Introduction

In its latest Advisory Circular (AC) on system planning, the FAA identified the need to consider environmental conditions as part of system plans. As discussed in the AC, the purpose of this is to ensure "the early evaluation of potential problems, with the objective of identifying alternatives, and may identify the need for additional environmental analysis for projects at a particular airport. FAA Order 5050.4, National Environmental Policy Act (NEPA) Implementing Instructions for Airport Projects, can assist airport sponsors and/or their consultants in the preparation of necessary environmental documentation."

The Tennessee Aviation System Plan (TASP) does not inventory environmental features to the degree necessary to make decisions on viable master planning alternatives or to scope an environmental document; however, the obvious and known environmental features, such as the presence of parklands, wildlife preserves, air quality areas, historic resources, and more have been evaluated to support this analysis. Data to complete this analysis were sourced from Google Earth aerial imagery, U.S. Department of Agriculture (USDA), Environmental Protection Agency (EPA), Tennessee state departments, and other federal and state sources.

This chapter provides an overview of the TDOT Aeronautics Division's current environmental policy and summaries of known environmental issues located on and around airports throughout Tennessee that may impact project development and implementation, including:

- Incompatible land uses
- Approach obstructions
- Environmental features (hazards, historic buildings, wetlands, etc.)

Overview of TDOT Aeronautics Division Environmental Policy

Effective January 1, 2020, TDOT Aeronautics Division published an environmental Standard Operating Procedure (SOP) that was developed to provide interested parties with the necessary guidance to "…ensure the proper level of environmental documentation is scoped, completed, and approved for all State and Federally-funded projects in compliance with the National Environmental Policy Act (NEPA), Federal Aviation Administration (FAA) guidance, State Block Grant Program's (SBGP) Memorandum of Agreement (MOA), and all other special purpose laws."

The SOP provides instructions on how and when the TDOT Aeronautics Division's Planning and Environmental staff must be consulted to determine the proper level of environmental documentation for a project. Additionally, the SOP provides information regarding the environmental documentation submission process and processing times.

As provided in the SOP, the following types of environmental documentation may be utilized for a variety of airport projects in Tennessee. Additional information and guidance regarding these documents are provided in the SOP:

- Memo to Record
- Simple Written Record
- Documented CATEX
- Environmental Assessment and Environmental Impact Statement

- Short Form Environmental Assessment

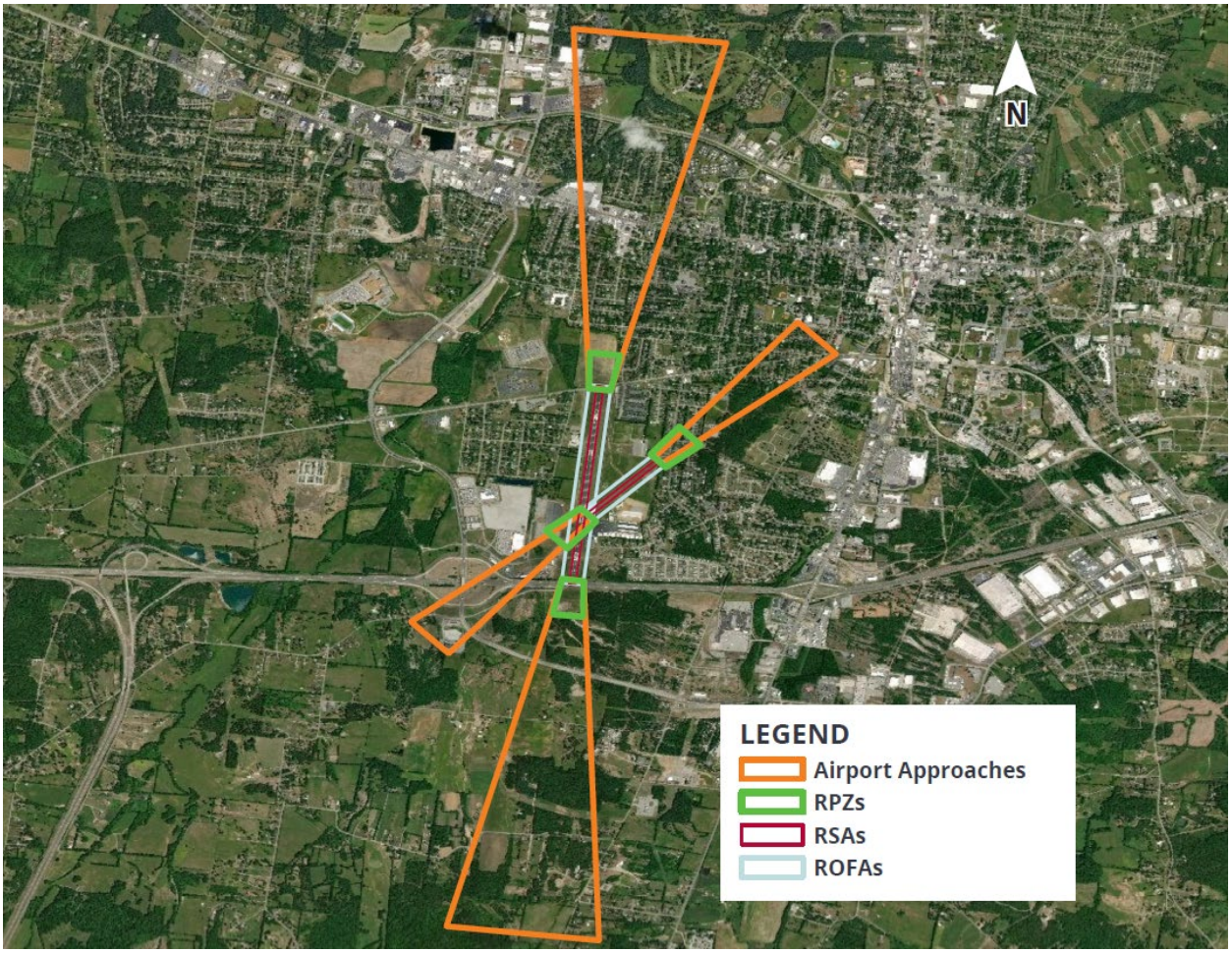
Land Use Evaluation

The land use evaluation was completed with a desktop review and assessment of specific land use types to provide greater context and understanding of the environments surrounding airports in Tennessee. This evaluation focused on identifying land uses that are generally considered to be incompatible in close proximity to airports, including buildings and structures whose height exceeds FAA standards, known as Part 77 surfaces, as well as other types of development that may attract wildlife or large concentrations of people, are noise-sensitive, or cause visual obstructions.

The land uses within each airport's runway approaches and Runway Protection Zones (RPZs) were the focus of the evaluation. For this analysis, the approach surfaces and RPZs were identified for each airport and the associated boundaries for these were mapped on aerial imagery, allowing for the identification of major incompatible land uses within critical airport areas. These maps were provided to each study airport during the site visits to facilitate discussion on current and potential future land use issues at or around their facility. An example map outlining the runway approaches and RPZs is provided in ***Figure 1***. Feedback from airport managers and sponsors during the site visit and aerial imagery via Google Earth provided the basis for this assessment.

The following sections review the presence of development often considered incompatible, including dense residential development, major developments (such as universities, stadiums, medical campuses, etc.), water bodies, and landfills within the two-dimensional approaches and RPZs of each TASP airport. Although airport approaches are three-dimensional surfaces, analysis was done for the length and width of the approaches only, not the height. Data are presented according to airport NPIAS code; GA-National and GA-Regional airports have been combined into one category. The following sections detail these evaluations as well as provide summary data for each. Individual airport data is provided in ***Table 2*** at the end of this Chapter.

Figure 1: Surfaces for Land Use Evaluation



Source: ArcGIS Evaluation, Kimley-Horn 2020

Approaches

To increase safety in and around airports, the FAA developed what are known as Part 77 surfaces (from 14 CFR Part 77 – Safe, Efficient Use, and Preservation of the Navigable Airspace), which are three-dimensional areas around airports designed to protect the critical environments. Many local jurisdictions use Part 77 surfaces to protect airports from encroachment, particularly from a height perspective. The size of the Part 77 surfaces is dependent upon each airport's runway types and visibility minima and therefore are not the same for all system airports. These surfaces are "imaginary" and include the following:

- **Primary Surface:** This surface is longitudinally centered on the runway. The length of the Primary Surface is determined by the existence of a prepared hard surface on the runway.
- **Approach Surface:** This surface is longitudinally centered on the centerline of the runway. It then extends outward and upward from each end of the Primary Surface. The length and width of the Approach Surface is dependent upon the approach capabilities of that specific runway (visual approach, non-precision instrument approach, precision

instrument approach). This surface is also dependent on whether the runway is utility or non-utility.

- **Transitional Surface:** This surface extends outward and upward from the sides of Primary Surfaces and Approach Surfaces at a slope of 7:1 until it reaches the height of the Horizontal Surface.
- **Horizontal Surface:** This surface is positioned 150 feet above the established airport elevation. The perimeter of the Horizontal Surface is constructed by swinging arcs of specified radii from the center of each end of the Primary Surface of each runway. Tangents then connect the adjacent arcs to form the Horizontal Surface.
- **Conical Surface:** This surface extends outward and upward from the Horizontal Surface for a horizontal distance of 4,000 feet at a slope of 20:1.

This analysis focuses specifically on approaches, as the majority of aviation accidents and incidents occur within an airport's approach. Due to this increased likelihood of accidents, keeping the approach surface clear of incompatible development is important for both for the safety of pilots and passengers, as well as individuals on the ground.

An approach is the last part of the flight, when a pilot descends and aligns the aircraft with the center of the runway for landing. There are different types of approaches ranging from visual (the most basic approach which is used during clear weather when the runway is clearly visible), to non-precision (an approach in which the pilot uses instruments that give lateral guidance of the landing environment but not vertical guidance), and precision (an approach which is often used when weather patterns are obscuring the runway environment to the point that the pilot must rely on instruments that provide both lateral and vertical guidance to land the aircraft).

The airports in the Tennessee system have a wide variety of approaches, ranging from visual only approaches at smaller, less busy airports, to larger facilities that support precision approaches. The approach category for the runway can differ by runway end. For instance, for an airport's sole runway, one end can be a non-precision approach while the other is rated for precision approaches. The type of approach assigned to the end of each runway is used to determine the approach surface. An approach surface is trapezoidal in shape, with a narrower base that flares out to a wider area the further away from the runway it extends. The size of the approach surface varies by approach type.

As previously mentioned, runway approaches were mapped for each airport to identify and better recognize incompatibilities located in approaches, specifically. Development and land uses that are typically considered incompatible in close proximity to airports, such as tall structures, uses that may attract wildlife or large concentrations of people, are noise-sensitive, or cause visual obstructions were evaluated. The following sections review the presence of such development, including residential development, major developments, water bodies, and landfills. ***Figure 2*** provides an overview of the types of features identified as part of this analysis.

Figure 2: Incompatible Development in Airport Approaches

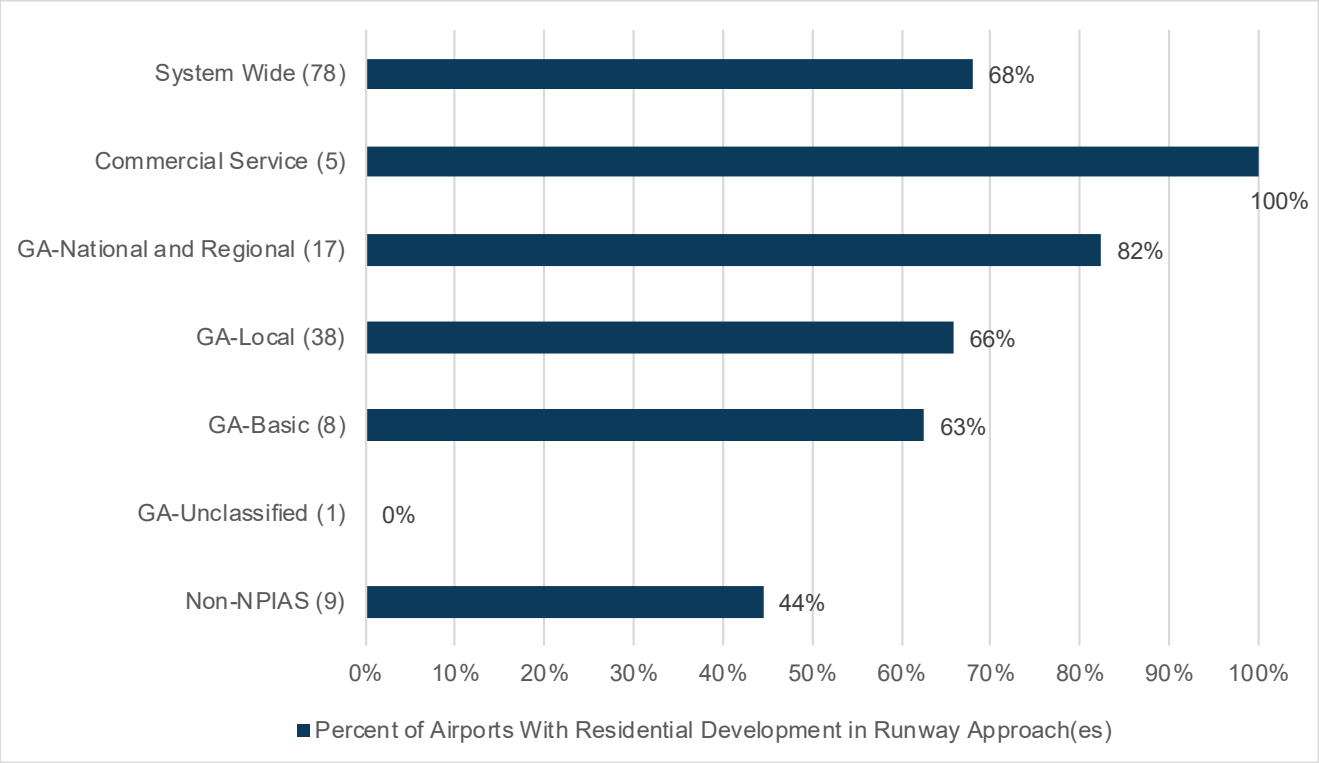
Source: ArcGIS Evaluation; Kimley-Horn, 2020

RESIDENTIAL DEVELOPMENT

One of the most commonly recognized incompatible land uses near airports is residential development. Dense residential development (either multi-level, multi-family, or dense single-family neighborhoods) creates a large concentration of people in a single area. When located within the boundary of a runway approach or within an aircraft traffic pattern, the safety of residents can be threatened in the event of an aircraft incident. Furthermore, noise in and around the airport environment is often considered a nuisance, another reason that airports and residential development are typically incompatible. Although noise was not a factor considered in this study, it is a major component of land use studies in and around airports.

Based on the visual assessment of airport approaches on aerial imagery, 68 percent of system airports have some sort of residential development that exists within the boundaries of the approach surface. All Commercial Service airports have residential developments within their approach surfaces. Eighty-two percent of GA-National and Regional, 66 percent of GA-Local, and 63 percent of GA-Basic airports have residential developments within their approach surfaces. Forty-four percent of Non-NPIAS airports have residential developments within their approach surfaces, as shown in ***Figure 3***.

Figure 3: Airports by Classification with Residential Development in Runway Approach(es)



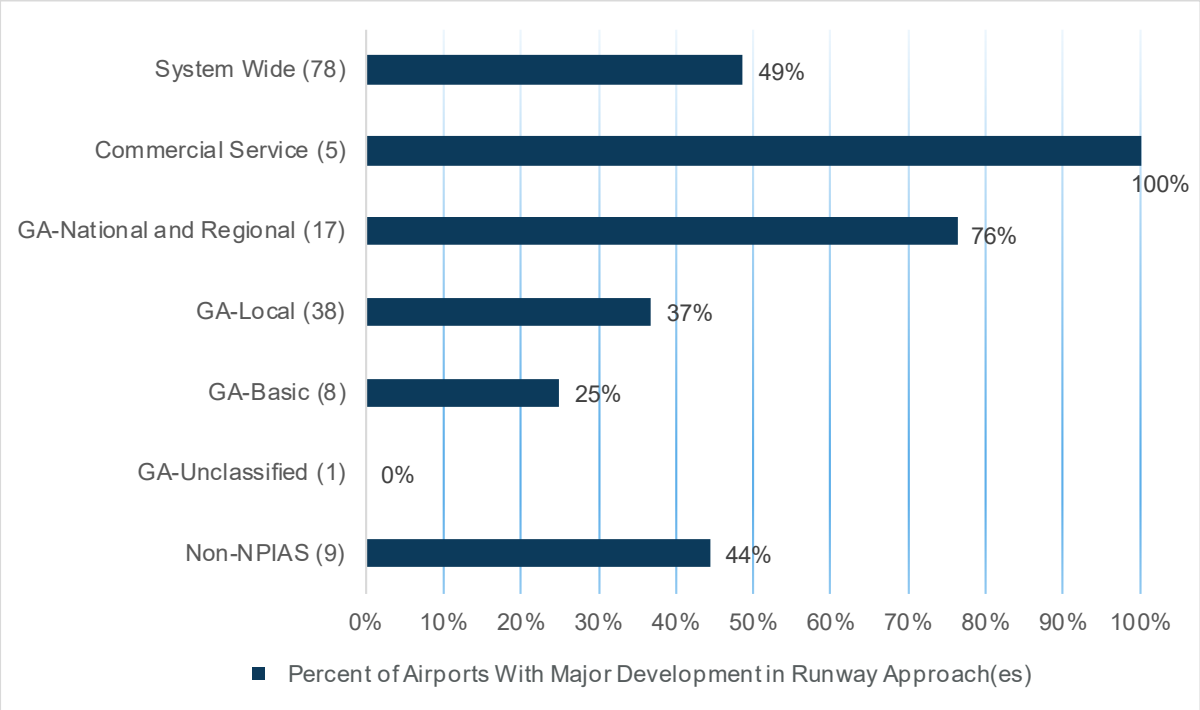
Source: Google Earth Evaluation; Kimley-Horn, 2020

MAJOR DEVELOPMENT

Major developments were also a factor of the incompatible land use evaluation. This analysis focused on those that encourage large concentrations of people, such as large malls, churches, schools, stadiums, and business parks. In addition to posing density concerns, some of these uses require high intensity lighting that can interfere with a pilot's focus and even their nighttime vision when attempting to land. Energy extraction, power plants and other industrial uses can generate smoke and steam that may also pose visual obstructions to pilots. Additionally, the height of these structures can be hazardous if they are tall enough to impede navigable airspace vital for takeoff and landing.

System-wide, 49 percent of TASP airports were identified as having some form of major development within their approach surfaces. All Commercial Service and 76 percent of GA-National and Regional airports were found to have major development within their approach boundaries; this is likely because the approach surfaces at these airports extend farther than most and therefore have the greatest likelihood to have this development in their approaches. Thirty-seven percent of GA-Local, 25 percent of GA-Basic, and 44 percent of Non-NPIAS airports also have major development within their approach boundaries, as shown in ***Figure 4***.

Figure 4: Airports by Classification with Major Development in Runway Approach(es)



Source: Google Earth Evaluation; Kimley-Horn, 2020

BODIES OF WATER

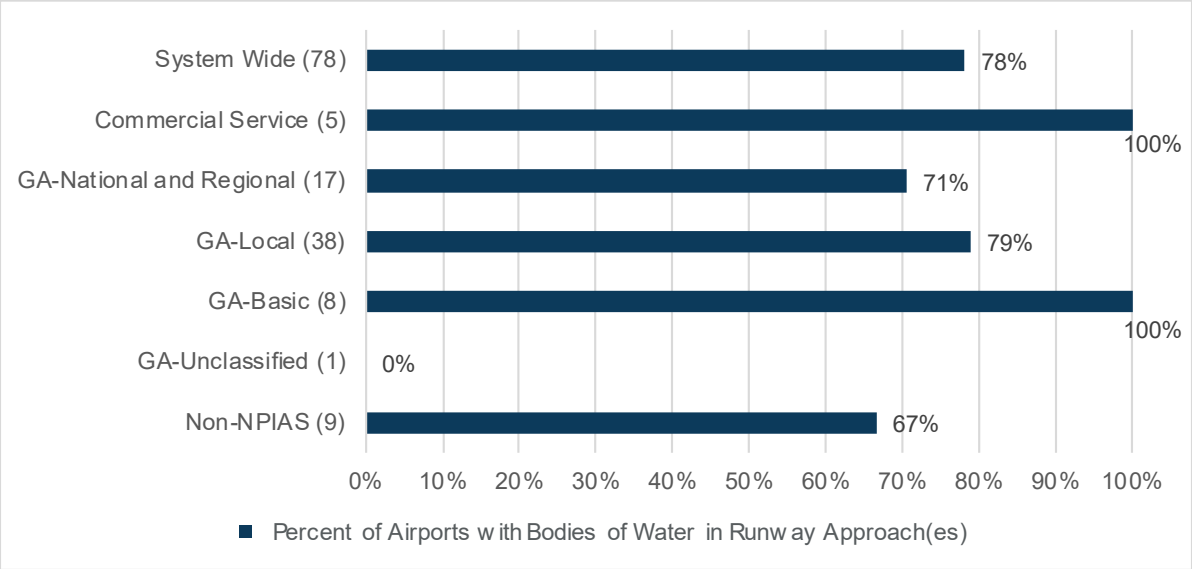
Water bodies in a runway's approach surface, other than at a seaplane base, can pose multiple risks to aviation activity. Water features can generate glare off the surface which can disorient and/or impact a pilot's ability to locate and land their aircraft on the runway. The presence of a water feature contributing to glare located directly ahead and slightly to the side of the pilot's vision on final approach causes the greatest impairment to their ability to see their instruments. According to the FAA's study on hazardous glare, bodies of water should be limited to at least 25 degrees from the direction of the pilots' viewpoints.

Further, the FAA's AC 150/5200-33B, *Hazardous Wildlife Attractants on or Near Airports*, provides guidelines and considerations regarding bodies of water known to attract wildlife by providing a source of water and roosting habitats, especially for birds. This can lead to wildlife collisions on and around runways and in the airspace as birds and other wildlife travel to and from the water – sometimes between two or more bodies of water. Wildlife strikes result in expensive aircraft damage and pose serious threats to pilots, passengers, and at times, the nearby public.

For this evaluation, water bodies were defined as: lakes, reservoirs, rivers, and creeks that were clearly identifiable. This does not imply that these are the only water features that can impact aircraft operations. Other smaller features, such as water detention/retention ponds and open irrigation canals can also pose a threat to safe aircraft operations and should be carefully considered near airports.

System-wide, 78 percent of all airports have some body of water within their approach surfaces. All Commercial Service and GA-Basic airports have water bodies in their approach surfaces. Seventy-one percent of GA-National and Regional, 79 percent of GA-Local, and 67 percent of Non-NPIAS airports also have bodies of water in their approach surfaces, as shown in ***Figure 5***.

Figure 5: Airports by Classification with Bodies of Water within Runway Approach(es)



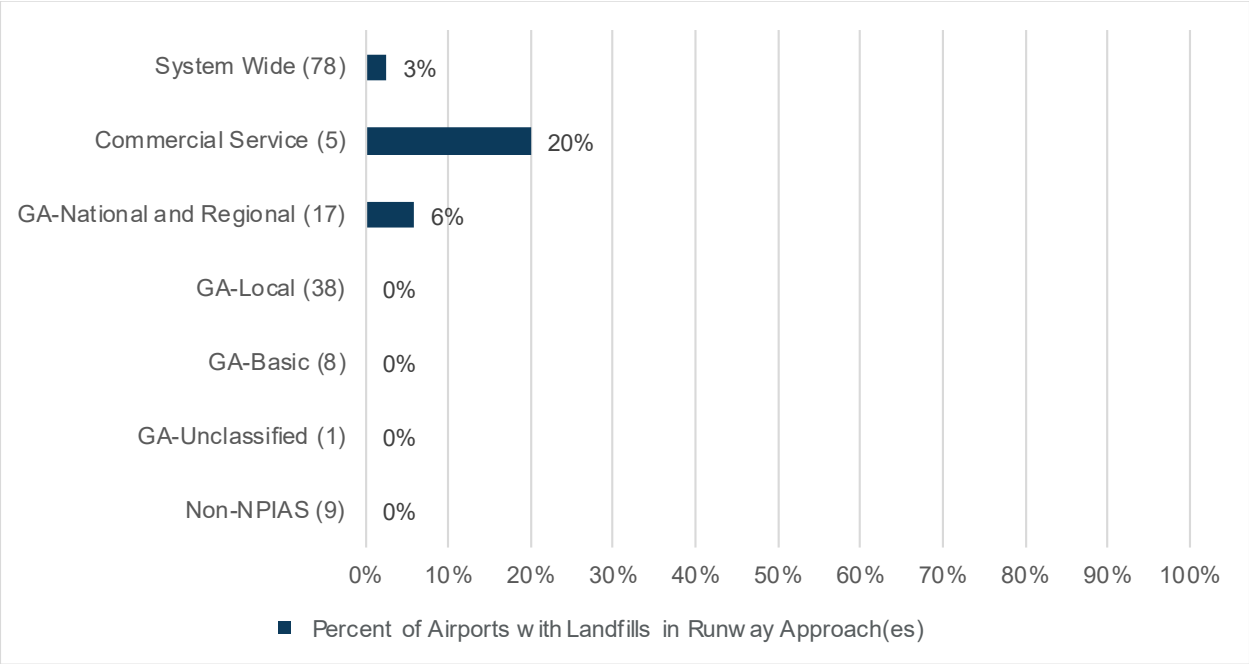
Source: Google Earth Evaluation; Kimley-Horn, 2020

LANDFILLS

Similar to water bodies, landfills pose a significant threat to aircraft operations because they attract wildlife, particularly birds, thus increasing the chance for wildlife strikes. To minimize the impact of these wildlife attractants, the FAA discourages the development of hazardous wildlife attractants within 5,000 feet of runways serving piston-powered aircraft, 10,000 feet of runways serving turbine-powered aircraft, and five miles away from any runway if they initiate bird movement across aircraft pathways and circulation.[1] Data obtained from the Tennessee Department of Environment and Conservation was used to determine the location of landfill facilities statewide. The location of each landfill facility was then compared against the nearby airport's approach surfaces to determine if it was located within any approach. Landfills five miles away from any runway were not assessed as part of this analysis; only landfills within airport approaches were determined.

As shown in ***Figure 6***, GA-Local, GA-Basic, GA-Unclassified, and Non-NPIAS airports do not have landfills within their approach surfaces. One Commercial Service airport and one GA-Regional airport have a landfill within their approach surfaces.

Figure 6: Airports by Classification with Landfills within Runway Approach(es)



Source: Google Earth Evaluation; Kimley-Horn, 2020

[1] FAA AC 150/5200-33C, *Hazardous Wildlife Attractants on or near Airports*, https://www.faa.gov/documentLibrary/media/Advisory_Circular/150-5200-33C.pdf

SUMMARY

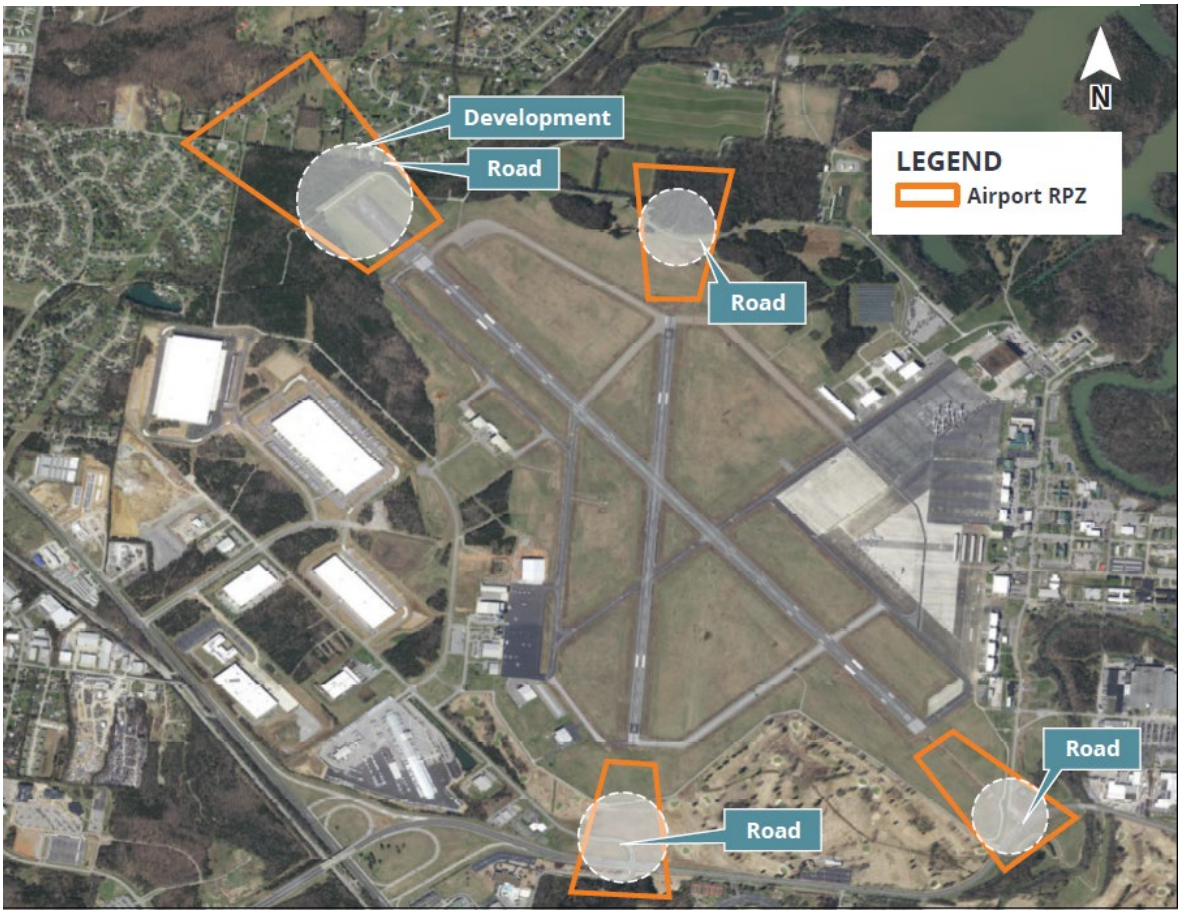
This section summarizes various types of land uses typically considered incompatible with airport operations, and their presence within TASP airport runway approaches based on a desktop review of aerial imagery and discussions with airport managers during site visits. Incompatible uses can negatively impact the safe and efficient operation of aircraft and impact the quality of life for those nearby communities. As such, identifying where these incompatible uses exist will help airports, TDOT, and other stakeholders better understand each airport's environment and the importance of limiting any new incompatible development. ***Table 2***, at the end of this chapter, presents the results of the land use evaluation for each airport. An "X" indicates that an incompatible land use was found during the land use evaluation.

RPZs

Runway Protection Zones are trapezoidal areas located at either end of a runway and are designed to accommodate the most demanding aircraft operating at each airport. RPZs are intended to minimize damage to people and property in the event of an aircraft overrun or undershoot. For safety purposes, the RPZ must be kept clear of obstructions. Once an aircraft enters the RPZ, it is nearly impossible for the pilot to maneuver around any obstacles that may be in the area due to the aircraft's proximity to the ground and the slow speed of the aircraft. FAA AC 150/5300-13A, *Change 1, Airport Design* recommends that airports control the land within each RPZ, if possible. This gives airports the ability to keep these critical safety areas clear of development and incompatible uses. However, complete control over RPZs through fee simple ownership and avigation easements is not always possible. Further, the FAA's guidance on RPZs has changed over time, so land uses such as roadways and structures that are now deemed incompatible were previously allowed based on prior guidance.

The RPZ assessment completed as part of this analysis built upon the approach analysis. In addition to identifying development (buildings), water bodies, and roads, the RPZ analysis also identified any dense vegetation. ***Figure 7*** provides an example of the analysis that was completed within airport RPZs.

Figure 7: Land Use Evaluation: RPZs



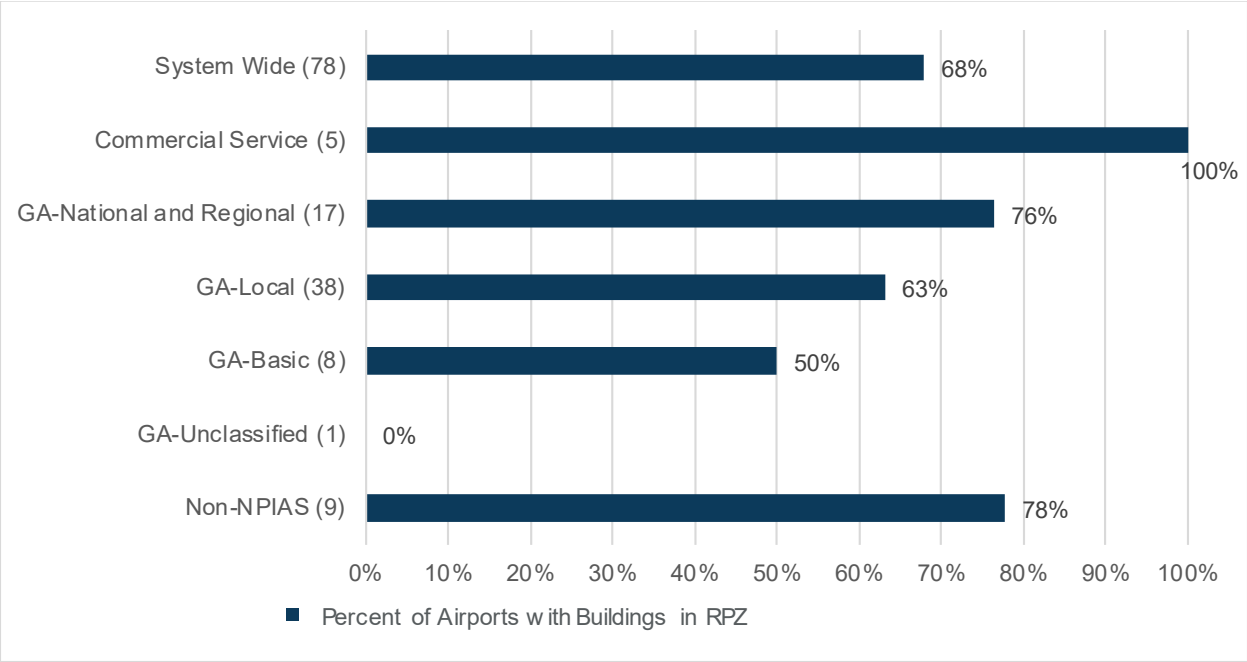
Source: ArcGIS Evaluation; Kimley-Horn, 2020

BUILDINGS

Buildings pose a significant threat to the safety of navigable airspace in an RPZ primarily due to their height. However, not only does a building's height pose a danger to pilots and passengers, but that building's occupants are also put at risk in the event of an aircraft accident. The FAA has provided interim guidance on land uses within RPZs. Per this guidance, staff must consult with the National Airport Planning and Environmental Division, APP-400 if certain land uses enter the limits of an RPZ as part of an airfield project, a change in the critical design aircraft that increase RPZ dimensions, a new or revised instrument approach procedure that increases the RPZ dimensions, or a local development proposal in the RPZ. One of those land uses is buildings and structures, including but not limited to: residences, schools, and churches.[2]

System-wide, 68 percent of system airports were identified as having some form of building within at least one of their RPZ(s). All Commercial Service airports were found to have buildings in their RPZs. Seventy-six percent of GA-National and Regional, 63 percent of GA-Local, 50 percent of GA-Basic, and 78 percent of Non-NPIAS airports have buildings within the boundaries of their RPZs, as shown in ***Figure 8***.

Figure 8: Airports by Classification with Buildings in RPZ



Source: Google Earth; Kimley-Horn, 2020

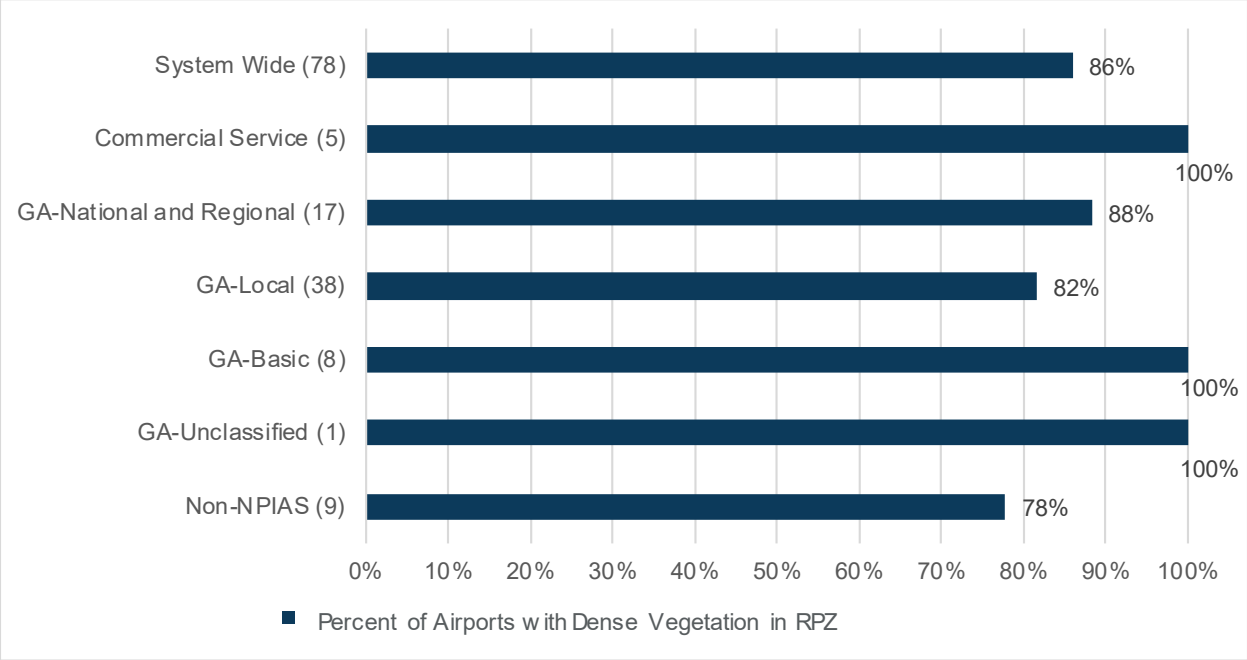
[2] FAA Interim Guidance on Land Uses Within a Runway Protection Zone, https://www.faa.gov/airports/planning_capacity/media/interimLandUseRPZGuidance.pdf

DENSE VEGETATION

Dense vegetation in an RPZ also obstructs airspace. Problems arise not only from the height of the vegetation, but also from the wildlife that the vegetation attracts, primarily birds. Increased bird presence can in turn lead to an increase in bird strikes and other hazardous wildlife conditions.

System-wide, 86 percent of Tennessee airports were identified as having dense vegetation within their RPZs. All Commercial Service, GA-Basic, and GA-Unclassified airports were found to have dense vegetation within their RPZs, while 88 percent of GA-National and Regional, 82 percent of GA-Local, and 78 percent of Non-NPIAS airports also have dense vegetation within their RPZs, as shown in ***Figure 9***.

Figure 9: Airports by Classification with Dense Vegetation in RPZ



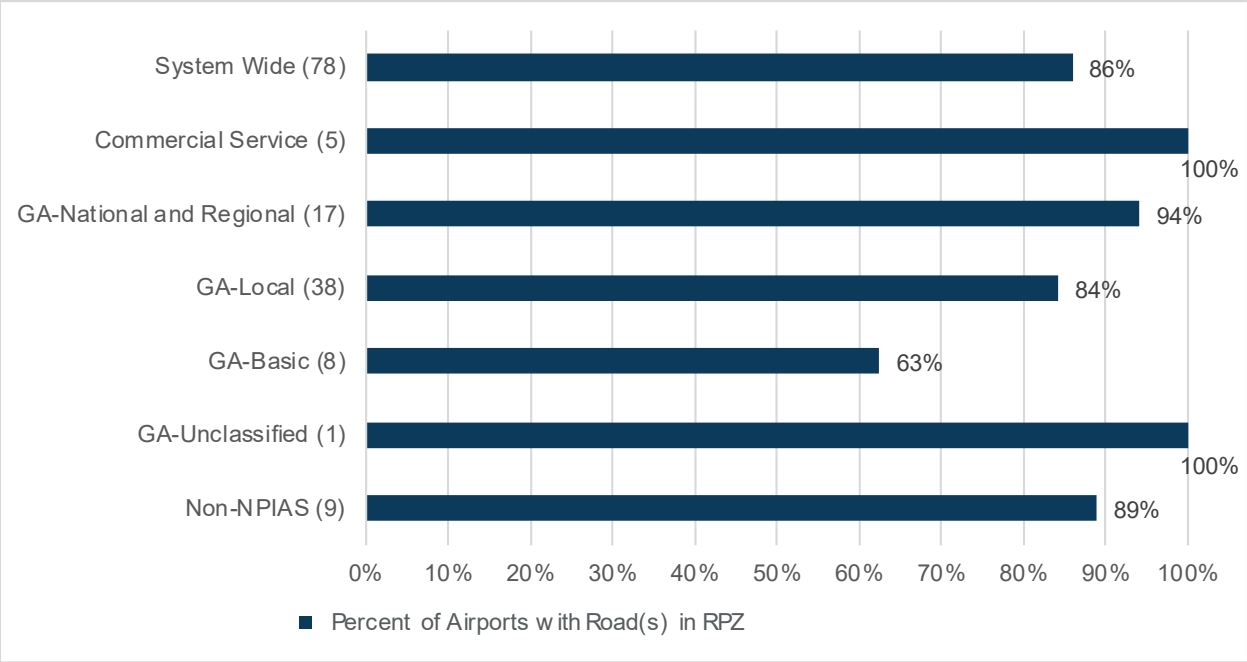
Source: Google Earth Evaluation; Kimley-Horn, 2020

PUBLIC ROADS

Roads inside an RPZ can also be hazardous. Larger vehicles, such as cargo trucks, can pose a significant hazard to aircraft entering an RPZ due to their height. Busy roads are particularly hazardous, because an increased number of drivers leads to increased risk of casualties in the event of an incident. As part of their interim guidance on RPZs, the FAA has required further coordination if new projects or airport conditions result in a road locating within an RPZ. [3]

System-wide, 86 percent of Tennessee airports were identified as having roads within their RPZs. All Commercial Service and GA-Unclassified airports were found to have roads within their RPZs. Ninety-four percent of GA-National and Regional, 84 percent of GA-Local, 63 percent of GA-Basic, and 89 percent of Non-NPIAS airports have roads within their RPZs. ***Figure 10*** summarizes the results of the analysis and depicts the airports by classification that have a road within their RPZs.

Figure 10: Airports with a Road in RPZ by Classification



Source: Google Earth Evaluation; Kimley-Horn, 2020

[3] FAA Interim Guidance on Land Uses Within a Runway Protection Zone, https://www.faa.gov/airports/planning_capacity/media/interimLandUseRPZGuidance.pdf

SUMMARY

Earlier FAA regulations were unclear on what constitutes a compatible land use and how to evaluate proposed land uses that would reside in an RPZ. The FAA has issued interim guidance to help address these recurrent questions. New or proposed public roadways, structures, and land uses are ideally located outside of RPZs and if this is not possible, a full range of alternatives should be analyzed and coordinated with FAA to minimize the associated risks. ***Table 2***, at the end of this chapter, presents all the results of the RPZ evaluation for each airport. An “X” indicates that buildings, dense vegetation, and/or roads are present in an airport’s RPZ(s).

Obstruction Analysis

At the most basic level, an obstruction is any manmade or naturally occurring object that poses a hazard to flight safety in and around airports. The FAA defines an obstruction as any object higher than:

- A height of 500 feet above ground level at the site of the object.
- A height of 200 feet above ground level or above the established airport elevation, whichever is higher, within 3 nautical miles of the established airport reference point.
- A height that is within the terminal obstacle clearance area which results in the vertical distance between any point on that object, and an established minimum instrument flight altitude within that area, being less than what is the required obstacle clearance.
- A height within an en route obstacle clearance area of a Federal airway or approved airway route, which would make the minimum obstacle clearance altitude increase.
- A height that would penetrate any imaginary surfaces associated with a public use airport (civil airport), military airport or heliport. [4]

An obstruction is considered a hazard to air safety until an FAA study can be conducted that concludes otherwise. Early identification and mitigation of these obstructions are critical, due to the increased risk for accidents that they pose.

Obstructions not only pose a hazard to air safety, but can negatively impact an airport's operations. When an obstruction is established in an airport's approach, airports can lose that approach, establish displaced thresholds, or other factors that affect an airport's utility. Therefore, obstacles in airport approaches must be avoided.

Identifying Obstructions

A statewide analysis was conducted to determine the number and type of manmade obstructions within airport approaches. The following steps were followed to complete this analysis:

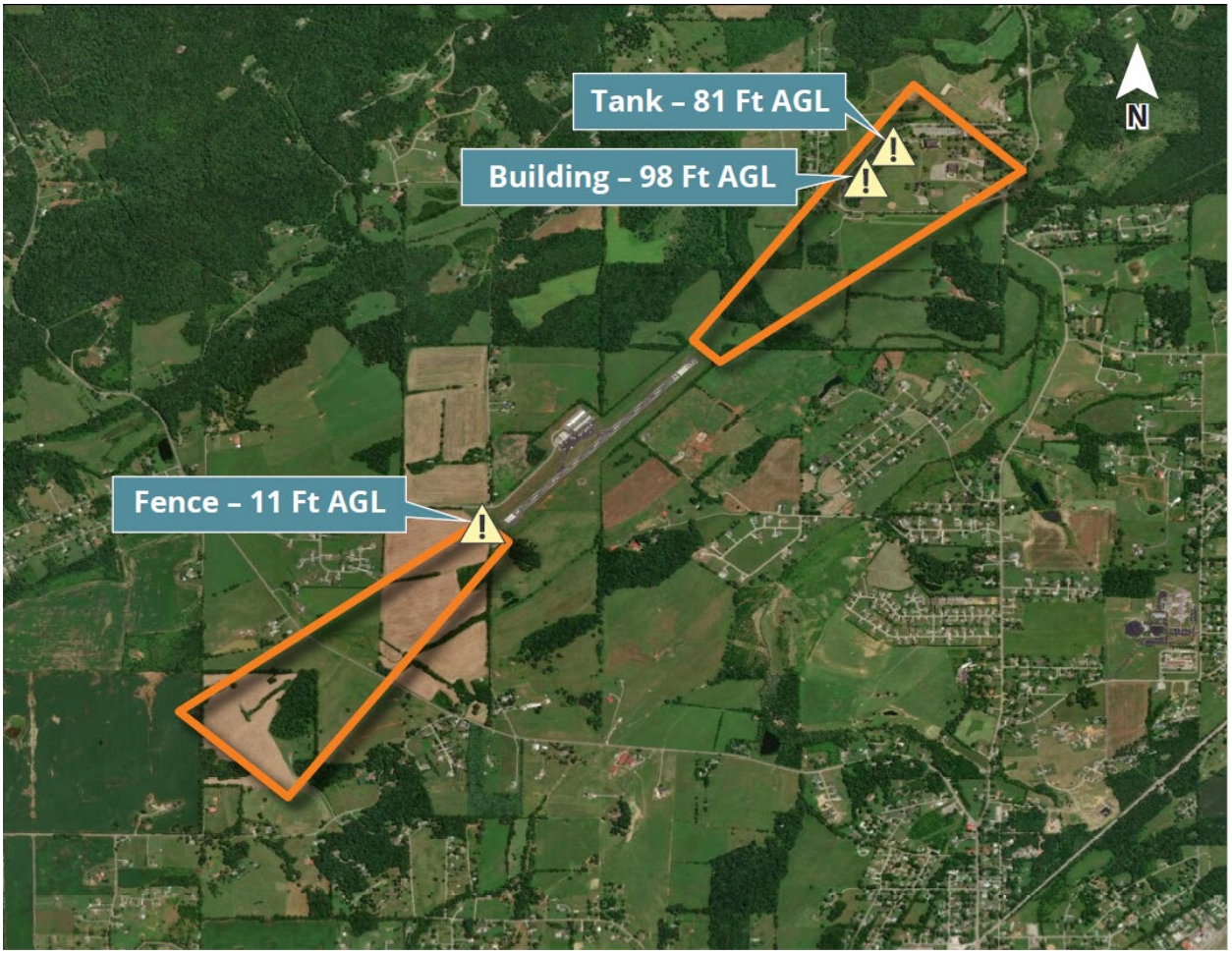
1. Review potential obstruction data for Tennessee from the FAA's Known Obstruction Database (www.faa.gov/air_traffic/flight_info/aeronav/obst_data/). This database, which is updated every 56 days, describes every known manmade obstacle in American airspace. Obstacles include: towers, antennae, poles, tanks, bridges, and many other manmade structures that may impact navigation.
2. Download statewide data for Tennessee in an Excel format. These data were downloaded on April 2, 2020 and identify 6,922 total obstructions.
3. Obstruction data included XY coordinates. Using these coordinates, data were georeferenced in ArcGIS, being converted from an Excel database to an Esri shapefile.
4. Airport approaches that were mapped for the land use evaluation (found at the beginning of this chapter) were added to the map document, which also contained the georeferenced obstruction data.
5. With both the approaches and obstructions mapped and georeferenced, obstructions located within airport approaches were identified and isolated.

[4] 14 Code of Federal Regulations, Part 77—Safe, Efficient Use, and Preservation of the Navigable Airspace, https://www.ecfr.gov/cgi-bin/text-idx?rgn=div5&node=14:2.0.1.2.9

6. Once obstructions within airport approaches were identified, the data for these obstructions was exported from ArcGIS back into Excel. The data was broken into categories, identifying the counts of types of obstructions as well as the NPIAS classifications of the approaches with obstructions.

An example of the obstruction analysis and identification is provided in ***Figure 11***. Notably, the FAA's Known Obstruction Database omits naturally occurring obstructions, such as trees. While the assessment of such obstructions was not a part of this analysis, it should be noted that trees are a frequently occurring obstruction in airport approaches.

Figure 11: Airport Approach Obstruction Analysis



Source: ArcGIS Evaluation; Kimley-Horn, 2020

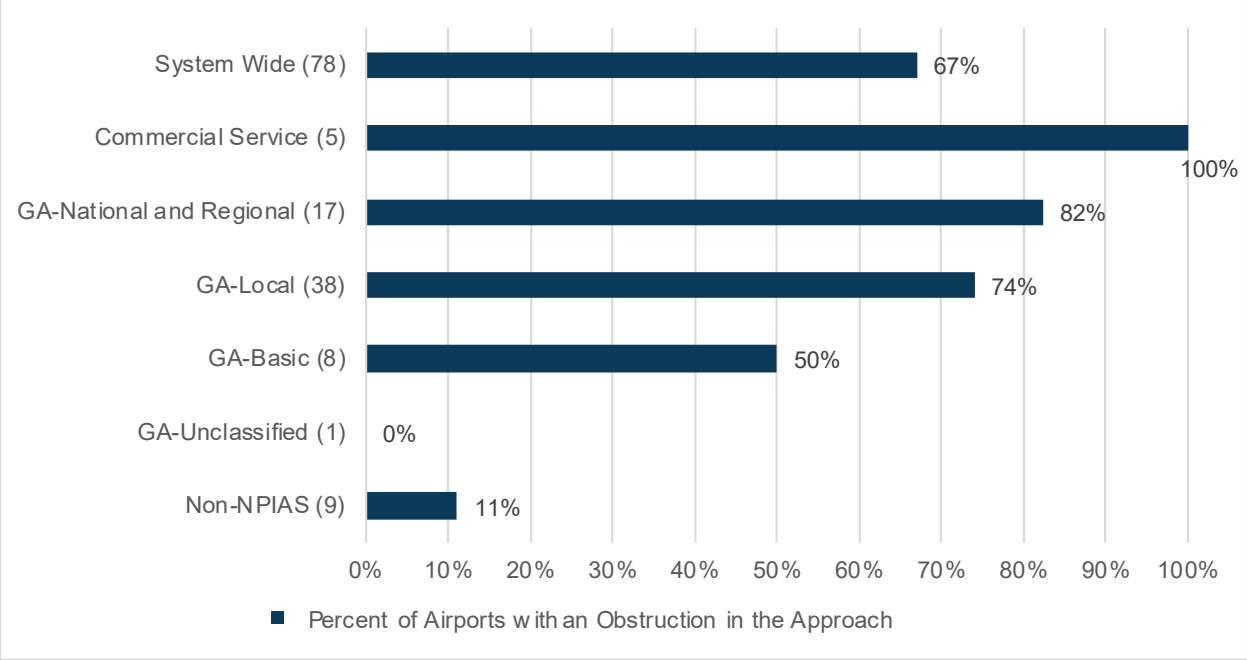
Findings

Data are presented according to airport NPIAS code; GA-National and GA-Regional airports have been combined into one category. System-wide, there are 6,922 obstructions, of which 561 are within airport approach surfaces. Sixty-seven percent of TASP airports have a known obstruction within one or more of their approach surfaces. All Commercial Service airports were found to have an obstruction within an approach surface, for a total of five airports, or about six percent of the total TASP system. The most common type of obstruction found in airport

approaches was transmission line towers, with 182 found, followed by poles with 122, and towers with 101.

Figure 12 displays the percentages of airports by NPIAS classification that had an obstruction in an approach.

Figure 12: Airports by Classification with an Obstruction in the Approach



Source: Google Earth Evaluation; Kimley-Horn, 2020

Summary

Keeping approaches clear of obstructions enhances the safety of pilots, passengers, and those in the surrounding area – and is required by the FAA. The analyses provided in this section provide greater context and understanding of obstruction impacts across the state in an effort to identify and mitigate them to the extent reasonable. Overall, 67 percent of TASP airports were found to have a known obstruction within one or more of their approach surfaces. It is critical that each TASP airport sponsor continually work to keep approach surfaces free of obstacles to maintain the safety and efficiency of TASP airspace and remain compliant with FAA requirements.

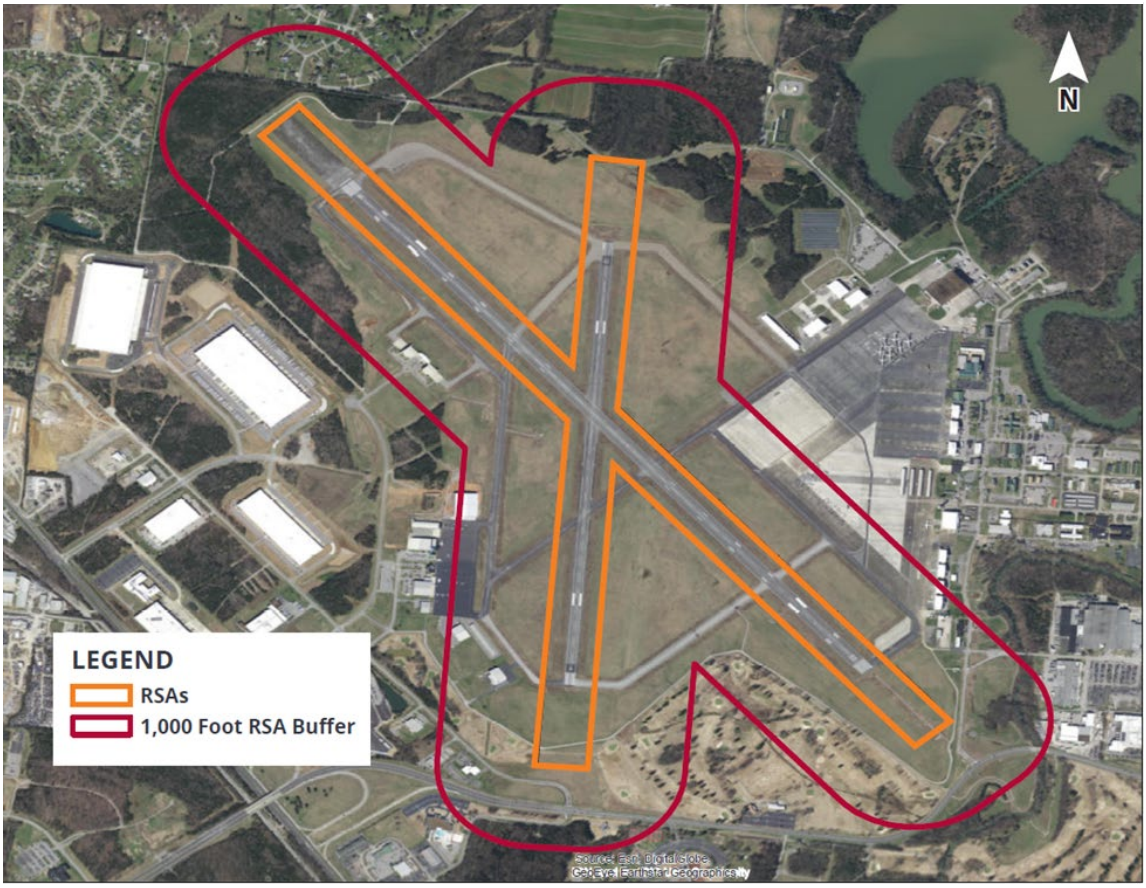
Environmental Feature Analysis

A key part of the airport planning process is analyzing the impact that the project will have on the natural environment, as well as the impact the natural environment may have on the project itself. Environmental features near runways may be hazardous if they attract wildlife or are tall and create an obstruction. Further, certain environmental features such as water bodies or wetlands may pose planning, engineering, and construction issues for airport projects. These factors are why TDOT Aeronautics Division, the FAA, and other federal agencies have environmental processes in place, so that possible impacts to both the TASP system and its environmental features can be identified and mitigated. The environmental features closest to the runway were evaluated, as this is the area where the most critical conflicts exist between environmental features and aircraft.

Identifying Environmental Features

For this analysis, Runway Safety Areas (RSAs) were mapped for all airports, and then created a buffer of either 500 or 1,000 feet around the RSAs. The size of the buffer was determined by NPIAS classification. Commercial Service, GA-National, and GA-Regional airports had a 1,000-foot buffer surrounding each RSA and GA-Local, GA-Basic, and GA-Unclassified airports had 500-foot buffers. These buffers were used to determine what environmental features were "near" the airport runways. ***Figure 13*** depicts a sample RSA buffer used for this analysis.

Figure 13: RSA Buffer Zones



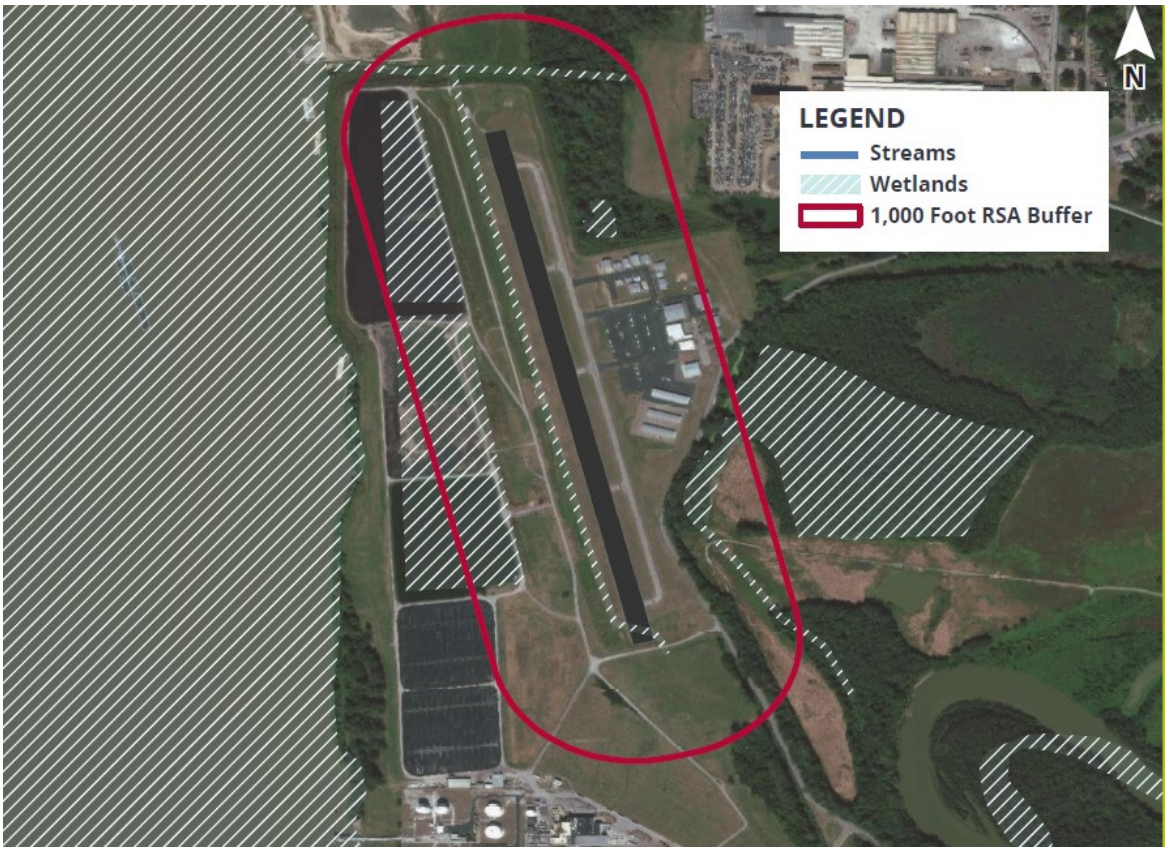
Source: ArcGIS Evaluation, Kimley-Horn, 2020

For each airport, 16 unique environmental features were evaluated, determined in consultation with FAA Standard Operating Procedures (SOP) 5.1. These features included:

- Air quality nonattainment areas
- Air quality lead points
- Coal mines
- Critical habitat for aquatic animals
- Critical habitat for land animals
- Hazard areas
- Historic buildings
- Historic districts
- Historic objects
- Historic sites
- Historic structures
- Scenic river
- Solid waste facilities
- Streams
- Wetlands
- Wilderness areas

Data for these categories were downloaded in GIS format from both state and federal sources, including state departments, the USDA, and the EPA, dependent on the source with more recent data. Of the 16 identified environmental categories, only four categories were identified within the RSA buffers. These features included streams, critical habitats for land animals, historic districts, and wetlands. An example of the environmental feature analysis can be found in ***Figure 14***. The data that follow are presented according to airport NPIAS code; GA-National and GA-Regional airports have been combined into one category.

Figure 14: Environmental Features



Source: ArcGIS Evaluation, Kimley-Horn, 2020

STREAMS

This analysis included an assessment of several different water types, including watersheds, scenic rivers, and streams. Only streams were found within the airport RSA buffers. Streams data were downloaded from the Tennessee GIS Organization, as compiled from EPA River Reach 3 files. The streams data detail the location of every stream at a 1:100,000 ratio.

Forty-three, or 55 percent, of system airports had a stream within their RSA buffer. While streams and other water features are important for providing safe drinking water, as well as supporting ecosystems and human environments, such water bodies can also be hazardous to safe airport operations. Water can attract birds and other wildlife, thus leading to a potential increase in bird strikes and other safety hazards. Additionally, water on airport property can pose construction and operational constraints. For instance, construction costs for a new airport pavement project may be increased by the need to mitigate against existing water.

CRITICAL HABITATS FOR LAND ANIMALS

The Endangered Species Act (ESA) protects the habitats of species deemed “endangered” or “threatened.” The ESA has certain requirements for construction that may impact the habitat of an endangered or threatened species. For instance, if there is a listed species or a critical habitat of an endangered or threatened species located on a proposed construction site, those proposing the construction may be asked to conduct a formal biological survey or conduct an environmental assessment under the National Environmental Policy Act (NEPA). However, and of importance to federally-funded airport projects, if a federal agency is funding a construction project, or if a federal permit is required for a construction project, the federal agency taking the action must fulfill the requirements of the ESA. [5]

This analysis assessed the critical habitats for land animals, aquatic animals, and plant species. Only critical habitats for land animals were found within the airport RSA buffers. While this analysis determined only the critical physical habitat for land animals, it should be noted that these land animals can exist and be in the airport environments outside of this habitat. Critical habitats for land animals information was downloaded from the U.S. Fish and Wildlife Service. These data provide information regarding Threatened and Endangered Species final Critical Habitat designation across the U.S., although the website notes that not all of the critical habitat data designated by the U.S. Fish & Wildlife Service is available from their portal. [6]

Two airports, Gatlinburg-Pigeon Forge and McGhee Tyson Airport are within the critical habitat for the *Myotis sodalist*, or Indiana bat. While these were the only two airports within the critical habitat for the Indiana bat, this bat can and will be found outside its critical habitat. In other words, the Indiana bat can impact airports outside of its critical habitat. Construction projects on the two airports within the critical habitat must follow the requirements set by the ESA up and until the critical land habitat changes or the Indiana bat is no longer listed as an endangered or threatened species.

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[5] Construction General Permit (CGP) Threatened and Endangered Species Eligibility, https://www.epa.gov/npdes/construction-general-permit-cgp-threatened-and-endangered-species-eligibility

[6] USFWS National GIS Data, https://www.fws.gov/gis/data/national/index.html

HISTORIC DISTRICTS

The National Historic Preservation Act of 1966 (NHPA) primarily regulates and protects historic, architectural, archaeological, and cultural resources at the federal level. These laws protect a range of historic sites, structures, objects, and districts. The NHPA specifically requires federal agencies to consider the effects of any construction projects on listed sites, structures, objects, or districts.

This analysis included an assessment of historic sites, structures, objects, and districts. Of these four components, only historic districts were found within the airport RSA buffers. Using information provided by the National Park Service, it was determined that four airports were situated within a historic district:

- Elizabethton Municipal Airport (0A9)
- Johnson County Airport (6A4)
- Knoxville Downtown Island Airport (DKX)
- Maury County Airport (MRC)

Based on this assessment, airports within a historic district may have to comply with certain standards of the NHPA when it comes to construction projects or other airport improvements.

WETLANDS

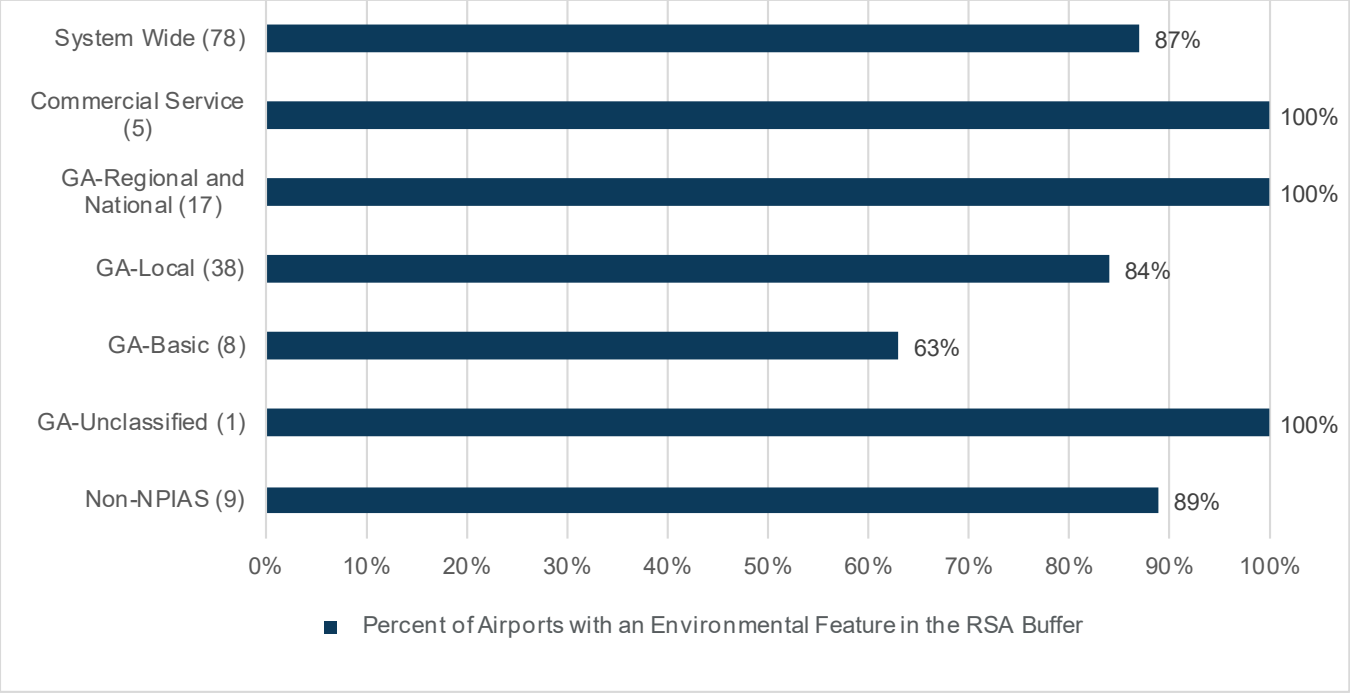
This analysis also included an assessment of floodplains, wilderness areas, wetlands and other water features, and other environmental resources. Of these, only wetlands were found within the airport RSA buffers. Wetlands are areas inundated or saturated by surface or groundwater at a frequency and duration sufficient to support vegetation adopted for life in saturated soil conditions. This includes bogs, marshes, and swamps. The wetlands data used for this analysis also include manmade aquatic environments, such as retention ponds. Wetlands data were downloaded from the U.S. Fish and Wildlife Service and are provided on a state-by-state basis. The U.S. Fish and Wildlife Service caution that data are being continually updated, so are only as accurate as when they were last viewed.

Sixty-eight, or 87 percent, of system airports had a wetland within their RSA buffer. While wetlands and other water features are important for providing safe drinking water, as well as supporting ecosystems and human environments, such water bodies can also be hazardous to safe airport operations. Water can attract birds and other wildlife, thus leading to a potential increase in bird strikes and other safety hazards. Additionally, water on airport property can pose construction and operational constraints. For instance, airport projects may need to be coordinated with appropriate environmental agencies to ensure that adverse impacts on the water resources can be mitigated and/or avoided.

Findings

System-wide, 87 percent of TASP airports have environmental features within their RSA buffer. All Commercial Service, GA-National and Regional, and GA-Unclassified airports have environmental features in their RSA buffer. Eighty-four percent of GA-Local, 63 percent of GA-Basic, and 89 percent of Non-NPIAS airports have an environmental feature in their RSA buffer. ***Figure 15*** displays the percentages of airports by NPIAS classification that had an environmental feature in their RSA buffer.

Figure 15: Airports by Classification with an Environmental Feature in the RSA Buffer



Source: Google Earth Evaluation; Kimley-Horn, 2020

As stated previously, only four categories of environmental features were identified within the RSA buffers. These features included streams, critical habitats for land animals, historic districts, and wetlands. ***Table 1*** provides an overview of how many airports had these categories of environmental features within their RSA buffers.

Table 1: Environmental Feature Totals by Category

Feature	Total Airports with this Feature	Percent of Airports with this Feature
Streams	43	55%
Critical habitats for land animals	2	0.3%
Historic districts	4	0.5%
Wetlands	68	87%

Summary

Conducting environmental analyses provide great insight into the relationship of the statewide aviation system and the natural features which encompass the system. Considering 87 percent of TASP wide airports were found to have an environmental feature in an RSA buffer zone, most airports will have to address environmental features when planning for new airport projects. Although the safety of pilots, passengers, and those on the ground is of the utmost importance when planning for airports and statewide systems, it is also crucial to protect the

environment surrounding an airport. By identifying important environmental features such as habitats for land animals, historic districts, streams, and wetlands within the RSA buffer zones, airport sponsors can be more cognizant of the unique natural features around their airports and can tailor improvement projects toward finding a solution that will be beneficial for the system users and environment alike. However, the analysis provided in this chapter is for system-planning purposes only and is not meant to be used in any official environmental assessments or studies. Rather, this high-level assessment provides airports, TDOT, the FAA, and other stakeholders with the context needed to understand local environmental concerns which is critical for identifying future limitations for development.

Table 2: Approach and RPZ Incompatible Land Uses by Airport

				Part 77 Approach				RPZs		
Associated City	Airport	Identifier	NPIAS	Water Bodies	Major Developments	Landfills	Housing Development (residential)	Roads	Buildings	Vegetation
Athens	McMinn County Airport	MMI	Local	X	X		X	X	X	X
Bolivar	William L Whitehurst Field	M08	Basic	X			X	X		X
Benton	Chilhowee Gliderport	92A	Non-NPIAS	X				X		
Bristol/Johnson/Kingsport	Tri-Cities Airport	TRI	Non-Hub	X	X		X	X	X	X
Camden	Benton County Airport	0M4	Local	X			X	X	X	
Centerville	Centerville Municipal Airport	GHM	Local	X				X	X	X
Chattanooga	Dallas Bay Sky Park	1A0	Non-NPIAS		X		X	X	X	X
Chattanooga	Lovell Field	CHA	Small Hub	X	X		X	X	X	X
Clarksville	Outlaw Field	CKV	Local	X	X		X	X		X
Cleveland	Cleveland Regional Jetport	RZR	Regional		X		X	X	X	X
Clifton	Hassell Field	M29	Basic	X					X	X
Columbia/Mount Pleasant	Maury County Airport	MRC	Local	X	X		X	X	X	X
Collegedale	Collegedale Municipal Airport	FGU	Non-NPIAS	X			X	X	X	X
Copperhill	Martin Campbell Field	1A3	Local					X		X
Covington	Covington Municipal Airport	M04	Local	X				X		
Crossville	Crossville Memorial - Whitson Field	CSV	Local	X	X		X	X	X	X
Dayton	Mark Anton Airport	2A0	Basic	X	X		X	X	X	X
Dickson	Dickson Municipal Airport	M02	Local	X			X	X	X	X
Dyersburg	Dyersburg Regional Airport	DYR	Regional	X	X		X	X	X	X
Eagleville	Puckett Field	50M	Non-NPIAS		X			X	X	
Elizabethton	Elizabethton Municipal Airport	0A9	Regional	X	X		X	X	X	X

				Part 77 Approach				RPZs		
Associated City	Airport	Identifier	NPIAS	Water Bodies	Major Developments	Landfills	Housing Development (residential)	Roads	Buildings	Vegetation
Fayetteville	Fayetteville Municipal Airport	FYM	Local	X	X		X		X	X
Gainesboro	Jackson County Airport	1A7	Basic	X	X					X
Gallatin	Music City Executive Airport	XNX	Regional				X	X	X	X
Greeneville	Greeneville Municipal Airport	GCY	Local	X	X		X	X	X	X
Halls	Arnold Field	M31	Non-NPIAS		X		X		X	X
Hohenwald	John A Baker Field	0M3	Non-NPIAS	X				X	X	X
Humboldt	Humboldt Municipal Airport	M53	Basic	X			X	X	X	X
Huntingdon	Carroll County Airport	HZD	Local	X			X			X
Jacksboro	Colonel Tommy C. Stiner Airfield	JAU	Local	X			X	X	X	X
Jackson	McKellar - Sipes Regional Airport	MKL	Regional	X	X			X	X	X
Jamestown	Jamestown Municipal Airport	2A1	Basic	X				X	X	X
Jasper	Marion County - Brown Field	APT	Local	X			X		X	
Johnson City	Johnson City Airport	0A4	Non-NPIAS	X	X			X	X	X
Knoxville	Knoxville Downtown Island Airport	DKX	Regional	X	X		X	X	X	X
Knoxville	McGhee Tyson Airport	TYS	Small Hub	X	X		X	X	X	X
Lafayette	Lafayette Municipal Airport	3M7	Local	X	X		X	X	X	X
Lawrenceburg	Lawrenceburg - Lawrence County Airport	2M2	Local	X	X		X	X	X	X
Lebanon	Lebanon Municipal Airport	M54	Regional	X	X		X	X	X	X
Lewisburg	Ellington Airport	LUG	Local				X	X		X
Lexington	Beech River Regional Airport	PVE	Local				X	X		X
Linden	James Tucker Airport	M15	Unclassified					X		X

				Part 77 Approach				RPZs		
Associated City	Airport	Identifier	NPIAS	Water Bodies	Major Developments	Landfills	Housing Development (residential)	Roads	Buildings	Vegetation
Livingston	Livingston Municipal Airport	8A3	Local	X	X		X	X	X	X
Madisonville	Monroe County Airport	MNV	Local		X					X
McKinnon	Houston County Airport	M93	Non-NPIAS	X			X	X	X	X
McMinnville	Warren County Memorial Airport	RNC	Local	X			X	X		
Memphis	General Dewitt Spain Airport	M01	Regional	X	X		X	X		X
Memphis	Memphis International Airport	MEM	Small Hub	X	X		X	X	X	X
Millington	Charles W Baker Airport	2M8	Regional					X		X
Millington	Millington - Memphis Airport	NQA	Regional	X				X		
Morristown	Moore - Murrell Airport	MOR	Regional		X		X	X	X	X
Mountain City	Johnson County Airport	6A4	Local	X				X	X	X
Murfreesboro	Murfreesboro Municipal Airport	MBT	Regional		X		X	X	X	X
Nashville	John C. Tune Airport	JWN	Regional	X	X	X	X	X		X
Nashville	Nashville International Airport	BNA	Medium Hub	X	X	X	X	X	X	X
Oneida	Scott Municipal Airport	SCX	Local	X			X	X		X
Paris	Henry County Airport	PHT	Local	X			X	X	X	X
Portland	Portland Municipal Airport	1M5	Local	X			X	X	X	
Pulaski	Abernathy Field	GZS	Local	X					X	X
Rockwood	Rockwood Municipal Airport	RKW	Local	X			X	X		X
Rogersville	Hawkins County Airport	RVN	Local		X		X	X	X	X
Savannah	Savannah - Hardin County Airport	SNH	Local	X				X	X	X
Selmer	Robert Sibley Airport	SZY	Local	X				X		X
Sevierville	Gatlinburg - Pigeon Forge Airport	GKT	Regional	X	X		X		X	X
Sewanee	Franklin County Airport	UOS	Basic	X			X	X		X
Shelbyville	Bomar Field- Shelbyville Municipal Airport	SYI	Regional	X	X		X	X	X	
Smithville	Smithville Municipal Airport	0A3	Local	X	X		X	X	X	X

				Part 77 Approach				RPZs		
Associated City	Airport	Identifier	NPIAS	Water Bodies	Major Developments	Landfills	Housing Development	Roads	Buildings	Vegetation
Smyrna	Smyrna Airport	MQY	National	X	X		X	X	X	X
Somerville	Fayette County Airport	FYE	Local	X						
Sparta	Upper Cumberland Regional Airport	SRB	Local		X		X	X		X
Springfield	Springfield Robertson County Airport	M91	Local					X	X	X
Tazewell	New Tazewell Municipal Airport	3A2	Local					X	X	X
Tiptonville	Reelfoot Lake Airpark	0M2	Non-NPIAS	X				X		X
Trenton	Gibson County Airport	TGC	Local	X				X	X	X
Tullahoma	Tullahoma Regional Airport	THA	Local	X	X		X	X	X	X
Union City	Everett Stewart Regional Airport	UCY	Local	X				X		
Waverly	Humphreys County Airport	0M5	Basic	X			X			X
Winchester	Winchester Municipal Airport	BGF	Regional	X			X	X	X	X
			Grand Total	**61**	**38**	**2**	**53**	**67**	**53**	**67**