TRENTON-MERCER AIRPORT

Airport Master Plan Update

June 2018

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Executive Summary

The FAA recommends that public use airports such as TTN prepare a new Airport Master Plan every 10 years +/-, or as local aviation conditions change. The previous Master Plan at Trenton – Mercer Airport (TTN) was completed in the late 1990's therefore, Mercer County has initiated this Airport Master Plan to ensure the Airport continues to operate in a safe and efficient manner and to address any changes in the aviation industry both locally and nationally. An Airport Master Plan is a process to plan for the short, intermediate, and long term development goals of the Airport. The Airport Master Plan for TTN will have a 20-year planning horizon based on Federal Aviation Administration (FAA)-approved aviation activity forecasts and will be developed through a combination of professional evaluation and public involvement. The goal of the Airport Master Plan is to provide the framework needed to guide future airport development that will cost-effectively satisfy aviation demand, while considering potential environmental and socioeconomic issues.

Initial tasks of the project acquired detailed airport mapping compliant with Advisory Circular 150/5300-18B and data for development of the Airport Master Plan Update (AMPU) and Airport Layout Plan (ALP). Baseline data was collected and presented for use in subsequent planning analyses. The Report contains the aviation activity forecast, environmental overview, facility requirements, alternatives analysis, financial and implementation plans and airport layout plan drawing set elements of the airport master plan per guidance in FAA Advisory Circulars 150/5070-6B *Airport Master Plans*, 150/5300-13A *Airport Design*, and other applicable state and local guidelines.

Located in Ewing Township in Mercer County, New Jersey, the Airport is within a 35-mile radius of 10 of New Jersey's 21 counties and three of Pennsylvania's counties (including the city of Philadelphia). It is located approximately four miles from the state capital Trenton. The Airport is convenient for much of Pennsylvania's greater Northeast Philadelphia region, particularly Bucks and Montgomery counties and is approximately 40 miles from Philadelphia International Airport. This master plan evaluated the airport facility needs and requirements for scheduled airline passenger traffic and operations, and general aviation descriptors such as based aircraft and operations.

The Master Plan Update assesses the recommended facility improvements identified in the Facility Requirements, against a number of evaluation factors to determine if the recommended improvements enhance the efficiency of the airport, while meeting future demand and minimizing environmental and community impacts. The evaluation factors used to compare development options were selected based on specific considerations associated with Trenton-Mercer Airport.

Inventory

Trenton-Mercer Airport has two grooved asphalt runways; Runway 6-24 is the primary runway and Runway 16-34 is the crosswind runway. Additionally, TTN has three asphalt helipads which are each 64 feet wide and long.

Runway 6-24 measures 6,006 feet long and 150 feet wide and is aligned in a northeast to southwest direction. Runway 6-24 has grooved asphalt pavement, which is in good condition. Runway 6-24 is equipped with high intensity runway edge lights (HIRL). In addition, Runway 6 is equipped with a medium intensity approach lighting system with runway alignment indicator lights (MALSR). Runway 24 is equipped with a 4-light precision approach path indicator (PAPI) with a standard three-degree glide path. The Runway 24 PAPI glide path is not coincident with the non-precision glide path.

Runway 6 has a precision instrument landing system (ILS) approach. Approach visibility minimums are ½ mile horizontally at a decision height/cloud ceiling of 414 feet. Runway 24 is equipped with runway end identifier lights (REIL) and has a non-precision approach with visibility minimums down to 1¼ miles. There is engineering materials arresting system (EMAS) beyond each runway end.

Runway 16-34 is 4,800 feet long and 150 feet wide and is aligned in a north to south direction. Runway 16-34 has grooved asphalt pavement, which is in good condition. This runway is the crosswind runway.

Runway 16-34 is equipped with HIRL. In addition, Runways 16 and 34 are equipped with REIL and non-precision approaches down to one (1) mile visibility. Both runway ends are equipped with a 4-light PAPI with a standard three-degree glide path. There is an EMAS beyond each runway end. The Runway 16 glide path is not coincident with the non-precision approach glide path.

General Aviation

GA landside facilities support both based and itinerant aircraft operations (except airline) at Trenton-Mercer. Components of general aviation landside facilities include Fixed Base Operator (FBO) facilities, conventional and T-hangars, apron areas, and automobile parking areas. GA is comprised of all flying with the exception of military and commercial service. GA users include individuals flying for business or personal reasons, flight training, and corporate flight departments that base their operations at the airport.

Signature Aviation is a nationwide FBO. Its Trenton location offers the following services:

- Fuel: Avgas and Jet A
- Ground handling
- De-icing
- Aircraft charter

- Maintenance
- Gourmet catering
- On-site rental cars
- Other services: quick-turn, lavatory, potable water, oxygen/nitrogen, concierge, international trash removal, and ramp-side vehicle access

Signature Aviation has aircraft handling capabilities of general aviation aircraft up to a Boeing 757. It has a ground power unit (GPU), tug, forklift, and de-icing equipment.

Passenger Terminal Building Complex

The passenger terminal complex is located in the western quadrant of the Airport and comprises the terminal building and adjacent automobile parking area and primary vehicular access route.

The passenger terminal building is a 24,780 SF facility, with an assessment of poor functional use, due to congestion during peak hours of activity and passenger flow. Deplaning passengers are required to bypass the interior of the building and to then re-enter to gain access to the baggage claim area located inside the building. The baggage claim area is not served with

restrooms, however an expansion to the baggage claim facility that will include restrooms is being constructed in 2017.

The passenger terminal building portrays a dated, negative impression to users from an aesthetics viewpoint; its overall design and use, passenger flow, and its function as the primary air gateway to the community would all rate poorly if measured against similar size and function airports.

The airline aircraft apron immediately east of the passenger terminal building is assessed as Fair condition. New expansion joints are required where concrete meets bituminous pavement, and pavement markings are in need of restriping. The lack of a dedicated airport operations ramp area contributes to this apron area being cluttered with ground service equipment.

Forecast

Forecasts of aviation demand are a key element in all airport planning. Demand forecasts, based upon the characteristics of the service area and airport, provide a basis for determining the type,

size, and timing of aviation facility development and are a platform upon which this master planning study is based. Consequently, these forecasts influence virtually all phases of the planning process. Major sections of this chapter include:

- Air Service Area
- Socioeconomic Trends
- External Demand Factors
- Aviation Forecasts
- Forecast Summary and Comparison
- Future Design Aircraft

	Actual 2014	FORECAST		
		2020	2025	2035
ENPLANEMENTS				
Airline	377,544	358,728	396,358	476,507
Peak Hour	276	345	414	490
AIRCRAFT OPERATIONS				
Air Carrier/ Air Taxi	9,599	10,239	10,895	12,364
General Aviation				
GA Itinerant	37,157	39,200	40,984	46,101
GA Local	29,716	30,961	32,264	35,019
Military	1,791	1,791	1,791	1,791
Total Operations	78,263	82,191	85,934	95,275
GENERAL AVIATION				
Airport Based Aircraft	133	139	147	156

Environmental

The operation and development of an airport has the potential to affect neighboring land-uses, natural, and human environments, which are of fundamental concern in the airport planning

process. Therefore, it is imperative to identify the resources and potential impacts to the environment and surrounding community during the initial stages of the planning process. This allows airport planners and engineers to incorporate measures in accordance with federal, state, and local rules and regulations to avoid, minimize or mitigate potential impacts to the environment.

The National Environmental Policy Act (NEPA) of 1969 requires that all federal agencies consider the potential impacts their projects and policies have on the environment. The FAA, an agency of the United States Department of Transportation (USDOT), has issued Order 1050.1F, *Environmental Impacts: Policies and Procedures* (Effective Date July 17, 2015), which ensures all FAA actions comply with NEPA. The FAA has also issued Order 5050.4B, *National Environmental Policy Act (NEPA) Implementing Instructions for Airport Actions* (Effective Date April 28, 2006). FAA Order 5050.4B guides NEPA compliance specifically for major federal actions at public-use airports.

FAA Orders 1050.1F and 5050.4B identify environmental categories that must be considered in relation to a proposed action to determine whether a significant impact would result, and determine what actions would be appropriate to avoid or minimize an impact's effect. FAA Order 1050.1F specifies the threshold of significance for each of the categories addressed.

The following is a list of environmental impact categories identified in Order 1050.1F that may be applicable to FAA actions:

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

Facility Requirements

Facility requirements are based upon several sources, including the aviation demand forecasts presented in Chapter 3, *Forecast*, and, FAA Advisory Circular (AC) 150/5300-13A, *Airport Design,* and 14 CFR Part 77, *Objects Affecting Navigable Airspace.* The findings of this chapter serve as the basis for the formulation of airport alternatives and development recommendations. The major components of this chapter are listed below:

Airside Requirements:

- Rehabilitate Runway 6-24 within the planning period
- Improve Runway 24 approach minimums
- Acquire control of runway protection zones (RPZs) not currently under Airport control or owned by a public entity
- Resolve runway-taxiway centerline separations between:
    - Runway 16-34 and Taxiway D
    - Runway 6-24 and Taxiway F
    - Runway 16-34 and Taxiway H
- Fix Taxiway D and Taxiway F widths to meet requirements
- Rehabilitate any pavement in failed, serious, very poor, or poor condition in the short-term and fair within the planning period
- Resolve geometry issues
- Update or replace the electrical vault in the short-term

Landside Requirements:

- Rehabilitate based aircraft parking within the planning period
- Widen taxilanes serving airplane design group (ADG) I aircraft to meet design standards, including taxilane object free area (TLOFA) dimensions
- Relocate the air traffic control tower (ATCT) to provide full visibility of the airfield and all approach areas and without employees needing to cross any movement area
- Consider a combined aircraft rescue and firefighting (ARFF)/snow removal equipment (SRE)/operations building when relocating the ARFF building.

Alternatives

The Alternatives chapter assesses the recommended facility improvements identified in Chapter 5, *Facility Requirements,* against a number of evaluation factors to determine if the recommended improvements enhance the efficiency of the airport, while meeting future demand and minimizing environmental and community impacts. The evaluation factors used to compare development options were selected based on specific considerations associated with Trenton-Mercer Airport (TTN or the Airport).

Airside alternatives will be considered first, followed by an evaluation of landside components. The preferred alternatives for airside and landside are selected based on assessed criteria, as well as their compatibility with one another and the overall airport environment. These individual

alternatives (airside and landside) combine to create an overall Preferred Airport Development alternative.

The identification and evaluation of the airport development alternatives are outlined as follows:

- Summary of Airport Facility Requirements
- Development Constraints
- Airside Alternatives
- Landside Alternatives Terminal Area Alternatives
- Preferred Airport Development Alternative

A detailed analysis of the key airport facility requirements is presented in Chapter 5, Alternatives.

The preferred airside alternative resolves all geometry issues at Trenton and provides dual parallel taxiways for both runways and improves the Runway 24 approach minimums. The following projects are associated with recommended airside alternative:

- Extend Taxiways B and J to create a full-length parallel taxiway for Runway 6-24. All taxiways associated with Runway 6-24 should meet TDG 3 standards.

- Extend Taxiway G and relocate Taxiway D to provide a full-length parallel taxiway for Runway 16-34 to meet separation requirements. All taxiways associated with Runway 16-34 should meet a minimum TDG 2 standards, except for those crossing Runway 6-24, which should meet TDG 3 standards to allow for all aircraft to cross over. This means the portion of Runway 16-34 parallel taxiway between Taxiways B and F will meet TDG 3 standards.

- Reconstruct Taxiway A intersection with Runway 6-24 to provide a perpendicular TDG 3 runway crossing.

- Reconstruct and extend Taxiway F to meeting separation requirements and provide access to Runway 24. This taxiway should meet TDG 3 standards.

- Reconstruct the intersection between Taxiways C and F with Runway 6-24 to resolve geometry issues and remove direct access from the ramp. This taxiway should meet TDG 3 standards.

- Remove Taxiway C between Taxiways A and Runway 6-24.

- Taxiway H was reconstructed in 2016 and meets airplane design group C-II separation requirements and prevents direct access from the apron.

- Remove Taxiway A between Taxiways G and Runway 16-34.

- Improve Runway 24 GPS approach to ¾-mile visibility minimums. This allows pilots to use the primary runway (Runway 24) during weather conditions less than 1 ¼ mile and alleviates traffic and noise to the Runway 6 end in inclement weather.

- Acquire approximately 2.5 acres in easements and fee within the RSA, ROFA, and RPZ prior to Runways 24 and 34 and 1.2 acres for proposed taxiway object free area.

The recommended landside alternative includes development areas in which general aviation development could be constructed. It should be noted that all general aviation development is anticipated to be constructed by private developers in coordination with Airport management. The following areas are available for general aviation development:

- An area spanning approximately 26 acres is located between Taxiways D and F south of Runway 34 provides existing pavement and buildings. This area could be modified or reconstructed for general aviation use.

- South of Taxiway G and between the corporate aviation hangars and conventional hangars is an area spanning approximately 17 acres available for general aviation development.

- North of Runway 16 and east of the t-hangars is an area of approximately 7 acres available for general aviation development.

- In the long-term (10-20 years), an area between Runways 24 and 34 spanning 16 acres could be reviewed for development.

- The ultimate development (20+ years) includes an area of approximately 23 acres for development, which includes property acquisition of approximately 7 acres. This area protects for a full-length parallel taxiway south of Runway 6-24 and associated taxiway object free areas.

The preferred Terminal Area Alternative involves a total replacement of the terminal structure. As compared to expanding the existing terminal, the design direction is not compromised by the split-level section and other physical realities dictated by the reuse of the existing structure. The lack of complicated construction phasing will lead to a shorter construction duration and less overall costs. Likewise, the ease of transition from the use of the existing terminal to new for both the traveling public and airport operators will be much more advantageous.

The recommended plan meets all of the building's facility requirements as well as expansion, operational and revenue generation goals. As opposed to Alternative 2, when factored beyond the planning period, the better operational efficiency will help yield greater dividends to the airport as well as eliminating serious phasing complications during construction.

Near term auto parking requirements may require additional auto parking facilities before the long term solution identified in the preferred alternatives can be constructed. In particular, a more durable long-term / overflow parking area has been identified which will provide a higher level of customer service over the existing grass overflow lot. A location for this auto parking lot

has been identified along Scotch Road, between RW 24 and the railway tracks. This lot will be able to accommodate approximately 400 parked vehicles along with room for existing rental car operations. Once the permanent terminal area parking facilities are constructed, it is anticipated the lot could continue to be used for rental car support.

1. Inventory

1.1. INTRODUCTION

The inventory chapter provides an overview of Trenton-Mercer Airport (TTN), including its ownership, physical facilities, operational characteristics, level of service, facility development, land use, and zoning. This information was obtained through on-site investigations of the airport, interviews with airport personnel, and review of published information as of Fall 2015. Information was also obtained from available planning documents and studies concerning the airport and surrounding areas. The information presented in this chapter serves as the basis for the development of aviation forecast as well as the *baseline data to be used in the facility requirements.*

1.2. AIRPORT BACKGROUND

Trenton-Mercer Airport is owned and operated by the County of Mercer, New Jersey. The airport is located approximately six miles northwest of downtown Trenton, the capital of New Jersey. The airport is located near the New Jersey-Pennsylvania border in the Ewing Township. Refer to Figure 1-1 for the Airport Location Map. It is also located in the middle of two large hub airports: Philadelphia and Newark Liberty International Airports.

The airport reference point is located at 40° 16" 36.10" North and 74° 48" 48.50" West with an airport elevation of 212.6 feet mean sea level (MSL) and covers approximately 1,345 acres. Access to the terminal is provided by Sam Weinroth Road to Terminal Drive. Interstate 95, a major north-south highway, is located within two miles of the airport.

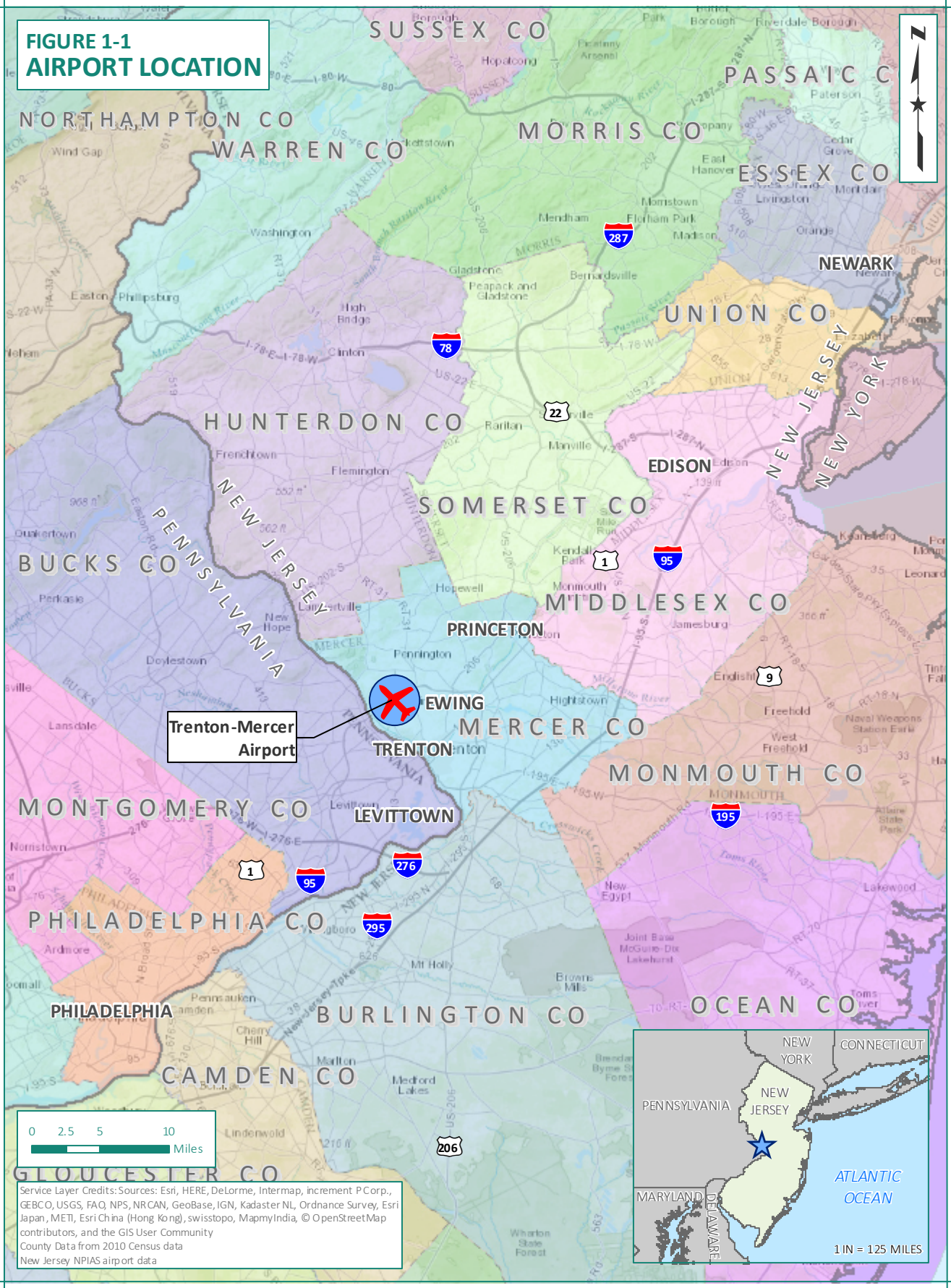
Trenton-Mercer is included in the national plan of integrated airports (NPIAS) as a national commercial service airport and served by Frontier Airlines. It serves the local community of approximately 30 miles from the airport.

In addition to the commercial airline service, the airport hosts a variety of based aircraft and serves as a regional gateway for general and corporate aviation. Different fixed base operators (FBOs) provide fuel, aircraft maintenance, oxygen service, and flight training. The airport is towered between 6 AM and 10 PM local time.

1.2.1. History

As early as 1907, aircraft were operating from a site known as Alfred Reeder's farm field adjacent to Bear Tavern Road in Ewing, on the west side of what is now known as Interstate 95. In 1929, this facility was opened to public use and named Skillman Airport. During World War II, the airport was expanded to allow its use as a test facility for the Grumman TBF Avenger carrier-based torpedo bombers for the United States Navy. The airport was renamed Mercer County Airport at the conclusion of World War II. In 1951, the United States Navy reestablished its presence in Ewing by constructing its Naval Air Warfare Center adjacent to the airport. The 1956 Master Plan is the first document detailing Mercer County's assumption of administration of the

FIGURE 1-1
AIRPORT LOCATION



Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
County Data from 2010 Census data
New Jersey NPIAS airport data

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airport from the Navy, and it shows the original airport converted to a golf course. The new airport was originally used for testing jet engines and remained in operation until 1997. The 27-acre site and facilities were transferred to Mercer County in October 2001 and comprises a portion of the existing airport. In 1995, the name of the airport was changed to Trenton-Mercer Airport to link it with the State Capital city and as the county seat of Mercer County.

Today, the airport encompasses 1,345 acres located six miles northwest of downtown Trenton in the West Trenton section of Ewing Township, Mercer County and serves as a base for several private and public entities. These include:

- Mercer County -- passenger terminal complex, airport administration and maintenance, sheriff's office, examiner's office, aircraft rescue and firefighting, and public works
- State of New Jersey -- Army National Guard, State Police
- Federal Government -- air traffic control tower (ATCT) (staffed under contract tower program), U.S. Marines Reserve
- Signature (formerly Landmark) Aviation -- fixed base operator
- Civil Air Patrol
- Private entities -- hangar facilities

Figure 1-2 provides an aerial view of the airport and displays existing conditions.

1.2.2. Past Major Capital Projects

The Trenton-Mercer Airport has implemented several major capital improvement projects over the recent past. Those since the year 2000 are summarized in Table 1-1, which also indicates the source(s) of funding.

1.2.3. Airport Service Area

The airport service area is based on vicinities within a 30 minute and 60 minute drive time.

- 30 minutes or less: Trenton, NJ, Princeton, NJ, Levittown, PA
- 60 minutes or less: Philadelphia, PA, New Brunswick, NJ, Edison, NJ

The Trenton-Mercer Airport is the only commercial airport within a 60 minute drive time radius. Other commercial airports, such as Newark Liberty International, Atlantic City International Philadelphia International, and Lehigh Valley International are over an hour away. The only airports that fall within a 60 minute drive time are classified as private and public reliever airports. A reliever airport is a type of general aviation airport that relieves the congestion of commercial service airports and provides an alternative for landing corporate and general aviation aircraft. Figure 1-3 depicts the service area surrounding the airport.

Figure 1-2: Trenton-Mercer Airport

Source: GoogleEarth.

Table 1-1: Recent Major Airport Capital Projects

Trenton-Mercer Airport FAA/NJDOT Grants 2000 - Current				
Project Name	FAA Cost	NJDOT Cost	TTN Cost	Total Cost
Rehabilitate RWY 16/34 Phase II	$2,250,000	$125,000	$125,000	$2,500,000
Conduct Runway Safety Area Studies	$90,000	$5,000	$5,000	$100,000
Acquire ARFF Trucks (2)	$162,912	N/A	$18,102	$181,014
Acquire Snow Removal Equipment	$1,065,646	N/A	$118,405	$1,184,051
Rehabilitate RWY 16/34 Phase III	$1,212,198	$31,900	$31,900	$1,275,998
Security Enhancement Projects	$675,000	$17,163	$17,163	$710,526
Acquire Snow Removal Equipment Phase II	$729,097	$19,187	$19,186	$767,470
Rehab TWY A, C, & J Design Only	$262,432	$13,812	N/A	$276,244
Airport Security Improvements Phase II	$407,370	$10,720	$10,720	$428,810
Rehab TWY A, C, & J Construction	$3,460,655	$95,807	$95,806	$3,832,268
Improve RWY 6/24 and RWY 16/34 EMAS Design	$1,666,300	$43,850	$43,850	$1,754,000
Rehab TWY A, C, & J Design Phase II	$88,437	$2,327	$2,327	$93,091
Rehab TWY A, C, & J Phase II	$3,092,337	$81,377	$91,377	$3,255,092
RWY 16/34 EMAS Construction	$13,433,000	$353,500	$353,500	$14,140,000
TWY H, B, & F Design Only	$973,750	$793,100	$793,100	$1,025,000
RWY 16/34 EMAS Construction	$14,275,800	$793,100	$793,100	$15,862,000
Wildlife Hazard Assessment Study	$65,325	N/A	$7,259	$72,584
ARFF Trucks (2)	$1,063,521	N/A	$118,169	$1,181,690
RPZ Obstruction Study	$281,250	N/A	$31,250	$312,500
ARFF Ancillary Equipment	$66,613	N/A	$7,402	$74,015
TWY H, B, & F Phase I	$2,751,427	$152,507	$153,207	$3,057,141
RPZ Environmental Assessment	$366,750	N/A	$40,750	$407,500
Airport Master Plan	$781,074	N/A	$86,786	$867,860
Sub-Total	**$49,220,894**	**$2,538,350**	**$2,963,359**	**$53,358,854**
New Jersey Department of Transportation Grants				
Project Name	FAA Cost	NJDOT Cost	TTN Cost	Total Cost
TWY A, C, & D	N/A	$1,485,000	$165,000	$1,065,000
Acquire and Install Wildlife Fencing	N/A	$71,250	$3,750	$75,000
Acquire CCTV Security Surveillance System	N/A	$1,485,000	$165,000	$1,650,000
Airfield Marking	N/A	$285,000	$15,000	$300,000
Airport Security Fencing	N/A	$1,377,542	$74,402	$1,450,044
Rehab of TWY H, B, & F Phase I and II	N/A	$2,500,000	$141,578	$2,641,578
Rehab of TWY H, B, & F Phase III	N/A	$1,377,542	$74,402	$1,451,944
Sub-Total	**N/A**	**$7,096,334**	**$474,132**	**$7,568,566**

Source: FAA Grant history

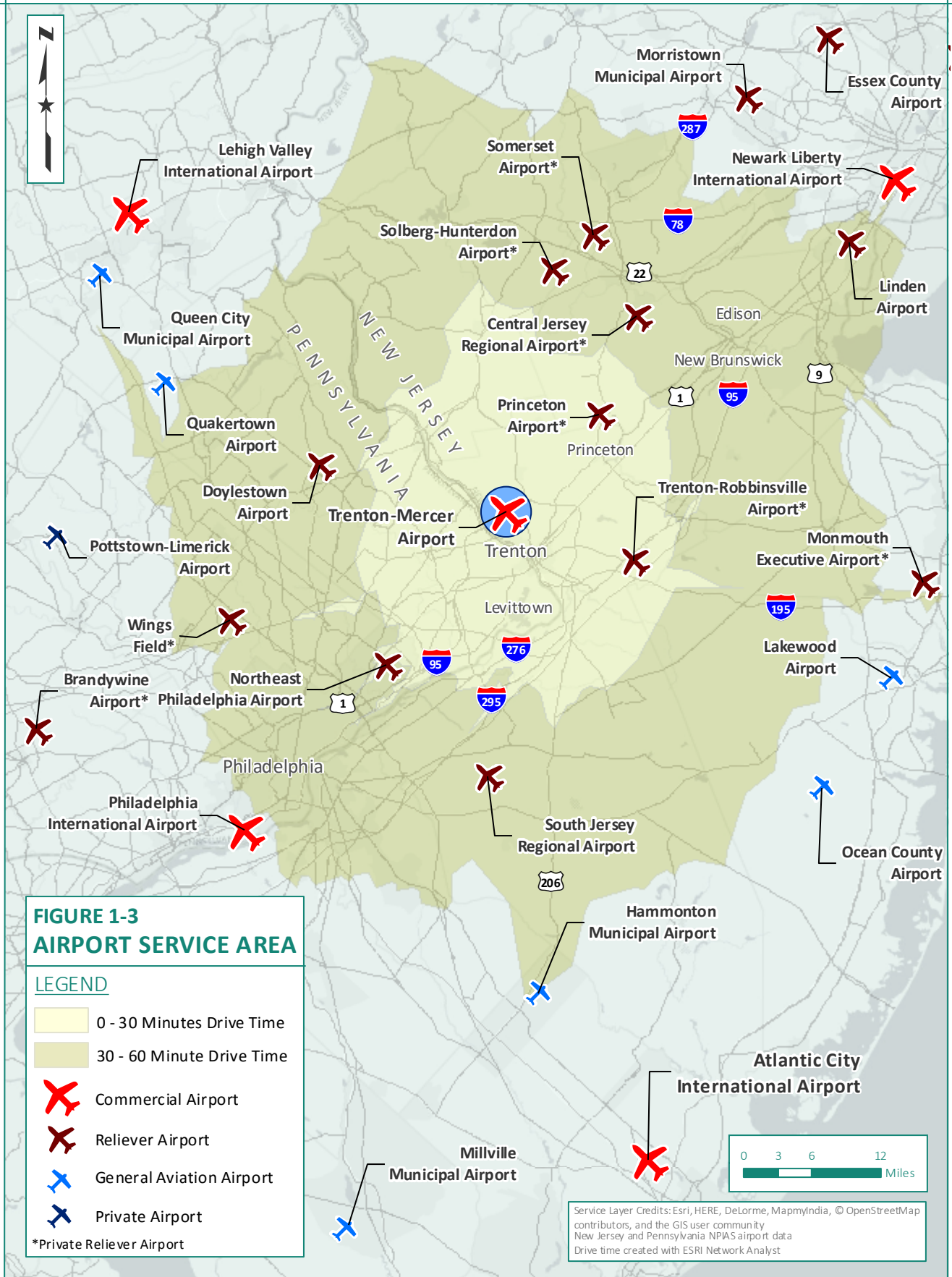

FIGURE 1-3
AIRPORT SERVICE AREA

LEGEND

- 0 - 30 Minutes Drive Time
- 30 - 60 Minute Drive Time
- Commercial Airport
- Reliever Airport
- General Aviation Airport
- Private Airport

*Private Reliever Airport

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1.2.4. Scheduled Airlines

Frontier Airlines was the sole airline serving the Airport prior to fall 2016; it began service in November 2012 with two weekly flights to Orlando, Florida. The number of weekly scheduled flights quickly increased to 75, and has presently stabilized to range between 50 flights and 70 flights per week to the following destinations depending on the season:

- Orlando,
- Fort Myers,
- Chicago (seasonal),
- Charlotte (seasonal),
- Raleigh/Durham (seasonal),
- Detroit (seasonal), and
- Atlanta (seasonal).

Allegiant Airways added service to 4 Florida destinations from the Airport in the fall of 2016.

Travel distances and times to airports in the region influence the size of an airport's air service area, as do competitive features with respect to flight schedules, frequencies, and destinations. Costs of ground travel including tolls and auto parking rates also affect user choices, particularly in multiple choice airport situations as is the case in this area of New Jersey between Philadelphia and New York/Newark.

In May 2013, six months after initiating service, a review of one week of data indicated that the passenger booking behavior is generally consistent with the drive times depicted in the airport service area figure. **Figure 1-4** displays the Frontier booking data sample based on the home zip code of passengers enplaning on Frontier Airlines' flights.

1.3. AIRSIDE FACILITIES

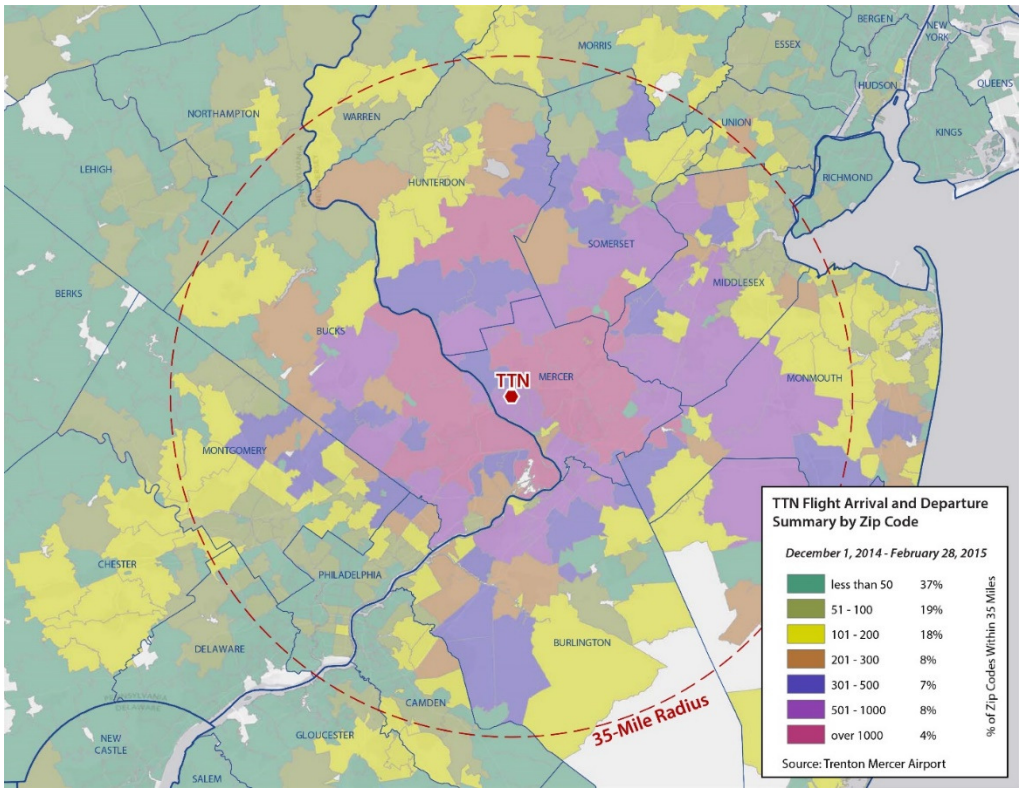
Discussion of airport facilities in this report will be divided into airside, landside, and building sections. Airside facilities are associated with the taxiing, takeoff, and landing of aircraft, (i.e., the airfield and its components). The airfield facilities discussed are the following:

- Runways
- Taxiways
- Airside Pavement Condition
- Visual and Navigational Aids

1.3.1. Runways

Trenton-Mercer Airport has two grooved asphalt runways; Runway 6-24 is the primary runway and Runway 16-34 is the crosswind runway. Additionally, TTN has three asphalt helipads which are each 64 feet wide and long.

Figure 1-4: Passenger Booking Summary by Zip Code



Source: UrbanEngineers.

Runway 6-24

Runway 6-24 measures 6,006 feet long and 150 feet wide and is aligned in a northeast to southwest direction. Runway 6-24 has grooved asphalt pavement, which is in good condition as shown on FAA Form 5010-1. As the primary runway, it supports all airport users and aircraft types.

Runway 6-24 is equipped with high intensity runway edge lights (HIRL). In addition, Runway 6 is equipped with a medium intensity approach lighting system with runway alignment indicator lights (MALSR). Runway 24 is equipped with a 4-light precision approach path indicator (PAPI) with a standard three-degree glide path. The Runway 24 PAPI glide path is not coincident with the non-precision glide path.

Runway 6 has a precision instrument landing system (ILS) approach. Approach visibility minimums are ½ mile horizontally at a decision height/cloud ceiling of 414 feet. Runway 24 is equipped with runway end identifier lights (REIL) and has a non-precision approach with visibility minimums down to 1¼ miles. There is engineering materials arresting system (EMAS) beyond each runway end.

Runway 16-34

Runway 16-34 is 4,800 feet long and 150 feet wide and is aligned in a north to south direction. Runway 16-34 has grooved asphalt pavement, which is in good condition as shown on FAA Form 5010-1. This runway is the crosswind runway.

Runway 16-34 is equipped with HIRL. In addition, Runways 16 and 34 are equipped with REIL and non-precision approaches down to one (1) mile visibility. Both runway ends are equipped with a 4-light PAPI with a standard three-degree glide path. There is an EMAS beyond each runway end. The Runway 16 glide path is not coincident with the non-precision approach glide path.

Helipads

Helipads H1, H2, and H3 are all 64 by 64 feet wide, of asphalt construction, in good condition, and with standard left traffic patterns. Helipad H1 is located at the intersection of Taxiways A and H near the general aviation apron. Helipad H2 is located at the northeast end of Taxiway B near Runway 24 and the New Jersey State Police hangar. Helipad H3 is located on the south (general aviation) apron at Taxiway F.

1.3.2. Taxiways

Trenton-Mercer has nine taxiways designated A through J (with the exception of "I" due to potential numerical confusion). Each of the taxiways is constructed with asphalt and display standard yellow taxiway markings. All taxiways are lit with blue omnidirectional Medium Intensity Taxiway Lights (MITL).

Taxiway A is 75 feet wide and connects the north general aviation parking apron with the terminal building ramp and connects to Taxiway F near the south general aviation parking apron.

Taxiway B is 75 feet wide and serves as a partial parallel taxiway to Runway 24. It connects to the New Jersey State Police hangar and provides access to the Runway 24 threshold.

Taxiway C is 75 feet wide and provides access to the corporate aviation hangars.

Taxiway D is 50 feet wide and serves as a partial south parallel taxiway to Runway 34.

Taxiway E is 75 feet wide and serves as a partial north parallel taxiway to Runway 34. It provides access to the New Jersey National Guard and New Jersey State Police apron areas.

Taxiway F varies in width between 50 and 80 feet and connects the north and south general aviation ramps while paralleling a portion of Runway 6-24.

Taxiway G is 75 feet wide and serves as a partial south parallel taxiway to Runway 16.

Taxiway H is 75 feet wide and serves as a partial north parallel taxiway to Runway 16 and provides access from the north general aviation apron to the Runway 16 threshold.

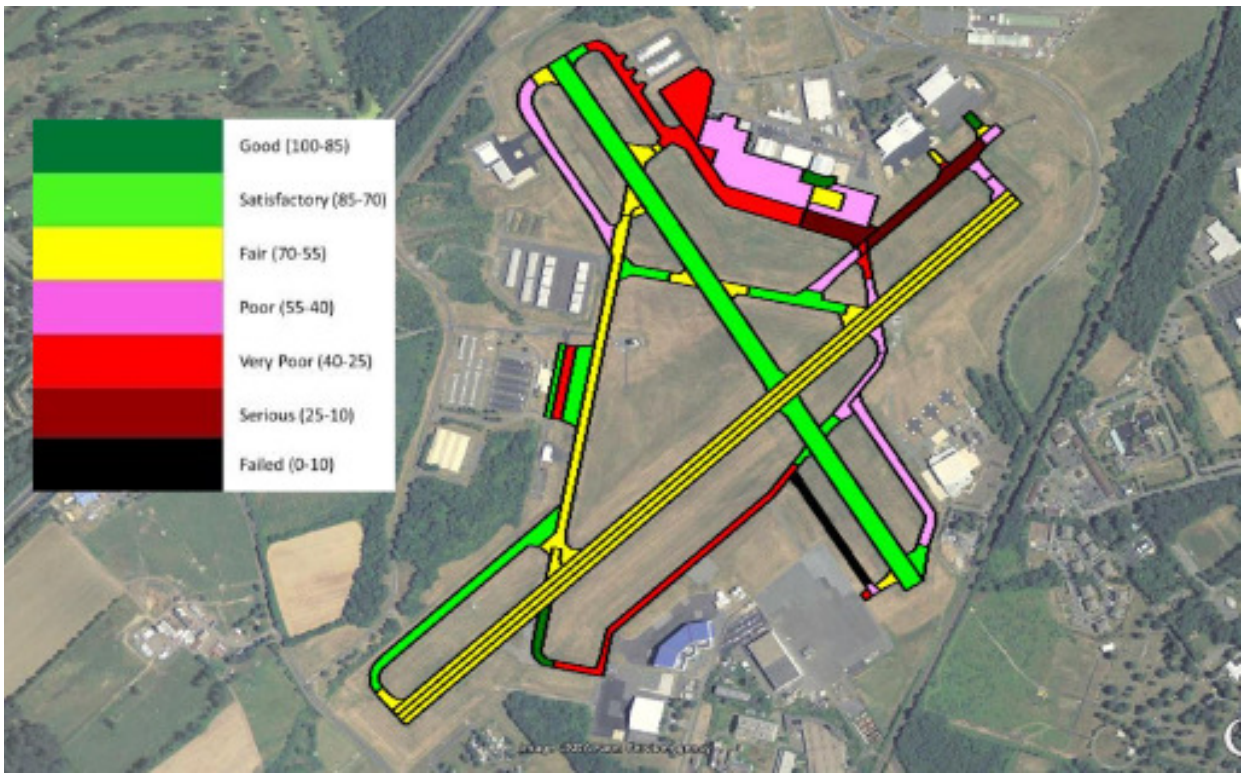
Taxiway J is 75 feet wide and serves as a partial parallel taxiway to Runway 6.

1.3.3. Airside Pavement Condition

Airfield pavements were evaluated as to their condition in 2014 for the New Jersey Department of Transportation. **Figure 1-5** provides an effective means to describe the condition of these pavements and their associated pavement condition index (PCI), which is a numerical grade used as an industry standard. The rating for **Figure 1-5** is the PCI scale as used in ASTM D5340-12.

Overall, the pavements at the Trenton-Mercer Airport are in fair condition, with an average PCI of 58. The pavements exhibit varying degrees of longitudinal and transverse cracking, alligator cracking, and block cracking in those sections constructed of asphalt concrete. Portland cement concrete pavement sections predominantly exhibit linear cracking and joint seal damage as the predominant distress. **Table 1-2** summarizes the pavement condition as a percentage of the airport as a whole; details of the pavement condition evaluation may be obtained from the New Jersey Department of Transportation and will be utilized as input to the capital improvement program for the airport developed as part of the Airport Master Plan.

Figure 1-5: Pavement Condition Index Map



Source: Pavement Condition Index Report, New Jersey Department of Transportation (Nov. 2014).

Table 1-2: Airfield Pavement Conditions

Condition	Percentage of Total Pavement	Predominant Areas
Good	2	Sections of some taxiways/taxilanes
Satisfactory	28	Runway 16-34; certain taxiways
Fair	33	Runway 6-24*
Poor or Worse	37	Certain taxiways and aprons

* FAA Form 5010-1 accessed in Sep. 2015 states Runway 6-24 pavement is in good condition.
Source: Pavement Condition Index Report, New Jersey Department of Transportation (Nov. 2014).

It should be noted that Taxiways B, F, and H, which are shown as being in very poor to serious conditions, are currently undergoing rehabilitation.

1.3.4. Navigational Aids (NAVAIDs)

Navigational aids (NAVAIDs) are any electronic or visual devices, airborne or on the ground, which provide point-to-point guidance information or position data to aircraft in flight. All local traffic is controlled by the FAA ATCT, which is operational between 6 AM and 10 PM local time per day. Trenton-Mercer has several electronic and visual NAVAIDs that pilots use to locate, navigate to, and land at the airport.

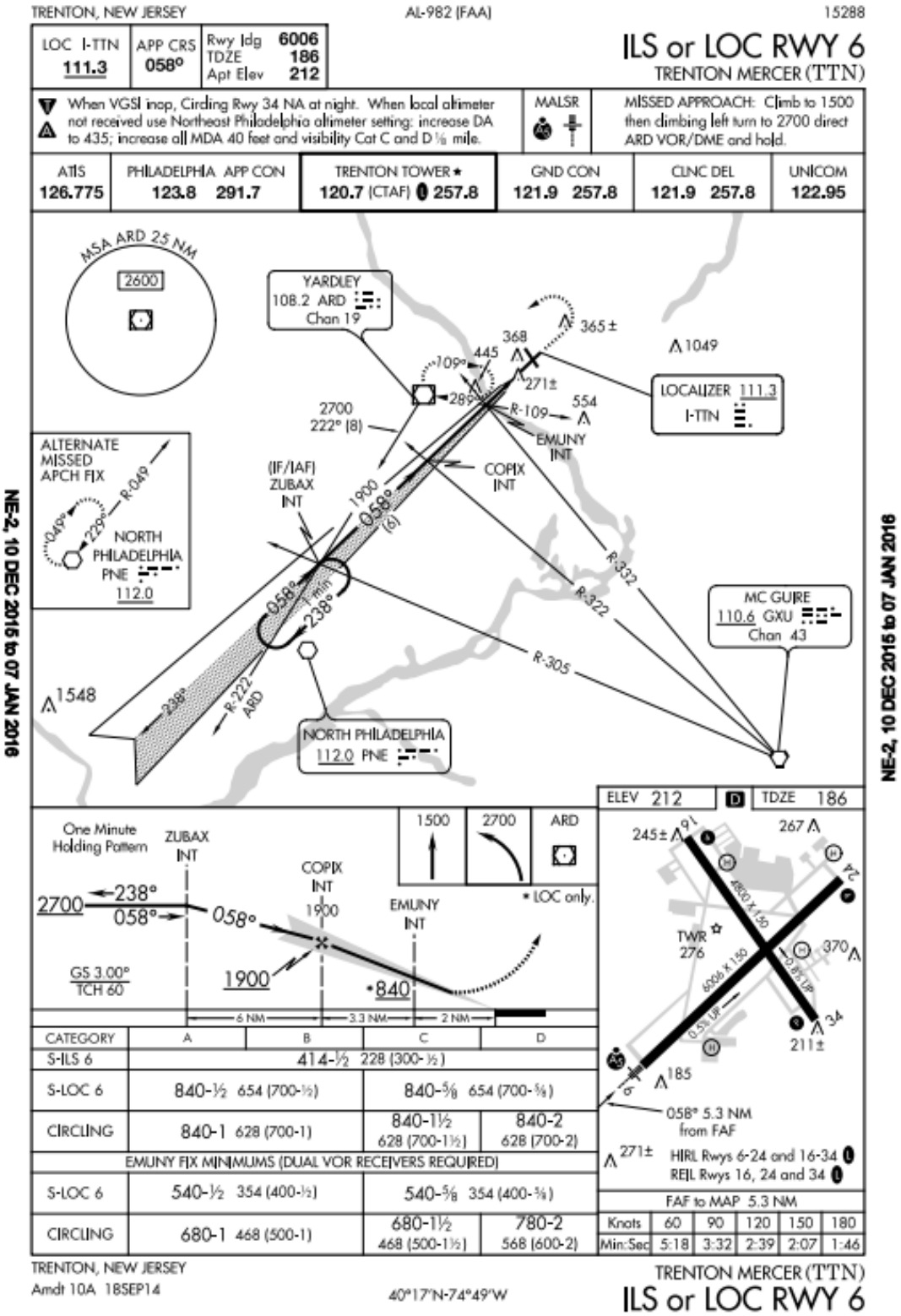
Instrument Landing System (ILS)

An ILS provides horizontal and vertical guidance to a runway end, which allows pilots to land aircraft when visual navigation is limited. The ILS is used in poor weather with low visibility conditions. Currently, Runway 6 at TTN has a precision instrument approach procedure. These are the lowest minimums a pilot approaching Runway 6 can land at Trenton-Mercer. The minimums for the Runway 6 approach are a decision height/cloud ceiling of 414 feet and a runway visual range (RVR) of approximately 1,800 feet or ½ mile visibility.

The electronic components that comprise the ILS are the localizer, glide slope, outer marker, and middle marker. The localizer signal is used to establish and maintain the aircraft's horizontal position until visual contact confirms the runway alignment and location. The glide slope is an electronic transmitter that emits signals used to establish and maintain the aircraft's descent rate until a pilot can visually confirm the runway alignment and location. The outer marker radiates a signal that marks the point at which glide slope altitude is verified or at which descent without glide slope is initiated. The middle marker radiates a signal that marks the decision point of the ILS approach.

Approach lighting systems are often used in conjunction with an ILS to assist pilots transitioning from instrument to visual conditions. Runway 6 is equipped with a MALSR. The medium intensity approach lighting system (MALS) portion is a series of steady burning light bars that begin at the runway threshold and extend outward 1,400 feet into the runway approach area along the extended runway centerline. The runway alignment indicator lights (RAIL) portion of the system is a series of single flashing lights that extend outward an additional 1,000 feet. The Runway 6 ILS approach procedure is shown in Figure 1-6.

Figure 1-6: Runway 6 ILS Approach Procedure



Source: FAA Terminal Procedures as of 10 Dec. 2015.

GPS/RNAV Approaches

At Trenton-Mercer, pilots can use Global Positioning System (GPS) equipment. GPS approaches are provided by satellite navigation systems. GPS utilizes range measurements from 30 satellites to determine an aircraft's position anywhere in the world. An aircraft must be properly equipped with antennas and receiver-processors in order to receive positioning, velocity, and timing from the satellites. The GPS approaches published for TTN offer a wide variety of minimums based on the type of approach and aircraft category flying. Minimums range from that of the ILS up to what is essentially visual flight rules (VFR) (1,000 feet ceilings and 3 miles visibility).

There are five published GPS instrument approach procedures to Trenton-Mercer. All published approaches, including height above touchdown, and visibility minimums are shown in **Table 1-3**.

Table 1-3: Instrument Approach Procedures

Runway End	Type Approach	Approach Minima
Runway 6	ILS or LOC	300-½
Runway 6	RNAV (RNP) Y	300-½
Runway 6	RNAV (GPS) Z	200-½
Runway 24	RNAV (RNP) Y	500-1½
Runway 24	RNAV (GPS) Z	400-1¼
Runway 16	RNAV (GPS)	300-1
Runway 34	RNAV (GPS)	300-1

Source: FAA Terminal Procedures 17 Sep. 2015 to 15 Oct. 2015.

Very High Frequency Omni-Directional Range (VOR)

A VOR is a system radiating very high frequency (VHF) radio signals to compatible airborne receivers. It gives pilots a direct indication of bearing relative to the facility. The VOR facility near Trenton-Mercer is the Yardley VOR-DME located 5 miles north of the airport. The DME (distance measuring equipment) provides pilots with a slant range of measurements of distance to the runway in nautical miles. It is a terminal area or en route navigation facility that provides the pilot with a direct readout indication of aircraft distance from the identified. Near Trenton, the DME is co-located with the VOR and has the following restrictions.

The VOR portion is unusable between 200 and 265 degrees beyond 17 nautical miles (NM) below 2,500 feet, between 266 and 280 degrees beyond 10NM, between 281 and 300 degrees beyond 17 NM below 3,000 feet, and between 300 and 353 degrees below 5,000 feet. The DME portion is unusable between 225 and 275 degrees beyond 15 NM below 2,400 feet and beyond

30 NM below 5,000 feet. The VOR/DME is unusable at 178 degrees beyond 5 NM and between 230 and 238 degrees beyond 8 NM below 3,000 feet.

There is one VOR/GPS-A approach to TTN, which has the following minimums: 700-foot cloud ceiling/decision height and one mile visibility for category A and B aircraft only; a decision height of 700 feet and 1 ½ mile visibility for category C aircraft; and a decision height of 780 feet and two-mile visibility for category D aircraft.

Automated Surface Observing System (ASOS)

Weather reporting equipment at Trenton-Mercer consists of an ASOS located near the ATCT. An ASOS provides continuous minute-by-minute observations and performs basic observing functions necessary to generate an aviation routine weather report (METAR) and other aviation weather information. An ASOS has the capability to report altimeter, wind, temperature/dew point, density altitude, visibility, clouds/ceiling, precipitation, and remarks.

Visual Approach Aids

Precision Approach Path Indicators (PAPIs) are lighting systems that provide pilots with visual decent guidance information during the approach to a runway. These lights are visible from three to five miles during the day and up to 20 miles or more at night. PAPIs have an effective visual range of approximately five miles during the day and up to 20 miles at night. There are three four-light PAPI units, which are located near Runways 16, 24, and 34.

There are two wind tees at the airport, which provide a visual indication where the wind is coming from and approximately how strong it is for visual approaches and while the airport is closed. The first is located near the Runway 24 end and near the Johnson and Johnson Aviation Division area. The second is midfield between the terminal apron and the runway intersection.

1.3.5. Obstruction Data

Each of the runways at the airport has multiple obstructions within their approach surface. The following main obstructions are published.

Runway 6: A tree 87 feet tall, 2,120 feet from the runway. The tree is located 790 feet right of the extended centerline and requires a 22:1 slope to clear it. A lighted pole 185 foot tall, which is located 100 feet from the threshold, 500 feet right of the extended runway centerline.

Runway 24: A tree 72 feet tall, 1,610 feet from the runway end, located 350 feet left of the extended runway centerline; it requires a 19:1 slope to clear it.

Runway 16: No main obstruction to the glide path is noted.

Runway 34: A tree 11 feet tall, 323 feet from the runway, located 254 feet right of the extended runway centerline; it requires a 10:1 slope to clear it.

A detailed obstruction study is currently being prepared by the airport to identify and develop a plan for mitigating obstructions with additional obstruction information contained in the inner approach drawing in the airport layout plan drawing set of this master plan.

1.4. GENERAL AVIATION

Landside facilities support the many activities and services involved in storing and maintaining aircraft before and after use of the airside facilities. Typical landside facilities include aircraft hangars and aprons, aviation fuel facilities, and access roads. Well-maintained and affordable landside facilities are important to an airport's efficient operation and success. Landside facilities and services have been divided into the following categories and will be discussed in detail on the pages to follow:

- General Aviation
- Other Landside Facilities

1.4.1. General Aviation Tenants

GA landside facilities support both based and itinerant aircraft operations (except airline) at Trenton-Mercer. Components of general aviation landside facilities include Fixed Base Operator (FBO) facilities, conventional and T-hangars, apron areas, and automobile parking areas. GA is comprised of all flying with the exception of military and commercial service. GA users include individuals flying for business or personal reasons, flight training, and corporate flight departments that base their operations at the airport.

Signature Aviation

Signature Aviation is a nationwide FBO. Its Trenton location offers the following services:

- Fuel: Avgas and Jet A
- Ground handling
- De-icing
- Aircraft charter
- Maintenance
- Gourmet catering
- On-site rental cars
- Other services: quick-turn, lavatory, potable water, oxygen/nitrogen, concierge, international trash removal, and ramp-side vehicle access

Signature Aviation has aircraft handling capabilities of general aviation aircraft up to a Boeing 757. It has a ground power unit (GPU), tug, forklift, and de-icing equipment.

ATP Flight School

ATP Flight School provides flight training at Trenton-Mercer Airport. It provides flight training starting with the private pilot's license all the way up to the required training for commercial and regional jet jobs. Flight training is conducted either in simulators or in a Cessna 172, Diamond DA40 with glass cockpit, or Piper Seminole (for multi-engine training). ATP also offers an airline career pilot training program, which includes the private pilot's license, instrument rating,

nationwide cross-country flying, multi-engine rating, commercial pilot's license, certified flight instructor license, and a guaranteed job as a flight instructor. Another option ATP offers is the multi-engine instructor rating. ATP Flight School prides itself in pilot training and connections within regional airlines for its graduates. Since 2002 it has posted all ATP graduates who have been hired and by what airline they have been hired.

Infinity Flight Group

Infinity Flight Group provides flight training, aircraft rental, charter, management, and maintenance services as Trenton-Mercer Airport. It offers the following flight training opportunities: private pilot's license, instrument rating, commercial pilot's license, multi-engine pilot's license, certified flight instructor license, certified flight instructor-instrument rating, and multi-engine flight instructor rating. It has a partnership with Mercer County Community College's Aviation program, a nationally accredited Part 141 program. Its fleet consists of Cessna 172, Piper Seminole, and Grumman AA-5 aircraft.

TAC Technical Instrument Corporation

TAC Technical Instrument Corporation manufactures ultrasonic inspection systems and supplies tube and bar inspections as well as consulting services.

Civil Air Patrol

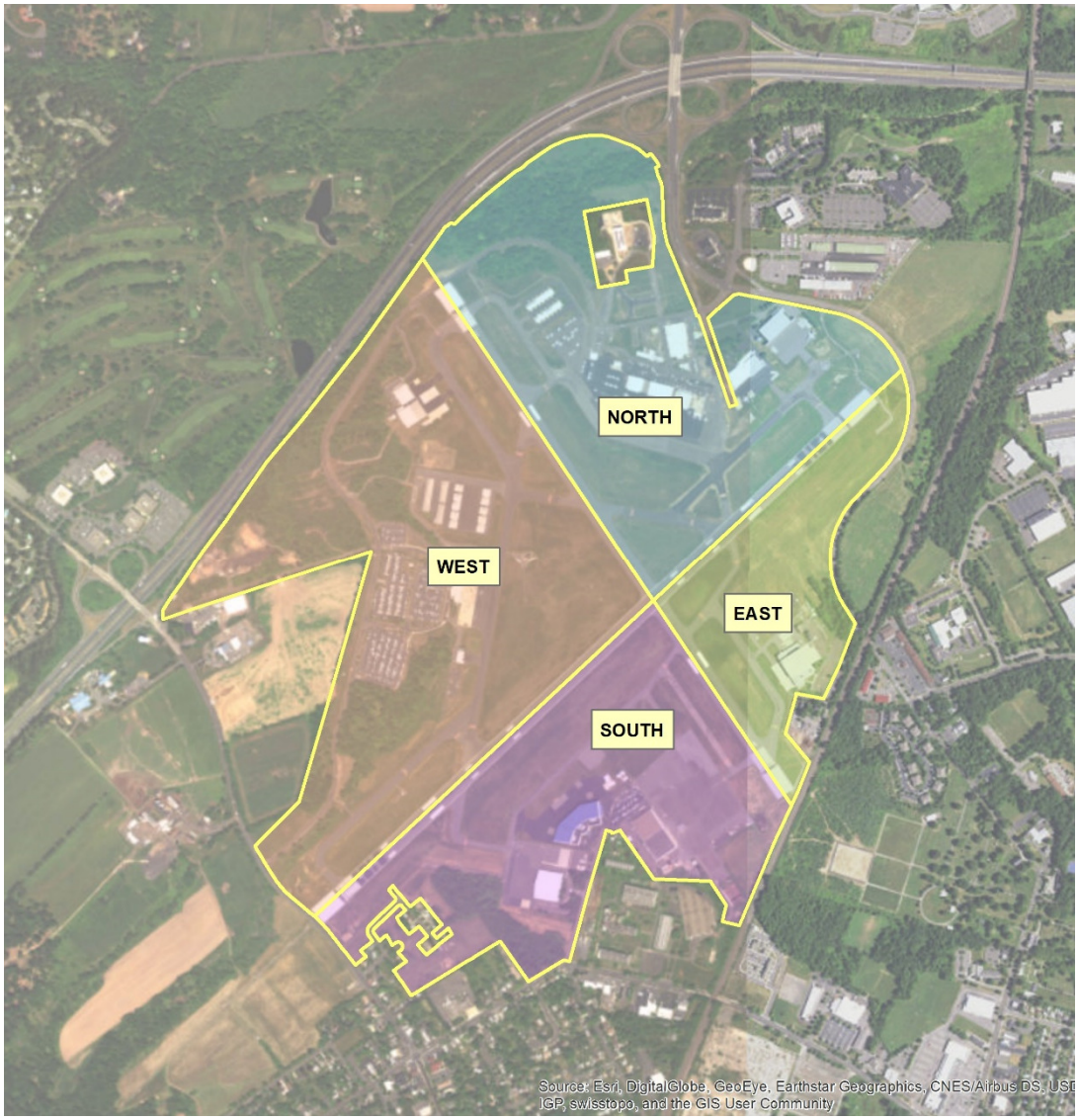
The Civil Air Patrol (CAP) has three primary missions: aerospace education, cadet programs, and emergency services. Aerospace education efforts focus on two different audiences: volunteer CAP members and the general public. The goal is to instill an appreciation for aviation and knowledge of aerospace issues. Cadet programs are youth programs (age 12-21) that include aerospace education, leadership training, physical fitness, and moral leaderships. Its mission of emergency services includes search and rescue, disaster relief, humanitarian services, Air Force support, and counterdrug programs.

1.4.2. General Aviation Buildings

The Airport was split up into quadrants based on the runway layout, as shown in **Figure 1-7**. Ratings were based on the following scale:

- **Excellent:** new, highly functioning, little to no maintenance requirements, no signs of aging.
- **Good:** meets needs, is functional, may need some updates to materials or components.
- **Fair:** starting to fail.
- **Poor:** functionally obsolete, outdated equipment, does not meet American's with Disabilities Act (ADA) minimum requirements, and has visible rust and/or missing components of the building.

Figure 1-7: Quadrant Map



Source: McFarland Johnson.

North Quadrant (Area bound by Runway 16 and Runway 24)

One of the primary general aviation terminal area facilities is located in the north quadrant of the airport and is accessed directly from East and West Piper Avenues. Sam Weinroth Road is aligned generally parallel to East and West Piper Avenues, which are accessed by South Cessna Avenue, Grumman Avenue, Boeing Avenue, and Lockheed Avenue.

The primary general aviation terminal buildings south of East and West Piper Avenues are assessed in Good functional condition. These include the conventional and T-hangars owned by Signature Aviation and individual corporate aircraft hangar owners. Above ground fuel tanks owned by Signature Aviation located west of the hangar restrict more efficient use of this land area.

There are several terminal area facilities without access to the airfield and north of East or West Piper Avenues that are used

for airport maintenance, the County Examiner's office, TAC Technical Instrument Corporation, the former Crest Ultrasonics building which now houses the Airport's detachment of the Mercer County Sheriff's office, and the Civil Air Patrol. Most of these buildings are in poor structural condition and are underutilized. Way-finding and vehicle circulation in this area of the airport is considered challenging for those unaccustomed to visiting this area of the airport. Consequently, the facilities in this area are assessed in Poor functional condition.

Aesthetically, the primary general aviation facilities are assessed as Good and appropriate for their uses. Those facilities north of either East or West Piper Avenues are unsightly, dilapidated, almost haphazardly positioned, and do not allow for clear lines of sight from Sam Weinroth Road to the primary general aviation facilities that should be the focus in the north quadrant of the airport. These facilities and the vehicular access are assessed as Poor, aesthetically.

West Quadrant (Area bound by Runway 6 and Runway 16)

A second primary general aviation terminal area is located in the west quadrant of the airport that houses a corporate aircraft hangar and a series of T-hangar facilities. Each has good access to the airfield. The corporate hangar is assessed in Excellent functional condition and the T-hangars are assessed as Good from a functional perspective.

South Quadrant (Area bound by Runway 6 and Runway 34)

A third primary general aviation terminal area is in the south quadrant of the airport. Hangar facilities located west of Jack Stephan Way are owned by corporate aircraft operators and have

good access to the airfield. These facilities are assessed as Excellent for functional condition.

The land area east of Jack Stephan Way is the former Naval Air Warfare Center Trenton hangar facility. It is in disrepair and not in use. The large apron area east of the hangar is serviceable and has good access to the airfield. Buildings and other structures south of the hangar are abandoned and have no access to the airfield. For these reasons, the overall functional condition assessment is Fair, provided that the hangar is rehabilitated or replaced and the land is evaluated for contaminants and judged safe for use.

1.4.3. State and Federal Government Terminal Area Facilities

The New Jersey State Police and Army National Guard are positioned in facilities in the east quadrant of the airport (the area bound by Runway 34 and Runway 24). Helicopter parking spots are convenient to a designated helicopter takeoff and landing area. The functional condition of these facilities is assessed as Good.

The United States Marines Reserve building is located in the north quadrant of the airport without access to the airfield and in an area of steep ground slopes. The building's functional condition is assessed as Good, and the facilities are well maintained.

1.4.4. Other Landside Facilities

Sky Lounge Restaurant is located in the terminal building and has sections both before and after security, to provide food and beverage services to anyone visiting the airport.

The following companies/organizations use Trenton-Mercer:

- New Jersey State Police
- New Jersey Air National Guard
- Johnson and Johnson Aviation Division
- U.S. Navy
- Mercer County Medical Examiner
- U.S. Marines Reserve
- Department of Public Works
- Pfizer
- Merck
- Crest-Ultrasonics

1.5. TERMINAL FACILITIES

An airport's airline terminal includes the passenger terminal building and the paved areas surrounding it on both the airside and landside.

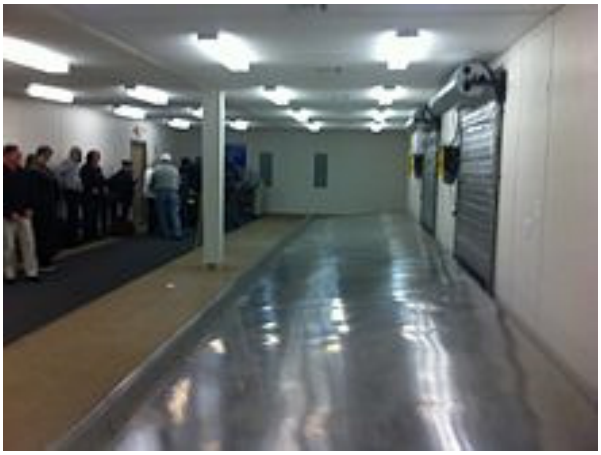
The terminal building facility functional areas have been assessed in relative terms as "Excellent," "Good," "Fair," or "Poor" as defined in Section 1.4.2. Other areas on airport property that are not directly utilized for aviation purposes will be reviewed in subsequent sections of the Master Plan report that address on-airport land use matters.

1.5.1. Terminal Area Facilities Condition Assessment

Passenger Terminal Building Complex

The passenger terminal complex is located in the western quadrant of the Airport and comprises the terminal building and adjacent automobile parking area and primary vehicular access route.

The passenger terminal building is a 24,780 SF facility, with an assessment of poor functional use, due to congestion during peak hours of activity and passenger flow. Deplaning passengers are required to bypass the interior of the building and to then re-enter to gain access to the baggage claim area located inside the building. The baggage claim area is not served with



restrooms, however an expansion to the baggage claim facility that will include restrooms is being constructed in 2017.

The passenger terminal building portrays a dated, negative impression to users from an aesthetics viewpoint; its overall design and use, passenger flow, and its function as the primary air gateway to the community would all rate poorly if measured against similar size and

function airports.

The airline aircraft apron immediately east of the passenger terminal building is assessed as Fair condition. New expansion joints are required where concrete meets bituminous pavement, and pavement markings are in need of restriping. The lack of a dedicated airport operations ramp area contributes to this apron area being cluttered with ground service equipment.

Vehicular access to the passenger terminal is via Bear Tavern Road at the intersection with Sam Weinroth Road that leads to the passenger terminal complex. Signage on Bear Tavern Road does not provide sufficient advance notice of the pending turn onto Sam Weinroth Road. Traffic approaching from the northwest routinely incurs delays when turning left onto Sam Weinroth Road during peak operating periods as a result of traffic leaving portions of Ewing Township and the City of Trenton to the east that are bound for Interstate 95. Therefore, the primary vehicular access functional condition is assessed as Fair.

From a wayfinding perspective, the primary access road is assessed as Fair owing to the relatively small signage, both directional and promotional, and its placement as passengers and visitors enter the Airport terminal complex.

The main automobile parking area west of the passenger terminal building is assessed as Good on a functional basis. The areas for public parking and the cell phone waiting lot are adequately signed to indicate space availability.

Auto Parking Facilities

There are three public parking lots that are connected and within five minutes walking distance of the passenger terminal building, refer to **Table 1-4**. Two of the lots share the same revenue control (automated toll facilities) and the third is just to the south, across from Terminal Circle Drive. All lots are patrolled by the Mercer County Sheriff's Office. There is an additional employee parking lot to the north of the public parking lot that holds 119 vehicles.

Table 1-4: Auto Parking Facilities

Lot	Size (acres)	Handicapped Parking Spaces	Regular Parking Spaces
Main Lot – East	2.7	40	248
Main Lot – West	3.1	0	314
Secondary Lot (south of Main Lots)	3.7	0	532

Ground Access and Circulation

Sam Weinroth Road provides access to Trenton-Mercer's terminal area and Terminal Drive, which serves as the circulation road. Sam Weinroth Road provides access on the south from Bear Tavern Road, which connects to Interstate 95 and on the north from Scotch Road.

Ground Transportation

New Jersey Transit connects the Trenton Train Station to New York City for approximately $16. The Southeastern Pennsylvania Transportation Authority (SEPTA) connects Trenton and West Trenton to Center City Philadelphia for approximately $11. There is no NJ Transit bus connection between the Airport Terminal and the West Trenton SEPTA station.

1.6. SUPPORT FACILITIES

1.6.1. Aircraft Rescue and Firefighting (ARFF) Station

The County operates the aircraft rescue and firefighting station that is located south of the passenger terminal building. The County also maintains a vehicle lot adjacent to the Station that is used by the aircraft rescue and firefighting (ARFF) staff.

The fire station provides Index B service. Airports certificated under FAR Part 139 are required to provide ARFF facilities and equipment. The index is based upon the largest aircraft types using the airport and their frequency of operation.

Index B requirements consist of:

> One vehicle carrying at least 500 pounds of sodium-based dry chemical, halon 1211, or clean agent and 1,500 gallons of water and the commensurate quantity of AFFF for foam production.
>
> OR Two vehicles:
>
> One vehicle carrying the extinguishing agents as specified above; and
>
> One vehicle carrying an amount of water and the commensurate quantity of AFFF so the total quantity of water for foam production carried by both vehicles is at least 1,500 gallons.

The County has two 1,500-gallon ARFF vehicles and is expecting to take delivery of two new Rosenbauer vehicles in July of 2014. This meets Index B requirements.

The functional condition of the ARFF station is assessed as Good and is positioned to have the required response time to aircraft movement areas. Aesthetically, the station is assessed as Good, although the grassed areas need attention.

1.6.2. Airfield Maintenance

There is one maintenance building at TTN located on the north general aviation apron. This building houses the snow removal equipment as well as maintenance and mowing vehicles.

1.6.3. Airport Utilities

The airport's utilities infrastructure consists of the following:

- **Electric/natural gas**: Public Service Electric & Gas, or PSE&G
- **Water**: Trenton Water
- **Telephone/Cable:** Verizon and AT&T
- **Stormwater and Sewer**: This empties into the municipal treatment plant

Deficiencies and necessary utilities for new/expanded airport facilities are discussed in the facility requirements chapter.

1.7. SECURITY

Airport security for both passengers and the airport itself is regulated by Transportation Security Regulations (TSR) 1542. Although many of the commercial service airport security procedures are confidential, general information regarding airport security can be documented. The TSA is responsible for providing passenger and baggage screening services. Some of TTN's security measures include enforcement of the Secure Identification Display Area (SIDA). Anyone entering the SIDA must have proper identification and be "badged" accordingly. In addition, there are numerous gates and fences on and around the airport, as well as security signage displayed throughout airport property. Patrols by law enforcement also help to maintain a secure environment.

1.7.1. Passenger Screening

All departing passengers are required to pass through the security screening checkpoint located in the passenger terminal. Passengers are screened with either a magnetometer or Advanced Imaging Technology machine. All carry-on baggage is screened through an enhanced imaging x-ray device. Restrictions on what may be transported by passengers through the checkpoint such as liquids, gels, and aerosols, is subject to change; a list of the most current restrictions can be found on the TSA website.

1.7.2. Airport Operations Area Gates

Security controls at airports are typically encountered by passengers and other users of the airport within the passenger terminal building. However, airports occupy large land areas and are equipped with access gates used by airport staff and emergency response units. Two airport operations area gates were assessed as Fair, and this assessment applies to all such

gates at the Airport. The type of gates employed are vulnerable to vehicles that can achieve high rates of speed to crash through the facility and gain access to high security areas on the airport property.

In 2015, the Airport undertook a perimeter security and wildlife fence replacement project. A portion of the Airport's perimeter fencing (20,000 linear feet) will be replaced with black vinyl clad, 10-foot high fence with barbed wire. Ten gates are also being replaced with the project for a final count of 14 gates. No AIP funds were used for this construction.

1.8. LAND USE AND ZONING

1.8.1. Airport Land Use

There is a mixture of land uses that makeup the airport and its surroundings. The airport property is comprised of Transportation, Communication, and Utilities, Other Urban or Built-up Land, Commercial and Services, Recreational Land, Agriculture, Barren Land, Forest, Water, and Wetlands land uses. In addition to the land uses that makeup the airport, the adjacent properties surrounding the airport have such land uses as, Industrial and Residential. Refer to **Figure 1-8** for the Airport Land Use Map.

1.8.2. Airport Zoning

The airport is located in the Industrial Park and Conservation Zoning Districts of the Ewing Township and the Office Park Zoning District of the Hopewell Township. Surrounding the airport is the zoning districts are Neighborhood Business, Highway Business, Residential, and Office Park in Ewing Township and Office Park in Hopewell Township. Refer to **Figure 1-9** for Airport Zoning Map.

Applicable Ewing Township Zoning Districts as defined:

Industrial Park (IP-1): is a multi-use zone, with such uses as manufacturing, structures and uses for research and engineering, office buildings, radio or broadcasting stations, animal hospitals kennels, farm uses, public safety facilities, child-care, highway business hotels, and indoor recreational facilitates and health clubs.

Conservation (C): is a district for public, instructional, agricultural, recreational uses that are owned and operated by federal, state, county, or local government.

Neighborhood Business (B-N): is a zone with a variety of shops, businesses, and services, such as bakeries, banks, barbers, gift shops, child-care, dry cleaners, tailors, dance studios, libraries, and offices, business, and professional uses.

FIGURE 1-8
AIRPORT LAND USE

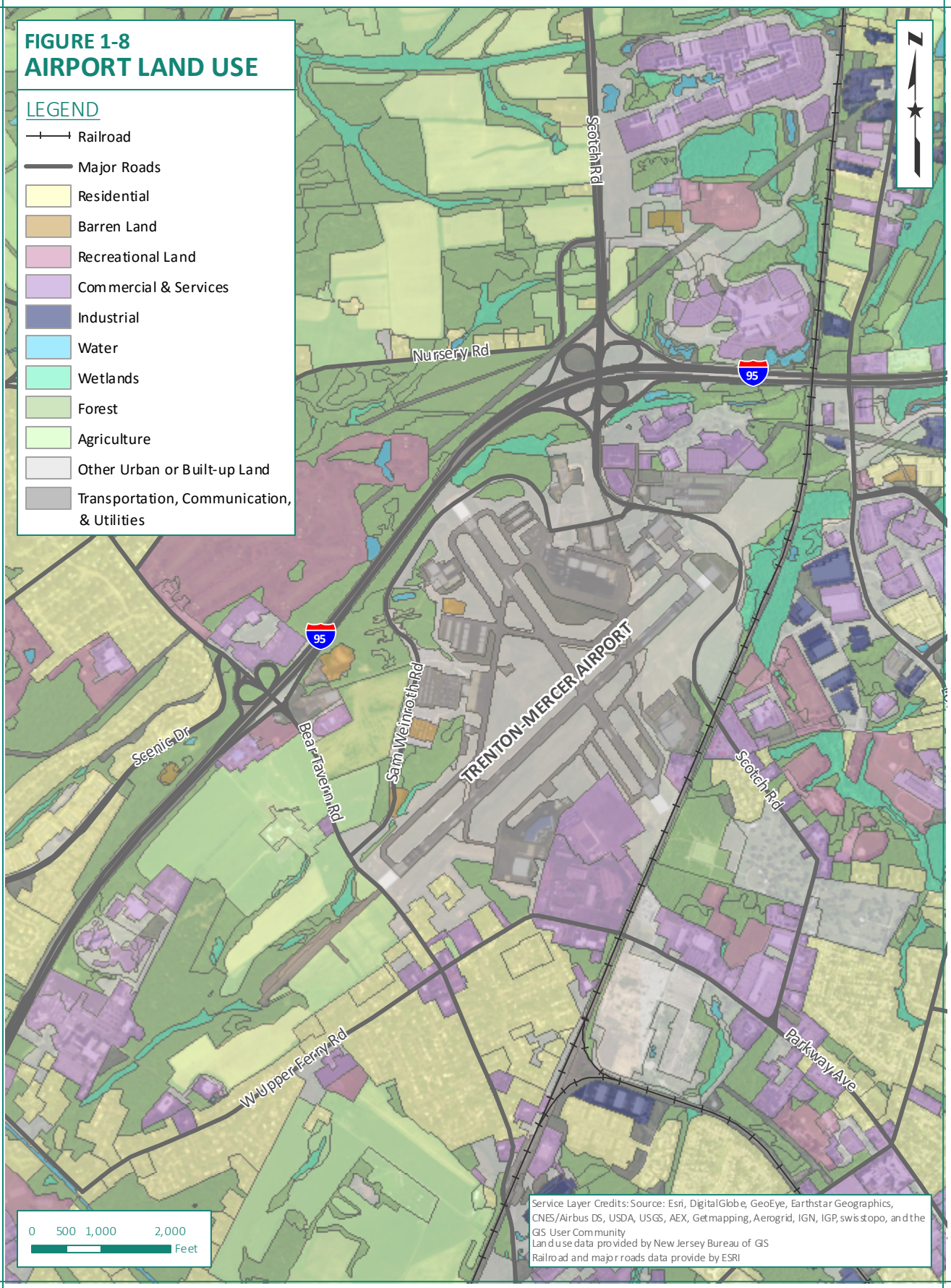


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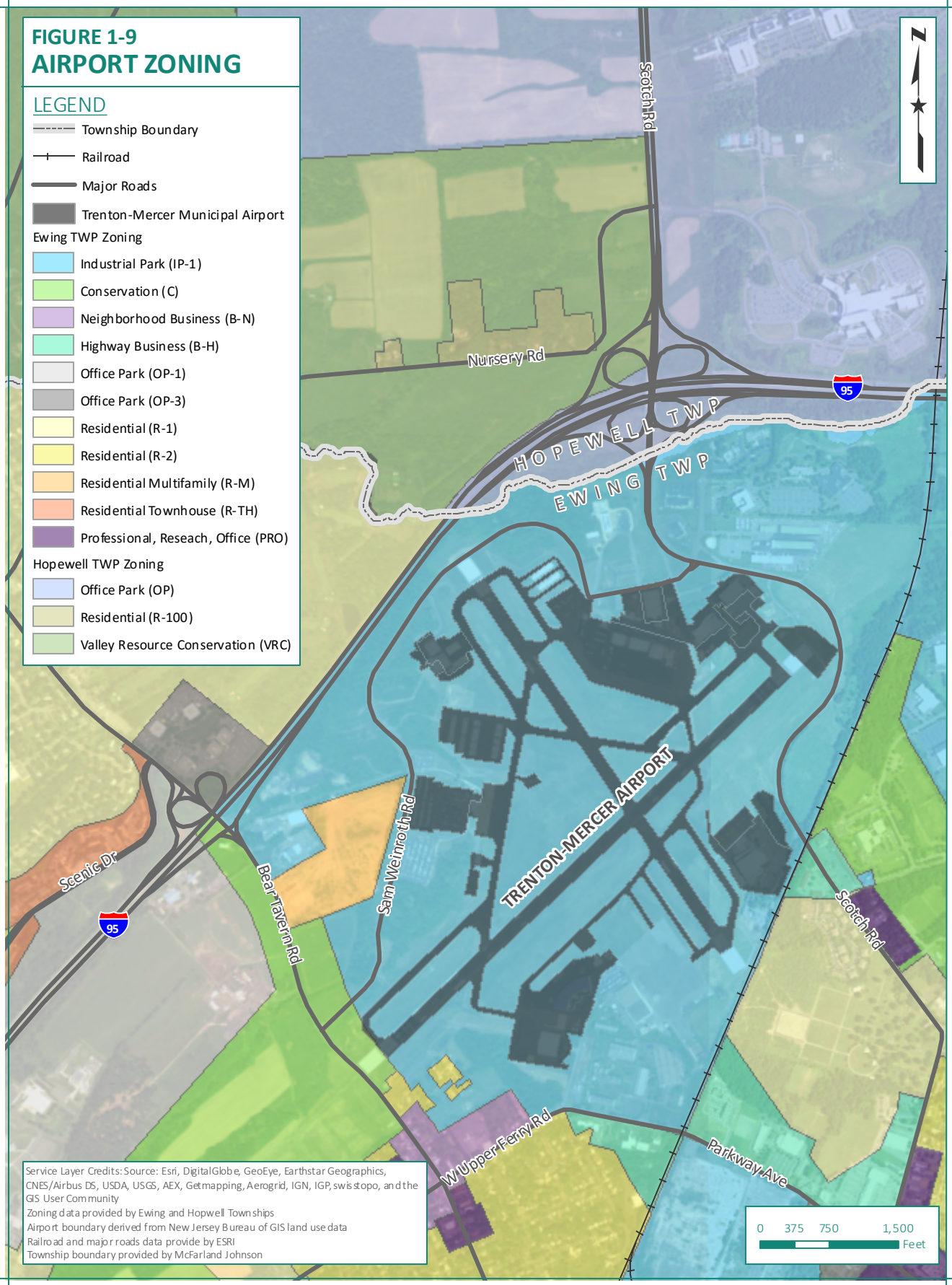
FIGURE 1-9
AIRPORT ZONING



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Highway Business (B-H): is similar to B-N, there are a variety of shops, businesses, and services that are permitted in this zone, such as automobile repair shops and showrooms, bowling alleys, business colleges, woodworking shops, catering, hardware stores, grocery stores, motels, nursing homes, shopping centers, trade schools, and hospitals.

Office Park (OP-1): permits single company office buildings, structures and uses for research and engineering, and child-care.

Residential (R-1): is a zone that permits single-family detached dwellings, farm and agricultural uses, golf courses, public parks, public safety facilities, cemeteries, and community residences.

Residential (R-2): is similar to R-1; however, the zone does not permit farm and agricultural uses and golf courses.

Residential Multifamily (R-M): permits apartments, condominiums, townhouses, cemeteries, and commercial and retail uses.

Applicable Hopewell Township Zoning District as defined:

Office Park (OP): permits office space, child care, hotel conference centers, retail, and recreational uses.

1.9. AIRSPACE AND AIR TRAFFIC CONTROL

Airspace in the United States is classified as controlled, uncontrolled, or special use. Controlled airspace is a generic term that covers the different classification of airspace (Class A, Class B, Class C, Class D, and Class E) and defined dimensions within which air traffic control (ATC) service is provided to instrument flight rules (IFR) flights and to VFR flights in accordance with the airspace classification. Uncontrolled airspace includes areas where ATC has neither authority nor responsibility to control aircraft. According to the Aeronautical Information Manual (AIM), special use airspace consists of airspace where activities must be confined because of their nature, or where limitations are imposed upon aircraft operations that are not part of the confined activities. Special use or restricted airspace is depicted on aeronautical charts unless it is the result of a controlled firing area. Special use areas are typically due to military training facilities.

1.9.1. Airspace Structure

Airspace in the United States is designated with the letters A through G (not including F). A summary of each of these types of airspace follows.

- **Class A:** All airspace above 18,000 feet MSL. Class A airspace contains all high-altitude airways (jet routes).

- **Class B:** Airspace from the surface to 10,000 feet MSL surrounding the nation's busiest airports in terms of IFR operations or passenger enplanements. Newark Liberty International (EWR) and Philadelphia International (PHL) Airports are the closest airports

to TTN surrounded by Class B airspace. Two other close Class B airspace airports are John F. Kennedy and La Guardia International Airports.

- Class C: Airspace from the surface to 4,000 feet above the airport elevation surrounding airports that have an operational control tower, are serviced by a radar approach control, and have a certain number of IFR operations or passenger enplanements. Greater Rochester and Syracuse Hancock International Airports are the closest airports to TTN that are surrounded by Class C airspace.

- Class D: The terminal area airspace surrounding non-hub commercial airports, such as Trenton-Mercer, with a radius of five statute miles. The airspace extends from the surface to a height of 2,700 feet above ground level (AGL) at TTN, which equates to an elevation of 2,900 feet above MSL. Within the Class D airspace, the TTN ATCT visually controls all air traffic arriving or departing the airport or transitioning the area. Aircraft within this area must establish two-way radio communication with the ATCT. When the ATCT is closed (between 10 PM and 6 AM local time) the airspace around TTN is Class E airspace.

- Class E: General and en route airspace that includes most of the remaining airspace not designated as A through D. In the Trenton region, the Class E airspace begins at 700 feet AGL and extends upward to the overlying Class A airspace. This airspace contains low altitude airways often called Victor Airways. Aircraft operating in this area must follow the general regulations for operating in controlled airspace.

- Class G: Uncontrolled airspace that exists between the ground and 700 feet AGL, beyond the limits of the TTN Class D area.

- Special Use Airspace: Alert area A-220 is located approximately 20 NM from Trenton-Mercer. It is associated with McGuire Air Force Base (AFB). A-220 is active daily from 0800 to 2200 hours local time from the surface to 4,500 feet MSL. There are also two restricted area within McGuire AFB's airspace: R5001 and R5002. Restricted area R5001A/B is the Fort Dix Artillery Range. It starts one nautical mile east of McGuire AFB and extends to nine nautical miles. It can be active from the surface to 8,000 feet MSL. Restricted area R5002 is an air-to-ground gunnery range. It is active from sunrise to sunset daily, from the surface to 14,000 feet MSL.

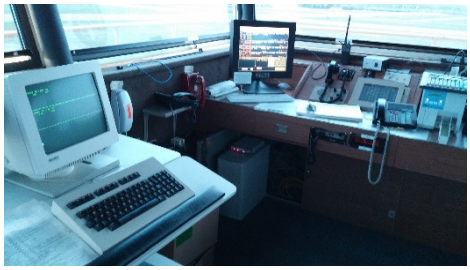
- En Route Airspace: Aircraft flying inbound to or outbound from TTN typically follow designated routes between ground based NAVAIDS. The primary en route NAVAID in this region is the Yardley VOR-DME, which is located approximately six nautical miles southwest of the airport

  These designated routes or airways have alphanumeric identifiers beginning with the letter V and are thus called Victor Airways. Several Victor Airways cross the Yardley VOR-DME, including V143, V147, V214, V276, V433, V445, and V479.

1.9.2. Air Traffic Control (ATC)

The ATCT at TTN is located near the terminal building ramp off of Taxiway A. TTN's ATCT is operational from 6 AM until 10 PM local time. New York Air Route Traffic Control Center (ARTCC) handles TTN's approach and departure operations during the overnight hours when the tower is closed.

The ATCT was constructed in 1961 and the presence of asbestos has been confirmed in certain spaces. Much of the equipment is functional, but does not meet current standards. There is a need for a field lighting panel, there is no elevator in the building structure, and the mechanical and equipment rooms are in need of updating. Line of sight to Taxiway J at the turn toward Runway 6 is obstructed. Functionally, the air traffic control is assessed in Poor condition. The facade of the ATCT is unsightly, as is the interior work and break areas.



Airspace Conflicts

The FAA has established planning specifications for evaluating potential airspace conflicts and to ensure safe and efficient aircraft operations. These guidelines are presented in FAA Order 7480-1A, Guidelines for Airport Spacing and Traffic Patterns. There are no airspace conflicts within the Trenton-Mercer Class D airspace.

Figure 1-10 displays the airspace structure for the TTN vicinity.

1.9.3. Standard Terminal Area Procedures (STARs) and IFR Alternate Airport Minimums

Standard Terminal Area Procedures (STARs)

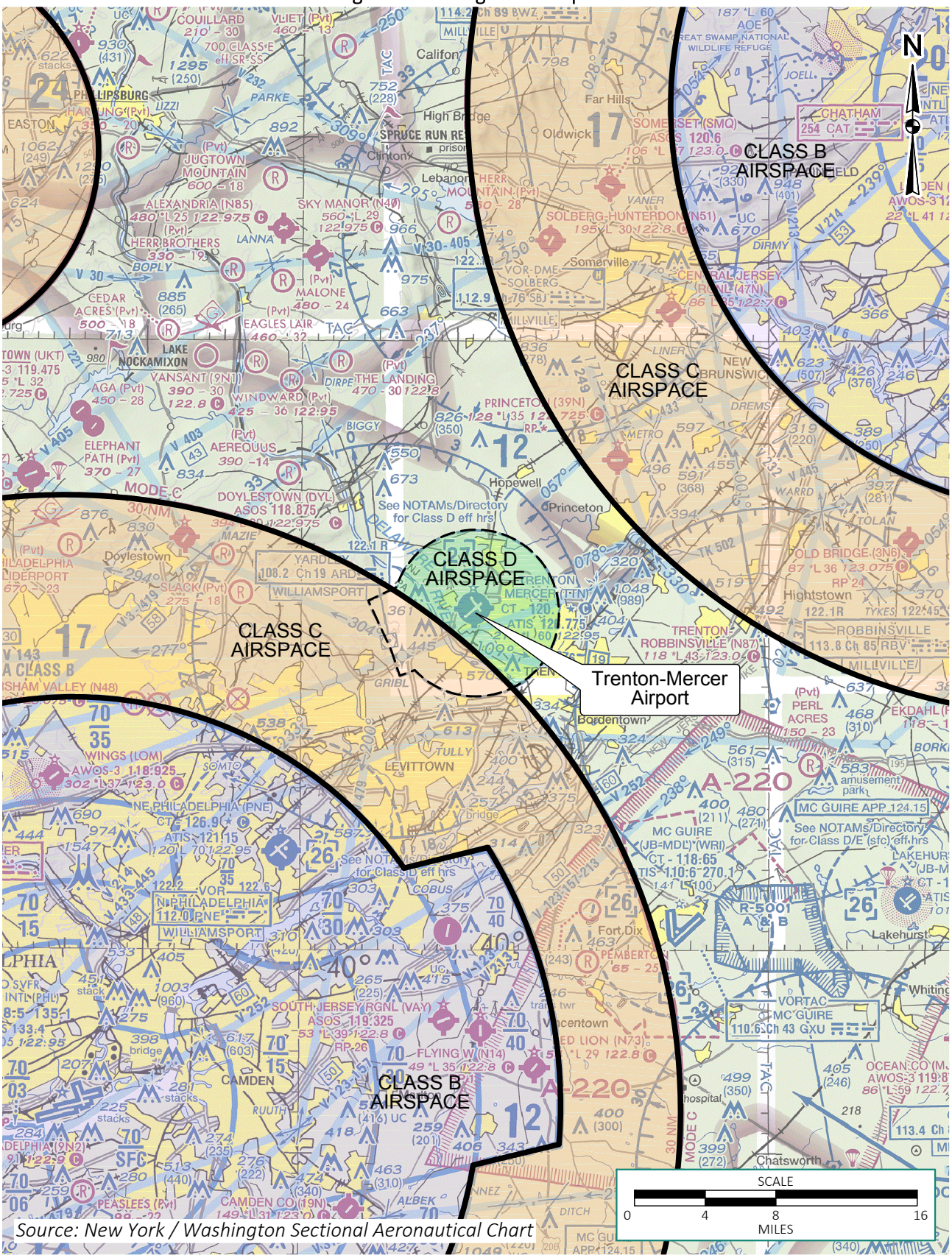
STARs are Air Traffic Control (ATC) coded IFR arrival routes established for certain airports to simplify clearance delivery procedures. There are five STARs in the Trenton-Mercer Airport vicinity; all are for Philadelphia International Airport: Bunts One Arrival, Cedar Lake Eight Arrival, Dupont Five Arrival, Jims Two Arrival, and Paats Two Arrival.

1.10. SUMMARY

The Trenton-Mercer Airport has been providing access to the airspace since 1907 and has expanded and improved to the current date as the aviation industry has evolved to accommodate larger aircraft that transport passengers and goods across the country and overseas.

An overview of the basic airfield and terminal area facilities at the airport and a general assessment of their functional condition and aesthetic appeal has been presented to serve future evaluations in the conduct of the Airport Master Plan with respect to their continued need and physical location at the airport. More detailed descriptions of the facilities, their use,

Figure 1-10: Regional Airspace



Source: New York / Washington Sectional Aeronautical Chart

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capacity, and other pertinent criteria will be presented in subsequent chapters of this report, as appropriate.

Table 1-5 below presents a summary of the functional condition of these primary airfield and terminal area facilities. Overall, the primary airfield and terminal area facilities are in Good to Fair condition, which warrants consideration as future use of the land resource at the airport is considered as part of the Airport Master Plan.

Table 1-5: Facilities Assessment Summary

Facility	Functional Condition *
Runway 6-24	Fair (b)/Good (a)
Runway 16-34	Good (a, b)
Taxiway System	Good to Serious[1] (b)
Passenger Terminal Building Complex	
Airline Aircraft Apron	Good/Fair (b)
Passenger Terminal Building	Poor (c)
Vehicular Access	Fair (c)
Automobile Parking	Good (c)
General Aviation Terminal Area Facilities	
North Quadrant	Good / Poor (c)
West Quadrant	Excellent / Good (c)
South Quadrant	Excellent / Fair (c)
Aircraft Rescue and Firefighting Station	Good (c)
Air Traffic Control Tower	Poor (c)
State and Federal Government Terminal Area Facilities	Good (c)
Airport Operations Areas Gates	Fair (c)

* More than one assessment may be noted depending on the range of use in the facility area

[1] Taxiways B, F, and H are rehabilitated, Taxiways D and G are being rehabilitated/reconstructed in 2017.

Sources: FAA Form 5010-1 (a), PCI (b), and Urban Engineers/QED assessment (c).

2. Aviation Forecasts

2.1. INTRODUCTION

Forecasts of aviation demand are a key element in all airport planning. Demand forecasts, based upon the characteristics of the service area and airport, provide a basis for determining the type, size, and timing of aviation facility development and are a platform upon which this master planning study is based. Consequently, these forecasts influence virtually all phases of the planning process. Major sections of this chapter include:

- Air Service Area
- Socioeconomic Trends
- External Demand Factors
- Aviation Forecasts
- Forecast Summary and Comparison
- Future Design Aircraft

This section presents the methodologies and assumptions used in the development of the aviation forecasts. To provide a useful planning tool, the projections are presented for short (2016-2020), intermediate (2021-2025), and long (2026-2035) range time frames. These time frames will be used to develop the airport's capital improvement program (ACIP).

The aviation demand forecasts will serve three primary purposes in the development of this master plan. Specifically, they provide the basis for:

- Determining the necessary capacity of the airfield, passenger terminal area, general aviation area, and ground access network serving the airport.
- Identifying the needed size of future facilities and the type of expansion needed.
- Assessing the financial feasibility of alternative airport development scenarios.

Forecasts of aviation demand can be developed for numerous elements. In the case of the Trenton-Mercer Airport, the key demand elements focus on scheduled airline passenger traffic and operations and general aviation descriptors such as based aircraft and operations. Other important elements are derived from these basic indicators. For this study aviation activity forecasts were prepared for the following elements:

Annual Passenger Enplanements – The number of people boarding aircraft at Trenton-Mercer Airport (TTN) each year.

Aircraft Operations – Defined as the number of takeoffs or landings at Trenton-Mercer (airline, general aviation, and military operations).

Based Aircraft by Type - Defined as a general aviation aircraft that is kept at an airport on a permanent basis.

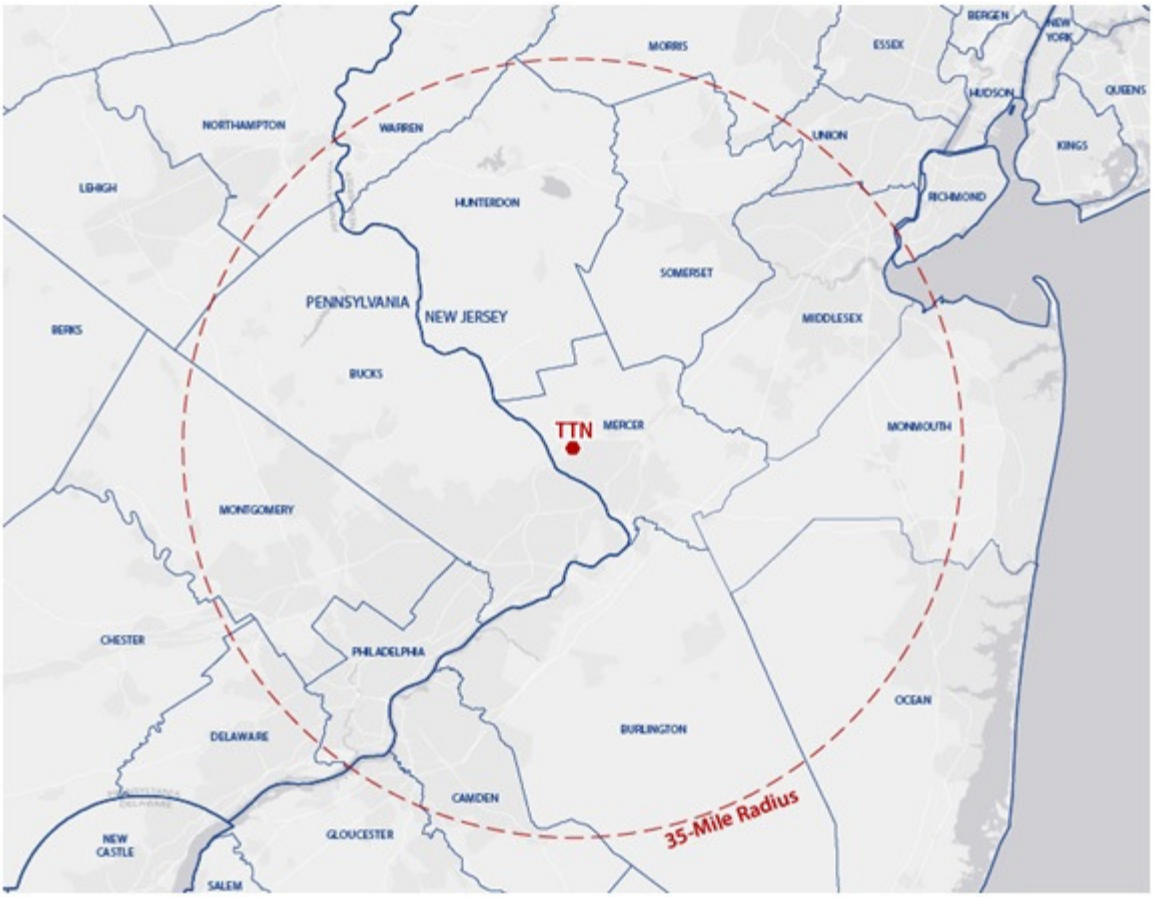
Annual Instrument Approaches – Approaches during instrument meteorological conditions at TTN.

General Aviation Enplanements – The estimated number of non-pilots utilizing general aviation facilities.

2.2. AIR SERVICE AREA

Located in Ewing Township in Mercer County, New Jersey, the Airport is within a 35-mile radius of 10 of New Jersey's 21 counties and three of Pennsylvania's counties (including the city of Philadelphia). It is located approximately four miles from the state capital Trenton. The Airport is convenient for much of Pennsylvania's greater Northeast Philadelphia region, particularly Bucks and Montgomery counties and is approximately 40 miles from Philadelphia International Airport. **Figure 2-1** illustrates the location of the Airport in its regional setting, including airports within the air service area.

Figure 2-1: Trenton-Mercer Airport Geographic Location



Source: Urban Engineers, 2015

The air service area was determined to be 35 miles from the airport as this area represents nearly all of based aircraft owners and vast majority of airline passengers.

2.3. SOCIOECONOMIC TRENDS

Socioeconomic trends and economic development activity in the air service areas are important indicators influencing future activity at the Airport. Mercer and Bucks Counties represent approximately 75 percent of all based aircraft owners. This study will review all counties which are mostly contained within the 35-mile service area (Bucks, Hunterdon, Mercer, Middlesex, Philadelphia, and Somerset Counties) to assess growth potential and socioeconomic conditions with respect to population, employment, and income, but place an emphasis on Mercer and Bucks Counties. These data are intended to provide an overview of the relative economic health of the overall air service area and its ability to support demand for air transportation services. The level of service provided by the private sector, particularly scheduled airlines, directly influences the extent to which aviation activity occurs at an airport. The socioeconomic overview is summarized in the sections below and compared to national and state data as an indicator of the relative economic health of the overall air service area and its ability to support demand for air transportation services.

2.3.1. Population

Historical population levels and that anticipated for the representative air service area emphasis counties, their respective states, and the United States are presented in Table 2-1 below. Consistent data sources for each geographic area were used to maintain a common base for each of the projections.

The following counties within the air service area have had growth rates higher than their respective states:

- Philadelphia County, Pennsylvania
- Somerset County, New Jersey
- Middlesex County, New Jersey – the growth rate between 2010 and 2014 was the same as the national average population growth rate during that time

New Jersey and Pennsylvania are both anticipated to experience slower growth in population than the forecast national growth.

2.3.2. Employment

The distribution of employment by industry sector serves to highlight the means by which the labor force is utilized to support the economic vitality of a geographic area. This data is summarized by major nonfarm industry sector for Mercer County and Bucks County as representative of the air service area, the states of New Jersey and Pennsylvania, and the United States in Table 2-2.

Table 2-1: Population Data and Projections

	Emphasis Counties of the Air Service Area		State/National		
Year	Mercer County	Bucks County	New Jersey	Pennsylvania	United States
2000	350,761	597,635	8,414,350	12,281,054	281,421,906
2010	367,511	625,249	8,791,894	12,702,379	308,745,538
2014	371,537	626,685	8,938,175	12,787,209	318,857,056
AAGR*	0.42%	0.35%	0.44%	0.29%	0.95%
2017	374,300		9,044,200		331,833,000
2020	373,000	629,420		13,230,170	341,387,000
2022	381,000		9,247,300		347,803,000
2027	389,400		9,463,600		363,880,000
2030		637,730		13,759,594	373,504,000
2032	397,100		9,665,800		379,912,000
2040		634,771		14,132,588	405,655,000
AAGR**	0.38%	0.05%	0.45%	0.40%	1.05%

** Average annual growth rate between 2000 and 2014*
*** Average annual growth rate between 2014 and the last year of the projection*
Sources: U.S. Census Bureau, 2014 (historical); New Jersey Department of Labor and Workforce Development, 2012 (Mercer and New Jersey forecasts); and the Center for Rural Pennsylvania, a Legislative Agency of the Pennsylvania General Assembly, March 2014 (Bucks County and Pennsylvania forecast)

Table 2-2: Employment by Nonfarm Industry Sector

	Percentage Distribution of Nonfarm Employment				
	Air Service Area Counties		State/National		
Major Industry Sector	Mercer County	Bucks County	New Jersey	Pennsylvania	United States
Mining	2.1	0.1	0.0	0.1	0.5
Construction	2.1	5.6	3.6	4.0	6.6
Manufacturing	3.5	11.0	6.1	9.8	10.3
Wholesale and Retail Trade	10.4	19.9	16.9	20.6	14.4
Transportation and Utilities	2.5	2.4	4.3	20.6	5.2
Information	1.9	1.9	1.9	1.5	2.3
Finance and Real Estate	7.2	4.2	6.2	5.4	6.8
Professional and Business Services	15.5	12.8	16.0	13.1	11.2
Education and Health Services	18.6	18.4	16.0	20.3	23.4
Leisure and Hospitality	5.7	10.6	9.0	9.4	9.2
Other Services	4.0	3.7	4.3	4.4	5.0
Government	28.6	9.4	15.7	12.2	5.1
Total	100.0	100.0	100.0	100.0	100.0

Sources: New Jersey Department of Labor, 2014 (Mercer County and New Jersey); Center for Workforce Information and Analysis, April 2015 (Bucks County and Pennsylvania); and Statistical Abstract of the United States, 2012 (United States)

The distribution of employment by major sectors highlights that generally there are slight differences among the geographic areas presented. Where there are distinct differences, these occur in the government sector, which includes local, state, and federal public agencies. This sector is more pronounced in Mercer County, due to the presence of the state capital. The

higher percentage of government employees in Mercer County is offset by a comparatively lower manufacturing and wholesale and retail trade employment levels. Each state also has higher distributions of government employees than that occurring in the nation.

The economy of the air service area is also influenced by the number of institutions of higher learning, as well as business and production facilities of companies engaged in the health care and pharmaceutical industries, several of which maintain their corporate headquarters in the air service area. The latter types of industries are good generators of demand for air transportation services as evidenced by the extent of corporate aircraft terminal area facilities owned and operated at the Airport. These businesses also utilize commercial airline service to visit their operations facilities located in other parts of the country and for international destinations.

According to the New Jersey Department of Labor and Workforce Development, total job growth in Mercer County is expected to rise between 2012 through 2022 by a total of 8.0 percent, slightly faster than the statewide increase of 7.5 percent over the 10-year period. Gains in employment in Mercer County and New Jersey are focused in the professional and business, and educational and healthcare services sectors. The Pennsylvania Center for Workforce Information and Analysis projects employment levels in Bucks County to increase 8.5 percent between 2012 and 2022, with most gains in similar industry sectors as Mercer County. This is higher than the 7.7 percent gain in employment anticipated for the Commonwealth of Pennsylvania over the same 10-year timeframe. Employment projections by the United States Bureau of Labor Statistics indicate higher gains in total employment, of about 10.7 percent between 2012 and 2022. Nationwide, persons engaged in the healthcare and educational sectors will experience gains offsetting employment declines in the information, construction and manufacturing industries. Overall, the air service area is viewed as providing improved opportunities for participation in the labor force as employment levels are expected to increase at rates faster than the growth in population.

Unemployment rates in the air service area are below state and national averages. Unemployment rates range from 5.0 to 6.0 percent (below the national average of 6.2 percent) in all counties except one. Philadelphia County had an unemployment rate of 8.9 percent. New Jersey has a slightly higher than average unemployment rate at 6.7 percent and Pennsylvania comes in lower than the national average a 5.6 percent. Overall, the average air service area unemployment rate is approximately 6.0 percent and therefore below the national average. The healthcare industry is anticipated to experience growth during the forecasting period, which may result in decreasing unemployment rates and an increasing population as people move to the area. These are all favorable factors for Trenton-Mercer Airport.

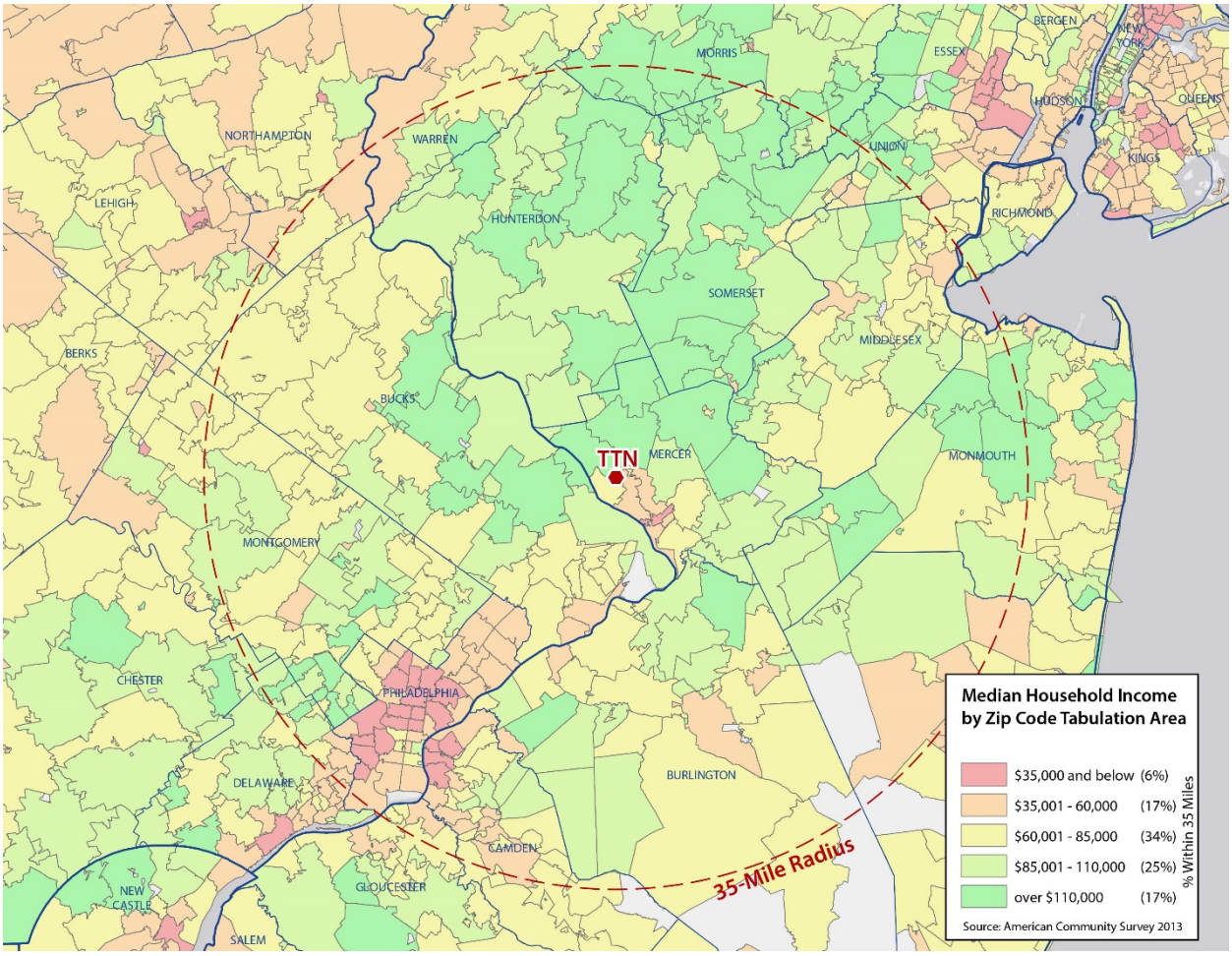
2.3.3. Income

One of the primary indicators of the demand for air transportation is income. Both per capita personal income (PCPI) and median household annual income, especially that in excess of $60,000, may indicate higher than average growth at an airport. Median household income in excess of $60,000 allows opportunity to use discretionary funds after spending for the essential costs of living that focus on housing, food, medical care, education, and personal transportation. Discretionary funds are often applied to long-range travel that is best accommodated by aircraft.

The median household income in the United States between 2009 and 2013 was $53,046. Pennsylvania was just below that level at $52,548 and New Jersey had a much higher median household income during that time period of $71,629.

The U.S. Census Bureau American Community Survey Office computes median household income by zip code tabulation area. The most recent year of available data (2013) is illustrated in Figure 2-2. Of the households within a 35-mile radius of the Airport, approximately 76 percent had a median household income greater than $60,000. More noticeably, about 17 percent of the households in the air service had annual median incomes in excess of $110,000. For comparison purposes, approximately 52 percent of households in the United States had annual median incomes in excess of $50,000. All major representative counties within the service area (Bucks, Hunterdon, Mercer, Middlesex, Somerset, and Philadelphia) have per capita and median household incomes higher than the national average (and in some cases double the national average), except Philadelphia County.

Figure 2-2: Median Household Income Distribution



Source: Urban Engineers, 2015

2.3.4. Socioeconomic Trend Summary

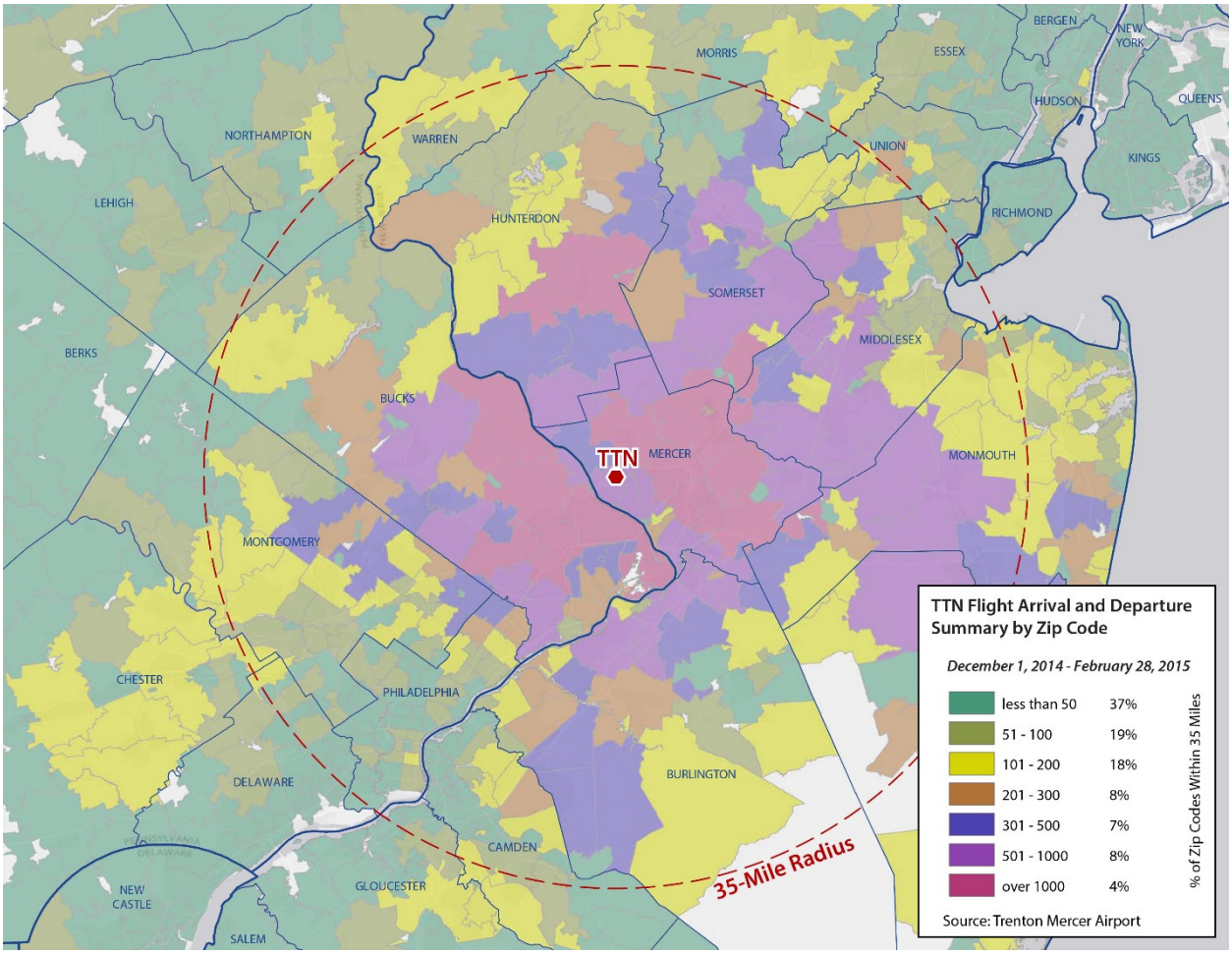
The demand for air transportation services as reflected in population, employment, and income levels in the Trenton-Mercer Airport air service area for commercial airline and general aviation activity indicates higher than average growth due to low unemployment rates and higher than average income levels. Although population increases are anticipated to be modest and less than that projected for the nation, the air service area offers strong potential to provide employment opportunities that will allow for comparatively higher annual median household incomes than expected nationally. This translates to moderate growth potential in commercial airline and general aviation aircraft activity in the Airport's air service area at levels that are on par or slightly exceeding those anticipated for the United States. The extent to which, competitive factors in the air service area (in terms of airline service, airport facilities, and user costs) will influence actual passenger and aircraft activity levels.

Frontier Airlines provided a sample of passenger booking trends for a period of December 2014 through February 2015 which shows passenger booking behavior largely consistent with the established 35 mile service area (**Figure 2-3**). Beyond Mercer County's borders, these passengers primarily originate from Hunterdon, Somerset, Middlesex, Burlington and Monmouth counties in New Jersey, along with Bucks and Montgomery counties in Pennsylvania. In February 2015, the Mercer County Board of Chosen Freeholders initiated a new marketing initiative with a goal of raising the Airport's profile. A new logo, Airport signs, a marketing plan, and new strategies for selling and marketing advertising space at the Airport are all envisioned as future initiatives.

2.3.5. General Aviation

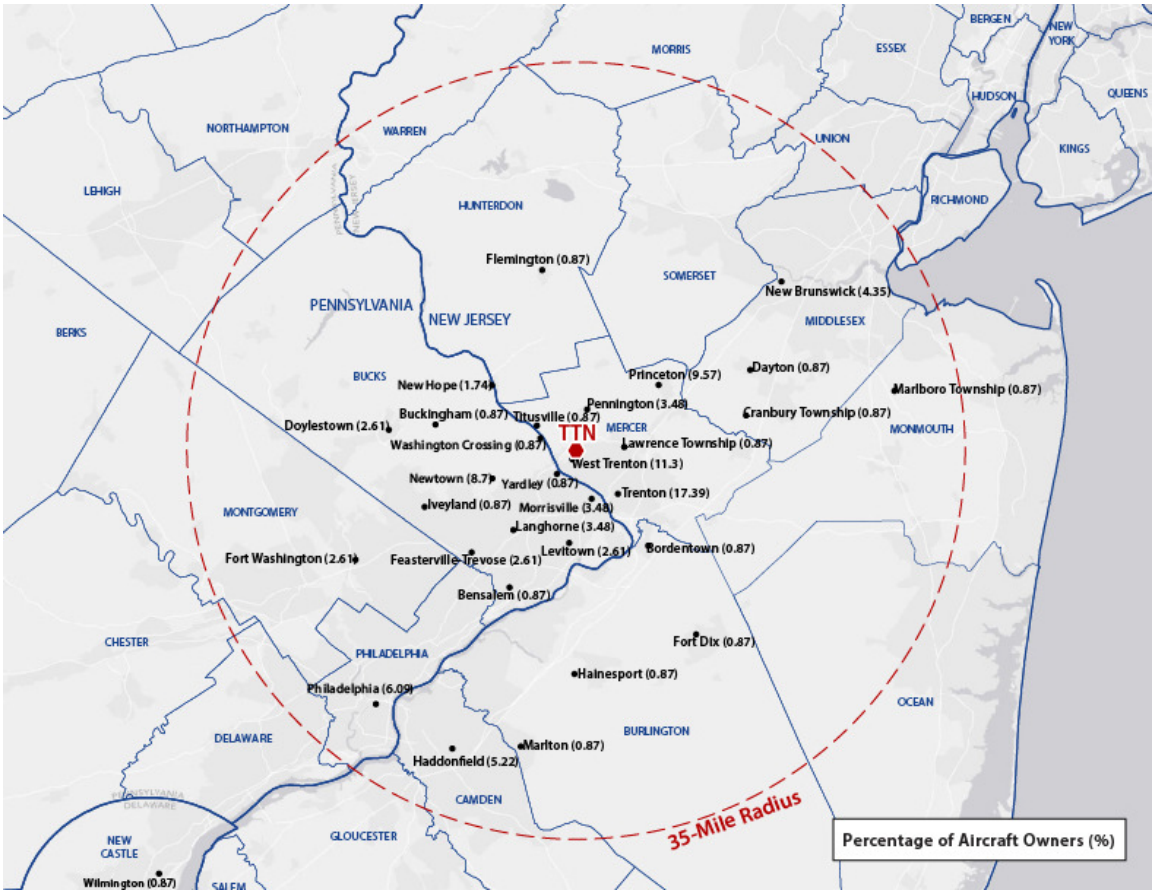
The service area for general aviation users also reflects travel time and distance, and the facilities and services and their associated costs available at alternative airports in a region. A review of the location of each based aircraft owner at the Airport established that approximately 98 percent are located within a 35-mile radius of the facility (**Figure 2-4**).

Figure 2-3: Air Carrier Service Area – December 2014 - February 2015



Source: Urban Engineers, 2015

Figure 2-4: General Aviation Service Area



Source: Urban Engineers, 2015

2.4. EXTERNAL DEMAND FACTORS

Local socioeconomic factors alone cannot guarantee a predictable level of air service for the Trenton market. Growth in the overall U.S. commercial aviation market is based on a variety of factors that are independent of the local market conditions. These external considerations have the ability to affect the viability of particular airline routes and sometimes the overall market itself. Many of these factors are beyond the control of the airport itself and represent tangible considerations such as airline service to other airports all the way to implications of geopolitical events such as a spike in the cost of fuel.

Pilot Shortage – While not currently (December 2015) impacting mainline air carriers, a shortage of pilots due to low pay along with new crew rest and training requirements has constrained regional flying in recent years. Many airlines are transitioning to larger regional jets with reduced frequency while also limiting block hours (i.e. longer flights). Airlines such as Delta have actually added mainline capacity in the form of 88 Boeing 717 aircraft to replace as many as 250 smaller 50-seat regional jet aircraft throughout their entire network. These smaller 50 seat aircraft now being replaced were utilized by Delta when they previously served TTN in the mid 2000s.

Fuel Prices – For most U.S. airlines, jet fuel accounts for more than 30% of the total operational cost for any particular flight. The price of fuel for airlines has experienced several fluctuations over the past five (5) years, during the most extreme peaks, the high cost of fuel made many previously profitable routes unprofitable for airlines and overall domestic capacity in the airline networks was reduced. Fuel prices have disrupted aviation demand in the past and likely will again in the future. Fuel spikes tend to disproportionately affect low-cost and leisure flying as high fuel costs can have an adverse effect on the broader economy.

Mergers/Acquisitions - The past 10 years have seen the 8 largest U.S. carriers consolidated down to 4. This consolidated has reduced competitive offerings for both passengers and airports/markets in general. Reduced choices and competition resulted in higher fares which had an adverse affect on passenger demand. Industry consolidation, however, has resulted in increased probability and stability for the remaining four airlines. Less airlines also means reduced options with regards to recruiting new air service to the airport.

Air Service Patterns at Vicinity Airports – TTN is located less than 60 minutes from two of the busiest airports on the east coast. The level of ease or congestion at these airports combined with the number of low fare offerings have the potential to greatly impact what types of service could be offered at TTN.

Trenton-Mercer Airport competes with area airports for based aircraft. Primary competitive airports include those shown in **Table 2-3**, which includes basic facilities and user fee information. This allows a comparative assessment of the attractiveness of an airport based on the type of aircraft operated. For example, ground travel time requirements aside, business jet aircraft owners and operators will seek to base at an airport that has a runway length to support nonstop flights to primary destinations, instrument approach capabilities with minimums of at least 400-foot ceiling and 1 mile visibility (400-1), and terminal facilities to support aircraft hangar storage and fuel.

Business jet operators located within the general aviation service area can be expected to consider Northeast Philadelphia Airport as a primary alternative to Trenton-Mercer Airport. This is because it is the only area airport within the service area with a runway of at least the length available at the Trenton-Mercer Airport. Additionally, the Northeast Philadelphia Airport has instrument approach procedures with low minimums, offers the requisite level of terminal area facilities and services, and has staffed air traffic control tower. Other airports of consideration, which are located slightly outside of the air service area are Ocean County, Morristown Municipal, and Teterboro Airports (**Table 2-4**). All of these airports have runways greater than 5,900 feet long, offer a set of maintenance and fuel amenities, and have precision instrument approaches. Ocean County Airport may be the least favorable as it has the shortest runway 5,949 feet long and is not towered. Morristown Municipal and Teterboro Airports are 36 and 49 nautical miles, respectively, from Trenton-Mercer. Newark International and Philadelphia International Airports are also just outside of the air service area, but may be too congested for business travelers' preferences.

Should business jet operators require customs, Morristown Municipal and Teterboro Airports are alternatives to Trenton-Mercer, in addition to Newark and Philadelphia International Airports.

Table 2-3: Air Service Area Airport Comparison

Within the Trenton-Mercer Service Area				
	Mercer-Trenton	Doylestown	Northeast Philadelphia	South Jersey Regional
Runways	6,006' x 150' 4,800' x 150'	3,002' x 60'	7,000' x 150' 5,000' x 150'	3,881' x 50'
Runway Lighting	HIRL, MIRL	MIRL	HIRL, MIRL	MIRL
Instrument Approach	Precision 414-1/2	Non-precision	Precision 316-1/2	Non-precision
Based Aircraft (Jets)	133 (16)	181 (0)	166 (19)	93 (0)
Tiedown Fees - $/month (Transient – $/day)	135 (10-460)	110 (5)	195-350 (10-195)	85 (10)
Handling Fee (Per Transient)	25*-920*	None	28-721	10
Landing Fee (In $)	5-120	None	11-200	10
Services	Fuel: 100LL; Jet A Airframe: Major Powerplant: Major Bottled Oxygen: Low Bulk Oxygen: Low	Fuel: 100LL; Jet A Airframe: Major Powerplant: Major	Fuel: 100LL; Jet A Airframe: Major Powerplant: Major Bottled Oxygen: High/Low Bulk Oxygen: High	Fuel: 100LL; Jet A Airframe: Major Powerplant: Major
Towered	Yes	No	Yes	No
Distance from TTN	0	15 NM	15 NM	20 NM

Sources: Urban Engineers/QED May 2015 Inventory and Forecast; FAA Form 5010-1; and FAA Instrument Approach Procedures

Table 2-4: Airports Beyond the TTN Service Area

Beyond the Trenton-Mercer Service Area					
	Ocean County	Newark International	Philadelphia International	Morristown Municipal	Teterboro
Runways	5,949' x 100' 3,599' x 75'	11,000' x 150' 10,000' x 150' 3,726' x 150'	10,506' x 200' 9,500' x 150' 6,506' x 150' 5,000' x 150'	5,998' x 150' 3,997' x 150'	7,000' x 150' 6,013' x 150'
Runway Lighting	HIRL, MIRL	HIRL (All)	HIRL (All)	HIRL, MIRL	HIRL, MIRL
Instrument Approach	Precision 331-3/4	Precision Cat IIIc	Precision Cat IIIc	Precision 383-1/2	Precision 260-1,800'
Based Aircraft (Jets)	78 (3)	9 (0)	24 (21)	191 (76)	121 (97)
Services	Fuel: 100LL; Jet A Airframe: Major Powerplant: Major Bottled Oxygen: High	Fuel: 100LL; Jet A Airframe: Major Powerplant: Major Bottled Oxygen: High	Fuel: 100LL; Jet A Airframe: Major Powerplant: Major Bottled Oxygen: High/Low Bulk Oxygen: High/Low	Fuel: 100LL; Jet A Bottled Oxygen: High/Low Bulk Oxygen: High/Low	Fuel: 100LL; Jet A Airframe: Major Powerplant: Major Bottled Oxygen: High/Low Bulk Oxygen: High/Low
Towered	No	Yes	Yes	Yes	Yes
Distance from TTN	32 NM	39 NM	32 NM	36 NM	49 NM

Sources: Urban Engineers/QED May 2015 Inventory and Forecast; FAA Form 5010-1; and FAA Instrument Approach Procedures

2.4.1. Aviation Forecast Approach

The evaluation of both the local socioeconomic trends and external demand forces resulted in the forecasts that are incorporated into the master plan for TTN. These forecasts serve as the basis for the airport facility requirements. The forecast elements are grouped into the following areas:

- Passenger Enplanements
- General Aviation Operations
- Based Aircraft

Existing FAA Forecasts - Forecast guidance is available from several existing sources within the FAA. The FAA Terminal Area Forecast (TAF) is an airport specific forecast created by the FAA. These forecasts are developed on general airport knowledge, high level trends, and national rates of growth or decline. No comprehensive airport-specific analyses are conducted as part of the development of the TAF. While these forecasts are not based on a master plan level analysis, they are considered generally reasonable and it is standard industry practice to use them as a benchmark for any other forecast. Forecasts that are not generally consistent with the TAF (10% off within 5 years and 15% off within 10 years) must be submitted to FAA headquarters in Washington D.C. for further analysis and approval.

Alternative Scenarios - Since its inception, the aviation industry has been in a constant state of change with new developments and technology constantly evolving. This forecast chapter will identify cases where an alternative scenario may exist in the future that have the potential to notably alter the operational activity at the airport. The alternative scenarios are separate from, but supplement to, the selected preferred forecast, which will be submitted to the FAA for approval. The alternative forecasts will allow TTB and Mercer County to quickly consider the impact of changes that could occur outside of the FAA approved forecasts.

2.5. PASSENGER ENPLANEMENTS

Passenger enplanements are a key measure in the forecasting efforts for commercial service airports. The enplanements forecast focuses on the total annual enplanements as well as the peak hour characteristics based on busier traffic periods. The results of these forecasts are particularly useful in the assessment of the passenger terminal building and associated facilities such as auto parking lots. Beyond that, the types and quantities of growth potentially extend beyond the terminal area to the airfield, a key example being the introduction of a new aircraft type by a low cost carrier.

With the limited history and sharp growth of the current operation, combined with intermittent enplanements over the longer history, traditional forecasting methodologies of regression and trend analysis are not valid for TTN. The limited and varied service history also limits opportunities for a traditional market share analysis forecast; one of the scenarios (Scenario 3) that compares similar airports is a variation of a market share forecast. Several forecast scenarios were developed on the basis that the airport is part of a competitive airport system and with national carriers, is subject to much of the same market dynamics as the overall transportation system. Many of these external factors were evaluated as part of this forecast. It is important to note that as a market with several other commercial service airports within a 90 minute drive that TTN will likely experience noteworthy fluctuations in demand (greater than 10-20% in a single year), both positive and negative over short durations throughout the planning period. It is important to focus on the overall growth levels and how they apply to the master plan development goals and requirements as opposed to the growth rates and short-term numbers.

From 2012 through 2015 the airport experienced tremendous growth taking the airport to record enplanement numbers. In 2015 and early 2016 however, schedules were optimized to balance market seasonality of the routes from TTN. While this adjustment to the schedules

resulted in a decrease in available seat capacity, it has yielded a consistent and predictable service pattern that will better position the market for success. Based on this schedule change, using the previous year actual data does not result in a reliable baseline. Scheduled seat inventory based on what is available for sale at TTN for 2016 was reviewed to better quantify the baseline. Presently there is an average of 42 weekly flights, which on an annual basis equates to approximately 327,600 annual departing seats. The FAA TAF identifies a 2016 forecast of 314,496, which given the historically high load factors consistent with ultra low cost carriers like Frontier, result in a prudent baseline for use in this forecast.

Scenario 1 - National Trend Based - Scenario 1 grows demand at an annual average rate of 1.7% over the 20-year planning period. The FAA national aerospace forecast identifies the 1.7% as the average annual growth rate for US mainline air carriers for 2014-2035; historically from 2001-2014 the average growth for all mainline passenger traffic was -0.5% annually. While airline schedule trends will vary year to year, this growth rate captures the long term average annual growth for the 20-year period. Peak period analysis and careful facility planning are needed to ensure the airport is prepared for short term variations in demand.

Scenario 2 - National Trend Based plus New Terminal Factor – Scenario 2 is similar to Scenario 1, except the growth rate is doubled to an average of 3.4% for three years in 2019 intended to reflect a bump in activity from a new/expanded terminal facility. As previously noted, sharper variations in growth for smaller airports like TTN near larger hubs are anticipated; these average annual growth rates are intended to identify the longer term trends.

Scenario 3 - Tertiary Airports – TTN is unique since it is a smaller airport within 60 minutes of a large-hub airport having diverse service offerings. There are several other airports operating in this type of environment similar to TTN. Each of these airports has their own unique service patterns. All have experienced periods of strong growth and sharp declines or no service at all within the past 5 years (2010-2014). The airports of Islip, NY; Newburgh (Stewart), NY; Portsmouth, NH; White Plains, NY (Westchester); and Worcester, MA were compared to TTN for this forecast. Both Worcester and Portsmouth had a period of no scheduled service in the past five years as is the case with TTN. A comparison of these facilities in presented in Table 2-5.

Table 2-5: Airport Comparison

Airport	2014 CY Enplanements	5-Year Low/High	Airlines	Gates	Destinations	% Low Cost	Constraints
Islip	646,171	646,171 - 858,741	2	10	6	95%	No
Newburgh (Stewart)	158,556	158,556 - 209,966	4	6	5	60%	No
Portsmouth	45,708	2,012 - 45,708	1	1	3	100%	No
Trenton	377,961	833 - 377,961	2	3	6 (Varies)	100%	Yes
White Plains (Westchester)	756,189	756,189 - 999,813	6	6	11	60%	Yes
Worcester	57,818	8,007 - 57,819	1	2	2	100%	Yes
Average	332,888	314,187 - 434,409	3	5	5	70%	N/A

Sources: McFarland Johnson analysis, FAA ACIS Database, airport websites, November 2015.

Looking at the average of these five unique facilities, the resulting average portrays an airport similar to what TTN is today. Scenario 3 combines this average and the difference from existing TTN enplanements and grows it at the national rate of 1.7% annually. Each of the airports compared have recently experienced the notable fluctuations in demand of greater than 10% that was previously noted.

Scenario 4 - Air Service Development Based - Much of the recent growth and changes in scheduled service at TTN is result air service development trends impact on the Airport. Future growth will likely come from seeking and recruiting new service based on the Trenton market. This air service development scenario was considered outside and independent of existing Frontier service at the airport.

The minimum core market for TTN is based on the air service patterns independent of Frontier and represent the minimum type of service TTN theoretically should have already had prior to the Frontier service launch. The minimum core market assumes an average of 21 weekly flights to Florida, keeping in mind this would likely be higher during the peak spring months and lower during the slower late summer/early fall timeframe. Also included in the minimum core market is an average of seven (7) weekly flights to larger business centers. For the sake of this scenario, this is quantified based on the Frontier model. The seven (7) weekly flights on mainline service is the equivalent of twice daily seasonal mainline flights (i.e. Atlanta and Chicago seasonal service) or twice daily (14 weekly) service on 70-seat regional jets on a network carrier to a hub airport.

Low, medium, and high scenarios grow on the minimum core market in similar service patterns that can reflect either the Frontier model or new airline service by other carriers as well; operations would change with more frequencies on regional aircraft but the enplanement scenario remains unchanged. The low, medium, and high are intended to reflect growth over the

20-year planning period with the high scenario being the 20-year enplanement level. A terminal planning scenario was created based on the high (20-year) plus 50% and is intended to plan for and protect the land and infrastructure needed for growth beyond the planning period at the airport. The Air Service Development Based scenario is displayed in Table 2-6.

Table 2-6: Air Service Scenario

Service Level	Service Type	Weekly Departures	Average Seats/Aircraft	Annual Enplanements
Minimum Core Market	Florida	21	138	135,626
	Business	7	138	45,209
	Total Core	28	276	180,835
Low	Florida	31	138	200,210
	Business	14	138	90,418
	Total	45	276	290,628
Medium	Florida	41	150	287,820
	Business	21	138	135,626
	Total	62	288	423,446
High	Florida	51	150	358,020
	Business	28	138	180,835
	Total	79	288	538,855
Terminal Max Planning (High + 50-%)	Florida	75	150	526,500
	Business	42	138	271,253
	Total	117	288	797,753

Source: McFarland Johnson, 2015

This forecast developed completely independent of any FAA identified growth rate still results in a forecast that is consistent with other scenarios.

Scenario 5 – Average of Scenarios 1-4 - Scenario 5 is based on an average of the previously mentioned scenarios.

The results of all scenarios are shown in Table 2-7.

Table 2-7: Results of All Scenarios

	Scenario 1 FAA Aerospace	Scenario 2 FAA Aero w/ Terminal	Scenario 3 Tertiary Airports	Scenario 4 Air Service Based	Scenario 5 Average	FAA TAF
2014	314,665	314,665	314,665	314,665	314,665	314,665
2020	336,614	347,962	381,280	369,256	358,728	341,915
2025	366,216	384,889	410,882	423,446	396,358	374,375
2035	433,458	455,560	478,124	538,885	476,507	440,145

Source: McFarland Johnson, 2015

2.5.1. Enplanements Summary

Despite approaching the enplanements forecast from different perspectives (i.e. national growth rates versus airline scheduling trends and other commercial airports in the region), the enplanement forecasts are all relatively consistent with one another. In particular, the forecast scenario that uses national trends for airline growth, that was modified to have a higher growth rate for three years following terminal improvements, is nearly identical to the FAA TAF.

Each of the forecast methodologies captures a unique characteristic of TTN, whether it is air service trends, the tertiary airport environment, or the consideration of new facilities. Even with a wide variation in methodologies, the forecasts do not differ greatly from one to the next, nor do they differ greatly from the FAA TAF. With each of the methodologies become contributing growth factors to TTN, Scenario 5, the blended average, is the selected enplanement forecast for the master plan.

It is important to note that small-hub and non-hub airports that have a tertiary proximity to a large-hub airport tend to be highly volatile in nature. This volatility is clearly identified in Scenario 3 with every comparable airport displayed either having their best or worst year in the previous five years in 2014. Facility improvements associated with passenger enplanements are recommended to be constructed in advance of the forecast years to avoid temporary facilities required from a short term spike in demand.

2.5.2. Enplanement Forecast Variations

Smaller commercial service airports with less than one million annual passengers tend to experience fluctuations in activity and demand when service patterns change. The following are some examples of fluctuations that could affect TTN over the forecast period. These scenarios could be what accounts for the growth identified in the forecast, or be in addition to the forecast, should there be any unforeseen changes.

Additional Low Cost Airline – At airports in the northeast it is fairly common to have multiple airlines on high demand routes. In the Northeastern U.S. the routes with the most competition

tend to be those going to/from Florida. This scenario would likely involve a new low cost airline offering seven (7) weekly flights from TTN, with additional weekly flights being incrementally added over time. This scenario would result in approximately 58,000 annual enplanements and 750 annual operations.

New Regional Airline – Service by a new regional airline would likely result in an additional 150 average daily departing seats. This service level would be representative of two 76-seat regional jets or three 50-seat regional jets per day (frequencies and aircraft size may be reduced on weekends). This type of service is consistent with air service patterns used by network airlines today in regional markets. This scenario would result in approximately 45,000 annual enplanements and 1,800 annual operations.

Specialty/Boutique Airline – For most of the 2000's, passenger service at Trenton was limited to a small airline providing scheduled charter service to Hanscom Field outside of Boston, MA. This type of service is typically provided on weekdays on small aircraft with less than 35 passenger seats. A specialty/boutique airline could supplement passenger options at the Airport; however it would likely be in the form of a destination not served by a low-fare or regional airline as low fare competition would affect the viability of the service. This scenario would result in approximately 5,000 annual enplanements and 500 operations.

Loss of Existing Service – Loss of service is never a desired scenario for the airport; however, the Trenton market, and similar markets have lost service in the past. Should there be an interruption in service as it exists today, many of the air service scenarios discussed in this chapter would remain viable options for the market. Over 300,000 annual passengers in recent years have demonstrated the viability of scheduled passenger service at Trenton; therefore, it is anticipated that any complete suspension of service would be short lived. The previous section identified the estimated minimum core market size of approximately 180,000 annual enplanements. Commercial operations based on the minimum core market size would likely range between 4,000 and 6,000 annual operations.

2.5.3. Enplanement Peaking Characteristics

Existing service patterns at TTN result in a peaking characteristic that is unconventional for similar sized airports. Traditional planning for peak activity allocated a certain percentage of the total daily activity. With the service pattern at TTN, activity spikes when an operation occurs, and with three (3) based Frontier aircraft, it is common to have a peak hour that consists of simultaneous operations. Airlines typically try to avoid sharp peak in activity as it increases their staffing requirements and thus increases their overall costs.

During periods of irregular operations, it is not uncommon to have as many as three (3) aircraft operating near simultaneously. While not common during routine/scheduled operations today, it is expected as activity grows that peak period demands will also grow. The existing terminal facility will limit the ability to accommodate a routine peak hour of three (3) simultaneous operations, therefore the triple operational peak is not identified in the forecast until 2025, though the 2020 forecast identifies a dual operation peak hour plus 50% bleed over from a third operation to accurately reflect existing facility constraints. The long term peak hour

enplanements assume that as the airport grows, activity will filter in to lower activity periods with busy periods throughout the day, but the burden is not experienced within a discrete hour.

These peaking characteristics can be seen in Table 2-8.

Table 2-8: Enplanement Peaking Characteristics

	Actual	Forecast		
	2015	2020	2025	2035
Average Peak Day Enplanements	276	345	414	490

Source: McFarland Johnson, 2015

While the peak month is traditionally measured, the peak hour is the consistent limitation for activity at TTN. The current service pattern balances Florida flying with other leisure flying throughout the year. Peak hour aircraft operations are not expected to result in any measurable delay; a capacity analysis is discussed in greater detail in the next chapter.

2.6. AVIATION OPERATIONS

Operations since the Great Recession of 2007-2009 have shown overall growth as the economy recovers. Disposable income has increased and unemployment rates have continued to decrease as consumer finances are improving and the housing market is recovering. These economic considerations in conjunction with lower gas prices result in anticipated total operations (airline and general aviation) increasing within the next 20 years. Two factors that may stifle growth are the current stagnation/recession in Europe and China's dwindling economic growth. These two elements may accelerate the start of the next U.S. recession, which is anticipated to start sometime between 2016 and 2018.

The Great Recession fundamentally changed how airlines operate. Financial restructuring, continued "right-sizing" of aircraft to meet demand on each route, and maximizing aircraft load factors have increased airline profits. Additionally, new aircraft are generally more fuel efficient, gas prices have been low, and the FAA's NextGen will minimize holding patterns and routes between airports and therefore maximize fuel efficiency per flight. All of these factors play into lower fares and anticipated growth of airline/air carrier operations by approximately 2.7% per year within the 20-year planning period. Regional jets with 50 or fewer seats are anticipated to decrease as the demand for aircraft between 70 and 90 seats continues to increase.

General aviation and air taxi average growth in operations has been strong in total turbine and total rotorcraft categories, which is anticipated to continue within the planning period. Other areas of general aviation and air taxi operations have experienced a decline. Lower fuel costs and higher disposable income are, and continue to be, the main driving factors in general aviation and air taxi hours flown. Operations for turbine and rotorcraft aircraft are anticipated to increase by 2.9 and 3.0 percent, respectively, within the 20-year planning period according to the 2014

FAA Aerospace Forecast. Experimental and sport aircraft are also anticipated to increase consistently by 2.4 and 5.1 percent, respectively within the planning period. It should be noted that starting in 2012, experimental light-sport category aircraft will no longer be shown in sport aircraft, but rather as experimental aircraft. Turbo jet operations, which mostly consist of business jet operations, are forecast to increase by 3.6 percent per year within the planning period.

The operations forecast for the airport is important for the assessment of the infrastructure and facilities utilized by all aviation elements including commercial airlines, corporate aviation, recreational aviation, and military activity. Overall, annual operations and peak hour activity numbers are not only applied in the assessment of runway and taxiway infrastructure, but the forecast is also useful for more specific airport requirements such as fuel facilities. The growth elements below discuss both the local and national factors that influence operations growth at TTN.

The TAF for total operations at the airport was compared with other commonly used forecasting methodologies to measure the reasonableness of the forecast. These commonly used methodologies include the operations per based aircraft, market share analysis and applying trends from the national aerospace forecast. These forecasts are explained and summarized below with results displayed in Table 2-9.

Terminal Area Forecast (TAF) - Forecast guidance is available from several existing sources within the FAA. The FAA TAF is an airport specific forecast created by the FAA. These forecasts are developed on general airport knowledge, high level trends, and national rates of growth or decline. No comprehensive airport-specific analyses are conducted as part of the development of the TAF. While these forecasts are not based on a master plan level analysis, they are considered generally reasonable and it is standard industry practice to use them as a benchmark for any other forecast.

Operations Per Based Aircraft - A good metric for defining activity at an airport is the operations per based aircraft (OPBA) count. This is derived by dividing the total number of annual airport operations by the number of based aircraft. In the past 20 years, this number has ranges as high as 943 to as low as 483, with an overall average being approximately 651 at TTN.

According to FAA Order 5090.3C, Field Formulation of the National Plan of Integrated Airport Systems (NPIAS), a general guideline is 450 operations per based aircraft for busy reliever airports. In circumstances, such as a busy reliever airport, like TTN with a large number of itinerant operations, the number of operations per based aircraft may be as high as 750.

The Trenton OPBA of 651 used in the forecast scenario is considered reasonable based on the guidance and methodology used by the FAA.

Market Share - The market share methodology is sometimes used when an airport operates as, or is located with, a multi-airport system. This approach is typically only used to measure operations as opposed to enplanements. For the sake of this analysis, Trenton's regional market share is compared to the regional total from South Jersey Regional, Doylestown, and Northeast

Philadelphia Airport. The historical average indicated that TTN commands approximately 38% of the total activity among the four airports. The market share scenario assumes that Trenton will maintain the same market share into the future based on the combined TAF forecast growth for the other airports in the region.

FAA National Aerospace Forecast - In addition to the TAF, each year the FAA publishes a national aerospace forecast that identifies activity trends on the nation-wide level. For airports with notable itinerant general aviation and commercial/scheduled traffic, such as TTN, the FAA National Aerospace Forecast is applicable because many of the operations are using the national airspace, as opposed to local operations driven by the local based users. More than 60% of TTN's traffic is considered itinerant, meaning it is operating through the national system to/from TTN.

Table 2-9: Annual Operations Forecast Scenarios

Year	Draft TAF	Operations Per Based Aircraft	Market Share	FAA Aerospace
2015	80,626	78,263	78,263	78,263
2020	81,452	80,448	83,927	82,191
2025	82,473	82,270	86,162	85,934
3035	84,560	86,475	90,803	95,275

Source: McFarland Johnson, 2015

2.6.1. Operations Summary

Overall, the various forecast metrics and methodologies are largely consistent with one another for use and analysis within a master plan. The greatest 20-year (2035) difference between all of the forecast scenarios is approximately 12,797 annual operations. On an annual basis, this is a difference of 35 total operations per day and approximately 3-4 per hour. The differences between these forecasts would not result in changes to the facility requirements. With nearby facilities becoming increasingly constrained, it is anticipated that future growth could meet or exceed those identified in the market share scenario. The highest growth scenario, which is based on the FAA National Aerospace Forecast is slightly higher than the market share analysis and represents the forecast recommended for capacity analysis and facility requirements planning as master of the TTN master plan. A detailed breakdown of the operations in this forecast scenario is presented in Table 2-10. For planning considerations, all itinerant operations are assumed to be instrument operations.

Table 2-10: Annual Operations Forecast

	Itinerant				Local			
Year	Air Carrier/ Air Taxi	General Aviation	Mil	Total	Civil	Mil	Total	Total Ops.
2015	9,599	37,157	1,516	48,272	29,716	275	29,991	78,263
2020	10,239	39,200	1,516	50,955	30,961	275	31,236	82,191
2025	10,895	40,984	1,516	53,395	32,264	275	32,539	85,934
2035	12,364	46,101	1,516	59,982	35,019	275	35,294	95,275

Source: McFarland Johnson, 2015

2.6.2. Growth Elements

Airline – Growth elements related to airline activity are discussed previously in the enplanements section. Operations for airline activity may vary in some of the text references and numbers used in the enplanements discussion as the type of airline/aircraft conducting the operations may vary over time. For example, 140 passengers can be transported via a single aircraft (two operations) or via two regional jets (four operations). As previously noted, enplanements are the critical consideration for future facility planning as opposed to airline operations.

Itinerant General Aviation – Itinerant general aviation activity (originating or terminating 50 nautical miles (NM) or greater from TTN) is down considerably from the peak activity back in 2000. The post 9/11 decline along with the Great Recession and subsequent fuel cost spikes resulted in a steady decline in itinerant general aviation operations during the 2000's. This decline in activity is consistent with national trends for similar airports throughout the northeast U.S. Growth in itinerant general aviation operations will be based on the ability to attract new tenants to the airport and compete with airports like Northeast Philadelphia and Morristown for regional business.

Local General Aviation – Local general aviation operations (originating or terminating within 50 NM of TTN, including traffic pattern operations) have declined slightly over the past decade. As airport operations grow and there is additional airline service, some local operations, especially touch-and-go activity, may opt to use other lower-activity airports in the region. Overall, local operations are expected to remain stable, though a slight decline is possible if airline and itinerant general aviation operations grow greater than anticipated.

Military – The FAA National Aerospace Forecast projects flat activity for both local and itinerant military operations for the 20-year planning horizon. It is anticipated that the military activity that has occurred in the past, will continue in a similar fashion into the future.

2.7. BASED AIRCRAFT

General aviation activity continues its recovery from the Great Recession in which general aviation experienced a steep decline. Recovery has been slow and certain parts of the general aviation market continue to experience no growth or even declines. These declines occurred for single-engine piston aircraft and multi-engine piston aircraft. All other general aviation aircraft types experienced some level of growth between 2007 and 2014, especially after 2009. It is anticipated that certain areas (turbine and rotorcraft aircraft) will show growth between 2.2 and 2.5 percent per year in the next 20 years. Sport aircraft are also anticipated to show a significant increase in based aircraft.

One of the reasons for this general decline in general aviation based aircraft could be FAA's 2010 Rule for Re-Registration and Renewal of Aircraft Registration. The FAA changed its ruling to require all aircraft owners re-register their aircraft within a three-year time period. This resulted in a decline of registered aircraft, which may have partially been the result of incorrect or out of date addresses on file at the FAA. It was estimated in 2010 that up to 30,000 registrations had incorrect or out of date addresses and may not receive FAA renewal paperwork. A three-year renewal of registration requirement may also deter hobby pilots from continuous renewal.

In an effort to stimulate flight training, student pilot certificates for pilots under the age of 40 were increased to be valid for 60 months (compared to the previous 36 months of validity). The goal is to allow student pilots additional time to complete their pilot training and continue flying after becoming a certified pilot. This may lead to an increase in based aircraft for flight schools.

Based aircraft forecasts serve an important role in the planning of future facilities at the Airport, particularly as it relates to features such as hangars and apron space. The most demanding based aircraft may also play in a role in the requirements for airport facilities that may not be utilized by the most demanding aircraft such as dedicated general aviation facilities. The growth elements below discuss both the local and national factors that influence based aircraft growth at TTN.

2.7.1. Growth Considerations

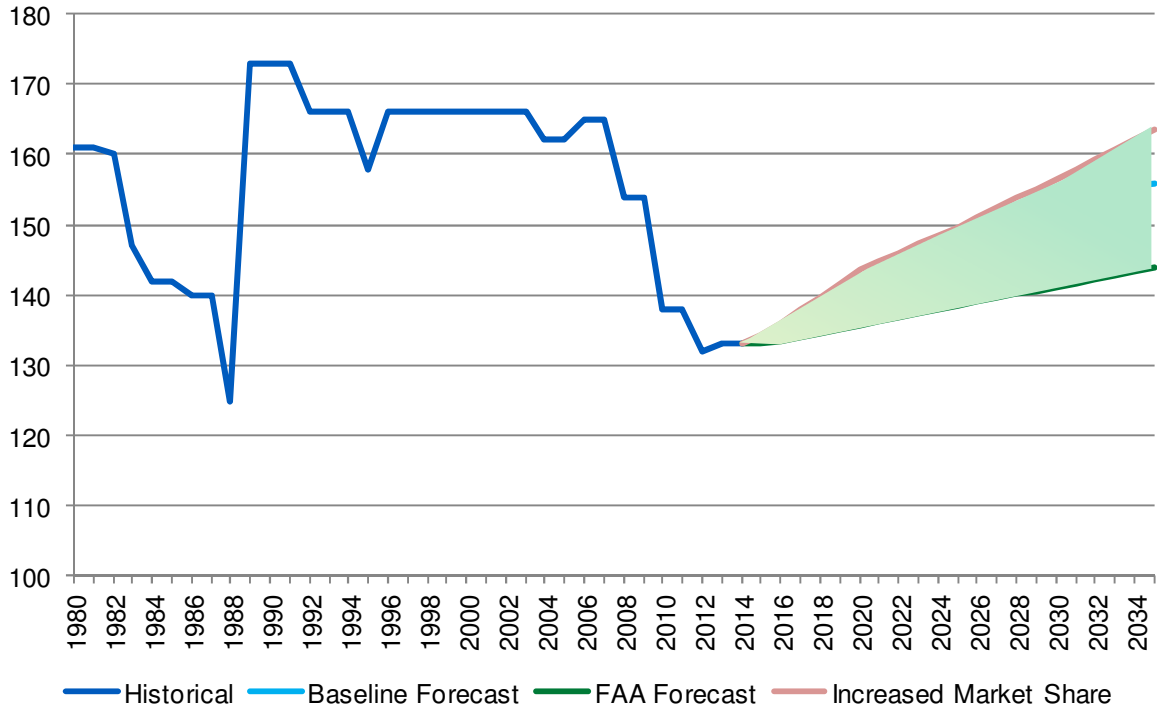
National Trends - The FAA publishes a forecast containing national trends and growth projections of active general aviation aircraft by type (jet, multi-turbo, multi-piston, single, and rotor). This forecast contains guidance that suggests relatively flat growth for both single and multi-engine aircraft with the majority of the growth occurring in the form of jet, rotorcraft, and light sport aircraft.

Local Socioeconomic Conditions – The growth in based aircraft provided by the FAA includes national growth rates. As previously discussed, the local socioeconomic conditions indicate a strong growth environmental based on income levels, types of businesses in the area, and low unemployment rates.

Three forecasts were created for Trenton-Mercer Airport as shown in **Figure 2-5.** The baseline forecast for based aircraft was calculated using the market share method. Within the service

area, Trenton-Mercer has recently accounted for over 25 percent of based aircraft. It is anticipated that it will continue to hold this market share, and represent 25% of the market area by 2035 which translates to a growth of approximately 1% per year.

Figure 2-5: Trenton-Mercer Forecasts



The low growth forecast is based on the current (2015-2035) FAA National Aerospace Forecast active general aviation and air taxi aircraft forecast of 0.4 percent per year. This growth rate would apply should socioeconomic conditions in the area start moving toward the national average due to decreased income or strong industries in the area declining.

The high growth forecast anticipates that Trenton-Mercer Airport increases its competitive edge within the planning period and local healthcare industries continue to do well and attract business operations. This high growth shows potential based aircraft should TTN regain its recent 25 percent market share of based aircraft in the service area by 2020 and then increasing its market share by 0.5 percent every five (5) years to a maximum of 26.5 percent in 2035.

The TAF for Trenton-Mercer is a flat line. Based aircraft TAF for the 20-year planning period were reviewed and the forecast, shown in **Table 2-11** shows TTN returning to its 2007 and 2009-2011 market share of approximately 25 percent of the air service area. **Table 2-11** shows the forecast of based aircraft for TTN along with the projected numbers in the TAF as well as the total based on FAA forecasted national growth rates.