

Draft Environmental Assessment for Charlotte Optimization of Airspace and Procedures in the Metroplex

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Prepared by:
**United States Department of Transportation
Federal Aviation Administration**



Atlanta, GA

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1 Introduction

The National Environmental Policy Act of 1969 (NEPA) [42 United States Code (U.S.C.) § 4321 *et seq.*], requires federal agencies to disclose to decision makers and the interested public a clear, accurate description of the potential environmental impacts that could arise from proposed federal actions. Through NEPA, Congress has directed federal agencies to consider environmental factors in their planning and decision-making processes and to encourage public involvement in decisions that affect the quality of the human environment. As part of the NEPA process, federal agencies are required to consider the environmental effects of a proposed action, reasonable alternatives to the Proposed Action, and a No Action Alternative (i.e., analyzing the potential environmental effects of not undertaking the proposed action). The Federal Aviation Administration (FAA) has established a process to ensure compliance with the provisions of NEPA through FAA Order 1050.1E, Change 1, *Environmental Impacts: Policies and Procedures* (FAA Order 1050.1E).

This Environmental Assessment (EA), prepared in accordance with FAA Order 1050.1E, documents the potential effects to the environment that may result from the optimization of Air Traffic Control (ATC) procedures that would standardize aircraft routing to and from airports in the Charlotte Metroplex,¹ including Charlotte/Douglas International Airport (CLT), Charlotte-Monroe Executive Airport (EQY), Greenville Downtown Airport (GMU), Piedmont Triad International Airport (Greensboro) (GSO), Greenville Spartanburg International Airport (GSP), Donaldson Center Airport (GYH), Hickory Regional Airport (HKY), Smith Reynolds Airport (INT), Concord Regional Airport (JQF), Rowan County Airport (RUQ), Spartanburg Downtown Memorial Airport (SPA), Statesville Regional Airport (SVH), and Rock Hill (York Co) Airport-Bryant Field (UZA). The Proposed Action, the subject of this EA, is called the Optimization of Airspace and Procedures in the Charlotte Metroplex or “CLT OAPM” Project. The procedures designed for the CLT OAPM Project would be used by arriving and departing aircraft operating under Instrument Flight Rules (IFR) at the study area airports (“the Study Airports”), using currently available navigational technology.

This EA includes the following chapters and appendices:

- **Chapter 1: Introduction.** Chapter 1 provides basic background information on the air traffic system, the Next Generation Air Transportation System (NextGen) program, Performance-Based Navigation (PBN), the FAA’s OAPM initiative, and information on the Charlotte Metroplex and the Study Airports.
- **Chapter 2: Purpose and Need.** Chapter 2 discusses the need (i.e., problem) and purpose (i.e., solution) for airspace and procedure optimization in the Charlotte Metroplex area, and identifies the Proposed Action.
- **Chapter 3: Alternatives.** Chapter 3 discusses the Proposed Action and the No Action Alternative analyzed as part of the environmental review process.
- **Chapter 4: Affected Environment.** Chapter 4 discusses existing environmental conditions within the Charlotte Metroplex area.

¹ A Metroplex is a geographic area covering several airports, serving major metropolitan areas and a diversity of aviation stakeholders.

- **Chapter 5: Environmental Consequences.** Chapter 5 discusses the potential environmental impacts associated with the Proposed Action and the No Action Alternative.
- **Appendix A: Agency and Public Coordination and List of Receiving Parties.** Appendix A documents agency and public coordination associated with the EA process and lists the local agencies and parties identified to receive copies of the Draft and Final EA documents.
- **Appendix B: List of Preparers.** Appendix B lists the names and qualifications of the principal persons contributing information to this EA.
- **Appendix C: References.** Appendix C provides references to documents used to prepare the EA document.
- **Appendix D: List of Acronyms and Glossary.** Appendix D lists acronyms and provides a glossary of terms used in the EA.
- **Appendix E: Basics of Noise.** Appendix E presents information on aircraft noise as well as the general methodology used to analyze noise associated with aviation projects.

1.1 Project Background

On January 16, 2009, the FAA asked RTCA² to create a joint government-industry task force to make recommendations for implementation of Next Generation Air Transportation System (NextGen) operational improvements for the nation's air transportation system. In response, RTCA assembled the NextGen Mid-Term Implementation Task Force (Task Force 5), which included more than 300 representatives from commercial airlines, general aviation, the military, aerospace manufacturers, and airport stakeholders.³ Section 1.2.5 discusses the NextGen Program in more detail.⁴

On September 9, 2009, RTCA issued the NextGen Mid-Term Implementation Task Force Report, which provided the Task Force 5 recommendations. One of these recommendations directed the FAA to undertake planning for the implementation of Performance-Based Navigation (PBN)⁵ procedures on a metroplex basis, including Area Navigation (RNAV) and Required Navigation Performance (RNP), discussed further in Sections 1.2.5.1 and 1.2.5.2. Based on this recommendation, the FAA began the OAPM initiative.

The purpose of the OAPM initiative is to optimize air traffic procedures and airspace on a regional scale. This would be accomplished by developing procedures that take advantage

² RTCA, Inc. Executive Summary, *NextGen Mid-Term Implementation Task Force Report*, September 9, 2009.

³ RTCA, Inc. is a private, not-for-profit corporation that develops consensus-based recommendations regarding communications, navigation, surveillance (CNS), and air traffic management (ATM) system issues. RTCA functions as a federal advisory committee and includes roughly 400 government, industry, and academic organizations from the United States and around the world. Members represent all facets of the aviation community, including government organizations, airlines, airspace users, airport associations, labor unions, and aviation service and equipment suppliers. More information is available at <http://www.rtca.org>.

⁴ RTCA Inc., Executive Summary, *NextGen Mid-Term Implementation Task Force Report*, September 9, 2009.

⁵ Additional information on Performance-Based Navigation (PBN) is provided on the FAA Fact Sheet, "NextGen Goal: Performance-Based Navigation," April 24, 2009 [http://www.faa.gov/news/fact_sheets/news_story.cfm?newsId=8768 (accessed April 11, 2012)].

of technological advances in navigation, such as RNAV, while ensuring that aircraft that are not equipped to use RNAV continue to have access to National Airspace System (NAS). This approach addresses congestion and other factors that reduce efficiency in busy metroplex areas and accounts for key operating airports and airspace in the metroplex. The CLT OAPM Study Airports are further discussed in Section 1.4. The OAPM initiative also addresses connectivity with other metroplex areas. The overall intent is to use limited airspace as efficiently as possible for congested metroplex areas.⁶

1.2 Air Traffic Control and the National Airspace System

The following sections provide basic background information on air traffic control and the NAS. This information includes a description of the NAS, the role of Air Traffic Control (ATC), the methods used by air traffic controllers to manage the Air Traffic Control system, and the different phases of aircraft flight within the NAS. Following this discussion, information is provided on the FAA's NextGen program and the OAPM initiative.

1.2.1 National Airspace System

Under the Federal Aviation Act of 1958 (49 USC § 40101 *et seq.*), the FAA is delegated control over use of the nation's navigable airspace and regulation of domestic civil and military aircraft operations in the interest of maintaining safety and efficiency. To help fulfill this mandate, the FAA established the NAS. Within the NAS, the FAA manages aircraft takeoffs, landings, and the flow of aircraft between airports through a system of infrastructure (e.g., air traffic control facilities), people (e.g., air traffic controllers, maintenance, and support personnel), and technology (e.g., radar, communications equipment, ground-based navigational aids [NAVAIDs],⁷ etc.) The NAS is governed by various FAA rules and regulations.

The NAS comprises one of the most complex aviation networks in the world. The FAA continuously reviews the design of all NAS resources to ensure they are effectively and efficiently managed. The FAA Air Traffic Organization (ATO) is the primary organization responsible for managing airspace and flight procedures used in the NAS. When changes are proposed to the NAS, the FAA works to ensure that the changes maintain or enhance system safety and improve efficiency. One way to accomplish this mission is to employ emerging technologies to increase system flexibility and predictability.⁸

1.2.2 Air Traffic Control within the National Airspace System

The combination of infrastructure, people, and technology used to monitor and guide (or direct) aircraft within the NAS is referred to collectively as ATC. One of ATC's responsibilities is to maintain safety and expedite the flow of traffic in the NAS through enforcement of defined minimum distances between aircraft (referred to as "separation"). This is accomplished through required communications between air traffic controllers and pilots and the use of navigational technologies such as radar.

⁶ U.S. Department of Transportation, Federal Aviation Administration, *FAA Response to Recommendations of the RTCA NextGen Mid-Term Implementation Task Force*, January 2010, p. 14.

⁷ NAVAIDs are facilities that transmit signals that define key points or routes.

⁸ U.S. Department of Transportation, Federal Aviation Administration, Order JO 7400.2J, Change 3, *Procedures for Handling Airspace Matters*, Section 32-3-5(b) "National Airspace Redesign," August 22, 2013.

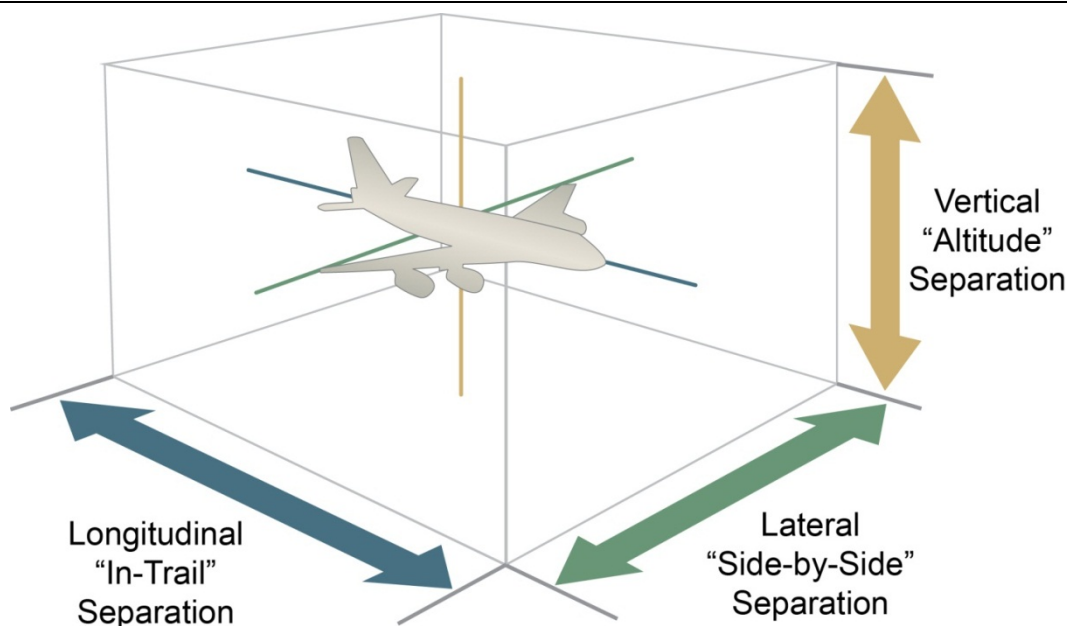
Aircraft operate under two distinct categories of flight rules: Visual Flight Rules (VFR) and Instrument Flight Rules (IFR).⁹ Under VFR, pilots are responsible to “see and avoid” other aircraft and obstacles such as terrain to maintain safe separation yet have greater flexibility to choose altitudes and routes. Under IFR, aircraft operators are required to file flight plans and use navigational instruments to operate within the NAS. The majority of commercial air traffic operates under IFR.

Depending on whether aircraft are operating under IFR or VFR, air traffic controllers apply various techniques to maintain separation between aircraft,¹⁰ including the following:

- **Vertical or “Altitude” Separation:** separation between aircraft operating at different altitudes;
- **Longitudinal or “In-Trail” Separation:** separation between two aircraft operating along the same flight route referring to the distance between a lead and a following aircraft; and,
- **Lateral or “Side-by-Side” Separation:** separation between aircraft (left or right side) operating along two separate but nearby flight routes.

Exhibit 1-1 depicts the three dimensions around an aircraft used to determine separation.

Exhibit 1-1 Three Dimensions Around an Aircraft



Source: ATAC Corporation, December 2012.
Prepared by: ATAC Corporation, October 2013.

Air traffic controllers use radar to monitor all aircraft and provide services that ensure separation. Published instrument procedures are tools used by ATC to provide predictable, efficient routes that move aircraft through the NAS in a safe and orderly manner. These

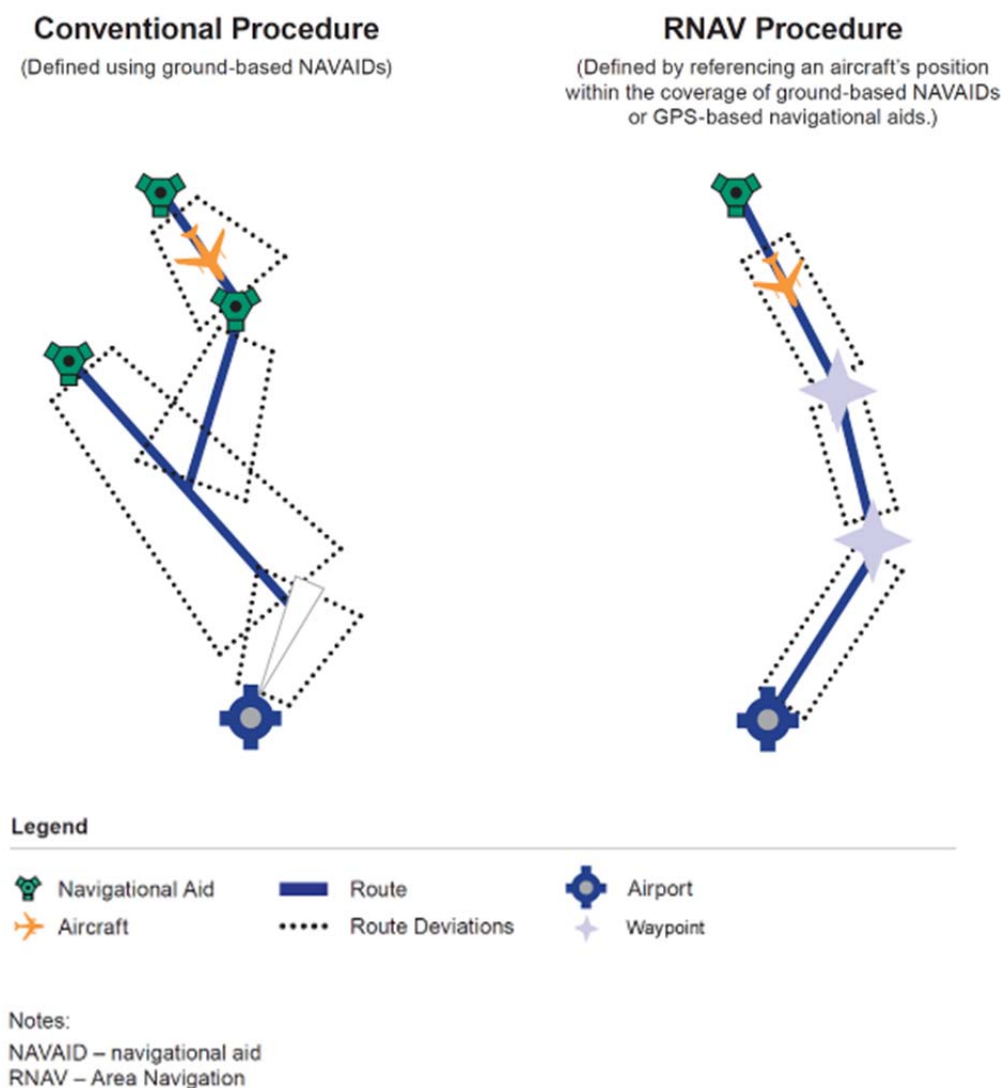
⁹ 14 Code of Federal Regulations (C.F.R.), Part 91.

¹⁰ Defined in FAA Order 7110.65U, *Air Traffic Control*.

procedures minimize the need for communication between air traffic controllers and pilots.

Published instrument procedures are described as “conventional” procedures when they use ground-based NAVAIDs or are based on verbal instructions (vectors) issued by an air traffic controller. In its effort to modernize the NAS, the FAA is developing instrument procedures that use advanced technologies. A primary technology being applied in this effort is RNAV. RNAV uses Global Positioning System (GPS) technology to allow an RNAV-equipped aircraft to fly a more efficient route. This route is based on instrument guidance that references an aircraft’s position relative to ground-based NAVAIDs or satellites. **Exhibit 1-2** compares a conventional procedure and an RNAV procedure.

Exhibit 1-2 Comparison of Routes Following Conventional versus RNAV Procedures



Source: U.S. Department of Transportation, Federal Aviation Administration, “Performance-Based Navigation (PBN)” brochure, 2009.
Prepared by: ATAC Corporation, March 2014.

ATC uses a variety of tools and coordination techniques to maintain safety within the NAS, including:

- **Vectors:** Headings issued to aircraft to provide navigational guidance and to maintain separation between aircraft and/or obstacles.
- **Speed Control:** Direction issued to aircraft to reduce or increase aircraft speed to maintain separation between aircraft.
- **Holding Pattern/Ground Hold:** Controllers assign aircraft to a holding pattern in the air or hold aircraft on the ground before departure to maintain separation between aircraft and to manage arrival/departure volume.
- **Altitude Assignment/Level-off:** Controllers assign altitudes to maintain separation between aircraft and/or to protect airspace. This may result in aircraft “leveling off” during ascent or descent.
- **Reroute:** Controllers may change an aircraft’s route for a variety of reasons, such as avoidance of inclement weather, to maintain separation between aircraft, and/or to protect airspace.
- **Point-out:** Notification issued by one controller when an aircraft might pass through or affect another controller’s airspace and radio communications will not be transferred.

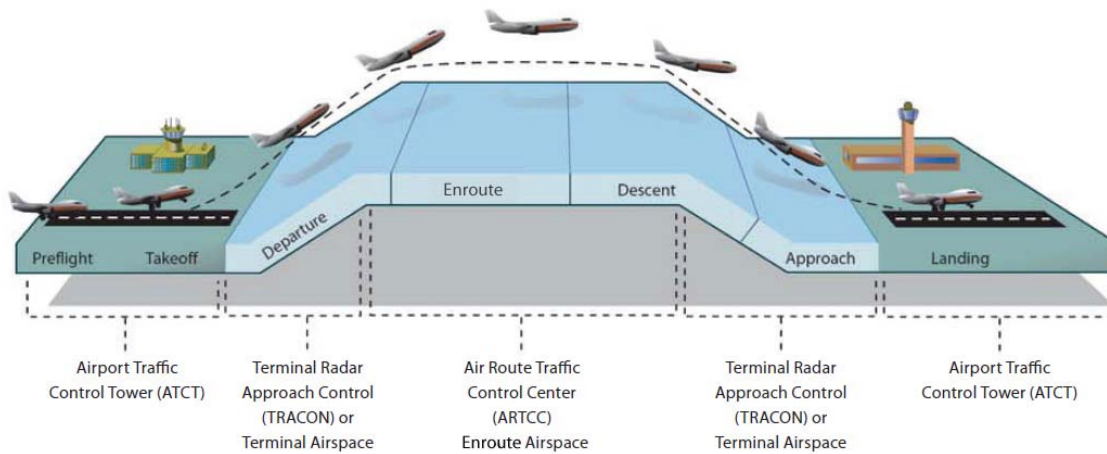
As an aircraft moves from origin to destination, ATC personnel function as a team and transfer control of the aircraft from one controller to the next, and from one ATC facility to the next.

1.2.3 Aircraft Flow within the National Airspace System

An aircraft traveling from airport to airport typically operates through six phases of flight (plus a “preflight” phase.) **Exhibit 1-3** depicts the typical phases of flight for a commercial aircraft. These phases include:

- **Preflight (Flight Planning):** The preflight route planning and flight checks performed in preparation for takeoff.
- **Push Back/Taxi/Takeoff:** The aircraft’s transition across the airfield from push-back at the gate, taxiing to an assigned runway, and takeoff from the runway.
- **Departure:** The aircraft’s in-flight transition from takeoff to the enroute phase of flight, during which it climbs to the assigned cruising altitude.
- **Enroute:** Generally, the level segment of flight (i.e., cruising altitude) between the departure and destination airports.
- **Descent:** The aircraft’s in-flight transition from an assigned cruising altitude to the point at which the pilot initiates the approach to a runway at the destination airport.
- **Approach:** The segment of flight during which an aircraft follows a standard procedure that guides the aircraft to the landing runway.
- **Landing:** Touch-down of the aircraft at the destination airport and taxiing from the runway to the gate or parking position.

Exhibit 1-3 Typical Phases of a Commercial Aircraft Flight



Source: U.S. Department of Transportation, Federal Aviation Administration, Houston Area Air Traffic System (HAATS), Airspace Redesign, Final Environmental Assessment, Figure 1.1.1-1, March 2008.

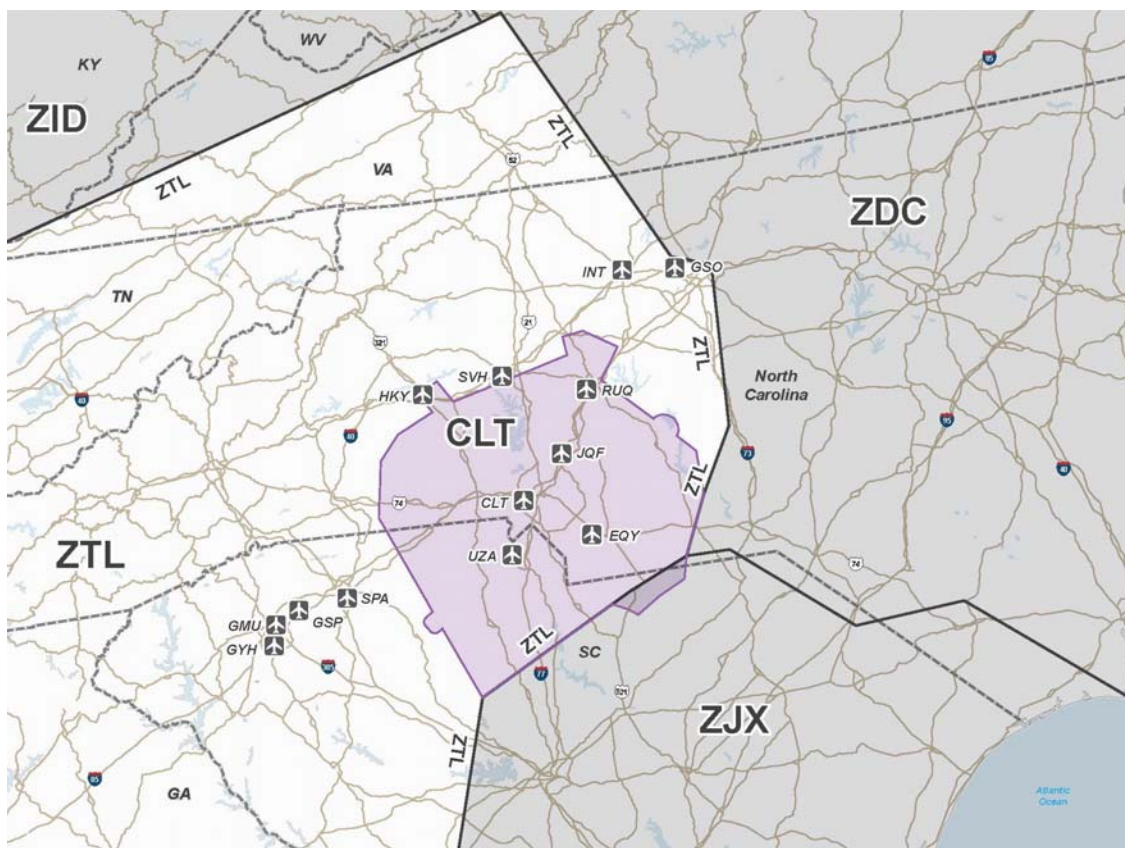
Prepared by: ATAC Corporation, March 2014.

1.2.4 Air Traffic Control Facilities

The NAS is organized into three-dimensional areas of navigable airspace (defined by a floor, a ceiling, and a lateral boundary), managed by different types of ATC facilities including:

- **Air Traffic Control Tower:** Controllers at an Air Traffic Control Tower (ATCT) located at an airport manage phases of flight associated with aircraft takeoff and landing. The ATCT typically controls airspace extending from the airport out to a distance of several miles.
- **Terminal Radar Approach Control:** Controllers at a Terminal Radar Approach Control (TRACON) facility manage aircraft as they transition between an airport and the enroute phase of flight. This includes the departure, climb, descent, and approach phases of flights. The TRACON airspace is broken down into sectors managed by individual TRACON controllers. As an aircraft moves between sectors, responsibility for management of that aircraft is transferred from controller to controller. Controllers maintain separation between aircraft that operate within their sectors. The terminal airspace in the Charlotte Metroplex area is referred to as Charlotte TRACON, or “CLT” and is shown on **Exhibit 1-4**.
- **Air Route Traffic Control Centers:** Controllers at Air Route Traffic Control Centers (ARTCCs or “Centers”) manage the flow of traffic during the enroute phase of flight. Similar to TRACON airspace, the Center airspace is broken down into sectors managed in a similar manner by individual controllers. As shown on **Exhibit 1-4**, the Charlotte Metroplex is comprised of airspace delegated to the Washington ARTCC (ZDC), Atlanta ARTCC (ZTL), Jacksonville ARTCC (ZJX), Indianapolis ARTCC (ZID) and CLT.

Exhibit 1-4 Airspace in the Charlotte Metroplex Area



Notes:

CLT - Charlotte/Douglas International Airport	EQY - Charlotte-Monroe Executive Airport
GMU - Greenville Downtown Airport	GSO - Piedmont Triad International Airport (Greensboro)
GSP - Greenville Spartanburg International Airport	GYH - Donaldson Center Airport
HKY - Hickory Regional Airport	INT - Smith Reynolds Airport
JQF - Concord Regional Airport	RUQ - Rowan County Airport
SPA - Spartanburg Downtown Memorial Airport	SVH - Statesville Regional Airport
UZA - Rock Hill (York Co) Airport-Bryant Field	CLT - Charlotte TRACON
ZDC - Washington ARTCC	ZTL - Atlanta ARTCC
ZJX - Jacksonville ARTCC	ZID - Indianapolis ARTCC

Sources: U.S. Department of Transportation, Federal Aviation Administration, National Flight Data Center, National Airspace System Resources, Airport, and Runway databases, accessed September 16, 2012 (airspace boundaries); National Atlas of the United States of America (U.S. County and State Boundaries, Water Bodies); Bureau of Transportation Statistics, National Transportation Atlas Database; ATAC Corporation (Study Area Boundary).

Prepared by: ATAC Corporation, August 2014.

The following sections discuss how air traffic controllers at these ATC facilities control the phases of flight for aircraft operating under IFR.

1.2.4.1 Departure Flow

As an aircraft operating under IFR departs a runway and follows its assigned heading, it moves from the ATCT airspace, through the terminal airspace, and into enroute airspace where it proceeds on a specific route to its destination airport.

Within the terminal airspace, TRACON controllers manage aircraft departing from the ATCT airspace to transfer control points referred to as “exit gates.” An exit gate represents an area along the boundary between terminal airspace and enroute airspace. Exit gates are generally established near commonly used routes to better facilitate transfer of aircraft between terminal and enroute airspace. When aircraft pass through the exit gate, control is transferred from TRACON to ARTCC controllers as an aircraft joins a specific route.

Standard Instrument Departures

Departing aircraft operating under IFR use a procedure called a Standard Instrument Departure (SID). A SID provides pilots with defined lateral and vertical guidance to facilitate safe and predictable navigation from an airport through the terminal airspace to a specific route in the enroute airspace. A “conventional” SID follows a route defined by ground-based NAVAIDs, may be based on vectoring, or a combination of both. Because of the increased precision inherent in RNAV technology, an RNAV SID, which uses GPS-based navigation, defines a more predictable route through the airspace than does a conventional SID. Currently, the Study Airports are served by seven RNAV SIDs and six conventional SIDs.

Some RNAV SIDs may be designed to include paths called “runway transitions” that serve particular runways at airports. A SID may have several runway transitions serving one or more runways at one or more airports. From the runway transition, aircraft may follow a common path before being directed along one or several diverging routes referred to as “enroute transitions.” Enroute transitions may terminate at exit fixes or continue into enroute airspace where aircraft join a specific route.

1.2.4.2 Arrival Flow

An aircraft will begin the descent phase of flight within the enroute airspace. During descent, the aircraft will pass into the terminal airspace through an “entry gate,” bound for the destination airport. The entry gate represents a point along the boundary between terminal airspace and enroute airspace where control of the aircraft is passed from ARTCC to TRACON controllers.

Standard Terminal Arrival Routes

Aircraft that arrive within the terminal airspace normally follow an instrument procedure called a Standard Terminal Arrival Route (STAR). Aircraft leaving enroute airspace and entering terminal airspace may follow an enroute transition from an entry fix to the STAR’s common route in the terminal airspace. From the common route segment, aircraft may follow a runway transition before making an approach to the airport. However, not all STARs include enroute or runway transitions. Currently, the Study Airports are served by six RNAV STARs and nine conventional STARs.

1.2.4.3 Required Aircraft Separation

As controllers manage the flow of aircraft into, out of, and within the NAS, they maintain the following separation distances between aircraft:

- **Altitude Separation (vertical):** When operating below 41,000 feet above mean sea level (MSL), two aircraft on separate routes must be at least 1,000 feet above/below each other until lateral separation is ensured.

- **In-Trail Separation (longitudinal):** Within a radar controlled area, the minimum distance between two aircraft on the same route (i.e., in-trail) can be between three to ten miles, depending on factors such as aircraft class, weight, and type of airspace.
- **Side-by-Side Separation (lateral):** Similar to in-trail separation, the minimum side-by-side (left or right side of an aircraft) separation between aircraft must be at least three miles in the terminal airspace and five miles in the enroute airspace.

1.2.5 Next Generation Air Transportation System

The NextGen program is the FAA's long-term plan to modernize the NAS through evolution from a ground-based system of air traffic control to a GPS-based system of air traffic management.¹¹ The OAPM initiative is a key step in the overall process of transitioning to the NextGen system by 2018. Achieving the NextGen ATC system requires implementation of PBN procedures, including RNAV and RNP, which use GPS-based technology, aircraft "auto-pilot", and Flight Management System (FMS)¹² capabilities. RNAV and RNP capabilities are now readily available and PBN can serve as the primary means aircraft use to navigate along a route. Most U.S. scheduled air carriers are equipped to support RNAV and RNP.¹³ The following sections describe PBN procedures in greater detail.

1.2.5.1 RNAV

Exhibit 1-5 compares conventional and RNAV routes. RNAV enables aircraft traveling through terminal and enroute airspace to follow more accurate and better-defined routes in areas covered by GPS-based NAVAIDs. This results in more predictable routes and altitudes that can be pre-planned by the pilot and air traffic control. Predictable routes provide the ability to ensure vertical, longitudinal, and lateral separation between aircraft.

Routes based on ground-based NAVAIDs are often limited by issues such as line-of-sight and signal reception accuracy. NAVAIDs such as VHF Omnidirectional Range (VOR) are affected by variable terrain and other obstructions that can limit their signal accuracy. Consequently, routes dependent upon ground-based NAVAIDS require at least six nautical miles (nm) of clearance on either side of a route's main path to ensure accurate signal reception. As demonstrated by the dashed lines on **Exhibit 1-5**, this clearance requirement increases the farther an aircraft is from the VOR. In comparison, RNAV signal accuracy requires only two nm of clearance on either side of a route's main path.

RNAV routes can mirror conventional routes or by using satellite technology, provide routes within the airspace that were not previously possible with ground-based NAVAIDs.

1.2.5.2 RNP

RNP is an RNAV procedure that is enhanced by the use of onboard performance monitoring and alerting systems. A defining characteristic of an RNP operation is the ability for an RNP-capable aircraft navigation system to monitor the accuracy of its navigation

¹¹ U.S. Department of Transportation, Federal Aviation Administration, Fact Sheet, "NextGen Goal: Performance-Based Navigation," April 24, 2009 [http://www.faa.gov/news/fact_sheets/news_story.cfm?newsId=8768 (accessed April 11, 2012)].

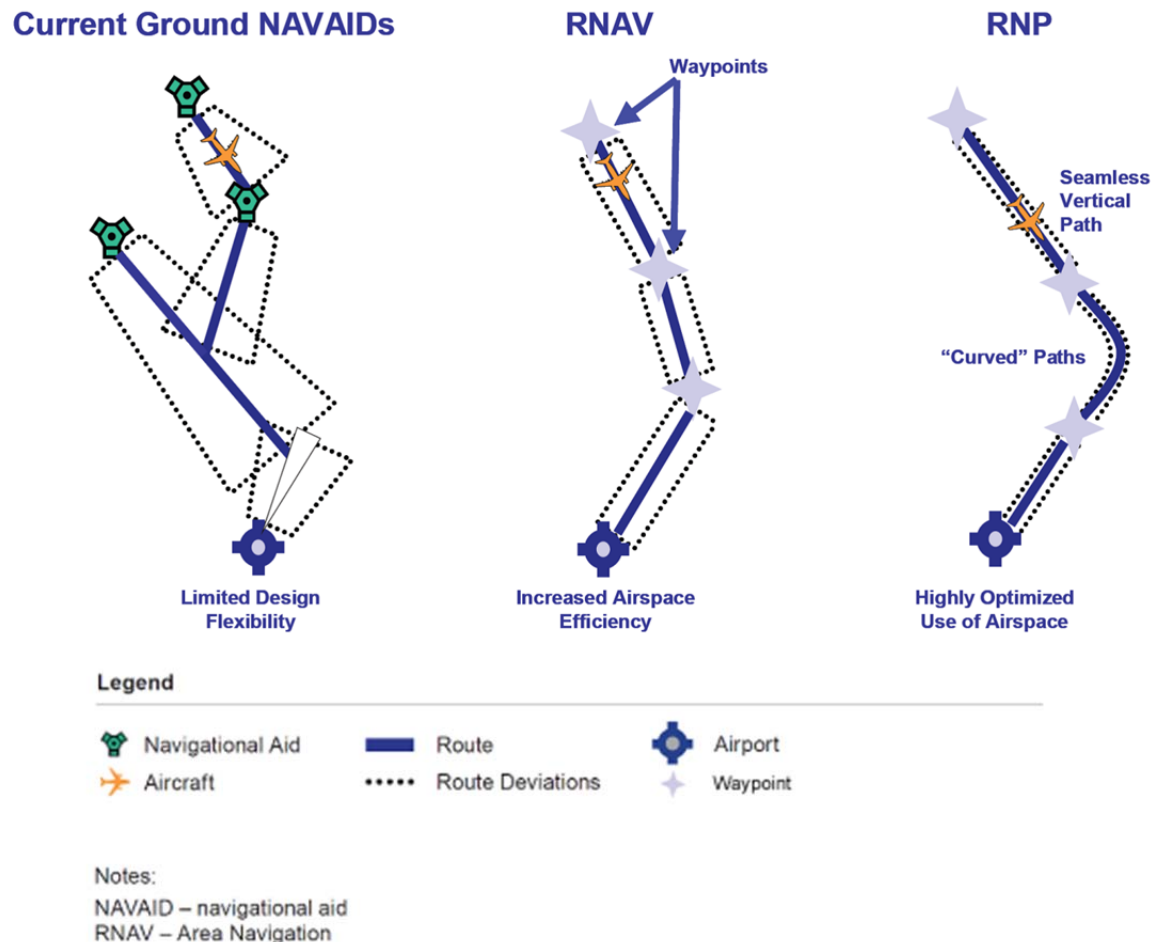
¹² A Flight Management System (FMS) is an onboard computer that uses inputs from various sensors (e.g., GPS and inertial navigation systems) to determine the geographic position of an aircraft and help guide it along its flight path.

¹³ U.S. Department of Transportation, Federal Aviation Administration, *NextGen Implementation Plan-2013*, June 2013, p. 36.

(based on the number of GPS satellite signals available to pinpoint the aircraft location) and inform the crew if the required data becomes unavailable.

Exhibit 1-5 compares conventional, RNAV, and RNP procedures and shows how an RNP capable aircraft navigational system provides a more accurate location (down to less than a mile from the intended path) and will follow a highly predictable path. The enhanced accuracy and predictability makes it possible to implement procedures within controlled airspace that are not always possible under the current air traffic system.

Exhibit 1-5 Navigational Comparison – Conventional/RNAV/RNP

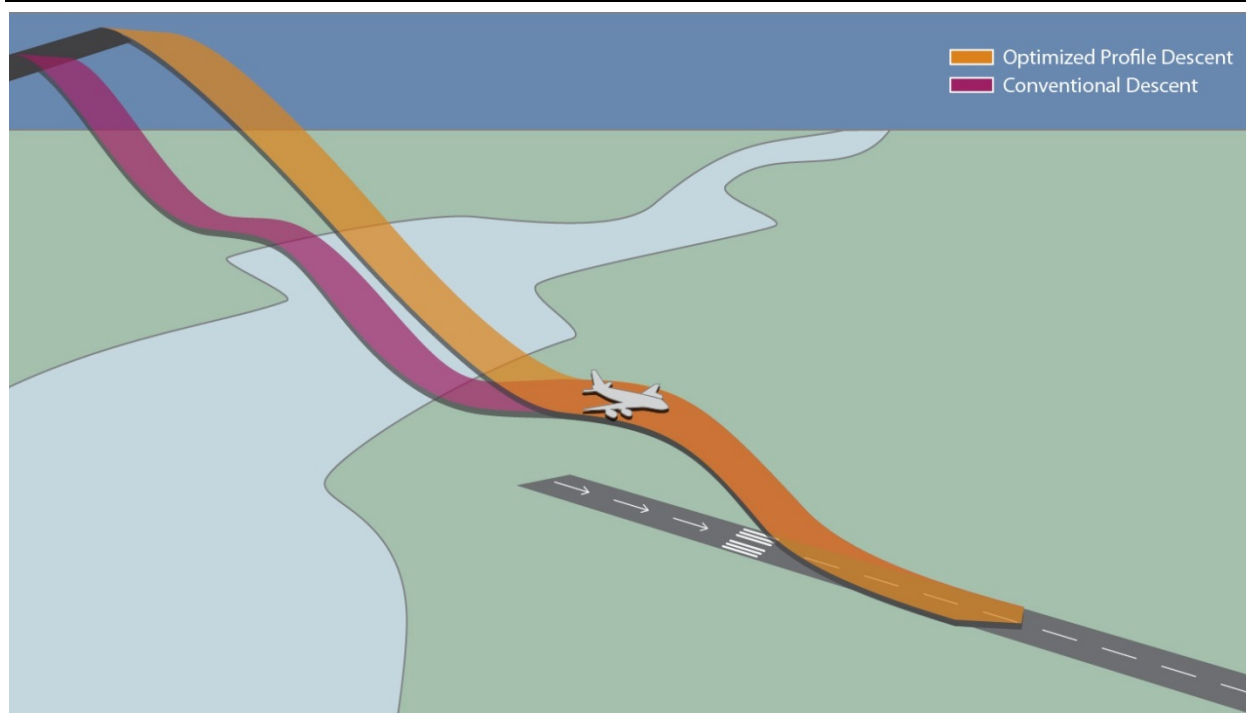


Source: U.S. Department of Transportation, Federal Aviation Administration, "Performance-Based (PBN) Brochure," October 2009.
Prepared by: ATAC Corporation, March 2013.

1.2.5.3 Optimized Profile Descent

An Optimized Profile Descent (OPD) is a flight procedure that allows the aircraft FMS to fly continuously from the top of descent to landing with minimal level-off segments. **Exhibit 1-6** illustrates an OPD procedure compared to a conventional descent. Aircraft that fly OPDs can maintain higher altitudes and lower thrust for longer periods. As level-off segments are eliminated, OPDs reduce the need for communications between controllers and pilots.

Exhibit 1-6 Optimized Profile Descent Compared to a Conventional Descent



Source: ATAC Corporation, December 2012.
Prepared by: ATAC Corporation, October 2013.

1.2.6 The OAPM Initiative

As part of the OAPM initiative, the FAA will design and implement RNAV procedures that take advantage of the technology that is readily available in a majority of commercial service aircraft. The OAPM initiative specifically addresses congestion, airports in close geographical proximity, and other limiting factors that reduce efficiency in busy metroplex airspace. Efficiency is improved by expanding the implementation of RNAV-based standard instrument procedures and connecting the routes defined by the standard instrument procedures to high- and low-altitude RNAV routes. Efficiency is further improved by using RNAV to maximize the use of the limited airspace in congested metroplex environments.

1.3 The Charlotte Metroplex

The following sections describe the airspace structure and existing standard instrument procedures of the Charlotte Metroplex that would be affected by the CLT OAPM Project.

1.3.1 Charlotte Metroplex Airspace

Exhibit 1-4 depicts the airspace structure in the Charlotte Metroplex. The Charlotte Metroplex consists of airspace delegated to CLT, ZDC, ZTL, ZJX, and ZID. Excluding airspace delegated to the ATCTs at controlled airports, CLT controllers currently manage airspace from the surface to 14,000 feet MSL over the Charlotte Metroplex area. CLT airspace is configured as a “four corner-post” airspace design for arrivals to CLT. In a typical four-corner post system, aircraft arrive to the terminal airspace through entry gates to

the northeast, southeast, southwest, and northwest. This provides the most efficient way to transfer aircraft to an airport from an entry gate.

1.3.1.1 Charlotte Metroplex Special Use Airspace

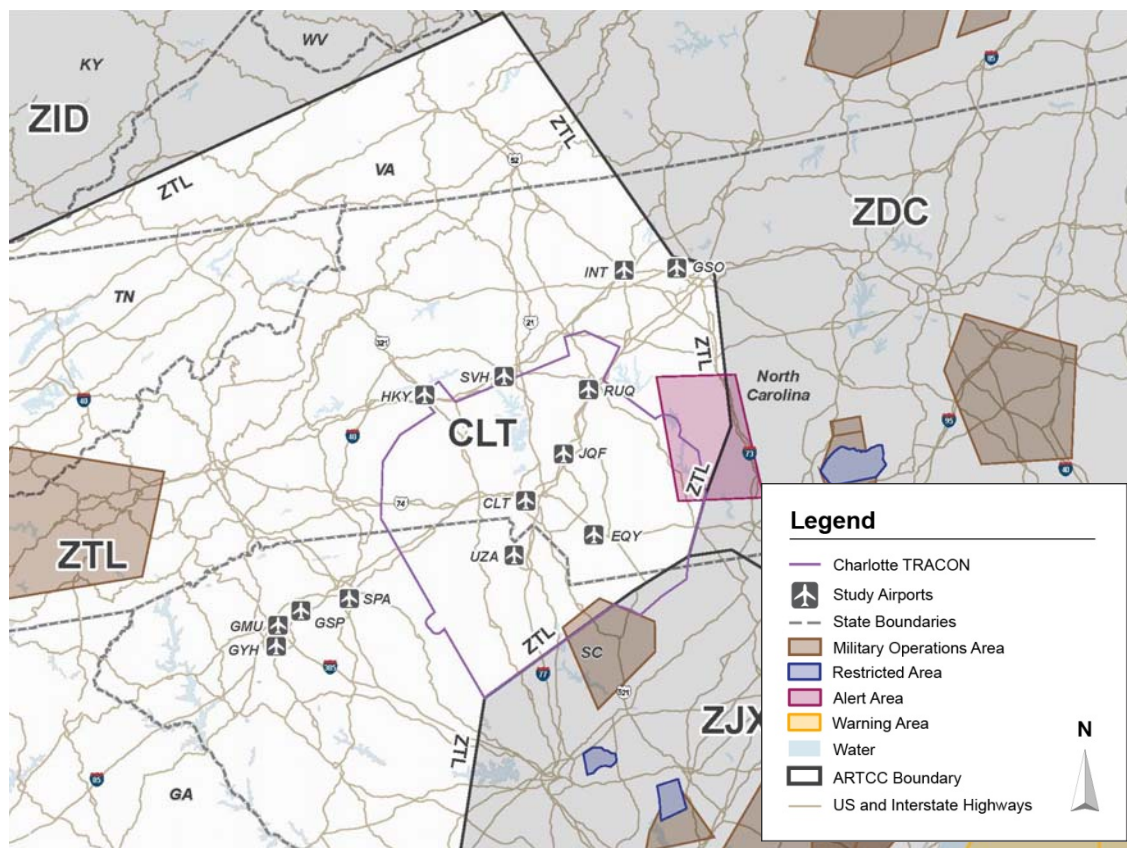
Exhibit 1-7 depicts the boundaries of Special Use Airspace (SUA) in the Charlotte Metroplex. SUA is airspace with defined boundaries in which certain activities such as military flight training and air-to-ground military exercises must be confined. These areas either restrict other aircraft from entering or limit aircraft activity allowed within the airspace. Three types of SUA are found within the Charlotte Metroplex:

- **Restricted Area:** Restricted areas contain airspace identified by an area within which aircraft, while not wholly prohibited, are subject to restrictions when the area is being used. The area denotes the existence of unusual, often invisible hazards to aircraft such as artillery firing, aerial gunnery, or guided missiles. Entering a restricted area without authorization may be extremely hazardous to the aircraft and its occupants. When the area is not being used, control of the airspace is released to the FAA and ATC can use the area for normal operations.
- **Warning Area:** Warning areas are airspace of defined dimensions, extending from three nm outward from the coast of the U.S. in which activity may occur that is hazardous to non-participating aircraft. The purpose of warning areas is to warn pilots of potential danger. A warning area may be located over domestic and/or international waters.
- **Military Operating Area:** Military Operating Areas (MOAs) consist of airspace with defined vertical and lateral limits established for the purpose of separating certain military training activities (e.g., air combat tactics, air intercepts, aerobatics, formation training, and low-altitude tactics) from IFR traffic. Whenever a MOA is being used, nonparticipating IFR traffic may be cleared through a MOA if IFR separation can be provided by ATC. Otherwise, ATC will reroute or restrict nonparticipating IFR traffic.

1.3.2 Current STARs and SIDs

As of October 2014, 31 published STARs and SIDs serve the airports within the CLT Metroplex airspace. Of these, 17 are conventional procedures (nine conventional STARs and eight conventional SIDs) and 14 are RNAV procedures (seven RNAV STARs and seven RNAV SIDs).

Exhibit 1-7 Special Use Airspace



Notes:

CLT - Charlotte/Douglas International Airport
GMU - Greenville Downtown Airport
GSP - Greenville Spartanburg International Airport
HKY - Hickory Regional Airport
JQF - Concord Regional Airport
SPA - Spartanburg Downtown Memorial Airport
UZA - Rock Hill (York Co) Airport-Bryant Field
ZDC - Washington ARTCC
ZJX - Jacksonville ARTCC

EQY - Charlotte-Monroe Executive Airport
GSO - Piedmont Triad International Airport (Greensboro)
GYH - Donaldson Center Airport
INT - Smith Reynolds Airport
RUQ - Rowan County Airport
SVH - Statesville Regional Airport
CLT - Charlotte TRACON
ZTL - Atlanta ARTCC
ZID - Indianapolis ARTCC

Sources: U.S. Department of Transportation, Federal Aviation Administration, National Flight Data Center (NFDC), National Airspace System Resources, Airport, and Runway databases, accessed September 16, 2012 (airspace boundaries); National Atlas of the United States of America (U.S. County and State Boundaries, Water Bodies); Bureau of Transportation Statistics,

Prepared by: ATAC Corporation, August 2014.

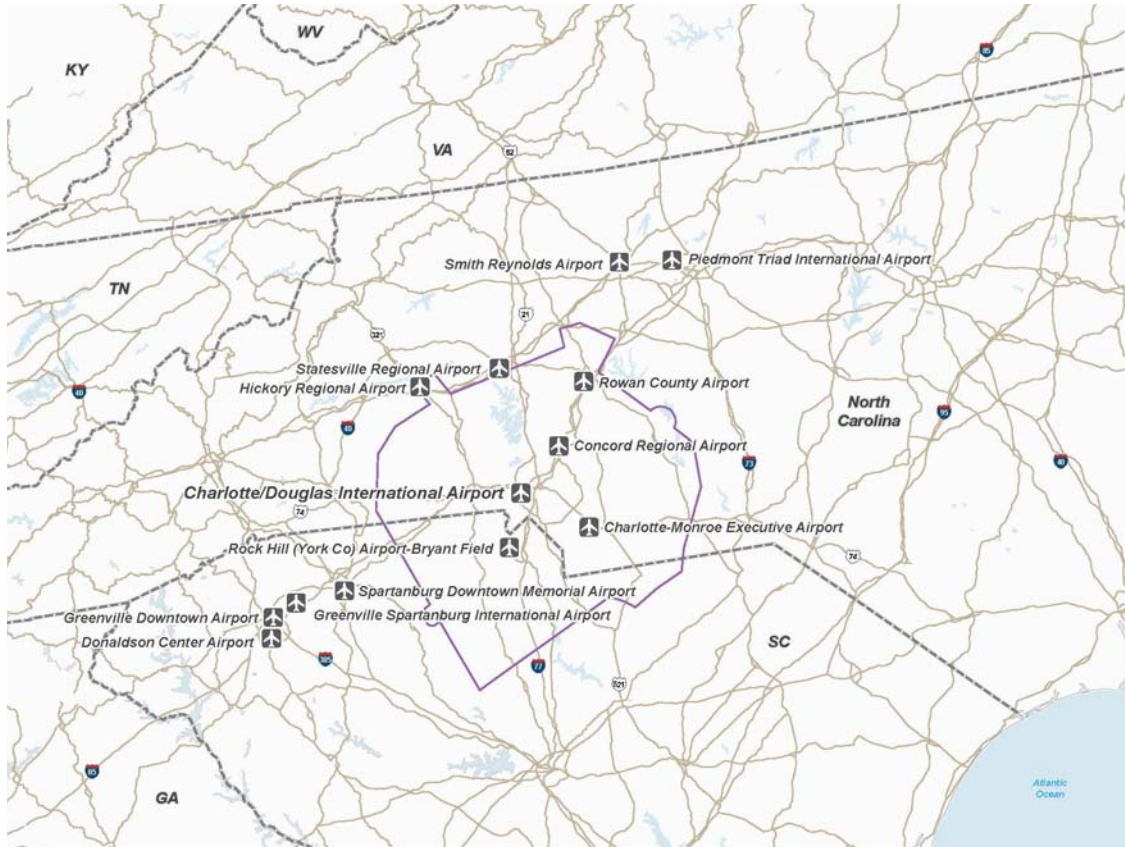
1.4 Charlotte Metroplex Airports

Exhibit 1-8 shows the locations of the CLT OAPM Study Airports. The CLT OAPM Study Airports include one major airport (Charlotte-Douglas International Airport) and 12 satellite airports.

Charlotte-Douglas International Airport (CLT) is classified as a large-hub primary commercial service airport in the National Plan of Integrated Airport Systems (NPIAS). CLT is the primary commercial service airport serving the Charlotte Metroplex area. Accordingly, CLT receives scheduled commercial service and accommodates at least 2.7 percent of total U.S. enplaned passengers. CLT supports a mix of domestic and international passenger airlines, air cargo carriers, and corporate aviation activity. The airport has four runways,

described in Table 1-1. As of October 2014, an aircraft arriving at CLT may be assigned one of five RNAV STARs or one of four conventional STARs. A departing aircraft may be assigned one of seven RNAV SIDs or one of five conventional SIDs.

Exhibit 1-8 Study Airport Locations



Sources: U.S. Department of Transportation, Federal Aviation Administration, National Flight Data Center (NFDC), National Airport, and Runway databases; National Atlas of the United States of America (U.S. County and State Boundaries, Water Bodies); Bureau of Transportation Statistics, National Transportation Atlas Database; ATAC Corporation (Study Area Boundary).

Prepared by: ATAC Corporation, October 2013.

Table 1-1 Charlotte Metroplex EA Study Airports

Airport Name		Airport Code	Location	Runways ^{1/}
Major Airports				
Charlotte-Douglas International Airport		CLT	Charlotte, North Carolina	18C, 36C, 18R, 36L, 18L, 36R, 05, 23
Satellite Airports				
Charlotte-Monroe Executive Airport		EQY	Monroe, North Carolina	05, 23
Greenville Downtown Airport		GMU	Greenville, South Carolina	01, 19, 10, 28
Piedmont Triad International Airport (Greensboro)		GSO	Greensboro, North Carolina	05R, 23L, 05L, 23R, 32, 14
Greenville Spartanburg International Airport		GSP	Greer, South Carolina	04, 22
Donaldson Center Airport		GYH	Greenville, South Carolina	05, 23
Hickory Regional Airport		HKY	Hickory, North Carolina	06, 24, 01, 19
Smith Reynolds Airport		INT	Winston Salem, North Carolina	15, 33, 04, 22
Concord Regional Airport		JQF	Concord, North Carolina	02, 20
Rowan County Airport		RUQ	Salisbury, North Carolina	02, 20
Spartanburg Downtown Memorial Airport		SPA	Spartanburg, South Carolina	05, 23
Statesville Regional Airport		SVH	Statesville, North Carolina	10, 28
Rock Hill (York Co) Airport-Bryant Field		UZA	Rock Hill, South Carolina	02, 20

Notes:

1/

A runway can be used in both directions, but are named in each direction separately. The runway number is based on the magnetic direction of the runway (e.g., Runway 09 points to the east direction). The two numbers on either side always differ by 180 degrees. If there is more than one runway pointing in the same direction, each runway number includes an "L," "C," or "R" at the end. This is based on which side a runway is next to another one in the same direction.

Source: U.S. Department of Transportation, Federal Aviation Administration, Digital Airport/Facility Directory, January 1, 2013 [http://aeronav.faa.gov/index.asp?xml=aeronav/applications/d_afd (accessed August 2014)].

Prepared by: ATAC Corporation, August 2014.

As shown in **Table 1-2**, in 2011, approximately 59 percent of all IFR traffic within the Charlotte Metroplex area operated at the Study Airports.

Table 1-2 2011 IFR Operations at Study Airports in the Charlotte Metroplex

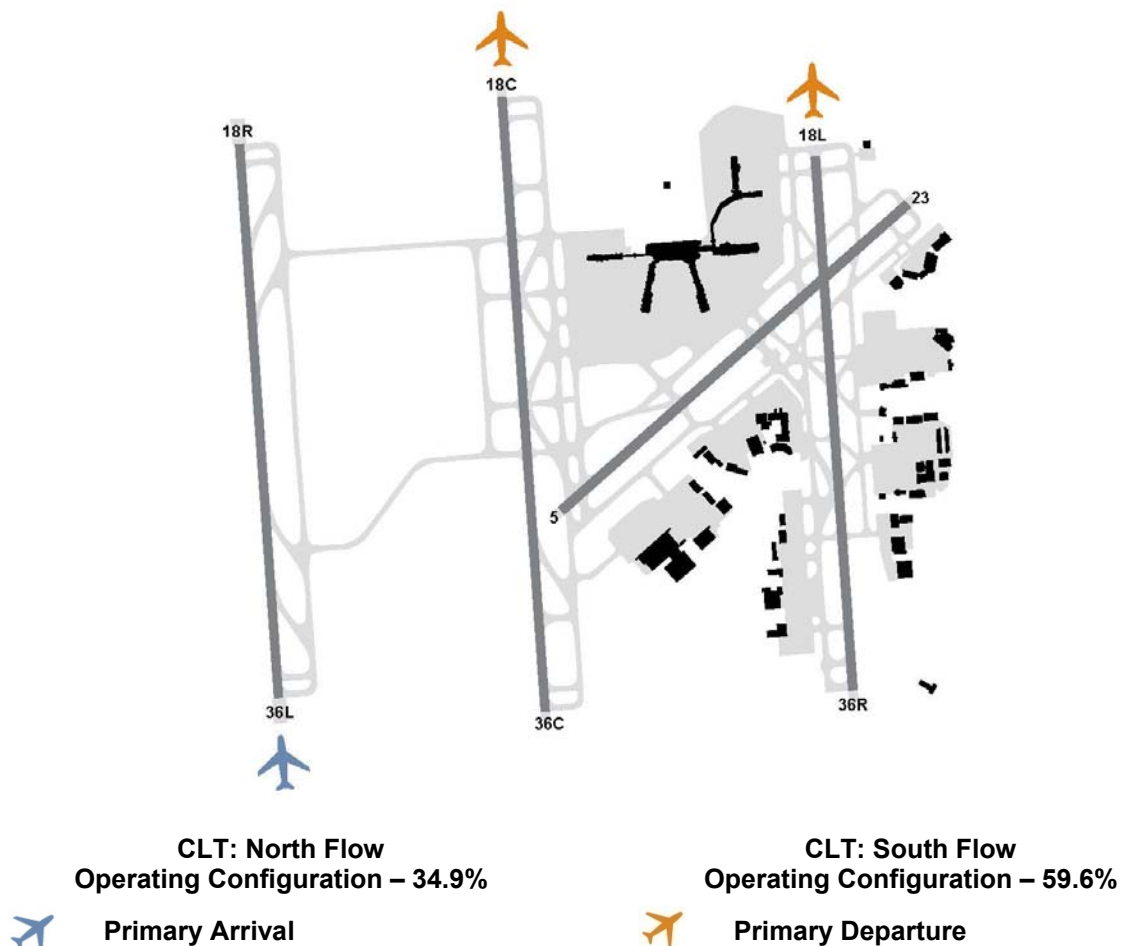
Airport	IFR Operations	Percent of Total Operations
Charlotte-Douglas International Airport	533,947	76.6%
Charlotte-Monroe Executive Airport	--	--
Greenville Downtown Airport	15,500	2.2%
Piedmont Triad International Airport (Greensboro)	67,915	9.7%
Greenville Spartanburg International Airport	44,816	6.4%
Donaldson Center Airport	4,109	0.6%
Hickory Regional Airport	5,412	0.8%
Smith Reynolds Airport	11,163	1.6%
Concord Regional Airport	14,527	2.1%
Rowan County Airport	--	--
Spartanburg Downtown Memorial Airport	--	--
Statesville Regional Airport	--	--
Rock Hill (York Co) Airport-Bryant Field	--	--
Total IFR Operations	697,387	58.7%
Total Metroplex IFR Operations	1,188,674	

Source: U.S. Department of Transportation, Federal Aviation Administration, Operations Network, Tower Counts [<https://aspm.faa.gov/opsnet/sys/Tower.asp> (accessed August 2014)].
Prepared by: ATAC Corporation, August 2014.

1.4.1 Study Airports Runway Operating Configurations

Exhibit 1-9 illustrates the primary runway operating configurations at CLT. CLT represents the major Study Airport for purposes of this EA. CLT often operates under several different runway operating configurations depending on conditions such as weather, prevailing wind, and air traffic conditions. As a result, it is possible for the runway ends used for arrivals and departures to change several times throughout a day. Controllers at these airports generally use two different runway operating configurations, and each runway operating configuration may designate primary and secondary arrival and departure runway ends for each configuration.

Exhibit 1-9 CLT Runway Operating Configurations



Notes: Noise abatement procedures (midnight configuration) represent 5.5% of operations.

Source: U.S. Department of Transportation, Federal Aviation Administration, Airport Diagrams [http://www.faa.gov/airports/runway_safety/diagrams/ (accessed October 2013)]; FAA ASPM (retrieved July 2014).

Prepared By: ATAC Corporation, August 2014.

2 Purpose and Need

Under NEPA, an Environmental Assessment (EA) must describe the purpose and need for the Proposed Action. The following sections discuss the need for the Proposed Action and provide specific examples of the overall problems in the Charlotte Metroplex. This discussion is followed by a description of the purpose for the Proposed Action, the criteria that will be used in this EA to evaluate the project alternatives, and the requested federal actions to facilitate completion of the Charlotte OAPM Project.

2.1 The Need for the CLT OAPM Project

In the context of an EA, the “need” refers to the problem that the Proposed Action is intended to resolve. The problem in this case is the inefficiency of the existing aircraft flight procedures in the Charlotte Metroplex. This inefficiency is due to constrained airspace design that prevents implementation of area navigation (RNAV) STARs with Optimized Profile Descents (OPDs) and lack of available RNAV procedures for CLT and the satellite airports in the Charlotte Metroplex. Efficiency in the Charlotte Metroplex can be substantially increased by updating existing area navigation (RNAV) procedures and supplementing conventional procedures that use older ground-based navigational aid (NAVAID) technology with procedures that employ newer RNAV technology.

Conventional procedures lack efficiencies inherent in RNAV-based procedures because they rely on technology that cannot provide specific navigational benefits for aircraft, including predetermined speeds or altitudes. Furthermore, as discussed in Section 1.2.5.1, conventional procedures are subject to lateral and vertical flight path limitations that are eliminated using RNAV technology. RNAV procedures can reduce the need for controllers to employ air traffic management tools, such as vectoring and speed adjustments, thus reducing controller and pilot workload. In turn, this adds efficiency to an air traffic system by enhancing predictability, flexibility, and route segregation. By taking advantage of the increased benefits associated with readily available RNAV technology, the FAA is better able to meet one of its primary missions as mandated by Congress – to provide for the efficient use of airspace– to develop plans and policy for the use of the navigable airspace, and to assign by regulation or order the use of the airspace necessary to ensure the safety of aircraft and the efficient use of airspace.¹⁴

The following sections describe in greater detail the problem and the factors that have caused the problem. Explanations of the technical terms and concepts used in this chapter are found in Chapter 1, *Background*.

2.1.1 Description of the Problem

As discussed in Chapter 1, the Charlotte Metroplex consists of the airspace and facilities that serve Charlotte Douglas International Airport (CLT) along with associated satellite airports. The principal air traffic control (ATC) facilities serving the Charlotte Metroplex include the Charlotte Terminal Radar Approach Control (CLT TRACON or CLT), Atlanta Air Route Traffic Control Center (ZTL ARTCC or Center), Washington ARTCC (ZDC), Jacksonville ARTCC (ZJX), and Indianapolis ARTCC (ZID). CLT airspace is characterized

¹⁴ 49 U.S.C. § 40103(b).

by a four-corner post design, with arrivals routed over corner posts located to the northwest, northeast, southwest, and southeast. Departures are routed to the north, south, east, and west.

Several key issues have been identified that hinder optimal efficiency in the use of the Charlotte Metroplex airspace. These issues include a current airspace configuration that prevents the implementation of OPDs for arrivals from each corner post. Similarly, departing aircraft experience periods of level-off in both terminal and enroute airspace due to the current airspace configuration. In addition, there are an insufficient number of transitions for existing Standard Terminal Arrival Routes (STARs) and arrivals from the northwest corner-post require greater support. There are also an insufficient number of Standard Instrument Departures (SIDs). The current SIDs are inefficiently designed and require earlier route divergence to increase departure throughput. As a result of these inefficiencies, T-Routes that traverse the Charlotte Metroplex are not being effectively utilized by itinerant¹⁵ aircraft.

The lack of predictability and accuracy that arises as from these issues results in increased controller and pilot workload. For example, controllers must frequently use airspace management tools and coordinating techniques such as issuing radar vectors to guide aircraft to their destinations. To ensure appropriate separation between aircraft along the common route, controllers may be required to employ airspace management tools, such as issuing speed control, vectors, or holding. This can result in more frequent controller-to-pilot and controller-to-controller communication. This increased communication may result in less predictable flight paths due to the time needed for a controller to issue an instruction to a pilot and for a pilot to confirm the instruction prior to execution. As a result, more airspace must be protected to allow aircraft the room to operate. This reduces flexibility in managing aircraft and results in less efficient operations as well as extended flight times. Combined, these factors form the basis for the problem within the Charlotte Metroplex.

It is important to note that a key design constraint is safety. Any proposed change to a procedure to resolve the problem must not compromise safety, and if possible must enhance it. The existing procedures meet FAA safety criteria. The Proposed Action is not being proposed to address any safety issues.

2.1.2 Causal Factors

A problem (or need) is best addressed by examining the circumstances or factors that when combined together result in its cause. For the Charlotte Metroplex, the FAA considers the current configuration of CLT airspace and the inefficiency of the existing SID and STAR procedures to be the primary foundation for the problem. Addressing the causal factors behind the problem will ultimately facilitate development of a reasonable alternative designed to resolve the problem (i.e., meet the “purpose”).

As summarized above, several issues have been identified as causes for the inefficiencies in the Metroplex. For purposes of this EA, these issues were grouped into three key causal factors:

- Lack of predictable standard routes defined by procedures to/from airport runways to/from en route airspace;

¹⁵ Itinerant aircraft are aircraft that arrive and depart to an airport from outside the airport area.

- Complex converging interactions between arrival and departure flight paths; and,
- Lack of flexibility in the efficient transfer of traffic between the enroute and terminal area airspace.

These three causal factors are discussed in the following sections.

2.1.2.1 Lack of Predictable Standard Routes Defined by Procedures to/from Airport Runways to/from Enroute Airspace

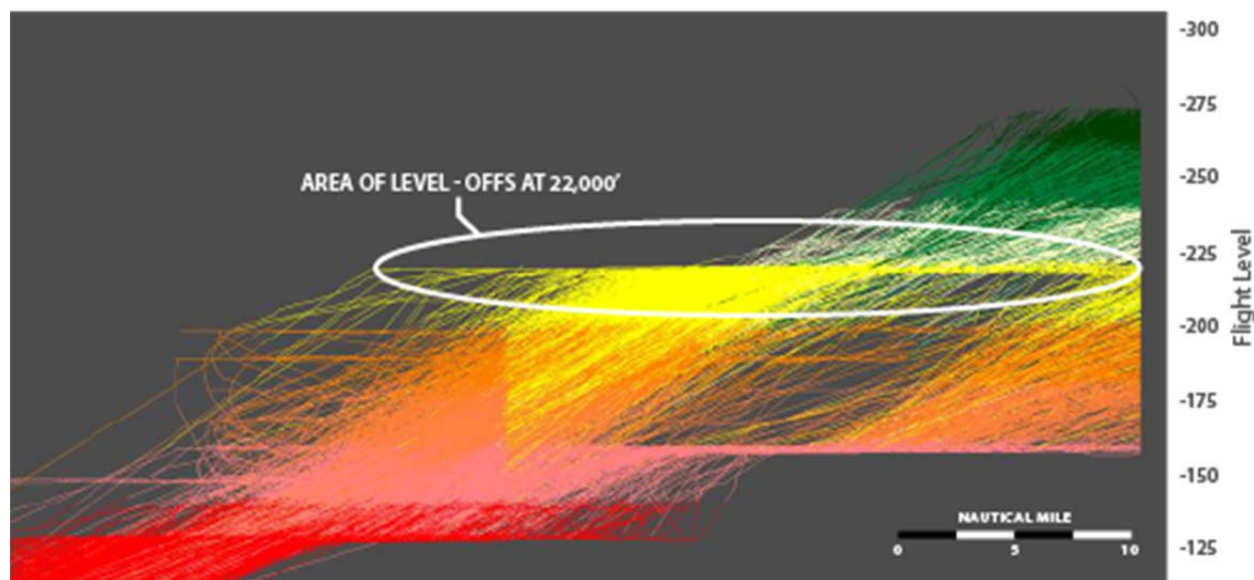
Predictable, defined routes provide pilots and controllers the ability to know ahead of time how, where, and when an aircraft should be operated. This allows for better planning of airspace use and aircraft control within a given volume of airspace. A predictable route may include expected locations (i.e., where), altitudes (i.e., where and how high), and speeds (i.e., how fast and when) at key points along a flight path. A procedure that provides these elements results in more predictable routes for both pilots and controllers. There are currently several factors that reduce the predictability of operating within the Charlotte Metroplex, including inefficient vertical paths for aircraft arriving to terminal airspace, inefficient RNAV SID design, and limited use of T-Routes. The following sections describe these factors and how they reduce predictable air traffic management.

Vertical Path

In guiding aircraft along their routes, controllers direct aircraft to climb, descend, or level off. During climb, the point when an aircraft reaches an assigned altitude may vary depending upon a combination of factors, including aircraft performance, weather conditions, and/or piloting technique. Aircraft arriving to or departing from the Study Airports are often required to level off during descent or climb to maintain adequate vertical separation from other aircraft travelling nearby. Flight time and distance can be increased for traffic flows with interrupted climbs and descents as the aircraft exit/enter the terminal airspace or transition to/from the runway approach environment. Unpredictable vertical guidance resulting from conflicting traffic can lead to increased controller workload and inefficient aircraft operation.

Exhibit 2-1 shows the vertical arrival flow profile for traffic arriving to CLT from the northeast on the SUDSY STAR. To avoid ZTL high altitude sectors, aircraft on the SUDSY STAR must descend to 22,000' (Flight Level [FL] 220) once over the MAYOS intersection. This reflects a typical pattern experienced by traffic arriving over all four corner posts. Level-offs during descent requires application of thrust for aircraft set up to land (e.g., flaps extended) to maintain approach speeds and altitude. This results in increased flight time and distance. Unpredictable vertical guidance resulting from avoidance of neighboring airspace sectors also leads to increased ATC controller workload.

Exhibit 2-1 Vertical Arrival Flow Profile Example (SUDSY STAR)



Source: ATAC (PDARS radar data), October 2014.

Prepared by: ATAC Corporation, October 2014.

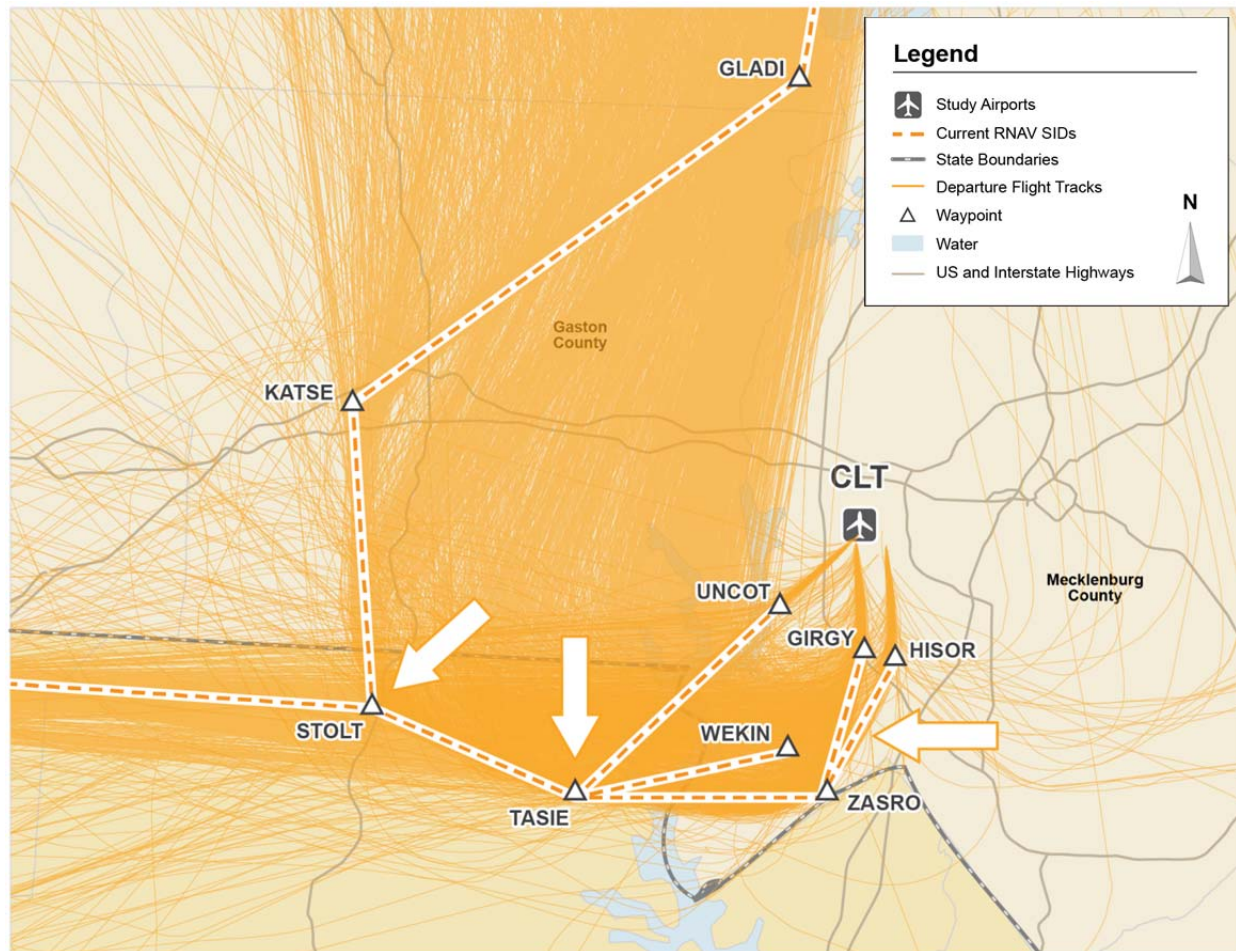
There are also routes and areas of crossing aircraft in the Charlotte Metroplex that require climbing aircraft to level-off in order to accommodate aircraft above them in a route crossing situation. For example, aircraft departing CLT are frequently directed to level-off at 8,000 feet above mean sea level (MSL) to avoid overhead arrival traffic crossing at 9,000 feet MSL. In these instances, aircraft efficiency suffers and the level-off typically leads to the aircraft taking longer to reach the enroute altitude and exit the terminal airspace.

Extended level-offs often result in increased controller-to-pilot communication and may require traffic alerts to pilots of the proximity of other aircraft or point-outs to other controllers responsible for neighboring airspace sectors. This adds to complexity (e.g., higher controller workload, the number of times controller-to-pilot communication occurs, and inefficient use of aircraft performance capabilities during a descent or climb.) This results in less predictable routes and reduced airspace efficiency.

Ground Path

The RNAV SIDs that are available in the Charlotte Metroplex provide routes that are inefficiently designed. Operations on these procedures provide an example of inaccurate ground path. The ground path is the track, or trace, along the surface of the earth directly below an aircraft that represents where it is flying. **Exhibit 2-2** shows how aircraft using multiple RNAV SID routes currently follow an extended common path prior to course divergence. Because of the shared common path, in-trail spacing, or the distance between aircraft over the route, must be increased to allow for greater separation between subsequent departures. The increased use of airspace management tools results in more frequent controller-to-pilot and controller-to-controller communication, increasing controller and pilot workload and reducing predictability.

Exhibit 2-2 Common Path and Course Divergence – ZAVER, DEBIE, and JACAL RNAV SIDs



Source: ATAC (PDARS radar data), October 2014.
Prepared by: ATAC Corporation, October 2014.

In addition, some RNAV SID routes incorporate unnecessary sharp angles (doglegs) which could be avoided by routing aircraft directly to exit fixes. The current route design also results in an increase in flight distance and time.

Rarely Used T-Routes

T-Routes are low-altitude RNAV routes established to allow aircraft to navigate through and around busy terminal airspace without requiring ATC to issue vectors to avoid potential conflicting operations. Four T-Routes (T-200 and T-202, oriented east-to-west and T-201 and T-203 oriented north-to-south) traverse CLT airspace; however, aircraft are rarely assigned to these routes most likely due to their close proximity with congested CLT airspace. Additionally, the high Minimum En Route Altitude (MEA) on T-200 through CLT airspace limits its practicality. Inefficient use of T-Routes by aircraft traversing CLT airspace leads to increased congestion and decreased predictability.

2.1.2.2 Complex Converging Interactions between Arrival and Departure Flight Paths

In some areas, the separation between arrival and departure flight routes (e.g., lateral separation between two routes or vertical separation between crossing routes) does not allow for fully efficient use of airspace. This requires that controllers carefully observe aircraft activity along the proximate or crossing flight routes and be prepared to manage aircraft to maintain safe separation distances.¹⁶ For example, where arrival and departure flight routes intersect, flight level-offs may be required for either arrivals or departures to ensure adequate vertical separation between aircraft. In some cases, arriving and departing aircraft on nearby flight routes may need to be vectored to ensure safe lateral separation. In other cases, controllers may need to issue point-outs.

All of the actions described above require verbal controller-to-controller and/or controller-to-pilot communication. This increases pilot and controller workload and system complexity. In addition, vectoring and level-offs can reduce airspace and flight efficiency by adding time and distance to flights as aircraft enter/exit terminal airspace.

The following sections provide specific examples of how these interactions function within the Charlotte Metroplex.

Multiple Transitions

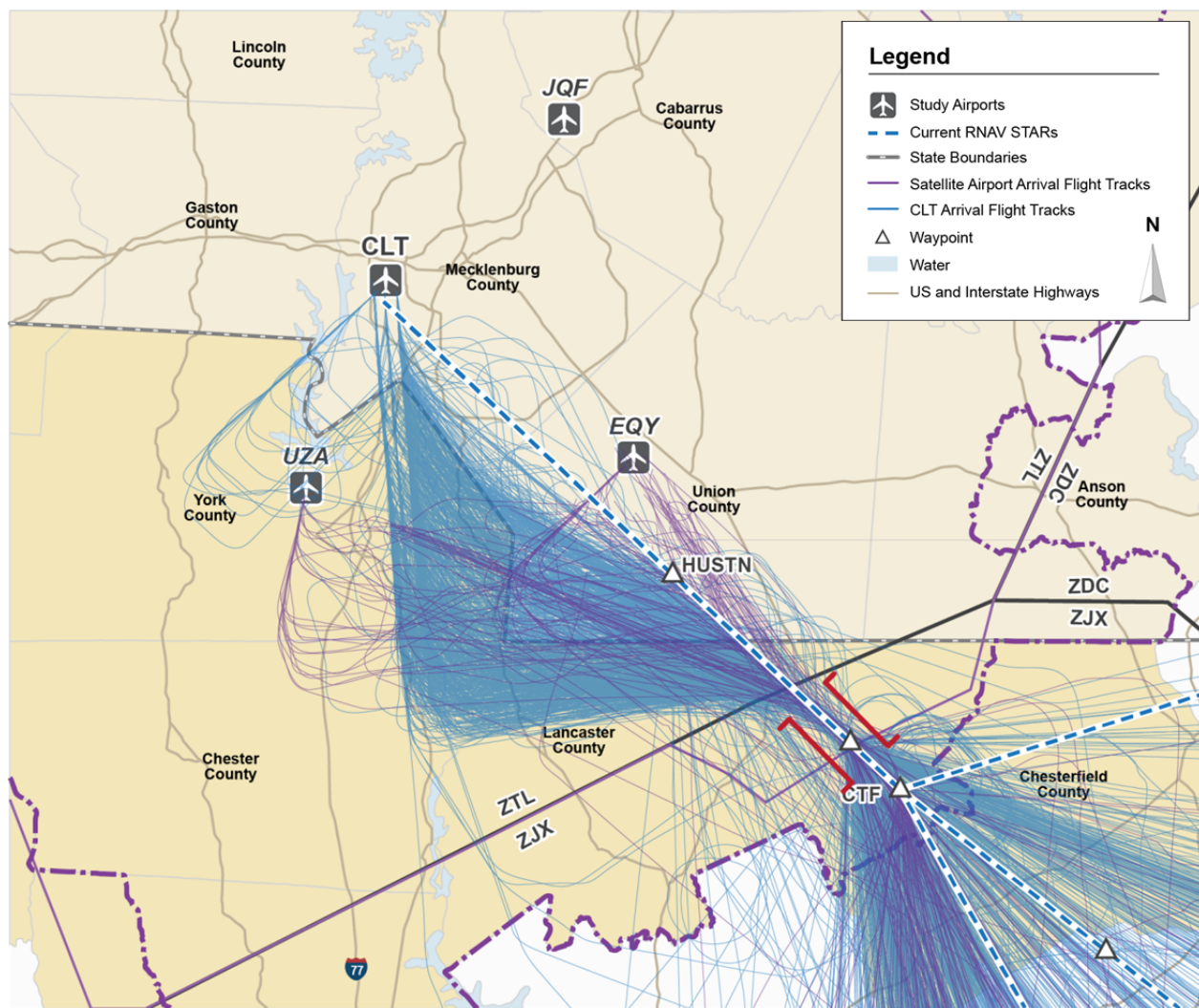
Although aircraft are routinely assigned to different runways, arrivals to CLT must be merged from several streams into a single arrival flow over the corner posts at the CLT boundary. This can result in delays due to the need to maintain appropriate in-trail separation between aircraft. Furthermore, different weather conditions that affect multiple routes can increase spacing needed between aircraft travelling at dissimilar speeds. Due to arrival demand during peak periods, delay vectors are issued to arrivals in enroute airspace. These factors can lead to delays and increased flight time and distance. Letters of Agreement (LOA) between airports, the TRACON, and the Centers and airspace limitations negate the ability to deliver more than one aircraft at a time over a fix.

Satellite Airports

Overall system efficiency has been decreased as a result of current interactions between CLT and satellite airport traffic. For example, as shown on **Exhibit 2-3**, arrival traffic to CLT and certain satellite airports is currently sequenced together on the HUSTN RNAV and Chesterfield (CTF) conventional STARs. Because of the complexity associated with sequencing aircraft destined for different airports along the same route, controller workload is increased, as is the potential for possible delays for arrivals to CLT and the satellite airports.

¹⁶ Areas where the lateral or vertical separation distances are inadequate to allow efficient use of the airspace are referred to as "confliction points" by air traffic controllers.

Exhibit 2-3 CLT and Satellite Airport Arrivals – HUSTN and CTF STARS



Source: ATAC (PDARS radar data), October 2014.
Prepared by: ATAC Corporation, October 2014.

In addition, southbound departures from CLT fly head on with aircraft arriving from the south to Hickory Regional Airport (HKY) and Statesville Regional Airport (SVH). This leads to an increase in controller and pilot workload as a result of necessary vectoring and aircraft level-offs necessary to avoid conflict.

Other interactions observed between CLT and satellite airport operations that result in a decrease in efficiency include:

- Northwest arrivals to Columbia Metropolitan Airport (CAE) and southwest arrivals to CLT;
- Northbound and eastbound departures from CAE and southwest and southeast arrivals to CLT and southbound departures from CLT;
- Southwest arrivals to Greenville Spartanburg International Airport (GSP) and southwest arrivals to CLT;

- Northeast arrivals to GSP and departures and northwest arrivals to CLT;
- Northwest arrivals to GSP and northwest arrivals to CLT;
- Westbound departures from Raleigh-Durham International Airport (RDU) and northeast arrivals to CLT and arrivals to GSP; and,
- Southbound and eastbound departures from Piedmont Triad International Airport (GSO) and northeast arrivals to CLT.

Conflicting Military Activity

Aerial refueling of military aircraft operating from Charleston Air Force Base occurs along a flight track (AR600) that can affect aircraft arriving to CLT from the southeast on the HUSTON/CTF STARs. When refueling operations are in effect, these arriving aircraft must either begin to descend prior to the NAVEE fix or use vectors to avoid military aircraft. This can result in increased flight time and distance and increased workload for controllers and pilots.

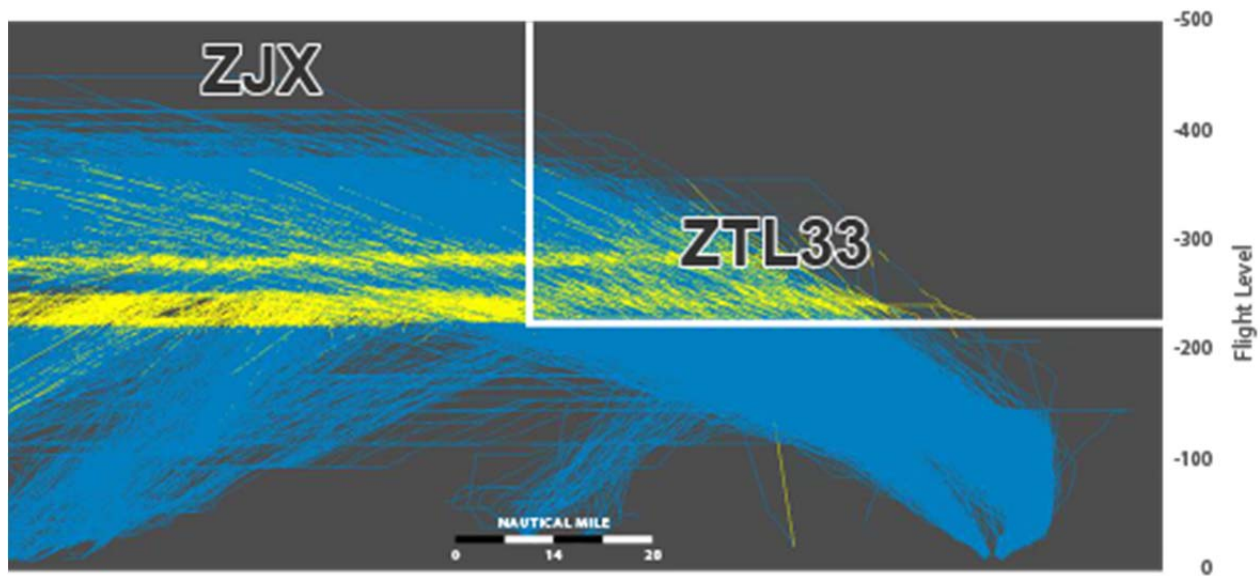
2.1.2.3 Lack of Flexibility in the Efficient Transfer of Traffic between the Enroute and Terminal Area Airspace

Lack of flexibility limits air traffic controllers' ability to adapt to oft-changing traffic demands. For example, although flights are scheduled, delays in other regions or severe weather along an air traffic route may cause aircraft to enter/exit the enroute or terminal area airspace at times and locations other than those previously planned. Controllers require options to manage traffic when faced with these kinds of demands. Elements such as constrained airspace design, a lack of adequate runway transitions for existing STARs, available RNAV SIDs for departing aircraft, and the rerouting of aircraft during Ground Delay Programs are all factors identified as negatively affecting airspace flexibility within the CLT Metroplex. The following sections discuss each of these issues in greater detail.

Airspace Configuration

Airspace configuration in the Charlotte Metroplex presents challenges to departing and arriving aircraft. Aircraft are often directed to interrupt climbs and descents to avoid interacting with adjacent airspace sectors. For example, because of the stratification of ZTL and ZJX airspace, aircraft departing CLT to the south during north flow conditions must frequently level-off at 23,000' and/or 27,000' (FL 230 and/or 270) until they are within the lateral boundaries of the ZJX66 airspace sector or unless they can achieve coordination with the controller responsible for the ZTL33 airspace sector that would allow passage through ZTL airspace. **Exhibit 2-4** shows areas of level-off in yellow and depicts how aircraft avoid ZTL airspace.

Exhibit 2-4 Departure Level Offs in Enroute Airspace



Source: ATAC (PDARS radar data), October 2014.
Prepared by: ATAC Corporation, October 2014.

Similarly, unless coordination can be achieved with the controller responsible for the ZTL30 airspace sector, aircraft departing from CLT to the north using the JACAL SID are frequently directed to level-off at 14,000' (or FL140) until they are within the lateral boundaries of the ZTL47 airspace sector. This lack of flexibility results in extended flight time and distance travelled as well as increased controller and pilot workload.

Runway Transitions

As discussed in Section 1.4.2, airports such as CLT use different runway operating configurations based on factors such as weather, prevailing wind, and the type and amount of air traffic. At an airport with a high level of traffic, especially during peak periods, the availability of STARs serving each runway can increase efficiency. STARs with one or multiple runway transition routes (routes that guide an aircraft to an airport final approach that typically ends at an Initial Approach Fix) enhance efficiency by minimizing the need for controller-to-pilot communication when an aircraft moves from enroute to terminal airspace.

Currently, RNAV STARs serving CLT are designed with a single downwind approach to the Airport. As a result, controllers at CLT are routinely required to vector aircraft to runways other than the primary runway to ensure that arrival traffic is efficiently balanced across runways. The lack of published runway transitions results in increased controller and pilot workload.

Rerouting Arriving Aircraft

During periods of inclement weather or heavy traffic congestion, ATC may implement a ground delay program (GDP) to reduce the volume of aircraft arriving to an airport. The purpose of the GDP is to avoid exceeding the airport's capacity to accommodate arriving aircraft. Typically, this is accomplished by holding aircraft on the ground at their origin airports until arrival volumes at the affected destination airport can be brought down to an acceptable level. To avoid delaying aircraft bound for CLT, some aircraft routed to arrive from the northeast using the SUDSY STAR are being rerouted to arrive from the southeast

using the HUSTN STAR. While rerouting aircraft can reduce the need to hold aircraft on the ground or for controllers to issue delay vectors, once departed from their origin airports, aircraft arriving from the northeast on the HUSTIN STAR are not able to reroute to the SUDSY STAR for arrival to CLT. This results in extended flight times and distance.

Lack of RNAV SIDs

There are not enough RNAV SIDs serving CLT. The lack of SIDs reduces efficiency for aircraft and increases delays by decreasing the rate at which aircraft can depart terminal airspace and increasing inter-departure times.

2.2 Purpose of the CLT OAPM Project

The purpose (solution) of the Proposed Action is to address the problems described in the previous sections by improving the efficient use of the navigable airspace within the Charlotte Metroplex. To meet this goal, the Proposed Action would optimize procedures serving the Study Airports, while maintaining or enhancing safety, in accordance with FAA's mandate under federal law. Specifically, the objectives of the Proposed Action are as follows:

- Improve predictability in transitioning traffic between enroute and terminal area airspace;
- Improve the segregation of arrivals and departures in the airspace; and,
- Improve flexibility in transitioning traffic between enroute and terminal area airspace and between terminal area airspace and the runways.

The frequency of controller-to-pilot communication would be expected to decrease reducing the complexity of both controller and pilot workload. Improvements in arrival and departure segregation among the Study Airports would reduce the need for vectoring and level flight segments, resulting in more predictable flows.

Each objective of the Proposed Action is discussed in greater detail below.

2.2.1 Improve Predictability in Transitioning Traffic between Enroute and Terminal Area Airspace

As discussed in Section 2.1.2.2, current procedures in the Charlotte Metroplex are inefficiently designed. The use of optimized descent and climb profiles is restrained by the current configuration of the airspace. Current SIDs are inefficiently designed and lack sufficient course divergence. Finally, RNAV T-Routes that traverse the Charlotte Metroplex are insufficiently used. The objective of the Proposed Action is to improve predictability by optimizing the efficient transfer of traffic between terminal and enroute airspace. This objective can be measured with the following criteria:

- Increase the number of RNAV procedures with altitude controls intended to optimize descent or climb patterns (measured by the count of procedures with altitude controls.)
- Increase the number of RNAV procedures with runway transitions routes to designated runways and enroute transitions (measured by the count of runway and enroute transitions.)

2.2.2 Improve the Segregation of Arrivals and Departures in Terminal Area and Enroute Airspace

As discussed in Section 2.1.2.2, in some portions of the airspace, arrival and departure routes cross, converge, or are within close proximity of each other. This requires controllers to manage the traffic to ensure that adequate separation between aircraft is maintained. RNAV procedures can be designed with capabilities such as speed control and altitude restrictions that maintain segregation of aircraft while reducing the complexity of controller and pilot workload. One objective of the Proposed Action is to implement procedures that would achieve better segregation of arrivals and departures within the airspace. This objective can be measured with the following criterion:

- Segregate Study Airport traffic (measured by the count of RNAV SIDs and/or STARs to/from Study Airports.)

2.2.3 Improve Flexibility in Transitioning Traffic between Enroute and Terminal Area Airspace and between Terminal Area Airspace and the Runways

As discussed in Section 2.1.2.3, the current airspace configuration prevents implementation of OPDs. The efficiency of the air traffic routes in the terminal airspace is further constrained by the lack of runway transitions for arriving aircraft traffic, rerouted arrivals due to GDPs, and a lack of sufficient SIDs. The objective of the Proposed Action is to improve the flexibility in transitioning traffic between enroute and terminal area airspace and between terminal area airspace area and the runways. This objective can be measured with the following criteria:

- Implement RNAV STARs with OPDs.
- Increase the number of enroute and runway transitions (measured by count of enroute and runway transitions for all SID and STAR procedures.)
- Segregate CLT traffic from satellite Study Airport traffic to/from Study Airports by increasing the number of STARs and/or SIDs to/from Study Airports.

2.3 Criteria Application

The Proposed Action is evaluated to determine how well it meets the purpose and need based on the measurable criteria and objectives described above. The evaluation of alternatives will include the No Action Alternative, under which the existing (2011) air traffic procedures serving the Study Airports would remain unchanged except for planned procedure modifications that were approved for implementation. The criteria are intended to aid in comparing the Proposed Action with the No Action Alternative.

2.4 Description of the Proposed Action

The Proposed Action considered in this EA would implement optimized RNAV SID and STAR procedures in the Charlotte Metroplex. This would improve the predictability and segregation of routes, as well as increase flexibility in the management of air traffic. The Proposed Action is described in detail in Chapter 3, *Alternatives*.

Implementation of the Proposed Action would not result in an increase in the number of aircraft operations at the Study Airports. Furthermore, the Proposed Action does not involve physical construction of any facilities such as additional runways or taxiways, and does not require permitting or other approvals or actions on a state or local level. Therefore, the implementation of the proposed changes to procedures in the Charlotte Metroplex would not require any physical alterations to environmental resources identified in Appendix A to FAA Order 1050.1E, Chg.1.

2.5 Required Federal Actions to Implement Proposed Action

Implementation of the Proposed Action requires the FAA to publish new or revised STARs and SIDs.

2.6 Agency and Tribal Coordination

On June 11, 2014, the FAA distributed an early notification letter to 356 federal, state, regional, and local officials as well as to three tribes. As detailed under 40 C.F.R. 1501.2 and 1501.7, the FAA sent the early notification letter to provide notice of the initiation of the EA; to request background information related to the EA study area; and to gain an understanding of issues, concern, policies, and/or regulations that may affect the environmental analysis. The FAA sent the early notification letter to serve the following purposes:

1. To advise agencies and tribes of the initiation of the EA study
2. To request background information regarding the study area established for the EA
3. To provide an opportunity to advise the FAA of any issues, concerns, policies or regulations regarding the environmental analysis that will be undertaken in the EA

Appendix A, *Agency Coordination, Public Involvement, and List of Receiving Parties*, includes a copy of the early notification letter (and attachments), a list of the receiving agencies and tribes, as well as correspondence received in response to the early notification letter.

3 Alternatives

The alternatives analysis was conducted pursuant to Council on Environmental Quality (CEQ) regulations and Federal Aviation Administration (FAA) guidance provided in FAA Order 1050.1E, Chg. 1, *Environmental Impacts: Policies and Procedures* (FAA Order 1050.1E). This chapter discusses the following topics:

- Alternative Development Process
- Alternatives Overview
- Comparison of Alternatives
- Listing of Federal Laws and Regulations

The technical terms and concepts discussed in this chapter are explained in Chapter 1, *Background*.

3.1 Alternative Development Process

The development of an alternative for the Charlotte Optimization of Airspace and Procedures in the Metroplex (CLT OAPM) Project was a multi-step process that began with the formation of the Charlotte Study Team (Study Team). The Study Team defined operational issues in the Charlotte Metroplex and recommended conceptual designs for procedures that would address these issues.¹⁷ The recommended procedures were then given to the CLT OAPM Design and Implementation (D&I) Team. The D&I Team designed individual procedures based on the Study Team's recommendations. Each procedure designed by the D&I Team was required to meet several design criteria as well as the Project Purpose and Need. As discussed in Chapter 2, the purpose of and need for the Proposed Action is to address existing inefficiencies with the current configuration of CLT airspace and Charlotte Metroplex Standard Instrument Departure (SID) and Standard Terminal Arrival Route (STAR) procedures. The FAA rejected individual procedures if, on their own merit, they did not meet the Purpose and Need.

For purposes of the CLT OAPM Project, the Proposed Action alternative evaluated in this Environmental Assessment (EA) is a package that includes several individual air traffic procedures that when combined form one alternative. This group of procedures was considered and evaluated in combination with one another to determine whether the alternative may meet the Project's Purpose and Need. The FAA considered multiple versions of each air traffic procedure before reaching a proposed final design. Several versions were not carried forward because they failed to meet the objectives established to meet the purpose of the Project.

The following sections describe the alternative development process the FAA used to create a series of procedures that when employed together would add efficiency to the Charlotte Metroplex.

¹⁷ CLT OAPM Metroplex Study Team Final Report, May 2011.

3.1.1 CLT OAPM Study Team

In February 2011, the CLT OAPM Study Team began work to define operational problems in the Charlotte Metroplex and identify potential solutions. The Study Team included experts on the Air Traffic Control (ATC) system for the Charlotte Metroplex. The Study Team's work was completed following a multi-step process that included identifying and characterizing existing issues, proposing conceptual designs and airspace changes to address these issues, and identifying the expected benefits and risks of the conceptual designs.

The Study Team held a series of outreach meetings with local facilities (e.g., air traffic control [ATC]), airspace users (e.g., pilots), and aviation industry representatives to learn more about the challenges of operating in the Charlotte Metroplex. These meetings helped identify operational challenges associated with existing procedures and potential solutions that would increase efficiency in the Charlotte Metroplex airspace.

The Study Team identified several Performance-based Navigation (PBN) solutions that could result in increased efficiency in the Charlotte Metroplex. The modifications proposed were conceptual in nature, and did not include a detailed technical assessment, which was reserved for the D&I Team to conduct.¹⁸

3.1.2 CLT OAPM Design and Implementation Team

Following completion of the Study Team's Final Report in May 2011, the D&I Team began work on the procedure designs. First, the Study Team proposals were prioritized based on complexity, interdependencies with other procedures, and degree of potential benefit to the Metroplex. Second, the D&I Team divided into workgroups to further develop and refine the Study Team proposals into preliminary designs. Finally, the preliminary designs were brought to the whole D&I Team for review and modification, if necessary. In developing the proposed procedures, the D&I Team was responsible for following regulatory and technical guidance, as well as meeting criteria and standards in three general categories:

1. **RNAV Design Criteria and Air Traffic Control Regulatory Requirements** – Flight procedure design is subject to requirements found in several FAA Orders, including FAA Order 7100.9D, *Standard Terminal Arrival Program and Procedures*; FAA Order 8260.43A, *Flight Procedures Management Program*; and FAA Order JO 7110.65U, *Air Traffic Control*. The *Guidelines for Implementing Terminal RNAV Procedures*, to be followed in conjunction with the requirements of FAA Order 8260.43A, includes an "18-Step Process" for developing, reviewing, and implementing RNAV procedures. In addition, FAA Order JO 7110.65U includes requirements governing air traffic control procedures, air traffic management, and appropriate technical terminology.
2. **Operational Criteria** – Operational criteria were consistent with the Purpose and Need for the Project. This includes increasing efficiency and flexibility, and decreasing complexity in air traffic management. These criteria were measured for all procedures using a full motion simulator, a stationary simulator, and/or flight training devices. These criteria were also measured for many procedures using real time Human-In-The-Loop Simulations (HITLs). These simulations

¹⁸ Id.

further validated that operations in the Charlotte Metroplex would not be limited by the proposed procedures. The D&I Team also evaluated each of the procedure designs with full motion aircraft simulators. The simulations helped ensure that aircraft could fly the procedure as designed and that efficiency (e.g., pilot workload) would not be limited by the proposed procedures.

3. **Safety Factors** – Procedures were subject to evaluation using the FAA's Air Traffic Organization's (ATO's) Safety Management System (SMS). The SMS is the ATO's system for managing the safety of ATC and navigation services in the National Airspace System (NAS). In compliance with SMS requirements, the procedures were evaluated by a Safety Risk Management Panel (SRMP) following a five-step process: 1) describe the system; 2) identify the hazards in the system; 3) analyze the risks; 4) assess the risk; and, 5) treat the risk. If a procedure introduced a new hazard or increased the severity and/or likelihood of an existing hazard that is being mitigated, the design was adjusted to reduce the hazard to acceptable levels.

To ensure that procedures included in the Proposed Action were viable, the D&I team undertook validation exercises that further refined the procedures. Over a multi-month period, the D&I Team worked to meet Proposed Final Design milestones at the 25, 50, 75, 90, and 100 percent design levels. To reach each of these milestones, the D&I Team relied on stakeholder input, design solution tools (e.g., design and testing software), and the criteria and standards described above. The combined final procedure designs have been brought forward in this EA as the Proposed Action. For purposes of illustrating the alternative development process, the following sections describe the creation of two of the procedures that were carried forward as part of the Proposed Action.

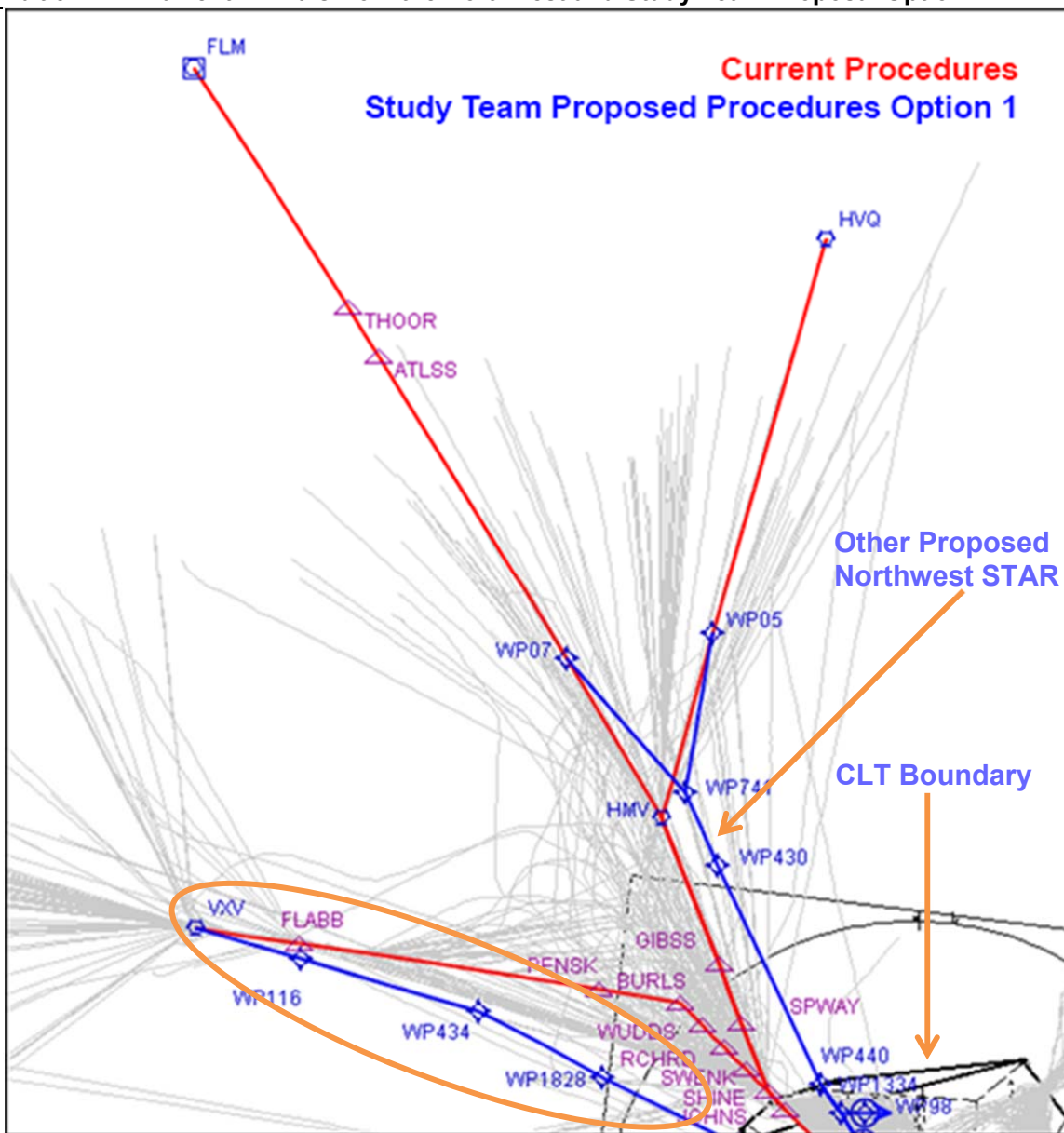
3.1.2.1 Northwest Arrivals – FILPZ ONE STAR

The Study Team identified several issues with arrivals to CLT from the northwest. Analysis of flight track data indicated that aircraft arriving to CLT experience level-offs and delay vectoring in both enroute and terminal airspace. This increases both flight time and distance. In addition, a lack of published runway transitions requires controllers to vector aircraft to the runways resulting in increased workload for both controllers and pilots.

Four versions of proposed northwest STARs, including a version that became the FILPZ ONE STAR, were developed and evaluated during the procedure design process. One version was rejected early on as the design provided no benefit to northwest arrivals. The Study Team recommendations carried forward included two options for improvements to northwest arrival procedures. The fourth and final version was the proposed FILPZ ONE STAR designed by the D&I Team based on the Study Team recommendations. The following sections discuss the iterative process in greater detail.

Exhibit 3-1 depicts the current JOHNS ONE STAR (red lines) with Option 1 of the Study Team's proposed northwest STARs (blue lines). The Study Team's proposed STAR that corresponds with the FILPZ ONE STAR is circled in orange. Option 1 provides more direct routing to the CLT boundary in comparison to the enroute transitions on the currently published STAR and eliminates level segments.

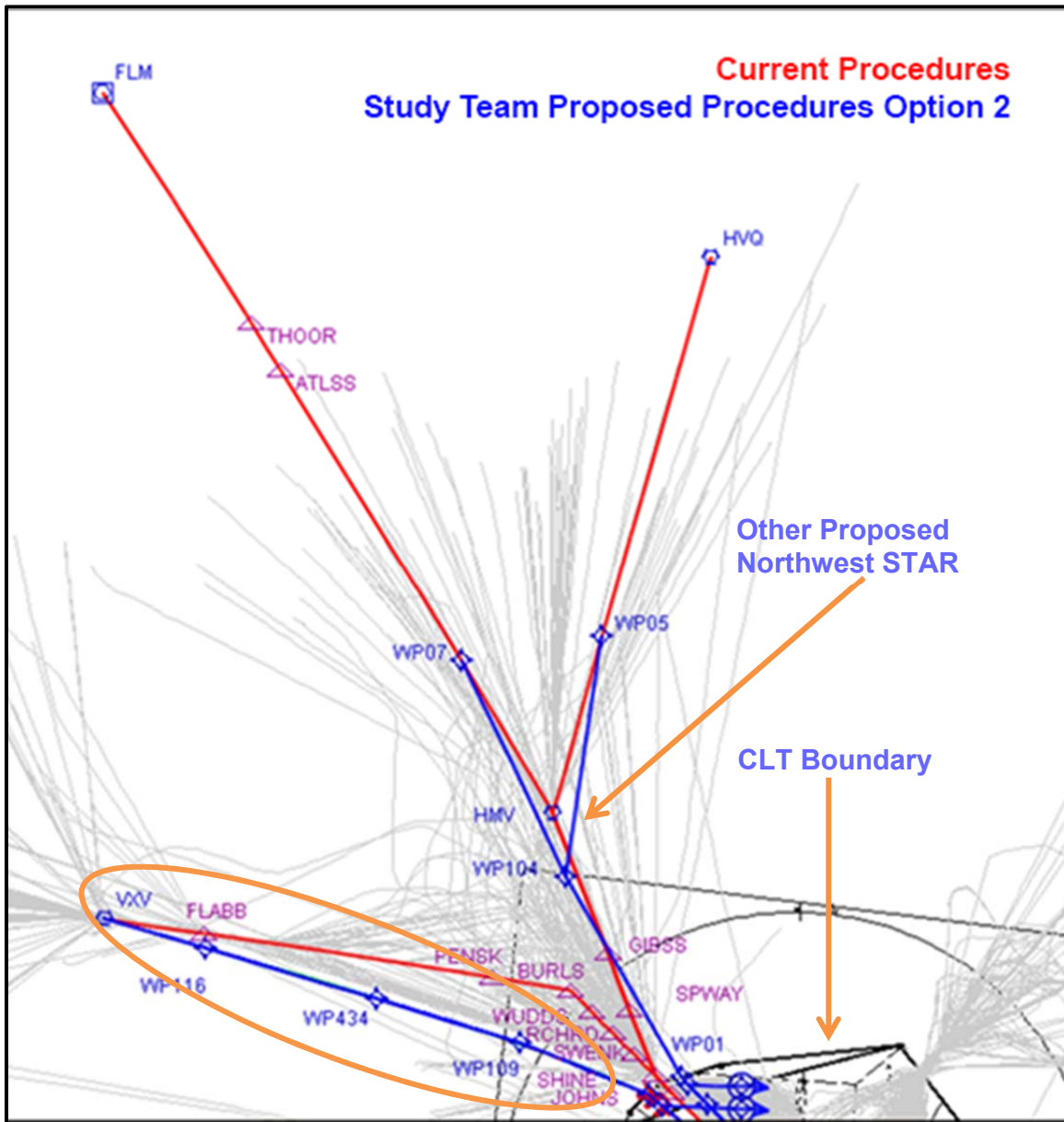
Exhibit 3-1 Current Arrivals from the Northwest and Study Team Proposal Option 1



Source: CLT OAPM Study Team, June 2011.
Prepared by: ATAC Corporation, October 2014.

Exhibit 3-2 depicts the current JOHNS ONE STAR (red lines) with Option 2 of the Study Team's proposed northwest STARs (blue lines). The Study Team's proposed STAR corresponding with the FILPZ ONE STAR is circled in orange. Similar to Option 1, Option 2 provides more direct routing to the CLT boundary in comparison to the enroute transitions on the currently published STAR and eliminates level segments. However, distance traveled to each runway end varies between Option 1 and Option 2.

Exhibit 3-2 Current Arrivals from the Northwest and Study Team Proposal Option 2



Source: CLT OAPM Study Team, June 2011.
Prepared by: ATAC Corporation, October 2014.

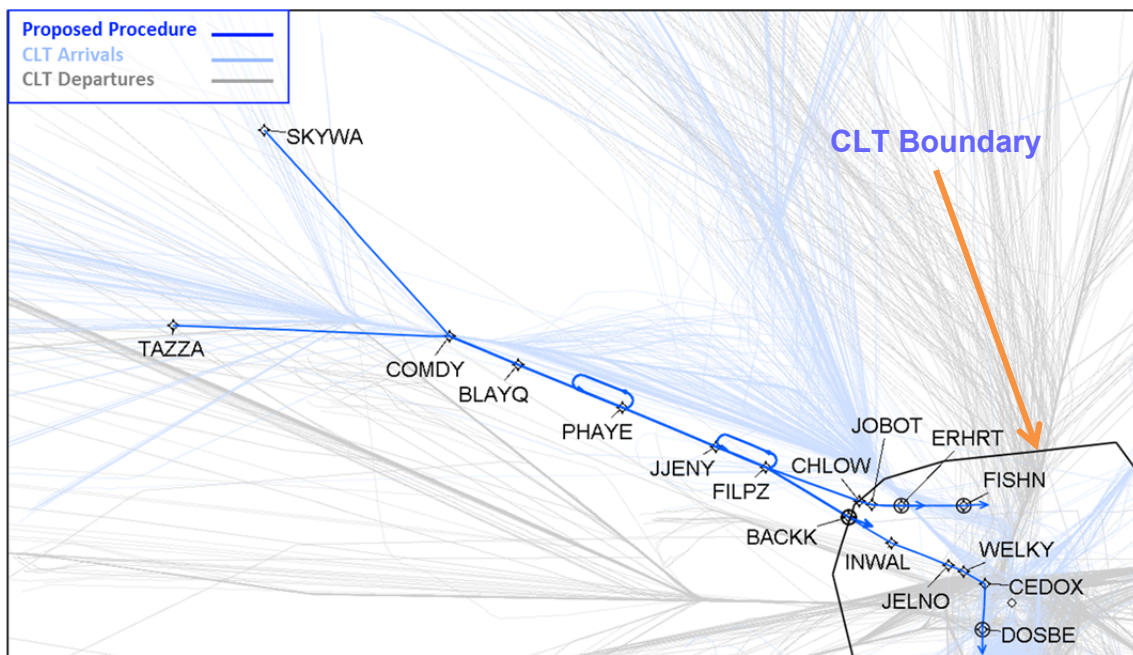
3.1.2.2 D&I Team Proposed Northwest STAR - FILPZ ONE

Exhibit 3-3 depicts the proposed FILPZ ONE STAR. Based on the Study Team recommendations, the Design Team developed the FILPZ STAR to replace the existing SHINE STAR (in conjunction with the PARQR STAR). The FILPZ STAR includes an optimized profile descent (OPD) that provides more efficient lateral paths and a reduction in miles flown.¹⁹ The proposed procedure includes two enroute transitions to better segregate

¹⁹ In comparison to the Study Team recommendations, there is a slight increase in miles flown during south flow but an overall reduction in miles flown when combined with all northwest SIDs and STARs.

arrival flows and multiple transitions to all runways at CLT. The FILPZ STAR would also serve several satellite airports including Rowan County Airport (RUQ), Charlotte-Monroe Executive Airport (EQY), and Rock Hill/York County Airport (UZA).

Exhibit 3-3 Proposed Procedure – FILPZ STAR



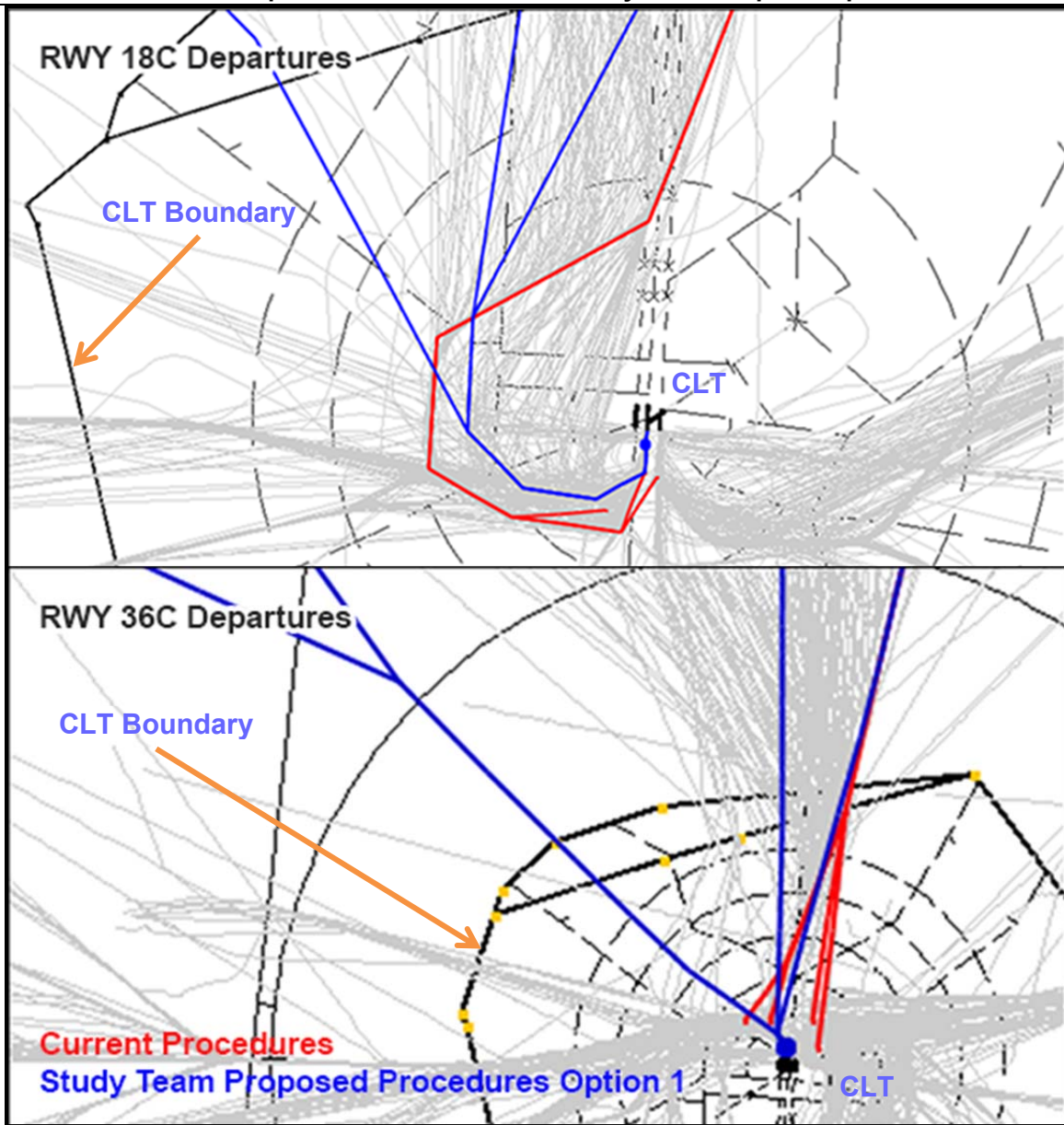
Source: CLT OAPM D&I Team, October 2014.
Prepared by: ATAC Corporation, October 2014.

3.1.2.3 Northwest Departures – JOJJO ONE SID

The Study Team identified several issues with departures from CLT to the northwest. These issues included level-offs in both terminal and enroute airspace and unnecessarily lengthy common paths requiring increased departure in-trail spacing,

Three versions of proposed northwest SIDs, including the proposed JOJJO SID were developed and evaluated during the procedure design process. **Exhibit 3-4** depicts the current JACAL SIX SID (red lines) with Option 1 of the Study Team's proposed northwest SIDs (blue lines). The proposed procedure formalizes some of the shortcuts currently employed, providing course divergence as close to the airport as possible and minimizing in-trail separation requirements and total miles flown.

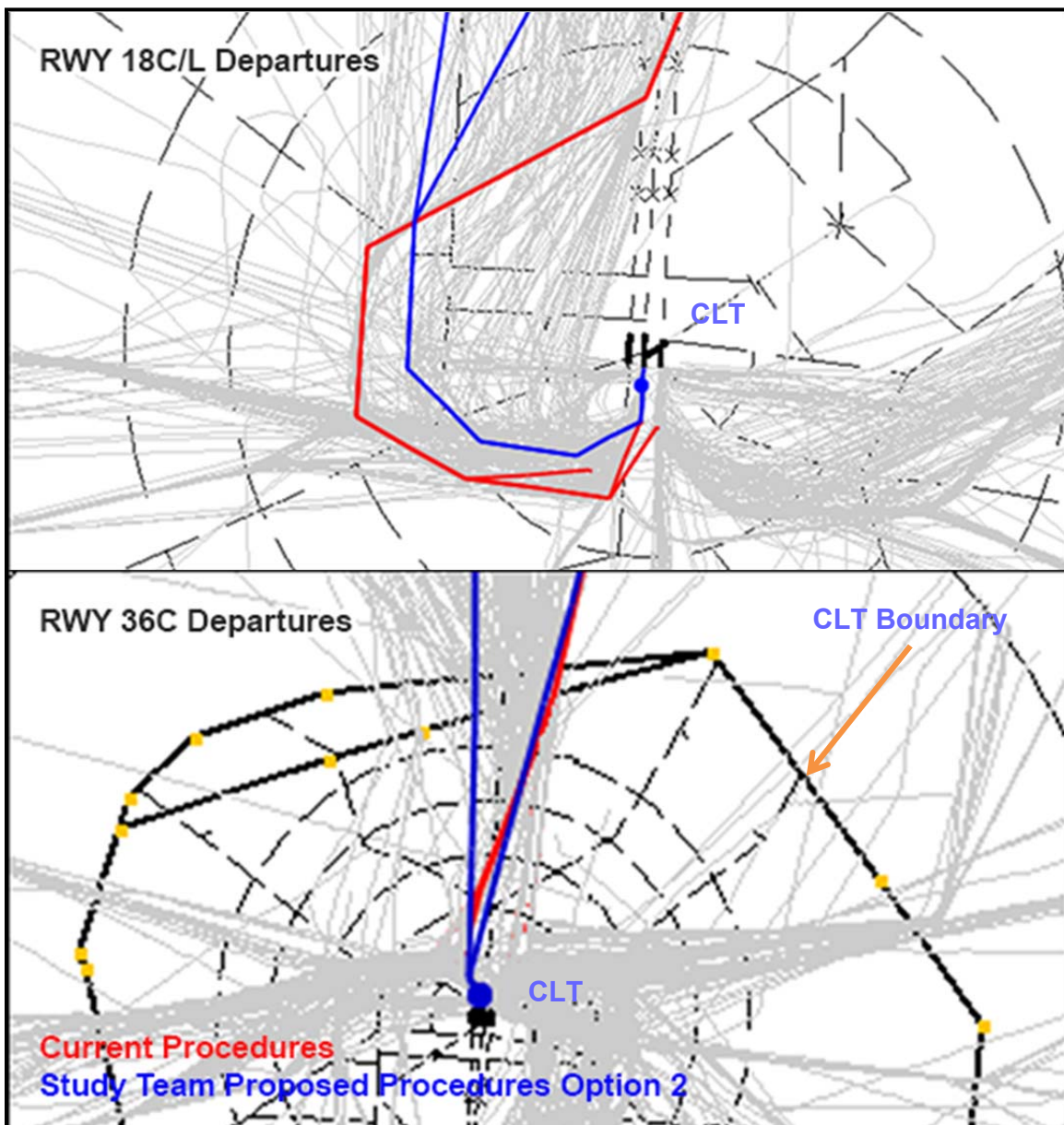
Exhibit 3-4 Current Departures to the North and Study Team Proposal Option 1



Source: CLT OAPM Study Team, June 2011.
Prepared by: ATAC Corporation, October 2014.

Exhibit 3-5 depicts the current JACAL SIX SID (red lines) with Option 2 of the Study Team's proposed northwest SIDs (blue lines). Similar to Option 1, the proposed procedure formalizes some of the shortcuts currently employed, providing course divergence as close to the airport as possible and minimizing in-trail separation requirements and total miles flown.

Exhibit 3-5 Current Departures to the North and Study Team Proposal Option 2

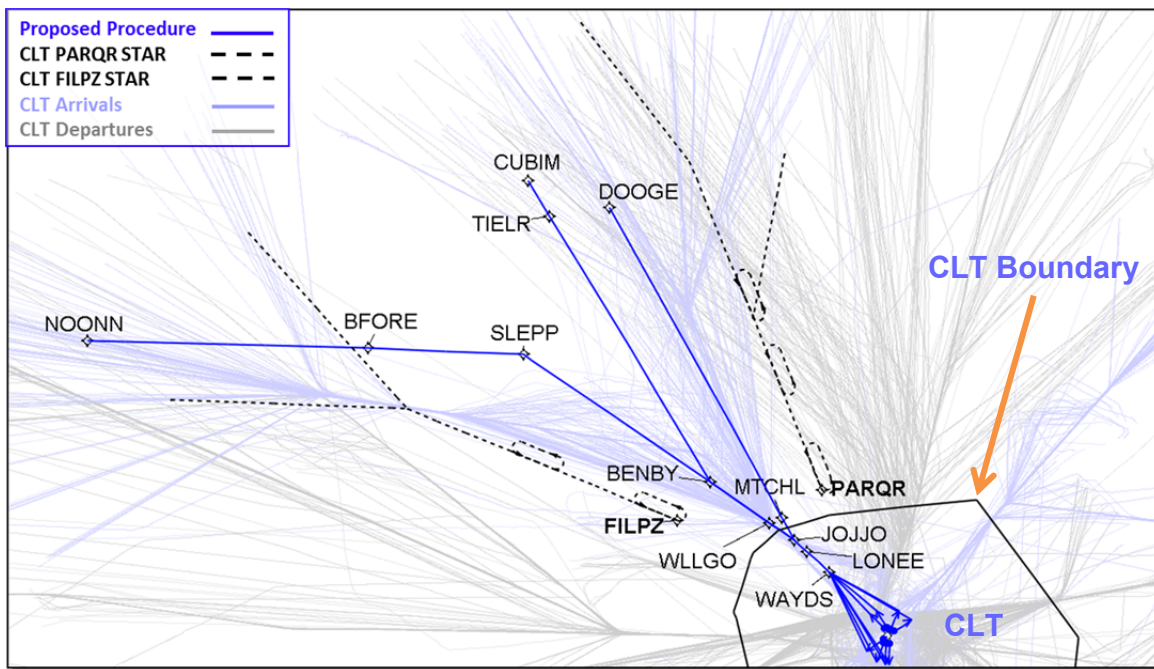


Source: CLT OAPM D&I Team, June 2011.
Prepared by: ATAC Corporation, October 2014.

3.1.2.4 D&I Team Proposed North SID - JOJJO ONE

Exhibit 3-6 depicts the proposed JOJJO ONE SID. Based on the Study Team's recommendations, the JOJJO SID was designed to incorporate earlier route divergence, decrease track miles flown, reduce level-offs and departure delays, increase departure efficiency, and create "destination specific" routings. The proposed procedure would serve CLT as well as several satellite airports, including RUQ, EQY, and UZA.

Exhibit 3-6 Proposed Procedure – JOJJO SID



Source: CLT OAPM D&I Team, October 2014.
Prepared by: ATAC Corporation, October 2014.

3.2 Alternatives Overview

The following sections discuss the Proposed Action and the No Action Alternative, the alternatives carried forward for analysis in the EA.

3.2.1 No Action Alternative

Under the No Action Alternative, the FAA would maintain existing arrival/departure procedures. The related routes and flows currently in use in the Charlotte Metroplex as of 2011 (representing existing conditions) would remain largely the same. However, some procedure modifications independent of those recommended for the Proposed Action are included in the No Action Alternative. These modifications would be implemented prior to the Proposed Action to deal with specific issues not related to this Project. These changes are taken into account in the analysis of impacts associated with the No Action Alternative (see Chapter 5, *Environmental Consequences*).

The causal factors limiting FAA's ability to increase efficiency are identified in Section 2.1.2. In summary, the causal factors are:

- Lack of predictable standard routes defined by procedures to/from airport runways to/from en route airspace;
- Complex converging interactions between arrival and departure flight paths; and,
- Lack of flexibility in the efficient transfer of traffic between the enroute and terminal area airspace.

3.2.1.1 No Action Alternative Procedures

Table 3-1 lists the names of the No Action Alternative procedures; the procedure type (i.e., SID or STAR); the basis of design (indicated by the type of navigational aid the procedures are based on: NAVAID (shown as VHF Omnidirectional Range [VOR]), RNAV, or radar vectors; the airports served; and the number of runway and enroute transitions for each procedure. Each of these characteristics address the objectives identified under the purpose and need for the Project (predictability, flexibility, and/or segregation). As discussed in Section 2.2, predictability can be measured by the count of procedures with altitude controls and enroute/runway transitions. Segregation can be measured by number of airports served. Finally, flexibility can be measured by the number of procedures with OPDs, the count of enroute/runway transitions, and number of SIDs/STARs from/to the Study Airports. These criteria are further discussed and evaluated in Section 3.3.

Table 3-1 No Action Alternative SIDs and STARs (1 of 4)

Airport	Procedure Type	No Action Procedure	Basis of Design	Transitions (enroute/runway)	Other Study Airports on Procedure
CLT	STAR	ADENA THREE	RNAV	3/0	
CLT	STAR	CHESTERFIELD THREE	VOR/DME radar vectors	4/0	EQY, UZA
CLT	STAR	HUSTN TWO	RNAV	4/0	
CLT	STAR	IVANE FOUR	RNAV	2/3	
CLT	STAR	JOHNS THREE	RNAV	4/0	
CLT	STAR	MAJIC ONE	VOR/DME radar vectors	3/0	EQY, UZA
CLT	STAR	SHINE SIX	VOR/DME radar vectors	4/0	EQY, UZA
CLT	STAR	SUDSY FOUR	RNAV	3/0	
CLT	STAR	UNARM THREE	VOR/DME radar vectors	2/0	EQY, JQF, RUQ, UZA
CLT	SID	ANDYS SEVEN	RNAV	1/8	
CLT	SID	BOBCAT FIVE	VOR/DME radar vectors	3/0	EQY, JQF, RUQ, UZA
CLT	SID	BUCKL SEVEN	RNAV	1/8	
CLT	SID	DEBIE SEVEN	RNAV	1/8	
CLT	SID	HORNET SEVEN	VOR/DME radar vectors	3/0	EQY, JQF, RUQ, UZA
CLT	SID	HUGO TWO	VOR/DME radar vectors	7/0	EQY, JQF, RUQ, UZA
CLT	SID	JACAL SIX	RNAV	1/8	
CLT	SID	LILLS SIX	RNAV	1/8	
CLT	SID	MERIL SIX	RNAV	1/8	
CLT	SID	PANTHER TWO	VOR/DME radar vectors	4/0	EQY, JQF, RUQ, UZA
CLT	SID	ZAVER THREE	RNAV	1/8	
CLT	SID	CHARLOTTE ONE	VOR/DME radar vectors	6/0	
EQY	STAR	CHESTERFIELD THREE	VOR/DME radar vectors	4/0	CLT, UZA

Table 3-1 No Action Alternative SIDs and STARS (2 of 4)

Airport	Procedure Type	No Action Procedure	Basis of Design	Transitions (enroute/runway)	Other Study Airports on Procedure
EQY	STAR	MAJIC ONE	VOR/DME radar vectors	3/0	CLT, UZA
EQY	STAR	SHINE SIX	VOR/DME radar vectors	4/0	CLT, UZA
EQY	STAR	UNARM THREE	VOR/DME radar vectors	2/0	CLT, JQF, RUQ, UZA
EQY	SID	BOBCAT FIVE	VOR/DME radar vectors	3/0	CLT, JQF, RUQ, UZA
EQY	SID	HORNET SEVEN	VOR/DME radar vectors	3/0	CLT, JQF, RUQ, UZA
EQY	SID	HUGO TWO	VOR/DME radar vectors	7/0	CLT, JQF, RUQ, UZA
EQY	SID	PANTHER TWO	VOR/DME radar vectors	4/0	CLT, JQF, RUQ, UZA
GMU	STAR	UNMAN THREE	RNAV	3/0	GSP, GYH, SPA
GMU	STAR	WHTTL TWO	RNAV	1/0	GSP, GYH, SPA
GMU	SID	No SIDS	N/A	N/A	
GSO	STAR	BLOCC ONE	VOR/DME radar vectors	1/0	INT
GSO	STAR	BROOK THREE	VOR/DME radar vectors	2/0	INT
GSO	STAR	HENBY TWO	VOR/DME radar vectors	2/0	INT
GSO	STAR	SMOKN THREE	VOR Radar vectors	1/0	INT
GSO	SID	QUAKER THREE	VOR/DME radar vectors	5/0	INT
GSO	SID	TRIAD SIX	VOR/DME radar vectors	4/0	INT
GSP	STAR	UNMAN TWO	RNAV	3/0	GMU, GYH, SPA
GSP	STAR	WHTTL TWO	RNAV	1/0	GMU, GYH, SPA
GSP	SID	No SIDS	N/A	N/A	
GYH	STAR	UNMAN TWO	RNAV	3/0	GMU, GSP, SPA
GYH	STAR	WHTTL TWO	RNAV	1/0	GMU, GSP, SPA
GYH	SID	No SIDS	N/A	N/A	
HKY	SID	HKY3	radar vectors	0/4	
INT	STAR	BLOCC ONE	VOR/DME radar vectors	1/0	GSO
INT	STAR	BROOK TWO	VOR/DME radar vectors	2/0	GSO
INT	STAR	HENBY TWO	VOR/DME radar vectors	2/0	GSO
INT	STAR	SMOKN THREE	VOR Radar vectors	1/0	GSO
INT	SID	QUAKER THREE	VOR/DME radar vectors	5/0	GSO
INT	SID	TRIAD SIX	VOR/DME radar vectors	4/0	GSO
INT	SID	WINSTON ONE	radar vectors	0/0	

Table 3-1 No Action Alternative SIDs and STARS (3 of 4)

Airport	Procedure Type	No Action Procedure	Basis of Design	Transitions (enroute/runway)	Other Study Airports on Procedure
JQF	STAR	UNARM THREE	VOR/DME radar vectors	4/0	CLT, EQY, RUQ, UZA
JQF	SID	BOBCAT FIVE	VOR/DME radar vectors	2/0	CLT, EQY, RUQ, UZA
JQF	SID	HORNET SEVEN	VOR/DME radar vectors	3/0	CLT, EQY, RUQ, UZA
JQF	SID	HUGO TWO	VOR/DME radar vectors	3/0	CLT, EQY, RUQ, UZA
JQF	SID	PANTHER TWO	VOR/DME radar vectors	7/0	CLT, EQY, RUQ, UZA
RUQ	STAR	NASCR ONE	VOR/DME radar vectors	4/0	JQF
RUQ	STAR	UNARM TWO	VOR/DME radar vectors	2/0	CLT, EQY, JQF, UZA
RUQ	SID	BOBCAT FIVE	VOR/DME radar vectors	3/0	CLT, EQY, JQF, UZA
RUQ	SID	HORNET SEVEN	VOR/DME radar vectors	3/0	CLT, EQY, JQF, UZA
RUQ	SID	HUGO TWO	VOR/DME radar vectors	7/0	CLT, EQY, JQF, UZA
RUQ	SID	PANTHER TWO	VOR/DME radar vectors	4/0	CLT, EQY, JQF, UZA
SPA	STAR	UNMAN TWO	RNAV	3/0	GMU, GSP, GYH
SPA	STAR	WHTTL TWO	RNAV	1/0	GMU, GSP, GYH
SPA	SID	No SIDS	N/A	N/A	
SVH	STAR	No STARS	N/A	N/A	
SVH	SID	No SIDS	N/A	N/A	
UZA	STAR	CHESTERFIELD THREE	VOR/DME radar vectors	4/0	CLT, EQY
UZA	STAR	MAJIC ONE	VOR/DME radar vectors	3/0	CLT, EQY
UZA	STAR	SHINE SIX	VOR/DME radar vectors	4/0	CLT, EQY
UZA	STAR	UNARM THREE	VOR/DME radar vectors	2/0	CLT, EQY, JQF, RUQ
UZA	SID	BOBCAT FIVE	VOR/DME radar vectors	3/0	CLT, EQY, JQF, RUQ
UZA	SID	HORNET SEVEN	VOR/DME radar vectors	3/0	CLT, EQY, JQF, RUQ
UZA	SID	HUGO TWO	VOR/DME radar vectors	7/0	CLT, EQY, JQF, RUQ

Table 3-1 No Action Alternative SIDs and STARS (4 of 4)

Airport	Procedure Type	No Action Procedure	Basis of Design	Transitions (enroute/runway)	Other Study Airports on Procedure
UZA	SID	PANTHER TWO	VOR/DME radar vectors	4/0	CLT, EQY, JQF, RUQ
<i>Notes:</i> N/A=Not Applicable DME=Distance Measuring Equipment STAR=Standard Terminal Arrival Route VOR=VHF Omnidirectional Range RNAV=Area Navigation VORTAC=VHF Omnidirectional Range/Tactical Aircraft Control SID=Standard Instrument Departure Airports CLT: Charlotte/Douglas International Airport EQY: Charlotte-Monroe Executive Airport GMU: Greenville Downtown Airport GSO: Piedmont Triad International Airport RUQ: Rowan County Airport GSP: Greenville Spartanburg International Airport GYH: Donaldson Center Airport INT: Smith Reynolds Airport JQF: Concord Regional Airport JZI: Charleston Executive Airport RDU: Raleigh-Durham International Airport SVH: Statesville Regional Airport UZA: Rock Hill Airport-Bryant Field					

Sources: National Flight Data Center National Airspace System Resources database, accessed January, 2013. Department of Transportation, Federal Aviation Administration Operational Procedure Files October 2014.

Prepared by: ATAC Corporation, October 2014.

For all of the Study Airports, the final approach to and initial departure flows from the runways remain similar under the No Action Alternative as under Existing Conditions.

3.2.1.2 Airspace Control Structure under the No Action Alternative

When aircraft depart or arrive on the assigned route or SID/STAR in the Charlotte Metroplex, transfer of control occurs between ZTL, ZJX, and ZDC Centers and Charlotte TRACON (CLT) airspace. In the Charlotte Metroplex, inefficient vertical profiles are an identified issue in all CLT STARS (northeast, northwest, southeast, and southwest). Level-offs are occurring to prevent aircraft from entering adjacent airspace and to avoid conflicting traffic. In addition, aircraft arriving from the en route transitions are required to level at the Transfer of Control Point (TCP), resulting in extended level-off segments in CLT. The transfer area between CLT and neighboring Centers would remain the same under the No Action Alternative as under Existing Conditions. For purposes of this EA, the areas where transfers occur are defined based on entry/exit gates. The gates are based on information provided in the Letter of Agreements (LOAs) between CLT and the adjacent Centers. The gates are purposely located to segregate arrivals and departures where possible.

The most efficient way to transfer aircraft to/from an airport from/to a transfer gate is a “four-corner post” manner. In a typical four-corner post system, departing aircraft exit the terminal airspace through departure gates to the north, east, south, and west, and arriving aircraft enter the terminal airspace through arrival gates to the northeast, southeast, southwest, and northwest. The locations of the CLT gates exemplify this arrangement.

Exhibit 3-7 shows all arrival and departure flows to the Study Airports associated with the No Action Alternative for North Flow conditions. Similarly, **Exhibit 3-8** depicts the No Action Alternative under South Flow conditions. Corridors are grouped by Study Airport and sorted by arrival and departure. The flows are based on No Action Alternative standard procedures or radar vectors entering/exiting the CLT airspace by runway operating configuration.

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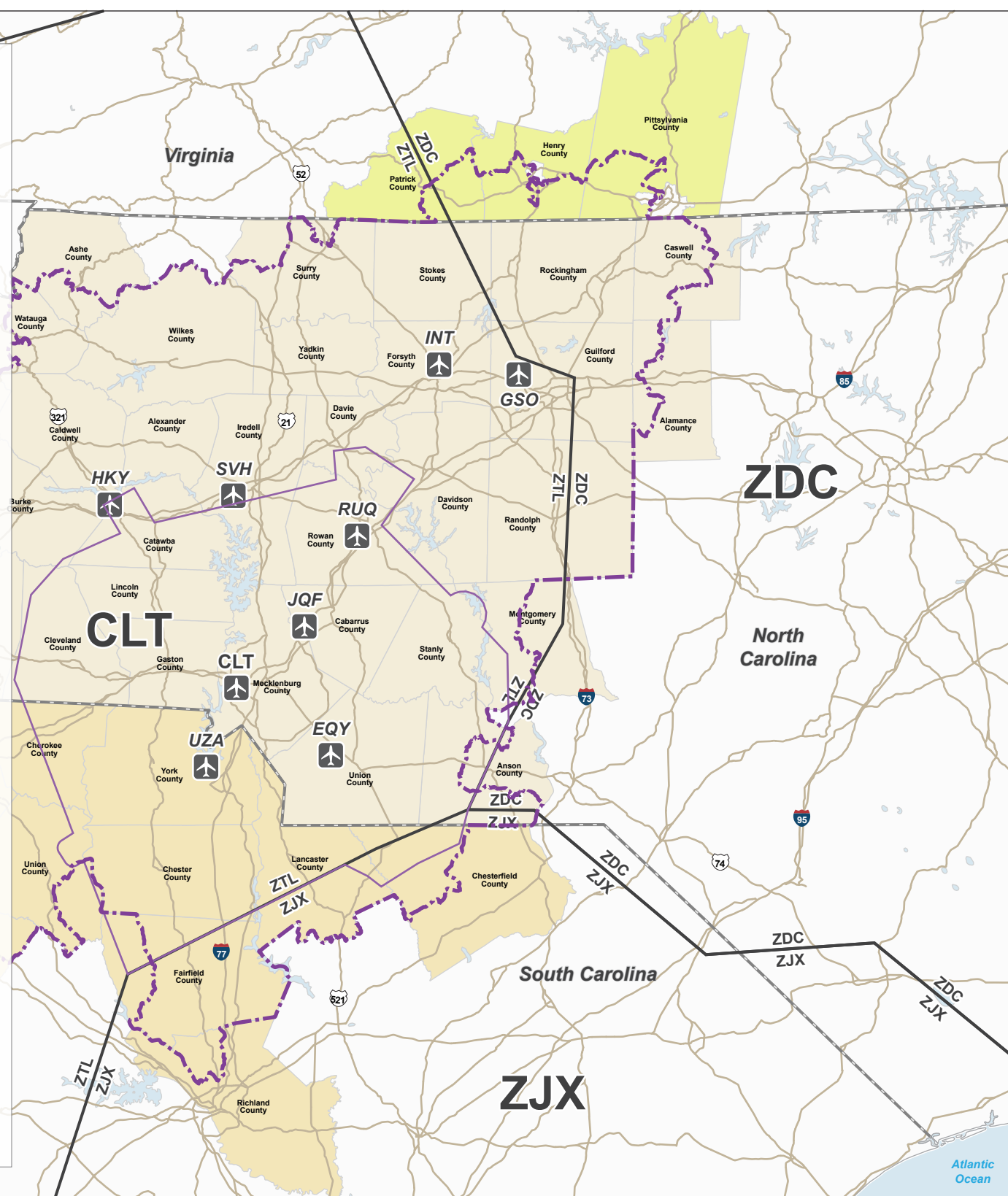
This exhibit allows the viewer to see No Action Alternative arrival and departure conventional and RNAV flight corridors under north flow conditions within the GSA.

Layering - To the left of the image you will see a list of conventional and RNAV arrival and departure flight corridors sorted by Study Airport. These corridors are shown in the Layers menu, identified with the “” icon. When the exhibit page comes into view, the corridors labels will change to bold text. Each corridor can be turned off and on by clicking on the box to the left of the corridor label. To turn the corridor layer on, click on the box and an “” icon will appear. Click on multiple boxes to turn on multiple corridors. To turn the corridor off, click on the box and the “” icon will disappear.

Zoom - To zoom in on a layered PDF document click on the “” icon at the top of the screen until the desired resolution has been reached. To zoom out, select the “” icon. Use the “” icon to pan through the exhibit.

Print – To print the exhibit, go to file in the Adobe Acrobat menu at the top of the window. Select print. To print just the exhibit, select “Current Page” under Pages to Print in the print dialogue window. To print the entire chapter, select “all” under Pages to Print in the print dialogue window. To print an exhibit depicting one or more corridors, select one or more layers following the instructions provided in the layering instructions above before printing the exhibit.

Turn off this box by clicking the “” icon to the left of the layer labeld “Introduction”.



Notes:

CLT	Charlotte Douglas International Airport
EQY	Charlotte-Monroe Executive Airport
GMU	Greenville Downtown Airport
GSO	Piedmont Triad International Airport
GSP	Greenville Spartanburg International Airport
GYH	Donaldson Center Airport
HKY	Hickory Regional Airport
INT	Smith Reynolds Airport
JQF	Concord Regional Airport
RUQ	Rcon County Airport
SPA	Spartanburg Downtown Memorial Airport
SVH	Statesville Regional Airport
UZA	Rock Hill/York County/Bryant Field Airport

Projection: Lambert Conformal Conic
Scale: 1:1.750.000

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LEGEND

- General Study Area Boundary
- Study Airport
- North Carolina County in Study Area
- South Carolina County in Study Area
- Virginia County in Study Area
- State Boundary
- U.S. and Interstate Highways
- Water
- Charlotte TRACON (CLT) Boundary
- ARTCC Boundary
- Conventional Arrival
- Conventional Departure
- RNAV Arrival
- RNAV Departure
- Radar Vectors Arrival
- Radar Vectors Departure

Notes:

- CLT Charlotte Douglas International Airport
- EQY Charlotte-Monroe Executive Airport
- GMU Greenville Downtown Airport
- GSO Piedmont Triad International Airport
- GSP Greenville Spartanburg International Airport
- GYH Donaldson Center Airport
- HKY Hickory Regional Airport
- INT Smith Reynolds Airport
- JQF Concord Regional Airport
- RUQ Rown County Airport
- SPA Spartanburg Downtown Memorial Airport
- SVH Statesville Regional Airport
- UZA Rock Hill/York County/Bryant Field Airport

Projection: Lambert Conformal Conic
Scale: 1:1,750,000

0 40 nm



No Action - South Flow

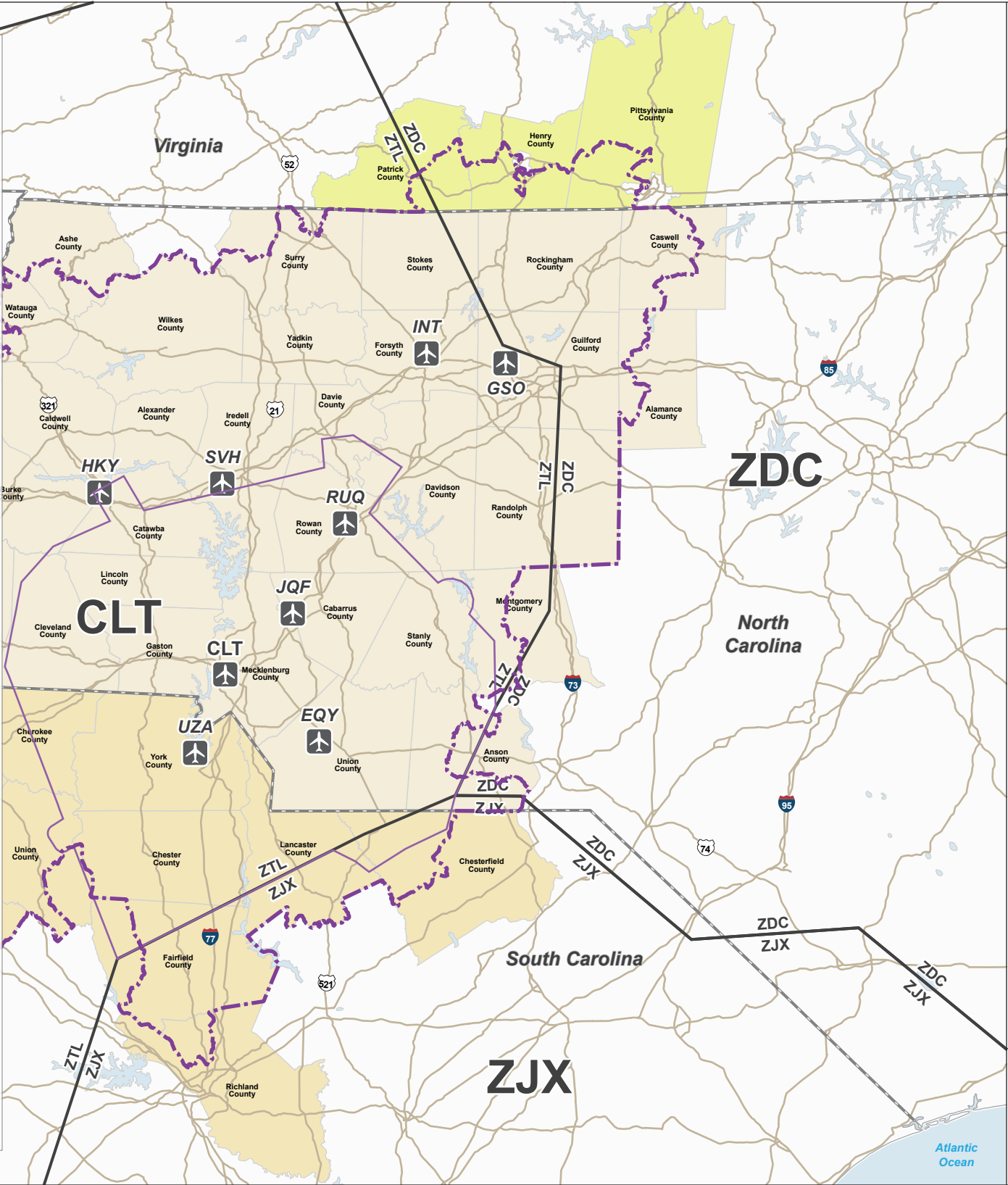
This exhibit allows the viewer to see No Action Alternative arrival and departure conventional and RNAV flight corridors under south flow conditions within the GSA.

Layering - To the left of the image you will see a list of conventional and RNAV arrival and departure flight corridors sorted by Study Airport. These corridors are shown in the Layers menu, identified with the “” icon. When the exhibit page comes into view, the corridors labels will change to bold text. Each corridor can be turned off and on by clicking on the box to the left of the corridor label. To turn the corridor layer on, click on the box and an “” icon will appear. Click on multiple boxes to turn on multiple corridors. To turn the corridor off, click on the box and the “” icon will disappear.

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Turn off this box by clicking the “” icon to the left of the layer labeld “Introduction”.



Sources: National Atlas of the United States of America: U.S. County Boudaries, 2005; U.S. State Boundaries, 2005; and Water Bodies, 2005; Bureau of Transportation Statistics: National Transportation Atlas Database National Highway Planning Network, 2012; FAA: NFDC Airport Database, 2012; ATAC Corporation: Study Area Boundary, 2014.
Prepared By: ATAC Corporation, October 2014.

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3.2.2 Proposed Action Alternative

The Proposed Action includes the combined proposed final designs for all procedures developed by the D&I Team as well as existing procedures that have been carried forward for continued use. This alternative is expected to add efficiency to airspace usage in the Charlotte Metroplex by increasing the number of RNAV procedures, flexibility in transitioning aircraft, segregating arrivals and departures, and improving the predictability of air traffic flows.

There are 46 procedures included in the Proposed Action. This includes 28 new RNAV procedures (15 new RNAV SIDs and 13 new RNAV STARs.) In addition, there are eight new conventional procedures (three conventional SIDs and five conventional STARs). Four existing conventional SIDs and six existing conventional STARs are carried forward as part of the Proposed Action. **Table 3-2** lists the names of the Proposed Action alternatives, the No Action Alternative procedure the Proposed Action alternative would replace (if applicable), the procedure type, and the basis of design (indicated by the type of navigational aid the procedures are based on (shown as VOR, RNAV, or radar vectors.) The table also shows the Study Airports served by the Proposed Action procedures and the number of runway and enroute transitions for each procedure. Each of these characteristics address the objectives identified under the purpose and need for the Project (predictability, flexibility, and/or segregation). As discussed in Section 2.2, predictability can be measured by the count of procedures with altitude controls and enroute/runway transitions. Segregation can be measured by number of airports served. Finally, flexibility can be measured by the number of procedures with OPDs, the count of enroute/runway transitions, and number of SIDs/STARs from/to the Study Airports. These criteria are further discussed and evaluated in Section 3.3. New or updated SIDs and STARs are shaded in gray.

Table 3-2 Proposed Action SIDs and STARs (1 of 5)

Proposed Action Procedure	No Action Procedure	Procedure Type	Basis of Design	Airports Served	Transitions (enroute/runway)	OPD	Altitude Controls
BANKR ONE	ADENA THREE	STAR	RNAV	CLT, EQY, JQF, RUQ, UZA	1/4	Yes	Yes
BANKR ONE	N/A	STAR	RNAV	EQY, CLT, JQF, RUQ, UZA	1/0	Yes	Yes
BANKR ONE	UNARM THREE	STAR	RNAV	JQF, CLT, EQY, RUQ, UZA	1/0	Yes	Yes
BARMY ONE	LILLS SIX	SID	RNAV	CLT, EQY, JQF, RUQ, UZA	3/8	No	Yes
BARMY ONE	HORNET SEVEN	SID	RNAV	UZA, CLT, EQY, JQF, RUQ	3/0	No	No
BEAVY ONE	ANDYS SEVEN	SID	RNAV	CLT, EQY, JQF, RUQ, UZA	2/8	No	Yes
BEAVY ONE	PANTHER TWO	SID	RNAV	UZA, CLT, EQY, JQF, RUQ	2/0	No	No
BIMMR ONE	N/A	SID	RNAV	SPA, GMU, GSP, GYH	2/0	No	No
BLOCC ONE	BLOCC ONE	STAR	VOR/DM E radar vectors	GSO, INT	1/0	No	No

Table 3-2 Proposed Action SIDs and STARs (2 of 5)

Proposed Action Procedure	No Action Procedure	Procedure Type	Basis of Design	Airports Served	Transitions (enroute/runway)	OPD	Altitude Controls
BOBZY ONE	ZAVER TWO	SID	RNAV	CLT, EQY, JQF, RUQ, UZA	8/2	No	Yes
BOBZY ONE	BOBCAT FIVE	SID	RNAV	UZA, CLT, EQY, JQF, RUQ	2/0	No	No
BOLLT ONE	TRIAD SIX	SID	RNAV	GSO, INT	1/6	No	Yes
BROOK THREE	BROOK THREE	STAR	VOR/DM E radar vectors	GSO, INT	2/0	No	No
BTSEY ONE	SHINE SIX	STAR	VOR/DM E radar vectors	CLT, EQY, UZA	1/0	No	Yes
BWALL ONE	N/A	SID	RNAV	GMU, GSP, GYH, SPA	1/0	No	Yes
CHARLOTTE ONE	CHARLOTTE ONE	SID	VOR/DM E radar vectors	CLT, EQY, GYH, JQF, RUQ, UZA	10/0	No	No
CHPTR ONE	UNARM THREE	STAR	VOR/DM E radar vectors	CLT, EQY, UZA	2/2	No	No
CHSLY ONE	SUDSY FOUR	STAR	RNAV	CLT, EQY, UZA	2/4	Yes	Yes
CHSLY ONE	IVANE FOUR	STAR	RNAV	CLT, EQY, UZA	2/0	Yes	Yes
CHSLY ONE	MAJIC ONE	STAR	RNAV	EQY, CLT, UZA	2/0	Yes	Yes
ESTRR ONE	DEBIE SIX	SID	RNAV	CLT, EQY, JQF, RUQ, UZA	1/8	No	Yes
ESTRR ONE	BOBCAT FIVE	SID	RNAV	UZA, CLT, EQY, JQF, RUQ	1/0	No	No
FILPZ ONE	JOHNS THREE	STAR	RNAV	CLT, EQY, UZA	1/2	Yes	Yes
FILPZ ONE	SHINE SIX	STAR	RNAV	UZA, CLT, EQY	1/0	Yes	Yes
HENBY TWO	HENBY TWO	STAR	VOR/DM E radar vectors	GSO, INT	2/0	No	No
HICKORY THREE	HICKORY THREE	SID	Radar vectors	HKY	0/4	No	No
ICONS ONE	BUCKL SEVEN	SID	RNAV	CLT, EQY, JQF, RUQ, UZA	1/8	No	Yes
ICONS ONE	PANTHER TWO	SID	RNAV	UZA, CLT, EQY, JQF, RUQ	1/0	No	No
JOJJO ONE	ZAVER TWO	SID	RNAV	CLT, EQY, JQF, RUQ, UZA	3/8	No	Yes
JOJJO ONE	JACAL SIX	SID	RNAV	CLT, EQY, JQF, RUQ, UZA	3/0	No	Yes
JOJJO ONE	HORNET SEVEN	SID	RNAV	UZA, CLT, EQY, JQF, RUQ	3/0	No	No
JONZE ONE	ADENA THREE	STAR	RNAV	CLT, EQY, JQF, RUQ, UZA	1/4	Yes	Yes

Table 3-2 Proposed Action SIDs and STARs (3 of 5)

Proposed Action Procedure	No Action Procedure	Procedure Type	Basis of Design	Airports Served	Transitions (enroute/runway)	OPD	Altitude Controls
JONZE ONE	UNARM THREE	STAR	RNAV	UZA, CLT, EQY, JQF, RUQ	1/0	Yes	Yes
JUNNR ONE	WHTTL TWO	STAR	RNAV	GMU, GSP, GYH, SPA	1/0	No	No
KABEE ONE	NASCR ONE	STAR	RNAV	JQF, RUQ, SVH	1/0	No	No
KABEE ONE	N/A	STAR	RNAV	SVH, JQF, RUQ	1/0	No	No
KERMIT ONE	CHARLOT TE ONE	SID	VOR/DM E radar vectors	CLT, EQY, GYH, JQF, RUQ, UZA	10/0	No	No
KERMIT ONE	PANTHER TWO	SID	VOR/DM E radar vectors	CLT, EQY, GYH, JQF, RUQ, UZA	10/0	No	No
KERMIT ONE	BOBCAT FIVE	SID	VOR/DM E radar vectors	CLT, EQY, GYH, JQF, RUQ, UZA	10/0	No	No
KERMIT ONE	HORNET SEVEN	SID	VOR/DM E radar vectors	CLT, EQY, GYH, JQF, RUQ, UZA	10/0	No	No
KERMIT ONE	PANTHER TWO	SID	VOR/DM E radar vectors	EQY, CLT, GYH, JQF, RUQ, UZA	10/0	No	No
KERMIT ONE	N/A	SID	VOR/DM E radar vectors	GYH, CLT, EQY, JQF, RUQ, UZA	10/0	No	No
KILNS ONE	MERIL SIX	SID	RNAV	CLT, EQY, JQF, RUQ, UZA	1/8	No	Yes
KILNS ONE	HORNET SEVEN	SID	RNAV	UZA, CLT, EQY, JQF, RUQ	1/0	No	No
KNIGHTS ONE	HUGO TWO	SID	VOR/DM E radar vectors	EQY, CLT, GHY, JQF, RUQ, UZA	8/0	No	No
KNIGHTS ONE	N/A	SID	VOR/DM E radar vectors	GYH, CLT, EQY, JQF, RUQ, UZA	8/0	No	No
KNIGHTS ONE	HUGO TWO	SID	VOR/DM E radar vectors	JQF, CLT, EQY, GYH, RUQ, UZA	8/0	No	No
KRITR ONE	JACAL SIX	SID	RNAV	CLT, EQY, JQF, RUQ, UZA	8/2	No	Yes
KRITR ONE	HORNET SEVEN	SID	RNAV	UZA, CLT, EQY, JQF, RUQ	2/0	No	No
KWEEN ONE	BUCKL SEVEN	SID	RNAV	CLT, EQY, JQF, RUQ, UZA	1/8	No	Yes
KWEEN ONE	PANTHER TWO	SID	RNAV	UZA, CLT, EQY, JQF, RUQ	1/0	No	No
LIINN ONE	SHINE SIX	STAR	VOR/DM E radar vectors	CLT, EQY, UZA	3/1	No	No
LILLS SEVEN	LILLS SIX	SID	RNAV	CLT, EQY, JQF, RUQ, UZA	1/8	No	Yes

Table 3-2 Proposed Action SIDs and STARs (4 of 5)

Proposed Action Procedure	No Action Procedure	Procedure Type	Basis of Design	Airports Served	Transitions (enroute/runway)	OPD	Altitude Controls
LILLS SEVEN	PANTHER TWO	SID	RNAV	EQY, CLT, JQF, RUQ, UZA	1/0	No	No
MAJIC ONE	MAJIC ONE	STAR	VOR/DM E radar vectors	CLT, EQY, UZA	3/0	No	No
MCHLN ONE	N/A	STAR	RNAV	SPA, GMU, GSP, GYH	1/0	No	No
MLLET ONE	HUSTN TWO	STAR	RNAV	CLT, EQY, UZA	2/3	No	No
MLLET ONE	CHESTER FIELD THREE	STAR	RNAV	EQY, CLT, UZA	2/0	No	No
NASCR ONE	NASCR ONE	STAR	VOR/DM E radar vectors	RUQ, JQF	4/0	No	No
No SIDS No STARS	N/A No STARS	SID STAR	N/A N/A	SVH HKY	N/A N/A	N/A N/A	N/A N/A
PARQR ONE	JOHNS THREE	STAR	RNAV	CLT, EQY, UZA	2/3	Yes	Yes
PARQR ONE	SHINE SIX	STAR	RNAV	UZA, CLT, EQY	2/0	Yes	Yes
QUAKER THREE	QUAKER THREE	SID	VOR/DM E radar vectors	GSO, INT	5/0	No	No
RASLN ONE	CHESTER FIELD THREE	STAR	VOR/DM E radar vectors	UZA, CLT, EQY	1/0	No	No
RCTOR ONE	UNMAN TWO	STAR	RNAV	GMU, GSP, GYH, SPA	1/0	No	No
SMOKN THREE	SMOKN THREE	STAR	VOR Radar vectors	GSO, INT	1/0	No	No
STOCR ONE	HUSTN TWO	STAR	RNAV	CLT, EQY, UZA	3/3	Yes	Yes
STOCR ONE	CHESTER FIELD THREE	STAR	RNAV	EQY, CLT, UZA	3/0	Yes	Yes
TRAKS ONE	BROOK TWO	STAR	RNAV	INT, GSO	2/0	No	No
TRIAD SEVEN	TRIAD SIX	SID	VOR/DM E radar vectors	GSO, INT	4/0	No	No
TRSHA ONE	TRIAD SIX	SID	RNAV	INT, GSO	2/4	No	Yes
UNARM FOUR	UNARM THREE	STAR	VOR/DM E radar vectors	UZA, CLT, EQY, JQF, RUQ	2/0	No	No
WEAZL ONE	JACAL SIX	SID	RNAV	CLT, EQY, JQF, RUQ, UZA	1/8	No	Yes
WEAZL ONE	HORNET SEVEN	SID	RNAV	EQY, CLT, JQF, RUQ, UZA	1/0	No	No

Table 3-2 Proposed Action SIDs and STARs (5 of 5)

Proposed Action Procedure	No Action Procedure	Procedure Type	Basis of Design	Airports Served	Transitions (enroute/runway)	OPD	Altitude Controls
WINSTON ONE	WINSTON ONE	SID	Radar vectors	INT	0/0	No	No
WORXS ONE	N/A	STAR	RNAV	GMU, GSP, GYH, SPA	1/0	No	No

N/A=Not Applicable

DME=Distance Measuring Equipment

STAR=Standard Terminal Arrival Route

VOR=VHF Omnidirectional Range

RNAV=Area Navigation

VORTAC=VHF Omnidirectional Range/Tactical Aircraft Control

SID=Standard Instrument Departure

Airports

CLT: Charlotte/Douglas International Airport

EQY: Charlotte-Monroe Executive Airport

GMU: Greenville Downtown Airport

GSO: Piedmont Triad International Airport

RUQ: Rowan County Airport

GSP: Greenville Spartanburg International Airport

GYH: Donaldson Center Airport

INT: Smith Reynolds Airport

JQF: Concord Regional Airport

JZI: Charleston Executive Airport

RDU: Raleigh-Durham International Airport

SVH: Statesville Regional Airport

UZA: Rock Hill Airport-Bryant Field

Source: National Flight Data Center National Airspace System Resources database, accessed January, 2013. Department of Transportation, Federal Aviation Administration Operational Procedure Files October 2014.

Prepared by: ATAC Corporation, October 2014.

Exhibit 3-9 shows all arrival and departure flows to the Study Airports associated with the Proposed Action during North Flow conditions. Similarly, **Exhibit 3-10** depicts the Proposed Action Alternative under South Flow conditions. Corridors are grouped by Study Airport and sorted by arrival and departure.

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LEGEND

- General Study Area Boundary
- Study Airport
- North Carolina County in Study Area
- South Carolina County in Study Area
- Virginia County in Study Area
- State Boundary
- U.S. and Interstate Highways
- Water
- Charlotte TRACON (CLT) Boundary
- ARTCC Boundary
- Conventional Arrival
- Conventional Departure
- RNAV Arrival
- RNAV Departure

Notes:

- CLT Charlotte Douglas International Airport
- EQY Charlotte-Monroe Executive Airport
- GMU Greenville Downtown Airport
- GSO Piedmont Triad International Airport
- GSP Greenville Spartanburg International Airport
- GYH Donaldson Center Airport
- HKY Hickory Regional Airport
- INT Smith Reynolds Airport
- JQF Concord Regional Airport
- RUQ Rown County Airport
- SPA Spartanburg Downtown Memorial Airport
- SVH Statesville Regional Airport
- UZA Rock Hill/York County/Bryant Field Airport

Projection: Lambert Conformal Conic
Scale: 1:1,750,000

0 40 nm



Proposed Action - North Flow

Proposed Action - North Flow

This exhibit allows the viewer to see Proposed Action Alternative arrival and departure conventional and RNAV flight corridors under north flow conditions within the GSA.

Layering - To the left of the image you will see a list of conventional and RNAV arrival and departure flight corridors sorted by Study Airport. These corridors are shown in the Layers menu, identified with the “” icon. When the exhibit page comes into view, the corridors labels will change to bold text. Each corridor can be turned off and on by clicking on the box to the left of the corridor label. To turn the corridor layer on, click on the box and an “” icon will appear. Click on multiple boxes to turn on multiple corridors. To turn the corridor off, click on the box and the “” icon will disappear.

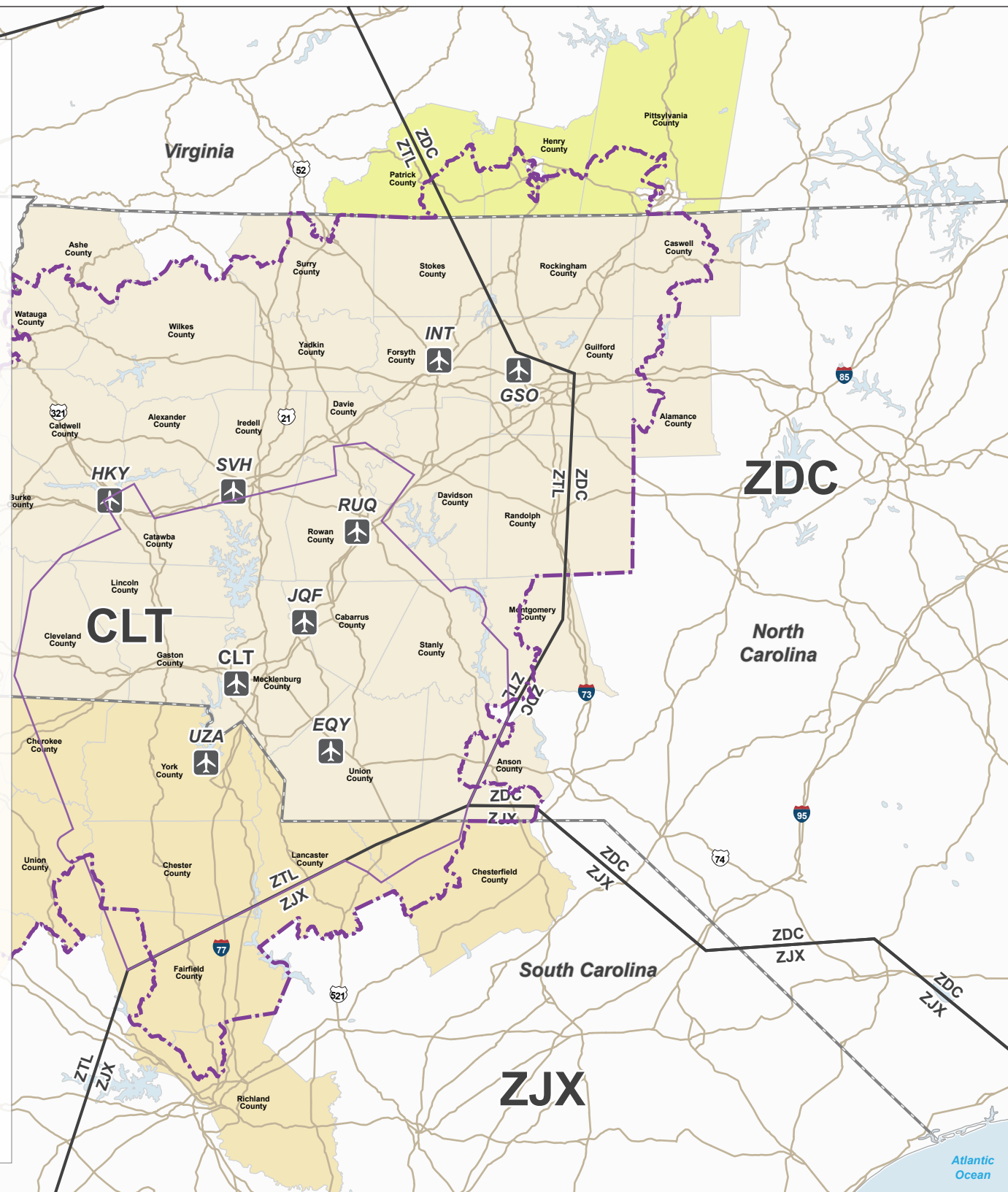
Zoom - To zoom in on a layered PDF document click on the “” icon at the top of the screen until the desired resolution has been reached. To zoom out, select the “” icon. Use the “” icon to pan through the exhibit.

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CLT	Charlotte Douglas International Airport
EQY	Charlotte-Monroe Executive Airport
GMU	Greenville Downtown Airport
GSO	Piedmont Triad International Airport
GSP	Greenville Spartanburg International Airport
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HKY	Hickory Regional Airport
INT	Smith Reynolds Airport
JQF	Concord Regional Airport
RUQ	Rown County Airport
SPA	Spartanburg Downtown Memorial Airport
SVH	Statesville Regional Airport
UZA	Rock Hill/York County/Bryant Field Airport

Projection: Lambert Conformal Conic
Scale: 1:1,750,000



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3.3 Summary Comparison of the Proposed Action and No Action Alternative

This section provides a comparative summary between the Proposed Action and No Action Alternative based on the objectives defined in Section 2.2:

- Improve predictability in transitioning traffic between enroute and terminal area airspace;
- Improve the segregation of arrivals and departures in the airspace; and,
- Improve flexibility in transitioning traffic between enroute and terminal area airspace and between terminal area airspace and the runways.

3.3.1 Improve Predictability in Transitioning Traffic between Enroute and Terminal Area Airspace

In Section 2.2.1, two criteria were established to measure the objective to improve the predictability of air traffic flow in the Charlotte Metroplex airspace:

- Increase the number of RNAV procedures with altitude controls intended to optimize descent or climb patterns (measured by the count of procedures with altitude controls.)
- Increase the number of RNAV procedures with runway transitions routes to designated runways and enroute transitions (measured by the count of runway and enroute transitions.)

Table 3-3 provides a comparative summary of the number of RNAV procedures serving the Study Airports under both the Proposed Action and No Action Alternative. Under the Proposed Action, of the 46 procedures serving the Study Airports, 20 are RNAV-based procedures with altitude controls. In comparison, only 10 of the 34 procedures included in the No Action Alternative have altitude controls. Of the 46 procedures included in the Proposed Action, 21 include runway transitions and 28 include enroute transitions. In comparison, only eight of the 34 procedures included under the No Action Alternative have runway transitions and 14 have enroute transitions. Based on the criteria above, the Proposed Action would better improve predictability in air traffic flow compared to the No Action Alternative.

Table 3-3 Alternatives Evaluation: Improve Predictability in Transitioning Traffic

Criteria	Alternative	
	No Action	Proposed Action
RNAV Procedures with Altitude Controls	10	20
RNAV Procedures with Runway Transitions	8	21
Enroute Transitions	14	28

Note: Blue shading indicates alternative that achieves desired criteria.

Sources: U.S. Department of Transportation, Federal Aviation Administration, *Charlotte Design and Implementation Team Final Report*, October 2014.

Prepared by: ATAC Corporation, October 2014.

3.3.2 Improve the Segregation of Arrivals and Departures in Terminal Area and Enroute Airspace

In Section 2.2.2 one criterion was established to measure the objective to segregate traffic in portions of the airspace where arrival and departure flows cross, converge, or are within proximity of each other:

- Segregate Study Airport traffic (measured by the count of RNAV STARs and/or SIDs to/from Study Airports).

Table 3-4 identifies the number of RNAV SID and STAR procedures that can be used separately to the Study Airports under both the Proposed Action and the No Action Alternative. Under the Proposed Action, of the 46 procedures serving the Study Airports, 28 are RNAV-based procedures. Twenty of those 28 procedures serve CLT; 18 serve EQY and UZA; 14 serve JQF and RUQ; six serve GMU, GSP, GYH, and SPA; three serve GSO and INT; and one serves SVH. In comparison, only 14 of the 34 procedures included in the No Action Alternative are RNAV-based. Twelve of those 14 procedures serve CLT and two serve GMU, GSP, GYH, and SPA. Therefore, the addition of RNAV STARs and SIDs under the Proposed Action indicates that this alternative would better achieve the objective to improve segregation of arrivals and departures in the Charlotte Metroplex.

Table 3-4 Alternatives Evaluation: Segregate Arrival and Departure Flows

Criteria	Alternative	
	No Action	Proposed Action
Number of RNAV Procedures		
CLT	12	20
EQY	0	18
GMU	2	6
GSO	0	3
GSP	2	6
GYH	2	6
HKY	0	0
INT	0	3
JQF	0	14
RUQ	0	14
SPA	2	6
SVH	0	1
UZA	0	18
Total	20	115

Note: Blue shading indicates alternative that achieves desired criteria.

Sources: U.S. Department of Transportation, Federal Aviation Administration, *Charlotte Design and Implementation Team Final Report*, October 2014.

Prepared by: ATAC Corporation, October 2014.

3.3.3 Improve Flexibility in Transitioning Traffic between Enroute and Terminal Area Airspace and between Terminal Area Airspace and the Runways

Section 2.2.3 includes three criteria established to measure the objective to increase the flexibility in transitioning aircraft between the terminal and enroute airspace:

- Implement RNAV STARs with OPDs.

- Increase the number of enroute and runway transitions (measured by count of enroute and runway transitions for all SID and STAR procedures.)
- Segregate CLT traffic from satellite Study Airport traffic to/from Study Airports by increasing the number of STARs and/or SIDs to/from Study Airports.

As shown in **Table 3-5**, under the Proposed Action, RNAV procedures with OPDs would increase to 23 compared to one under the No Action Alternative. The Proposed Action includes 28 RNAV procedures compared to 14 RNAV procedures under the No Action Alternative.

The Proposed Action procedures include 110 enroute transitions and 119 runway transitions (associated with both conventional and RNAV procedures). In comparison, the No Action Alternative includes 82 enroute transitions and 59 runway transitions. Therefore, the increased number of enroute and runway transitions under the Proposed Action indicates that this alternative would achieve the objective of improving flexibility in transitioning traffic in the Charlotte Metroplex airspace.

Table 3-5 Alternatives Evaluation: Improve Flexibility in Transitioning Aircraft

Criteria	Alternative	
	No Action	Proposed Action
Total RNAV STARs with OPD	1	23
Total RNAV Procedures	14	28
Total Enroute Transitions	82	110
Total Runway Transitions	59	119

Notes: Blue shading indicates alternative that achieves desired criteria.

Sources: U.S. Department of Transportation, Federal Aviation Administration, *Charlotte Design and Implementation Team Final Report*, October 2014.

Prepared by: ATAC Corporation, October 2014.

3.4 Preferred Alternative Determination

Of the two alternatives carried forward for detailed analysis, the Proposed Action would better meet the Purpose and Need for the CLT OAPM Project based on the criteria discussed above. Therefore, the Proposed Action is the Preferred Alternative. Although it would not meet the Purpose and Need, the No Action Alternative was carried forward, as required by Council on Environmental Quality (CEQ) regulations, to establish a benchmark against which decision makers can compare the magnitude of environmental effects of undertaking the Proposed Action.

3.5 Listing of Federal Laws and Regulations Considered

Table 3-6 lists the relevant federal laws and statutes, Executive Orders, and regulations applicable to the Proposed Action and the No Action Alternative and considered in preparation of this EA.

Table 3-6 List of Federal Laws and Regulations Considered – CLT OAPM Project (1 of 2)

Federal Laws and Statutes	Citation
National Environmental Policy Act of 1969	42 U.S.C. § 4321 <i>et seq.</i>
Clean Air Act of 1970, as amended	42 U.S.C. § 7401 <i>et seq.</i>
Department of Transportation Act of 1966, Section 4(f)	49 U.S.C. § 303(c)
Aviation Safety and Noise Abatement Act of 1979	49 U.S.C. § 47501 <i>et seq.</i>
Federal Aviation Act of 1958, as amended	49 U.S.C. § 40101 <i>et seq.</i>
Endangered Species Act of 1973	16 U.S.C. § 1531 <i>et seq.</i>
Fish and Wildlife Coordination Act of 1958	16 U.S.C. § 661 <i>et seq.</i>
 Migratory Bird Treaty Act of 1918	 16 U.S.C. § 703 <i>et seq.</i>
National Historic Preservation Act of 1966, as amended	16 U.S.C. § 470
Archaeological and Historic Preservation Act of 1974, as amended	16 U.S.C. § 469 <i>et seq.</i>
Federal Regulations	Citation
Council for Environmental Quality Regulations	40 C.F.R. Part 1500 to Part 1508
General Conformity Regulations	40 C.F.R. Part 93 Subpart B
Protection of Historic Properties Regulations	36 C.F.R. 800
Airport Noise Compatibility Planning Regulations	14 C.F.R. Part 150
Federal Aviation Regulations (FAR) Part 71:	14 C.F.R. Part 71
Designation of Class A, Class B, Class C, Class D, and Class E Airspace Areas; Airways; Routes; and Reporting Points, December 17, 1991.	
Executive Orders	Citation
11593, Protection and Enhancement of the Cultural Environment	36 Federal Register (FR) 8921 (May 13, 1971)
12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations	59 FR 7629 (February 16, 1994)
13045, Protection of Children from Environmental Health Risks and Safety Risks	62 FR 19885 (April 23, 1997)

Table 3-6 List of Federal Laws and Regulations Considered – CLT OAPM Project (2 of 2)

FAA/U.S. Department of Transportation Orders

U.S. DOT Order 5680.1a: *Final Order to Address Environmental Justice in Low-Income and Minority Populations*, 2012.
FAA Order 1050.1E, Chng. 1: *Environmental Impacts: Policies and Procedures*, March 20, 2006.
FAA Order 7100.9D, *Standard Terminal Arrival Program and Procedures*, December 15, 2003.
FAA Order 7400.2K, *Procedures for Handling Airspace Matter*, April 3, 2014.
FAA Order 8260.3B, Change 20, *United States Standard for Terminal Instrument Procedures (TERPS)*, December 7, 2007.
FAA Order 8260.40B, *Flight Management System (FMS) Instrument Procedures Development*, December 31, 1998.
FAA Order 8260.44A, Chg 2, *Civil Utilization of Area Navigation (RNAV) Departure Procedures*, November 6, 2006.
FAA Order 8260.46D, *Departure Procedure (DP) Program*, August 20, 2009.
FAA Order 8260.48, *Area Navigation (RNAV) Approach Construction Criteria*, April 8, 1999.
FAA Order 8260.52, *United States Standard for Required Navigation Performance (RNP) Approach Procedures with Special Aircraft and Aircrew Authorization Required (SAAAR)*, June 3, 2005.
FAA Order 8260.54A, *The United States Standard for Area Navigation (RNAV)*, December 7, 2007.
FAA Order JO 7110.65U, *Air Traffic Control*, February 9, 2012.

FAA Advisory Circulars

FAA Advisory Circular 150/5020-1: *Noise Control and Compatibility Planning for Airports*, August 5, 1983.
FAA Advisory Circular 150/5200-33B: *Hazardous Wildlife Attractants on or near Airports*, August 28, 2007.
FAA Advisory Circular 36-3H: *Estimated Airplane Noise Levels in A-Weighted Decibels*, April 25, 2002.

Source: ATAC Corporation, August 2013.
Prepared by: ATAC Corporation, December 2013.

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4 Affected Environment

This chapter describes the human, physical, and natural environmental conditions that could be affected by the Proposed Action. Specifically, this Environmental Assessment (EA) considers effects on the environmental resource categories identified in Appendix A of Federal Aviation Administration (FAA) Order 1050.1E, Chg. 1, *Environmental Impacts: Policies and Procedures* (FAA Order 1050.1E). The potential environmental impacts of the Proposed Action and No Action Alternatives are discussed in Chapter 5, *Environmental Consequences*.

The technical terms and concepts discussed in this chapter are explained in Chapter 1, *Background*.

4.1 General Study Area

To describe Existing Conditions in the Charlotte Metroplex, the FAA developed a General Study Area. The General Study Area is used to evaluate the potential for environmental impacts under the Proposed Action. Two overall objectives guided the development of the General Study Area:

1. The General Study Area captures all flight paths identified for the No Action Alternative using 2011 radar data (the latest year of complete data available when this project started) and the flight paths designed for the Proposed Action, up to the point at which 95 percent of departing aircraft are at or above 10,000 feet above ground level (AGL) and 95 percent of arriving aircraft are at or above 7,000 feet AGL. As stated in FAA Order 1050.1E, Appendix A, Paragraph 14.5e, the FAA requires consideration of noise impacts of airspace actions from the surface to 10,000 feet AGL if the study area is larger than the immediate area around an airport or involves more than one airport. Furthermore, policy guidance issued by the FAA Program Director for Air Traffic Airspace Management states that, for air traffic project environmental analyses, noise impacts should be evaluated for proposed changes in arrival procedures between 3,000 and 7,000 feet AGL and departure procedures between 3,000 and 10,000 feet AGL for large civil jet aircraft weighing over 75,000 pounds.²⁰
2. The lateral boundary of the General Study Area is based on where aircraft cross U.S. Census tract boundaries at the 10,000/7,000 feet AGL thresholds. This extent is concisely defined to focus on areas of air traffic flow.

Exhibit 4-1 presents the General Study Area developed for this EA. **Table 4-1** identifies the states and counties that fall within or are intersected by the GSA boundary. In total, portions of 39 counties in North Carolina, 15 counties in South Carolina and three counties and two independent cities in Virginia fall within the General Study Area.

²⁰ Department of Transportation, Federal Aviation Administration, *Memorandum Regarding Altitude Cut-Off for National Airspace Redesign (NAR) Environmental Analyses*, September 15, 2003.

Table 4-1 States and Counties in the Study Area

North Carolina				
Alamance County	Caswell County	Henderson County	Rockingham County	Wilkes County
Alexander County	Catawba County	Iredell County	Rowan County	Yadkin County
Anson County	Cleveland County	Lincoln County	Rutherford County	Yancey County
Avery County	Davidson County	McDowell County	Stanly County	
Buncombe County	Davie County	Mecklenburg County	Stokes County	
Burke County	Forsyth County	Mitchell County	Surry County	
Cabarrus County	Gaston County	Montgomery County	Transylvania County	
Caldwell County	Guilford County	Polk County	Union County	
South Carolina				
Abbeville County	Chester County	Greenville County	Laurens County	Spartanburg County
Anderson County	Chesterfield County	Greenwood County	Pickens County	Union County
Cherokee County	Fairfield County	Lancaster County	Richland County	York County
Virginia				
Pittsylvania County	Patrick County	Henry County	Danville City	Martinsville City

Source: National Atlas of the United States of America: U.S. County Boundaries, 2005; ATAC Corporation, August 2014.

Prepared by: ATAC Corporation, August 2014.

4.2 Resource Categories or Sub-Categories Not Affected

This section discusses the environmental resource categories or sub-categories that would remain unaffected by the Proposed Action. These resource categories would remain unaffected, either because the resource does not exist within the General Study Area or the types of activities associated with the Proposed Action would not affect them. The resource categories or sub-categories are as follows:

- **Coastal Resources:** The Proposed Action does not involve land acquisition or ground disturbing activities that would affect coastal resources.
- **Construction Impacts:** The Proposed Action does not involve any construction or ground disturbing activities.
- **Farmlands:** The Proposed Action would not involve any land acquisition or ground disturbance that would have the potential to convert existing farmland to a non-agricultural use.
- **Fish, Wildlife and Plants (*Fish and Plants sub-categories only*):** The Proposed Action is generally situated in areas above 3,000 feet AGL and would not involve ground disturbance or other activities that would affect plant or terrestrial animal species.
- **Floodplains:** The Proposed Action would not be located in areas that include floodplains.

- **Hazardous Materials, Pollution Prevention, and Solid Waste:** The Proposed Action would not generate, disturb, transport, or treat hazardous materials or solid waste.
- **Historic, Architectural, Archeological, and Cultural Resources (*Archeological and Architectural sub-categories only*):** The Proposed Action would not involve land acquisition or ground disturbing activities that would affect archaeological or architectural resources.
- **Light Emissions and Visual Impacts:** The Proposed Action would not involve construction of any structures that would introduce new sources of lighting or result in visual impacts to surrounding areas. The changes to air traffic associated with the Proposed Action would generally occur at altitudes at or above 3,000 feet AGL and in the same general areas in which aircraft currently operate. Accordingly, the distances between aircraft and viewers on the ground would be sufficient to avoid intrusions and new aircraft operations would not be introduced to the viewshed that would constitute an adverse impact.
- **Natural Resources and Energy Supply (*Natural Resources sub-category only*):** The Proposed Action would not require use of unusual natural resources or other materials, or those in short supply.
- **Secondary (Induced) Impacts:** The Proposed Action would not cause changes in patterns of population movement or growth, public service demands, or business and economic activity. In addition, implementation of the Proposed Action would not result in an increase in the number of aircraft operations at the Study Airports. Furthermore, the Proposed Action does not involve construction of airport facilities that would result in or induce an increase in operational capacity or other ground disturbing activities that would involve the relocation of people or businesses.
- **Socioeconomic Impacts, Environmental Justice, and Children's Environmental Health and Safety Risks**
 - ***Socioeconomic Impacts sub-category:*** The Proposed Action would not involve acquisition of real estate, relocation of residents or community businesses, disruption of local traffic patterns, loss in community tax base, or changes to the fabric of the community.
 - ***Children's Environmental Health and Safety Risks sub-categories:*** The Proposed Action would not involve products or substances with which a child is likely to be exposed, come into contact, ingest, or use. Furthermore, the Proposed Action would not result in a local increase in emissions that would have the potential to affect children's health. Accordingly, there would be no increase in environmental health and safety risks that could disproportionately affect children.
- **Water Quality:** The Proposed Action does not involve any ground disturbing activities that would result in an increase in impervious surfaces or affect water quality or ground water.
- **Wetlands:** The Proposed Action does not involve land acquisition or ground disturbing activities that would affect wetlands.

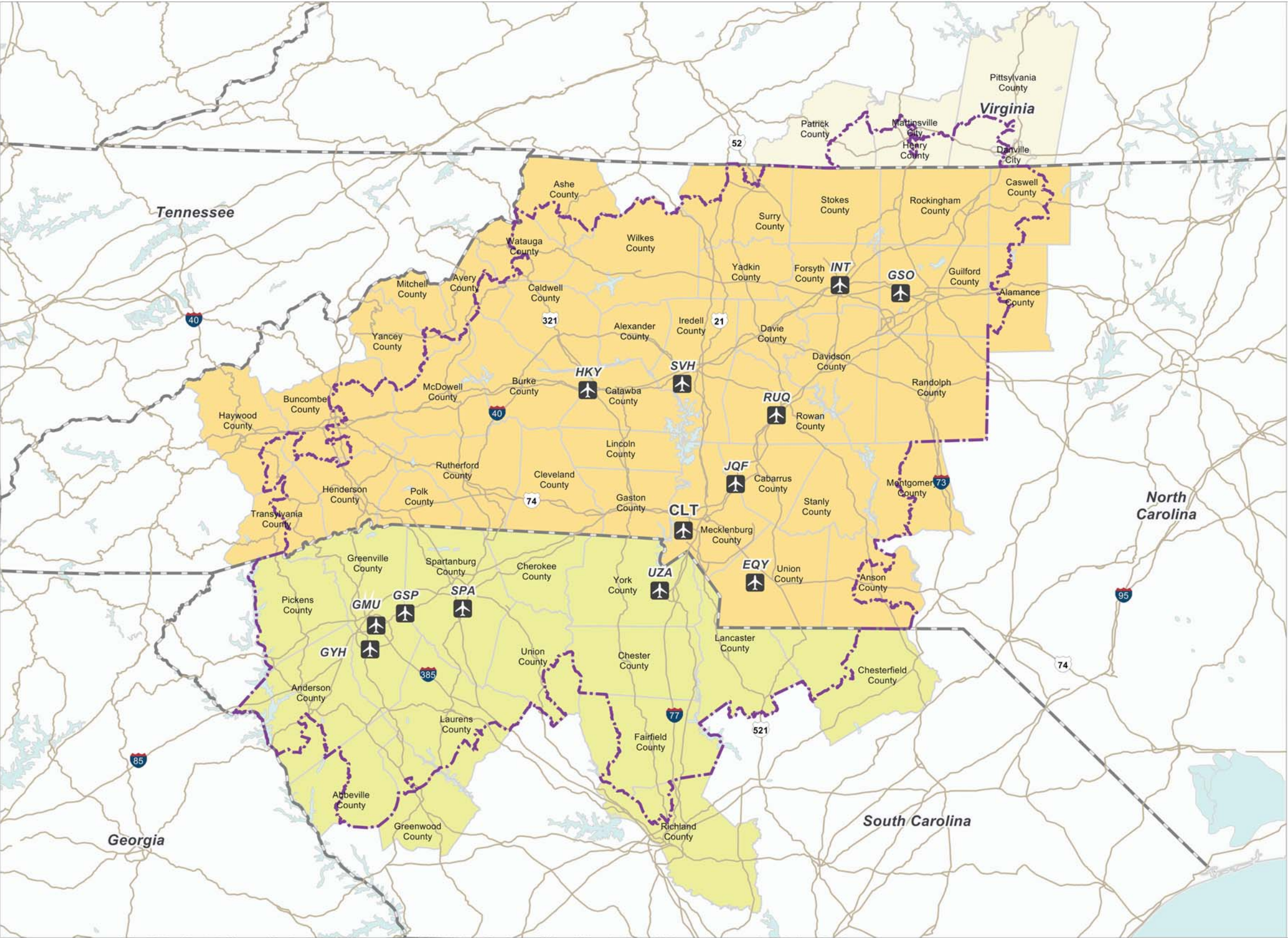
- **Wild and Scenic Rivers:** Two designated rivers, the New River and Wilson Creek, are located within the General Study Area. However, the Proposed Action would not involve ground disturbance or any other activity that would result in any diminishment of the scenic, recreational, or biological value of the rivers.

4.3 Potentially Affected Resource Categories or Sub-Categories

This section provides information on the current conditions within the General Study Area for those environmental resource categories or components that the Proposed Action could potentially affect. These environmental resource categories or sub-categories include:

- **Noise** (Section 4.3.1)
- **Compatible Land Use** (Section 4.3.2)
- **Department of Transportation Act: Section 4(f) Resources** (Section 4.3.3)
- **Historic, Architectural, Archeological, and Cultural Resources – *Historic and Cultural Resources sub-categories only*** (Section 4.3.4)
- **Fish, Wildlife, and Plants – *Wildlife sub-category only*** (Section 4.3.5)
- **Socioeconomic Impacts, Environmental Justice, and Children's Environmental Health and Safety Risks – *Environmental Justice sub-category only*** (Section 4.3.6)
- **Natural Resources and Energy Supply- *Energy Supply sub-category only (aircraft fuel only)*** (Section 4.3.7)
- **Air Quality** (Section 4.3.8)
- **Climate** (Section 4.3.9)

The following sections discuss each of the above listed environmental resource categories in detail.



LEGEND

- General Study Area Boundary
- Study Airport
- North Carolina County in Study Area
- South Carolina County in Study Area
- Virginia County in Study Area
- State Boundary
- U.S. and Interstate Highways
- Water

- Notes:
- CLT Charlotte Douglas International Airport
 - EQY Charlotte-Monroe Executive Airport
 - GMU Greenville Downtown Airport
 - GSO Piedmont Triad International Airport
 - GSP Greenville Spartanburg International Airport
 - GYH Donaldson Center Airport
 - HKY Hickory Regional Airport
 - INT Smith Reynolds Airport
 - JQF Concord Regional Airport
 - RUQ Rowan County Airport
 - SPA Spartanburg Downtown Memorial Airport
 - SVH Statesville Regional Airport
 - UZA Rock Hill/York County/Bryant Field Airport

Projection: Lambert Conformal Conic
Scale: 1,750,000

0 40 nm



Sources: National Atlas of the United States of America: U.S. County Boundaries, 2005; U.S. State Boundaries, 2005; and Water Bodies, 2005; Bureau of Transportation Statistics: National Transportation Atlas Database National Highway Planning Network, 2012; FAA: NFDC Airport database, 2012; ATAC Corporation: Study Area Boundary, 2013.
Prepared by: ATAC Corporation, December 2014.

Exhibit 4-1

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4.3.1 Noise

Aircraft noise is often the most noticeable environmental effect associated with any aviation project. This section discusses FAA guidance on conducting noise analyses, noise model input development, and existing aircraft noise conditions. **Appendix E** provides background information on the physics of sound, the effects of noise on people, and noise metrics. Detailed information on the noise analysis is provided in the *CLT OAPM Aircraft Noise Technical Report*, available on the OAPM Project website (<http://www.oapmenvironmental.com>).

4.3.1.1 Noise Modeling Methodology

The FAA has issued guidance on the assessment of aircraft noise in FAA Order 1050.1E. This guidance requires that aircraft noise analysis use the yearly Day-Night Average Sound Level (DNL) metric. The DNL metric is a single value representing the aircraft sound level over a 24-hour period and includes all of the sound energy generated within that period. The DNL metric includes a 10 decibel (dB) weighting for noise events occurring between 10:00 P.M. and 6:59 A.M. (i.e., nighttime). This weighting helps account for the greater level of annoyance caused by nighttime noise events when ambient noise levels are lower. Accordingly, the metric essentially equates one nighttime flight to 10 daytime flights. The DNL metric is further discussed in **Appendix E**.

In addition to requiring the use of the DNL metric, FAA Order 1050.1E also requires that aircraft noise be evaluated using one of three noise models: (1) the Integrated Noise Model (INM), (2) the Heliport Noise Model (HNM), or (3) the Noise Integrated Routing System (NIRS). NIRS is typically used for flight track changes over large areas and at altitudes over 3,000 feet AGL. For this EA, the FAA uses NIRS, Version 7.0b to analyze noise associated with the Proposed Action and No Action Alternative.

To evaluate Existing Conditions, the FAA conducted a detailed analysis of aircraft operating under instrument flight rules (IFR) conditions in 2011. Although the noise environment around major airports comes almost entirely from jet aircraft operations, the DNL calculations reflect noise from many types of jet and propeller aircraft operations on IFR flight plans that could be affected by the Proposed Action. Most aircraft around major airports that operate under IFR conditions obtain direction from air traffic control (ATC) related to separation from surrounding aircraft in these busy areas.

When operating outside certain categories of controlled airspace, aircraft operating under visual flight rules (VFR) conditions are not required to be in contact with ATC. Because these aircraft operate at the discretion of the pilot and are often not required to file flight plans, the FAA has very limited information for these operations. Subsequently, there is no known source for comprehensive route, altitude, aircraft type, and frequency information for VFR operations in the General Study Area. However, even if complete information were available for VFR operations, the Proposed Action evaluated in the EA would not require any changes to routing or altitudes to accommodate these operations. If they could be modeled, they would use the same flight routes and altitudes under the Proposed Action and No Action Alternative scenarios. Their operations would not be affected by the forecast conditions in 2015 (i.e., the first year of implementation) and 2020 (i.e., five years after implementation) for either the Proposed Action or the No Action Alternative. Therefore, VFR aircraft were not included in the analysis.

NIRS requires a variety of inputs, including local environmental data (e.g., temperature and humidity), runway layout, number and type of aircraft operations, runway use, and flight tracks. Accordingly, detailed information on aircraft operations for the Study Airports was assembled for input into NIRS. This includes specific aircraft fleet mix information, including aircraft type, arrival and departure times, and origin/destination airport.

A total of 743,312 IFR-filed flights to/from the Study Airports were identified through an examination of radar data obtained from the FAA's Performance Data Analysis and Reporting System (PDARS). The PDARS database was queried for the 2011 calendar year for all IFR-filed flights that operated at the Study Airports within the General Study Area. During this 365-day period, 15 days of data were unusable due to radar equipment anomalies, operational outages, or extreme weather events that made the data unreliable. The 350 days of usable data span all seasons and runway usage configurations for the Study Airports in the General Study Area. This data was used to develop the average annual day (AAD) fleet mix, time of day (day and night), and runway use input for NIRS. More detailed information related to the NIRS inputs for Existing Conditions is provided in the *CLT OAPM Aircraft Noise Technical Report*, available on the OAPM Project website (<http://www.oapmenvironmental.com>).

The PDARS data provided tracks for each flight that occurred within the 350 day period of 2011. The data was used both to define the AAD track locations and to represent a typical flow of traffic, including the typical climb and descent patterns that occur along each flow. Patterns also include top-of-climb and top-of-descent locations for fuel burn modeling purposes. The tracks were analyzed using proprietary software in order to visualize and analyze the radar data. All the trajectories were "bundled" into a set of tracks, representing a flow. The flows comprise all typical flight routings within the General Study Area for an annual average day. NIRS tracks are then developed based on the group of radar tracks representing each flow.

The NIRS model was used to calculate noise levels for the following specific locations on the ground:

- **Census Block Centroids:** The NIRS model can calculate DNL at the geographic centers (i.e., centroids) of census blocks to estimate the population exposed to varying levels of aircraft noise exposure. For this EA, population within the General Study Area was analyzed using 2010 U.S. Census block geometries.²¹ A census block is the smallest geographical unit used by the United States Census to collect data. The census block centroid DNL represents the DNL for the total maximum potential population within that census block. Because noise levels are analyzed only at the centroid point and applied to the entire census block area population, and because the area represented by each centroid varies depending on the density of population, the actual noise exposure level for individuals will vary from the reported level based on their proximity to the geographic centroid.
- **Grid Points:** The NIRS model can also be used to calculate noise exposure at evenly spaced grid points. For this EA, the General Study Area was covered with a grid with points spaced evenly at intervals of 0.5 nautical miles (nm). This grid was used to calculate noise at regular intervals throughout the General Study Area, as

²¹ U.S. Census Bureau, *2010 Tracts and American Community Survey Selected Economic Characteristics*, 2010.

well as within properties requiring evaluation under Section 4(f) of the *U.S. Department of Transportation (DOT) Act of 1966* (i.e., Section 4(f) Resources). These resources are discussed further in Sections 4.3.3.

- **Unique Points:** Noise levels at sites of interest that are too small to be captured in the 0.5 nm grid can also be analyzed using the NIRS model. Such sites include individual Section 4(f) resources that are less than one square nm in area (such as significant public parks or trails), and specific historic sites (such as individual buildings). See Section 4.3.3 for a discussion of what constitutes a Section 4(f) resource and Section 4.3.4 for a discussion of historic properties in the General Study Area.

In total, noise exposure levels were calculated at 115,841 census block centroids (centroids in the General Study Area that represent areas with population), 201,156 grid points, and 17,431 unique points throughout the General Study Area.

4.3.1.2 Existing Aircraft Noise Exposure

Table 4-2 identifies the total population exposed to aircraft noise between DNL 45 dB and 60 dB, DNL 60 dB and 65 dB, and DNL 65 dB and higher. This data is provided to establish a baseline for existing aircraft noise exposure. **Exhibit 4-2** provides a graphical representation of 2011 Existing Conditions noise exposure within the General Study Area by DNL 5 dB bands. As shown on **Exhibit 4-2**, areas exposed to higher DNL are generally aligned with Study Airport runways and areas with existing aircraft traffic.

Table 4-2 Maximum Population Exposed to Aircraft Noise (DNL) within the Study Area (2011)

DNL Range (dB)	Population
DNL 45 dB to DNL 60 dB	402,794
DNL 60 dB to less than DNL 65 dB	5,939
DNL 65 dB and higher	262
Total Above DNL 45 dB	408,995

Sources: U.S. Department of Transportation, Federal Aviation Administration, *NIRS Version 7.0b3*; U.S. Census Bureau, *2010 Tracts and American Community Survey Selected Economic Characteristics*, 2010.

Prepared by: ATAC Corporation, July 2014.

4.3.2 Compatible Land Use

Existing land use in the General Study Area is characterized by using generalized land coverage data obtained from the U.S. Geological Survey (USGS) *2006 National Land Cover Database (NLCD 2006)*. As shown on **Exhibit 4-3**, land use in the General Study Area is typified by dense urban development around the Charlotte, Greensboro, and Greenville areas. Areas of mixed forest interspersed with grassland dominate the remainder of the General Study Area. The General Study Area includes numerous large parks, recreational areas, wilderness areas, forests, and other types of resources managed by federal and state agencies. Section 4.3.3 further discusses these resources.

4.3.3 Department of Transportation Act, Section 4(f) Resources

Section 4(f) of the *U.S. Department of Transportation Act of 1966* (49 U.S.C. § 303(c)), states that, subject to exceptions for *de minimis* impacts:

... [The] Secretary [of Transportation] may approve a transportation program or project (other than any project for a park road or parkway under section 204 [1] of title 23) requiring the use of publicly owned land of a public park, recreation area, or wildlife and waterfowl refuge of national, State, or local significance, or land of an historic site of national, State, or local significance (as determined by the Federal, State, or local officials having jurisdiction over the park, area, refuge, or site) only if...there is no prudent and feasible alternative to using that land; and... the program or project includes all possible planning to minimize harm to the park, recreation area, wildlife and waterfowl refuge, or historic site resulting from the use.

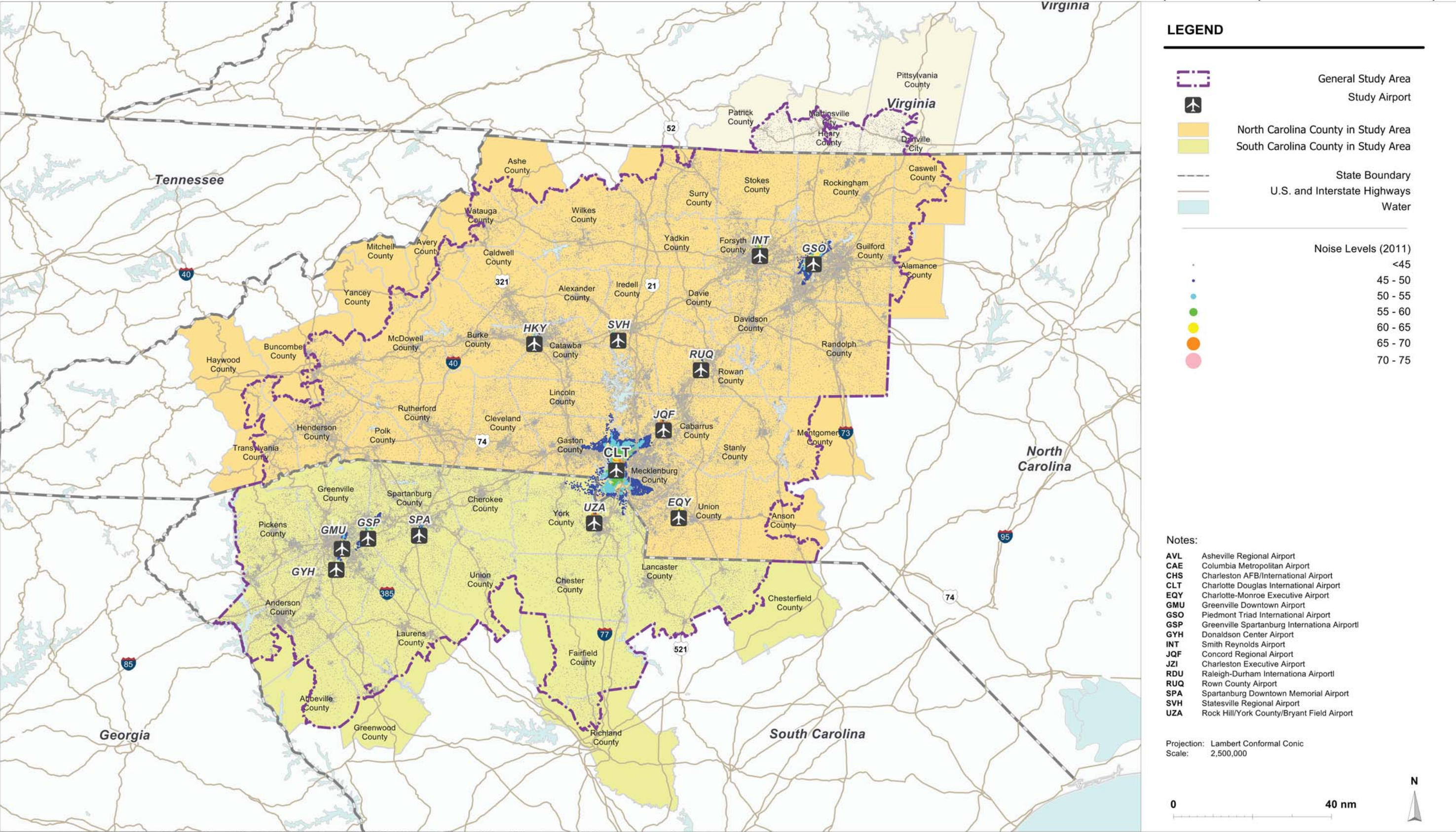
The term “use” includes both direct (i.e., physical) and indirect (i.e., constructive) impacts to Section 4(f) properties. Direct use is the physical occupation or alteration of a Section 4(f) property or any portion of a Section 4(f) property. A constructive use does not require direct physical impacts or occupation of a Section 4(f) resource, but would occur when an action would result in substantial impairment of a resource to the degree that the activities, features, or attributes of the resource that contribute to its significance or enjoyment are substantially diminished.

Parks and natural areas where a quiet setting is a generally recognized purpose and attribute receive special consideration. In these areas, the FAA official “must consult all appropriate Federal, State, and local officials having jurisdiction over the affected Section 4(f) resources when determining whether project-related noise impacts would substantially impair the resource.” Privately owned parks, recreation areas, and wildlife refuges are not subject to the Section 4(f) provisions.

Some Section 4(f) properties received funding through Section 6(f) of the *Land and Water Conservation Fund (LWCF) Act of 1965* (16 U.S.C. § 460l-4 *et seq.*) Section 6(f) states that no public outdoor recreation areas acquired or developed with LWCF assistance can be converted to non-recreation uses without the approval of the Secretary of the Interior. The Secretary of the Interior may only approve conversions if they are in accordance with the comprehensive statewide outdoor recreation plan, and if other recreation lands of reasonably equivalent usefulness and location will replace the converted areas.

4.3.3.1 Section 4(f) Resources in the General Study Area

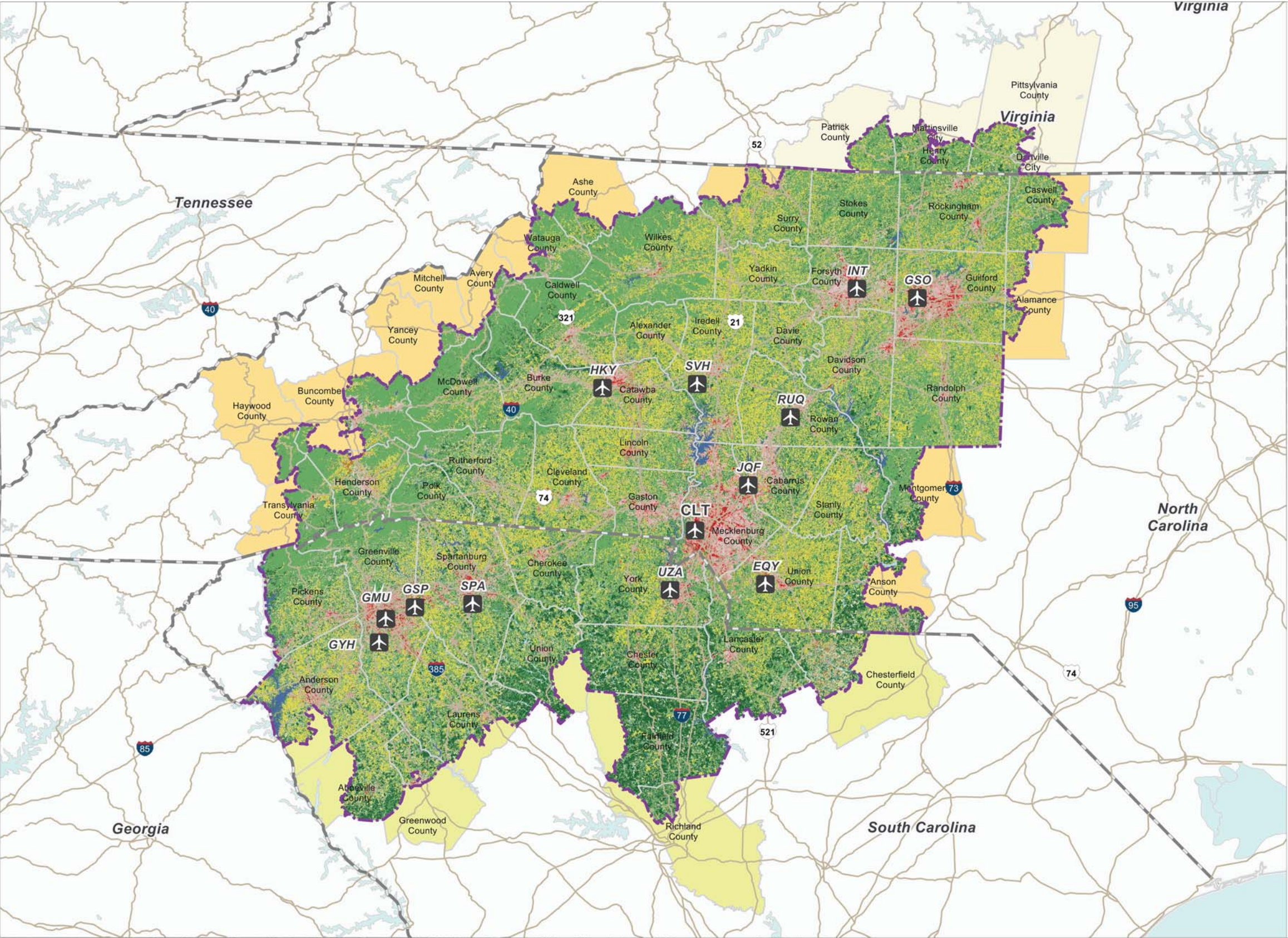
Data collected from both federal and state sources was used to identify Section 4(f) resources within the General Study Area. A total of 3,008 Section 4(f) resources were identified within the General Study Area. **Exhibit 4-4** depicts the locations of these resources. The locations of historic and cultural resources, also considered Section 4(f) resources, are discussed in Section 4.4 and depicted on **Exhibit 4-5**.



Sources: National Atlas of the United States of America: U.S. County Boundaries, 2005; U.S. State Boundaries, 2005; and Water Bodies, 2005; Bureau of Transportation Statistics: National Transportation Atlas Database National Highway Planning Network, 2012; FAA: NFDC Airport database, 2012; ATAC Corporation: Study Area Boundary, 2012, and Noise Levels, 2013.
Prepared by: ATAC Corporation, December 2014.

Exhibit 4-2

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LEGEND

General Study Area Boundary
Study Airport

North Carolina County in Study Area
South Carolina County in Study Area

State Boundary
U.S. and Interstate Highways
Water

National Land Cover Data

- Open Water
- Perennial ice/snow
- Developed, open space
- Developed, low intensity
- Developed, medium intensity
- Developed, high intensity
- Barren land
- Deciduous forest
- Evergreen forest
- Mixed forest
- Shrub/scrub
- Grassland/herbaceous
- Hay/pasture
- Cultivated crops
- Woody wetlands
- Herbaceous wetlands

- Notes:
- AVL Asheville Regional Airport
 - CAE Columbia Metropolitan Airport
 - CHS Charleston AFB/International Airport
 - CLT Charlotte Douglas International Airport
 - EQY Charlotte-Monroe Executive Airport
 - GMU Greenville Downtown Airport
 - GSO Piedmont Triad International Airport
 - GSP Greenville Spartanburg International Airport
 - GYH Donaldson Center Airport
 - INT Smith Reynolds Airport
 - JQF Concord Regional Airport
 - JZI Charleston Executive Airport
 - RDU Raleigh-Durham International Airport
 - RUQ Rowan County Airport
 - SPA Spartanburg Downtown Memorial Airport
 - SVH Statesville Regional Airport
 - UZA Rock Hill/York County/Bryant Field Airport

Projection: Lambert Conformal Conic
Scale: 2,500,000



Sources: National Atlas of the United States of America: U.S. County Boundaries, 2005; U.S. State Boundaries, 2005; and Water Bodies, 2005; Bureau of Transportation Statistics: National Transportation Atlas Database National Highway Planning Network, 2012; FAA: NFDC Airport database, 2012; ATAC Corporation: Study Area Boundary, 2013; Multi-Resolution Land Characteristics (MRLC) Consortium: 2006 National Land Cover Database

Prepared by: ATAC Corporation, December 2014.

Exhibit 4-3

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4.3.4 Historic, Architectural, Archeological, and Cultural Resources – Historic and Cultural Resources Sub-Categories

The *National Historic Preservation Act (NHPA)* of 1966 (16 U.S.C. § 470, as amended) requires federal agencies to consider the effects of their undertakings on properties listed or eligible for listing in the National Register of Historic Properties (i.e., National Register). Compliance requires consultation with the Advisory Council on Historic Preservation (ACHP), State Historic Preservation Officers (SHPO), and/or the Tribal Historic Preservation Officers (THPO).

It is possible that changes in aircraft flight routes associated with the Proposed Action could introduce or increase aircraft routing over historic resources and result in potential adverse aircraft noise impacts. For purposes of this EA, historic properties are defined as resources that are listed or eligible for listing in the National Register or relevant SHPO listings, or that have been identified through tribal consultation for values other than their archaeological qualities. As noted in Section 4.2, the Proposed Action does not involve ground disturbance that could potentially impact archaeological or architectural resources. Thus, these resources are not further discussed in this EA.

4.3.4.1 Historic and Cultural Resources in the General Study Area

Exhibit 4-5 shows the location of historic and cultural resources identified in the General Study Area. A total of 1,246 National Register listed properties and one tribal property were identified in the General Study Area. Historic properties are representative of every period in the history of this region and include some of the nation's most important historic and cultural resources from the colonial, antebellum, and post-Civil War periods.

4.3.5 Fish, Wildlife, and Plants – Wildlife Sub-Category

This section discusses the existing wildlife resources within the General Study Area. The Proposed Action involves redesign of standard instrument arrival and departure procedures (generally above 3,000 feet AGL) and the supporting airspace management structure serving the Study Airports. Accordingly, discussion is focused on avian and bat species that may be present within the General Study Area.

4.3.5.1 Threatened and Endangered Species and Migratory Birds

The *Endangered Species Act (ESA)* of 1973 (16 U.S.C. § 1531 *et seq.*), requires the evaluation of all federal actions to determine whether a Proposed Action is likely to jeopardize any proposed, threatened, or endangered species or proposed or designated critical habitat. A federal action is one that is conducted, funded, or permitted by a federal agency. Section 7 of the ESA requires the lead federal agency – in this case the FAA – to consult with the U.S. Fish and Wildlife Service (USFWS) and the National Oceanic and Atmospheric Administration (NOAA) to determine whether the proposed federal action would jeopardize the continued existence of any species listed or proposed for listing as threatened or endangered, or would result in the destruction or adverse modification of designated or proposed critical habitat. Critical habitat includes areas that will contribute to the recovery or survival of a listed species. Federal agencies are responsible for determining if an action “may affect” listed species. If so, the federal agency is required to prepare a Biological Assessment (BA) to determine if the action is “likely to adversely affect

the species.” The presence of federal and state listed avian and bat species was assessed based on agency lists and reports. Data from the USFWS were used to identify potential federally-listed species.

4.3.5.2 Migratory Birds

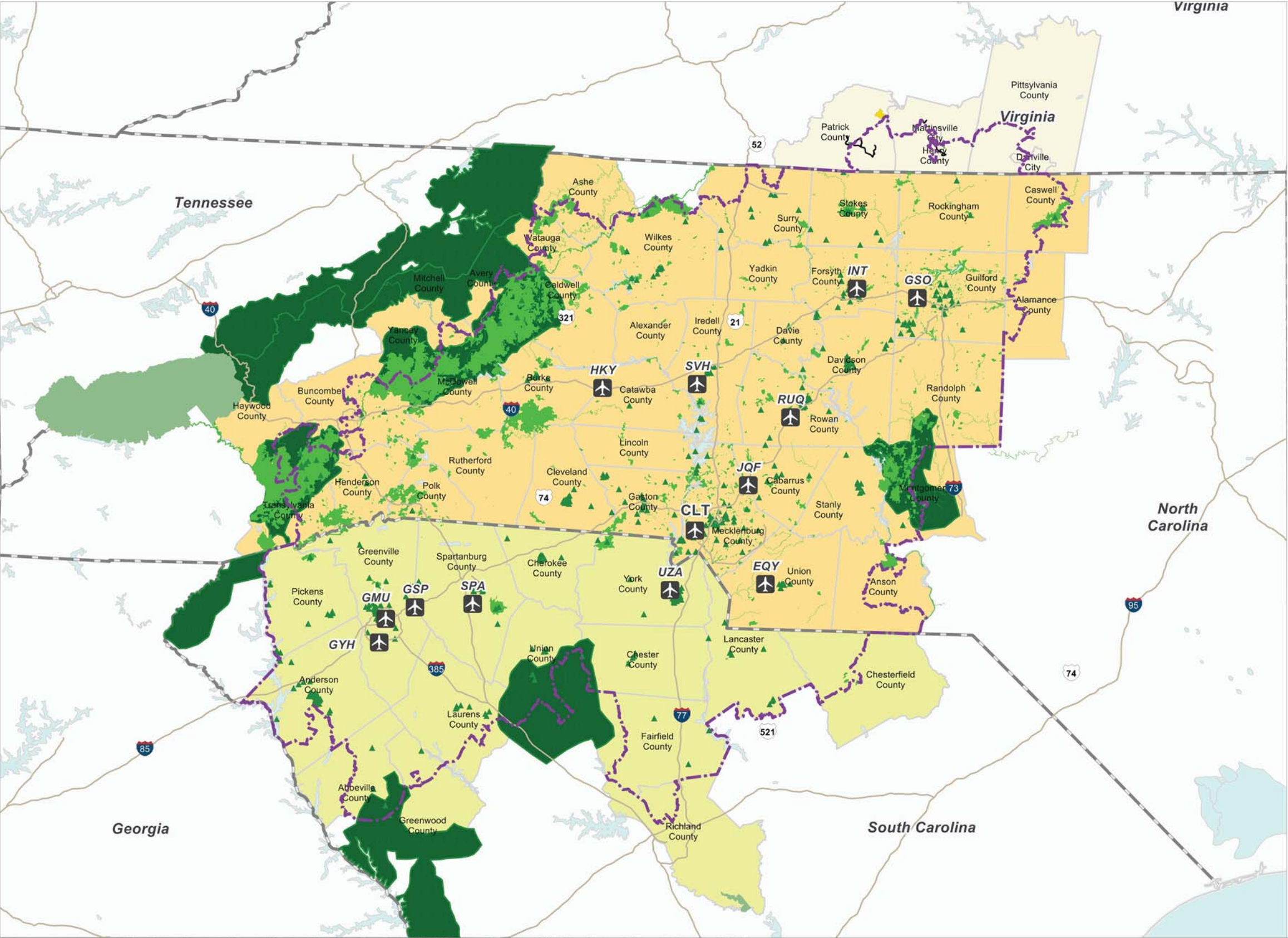
The *Migratory Bird Treaty Act (MBTA) of 1918* (16 U.S.C. §§ 703-712) prohibits the taking of any migratory bird and any part, nest, or egg of any such bird, without a permit issued by the USFWS. “Take” under the MBTA is defined as the action or attempt to “pursue, hunt, shoot, capture, collect, or kill.” Migratory birds listed under the ESA are managed by the agency staff members who handle compliance with Section 7 of the ESA; management of all other migratory birds is overseen by the Migratory Bird Division of the ESA. Several migratory bird species occur in, or migrate through, the General Study Area.

Birds migrate along four main routes or flyways in North America loosely delineated by geographic region: (1) Atlantic, (2) Central, (3) Mississippi, and (4) Pacific. The General Study Area for the CLT OAPM Project is located within the Atlantic Flyway. These flyways are not specific lines the birds follow but broad areas through which the birds migrate.

Migration routes may be defined as the various lanes birds travel from their breeding ground to their winter quarters. The actual routes followed by a given bird species differ by distance traveled, starting time, flight speed, geographic position and latitude of the breeding, and wintering grounds. The Atlantic Flyway includes multiple primary migration routes throughout these areas and connects to other primary flyway routes.

The most frequently traveled migration routes conform very closely to major topographical features that lie in the general north-south movement of migratory bird flyways. Therefore, the lanes of heavier concentration in the General Study Area follow principal valleys and mountain ranges.

Table 4-3 lists the eight federally listed threatened and endangered bird or bat species of concern that are found within the General Study Area.



LEGEND

- General Study Area Boundary
- Study Airport
- North Carolina County in Study Area
- South Carolina County in Study Area
- State Boundary
- U.S. and Interstate Highways
- Water
- Potential DOT 4(f) Resources
 - National Forest
 - National Park
 - National Recreation Area
 - National Wildlife Refuge
 - National Wilderness Area
 - Park/Trail
 - State/Regional Park

Notes:

- AVL Asheville Regional Airport
- CAE Columbia Metropolitan Airport
- CHS Charleston AFB/International Airport
- CLT Charlotte Douglas International Airport
- EQY Charlotte-Monroe Executive Airport
- GMU Greenville Downtown Airport
- GSO Piedmont Triad International Airport
- GSP Greenville Spartanburg International Airport
- GYH Donaldson Center Airport
- INT Smith Reynolds Airport
- JQF Concord Regional Airport
- JZI Charleston Executive Airport
- RDU Raleigh-Durham International Airport
- RUQ Rown County Airport
- SPA Spartanburg Downtown Memorial Airport
- SVH Statesville Regional Airport
- UZA Rock Hill/York County/Bryant Field Airport

Projection: Lambert Conformal Conic
Scale: 2,500,000

0 40 nm



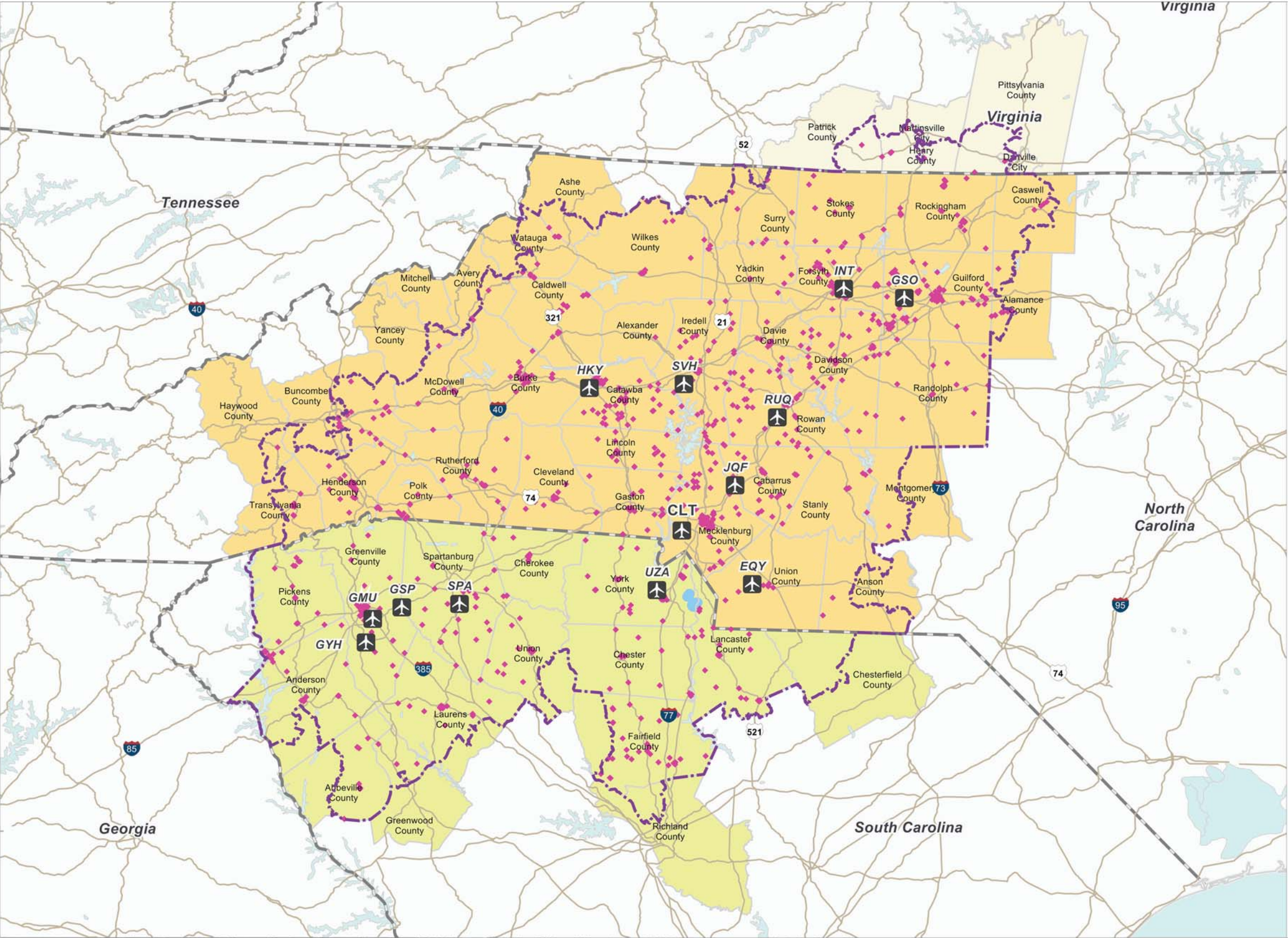
Sources: National Atlas of the United States of America: U.S. County Boundaries, 2005; U.S. State Boundaries, 2005; Water Bodies, 2005; and Federal Lands, 2005; Bureau of Transportation Statistics: National Transportation Atlas Database National Highway Planning Network, 2012; FAA: NFDC Airport database, 2012; National Park Service: Register of Historic Places, 2012; ATAC Corporation: Study Area Boundary, 2013.
Prepared by: ATAC Corporation, December 2014.

Exhibit 4-4

Section 4(f) Resources
in the General Study Area

CLT OAPM EA

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LEGEND

- General Study Area Boundary
- Study Airport
- North Carolina County in Study Area
- South Carolina County in Study Area
- Virginia County in Study Area
- State Boundary
- U.S. and Interstate Highways
- Water
- Historic Resources
- Tribal Lands

Notes:

- AVL Asheville Regional Airport
- CAE Columbia Metropolitan Airport
- CHS Charleston AFB/International Airport
- CLT Charlotte Douglas International Airport
- EQY Charlotte-Monroe Executive Airport
- GMU Greenville Downtown Airport
- GSO Piedmont Triad International Airport
- GSP Greenville Spartanburg International Airport
- GYH Donaldson Center Airport
- INT Smith Reynolds Airport
- JQF Concord Regional Airport
- JZI Charleston Executive Airport
- RDU Raleigh-Durham International Airport
- RUQ Rowan County Airport
- SPA Spartanburg Downtown Memorial Airport
- SVH Statesville Regional Airport
- UZA Rock Hill/York County/Bryant Field Airport

Projection: Lambert Conformal Conic
Scale: 2,500,000

0 40 nm



Sources: National Atlas of the United States of America: U.S. County Boundaries, 2005; U.S. State Boundaries, 2005; and Water Bodies, 2005; Bureau of Transportation Statistics: National Transportation Atlas Database National Highway Planning Network, 2012; FAA: NFDC Airport database, 2012; National Park Service: Register of Historic Places, 2012; ATAC Corporation: Study Area Boundary, 2013.

Prepared by: ATAC Corporation, December 2014.

Exhibit 4-5

Historic and Cultural Resources
in the General Study Area

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Table 4-3 Threatened or Endangered Avian and Bat Species Potentially in the Study Area

Status	Species	Type	North Carolina	State South Carolina	Virginia
Endangered	Bat, gray Entire (<i>Myotis grisescens</i>)	Bat	X		
Endangered	Bat, Indiana Entire (<i>Myotis sodalis</i>)	Bat	X		X
Endangered	Bat, Virginia big-eared Entire (<i>Corynorhinus (=Plecotus) townsendii virginianus</i>)	Bat	X		X
Threatened	Plover, piping except Great Lakes watershed (<i>Charadrius melodus</i>)	Bird	X	X	
Endangered	Stork, wood AL, FL, GA, SC (<i>Mycteria americana</i>)			X	
Endangered	Tern, roseate northeast U.S. nesting pop. (<i>Sterna dougallii dougallii</i>)	Bird	X		X
Endangered	Warbler (=wood), Bachman's Entire (<i>Vermivora bachmanii</i>)	Bird		X	
Endangered	Woodpecker, red-cockaded Entire (<i>Picoides borealis</i>)	Bird	X	X	X

Sources: US Fish and Wildlife Service, <http://www.fws.gov/endangered/> Accessed March 2013; August 2014.

Prepared by: ATAC Corporation, August 2014.

4.3.5.3 Existing Wildlife Strikes

The aviation community has long recognized that the threat of aircraft collision with wildlife is real and increasing. Globally, wildlife strikes have killed more than 229 people and destroyed over 210 aircraft since 1988.²² Contributing factors to this threat include an increase in large bird populations as well as an increase in air traffic operations by quieter, turbofan-powered aircraft. According to the FAA National Wildlife Strike Database, since 1990 the majority (92 percent) of aircraft collisions with wildlife have occurred below 3,000 feet AGL.

Wildlife strike reports from 2011 were collected from the FAA *National Wildlife Strike Database* for each Study Airport. According to the wildlife strike reports, Study Airports accounted for 3.3 percent of the 2011 national wildlife strike total and three percent of the 2011 national avian/bat strike total. **Table 4-4** depicts study airports that had wildlife and avian/bat strikes for 2011. Of the 133 avian/bat strikes reported for 2011, 117 included information on the altitude at which the strike took place. A total of 20 of the 133 bird strikes reported occurred at altitudes above 3,000 feet.

²² U.S. Department of Transportation, Federal Aviation Administration, *Wildlife Strikes to Civil Aircraft in the United States, 1990-2010*, Serial Report Number 17, 2011.

Table 4-4 2011 Study Airports Wildlife and Avian/Bat Strike Summary

Airport	Avian/Bat	<u>Strikes</u>		Total
			Other Wildlife	
CLT	114	3		117
EQY	0	0		0
GMU	1	0		1
GSO	7	0		7
GSP	8	0		8
GYH	0	0		0
HKY	1	0		1
INT	1	0		1
JQF	0	0		0
RUQ	0	0		0
SPA	0	0		0
SVH	0	0		0
UZA	1	0		1
Total	133	2		136

Source: U.S. Department of Transportation, Federal Aviation Administration, *Wildlife Strike Database* (<http://wildlife-mitigation.tc.faa.gov/wildlife/database.aspx>; accessed December 2014).

Prepared by: ATAC Corporation, December 2014.

4.3.6 Socioeconomic Impacts, Environmental Justice, and Children's Environmental Health and Safety Risks – Environmental Justice Sub-Category

This section is limited to a discussion of Environmental Justice as it pertains to potential aircraft noise impacts in the General Study Area. An environmental justice analysis considers the potential of the proposed project alternatives to cause disproportionate and adverse effects on low-income or minority populations. In the event that adverse effects are determined, applicable mitigation ensures that no minority or low-income populations bear a disproportionate burden of those effects.

As discussed in FAA Order 1050.1E, both Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, and the accompanying Presidential Memorandum, as well as Order DOT 5610.2, *Environmental Justice*, require the FAA to provide for meaningful public involvement by minority and low-income populations. These documents encourage consideration of environmental justice impacts in EAs to determine whether a disproportionately high and adverse impact may occur.

The socioeconomic and racial characteristics of the population within the General Study Area are based on data from the 2010 U.S. Census. Minority and low-income populations for each census tract within the General Study Area were identified using Geographic Information Systems (GIS). This analysis defines and identifies minority population census tracts and low-income population census tracts as follows:

- A **Minority Population census tract** is defined as a tract having a minority population percentage greater than the average minority population percentage of the General Study Area. Based on the 2010 census data, the average percentage of minority population residing in the General Study Area was 41 percent.

Therefore, every census tract with a percentage of minority population greater than 41 percent was identified as a census tract of environmental justice concern. A minority population is defined as as “any readily identifiable groups 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.”²³ Minority means a person who is Black, Hispanic or Latino, Asian American, American Indian and Alaskan Native, or Native Hawaiian and Other Pacific Islander.²⁴

- A **Low-Income Population census tract** is defined as a tract having a greater percentage of low-income population than the average percentage of low-income population residing in the General Study Area. Based on the 2010 Poverty Guidelines identified by the Department of Health and Human Services (HHS), the poverty threshold for a household of three persons was set at \$18,310 for the 48 contiguous states, and therefore is applicable to the General Study Area. For the purposes of identifying low-income population census tracts, the HHS threshold of \$18,310 was used. Based on the 2010 data, the average percentage of low-income population residing in the General Study Area was 12.6 percent. Therefore, every census tract with a percentage of low-income population greater than 12.6 percent was identified as a census tract of environmental justice concern.

Exhibit 4-6 depicts areas of environmental justice concern in the General Study Area. **Table 4-5** shows the total population, minority population, and low-income population for each state in the General Study Area as reported by the 2010 Census.

Table 4-5 Selected Populations in the General Study Area

State	Population	General Study Area Population			
		Minority	% of Total	Low Income	% of Total
North Carolina	4,589,721	1,164,167	25%	537,055	12%
South Carolina	1,796,186	447,432	25%	227,537	13%
Virginia	107,368	28,456	27%	13,654	13%

Source: U.S. Census Bureau, *2010 Tracts and American Community Survey Selected Economic Characteristics*, 2010.

Prepared by: ATAC Corporation, October 2014.

4.3.7 Energy Supply (Aircraft Fuel)

This section describes fuel consumption by IFR aircraft arriving at and departing from the Study Airports. Using the NIRS model, aircraft fuel burn was calculated to estimate aircraft fuel consumption associated with air traffic flows under 2011 Existing Conditions. NIRS calculates fuel burn using the same input used for calculating noise. (See Section 4.3.1.1 for a discussion of NIRS model inputs.) Based on the NIRS calculation, IFR aircraft arriving at and departing from the Study Airports burn approximately 1,394,001 kg of fuel on an AAD basis.

²³ Order DOT 5610.2, *Environmental Justice*, May 2, 2012.

²⁴ Id.

4.3.8 Air Quality

This section describes air quality conditions within the General Study Area. In the United States, air quality is generally monitored and managed at the county or regional level. The U.S. Environmental Protection Agency (EPA), pursuant to mandates of the federal *Clean Air Act*, (42 U.S.C. § 7401 *et seq.*), has established the National Ambient Air Quality Standards (NAAQS) to protect public health, the environment, and quality of life from the detrimental effects of air pollution. Standards have been established for the following criteria pollutants: carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO₂), ozone (O₃), particulate matter (PM), and sulfur dioxide (SO₂). PM standards have been established for inhalable coarse particles ranging in diameter from 2.5 to 10 micrometers (µm) [referred to as PM₁₀] and fine particles less than 2.5 µm [PM_{2.5}] in diameter.

In accordance with the *Clean Air Act* (), 42 U.S.C. 7401 *et. seq.* the EPA uses air monitoring data it compiles as well as data collected by local air quality agencies to classify counties and some sub-county geographical areas by their compliance with the NAAQS. An area with air quality at or below the NAAQS is designated as an attainment area. An area with air quality that exceeds the NAAQS is designated as a nonattainment area. Nonattainment areas are further classified as extreme, severe, serious, moderate, and marginal by the extent the NAAQS are exceeded. Areas that have been reclassified from nonattainment to attainment are identified as maintenance areas. An area may be designated as unclassifiable when there is a temporary lack of data on which to base its attainment status. **Table 4-6** identifies those areas within the General Study Area that are in nonattainment or maintenance for one or more criteria pollutants.

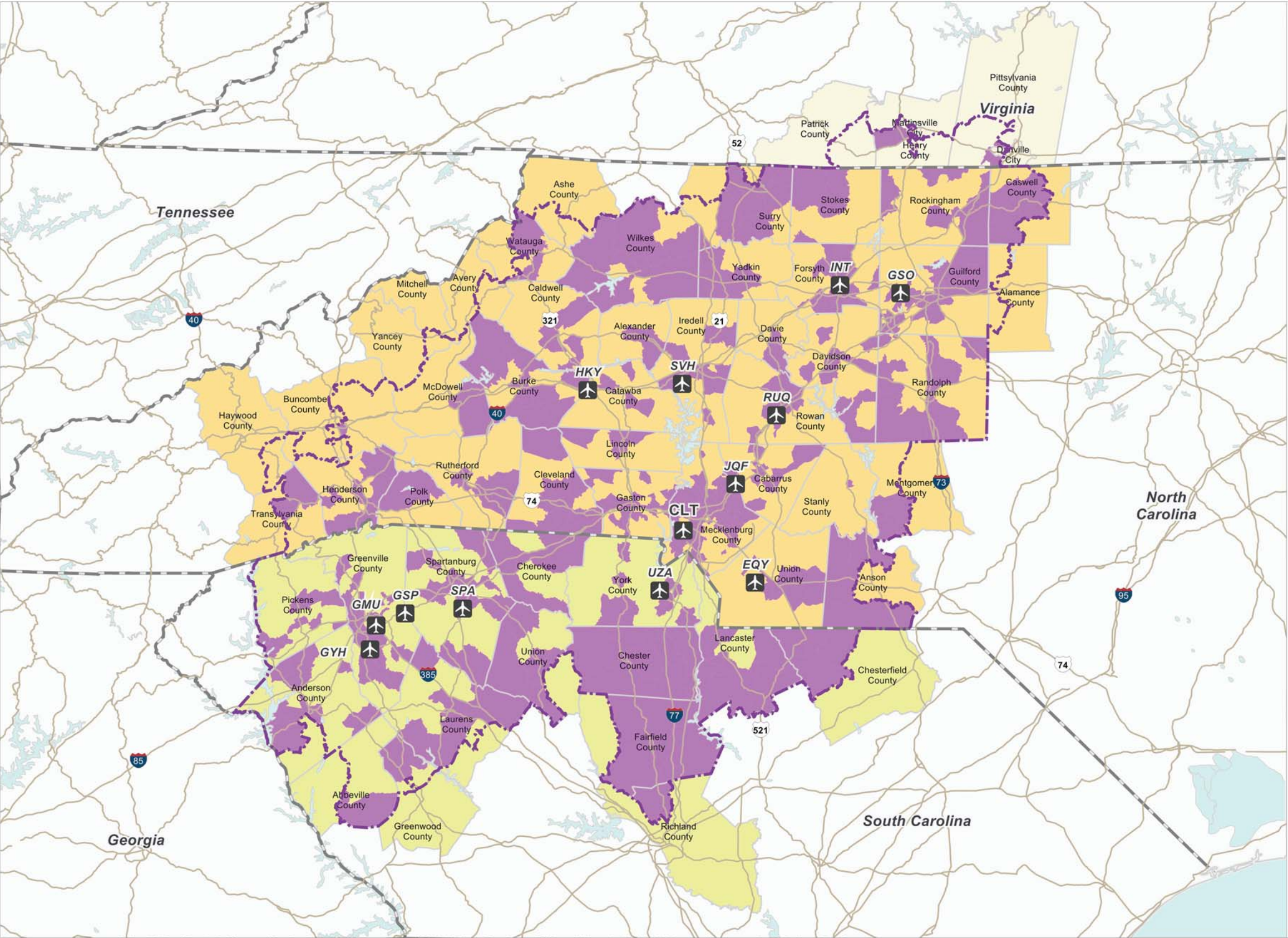
The FAA has determined that aircraft operations at or above the average mixing height of 3,000 feet AGL have a very small effect on pollutant concentrations at ground level.²⁵ The mixing height represents the height of the completely mixed portion of the atmosphere that begins at the earth's surface and extends to a few thousand feet overhead where the atmosphere becomes fairly stable.²⁶

Table 4-6 NAAQS Attainment Areas in the General Study Area

Criteria Pollutant	Status	State	County
Ozone (8-Hour)	Marginal	NC	Lincoln County, Union County, Mecklenburg County, Cabarrus County, Rowan County
		SC	York County
Carbon Monoxide	Moderate	NC	Mecklenburg County, Durham County, Wake County, Forsyth County
Sources:	US Environmental Protection Agency Green Book [http://www.epa.gov/oaqps001/greenbk/]. Accessed March 2013.		
Prepared by:	ATAC Corporation, March 2013.		

²⁵ Wayson, Roger, and Fleming, Gregg, "Consideration of Air Quality Impacts by Airplane Operations at or Above 3000 feet AGL," Volpe National Transportation Systems Center and FAA Office of Environment & Energy, FAA-AEE-00-01-DTS-34, September 2000 (http://www.faa.gov/regulations_policies/policy_guidance/envir_policy/).

²⁶ U.S. Department of Transportation, Federal Aviation Administration, *Air Quality Procedures For Civilian Airports & Air Force Bases*, April 1997 (http://www.faa.gov/regulations_policies/policy_guidance/envir_policy/airquality_handbook/media/Handbook.PDF).



LEGEND

- General Study Area Boundary
- Study Airport
- North Carolina County in Study Area
- South Carolina County in Study Area
- State Boundary
- U.S. and Interstate Highways
- Water
- Environmental Justice Community

- Notes:
- CLT Charlotte Douglas International Airport
 - EQY Charlotte-Monroe Executive Airport
 - GMU Greenville Downtown Airport
 - GSO Piedmont Triad International Airport
 - GSP Greenville Spartanburg International Airport
 - GYH Donaldson Center Airport
 - HKY Hickory Regional Airport
 - INT Smith Reynolds Airport
 - JQF Concord Regional Airport
 - RUQ Rowan County Airport
 - SPA Spartanburg Downtown Memorial Airport
 - SVH Statesville Regional Airport
 - UZA Rock Hill/York County/Bryant Field Airport

Projection: Lambert Conformal Conic
Scale: 1,750,000



Sources: National Atlas of the United States of America: U.S. County Boundaries, 2005; U.S. State Boundaries, 2005; and Water Bodies, 2005; Bureau of Transportation Statistics: National Transportation Atlas Database National Highway Planning Network, 2012; FAA: NFDC Airport database, 2012; U.S. Census Bureau: 2010 Tracts, Profile of General Population and Housing Characteristics, and American Community Survey Selected Economic Characteristics; ATAC Corporation: Study Area Boundary, 2013.

Prepared by: ATAC Corporation, December 2014.

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4.3.9 Climate

Greenhouse gases (GHGs) are naturally occurring and man-made gases that trap heat in the earth's atmosphere. These gases include CO₂, methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF₆). According to the EPA, in 2009 the General Accounting Office (GAO) reported that domestic aviation contributed approximately three percent of national CO₂ emissions.²⁷ Similarly, the International Civil Aviation Organization (ICAO) estimated that aviation accounted for approximately three percent of all man-made global CO₂ emissions.²⁸ The FAA considers CO₂ emissions from aircraft to be the primary GHG of concern.

In June 2012, the CEQ updated the *Federal GHG Accounting and Reporting Guidance* establishing requirements for federal agencies to calculate and report GHG emissions associated with their operations. The federal guidance establishes a single metric for reporting all GHGs in metric tons (MT) of CO₂ equivalent (CO₂e) or MTCO₂e.

For purposes of this EA, the amount of fuel burned by IFR aircraft arriving and departing from the Study Airports in the General Study Area as estimated by the NIRS model is used to calculate total MTCO₂e. Fuel burn calculations are discussed in Section 4.3.7, *Energy Supply*. The calculated fuel burn was used to estimate the total MT of CO₂, reported here as MTCO₂e. **Table 4-7** presents the total estimated MTCO₂e along with estimates of all national and global emissions of MTCO₂e.

Table 4-7 CLT OAPM CO₂e Estimates (2011)

CLT OAPM	National	Global
0.00044 MMT	148 MMT	50,100 MMT ¹
Notes: 1\ 2010 estimate. MMT=Million Metric Tons		
Source: U.S. Environmental Protection Agency, <i>Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2011</i> (EPA 430-R-13-001), April 12, 2013; United Nations Environment Programme, <i>The Emissions Gap Report 2012</i> , November 2012; ATAC Corporation, July 2014.		
Prepared by: ATAC Corporation, August 2014.		

²⁷United States Congress, U.S. Government Accountability Office, *Aviation and Climate Change. GAO Report to Congressional Committees*, (2009). (<http://www.gao.gov/new.items/d09554.pdf>).

²⁸ Alan Melrose, "European ATM and Climate Adaptation: A Scoping Study," in *ICAO Environmental Report*. (2010).

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5 Environmental Consequences

This chapter discusses the potential environmental impacts that could result from implementation of the Proposed Action and the No Action Alternative. Specifically, this EA considers effects on the environmental resource categories identified in Appendix A of FAA Order 1050.1E. Both the Proposed Action and the No Action Alternative were evaluated under forecasted 2015 conditions, the first year of implementation for the Proposed Action, and under forecasted 2020 conditions, five years after implementation of the Proposed Action. This evaluation includes consideration of the direct, indirect, and cumulative effects associated with the Proposed Action and No Action Alternative, as required under FAA Order 1050.1E.

Potential environmental impacts are identified for the environmental resource categories described in Section 4.3. Neither the Proposed Action nor the No Action Alternative would involve land acquisition; physical changes to the environment resulting from ground disturbance or construction activities; changes in patterns of population movement or growth, increases in public service demands, or business and economic activity; or generation, disturbance, transportation, or treatment of hazardous materials. Therefore, neither alternative is expected to result in impacts to certain environmental resource categories (please see Section 4.2 for a list of excluded categories). These environmental resource categories are not further discussed in this chapter.

Table 5-1 identifies the environmental impact categories with potential to be affected by the Proposed Action, the thresholds of significance used to determine the potential for impacts (if applicable), and a side-by-side comparative summary of the potential for environmental impacts resulting from implementation of the Proposed Action under 2015 and 2020 forecast conditions.

Table 5-1 Summary of Potential Environmental Impacts (1 of 2)

Environmental Impact Category	Threshold of Significance	Significant Impact?	
		2015	2020
Noise	A significant noise impact would occur if analysis shows that the proposed action will cause noise sensitive areas to experience an increase in noise of DNL 1.5 dB or more at or above DNL 65 dB noise exposure when compared to the no action alternative for the same timeframe.	No	No
Compatible Land Use	A significant noise impact may occur if analysis shows that the proposed action will cause noise sensitive areas to experience an increase in noise of DNL 1.5 dB or more at or above DNL 65 dB noise exposure when compared to the no action alternative for the same timeframe.	No	No

Table 5-1 Summary of Potential Environmental Impacts (2 of 2)

Environmental Impact Category	Threshold of Significance	2015	2020
Department of Transportation Act, Section 4(f) Resources	A significant impact would occur pursuant to NEPA when a proposed action either involves more than a minimal physical use of a section 4(f) property or is deemed a "constructive use" substantially impairing the 4(f) property, and mitigation measures do not eliminate or reduce the effects of the use below the threshold of significance (e.g., by replacement in kind of a neighborhood park). Substantial impairment would occur when impacts to section 4(f) lands are sufficiently serious that the value of the site in terms of its prior significance and enjoyment are substantially reduced or lost.	No	No
Historic and Cultural Resources	A significant impact may occur when an action adversely affects a protected property and the responsible FAA official determines that the information from the State and/or Tribal Historic Preservation Officer addressing alternatives to avoid adverse effects and mitigation warrant further study.	No	No
Wildlife (Avian and Bat Species)	A significant impact to federally-listed threatened and endangered species would occur when the FWS or NMFS determines that the proposed action would be likely to jeopardize the continued existence of the species in question, or would result in the destruction or adverse modification of Federally-designated critical habitat in the affected area. An action need not involve a threat of extinction to federally listed species to meet the NEPA standard of significance. Lesser impacts including impacts on non-listed species could also constitute a significant impact.	No	No
Environmental Justice	A significant impact would occur if there were disproportionately high and adverse human health or environmental effects on minority and low-income populations.	No	No
Energy Supply (Aircraft Fuel)	A significant impact may occur when an action's construction, operation or maintenance would cause demands that would exceed available or future (project year) natural resources or energy supplies and the responsible FAA official determines that additional analysis in an EIS is necessary	No	No
Air Quality	Potentially significant air quality impacts associated with an FAA project or action would be demonstrated by the project or action exceeding one or more of the NAAQS for any of the time periods analyzed.	No	No
Climate	No significance thresholds have been established.	No	No

Source: FAA Order 1050.1E, Chg 1, Appendix A; ATAC Corporation, December 2013.
Prepared By: ATAC Corporation, December 2014.

The following sections describe the impact findings for each environmental resource category, followed by a discussion of potential cumulative impacts.

5.1 Noise

This section discusses the analysis of aircraft noise exposure under the Proposed Action and the No Action Alternative under both 2015 and 2020 forecast conditions. This discussion includes identification of the differences in noise exposure between the Proposed Action and the No Action Alternative. This comparison is used to determine if implementation of the Proposed Action would result in significant noise impacts. Additional information on noise metrics and the basics of noise can be found in **Appendix E**. Detailed information on the noise analysis prepared for the CLT OAPM Project is included in the *CLT OAPM Noise Technical Report*, available on the project website (<http://www.oapmenvironmental.com>).

5.1.1 Summary of Impacts

Aircraft noise exposure was modeled for both the Proposed Action and the No Action Alternative under 2015 and 2020 forecast conditions. The noise analysis demonstrates that noise exposure resulting from implementation of the Proposed Action would not result in a day-night average sound level (DNL) increase of 1.5 dBA or higher in noise sensitive areas exposed to DNL 65 dB or higher. Therefore, the Proposed Action would not result in a significant noise impact.

5.1.2 Methodology

The noise analysis evaluated noise exposure to communities within the General Study Area generated by aircraft forecasted to be operating under Instrument Flight Rules (IFR) -filed flight plans, at altitudes between the surface (i.e., ground level) and up to 10,000 feet above ground level (AGL). IFR-filed aircraft activity was forecasted for the years 2015 and 2020 and used to model conditions under both the Proposed Action and the No Action Alternative. Noise modeling was conducted using Noise Integrated Routing System (NIRS) Version 6.1, the FAA-required noise model for projects involving air traffic changes over large areas and altitudes over 3,000 feet AGL.

If the Proposed Action is approved, the FAA expects to begin and complete implementation in 2015; therefore, aircraft noise modeling was completed for 2015 and five years later (2020), as required by FAA Order 1050.1E. Future year noise exposure levels modeled for the Proposed Action and the No Action Alternative were compared to determine whether there is a potential for noise impacts.

In both the 2015 and 2020 forecast scenarios, the Proposed Action and the No Action Alternative were modeled using the same number and type of aircraft operations. The Proposed Action does not include development or construction of facilities, such as runways or terminal expansions that would be necessary to accommodate an increase in aviation activity; therefore, no additional growth in operations is anticipated. The noise analysis reflects the change in noise exposure resulting from the proposed changes in aircraft routes (i.e., flight tracks) under the Proposed Action compared to the No Action Alternative.

Detailed information on IFR-filed aircraft operations within the General Study Area was assembled for input into NIRS, including the following data:

Average Annual Day IFR-Filed Aircraft Flight Schedules: The IFR-filed aircraft flight schedules identify arrival and departure times, aircraft types, and origin/destination information for an average annual day (AAD) in 2015 and in 2020. The AAD represents all

the aircraft operations for every day in a study year divided by 365, the number of days in a year. The AAD does not reflect a particular day, but is meant to represent a typical day over a period of a year. The forecast was based on the FAA's 2012 Terminal Area Forecast (TAF),²⁹ modified for 2015 and 2020 with additional details using previously identified arrival/departure times, aircraft types, and origin/destination information. For 2015, a total of 743,312 IFR operations (2,063 IFR operations for an average annual day) were modeled for all Study Airports. For 2020, a total of 828,172 IFR operations (2,296 IFR operations for an average annual day) were modeled for all Study Airports.

Flight Tracks: The flight tracks used in modeling were based on radar data collected for the existing conditions (2011) noise analysis and information provided by FAA Air Traffic Control (ATC) personnel. Aircraft routings under both the No Action Alternative and Proposed Action are depicted on **Exhibits 3-5 through 3-8** in Chapter 3, *Alternatives*. For the Proposed Action, flight tracks were developed from the aircraft procedures created by the CLT OAPM Design & Implementation (D&I) Team using the Terminal Area Route Generation, Evaluation, Traffic and Simulation (TARGETS) program. The majority of the No Action Alternative modeled flight tracks are based on the existing conditions noise analysis. The flight tracks for amended or new procedures that are part of the No Action Alternative were modeled based on input from the ATC subject matter experts who developed the procedures.

Runway Use: Runway use percentages were identified for all runways at the Study Airports. Forecasted aircraft operations were assigned to particular runways representing operating conditions at the Study Airports under Proposed Action and No Action Alternative conditions. The Proposed Action Alternative was not expected to change runway use patterns at the Study Airports compared to the No Action Alternative.

More detail related to the development of the NIRS model input files is provided in the *CLT OAPM Noise Technical Report*, available on the project website (<http://www.oapmenvironmental.com>).

As discussed in Section 4.3.1.1, the NIRS model was used to compute DNL values for 2015 and 2020 Proposed Action and No Action Alternative conditions at three sets of data points throughout the General Study Area:

1. 115,841 2010 Census block centroids;
2. 201,156 uniform grid points at 0.5-nautical mile (nm) intervals on a uniform grid covering the General Study Area, which were also used to calculate DNL values at potential Department of Transportation Act (DOT), Section 4(f) resources and historic sites; and,
3. 17,431 unique points representing Section 4(f) resources too small to be captured in the uniform grid, including 2,234 unique points representing National Register listed historic sites.

As discussed in Section 4.3.1.1, Section 14, paragraph 14.5e of Appendix A to FAA Order 1050.1E, requires analysis of aircraft noise using the DNL metric. **Table 5-2** provides the

²⁹ U.S. Department of Transportation, Federal Aviation Administration, Terminal Area Forecast, 2012 (<https://aspm.faa.gov/main/taf.asp>).

criteria used to assess the changes in aircraft noise exposure attributable to the Proposed Action compared with the No Action Alternative. FAA Order 1050.1E defines a significant impact as an increase of DNL 1.5 dB at noise-sensitive land use locations (e.g., residences, schools, etc.) exposed to aircraft noise of DNL 65 dB or higher under the Proposed Action. For example, an increase from 63.5 dB to 65 dB is considered a significant impact.

In addition, in response to a recommendation made in 1992 by the Federal Interagency Committee on Noise (FICON), FAA Order 1050.1E also recommends that in instances where there are DNL increases of 1.5 dB or more at noise sensitive locations in areas exposed to aircraft noise of DNL 65 dB and higher, DNL increases of 3 dB or more in areas exposed to aircraft noise between DNL 60 dB and 65 dB should also be evaluated and disclosed. It is important to note that DNL increases of 3 dB in areas exposed to aircraft noise below DNL 65 dB are not considered “significant impacts” but are to be considered in the environmental evaluation of a proposed project.

FAA Order 1050.1E also stipulates that changes in exposure of DNL 5 dB or greater in areas exposed to aircraft noise between DNL 45 dB and 60 dB should be considered for airspace actions, such as changes to air traffic routes. This threshold was established in 1990, following issuance of an FAA noise screening procedure to evaluate whether certain airspace actions above 3,000 feet AGL might increase DNL levels by 5 dB or more. The noise screening procedure was prepared as a result of FAA experience that indicates that DNL increases 5 dB or more at cumulative levels well below DNL 65 dB could be disturbing to people and become a source of public concern.

Table 5-2 Criteria for Determining Impact of Changes in Aircraft Noise

DNL Noise Exposure Level	Increase in DNL with Proposed Action	Aircraft Noise Exposure Change Consideration
DNL 65 and higher	DNL 1.5 dB or more ^{1/}	Exceeds Threshold of Significance
DNL 60 to 65	DNL 3.0 dB or more ^{2/}	Reportable Noise Increase (Considered When Evaluating Air Traffic Actions)
DNL 45 to 60	DNL 5.0 dB or more ^{3/}	Reportable Noise Increase (Information Disclosed When Evaluating Air Traffic Actions)

Notes:

1/ Source FAA, Order 1050.1E, Appendix A, Paragraph 14.3; Title 14 C.F.R. Part 150.21 (2) (d); and Federal Interagency Committee on Noise, Federal Agency Review of Selected Airport Noise Issues, August 1992.

2/ Source FAA Order 1050.1E, Appendix A, Paragraphs 14.4c and 14.5e; and Federal Interagency Committee on Noise, Federal Agency Review of Selected Airport Noise Issues, August 1992.

3/ Source FAA Order 1050.1E, Appendix A, Paragraph 14.5e.

Source: FAA Order 1050.1E, Appendix A. June 8, 2004.

Prepared By: ATAC Corporation, September 2013.

5.1.3 Potential Impacts – 2015 and 2020

Table 5-3 summarizes the results of the noise analysis for 2015 and 2020 conditions. The results for both years indicate that, when compared to the No Action Alternative, the Proposed Action would not result in a DNL 1.5 dB or higher increase in noise-sensitive areas exposed to DNL 65 dB or higher. Furthermore, no population would experience a reportable noise increase in areas exposed to DNL between 60 dB and 65 dB or between 45 dB and 60 dB. These results indicate that Proposed Action would not result in a

significant noise exposure impact on population exposed to DNL 65 dB or higher levels under the Proposed Action or produce reportable noise increases in areas exposed to DNL 45 dB to 65 dB.

Table 5-3 Change in Potential Population Exposed to Aircraft Noise – 2015 and 2020

DNL Noise Exposure Level Under the Proposed Action	Increase in DNL with the Proposed Action	Population Exposed to Noise that Exceeds the Threshold	
		2015	2020
DNL 65 and higher	DNL 1.5 dB or greater	0	0
DNL 60 to 65	DNL 3.0 dB or greater	0	0
DNL 45 to 60	DNL 5.0 dB or greater	0	0

Source: U.S. Census Bureau, 2010 Census (population centroid data), accessed August 2012; ATAC Corporation, July 2014 (NIRS modeling results).

Prepared by: ATAC Corporation, August 2014.

5.2 Compatible Land Use

This section discusses potential impacts to compatible land use under the Proposed Action and the No Action Alternative.

5.2.1 Summary of Impacts

Under both the Proposed Action and No Action Alternative, there would be no changes in aircraft noise exposure that would exceed the FAA's significance threshold for noise impacts on people. Likewise, there are no conflicts with Federal, regional, State, local land use plans, policies and controls. Therefore, neither the Proposed Action nor the No Action Alternative would result in compatible land use impacts.

5.2.2 Methodology

FAA Order 1050.1E requires that EA documents discuss possible conflicts between the proposed action and the objectives of Federal, regional, State, local, and Tribal land use plans, policies, and controls for the area concerned. Potential impacts to compatible land use were focused on changes in aircraft noise exposure resulting from implementation of the Proposed Action. FAA Order 1050.1E states, "The compatibility of existing and planned land uses in the vicinity of an airport is usually associated with the extent of the airport's noise impact. If the noise analysis concludes that there is no significant impact, a similar conclusion usually may be drawn with respect to compatible land use."³⁰ The CLT OAPM Project does not result in direct impacts to land such as ground disturbance. Accordingly, the compatible land use analysis relies on changes in aircraft noise exposure between the Proposed Action and the No Action Alternative (discussed in Section 5.1) as the basis for determining compatible land use impacts within the General Study Area.

5.2.3 Potential Impacts – 2015 and 2020

As stated in Section 5.1, the Proposed Action, when compared with the No Action Alternative, would not result in changes in aircraft noise exposure in 2015 or 2020 that would exceed FAA's significance thresholds. The Proposed Action would not result in newly non-compatible land uses or new exposure of population to noise levels of DML 65 dB or

³⁰ U.S. Department of Transportation, Federal Aviation Administration, Order 1050.1E, Appendix A, Sec. 4.1.a.

higher. Furthermore, the Proposed Action would not conflict with Federal, regional, State, local land use plans, policies and controls. Therefore, the Proposed Action would not result in significant compatible land use impacts.

Under the No Action Alternative, there would be no changes to air traffic routing in the General Study Area and no changes in aircraft noise exposure expected to occur in either 2015 or 2020. Therefore, the No Action Alternative would not result in significant compatible land use impacts.

5.3 Department of Transportation Act, Section 4(f) Resources

This section discusses potential impacts to Department of Transportation (DOT) Act, Section 4(f) Resources. **Exhibit 4-4** depicts Section 4(f) resources within the General Study Area as described in Section 4.3.3.

5.3.1 Summary of Impacts

Evaluation of potential impacts to Section 4(f) resources focuses on changes in aircraft noise exposure resulting from implementation of the Proposed Action. Under the Proposed Action, the aircraft noise exposure analysis indicates that the Proposed Action would not change the noise environment in a way that would substantially impair any Section 4(f) resource identified within the General Study Area when compared with the No Action Alternative. Therefore, no constructive use of a Section 4(f) resource associated with the Proposed Action would occur and no impacts would be anticipated.

Under the No Action Alternative, no changes in air traffic routes in the General Study Area would occur; therefore, no changes to aircraft noise exposure or aircraft overflight patterns would occur over Section 4(f) resources and no impacts would be anticipated.

5.3.2 Methodology

The FAA evaluates potential effects on Section 4(f) resources in terms of both direct impacts (i.e., physical use) and indirect impacts (i.e., constructive use). A direct impact would occur as a result of land acquisition, construction, or other ground disturbance activities that would result in physical use of all or a portion of a Section 4(f) property. As land acquisition, construction, or other ground disturbance activities would not occur under either the Proposed Action or the No Action Alternative, neither alternative would have the potential to cause a direct impact to a Section 4(f) resource. Therefore, analysis of potential impacts to Section 4(f) resources is limited to identifying indirect impacts resulting from constructive use. A constructive use of a Section 4(f) resource would occur if there were a substantial impairment of the resource to the degree that the activities, features, or attributes of the site that contribute to its significance or enjoyment are substantially diminished. This could occur as a result of both visual and noise impacts. As regards aircraft noise, a constructive use would occur should noise levels substantially impair the resource.

Noise exposure levels were calculated for grid points placed at Section 4(f) properties. Section 5.1.2 includes further discussion on the grid points used in the Section 4(f) analysis. The analysis of potential impacts to Section 4(f) resources considered whether these properties would experience a significant noise increase, when comparing the Proposed Action with the No Action Alternative, using the applicable thresholds shown in **Table 5-2**.

FAA Order 1050.1E requires consideration of additional factors in determining whether to apply the thresholds listed above in determining the significance of noise impacts on Section 4(f) resources. If a reportable noise increase were to occur, the Section 4(f) properties would be evaluated further to determine if the project-related effects would constitute a constructive use. Further evaluation may include confirming that the property is in fact a Section 4(f) resource as well as identifying the specific attributes for which the property is managed (e.g., for traditional recreational uses or where other noise is very low and a quiet setting is a generally recognized purpose and attribute).

In cases where Land and Water Conservation Fund (LWCF) resources are “used” by a transportation project, FAA Order 1050.1E stipulates that replacement satisfactory to the Secretary of the Interior is specifically required for recreation lands aided by the Department of Interior’s LWCF. Therefore, these resources are considered as part of the Section 4(f) impact analysis process.

5.3.3 Potential Impacts – 2015 and 2020

As stated in Section 5.1, the Proposed Action, when compared with the No Action Alternative, would not result in changes in aircraft noise exposure in 2015 or 2020 that would exceed the FAA’s significance threshold or result in reportable noise increases. Therefore, the Proposed Action would not result in potential impacts to Section 4(f) resources.

Under the No Action Alternative no changes to air traffic routes in the Charlotte Metroplex would occur in either 2015 or 2020 and no effects related to changes in aircraft noise exposure would be anticipated. Therefore, the No Action Alternative would not result in potential impacts to Section 4(f) resources.

5.4 Historic and Cultural Resources

This section discusses the analysis of impacts to historic resources and tribal lands under the Proposed Action and the No Action Alternative. Section 4.3.4 provides information on historic resources and tribal lands within the General Study Area. The FAA has initiated consultation with the appropriate State Historic Preservation Officer (SHPO) and Tribal Historic Preservation Officers (THPOs), as well as relevant local agencies, in accordance with Section 106 of the *National Historic Preservation Act of 1966* (16 U.S.C. § 470 *et seq.*) and the implementing regulations at 36 C.F.R. Part 800.

5.4.1 Summary of Impacts

The aircraft noise exposure analysis indicates that there would be no substantial change to the noise environment at any historic resources or tribal land under the Proposed Action compared with the No Action Alternative. Furthermore, any changes in aircraft traffic patterns would occur at altitudes and distances from viewers that would not substantially impair the view or setting of historic resources or tribal lands. Therefore, no adverse indirect effects to historic resources or tribal lands under the Proposed Action would be anticipated for 2015 or 2020.

Under the No Action Alternative, no changes to air traffic routes in the Charlotte Metroplex would occur in either 2015 or 2020 and no changes to aircraft noise exposure or changes in aircraft overflight patterns over historic resources or tribal lands would be anticipated. Therefore, no historic resources or tribal lands would be affected by aircraft noise, nor

would there be any visual impacts at historic resources or tribal lands under the No Action Alternative.

5.4.2 Methodology

The *National Historic Preservation Act of 1966* requires the FAA to consider the effects of its undertakings on properties listed or eligible for listing in the National Register of Historic Places (i.e., National Register). In assessing whether an undertaking, such as the Proposed Action, affects a property listed or eligible for listing on the National Register, FAA must consider both direct and indirect effects. Direct effects include the physical removal or alteration of an historic resource. Indirect effects include changes in the environment of the historic resource that could substantially alter the characteristics that made it eligible for listing on the National Register. Such changes could include changes in noise exposure impacts.

An area of potential effects (APE) has been defined to assess the potential indirect effects of the Proposed Action on historic resources. Federal regulations define the APE as 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. The scale and nature of an undertaking influences the APE and it may be different for different kinds of effects caused by the undertaking.

For purposes of this analysis, the APE is contiguous with the General Study Area. **Exhibit 4-5** in Section 4.3.4 shows the historic properties listed on the National Register that are found within the General Study Area.

All historic and cultural resources identified within the APE require further evaluation by the FAA to determine if the property may experience a potential adverse effect. Therefore, noise exposure levels at points representing historic properties listed on the National Register were calculated for purposes of determining potential adverse effects. In addition, noise exposure results for the uniform grid points (located at 0.5 nm intervals throughout the General Study Area) were evaluated for purposes of identifying potential adverse effects to historic properties that are eligible but may not be listed on the National Register. In the event that a significant or reportable noise increase was identified at one of these grid points, the surrounding area would be examined for the presence of eligible-to-be-listed historic properties.

The analysis of potential impacts to historic and cultural resources considers whether these properties would experience a significant noise increase, when comparing the Proposed Action with the No Action Alternative, using the applicable thresholds shown in **Table 5-2**. Properties exposed to DNL 65 dB or higher under the Proposed Action and an increase of DNL 1.5 dB or higher may be considered to be potentially adversely affected by the project. Formal consultation with the appropriate SHPO/THPO would be conducted to confirm this determination. If reportable increases in noise are detected for properties exposed to DNL between DNL 45 dB and lower than 65 dB, the FAA would consider further whether the increase would result in an adverse effect on historic properties. If the noise analysis indicates a reportable change for the resources, further research and/or survey on the subject property may be conducted to determine if the reportable increase would diminish the integrity of a property's setting for which the setting contributes to historical or cultural significance.

5.4.3 Potential Impacts – 2015 and 2020

As stated in Section 5.1, when compared with the No Action Alternative, the Proposed Action would not result in changes in aircraft noise exposure in 2015 or 2020 that would exceed FAA's significance threshold or result in reportable noise increases. Therefore, the Proposed Action would not result in potential impacts to historic or cultural resources.

Under the No Action Alternative no changes to air traffic routes in the Charlotte Metroplex would occur in either 2015 or 2020 and no effects related to changes in aircraft noise exposure would be anticipated. Therefore, the No Action Alternative would not result in impacts to historic or cultural resources.

5.5 Wildlife (Avian and Bat Species)

This section discusses the analysis of potential impacts to avian and bat species under the Proposed Action and the No Action Alternative.

5.5.1 Summary of Impacts

The greatest potential for impacts to wildlife species would result from wildlife strikes on avian and bat species at altitudes below 3,000 feet AGL. Under the Proposed Action, changes to air traffic flows would primarily occur at or above 3,000 feet AGL and operation levels would remain the same as the No Action Alternative. Therefore, the Proposed Action would not result in significant impacts to avian and bat species when compared with the No Action Alternative.

The No Action Alternative would not involve changes to air traffic flows, land acquisition, construction, or other ground disturbance activities. Therefore, the No Action Alternative would not result in significant impacts to fish, wildlife, or plants.

5.5.2 Methodology

The FAA's *Wildlife Strike Database* is the best information available for assessing potential impacts of aircraft on wildlife. Strike reports over the past 22 years aggregated nationally as well as for individual airports are available from the database to understand existing conditions. Strike reports are comparable to known information on the presence of specific species of concern to corroborate the reports.

This analysis involved a review of wildlife strike reports³¹ for the Study Airports under both the Proposed Action and the No Action Alternative, and an evaluation of the potential for the presence of federal- and state-listed threatened and endangered species (i.e., special-status species) within the General Study Area. The FAA compared modifications in flight procedures to the occurrence of special-status species to qualitatively assess the likelihood of whether wildlife strikes might change under the Proposed Action.

5.5.3 Potential Impacts – 2015 and 2020

A significant impact would be likely to occur if the Proposed Action were to jeopardize the existence of special-status species or result in the destruction or adverse modification of

³¹ U.S. Department of Transportation, Federal Aviation Administration, *Wildlife Strike Database* (http://www.faa.gov/airports/airport_safety/wildlife/database/; accessed August 2014).

critical habitat in the General Study Area. However, the Proposed Action would primarily occur at or above 3,000 feet AGL, so there is no potential for the destruction or adverse modification of critical habitat in the General Study Area. Accordingly, the analysis is focused on the potential for significant impacts to species resulting from increased wildlife strikes with aircraft. Since 1990, the FAA has compiled reports of wildlife strikes with aircraft. The information is available to the public through the FAA's *Wildlife Strike Database* and the "Annual Report: Wildlife Strikes to Civil Aircraft in the United States." Between 1990 and 2013, the Wildlife Strike Database reported 152,181 wildlife strikes nationally.³² Of the records that identify the type of animal involved in the strike incident, birds and bats represent 92.9 percent of all strikes.³³ Of those records, 96 percent of the strikes occurred below 3,000 feet AGL.³⁴ The Wildlife Strike Database reports that gulls have the highest occurrence of strikes (16 percent), followed by doves/pigeons (15 percent).³⁵

The *Wildlife Strike Database* reports strike information by airport and includes information on species struck, strike elevation, and type and extent of aircraft damage. **Table 5-4** provides a summary of wildlife strikes reported for the Study Airport between 1990 and April 2014. In total, 1,315 records provide strike altitude for incidents at the Study Airports involving birds and bats. Of these, a total of 1,164 reported strikes (89 percent of all strike records) occurred at altitudes at or below 3,000 feet AGL. A total of 400 strikes reported at the Study Airports included species identification.

The *Migratory Bird Treaty Act (MBTA) of 1918* (16 U.S.C. §§ 703–712) protects all the bird species identified in these reports. Furthermore, federal and state laws protect listed endangered and threatened species. **Table 4-3** in Chapter 4, identifies the eight federal- and state-listed threatened and endangered bird and bat species found in North Carolina, South Carolina, and Virginia. These species include gray bat (*Myotis grisescens*), Indiana bat (*Myotis sodalis*), Virginia big-eared bat (*Corynorhinus (=Plecotus) townsendii virginianus*), piping plover (*Charadrius melodus*), wood stork (*Mycteria americana*), roseate tern (*Sterna dougallii dougallii*), Bachman's Warbler (*Vermivora bachmanii*), and red-cockaded woodpecker (*Picoides borealis*). Six of these species are known to occur in North Carolina (gray bat, Indiana bat, Virginia big-eared bat, piping plover, roseate tern, and red-cockaded woodpecker).³⁶ Four of these species are known to occur in South Carolina (piping plover, wood stork, Bachman's Warbler, and red-cockaded woodpecker).³⁷ Four of these species are known to occur in Virginia (Indiana bat, Virginia big-eared bat, roseate tern, and red-cockaded woodpecker).³⁸

Four of the federal- and state-listed species are reported to occur in counties located within

³² Id.

³³ Id.

³⁴ Id.

³⁵ Id.

³⁶ North Carolina Department of Environment and Natural Resources, Natural Heritage Program List of the Rare Animal Species of North Carolina, 2014, < http://portal.ncdenr.org/c/document_library/get_file?uuid=537d88dd-5168-4374-aaba-a159785bbfbf&groupId=61587>, accessed December 4, 2014.

³⁷ South Carolina Department of Natural Resources, SC Rare, Threatened & Endangered Species Inventory, <http://www.dnr.sc.gov/species/pdf/SC_state_wide.pdf>, accessed December 4, 2014.

³⁸ Commonwealth of Virginia Department of Conservation and Recreation's Division of Natural Heritage, Natural Heritage Resources of Virginia: Rare Animals, <http://www.dcr.virginia.gov/natural_heritage/documents/anlist2013.pdf>

the General Study Area.^{39, 40, 41} The gray bat is reported to occur in Buncombe, Haywood, and Transylvania Counties, North Carolina.⁴² The Indiana bat is reported to occur in Haywood and Rutherford Counties, North Carolina.⁴³ The Virginia big-eared bat is reported to occur in Avery, Caldwell, Watauga, and Yancey Counties, North Carolina.⁴⁴ Finally, the red cockaded woodpecker (*Picoides borealis*) is reported to occur in Anson, Forsyth, and Montgomery Counties, North Carolina and Chesterfield and Laurens Counties, South Carolina.^{45,46}

Habitat for the four listed species that are reported to occur in the General Study Area is primarily limited to woodlands; however, during winter two of the three bat species, the gray bat and the Indiana bat, retire to underground hibernacula typically located within caves in karst areas or locations with similar characteristics.^{47,48} The Virginia big-eared bat resides in karst area caves year round.⁴⁹ The red-cockaded woodpecker typically subsides on tree-bound insects and its foraging habitat is generally limited to areas beneath the tree canopy in pine forests.⁵⁰ All four bat species forage within woodlands and forested areas.^{51,52,53} The gray bat's foraging elevation generally extends up to 16 feet above open water bodies or riparian zones located near forested shorelines.^{54, 55} Indiana bats typically forage in riparian zones and floodplains located near wooded areas as well as in upland forests, and sometimes over open areas and water.⁵⁶ The Indiana bat's foraging elevation ranges from six to 100 feet AGL.⁵⁷ The Virginia big-eared bat typically forages close to their caves,

³⁹ U.S. Department of the Interior, U.S. Fish and Wildlife Service, Endangered and Threatened Species of North Carolina, <http://www.fws.gov/Raleigh/es_tes.html>, accessed December 4, 2014.

⁴⁰ South Carolina Department of Natural Resources, SC Rare, Threatened & Endangered Species Inventory, <<http://www.dnr.sc.gov/species/index.html>>, accessed December 4, 2014.

⁴¹ Commonwealth of Virginia Department of Conservation and Recreation's Division of Natural Heritage, Virginia Natural Heritage Database, < <https://vanhde.org/species-search>>, accessed December 4, 2014.

⁴² U.S. Fish and Wildlife Service, Endangered and Threatened Species of North Carolina, <http://www.fws.gov/Raleigh/es_tes.html>, accessed December 4, 2014.

⁴³ Id.

⁴⁴ Id.

⁴⁵ Id.

⁴⁶ South Carolina Department of Natural Resources, SC Rare, Threatened & Endangered Species Inventory, <<http://www.dnr.sc.gov/species/index.html>>, accessed December 4, 2014.

⁴⁷ U.S. Department of the Interior, U.S. Fish and Wildlife Service, Gray Bat Recovery Plan, July 1982. <http://ecos.fws.gov/docs/recovery_plan/820701.pdf>, accessed January 9, 2014.

⁴⁸ U.S. Department of the Interior, U.S. Fish and Wildlife Service, Indiana Bat (*Myotis sodalis*) Draft Recovery Plan: First Revision. April 2007.

⁴⁹ U.S. Department of the Interior, U.S. Fish and Wildlife Service, Virginia Big-eared Bat (*Corynorhinus townsendii virginianus*) Plan for Controlled Holding, Propagation, and Reintroduction, August 2009.

⁵⁰ Rudolph, D. Craig, Conner, Richard N., Schaefer, Richard R, "Red-Cockaded Woodpecker Foraging Behavior in Relation to Midstory Vegetation." *The Wilson Bulletin* 114, no. 2, (June 2002): 235-242.

⁵¹ U.S. Army Corps of Engineers, Species Profile: Gray Bat (*Myotis grisescens*) on Military Installations in the Southeastern United States, March 1998.

⁵² U.S. Department of the Interior, U.S. Fish and Wildlife Service, Indiana Bat (*Myotis sodalis*) Draft Recovery Plan: First Revision. April 2007.

⁵³ U.S. Department of the Interior, U.S. Fish and Wildlife Service, Virginia Big-eared Bat (*Corynorhinus townsendii virginianus*) Plan for Controlled Holding, Propagation, and Reintroduction, August 2009.

⁵⁴ U.S. Army Corps of Engineers, Species Profile: Gray Bat (*Myotis grisescens*) on Military Installations in the Southeastern United States, March 1998.

⁵⁵ Georgia Department of Natural Resources, Wildlife Resources Division, Rare Species Profiles, "Gray Myotis (*Myotis grisescens*)", <http://www.georgiawildlife.org/sites/default/files/uploads/wildlife/nongame/pdf/accounts/mammals/myotis_grisescens.pdf>, accessed January 10, 2014.

⁵⁶ Georgia Department of Natural Resources, Wildlife Resources Division, Rare Species Profiles, "Indiana Myotis (*Myotis sodalis*)", <http://www.georgiawildlife.org/sites/default/files/uploads/wildlife/nongame/pdf/accounts/mammals/myotis_sodalis.pdf>, accessed January 10, 2014.

⁵⁷ U.S. Department of the Interior, U.S. Fish and Wildlife Service, Indiana Bat (*Myotis sodalis*) Draft Recovery Plan: First Revision. April 2007.

skirting woodlands, forest edges, old fields, and hay fields.⁵⁸ The Wildlife Strike Database does not include strike reports at the Study Airports for any of these species.

The number of aircraft operations between the Proposed Action and No Action Alternative would be the same. Therefore, the assessment of the potential impacts focuses on changes to flight paths and the potential for impact due to wildlife strikes. As shown in **Table 5-4**, only 11 percent of bird/bat strikes (147 of 1,315 total records) occurred at altitudes above 3,000 feet AGL. The decline in the number of strikes reported above 3,000 feet AGL indicates that there is less likelihood of bird/bat strikes at these altitudes. Under the Proposed Action, the changes to proposed flight paths would primarily occur at or above 3,000 feet AGL and no significant changes to arrival and departure corridors below 3,000 feet AGL would be expected. Because the four listed species identified are generally only active in areas close to the ground (below 100 feet AGL), no significant impacts to these species would be anticipated. The No Action Alternative would not involve changes to air traffic flows, land acquisition, construction, or other ground disturbance activities; therefore, no impacts to avian and bat species would occur.

Table 5-4 FAA Wildlife Strike Database Records for Study Airports by Altitude (1990 - 2013)
(1 of 2)

Type of Strike	Airport	3,000 ft. AGL or less	>3,000 ft. AGL to ≤ 10,000 ft. AGL	Greater than 10,000 ft. AGL	Total
Identified Bird and Bat Species	CLT	315	13	0	328
	EQY	0	0	0	0
	GMU	2	0	0	2
	GSO	38	2	0	40
	GSP	20	0	0	20
	GYH	0	0	0	0
	HKY	0	0	0	0
	INT	2	1	0	3
	JQF	5	0	0	5
	RUQ	0	0	0	0
	SPA	1	0	0	1
	SVH	0	0	0	0
	UZA	1	0	0	1
	Total	384	16	0	400

⁵⁸ U.S. Department of the Interior, U.S. Fish and Wildlife Service, Virginia Big-eared Bat (*Corynorhinus townsendii virginianus*) Plan for Controlled Holding, Propagation, and Reintroduction, August 2009.

Table 5-4 FAA Wildlife Strike Database Records for Study Airports by Altitude (1990 - 2013)
(2 of 2)

Type of Strike	Airport	3,000 ft. AGL or less	>3,000 ft. AGL to ≤ 10,000 ft. AGL	Greater than 10,000 ft. AGL	Total
Unknown Bird and Bat Species	CLT	615	104	2	721
	EQY	2	0	0	2
	GMU	10	0	0	10
	GSO	89	15	0	104
	GSP	58	10	2	70
	GYH	2	1	0	3
	HKY	0	0	0	0
	INT	1	0	0	1
	JQF	1	1	0	2
	RUQ	0	0	0	0
	SPA	1	0	0	1
	SVH	0	0	0	0
	UZA	1	0	0	1
	Total	780	131	4	915
	Grand Total	1,164	147	4	1,315
	Percentage	89%	11%	0%	100%

Notes:

1/ The table does not include 299 strike reports that did not report altitudes.

2/ Percentages may not add up due to rounding.

Source: U.S. Department of Transportation, Federal Aviation Administration, *FAA Wildlife Strike Database* (<http://wildlife-mitigation.tc.faa.gov/wildlife/default.aspx>) (accessed December 4, 2013).

Prepared by: ATAC Corporation, December 2013.

5.6 Environmental Justice

This section presents a summary of the analysis of environmental justice impacts under the Proposed Action and the No Action Alternative.

5.6.1 Summary of Impacts

Neither the Proposed Action nor the No Action Alternative would displace people or businesses; therefore, implementation of the Proposed Action and No Action Alternative would not result in direct impacts in this category. No areas within the General Study Area would experience significant impacts to air quality or a significant impact related to a change in DNL exposure to people (see Section 5.1); therefore, no disproportionately high and adverse effects to children, minority populations, or low-income populations would occur under either the Proposed Action or the No Action Alternative.

5.6.2 Methodology

Executive Order (EO) 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, requires that federal agencies include environmental justice as part of their mission by identifying and addressing as appropriate, the potential for disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations. Environmental justice applies to all environmental resources. Therefore, a

disproportionately high and adverse human health or environmental effect on minority and low-income populations may represent a significant impact.

5.6.3 Potential Impacts – 2015 and 2020

Under the Proposed Action, neither people nor businesses would be displaced. As discussed in Section 5.1, under the Proposed Action, no census block centroids in the General Study Area would experience a change in noise exposure in 2015 or 2020 that exceeds any of the FAA's significance thresholds for noise impacts on people. Therefore, no adverse direct or indirect effects would occur to any environmental justice populations within the General Study Area under the Proposed Action for 2015 and 2020.

Under the No Action Alternative, neither people nor businesses would be displaced. Furthermore, air traffic routes would not change and there would be no change in aircraft noise exposure in 2015 or 2020 that could result in an indirect impact. Therefore, the No Action Alternative would not result in disproportionately high and adverse human health or environmental effects on minority and low-income populations.

5.7 Energy Supply (Aircraft Fuel)

This section discusses whether changes in the movement of aircraft would result in measurable effects on local energy supplies under the Proposed Action and the No Action Alternative.

5.7.1 Summary of Impacts

The Proposed Action would result in a decrease in aircraft fuel burned for both study years: -0.79 percent in 2015 and -0.77 percent in 2020. Therefore, no significant impacts to energy supply would be anticipated.

The No Action Alternative would not involve changes to air traffic flows, construction, or other ground disturbance activities; therefore, the No Action Alternative would not result in the depletion of local energy supply.

5.7.2 Methodology

The Proposed Action would not change the number of aircraft operations relative to the No Action Alternative, but it would involve changes to air traffic flows during the departure, descent, and approach phases of flight. These changes affect both the route an aircraft may follow as well as its climb-out and descent profiles. This in turn may directly affect aircraft fuel burn (or fuel expended). Aircraft fuel burn is considered a proxy for determining whether the Proposed Action would have a measurable effect on local energy supplies when compared with the No Action Alternative.

In addition to calculating aircraft noise exposure, the FAA's NIRS model calculates aircraft-related fuel burn (e.g., AAD flight schedules, flight tracks, and runway use). See Section 5.1.2 for further discussion on NIRS input data. Determining the difference in fuel burn between alternatives can be used as an indicator of changes in fuel consumption resulting from implementation of the Proposed Action when compared with the No Action Alternative.

5.7.3 Potential Impacts – 2015 and 2020

Table 5-5 presents the results of the fuel burn analysis for the Proposed Action and No Action Alternative. When compared to the No Action Alternative, the Proposed Action would result in a fuel burn reduction of approximately 12 MT in 2015 (0.79 percent decrease) and a fuel burn reduction of approximately 14 MT in 2020 (0.77 percent increase). As fuel burn would decrease under the Proposed Action, no significant impacts to energy supply would be anticipated.

Table 5-5 Energy Consumption Comparison

	<u>2015</u>		<u>2020</u>	
	<u>No Action Alternative</u>	<u>Proposed Action</u>	<u>No Action Alternative</u>	<u>Proposed Action</u>
Fuel Burn (MT)	1,528.4	1,516.4	1,760.0	1,746.3
Volume Change (MT)		12		13.7
(Proposed Action – No Action Alternative)				
Percent Change from No Action Alternative		-0.79%		-0.77%

Note: MT = Metric Ton

Source: ATAC Corporation, August 2014 (NIRS modeling results).

Prepared by: ATAC Corporation, August 2014.

5.8 Air Quality

This section discusses the analysis of air quality impacts under the Proposed Action and the No Action Alternative.

5.8.1 Summary of Impacts

The Proposed Action would result in a decrease in emissions when compared to the No Action Alternative. Therefore, no significant impacts to air quality would be anticipated.

The No Action Alternative would not result in a change in the number of aircraft operations or air traffic routes; therefore, no impacts to air quality would be anticipated.

5.8.2 Methodology

Typically, significant air quality impacts would be identified if an action would result in the exceedance of one or more of the NAAQS for any time period analyzed.⁵⁹ Section 176(c) of the *Clean Air Act* requires that federal actions conform to the appropriate SIP in order to attain the air quality goals identified in the CAA. However, a conformity determination is not required if the emissions caused by a federal action would be less than the *de minimis* levels established in regulations issued by EPA.⁶⁰ FAA Order 1050.1E provides that further analysis for NEPA purposes is normally not required where emissions do not exceed the EPA's *de minimis* thresholds.⁶¹ The EPA regulations identify certain actions that would not exceed these thresholds, including ATC activities and adoption of approach, departure, and enroute procedures for aircraft operations above the mixing height specified in the

⁵⁹ FAA Order 1050.1E, Chg.1, App. A, sec. 2.3.

⁶⁰ 40 C.F.R. § 93.153(b).

⁶¹ FAA Order 1050.1E, Chg. 1, App. A, sec. 2.1c.

applicable SIP (or 3,000 feet AGL in places without an established mixing height). In addition, the EPA regulations allow federal agencies to identify specific actions as “presumed to conform” (PTC) to the applicable SIP.⁶² In a notice published in the Federal Register, the FAA has identified several actions that “will not exceed the applicable *de minimis* emissions levels” and, therefore, are presumed to conform, including ATC activities and adoption of approach, departure, and enroute procedures for air operations.⁶³ The FAA’s PTC notice explains that aircraft emissions above the mixing height do not have an effect on pollution concentrations at ground level. The notice also specifically notes that changes in air traffic procedures above 1,500 feet AGL and below the mixing height “would have little if any effect on emissions and ground concentrations.”⁶⁴

5.8.3 Potential Impacts – 2015 and 2020

The fuel burn analysis indicates that under the Proposed Action there would be a decrease in fuel burn (0.79 percent in 2015 and 0.77 percent in 2020) when compared to the No Action Alternative. This would result in a corresponding decrease in emissions and ground concentrations. Therefore, no significant impacts to air quality are anticipated. No further air quality analysis is necessary, a conformity determination is not required, and the Proposed Action would not result in a significant impact to air quality.

The No Action Alternative would not result in a change in the number of aircraft operations or air traffic routes; therefore, no impacts to air quality would be anticipated.

5.9 Climate

This section discusses greenhouse gas (GHG) emissions and effects to the climate as they relate to the Proposed Action and the No Action Alternative.

5.9.1 Summary of Impacts

Under the Proposed Action, fuel burn would decrease as would GHG emissions. Therefore, no impacts to climate would be anticipated.

The No Action Alternative would not result in a change in the number of aircraft operations or air traffic routes; therefore, no impacts to climate would be anticipated.

5.9.2 Methodology

In accordance with FAA guidance, estimated CO₂ emissions were calculated from the amount of fuel burned under the No Action Alternative and the Proposed Action in 2015 and 2020 (see Section 5.8). The resulting CO₂ emissions were then reported as CO₂e.

5.9.3 Potential Impacts – 2015 and 2020

Table 5-6 shows project-related CO₂e emissions. In 2015, the Proposed Action would produce approximately 4,784 metric tons (MT) of CO₂e and the No Action Alternative would produce approximately 4,822 MT of CO₂e. This represents a decrease of approximately 38 MT of CO₂e or a reduction of 0.79 percent under the Proposed Action when compared to

⁶² Id at 93.153(f).

⁶³ Federal Presumed to Conform Actions under General Conformity, 72 Fed. Reg. 41565 (July 30, 2007).

⁶⁴ Id.

the No Action Alternative. Similarly, in 2020, the Proposed Action would produce approximately 5,510 MT of CO₂e and the No Action Alternative would produce approximately 5,553 MT of CO₂e. This represents a decrease of approximately 43 MT of CO₂e or a reduction of 0.77 percent under the Proposed Action when compared to the No Action Alternative.

Table 5-6 CO₂e Emissions – 2015 and 2020

	2015		2020	
	No Action Alternative	Proposed Action	No Action Alternative	Proposed Action
CO₂e Emissions (MT)	4,822.0	4,784.1	5,553.0	5,510.0
Volume Change (MT)		-37.9		-43
(Proposed Action – No Action Alternative)		-0.79		-0.77

Note: CO₂e = Carbon Dioxide Equivalent

Source: ATAC Corporation, August 2014 (NIRS modeling results).

Prepared by: ATAC Corporation, August 2014.

5.10 Cumulative Impacts

Consideration of cumulative impacts applies to the impacts resulting from the implementation of the Proposed Action with other actions. CEQ regulations define cumulative impact as “an impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions.”⁶⁵ The regulations also state that cumulative impacts can result from individually minor, but collectively significant actions that take place over a period of time.

The Proposed Action would not result in any direct, indirect, or cumulative impacts to environmental resources within the General Study Area. Accordingly, no significant cumulative impacts would be anticipated.

⁶⁵ 40 C.F.R § 1508.7