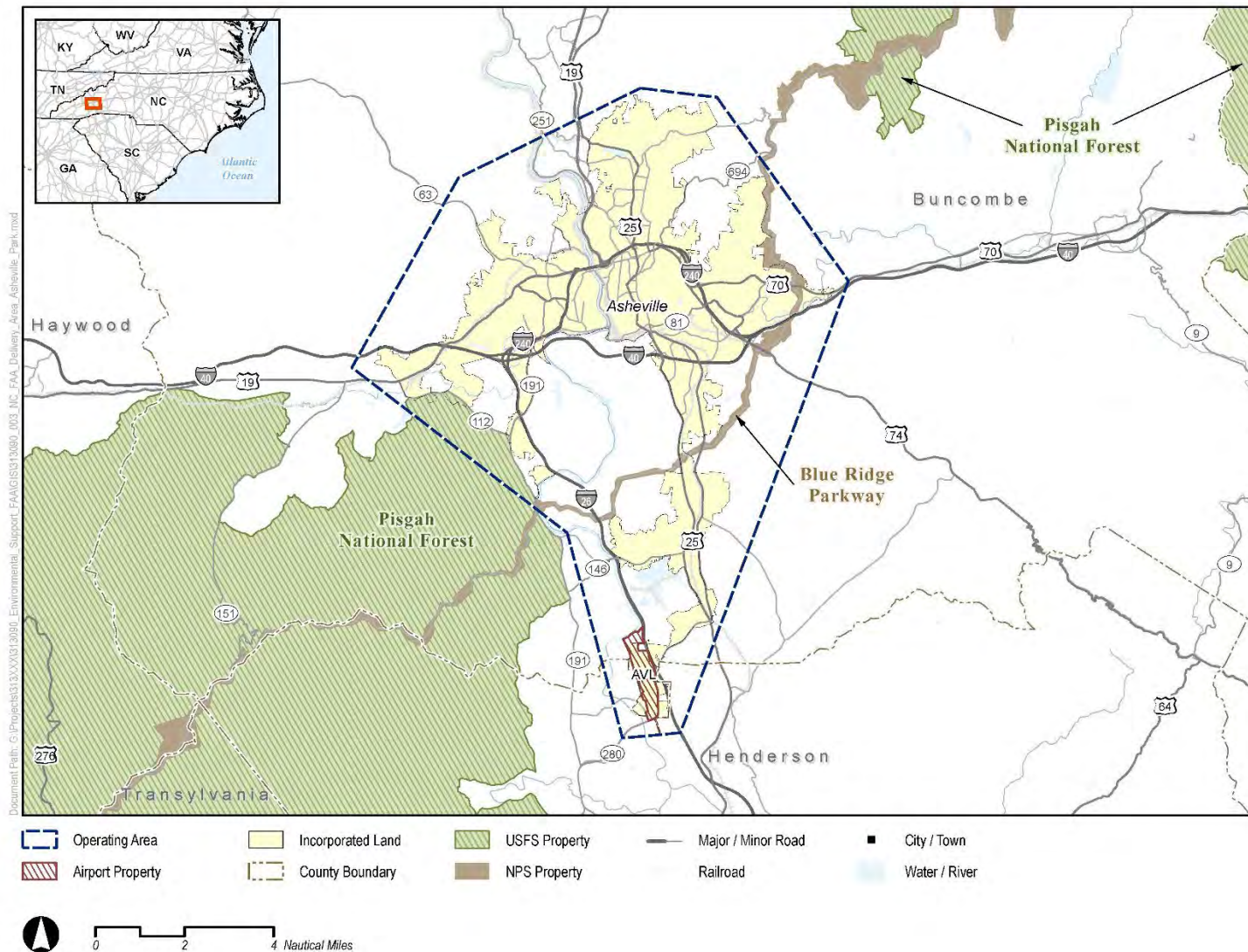
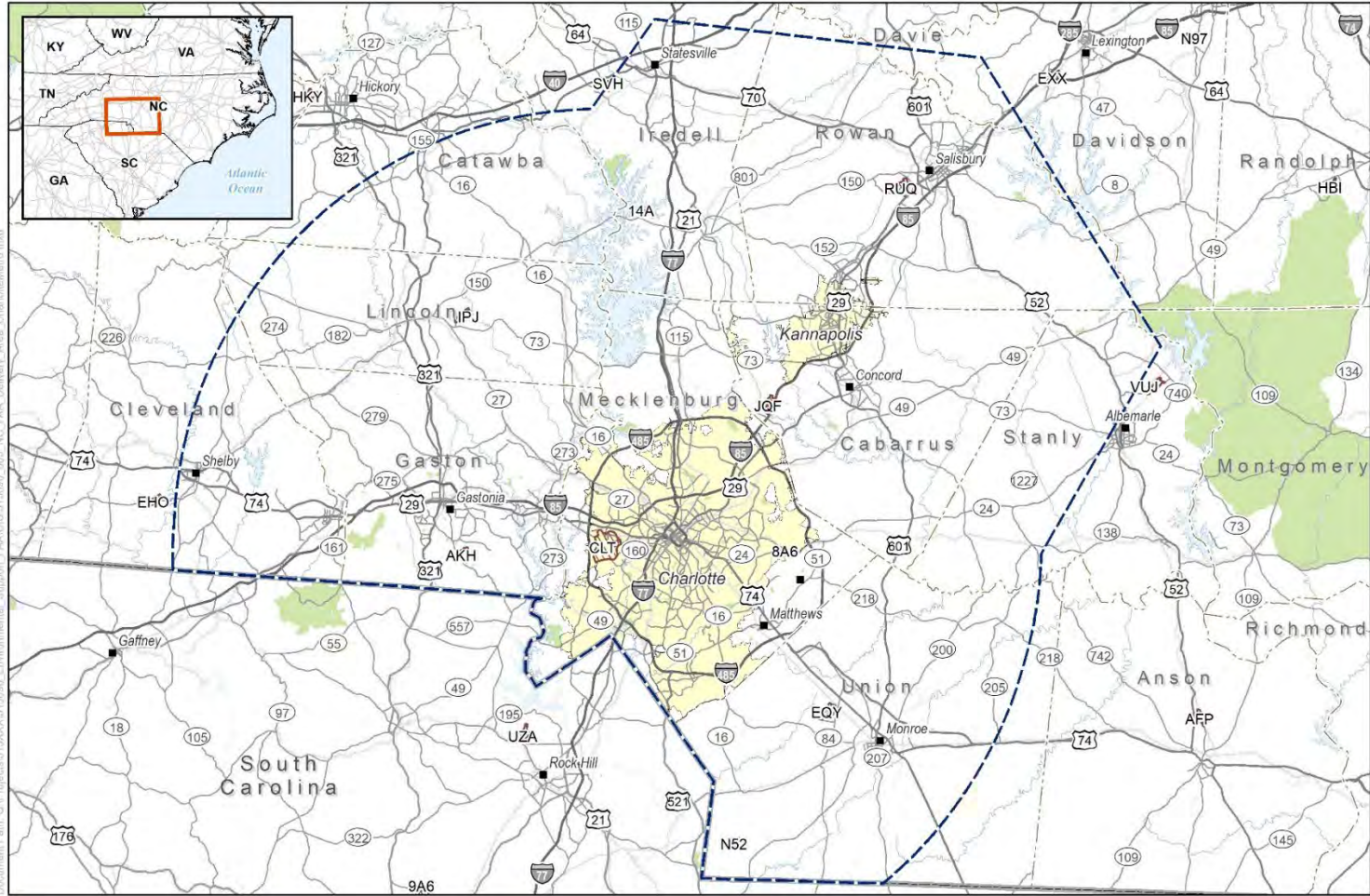


Figure 3. Asheville Operating Area



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- Operating Area
- Incorporated Land
- Park
- Major / Minor Road
- City / Town
- Airport Property
- County Boundary
- Water / River
- Railroad
- State Boundary

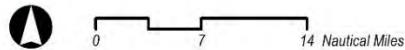


Figure 4. Charlotte Metro Operating Area

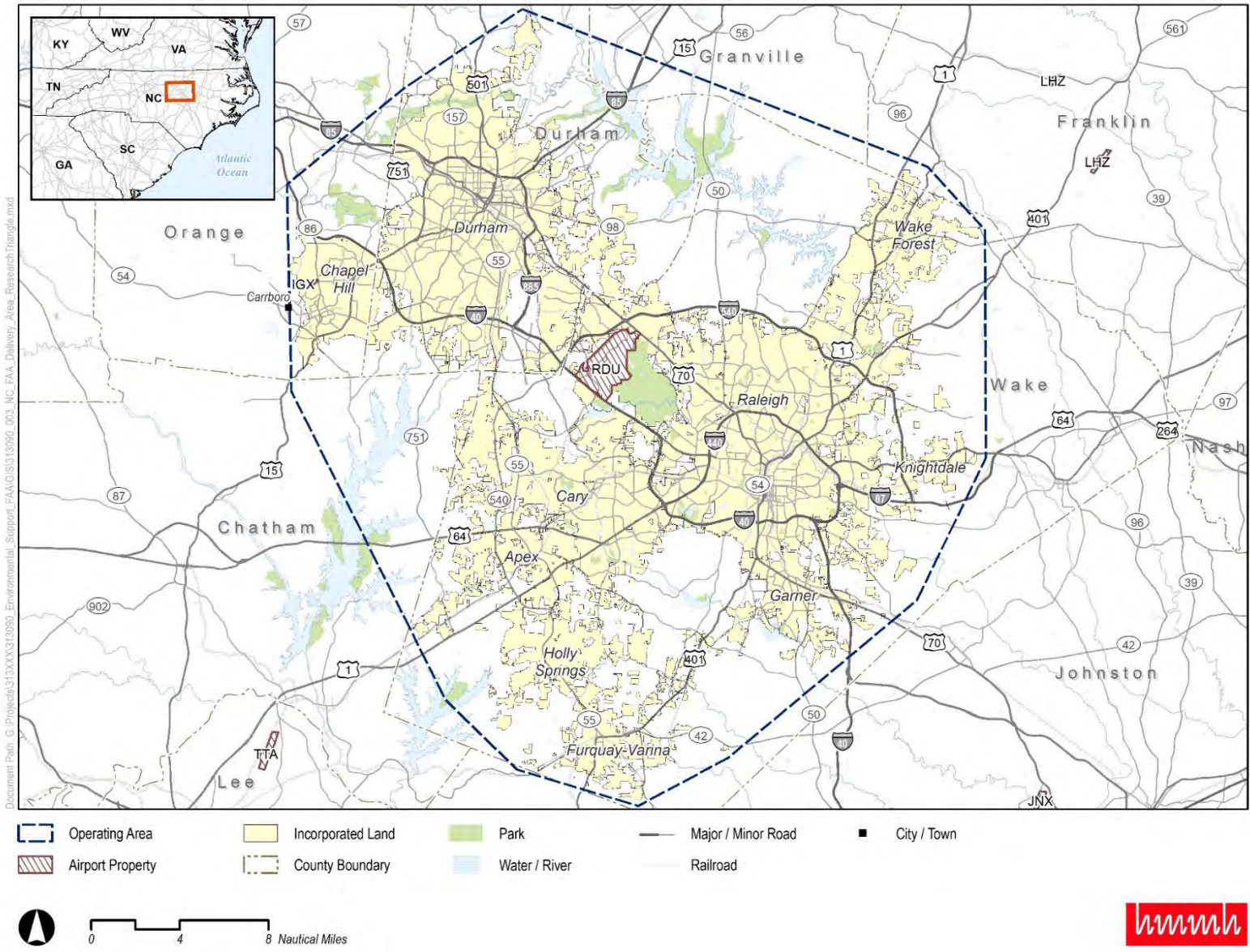


Figure 6. Research Triangle Operating Area

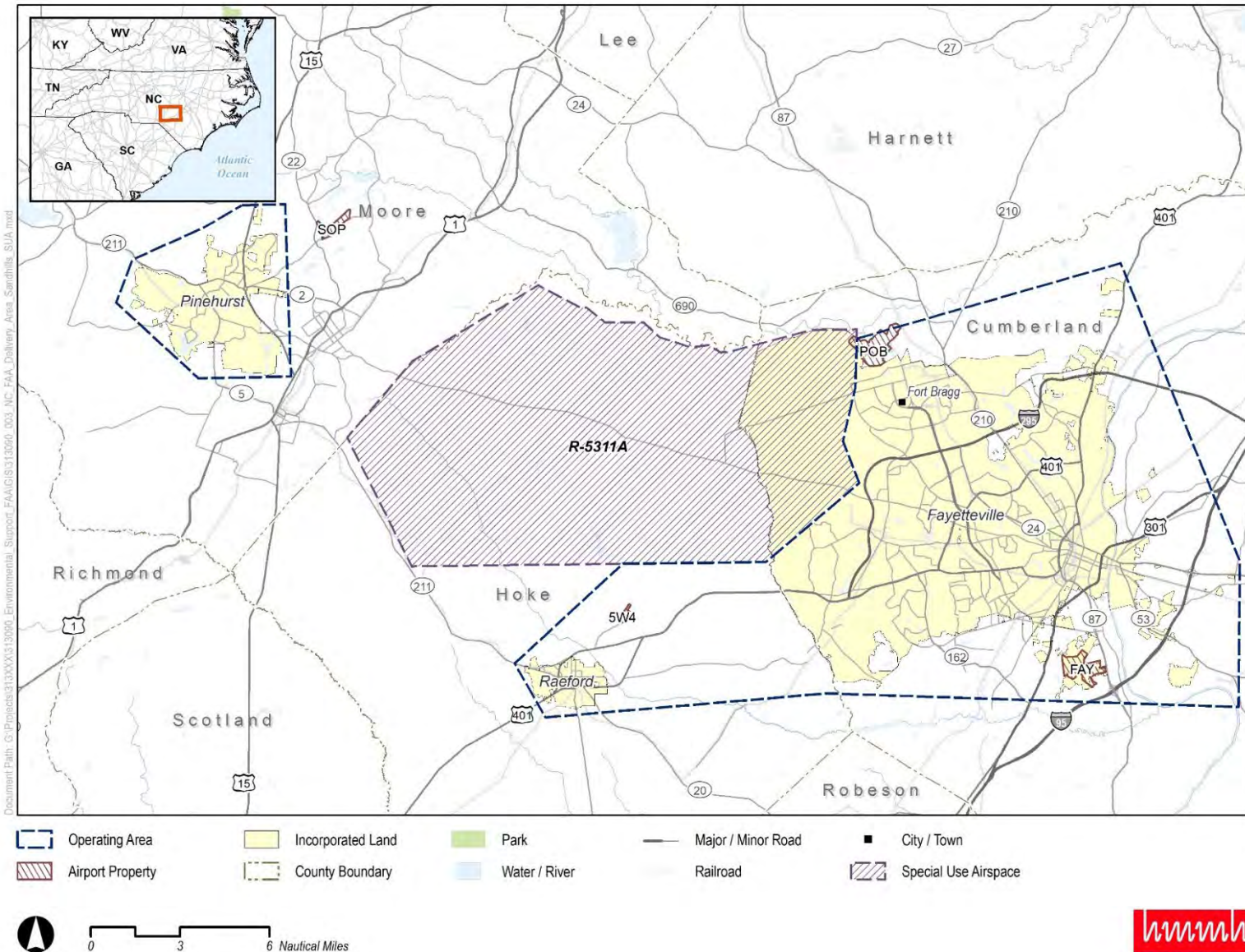
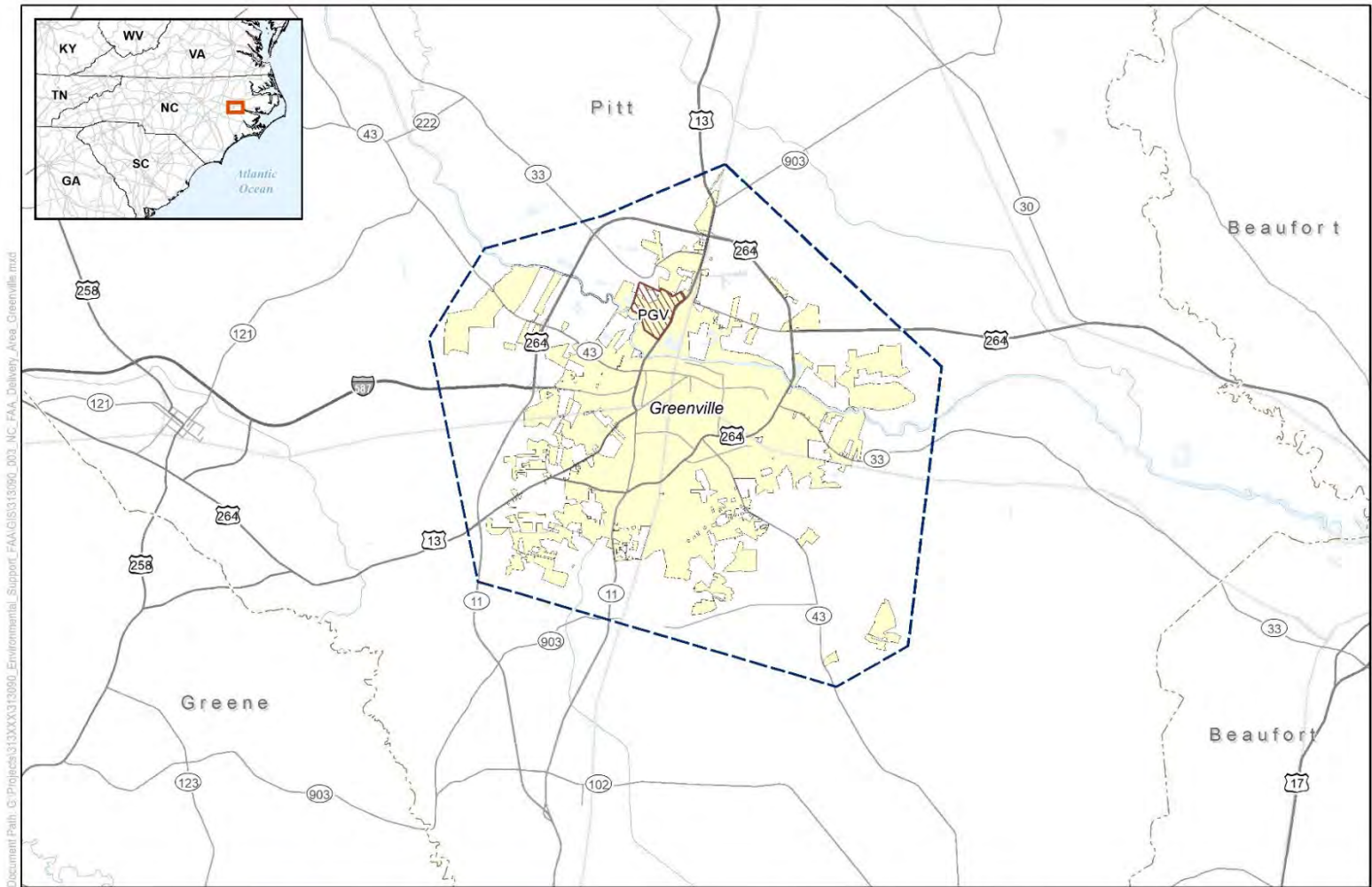


Figure 7. Sandhills Operating Area



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- Operating Area
- Incorporated Land
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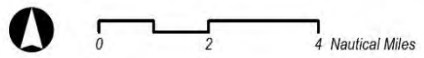


Figure 8. Greenville Operating Area

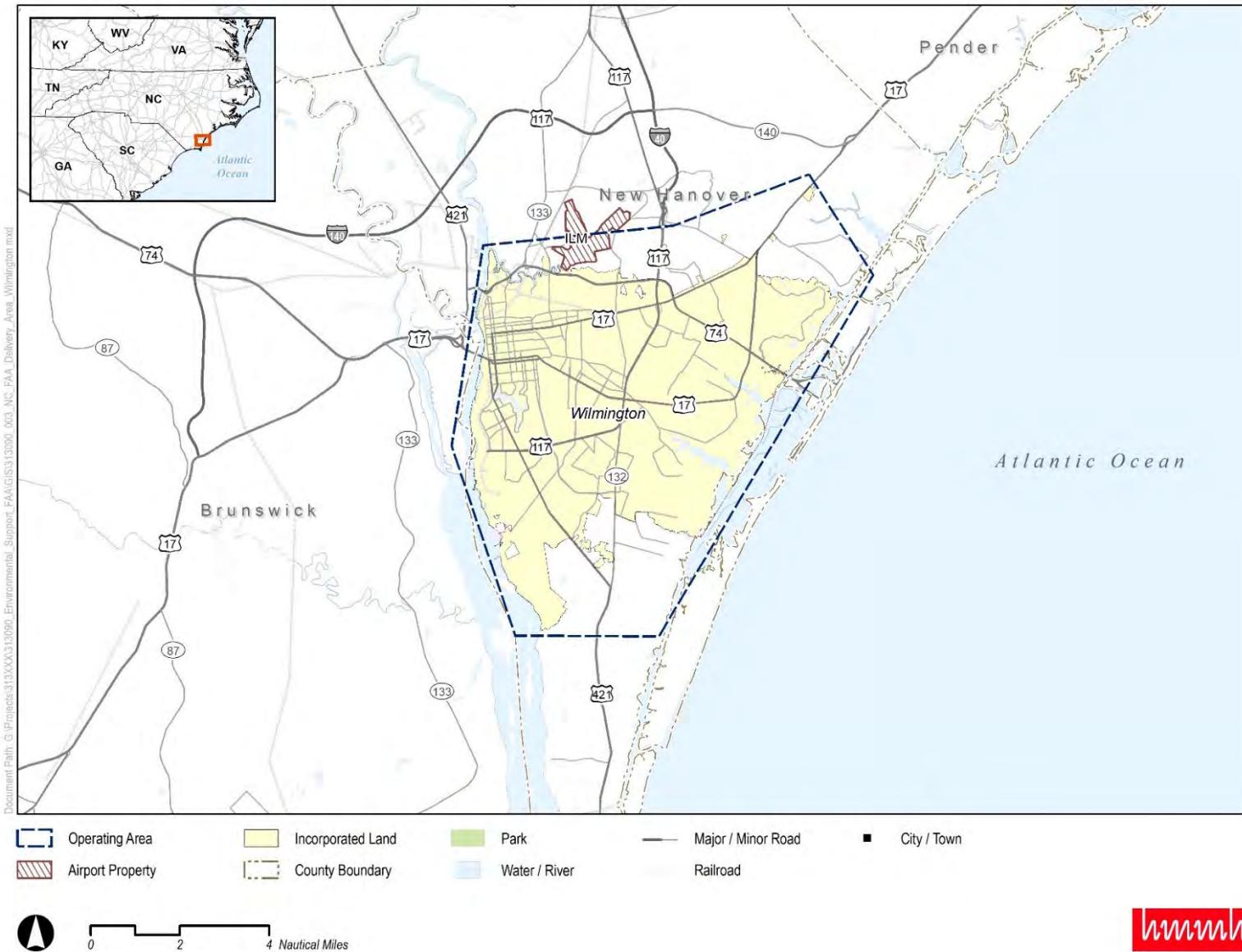


Figure 9. Wilmington Operating Area



U.S. Department
of Transportation
**Federal Aviation
Administration**

Aviation Safety

800 Independence Ave., SW.
Washington, DC 20591

Via Email

Aaron LaRocca
Superintendent
Guilford Courthouse National Military Park
National Park Service
Email: aaron_larocca@nps.gov

Dear Mr. LaRocca:

The purpose of this letter is to inform you of a proposal under consideration by the Federal Aviation Administration (FAA) and solicit your feedback. In accordance with the National Environmental Policy Act, the FAA is preparing a programmatic environmental assessment (EA) to assess the potential environmental impacts of commercial Unmanned Aircraft Systems operators delivering goods to customers (referred to as package delivery) using unmanned aircraft (also referred to as drones) in accordance with 14 Code of Federal Regulations Part 135 in the state of North Carolina. The North Carolina Department of Transportation (NCDOT) is the proponent of the project. NCDOT has identified the City of Greensboro as a potential location where drone package delivery flights might occur in the future. For your reference, a project description is enclosed with this letter.

When preparing EAs, the FAA considers 14 impact categories, one of which is the Department of Transportation Act, Section 4(f). The full list of impact categories is presented in FAA Order 1050.1F, Paragraph 4-1.¹ As we develop the draft EA, we wish to solicit your views regarding potential environmental impacts on the Guilford Courthouse National Military Park (NMP), which is a property protected by Section 4(f), as well as potential best management practices or mitigation measures to avoid or minimize any potential impacts.

The FAA is aware of the National Park Service's policy regarding drone use at national parks, including the Guilford Courthouse NMP. According to the National Park Service, launching, landing, or operating an unmanned aircraft from or on lands and waters administered by the National Park Service within the boundaries of the Guilford Courthouse NMP is prohibited.² The FAA expects drone package delivery operators to comply with this policy. However, there could be instances of drones flying over the NMP periodically as the drone is flying to and from a hub as part of package delivery operations. Typical cruise altitude as the drone flies to and from a hub is 150–375 feet above ground level and typical cruise speed ranges from 30–60 knots (35–75 miles per hour).

¹ See:

https://www.faa.gov/about/office_org/headquarters_offices/apl/enviro_policy_guidance/policy/faq_nepa_order

² <https://www.nps.gov/guco/learn/management/superintendent-s-compendium.htm>

Your timely response over the next 30 days will greatly assist us in incorporating your comments into our environmental review of the operation. Please contact Nicholas Baker via email at 9-faa-drone-environmental@faa.gov within 30 days of the receipt of this letter with any feedback. You will also have another opportunity to provide comments when the FAA publishes a draft EA for public review.

Sincerely,

Jay Kinser
Manager, Strategic Programs Branch
UAS Integration Office

Enclosure: Attachment 1 – Project Description

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To support the development of a programmatic EA, NCDOT developed a forecast for future Part 135 UAS package delivery operations in North Carolina and shared it with the FAA. The FAA used the forecast to identify operating areas where UAS package delivery operations are likely to occur between 2024 and 2030 and to define the levels of UAS activities that may be expected based on existing and future market analyses.

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Source: NCDOT 2024

Typical Flight Profile

Typical Flight Duration: 10–40 minutes round-trip

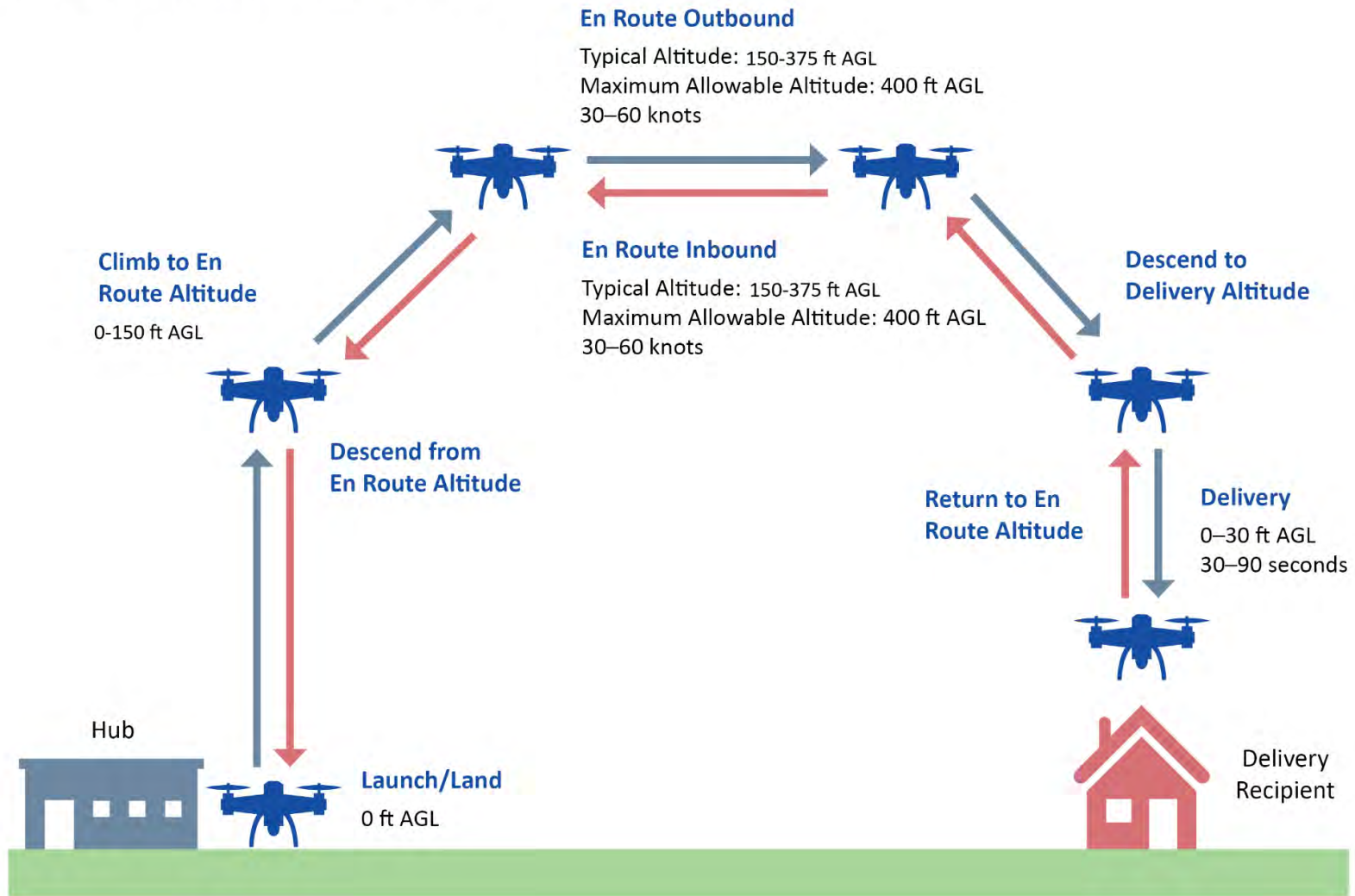


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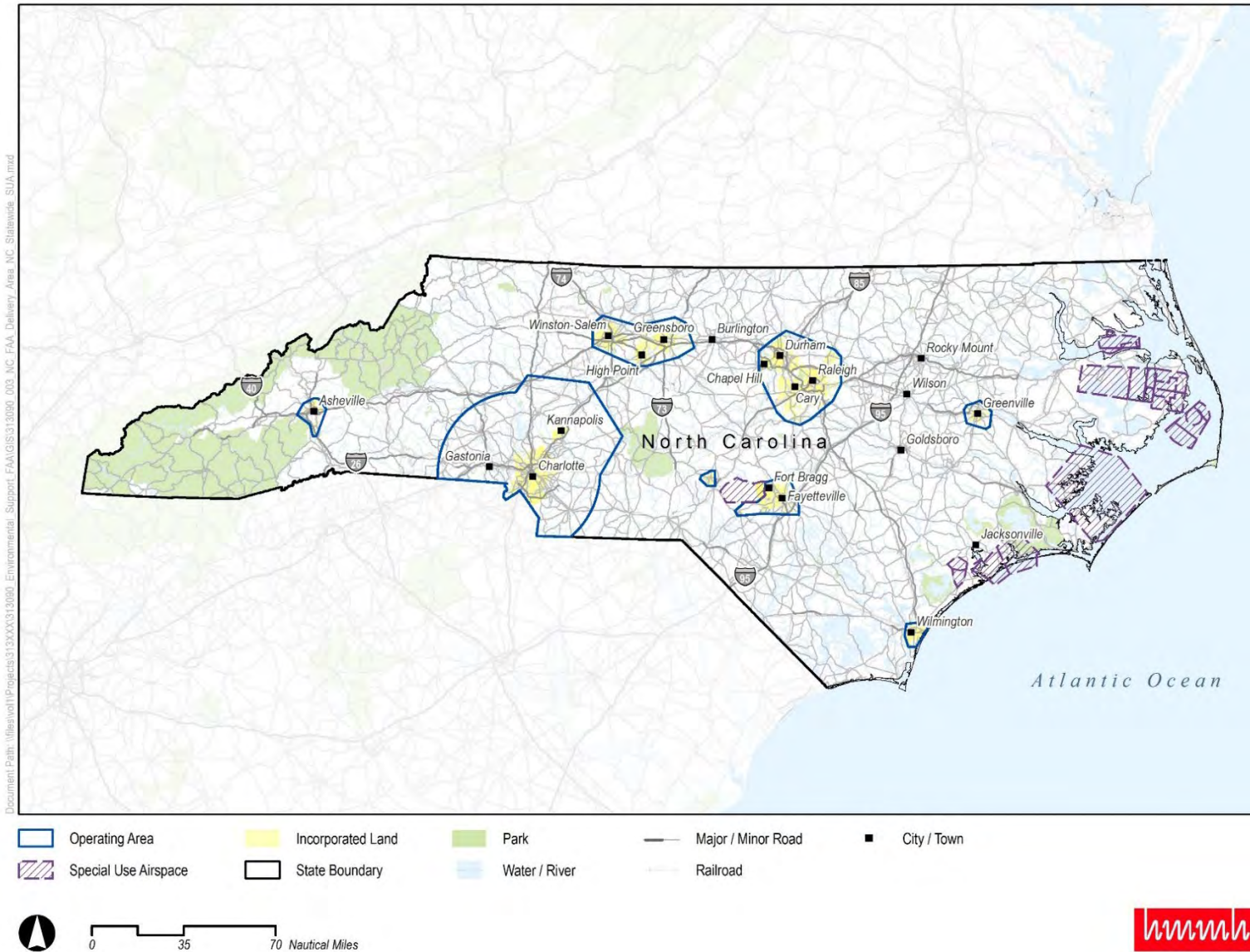


Figure 2. Operating Areas – Statewide



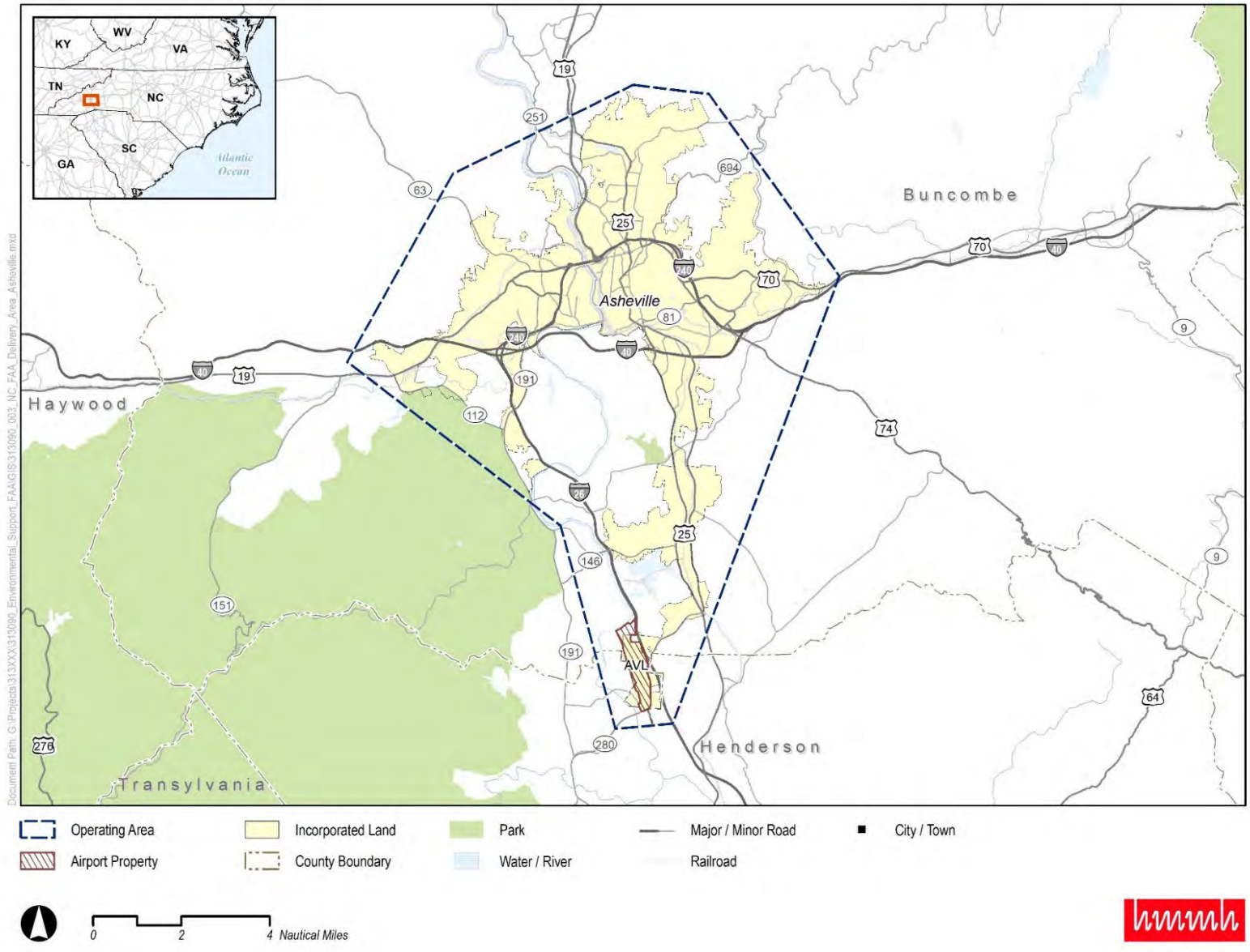
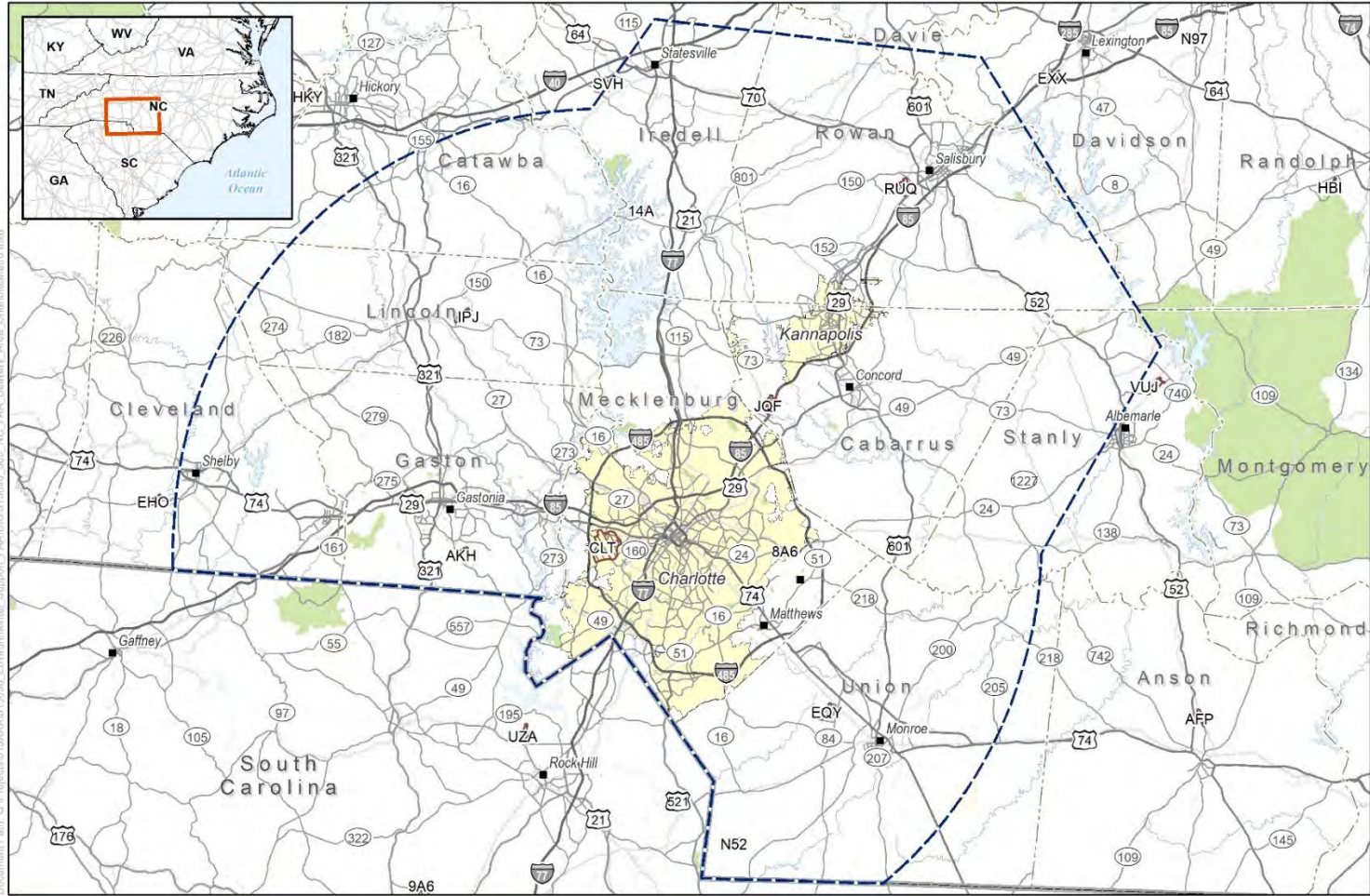


Figure 3. Asheville Operating Area



Document Path: G:\Projects\13XXXX\130303_Environmental_Support\244\GIS\201608_005_NC_044_Duplicate_Areas_Chronicle\main.mxd

- Operating Area
- Incorporated Land
- Park
- Major / Minor Road
- City / Town
- Airport Property
- County Boundary
- Water / River
- Railroad
- State Boundary

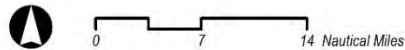
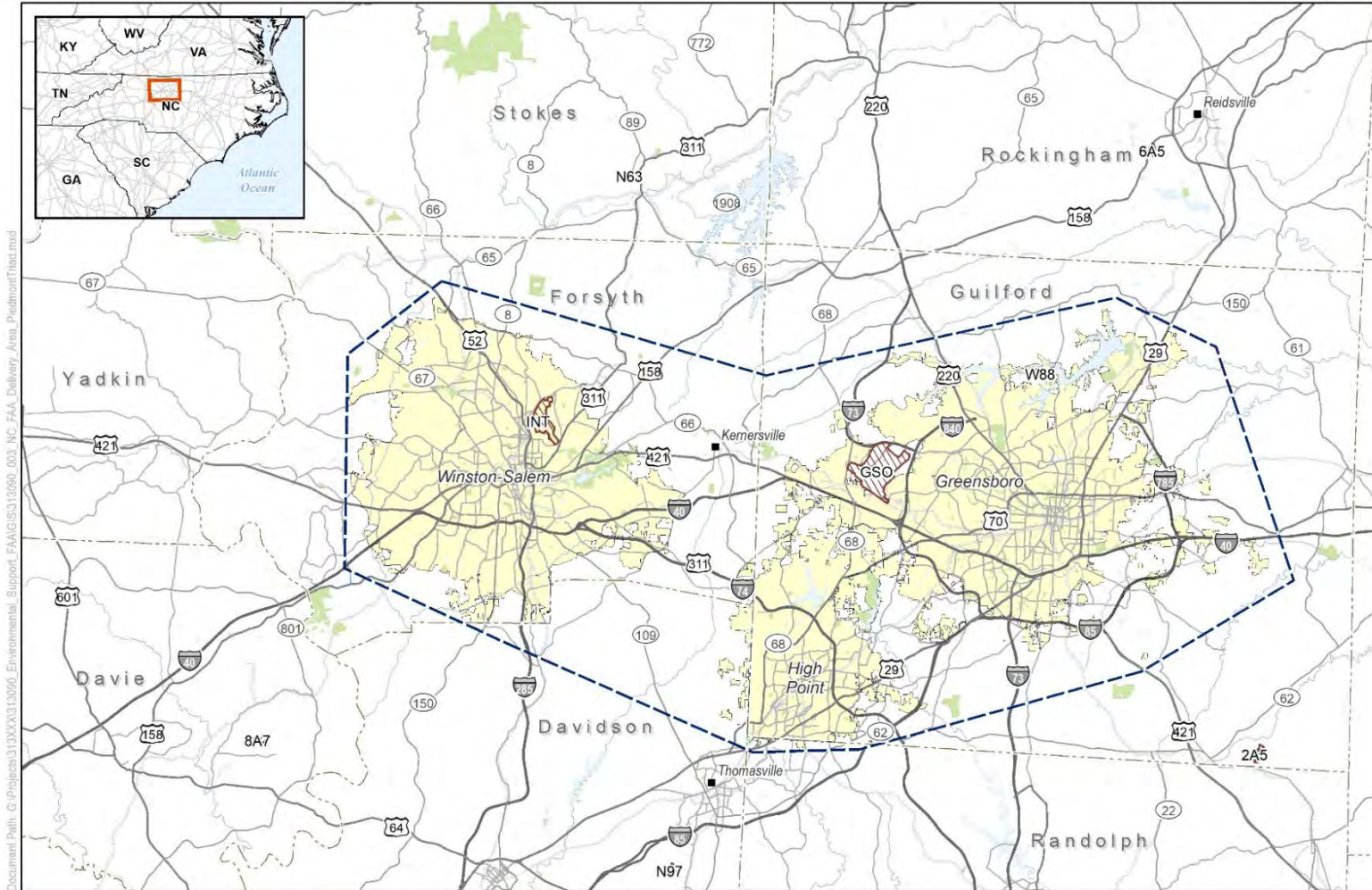


Figure 4. Charlotte Metro Operating Area



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- | | | | | |
|------------------|-------------------|---------------|--------------------|-------------|
| Operating Area | Incorporated Land | Park | Major / Minor Road | City / Town |
| Airport Property | County Boundary | Water / River | Railroad | |

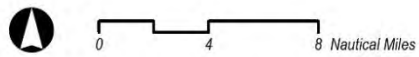


Figure 5. Piedmont Triad Operating Area

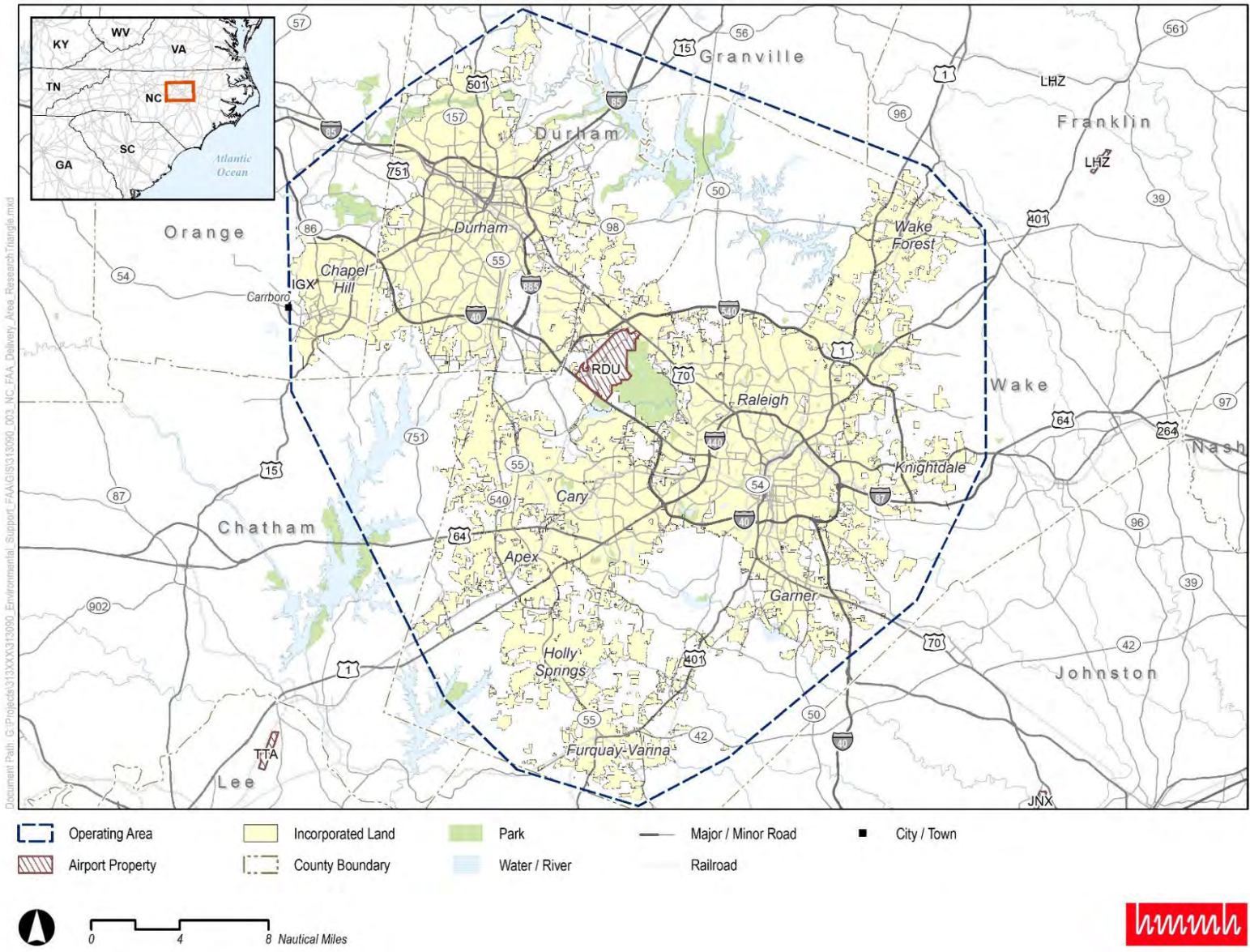


Figure 6. Research Triangle Operating Area



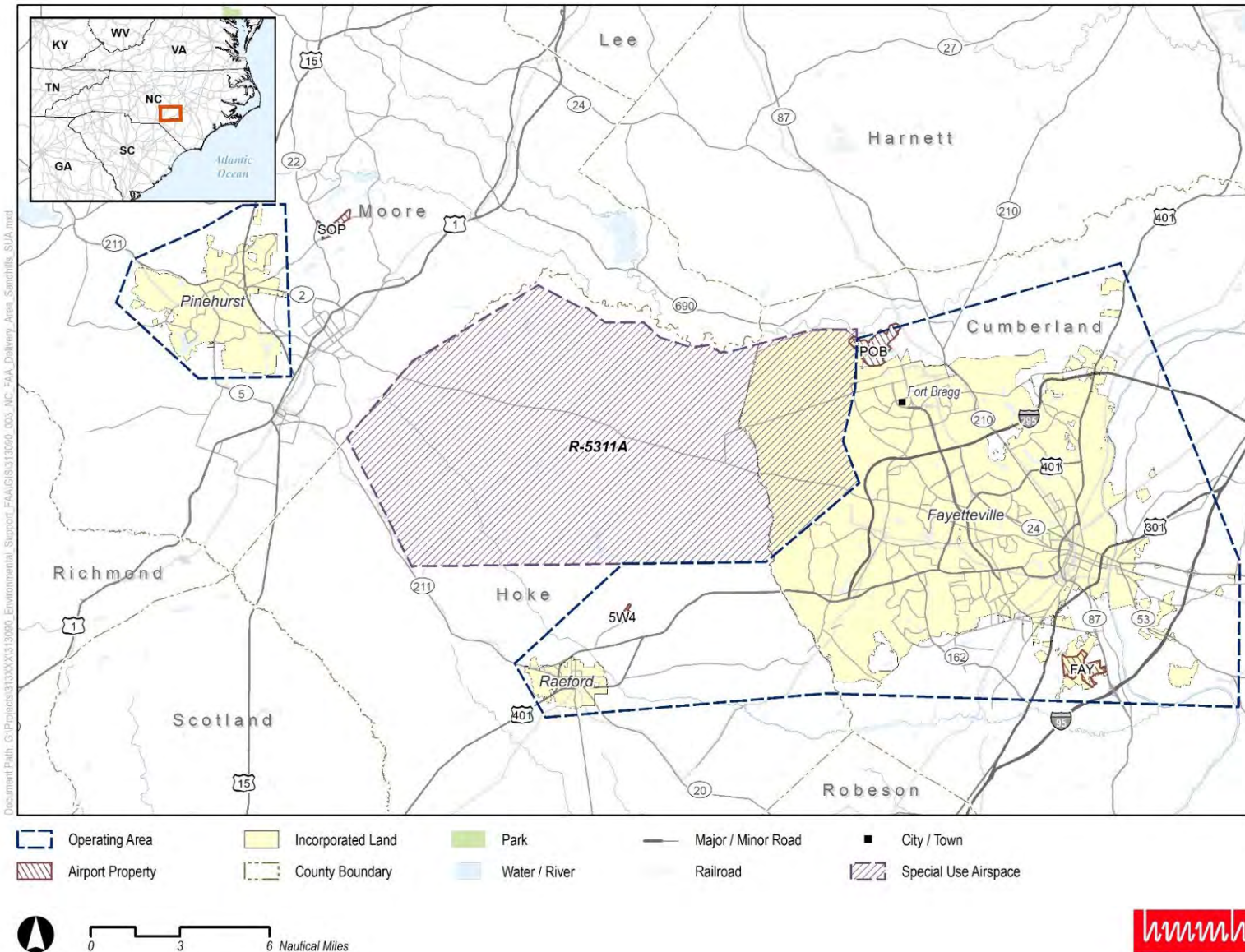
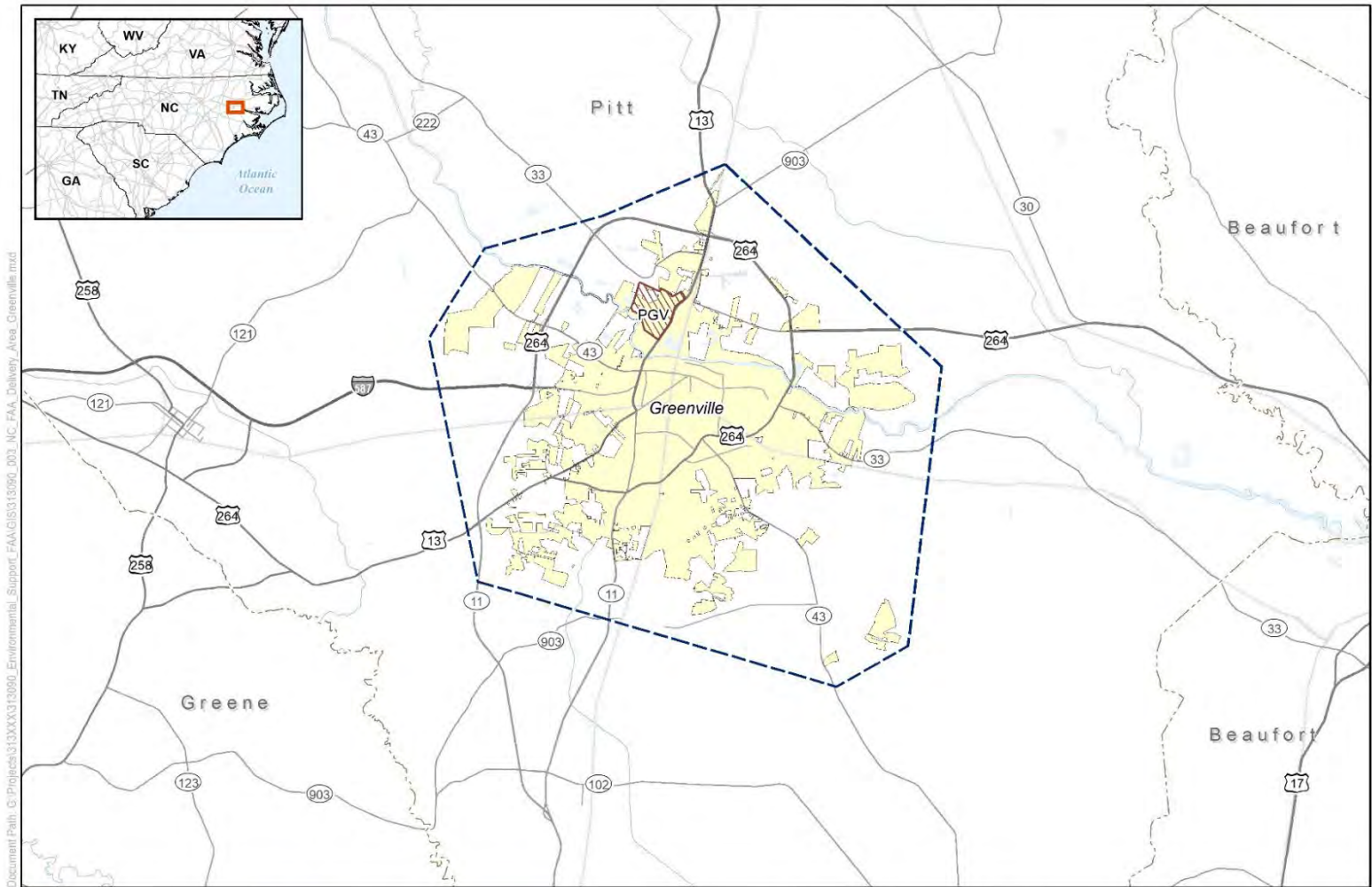


Figure 7. Sandhills Operating Area



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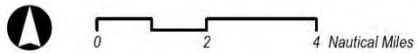


Figure 8. Greenville Operating Area

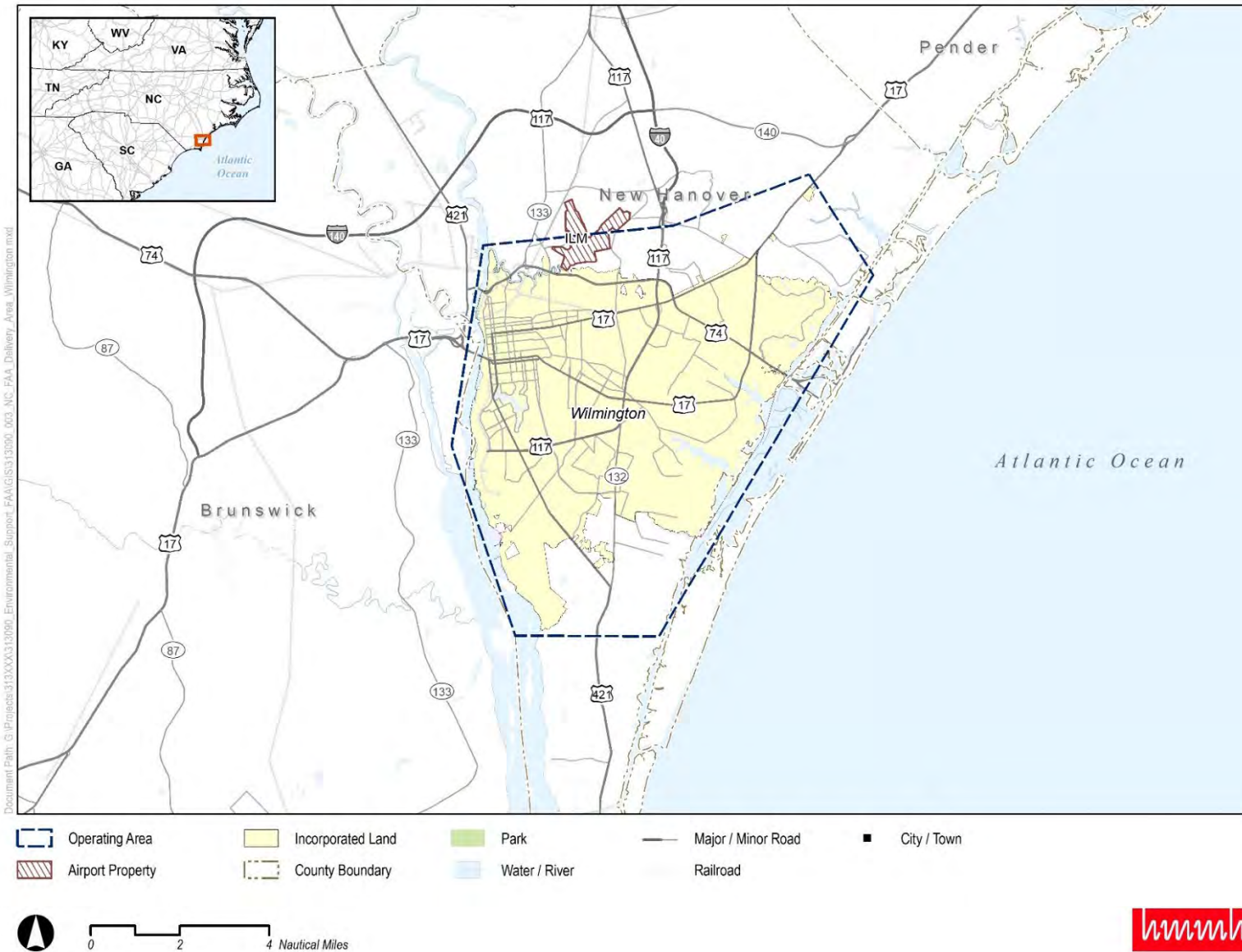


Figure 9. Wilmington Operating Area



United States Department of the Interior



NATIONAL PARK SERVICE

Atlanta Federal Center
1924 Building
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IN REPLY REFER TO:

1.A.2 (SERO-PC)

Jay Kinser
Manager, Strategic Programs Branch
UAS Integration Office Federal Aviation Administration
US Department of Transportation
800 Independent Avenue, SW
Washington, DC 20591

Dear Mr. Kinser:

The National Park Service (NPS) received a letter from the Federal Aviation Administration (FAA) on January 25, 2024, describing a proposal by the North Carolina Department of Transportation (NCDOT) for using commercial Unmanned Aircraft Systems (UAS) operators delivering goods to customers (referred to as package delivery) using unmanned aircraft (also referred to as drones). The FAA is preparing a programmatic environmental assessment (EA) to assess the potential environmental impacts of this proposal in accordance with 14 Code of Federal Regulations Part 135 in the state of North Carolina and is seeking NPS feedback regarding the potential environmental impacts of the proposal on NPS units which are properties protected by 49 U.S.C. § 303 (commonly known as Section 4(f)). Additionally, FAA is seeking input on best management practices or mitigation measures to avoid or minimize any potential impacts to NPS units.

As noted in your letter and based on our review, the proposal has the potential to affect the Blue Ridge Parkway near Asheville, NC, and Guilford Courthouse National Military Park in Greensboro, NC. It is the mission of the NPS to preserve unimpaired the natural and cultural resources and values of the national park system for the enjoyment, education, and inspiration of this and future generations. The NPS cooperates with partners to extend the benefits of natural and cultural resource conservation and outdoor recreation. The variety and diversity of each NPS unit throughout the country require a strong commitment to resource stewardship and management to ensure both the protection and enjoyment of these resources for future generations. In addition, Guilford Courthouse is designated as a National Historic Landmark (NHL), and the entirety of the Blue Ridge Parkway has been nominated as an NHL. With these responsibilities in mind, the NPS appreciates the opportunity to share comments on this proposal as FAA considers potential impacts of UAS in the use of personal delivery missions on the natural and cultural resources and visitor enjoyment of Blue Ridge Parkway and Guilford Courthouse National Military Park. Please note that our comments pertain specifically to

Interior Region 2 • South Atlantic–Gulf

Alabama, Florida, Georgia, Kentucky, Louisiana, Mississippi
North Carolina, Puerto Rico, South Carolina, Tennessee, U.S. Virgin Islands

potential impacts to Blue Ridge Parkway and Guilford Courthouse sites, not to UAS operations for personal delivery affecting NPS units more broadly.

General Comments on 4(f) Resources

Overall, the National Park Service recommends that FAA require avoidance of federal park sites as an initial approach. If avoidance is not possible through hub location selection, geofencing, or other means, the NPS supports minimizing impacts to national park sites through coordinated selection of limited, pre-approved routes, aimed at mitigating negative impacts on park resources and visitor experiences.

Blue Ridge Parkway

Established in 1936, the Blue Ridge Parkway traverses the states of Virginia and North Carolina through the central and southern Appalachian Mountains. The continuous 469-mile motor road connects Shenandoah National Park to the north with Great Smoky Mountains National Park to the south. Created as a national rural roadway with limited access, the parkway was designed for pleasant motoring, a form of recreational driving free from commercial traffic or stop signs. The Blue Ridge Parkway travels the crests, ridges, and valleys of five major mountain ranges, encompassing several geographic and vegetative zones ranging in elevation from approximately 600 to more than 6,000 feet above sea level. Visitors experience diverse vistas of scenic Appalachian landscapes ranging from forested ridge tops and mountain slopes to rural rolling farmlands to urban areas. It is known nationally and internationally for its designed landscape as a scenic park. The purpose of the Blue Ridge Parkway is to connect Shenandoah and Great Smoky Mountains National Parks via a scenic parkway, with areas for recreation, through the Appalachian Mountains of Virginia and North Carolina, and to preserve natural and cultural resources while providing opportunities for public enjoyment.

The Parkway's Foundation Document outlines a set of Fundamental Resources and Values (FRVs), which define the most significant resources and values of the National Park site. These resources and values drive all park operations and visitor services. Two of those FRVs, the values of a *Leisurely Driving Experience* and *Designed Landscape and Scenic Integrity* may be impacted with this proposal, by impairing the quality of the driving experience of Parkway visitors and impairing the character of the protected views along the motor road, which presently maintain a high degree of scenic integrity. It is these scenic views that have supported the Parkway's NHL nomination.

Guilford Courthouse National Military Park

Established in 1917, Guilford Courthouse National Military Park was the first revolutionary war site designated by the federal government. The park received national historic landmark status in 2000. Guilford Courthouse National Military Park protects 250 acres of the approximately 1,000 acres of the actual battlefield. Within the park boundary are locations of the American First, Second, and Third lines, the probable site of Guilford Courthouse, and portions of the New Garden Road, the region's main transportation corridor at the time of the battle. The park also protects the Hoskins Farm site, where Cornwallis deployed his troops into battle lines to commence the attack on the American forces. The purpose of Guilford Courthouse National Military Park is to preserve for historical and professional military study as well as the benefit,

education, and inspiration of the public, the battlefield and the accounts of the Battle of Guilford Courthouse during the Southern Campaign of the American Revolution.

Soundscapes

The acoustic environment (or natural soundscape) of national parks is one of the many natural and cultural resources protected under the NPS Organic Act. NPS management policies further describe the responsibilities of the NPS: "...to prevent or minimize all noise that through frequency, magnitude, or duration adversely affects the natural soundscape or other park resources or values" (NPS Management Policies 2006, 4.9) and to "work constructively and cooperatively with those responsible for inappropriate sources of noise in parks" (Director's Order #47: Soundscape Preservation and Noise Management 2000).

In addition, Section 110(f) of the National Historic Preservation Act of 1966 (NHPA) requires that before approval of any federal undertaking which may directly and adversely affect any NHL, the head of the responsible federal agency shall, to the maximum extent possible, undertake such planning and actions as may be necessary to minimize harm to such landmark, As a result, impacts expected to be evaluated Under 36 CFR, 800- [eCFR :: 36 CFR 800.5 -- Assessment of adverse effects](#). (Protection of Historic Properties) would include:

- (v) Introduction of visual, atmospheric or audible elements that diminish the integrity of the property's significant historic features.

Visual Resources

The scenic value and visual resources of NPS lands and waters are critically important to the NPS mission, and similar to the acoustic environment, the NPS is statutorily mandated to protect the visual scene of parks. Blue Ridge Parkway provides a continuous series of panoramic views, the boundaries of the parkway's protected lands rarely apparent, and miles of the adjacent countryside seemingly a part of the protected scene. The designed landscape, including those sweeping views, is a fundamental resource and value of the Blue Ridge Parkway as identified in the Parkway's Foundation document.

Cultural Resources

The NPS protects, preserves and fosters appreciation of the cultural resources in its custody and demonstrates respect for peoples traditionally associated with those resources through appropriate programs of research, planning and stewardship. Blue Ridge Parkway has been nominated as an NHL, and low-flying UAS devices may negatively impact visitor experience and primary resources including individual cultural landscapes as well as values and experiences at scenic overlooks along the Parkway. As described previously, NHPA Section 110(f) requires that before approval of any federal undertaking which may directly and adversely affect any NHL, the head of the responsible federal agency shall, to the maximum extent possible, undertake such planning and actions as may be necessary to minimize harm to such landmark, and shall afford the Advisory Council a reasonable opportunity to comment on the undertaking. As noted previously, Guilford Courthouse is an NHL as well as being on the National Register of Historic Places.

Unmanned Aircraft Systems (UAS)

Policy Memorandum 14-05, released by the NPS director in June 2014, directed each superintendent to use the authority under 36 CFR 1.5 to prohibit the launching, landing, or operation of unmanned aircraft, subject to the certain conditions and exceptions set forth in the memorandum. This is still in force with a very few exceptions. This action applies to the launching, landing, and operation of unmanned aircraft on lands and waters administered by the NPS, other than for park-specific administrative and emergency use. Jurisdiction by the NPS ends at the park boundary. The policy memorandum does not modify any requirement imposed by the FAA on the use or operation of unmanned aircraft in the National Airspace System. The NPS appreciates that FAA confirmed that launching, landing, and operating an unmanned aircraft within the boundaries of the Blue Ridge Parkway and Guilford Courthouse would not occur. The EA should be clear that “landing” includes all forms of package delivery and would be prohibited. For future reference regarding the use of UAS in units of the national park system, please refer to [NPS Reference Manual 60](#).

Detailed Comments Regarding EA Content and Analysis Considerations for 4(f) Resources

The following are issues or concerns regarding resources the NPS would like to have considered and analyzed in the development of the programmatic EA.

- In most EAs, the FAA depends solely on the Day Night Average Sounds Level (DNL) for impact assessment (14 Code of Federal Regulations Part 150), generally focusing only on 65 DNL. However, DNL 65 is not an acceptable metric for national parks since it is based on the level of aircraft noise at which someone in an urban environment around airports would become highly annoyed, which is not compatible with the NPS Organic Act and other authorities for managing national park resources and visitor experience. More detailed noise modeling will enable the NPS to better consider the noise impacts of these projects on NPS lands and waters in a manner that will allow the NPS to make comments, recommendations, and suggest mitigations in line with our NPS Organic Act responsibilities.
 - The NPS has reviewed the FAA’s November 2023 EA for the Proposed Drone Package Delivery Operations in Dallas-Fort Worth, which is of similar design. We were encouraged by the scope of the analysis at multiple decibel levels for the nests (called “hubs” in this EA). In fact, the analysis estimated extent of noise exposure from a nest per number of deliveries at DNL levels 45, 50, 55, 60, and 65 (see Table 6, Appendix D). Since the proposed hours of operation for this EA will be 7:00am-10:00pm, no nighttime penalty will be assessed and the estimated noise extent would equal an $L_{Aeq, 24}$ hours. The NPS requests a similar analysis be conducted for this programmatic EA up to 1,000 deliveries per day, per hub.
 - Moreover, NPS respectfully requests that DNL levels be estimated down to 35 DNL or $L_{Aeq, 24}$ hours. 35 L_{Aeq} is an important metric and indicator of quality for the acoustic environment in national park service units (Betchkal et al., 2023).
 - The en route analysis for Dallas-Fort Worth used a conservative estimate for inbound and return flights, including conducting the analysis at the minimum AGL of 150ft. DNL estimates of noise exposure directly under en route flights

paths were used (see Table 7, Appendix D). The NPS requests this same analysis for the current project. Additionally for en route analysis, NPS requests estimates of L_{\max} or L_{50} at 150ft. The maximum noise level of each event is important for the NPS to understand the highest level of sound pressure for impacts to the visitor use experience.

- Because DNL metrics are not sufficient for analyzing impacts to NPS resources and values, the NPS requests additional supplemental metrics.
 - Given the low decibel level over an extended period of time, estimated percent time audible over NPS lands and waters would be a meaningful metric for UAS use.
 - Time above metrics in specific SPL values would be especially helpful. We specifically request time above 35 dBA and 52 dBA.
- The EA should include more specifics about the exact make and model of UAS that will be used, especially noise spectral information for each aircraft. Specific drones have different acoustic signatures, which, in turn, affect soundscapes, visitors, and wildlife differently. The potential acoustic impacts of each vehicle need to be evaluated separately.
 - Similarly, different types of payloads, particularly the pendulum used for personal delivery, can have different effects as well. Therefore, information regarding the technological specifics of the payload used with each type of UAS would allow agencies and the public to better understand the effects of personal delivery flights.
- The EA should consider impacts to human annoyance at the specific frequency bands and flight patterns of the UAS. Psychoacoustic research on Unmanned Aerial System noise indicates that a small UAS is perceived as more noticeable and annoying than other transportation sources (Schaffer et al 2021; Torija et al 2020), even when overall loudness is lower. Moreover, early research suggests that the annoyance response isn't alleviated by an increase in elevation (Christian and Cabell 2017). This has been attributed to drones' higher levels of sharpness, roughness, and tonality, as well as their different flight patterns and uses (Lotinga et al 2023; Schaffer et al 2021). However, little research has been done on perceptions of drone noise in quiet areas, much less in parks and protected areas, where visitors expect to experience a mostly natural acoustic environment and/or more profound cultural soundscape.
 - The EA should consider analyzing full impacts of noise using psychoacoustic Sound Quality Metrics, which have been suggested as better indicators of the effects of UAS on soundscapes than loudness, as they provide a more comprehensive understanding of people's reactions to drones' distinctive sonic characteristics and use patterns (Lotinga et al 2023).
 - Especially due to the lack of understanding regarding impacts of UAS noise on protected areas such as Blue Ridge Parkway and Guilford Courthouse, a precautionary approach is warranted.
- The EA should consider impacts to wildlife at the specific frequency bands and flight patterns of the UAS. There has been a significant amount of research about the impacts of

noise on wildlife (Shannon et al., 2016). However, many of these impacts are based upon noise from more traditional noise sources, such as aircraft and vehicles – noise which is lower in frequency. For example, birds have been found to change the sound frequency of their calls so that noise does not mask their calls. Yet, this adaptive behavior may not be as effective against higher frequency noise that are produced by UAS. Current research indicates that responses vary by species, with some bird species changing song behavior in the presence of drones (Wilson et al, 2022) and black bears specifically showing physiological stress in the presence of drones (Ditmer et al 2015). Therefore, in addition to the amount of noise, the sound frequency of UAS noise should be specifically considered as it may impact wildlife.

- The acoustic impacts of UAS use on Blue Ridge Parkway and Guilford Courthouse will depend on geographic and temporal specifics. The EA should include more information about each of the following:
 - An explanation of the methods by which the number of deliveries per day were determined for each region, and how these numbers are expected to change by 2030.
 - Locations of hubs or nests, ideally beyond the acoustic environment of NPS units and positioned so that UAS flight paths wouldn't need to cross NPS lands and waters.
 - Clarity regarding locations where package deliveries will be or will not be prohibited.
 - How the pilot or program determines specific altitudes within the stated 150-375 AGL, as well as how the altitudes may vary by vehicle, terrain, and/or weather. Any aircraft flying above NPS lands should be as high as allowable. Minimum elevations should be set over particular locations such as visitor centers, monuments, and scenic viewpoints.
- The EA should include consideration for potential impacts of commercial UAS use on the historic character of all listed properties and districts within the project area.
- The EA should consider noise and visual impacts to cultural and tribal resources and activities, including privacy for ceremonies.
- The EA should have a robust review and analysis of the potential visual impacts to viewsheds at both the Blue Ridge Parkway and Guilford Courthouse.

Additional Considerations

- The EA should include a risk analysis for the potential for an UAS to drop a package or crash in NPS lands or waters.
 - It should also be clear on the responsibilities, mitigation, and compensation due to the NPS if an UAS above NPS lands or water drops a package or crashes.
 - As part of this, the EA should consider responsibilities, mitigation, and compensation should a crashed UAS damage infrastructure or property, injure staff, visitors, or wildlife, or ignite a wildfire.
- The NPS uses UAS and low flight aircraft for research, search and rescue operations, fire management, prescribed burns, and other administrative functions. The EA should

consider potential conflicts in low elevation airspace and include stipulations for commercial UAS operators to avoid interfering with other aircraft and operations over NPS units.

Procedural Clarifications

- UAS technology and applications are likely to change during the lifetime of the proposed action, set to run until 2030. The EA needs to include clarification as to what would trigger a new review, or whether the permit can be amended without review, should the commercial UAS operator want to begin flying a new model UAS, increase the number of daily deliveries, make nighttime deliveries, or otherwise modify the current proposal.
- The EA should state what entity is responsible for monitoring commercial UAS flights over NPS lands and waters and what entity is responsible for enforcing adherence to any permit stipulations.
- The NPS would like to be able to track the number and routes of UAS flights over NPS lands and waters. The EA should specify the process by which this information can be obtained. The NPS requests that operators be required to equip with Automatic Dependent Surveillance-Broadcast (ADS-B) so that UAS flight paths can be passively monitored, and not require an information request from the operator or FAA.
- The NPS recommends that approved hubs and flight lines be depicted on aviation charts.
- The NPS recommends that FAA should note in the EA how UAS will be handled if there are changing conditions at the hub location which may preclude the UAS to return to the hub while the UAS is out for delivery.
- The NPS recommends FAA provide transparency to viewing the flight logs to monitor the level of use and locations.

Alternatives Development

- The NPS suggests the following potential mitigation measures as part of the alternatives development:
 - Consider a pre-programmed route and hub structure that may be designed for maximum avoidance of NPS lands and waters. In particular, Guilford Courthouse is a compact unit that makes up a small percentage of the Greensboro project area; flights over this unit could be prohibited without major disruption or expense. The NPS appreciates that FAA agreed on 2/29/24 that Guilford Courthouse would be avoided from having any flight routes over the park for these reasons.
 - The NPS also requests that flight routes avoid flying over Blue Ridge Parkway to ensure complete avoidance of park resources.
 - If a complete prevention of flying over Blue Ridge Parkway is unfeasible, consider consulting park management to identify specific corridor crossings that avoid noise sensitive habitat, critical infrastructure and areas of concentrated visitor use.
 - If corridor crossings are also impractical, at minimum pre-program specific, sensitive areas within NPS units to avoid during en route flight phases, such as airspace over visitor centers, overlooks, and monuments.

- Ensure that proposed crossings avoid entering viewsheds visible from Parkway overlooks within the proposed area.
- Blue Ridge Parkway can provide spatial data to FAA highlighting sensitive habitats and park critical infrastructure for maximum avoidance.
- To reduce acoustic and visual impacts, ensure that hubs or nests are located far enough away from any unit of the national park system in order to avoid unacceptable impacts.
- We understand that most personal package delivery services provide photographs of the packages at the point of delivery for verification purposes. Notwithstanding it is important that FAA and NCDOT ensure that UAS do not record aerial imagery of landscapes, traditional cultural properties, or infrastructure while flying over NPS lands or waters. Commercial filming that occurs within an NPS unit requires a permit.
- En route flights over NPS lands should be at the maximum allowable height (i.e., 375 AGL and not 150 AGL).

Summary Comments

The NPS has a continuing interest in working with the FAA and project proponents to ensure that impacts from UAS commercial delivery services to resources of concern in the NPS units are adequately addressed. We appreciate the opportunity to review the project description and provide our comments, and we look forward to discussions that emerge in the development of the FAA's programmatic EA. Please include the NPS in future communications regarding this project or if you have any questions about our comments, please contact Sabrina Henry at sabrina_henry@nps.gov or (404) 507-5706.

Sincerely,

Mark A. Foust
Regional Director

cc: Tracy Swartout, Blue Ridge Parkway, National Park Service
Aaron LaRocca, Guilford Courthouse National Military Park National Park Service
Sabrina Henry, Interior Region 2, National Park Service
Karen Trevino, Natural Sounds and Night Skies Division, National Park Service
John Buelher, National Aviation Manager, National Park Service
Bradley Koecheritz, National Unmanned Aircraft Specialist, Department of the Interior

Enclosure

ENCLOSURE

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U.S. Department
of Transportation
**Federal Aviation
Administration**

Aviation Safety

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Via Email

Mark Foust
Regional Director
National Park Service
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1924 Building
100 Alabama Street, SW
Atlanta, GA 30303

Dear Mr. Foust:

Thank you for your March 20, 2024, letter in response to the Federal Aviation Administration's (FAA) letter seeking National Park Service (NPS) feedback on a North Carolina Department of Transportation (NCDOT) proposal that the FAA is evaluating in a programmatic environmental assessment (PEA). The FAA is considering NPS's feedback as we prepare the draft PEA.

The FAA acknowledges NPS's Policy Memorandum 14-05 that directs each superintendent to prohibit drones from taking off from and landing on lands and waters administered by NPS, including the two park sites within the project's study area—Guilford Courthouse National Military Park (NMP) and Blue Ridge Parkway (Parkway). The FAA expects drone operators to comply with NPS's policy. Additionally, as noted in the forthcoming draft EA, the analysis assumes commercial drone package delivery operators would not fly over or within the Guilford Courthouse NMP. Regarding the Parkway, the FAA recognizes the high degree of scenic integrity along the Parkway. If the FAA received an application that involved drones flying over the Parkway, the FAA would coordinate further with NPS to identify specific corridor crossings that avoid noise sensitive habitat, critical infrastructure, and areas of concentrated visitor use.

In the draft PEA and associated noise assessment report, which is similar to the report conducted for the FAA's 2023 EA for drone package delivery in the Dallas-Fort Worth area, the analysis identifies hub setback distances from noise-sensitive land use based on the number of daily operations at a hub to avoid significant noise impacts. The noise assessment includes all drones currently conducting commercial package delivery under 14 Code of Federal Regulations (CFR) Part 135. Please note that NCDOT's proposal includes a maximum of 500 deliveries per day from a hub (not 1,000 deliveries per day per hub indicated in your letter).

In addition to the hub setback distances for noise-sensitive land use, as part of National Historic Preservation Act Section 106 consultation with the State Historic Preservation Officer, the consultation identified siting hubs at least 0.5 mile from sensitive historic properties, including the Guilford Courthouse NMP and Parkway. This distance is further than the setback distances identified in the noise

assessment report to avoid significant noise impacts. This 0.5-mile setback will also help to avoid or minimize visual impacts.

With these avoidance measures in place, the FAA does not expect adverse impacts to the Guilford Courthouse NMP or Parkway and does not see the need to include supplemental noise metrics in the draft PEA. As stated above, if the FAA receives an application involving overflight of the Parkway, the FAA will coordinate further with NPS at such time. If additional environmental review is required for such an application, the FAA may consider supplemental noise metrics.

Regarding your comment stating the EA needs to include clarification as to what would trigger a new review, upon receiving an authorization request, the FAA will evaluate the proposal against the PEA to determine if the proposal and its potential environmental consequences fall within the scope of the PEA. While NCDOT's forecast is an estimated prediction of potential commercial drone package delivery operations in North Carolina through 2030, the actual proposed operations depend on applications received by the FAA. If an applicant's proposal falls outside the scope of the PEA, the FAA will conduct further environmental review, which could include preparing another NEPA document that tiers from the PEA. To assist with this review, the FAA drafted a checklist, which is included in Appendix B of the draft PEA.

Regarding public safety and risk analysis in general, in evaluating the safety of drone proposals, the FAA is responsible for ensuring that operations are designed to minimize risks to other aircraft and people and property on the ground. The safety evaluation includes risk of aircraft failure that could result in fire or other catastrophic accidents on the ground. The risks of the proposed use of the system are evaluated to ensure that a level of safety equivalent to the current state of safety in the National Airspace System is met. Thus, FAA approval of the operations indicates that FAA has determined there should be little to no additional risks or hazards to the public resulting from drone operations.

Regarding your comment asking how a drone will be handled if there are changing conditions at the hub location which may preclude the drone to return to the hub while the drone is out for delivery, the FAA-issued exemptions to Part 135 drone operators contain operating conditions and limitations. One of the conditions and limitations states:

Prior to each operation, the operator must designate safe alternate landing areas that the UA [unmanned aircraft] can reach if it is unable to complete the intended flight, and identify such alternate landing areas to the PIC [pilot in command] operating the aircraft. The alternate landing areas must a) provide for a landing without undue hazard to persons or property on the ground, and avoid structures and roads where overflight is not permitted; and b) be areas with a low likelihood of exposed persons, such as forested areas providing significant sheltering, farmland, or prairies.

Regarding your request that drone operators be required to equip with Automatic Dependent Surveillance-Broadcast (ADS-B) so that drone flight paths can be passively monitored, 14 CFR Part 91 does not permit drones to transmit ADS-B due to the possible overload of the system. However, all drones that are required to be registered must have remote identification (Remote ID) and be

transmitting their location.¹ NPS may monitor a drone's Remote ID, but most Remote ID systems transmit short distances (approximately 1–3 miles).

For more information regarding operational requirements, please refer to the conditions and limitations contained in exemptions issued to Part 135 certificate holders. For example, see:

<https://www.regulations.gov/document/FAA-2018-0835-0068>. Some of these requirements, which are designed to avoid or minimize risk to public safety, also act as environmental avoidance or minimization measures. The draft PEA references certain conditions and limitations in the appropriate environmental impact category.

The FAA appreciates NPS's feedback on the project and looks forward to continued collaboration with NPS as this industry expands. The FAA will include NPS in future communications regarding this project, including the distribution of the draft PEA.

Sincerely,

Derek Hufty
Manger, General Aviation and Commercial Branch
Emerging Technologies Division
Office of Safety Standards, Flight Standards Service

¹ Except drones operated in FAA-Recognized Identification Areas. See: https://www.faa.gov/uas/getting_started/remote_id/fria.

U.S. Forest Service



U.S. Department
of Transportation
**Federal Aviation
Administration**

Aviation Safety

800 Independence Ave., SW.
Washington, DC 20591

Via Email

David Casey
District Ranger
Pisgah Ranger District
U.S. Forest Service
Email: dmcasey@fs.fed.us

Dear Mr. Casey:

The purpose of this letter is to inform you of a proposal under consideration by the Federal Aviation Administration (FAA) and solicit your feedback. In accordance with the National Environmental Policy Act, the FAA is preparing a programmatic environmental assessment (EA) to assess the potential environmental impacts of commercial Unmanned Aircraft Systems operators delivering goods to customers (referred to as package delivery) using unmanned aircraft (also referred to as drones) in accordance with 14 Code of Federal Regulations Part 135 in the state of North Carolina. The North Carolina Department of Transportation (NCDOT) is the proponent of the project. NCDOT has identified the City of Asheville as a potential location where drone package delivery flights might occur in the future. For your reference, a project description is enclosed with this letter.

When preparing EAs, the FAA considers 14 impact categories, one of which is the Department of Transportation Act, Section 4(f). The full list of impact categories is presented in FAA Order 1050.1F, Paragraph 4-1.¹ As we develop the draft EA, we wish to solicit your views regarding potential environmental impacts on the Pisgah National Forest, which is a property protected by Section 4(f), as well as potential best management practices or mitigation measures to avoid or minimize any potential impacts.

As shown in **Figure 3** (attached), there is a small portion of the Pisgah National Forest in the Asheville operating area. While we are not currently evaluating specific applications for drone package delivery in the Asheville operating area, and while we do not expect an applicant to propose to locate a “hub”² within the Pisgah National Forest, there could be instances of drones flying within this small portion of the forest periodically, if a drone was delivering a package to a customer in this area.

Your timely response over the next 30 days will greatly assist us in incorporating your comments into our environmental review of the operation. Please contact Nicholas Baker via email at 9-faa-drone-

¹ See:

https://www.faa.gov/about/office_org/headquarters_offices/apl/envirom_policy_guidance/policy/faa_nepa_order

² Refer to the attached project description for a description of a hub and expected locations for hubs.

environmental@faa.gov within 30 days of the receipt of this letter with any feedback. You will also have another opportunity to provide comments when the FAA publishes a draft EA for public review.

Sincerely,

Jay Kinser
Manager, Strategic Programs Branch
UAS Integration Office

Enclosure: Attachment 1 – Project Description

Attachment 1 – Project Description

Background

In 2012, the U.S. Congress first charged the Federal Aviation Administration (FAA) with integrating Unmanned Aircraft Systems (UAS) into the national airspace system (NAS). The FAA has engaged in a phased, incremental approach to integrating drones into the NAS and continues to work toward full integration of drones into the NAS. From 2017 through 2020, the UAS Integration Pilot Program focused on testing and evaluating the integration of drone operations into the NAS. This work continues under the UAS BEYOND program, which focuses on the remaining challenges of UAS integration, including beyond visual line of sight operations, societal and economic benefits of UAS operations, and community engagement. Participants in these programs are among the first to prove their concepts, including package delivery by drone through air carrier certification in accordance with 14 Code of Federal Regulations (CFR) Part 135. Part 135 certification is currently the only path for drones to carry the property of another for compensation beyond visual line of sight.

In 2019, the FAA began issuing air carrier certificates to UAS operators in accordance with Part 135 so that operators can conduct package delivery flights. Generally, these approvals are associated with issuing a new or amended Part 135 air carrier Operations Specifications³ as the operative approval. The FAA has completed 17 environmental assessments (EAs) in accordance with the National Environmental Policy Act (NEPA), Council on Environmental Quality NEPA Implementing Regulations (40 CFR Parts 1500–1508), and FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*⁴ for individual package delivery proposals. Each EA resulted in a finding of no significant impact.⁵

The North Carolina Department of Transportation (NCDOT) has been a lead partner in the FAA’s drone integration partnership programs since 2017, first as a partner in the Integration Pilot Program and then continuing as a partner in the BEYOND program. In this role, NCDOT is collaborating with partners to test and prove operations that can gain FAA approvals to expand beyond visual line of sight and other complex operations in the state. Within the state of North Carolina, NCDOT has the authority to implement and manage regulations pertaining to state laws as set by the North Carolina State General Assembly concerning drone operations.

To support the development of a programmatic EA, NCDOT developed a forecast for future Part 135 UAS package delivery operations in North Carolina and shared it with the FAA. The FAA used the forecast to identify operating areas where UAS package delivery operations are likely to occur between 2024 and 2030 and to define the levels of UAS activities that may be expected based on existing and future market analyses.

Proposed Action

The proposed action is commercial drone package deliveries from takeoff and landing areas (referred to as “hubs”) based on NCDOT’s maximum forecasted operations for conservative purposes. NCDOT has

³ An Operations Specifications is a document that defines the scope of aircraft operations the FAA has authorized.

⁴ FAA Order 1050.1F serves as the FAA’s policy and procedures for compliance with NEPA and CEQ’s NEPA-implementing regulations. See:

https://www.faa.gov/about/office_org/headquarters_offices/apl/enviro_nepa_guidance/policy/faa_nepa_order

⁵ See: https://www.faa.gov/uas/advanced_operations/nepa_and_drones.

projected Part 135 drone package delivery operations for the state of North Carolina out to year 2030 and provided that projection to the FAA for environmental analysis.

The type, size, and weight of aircraft used to deliver packages could vary, but NCDOT anticipates multi-copter platforms will be the primary type of unmanned aircraft (UA) used to deliver small packages in the foreseeable future. The characteristics of the UAS considered in the EA are displayed in **Table 1**.

Table 1. UAS Characteristics

Characteristic	Criteria
Platform/Vehicle Type	Multi-copters (2 to 8 propellers), fixed wing, and hybrid aircraft (vertical lift with fixed-wing cruise)
Power	Electric motor
Delivery Mechanism Types	Drop off, tethered (wire/cable), customer unloads, ground drop, parachute
Maximum Aircraft Weight	Approximately 87 pounds
Maximum Payload (Package) Weight	Approximately 5 pounds
Maximum Aircraft Takeoff Weight	Approximately 92 pounds
Typical Cruise Altitude	150–375 feet above ground level
Maximum Cruise Altitude	400 feet above ground level
Hours of Operation	7:00 a.m. – 10:00 p.m.
Operation Days	7 days per week, 365 days per year

While UA come in varying sizes with varying flight capabilities, the flight operations can generally be categorized into the following five phases: 1) takeoff and climb, 2) en route outbound, 3) delivery, 4) en route inbound, and 5) descent and landing (see **Figure 1**). In general, package delivery operators partner with established businesses and identify the location for a hub at the business’s parking lot, rooftop, or other area where it is not disruptive to the business and does not present a safety hazard. This allows the drone operator to conduct operations with minimal infrastructure requirements and no ground disturbance activities. Prior to takeoff, packages are manually loaded onto the UA by a ground crew at the hub. The UA then climbs and performs aerial deliveries following a predetermined flight path that is set using software that assigns, deconflicts, and routes each flight. After delivery, the UA returns to its hub.

According to NCDOT’s forecast, in general, Part 135 UAS package delivery operators prefer areas where they can serve the most customers while flying the least distance. Also, operators need enough unrestricted airspace to operate with minimal physical restrictions. Based upon these parameters, as well as existing UAS package delivery operations in North Carolina, NCDOT identified seven regions within North Carolina as likely operating areas for UAS package deliveries in the next seven years. These operating areas include Asheville, Charlotte Metro (including Kannapolis), Piedmont Triad (Winston-Salem, High Point, and Greensboro), Research Triangle (Raleigh, Durham, Chapel Hill, and adjacent communities), Sandhills (Pinehurst, Raeford, and Fayetteville), Greenville, and Wilmington (see **Figures 2–9**).

Table 2 displays NCDOT’s forecasted daily operations for each operating area in 2030. As shown in the table, the geographic distribution of NCDOT’s proposed UAS drone package delivery operations center heavily in the Charlotte Metro and Research Triangle operating areas. Regarding Asheville, NCDOT estimates there could be one hub with up to 478 deliveries per day throughout the operating area.

Table 2. Estimated Daily Deliveries per Operating Area in 2030

Operating Area Name	Approximate Size (square miles)	Estimated Number of Hubs	Estimated Range of Daily Deliveries
Asheville	220	1	164 – 478
Charlotte Metro	3,524	6	1,649 – 4,801
Piedmont Triad	713	5	413 – 1,201
Research Triangle	1,039	6	1,704 – 4,960
Sandhills	209	2	328 – 955
Greenville	137	1	164 – 478
Wilmington	129	1	164 – 478

Source: NCDOT 2024

Typical Flight Profile

Typical Flight Duration: 10–40 minutes round-trip

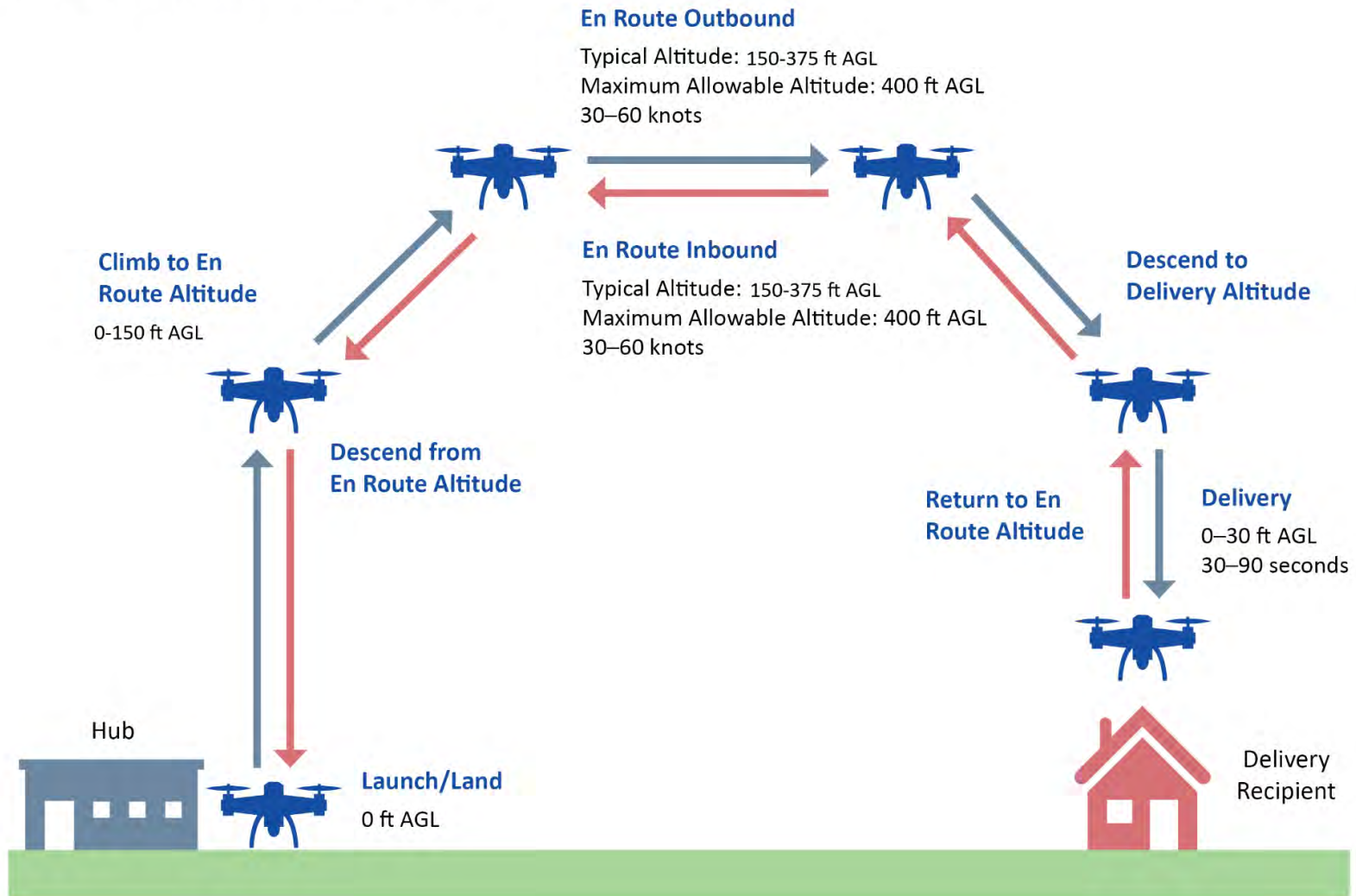


Figure 1. Typical Flight Profile

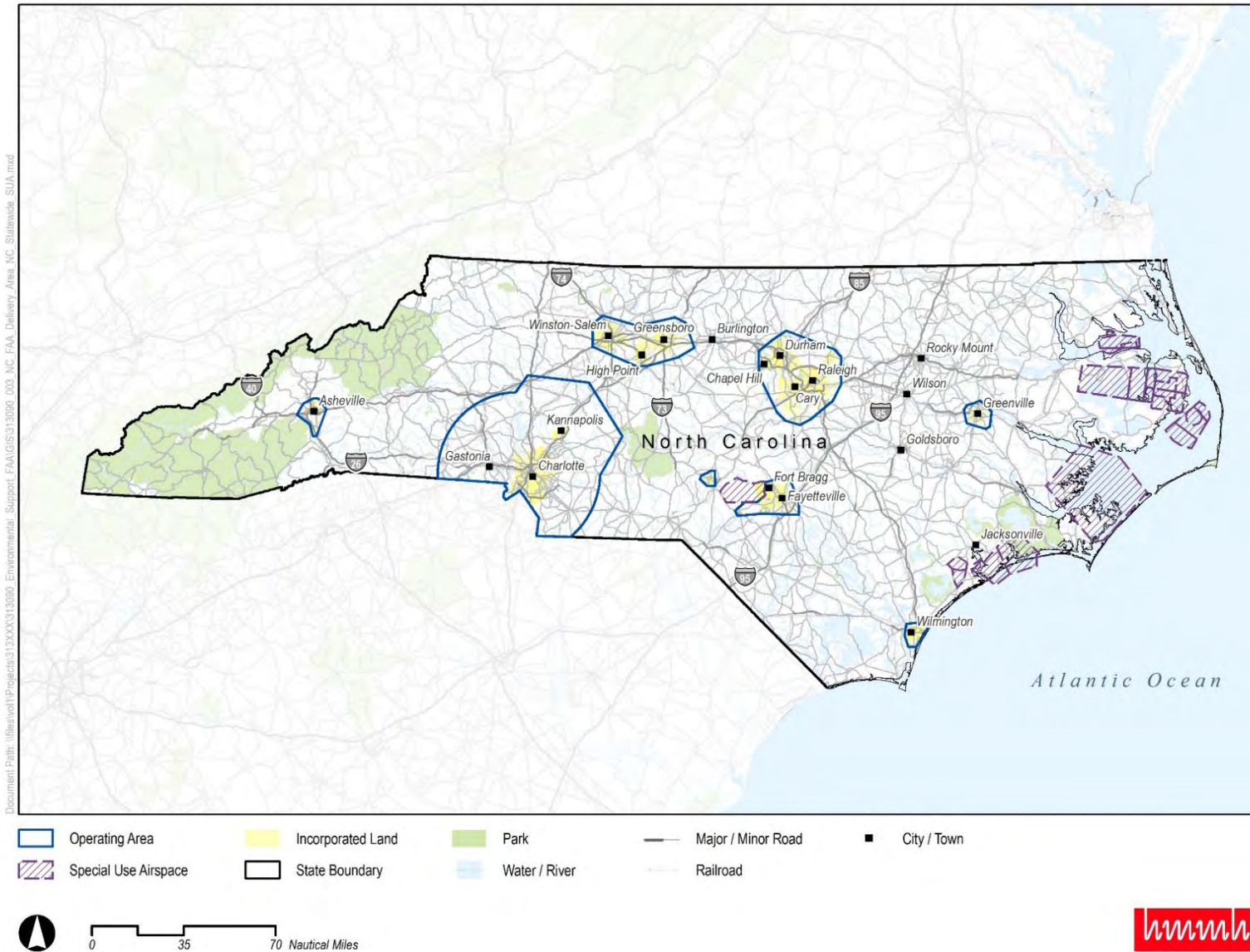


Figure 2. Operating Areas – Statewide

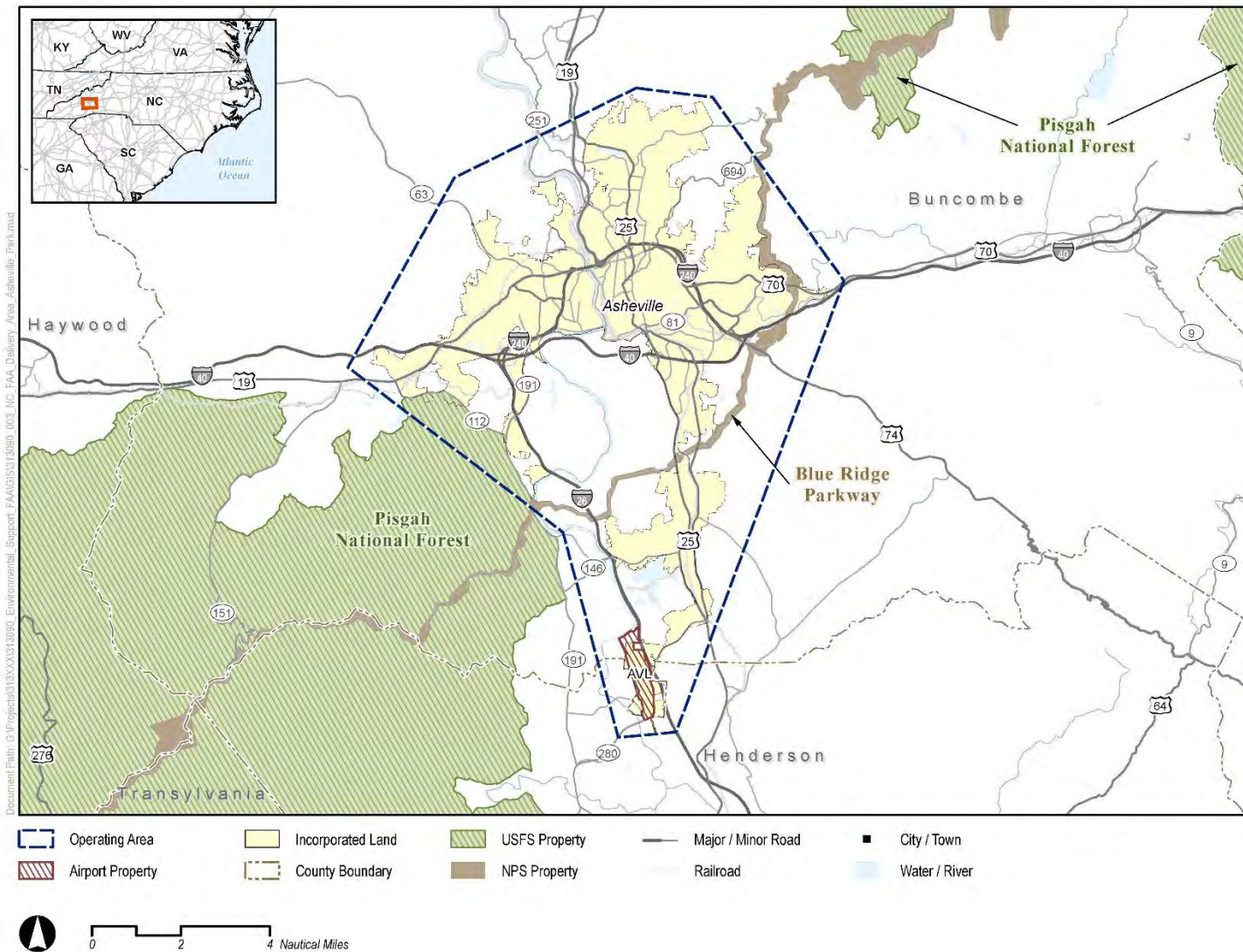
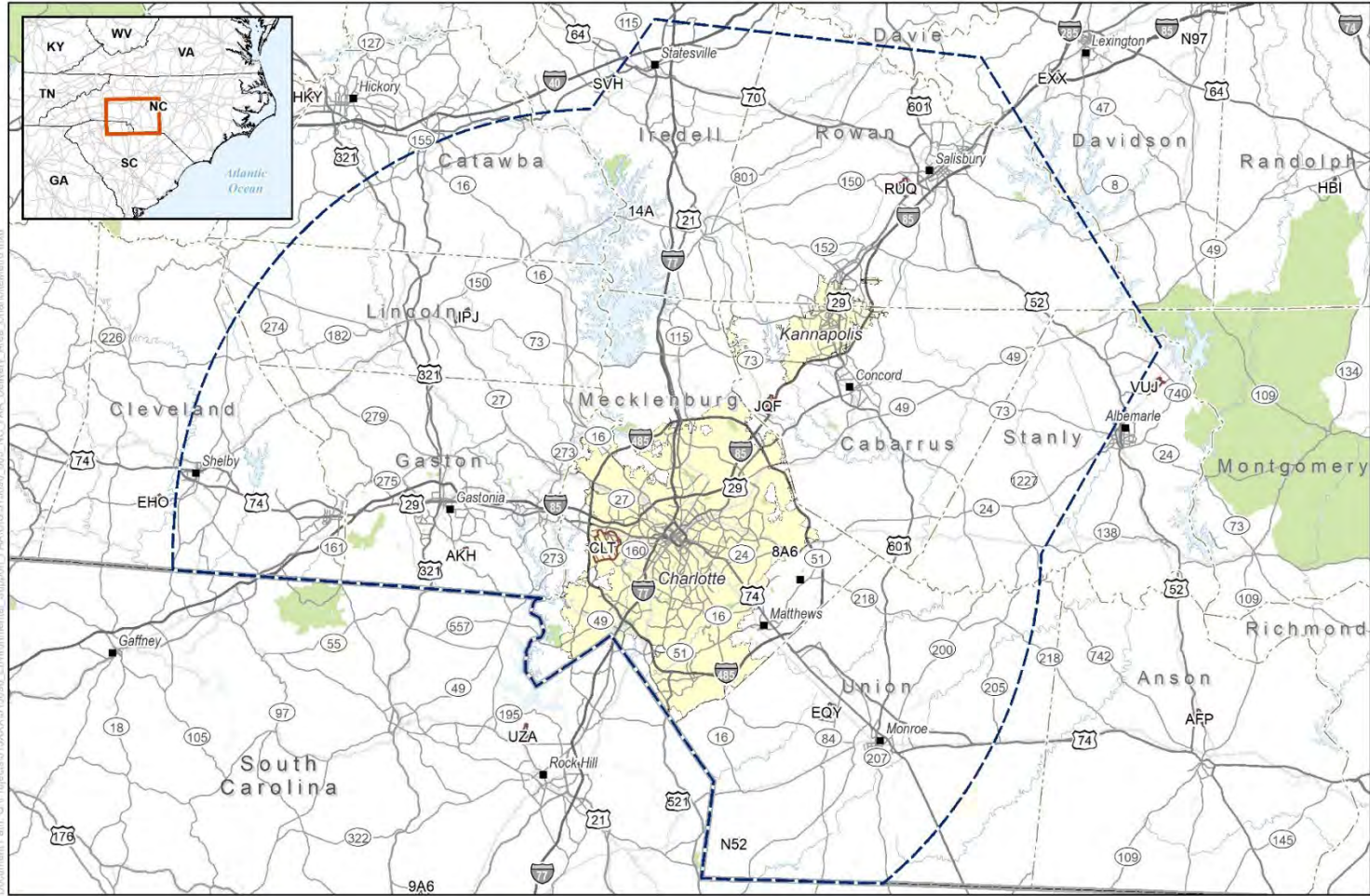


Figure 3. Asheville Operating Area



- Operating Area
- Incorporated Land
- Park
- Major / Minor Road
- City / Town
- Airport Property
- County Boundary
- Water / River
- Railroad
- State Boundary

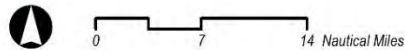


Figure 4. Charlotte Metro Operating Area

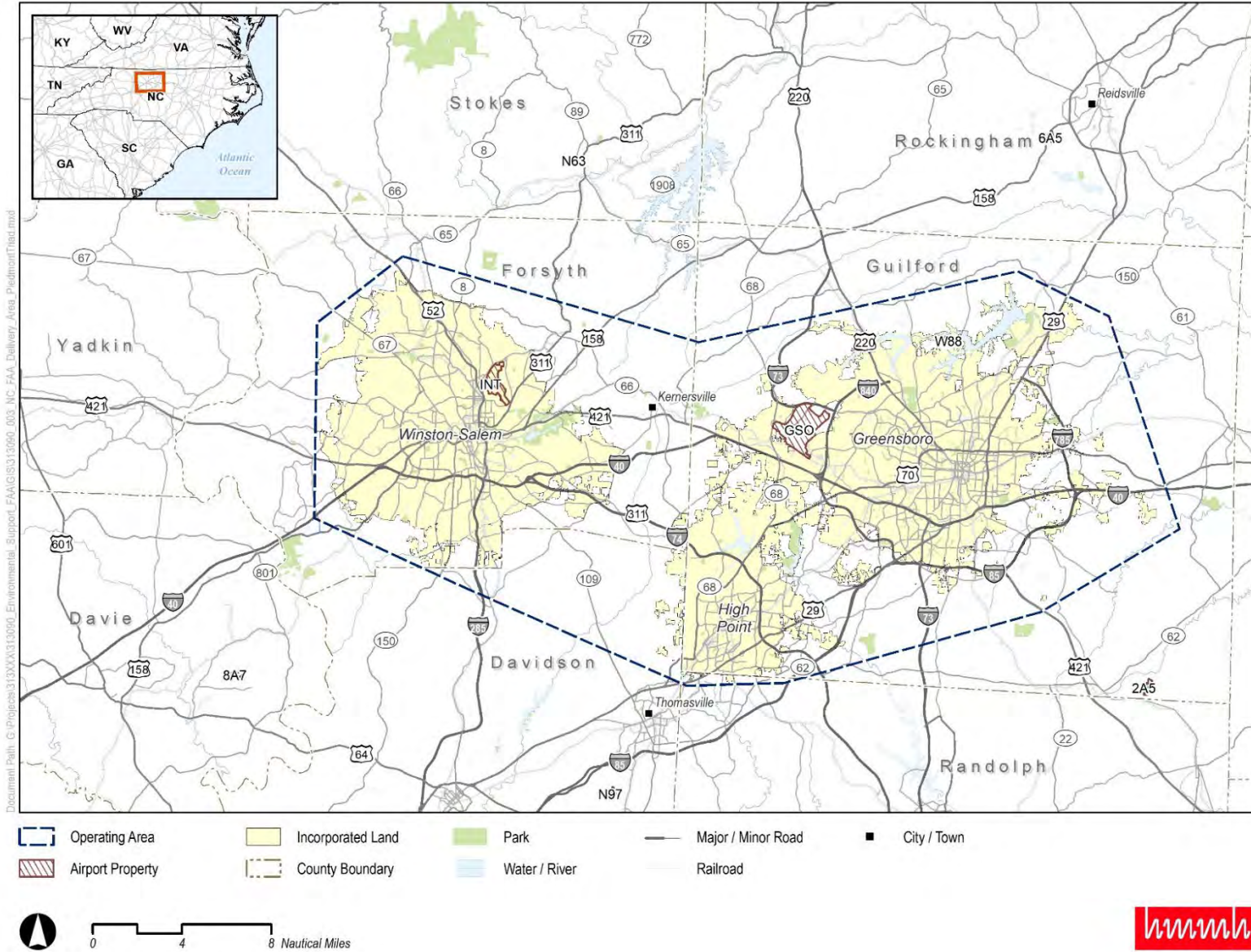


Figure 5. Piedmont Triad Operating Area



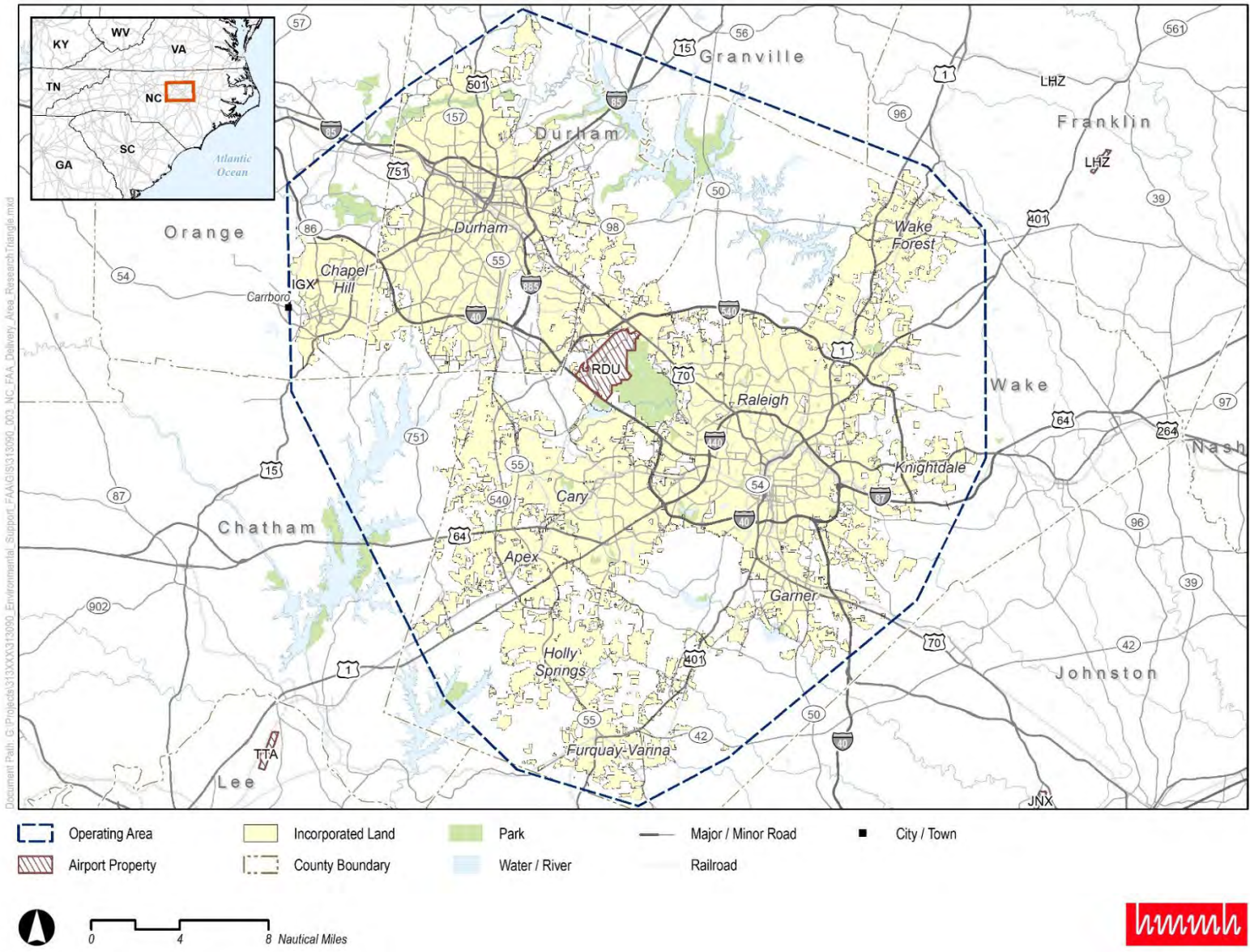


Figure 6. Research Triangle Operating Area

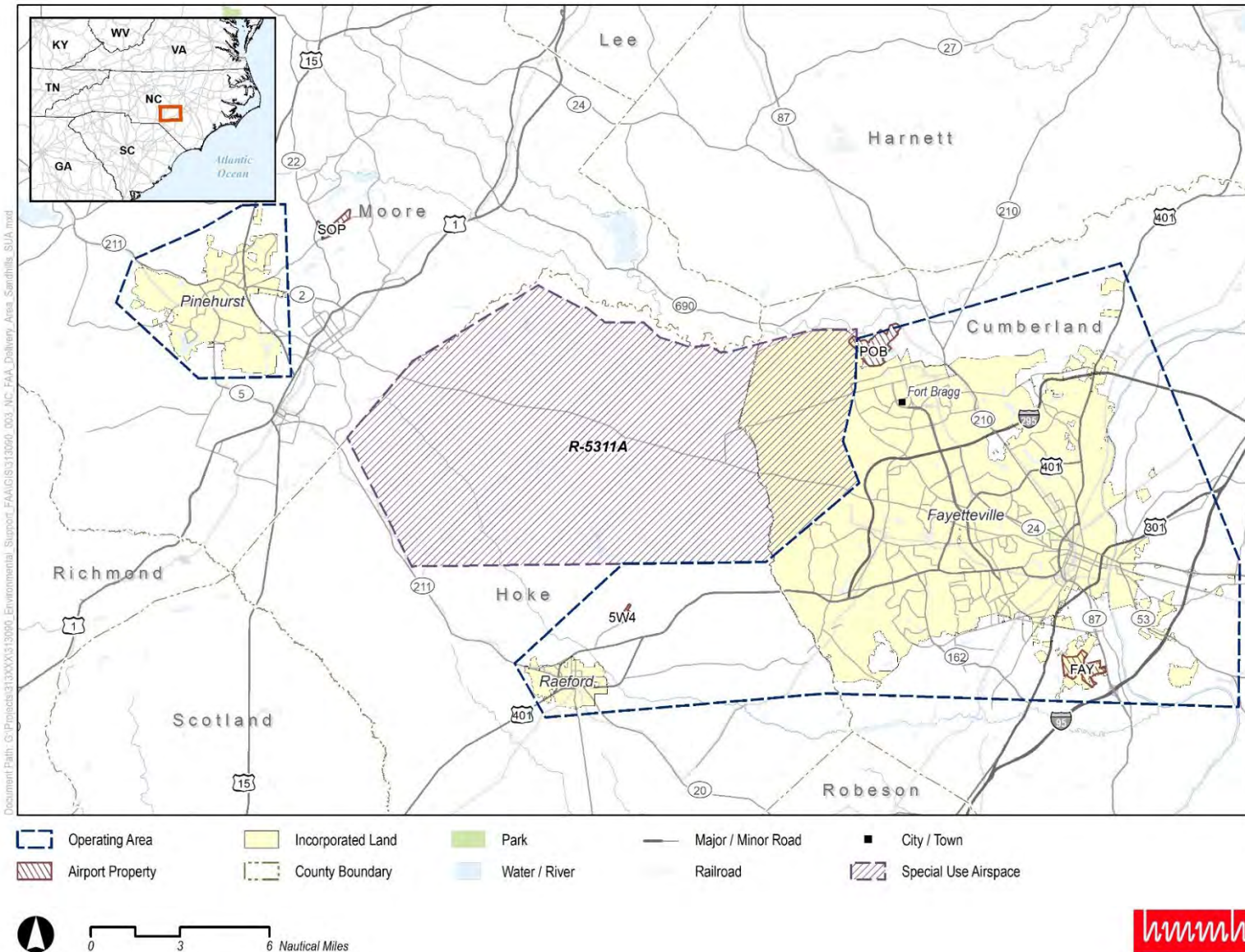
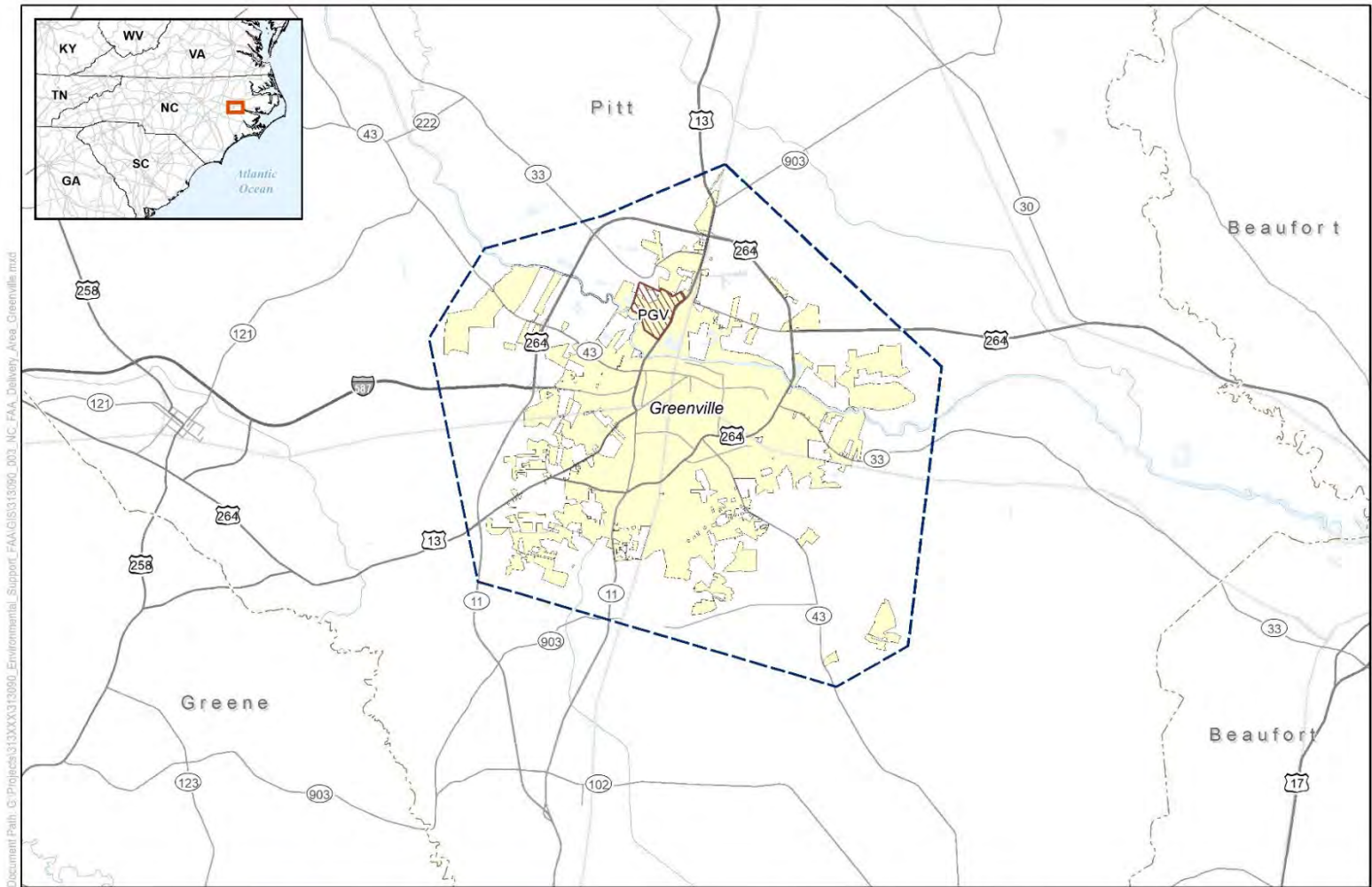


Figure 7. Sandhills Operating Area





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- Operating Area
- Incorporated Land
- Park
- Major / Minor Road
- City / Town
- Airport Property
- County Boundary
- Water / River
- Railroad

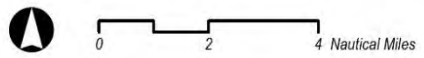


Figure 8. Greenville Operating Area

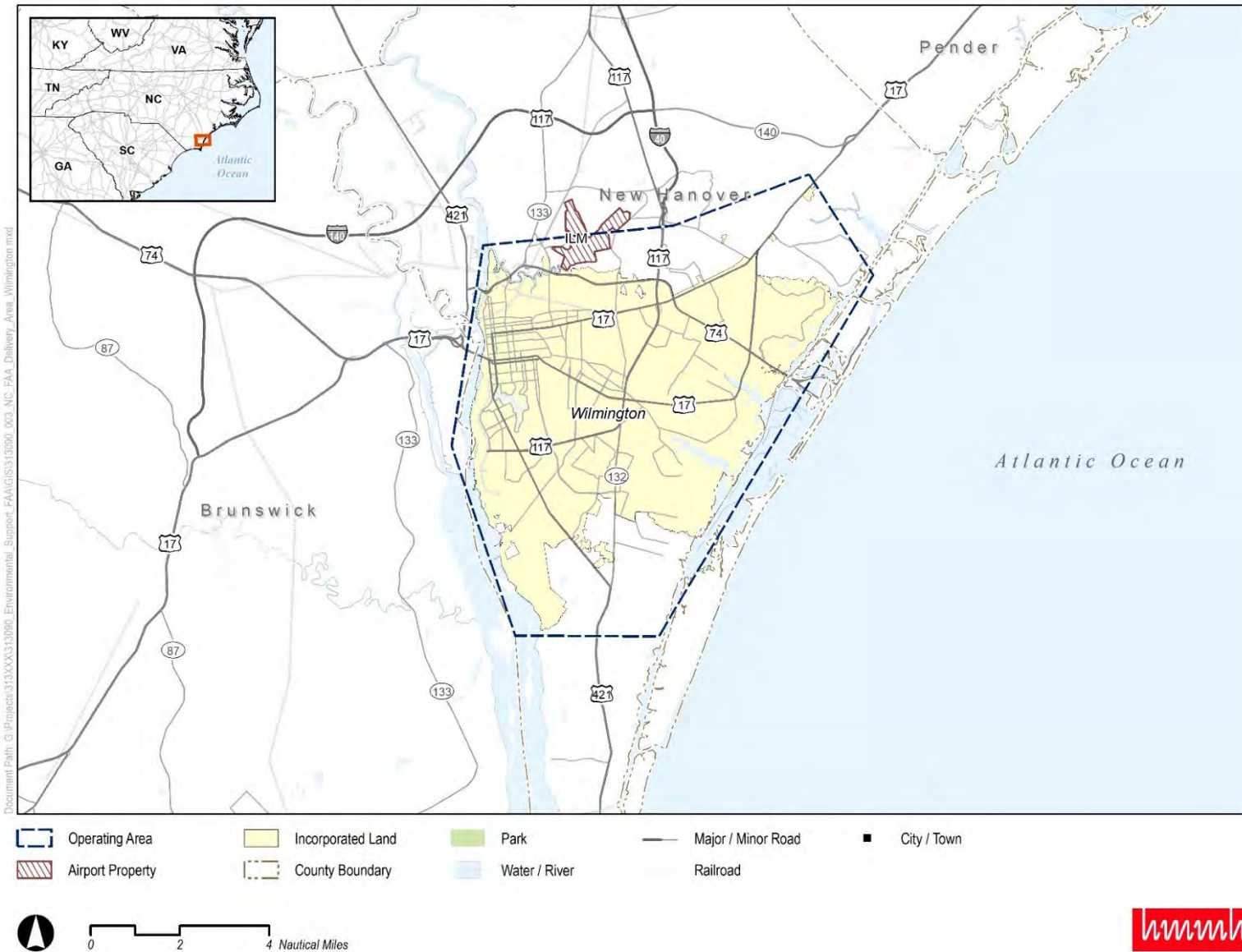


Figure 9. Wilmington Operating Area



APPENDIX D

NOISE



Federal Aviation Administration

Memorandum

Date: April 18, 2024

To: Don Scata, Deputy Director (Acting), Office of Environment and Energy (AEE-2)

From: Chris Hurst and Shelia Neumann, Flight Standards (AFS), General Aviation and Commercial Branch, AFS-752
CHRISTOPHER A HURST Digitally signed by CHRISTOPHER A HURST
Date: 2024.04.18 14:04:47 -0500

Subject: Programmatic Environmental Assessment Noise Methodology Approval Request for Part 135 Drone Package Delivery Operations in North Carolina

FAA Office of Flight Standards (AFS) requests FAA Office of Environmental and Energy, Noise Division (AEE-100) approval of the noise methodology to be used for the Programmatic Environmental Assessment (PEA) for package delivery operations conducted under 14 Code of Federal Regulations Part 135 using unmanned aircraft (UA) in seven metropolitan areas in North Carolina.

As required under the National Environmental Policy Act, the FAA must consider the potential for environmental impacts in informing the agency's decision to approve federal actions, including the potential for noise impacts as detailed in FAA Order 1050.1F.

As the FAA does not currently have a standard approved noise model for UA, this memo serves as a request for written approval from AEE-100 to use the proposed methodology to support the noise analysis for the PEA.

Description of Proposed Operations

AFS is programmatically evaluating proposed commercial drone package delivery operations using UA according to a forecast developed by the North Carolina Department of Transportation (NCDOT). AFS, in coordination with NCDOT as the project proponent, is preparing the PEA. The purpose of the PEA is to assist decisionmakers and the public in understanding the potential environmental impacts from proposed drone package delivery operations in North Carolina. The PEA may also be useful in providing the basis for subsequent project-level specific environmental reviews in North Carolina.

To support the development of the PEA, NCDOT developed a forecast for future Part 135 drone package delivery operations in the state based on a 2030 forecast year. NCDOT identified seven regions within North Carolina as likely operating areas for UAS package deliveries in the next seven years. These operating areas include Asheville, Charlotte Metro (including Kannapolis), Piedmont Triad (Winston-Salem, High Point, and Greensboro), Research Triangle (Raleigh, Durham, Chapel Hill, and adjacent communities), Sandhills (Pinehurst, Raeford, and Fayetteville), Greenville, and Wilmington. The NCDOT

2030 forecasted number of daily delivery operations and estimated number of delivery hubs for each of these seven regions are presented in **Table 1**.

Table 1. Estimated Daily Deliveries per Operating Area in 2030

Operating Area Name	Estimated Number of Hubs	Estimated Range of Daily Deliveries
Asheville	1	164 – 478
Charlotte Metro	6	1,649 – 4,801
Piedmont Triad	5	413 – 1,201
Research Triangle	6	1,704 – 4,960
Sandhills	2	328 – 955
Greenville	1	164 – 478
Wilmington	1	164 – 478

Estimation of potential noise exposure resulting from the proposed action will be based on four data sets consisting of the available noise data for all currently operating Part 135 multi-copter UA in the United States. The four multi-copter UA currently in use for Part 135 package deliveries and their associated maximum takeoff weights (MTOW) are the Amazon Prime Air MK27-2 (91.5 pounds MTOW), Wing Hummingbird 7000W-B (15 pounds MTOW), Causey Flytrex FTX-M600P (33.4 pounds MTOW), and UPS Flight Forward Matternet M2 (29.1 pounds MTOW). The FAA previously analyzed each of these UA in separate noise studies as part of prior EAs, presented in **Table 2**, for package delivery operations at various locations across the United States.

Table 2. Part 135 Multi-copter UA Package Delivery Environmental Assessments

Operator and UA	MTOW (lbs)	Environmental Assessment	Date
Wing Hummingbird 7000W-B	15	Final EA and FONSI/ROD for Wing Aviation, LLC Proposed Drone Package Delivery Operations in Dallas–Fort Worth, Texas	November 2023
		Final EA and FONSI/ROD Wing Aviation Drone Package Delivery Operations Frisco and Little Elm, TX	February 2022
		FONSI/ROD for EA for Wing Aviation Drone Package Delivery Operations Christiansburg, Virginia	December 2021
Causey Flytrex FTX-M600P	33.4	Final EA and FONSI/ROD Causey Aviation Unmanned, Inc. Drone Package Delivery Operations in Granbury and Rowlett, Texas	August 2023
		Final EA and FONSI/ROD for Causey Aviation Unmanned, Inc. Drone Package Delivery Operations in Fayetteville, Holly Springs, Raeford, and Pinehurst, North Carolina	November 2022
UPS Flight Forward Matternet M2	29.1	Final EA and FONSI/ROD UPS Flight Forward, Inc. Drone Package Delivery Operations Columbus, Ohio	March 2023
		Final EA and FONSI/ROD UPS Flight Forward, Inc. Drone Package Delivery Operations Winston-Salem, NC	December 2022

Operator and UA	MTOW (lbs)	Environmental Assessment	Date
		Final EA and FONSI/ROD UPS Flight Forward, Inc. Drone Package Delivery Operations The Villages, FL	November 2022
		Final EA and FONSI/ROD UPS Flight Forward, Inc. Drone Flight Training Operations at Fisherville, KY	August 2022
		Final EA and FONSI/ROD UPS Flight Forward Drone Package Delivery Operations Wake Forest Baptist Health (WFBH) Routes, Winston-Salem, NC	December 2021
		Final EA and FONSI/ROD UPS Flight Forward Drone Package Delivery Operations Lake Sumter Landing Route, Villages, FL	November 2021
Amazon MK27-2	91.5	Final EA and FONSI/ROD Amazon Prime Air Drone Package Delivery Operations in College Station, Texas	December 2022
		Final EA and FONSI/ROD Impact/Record of Decision Amazon Prime Air Drone Package Delivery Operations in Lockeford, California	November 2022
		EA for Amazon Prime Air Drone Package Delivery Test Operations in Pendleton, Oregon	November 2022

Notes: lbs = pounds; MTOW = maximum takeoff weight; UA = unmanned aircraft

The four UA analyzed are of varying sizes with varying flight capabilities, the flight operations can generally be categorized into the following five phases: (1) takeoff and climb, (2) en-route outbound, (3) delivery, (4) en route inbound, and (5) descent and landing. In general, package delivery operators partner with established businesses and identify the location for a hub at the business’s parking lot, rooftop, or other area where it is not disruptive to the business and does not present a safety hazard.

The four UA will be assessed for each flight phase in two groupings: UA ranging from approximately 15–34 pounds MTOW (Group 1) and UA ranging from approximately 15–92 pounds MTOW (Group 2). For each grouping, AFS will estimate potential noise exposure for distances ranging from 32.8 feet to 2,500 feet radially out from both hubs and delivery points. The distance of 32.8 feet is the closest common distance for which measurement data is available for most of the analyzed UA, and 2,500 feet is the distance determined where noise from flight of the UA en route would be the dominant noise source for receivers directly beneath the UA flight path (see Figures 7 and 8 in HMMH’s noise report, referenced below).

Noise Analysis Methodology

AFS requests use of the noise analysis methodology described in HMMH Report No. 313090.003.2.3-1 for the “Noise Assessment for Package Delivery Operations with Unmanned Aircraft in North Carolina” dated March 20, 2024.



Federal Aviation Administration

Memorandum

Date: April 23, 2024

To: Christopher Hurst and Shelia Neumann, Flight Standards, General Aviation Operations Branch, (AFS-830)

From: Don Scata, Noise Division Manager, Office of Environment and Energy (AEE-100)

DONALD S SCATA JR Digitally signed by DONALD S SCATA JR
Date: 2024.04.23 16:52:49 -0400

Subject: Programmatic Environmental Assessment (PEA) Noise Methodology Approval Request for Part 135 Drone Package Delivery Operations in North Carolina

The Office of Environment and Energy, Noise Division (AEE-100), has reviewed the proposed non-standard noise modeling methodology for commercial package delivery operations using unmanned aircraft (UA) in seven regions in North Carolina. This request is in support of a Programmatic Environmental Assessment (PEA) for proposed commercial drone package delivery operations under 14 CFR Part 135 according to a forecast developed by the North Carolina Department of Transportation (NCDOT). The purpose of the PEA is to assist decisionmakers and the public in understanding the potential environmental impacts from proposed drone package delivery operations in North Carolina.

The Proposed Action is to evaluate future Part 135 package delivery operations in North Carolina based on a forecast developed by NCDOT for the 2030 forecast year based on four data sets consisting of the available noise data for all currently operating Part 135 multi-copter UA in the United States. These four UA are the Amazon Prime Air MK27-2, Wing Hummingbird 7000W-B, Causey Flytrex FTX-M600P, and UPS Flight Forward Matternet M2. The FAA previously analyzed each in separate noise studies as part of prior EAs for package delivery operations at various locations across the United States. These four UA analyzed in the Proposed Action are of varying sizes with varying flight capabilities, and flight operations can generally be categorized into the five flight phases of (1) takeoff and climb, (2) en-route outbound, (3) delivery, (4) en route inbound, and (5) descent and landing.

NCDOT identified seven regions within North Carolina in the 2030 forecast as likely operating areas for UAS package deliveries in the next seven years under the scope of this Proposed Action. These operating areas include Asheville, Charlotte Metro (including Kannapolis), Piedmont Triad (Winston-Salem, High Point, and Greensboro), Research Triangle (Raleigh, Durham, Chapel Hill, and adjacent communities), Sandhills (Pinehurst, Raeford, and Fayetteville), Greenville, and Wilmington. The NCDOT 2030 forecasted number of daily delivery operations and estimated number of delivery hubs for each of these seven regions are presented in Table 1 of the proposed non-standard noise modeling methodology request, "Programmatic Environmental Assessment Noise Methodology

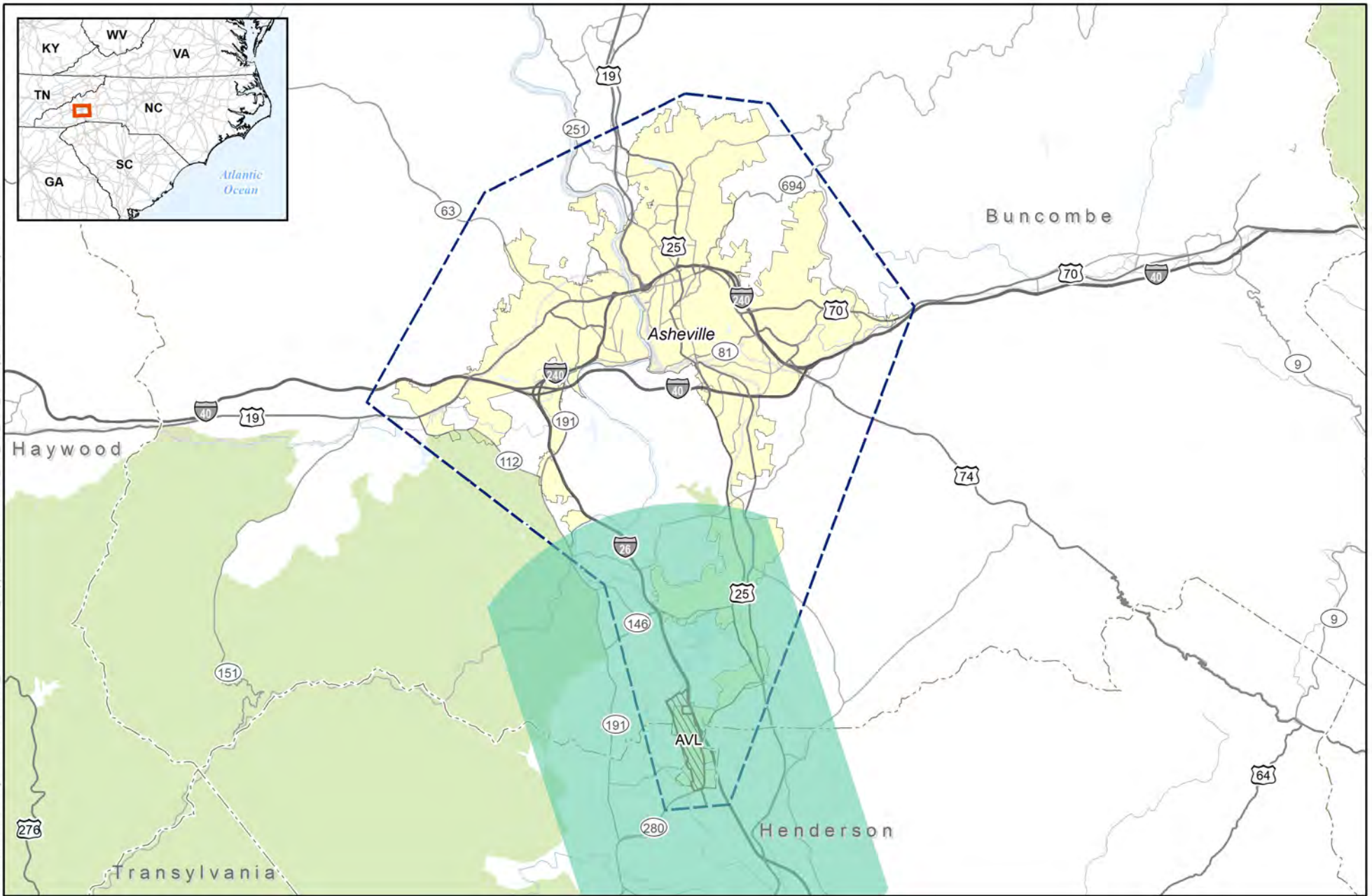
Approval Request for Part 135 Drone Package Delivery Operations in North Carolina” dated April 18, 2024.

As the FAA does not currently have a standard approved noise model for assessing UA, and in accordance with FAA Order 1050.1F, all non-standard noise analysis in support of the noise impact analysis for the National Environmental Policy Act (NEPA) must be approved by AEE. This letter serves as AEE’s response to the method developed in HMMH Report No. 313090.003.2.3-1 for the “Noise Assessment for Package Delivery Operations with Unmanned Aircraft in North Carolina” dated March 20, 2024.

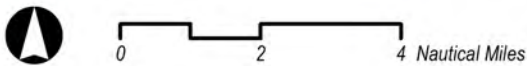
The proposed methodology appears to be adequate for this analysis; therefore, AEE-100 concurs with the methodology proposed for this project. Please understand that this approval is limited to this particular Environmental Review, location, vehicles, and circumstances. Any additional projects using this or other methodologies or variations in the vehicles will require separate approval.

Airspace Mapping

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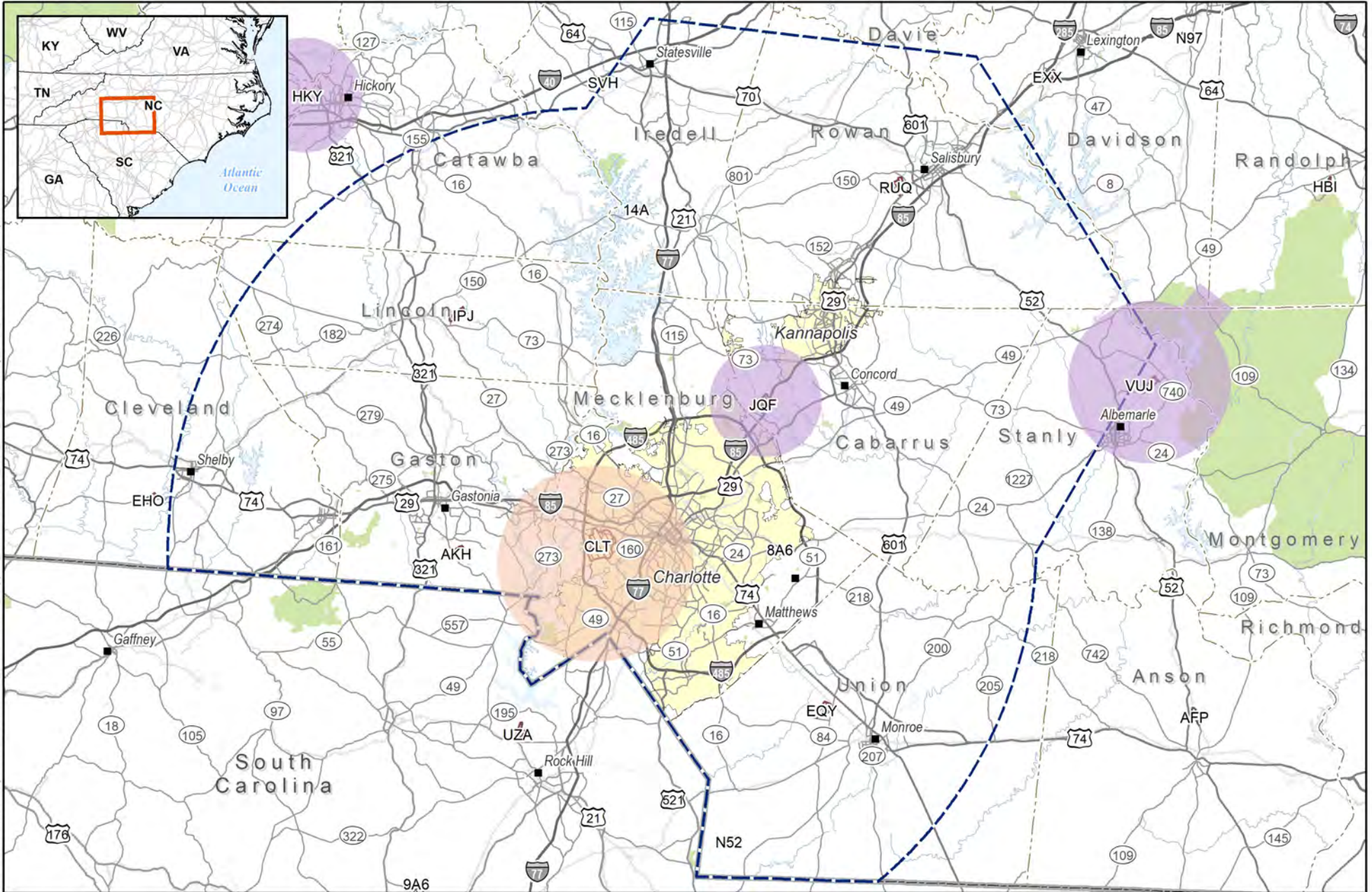


- Operating Area
- Incorporated Land
- Park
- Major / Minor Road
- Water / River
- Airport Property
- County Boundary
- Class C Airspace
- Railroad
- City / Town

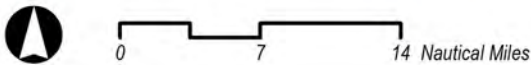


Asheville Airspace

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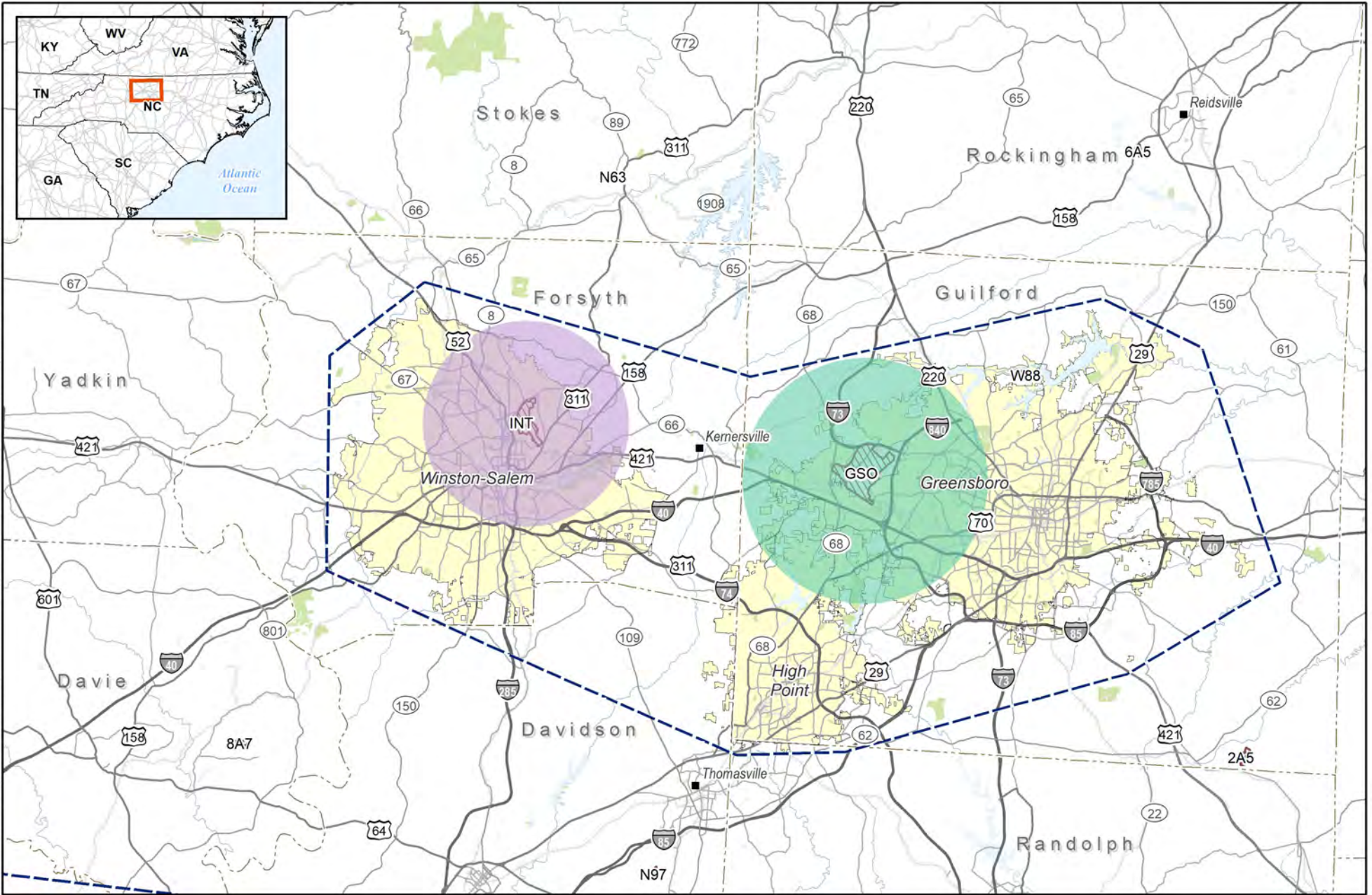


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| Operating Area | Incorporated Land | Class B Airspace | Park | Major / Minor Road | City / Town |
| Airport Property | County Boundary | Class D Airspace | Water / River | Railroad | State Boundary |

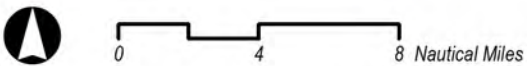


Charlotte Metro Airspace

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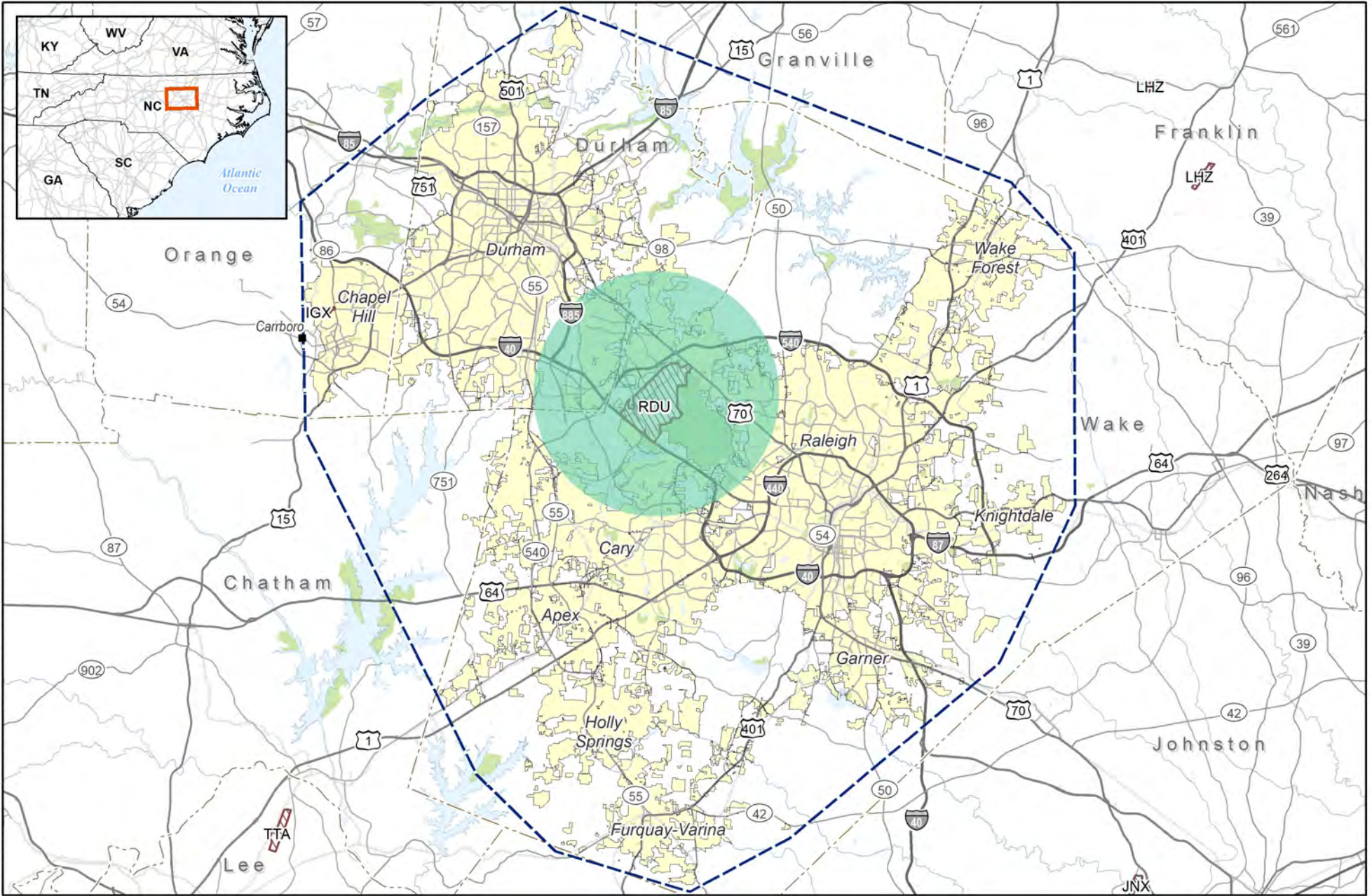


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|------------------|-------------------|------------------|---------------|--------------------|-------------|
| Operating Area | Incorporated Land | Class C Airspace | Park | Major / Minor Road | City / Town |
| Airport Property | County Boundary | Class D Airspace | Water / River | Railroad | |

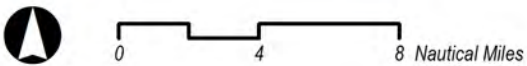


Piedmont Triad Airspace

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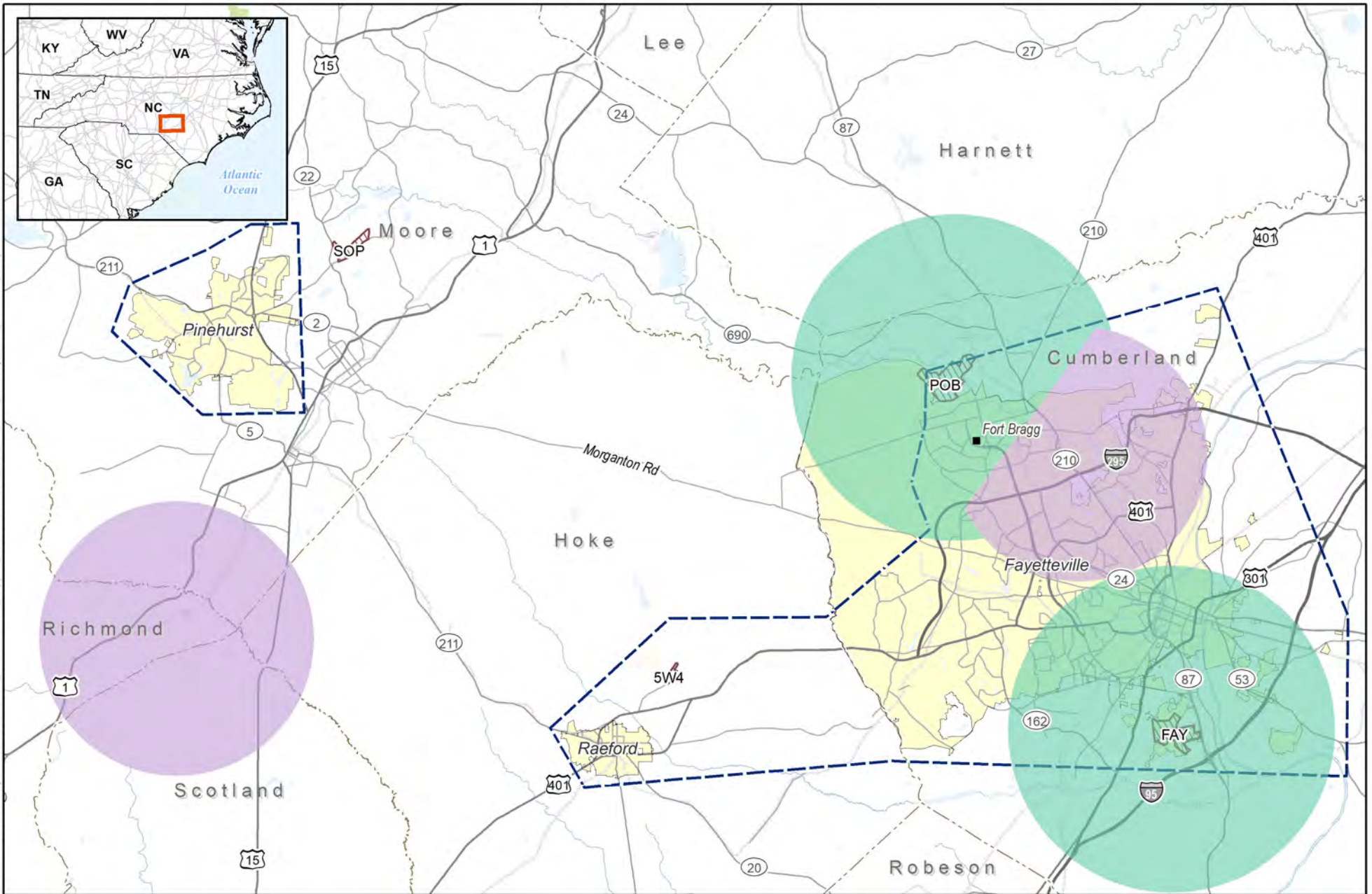


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|------------------|-------------------|------------------|--------------------|---------------|
| Operating Area | Incorporated Land | Park | Major / Minor Road | Water / River |
| Airport Property | County Boundary | Class C Airspace | Railroad | City / Town |

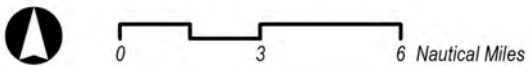


Research Triangle Airspace

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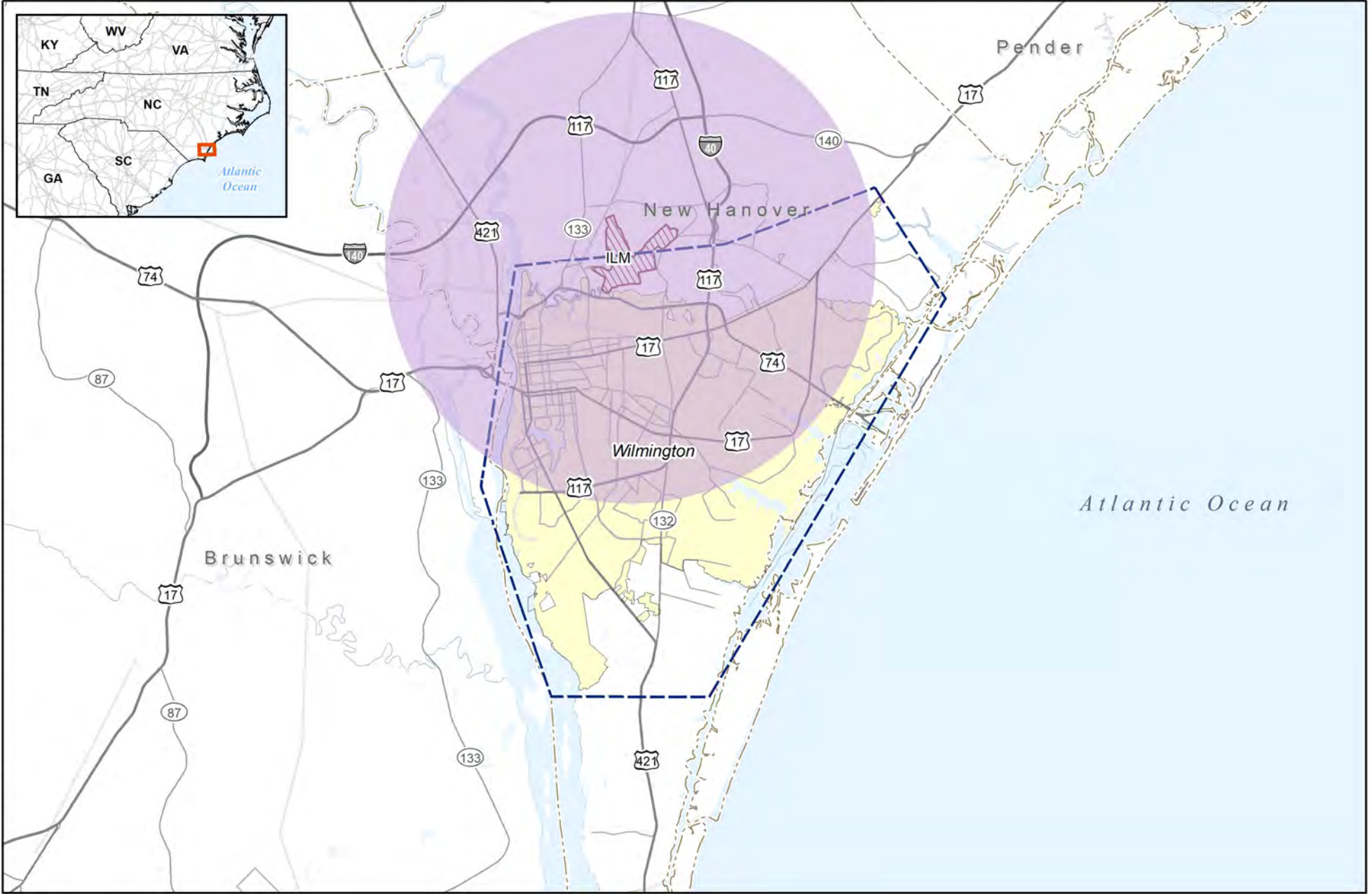


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| Operating Area | Incorporated Land | Class C Airspace | Park | Major / Minor Road | City / Town |
| Airport Property | County Boundary | Class D Airspace | Water / River | Railroad | |

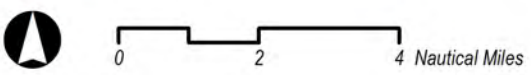


Sandhills Airspace

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| Operating Area | Incorporated Land | Park | Major / Minor Road | Water / River |
| Airport Property | County Boundary | Class D Airspace | Railroad | City / Town |



Wilmington Airspace

Noise Assessment Report

Noise Assessment for Package Delivery Operations with Unmanned Aircraft in North Carolina

In support of U.S. Code of Federal Regulations Title 14, Part 135

Final

HMMH Report No. 313090.003.2.3-1

March 20, 2024

Prepared for:

Federal Aviation Administration

Unmanned Aircraft Systems Integration Office (AUS)
Unmanned Aircraft System (UAS) Environment Review
697DCK-22-D-00004



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1 Introduction and Background

This document presents the methodology for and estimation of noise exposure related to the operation of Unmanned Aircraft (UA) for package delivery operations within the state of North Carolina under Title 14 Code of Federal Regulations (CFR) Part 135 (herein referred to as “Part 135”).

The National Environmental Policy Act (NEPA) requires federal agencies to assess the environmental effects of proposed major federal actions prior to making decisions. Major Federal Aviation Administration (FAA) actions include authorizations issued to operators of Unmanned Aircraft Systems (UAS) to enable unmanned aircraft (UA; also referred to as a drone) operations in the National Airspace System (NAS). One type of UAS operation is using drones to deliver goods to customers (referred to as package delivery). In 2019, the FAA began issuing air carrier certificates to UAS operators in accordance with Part 135 so that operators could conduct package delivery flights. Generally, these approvals were primarily associated with amendments to Part 135 air carrier Operations Specifications (OpSpec)¹ as the operative approval. The FAA has completed 17 environmental assessments (EAs) in accordance with FAA Order 1050.1F for individual package delivery proposals. Each EA resulted in a finding of no significant impact (FONSI).²

To streamline the environmental review process for UAS package delivery proposals in North Carolina, the FAA, in coordination with the North Carolina Department of Transportation (NCDOT) as the project proponent, is preparing a programmatic environmental assessment (PEA) in accordance with NEPA, Council on Environmental Quality (CEQ) NEPA-implementing regulations, and FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*. A programmatic environmental review assists decisionmakers and the public in understanding the environmental impact from proposed large scope federal actions and activities. A programmatic NEPA document may be prepared to cover (1) a broad group of related actions; or (2) a program, policy, plan, system, or national level proposal that may later lead to individual actions, requiring subsequent NEPA analysis. A programmatic document is useful in analyzing the cumulative impacts of a group of related actions. When the proposed actions are adequately analyzed, the programmatic document can serve as the NEPA review for those actions. Programmatic documents may also be useful in providing the basis for subsequent project-level specific environmental reviews. A programmatic NEPA document may contain a broader, less specific analysis compared to what is performed for a specific proposed project.

To support the analysis of noise and noise compatible land use for the PEA, this document proposes a methodology for determining potential noise exposure resulting from UA package delivery operations in terms of the Day-Night Average Sound Level (DNL) metric based on available data from prior individual UA package delivery EAs.

The methodology proposed in this document provides quantitative guidance to FAA Environmental Specialists to inform environmental decision making on UA noise exposure from proposed package delivery operations. The methods presented here are suitable for review of federal actions under the requirements of NEPA and other applicable environmental special purpose laws or other federal

¹ An Operations Specifications is a document that defines the scope of aircraft operations that the FAA has authorized.

² See: https://www.faa.gov/uas/advanced_operations/nepa_and_drones.

environmental review requirements at the discretion and approval of the FAA. In particular, this report is intended to function as a nonstandard equivalent methodology under FAA Order 1050.1F, and as such, requires written approval from FAA's Office of Environment and Energy (AEE) for the project for which a NEPA determination is sought.³

The methodology has been developed with data provided by current Part 135 UA package delivery operators and the FAA to date. Results of the noise analysis are presented in terms of the Yearly DNL based on varying levels of forecast operations for areas at ground level below each phase of the flight. The methodology and analysis presented herein was developed specifically to evaluate the NCDOT's proposed action and the associated forecast for UA package deliveries in North Carolina. As, such the applicability of this document is limited to supporting analysis of the relevant environmental resource categories for the associated PEA.

Section 2 of this document describes the relevant noise and operations data provided by the FAA and various Part 135 UA package delivery operators. Section 3 describes the methodology to develop noise exposure estimates for the various UA flight phases associated with typical operations using available data. Section 4 presents the estimated DNL levels for various flight phases based on varying levels of typical operations as described to date. Section 5 discusses the consideration of cumulative noise exposure resulting from multiple sources of aviation noise.

³ Discussion of the use of "...another equivalent methodology..." is discussed in FAA Order 1050.1F, July 16, 2015, Appendix B, Section B-1.2, available online at https://www.faa.gov/documentLibrary/media/Order/FAA_Order_1050_1F.pdf#page=113

2 Unmanned Aircraft Delivery Operations and Noise Data Set Descriptions

The NCDOT has projected Part 135 drone package delivery operations for the state of North Carolina out to year 2030 and provided that projection to the FAA for analysis in the PEA. The proposed action evaluated in the PEA includes commercial drone package deliveries from takeoff and landing areas (referred to as “hubs”) based on NCDOT’s maximum forecasted operations for conservative purposes. The type, size, and weight of aircraft used to deliver packages could vary, but NCDOT anticipates multi-copter platforms will be the primary type of UA used to deliver small packages in the foreseeable future.

Four data sets consisting of the available noise data for all currently operating Part 135 multi-copter UA form the basis of the noise assessment for the forecast UA package delivery operations in North Carolina. The four UA currently in use for Part 135 package deliveries⁴ and their associated maximum takeoff weights (MTOW) are the Amazon Prime Air MK27-2 (91.5 pounds MTOW), Wing Hummingbird 7000W-B (15 pounds MTOW), Causey Flytrex FTX-M600P (33.4 pounds MTOW), and UPS Flight Forward Matternet M2 (29.1 pounds MTOW). Each of these UA have been previously analyzed in separate noise studies supporting multiple individual EAs for package delivery operations at various locations across the United States.

The source documents and associated noise measurements and data analysis used as the basis for this PEA noise assessment are:

- HMMH Report No. 309990.003-5: Noise Assessment for Causey Proposed Package Delivery Operations with Flytrex FTX-M600P Unmanned Aircraft, February 28, 2022⁵ (“Causey noise report”)
 - Including Attachment A: FAA Memorandum, Estimated Noise Levels for Flytrex FTXM600P UA, February 17, 2022
- HMMH Report No. 309990.003-6: Noise Assessment for UPS Flight Forward Inc. Proposed Package Delivery Operations with Matternet Model M2 Unmanned Aircraft, May 18, 2022⁶ (“UPS noise report”)

⁴ The four UA considered for this analysis are all multicopter or hybrid multicopter/fixed-wing vehicles that all have the capability to hover and takeoff and land vertically. This noise analysis is not applicable to UA without hover and vertical flight capability, such as fixed-wing, or UA with operating procedures different than those described in Section 2.1.2.

⁵ Included as Appendix B in the Final Environmental Assessment and Finding Of No Significant Impact/Record of Decision Causey Aviation Unmanned, Inc. Drone Package Delivery Operations in Granbury and Rowlett, Texas, August 2023.
https://www.faa.gov/uas/advanced_operations/nepa_and_drones/FinalEA_FONSI_ROD_Causey_Granbury_Rowlett_TX.pdf

⁶ Included as Appendix C in Finding of No Significant Impact/Record of Decision, and Final Environmental Assessment UPS Flight Forward, Inc. Drone Package Delivery Operations Columbus, Ohio, March 2023.
https://www.faa.gov/uas/advanced_operations/media/FONSI-ROD-and-Final-EA_UPSFF_Columbus-OH_2023-03-30

- Including Attachment A: FAA Memorandum, Estimated Noise Levels for Matternet Model M2 UA, May 13, 2022
- HMMH Report No. 309990.003-7: Noise Assessment for Amazon Prime Air Proposed Package Delivery Operations with Amazon Prime Air MK27-2 Unmanned Aircraft Wing Hummingbird 7000W-A, August 19, 2022⁷ (“Amazon noise report”)
 - Including Attachment A: FAA Memorandum, Estimated Noise Levels for Amazon Prime Air MK27-2 UA, August 4, 2022
- HMMH Report No. 313090.002 002-2: Noise Assessment for Wing Aviation Proposed Package Delivery Operations with Hummingbird 7000W-B Unmanned Aircraft, March 17, 2023⁸

Figures 1 – 4 depict the four UA used in this analysis.

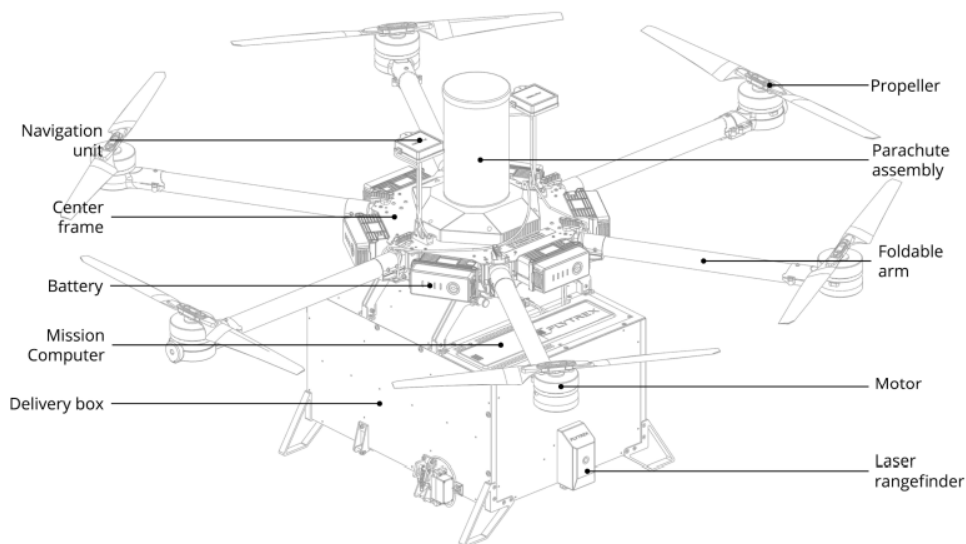


Figure 1. Flytrex FTX-M600P UA

Source: Causey

⁷ Included as Appendix C in the Final Environmental Assessment and Finding of No Significant Impact/Record of Decision Amazon Prime Air Drone Package Delivery Operations in College Station, Texas, December 2022. https://www.faa.gov/sites/faa.gov/files/FONSI-ROD_Final-EA-Amazon-Prime-Air_College-Station-TX.pdf

⁸ Included as Appendix D in the Final Environmental Assessment and Finding of No Significant Impact/Record of Decision for Wing Aviation, LLC Proposed Drone Package Delivery Operations in Dallas–Fort Worth, Texas, November 2023. https://www.faa.gov/uas/advanced_operations/nepa_and_drones/Final_EA_for_Wing_at_DFW_Nov23_ADA_Signed.pdf

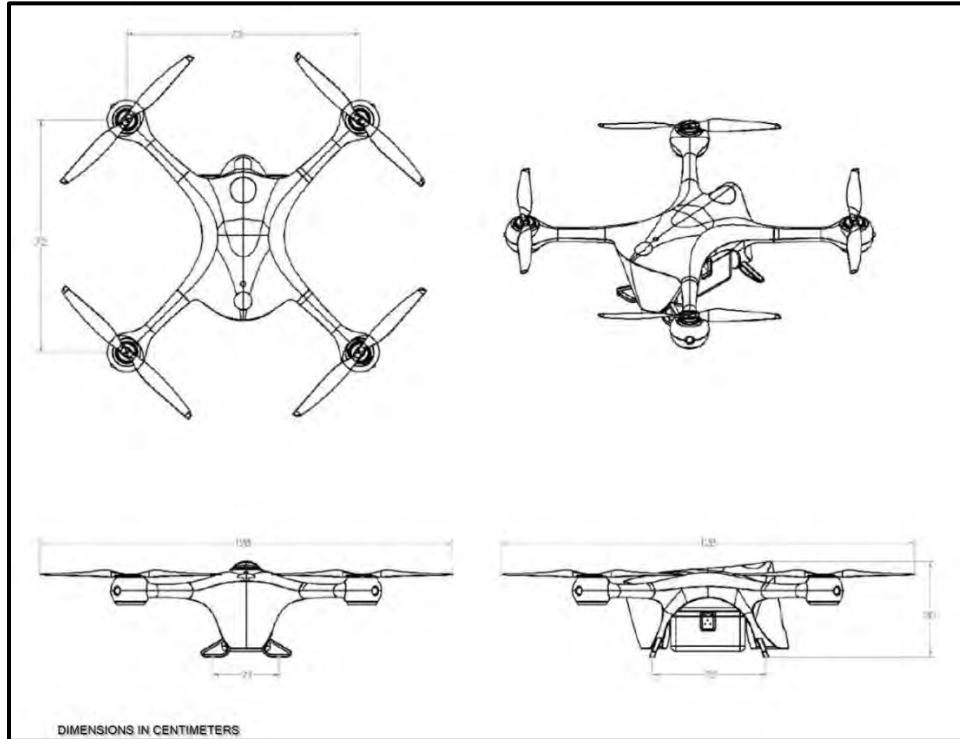


Figure 2. Matternet Model M2 Unmanned Aircraft

Source: UPS-FF

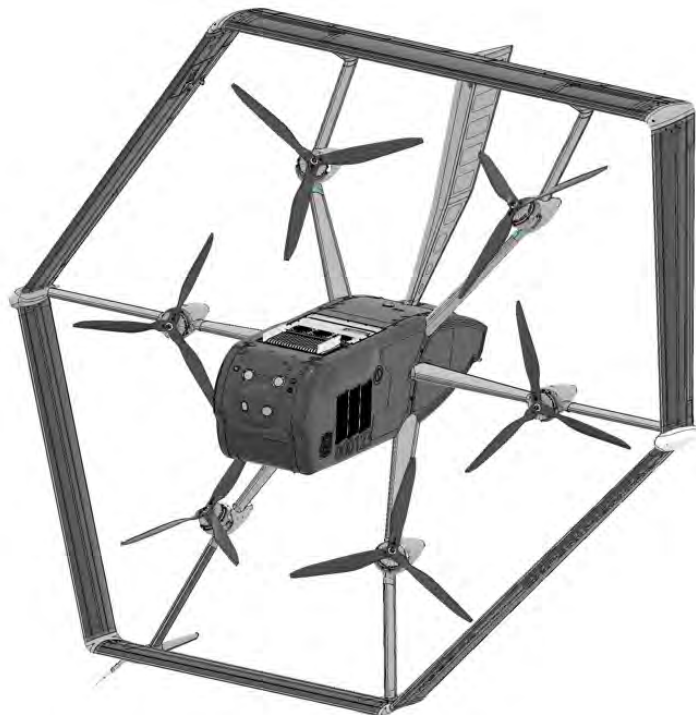


Figure 3. Amazon Prime Air MK27-2 Unmanned Aircraft

Source: Amazon



Figure 4. Wing Hummingbird 7000W-B Unmanned Aircraft

Source: Wing

2.1 Operations Forecast, Flight Paths, and Flight Profile Data

Evaluation of potential noise exposure from UA package delivery operations requires information on numbers of annual UA package deliveries, where those UA will operate, and the flight profiles (i.e., procedures) used when transporting packages between locations. While the specifics of these factors can vary for each Part 135 operator, general commonalities do exist and are presented in this section. The following subsections present the forecast annual UA package delivery operations, the geographic distribution of those operations, and a generalized description of a typical delivery flight profile.

2.1.1 Operations Forecast

The NCDOT has projected Part 135 drone package delivery operations for the state of North Carolina out to year 2030 and provided that projection to the FAA for analysis in the PEA. The proposed action evaluated in the PEA includes commercial drone package deliveries from takeoff and landing areas (referred to as “hubs”) based on NCDOT’s maximum forecasted operations for conservative purposes.

The FAA, in collaboration with NCDOT, identified seven regions within North Carolina as likely operating areas for UAS package deliveries in the next seven years. These operating areas include Asheville, Charlotte Metro (including Kannapolis), Piedmont Triad (Winston-Salem, High Point, and Greensboro), Research Triangle (Raleigh, Durham, Chapel Hill, and adjacent communities), Sandhills (Pinehurst, Raeford, and Fayetteville), Greenville, and Wilmington (see **Figure 5**). The operating areas exclude special use airspace because drone package delivery operations would not be allowed in these areas.

Table 1 displays the forecasted daily operations for each operating area in 2030.

Table 1. Estimated Daily Deliveries per Operating Area in 2030

Operating Area Name	Estimated Number of Hubs	Estimated Range of Daily Deliveries
Asheville	1	164 – 478
Charlotte Metro	6	1,649 – 4,801
Piedmont Triad	5	413 – 1,201
Research Triangle	6	1,704 – 4,960
Sandhills	2	328 – 955
Greenville	1	164 – 478
Wilmington	1	164 – 478

Source: NCDOT 2023

Asheville

The Asheville operating area is approximately 220 square miles in size and contains the Asheville metro area. This operating area includes one airport: the Asheville Regional Airport (AVL).

Charlotte Metro

The Charlotte Metro operating area is approximately 3,524 square miles in size and contains the cities of Charlotte and Kannapolis, along with the surrounding unincorporated areas. This operating area includes four airports: Charlotte Douglas International Airport (CLT), Charlotte-Monroe Executive Airport (EQY), Concord-Padgett Regional Airport (JQF), and Mid-Carolina Regional Airport (RUQ).

Piedmont Triad

The Piedmont Triad is approximately 713 square miles in size and includes the cities of Winston-Salem, High Point, and Greensboro. This operating area includes two airports: the Smith Reynolds Airport (INT) and the Piedmont Triad International Airport (GSO).

Research Triangle

The Research Triangle operating area is approximately 1,039 square miles in size and includes the cities of Raleigh, Durham, and Chapel Hill, as well as adjacent communities. This operating area includes one active airport—Raleigh-Durham International Airport (RDU)—and the former Horace Williams Airport (IGX).

Sandhills

The Sandhills operating area is approximately 209 square miles in size and contains the cities of Pinehurst, Raeford, and Fayetteville. This operating area contains the P K Airpark Airport (5W4) and a portion of Pope Field Airport (POB). Fayetteville Regional Airport (FAY), Moore County Airport (SOP), and Special Use Airspace R-5311A are located outside this operating area.

Greenville

The Greenville operating area is approximately 137 square miles in size and contains the Greenville metro area. This operating area includes one airport: Pitt-Greenville Airport (PGV).

Wilmington

The Wilmington operating area is approximately 129 square miles in size and consists of the Wilmington metro along the Atlantic Coast. This operating area includes one airport: Wilmington International Airport (ILM).

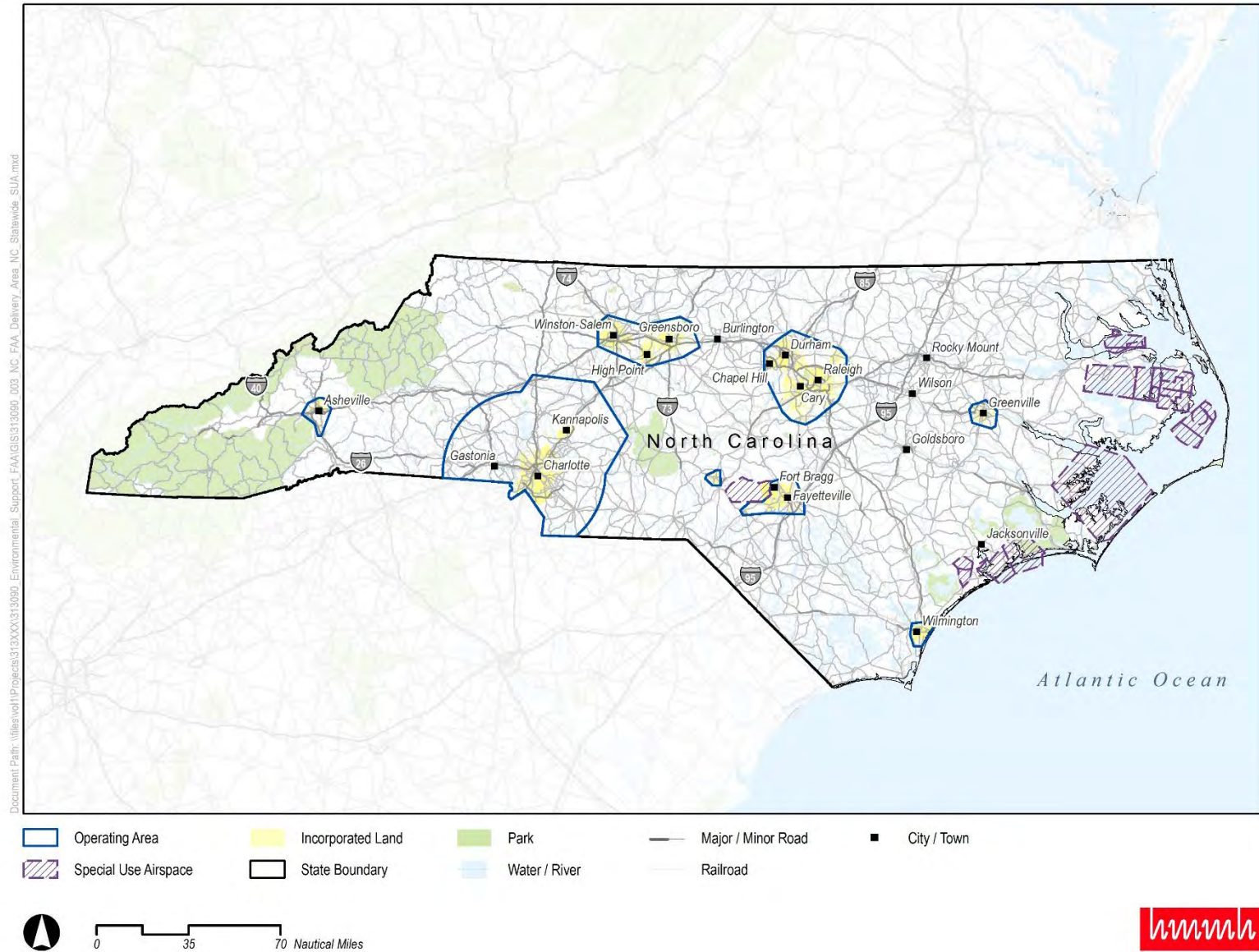


Figure 5. Operating Areas – North Carolina

The methodology presented in this report can be used to assess UA noise for the proposed activity levels within North Carolina; however, FAA review and approval of its use at specified activity levels is required. The activity ranges shown in Section 4 represent what the FAA considers low to moderate activity levels, and as appropriate for consideration with this methodology. At higher activity levels, this methodology may not be sufficient to inform an environmental determination and further consideration or refinements at the discretion of the FAA may be needed.

The DNL noise levels presented in this report are all shown consistent with effective daytime (7 AM to 10 PM) operations levels. For consideration of nighttime (10 PM to 7 AM) noise levels, a 10 times operational weighting (equivalent to 10-decibel [dB] increase) should be applied.

Section 3.1 provides techniques to apply the operational weighting necessary to calculate effective operations for analysis with the DNL metric.

2.1.2 General Flight Paths and Profiles

While UA come in varying sizes with varying flight capabilities, the flight operations can generally be categorized into the following five phases: (1) takeoff and climb, (2) en-route outbound, (3) delivery, (4) en route inbound, and (5) descent and landing. In general, package delivery operators partner with established businesses and identify the location for a hub at the business's parking lot, rooftop, or other area where it is not disruptive to the business and does not present a safety hazard. The five phases of operation are described below for a typical multi-copter or hybrid UA and are depicted in **Figure 6** with additional detail.

Takeoff and Climb

The takeoff and climb phase is described as the portion of the flight in which a fully loaded UA takes off from the hub and climbs vertically. The UA may then hover briefly as it conducts various systems checks to ensure it is functioning properly. With a multi-copter design, the UA can take off and ascend vertically, as well as hover. Typical flights begin with the UA departing from a hub and ascending vertically to no more than 400 feet above ground level (AGL).

En-Route Outbound

The en-route outbound phase is defined as the part of the flight in which the fully loaded UA flies a pre-programmed route from its hub to a delivery point. During this flight phase, typical normal cruising speeds range from 30–60 knots (35 to 70 miles per hour), and normal cruising altitudes range from 150–375 feet AGL.

Delivery

The delivery phase is defined by descent from the en route outbound phase to a delivery point to deliver a package. Upon arrival at the delivery point, the UA descends vertically to deliver the package. The UA may hover at an altitude that varies in height. UA may use a tether to lower the package from the UA to the ground while the drone hovers or simply release the package onto the ground after reaching a designated hover height or landing. Once the UA releases the package, it climbs vertically to the cruise altitude and begins the en route inbound phase. The delivery process ranges from 30–90 seconds depending on the operator.

En-Route Inbound

Upon completion of a delivery, the UA flies from the delivery point back to a hub.

Descent and Landing

Upon reaching the hub, the UA vertically descends, lands, and turns off its rotors.

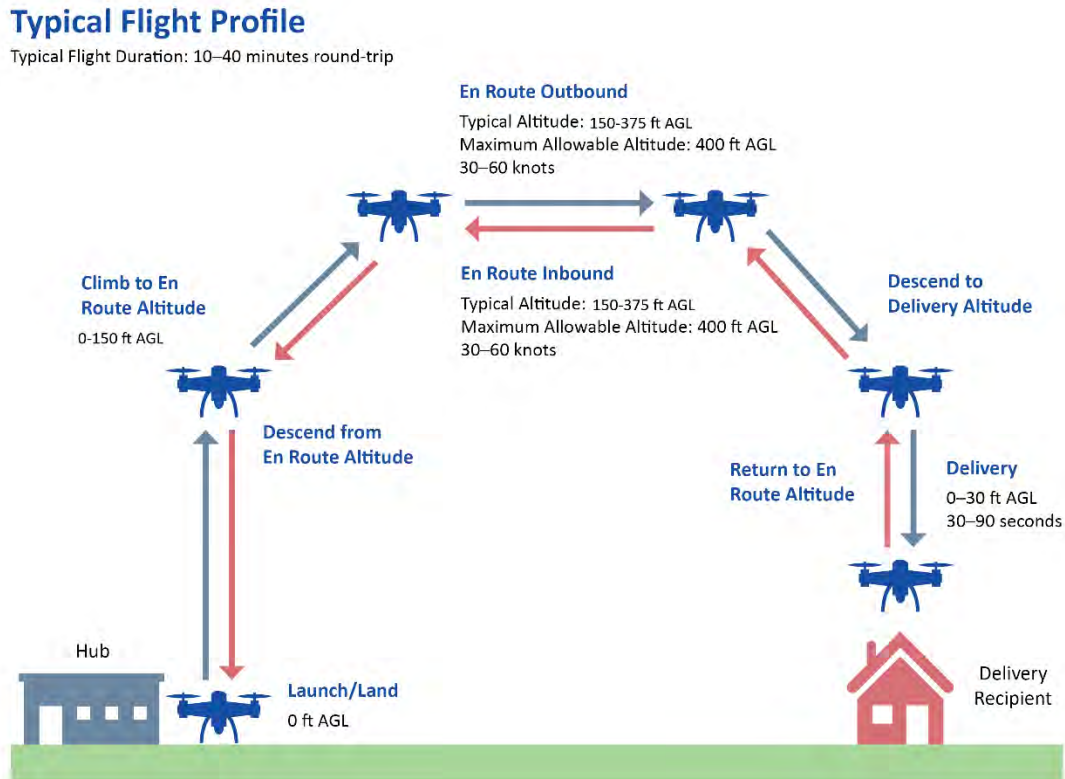


Figure 6. Typical UA Package Delivery Flight Profile

Regarding the four UA used for this noise assessment, more in depth descriptions of the delivery procedures specific to each is presented in the corresponding source documents referenced in Section 2.

2.2 Acoustical Data

Acoustical data for each UA included in this analysis were collected through various separate measurement efforts. The set of available measurement data for each UA varies somewhat due to the fact that not all measurement efforts were conducted for the specific purpose to support analysis for environmental reviews, and no standardized protocols for UA noise measurements to support environmental reviews were in place at the time the measurements were conducted.

The acoustical data available for each UA is covered in detail in the “Acoustical Data” section of the earlier referenced source noise reports (see Section 2 of this report). A summary of the information presented in the noise reports is provided below.

Wing 7000W-A/B UA

Noise estimates for the UA were calculated using the aircraft certification noise measurement data collected for Wing’s 7000W-A UA by JR Engineering in April of 2021.⁹ This data set included measurements of multiple passes of level straight line overflights at 100 feet and 200 feet AGL. Overflight measurements were taken with the UA operating at Maximum Takeoff Weight (MTOW) with payload at a target cruise airspeed of 56 knots [29 meters per second (m/s)] and without payload at a target max airspeed of 70 knots (36 m/s). Supplementary measurements were also collected for multiple instances of stationary hovers at 20 feet AGL. **Table 2** presents a summary of the 7000W-A acoustical data including averaged A-weighted Sound Exposure Level (SEL) and A-weighted Maximum Sound Level (L_{Amax}) at various altitudes.

Table 2. Aircraft Certification Noise Measurement Data Summary

Type	Altitude (AGL)	Package	Speed (knots)	Average L _{Amax} (dB)	Average SEL (dB)
Overflight	100 ft	No	70	63	66
	100 ft	Yes	56	64	67
	200 ft	No	70	59	63
	200 ft	Yes	56	60	64
Hover*	20 ft	Yes	-	73	-

*Notes: *UA at 20 ft AGL and 20 ft laterally from the microphone position.*

Source: JR Engineering, 2021

Though Wing now operates the 7000W-B model UA, noise measurements of 7000W-A model were utilized for the analysis, as measurement data for the 7000W-B was not available. Wing reports that improvements made to the 7000W-B model have reduced the noise level of the UA, and as such, use of the 7000W-A as a surrogate in the analysis is conservative for noise estimation.

UPS FF Matternet Model M2 UA

Noise measurements of the Matternet Model M2 UA were collected at Ells Field Airport near Willits, California in June 2021. The FAA then processed and analyzed the measurement data to calculate

⁹ Engineering Coordination Memo and Data Files, Subject: “Data Submittal for AEE”, JR Engineering 2021.

estimated noise levels for each of the flight phases (takeoff and climb, en route outbound, descent, landing, delivery, and en route inbound). The FAA analyzed the measurement data and provided the acoustical data used for environmental analysis in a report that was included as Attachment A to the UPS noise report.

The data presented in the FAA report included A-weighted SEL corresponding to each flight phase. Because the noise from one take off plus one landing at the same location is also representative of the noise from a delivery, the estimated SELs for takeoff, landing, and delivery locations were presented as a single function of distance from the landing pad or delivery point to the receiver (see **Table 3**). En route SELs were presented for maximum weight and empty weight (see **Table 4**). The maximum weight SEL is applicable for the UA carrying a package while the empty weight SEL is applicable when the UA is not carrying a package.

Table 3. Estimate of Sound Exposure Level at the Takeoff and Landing areas for Matternet Model M2 UA

Distance between Landing Pad and Receiver (ft) ^a	SEL (dB)	Distance between Landing Pad and Receiver (ft) ^a	SEL (dB)	Distance between Landing Pad and Receiver (ft) ^a	SEL (dB)	Distance between Landing Pad and Receiver (ft) ^a	SEL (dB)
20	90.1	900	65.6	1800	59.6	2700	56.1
50	84.7	950	65.2	1850	59.4	2750	56.0
100	81.1	1000	64.7	1900	59.2	2800	55.8
150	79.0	1050	64.3	1950	59.0	2850	55.7
200	77.3	1100	63.9	2000	58.7	2900	55.5
250	75.8	1150	63.5	2050	58.5	2950	55.4
300	74.5	1200	63.2	2100	58.3	3000	55.2
350	73.4	1250	62.8	2150	58.1	3050	55.1
400	72.3	1300	62.5	2200	57.9	3100	54.9
450	71.4	1350	62.1	2250	57.7	3150	54.8
500	70.5	1400	61.8	2300	57.5	3200	54.6
550	69.8	1450	61.5	2350	57.3	3250	54.5
600	69.0	1500	61.2	2400	57.1	3300	54.4
650	68.4	1550	60.9	2450	57.0	3350	54.2
700	67.8	1600	60.7	2500	56.8	3400	54.1
750	67.2	1650	60.4	2550	56.6	3450	54.0
800	66.6	1700	60.1	2600	56.5	3500	53.9
850	66.1	1750	59.9	2650	56.3		

Notes:

a) Takeoff starts at the landing pad. Distance is along ground from landing pad to receiver.

Source: FAA, May 13, 2022

Table 4. Estimates of En Route SEL

Aircraft Config	Reference Air Speed (KTS)	Reference Altitude (ft AGL)	SEL (dB)
Max Weight	35.1	250	67.8
Empty Weight	35.1	250	65.3

Source: FAA May 13, 2022

Causey Flytrex FTXM600P UA

Noise estimates for the UA were provided by the FAA are representative of each phase of flight (takeoff and climb, en route, delivery, and descent and landing). The UA noise measurements were performed at a Causey facility near Liberty, North Carolina in July 2021. The FAA analyzed the measurement data and provided the acoustical data used for environmental analysis in a report that was included as Attachment A to the Causey noise report.

The data presented in the FAA report included A-weighted SELs corresponding to each flight phase. The estimated SELs for takeoff, landing, and delivery locations were presented as a function of distance from the landing pad or delivery point to the receiver (**Tables 5 – 7**). En route SELs were presented for maximum weight and empty weight (**Table 8**). The maximum weight SELs are applicable for the UA carrying a package while flying outbound to a delivery point, while the empty weight SEL is applicable for the UA flying inbound to the distribution center after the UA completes a delivery and/or is not carrying cargo, respectively.

Table 5. Estimate of SEL for Takeoff and Climb at Maximum Weight

Distance between Launch Pad and Receiver (ft) ^a	SEL (dB)
50	75.0
100	71.9
150	69.7
200	67.9
250	66.4
300	65.1
350	63.9
400	62.9
450	62.0
500	61.1

*Note: a) Distance is along ground from landing point (launch pad) to receiver.
 Source: FAA February 17, 2022*

Table 6. Estimate of SEL for Descent and Landing at Empty Weight

Distance between Launch Pad and Receiver (ft) ^a	SEL (dB)
50	79.2
100	74.4
150	71.4
200	69.2
250	67.5
300	66.1
350	64.8
400	63.8
450	62.8
500	61.9

*Note: a) Distance is along ground from landing point (launch pad) to receiver.
 Source: FAA February 17, 2022*

Table 7. Estimate of SEL for Delivery Profile

Sideline Distance between Delivery Point and Receiver (ft) ^a	SEL ^b (dB)
0	81.0
50	79.7
100	77.3
150	75.1
200	73.3
250	71.7
300	70.3
350	69.1
400	68.1
450	67.1
500	66.2

Notes:

a) Distance is along ground from delivery point to receiver.

The distance of 0 feet represents a receiver directly underneath the UA.

b) Delivery profile starting directly over delivery point at an altitude of 230 feet AGL, and remaining over the delivery point through descent, unhooking of the package, and climb back to an altitude of 230 feet AGL.

Source: FAA February 17, 2022

Table 8. Estimates of En Route SEL

Configuration ^a	Applicable Flight Phase	Distance between Source and Microphone (ft)	SEL (dB)
Maximum	En route outbound	216	66.4
Empty	En route inbound	216	62.8

Note: a) Level flight at 29 knots

Source: FAA February 17, 2022

Amazon MK27-2 UA

Noise measurements of the Amazon Prime Air MK27-2 UA were collected at the Pendleton UAS Range located at the Eastern Oregon Regional Airport (KPDT) in Pendleton, Oregon in April 2021. The FAA then processed and analyzed the measurement data to calculate estimated noise levels for five flight phases (takeoff, transitions to and from vertical to horizontal flight, en route, delivery, and landing). The FAA provided the acoustical data used for environmental analysis in a report that was included as Attachment A to the Amazon noise report.

The data presented in the FAA report included SELs corresponding to each flight phase. The estimated SELs for the vertical portions of flight near takeoff, landing, and delivery locations were provided by sets of tables (**Tables 9 – 11**) and with a corresponding formula (Equation 1) providing a curve fit for the estimation of SEL at various receiver distances. During en route flight, the MK27-2 tilts forward approximately 90 degrees and is aided by lift generated from the wings bridging the space between each propeller motor. After takeoff and prior to delivery descent or landing, there is a transition phase between fully vertical and en route flight modes. SELs for this transition phase were presented in a single table of SEL as a function of distance from takeoff, landing, and delivery locations (**Table 12**). SELs



for en route flight at were presented for one under track and three laterally offset receiver positions (88, 142, and 197 feet). The en route SEL for the 88-foot lateral offset position was highest at 67.7 dB and therefore used in all subsequent analysis as a the most conservative representation of en route noise (Table 13).

$$SEL = m \times \log_{10}(d) + b, dB \tag{1}$$

Table 9. Parameters for Estimating Sound Exposure Level for Takeoff versus Distance

Range for d (ft from launch pad)	m	b
32.8 to 49.2	-9.09	109.47
49.2 to 65.6	-16.41	121.86
65.6 to 85.3	-26.39	140
85.3 to 142.2	-27.79	142.71
142.2 and greater	-23.39	134.99

Note: Distance is along ground from launch pad to receiver.

Source: FAA, August 4, 2022 (Attachment A)

Table 10. Parameters for Estimating Sound Exposure Level for Landing versus Distance

Range for d (ft from landing pad)	m	b
32.8 to 49.2	-9.26	108.81
49.2 to 65.6	-8.8	108.05
65.6 to 85.3	-17.1	123.12
85.3 to 142.2	-24.56	137.53
142.2 and greater	-23.39	134.99

Note: Distance is along ground from landing pad to receiver.

Source: FAA, August 4, 2022 (Attachment A)

Table 11. Parameters for Estimating Sound Exposure Level for Delivery versus Distance

Range for d (ft from delivery point)	m	b
32.8 to 49.2	-5.85	105.35
49.2 to 65.6	-7.2	107.64
65.6 to 85.3	-16.92	125.3
85.3 to 142.2	-26.31	143.42
142.2 and greater	-21.9	133.91

Note: Distance is along ground from delivery point to receiver.

Source: FAA, August 4, 2022 (Attachment A)

Table 12. Estimated Sound Exposure Levels from Transition Phase of Flight Profile at 165' Above Ground Level

Distance from launch pad, landing pad or delivery point (ft)	SEL (dB)
0	69.9
100	70.6
200	70.3
400	69.4
800	68.2
1600	67.7
3200	67.7

Source: FAA, August 4, 2022 (Attachment A)

Table 13. Estimates of En Route SEL

Aircraft Config	Reference air speed (KTS)	Reference Altitude (ft AGL)	SEL (dB)
Max Weight	52.4	165	67.7

Source: FAA August 4, 2022

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3 Methodology for Data Analysis

The previously described data sets were used to develop a method to estimate community noise exposure that could result from UA package delivery operations. The operations would originate from a single delivery hub location within each proposed area of operations and occur daily between the hours of 7:00 AM and 10:00 PM. Numbers of daily and equivalent annual delivery operations would vary for different operating areas. There are currently no standardized tools or processes in place to conduct a noise assessment for the proposed operational scenario and UA; therefore, HMMH, with detailed technical guidance from the FAA Office of Environment and Energy, developed a customized noise exposure prediction process based on the available data to conduct this analysis. The process was developed around FAA’s understanding of typical use of UA by existing Part 135 package delivery operators. The following subsections describe the noise analysis methodology.

3.1 Application of Operations

The DNL metric applies a 10 dB weighting for operations between 10 PM and 7 AM. The 10 dB weighting is mathematically equivalent to 10 times the number of operations. Therefore, the operations near point i can be weighted to develop a daytime equivalent number of operations ($N_{Equiv,i}$). The generalized form is expressed in Equation (2).¹⁰

$$N_{Equiv,i} = W_{Day} \times N_{Day,i} + W_{Eve} \times N_{Eve,i} + W_{Night} \times N_{Night,i} \quad (2)$$

Where:

- $N_{Day,i}$ is the number of user-specified operations between 7 AM and 7 PM local time
- $N_{Eve,i}$ is the number of user-specified operations between 7 PM and 10 PM local time
- $N_{Night,i}$ is the number of user-specified operations between 10 PM and 7 AM local time
- W_{Day} is the day-time weighting factor, which is 1 operation for DNL
- W_{Eve} is the evening weighting factor, which is 1 operation for DNL
- W_{Night} is the night-time weighting factor, which is 10 operations for DNL

For the DNL metric, the number of DNL daytime equivalent operations, $N_{DNL,i}$ simplifies to

$$N_{DNL,i} = N_{Day,i} + N_{Eve,i} + 10 \times N_{Night,i} \quad (3)$$

In practice, Equation (2) can be further simplified by defining the user-defined operations between 7 AM and 10 PM as a single value, rather than tracking $N_{Day,i}$ and $N_{Eve,i}$ separately.

¹⁰ Equation (2) includes the three time periods of day, evening, night for consistency with other FAA documents that discuss the development of time averaging metrics such as DNL from individual SELs when operations during the evening are weighted differently.

3.2 Delivery Hub Infrastructure

As noted in Section 2.1.2, UA package deliveries would emanate from a delivery hub location. A single delivery hub is anticipated to typically support multiple sets of launch and landing pads. For the purpose of the noise analysis, only one delivery hub is considered at a time. All the operations for the hub (all the launch and landing pads) are considered to be collocated at the centroid of the hub.

3.3 Application of Acoustical Data

The DNL at a location can be estimated with a summation of the SELs.

For the purpose of calculating SEL, four specific activities are considered:

- The UA taking off from the hub and climbing to en route altitude;
- En route travel of the UA between the hub, the delivery point, and return;
- Delivery maneuvers of the UA at the delivery point; and
- Landing related activities of the UA at the hub.

The following subsections develop the estimated SELs for the four specific activities as identified above using the data presented in Section 2.

3.3.1 Approach and General Assumptions

This analysis is based on the acoustic data referenced and presented in Section 2. The minimum distance for which measurements are available varied for each UA from 20 feet to 50 feet.

The analysis presented in this section provides estimates of expected SELs resulting from a hybridization of typical operations from the four UA detailed in Section 2. The DNLs can be calculated with a summation of the SELs estimated to occur over a range of distance from each flight phase. For all UA except the 7000W-A, the source SEL data provided for takeoff, landing, and delivery associated with each flight phase was provided as a function of distance from those locations. For the 7000W-A, the aforementioned source data does not directly indicate noise exposure from UA operations over a range of distance from those locations. Therefore, the available data was utilized to develop aircraft SELs as a function of the aircraft speed and distance to the aircraft by integrating over discrete time intervals.

The 7000W-A's flight profile was separated into discrete time intervals. Each interval was assigned a time duration, fixed to one second in the analysis. For each single discrete time interval, the aircraft's performance state (hover, climb, descend, accelerating, level flight/en route) are identified and aircraft's position, altitude, speed and acceleration are estimated.¹¹ The applicable en route SEL or the available L_{Amax} hover noise data was assigned to the interval, and the slant distances at the start and end of the

¹¹ This process using the equations of motion to fill in various elements of the profile that were not specifically provided. The equations of motion provide relationships of an object's position, speed and time. Acceleration is assumed to be constant across multiple time intervals while speed is changing.

time interval is calculated. The noise levels for the start and end of each segment were numerically integrated using the trapezoidal rule to develop a one second partial SEL associated with each interval.¹²

This method assumes the LAmax measurements are omnidirectional (valid for all orientations around the aircraft). This method also assumes the sound level at the receiver is solely a function of distance to the aircraft with no additional atmospheric attenuation or propagation effects. Upon completion of this process, data for SEL as a function of distance was available for all four UA.

UA package delivery operations considered in the PEA could be from any combination of the four referenced UA or any other yet unmeasured UA with similar characteristics and operating procedures. Because of this, it is useful to evaluate potential noise exposure based on an aggregate representation of all currently operating Part 135 package delivery UA. Among the available data, three UA are more similar in weight. Those three UA are the 7000W-A, Matternet Model M2, and Flytrex FTXM600P. The MK27-2 UA is heavier and differs from the M2 and FTXM600P due to the use of additional wing generated lift during en route flight. Because of these characteristics, noise exposure estimations in this assessment are evaluated for two groupings of the available UA data. Group 1 consists of the lighter weight 7000W-A, Matternet Model M2, and Flytrex FTXM600P, and Group 2 consists of all four UA combined.

Noise exposure resulting from UA package delivery operations is quantified in terms of SEL and subsequently DNL, which both account for the instantaneous sound level and the total duration of sound received at a location. Due to this fact, the UA producing the highest instantaneous levels is not necessarily the UA with the highest resulting SEL and DNL noise exposures. A UA, which is less noisy in terms of instantaneous sound level, can produce higher overall noise exposure levels if the duration over which it conducts its operational activities is longer (e.g., slower ascent/descent rates, longer hover periods, and/or slower en route speeds). In order to account for all of these potential variations in this analysis with the available UA noise data, the SELs for each were compared at equivalent distances, and the maximum SEL from each of the four was identified at each distance. The maximum SEL at each distance was taken over the entire available data distance range for both UA Group 1 and Group 2. The result of this was the development of two sets of aggregate (i.e., Group 1 and Group 2) UA SELs as a function of distance. The Group 1 and Group 2 SEL data sets for each flight phase were then used for all subsequent analysis as a means of conservatively representing the potential noise exposure that could result from any of those UA or estimating it for other potential UA with characteristics similar to those within each group.

As mentioned previously, the minimum distance range for which data was available for each UA varied from 20 feet to 50 feet. In order to develop single aggregate SEL data sets for each UA group a common minimum distance had to be selected. Group 1 and Group 2 both use a minimum distance of 32.8 feet as that distance has the maximum SEL for nearest common distance of each group.

The SELs presented in the following subsections are presented at discrete distances to the UA's vertical profile relative to the point of delivery, takeoff, or landing. SELs were developed at receiver distance intervals of 1 foot between 33 feet and 2,500 feet. This was accomplished by the following for each UA:

- 7000W-A: Calculating SELs for additional receiver positions using the method described above and in the source report

¹² The numerical integration method in this application with the trapezoidal rule is limited to equal time intervals.

- Matternet Model M2: Linear interpolation of SELs for distances in between values in the provided source data tables
- Flytrex FTXM600P: Linear interpolation of SELs for distances in between values in the provided source data tables
- MK27-2: Calculating SELs for additional receiver positions using the provided curve fit formula and data tables

Finally, noise contributions from each flight phase were summed at each receiver distance via decibel addition as follows in Equation (4).

$$Combined\ SEL = 10\log_{10} \left[\sum_i^n 10^{\left(\frac{SEL_i}{10}\right)} \right],\ dB \quad (4)$$

The overall result of this approach yielded SEL as function of distance for Group 1 and Group 2 for the following:

- All flight activity associated with a delivery hub (i.e., takeoff, transition to en route outbound, transition from en route inbound, and landing)
- All flight activity associated with a delivery location (i.e., transition from en route inbound, descent for delivery, delivery, climb out, and transition to outbound en route)

3.3.2 En Route

For some UA, the flight altitudes and/or speeds represented in the available measurement data differed somewhat from the expected typical en route conditions. In these circumstances adjustments were made to the measured data to estimate SELs for UA operation at the planned typical operating conditions. This section describes the process used to make those adjustments.

Sound exposure level for a given point i (SEL_i) with the aircraft flying directly overhead at altitude (Alt_i) in feet and a ground speed (V_i) in knots, was calculated based on the guidance in *14 CFR Part 36 Appendix J, Section J36.205 Detailed Data Correction Procedures*.¹³ It should be noted that the equations presented in this Section are only applicable for an aircraft that is moving relative to a stationary receptor.

In particular, the sound exposure level adjustment for the altitude defined in 14 CFR Part 36 for a moving aircraft, is presented here as Equation (5).

$$\Delta J_1 = 12.5 \times \log_{10} \left(\frac{H_A}{H_T} \right),\ dB \quad (5)$$

where ΔJ_1 is the quantity in decibels that must be algebraically added to the measured SEL in order to estimate the SEL for a level flight path at an altitude differing from the altitude corresponding to the measured SEL; H_A is the reference height, in feet, corresponding to the measured SEL; H_T is the altitude

¹³ 14 CFR Part 36 Noise Standards: Aircraft Type and Airworthiness Certification available at <https://www.ecfr.gov/current/title-14/chapter-I/subchapter-C/part-36>

at which an estimate of the SEL is being made; and the constant (12.5) accounts for the effects on spherical spreading and duration from the off-reference altitude. The value of ΔJ_1 is 0 if H_T is equal to H_A and can be negative if H_T is greater than (higher altitude) than H_A .

The sound exposure level adjustment for speed, as defined in 14 CFR Part 36, is presented here as Equation (6).

$$\Delta J_3 = 10 \times \log_{10} \left(\frac{V_{RA}}{V_R} \right), \text{ dB} \quad (6)$$

Where ΔJ_3 is the quantity in decibels that must be algebraically added to the measured SEL noise level to correct for the influence of the adjustment of the reference speed on the duration of the measured flyover event as perceived at the noise measurement station, V_R is the speed at which the vehicle will be estimated at, and V_{RA} is the speed associated with the measured SEL.

To estimate the SEL of the UA flying en route at typical speed and altitude, the measured SEL made during overflight (SEL_M) was adjusted by combined application of equations (5) and (6). When the UA is flying at an altitude of Alt_i feet AGL and ground speed of V_i knots, Equation (7) was used to arrive at an $SEL_{adjusted}$ dB estimate for the respective phase of en route flight.

$$SEL_{adjusted} = SEL_M + 12.5 \times \log_{10} \left(\frac{Alt_A}{Alt_i} \right) + 10 \times \log_{10} \left(\frac{V_{RA}}{V_i} \right), \text{ dB} \quad (7)$$

Table 14 presets the en route SEL values for each UA. For some UA, data was available or selected for use in the analysis.

Table 14. Adjusted Estimates of En Route SEL

UA	Weight	Altitude (ft AGL)	Speed (knots)	SEL (dB)	Combined Round trip SEL (dB)
7000W-A	Max	150	51	65.2	68.2
	Empty	150	51	65.2	68.2
Matternet Model M2	Max	250	31	68.3	71.3
Flytrex FTXM600P	Max	216	29	66.4	68
	Empty	216	29	62.8	68
MK27-2	Max	165	52.4	67.7	70.7

3.3.3 Delivery Hub

Figure 7 presents the estimated SELs for all delivery hub flight activity. This includes takeoff, landing, and transitions to and from en route flight. The SEL values assume that the UA passes directly over the receiver during all flight activity except vertical ascent and descent. SEL values are shown for each individual UA as well as the resultant Group 1 and Group 2 UA aggregates. Application of the SEL should be based on the position of the launch pad at a hub and can be applied radially as a circle with the pad in the center. If the exact location of the launch pad is not known, then using an outer boundary of the delivery hub would be slightly conservative.

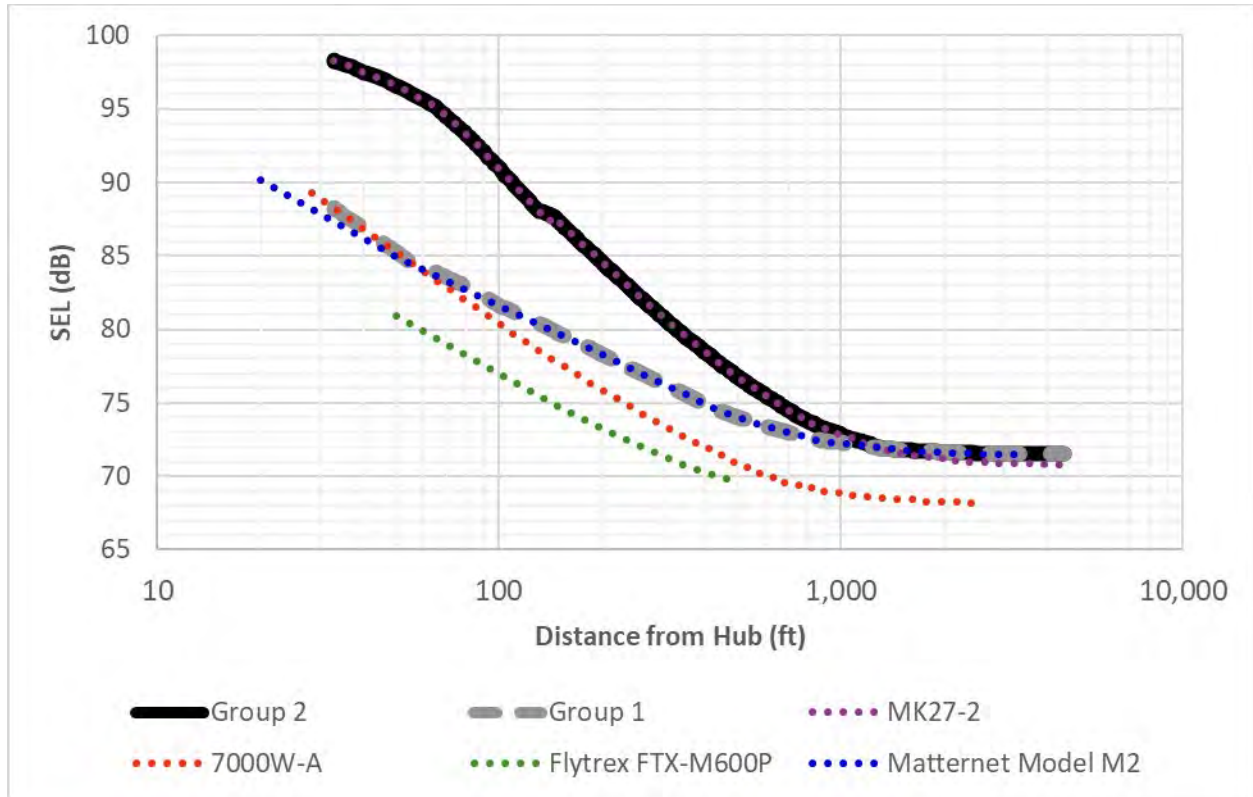


Figure 7. Delivery Hub UA Sound Exposure Levels

Source: HMMH

3.3.4 Delivery Location

Figure 8 presents the estimated SELs for all delivery location flight activity. This includes approaching at en route altitude, descending for delivery, delivery, ascending back to en route altitude, and departing the area. The SEL values assume that the UA passes directly over the receiver during all flight activity except vertical ascent and descent. SEL values are shown for each individual UA as well as the resultant Group 1 and Group 2 UA aggregates. Application of the SEL should be based on the position of the package delivery location and can be applied radially as a circle with the delivery point in the center.

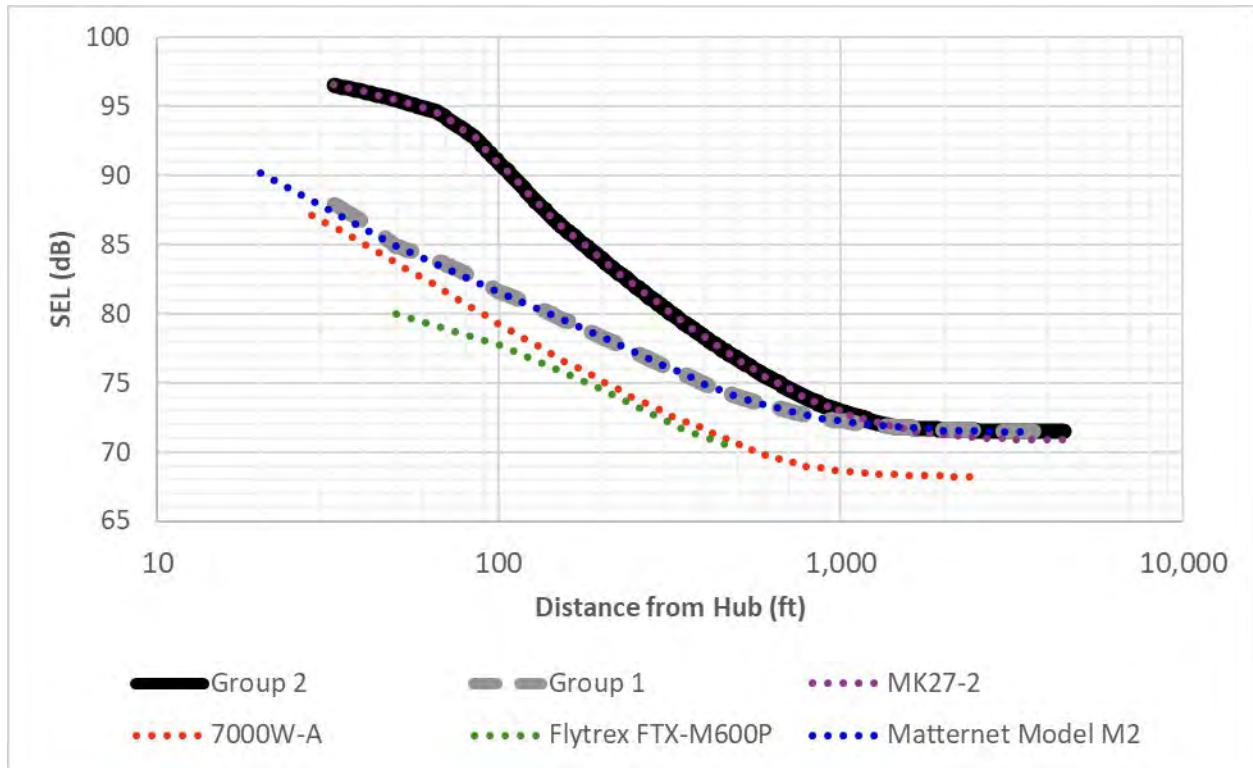


Figure 8. Delivery Location UA Sound Exposure Levels

Source: HMMH

3.4 Proposed DNL Estimation Methodology

The number of operations overflying a particular receiver on the ground will vary based on the proposed operating area and demand. For a given receiver location i , and a single instance of sound source A , the SEL for that sound source SEL_{iA} is (energy) summed for the average annual daily number of DNL daytime equivalent operations ($N_{DNL,iA}$) to compute the DNL, or equivalently, by Equation (8).

$$DNL_{iA} = SEL_{iA} + 10 \times \log_{10}(N_{DNL,iA}) - 49.4, (dB) \quad (8)$$

The above equation applies to an SEL value representing all flight activity occurring for a single delivery at a delivery hub, delivery location, or directly under en route flight as presented in **Figures 7 and 8** and Table 14. For each of the conditions presented below, results will be presented in tabular format with the estimated DNL.

3.4.1 DNL for Delivery Hubs

The takeoff and landing operations are anticipated to occur at the same location. Therefore, the results are calculated for a single set of receptors. Operations will be based on representative numbers defined in the NCDOT forecast and are assumed to be “head-to-head” in which case the takeoff and the landing flight paths are the same. Delivery hub operations are represented by a single SEL, as presented in **Figure 7**, which includes the estimated noise exposure for takeoff, landing, and transitions to and from en route flight.

3.4.2 DNL for En Route

En route includes the UA flying from a hub to a delivery location and back to a hub as discussed in Section 2.1.2. A representative receiver will be positioned directly under the flight path, and the DNL will be calculated based on the altitude and speed-adjusted delivery SEL calculated in Section 3.3.2. Operations will be based on representative numbers defined in the NCDOT forecast and assume that a receiver under the flight path will be overflown by the UA while it is traveling both outbound and inbound for a single delivery. The en route outbound noise level and the en route inbound noise level will be added together with Equation (4).

3.4.3 DNL for Delivery Locations

Operations will be based on representative numbers defined in the NCDOT forecast and are assumed to be “head-to-head” in which case the en route approach and en route departure flight paths are the same. Therefore, the results are calculated for a single set of receptors. Delivery operations are represented by a single SEL, as presented in **Figure 8**, which includes the estimated noise exposure for approaching at en route altitude, descending for delivery, delivery, ascending back to en route altitude, and departing the area. Overall exposure will include en route noise for UA flying over the delivery location en route to some other delivery location as outlined below in Section 4.

4 Noise Exposure Estimate Results

This section presents the estimated noise exposure for proposed UA package delivery operations for a given set of average annual day (AAD) deliveries. The values presented are in tabular format and use of the table requires estimating the number of DNL Equivalent deliveries associated with a delivery hub. One delivery includes the outbound takeoff and inbound landing and is representative of two operations.

The DNL Equivalent deliveries, $N_{DNL,i}$ as described in Section 3.1, is presented below as Equation (9).

$$Deliveries_{DNL,i} = Deliveries_{Day} + 10 \times Deliveries_{Night} \quad (4)$$

$Deliveries_{Day}$ are between 7 AM and 10 PM and $Deliveries_{Night}$ are between 10 PM and 7 AM. If a portion of a delivery (either takeoff or landing) occurs in the nighttime hours, then it should be counted within $Deliveries_{Night}$.

For estimating noise exposure, the noise levels for each flight phase should be considered separate based on the level of proposed operations for a given location. If a particular location is at the transition of different flight phases, the cumulative noise exposure should then be determined by adding the noise from each phase. For example, a typical mission profile will include noise from multiple flight phases:

1. UA depart from and return to a hub, including transition to and from vertical to horizontal en route flight;
2. En route flight at a defined altitude to and from a hub to a delivery point; and
3. Transition to and from horizontal en route flight to vertical flight at the delivery point, vertical descent to complete a delivery at the delivery point, and vertical ascent back to en route altitude for return to a hub.

4.1 Noise Exposure for Operations at Delivery Hub

For operations at a delivery hub, the UA-related noises include takeoff, landing, and transitions to and from en route flight. To provide a conservative view, all operations are assumed to be on the same en route flight path with outbound and inbound flights traversing it in opposite directions. For air traffic deconfliction, en route overflight of one operator's delivery hub by another operator is not anticipated. As such, the results presented here only include the air traffic associated with UA taking off or landing at a delivery hub.

Tables 15 and 16 present data for the estimated extent of DNL contours under the flight path for 45 dB through 80 dB in 5 dB increments. The distance for 62 dB DNL is also provided as a means to determine the distance at which two nearby delivery hubs might have an interacting effect that would generate 65 dB DNL (62 dB + 62 dB = 65 dB). The range of daily deliveries presented is between 1 and 1,500; however, NCDOT's forecast indicates 500 daily deliveries as the highest currently planned by any of the operators that provided data.

Table 15. Group 1 UA Estimated Extent of Noise Exposure from Delivery Hub per Number of Deliveries

Number of DNL Equivalent Deliveries Served Per Hub		Estimated Extent in Feet for								
Average Daily	Annual	DNL 45 dB	DNL 50 dB	DNL 55 dB	DNL 60 dB	DNL 62 dB	DNL 65 dB	DNL 70 dB	DNL 75 dB	DNL 80 dB
<=1	<=365	<33	<33	<33	<33	<33	<33	<33	<33	<33
<=5	<=1,825	38	<33	<33	<33	<33	<33	<33	<33	<33
<=10	<=3,650	59	<33	<33	<33	<33	<33	<33	<33	<33
<=20	<=7,300	107	44	<33	<33	<33	<33	<33	<33	<33
<=30	<=10,950	154	56	<33	<33	<33	<33	<33	<33	<33
<=40	<=14,600	199	74	<33	<33	<33	<33	<33	<33	<33
<=50	<=18,250	243	89	38	<33	<33	<33	<33	<33	<33
<=100	<=36,500	455	162	59	<33	<33	<33	<33	<33	<33
<=200	<=73,000	>2,500	297	107	44	38	<33	<33	<33	<33
<=300	<=109,500	>2,500	431	154	56	48	<33	<33	<33	<33
<=400	<=146,000	>2,500	614	199	74	59	<33	<33	<33	<33
<=500	<=182,500	>2,500	913	243	89	74	38	<33	<33	<33
<=600	<=219,000	>2,500	2,459	285	101	86	42	<33	<33	<33
<=700	<=255,500	>2,500	>2,500	328	119	96	46	<33	<33	<33
<=800	<=292,000	>2,500	>2,500	369	134	107	50	<33	<33	<33
<=900	<=328,500	>2,500	>2,500	408	147	121	54	<33	<33	<33
<=1,000	<=365,000	>2,500	>2,500	455	162	133	59	<33	<33	<33
<=1,100	<=401,500	>2,500	>2,500	509	177	144	65	<33	<33	<33
<=1,200	<=438,000	>2,500	>2,500	572	191	155	71	<33	<33	<33
<=1,300	<=474,500	>2,500	>2,500	644	204	167	76	34	<33	<33
<=1,400	<=511,000	>2,500	>2,500	725	219	179	81	35	<33	<33
<=1,500	<=547,500	>2,500	>2,500	824	232	190	85	37	<33	<33

Notes:

- a) One delivery includes the outbound takeoff and inbound landing and is representative of two operations.
- b) If a value for the number of deliveries is not specifically defined in this table, use the next highest value. For example, if there are 90 average daily DNL Equivalent deliveries, use the entry for 100 average daily DNL Equivalent deliveries.
- c) If a DNL value at an estimated extent is not specifically defined in this table, use the next highest value. For example, to determine the DNL at a distance of 100 feet for 50 daily DNL Equivalent Deliveries, use the value at 89 feet corresponding to DNL 50 dB.
- d) "<33": Limit of available data; Level falls within 33' range or is not applicable.
- e) ">2,500": En Route noise dominates beginning at 2,500 ft and greater. Refer to en route noise DNL table.

Table 16. Group 2 UA Estimated Extent of Noise Exposure from Delivery Hub per Number of Deliveries

Number of DNL Equivalent Deliveries Served Per Hub		Estimated Extent in Feet for								
Average Daily	Annual	DNL 45 dB	DNL 50 dB	DNL 55 dB	DNL 60 dB	DNL 62 dB	DNL 65 dB	DNL 70 dB	DNL 75 dB	DNL 80 dB
<=1	<=365	72	<33	<33	<33	<33	<33	<33	<33	<33
<=5	<=1,825	150	88	42	<33	<33	<33	<33	<33	<33
<=10	<=3,650	204	116	72	<33	<33	<33	<33	<33	<33
<=20	<=7,300	284	166	97	53	<33	<33	<33	<33	<33
<=30	<=10,950	348	201	114	70	51	<33	<33	<33	<33
<=40	<=14,600	408	229	127	80	64	<33	<33	<33	<33
<=50	<=18,250	462	254	150	88	72	42	<33	<33	<33
<=100	<=36,500	722	357	204	116	97	72	<33	<33	<33
<=200	<=73,000	>2,500	533	284	166	127	97	53	<33	<33
<=300	<=109,500	>2,500	696	348	201	162	114	70	<33	<33
<=400	146,000	>2,500	873	408	229	185	127	80	<33	<33
<=500	<=182,500	>2,500	1,147	462	254	204	150	88	42	<33
<=600	<=219,000	>2,500	2,459	516	276	223	162	95	51	<33
<=700	<=255,500	>2,500	>2,500	565	300	240	174	101	57	<33
<=800	<=292,000	>2,500	>2,500	619	319	255	185	106	64	<33
<=900	<=328,500	>2,500	>2,500	669	339	270	195	111	68	<33
<=1,000	<=365,000	>2,500	>2,500	722	357	284	204	116	72	<33
<=1,100	<=401,500	>2,500	>2,500	773	378	298	214	121	75	<33
<=1,200	<=438,000	>2,500	>2,500	837	394	311	224	125	78	<33
<=1,300	<=474,500	>2,500	>2,500	899	414	324	232	129	81	34
<=1,400	<=511,000	>2,500	>2,500	970	430	335	240	138	84	37
<=1,500	<=547,500	>2,500	>2,500	1,050	445	348	248	147	86	40

Notes:

- a) One delivery includes the outbound takeoff and inbound landing and is representative of two operations.
- b) If a value for the number of deliveries is not specifically defined in this table, use the next highest value. For example, if there are 90 average daily DNL Equivalent deliveries, use the entry for 100 average daily DNL Equivalent deliveries.
- c) If a DNL value at an estimated extent is not specifically defined in this table, use the next highest value. For example, to determine the DNL at a distance of 100 feet for 50 daily DNL Equivalent Deliveries, use the value at 88 feet corresponding to DNL 60 dB.
- d) "<33": Limit of available data; Level falls within 33' range or is not applicable.
- e) ">2,500": En Route noise dominates beginning at 2,500 ft and greater. Refer to en route noise DNL table.

4.2 Noise Exposure under En Route Paths

For noise estimation under en route conditions, the UA are conservatively assumed to fly the same outbound flight path between the hub and the delivery point and inbound flight path back to the hub. Therefore, each location under the en route path would be overflowed twice for each delivery served by the respective overhead en route path.

Table 17 provides the estimated DNL for a location on the ground directly under an en route path for various counts of daily average DNL Equivalent deliveries over the range of en route SEL applicable to all UA considered in the analysis and as indicated in **Table 14**. The en route noise calculated for each delivery includes both the inbound and outbound traversal of the en route path. Because the exact location of all potential delivery hubs and their applicable delivery ranges is not known, Table 17 presents estimated DNL for up to 5,000 annual average daily deliveries based on the maximum NCDOT forecast number of average daily deliveries of 4,801 for the Charlotte Metro area. However, due to the generally expected limits of UA delivery area ranges, it is highly unlikely that it would be possible for 100 percent of deliveries occurring with any of the forecast operation areas to overfly the same location as would be required to result in the estimated levels.

Table 17. Estimated Noise Exposure Directly Under En Route Flight Paths

Number of DNL Equivalent Deliveries Served by Route		DNL (dB) for AAD Deliveries Based on En Route SEL (dB)				
Average Daily	Annual	68 SEL	69 SEL	70 SEL	71 SEL	72 SEL
<=1	<=365	18.6	19.6	20.6	21.6	22.6
<=5	<=1,825	25.6	26.6	27.6	28.6	29.6
<=10	<=3,650	28.6	29.6	30.6	31.6	32.6
<=20	<=7,300	31.6	32.6	33.6	34.6	35.6
<=30	<=10,950	33.4	34.4	35.4	36.4	37.4
<=40	<=14,600	34.7	35.7	36.7	37.7	38.7
<=50	<=18,250	35.6	36.6	37.6	38.6	39.6
<=100	<=36,500	38.6	39.6	40.6	41.6	42.6
<=200	<=73,000	41.6	42.6	43.6	44.6	45.6
<=300	<=109,500	43.4	44.4	45.4	46.4	47.4
<=400	<=146,000	44.7	45.7	46.7	47.7	48.7
<=500	<=182,500	45.6	46.6	47.6	48.6	49.6
<=600	<=219,000	46.4	47.4	48.4	49.4	50.4
<=700	<=255,500	47.1	48.1	49.1	50.1	51.1
<=800	<=292,000	47.7	48.7	49.7	50.7	51.7
<=900	<=328,500	48.2	49.2	50.2	51.2	52.2
<=1,000	<=365,000	48.6	49.6	50.6	51.6	52.6
<=1,500	<=547,500	50.4	51.4	52.4	53.4	54.4
<=2,000	<=730,000	51.6	52.6	53.6	54.6	55.6
<=3,000	<=1,095,000	53.4	54.4	55.4	56.4	57.4
<=4,000	<=1,460,000	54.7	55.7	56.7	57.7	58.7
<=5,000	<=1,825,000	55.6	56.6	57.6	58.6	59.6

4.3 Noise Exposure for Operations at Delivery Point

For operations at a delivery location, the UA-related noises include approaching at en route altitude, descending for delivery, delivery, ascending back to en route altitude, and departing the area. To provide a conservative view, all operations are assumed to be on the same en route flight path with inbound and outbound flights traversing it in opposite directions. **Tables 18 and 19** present the estimated DNL values for a range of potential daily average DNL Equivalent delivery counts at a delivery point. Values were calculated at distances of 32.8 feet, 50 feet, 75 feet, 100 feet, and 125 feet from the delivery point and are representative of distances from which nearby properties may experience noise from a delivery.¹⁴

Table 18. Group 1 UA Estimated Noise Exposure at Various Distances from a Delivery Point per Number of Deliveries

Average Daily DNL Equivalent Deliveries	Annual DNL Equivalent Deliveries	Estimated Delivery DNL at 32.8 feet	Estimated Delivery DNL at 50 feet	Estimated Delivery DNL at 75 feet	Estimated Delivery DNL at 100 feet	Estimated Delivery DNL at 125 feet
<=1	<= 365	38.6	35.5	33.9	32.2	31.3
<=5	<= 1,825	45.6	42.5	40.9	39.2	38.3
<=10	<= 3,650	48.6	45.5	43.9	42.2	41.3
<=20	<= 5,475	51.6	48.5	46.9	45.2	44.3
<=30	<= 7,300	53.3	50.3	48.7	47.0	46.1
<=40	<= 14,600	54.6	51.6	49.9	48.3	47.3
<=50	<= 21,900	55.6	52.5	50.9	49.2	48.3
<=100	<= 29,200	58.6	55.5	53.9	52.2	51.3
<=200	<= 36,500	61.6	58.5	56.9	55.2	54.3
<=300	<= 43,800	63.3	60.3	58.7	57.0	56.1
<=400	<= 51,100	64.6	61.6	59.9	58.3	57.3
<=500	<= 58,400	65.6	62.5	60.9	59.2	58.3

¹⁴ The 2022 US Census national average lot size for single-family sold homes was 15,265 square feet. This is representative of a property with dimensions of a 123.55-by-123.55-foot square. The 125 feet represents a 125-foot lateral width of the parcel rounded up to the nearest 25 feet. <https://www.census.gov/construction/chars/> See file "Soldlotsize_cust.xls" sheet MALotSizeSold. Accessed December 6, 2023.



Table 19. Group 2 UA Estimated Noise Exposure at Various Distances from a Delivery Point per Number of Deliveries

Average Daily DNL Equivalent Deliveries	Annual DNL Equivalent Deliveries	Estimated Delivery DNL at 32.8 feet	Estimated Delivery DNL at 50 feet	Estimated Delivery DNL at 75 feet	Estimated Delivery DNL at 100 feet	Estimated Delivery DNL at 125 feet
<=1	<= 365	47.2	46.1	44.3	41.5	39.0
<=5	<= 1,825	54.2	53.1	51.3	48.5	46.0
<=10	<= 3,650	57.2	56.1	54.3	51.5	49.0
<=20	<= 5,475	60.2	59.1	57.3	54.5	52.0
<=30	<= 7,300	62.0	60.9	59.1	56.3	53.8
<=40	<= 14,600	63.3	62.2	60.4	57.6	55.1
<=50	<= 21,900	64.2	63.1	61.3	58.5	56.0
<=100	<= 29,200	67.2	66.1	64.3	61.5	59.0
<=200	<= 36,500	70.2	69.1	67.3	64.5	62.0
<=300	<= 43,800	72.0	70.9	69.1	66.3	63.8
<=400	<= 51,100	73.3	72.2	70.4	67.6	65.1
<=500	<= 58,400	74.2	73.1	71.3	68.5	66.0

Additionally, en route flight paths could overfly package delivery locations, resulting in combined noise exposure from both. In such cases, the DNL values from Table 17 and Tables 18 or 19 can be combined to determine the total noise exposure. Section 5 provides instructions on combining DNL from multiple sources of noise. For example, considering 72 dB SEL en route overflights from 500 daily deliveries, the combined noise with a location receiving 5 daily package deliveries would be 51.1 or 55.5 dB DNL for groups 1 and 2, respectively, at a distance of 32.8 feet from the delivery location.

5 Cumulative Noise Exposure

For instances where the proposed UA package delivery operations would occur in areas subject to other aviation noise sources, it is necessary to evaluate the cumulative noise exposure that would result from the other aviation noise sources present. Examples of such scenarios are UA package delivery operations occurring in the vicinity of an airport and where package delivery area ranges from multiple delivery hubs may overlap with one another.

FAA Order 1050.1F *Environmental Impacts: Policies and Procedures* and the associated *1050.1F Desk Reference* defines the criteria for changes in noise exposure resulting from a proposed action and cumulative effects that are considered reportable and/or significant. *Order 1050.1F Section 4-3.3 Significance Thresholds* states the following pertaining to the environmental impact category of Noise and Noise Compatible Land Use.

The action would increase noise by DNL 1.5 dB or more for a noise sensitive area that is exposed to noise at or above the DNL 65 dB noise exposure level, or that will be exposed at or above the DNL 65 dB level due to a DNL 1.5 dB or greater increase, when compared to the no action alternative for the same timeframe. For example, an increase from DNL 65.5 dB to 67 dB is considered a significant impact, as is an increase from DNL 63.5 dB to 65 dB.

Additionally, *Order 1050.1F Appendix B Section B-1.4 Environmental Consequences* requires additional reporting for air traffic airspace and procedure actions where the study area is larger than the immediate vicinity of an airport. In such cases, noise exposure assessments should identify where noise will change by the following specified amounts:

1. For DNL 65 dB and higher: +1.5 dB
2. For DNL 60 dB to <65 dB: +3 dB
3. For DNL 45 dB to <60 dB: +5 dB

The FAA refers to noise changes meeting criteria 1 as “significant” and those meeting criteria 2 and 3 as “reportable.” **Figure 9** presents the relationship between the dB difference in two noise sources and the increase resulting from the summation of those noise sources. The FAA’s change criteria of plus 1.5, 3, and 5 dB are also plotted on the curve for reference.

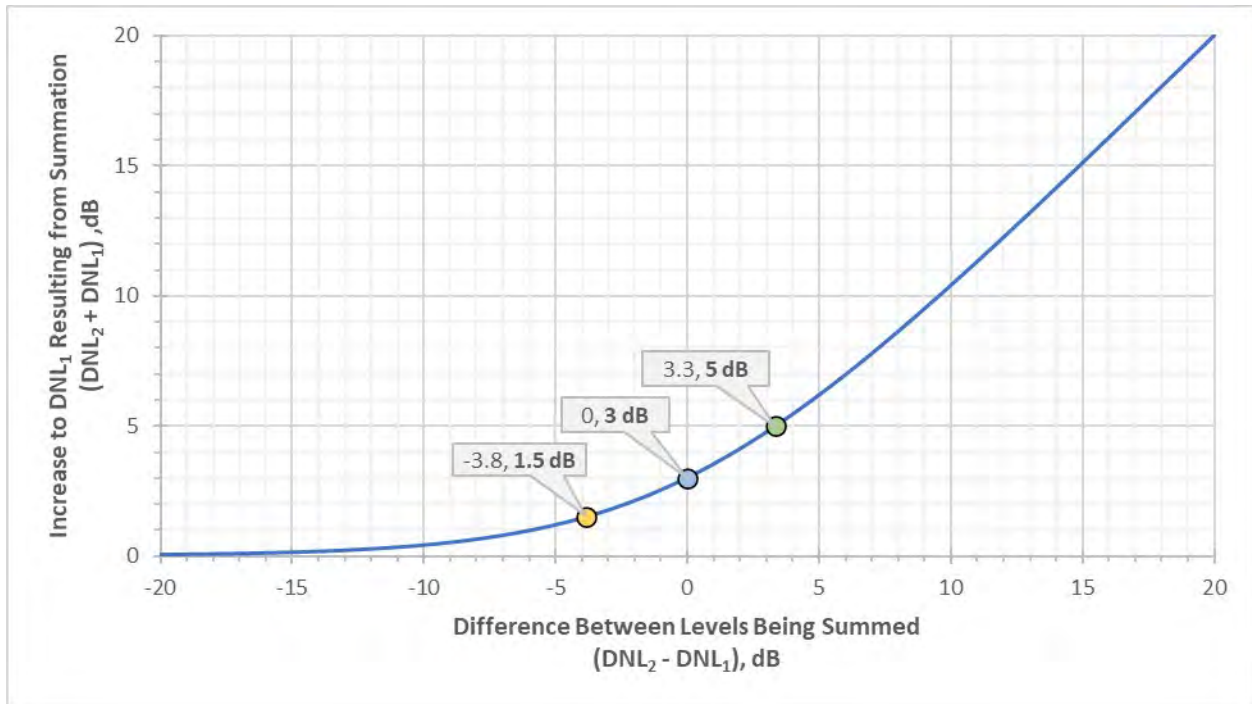


Figure 9. dB Increase Resulting from DNL Summation

Source: HMMH

Potential increases to DNL resulting from cumulative aviation noise effects can be evaluated with Figure 9 by considering the proposed action noise exposure as DNL₂ and the sum of all other aviation noise sources at the same location as DNL₁. If the difference between DNL₂ and DNL₁ is:

- Less than -3.8 dB, the increase in DNL would be less than 1.5 dB.
- From -3.8 dB up to but not including 0 dB, the increase in DNL would range from 1.5 dB up to but not including 3 dB.
- From 0 dB up to but not including 3.3 dB, the increase in DNL would range from 3 dB up to but not including 5 dB.
- 3.3 dB or greater, the increase in DNL would be 5 dB or greater.

Beyond differences of +/- 15 dB, the curve becomes asymptotic to a slope of 1 and 0, illustrating that the addition of noise levels with differences greater than that results in effectively no increase from the higher of the two noise source levels being summed.

For the noise assessments used in official environmental review documentation, the exact resulting combined noise exposure levels and associated changes should be calculated by use of Equation (4) presented earlier in Section 3.3.1 (substituting DNL for SEL). An example of applying Equation 4 to three aviation noise sources is presented in **Table 20**.

Table 20. Cumulative Noise Calculation Example

Noise Source	Noise Source Description	Single Source DNL (dB)	$10^{(DNL/10)}$	Combined Source DNL (dB) $10 * \text{Log}_{10}(10^{(DNL/10)})$
1	Proposed Action (PA)	42	15848.9	-
2	Airport	55	316227.8	-
3	Other UAS	40	10000.0	-
2+3	Airport + Other UAS	-	326227.8	55.1
1+2+3	PA + Airport + Other UAS	-	342076.7	55.3
Delta	Change in Cumulative Noise	-	-	0.2

APPENDIX E
NATIONAL HISTORIC PRESERVATION ACT
SECTION 106 CONSULTATION AND
TRIBAL CONSULTATION

SHPO CONSULTATION



U.S. Department
of Transportation

**Federal Aviation
Administration**

Aviation Safety

800 Independence Ave., SW.
Washington, DC 20591

Via Email

Mr. Luan Cao
North Carolina Department of Natural and Cultural Resources
State Historic Preservation Office
4617 Mail Service Center
Raleigh, North Carolina 27699-4617
Email: Environmental.Review@ncdcr.gov

RE: Section 106 Consultation Initiation and Identification of the Area of Potential Effects for Drone Package Delivery Operations in North Carolina

Dear Mr. Cao:

As discussed in a pre-consultation meeting on August 17, 2023, the Federal Aviation Administration (FAA) is preparing a programmatic environmental assessment (PEA) to assess the potential environmental impacts of the FAA's action of authorizing commercial Unmanned Aircraft Systems (UAS) operators to deliver goods to customers (referred to as package delivery) using unmanned aircraft (UA; also referred to as drones) in accordance with 14 Code of Federal Regulations (CFR) Part 135 (Part 135) in the state of North Carolina. Since 2019, the FAA has been issuing air carrier certificates to UAS operators in accordance with Part 135 so that operators can conduct package delivery flights. Generally, these approvals are associated with issuing a new or amended Part 135 air carrier Operations Specifications (OpSpec)¹ as the operative approval.

The North Carolina Department of Transportation (NCDOT) has been a lead partner in the FAA's drone integration partnership programs since 2017. In this role, NCDOT is collaborating with partners to test and prove operations that can gain FAA approvals to expand beyond visual line of sight and other complex operations in the state. Within the state of North Carolina, NCDOT has the authority to implement and manage regulations pertaining to state laws as set by the North Carolina General Assembly concerning drone operations. To support the development of the PEA, NCDOT developed a forecast for future Part 135 UAS package delivery operations in North Carolina out to year 2030. The FAA used the forecast to identify operating areas where UAS package delivery operations are likely to occur between 2024 and 2030 and to define the levels of UAS activities that may be expected based on existing and future market analyses.

The FAA intends to use the PEA and associated interagency consultations to comply with its environmental review requirements for requests for authorizations from individual UAS operators proposing to conduct package drone delivery operations in North Carolina. Upon receiving an authorization request from an

¹ An OpSpec is a document that defines the scope of aircraft operations the FAA has authorized.

operator, the FAA would evaluate the proposal (application) against the PEA and associated interagency consultations to determine if the proposal and its potential environmental impacts fall within the scope of the PEA and consultations. If the proposal and its potential effects fall outside the scope of the PEA and consultations, the FAA would conduct further environmental review.

The FAA has determined the proposed action of issuing authorizations for commercial UAS package delivery in North Carolina is an undertaking as defined under the regulations implementing Section 106 of the National Historic Preservation Act (36 CFR § 800.16(y)). The purpose of this letter is to initiate Section 106 consultation with the State Historic Preservation Officer (SHPO) and request concurrence on the definition of the Area of Potential Effects (APE). The FAA is also requesting input from the SHPO on identification of any other consulting parties.

Project Description

The proposed undertaking includes the various FAA approvals associated with authorizing drone package delivery under Part 135 within seven operating areas (predominantly metro areas) in North Carolina through the year 2030. As noted above, generally, the approval is associated with issuing a new or amended OpSpec to an individual UAS operator. NCDOT has projected Part 135 drone package delivery operations for the state of North Carolina out to year 2030 and provided that projection to the FAA for analysis.

The type, size, and weight of UA used to deliver packages could vary, but NCDOT anticipates that multi-copter platforms will be the primary type of UA used to deliver small packages in the next seven years. While NCDOT’s forecast considered fixed-wing platforms, the only fixed-wing operator in service in North Carolina at the time NCDOT developed the forecast has since decommissioned its flight operations in North Carolina. It is possible that a hybrid (rotary wing and fixed-wing) vehicle could be in operation in the next five years; however, specific details for this type of vehicle are currently unknown.

Drone delivery distances depend on the UA’s battery duration, which can be influenced by weather and other factors. Delivery distances for a rotary-wing UA typically range from 3–10 miles one-way or 6–20 miles roundtrip, with durations of 5–20 minutes one-way or 10–40 minutes roundtrip. Cruising altitudes for drone package deliveries are typically 150–375 feet above ground level (AGL) and would not exceed 400 feet AGL to adhere to FAA requirements. The characteristics of the UAS considered in this consultation are displayed in **Table 1**. Applications involving proposed operations that deviate from the characteristics listed in **Table 1** may require additional environmental review.

Table 1. UAS Characteristics Evaluated

Characteristic	Criteria
Platform/Vehicle Type	Multi-copters (2–8 propellers), fixed-wing, and hybrid aircraft (vertical lift with fixed-wing cruise)
Power	Electric motor
Delivery Mechanism Types	Drop off, tethered (wire/cable), customer unloads, ground drop, parachute
Maximum Aircraft Weight	Approximately 87 pounds
Maximum Payload (Package) Weight	Approximately 5 pounds
Maximum Aircraft Takeoff Weight	Approximately 92 pounds
Typical Cruise Altitude	150–375 feet above ground level
Maximum Cruise Altitude	400 feet above ground level
Hours of Operation	7:00 a.m. to 10:00 p.m.
Operation Days	7 days per week, 365 days per year

General Description of Operations

While UA come in varying sizes with varying flight capabilities, the flight operations can generally be categorized into the following five phases: 1) takeoff and climb, 2) en route outbound, 3) delivery, 4) en route inbound, and 5) descent and landing (see **Attachment A, Figure 1**). In general, package delivery operators partner with established businesses and identify the location for a hub at the business's parking lot, rooftop, or other area where it is not disruptive to the business and does not present a safety hazard. This allows the drone operator to conduct operations with minimal infrastructure requirements and no ground disturbance activities. Prior to takeoff, packages are manually loaded onto the UA by a ground crew at the hub. The UA then climbs and performs aerial deliveries following a predetermined flight path that is set using software that assigns, deconflicts, and routes each flight. After delivery, the UA returns to its hub via a predetermined flight path.

Takeoff

The takeoff and climb phase is described as the portion of the flight in which a fully loaded UA takes off from the hub and climbs vertically. The UA may then hover briefly as it conducts various systems checks to ensure it is functioning properly. With a multi-rotor design, the UA can take off and descend vertically, as well as hover. Typical flights begin with the UA departing from a hub and ascending vertically to no more than 400 feet AGL.

En Route Outbound

The en route outbound phase is defined as the part of the flight in which the fully loaded UA flies a pre-programmed route from its hub to a delivery point. During this flight phase, typical normal cruising speeds range from 30–60 knots (35–70 miles per hour) and normal cruising altitudes range from 150–375 feet AGL.

Delivery

The delivery phase is defined by descent from the en route outbound phase to a delivery point to deliver a package. Upon arrival at the delivery point, the UA descends vertically to deliver the package. The UA may hover at an altitude that varies in height. Most UA use a tether to lower the package from the UA to the ground while the drone hovers. Once the UA releases the package from the tether, it climbs vertically to the cruise altitude and begins the en route inbound phase. The delivery process typically takes 30–90 seconds, depending on the operator.

En Route Inbound

Upon completion of a delivery, the UA flies from the delivery point back to a hub.

Descent and Landing

Upon reaching the hub, the UA vertically descends, lands, and turns off its rotors.

Predicted Sound Levels

The FAA conducted a noise analysis using available noise data for all currently operating Part 135 multi-copter UA. The four multi-copter UA currently in use for Part 135 package deliveries and their associated maximum takeoff weights (MTOW) are the Amazon Prime Air MK27-2 (91.5 pounds MTOW), Wing Hummingbird 7000W-B (15 pounds MTOW), Causey Flytrex FTX-M600P (33.4 pounds MTOW), and UPS Flight Forward Matternet M2 (29.1 pounds MTOW). For the noise analysis, these four UA were assessed in two groupings: UA ranging from approximately 15–34 pounds MTOW (Group 1) and UA ranging from

15–92 pounds MTOW (Group 2). For each grouping, the FAA calculated the maximum sound exposure level (SEL)² for distances ranging from 32.8 feet to 2,500 feet.

The estimated maximum SEL for all flight phases of Group 2 (the heavier group) is 96.6 decibels (dB) occurring at 32.8 feet from a delivery point. Noise from Group 1 (the lighter group) is lower, with a maximum SEL of 87.9 dB at the same location. The maximum SEL of all UA for the en route phase is 67.8 dB for a UA flying 31 knots at 250 feet AGL. This maximum en route SEL of 67.8 dB would occur at distances of 2,500 feet or greater for receivers directly under the UA flight path. For distances between 32.8 and 2,500 feet from a hub or delivery point, the SEL directly under a UA flight path would be between 87.9 dB and 67.8 dB. The majority of package delivery UA are expected to fall into the 14 CFR Part 107 small UA classification of under 55 pounds MTOW and are likely to have noise levels similar to the lighter group (Group 1).

Operating Areas

In general, Part 135 UAS package delivery operators prefer areas where they can serve the most customers while flying the least distance. In addition, operators look for communities with median incomes sufficient to support spending extra money on drone package delivery services. Finally, operators need enough unrestricted airspace to operate with minimal physical restrictions.

Based upon these parameters, as well as existing UAS package delivery operations in North Carolina, NCDOT identified seven regions within North Carolina as likely operating areas for UAS package deliveries in the next seven years. These operating areas include Asheville, Charlotte Metro (including Kannapolis), Piedmont Triad (Winston-Salem, High Point, and Greensboro), Research Triangle (Raleigh, Durham, Chapel Hill, and adjacent communities), Sandhills (Pinehurst, Raeford, and Fayetteville), Greenville, and Wilmington (see **Attachment A, Figures 2–9**). The operating areas exclude special use airspace because drone package delivery operations would not be allowed in these areas.

The FAA has previously analyzed the potential environmental impacts of Part 135 drone package delivery operations in some of the operating areas:³

- UPS Flight Forward in Winston-Salem (Piedmont Triad)
 - In 2021, the FAA completed an EA and issued a Finding of No Significant Impact (FONSI) for UPS Flight Forward drone package delivery operations in Winston-Salem. The FAA determined its undertaking had no potential to affect historic properties and notified the SHPO. The FAA received a response from the SHPO (July 29, 2020) acknowledging the finding and stating no comment.
 - In 2022, the FAA completed another EA and issued a FONSI for UPS Flight Forward drone package delivery operations in Winston-Salem. This EA considered more daily deliveries than the 2021 EA (up to 112 deliveries per day from one distribution center). The FAA determined its undertaking had no potential to affect historic properties and notified the SHPO. The FAA received a response from the SHPO (May 27, 2022) stating: “[w]e understand that the FAA has determined that this new approval has no potential

² Sound exposure level (SEL) is a single event metric that considers both the noise level and duration of the event, referenced to a standard duration of one second.

³ Refer to the FAA’s “National Environmental Policy Act (NEPA) and Drones” website at: https://www.faa.gov/uas/advanced_operations/nepa_and_drones.

to effect historic properties and again concur with your finding of no effect on historic properties.”

- Causey Aviation Unmanned, Inc. / Flytrex in Fayetteville, Holly Springs, Raeford, and Pinehurst
 - In 2022, the EA completed an EA and issued a FONSI for Causey Aviation Unmanned, Inc. / Flytrex package delivery operations. The EA considered up to 104, 79, 45, and 60 deliveries per day in Fayetteville,⁴ Holly Springs, Pinehurst, and Raeford, respectively. The operating area was modified to exclude the Pinehurst Historic District and National Historic Landmark. The FAA received responses from the SHPO (October 14, 2020; November 16, 2020; February 12, 2021; March 4, 2021; September 16, 2021; and March 8, 2022) stating: “[w]e have conducted a review of the project and are aware of no historic resources which would be affected by the project. Therefore, we have no comment on the project as proposed.”
- Zipline International, Inc. in Kannapolis
 - In 2022, the FAA completed an EA and issued a FONSI for Zipline International, Inc. package delivery operations in Kannapolis. This EA considered up to 20 deliveries per day.⁵ The FAA determined its undertaking had no potential to affect historic properties and notified the SHPO. The FAA received a response from the SHPO (February 21, 2022) stating: “[w]e have conducted a review of the project and are aware of no historic resources which would be affected by the project. Therefore, we have no comment on the project as proposed.”

Area of Potential Effects

In accordance with 36 CFR § 800.4(a)(1), the FAA has defined the APE in consideration of the undertaking’s potential direct and indirect effects. The APE consists of the operating areas outlined in **Attachment A, Figures 2–9**. The operating areas capture all possible flight routes to the delivery areas and where potential effects (e.g., visual, auditory) to historic properties could occur. The FAA is seeking concurrence from the SHPO on the APE.

Conclusion

The FAA requests your concurrence on the definition of the APE. The FAA also seeks input on the identification of any other consulting parties. Your response within the next 30 days will greatly assist us in our environmental review process. If you have any questions or need additional information, please contact Mr. Nicholas Baker via e-mail at 9-AWA-AVS-AFS-ENVIRONMENTAL@faa.gov.

Sincerely,

Jay Kinser
Manager, Strategic Programs Branch
UAS Integration Office

⁴ Causey has decommissioned drone package delivery operations in Fayetteville.

⁵ Zipline has since decommissioned operation of its fixed-wing drone in Kannapolis.

ATTACHMENT A
FIGURES

Typical Flight Profile

Typical Flight Duration: 10–40 minutes round-trip

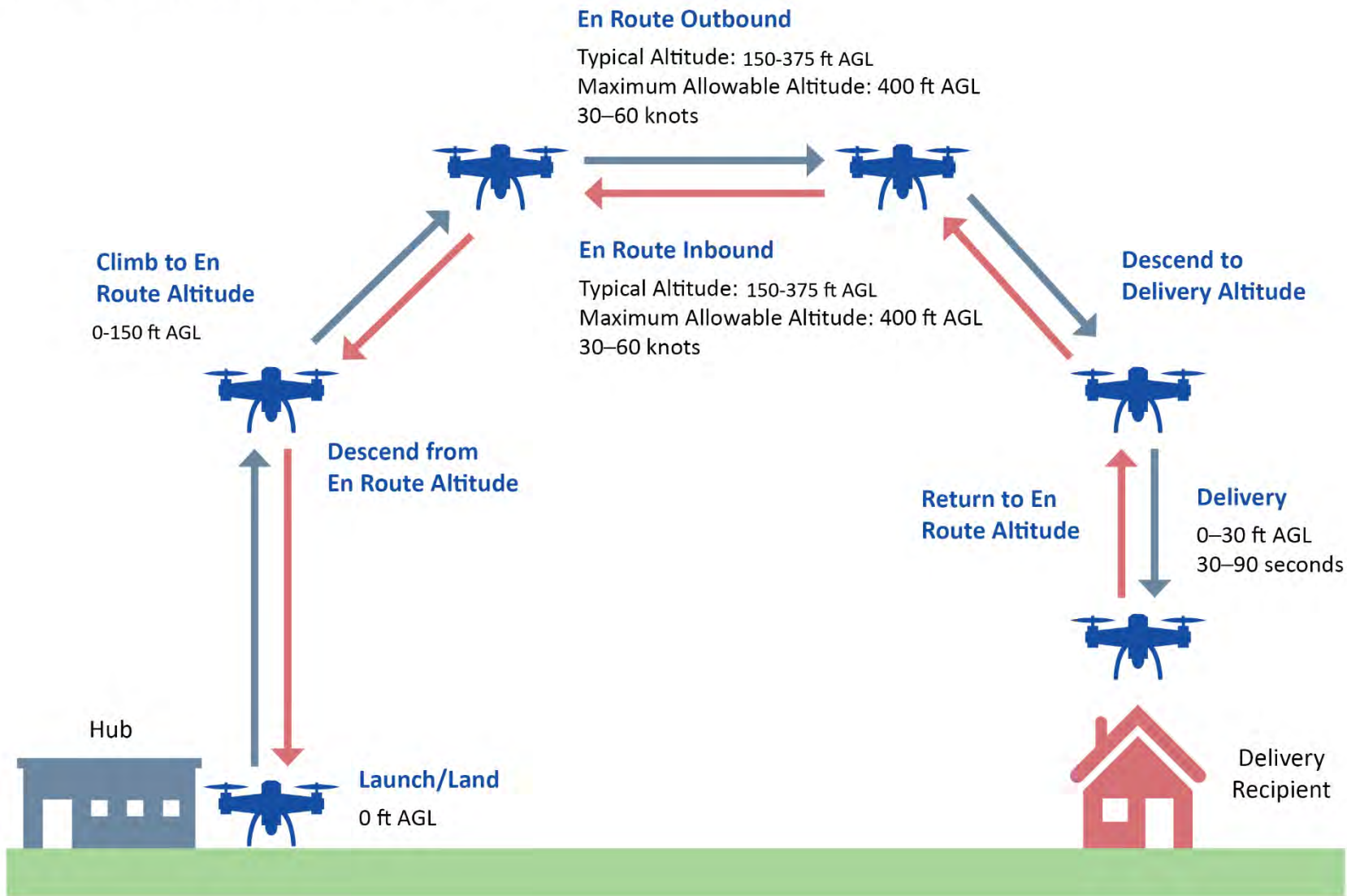
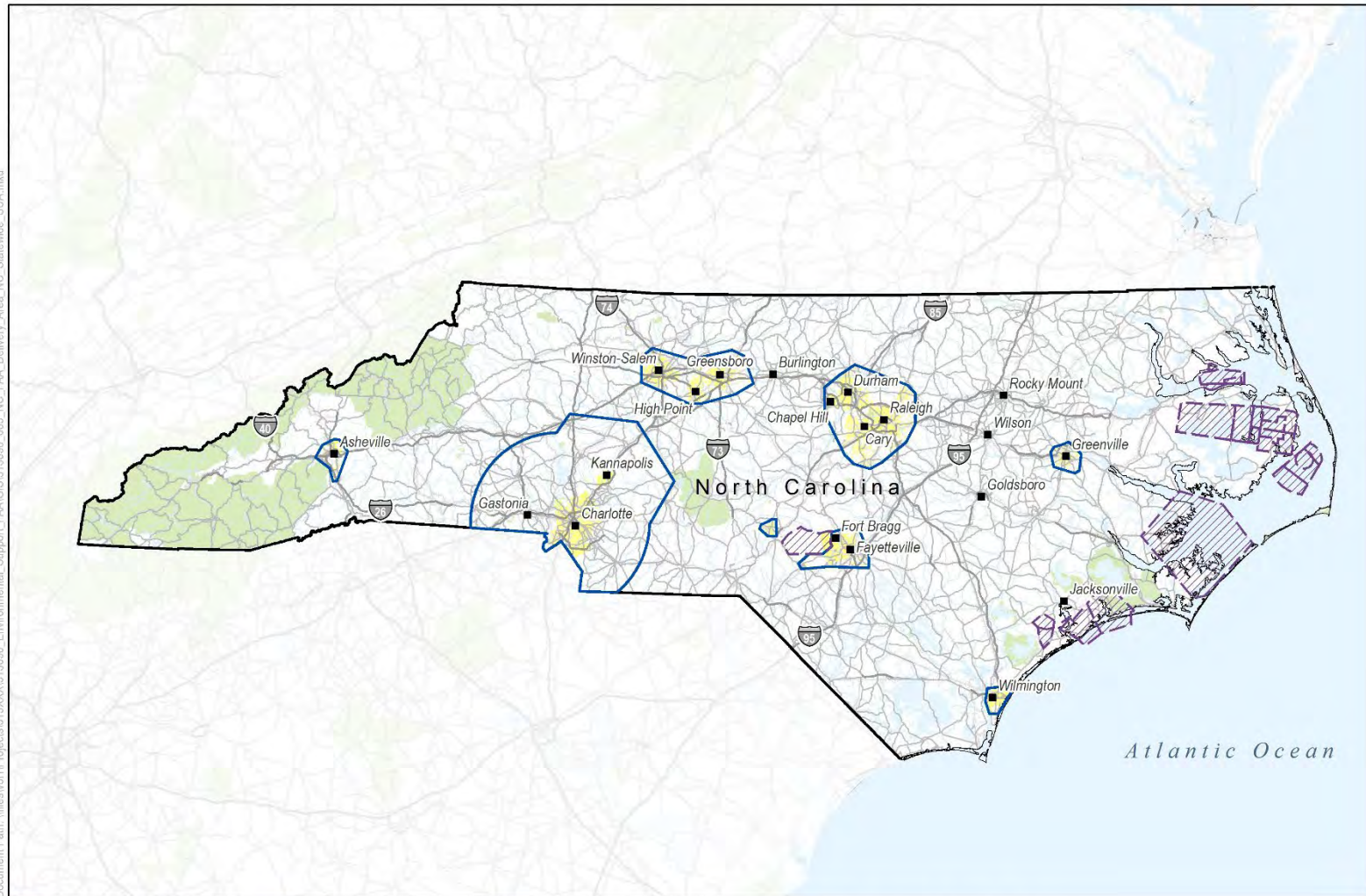


Figure 1. Typical Flight Profile

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- | | | | | |
|----------------------|-------------------|---------------|--------------------|-------------|
| Operating Area | Incorporated Land | Park | Major / Minor Road | City / Town |
| Special Use Airspace | State Boundary | Water / River | Railroad | |

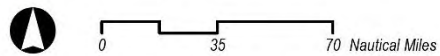
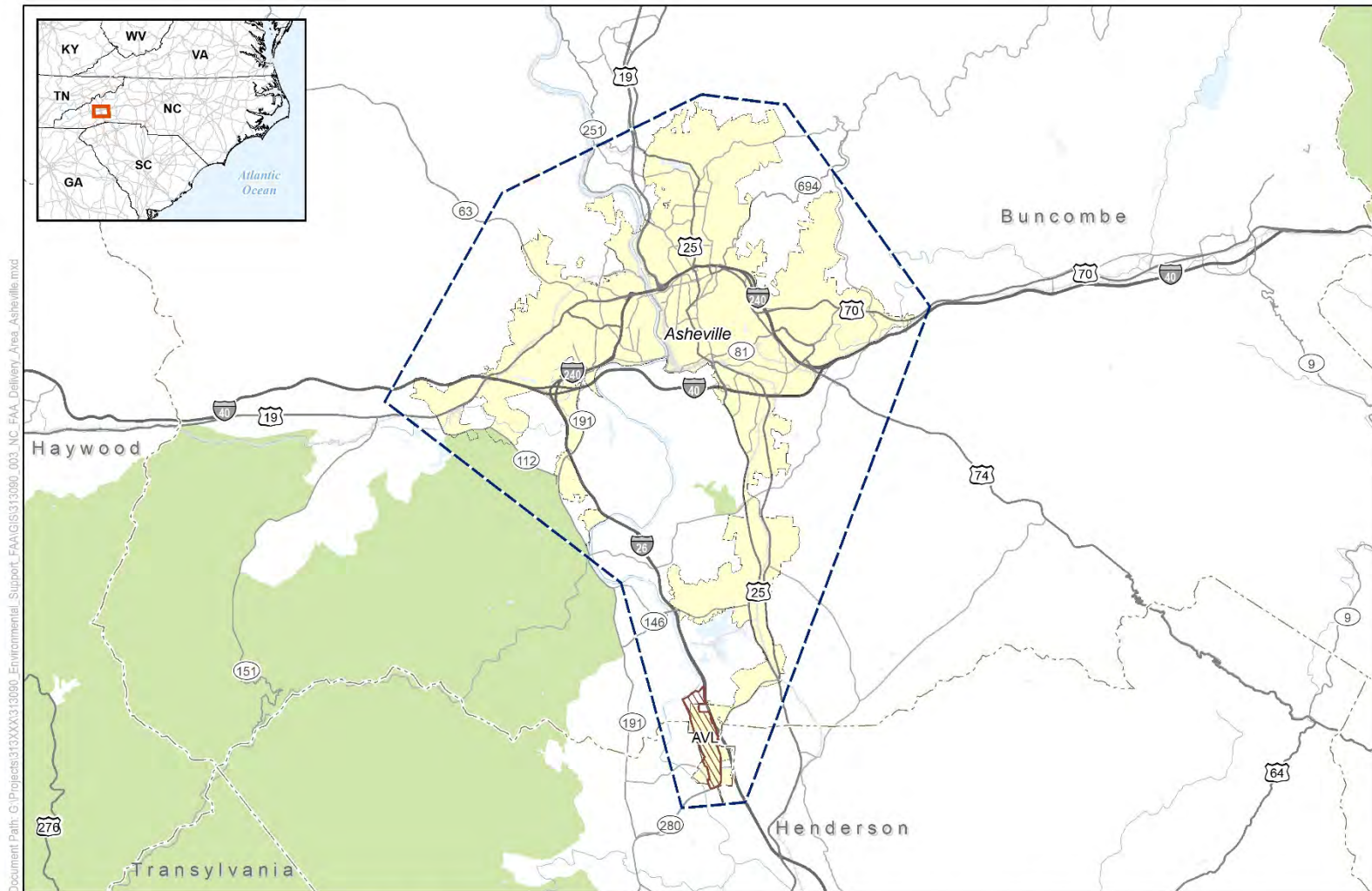


Figure 2. Operating Areas - Statewide



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- Operating Area
- Incorporated Land
- Park
- Major / Minor Road
- City / Town
- Airport Property
- County Boundary
- Water / River
- Railroad

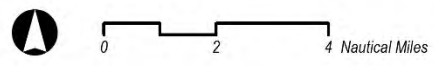


Figure 3. Asheville Operating Area

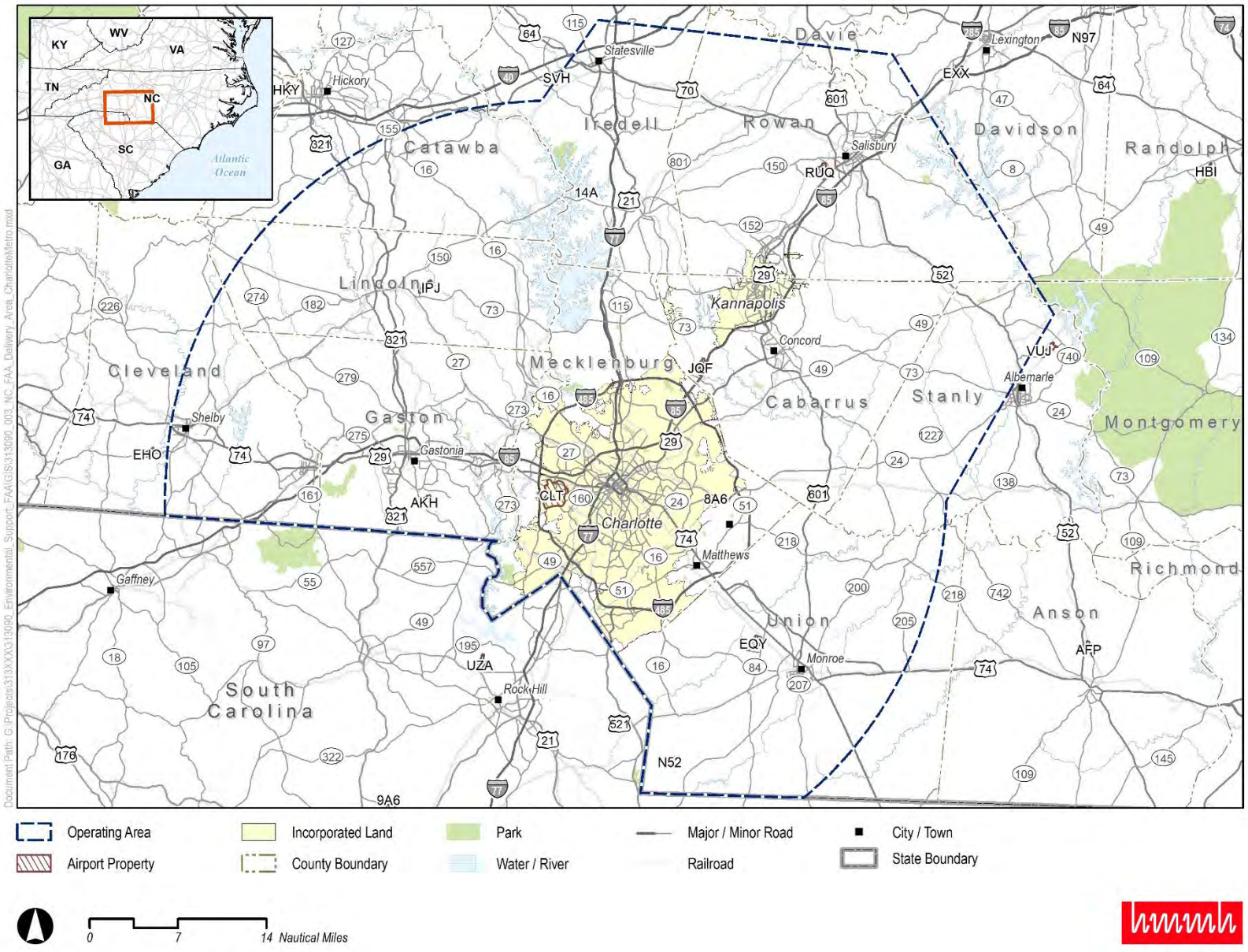
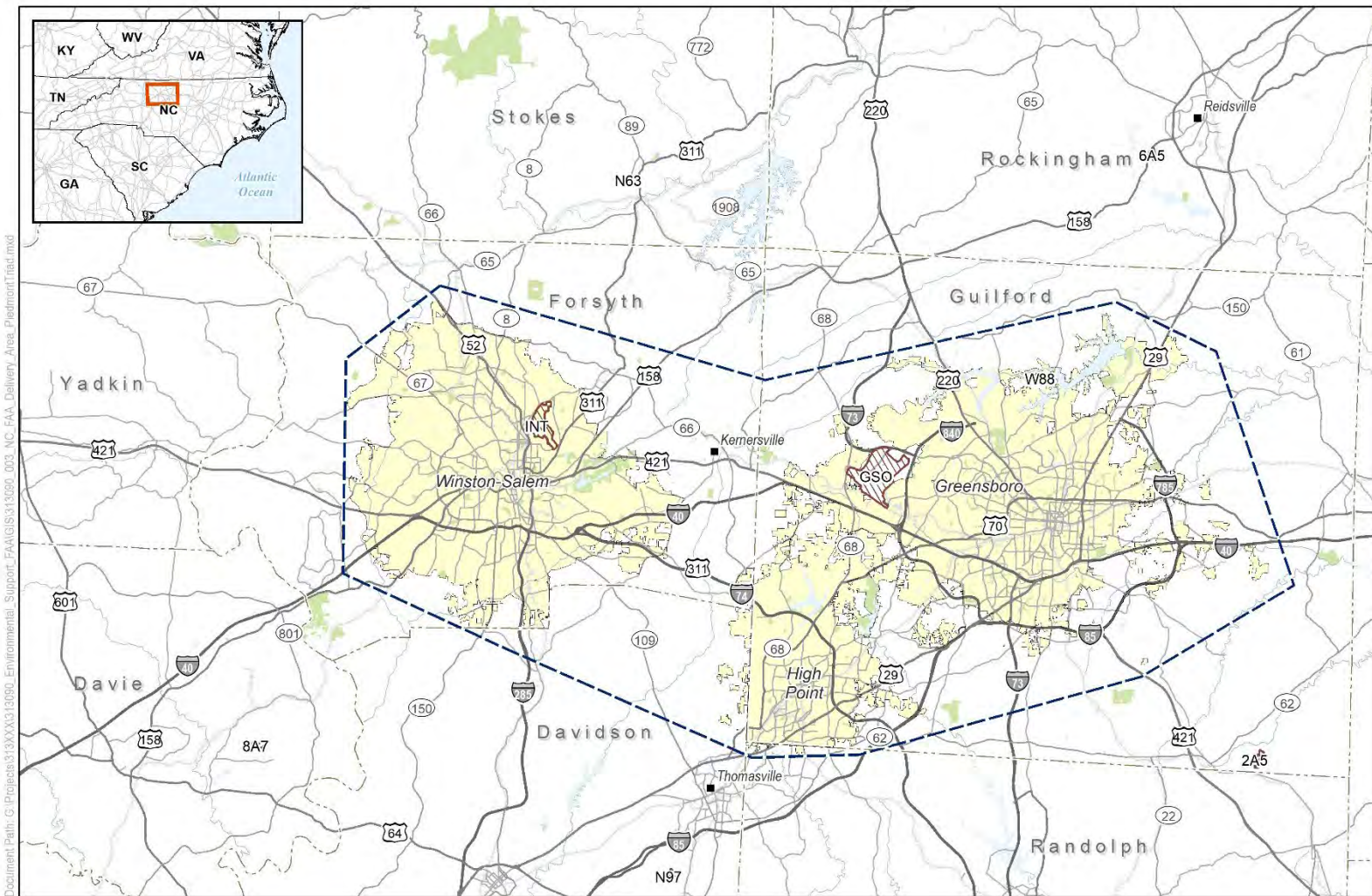


Figure 4. Charlotte Metro Operating Area





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- Operating Area
- Incorporated Land
- Park
- Major / Minor Road
- City / Town
- Airport Property
- County Boundary
- Water / River
- Railroad

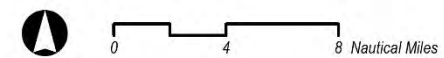
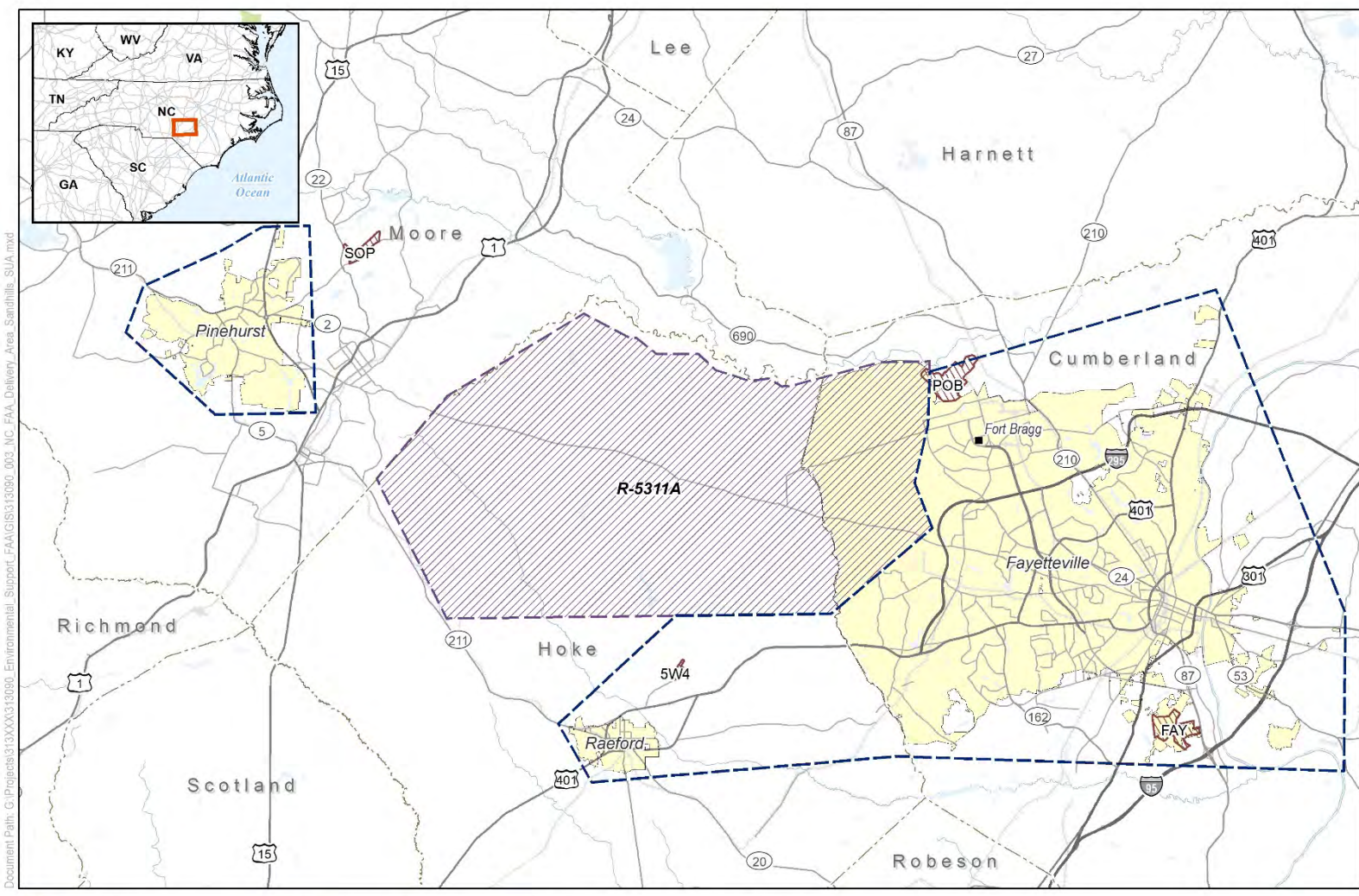


Figure 5. Piedmont Triad Operating Area



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| Operating Area | Incorporated Land | Park | Major / Minor Road | City / Town |
| Airport Property | County Boundary | Water / River | Railroad | Special Use Airspace |

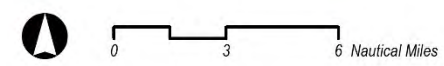
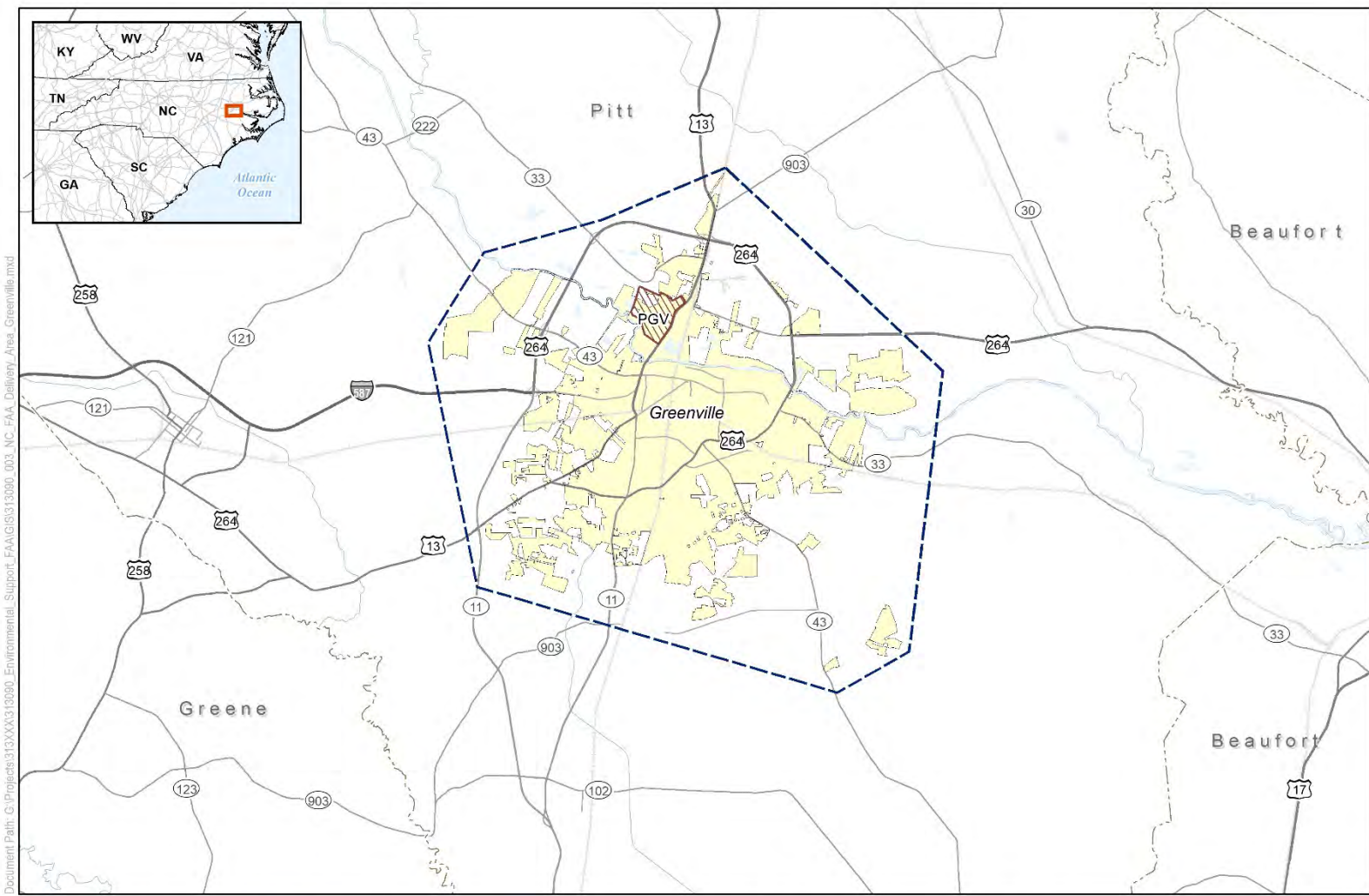


Figure 7. Sandhills Operating Area



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- Operating Area
- Incorporated Land
- Park
- Major / Minor Road
- City / Town
- Airport Property
- County Boundary
- Water / River
- Railroad

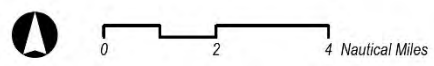
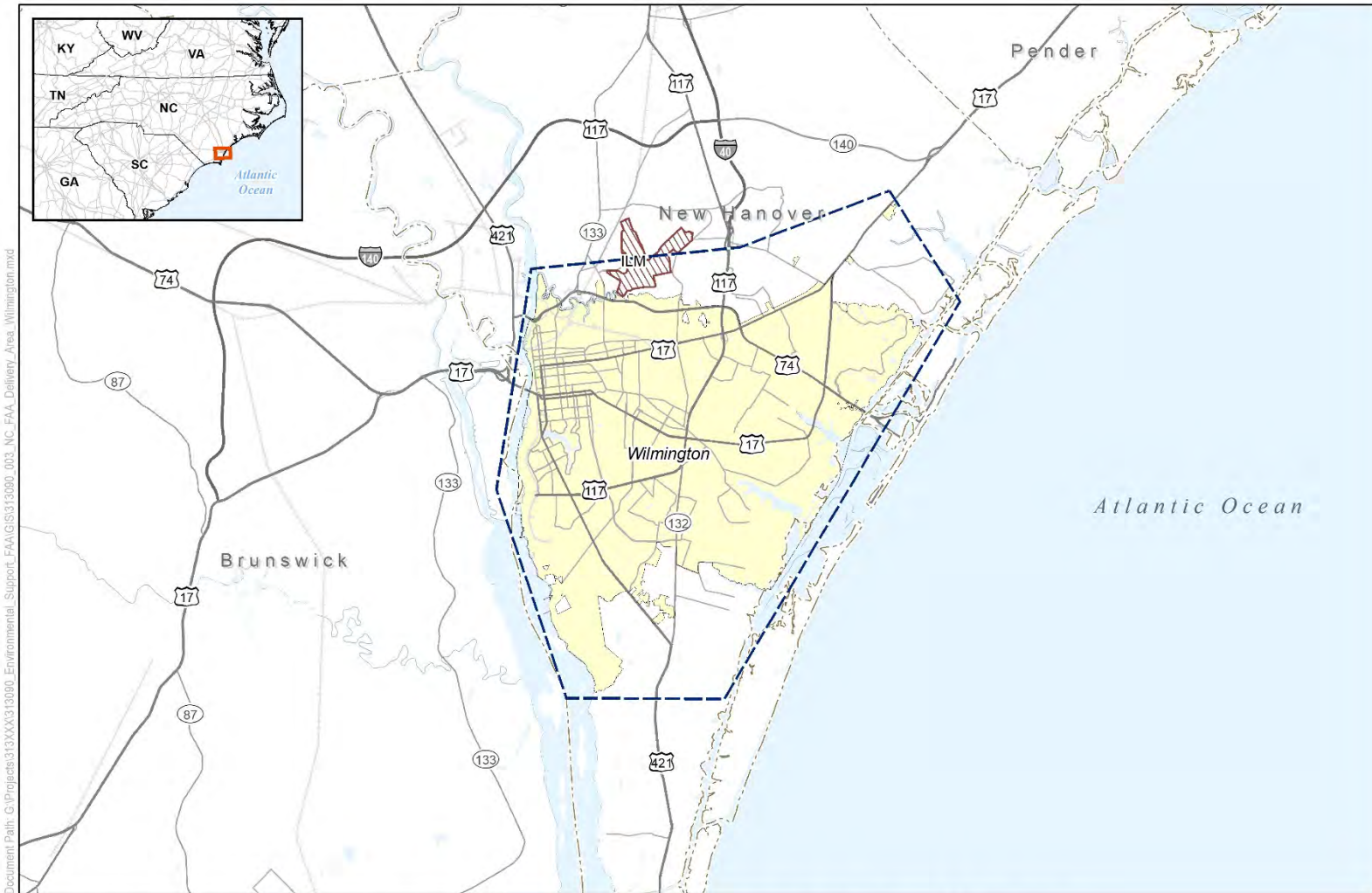


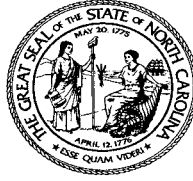
Figure 8. Greenville Operating Area



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Figure 9. Wilmington Operating Area



North Carolina Department of Natural and Cultural Resources
State Historic Preservation Office

Ramona M. Bartos, Administrator

Governor Roy Cooper
Secretary D. Reid Wilson

Office of Archives and History
Deputy Secretary, Darin J. Waters, Ph.D.

December 18, 2023

Jay Kinser
Manager, Strategic Programs Branch
UAS Integration Office
Federal Aviation Administration

Jay.Kinser@faa.gov

Re: Section 106 Consultation Initiation and Identification of the Area of Potential Effects for Drone Package Delivery Operations in North Carolina, Multi County, ER 23-1844

Dear Mr. Kinser:

Thank you for your email of November 13, 2023, regarding the above-referenced undertaking. We have reviewed the submittal and offer the following comments.

We concur with the Federal Aviation Administration's (FAA) Area of Potential Effect (APE) for drone package delivery operations within seven operating areas (Asheville, Charlotte, Piedmont Triad, Research Triangle, Sandhills, Greenville, Wilmington) in North Carolina through the year 2030 as forecasted by the North Carolina Department of Transportation (NCDOT), and as illustrated in Figures 2-9 of the submittal and note that if a 14 Code of Federal Regulation Part 135 (Part 135) Unmanned Aircraft Systems (UAS) certificate/request for authorization falls outside of the scope that the FAA will conduct further environmental review.

Each new or amended Part 135 UAS certificate/request for authorization related to drone package delivery operations within the APE should be submitted for our review with each request submitted as a separate, individual project. Based on the UAS operating characteristics as summarized in Table 1 and the maximum sound exposure levels (SEL) on pages 3-4, we recommend that historic resources that are listed in or are study-listed/eligible for listing in the National Register of Historic Places (NRHP) are identified within a half-mile radius from the launch hub, inbound/outbound routes, and delivery areas. Requests for review can be submitted following our Project Review Checklist (<https://www.dncr.nc.gov/shpo/er/project-review-checklist>) and for the latest information on above-ground historic properties in the APE, please see our online GIS at HPOWEB (<https://www.hpo.nc.gov/gis>).

If NRHP eligible or listed properties are present within a half-mile radius of the operation area, each submission should also include:

- a summary and photographs of the present integrity of setting and feeling of each historic resource,
- photographs of the viewshed from these historic resources facing towards the proposed drone operation area,
- an assessment on the visibility and audibility of the drones from these historic resources, and

- recommendations on whether the operations will have an adverse effect to the historic resources by a Secretary of the Interior (SOI) qualified architectural historian.

As noted in our meeting on August 17, 2023, we look forward to continually working with the FAA in developing best management practices, and in the future, work towards a Programmatic Agreement to streamline the review process as we better understand the evolution and expansion of drone package delivery and their potential adverse effects to historic resources. Based on our previous reviews, drone package delivery operation is likely to have no adverse effect to residential and commercial historic districts in more developed areas. At this time, we believe the most sensitive historic resources to drone package delivery operations include battlefields, memorial, cemeteries, landmarks, museums, places of worship, and sites with an associated cultural/natural/scenic landscapes, in particular, with minimum modern disturbances in their present viewsheds and generally associated with the 19th century or earlier.

We recommend that other consulting parties include local Historic Preservation Commissions (<https://www.hpo.nc.gov/about-historic-preservation-commissions>), Federal and State recognized tribes, and Urban Indian organizations located within the APE who may identify areas of cultural significance to be avoided (<https://www.doa.nc.gov/divisions/american-indian-affairs/map-nc-tribal-communities>).

The above comments are made pursuant to Section 106 of the National Historic Preservation Act and the Advisory Council on Historic Preservation's Regulations for Compliance with Section 106 codified at 36 CFR Part 800.

Thank you for your cooperation and consideration. If you have questions concerning the above comment, contact Renee Gledhill-Earley, environmental review coordinator, at 919-814-6579 or environmental.review@dncr.nc.gov. In all future communication concerning this project, please cite the above referenced tracking number.

Sincerely,



for Ramona Bartos, Deputy
State Historic Preservation Officer

cc: Nick Baker, FAA

Nicholas.m.baker@faa.gov
9-AWA-AVS-AFS-ENVIRONMENTAL@faa.gov



U.S. Department
of Transportation

**Federal Aviation
Administration**

Aviation Safety

800 Independence Ave., SW.
Washington, DC 20591

March 22, 2024

Mr. Luan Cao
North Carolina Department of Natural and Cultural Resources
State Historic Preservation Office
4617 Mail Service Center
Raleigh, NC 27699-4617

Via electronic submission to Environmental.Review@ncdcr.gov

RE: Section 106 Consultation, Identification of Historic Properties and Effects Determination for Drone Package Delivery Operations in North Carolina, Multi-County, ER 23-1844

Dear Mr. Cao:

The purpose of this letter is to continue National Historic Preservation Act Section 106 consultation with the State Historic Preservation Officer (SHPO) and request concurrence on the identification of historic properties and assessment of effects. The Federal Aviation Administration (FAA) initiated Section 106 consultation with the SHPO and requested concurrence on the identification of the Area of Potential Effects (APE) via a letter dated November 13, 2023. The SHPO concurred with the APE via a letter dated December 18, 2023. The FAA met with you on January 4, 2024, to discuss the identification and evaluation of historic properties in the APE and potential effects.

The FAA appreciates the SHPO's recommendation regarding other consulting parties as stated in your December 2023 letter. Given the size of the APE, the programmatic nature of this assessment (i.e., the FAA is not evaluating a specific operator's proposal at this time), and the limited potential for adverse effects, the FAA will involve additional consulting parties as needed in the future during the review of an individual operator's drone package delivery proposal.

Identification of Historic Properties

The proposed undertaking does not have the potential to affect below-ground or archaeological resources because the undertaking does not include ground disturbance. Therefore, the FAA focused its identification efforts on above-ground historic properties.

In its December 18, 2023, letter, the SHPO stated drone package delivery operation is likely to have no adverse effect on residential and commercial historic districts in more developed areas. The SHPO believes the most sensitive historic resources to drone package delivery operations include battlefields, memorials, cemeteries, landmarks, museums, places of worship, and sites with an associated cultural/natural/scenic landscape, in particular, with minimum modern disturbances in their present viewsheds and generally associated with the nineteenth century or earlier.

New South Associates (NSA) conducted a desktop review of the seven operating areas comprising the APE. An NSA architectural historian reviewed GIS data generated from previously completed architectural studies and surveys available on HPOweb, the SHPO's online GIS database. NSA focused its

identification efforts on those properties identified by the SHPO as being most sensitive to potential effects from drone package delivery operations.

Due to the size of the operating areas, this desktop scoping study focused on 1) resources currently listed on or determined eligible for listing on the National Register of Historic Places (NRHP), 2) National Historic Landmarks (NHL), and 3) culturally sensitive areas. The identified historic properties are presented below for each operating area, starting in the west and moving east.

Asheville Operating Area

Figures 1-A and 1-B depict sensitive historic resources in the Asheville operating area, which encompasses portions of Buncombe and Henderson counties. Previous surveys in the operating area have documented approximately 5,000 historic resources. Of these, NSA identified ten as sensitive to potential project effects based on the SHPO’s December 2023 letter (**Table 1**).

There are three National Historic Landmarks (NHLs) in the Asheville operating area, two of which are associated with the 1889-1895 Biltmore Estate (BN0004). The Biltmore Estate was placed on the NRHP and designated an NHL in 1966. In 2005, the NRHP boundary was reduced, and the additional documentation was assigned HPO Survey Site Number: BN1835. In addition to the Biltmore Estate, the 1883 Thomas Wolfe House (BN0019) is designated an NHL. The home of author Thomas Wolfe, this two-story Queen Anne dwelling is also designated as a local historic landmark, but it is within the Downtown Asheville Historic District (BN0003). Due to its urban setting, the Thomas Wolfe House (BN0019) is not considered a sensitive resource.

All of the resources, except for one, are located in Buncombe County and are primarily concentrated in the center of the operating area. The largest resource is the Biltmore Estate, which is framed by the Blue Ridge Parkway on the south and east sides.

Table 1. Sensitive Historic Properties in the Asheville Operating Area

Site Number	Name	Description
NC0001	Blue Ridge Parkway (Blue Ridge Parkway - Highlands District/DOE)	1936 National Parkway
BN0004/BN1835	Biltmore Estate (NHL)	1889-1895 French Chateau-style Vanderbilt Estate
BN0010	Grove Park Inn (NRHP)	1913 Rustic/Craftsman Stone Inn
BN0057	Riverside Cemetery (NRHD)	Circa 1885 cemetery
BN0141	Biltmore Industries (NRHP)	Early 20 th century crafts complex
BN1825	Municipal Golf Course (NRHP)	1927, Donald Ross-designed golf course
BN2482	Biltmore Forest Historic District (SLDOE)	Early 20 th century planned suburb
BN6304	Lutheridge (DOE)	1949 Lutheran Church Conference Center and Camp of Rustic Revival and Modernist-style Buildings
BN0898	Bent Creek Campus, Appalachian Forest Experiment Station (NRHP)	1925-1934 Forest Service facility
BN6497	South Asheville Cemetery and St. John ‘A’ Baptist Church (NRHP)	Circa 1850-1943 African American cemetery and 1929 front-gable church

DOE = Determined Eligible; NHL = National Historic Landmark; NRHD = National Register Historic District; NRHP = National Register of Historic Places; SLDOE = Study List and Determined Eligible

Piedmont Triad Operating Area

The Piedmont Triad operating area contains portions of Guilford, Forsyth, and Davidson counties. Anchored by three mid-size cities—Greensboro, Winston-Salem, and High Point—the operating area contains over 13,000 sites recorded by HPO. About 335 resources are listed in the NRHP, determined eligible for listing in the NRHP, or identified as warranting further study and evaluation. NSA identified

23 resources as sensitive to potential project effects based on the SHPO’s December 2023 letter (**Table 2; Figures 2-A through 2-E**).

While most of the sites are concentrated within the municipalities of Greensboro, Winston-Salem, and High Point, rural sites dot the periphery. Most of the NHLs in this operating area are associated with the region’s eighteenth-century Moravian settlements. The Moravian Brethren arrived in North Carolina in 1753 and settled the community of Bethabara in northwest Forsyth County. By 1766, the group established the town of Salem on the 98,000-acre Wachovia Tract. NHL landmarks associated with the Moravian settlements are some of the most sensitive resources in this area and are listed in **Table 2**.

Other sensitive resources include two former estates belonging to the Hanes and Reynolds families: 1913 Reynolda Historic District (FY0024) and Graylyn (FY0006), a 1929-1932 Norman Revival estate and retreat center. These resources are associated with prominent industrialists and are situated northwest of the Winston-Salem city center (**Table 2; Figure 2-D**). To the east, the Guilford Courthouse Military Park (Battlefield), is located in Guilford County. This battlefield is the site of a 1781 Revolutionary War Battlefield and has been designated as both an NHL and a National Military Park managed by the National Park Service.

Table 2. Sensitive Historic Resources in the Piedmont Triad Operating Area

Site Number	Name	Description
FY0006	Graylyn Estate (NRHP)	1929-1932 Norman Revival estate and retreat center
FY0009	Old Salem Historic District, Winston-Salem (NHL)	Moravian settlement founded in 1766
FY0013	Salem Tavern (NHL)	1784 Moravian tavern
FY0016	Single Brothers House (NHL)	1768 Moravian building constructed of half-timber and brick
FY0024	Reynolda Historic District (NRHP)	1913-1917 house and estate
FY0048	Bethabara Historic District (NHL)	18th century Moravian Settlement
FY0060	God’s Acre Cemetery (NRHD)	1759 cemetery
FY050	Waughtown Community Cemetery (NRHD)	Circa 1816 cemetery
FY2101	African Methodist Episcopal Zion Church Graveyard (NRHP)	1845 cemetery
FY2558	Salem Cemetery (DOE)	18th and 19th century cemetery
FY3916	Hope-Fraternity Historic District (SL)	1752-2009 Moravian and Brethren farms, cemetery, and churches
FY8772	Bethania Historic District (NHL)	Eighteenth-century Moravian Settlement
FY9134	Winston Lake Golf Course (NRHP)	1956, 1964 golf course constructed for African American residents
GF0001	Blandwood (NHL)	1844 Italianate house of Governor John Morehead
GF0006	Guilford Courthouse National Military Park (NHL)	1781 Revolutionary War Battle site
GF0022	Buffalo Presbyterian Church and Cemetery (NRHP)	1827 brick church and cemetery
GF0504	Deep River Friends Meeting House and Cemetery (NRHP)	1875 front-gable Quaker Meeting House and Cemetery
GF0597	Green Hill Cemetery	1877 public cemetery
GF1141	Alamance Presbyterian Church and Cemetery (DOE)	1955 Colonial Revival Church, founded 1764
GF1224	New Garden Friends Cemetery (DOE)	Circa 1950 cemetery
GF1263	Union Cemetery (NRHP)	1882-1940 African American cemetery
GF1583	Oakwood Cemetery (SL)	19th century cemetery
GF3020	Pleasant Grove Baptist Church (DOE)	Circa 1800-present rural community cemetery

Site Number	Name	Description
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DOE = Determined Eligible; NHL = National Historic Landmark; NRHD = National Register Historic District; NRHP = National Register of Historic Places; SL = Study List

Charlotte Metro Operating Area

The Charlotte Metro operating area contains the entirety of Mecklenburg County along with portions of Gaston, Cleveland, Lincoln, Catawba, Iredell, Cabarrus, Union, Rowan, and Stanly counties. The city of Charlotte is located at the south end of the operating area. Historically, the Charlotte Metro region has been one of North Carolina’s most densely populated areas and represents a significant cluster of historic resources. The HPO has documented over 12,000 resources in the Charlotte Metro operating area.

About 787 resources in the operating area are listed in the NRHP, determined eligible for listing in the NRHP, or identified as warranting further study and evaluation. NSA identified 12 resources as sensitive to potential project effects based on the SHPO’s December 2023 letter (**Table 3; Figures 3-A through 3-C**). One site, the Reed Gold Mine (CA0004) in Cabarrus County, is designated an NHL (**Figure 3-C**). Also a State Historic Site, the Reed Gold Mine is the location of the first recorded gold find in the United States and was key in the commercial development of the Charlotte Metro area.

Table 3. Sensitive Historic Resources in the Charlotte Metro Operating Area

Site Number	Name	Descriptions
CA0004	Reed Gold Mine, Concord vicinity (NHL)	19 th century gold mine and State Historic Site
CA0571	Saint John’s Evangelical Lutheran Church Cemetery (SL)	1771 church and cemetery
CL0288	Shiloh Presbyterian Church Cemetery (NRHP)	1780-1916 cemetery, 108 gravestones
GS0020	Belmont Abbey Historic District	1876 and later Catholic monastery/college
GS0265	Flume House in Crowders Mountain State Park	Historic resource within State Park boundaries
GS0542	Oakwood Cemetery (NRHD)	Circa 1856 cemetery within the York-Chester Historic District
ID1753	Mooresville Colored Cemetery (Green Acres Cemetery/SL)	Late 19 th century to 1959 cemetery
LN0515	Machpelah Cemetery (SLDOE)	19 th century cemetery
MK0026	Providence Presbyterian Church and Cemetery (NRHP)	1858 and later frame church complex; cemetery
MK0072	Elmwood and Pinewood Cemetery (DOE)	1853 public cemetery
MK1687	Paw Creek Presbyterian Church (DOE)	1882 brick church and cemetery (from 1810)
RW1678	Mount Zion Reformed Church (DOE)	Gothic Revival church and cemetery

DOE = Determined Eligible; NHL = National Historic Landmark; NRHD = National Register Historic District; NRHP = National Register of Historic Places; SL = Study List

Research Triangle Operating Area

The Research Triangle operating area contains portions of Wake, Chatham, Durham, Orange, Granville, and Franklin counties. Raleigh, the North Carolina State Capitol, is situated in the southeast quadrant of the operating area. The operating area also includes the major metropolitan areas of Durham and Chapel Hill, home of Duke University and the University of North Carolina, respectively. About 435 resources in the operating area are listed in the NRHP, determined eligible for listing in the NRHP, or identified as warranting further study and evaluation. Eight sites are designated NHLs and over 9,000 resources have been surveyed in some capacity. Individual local governments within the operating area

have designated 25 local historic districts. NSA identified 19 resources as sensitive to potential project effects based on the SHPO’s December 2023 letter (**Table 4; Figures 4-A through 4-E**).

While concentrated in the city centers of Durham, Raleigh, and Chapel Hill, NRHP-listed and eligible resources are dispersed throughout the operating area. Outside the metropolitan centers, two particularly sensitive areas emerge: the Crabtree Creek Recreational Demonstration Area Historic District (now William B. Umstead State Park) is located centrally within the operating area (**Figure 4-C**), and the Bennehan-Cameron Historic District occupies the northernmost corner of the operating area (**Figure 4-D**). These areas are particularly sensitive due to their agricultural or recreational character. Agricultural communities in the southeast and northeast quadrants of the operating area have recently experienced rapid commercial and residential growth. Some resources, including the formerly rural Jones-Johnson-Ballentine Historic District (WA0723), have been determined ineligible for listing due to the subdivision of historic agricultural land and surrounding development.

Table 4. Sensitive Historic Resources in the Research Triangle Operating Area

Site Number	Name	Description
DH0008	Duke Homestead and Tobacco Factory (NHL)	1852 Duke Family farm complex and tobacco factory.
DH0010	W.T. Balckwell and Co. (Bull Durham) Tobacco Factory (NHL)	1875 Victorian-Italianate brick tobacco factory
DH0014	Mechanics Farm and Bank (NHL)	1921 six-story brick commercial building; keystone of Durham’s Black Wallstreet
DH1252	Pauli Murray Family Home (Robert G. Fitzgerald House) (NHL)	1890 frame house
DH1287	Maplewood Cemetery (SL)	1872 to present cemetery
DH2169	Bennehan-Cameron Historic District (DOE)	Rural historic district containing at least three early-nineteenth century Georgian and Federal houses and agricultural outbuildings including the individually listed Stagville (DH0007), a 1799 frame house representative of the Georgian style.
OR0013	Old East, Cameron Avenue, Chapel Hill (NHL)	1795 core of UNC Chapel Hill campus
OR0016	Playmakers Theatre (NHL)	1850 Greek Revival, temple-form theater
OR0496	Old Chapel Hill Cemetery (NRHP)	1798-1944 town cemetery; 1,621 marked graves
WA0007	North Carolina State Capitol (NHL)	1848-1852 Gothic Revival stone Episcopal church
WA0009	Christ Church (NHL)	1833-40 Greek Revival, stone church, State Historic Site
WA0094	Oakwood Cemetery (NRHD)	1867 cemetery
WA0721	Crabtree Creek Recreational Demonstration Area Historic District (William B. Umstead State Park) (NRHP)	4912.16-acre State Park constructed by the Civilian Conversation Corp between 1936 and 1941. Completed in 1940 with two 25-acre lake and four group camps with 92 cabins and 4 lodges.
WA1670	Samaria Baptist Church (DOE)	1930 church with 1950s education and office wings partially constructed with discarded Raleigh streets paving stones; 1880 cemetery
WA1847	Dix Hill (Dorothea Dix State Hospital)	1856-1939 state mental hospital complex
WA2484	Oak Grove Cemetery (Method Community Cemetery)	1891-present African American cemetery w/ 76 numbered plots
WA3792	Mount Hope Cemetery (NRHP)	1872-1950s African American cemetery
WA3905	City Cemetery (NRHP)	1798-1900; Raleigh's oldest public cemetery
WA6388	Oberlin Cemetery (NRHP)	1873-1971 2.93-acre African American cemetery

DOE = Determined Eligible; NHL = National Historic Landmark; NRHD = National Register Historic District; NRHP = National Register of Historic Places; SL = Study List

Sandhills (Pinehurst) Operating Area

One of the smaller of the operating areas, the Sandhills (Pinehurst) operating area contains the entirety of the city limits of Pinehurst, as well as smaller communities including Taylortown, Monroetown, Jackson Hamlet, and Garren Hill in Moore County. Previous efforts have surveyed about 300 sites in the operating area and only six are on the NRHP, including two individually listed sites and two as NRHP-listed districts. NSA identified three resources as sensitive to potential project effects based on the SHPO’s December 2023 letter (**Table 5; Figure 5**).

The largest and most sensitive site is the Pinehurst Historic District and its boundary expansion (MR0006/MR0615). Developed between 1895 and 1970, the Pinehurst Historic District is a nineteenth-century resort community designed by the firm Olmsted, Olmsted, and Eliot of Brookline, Massachusetts. Containing approximately 314 contributing buildings, structures, and sites, the district is designated an NHL and is key to the character of the community.

Table 5. Sensitive Historic Resources in the Sandhills (Pinehurst) Operating Area

Site Number	Name	Description
MR0006/MR0615	Pinehurst Historic District and Boundary Expansion (NHL)	1895 resort village and golf course
MR0069	Lloyd-Hower House (NRHP)	9.27-acre rustic-style resort house developed in 1929
MR0504	Pinehurst Racetrack (NRHP)	48.4-acre equestrian complex developed in 1915

NHL = National Historic Landmark; NRHP = National Register of Historic Places

Sandhills (Fayetteville-Raeford) Operating Area

The Sandhills (Fayetteville-Raeford) operating area spans portions of Cumberland and Hoke counties and includes the city limits of each of the county seats, Fayetteville and Raeford, respectively. The Fort Liberty Military Reservation occupies the northeast quadrant of the area. A total of 88 of the previously surveyed 685 resources in the county are listed in the NRHP, determined eligible for listing, or placed on the NC Study List. NSA identified four resources as sensitive to potential project effects based on the SHPO’s December 2023 letter (**Table 6 and Figures 6-A and 6-B**). The most sensitive resource is the NRHP-eligible Old Post Historic District, which is located in the northwest quadrant of Fayetteville (**Figure 6-A**). Only one site within the operating area is designated as an NHL, the Market House (CD0001) in Fayetteville.

Table 6. Sensitive Historic Resources in the Sandhills (Fayetteville-Raeford) Operating Area

Site Number	Name	Descriptions
CD0001	Market House (NHL)	1832 brick arcaded market house
CD0199	Confederate Breastworks (NRHP)	1865 Civil War earthworks located within the NRHP-boundary of the Fayetteville Veterans Administration Hospital Historic District.
CD0636	Cross Creek Cemetery No. 2 (SLDOE)	50.9-acre section of Cross Creek cemetery on the north side of Grove Street.
CD0535	Old Post Historic District (DOE)	790-acre district containing officer housing and infrastructure related to the Fort Liberty military installation.

DOE = Determined Eligible; NHL = National Historic Landmark; NRHP = National Register of Historic Places; SLDOE = State List and Determined Eligible

Greenville Operating Area

The Greenville operating area includes the entirety of the Greenville city limits, the Pitt County Seat, as well as surrounding unincorporated communities, including Bells Fork, Winterville, and Rock Spring. Thirty-five of the previously surveyed 1,159 resources in the operating area are on the NRHP or have been determined eligible for listing or further study. NSA identified one resource as sensitive to potential project effects based on the SHPO’s December 2023 letter (**Table 7; Figure 7**). There are no NHLs in the Greenville operating area.

Table 7. Sensitive Historic Resources in the Greenville Operating Area

Site Number	Name	Descriptions
PT0049	Red Banks Primitive Baptist Church (NR)	1893 front-gable frame church with 1895 cemetery

NR = National Register

Wilmington Operating Area

The Wilmington operating area encompasses the northern portion of New Hanover County extending from the Cape Fear River to the Intracoastal Waterway. Most of the NRHP-listed and eligible sites in the operating area are clustered on the west side of the county within the Wilmington city center.

The largest resource in the county is the NRHP-listed Wilmington Historic District, which contains 2,031 acres on the east and west sides of the Cape Fear River. In addition, small clusters dot the Winter Park, Masonboro, and Seagate communities near the coast. Previous surveys have documented approximately 1,886 historic resources in the operating area. Of these, 29 properties are listed in the NRHP, determined eligible for listing in the NRHP, or placed on the NC Study List. Only one site, the USS North Carolina—a WWII Battleship docked in an inlet of the Cape Fear River—is designated an NHL. NSA identified three sites as sensitive to potential project effects based on the SHPO’s December 2023 letter (**Table 8; Figure 8**).

Table 8. Sensitive Historic Resources in the Wilmington Operating Area

Site Number	Name	Descriptions
NH0004	USS North Carolina (NHL)	1937 WWII Battleship located within the USS North Carolina Battleship Memorial State Historic Site
NH0160	Oakdale Cemetery (NC Study List)	65-acre Victorian-era cemetery containing known burials dating from 1855. Including the enclosed Hebrew Cemetery, Masonic Section, and Front Street methodist plot.
NH1634	Wilmington National Cemetery (NRHP)	5.1-acre cemetery containing roughly 6,000 known burials from 1867 to 2005. Roughly bounded by Chestnut Street, N 20 th Street, Burnt Mill Creek, and Market Street (NC-17).

NHL = National Historic Landmark; NRHP = National Register of Historic Places

Assessment of Effects

As noted above, the proposed undertaking does not have the potential to affect below-ground or archaeological resources because the undertaking does not include ground disturbance. Drone package delivery operators partner with established businesses and identify the location for a hub at the business’s parking lot, rooftop, or other areas where it is not disruptive to the business and does not present a safety hazard. Land use and zoning are typically governed by local and state laws. The operators are responsible for complying with any such applicable laws relevant to establishing their operations (e.g., siting hubs). The FAA expects that all hub locations would be sited in accordance with

all local land use ordinances and zoning requirements. Local jurisdictions may vary in the scope of their review and approval of commercial operations.

Given the size of the unmanned aircraft (UA) and predicted sound levels, UA operations would not produce vibrations that could impact the architectural structure or contents of any historic property in the APE. While the UA is not expected to generate significant noise levels at or within any historic property, the FAA considered drone delivery noise and potential visual effects on historic properties where a quiet setting or visually unimpaired sky might be a key attribute of the property's significance. The highest concentration of flights would occur around hubs where drones takeoff and land. As a result, noise and visual impacts are expected to be the highest in close proximity to hubs.

Operations at Hubs

To avoid effects to the identified historic properties (**Tables 1–8**), the FAA recommends a 0.5-mile buffer around the historic properties when siting a hub. Noise levels from a maximum proposed 500 daily deliveries at a hub are predicted to not exceed a Day-Night Average Sound Level (DNL)¹ of 49.6 decibels (dB) at 0.5 mile (see attached noise report). Additionally, given that hubs would be located in business districts, the drones are not likely to be visible from a historic property 0.5 mile away due to the small size of the UA and structures obstructing the view. With this avoidance measure in place, operations at the hub would not adversely affect historic properties.

En Route Operations

Drone noise levels under en route flight paths are predicted to be less than DNL 59.6 dB. For noise estimation under en route conditions, the UA are conservatively assumed to fly the same outbound flight path between the hub and the delivery point and inbound flight path back to the hub. As such, each location under the en route path would be overflown twice for each delivery served by the respective overhead en route path. Among different operators, the actual en route flight path procedures could vary, and the same locations may not be overflown multiple times. The exact location of all potential delivery hubs and their applicable delivery ranges is not known, so this estimation also conservatively assumes all forecast delivery operations overfly the same location. However, due to the generally expected limitations of drone delivery area ranges, it is highly unlikely that it would be possible for 100% of deliveries occurring within any of the operating areas to overfly the same location as would be required to result in the estimated level. The estimated DNL of 59.6 dB is based on the Charlotte Metro operating area, which had the maximum forecast daily deliveries totaling approximately 5,000.

Based upon a previous consultation with the SHPO, commercial package delivery operators will not be allowed to operate within or over the Pinehurst Historic District (MR0006/MR0615). In collaboration with the National Park Service, the FAA has also identified the Guilford Courthouse National Military Park (GF0006) as an avoidance area (i.e., this assessment assumes that commercial drone package delivery operators will not fly within or over this property during delivery operations). Additionally, if the FAA received an application that involved UA flying over the Blue Ridge Parkway (Asheville operating area), the FAA would coordinate further with the National Park Service to identify specific corridor crossings that avoid noise sensitive habitat, critical infrastructure, and areas of concentrated visitor use.

The FAA also expects operators to comply with existing policies regarding drone use associated with any of the historic properties listed in the tables above. For example:

¹ Day-Night Average Sound Level means the 24-hour average sound level, in decibels, for the period from midnight to midnight, obtained after the addition of 10 decibels to sound levels for the periods between midnight and 7 a.m., and between 10 p.m. and midnight, local time.

- According to the National Park Service, launching a UA from or landing a UA on lands and waters administered by the National Park Service within the boundaries of the park is prohibited except as approved in writing by the park superintendent.² This includes the Blue Ridge Parkway (NC0001) and Guilford Courthouse National Military Park (GF0006).
- Launching a UA from or landing a UA on Biltmore property (BN0004/BN1835) is prohibited.³
- Drone operators are prohibited from ascending or taking off within or upon any state park area or state park water surface.⁴ This includes the Flume House in Crowders Mountain State Park (GS0265) and Crabtree Creek Recreational Demonstration Area Historic District (William B. Umstead State Park) (WA0721).

Delivery Operations

The maximum potential number of daily deliveries to individual delivery locations is unknown, but most deliveries would be of goods and products to residential locations and other businesses, and the FAA expects that more than one or two deliveries per day over the course of a year at the same location in residential locations would be atypical. Thus, the noise estimation for deliveries conservatively assumes five deliveries per day at the same delivery location. Based on five daily deliveries, the predicted DNL at 125 feet from the delivery location would be up to 46 dB. The distance of 125 feet corresponds to an average residential lot size. According to the 2022 U.S. Census, the national average lot size for a single-family home is 15,265 square feet (125 feet x 125 feet). As such, the noise level at that distance approximates the level to which a property adjacent to the delivery location might be exposed.

The FAA does not expect packages to be delivered to any of the sites listed in Tables 1–8. The FAA assumes if packages were delivered to any of those sites, whomever ordered the package would have permission to do so from the property owner or manager.

The regulations used for assessing effects are outlined in 36 CFR Part 800. An adverse effect is described in 36 CFR § 800.5 as follows:

An adverse effect is found when an undertaking may alter, directly or indirectly, the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property’s location, design, setting, materials, workmanship, feeling, or association. Consideration shall be given to all qualifying characteristics of a historic property, including those that may have been identified subsequent to the original evaluation of the property’s eligibility for the National Register. Adverse effects may include reasonably foreseeable effects by the undertaking that may occur later in time, be farther removed in distance, or be cumulative.

The undertaking would not result in physical alterations to historic properties and would not directly affect the existing or continued use of any historic property. Any potential visual or auditory intrusion from drone operations would not diminish the integrity of the property’s significant historic features. The undertaking would not result in neglect of a property and would not alter the existing ownership or zoning. The undertaking is not anticipated to result in planned growth or a change in land use. Therefore, cumulative effects are not anticipated.

² See: https://www.nps.gov/subjects/policy/upload/PM_14-05.pdf.

³ See: <https://www.biltmore.com/faq/do-you-allow-drones-or-aerial-photography/>.

⁴ See: [https://www.ncparks.gov/about-us/permits#:~:text=Park%20visitors%20are%20prohibited%20from,Ridge%20State%20Park\)%2C%20or%20other.](https://www.ncparks.gov/about-us/permits#:~:text=Park%20visitors%20are%20prohibited%20from,Ridge%20State%20Park)%2C%20or%20other.)

In summary, based on the assessment above and in accordance with 36 CFR 800.5(b), the FAA is proposing a ***finding of no adverse effect***.

Upon receiving a Part 135 application for drone package delivery operations in the APE, if the operator is not able to locate its hub at least 0.5 mile away from a historic property identified in the tables above, the FAA proposes to conduct an individual Section 106 review of that proposal. In accordance with your December 2013 letter, individual reviews, when necessary, would include the following:

1. A summary and photographs of the present integrity of setting and feeling of each historic resource;
2. Photographs of the viewshed from the historic resources facing towards the proposed drone operation area;
3. An assessment on the visibility and audibility of the drones from the historic resources; and
4. Recommendations on whether the operations will have an adverse effect to the historic resources by a Secretary of the Interior-qualified architectural historian.

Conclusion

The FAA requests your concurrence on the proposed ***finding of no adverse effect***. Your response within the next 30 days will greatly assist us in our environmental review process.

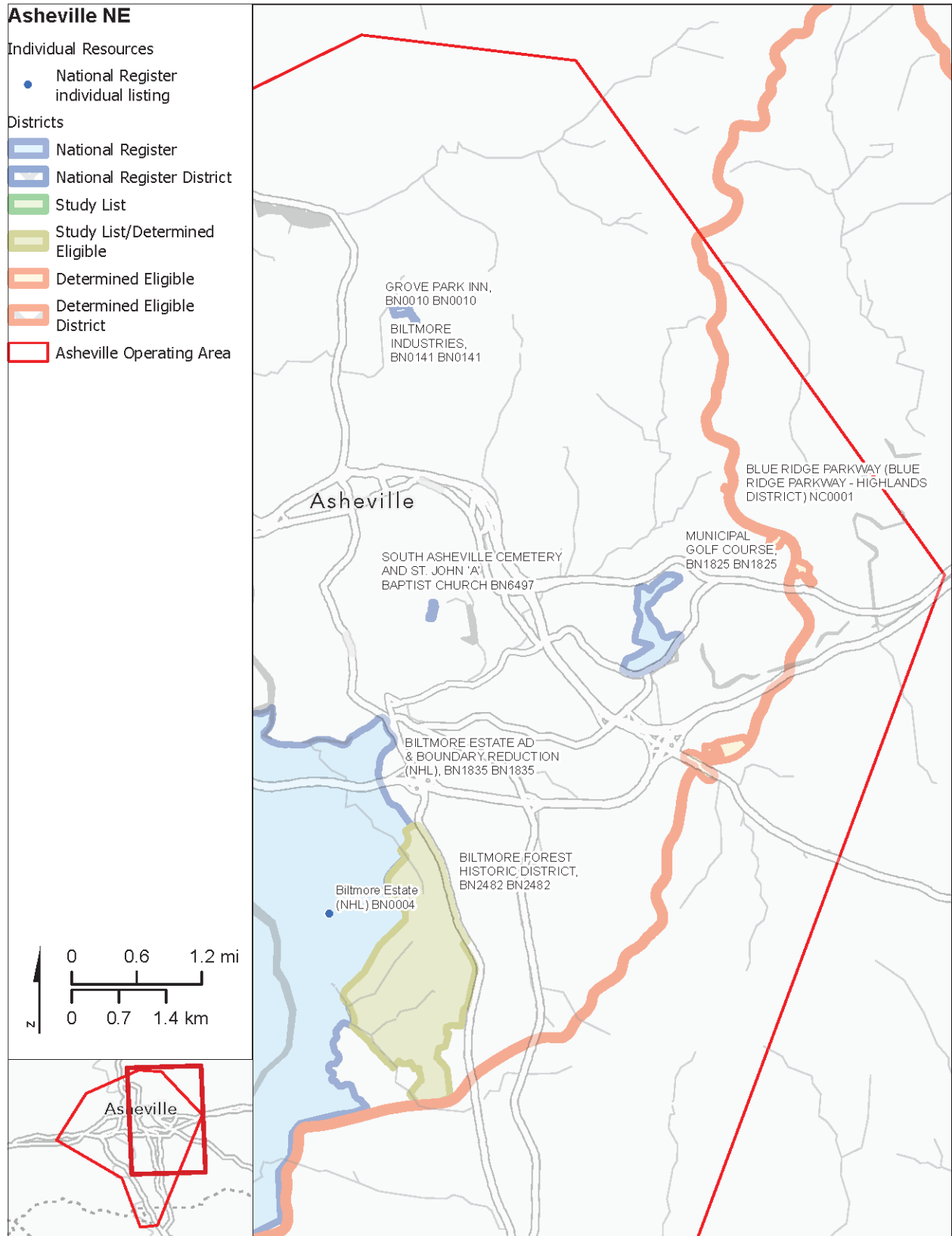
If you have any questions or need additional information, please contact Mr. Nicholas Baker via e-mail at 9-faa-drone-environmental@faa.gov.

Sincerely,

Derek Hufty
Manager, General Aviation and Commercial Branch
Emerging Technologies Division
Office of Safety Standards, Flight Standards Service

ATTACHMENT A

Figures



Basemap: ESRI Human Geography Imagery (2023)

Figure 1-A: Sensitive Historic Properties in the Asheville Operating Area

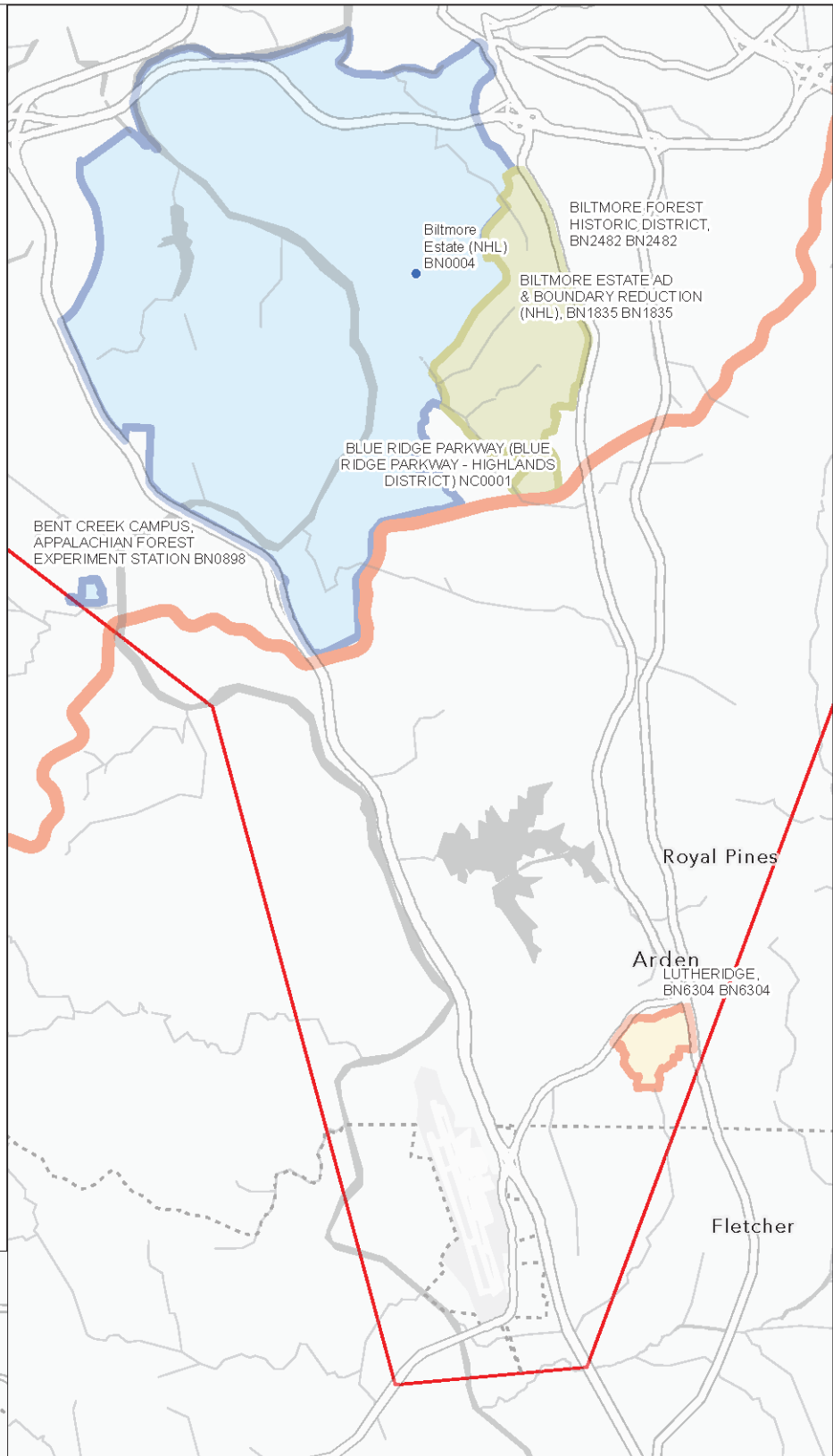
Asheville South

Individual Resources

- National Register individual listing

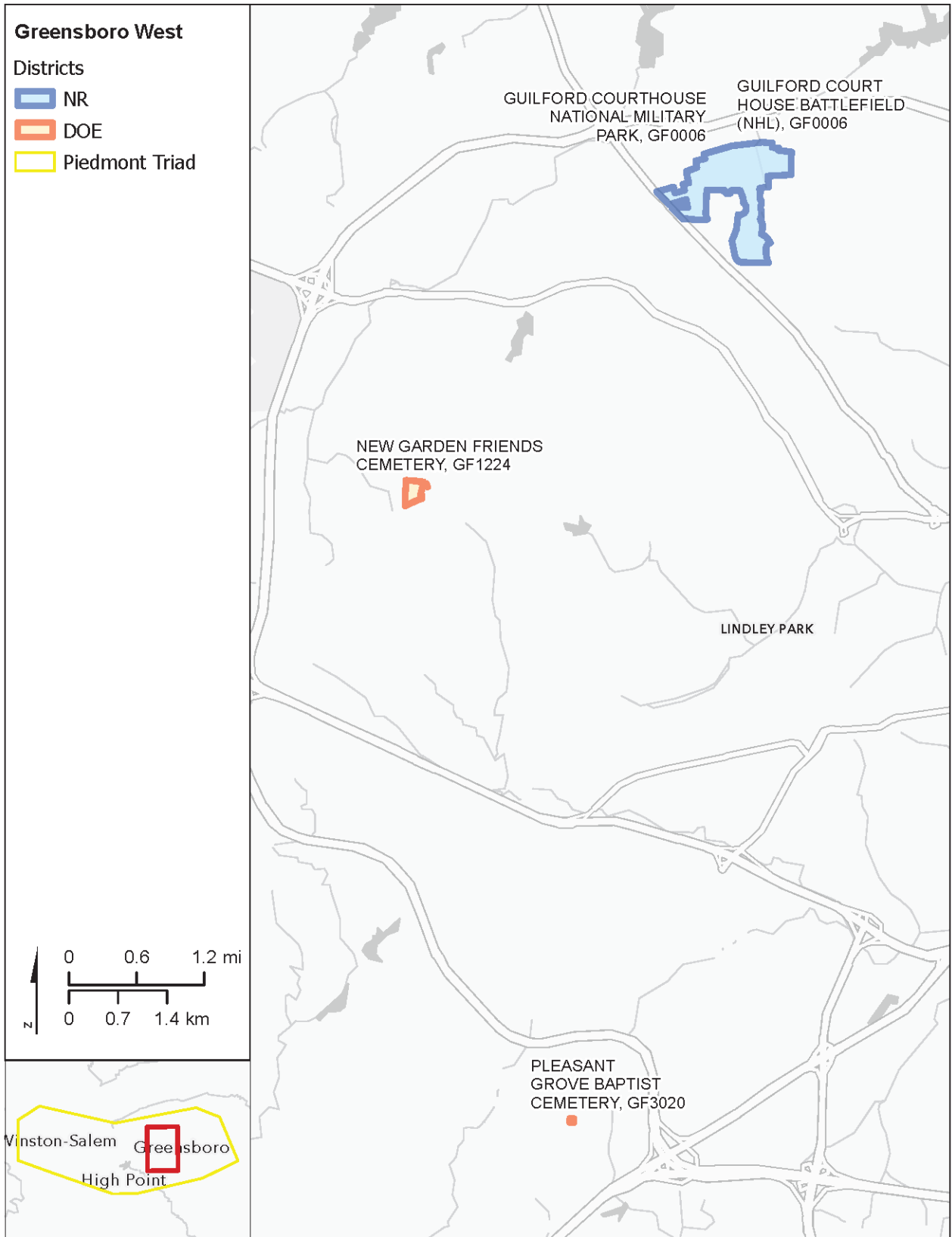
Districts

- ▭ National Register
- ▭ National Register District
- ▭ Study List
- ▭ Study List/Determined Eligible
- ▭ Determined Eligible
- ▭ Determined Eligible District
- ▭ Asheville Operating Area



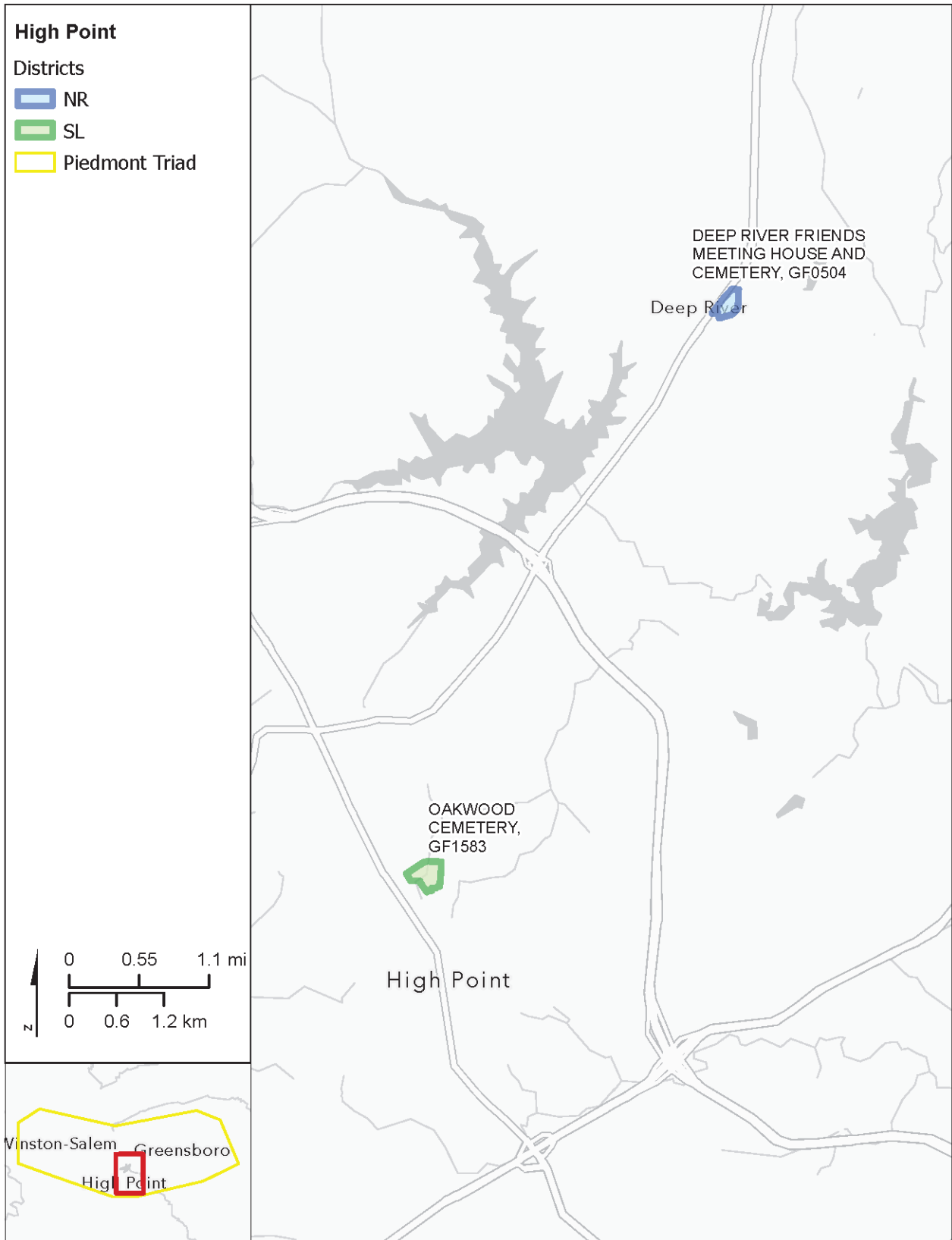
Basemap: ESRI Human Geography Imagery (2023)

Figure 1-B: Sensitive Historic Properties in the Asheville Operating Area



Basemap: ESRI Human Geography Imagery (2023)

Figure 2-A: Sensitive Historic Resources in the Piedmont Triad Operating Area



Basemap: ESRI Human Geography Imagery (2023)

Figure 2-B: Sensitive Historic Resources in the Piedmont Triad Operating Area

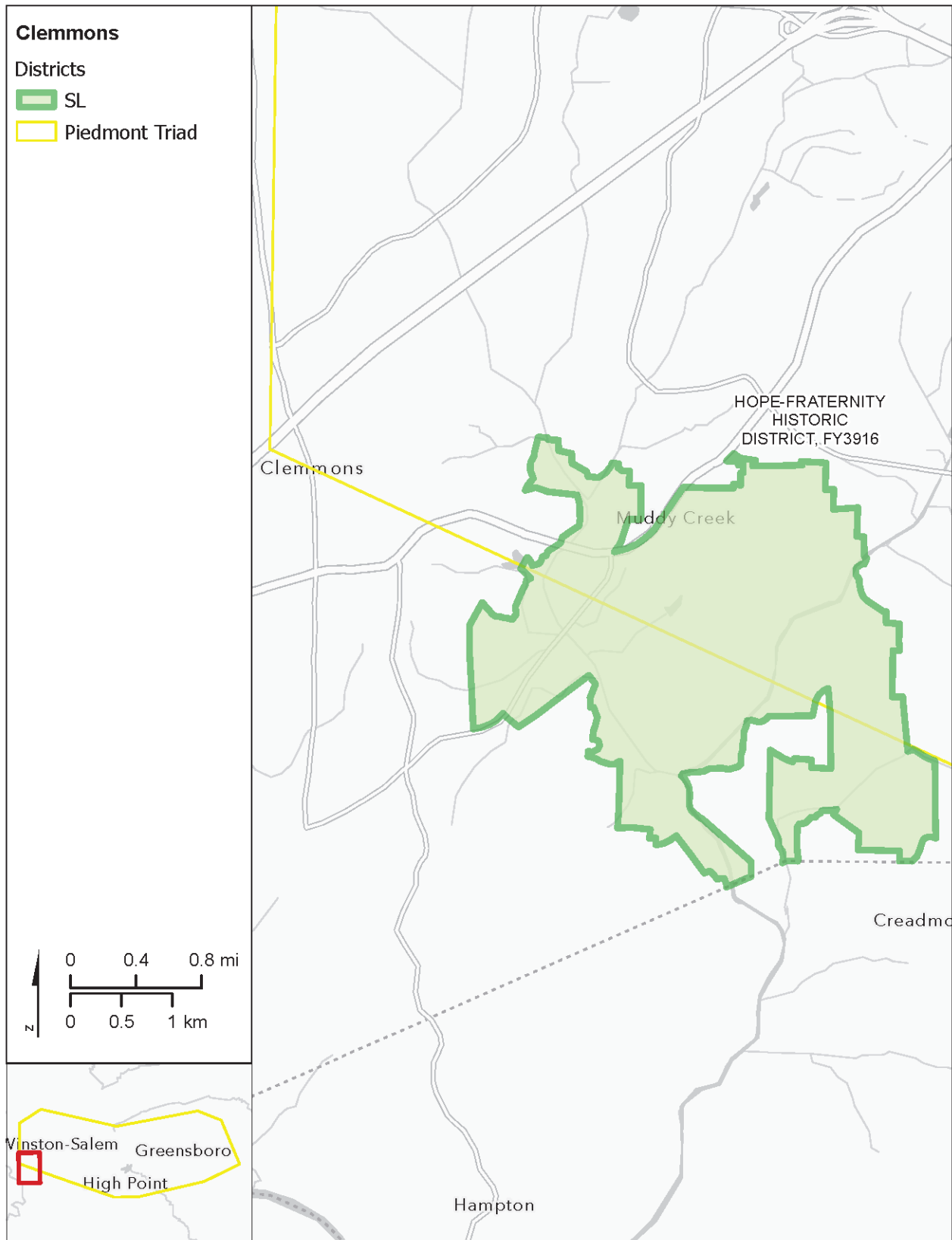
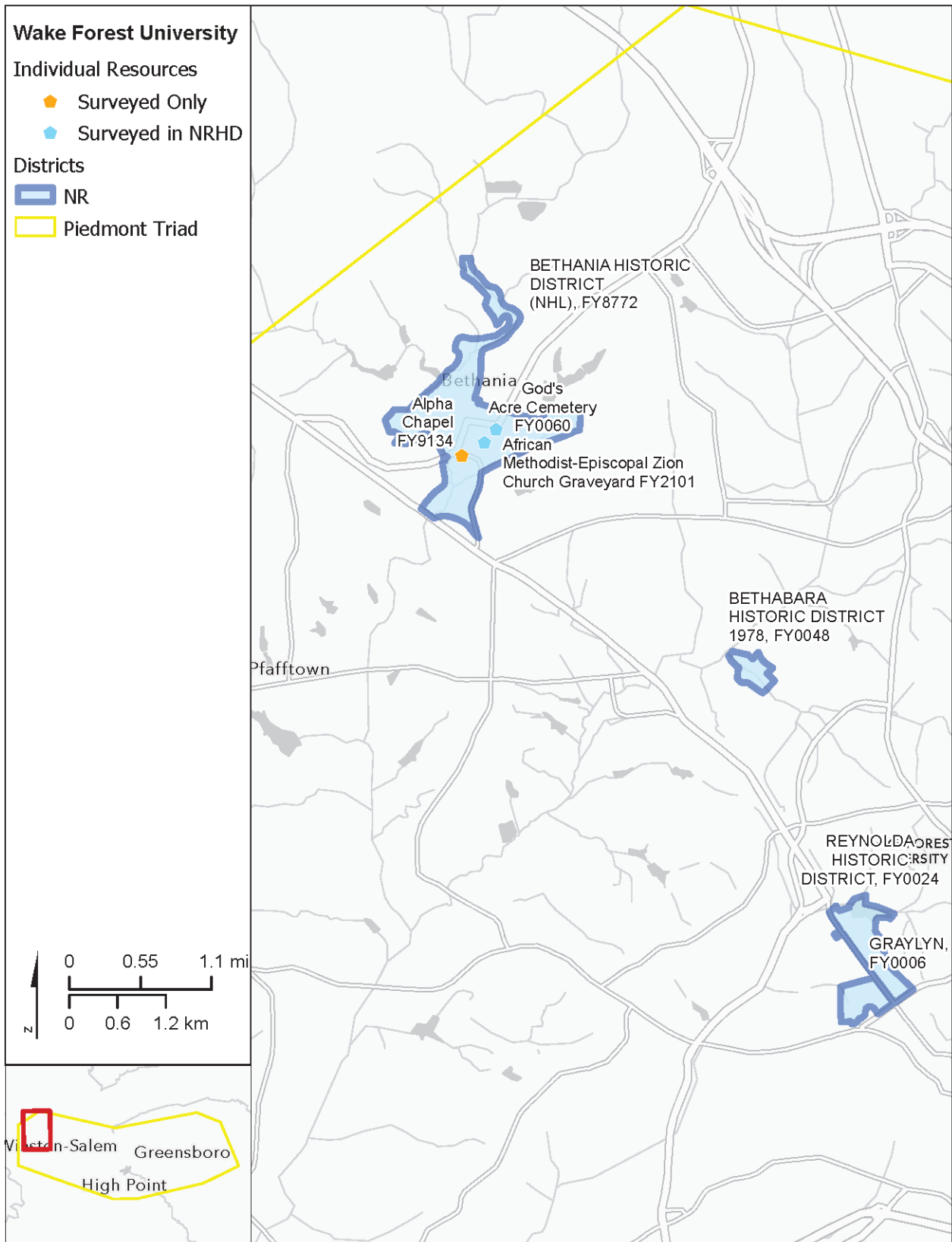
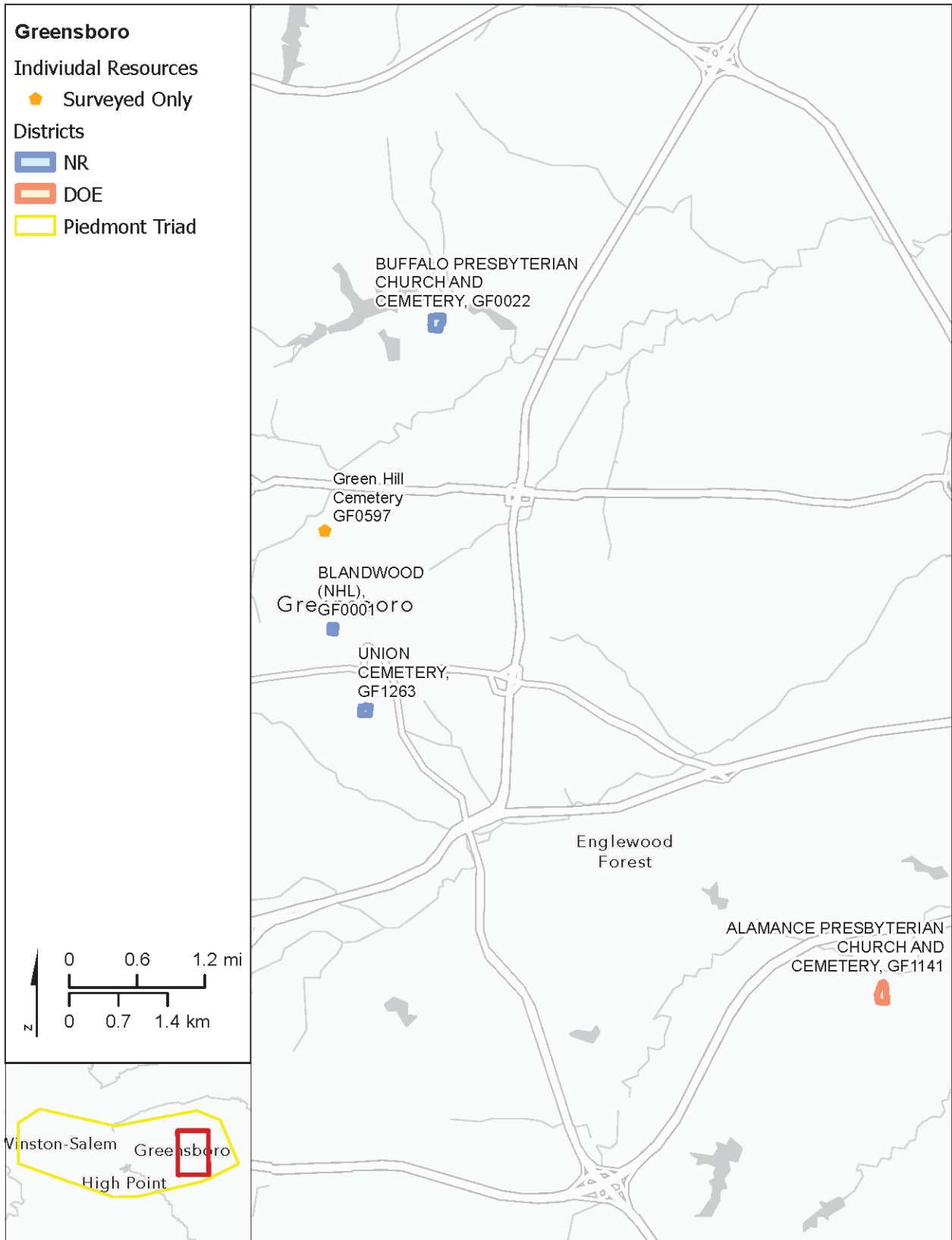


Figure 2-C: Sensitive Historic Resources in the Piedmont Triad Operating Area



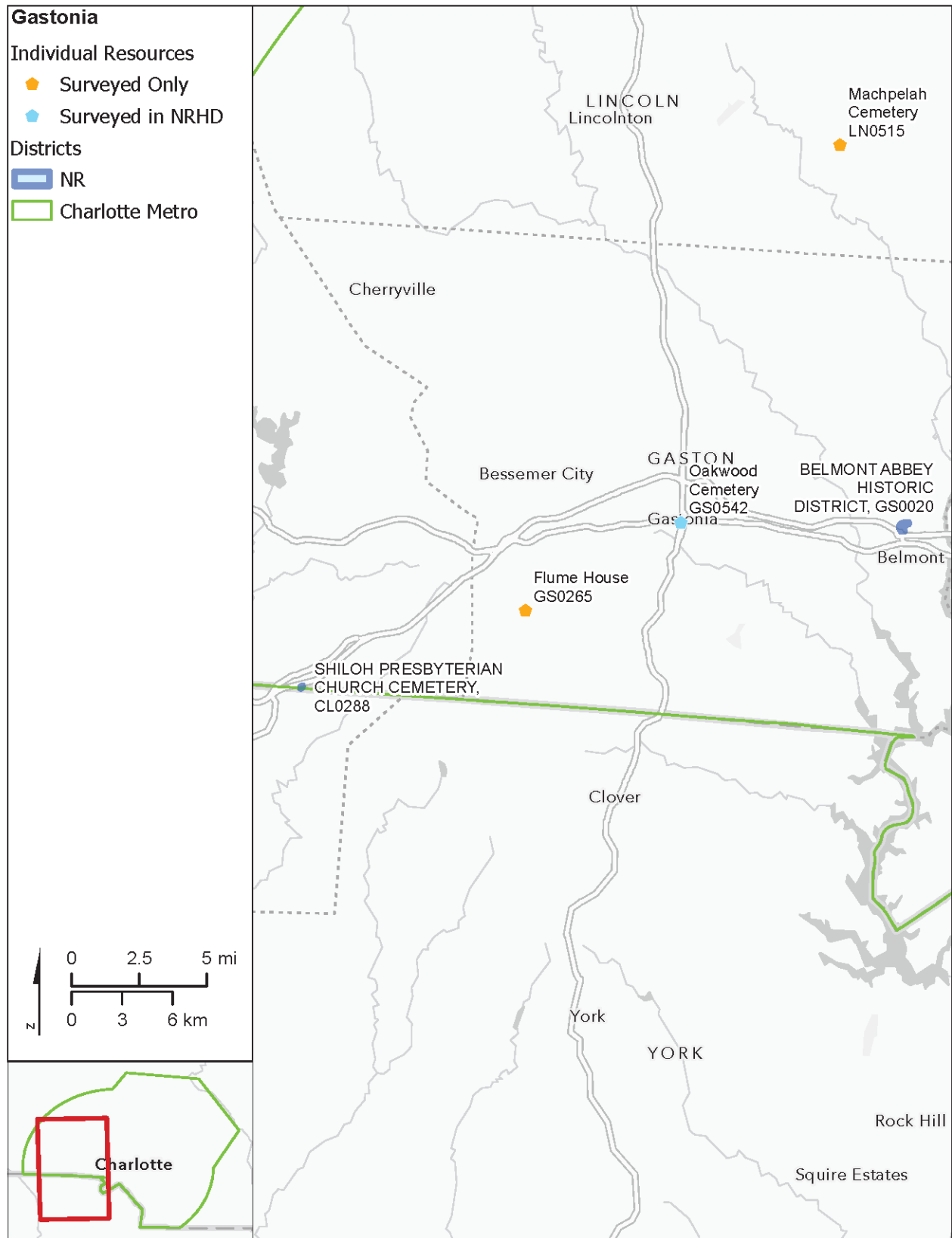
Basemap: ESRI Human Geography Imagery (2023)

Figure 2-D: Sensitive Historic Resources in the Piedmont Triad Operating Area



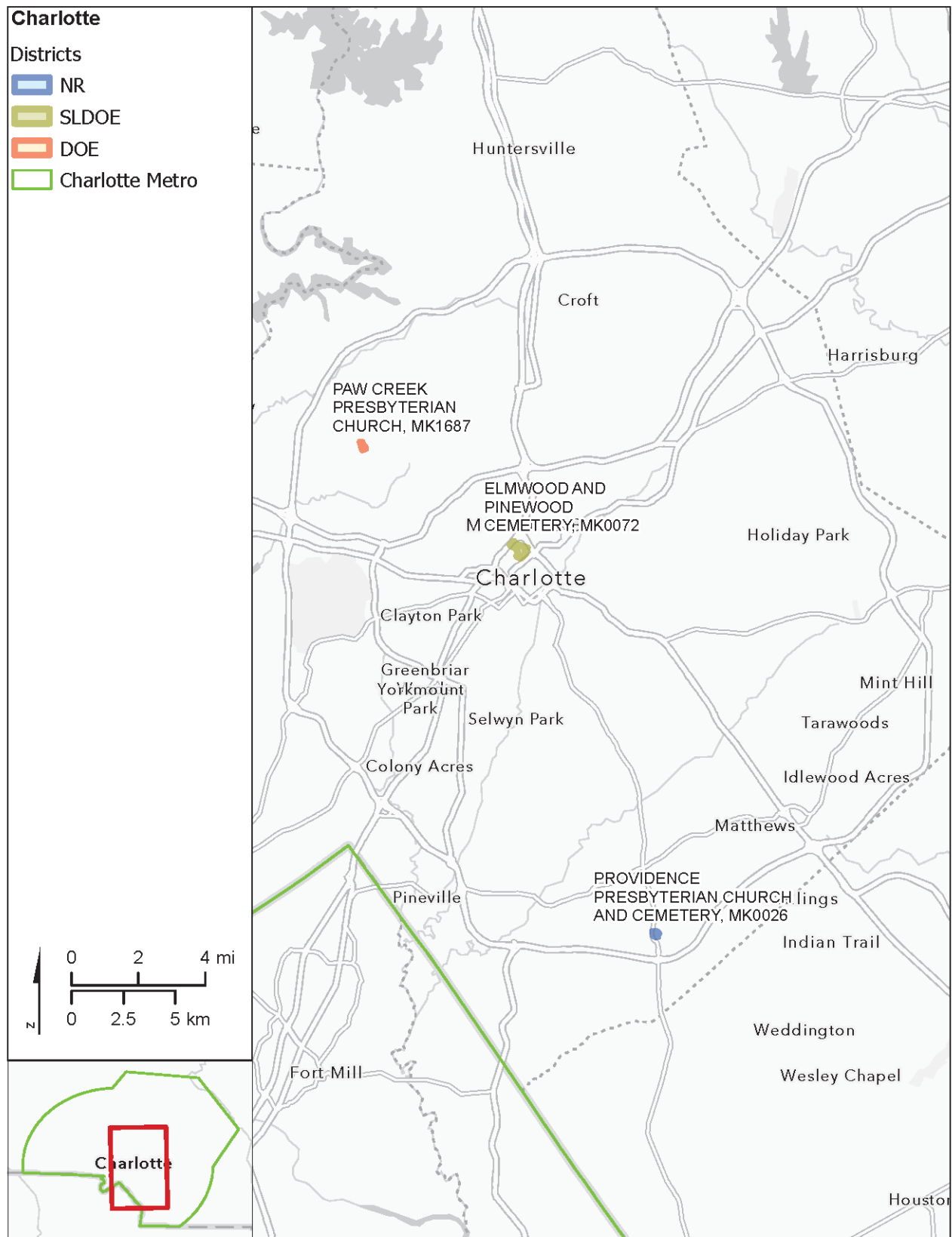
Basemap: ESRI Human Geography Imagery (2023)

Figure 2-E: Sensitive Historic Resources in the Piedmont Triad Operating Area



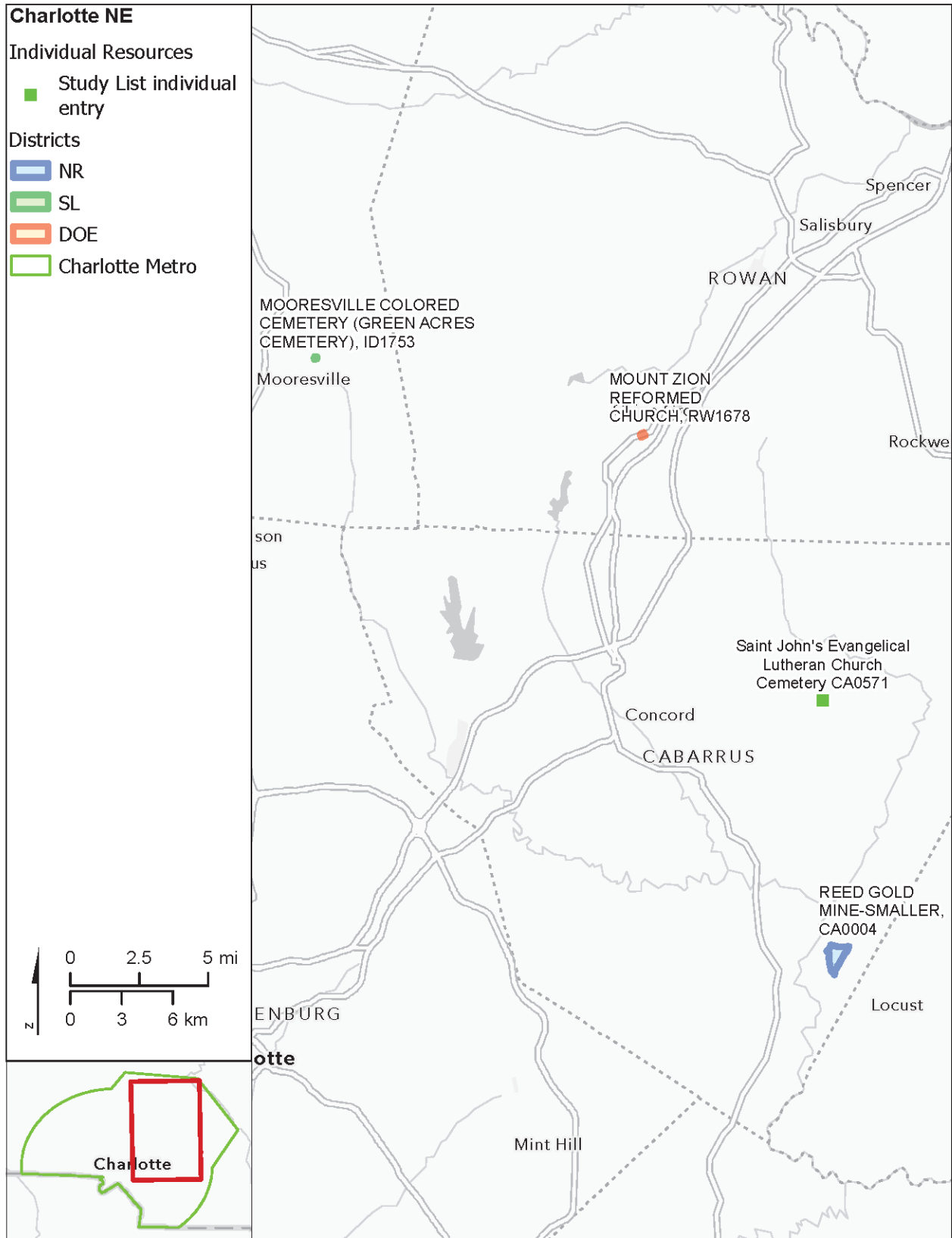
Basemap: ESRI Human Geography Imagery (2023)

Figure 3-A: Sensitive Historic Resources in the Charlotte Metro Operating Area



Basemap: ESRI Human Geography Imagery (2023)

Figure 3-B: Sensitive Historic Resources in the Charlotte Metro Operating Area



Basemap: ESRI Human Geography Imagery (2023)

Figure 3-C: Sensitive Historic Resources in the Charlotte Metro Operating Area

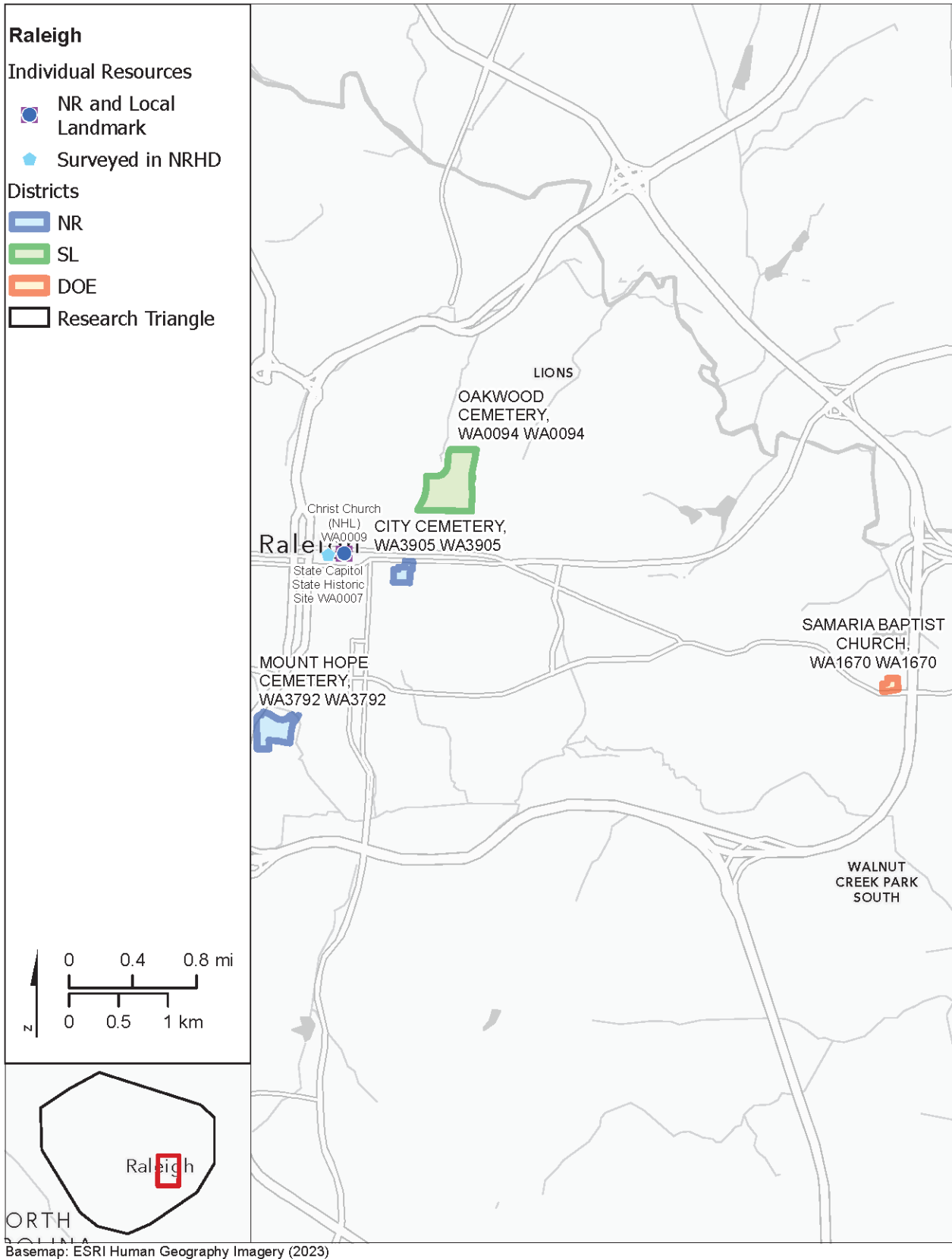


Figure 4-A: Sensitive Historic Properties in the Research Triangle Operating Area

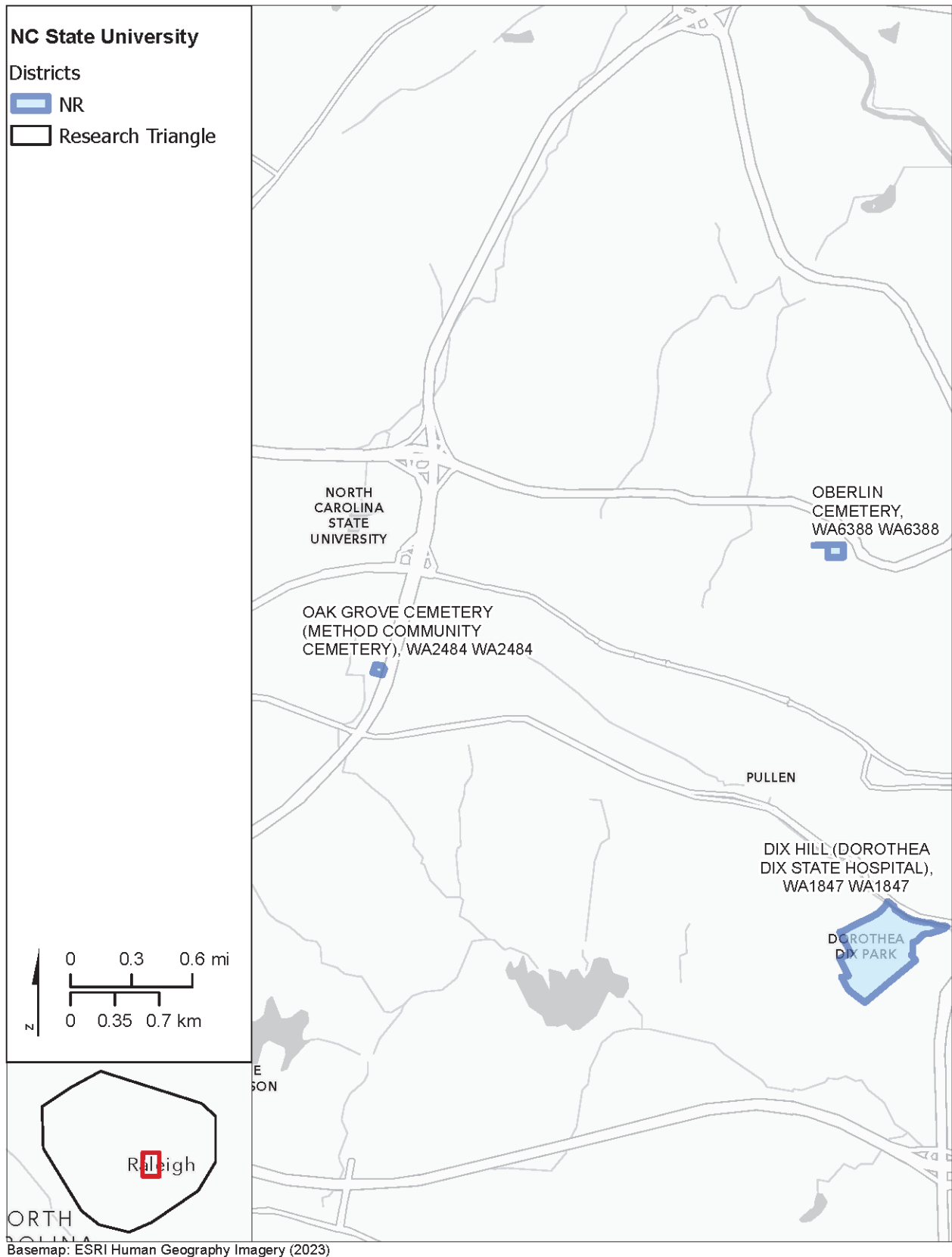


Figure 4-B: Sensitive Historic Properties in the Research Triangle Operating Area

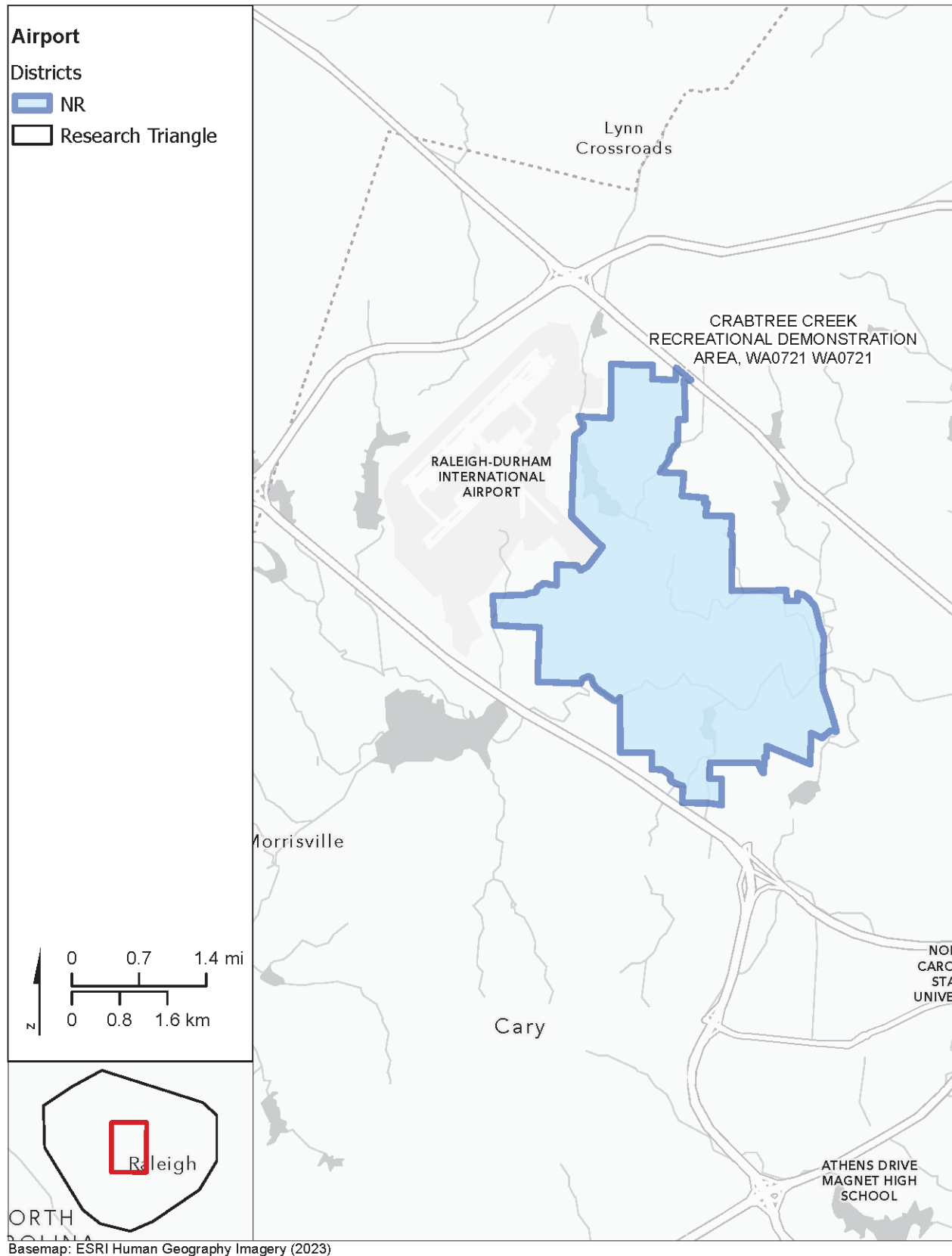


Figure 4-C: Sensitive Historic Properties in the Research Triangle Operating Area

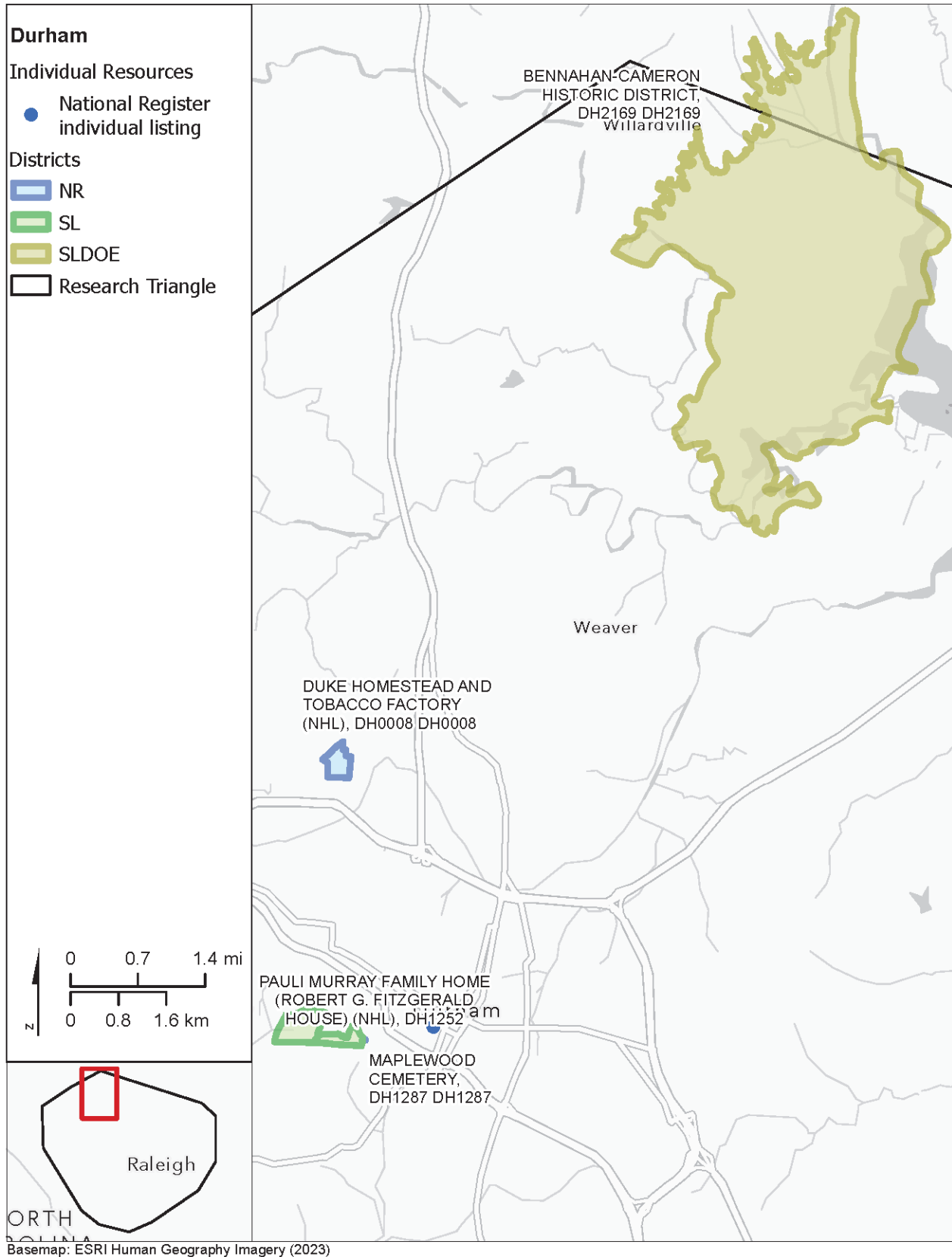


Figure 4-D: Sensitive Historic Properties in the Research Triangle Operating Area

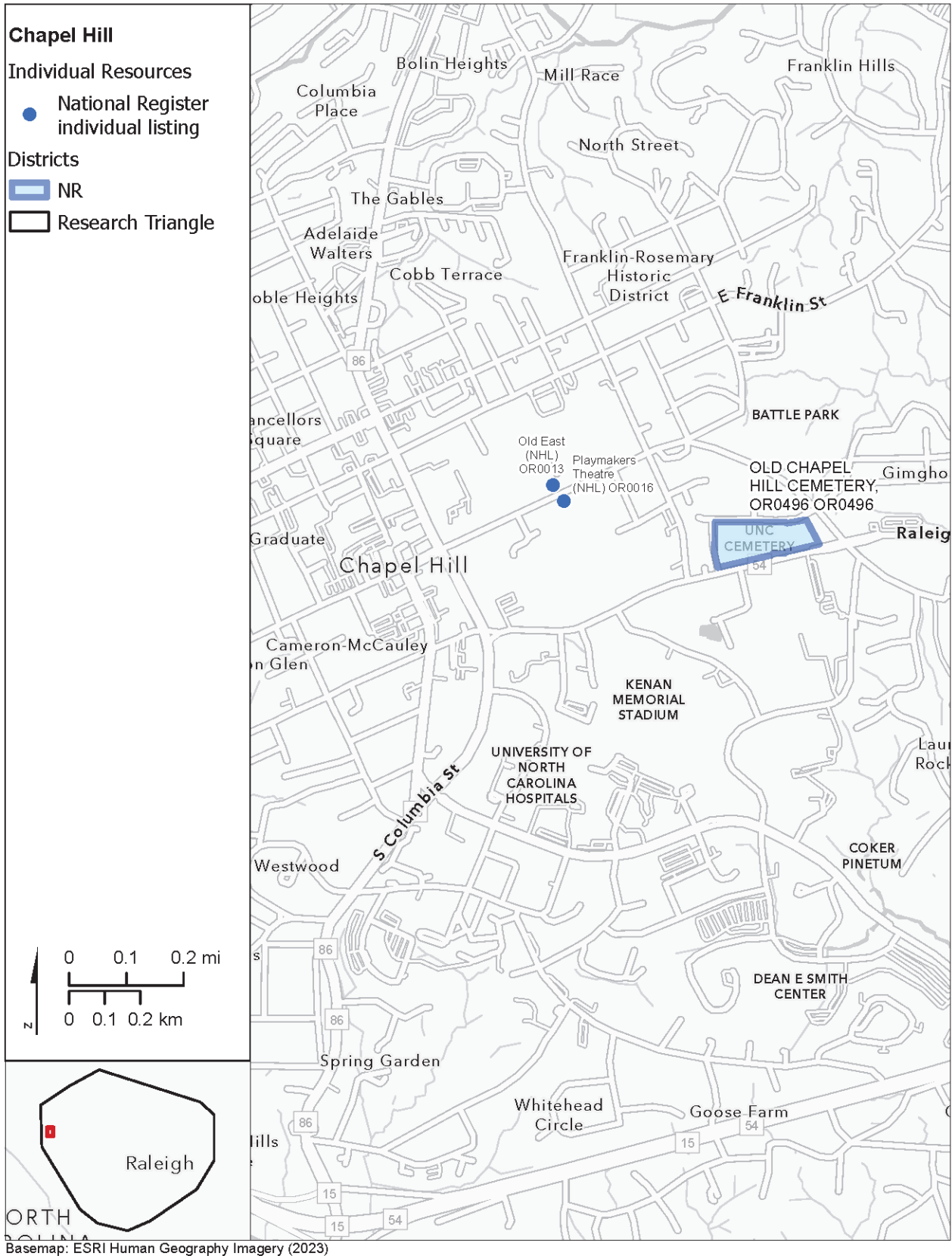
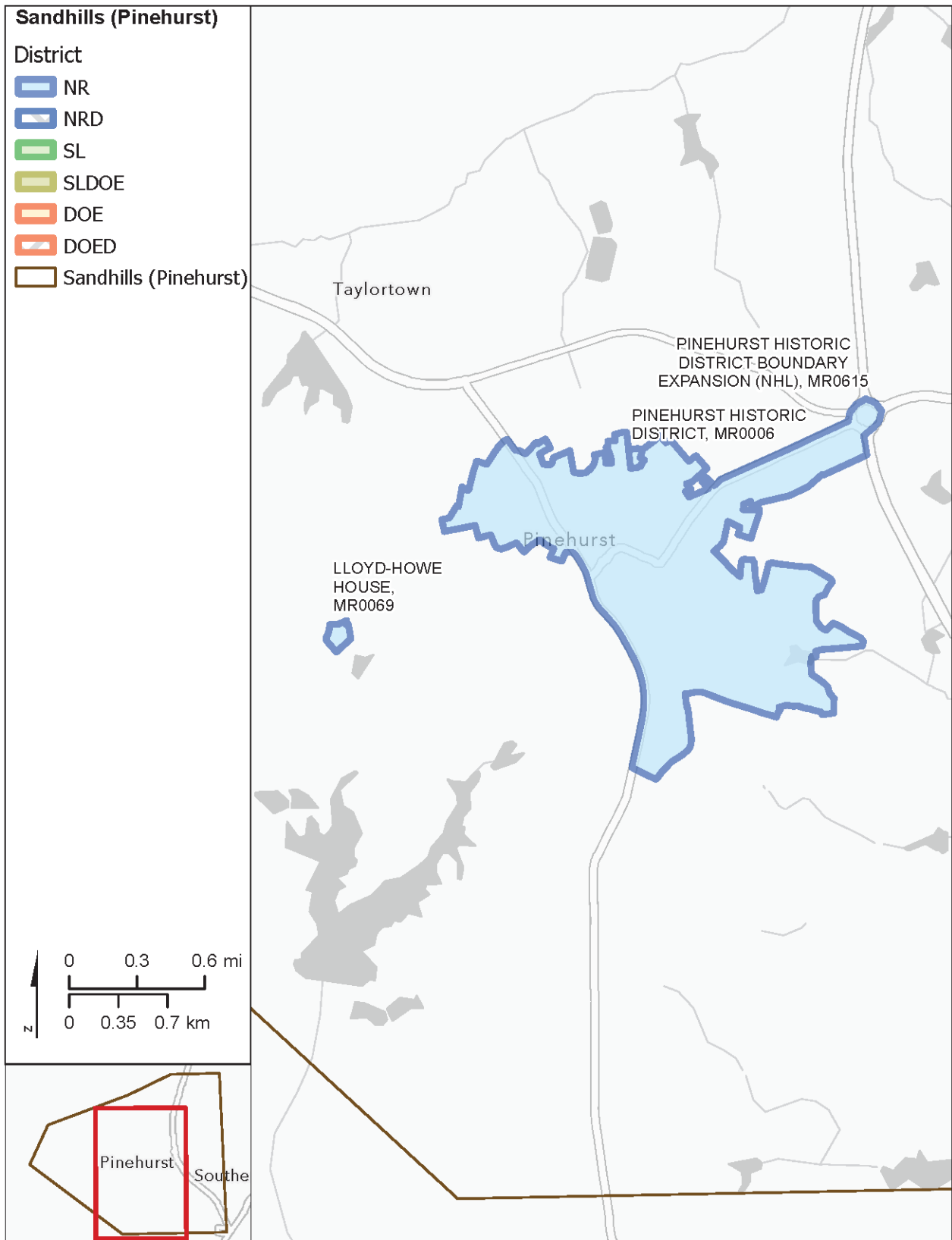
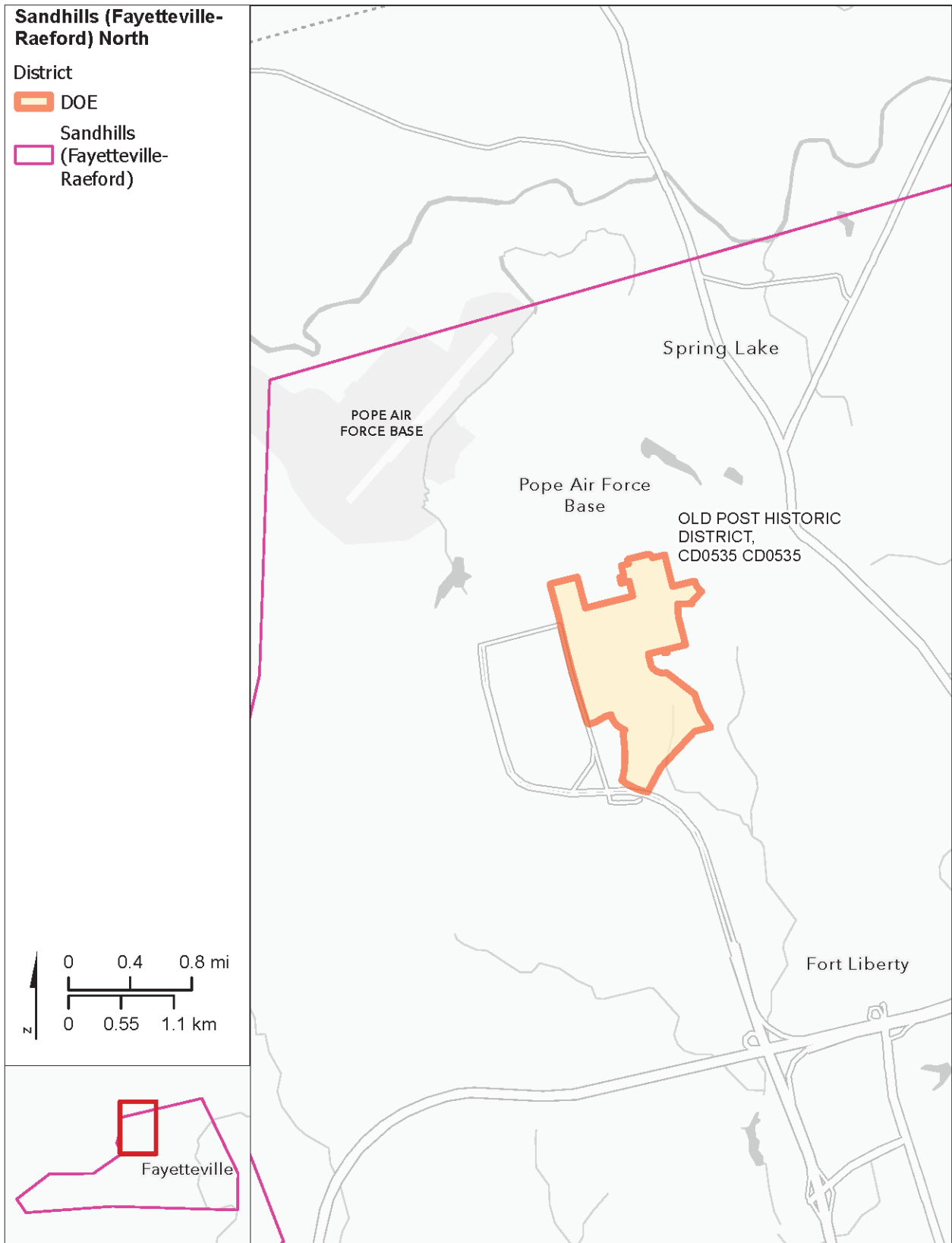


Figure 4-E: Sensitive Historic Properties in the Research Triangle Operating Area



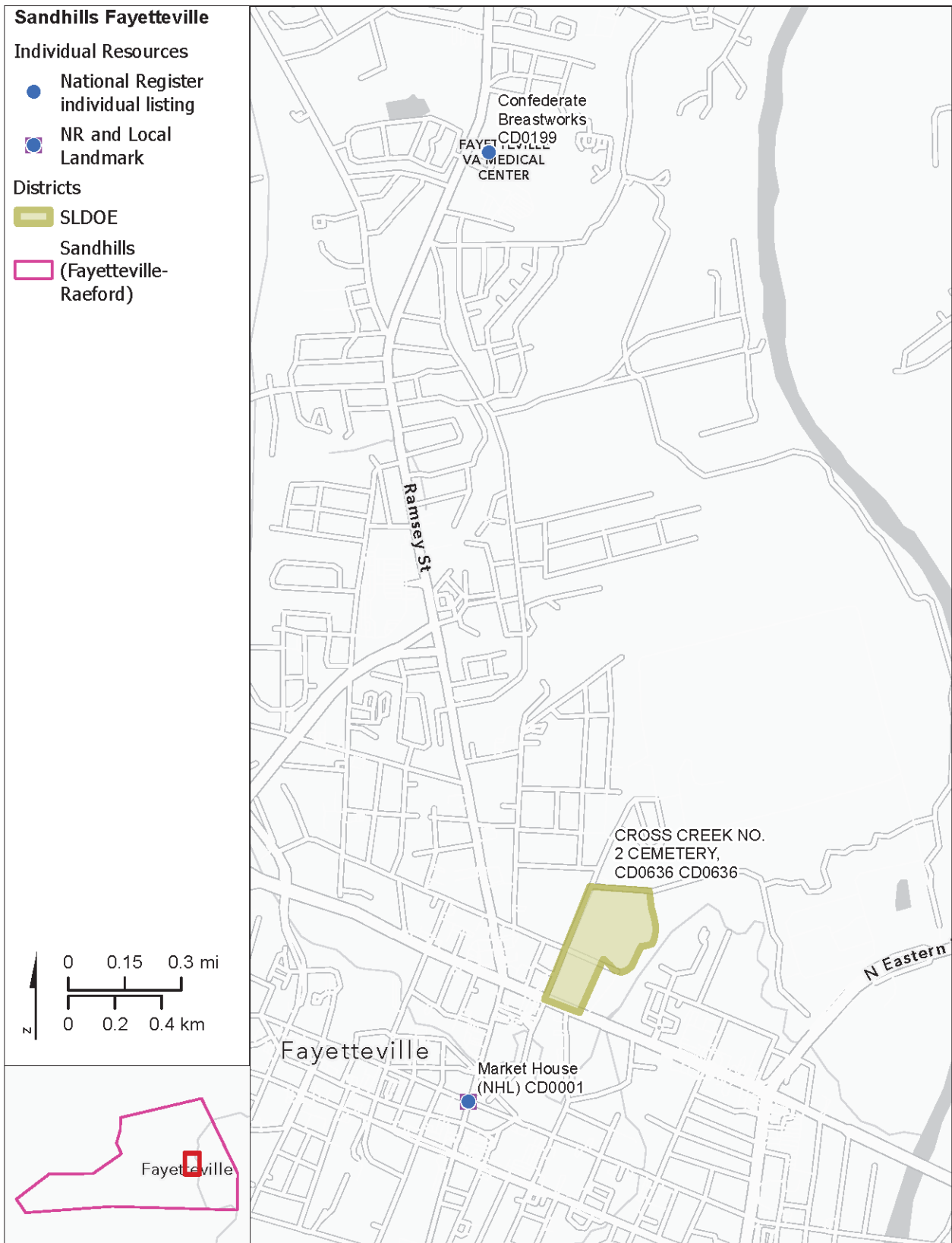
Basemap: ESRI Human Geography Imagery (2023)

Figure 5: Sensitive Historic Resources in the Sandhills (Pinehurst) Operating Area



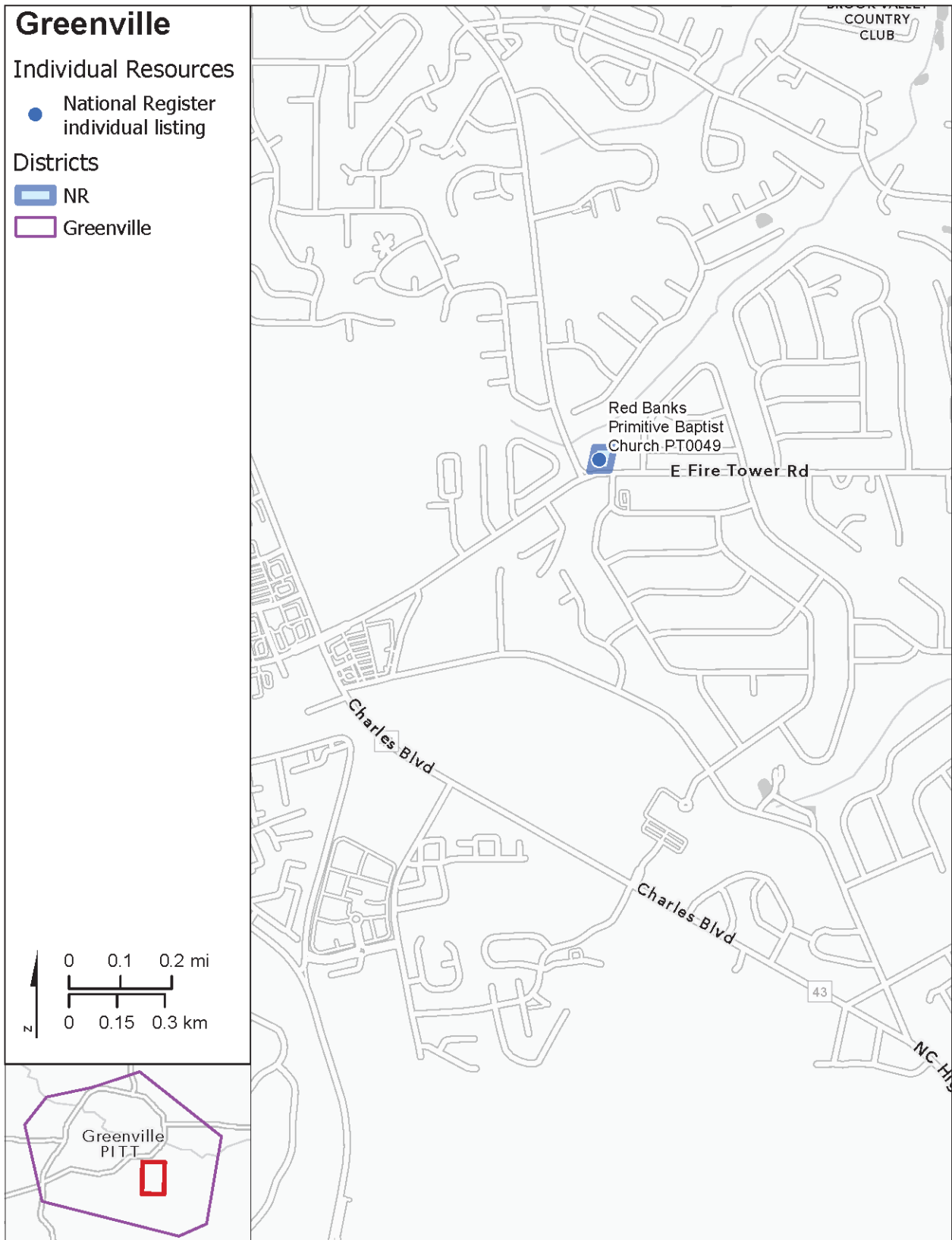
Basemap: ESRI Human Geography Imagery (2023)

Figure 6-A: Sensitive Historic Resources in the Sandhills (Fayetteville-Raeford) Operating Area



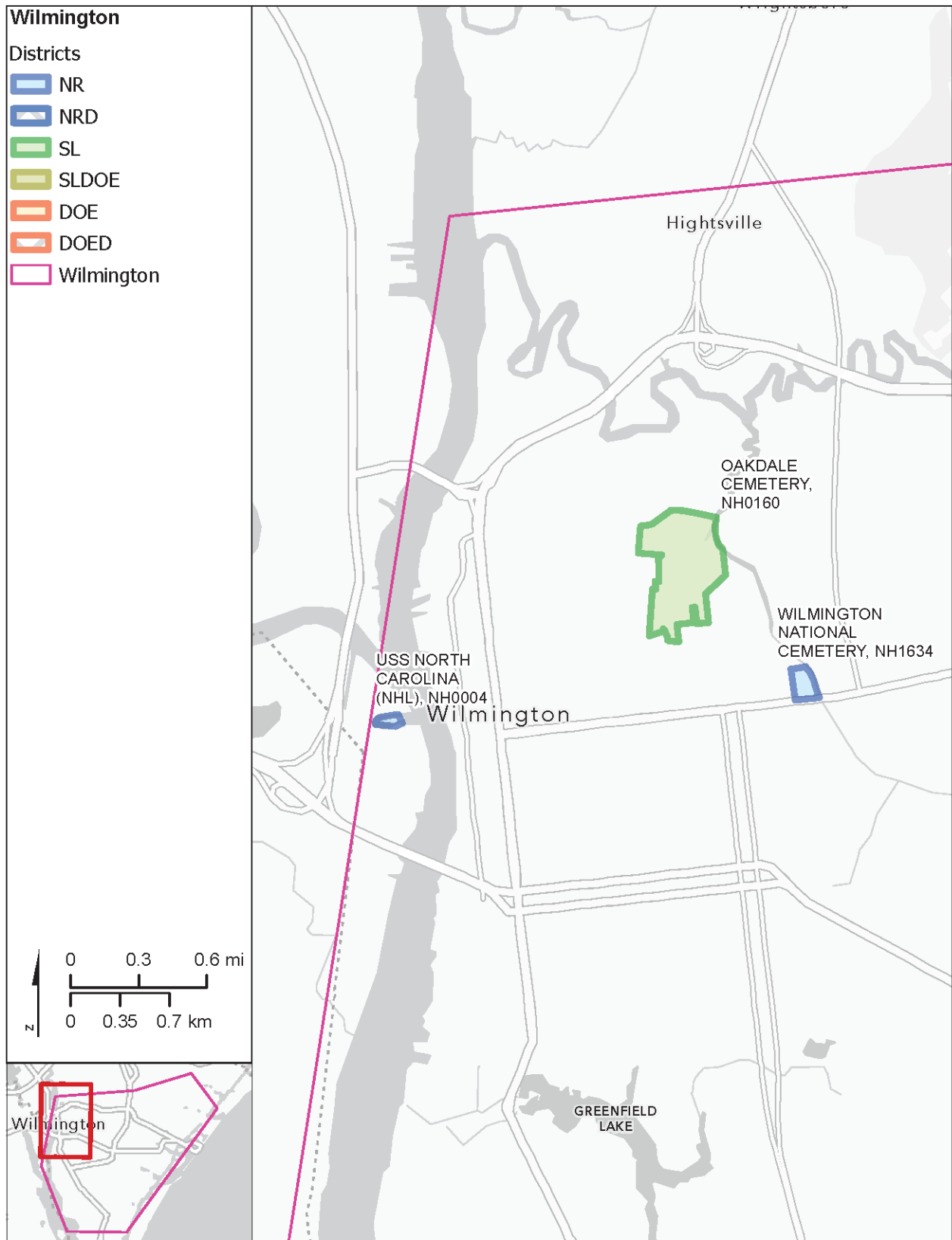
Basemap: ESRI Human Geography Imagery (2023)

Figure 6-B: Sensitive Historic Resources in the Sandhills (Fayetteville-Raeford) Operating Area



Basemap: ESRI Human Geography Imagery (2023)

Figure 7: Sensitive Historic Resources in the Greenville Operating Area



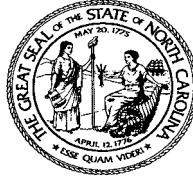
Basemap: ESRI Human Geography Imagery (2023)

Figure 8: Sensitive Historic Resources in the Wilmington Operating Area

ATTACHMENT B

Noise Assessment Report

*(Note: See Appendix D of
draft PEA for noise report).*



**North Carolina Department of Natural and Cultural Resources
State Historic Preservation Office**

Ramona M. Bartos, Administrator

Governor Roy Cooper
Secretary D. Reid Wilson

Office of Archives and History
Deputy Secretary, Darin J. Waters, Ph.D.

April 8, 2024

Nicholas Baker
FAA UAS Integration Office
Safety & Integration Division
Strategic Programs Branch (AUS-430)
Morrisville, NC

9-faa-drone-environmental@faa.gov

Re: Programmatic Environmental Assessment: Commercial package delivery using unmanned aircraft systems (drones), North Carolina, Multiple Counties, ER 23-1844

Dear Mr. Baker:

Thank you for your letter of March 25, 2024, concerning the above-referenced undertaking. We have reviewed the submittal and offer the following comments.

We concur with the Federal Aviation Administration's (FAA) finding of no adverse effect. We would like to acknowledge the excellent quality and thoroughness of New South Associates (NSA) screening of sensitive historic resources that may be affected by drone package delivery operations as well as providing everything as requested in your submittal for our review.

The above comments are made pursuant to Section 106 of the National Historic Preservation Act and the Advisory Council on Historic Preservation's Regulations for Compliance with Section 106 codified at 36 CFR Part 800.

Thank you for your cooperation and consideration. If you have questions concerning the above comment, contact Renee Gledhill-Earley, environmental review coordinator, at 919-814-6579 or environmental.review@dncr.nc.gov. In all future communication concerning this project, please cite the above referenced tracking number.

Sincerely,

A handwritten signature in blue ink that reads "Renee Gledhill-Earley".

for Ramona Bartos, Deputy
State Historic Preservation Officer

TRIBAL CONSULTATION



U.S. Department
of Transportation
**Federal Aviation
Administration**

Aviation Safety

800 Independence Ave., SW.
Washington, DC 20591

Via Email and Regular Mail

Principal Chief Michell Hicks
Eastern Band of Cherokee Indians
P.O. Box 1927
Cherokee, NC 28719
Email: ashlstep@nc-chokeee.com; pamstraughan@ebci-nsn.gov

RE: Invitation for Government-to-Government Tribal Consultation for Drone Package Delivery Operations in North Carolina

The purpose of this letter is to initiate formal government-to-government consultation regarding a proposal under consideration by the Federal Aviation Administration (FAA) to authorize commercial Unmanned Aircraft Systems (UAS) operators to deliver goods to customers (referred to as package delivery) using unmanned aircraft (also referred to as drones) in accordance with 14 Code of Federal Regulations Part 135 (Part 135) in the state of North Carolina. The FAA is the lead federal agency for government-to-government consultation for the proposed project. The North Carolina Department of Transportation is the proponent of the project. We wish to solicit your views regarding potential effects on tribal interests in the area.

The primary purpose of government-to-government consultation is to ensure that Federally Recognized Tribes are given the opportunity to provide meaningful and timely input regarding proposed FAA actions that uniquely or significantly affect the Tribes. This policy is provided in Federal Executive Order 13175, *Consultation and Coordination with Indian Tribal Governments*; Presidential Memorandum, *Uniform Standards for Tribal Consultation*; DOT Order 5301.1A, *Department of Transportation Tribal Consultation Policy and Procedures*; and FAA Order 1210.20, *American Indian and Alaska Native Tribal Consultation Policy and Procedures*.

Consultation Initiation

With this letter, FAA is seeking input concerning any Tribal lands or sites of religious or cultural significance that may be affected by the proposed operation. Early identification of Tribal concerns, or known properties of traditional, religious, and cultural importance, will allow the FAA to consider ways to avoid or minimize potential impacts to Tribal resources. We are available to discuss the details of the proposed project with you. By copy of this letter, we are also notifying the Tribal Historic Preservation Office for the Eastern Band of Cherokee Indians of this request.

Proposed Activity Description

The FAA is preparing a programmatic environmental assessment to assess the potential environmental impacts of the FAA's actions of authorizing commercial package delivery operations using drones in the state of North Carolina under Part 135. Since 2019, the FAA has been issuing air carrier certificates to UAS operators in accordance with Part 135 so that operators can conduct package delivery flights. Generally, these approvals are associated with issuing a new or amended Part 135 air carrier Operations Specifications as the operative approval. For your reference, a project description is enclosed with this letter.

Confidentiality

We understand that you may have concerns about the confidentiality of information on areas or resources of traditional, religious, and cultural importance to your Tribe. We are available to discuss these concerns and develop procedures to ensure the confidentiality of such information is maintained.

FAA Contact Information

Your timely response over the next 30 days will greatly assist us in incorporating your concerns into our environmental review of the operation. In addition, we respectfully request your response in the event that the Eastern Band of Cherokee Indians would like to consult with the FAA in a government-to-government relationship about this proposal. Please contact Nicholas Baker via email at 9-AWA-AVS-AFS-ENVIRONMENTAL@faa.gov within 30 days of the receipt of this letter to confirm your intent to participate in this government-to-government consultation.

Sincerely,

Jay Kinser
Manager, Strategic Programs Branch
UAS Integration Office

Enclosure: Attachment 1 – Project Description

Cc: Russell Townsend
Tribal Historic Preservation Office
Eastern Band of Cherokee Indians
P.O. Box 455
Cherokee, North Carolina 28719
Email: russtown@ebci-nsn.gov; syerka@ebci-nsn.gov

Attachment 1 – Project Description

Background

In 2012, the U.S. Congress first charged the Federal Aviation Administration (FAA) with integrating Unmanned Aircraft Systems (UAS) into the national airspace system (NAS). The FAA has engaged in a phased, incremental approach to integrating drones into the NAS and continues to work toward full integration of drones into the NAS. From 2017 through 2020, the UAS Integration Pilot Program focused on testing and evaluating the integration of drone operations into the NAS. This work continues under the UAS BEYOND program, which focuses on the remaining challenges of UAS integration, including beyond visual line of sight operations, societal and economic benefits of UAS operations, and community engagement. Participants in these programs are among the first to prove their concepts, including package delivery by drone through Part 135 air carrier certification. Part 135 certification is currently the only path for drones to carry the property of another for compensation beyond visual line of sight.

The North Carolina Department of Transportation (NCDOT) has been a lead partner in the FAA's drone integration partnership programs since 2017, first as a partner in the Integration Pilot Program and then continuing as a partner in the BEYOND program. In this role, NCDOT is collaborating with partners to test and prove operations that can gain FAA approvals to expand beyond visual line of sight and other complex operations in the state. Within the state of North Carolina, NCDOT has the authority to implement and manage regulations pertaining to state laws as set by the North Carolina State General Assembly concerning drone operations.

To support the development of a programmatic environmental assessment, NCDOT developed a forecast for future Part 135 UAS package delivery operations in North Carolina and shared it with the FAA. The FAA used the forecast to identify operating areas where UAS package delivery operations are likely to occur between 2024 and 2030 and to define the levels of UAS activities that may be expected based on existing and future market analyses. The NCDOT selected 2030 as the future year for evaluation in the forecast because it is a reasonable timeframe in which UAS market and fleet predictions can be made.

Proposed Action

The proposed action includes the various FAA approvals associated with authorizing drone package delivery under Part 135. NCDOT has projected Part 135 drone package delivery operations for the state of North Carolina out to year 2030 and provided that projection to the FAA for environmental analysis. The proposed action includes commercial drone package deliveries from takeoff and landing areas (referred to as hubs) based on NCDOT's maximum forecasted operations for conservative purposes.

The type, size, and weight of aircraft used to deliver packages could vary, but NCDOT anticipates multi-copter platforms will be the primary type of unmanned aircraft (UA) used to deliver small packages in the foreseeable future. The characteristics of the UAS considered in the environmental assessment are displayed in **Table 1**.

Table 1. UAS Characteristics

Characteristic	Criteria
Platform/Vehicle Type	Multi-copters (2 to 8 propellers), fixed wing, and hybrid aircraft (vertical lift with fixed-wing cruise)
Power	Electric motor
Delivery Mechanism Types	Drop off, tethered (wire/cable), customer unloads, ground drop, parachute
Maximum Aircraft Weight	Approximately 87 pounds
Maximum Payload (Package) Weight	Approximately 5 pounds
Maximum Aircraft Takeoff Weight	Approximately 92 pounds
Typical Cruise Altitude	150–375 feet above ground level
Maximum Cruise Altitude	400 feet above ground level
Hours of Operation	7:00 a.m. – 10:00 p.m.
Operation Days	7 days per week, 365 days per year

While UA come in varying sizes with varying flight capabilities, the flight operations can generally be categorized into the following five phases: 1) takeoff and climb, 2) en route outbound, 3) delivery, 4) en route inbound, and 5) descent and landing. In general, package delivery operators partner with established businesses and identify the location for a hub at the business’s parking lot, rooftop, or other area where it is not disruptive to the business and does not present a safety hazard. This allows the drone operator to conduct operations with minimal infrastructure requirements and no ground disturbance activities. Prior to takeoff, packages are manually loaded onto the UA by a ground crew at the hub. The UA then climbs and performs aerial deliveries following a predetermined flight path that is set using software that assigns, deconflicts, and routes each flight. After delivery, the UA returns to its hub via a predetermined flight path.

In general, Part 135 UAS package delivery operators prefer areas where they can serve the most customers while flying the least distance. In addition, operators look for communities with median incomes sufficient to support spending extra money on drone package delivery services. Finally, operators need enough unrestricted airspace to operate with minimal physical restrictions. Based upon these parameters, as well as existing UAS package delivery operations in North Carolina, NCDOT identified seven regions within North Carolina as likely operating areas for UAS package deliveries in the next seven years. These operating areas include Asheville, Charlotte Metro (including Kannapolis), Piedmont Triad (Winston-Salem, High Point, and Greensboro), Research Triangle (Raleigh, Durham, Chapel Hill, and adjacent communities), Sandhills (Pinehurst, Raeford, and Fayetteville), Greenville, and Wilmington (see **Figures 1–8**).

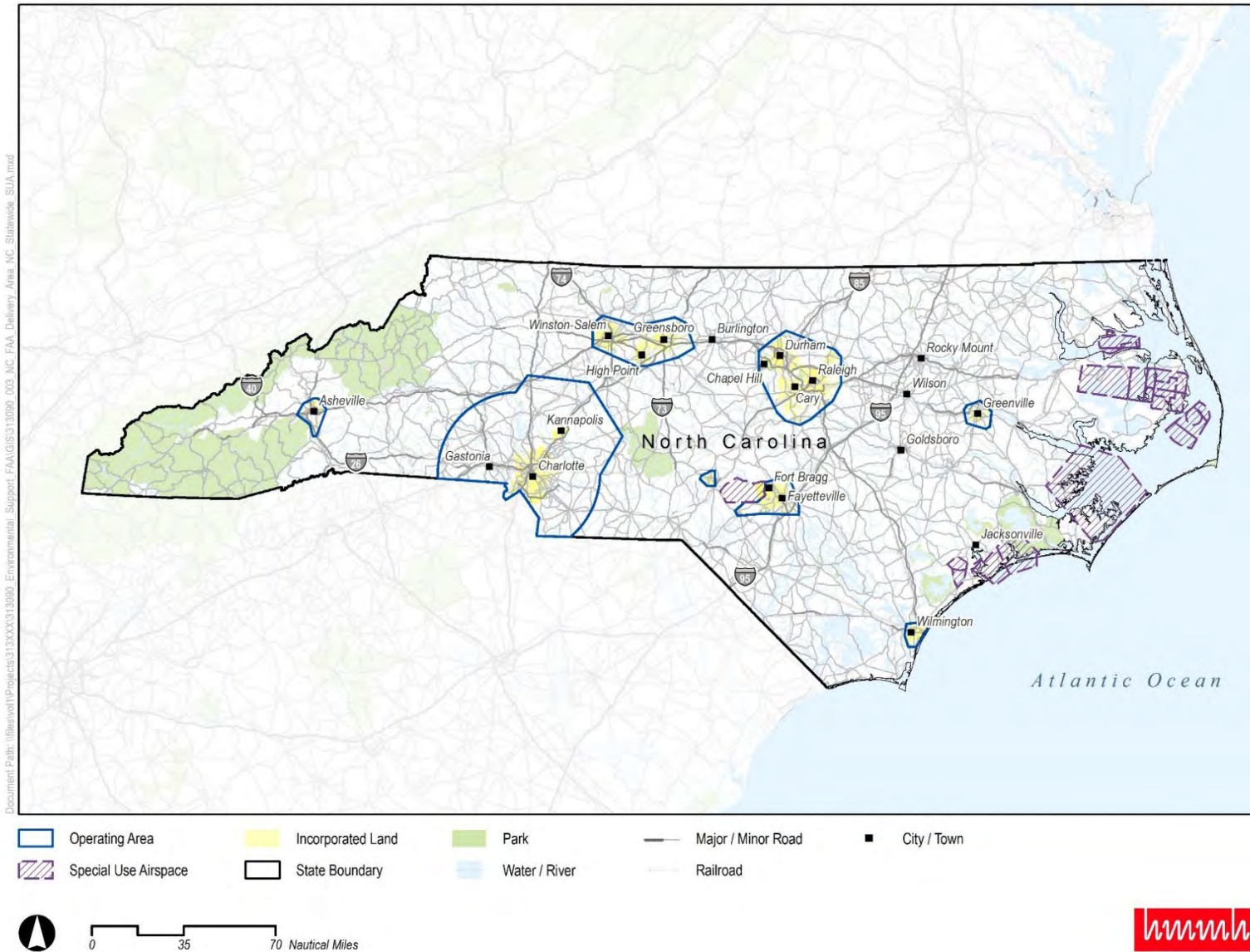


Figure 1. Operating Areas – Statewide

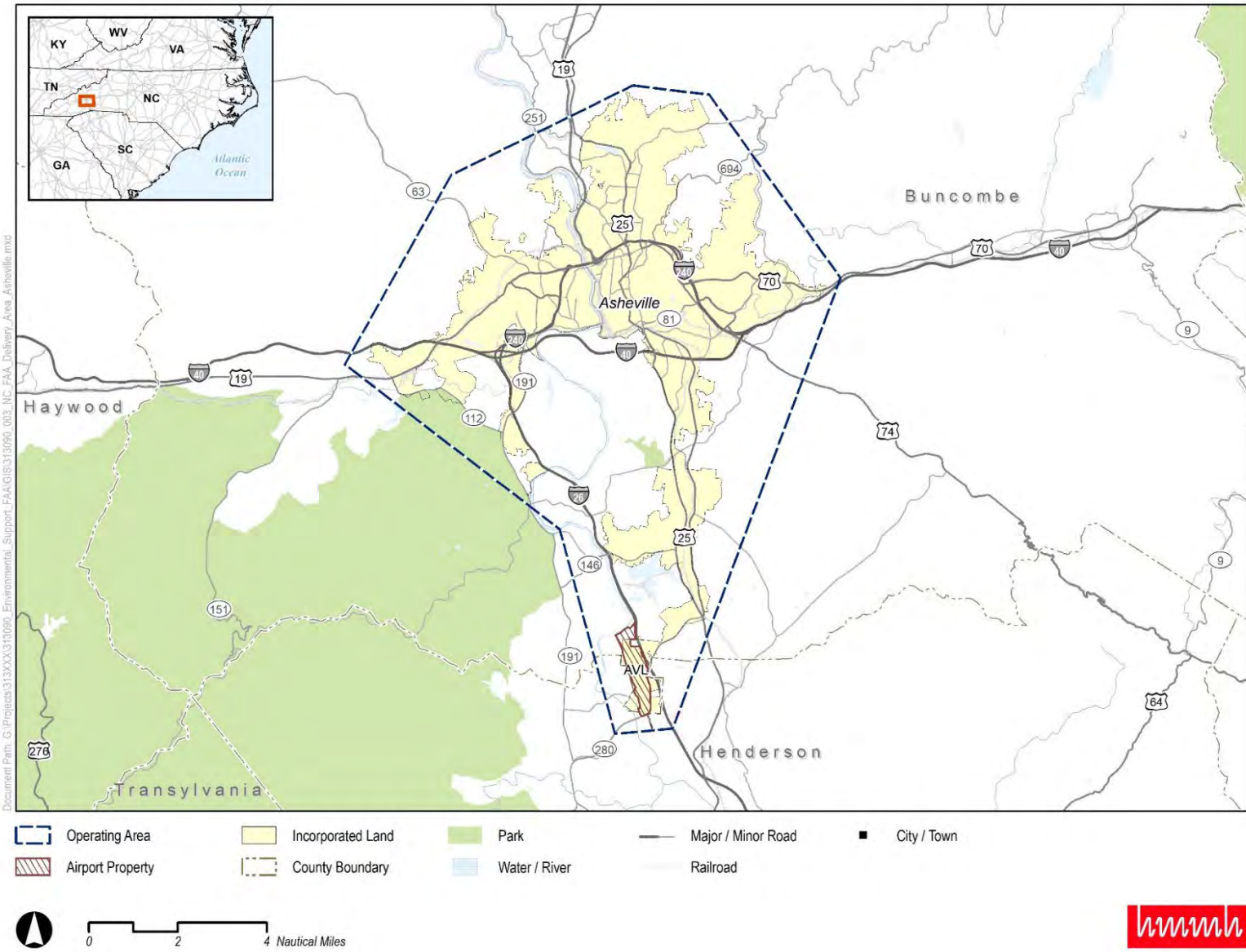
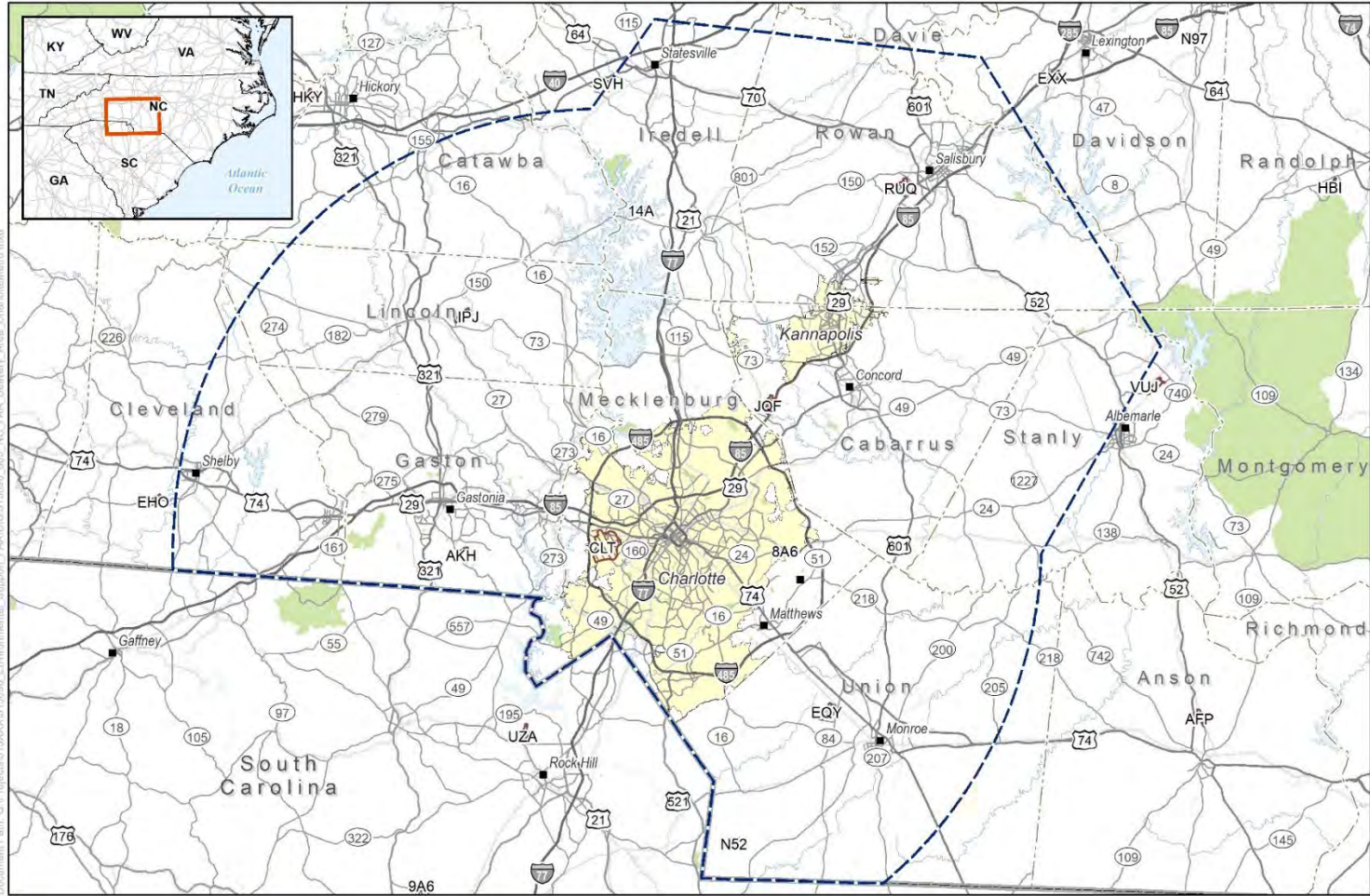


Figure 2. Asheville Operating Area



- Operating Area
- Incorporated Land
- Park
- Major / Minor Road
- City / Town
- Airport Property
- County Boundary
- Water / River
- Railroad
- State Boundary

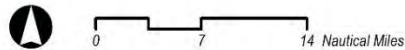
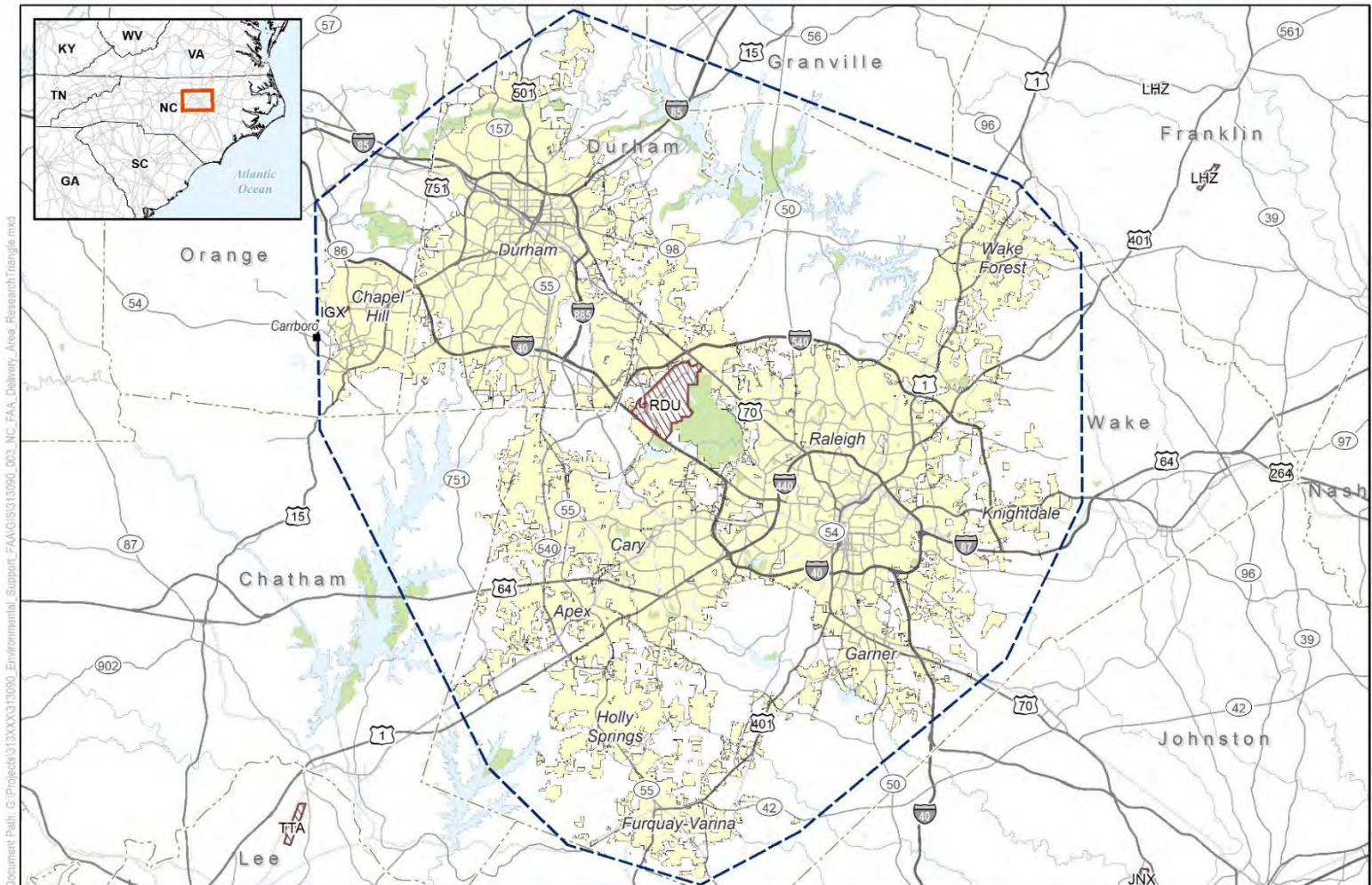
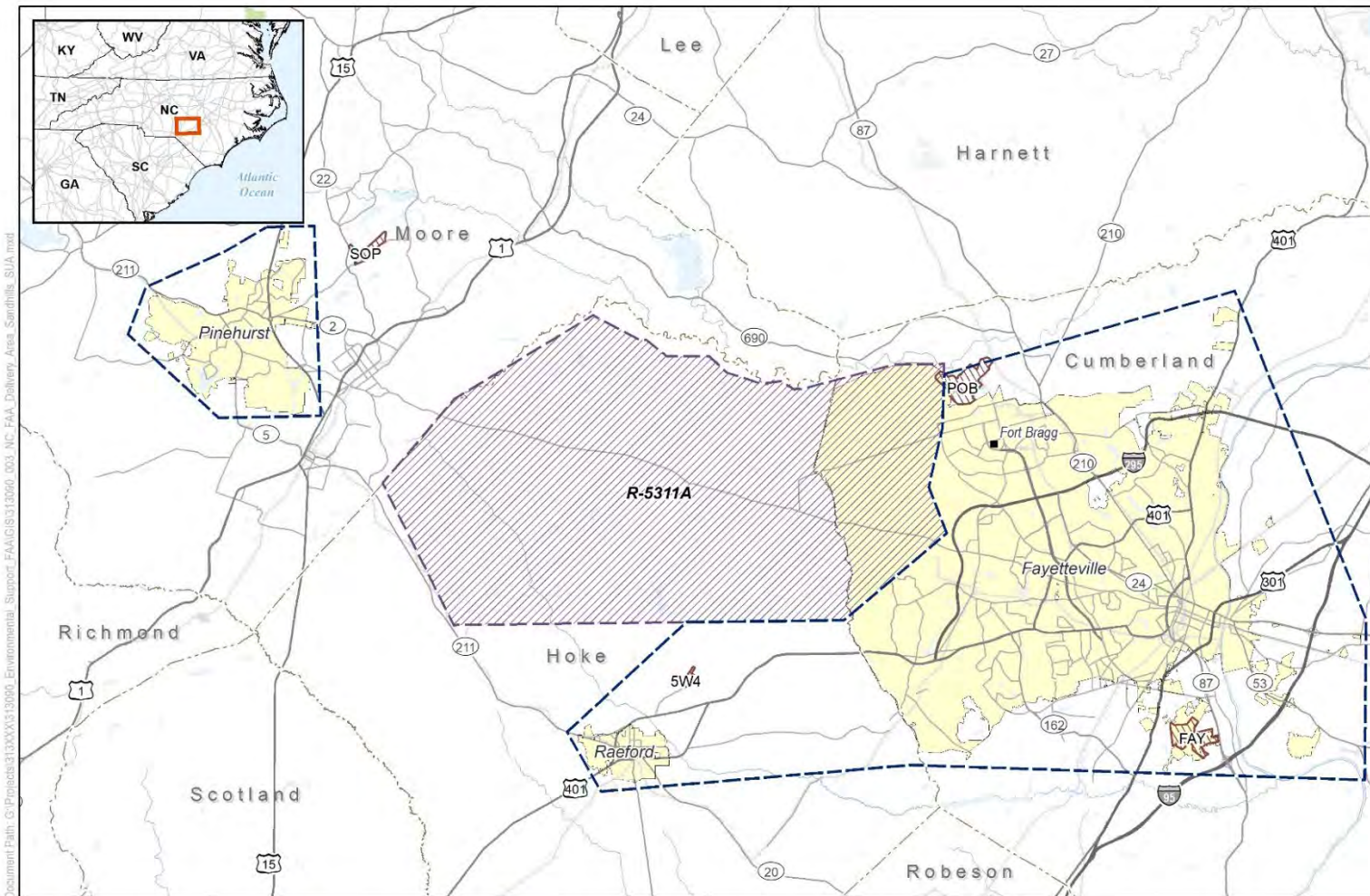


Figure 3. Charlotte Metro Operating Area



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Figure 5. Research Triangle Operating Area



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- | | | | | |
|------------------|-------------------|---------------|--------------------|----------------------|
| Operating Area | Incorporated Land | Park | Major / Minor Road | City / Town |
| Airport Property | County Boundary | Water / River | Railroad | Special Use Airspace |



0 3 6 Nautical Miles



Figure 6. Sandhills Operating Area

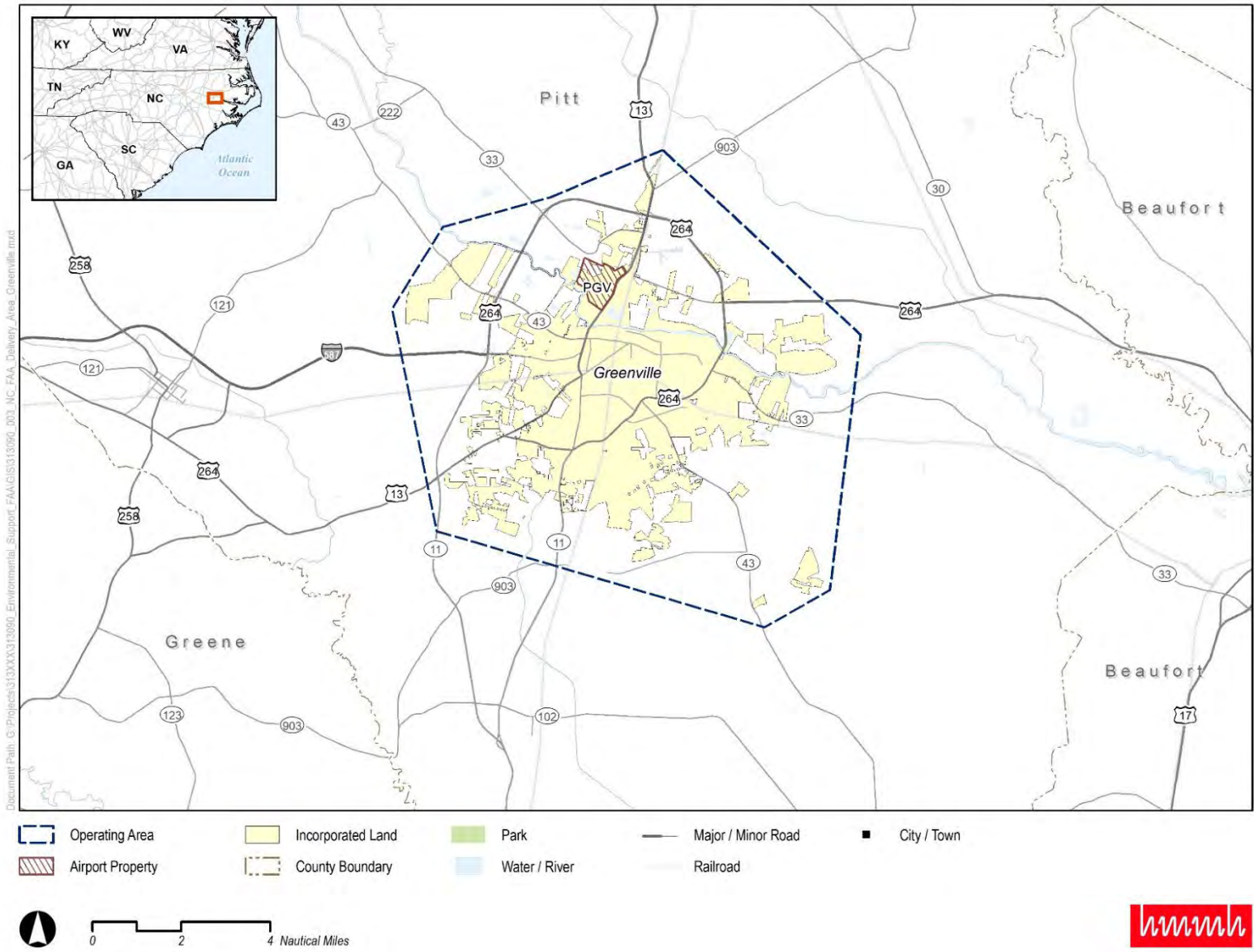


Figure 7. Greenville Operating Area

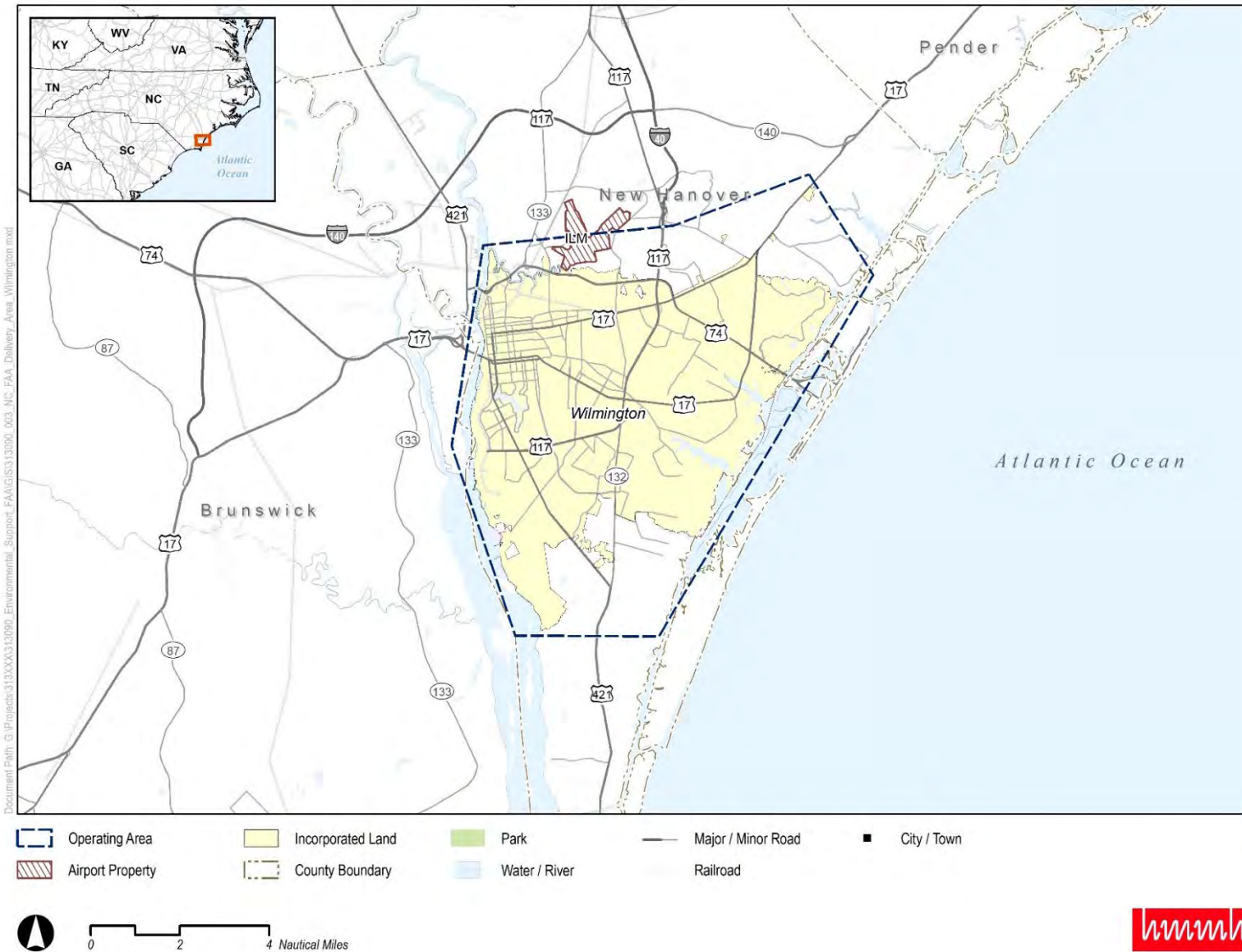


Figure 8. Wilmington Operating Area

APPENDIX F
DEPARTMENT OF TRANSPORTATION
ACT, SECTION 4(f) RESOURCES

Publicly-Owned Parks and Recreation Areas within Study Area

Name	Operating Area	Area (Acres)
Blue Ridge Parkway	Asheville	1756.3
Brooklawn Park	Asheville	232.4
Cedar Cliff/Little Cedar Mountain	Asheville	342.6
Deaver View Mountain	Asheville	243.9
Fanning Bridge Swamp	Asheville	35.1
Long Shoals Wetland Complex	Asheville	8.2
Pisgah National Forest	Asheville	2087.3
Richmond Hill Forest	Asheville	241.7
Albemarle Road Park	Charlotte Metro	14.4
Alexander Park	Charlotte Metro	4.1
Allen Hills Park	Charlotte Metro	8.3
Amay James Park	Charlotte Metro	12.9
American Legion Park	Charlotte Metro	12.9
Andrew Jackson Ridges	Charlotte Metro	906.6
Anita Stroud Park	Charlotte Metro	6.8
Archdale Park	Charlotte Metro	18.5
Armstrong Ford	Charlotte Metro	116.7
Back Creek Gabbro Hill	Charlotte Metro	28.7
Baker Creek Park	Charlotte Metro	26.5
Bakers CR Park	Charlotte Metro	3.6
Barber Hardpan Forest	Charlotte Metro	17.8
Barber Oak-Hickory Forest	Charlotte Metro	26.8
Baseball Field	Charlotte Metro	4.0
Baucom Bluff	Charlotte Metro	9.2
Baxter Street Park	Charlotte Metro	10.9
Beaver Street Park	Charlotte Metro	1.2
Bell Farm Bigleaf Magnolia Slopes	Charlotte Metro	94.2
Bessemer City Park	Charlotte Metro	19.5
Beth Haven Church Road Forests	Charlotte Metro	906.3
Beth Haven Flatrock	Charlotte Metro	109.7
Betty Ross Park	Charlotte Metro	37.0
Beverly Hills Park	Charlotte Metro	13.5
Biddleville Park	Charlotte Metro	9.1
Biggerstaff Park	Charlotte Metro	72.7
Bingham Road Hardpan Forest	Charlotte Metro	15.8
Black Park	Charlotte Metro	1.2
Blackwelder Hill Rare Plant Site	Charlotte Metro	26.9
Blythe Landing Park	Charlotte Metro	39.1
Boones Cave Slopes	Charlotte Metro	95.3
Boones Cave State Park	Charlotte Metro	101.3
Brackett Bluff	Charlotte Metro	61.1
Briarwood Park	Charlotte Metro	3.5
Bryant Park	Charlotte Metro	8.4
Buffalo Creek Rare Plant Site	Charlotte Metro	322.5
Butcher Branch Forest	Charlotte Metro	50.6
Caldwell Park	Charlotte Metro	16.5
Campbell Creek Greenway	Charlotte Metro	43.5
Cane Creek Park	Charlotte Metro	217.8
Carmel Park	Charlotte Metro	7.0

Publicly-Owned Parks and Recreation Areas within Study Area

Name	Operating	Area (Acres)
Carpenter Creek Heartleaf Site	Charlotte	33.3
Cat Square Heartleaf Forest	Charlotte	50.9
Catawba Creek Forests	Charlotte	253.5
Cedarwood Park	Charlotte	7.4
Charity Church Hardwood Forest	Charlotte	336.6
Charles Avenue Park	Charlotte	0.7
Chickasaw Plum Forest	Charlotte	4.5
Chuck Moorehead Park	Charlotte	9.8
City Park	Charlotte	40.6
City Park and Recreation	Charlotte	23.7
Clanton Park	Charlotte	103.8
Clarke Creek Heronry	Charlotte	235.6
Cloninger Lane Woods	Charlotte	78.9
Collins Park	Charlotte	2.9
Colonial Park	Charlotte	3.3
Concord Ring Dike/Jackson School Natural Area	Charlotte	16.1
Copperhead Island Park	Charlotte	14.1
Cordelia Park	Charlotte	21.4
Coulwood Park	Charlotte	23.0
Crooked Creek Ledges	Charlotte	127.6
Crooked Creek Woods	Charlotte	82.0
Crowder Mountain State Park	Charlotte	2144.7
Crowders Mountain State Park and Vicinity	Charlotte	3476.2
Dan Nicholas Park	Charlotte	341.5
David B Waymer Complex Park	Charlotte	6.8
Davis Park	Charlotte	37.0
Deal Park	Charlotte	18.7
Derita Creek Park	Charlotte	28.2
Devonshire Park	Charlotte	1.5
Double Oaks Park	Charlotte	15.0
Duke Power State Park	Charlotte	1925.4
Dunns Mountain	Charlotte	26.0
Dutch Buffalo Creek Dam	Charlotte	513.6
East Fork Twelvemile Creek Floodplain	Charlotte	419.1
East Park	Charlotte	4.8
Eastover Park	Charlotte	22.6
Edgehill Park	Charlotte	6.2
Edna Love Park	Charlotte	16.1
Eighth Street Ball Park	Charlotte	5.3
Ellis Creek--Stokes Ferry Hardwood Forests	Charlotte	22.9
Ellis Park	Charlotte	41.4
Enderly Park	Charlotte	6.9
Erwin Park	Charlotte	6.7
Ezra Bridges Park	Charlotte	6.3
Ferguson Park	Charlotte	28.4
Fergusons Knob	Charlotte	188.0
Ferrelltown Nature Preserve and Vicinity	Charlotte	81.0
First Broad Hop-Hornbeam Natural Area	Charlotte	18.4
First Broad Leatherwood Slope	Charlotte	8.5
First Ward Park	Charlotte	3.6

Publicly-Owned Parks and Recreation Areas within Study Area

Name	Operating	Area (Acres)
Five Points Park	Charlotte	2.3
Flat Branch Hardpan	Charlotte	35.5
Flyer Park	Charlotte	8.6
Fourth Creek Floodplain Pool	Charlotte	50.2
Fourth Creek Magnolia Slope	Charlotte	35.5
Fourth Ward Park	Charlotte	3.9
Frank Liske Park	Charlotte	225.3
Frazier Park	Charlotte	20.7
Fred Alexander Park	Charlotte	6.6
Freedom Park	Charlotte	75.0
Friday Meadow	Charlotte	37.7
Gaston Co Park at N Belmont	Charlotte	21.9
Gaston Co S Fork River Park	Charlotte	104.5
Gaston County Park	Charlotte	35.6
Gaston County Park at Bessemer City Park	Charlotte	35.3
Gaston County Park at Chapel Grove	Charlotte	20.8
Gaston County Park at Tyron	Charlotte	30.4
Gateway Nature Preserve	Charlotte	136.8
Georgeville Sunflower Site	Charlotte	4.8
Gibson Ball Park	Charlotte	4.8
Gold Hill Flats	Charlotte	82.0
Good Shepherd Upland Depression Swamp	Charlotte	3.0
Goodman Park	Charlotte	50.2
Goose Creek/Duck Creek Floodplain	Charlotte	216.4
Grady Cole Center	Charlotte	8.6
Grant Hill	Charlotte	30.4
Grayson Park	Charlotte	14.6
Greenville Park	Charlotte	15.7
Grier Heights Park	Charlotte	10.5
Harold Rankin Park	Charlotte	11.4
Hartsell Park	Charlotte	10.1
Hartsell Road Mesic Forest	Charlotte	15.0
High Rock Reservoir Wetlands	Charlotte	811.8
Highland Park	Charlotte	6.3
Holbrook Park	Charlotte	13.0
Holbrooks Road Park	Charlotte	13.7
Holly Oaks Park	Charlotte	19.1
Honeycutt Road Woods	Charlotte	159.4
Hornets Nest Park	Charlotte	48.8
Hoskins Park	Charlotte	5.0
Huntington Farms Park	Charlotte	7.1
Hurley Park	Charlotte	15.4
Idlewild Road Park	Charlotte	69.0
Independence Park	Charlotte	24.1
Indian Creek Slopes	Charlotte	79.3
Jackson Blackjacks	Charlotte	39.3
Jackson Sunflower Site	Charlotte	6.6
James Boyce Park	Charlotte	344.4
Jaycee Park	Charlotte	14.9
Jeffers Community Center	Charlotte	17.2

Publicly-Owned Parks and Recreation Areas within Study Area

Name	Operating	Area (Acres)
Jefferson Park	Charlotte	1.2
Jesse Helms Park Natural Area	Charlotte	44.1
Jesse Slagle Knoll	Charlotte	29.0
Jetton Park	Charlotte	82.8
June Bug Woods	Charlotte	159.5
Kannapolis Recreation Area	Charlotte	13.6
Kenwood Park	Charlotte	3.0
Kidd Road Upland Swamp	Charlotte	59.0
Kilborne Park	Charlotte	49.4
Kings Road Park	Charlotte	11.4
Kinza Slate Bluffs	Charlotte	39.0
L C Coleman Park	Charlotte	14.3
Lake Norman Slopes and Shoreline	Charlotte	285.5
Lake Norman State Park Natural Areas	Charlotte	116.5
Lake Wylie Park	Charlotte	34.8
Latta Park	Charlotte	23.8
Latta Plantation Natural Areas	Charlotte	1432.7
Latta Plantation Park	Charlotte	665.4
Laurel Hill Nursery Forest	Charlotte	418.4
Leepers Creek Heartleaf Site	Charlotte	28.0
Leepers Creek Monadnock and Wetland	Charlotte	146.0
Lentz Harness Shop Road Upland Depression	Charlotte	53.5
Leonard Road Slopes	Charlotte	61.7
Les Myers Park	Charlotte	21.0
Library Park	Charlotte	2.0
Lick Run Slopes	Charlotte	68.2
Lineberger Park	Charlotte	19.8
Linn Field	Charlotte	8.0
Linwood Park	Charlotte	16.9
Little Egypt Woods	Charlotte	270.9
Little League Park	Charlotte	5.1
Little Peoples Park	Charlotte	0.2
Locust Barrens	Charlotte	34.7
Long Creek Bluff	Charlotte	346.1
Longs Farm/Riverbend	Charlotte	431.8
Longview Road Depression Swamp	Charlotte	33.8
Love Park	Charlotte	9.3
Lower Butcher Branch Depression Swamps	Charlotte	180.2
Mallard Creek Park	Charlotte	341.6
Mallard Creek Road Sunflower Site	Charlotte	12.9
Marshall Park	Charlotte	6.7
Martha Rivers Park	Charlotte	52.2
Martin Luther King Park	Charlotte	30.6
Mason Wallace Park	Charlotte	35.7
McCoy Road Sunflower Site	Charlotte	10.3
McDowell Nature Preserve	Charlotte	1202.1
McDowell/Torrence Creek Confluence Slope	Charlotte	20.2
McLaughlin Road Basic Forest	Charlotte	39.7
Methodist Home Park	Charlotte	27.2
Miami Church Hill Rare Plant Site	Charlotte	215.9

Publicly-Owned Parks and Recreation Areas within Study Area

Name	Operating	Area (Acres)
Middle Pasour Mountain	Charlotte	37.7
Midwood Park	Charlotte	8.9
Mike Moore Hill	Charlotte	52.1
Mineral Springs Barrens	Charlotte	63.9
Mint Hill Municipal Park	Charlotte	32.9
Moose Park	Charlotte	1.9
Morgan Park	Charlotte	2.2
Mount Olive Church Basic Forest	Charlotte	248.8
Mount Pleasant Road Roadside	Charlotte	6.9
Mount Zion Heartleaf Forest	Charlotte	42.8
Mountain Island Lake Dam Rare Plant Sites	Charlotte	41.6
Mountain Island Lake Forest	Charlotte	1521.3
Murrays Mill/Upper Balls Creek Natural Area	Charlotte	101.4
Neely Road Swamps	Charlotte	17.5
New Hope Recreation Area	Charlotte	10.0
New London Ridges	Charlotte	155.5
New Salem Branch	Charlotte	62.0
New Testament Baptist Church Knoll and Seep	Charlotte	76.6
Ninth Street Park	Charlotte	3.0
North Charlotte Park	Charlotte	3.1
North Fork Crooked Creek Rare Plant Site	Charlotte	9.4
North Mecklenburg Park	Charlotte	91.3
North Park	Charlotte	7.3
North Stanley Creek Basic Forest	Charlotte	458.2
Oak Mountain Quartzite Ridge	Charlotte	154.8
Oaklawn Park	Charlotte	3.6
Oakurst Park	Charlotte	4.7
Old Bell Mission Church Forest	Charlotte	48.7
Olde Providence Park	Charlotte	30.0
Optimist Park	Charlotte	5.2
Palmer Park	Charlotte	14.8
Park Road Park	Charlotte	135.1
Pearl Street Park	Charlotte	7.7
Penegar/Gastonia South Natural Area	Charlotte	24.8
Pine Bluff Church Road Roadside	Charlotte	7.7
Plaster Park	Charlotte	7.9
Point Road Forest	Charlotte	138.5
Polk Mountain	Charlotte	230.3
Progress Park	Charlotte	1.0
Providence Flats Swamp	Charlotte	25.3
Ramblewood Park	Charlotte	71.4
Ramsey Creek Park	Charlotte	47.0
Randolph Road Park	Charlotte	15.7
Rankin Lake Park	Charlotte	147.0
Redlair Preserve	Charlotte	869.1
Reed Gold Mine Forests	Charlotte	831.1
Reedy Creek Knoll and Beaver Pond	Charlotte	81.9
Reedy Creek Nature Preserve Forests	Charlotte	1042.3
Reedy Creek Park	Charlotte	149.6
Reese Mountain	Charlotte	56.9

Publicly-Owned Parks and Recreation Areas within Study Area

Name	Operating	Area (Acres)
Reid Field	Charlotte	8.4
Renaissance Park	Charlotte	170.2
Revolution Park	Charlotte	56.9
Rhyne Bluffs	Charlotte	17.3
Rhyne Conservation Preserve	Charlotte	525.9
Richfield Park	Charlotte	146.0
Ridge Road Hardpan Forest	Charlotte	32.8
Ritchies Hardpan Forest	Charlotte	229.1
Rock Grove Church Granite Outcrops	Charlotte	31.0
Rock Hole Creek Natural Area	Charlotte	122.8
Rocky River Corridor	Charlotte	155.9
Rocky River/Morgans Bluff	Charlotte	22.2
Rowan Giants Park	Charlotte	3.7
Saint Nicholas Park	Charlotte	14.1
Salisbury Nature Study Area	Charlotte	45.3
Second Creek Natural Area	Charlotte	74.0
Second Creek Wetlands	Charlotte	200.9
Sedgefield Park	Charlotte	7.3
Shamrock Park	Charlotte	3.4
Shannon Park	Charlotte	11.6
Sheffield Park	Charlotte	10.1
Shuffletown Powerline Rare Plant Site	Charlotte	46.1
Sims Legion Park	Charlotte	34.7
Sixteenth Street Park	Charlotte	0.8
Smith Grove Slopes	Charlotte	33.5
South Crowders Creek Forests	Charlotte	301.6
South Park	Charlotte	2.1
South Pasour Mountain	Charlotte	84.0
South Yadkin Beech Slopes	Charlotte	20.7
Southside Park	Charlotte	21.3
Southwest Park	Charlotte	2.5
Squirrel Lake Park	Charlotte	34.9
Stagecoach Road Granitic Outcrop	Charlotte	9.3
Stalling Park	Charlotte	5.7
Stanley Park	Charlotte	6.9
Stanly Community College Basic Forest	Charlotte	42.1
Statesville Road Park	Charlotte	304.1
Stevens Creek Nature Preserve	Charlotte	226.8
Stowe Park	Charlotte	8.0
Sugar Creek Greenway	Charlotte	1.8
Sugar Creek Park and Recreation Center	Charlotte	79.7
Sunnyside Meadow	Charlotte	5.1
Suther Prairie	Charlotte	6.0
Taylor Heights Park	Charlotte	2.2
Terrapin Creek Corridor	Charlotte	61.0
Thompson Park	Charlotte	6.4
Tuckaseegee Park	Charlotte	16.8
Twin Brooks/Stanley Basic Forest	Charlotte	59.3
Uwharrie National Forest	Charlotte	564.5
Veterans Park	Charlotte	20.0

Publicly-Owned Parks and Recreation Areas within Study Area

Name	Operating Area	Area (Acres)
Waddell Street Park	Charlotte Metro	22.4
Walker Road Hardpan Forest	Charlotte Metro	11.6
Waxhaw Creek Floodplain	Charlotte Metro	620.8
Waxhaw Sunflower Site	Charlotte Metro	15.0
West Branch Preserve	Charlotte Metro	72.4
West Charlotte Park	Charlotte Metro	4.3
Westerly Hills Park	Charlotte Metro	2.0
Whitehall Nature Preserve	Charlotte Metro	49.6
Wilmore Park	Charlotte Metro	3.6
Wingate Creek Slopes	Charlotte Metro	95.4
Winget Road Rare Plant Site	Charlotte Metro	11.2
Yadkin Basic Slopes	Charlotte Metro	44.8
Yadkin River/Grants Creek Forests	Charlotte Metro	685.8
Youngs Mountain	Charlotte Metro	70.1
Zion Church/Eastern Gold Hill Flatwoods	Charlotte Metro	329.2
Harris Mill Run Slopes	Greenville	196.9
River Park North Floodplain Forest	Greenville	349.8
Tar River/Blue Banks Farm Slopes	Greenville	98.2
Voice of America Site C	Greenville	78.3
14th Street Park	Piedmont Triad	6.1
Abington Wetland Area	Piedmont Triad	46.8
Allen Jay Park	Piedmont Triad	19.2
Amber Park	Piedmont Triad	8.8
Ardmore Park	Piedmont Triad	11.0
Armstrong Park	Piedmont Triad	12.4
Barber Park	Piedmont Triad	135.0
Beeson Road Park	Piedmont Triad	69.7
Belview Park	Piedmont Triad	6.9
Benbow Park	Piedmont Triad	4.0
Bethabara Park	Piedmont Triad	157.7
Bethania Forest	Piedmont Triad	64.4
Bethania Swamp and Slopes	Piedmont Triad	25.7
Big Tree Natural Area	Piedmont Triad	31.9
Bingham Street Park	Piedmont Triad	15.8
Blum Park	Piedmont Triad	22.3
Bolton Park	Piedmont Triad	42.8
Brentwood Park	Piedmont Triad	8.2
Brevard Park	Piedmont Triad	1.5
British Woods Park	Piedmont Triad	31.9
Brockett Street Park	Piedmont Triad	3.0
Brown Bark Park	Piedmont Triad	15.7
Brown Park	Piedmont Triad	26.6
Browns Summit Forest/Hardys Millpond	Piedmont Triad	322.0
Brushy Fork Park	Piedmont Triad	5.7
Bryan Park	Piedmont Triad	388.9
Bur Mil Park	Piedmont Triad	157.7
Bywood Park	Piedmont Triad	34.6
C G Hill Memorial Park	Piedmont Triad	69.7
Caldwell Park	Piedmont Triad	17.2
Camp Betty Hastings Forests	Piedmont Triad	128.7

Publicly-Owned Parks and Recreation Areas within Study Area

Name	Operating	Area (Acres)
Camp Lasater Forest	Piedmont Triad	155.0
Carriage Hills Park	Piedmont Triad	39.0
Cascade Park	Piedmont Triad	3.6
Ceaser Park	Piedmont Triad	11.9
Cedrow Park	Piedmont Triad	14.1
Central Park	Piedmont Triad	11.2
City Lake Park	Piedmont Triad	25.2
Civitan Park	Piedmont Triad	37.4
College Park	Piedmont Triad	2.7
Cool Branch Slopes	Piedmont Triad	1.3
Coronado Park	Piedmont Triad	18.7
Council Street Park	Piedmont Triad	1.5
Country Park	Piedmont Triad	166.8
Craft Park	Piedmont Triad	3.8
Crawford Park	Piedmont Triad	19.7
Cumberland Park	Piedmont Triad	3.6
Deep River Community Park	Piedmont Triad	21.6
Dogwood Park	Piedmont Triad	4.5
Dorothy Brown Park	Piedmont Triad	4.9
Douglas Park	Piedmont Triad	3.7
East Belews Creek Watershed	Piedmont Triad	47.0
Easton Park	Piedmont Triad	5.8
Eastwood Park	Piedmont Triad	8.7
Elmwood Park	Piedmont Triad	1.7
Ernie Shore Ball Park	Piedmont Triad	9.7
Erskine Natural Area	Piedmont Triad	6.9
Evans Street Park	Piedmont Triad	0.9
Fairview Homes Park	Piedmont Triad	4.4
Fairview Park	Piedmont Triad	3.1
Festival Park	Piedmont Triad	41.4
Fisher Park	Piedmont Triad	16.5
Five Point Park	Piedmont Triad	1.8
Folk Park	Piedmont Triad	4.0
Forest Park	Piedmont Triad	16.1
Forest Valley Park	Piedmont Triad	9.2
Fourth of July Park	Piedmont Triad	21.1
Friedburg Marsh	Piedmont Triad	4.6
Friendly Acres Park	Piedmont Triad	9.0
Gibson Park	Piedmont Triad	458.3
Gillespie Park	Piedmont Triad	16.7
Glenwood Park	Piedmont Triad	7.1
Goldston Park	Piedmont Triad	3.6
Gracewood Park	Piedmont Triad	10.5
Granville Park	Piedmont Triad	7.6
Greenbrier Park	Piedmont Triad	2.0
Greenfield Park	Piedmont Triad	19.7
Greenhaven Park	Piedmont Triad	24.9
Greentree Park	Piedmont Triad	8.4
Griffith Park	Piedmont Triad	6.1
Guilford Courthouse	Piedmont Triad	226.8

Publicly-Owned Parks and Recreation Areas within Study Area

Name	Operating	Area (Acres)
Guilford Courthouse National Military Park	Piedmont	157.8
Guilford Hills Park	Piedmont	6.4
Hamilton Lakes Park	Piedmont	50.4
Hampton Park	Piedmont	12.1
Hanes Hosiery Park	Piedmont	7.0
Hanes Park	Piedmont	37.8
Happy Hill Park	Piedmont	26.3
Harnafor Park	Piedmont	9.1
Harvell Park	Piedmont	24.7
Hathaway Park	Piedmont	20.9
Heath Park	Piedmont	16.9
Hedgecock Park	Piedmont	9.9
Helen Nichols Park	Piedmont	8.2
Henry Street Park	Piedmont	11.7
Her-la-Co Park	Piedmont	15.8
High Point Athletic Center	Piedmont	36.9
Hillsdale Park	Piedmont	30.2
Hine Park	Piedmont	31.2
Historic Bethabara Natural Area	Piedmont	31.1
Hobby Park	Piedmont	63.3
Hunter Hills Park	Piedmont	11.7
Jaycee Park	Piedmont	61.6
Jerry King Park	Piedmont	16.6
Johnson Park	Piedmont	11.9
Johnson Street Park	Piedmont	24.6
Keeley Park	Piedmont	152.0
Keeling Park	Piedmont	7.9
Kernersville Lake Park Hardwood Forest	Piedmont	110.9
Kimberly Park	Piedmont	44.0
Kings Forest Park	Piedmont	34.6
Kirkwood Park	Piedmont	5.6
Lake Brandt Slopes	Piedmont	8.1
Lake Daniel Park	Piedmont	96.3
Lake Higgins Forest	Piedmont	28.4
Lake Mackintosh Slopes	Piedmont	46.7
Latham Park	Piedmont	99.0
Laurel Bluff Ravine	Piedmont	5.1
Leonard Street Park	Piedmont	12.8
Lindley Park	Piedmont	131.9
Little Alamance Creek Forest	Piedmont	14.6
Little Creek Park	Piedmont	8.5
Lockland Park	Piedmont	2.9
Luper Park	Piedmont	7.9
Mayer Park	Piedmont	0.7
McCain Park	Piedmont	10.0
McCulloch Street Park	Piedmont	0.8
Meadowbrook Park	Piedmont	2.6
Merideth Street Park	Piedmont	1.0
Merryweather Park	Piedmont	1.0
Miller Park	Piedmont	42.3

Publicly-Owned Parks and Recreation Areas within Study Area

Name	Operating	Area (Acres)
Mitchell Park	Piedmont Triad	16.5
Mohawk Park	Piedmont Triad	2.0
Moorehead Recreation Park	Piedmont Triad	3.5
Moores Creek/Reedy Fork Slopes and Floodplain	Piedmont Triad	332.1
Morris Farlow Park	Piedmont Triad	3.4
Murchie Street Park	Piedmont Triad	1.5
Natural Science Center Park	Piedmont Triad	33.4
Nocho Park	Piedmont Triad	9.1
North Hills Park	Piedmont Triad	7.0
North Johnson Street Park	Piedmont Triad	36.4
Nut Bush Natural Area	Piedmont Triad	2.1
O Henry Oaks Park	Piedmont Triad	8.5
Oak Hollow Park	Piedmont Triad	44.6
Oak Summit Park	Piedmont Triad	27.4
Oaks West Park	Piedmont Triad	23.5
Oakview Park	Piedmont Triad	7.4
Oka Hester Park	Piedmont Triad	78.3
Old Kernersville Lake Park	Piedmont Triad	6.9
Old Peck Park	Piedmont Triad	6.0
Old Town Park	Piedmont Triad	29.0
Parkland Park	Piedmont Triad	8.3
Parkside Park	Piedmont Triad	2.4
Peeler Park	Piedmont Triad	6.5
Pennydale Park	Piedmont Triad	6.0
Pershing Street Park	Piedmont Triad	1.6
Piedmont Environmental Center	Piedmont Triad	159.6
Piney Grove Park	Piedmont Triad	4.5
Pisgah Church Road Park	Piedmont Triad	18.0
Polo Park	Piedmont Triad	15.8
Providence Church Road Forest	Piedmont Triad	29.6
Random Woods Park	Piedmont Triad	8.5
Revolution Park	Piedmont Triad	18.5
Reynolda Road Park	Piedmont Triad	14.0
Reynolds Park	Piedmont Triad	80.7
Richardson Park	Piedmont Triad	2.6
Robin Ridge Park	Piedmont Triad	6.8
Rolling Roads Park	Piedmont Triad	21.5
Rotherwood Park	Piedmont Triad	3.8
Rupert Bell Park	Piedmont Triad	20.0
Salem Lake Natural Area	Piedmont Triad	769.9
Salem Lake Regional Park	Piedmont Triad	1281.2
Sara Lee Soccer Park	Piedmont Triad	53.4
Sedge Garden Park	Piedmont Triad	30.1
Shaffner Park	Piedmont Triad	54.5
Shannon Hills Park	Piedmont Triad	19.7
Shannon Woods Park	Piedmont Triad	41.1
Shiloh Park	Piedmont Triad	3.8
Skyland Park	Piedmont Triad	18.6
Smith Park	Piedmont Triad	19.0
South Fork Park	Piedmont Triad	25.3

Publicly-Owned Parks and Recreation Areas within Study Area

Name	Operating Area	Area (Acres)
South Park	Piedmont Triad	5.9
South Side Recreation Park	Piedmont Triad	4.7
Southmont Park	Piedmont Triad	6.1
Southwest Park	Piedmont Triad	341.1
Sprague Park	Piedmont Triad	8.2
Spring Valley Park	Piedmont Triad	9.0
Spring Valley Plaza Natural Area	Piedmont Triad	4.1
Starmount Natural Area	Piedmont Triad	35.5
Steelman Park	Piedmont Triad	3.0
Sunset Hills Park	Piedmont Triad	13.4
Sussmans Park	Piedmont Triad	9.4
Ted Leonard Recreation Park	Piedmont Triad	30.5
Terrell Keck Park	Piedmont Triad	1.9
Textile Drive Park	Piedmont Triad	5.0
The Bog	Piedmont Triad	20.8
Three Meadows Park	Piedmont Triad	8.7
Tiffany Park	Piedmont Triad	6.3
Triad Park	Piedmont Triad	444.9
Triangle Park	Piedmont Triad	3.8
Trogdon Street Park	Piedmont Triad	1.0
Tuscaloosa Park	Piedmont Triad	1.3
Twin Lakes Park	Piedmont Triad	21.5
Two Creeks Basic Forest	Piedmont Triad	63.8
Union Cross Park	Piedmont Triad	18.8
University Park	Piedmont Triad	43.2
Walkertown Park	Piedmont Triad	25.6
Walnut Bluffs	Piedmont Triad	34.7
Walnut Street Park	Piedmont Triad	1.1
War Memorial Park	Piedmont Triad	21.1
Warnersville Park	Piedmont Triad	6.4
Washington Park	Piedmont Triad	55.6
Washington Terrace Community Park	Piedmont Triad	28.2
Wesley Drive Park	Piedmont Triad	1.3
West Clemmonsville Park	Piedmont Triad	5.9
West End Park	Piedmont Triad	21.0
Westbury Park	Piedmont Triad	4.6
Weston Park	Piedmont Triad	10.8
Westview Park	Piedmont Triad	6.5
Whitaker Park	Piedmont Triad	6.3
Windsor Park	Piedmont Triad	5.4
Winston Lake Park	Piedmont Triad	136.0
Woodlea Acres Park	Piedmont Triad	19.8
Woodlea Lakes Park	Piedmont Triad	3.7
Woodmere Park	Piedmont Triad	14.4
Zoe Barbee Park	Piedmont Triad	1.4
Action Park	Research Triangle	17.0
Adam Mountain	Research Triangle	41.3
Ailey Young Park	Research Triangle	8.6
Anderson Point Park	Research Triangle	98.8
Annie L Jones Park	Research Triangle	12.8

Publicly-Owned Parks and Recreation Areas within Study Area

Name	Operating Area	Area (Acres)
Apex Community Park	Research Triangle	161.8
Apex Elementary School Park	Research Triangle	8.8
Apex Jaycees Ballfield	Research Triangle	2.4
Baldwin Park	Research Triangle	2.6
Battle Park	Research Triangle	85.3
Beaver Creek Floodplain	Research Triangle	172.1
Beaverdam Lake Swamps and Arkose Outcrops	Research Triangle	1.3
Bennett Place Forest	Research Triangle	46.3
Berryhill Rhododendron Bluff	Research Triangle	7.0
Big Oak Woods	Research Triangle	56.6
Big Woods Road Upland Forests	Research Triangle	103.3
Biltmore Hills Park	Research Triangle	45.2
Birchwood Park	Research Triangle	3.8
Blue Jay Point County Park	Research Triangle	238.8
Blue Pond	Research Triangle	2.6
Bolin Creek Natural Area	Research Triangle	142.1
Boothe Hill	Research Triangle	117.2
Brentwood Park	Research Triangle	14.8
Brookhaven Park	Research Triangle	17.6
Bush Creek Marshes	Research Triangle	113.5
Cabin Branch Creek Bottomland-Swamp	Research Triangle	183.1
Campus Hills Park	Research Triangle	44.3
Carl Alwin Schenck Memorial FP	Research Triangle	146.1
Carolina Pines Park	Research Triangle	42.4
Catsburg Natural Area	Research Triangle	124.8
Cedar Falls Park	Research Triangle	53.3
Cedar Forks District Park	Research Triangle	66.9
Cedar Hills Rotary Park	Research Triangle	33.2
Chavis Heights Park	Research Triangle	30.1
Chelton Oaks Park	Research Triangle	11.6
Cloverdale Park	Research Triangle	7.7
Cornwallis Road Park	Research Triangle	15.1
Couch Mountain	Research Triangle	131.9
Crabtree Creek/Ebenezer Church Road Slopes	Research Triangle	34.2
Creek Woods Park	Research Triangle	11.8
Crosswinds	Research Triangle	413.1
Crowder District Park	Research Triangle	25.3
Cub Creek Forests and Beaver Ponds	Research Triangle	180.2
Drewry Hills Park	Research Triangle	12.0
Dry Creek/Mount Moriah Bottomland	Research Triangle	485.0
Duke Forest Korstian Division	Research Triangle	1978.7
Duke Forest Oak-Hickory Upland	Research Triangle	417.8
Duke Park	Research Triangle	19.4
Dunberry Park	Research Triangle	0.9
Durham Athletic Park	Research Triangle	7.9
East Durham Park	Research Triangle	4.5
Eastend Park	Research Triangle	5.4
Eastgate Park	Research Triangle	25.4
Elmira Park	Research Triangle	4.5
Eno River Diabase Sill	Research Triangle	44.7

Publicly-Owned Parks and Recreation Areas within Study Area

Name	Operating Area	Area (Acres)
Eno River Mountain Spleenwort and Rhododendron Bl*	Research	21.7
Eno River State Park	Research	1792.2
Eno River/Cates Ford Slopes and Uplands	Research	16.6
Erwin Park	Research	12.6
Falcon Park	Research	5.8
Fallon Park	Research	13.9
Falls Lake Shoreline and Tributaries	Research	8395.2
Falls Lake State Rec Area	Research	4987.8
Flat River Bend Forest	Research	1.9
Forest Hills Park	Research	59.1
Forest Park	Research	6.5
Fred Fletcher Park	Research	25.5
Fred G Bond Metro Park	Research	245.3
Fuquay Varina Elem School Park	Research	10.1
Garner Recreation Park	Research	30.4
Garrett Road Park	Research	7.5
Gate 4 Mafic Forests	Research	237.0
Gate 9 Pond	Research	205.0
Glen Eden Pilot Park	Research	24.9
Godbold Park	Research	12.1
Great Bend of the Neuse Natural Area	Research	81.1
Green Road Park	Research	15.5
Halifax Park	Research	4.7
Hargraves Park	Research	8.4
Harris Lake County Park	Research	528.4
Heater Park	Research	2.3
Hebron Road Remnant Glade	Research	124.1
Hemlock Bluffs State Natural	Research	86.6
Hemlock Bluffs State Natural Area	Research	122.0
Henry J. Oosting Natural Area	Research	306.8
Herndon Creek Ravine	Research	73.8
Hillside Park	Research	16.5
Hodges Mill Creek Granitic Flatrocks	Research	11.7
Hollemans Crossroads Slopes	Research	132.4
Hollemans Crossroads Wetland	Research	3.4
Honeycutt Park	Research	50.7
Horseshoe Farms Park	Research	148.3
Jaycee Park	Research	15.2
Jaycees Park	Research	11.9
Jim Branch/Buckhorn Creek Forests	Research	1.1
Johnson Environmental Park	Research	22.1
Jones Park	Research	11.1
Jones Soccer Complex	Research	13.1
Kentwood Park	Research	14.1
Kit Creek Slopes and Floodplain	Research	55.4
Kiwanis Park	Research	13.7
Knightdale Elementary SCH Park	Research	16.0
Lake Benson Park	Research	78.1
Lake Crabtree County Park	Research	245.6
Lake Johnson Park	Research	479.4

Publicly-Owned Parks and Recreation Areas within Study Area

Name	Operating Area	Area (Acres)
Lake Lynn Park	Research	41.2
Lake Mirl Granitic Flatrocks	Research	4.5
Lake Raleigh Hardwood Forest	Research	89.0
Lake Wheeler Park	Research	102.1
Lakeview Park	Research	8.2
Laurel Hills Park	Research	45.5
Leatherwood Cove	Research	159.0
Lexie Lane Park	Research	3.9
Lick Creek Bottomland Forest	Research	1647.0
Lions Park	Research	31.5
Little Beaverdam Creek Slopes	Research	95.8
Little Creek Bottomlands and Slopes	Research	1448.5
Little River Gorge	Research	842.7
Longveiw Pool and Park	Research	10.0
Lower Eno River/Little River Bottomlands	Research	2364.8
Lower New Hope Creek Floodplain Forest and Slopes	Research	1821.2
Lyon Park	Research	10.7
MacDonald Woods Park	Research	5.4
Marks Creek Floodplain	Research	97.9
Marsh Creek Park	Research	70.5
McArthur Park	Research	19.4
Middle Creek Bluffs and Floodplain	Research	415.2
Middle Creek--Barber Bridge Floodplain	Research	118.3
Middle Eno River Bluffs and Slopes	Research	2103.8
Middle Lick Creek Bottomlands	Research	795.7
Midway Forest Beaver Dam Creek Complex	Research	25.4
Millbrook Exchange Park	Research	50.9
Miller Park	Research	5.3
Mims House Park	Research	5.6
Moore Square	Research	5.5
Morgan Creek Bluffs and Laurel Hill	Research	706.9
Morgan Creek Floodplain Forest	Research	1557.7
Morrisville Community Park	Research	15.8
Nash Square	Research	5.5
Neuse River (Clayton) Forests	Research	795.8
Neuse River Park East	Research	33.7
Neuse River Park West	Research	30.1
New Hope Chestnut Oak Forest	Research	19.2
New Hope Creek Bottomland Forest	Research	949.4
New Hope Creek Slopes	Research	474.7
New Light Creek Slopes	Research	50.4
North Edwards Ridge	Research	119.8
North Hills Drive Park	Research	31.3
Northeast Creek Floodplain Forest	Research	953.6
Northeast Creek/Panther Creek Dikes and Bottomlan*	Research	498.7
Northgate Park	Research	32.9
Northside Diabase Area	Research	1.9
Oakboro Park	Research	2.3
Oakwood Park	Research	13.4
Okelly Riddick Stadium	Research	10.4

Publicly-Owned Parks and Recreation Areas within Study Area

Name	Operating Area	Area (Acres)
Old Farm Park	Research	322.6
Old Still Creek Natural Area	Research	56.3
Old Weaver Trail Slopes	Research	317.9
Optimist Park	Research	17.6
Oval Drive Park	Research	4.6
Penny Road Elementary SCH Park	Research	4.2
Pennys Bend/Eno River Bluffs	Research	329.9
Pine Wood Park	Research	44.2
Poplar Point	Research	1.7
Pullen Park	Research	74.1
Red Maple Park	Research	18.2
Regency Park	Research	110.7
Richland Creek Hardwood Forest	Research	73.6
Ritter Park	Research	54.5
Roberts Park	Research	8.6
Rock Quarry Park	Research	14.5
Rockwood Park	Research	7.0
Rolesville Elem School Park	Research	3.3
Rolesville Park	Research	20.2
Rose Garden Park	Research	6.6
RS Dunham Park	Research	7.6
Sanderford Road Park	Research	19.9
Shady Oaks Park	Research	2.3
Shearon Harris Longleaf Pine Forest	Research	356.9
Shelley Sertoma Park	Research	114.1
Six Forks Longleaf Pine Forest	Research	41.7
Smith Creek Alluvial Forest and Slopes	Research	158.8
South Butner Cedar Glades	Research	6.9
South Butner Diabase Swamp and Forest	Research	28.9
South Garner Park	Research	34.4
South Park	Research	18.6
Southern Boundaries Park	Research	44.4
Southgate Park	Research	9.7
Southwest Rolesville Granitic Outcrops	Research	18.8
Spring Forest Road Park	Research	33.9
Stephen Properties Soccer FLD	Research	5.4
Stirrup Iron Creek Marsh and Sloughs	Research	217.9
Swift Creek Bluffs	Research	48.5
Swift Creek Elem School Park	Research	5.6
Taylor Street Park	Research	2.7
Temple Rock	Research	6.7
The Orchard Park	Research	4.3
Third Fork Creek Wetlands	Research	165.4
Timberlake Park	Research	15.3
Trinity Watts Park	Research	3.3
Twin Lakes Park	Research	66.3
Umstead Park	Research	8.4
Unity Village Park	Research	6.3
Upper Barton Creek Bluffs and Ravine	Research	73.0
Upper Neuse River Floodplain	Research	1890.4

Publicly-Owned Parks and Recreation Areas within Study Area

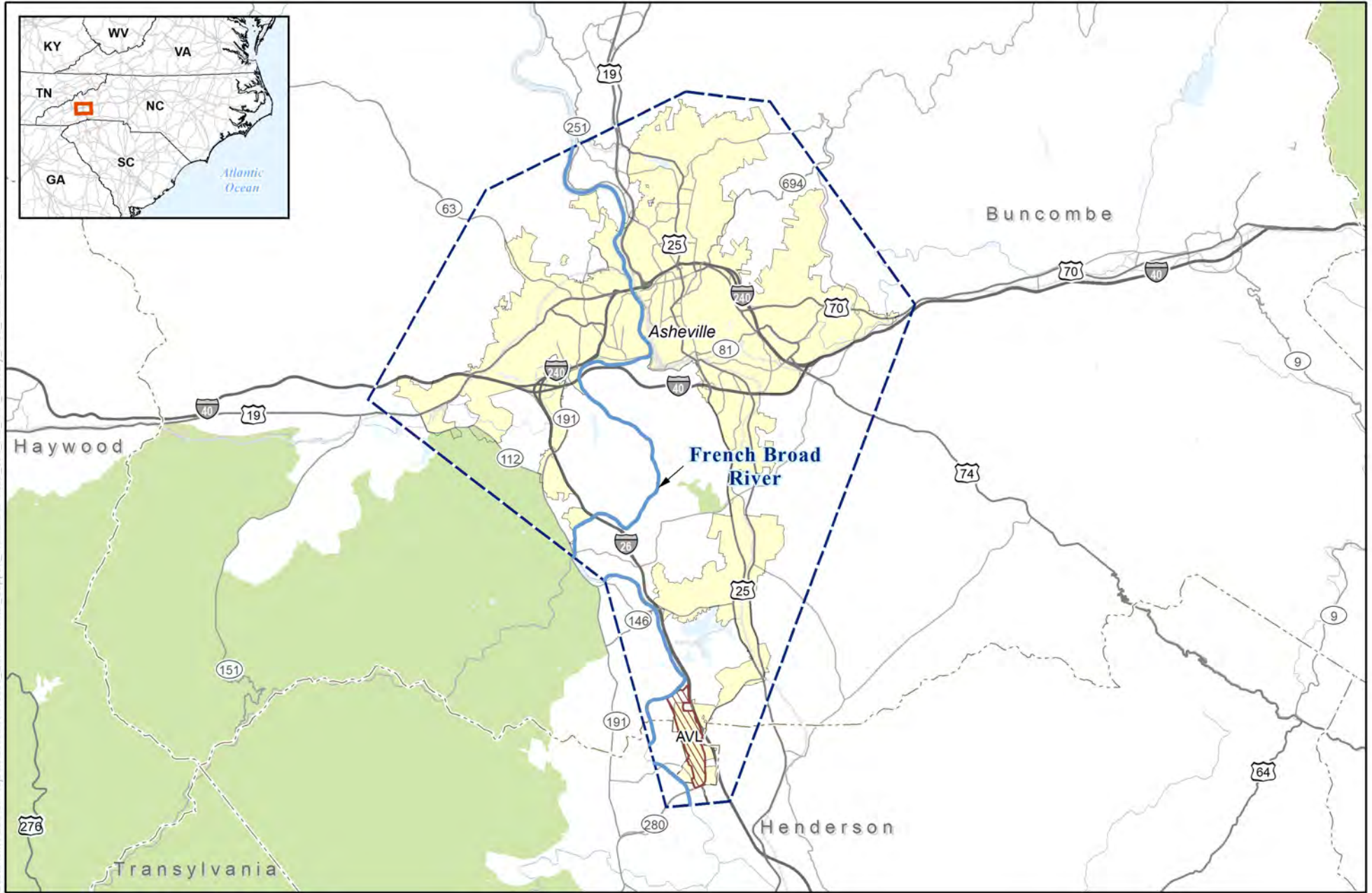
Name	Operating Area	Area (Acres)
Utley Creek Slopes	Research Triangle	459.2
Vance Elementary School Park	Research Triangle	9.7
Walnut Creek Park North	Research Triangle	105.7
Walnut Creek Sumac Site	Research Triangle	5.1
Walnut Creek Wetlands	Research Triangle	290.3
Weaver Meadow Park	Research Triangle	4.1
Wellington Park	Research Triangle	30.0
Westover Park	Research Triangle	8.1
Westwood Park	Research Triangle	16.6
Whippoorwill Park	Research Triangle	26.0
White Oak	Research Triangle	42.6
White Oak Creek Floodplain	Research Triangle	927.7
White Oak Park	Research Triangle	23.0
Wild Cat Hollow	Research Triangle	23.8
William B. Umstead State Park	Research Triangle	5655.7
Williams Park	Research Triangle	10.1
Willow Springs Elem SCH Park	Research Triangle	9.5
Wilson Park	Research Triangle	7.3
Windemere Beaver Dam Park	Research Triangle	19.5
Womble Park	Research Triangle	43.9
Wooten Park	Research Triangle	20.4
Worthdale Park	Research Triangle	8.0
Wrsl Soccer Center	Research Triangle	84.4
Wrightwood Park	Research Triangle	19.1
Yates Millpond	Research Triangle	162.0
Bonnie Doone Natural Area	Sandhills	548.8
Cape Fear Botanical Garden	Sandhills	61.1
Carvers Creek Sandhills	Sandhills	2808.8
Carvers Falls	Sandhills	123.5
Clark Park Natural Area	Sandhills	86.1
Fort Liberty (Central Section)	Sandhills	3361.5
Fort Liberty (Little River Section)	Sandhills	1.2
Fort Liberty (Northeast Section)	Sandhills	9437.2
Gordon Butler/Hope Mills Preserve	Sandhills	32.7
Lower Little River (Cumberland/Harnett) Corridor	Sandhills	9.4
Manchester Sandhills	Sandhills	312.3
Methodist College Hardwood Slopes	Sandhills	107.7
Redwing Pond Seeps	Sandhills	470.2
River Oaks Preserve	Sandhills	140.8
River Road Hardwoods	Sandhills	460.6
Rockfish Creek/Raeford Natural Area	Sandhills	829.8
Barnards Creek Natural Area	Wilmington	186.6
Brunswick River/Cape Fear River Marshes	Wilmington	48.7
Figure Eight Island Marsh	Wilmington	63.0
Greenfield Lake	Wilmington	148.6
Howe Creek Natural Area	Wilmington	232.9
Masonboro Island	Wilmington	891.7
Mott Creek Natural Area	Wilmington	123.7
Northeast Cape Fear River Floodplain	Wilmington	170.2
Pages Creek Natural Area	Wilmington	87.3

Publicly-Owned Parks and Recreation Areas within Study Area

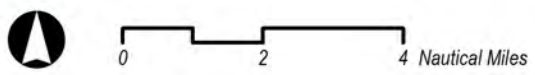
Name	Operating Area	Area (Acres)
South Wilmington Sandhills	Wilmington	60.1
UNC-Wilmington Longleaf Pine Forest	Wilmington	186.0
Upper Smith Creek Natural Area	Wilmington	109.2

APPENDIX G
NATIONWIDE RIVERS INVENTORY SEGMENTS

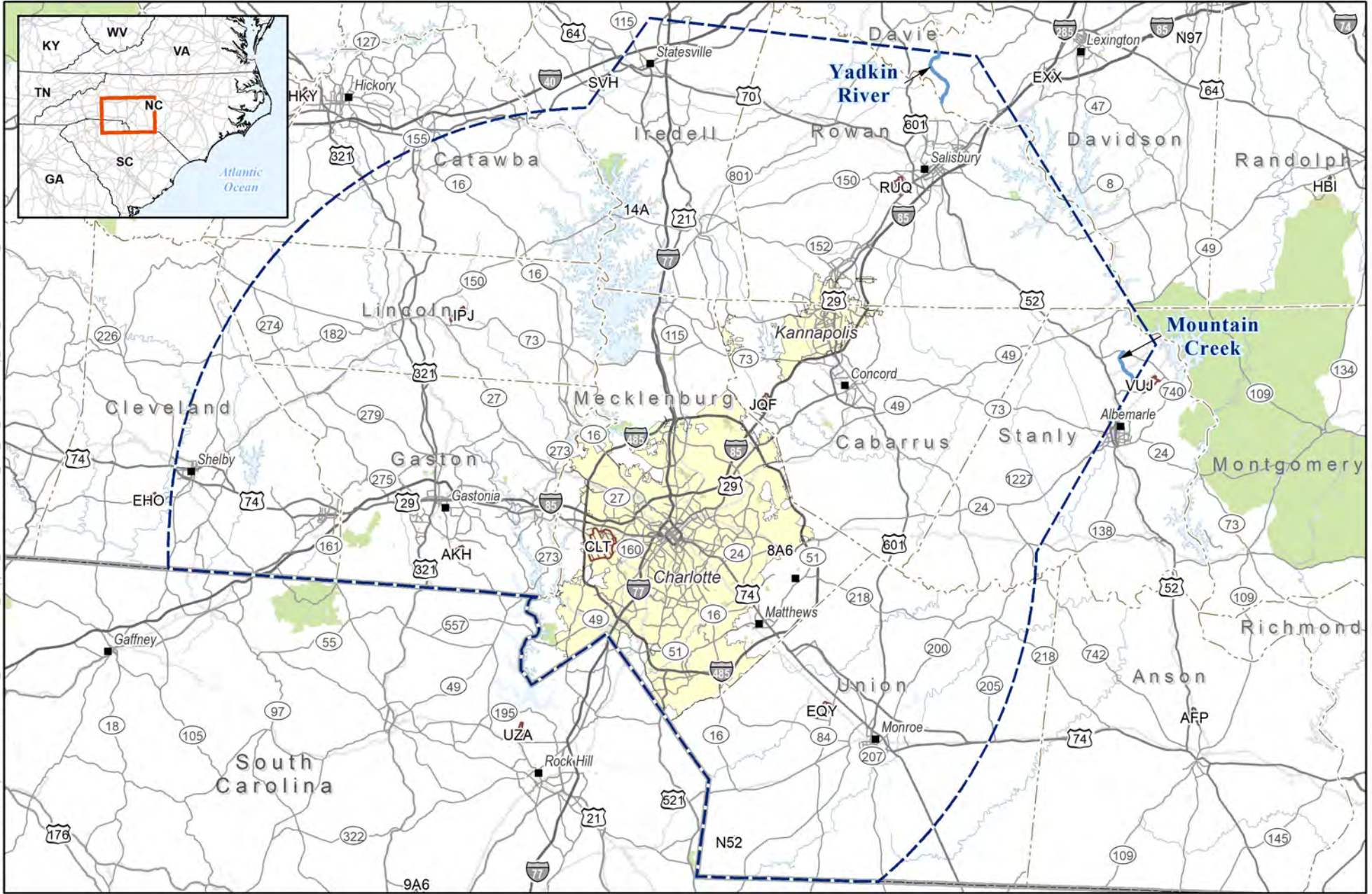
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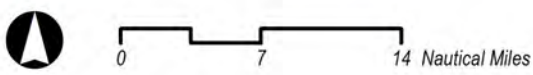
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- Incorporated Land
- Park
- Major / Minor Road
- City / Town
- Airport Property
- County Boundary
- Water / River
- Railroad
- National Rivers Inventory River Segment

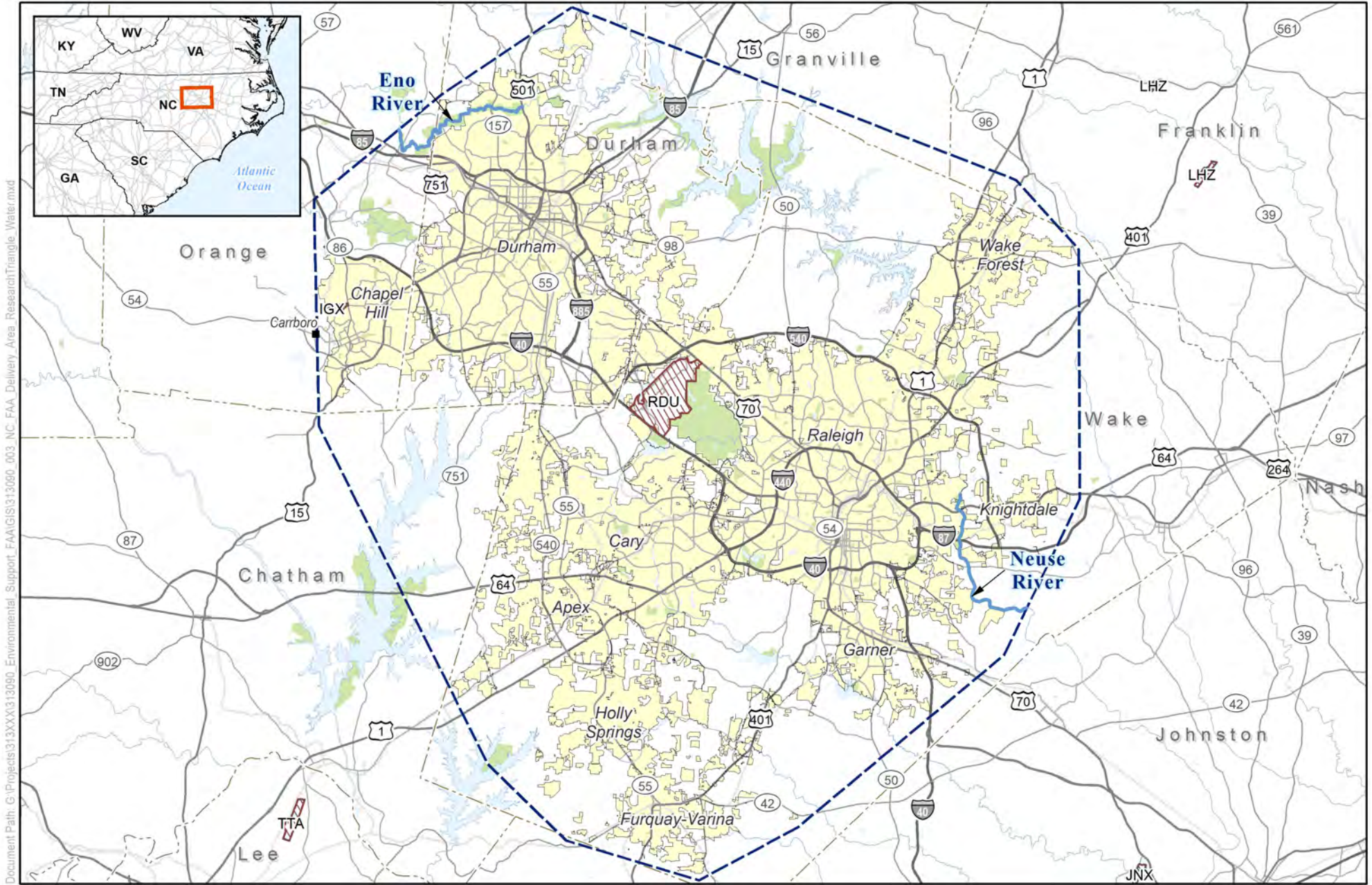


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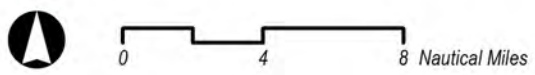
- Operating Area
- Incorporated Land
- Park
- Major / Minor Road
- City / Town
- State Boundary
- Airport Property
- County Boundary
- Water / River
- Railroad
- National Rivers Inventory River Segment



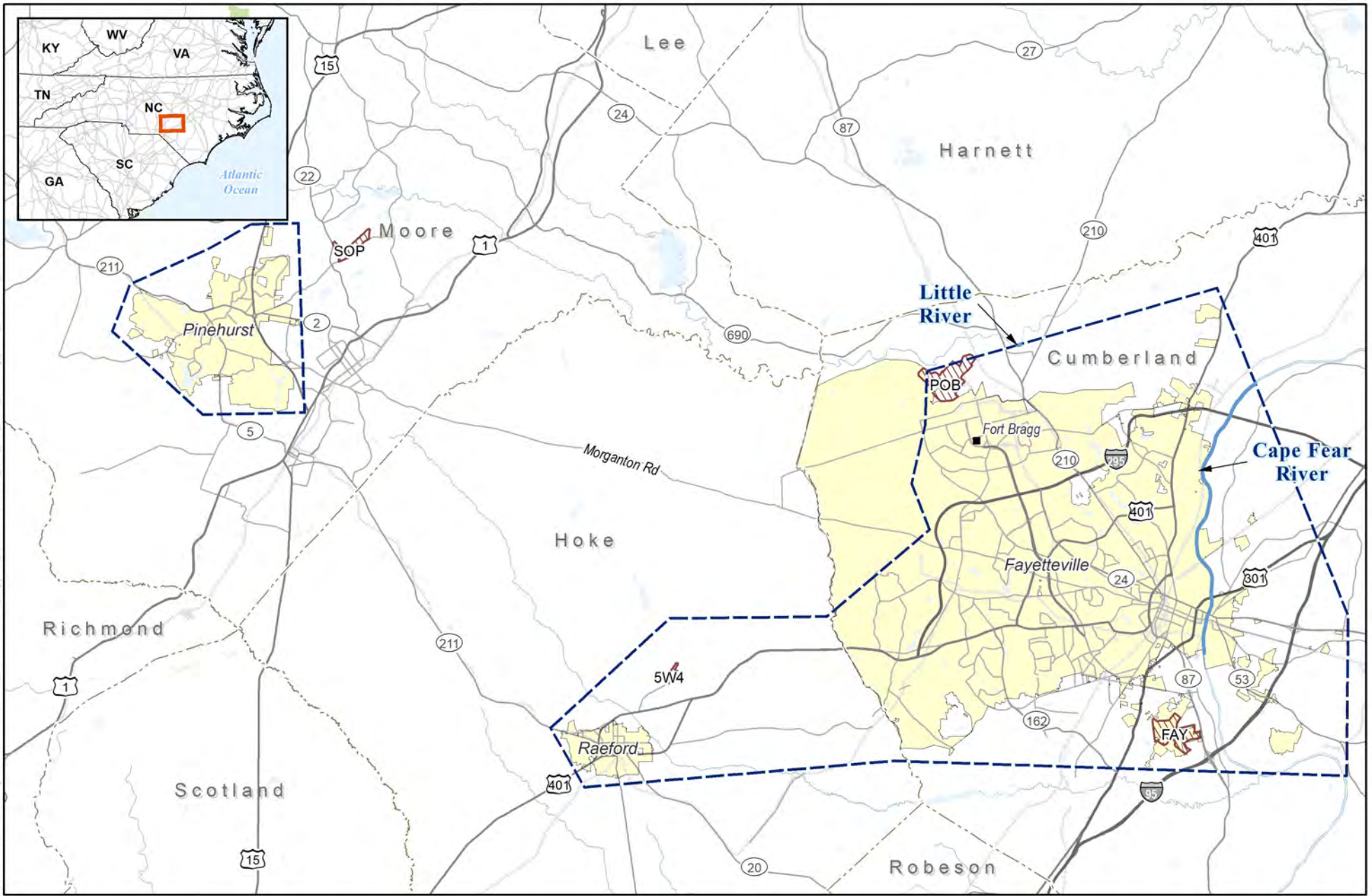


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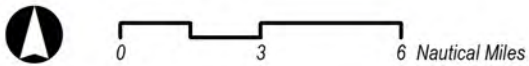
- | | | | | |
|---|---|---|--|---|
|  Operating Area |  Incorporated Land |  Park |  Major / Minor Road |  City / Town |
|  Airport Property |  County Boundary |  Water / River |  Railroad |  National Rivers Inventory River Segment |



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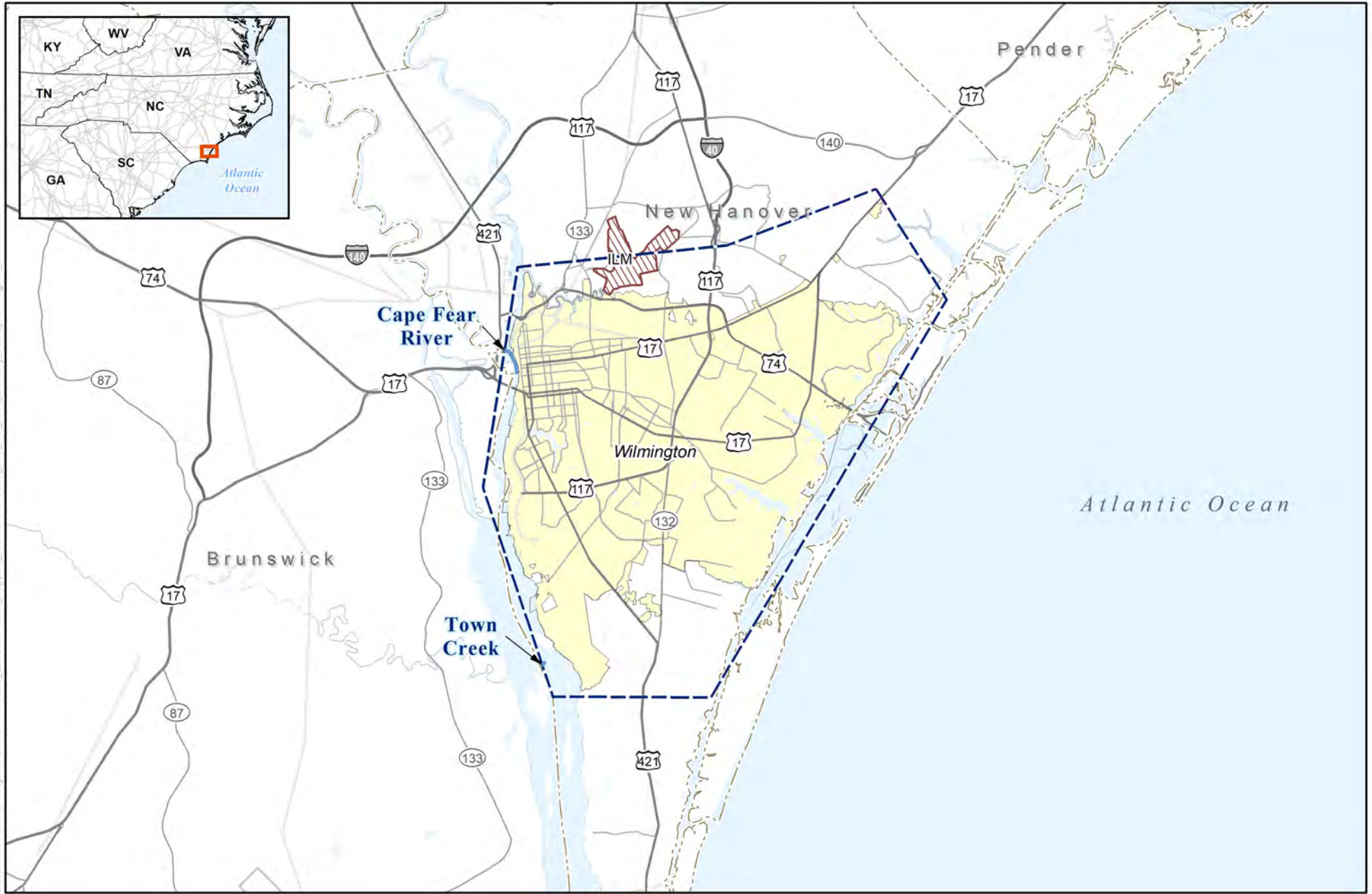


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|------------------|-------------------|---------------|--------------------|---|
| Operating Area | Incorporated Land | Park | Major / Minor Road | City / Town |
| Airport Property | County Boundary | Water / River | Railroad | National Rivers Inventory River Segment |

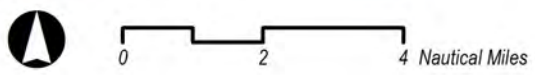


Sandhills

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- | | | | | |
|------------------|-------------------|---------------|--------------------|---|
| Operating Area | Incorporated Land | Park | Major / Minor Road | City / Town |
| Airport Property | County Boundary | Water / River | Railroad | National Rivers Inventory River Segment |



Wilmington

APPENDIX H

BIOLOGICAL RESOURCES



U.S. Department
of Transportation

**Federal Aviation
Administration**

Aviation Safety

800 Independence Ave., SW.
Washington, DC 20591

Via Email

Ms. Kathy Matthews
United States Fish and Wildlife Service
Raleigh Ecological Services Field Office
P.O. Box 33726
Raleigh, NC 27636-3726
Email: Raleigh@fws.gov

Ms. Rebekah Reid
United States Fish and Wildlife Service
Asheville Ecological Services Field Office
160 Zillicoa St., Suite B
Asheville, NC 28801
Email: rebekah_reid@fws.gov

RE: Endangered Species Act Section 7 Consultation for Drone Package Delivery Operations in North Carolina

Dear Ms. Matthews and Ms. Reid:

As discussed in a pre-consultation meeting on August 31, 2023, the Federal Aviation Administration (FAA) is preparing a programmatic environmental assessment (PEA) to assess the potential environmental impacts of the FAA's action of authorizing commercial Unmanned Aircraft Systems (UAS) operators to deliver goods to customers (referred to as package delivery) using unmanned aircraft (UA; also referred to as drones) in accordance with 14 Code of Federal Regulations (CFR) Part 135 (Part 135) in the state of North Carolina. Since 2019, the FAA has been issuing air carrier certificates to UAS operators in accordance with Part 135 so that operators can conduct package delivery flights. Generally, these approvals are associated with issuing a new or amended Part 135 air carrier Operations Specifications (OpSpec)¹ as the operative approval.

The North Carolina Department of Transportation (NCDOT) has been a lead partner in the FAA's drone integration partnership programs since 2017. In this role, NCDOT is collaborating with partners to test and prove operations that can gain FAA approvals to expand beyond visual line of sight and other complex operations in the state. Within the state of North Carolina, NCDOT has the authority to implement and manage regulations pertaining to state laws as set by the North Carolina General Assembly concerning drone operations. To support the development of the PEA, NCDOT developed a forecast for future Part 135 UAS package delivery operations in North Carolina out to year 2030. The FAA used the forecast to identify operating areas where UAS package delivery operations are likely to occur between 2024 and 2030 and to define the levels of UAS activities that may be expected based on existing and future market analyses.

¹ An OpSpec is a document that defines the scope of aircraft operations the FAA has authorized.

The FAA intends to use the PEA and associated interagency consultations to comply with its environmental review requirements for requests for authorizations from individual UAS operators proposing to conduct package drone delivery operations in North Carolina. Upon receiving an authorization request from an operator, the FAA would evaluate the proposal (application) against the PEA and associated interagency consultations to determine if the proposal and its potential environmental impacts fall within the scope of the PEA and consultations. If the proposal and its potential effects fall outside the scope of the PEA and consultations, the FAA would conduct further environmental review.

In accordance with Section 7 of the Endangered Species Act (ESA), the FAA is initiating consultation with the U.S. Fish and Wildlife Service and requesting concurrence with our *may affect* determinations as described in the attached biological evaluation. The biological evaluation includes a description of the action, identification of the action area, identification of ESA-listed species and critical habitat in the action area, and a discussion of potential effects to ESA-listed species and critical habitat.

As discussed in the biological evaluation, the FAA has determined the action ***may affect, but is not likely to adversely affect*** the following species: gray bat (*Myotis grisescens*), northern long-eared bat (*Myotis septentrionalis*), tricolored bat (*Perimyotis subflavus*), West Indian manatee (*Trichechus manatus*), piping plover (*Charadrius melodus*), red knot (*Calidris canutus rufa*), red-cockaded woodpecker (*Picoides borealis*), green sea turtle (*Chelonia mydas*), Kemp's ridley sea turtle (*Lepidochelys kempii*), leatherback sea turtle (*Dermochelys coriacea*), and loggerhead sea turtle (*Caretta caretta*).

The FAA appreciates your review of the proposed project and requests your concurrence with our effects determinations as stated above and in the biological evaluation. Your response within the next 60 days will greatly assist us in our environmental review process. If you have any questions or need additional information, please contact Mr. Nicholas Baker via e-mail at 9-AWA-AVS-AFS-ENVIRONMENTAL@faa.gov.

Sincerely,

Jay Kinser
Manager, Strategic Programs Branch
UAS Integration Office

Attachment: Biological Evaluation

FINAL

**PROGRAMMATIC BIOLOGICAL EVALUATION FOR SPECIES LISTED
UNDER THE ENDANGERED SPECIES ACT FOR UNMANNED AIRCRAFT
SYSTEMS PACKAGE DELIVERY OPERATIONS IN NORTH CAROLINA**

**Submitted to:
United States Fish and Wildlife Service**

**Submitted by:
Federal Aviation Administration**



Date: January 2024

1. INTRODUCTION

Section 7(a)(1) of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. § 1531 *et seq.*) requires federal agencies, in consultation with and with the assistance of the U.S. Fish and Wildlife Service (USFWS) and/or the National Marine Fisheries Service (NMFS), to use their authorities to further the purposes of the ESA by carrying out programs for the conservation of listed species. Section 7(a)(2) of the ESA requires each federal agency, in consultation with and with the assistance of USFWS and/or NMFS, ensure that any action authorized, funded, or carried out by the agency is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat of those species. When the action of a federal agency may affect a listed species or its designated critical habitat, that agency is required to consult with either NMFS or USFWS, or both, depending upon the species that may be affected.

Consultations conducted under ESA Section 7 may be project-specific or programmatic. A programmatic consultation is a consultation addressing an agency's multiple actions on a program, region, or other basis. A programmatic Section 7 consultation can achieve several objectives with positive administrative benefits for both the action and consulting agency. A programmatic approach streamlines the procedures and time involved in consultations for broad agency programs or multiple similar, frequently occurring, or routine actions with predictable effects on ESA-listed species and/or critical habitat, thus reducing the amount of time spent on individual project-by-project consultations.

Programmatic consultations allow for streamlined project-specific review because the effects analysis for a suite of activities is completed in the programmatic consultation document. At the individual project-specific review stage, a proposed activity is reviewed to determine if it can be implemented in accordance with any protection measures or criteria regarding activity effects and stressors identified in the programmatic consultation.

The Federal Aviation Administration (FAA) prepared this programmatic Biological Evaluation to support its ESA Section 7 consultation with the USFWS for actions related to Unmanned Aircraft Systems (UAS) operations in specific areas of North Carolina. The Biological Evaluation assesses the potential effects of the FAA's action of authorizing commercial UAS operators to deliver goods to customers (referred to as package delivery) using unmanned aircraft (UA; commonly referred to as drones) in accordance with 14 Code of Federal Regulations (CFR) Part 135 (Part 135) on species listed by and critical habitat designated by the USFWS under the ESA. The FAA does not expect any effects to listed species or critical habitat under the jurisdiction of NMFS.

In 2019, the FAA began issuing air carrier certificates to UAS operators in accordance with Part 135 so that operators could conduct package delivery flights. Generally, these approvals are associated with issuing new or amended Part 135 air carrier Operations Specifications as the operative approval. An Operations Specifications is a document that defines the scope of aircraft operations that the FAA has authorized.

To streamline the environmental review process for UAS package delivery proposals in North Carolina, the FAA, in coordination with the North Carolina Department of Transportation (NCDOT) as the project proponent, is preparing a programmatic environmental assessment in accordance with the National Environmental Policy Act (NEPA), Council on Environmental Quality NEPA-implementing regulations, and

FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*. This programmatic ESA consultation will support the FAA’s analysis and findings in the environmental assessment.

The FAA intends to use this programmatic consultation to comply with its ESA obligations for subsequent requests for authorizations from individual UAS operators proposing to conduct package delivery operations in North Carolina. Upon receiving an authorization request, the FAA will evaluate the proposal against this consultation to determine if the proposal and its potential effects on ESA-listed species and critical habitat fall within the scope of this consultation. If the proposal and its potential effects fall outside the scope of this consultation, the FAA will conduct a project-specific consultation.

2. PROPOSED ACTION

The action includes UAS operators conducting commercial drone package deliveries beyond the visual line of sight of the pilot in command within seven operating areas (predominantly metro areas) in North Carolina through the year 2030. The NCDOT has projected Part 135 drone package delivery operations for the state of North Carolina out to year 2030 and provided that projection to the FAA for analysis. The action includes commercial drone package deliveries from takeoff and landing areas (referred to as “hubs”) based on NCDOT’s maximum forecasted operations for conservative purposes.

2.1 Descriptions of UA

The type, size, and weight of UA used to deliver packages could vary, but NCDOT anticipates multi-copter platforms will be the primary type of UA used to deliver small packages in the next seven years. While NCDOT’s forecast considered fixed-wing platforms, the only fixed-wing operator in service in North Carolina at the time NCDOT developed the forecast has since decommissioned its flight operations in North Carolina. It is possible that a hybrid (rotary-wing and fixed-wing) vehicle could be in operation in the next five years; however, specific details for this type of vehicle are currently unknown.

Drone delivery distances depend on the UA’s battery duration, which can be influenced by weather and other factors. Delivery distances for a rotary-wing UA typically range from 3–10 miles one-way or 6–20 miles roundtrip, with durations of 5–20 minutes one-way or 10–40 minutes roundtrip. Cruising altitudes for drone package deliveries are typically 150–375 feet above ground level (AGL) and would not exceed 400 feet AGL. The characteristics of the UAS considered in this consultation are displayed in **Table 1**. Applications involving proposed operations that deviate from the characteristics listed in **Table 1** may require a project-specific consultation.

Table 1. UAS Characteristics Evaluated

Characteristic	Criteria
Platform/Vehicle Type	Multi-copters (2–8 propellers), fixed-wing, and hybrid aircraft (vertical lift with fixed-wing cruise)
Power	Electric motor
Delivery Mechanism Types	Drop off, tethered (wire/cable), customer unloads, ground drop, parachute
Maximum Aircraft Weight	Approximately 87 pounds
Maximum Payload (Package) Weight	Approximately 5 pounds
Maximum Aircraft Takeoff Weight	Approximately 92 pounds
Typical Cruise Altitude	150–375 feet above ground level
Maximum Cruise Altitude	400 feet above ground level
Hours of Operation	7:00 a.m. to 10:00 p.m.
Operation Days	7 days per week, 365 days per year

2.2 General Description of Operations

While UA come in various sizes with various flight capabilities, the flight operations can generally be categorized into the following five phases: 1) takeoff and climb, 2) en route outbound, 3) delivery, 4) en route inbound, and 5) descent and landing (see **Figure 1**). In general, package delivery operators partner with established businesses and identify the location for a hub at the business's parking lot, rooftop, or other area where it is not disruptive to the business and does not present a safety hazard. This allows the drone operator to conduct operations with minimal infrastructure requirements and no ground disturbance or construction activities. Prior to takeoff, packages are manually loaded onto the UA by a ground crew at the hub. The UA then climbs and performs aerial deliveries. The five phases of operation are described below for a typical multi-copter or hybrid UA.

Takeoff and Climb

The takeoff and climb phase is defined as the portion of the flight in which a fully loaded UA takes off from the hub and climbs vertically. The UA may then hover briefly as it conducts various systems checks to ensure it is functioning properly. With a multi-rotor design, the UA can take off and descend vertically, as well as hover. Typical flights begin with the UA departing from a hub and ascending vertically to no more than 400 feet AGL.

En Route Outbound

The en route outbound phase is defined as the part of the flight in which the fully loaded UA flies a pre-programmed route from its hub to a delivery point. During this flight phase, normal cruising speeds range from 30–60 knots (35–70 miles per hour) and normal cruising altitudes range from 150–375 feet AGL.

Delivery

The delivery phase is defined as the descent from the en route outbound phase to a delivery point to deliver a package. Upon arrival at the delivery point, the UA descends vertically to deliver the package. The UA may hover at various altitudes. Most UA use a tether to lower the package from the UA to the ground while the drone hovers. Once the UA releases the package from the tether, it climbs vertically to the cruise altitude and begins the en route inbound phase. The delivery process typically takes 30–90 seconds, depending on the operator.

En Route Inbound

Upon completion of a delivery, the UA flies from the delivery point back to a hub.

Descent and Landing

Upon reaching the hub, the UA vertically descends, lands, and turns off its rotors.

2.3 Predicted Sound Levels

The FAA conducted a noise analysis using the available noise data for all currently operating Part 135 multi-copter UA. The four multi-copter UA currently in use for Part 135 package deliveries and their associated maximum takeoff weights (MTOW) are the Amazon Prime Air MK27-2 (91.5 pounds MTOW), Wing Hummingbird 7000W-B (15 pounds MTOW), Causey Flytrex FTX-M600P (33.4 pounds MTOW), and UPS Flight Forward Mat ernet M2 (29.1 pounds MTOW). For the noise analysis, these four UA were assessed in two groupings: UA ranging from approximately 15–34 pounds MTOW (Group 1) and UA

ranging from approximately 15–92 pounds MTOW (Group 2). For each grouping, the FAA calculated the maximum sound exposure level (SEL) for distances ranging from 32.8 feet to 2,500 feet.

The estimated maximum SEL for all flight phases of Group 2 (the heavier group) is 96.6 decibels (dB) occurring at 32.8 feet from a delivery point. Noise from Group 1 (the lighter group) is lower, with a maximum SEL of 87.9 dB at the same location. The maximum SEL of all UA for the en route phase is 67.8 dB for a UA flying 31 knots at 250 feet AGL. This maximum en route SEL of 67.8 dB would occur at distances of 2,500 feet or greater for receivers directly under the UA flight path. For distances between 32.8 and 2,500 feet from a hub or delivery point, the SEL directly under a UA flight path would be between 87.9 dB and 67.8 dB. The majority of package delivery UA are expected to fall into the 14 CFR Part 107 small UA classification of under 55 pounds MTOW and are likely to have noise levels similar to the lighter group (Group 1).

2.4 Operating Areas

In general, Part 135 UAS package delivery operators prefer areas where they can serve the most customers while flying the least distance. In addition, operators look for communities with median incomes sufficient to support spending extra money on drone package delivery services. Finally, operators need enough unrestricted airspace to operate with minimal physical restrictions.

Based on these parameters, as well as existing UAS package delivery operations in North Carolina, NCDOT identified seven regions within North Carolina as likely operating areas for UAS package deliveries in the next seven years. These operating areas include Asheville, Charlotte Metro (including Kannapolis), Piedmont Triad (Winston-Salem, High Point, and Greensboro), Research Triangle (Raleigh, Durham, Chapel Hill, and adjacent communities), Sandhills (Pinehurst, Raeford, and Fayetteville), Greenville, and Wilmington (see **Figure 2**). The operating areas exclude special use airspace because drone package delivery operations would not be allowed in these areas.

The FAA has previously analyzed the potential environmental impacts of Part 135 drone package delivery operations in some of the operating areas:¹

- UPS Flight Forward in Winston-Salem (Piedmont Triad)
 - In 2021, the FAA completed an EA and issued a Finding of No Significant Impact (FONSI) for UPS Flight Forward drone package delivery operations in Winston-Salem. The FAA determined the action assessed in the 2021 EA would have *no effect* on ESA-listed species.
 - In 2022, the FAA completed another EA and issued a FONSI for UPS Flight Forward drone package delivery operations in Winston-Salem. This EA considered more daily deliveries than the 2021 EA (up to 112 deliveries per day from one distribution center). The FAA determined the action assessed in the 2022 EA would have *no effect* on ESA-listed species.

¹ Refer to the FAA’s “National Environmental Policy Act (NEPA) and Drones” website at: https://www.faa.gov/uas/advanced_operations/nepa_and_drones.

- Causey Aviation Unmanned, Inc. in Fayetteville, Holly Springs, Raeford, and Pinehurst (Sandhills)
 - In 2022, the FAA completed an EA and issued a FONSI for Causey Aviation Unmanned, Inc. / Flytrex package delivery operations. The EA considered up to 104, 79, 45, and 60 deliveries per day in Fayetteville,² Holly Springs, Pinehurst, and Raeford, respectively. The FAA determined the action assessed in the 2022 EA would have *no effect* on ESA-listed species.
- Zipline International, Inc. in Kannapolis (Charlotte Metro)
 - In 2022, the FAA completed an EA and issued a FONSI for Zipline International, Inc. package delivery operations in Kannapolis. This EA considered up to 20 deliveries per day.³ The FAA determined the action assessed in the 2022 EA would have *no effect* on ESA-listed species.

Therefore, baseline conditions in Winston-Salem, Holly Springs, Pinehurst, and Raeford include existing authorized drone package delivery flights. The FAA is not aware of any adverse effects to ESA-listed species from package delivery flights in these locations.

Asheville

The Asheville operating area is approximately 220 square miles and contains the Asheville metro area (see **Figure 3**). This operating area includes one airport: the Asheville Regional Airport (AVL).

Charlotte Metro

The Charlotte Metro operating area is approximately 3,524 square miles and contains the cities of Charlotte and Kannapolis, along with the surrounding unincorporated areas (see **Figure 4**). This operating area includes four airports: Charlotte Douglas International Airport (CLT), Charlotte-Monroe Executive Airport (EQY), Concord-Padget Regional Airport (JQF), and Mid-Carolina Regional Airport (RUQ). This operating area includes 1) the area previously assessed by the FAA as part of Zipline’s proposal to conduct drone package delivery operations based out of Kannapolis, NC (see above), and 2) a 30-nautical mile radius around CLT.

Piedmont Triad

The Piedmont Triad is approximately 713 square miles and includes the cities of Winston-Salem, High Point, and Greensboro (see **Figure 5**). This operating area includes two airports: the Smith Reynolds Airport (INT) and the Piedmont Triad International Airport (GSO).

Research Triangle

The Research Triangle operating area is approximately 1,039 square miles and includes the cities of Raleigh, Durham, and Chapel Hill, as well as adjacent communities (see **Figure 6**). This operating area includes one active airport—Raleigh-Durham International Airport (RDU)—and the former Horace Williams Airport (IGX).

² Causey has decommissioned drone package delivery operations in Fayetteville.

³ Zipline has since decommissioned operation of its fixed-wing drone in Kannapolis.

Sandhills

The Sandhills operating area is approximately 209 square miles and contains the cities of Pinehurst, Raeford, and Fayetteville (see **Figure 7**). This operating area contains the P K Airpark Airport (5W4) and a portion of Pope Field Airport (POB). Fayetteville Regional Airport (FAY), Moore County Airport (SOP), and Special Use Airspace R-5311A are located outside this operating area.

Greenville

The Greenville operating area is approximately 137 square miles and contains the Greenville metro area (see **Figure 8**). This operating area includes one airport: Pit -Greenville Airport (PGV).

Wilmington

The Wilmington operating area is approximately 129 square miles and consists of the Wilmington metro along the Atlantic Coast (see **Figure 9**). This operating area includes one airport: Wilmington International Airport (ILM).

The seven operating areas, including the forecasted daily operations for each operating area, are summarized in **Table 2**.

Table 2. Proposed UAS Operating Areas for Package Delivery in North Carolina

Operating Area Name	Estimated Size (square miles)	Estimated Number of Hubs	Estimated Range of Daily Deliveries	Major City/Cities	County/Counties
Asheville	220	1	164–478	Asheville	Buncombe, Henderson
Charlotte Metro	3,524	6	1,649–4,801	Charlotte, Mecklenburg, Kannapolis	Cleveland, Lincoln, Catawba, Iredell, Rowan, Stanly, Union, Cabarrus, Mecklenburg, Gaston
Piedmont Triad	713	5	413–1,201	Winston-Salem, High Point, Greensboro	Davidson, Forsyth, Guilford, Randolph
Research Triangle	1,039	6	1,704–4,960	Raleigh, Durham, Chapel Hill	Chatham, Wake, Orange, Durham, Granville, Franklin, Harnet
Sandhills	209	2	328–955	Pinehurst, Raeford, Fayetteville	Moore, Cumberland, Hoke
Greenville	137	1	164–478	Greenville	Pit
Wilmington	129	1	164–478	Wilmington	New Hanover, Brunswick

Typical Flight Profile

Typical Flight Duration: 10–40 minutes round-trip

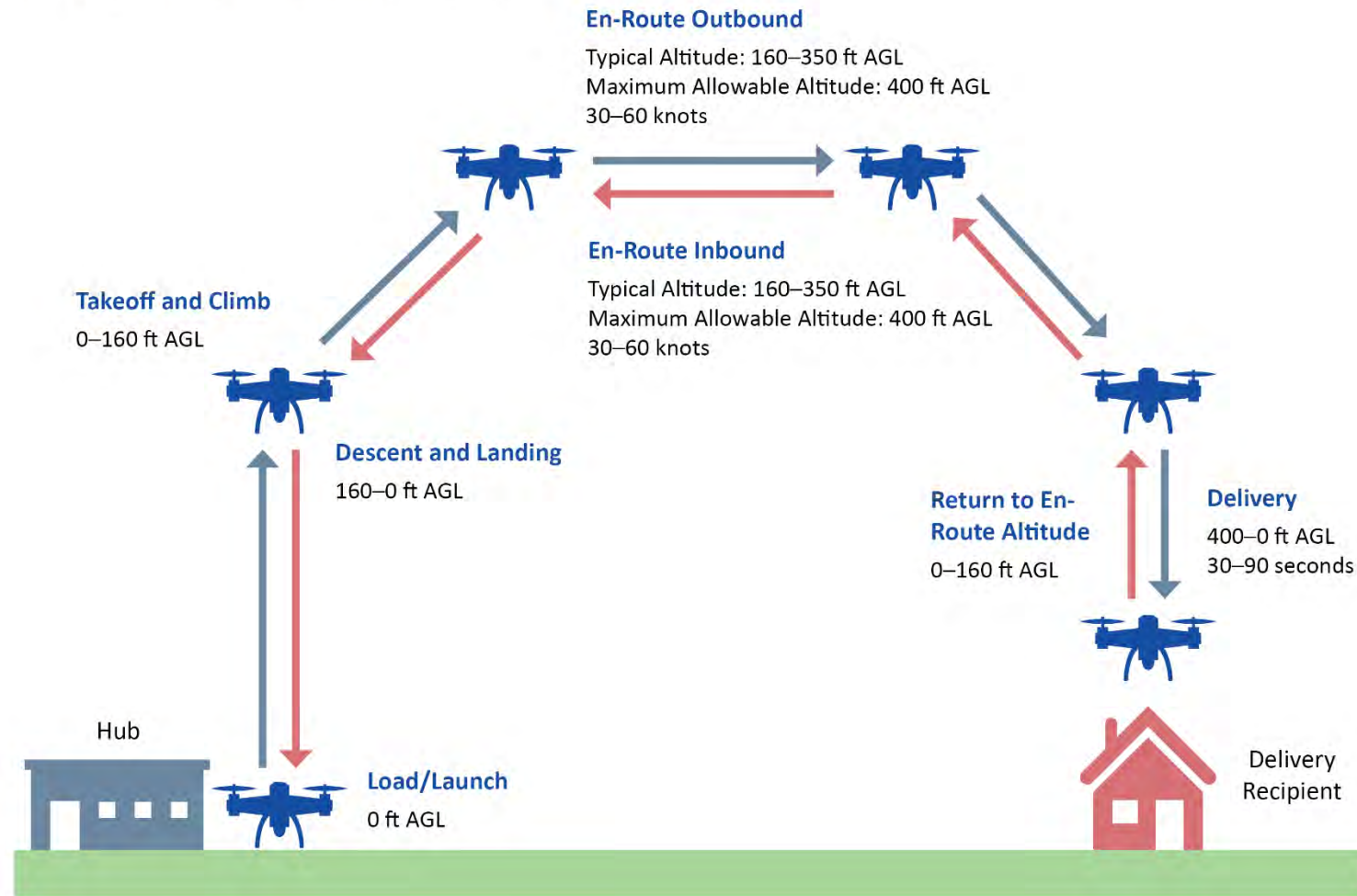


Figure 1. Typical Flight Profile

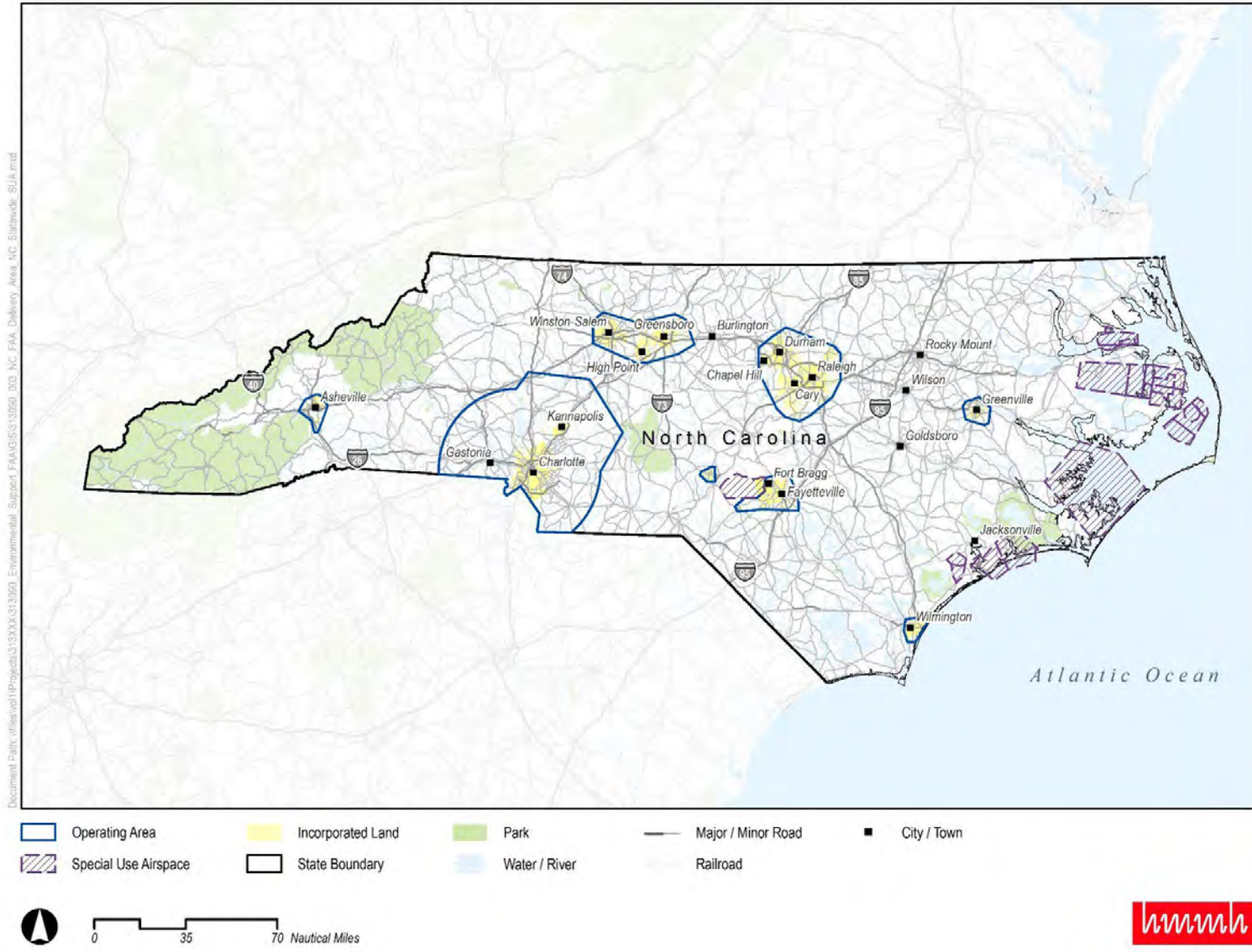


Figure 2. Operating Areas – Statewide

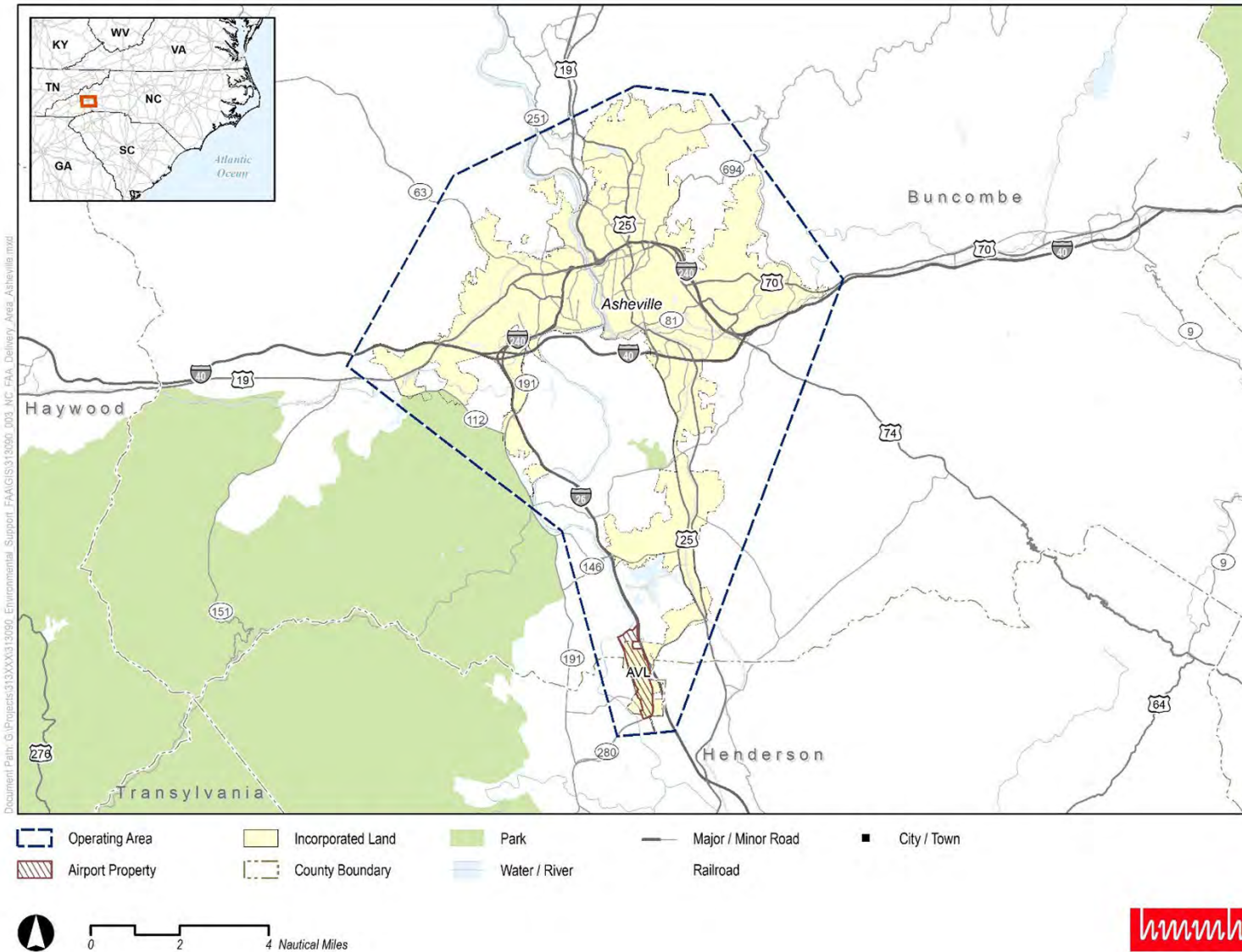
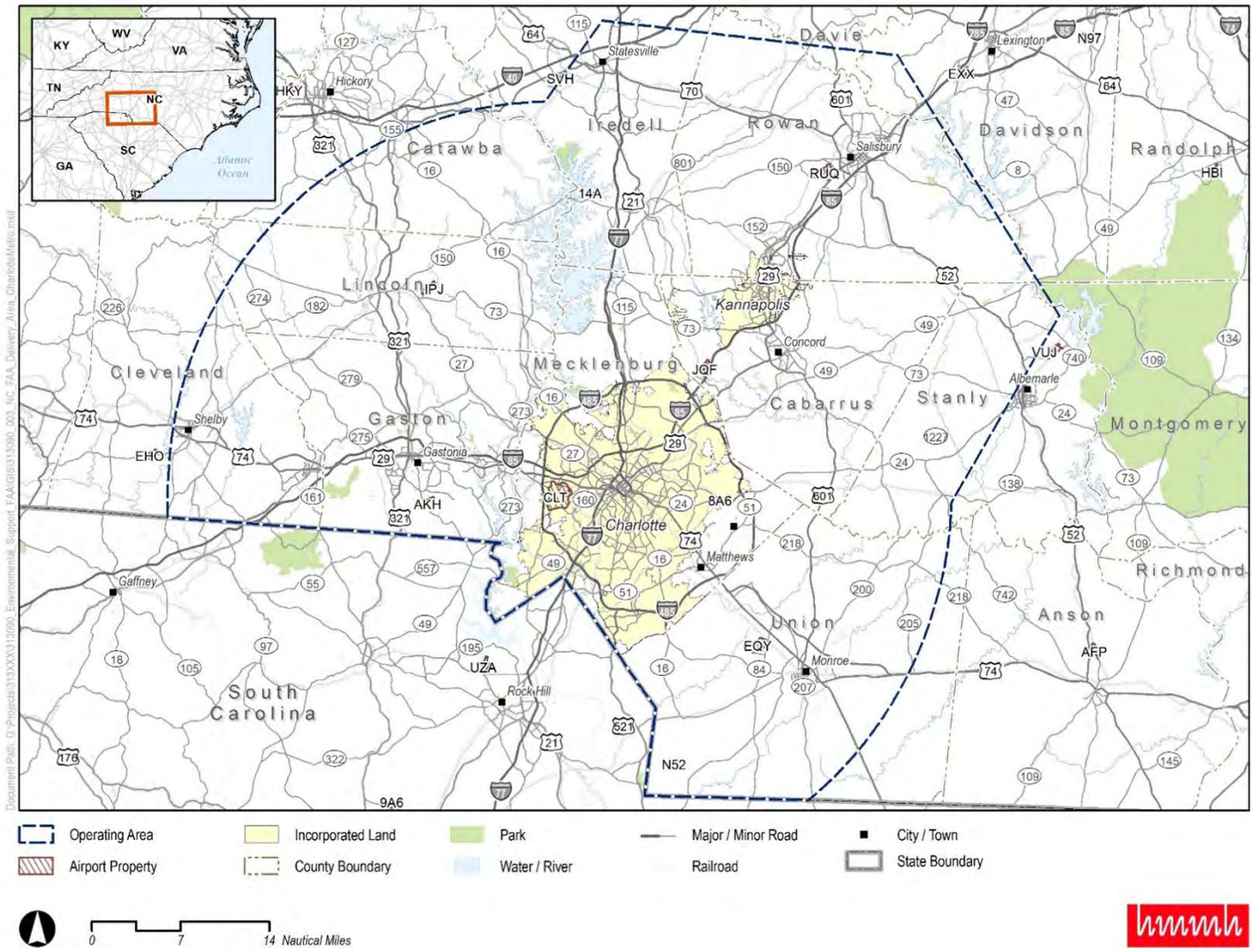


Figure 3. Asheville Operating Area



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Figure 4. Charlotte Metro Operating Area



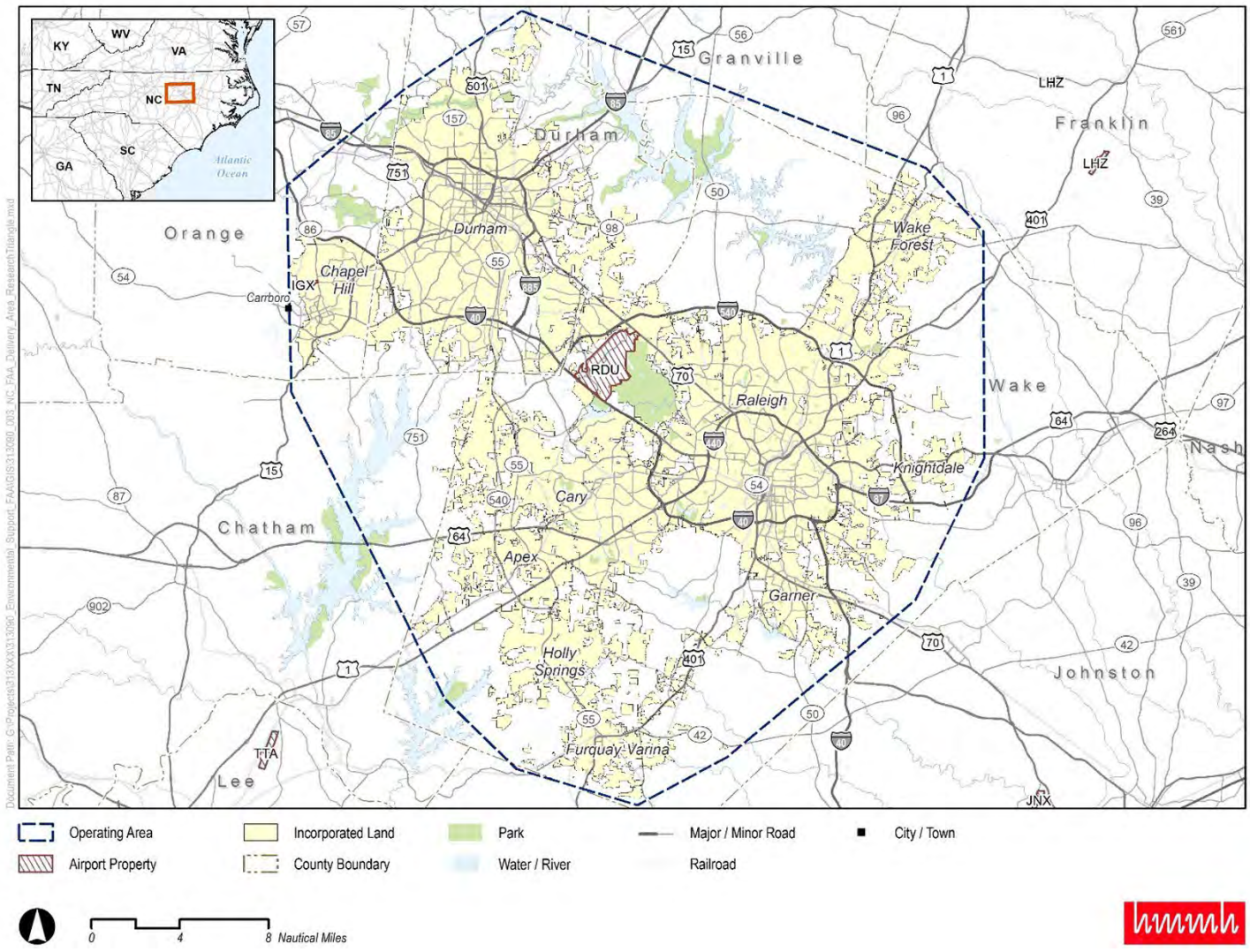


Figure 6. Research Triangle Operating Area

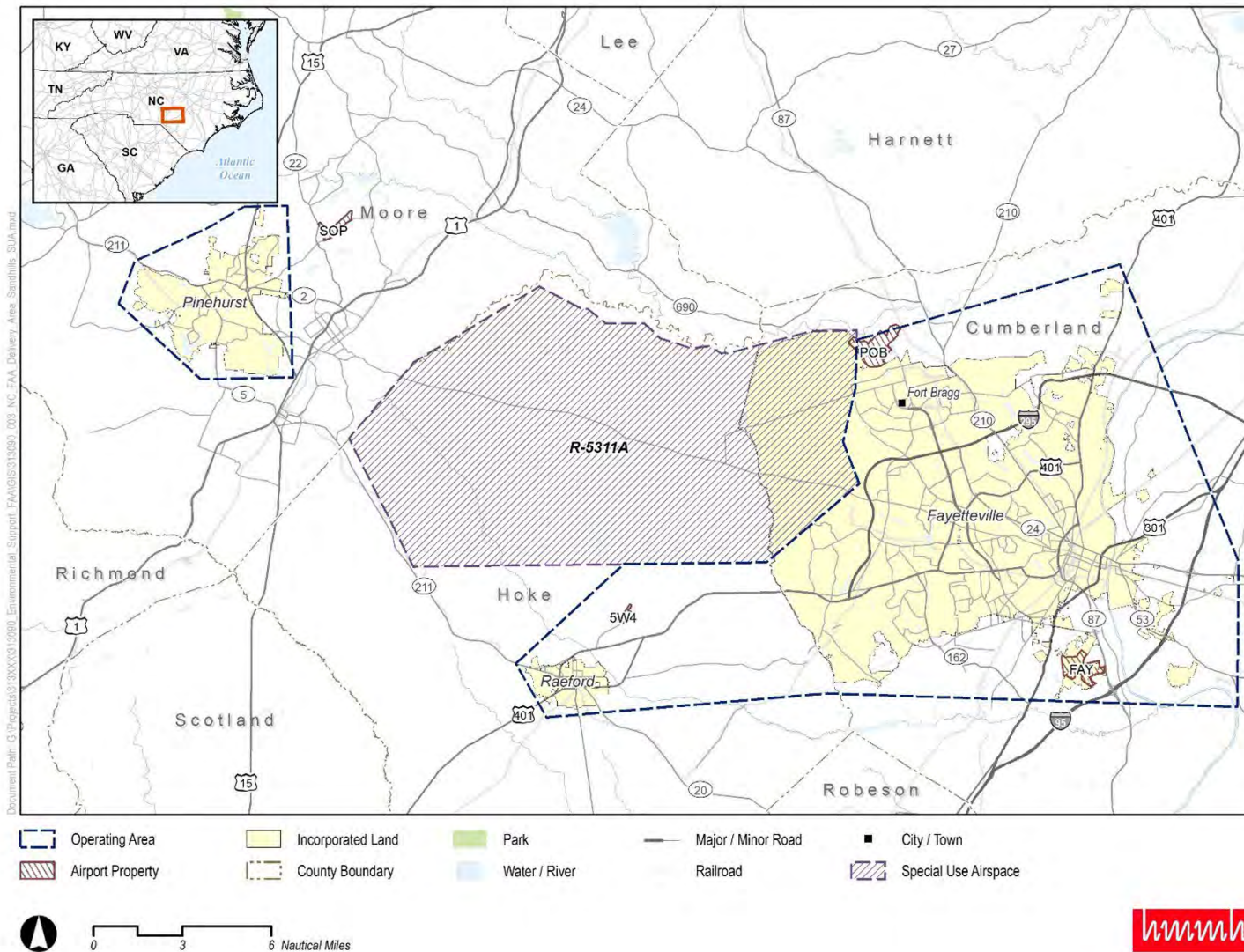


Figure 7. Sandhills Operating Area

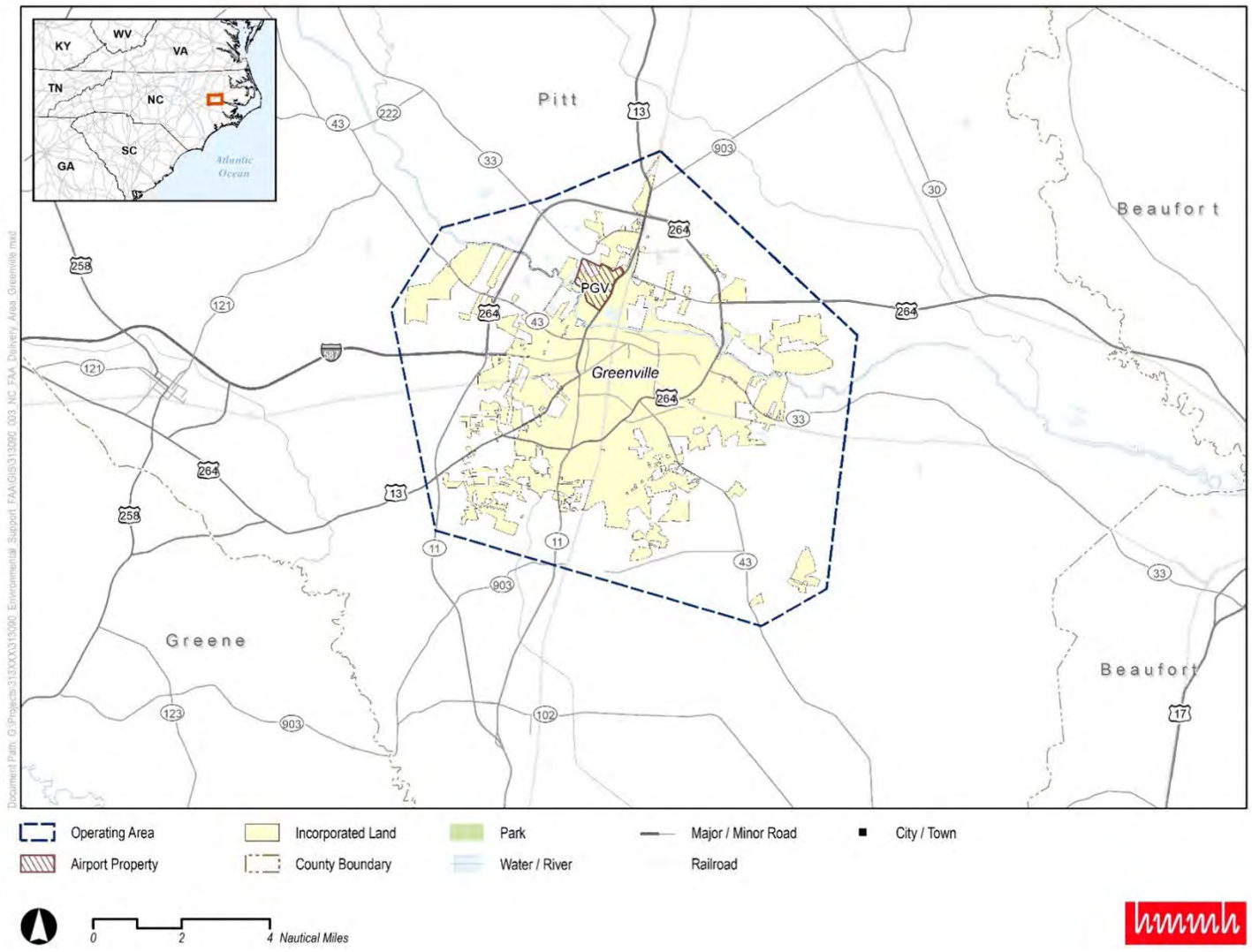


Figure 8. Greenville Operating Area

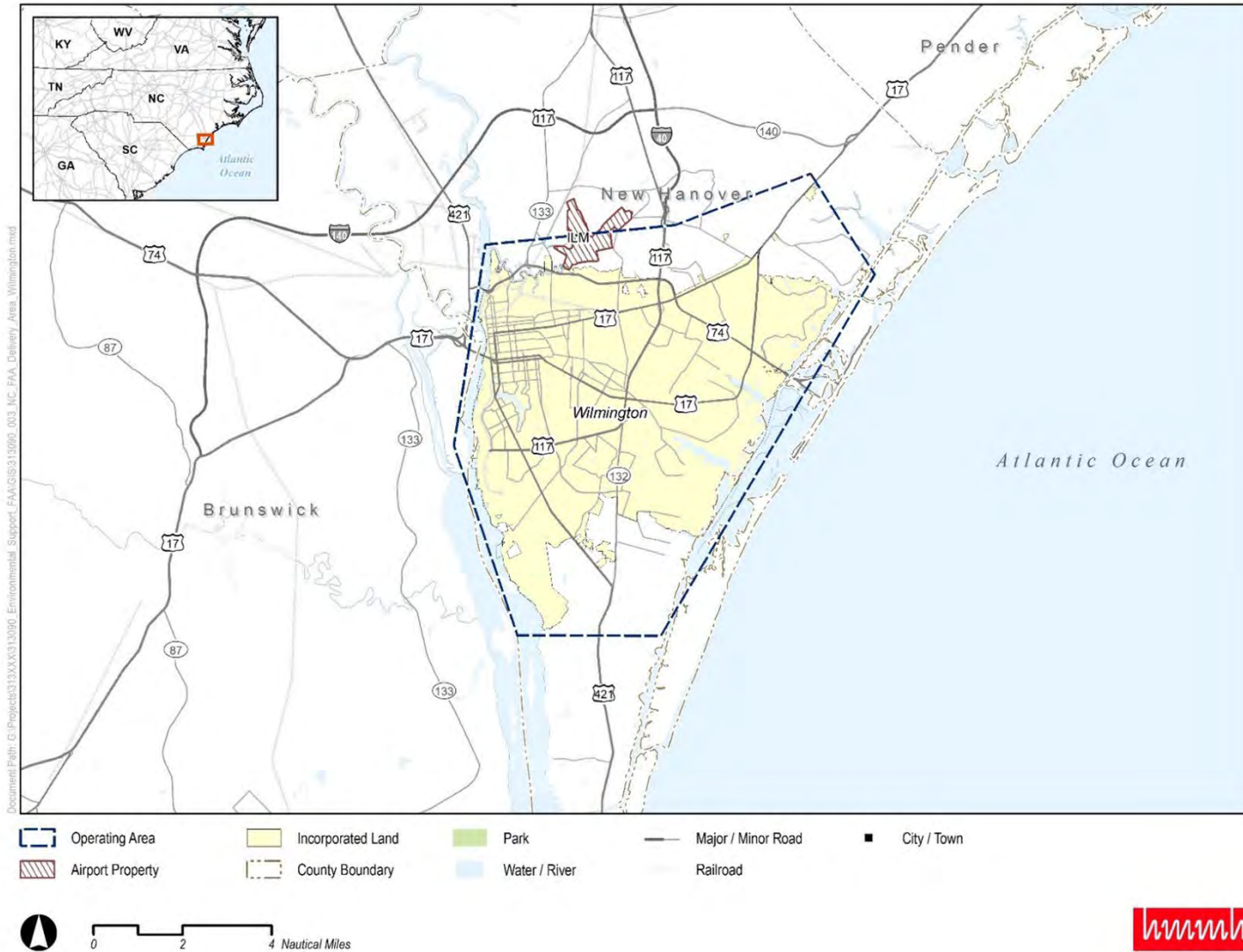


Figure 9. Wilmington Operating Area

2.5 Project Design Criteria / Environmental Protection Measures

Project design criteria are identified as part of a programmatic consultation and are applicable to future projects implemented under the program. In the case of this consultation, project design criteria include environmental protection measures (EPMs) to limit the effects of UAS package delivery operations.

As described in Section 5, the FAA does not expect the action would result in any adverse effects to ESA-listed species or critical habitat. Nonetheless, the FAA has developed the following EPMs to lead to avoidance and minimization of effects to ESA-listed species in the action area to assist in the conservation of these resources.

Education

- The FAA will inform UAS operators about the potential presence of ESA-listed species in the operating area and each operator's obligation to comply with environmental laws (e.g., ESA, Bald and Golden Eagle Protection Act, and Migratory Bird Treaty Act).
- The FAA will recommend each UAS operator provide an environmental awareness briefing to all personnel as part of its operational plans for purposes of advising personnel about the potential presence of ESA-listed species in the operating area and identifying where such species may be present in the operating area.

Bat-specific EPM

- The FAA will contact the North Carolina Wildlife Resources Commission bat biologist to obtain statewide bat roost and hibernacula data. The FAA will provide this data to Part 135 package delivery operators and request operators prohibit hovering, taking off, and landing within 150 feet of the bat roost or hibernacula. In the case of roosts in bridges or culverts, the 150-foot buffer applies to any point on the structure.

West Indian Manatee-Specific EPM

- The FAA will recommend to operators operating in the Greenville and Wilmington operating areas from June to October to conduct en route flights at an altitude of 350 feet over potential manatee habitat.

Reporting

- The FAA will instruct each UAS operator to contact the FAA and USFWS if a drone strikes any species that may be an ESA-listed species. The FAA and USFWS will coordinate with the UAS operator to determine the species:
 - FAA contact: 9-faa-drone-environmental@faa.gov
 - For operations occurring in the Asheville, Charlotte Metro, and Piedmont Triad operating areas, contact the USFWS Asheville Ecological Services Field Office at 825-258-3939.
 - For operations occurring in the Research Triangle, Sandhills, Greenville, and Wilmington operating areas, contact the USFWS Raleigh Ecological Services Field Office at 919-856-4520.
- To the extent the FAA can collect the following data from each Part 135 operator conducting package delivery operations in the action area, in February or March of each year, the FAA will report the data to the USFWS (Asheville and Raleigh Ecological Services Field Offices) for the preceding calendar year:

- Locations of approved hubs in each operating area
- By hub:
 - Annual number of flights
 - Average flight height
 - Average distance of flights
 - Average speed of flights
 - Timing of flights (e.g., number of flights in the morning, afternoon, evening)
 - A heat map displaying the general flight tracks and relative number of flights
- Documentation of any wildlife strikes
- Documentation of any non-lethal wildlife interactions with drones

3. ACTION AREA

The *action area* means all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action (50 CFR § 402.02). The action area for this evaluation is defined as the operating areas depicted in Figures 2–8. The operating areas capture all possible flight routes to the delivery areas and where potential effects (e.g., visual, auditory, physical) to listed species and critical habitat could occur.

4. ESA-LISTED SPECIES AND CRITICAL HABITAT IN THE ACTION AREA

The FAA used the USFWS Information for Planning and Consultation (IPaC) online system (accessed September and October 2023) to identify ESA-listed species and critical habitat in the action area (see **Appendix A**). In total, there are 41 species listed, proposed to be listed, or candidates for listing in the action area. **Table 3** includes these 41 species and identifies their occurrence within each of the seven operating areas. **Table 3** also identifies designated or proposed critical habitat within each of the operating areas. There is designated critical habitat for five species and proposed critical habitat for 6 species in the action area. IPaC also identified two species due to similarity of appearance to a threatened species (bog turtle [*Glyptemys muhlenbergii*] and American alligator [*Alligator mississippiensis*]). Since these two species are not federally listed or similar in appearance to listed species within the action area, they are not included in this analysis.

Table 3. ESA-Listed Species and Critical Habitat in the Action Area

Class	Scientific Name	Common Name	Federal Listing	Asheville	Charlotte Metro	Piedmont Triad	Research Triangle	Sandhills	Greenville	Wilmington
Mammals (n=4)	<i>Myotis grisescens</i>	Gray bat	E	X						
Mammals (n=4)	<i>Myotis septentrionalis</i>	Northern long-eared bat	E	X					X	X
Mammals (n=4)	<i>Perimyotis subflavus</i>	Tricolored bat	PE	X	X	X	X	X	X	X
Mammals (n=4)	<i>Trichechus manatus</i>	West Indian manatee	T						X	X
Birds (n=3)	<i>Charadrius melodus</i>	Piping plover	T							X

Class	Scientific Name	Common Name	Federal Listing	Asheville	Charlotte Metro	Piedmont Triad	Research Triangle	Sandhills	Greenville	Wilmington
Birds (n=3)	<i>Calidris canutus rufa</i>	Red knot	T							X
Birds (n=3)	<i>Picoides borealis</i>	Red-cockaded woodpecker	E		X		X	X		X
Reptiles (n=4)	<i>Chelonia mydas</i>	Green sea turtle	T							X
Reptiles (n=4)	<i>Lepidochelys kempii</i>	Kemp's ridley sea turtle	E							X
Reptiles (n=4)	<i>Dermochelys coriacea</i>	Leatherback sea turtle	E							X
Reptiles (n=4)	<i>Caretta caretta</i>	Loggerhead sea turtle	T							X
Amphibians (n=1)	<i>Necturus lewisi</i>	Neuse river waterdog	T				X (CH)		X (CH)	
Fishes (n=2)	<i>Notropis mekistocholas</i>	Cape fear shiner	E				X	X		
Fishes (n=2)	<i>Noturus furiosus</i>	Carolina madtom	E				X (CH)		X	
Clams / Mussels (n=7)	<i>Alasmidonta raveneliana</i>	Appalachian elktoe	E	X						
Clams / Mussels (n=7)	<i>Fusconaia masoni</i>	Atlantic pigtoe	T		X	X	X (CH)	X	X	
Clams / Mussels (n=7)	<i>Lasmigona decorate</i>	Carolina heelsplitter	E		X (CH)					
Clams / Mussels (n=7)	<i>Alasmidonta heterodon</i>	Dwarf wedgemussel	E				X		X	
Clams / Mussels (n=7)	<i>Lasmigona subviridis</i>	Green floater	PT			X	X (PCH)			
Clams / Mussels (n=7)	<i>Parvaspina steinstansana</i>	Tar River spiny mussel	E				X		X	
Clams / Mussels (n=7)	<i>Elliptio lanceolata</i>	Yellow lance	T				X (CH)			
Snails (n=1)	<i>Planorbella magnifica</i>	Magnificent ramshorn	E							X
Insects (n=2)	<i>Danaus plexippus</i>	Monarch butterfly	C	X	X	X	X	X	X	X
Insects (n=2)	<i>Neonympha mitchellii francisci</i>	Saint Francis' satyr butterfly	E					X		
Plants (n=16)	<i>Schwalbea americana</i>	American chaffseed	E					X		
Plants (n=16)	<i>Sagittaria fasciculata</i>	Bunched arrowhead	E	X						

Class	Scientific Name	Common Name	Federal Listing	Asheville	Charlotte Metro	Piedmont Triad	Research Triangle	Sandhills	Greenville	Wilmington
Plants (n=16)	<i>Hexastylis naniflora</i>	Dwarf-flowered heartleaf	T		X					
Plants (n=16)	<i>Carex lutea</i>	Golden sedge	E							X
Plants (n=16)	<i>Ptilimnium nodosum</i>	Harperella	E				X			
Plants (n=16)	<i>Rhus michauxii</i>	Michaux's sumac	E		X		X	X		
Plants (n=16)	<i>Sarracenia rubra</i> spp. <i>jonesii</i>	Mountain sweet pitcher-plant	E	X						
Plants (n=16)	<i>Lindera melissifolia</i>	Pondberry	E					X		
Plants (n=16)	<i>Lysimachia asperulaefolia</i>	Rough-leafed loosestrife	E				X	X		X
Plants (n=16)	<i>Helianthus schweinitzii</i>	Schweinitz's sunflower	E		X	X				
Plants (n=16)	<i>Isotria medeoloides</i>	Small whorled pogonia	T	X		X				
Plants (n=16)	<i>Echinacea laevigata</i>	Smooth coneflower	T		X		X			
Plants (n=16)	<i>Helonias bullata</i>	Swamp pink	T	X						
Plants (n=16)	<i>Sisyrinchium dichotomum</i>	White iris e	E	X						
Plants (n=16)	<i>Isoetes melanospora</i>	Black Spored Quillwort	E		X					
Lichens (n=1)	<i>Gymnoderma lineare</i>	Rock gnome lichen	E	X						

E = endangered; T = threatened; C = candidate; PE = proposed endangered; PT = proposed threatened; CH = critical habitat; PCH = proposed critical habitat

5. POTENTIAL EFFECTS OF THE ACTION ON ESA-LISTED SPECIES AND CRITICAL HABITAT

This section discusses the potential effects of the action on classes and individual species based on available data and a literature review. *Effects of the action* are all consequences to listed species or critical habitat that are caused by the action, including the consequences of other activities that are caused by the action. A consequence is caused by the action if it would not occur but for the action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action. [50 CFR § 402.02].

The standard to finding that an action *may affect, but is not likely to adversely affect* ESA-listed species or designated critical habitat is that all of the effects of the action are expected to be discountable, insignificant, or wholly beneficial. For an effect to be discountable, there must be a plausible adverse effect (i.e., a credible effect that could result from the action that would be an adverse effect if it did affect an ESA-listed species), but it is very unlikely to occur. Insignificant effects relate to the size or

severity of the impact and include those effects that are undetectable, not measurable, or so minor they cannot be meaningfully evaluated. Insignificant is the appropriate effect conclusion when plausible effects are going to happen but will not rise to the level of constituting an adverse effect. Beneficial effects have an immediate positive effect without any adverse effects to the species or habitat.

The following subsections identify the potential stressors and analyze the potential effects of the action on the ESA-listed species and critical habitat in the action area.

Potential Stressors to ESA-Listed Species

UA noise, visual presence, and the potential for airborne strikes with flying species are the action's potential stressors or threats to ESA-listed species. Flight operations would take place mostly in an urban or suburban environment, within airspace, and typically remain well above the tree line while en route to and from a hub. The duration of exposure by wildlife on the ground to visual or noise impacts from the UA would be of very short duration (less than 60 seconds during takeoff/landing, up to 90 seconds during delivery, and a few seconds during the en route phase as the UA flies by).

Strike

The action includes drone operation from 0 feet at takeoff and landing to a maximum cruising altitude of 400 feet AGL (with nominal cruising altitude ranging from 150–375 feet AGL); therefore, the potential for a drone to strike a flying species (bat, bird, or insect) exists. The FAA has maintained a Wildlife Strike Database since 1990 that contains all recorded wildlife strikes,⁴ but strike reporting is voluntary. As of October 1, 2023, there have been thousands of commercial drone small package delivery flights throughout the country. The FAA Wildlife Strike Database does not have documented reports of drone package delivery operations striking wildlife in the United States; though, as noted, strike reporting is voluntary.

Although public data is lacking for this airframe specifically, it is important to evaluate available wildlife strike data because the flight profile of the UA will place operations in similar altitudes that have been evaluated by the FAA since 1990. The FAA produces an annual serial report in cooperation with the U.S. Department of Agriculture, Wildlife Services that analyzes reported wildlife strike data from 1990–2022. Roughly 70 percent of bird strikes occurred at or below 500 feet AGL during this timeframe for commercial transport and general aviation aircraft (Dolbeer et al. 2023). The majority of local movements of birds occur below 500 feet AGL, as birds take the lowest altitude available to them to expend the least amount of energy.

Visual Presence

In addition to a potential strike, studies have shown varying responses from animals to the presence of drones. Some have shown changes in behavior such as fleeing (see West Indian manatee, below), changing foraging or course (McEvoy et al. 2016), aggression (Rebolo-Ifrán et al. 2019), and temporary or permanent nest or young abandonment (Cantu de Leija et al. 2023). Studies showing nest abandonment were using drone technology for wildlife population surveys, animal detection, and animal behavior survey and subsequent response to drone presence (Mo and Bonatakis 2022). One study found that, in most instances, drones within four meters of birds did not cause a behavioral response (Vas et al. 2015).

⁴ See: <https://wildlife.faa.gov/home>.

In another study, drones barely elicited behavioral responses in terrestrial mammals (Mulero-Pázmány et al. 2017). Type of drone, size, and wing attachment were all found to affect disturbance to wildlife as well, with fixed-wing drones being more likely to elicit a response due to their shape and shadow resembling predators and larger drones causing more disruption (Rebolo-Ifrán et al. 2019, McEvoy et al. 2016, Kuhlmann et al. 2022).

Visual presence of the UA will be greatest at the hubs, where the UA takeoff and land. The hubs will be located in commercial business areas or parking lots, areas unlikely to sustain abundant wildlife populations, including ESA-listed species identified for the action area. The delivery locations will be residential houses (yards, sidewalks, driveways, or other cleared areas) or other businesses (parking lots, rooftops, or other cleared areas at the business).

Noise

Wildlife could be exposed to UA noise during all flight phases. A wide range of studies have been conducted concerning noise effects on animals (Manci et al. 1988, Dufour 1980, McKechnie and Gladwin 1993, Bradley et al. 1990, Lee and Fleming 2002, Bowles 1995). Natural factors which affect reaction include season, group size, age and sex composition, on-going activity, motivational state, reproductive condition, terrain, weather, and temperament (Bowles 1995). Individual animal response to a given noise event or series of events also can vary widely due to a variety of factors, including time of day, physical condition of the animal, physical environment, the experience of the individual animal with noises, and whether other physical stressors (e.g., drought) are present (Manci et al. 1988). Consequently, it is difficult to generalize animal responses to noise disturbances across species.

One result of the Manci et al. (1988) literature review was the conclusion that, while behavioral observation studies were relatively limited, a general behavioral reaction in animals from exposure to aircraft noise is the startle response. The intensity and duration of the startle response appears to be dependent on which species is exposed, whether there is a group or an individual, and whether there have been some previous exposures. Responses range from flight, trampling, stampeding, jumping, or running, to movement of the head in the apparent direction of the noise source. Manci et al. (1988) reported that the literature indicated that avian species may be more sensitive to aircraft noise than mammals.

A noise descriptor for noise effects on wildlife has not been universally adopted, but some research indicates SEL is the most useful predictor of responses. Characteristic of the bulk of research to date has been lack of systematic documentation of the source noise event. Many studies report “sound levels” without specifying the frequency spectrum or duration. A notable exception is a study sponsored by U.S. Air Force that identifies SEL as the best descriptor for response of domestic turkey poults to low-altitude aircraft overflights (Bradley et al. 1990). This study identified a threshold of response for disturbance of domestic turkeys (“100 percent rate of crowding”) as SEL 100 dB. As noted above in Section 2.3, the estimated maximum SEL for all flight phases of the heavier UA group is 96.6 dB occurring at 32.8 feet from a delivery point. Noise from the lighter UA group would be lower, with a maximum SEL of 87.9 dB at the same location. The maximum en route SEL of 67.8 dB would occur at distances of 2,500 feet or greater for receivers directly under the UA flight path. For context, the noise level of a diesel truck at 50 feet or a noisy urban environment during the day is estimated between 80 to 90 dB; the sound level of an air conditioning unit at 100 feet is approximately 60 dB.

Potential Effects to Critical Habitat

The action area includes designated critical habitat for five aquatic species and proposed critical habitat for one aquatic species. The action does not include any ground construction or habitat modification. During nominal operations, the UA would not touch the ground except at the hubs, which would be located in commercial areas, such as shopping centers. The action would not result in any physical or auditory disturbance to the designated and proposed critical habitat in the action area. Therefore, the FAA has determined the action would have *no effect* on critical habitat.

Potential Effects to Listed Species

Mammals

Bats

The gray bat (*Myotis grisescens*) has the potential to occur within the Asheville operating area (Buncombe County). It occurs sparingly in the southern half of the North Carolina mountains. Until about 2000, there was only a single record from the Asheville area, and the thought at that time was the record was perhaps of a stray/vagrant individual in search of a roosting cave. The gray bat is in decline due to white-nose syndrome severely affecting cave populations. This species is more closely tied to caves during all seasons compared to other bats. The gray bat favors limestone caves with creeks flowing through them; however, it can be found roosting under bridges and inside trees during the warmer months in North Carolina. The gray bat hibernates in the winter; its winter habitat in North Carolina is not known. This species forages specifically at night over water, such as lakes, ponds, and rivers, fairly close to caves (LeGrand et al. 2023).

The northern long-eared bat (*Myotis septentrionalis*) has a wider distribution within North Carolina compared to the gray bat, commonly found in the mountains and the coastal plain, giving it potential to occur in one or more operating areas (see **Table 3**). It occurs in North Carolina year-round and is not known to be migratory. It is most often found in moderate to heavy forested areas, preferring to roost in trees or buildings in the warmer months and uses caves and other larger structures in winter months. This species tends to forage well after dark (LeGrand et al. 2023).

The tricolored bat (*Perimyotis subflavus*) can be found throughout the state, with the potential to occur within one or more operating areas (see **Table 3**). This species is in decline due to white-nose syndrome. While not truly migratory, the tricolored bat moves to caves and mines in the mountains and foothills during winter months. This species has a wide range of habitats, including upland to lowland forests, groves, farmyard, and towns, at times roosting in old buildings. The species is rarely seen in heavily populated areas. They emerge in the evening, often slow in flight, to forage over water, open fields, and wooded areas (LeGrand et al. 2023).

Both the northern long-eared bat and tricolored bat are active year-round in the North Carolina coastal plain. Both species may roost in trees year-round and leave the roost to forage on warm winter nights.

In the North Carolina piedmont and coastal plain during all seasons of the year, tricolored bats may be found roosting in caves, mines, culverts, and other cave-like structures. During winter months in the piedmont, USFWS believes there are periods of activity (and/or tree roosting) on warm winter nights, but more research on the life history of tricolored bats in the piedmont is needed.

There has been a dramatic population decline of certain ESA-listed bat species caused by white-nose syndrome, a disease caused by an invasive fungus that ultimately causes affected hibernating bats to starve to death over the winter. Legal protections afforded by the listing status of bats are focused on minimizing and avoiding direct loss of the remaining individuals by protecting the known hibernation sites and limiting forest management activities where certain bats (e.g., the northern long-eared bat) are most likely to be present in certain times of the year. The action would not physically affect hibernacula (caves) and does not involve forest management activities. The action would not result in any ground disturbance or impacts on suitable bat habitats. Bats use a diversity of forest habitats for roosting, foraging, and raising young. In general, any tree large enough to have a cavity or that has loose bark may be used by a bat for roosting or rearing young.

Bats hibernate during the winter and are most often found in caves or abandoned mines. It is important to protect these sites because bats will return year after year to the same hibernation site and can occur in very large numbers. UA conducting package deliveries are not expected to fly close enough to hibernacula to result in effects. The action would not result in direct impacts on bat hibernacula.

Potential impacts to bats from drone package delivery operations include potential strike and nuisance during dawn, dusk, and evening foraging hours, and waking and nuisance during daytime roosting hours. Additionally, noise emitted from UA may interfere with low-frequency bat calls and cause bats to avoid UA flying overhead (Ednie et al. 2021). Noise associated with UA would be temporary and is anticipated to be negligible on wildlife (including bats).

There is also potential for UA to accidentally strike a bat during dawn, dusk, and evening operations. If an in-flight collision occurs, a UA may harm or kill the impacted bat. In addition, there is the potential that UA could cause a nuisance near undocumented hibernacula or maternity roost trees of ESA-listed bats. Drone package delivery operations involve the UA moving from the commercial hub directly to the delivery site, occurring in urban or suburban (built) environments. The literature has shown bats will avoid areas with drone noise and presence, and a drone conducting package delivery operations would only be in range of nearby roosts for a short period of time.

Bats experiencing disturbance would be expected to leave the area and return once the disruption ends. Disturbance at the hub and climb phase would be repeated frequently. Disturbance while en route and during descent and delivery would be temporary and sporadic or may be repeated frequently in the same location (e.g., a business or medical facility). None of these bat species tend to roost in heavily populated areas, where the hubs would be located; however, the tricolored bat and northern long-eared bat may use abandoned buildings, while the gray bat may use larger bridge structures to roost during the winter months. Human presence at hubs (i.e., commercial areas) could also disturb roosting or foraging bats, although this disruption is anticipated to be similar to existing conditions due to the developed nature of these sites (i.e., commercial areas).

Given the potential presence of ESA-listed bats in the action area and the potential for the identified stressors to cause effects, the action **may affect** listed bats. Based on 1) operations occurring mostly in an urban and suburban environment, 2) the altitude at which the UA flies in the en route phase (150–370 feet AGL), 3) the expected low sound levels experienced by a bat, 4) any increase in ambient sound levels would be short in duration, 5) the low probability of an ESA-listed bat occurring at the hubs and delivery sites, and 6) the low likelihood of the UA striking a bat given the low probability of encountering a bat and a bat's ability to avoid a drone, the FAA has determined the action **may affect, but is not likely**

to adversely affect, the gray bat, northern long-eared bat, and tricolored bat.⁵ Any effects are expected to be discountable or insignificant.

West Indian Manatee

The West Indian manatee (*Trichechus manatus*) potentially occurs within the Wilmington and Greenville operating areas during warmer months (June–October). Manatees are typically seen along the southern third of the North Carolina coast and inshore of the open ocean. Manatees prefer brackish waters of the coastal estuaries, including the intercoastal, bays, and large river mouths. They are almost always present during the warmer months (LeGrand et al. 2023).

All hubs would be inland (commercial/built areas). Potential impacts to manatees from drone package delivery operations are limited to nuisance associated with drone noise and visibility during flight adjacent to or over manatee habitat. Habitat fragmentation/loss is the primary threat to manatees (USFWS 2023a). The action would not result in any ground disturbance or habitat fragmentation/loss.

Manatees have been documented to change their behavior by fleeing the area and evading drone activities at 6 to 52 meters AGL (19 to 171 feet), and with drones operating at altitudes as high as 104 meters (341 feet) (Ramos et al. 2018). Another study found drone noise at lower altitudes (less than 23 meters [75 feet]) were quieter or diminished by surrounding coastal ambient noise (Smith et al. 2016). This study noted that, generally, cetaceans and sirenians (including manatees) do not seem to be acoustically disturbed by UA, due to the loss of acoustic energy at the air-water boundary. Consequently, most of the studies assessing drone noise impacts are using drones for mammal population surveys, animal research, and other intentional purposes. The UA used for package delivery operations would only encounter a West Indian manatee by chance, en route, if the UA flies over preferred manatee habitat, and the exposure time would be short (a few seconds as the drone flies by).

Given the potential presence of West Indian manatees in the action area and the potential for the identified stressors (noise, visual presence) to cause effects, the action **may affect** West Indian manatees. Given that 1) the likelihood of a UA flying directly over a manatee is very low, 2) manatees are not expected hear a UA as it flies by due to the cruise altitude and the loss of acoustic energy at the air-water interface, and 3) the limited duration of potential exposure (seconds), the FAA has determined the action **may affect, but is not likely to adversely affect**, the West Indian manatee. Any effects are expected to be discountable or insignificant.

Birds

The piping plover (*Charadrius melodus*) potentially occurs in the Wilmington operating area. This coastal species has been found both breeding and wintering in the state, meaning they inhabit the coast all year round. They forage on small crustaceans, marine worms, and insects. The populations seen along the coast are from all three breeding populations: Atlantic Coast, the Northern Great Plains, and the Great Lakes (National Audubon Society 2023). Threats include habitat alteration, insecticide use, increases in invasive species, and intraspecific aggression related to increasing densities in populations (USFWS 2023b).

⁵ The IPaC review included a determination key (dKey) for northern long-eared bat. The dKey resulted in a *may affect but is not likely to adversely affect* result for the northern long-eared bat in the Greenville and Wilmington operating areas and a *may affect* result for the Asheville operating area.

The red knot (*Calidris canutus rufa*) potentially occurs in the Wilmington operating area. This species is highly migratory, flying more than 9,300 miles south to north every spring. The red knot inhabits similar coastal marine and estuarine habitats with large exposed intertidal sediments along the entire migratory path, nesting and breeding in the central Canadian arctic. Southern coastal America is used for wintering habitat and stopover habitat during migration (USFWS 2023c). Threats include habitat modification and climate change (USFWS 2023d).

The red-cockaded woodpecker (RCW) (*Picoides borealis*) potentially occurs within multiple operating areas (see **Table 3**). This species has been known to be territorial and non-migratory. It is the only North American bird species to excavate roosts and nest in cavities of live pine trees (longleaf pine is thought to be the most preferred). RCWs forage on insects and bugs by flaking away tree bark and probing underneath. RCW clusters are found in isolated habitats throughout the state; the two strong holds for RCWs are the open longleaf pine forests of the Sandhills and Coastal Plain. Sixty-three percent of active RCW nests are found on public lands, while private land clusters are disclosed voluntarily by property owners (NCWRC 2023). Threats include loss of habitat (mature pines) and habitat fragmentation (USFWS 2023e).

Potential impacts to birds from drone package delivery operations include potential strike and nuisance. The action would not result in any ground disturbance, vegetation removal, or impacts on nesting or foraging habitats. The action is anticipated to have a neutral to positive impact on climate change, if drone package delivery operations result in fewer automobile miles driven (Kreier, 2022). The action would not perpetuate or increase the primary threats to the piping plover, red knot, and RCW.

Birds are generally sensitive to UA operations and may elicit anti-predator responses, such that the UA may be attacked by birds; such reactions are more likely to occur for flight patterns that seemingly target individuals rather than those that just operate within the area (Mulero-Pázmány et al. 2017). Birds experiencing disturbance would be expected to leave the area and return once the disruption ends. Disturbance at the takeoff site and climb would be repeated frequently, but would not occur within RCW, piping plover, or red knot habitat. Disturbance while en route and during descent and landing may be temporary and sporadic or may be repeated frequently in the same location. However, given that operations involve delivering packages to residents or other businesses, operations are not expected to occur frequently in RCW, piping plover, or red knot habitat.

Because there is potential for UAS operations to cause a nuisance to or accidentally strike ESA-listed birds, the action **may affect** these species. Given that 1) operations would occur mostly in an urban or suburban environment, 2) the expected low sound levels experienced by a bird, 3) any increase in ambient sound levels would be short in duration, and 4) the probability of a UAS encountering and striking any of these three species is very unlikely, the FAA has determined the action **may affect, but is not likely to adversely affect**, the piping plover, red knot, and RCW. Any effects are expected to be discountable or insignificant.

Reptiles

Four species of sea turtle—green sea turtle (*Chelonia mydas*), Kemp's ridley sea turtle (*Lepidochelys kempii*), leatherback sea turtle (*Dermochelys coriacea*), and loggerhead sea turtle (*Caretta caretta*)—potentially occur on beaches in the Wilmington operating area. All hubs would be located inland in commercial areas. Deliveries are not expected to occur on beaches where sea turtles nest. Habitat loss,

wildlife trafficking, and bycatch are the primary threats to sea turtles (USFWS 2021). The action does not include ground disturbance or fishing.

Generally, species that occupy aquatic habitats are less likely to show a behavioral response than those occupying terrestrial habitats (Mulero-Pázmány et al. 2017, Rebolo-Ifrán et al. 2019). While data related to potential impacts of UAS on sea turtles is limited, one study of the Kemp's ridley sea turtle found no behavioral responses to UAS presence (Bevan et al. 2015). Generally, flight below 10 meters (33 feet) might disturb turtles, but it is unclear if these disturbances are visual or auditory, and some sea turtles showed no reaction to shadows cast by UAS, nor did they exhibit any avoidance behaviors (Rhodes and Pickett 2021). The UAS used for delivery would be flying well over the altitude threshold and would rarely (if ever) fly over the beach. As such, the likelihood of encountering a sea turtle while it is on the beach is extremely low. Therefore, the FAA has determined the action **may affect, but is not likely to adversely affect**, ESA-listed sea turtles. Any effects are expected to be discountable or insignificant.

Amphibians

One amphibian, the Neuse River waterdog (*Necturus lewisi*), occurs in the Research Triangle and Greenville operating areas. The Neuse River waterdog is one of the rarest salamanders in the southeastern United States. It is a permanently aquatic salamander and only found in the Neuse and Tar-Pamlico River Basins of North Carolina. It lives in medium to large streams and rivers in the Piedmont and Coastal Plains (USFWS 2023f). Habitat degradation is the primary threat to the Neuse River waterdog, especially the effects of siltation, deposits of sediment in freshwater, and the construction of impoundments or stream channelization (USFWS 2023g). The action would not result in any ground disturbance or impacts on Neuse River waterdog habitat.

All hubs and delivery locations would be terrestrial; therefore, operations at and near the hub and delivery site would not affect the Neuse River waterdog. The potential for effects would be limited to nuisance associated with drone noise and visibility during the en route phases if the drone were to fly over Neuse River waterdog habitat. Generally, species that occupy aquatic habitats are less likely to show a behavioral response to drones than those occupying terrestrial habitats (Mulero-Pázmány et al. 2017, Rebolo-Ifrán et al. 2019). No studies or data could be found associated with potential impacts of UA on amphibians at the time of this evaluation.

Based on 1) operations occurring in an urban or suburban environment, 2) the altitude at which the UA flies in the en route phase (150–375 feet AGL), 3) the low probability of a UA flying over a Neuse River waterdog, and 4) Neuse River waterdogs are entirely aquatic and are not expected to hear or detect the UA given the very limited exposure duration and the loss of acoustic energy at the air-water interface, the FAA has determined the action would have **no effect** on the Neuse River waterdog.

Fishes

Two species of fish, the Cape Fear shiner (*Notropis mekistocholas*) and the Carolina madtom (*Noturus furiosus*), potentially occur in the action area. The Cape Fear shiner may occur in the Research Triangle and Sandhills operating areas. The Carolina madtom may occur in the Research Triangle and Greenville operating areas. Habitat and water-quality degradation are the primary threats to the Cape Fear shiner (USFWS 2023h) and Carolina madtom (USFWS 2023i). The action would not result in any ground disturbance or impacts on the habitat of these two fish species.

Generally, species that occupy aquatic habitats are less likely to show a behavioral response than those occupying terrestrial habitats (Mulero-Pázmány et al. 2017, Rebolo-Ifrán et al. 2019). UA produce low sound levels. Some fish may be able to hear sounds within the frequency band of drones and may detect or respond to drone noise (Erbe et al. 2017), but the impact of drone noise to marine fauna is minimal.

Based on 1) operations occurring in an urban or suburban environment, 2) the altitude at which the UA flies in the en route phase (150–375 feet AGL), 3) the low probability of a UA flying over an individual ESA-listed fish, and 4) fish are not expected to hear or detect the UA given the very limited exposure duration and the loss of acoustic energy at the air-water interface, the FAA has determined the action would have **no effect** on the Cape Fear shiner or Carolina madtom.

Clams/Mussels

Seven species of clams/mussels—Appalachian elktoe (*Alasmidonta raveneliana*), Atlantic pigtoe (*Fusconaia masoni*), Carolina heelsplit er (*Lasmigona decorate*), dwarf wedgemussel (*Alasmidonta hetero*), green floater (*Lasmigona subviridis*), tar river spiny mussel (*Parvaspina steinstansana*), and yellow lance (*Elliptio lanceolata*)—potentially occur within one or more operating areas (see **Table 3**). The action would not result in any ground disturbance or impacts to water quality. Clams and mussels do not have the ability to see or hear UA. Therefore, the action would have **no effect** on ESA-listed clam or mussel species.

Snails

One species of aquatic snail, the magnificent ramshorn (*Planorbella magnifica*), occurs within the Wilmington operating area. The action would not result in any ground disturbance or impacts to water quality. Snails have very poor vision and no ability to hear UA. Therefore, the action would have **no effect** on the magnificent ramshorn.

Insects

The Saint Francis' satyr but erfly (*Neonympha mitchellii francisci*) potentially occurs within the Sandhills operating area. Currently, the Saint Francis' satyr but erfly is only found within a portion of Fort Bragg, within restricted airspace. Package delivery operations would not be authorized within restricted airspace. Therefore, the action would have **no effect** on the Saint Francis' satyr but erfly.

The monarch but erfly (*Danaus plexippus*) is a candidate for federal listing. It potentially occurs throughout the entire action area. The primary threat to monarch but erflies is habitat loss, including the loss of breeding, migratory, and overwintering habitat. Pesticide use and climate change are also threats. The action would not physically affect monarch but erfly habitat or host plants. Monarch but erflies could be struck by drones en route to and from delivery; however, strikes are not likely given the species' mobility. Information regarding drone impacts on insects is limited, and there have been no widespread negative impacts identified in the scientific literature. Based on the information available, the action is not expected to adversely affect the monarch but erfly.

Plants and Lichen

There are 16 ESA-listed plant species and one ESA-listed lichen species that potentially occur within one or more operating areas (see **Table 3**). The action would not result in any ground disturbance or vegetation removal. Takeoff and landing sites would be within existing developed areas (e.g., paved,

mowed grass) and not within suitable habitat for ESA-listed plant or lichen species. Therefore, the action would have **no effect** on ESA-listed plant or lichen species.

6. CUMULATIVE EFFECTS

Cumulative effects are those effects of future state or private activities, not involving federal activities, that are reasonably certain to occur within the action area of the federal action subject to consultation (50 CFR § 402.02). As described above, the FAA has determined the action is not likely to adversely affect ESA-listed species and would have no effect on critical habitat. Programmatic consultations involve actions that may occur with some frequency over many years and possibly continue for an indefinite time. The FAA evaluated the potential for the effects of the stressors to ESA-listed species noted above over the lifetime of the action to result in additive effects due to chronic stress or cumulative effects.

The drone package delivery operations considered in this programmatic consultation would occur in the operating areas depicted above. Each of the stressors were determined to have effects that are extremely unlikely to occur and therefore discountable, or to result in effects that are so small as to be insignificant. The possibility of the discountable effects overlapping in time and space and having a cumulative effect to ESA-listed species in the action area does not seem plausible considering the limited time operations occur outside the commercial area where the hub is located. Within the same reasoning, chronic stress from activities whose effects are considered insignificant also does not seem plausible. Therefore, additive effects from the activities considered in this consultation are extremely unlikely and thus discountable.

7. CONCLUSION

In summary, the FAA has determined the action would have **no effect** on designated critical habitat and critical habitat proposed for designation. The FAA has determined the action would either have **no effect** or **may, affect but is not likely to adversely affect**, the ESA-listed species or species proposed to be listed in the action area (see **Table 4**). Additionally, the action is not expected to adversely affect the monarch butterfly, a candidate species for federal listing.

Table 4. Effect Determinations for ESA-Listed Species and Species Proposed for Listing

Species	Effect Determination
Mammals	
Gray bat	NLAA
Northern long-eared bat	NLAA
Tricolored bat	NLAA
West Indian manatee	NLAA
Birds	
Piping plover	NLAA
Red knot	NLAA
Red-cockaded woodpecker	NLAA
Reptiles	
Green sea turtle	NLAA
Kemp's ridley sea turtle	NLAA
Leatherback sea turtle	NLAA
Loggerhead sea turtle	NLAA
Amphibians	
Neuse River waterdog	No Effect
Fish	
Cape Fear shiner	No Effect

Species	Effect Determination
Carolina madtom	No Effect
Clams and Mussels	
7 species (see Table 3)	No Effect
Snails	
Magnificent ramshorn	No Effect
Insects	
Saint Francis' satyr butterfly	No Effect
Plants and Lichens	
17 species (see Table 3)	No Effect

Note: NLAA = may affect, not likely to adversely affect

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APPENDIX A.
IPaC Documentation

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location

North Carolina and South Carolina



Local offices

South Carolina Ecological Services

☎ (843) 727-4707

📠 (843) 727-4218

176 Croghan Spur Road, Suite 200
Charleston, SC 29407-7558

Raleigh Ecological Services Field Office

☎ (919) 856-4520

📠 (919) 856-4556

MAILING ADDRESS

Post Office Box 33726
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PHYSICAL ADDRESS

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NOT FOR CONSULTATION

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species¹ and their critical habitats are managed by the [Ecological Services Program](#) of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries²).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact [NOAA Fisheries](#) for [species under their jurisdiction](#).

1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the [listing status page](#) for more information. IPaC only shows species that are regulated by USFWS (see FAQ).
2. **NOAA Fisheries**, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS
<p>Gray Bat <i>Myotis grisescens</i> Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/6329</p>	Endangered
<p>Northern Long-eared Bat <i>Myotis septentrionalis</i> Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/9045</p>	Endangered
<p>Tricolored Bat <i>Perimyotis subflavus</i> Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/10515</p>	Proposed Endangered
<p>West Indian Manatee <i>Trichechus manatus</i> Wherever found There is final critical habitat for this species. Your location does not overlap the critical habitat. https://ecos.fws.gov/ecp/species/4469</p>	Threatened Marine mammal

Birds

NAME	STATUS
<p>Eastern Black Rail <i>Laterallus jamaicensis</i> ssp. <i>jamaicensis</i></p> <p>Wherever found</p> <p>No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/10477</p>	Threatened
<p>Piping Plover <i>Charadrius melodus</i></p> <p>There is final critical habitat for this species. Your location does not overlap the critical habitat. https://ecos.fws.gov/ecp/species/6039</p>	Threatened
<p>Red Knot <i>Calidris canutus rufa</i></p> <p>Wherever found</p> <p>There is proposed critical habitat for this species. https://ecos.fws.gov/ecp/species/1864</p>	Threatened
<p>Red-cockaded Woodpecker <i>Picoides borealis</i></p> <p>Wherever found</p> <p>No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/7614</p>	Endangered

Reptiles

NAME	STATUS
<p>American Alligator <i>Alligator mississippiensis</i></p> <p>Wherever found</p> <p>No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/776</p>	SAT

Bog Turtle *Glyptemys muhlenbergii*

No critical habitat has been designated for this species.

<https://ecos.fws.gov/ecp/species/6962>

SAT

Green Sea Turtle *Chelonia mydas*

There is **final** critical habitat for this species. Your location does not overlap the critical habitat.

<https://ecos.fws.gov/ecp/species/6199>

Threatened

Kemp's Ridley Sea Turtle *Lepidochelys kempii*

Wherever found

There is **proposed** critical habitat for this species.

<https://ecos.fws.gov/ecp/species/5523>

Endangered

Leatherback Sea Turtle *Dermochelys coriacea*

Wherever found

There is **final** critical habitat for this species. Your location does not overlap the critical habitat.

<https://ecos.fws.gov/ecp/species/1493>

Endangered

Loggerhead Sea Turtle *Caretta caretta*

There is **final** critical habitat for this species. Your location does not overlap the critical habitat.

<https://ecos.fws.gov/ecp/species/1110>

Threatened

Amphibians

NAME

STATUS

Neuse River Waterdog *Necturus lewisi*

Wherever found

There is **final** critical habitat for this species. Your location overlaps the critical habitat.

<https://ecos.fws.gov/ecp/species/6772>

Threatened

Fishes

NAME	STATUS
<p>Cape Fear Shiner <i>Notropis mekistocholas</i></p> <p>Wherever found</p> <p>There is final critical habitat for this species. Your location does not overlap the critical habitat.</p> <p>https://ecos.fws.gov/ecp/species/6063</p>	Endangered
<p>Carolina Madtom <i>Noturus furiosus</i></p> <p>Wherever found</p> <p>There is final critical habitat for this species. Your location overlaps the critical habitat.</p> <p>https://ecos.fws.gov/ecp/species/528</p>	Endangered

Clams

NAME	STATUS
<p>Appalachian Elktoe <i>Alasmidonta raveneliana</i></p> <p>Wherever found</p> <p>There is final critical habitat for this species. Your location does not overlap the critical habitat.</p> <p>https://ecos.fws.gov/ecp/species/5039</p>	Endangered
<p>Atlantic Pigtoe <i>Fusconaia masoni</i></p> <p>Wherever found</p> <p>There is final critical habitat for this species. Your location overlaps the critical habitat.</p> <p>https://ecos.fws.gov/ecp/species/5164</p>	Threatened
<p>Carolina Heelsplitter <i>Lasmigona decorata</i></p> <p>Wherever found</p> <p>There is final critical habitat for this species. Your location overlaps the critical habitat.</p> <p>https://ecos.fws.gov/ecp/species/3534</p>	Endangered

Dwarf Wedgemussel *Alasmidonta heterodon*

Endangered

Wherever found

No critical habitat has been designated for this species.

<https://ecos.fws.gov/ecp/species/784>

Green Floater *Lasmigona subviridis*

Proposed Threatened

Wherever found

There is **proposed** critical habitat for this species.

<https://ecos.fws.gov/ecp/species/7541>

Tar River Spiny mussel *Parvaspina steinstansana*

Endangered

Wherever found

No critical habitat has been designated for this species.

<https://ecos.fws.gov/ecp/species/1392>

Yellow Lance *Elliptio lanceolata*

Threatened

Wherever found

There is **final** critical habitat for this species. Your location overlaps the critical habitat.

<https://ecos.fws.gov/ecp/species/4511>

Snails

NAME

STATUS

Magnificent Ramshorn *Planorbella magnifica*

Endangered

Wherever found

There is **final** critical habitat for this species.

<https://ecos.fws.gov/ecp/species/6216>

Insects

NAME

STATUS

Monarch Butterfly *Danaus plexippus*

Candidate

Wherever found

No critical habitat has been designated for this species.

<https://ecos.fws.gov/ecp/species/9743>**Saint Francis' Satyr Butterfly** *Neonympha mitchellii francisci*

Endangered

Wherever found

No critical habitat has been designated for this species.

<https://ecos.fws.gov/ecp/species/5419>

Flowering Plants

NAME

STATUS

American Chaffseed *Schwalbea americana*

Endangered

Wherever found

No critical habitat has been designated for this species.

<https://ecos.fws.gov/ecp/species/1286>**Bunched Arrowhead** *Sagittaria fasciculata*

Endangered

Wherever found

No critical habitat has been designated for this species.

<https://ecos.fws.gov/ecp/species/1720>**Cooley's Meadowrue** *Thalictrum cooleyi*

Endangered

Wherever found

No critical habitat has been designated for this species.

<https://ecos.fws.gov/ecp/species/3281>**Dwarf-flowered Heartleaf** *Hexastylis naniflora*

Threatened

Wherever found

No critical habitat has been designated for this species.

<https://ecos.fws.gov/ecp/species/2458>

Golden Sedge *Carex lutea*

Endangered

Wherever found

There is **final** critical habitat for this species. Your location does not overlap the critical habitat.

<https://ecos.fws.gov/ecp/species/6025>

Harperella *Ptilimnium nodosum*

Endangered

Wherever found

No critical habitat has been designated for this species.

<https://ecos.fws.gov/ecp/species/3739>

Michaux's Sumac *Rhus michauxii*

Endangered

Wherever found

No critical habitat has been designated for this species.

<https://ecos.fws.gov/ecp/species/5217>

Mountain Sweet Pitcher-plant *Sarracenia rubra* ssp. *jonesii*

Endangered

Wherever found

No critical habitat has been designated for this species.

<https://ecos.fws.gov/ecp/species/4283>

Pondberry *Lindera melissifolia*

Endangered

Wherever found

No critical habitat has been designated for this species.

<https://ecos.fws.gov/ecp/species/1279>

Rough-leaved Loosestrife *Lysimachia asperulaefolia*

Endangered

Wherever found

No critical habitat has been designated for this species.

<https://ecos.fws.gov/ecp/species/2747>

Schweinitz's Sunflower *Helianthus schweinitzii*

Endangered

Wherever found

No critical habitat has been designated for this species.

<https://ecos.fws.gov/ecp/species/3849>**Small Whorled Pogonia** *Isotria medeoloides*

Threatened

No critical habitat has been designated for this species.

<https://ecos.fws.gov/ecp/species/1890>**Smooth Coneflower** *Echinacea laevigata*

Threatened

Wherever found

No critical habitat has been designated for this species.

<https://ecos.fws.gov/ecp/species/3473>**Swamp Pink** *Helonias bullata*

Threatened

No critical habitat has been designated for this species.

<https://ecos.fws.gov/ecp/species/4333>**White Irisette** *Sisyrinchium dichotomum*

Endangered

Wherever found

No critical habitat has been designated for this species.

<https://ecos.fws.gov/ecp/species/8097>

Ferns and Allies

NAME

STATUS

Black Spored Quillwort *Isoetes melanospora*

Endangered

Wherever found

No critical habitat has been designated for this species.

<https://ecos.fws.gov/ecp/species/6315>

Lichens

NAME

STATUS

Rock Gnome Lichen *Gymnoderma lineare*

Endangered

Wherever found

No critical habitat has been designated for this species.

<https://ecos.fws.gov/ecp/species/3933>

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

This location overlaps the critical habitat for the following species:

NAME

TYPE

Atlantic Pigtoe *Fusconaia masoni*

Final

<https://ecos.fws.gov/ecp/species/5164#crithab>

Carolina Heelsplitter *Lasmigona decorata*

Final

<https://ecos.fws.gov/ecp/species/3534#crithab>

Carolina Madtom *Noturus furiosus*

Final

<https://ecos.fws.gov/ecp/species/528#crithab>

Neuse River Waterdog *Necturus lewisi*

Final

<https://ecos.fws.gov/ecp/species/6772#crithab>

Yellow Lance *Elliptio lanceolata*

Final

<https://ecos.fws.gov/ecp/species/4511#crithab>

Bald & Golden Eagles

Bald and golden eagles are protected under the [Bald and Golden Eagle Protection Act](#) and the [Migratory Bird Treaty Act](#).

Any person or organization who plans or conducts activities that may result in impacts to bald or golden eagles, or their habitats, should follow appropriate regulations and consider implementing appropriate conservation measures, as described [below](#).

Additional information can be found using the following links:

- Eagle Management <https://www.fws.gov/program/eagle-management>
- Measures for avoiding and minimizing impacts to birds <https://www.fws.gov/library/collections/avoiding-and-minimizing-incident-take-migratory-birds>
- Nationwide conservation measures for birds <https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf>

There are bald and/or golden eagles in your project area.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle <i>Haliaeetus leucocephalus</i> This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds Sep 1 to Aug 31
Golden Eagle <i>Aquila chrysaetos</i> This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1680	Breeds elsewhere

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is $0.25/0.25 = 1$; at week 20 it is $0.05/0.25 = 0.2$.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (■)

Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)

Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

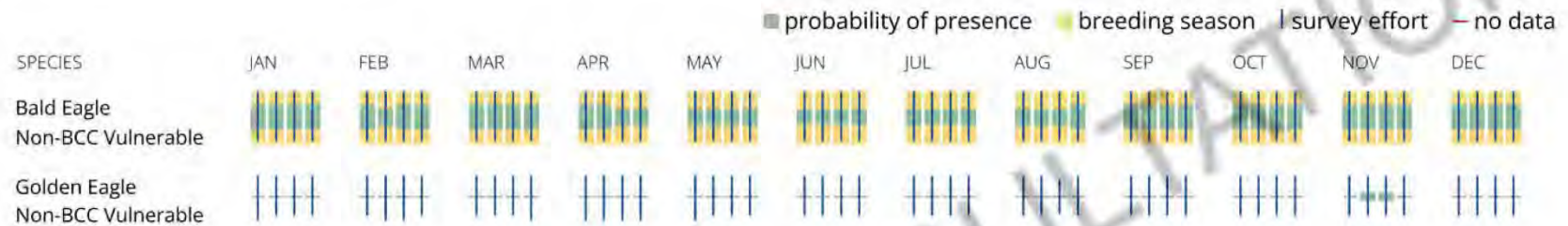
To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (-)

A week is marked as having no data if there were no survey events for that week.

Survey Timeframe

Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



What does IPaC use to generate the potential presence of bald and golden eagles in my specified location?

The potential for eagle presence is derived from data provided by the [Avian Knowledge Network \(AKN\)](#). The AKN data is based on a growing collection of [survey, banding, and citizen science datasets](#) and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle ([Eagle Act](#) requirements may apply). To see a list of all birds potentially present in your project area, please visit the [Rapid Avian Information Locator \(RAIL\) Tool](#).

What does IPaC use to generate the probability of presence graphs of bald and golden eagles in my specified location?

The Migratory Bird Resource List is comprised of USFWS [Birds of Conservation Concern \(BCC\)](#) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the [Avian Knowledge Network \(AKN\)](#). The AKN data is based on a growing collection of [survey, banding, and citizen science datasets](#) and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle ([Eagle Act](#) requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the [Rapid Avian Information Locator \(RAIL\) Tool](#).

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the [Eagle Act](#) should such impacts occur. Please contact your local Fish and Wildlife Service Field Office if you have questions.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act¹ and the Bald and Golden Eagle Protection Act².

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described [below](#).

1. The [Migratory Birds Treaty Act](#) of 1918.
2. The [Bald and Golden Eagle Protection Act](#) of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern <https://www.fws.gov/program/migratory-birds/species>
- Measures for avoiding and minimizing impacts to birds <https://www.fws.gov/library/collections/avoiding-and-minimizing-incident-take-migratory-birds>
- Nationwide conservation measures for birds <https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf>

The birds listed below are birds of particular concern either because they occur on the [USFWS Birds of Conservation Concern](#) (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ [below](#). This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the [E-bird data mapping tool](#) (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found [below](#).

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
American Kestrel <i>Falco sparverius paulus</i> This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/9587	Breeds Apr 1 to Aug 31
American Oystercatcher <i>Haematopus palliatus</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/8935	Breeds Apr 15 to Aug 31
Bachman's Sparrow <i>Aimophila aestivalis</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/6177	Breeds May 1 to Sep 30

Bald Eagle *Haliaeetus leucocephalus*

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain **types of development or activities.**

Breeds Sep 1 to Aug 31

Black Scoter *Melanitta nigra*

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Breeds elsewhere

Black Skimmer *Rynchops niger*

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

<https://ecos.fws.gov/ecp/species/5234>

Breeds May 20 to Sep 15

Black-billed Cuckoo *Coccyzus erythrophthalmus*

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

<https://ecos.fws.gov/ecp/species/9399>

Breeds May 15 to Oct 10

Black-legged Kittiwake *Rissa tridactyla*

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Breeds elsewhere

Bobolink *Dolichonyx oryzivorus*

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Breeds May 20 to Jul 31

Brown Pelican *Pelecanus occidentalis*

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Breeds Jan 15 to Sep 30

Brown-headed Nuthatch *Sitta pusilla*

This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Breeds Mar 1 to Jul 15

Canada Warbler *Cardellina canadensis*

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Breeds May 20 to Aug 10

Cerulean Warbler *Dendroica cerulea*

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

<https://ecos.fws.gov/ecp/species/2974>

Breeds Apr 26 to Jul 20

Chimney Swift *Chaetura pelagica*

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Breeds Mar 15 to Aug 25

Common Eider *Somateria mollissima*

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Breeds Jun 1 to Sep 30

Common Loon *Gavia immer*

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

<https://ecos.fws.gov/ecp/species/4464>

Breeds Apr 15 to Oct 31

Double-crested Cormorant *phalacrocorax auritus*

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

<https://ecos.fws.gov/ecp/species/3478>

Breeds Apr 20 to Aug 31

Dovekie *Alle alle*

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

<https://ecos.fws.gov/ecp/species/6041>

Breeds elsewhere

Eastern Whip-poor-will *Antrostomus vociferus*

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Breeds May 1 to Aug 20

Golden Eagle *Aquila chrysaetos*

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

<https://ecos.fws.gov/ecp/species/1680>

Breeds elsewhere

Golden-winged Warbler *Vermivora chrysoptera*

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

<https://ecos.fws.gov/ecp/species/8745>

Breeds May 1 to Jul 20

Great Shearwater *Puffinus gravis*

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Breeds elsewhere

Gull-billed Tern *Gelochelidon nilotica*

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

<https://ecos.fws.gov/ecp/species/9501>

Breeds May 1 to Jul 31

Henslow's Sparrow *Ammodramus henslowii*

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

<https://ecos.fws.gov/ecp/species/3941>

Breeds May 1 to Aug 31

Kentucky Warbler *Oporornis formosus*

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Breeds Apr 20 to Aug 20

King Rail *Rallus elegans*

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

<https://ecos.fws.gov/ecp/species/8936>

Breeds May 1 to Sep 5

Lesser Yellowlegs *Tringa flavipes*

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

<https://ecos.fws.gov/ecp/species/9679>

Breeds elsewhere

Long-tailed Duck *Clangula hyemalis*

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

<https://ecos.fws.gov/ecp/species/7238>

Breeds elsewhere

Manx Shearwater *Puffinus puffinus*

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Breeds Apr 15 to Oct 31

Marbled Godwit *Limosa fedoa*

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

<https://ecos.fws.gov/ecp/species/9481>

Breeds elsewhere

Northern Saw-whet Owl *Aegolius acadicus acadicus*

This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Breeds Mar 1 to Jul 31

Painted Bunting *Passerina ciris*

This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Breeds Apr 25 to Aug 15

Pomarine Jaeger *Stercorarius pomarinus*

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Breeds elsewhere

Prairie Warbler *Dendroica discolor*

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Breeds May 1 to Jul 31

Prothonotary Warbler *Protonotaria citrea*

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Breeds Apr 1 to Jul 31

Purple Sandpiper *Calidris maritima*

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Breeds elsewhere

Razorbill *Alca torda*

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Breeds Jun 15 to Sep 10

Red Phalarope *Phalaropus fulicarius*

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Breeds elsewhere

Red-breasted Merganser *Mergus serrator*

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Breeds elsewhere

Red-headed Woodpecker *Melanerpes erythrocephalus*

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Breeds May 10 to Sep 10

Red-necked Phalarope *Phalaropus lobatus*

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Breeds elsewhere

Red-throated Loon *Gavia stellata*

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Breeds elsewhere

Ring-billed Gull *Larus delawarensis*

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain **types of development or activities.**

Breeds elsewhere

Roseate Tern *Sterna dougallii*

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Breeds May 10 to Aug 31**Royal Tern** *Thalasseus maximus*

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Breeds Apr 15 to Aug 31

Ruddy Turnstone *Arenaria interpres morinella*

This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Breeds elsewhere

Rusty Blackbird *Euphagus carolinus*

This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Breeds elsewhere

Saltmarsh Sparrow *Ammodramus caudacutus*

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

<https://ecos.fws.gov/ecp/species/9719>

Breeds May 15 to Sep 5

Short-billed Dowitcher *Limnodromus griseus*

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

<https://ecos.fws.gov/ecp/species/9480>

Breeds elsewhere

Sooty Tern *Onychoprion fuscatus*

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain **types of development or activities.**

Breeds Mar 10 to Jul 31

Surf Scoter *Melanitta perspicillata*

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Breeds elsewhere

Swallow-tailed Kite *Elanoides forficatus*

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

<https://ecos.fws.gov/ecp/species/8938>

Breeds Mar 10 to Jun 30

Thick-billed Murre *Uria lomvia*

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Breeds Apr 15 to Aug 15

White-winged Scoter *Melanitta fusca*

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

Breeds elsewhere

Willet *Tringa semipalmata*

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Breeds Apr 20 to Aug 5

Wilson's Plover *Charadrius wilsonia*

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Breeds Apr 1 to Aug 20

Wilson's Storm-petrel *Oceanites oceanicus*

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain **types of development or activities.**

Breeds elsewhere

Wood Thrush *Hylocichla mustelina*

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Breeds May 10 to Aug 31**Yellow Rail** *Coturnicops noveboracensis*

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Breeds elsewhere

<https://ecos.fws.gov/ecp/species/9476>

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.

- To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is $0.25/0.25 = 1$; at week 20 it is $0.05/0.25 = 0.2$.
- The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (🟡)

Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)

Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

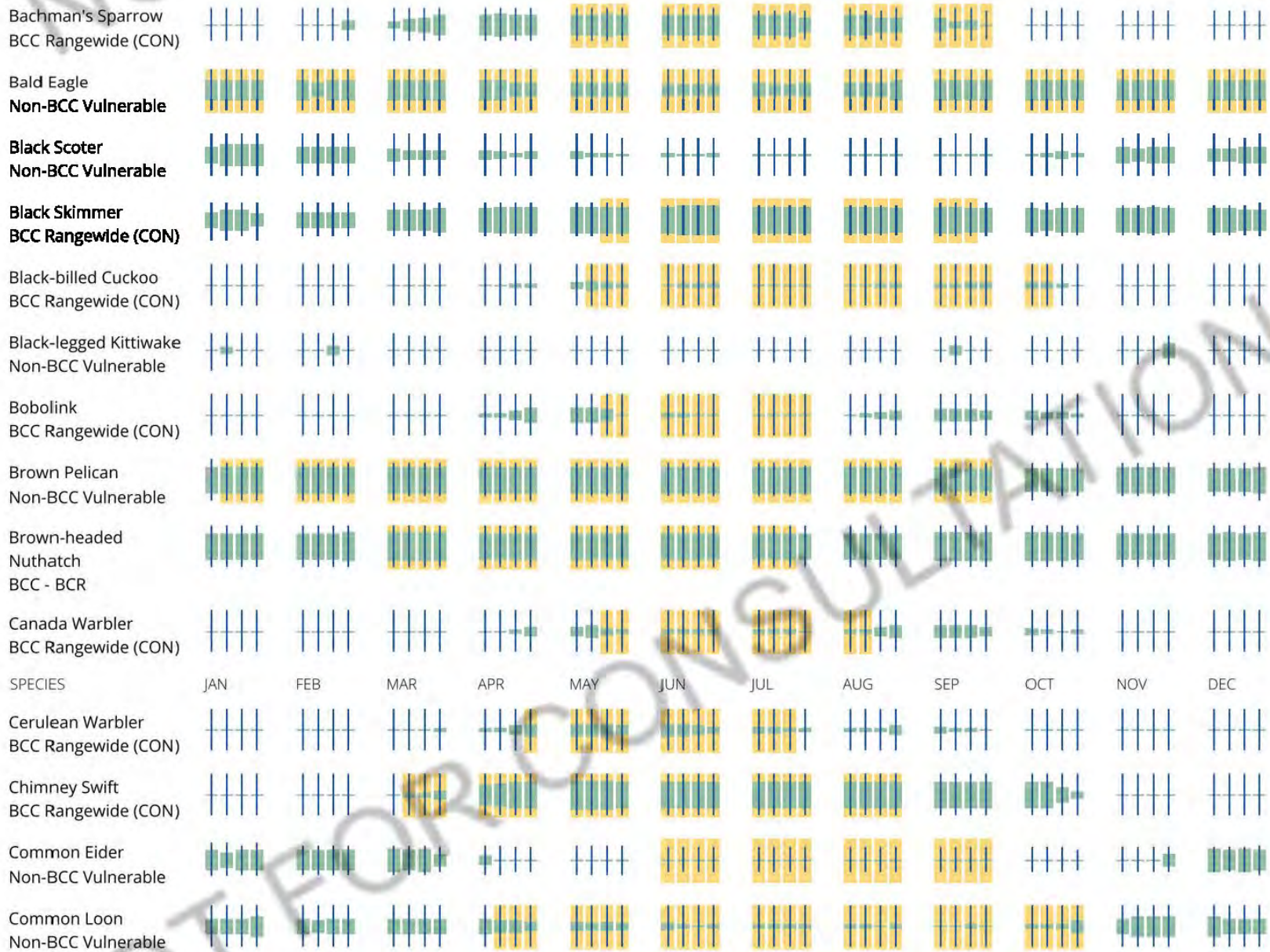
No Data (—)

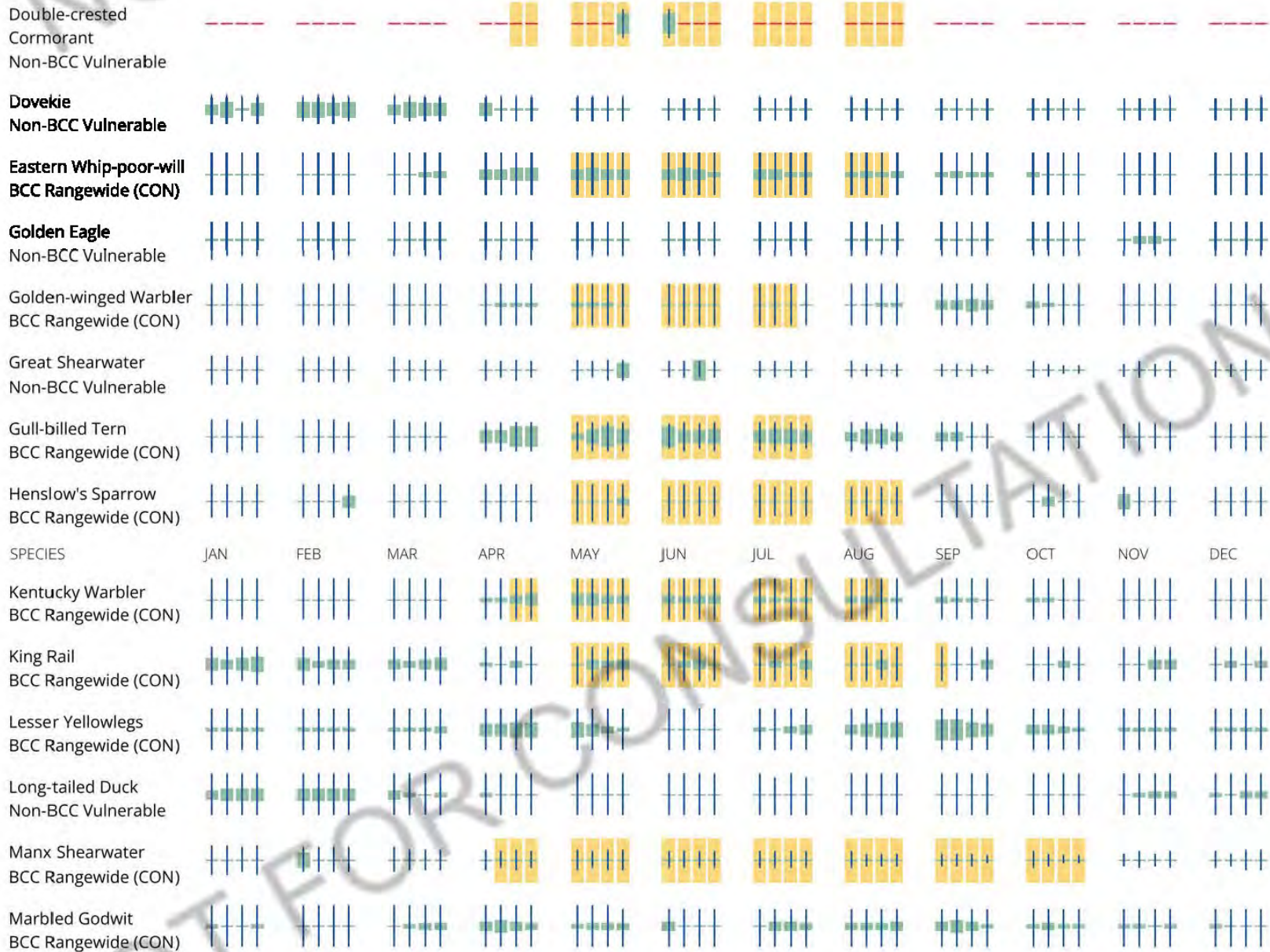
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe

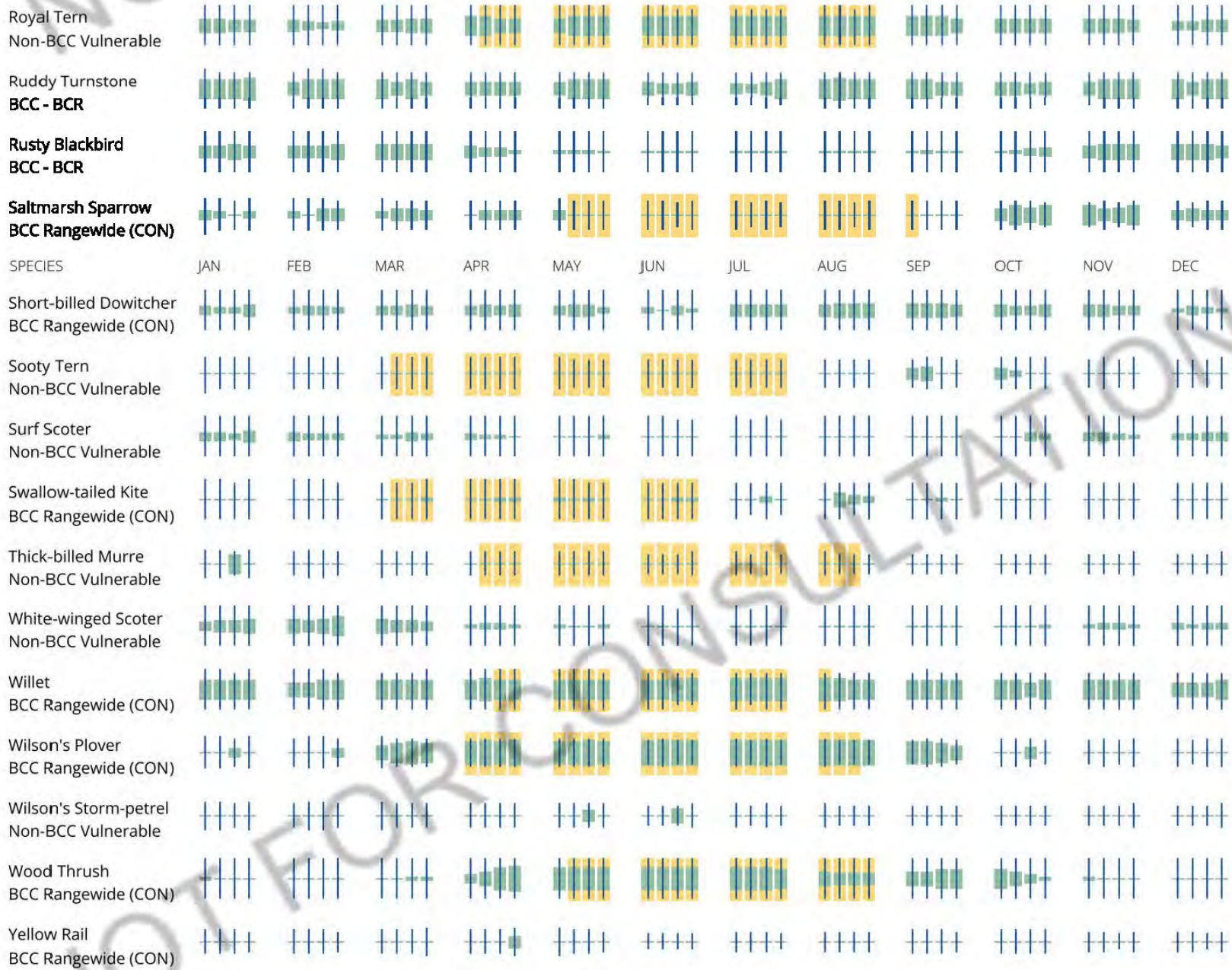
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.







SPECIES	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Northern Saw-whet Owl BCC - BCR												
Painted Bunting BCC - BCR												
Pomarine Jaeger Non-BCC Vulnerable												
Prairie Warbler BCC Rangwide (CON)												
Prothonotary Warbler BCC Rangwide (CON)												
Purple Sandpiper BCC Rangwide (CON)												
Razorbill Non-BCC Vulnerable												
Red Phalarope Non-BCC Vulnerable												
Red-breasted Merganser Non-BCC Vulnerable												
Red-headed Woodpecker BCC Rangwide (CON)												
Red-necked Phalarope Non-BCC Vulnerable												
Red-throated Loon Non-BCC Vulnerable												
Ring-billed Gull Non-BCC Vulnerable												
Roseate Tern Non-BCC Vulnerable												



Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

[Nationwide Conservation Measures](#) describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be **breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure.** To see when birds are most likely to occur and be breeding in your project area, view the [Probability of Presence Summary](#). [Additional measures](#) or [permits](#) may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the list of migratory birds that potentially occur in my specified location?

The Migratory Bird Resource List is comprised of USFWS [Birds of Conservation Concern \(BCC\)](#) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the [Avian Knowledge Network \(AKN\)](#). The AKN data is based on a growing collection of [survey, banding, and citizen science datasets](#) and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle ([Eagle Act](#) requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the [Rapid Avian Information Locator \(RAIL\) Tool](#).

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the [Avian Knowledge Network \(AKN\)](#). This data is derived from a growing collection of [survey, banding, and citizen science datasets](#).

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the [Probability of Presence Summary](#) and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering or migrating in my area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may query your location using the [RAIL Tool](#) and look at the range maps provided for birds in your area at the bottom of the profiles provided for each bird in your results. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area,

there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are [Birds of Conservation Concern](#) (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the [Eagle Act](#) requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the [Northeast Ocean Data Portal](#). The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the [NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf](#) project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the [Diving Bird Study](#) and the [nanotag studies](#) or contact [Caleb Spiegel](#) or [Pam Loring](#).

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to [obtain a permit](#) to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Marine mammals

Marine mammals are protected under the [Marine Mammal Protection Act](#). Some are also protected under the Endangered Species Act¹ and the Convention on International Trade in Endangered Species of Wild Fauna and Flora².

The responsibilities for the protection, conservation, and management of marine mammals are shared by the U.S. Fish and Wildlife Service [responsible for otters, walruses, polar bears, manatees, and dugongs] and NOAA Fisheries³ [responsible for seals, sea lions, whales, dolphins, and porpoises]. Marine mammals under the responsibility of NOAA Fisheries are **not** shown on this list; for additional information on those species please visit the [Marine Mammals](#) page of the NOAA Fisheries website.

The Marine Mammal Protection Act prohibits the take (to harass, hunt, capture, kill, or attempt to harass, hunt, capture or kill) of marine mammals and further coordination may be necessary for project evaluation. Please contact the U.S. Fish and Wildlife Service Field Office shown.

1. The [Endangered Species Act](#) (ESA) of 1973.
2. The [Convention on International Trade in Endangered Species of Wild Fauna and Flora](#) (CITES) is a treaty to ensure that international trade in plants and animals does not threaten their survival in the wild.
3. [NOAA Fisheries](#), also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following marine mammals under the responsibility of the U.S. Fish and Wildlife Service are potentially affected by activities in this location:

NAME

West Indian Manatee *Trichechus manatus*

<https://ecos.fws.gov/ecp/species/4469>

Coastal Barrier Resources System

Projects within the [John H. Chafee Coastal Barrier Resources System](#) (CBRS) may be subject to the restrictions on Federal expenditures and financial assistance and the consultation requirements of the Coastal Barrier Resources Act (CBRA) (16 U.S.C. 3501 et seq.). For more information, please contact the local [Ecological Services Field Office](#) or visit the [CBRA Consultations website](#). The CBRA website provides tools such as a flow chart to help determine whether consultation is required and a template to facilitate the consultation process.

This location overlaps the following CBRS unit(s):

Unknown

[L08](#)

[L08](#)

[L08](#)

[L09](#)

[L09](#)

[L09](#)

Data limitations

The CBRS boundaries used in IPaC are representations of the controlling boundaries, which are depicted on the [official CBRS maps](#). The boundaries depicted in this layer are not to be considered authoritative for in/out determinations close to a CBRS boundary (i.e., within the "CBRS Buffer Zone" that appears as a hatched area on either side of the boundary). For projects that are very close to a CBRS boundary but do not clearly intersect a unit, you may contact the Service for an official determination by following the instructions here: <https://www.fws.gov/service/coastal-barrier-resources-system-property-documentation>

Data exclusions

CBRS units extend seaward out to either the 20- or 30-foot bathymetric contour (depending on the location of the unit). The true seaward extent of the units is not shown in the CBRS data, therefore projects in the offshore areas of units (e.g., dredging, breakwaters, offshore wind energy or oil and gas projects) may be subject to CBRA even if they do not intersect the CBRS data. For additional information, please contact

CBRA@fws.gov.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the [National Wildlife Refuge](#) system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

There are no refuge lands at this location.

Fish hatcheries

There are no fish hatcheries at this location.

Wetlands in the National Wetlands Inventory (NWI)

Impacts to [NWI wetlands](#) and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local [U.S. Army Corps of Engineers District](#).

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

This location overlaps the following wetlands:

The area of this project is too large for IPaC to load all NWI wetlands in the area. The list below may be incomplete. Please contact the local U.S. Fish and Wildlife Service office or visit the [NWI map](#) for a full list.

ESTUARINE AND MARINE DEEPWATER

[E1UBL](#)

[E1UBLx](#)

[E1UBLh](#)

ESTUARINE AND MARINE WETLAND

[E2EM1Nd](#)

[E2EM1N](#)

[E2USM](#)

[E2EM1Pd](#)

[E2USN](#)

[E2EM1Ps](#)

[E2EM5Pd](#)

[E2US2P](#)

[E2EM1P](#)

[E2US2N](#)

[E2US2Ps](#)

[E2FO1P](#)

[E2EM5Ps](#)

[E2USPs](#)

[E2FO1/4P](#)

[E2SS3Ps](#)

[E2USNs](#)

[E2SS4P](#)

[E2EM5P](#)

[E2USP](#)

[E2FO4P](#)

[E2SS4Pd](#)

FRESHWATER EMERGENT WETLAND

- [PEM1A](#)
- [PEM1/FO1F](#)
- [PEM1/SS1Bd](#)
- [PEM1/SS1T](#)
- [PEM1/SS1Sd](#)
- [PEM1/FO4Bd](#)
- [PEM1/FO1Sd](#)
- [PEM1/AB4F](#)
- [PEM1/SS4Cd](#)
- [PEM1/SS1Rd](#)
- [PEM1/SS1Cd](#)

FRESHWATER POND

- [PAB3Hh](#)
- [PABHh](#)
- [PAB4Hh](#)
- [PAB4H](#)
- [PABHx](#)
- [PAB4F](#)
- [PAB4Fb](#)
- [PAB4Fh](#)
- [PAB4Hx](#)
- [PABH](#)
- [PAB4Fx](#)
- [PAB3Fx](#)
- [PAB3F](#)
- [PAB3Fb](#)

LAKE

- [L1UBHh](#)
- [L2EM2Fh](#)
- [L2EM2Gh](#)

[L1UBHx](#)[L2USK](#)[L2USCx](#)[L2UBFx](#)[L2USCh](#)[L2USAx](#)[L1UBH](#)[L1ABHh](#)[L2UBFh](#)[L2AB3Hh](#)[L2USAh](#)[L2ABHh](#)

A full description for each wetland code can be found at the [National Wetlands Inventory website](#)

NOTE: This initial screening does **not** replace an on-site delineation to determine whether wetlands occur. Additional information on the NWI data is provided below.

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tubercid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate Federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

Archived: Tuesday, February 20, 2024 8:35:08 PM

From: Baker, Nicholas M (FAA)

Sent: Friday, February 2, 2024 2:04:47 PM

To: Missi Shumer; Brandon L. Robinette

Cc: Hurst, Christopher A (FAA); Neumann, Shelia S (FAA); Teodorescu, Andrew P (FAA); Crane, Christopher M (FAA); Steinheimer, Nicholas A (FAA)

Subject: FW: [EXTERNAL] RE: FAA: ESA Section 7 (USFWS Project Codes 2023-0127859; 2023-0128355; 2023-0128390; 2023-0128398; 2023-0128407; 2023-0128366)

Sensitivity: Normal

[EXTERNAL]

Missi,

We received USFWS's concurrence (see below). Respectfully,

Nick Baker

Environmental Protection Specialist Federal Aviation Administration UAS Integration Office
Safety & Integration Division Strategic Programs Branch (AUS-430) Morrisville, NC 27560

From: Matthews, Kathryn (Kathy) <kathryn_matthews@fws.gov>

Sent: Friday, February 2, 2024 2:40 PM

To: Baker, Nicholas M (FAA) <Nicholas.M.Baker@faa.gov>; Reid, Rebekah N <rebekah_reid@fws.gov>

Cc: Kinser, Jay (FAA) <Jay.Kinser@faa.gov>; Mann, Leigh <leigh_mann@fws.gov>

Subject: Re: [EXTERNAL] RE: FAA: ESA Section 7 (USFWS Project Codes 2023-0127859; 2023-0128355; 2023-0128390; 2023-0128398; 2023-0128407; 2023-0128366)

Hi Nick,

Thank you for the updated BE and for the additional information. The Service concurs with your species determinations in the BE for the six drone delivery projects. Please include us in future review of any EAs or other NEPA documents.

Let me know if you need anything else. Have a good weekend,

We are temporarily lacking a physical office. Electronic and phone correspondence is preferred. For snail mail, please use the P.O. Box listed below, rather than our former physical address. We will update our physical courier address when we move into the new space (expected by June 2024). Thanks!

Kathy Matthews

NC Renewable Energy Coordinator

U.S. Fish and Wildlife Service

P.O. Box 33726

Raleigh, NC 27636-3726

NEW Phone! 984-308-0852

APPENDIX I
PUBLIC COMMENTS AND FAA RESPONSES

Public Comments and FAA Responses

The FAA received six comment submissions on the draft programmatic environmental assessment (PEA) during the public comment period (April 30, 2024 to May 30, 2024). The FAA also received one comment (question) during the oral comment portion of the public meeting held on May 21, 2024. The six comment submissions, along with the question received during the public meeting, and the FAA's responses are provided below.

Comment Submission #1: Vaidila Satvika, City of Asheville, Planning and Urban Design Department

Missi Shumer

From: Vaidila Satvika <vsatvika@ashevillenc.gov>
Sent: Wednesday, May 1, 2024 2:01 PM
To: 9-FAA-Drone-Environmental (FAA)
Subject: North Carolina Draft PEA

CAUTION: This email originated from outside of the Federal Aviation Administration (FAA). Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Comment regarding 'biological resources'.

The section on biological resources doesn't mention birds and/or impact on bird habitat, migration, and/or health. It is not unreasonable to consider the noise of continuous drone operations, especially in repetitive patterns, to cause negative impacts on bird habitat.

Comment regarding 'Land Use'.

When delivery operations take place today, they occur within the public right of way along streets primarily. How would this proposed drone delivery work in this regard? Would we expect drones to fly over private property where there would be concerns of privacy or would the drones be required to follow the paths of rights-of-ways?

Comment regarding 'Lighting'.

The American Medical Association and others have recommended that outdoor lighting color temperature should be limited to no higher than 3000 Kelvin as there has been research pointing to the negative impacts of bluer lighting on wildlife and human health as cooler spectrum lights are not evolutionarily appropriate to nighttime conditions. Consider implementing a lighting temperature maximum guide on proposed delivery drones to not exceed a lower threshold as the science is still unclear, perhaps 2000 Kelvin.

Thank you,

Vaidila Satvika, AICP
Planning and Urban Design Department
City of Asheville
Office: 828-251-4036
Cell: 828-713-0546

FAA Response:

Regarding biological resources, Section 3.8, *Biological Resources (Wildlife)*, of the PEA addresses birds. Section 3.8.3.2 describes the potential effects to common birds, birds protected by the federal Endangered Species Act, state species of concern, migratory birds, and bald and golden eagles. Refer to the headings “Common Species,” “ESA-Listed Species and Critical Habitat,” “State Species of Concern,” “Migratory Birds,” and “Bald and Golden Eagles” in Section 3.8.3.2.

Regarding land use, drone operators are not required to send flight routes to the FAA. Operators are not required to fly routes that follow the paths of public rights-of-way; however, they may choose to do so. With prior airspace authorization, commercial drone package delivery operators can fly over private property as they fly to and from a hub and upon delivering a package to a customer.

Regarding privacy, the FAA’s mission is to provide the safest, most efficient aerospace system in the world and does not include regulating privacy. Although the FAA is not authorized to impose regulations based on privacy concerns, the FAA intends to continue collaborating with the public, stakeholders, and other agencies with authority and subject matter expertise in privacy law and policy. Regardless, this does not relieve drone operators from complying with existing laws and regulations, including those related to privacy. Information on the FAA’s Privacy Impact Assessments is available on the FAA’s website at <https://www.transportation.gov/individuals/privacy/privacy-impact-assessments>.

Regarding lighting, the FAA does not regulate the color temperature of lights on drones. The FAA requires all commercial drone operators equip their drones with anti-collision lights. The anti-collision lighting must be visible for at least 3 statute miles and have a flash rate sufficient to avoid a collision. The anti-collision lights must be on for all flight operations, except when the pilot determines that, because of operating conditions, it would be in the interest of safety to turn the lights off.

Comment Submission #2: David Dunning, General Aviation Manufacturers Association



May 29, 2024

Department of Transportation
Federal Aviation Administration (FAA)
Washington, DC 20591

Subject: Draft Programmatic Environmental Assessment for Drone Package Delivery in North Carolina

Dear Mr. Hufty,

Introduction

The General Aviation Manufacturers Association (GAMA) is an international association which represents over 150 of the world's leading general aviation airplane, rotorcraft, and powered-lift manufacturers, operators, service providers, repair facilities, and fixed-based operators, as well as companies developing unmanned aerial vehicles.

GAMA appreciates the opportunity to file comments in response to the Draft Programmatic Environmental Assessment for Drone Package Delivery in North Carolina, posted by the Federal Aviation Administration (FAA) on May 1, 2024.

GAMA members recognize this is a positive step towards enabling drone operations beyond individual, operator-based approvals. GAMA encourages the FAA to use this programmatic assessment as a precedent in other states, forming the basis for a national standard for environmental approvals. A national precedent and approval is the only practical environmental assessment that will enable the scale of UAS operations needed to realize their societal benefits.

General Comment

The current Environmental Impact Assessment process for drone operators is time-consuming and duplicative. Part 135 drone operators must conduct a new environmental analysis for each location where they plan to operate. This process can take up to 12 months per location and requires hundreds of staff hours to research and create the necessary documents. Without a significant shift in policy and interpretation, it is possible that the FAA will create a process for new entrants (drone and AAM operators) that is substantially more burdensome than the process for conventional fixed-wing and rotorcraft Part 135 operators, without any demonstrable benefits to the general public.

NEPA review is required due to a government action. However, the FAA may benefit from update to its interpretation of "government action" so that the issuance of waivers and exemptions, or site-specific approvals (e.g., for newly constructed vertiports), are not classified as "government action" where precedent for that action already exists.

GAMA notes that Sections 909 and 953 of the FAA Reauthorization Act of 2024 impose new requirements on the FAA regarding UAS noise and environmental impacts. Combined, these sections indicate Congress' clear intent that new entrant operations should not face undue scrutiny based on unfounded concerns about potential environmental impacts. Specifically, under Sec. 909, the FAA is expected to develop UAS-specific guidance (which this PA could serve as a useful baseline) to prioritize new operations that "demonstrate other factors that benefit human safety or the environment."

General Aviation Manufacturers Association

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GAMA 24-22: Draft Programmatic Environmental Assessment for Drone Package Delivery in North Carolina

Additionally, under Sec. 953, the FAA should "apply any applicable categorical exclusions" to new vertiports at airports.

Regarding considerations related to the broader Advanced Air Mobility transportation system, existing approvals are sufficient for AAM operators of larger type certificated aircraft to use established airports, heliports, and vertiports. The FAA should leverage the North Carolina programmatic assessment to establish a corresponding precedent, allowing drones under Part 135 or the forthcoming BVLOS Rule to operate anywhere in the United States without requiring additional environmental review.

GAMA members caution that the FAA should not subject AAM or drone operators to further environmental review where existing procedures are already approved for AAM or UAS. Likewise, established precedents for one location should be recognized as valid for additional locations. Requiring location-by-location approvals for the same operations places an unnecessary burden on operators and does nothing to improve the environmental review process. Such a process is inconsistent with how environmental assessments are conducted for other airspace users today and would needlessly constrain the UAS and AAM industry's ability to scale.

Industry seeks clarity on the programmatic assessment's approach to accounting for the cumulative impact of increasing UAS and subsequent AAM operations. UAS and AAM operations should not face additional scrutiny compared to commercial airlines adjusting schedules. Cumulative impact has been a sensitive issue for overflown communities, as seen with Metroplex procedure rollouts. GAMA aims to avoid repeating such situations. GAMA opposes penalizing new operations based on arbitrary cumulative impact thresholds or imposing requirements that disperse operations, reducing airspace efficiency. In a cumulative analysis, new proposed operations should not be prejudiced by existing operations.

In Summary

The North Carolina programmatic assessment is a commendable first step. However, given the extensive material the FAA must gather and present, it alone is not a scalable process. Drone delivery companies are preparing to scale operations in multiple states and tribal lands across the United States within the next 18 months. Relying on subsequent PAs for each state does not efficiently utilize federal, local, and applicant resources to meet the needs of both the industry and the public at large.

Recommendation

GAMA strongly recommends that the FAA use the North Carolina programmatic assessment as a precedent for environmental approvals in other states, establishing a national standard. This is essential for scaling UAS operations and realizing their societal benefits. The FAA should update its interpretation of "government action" to exclude waivers, exemptions, and site-specific approvals where precedent exists, recognizing established approvals for one location as valid for additional locations.

GAMA expresses its continued commitment to collaboration with the FAA and other stakeholders to ensure the continued safety, efficiency, and growth of operations in the NAS.

Sincerely,

David Dunning
Director, Global Innovation and Policy
General Aviation Manufacturers Association

General Aviation Manufacturers Association

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FAA Response:

Thank you for your comments. Regarding cumulative impacts, when analyzing a proposed action, the FAA assesses cumulative impacts in accordance with the Council on Environmental Quality's regulations implementing the National Environmental Policy Act (NEPA) (40 CFR Parts 1500–1508) and FAA's NEPA policies and procedures—FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*.



**Draft Programmatic Environmental Assessment –
Drone Package Delivery Operations in North Carolina**

Comments of Small UAV Coalition

May 30, 2024

filed with 9-FAA-Drone-Environmental@faa.gov

The Small UAV Coalition (“Coalition”) is pleased to provide comments in support of the FAA’s draft Programmatic Environmental Assessment (“PEA”) for drone delivery operations in several metropolitan areas in the State of North Carolina. The “major federal action” triggering review under the National Environmental Policy Act (“NEPA”) is the FAA’s amendment of an air carrier’s Operations Specifications (“OpSpecs”). The Coalition strongly supports the FAA’s use of a programmatic environmental assessment, which it has long advocated for in previous comments to the FAA. The Coalition notes also that section 909 of the recently- enacted Securing Growth and Robust Leadership in American Aviation Act provides in pertinent part:

Not later than 180 days after the date of enactment of this Act, the Administrator shall examine and integrate programmatic-level approaches to the requirements of the National Environmental Policy Act of 1969 (42 U.S.C. 4321 et seq.) by which the Administrator can— (1) leverage an environmental review for unmanned aircraft operations within a defined geographic region, including within and over commercial sites, industrial sites, or other sites closed or restricted to the public; and (2) leverage an environmental assessment or environmental impact statement for

nationwide programmatic approaches for large scale distributed unmanned aircraft operations.

The Coalition commends the FAA for using a PEA for drone delivery operations in North Carolina and urges the FAA to consider using a PEA for other states and metropolitan areas in which drone operations are prevalent such as in Texas and Virginia.

While completing the NEPA process often is a protracted exercise, NEPA also has tools to make such reviews efficient and timely, such as programmatic reviews and categorical exclusions. NEPA guidance from the Council of Environmental Quality (“CEQ”) and FAA provides that programmatic reviews are useful in considering cumulative impacts of a group of related actions. Programmatic reviews can establish boundaries for analyses, documentation, and a clear basis for subsequent project-level decisions to avoid the cost and duplication of initiating multiple individual project-level EAs.

Among the benefits of conducting a programmatic review of environmental impacts is that subsequent requests for an OpSpecs amendment to conduct drone delivery operations within a designated area in North Carolina may obviate any further environmental review other than to confirm that the proposed operations fit within the parameters of the PEA, thereby promoting the ability to provide drone delivery services to communities and consumers expeditiously.

The FAA states that further environmental assessment would be required for operations outside the scope of the PEA, such as new delivery areas, new distribution centers/hubs, and modification of operating times or other changes. The Coalition requests the FAA confirm that any additional environmental assessment would be limited to the NEPA category or categories for which the proposed operations are outside the scope of the PEA’s analysis and findings.

The Coalition also supports the FAA’s conclusion in this draft PEA as well as in the 17 previous environmental assessments authorizing drone operations that no detailed analysis is necessary in 9 of the 17 environmental review areas:

- air quality and climate
- biological resources (fish and plants)
- coastal resources

- farmlands
- hazardous materials, solid waste, and pollution prevention
- land use
- natural resources and energy supply
- socioeconomic impacts and children's environmental health and safety risks
- water resources (wetlands, floodplains, surface waters, and groundwater)

Indeed, the draft PEA expects that drone package delivery will reduce greenhouse gas emissions and energy use in the freight sector, as well as enhance the economy, and serve a broader range of people in different socioeconomic strata or with limited mobility options. Using drones for delivery can potentially replace tens of millions of car trips, which would not only eliminate hundreds of thousands of tons of vehicular CO₂ emissions but also reduce traffic congestion and accidents caused by surface transportation. Beyond delivery, drones already offer a safer alternative to critical business and government activities like infrastructure inspection, precision agriculture, and emergency response.

Given these benefits, it is not surprising that an increasing number of counties and localities have been receptive to the drone delivery, and we commend the FAA for recognizing the interest in and advantages of drone delivery in the operating areas identified in North Carolina.

The Coalition also supports the FAA's determination that drone delivery operations in North Carolina do not result in a significant impact on noise, visual effects, historic, architectural, archeological, and cultural resources, DOT section 4(f) resources, waters (wild & scenic rivers), biological resources (wildlife), environmental justice, and cumulative impacts from noise and to biological resources. The Coalition agrees with the draft PEA's statement that drone operations will bring environmental justice benefits over operations that require a car or truck to pick up a package from a store.

Drone package deliveries would provide additional access to small goods, such as groceries and medicine, which could present a positive effect on low-income and minority communities where individuals may not have reliable access to personal vehicles and/or other modes of transportation. For these reasons, the proposed action may result in a benefit to low-income and

minority communities by providing additional and on-demand access to small goods.

The Coalition has reviewed the noise impacts analysis in the draft PEA and supporting information and agrees the noise impacts are well below the DNL 65 threshold of significance for all but the immediate area of takeoffs and landings (operations at the hubs). The noise impacts during en route and delivery operations are considerably lower, well under DNL 50. The draft PEA recommends as mitigation – but does not mandate – that operators locate hubs a certain distance from noise-sensitive areas.

Accordingly, the Coalition supports the FAA’s draft PEA and urges the FAA to issue a Finding of No Significant Impact (“FONSI”).

As demand for drone delivery continues to grow, it would be beneficial to frame long-term goals in regions and localities in terms of increased access. Each operator offers different areas of serviceability given variability in delivery range, and as operators work with communities to determine their needs, hubs will vary in size and activity. A specific quantity of hubs is not necessarily indicative of the number of flights from these hubs but rather determines the areas eligible to receive drone delivery services. For instance, in less densely populated areas, some operators may utilize more hubs to reach the same number of homes and others may use fewer depending on the characteristics of their system. This would not impact the overall number of flights needed to serve a community.

An approach that accounts for coverage and volume rather than only the number of hubs would be more effective in accommodating the various different drone delivery services versus limiting the number of total hubs to a specific figure. The next generation of transportation networks would be best served by a distributed network of operators spread across a service area. This decentralized system would be able to support drone delivery in different locations, whether across major metropolitan areas or more sparsely populated regions.

During the FAA’s May 21 public meeting on this subject, one participant inquired whether the South Carolina portion of the Charlotte/Douglas International Airport Mode C veil is within the scope of the PEA, to which the FAA responded that it is

not being included at this time. The Coalition encourages the FAA to include the SC portion of the mode C veil in this assessment. Many operators are utilizing the Mode C veil as an operating area for airspace and other FAA approvals so harmonizing this would align FAA resources to operational requests. As such, the Coalition urges the FAA to consider these issues in its analysis going forward.

The Coalition applauds the FAA's efforts to evaluate environmental impacts of the continued integration of commercial drone delivery in North Carolina and to encourage the development of hubs for drone operators. This action is a significant and important first step in recognizing and facilitating further growth in the drone delivery industry. We concur with the FAA's assessment of the benefits drone delivery offers and view this PEA as a step to enable more operators to provide these benefits to communities across North Carolina.

Respectfully submitted,



Gregory S. Walden

Aviation Counsel

Small UAV Coalition

Gregory.walden@dentonsglobaladvisors.com

202-403-9904

FAA Response:

Thank you for your comments. Regarding your request for the FAA to confirm that any additional EA would be limited to the NEPA category or categories for which the proposed operations are outside the scope of the PEA's analysis and findings, the FAA confirms that an EA tiering from the PEA would focus on those aspects of the human environment needing additional environmental review based on the specific proposal.

Regarding the comment about the South Carolina portion of Charlotte/Douglas International Airport's (CLT) Mode C veil, the PEA is based on a forecast provided by the North Carolina Department of Transportation (NCDOT) (the project proponent). NCDOT's forecast did not include areas outside North Carolina. If the FAA received an application for operations within the entirety of CLT's Mode C veil, an EA tiering from the PEA would be prepared, focusing on the area in South Carolina.

Comment Submission #4: Jamilha Washington-Newton, U.S. Environmental Protection Agency

Missi Shumer

From: Washington-Newton, Jamilha <WashingtonNewton.Jamilha@epa.gov>
Sent: Thursday, May 30, 2024 5:49 PM
To: 9- FAA- Drone- Environmental (FAA)
Cc: Dean, Kenneth; Buskey, Traci P.
Subject: EPA Comments on the Draft PEA for Drone Package Delivery in North Carolina

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United States Department of Transportation
Federal Aviation Administration
800 Independence Avenue, SW
Washington, DC 20591

Re: EPA Comments on the Draft Programmatic Environmental Assessment for Drone Package Delivery in North Carolina

Dear FAA:

The U.S. Environmental Protection Agency has reviewed the above-referenced document pursuant to the National Environmental Policy Act and Section 309 of the Clean Air Act. The Federal Aviation Administration prepared the draft Programmatic Environmental Assessment to analyze potential environmental impacts associated with Unmanned Aircraft Systems package delivery in North Carolina on a programmatic level in accordance with FAA Order 1050.1F.

The purpose of the proposed project is to provide commercial drone package delivery service to customers, including businesses and households. The proposed action is needed to provide businesses with additional options instead of relying on the usage of automobiles to deliver goods and products to other businesses and consumers. The Proposed Action identified seven regions located throughout North Carolina that would operate as areas for UAS package deliveries over the next seven years. These regions include Asheville, Charlotte Metro (including Kannapolis), Piedmont Triad (Winston-Salem, High Point, and Greensboro), Research Triangle (Raleigh, Durham, Chapel Hill, and adjacent communities), Sandhills (Pinehurst, Raeford, and Fayetteville), Greenville, and Wilmington. Additionally, due to certain areas being restricted to special use airspace, drone operations would not be allowed in these areas, and are therefore excluded from operational usage within these restricted airspaces.

The PEA examines one Action Alternative a "No Action" Alternative. The two alternatives are described below:

- Alternative 1 – the "No Action" Alternative - no change to current Part 135 operations in North Carolina under the assumption that Unmanned Aircraft (also referred to as drone) operators would continue conducting drone package delivery operations in North Carolina according to existing approvals and without the implementation of a shared access UAS traffic management system in communities.
- Alternative 2 – the Proposed Action Alternative – the operation of commercial drone package deliveries from takeoff and landing areas (referred to as "hubs" in this PEA) based on North Carolina Department of Transportation's maximum forecasted operations for conservative purposes.

Based on our review of the Draft PEA, EPA has not identified any significant environmental concerns to be addressed in Final PEA. The EPA acknowledges the mitigation measures to be implemented by the FAA to avoid or minimize impacts on noise quality, biological resources (specifically wildlife), public parks and recreation facilities, and cultural resources.

The EPA appreciates the opportunity to review the Draft PEA for the Drone Package Delivery in North Carolina. If you have questions regarding our comments, please contact Ms. Jamilha Washington-Newton of the NEPA Section at (404) 562-8693 or washingtonnewton.jamilha@epa.gov.

Kind regards,

Jamilha Washington-Newton, M.S.

Jamilha Washington-Newton
Physical Scientist | NEPA Division

Environmental Justice, Community Health
and Environmental Review Division
U.S. EPA Region 4
61 Forsyth Street, SW
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Phone: 404-562-8693



FAA Response:

Thank you for your comments.

Comment Submission #5: Amber Harrison, Zipline International Inc.



May 30, 2024

Submitted electronically to 9-FAA-Drone-Environmental@faa.gov

Federal Aviation Administration
Suite 802W, C/O AVS Environmental
800 Independence Avenue SW
Washington, DC 20591

Subject: Zipline Comments to the April 2024 Draft Programmatic Environmental Assessment for Drone Package Delivery in North Carolina

To Whom it May Concern,

Zipline International Inc. (Zipline) appreciates the opportunity to respond to the Federal Aviation Administration's (FAA) draft programmatic environmental assessment (PEA) that evaluates the potential impacts of Unmanned Aircraft Systems (UAS) package delivery operations in the State of North Carolina.

Zipline is a U.S. company whose mission is to transform logistics and delivery systems to serve all people equally, regardless of location. Zipline designs, manufactures, and operates a UAS that delivers medical supplies, healthcare goods, and other consumer products. We have used our electric, lightweight, autonomous aircraft to fly more than 74 million autonomous miles and completed more than one million deliveries to customers. Zipline received our 14 CFR Part 135 (Part 135) air carrier certificate for commercial package delivery operations from the FAA in June 2022. We have been proud to serve people and communities in North Carolina, Arkansas, and Utah.

Zipline supports the FAA's efforts to proceed with a programmatic environmental assessment (EA) approach for UAS package delivery operations in North Carolina. The PEA is a positive first step away from the current process and towards creation of a broader scope environmental assessment, capable of identifying a UAS operation's environmental impact on established urban areas. This concept could be used to leverage a broader-scale, holistic approach to environmental assessments, critical to ensure consistent and fair processes for all airspace users.

Through our global experience, Zipline has witnessed the vast environmental benefits that can result from deploying these operations at scale, and look forward to bringing those benefits to communities here in the United States. The existing EA process for UAS package delivery operations is location-specific, time-consuming, and duplicative. FAA authorizations issued to



companies, such as Zipline, operating under Part 135 — including authorizations necessary to expand our services to serve new communities — may trigger a new EA. This process can take 12 months or longer per location, as well as consuming hundreds of staff hours to research and document. This economic burden on UAS operators, both in cost and delays, reinforces industry-wide barriers to entry without any tangible environmental or community benefits.¹

Zipline recognizes that environmental review remains a critical piece of the regulatory framework for enabling UAS package delivery operations to scale in the United States. With this PEA to evaluate the potential environmental impacts associated with those operations in North Carolina, the FAA has appropriately applied a programmatic approach to the environmental review of UAS package delivery operations which are similar in nature and environmental impacts. Consistent with the Council on Environmental Quality regulations and guidance, and as demonstrated in this PEA, the use of a programmatic approach for this EA is an effective and efficient approach to environmental analysis for similar types of UAS operations across the country.²

As UAS technology continues to evolve and UAS package delivery operations expand in the United States, the use of programmatic environmental approaches will support the successful deployment of these technologies and the realization of the significant public benefits of UAS operations for American people, businesses, and communities. Notably, societal benefits include significant environmental benefits. For example, increased UAS delivery operations will alleviate congested roadways and decrease greenhouse gas emissions and pollution due to a decline in vehicle miles traveled (VMT) as UAS replace some deliveries conducted by truck and car. Positive impacts are also likely to include a decrease in accidents as VMT decreases over time, which will make alternate modes of transportation (biking, walking, etc) safer and more desirable. Existing commercial drone deployments have already demonstrated a net positive impact on the environment—including reductions in overall noise levels and CO₂ greenhouse gas emissions. Zipline's more than 1 million commercial deliveries and more than 70 million miles flown averted over 7,000 metric tons of CO₂ emissions to date.

Zipline provides the following recommendations to further leverage this PEA for the FAA's consideration:

- ***Expedition expansion of Programmatic Reviews to support UAS operations.***
Communities across the United States are eager to receive these services and UAS

¹ As noted in this PEA, as of today's date, the FAA has completed 17 environmental assessments (EA) in accordance with FAA Order 1050.1F for individual Part 135 package delivery operations proposals. Each EA resulted in a finding of no significant impact.

² 40 C.F.R. § 1501.11; FAA Order 1050.1F, para. 3-2.



package delivery operators, like Zipline, are prepared to meet that demand. Subsequent PEAs for other regions should build upon this initial programmatic review to meet industry's aspirations to safely scale over the next 12-18 months. The North Carolina PEA is an important and applauded first step. However, because of the amount of material the FAA must gather and present, it alone is not a solution sufficient to meet the anticipated growth of the industry. Zipline urges the FAA to adopt a broader scope for future EAs for UAS operations.

- ***Importance of nationwide assessments in relation to proposed BVLOS Rulemaking.*** This PEA undoubtedly reflects a positive evolution toward a broad approach to enable scalable drone operations and to step away from ad-hoc assessments for each operator. To enable the scale and diversity of drone operations that are already possible, and will likely increase under the FAA's anticipated BVLOS rulemaking, Zipline encourages the FAA to ensure an environmental assessment is conducted to enable timely rulemaking. A nationwide approval should be based on the precedent set by this PEA now, so that UAS under Part 135 or future enabling regulations can operate anywhere in the United States without additional environmental review.
- ***Consideration of the full scope of commercial BVLOS deliveries.*** An increase in UAS operations that is similar to existing operations should be eligible for a categorical exclusion and not require a new environmental review or re-evaluation. UAS operational areas will vary over time as each operator adjusts to market and environmental conditions. For example, certain safety-critical operations may occur overnight, including deliveries of life-saving medical supplies and maintenance flights to ensure continued safe operations. A programmatic approval basis that only considers UAS operations that occur at certain hours of the day may limit operators' abilities to serve communities needs. Zipline therefore urges the FAA to take this opportunity to consider the full scope of commercial BVLOS delivery operations as it considers a national-scale environmental assessment.
- ***Quickly Implement Section 909 of the FAA Reauthorization Act of 2024.*** We encourage the FAA to quickly implement Section 909 of the FAA Reauthorization Act of 2024. Section 909 directs the FAA to, among other things, (1) publish UAS-specific environmental review guidance and implementation procedures; (2) prioritize project applications that offset the impacts of non-zero emissions activities; (3) leverage environmental reviews for nationwide programmatic approaches for large scale distributed UA operations; and (4) develop one or more new categorical exclusions appropriate for commercial UA operations. Taking these steps will meaningfully improve the environmental review process for UA operations by providing greater clarity on



project timelines and required resources. In the interim, Zipline recommends that the FAA more narrowly scope EAs for UA operations based on its previous experience with similar EAs.

- **Calculation of noise impacts.** Zipline remains concerned that the draft PEA references DNL limits that may not be appropriate for evaluating the impact of UAS noise profiles. UAS operations would likely not even register on maps that have historically been used to determine jet aircraft noise impacts.³ Furthermore, DNL does not have any weighting for the frequencies emitted by drones, which differ significantly from typical jet aircraft noise profiles. As a result, some UAS noise emissions may be hard to distinguish from ambient noise, including nearby car and truck traffic. Zipline recommends that if the FAA continues to use DNL, then where a UAS noise profile does not exceed 65 dB (DNL or equivalent scaled metric), the UAS operation would not need to be subject to any further noise review.⁴
- **Reduce potential for resource disparities based on where you live.** While the PEA is a critical first step to scalable environmental assessments for UAS operations, Zipline encourages the FAA to expand the scope to include rural and suburban communities, to avoid the inadvertent creation or perpetuation of unequal access to resources for people in those communities. Zipline suggests a more holistic approach to programmatic environmental assessments. Instead of focusing solely on a specific list of metropolitan areas, the FAA should consider a generalized rural, suburban, and urban focus. This will not only ensure a more equitable UAS service area, but also will be more reflective of the diverse profiles and locations of actual, scaled UAS operations.

With this PEA, the FAA is taking important steps to support the UAS industry's viability and to enable safe, efficient and environmentally friendly UAS package delivery operations that will benefit the American public. Zipline looks forward to continuing to work with the FAA to move UAS integration forward safely and securely.

With Kindest Regards,

Amber Harrison

Amber Harrison
Aviation Regulatory Counsel
Zipline International, Inc.

³ Drones will often be 10 dB quieter (or more) than the [quietest permissible Stage 5 two-engine aircraft](#)

⁴ This is consistent with policy set by 24 CFR Part 51.

FAA Response:

Regarding calculation of noise impacts, currently, the Day-Night Average Sound Level (DNL) is the only metric for which there are established federal regulatory environmental impact thresholds for aviation noise. DNL uses the A-weighting scale which approximates the frequency response of human hearing across the audible range of frequencies and is generally an appropriate weighting scale to use for noise sources that are not very high in level and/or very low frequency dominant. Research on the effects of drone noise and the establishment of associated dose response relationships based on DNL and/or other metrics does not yet exist at a level sufficient to inform potential aviation noise policy changes or additions.

The DNL metric is used to reflect a person's cumulative exposure to sound over a 24-hour period, expressed as the noise level for the average day of the year on the basis of annual aircraft operations. The DNL resulting from aviation operations is based on not just the instantaneous sound levels produced by the aircraft, but also the duration of sound exposure, and the number of occurrences of sound exposure at a location. DNL also includes a 10-dB weighting applied to nighttime (10 pm to 7 am) operations to account for increased human sensitivity to noise at night. As such, operations from the same aircraft can produce a wide range of DNL depending on the manner in which the aircraft is operated, the numbers of aircraft operations, and the time of day in which those operations occur. If any of these factors change, it may be necessary to evaluate the corresponding change to the DNL even when the aircraft being operated remains unchanged.

NEPA also requires the evaluation of cumulative effects to evaluate the potential for impacts to result from the incremental effect of a proposed action when added to the effects of other past, present, and reasonably foreseeable actions regardless of what agency (federal or non-federal) or person undertakes such other actions. An identical action proposed in different locations could result in a cumulative impact in one location but not the other location. Because of this, separate environmental reviews may be required for similar actions when the setting of those actions differ.

It should be noted that just because UAS noise does not exceed DNL 65 dB, it does not mean that it could not result in impacts or that those impacts could not be significant. The PEA looked into a potential increase in noise with the proposed action. Due to reasons such as unknown hub locations, non-established flight paths, and existing aviation-related noise around airports, it was necessary to look into the DNL values lower than DNL 65.

Comment Submission #6: Emily Kimball, Commercial Drone Alliance



May 30, 2024

Submitted via Email to 9-FAA-Drone-Environmental@faa.gov

Federal Aviation Administration
Suite 802W, C/O AVS Environmental
800 Independence Ave. SW
Washington, DC 20591

COMMENTS OF THE COMMERCIAL DRONE ALLIANCE

The Commercial Drone Alliance ("CDA") appreciates the opportunity to comment on the Federal Aviation Administration's ("FAA") Programmatic Environmental Assessment ("PEA") for Drone Package Delivery in North Carolina.¹ This action is a significant step in recognizing and facilitating further growth in the drone industry.

The CDA is an independent non-profit organization led by key members of the commercial drone industry.² The CDA actively participates in legislative, regulatory, and policy efforts to facilitate the safe and secure development and expansion of commercial drone operations. The CDA brings together commercial drone end-users; manufacturers; service providers; advanced air mobility companies; drone security companies; and vertical markets including oil and gas, precision agriculture, construction, security, communications technology, infrastructure, newsgathering, filmmaking, and more. The CDA works with policymakers across government to collaborate on policies for industry growth and educates the public on the safe and responsible use of commercial drones to achieve economic benefits and humanitarian gains.

The CDA supports the FAA's Programmatic Environmental Assessment for drone package delivery within the state of North Carolina. The CDA recognizes that environmental review is a critical piece of the regulatory framework for enabling UAS operations to scale in the U.S. Importantly, FAA's effort to apply a programmatic approach to this review is consistent with Congress' recent mandate in the FAA Reauthorization Act of 2024, wherein Congress directed the FAA to "examine and integrate programmatic-level approaches to the requirements of the National Environmental Policy Act" and "leverage an environmental review for unmanned aircraft operations within a defined geographic region" as well as "leverage an environmental assessment or environmental impact statement for

¹ See Notice of Availability, Notice of Public Meeting, and Request for Comment on the Draft PEA for Drone Package Delivery in North Carolina, 89 Fed. Reg. 40525 (May 10, 2024).

² Learn more at www.commercialdronealliance.org.

nationwide programmatic approaches for large scale distributed unmanned aircraft operations.³ We further note that under Section 909 of the FAA Reauthorization Act of 2024 the FAA is expected to develop UAS-specific guidance and implementation procedures, and work towards a potential categorical exclusion. With this PEA, FAA is taking a positive step toward meeting that mandate and enabling increased drone operations.

The FAA has appropriately applied a programmatic approach to the environmental review of UAS flight operations which are similar in nature and environmental impacts. As demonstrated in the draft PEA, the use of a programmatic approach for this evaluation is an effective and efficient approach to environmental analysis of similar types of drone operations across the state. Significantly, the framework established in the PEA will allow for tiering, where appropriate, so that any proposed project, operation, or other action that may have unique specific environmental impacts requiring additional analysis may be studied to supplement the analysis set forth in the PEA. By allowing for tiering, the efficiencies and effectiveness of this approach are substantial. The ability to tier off a PEA with a separate environmental review is an effective means of ensuring that any proposed project, operation, or other action that may have specific impacts is studied further.

As UAS technology continues to evolve (including with respect to noise level reduction) and commercial drone use expands in the United States, the use of programmatic environmental analysis approaches such as this will support the successful deployment of these technologies and the realization of the countless public benefits of UAS operations for Americans, American businesses, and American communities. As the assessment notes, drone delivery at scale has the potential to result in numerous societal benefits, including improving the environment, enhancing the economy, and serving a broader range of people in different socioeconomic strata or with limited mobility options.

And, those societal benefits include significant environmental benefits. Using drones for delivery can potentially replace tens of millions of car trips, which would not only eliminate hundreds of thousands of tons of vehicular CO₂ emissions but also reduce traffic congestion and accidents caused by surface transportation. Two 2021 studies found that drone-based delivery reduced delivery carbon emissions and energy usage by 96-98% compared to cars, a significantly larger reduction than switching to EVs.⁴ A study of the Dallas-Fort Worth Metroplex, an area that currently enjoys a the benefits of drone delivery, estimated that drones could remove the equivalent of 11,000 cars from the road, which would avoid approximately 190 road accidents each year and eliminate 49,000 tons of annual CO₂ emissions.⁵ Similarly, a September 2020 economic report published by the Virginia Tech Office of Economic Development found that enabling drone delivery in a single metropolitan area could avoid up to 294 million miles per year in road use and up to 580 car crashes per year,

³ FAA Reauthorization Act of 2024, Pub. L. No. 118-63, tit. IX, § 909(c) (2024).

⁴ Rodrigues et al, [Drone flight data reveal energy and greenhouse gas emissions savings for small package delivery](#) (Cornell Univ. arXiv.org, Nov. 2021); Zipline, [A First-Ever Look at the Sustainability of Autonomous Aerial Logistics](#) (Zipline Blog, Nov. 2021).

⁵ 'Faster, Safer and Greener: The Potential Impact of Delivery Drones in the Dallas-Fort Worth Metroplex' (February 2021), Report by Accenture, p 5. Available: <https://storage.googleapis.com/wing-static-us/us/Dallas%20Impact%20Report.pdf>.

equivalent to taking 25,000 cars off the road or planting 46,000 acres per year of new forest, reducing carbon emissions by up to 113,900 tons per year.⁶

UAS also play an increasingly important role in reducing global greenhouse gas emissions associated with infrastructure construction and sustainment⁷ and in supporting and encouraging the transition from fossil fuels to renewable energy. UAS enable increased efficiencies in both the construction and operation phases of renewable energy plants – such as solar, wind, nuclear, and hydro. In short, UAS make renewable energy projects more economically viable and cost-effective by facilitating less-costly inspections of such infrastructure.

Given these and other benefits, it is not surprising that an increasing number of countries and localities have begun to participate in drone delivery. We commend the FAA for recognizing the interest in and advantages of drone delivery in the operating areas identified in North Carolina as part of their analysis of environmental justice considerations.

As demand for drone delivery continues to grow, it will be important to examine long-term goals in regions and localities in the context of increased access. Each operator offers different areas of serviceability given variability in delivery range, and as operators work with communities to determine their needs, hubs will vary in size and activity. A specific quantity of hubs is not necessarily indicative of the number of flights from these hubs but rather determines the area eligible to receive drone delivery services. For instance, in less densely populated areas, some operators utilize more hubs to reach the same number of homes. And as such, in less densely populated areas, there will be a need for a greater number of smaller hubs for certain operators to reach communities.

An approach that accounts for coverage and volume rather than only the number of hubs would be more effective in accommodating the various different systems providing drone delivery services versus limiting the number of total hubs to a specific figure. The next generation of transportation networks would be best served by a distributed network of operators spread across a service area. This decentralized system would be able to support high-volume drone delivery in different locations, whether across major metropolitan areas or more sparsely populated regions.

With respect to the scope of the PEA, the CDA understands that at this time, the FAA has excluded the South Carolina portion of the Charlotte/Douglass International Airport Mode C veil. Many operators are utilizing the Mode C veil as an operating area for airspace and other FAA approvals so harmonizing this would align FAA resources to operational requests. As such, the CDA urges the FAA to consider these issues in its analysis going forward.

⁶ Virginia Tech Office of Economic Development, “Measuring the Effects of Drone Delivery in the United States,” (September 2020), available at https://vttechworks.lib.vt.edu/bitstream/handle/10919/100104/Effects%20of%20Drone%20Delivery%20US_September%202020.pdf?sequence=1&isAllowed=y.


⁷ World Bank, “[Low-Carbon Infrastructure, Private Participation in Infrastructure \(PPI\) 2002 to H1 2017](#)” (2018) (“Approximately 70 percent of global greenhouse-gas emissions emanate from infrastructure construction and operations such as power plants, buildings and transportation systems.”). See also Groves, Brendan, “How Drones Can Unlock Greener Infrastructure Inspection,” *World Economic Forum* (Aug. 10, 2021), available at <https://www.weforum.org/agenda/2021/08/how-drones-unlock-greener-infrastructure-inspection/>.

The CDA agrees with the FAA's conclusions in the draft PEA that for each of the environmental impact categories analyzed—including noise and compatible land use, and visual effects, historical, architectural, archeological, and cultural resources, water resources (wild and scenic rivers), and biological resources (wildlife)—and in light of the proposed mitigation measures, the environmental effects of the UAS operations would not meet the FAA's significance thresholds (where one has been established) or otherwise result in adverse impacts or significant cumulative impacts. Therefore, the CDA urges the FAA to finalize its preliminary determination that there will not be a significant impact to the human environment, individually or cumulatively, as a result of UAS operations, and issue a Finding of No Significant Impact.

As drone delivery companies prepare to expand across the United States in the next 18 months, we urge the FAA to continue taking a programmatic approach to its environmental reviews. The CDA further emphasizes the importance of expeditiously rolling out a scalable process that could support the pace of industry's deployment of commercial operations across all states.

Thank you for your efforts to advance the continued integration of commercial drone delivery. With this PEA, the FAA is taking important steps to support the UAS industry's viability and to enable safe, efficient and environmentally friendly commercial UAS operations that will benefit communities across North Carolina.

Respectfully submitted,



Emily Kimball
Deputy Director
Commercial Drone Alliance

FAA Response:

Regarding the comment about the South Carolina portion of CLT's Mode C veil, the PEA is based on a forecast provided by NCDOT (the project proponent). NCDOT's forecast did not include areas outside North Carolina. If the FAA received an application for operations within the entirety of CLT's Mode C veil, an EA tiering from the PEA would be prepared, focusing on the area in South Carolina.

Comment Submission #7: Mr. Gregory Blaize

Do you have any sort of perspective on the personnel—the amount of personnel per operation—that would be needed to successfully do these deliveries per company involved?

FAA Response:

The FAA recommends contacting commercial drone package delivery operators to obtain that information.