May 2024

St. Lucie TPO AAM Phase II Study

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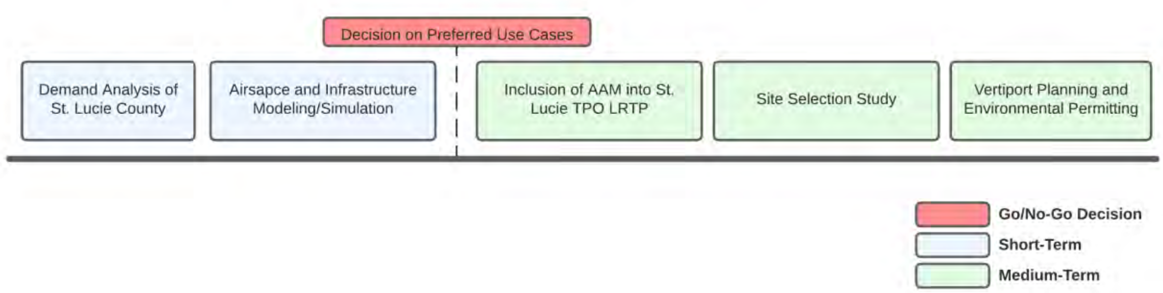
Chapter 1. Introduction

1.1. Background on Advanced Air Mobility and Prior Studies from Port St. Lucie Transportation Planning Organization (TPO)

Advanced Air Mobility (AAM) is an air transportation system that moves people and cargo between local, regional, intraregional, and urban places previously served or underserved by aviation. At a mature state, AAM will integrate revolutionary aircraft including Electrical Vertical Take-Off and Landing (eVTOL) aircraft, Short Take-Off and Landing (STOL) aircraft, Unmanned Aircraft Systems (UAS) or drones, fixed-wing aircraft, and helicopters into highly automated networks. Currently, the new AAM technology is outpacing the development of the regulatory framework with limited AAM-related guidance at the federal, state, and local levels. As such, the St. Lucie Transportation Planning Organization (TPO) is independently seeking to learn more about this emerging industry and explore the possible integration of AAM into the region.

Prior to this study, the TPO has undertaken an initiative as part of its FY 2022/23 Unified Planned Work Program (UPWP) to gain a deeper understanding of the emerging industry. This effort has resulted in the creation of the ***Drone Port/Advanced Air Mobility Preliminary Review***, completed in 2022. This study provides recommendations and outlines potential opportunities for TPO to support the integration of AAM into the TPO area as depicted in **Figure 1** below.

Figure 1 – St. Lucie TPO AAM Integration Roadmap



Source: Drone Port/Advanced Air Mobility Preliminary Review, St. Lucie TPO 2022

To further advance the AAM effort, TPO has taken the initiative as part of its FY 2023/24 UPWP to make progress on the short-term action items identified in **Figure 1** above***,*** specifically the demand analysis of St. Lucie County and airspace/infrastructure modeling (the blue cells in the above figure). These studies will now be referred to as Phase 2 studies going forward and this technical memorandum provides a summary of the findings from Phase 2. As this technical memorandum does not include general information regarding AAM, readers are encouraged to refer to the TPO's ***Drone Port/Advanced Air Mobility Preliminary Review*** for a better understanding of the AAM system.

1.2. Purpose of the Study

The purpose of this study was to conduct a short-term evaluation as outlined in the roadmap. This evaluation included analyzing potential vertiport locations in the TPO area, assessing the suitability of on-airport locations at Treasure Coast International Airport (FPR), and modeling and simulating airspace in the St. Lucie County based on the findings of the first two evaluations.

It is important to note that this study does not consider cargo use cases for vertiports, as companies like Amazon Prime Air and Wisk have expressed their intention to deliver goods directly from warehouses to customers' homes. Therefore, location of the cargo use case vertiport would primarily be driven by the existing or planned warehouse locations of delivery and Ecommerce companies. Conversely, the passenger use case requires a last-mile connection to consumers' final destinations. Indicating that location of the destination vertiport is crucial for the users as it impacts the cost of last-mile transportation, time savings, and overall convenience for users of AAM.

The initial task of the study involved analyzing off-site demand to assess local consumer demand in AAM transportation. This analysis utilized anonymous location-based primary trip data and the most up-to-date census data (2020)—such as average commute time to work, median household income, and population density—to identify two census tracts that exhibit the highest demand for AAM transportation, and to gain a comprehensive understanding of the potential demand for AAM in the TPO area.

The second task included a preliminary site review of the Treasure Coast International Airport property as part of a preliminary vertiport site review. The analyses listed below were performed as part of this study, and three (3) potential vertiport location on Airport property were identified as a result of these analyses. Given the limited scope of the study, it is important to acknowledge that the findings generated were preliminary. Therefore, it is recommended that a comprehensive review be conducted by the TPO or the Airport Sponsors prior to integrating a vertiport infrastructure into the FPR.

1. Integration into airspace/airport operations: performed cursory airspace analysis to identify clearance requirements and potential obstacles (e.g., buildings, towers, vegetation) to future vertiport imaginary surfaces, including obstacle clearance surfaces and Part 77 surfaces. This analysis utilized obstacle data provided by the Airport (if applicable), the Airport' s most recent FAA-approved airport layout plan (ALP), data from the FAA' s Obstruction Evaluation/Airport Airspace Analysis (OE/AAA) database, and/or the Consultant' s knowledge of the project area. As part of this analysis, the vertiport approach, departure, and transitional surfaces, as published in Engineering Brief (EB) 105 and Title 14 Code of Federal Regulations (CFR) Part 77, respectfully, were evaluated to determine eVTOL ingress/egress clearance requirements, and potential obstacles. A review of the Airport's approach and departure procedures, traffic flow, and the surrounding airspace was also included.
2. FAA separation standards: reviewed FAA separation standards for aircraft operations, utilizing guidance published in EB 105, FAA Advisory Circular (AC) 150/ 5300-13B – Airport Design, and FAA Order JO 7110. 65 – Air Traffic Control.
3. Potential for future vertiport infrastructure and expansion possibilities: reviewed Airport property to identify three (3) area that may be used for future vertiport and related development.

The final step of the project consolidated the findings of the first two evaluations and developed a visualization of AAM operations in the TPO area. Two specific locations for a vertiport integration were identified to generate basic travel metrics to provide context of how AAM integration could potentially benefit or impact the current transportation network in the TPO region.

1.3. Goals and Objectives

The goals and objectives of this study integrated the goals of the Federal, State, and the TPO's Long Range Transportation Plan (LRTP), ***SmartMoves 2045***, which aims to provide the public with a safe and efficient multimodal transportation system. The LRTP goals are as follows:

1. Support Economic Activities
2. Provide Travel Choices
3. Maintain the Transportation system
4. Provide Equitable, Affordable, and Sustainable Urban Mobility
5. Improve Safety and Security

Source: SmartMoves 2045, St. Lucie TPO 2021

While no specific performance measures were considered in this analysis, the above LRTP goals guided the decision-making process throughout the study in order to establish an outcome that promotes a safe and efficient transportation system while also preserving equity of the community members in the TPO area.

1.4. Technical Advisory Committee (TAC)

A Technical Advisory Committee (TAC) was established to provide ongoing guidance and support throughout the project. These members offered local, regional, statewide, and national insights on various issues affecting the AAM industry. Throughout the process, the TAC members were consulted and engaged, providing feedback on the usefulness and effectiveness of each study task. The TAC consisted of stakeholders with extensive knowledge and experience in traditional aviation, AAM, transportation, and related fields. The following organizations were represented by the TAC:

- Federal Aviation Administration (FAA)
- Florida Department of Transportation (FDOT)
- St. Lucie Transportation Planning Organization
- City of Fort Pierce
- City of St. Lucie
- Treasure Coast International Airport

Chapter 2. Off-Site Demand Analysis

The off-site suitability analysis identified two (2) sites for vertiport integration in the TPO area that exhibit the highest demand for passenger use. This analysis utilized the most up-to-date census data (2020) — such as average commute time to work, median household income, and population density—to identify two census tracts that exhibit the highest demand for AAM transportation, and to gain a comprehensive understanding of the potential demand for AAM in the TPO area. Various data sources evaluated as part of the analysis are discussed below.

2.1. American Community Survey

The U.S. Census Bureau conducts the American Community Survey (ACS) annually to gather demographic information. This survey collects data that was previously only included in the long form of the decennial census, such as ancestry, citizenship, education, income, language proficiency, migration, disability, employment, and housing characteristics. Data generated from the survey are widely utilized by various stakeholders in the public, private, and nonprofit sectors for purposes such as funding allocation, tracking demographic changes, emergency planning, and transportation planning. The survey is sent to approximately 295,000 addresses each month, making it the largest household survey administered by the U.S. Census Bureau. In the context of this study, the ACS data provided metrics that were identified as a proxy towards transportation demand for each census tract in the TPO area.

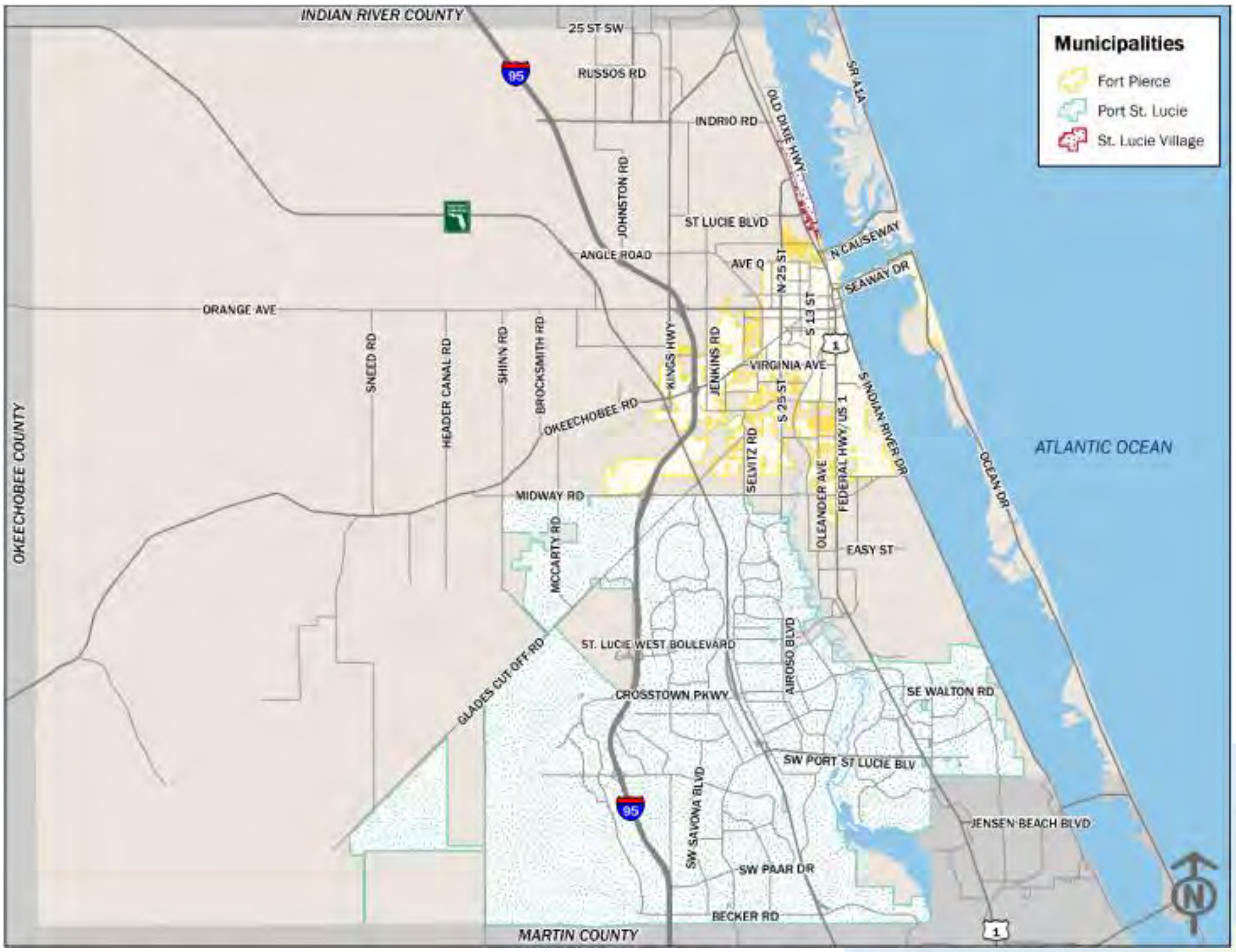
2.2. Replica© Data

In addition to the ACS survey, this project utilized Replica© data to gain a better understanding of existing travel patterns in the TPO area. Replica© is a tool that utilizes credit card transactions and other anonymous location-based sources, providing primary trip data for market and transit assessments. Data from September 2022 to January 2024 was collected and provided insights into various aspects of trips such as purpose, length, duration, mode of transportation, and start and end times. Replica© also provided anonymized data on trip takers, including household income, age, race and ethnicity, approximate home, work, and school locations, and employment status; it also differentiated between trips taken by visitors and full-time residents in TPO area. In the context of this study, data variables such as origin and destination pairing, trip purpose, and other data sets were utilized to help better understand the travel trends and emerging market opportunities for AAM in the TPO area.

2.3. Study Boundary

Started after the 1980 Census, the St. Lucie TPO is a Metropolitan Planning Organization (MPO) responsible for the planning and programming of State and Federal funding for transportation improvements for the City of Fort Pierce, City of Port St. Lucie, St. Lucie Village, and the unincorporated areas of St. Lucie County. Therefore, the AAM study boundary is the same as TPO's jurisdiction boundary as depicted below.

Figure 2 – St. Lucie TPO Boundary



Source: SmartMoves 2045, St. Lucie TPO 2021

2.3.1. U.S. Census Tract in St. Lucie

Establishing a common boundary is crucial to the assignment of unique variables that are associated with each boundary, and there are multiple geographic units available for the purpose of tabulating data. While there are numerous ways to delineate a region, presented below are geographic units that are commonly used in this type of study.

U.S. Census Tract (Recommended) – A small, relatively permanent statistical subdivision of a county delineated by a local committee of census data users for the purpose of presenting data. Census tract boundaries normally follow visible features but may follow governmental unit boundaries and other non-visible features. Census tracts always nest within counties. Designed to be relatively homogeneous units with respect to population characteristics, economic status, and living conditions at the time of establishment, census tracts average about 4,000 inhabitants. They may be split by any sub-county geographic entity.

U.S. Census Block – A subdivision of a census tract (or, prior to 2000, a block numbering area), a block is the smallest geographic unit for which the Census Bureau tabulates 100-percent data. Many blocks correspond to individual city blocks bounded by streets, but blocks – especially in rural areas – may include many square miles and may have some boundaries that are not streets. The U.S. Census Bureau established blocks covering the entire nation for the first time in 1990. Previous censuses back to 1940 had blocks established only for part of the nation. Over 8 million blocks are identified for Census 2000.

When leveraging census tract data, it is important to acknowledge that each census tract varies in size, thereby resulting in disparities in data concentration. Therefore, some metrics evaluated need to be divided into a standardized format such as per square mile.[1]

2.4. Inventory of Existing Data

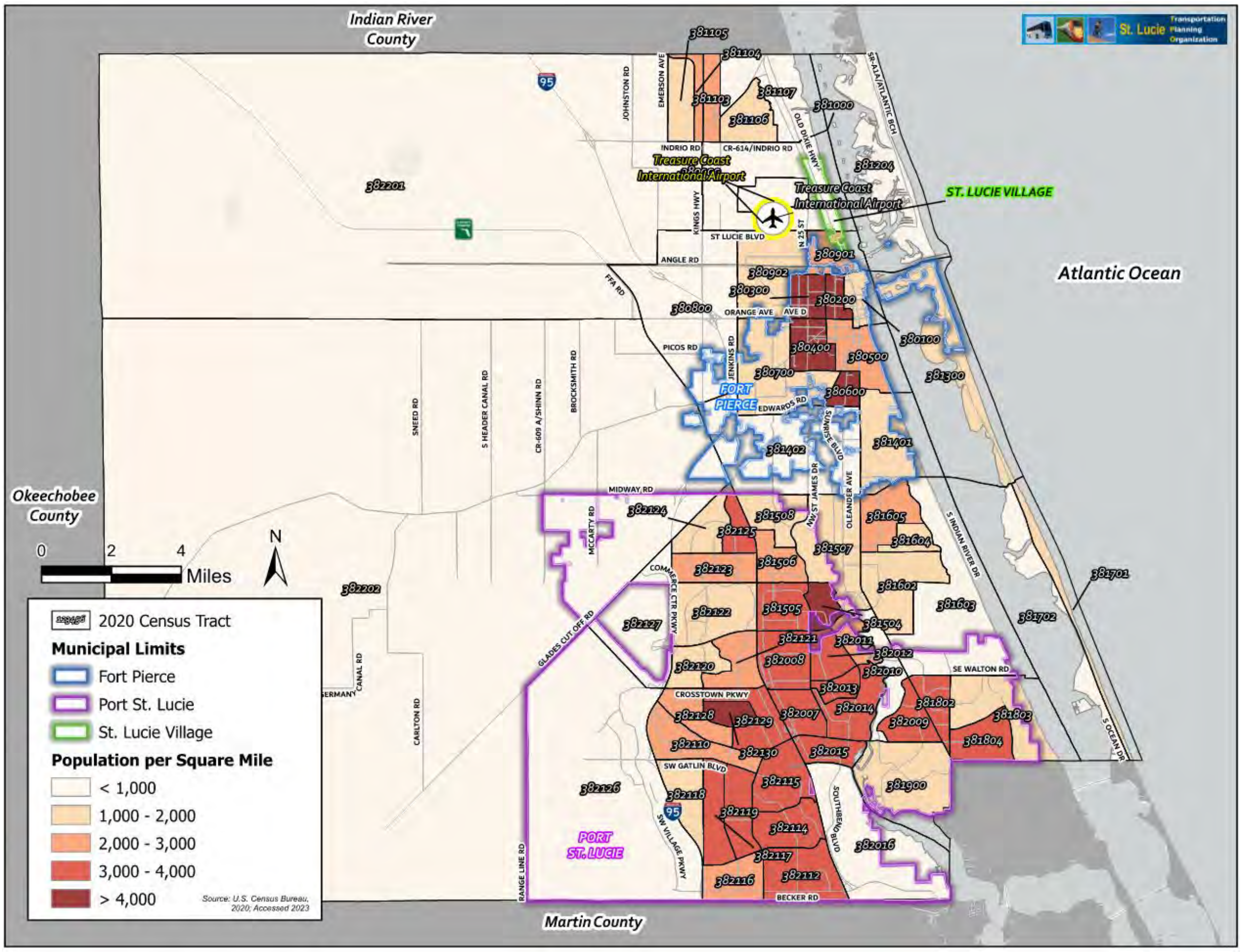
This section provides an overview of the variables that were assessed for each census tract in the TPO area. The purpose of this inventory was to establish an individual understanding of each data variable that was evaluated comprehensively in section 2.5 using GIS-based suitability analysis. It is important to acknowledge that these variables may not be the sole factors influencing the demand for a vertiport facility. Other factors—such as land availability, airspace regulations, and local patterns that could not be measured/quantified at the time data was collected for this report—may need to be considered in the future when defining a more specific location beyond a census tract level.

2.4.1. Population Density/Sq Mile

Population density is an important variable to consider when determining the suitability of a vertiport location in a region. The number of people residing within a given area is often indicative of the demand for transportation services. Higher population density typically corresponds to a greater concentration of transportation service demand. In addition to being a demand proxy, selecting a vertiport location in an area with high population density ensures that it will be easily accessible to a large number of individuals. It is important to note that when analyzing population data, it is necessary to account for disparities in data concentration. As such, population count for each census tract are divided by the corresponding census tract's area to generate population density that is defined per square mile. **Figure 3** depicts population density of each census tract within the St. Lucie TPO boundary where values range from below 1,000 to over 4,000 people per square mile.

[1] *For instance, consider block group A, which encompasses an area of 10 square miles with a population of 10 inhabitants. This would yield a 1 population density per square mile, which is the same population density value for block group B, which spans an area of 20 square miles with a population of 20 inhabitants.*

Figure 3 – Population Density



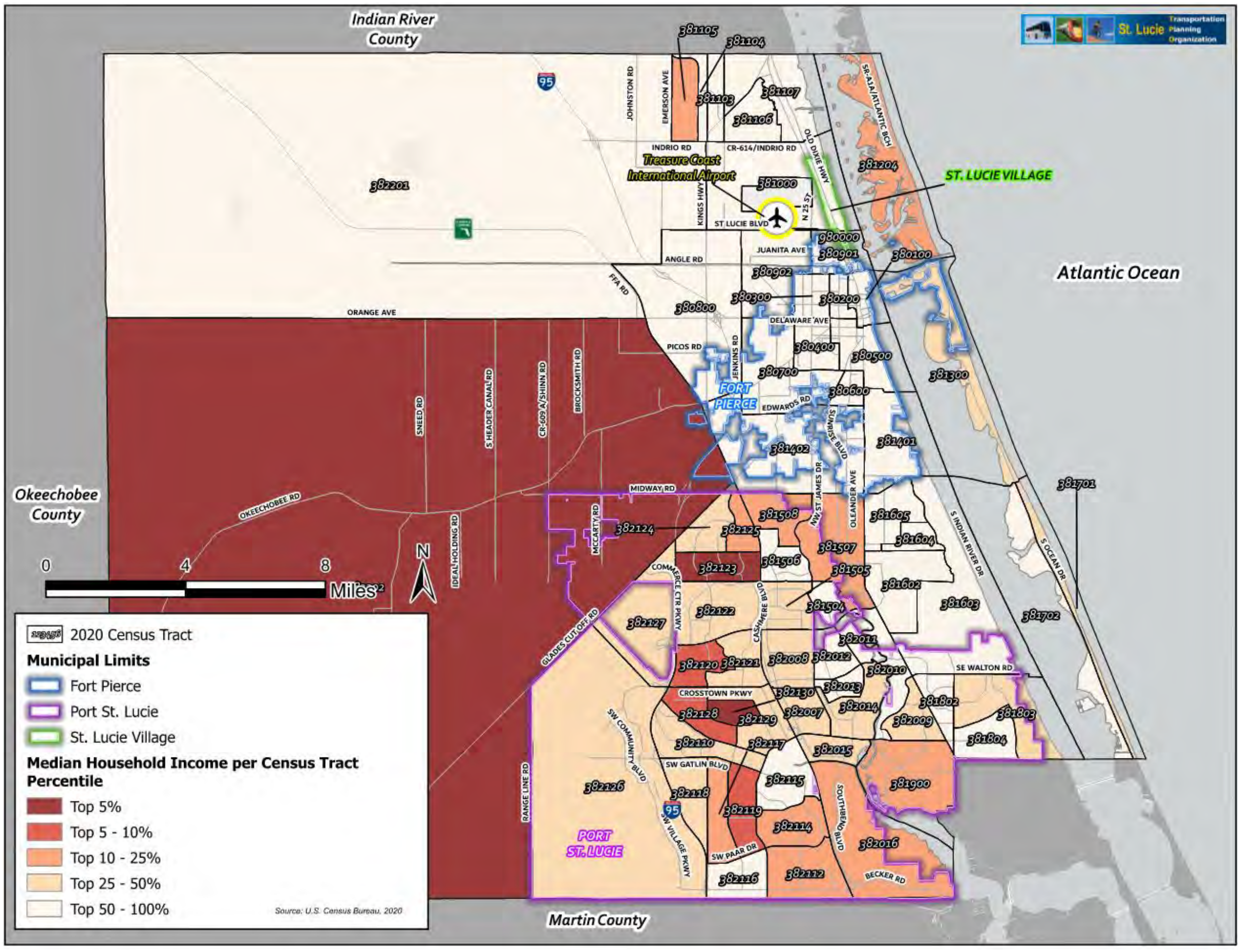
Source: U.S. Census Bureau, 2020

Figure 3 indicates that there are concentrated areas (Census Tract# 380200, 380400, and 380600) of high population density in downtown Fort Pierce and in the residential areas (Census Tract# 382130 381504) of the City of Port St. Lucie. The census tract in Fort Pierce near the downtown region is the most dense with 4,905 of inhabitants per square mile, while the non-incorporated regions and St. Lucie Village generally reported a lower population density compared to the region's average.

2.4.2. Median Household Income

Median household income can serve as a proxy for AAM transportation demand. A higher average income suggests that households have more disposable income to spend on convenience and time saving benefits. Being a new mode of travel, AAM is expected to have a higher cost during its infancy compared to traditional transportation alternatives. Households with higher incomes are more likely to be the early adopters of AAM services. **Figure 4** depicts relative percentile groups of median household incomes for each census tract within the St. Lucie TPO boundary. The median household income value ranged from below $20,000 to slightly above $100,000 in the past 12 months.

Figure 4 – Median Household Income



Source: U.S. Census Bureau, 2020

The median household income in the past 12 months is evenly distributed throughout the region, with lower than average incomes reported in the tracts located along the eastern part of the City of Fort Pierce, particularly in the downtown area. The highest median highest household income in the top 5% percentile was reported as $102,000 in Census Tract# 382123.

2.4.3. Points of Interests – Pedestrian Shed

Points of interest (POI) can serve as a reliable proxy for transportation demand when determining the placement of vertiport infrastructure. These locations—such as commercial developments, tourist attractions, sports stadiums, entertainment venues, etc.—attract a significant concentration of people, indicating a high potential for transportation needs for users of these facilities to get to and from these points of interests. Transportation planning strategically places transit facilities near these points of interest to be able to capture the demand generated by these areas and provide convenient access through AAM transportation services.

Additionally, highly accessed locations often have well-established transportation infrastructure, including roads, highways, and public transit stations. Leveraging this existing infrastructure can enhance last-mile connectivity between the vertiports and other modes of transportation, creating a seamless and efficient transportation network. By capitalizing on the accessibility and central location of points of interest in the

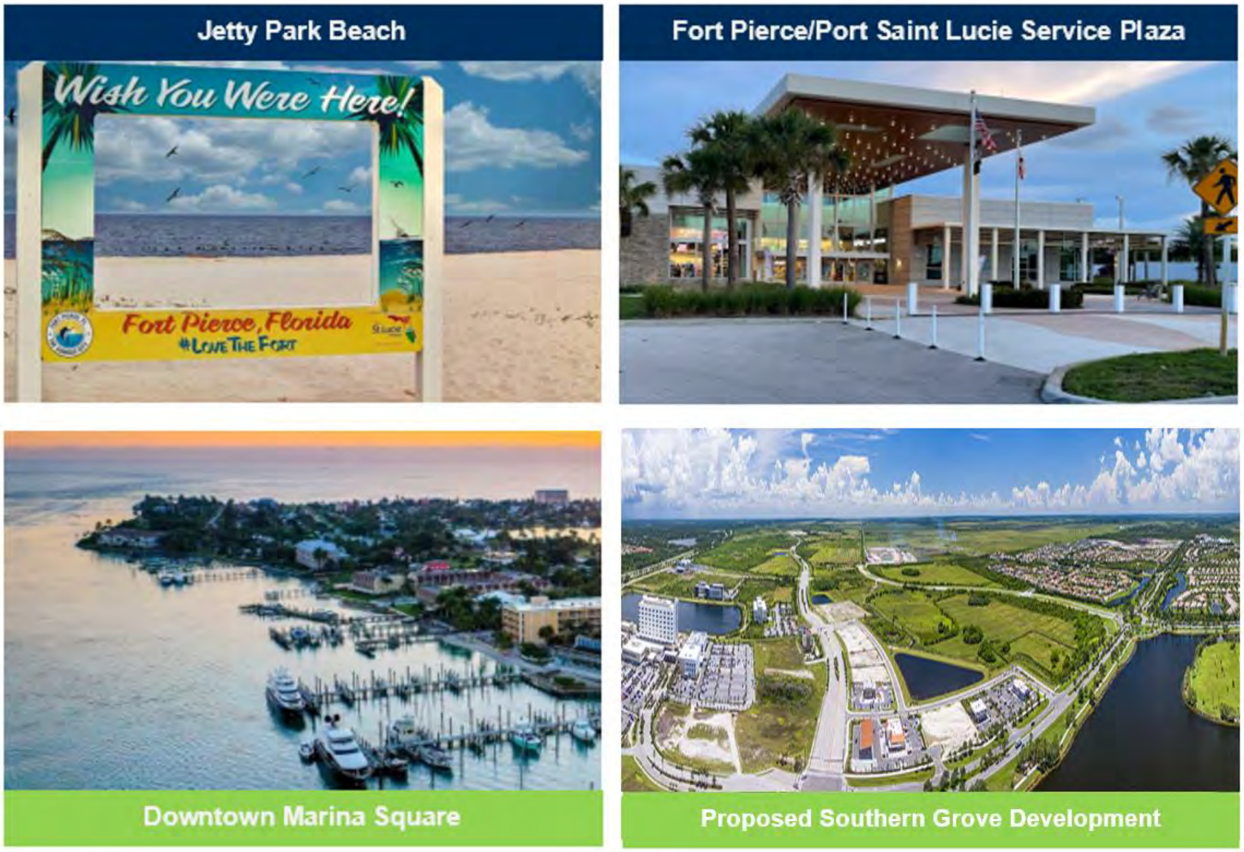
TPO area, AAM can efficiently serve the transportation needs of both residents and visitors, further improving the time saving benefits and the overall passenger experience.

For this evaluation, a preliminary list of the 30 most popular points of interest (POIs) within the study boundary was collected through published sources such as VISIT Florida, St. Lucie website, and the SmartMoves 2045 Long Range Transportation Plan (LRTP). This list was then reviewed and refined by the TAC members during the first committee meeting on February 28, 2024. The final POIs include city centers, beaches, intercity bus facilities, parks, museums, entertainment venues, lodging options, golf courses, stadiums, as well as proposed job opportunity areas for large-scale manufacturing, logistics and retail development (Southern Grove Development). **Table 1** below presents the complete list of POIs utilized as part of this analysis.

Table 1 – Points of Interests in St. Lucie County

Facility Name	Jurisdiction	Type
Blind Creek Beach	Fort Pierce	Beach
Downtown Marina Square	Fort Pierce	City Center
Fort Pierce Inlet State Park	Fort Pierce	Beach
Fort Pierce Station "Dunkin Donuts"	Fort Pierce	Intercity Bus Facility
Fort Pierce Station "Loves Travel Stop"	Fort Pierce	Intercity Bus Facility
Frederick Douglass Memorial Park	Fort Pierce	Beach
Heathcote Botanical Gardens	Fort Pierce	Park
Jetty Park	Fort Pierce	Beach
Navy Seal Museum	Fort Pierce	Museum
Pepper Park Beach	Fort Pierce	Beach
South Beach Park	Fort Pierce	Beach
South Causeway Beach	Fort Pierce	Beach
Sunrise Theater	Fort Pierce	Entertainment
Surfside Park	Fort Pierce	Park
Fairwinds Golf Club	Fort Pierce	Lodging/Golf
Clover Park	Port St. Lucie	Stadium
Fort Pierce/Port Saint Lucie Service Plaza	Port St. Lucie	Intercity Bus Facility
Hilton Garden Inn PGA Village	Port St. Lucie	Entertainment
MIDFLORIDA Event Center	Port St. Lucie	Venue
PGA Village	Port St. Lucie	Entertainment
Port Saint Lucie Station "Shell Gas Station"	Port St. Lucie	Intercity Bus Facility
Port Saint Lucie Station "Sunoco Gas Station"	Port St. Lucie	Intercity Bus Facility
Port St. Lucie Botanical Gardens	Port St. Lucie	Park
Sandpiper Bay Resort	Port St. Lucie	Lodging/Golf
Savannas Preserve State Park	Port St. Lucie	Park
The Saints of Port St. Lucie	Port St. Lucie	Entertainment
Tradition Village Center	Port St. Lucie	Entertainment
Port District	Port St. Lucie	Entertainment
McCarty Ranch Preserve	Port St. Lucie	Park
Florida Sports Hall of Fame	Port St. Lucie	Museum
Oxbox Eco-Center	Port St. Lucie	Park
River Lilly Cruises	Port St. Lucie	Park
Indian River State College	Port St. Lucie	School
Southern Grove – Industrial Area	Port St. Lucie	Industrial Area
Southern Grove – Cultural Arts/Entertainment	Port St. Lucie	Cultural Arts /Entertainment
Southern Grove – Main Street/Office	Port St. Lucie	Main Street/Office

Figure 5 – Points of Interest in St. Lucie County



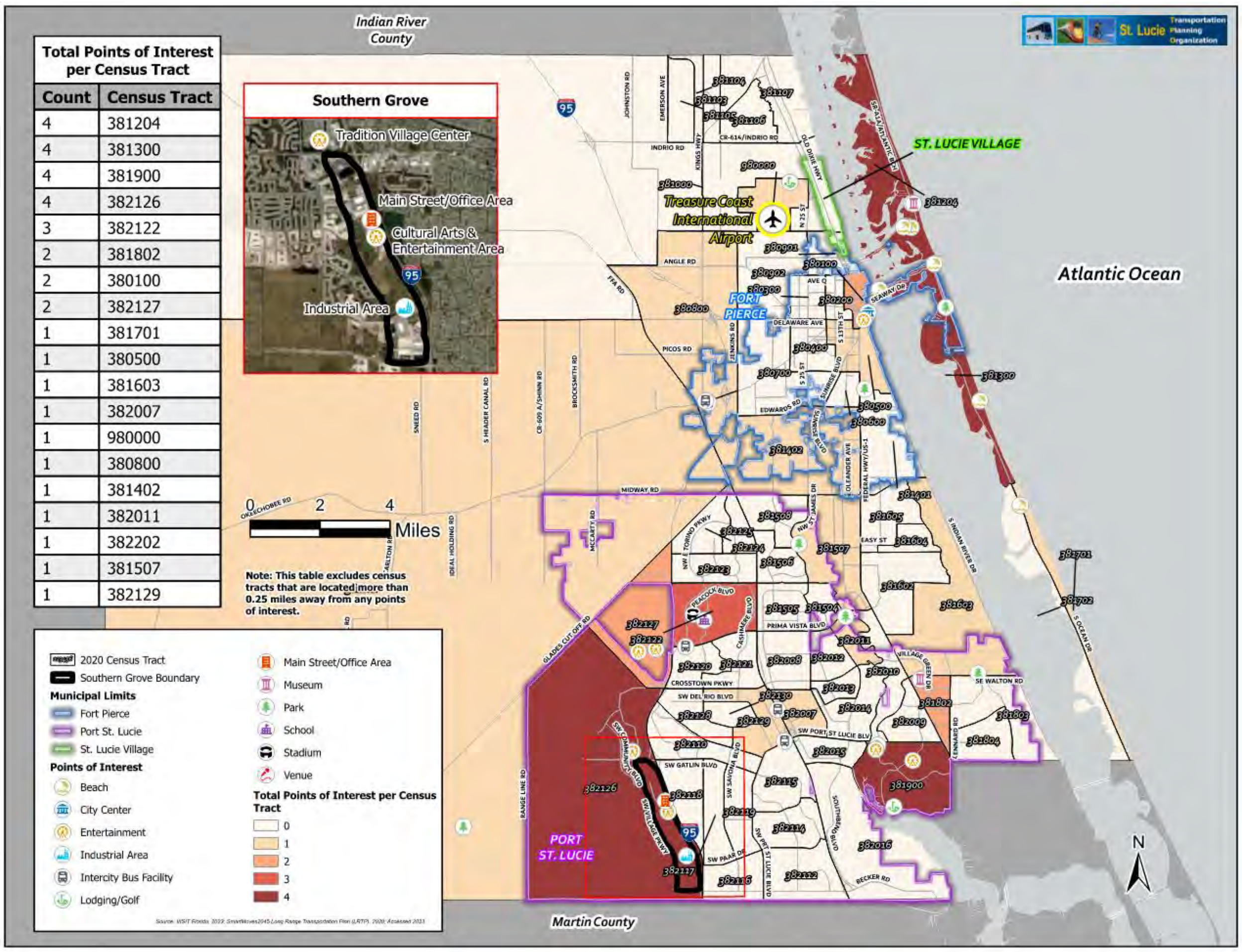
In addition to the attraction POIs that generate transportation demands to the region, there are also POIs such as transit facility that relieve transportation demands to and from the region and can be a suitable vertiport location. These transit facilities would enhance multi-modality and provide convenient last-minute connections to and from the vertiport. Furthermore, there are proposed developments that do not currently exist, but were taken into consideration. These developments indicate a potential shift in transportation demand; they also provide opportunity for better coordination and integration of the vertiport infrastructure and amenities to ensure that the vertiport is seamlessly woven into the fabric of the overall development, which would create a more cohesive and functional environment. Two specific locations in St. Lucie TPO region—the Fort Pierce/Port Saint Lucie Service Plaza and the proposed Southern Grove Development—are explored further below.

- **Fort Pierce/Port Saint Lucie Service Plaza -** Florida's Turnpike Mainline has eight service plazas located approximately every 40 miles. These plazas are open 24/7 and offer various dining options, gift shops, ATMs, public telephones, travel information, dog walks, and other amenities. The main advantages of hosting a vertiport facility in the vicinity of a service plaza are its amenities, the proximity to the turnpike, and the open space nearby that may be more suitable for vertiport's airspace and land use integration.
- **Southern Grove Development -** Southern Grove is one of Florida's unique job opportunity areas for large-scale manufacturing, logistics and retail development. It has the largest swath of development-ready vacant land in all South Florida that fronts over four miles of Interstate 95, with interchanges at both Tradition Parkway and Becker Road. Port St. Lucie has a talent-ready labor market with a central location between several major metro areas, including international airports located in Orlando and West Palm Beach. It is an

opportunity for development with the city of Port St. Lucie with over 10 million square feet of office, industrial, warehouse, and retail space. Parcel sizes are flexible to allow opportunities for large-footprint users. Potential development include manufacturing, distribution, warehousing, corporate office, medical office, research and development, retail, multi-family residential, hospitality and educational uses.

The analysis applied a pedestrian “Shed” with a radius of ¼-mile to each of the POIs.[2] This is because simply counting the number of POIs in each census tract may not provide an accurate representation of their proximity to surrounding tracts. It is possible that a POI may be more easily accessible from a different census tract rather than from the opposite end of the tract it is located within. **Figure 6** presents the ranking of each census tract based on the number of POI pedestrian shed are contained within them.

Figure 6 – Points of Interests



Source: U.S. Census Bureau, 2020

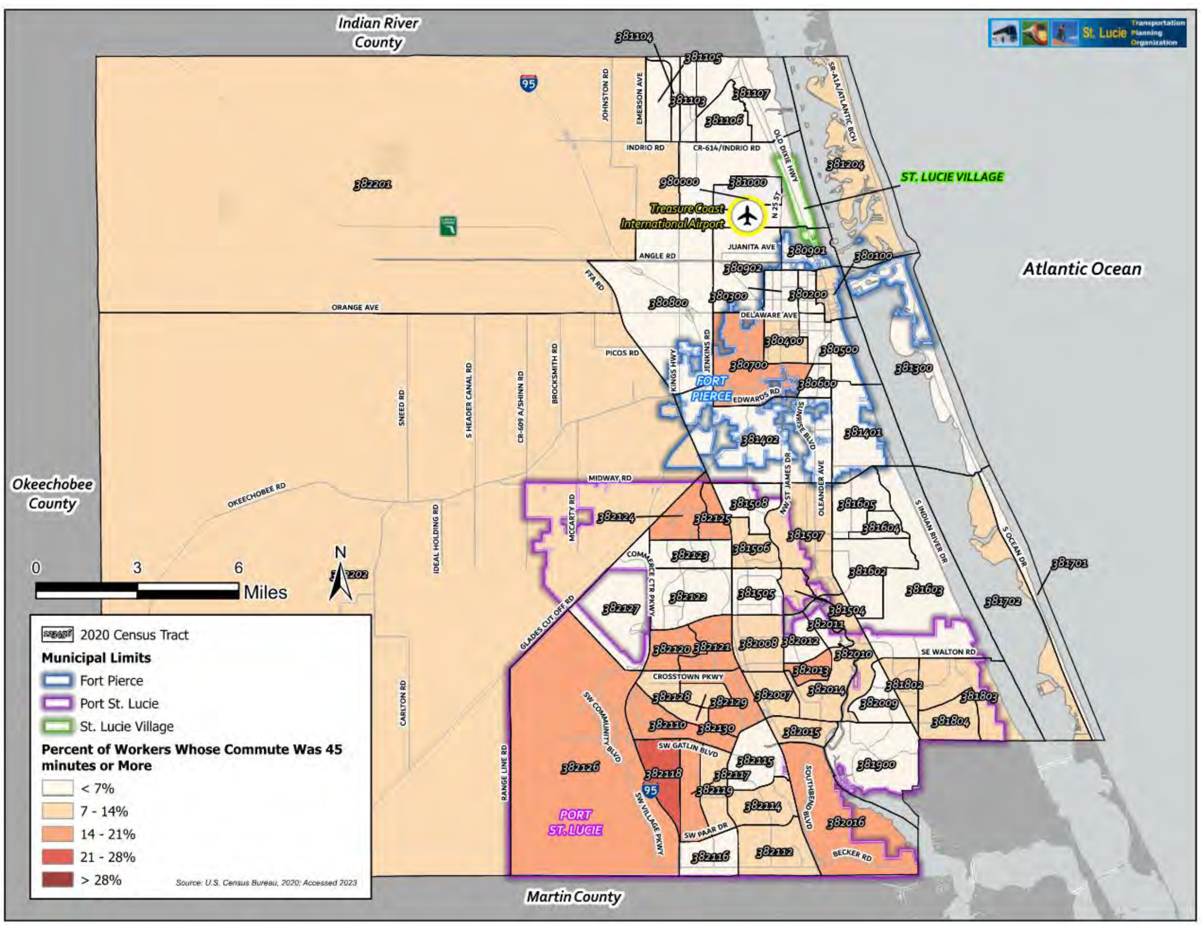
Figure 6 indicates that there are several census tracts that have a high concentration of POIs.

[2] ¼ mile is what is commonly accepted as the typical distance people are willing to walk.

2.4.4. High Commute Time to Work

High commute time to work serves as a valuable indicator of passenger demand towards transportation and time-saving benefits. When commuters experience long commute times, it often can be tied to a stronger desire to explore alternative transportation options to reduce travel time. AAM has the potential to significantly decrease commute times by bypassing traditional road congestion and utilizing direct flight paths. Therefore, areas with above-average commute times can be considered potential hotspots for AAM services, as individuals in these locations are likely to be motivated to seek alternative transportation to shorten their commutes. Additionally, high commute times can also be attributed to inadequate transportation infrastructure in a particular area, further contributing to the potential demand for AAM services to enhance transportation efficiency. In the context of AAM, this suitability analysis focuses on the percentage of workers whose commute exceeds 45 minutes within a census tract. Any commute time less than 45 minutes is not considered an appropriate proxy for AAM, as the time-saving benefits yielded from AAM are not expected to be significant. **Figure 7** depicts the percent of workers whose commute was 45 minutes or more per census tract within the study boundary.

Figure 7 – Commute Time to Work



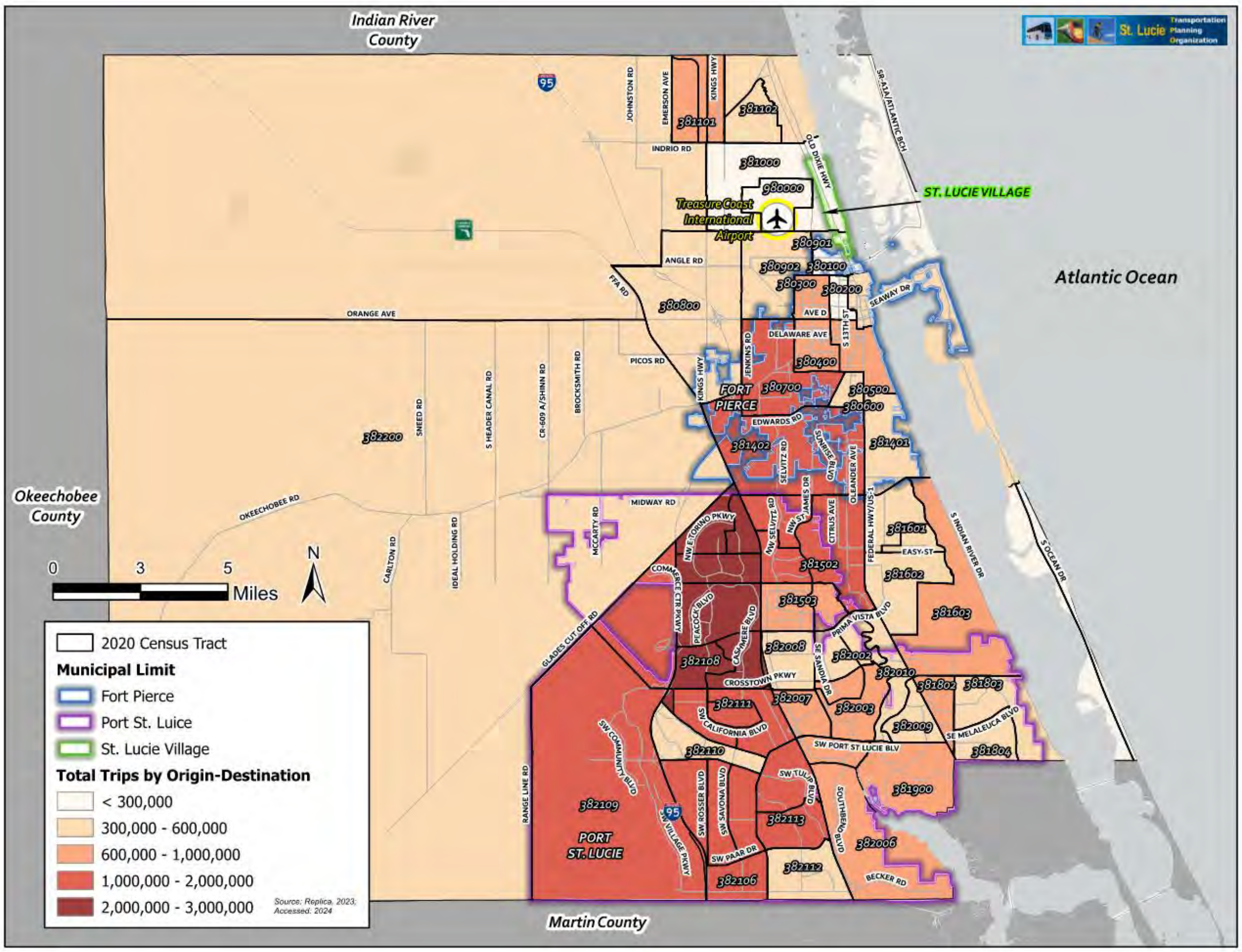
Source: U.S. Census Bureau, 2020

Figure 7 indicates that the percentage of workers whose commute was 45 minutes or more is higher in southern Port St. Lucie area compared to other areas within the study boundary; census tract# 382118 has the highest percentage at 25% of workers with commute times over 45 minutes.

2.4.5. Origin-Destination Trip Count

Origin and destination (O&D) trip count is a direct indication of transportation demand, which accounts for all transportation related activities in each census tract. This data utilizes credit card transactions and other anonymous location-based sources, and provides primary trip data for market and transit assessments. For this project, this data is sourced from Thursdays and Saturdays in the fall of 2023, and provides insights into various aspects of trips such as purpose, length, duration, mode of transportation, and start and end times.

Figure 8 – Origin-Destination Trip Count



Source: U.S. Census Bureau, 2020

Figure 8 indicates that the highest concentration of O&D trip count was recorded in the region of Port St. Lucie West.

2.5. Evaluation of Data – GIS-based Demand Analysis

The final step of the analysis involved assigning a score to each census tract based on a scoring system developed for each of the variables. The scoring system ranged from 1 – 5 points for a specific variable—depending on how a given census tract performed when compared to other census tracts in the TPO area—with a score of 5 being more favorable than a score of 1. For instance, a census tract with a top 5% median household income received 5 points, while a lower census tract in the bottom percentile received a lower score. The purpose of developing this scoring system was to incorporate the scores into a comprehensive suitability analysis that combined all the variables' associated scores in order to calculate a comprehensive ranking. In addition, the Analytical Hierarchy Process (AHP) was utilized to incorporate the community's vision into the overall process. The AHP process involves surveying participants using pairwise comparisons to quantify individual opinions and establish measurable numeric relationships/prioritization between each of the variables. This process ultimately defined specific weights that were applied to each of the variables used for the GIS-based demand analysis. The TAC members were presented with the individual variables discussed in the previous section, and surveyed using the AHP process.[3] The AHP survey results of the TAC members were averaged to determine the collective prioritization of variables for analyzing AAM transportation demand in the TPO area. **Table 2** below depicts the average weights each of the variable, which contributed to the final suitability analysis.

Table 2 – AHP Survey Result

Population Density	Average Commute Time to Work	Median Household Income	Trip Counts	Points of Interests
14%	**20%**	**38%**	**19%**	**9%**

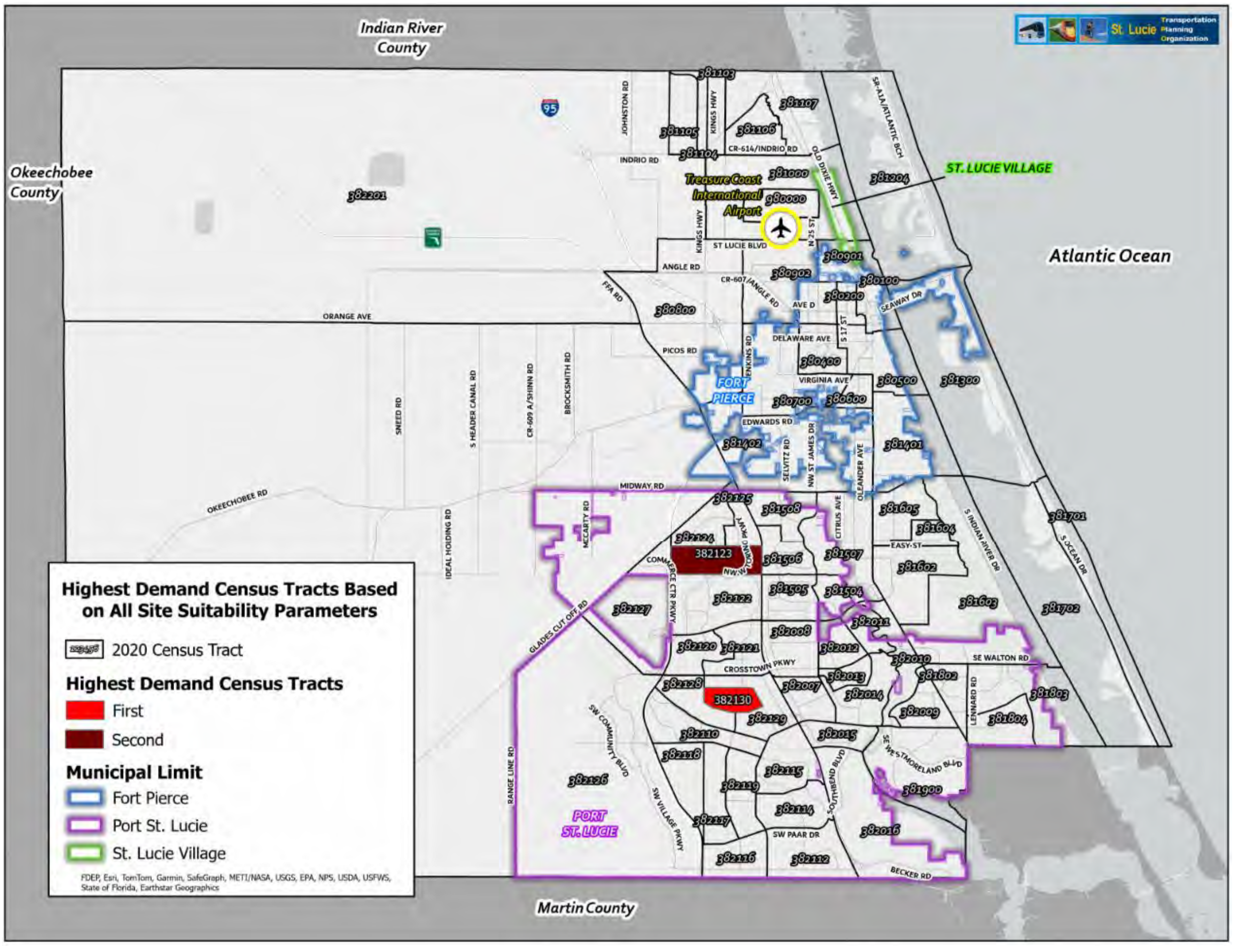
Note: *The AHP Survey result represents the average opinions of all seven TAC members. This survey was conducted during the first committee meeting on February 28, 2024.*

2.5.1. Findings Summary

Figure 9 indicates that Census Tract# 382123 and 382130 are the two census tracts that exhibited the highest AAM Demand in the TPO area. The subsequent section provides more in-depth analytics of these two census tracts.

3 *An example AHP survey can be accessed from the following link. https://bpmsg.com/ahp/ahp-calc.php?n=5&c%5B0%5D=Population+Density&c%5B1%5D=Average+Commute+Time+to+Work&c%5B2%5D=Median+Household+Income&c%5B3%5D=Trip+Counts&c%5B4%5D=Points+of+Interests*

Figure 9 – Two Highest Demand Census Tracts



Source: U.S. Census Bureau, 2020

#1 - Census Tract # 382130 – Located in the central area of Port St. Lucie, this census tract exhibited high demand in terms of population density and median household income. Although there were no points of interest directly located within, there are various types of entertainment, retail, industrial, and transit facility POIs in close proximity to the census tract within the 3-mile buffer.

- **Population Density** – 5 out of 5 points with 4,196 person per square mile
- **Average Commute Time to Work** – 2 out of 5 points with 11.4% of workers whose commute was 45 minutes or more
- **Median Household Income** – 5 out of 5 points with $95,443 median household income.
- **Trip Counts –** 4 out of 5 points with 1.8 million origin and destination trips.

Points of Interests – 0 out of 5 points with 0 POIs located inside the census tract.

#2 – Census Tract # 382123 – Located in the northern area of Port St. Lucie, this census tract exhibited high demand in terms of median household income and trip counts. Although there were no points of interest directly located within, there are various type of entertainment, retail, industrial, and transit facility POIs located north of the census tract within the 3-mile buffer. Furthermore, the census tract is in close proximity to the future Southern Grove development area.

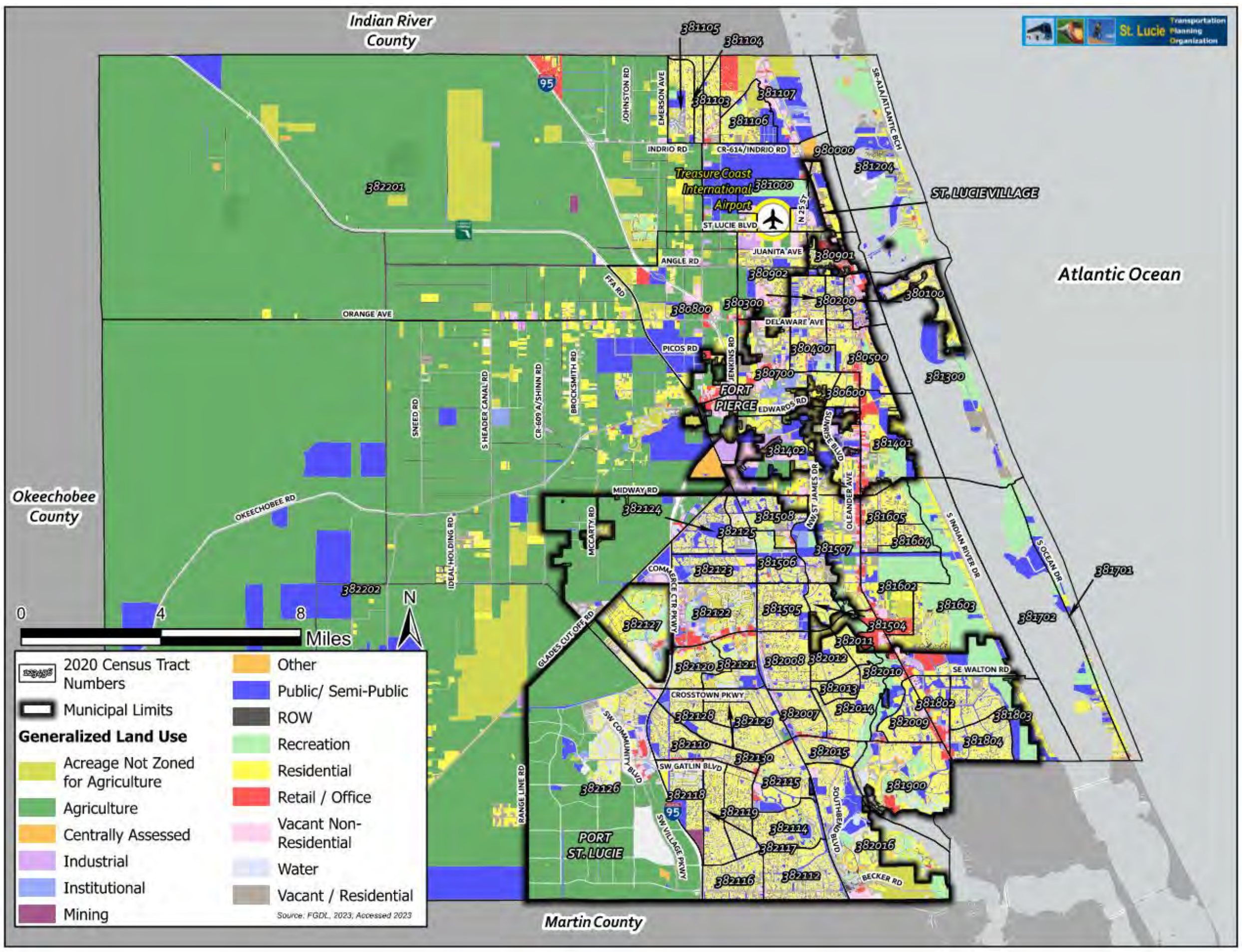
- **Population Density** – 3 out of 5 points with 2,247 person per square mile

- **Average Commute Time to Work** – 1 out of 5 points with 6.3% of workers whose commute was 45 minutes or more
- **Median Household Income** – 5 out of 5 points with $102,646 median household income.
- **Trip Counts –** 5 out of 5 points with 2.7 million origin and destination trips.

Points of Interests – 0 out of 5 points with 0 POIs located inside the census tract.

While these census tracts exhibited the highest AAM demand, it is important to acknowledge that they may not be the most suitable in terms of the composition of land use. **Figure 10** depicts the land use composition of each census tract within the study boundary.

Figure 10 – Generalized Land Use

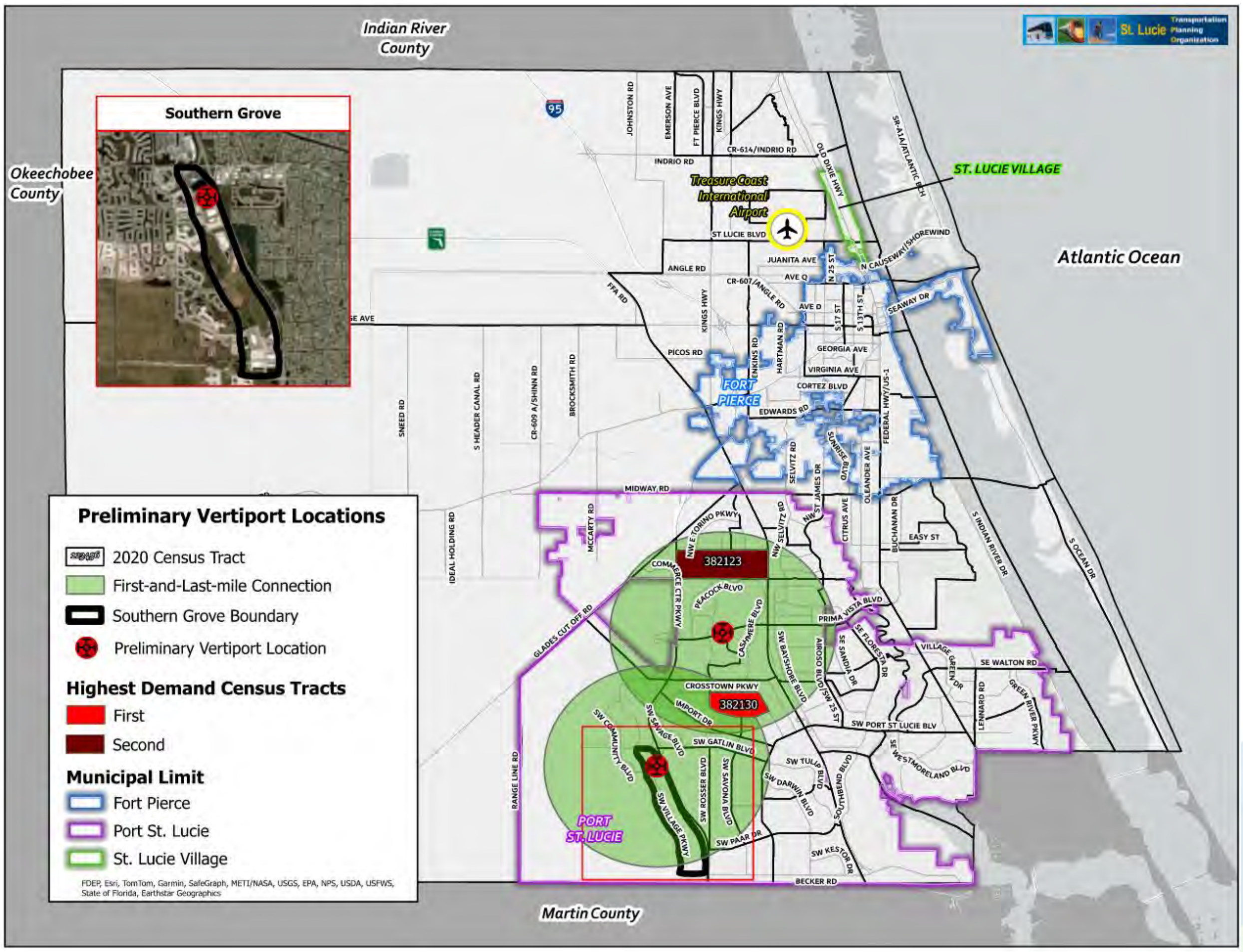


Source: Florida Geographic Data Library (FGDL), 2023

As can be seen from **Figure 10**, the presence of heavy residential land use in the two identified census tracts may amplify the perception of AAM impacts (such as noise, privacy, and safety) to the surrounding communities of the vertiport. Therefore, it is recommended that land use compatibility with the vertiport infrastructure be considered when determining a specific location of the vertiport. To achieve this, a 3-mile threshold (three to ten minutes of driving depending on the area and local speed limit) is established to identify vertiport locations that are more suitable in terms of land use compatibility perspective but also still accessible to the identified high demand census tracts through first- and last-mile connections.

Figure 11 depicts two potential locations for vertiports in the TPO area. The first vertiport is located in St. Lucie West – a commercial/retail area. This location provides convenient access to both census tracts, as it falls within the overlapping area of the two highest demand tracts within a 3-mile radius. The second location is south of census tract # 382130, which is proposed to be developed inside the Southern Grove development. This provides an opportunity for concurrent planning and development of the vertiport infrastructure to ensure that the vertiport is seamlessly woven into the fabric of the overall development.

Figure 11 – Vertiport Locations



Source: U.S. Census Bureau, 2020

Based on existing transportation indicators, two preliminary vertiport locations have been identified as part of the study. However, discussions with the stakeholders and evaluation of the surrounding land use have indicated that the Port St. Lucie West location may not be feasible for vertiport integration due to foreseen impacts from the AAM corridor. Unlike the Southern Grove development location, which is designated for large-scale manufacturing, logistics, and retail development, the St. Lucie West is in close proximity to existing residential land uses. For these reasons, it is important to consider the vertiport feasibility in relation to the AAM corridors that aircraft will need to traverse to reach the vertiport location.

Although the St. Lucie West vertiport location is still included as a preliminary recommendation, it will further be evaluated in **Chapter 4 – Airspace and Infrastructure Modeling**, which will consider the placement and impact of AAM corridors to determine the suitability of the identified locations. If deemed unsuitable, the identified locations may be removed/adjusted for the final vertiport recommendation of the study.

Chapter 3. Preliminary Site Review – Treasure Coast International

3.1. Treasure Coast International Airport

Existing aviation assets—airports and heliports—are expected to be the first operating locations for eVTOL aircraft due to the infrastructure in place both on the ground and in the air. As the industry matures, AAM is anticipated to provide air connectivity between airports, mobility hubs, and other locations not traditionally served by aviation in urban, suburban, and rural areas. Given the complexity and long lead times of airport infrastructure projects, it is prudent that airports proactively incorporate AAM considerations into infrastructure, investment, and business planning.

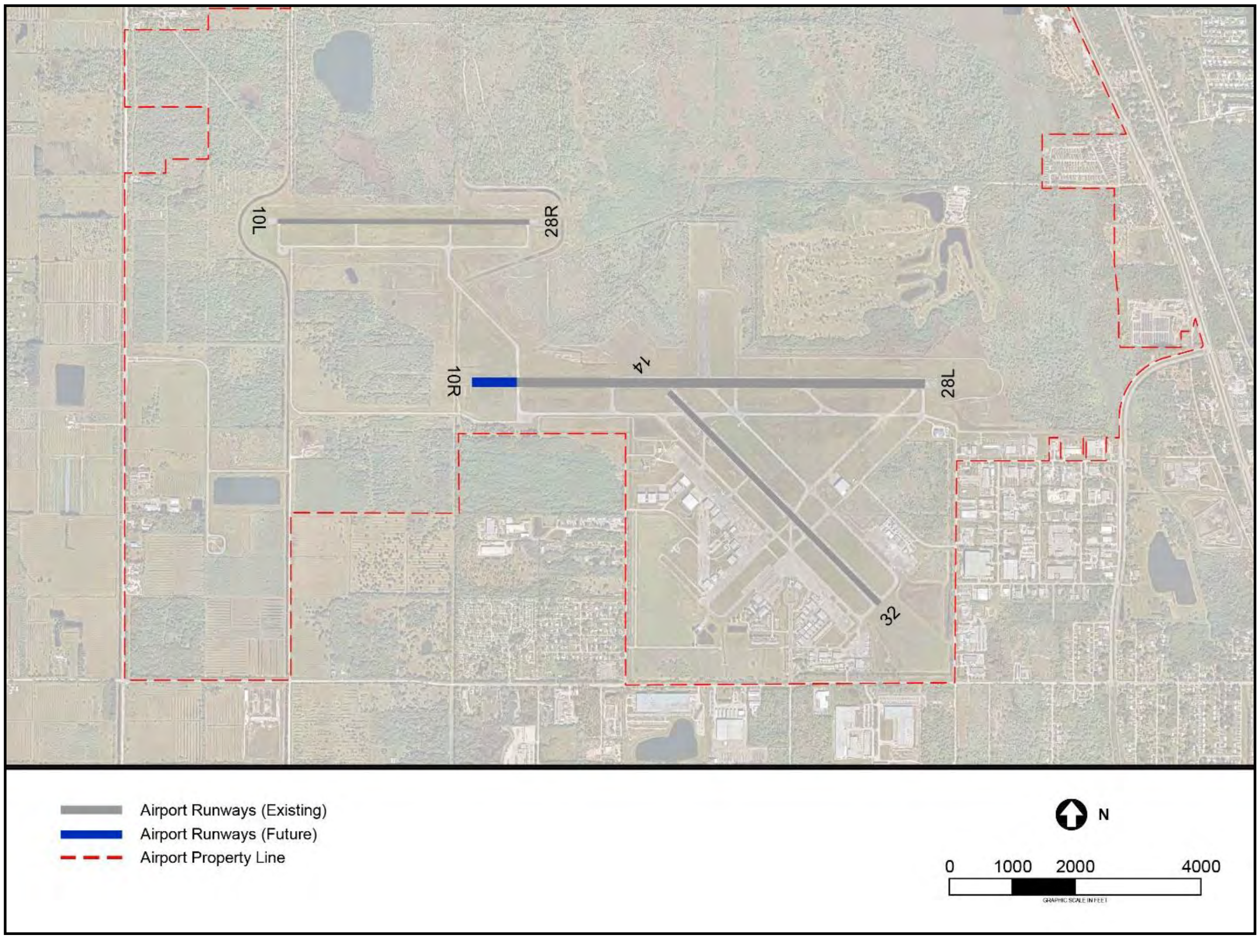
FPR is a public, general aviation (GA) airport sited on 3,660 acres in northeast St. Lucie County, approximately three miles northwest of downtown Fort Pierce and four miles west St. Lucie's coastline. The Airport is owned and operated by St. Lucie County. As a key economic driver for the region, FPR is well positioned to support the County's mobility goals through AAM operations.

Existing conditions at the Airport provide a foundation from which a vertiport site review may be based. This section summarizes various facilities and areas at FPR that may impact or be impacted by a vertiport sited at the Airport.

3.1.1. Runways

FPR has three runways. Runway 10R/28L is oriented in an east/west direction and serves as the Airport's primary runway, measuring 6,492 feet long by 150 feet wide. Notably, a 708-foot western runway extension is noted on FPR's airport layout plan (ALP), with an ultimate runway length of a minimum of 7,200 feet. Runway 10L/28R is a parallel runway located northwest of 10R/28L. This runway measures 4,000 feet long by 75 feet wide, primarily serves small (i.e., less than or equal to 12,500 pounds) single-engine piston aircraft, and hosts extensive flight training operations. A third runway, designated Runway 14/32 and measuring 4,755 feet long by 100 feet wide, is oriented in a northwest/southeast direction and serves as the Airport's crosswind runway. Runway 14/32 is located immediately south of Runway 10R/28L and intersects Taxiway A. **Figure 12** illustrates FPR's runway facilities, including the planned extension to Runway 10R/28L.

Figure 12 – FPR Runways



Source: Kimley-Horn, 2024.
Image Source: Nearmap, accessed March 2024.

3.1.2. FPR's Airspace and Operating Procedures

This section provides an inventory of standard aircraft operating procedures and airspace at FPR. This review helps identify potential constraints to future eVTOL operations and preliminary vertiport sites at the Airport. A vertiport located at FPR would represent new aircraft approach and departure paths, in addition to the paths associated with the Airport's existing runways. It is crucial that the site of a vertiport does not adversely impact the safety and efficiency of FPR airspace and fixed-wing aircraft operations.

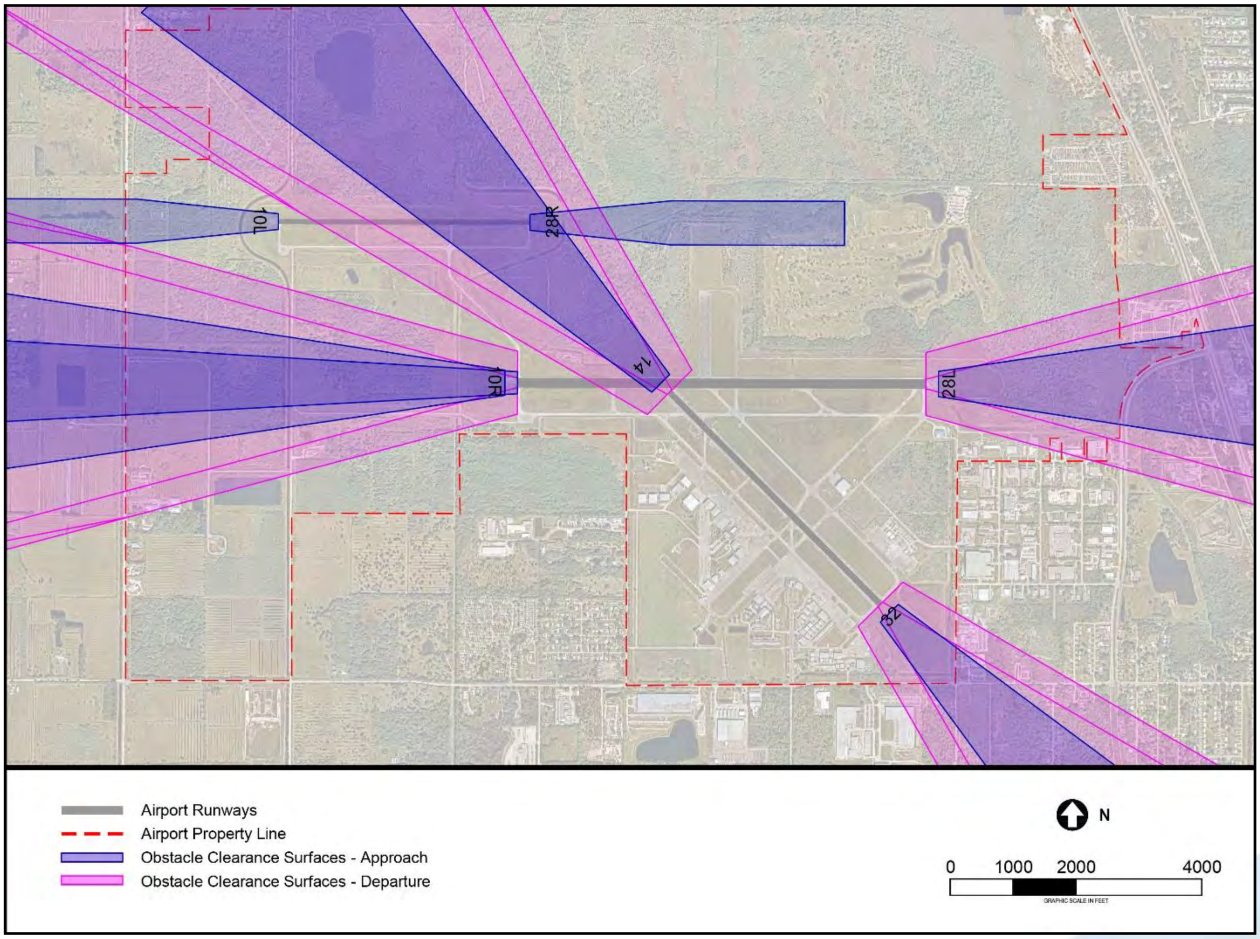
3.1.2.1. Airspace

FPR is located within Class D airspace, which generally spans from the surface to 2,500 feet above airport elevation at certain airports equipped with an airport traffic control tower (ATCT). At FPR, the Class D airspace has a diameter of three statute miles and extends to 2,523 feet above mean sea level (MSL). Aircraft must establish two-way radio communication with the ATCT prior to entering this airspace.

3.1.2.2. Obstacle Clearance Surfaces

Obstacle Clearance Surfaces (OCS)—approach and departure—help ensure that aircraft have a clear path free from obstacles (e.g., vegetation, structures, poles) when landing at or taking off from a runway. Detailed in FAA Advisory Circular (AC) 150/5300-13B - Airport Design, OCS dimensions vary depending on the approach capability and visibility minimums of each runway end, and a single runway end may have multiple approach OCSs. The existing approach and departure OCSs at FPR are depicted in **Figure 13**. Future vertiport operations should not adversely impact the approach and departure OCSs.

Figure 13 – Obstacle Clearance Surfaces



Source: Kimley-Horn, 2024.
Image Source: Nearmap, accessed March 2024.

3.1.2.3. Part 77 Surfaces

Title 14, Code of Federal Regulations, Part 77 - *Safe, Efficient Use and Preservation of the Navigable Airspace* (Part 77) defines airspace surfaces around an airport to identify and mitigate potential obstacles to aircraft operations. Obstacles that are not removable can be mitigated through marking and/or lighting. If not appropriately addressed, obstacles can have a negative impact on runway approach and departure minimums as well as standard operating procedures.

The Part 77 surfaces that are particularly applicable to vertiport siting are:

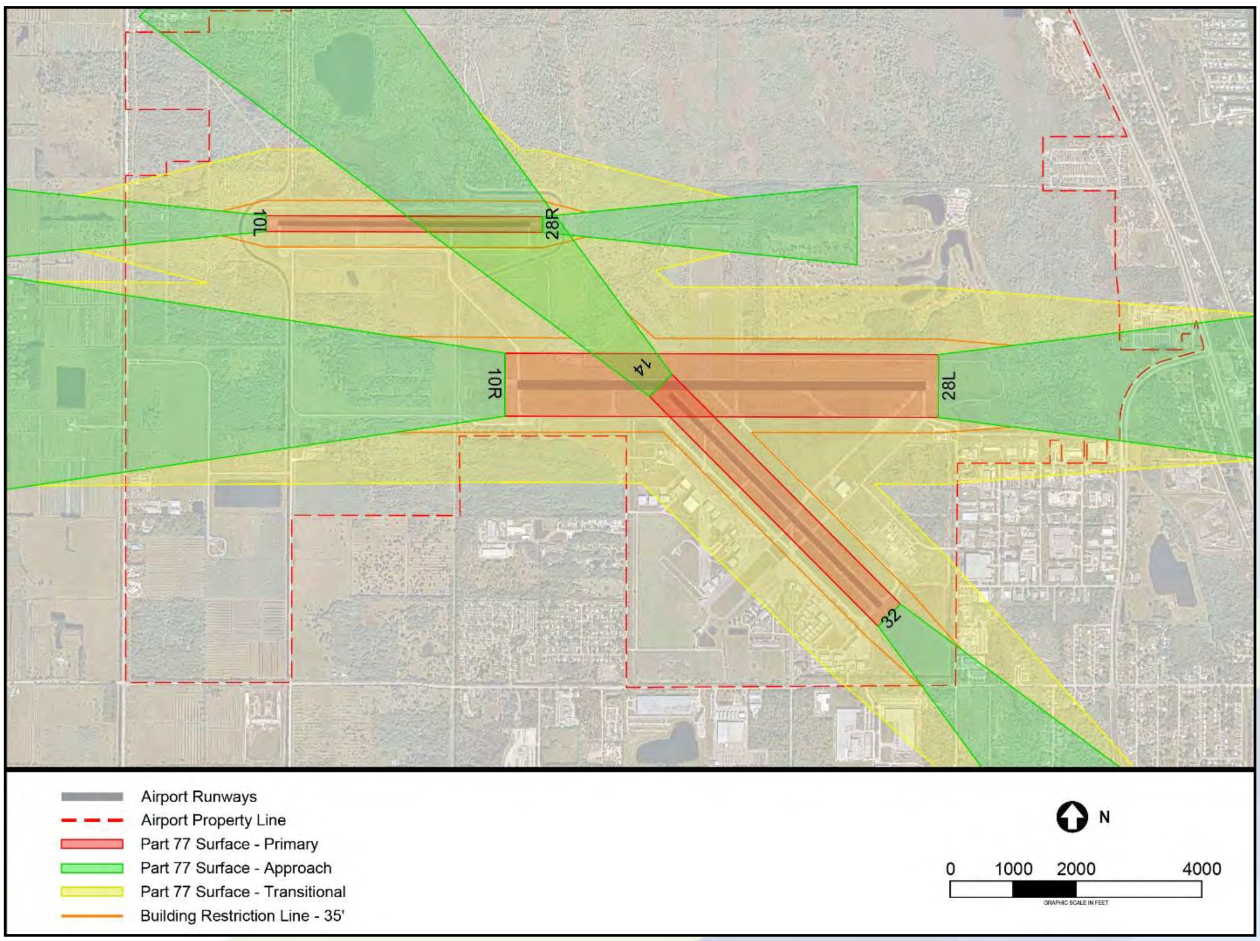
Primary Surface: The primary surface is centered on a runway centerline and extends 200 feet beyond each runway end. The width of the primary surface depends on a runway's instrument approach capabilities and the aircraft that operate on it. Other than airfield equipment necessary for aircraft ground navigation (e.g., airfield lighting, signage navigational aids), infrastructure should not be located within the primary surface.

Approach Surface: The Part 77 approach surface is separate from and in addition to the approach OCS. An approach surface's dimensions and slope are based on a runway's instrument approach capabilities and the aircraft that operate on it. To the extent practicable, eVTOL operations (i.e., approach and departures) should not disrupt a runway's Part 77 approach surface and ultimately the operations of fixed-wing aircraft.

Transitional Surface: The transitional surface extends outward and upward at a slope of seven to one (i.e., one vertical foot for every seven horizontal feet) from both sides of a runway's primary surface. The transitional surface is often expressed as a building restriction line (BRL) at a given height, which indicates that structures can be no taller than the given height at a specific location. For example, the 35-foot BRL represents the transitional surface's location at 35 feet above ground level (AGL). In this case, structures taller than 35 feet AGL at the location of the 35-foot BRL will penetrate the Part 77 transitional surface and may present a hazard to aircraft operations. While infrastructure is permitted under the transitional surface, it should not obstruct safe air navigation.

FPR's Part 77 primary, approach, and transitional surfaces are depicted in **Figure 14**. The 35-foot BRL is also shown for reference.

Figure 14 – Part 77 Surfaces

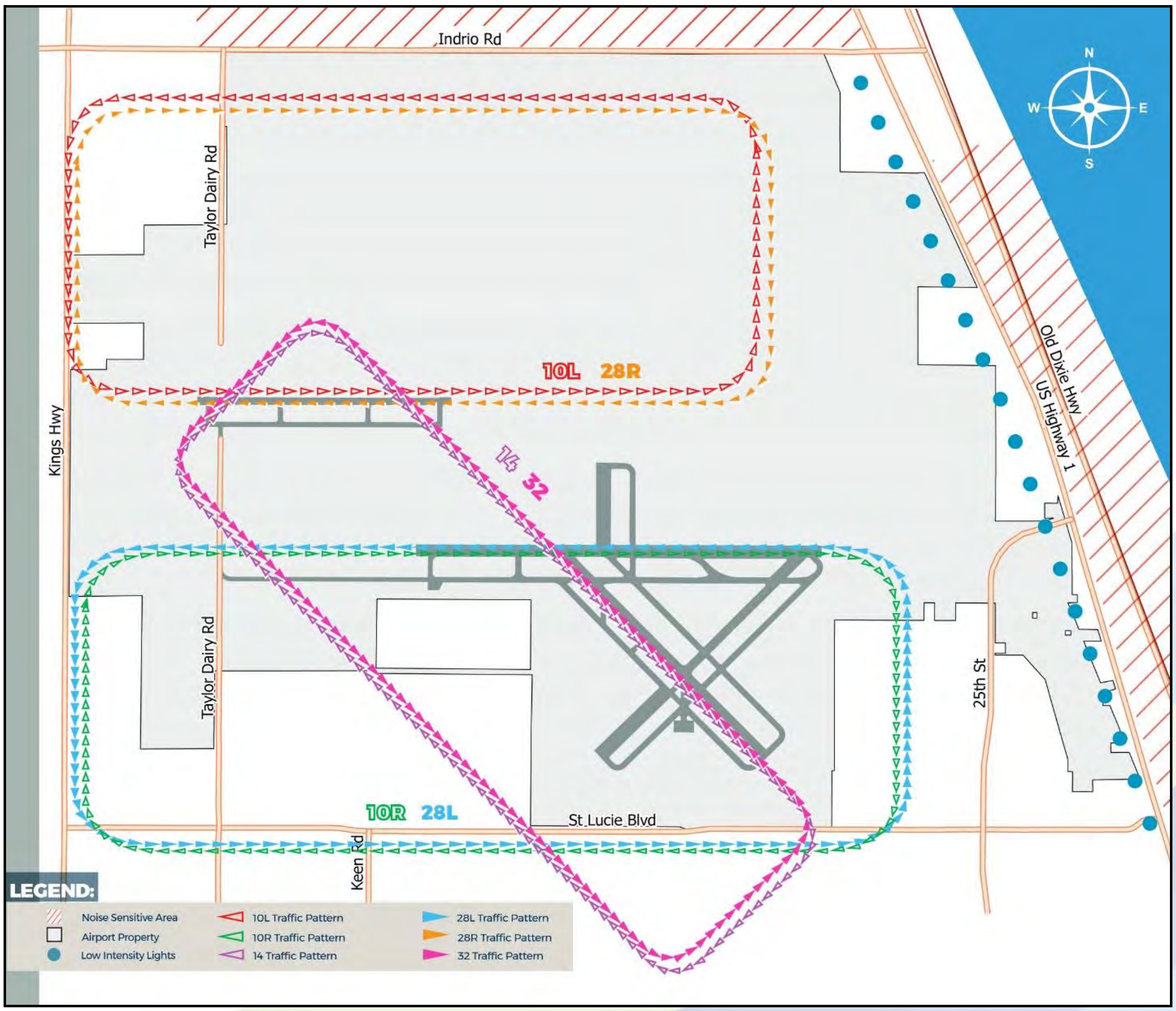


Source: Kimley-Horn, 2024.
Image Source: Nearmap, accessed March 2024.

3.1.2.4. Aircraft Traffic Flow

For arriving aircraft, FPR utilizes a right-hand traffic pattern for Runways 10R, 28R, and 14 and a standard left-hand traffic pattern for Runways 10L, 28L, and 32. Aircraft within the traffic patterns are generally at an elevation of 1,000 feet AGL. Noise sensitive areas exist north and east of the Airport, which are mostly associated with residential communities. Jet aircraft that depart on Runway 10R are asked to maintain the runway heading until they ascend to an altitude of 2,000 feet AGL or until they reach the ocean shoreline prior to making any turns. **Figure 15** illustrates the Airport's traffic pattern as published in the FPR Voluntary Noise Abatement Procedures brochure. As with airspace surfaces, a vertiport should not disrupt FPR's runway traffic patterns. Rather, it should be sited to facilitate eVTOL operations that are complimentary to existing airport procedures.

Figure 15 – FPR Traffic Pattern



Source: Treasure Coast International Airport, Voluntary Noise Abatement Procedures Brochure.

3.1.3. Landside Access

Primary vehicular access to FPR is provided on the south side of the Airport by Curtis King Boulevard via St. Lucie Boulevard/County Road 608 (East). This area of the Airport hosts the fixed-base operator (FBO) terminal, U.S. Customs facility, the Airport's restaurant, two flight schools, aircraft hangars, and various Airport tenants. Several other roadways provide access to facilities throughout the airfield: The aircraft hangars east of Runway 14/32 are accessed by Jet Center Terrace via Industrial 33rd Street, and facilities west of Runway 14/32 can be accessed via Hammond Road, Crosswind Drive, Tailwind Drive, and Airman's Way.

3.2. Vertiport Standards

3.2.1. Engineering Brief No. 105

Planning and design guidance for vertiports are provided by the FAA Engineering Brief No. 105 (EB 105) (September 21, 2022). EB 105 serves as the FAA's temporary guidance for vertiport design to support initial infrastructure development for eVTOL operations. The FAA has limited verified eVTOL aircraft performance data and is therefore taking a conservative approach with EB 105's recommendations. Eventually, vertiport guidance is expected to transition into aircraft performance-based design standards. In the meantime, EB 105 is a dynamic document that serves as the FAA's initial interim guidance and will be updated as more performance data is obtained to address new aircraft and technology.

3.2.1.1. EB 105 Reference Aircraft

Due to the rapid development and diverse designs of emerging eVTOL aircraft, the FAA utilizes a "Reference Aircraft" in EB 105 to establish baseline vertiport design criteria. This reference aircraft was developed in coordination with various original equipment manufacturers (OEMs) and incorporates common features observed among nine current eVTOL prototypes, such as multiple engines and emergency hover capabilities. The FAA acknowledges this is a temporary solution and plans to refine vertiport design guidance as they gather more data from evolving VTOL technologies. The foundation for this study is based on guidance and criteria from the EB 105 reference aircraft.

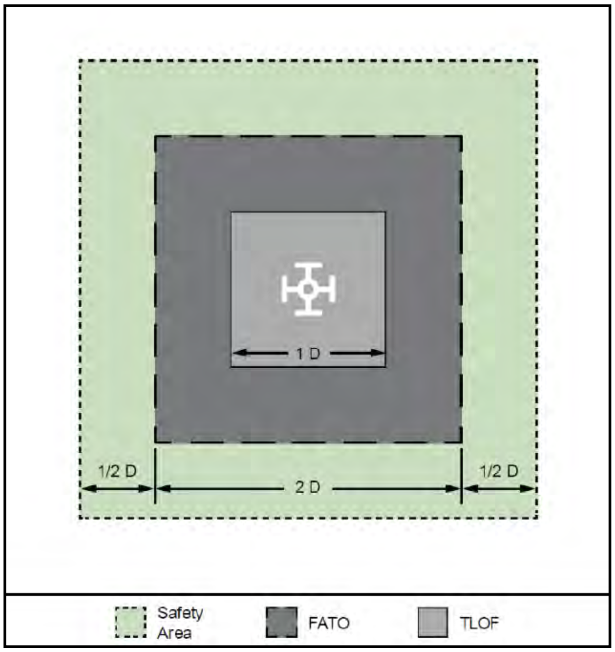
3.2.2. Vertiport Design and Geometry

Vertiport design and geometry standards are developed to promote safe and efficient eVTOL operations. Elements of a vertiport include the Touchdown and Liftoff (TLOF) Area, Final Approach and Takeoff (FATO) Area, and Safety Area. **Figure 16** on the following page illustrates the sizes of these elements, which are based on the dimensions of a specific design aircraft.

In this figure, "D" represents the controlling dimension. EB 105 defines D as "The diameter of the smallest circle enclosing the VTOL aircraft projection on a horizontal plane, while the aircraft is in the takeoff or landing configuration, with rotors/propellers turning, if applicable." The value of D for the reference aircraft in EB 105 eVTOL aircraft is 50 feet. According to the FAA, as more validated performance data for individual eVTOL aircraft becomes available, these criteria may be adjusted accordingly. Descriptions of the vertiport TLOF, FATO, and safety area are provided below. For more detailed design information on each element, refer to EB 105 and, if applicable, AC 150/5390-2D - Heliport Design.

3.2.2.1. TLOF

Figure 16 – Vertiport Elements



Source: FAA, Engineering Brief 105 - Vertiport Design, 2022

At the center of the vertiport is the TLOF, which is load bearing and generally paved. This area is where an eVTOL aircraft performs a touchdown and liftoff maneuver. The TLOF should be clear of any ground objects (e.g., lighting, charging stations, air vents). Airspace surfaces should be clear of any obstacles when planning for the siting of the TLOF. This will ensure a safe approach and departure of an aircraft and prevent any penetrations to approach/departure and transitional surfaces.

As mentioned previously, the TLOF should be load bearing to support the weight of the design eVTOL aircraft and any operating ground vehicles within the area. EB 105 states that the TLOF should support dynamic loads based on 150 percent of the maximum takeoff weight (MTOW) of the design eVTOL aircraft. Using the EB 105 reference eVTOL aircraft with an MTOW of 12,500 pounds, the TLOF should support dynamic loads of up to 18,750 pounds. Rotor/propeller downwash is also accounted for in this load requirement.

3.2.2.2. FATO

The FATO surrounds the TLOF and is a defined area where an eVTOL aircraft completes the final phase of its approach and first phase of its departure (i.e., initial/final hover before initiating takeoff/landing). Like the TLOF, the FATO is generally a paved surface, should be clear of obstacles and ground objects, and should support dynamic loads based on 150 percent of the MTOW of the design eVTOL aircraft.

3.2.2.3. Vertiport Safety Area

The Safety Area is a designated space surrounding the FATO to minimize the risk of unintentional diversion for eVTOL aircraft. To ensure safety, the Safety Area should not contain any fixed objects such as parapet walls, lighting, elevator penthouses, canopies, or exhaust vents. However, certain navigation aids (NAVAIDs) that are classified as "fixed-by-function" by the FAA can be placed within the Safety Area as long as they are mounted on frangible supports, similar to how they are implemented on runways.

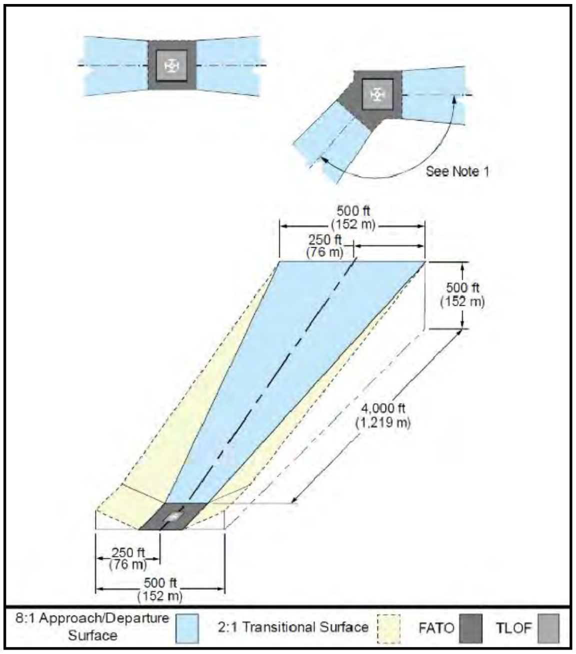
3.2.3. Vertiport Airspace

The purpose of vertiport airspace surfaces is to promote safe and unobstructed operations of eVTOL aircraft near a vertiport. These surfaces are summarized below. It is important to note that the FAA's published guidance on vertiport airspace pertains to visual flight rules (VFR), which is the expected operating mode for initial eVTOL aircraft. Future guidance will include information on airspace considerations for instrument flight rules (IFR) operations.

3.2.3.1. Part 77 Surfaces

Like Part 77 surfaces for runways, the airspace surfaces associated with vertiports are defined in Part 77 for heliports. These surfaces include the primary, approach, and transitional surfaces, which are summarized below and shown in **Figure 17**.

Figure 17 – Vertiport Part 77 Surfaces



Source: FAA, Engineering Brief 105 - Vertiport Design, 2022

Primary Surface: The vertiport's primary surface is a flat, level area that aligns with the shape and size of the FATO. The elevation of the primary surface matches the established elevation of the vertiport.

Approach Surface: The approach surfaces begin at each end of the vertiport primary surface. They have the same width as the primary surface and extend outward and upward for a horizontal distance of 4,000 feet at a slope of 8:1. The outer widths of the approach surfaces are 500 feet. Per EB 105, a vertiport's Part 77 approach surfaces also serve as the VFR approach/departure paths. These paths must be clear of all obstacles to ensure a safe operating environment for eVTOL aircraft.

Transitional Surface: Transitional surfaces extend outward and upward from the lateral boundaries of the primary surface and the approach surfaces. These surfaces extend for a horizontal distance of 250 feet at a slope of 2:1 from the center of the primary and approach surfaces.

3.2.3.2. Approach / Departure Paths

Vertiport approach/departure paths are the designated flight paths for eVTOL aircraft takeoff and landing at a vertiport. Similar to airport runways, these paths should be aligned with the prevailing wind direction. If a vertiport is located at an airport, it is important that these paths should not interfere with the existing approach and departure surfaces of the runways.

Ideally, vertiports should be designed to accommodate approaches and departures from two different directions, allowing for bidirectional use. It is preferrable for these paths to have reciprocal magnetic headings, such as 180 degrees and 360 degrees, and should be free from any obstacles. However, in certain situations where there are obstacles, sensitive land uses, or other constraints, it may be necessary to curve the approach and departure paths to avoid any conflicts.

3.2.4. Vertiport Support Facilities

When conducting a spatial analysis for vertiport infrastructure, it is essential to consider not only the previously mentioned elements but also the necessary support facilities and components needed for operations, including but not limited to:

- Vertiport lighting (required for nighttime operations)
- NAVAIDs (e.g., wind cones, visual glideslope indicator [VGSI])
- Aircraft stands and charging stations
- Ground service equipment
- Maintenance facilities
- Passenger facilities
- Emergency services

- Security features

3.3. Site Review

3.3.1. Vertiport Orientation

Runways are meant to be oriented such that aircraft can take off and land in the same direction as the prevailing wind (into the wind). Like a runway, a vertiport's approach/departure surfaces should be aligned in the direction of the prevailing wind to the extent practicable. Vertiport approach/departure surfaces should also complement existing airport infrastructure and limit impacts to runway operations. Therefore, it is recommended the vertiport approach/departure surfaces at FPR be aligned in an east-west orientation parallel to Runways 10R/28L and 10L/28R. Notably, Runway 14/32 provides an alternative landing direction during crosswind conditions, primarily for smaller aircraft. Given that eVTOL aircraft will likely be sensitive to the same crosswind components as small aircraft, supplementary vertiport approach/departure alignments in a 14/32 orientation should also be considered. Operational considerations associated with parallel and convergent runway/vertiport operations are discussed in the sections below.

3.3.2. Landside Access

As previously noted, efficient landside access is critical to maximizing the benefit of AAM to an airport and its community. Therefore, potential vertiport development sites should be located in a way that facilitates convenient access to existing airport access roads, other airport facilities, and local and regional roadways. As such, the following analyses primarily focus on available land adjacent to existing development at FPR—specifically, land south of Runway 10L/28R. Based on current lack of accessibility, vast undeveloped land, and distance from existing access roads, the northern half of Airport property is not recommended to be considered for initial vertiport infrastructure. However, industry growth and local demand for AAM should be monitored as the suitability of the northern half of Airport property for AAM-related development may be revisited in the future.

3.3.3. Vertiport / Runway Separation

The distances between parallel runway centerlines and vertiport approach/departure surfaces play a crucial role in ensuring the safety and efficiency of fixed-wing aircraft, helicopters, and eVTOL aircraft that operate in close proximity to one another. Standard distances between facilities take into consideration various factors such as the type of aircraft, approach speed, and characteristics of wake turbulence. It is critical that the location of a vertiport is carefully chosen to avoid compromising airport safety and to minimize any negative impacts on existing airport operations, capacity, and delays. The minimum separation distances between FPR's runways and potential future vertiport infrastructure for VFR, IFR, and wake turbulence considerations are illustrated in **Figure 18**.

3.3.3.1. VFR Operations

EB 105 establishes standards and guidelines for separation distances between the centerlines of approach/departure surfaces for both runways and vertiport during simultaneous, same-direction operations under VFR. These guidelines, summarized in **Table 3**, assume that the EB 105 reference eVTOL aircraft has an MTOW of 12,500 pounds or less.

Table 3 – Minimum Distance between Runway Centerline and Vertiport FATO for VFR Operations

Airplane Size (MTOW) *	Distance between Runway Centerline and Vertiport FATO Center †
Small (≤ 12,500 lbs.)	300'
Large (12,500 lbs. to 300,000 lbs.)	500'
Heavy (> 300,000 lbs.)	700'

Notes:
VFR = Visual Flight Rules
MTOW = Maximum Takeoff Weight
**Airplane Size refers to the MTOW of fixed-wing aircraft operating on a parallel runway to a vertiport approach/departure surface.*
†Assumes eVTOL aircraft with an MTOW of 12,500 pounds or less

Source: FAA Engineering Brief 105 - Vertiport Design, 2022.

FPR's three runways each accommodate varying aircraft type, leading to different standard separation distances from runway centerlines to a vertiport's FATO center:

Runway 10L/28R: As a visual runway constructed for small single-engine piston aircraft, Runway 10L/28R primarily hosts aircraft with MTOWs less than or equal to 12,500 pounds. Therefore, a vertiport should be sited no closer than 300 feet from the centerline of Runway 10L/28R.
Runway 10R/28L: Runway 10R/28L serves as the primary runway at FPR and hosts a variety of aircraft operations. According to the FAA's Traffic Flow Management System Counts (TFMSC) database, several aircraft with MTOWs between 12,500 and 300,000 pounds consistently operate on Runway 10R/28L. As such, a vertiport should be sited at least 500 feet from the centerline of Runway 10L/28R.
Runway 14/32: Runway 14/32 serves as the Airport's crosswind runway and, like Runway 10R/28L, accommodates a variety of aircraft type. To ensure compatibility with fixed-wing aircraft operations on the runway, a vertiport should be sited at least than 500 feet from the centerline of Runway 14/32.

3.3.3.2. IFR Operations

The guidance in EB 105 for vertiport/runway separation is limited to VFR operations. Given there are published instrument approach procedures on Runways 10R/28L and 14/32 at FPR, an evaluation of available guidance on instrument flight rules (IFR) and its criteria is necessary. At the time of writing, the FAA is developing vertiport-specific IFR operations criteria. In the meantime, FAA Advisory Circular 150/5300-13B and FAA Order JO 7110.65AA – Air Traffic Control (JO 711.65AA) can be referenced for criteria related to simultaneous, same-direction IFR aircraft operations at airports. These criteria are based on runway separation, airport elevation, and aircraft departure course.[4]

Simultaneous IFR Approaches: For simultaneous IFR approaches at airports below 2,000 feet MSL, like FPR (23.4 feet MSL), a minimum separation distance of 3,200 feet between parallel runway centerlines is required for straight-in instrument approaches. Alternatively, a separation of 2,500 feet is allowed if there is an offset approach to one runway end.
Simultaneous IFR Departures: Simultaneous IFR departures are permitted with a minimum runway separation distance of 2,500 feet as long as the aircraft departure courses diverge by at least 10 degrees.

[4] FAA Advisory Circular 150/5300-13B - Airport Design, March 2022.

Alternatively, a separation of less than 2,500 feet is permitted if the departure courses diverge by at least 15 degrees.

Simultaneous IFR Mixed Operations: In the case of simultaneous IFR mixed operations, where an aircraft is departing on one runway while another aircraft is on final approach to a parallel runway, the parallel runways must be separated by at least 2,500 feet.[5]

As previously noted, a vertiport's approach/departure surfaces should be aligned in the direction of the prevailing winds to the extent practicable and should not interfere with existing airport operations. As such, it is recommended the primary vertiport approach/departure surfaces at FPR be aligned in an east-west orientation and parallel to Runways 10R/28L and 10L/28R, with supplementary approach/departure surfaces aligned in an 14/32 orientation to support operations in periods of crosswinds.

Although guidance is only available for VFR eVTOL operations, it is prudent to plan conservatively to ensure safe and efficient airport operations in the future. To protect for potential simultaneous parallel IFR operations between fixed-wing aircraft and eVTOL, a vertiport at FPR should be located at least 2,500 feet from the centerline of Runway 10R/28L (this recommendation does not apply to Runway 10L/28R given that it does not have published instrument procedures). As described above, a separation of less than 2,500 feet from the runway centerline may be acceptable if the vertiport FATO is offset from the runway ends.

3.3.3.3. Wake Turbulence

Both AC 150/5300-13B and JO 7110.65AA reference FAA Order JO 7110.126B – Consolidated Wake Turbulence (JO 7110.126B) as a resource for managing wake turbulence separation during parallel operations involving aircraft and helicopters. JO 7110.126B provides guidelines and recommendations for minimizing the impact of wake turbulence caused by aircraft. The order categorizes aircraft based on their MTOW and their ability to withstand encounters with wake turbulence. This categorization, ranging from Category A (largest aircraft) to Category I (smallest aircraft), helps determine the necessary separation distances between aircraft during takeoff and landing.

The EB 105 reference eVTOL aircraft has an MTOW of 12,500 pounds and is categorized by JO 7110.126B as "Category I – Lower Small," defined as any aircraft with an MTOW of 15,400 pounds or less (not to be confused with the FAA's general definition of "small" aircraft with an MTOW of 12,500 pounds or less). According to 2023 FPR operations data from the FAA's TFMSC database, there were 2,914 operations by aircraft categorized as "Category H – Upper Small," 331 operations of "Category G – Lower Large," 136 operations of "Category F – Upper Large," and nine operations of "Category E – B757." There were no operations at FPR in 2023 by aircraft categorized as D, C, B, or A.

For this discussion, it is assumed a vertiport at FPR would have primary approach/departure surfaces that are aligned in an east-west orientation and parallel to Runway 10R/28L, as recommended above. For parallel runways (i.e., Runway 10R/28L and a future vertiport), JO 7110.126B states that ATC should separate Category I aircraft behind Category E aircraft by two minutes when departing parallel runways that are separated by less than 700 feet *or* if parallel runways separated by at least 700 feet have intersecting flight paths. In the case of nonintersecting converging runways (i.e., Runway 14/32 and a future vertiport), ATC should separate Category I aircraft behind Category E aircraft by two minutes if flight paths with cross.

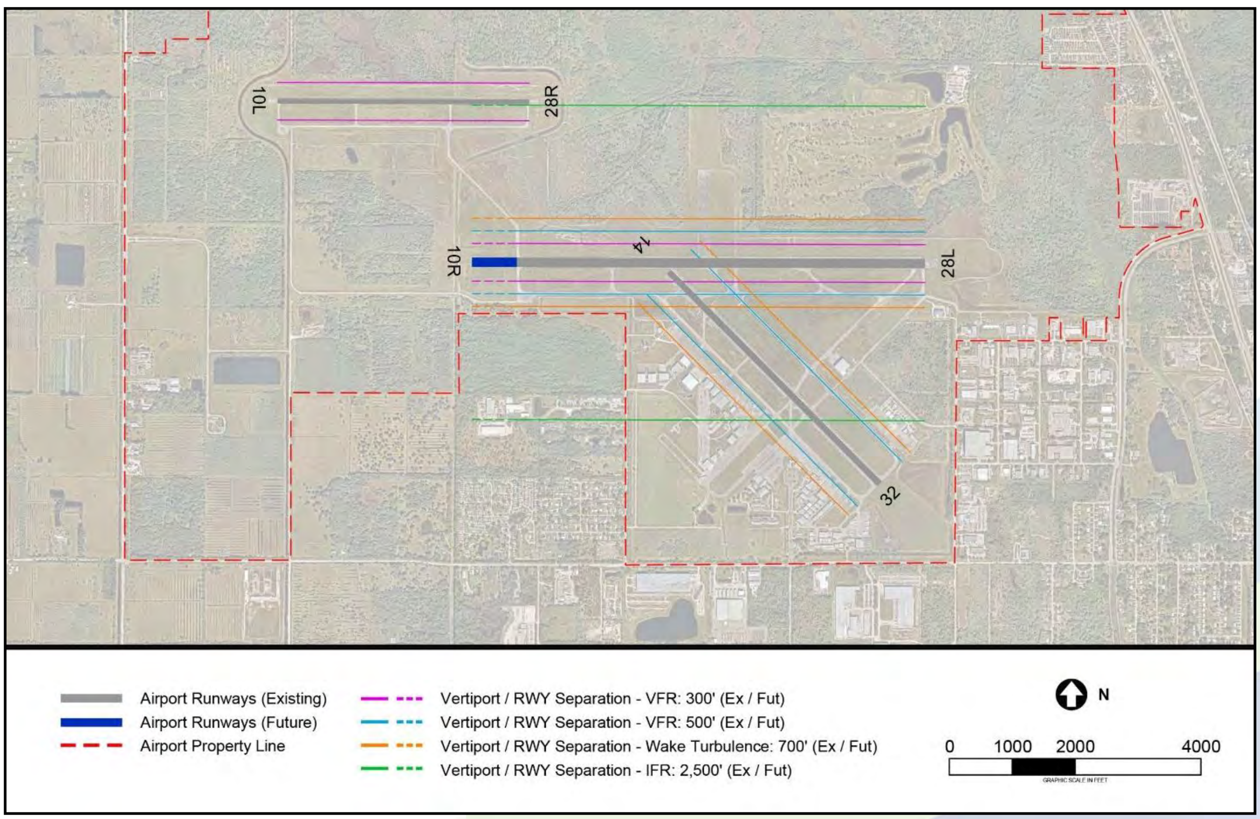
[5] When parallel runways are staggered, runway separation distance may be reduced based on the distance of threshold stagger.

Although there were only nine operations by aircraft with a Category E designation at FPR in 2023, a conservative planning approach to vertiport infrastructure should account for long-term changes in an airport's fleet mix. Therefore, it is recommended that a vertiport is sited at a minimum of 700 feet from all existing runway centerlines at FPR. Given that Runway 10L/28R only accommodates small, single-engine piston aircraft, these wake turbulence separation distances for vertiport siting do not apply to the visual runway.

3.3.3.4. Summary of Vertiport/Runway Separation

As shown in **Figure 18**, the separation distances of 500 feet associated with VFR operations on both Runways 10R/28L and Runway 14/32 are superseded by the separation distances of 700 feet associated with wake turbulence considerations. Furthermore, the recommended separation distance between Runway 10R/28L and a future vertiport is 2,500 feet to protect for simultaneous IFR mixed operations. Notably, this distance of 2,500 feet may be reduced with a staggered runway threshold and vertiport FATO, which is likely to be the case. The Airport's fleet mix and runway operations should be monitored for significant changes that may impact vertiport wake turbulence considerations.

Figure 18 – Vertiport / Runway Separation Distances



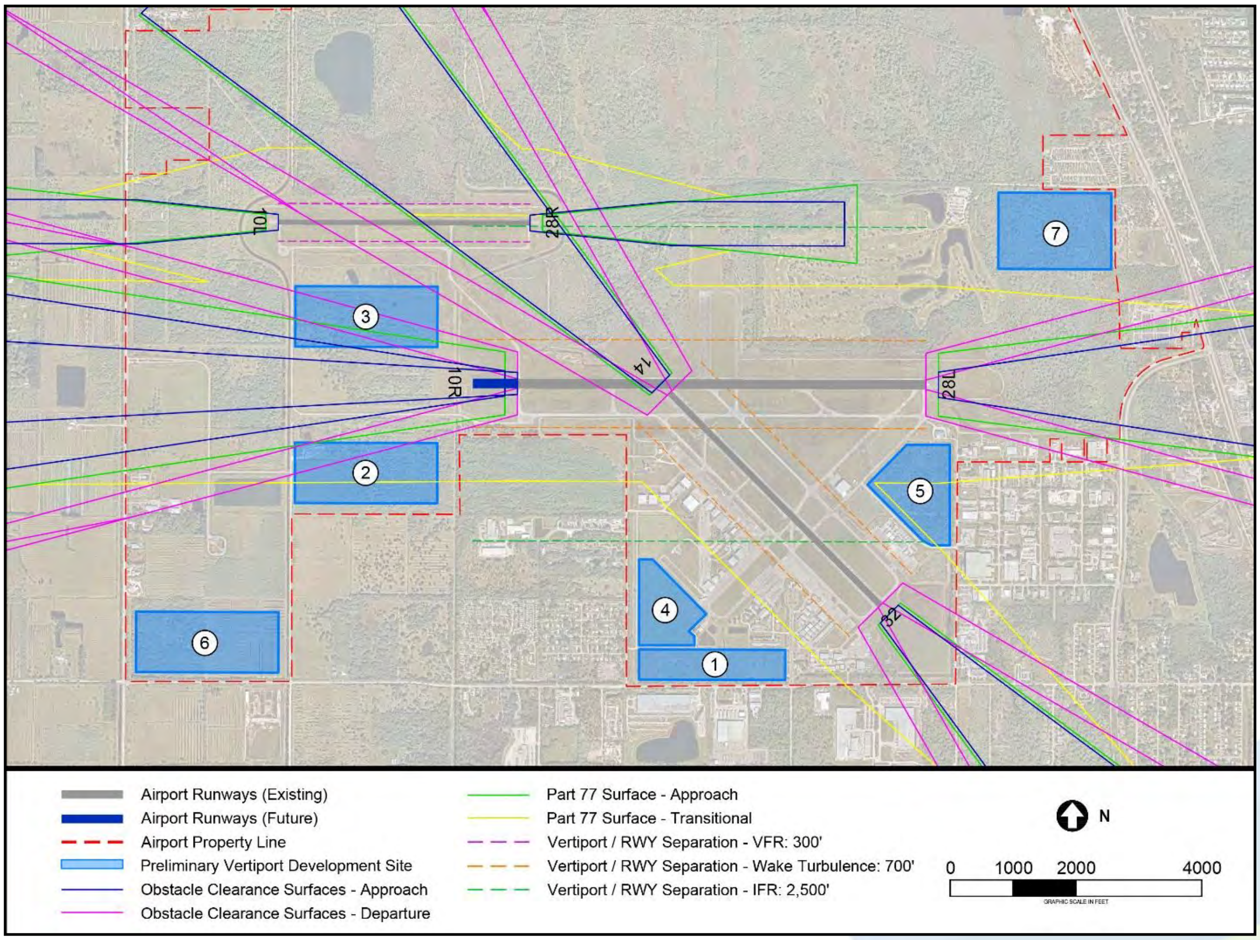
Source: Kimley-Horn, 2024.
Image Source: Nearmap, accessed March 2024.

3.4. Preliminary Sites

Thus far, this chapter has summarized the airspace at FPR (OCS and Part 77 surfaces), the general airspace surfaces associated with vertiports (approach/departure and transitional surfaces), vertiport and runway separation requirements, landside connectivity, and various other vertiport siting considerations.

Figure 19 layers various vertiport siting considerations into one exhibit to help further define preliminary sites for a vertiport at FPR. As shown, seven preliminary vertiport sites have been identified based on the analyses in the previous section. These sites are adequate in size to accommodate an eVTOL takeoff/landing area and supporting infrastructure, including aircraft parking stands, electric aircraft charging stations, taxiways, pedestrian areas, terminal facilities, ground vehicle parking, and landside access roadways.

Figure 19 – Preliminary Vertiport Sites



Source: Kimley-Horn, 2024.
Image Source: Nearmap, accessed March 2024.

3.4.1. Initial Review of Preliminary Sites

Airport management was consulted regarding the preliminary sites identified in **Figure 19**, and noted that Sites 4 and 5 are earmarked for near-term aeronautical development. With requests for proposals (RFPs) being released for both parcels, these sites are not available for vertiport infrastructure.

Site 7 is aligned with the extended centerline of Runway 10L/28R. A vertiport sited in this location may disrupt aircraft operations on the runway, especially with the high level of training operations that occur on this runway. Additionally, the site is located adjacent to a mobile home residential community and would facilitate eVTOL operations near several other residential neighborhoods.

Site 3, while complying with vertiport/runway separation distances and not falling along an extended runway centerline, is located in a congested portion of the airfield in terms of airspace. Additionally, there is no existing landside access to this site, which would substantially increase the total cost of improvements.

Based on this initial review, Sites 3, 4, 5, and 7 will not be considered for vertiport development at the Airport. The following sections perform a deeper dive into the remaining sites: Sites 1, 2, and 6.

3.4.2. Vertiport Airspace Obstacle Analysis

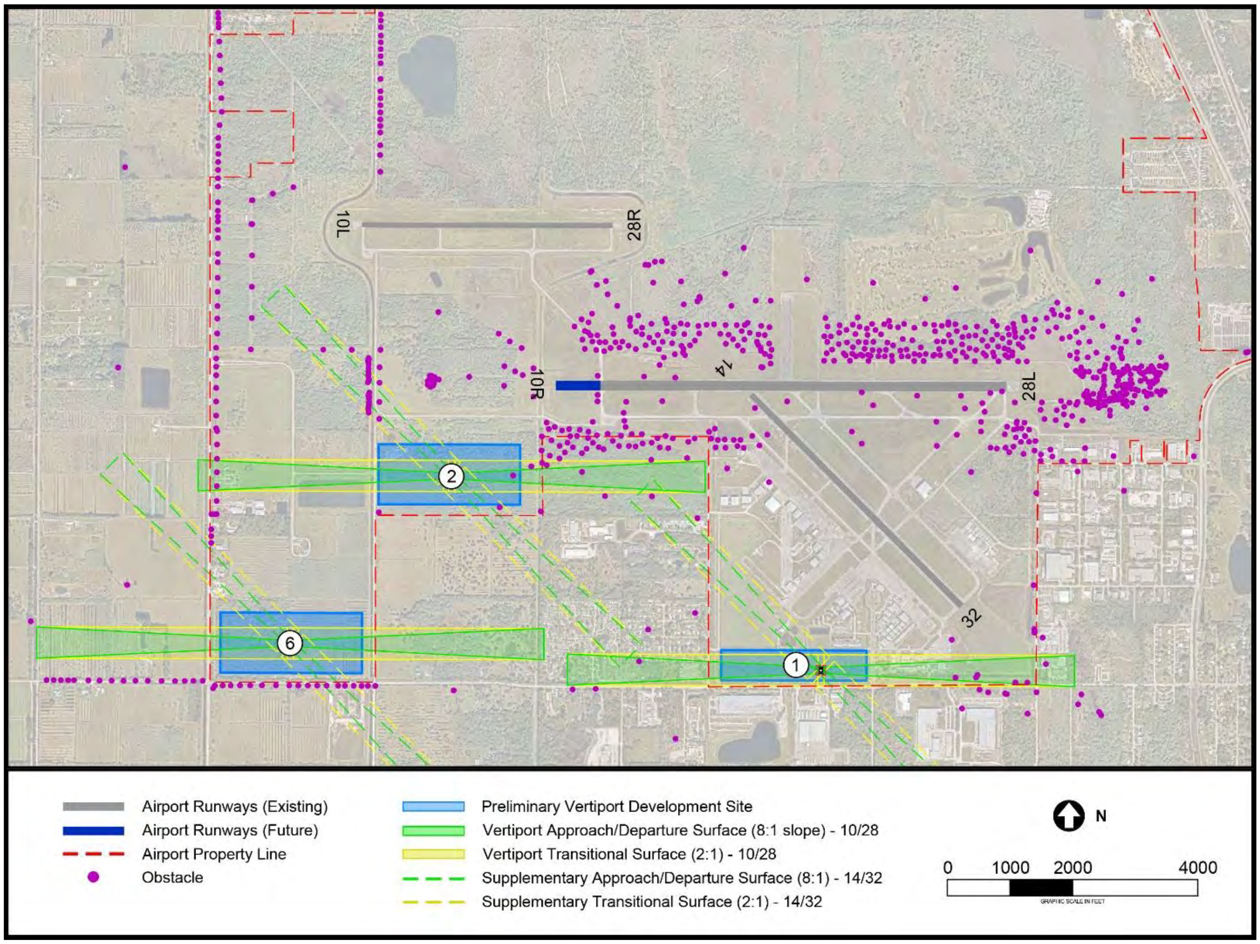
To promote safe eVTOL operations during flight, it is necessary to protect the vertiport Part 77 surfaces and the corresponding approach/departure paths from any obstacles. Airport obstacles were sourced from available data in the FAA's OE/AAA database to determine potential objects that may affect the imaginary surfaces of vertiports located within the three preliminary sites.

Figure 20 below shows the obstacle data and adds vertiport imaginary surfaces to each preliminary site. Although the exact location of a vertiport on each site can vary, this visual provides an initial review of potential obstacles to these surfaces. Obstacles near the preliminary vertiport sites include trees, utility poles, and buildings. Trees can be trimmed or removed, but the ultimate location of a vertiport should ensure objects that cannot be easily relocated or moved, such as utility poles and buildings, do not penetrate the imaginary surfaces.

A review of the obstacle data shows that while there are some trees, utility poles, and buildings located within the limits of the vertiport imaginary surfaces, these objects would not penetrate the surfaces and therefore would not be deemed hazards to air navigation. As such, there are no significant obstacle constraints that prevent a vertiport from being sited in either of the three preliminary locations.

It is important to note that data within the FAA's OE/AAA database represent existing obstacles to the imaginary surfaces of the Airport's runways (i.e., OCS, Part 77 surfaces). Prior to selecting a vertiport site at FPR, a site-specific obstacle analysis should be conducted to identify potential hazards to eVTOL operations and, if necessary, an obstacle mitigation plan should be developed.

Figure 20 – Airport Obstacles



Source: Kimley-Horn, 2024.

Obstacle Data Source: FAA Obstruction Evaluation / Airport Airspace Analysis (OE/AAA) database (accessed March 2023).
Image Source: Nearmap, accessed March 2024.

3.4.3. Integration into Airport Operations

A vertiport at FPR must facilitate eVTOL operations that effectively integrate into the Airport's existing procedures to promote the safe and efficient movement of aircraft in the airspace and on the ground. Referencing the Airport's traffic pattern in **Figure 15**, Site 1 is located inside the traffic patterns of Runways 10R/28L and 14/32, Site 2 is located inside the Runway 10R/28L traffic pattern and directly under the traffic pattern of Runway 14/32, and Site 6 is located within the southwest corner of the Runway 10R/28L pattern. Recognizing that a vertiport's approach/departure surfaces at FPR are ideally aligned in an east-west orientation (parallel to Runway 10R/28L) with supplemental approach/departure surfaces aligned in an 14/32 alignment, an eVTOL aircraft approaching/departing a vertiport located in Sites 1, 2, or 6 may conflict with fixed-wing aircraft in the Airport's traffic patterns. Coordination to ensure smooth aircraft traffic flow may increase ATC workload, especially during peak periods of activity.

Alternatively, neither of the three preliminary sites conflict with the traffic pattern of Runway 10L/28R. Unlike the patterns of Runways 10R/28L and 14/32, which are primarily used to facilitate aircraft departures and arrivals, the Runway 10L/28R traffic pattern is frequently utilized for training activity and may have multiple aircraft in the traffic pattern at one time while performing touch-and-go maneuvers.

Regarding ground operations, both Sites 1 and 2 are adjacent to existing taxiways/taxilanes. In the event that an eVTOL aircraft needs to access other facilities on the airfield, such as maintenance and repair, a taxilane connection may be made to support ground taxiing or tug operations. Site 6 is located west and south of existing airfield facilities on a portion of Airport property that extends south, like a peninsula. Additionally, the Airport does not own properties between the main landside area and Site 6, and Airport-owned parcels north of Site 6 are currently non-aeronautical uses, eliminating the possibility to connect a vertiport on Site 6 with the airfield.

3.4.4. Landside Considerations

3.4.4.1. Access Roadways and Landside Facilities

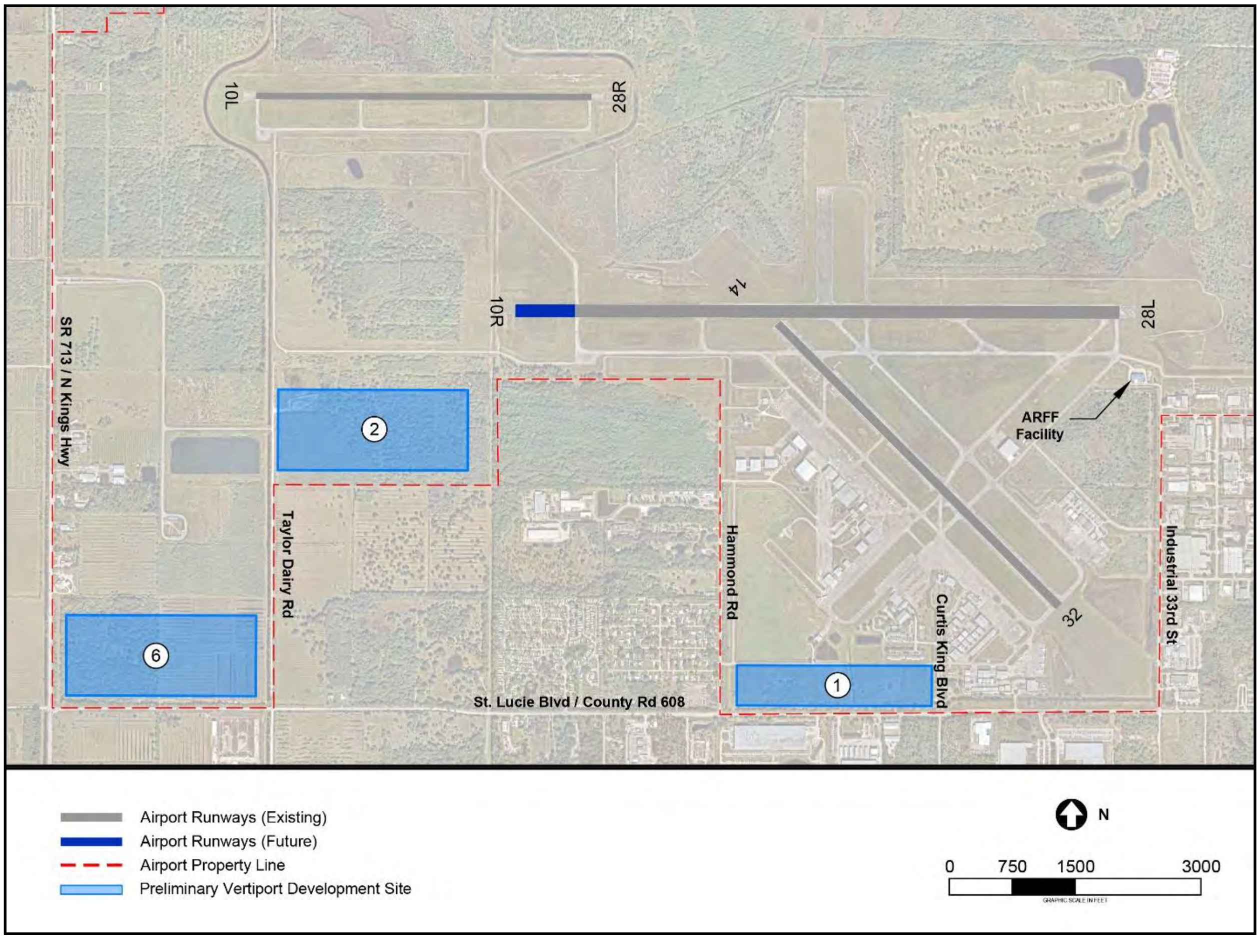
Access roadways are critical to connecting an airport's facilities and the communities they serve. With sustained, streamlined mobility being among AAM's key objectives, efficient landside access will play a critical role in facilitating first- and last-mile transportation for eVTOL users.

Site 1 is located near the main access point to the Airport and may be accessed by Curtis King Boulevard via St. Lucie Boulevard/County Road 608 (East). This location near existing Airport access points provides for efficient vehicular connectivity between a vertiport and the St. Lucie County roadway network. Site 1 is also conveniently located near FPR's main landside campus, including the FBO, U.S. Customs facility, restaurant, and flight schools.

Sites 2 and 6 are located further from the Airport's existing landside areas than Site 1. Site 2 can be accessed via Taylor Dairy Road, an unpaved roadway. It is likely this road will require improvements should a vertiport be located in Site 2. Site 6, while located further from the Airport's landside areas, is accessible via St. Lucie Boulevard/County Road 608 (East). As discussed, however, Site 6 is separated from the rest of Airport property with future aeronautical connectivity being unlikely due to the number of non-aeronautical uses that surround the site.

The Airport's access roadways are shown on the following page in **Figure 21**.

Figure 21 – Access Roadways



Source: Kimley-Horn, 2024.
Image Source: Nearmap, accessed March 2024.

3.4.4.2. Emergency Response

Landside access also facilitates efficient emergency response in the event of an incident at or around a vertiport. As shown above in **Figure 21**, FPR has an on-site Aircraft Rescue and Fire Fighting (ARFF) facility located immediately south of Runway end 28L. ARFF personnel utilize ground vehicles (e.g., ARFF trucks) to access emergencies throughout the Airport. Preliminary vertiport Sites 1 and 2 can be accessed by ARFF personnel via the airfield as long as vehicle service roads provide access between existing airfield facilities and the vertiport development area. Given the remote nature of Site 6, ARFF personnel would be required to exit the airfield, travel south on Industrial 33rd Street, and then west on St. Lucie Boulevard/County Road 608 (East) to access the vertiport—an approximately 3-mile trip around the perimeter of Airport property.

3.4.5. Preliminary Site Determination

Based on the analyses within this chapter, Sites 1, 2, and 3 are capable of hosting vertiport operations in the future—the sites do not conflict with runway imaginary surfaces and are not constrained by airspace obstacles. For all sites, ATC will be required to coordinate eVTOL operations in/out of the vertiport to avoid interference with aircraft in runway traffic patterns. As noted above, however, Site 1 provides the most efficient landside connectivity for both eVTOL users and ARFF personnel of the three sites. Additionally, vertiport infrastructure on the site may benefit from adjacent utilities associated with existing development. Therefore, this study favors Site 1 as the leading candidate for future vertiport development at FPR.

The St. Lucie TPO recognizes the Airport's autonomy in infrastructure planning at FPR. The analyses and recommendations of this study are meant to provide initial due diligence to support AAM adoption and integration at FPR and throughout St. Lucie County. It is recommended the Airport conduct additional site investigation and planning to confirm, refine, and/or revise the recommendations of this study.

3.5. Assumptions and Limitations

AAM is a developing industry in its early stages. At the time of writing, validated data for eVTOL aircraft are not readily available, and subsequent guidance and regulations for vertiport development and AAM operations are preliminary in nature. In response to this rapidly evolving industry, the FAA has advised interested parties to refer to existing guidance, such as EB 105, AC 150/5300-13B, and Part 77, for initial AAM planning.

While a preliminary site investigation such as this one is the first step in reviewing feasibility of an area for vertiport development, future studies should be conducted to gather input from stakeholders and subject-matter experts, and a thorough analysis of the site should be performed using the latest FAA standards, airport survey data, and industry trends. Future studies should also include reviews of ATC line-of-sight from the ATCT to the vertiport, the capacity of the local power grid to support electric aircraft charging stations, and the land use and zoning surrounding a vertiport. Furthermore, additional site investigation and engineering design—including environmental, grading, stormwater, and utilities—should be conducted prior to finalizing site plans for a future vertiport at FPR.

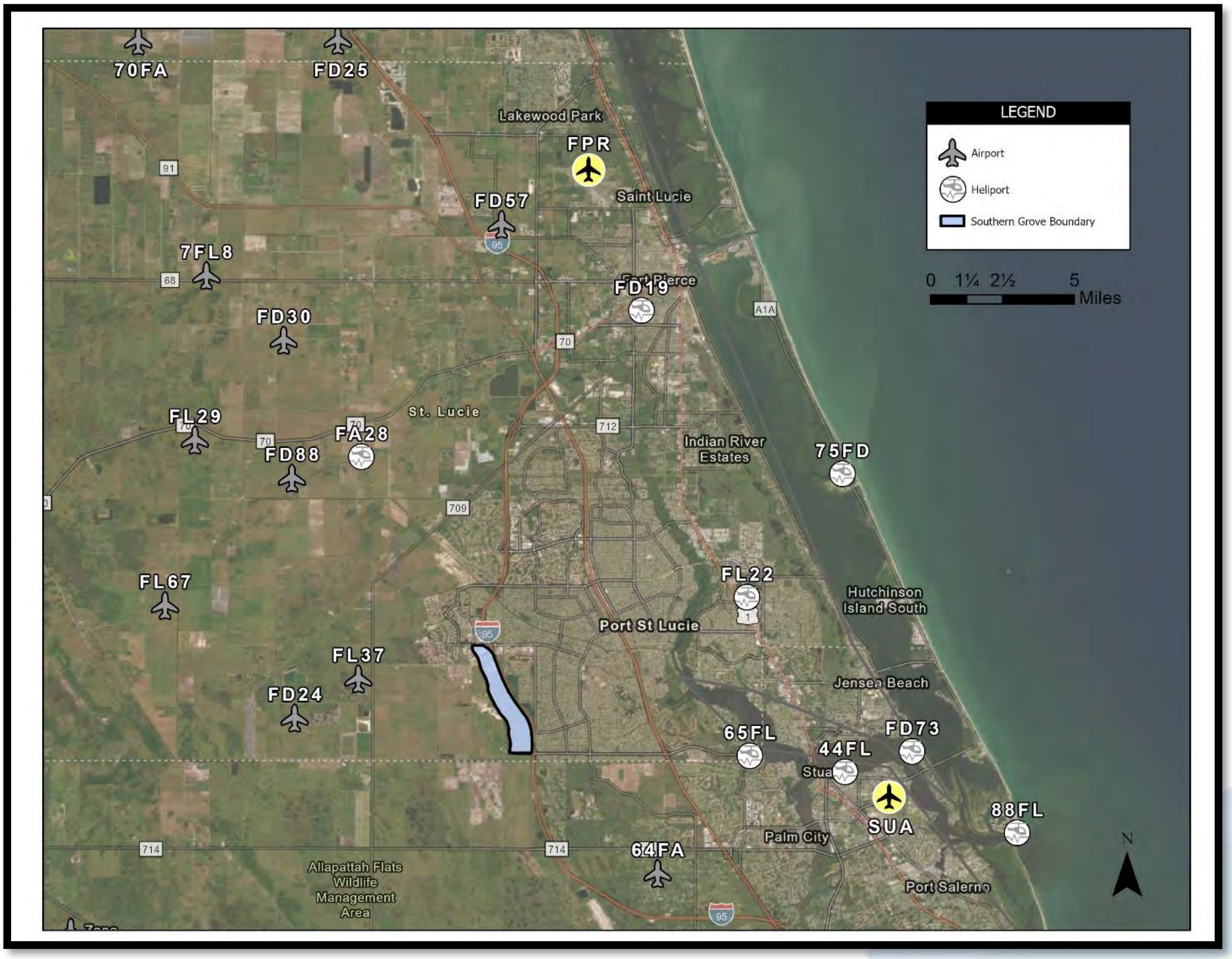
Based on this information, limited regulatory guidance, and a lack of published aircraft operational and performance data, the findings and recommendations of this study should not be used as the sole basis for the Airport's decision making.

Chapter 4. Airspace and Infrastructure Modeling

4.1. Airports in St. Lucie

The first step of any airspace modeling task is to understand the location of local airports and heliports that influence the structure of airspace surrounding the study area. Airports and heliports (both public and private) surrounding the study area are shown in Figure 22.

Figure 22 – Local Airports and Heliports Facilities



Notes: Facility callout acronyms illustrated above are FAA identification codes.
Source: FAA Sectional / Kimley-Horn.

For purposes of this study, it is assumed that the proposed future vertiport sites as determined in previous chapters of this study will represent initial AAM operating areas within St. Lucie County. Exact locations and designs of these facilities are to be further evaluated once operators are identified and the economics of the operations are verified. No existing airports or heliports were located within the areas identified in Chapter 2 of this study.

4.2. Airspace Structure Overview

Airspace is defined in three-dimensional volumes and organized by the FAA. The National Airspace System (NAS) consists of a network of airspace, airports, air navigation systems, and Air Traffic Control (ATC) facilities, and is governed by a set of rules and regulations that allow for the coordination and control of airspace within the U.S. Classified airspace corresponding to the airports presented in **Figure 23** was collected. These data were analyzed to ensure the airspace system and procedures can accommodate the anticipated demands of AAM.

4.2.1. Controlled Airspace

Classification and active control help the FAA organize complex airspace. Restrictions on certain portions of airspace may include specific aircraft equipment, visibility minimums, cloud clearance, and/or procedures when operating inside them, such as communication with ATC. These restrictions assist the NAS to operate at maximum levels of safety and efficiency. Controlled airspace (Classes A, B, C, D, and E) refers to airspace where ATC services are provided. Typically, these classifications are associated with different types of airports and are dependent on the frequency of operations and complexities of the local airspace. Special use designates airspace where specific activities occur or where limitations must be imposed, such as military operating areas or routes, which are typically coordinated by ATC.

4.2.2. Uncontrolled Airspace

Within uncontrolled airspace (Class G) ATC has no authority over or responsibility to control. Other airspace refers to the remaining airspace not covered by the aforementioned classifications.

4.3. Airspace Above St. Lucie

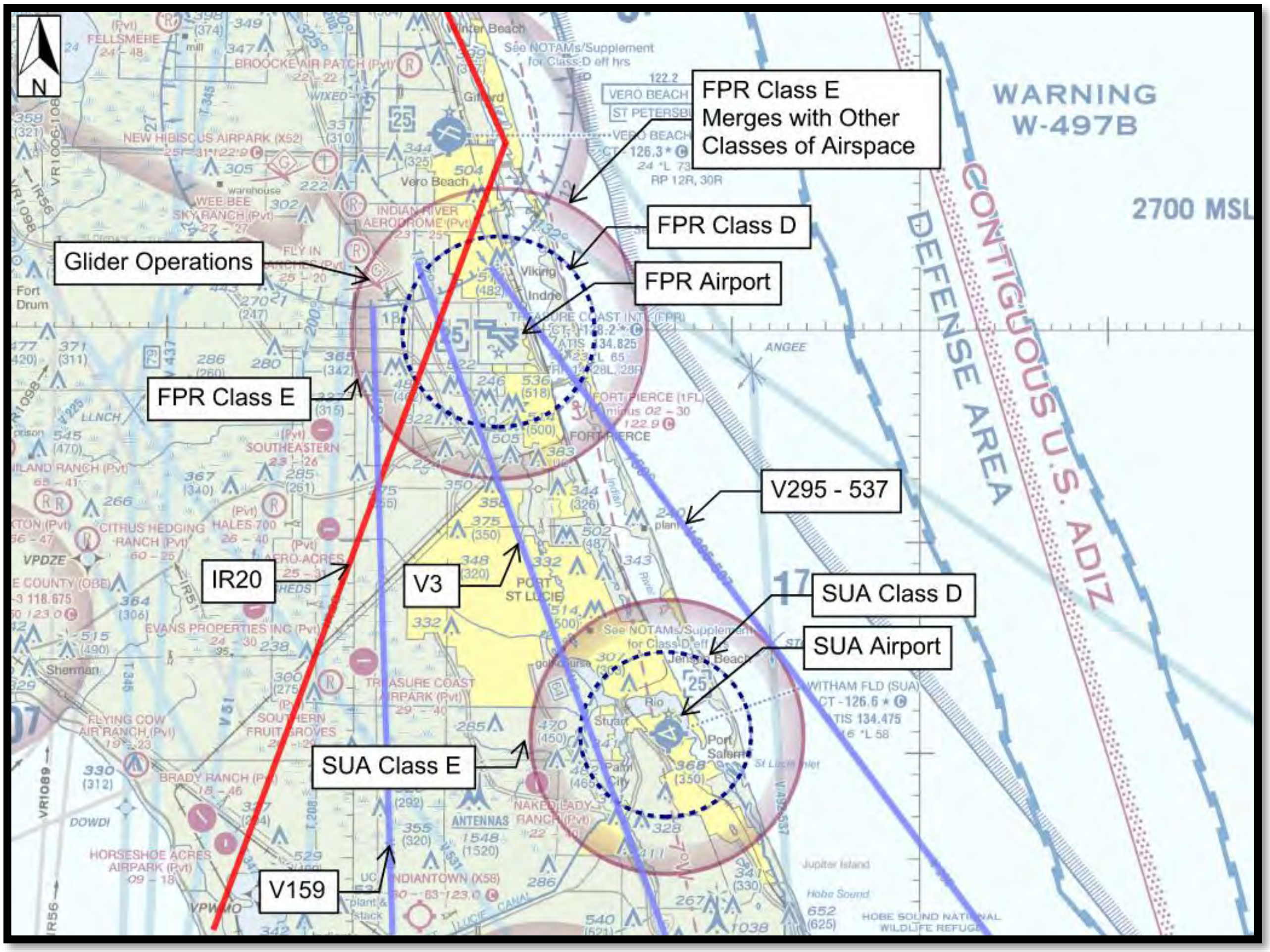
The airspace above St. Lucie County is depicted within **Figure 23** below. A glider operating area located northwest of FPR is the only special use airspace within the County. Class A airspace generally begins at 18,000 feet above mean sea level (MSL) and extends up to and including 60,000 feet MSL (flight level 600). AAM operations are not anticipated to operate at this high altitude and therefore will not utilize Class A airspace.

Class D airspace surrounds FPR to the north and Witham Field (SUA) to the south during specified hours. Class D airspace starts at the ground surface and extends upward to 2,500 feet above ground level (AGL). It is required that aircraft establish communication with ATC prior to entering Class D airspace. Class D airspace surrounding each airport is only active when the ATCT is operational. For exact ATCT service hours, refer to the FAA's "Chart Supplement" for each airport.

Class E airspace extends beyond the lateral extent of Class D that surrounds FPR and SUA, and overlays the airports when not operating as Class D airspace. Class E makes up the majority of airspace above St. Lucie County. Class E is controlled airspace by ATC surrounding FPR and SUA, which begins at 700 feet AGL and extends up to 17,999 feet MSL surrounding each airport within the local region, with FPR's Class E merging to the north with other airport's Class E airspaces. Outside the Class E lateral bounds for each airport, Class E begins at 1,200 AGL, as opposed to 700 feet AGL near those airports.

Class G airspace makes up all other local airspace underneath Class E airspace, inclusive of airspace immediately above FPR, up to 699 feet AGL, when Class D is not active. Class G is uncontrolled airspace and operates under VFR.

Figure 23 – Airspace Classifications and Airways Above St. Lucie



Note: This exhibit is for illustrative purposes and not to be used for air navigation; Victor Airways (V); Treasure Coast International Airport (FPR); Witham Field (SUA); Instrument Military Training Route (IR).

Source: FAA, Sectional Aeronautical Chart, 2024; Kimley-Horn, 2024.

4.3.1. Existing Airways and Routing Above St. Lucie

In addition to airspace classifications around the study area, **Figure 23** above also identifies common routes and airways used by aircraft navigating the NAS, such as victor airways. Victor airways are commonly contained within Class E airspace and are used by pilots to navigate between Very High Frequency Omnidirectional Range Stations (VORs), which is a NAVAID used by pilots. These routes are used by a variety of aircraft types and speeds for both VFR and IFR, three of which are near the study area: V3, V159, V159, V537.

A published military training route closest to St. Lucie County, which traverses FPR airspace, was identified. This route, named IR20, is used by military aircraft operating under instrument flight rules regardless of weather conditions traveling at high speeds and low altitudes, typically below 10,000 feet MSL. The route has a width of 8 nautical miles and is commonly contained within Class E airspace.

AAM operations should not impede or interfere with these published routes identified above. Therefore, any operational corridors between vertiports should be sited in a way that does not overlap these routes for extended periods, and minimize intersections to the extent possible.

4.4. AAM Corridors

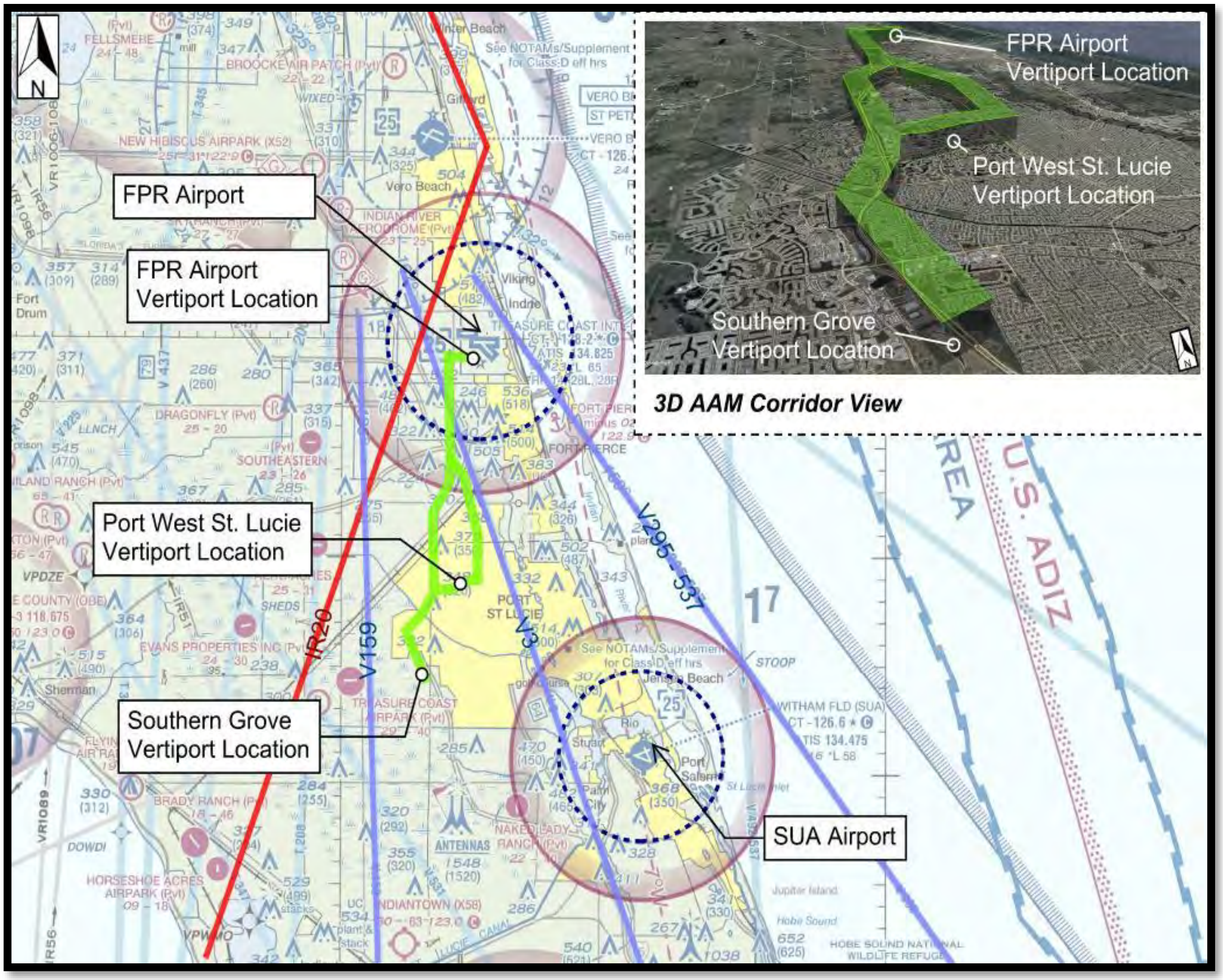
Any proposed AAM operational areas within this feasibility study must integrate into existing airspace without impeding on aircraft operations. As defined within the sections above, there are multiple airways used by aircraft to navigate in and around the St. Lucie airspace, and the airspace is prominently influenced by FPR to the north and SUA to the south. Additionally, the AAM corridor should factor in noise impacts to the local community, even though AAM operations are anticipated to be much quieter than traditional small aircraft.

A corridor is defined within this study as a volume of three-dimensional airspace that would be used to route AAM operations between vertiports. It was determined that two distinct corridor routes were needed to accommodate potential operations, connecting the three recommended initial vertiport locations: FPR, Southern Grove, and Port St. Lucie West. One would connect directly between FPR and Southern Grove vertiport locations, and another would connect all the three vertiport locations. Each corridor is planned to be 0.5 nautical miles wide due to the anticipated size and speed of aircraft; each corridor is planned to extend from the ground to 2,500 feet AGL which allows for bi-directional vertical separation between aircraft, which is assumed to require 1,000 feet of vertical separation. Northbound operations would be traveling at an altitude of around 1,000 feet AGL, with southbound operations operating at 2,000 feet AGL.

Corridors were planned to follow existing roadways to protect against additional noise exposure to noise-sensitive community areas such as parks, schools, and residential areas. In addition to aligning with roadways to limit noise impacts, roadways are often utilized by pilots and aircraft when operating by visual navigation.

The conceptual AAM corridors aligning to existing roadways and avoiding existing airspace conflicts is shown within **Figure 24** below. AAM corridors are not in conflict with victor airways, nor the military training route. AAM operations are anticipated to be in constant communication with ATC when flying inside Class E and Class D airspace. The proposed AAM corridors are predominantly inside Class E airspace, aside from operating near FPR when Class D is active, or under Class E airspace, which reverts to Class G. ATC may route AAM operations differently than what is shown in **Figure 24,** when operating within Class D to separate AAM operations and other air traffic as needed.

Figure 24 –Conceptual AAM Corridor(s)



Note: This exhibit is for illustrative purposes and not to be used for air navigation. Furthermore, these corridors represent potential feasible locations, and must be further vetted through design and coordination with the FAA.

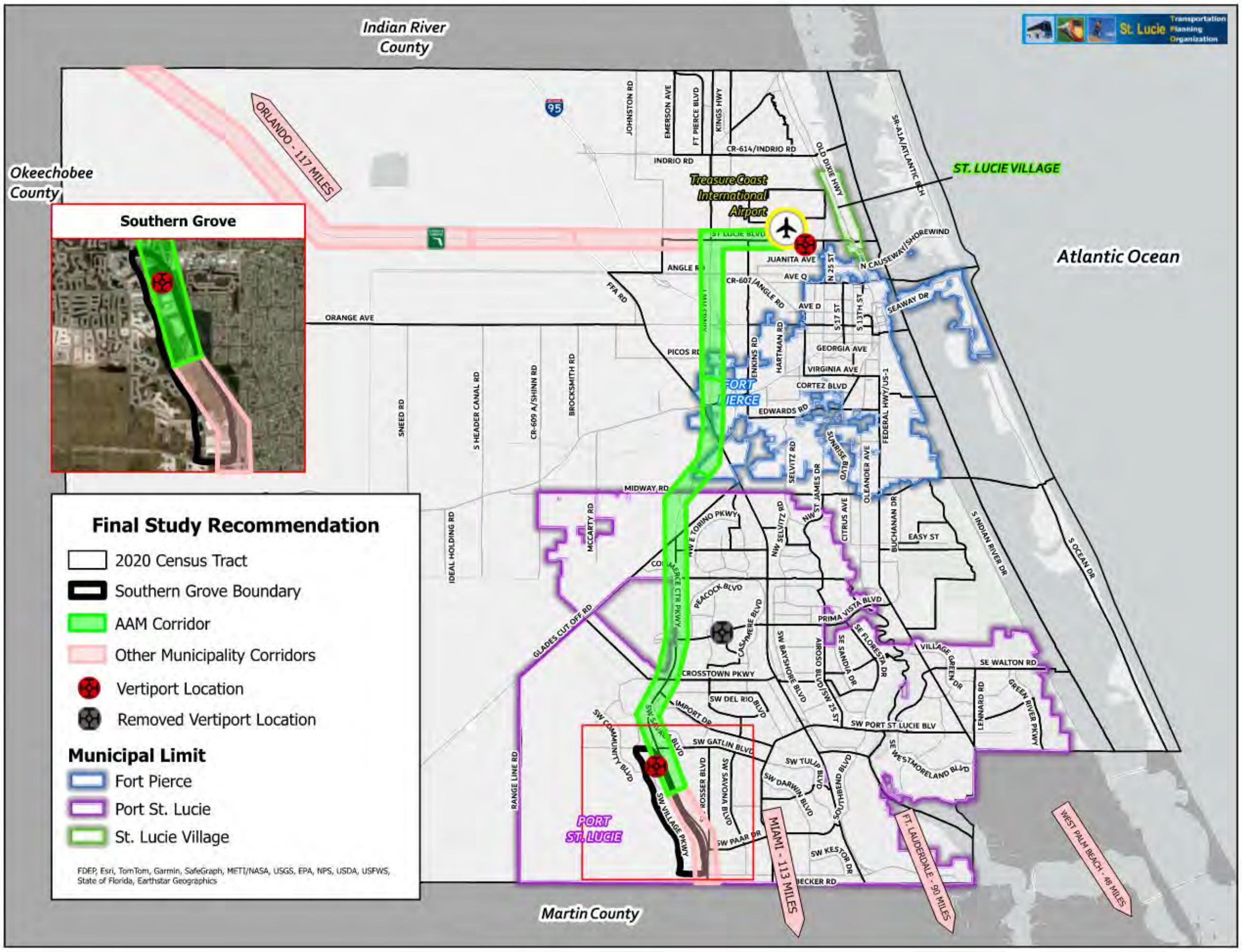
Source: FAA, Sectional Aeronautical Chart, 2024; Google Earth Imagery, accessed 2024; Kimley-Horn, 2024.

The corridor distances are relatively short ranging from 6 to 17 nautical miles. AAM travel times will depend on vehicle performance and capabilities. Depending on schedules and volume of traffic, additional corridors or wider corridors may be required to provide adequate separation.

4.5. Final Recommendation – Conclusion

Based on the airspace evaluation, it has been determined that the St. Lucie West Vertiport location is not suitable due to its potential negative impacts on nearby residential areas and short segments with tight maneuvers. Although the surrounding land use of the vertiport itself is compatible, the only feasible AAM corridor that follows St. Lucie West Boulevard would still potentially result in excessive noise impacts on the surrounding community areas such as parks, schools, and residential land uses. On the other hand, the Southern Groves Development Area remains a suitable location due to its proposed large-scale manufacturing, logistics, and retail development and the ability to utilize Interstate 95 as the primary roadway infrastructure for the AAM corridor to be placed above, thereby minimizing noise exposure on the communities in between FPR and Southern Grove. Considering these factors, the study recommends two vertiport locations in St. Lucie County: FPR and the Southern Grove development area, connected by a conceptual AAM corridor above Interstate 95. **Figure 25** below depicts the final recommendation of the study.

Figure 25 – Final Recommendation



Source: Kimley-Horn, 2024

Lastly, it is important to note that AAM services will heavily rely on existing Aviation infrastructure, such as FPR and connectivity to out of County origins and destinations. St. Lucie is well suited to connect to a larger statewide UAM system, serving as a stopover point or transition point to other locations along the eastern seaboard of Florida and possibly connection to the southwestern portion of the peninsula.

Therefore, off-airport locations for AAM are expected to be developed at a later, mature stage, when higher volumes of AAM traffic is expected. At the time of implementation, the AAM industry would have advanced further and additional variables may need to be evaluated. For these reasons, it is recommended that these recommendations be reevaluated with updated transportation indicators in the future. The two vertiport locations are recommended and should be further evaluated as part of the TPO's planning endeavors, such as the LRTP.