Palm Beach International Airport
MASTER PLAN UPDATE - VOLUME I

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AECOM

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Palm Beach International Airport Master Plan Update

The Master Plan Update represents a financially feasible development plan that accommodates existing and anticipated demand throughout the 20-year planning horizon.

Quality information

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Acronyms

AAAB	Aviation and Airports Advisory Board
AAC	Aircraft Approach Category
AADT	Annual Average Daily Traffic
AAGR	Average Annual Growth Rate
AASHTO	American Association of State Highway and Transportation Officials
AC	Advisory Circular
ACI-NA	Airports Council International-North America
ACIP	Airport Capital Improvement Program
ACRP	Airport Cooperative Research Program
ACSP	Air Cargo System Plan
ADG	Airplane Design Group
ADIZ	Air Defense Identification Zone
ADO	Airports District Office
ADPM	Average Day Peak Month
AFFF	Aqueous Film Forming Foam
ALP	Airport Layout Plan
AGL	Above Ground Level
AIP	Airport Improvement Program
AIT	Advanced Imaging Technology
ALP	Airport Layout Plan
ALS	Approach Lighting System
ANOMS	Airport Noise and Operations System
AOA	Airport Operations Area
APC	Automated Passport Control
APM	Airport Planning Manuals
APRC	Approach Reference Code
AQI	Air Quality Index
ARC	Airport Reference Code
ARFF	Aircraft Rescue and Firefighting
ARPA	Archaeological Resources Protection Act
ARPZ	Approach Runway Protection Zone
ASDA	Accelerate Stop Distance Available
ASIG	Aircraft Service International Group
ASOS	Automated Surface Observation System
ASPM	Aviation System Performance Metrics
ASR	Airport Surveillance Radar
AST	Aboveground Storage Tank
ASV	Annual Service Volume
ATADS	Air Traffic Activity Data System
ATCT	Airport Traffic Control Tower
ATO	Airline Ticketing Office
AUTEC	Atlantic Underseas Test and Evaluation Center
AVS	Alternate Viewing Station
AZO	Airport Zoning Overlay
BHS	Baggage Handling System
BLS	Bottle Liquid Scanner
BMP	Best Management Practice
BTS	Bureau of Transportation Statistics
CAT	Category
CBIS	Checked Baggage Inspection System
CBO	Congressional Budget Office
CBP	Customs and Border Protection
CCAN	Citizen's Committee on Airport Noise
CDG	Checkpoint Design Guide
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CPE	Cost per Enplaned Passenger
CRA	Community Redevelopment Agency
CSA	Combined Statistical Area
DME	Distance Measuring Equipment
DOA	Department of Airports
DPRC	Departure Reference Code
DRI	Development of Regional Impact
DRPZ	Departure Runway Protection Zone
EDS	Explosives Detection System
EFH	Essential Fish Habitat

EIS	Environmental Impact Statement
EMAS	Engineered Materials Arresting System
EO	Executive Order
EPA	Environmental Protection Agency
EQA	Equivalent Aircraft
ETD	Explosives Trace Detection
ETMSC	Enhanced Traffic Management System Counts
F&B	Food and Beverage
FAA	Federal Aviation Administration
FACT	Future Airport Capacity Task
FAR	Federal Aviation Regulations
FASP	Florida Aviation System Plan
FBO	Fixed Base Operator
FDEP	Florida Department of Environmental Protection
FDOT	Florida Department of Transportation
FEDEX	Federal Express
FEMA	Federal Emergency Management Agency
FFWCC	Florida Fish and Wildlife Conversation Committee
FIS	Federal Inspection Services
FLL	Fort Lauderdale-Hollywood International Airport
FPSS	Feet-per-second-squared
FSI	Flight Service International
FUDS	Formerly Used Defense Sites
FY	Fiscal Year
GA	General Aviation
GAFIS	General Aviation Federal Inspection Services
GARB	General Airport Revenue Bond
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GIS	Geographic Information System
GPS	Global Positioning System
GS	Glideslope
GSE	Ground Support Equipment
HCM	Highway Capacity Manual
HIRL	High Intensity Runway Lights
I-95	Interstate 95
IAOFZ	Inner Approach Obstacle Free Zone
IAP	Instrument Approach Procedure
IATA	International Air Transport Association
IFR	Instrument Flight Rules
ILS	Instrument Landing System
IMC	Instrument Meteorological Conditions
ITC	Intermodal Transit Center
ITOFZ	Inner Transitional Obstacle Free Zone
LAHSO	Land and Hold Short Operations
LDA	Landing Distance Available
LED	Light Emitting Diode
LLWAS	Low-Level Wind Shear Alert System
LOC	Localizer
LOS	Level of Service
LRTP	Long-Range Transportation Plan
LUST	Leaking Underground Storage Tank
MALSR	Medium Intensity Approach Light System with Runway Alignment Indicator Lights
MAP	Million Annual Passengers
MEPT	Mechanical, Electrical, Plumbing, and Telecommunications
MI	Managed Inclusion
MIA	Miami International Airport
MII	Majority-in-Interest
MIRL	Medium Intensity Runway Lights
MITL	Medium Intensity Taxiway Lights
MJS	Maintenance, Janitorial, and Storage
MLW	Maximum Landing Weight
MOS	Modification of Airport Standards
MPH	Miles per Hour
MPO	Metropolitan Planning Organization
MPU	Master Plan Update
MRO	Maintenance, Repair, and Overhaul
MSA	Metropolitan Statistical Area

MSGP	Multi-Sector General Permit
MSL	Mean Sea Level
MTOW	Maximum Takeoff Weight
NAAQS	National Ambient Air Quality Standards
NAVAIDS	Navigational Aids
NCEI	National Centers for Environmental Information
NEO	New Engine Option
NEPA	National Environmental Protection Association
NextGen	Next Generation Air Transportation System
NFPA	National Fire Protection Association
NM	Nautical Mile
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPA	Non-Precision Approach
NPDES	National Pollutant Discharge Elimination System
NPIAS	National Plan of Integrated Airport Systems
NPL	National Priority List
NRHP	National Register of Historic Places
O&D	Origin and Destination
O&M	Operation and Maintenance
OFZ	Obstacle Free Zone
OOG	Out-of-Gauge
OPSNET	Operational Network
PA	Precision Approach
PAPI	Precision Approach Path Indicators
PAYGO	Pay-as-You-Go
PBI	Palm Beach International Airport
PCI	Pavement Condition Index
PCN	Pavement Classification Number
PFC	Passenger Facility Charge
PGDS	Planning Guidelines and Design Standards for Checked Baggage Inspection Systems
POFZ	Precision Obstacle Free Zone
PRT	Personal Rapid Transit
RCL	Runway Centerline Lights
RCRA	Resource Conservation and Recovery Act
RDC	Runway Design Code
REIL	Runway End Identifier Lights
RIM	Runway Incursion Mitigation
RNAV	Area Navigation
RNP	Required Navigation Performance
ROD	Record of Decision
ROFA	Runway Object Free Area
ROFZ	Runway Obstacle Free Zone
RON	Remain Overnight
ROT	Runway Occupancy Time
RPZ	Runway Protection Zone
RSA	Runway Safety Area
RTM	Revenue Ton Miles
RTR	Remote Transmitter/Receiver
RVR	Runway Visual Range
SF	Square Feet or Square Foot
SFHA	Special Flood Hazard Area
SFMA	Southeast Florida Metropolitan Area
SFWMD	South Florida Water Management District
SHPO	State Historic Preservation Office
SIS	Strategic Intermodal System
SMMP	Stormwater Management Master Plan
SSCP	Security Screening Checkpoint
SWA	Solid Waste Authority
SWPPP	Stormwater Pollution Prevention Plan
SY	Square Yards
TAF	Terminal Area Forecast
TDG	Taxiway Design Group
TERPS	U.S. Standard for Terminal Instrument Procedures
TNC	Transportation Network Company
TODA	Takeoff Distance Available
TOFA	Taxiway/Taxilane Object Free Area
TORA	Takeoff Run Available

TPSO	Traffic Performance Standards Ordinance
TRACON	Terminal Radar Approach Control Facilities
TRB	Transportation Research Board
TSA	Transportation Security Administration or Taxiway/Taxilane Safety Area
U.S.	United States
UPS	United Parcel Service
USACE	United States Army Corps of Engineers
USEIA	United States Energy Information Administration
USFWS	United States Fish and Wildlife Service
UST	Underground Storage Tank
VFR	Visual Flight Rules
VIP	Very Important Person
VMC	Visual Meteorological Conditions
VORTAC	VHF Omnidirectional Range with Tactical Air Navigation System
WHA	Wildlife Hazard Assessment
WHMP	Wildlife Hazard Management Plan
WTE	Waste-to-Energy
WTMO	Walk Through Metal Detector
VHF	Very High Frequency

Introduction

01

01 Introduction

The Palm Beach International Airport (PBI or Airport) Master Plan Update summarizes the 20-year vision for future development. It was developed in collaboration with the Federal Aviation Administration (FAA), Florida Department of Transportation (FDOT), Palm Beach County Department of Airports (DOA), and various stakeholders with particular interest and insight regarding the future of the Airport and region.

PBI is located in West Palm Beach, Florida and is the primary commercial service airport in Palm Beach County. The Airport is within the Southeast Florida Metropolitan Area (SFMA) which is the most populated region in Florida and is considered a critical component of the State's economy. PBI's contribution accounts for nearly $3.5 billion of total economic output[1] and will continue to be an important economic engine for the City and region in the future.

1.1 Purpose and Need

An Airport Master Plan evaluates the capability of an airport's facilities to accommodate anticipated changes in demand and presents a cost-effective development and funding plan to improve aging and/or inadequate facilities. Changes in demand can result from technological improvements, airline consolidation and service decisions, regulatory initiatives, and other factors in the aviation industry which impact airport capacity and facility needs.

Figure 1.1. Illustrates the primary proposed developments identified in the 2006 Master Plan. The 2006 Master Plan was completed at a time when the FAA considered PBI as one of a few airports in the U.S. with significant capacity constraints. As these constraints were impacting the overall U.S. air transportation system, the primary feature of the 2006 Master Plan was a new air carrier runway (Runway 10R-28L). However, the economic recession beginning in 2008 resulted in a significant decrease in aircraft operations which deferred the need for the new runway. Therefore, the purpose of this Master Plan is to update the aviation activity forecasts, evaluate existing and proposed aviation needs, and define solutions that will best serve PBI and the surrounding community.

Existing On-Airport Land Use

1. Passenger Terminal Area
2. Landside Facilities
3. Airport/Airline Support Area
4. Air Cargo Area
5. Southwest GA Area
6. Southeast GA Area
7. Northwest GA Area
8. Airport Maintenance Area
9. Air Traffic Control

2006 Master Plan Primary Development Projects

1. Relocate general aviation to the Golfview area
2. Upgrade Runway 10R-28L
3. Expand passenger terminal for a new Concourse D
4. Facilitate non-aviation/ commercial/industrial development

Figure 1.1: Primary Proposed Developments in 2006 PBI Master Plan
Source: AECOM (2016)

1 *Statewide Aviation Economic Impact Study Update, FDOT, August 2014.*

1.2 Focus Areas

The PBI Master Plan addresses all essential components of the airport per FAA and FDOT guidelines. However, each Master Plan is conducted to resolve specific issues or opportunities that have emerged since the previous Master Plan. This Master Plan includes five primary Focus Areas (commercial passenger terminal, airside design, general aviation, land use opportunities, and environment and sustainability) as summarized in the following sections.

1.2.1 Commercial Passenger Terminal

The commercial passenger terminal is typically the single feature passengers remember most at an airport. While the aesthetics of a terminal are often used to depict the character of a city and/or region, the functional flow and efficiency are also important factors in the opinions passengers formulate of the airport.

The various functions within the terminal (ticketing, security screening, holdrooms, baggage claim, etc.) have changed significantly in recent years due to advancements in technology, passenger preference, and regulatory requirements. This Master Plan identifies key terminal improvements that accommodate anticipated demand and maximize the passenger experience.

1.2.2 Airside Design

The airside of an airport is a complex system of runways, taxiways, aircraft parking aprons, and support facilities such as Navigational Aids (NAVAIDS). The size, number, and configuration of these elements can have a direct impact on the safety and number of aircraft operations that can occur during a specific time period.

The primary airside design features evaluated in this Master Plan include (1) the need and timing of the new runway and (2) the configuration of the existing taxiway system. Since the 2006 Master Plan, the FAA published Advisory Circular (AC) 150/5300-13A (Change 1), *Airport Design*, which includes significant updates and/or clarifications to runway and taxiway design methodologies.

1.2.3 General Aviation Infrastructure

The General Aviation (GA) market at PBI is significant. General Aviation facilities encompass much of the southern area of the airport and additional facilities are being constructed in the area between Runways 10L and 14 (known as the Golfview site). General Aviation is expected to remain an important revenue source throughout the planning horizon. As the proposed new runway impacts much of the existing GA facilities, a development and implementation plan which efficiently transitions existing and future GA facilities to new areas of the airport is a key component of this Master Plan Update.

1.2.4 Land Use Opportunities

The Airport is surrounded by major roads and residential communities that represent long-term constraints to airport expansion and development. Existing and future land uses for on and off-airport property must maximize the benefit to the airport and its operations. This Master Plan explores land use opportunities that can improve the Airport's revenue sources as well as maximize the efficiency of aviation related activities.

1.2.5 Environment and Sustainability

The FAA and National Environmental Protection Agency (NEPA) each have guidelines governing airport development as it relates to environmental impacts. Many airports are implementing proactive measures to minimize environmental impacts and enhance overall sustainability, including utilization of solar energy, protection of wetlands, conversion to electric or alternative fuel vehicles, and numerous others programs. This Master Plan also evaluates existing facilities and the proposed development plan against known environmental issues, particularly noise due its historical significance among the community.

1.3 Master Plan Stakeholders

An important component to the success of a Master Plan is providing those with an interest in the development and operation of the Airport an opportunity to review and comment on the proposed development plan.

The stakeholder outreach program occurred throughout this Master Plan Update to obtain feedback and ultimately, a consensus on the proposed development plan. The process consisted of multiple stakeholder meetings attended by representatives from the FAA, FDOT, Palm Beach County Aviation and Airports Advisory Board (AAAB), airlines, and fixed base operators (FBO). The following sections summarize the purpose and intent of each meeting. **Appendix A** provides more detail on each of these meetings as required by the "Florida Sunshine Law"[2].

1.3.1 Visioning Meeting

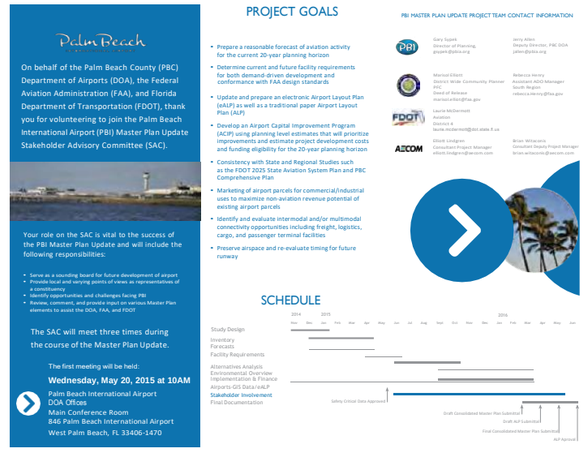
As the first key stakeholder session, the primary purpose of the Visioning meeting is to introduce the Master Plan, identify and/or confirm the key issues, and finalize the overall goals and objectives. The Visioning meeting establishes the baseline for the Master Plan, including existing conditions, aviation trends, preliminary forecasts, and so forth. Each stakeholder had the opportunity to identify and discuss additional issues for inclusion in the Master Plan.

1.3.2 Realization Meetings

Four Realization meetings were conducted to present the results of the Master Plan study at key intervals. The final proposed development plan is inclusive of comments and recommendations received at these meetings.

2 *Florida Statutes Chapter 286.011, Public Meetings and Records; Public Inspection; Criminal and Civil Penalties*

JetBlue A320 Aircraft at Gate C16
Source: AECOM (2014)



Stakeholder Meeting Brochure
Source: AECOM (2014)

1.4 Master Plan Goals & Objectives

Consistent with FDOT and FAA guidelines, the primary goal of this Master Plan is to update the Airport development plan based on existing conditions and aviation activity forecasts. More specifically, the goals and objectives of this Master Plan include:

- Prepare a reasonable forecast of aviation activity for the 20-year planning horizon (2035)
- Determine current and future facility requirements for both demand-driven development and conformance with FAA design standards
- Prepare an Airports-GIS database per AC 150/5300-18B as well as a traditional paper Airport Layout Plan (ALP) for FDOT and FAA review and approval
- Develop an Airport Capital Improvement Program (ACIP) using planning level estimates that will prioritize improvements and estimate project development costs and funding eligibility for the 20-year planning horizon
- Consistency with State and Regional Studies such as the FDOT 2025 State Aviation System Plan and Palm Beach County Comprehensive Plan
- Maximize land use and development opportunities
- Maximize the passenger experience within the commercial passenger terminal building
- Identify and evaluate intermodal and/or multimodal connectivity opportunities including freight, logistics, cargo, and passenger terminal facilities
- Preserve airspace and re-evaluate timing for future runway

1.5 Master Planning Process

The PBI Master Plan was completed in three general phases: Needs, Solutions, and Documentation as depicted and described in **Figure 1.3**.

1.5.1 Needs

This phase of the Master Plan includes the confirmation of existing conditions, development of the aviation activity forecasts, and identifying facility requirements required to accommodate expected demand. Each of these elements set the basis for the subsequent alternatives analysis.

The objective of the inventory is to gather and summarize the current airport facilities, airspace, land-use, and environmental data that will be required in subsequent study elements. This Master Plan included detailed derivative forecasts, such as peaking characteristics, aircraft fleet mix, and other projections. The new forecasts were approved by the FAA in January 2016 and used to prepare the facility requirements for future aviation demand.

A significant component of the Needs phase is initiation of the Stakeholder Outreach Program. As part of this phase, the key stakeholders identified by the DOA, FDOT, and FAA had the opportunity to provide their ideas, comments, and opinions on the future role of PBI in the community and aviation industry as a whole.

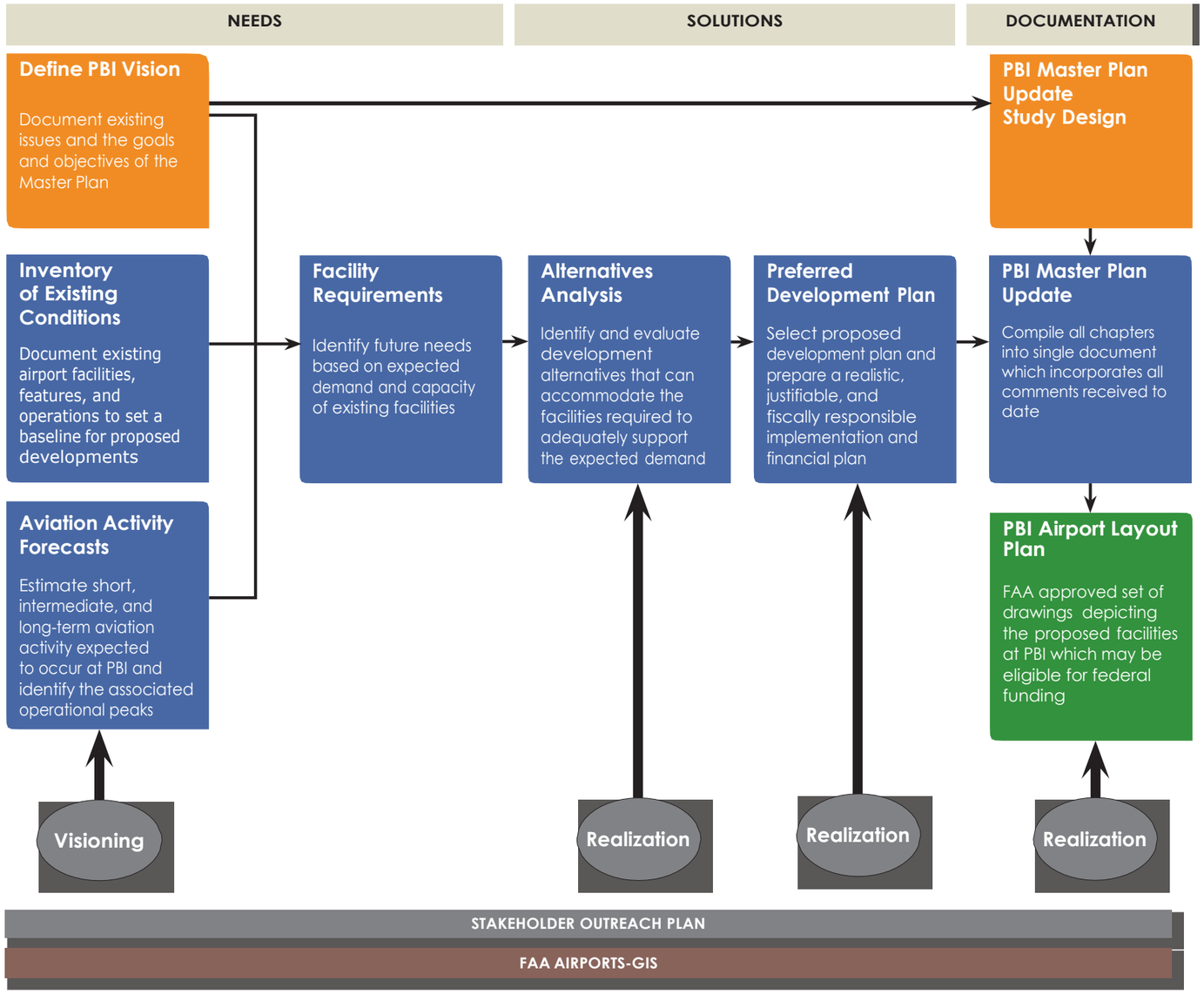


Figure 1.2: Master Planning Process
Source: AECOM (2014)

1.5.2 Solutions

This phase analyzes alternative solutions for implementing the facility requirements and provides a responsible and cost-effective implementation and financing schedule. A collaborative approach to alternative development and screening was incorporated through several review meetings with the DOA, FAA, FDOT, and Stakeholders to identify, assess, refine, and ultimately narrow the plan recommendations. Although the final plan suggests a single comprehensive, adaptable, and sustainable concept, the analyses are documented to facilitate a contingency plan which accounts for a range of potential circumstances.

Initial alternative developments emphasize aviation safety, efficiency, and demand-driven needs. Exploration of opportunities related to new revenue generation and activities that support the metropolitan area's economic growth are also considered. The use of all existing and future Airport property is a key component to exploring potential options. Additionally, aligning the Airport's vision to the Palm Beach area's growth strategy can produce synergies that drive growth across the Region and for the Airport.

1.5.3 Documentation

The FAA primarily relies on the ALP drawing set when participating in the funding of eligible projects. Therefore, the ALP is a key deliverable representing the final product of the master plan process. Today, airport master plans provide a more comprehensive connection to local planning, policy, and administrative goals. Many airport master plans are now incorporated by reference into other plans. The level of detail must provide sufficient detail to support understanding by non-aviation users. The master plan will therefore be prepared with this in mind, augmenting highly technical aviation discussions with more simplified "guiding" or "policy" principals that can be easily interpreted by local policy-makers and non-aviation stakeholders.

1.5.4 Airports-GIS

In 2008, the FAA released new standards for federally funded projects to be completed in a specific Geographic Information Systems (GIS) format. GIS are computer-based software that links geographic features on a map with data related to the feature. GIS may be used by the Airport Sponsor/Airport Operator for a number of purposes, including the inventory and maintenance of airport facilities, preparation for emergency services, planning for airport improvements, inventory of airport property, and the inventory of sensitive environmental areas. This project developed an Airports-GIS database utilizing newly acquired aerial and ground survey according to FAA AC's 150/5300-16A, 17C and 18B (Change 1).

1.6 Alternative Evaluation Criteria

The FAA recommends identifying a standard set of evaluation criteria to assess development alternatives based on an airport's unique situation. The evaluation process should feature "generally accepted planning principles, be replicable, consistently applied, and well documented." Accordingly, a single set of evaluation criteria were established for use in the analysis of each development alternative. The selected criteria are as follows:

Long-Term Aviation Needs

The preferred alternative must provide sufficient capacity to address the PBI facility requirements through 2035 and should also take into consideration the aviation needs beyond 2035.

Compatibility

The preferred alternative should be consistent with all environmental regulations and minimize impacts to the 21 environmental impact categories identified in FAA Order 5050.4B, National Environmental Policy Act (NEPA) Implementing Instructions for Airport Actions. Future development should support growth for both aviation and non-aviation functions while minimizing impacts to the environment and community.

Flexibility to Accommodate Change and/or Additional Air Service

The preferred alternative should be flexible enough to accommodate unexpected changes in demand.

Operational Efficiency

Proposed alternatives should be configured and located to maintain or enhance the operational efficiency of the Airport. Improvements should support future intermodal connectivity and expanded airline service.

Financial Feasibility & Implementation

The preferred alternative must be cost-effective and within the ability of the DOA to secure funding for proposed improvements. Construction of the proposed improvements should be implemented without undue interference to existing operations. A realistic schedule for the implementation of proposed improvements is also required.

Seating Area in Main Terminal
Source: AECOM (2014)

PBI Airport Traffic Control Tower
Source: AECOM (2014)

1.7 Master Plan Organization

The organization of this Master Plan Update is intended to address all master planning elements included in the FDOT Guidebook for Airport Master Planning as well as the FAA Airport Master Plans AC (150/5070-6B [Change 2]). In accordance with the FDOT's airport master planning philosophy of viewing the individual planning elements as separate modules and in lieu of a traditional approach where all functional areas and components of an airport are grouped into the facility requirements and alternatives analysis chapters, this Master Plan separates them into autonomous reports. The Airside, Terminal, Landside, General Aviation, and Land Use components of the Master Plan are each discussed in an individual chapter. Each chapter includes a summary of the facility requirements and alternatives analysis. An implementation and financial plan complete the analysis and present a feasible schedule and funding strategy to incorporate the proposed developments. The purpose of this method is to provide a complete Master Plan but with independent plans for each component that can each be individually maintained. This method not only simplifies the development plan but also allows the DOA, FDOT, FAA and other stakeholders to concentrate on a particular aspect of the Master Plan.

Chapter 2: Inventory of Existing Conditions

This chapter contains a summary of existing conditions at PBI, including a review of relevant studies and potential impacts to proposed developments. A key component will be identifying on and off-airport land uses and any potential constraints to future development. The inventory chapter provides the baseline for all subsequent facility requirements and alternatives analysis. The information included in this chapter is obtained from the airport survey conducted for the Airports-GIS database, site visits, previous studies, and relevant city, county, state, and federal information.

Chapter 3: Aviation Activity Forecasts

The aviation activity forecasts are the foundation for all Master Plans. Airport Master Plans are typically updated due to changes in demand. Forecasts assist the Airport in identifying realistic expectations for future demand based on current information. These forecasts are used to broadly assess the aviation and socio-economic trends most directly affecting PBI.

The base year of activity levels for this Master Plan is 2013 and forecasts were developed for the short-term (5-year), medium-term (10-year) and long-term (20-year) planning horizons. The base point for development of the forecasts was the 2014 FAA Terminal Area Forecast (TAF). Alternative forecasts were developed for comparison purposes and to consider varying demand scenarios based on a different combination of assumptions and expectations.

Chapter 4: Airside Analysis

The airside analysis identifies the most critical, demand-driven facility requirements for airside components and evaluates alternatives for alleviating shortfalls in capacity. Airside components analyzed in this section includes runway length, number of runway exits and location, NAVAIDS, taxiway configuration and nomenclature, separation standards, safety areas and airspace.

Chapter 5: Terminal Analysis

The terminal analysis concentrates on the terminal complex. The analysis recommends infrastructure improvements required to maintain a Level of Service C based on International Air Transport Association (IATA) standards and the guidelines of the Transportation Research Board (TRB) Airport Cooperative Research Program (ACRP) Report 25, Airport Passenger Terminal Planning and Design. Primary terminal elements included in this chapter include curb fronts, interior spaces, gate capacity, and the aircraft parking aprons and associated support facilities. One of the primary objectives is to maximize the passenger experience through efficient facilities that mitigate existing constraints and/or improves convenience.

Chapter 6: General Aviation & Support Facilities

Since General Aviation is a significant contributor to PBI's operations and revenue stream, it is important component of future airport use and development. This chapter analyzes the need for General Aviation facilities and alternatives to accommodate new and potentially relocated facilities. In addition, other aviation support facilities such as airfield rescue and firefighting (ARFF), airport and airline maintenance, fuel farms, and so forth are evaluated to determine need for new and/or improved facilities.

Chapter 7: Landside Analysis

The aviation activity forecasts are interpreted to derive a corresponding impact to aviation access, circulation, and related ground transportation facility needs such as supplemental long term parking, employee parking, and rental car facilities. Information emerging from stakeholder involvement and/or regional transportation studies is used to explore project needs, such as a transit stop to downtown or improvements to public roads required by future airport development. An analysis of a potential connection to Interstate 95 for cargo operations is explored in addition to intermodal connectivity and its associated impacts.

Chapter 8: Environmental Review

The environmental review summarizes the environmental process and implications associated with the development plan. While baseline environmental conditions are summarized in the inventory, this chapter identifies potential impacts quantified as part of the alternatives analysis which will assist the DOA in evaluating the scope of subsequent environmental analysis necessary to support near-term development with an overall outlook regarding the scope and timing of longer-range projects. A summary of potential environmental impacts associated with the development plan will identify the significance of those impacts and potential means for mitigation and/or the need for subsequent field investigation or survey.

In terms of the human environment, perception of aircraft noise exposure and visual aircraft flyovers is typically the most sensitive concern for the residents and businesses in the vicinity of an airport. Noise Contours will be prepared based on the activity forecasts and the development plan. Potential issues arising from noise, regardless of noise levels, are identified and discussed.

Chapter 9: Implementation Plan

The implementation plan provides a general phasing plan for incorporating the recommended improvements within the 20-year planning horizon. The implementation schedule for specific projects is predominantly based on accommodating forecast demand but in some cases are scheduled to enable other improvement projects.

Chapter 10: Financial Plan

The financial plan presents a potential funding plan for implementing the recommended CIP projects, along with an assessment of the ability of the DOA to fund the projects. The financial plan considers the Airport's existing financial structure, potential changes to the financial structure and revenues, and potential new funding sources as necessary.

Inventory of Existing Conditions

02

02 Inventory of Existing Conditions

The first task of a Master Plan is to present an inventory of existing conditions. Pertinent information on physical, operational, and functional characteristics of the Airport were collected to serve as the baseline for evaluating the capability of the existing facilities to accommodate forecast growth. The PBI inventory is presented in the following four sections: (1) Airport Locale; (2) Airport Role; and (3) Existing Airport Facilities.

PBI is located in West Palm Beach, Florida and is the primary commercial service airport in Palm Beach County. The Airport is also within the SFMA which is the most populated region in Florida and is considered a critical component of Florida's economy. PBI's contribution accounts for nearly $3.5 billion of total economic output[1] and will continue to be an important economic engine for the City and region in the future.

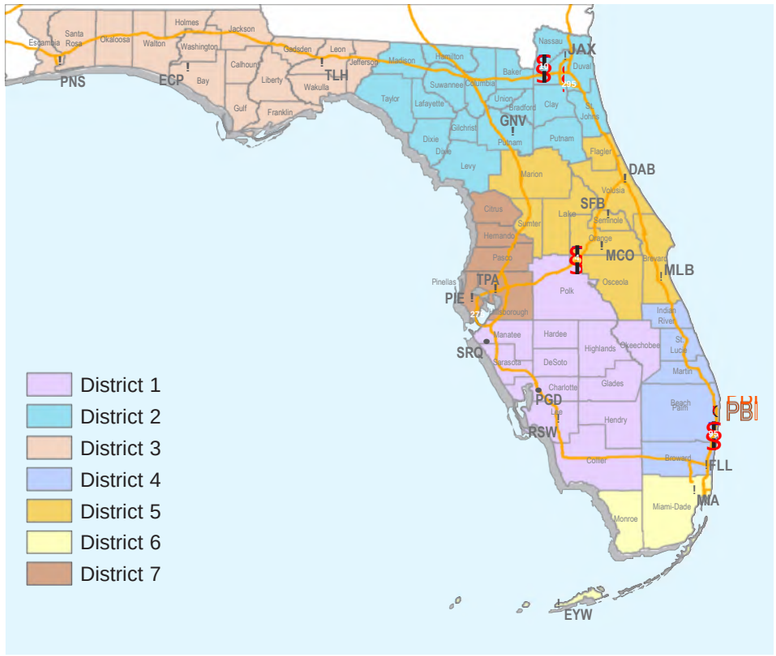


Figure 2.1: Airport Location Map
Source: AECOM (2014); Basemap from ESRI

Figure 2.2: Airport Vicinity Map
Source: AECOM (2014); Base map from ESRI

2.1 Airport Locale

PBI is the primary provider of commercial air carrier services in Palm Beach County and is owned and operated by the DOA. PBI is located in the FDOT District 4 (Ft. Lauderdale) along the Interstate-95 (I-95) corridor. **Figure 2.1** depicts the location of PBI as it relates to the State of Florida and other airports within the SFMA, including Fort Lauderdale/Hollywood International (FLL) and Miami International (MIA). The SFMA consists of the 8th largest Metropolitan Statistical Area (MSA) in the United States (Miami, Fort Lauderdale, and West Palm Beach) with over 5.5 million residents per the 2010 U.S. Census. **Figure 22** depicts the area immediately surrounding PBI, including neighborhoods, prominent landmarks, and access roads.

2.1.1 Airport History

Figure 2.3 provides an illustrated timeline of major milestones throughout PBI's history.

Commercial service at PBI dates back to 1936, when the Airport was officially opened as Morrison Field in honor of Miss Grace K. Morrison, an aviation pioneer who championed the planning and establishment of the field. Eastern Air Lines was the first commercial air carrier at PBI, with a daily northbound flight from Miami to New York via 12 cities including West Palm Beach.

After operating solely as a military airfield during World War II, the airport was officially renamed Palm Beach International Airport in 1948. Palm Beach County obtained operational control of PBI twelve years later in 1959. The

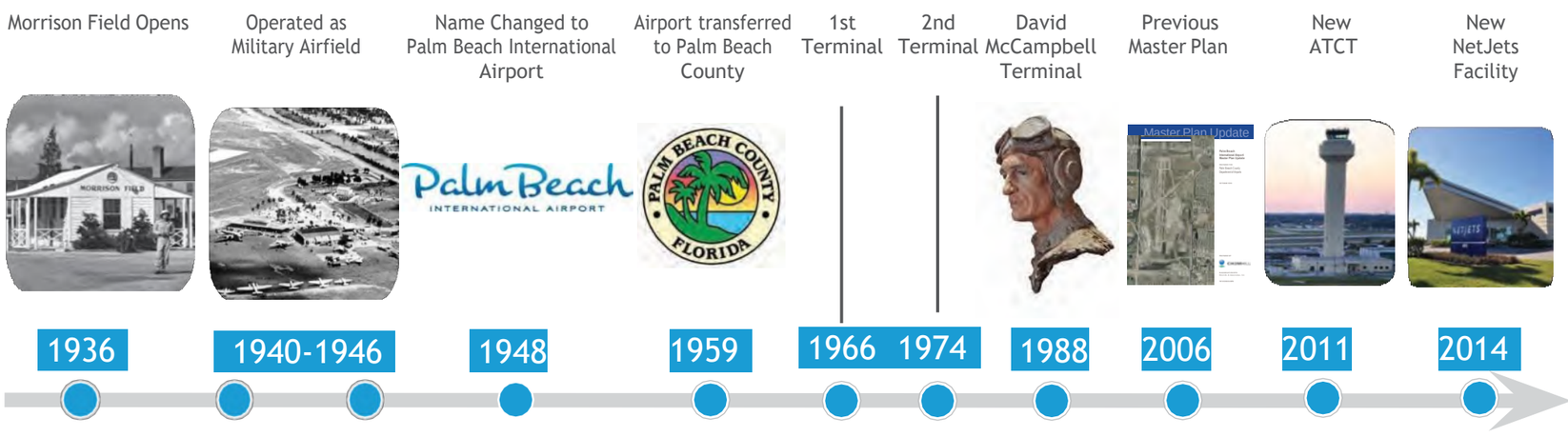


Figure 2.3: PBI General Historical Timeline
Photo Sources (from left to right): Historical Society of Palm Beach County; Palm Beach Post; DOA; Palm Beach County; AECOM; DOA; AECOM; AECOM

1 *Statewide Aviation Economic Impact Study Update, FDOT, August 2014.*

first terminal building was opened in 1966 followed by a second one, built by Delta Air Lines, in 1974. The existing Captain David McCampbell Terminal, named after the famed U.S. Navy aviator and Medal of Honor recipient, was opened in 1988.

The 2006 Master Plan was followed by multiple improvement projects, including a new Airport Traffic Control Tower (ATCT) in 2011. The new NetJets Terminal opened in 2014 and represented the initiation of GA facilities expansion recommended in the previous Master Plan. **Figure 2.4** highlights projects completed since the last Master Plan.

2.1.2 Socioeconomic Characteristics

In 2013, population in Palm Beach County made up for 7% of Florida population. The median household income in Palm Beach County ($52,432) is higher than the state of Florida ($46,956). In 2012, the 43,159 businesses in Palm Beach County accounted for 8.6% of total businesses in Florida, and generated 449,798 jobs (6.5% of state total). A location quotient analysis on 2012 County Business Patterns data reveals that the top three specialty industries in Palm Beach County are arts and recreation, corporates management, and scientific and technical services.

2.2 Land Use & Zoning

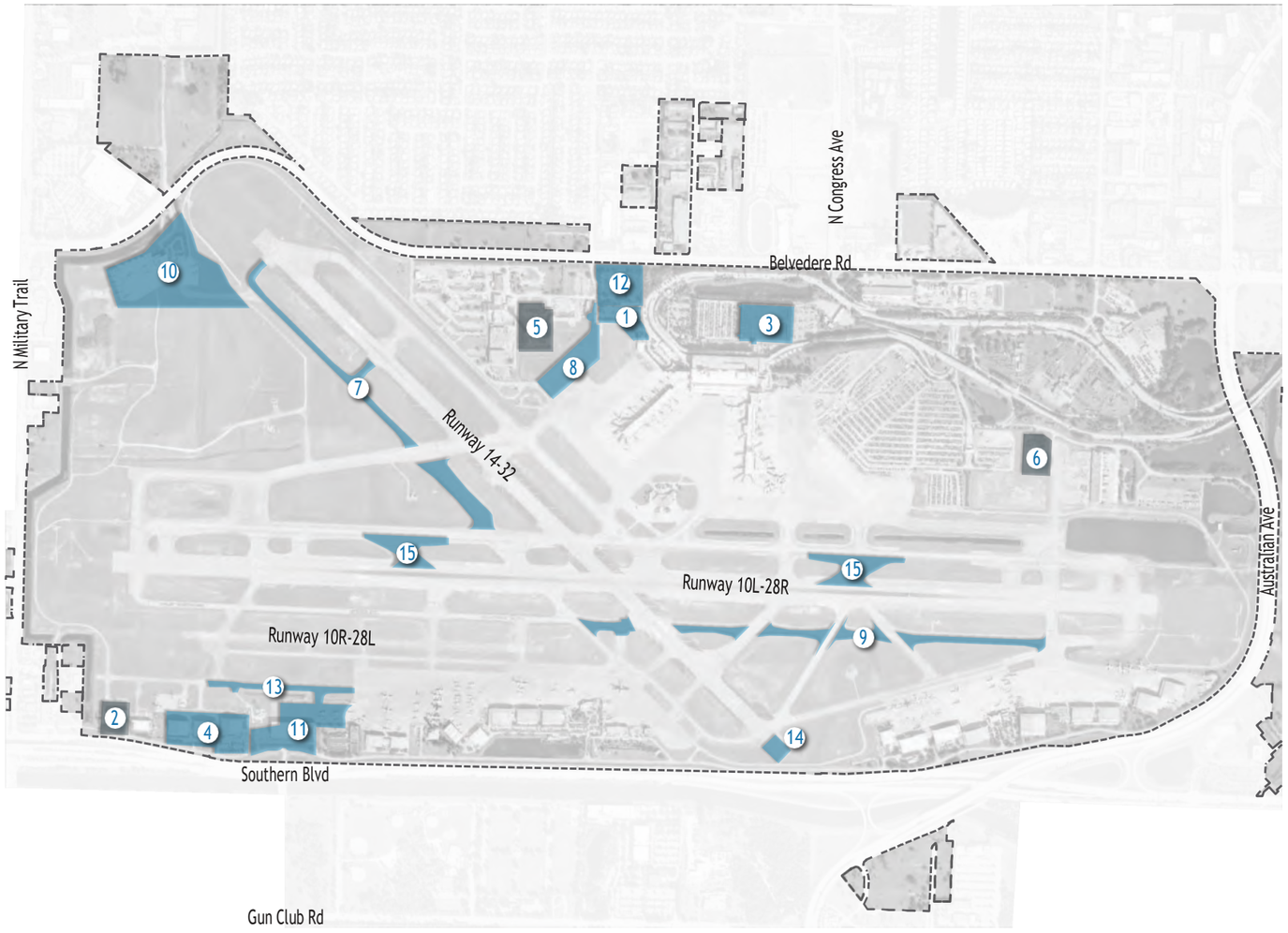
After a decade-long effort to update and modernize land development regulations, the DOA created a simplified entitlement process for aviation and non-aviation uses. This effort consisted of re-zoning multiple properties to a single designation, establishment of a traffic concurrency reservation, and creation of an overlay zoning designation to identify specified permitted uses as well as a streamlined approval process. As a result of this effort, new construction of hotel, office, industrial and travel-oriented commercial uses is expected to begin within the next few years.

The following are current and proposed land use designations and zoning codes for PBI and the surrounding areas, including those within unincorporated Palm Beach County.

2.2.1 On-Airport Land Uses

Figure 2.5 depicts existing on-airport land uses for PBI as summarized in **Table 2.1**. These designations are for airport purposes only and may not reflect PBC or West Palm Beach designations. Re-designation may be required to develop on some sites.

A small portion of PBI, the southwest corner of the Belvedere Road and Australian Avenue intersection, is located within the jurisdiction of the City of West Palm Beach. West Palm Beach has designated this property under the Community Service for existing and future land uses. The properties located west of Military Trail and Runways 10L and 10R are designated as a Special Planning Area known as the PBI Approach Path Conversion Area Overlay. Neither the City of West Palm Beach nor the Town of Haverhill, which is directly adjacent to the PBI Approach Path Conversion Area Overlay, has specific airport-related regulations.



Airport Improvements Since 2006

2008	1	New DOA office	**2010**	5	New ATCT construction	**2011**	8	Apron A expansion	**OTHERS**	12	Career Source PBC
	2	PBC Sheriff Aviation Unit Hangar		6	Air cargo apron expansion		9	Taxiway L Extension		13	Taxilane T
	3	Long-term parking garage expansion		7	Taxiway F extension	**2013**	10	NetJets terminal		14	Runway 32 EMAS
2007	4	Atlantic Aviation hangars & apron				**2014**	11	Atlantic Aviation hangars		15	Exit Taxiways C4 & D

Figure 2.4: Airport Improvements Since 2006
Source: AECOM (2016)

Table 2.1: On-Airport Land Uses

Land Use Type	Description	Acres	Percentage
Aircraft Movement Area	Runways and taxiways	648.3	34.7%
Passenger Terminal Area	Terminal building, aircraft parking aprons, and taxilanes	100.7	5.4%
Airport Access and Parking	Access Roads and Parking lots/structures	144.1	7.7%
General Aviation Areas	Fixed base operators, and the associated hangars, terminals, aprons	185.9	10.0%
Air Cargo Area	Distribution building, truck loading docks, and cargo apron	15.2	0.8%
Airspace Protection	Runway protection zone for Runway 14 end	36.2	1.9%
Airport/Airlines Support	Freight building, fuel farms, ground handling service provider, airline catering services, airport maintenance, ARFF station, ATCT	68.0	3.6%
Environmental	Lakes, Retention Ponds, Canals, etc.	116.8	6.3%
Commercial	CareerSource PBC, Hilton Palm Beach Airport, Trump Golf Club, etc.	442.3	23.7%
Aviation Development	Golfview Area for future GA expansion	109.8	5.9%
Total		**1,867.4**	**100.0%**

Figure 2.5: On-Airport Land Use Map
Source: AECOM (2016)

Notes:

(1) Designated as a Community Service (CS) district in the City of West Palm Beach's Existing and Future Land Use Map
(2) Designated as Commercial Recreation (CR) in Palm Beach County's Existing and Future Land Use Map

The re-designation of these properties is an ongoing process. Properties within the PBI Approach Path Conversion Area Overlay west of Military Trail and Runways 10L and 10R are being redesignated to allow for future Industrial uses. As part of this process, the DOA secured approval from the County to revoke the State of Florida's Development of Regional Impact (DRI) designation for PBI which now allows for land use modifications without any additional review by state or regional planners and officials.

For new development to occur on these properties, Florida Statutes require that the impact of that development occur concurrently with the improvements to the facilities being impacted. A traffic concurrency reservation approval for PBI was secured in 2009 for the existing airport facilities and future potential aviation, industrial, office, hotel, and commercial uses. This approval provides established concurrency reservations for future property uses.

PBI is also located within the Airport Zoning Overlay (AZO) which establishes permitted uses, specific development regulations, and the review process for development within Airport property. This overlay allows for most desired uses to obtain entitlements without a lengthy development review process or additional public hearings.

As a result of these multiple efforts, the development of aviation and non-aviation uses within PBI properties is imminent. One of the first properties developed was the Airport Travel Plaza at Belvedere Road and Florida Mango Road which received site plan approval in September 2014. Development of another property at the southeast corner of Australian Avenue and Southern Boulevard as a car dealership received site plan approval in January 2015. Additional site plan approvals for office, hotel, industrial and travel-oriented uses are anticipated during the next several years.

2.2.2 Existing Off-Airport Land Uses

As illustrated in **Figure 2.6**, PBI is predominantly bordered by low-density residential areas approximately one mile to the east and west as well as immediately northwest and southeast. Most of the residential properties are one-story, single-family detached houses. Pockets of mobile homes are scattered around PBI, with the closest ones immediately to the north.

To the northeast of PBI lies commercial land where hotels, rental car facilities, and the Palm Beach Kennel Club are located. A number of light industrial establishments are also located to the northeast, including auto service and repair, heat and air-conditioning supplies, electronic equipment, and plumbing supplies.

Open space around PBI includes Lake Lytal Park immediately adjacent to the south, Haverhill Park and Mounts Botanical Garden to the west, and Dreher Park, Palm Beach Zoo, and Hillcrest Memorial Park to the southeast. A canal flows alongside the south and west borders of PBI, and the Pine Lake lies immediately to the east. Judicial and military institutes such as the Criminal Justice Complex and U.S. Army Reserve are situated south of PBI, east of Lake Lytal Park.

2.2.3 Palm Beach County Future Land Uses

Figure 2.7 depicts the PBC designated future land use categories as of February 2015. The predominant changes include planned commercialization in the areas southeast and north of PBI. Mixed-use corridors are planned along S Military Trial and S Congress Avenue. Areas currently designated mobile home areas will be re-categorized as high-density residential areas.

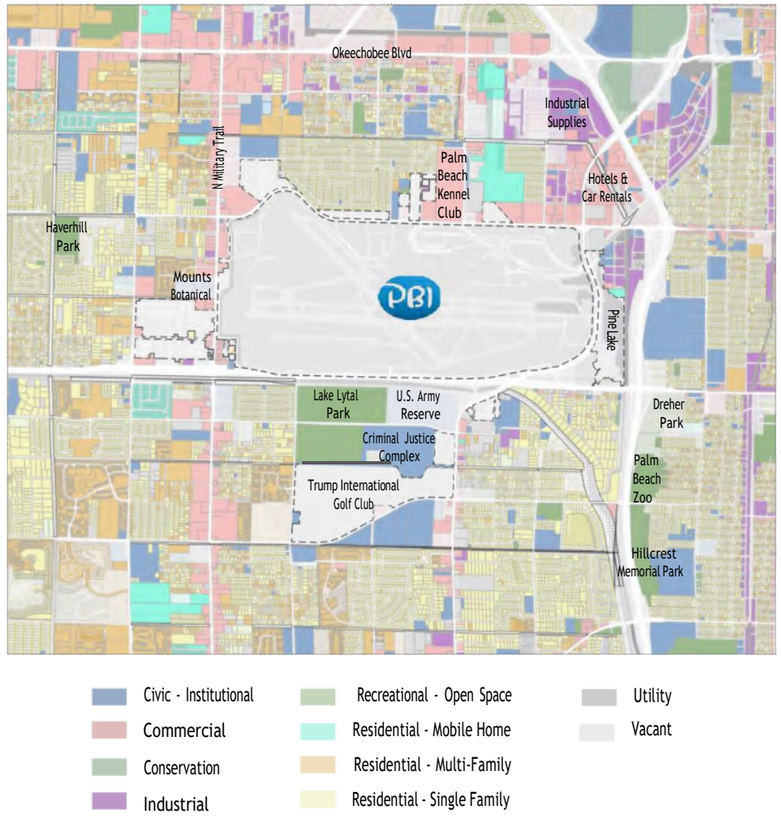


Figure 2.6: Existing Off-Airport Land Uses
Source: Palm Beach County (2014); Basemap by ESRI

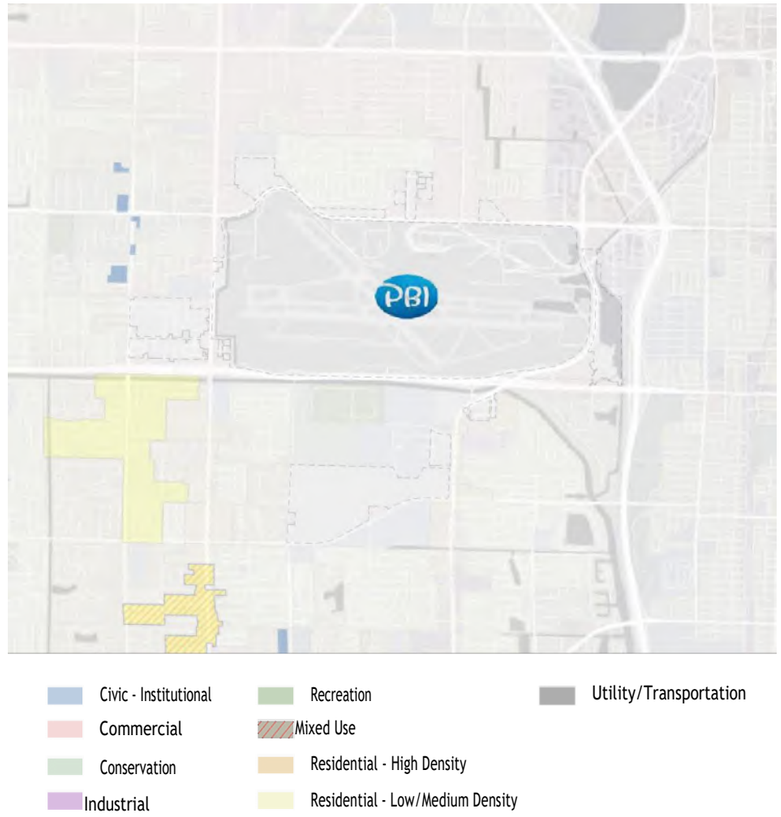


Figure 2.7: Future Off-Airport Land Uses
Source: Palm Beach County (2014); Basemap by ESRI

2.3 Airport Role

The 2015-2019 National Plan of Integrated Airport Systems (NPIAS) report (FAA, 2014) classifies PBI as a medium-hub primary commercial service airport. A medium-hub airport has at least 0.25% but less than 1% of the total U.S. annual passenger enplanements. A Primary commercial service airport has at least 10,000 annual passenger enplanements. PBI is the sixth largest NPIAS airport in Florida with nearly 2.8 million annual enplanements.

As depicted in **Figure 2.8**, non-stop commercial service from PBI is offered to approximately 30 destinations, including one short-haul connection to Tampa, 25 domestic long-haul destinations to the northeast and the west, and four international flights (two to Canada and two to the Bahamas).

2.3.1 2025 Florida State Aviation System Plan

The Florida Aviation System Plan (FASP) 2025 (FDOT, 2012), identifies the SFMA as the nation's gateway to Latin America and the Caribbean. With rapid population growth in the area, Southeast Florida is deemed to "have the potential to move alongside London, Paris, New York, and other world leaders in international commerce." In order to support this potential, the FASP advocates for capacity enhancement at the region's major airports (PBI, MIA, and FLL) as the FASP has projected that PBI will exceed operational capacity by 2040.

2.3.2 Economic Impact

As one of the major airports in the State of Florida, PBI has considerable economic impact. According to the Economic Impact of Palm Beach International Airport (FDOT, 2014), the total economic activity at PBI in 2013 was nearly $3.5 billion (2.4% of annual total output of the aviation industry in Florida). This includes direct impacts of $593 million from tenants and construction projects at the airport, $1.34 billion of indirect impacts from spending of visitors by air, and $1.5 billion of multiplier impacts. Employment related to services provided by PBI included 34,048 jobs and a total payroll of $951 million, accounting for 2.6% and 2.1% of the state total in the aviation industry respectively.

Figure 2.8: Non-stop Commercial Service Markets in 2014
Source: Palm Beach County Department of Airports (2014); Basemap from ESRI

Beach Along Ocean Boulevard
Source: AECOM (2014)

City Place Shopping Area
Source: AECOM (2014)

2.4 Existing Airport Facilities

The existing property consists of 1,865.7 acres, of which 1,339.1 acres is the primary aviation operations area and 526.6 acres are outlying properties for non-aviation uses. The following sections describe the existing airside, terminal, landside, general aviation, and other support facilities at PBI. **Figure 2.9** illustrates a general airport facilities layout and **Table 2.2** identifies general airport data.

Table 2.2: General Airport Data

Item	Existing Conditions
Airport Reference Code (ARC)	D-IV
Airport Elevation (MSL) – NAVD 88	19.5
Airport Reference Point (ARP) NAD 83:	
Latitude	26° 40' 59.4"
Longitude	80° 05' 44.1"
Mean Maximum Temperature (Hottest Month)	94.2° (July)
Critical Aircraft1	B757-300
Airport Magnetic Variation (March 2015)	6° 38' W ± 0° 19' (changing 0° 6' W per year)
NPIAS Service Level	Medium-Hub Primary Commercial Service
Florida Service Level	Primary Commercial
Airport Role	Passenger Transport

Notes:

An airport's critical aircraft is traditionally defined as the aircraft or family of aircraft that utilizes or is expected to utilize a runway a minimum of 500 annual operations (FAA Memorandum, Regional Policy and Guidance: Planning Guidance, no. 09-01 Runway Extension Justification Considerations, April 2009).

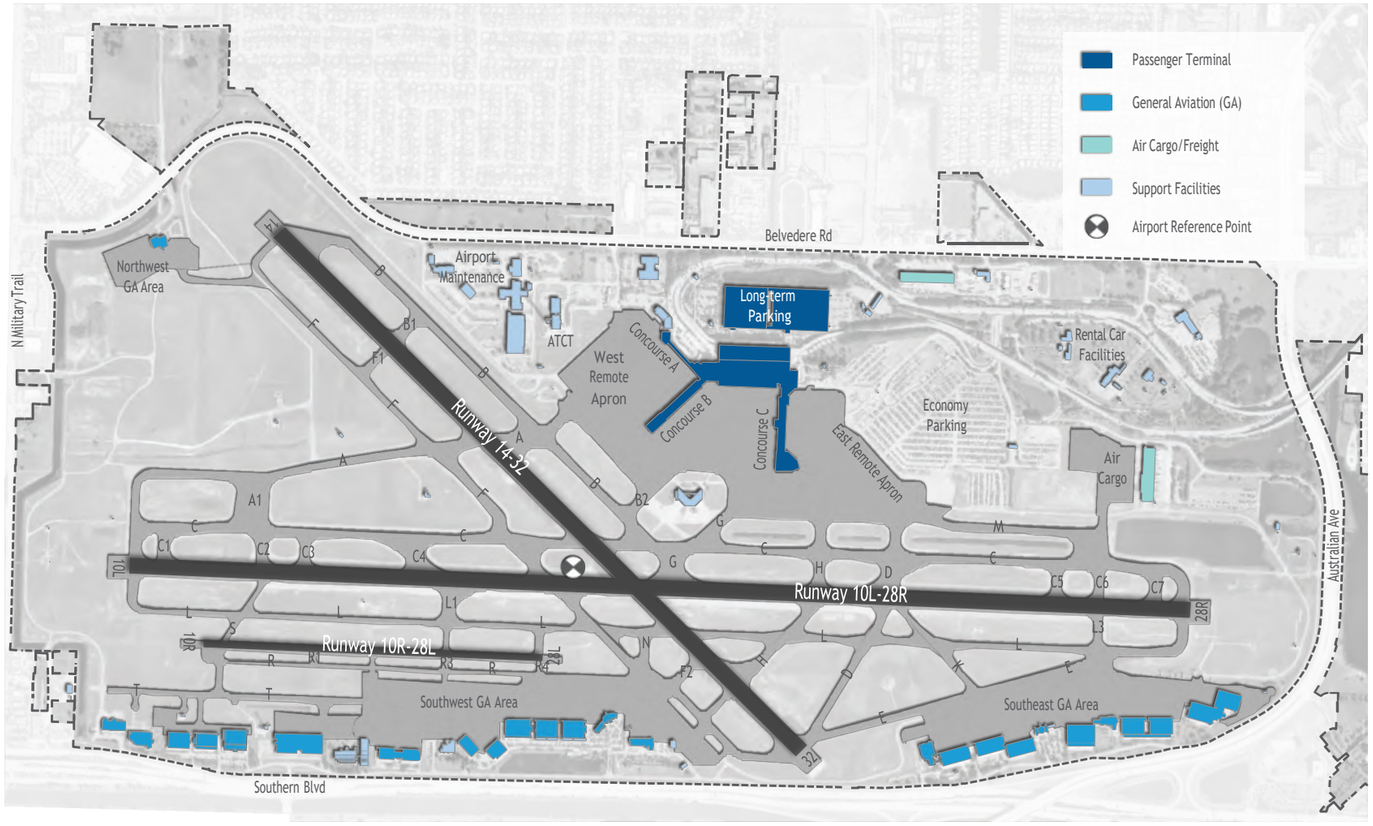


Figure 2.9: Existing Airport Facilities
Source: AECOM (2014)

2.4.1 Airside Facilities

Airside facilities include the system of runways, taxiways, navigational aids, weather aids, and air traffic control facilities that facilitate aircraft operations.

2.4.1.1. Runways

The existing airfield includes two parallel runways (10L-28R and 10R-28L) and one crosswind runway (14-32). The previous designations of 9L-27R, 9R-27L, and 13-31 were updated in December 2009 to account for a change in magnetic declination. Each runway has undergone a rehabilitation since the 2006 Master Plan. **Table 2.3** provides the key characteristics of each.

Runway 10L is the most frequently used runway, accounting for 54% of total operations in 2014. However, Runway 28R is the noise-preferred runway and accounted for 30.6% of 2014 operations. It is used heavily during the fall and winter as well as night operations.

Runway 14-32 is the crosswind runway and is used only when weather conditions are not suitable for operations on the parallel runways. However, operators at the new NetJets facility in the Northwest General Aviation area utilize this runway due to its close proximity and relatively short taxi distance. In order to provide more efficient access to Runway 10L-28R, the DOA is constructing a new taxiway (Taxiway W) from the NetJets apron to Taxiway A with an expected completion date in late 2016.

Runway 10R-28L is the dedicated general aviation runway for use by small non-air carrier aircraft only.

The Runway Design Code (RDC) is currently D-IV-2400 for Runways 10L-28R and 14-32 and B-I-VIS for Runway 10R-28L. The RDC determines the FAA design standards that apply to each runway and will be referenced to evaluate the existing runway design. RDC is a function of the Aircraft Approach Category (AAC), Airplane Design Group (ADG), and the Visibility Minimums of instrument approach procedures. Runways 10L-28R and 14-32 are designed to accommodate aircraft as large as a Boeing 767-400 on a regularly scheduled basis while Runway 10R-28L is designed to accommodate small aircraft, such as a Cessna 182.

The Approach Reference Code (APRC) and Departure Reference Code (DPRC) describe the current operational capability of a runway without the use of special procedures. The APRC is a function of the separation between the centerlines of the runway and parallel taxiway as well as the visibility minimums associated with the approach procedure. For example, the APRC for Runway 10L is D/IV/2400 and D/V/2400 which indicates that aircraft within approach categories A, B, C, and D and airplane design groups I, II, III, IV, and V can land at visibilities as low as ½ mile without special operating procedures. On the other hand, the DPRC is determined solely on the amount of separation between the centerlines of a runway and parallel taxiway. For Runway 10L-28R, the DPRC is D/IV and D/V signifying that aircraft within approach categories A, B, C, and D and airplane design groups I, II, III, IV, and V can depart without special operating procedures.

Table 2.3: Existing Runway Data

Item		Runway					
		10L	28R	10R	28L	14	32
Length[1]		10,001'		3,214'		6,931'	
Width[1]		150'		75'		150'	
Runway Design Code[2]		D-IV-2400	D-IV-4000	B-I-VIS	B-I-VIS	D-IV-5000	D-IV-5000
Approach Reference Code[2]		D/IV/2400 D/V/2400	D/IV/4000 D/V/4000	B/I(S)/VIS	B/I(S)/VIS	D/IV/5000 D/V/5000	D/IV/5000 D/V/5000
Departure Reference Code[2]		D/IV D/V	D/IV D/V	B/I(S)	B/I(S)	D/IV D/V	D/IV D/V
Aircraft Approach Speed		< 166 knots		< 121 knots		< 166 knots	
Airplane Design Group	Wingspan	< 171'		< 49'		< 171'	
	Tail Height	< 60'		< 20'		< 60'	
Visibility Minimums (RVR)		2400	4000	VISUAL	VISUAL	5000	5000
Critical Aircraft		B757-300		TBD		B757-300	
LAHSO Distance[1]		3,117'	3,725'	n/a	n/a	4,295'	n/a
Displaced Threshold[1]		1,200'	811'	0'	0'	0' (Trees)	418'
Runway End Elevation (MSL)[2]		19.56'	16.32'	17.5'	13.6'	16.9'	16.2'
Threshold Elevation (MSL)[2]		15.97'	18.20'	17.5'	13.6'	16.9'	15.8'
Effective Gradient (%)		-0.03	0.03	-0.1	0.1	-0.01	0.01
Surface[2]		Asphalt Grooved	Asphalt Grooved	Asphalt	Asphalt	Asphalt Grooved	Asphalt Grooved
Pavement Classification Number (PCN)		93 F/B/W/T		unknown		unknown	
Pavement Strength[1]	Single Wheel	120K Lbs.		25K Lbs.		100K Lbs.	
	Dual Wheel	175K Lbs.		-		180K Lbs.	
	Single Tandem	175K Lbs.		-		175K Lbs.	
	Dual Tandem	550K Lbs.		-		325K Lbs.	
	Dbl. Dual Tandem	840K Lbs.		-		400K Lbs.	
Approach Surfaces[3]		50:1	50:1	20:1	20:1	34:1	34:1
Runway Pavement Markings		Precision	Precision	Visual	Visual	Non-precision	Non-precision
Navigational Aids[1]		MALSR PAPI ILS HIRL RCL	PAPI ILS HIRL RCL	REIL MIRL	REIL PAPI MIRL	VORTAC REIL PAPI MIRL	VORTAC REIL PAPI MIRL

Sources:

[1] *Airport/Facility Directory*

[2] *Advisory Circular 150/5300-18B survey completed February 2015*

[3] *Safe, Efficient Use, and Preservation of the Navigable Airspace, 2014*

2.4.1.2. Taxiways

The taxiway system of an airport links the various areas of an airfield, primarily the runways and aircraft parking areas. On the other hand, taxilanes are portions of an aircraft parking apron that provide access to designated parking locations, such as a terminal gate, and are uncontrolled at PBI. All taxiways are constructed with asphaltic concrete. **Table 2.4** provides a summary of the existing taxiways at PBI. The following sections describe existing conditions related to taxiway design, exit taxiway location, pavement condition, and other operational issues.

Taxiway Design

The Taxiway Design Group (TDG) is a design method initiated by the FAA in 2012. The existing taxiways were constructed under legacy design standards and may not adhere to the current standards. Reconfiguration of existing taxiway design is typically required only if the non-standard intersection is included as part of a capital project; however, it is preferred that intersections defined as a 'Hot Spot' are corrected even in the absence of a capital project. A 'Hot Spot' refers to an intersection with a higher risk for a runway incursion or other safety related issue due to complex, confusing, or otherwise problematic configurations.

In order to minimize the risk of a potential runway incursion or surface incident, the FAA has identified several taxiway designs that are complex and/or confusing for pilots to maneuver. These designs include, but are not limited to, the following:

1. Intersections having greater than three possible turns
2. A wide expanse of pavement entering a runway
3. Convergence of numerous taxiways entering a runway
4. Taxiways intersecting a runway at other than a right angle
5. Non-standard location of runway holding position markings

Figure 2.10 identifies the locations of existing 'Hot Spots' at PBI according to the list above. Mitigation of the "Hot Spot" located at the intersection of Taxiways L, E and the Southeast GA was scheduled for completion in 2016.

Although identification of 'Hot Spots' provide pilots and controllers locations requiring increased awareness and caution, there are also other areas of the airfield that do not adhere to the current FAA design methodology. Additional details and analysis on existing non-standard taxiway configurations are discussed in Chapter 4, Airside Analysis.

Table 2.4: Existing Taxiways

Taxiway	Location / Description	ADG	TDG	Width
A	Entrance to Runway 14-32	V	5	75
B	Parallel to Runway 14-32	V	5	75
C	Parallel to Runway 10L-28R	V	5	75
D	Connecting Runways 10L-28R and 14-32	IV	5	75
E	Entrance to Runway 14-32	IV	5	75
F	Parallel to Runway 14-32	III	3	75
G	Connecting terminal area to Runways 10L-28R and 14-32	V	5	100
H	Connecting Runways 10L-28R and 14-32	V	5	75
K	Connecting Runway 10L-28R to Taxiway E	III	3	50
L	Parallel to Runway 10L-28R	III	3	50
M	Connecting terminal area to Taxiway C	V	5	75
N	Connecting Taxiway F and Taxiway L	V	5	85
R	Parallel to Runway 10R-28L	I	2	40
S	Connecting Runways 10L-28R and 10R-28L	III	4	50
T	Taxilane parallel with Taxiway R, connecting to the southwest GA area	III	4	50

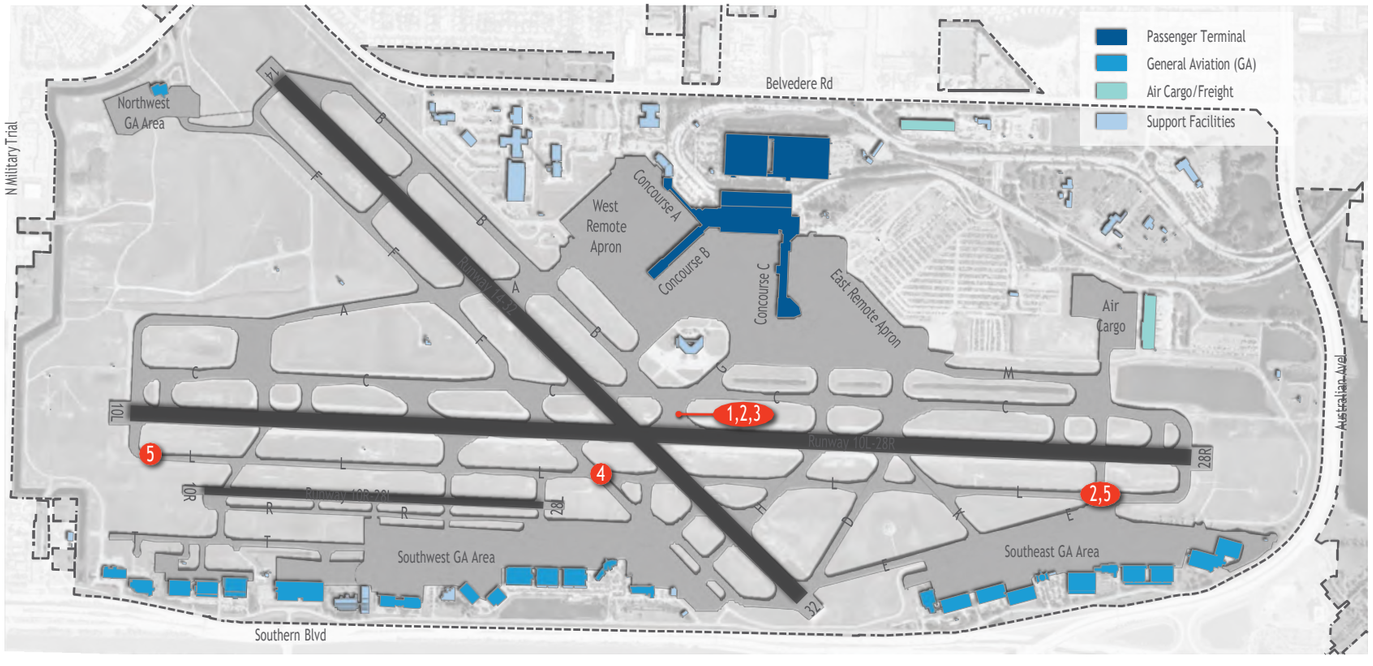


Figure 2.10: Existing Hotspot Locations
Source: FAA (2015)
Note: Reconfiguration of the Taxiways L and E intersection is scheduled for completion in 2016

Exit Taxiways

One of the most important functions of a taxiway system is to maximize pilot sight distance and minimize the runway occupancy time (ROT) for aircraft landing on a particular runway. Minimizing ROT can increase an airport's operational capacity by minimizing the sequencing time between arriving and departing aircraft. The most efficient method of reducing ROT and maximizing pilot sight distance is to provide high-speed, or acute-angled, exits at strategic locations along the runway. High-speed exits are typically angled at 30-degrees in relation to the runway centerline which can support aircraft exit speeds up to 60 miles per hour (mph). There are currently high-speed exits provided for arrivals on Runway 10L (Taxiway D) and Runway 28R (Taxiway C4) .

Pavement Condition and Planned Improvements

FDOT sponsors an airfield pavement management program for numerous public airports to "prioritize pavement maintenance and rehabilitation, determine maintenance scheduling, performing material evaluations and supporting design considerations." FDOT is in the process of updating these pavement reports. **Figure 2.11** depicts the 2014 conditions as most recently reported by FDOT in June 2015.

Runway 10L-28R and Runway 14-32 were both rehabilitated since the 2006 Master Plan and identified as in good condition by the FDOT accordingly. Runway 10R-28L was identified as primarily in satisfactory condition but a rehabilitation scheduled for completion in 2017 will upgrade it to good condition. Sections of Taxiways A, A1, C, D, E, F, G, H, K, N, and R are all identified as being in either poor, very poor, or serious condition and in need of repair. In addition, the East Remote Apron, Concourse A Apron, and outer sections of the Concourse C Apron were identified as in either poor or very poor condition. The DOA has recently initiated projects to repair Taxiways A, C (including connectors up to the Safety Area of Runway 10L-28R), D, and E as well as the Concourse A/B Apron. The Taxiway C project will also include redesignating taxiway connectors according to FAA guidelines.

Operational Issues

There are currently two operational issues associated with the taxiway system as noted by the DOA. The first is the existing hotspot located at the intersection of Taxiways E and L. The other issue concerns the use of ADG-I Taxiway R by ADG-III aircraft from the Southwest GA area. The preferred taxi route is the apron edge taxilane along the Southwest GA apron to Taxiway T; however, aircraft exiting the Signature Aviation parking apron utilize Taxiway R to avoid potential issues with aircraft parked on the Atlantic Aviation apron. The DOA is planning to relocating Taxiway R to mitigate this issue.

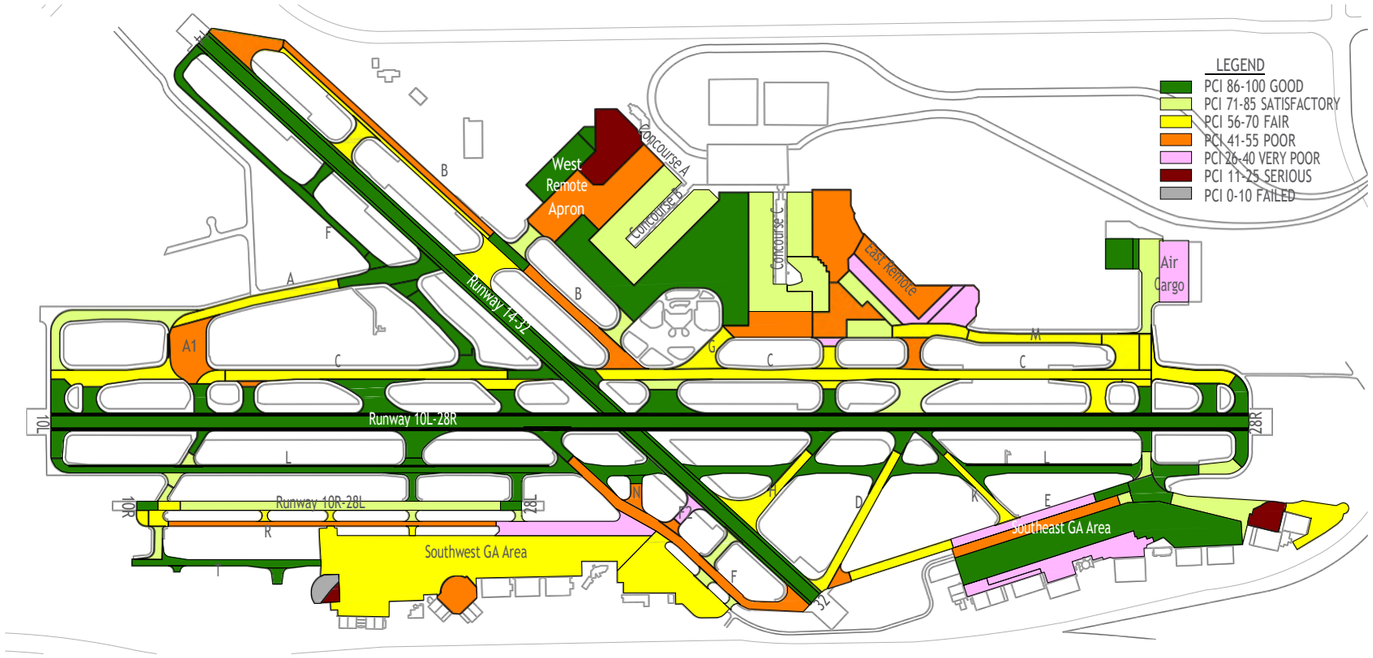


Figure 2.11: FDOT Pavement Conditions Index (2014)
Source: FDOT Statewide Airfield Pavement Management Program (June 2015); Basemap from ESRI

East Remote Apron
Source: AECOM (2014)

Southwest GA Apron
Source: AECOM (2014)

2.4.1.3. Navigational Aids (NAVAIDS)

Navigational aids (NAVAIDS) are installed at airports to help pilots safely navigate aircraft. **Figure 2.12** shows the locations of the NAVAIDS located at PBI. NAVAIDS are typically categorized as visual or instrument-based but also include communications, surveillance, or weather facilities. The FAA owns and operates the majority of these facilities and is responsible for their installation and maintenance.

Visual Aids

During visual approaches, pilots rely solely on visual aids. For the ATCT to authorize visual approach, reported weather at an airport must have a cloud ceiling at or above 1,000 feet and visibility of three statute miles or greater.

All the runway ends, except Runway 10L, have Runway End Identifier Lighting (REIL) systems. REIL lights are installed in line with runway threshold lights to enable pilots to identify an established runway end, especially for runways that may lack contrast with the surrounding terrain.

All six runway ends are also equipped with Precision Approach Path Indicator (PAPI) lights to provide visual vertical guidance to pilots during an approach.

Wind cones are present at all the runway ends to indicate prevailing wind direction.

Instrument Aids

Instrument approaches are required during conditions of low visibility such as that caused by fog, snow, or rain. Pilots follow an instrument approach procedure (IAP) using ground and/or satellite-based instrument aids and aircraft equipment to a point from which a landing may be made visually.

IAPs are classified as either Precision Approaches (PA), Approaches with Vertical Guidance (APV), or Non-Precision Approaches (NPA). PAs are facilitated with both lateral and vertical guidance, NPAs are performed with lateral guidance only. A PA and APV is available for Runway Ends 10L and 28R while NPAs are available for Runway Ends 10L, 28R, 14, and 32. Runway Ends 10R and 28L are for visual approaches only.

Runways 10L and 28R are equipped with a Category I instrument landing system (CAT I ILS). The ILS includes a localizer (LOC) and a glide slope (GS) antenna at each runway end. The Runway 10L system also includes a Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR) and a Distance Measuring Equipment (DME) antenna. The MALSR supplements the LOC and GS to allow for lower visibility minimums of ½ mile at the 10L end, compared to ¾ mile at the 28R end. Touchdown Runway Visual Ranges (RVRs) are installed near both runway ends to support the CAT I ILS.

Non-precision approaches available at PBI include a Very High Frequency Omnidirectional Range Collocated Tactical Air (VORTAC), global positioning system (GPS), and localizer only. Non-precision approaches rely on area navigation (RNAV) systems. Both RNAV RNP and RNAV GPS approaches are available at PBI. RNAV GPS utilizes global positioning systems to guide navigation, while RNAV RNP (required navigation performance) requires on-board monitoring equipment to advance performance and accuracy. **Table 2.5** provides the existing IAPs and the associated approach minimums.

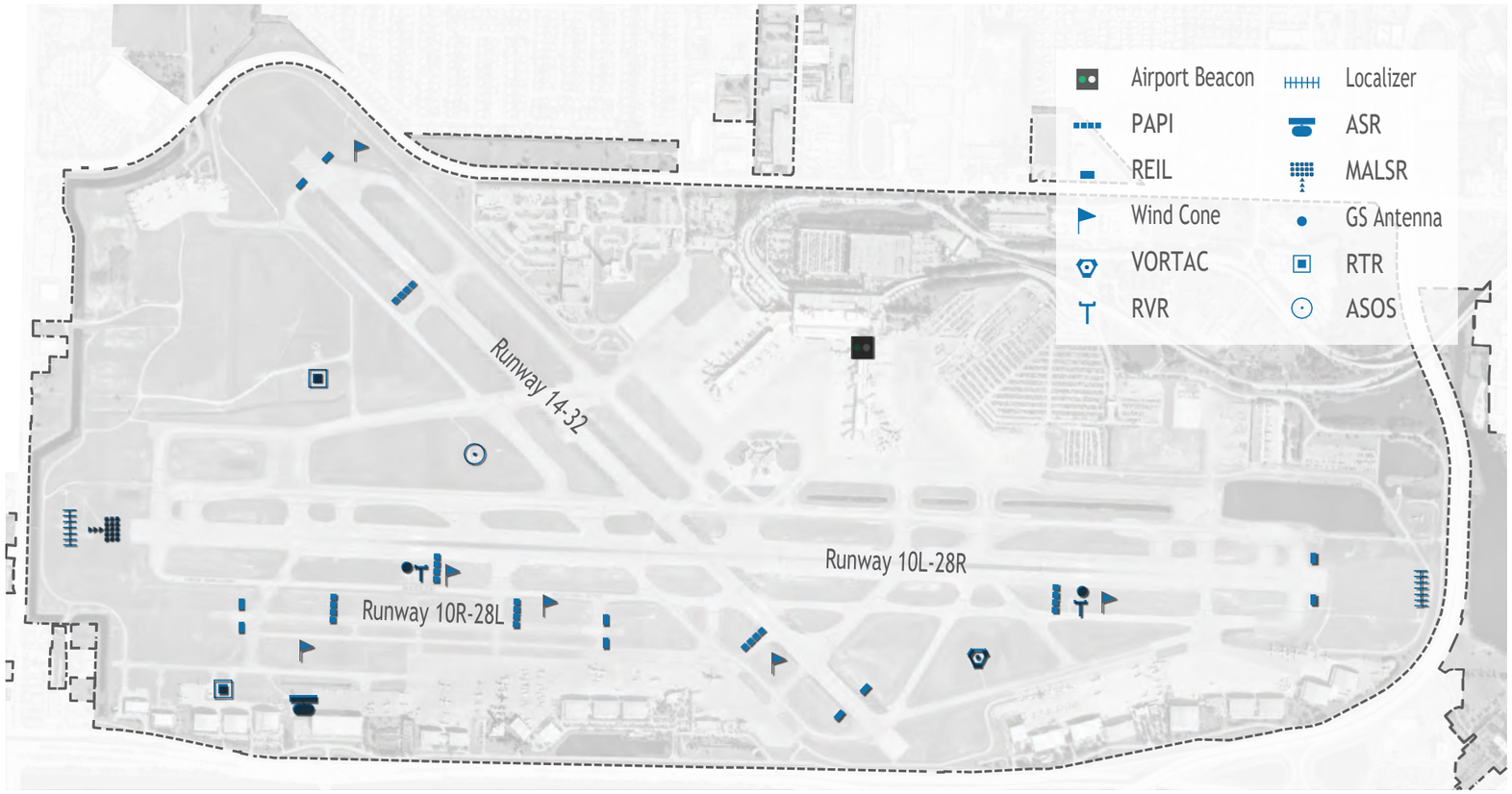


Figure 2.12: Existing On-Airport NAVAIDS
Source: AECOM (2014)

Table 2.5: Existing Instrument Approaches

Runway	Type	Approach Minimums (Altitude - Visibility Minimums)	Glideslope Angle (°)	Threshold Crossing Height
10L	CAT-I ILS	220-24 RVR	3	52
10L	RNAV (RNP)	318-24 RVR	3	52
10L	RNAV (GPS)	220-24 RVR	3	52
28R	CAT-I ILS	218-40 RVR	3	58
28R	RNAV (RNP)	404-60 RVR	3	58
28R	RNAV (GPS)	356-60 RVR	3	58
14	RNAV (RNP)	320-1 SM	3	51
14	RNAV (GPS)	293-1 SM	3	51
32	RNAV (RNP)	345-1 SM	3	57
32	RNAV (GPS)	336-1 SM	3	57

Communication & Surveillance Aids

Two remote transmitters/receivers (RTR) are installed at PBI to allow radio communications between pilots and the ATCT. One is located in the northwest quadrant between Runways 10L-28R and 14-32, the other in the southwest quadrant adjacent to GA hangars. Next to the RTR in the southwest GA area is the Airport Surveillance Radar (ASR), which helps the ATCT detect azimuth, range, and elevation of aircraft operating within terminal airspace.

Weather Aids

Weather aids at an airport help to accurately measure the cloud cover and ceiling, visibility, wind speed and direction, temperature, dew point, and so forth. An Automated Surface Observation System (ASOS) along with a Low Level Windshear Alert System (LLWAS) to measure wind speed and direction is located in the west of Taxiway F, north of Taxiway C, and south of Taxiway A. The purpose of an LLWAS is to minimize the risk of aircraft accidents during approaches or departures caused by unusual wind gusts, microbursts, and other wind phenomena.

24.1.4. Airspace

PBI operates within Class C Airspace and has a 24-hour operating ATCT.

Class C airspace consists of an inner and outer ring. The inner ring extends horizontally at a radius of five nautical miles and vertically from the surface to 4,000-feet Above Ground Level (AGL). The outer ring extends out horizontally from the inner ring to a total radius of ten nautical miles and vertically from 1,200-feet AGL to 4,000-feet AGL. The southern portion of the outer ring overlaps with the Class C airspace of the non-towered Palm Beach County Park Airport (LNA) which extends vertically from 1,600-feet AGL up to 4,000-feet AGL. **Figure 2.13** depicts the PBI airspace and its surroundings.

To operate in Class C airspace, pilots must maintain two-way communications with ATC at all times. Aircraft must be equipped with a Mode C transponder to visually display the aircraft's altitude on the ATC's radar. Pilots can only enter the airspace after radio communication has been established with the ATC at PBI.

Several Class D and E airports are located within a 20-mile radius of PBI, but not within the PBI airspace except the DOA operated LNA. The closest Class C airport is FLL, which is 50 miles to the south. The closest Class B airport is MIA approximately 70 miles south of PBI.

Loxahatchee National Wildlife Refuge area is immediately to the southwest of PBI airspace. Flight operations are restricted to 2,000 feet above the surface and landing is prohibited without authorization by the U.S. Fish and Wildlife Service. Alert Area A-291A, a concentrated flight training area, is approximately 20 miles southwest of PBI. In addition, the contiguous U.S. Air Defense Identification Zone (ADIZ) is aligned parallel to the coast approximately 20 miles east of PBI. All aircraft entering the ADIZ from outside of the U.S. must obtain FAA approval and provide identification prior to entry.

PBI airspace is controlled from the Terminal Radar Approach Control Facilities (TRACON) located at the ATCT facility.

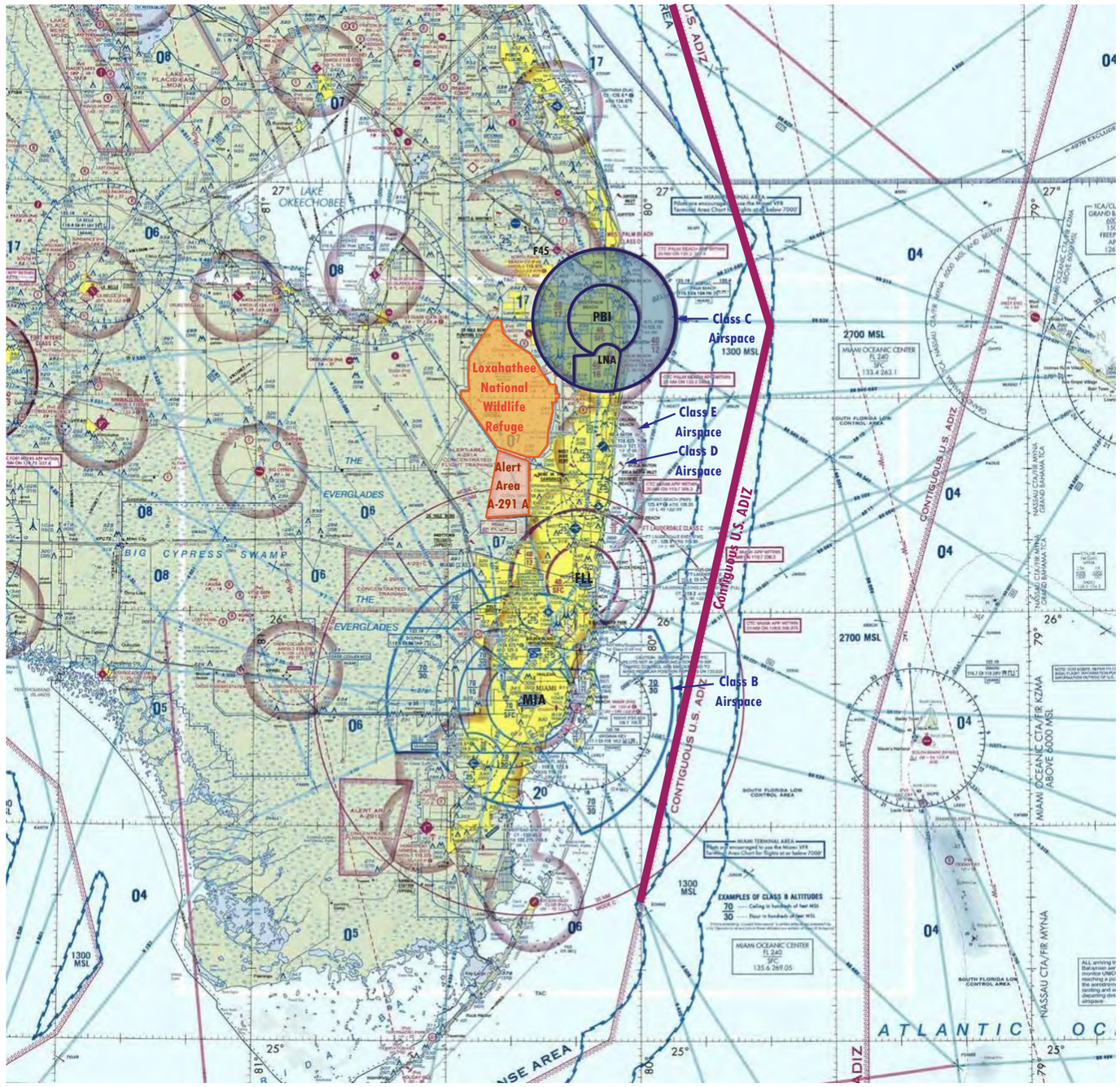


Figure 2.13: Existing Airspace
Source: AECOM (2016); Miami Sectional Chart (2016)

2.5 Meteorological Conditions

Meteorological data is used in several elements of the master planning process. Temperature is used as a factor in determining runway length requirements, while the prevalence of ceiling and horizontal visibility data is used as a factor in determining airfield capacity. Likewise, wind data is used as a factor in determining the adequacy of the number and orientation of existing runways. Therefore, this section presents the meteorological data that will be used in subsequent sections of this Master Plan Update.

2.5.1 Precipitation and Temperature

Climate data for PBI was obtained from the National Oceanic and Atmospheric Administration (NOAA) National Centers for Environmental Information (NCEI). Monthly precipitation and temperature data from weather station 089525 between January 1948 and December 2013 (65 years) was used to determine conditions and trends. Key weather data is provided in **Table 2.6**.

2.5.2 Wind Analysis

Runways are typically oriented based on the prevailing wind patterns given aircraft performance during arrivals and departures is most efficient when conducted into the wind. The FAA recommends an airport's runways provide a minimum of 95.0% combined wind coverage to provide an acceptable level of safety. PBI wind data was obtained from the NCEI and included 112,452 weather observations during a 10-year period between 2004 and 2013. Weather observations are provided according to three types of conditions as described below:

- All-weather observations include all of the 112,452 recordings throughout the study period regardless of cloud ceiling and visibility
- Visual flight rules (VFR) observations include those when the visibility was at least 3 statute miles and distance from clouds was at least 500 feet below, 1,000 feet above, and 2,000 feet horizontal per the specifications for Class C airspace in 14 CFR §91.155
- Instrument flight rules (IFR) observations include those when visibility and cloud distance do not satisfy the requirement for VFR

PBI experienced 103,000 VFR (92%) and 3,847 IFR (3%) weather observations during the ten-year data period.

The allowable crosswind component for runways affects the percentage of wind coverage. A runway with a higher RDC also has a higher allowable crosswind component, because larger aircraft that use this runway can withstand stronger crosswind without deviating from the landing path. **Table 2.7** summarizes the RDC and allowable crosswind component for each runway at PBI.

In addition to the allowable crosswind component, 10.5-knot, 13-knot, and 16-knot crosswind components are also analyzed for the D-IV runways to account for GA activities with smaller aircraft.

The NCEI data was used to conduct a wind analysis based on the standards specified in FAA AC 1500/5300-13A, *Airport Design (Change 1)*. Wind coverage statistics and wind roses were generated with the wind analysis tool on the FAA Airports-GIS website.

Figure 2.14 and **Table 2.8**, **Table 2.9**, and **Table 2.10** present wind roses and wind coverage for the runways under different meteorological conditions and crosswind components. The analysis reveals that Runway 10L-28R provides greater than 95.0% wind coverage for maximum crosswind components of 13 knots, 16 knots, and 20 knots in All-Weather and VFR conditions. However, Runway 10L-28R only provides greater than 95.0% wind coverage for a maximum crosswind component of 20 knots during IFR weather conditions.

Runway 14-32 is justified as a crosswind runway for aircraft with a maximum crosswind component of 10.5 knots during All-Weather and IFR conditions. While the combined wind coverage for aircraft with maximum crosswind components of 10.5 knots and 13 knots is less than 95.0% during IFR conditions, a new crosswind runway to provide the minimum recommended 95.0% coverage is not anticipated to be included in this Master Plan.

Table 2.6: PBI Weather Conditions

Item	Condition
Average Annual Precipitation Total	60.39 inches
Maximum Average Monthly Precipitation Total	8.84 inches (September)
Minimum Average Monthly Precipitation Total	2.63 inches (February)
Average Daily Temperature of Hottest Month	94.2° F (July)
Average Daily Temperature of Coldest Month	65.9° F (January)

Table 2.7: Runway Maximum Allowable Crosswind Component

Runway	RDC	Allowable Crosswind Component[1]
10L-28R	D-IV	20 knots
10R-28L	B-I	10.5 knots
14-32	D-IV	20 knots

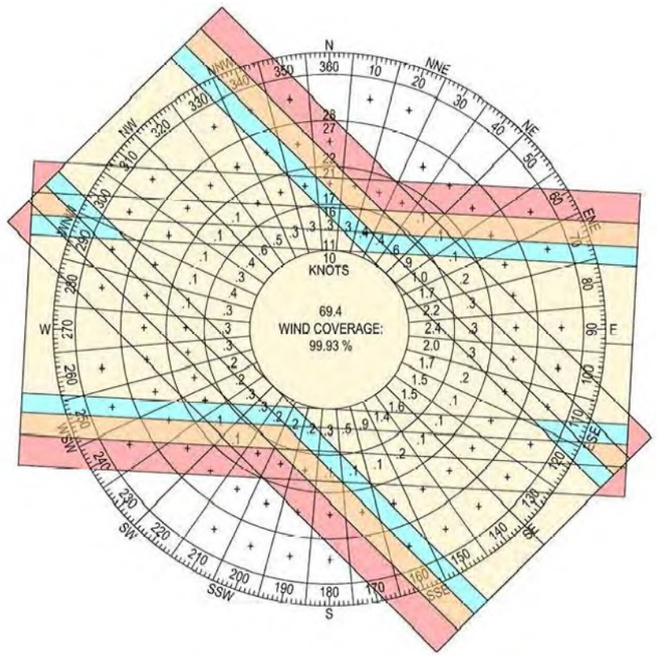
Notes:

[1] FAA Advisory Circular 150/5300-13A, Airport Design, Change 1

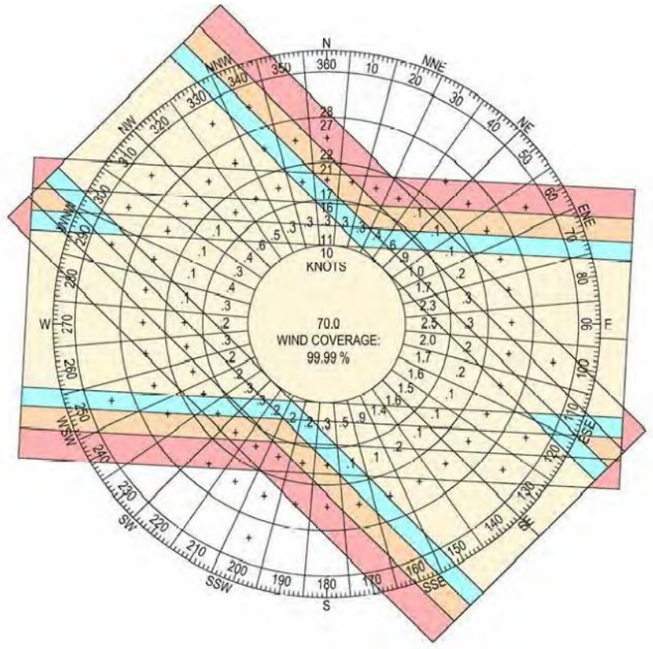
Royal Palm Way (Palm Beach, FL)
Source: AECOM (2014)

Atlantic Ocean at S Ocean Boulevard (Palm Beach, FL)
Source: AECOM (2014)

ALL-WEATHER



VFR



IFR

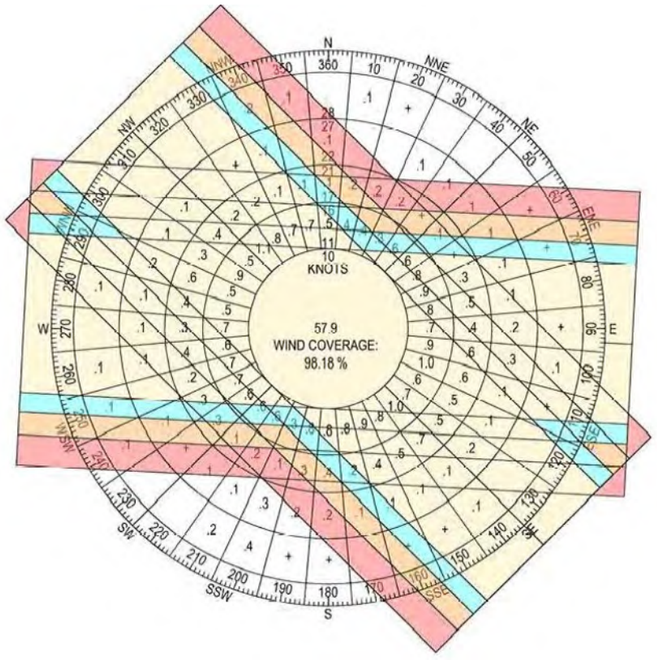


Figure 2.14: PBI Wind Coverage Roses
Source: AECOM (2014); FAA; NCEI

Table 2.8: All-Weather Wind Coverage

Crosswind Component	Runway Heading		Total
	10-28	14-32	
10.5 knots	91.29%	89.04%	**96.89%**
13 knots	95.99%	94.68%	**98.86%**
16 knots	99.02%	98.80%	**99.72%**
20 knots	99.75%	99.76%	**99.93%**

Table 2.9: VFR Wind Coverage

Crosswind Component	Runway Heading		Total
	10-28	14-32	
10.5 knots	91.70%	89.45%	**97.14%**
13 knots	96.31%	95.00%	**99.02%**
16 knots	99.23%	98.99%	**99.83%**
20 knots	99.88%	99.87%	**99.99%**

Table 2.10: IFR Wind Coverage

Crosswind Component	Runway Heading		Total
	10-28	14-32	
10.5 knots	80.22%	80.69%	**90.73%**
13 knots	87.19%	87.48%	**94.50%**
16 knots	93.17%	93.76%	**96.81%**
20 knots	96.15%	96.94%	**98.18%**

2.6 Commercial Passenger Terminal

The 600,000 square-foot terminal complex was built in 1988. As shown in **Figure 2.15**, the terminal complex consists of a Main Terminal building with three Concourses (A, B, and C) which include a total of 32 aircraft gates, four of which are ground loaded positions at Concourse A. **Table 2.11** provides a summary of the allocated space in the terminal and concourses.

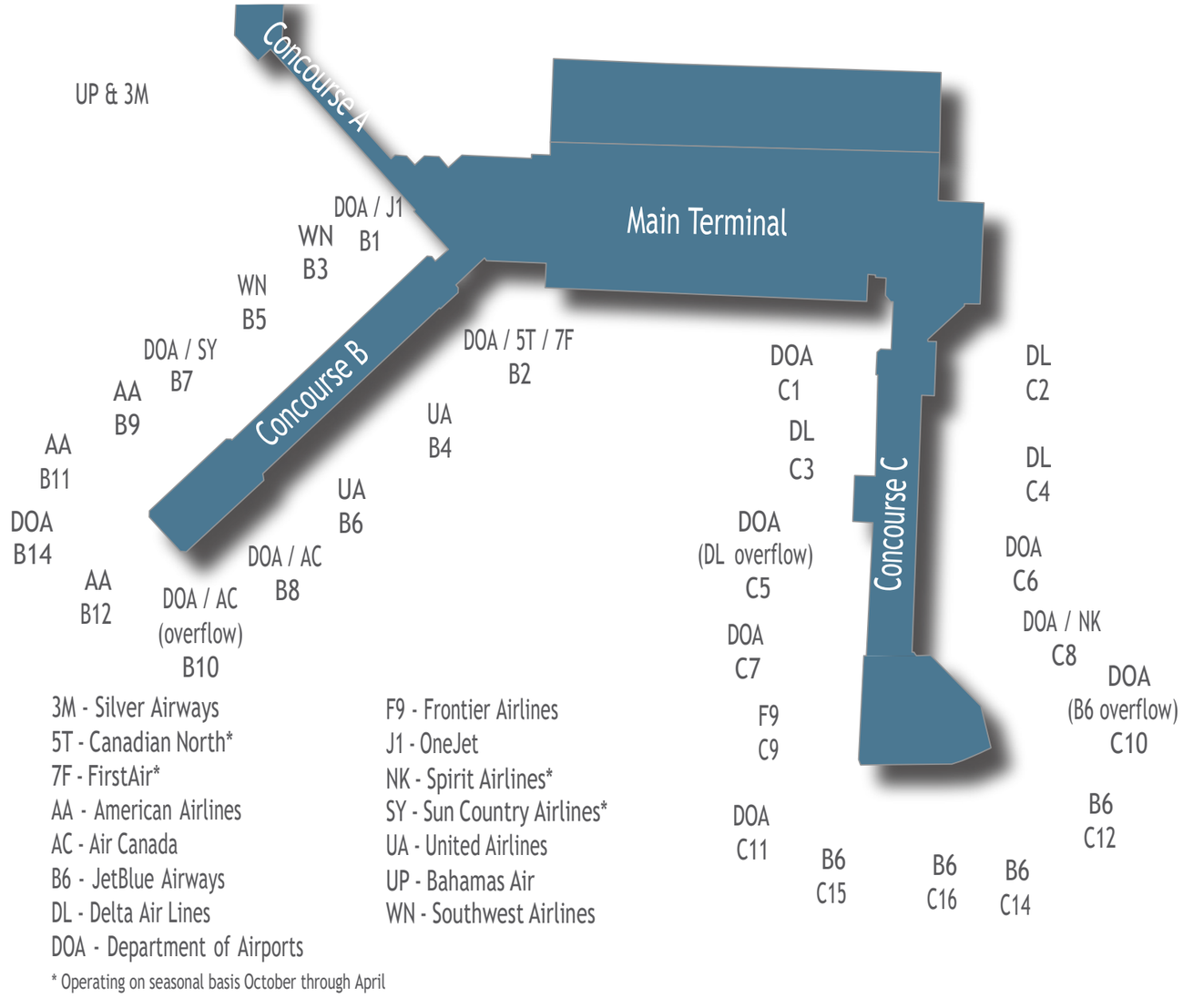


Figure 2.15: Existing Terminal Complex
Source: AECOM (2014)

Table 2.11: Existing Terminal Space

Space	Units[1]	Main Terminal	Concourse A	Concourse B	Concourse C	Total
Airline Processor Areas						
Ticketing Counters	EA	46				46
Ticket Counter Area	SF	5,605				5,605
Ticketing Queue Area	SF	6,130				6,130
Airline Ticket Offices	SF	22,826				22,826
Airline Operations	SF			24,111	18,882	42,993
Baggage Screening	SF	70,206				70,206
Airline Clubs	SF				4,421	4,421
Aircraft Gates						
Widebody Positions[2]	EA			4	7	11
Narrowbody Positions	EA		4	9	8	21
Holdrooms	SF		5,200	26,324	27,436	58,960
Baggage Claim (Domestic Only)						
Claim Frontage	LF	1,433				1,433
Claim Units	EA	7				7
Claim Area	SF	38,757				38,757
Baggage Service Office	SF	2,417				2,417
International Operations						
CBP Support	SF	4,180				4,180
International Arrivals	SF	10,933	2,880	2,154		15,967
Concessions						
Concessions	SF	25,585	334	6,799	11,759	44,477
Concessions Support	SF	6,023			19,040	25,063
Rental Car	SF	3,248				3,248
Security						
SSCP Lanes	EA			7	7	14
Passenger Screening	SF			7,674	8,643	16,317
Queuing Area	SF			4,854	2,648	7,502
Support Space						
Restrooms	SF	10,952	827	1,839	4,754	18,372
Circulation	SF	96,393	8,930	15720	36,773	157,816
Meeter-Greeter	SF	7,723				7,723
DOA Administration	SF	18,625				18,625
TSA Administration	SF	7,797		456	596	8,849
MEPT[3]	SF	58,458	504	8,397	28,390	95,749
PBC Sheriff's Office	SF	699				699
Unfinished or Inaccessible	SF	6,869				6,869
Total	**SF**	**392,474**	**17,848**	**96,496**	**158,595**	**665,413**

Notes:

[1] Units: EA = Each; LF = Linear Feet; SF = Square Feet
[2] Widebody positions can accommodate aircraft with wingspans similar to a B767 or larger
[3] MEPT = Mechanical, Electrical, Plumbing, Telecommunications

2.6.1 Main Terminal Building

The Main Terminal is a three-level structure that includes the Ticketing Hall, Departures Level, and Arrivals Level. Passengers checking baggage, obtaining a ticket, and/or being dropped off will first encounter the Ticketing Hall. Access to the Departures Level from the Ticketing Hall is provided via four escalator/stairwells or two elevator banks at either end of the terminal. Arriving passengers can access the Arrivals Level via the same escalator/ stairwells and elevator banks.

The following sections summarizes the key features and functions of each level.

Ticketing Hall

As illustrated in **Figure 2.16,** the Ticketing Hall supports ticketing and check-in services via curbside check-in, ticket/baggage check-in counters, self-check-in kiosks, and airline ticketing offices. According to the DOA, the existing office space on the third level is oversized and the ticket counter queuing area is inadequate to support peak traffic levels.

An area on the east end of the terminal remains unfinished and available for use as needed.

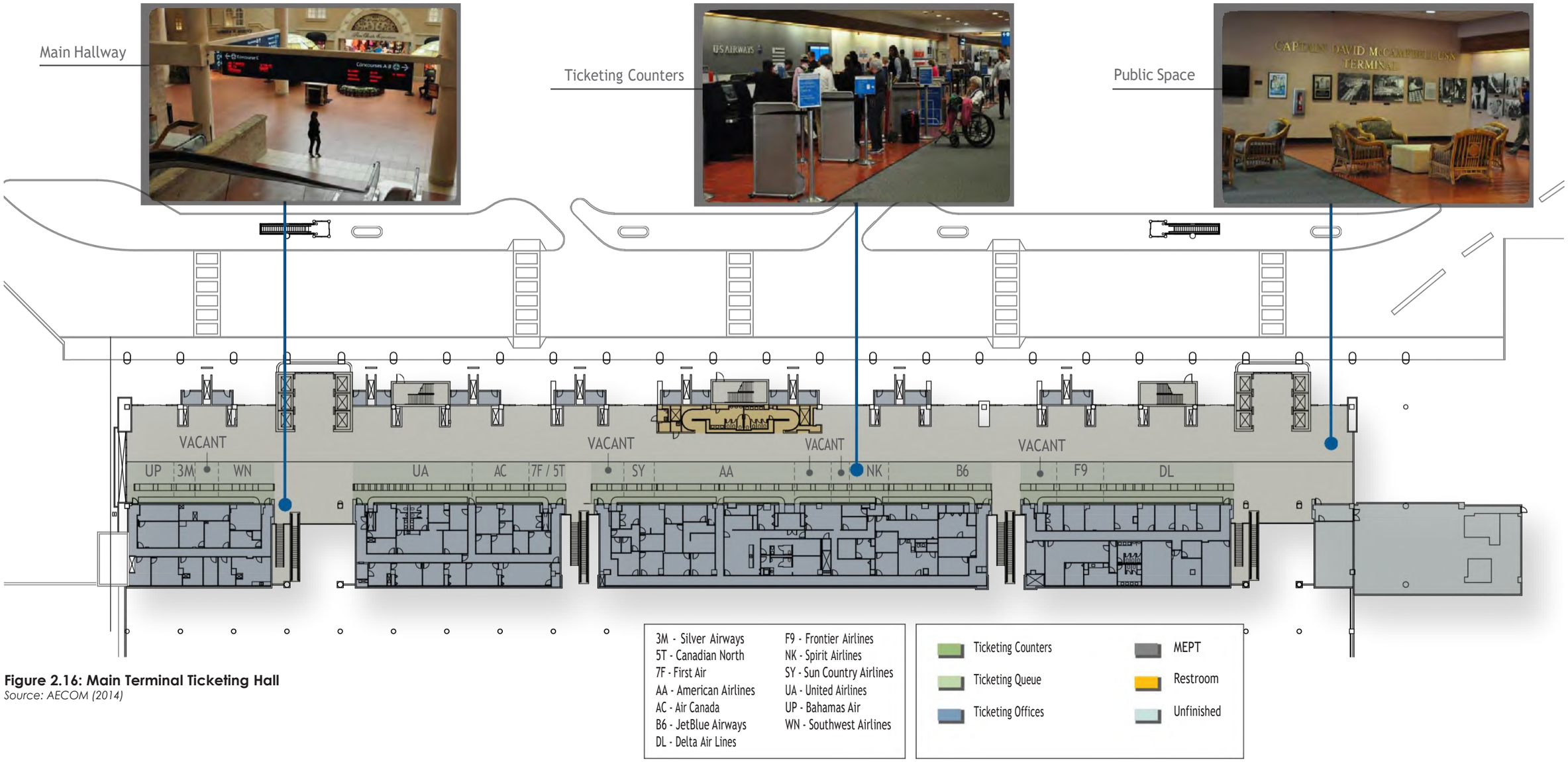


Figure 2.16: Main Terminal Ticketing Hall
Source: AECOM (2014)

Departures Level

The Departures Level, illustrated in **Figure 2.17,** supports departure functions including a passenger security screening checkpoint (SSCP) at each end of the terminal, three meeter/greeter areas, three restaurants, a coffee shop, and other concessions.

The SSCPs were enhanced since the 2006 Master Plan in order to optimize passenger flows and enhance processing. Each SSCP has seven screening devices. The SSCP A/B provides access to Concourse B departure gates on the same level and Concourse A departure gates on the level below.

Direct access to the short-term and long-term parking garages is provided via bridge structure over the Arrivals Level below.

The large non-secure concessions area between the two concourses was constructed prior to enhanced security procedures which altered passenger flows. The majority of passengers now proceed through security screening and then on to their gate location where they look for concessions. This change in flows has adversely impacted the non-secure concessions.

A DOA conference room at the junction of Concourse B and the Main Terminal is utilized on occasion but could be used for future concessions.

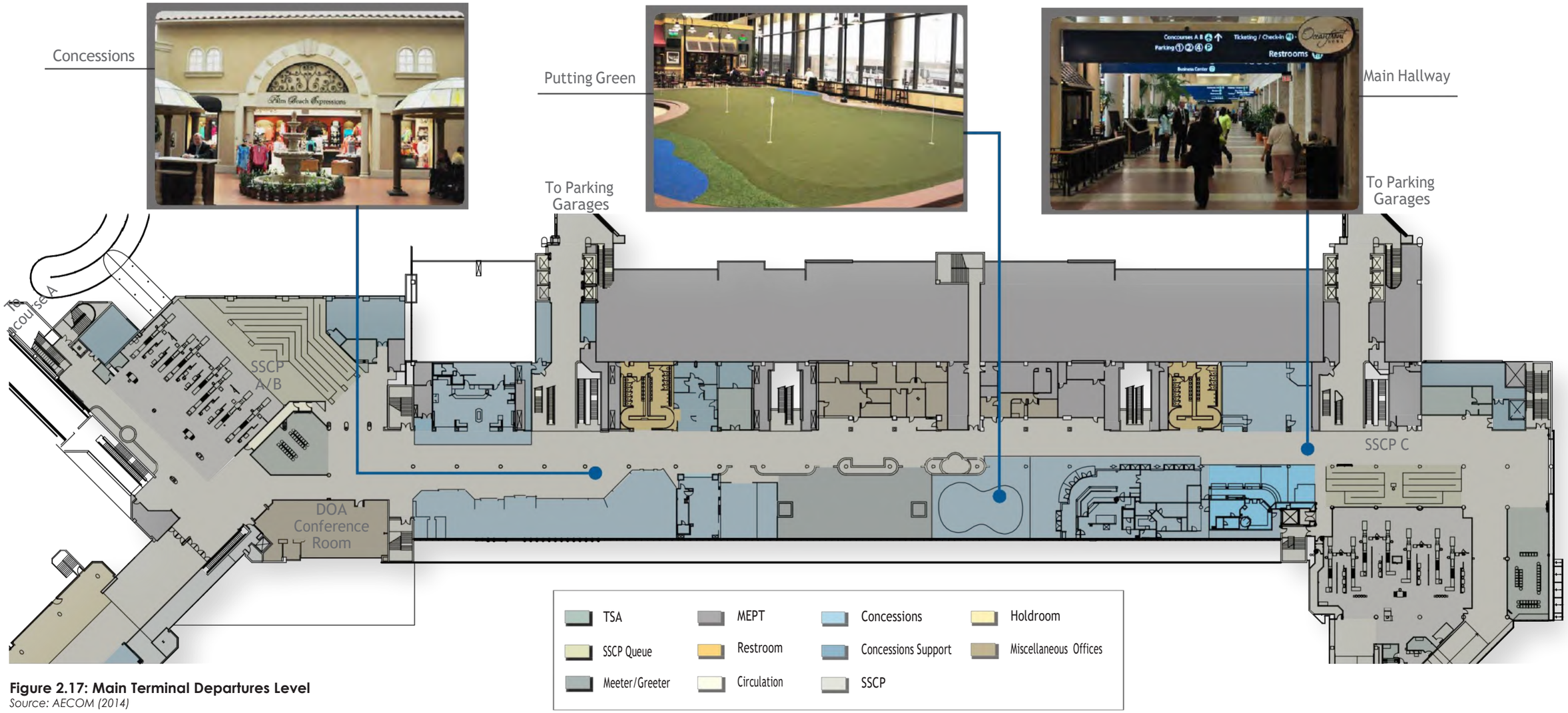


Figure 2.17: Main Terminal Departures Level
Source: AECOM (2014)

Arrivals Level

As illustrated in **Figure 2.18**, the Arrivals Level supports arrivals with baggage claim facilities, ground transportation services, and U.S. Customs and Border Protection (CBP) Federal Inspection Services (FIS) facilities. International arriving passengers must process through the FIS facilities for passport/visa and baggage inspection at the FIS facilities. The FIS facilities are capable of handling 300 passengers per hour and aircraft up to the size of B747-400. A sterile corridor accesses the facilities from Concourse A and Gate B2.

The Transportation Security Administration (TSA) leases approximately 6,000 square feet of office space adjacent to the FIS facilities.

The Arrivals level includes six baggage claim devices for domestic arrivals, baggage service offices, and rental car counters.

Behind the baggage claim devices is a large baggage screening and drop off area. The DOA is in the process of upgrading the baggage screening area to provide a full in-line system as depicted in **Figure 2.18**. The expected completion date for this project is 2016.

A large loading dock area with a concessions storage area is provided on the east side of the terminal.

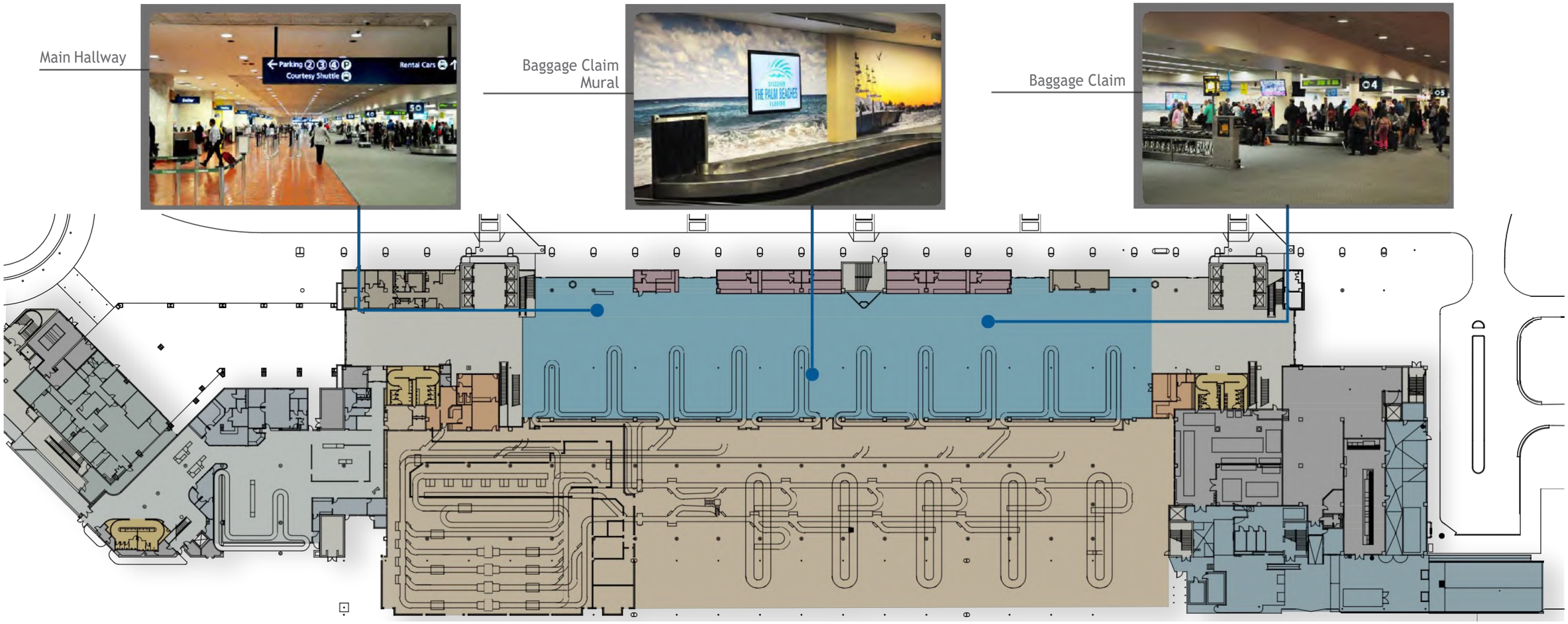


Figure 2.18: Main Terminal Arrivals Level
Source: AECOM (2014)

2.6.2 Concourse A

Concourse A (depicted in **Figure 2.19**) is a single level structure supporting commuter and short-haul international flights. Airlines currently providing service in Concourse A include Silver Airways and Bahamas Air. The Concourse includes one common-use passenger waiting area (holdroom), four ground loaded aircraft gates, a concession area, and restrooms. Domestic and international passengers access Concourse A through two separate corridors that connect from the Main Terminal.

Departing passengers (both domestic and international) utilize vertical circulation located just outside the SSCP at the west end of the Main Terminal.

Arriving international passengers arrive through a sterile corridor and proceed to the CBP area for additional processing. Arriving domestic passengers enter through one of the four gates and proceed down the corridor and up to the Main Terminal Departures Level via vertical circulation.

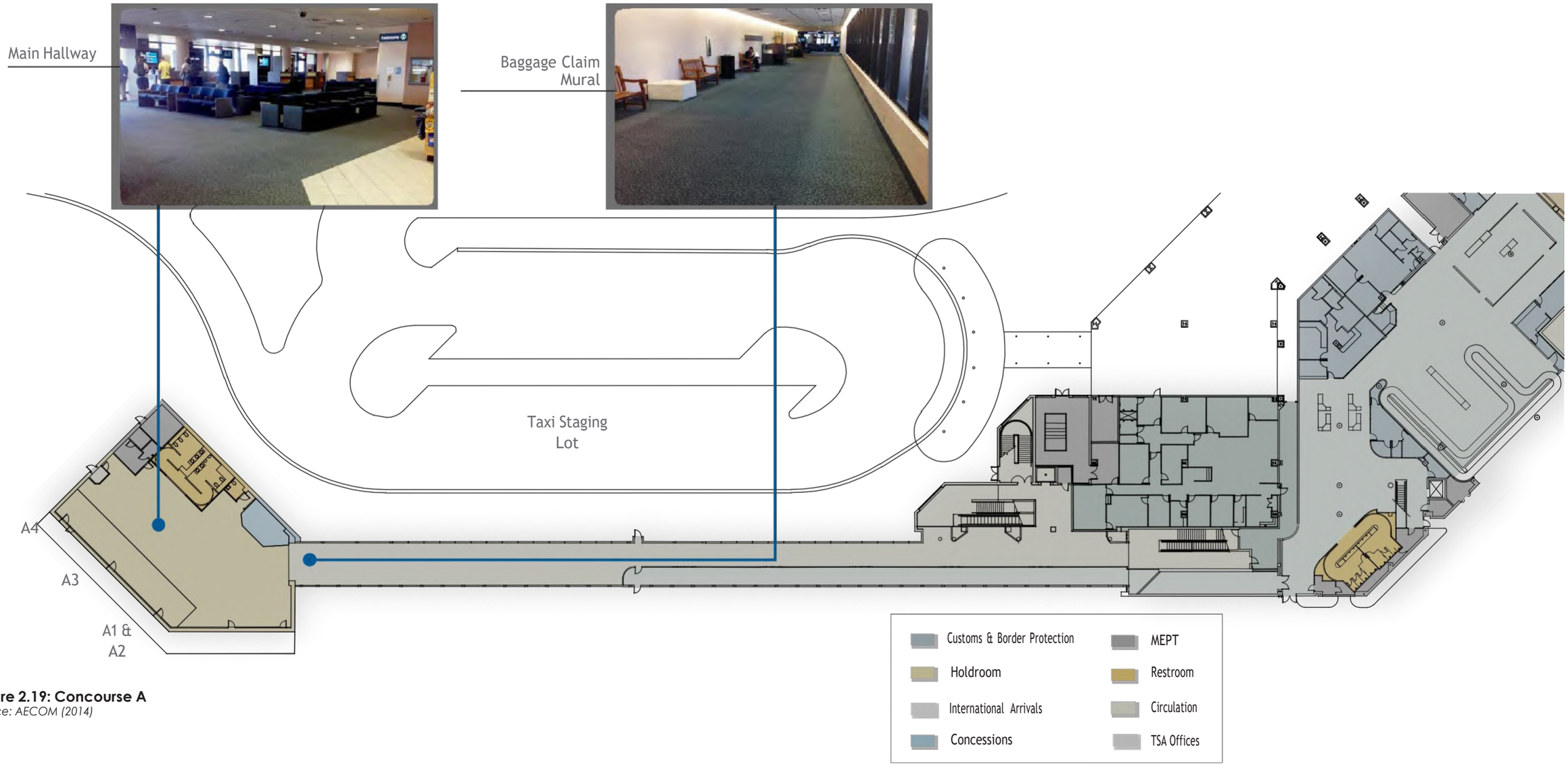


Figure 2.19: Concourse A
Source: AECOM (2014)

2.6.3 Concourse B

Concourse B (depicted in **Figure 2.20**) is two-level structure supporting both domestic and international operations via 13 contact gates. The first level is a non-public area accommodating airline operations space such as storage rooms, offices, and mechanical/electrical equipment. The second level predominantly consists of concessions, restrooms, and holdrooms.

Gate B2 supports international operations through a sterile corridor that connects with the FIS facilities on the first level of the Main Terminal. Airlines currently operating in Concourse B include Air Canada, American Airlines, Southwest Airlines, Sun Country Airlines, and United Airlines.

Concessions within Concourse C are limited, comprising two retail locations, a market, restaurant, bar, and coffee shop.

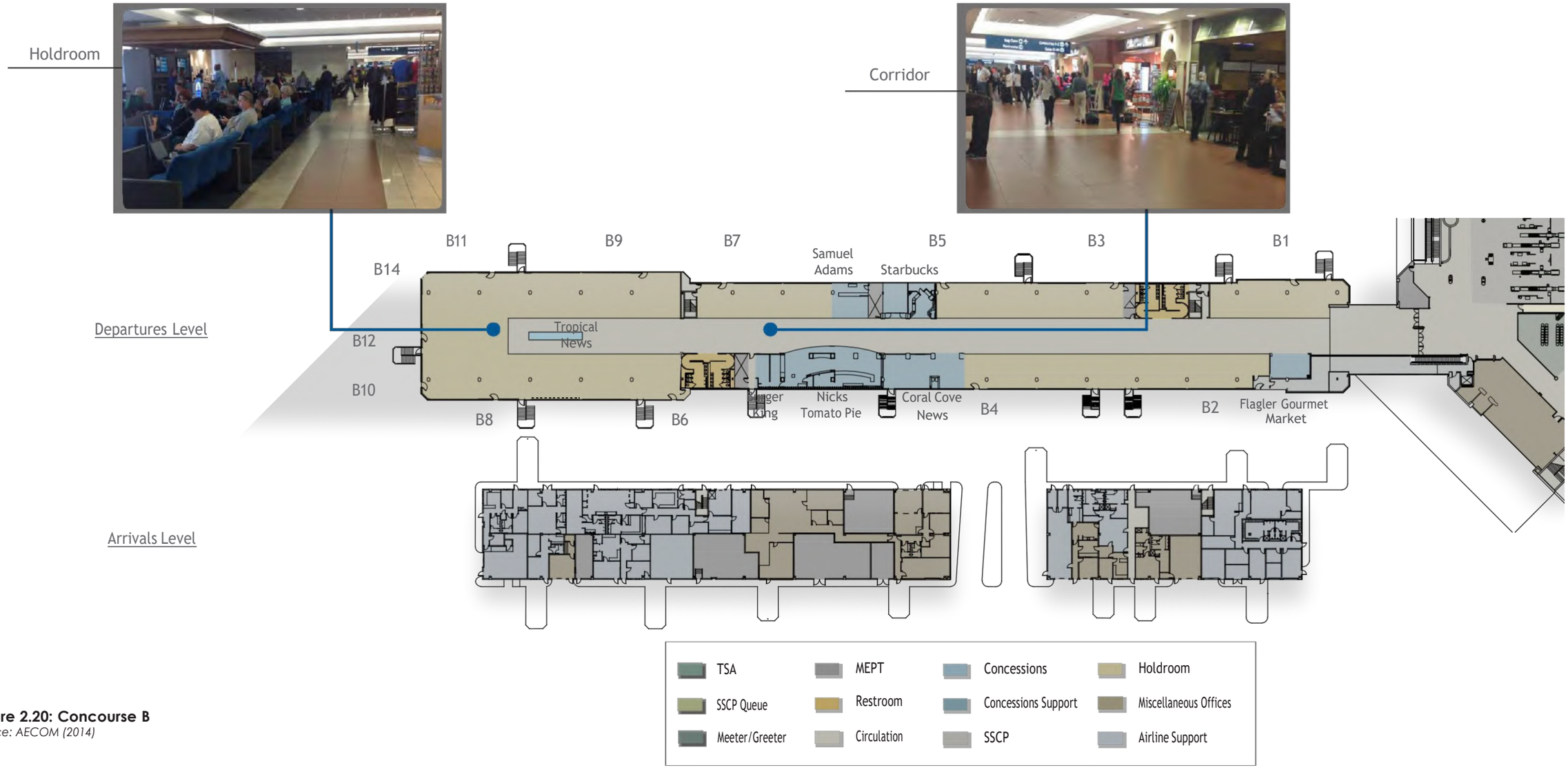


Figure 2.20: Concourse B
Source: AECOM (2014)

2.6.4 Concourse C

As illustrated in **Figure 2.21**, Concourse C is a two-level structure supporting domestic operations via 15 contact gates. Similar to Concourse B, the first level is a non-public area accommodating concessions storage areas, airline operations space and mechanical/electrical equipment. The second level consists of concessions, an airline lounge, restrooms, and holdrooms. Airlines currently operating in Concourse C include Delta Air Lines, Frontier Airlines, JetBlue Airways, and Spirit Airlines.

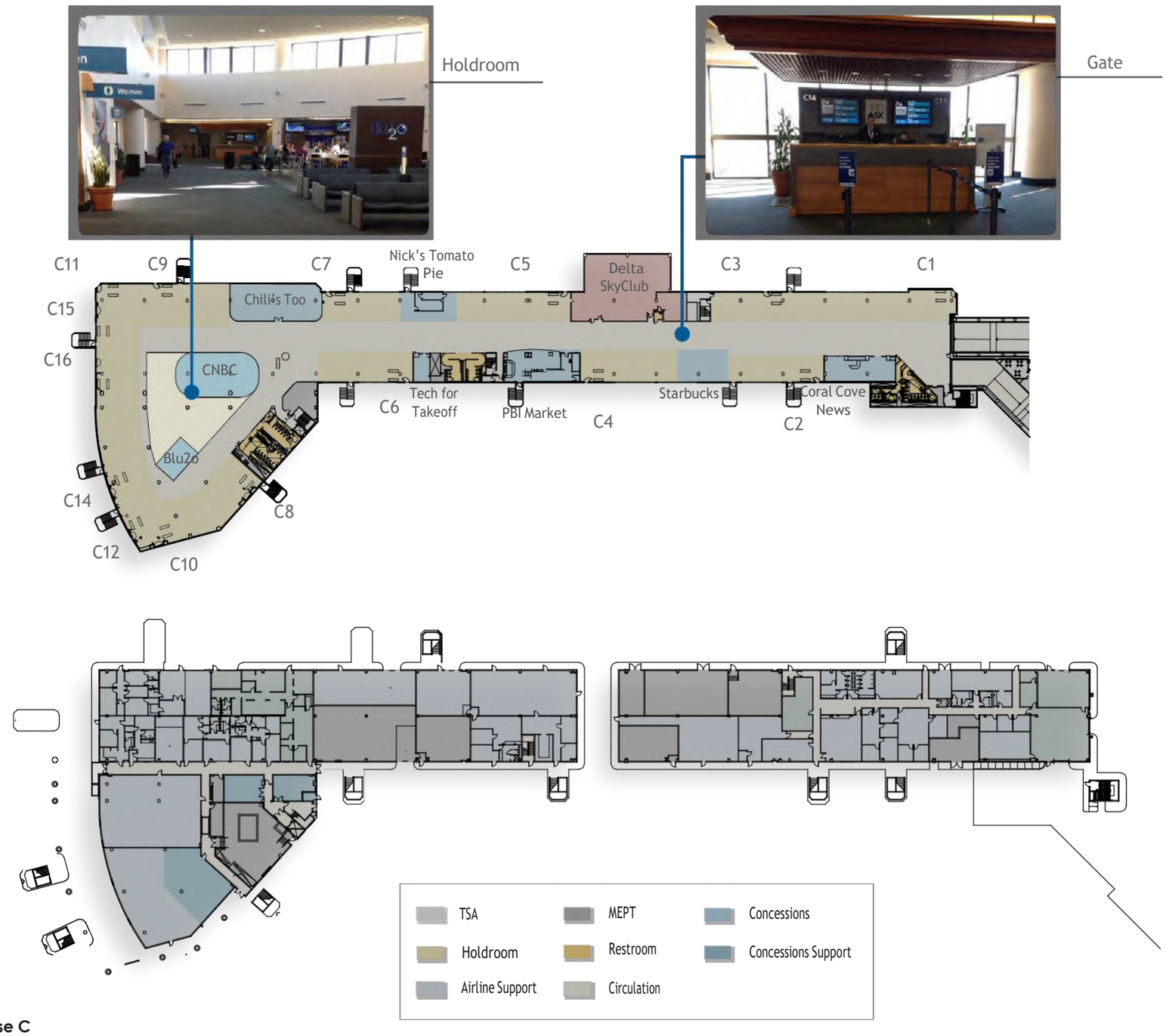
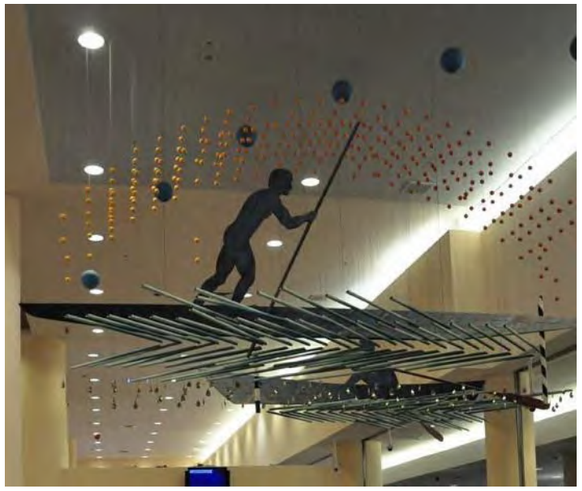


Figure 2.21: Concourse C
Source: AECOM (2014)

2.6.5 Terminal Art Program

The PBC sponsors an "Art in Public Places" program intended to provide art that complements public buildings, enhances community identity, and improves the design quality of public infrastructure. PBI displays numerous pieces of artwork throughout the terminal and hosts a rotating "Art at the Airport" exhibition to support this program. PBI regularly organizes receptions along the main hallway on the departures level for the public to meet with the artists. The art program is an important aspect of the terminal and is expected to remain in place throughout the planning horizon of this Master Plan.



"Art at the Airport"
Source: AECOM (2015)

2.7 General Aviation

General Aviation refers to those facilities and operations of all civil aviation users other than scheduled or non-scheduled commercial air services. GA aircraft include light propeller aircraft up to a Boeing Business Jet or larger. A variety of users are accommodated by General Aviation with the largest component of users being recreational and business/corporate travel. Typical facilities for GA are passenger terminals, flight operations centers, hangars (both storage and maintenance), supporting fuel farms, and ramp spaces. A fixed base operator (FBO) is an integrated supplier of GA services that combines passenger accommodations, aircraft storage, aircraft maintenance, an operations center, and a fuel farm.

GA activity plays a major role at PBI and reflects a current trend of the growth of corporate travel in the US and overseas, either through flight charter providers or in-house corporate aviation departments. As of January 2015, 148 GA aircraft were based at PBI including six single-engine aircraft, eight multi-engine aircraft (non-jet engine), 117 jet aircraft, and 17 helicopters.

2.7.1 Southeast GA Facilities

The Southeast GA area illustrated in **Figure 2.22** includes over 160,000 square yards of paved apron, two FBOs (Jet Aviation and Signature), and multiple hangars. Gulfstream Aerospace leases a hangar and office space from Signature Flight Support.

Signature Flight Support

Signature Flight Support operates 24 hours per day, 7 days a week at PBI. Special features provided by this FBO include a pilot lounge with video library and shower facility. As of 2015, 17 aircraft are based at Signature.

Gulfstream Aerospace leases a hangar (1500D) and office space (1500C) from Signature and a section of the aircraft parking apron. Gulfstream operates a service center performing maintenance services on Challenger, Hawker, and Falcon jets. The capabilities include all major inspections, major structural modifications and repairs, and spare part exchanges and sales. The FBO has expressed the need for additional apron space and a physical separation of FBO and maintenance activities to streamline operations. **Table 2.12** summarizes the Signature facilities.

Jet Aviation

Jet Aviation also operates 24 hours per day, 7 days a week. The services provided by Jet Aviation include domestic and international handling, complete line services, aircraft interior and exterior cleaning, aircraft fuel sales, and overnight hangar parking. Amenities include ramp access for passenger vehicles, hotel and catering coordination, complimentary crew cars, and VIP transport to and from the surrounding area. In addition, Jet Aviation operates an executive terminal with a lounge and conference room, Wi-Fi, crew snooze room, and private crew showers. **Table 2.13** summarizes the Jet Aviation facilities.

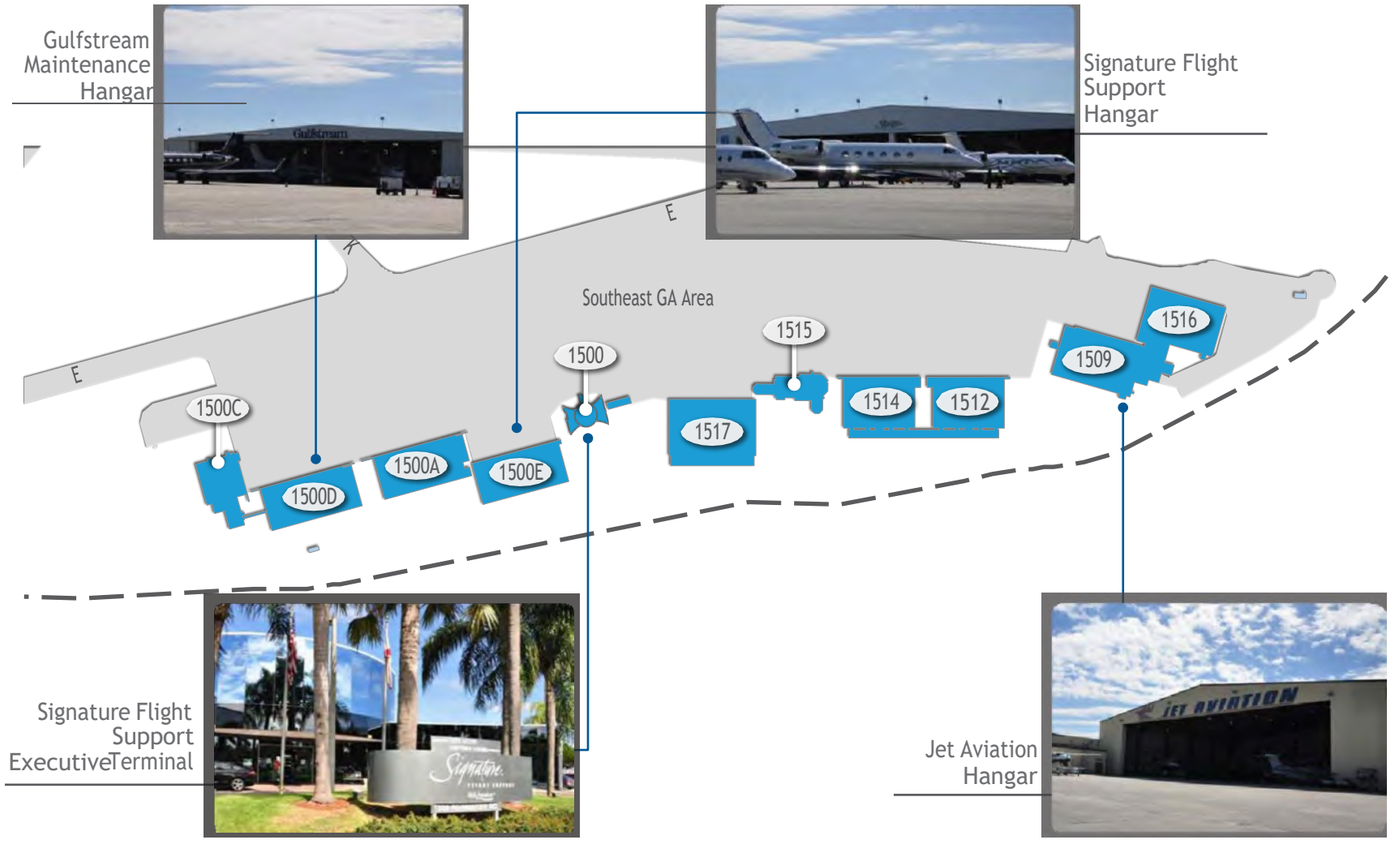


Figure 2.22: Southeast GA Facilities
Source: AECOM (2014)

Table 2.12: Signature Flight Support Facilities

Building	Occupant	Type	Use	Total Area (SF)	Condition
1500	Signature	Terminal	Operations	6,230	Good
1500A	Signature	Hangar	Storage	33,380	Good
1500C	Gulfstream	Office	Operations	19,838	Fair
1500D	Gulfstream	Hangar	Maintenance	34,415	Fair
1500E	Signature	Hangar	Storage	34,130	Fair
Total				**127,993**	

Table 2.13: Jet Aviation Facilities

Building	Occupant	Type	Use	Total Area (SF)	Condition
1509	Jet Aviation	Hangar	Storage	40,500	Fair
1512	Jet Aviation	Hangar	Storage	39,500	Good
1514	Jet Aviation	Hangar	Storage	39,500	Good
1515	Jet Aviation	Terminal	Operations	13,780	Good
1516	Jet Aviation	Hangar	Storage	30,000	Fair
1517	Jet Aviation	Hangar	Storage	50,000	Good
Total				**213,280**	

2.7.2 Southwest GA Facilities

The Southwest GA area illustrated in **Figure 2.23** includes over 200,000 square yards (SY) of paved aircraft parking apron and serves Atlantic Aviation, Gama Aviation, and other GA operators. Taxiway T provides access to Hangars 1636, 1637, 1638, 1639, 1640, and 1642. An apron edge taxilane provides access to the remaining hangars.

Atlantic Aviation (previously Galaxy Aviation)

Atlantic Aviation acquired Galaxy Aviation in February 2014. Amenities provided by Atlantic Aviation include hangar space, pilot's lounge, crew & rental cars, and a conference room. Atlantic Aviation operates 12 facilities but sub-leases one to a Maintenance, Repair, and Overhaul provider (B. Coleman MRO). B. Coleman MRO operates 24 hours per day, 7 days a week, and offers services relating to maintenance, repair, overhaul, refurbishment, upgrades, modification, parts and support capabilities for most business aircraft models. **Table 2.14** summarizes the Atlantic Aviation facilities.

Gama Aviation, Inc.

Signature Flight Support sub-leases two hangars and office space to Gama Aviation. Gama Aviation provides executive charter, aircraft sales, and aircraft management delivering service. **Table 2.15** summarizes the Gama Aviation facilities in the Southwest GA area.

Other GA Tenants

In addition to the FBOs, other GA entities at PBI provide a variety of services. These currently include the U.S. CBP, Atlantic Undersea Test and Evaluation Center (AUTEC), Rotortech, Flight Service International (FSI), Trauma Hawk, and the PBC Sheriff's office. **Table 2.16** and the following sections provide a summary of these facilities.

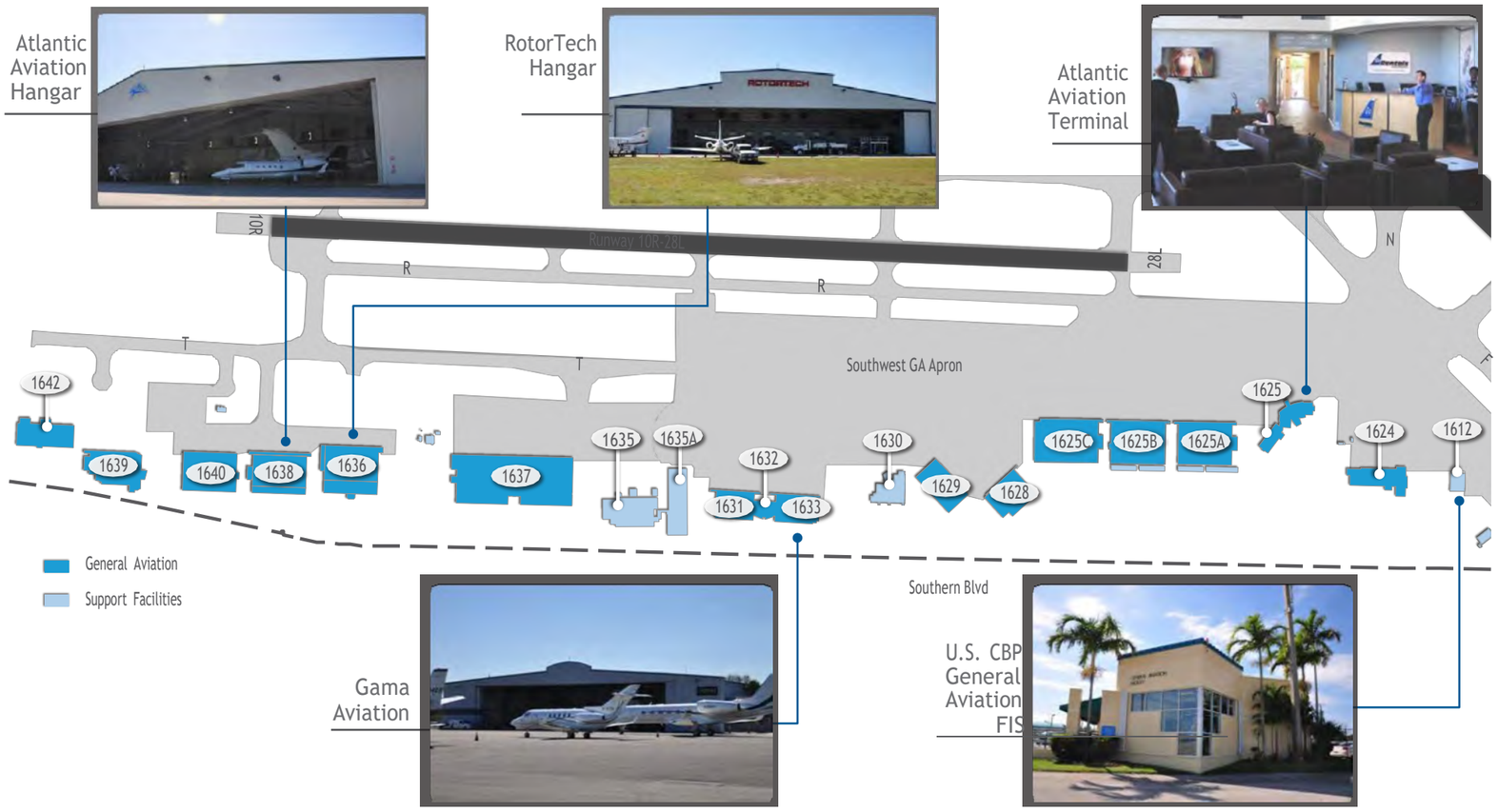


Figure 2.23: Southwest GA Facilities
Source: AECOM (2014)

Table 2.14: Atlantic Aviation Facilities

Building	Occupant	Type	Use	Total Area (SF)	Condition
1625	Atlantic Aviation	Terminal	Operation	14,500	Good
1625A	Atlantic Aviation	Hangar	Storage	32,500	Good
1625B	B. Coleman MRO	Hangar	Maintenance	32,500	Fair
1626C	Atlantic Aviation	Hangar	Operations	32,500	Good
1628	Atlantic Aviation	Hangar	Storage	18,480	Poor
1629	Atlantic Aviation	Hangar	Storage	18,170	Poor
1637	Atlantic Aviation	Hangar	Storage	75,000	New (2015)
1638	Atlantic Aviation	Hangar	Storage	32,000	Good
1640	Atlantic Aviation	Hangar	Storage	29,250	Good
Total				**284,900**	

Table 2.15: Gama Aviation Facilities

Building	Occupant	Type	Use	Total Area (SF)	Condition
1631	Gama	Hangar	Maintenance	15,280	Fair
1632	Gama	Office	Operations	4,800	Fair
1633	Gama	Hangar	Maintenance	16,870	Fair
Total				**36,950**	

Table 2.16: Other GA Facilities

Building	Occupant	Type	Use	Total Area (SF)	Condition
1612	CBP	Office	Operations	3,650	Good
1624	AUTEC	Hangar	Maintenance	16,140	Fair
1636	Rotortech	Hangar	Maintenance	32,000	Good
1635	FSI	Hangar	Training	20,700	Fair
1635A	FSI	Hangar	Training	17,750	Fair
1639	Trauma Hawk	Hangar	Storage	25,660	Good
1641	PBC Sheriff	Hangar	Storage	19,380	Good
Total				**135,280**	

Rotortech

Rotortech Service, Inc. leases one hangar and provides complete maintenance and repair services for helicopter owners and pilots. Storage suites, shower facilities, conference room, and waiting area are also provided for their customers.

RotorTech Hangar
Source: AECOM (2014)

Flight Safety International (FSI)

Flight Safety International specializes in training for pilots, attendants, and dispatchers. The Palm Beach branch of the company occupies two connected buildings (1635 & 1635A) in the Southwest GA area at PBI.

Flight Safety International
Source: AECOM (2014)

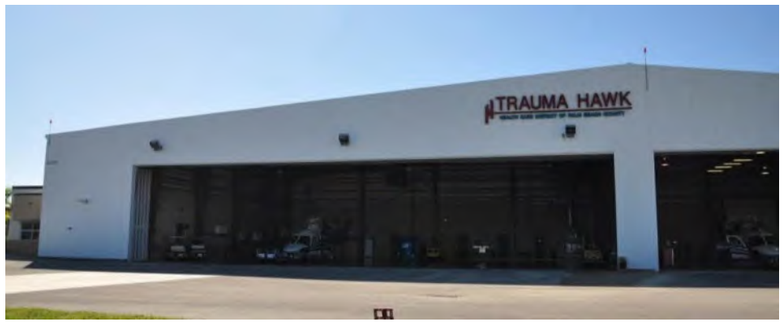
U.S. Customs and Border Protection

The U.S. CBP has a facility in the southwest GA area to provide federal inspection services. The facility serves as a port of entry for both international GA flights and marine operations arriving at local ports and/or marinas from international waters.

US CBP General Aviation Facility
Source: AECOM (2014)

Trauma Hawk

Palm Beach County utilizes a hangar at PBI as the base of operations for the Trauma Hawk program. The program was established in 1990 to provide rapid transport of traumatically-injured patients to specialized health care facilities throughout Palm Beach County and the region. Two air ambulances are available at PBI, each capable of transporting up to two patients and four medical attendants. The aeromedical hangar is also equipped with maintenance bay, training center, office space, pre-flight center, and living quarters for the overnight crew.



/Source: AECOM (2014)

Atlantic Undersea Test and Evaluation Center (AUTEC)

The AUTEC operates an administrative and technical support office in the Southwest GA area. AUTEC aircraft make daily scheduled flights between PBI and Andros Town Airport, where AUTEC runs undersea test and research programs to assess war fighter readiness for the U.S. Navy.

AUTEC Hangar
Source: AECOM (2014)

PBC Sheriff Aviation Unit

The Palm Beach County Sheriff Aviation Unit utilizes a hangar at PBI to store and maintain two Bell 407 helicopters. The helicopters are involved in law enforcement activities such as searching for missing people and crime suspects, providing routine patrols, and assisting other agencies such as the FBI and U.S. Coast Guard. The facility also plays a role as a back-up aeromedical platform.

PBC Sheriff Bell 407 Helicopter
Source: AECOM (2014)

2.7.3 Northwest GA Facilities

The Northwest GA facilities (also known as the Golfview area) accommodates one facility, the NetJets terminal and apron as depicted in **Figure 2.24**. The DOA has designed additional facilities in the Golfview GA area, including a new Taxiway W that will connect the NetJets and other GA facilities in the Golfview area to Runway 10L-28R.

Signature Flight Support

Signature Flight Support sub-leases this facility to NetJets which provides private aviation services through fractional ownership, aircraft lease, and jet cards. In 2013 Signature Flight Support partnered with NetJets to develop a 10,000 square-foot facility in the Northwest GA area. NetJets operates more than 10,000 flights in and out of PBI annually. All the aircraft operations at NetJets are transient.

This new facility includes amenities such as conference and business center, flight planning facilities, crew lounge, children's entertainment room, and an automobile parking area. Approximately six acres of paved apron is available for aircraft parking. Access to the facility is provided via Belvedere Road

Expansion Plans

In late 2014, the DOA developed a site plan for additional development in the Golfview area as illustrated in **Figure 2.24**. The plans included construction of a new taxiway (Taxiway W) connection from the NetJets apron to Taxiway A which is scheduled for completion in late 2016 or early 2017.

In addition, improvements to the storm-water management system, as well as construction of a North Access Roadway, Central Access Roadway, waste water collection system, and a water distribution system are planned.

Table 2.17: NetJets Facilities

Building	Occupant	Type	Use	Total Area (SF)	Condition
985	NetJets	Terminal	Operations	13,550	New (2013)
Total				**13,550**	

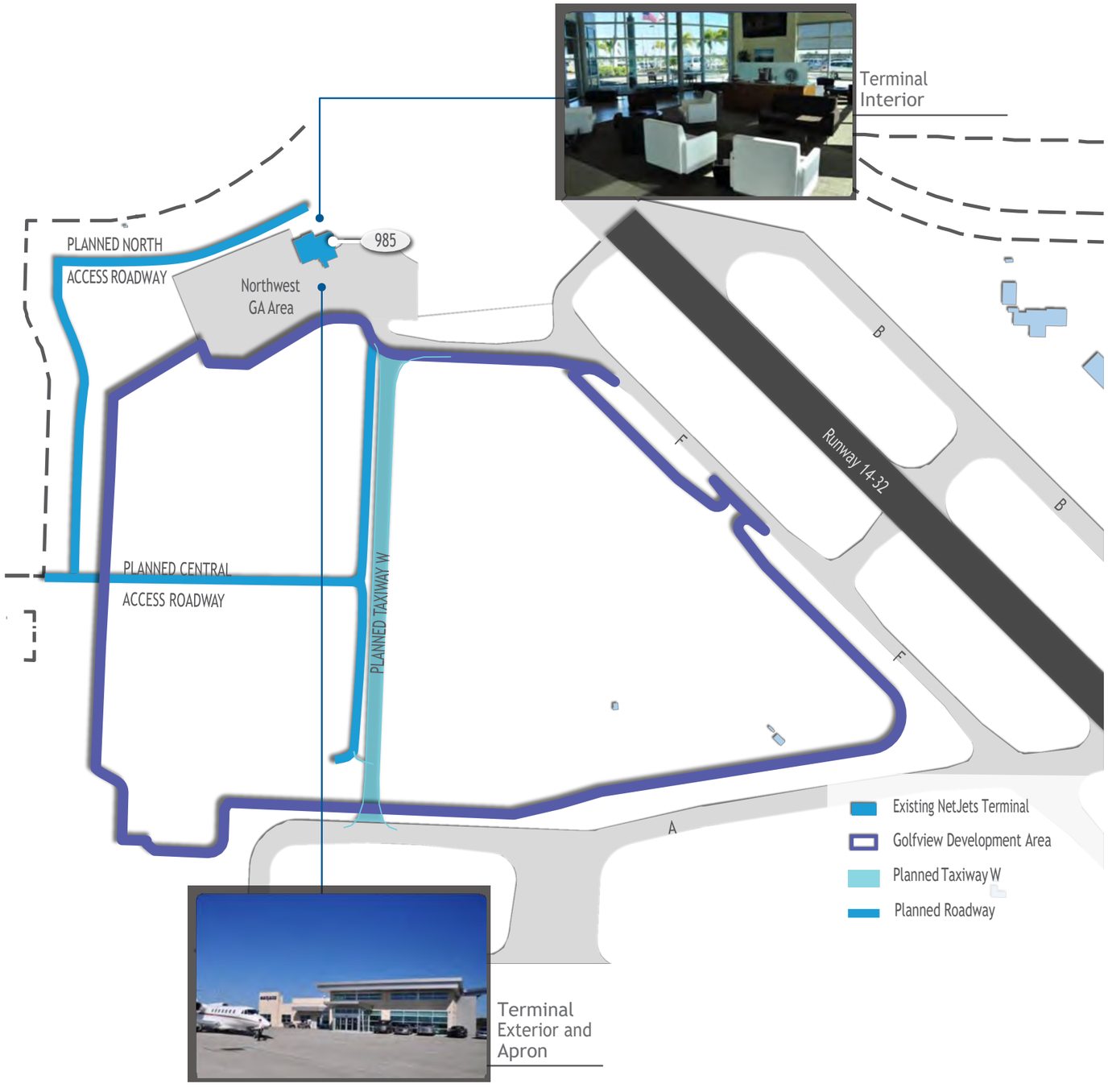


Figure 2.24: Northwest GA Facilities
Source: AECOM (2014)

2.8 Cargo Facilities

Air cargo facilities are located in the northeast quadrant of the airport and include the air freight building and air cargo building.

2.8.1 Air Freight Buildings (1301 – 1312)

The Air Freight Building consists of 13 separate, leasable spaces totaling approximately 31,404 square feet. Use of the building is divided between belly cargo processors, freight forwarders, and other ground support tenants.

Cargo is transferred between parked aircraft and this building via a secure access road as shown on **Figure 2.25**. Building 1301-1312 has 17 truck docks and approximately 500 linear feet of loading dock frontage on both sides. Landside loading dock area totals 6,533 square feet.

2.8.2 Air Cargo Building (1475)

Building 1475, commonly known as the Air Cargo Building, has 40,334 square feet of floor space. United Parcel Service (UPS) and Federal Express (FedEx) occupy 90% of the building. Approximately 4,000 square feet of is unoccupied or used for storage by the DOA. Building 1475 has 13 truck docks and approximately 500 linear feet of loading dock frontage on both sides.

The cargo apron located west of Building 1475 provides two aircraft parking positions adjacent to the building. An additional apron west of the cargo apron taxilane provides an additional aircraft parking position. The total apron area available for cargo operations is approximately 25,590 square yards (230,284 square feet).

UPS used to be the only all-cargo carrier at PBI. FedEx started all-cargo operations at PBI in 2009. The most frequently operated aircraft by UPS and FedEx at PBI are the B757-200F and A310-200C/F respectively; however, the apron is designed to accommodate the larger B767-300 Freighter aircraft.

As illustrated in **Figure 2.25**, access to this facility is provided via Perimeter Road. The DOA noted that access to and from I-95 is inefficient and the cargo operators have requested a direct connection to improve operations.

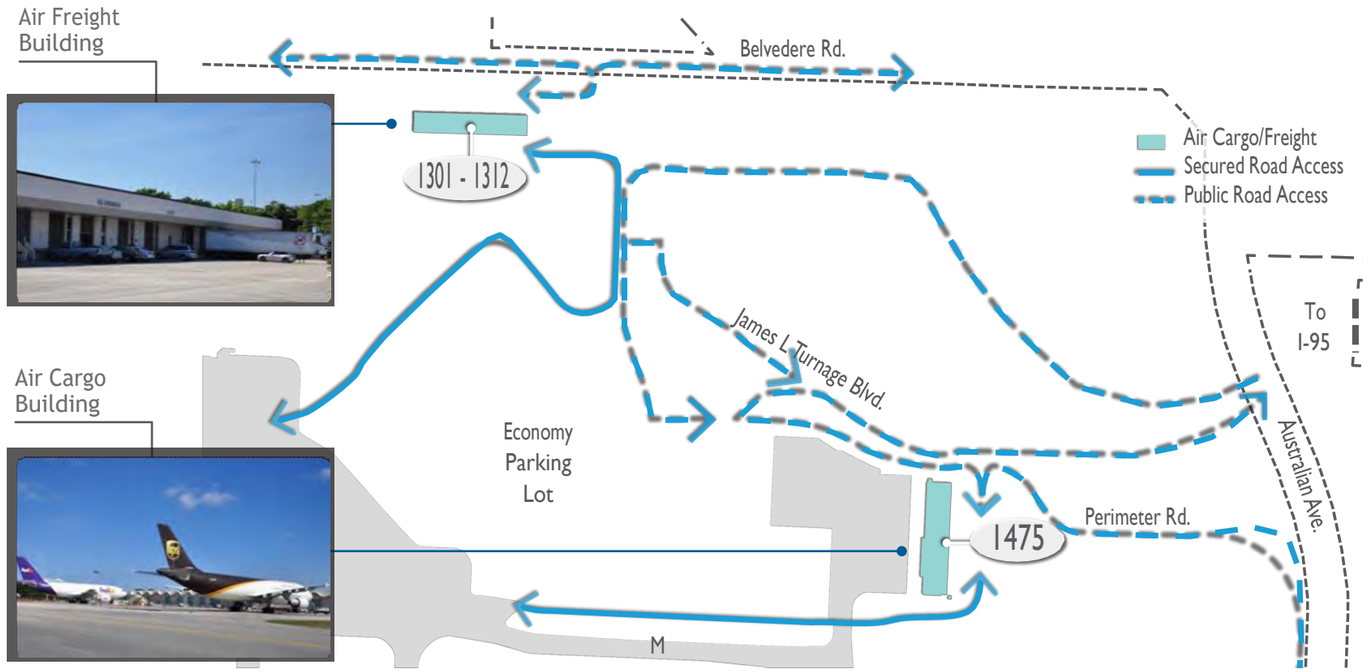


Figure 2.25: Cargo Facilities
Source: AECOM (2014)

Table 2.18: Air Freight Building Space Allocation

Unit Number	Tenant	Type	Lease Space (SF)
1301	Centerport	Belly cargo & freight forwarding	5,000
1302	Big Sky	Minor aircraft maintenance services	1,000
1303	Centerport	Belly cargo & freight forwarding	2,017
1304	FAA	Governmental agency storage	1,988
1305	Lund & Pullara	Freight forwarding	1,472
1306	Jetstream	Belly cargo & freight forwarding	1,984
1307	U.S. Customs	Governmental agency storage	1,000
1308	A + M	Maintenance for ground handling equipment	1,672
1309	Vacant	-	1,485
1310-A	Vacant	-	1,740
1310	Vacant	-	5,027
1311-1312	Delta Air Lines	Belly cargo	7,019
	Total		**31,404**

Table 2.19: Air Cargo Building Space Allocation

Facility	Space (SF)	Number of Bays
United Parcel Service	6,073	5
FedEx	29,914	13
Total	**35,987**	**18**

2.9 Airline & Airport Support

Airline and airport support facilities include numerous functions that facilitate safe and efficient operations such as catering services, airport administration, airport maintenance, and fuel storage. The following sections describe the current facilities available at PBI.

2.9.1 Airline Support Facilities

PBI is equipped with comprehensive airline support facilities, including an airline catering and flight kitchen, airline Ground Support Equipment (GSE) storage and maintenance, and a large fuel farm. The locations of these facilities are illustrated on **Figure 2.26** and summarized in **Table 2.20**.

Airline Catering & Flight Kitchen (1169)

Gate Gourmet, a global catering company with locations in 28 countries, provides airline catering service at PBI. Services provided by Gate Gourmet include basic beverage and snack assembly, fresh food retail, and commercial airlines service. Gate Gourmet replaced the former airline caterer, LSG Sky Chef, in 2010; however, LSG Sky Chef still serves JetBlue via their operation at FLL.

Airline GSE Storage & Maintenance (1332 & 1334)

The Aircraft Service International Group (ASIG) provides ground service needs, such as cabin cleaning, ground handling, and GSE maintenance. The ASIG storage shed (Building 1332) and ASIG office (Building 1334) are located to the east of the Air Freight Building (1301-1311). ASIG service vehicles access the airfield via a secure road west of Perimeter Road.

Fuel Storage

The fuel farm for commercial airlines and cargo operators is operated by ASIG and consists of 14 above-ground Jet-A fuel tanks and one diesel fuel tank. Fuel is transported through underground pipelines to the airfield where tanker trucks collect it for distribution to aircraft at the terminal gates. Each FBO also operates a fuel farm in proximity to their facilities. The capacity and fuel types for fuel storage are provided in **Table 2.21** and **Table 2.22.**

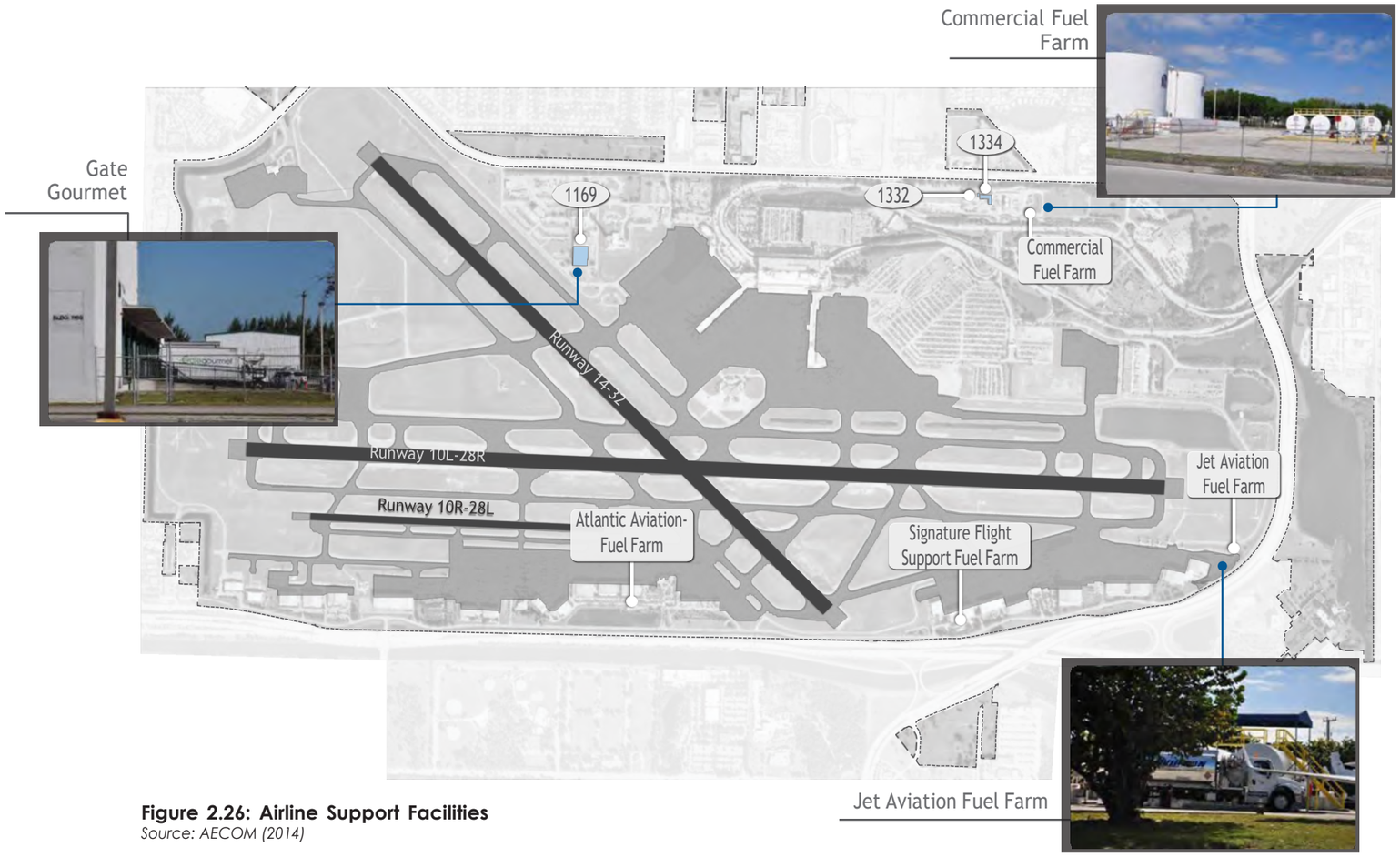


Figure 2.26: Airline Support Facilities
Source: AECOM (2014)

Table 2.20: Airline Support Facilities

Building	Occupant	Use	Total Area (SF)	Condition
1169	Gate Gourmet	Flight Kitchen / Storage	28,370	Poor
1332	ASIG	Storage	785	Poor
1334	ASIG	Office	6,950	Poor
Total			**36,105**	

Table 2.21: ASIG Fuel Storage

Fuel Type	Number of Tanks	Tank Capacity (gallons)	Total Capacity (gallons)
Jet-A	2	350,000	700,000
Jet-A	6	30,000	180,000
Jet-A	6	20,000	120,000
Total	**14**		**1,000,000**
Diesel	1	10,000	10,000

Table 2.22: FBO Fuel Storage

FBO	Type of Fuel	Number of Tanks	Tank Capacity (gallons)	Total Capacity (gallons)
Atlantic Aviation	Jet-A	3	40,000	120,000
Jet Aviation	AvGas	1	12,000	12,000
	Jet-A	2	30,000	60,000
Signature Flight Support	AvGas	1	20,000	20,000
	Jet-A	1	100,000	100,000

2.9.2 Airport Support Facilities

The three major airport support facilities at PBI include the DOA administration building, the Aircraft Rescue and Firefighting (ARFF) facility, and airport maintenance facility as identified in **Figure 2.27** and summarized in **Table 2.23**.

2.9.2.1. Aircraft Rescue & Fire Fighting Facility

Palm Beach County Fire Rescue Aviation Battalion operates at Fire Station No. 81, located between the passenger terminal apron area and the airfield. The station is dedicated to the airport and does not provide service to the area communities. Due to its location inside the Air Operations Area (AOA), access to the facility requires security clearance.

PBI's ARFF Index was reduced from a Level D to Level C in 2013. The ARFF Index is determined by the length of air carrier aircraft and the average daily departures of these aircraft per Title 14 of the Code of Federal Regulation (CFR), Part 139.315. Index C is for aircraft between 126-feet and 159-feet in length with an average of five daily departures. Different requirements are stipulated for different ARFF Indexes per 14 CFR 139.317 as it relates to the number and capacity of ARFF vehicles and personnel requirements. ARFF Index C requires 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 aqueous film forming foam (AFFF) for foam production and one vehicle carrying water and the commensurate quantity of AFFF so the total quantity of water for foam production carried by both vehicles is at least 3,000 gallons.

Seven fire fighting vehicles of different capacities are available, of which three were put into operation after 2006. The specifics of these vehicles are presented in **Table 2.24**. The fleet at PBI satisfies the Part 139 requirements for Level C airports and are able to reach all the runway ends from the station within the maximum 3-minute response time. In addition, two command vehicles for the Captain and District Chief, one escort van, one air stair vehicle, one light truck, and one heavy truck for rescue in the event of a mass casualty situation are also available at PBI.

Rescue personnel provide a range of services including complete advanced life support paramedic services to airport passengers and employees, emergency responses to all FBO facilities, and response to off-airfield incidents outside the airport boundary. The ARFF station responds to approximately 1,600 calls a year for assistance and is typically staffed with six to nine rescue personnel.

2.9.2.2. DOA Administration Office Building

The DOA office building was built in 2008. It accommodates most of the DOA administrative functions, including but not limited to the Airport Planning Division and Airports Business Affairs division. Eighth Street provides vehicle access to the building.

2.9.2.3. Airport Maintenance

The Maintenance Division of the DOA is in charge of all airport maintenance activities. The Division is subdivided into the Terminal Maintenance Division and Airside/Landside Site Maintenance Division. The Maintenance Division is responsible for maintenance at PBI as well as three other GA airports within Palm Beach County.

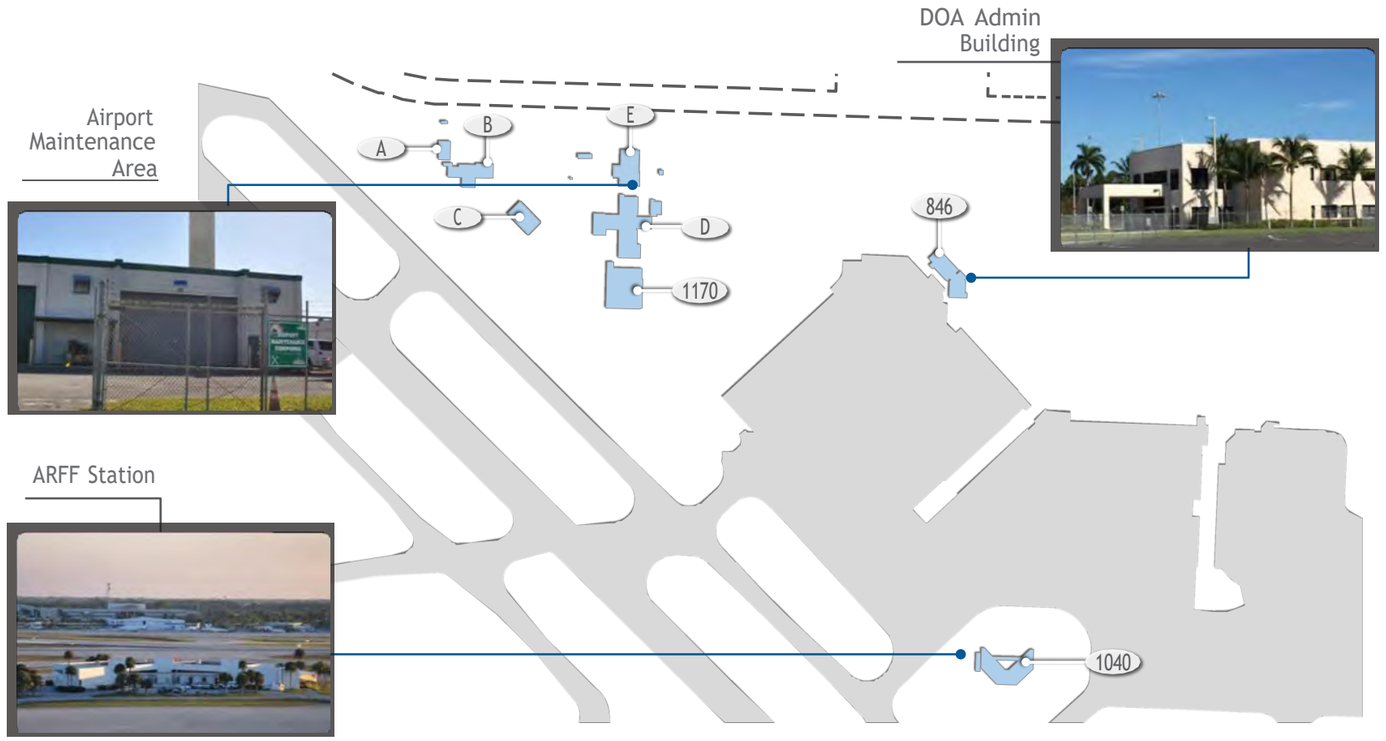


Figure 2.27: Airport Support Facilities
Source: AECOM (2014)

Table 2.23: Airport Support Facilities

Building	Occupant	Use	Total Area (SF)	Condition
846	DOA	Operations	15,740	Good
1040	ARFF	Storage	785	Fair
1170	DOA Repair Shop	Repair	28,390	Fair
A	DOA Maintenance	Storage	4,130	Fair
B	DOA Maintenance	Storage	14,265	Fair
C	DOA Maintenance	Storage	10,110	Fair
D	DOA Maintenance	Storage	34,580	Fair
E	DOA Maintenance	Storage	14,550	Fair
Total			**122,550**	

Table 2.24: ARFF Vehicles

Vehicle	Vehicle Model	Year	Water Capacity (gallons)	Pump Rate (gpm)	Foam Capacity (gallons)	Chemical Capacity (lbs)
Dragon 1	Emergency One	2006	3,000	2,050	400	450
Dragon 2	Oshkosh	2009	1,500	1,850	200	450
Dragon 3	Oshkosh	2009	1,500	1,850	200	450
Dragon 4	Emergency One	1997	3,000	2,050	400	500
Dragon 5	Emergency One	2001	3,000	2,000	400	500
Airport Lieutenant 1	Ford 550 Mini-pumper	2001	300	-	15	-
Rescue Pumper 81	American LaFrance Medic-Master Freightliner M2	2007	300	500	15	n/a

2.10 Ground Access

The ground access network connects the airport with the surrounding region. The following sections discuss the existing roadway system providing access to PBI, ground transportation services, and regional multimodal transportation facilities.

2.10.1 Roadways

The airport is located 3 miles west of Palm Beach, Florida. I-95 extends along the eastern edge of the airport while Florida's Turnpike (Toll Road) is 5 miles to the west of the airport. The airport is bordered by Belvedere Road to the north, N Military Trail to the east, Southern Boulevard (also US-98/FL-80) to the south, and Australian Avenue to the east. **Figure 2.28** shows the major access roads around the airport as well as the annual average daily traffic (AADT) on these roads in 2014. Southern Boulevard and N Military Trail are generally more utilized than the others. The AADT of I-95 in the vicinity of PBI was 201,000 in 2014.

The primary terminal access is from James L. Turnage Boulevard, a four-lane unidirectional road that circulates through the terminal area in a counter clockwise direction. James L. Turnage also includes several connections along the way to all parking lots, rental car facilities, a cell phone lot, taxicab staging area, Air Cargo facility, and Perimeter Road. James L. Turnage Boulevard is accessed via I-95 exit ramps, Belvedere Road, and Australian Avenue. A dual level curbfront provides direct access to the ticketing level and the arrivals levels.

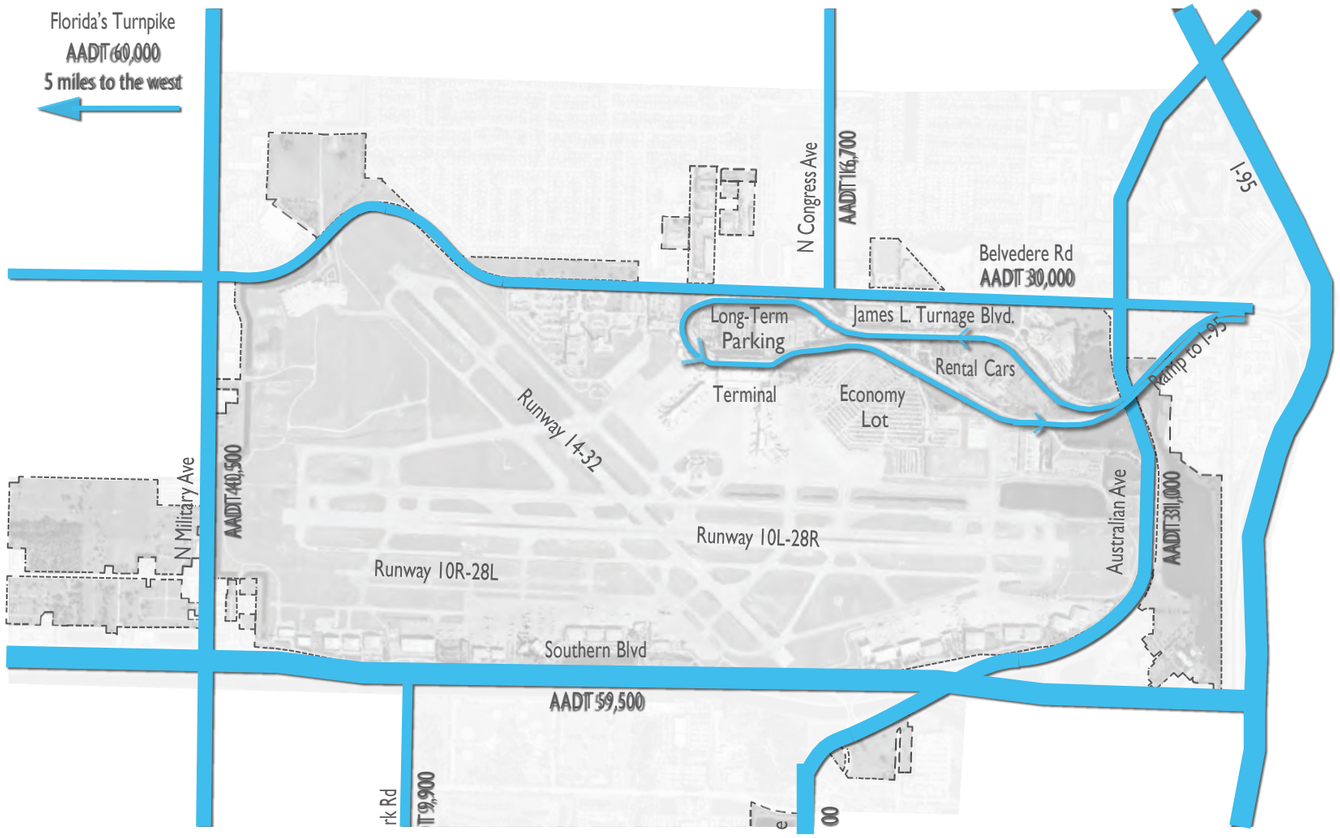


Figure 2.28: Airport Support Facilities
Source: AECOM (2014)

2.10.2 Automobile Parking

Multiple parking areas are available for passengers, airport employees, airline crews, and staging for taxi cabs as shown on **Figure 2.29**.

2.10.2.1. Public Parking

Four public automobile parking options are available at PBI: premium parking, short-term parking, long-term parking, and an economy lot. The rates, number of parking spaces, locations, and structure type of each parking option are listed in **Table 2.26**. An overflow lot is available east of the Air Cargo Building for high peak periods such as Thanksgiving and President's Day weekend.

2.10.2.2. Employee Parking

The employee parking lot i s adjacent to the economy lot and provides approximately 954 parking spaces. Employees are able to walk to the terminal from this lot.

2.10.2.3. Cell Phone Waiting Lot

A cell phone waiting lot (82 spaces) is located within a three-minute driving distance from the main terminal. The DOA is developing a new travel plaza at the intersection of Belvedere Road and N Florida Mango Road. It is expected to be complete in late 2016 or early 2017. The new travel plaza consists of a cell phone lot with 66 parking spaces, gas station, compressed natural gas station, drive-through restaurant, convenience store, automatic car wash facilities, and a real-time flight information board.

2.10.2.4. Taxicab Staging Lot

Taxicab staging lots are provided on the east and west ends of the Main Terminal on the Arrivals level. Passengers can obtain taxi services from these locations. These parking lots are restricted and use is only permitted to the on-demand concessionaire under contract with the DOA. Transportation Network Companies (TNCs) such as Uber and Lyft are not permitted to use these lots.

Table 2.26: Public Parking Facilities

Parking Type	Rates	Number of Spaces	Location	Structure Type
Premium parking	$30/day	184	Immediately north of the main terminal, quick access from baggage claim	Surface
Short-term Parking	$17/day	909	Levels 4-7 of the Main Terminal	Garage
Long-term Parking	$13/day	5,464	North of the premium parking lot	Garage & surface
Economy Lot	$7/day	3,075	5-minute walking distance southeast of the main terminal; Complimentary shuttle service provided	Surface
Total		**9,632**		

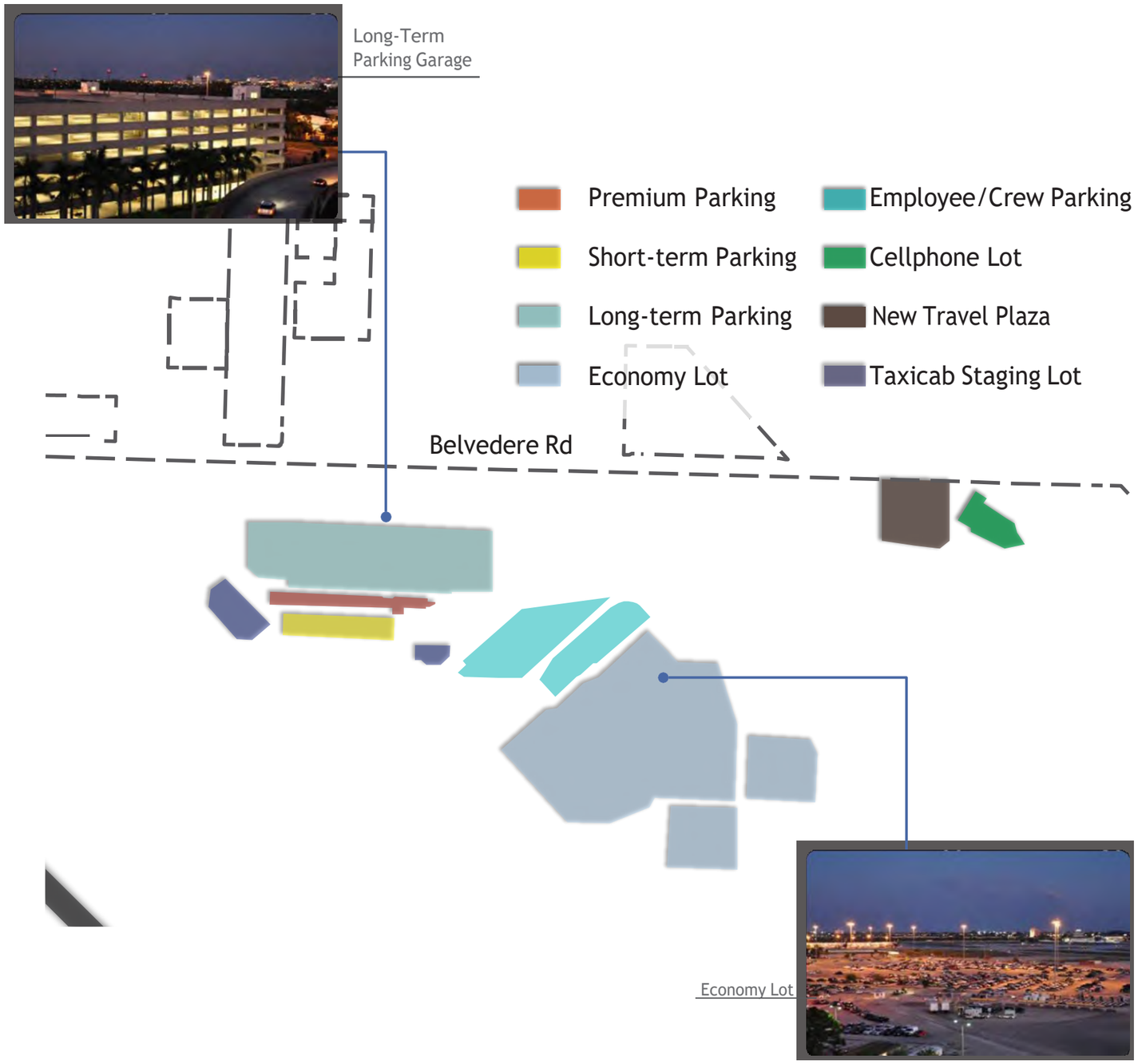


Figure 2.29: Vehicle Parking Facilities
Source: AECOM (2014)

2.10.3 Ground Transportation Services

Public transportation options to and from PBI include Bus, Taxi and limousine services, and hotel courtesy shuttles. Shuttle services are also provided to and from the West Palm Beach Intermodal Transit Center (ITC) where Tri-Rail and Amtrak offer service.

2.10.3.1. Buses

Public bus access to PBI is provided by Palm Tran Route 42 and Route 44 as illustrated in **Figure 2.30**. Palm Tran is operated by PBC. Route 44 offers one stop at the curbside of the Main Terminal. The route starts from the ITC in downtown West Palm Beach, passing through residential areas and an auto repair district northeast of PBI before stopping at PBI. The route circulates to the north through the Westgate residential neighborhood before heading south to serve the residential areas along Belvedere Rd. Under good traffic conditions, it takes approximately 54 minutes to travel the entire route.

Route 42 also starts from the ITC and follows Australian Avenue down to PBI. After circulating through the terminal area of PBI, the route heads west along Belvedere Rd, and terminates at the Super Wal-Mart northeast of PBI. Under good traffic conditions, it takes 28 minutes to travel the route. **Table 2.27** summarizes the frequency of the bus services.

Table 2.27: Frequency of Bus Services

Time	Sub-Type	44		42	
		Frequency	Operating Hours	Frequency	Operating Hours
Weekdays	Peak	Every 30 minutes	5:45am – 7:25pm	Every hour	7:15am – 7:05pm
	Off-peak	Every hour			
Saturdays	Eastbound	Every hour	6:45am - 6:35pm	No Service	
	Westbound	Every hour	7:45am - 5:45pm		
Sundays	Eastbound	Every hour	9:45am - 4:35pm		
	Westbound	Every hour	8:45am - 3:45pm		

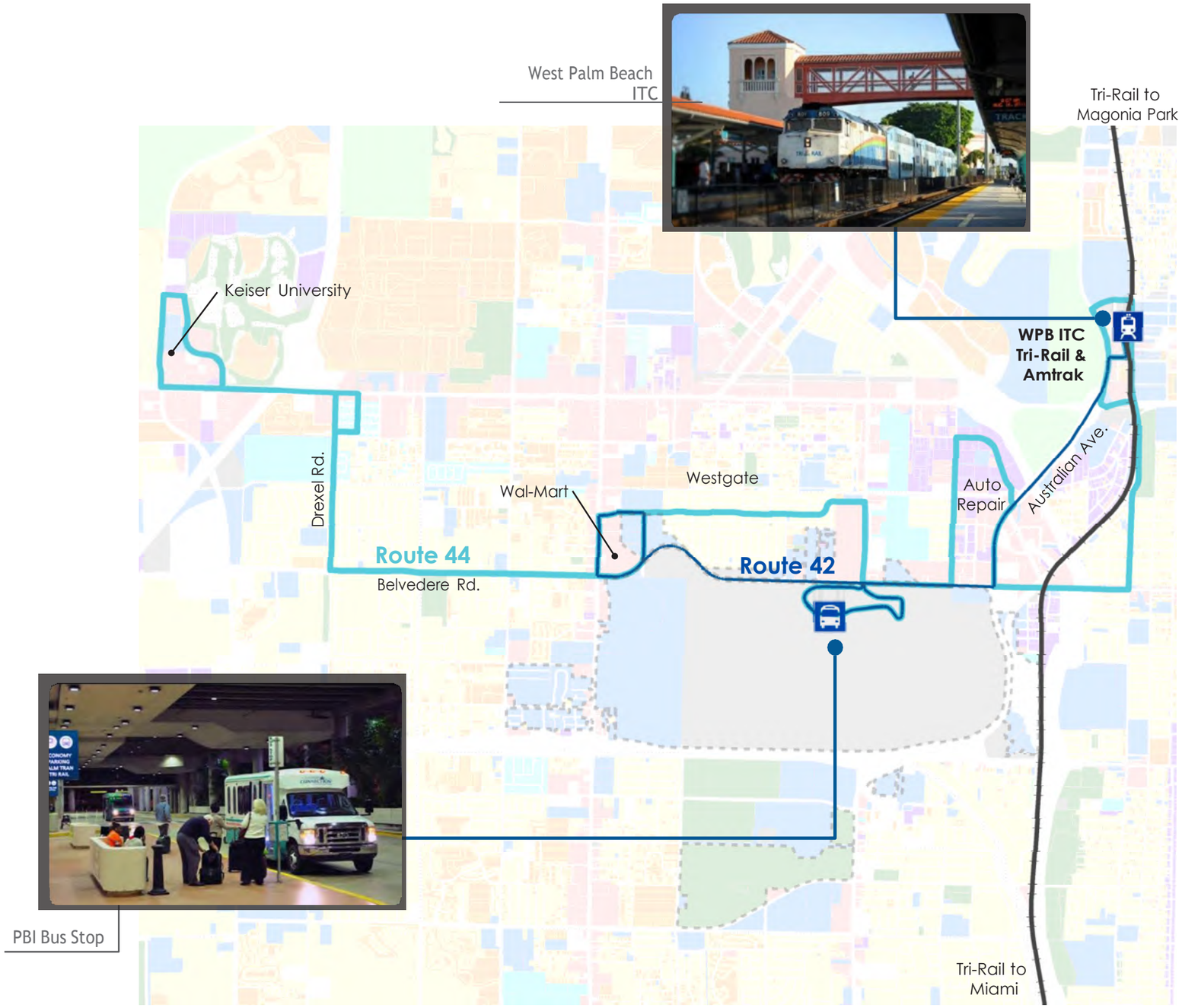


Figure 2.30: Airport Support Facilities
Source: AECOM (2014)

2.10.3.2. Rental Cars

Eight rental car companies have service counters on site at PBI with shuttle service to facilities located close to the terminal as illustrated in **Figure 2.31**. They are Alamo Rent-A-Car, Avis Rent-A-Car, Car Rentals from Budget, Dolla Rent-A-Car, Enterprise, Hertz Rent-A-Car, National, and Thrifty. The rental car counters are located across from baggage claim on Level One in the Main Terminal.

All rental car companies provide frequent courtesy shuttle services between the terminal curbside and their service facilities. A new Enterprise / National / Alamo facility is under construction north of Belvedere Road and is scheduled for completion in late 2016. The facilities occupied by National and Alamo in the James L. Turnage Boulevard island will be vacated and the DOA plans to issue an Request For Proposals for other services to utilize the facilities.

In addition to the eight companies on-site, Advantage Rent-A-Car operates a facility at Hilton Palm Beach Airport located southeast of the airport.

PBI provides an overflow parking lot for rental cars east of Air Cargo Building as well as the lots in the airport maintenance area.

2.10.3.3. Taxi & Hotel Shuttles

Companies providing taxi, van, limousine, or shared-ride services at PBI include Yellow Cab, Imperial Transportation PBC, Inc., Executive Sedan, Shared Ride Services, and TNCs. The TNCs operate at PBI under a special agreement and must remain off-airport property until service is requested. Numerous off-airport ground transportation providers are also authorized to pick up passengers at PBI on a pre-arranged basis.

As of 2014, 10 hotels are permitted to operate courtesy shuttles at PBI. Shuttles can pick up passengers from a designated curb area on the arrivals roadway.

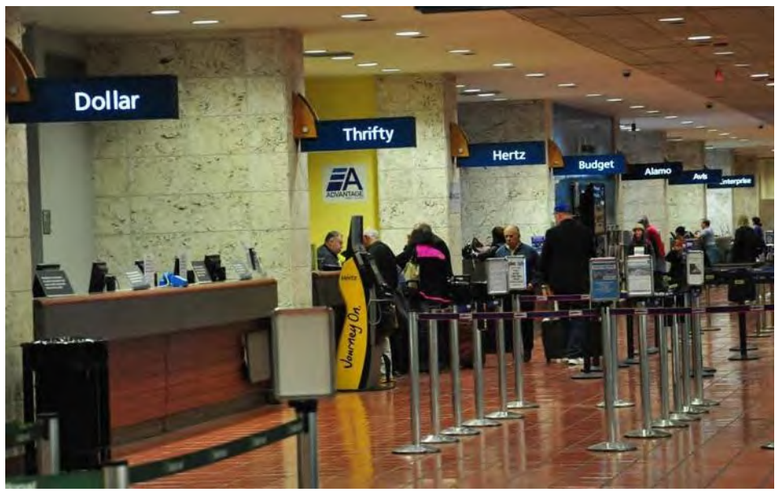
The introduction of TNCs has impacted ground transportation services at airports. Traditional on-demand concessionaires are faced with increasing competition and losing market share while operating under agreements which further reduce their revenues and sustainability. Accordingly, the DOA is evaluating methods to properly manage and structure operating agreements for all ground transportation services. A separate study will provide the recommendations regarding the ground transportation services.

2.10.3.4. Tri-Rail and Amtrak

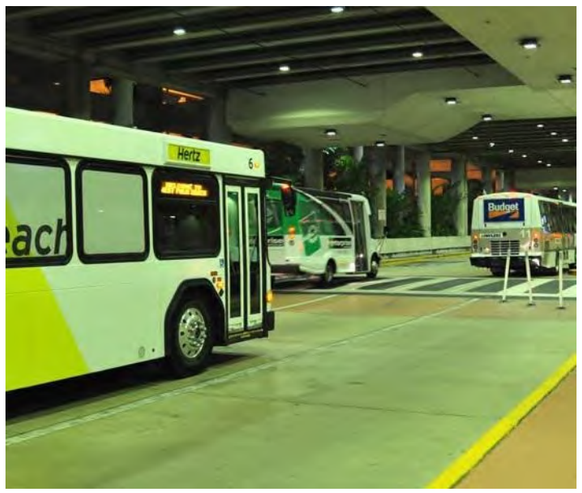
A Tri-Rail and Amtrak station is located at 203 South Tamarind Avenue, 3 miles northeast of PBI. Palm Tran provides one shuttle to carry passengers between PBI and the Tri-Rail station.

Tri-Rail is operated by the South Florida Regional Transportation Authority to provide rail service transportation between West Palm Beach and Miami. It connects the three major airports (PBI, MIA, and FLL) in South Florida. The trip from PBI to MIA is approximately 2 hours, and the trains leave every hour between 4 AM and 9 PM.

Figure 2.31: Rental Car Facilities
Source: AECOM (2014)



Rental Car Counters
Source: AECOM (2014)



Rental Car Shuttles
Source: AECOM (2014)

2.10.4 Regional Multimodal Transportation Plans

It is essential to plan transportation systems from a multimodal perspective. Different transportation modes, when well-integrated, could provide optimized convenience and efficiency to the general public. In the region where PBI is located, multiple planning organizations and transportation operators devise multimodal transportation plans which provide enhanced connection from PBI to other destinations in the region. The major plans and projects include the 2040 Long-Range Transportation Plan (LRTP), All Aboard Florida, and Tri-Rail Coastal Link.

2.10.4.1. 2040 Long-Range Transportation Plan

The 2040 Long-Range Transportation Plan (LRTP) was adopted by the Palm Beach Metropolitan Planning Organization (MPO) in October 2014 to prioritize transportation projects for Federal and State funding from a regional prospective. The MPO updates the LRTP every five years. Transportation projects in the region are only eligible for Federal and State funding if they are included in the LRTP.

The Palm Beach MPO aims at developing a balanced and equitable multimodal transportation system in the region through short-term and long-term planning. The Board of the MPO is composed of County Commissioners, elected municipal officials, and one elected official from the Port of Palm Beach.

Figure 2.32 is adapted from the 2040 Desires Plan in the LRTP, which shows the existing transportation facilities and the committed/desired facilities in the region. Several planned projects that affect PBI can be identified from the map:

- New Tri-Rail station with Park-N-Ride Facility on southeast border of PBI
- Express Bus Service along SR-80 and Australian Avenue
- Rail station to the northeast of PBI for both All Aboard Florida and Tri-Rail Coastal Link services

This section focuses on the new Tri-Rail Station and Express Bus Service, while All Aboard Florida and Tri-Rail Coastal Link are discussed separately in subsequent sections.

Currently the Tri-Rail trains do not stop at PBI. The station closest to PBI is 3 miles away at the ITC. One additional Tri-Rail station is planned in the LRTP to be situated immediately on the southeast border of PBI. The estimated project costs are $22.5 million and the project is phased by Palm Beach MPO for 2021 – 2025.

Palm Tran does not provide express bus services at PBI. In the LRTP, one Express Bus Route via State Road 80, passing by PBI, is planned for 2031 – 2040 together with an extensive express bus network connecting major destinations throughout the county. This route provides faster connection from PBI to the ITC as well as Glades Area Intermodal Center. The estimated costs are $5.9 million.

Figure 2.32: LRTP 2040 Plan
Source: Palm Beach Metropolitan Planning Organization (2014)

2.10.4.2. All Aboard Florida

All Aboard Florida is planned to be a 195-mile intercity passenger rail corridor, connecting Miami and Orlando via Fort Lauderdale and West Palm Beach in less than three hours. The West Palm Beach station of All Aboard Florida is located 4.5 miles northeast of PBI in downtown West Palm Beach. **Figure 2.33** shows an architectural rendering of the newly designed West Palm Beach station. Station construction started on November 12, 2014.

All Aboard Florida, a project by Florida East Coast Industries LLC, is the first passenger rail system that is privately owned, operated, and maintained in the United States. The estimated capital costs are $1.5 billion. As of January 2015, orders for the rolling stock were placed, necessary property acquisition was completed, and construction for some stations was started.

2.10.4.3. Tri-Rail Coastal Link

Tri-Rail Coastal Link is a planned commuter rail service extending 85 miles between Miami and Jupiter, Florida. One station is planned to be co-located with the All Aboard Florida West Palm Beach station. The proposed alignment runs on the Florida East Coast railway's right-of-way, which is parallel to the existing Tri-Rail service. The service will be integrated with the existing Tri-Rail service to enhance connectivity between regional centers in Southeast Florida, notably West Palm Beach, Boca Raton, Fort Lauderdale, and downtown Miami.

The revenue service is expected to begin as early as 2018, though the actual progress depends on funding commitments. The estimated capital costs of this project are $600-800 million.

The Tri-Rail Coastal Link is jointly developed by a regional partnership that includes FDOT, South Florida Regional Transportation Authority, three MPOs (Palm Beach, Broward, Miami-Dade), Southeast Florida Transportation Council, South Florida Regional Planning Council, and Treasure Coast Regional Planning Council.

Figure 2.33: Conceptual West Palm Beach All Aboard Florida Station
Source: All Aboard Florida (2014)

Aviation Activity Forecasts

03

03 Aviation Activity Forecasts

This chapter presents the unconstrained aviation demand forecast PBI. Forecast scenarios were developed for passenger enplanements, aircraft operations, based aircraft, and air cargo tonnage. The supporting analyses used to develop the forecasts are summarized in this section, including a comparison to the 2014 FAA TAF and the Florida Aviation Activity Forecast for the FASP developed by the FDOT. The recommended forecast provides the basis for determining the planning activity levels, and future facility requirements in the next chapter.

3.1 Airport Service Region

As shown on **Figure 3.1**, the primary catchment area served by PBI consists of Palm Beach, Martin, St. Lucie, and Indian River counties and is within the Miami-Fort Lauderdale-Port St. Lucie Combined Statistical Area (CSA). The primary catchment area for PBI focuses on these four counties considering the proximity of FLL in Broward County and MIA in Miami-Dade County. The comparison of markets (destinations) served by similar large and medium hub airports surrounding PBI, including Orlando International Airport (MCO), Southwest Florida International Airport (RSW), FLL and MIA, as presented in the next section demonstrates that these airports provide similar top destinations in the area. Passengers have the tendency to pick the airport nearest to them for the same destination. The PBI service region includes the counties mid-way between the surrounding airports.

According to the U.S. Department of Commerce, Bureau of the Census, and the 2014 Florida State Profile from Woods & Poole Economics, the population of the Airport service region was 1,970,802 in 2013 (see **Table 3.1** and **Figure 3.2**), representing approximately 10% of the total Florida population of 19.6 million. PBI is located in Palm Beach County, which accounts for about 70% of the population of the service region as reflected by the population densities shown in **Figure 3.1**. The economic growth and activity within Palm Beach County and the service region stimulate a significant portion of passenger demand at PBI. As such, the statistics for this service region were used to evaluate long-term and future aviation activity trends at PBI.

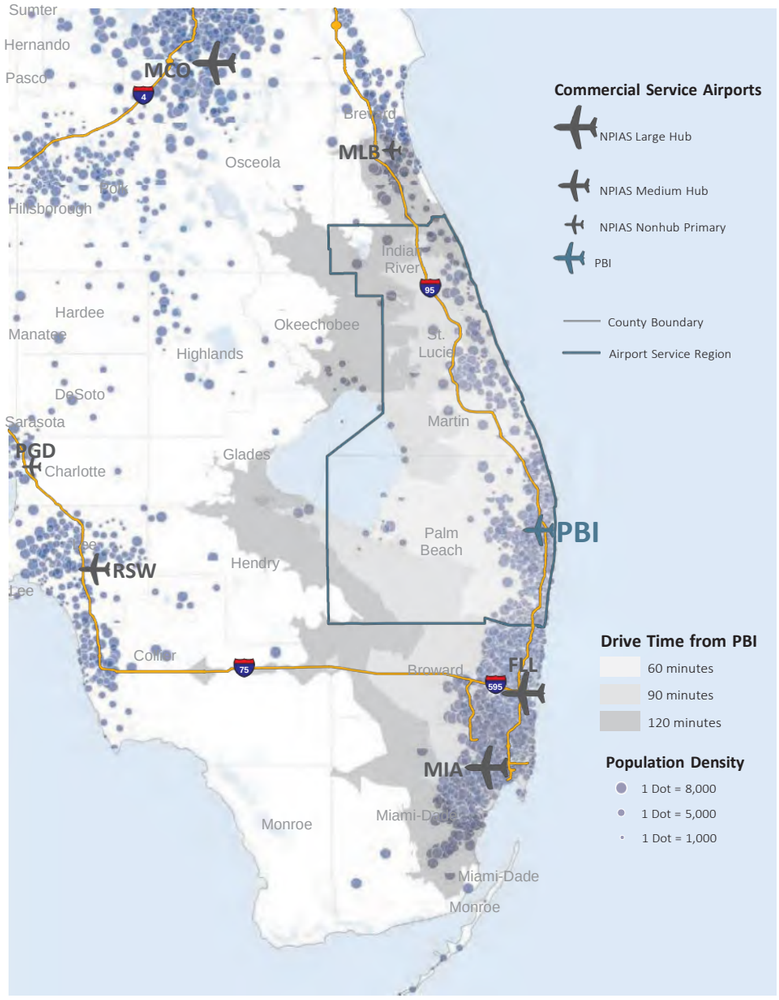


Figure 3.1: Airport Service Region
Source: AECOM (2014); U.S. Census Bureau

Table 3.1: Population Distribution in the Airport Service Region and Florida

Area	2013 Population	Percentage
Florida (FL)	19,552,860	
Airport Service Region	1,970,802	10.1% of FL
Palm Beach County	1,385,372	70.30%
Martin County	151,760	7.70%
St. Lucie County	291,042	14.80%
Indian River County	142,628	7.20%
4-County Total	1,970,802	100.00%

Note:

(1) Percentages may not add to totals because of rounding.

Sources:

(1) U.S. Census Bureau, Population Division, Annual Estimates of the Resident Population for Selected Age Groups by Sex for the United States, States, Counties, and Puerto Rico Commonwealth and Municipios: April 1, 2010 to July 1, 2013.
(2) Woods & Poole Economics.

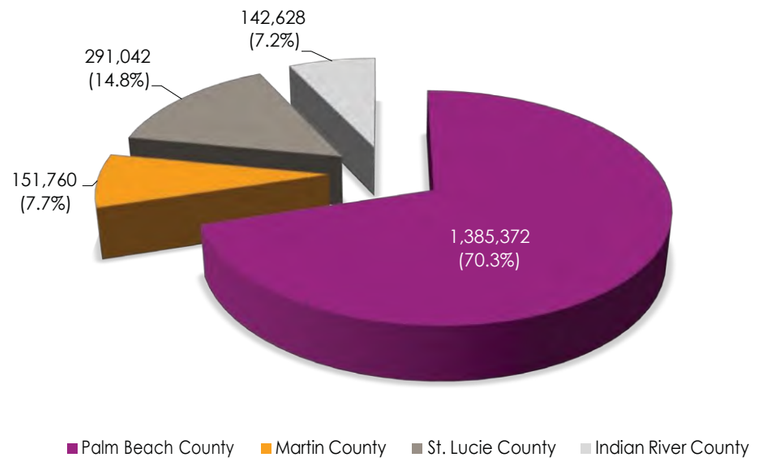


Figure 3.2: Population Distribution in the Airport Service Region

Sources:

(1) U.S. Census Bureau, Population Division, Annual Estimates of the Resident Population for Selected Age Groups by Sex for the United States, States, Counties, and Puerto Rico Commonwealth and Municipios: April 1, 2010 to July 1, 2013.
(2) Woods & Poole Economics.

3.2 Commercial Service Airports in Southeast Florida

The extent of PBI's service region is also related to the proximity of other airports within reasonable driving distances and the destinations (markets) these airports serve. There are four surrounding commercial service airports of similar size as PBI (medium or large hub airports); FLL, MIA, MCO, and RSW. The top 33 scheduled service destinations provided by these airports in 2013 were analyzed and a comparison is provided in **Table 3.2** as an indication of the level of existing and potential air service competition. **Appendix B** provides the complete analysis.

The top destinations from PBI largely overlap with FLL, MIA, MCO, and RSW. FLL provides service to all the domestic and international markets that PBI serves and provides more departures than PBI for most destinations. MIA, MCO, and RSW each provide service to at least 88-percent of those provided at PBI.

There are few international scheduled passenger services from PBI and are currently limited to the Bahamas and Canada. However, there are occasional non-scheduled passenger charter flights from Europe, such as Prague, Stockholm, Anguilla, Northolt, Nuremberg, Las Palmas, Hamburg, and Zurich.

Table 3.2: Scheduled Airline Service at PBI and Comparison with Similar Surrounding Airports in 2013

Destinations from PBI			Number of Departures from Surrounding Airports to the same Destinations			
Airport	**City, State**	**Number of Departures**	**FLL**	**MIA**	**MCO**	**RSW**
Domestic						
ATL	Atlanta, GA	4,119	8,301	6,690	8,890	4,275
LGA	New York, NY	2,426	5,369	5,686	3,654	1,379
EWR	Newark, NJ	2,364	3,748	2,629	4,900	1,457
CLT	Charlotte, NC	1,825	2,930	4,153	3,583	1,870
JFK	New York, NY	1,737	4,242	3,307	5,466	1,328
PHL	Philadelphia, PA	1,425	2,465	2,241	4,866	1,179
BOS	Boston, MA	1,315	2,468	2,530	3,429	1,886
HPN	White Plains, NY	1,093	855	N/A	1,423	360
BWI	Baltimore, MD	1,044	4,404	1,015	3,748	1,361
DCA	Washington, DC	923	2,355	3,233	3,779	855
TPA	Tampa, FL	852	3,068	2,174	69	23
DFW	Dallas/Fort Worth, TX	817	2,930	3,691	3,948	1,116
ISP	Islip, NY	777	600	N/A	1,200	59
ORD	Chicago, IL	747	2,615	3,942	3,615	1,865
IAH	Houston, TX	603	1,673	3,158	2,656	723
DTW	Detroit, MI	424	2,473	1,360	3,370	1,535
BDL	Hartford, CT	367	1,006	405	1,779	272
SJU	San Juan, PR	316	2,991	2,539	3,385	N/A
CLE	Cleveland, OH	213	573	839	842	584
ACY	Atlantic City, NJ	164	818	N/A	706	502
MCO	Orlando, FL	86	1,673	3,225	N/A	197
FLL	Fort Lauderdale, FL	65	N/A	18	1,692	67
PVD	Providence, RI	60	886	1	2,160	66
PIT	Pittsburgh, PA	59	502	736	1,733	565
LAX	Los Angeles, CA	41	2,131	3,098	2,199	N/A
BUF	Buffalo, NY	38	583	N/A	1,838	211
MIA	Miami, FL	37	28	N/A	3,250	107
International						
MHH	Marsh Harbour, The Bahamas	586	563	340	325	N/A
YYZ	Toronto, Canada	344	1,820	2,378	2,015	868
YUL	Montreal, Canada	29	1,463	1,168	610	27
ELH	North Eleuthera, The Bahamas	23	473	300	N/A	N/A
FPO	Freeport, The Bahamas	23	1,348	1,369	N/A	N/A
NAS	Nassau, The Bahamas	22	2,102	4,297	902	N/A

Sources:

(1) U.S. Department of Transportation, T-100 Segment database.
(2) AECOM analysis.

Note:

(1) Less than 10 scheduled departures from PBI in 2013 are not shown.

3.3 Economic Basis for Aviation Demand

The economy of the region served by the Airport is an important determinant of long-term passenger demand at PBI. The development and diversity of the economic base of the Airport service region is important to future passenger traffic growth[2]. The southeast Florida area has a diverse population and economic base and is one of the most actively growing regions in Florida. Florida's relatively strong and diverse service economy, coupled with a steady inflow of retirees, has historically provided a stable basis for economic growth. Florida also has a well-developed tourism infrastructure and the tourism industry makes substantial economic contributions to the state.

The following sections discuss the economic basis for aviation demand at PBI, including a summary of the economic outlook for the United States, Florida, and the PBI service region.

3.3.1 Socioeconomics

Table 3.3 to **Table 3.5** present the historical trends in population, non-farm employment, and per capita personal income in the PBI service region, Florida, and the United States from 2000 through 2013. **Table 3.6** presents the projections in population, non-farm employment, and per capita personal income in the service region for the 20-year planning horizon through 2035.

3.3.1.1. Population

As shown in **Table 3.3**, the population of the combined four-county service region increased at an average annual growth rate of 1.76%, which was higher than that experienced by the state (1.53%) and the nation (0.88%) between 2000 and 2013.

Palm Beach County (1.33 million) accounts for about 70% of the population of the service region and is the third largest county in Florida behind its neighbors to the south Miami-Dade (2.55 million) and Broward (1.77 million)[3].

Other fast-growing counties in the service region include St. Lucie and Indian River counties, which have experienced average annual growth rates of 3.19% and 1.78% respectively from 2000 to 2013.

Populations in the region and in Florida are projected to follow the historical trend and continue to outpace the nation as a whole. The population of Florida is expected to grow at an average annual rate of 1.35% from 2015 to 2035, a slowdown from the 2.50% growth rate between 1969 and 2013 but well above the national average and the fifth fastest projected rate for any state[4]. . The population of the combined four-county region is projected to grow at an average annual rate of 1.69% from 2015 to 2035, which is higher than the state and national average. **Table 3.6** summarizes the population projections for the 20-year planning horizon through 2035.

2 *Woods and Poole Economics.*

3 *Palm Beach County website, accessed December 2012*

4 *Ibid.*

Table 3.3: Historical Population

Year	Population (thousands)		
	Airport Service Region	Florida	United States
2000	1,570	16,048	282,162
2001	1,604	16,357	284,969
2002	1,648	16,689	287,625
2003	1,690	17,004	290,108
2004	1,746	17,415	292,805
2005	1,790	17,842	295,517
2006	1,813	18,167	298,380
2007	1,832	18,368	301,231
2008	1,849	18,527	304,094
2009	1,864	18,653	306,772
2010	1,886	18,846	309,326
2011	1,902	19,083	311,583
2012	1,936	19,321	313,874
2013	1,971	19,553	316,129
Period	**Year-over-Year Percentage Changes (%)**		
2000-2001	2.19	1.93	0.99
2001-2002	2.74	2.03	0.93
2002-2003	2.54	1.89	0.86
2003-2004	3.28	2.42	0.93
2004-2005	2.56	2.45	0.93
2005-2006	1.27	1.82	0.97
2006-2007	1.02	1.11	0.96
2007-2008	0.94	0.87	0.95
2008-2009	0.84	0.68	0.88
2009-2010	1.19	1.03	0.83
2010-2011	0.82	1.26	0.73
2011-2012	1.79	1.25	0.74
2012-2013	1.80	1.20	0.72
Period	**Average Annual Compound Growth Rate (AAGR) (%)**		
2000-2005	2.66	2.14	0.93
2005-2010	1.05	1.10	0.92
2010-2013	1.47	1.24	0.73
2000-2013	1.76	1.53	0.88

Sources:

(1) U.S. Census Bureau, Population Division, Intercensal Estimates of the Resident Population for the United States, Regions, States, and Puerto Rico: April 1, 2000 to July 1, 2010
(2) U.S. Census Bureau, Population Division, Annual Estimates of the Resident Population for Selected Age Groups by Sex for the United States, States, Counties, and Puerto Rico Commonwealth and Municipios: April 1, 2010 to July 1, 2013
(3) Woods & Poole Economics.

Note:

(1) The populations for Palm Beach, Martin, St. Lucie, and Indian River counties in 2012 and 2013 are estimates by Woods & Poole Economics.

Office Building - West Palm Beach
Source: AECOM (2014)

Arts & Entertainment - District West Palm Beach
Source: AECOM (2014)

3.3.1.2. Employment

Similar to the growth in population, the historical growth of non-farm employment in the combined four-county service region outpaced the average state and national growth, as shown in **Table 3.4**. Between 2000 and 2013, non-farm employment in the service region increased an average rate of 1.67% per year which is higher than the annual averages of 0.55% in Florida and 0.25% in the United States.

An indicator of a region's economic strength is its performance during recessions or periods of weak economic conditions. Since 2000, the fluctuations in economic activity in the region during economic recessions, as measured by non-farm employment, have often exceeded national trends, especially during recovery. During and after the 2001 recession, the non-farm employment in the combined four-county region maintained at growth rate higher than the state average. On the contrary, the national non-farm employment contracted at -0.24% to -1.1% between 2001 and 2003. During the recent recession beginning December 2007 through 2010, the non-farm employment in both the region and the state decreased with the national trend. The decrease in non-farm employment in both the region and the state was slightly higher than the nation, which is likely due to the greater impact of the last recession on the tourism industry and related employment. When the economy recovered, the regional and state-wide employment levels increased at a higher rate than the nation. Non-farm unemployment in the service region recovered faster from 2010 to 2013 than either the state or the nation.

The service region and the State of Florida are expected to continue to generate jobs at a steady pace over the next 20-year planning horizon. The non-farm employment of the combined four-county region is projected to grow at an average annual rate of 1.94% from 2015 to 2035, which is higher than the state at 1.66% and the national average at 1.36%. **Table 3.6** summarizes the non-farm employment projections for the 20-year planning horizon through 2035.

Table 3.4: Historical Non-farm Employment

Year	Non-farm Employment (thousands)		
	Airport Service Region	Florida	United States
2000	827	7,055	132,030
2001	859	7,144	132,080
2002	881	7,153	130,628
2003	909	7,232	130,315
2004	950	7,481	131,732
2005	1,007	7,781	133,997
2006	1,040	7,984	136,403
2007	1,053	7,999	137,935
2008	1,014	7,715	137,170
2009	974	7,231	131,220
2010	971	7,172	130,272
2011	985	7,252	131,849
2012	1,005	7,397	134,098
2013	1,025	7,580	136,363
Period	**Year-over-Year Percentage Changes (%)**		
2000-2001	3.89	1.26	0.04
2001-2002	2.53	0.12	-1.10
2002-2003	3.22	1.11	-0.24
2003-2004	4.55	3.43	1.09
2004-2005	5.97	4.02	1.72
2005-2006	3.26	2.61	1.80
2006-2007	1.26	0.19	1.12
2007-2008	-3.75	-3.55	-0.55
2008-2009	-3.87	-6.28	-4.34
2009-2010	-0.30	-0.81	-0.72
2010-2011	1.44	1.11	1.21
2011-2012	2.01	1.99	1.71
2012-2013	2.01	2.48	1.69
Period	**AAGR (%)**		
2000-2005	4.03	1.98	0.30
2005-2010	-0.72	-1.62	-0.56
2010-2013	1.82	1.86	1.53
2000-2013	1.67	0.55	0.25

Sources:

(1) U.S. Department of Labor, Bureau of Labor Statistics. Accessed November 2014.
(2) Woods & Poole Economics.

Note:

(1) The non-farm employments for Palm Beach, Martin, St. Lucie, and Indian River counties in 2012and 2013 are estimates by Woods & Poole Economics.

High-rise Housing in West Palm Beach
Source: AECOM (2014)

S County Road & Worth Avenue Intersection
Source: AECOM (2014)

3.3.2 Per Capita Personal Income

Average per capita personal income in the service region has historically been higher than that in the state and the nation as shown in **Table 3.5**. In 2012, the most recent year for which per capita income data was available from Woods & Poole Economics at the time this report was prepared, the average per capita income (in 2009 dollars) in the combined four-county region was $48,054 as compared to $38,342 in Florida and $40,261 in the United States.

Average annual growth in per capita income in the region has generally exceeded that of the state and nation, as was the case between 2003 and 2007 when the region's growth was 4.17% compared to 3.18% for Florida and 2.49% for the United States. Growth slowed in subsequent years due to the recession beginning December 2007. While the higher income locations were impacted more significantly, the decrease in the service region per capita income was higher than that for Florida and the United States. Recovery from the recession has also been slower compared to the state and the nation, partially due to the higher growth in population in the service region.

The per capita personal income for the Airport service region is expected to growth at 1.53% from 2015 to 2035 as shown in **Table 3.6**.

Table 3.5: Historical Per capita Personal Income (2009 dollars)

Year	Per Capita Personal Income (2009 dollars)		
	Airport Service Region	Florida	United States
2000	48,788	34,981	36,473
2001	48,385	35,175	36,772
2002	48,378	35,475	36,661
2003	47,398	35,674	36,878
2004	50,758	37,304	37,802
2005	51,781	38,466	38,426
2006	54,928	40,111	39,825
2007	55,806	40,429	40,687
2008	54,774	39,952	40,921
2009	47,173	36,849	38,637
2010	47,368	37,721	39,144
2011	47,951	38,080	39,929
2012	48,054	38,342	40,261
2013	48,219	38,633	40,644
Period	**Year-over-Year Percentage Changes (%)**		
2000-2001	-0.82	0.55	0.82
2001-2002	-0.01	0.85	-0.30
2002-2003	-2.03	0.56	0.59
2003-2004	7.09	4.57	2.51
2004-2005	2.02	3.11	1.65
2005-2006	6.08	4.28	3.64
2006-2007	1.60	0.79	2.16
2007-2008	-1.85	-1.18	0.58
2008-2009	-13.88	-7.77	-5.58
2009-2010	0.41	2.37	1.31
2010-2011	1.23	0.95	2.01
2011-2012	0.21	0.69	0.83
2012-2013	0.34	0.76	0.95
Period	**AAGR (%)**		
2000-2005	1.20	1.92	1.05
2005-2010	-1.77	-0.39	0.37
2010-2013	0.60	0.80	1.26
2000-2013	-0.09	0.77	0.84

Sources:

(1) Woods & Poole Economics.

Note:

(1) The per capita personal income for Palm Beach, Martin, St. Lucie, and Indian River counties in 2013 are estimates by Woods & Poole Economics.

Table 3.6: Projections of Socioeconomic Parameters for the Service Region

Year	Airport Service Region		
	Population (thousands)	Non-farm Employment (thousands)	Per capita Personal Income (2009 dollars)
2013	1,971	1,025	48,219
2014	2,006	1,046	48,518
2015	2,042	1,067	48,912
2016	2,079	1,088	49,381
2017	2,116	1,110	49,910
2018	2,154	1,132	50,497
2019	2,192	1,154	51,137
2020	2,230	1,177	51,839
2021	2,269	1,200	52,586
2022	2,309	1,223	53,371
2023	2,349	1,247	54,191
2024	2,389	1,272	55,042
2025	2,429	1,296	55,927
2026	2,470	1,322	56,839
2027	2,512	1,347	57,779
2028	2,554	1,373	58,746
2029	2,596	1,399	59,740
2030	2,638	1,426	60,762
2031	2,681	1,453	61,808
2032	2,724	1,481	62,882
2033	2,767	1,509	63,983
2034	2,811	1,538	65,112
2035	2,855	1,567	66,271
Period	**AAGR (%)**		
2015-2020	1.78	1.98	1.17
2015-2025	1.75	1.97	1.35
2015-2035	1.69	1.94	1.53

Sources:

(1) Woods & Poole Economics.

3.3.3 Economic Outlook

Economic activity in the service region and in Florida is directly linked to the production of goods and services in the rest of the United States. Both airline travel and the movement of cargo through PBI depend on the economic linkages between the regional, state, and national economies.

3.3.3.1. U.S. Economy

A summary of the U.S. economic outlook was conducted using publications by the U.S. Congress, including the Congressional Budget Office's (CBO) "Budget and Economic Outlook: Fiscal Years 2014 to 2024 (February 2014) and "An Update to the Budget and Economic Outlook: Fiscal Years 2014 to 2024" (August 2014). In addition, the economic forecasts contained in the FAA Aerospace Forecast FY2013-2034 [5], and socioeconomic forecasts from Woods & Poole Economics were utilized in this analysis.

The U.S. economy has struggled to recover from the recent recession that, according to the National Bureau of Economic Research, began in December 2007 and ended in June 2009. The pace of growth in the nation's output after the recent recession has been slow compared with that in most other recession recoveries since World War II.

The slow pace is broadly consistent with international experiences following a financial crisis. It requires time for households to settle their debts and build up wealth, for companies to regain their confidence in investing in their businesses, and for financial institutions to recover their capital bases and credit levels.

As the recovery is approaching its fifth year, the U.S. economy is expected to grow at a solid pace for the next few years. A recent report indicates that private sector debt levels have been decreasing while public sector debt levels have stabilized and recent data suggest a recovery in the employment market. On the other hand, the boost to the economy from the fiscal stimulus is diminishing, leaving the economy to rely on the underlying strength in private demand[6].

Taking several factors into account, the CBO projects that economic growth will pick up in the next few years and grow moderately afterwards. The projections by Woods & Poole Economics are close to the CBO in the medium term (10-year) and remain steady in the long term (20-year). The economic forecasts in the FAA Aerospace Forecast FY2014-2034 include a range of projections for U.S. economic growth, including a baseline, pessimistic, and optimistic scenarios. The CBO and Woods & Poole projections are within the range predicted by these three scenarios.

The long term projections of Gross Domestic Product (GDP) growth rates in the FAA's baseline scenario and Woods & Poole are close with each other, at approximately 2.3 to 2.5% per year over the 20-year planning period. **Figure 3.3** illustrates the GDP projections by the CBO, FAA Aerospace Forecast FY2014-2034 and Woods & Poole Economics. Year-over-year changes are included to demonstrate the historic and forecast trend.

Unemployment rate and oil prices are also key parameters relevant to the U.S. economy and are discussed in later sections.

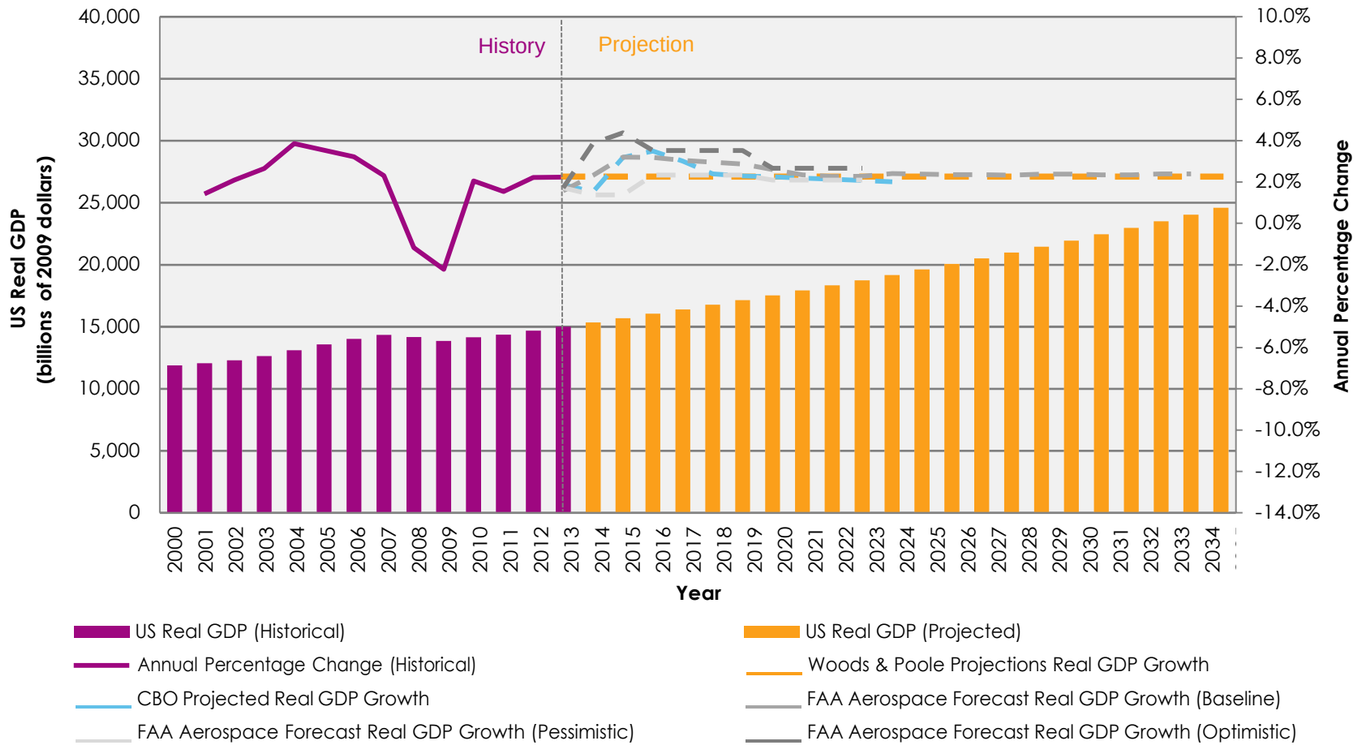


Figure 3.3: Historical and Projected Real GDP in the U.S.

Sources:

(1) U.S. Congressional Budget Office (CBO), An Update to the Budget and Economic Outlook: FY 2014 to 2024.
(2) The FAA Aerospace Forecast FY2014-2034.
(3) Woods & Poole Economics

5 *The FAA used the economic forecasts developed by IHS Global Insight, Inc.*

6 *FAA Aerospace Forecast FY2014-2034.*

3.3.3.2. Statewide and Regional Economy

Florida has traditionally been one of the fastest growing states in the nation. The top industries in Florida range from tourism, international trade, agriculture and construction to services, software, health technology and university research. Approximately 40% of all U.S. exports to Latin and South America pass through Florida. Florida is the top travel destination in the world and its tourism industry has an economic impact of approximately $67 billion on Florida's economy[7]. The space industry represents $4.1 billion of the state's economy; the number of people employed at Kennedy Space Center alone is 13,000 and Florida ranks 4th among the states in overall aerospace employment with 33,000 jobs[8] .

Florida's relatively strong and diverse service and agricultural economy coupled with a steady inflow of retirees has historically provided a stable basis for economic growth. Starting in 2013, the downturn in housing construction and the rise in home foreclosures in parts of Florida began to reverse and is expected to continue. The regional economies most affected are projected to eventually digest excess housing stock inventories and resume steady economic growth[9].

Palm Beach County accounts for about 70% of the population in the service region and is the economic engine of the four-county region. The three major industries in Palm Beach County are tourism, construction and agriculture. There are also high-tech industries such as bioscience that contribute to the growing economy. Tourism accounts for more than 53,000 jobs in businesses such as hotels, restaurants, stores, transportation services, and others. More than 2 million people visit Palm Beach County annually, spending approximately $3 billion during their visits[10].

A 2012 visitor profile report revealed that Palm Beach County's visitors are more affluent and mature than the average Florida visitor. Both the income and average age of its visitors has increased since 2011, with "Affluent Mature" visitors making up 32% of the total. The "Young & Free" demographic category, ages 18 to 34 with no children, showed significant strength at 19% of visitors; ahead of the state average by 6%[11]. These two groups of visitors tend to have higher spending capacity and the growth of these visitors will support the overall economic growth in the region where it is expected to increase more rapidly than the state and the nation. The GDP for the four-county region is forecast to grow at 2.9% per year as compared to 2.6% in Florida and 2.3% in the United States over the 20-year planning horizon.

Table 3.7 summarizes the historical and projected real GDP of the Airport service region, Florida, and the United States from Woods & Poole Economics.

Table 3.7: Historical & Projected Real GDP for Service Region, Florida, & U.S.

Year	Real GDP (in millions of 2009 dollars)		
	Airport Service Region	Florida	United States
2000	60,774	578,913	11,890,302
2010	70,899	716,127	14,154,695
2011	70,743	717,137	14,372,520
2012	72,811	735,607	14,692,775
2013	74,939	754,555	15,020,627
2014	77,128	773,993	15,356,265
2015	79,380	793,935	15,699,883
2020	91,660	901,664	17,544,865
2025	105,820	1,024,089	19,621,692
2030	122,145	1,163,224	21,961,223
2035	140,960	1,321,363	24,598,661
Period	**Historic AAGR (%)**		
2000-2005	4.45	4.99	2.71
2005-2010	-1.26	-0.61	0.82
2010-2013	1.86	1.76	2.00
2000-2013	1.62	2.06	1.81
Period	**Forecast AAGR (%)**		
2015-2020	2.90	2.60	2.20
2015-2025	2.90	2.60	2.30
2015-2035	2.90	2.60	2.30

7 *State of Florida website. Accessed December 2014.*

8 *Ibid.*

9 *Woods & Poole Economics.*

10 *Palm Beach County website, accessed December 2012.*

11 *Palm Beach County website, accessed December 2012.*

3.3.3.3. Unemployment Rates

Just as employment trends can provide an indication of economic conditions and its relation to aviation demand, unemployment rates can identify a relationship with the reduction in aviation demand. **Figure 3.4** depicts historical and projected unemployment rates. Historical data was obtained from the Bureau of Labor Statistics for Florida and the U.S. (2000-2013) as well as Indian River, Martin, Palm Beach and St. Lucie counties from Woods & Poole Economics (2003-2012).

Unemployment rates were steadily decreasing beginning in 2002 and dropped below 4% for the service region, Florida, and the U.S. However, the recession caused rates to soar to highs of nearly 14% in Indian River and St. Lucie counties, 11% in Martin and Palm Beach counties as well as Florida overall, and 9% for the U.S. While unemployment rates started to decrease in the 2010 time period, overall U.S. rates are expected to level out during the planning horizon to approximately 5% in 2035. It is anticipated that the unemployment rate for the service region will remain in-line with the Florida unemployment in the future similar to the historical trend.

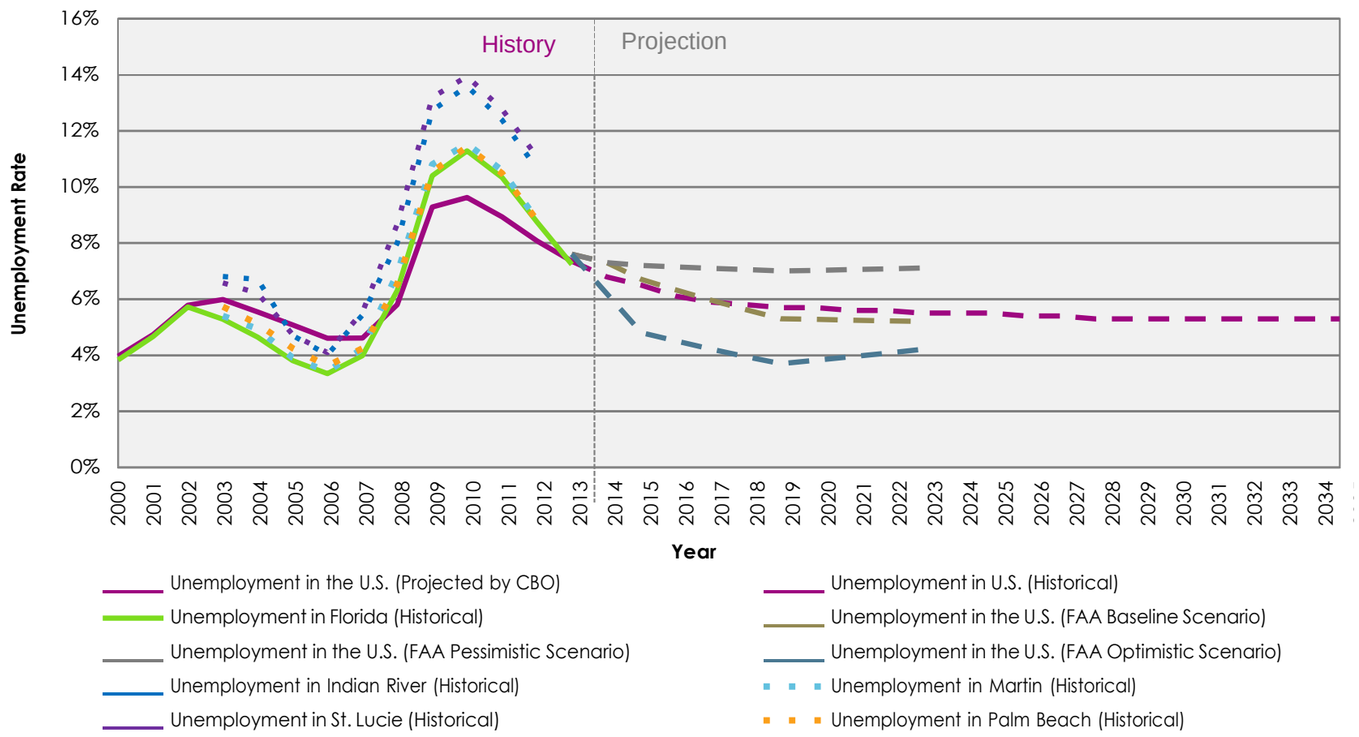


Figure 3.4: Historical and Projected Unemployment Rate

Sources:

(1) U.S. Bureau of Labor Statistics for the historical unemployment rate for the U.S., and Florida.
(2) Woods & Poole Economics for the historical unemployment rate for Indian River, Martin, Palm Beach and St. Lucie counties.
(3) U.S. Congressional Budget Office (CBO): 2014 Long-Term Budget Outlook, issue July 2014, for the projected data from 2014 to 2035.
(4) FAA Aerospace Forecast FY2014-2034 for the projected civilian unemployment rate from 2014 to 2023.

3.3.4 Aviation Fuel Prices

Fluctuations and overall trends in the cost of aviation fuel is an important factor affecting the aviation industry since it directly impacts an airline's operating expenses and thus airfares and passenger demand. Fuel prices are particularly sensitive to worldwide economic uncertainty and political instability. Beginning in 2003, fuel prices increased as a result of the Iraq War, political instability in some oil-producing countries, the rapidly growing economies of China, India, and other developing countries, and others. By mid-2008, average fuel prices were three times higher than they were in 2003. In the second half of 2008 when the recession was approaching its peak fuel demand decreased worldwide and prices followed. However, with the initial recovery stage in 2009 prices began to back to a relatively steady cost between $3.00 and $3.50 per gallon as depicted in **Figure 3.5**.

Analysts hold different views regarding how oil and aviation fuel prices may change in the future. Reference case forecasts project fuel prices out into the future based on current market conditions, exchange rates, technology advancement in oil extraction, and other possible factors which may affect the supply and demand of crude oil. In order to consider future uncertainties, organizations such as the U.S. Energy Information Administration (USEIA) develop both high and low oil price forecasts in addition to a reference case. The long-term annual projections of jet fuel by the USEIA, including the reference as well as the high and low oil price cases are illustrated in **Figure 3.6**. The projected average annual growth rates of jet fuel price by the USEIA from 2013 to 2034 are -1.61%, 0.71%, and 2.27% for the low, reference, and high oil price cases respectively. The FAA Aerospace Forecast FY2014-2034 projects U.S. mainline air carrier jet fuel prices to decrease -0.4% which is on the low side but falls within the projections by the USEIA's reference and low oil price cases. The regression analysis for the enplanement forecast considered the three oil price cases projected by USEIA. It is anticipated that the oil prices will steer towards the low side and favor the optimistic growth scenario.

3.3.5 Summary of Economic Outlook

The various economic and demographic indicators discussed above collectively portray the PBI service region as a mature economic area capable of producing significant demand for air transportation services. Similar to the historical trend, the Woods & Poole Economics forecast GDP growth within the service region out paces the growth in the U.S. and shows solid recovery after the last recession. Thus, the historical trends and projections for all the key economic variables were used in the development of the aviation demand forecasts. However, the results of these analyses do not necessarily provide a direct correlation between growth of an individual economic variable and the forecast elements. Instead, the trends in economic variables are compared with the trends in aviation demand in an attempt to uncover relationships between the two and identify reasonable indicators of growth in future aviation activity. The primary reason for this comparison is that innumerable outside influences can affect the ultimate reality of forecasting. Events such as economic recessions, financial crisis, new technology, widespread health issues, terrorist attacks, and so forth cannot be predicted with any certainty or likelihood and therefore, the results of the economic analyses serve as a guideline and indicator for projecting future aviation demand rather than a precise predictor.

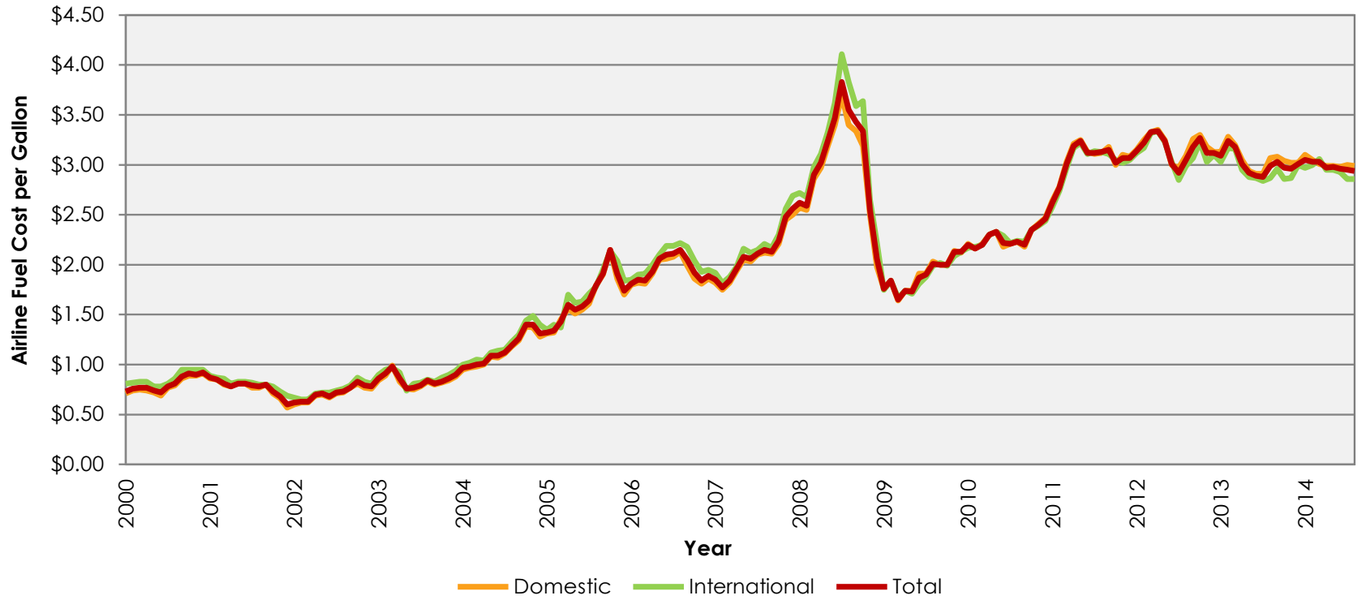


Figure 3.5: Historical Monthly Airline Fuel Cost per Gallon for all U.S. Carriers (nominal dollars)

Sources:

(1) Bureau of Transportation Statistics F41 Schedule P12A as of March 2015

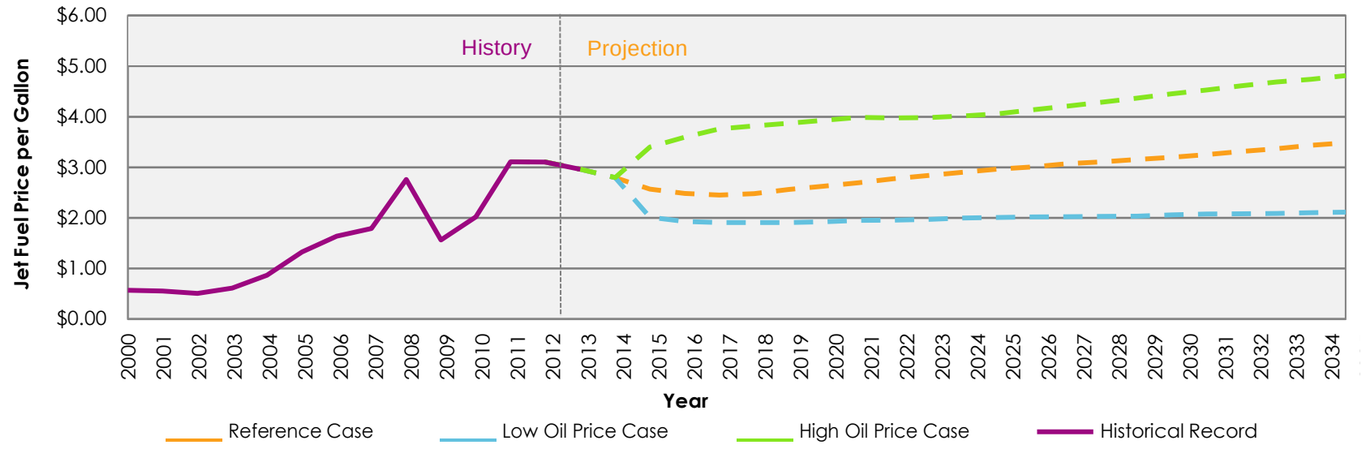


Figure 3.6: Projections of Jet Fuel Price (2012 dollars per gallon)

Sources:

(1) U.S. Energy Information Administration, Annual Energy Outlook 2014 with Projections to 2040, issue April 2

(2) Historical fuel price is converted to 2012 dollars based on CPI for all urban consumers from the U.S. Bureau of Labor Statistics.

3.4 Historical Aviation Demand

This section describes historical aviation demand at PBI, including an analysis of commercial air carrier service providers; enplaned passengers, load factors, seats per departure; airline shares of passengers; airline service; airline yields; air cargo tonnage; and aircraft operations.

3.4.1 Airlines Serving the Airport

In 2013, nine mainline airlines and five regional affiliates for scheduled passenger services provided service at PBI. All of the top six major U.S. airlines operate at PBI, including American Airlines/US Airways, Delta Air Lines, United Airlines, Southwest Airlines, JetBlue Airways and Air Canada. Mainline airlines publish their own schedules and usually operate larger Narrowbody (B737) or Widebody (A330) aircraft. Regional affiliates or subsidiaries of mainline airlines typically operate smaller aircraft and are often contracted by mainline airlines to fly a limited flight schedule to airports within a specified operating region. The FAA has defined mainline air carriers as airlines that use large passenger jets (over 90 seats) and regional carriers as airlines that use smaller piston, turboprop, and regional jet aircraft (up to 90 seats) to provide connecting passengers to the larger carriers.

The airlines are grouped into mainline and regional air carrier based on their average number of seats per departure. Frontier Airlines, Allegiant Air, and PEOPLExpress Airlines each commenced operations at PBI in 2014 and are not included in the table.

Table 3.8: Passenger Airlines Serving PBI (2013)

Mainline Air Carrier		Regional Air Carrier	
Airline	**Average Seat Capacity**	**Airline**	**Average Seat Capacity**
Scheduled			
JetBlue Airways	137	Republic Airlines (Note 3)	75
Delta Air Lines	160	ExpressJet Airlines (Note 4)	50
US Airways (Note 1)	137	Silver Airways	35
Southwest Airlines (Note 2)	142	Bahamas Air	50
United Air Lines	149	Shuttle America (Note 5)	70
American Airlines (Note 1)	146		
AirTran Airways (Note 2)	117		
Air Canada	142		
Spirit Air Lines	164		
Non-scheduled/Charter			
Lufthansa Airlines	326	SkyWest Airlines (Note 6)	66
Lan-Chile Airlines	251	Envoy Air (Note 7)	49
Lan Peru Airlines	230		
Miami Air International	173		
Sky King	150		
Vision Airlines	142		

Notes:

(1) American Airlines and US Airways are currently integrating as the new American Airlines.
(2) Southwest Airlines and AirTran Airways are currently integrating after their merger in 2013.
(3) Affiliated with American Airlines, US Airways, United Airlines and Delta Air Lines. Operates as US Airways Express for flights to/from Washington (PBI-DCA) and Charlotte (PBI-CLT).
(4) Affiliated with American Airlines, Delta Air Lines, and United Air Lines (operates as American Eagle, Delta Connection, and United Express). Operates as United Air Lines for flights to/from Houston (PBI-IAH) and Cleveland (PBI-CLE).
(5) A subsidiary of Republic Airways and affiliated with United Air Lines and Delta Air Lines. Operates as United Air Lines for flights to/from Newark (PBI-EWR) and Houston (PBI-IAH).
(6) Affiliated with United Air Lines, Delta Air Lines, US Airways, American Airlines and Alaska Airlines. Operates as United Air Lines for flights to/from Houston (PBI-IAH) and Cleveland (PBI-CLE).
(7) Wholly owned subsidiary of American Airlines and is flying as American Eagle.

Remarks:

(1) Lufthansa, Lan-Chile, Lan Peru, SkyWest, and Envoy operated a few Class F scheduled passenger/cargo flights at PBI in 2013 (less than ten departures each). They do not provide regular scheduled service at PBI and are grouped under non-schedule/charter air carrier.
(2) Airlines providing on-demand services with small aircraft (under 30 seats or a maximum payload capacity of 7,500lb) are grouped as air taxi air carriers and are not shown in this table. Air taxi carriers at PBI include G5 Executive, TAG Aviation Espana S.L., Gainjet Aviation, Amira Air, Swiss Air Ambulance, Avjet Corporation, Tradewind Aviation, London Air Services, Air Alsie A/S, Abaco Air, and Chartright Air. Air taxi operations are discussed separately in subsequent sections.

Sources:

(1) U.S. Department of Transportation, T-100 Segment database.
(2) AECOM analysis.

Southwest Airlines at Concourse B
Source: AECOM (2014)

Delta Air Lines Sunset Takeoff
Source: AECOM (2014)

Airline Market Share

Table 9 and **Figure 3.7** present the historical market share of the top passenger airlines serving PBI. These airlines comprised over 90% of the market share at PBI from 2002 to 2014. Historical data for airlines merged over the years or in the process of integration after merger are combined in Table 9 and Figure 7. For example, data for Southwest Airlines and AirTran Airways, Delta Air Lines and Northwest Airlines, American Airlines and US Airways, United Air Lines and Continental Air Lines, are combined for comparison. Historical data for Air Canada, Spirit Air Lines, Frontier Airlines, Allegiant Air, PEOPLExpress Airlines, Sun Country Airlines, Vision Airlines, and etc. are included under the other mainland airlines category, and their combined market share is less than 3% in the past years between 2002 and 2013. With the new addition of low cost carriers Frontier Airlines, Allegiant Air, and PEOPLExpress Airlines, the percentage share for the other mainline carriers increased to 3.2% in 2014.

JetBlue's market share at PBI has increased continuously over the years from less than 8% in 2002 to over 24% in 2014, and became one of two largest airlines at PBI, in terms of passenger market share. During the same period, the total passengers of combined Delta Air Lines and Northwest Airlines decreased from 40.2% to the lowest 22.8% in 2008, then increased back to 26.6% in 2014. Delta Airlines has the largest market share at PBI in 2014. Delta and JetBlue together represented over 50% of the total passenger market shares in 2013 and 2014.

All the regional air carriers are grouped together and their combined market share has been less than 4% in the last decade and gradually decreased to 1.2% in 2014. Most of the scheduled passengers at PBI are served by mainline airlines. The market share for mainline airlines increased from the approximately 96% in 2002 to 98.8% in 2014.

Table 3.9: Historical Market Shares (%) of Airlines Serving PBI (2002-2014)

Year	Market Share (%)							
	Mainline Air Carrier							Regional Air Carrier
	B6	DL/NW	AA/US	WN/FL	UA/CO	Other	Total	
2002	7.23	40.21	21.68	10.34	14.72	2.60	96.80	3.22
2003	9.57	37.73	20.89	12.39	13.95	1.52	96.06	3.95
2004	10.33	35.64	21.88	13.83	12.90	1.73	96.31	3.69
2005	12.54	34.30	20.06	14.38	12.50	3.59	96.35	3.63
2006	17.38	24.71	22.04	15.96	15.50	1.66	96.72	2.75
2007	17.12	23.08	20.40	18.59	15.96	2.09	97.24	2.76
2008	18.40	22.77	19.67	19.40	14.47	2.50	97.21	2.79
2009	19.24	24.58	19.85	19.49	13.72	1.75	98.63	1.37
2010	19.66	24.87	20.70	18.59	13.34	1.96	99.12	0.88
2011	22.26	23.40	19.36	18.19	13.42	2.08	98.71	1.29
2012	24.33	24.34	20.53	16.06	12.02	1.92	99.20	0.80
2013	25.84	25.22	21.26	13.18	10.96	2.04	98.50	1.50
2014	24.16	26.61	22.67	12.04	10.14	3.19	98.80	1.20

AA: American Airlines
B6: JetBlue Airways
CO: Continental Airlines
DL: Delta Air Lines
FL: AirTran Airways
NW: Northwest Airlines
UA: United Airlines
US: US Airways
WN: Southwest Airlines

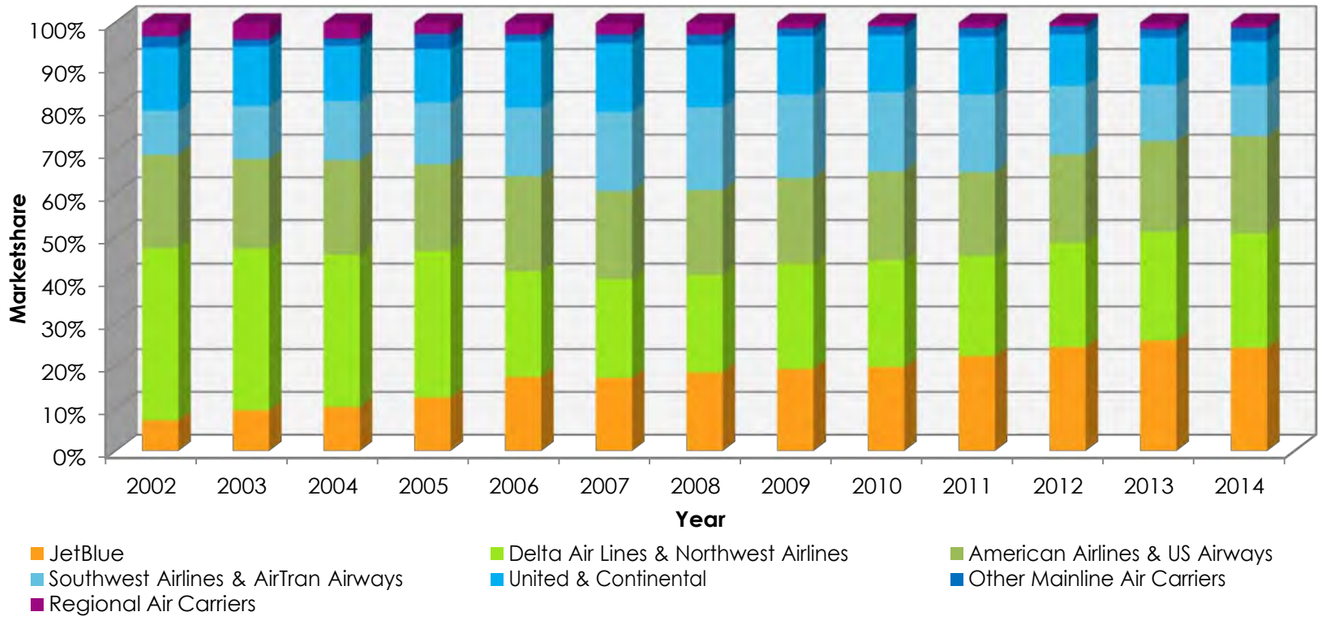


Figure 3.7: Market Shares of Passenger Airlines Serving PBI (2002-2014)

Source: 2002 to 2014: PBI Airport Passenger Statistics Reports

Note:

(1) Numbers may not add up due to rounding.

3.4.2 Enplaned Passengers

Enplaned passengers represent one of the single largest drivers in the master planning process for any airport and include passengers boarding an aircraft only. **Table 3.10** and **Figure 3.8** present enplaned passengers at PBI for the thirty year period from 1984 through 2013. During this period, enplaned passenger levels varied with peaks of 2.86 million in 1990 before the 1990/91 recession, 2.98 million in 2001 before the 2001 recession, and a historical peak at 3.52 million in 2005. Enplaned passengers remained relatively stable around 3.5 million until the recent recession caused a 7% decrease in both 2008 and 2009. Enplaned passengers have since stabilized at around 2.9 million per year since 2010.

As is typical for most airports, the trend of historical enplaned passengers generally follows the timeline for periods of economic recession. The financial crisis in early 1990s, Iraq's invasion of Kuwait in the summer of 1990 which drove up the world price of oil, the burst of the Dot-Com bubble in 2000, the attack on September 11, 2001, and the financial turmoil in late 2007 all correlate to a reduction in enplaned passengers at PBI. Enplanements rebounded after each financial downturn and the effects of the Gulf War and September 11th whereas growth was strong and continuous between 2003 and 2005 after the quick recovery from the 2001 recession. However, the 2007 financial downturn lasted longer than previous ones and enplaned passenger levels did not achieve positive growth rates until 2013.

Table 3.10: Historical Enplaned Passengers

Year	Enplaned Passengers	Change (%)	Year	Enplaned Passengers	Change (%)
1984	1,972,863	5.63	2003	3,011,973	9.6
1985	1,901,839	-3.6	2004	3,280,291	8.91
1986	2,093,833	10.1	2005	3,523,184	7.4
1987	2,332,750	11.41	2006	3,428,040	-2.7
1988	2,518,739	7.97	2007	3,488,937	1.78
1989	2,583,523	2.57	2008	3,248,434	-6.89
1990	2,856,757	10.58	2009	3,010,891	-7.31
1991	2,541,922	-11.02	2010	2,936,763	-2.46
1992	2,534,978	-0.27	2011	2,904,588	-1.1
1993	2,544,757	0.39	2012	2,811,687	-3.2
1994	2,801,615	10.09	2013	2,848,432	1.31
1995	2,729,122	-2.59	2014	2,940,798	3.24
1996	2,852,014	4.5	**Period**	**Years**	**AAGR (%)**
1997	2,917,014	2.28			
1998	2,965,253	1.65	30 years	1984-2014	1.34
1999	2,879,246	-2.9	20 years	1994-2014	0.24
2000	2,932,635	1.85	10 years	2004-2014	-1.09
2001	2,978,763	1.57	5 years	2009-2014	-0.47
2002	2,748,181	-7.74	3 years	2011-2014	0.25

AAGR: Average Annual Growth Rate

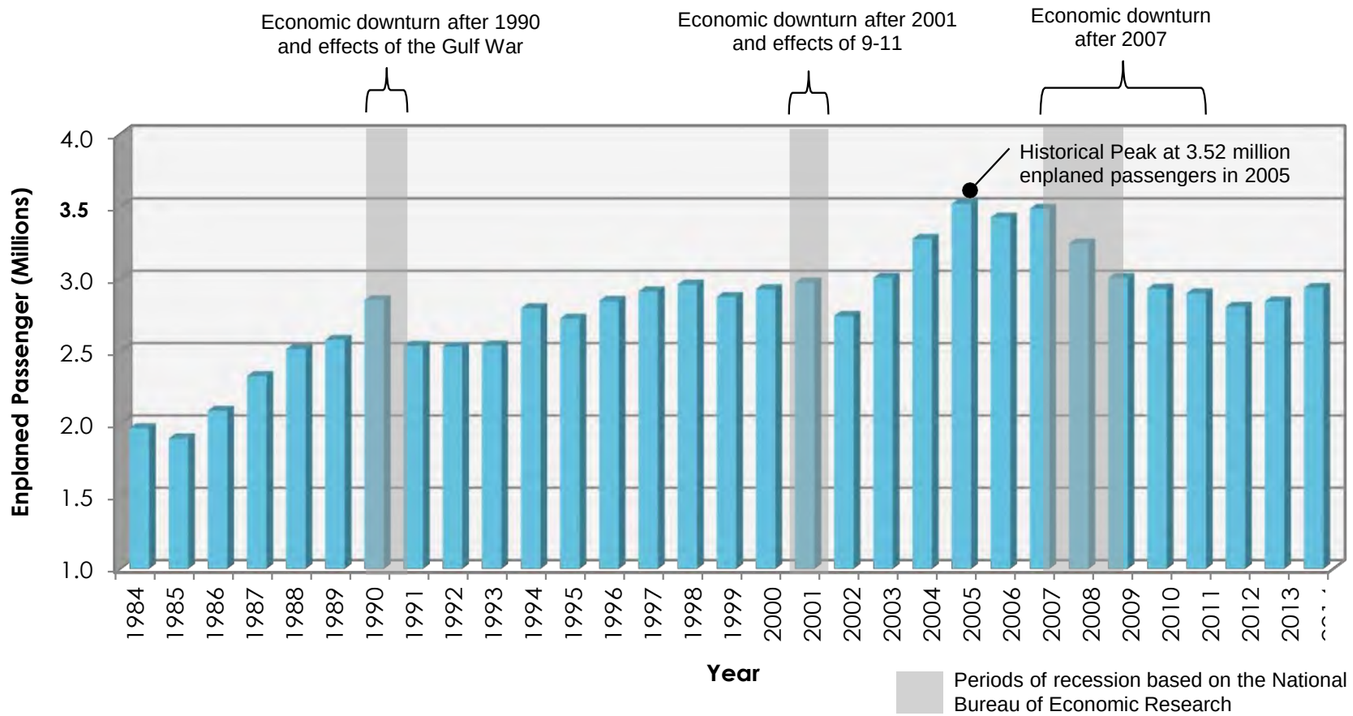


Figure 3.8: Historical Enplaned Passengers

Sources:

(1) 1984 to 2004: Palm Beach International Airport Forecast Technical Report #2, December 2005.
(2) 2005 to 2014: PBI Airport Passenger Statistics Reports.

Concourse C Holdroom
Source: PBI

Gate B5 Holdroom
Source: AECOM (2014)

3.4.2.1. Domestic vs. International Passengers

Table 3.11 and **Figure 3.9** present the split between total international and domestic passengers at PBI between 2000 and 2014, including enplanements and deplanements. The percentage of international passengers at PBI is illustrated in **Figure 3.10**. Although the percentage of international passengers at PBI declined from 2.29% in 2000 to 2.02% in 2014, the recovery in international passengers from the lowest level of 67,952 passengers (1.13% of total passengers) in 2009 to 119,140 passengers in 2014 (2.02% of total passengers) is steady and continuous at an average annual compound growth rate of 11.88%.

Table 3.11: Historical International and Domestic Passengers

Year	International Passengers	Domestic Passengers	% International Passengers	% Domestic Passengers
2000	133,767	5,708,827	2.29	97.71
2001	150,764	5,788,640	2.54	97.46
2002	103,822	5,379,840	1.89	98.11
2003	113,938	5,896,882	1.90	98.10
2004	133,859	6,403,404	2.05	97.95
2005	123,576	7,090,661	1.71	98.29
2006	129,398	6,695,391	1.90	98.10
2007	161,235	6,775,214	2.32	97.68
2008	120,678	6,355,625	1.86	98.14
2009	67,952	5,926,654	1.13	98.87
2010	70,955	5,816,768	1.21	98.79
2011	74,019	5,693,188	1.28	98.72
2012	86,430	5,522,738	1.54	98.46
2013	102,391	5,589,356	1.80	98.20
2014	119,140	5,770,494	2.02	97.98
Period		**AAGR (%)**		
2004-2014	-1.16	-1.04	-0.12	0.003
2009-2014	11.88	-0.53	12.28	-0.18

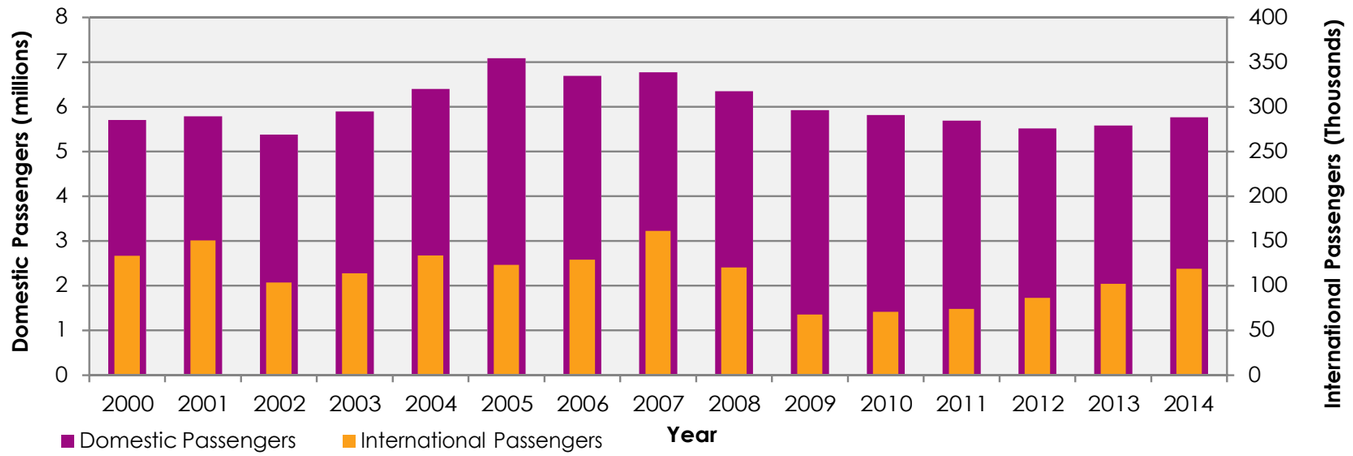


Figure 3.9: Historical International and Domestic Passengers

Source: 2000 to 2014: PBI Airport Passenger Statistics Reports.

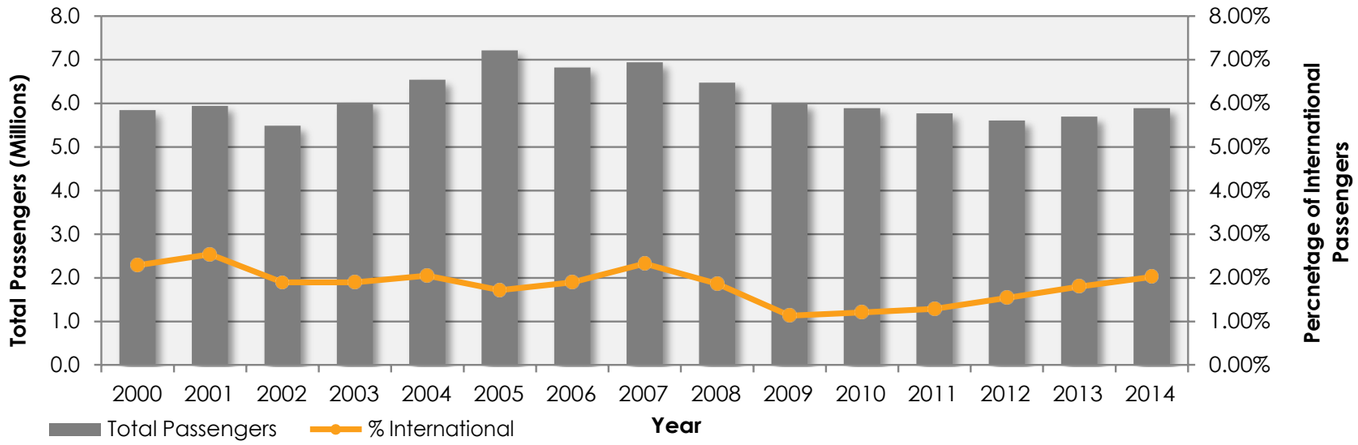


Figure 3.10: Historical Percentages of International Passengers

Source: 2000 to 2014: PBI Airport Passenger Statistics Reports.

3.4.2.2. Enplaned Passenger Comparison

Table 3.12 provides the average annual compound growth rates (AAGR) of enplaned passengers at PBI, FLL, the State of Florida, and in the nation as a whole for different periods.

During the past 20-year period from 1994 to 2014, the number of enplaned passengers at PBI grew at a slower rate (0.24%) than the growth of enplaned passengers in Florida (2.19%), and in the nation as a whole (1.44%). Between 2004 and 2014, the number of enplaned passengers at PBI declined (-1.1%) while the national total increased (0.79%), as well as the Florida total (1.55%). However, in the recent three years, the number of enplaned passengers at PBI indicated strong growth and rebounded at 0.23% per year.

The historical share of PBI and FLL over the total enplanements in Florida and the nation are summarized in **Table 3.13** and **Figure 3.11**. The annual share of PBI enplanements declined gradually from 6.05% to 4.12% of total Florida enplanements and from 0.50% to 0.39% of total United States enplanements from 1994 through 2014. Regardless of the overall decline in the past twenty years, the share of PBI enplanements indicates a growing trend in the most recent three years.

Further market share analysis, including MIA as the second nearest hub airport, is included in **Appendix C** for reference. The complete analysis indicates that changes in the historical market share are more correlated to the decision between selecting FLL or MIA than PBI.

Table 3.12: Comparison of Enplaned Passengers Historical AAGR

Period	Years	AAGR (%)			
		PBI	FLL	Florida	U.S.
20-year	1994-2014	0.24	4.49	2.19	1.44
10-year	2004-2014	-1.10	2.30	1.55	0.79
5-year	2009-2014	-0.49	3.04	1.95	1.46
3-year	2011-2014	0.23	0.93	0.63	0.67

Sources:

(1) FLL enplanements in 2009 to 2014 are based on the FLL airport monthly statistics. 2014 enplanement were estimated from monthly statistics from Jan to Nov 2014. Enplanements from 1994 to 2008 are based on FAA TAF, February 2014.
(2) Florida and the United States Enplanements are based on FAA Terminal Area Forecast (TAF), January 2015.

Table 3.13: Historical Share of Enplanements at PBI and FLL

Year	Share of Enplaned Passengers (%)				Year	Share of Enplaned Passengers (%)			
	PBI		FLL			PBI		FLL	
	Florida	U.S.	Florida	U.S.		Florida	U.S.	Florida	U.S.
1994	6.05	0.50	10.96	0.90	2005	5.30	0.48	16.42	1.49
1995	5.80	0.47	9.95	0.80	2006	5.18	0.47	15.33	1.39
1996	5.56	0.46	11.00	0.92	2007	5.06	0.46	15.69	1.43
1997	5.33	0.46	11.75	1.01	2008	4.68	0.43	16.26	1.51
1998	5.50	0.46	11.21	0.93	2009	4.65	0.43	16.25	1.51
1999	5.08	0.43	11.99	1.01	2010	4.49	0.42	17.12	1.59
2000	4.96	0.42	12.95	1.09	2011	4.20	0.40	16.88	1.61
2001	5.00	0.43	14.09	1.21	2012	4.03	0.38	16.84	1.61
2002	5.15	0.44	14.78	1.26	2013	4.06	0.39	16.74	1.60
2003	5.44	0.47	15.18	1.31	2014	4.12	0.39	17.13	1.63
2004	5.36	0.47	15.91	1.41					

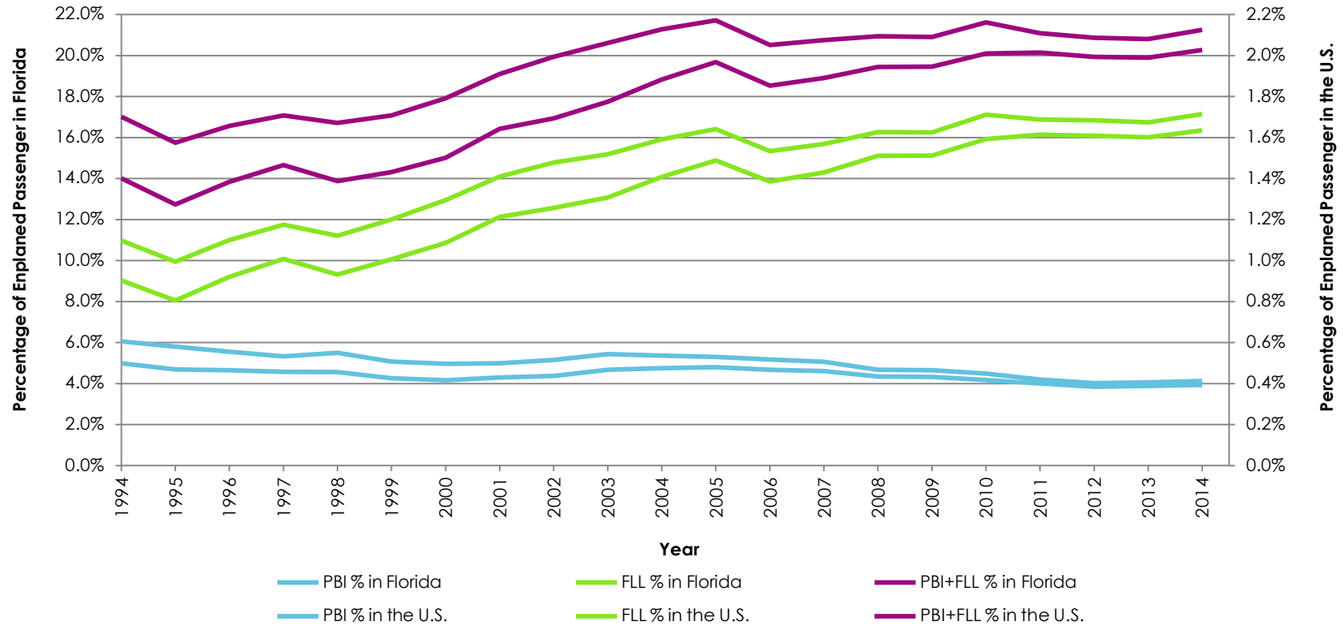


Figure 3.11: Historical Share of Enplanements in PBI and FLL
Source: AECOM (2014)

3.4.3 Load Factors

Enplaned passenger trends at any airport typically do not tell the complete story regarding service by tenant airlines. It is also important to evaluate the historical trend of average load factors and seat capacity to better understand airport utilization dynamics. The number of aircraft operations and the average size of aircraft serving the airport do not necessarily increase or decrease with the numbers of enplaned passengers. Thus, this section describes the PBI load factors; the subsequent section discusses PBI seat capacity and fleet mix.

Historical data on load factors for 2002 through 2013 is summarized in **Table 3.14** and trends illustrated in **Figure 3.12** and **Figure 3.13**. The load factors for both international and domestic departures from PBI varies seasonally with peaks in springs and summers (tourism seasons) and troughs in falls and winters. Regardless of monthly variations, the overall annual load factor increased gradually for international, domestic, and total departures throughout the past decade. The average load factor for domestic departures at PBI increased from 75.44% in 2002 to 85.6% in 2013 (i.e. a 10.16% increase).

The average load factor for international departures at PBI increased from 69.93% in 2002 to 80.47% in 2013. The average load factor for total departures is similar to domestic departures as most of the flights at PBI are domestic, increasing from 75.38% in 2002 to 85.48% in 2013. The increase in load factors for international departures at PBI outpaced the national trend. Load factors for international departures of all commercial air carriers in the U.S. increased from 74.5% in 2002 to 82.6% in 2013 (i.e. a 8.1% increase). The load factors of domestic departures and total departures at PBI were generally above the national average before 2010, and hence the margin for further increase during the last decade is less than the national system. Load factors for domestic departures of all commercial air carriers in the U.S. increased from 69.4% in 2002 to 83.5% in 2013 (i.e. a 14.1% increase). Load factors for the combined system in the U.S. increased from 70.6% in 2002 to 83.2% in 2013 (i.e. a 12.6% increase).

Table 3.14: Historical Load Factor

Year	Load Factor (%)		
	Domestic	International	Airport Total
2002	75.44	69.93	75.38
2003	75.03	65.48	74.91
2004	76.91	66.23	76.77
2005	79.38	68.34	79.24
2006	80.44	68.99	80.29
2007	79.6	71.4	79.46
2008	79.99	77.19	79.96
2009	82.84	77.84	82.79
2010	81.27	81.66	81.27
2011	81.03	79.12	81.01
2012	82.19	77.26	82.12
2013	85.6	80.47	85.48
Period	**Percentage Change (%)**		
2002 to 2013	10.16	10.54	10.1

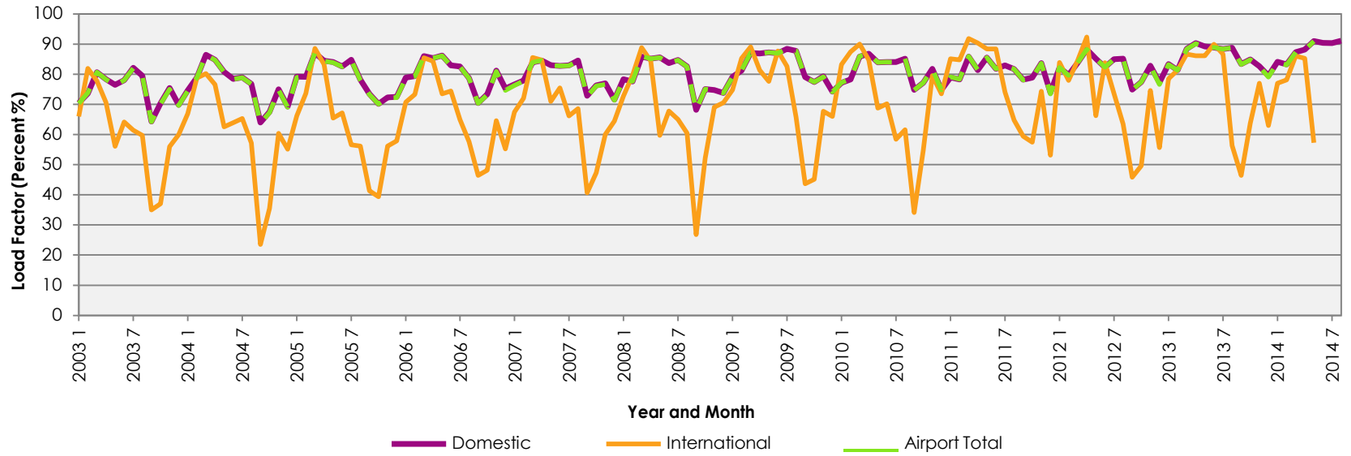


Figure 3.12: Historical Load Factor (Monthly)

Note: Percentage change in load factor is given in absolute difference.

Source:

(1) U.S. Department of Transportation, T-100 Segment database. AECOM analysis.

(2) FAA Aerospace Forecast FY2014-2034.

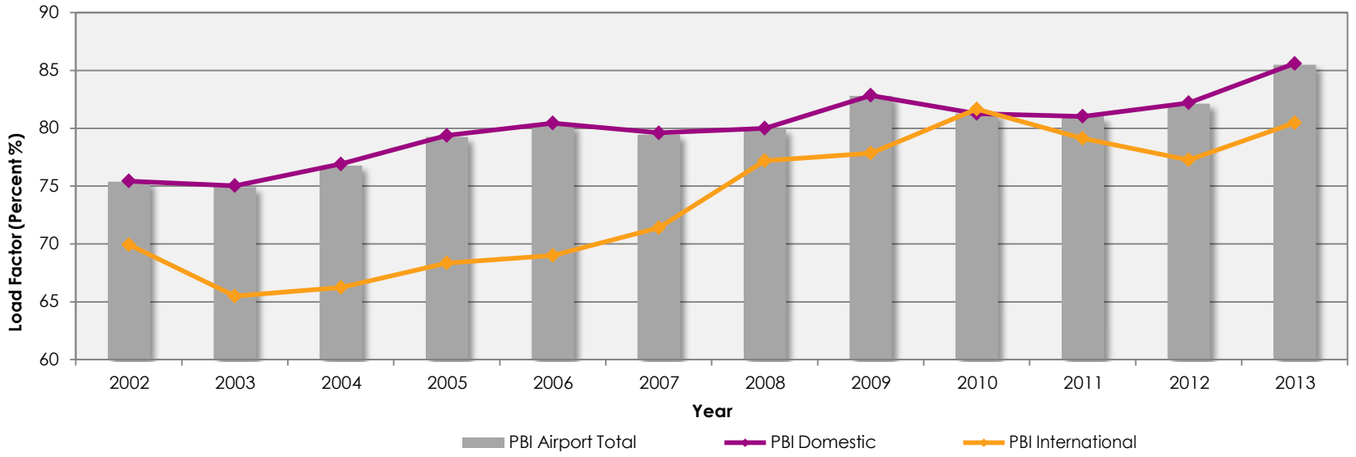


Figure 3.13: Historical Load Factor (Monthly)

Note: Percentage change in load factor is given in absolute difference.

Source:

(1) U.S. Department of Transportation, T-100 Segment database. AECOM analysis.

(2) FAA Aerospace Forecast FY2014-2034.

3.4.4 Aircraft Fleet Mix and Average Seats per Departure

The aircraft fleet mix and the average seats per departure for mainline and regional air carriers with scheduled passenger services at PBI in 2003, 2008, and 2013 are analyzed and summarized in **Appendix D**.

JetBlue Airways used to operate only Airbus 320-100/200 aircraft with approximately 156 to 168 seats per departure for flights between PBI and JFK in the early 2000s. As JetBlue Airways expanded their scheduled services at PBI in the mid-2000s they added the 100-seat Embraer 190 to their fleet of 150-seat A320s and gradually reduce the average seats per departure from 161 in 2003, to 137 in 2013.

Delta Air Lines mainly operates their B737s, B757s, B767s, and MD88 aircraft in PBI. After the merger with Northwest Airlines, Delta began to operate Northwest's A319 and A320-100/200 aircraft in PBI as well. Their overall average seats per departure decrease from 180 in 2003 to 160 in 2013.

US Airways has utilized a very similar fleet mix for their services at PBI over the past decade. Their dominate fleet is comprised of B737-400 and A319, with some A320-100/200, A321, E190, and a few B757-200 aircraft. US Airways' average seats per departure at PBI maintained at approximately 137 seats from 2003 to 2013.

American Airlines retired their A300 aircraft in 2009. Other than the retirement of A300s, American Airlines' fleet mix at PBI has been consistent over the years. The majority of their services in PBI are flown by 150-seat B737-800, and 140-seat MD80 aircraft. The larger B757-200, B767-300s and B777-200s aircraft provide seasonal services with only a few departures from PBI every year. American Airlines increased the use of the 150-seat B737-800 over the 140-seat MD80 over the years as the older, noisier, and less fuel efficient MD80's are being retired. The overall average seats per departure increase from 130 in 2003 to 146 in 2013.

Southwest Airlines is gradually adding new 175-seat B737-800 aircraft and reducing the older 122-seat B737-500s. Most of the flights to/from PBI are served by B737-700 aircraft. Southwest Airlines reconfigured the B737-700 to increase seat capacity from 137 to a range bewteen141 and 143 seats since 2012. Consequently, Southwest's average seats per departure increased from 137 in 2003 to 142 in 2013.

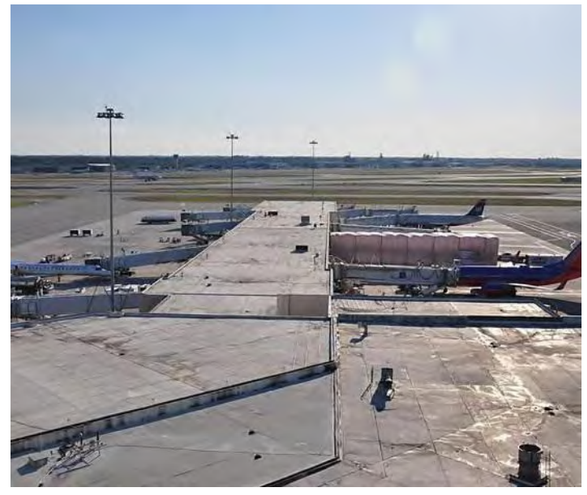
AirTran Airways has maintained the same fleet mix of 117-seat B717-200 and 137-seat B737-700 throughout the years. Since most of the flights to/from PBI are served by the 117-seat B717-200, the overall average seat capacity maintained at approximately 117 seats per departure from 2003 to 2013.

United Airlines has introduced their new B737-800 (152 to 155-seat) and B737-900 (167 to 169-seat) aircraft to PBI since 2010. The A320 and A319 aircraft also provide regular service. After the integration with Continental Airlines, there was no significant change in United Airlines' fleet mix at PBI except the addition of the 118 seat B737-700. United Airlines' overall average seats per departure increased from 134 in 2003 to 149 in 2013, largely as a result of increased B737-800 utilization.

Air Canada's dominant fleet for services in PBI is their 146-seat A320-200 aircraft. The A320-200 aircraft previously averaged between 134 and 140 seats but were reconfigured to contain 146 seats in recently years. Air Canada has expanded their scheduled services at PBI with the 146-seat A320-200. Air Canada also utilizes the A319, A321, and E190 at PBI but the service is limited. The overall average seats per departure increased from 138 in 2003 to 142 in 2013.

Republic Airlines is the major regular air carrier in PBI with scheduled services. Their fleet includes mainly the 80-seat ERJ-175, and 69-seat E170. Their average seats per departure are approximately 76 in 2013.

The above-discussion of mainline and regional air carriers accounts for over 95% of the total market share at PBI. The historical fleet mix and seat capacity provide the baseline for the estimation of future average seat capacity as well as projections of future commercial aircraft operations.



Concourse B
Source: AECOM (2014)

General Aviation Aircraft
Source: AECOM (2014)

3.4.5 Airline Yields

Table 3.15 presents information on airline yields for PBI and the U.S. from 2000 through 2013. Yield is a measure of airline revenue, normalized for distance. Yield is measured in cents per revenue-passenger-mile, and is calculated by dividing fare revenue by trip length. **Figure 3.14** graphical present the year over year changes on the yields for both the PBI and the United States. The majority of passengers at PBI (over 97%) are domestic. Domestic passenger yields for air carriers in the United States are included in **Table 3.15** and **Figure 3.14** for comparison with PBI.

As shown in **Figure 3.14**, historical variations in the changes in yields for PBI and domestic yields for the U.S. go up and down at a similar pattern. During the period from 2000 to 2005 PBI yields decreased by an annual average rate of -3.55% and the domestic yields for the U.S. as a whole decreased at -3.98%.

From 2005 to 2010, PBI yields and the domestic yields of the nation increased at an AAGR of 3.54% and 2.37% respectively. In the recent three years, PBI yields increased at 6.31% per year, which is much higher than the growth of the domestic yields for the nation at 3.84% per year. Over the past 13 years, the PBI yields increased at 1.37% per year, while the growth of the domestic yields for the nation increased at 0.21% per year.

With the addition of new services by low cost carriers including Frontier Airlines, Allegiant Air, and PEOPLExpress Airlines in 2014, it is anticipated that the ticket price will be competitive and the year-over-year increase in airline yields will be closer to the national average.

Table 3.15: Historical Yields

Year	Yields (Cents)		Change (%)	
	PBI	U.S. (Domestic)	PBI	U.S.
2000	17.87	14.03	-	-
2001	15.84	13.53	-11.37	-3.55
2002	15.55	12.12	-1.83	-10.42
2003	15.3	12.08	-1.64	-0.33
2004	14.98	11.52	-2.05	-4.64
2005	14.92	11.45	-0.4	-0.61
2006	16.87	12.36	13.04	7.95
2007	16.82	12.45	-0.29	0.69
2008	17.68	13.11	5.12	5.35
2009	16.41	11.95	-7.2	-8.83
2010	17.76	12.87	8.25	7.71
2011	19.8	13.62	11.47	5.78
2012	20.85	14.08	5.33	3.36
2013	21.34	14.42	2.33	2.41
Years	**Period**	**AAGR (%)**		
2000-2005	5 years	-3.55	-3.98	
2005-2010	5 years	3.54	2.37	
2010-2013	3years	6.31	3.84	
2000-2013	13 years	1.37	0.21	

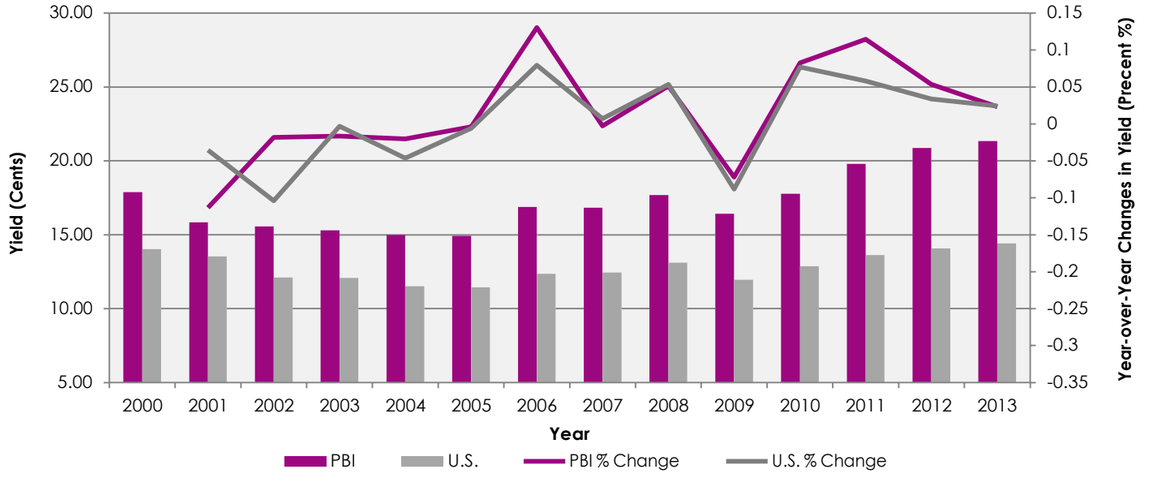


Figure 3.14: Historical Yield and Year-over-Year Changes
Sources:

(1) U.S. Department of Transportation, Origin-Destination Survey DB1B database.
(2) FAA Aerospace Forecast FY2014-2034.
(3) AECOM analysis.

3.4.6 Air Cargo

Historical air cargo (air freight and mail) tonnage throughput at PBI from 2000 to 2014 is presented in **Table 3.16** and **Figure 3.15**. All the recorded cargo operations are domestic. Total air cargo tonnage at PBI generally declined in the first eight years reaching its lowest level in 2009 at 13,246 tons; however, there has been strong and continuous growth from 2009 to its highest level of 27,642 tons in 2014.

The decrease in total cargo volumes at PBI during the first few years of the century was due to the combined effect of the September 11th and the subsequent economic downturn. The total cargo volume remained stagnant from 2003 to 2006 with minimal growth and then declined further in 2007 to 2009 during the most recent economic recession. Thereafter, cargo volume rebounded and continued through 2014 which followed the national domestic all-cargo trend.

UPS began operations at PBI in 1994 and was the only all-cargo carrier serving PBI. FedEx started all-cargo operations at PBI in 2009 and contributed to the continuous growth in cargo volume.

Most of the UPS cargo operations at PBI are connected to their hub at Louisville International Airport (over 550 operations at PBI in 2013). UPS also has regular connections to Fort Myers International Airport (RSW) with approximately 100 operations in 2013. Other connections to St. Petersburg–Clearwater International Airport (PIE), MIA, Philadelphia International Airport (PHL), and Southwest Georgia Regional Airport (ABY) but these are infrequent (less than once a week).

FedEx connects most of their cargo operations to their hub at Memphis International Airport (approximately 450 operations at PBI in 2013). FedEx also operates connections to other airports in Florida such as MIA, MCO, FLL, RSW, Tampa International Airport (TPA), Hartsfield–Jackson Atlanta International Airport (ATL), and etc. but these flights are infrequent (less than once a week).

Table 3.16: Historical Total Cargo Volume

Year	Total Cargo (Tons)	Year-over-Year % Changes
2000	23,121	-9.34
2001	22,715	-1.76
2002	19,980	-12.04
2003	20,177	0.98
2004	20,257	0.4
2005	19,315	-4.65
2006	18,965	-1.81
2007	16,207	-14.54
2008	14,962	-7.68
2009	13,246	-11.47
2010	19,018	43.58
2011	20,076	5.56
2012	20,613	2.67
2013	21,671	5.13
2014	27,642	27.55

Period		AAGR (%)
2004-2014	10-year	3.16
2009-2014	5-year	15.85
2010-2014	4-year	9.8

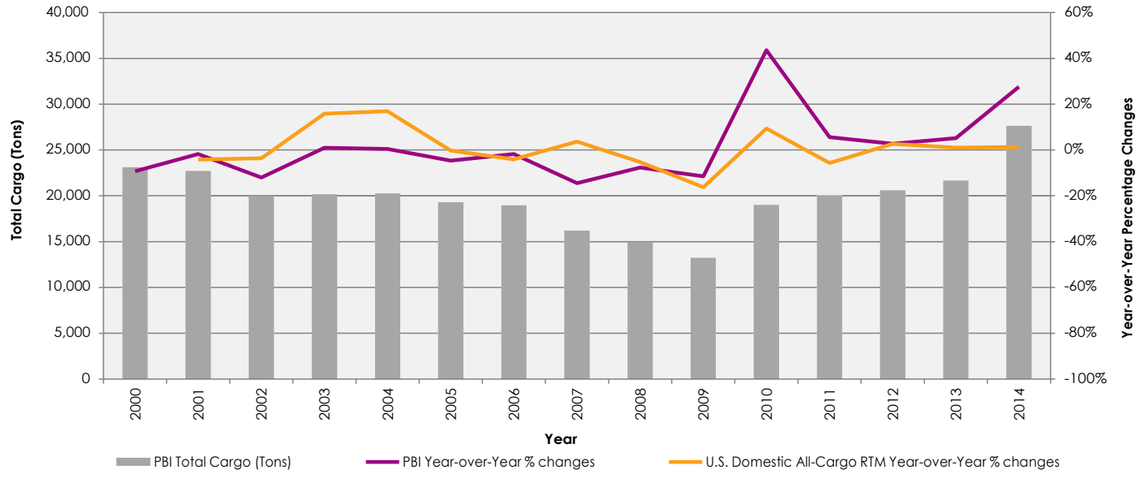


Figure 3.15: Historical Total Cargo Volume and Year-over-Year Changes

Sources:

(1) PBI Airport Passenger Statistics Reports.
(2) FAA Aerospace Forecast FY2014-2034.
(3) AECOM analysis.

Air Cargo Operator Market Share

UPS and FedEx together share approximately 97 to 98% of the PBI all-cargo market based on an analysis of U.S. DOT data for the five-year period between 2009 and 2013. The remaining 2 to 3% are provided by charter flights from Kalitta Charters which operates connections mostly to Blue Grass Airport in Lexington, Kentucky (approximately 18 operations at PBI in 2013) and other locations such as New Orleans, Dallas, and Islip. Other occasional all-cargo carriers that operated at PBI in the past five years include Volga-Dnepr Airlines, ABX Air, Atlas Air, and Ameristar Air Cargo. **Figure 3.16** summarizes the market shares of all-cargo carriers at PBI for enplaned and deplaned cargo volume.

Cargo Aircraft Fleet Mix

The aircraft fleet mix of UPS, FedEx and Kalitta Charters for their operations at PBI are given in **Table 3.17**.

According to the 2012 Florida Air Cargo System Plan Update, there are 15 airports in Florida which have scheduled air cargo service. These airports are divided into two categories: Strategic Intermodal System (SIS) Airports and Tier Two Airports. FDOT defines SIS Commercial Service Airports as those accommodating 0.25% of total U.S. passenger or freight activity. PBI is one of the seven SIS Commercial Service Airports in Florida and ranks seventh in terms of total cargo tonnage among SIS airports. Nevertheless, PBI is the only airport among the seven SIS facilities that demonstrated growth in air cargo tonnage from 2006 to 2011. In terms of average daily lifting capacity, PBI is ranked sixth in Florida and indicated continuous growth.

The 2012 Florida Air Cargo System Plan Update also mentioned the following new operators at PBI:

- IBC Airways, an all-cargo carrier, providing service from PBI to FLL and Marsh Harbour using Saab 340 and Fairchild Metro aircraft.
- Flight Express operated bank check hauling flights at PBI in June 2012 utilizing a Cessna 210.

These operators hold Federal Aviation Regulations (FAR) Part 135 certification as they operate aircraft with a payload capacity below 7,500-lb (Saab 340 is close to 7,500-lb depending on the range). Their operations at PBI are included under air taxi.

Table 3.17: All-Cargo Operator's Fleet Mix

All-Cargo Carriers	Aircraft	Gross Landing Weight (lbs)
UPS	Airbus A300-600/R/CF/RCF	315,000
	Boeing 757-200 (Note 1)	198,000
	Boeing 767-300/300ER	326,000
FedEx	Airbus A300-600/R/CF/RCF	315,000
	Boeing 757-200	198,000
	Airbus A310-200C/F (Note 1)	267,900
Kalitta Charters	Boeing 727-200/231A (Note 1)	154,500

Note:

The most frequently used aircraft model for operations at PBI.

Sources:

(1) U.S. DOT T-100 database.
(2) List of Aircraft and Maximum Landed Weight for Reporting All-Cargo Data to FAA, Jan 2015.
(3) AECOM analysis.

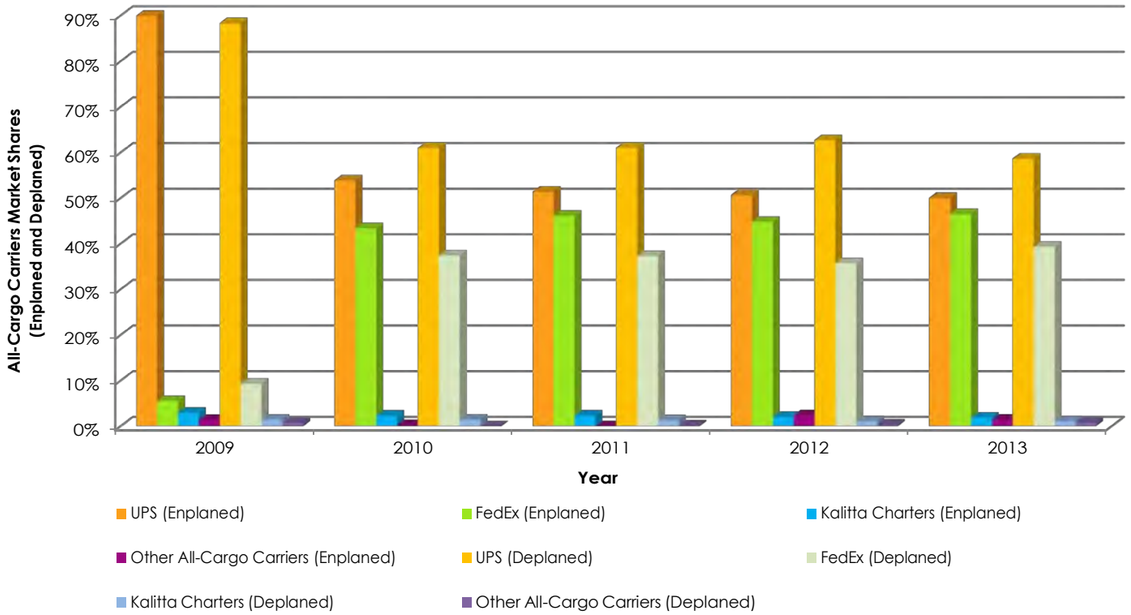


Figure 3.16: Historical Market Shares of All-Cargo Carriers

Sources:

(1) U.S. DOT T-100 database.
(2) AECOM analysis.

PBI Cargo Apron

Source: AECOM (2014)

Air Cargo Building

Source: AECOM (2014)

3.4.7 Aircraft Operations

Historical total aircraft operation data provided in **Table 3.18** is based on the FAA Air Traffic Activity Data System (ATADS). A reconciliation and comparison of the operations recorded by the Airport Statistical Data Reports and the FAA ATADS was conducted to estimate the air taxi operations that are non-commercial. The commercial operations follow the Airport Statistical Data Reports which include detailed passenger traffic and cargo records. The general aviation and military operations are based on the FAA ATADS.

Annual aircraft operations at PBI decreased from approximately 214,300 in 2000 to 139,700 in 2014 at an annual average contraction rate of -3.0%. As shown in **Figure 3.17**, all categories of civilian aviation activities decreased between 2000 and 2014 except air taxi which increased at an average rate of 2.59% per year.

The contributing factors to the decline in aircraft operations at PBI include the growth in commercial passenger load factors (with over 10% absolute increase over a ten-year period for both domestic and international flights as presented in **Table 3.14** above), which allowed airlines to accommodate more passengers without a significant increase in operations. Total cargo volume has increased since 2009; however, the cargo aircraft operations at PBI decreased. It is probably influenced by the increase in cargo aircraft size and lifting capacity per flight, the optimization of freight per flight, and the balance between enplaned and deplaned demand. The entry of FedEx in the market and their increasing market share contribute to the increase in total cargo throughput without increasing the cargo aircraft operations.

The general aviation activities at PBI decreased to approximately 60,000 operations in 2009 and remained stable within the range of 58,000 to 62,500 operations in 2010 through 2014. The decrease in operations from 2000 primarily results from the decline in local activity, which is indicative of a shift in flight training activity away from PBI to other general aviation airports. Despite the overall decrease in general aviation activities, PBI is still one of the top ten airports for domestic business jet operations in the U.S. and business aviation has significant activities at the airport. Further discussion on the historic trend of business aviation operations in PBI is included in the subsequent section.

Table 3.18: Historical Aircraft Operations

Year	Commercial[1]		Air Taxi[3]	GA	Military[4]	Total Operations
	Air Carrier	Cargo Aircraft[2]				
2000	69,563	1,829	18,973	122,819	1,143	214,327
2001	68,968	1,827	23,844	116,459	1,542	212,640
2002	57,964	1,826	23,249	105,208	1,558	189,805
2003	64,304	1,873	25,937	104,514	1,348	197,976
2004	67,778	1,864	28,304	99,861	1,301	199,108
2005	67,054	1,825	30,294	97,667	1,111	197,951
2006	66,024	1,812	32,596	91,296	1,027	192,755
2007	70,471	1,840	31,259	86,078	815	190,463
2008	60,739	1,848	32,500	76,832	680	172,599
2009	53,330	1,569	22,483	59,985	1,003	138,370
2010	54,280	1,582	23,470	61,090	965	141,387
2011	52,732	1,584	25,083	62,514	1,281	143,194
2012	50,459	1,572	25,071	58,020	1,037	136,159
2013	50,327	1,483	24,714	58,092	971	135,587
2014	50,940	1,166	27,157	59,103	1,346	139,712
Period	**AAGR (%)**					
2000-2005	-0.73	-0.04	9.81	-4.48	-0.57	-1.58
2005-2010	-4.14	-2.82	-4.98	-8.96	-2.78	-6.51
2010-2014	-1.58	-7.34	3.72	-0.82	8.67	-0.30
2000-2014	-2.20	-3.16	2.59	-5.09	1.17	-3.01

Notes:

(1) PBI airport passenger statistics reports.
(2) Cargo aircraft data in March 2014 is missing.
(3) Estimated from FAA ATADS and PBI airport passenger statistics reports.
(4) Total from FAA ATADS are adopted. Total shown may vary from PBI airport passenger statistics reports between 2000 and 2009. Total shown in 2010 to 2014 are the same as the PBI airport passenger statistics reports.

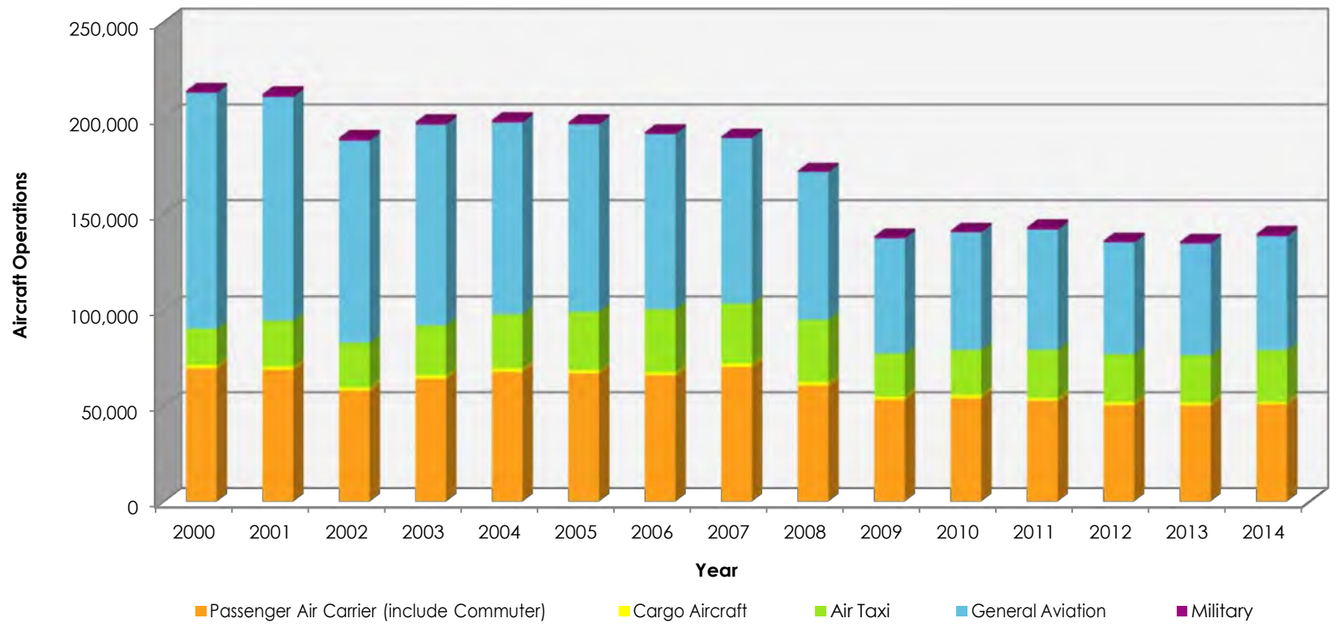


Figure 3.17: Historical Aircraft Operations

3.4.8 Business Aviation

Business aviation plays an important role in the aviation activities at PBI. As a subset of general aviation, business aviation is generally defined as the use of general aviation aircraft for business purposes. Business aircraft include helicopters, piston-powered propeller-driven aircraft (piston), turbine-powered turboprops (turbine), and turbojets (jet).

PBI is one of the top ten airports for business jet operations in the U.S.

Figure 3.18 presents the historic business jet operations and year-over-year change in the U.S. since 2001 based on the FAA Business Jet Report.

National business jet operations maintained consistent growth since 2001, peaking in 2007 before two years of decline. After a decade low in 2009, business jet operations rebounded in 2010 and began another growth trend. This trend is likely to continue due to such issues as increasing levels of security restrictions and the hassles of travel placed on commercial airline passengers.

As one of the top ten airports for domestic business jet operations in the nation, the historic year-over-year growth trend between 2009 and 2014 at PBI is similar to national trend. **Figure 3.19** summarizes the domestic business jet operations at PBI and the national ranking from 2009 through 2014. The percentage market share of PBI business jet operations increased continuously in the past five years with PBI ranked as either the sixth or seventh busiest business jet airport nationally.

The FAA TAF provides forecasts for overall general aviation operations (non-commercial and non-military) in two groups, air taxi and general aviation. Thus, additional analysis was required to extract business aviation operations from the overall general aviation activities at PBI for forecasting purposes.

Air taxi operators are air carriers that transport persons, property, and mail using small aircraft under 30 seats or a maximum payload capacity of 7,500 lbs. Air taxi air carriers typically hold FAR Part 135 certification and provide on-demand services (for compensation or hire). Their services are considered business aviation.

Operations in which persons or cargo are transported without compensation or hire are conducted under FAR Part 91. There are many business aircraft that are not used for compensation or hire and are thus only governed by FAR Part 91. These business aircraft are typically owned by individuals or businesses.

Other than full ownership of the business aircraft, users have a variety of options such as air charter, fractional ownership, leasing, time-share agreements, partnerships, aircraft management contracts, and interchange agreements, etc. On-demand air charter provides the convenience to the business aircraft users with instant access to business aircraft. Fractional ownership enables multiple users to acquire ownership interests in the same business aircraft in exchange for the aircraft's shared utilization.

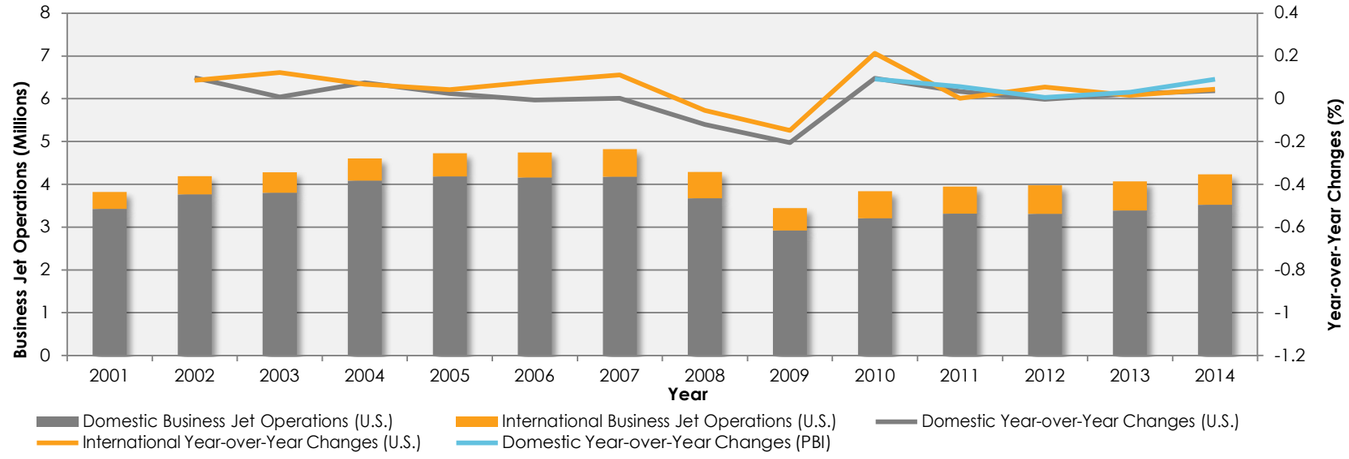


Figure 3.18: Historical Business Jet Operations in the United States and PBI
Sources:

(1) FAA Business Jet Reports.
(2) AECOM analysis.

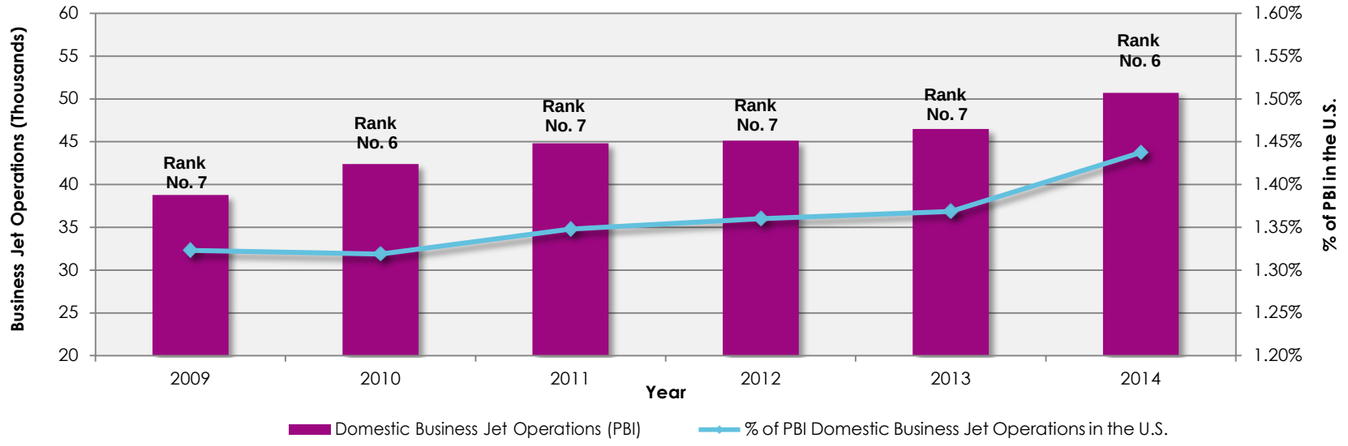


Figure 3.19: Historical Business Jet Operations at PBI
Sources:

(1) FAA Business Jet Reports.
(2) AECOM analysis.

Some users are willing to allow others to use their aircraft part of the time, and they enter into partnerships, time-share or interchange agreements. Some aircraft owners who want to offset the expense of operating and maintaining their aircraft, offer their aircraft for charter under FAR Part 135 regulations through charter operators. When the owners fly their aircraft as general aviation for personal use, they are governed by FAR Part 91.

One of the three largest fractional ownership operators in the U.S., NetJets, partnered with the FBO Signature Flight Support and constructed an exclusive use terminal at PBI for business aviation in 2013. The construction of new facility demonstrates the prosperous growth in business aviation. Air charter operators at PBI include RSVP Jet, Gama Aviation, and ACP Jets among others. These operators sublease their facilities from the FBOs Jet Aviation, Signature Fight Support, and Atlantic Aviation respectively.

In summary, there is a portion of the general aviation operations classified as business aviation, which includes operations by business aircraft owned by individuals or companies operated under FAR Part 91, and all of the operations governed by FAR Part 135. The remaining portion of the general aviation operations are non-business (e.g. personal) and are governed by FAR Part 91.

Analysis on the business aviation data in the FAA Enhanced Traffic Management System Counts (ETMSC) from 2009 to 2014 revealed that the business aviation activities at PBI increased gradually. Only the non-business general aviation operation decreased as depicted in **Figure 3.20**.

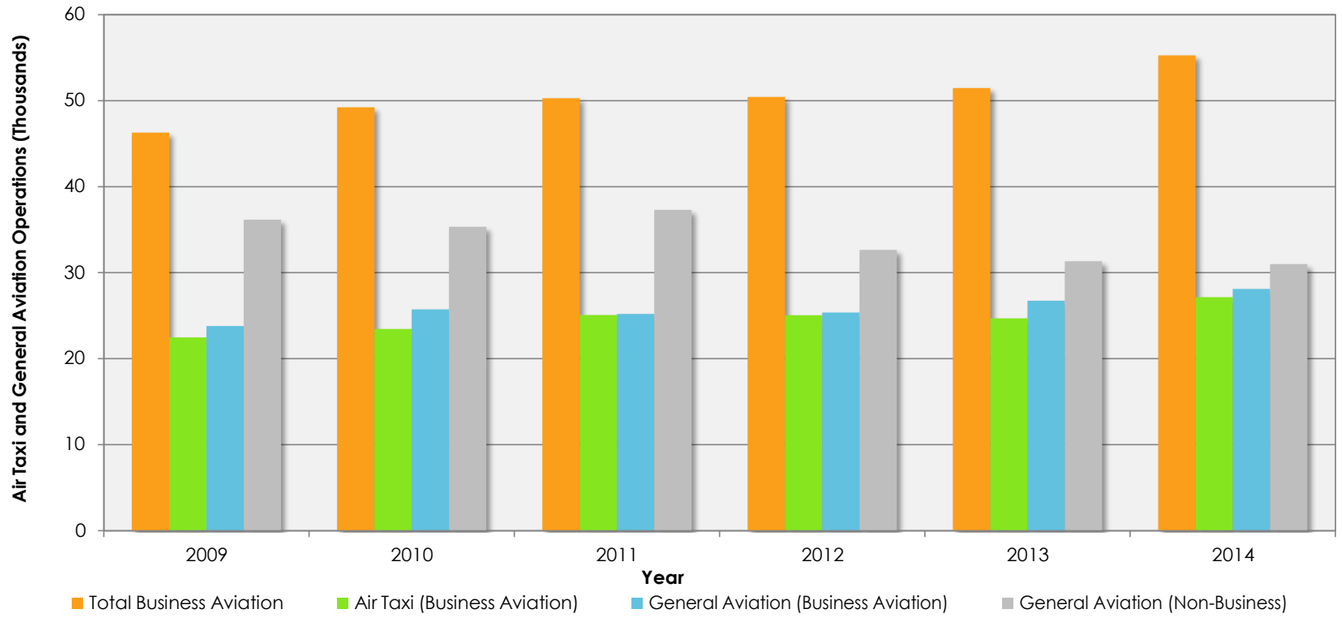


Figure 3.20: Historical Business and Non-Business Aviation Operations at PBI

Sources:

(1) FAA ETMSC.
(2) AECOM analysis.

Corporate Jet at PBI

Source: AECOM (2014)

Corporate Jet in Hangar at PBI

Source: AECOM (2014)

3.4.9 Based Aircraft

Historical based aircraft records were obtained from the FAA TAF and updated with 2014 records from FAA Form 5010-1. **Table 3.19**, **Figure 3.21,** and **Figure 3.22** provide information on aircraft based at PBI since 2000, including the number of single-engine, multi-engine, jet, and helicopter aircraft.

While the total number based aircraft in PBI has decreased from 163 in 2000 to 148 in 2014, the number of jets increased significantly from 55 to 117 in 2014 or from 34% to approximately 79% of the total based aircraft. The increase in jet aircraft and associated decrease in single-engine and multi-engine aircraft is indicative of business aviation and FBO activity at PBI.

Table 3.19: Historical Based Aircraft

Year	Number of Based Aircraft					Percentage of Total Based Aircraft			
	Single	Jet	Multi	Helicopter	Total	Single	Jet	Multi	Helicopter
2000	51	55	39	18	163	31.29	33.74	23.93	11.04
2001	46	51	23	17	137	33.58	37.23	16.79	12.41
2002	25	68	20	17	130	19.23	52.31	15.38	13.08
2003	25	69	20	17	131	19.08	52.67	15.27	12.98
2004	38	74	17	19	148	25.68	50	11.49	12.84
2005	18	57	23	18	116	15.52	49.14	19.83	15.52
2006	18	57	23	18	116	15.52	49.14	19.83	15.52
2007	18	57	23	18	116	15.52	49.14	19.83	15.52
2008	11	68	27	7	113	9.73	60.18	23.89	6.19
2009	16	68	17	25	126	12.7	53.97	13.49	19.84
2010	17	85	19	6	127	13.39	66.93	14.96	4.72
2011	15	96	18	20	149	10.07	64.43	12.08	13.42
2012	15	96	18	20	149	10.07	64.43	12.08	13.42
2013	10	104	7	15	136	7.35	76.47	5.15	11.03
2014	6	117	8	17	148	4.05	79.05	5.41	11.49
Period	**AAGR (%)**								
2000-2005	-18.8	0.72	-10.02	0	-6.58	-13.09	7.81	-3.69	7.04
2005-2010	-1.14	8.32	-3.75	-19.73	1.83	-2.91	6.38	-5.48	-21.17
2010-2014	-22.92	8.32	-19.45	29.74	3.9	-25.82	4.25	-22.47	24.87
2000-2014	-14.18	5.54	-10.7	-0.41	-0.69	-13.58	6.27	-10.08	0.28

Sources:

(1) 2000 to 2013: FAA TAF, January 2015.
(2) 2014: FAA Form 5010-1, April 2014
(3) AECOM analysis.

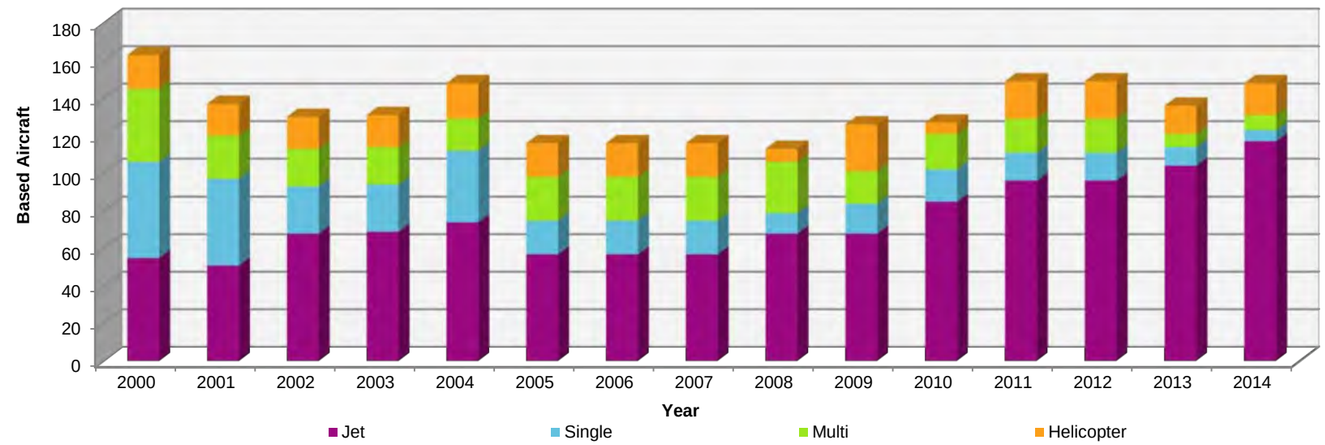


Figure 3.21: Historical Based Aircraft

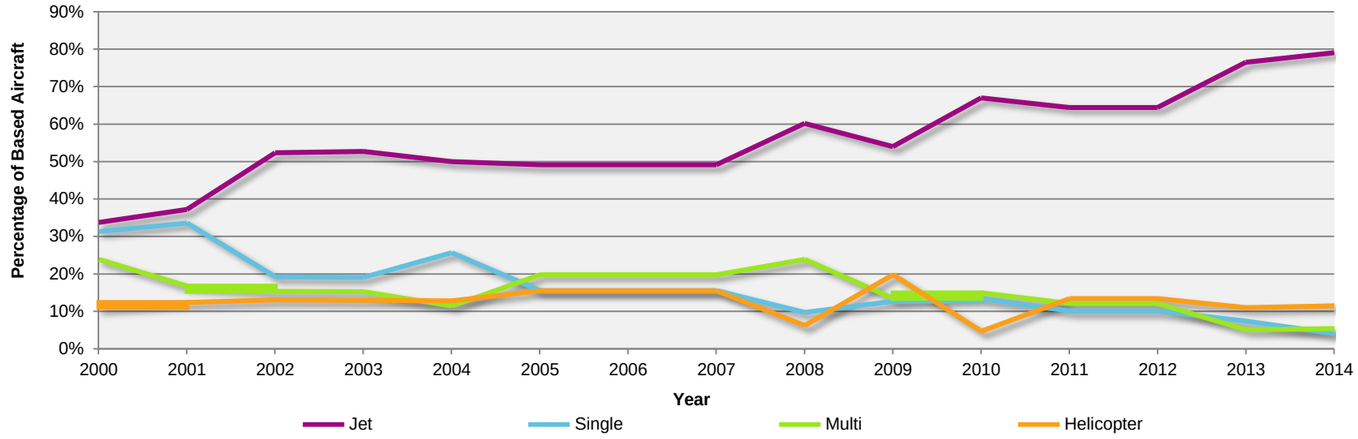


Figure 3.22: Historical Based Aircraft Percentage Share

3.5 Aviation Demand Forecasts

Forecasts of aviation demand were developed for the two major categories of commercial passenger airline activity as well as significant components of activity associated with them, including:

- Enplaned passengers
  - Domestic and international passengers
  - Mainline and regional enplaned passengers
- Aircraft operations
  - Passenger aircraft
  - All-cargo aircraft
  - General aviation
  - Military aircraft operations
- Based Aircraft

Each forecast includes expected demand for the 20-year planning horizon (2035) grouped into five-year periods and utilizing actual 2014 statistics as the baseline.

3.5.1 Enplaned Passengers Forecast

Three forecast models were utilized for analysis and comparison purposes, the Regression, Market Share, and Time-Series models. The approach, methodology, and key assumptions used in each are summarized in the following subsections. The results of each forecast are provided in **Table 3.20** and **Figure 3.23**.

3.5.1.1. Regression Model

Regression analysis is a statistical technique that ties aviation demand (dependent variables), such as enplaned passengers, to key parameters (independent variables) such as airline yields, fuel prices, population, employment, income, and GDP. Correlations between historical aviation demand and socioeconomic data are analyzed to find the highest relationship between the dependent and independent variables. The forecast of enplaned passengers is then derived from a regression model incorporating forecast socioeconomic data up to 2035.

A regression model also includes 'dummy' variables as a representation of unusual events that do not correlate to underlying socioeconomic trends and airline yields. For example, an unusual event that had a noticeable impact on PBI passenger traffic was the terrorist attacks of September 11, 2001 which had the effect of depressing aviation demand nationwide traffic. The regression model also includes a 'first-order autoregressive factor' to account for serial correlation that is inherent in time series data. It is a variable that accounts for the interrelationship between prior and current year levels of enplanements.

Multiple regression analyses on historical data from 2000 to 2013 demonstrated that there is a strong correlation of PBI enplaned passengers to jet fuel prices, the real GDP, and per capita personal income of the airport service region. The coefficient of determination (R^2) is 0.96 which signifies a high percent of variation in the dependent variables that are explained by the independent variables.

Table 3.20: Enplaned Passengers Forecast by Regression, Market Share and Time Series Trend Models

Year	Regression Model			Market Share Model			Time Series Trend Model (30-Year)
	Scenario 1 Baseline	Scenario 2 Optimistic	Scenario 3 Pessimistic	Scenario A Baseline	Scenario B Optimistic	Scenario C Pessimistic	
2015	3,049,121	3,116,859	2,978,397	3,005,682	3,028,823	3,004,384	3,295,705
2020	3,265,592	3,415,040	3,087,167	3,499,427	3,664,223	3,273,245	3,443,305
2025	3,453,075	3,648,981	3,165,874	3,937,532	4,284,135	3,446,472	3,590,905
2030	3,683,857	3,924,099	3,245,204	4,400,342	4,974,846	3,604,178	3,738,505
2035	3,948,386	4,236,604	3,336,586	4,890,311	5,744,918	3,748,224	3,886,105
Years				**AAGR (%)**			
2015-2020	1.38	1.84	0.72	3.09	3.88	1.73	0.88
2015-2025	1.25	1.59	0.61	2.74	3.53	1.38	0.86
2015-2035	1.30	1.55	0.57	2.46	3.25	1.11	0.83

Sources:

(1) PBI Airport Passengers Statistics Report
(2) AECOM Analysis

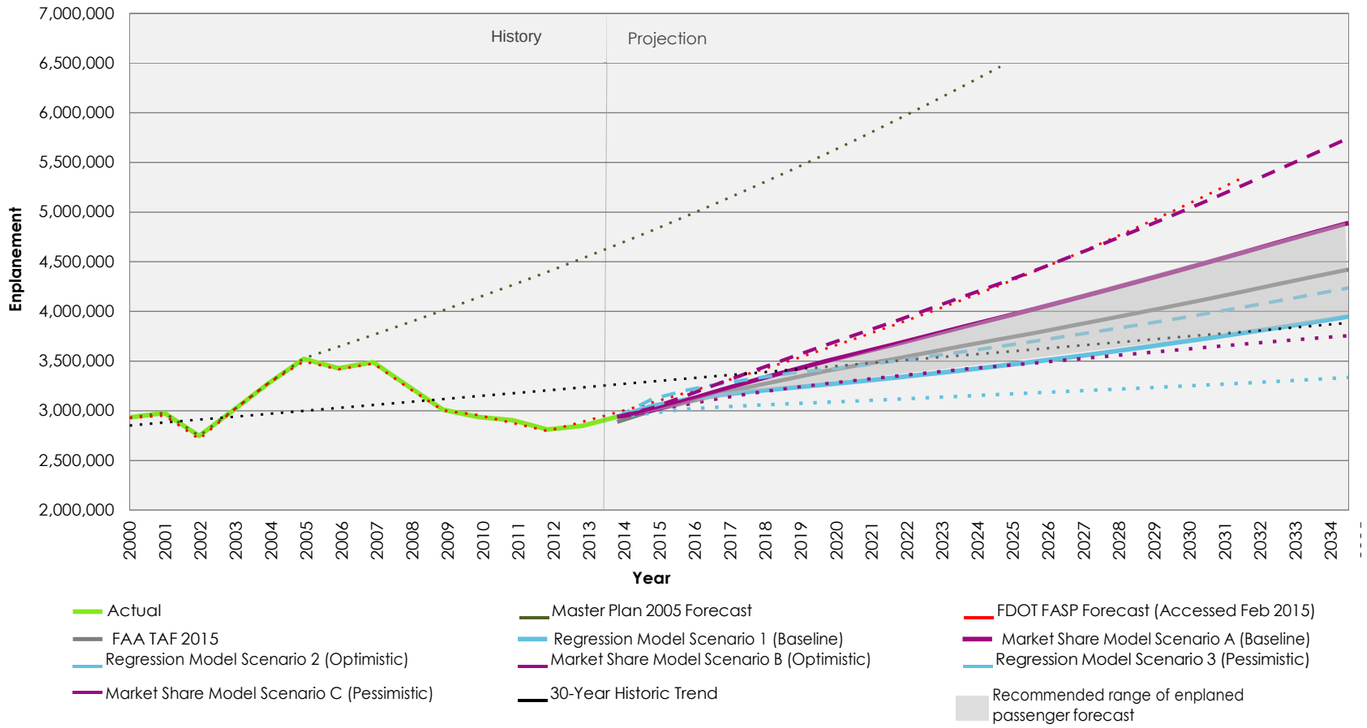


Figure 3.23: Enplaned Passengers Forecast

Sources:

(1) PBI Airport Passenger Statistics Reports.
(2) Florida Commercial Services Forecast; FDOT; January 2013.
(3) FAA TAF, Issue February 2014. TAF base year is Federal Fiscal Year 2012.
(4) Master Plan 2005.
(5) AECOM Analysis.

Three scenarios were developed to evaluate the impact of changing variables: (1) Baseline, (2) Optimistic, and (3) Pessimistic. These scenarios incorporate associated growth in the PBI service region economy as well as the reference, low, and high cases for the jet fuel prices respectively. Forecast socioeconomic data, including the real GDP and per capita personal income of the service region, were based on the projections of Woods & Poole Economics (WPE) as well as the national trends in the FAA Aerospace Forecast FY2014-2034. Forecast jet fuel prices were based on the Annual Energy Outlook 2014, issue April 2014, from the USEIA. The assumptions for each scenario are summarized below:

Regression Model Scenario 1 (Baseline)

- The jet fuel projections are based on the USEIA 'reference' case
- Real GDP will increase annually at approximately 2.9% per WPE
- Per capita personal income will increase at an annual average of 1.53%

Regression Model Scenario 2 (Optimistic)

- The jet fuel projections are based on the USEIA 'low' case
- Real GDP will grow similar to the optimistic scenario in the FAA Aerospace Forecast FY2014-2034 and extrapolated to 2035
- Projected real GDP will grow at approximately 3.7% from 2015 to 2019 and 3.2% from 2020 to 2035
- Personal income will increase similar to the real disposal income projections of the FAA's 'optimistic' scenario forecast
- Population growth of the four counties utilize projections from WPE
- Per capita personal income will increase at approximately 1.8% per year from 2015 to 2035

Regression Model Scenario 3 (Pessimistic)

- The jet fuel projections are based on the USEIA 'high' case
- Real GDP will grow similar to the pessimistic scenario in the FAA Aerospace Forecast FY2014-2034 and extrapolated to 2035
- Projected real GDP will grow at approximately 1.4% in 2015 and 2.1% from 2016 to 2035
- Personal income will increase similar to the real disposal income projections of the FAA's pessimistic scenario forecast
- Population growth of the four counties utilize projections from WPE
- Per capita personal income will increase at approximately 0.7% per year from 2015 to 2035

3.5.1.2. Market Share Model

The market share approach is a top-down model based on the allocation of total enplanements in the United States and Florida as projected by the FAA. The national and statewide forecasts are based on the FAA TAF data. The historical share of PBI enplanements to the total enplanements in Florida declined slightly from 4.96% in 2000 to 4.12% in 2014 and the share in the U.S. also declined slightly from 0.42% in 2000 to 0.39% in 2014. Despite the gradual decrease from 2003 to 2011, the share of PBI enplanements in Florida has increased in the recent three years from 4.03% in 2012 to 4.12% in 2014 as previously provided in . The following scenarios were considered in the market share model:

Market Share Model Scenario A (Baseline)

- PBI market share of Florida enplanements will maintain the recent three year average of 4.1%
- Represents PBI growth and market share will be consistent with current trend other airports in Florida over the 20-year planning period

Market Share Model Scenario B (Optimistic)

- PBI market share of Florida enplanements will continue to grow similar to the past three years and increase from 4.1% in 2014 to 4.8% by 2035 (the historical average since 2000)
- Represents PBI growth above other airports in Florida over the 20-year planning period

Market Share Model Scenario C (Pessimistic)

- PBI market share of Florida enplanements will follow the general decline from 2000 to 2014 and will decrease slightly from 4.1% in 2014 to 3.1% in 2035 at an average annual reduction rate of -1.3% per year
- Represents the case that growth at PBI will slightly lag behind other airports in Florida over the 20-year planning period

Additionally, a separate market share model based on PBI enplanements maintaining a constant 0.39% share (average of recent three years) of the overall U.S. enplanements was also considered for comparison. The outcome of this scenario closely resembles the baseline Scenario A described above and therefore, is not detailed in this section.

3.5.1.3. Time-Series Trend Model

Trend analysis projects historic trends into the future. Simple equations were set up for different time periods (10-year, 20-year, and 30-year) as the independent variables. Since aviation demands is typically cyclical in response to changing economic conditions, evaluation of fixed time periods can sometimes provide misleading conclusions. For example, the most recent 10-year historic trend for PBI represents a sharp decline due to the recent financial crisis. For the time-series trend model, the 30-year historic trend between 1985 and 2014 is continued into the future as an indication of potential demand.

Airport Entrance Pond
Source: AECOM (2014)

Aircraft Taxiing to Gate
Source: AECOM (2014)

3.5.1.4. Forecasts by Other Recent Studies

The forecast of enplaned passengers from different references are summarized in **Table 21** and graphically presented along with the forecasts developed for this Master Plan in **Figure 3.23** for comparison. These referenced forecasts include:

- 2006 PBI Master Plan Forecast provided in Technical Report #2; CH2M Hill in association with Ricondo & Associates; December 2005
- Florida Commercial Services Forecast; FDOT FASP; February 2015
- FAA TAF; January 2015

The 2006 PBI Master Plan forecast and the FDOT FASP forecast are both aggressive and project enplaned passengers increasing at an average annual growth rate of approximately 3.08% from 2005 to 2025 and 3.3% from 2012 to 2032 respectively. The 2006 PBI Master Plan forecast assumed the level of growth experienced from 2001 to 2005 at PBI would continue unabated. In comparison to the FDOT FASP forecast growth rate of 3.3%, the FAA TAF estimates an average growth rate of 2.08% per year for the same time period.

Table 3.21: Forecast Enplaned Passengers by Previous Master Plan, FDOT and FAA TAF

Year	Actual	2006 Master Plan	FDOT FASP	FAA TAF
2005	3,523,184	3,527,170	3,496,936	3,499,140
2006	3,428,040	3,646,083	3,418,310	3,387,464
2007	3,488,937	3,764,421	3,475,345	3,483,010
2008	3,248,434	3,885,898	3,232,009	3,308,622
2009	3,010,891	4,010,628	3,004,076	3,032,701
2010	2,936,763	4,138,729	2,958,416	2,940,226
2011	2,904,588	4,267,065	2,877,158	2,918,356
2012	2,811,687	4,398,713	2,796,359	2,785,950
2013	2,848,432	4,533,793	2,888,639	2,816,540
2014	2,940,798	4,672,413	2,983,964	2,888,929
2015		4,814,702	3,082,435	3,002,439
2016		4,960,777	3,184,155	3,087,141
2017		5,110,769	3,289,232	3,175,846
2018		5,264,806	3,397,777	3,255,037
2019		5,423,032	3,509,904	3,327,645
2020		5,585,580	3,625,730	3,401,173
2021		5,752,031	3,745,379	3,464,756
2022		5,923,441	3,868,977	3,526,452
2023		6,099,367	3,996,653	3,592,572
2024		6,279,299	4,128,543	3,658,705
2025		6,463,910	4,264,785	3,722,382
2026			4,405,523	3,785,056
2027			4,550,905	3,853,612
2028			4,701,085	3,920,566
2029			4,856,220	3,990,125
2030			5,016,476	4,058,835
2031			5,182,019	4,129,948
2032			5,353,026	4,203,410
2033				4,278,773
2034				4,351,103
2035				4,423,373

Year	Period		AAGR (%)	
2005-2025	20 years	3.08	1.00	0.31
2012-2032	20 years		3.30	2.08
2015-2035	20 years			1.96

Sources:

(1) PBI Airport Passenger Statistics Reports.
(2) 2006 PBI Master Plan
(3) Florida Commercial Enplanements Forecast; FDOT; accessed February 2015
(4) FAA TAF, January 2015

3.5.1.5. Recommended Enplaned Passengers Forecast

To account for the inherent uncertainty of aviation demand forecasting, a range of enplaned passenger forecasts were developed considering various economic and airline industry conditions. Together these forecast scenarios represent a reasonable range of potential passenger demand. The Baseline, Optimistic, and Pessimistic regression models represent varying levels of enplaned passenger activity that may occur based on economic conditions in the service region as well as fuel price fluctuations that could impact the aviation industry. The three market share models are based on the FAA TAF Florida and reference historic shares of PBI enplanements in the state. These models reflect growth in Florida enplanements that out pace the nation and are supported by positive economic conditions in Florida.

The range of the forecast enplanement forecast for the 5, 10, and 20 year planning horizons are comparable to the FAA TAF. The average annual growth rate in the FAA TAF is 1.96% as compared to a range of 0.57% and 3.25% for the Pessimistic Regression and Optimistic Market Share models respectively.

'It is recommended that the FAA Terminal Area Forecasts are used as the basis for evaluating future facility requirements'

As a high and low case representation, it is recommended the Baseline Market Share and Baseline Regression models are used at average annual growth rates of 1.30% and 2.46%. In the near term to 2016, the baseline regression model predicts a faster growth rate than the FAA TAF but it slows down in the long term to represent the low case. As outlined in **Table 3.22**, the forecast enplanements for the high and low cases differ from the FAA TAF by less than 10% in the 10 year planning horizon (2.89% and -3.99%), and 15% in the 20 year planning horizon (10.56% and -10.74%).

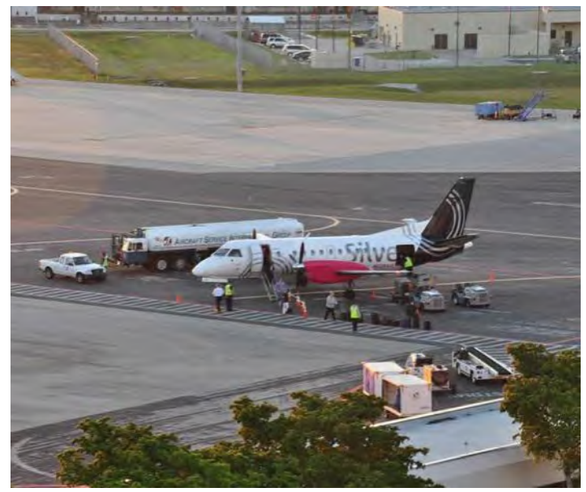
Table 3.22: Comparison of Enplaned Passengers Forecast and FAA TAF

Year	High Case Forecast Enplanements	Recommended FAA TAF Enplanements	Low Case Forecast Enplanements	FAA TAF High Case Differential (%)	FAA TAF Low Case Differential (%)
2015	3,005,682	3,002,439	3,049,121	0.11	1.55
2020	3,499,427	3,401,173	3,265,592	2.89	3.99
2025	3,937,532	3,722,382	3,453,075	5.78	7.23
2030	4,400,342	4,058,835	3,683,857	8.41	9.24
2035	4,890,311	4,423,373	3,948,386	10.56	10.74
Years	**Period**			**AAGR (%)**	
2015-2020	5 years	3.09	2.53	1.38	
2015-2025	10 years	2.74	2.17	1.25	
2015-2035	20 years	2.46	1.96	1.3	

Sources:

(1) FAA TAF, January 2015.
(2) AECOM Analysis.

JetBlue Aircraft at Concourse C
Source: AECOM (2014)



Silver Airways at Concourse A
Source: AECOM (2014)

3.5.2 Air Cargo Forecast

The primary objective of the air cargo forecast is to provide a reasonable order of magnitude that can be expected over the 20 year planning horizon. Due to the cyclical nature of the economy, the focus of the forecasts is not to predict year-to-year fluctuations but establish a trend that represents long-term growth potential. The air cargo industry is in continuous development and subject to drastic fluctuations if an air cargo operator revises the structure of their operations or opens a new distribution center or new cargo hub/facility either at PBI or another airport. Nevertheless, three individual air cargo growth forecasts are analyzed to identify a reasonable expectation for air cargo volume at PBI in the future.

Scenario 1 - Boeing's World Air Cargo Forecast 2014-2015

Boeing annually develops a detailed analysis and forecast on the air cargo industry for worldwide regions and markets. The latest forecast includes 2013 to 2033 and projects the U.S. domestic market to grow at an average annual rate of 2.2% over the 10-year period from 2013 to 2023 and 2.1% over the full 20-year period from 2013 to 2033. Scenario 1 is based on Boeing's World Air Cargo Forecast with an extrapolation to 2035 for the purposes of this Master Plan.

Scenario 2 - The FAA Aerospace Forecast FY 2014-2034

The FAA projects the U.S. total domestic air cargo revenue ton miles (RTMs) to increase at an average annual rate of 1.6% for the 10-year period from 2013 to 2023 and 1.4% for the 20-year period from 2013 to 2034. Scenario 2 is based on the FAA Aerospace Forecast and extrapolates to 2035.

Scenario 3 – Time-Series Trend

Air cargo volume has increased continuously since FedEx started their operations at PBI in 2009. Total air cargo handled at PBI has doubled from 13,200 tons to 27,600 tons in 2014 and achieved the volume projected by the 'Modest' Case of the 2006 Florida Air Cargo System Plan (ACSP). Scenario 3 assumes that air cargo will continue this trend and increase at a rate of 4.1% per year.

Table 3.23 and **Figure 3.24** present the air cargo forecasts for these three scenarios. The Florida ACSP air cargo volume High, Modest, and Low forecasts through 2025 are also included for comparison purposes.

Table 3.23: Total Air Cargo Forecast (Tons)

Year	PBI Master Plan			2006 Florida Air Cargo System Plan		
	Scenario 1	Scenario 2	Scenario 3	High	Modest	Low
2015	28,250	28,084	28,775	29,426	28,867	26,724
2020	31,497	30,404	35,178	36,321	35,290	31,434
2025	34,988	32,644	43,006	44,831	43,143	36,974
2030	38,648	34,616	52,575			
2035	42,691	36,707	64,274			
Years			**AAGR (%)**			
2015-2020 (5-year)	2.20	1.60	4.10	4.30	4.10	3.30
2015-2025 (15-year)	2.20	1.50	4.10	4.30	4.10	3.30
2015-2035 (20-year)	2.10	1.40	4.10			

Sources:

(1) PBI Airport Passengers Statistics Reports
(2) Boeing World Air Cargo Forecast 2014-2015
(3) The FAA Aerospace Forecasts FY2014-2034
(4) AECOM analysis

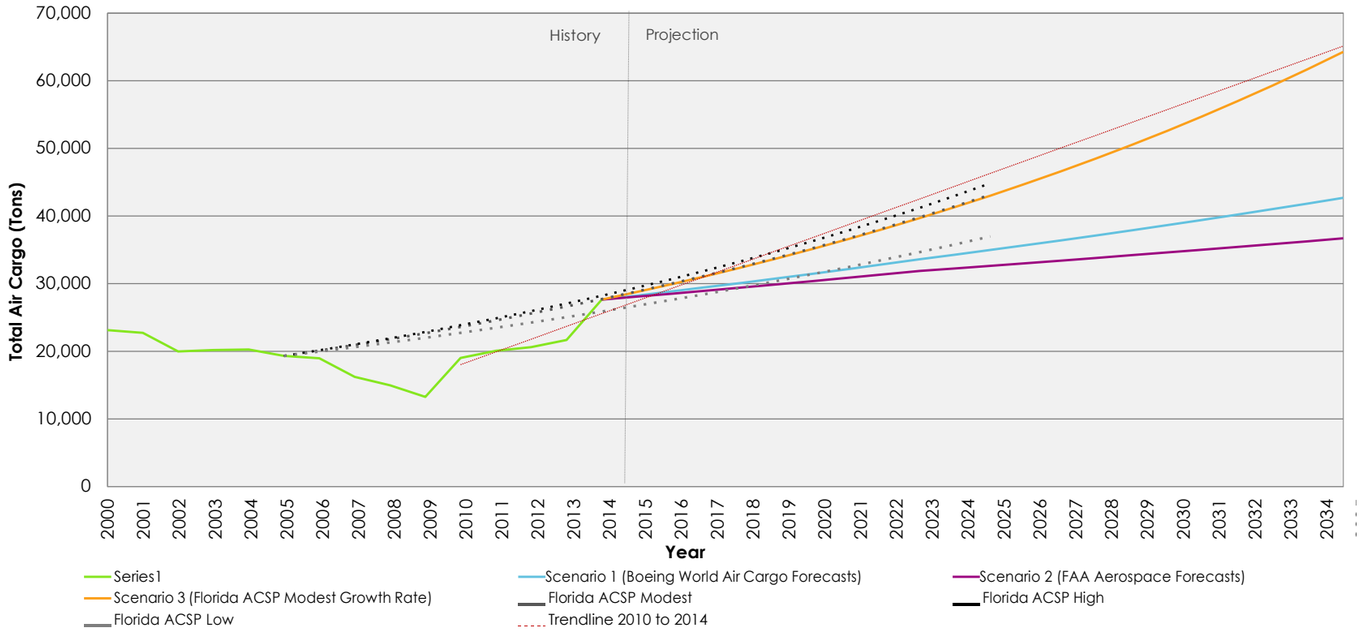


Figure 3.24: Forecast Air Cargo Operations

Sources:

(1) PBI Airport Passenger Statistics Reports.
(2) Boeing World Air Cargo Forecast 2014-2015
(3) The FAA Aerospace Forecasts FY2014-2034
(4) AECOM Analysis.

3.5.3 Aircraft Operations Forecast

Aircraft operations were projected for the four major categories of users: commercial passenger airlines, commercial all-cargo carriers, general aviation, and military.

Commercial air carrier operations include those certified under FAR Part 121 or 127 to conduct scheduled services on specific routes. For the purposes of master planning, commercial airline operations include the activities by commercial air carriers, including commuter air carriers with FAR Part 121 certification, which provide scheduled services on specific routes. Commuter air carriers are those carriers that operate aircraft of 60 or fewer seats, or a maximum payload capacity of 18,000 pounds or less. These commuter air carriers hold a certificate issued under section 298C of the Federal Aviation Act. Some of the commuter air carriers hold certification under both FAR Part 121 and 135, while some may hold only FAR Part 135 certification if their fleet typically consists of small aircraft below 30-seats.

As previously noted, Air taxi operators typically hold FAR Part 135 certification and provide on-demand services for compensation or hire. The air taxi operations are analyzed together with the general aviation activities. The approach and methodologies are detailed in the following sections.

3.5.3.1. Commercial Airline Operations

Commercial airline operations were estimated utilizing the enplaned passenger forecasts. The aggregate number of commercial operations at an airport depends on three main factors: total passengers, average aircraft size (seat capacity), and average load factor. The number of operations was derived by total passengers divided by the multiple of average seat capacity and average load factor. Total passengers include both enplaned and deplaned passengers.

Passenger aircraft operations were further divided into international air carrier, domestic mainline air carrier and regional air carrier operations based on the forecast enplanements for each group as well as differences in average aircraft size (seat capacity) and average load factor.

The forecast enplaned passengers for each group are summarized in **Table 3.24**.

The following assumptions were made in the forecast enplaned passengers for international, domestic mainline and regional air carriers:

– International passengers have been increasing at PBI since 2009 and will continue to increase from 2.02% in 2014 to approximately 3% by 2035 as a factor of total passengers. The average annual compound growth rate for international enplanements is projected to reach 3.82% for the base case over the 20 year planning horizon, which is close to the national average of 3.9[12].

– The market share of regional air carriers at PBI has decreased from a high of 3.9% in 2003 to a low of 0.8% in 2012. Consolidation has occurred among regional carriers and only four major domestic regional carriers operate at PBI with scheduled services in recent years: Republic Airlines, Shuttle America, ExpressJet Airlines, and Silver Airways. With the exception of Silver Airways, all are affiliates of mainline carriers and primarily operate as either US Airways or United Airlines. It is anticipated that the regional air carriers will maintain a market share of approximately 1.2% through 2035.

– The majority of the market share for scheduled passengers at PBI (average 98% in the last decade) is attributable to the mainline air carriers and it is projected this will remain at approximately 98 to 99%. The average annual compound growth rate for domestic mainline air carriers is forecasted will be 1.91% per year from 2015 through 2035 which would out pace the national average of 1.8% for domestic scheduled passengers.

PBI Arrival
Source: AECOM (2014)

Table 3.24: Enplaned Passengers Distribution

Year	International			Domestic Mainline			Domestic Regional		
	High	Base (F F)	Low	High	Base (F F)	Low	High	Base (F F)	Low
2015	62,067	62,000	62,964	2,907,683	2,904,546	2,949,706	35,932	35,893	36,451
2020	80,137	77,887	74,782	3,377,854	3,283,013	3,152,142	41,436	40,273	38,668
2025	99,029	93,618	86,845	3,792,326	3,585,111	3,325,735	46,177	43,654	40,495
2030	120,569	111,212	100,938	4,228,668	3,900,485	3,540,136	51,104	47,138	42,783
2035	144,998	131,153	117,070	4,689,075	4,241,351	3,785,910	56,239	50,869	45,406
Period					**AAGR (%)**				
2015-2020 (5-year)	5.24	4.67	3.5	3.04	2.48	1.34	2.89	2.33	1.19
2015-2025 (10-year)	4.78	4.21	3.27	2.69	2.13	1.21	2.54	1.98	1.06
2015-2035 (20-year)	4.33	3.82	3.15	2.42	1.91	1.26	2.27	1.76	1.1

12 *After the restoration of full diplomatic relations with Cuba in December 2014, tourism opportunities between south Florida and Cuba are anticipated by some tourism officials. It will potentially increase international traffic by air and by cruise. The high case scenario considers the potential increase. As the subsequent policy on travel restrictions reveals, continuous review is recommended.*

3.5.3.2. Domestic Mainline Air Carrier Operations

The following assumptions were made in the projected fleet mix and load factor for domestic mainline carrier operations at PBI and given in **Table 3.25**:

- In general, the older narrowbody aircraft, such as A320s and B757/300, will be replaced by next generation narrowbody aircraft like the A320 NEO and the 737 MAXs with approximately 189 and 200 maximum seats respectively.
- American Airlines will retire their MD80 aircraft. Delta Air Lines retires their MD-90, DC9, and MD88 aircraft. The retirement of older inefficient aircraft will be replaced by B737s and A320s in the near term and will gradually be replaced by more efficient next generation narrowbody in the long term.
- Southwest Airlines leases out AirTran Airways' B717-200 aircraft and uses more B737s as their fleet integrates.
- The overall average seats per departure for domestic mainline air carriers at PBI are projected to increase from 147 in 2013 to 150 in 2035.
- The average load factor for domestic departures at PBI increased from 75.44% in 2002 to 85.6% in 2013 (i.e. increased by 10.16%). The load factors of domestic departures at PBI were generally higher than the national average before 2010 and in 2013, and hence the margin for further increase is less than the national system. It is estimated that the load factors for domestic mainline departures will increase slightly to the national average of 85.8% by 2035.

The projected domestic mainline air carrier operations over the 20-year planning period for the high, baseline, and low cases are summarized in **Table 3.28**.

3.5.3.3. Domestic Regional Air Carrier Operations

The following assumptions were made to project the fleet mix and load factor for domestic regional carrier operations at PBI and given in **Table 3.26**:

- United Airlines and the new American Airways indicate that they will be moving ahead with plans to bring down the number of 50-seat regional jets flown by their regional partners.
- The retirement of 50 to 65-seat Canadair RJ-200 and Embraer-145 in the future will be replaced with 70 to 90-seat models.
- The overall average seats per departure for domestic regional air carriers at PBI are projected to increase from 50 in 2013 to 56 in 2035.
- The actual load factor estimated from the 2013 U.S. DOT T-100 data is approximately 78.5%, which is the same as the projected national average for domestic regional operations. It is assumed that the forecast load factor will be maintained at similar level as the national projection at 78.5% through 2035.

Table 3.25: Average Seats per Departure and Average Load Factor for Domestic Mainline Air Carrier

Seating Range	Example Fleet mix in 2013	Percentage of Operations					
		2013	2015	2020	2025	2030	2035
200 and above	Boeing 767-300/300ER Boeing 777-200ER/200LR/233LR Boeing 757-300 Airbus A321 Airbus A340-600	0.1	0.1	0.5	1	1.5	2
180 to 199	Boeing 757-200 Airbus A321	9.3	9.3	9.6	9.6	9.6	9.8
170 to 179	Boeing 737-800 Boeing 757-200 Airbus A321 Airbus A320-100/200	0.6	0.6	0.5	0.5	0.4	0.4
160 to 169	Boeing 737-800/900 Boeing 737-800 MD-90	4.9	4.9	4.9	4.9	5	5
150 to 159	Boeing 737-800 Boeing 737-400 Airbus A320-100/200	32.9	32.9	33.7	34.5	35.3	36
140 to 149	MD81/82/83/88 Boeing 737-700/700LR Airbus A320-100/200 Airbus A319	26.5	26.5	25.9	25.3	24.7	24
130 to 139	Boeing 737-700/700LR Boeing 737-300 MD81/82/83/88	4.6	4.6	4.7	4.8	4.9	5
120 to 129	Airbus A319	7.6	7.6	7.6	7.6	7.6	7.6
110 to 119	Boeing 737-700/700LR	5.2	5.2	4.4	3.6	2.8	2
90 to 109	Embraer 190	8.2	8.2	8.2	8.2	8.2	8.2
Weighted Average Seats per Departure		147	147	147	148	149	150
Average Load Factor		85.6	85.6	85.6	85.6	85.7	85.8

Sources:

(1) 2013 data: U.S. Department of Transportation, T-100 Segment database.
(2) AECOM analysis.

Table 3.26: Average Seats per Departure and Average Load Factor for Domestic Regional Air Carriers

Seating Range	Example Fleet mix in 2013	Percentage of Operations					
		2013	2015	2020	2025	2030	2035
70 to 89	Embraer ERJ-175 Embraer 170	14.20	14.20	18.20	22.20	26.10	30.00
60 to 69 (mainly 69) (payload > 18,000 pounds)	Embraer 170	10.10	10.10	11.30	12.50	13.70	15.00
61 to 69 (payload > 18,000 pounds)	Canadair RJ-700	0.30	0.30	0.30	0.30	0.30	0.30
50 to 59 (mainly 50)	Embraer-145 DHC8-300 Dash 8	31.50	31.50	26.30	21.10	16.00	10.80
40 to 49	Embraer-140	0.03	0.03	0.03	0.03	0.03	0.03
30 to 39	Saab-Fairchild 340/B	43.80	43.80	43.80	43.80	43.80	43.80
0 to 29 (mainly 19)	Beech 1900 A/B/C/D	0.03	0.03	0.03	0.03	0.03	0.03
Weighted Average Seats per Departure		50	50	51	53	54	56
Average Load Factor		78.50	78.50	78.50	78.50	78.50	78.50

3.5.3.4. International Air Carrier Operations

The following assumptions were made in the projected fleet mix and load factor for international operations at PBI and given in **Table 3.27**:

- Mainline air carriers generally will shift their wide-body and larger narrow-body aircraft to international services.
- A majority (over 70% in 2013 based on passenger share) of the international market at PBI is taken by Air Canada. Air Canada uses mostly their A320-200 jets for flights between PBI and Montreal or Toronto. Most of their A320-200 jets are over twenty years old. It is anticipated that Air Canada will gradually replace their A320s with the newly ordered 737 MAXs.
- Bahamas Air operates their 50-seat Dash 8 turboprop aircraft between PBI and Marsh Harbor, Nassau in the Bahamas. Their Dash 8 aircraft are over twenty years old. It is anticipated that the 50-seat fleet will remain for the near term and will eventually be replaced by new aircraft variants in the 70 to 90-seat configuration in the long term.
- The overall average seats per departure for international air carriers at PBI are projected to increase from 78 in 2013 to 112 in 2035.
- The average load factor for international departures at PBI increased from 69.93% in 2002 to 80.47% in 2013 (i.e. increased by 10.54%). It is projected that the average load factor will increase to approximately 82.4% by 2035 which is similar to the national trend.

3.5.3.5. Summary of Air Carrier Aircraft Operations

The combined results of the passenger aircraft operations, including international, domestic mainline and regional operations are summarized in **Table 3.28**.

Table 3.27: Average Seats per Departure and Average Load Factor for International Air Carriers

Seating Range	Fleet mix in 2013	Percentage of Operations					
		2013	2015	2020	2025	2030	2035
200 and above	Boeing 767-300/300ER Boeing 777-200ER/200LR/233LR	0.00	0.00	1.00	2.50	3.00	3.50
170 to 199 (mainly 174)	Airbus A321	1.00	1.00	2.00	3.00	4.00	5.00
130 to 169 (mainly 146)	Airbus A320-100/200 Boeing 737-800	31.00	31.00	31.50	32.50	33.50	34.50
80 to 129 (mainly 97, 120)	Embraer 190 Airbus A319	5.00	5.00	13.00	20.00	28.00%	36.00
35 to 79 (mainly 50)	DHC8-300 Dash 8	27.00	27.00	22.50	18.00	13.50	9.00
0 to 35 (mainly 34)	Saab-Fairchild 340/B	36.00%	36.00	30.00	24.00	18.00	12.00
Weighted Average Seats per Departure		78	78	87	96	104	112
Average Load Factor		80.47	81.00	81.35	81.70	82.05	82.40

Table 3.28: Commercial Passenger Aircraft Operation Projections

Year	International Operations			Domestic Mainline Air Carrier Operations			Domestic Regional Air Carrier Operations			Total Passenger Aircraft Operations		
	High	Base (FAA TAF)	Low	High	Base (FAA TAF)	Low	High	Base (FAA TAF)	Low	High	Base (FAA TAF)	Low
2015	1,971	1,969	2,000	46,215	46,165	46,883	1,831	1,829	1,857	50,018	49,964	50,740
2020	2,285	2,221	2,132	53,688	52,181	50,101	2,070	2,012	1,932	58,043	56,414	54,165
2025	2,536	2,398	2,224	59,869	56,597	52,503	2,220	2,098	1,947	64,625	61,094	56,674
2030	2,836	2,616	2,374	66,309	61,163	55,512	2,411	2,224	2,019	71,556	66,003	59,905
2035	3,151	2,850	2,544	73,039	66,065	58,971	2,559	2,314	2,066	78,748	71,229	63,580
Period	**Average Annual Compound Growth Rate (AAGR)**											
2015-2020 (5-year)	3.00%	2.43%	1.29%	3.04%	2.48%	1.34%	2.49%	1.93%	0.79%	3.02%	2.46%	1.31%
2015-2025 (10-year)	2.55%	1.99%	1.07%	2.62%	2.06%	1.14%	1.94%	1.38%	0.47%	2.60%	2.03%	1.11%
2015-2035 (20-year)	2.37%	1.87%	1.21%	2.31%	1.81%	1.15%	1.69%	1.18%	0.53%	2.30%	1.79%	1.13%

Source: AECOM Analysis

3.5.4 All-Cargo Aircraft Operations

As previously described, FedEx began all-cargo operations at PBI in 2009 and primarily utilize Airbus A310-200's and will gradually transition to B757-200 as A310 retires. UPS predominantly operates the Boeing B757-200 at PBI but also utilizes the A300-600 and B767-300 on occasion. The payload capacity of FedEx's A310-200 is higher than UPS's Boeing 757-200. Thus, while the total cargo volume at PBI increased in the past five years, all-cargo aircraft operations actually decreased.

The ratio of cargo volume to cargo aircraft operations increased from 8.4 in 2009 to 14.1 in 2013 and over 20 in 2014. The 2014 ratio is used to forecast all-cargo aircraft operations as this approach reflects the current all-cargo characteristics at PBI and assumes a stable operation similar to current conditions in the 20 year planning horizon. The forecast all-cargo operations for the high, base, and low cases are summarized in **Table 3.29**.

3.5.5 General Aviation and Air Taxi Operations

General aviation is the operation of civilian aircraft for purposes other than commercial passenger or freight transport and includes personal, business and instructional flying. The commercial operations of commuters or regional airlines are excluded from the general aviation category; however, operations of non-commercial air taxi operators are included in the analysis of this section.

Business aviation plays an important role at PBI and has demonstrated continuous growth in past years. The overall decline in total general aviation activities is attributable to the non-business portion of general aviation. With the opening of the NetJets terminal in 2014, the positive economic outlook driven by increasing corporate profiles, growth of statewide and national GDP, and concerns about safety, security screening hassles, and flight delays, it is anticipated that business aviation will continue increasing and attract more affluent business travelers to PBI.

The projection of business aviation demand is based on the historic growth trend in the past five years and assumes an average annual growth rate of 2.69%. Total business aviation operations are projected to reach approximately 96,500 by 2035 while the non-business portion of the general aviation is estimated to decrease by -3.53% based on historic trends.

As previously noted, many business aircraft are owned by individuals or businesses and they typically are operated by employed crews who are responsible for the operation of the aircraft. They are not used for compensation or hire and are regulated by FAR Part 91 instead of FAR Part 135. It is anticipated that the growth of the business aviation, which operates as general aviation under FAR Part 91, will be greater than air taxi activities under FAR Part 135. The forecast of air taxi operations represent a share of total projected business aviation operations, including an average of 48.8% between 2009 and 2014 which is gradually reduced to 40% by 2035. Conversely, business operations will increase from 51.2 % to 60% of total business aviation demand by 2035.

The split between itinerant and local general aviation activities is based on the historical average in the last five years from the FAA ATADS, approximately 98.8% itinerant and 1.2% local. **Table 3.30** summarizes the projections for air taxi and general aviation operations.

Table 3.29: All-Cargo Aircraft Operation Projections

Year	All-Cargo Aircraft Operations		
	High	Base	Low
2015	1,439	1,413	1,404
2020	1,759	1,575	1,520
2025	2,150	1,749	1,632
2030	2,629	1,932	1,731
2035	3,214	2,135	1,835
Period	**AAGR (%)**		
2015-2020 (5-year)	4.10%	2.20%	1.60%
2015-2025 (10-year)	4.10%	2.16%	1.52%
2015-2035 (20-year)	4.10%	2.09%	1.35%

Source: AECOM Analysis

Table 3.30: Air Taxi and General Aviation Operations Projects

Year	Business Aviation	Air Taxi	General Aviation (Business)	General Aviation (Non-Business)	General Aviation (Itinerant)	General Aviation (Local)	Total General Aviation	Air Taxi & General Aviation (Total Non-Commercial)
2015	56,748	27,451	29,297	29,904	58,481	720	59,201	86,652
2020	64,805	29,893	34,911	24,983	59,166	728	59,894	89,788
2025	74,005	32,553	41,452	20,872	61,566	758	62,324	94,877
2030	84,512	35,450	49,062	17,437	65,690	809	66,499	101,949
2035	96,511	38,604	57,906	14,567	71,592	881	72,474	111,078
Period	**AAGR (%)**							
2015-2020 (5-year)	2.69	1.72	3.57	-3.53	0.23	0.23	0.23	0.71
2015-2025 (10-year)	2.69	1.72	3.57	-3.53	0.52	0.52	0.52	0.91
2015-2035 (20-year)	2.69	1.72	3.53	-3.53	1.02	1.02	1.02	1.25

Note: Numbers may not add due to rounding

Source: AECOM Analysis

3.5.6 Military Operations

Military activity is relatively minimal at PBI and can vary due to many unpredictable factors such as the political climate and variation in government funding on military activities. Without any specific information from the military, it is recommended to assume the military activity will remain constant throughout the planning period for PBI. The number of annual military operations at PBI is projected to maintain at the same level of 1,346 operations as recorded in 2014.

3.5.7 Forecasts by Other Recent Studies

The projected aircraft operations from the recent 2006 Master Plan, FAA TAF, and FDOT FASP forecasts are summarized in **Table 3.31**.

The Master Plan 2005 forecasts and FDOT FASP forecasts are aggressive and projected the commercial (passenger and cargo aircraft), non-commercial (air taxi and general aviation), and total operations to rise at an average annual growth rate much higher than the FAA TAF. The Master Plan 2005 forecasts do not reflect the recent decline in at PBI since 2005. The FDOT FASP forecasts adopt 2012 as the base year. Their estimates for 2013 and 2014 do not represent the actual record.

Table 3.31: Other Aircraft Operations Forecasts

Year	Air Carrier (Passenger and Cargo)			Air Taxi and General Aviation			Total Operations		
	2006 Master Plan	FDOT FASP	FAA TAF	2006 Master Plan	FDOT FASP	FAA TAF	2006 Master Plan	FDOT FASP	FAA TAF
2005	71,641	68,779	61,847	128,823	97,122	136,002	201,964	165,901	198,880
2006	73,186	67,836	60,219	129,370	92,433	132,749	204,087	160,269	194,111
2007	74,765	72,311	63,147	129,920	118,351	127,322	206,232	190,662	191,350
2008	76,379	66,637	60,448	130,474	105,962	118,887	208,400	172,599	179,997
2009	78,027	54,899	53,712	131,031	83,193	88,018	210,590	138,092	142,636
2010	79,712	55,863	52,768	131,592	85,524	86,534	212,804	141,387	140,348
2011	82,044	54,320	52,433	132,156	88,874	90,985	215,766	143,194	144,571
2012	84,445	52,031	50,511	132,723	84,124	85,168	218,769	136,155	136,816
2013	86,917	53,540	47,979	133,294	85,007	85,683	221,814	138,547	134,614
2014	89,463	55,093	48,897	133,869	85,900	87,890	224,901	140,993	137,985
2015	92,084	56,690	49,822	134,447	86,802	88,032	228,031	143,492	139,052
2016	94,900	58,334	51,285	135,029	87,713	88,791	231,508	146,047	141,274
2017	97,802	60,026	52,839	135,614	88,634	89,547	235,038	148,660	143,584
2018	100,795	61,767	54,268	136,203	89,565	90,274	238,622	151,332	145,740
2019	103,881	63,558	55,604	136,796	90,505	91,001	242,260	154,063	147,803
2020	107,062	65,401	56,961	137,392	91,456	91,743	245,954	156,857	149,902
2021	110,554	67,298	58,173	137,992	92,416	92,443	250,147	159,714	151,814
2022	114,161	69,249	59,383	138,596	93,386	93,130	254,411	162,635	153,711
2023	117,888	71,258	60,603	139,203	94,367	93,902	258,747	165,625	155,703
2024	121,737	73,324	61,726	139,815	95,358	94,769	263,158	168,682	157,693
2025	125,714	75,450	62,798	140,430	96,359	95,648	267,644	171,809	159,644
2026		77,639	63,840		97,371	96,535		175,010	161,573
2027		79,890	64,988		98,393	97,422		178,283	163,608
2028		82,207	66,106		99,426	98,328		181,633	165,632
2029		84,591	67,262		100,470	99,234		185,061	167,694
2030		87,044	68,403		101,525	100,156		188,569	169,757
2031		89,568	69,599		102,591	101,088		192,159	171,885
2032		92,166	70,824		103,668	102,038		195,834	174,060
2033			72,095			102,998			176,291
2034			73,311			103,962			178,471
2035			74,517			104,937			180,652
Period					**AAGR (%)**				
2005-2025 (20-year)	2.85	0.46	0.08	0.43	-0.04	-1.74	1.42	0.18	-1.09
2012-2032 (20-year)		2.9	1.7		1.05	0.91		1.83	1.21
2015-2035 (20-year)			2.03			0.88			1.32

3.5.8 Recommended Aircraft Operations Forecast for Master Plan

Commercial aircraft operations are estimated for each scenario based on the high, base, and low cases of enplanement and air cargo tonnage forecasts. Air taxi and general aviation aircraft operations are projected anticipating strong growth in business aviation at PBI. Together, these forecasts, as presented in **Table 3.32** and illustrated in **Figure 3.25, Figure 3.26**, and **Figure 3.27**, provide a reasonable range of expected aircraft operations throughout the planning horizon.

The total aircraft operation forecast scenarios for the 5-year, 10-year and 20-year planning periods are comparable to the FAA TAF. The average annual growth rate in the FAA TAF is 1.32% over the 20-year planning period. The average annual growth rate in the forecast scenarios developed for this Master Plan vary from 1.20% to 1.67%.

For master planning and facilities planning purposes, it is recommended to adopt the base case for total aircraft operations, which is based on FAA TAF enplanements. The average annual growth rate of 1.45% represents a moderate growth between the high and low cases.

A comparison of the projected total operations with the FAA TAF is included in **Table 3.32**. The forecast total operations for the high, base and low cases differ from the FAA TAF by 0.69%, -0.52%, and -2.06% (i.e. less than 10%) in the 5-year forecast period, and 2.10%, -0.36%, and -3.20% (i.e. less than 15%) in the 10-year forecast period respectively. Comparison of Aircraft Operations

Table 3.32: Forecast and FAA TAF

Year	Air Carrier			Air Taxi	General Aviation	Military	Total Operations			Percentage Difference with FAA TAF		
	High	Base 1	Low				High	Base	Low	High	Base	Low
2015	51,456	51,376	52,145	27,451	59,201	1,346	139,454	139,374	140,143	0.29%	0.23%	0.78%
2020	59,802	57,989	55,685	29,893	59,894	1,346	150,936	149,122	146,819	0.69%	-0.52%	-2.06%
2025	66,775	62,843	58,306	32,553	62,324	1,346	162,998	159,066	154,529	2.10%	-0.36%	-3.20%
2030	74,185	67,935	61,636	35,450	66,499	1,346	177,480	171,230	164,931	4.55%	0.87%	-2.84%
2035	81,962	73,363	65,416	38,604	72,474	1,346	194,386	185,788	177,840	7.60%	2.84%	-1.56%
Period							**AAGR (%)**					
2015-2020 (5-year)	3.05%	2.45%	1.32%	1.72%	0.23%	0.00%	1.59%	1.36%	0.94%			
2015-2025 (10-year)	2.64%	2.04%	1.12%	1.72%	0.52%	0.00%	1.57%	1.33%	0.98%			
2015-2035 (20-year)	2.35%	1.80%	1.14%	1.72%	1.02%	0.00%	1.67%	1.45%	1.20%			

Note:
(1) Base Case for passenger air carrier operations is estimated from FAA TAF enplanement forecasts, issue January 2015.
(2) Numbers may not add up due to rounding.

Source:
(1) FAA TAF, issue January 2015.
(2) AECOM Analysis.

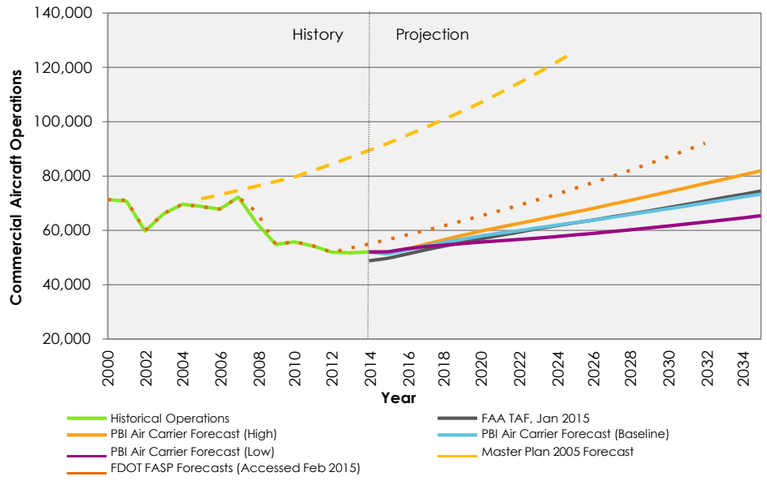


Figure 3.25: Total Commercial Aircraft Operations Forecast

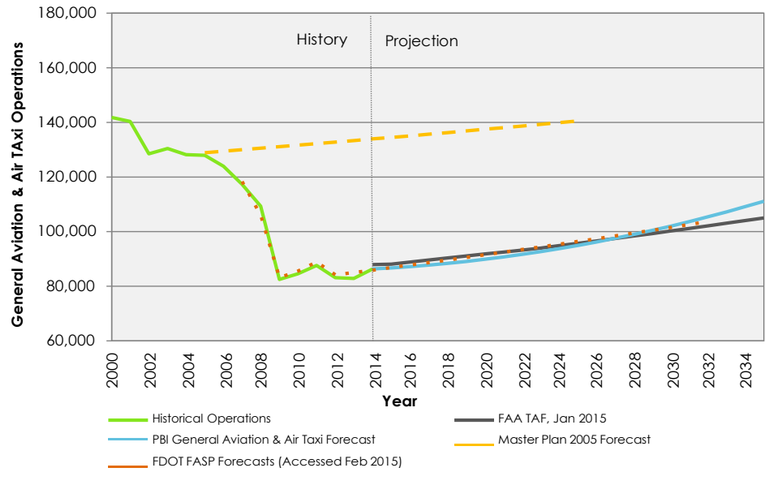


Figure 3.26: Total General Aviation & Air Taxi Operations Forecast

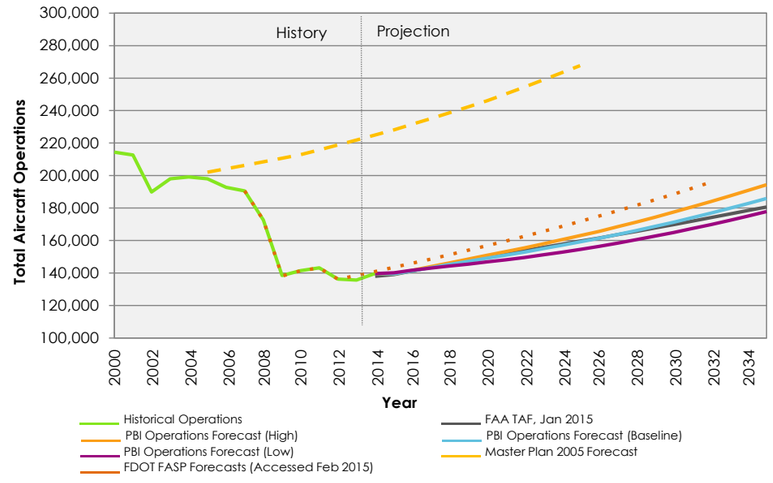


Figure 3.27: Total Aircraft Operations Forecast

3.6 Based Aircraft Forecast

It is anticipated that the growth in business aviation demand will be driven by a strong recovery in the U.S. economy, especially in the turbo jet market, and will continue to grow over the long term. Furthermore, the restriction on jet aircraft operation at the Palm Beach County Park Airport (LNA) favors the growth of based jet aircraft at PBI. Since it is expected that the number of single- and multi-engine based aircraft and helicopters will maintain a level similar to the existing, growth of based aircraft at PBI will focus on jet aircraft.

Figure 3.28 identifies the based jet aircraft forecast. **Table 3.33** summarizes the total based aircraft forecast as well as a comparison of the total based aircraft forecast with the FAA TAF. **Figure 29** illustrates the total based aircraft forecast. Three different scenarios are identified that reflect high, moderate, and low forecast estimates:

Scenario 1 – Bombardier Business Aircraft Market Forecast 2014-2033

Bombardier annually conducts a detailed analysis on the business manufacturing industry for different regions and markets worldwide. In the recent forecast Bombardier projects the business jet aircraft fleet in North America will grow at an average annual rate of 2% from 2013 to 2033. The forecast analysis includes estimates of new aircraft deliveries and the retirement of old aircraft. Scenario 1 utilizes the Bombardier's Business Aircraft Market Forecast (extrapolated to 2035) to derive a based aircraft projection of 177 in 2035.

Scenario 2 – Time-Series Model

The historic growth rate of business jet aircraft from 2000 to 2012 was projected out to 2035 using a time series model. This analysis projects based jet aircraft will total approximately 153 by 2035. The historic record for 2013 and 2014 are not included in the time series model because the recent spike is highly impacted by individual incidents, e.g. the new hangar spaces and new business aviation terminal facilities, which attracts relatively high growth in based jet aircraft numbers in the short term. Scenario 2 represents growth since 2000 and assumes the long term growth continues similar to the historic trend. The average annual growth rate of approximately 1.28% results in an estimate of 153 based jet aircraft in 2035.

Scenario 3 – Pessimistic Case

Scenario 3 takes a more pessimistic approach than Scenarios 1 and 2. It represents a low case in the event economic conditions are not as positive as assumed in the Bombardier Business Aircraft Market Forecast (which assumes GDP at the North America to grow at 2.5% per year on average), and the growth starts to slow down and follow a trend similar to the first half of the 2000s. Scenario 3 assumes an average annual growth rate of 0.72% which projects based jet aircraft of 136 by 2035.

The total based aircraft forecast for the high Scenario 1, moderate Scenario 2 and low Scenario 3 differ from the FAA TAF by 13.03%, 9.22%, and 6.35% in the 5-year forecast period; and 17.65%, 10.37%, and 5.07% in the 10-year forecast period respectively. Both Scenarios 2 and 3 are within the 10-percent and 15-percent differences from FAA TAF for the 5-year and 10-year planning period. For master planning and facilities planning purposes, it is recommended to adopt the moderate Scenario 2 as the baseline for based aircraft projections. The average annual growth rate of 1.04% represents a moderate growth between the high and low cases.

Table 3.33: Based Aircraft Projections

Year	Single-Engine	Jet			Multi-Engine	Helicopter	Total Based Aircraft			Percentage Difference with FAA TAF		
		Scenario 1	Scenario 2	Scenario 3			High	Base	Low	High	Base	Low
2015	6	119	118	118	8	17	150	149	149	8.16%	7.55%	7.08%
2020	6	132	126	122	8	17	163	157	153	13.03%	9.22%	6.35%
2025	6	145	135	127	8	17	176	166	158	17.65%	10.37%	5.07%
2030	6	161	143	131	8	17	192	174	162	23.62%	12.51%	4.67%
2035	6	177	153	136	8	17	208	184	167	30.21%	14.88%	4.39%
Period						**AAGR (%)**						
2015-2020 (5-year)	0	2	1.28	0.72	0	0	1.6	1.02	0.57			
2015-2025 (10-year)	0	2	1.28	0.72	0	0	1.62	1.03	0.57			
2015-2035 (20-year)	0	2	1.28	0.72	0	0	1.64	1.04	0.58			

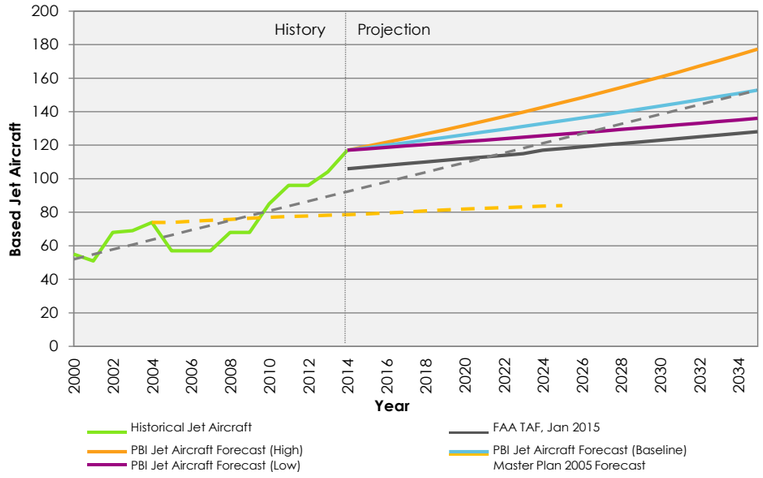


Figure 3.28: Total Based Jet Aircraft Forecast

Sources:

(1) Florida Commercial Services Forecast; FDOT; January 2013.
(2) FAA TAF, January 2015. TAF base year is Federal Fiscal Year 2013.
(3) Master Plan 2005.
(4) AECOM Analysis.

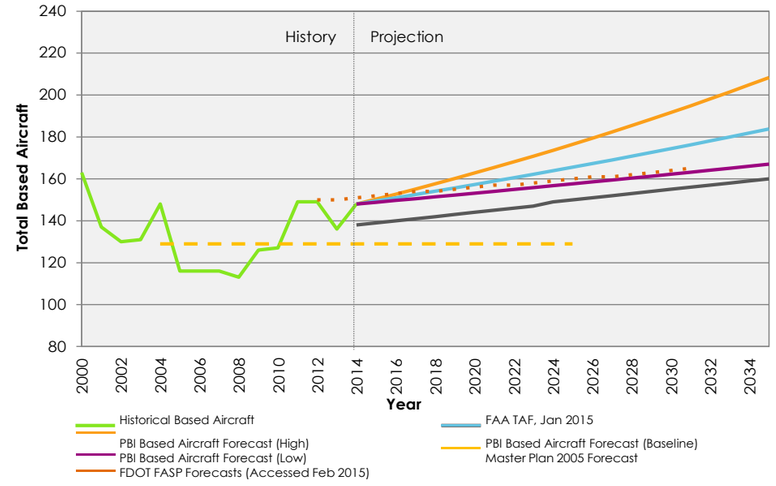


Figure 3.29: Total Based Aircraft Forecast

Sources:

(1) Florida Commercial Services Forecast; FDOT; January 2013.
(2) FAA TAF, January 2015. TAF base year is Federal Fiscal Year 2013.
(3) Master Plan 2005.
(4) AECOM Analysis.

3.7 Summary of Aviation Activity Forecasts

Table 3.34 summarizes the recommended forecasts for enplanements, aircraft operations, and based aircraft for PBI.

Disclaimer

All forecasts are subject to levels of uncertainty. The forecasts provided in this Master Plan are based on the information available at the time of their creation. Various factors, other than those included in the forecast models, can influence future aviation demand. Unexpected events may occur and some underlying forecast assumptions and/or expectations may not materialize. Therefore, actual performance may differ from the forecasts presented in this chapter and could be significant.

Table 3.34: Summary of Aviation Activity Forecasts

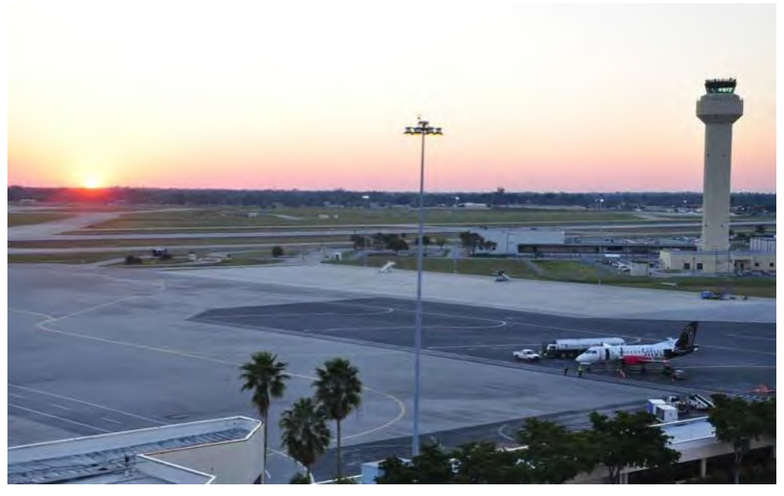
Year	Total Enplanements[1]	Operations					Based Aircraft				
		Air Carrier	Air Taxi	General Aviation	Military	Total Operations	Single-Engine	Jet	Multi-Engine	Helicopter	Total Based Aircraft
Actual											
2014	2,940,798	52,106	27,157	59,103	1,346	139,712	6	117	8	17	148
Forecast											
2015	3,002,439	51,376	27,451	59,201	1,346	139,374	6	118	8	17	149
2020	3,401,173	57,989	29,893	59,894	1,346	149,122	6	126	8	17	157
2025	3,722,382	62,843	32,553	62,324	1,346	159,066	6	135	8	17	166
2030	4,058,835	67,935	35,450	66,499	1,346	171,230	6	143	8	17	174
2035	4,423,373	73,363	38,604	72,474	1,346	185,788	6	153	8	17	184
Period		**AAGR (%)**									
2015-2020 (5-year)	2.53	2.45	1.72	0.23	0	1.36	0	1.28	0	0	1.02
2015-2025 (10-year)	2.17	2.04	1.72	0.52	0	1.33	0	1.28	0	0	1.03
2015-2035 (20-year)	1.96	1.8	1.72	1.02	0	1.45	0	1.28	0	0	1.04

Note:

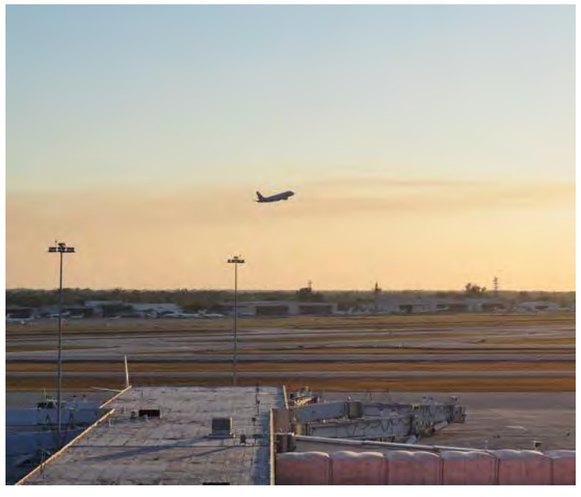
(1) Numbers may not add up due to rounding

Sources:

(1) FAA TAF (January 2015)
(2) AECOM Analysis



Regional Jet at Concourse A
Source: AECOM (2014)



Runway 28R Takeoff
Source: AECOM (2014)

3.8 Operational Peaks

Passenger demand patterns at an airport are subject to seasonal, monthly, daily, and even hourly variations. These variations result in peak periods when the greatest amount of demand is upon the facilities. Peaking characteristics identify the expected peak periods throughout the planning horizon for facility planning purposes. The peak periods assessed in this section include:

- Commercial activities (enplanements and aircraft operations)
  - Domestic Mainline
  - Domestic Regional
  - International
- Non-commercial activities (aircraft operations)
  - All-Cargo aircraft
  - General Aviation, Air Taxi, and Others (e.g. Military)

Passenger enplanements and non-commercial activity peaks are primarily used to determine the requirements for the Terminal, General Aviation, and Cargo facilities (Chapters 5 and 7 respectively). However, they are included in this section as they also impact the airside components such as airfield capacity and runway length requirements.

3.8.1 Average Day of the Peak Month and Peak Hour

FAA guidance recommends using the peak hour of the average day in the peak month (ADPM) for the purposes of physical facility planning. The peak hour determination for enplanements and aircraft operations are based on monthly and hourly historic data from PBI Airport Passenger Statistics Reports, FAA Aviation System Performance Metrics (ASPM), and Airport Noise and Operations Monitoring System (ANOMS).

Figure 3.30, **Figure 3.31**, **Figure 3.32**, and **Figure 3.33** depict monthly enplanements, commercial aircraft operations, all-cargo aircraft operations, general aviation and other aircraft operations at PBI between 2003 and 2014, respectively. The peak month during this period is consistently March for enplanements, operations, general aviation and other aircraft operations while December is the peak for all-cargo aircraft operations.

The following sections summarize the peak month, ADPM, and peak hour demands for the different categories of aviation activity.

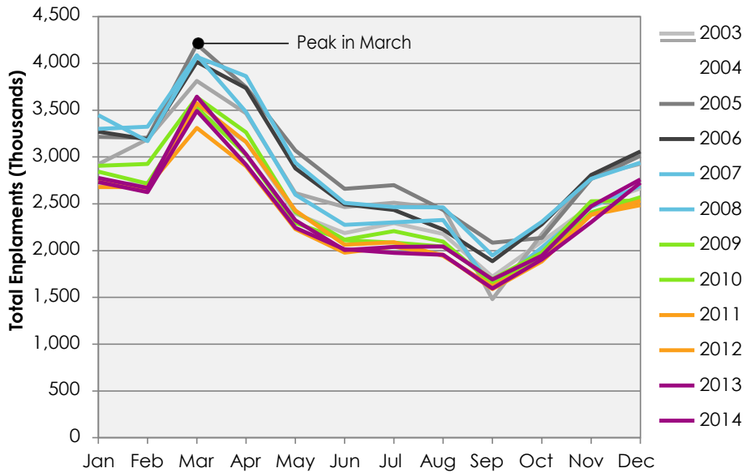


Figure 3.30: Monthly Passenger Enplanements
Sources: PBI Passenger Statistics Reports 2003 to 2014

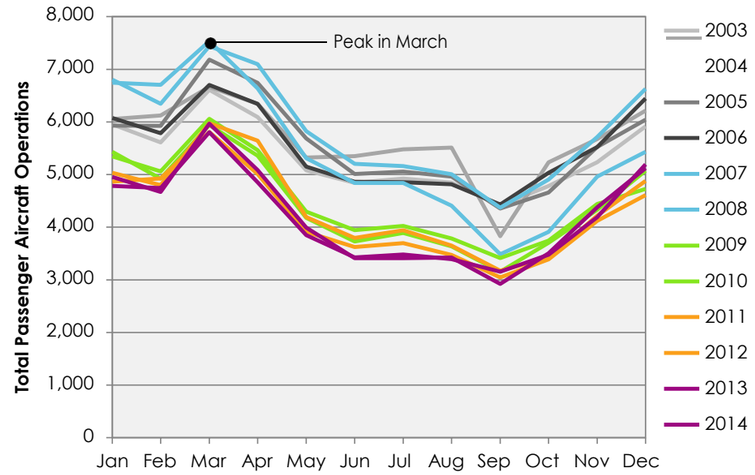


Figure 3.31: Monthly Commercial Aircraft Operations
Sources: PBI Passenger Statistics Reports 2003 to 2014

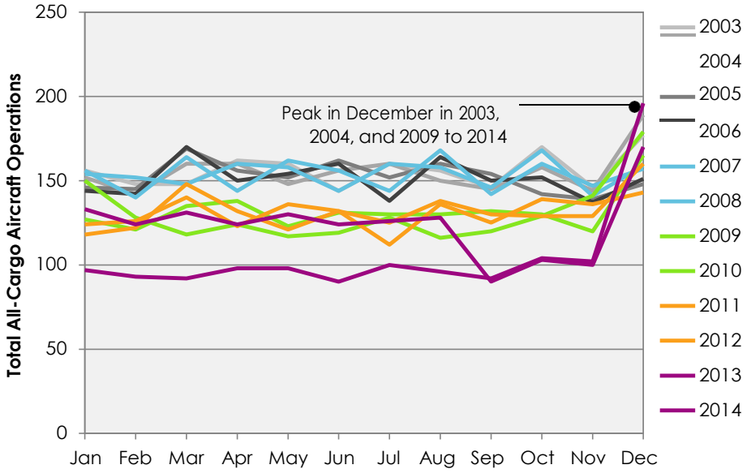


Figure 3.32: Monthly All-Cargo Aircraft Operations
Sources: PBI Passenger Statistics Reports 2003 to 2014

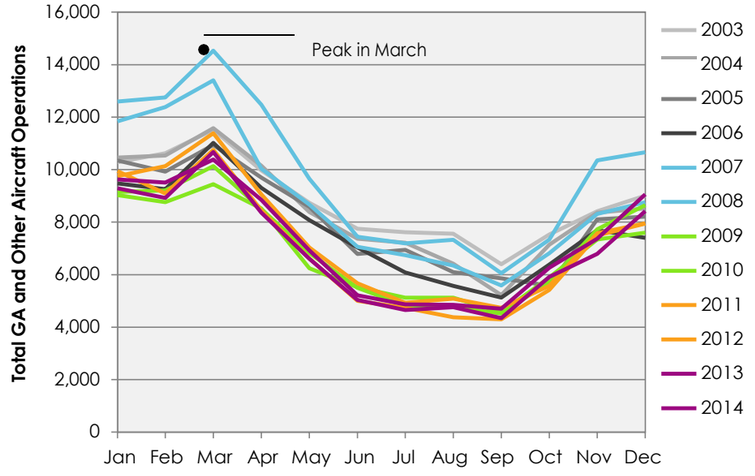


Figure 3.33: Monthly General Aviation & Other Aircraft Operations
Sources: PBI Passenger Statistics Reports 2003 to 2014

3.8.2 Domestic Mainline Enplanements

The peaking characteristics of domestic passengers at PBI are similar to the pattern of the overall total passengers since approximately 98% of the total passengers are domestic and most of the services are provided by mainline carriers (nearly 97%).

The peak month of March typically accounted for 11.3% to 12.4% of the total domestic passengers between 2003 and 2015 as depicted in **Figure 3.34**. The historic trend shows that growth in the peak month is slightly higher than the other months of the same year. Therefore, it is assumed that peak month enplanements will be approximately 12.4% of total annual enplanements for the 20-year planning horizon.

The peak hour analysis for domestic mainline activities is based on the flight schedule for the ADPM. **Figure 3.35** shows the daily distribution of domestic mainline enplaned and deplaned passengers on a typical Friday in March 2015[13]. Accordingly, peak hour demand is approximately 12.5% and 13.4% of daily demand for enplanement and deplanements passengers respectively.

Table 3.35 summarizes the peak hour demands for domestic mainline passenger demands based on the estimated peak month ratio (12.4%), number of days in the peak month (31), and the peak hour ratio (12.5 % for enplanements and 13.4% for deplanements). Based on these historic trends, it is anticipated that peak hour enplanements and deplanements will increase from 1,454 and 1,551 to 2,123 and 2,265 (46%) respectively during the planning horizon.

Table 3.35: Domestic Mainline Passenger Demand Peaking Characteristics

Domestic Mainline Passenger Demand	2014 (Existing)	2015	2020	2025	2030	2035
Annual Enplanements	2,846,171	2,904,546	3,283,013	3,585,111	3,900,485	4,241,351
Peak Month Enplanements	342,231	359,352	406,176	443,552	482,570	524,742
ADPM Enplanements	11,040	11,592	13,102	14,308	15,567	16,927
Peak Hour Enplanements	1,384	1,454	1,643	1,794	1,952	2,123
Peak Hour Deplanements	1,477	1,551	1,753	1,914	2,083	2,265

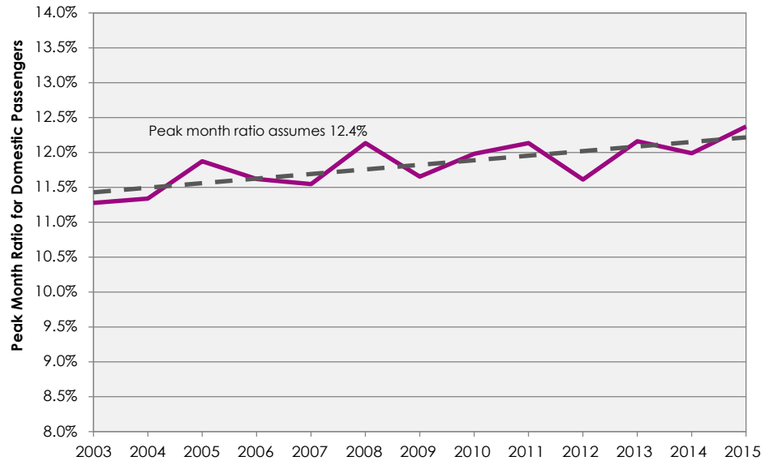
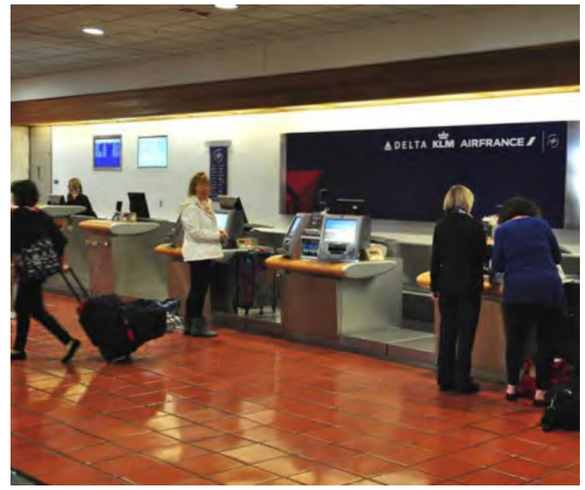
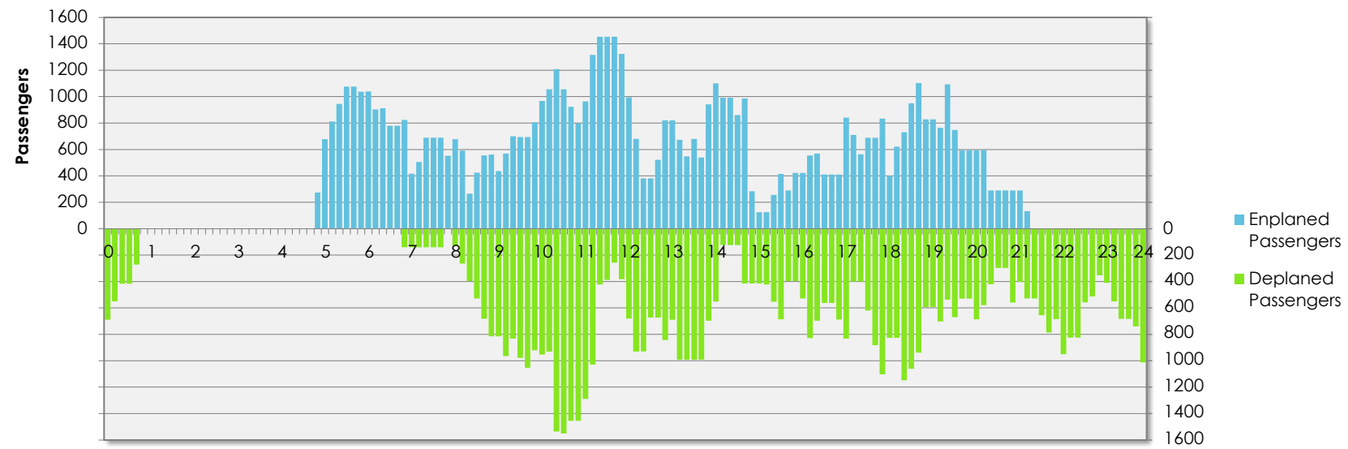


Figure 3.34: Percentage of Domestic Passengers in March over Annual Domestic Passengers



Passengers at Ticketing Counters
Source: AECOM (2014)



Peak Rolling Hour:	Peak Hour Begins at 11:30	Peak Hour Begins = 1,454
Enplaned Passengers:	Daily Total = 11,592	% of Daily Total = 12.5%
Peak Rolling Hour:	Peak Hour Begins at 10:40	Peak Hour Begins = 1,550
Deplaned Passengers:	Daily Total = 11,587	% of Daily Total = 13.4%

Figure 3.35: ADPM Domestic Mainline Passenger Profile in Rolling 60 Minute Periods (March 2015)
Source: AECOM Analysis of PBI Monthly Schedule Report March 2015.

13 *Based on review of the 2015 PBI Monthly Schedule Report*

3.8.3 Domestic Mainline Aircraft Operations

The peak month of March typically accounted for 9.8% to 12% of total passenger aircraft operations through 2003 to 2014 as shown in **Figure 3.36**. The historic trend indicates the growth in peak month aircraft operations is higher than other months within the same year. Therefore, it is assumed that the peak month passenger aircraft operations will be approximately 12% of the annual passenger aircraft operations for the 20-year planning horizon.

The peak hour analysis for domestic mainline air carrier operations is based on the PBI Monthly Schedule Report for March 2015 which indicates 97 departures and 97 arrivals on a typical Friday in March 2015. Domestic mainline aircraft operations accounted for 85 of the departures and arrivals, or roughly 88%. **Figure 3.37** depicts the hourly distribution of scheduled domestic mainline departure and arrival operations. The peak hour operation is approximately 11.8% and 12.9% of the ADPM operations for departures and arrivals respectively.

Table 3.36 summarizes the peak hour demands for domestic mainline passenger demands based on the estimated peak month ratio (12%), number of days in the peak month (31), and the peak hour ratio (11.8 % for enplanements and 12.9% for deplanements). Based on these historic trends, it is anticipated that peak hour departures and arrivals will increase from 10 and 11 in 2015 to 15 (50%) and 16 (46%) in 2035 respectively.

Table 3.36: Domestic Mainline Aircraft Operations Peaking Characteristics

Domestic Mainline Aircraft Operations	2014 (Existing)	2015	2020	2025	2030	2035
Annual Operations	47,016	46,165	52,181	56,597	61,163	66,065
Peak Month Operations	5,235	5,270	6,262	6,792	7,340	7,928
ADPM Operations	169	170	202	219	237	256
Peak Hour Departures	10	10	12	13	14	15
Peak Hour Arrivals	11	11	13	14	15	16

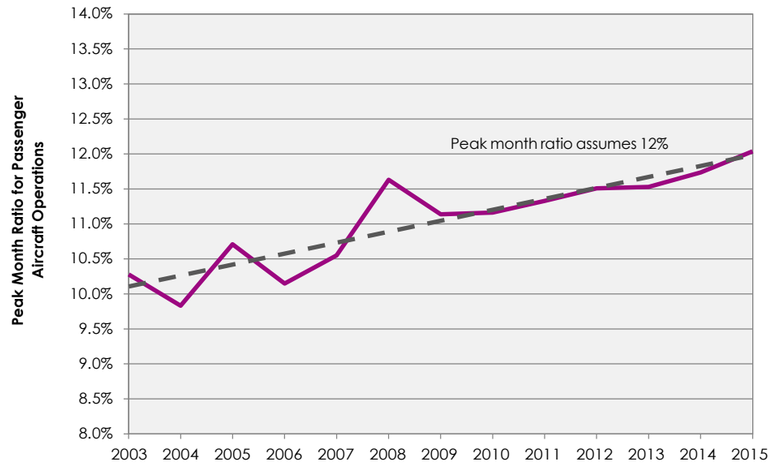
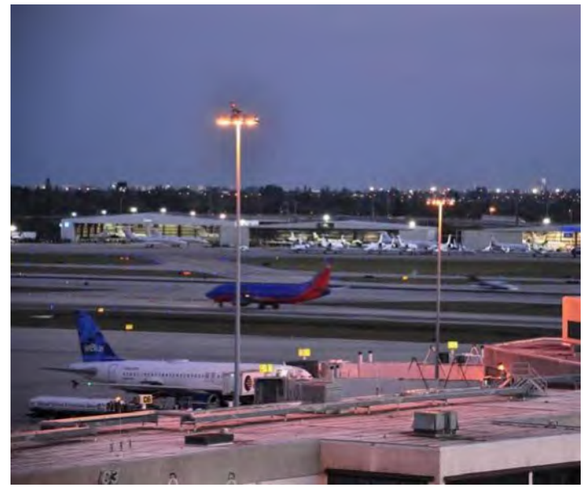
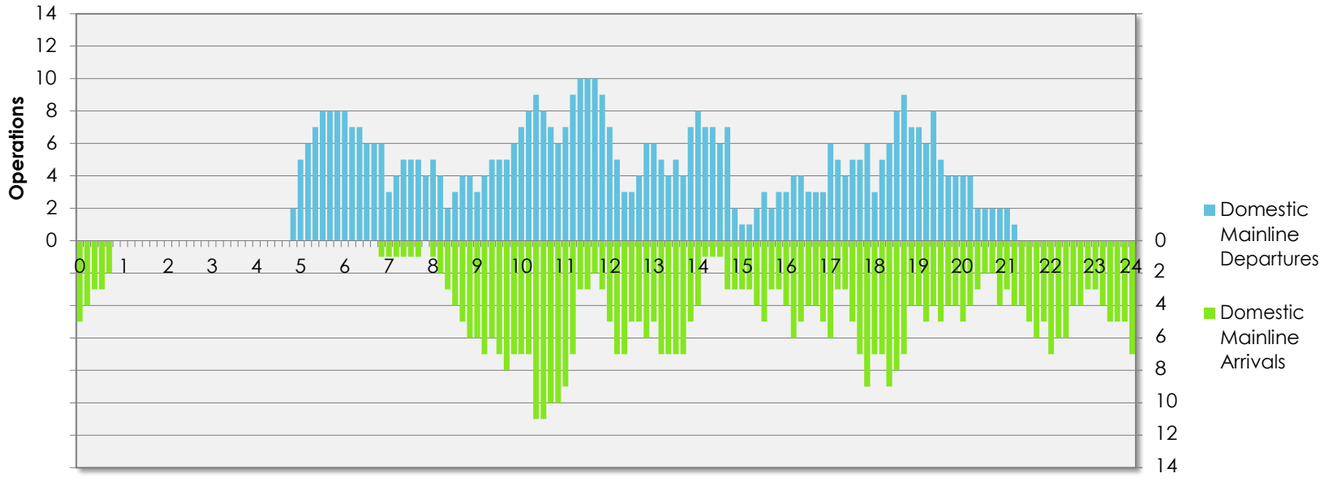


Figure 3.36: Percentages of Aircraft Operations in March over Annual Aircraft Operations
Source: AECOM Analysis of PBI Monthly Schedule Report March 2015.



Night Operations at PBI
Source: AECOM (2014)



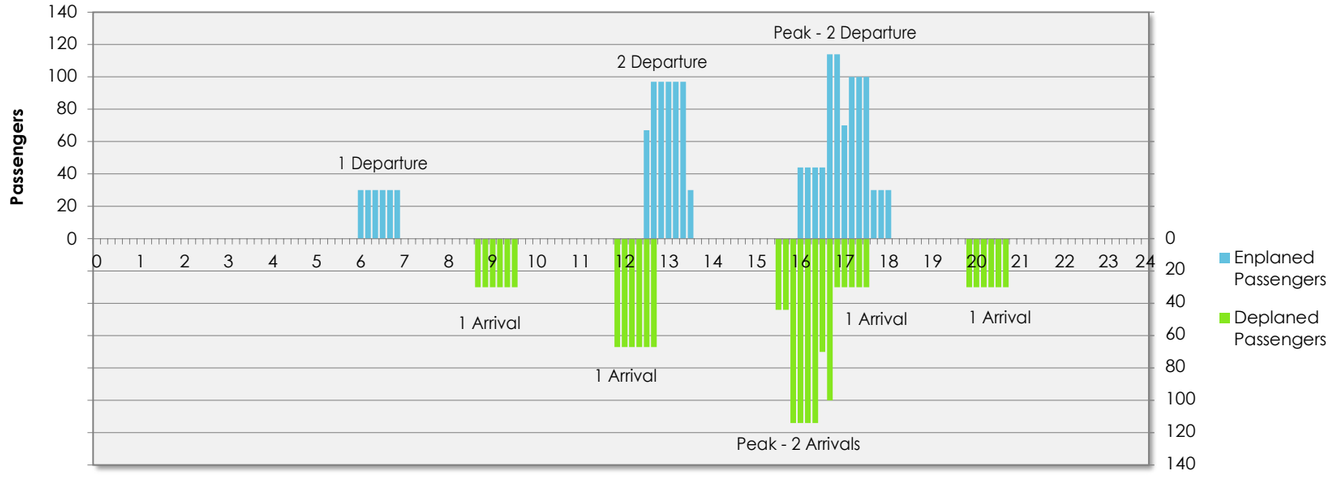
Peak Rolling Hour:	Peak Hour Begins at 11:30	Peak Hour Begins = 10
Departures	Daily Total = 85	% of Daily Total = 11.8%
Peak Rolling Hour:	Peak Hour Begins at 10:40	Peak Hour Begins = 11
Arrivals:	Daily Total = 85	% of Daily Total = 12.9%

Figure 3.37: ADPM Domestic Mainline Passenger Profile in Rolling 60 Minute Periods (March 2015)
Source: AECOM Analysis of PBI Monthly Schedule Report March 2015.

3.8.4 Domestic Regional Enplanements & Aircraft Operations

The ADPM and peak hour analysis for domestic regional activities is based on the flight schedule for the ADPM. **Figure 3.38** depicts the daily distribution of domestic regional enplaned and deplaned passengers on a typical Friday in March 2015 as derived from the PBI Monthly Schedule Report 2015 as well as the corresponding number of arrivals and departures. The average daily demand for regional enplanements is approximately 271. The peak hour demand is approximately 42.1% of the daily demand for enplaned and deplaned passengers.

Table 3.37 summarizes the peak demands for domestic regional passengers. **Table 3.38** summarizes the peak demands for aircraft operations for the six departures and arrivals of regional carriers.



Peak Rolling Hour:	**Peak Hour Begins at 16:50**	**Peak Hour Begins = 114**
Enplaned Passengers	**Daily Total = 271**	**% of Daily Total = 42.1%**
Peak Rolling Hour:	**Peak Hour Begins at 16:00**	**Peak Hour Begins = 114**
Deplaned Passengers:	**Daily Total = 271**	**% of Daily Total = 42.1%**

Figure 3.38: ADPM Domestic Regional Passenger Profile and Operations in Rolling 60 Minute Periods
Source: AECOM Analysis of PBI Monthly Schedule Report March 2015.

Notes:

(1) Departure and arrival operations are annotated in the graph.
(2) Load factor assumes March 2014 record from the U.S. DOT T-100 data (i.e. 87.34% for domestic).

Table 3.37: Domestic Regional Passenger Demand Peaking Characteristics

Domestic Regional Passenger Demand	2014 (Existing)	2015	2020	2025	2030	2035
Annual Enplanements	35,223	35,893	40,273	43,654	47,138	50,869
Peak Month Enplanements	8,014	8,403	9,428	10,219	11,035	11,908
ADPM Enplanements	259	271	304	330	356	384
Peak Hour Enplanements	109	114	128	139	150	162
Peak Hour Deplanements	109	114	128	139	150	162

Table 3.38: Domestic Regional Air Carrier Operations Peaking Characteristics

Domestic Regional Aircraft Operations	2014 (Existing)	2015	2020	2025	2030	2035
Annual Operations	1,865	1,829	2,012	2,098	2,224	2,314
Peak Month Operations	370	372	409	427	452	471
ADPM Operations	12	12	13	14	15	15
Peak Hour Departures	2	2	2	2	2	3
Peak Hour Arrivals	2	2	2	2	2	3

3.8.5 International Enplanements & Operations

The historic peak month for international passengers at PBI is also March as illustrated in **Figure 3.39**. However, a higher proportion of the international enplanements occurred during the peak season between December to April than the low season between September and October as compared to domestic activities. As depicted in **Figure 3.40**, between 2003 and 2015 approximately 12% to 24.8% of annual international passengers occurred in March. The historic trend indicates growth in international passengers during the peak seasons will outpace the low seasons. Therefore, it is assumed that the peak month for international enplanements will be approximately 24.8% of the annual international enplanements during the 20-year planning horizon.

Similar to analysis for domestic passengers, the peak hour analysis for international passengers is based on the flight schedule of the ADPM. **Figure 3.41** depicts the daily distribution of international enplaned and deplaned passengers as derived from the PBI Monthly Schedule Report 2015. The peak hour demand is approximately 50.8% of the daily demand for both enplaned and deplaned international passengers. **Table 3.39** summarizes the peak demands for international passengers. **Table 3.40** summarizes the peak demands for international aircraft operations for the six departures and arrivals of international air carriers.

Additionally, the DOA is anticipating growth in international activities at PBI with the potential of new flights from Canada for the Canadian Cruise Line. The estimated peak demand is approximately 500 passengers per hour or 250 passengers during the peak 30 minutes. The aircraft are likely to include a B757, B787, and/or A350 with seat capacities ranging from approximately 180 to over 300 seats. Therefore, two to three international flights are expected during the peak hour.

Table 3.39: International Passenger Demand Peaking Characteristics

International Passenger Demand	2014 (Existing)	2015	2020	2025	2030	2035
Annual Enplanements	59,404	62,000	77,887	93,618	111,212	131,153
Peak Month Enplanements	14,318	15,376	19,316	23,217	27,580	32,526
ADPM Enplanements	462	496	623	749	890	1,049
Peak Hour Enplanements	235	252	317	380	452	533
Peak Hour Deplanements	235	252	317	380	452	533

Table 3.40: International Air Carrier Operations Peaking Characteristics

International Air Carrier Operations	2014 (Existing)	2015	2020	2025	2030	2035
Annual Operations	1,966	1,969	2,221	2,398	2,616	2,850
Peak Month Operations	362	372	420	453	494	538
ADPM Operations	12	12	14	15	16	17
Peak Hour Departures	2	2	2	2	3	3
Peak Hour Arrivals	2	2	2	2	3	3

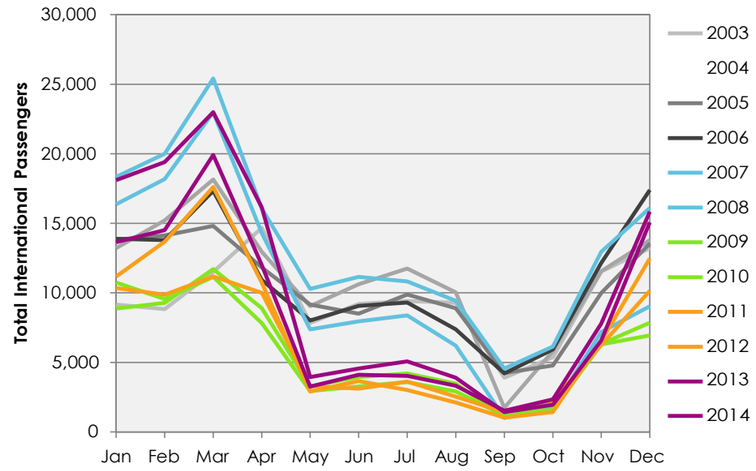


Figure 3.39: Monthly International Enplanements

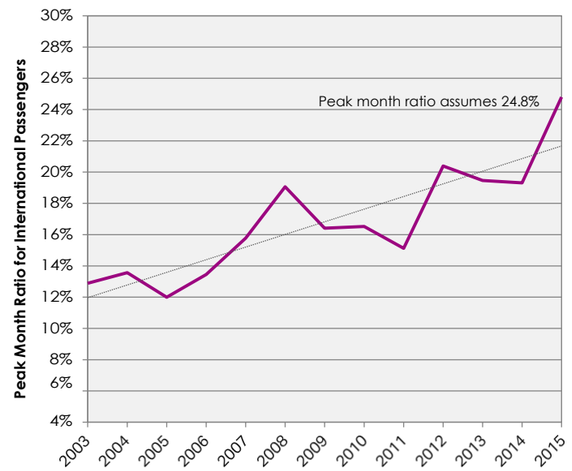
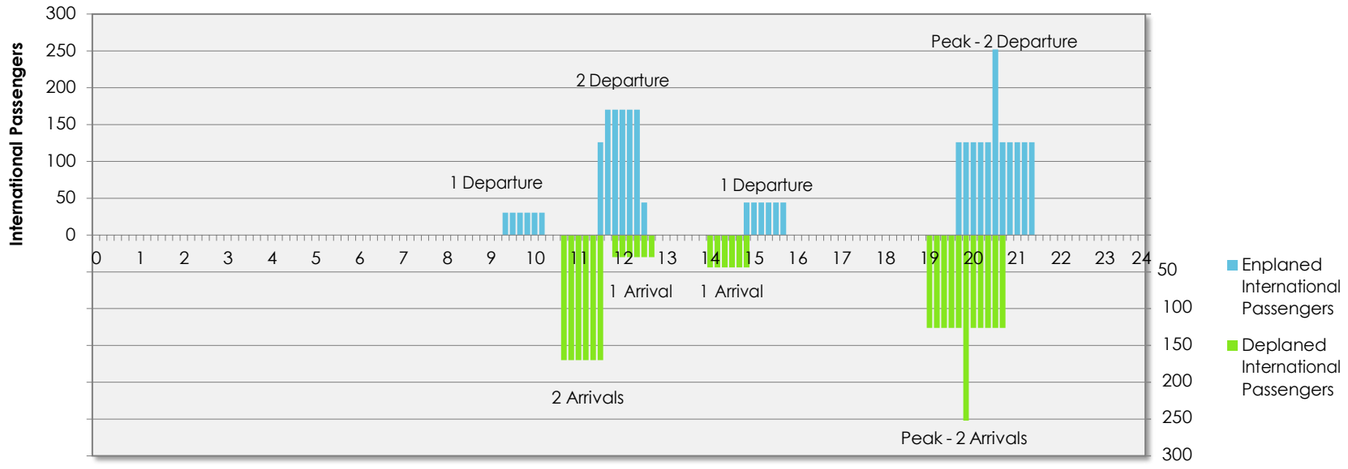


Figure 3.40: Percentages of International Passengers in March over Annual International Passengers



Peak Rolling Hour: Enplaned Passengers	**Peak Hour Begins at 20:40** **Daily Total = 496**	**Peak Hour Begins = 252** **% of Daily Total = 50.8%**
Peak Rolling Hour: Deplaned Passengers:	**Peak Hour Begins at 20:00** **Daily Total = 496**	**Peak Hour Begins = 252** **% of Daily Total = 50.8%**

Figure 3.41: ADPM International Passenger Profile in Rolling 60 Minute Periods (March 2015)

Source: AECOM Analysis of PBI Monthly Schedule Report March 2015.

Notes:

(1) The numbers of departure and arrival operation are annotated in the graph.

(2) Load factor assumes March 2014 record from the U.S. DOT T-100 data

(3) Flights to and from the Bahamas and Canada are considered as international for the peak hour analysis.

3.8.6 All-Cargo Aircraft Peaking Characteristics

The peak month for air cargo operations is in December with the holiday season. The traffic patterns of UPS and FedEx during the two weeks before Christmas, i.e. from December 11 to 25, 2014, were reviewed to identify peaking characteristics.

The air freighters mainly operate on weekdays with minimal operations on Saturdays, and no operations on Sundays and Christmas Day. FedEx generally conducts one to two flights every weekday from Memphis and Miami, and depart to Memphis and Tampa. During the days when FedEx has two flights, one normally operates in the early morning and the other operates in the evening. UPS normally has two to four flights every weekday connecting to their hub in Louisville and other destinations including Philadelphia, Fort Myers, and Miami, etc. Most of UPS flights arrive in the morning and leave either in the morning or in the evening. The peak all-cargo operations normally do not overlap with the peak passenger airline operations.

Figure 3.42, **Figure 3.43**, and **Figure 3.44** present the traffic pattern for UPS and FedEx on three weekdays, Monday to Wednesday, in December 2014[14]. There were approximately 8 to 12 total daily operations on weekdays in December, averaging 10 daily operations. Peak hour air cargo operations include 2 departures and 3 arrivals.

As depicted in **Table 3.41**, peak hour air cargo operations are expected to increase to 3 departures and 5 arrivals by 2035, an increase of 33% and 67% respectively.

Table 3.41: All-Cargo Aircraft Operations Peaking Characteristics

All-Cargo Aircraft Operations	2014 (Existing)	2015	2020	2025	2030	2035
Annual Operations	1,258	1,413	1,575	1,749	1,932	2,135
Peak Month Operations	196	219	244	271	300	331
ADPM Operations	10	11	12	14	15	17
Peak Hour Departures	2	2	2	3	3	3
Peak Hour Arrivals	3	3	4	4	5	5

Source:

The annual and peak month all-cargo operations are based on PBI Passenger Statistics Reports for December 2014 and the missing March 2014 cargo aircraft operations are assumed to be similar to April 2014.

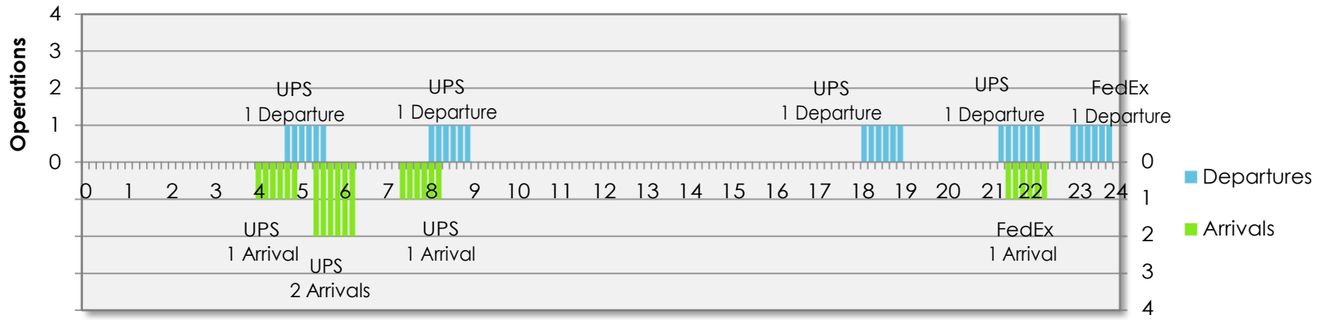


Figure 3.42: All-Cargo Operations on Monday December 22, 2014 in Rolling 60 Minute Periods

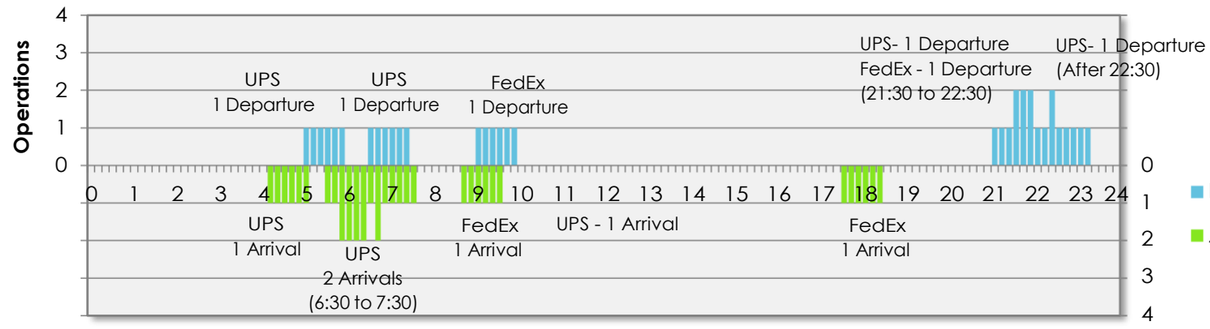


Figure 3.43: All-Cargo Operations on Monday December 23, 2014 in Rolling 60 Minute Periods

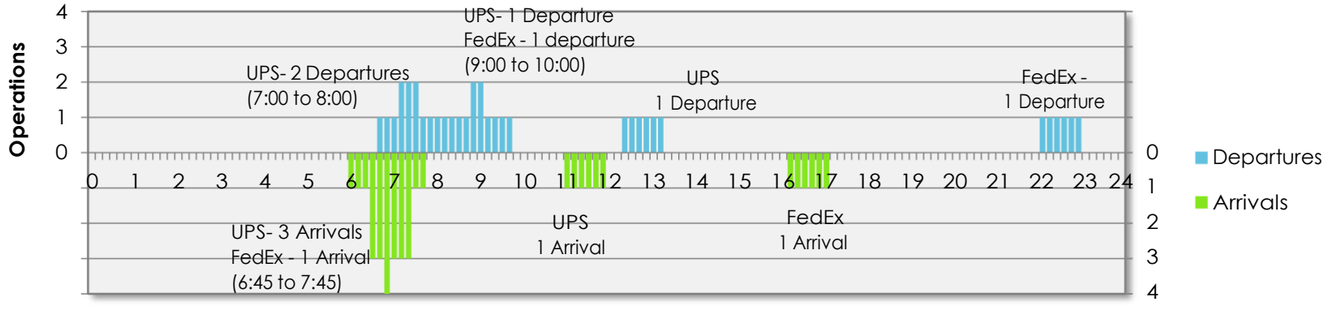


Figure 3.44: All-Cargo Operations on Monday December 24, 2014 in Rolling 60 Minute Periods

14 Traffic patterns are estimated based on historical flight information and observations at the airport.

3.8.7 General Aviation and Air Taxi Aircraft Operations

General aviation and air taxi (AT) activities also peak in March which accounted for between 11% and 12.8% of annual operations from 2003 through 2015 (see **Figure 3.45**). As such, it is assumed that the peak month GA and AT operations will account for approximately 12.8% of the annual operations for the 20-year planning horizon.

Based on a review of ANOMS data, hourly operations between March 6 and March 12, 2014 includes the highest and the lowest number of peak hour operations for all of March 2014. As depicted in **Figure 3.46**, peak hour GA and AT operations vary from 59 operations on the busiest day to 27 operations on the lowest day. **Figure 3.47** presents the general aviation and air taxi operations on the ADPM in 2014 (March 7), including propeller, turboprop, and jet aircraft. During the peak hour, there are approximately 15 air taxi, 3 propeller aircraft, and 31 turboprop and jet aircraft for a total 49 operations. As depicted in **Table 3.42**, peak hour GA and AT operations are expected to increase 68 (39%) operations by 2035.

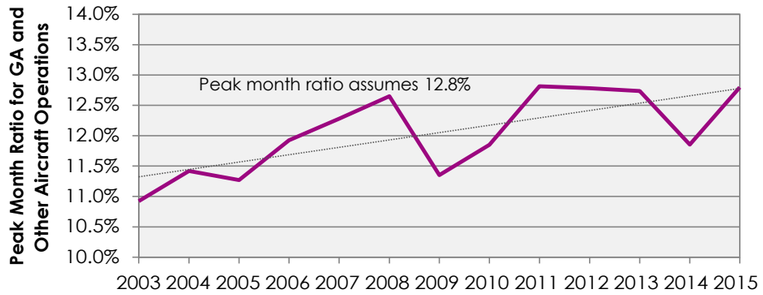


Figure 3.45: Percentages of General Aviation and other Aircraft Operations in March over Annual Operations

Table 3.42: GA and AT Operations Peaking Characteristics

Type	Existing (2014)	Forecast				
		2015	2020	2025	2030	2035
Annual Operations	86,260	86,652	89,788	94,877	101,949	111,078
Peak Month Ops	10,212	11,090	11,493	12,144	13,049	14,218
ADPM Operations	329	358	371	392	421	459
Peak Hour Operations						
Air Taxi	19	21	21	23	24	26
GA (Turboprop & Jet)	31	34	35	37	40	43
GA (Propeller)	5	5	6	6	6	7
Total GA & AT	49	53	55	58	63	68

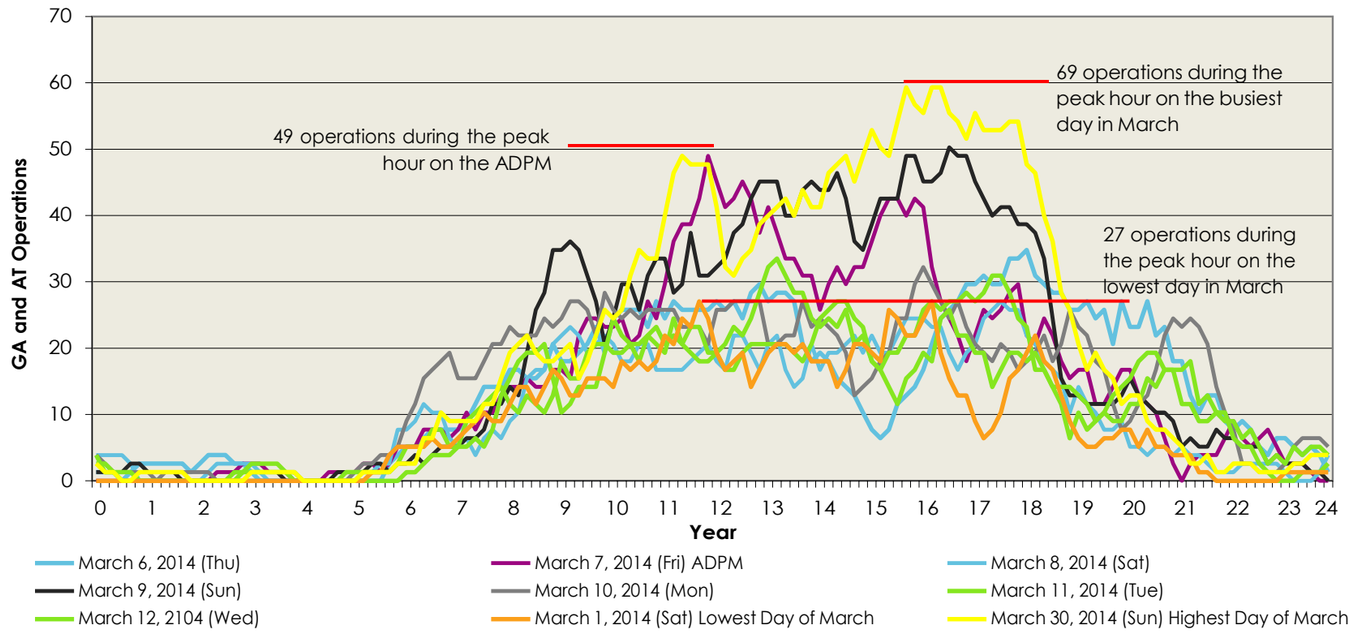


Figure 3.46: General Aviation and Air Taxi Operations in March 2014 in Rolling 60 Minute Periods

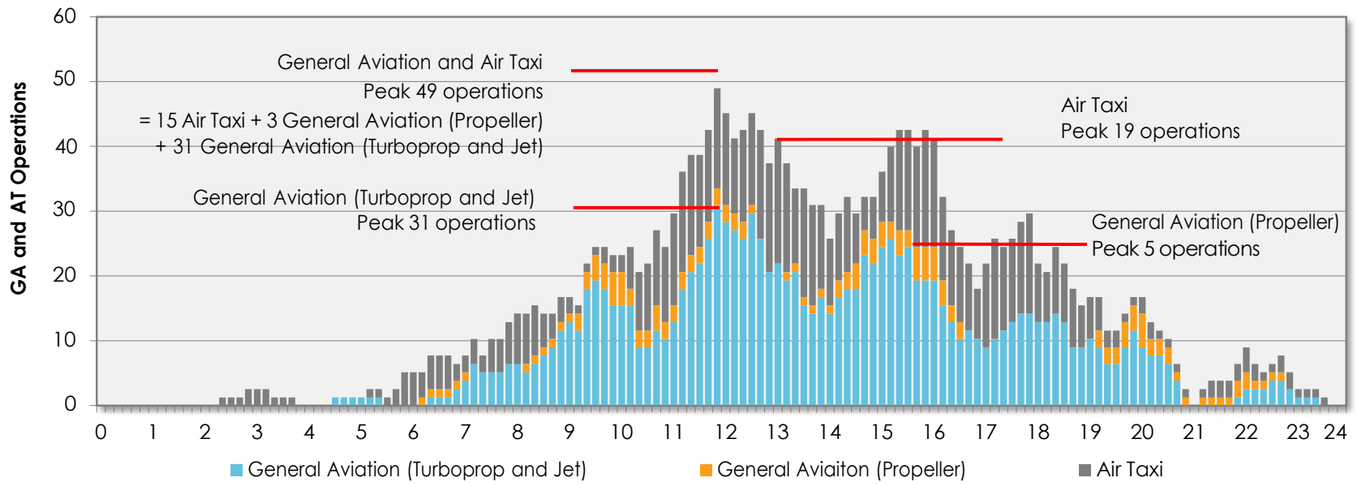
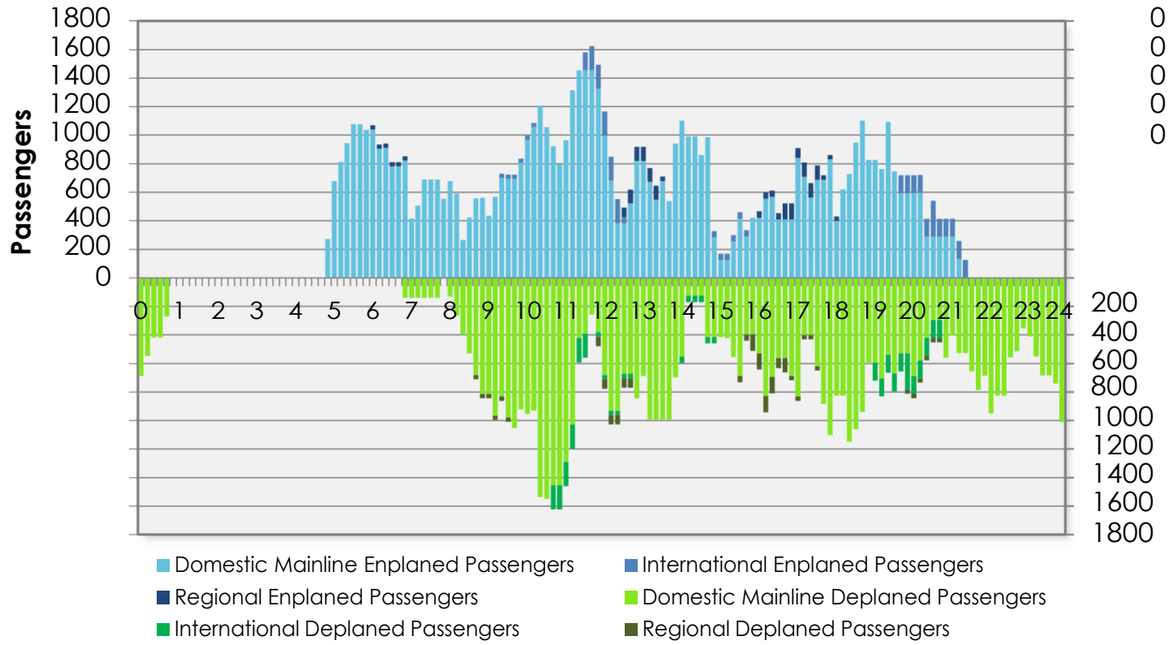


Figure 3.47: General Aviation and Air Taxi Operations on ADPM 2014 in Rolling 60 Minute Periods

3.8.8 Summary of Peaking Characteristics

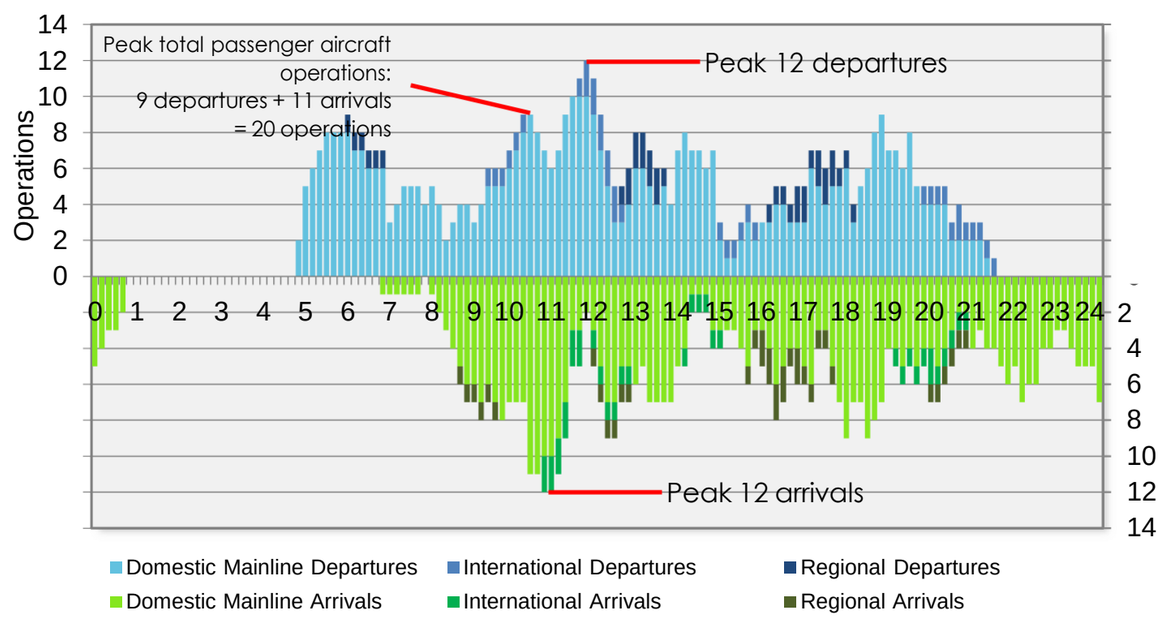
The peak hour for domestic mainline, regional, and international enplanements and commercial aircraft operations occur at different times of the day. In order to obtain the overall or composite peak hour for the Airport, the combined enplanements and deplanements as well as aircraft operations are depicted in **Figure 3.48** and **Figure 3.49** respectively. The ADPM includes roughly 12,350 enplanements and deplanements with the peak hour representing 13.1% of the ADPM. On the other hand, commercial aircraft operations consist of 97 departures and arrivals (194 total) with the peak hour representing 12.4% of the ADPM (12 operations each).

Figure 3.50 summarizes the total aircraft operations for March 2014. The peaking characteristics of the air carrier operations recorded in ANOMS are similar to the pattern derived from the flight schedule for March 2015. **Table 3.43** summarizes the forecast enplanements peaking characteristics while **Table 3.44** summarizes the peaking characteristics of forecast aircraft operations.



Peak Rolling Hour: Enplaned Passengers	Peak Hour Begins at 11:50 Daily Total = 12,359	Peak Hour Begins = 1,624 % of Daily Total = 13.1%
Peak Rolling Hour: Deplaned Passengers:	Peak Hour Begins at 10:50 Daily Total = 12,354	Peak Hour Begins = 1,624 % of Daily Total = 13.1%

Figure 3.48: ADPM Total Passenger Profile in Rolling 60 Minute Periods (March 2015)



Peak Rolling Hour: Enplaned Passengers	Peak Hour Begins at 11:50 Daily Total = 97	Peak Hour Begins = 12 % of Daily Total = 12.4%
Peak Rolling Hour: Deplaned Passengers:	Peak Hour Begins at 10:50 Daily Total = 97	Peak Hour Begins = 12 % of Daily Total = 12.4%

Figure 3.49: ADPM Total Passenger Aircraft Operations in Rolling 60 Minute Periods (March 2015)

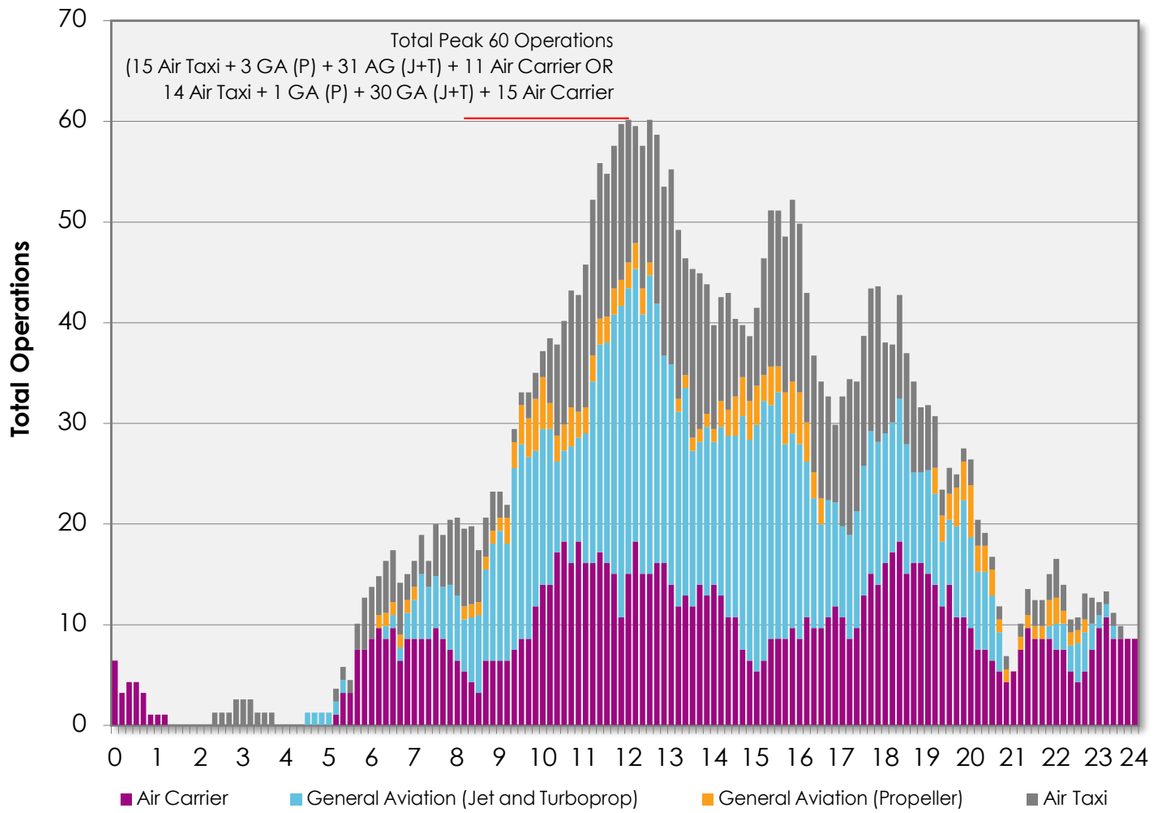


Figure 3.50: ADPM Total Aircraft Operations in Rolling 60 Minute Periods (March 2014)

Table 3.43: Total Passenger Enplanements Peaking Characteristics

Passenger Enplanements	2014 (Existing)	2015	2020	2025	2030	2035
Annual Enplanements						
Domestic Mainline	2,846,171	2,904,546	3,283,013	3,585,111	3,900,485	4,241,351
Regional	35,223	35,893	40,273	43,654	47,138	50,869
International	59,404	62,000	77,887	93,618	111,212	131,153
Total Annual Enplanements	2,940,798	3,002,439	3,401,173	3,722,382	4,058,835	4,423,373
Peak Month Enplanements						
Domestic Mainline	342,231	359,352	406,176	443,552	482,570	524,742
Regional	8,014	8,403	9,428	10,219	11,035	11,908
International	14,318	15,376	19,316	23,217	27,580	32,526
Total Peak Month	364,563	383,131	434,920	476,988	521,186	569,176
ADPM Enplanements						
Domestic Mainline	11,040	11,592	13,102	14,308	15,567	16,927
Regional	259	271	304	330	356	384
International	462	496	623	749	890	1,049
Total ADPM Enplanements	11,760	12,359	14,030	15,387	16,812	18,361
Peak Hour Enplanements						
Domestic Mainline	1,384	1,454	1,643	1,794	1,952	2,123
Regional	109	114	128	139	150	162
International	235	252	317	380	452	533
Combined Peak Hour						
Enplanements	1,545	1,624	1,844	2,022	2,209	2,413

Note: Numbers may not add up due to rounding.

Table 3.44: Total Operations Peaking Characteristics

Aircraft Operation Type	Existing (2014)	Forecast				
		2015	2020	2025	2030	2035
Annual Operations						
Domestic Mainline	47,016	46,165	52,181	56,597	61,163	66,065
Regional	1,865	1,829	2,012	2,098	2,224	2,314
International	1,966	1,969	2,221	2,398	2,616	2,850
Total Commercial Aircraft	50,848	49,964	56,414	61,094	66,003	71,229
All-Cargo	12,581	1,413	1,575	1,749	1,932	2,135
General Aviation & Air Taxi	86,260	86,652	89,788	94,877	101,949	111,078
Military	1,346	1,346	1,346	1,346	1,346	1,346
Total Annual Operations	**139,712**	**139,374**	**149,122**	**159,066**	**171,230**	**185,788**
Peak Month Operations						
Domestic Mainline	5,235	5,270	6,262	6,792	7,340	7,928
Regional	370	372	409	427	452	471
International	362	372	420	453	494	538
Total Commercial Aircraft	5,967	6,014	7,090	7,671	8,286	8,937
All-Cargo	196	219	244	271	300	331
General Aviation & Air Taxi	10,212	11,090	11,493	12,144	13,049	14,218
Military	172	172	172	172	172	172
Total Peak Month	**16,547**	**17,495**	**19,000**	**20,259**	**21,807**	**23,658**
ADPM Operations						
Domestic Mainline	169	170	202	219	237	256
Regional	12	12	13	14	15	15
International	12	12	14	15	16	17
Total Commercial Aircraft	193	194	229	247	267	288
All-Cargo	10	11	12	14	15	17
General Aviation & Air Taxi	329	358	371	392	421	459
Military	6	6	6	6	6	6
Total ADPM Operations	**538**	**569**	**618**	**659**	**710**	**770**

Aircraft Operation Type	Existing (2014)	Forecast				
		2015	2020	2025	2030	2035
Peak Hour Departures						
Domestic Mainline	10	10	12	13	14	15
Regional	2	2	2	2	2	3
International	2	2	2	2	3	3
Total Commercial Aircraft Departures	12	12	14	15	17	18
All-Cargo Departures	2	2	2	3	3	3
Peak Hour Arrivals						
Domestic Mainline	11	11	13	14	15	16
Regional	2	2	2	2	2	3
International	2	2	2	2	3	3
Total Commercial Aircraft Arrivals	12	12	14	15	17	18
All-Cargo Arrivals	3	3	4	4	5	5
Peak Hour Operations[1]						
Passenger Aircraft	18	20	24	26	28	30
All-Cargo	5	5	6	7	7	8
General Aviation & Air Taxi	49	53	55	58	63	68
Combined Peak Hour Operations[2]	**60**	**65**	**69**	**73**	**79**	**85**

(1) The peak hour for each airport operation type represents the peak hour for that operation type only
(2) Combined peak hour operations are a composite of all aircraft operation types and represents PBI's overall peak hour

Airside Analysis

04

04 Airside Analysis

The primary airside facilities of an airport consist of the runways, taxiways, NAVAIDS, and support facilities that promote the safe movement of aircraft. These facilities typically encompass the largest area of an airport due to their size and required safety clearances. Therefore, the required airside facilities are evaluated first to identify a preferred alternative and provide the basis for planning of other airport facilities. The following sections summarize the airside facility requirements and the evaluation of alternatives.

4.1 Facility Requirements

The facility requirements identify potential issues associated with existing facilities by applying FAA, industry, and site specific planning parameters to existing and forecast demand. The airside facility requirements include an assessment of runway operational capacity as well as the overall design of the runways and taxiways based on a design aircraft. Wherever deficiencies are identified[15], the number and/or size of facilities needed to address capacity shortfalls are determined.

4.1.1 Airfield Demand/Capacity

The airfield demand/capacity analysis evaluates the ability of the runway system to accommodate the forecast number of aircraft operations. While complex computer simulation software is available, this analysis was limited to the methods provided in the following guidance:

- FAA Advisory Circular (AC) 150/5060-5, Airport Capacity and Delay
- FAA-RD-74-124, Techniques for Determining Airport Airside Capacity and Delay
- ACRP Report 79, Evaluating Airfield Capacity

Airfield capacity is defined as the number of aircraft operations an airport can conduct during a specified period of time and various operating conditions. Annual capacity (Annual Service Volume) and hourly capacity (throughput capacity) are the two common measures used by the FAA to evaluate an airfield's operational capabilities. The 2006 PBI Master Plan was completed at a time when PBI was experiencing significant growth in aircraft operations and unusually high levels of aircraft delays. At the peak of the capacity issue (2004), total operations (199,108) consisted of 67,778 air carrier; 1,864 cargo; 28,304 air taxi; 99,861 general aviation, and 1,301 military. The number of operations leading to the capacity issues in the early to mid-2000s will serve as a basis for evaluating capacity in the future in addition to the methods provided by the FAA.

PBI's estimated Annual Service Volume (ASV) is a factor of the various runway use configurations, aircraft fleet mix, and a Runway Exit (E) factor. While a Touch and Go (T) factor is included in the FAA's methodology, it is not significant at PBI based on the limited number of local operations. Therefore, a (T) factor of 1.00 is used to identify ASV and throughput capacity.

4.1.1.1. Meteorological Conditions

Meteorological conditions have a significant effect on runway use and, in turn, airfield capacity. During Visual Meteorological Conditions (VMC), runway use is primarily influenced by prevailing winds. Runway use during Instrument Meteorological Conditions (IMC) is a combination of the prevailing winds and the availability of instrument approach procedures. Operational factors such as airspace constraints, runway length, and noise abatement procedures can also affect runway use. Thus, airfield capacity is typically higher in VMC than IMC.

Based on hourly meteorological conditions collected by the NCEI in 2014, VMC occurred approximately 96.4% of the time and IMC occurred approximately 3.6% of the time. Included in the IMC observations are periods when the cloud ceilings and horizontal visibility are below the Airport's existing instrument approach minimums.

4.1.1.2. Runway Use Configuration

PBI has three runways: 10L-28R, 10R-28L, and 14-32. Runway 10L-28R and 10R-28L are parallel runways separated by 700 feet. The limited separation of these two parallel runways precludes independent operations under IFR) conditions. While simultaneous operations are allowed during VFR, Runway 10R-28L is restricted to small GA aircraft with wingspans less than 49 feet and approach speeds less than 120 knots (typically single-engine propeller driven aircraft).

Runway 14-32 is the crosswind runway and intersects with Runway 10L-28R. Aircraft operations on either runway are dependent on operations on the other runway. When both runways are in use, adequate in-flight separation must be provided to allow an aircraft operating on one runway to clear the runway intersection point, whether landing or departing. In order to increase airfield capacity at airports with intersecting runways, land and hold short operations (LAHSO) are often implemented. LAHSO operations allows for independent arrivals to intersecting runways so long as aircraft do not cross the LAHSO point. PBI currently has LAHSO points on Runway 14, 10L, and 28R which provide landing distances of 4,295 feet, 3,117 feet, and 3,725 feet respectively. However, the existing LAHSO points were not utilized to determine the existing annual and hourly capacity as most commercial aircraft, including smaller regional jets, require landing distances in excess of 4,000 feet.

Figure 4.1 illustrates the predominant runway use configuration based on meteorological conditions. In each of the four runway use configurations, mixed mode operations (arrivals and departures) for commercial air carriers and business jets predominantly occur on Runway 10L-28R while Runway 10R-28L is used by small GA aircraft only. Runway 14-32 is used relatively infrequently by small GA aircraft and business jets.

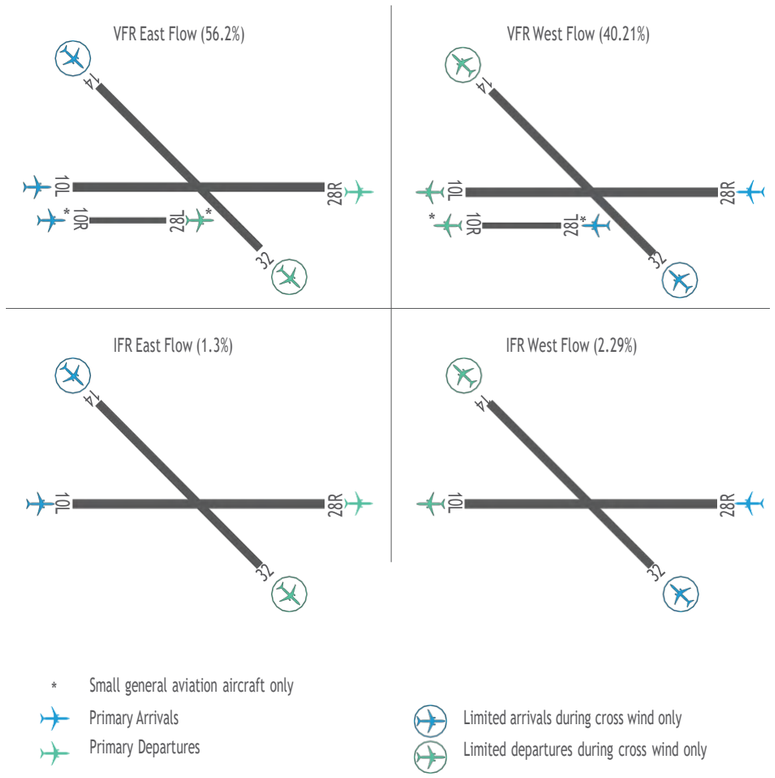


Figure 4.1: Existing Runway Use Configuration
Data Source: NCDC

*15 Depicted as **RED** text in tables*

4.1.1.3. Aircraft Mix Index

The FAA Air Traffic Control Handbook (Order 7110.65) applies separation standards for aircraft on final approach based on wake turbulence the generation of wake turbulence. Greater separation requirements between aircraft lowers the capacity of the airfield.

As summarized in **Table 4.1**, the FAA classifies aircraft in one of four classes according to their maximum takeoff weight (MTOW) and number of engines. The FAA's methodology utilizes the term "Mix Index" to describe an airport's fleet mix. The aircraft mix index indicates the relative percentage of operations conducted by Class C and Class D (C+3D) aircraft as these require the largest in-trail separation distances.

The following PBI aircraft mix indexes for each runway were derived from 2014 data provided in the FAA ETMSC:

– Runway 10L-28R: between 100 and 120

– Runway 14-32: between 80 and 90

Since Runway 10R-28L is only utilized by small GA aircraft (A and/or B), the aircraft mix index is 0.

4.1.1.4. Exit Factor

The Exit (E) factor refers to the number and location of exit taxiways. An inadequate amount or location of exit taxiways can increase the amount of time an aircraft is on the runway during an arrival (known as runway occupancy time). The FAA provides this factor based on the aircraft mix index, percentage of arrivals, and the number of exits within a given range. An exit factor is applied to each runway use configuration and ranges from 92% to 100% at PBI.

4.1.1.5. Airfield Capacity

The FAA recommends planning for airfield enhancements when annual operations reach 60% of the ASV and implementing the enhancements when annual operations approach 80% of ASV. The ASV is a function of the weighted average hourly capacities (C_w) for each runway use configuration as well as daily demand (D) and hourly demand (H) ratios.

The weighted hourly capacities for each runway use configuration were evaluated via three sensitivity tests which applied runway utilization percentages for each meteorological condition, as summarized in **Table 4.2**. Since the IFR occurrence is only 3.6%, the outcomes are relatively insensitive to the assumptions. Likewise, it is assumed that usage of the crosswind runway is not significant during IFR conditions.

The Daily Demand Ratio (D) is a factor of average daily demand during the peak month (March) against total annual demand (aircraft operations). Based on the previous 6 years, (D) is estimated at 261. Annual and peak month demand was based on the PBI passenger statistics reports from 2009 through 2014.

The Hourly Demand Ratio (H) is a factor of peak hour demand against average daily demand in the peak month. Based on the previous 6 years, (H) is estimated at 10. Historic hourly demand was estimated based on FAA Operational Network (OPSNET) data between 2009 through 2014.

Based on these factors, the estimated hourly capacity for PBI is approximately 60 to 65 operations while the estimated ASV ranges from 160,000 to 172,000 operations per year. While the exiting hourly capacity is roughly the same as that included in the 2006 Master Plan, the existing ASV is roughly 90,000 operations less. This is the result of changes in the daily demand and hourly demand ratios.

As summarized in **Table 4.3**, existing annual demand (140,878) already exceeds 80% of ASV. Similarly, the existing peak hour demand is estimated to be between 92% and 100% of capacity, increasing to between roughly 131% and 142% in 2035. PBI Passenger Statistic reports from January 2015 to July 2015 indicate total operations exceeded 91,500 operations (33,000 air carrier/cargo and 58,500 GA & Other). Total operations by the end of 2015 can potentially reach between 157,000 and 176,000 based on the average 2015 monthly operations thus far or the average 2014 operations between August and December respectively. Furthermore, GA & Other (Air Taxi / military) alone can exceed 110,000 operations which is roughly 85% of total operations in 2004.

The airfield capacity analysis confirms the need for a new runway. Since the FAA's 2012 Environmental Impact Statement (EIS) Record of Decision (ROD) delayed evaluation of the proposed new runway, it is recommended an EIS is initiated to analyze the potential impacts. As sufficient lead time is necessary to design and construct a new runway as well as complete all associated "enabling projects", such as the relocation of General Aviation and other support facilities, initiating the new runway project becomes critical. Alternatives for the new runway are evaluated in Section 4.2 and the schedule for its implementation provided in Chapter 9 Implementation Plan. **Table 4.4** summarizes the airfield capacity analysis, including the assumptions, weighted hourly capacity, and the ASV for the three sensitivity tests.

Table 4.1: Aircraft Classifications

Aircraft Class	Maximum Takeoff Weight (lbs)	Number of Engines	Wake Turbulence Classification
A	12,500 or less	Single	Small (S)
B	12,500 or less	Multi	Small (S)
C	12,500 – 300,000	Multi	Large (L)
D	Over 300,000	Multi	Heavy (H) / B757

Source: FAA AC 150/5060-5, Airport Capacity and Delay

Table 4.2: Airfield Capacity Sensitivity Tests

Operational Flow	Weather Conditions	Runway End	Sensitivity Test		
			1	2	3
East Flow	VFR (56.20%)	10L	70%	60%	50%
		10R	25%	30%	35%
		14	5%	10%	15%
	IFR (1.30%)	10L	70%	60%	50%
		14	30%	40%	50%
West Flow	VFR (40.21%)	28R	70%	60%	50%
		28L	25%	30%	35%
		32	5%	10%	15%
	IFR (2.29%)	28R	70%	60%	50%
		32	30%	40%	50%

Table 4.3: Forecast Operations

Operation Type	Existing (2014)	Forecast				
		2015	2020	2025	2030	2035
Air Carrier	52,106	51,376	57,989	62,843	67,935	73,363
Cargo	1,166	1,413	1,575	1,749	1,932	2,135
Air Taxi	27,157	27,451	29,893	32,553	35,450	38,604
GA	59,103	59,201	59,894	62,324	66,449	72,474
Military	1,346	1,346	1,346	1,346	1,346	1,346
Annual Total	140,878	140,787	150,697	160,815	173,162	187,922
ASV	**160,000 ~ 172000**					
Annual Demand/ ASV	0.82 ~ 0.88	0.82 ~ 0.88	0.88 ~ 0.94	0.93 ~ 1.01	1.01 ~ 1.08	1.09 ~ 1.17
Peak Hour	60	65	69	73	79	85
Hourly Capacity	60 ~ 65					
Hourly Demand/ Capacity	**0.92 ~ 1.00**	**1.00 ~ 1.08**	**1.06 ~ 1.15**	**1.12 ~ 1.22**	**1.22 ~ 1.32**	**1.31 ~ 1.42**

Table 4.4: Summary of Airfield Capacity Analysis

Capacity Analysis Input		Operational Conditions											
		East Flow						West Flow					
		VFR (56.20%)				IFR (1.30%)		VFR (40.21%)				IFR (2.29%)	
		Runway 10L: Mixed Mode	Runway 10R: Mixed Mode (Small GA Only)	Runway 10L: Mixed Mode Runway 14: Arrivals Only	Runway 10L: Departures Only Runway 14: Arrivals Only	Runway 10L: Mixed Mode	Runway 10L: Mixed Mode Runway 14: Arrivals Only	Runway 28R: Mixed Mode	Runway 28L: Mixed Mode (Small GA Only)	Runway 28R: Mixed Mode Runway 32: Departures Only	Runway 28R: Departures Only Runway 14: Arrivals Only	Runway 28R: Mixed Mode	Runway 28R: Mixed Mode Runway 32: Departures Only
Runway Configuration													
Configuration Utilization	Sensitivity Test 1	39.3%	14.1%	1.1%	1.1%	0.9%	0.4%	28.1%	10.1%	1.0%	1.0%	1.6%	0.7%
	Sensitivity Test 2	33.7%	16.9%	2.8%	2.8%	0.8%	0.5%	24.1%	12.1%	2.0%	2.0%	1.4%	0.9%
	Sensitivity Test 3	28.1%	19.7%	4.2%	4.2%	0.7%	0.7%	20.1%	14.1%	3.0%	3.0%	1.1%	1.1%
Aircraft Mix Index (C+3D)		approx. 100-120	0	approx. 80-90	approx. 80-90	approx. 100-120	0	approx. 100-120	0	approx. 80-90	approx. 80-90	approx. 100-120	0
Exit Range (feet)		5000 to 7000	2000 to 4000	5000 to 7000	5000 to 7000	5000 to 7000	2000 to 4000	5000 to 7000	2000 to 4000	5000 to 7000	5000 to 7000	5000 to 7000	2000 to 4000
Number of Exits (N)		2	2	2	2	2	2	2	2	2	2	2	2
Exit Factor (E)		0.92	0.94	1	0.93	0.92	0.92	0.92	0.94	1	0.93	0.92	0.92
Touch and Go Factor (T)		1.00				1.00			1.00			1.00	
Arrival %		50%				50%			50%			50%	
Hourly Capacity Base[1]		52	84	58	70	48	62	52	84	58	70	48	62
Weighted Hourly Capacity (Cw)[2]	Sensitivity Test 1	20	12	1	1	0	0	15	8	1	1	1	0
	Sensitivity Test 2	18	14	2	2	0	0	13	10	1	1	1	1
	Sensitivity Test 3	15	17	2	3	0	0	10	12	2	2	1	1
Total Hourly Capacity[3]	Sensitivity Test 1												60
	Sensitivity Test 2										**Estimated Hourly Capacity: 60 to 65**		62
	Sensitivity Test 3												65
Annual Service Volume (ASV)[4]	Sensitivity Test 1												158,800
	Sensitivity Test 2										**Estimated ASV: 160,000 to 172,000**		165,500
	Sensitivity Test 3												171,300

Notes:

(1) Based on FAA AC 150/5060-5 and FAA Capacity Profiles (July 2014) of airports with similar operating configurations
(2) Cw = Hourly Capacity Base x Configuration Utilization
(3) Sum of Weighted Hourly Capacity for each configuration
*(4) ASV = Total Hourly Capacity *(D) *(H); D = 261, H = 10*

4.1.2 Design Aircraft

Evaluating existing airfield facilities and planning for improvements requires the identification of a design aircraft. The design aircraft relates airport design to the operational and physical characteristics of the most demanding aircraft or family of aircraft that utilize the airfield on a regular basis. According to FAA guidance[16], federally funded projects require that the design aircraft conduct a minimum of 500 itinerant operations per year at the airport.

The FAA defines three parameters for the critical design aircraft: Aircraft Approach Category (AAC), Aircraft Design Group (ADG), and Taxiway Design Group (TDG). The AAC (defined by a letter) relates to aircraft approach speed while ADG (defined by a numeral) relates to aircraft wingspan and tail height. In combination with the runway visibility minimums (defined by runway visual range values), these are used to identify clearance standards and the operational capabilities for a particular runway. **Table 4.5** depicts the three criteria used to determine the RDC of a runway.

Conversely, the TDG is a function of an aircraft's main landing gear width and its location relative to the cockpit. The TDG provides a basis to evaluate the ability of the design aircraft to utilize the existing taxiway structure.

The design aircraft at PBI is based on existing and forecast aircraft operations. **Table 4.6** summarizes the major fleet mix and estimated operations in each of the planning horizons. The most demanding ADG I aircraft for Runway 10R-28L is also identified and presented among the major fleet mix.

The following assumptions were made in projecting operations by aircraft:

- Use of single-aisle aircraft would increase significantly
- Existing fleet of A319s, A320s, and A321s are being gradually upgraded to the new engine options (NEO)
- Existing fleet of 737 Next Generation (i.e. B737-700, B737-800, B737-900) are being gradually upgraded to 737 MAX 7, MAX 8, and MAX 9
- B757s, B767s, B717s, B737-300s, B737-400s, and MD models are being retired and replaced with more efficient aircraft such as the B737 MAX-9, A321 NEO, B787, and A350
- The smaller Q300s and Embraer-145s are being replaced with 70 to 90-seat Embraer 170s and 175s
- Cargo operations and business aviation operations by aircraft model would increase at the same rate as total operations
- FedEx is transitioning from utilizing A310s to B757-200 Freighter aircraft at PBI. B767s are also being retired from passenger fleet but will increasingly serve cargo operations

As shown in **Table 4.6**, the design aircraft for Runways 10L-28R and 14-32 is B757-200. The design aircraft for the existing GA Runway 10R-28L is the Saab 340. The Airport Reference Code (ARC) for PBI is D-IV based on a combination of the most critical aircraft utilizing the airport on a regular basis, the B757-200 (C-IV) and B737-900[17] (D-III). The existing runway and taxiway design will be evaluated based on this ARC as well as any proposed developments.

16 *AC 150/5325-4B, Runway Length Requirements for Airport Design*

17 *The differences between the dimensions of B737 MAX 9 and B737-900 Next Generation are less than 0.5 ft, and the MAX 9 is expected to have lower requirement for runway length because of its improved engine. Comparatively between the two, B737-900 Next Generation is the more demanding aircraft and thus the design aircraft for PBI.*

Table 4.5: Runway Design Code Classifications

Aircraft Approach Category			
Category	**Aircraft Approach Speed (knots)**	**Typical Aircraft Type**	**Example Aircraft**
A	Less than 91	Small single-engine	Piper Cherokee
B	91-120	Small multi-engine	Hawker Siddeley 125
C	121-140	Short-Medium range	A318
D	141-165	Long range	B737-800; B747-8
E	166 or greater	Military	Military

Aircraft Design Group (ADG)				
Design Group	**Wingspan (feet)**	**Tail Height (feet)**	**Typical Aircraft Type**	**Example Aircraft**
I	< 49	<20	Single & multi-engine	King Air 100
II	49 < 79	20 <30	Commuter aircraft	ERJ145
III	79 < 118	30 < 45	Narrowbody	B737
IV	118< 171	45 < 60	Widebody	B757 / B767
V	171 < 214	60 <66	Widebody	B777
VI	214 < 262	66 < 80	Jumbo Commercial	A380

Visibility Minimums	
RVR (ft)	**Flight Visibility Category (Statute Mile)**
VIS	Visual only
5000	Not lower than 1 mile
4000	Lower than 1 mile but not lower than ¾ mile
2400	Lower than ¾ mile but not lower than ½ mile
1600	Lower than ½ mile but not lower than ¼ mile
1200	Lower than ¼ mile

Table 4.6: Existing and Projected Operations by Aircraft

Aircraft	Operations						ARC	TDG
	Existing	Forecast						
	2014	2015	2020	2025	2030	2035		
A319(NEO)	5,805	6,005	6,813	7,405	8,036	8,705	C-III	3
A320(NEO)	12,798	13,405	16,054	15,965	17,350	18,805	C-III	3
A321(NEO)	374	943	1,164	2,200	2,441	2,778	C-III	5
A330/A350[3]	5	9	50	171	269	380	C-V	5
B717-100	478	480	-	-	-	-	C-III	2
B737-300	1,308	637	368	-	-	-	C-III	3
B737-400	1,337	1,018	357	-	-	-	C-III	3
B737 (MAX 7)	4,305	6,440	8,866	10,482	10,752	10,967	C-III	3
B738 (MAX 8)	5,370	7,228	8,714	11,624	12,836	14,114	D-III	3
B739 (MAX 9)	1,055	2,114	3,791	5,167	5,749	6,441	D-III	3
B757-200[4]	4,745	2,490	1,587	435	604	794	C-IV	4
B757-300	4	16	13	-	-	-	D-IV	4
B767-300[3,4]	50	37	50	23	24	24	C-IV	4
B777/B787[3]	4	10	40	92	140	195	C-V	6
Hawker 400	2,802	2,824	3,022	3,225	3,473	3,769	B-I	1A
Q300	779	820	764	653	531	381	A-III	3
Embraer 145	73	88	100	221	178	125	C-II	2
Embraer 170	1,926	515	576	496	595	695	C-III	3
Embraer 175	0	130	183	233	291	348	C-III	3
Embraer 190	3,741	3,835	4,423	4,881	5,382	5,930	C-III	3
MD-90	2,367	679	384	-	-	-	C-III	4
MD80x	2,059	1,860	921	-	-	-	C/D-III	4
Saab 340	2,280	1,510	1,548	1,494	1,445	1,356	B-II	3
A300-600	485	489	523	558	601	652	C-IV	5

Notes:
(1) Based on data from FAA ETMSC 2014
(2) Forecast aircraft operations are interpolated from the Aviation Activity Forecasts
(3) It is anticipated that the B787-8 (D-V) and A350-900 (D-V) will replace B767s, B777s and A330s.
(4) Includes passenger and cargo operations

4.1.3 Runway System

The runways are the fundamental component supporting air transportation at any airport. The runway system is a combination of the structural pavement used for takeoffs and landings, shoulders, blast pads, safety areas, protection zones, and obstruction identification surfaces. The following evaluates the existing runway system and future requirements for each component.

4.1.3.1. Number of Runways

The required number of runways at an airport is based on the annual and hourly capacity of the airfield as well as the prevailing wind conditions. As noted in Section 4.1.1, the hourly capacity of Runway 10L-28R is insufficient to accommodate anticipated demand throughout the planning horizon.

The prevailing wind conditions at PBI indicates that Runway 10L-28R satisfies the FAA's recommended 95% combined wind coverage for aircraft with maximum crosswind components of 13 knots, 16 knots, and 20 knots in All-Weather and VFR conditions but not IFR conditions. While the combination of Runway 10L-28R and Runway 14-32 provides 95% wind coverage for a maximum crosswind component of 16 knots and 20 knots in IFR conditions, Runway 14-32 is rarely used by these aircraft (ADG-III and ADG-IV to ADG VI respectively) due to its limited length.

Given the limited periods of IFR conditions at PBI, a new crosswind runway to satisfy the 95% wind coverage is not recommended.

4.1.3.2. Runway Length Requirements

The operating length of a runway is its most important functional element. The length of the primary runway should support the most demanding aircraft operating at a takeoff weight required to reach its destination, otherwise known as the stage length. The required runway length is determined based on the guidelines provided in FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design*.

Since the most demanding aircraft regularly operating at PBI each have a MTOW exceeding 60,000 pounds, the aircraft performance charts published by the aircraft manufacturers in the airport planning manuals (APM) were used to determine both takeoff and landing length requirements.

Aircraft Stage Length

The existing and potential non-stop markets were analyzed to determine the representative aircraft stage length from PBI. Since aircraft are typically loaded with an amount of fuel based on the destination, stage length affects the MTOW of aircraft, and thus affects the required runway length.

As illustrated in **Figure 4.2**, the existing destinations regularly served from PBI are within roughly 1,000 Nautical Miles (NM). As aircraft are typically loaded with an amount of fuel commensurate with the destination, the stage length influences the weight of an aircraft at takeoff which in turn impacts the required runway length. For example, the A321 has a maximum range of approximately 3,200 NM with 185 passengers and a MTOW of approximately 205,000 lbs. A stage length of 1,000-1,250 NM would equate to a conservative takeoff weight of approximately 165,000 lbs[18] or 80% of the maximum.

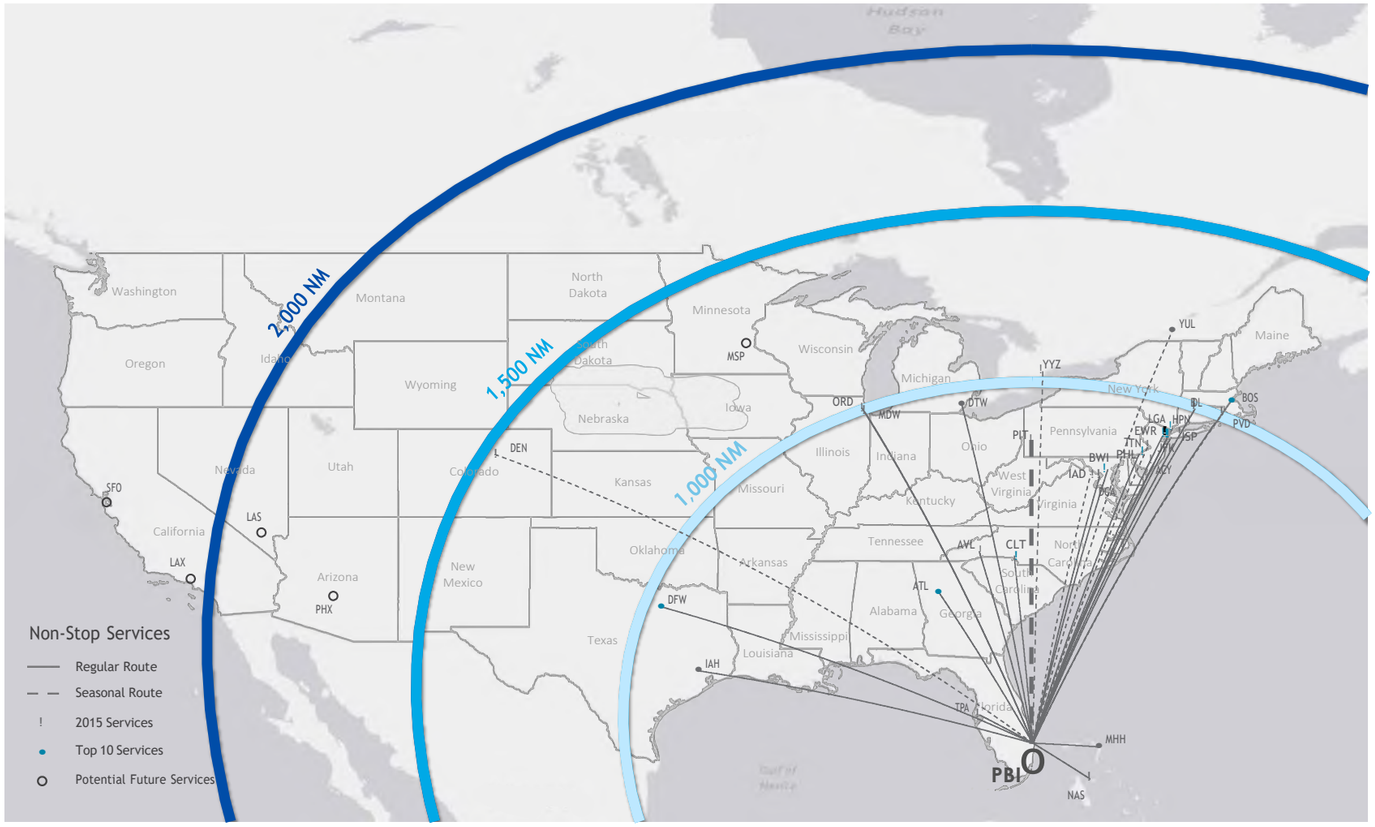


Figure 4.2: Aircraft Stage Length
Source: AECOM (2015) Basemap from ESRI

18 *Operating Empty Weight of 107,000 lbs + 185 Passengers and baggage at 38,000 lbs + fuel at 20,000 lbs*

Although there are no existing destinations beyond 1,500 NM from PBI and no known plans to serve additional destinations, potential markets are considered in this analysis to evaluate the impacts on runway length requirements. These include markets that existing airlines at PBI serve such as Las Vegas (LAS), San Francisco (SFO), and Minneapolis – St. Paul (MSP).

Runway Takeoff Length Required by Future Fleet Mix

The runway takeoff length requirements are a factor of airport elevation, temperature, and runway gradients whereas higher values for each will increase the takeoff length due to aircraft performance characteristics. For the purposes of this analysis, the APMs were used to identify the standard takeoff length required for an airport at sea level on a standard day (59 degrees Fahrenheit and zero wind) and a zero runway gradient. Adjustments were then incorporated for conditions specific to PBI which include:

- 19.6 feet airport elevation
- 94.2 degree (Fahrenheit) mean maximum temperature of hottest month
- 3.2-foot runway gradient

Figure 4.3 illustrates the takeoff length required for a mix of aircraft that operate or may operate at PBI. The required takeoff length for each aircraft is compared with the Takeoff Run Available (TORA) for Runways 10L-28R and 14-32. TORA is the distance declared suitable for an aircraft to accelerate from brake release to lift-off, plus additional safety factors. Refer to **Section 4.1.3.4** for more information on TORA and other declared distances.

Runway 10L-28R has adequate length to support all the aircraft operating at 95% MTOW, except the A330, B763 and B772LR. Only the B738, A320, A319, A310, Q300, Saab F340B, and Embraer aircraft can utilize Runway 10L-28R operating at 100% MTOW. While a runway extension is not required for existing and anticipated operations, it is recommended that the DOA preserve the ability to maximize the length of Runway 10L-28R in the event there is an increase in long-range markets served from PBI.

The FAA recommends that the length of a crosswind runway (14-32) should be 100% of the primary runway. While Runway 14-32 does not satisfy this guideline, it is sufficient to support most aircraft operating at either 80% or 90% MTOW (which includes most of the destinations served from PBI at a stage length of 1,000 NM). Furthermore, Runway 14-32 is not a required crosswind runway for most air carrier aircraft during VFR conditions for the aircraft. Therefore, an extension of Runway 14-32 is not recommended.

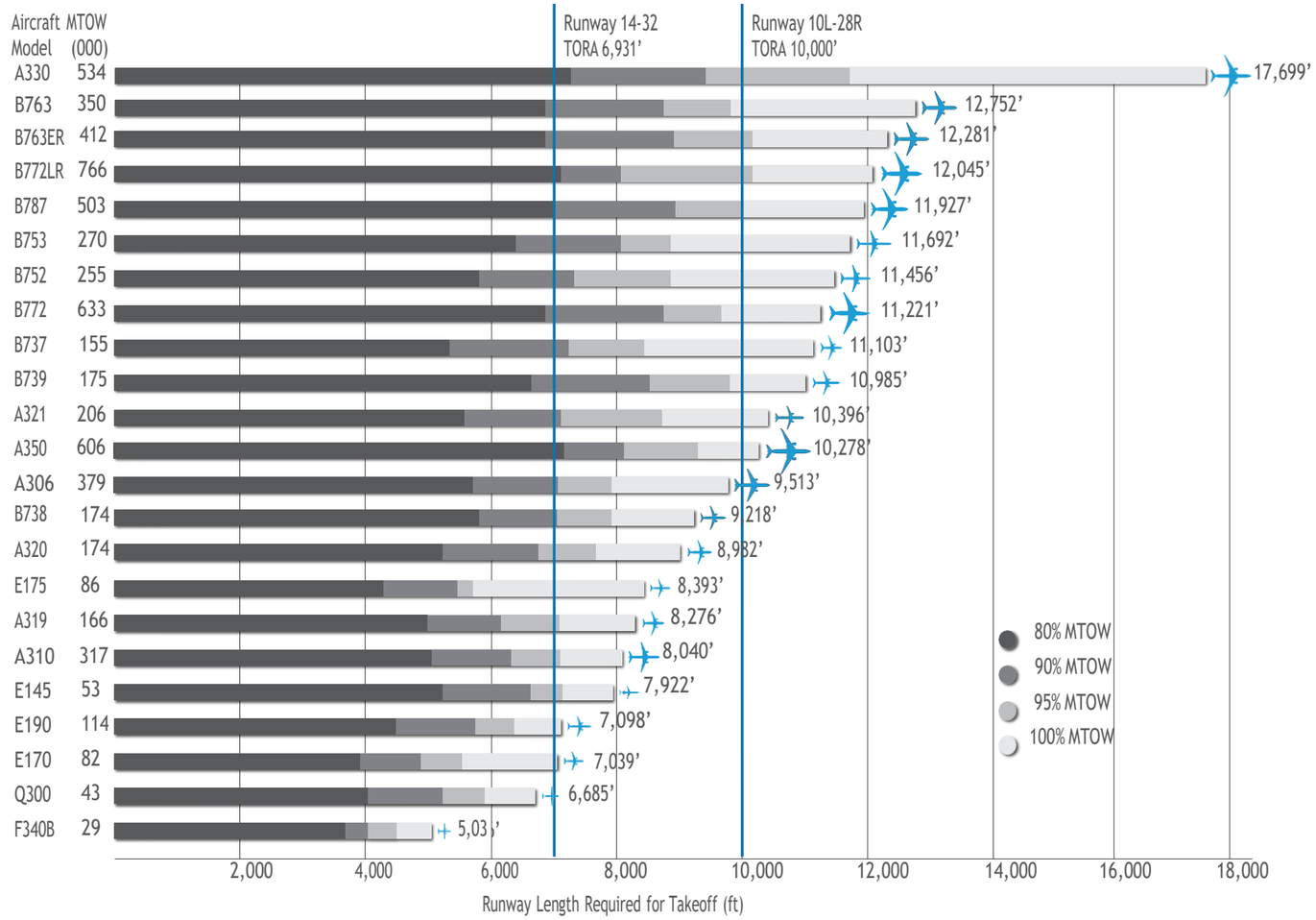


Figure 4.3: Runway Takeoff Length Requirements

Assumptions:

(1) Zero wind; air conditioning off; dry runway; optimum flap setting.

Sources:

(1) Primary fleet mix from Table 4.6
(2) Manufactures Airport Planning Manuals (APM)

Notes:

(1) Takeoff performance information for Airbus NEOs and 737 MAXs is not available. However, it is anticipated that these aircraft will improve upon or remain similar to existing models.
(2) Runway 10R-28L is primarily limited to small propeller driven aircraft (B-I) and therefore, is not included in this analysis.

Runway Landing Length Required by Future Fleet Mix

While departures generally require more runway length than arrivals, three of the four primary runway ends (10L, 28R, and 32) each have a displaced threshold which reduces the landing distance available (LDA). As illustrated in **Figure 4.4**, landing length requirements were calculated for both wet and dry runway conditions at the maximum landing weight (MLW) for the mix of aircraft that operate or may operate at PBI. These operating conditions provide a conservative landing length for the purposes of evaluating and/or establishing runway length. If the APMs did not provide landing performance on wet runways, the landing distances for dry runways were increased by 15%.

The primary runway at PBI (10L-28R) has adequate landing length for the most demanding aircraft without any weight restrictions. Runway 14-32 can accommodate the majority of the aircraft fleet mix during dry conditions.

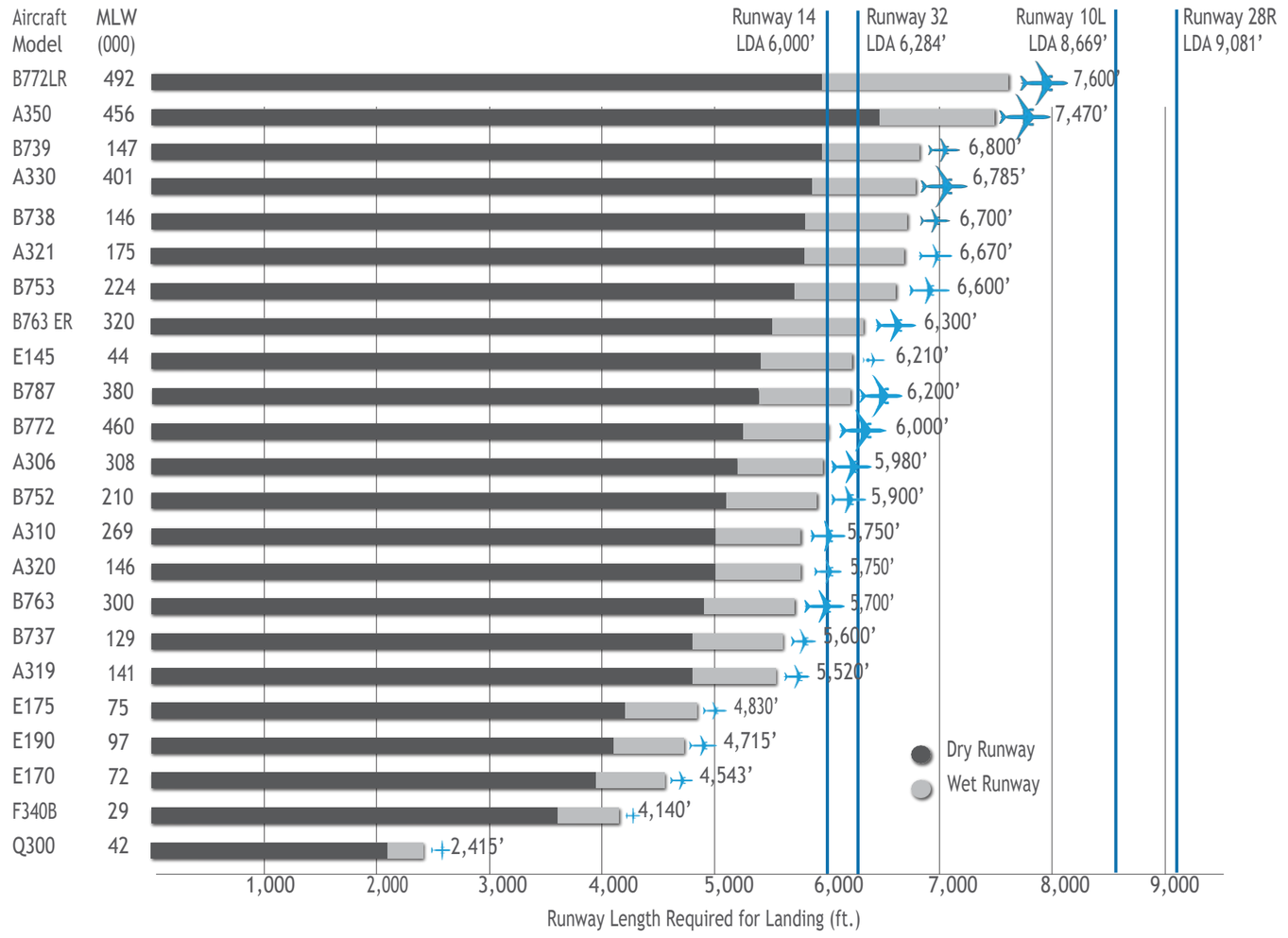


Figure 4.4: Runway Landing Length Requirements

Assumptions:

(1) Zero wind; maximum landing weight (MLW)
(2) No reverse engine thrust; Anti-skid operative

Sources:

(1) Primary fleet mix from Table 4.6
(2) Manufactures Airport Planning Manuals (APM)

Note:

(1) Landing performance information for Airbus NEOs and 737 MAXs is not available. However, it is anticipated that these aircraft will improve upon or remain similar to existing models

4.1.3.3. Runway Geometry and Safety

The geometry of an airfield is subject to the FAA airport design standards which provide for safe operations and consistency among the nation's airports. **Figure 4.5** illustrates existing non-standard conditions at PBI which are discussed in the following sections and summarized in **Table 4.7**.

Runway Pavement

Runway geometry standards include runway length and width, runway shoulder width, and blast pad which "provide resistance to blast erosion and accommodate the passage of maintenance and emergency equipment and the occasional passage of aircraft veering off the runway". These features are based on the ADG of the design aircraft and are intended to provide a sufficient amount of pavement for safe operations. All of the existing runways adhere to the applicable standards with the exception of Runway 10R-28L which does not have any shoulder pavement and blast pads that are 5 feet less than the recommended width. However, Runway shoulders are not required for Runway 10R-28L as it is only used by small GA aircraft. Therefore, no improvements to the existing Runway 10R-28L pavement are recommended.

Runway Separation

Runway separation standards are intended to provide sufficient separation between aircraft operating on a runway and other aircraft and/or vehicles on the airfield, including parallel runways, parallel taxiways, and aircraft parking aprons. Current non-standard separation distances include the holding position marking lines on Taxiways R1, R3, and R4 from Runway 10R-28L and the centerline distance from Runway 10L-28R to Taxiway L (325 feet). It is recommended that the holding position markings are relocated to the standard separation of 125 feet and a Modification of Airport Standards (MOS) obtained for existing operations on Taxiway L. Realignment of Taxiway L is recommended when a future airfield project necessitates the upgrade and/or rehabilitation of Taxiway L.

Runway Safety Area (RSA)

The RSA functions as a safety buffer in the rare event an aircraft undershoots, overruns, or veers off the runway. Per FAA standards, the RSA must be free of all objects except those that must be located in the RSA because of their function, such as NAVAIDS. Public roads, airport service roads, ILS localizers, and other objects not frangibly-mounted and fixed by function are not allowed within an RSA. Belvedere Road is slightly within the Runway 14 RSA, Southern Boulevard is within the Runway 32 RSA, and the Runway 28R ILS localizer is within the Runway 10L RSA. Additionally, airport service roads are within the RSAs at Runways 10L, 28R, 14, and 32.

A non-standard Engineered Materials Arresting System (EMAS) was installed on the Runway 32 end in 2014. EMAS is an alternative solution when a full-dimension RSA is impractical due to natural obstacles, local development, and/or environmental constraints. However, it is considered non-standard as it is limited to a runway exit speed of approximately 40 knots by the design aircraft (B757) instead of the standard 70 knots. Additionally, the Runway 28R ILS localizer (west of Runway 10L) was relocated in 2016 to maximize the RSA to 888 feet beyond the Runway 10L end. It is recommended that the RSAs are improved to maximize clearance from public roads, vehicle service roads, and the 28R localizer the extent practical and declared distances incorporated as necessary.

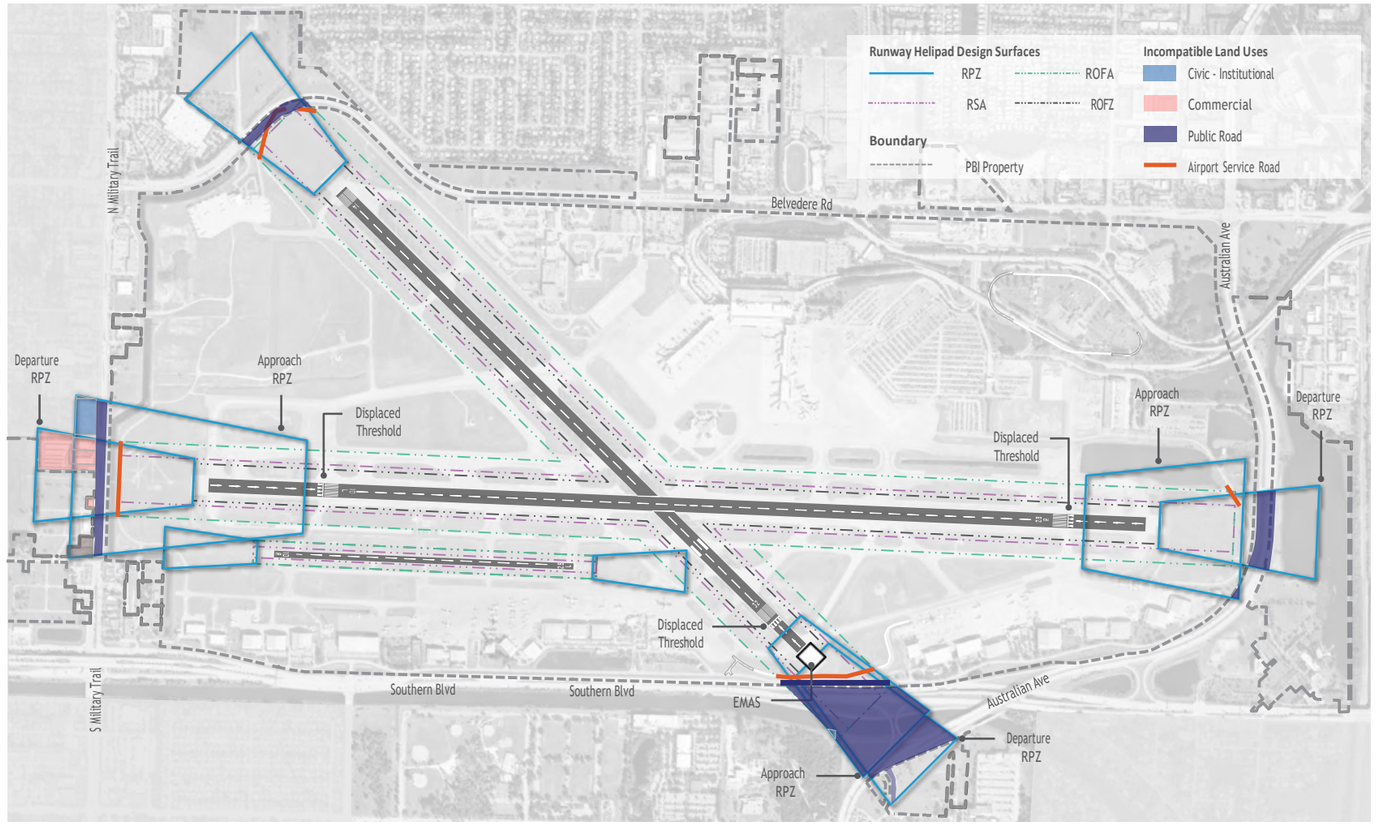


Figure 4.5: Existing Runway Design and Non-Standard Conditions
Source: AECOM (2015)

Runway Object Free Area (ROFA)

The ROFA further enhances the safety of aircraft operations by providing additional clearances from objects non-essential to air navigation or aircraft movements on the taxiway system. The ROFA is an extension of the RSA and must be cleared of above-ground objects protruding above the nearest point of the RSA. Frangible NAVAIDS that are fixed by function are allowed in ROFA, such as RVR antennas.

The non-standard conditions associated with the RSA also apply to the ROFA. However, in some instances the ROFA length prior to or beyond a runway end is less than the RSA due to the alignment of airport service roads. In order to provide a standard ROFA, the removal of disallowed objects or implementation of declared distances is recommended.

Runway Protection Zone (RPZ)

The RPZ is a trapezoidal area at each runway end and/or threshold. The main purpose of RPZ is to protect people and property on the ground. The FAA recommends airports gain control of RPZs. While it is desirable to keep the entire RPZ clear of all above-ground objects, RPZs should be maintained clear of all incompatible activities at a minimum. Per the FAA, permissible land uses within RPZs include:

- Farming
- Irrigation channels
- Airport service roads
- Underground facilities
- Unstaffed NAVAIDS and facilities (only if fixed by function)

The FAA also recommends airports coordinate with the Airports District Office (ADO) to remove or mitigate the risk of any existing incompatible land uses in the RPZ as practical, including public roads.

The RPZ includes both an Approach RPZ (ARPZ) and a Departure RPZ (DRPZ). The ARPZ is located 200 feet from the runway threshold. The DRPZ begins 200 feet beyond the runway end, or the far end of the TORA if it is not the same as the runway end. The location and size of the ARPZ and DRPZ are the same for Runways 10R, 28L, and 14 but different for Runways 10L, 28R and 32 due to the displaced threshold on these runways.

The RPZs of Runway 10L are penetrated by N Military Trail and other properties; however, the Airport is in currently in the process of acquiring multiple parcels within the 10L RPZs. Australian Avenue traverses both Runway 28R RPZs. The RPZ of Runway 14 is penetrated by Belvedere Road, and the RPZs of Runway 32 is traversed by multiple public roads, including Australian Avenue and Southern Boulevard.

For private properties that fall within the RPZs, it is recommended the Airport acquire the properties. When property acquisition is not attainable, an avigation easement should be obtained to avoid construction of incompatible structures within the RPZs. As for the public roads, if possible, the Airport should work with the FDOT to reroute them clear of the RPZs in the long run to the extent practicable.

Table 4.7: FAA Runway Design Standards

Item	ARC D – IV					ARC B-I Small	
	Standard (feet)	Runway 10L	Runway 28R	Runway 14	Runway 32	Standard	Runway 10R-28L
Visibility Minimums		½ mile	¾ mile	1-1/4 mile	1-1/4 mile	Visual	Visual
Runway Geometry							
Runway Design Code (RDC)	Varies	D-IV-2400	D-IV-4000	D-IV-5000	D-IV-5000	B-I-VIS	B-I-VIS
Runway Length	Varies	10,001	10,001	6,931	6,931	3,214	3,214
Runway Width	150	150	150	150	150	60	75
Shoulder Width	25	≥35	≥35	≥25	≥25	10	0
Blast Pad Width	200	220	220	200	200	80	75
Blast Pad Length	200	200	200	200	200	60	200
Runway Separation							
Parallel runway centerline	700[1]	700	700	N/A	N/A	700[1]	700
Holding Position	250	270	270	250	250	125	100[2]
Parallel taxiway/taxilane centerline	400	**≥398[3]**	**≥398[3]**	410	410	150	≥150
Aircraft parking area	500	950	620	535	535	125	250
Runway Safety Area (RSA)							
Length beyond departure end	1,000	**983**	**888**	**550[4]**	**940**	240	240
Length prior to threshold	600	888	983	940	**550[4]**	240	240
Width	500	500	500	500	500	120	120
Runway Object Free Area (ROFA)							
Length beyond runway end	1,000	**869**	**888**	**385[4]**	**821**	240	240
Length prior to threshold	600	888	869	821	**385[4]**	240	240
Width	800	800	800	800	800	250	250
Runway Obstacle Free Zone (ROFZ)							
Length beyond runway end	200	200	200	200	200	200	240
Width	400	400	400	400	400	250	250
Approach Runway Protection Zone (ARPZ)[5]							
Length	1,700[6]	2,500	1,700	1,700	1,700	1,000	1,000
Inner Width	1,000[6]	1,000	1,000	500	500	250	250
Outer Width	1,510[6]	1,750	1,510	1,010	1,010	450	450
Departure Runway Protection Zone (DRPZ)[5]							
Length	1,700	1,700	1,700	1,700	1,700	1,000	1,000
Inner Width	500	500	500	500	500	250	250
Outer Width	1,010	1,010	1,010	1,010	1,010	450	450

Notes:

(1) Minimum separation required for simultaneous takeoffs and landings under Visual Flight Rules (not considering wake turbulence)
(2) Holding position on Taxiways R1, R3, and R4
(3) Taxiway L separation as labeled on 2006 ALP
(4) Runway 32 has a "non-standard EMAS" of 225 feet with a 35-foot setback to enhance operational safety
(5) Mitigation of existing public roadways within RPZs will be evaluated and improved to the extent practical
(6) Standard is 2,500 feet, 1,000 feet, and 1,750 feet for length, inner width, and outer width respectively when visibility minimums are lower than ¾ stature mile

Obstacle Free Zone (OFZ)

The OFZ provides clearance protection for aircraft landing or taking off from the runway as well as missed approaches. The OFZ must be clear of all objects (including aircraft), except for frangible NAVAIDS that are fixed by function.

The OFZ is composed of the Runway OFZ (ROFZ), and when applicable, the Inner-Approach OFZ (IAOFZ), Inner Transitional OFZ (ITOFZ), and Precision OFZ (POFZ). The Runway OFZ applies to all runways. The IAOFZ applies to runways with an Approach Light System (ALS) while the ITOFZ applies to runways with lower than ¾ statute mile approach visibility minimums. Runway 10L satisfies both of these conditions and therefore is subject to the IAOFZ and ITOFZ.

Runway 28R does not have an ALS and is only subject to the ITOFZ. The POFZ is in effect when the approach includes vertical guidance, visibility is less than ¾ statute miles or when ceiling is below 250 feet, and aircraft is on final approach within 2 miles of the runway threshold. When the POFZ is in effect, an aircraft's wing can be within the POFZ when holding on an adjacent taxiway but its fuselage and tail cannot. POFZs apply to both Runways 10L and 28R. Based on the primary fleet mix at PBI and the holdlines on Taxiways C2 and C6 near the runway thresholds, none of the aircraft will have a fuselage/tail penetration when holding near the POFZs.

As noted in the Airport Inventory, large GA aircraft (ADG III) occasionally will utilize Taxiway R while taxiing to and/or from Runway 10L-28R. As a B-I runway serving small GA aircraft only, the ROFZ is 250 feet wide. Taxiway R is located 150 feet from the Runway 10R-28L centerline and an ADG III GA aircraft (Global Express) utilizing Taxiway R penetrates the ROFZ by approximately 22 feet (as depicted in **Figure 4.6**) and essentially precludes operations on Runway 10R-28L. While Taxiway T was constructed as an alternate route for access to Runway 10L from the Southeast GA area, the congestion on the Atlantic Aviation apron often obstructs access to Taxiway T. The DOA is currently in the planning stages to relocate Taxiway R to mitigate this issue.

All other OFZs are clear of non-frangibly mounted NAVAIDS fixed by function.

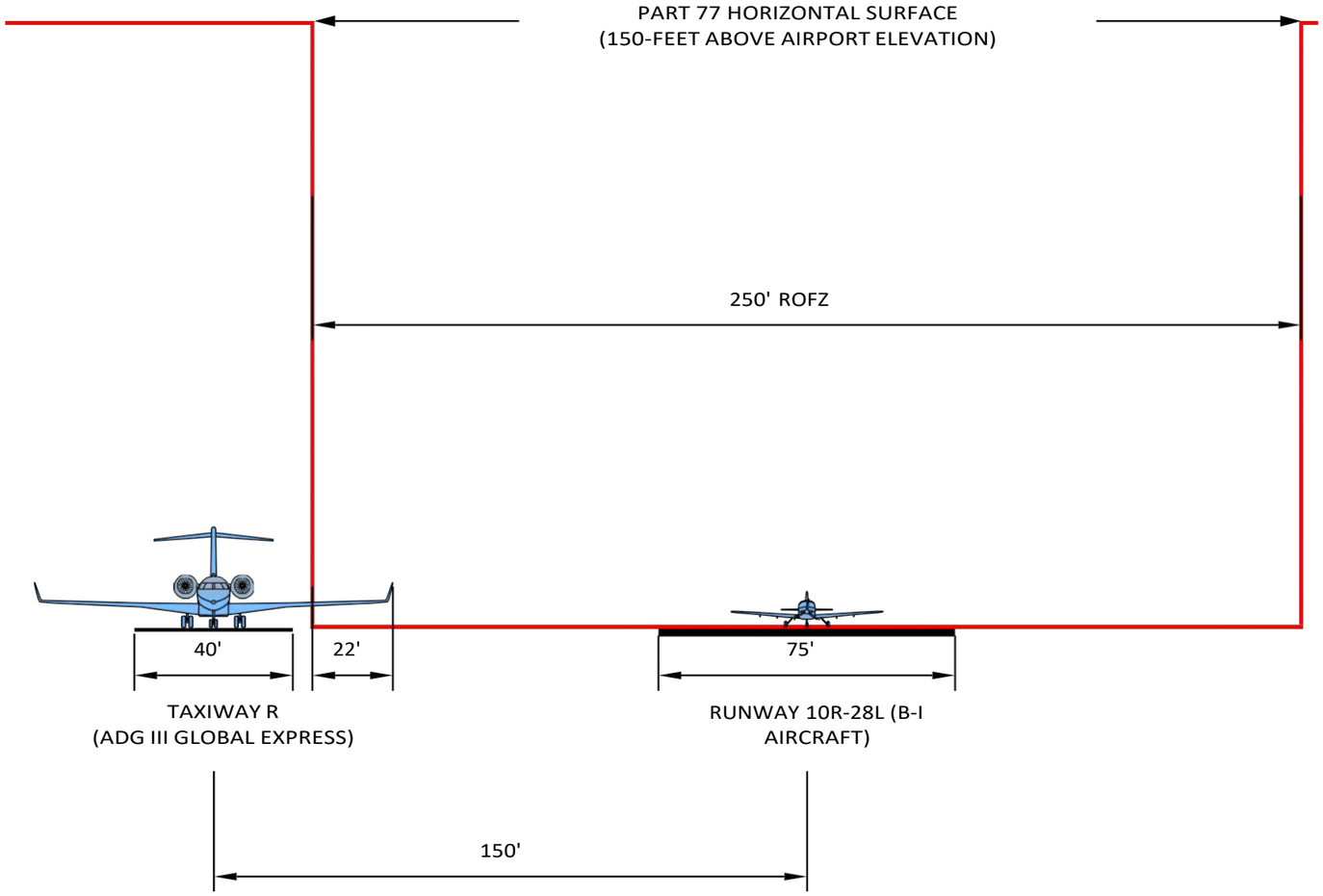


Figure 4.6: Existing Runway Design Surfaces and Non-Standard Conditions
Source: AECOM (2015)

4.1.3.4. Declared Distances

The FAA allows the use of declared distances to identify maximum distances available for arrivals and departures when the full physical length of the runway is unavailable. Declared distances are typically utilized to obtain additional runway safety and/or object free area, mitigate unacceptable land uses within a runway protection zone, provide obstacle clearance, or mitigate environmental concerns. However, the FAA does not require an airport "to reduce the length of a runway or declare its length to be less than the actual pavement length to meet runway safety area standards if there is an adverse operational impact to the airport.[19]" The four declared distances include the Takeoff Run Available (TORA), Takeoff Distance Available (TODA), Landing Distance Available (LDA), and Accelerate Stop Distance Available (ASDA). **Table 4.8** summarizes the key elements of each declared distance.

Table 4.9 identifies the currently published declared distances at PBI as well as proposed revisions based on existing conditions. The ASDA and LDA for Runway10L, 28R, and 32 are reduced to provide 1,000 feet ROFA and RSA beyond the departure ends. Revisions to the TORA and TODA are not recommended as removing incompatible land uses from the RPZs would have a significant adverse operational impact to the airport. However, reductions to the TODA may be required to mitigate penetrations to the existing and/or future 40:1 departure surface. Obstruction data is being collected in conjunction with this Master Plan and impacts to the departure surface will be evaluated as part of the Airport Layout Plan (ALP).

Table 4.8: FAA Declared Distances

Declared Distance	Definition	Limitations	Reduction Reasons
TORA	Distance to accelerate from brake release to lift-off plus safety factors	Must not exceed the length of the runway or TODA	Mitigate incompatible land uses and environmental effects
TODA	Distance to accelerate from brake release past lift-off to start of takeoff climb plus safety factors	Must not exceed the length of the runway plus clearway	Mitigate 40:1 Instrument Departure Surface penetrations
LDA	Distance from threshold to complete the approach, touchdown, and decelerate to stop plus safety factors	Must not exceed the length of the runway	Provide the standard ROFA and/or approach RSA, satisfy approach surface requirements, mitigate incompatible land uses in approach RPZ and environmental effects
ASDA	Distance available to accelerate from brake release to takeoff speed and then decelerate to a stop plus safety factors	Must not exceed the length of the runway plus stopway	Provide standard ROFA and/or approach and departure RSA

Table 4.9: Existing and Revised Declared Distances

Runway		Declared Distance						Comment
ID	Length	TORA	TODA	ASDA		LDA		
		Existing	Existing	Existing	Revised	Existing	Revised	
10L	10,000	10,000	10,000	10,000	9,869	8,800	8,669	ASDA/LDA reduced to provide standard RSA and ROFA beyond DER
28R	10,000	10,000	10,000	10,000	9,888	9,189	9,077	ASDA/LDA reduced to provide standard RSA and ROFA beyond DER
10R	3,213	3,213	3,213	3,213	-	3,213	-	No Change
28L	3,213	3,213	3,213	3,213	-	3,213	-	No change
14	6,931	6,931	6,931	6,000	-	6,000	-	No Change
32	6,931	6,931	6,931	6,931	6,752	6,513	6,284	ASDA/LDA reduced to provide standard RSA and ROFA beyond DER

Abbreviations:

TORA: Takeoff Run Available TODA: Takeoff Distance Available ASDA: Accelerate-Stop Distance Available LDA: Landing Distance Available

19 *AC 150/5220-22B, Engineered Materials Arresting Systems (EMAS) for Aircraft Overruns*

4.1.3.5. Runway End Siting and Airspace Protection

Runway end (threshold) siting is subject to FAA standards for obstruction clearance and other specifications based on visibility minimums. Existing Runway 10L-28R has a precision IAP to each end while Runway 14-32 has a non-precision IAP to each end. Runway 10R-28L is a visual runway only.

Both runways adhere to the IAP standards for runway markings, holding position signs and markings, runway edge lights, parallel taxiway, and approach lights. Other applicable requirements are listed in **Table 4.10**.

4.1.3.6. Runway Pavement Design Strength and Condition

Each of the runways at PBI has sufficient pavement strength to accommodate the aircraft fleet mix intended to use it.

The overall airfield condition at PBI is satisfactory according to the FDOT Statewide Airfield Pavement Report (June 2015). The FDOT weighted Pavement Condition Index (PCI) for each runway is summarized in **Table 4.11** . The PCI indicates the structural integrity and surface operational condition of a pavement. It is an objective measurement of the type, severity, and quantity of distress where 100 indicates new pavement and 0 indicates a failed pavement. PCI from 85 to 100 is considered "good", 70 to 85 considered "satisfactory", and 55 to 70 considered "fair". FDOT recommends a minimum PCI of 75 for runways. Runway 10R-28L is currently at the minimum standard; however, the DOA is in the process of rehabilitating the runway and is expected to be completed in 2017.

Table 4.10: Runway End Siting Requirements

Visibility Minimums	< 3/4 mile		≥ 3/4 mile but < 1 mile		≥ 1 mile		Visual	
Runway(s)	10L		28R		14-32		10R-28L	
	Requirement	Existing Condition	Requirement	Existing Condition	Requirement	Existing Condition	Requirement	Existing Condition
Height Above Threshold	<250-ft	200	≥ 250-ft	200	≥ 20-ft	303 / 320	N/A	N/A
Precision OFZ	Required	Clear	Required	Clear	Required	Clear	N/A	N/A
Runway Markings	Precision	Precision	Non-Precision	Precision	Non-Precision	Non-Precision	Visual	Visual
Runway Edge Lights[1]	HIRL	HIRL	HIRL	HIRL	MIRL/LIRL	MIRL	N/A	MIRL
Approach Lights	MALSR, SSALR, or ALSF	MALSR	Recommended	None	Recommended	None	N/A	N/A
Minimum Runway Length (feet)	4,200 (paved)	10,001	3,200	10,001	3,200	6,931	N/A	3,214
Survey Required	VGS	VGS	VGS	VGS	NVGS	VGS	N/A	NVGS

Notes:

(1) High Intensity Lights are required for RVR based minimums

Table 4.11: Runway Pavement Condition

Runway	Pavement Classification Number	Weighted Pavement Condition Index (PCI)	PCI Rating
10L-28R	93 F/B/W/T	100	Good
14-32	TBD	87	Good
10R-28L	TBD	75	Satisfactory

Source: FDOT Statewide Airfield Pavement Management Program Update Summary Report, June 2015

4.1.4 Taxiway System

The taxiway system of an airport provides for the safe and efficient movement of aircraft between the runways, terminal area, and general aviation facilities. The following evaluates the taxiways according to design standard and operational efficiency from a runway exit perspective.

4.1.4.1. Taxiway Design

Taxiway design standards are based on the ADG and TDG of the aircraft frequently using the taxiways. ADG affects the protection areas, separation standards, and wingtip clearances. TDG determines the width, main-gear safety margin, and shoulder width. The design requirements that apply to taxiways at PBI are summarized in **Table 4.12**.

An evaluation of the existing taxiway system revealed the non-standard conditions identified in **Table 4.13**. All the taxiways and taxilanes adhere to the standard separation from other parallel taxiways and/or fixed/movable objects. While all the taxiways are of sufficient width, several do not provide the FAA standard shoulder pavement. Therefore, it is recommended that the shoulders which need to be added, widened, or completed are implemented.

Table 4.12: Taxiway/Taxilane Design Standards

Item	ADG				
	I	II	III	IV	V
Protection					
Taxiway Safety Area	49	79	118	171	214
Taxiway Object Free Area	89	131	186	259	320
Taxilane OFA	79	115	162	225	276
Taxiway Separation					
Parallel Centerline	70	105	152	215	267
Fixed or Movable Object	44.5	65.5	93	129.5	160
Taxilane Separation					
Parallel Centerline	64	97	140	198	245
Fixed or Movable Object	39.5	57.5	81	112.5	138
Wingtip clearance					
Taxiway Wingtip Clearance	20	26	34	44	53
Taxilane Wingtip Clearance	15	18	27	27	31
			TDG		
	2	3	4	5	6
Taxiway Width	35	50	50	75	75
Taxiway Edge Safety Margin	7.5	10	10	15	15
Taxiway Shoulder Width	15	20	20	30	30
Parallel Taxiway/Taxilane Centerline with180° Turn	162	162	240	240	312

Table 4.13: Non-Standard Taxiways

ID	ADG	TDG	Width (ft)	Shoulders (ft)	Non-Standard Condition
A	V	5	75	25	Insufficient shoulder width
B	V	5	75	25	Insufficient shoulder width
C	V	5	75	35	Incomplete shoulders near Runway 28R end
D	IV	5	75	0	No shoulders
E	IV	5	75	0	No shoulders
F	III	3	75	35	Incomplete shoulders
G	V	5	100	25	Insufficient shoulder width
H	V	5	75	25	Insufficient shoulder width
L	III	3	50	20	Incomplete shoulders near Runway 28R end
M	V	5	75	25	Insufficient shoulder width
N	V	5	85	8	Insufficient shoulder width
R	I	2	40	0	No Shoulders
T	III	4	50	0	No Shoulders

Notes:

(1) Taxiways only include those with non-standard conditions; those not shown adhere to the FAA design standards.

4.1.4.2. Taxiway Configurations

The revised FAA design standards in AC 150/5300-13A (Change 1) include guidance regarding taxiway configurations, particularly points of intersection with a runway. In addition to the existing "hotspots" at PBI, a review of the existing taxiway system configuration revealed approximately 13 intersections that do not adhere to the new standards as depicted in **Figure 4.7**.

The existing "hotspots", include:

1. Non-standard location of runway holding position sign on Taxiway L at Runway 10L end
2. Aircraft occasionally miss the turn onto Taxiway L from Taxiway F and cross Runway 10R-28L
3. Aircraft occasionally miss the turn onto Taxiway C from Taxiway B and cross Runway 10R-28L
4. Large pavement area at Taxiway L and E intersection

The other non-standard conditions include direct taxiway access from an apron onto a runway, "Y" shaped taxiways crossing a runway, convergence of numerous taxiways entering a runway, and so forth. As such, it is recommended that the development plan include the elimination of these non-standard taxiway configurations. The DOA is in the process of reconfiguring the Taxiway L and Taxiway E intersection as well as the Taxiway C, Taxiway B, and Taxiway G intersection. These improvements will eliminate the associated "hotspots".

The Taxiway L and Taxiway E reconfiguration is in design and expected to be completed in 2015 while the Taxiway G, Taxiway B, and Taxiway C intersection reconfiguration is expected to be completed in 2018.

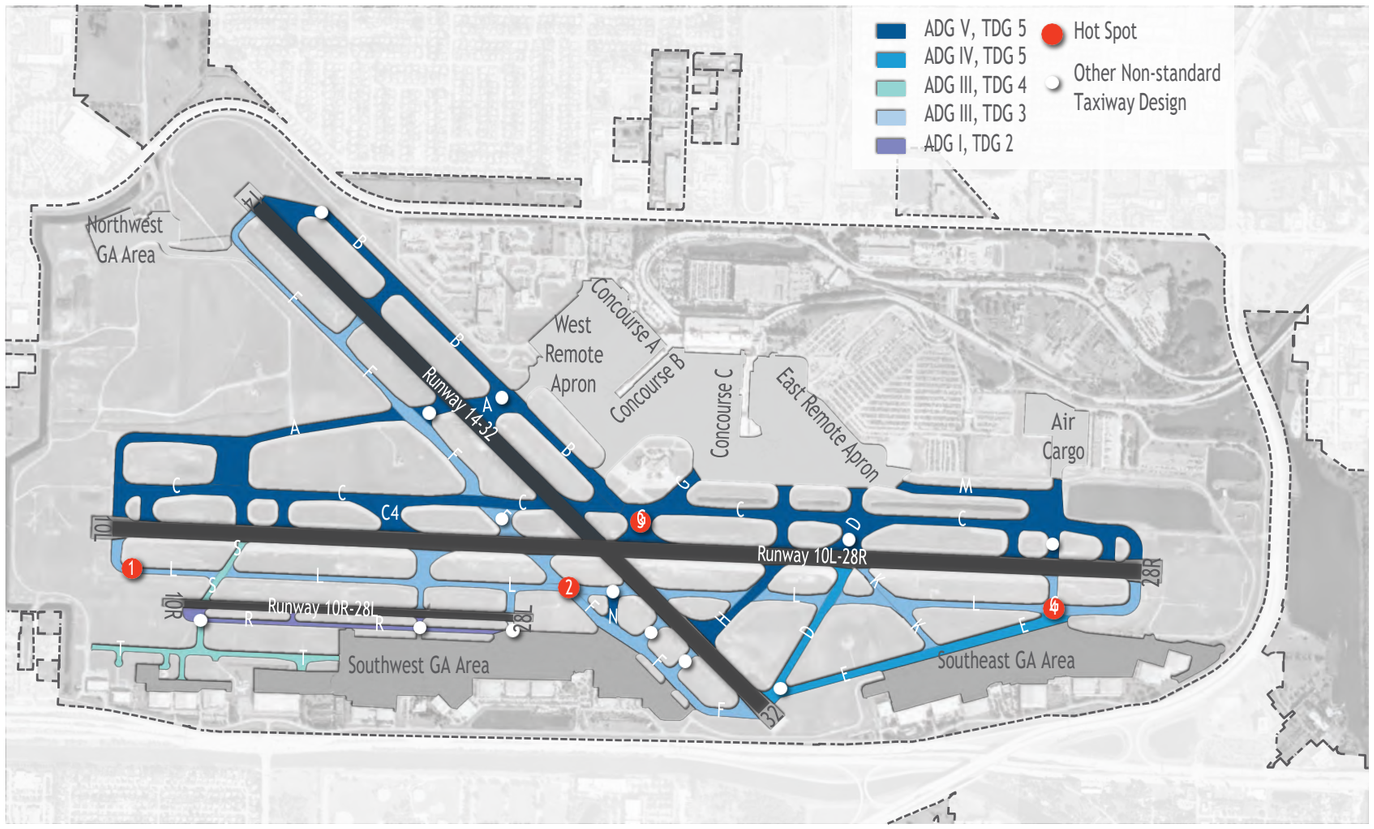
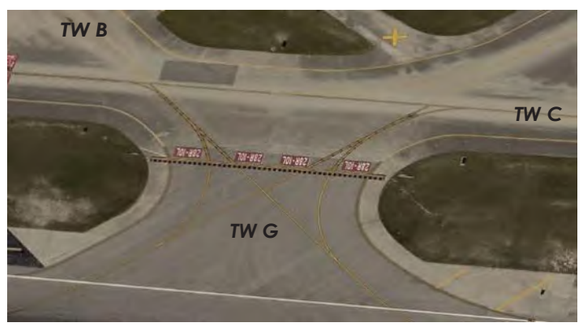


Figure 4.7: Existing Non-Standard Taxiway Configurations
Source: AECOM (2015)

Hotspot 1: Taxiway L & Runway 10L-28R Intersection
Source: Pictometry (2015)

Hotspot 2: Taxiway F & Taxiway L Intersection
Source: Pictometry (2015)



Hotspot 3: Taxiways B, C, and G Intersection
Source: Pictometry (2015)

Hotspot 4: Taxiways L and E Intersection
Source: Pictometry (2015)

4.1.4.3. Exit Taxiways

While the primary runways at PBI can accommodate the aircraft fleet mix based on landing length requirements, the location of the exit taxiways can have a significant impact on the capacity of the runway system. **Figure 4.8** depicts the locations of the existing Runway 10R-28L exit taxiways relative to the landing length requirements for the existing and future fleet mix.

The traffic light color scheme indicates an aircraft's relative ability to utilize the exits and includes the following:

- Red indicates the distance an aircraft cannot exit the runway due to its speed at that point
- Yellow indicates a distance an aircraft can potentially exit the runway depending on deceleration rate, which varies based on weather conditions and airline or pilot operational procedures
- Green indicates a distance that the aircraft can exit the runway with conservative deceleration rates

Since the 2006 Master Plan, Taxiways D and C4 were widened and reconfigured to provide a modified high-speed exit taxiway for arrivals on Runways 10L and 28R. The modified Taxiways D and C4 are considered high-speed exits, albeit at an angle less than a typical high-speed exit (30 degrees). While this does not impact the ability of an aircraft to utilize the exit, it does increase the deceleration rate required when braking and the ROT.

FAA AC 150/5300-13A, *Airport Design (Change 1),* provides cumulative utilization percentages for taxiways based on location and aircraft size. At a distance of approximately 5,650 feet from the Runway 10L threshold, Taxiway D can accommodate only 27% of Large Aircraft[20] and 0% of Heavy Aircraft[21] on a wet runway and 92% and 81% respectively on a dry runway. Conversely, Taxiway C4 (approximately 6,140 feet from the Runway 28R threshold) can accommodate 48% and 10% of Large and Heavy aircraft on a wet runway and 98% and 95% on a dry runway respectively.

While the existing taxiway locations are sufficient to support the existing and future fleet mix, it is recommended that a new standard high speed exit between 6,000 and 6,500-feet is considered in the future to improve airfield capacity during wet conditions.

4.1.5 Holding Bay

A holding bay is an area where aircraft can perform final pre-flight checks of the aircraft equipment or wait until receiving clearance from the FAA to depart. Holding bays can improve capacity and operational efficiency by allowing other aircraft which have either received clearance or completed pre-flight checks to move ahead of those which have not. The FAA recommends an airport provide a holding bay when runway operations reach 30 per hour.

Therefore, it is recommended that a holding bay is provided at both the Runway 10L and Runway 28R ends as these are expected to continue serving as the primary departure points.

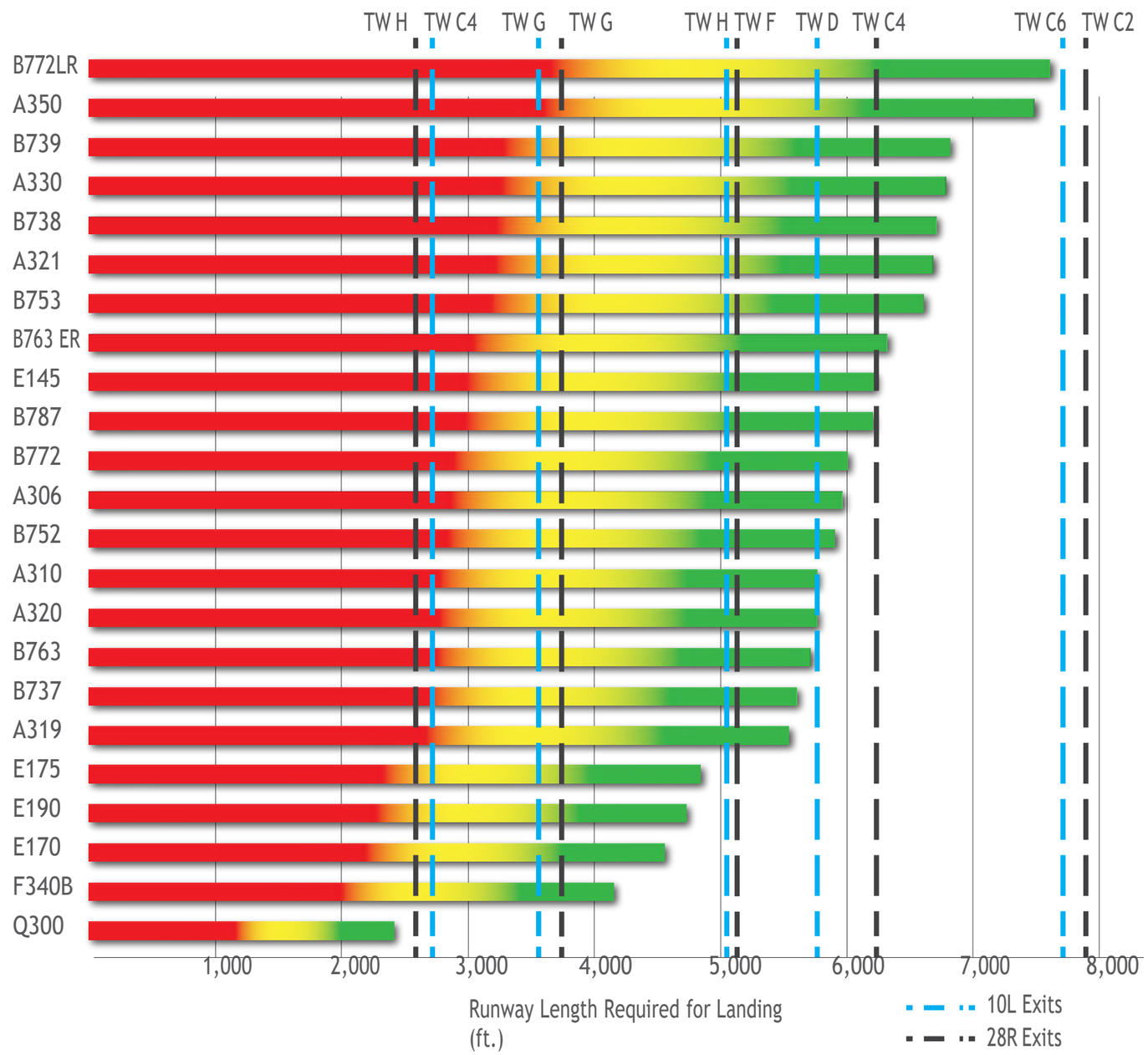


Figure 4.8: Runway 10R-28L Taxiway Exit Locations
Notes:

(1) The traffic light color scheme indicates the relative ability of the aircraft
(2) Taxiway locations are relative to the distance from the runway displaced threshold

20 12,500 to <300,000 pounds
21 300,000 pounds

4.1.6 Navigational Aids

Each runway end/threshold at PBI is equipped with visual approach aids. REILs are available for all runway ends except Runway 10L which has a MALSR. A PAPI system and wind cone are provided for all runway end/threshold. Wind cones are not fixed by function within the RSA or ROFA. Each of the existing wind cones, except Runway 10R is located within the ROFA. It is recommended the wind cones are relocated outside the ROFA per FAA standards.

Although Runway 10L-28R and Runway 14-32 are equipped with approaches having horizontal and vertical guidance, only Runway 10L-28R includes a traditional ground-based ILS. Similar to the location of wind cones, ILS glideslope antennas are not fixed-by-function within the RSA or ROFA. However, the FAA will evaluate the allowing a glideslope antenna within the ROFA due to physical constraints on a case by case basis. The existing Runway 10L-28R parallel taxiways (C and L) represent physical constraints and therefore, relocation of the glideslope antennas is not recommended.

Runways 10L, 28R, 14, and 32 each have an Area Navigation (RNAV) approach with vertical guidance. These approaches include both Required Navigation Performance (RNP) and GPS and do not require additional navigation equipment on an airport. Although these approaches can support visibility minimums similar to an ILS, the cloud ceiling minimums are higher at PBI. As the FAA is in the process of transitioning from a ground-based to a satellite-based navigation system with the development of the Next Generation Air Transportation System (NextGen) and the existing approaches provide sufficient instrument approach capabilities, no additional instrument approach aids are required or recommended. However, it is recommended the new runway is equipped with instrumentation to provide sufficient horizontal and vertical guidance.

4.1.7 Airfield Lighting

Airfield Lighting includes ALS, runway lights, taxiway lights, and apron lights to further promote safe operations at night or in other periods of reduced visibility.

4.1.7.1. Approach Lighting

The FAA does not require but recommends approach lighting systems on runway ends having instrument approaches with straight-in minimums of 3/4 mile and greater. However, a MALSR is required to support a reduction of horizontal visibility minimums to 1/2 mile. Installation of a MALSR is recommended for the proposed new runway as it is intended to serve as the primary arrival runway.

4.1.7.2. Runway Lighting

Runway 10L-28R currently has High Intensity Runway Edge Lights (HIRLs) and Runway 14-32 and Runway 10R-28L each have Medium Intensity Runway Edge Lights (MIRL). This lighting satisfies the FAA standard for the approach visibility minimums of each runway and is sufficient to accommodate existing and future aircraft operations.

Runway centerline and touchdown zone lighting are required to support instrument approaches based on RVR minimums. Runway 10L-28R is equipped with runway centerline and touchdown zone lighting accordingly. It is recommended the proposed runway is equipped with this lighting as well to support instrument approaches based on RVR minimums.

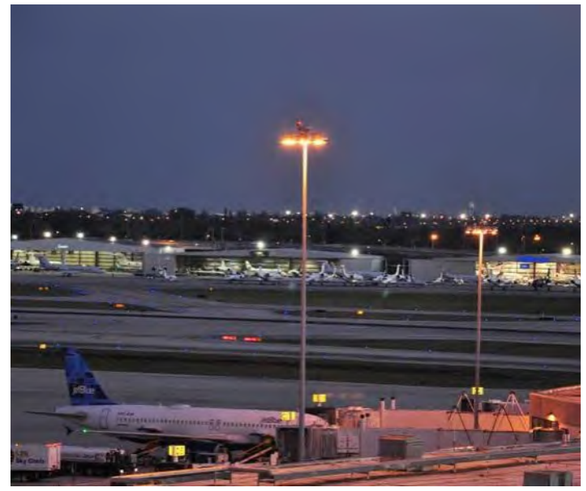
4.1.7.3. Taxiway Lighting

All the existing taxiways at PBI have Medium Intensity Taxiway Lights (MITL). This lighting is sufficient to satisfy existing and future operational requirements.

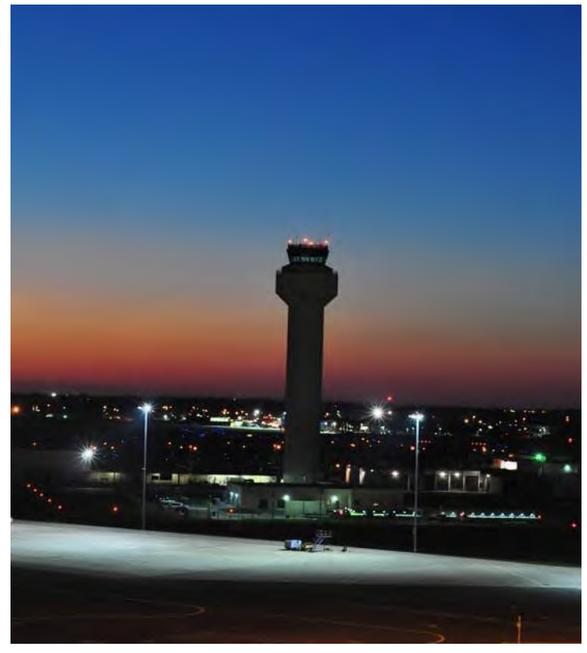
4.1.8 Summary of Airside Facility Requirements

The airside facility requirements represent the minimum requirements that allow the Airport to accommodate future aviation demand, adhere to FAA design standards, and/or improve operational efficiency. However, depending on the Airport's goals, extra facilities can be developed to provide higher capacity. The following list includes the recommended airside facilities:

- Construct a new air carrier runway to support an expected increase in hourly demand
- Provide a MALSR, runway centerline lighting, and touchdown zone lighting for the new runway
- Upgrade and realign Taxiway L to satisfy FAA runway-to-taxiway centerline separation requirements and support operations by ADG IV / TDG 5 aircraft
- Increase separation from Runway 10R-28L to taxiway holding positions
- Obtain control of land within RPZs outside of the existing airport boundary
- Provide standard RSAs and ROFAs utilizing declared distances as necessary
- Construct, widen, and/or lengthen taxiway shoulders as required
- Reconfigure non-standard taxiway geometries based on FAA design standards
- Provide a holding bay for Runway 10L and Runway 28R



Airfield Lighting
Source: AECOM (2014)



West Remote Ramp Lighting and ATCT
Source: AECOM (2014)

4.2 Airside Development Plan

As the primary component of all airports, a master plan must first identify the recommended airside improvements required to accommodate anticipated demand and satisfy safety standards prior to development of other supporting functions. The following sections summarize the constraints which governed the analysis and the subsequent alternatives development.

4.2.1 Development Constraints

PBI is surrounded by major public roads, water bodies, and residential/commercial/industrial development. As a result, proposed airfield expansion must consider the ability and feasibility of impacts to these features. As illustrated in **Figure 4.9** and summarized in the following sections, constraints include those associated with infrastructure and environmental features.

4.2.1.1. Infrastructure Constraints

Existing and/or currently proposed man-made infrastructure features are classified are either primary constraints or secondary constraints. Primary constraints represent elements this Master Plan Update shall not impact and include the following:

- Recently completed infrastructure development (e.g., ATCT)
- Current infrastructure development (e.g., Travel Plaza, Hotel)
- Infrastructure which is financially prohibitive to relocate (e.g., Interstate 95, Commercial Passenger Terminal, Southern Boulevard, and the Fuel Farm)

Secondary constraints represent elements proposed developments should avoid to the extent practical but can impact if the benefits of doing so offset the significant financial investment required. These constraints include Belvedere Road, North Military Trail, Australian Avenue, and James L. Turnage Boulevard.

4.2.1.2. Environmental Constraints

The environmental constraints at PBI are mainly surface water bodies (ditches, retention ponds, lakes), many with associated wetlands, that are located around the edges of the property. The surface water bodies are also considered wetlands by the U.S. Geological Survey. Wetlands are regulated by the U.S. Army Corps of Engineers (USACE). Per Executive Order 11990, Protection of Wetlands, federal agencies must "avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative."

In addition, floodplains (areas subject to inundation of 1% annual chance flood) are located in between the runways and taxiways, as well as in and around the surface water bodies. Proposed airside developments should avoid these areas to the extent practical. Floodplains provide natural flood and erosion control and Executive Order 11988, Floodplain Management, requires Federal agencies to avoid, to the extent possible, adverse impacts to 100-year floodplains wherever there is a practicable alternative.

There is the potential for threatened and endangered species habitat in the undeveloped areas of the Airport that must be investigated in consultation with the U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), and the Florida Fish and Wildlife Conservation Commission (FFWCC) prior to construction. Chapter 8 provides more information on environmental features and the associated impacts of proposed developments.

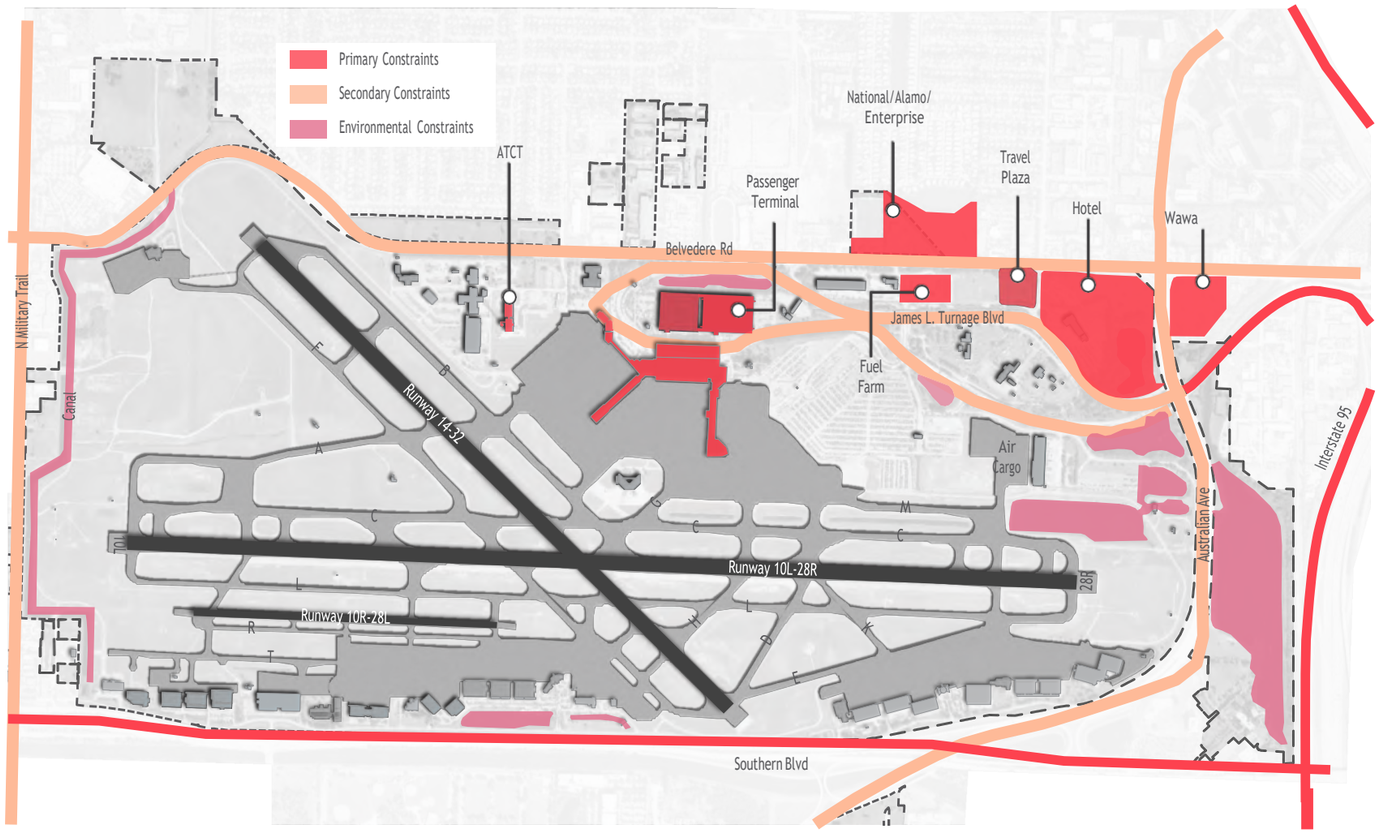


Figure 4.9: Development Constraints

4.2.2 Runway System

Since the 2001 PBI Strategic Master Plan, multiple airfield planning efforts were completed to address airfield capacity issues and explore various development alternatives. The 2005 PBI Airspace & Airfield Constraints Analysis recommended relocation and extension of existing Runway 10L-28R to 8,000 feet.

The 2012 FAA ROD conditionally approved the Long-Term Airport Improvement Program (AIP) but did not rule on the relocation and extension of Runway 10R-28L due to a significant decrease in aircraft operations. Aircraft operations have since recovered and are again expected to exceed the capacity of the existing airfield within the planning horizon of this Master Plan Update.

4.2.2.1. Runway Alternatives Analysis

The preferred runway development plan was selected through a 3 round alternatives analysis process. High level concepts were developed in Round 1 and evaluated based on qualitative evaluation criteria to eliminate less feasible options. The remaining alternatives were refined evaluated based on specific quantitative criteria in Round 2. The final two alternatives were further refined and evaluated based on a weighted set of quantitative and qualitative criteria in order to arrive at a preferred runway development alternative.

Round 1 – Preliminary Screening

Considering the development constraints and the FAA's 2012 ROD, the six alternatives depicted in **Figure 4.10** include:

1. **Alternative 1:** Limits runway development to the extension of Runway10L-28R to maximize runway takeoff length on the primary runway.
2. **Alternative 2**: Expands upon Alternative 1 with the addition of the relocated and extended Runway 10R-28L to improve airfield capacity and efficiency. Existing Runway 14-32 remains and intersects both Runways 10L-28R and 10R-28L.
3. **Alternative 3:** Similar to the 2006 Master Plan, this alternative includes the upgrade of existing Runway 10R-28L to an air carrier runway and shortens Runway 14-32 to eliminate the dual runway crossing.
4. **Alternative 4:** This alternative is similar to Alternative 3 but decommissions Runway 14-32 in order to maximize the area available for other aviation-related development.
5. **Alternative 5:** Extends existing Runway 10L-28R, realigns and extends existing Runway 10R-28L, and decommissions Runway 14-32 to maximize the space for General Aviation and/or other aviation related facilities.
6. **Alternative 6:** Decommissions existing Runway 10L-28R, extends existing Runway 10R-28L to 10,000-feet, and shortening existing Runway 14-32 to 5,000-feet to maximize space for GA facilities.

Each alternative includes options that are interchangeable; however, they were evaluated as individual alternatives for preliminary screening purposes. **Table 4.14** summarizes the Round 1 alternatives evaluation according to five general qualitative criteria.

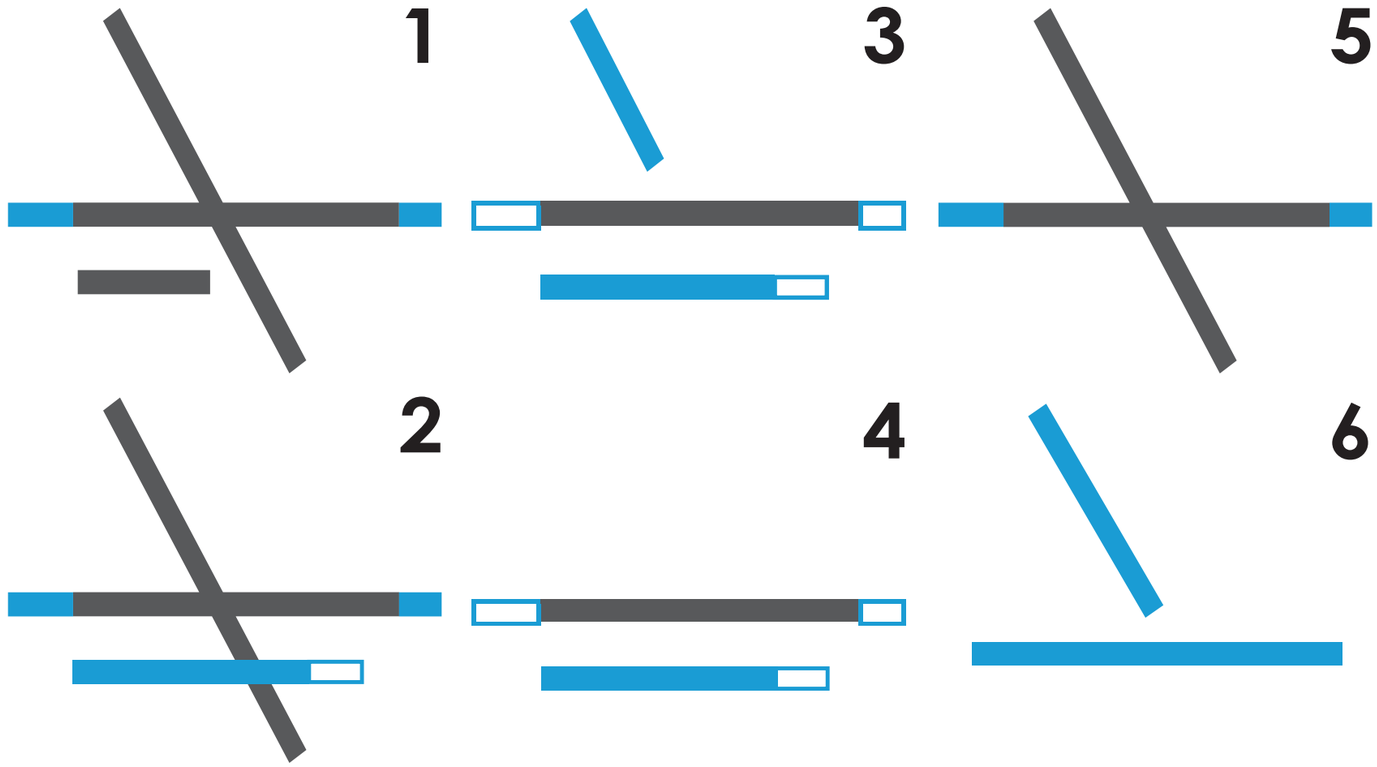


Figure 4.10: Runway Alternatives - Round 1

The impacts to airfield capacity are based on preliminary calculations utilizing FAA criteria. Alternatives 2, 3, and 4 each provide a considerable increase to airfield capacity while there is no change with Alternative 1. Similarly, Alternative 6 provides a relatively insignificant increase to airfield capacity and is given a neutral rating. On the other hand, Alternative 5 decreases overall capacity due to the decommissioning of Runway 10R-28L and the dependencies associated with the runway intersection.

Each alternative, except Alternative 6, can include an extended Runway 10L-28R which maximizes runway length. While Alternative 6 includes the relocation of Runway 10L-28R, it can only accommodate the existing length of 10,001-feet. The primary benefit of Alternative 6 is that it provides the largest area for aviation development opportunities. Similarly, Alternatives 4 and 5 optimize aviation development by decommissioning Runway 14-32. Alternatives 1, 2, and 3 provide the least amount of space for aviation development opportunities.

Based on these criteria, Alternatives 3 and 4 were selected for further refinement in Round 2.

Table 4.14: Round 1 Runway Alternatives Evaluation

Evaluation Criteria	Alternative 1	2	3	4	5	6
Long-Term Needs (Capacity)	○	●	●	●	●	○
Long-Term Needs (Runway Length)	●	●	●	●	●	○
Compatibility	●	●	●	●	●	●
Flexibility	●	●	●	●	●	●
Operational Efficiency	●	●	●	●	●	●
Financial Feasibility & Implementation	○	○	○	○	○	●

● Positive ○ Neutral ● Negative

Round 2 – Runway Length Analysis

Since the primary difference between Alternatives 3 and 4 is the inclusion of Runway 14-32, the length of the new Runway 10R-28L was the primary focus of Round 2. As illustrated in **Figure 4.11**, four alternatives for the ultimate runway length were developed to evaluate the impacts.

Alternative A limits the length of the relocated Runway 10R-28L to 6,500 feet, similar to the 2001 ALP concept. Since Runway 10R-28L will be used primarily as the arrival runway, this concept provides sufficient landing length for most aircraft operating at PBI while also maintaining some of the existing Southeast GA facilities. This alternative will require a high-speed exit located at approximately 6,000-feet or more from the landing threshold to support larger ADG III aircraft such as the A321 and B737-900.

Alternative B matches the 2006 Master Plan by providing a length of 8,000 feet. This alternative will require relocation of all facilities in the southeast GA area but provides sufficient landing length for all aircraft operating or expected to operate at PBI. The additional 1,500 feet of runway length will support departures by ADG III aircraft at a takeoff weight less than the maximum designed for the aircraft.

Alternative C maximizes the length of Runway 10R-28L to 9,320 feet. While displaced threshold of 1,320 feet is required on Runway 28L for obstruction clearance purposes, the additional length supports Runway 28L departures with less weight restrictions. Departures from Runway 10R are still limited to 8,000-feet due to existing obstacles.

Alternative D is similar to Alternative C but with the addition of an extension to both the Runway 10L and 28R ends. While the additional length on either end is unavailable for arrivals, the additional length can be used for departures from their respective runway ends. Thus, the increase to the takeoff run available (TORA) is 642 feet from the Runway 10L end and 344 feet from the Runway 28R end. The increase in runway length can accommodate unrestricted departures by aircraft such as A321, B739, and A350. Furthermore, the additional runway length increases the maximum stage length achievable from PBI by approximately 2,500 nautical miles due to the improved performance characteristics of modern commercial aircraft. As a result, air carriers could offer non-stop flights from PBI to nearly anywhere in the world.

As summarized in **Table 4.15**, Alternative D was selected as the preferred alternative for additional refinement and analysis in Round 3.

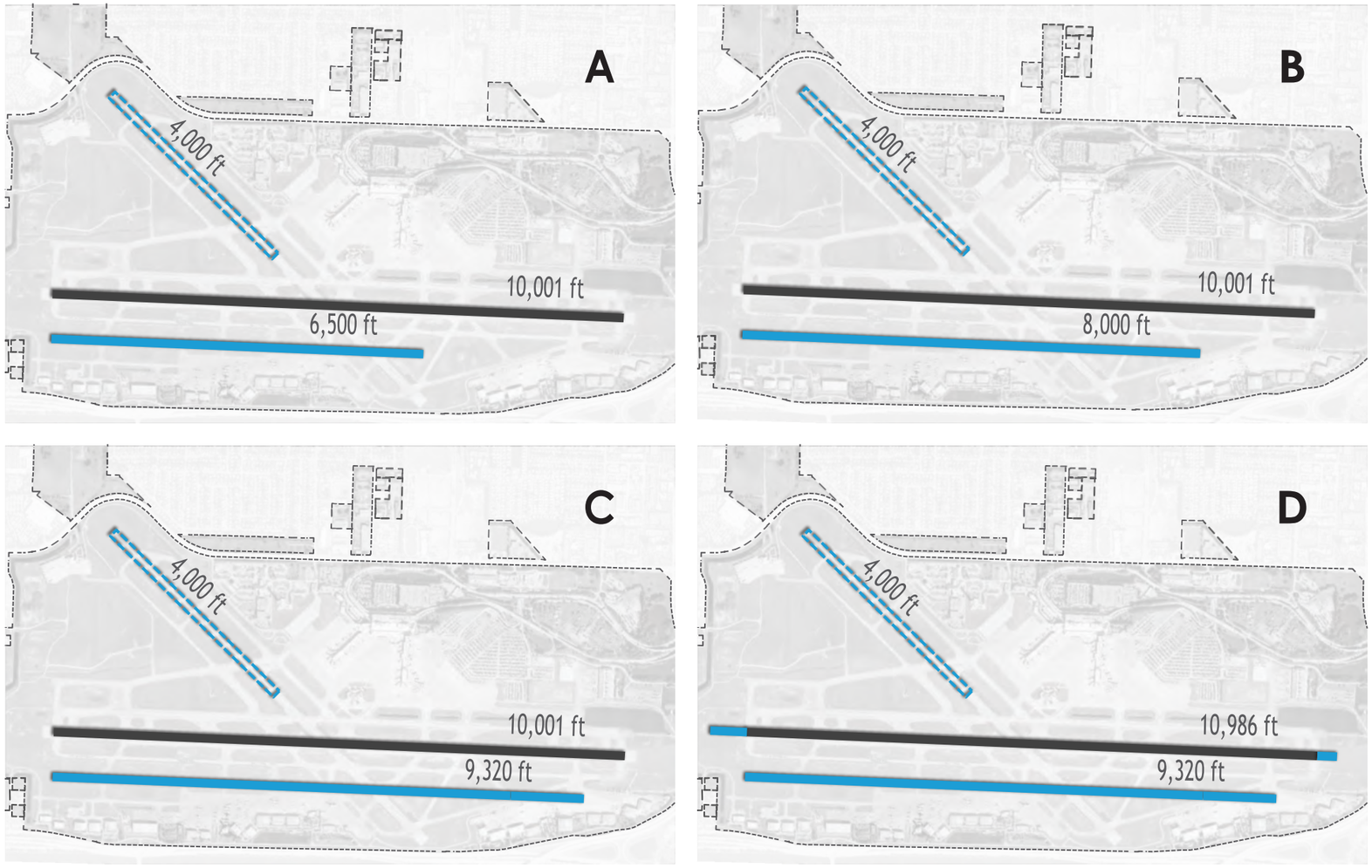


Figure 4.11: Runway Alternatives - Round 2

Table 4.15: Round 2 Runway Alternatives Evaluation

Evaluation Criteria	Alternative			
	A	B	C	D
Long-Term Needs (Runway Length)	Negative	Neutral	Positive	Positive
Long-Term Needs (Stage Length)	Neutral	Neutral	Neutral	Positive
South Development Area (acres)	± 123	± 90	± 90	± 90

Positive Neutral Negative

Round 3 – Preferred Alternative Selection

Given the selection of Alternatives 3 and 4 in Round 1 and Alternative D in Round 2, two alternatives (Alternatives 3D and 4D) were refined for analysis in this final round. As depicted in **Figure 4.12**, the decommissioning of Runway 14-32 nearly doubles the area available for aviation development. Therefore, Round 3 focused on the advantages and disadvantages of decommissioning Runway 14-32.

Based on wind data collected at PBI between 2005 and 2015, approximately 5.6% of wind conditions require small GA aircraft, with a maximum crosswind component of 10.5 knots, to utilize Runway 14-32. On an annual basis, approximately 7% of aircraft operating at PBI are within this category.[22] Therefore, the amount of annual operations that would be impacted by the decommissioning of Runway 14-32 is approximately 0.39%, or roughly 740 operations in 2035 by A-I and B-I aircraft.

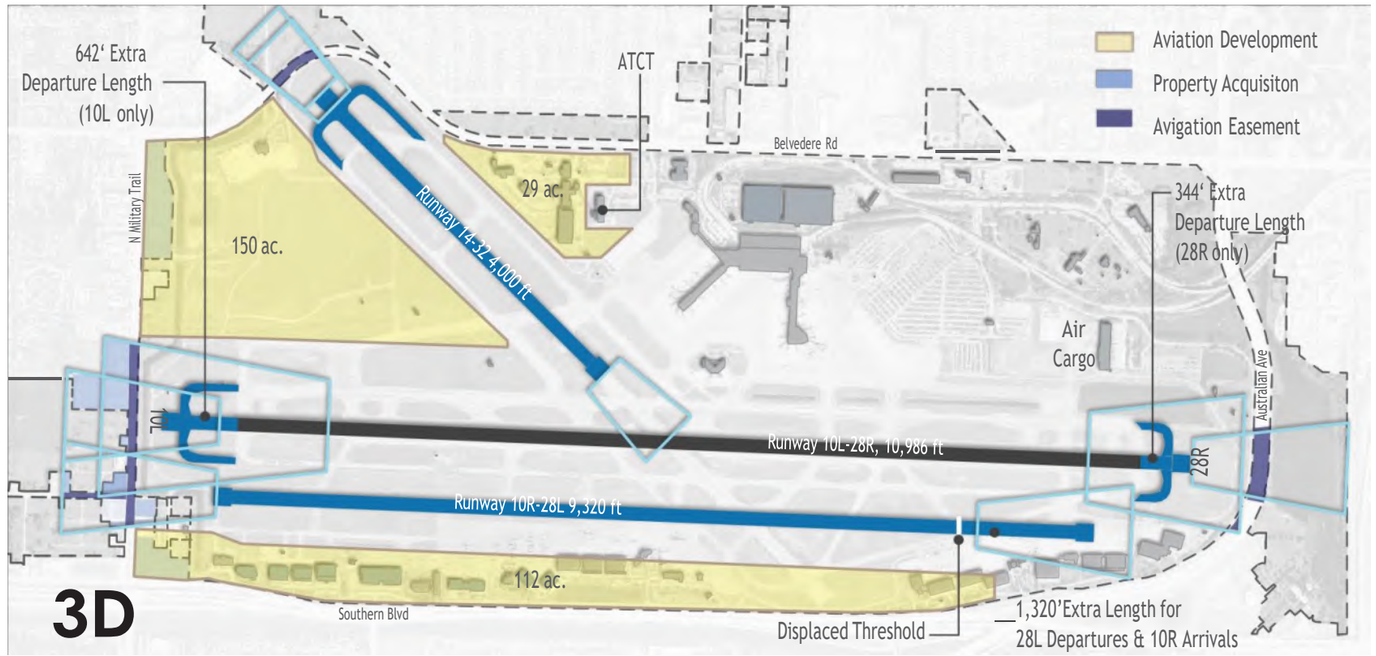
Table 4.16 summarizes the evaluation of the two Round 3 alternatives. In contrast to previous rounds, the Round 3 evaluation incorporated a weighed system for specific criteria. Each alternative was given a score between 1 (worst) and 5 (best) and the total rating generated by the weight of each criteria.

Alternative 3D provides slightly higher airfield capacity and fewer operational restrictions due to the crosswind runway, but would provide less land for aviation development. The primary cost of each is the relocation and extension of Runway 10R-28L and its enabling projects but Alternative 3 includes additional costs associated with the continued maintenance and operation of Runway 14-32. Furthermore, the parcel along the extended centerline of Runway 14-32 north of Belvedere Road can be utilized for non-aviation, revenue generating functions which increases the difference in costs between the two alternatives.

Based on this analysis and input from the DOA and Stakeholder Advisory Committee, Alternative 4D was selected as the preferred alternative.

Table 4.16: Round 3 Runway Alternatives Evaluation

Evaluation Criteria	Weight (%)	Alternative	
		3D	4D
Long-Term Aviation Needs	35%	5	4
Operational Efficiency	25%	4	3
Compatibility	20%	2	5
Financial Feasibility & Implementation	15%	2	3
Flexibility	5%	2	5
Total Weighted Rating	**100%**	**3.6**	**3.9**



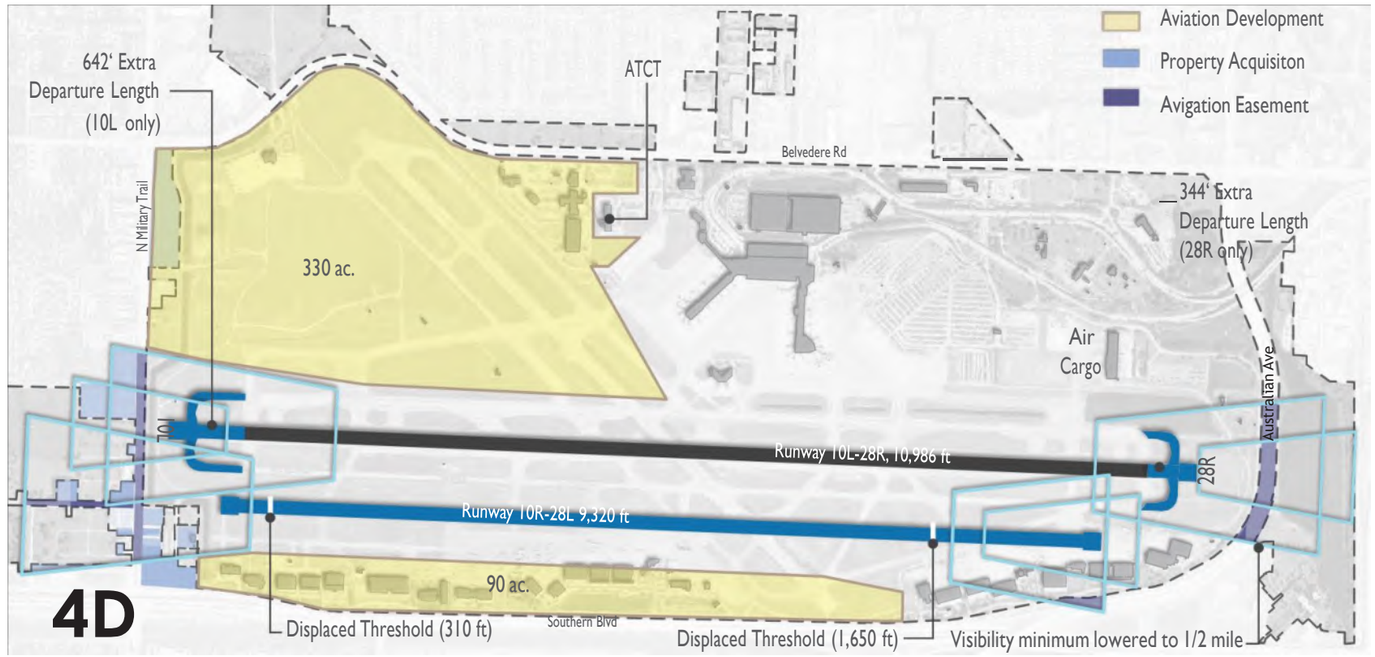


Figure 4.12: Runway Alternatives - Round 3

22 *Analyzed from ANOMS 2014 operations data*

4.2.3 Taxiway System

While the majority of proposed modifications to the taxiway system are based on the ultimate configuration of the airfield, there are several modifications recommended to align the existing taxiway system with FAA design standards per AC 150/5300-13A, *Airport Design* (Change 1). The FAA recently initiated a multi-year Runway Incursion Mitigation (RIM) program to "identify, prioritize, and develop strategies to help airport sponsors mitigate risk[23]" for taxiway intersections with non-standard configurations.

In addition, FAA Engineering Brief 89, *Taxiway Nomenclature Convention*, provides guidance on taxiway designations intended to minimize potential pilot confusion and the risk of runway incursions. **Figure 4.13** illustrates proposed near-term taxiway improvements which eliminate existing non-standard configurations and revise taxiway nomenclatures. The majority of near-term modifications are included in on-going projects while others will be mitigated via the long-term airside development plan.

Short-Term Modifications

- Removal of direct access from an aircraft parking apron to a runway:
  - Taxiway A between the West Remote Apron and Taxiway B (mitigation anticipated via the on-going Taxiway B rehabilitation project)
  - Taxiways H and D from the Concourse C apron (mitigation anticipated via the on-going Taxiway M rehabilitation project)
  - Taxiways R3 and R4 from the Southwest GA apron to Runway 10R-28L (mitigation anticipated via the on-going Taxiway R relocation project)
  - Taxiways F2 and F3 from the Southwest GA Apron to Runway 14-32 (mitigation anticipated via the on-going Taxiway F rehabilitation project)
  - Taxiway C6 from the Air Cargo apron and Runway 10L-28R (mitigation anticipated via the on-going Taxiway M rehabilitation project)
  - Taxiway F between Taxiways L and N [Hotspot 2] (mitigation anticipated via the on-going Taxiway F rehabilitation project)
- Removal of taxiways that create a Y-shaped intersection with a runway:
  - Taxiways D and K between Taxiway L and Runway 10L-28R (will be mitigated with proposed Runway 10R-28L)
  - Taxiway D and E at the Runway 32 entrance (will be mitigated with proposed Runway 10R-28L)
- Realignment of taxiways which intersect a runway at an angle other than 90-degrees:
  - Taxiway H between Taxiway L and Runway 10L-28R (will be mitigated with proposed Runway 10R-28L)
  - Taxiway B entering Runway 14 (mitigation anticipated via the on-going Taxiway B rehabilitation project)
  - Taxiway S between Runways 10L-28R and 10L-28R (will be mitigated with construction of new Runway 10R-28L)
- Removal of intersections which do not adhere to the "3-node" concept:
  - Taxiway G between Taxiway C and the terminal apron (mitigation anticipated via the on-going Taxiway M rehabilitation project)

23 FAA (2015), http://www.faa.gov/airports/special_programs/rim/

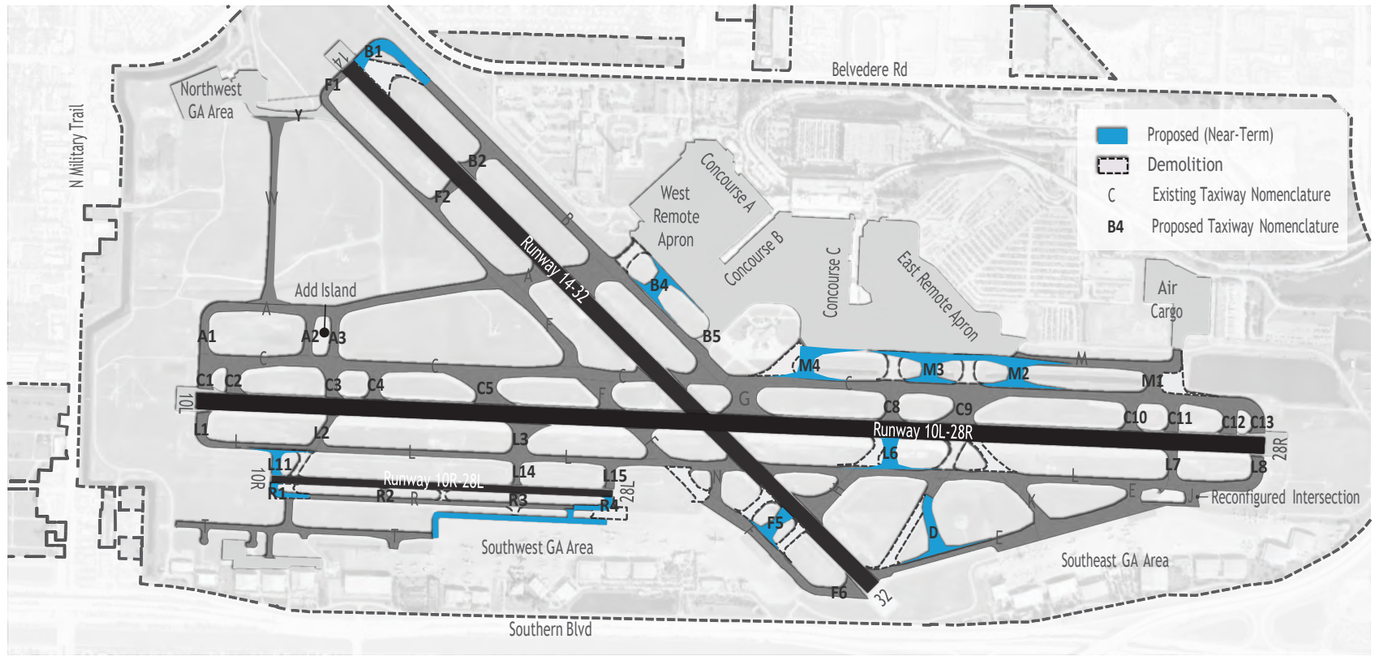


Figure 4.13: Potential Short-term Taxiway Improvements
Note:

(1) Proposed taxiway nomenclature is based on FAA Engineering Brief 89, Taxiway Nomenclature Convention

PBI Airfield
Source: AECOM (2014)

Aircraft at Gulfstream Facility
Source: AECOM (2014)

Long-Term Modifications

The long-term taxiway configuration is primarily associated with the development of the Runway 10R-28L, extension of Runway 10L-28R, and relocation of the existing GA facilities (discussed in **Chapter 6**).

As illustrated in **Figure 4.14**, The proposed modifications include:

- Full-length parallel taxiway on the south side of the new Runway 10R-28L (preliminarily identified as Taxiway R)
- Upgrade Taxiway L and its associated intersections from ADG III/TDG 3 to ADG IV/TDG 5[24]
- New high-speed exit taxiways from the new Runway 10R-28L to Taxiway L
- Taxiways A, C, and L extensions associated with extension of Runway 10L-28R
- Holding bay between Taxiways A, A1, and C to increase airfield operational efficiency and capacity
- Extension of Taxiway M to connect with Concourse B apron (requires relocation of existing ARFF facility)
- Relocation of terminal apron edge taxilane to accommodate expansion of Concourse B and/or C
- Demolition of several existing taxiways to support the ultimate configuration

4.2.4 Summary

The preferred alternative presents an ultimate airfield configuration consisting of two parallel runways which support air carrier, general aviation, and cargo operations at PBI in the 20-year planning horizon. **Table 4.17** summarizes the runway characteristics in the preferred development plan. The airfield improvements can be financed and implemented in multiple development phases based on specific demand triggers which will be summarized in the Implementation Plan and Financial Plan.

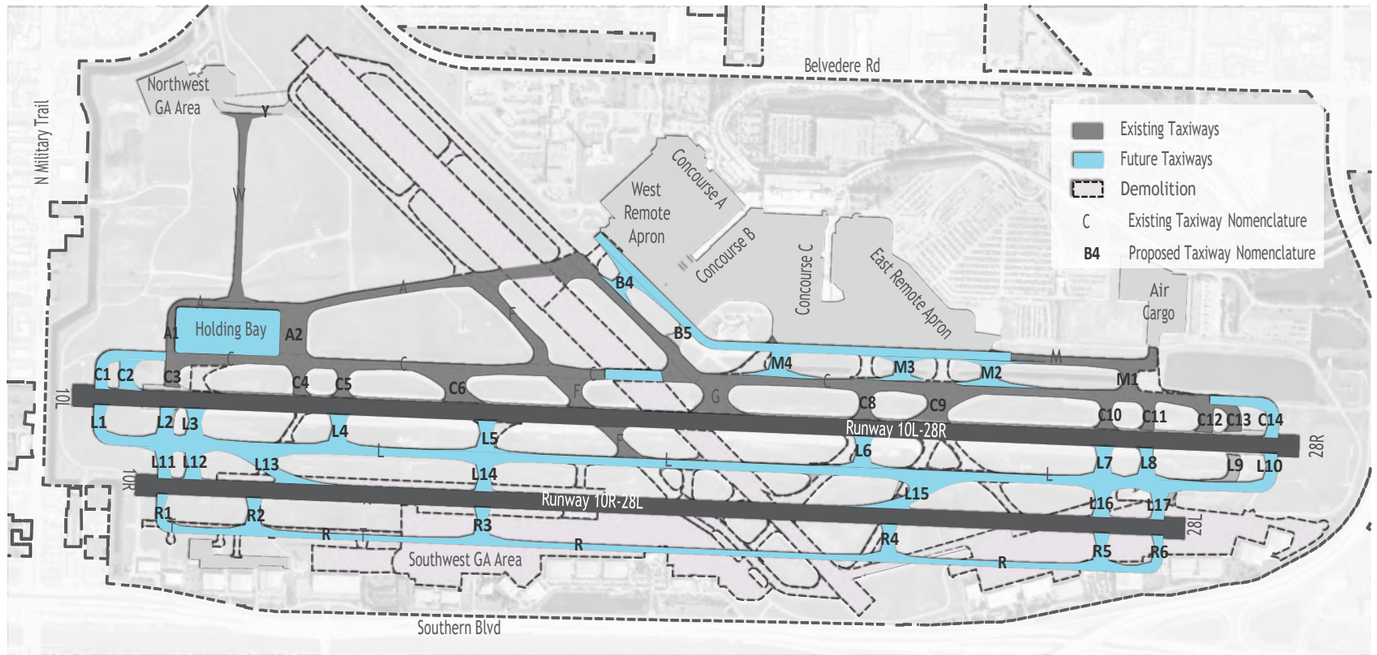


Figure 4.14: Recommended Long-term Taxiway System

Note:

(1) Proposed taxiway nomenclature is based on FAA Engineering Brief 89, Taxiway Nomenclature Convention

Table 4.17: Proposed Runway Characteristics

Item	Runway			
	10L	28R	10R	28L
Length	10,986'		9,320'	
Width	150'		150'	
Approach Type	CAT-I Precision		CAT-I Precision	
Runway Design Code	D-IV-2400	D-IV-2400	D-IV-2400	D-IV-4000
Displaced Threshold	1,842'	1,155'	310'	1,650'
Runway End Elevation	19.6'	16.42'	18'	17'
Threshold Elevation	16'	18.27'	18'	17'
Declared Distances				
TODA	10,986'	10,344'	8,000'	9,320'
TORA	10,986'	10,344'	8,000'	9,320'
ASDA	10,511'	10,232'	9,320'	9,320'
LDA	8,669'	9,077'	9,010'	7,670'

24 *The 2012 ROD included unconditional approval to increase the width of Taxiway L to 75 feet.*

Terminal Analysis

05

05 Terminal Analysis

A commercial service airport's passenger terminal facility provides for the efficient transfer of passengers and baggage between surface vehicles and aircraft. The terminal is the most prominent feature of any airport. As such, PBI's David McCampbell Terminal (terminal) is one of the primary focal points of the Master Plan.

This chapter identifies facility requirements and evaluates recommended terminal improvements to (1) accommodate the forecast aviation activity and (2) maximize passenger convenience within the following core terminal functional areas:

- Terminal Gates and Aircraft Parking Stands
- Passenger Check-In
- Security Screening Checkpoint (SSCP)
- Gate Lounge
- Outbound Baggage Screening
- Inbound Baggage Claim
- U.S. Customs & Border Protection (CBP)

5.1 Commercial Passenger Terminal Facility Requirements

This section assesses the capability of the existing terminal facility to accommodate forecast peak hour demand. The planning parameters referenced in this analysis are based on current design codes, guidelines, and standards from the airport, industry, and federal agencies and include the following:

- Airport Development Reference Manual (ADRM) 10th Edition, August 2015; International Air Transport Association (IATA)
- Airport Cooperative Research Program (ACRP) Report 25, Airport Passenger Terminal Planning and Design, 2010
- Checkpoint Design Guide (CDG), Revision 6.0, December 29, 2014; Transportation Security Administration (TSA)
- Planning Guidelines and Design Standards for Checked Baggage Inspection Systems (PGDS), Version 4.2, March 2, 2014; TSA
- Recommended Security Guidelines for Airport Planning, Design and Construction, May 1, 2011; TSA
- Airport Technical Design Standards, Passenger Processing Facilities, June 2012; U.S. Customs and Border Projection (CBP)
- FAA Advisory Circulars (ACs)

5.1.1 Terminal Level of Service

The IATA has developed and refined a comprehensive set of standards for evaluating and planning passenger terminals utilizing the level of service (LOS) concept. The LOS framework published in the IATA ADRM (10th Edition) utilizes the terminology "Over Design", "Optimum", and "Suboptimum". The definitions for each of the three-level LOS framework is summarized in **Table 5.1**. Two important variables jointly determine the LOS for the core terminal functions: queuing space and waiting time. **Table 5.2** illustrates the space-time parameters and the corresponding LOS.

LOS for terminal functions fluctuates during the day, week, or month depending on peaking characteristics. The optimum LOS for both space and time requirements is recommended as the target performance standard for the future terminal facilities. Optimum LOS used to be expressed as LOS "C" in previous standards. Terminal programming and planning would typically strive to achieve LOS "C" during the peak period of the average day peak month (ADPM). If planning configurations and program areas were able to achieve LOS "C" at this peak period, other times of day and other days would be at or better than LOS "C" with the exception of peak travel periods such as Thanksgiving.

5.1.2 Time and Space Planning Parameters

The Optimum LOS space and waiting time standards for the core passenger processing areas are summarized in **Table 5.3**. The recommended improvements to functional areas also consider minimizing total passenger processing time (approximately 20 minutes from the terminal curbside to post security) in order to maximize convenience to the extent practical.

Table 5.1: Terminal Level of Service Definitions

Level of Service	Space	Time
Over Design	Excessive or empty space	Over provision of resources
Optimum	Sufficient space to accommodate the necessary functions in a comfortable environment	Acceptable processing and waiting times
Sub-optimum	Crowded and uncomfortable	Unacceptable processing and waiting times

Source: IATA ADRM (10th Edition)

Table 5.2: Space and Time Variables for LOS Concepts

		Space		
		Over Design (> Y SF)	Optimum (X to Y SF)	Suboptimum (< X SF)
Time	Over Design (< A Mins)	Over Design		Consider Improvements
	Optimum (A to B Mins)		Optimum	
	Suboptimum (> B mins)	Consider Improvements		Reconfigure

Source: IATA ADRM (10th Edition)

Table 5.3: Optimum LOS Terminal Planning Parameters

Passenger Terminal Processor	Planning Parameters
Check-In	
Queue space	14.0 - 19.4 SF/Pax
Self-check-in kiosk waiting time	0 - 2 min
Baggage drop / curbside waiting time	0 - 5 min
Check-in Desk Waiting time:	
Business/First Class/Frequent Flyer[1]	0 - 3 min
Economy Class	10 - 20 min
Security Screening Checkpoint (SSCP)	
Queue space	10.8 - 12.9 SF/Pax
Waiting time for Fast Track [2,3]	0-3 min
Waiting time for Regular	5-10 min
Holdrooms	
Seating Space	16.1 – 18.3 SF/Pax
Standing Space	10.8 – 12.9 SF/Pax
Baggage Claim	
Claim Device Frontage	1.5 LF/Pax
Retrieval and peripheral area	16.1 to 18.3 SF/Pax

Source: IATA ADRM (10th Edition)

Note:

(1) Assumes 15% of the check-in passengers are business/first class/frequent flyer.
(2) Fast track includes TSA Pre✓™ passengers, employees, and Managed Inclusion (MI) passengers. MI combines the use of multiple layers of security to indirectly conduct a real-time assessment of passengers at designated SSCPs depending on passenger volume and other variables.
(3) TSA's passenger waiting time performance goal is less than 5 minutes for 95% of Pre✓™ passengers and less than 10 minutes for 95% of regular passengers. IATA recommends 0 to 3 minutes for fast track processing.
(4) Abbreviations: Pax - passenger; LF - linear feet; SF - square feet; min = minutes

5.1.3 Terminal Gates & Aircraft Parking Stands

The number of terminal gates and aircraft parking stands directly impacts the space requirements for other functional areas of the terminal. Therefore, the terminal analysis first evaluates the capacity (number and size) of existing gates against anticipated demand.

Most airlines typically attempt to minimize occupancy times[25] to maximize aircraft and gate utilization. In general, gate or parking stand (contact and/or remote)[26] shortages may occur if:

- Demand exceeds available capacity
- Demand for large aircraft increases unexpectedly
- Aircraft remain at the gate for an extended period

Hence, the capacity of gates or stands is closely related to the number and type of aircraft parking stands, occupancy time (turns), availability of multiple aircraft ramp stands (or restrictions between adjacent gates), and the type of gate or stands (contact or remote). The existing demand patterns and gate utilization characteristics are based on the airline ADPM flight schedules (March 2015). The existing terminal gate capacity is also based on these characteristics.

5.1.3.1. Gate Utilization Characteristics

As summarized in **Table 5.4**, the existing gate utilization characteristics according to the ADPM flight schedules and gate assignments information from the Airport[27] include:

- Number of the existing gates used by each airline
- Largest aircraft parked at each gate (shown in bracket)
- Number of daily departures
- Maximum number of departures per gate
- Approximate occupancy time for the busiest gate
- Number of overnight parking positions required

The gates highlighted in **BOLD** indicate preferential or exclusive use gates for the respective airline. All other gates are DOA gates which can be assigned to airlines on an as needed basis.

25 *Amount of time between an arrival and subsequent departure*

26 *Contact gates or stands are either in physical contact with the terminal through the use of a passenger boarding bridge or in enough proximity to the terminal to allow passengers to walk to the aircraft. Remote gates or stands are far enough from the terminal to require bus or transporter for passengers.*

27 *Palm Beach International Airport Gate Assignments (November 14, 2014)*

Table 5.4: Summary of Existing Gate Utilization (March 2015)

Airline	Existing Gates (Largest Aircraft)1	Number of Existing Gates	Daily Departures	Maximum Departures per Gate	Approximate Occupancy Time (Minutes)	Overnight Parking Positions
JetBlue Airways[2]	C10, **C12**, **C14**, C15 - (320) **C16** - (321)	3 to 5	23	7	40 to 60	5
American Airlines[3]	**B9**, **B11**, B14 - (321) **B10**, **B12** - (738) B8 - (E75)	4 to 6	21	7	40 to 60	5
Delta Air Lines[4]	**C3**, **C4**, C5 - (757) **C2** - (M90) C1- (M88)	3 to 5	19	7	40 to 50	5
Southwest Airlines[5]	B1, **B3** - (73C) **B5** - (73H)	2 to 3	11	6	20 to 60	2
United Airlines[6]	**B4** – (738) **B6**, B8 - (739)	2 to 3	11	7	30 to 50	4 [8]
Air Canada[7]	C5, **C7 -** (A320)	1 to 2	3	2	< 1 hour	0
Spirit Airlines	**C8** - (A320)	1	2	2	< 1 hour	0
Frontier Airlines	**C9**- (A319)	1	1	1	< 1 hour	0
Silver Airways	A - (SF3)	1 to 2	4	4	< 1 hour	1
Bahamas Air	A - (DH8)	1 to 2	2	2	≤ 1 hour	0
Allegiant Air[8]	**B8** - (320)	1	N/A	N/A	N/A	N/A
DOA	B1, B2, B7, B12, B14, C1, C5, C6, C7*, C8*, C10, C11, C15 (* seasonal use by Air Canada and Spirit)	13	N/A	N/A	N/A	N/A

Notes:

*(1) Gates highlighted in **BOLD** indicate preferential or exclusive use by the respective airline. Largest aircraft parked are given in bracket.*

(2) JetBlue use mostly gates C12, C14, and C16 with 6 to 7 flights per day; Gates C10 and C15 only have one and two flights per day respectively for extended ground times, schedule buffer, and overnight parking

(3) Includes US Airways which merged with American Airlines in 2013; American Airlines mostly utilized Gates B9 and B11 with 4 to 7 flights per day and Gates B10 and B12 with 3 to 5 flights per day; Gates B8 and B14 only have one flight per day; Gate B8 accommodates a regional operation and Gate B14 is utilized for overnight parking

(4) Delta predominantly uses Gates C2, C3, and C4 with 5 to 7 flights per day; Gates C1 and C5 only have one flight per day and are mainly for overnight parking

(5) Southwest mainly uses Gates B3 and B5 with 4 to 6 flights per day; Gate B1 is used for overnight parking

(6) United mainly use Gates B4 and B6 with as high as 7 daily departures from Gate B6; United has two flights at Gate B8 and includes overnight parking; Gate B8 is a shared use gate with American Eagle (formerly US Airways Express) and Allegiant

(7) Gate C5 is the overflow for Air Canada; flights from Canadian airports without pre-clearance may arrive at the existing International gate on Concourse B and depart at Concourse C

(8) Allegiant conducts two flights per week to Asheville (Thursdays and Sundays in March 2015)

(9) Other than Gates B4, B6, and B8, United may utilize Gate B2 or other vacant gates for overnight parking

Abbreviations: N/A – not applicable DOA – Department of Airports

During the peak month (March 2015), mainline air carriers operated on 24 gates of the 28 total gates at Concourses B and C. The major airlines[28] operate at 14 gates and conducted four to seven departures per gate per day. Four gates (C7, C8, C9, and B8) are assigned to Air Canada, Spirit Airlines, Frontier Airlines, and Allegiant Air with approximately one to two departures per day. Six gates (B1, B14, C1, C5, C10, and C15) are primarily used on an as needed basis for airlines operating on adjacent gates. Four gates (B2, B7, C6, and C11) remain vacant during the peak month. The primary aircraft utilized by the mainline carriers are narrowbody (e.g. B737 and A320) with the largest being the B757 and A321. Regional air carriers Bahamas Air and Silver Airways operate two to four departures a day from four non-contact gates at Concourse A. Bahamas Air utilizes a 50-seat Dash 8 while Silver Airways utilizes a 34-seat Saab 340. Most of the major airlines typically have an occupancy time of approximately

one hour or less and can conduct seven turns per day at the busiest gate. All the major airlines conduct an evening arrival with a subsequent early morning departure at PBI. These aircraft remain overnight (RON) at a gate or remote stand. It is estimated that the existing demand for RON positions is 21 at Concourses B and C and one at Concourse A.

The existing gate utilization characteristics are typical for airports with short to medium-haul flights[29] such as PBI. International flights between destinations in the Caribbean and Canada are short-haul and medium-haul respectively. Additionally, flights to the west coast are also considered medium-haul even though these markets are not currently served from PBI. There are no long-haul flights that would typically require extended parking between early-morning arrivals and late-afternoon or evening departures at PBI.

5.1.3.2. Gate Demand/Capacity

Gate capacity can vary depending on an airline's operational response to demand, whether through an increase in aircraft size and seat capacity or the number of operations conducted. As such, three sensitivity tests were conducted to evaluate a reasonable range of scenarios.

The first sensitivity test assumes five daily departures (or turns) per gate for each of the 30 gates at PBI with a 150 seat Airplane Design Group (ADG) III aircraft (B737) at all Concourse B and C gates and a 50-seat ADG III commuter aircraft (Dash 8) at the Concourse A gates. This test represents a situation based on the most common aircraft models.

The second sensitivity test increases daily departures per gate to six assuming the same aircraft will be used to accommodate anticipated demand.

The third sensitivity test assumes a long-term scenario where a future fleet mix utilizing a B737 Max (200-seat) for ADG III as well as the maximum aircraft gauge that the existing gate can accommodate. The number of turns per gate and the type of aircraft assumed are summarized below:

- ADG III Regional Jets/Commuters: 7 turns, 50 seats
- ADG III Narrow-body: 7 turns, 200 seats
- ADG IV B757s: 6 turns, 230 seats
- ADG IV Wide-body: 5 turns, 250 seats
- ADG V Jumbo: 5 turns, 350 seats

This test represents an ideal situation where each gate is fully utilized with the largest aircraft. However, large ADG IV and/or V aircraft are not currently serving PBI on a regular basis and the forecast estimates that only 2% of the mainline air carrier operations will be served by aircraft with 200 or more seats in the 20-year planning horizon.

The gate capacity estimated from the three sensitivity tests, expressed in terms of ADPM enplanements and annual enplanements, are illustrated in **Figure 5.1** and **Figure 5.2** respectively. The forecast demand at the 5-year, 10-year, and 20-year planning horizons are also depicted for reference. Sensitivity tests 1 and 2 demonstrate that as the demand increases, an average of five turns per gate may be marginally sufficient, i.e. some gates may require six or more turns if the airlines do not increase the size of the aircraft utilized. Sensitivity test 3 demonstrates that if all the gates are fully utilized, there is sufficient capacity for both the ADPM daily and overall annual demand.

In addition to estimating gate capacity based on daily turns per gate and overall enplanements, an evaluation of peak hour capacity is also required. As indicated in the 2006 Master Plan, peak hour air carrier operations (26) operated on 25 active gates (13 gates at Concourse B and 12 gates at Concourse C at the time). Taking this and an average gate occupancy time of less than 60 minutes into consideration, this analysis estimates that one gate is required for each peak hour operation. Peak hour commercial aircraft operations are projected to increase from 20 (including one commuter operation) in 2015 to 30 operations (including one to two commuter operations) by 2035.

Although there are 32 existing gates, two additional contact gates are recommended to accommodate 2035 peak hour demand and allow for flexibility in the selection of aircraft as summarized in **Table 5.5** Additionally, existing Gate C11 is currently not utilized due to its corner location and proximity to adjacent gates. Therefore, it is recommended that a new location for Gate C11 is also identified.

Appendix E provides gate requirements for individual airlines assuming the gates continue to operate on a preferential or exclusive-use basis.

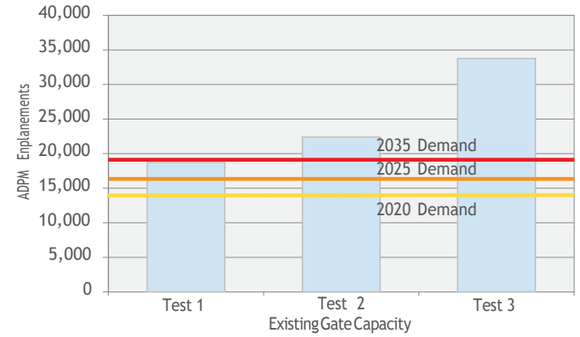


Figure 5.1: Estimated Gate Capacity (ADPM Enplanements)

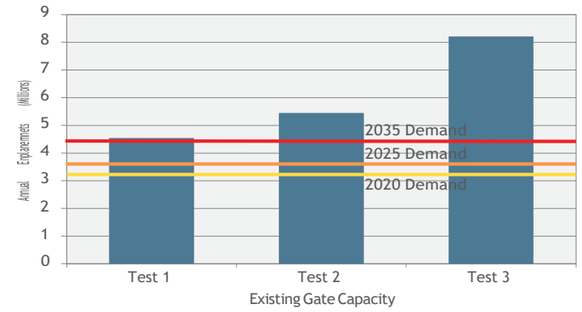


Figure 5.2: Estimated Gate Capacity (Annual Enplanements)

Table 5.5: Summary of Gate Requirements

Item	Existing 2014[1]	Forecast				
		2015	2020	2025	2030	2035
Number of Gates Required	28	20	24	26	28	30
Number of Gates Above Existing	-	0	0	0	0	2

[1] *Does not include the existing 4 non-contact commuter gates*

28 *Major mainline passenger airlines include JetBlue Airways, American Airlines (US Airways), Delta Air Lines, Southwest Airlines, and United Airlines. Their combined market share at PBI is over 90% as summarized in the Aviation Activity Forecasts*

29 *In general, short-haul flights are under 3 or 4 hours, distance less than or equal to 1,000 nautical miles non-stop; medium-haul flights are 3 or 4 to 6 or 7 hours, distance between 1,000 to 5,000 nautical miles non-stop; long-haul flights are over 6 or 7 hours, distance more than 5,000 nautical miles non-stop.*

5.1.3.3. International Gate Requirements

In addition to the total number of gates required, some gates may be designated as international arrival gates in order to provide a secure (sterile) corridor accessing the CBP Federal Inspection Services (FIS) area. Existing international arrival points are located at Gate B2 and Concourse A.

The estimated peak demand for the international arrivals includes three flights and approximately 500 passengers per hour or 250 passengers during the peak 30 minutes. These flights are associated with the transport of Canadian cruise line passengers. Although the type and size aircraft to be used is unknown at this point, it is anticipated that it will be a B757, B787, or A350 with a seat capacity ranging from 180 to over 300 seats. Even though some of the existing international flights originate from airports with pre-clearance[30] (such as Marsh Harbor, Nassau, Montreal, and Toronto), it is recommended to provide three international arrival gates on Concourse B to maintain flexibility as well as the existing international arrival capability on Concourse A.

5.1.4 Passenger Check-in

PBI provides a variety of check-in options including full service check-in counters, self-service kiosks, and curbside check-in as summarized in **Table 5.6**. Most air carriers are now replacing traditional check-in counters with self-service check-in kiosks due to technological advancements which effectively decrease processing time and staff requirements. Therefore, the traditional ticket counter and check-in process has drastically changed and continues to evolve.

Another important trend to consider is the strategic partnerships being established between airports, hotels, local attractions, and other businesses to increase convenience and establish a competitive advantage. Such partnerships allow passengers to check-in at locations other than the airport (including baggage drop off) and be shuttled to the airport where they can proceed directly to the security screening checkpoint. Such arrangements increase passenger processing capacity without the associated need to provide additional check-in facilities at the airport.

For the purposes of this analysis, three check-in selection scenarios (conservative, moderate, and high) were evaluated. Each scenario assumes varying degrees of "non-conventional" check-in methods as opposed to the traditional ticket agent counter, such as check-in via self-service kiosks, remote check-in (online, smartphone, or check-in at locations other than the airport), and curbside counters/baggage drop. The analysis incorporates the results of a recent survey at other airports on the check-in selection for both domestic and international passengers. In general, approximately 35%-45% of existing passengers check-in with a smartphone or online; 25%-40% utilize self-service kiosks; and approximately 15%-40% utilize the traditional full service counters. International passengers tend to utilize the traditional full service counters (closer to 40%) more so than the other methods.

The conservative scenario assumes recent passenger characteristics with approximately 40% smartphone/online check-in, 25% kiosks, 25% traditional counters and 10% curbside. The high scenario assumes non-conventional check-in methods will largely replace the traditional ticket counters in the future. The moderate scenario represents a split between the conservative and high scenarios. **Figure 5.3** illustrates the assumed check-in methods for each of the scenarios.

30 *CBP services are provided at the departure airports with pre-clearance*

Table 5.6: Existing Check-in Positions

Airlines	Full Service	Kiosk	Bag Drop	Curbside
Bahamas Air (UP)	4	0	0	0
Southwest Airlines (WN)	6	4	4	2
United Airlines (UA)	6	9	7	3
Silver Airways (3M)	9	0	0	0
American Airlines (AA)	8	3	2	3
Allegiant Air (G4)	4	0	0	0
US Airways (US)	4	8	5	3
Spirit Airlines (NK)	6	0	0	0
JetBlue (B6)	10	4	0	2
Air Canada (AC)	4	0	0	0
Frontier Airlines (F9)	2	0	0	0
Delta Air Lines (DL)	4	12	10	4
Total	**67**	**40**	**28**	**17**

Source: Data collected on-site (2015)

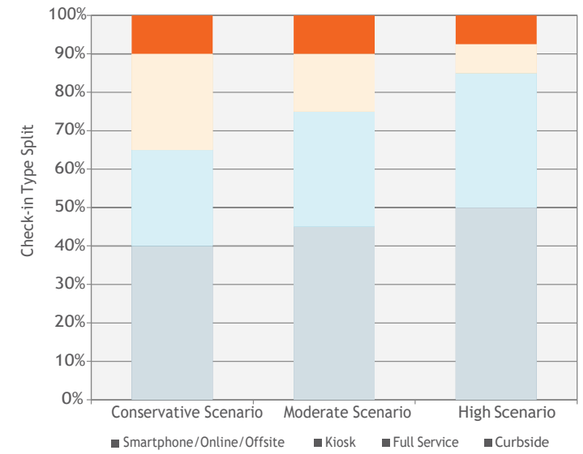


Figure 5.3: Passenger Check-in Mode Split

Ticket Counters

Source: AECOM (2014)

The check-in facility requirements are also based on the peak 30-minute period for originating passengers. The peak 30-minute period is identified from the "passenger arrival" profile which highlights the amount of time (buffer) prior to a scheduled departure time in which passengers typically arrive at the airport. In general, passengers tend to allow less of a buffer for early morning flights, flights to/from smaller airports, and/or domestic flights. The peak hour at PBI is after 9:00 am and the pattern of departing passengers generally is anticipated to be similar to other regional airports. The cumulative arrival profile for domestic and international passengers arriving at a terminal before their scheduled departure time is illustrated in **Figure 5.4** and **Figure 5.5**, respectively. The profile includes actual data collected from both a small/ regional east coast airport and a large international airport[31]. Since most of the peak hour passengers departing from PBI are on domestic flights, it is estimated that approximately 50% of the originating passengers typically arrive at PBI during the peak 30-minute period.

Passengers who check-in by smartphone or online but still have to check-in baggage need to access the ticket counter before proceeding to security screening. While some airlines have designated baggage drop stations for this purpose, others still combine the baggage drop service with ticket agent counters or kiosks. Thus, the number of baggage drop stations is estimated for remote check-in passengers based on a percentage of passengers with checked baggage. These counters can be designated baggage drop stations, kiosks, curbside counters, or traditional agent counters depending on different airline operations.

The 2006 Master Plan included a passenger survey conducted during a week in July 2005 which recorded 63% of departing passengers checked baggage. Taking into consideration that many of the passengers at PBI are leisure travelers, who tend to check baggage more often (e.g. with golf bags) than business travelers, it is assumed that 70% of passenger will check baggage for planning purposes. The percentage of Business/First Class passengers are estimated at approximately 15% based on the percentage of seats allocated as such for the common aircraft models used by Delta Air Lines, American Airlines, United Airlines, and Air Canada at PBI.

Table 5.7 summarizes the estimated requirements for the different types of check-in facilities at PBI during the planning horizon. To allow maximum flexibility for each type of check-in methods, the passenger check-in requirements are based on the highest of the three scenarios tested. In addition, allowances were included to account for the individual peaks of airlines and possible addition of new airlines at PBI.

The existing check-in positions and queue space are generally adequate for the planning horizon but it is anticipated that more airlines will reallocate some of the full service ticket counter positions to self-service kiosks. While the overall queue space is adequate for peak activity, there is insufficient depth to support peak traffic at some counters without compromising circulation space. Additionally, the existing space allocated for Airline Ticketing Offices (ATO) is approximately 12,000 SF more than required in 2035.

It is recommended that the unused ticket counter positions and ATO space is reconfigured in order to enhance the check-in queue space and optimize the utilization of the ticketing hall.

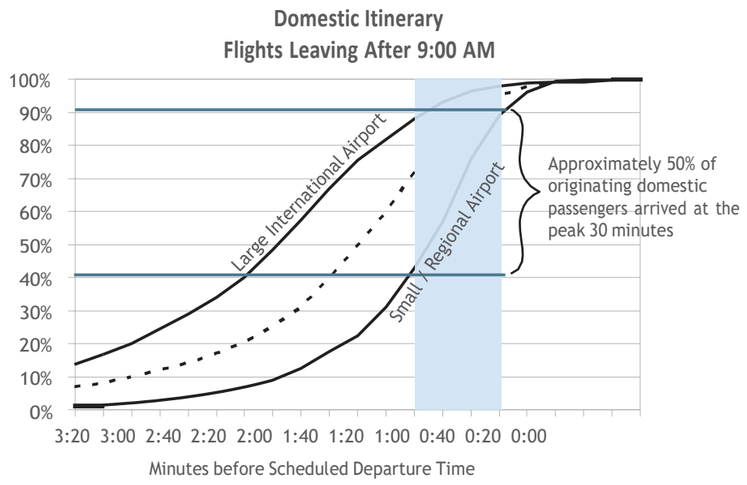


Figure 5.4: Typical Domestic Passenger Arrival Profile

Source: ACRP Report 23; AECOM analysis

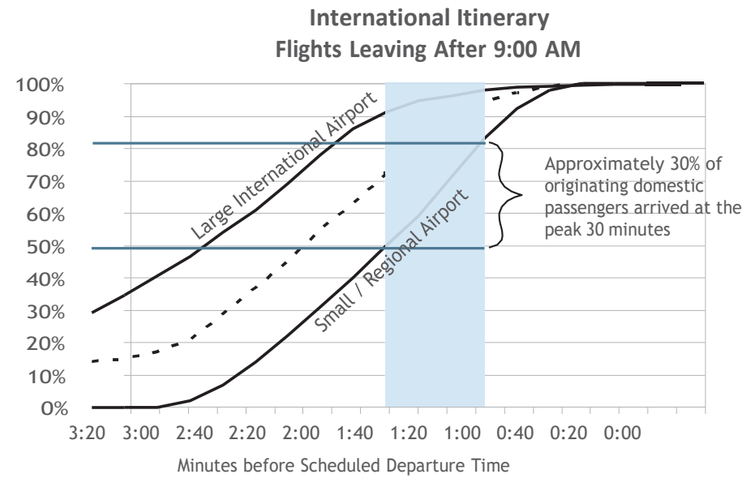


Figure 5.5: Typical International Passenger Arrival Profile

Source: ACRP Report 23; AECOM analysis

Table 5.7: Passenger Check-In Requirements

Descriptions	Existing Inventory	Estimated Requirements				
		2014	2020	2025	2030	2035
Peak Hour Enplanements	1,545	1,545	1,844	2,022	2,209	2,413
Check-in Positions						
Full Service	67	24	29	32	34	37
Kiosk	40	32	38	41	45	49
Bag Drop	28	12	14	15	17	18
Curbside	17	9	10	11	12	13
Total	**152**	**78**	**91**	**99**	**108**	**117**
Queue Space (SF)						
Full Service	-	1,550	1,900	2,050	2,250	2,450
Kiosk	-	1,150	1,400	1,550	1,650	1,850
Bag Drop	-	700	800	900	950	1,050
Curbside	-	350	400	450	500	550
Total	**7,460**	**3,750**	**4,500**	**4,950**	**5,350**	**5,900**
Airline Ticketing Offices[1]	**22,797**	**6,900**	**8,250**	**9,000**	**9,750**	**10,575**

Note:
(1) Airline Ticketing Office (ATO) space is estimated based on a depth of 30-feet and a standard counter width of 5-feet for full service and 2.5-feet for kiosks and bag drop stations

31 *ACRP Report 23, Airport Passenger-Related Processing Rates Guidebook*

Furthermore, future reductions in staff and terminal space requirements are likely with additional technological advancements and alternative check-in methods, such as:

- **Self-Tagging Stations**: Self-tagging functions can be incorporated into the self-service check-in kiosks or as a stand-alone device that scans the passenger's boarding pass; passengers deliver the self-tagged baggage to a collection conveyor for loading into the baggage system
- **Portable Device:** Facilitates printing of boarding passes and baggage tags by airline employees without the need for a ticket counter; this type of check-in is primarily used when there are unexpected crowds, such as weather delays. Similar technology that may increase the passenger processing rate without an increase in square footage of the check-in lobby is not reflected in the terminal requirements.
- **Offsite Check-In:** Passengers can check-in and drop their baggage at an off-site location (e.g. Cruise Terminal or Hotel) at a certain period of time ahead of the scheduled departure time.

5.1.5 Security Screening Checkpoints (SSCP)

After ticketing, passengers flow to the security screening checkpoints (SSCP). Passenger screening is generally regarded as a major "pressure point" in the terminal. In contrast to other areas where technology expedites processing, security technology, with its steadily increasing complexity, could increase the associated processing time and space requirement. Therefore, the security area should have sufficient and easily convertible space to accommodate changing security devices in the future.

A typical SSCP consists of standard module set with either single or dual inspection lanes. A typical single-lane module set consists of the following:

- X-Ray Unit
- Walk Through Metal Detector (WTMD) and/or an Advanced Imaging Technology (AIT) unit
- Passenger containment

A secondary screening area with Explosives Trace Detection (ETD), Bottle Liquid Scanner (BLS), Alternate Viewing Station (AVS), and passenger and carry-on bag inspection.

A dual-lane module set is similar to a single-lane module set but with a second X-ray unit. The dual-lane module set increases the efficiency of the SSCP and is generally recommended. However, a single-lane module set is utilized when there are an odd number of lanes required per peak hour demand.

In addition to the standard equipment, the TSA has provided Pre✓™ lanes at PBI since September 2013 to expedite the screening process. Pre✓™ lanes allow pre-approved travelers to leave on shoes, light outerwear and belts, laptops in its case, and 3-1-1 compliant liquids/gels bag in the carry-on luggage. Passengers and personnel that are screened through TSA Pre✓™ lanes include the TSA Pre✓™ passengers, Managed Inclusion (MI) passengers, and crew members. Employees use the regular lanes but they are processed with expedited screening[32]. **Table 5.8** summarizes the existing conditions for each SSCP.

As PBI has a SSCP at Concourse A/B and Concourse C, the peak demand for these two facilities can vary due to flight schedule differences among airlines and the gate capacity at different concourses. Therefore, the analysis included four SSCP demand scenarios between Concourses A/B and C as described below:

- **50:50 Split**: This scenario considers a balanced peak hour demand between the two SSCP as well as the potential for two additional gates on Concourse B by 2035.
- **45:55 Split:** This scenario is generally representative of the current situation with Delta Air Lines and JetBlue Airways at Concourse C gates operating slightly larger aircraft than United Airlines and American Airlines (formerly US Airways) at Concourse B gates. Delta Air Lines and JetBlue Airways also peak around noon which increases peak demand at SSCP C. Other airlines operating at Concourses A and B generally have a more distributed departure schedule throughout the day which decreases peak demand at SSCP AB.
- **40:60 Split:** This scenario considers a larger growth in peak hour demand at SSCP C than SSCP AB. It also considers the potential addition of two gates towards Concourse C or the east portion of the terminal complex by 2035.
- **Consolidated SSCP:** This scenario considers a consolidated SSCP which optimizes utilization, reduces infrastructure and TSA staff requirements, and provides a secure connection between the two concourses.

The use of TSA Pre✓™ is anticipated to increase based on recent registration statistics and the TSA's initiative in risk based screening (RBS). RBS refers to the method that defines a passenger's credentials prior to the security screening process. TSA Pre✓™ is an existing example of the RBS program. Although there are few other RBS methods currently utilized, the TSA plans on expanding RBS in the future. The implementation of the TSA Pre✓™ has effectively increased the processing rate at TSA Pre✓™ checkpoints. Therefore, it is assumed that the current TSA Pre✓™ utilization of 35 to 40% will gradually increase to approximately 60% in the 20-year planning horizon in order to estimate the future SSCP requirements for PBI.

Table 5.9 summarizes the planning parameters for SSCP facility requirements based on the existing information from TSA.

Table 5.8: Existing SSCP Conditions

Parameters	SSCP A/B		SSCP C	
	Pre✓™	Regular	Pre✓™	Regular
Lanes	2	5	2	5
Queue Space (SF)	1,425	4,275	625	1,875

Table 5.9: Key Parameters for the SSCP Facility

Planning Parameters	Pre✓™ Lanes	Regular Lanes
Existing Passenger Split	35 – 40%	60 -65%
Future Passenger Split[1]	60%	40%
Processing Rate (passenger/hour/lane)	180	150
Additional Crew Traffic[2]	5%	0%
Additional Employee Traffic[3]	0%	5%

Source: TSA, August 2015.

Notes:

(1) Assumes the use of Pre✓TM lanes will increase gradually

(2) Crew members typically use Pre✓TM lanes

(3) Employees use the regular lanes but they are processed with expedited screening

TSA Pre ✓™ Office

Source: AECOM (2014)

32 *Expedited screening refers to screening by WTMD instead of AIT and potentially no need to remove items like shoes, laptops, 3-1-1 liquids, belts, and light jackets*

Table 5.10 summarizes the estimated facility requirements for the SSCP based on the existing configuration (one at each end of the terminal) and a potential consolidated SSCP. In summary, the existing 7-lane SSCP A/B has sufficient capacity if it continues to process less than 45% of the peak hour originating passengers; however, an additional lane may be required by 2025 (total 8 lanes) if 50% or more of the peak hour traffic utilizes SSCP A/B. The existing 7-lane SSCP C will likely reach capacity by 2025 if it continues to account for approximately 50%-55% of the peak hour originating passengers. An additional lane is recommended prior to 2020 if utilization of the SSCP C increases to 60%.

The option of providing a consolidated SSCP provides an overall reduction in screening lanes as well as the associated TSA office space. It is estimated that a total of 12 lanes will be required in 2020 to accommodate demand and 16 lanes by 2035. It is also noted that the throughput per lane (passenger/hour/lane) is based on the existing data collected from TSA. It is anticipated that the processing rate will increase in the future as new technologies and/or screening processes are made available. If the processing rate, especially the TSA Pre✓™ lanes, increases in the future, the number of lanes required will likely decrease.

Table 5.10: SSCP Facility Requirements

Item	Estimated Requirements[1]									
	2014		2020		2025		2030		2035	
	Pre✓™	Regular	Pre✓™	Regular	Pre✓™	Regular	Pre✓™	Regular	Pre✓™	Regular
Peak Hour Enplanements (Pre✓™: Regular)	1,545 (35 to 40: 60 to 65)		1,844 (45:55)		2,022 (50:50)		2,209 (55:45)		2,413 (60:40)	
Security Screening Lanes[2]										
SSCP AB										
50% Portion	2	4	3	4	**4**	**4**	**4**	**4**	**5**	**3**
45% Portion	2	3	3	3	3	3	4	3	5	3
40% Portion	2	3	3	3	3	3	4	3	4	**3**
SSCP C										
50% Portion	2	4	3	4	4	**4**	**4**	**4**	**5**	**3**
55% Portion	3	4	3	4	**4**	**4**	**5**	**4**	**6**	**4**
60% Portion	3	4	4	4	**4**	**4**	**5**	**4**	**6**	**4**
Consolidated SSCP	4	6	**6**	**6**	**7**	**6**	**8**	**6**	**10**	**6**
Queue Area (SF)[3]										
SSCP AB										
50% Portion	250	900	350	850	450	1,000	500	1,000	600	950
45% Portion	250	650	300	900	400	900	450	900	550	850
40% Portion	200	550	300	800	350	650	400	800	500	750
SSCP C										
50% Portion	250	900	300	850	450	1,000	500	1,000	600	950
55% Portion	250	700	400	1,100	450	1,100	550	1,050	650	1,050
60% Portion	300	950	450	1,200	500	1,200	600	1,150	700	1,150
Consolidated SSCP	**500**	**1,800**	**700**	**1,700**	**850**	**1,950**	**1,000**	**1,900**	**1,150**	**1,850**

Notes:

(1) The estimated requirements include the most critical from the models tested
(2) The number of security screening lanes includes a correction factor for demand variability and is based on the maximum waiting time allowed
(3) Queue space includes a correction factor for the maximum number of passengers in the security queue at any one time and is based on the maximum waiting time allowed

Abbreviations: N/A – not applicable; SF – square feet.

5.1.6 Gate Lounges

The gate lounges provide a waiting area for passengers prior to boarding an aircraft. For the purposes of this analysis, the gate lounge requirements are based on the analytical approach provided in the IATA ADRM which estimates the size of the gate lounges as a function of the depth of the passenger seating areas (holdrooms), concessions along the pier, and circulation corridors[33]. The IATA ADRM method is based on an open-area gate concept (similar to PBI) which involves an analysis by zones/areas instead of gate-by-gate. Gate lounges require less space if they are within an open environment because passengers have the flexibility to stay further away from the boarding point.

Each of the concourses are generally open and passengers have the option to go to the holdroom, food and beverage (F&B) areas, or retail shops. **Figure 5.6** illustrates the existing zones/areas in Concourses A, B, and C identified for this analysis.

For planning purposes, the aircraft with the largest seating capacity is considered at each gate. In instances where aircraft parking at one gate is potentially restricted based on the type of aircraft at an adjacent gate, the configuration with the highest seating requirements is considered. The assumptions on future aircraft seating capacity in **Table 5.11** correspond to the gate demand analysis and include the common aircraft models currently serving PBI as well as potential future aircraft models.

The Equivalent Aircraft (EQA) is a planning factor used to standardize the definition of a gate in order to determine the facility requirements for shared terminal functions, such as restrooms. For example, a concourse that has only 150-200 seat narrowbody aircraft will have an EQA equal to the number of gates.

Table 5.11: Aircraft Seating Capacity Assumptions

Aircraft Design Group	Description	Typical Seats	Typical Aircraft	Equivalent Aircraft (EQA) Index
III	Medium Regional	50	SF340/CRJ	0.4
	Narrowbody	150-200	B737/A320	1
IV	B757	230	B757	1.3
	Widebody	250	B767	1.9
V	Jumbo	350	A340	2.8

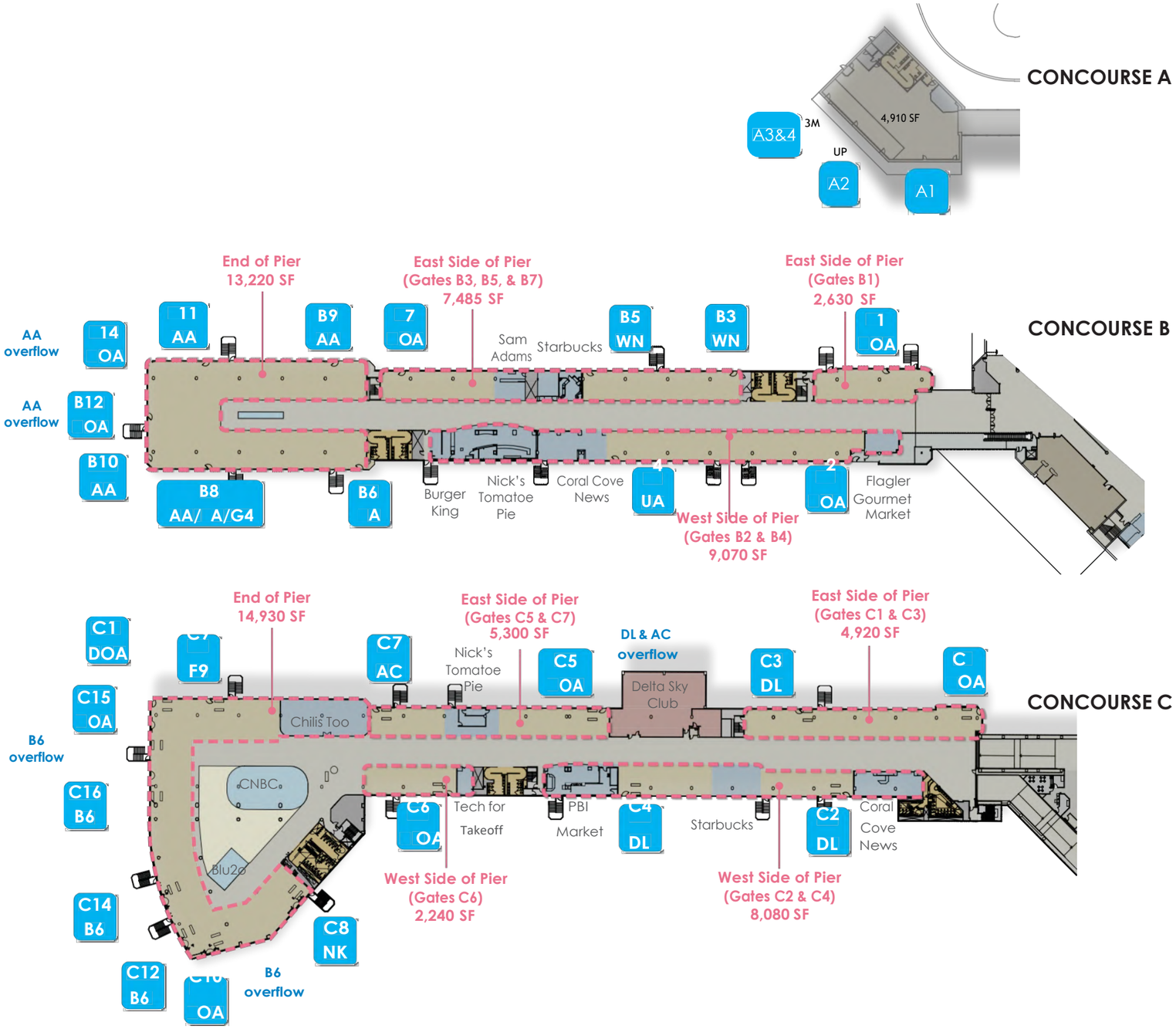


Figure 5.6: Existing Gate Lounge Areas

Source: AECOM (2015)

33 *For most medium-volume airports primarily serving O&D flights such as PBI, a 30-foot wide circulation corridor is recommended for double-loaded concourses which do not have moving walkway*

Gate lounge requirements associated with 150-seat narrowbody aircraft occupying all gates are analyzed as well to identify a potential shortage in the near-term based on existing conditions.

Other planning parameters incorporated into the analysis include:

- 85% Load Factor (average percentage of aircraft seats occupied per flight)
- 70% passengers are seated in holdroom per the Optimum LOS; 50% is considered only if extensive F&B and concession zone seating is available
- 10% increase in seating area is included to account for the loss of capacity resulting from a single passenger utilizing an adjacent seat for personal belongings
- 5% increase in standing area to account for the boarding and airline agent podiums
- Waiting areas of 17 SF per seating passengers and 11 SF per standing passengers per the Optimum LOS standard
- One standard 1,500 SF restroom facility (male, female, companion care, and janitor closet) per eight EQA
- 2% of the required gate lounge area for mechanical, electrical, plumbing, and telecommunications (MEPT) space as well as other Maintenance, Janitorial, and Storage (MJS) space

Table 5.12 summarizes the overall space and concourse width requirements. Deficiencies with the existing facilities are highlighted in **RED**.

In summary, Concourses B and C generally have sufficient holdroom space to support narrowbody aircraft operations (150-seats) except at the 'end of pier' where seven and eight gates are located respectively. These areas will become congested and decrease the LOS when adjacent gates are in use at the same time, particularly at the corner gates B10 and B14 as well as C11 and C12. There is also insufficient queue space for boarding passengers who may have to occupy circulation spaces. As the size of aircraft increases and the average seating capacity exceeds 200 seats, most of the zones/areas at Concourses B and C will operate in the Suboptimum LOS.

Additionally, the estimated gate lounge area required for the two additional gates is approximately 8,500 SF to 11,200 SF based on the double-loaded pier configuration for ADG III/IV aircraft. Depending on the layout and location of the new gates, these space requirements may vary.

Table 5.12: Gate Lounge Space Requirements

Item	Existing Inventory		Gate Lounge Requirements (150-seat NB)			Gate Lounge Requirements (Optimum)		
	Width (feet)	Area (SF)	Design Seat Capacity	Width (feet)	Area (SF)	Design Seat Capacity	Width (feet)	Area (SF)
Concourse A	-	4,881	200	-	2,700	200	-	2,700
Restrooms	-	3,321	-	-	1,500	-	-	1,500
MEPT/ MJS		440			324			324
Total Concourse A	**-**	**8,642**	**-**	**-**	**4,524**	**-**	-	**4,524**
Concourse B								
East side of pier (Gate B1)	24	2,630	150	21	2,000	200	**28**	**2,700**
East side of pier (Gates B3, B5 & B7)	24	7,485	450	19	6,000	600	**26**	**8,000**
West side of pier (Gates B2 & B4)	24	9,070	300	11	4,000	600	21	8,000
End of pier (Gates B6, B8, B9, B10, B11, B12, B14)	-	13,220	1,050	-	**14,000**	1,810	-	**24,000**
Restrooms	-	1,828	-	-	**3,000**	-	-	**4,500**
MEPT/ MJS (Departures Level only)	-	1,280	-	-	**1,560**	-	-	**2,562**
Circulation (25-foot central corridor)	25	17,000			**17,000**			**17,000**
Total Concourse B	**75**	**52,513**	**1,950**	**61**	**47,560**	**3,210**	**79**	**66,762**
Concourse C								
East side of pier (Gates C1 & C3)	24 to 28	4,920	300	20	4,000	550	**36**	**7,300**
East side of pier (Gates C5 & C7)	24 to 28	5,300	300	19	4,000	450	**29**	**6,000**
West side of pier (Gates C2 & C4)	21 to 29	8,080	300	12	4,000	500	19	6,700
West side of pier (Gate C6)	24	2,240	150	21	2,000	230	**33**	**3,100**
End of pier (Gates C8, C9, C10, C11, C12, C14, C15, C16)	-	14,930	1,200	-	**15,900**	1,600	-	**21,200**
Restrooms	-	3,924	-	-	**4,500**	-	-	**4,500**
MEPT/ MJS (Departures Level only)	-	2,358	-	-	1,794	-	-	**2,658**
Circulation (25-foot central corridor)	25	31,811						
Total Concourse C	**75**	**73,563**	**2,250**	**71**	**55,594**	**3,310**	**99**	**70,558**
Two new gates (including 25-foot circulation corridor)	-	-	**300**	-	**8,500**	**500**	-	**11,200**

Abbreviations: MEPT = Mechanical, Electrical, Plumbing, Telecommunications; MJS = Maintenance, Janitorial, Storage

5.1.7 Concessions

Concession space planning is important to the overall terminal program because of its impact on airport revenues as well as passenger convenience/ satisfaction. For master planning purposes, the primary goal is to identify existing and potential issues and recommend improvements based on industry guidelines. While the requirements for gate lounges included concession space, this section evaluates the overall concession space throughout the entire terminal complex and how it is allotted.

Concessions are provided both prior to and after the SSCP (pre-security and post-security). The standard metrics recommended for benchmarking concession space are based on annual enplanements, in multiples of one thousand. For airports with annual enplanements between 3 and 4 million, the typical concession spaces (per 1,000 enplaned passengers) include the parameters included in **Table 5.13.**

Convenience retail refers to traditional concessions such as newsstands, news/gift shops, and convenience stores typically found at transportation terminals. Convenience retail options at PBI include Coral Cove News, Tropical News, Ocean Front News, and CNBC newsstands.

Specialty retail refers to shops that offer a specialized line of merchandise, e.g. jewelry, travel accessories, cosmetics, personal care products, clothing and shoes, candy/chocolates, local arts and crafts, etc. Specialty retail options at PBI include Brooks Brothers, Kid Zoo, Brighton, PGA Tour Shop, and Tech for Takeoff.

The location of concession spaces has a significant impact on the potential revenues and passenger satisfaction. Common themes demonstrated at numerous airports include:

- Post-security concessions are more preferable than pre-security concessions as they typically generate higher revenues; based on airport surveys conducted for ACRP Project 01-11, medium hub airports indicated post-security concessions should be increased to an average of 69% to 79%
- Centralized and concentrated concession zones are more preferable than dispersed areas; the concession units are preferably positioned along natural passenger flow paths with convenient access to attract more customers
- Walk-through concession zones are recommended to directly connect the products to customers, maximize the opportunity to capture potential buyers, and increase the concession revenue per passenger

At PBI, more than 28,000 SF (61%) of concessions space is located in the main terminal prior to security screening while approximately 18,000 SF (39%) are post-security and distributed amongst the three concourses. As the existing distribution of concession spaces at pre- and post-security locations is not favorable as compared the target 69% to 79% of post-concessions, it is recommended that the existing concessions are reconfigured and redistributed to post-security options to maximize revenues and overall passenger experience.

Table 5.13: Concessions Planning Parameters

Concessions Type	Space per 1,000 Annual Enplanements (SF)	Proportion of Overall Concessions (%)
Food and Beverage (F&B)	6.8	66
Convenience Retail	1.8	17
Specialty Retail	1.8	17

Source: ACRP Report 54, Resource Manual for Airport In-Terminal Concessions

Oceanfront News

Source: AECOM (2014)

Sam Snead's Restaurant

Source: AECOM (2014)

Table 5.14 provides a comparison of existing PBI concession spaces and the recommended concession spaces for the 20-year planning horizon for the overall airport as well as category and location. While the total concession spaces for the airport are generally adequate as compared to similar medium size airports, the existing allocation favors pre-security concessions. As such, it is recommended that current concessions space is reconfigured in the near-term to provide more post-security concessions while additional F&B overall is provided by approximately 2030 or when annual enplanements approach 4 million.

In order to further understand the distribution of existing concessions and need for future concessions, a comparison of each concourse is provided in **Table 5.15**. The allocation between concourses is based on the seating capacity of the gates which equates to approximately 3% for Concourse A, 44% for Concourse B, and 53% for Concourse C. It is recommended that additional F&B is provided in all concourses and some of the specialty retail space within the main terminal area is reallocated to Concourses B and C.

A separate terminal concessions study is being completed in conjunction with this Master Plan to identify a preferred solution to the concessions issue. The preferred concessions plan identified in that study will be incorporated into this Master Plan.

Table 5.14: Overall Concessions Space Allocation

Zone	Category	Existing Inventory			Concession Space Allocation				
		Area (SF)	Percentage		Area (SF)				
		2014	2014	2015-2035	2015	2020	2025	2030	2035
Airport Total	F&B	25,538	54%	66%	20,420	23,140	25,320	**27,610**	**30,090**
	Convenience Retail	10,681	23%	17%	5,410	6,130	6,710	7,320	7,980
	Specialty Retail	11,059	23%	17%	5,410	6,130	6,710	7,320	7,980
	Total	**47,278**	**100%**	**100%**	**31,240**	**35,400**	**38,740**	**42,250**	**46,050**
Pre-Security	F&B	14,032	49%	66%	4,290	4,860	5,320	5,800	6,320
	Convenience Retail	3,771	13%	17%	1,140	1,290	1,410	1,540	1,680
	Specialty Retail	11,059	38%	17%	1,140	1,290	1,410	1,540	1,680
	Total	**28,862**	**61%**	**21%**	**6,570**	**7,440**	**8,140**	**8,880**	**9,680**
Post-Security	F&B	11,506	62%	66%	**16,130**	**18,280**	**20,000**	**21,810**	**23,770**
	Convenience Retail	6,910	38%	17%	4,270	4,840	5,300	5,780	6,300
	Specialty Retail	0	0%	17%	**4,270**	**4,840**	**5,300**	**5,780**	**6,300**
	Total	**18,416**	**39%**	**79%**	**24,670**	**27,960**	**30,600**	**33,370**	**36,370**

Table 5.15: Concessions Space Allocation by Concourse

Post-Security (% of Demand)	Category	Existing			Concession Space Allocation				
		Area (SF)	Percentage		Area (SF)				
		2014	2014	2015-2035	2015	2020	2025	2030	2035
Concourse A (3%)	F&B	0	0%	66%	**485**	**550**	**600**	**655**	**715**
	Convenience Retail	272	100%	34%	260	**295**	**320**	**350**	**380**
	Sub-total	**272**	**100%**	**100%**	**745**	**845**	**920**	**1,005**	**1,095**
Concourse B (44%)	F&B	4,067	61%	66%	**7,100**	**8,045**	**8,800**	**9,600**	**10,460**
	Convenience Retail	2,632	39%	17%	1,880	2,130	2,335	2,545	**2,775**
	Specialty Retail	0	0%	17%	**1,880**	**2,130**	**2,335**	**2,545**	**2,775**
	Sub-total	**6,699**	**100%**	**100%**	**10,860**	**12,305**	**13,470**	**14,690**	**16,010**
Concourse C (53%)	F&B	7,439	65%	66%	**8,550**	**9,690**	**10,600**	**11,560**	**12,600**
	Convenience Retail	4,006	35%	17%	2,265	2,570	2,810	3,065	**3,340**
	Specialty Retail	0	0%	17%	**2,265**	**2,570**	**2,810**	**3,065**	**3,340**
	Sub-total	**11,445**	**100%**	**100%**	**13,080**	**14,830**	**16,220**	**17,690**	**19,280**

Requirements highlighted in **RED** *indicates existing facilities are inadequate to accommodate anticipated demand*

5.1.8 Outbound Baggage Screening

All checked baggage at airports is subject to screening for explosives. The requirements for outbound baggage screening facilities are based on the amount of checked bags per passenger during the peak hour as well as the processing rate of the screening equipment.

Baggage screening is completed by ETD units and/or Explosives Detection Systems (EDS). ETD units are typically used for checking 'out-of-gauge' (OOG) baggage that are too large for EDS machines as well as additional screening of baggage alarmed by EDS units. However, the throughput rate of ETD units is significantly lower than EDS units.

There are generally two broad categories of Checked Baggage Inspection Systems (CBIS) at airports which use a combination of EDS and ETD units: (1) in-line and (2) stand-alone. Within these two categories there are alternatives that range from highly integrated, highly automated, and low labor-intensive systems to low-automated and high labor-intensive systems.

The DOA replaced their manual stand-alone system in 2016 with a fully automated in-line CBIS which consists of a single matrix of four EDS machines. The designed hourly throughput rate is approximately 684 bags per hour (bph). With the fully automated and centralized CBIS, PBI has the flexibility to allocate check-in facilities to different airlines in order to balance demand.

The common "rule of thumb" used by many airports is 1.5 bags per passenger for domestic flights and 2.0 bags for international passengers. However, the current TSA PGDS 4.2 (May 2014), which is based on an extensive collection of field data and information from airlines, indicates that the actual numbers of checked bags per passengers are generally lower than the "rule of thumb". Generally, an average of 0.6 checked bags for each originating passenger on domestic airlines; 1.2 checked bags for each originating international passenger; and 1.2 recheck bags for each international-to-domestic connecting passenger. Considering PBI is primarily a tourist destination and leisure travelers generally have a slightly higher checked bag per passenger ratio, 1.1 checked bags per passenger with checked bags is assumed.

Other key assumptions in estimating the EDS requirements for the 20-year planning period include:

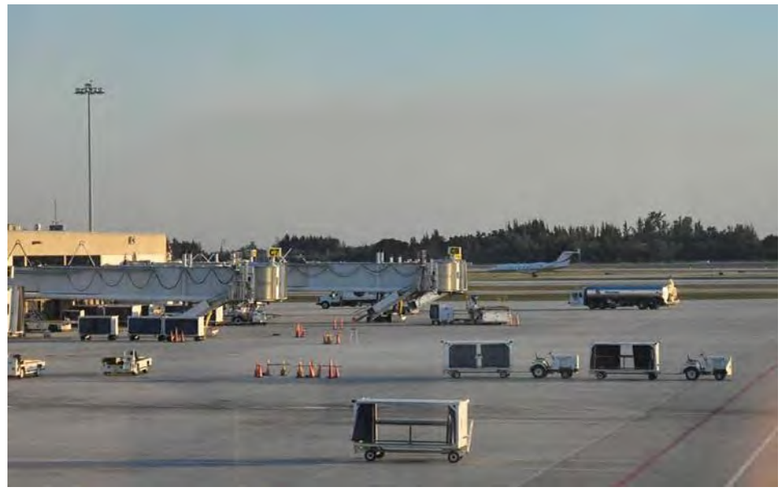
- Approximately 70% of passengers check their baggage
- A surge factor is applied to the ADPM peak hour baggage demand; the use of surge factor is recommended by the TSA to capture the intrinsic variance of baggage demand and to ensure that equipment requirements are not undersized[34]
- Redundancy of one extra EDS unit is included in estimating the EDS requirement for the centralized medium throughput in-line CBIS; for decentralized systems like the mini in-line or stand-alone systems, redundancy is assumed to be provided by the nearby machine

The projected baggage demand and the estimated EDS requirements for the 20-year planning horizon are summarized in **Table 5.16.** The new consolidated automatic CBIS with 4 in-line EDS machines will have sufficient capacity throughout the planning horizon based on estimated demand.

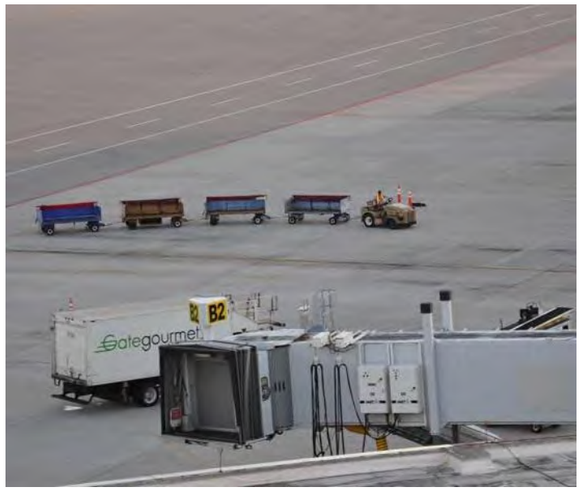
Table 5.16: EDS Requirements

Descriptions	Existing Inventory	Forecast				
		2015	2020	2025	2030	2035
Peak Hour Enplaned Passengers (pax)	1,545	1,624	1,844	2,022	2,209	2,413
Peak Hour Checked Baggage (bph)	1,154	1,213	1,377	1,510	1,650	1,802
Surged Peak Hour Baggage Demand (bph)	1,281	1,342	1,512	1,650	1,793	1,950
EDS Requirements (Units)						
Medium Throughput In-Line CBIS (EDS throughput approx. 684 bph, EDS+1)	-	3	4	4	4	4

Abbreviations: bph – bags per hour; EDS – Explosive Detection System; N/A – Not applicable.



Concourse C Apron
Source: AECOM (2014)



Concourse B Apron
Source: AECOM (2014)

34 *PGDS for CBIS, Version 4.2, May 2014.*

5.1.9 Baggage Claim

PBI has seven flat plate baggage claim units, which are designed in an "F", "L", or "U" configuration. These units are manually fed from the secure baggage make-up area on the same level. Six of baggage claim units are located in the domestic arrivals baggage claim and one is located in the secure international arrivals area. **Figure 5.7** shows the existing baggage claim units, non-secure claim frontage length for each unit, and the overall claim area square footage.

Baggage claim requirements are based on domestic and international peak hour arrivals (deplanements). However, some of the markets served in Canada and the Bahamas, including Toronto, Montreal, and Nassau, are from a U.S. pre-clearance facility where immigration, customs, and agriculture inspections are performed by the U.S. CBP before passengers depart for U.S. airports. Pre-clearance at foreign airports streamlines border procedures and reduces congestion at the U.S. port of entry. Once passengers arrive at U.S. airports, they are processed through the domestic terminal facilities. Considering the pre-clearance locations may vary throughout the planning horizon, the domestic baggage claim requirements are estimated base on the total peak hour arrival passengers (domestic and international) to allow maximum flexibility in the future. The international baggage claim requirements are estimated based solely on the peak hour international arrival passengers.

Most arrival passengers will be in the baggage claim hall by the time the first bags are unloaded. The walking distances from the gates to the baggage claim hall at PBI are generally between 700 to 1,450 feet and the walking time is between 2 to 12 minutes based on an average walking speed of 120 feet to 360 feet per minute. For the purposes of this analysis, the required claim frontage and space are sized based on the estimated number of terminating passengers waiting for baggage since most bags are claimed on the first revolution of the claim carousels.

The key assumptions in estimating the baggage claim requirements include:

- Approximately 70% of passengers check their bags
- Approximately 60% of arrival passengers with checked bags arrive at the domestic baggage claim carousel within the average 20-minute time-frame for baggage to be unloaded and transferred to the baggage claim facility[35]

Table 5.17 summarizes the requirements for carousel frontage and the active retrieval and peripheral area around the claim units for the domestic baggage claim areas. The existing domestic baggage claim facilities are generally sufficient for the 20-year planning horizon. International baggage claim requirements are provided in the following section as these are dictated by the U.S. CBP Airport Technical Design Standards (ATDS).

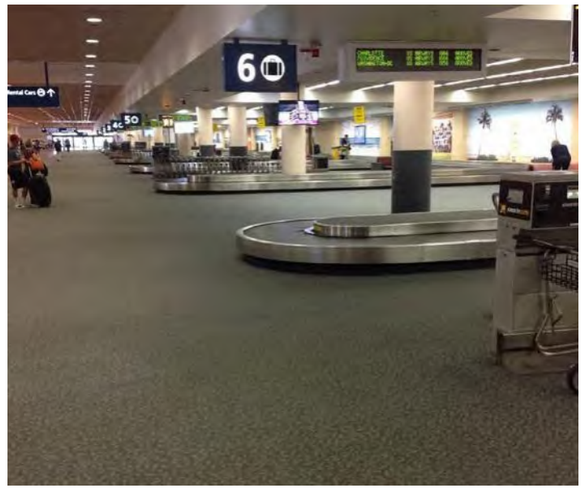
In order to enhance the passenger experience and the aesthetics, the DOA refurbished the domestic baggage claim hall in 2016. As illustrated in **Figure 5.7,** the proposed floor pattern was designed to emphasize major transitional nodes at vertical circulation cores, complement the design in other areas of the terminal, and enhance intuitive wayfinding by highlighting directional flows in the form of a thin dark line traversing the baggage claim area.

Table 5.17: Baggage Claim Facility Requirements

Baggage Claim Area	Requirements	Existing Inventory	Baggage Claim Requirements				
			2015	2020	2025	2030	2035
Domestic	Claim Frontage (LF)	1,263	800	900	1,000	1,100	1,200
Baggage Claim	Retrieval and Peripheral Area (SF)	18,680	9,600	10,900	12,000	13,100	14,300
International	Claim Frontage (LF)	170	150	**180**	**220**	**260**	**300**
Baggage Claim	Retrieval and Peripheral Area (SF)	2,100	1,800	**2,200**	**2,700**	**3,200**	**3,700**

Abbreviations: LF - linear feet; SF - square feet.

Old Baggage Claim Hall



New Baggage Claim Hall

Figure 5.7: Baggage Claim Hall Renovations

Source: AECOM (2017)

35 *ACRP Report 25, Airport Passenger Terminal Planning and Design.*

5.1.10 U.S. Customs and Border Protection

Processing of international passengers is completed by the U.S. CBP. A typical CBP Passenger Processing Facility at small airports[36] similar to PBI, the sterile FIS area includes the arrival gate vestibules, sterile corridor system, passenger processing area, international baggage claim, and CBP office and support space.

The arrival gate vestibules and sterile corridor system provide secure access to the CBP passenger processing area. Their location and size are dependent on the location and layout of the designated international gates which are evaluated as part of the development alternatives (Section 5.2).

The existing CBP facilities can process up to 300 passengers per hour and aircraft up to the size of B747-400[37]. Future international arrival passengers are projected to surpass 300 per peak hour by 2020 and over 500 per peak hour by 2035. Therefore, the CBP facilities must be expanded to process additional international traffic. A separate study was completed to determine the required size of the CBP facilities per the June 2012 CBP ATDS and evaluate development alternatives which accommodate the required spaces. The proposed space allocations identified as part of this study in coordination with the CBP are summarized in **Table 5.18**.

Table 5.18: CBP Facility Requirements

CBP Area	Items	Existing Inventory (2014)	CBP Space Requirements	
			2012 ATDS Requirement	Proposed
Primary Processing	No. of Primary Booths (1 booth has 2 lanes)	2	6	6
	Primary Processing Area (SF)[1]	3,970	10,600	10,160
Secondary Processing	Secondary Processing Area (SF)	4,700	3,790	3,963
	Secondary Operations and Support Area (SF)		520	535
CBP Administration	CBP Officer / Staff Area (SF)	1,560	1,958	2,015
	CBP Support Spaces (SF)		2,880	2,750
Baggage Claim Lobby	Claim Units / Circulation / Restrooms	6,000	9,650	10,220
Others	Exit Podium / circulation / MEPT[2]		5,091	5,132
Grand Total	**CBP Space Requirements (SF)**	**16,230**	**34,489**	**34,775**

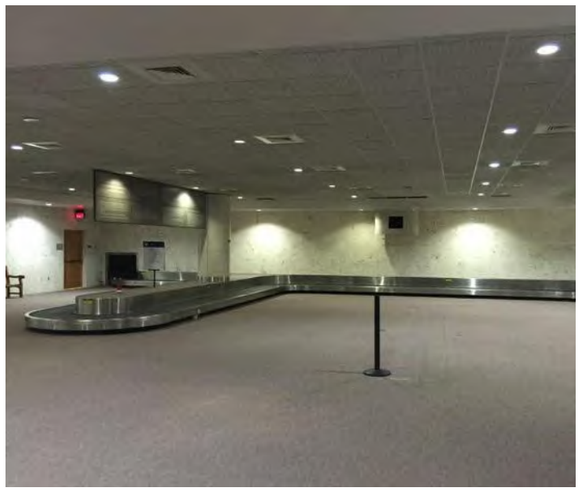
Notes:

(1) Includes the restroom for existing conditions but not proposed

(2) MEPT = Mechanical, Electrical, Plumbing, Telecommunications

Primary Processing Area

Source: AECOM (2014)



International Baggage Claim

Source: AECOM (2014)

36 *CBP classifies airport processing facilities by determining the maximum number of arrival passengers processed at the peak hour. Small airports include those with less than 800 passengers per hour. PBI is classified as small airports by CBP.*

37 *PBI airport website, http://www.pbia.org/about/.*

5.1.11 Commercial Terminal Facility Requirements Summary

The capacity of the core terminal facility and processing functions were analyzed to evaluate if they can accommodate the forecast peak demand. **Table 5.19** and the following summarize the key items identified for improvement and/or expansion to support the growth in passenger activity levels, optimize the utilization of existing spaces, and enhance passenger experience:

- Terminal Gates and Aircraft Parking Stands:
  - Add 2 new gates by 2035
  - Add 1 international gate in near to medium term and ultimately provide total 3 international gates ultimately
- Check-In:
  - Reallocate existing space to accommodate an increase in demand for kiosks and enhance public circulation
  - Reconfigure and optimize the use of existing ATO space
- Security Screening Checkpoints (SSCP):
  - Anticipate SSCP C may reach capacity around 2025 and SSCP AB may also reach capacity by around 2030
  - Implement a consolidated SSCP and utilize existing SSCP for other revenue generating functions
- Gate Lounges:
  - Anticipate congestion in Concourse B as the seating capacity of narrowbody aircraft are increased from 150 to 200-seats
  - Expand Concourse B and/or C to provide additional gates, holdroom, and concessions
- Concessions:
  - Reconfigure and reallocate the concessions space to provide more post-security concessions
  - Increase the food and beverages in all concourses and add specialty retail in Concourses B and C
- Inbound Baggage Reclaim
  - Expand the international baggage reclaim area around 2020
- U.S. Customs & Border Protection (CBP)
  - Expand the CBP area before 2020

Table 5.19: Summary of Commercial Passenger Terminal Facility Requirements

Terminal Facility Requirements	Short-Term (2020)	Medium-Term (2025)	Long-Term (2035)
Annual Enplanements	3.4 M	3.7 M	4.4 M
Peak Hour Enplanements	1,844	2,022	2,413
International Gates	Add 1 gate	Add 1 gate	
Total Terminal Gates			Add 2 domestic gates
Check-in			
SSCP		Enhance SSCP C	Enhance SSCP AB
Gate Lounges / Concessions	Reallocate concessions	Enhance gate lounges	Enhance gate lounges
Baggage screening			
Domestic bag claim			
International bag claim	Expand bag claim		
CBP	Expand CBP area		
Other recommended enhancements	• Optimize the ticketing hall • Increase post-security concessions		

5.2 Terminal Development Plan

The commercial passenger terminal is one of the primary focal points of the PBI Master Plan. The terminal is often the most iconic feature of any airport and is typically the source of either positive or negative perceptions by passengers. Accordingly, the goals and objectives for improving the passenger terminal include:

- Accommodate the facility requirements to maintain an Optimum LOS
- Maximize passenger convenience through a seamless transition from ground transportation to air transportation
- Re-balance concessions between the secure and non-secure areas of the terminal
- Make the terminal a show place of functionality and design that reflects the local feel of West Palm Beach
- Ensure feasibility of construction

The following sections summarize the alternatives analysis of the primary terminal functional areas. The preferred alternative for each area collectively compose the preferred terminal development plan.

5.2.1 Passenger Check-in (Ticketing)

The existing passenger check-in area (the ticketing hall) has a sufficient number of check-in positions and queue space available to accommodate forecast 2035 demand; however, it does not maximize the passenger experience, convenience, or wayfinding due to a configuration based on antiquated check-in procedures and requirements. As such, three alternatives (**Figure 5.8**) were developed with varying levels of improvements to address these existing issues.

5.2.1.1. Ticketing - Alternative 1

Alternative 1 maintains the existing configuration but proposes enhancements to maximize the passenger experience, including:

- Existing alcoves along the exterior wall are utilized to provide additional common use check-in kiosks
- Ticket agent and baggage drop podiums are replaced with modern casework
- Dark interior finishes (such as the carpet, floor tiles, and ceiling) are replaced with a brighter color palette

While these improvements are minimal, updating the interior finishes is generally an inexpensive method to enhance the passenger check-in area via the perception of a larger and brighter space.

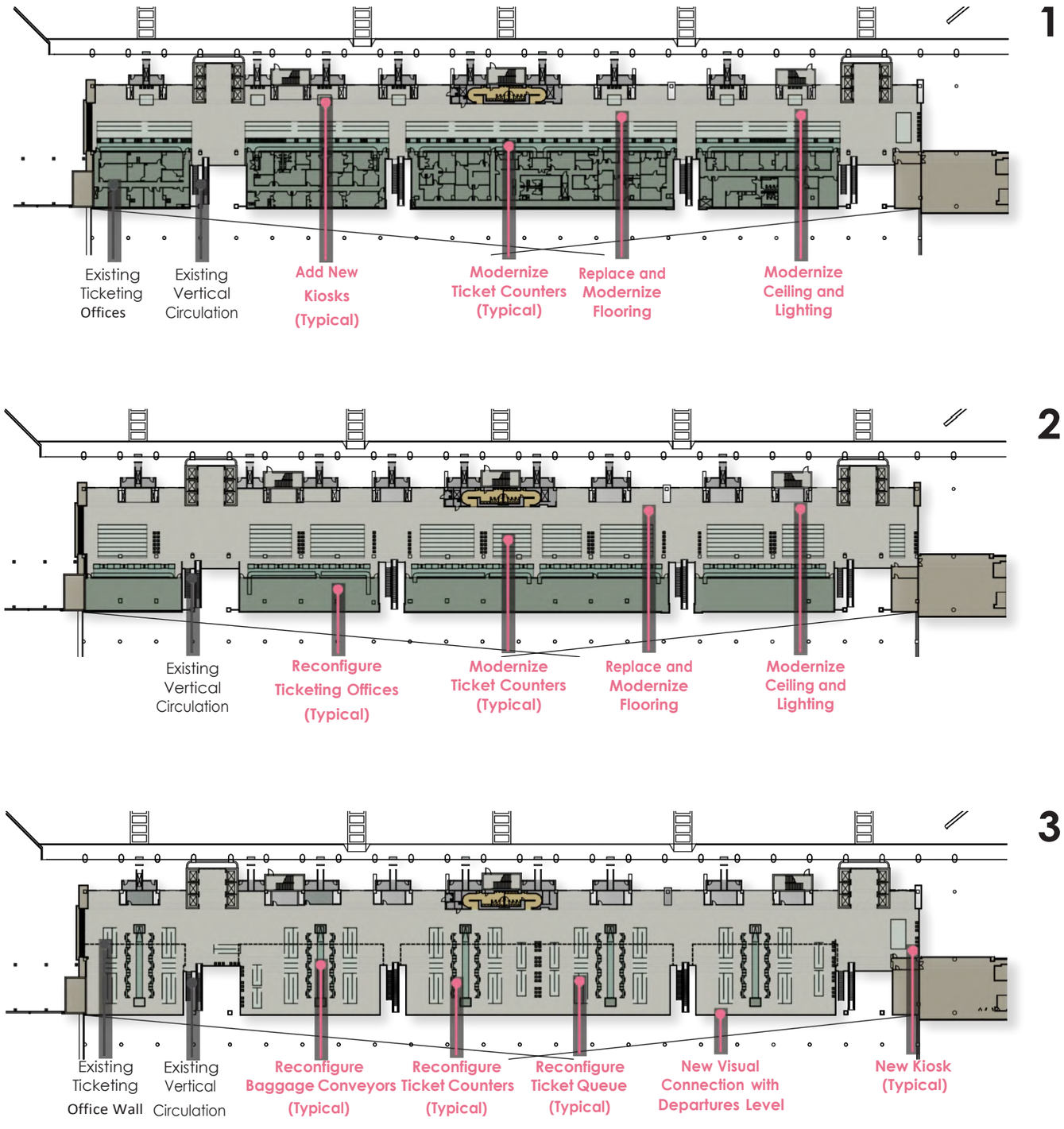


Figure 5.8: Ticketing Hall Alternatives

Source: AECOM (2017)

5.2.1.2. Ticketing - Alternative 2

Alternative 2 builds upon Alternative 1 by proposing an additional yet more comprehensive enhancement in removing some of the existing underutilized ATO space. Removal of the excess ATO allows for the relocation of the existing ticket counters to provide additional passenger queue and circulation space while improving the visual connection to the escalators leading to the Departures level below. This alternative also requires the relocation of the existing baggage drops and modification to the conveyor system. However, the intent is to maintain the approximate alignment of the existing baggage drops to minimize the required modifications.

5.2.1.3. Ticketing - Alternative 3

Alternative 3 proposes a complete reconfiguration of the ticketing hall. As the need for ATO space directly adjacent to the ticketing counters has significantly diminished in recent years due to evolution of ticketing procedures and processes, the existing ATO space is relocated to another area of the terminal. Minimal ATO space is provided for storage and required security functions.

The ticket counters are realigned into 'ticketing islands' perpendicular to the main flow of circulation. This provides an open view to the non-secure Departures level below and the airfield beyond while significantly enhancing the amount of natural light. The perception of volume to and from the Departures level will maximize a passenger's intuitive wayfinding as well as their overall experience. This alternative requires new baggage drop locations and baggage conveyor right of ways, and substantial interior renovation. Therefore, it is the most expensive alternative to implement.

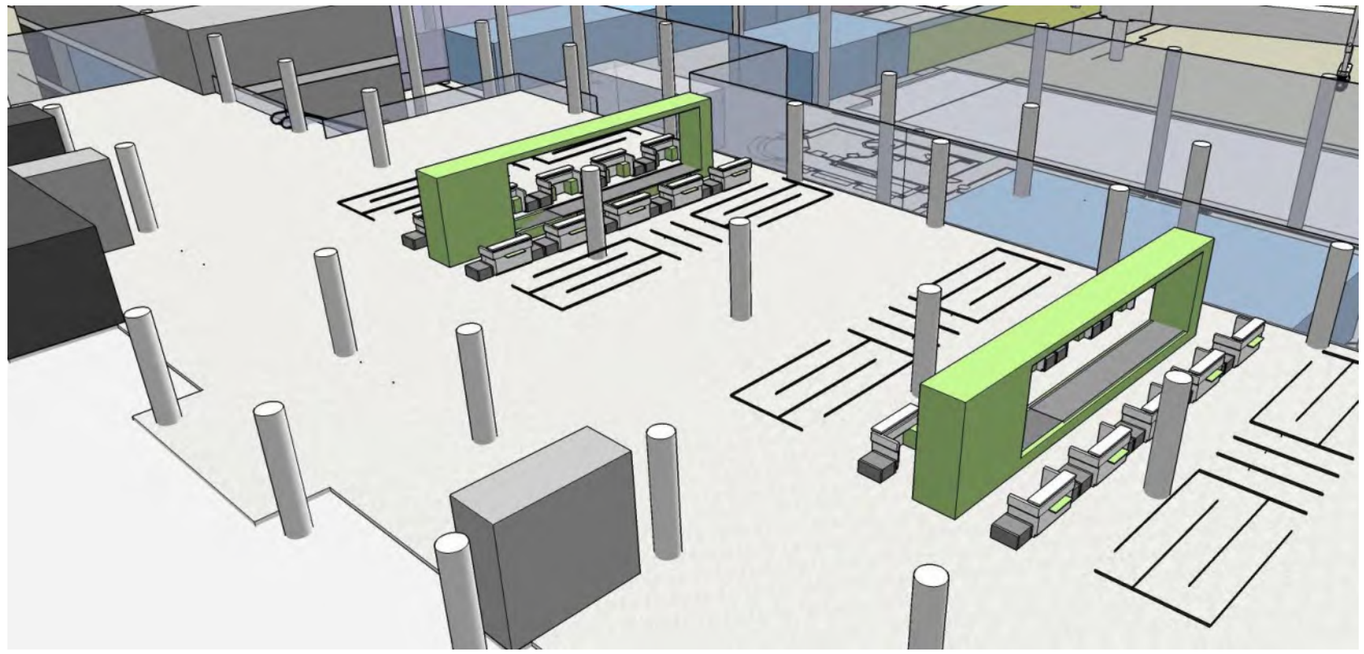
5.2.1.4. Ticketing Alternatives Evaluation

Given that the existing ticketing hall provides sufficient ticket counters and queue space, the selected alternative is largely dependent upon the level of enhancements desired and/or the amount of investment funds available. Nevertheless, Alternative 3 is recommended as it maximizes passenger experience and significantly enhances both passenger wayfinding and the overall operational efficiency of the ticketing function. **Table 5.20** summarizes the alternatives evaluation.

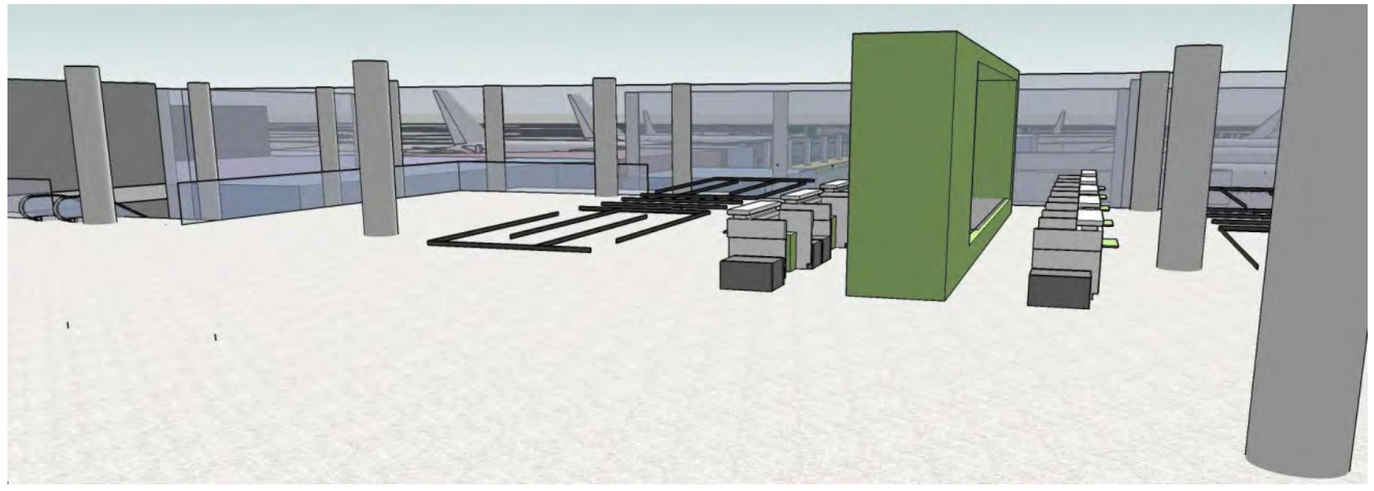
Table 5.20: Passenger Check-In Alternatives Evaluation

Evaluation Criteria	Alternative		
	1	2	3
Passenger Experience	Negative	Negative	Positive
Passenger Wayfinding	Negative	Negative	Positive
Compatibility with Existing Conditions	Positive	Neutral	Negative
Operational Efficiency	Negative	Negative	Positive
Financial Feasibility & Implementation	Positive	Neutral	Negative

Positive Neutral Negative



Conceptual Ticketing Counter Layout
Source: AECOM (2015)



Conceptual Ticketing Hall View to Departures Level and Airside
Source: AECOM (2015)

5.2.2 Security Screening Checkpoints (SSCP)

Since 2011, the increasing size of security screening equipment and associated security procedures has disconnected previously successful retail from secure passengers. As such, two SSCP alternatives were developed to accommodate the facility requirements and re-balance concessions between secure and non-secure passengers. As illustrated in **Figure 5.9**, the first alternative evaluates the feasibility of a consolidated SSCP and includes two options while the second alternative maintains separate SSCPs at Concourses A and B. Each alternative includes a building expansion to support the relocation of the airline club currently located along Concourse C which is discussed in the Gate Lounges section.

5.2.2.1. Consolidated SSCP - Alternative 1

A consolidated SSCP is often considered more efficient both operationally and functionally since it concentrates passenger screening in one location and minimizes staff requirements for the TSA. A consolidated SSCP also allows for the existing SSCP areas to be used for other functions such as office space and/or additional concessions. Two consolidated SSCP options were developed, both located on the existing Departures Level in a central location to allow passenger disbursement to each concourse. The options require significant reconfiguration of existing concessions.

Option 1A

Option 1A proposes a consolidated SSCP within the existing boundaries of the terminal building. New escalators on both sides of the existing restrooms on the Ticketing Hall above provide access to the SSCP area. Although this layout minimizes new construction outside the existing building, it requires a significant reconfiguration of existing mechanical and utility features located beneath the Ticketing Hall. An optional expansion of the existing building is also proposed to provide a prominent concessions area as passengers exit the SSCP.

Option 1B

Option 1B places the SSCP between the two existing central escalators that connect the Ticketing Hall to the Departures level. This option avoids impacts to the existing mechanical area beneath the Ticketing Hall but requires a relatively significant building expansion to accommodate the SSCP. Given that, this option requires passengers to turn back slightly to either Concourse AB or C and the concessions on either side of the SSCP become less visible for those passengers.

5.2.2.2. Segregated SSCP - Alternative 2

Alternative 2 maintains the existing SSCP locations. However, the Concourse AB exit is reconfigured to allow for future expansion and additional secure concessions within the existing meeter/greeter area. Similarly, SSCP C is shifted and reconfigured to allow for future expansion, additional airside retail, and to provide a more direct exit route. While this alternative depicts the existing central terminal area, redevelopment of this area is discussed in the Secure Connector section.

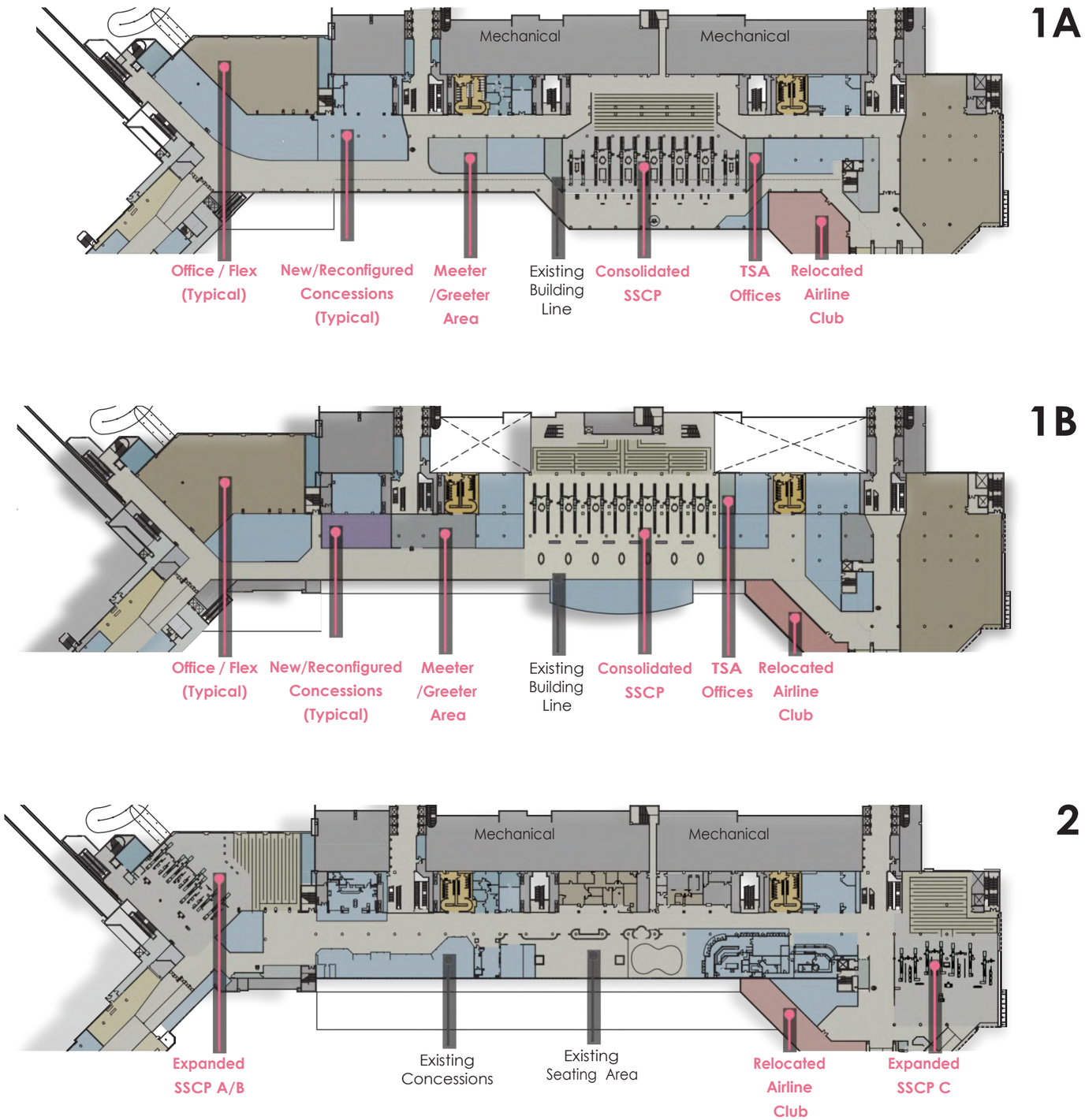


Figure 5.9: SSCP Alternatives

Source: AECOM (2017)

5.2.2.3. SSCP Alternatives Evaluation

Although a consolidated checkpoint maximizes the efficiency of security screening operations, the significant renovations that would be needed to the existing building and the associated cost are prohibitive. Based on the evaluation depicted in **Table 5.21** as well as discussions with the DOA and the Master Plan Stakeholder Advisory Committee, Alternative 3 was selected as the preferred alternative with the provision that a secure connector between the two concourses and additional secure concessions are provided.

Table 5.21: SSCP Alternatives Evaluation

Evaluation Criteria	Alternative		
	1A	1B	2
Passenger Experience	Positive	Positive	Neutral
Compatibility with Existing Conditions	Negative	Negative	Positive
Operational Efficiency	Positive	Positive	Neutral
Financial Feasibility & Implementation	Negative	Negative	Positive

Positive Neutral Negative

5.2.3 Gate Lounges

While additional gates are recommended based on forecast demand, the primary gate lounge improvements involve re-balancing of the existing under-utilized non-secure concessions. The following sections summarize the key recommended improvements. Details on the type of concessions in each location are provided in the terminal concessions study.

5.2.3.1. Concourse B

The DOA have existing plans for a future "hammerhead" expansion of Concourse B towards the West Remote Ramp. While the proposed Concourse B expansion is maintained as part of this Master Plan, the expansion is reversed towards the Concourse C apron in order to minimize airside impacts and take advantage of the area which can be made available by the relocation of the ARFF facility.

As illustrated in **Figure 5.10**, the proposed Concourse B improvements include:

- 24,500 SF "hammerhead" expansion to provide two additional domestic gates and concessions
- 2,400 SF expansion of the existing concessions area between Gates B5 and B7
- 3,000 SF expansion of the concessions and restroom area between Gates B4 and B6
- Expansion of Gate B1 to provide additional holdroom space
- Three total international gates:
  - New sterile corridor at Gate B1 which will utilize and re-purpose an existing escalator (requires relocation of vehicle service road)

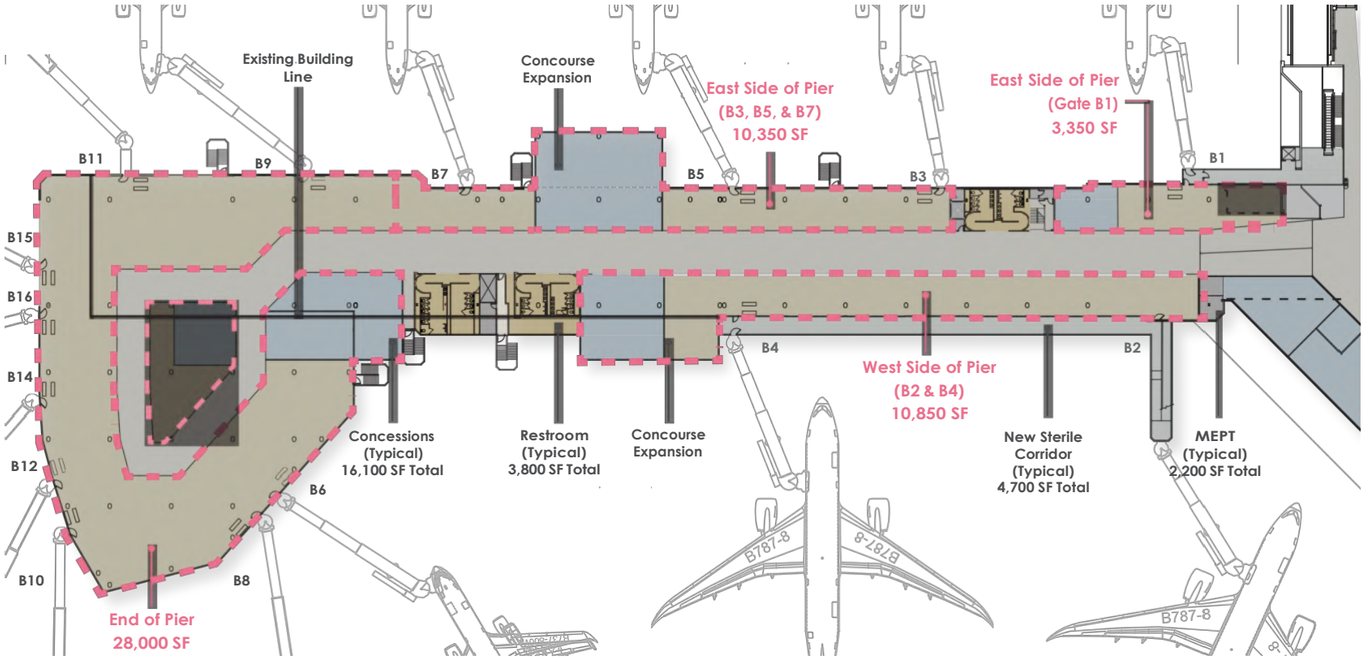


Figure 5.10: Concourse B Expansion and Redevelopment

Source: AECOM (2017)

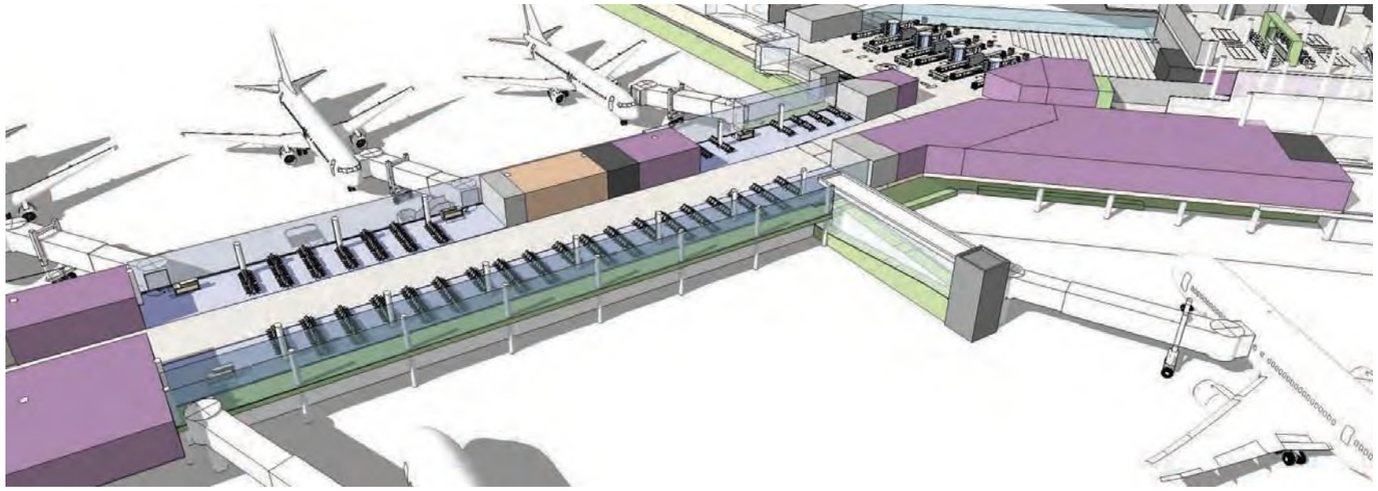


Figure 5.11: Gate B2/B4 Sterile Corridor

Source: AECOM (2017)

- Reconfiguration of Gate B2 sterile corridor to provide a ramp structure accessing the CBP facility baggage claim below (refer to **Section 5.2.5** for more detail)
- New sterile corridor at Gate B4 which will utilize the new ramp structure at Gate B2 (see **Figure 5.11**)

5.2.3.2. Main Terminal Area

The main terminal area connects Concourse AB and Concourse C. The re-balancing of concessions from pre-security to post-security provides an opportunity to utilize the central terminal area for a secure connection between the concourses as well as additional aircraft gates to satisfy the facility requirements. As illustrated in **Figure 5.12**, the proposed central terminal area development plan includes two holdrooms for a relocated Gate C11 and Gate C1. Other proposed improvements include:

– 15,600 Square Foot (SF) expansion at the corner of existing Gate C1 and the central terminal area
  - Provides additional concessions and a relocated airline club
  - Existing Gate C1 will be utilized for concessions and additional holdroom for Gate C3)

– 6,900 SF expansion at the corner of existing Gate B2 and the central terminal area
  - Provides additional concessions
  - Coincides with the expansion of the CBP area on the arrivals level (refer to **Section 5.2.5** for more detail)

The new gates will maximize passenger utilization of the Central Terminal Area and exposure to airside concessions which, in effect, will create a unique space that will act as the new focal point and icon for PBI.

5.2.3.3. Concourse C

Although Concourse C is nearly 13,000 SF larger than Concourse B, the gate lounges are still deficient based on forecast demand. The relocation of Gates C11 and C1 to the Central Terminal Area reduces the gate lounge requirement on Concourse C and maximizes concessions opportunities. As illustrated in **Figure 5.13** the proposed Concourse C improvements include:

– 1,800 SF expansion of the Gate C9 holdroom

– 1,900 SF expansion of the concessions and restroom area between Gates C4 and C6

– 900 SF expansion of the C6 holdroom

– Reconfiguration of the concessions within the “hammerhead”

– Re-purposing of the Delta SkyLounge for concessions

– Consolidation and reconfiguration of the Gates C2 and C4 holdrooms

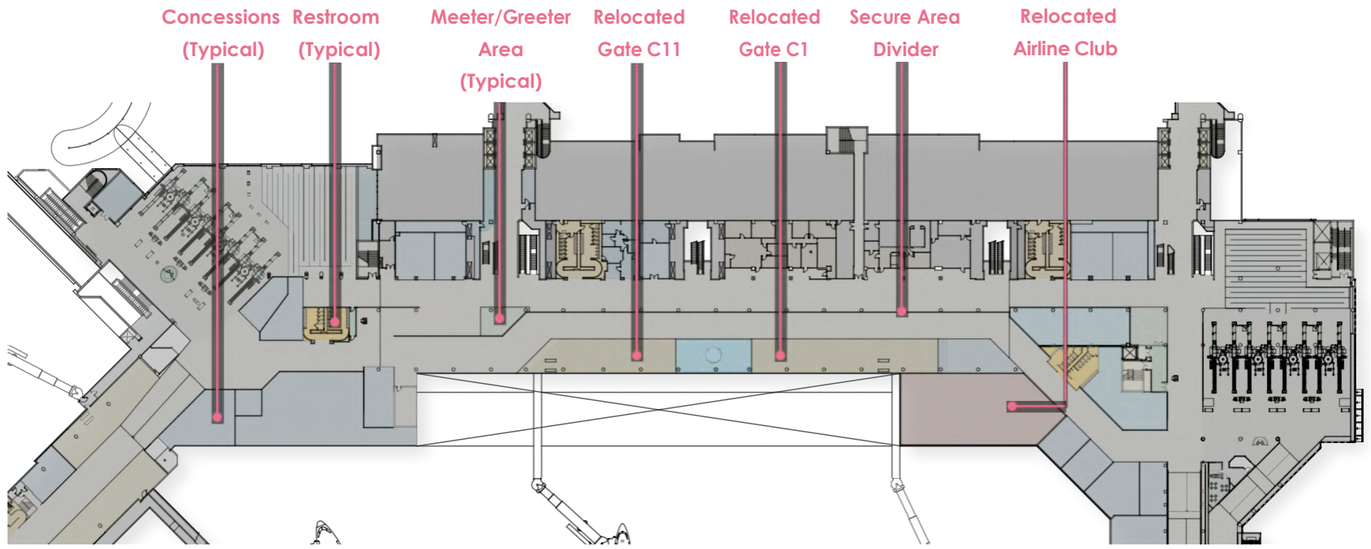


Figure 5.12: Main Terminal Expansion and Redevelopment
Source: AECOM (2017)

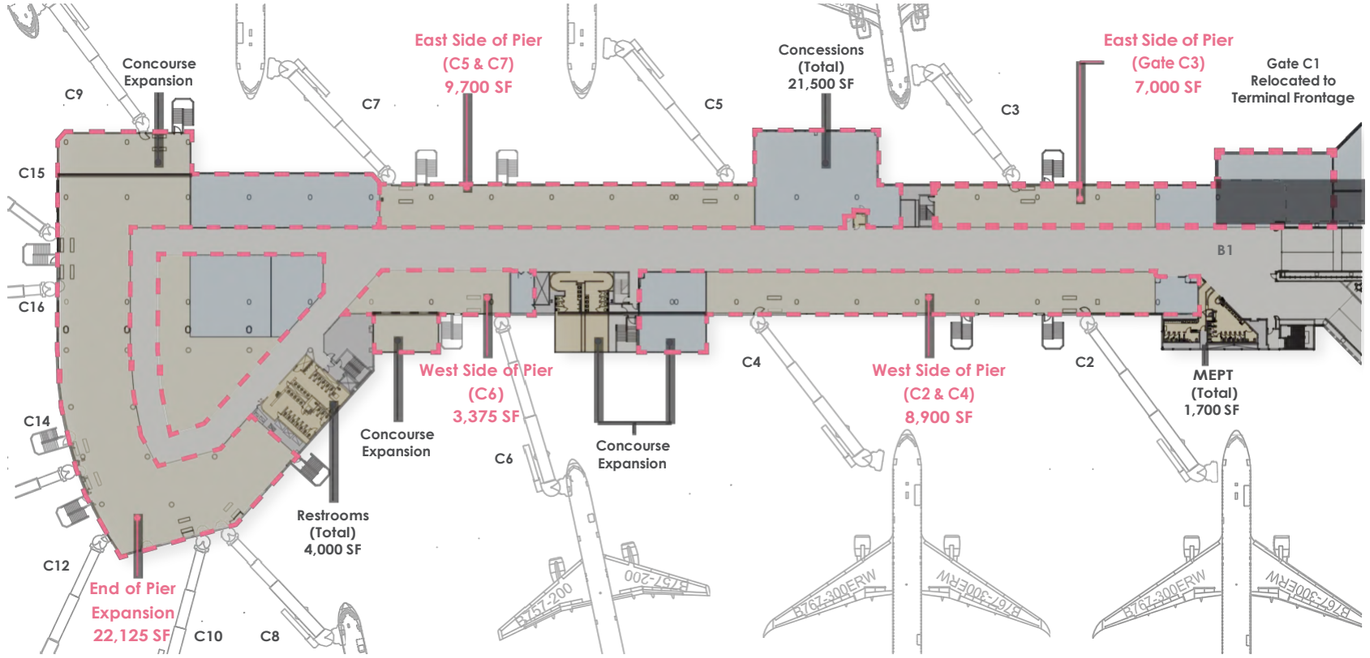


Figure 5.13: Concourse C Expansion and Redevelopment
Source: AECOM (2015)

5.2.4 U.S. Customs and Border Protection (CBP)

As previously noted, a separate study was completed to identify an expanded and reconfigured CBP area at PBI. In coordination with the DOA and CBP representatives, a concept design was approved in June 2016 and will be progressed for final design and construction. The proposed expansion includes development of the existing open areas under SSCP AB as well as Gates B1 and B2. The existing vehicle service road adjacent to Gates B1 and B2 will be closed and vehicles rerouted to the existing pass-through located at Gates B4 and B5.

Whereas international passengers have traditionally proceeded through CBP processing prior to obtaining their checked baggage, the proposed CBP facility was designed for "baggage first" functionality where international passengers collect their baggage prior to CBP processing. New Automatic Passport Control (APC) kiosks are provided to expedite the CBP process and Global Entry booths provided for those passengers enrolled in the program.

5.2.5 Summary of Recommended Terminal Improvements

Other than the expanded CBP facility, the recommended terminal development plan primarily includes expansion and reconfiguration of the Departures Level. While a significant renovation of the Ticketing Level is recommended, it is not demand-based.

The recommended Departures Level development plan is illustrated in **Figure 5.14**. The expansion of Concourse B provides sufficient space to accommodate the anticipated demand. The relocation of the existing ARFF facility allows for an expansion of Concourse B and an additional two domestic gates (overall capacity of 30) as well as a significant increase in concessions. Gates B1 and B4 are converted to international-capable gates to support a total of three international flights.

Small expansions to Concourse C are proposed to accommodate more gate lounge space at the "hammerhead" and Gate C6 as well as additional restrooms and concessions. Gates C1 and C11 are relocated to the central terminal area to decrease congestion on the concourse and allow better utilization of the central terminal area.

As summarized in **Table 5.22** and **Table 5.23**, the recommended terminal development plan includes a significant increase in gate lounges space, including the reallocation of pre-security and post-security concessions.

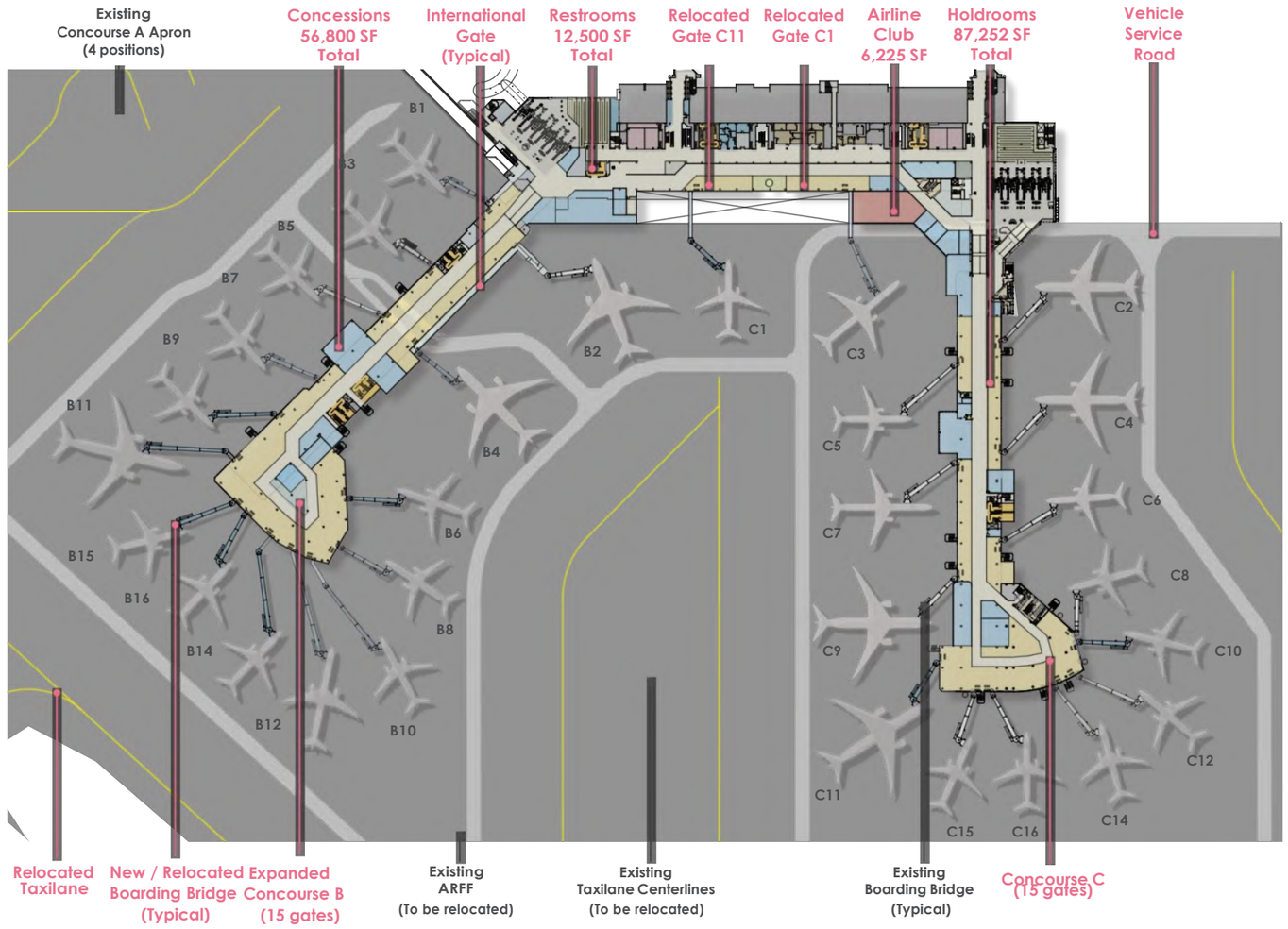


Figure 5.14: Preferred Terminal Development Plan - Departures Level

Source: AECOM (2017)

Table 5.22: Gate Lounge Allocation

Item	Existing Inventory	Space Allocations (SF)	
		2035 Facility Requirements	Recommended Development Plan
Concourse A	4,881	2,700	4,881
Restrooms	3,321	1,500	3,321
MEPT/ MJS	440	324	440
Total Concourse A	**8,642**	**4,524**	**8,642**
Concourse B			
East side of pier (Gate B1)	2,630	2,700	3,350
East side of pier (Gates B3, B5, & B7)	7,485	8,000	10,350
West side of pier (Gates B2 & B4)	9,070	8,000	10,850
End of pier (Gates B9, B11, B14, B12, B10, B8, & B6)	13,220	24,000	28,000
Restrooms	1,828	4,500	4,500
MEPT/ MJS (Departures Level only)	1,280	2,562	2,200
Total Concourse B (including 25-foot circulation corridor)	**48,100**	**64,562**	**79,250**
Concourse C			
East side of pier (Gates C1 & C3)	4,920	7,300	7,000
East side of pier (Gates C5 & C7)	5,300	6,000	9,700
West side of pier (Gates C2 & C4)	8,080	6,700	8,900
West side of pier (Gate C6)	2,240	3,100	3,375
End of pier (Gates C9, C11, C15, C16, C14, C12, C10, & C8)	14,930	21,200	22,125
Restrooms	3,924	4,500	4,850
MEPT/ MJS (Departures Level only)	2,358	2,658	1,775
Total Concourse C (including 25-foot circulation corridor)	**70,144**	**70,558**	**80,125**
Two new gates (including 25-foot circulation corridor)	**-**	**11,200**	**18,250**

Table 5.23: Concessions Space Allocation

Zone	Category	Concessions Space Allocation		
		Existing Inventory	2035 Facility Requirements	Recommended Development Plan
Airport Total	F&B	25,538	30,090	34,250
	Convenience Retail	10,681	7,980	9,300
	Specialty Retail	11,059	7,980	10,550
	Total	47,278	46,050	56,135
Pre-Security	F&B	14,032	6,320	4,500
	Convenience Retail	3,771	1,680	1,000
	Specialty Retail	11,059	1,680	2,050
	Total	28,862	9,680	7,550
Post-Security	F&B	11,506	23,770	29,750
	Convenience Retail	6,910	6,300	8,300
	Specialty Retail	0	6,300	8,500
	Total	18,416	36,370	46,550

General Aviation & Support Facilities

06

06 General Aviation & Support Facilities

PBI has and will continue to be one of the nation's premiere locations for General Aviation (GA), specifically business aviation activity. Based on the forecasts and information received from the Fixed Base Operators (FBOs) during the Stakeholder Advisory Committee meetings, PBI is expected to increase business aviation operations and remain within the nation's Top 10 Business Aviation Airports[38].

As noted in the Airport Inventory (Chapter 2), construction of the "Golfview" Area for new and relocated GA facilities is currently on-going with the proposed Taxiway W connecting the NetJets facility to Taxiway A for access to Runway 10L. While general development plans already exist for the Golfview area, this chapter identifies the GA facility requirements based on the updated aviation activity forecasts as well as development alternatives for the relocation and expansion of existing facilities as necessary. In addition, other aviation support facilities such as Air Cargo, ARFF, Fuel Storage, and Maintenance are evaluated to determine the need for new and/or improved facilities and development alternatives accordingly.

6.1 General Aviation Facilities

This section focuses on GA facilities and includes identification existing and future deficiencies within the 20-year planning horizon. A preferred GA development plan is provided based on an analysis of several alternatives intended to satisfy the identified facility requirements and accommodate the preferred airside development plan. The primary GA facilities include the aircraft parking area and storage hangars, FBO terminal facilities, vehicle parking, U.S. CBP General Aviation Federal Inspection Services (GAFIS), an aircraft wash rack, and fuel storage facilities.

6.1.1 Facility Requirements

This section compares the capacity of all GA infrastructure and support facilities to accommodate existing and forecast demand. The facility requirements utilize FAA design standards, industry standard planning factors, and site specific conditions such as number and type of based aircraft, itinerant operations, zoning, noise compatibility, and building codes.

FAA design standards and industry standard planning factors were referenced from the following guidance:

- FAA Advisory Circular 150/5300-13A, *Airport Design (Change 1)*
- FAA Advisory Circular 150/5360-13, *Planning and Design Guidelines for Airport Terminal Facilities*
- Transportation Research Board (TRB) Airport Cooperative Research Program (ACRP) *Report 113: Guidebook on General Aviation Facility Planning*

For the purposes of this analysis, Air Taxi operations are considered in conjunction with GA since these operations primarily occur at the GA facilities.

As shown in **Table 6.1**, GA operations (59,103) and Air Taxi operations (27,157) accounted for nearly 62% of total aircraft operations at PBI (139,712) in 2014. Modest AAGR for total GA and Air Taxi operations are anticipated in each of the 5, 10, and 20 year planning horizons with an increase of roughly 12,000 annual operations each. However, the percentage of business aviation as a function of GA operations is expected to increase.

The specific market factors that affect the need for particular GA facilities at PBI include:

- PBI generally accommodates higher-end general aviation users with a mix of transient aircraft that include corporate jets and air taxi/private charters
- Compared with smaller general aviation airports, PBI provides general aviation users with better services, amenities, and facilities, including:
  - 24-hour ATCT services and radar coverage;
  - Instrument approach capabilities;
  - GA dedicated CBP support including FIS; and
  - Three full-service FBOs
- The hangar occupancy rate is nearly 100%; since the South Florida climate is not ideal for long-term parking on the apron, future growth in based aircraft will be constrained unless additional hangar facilities are constructed
- Changes in the corporate jet fleet mix are leading to increases in aircraft size, such as the Dassault 8X, Gulfstream V, Bombardier Global Express, and Boeing Business Jet which require larger ground taxi maneuvering areas and parking positions

For the purposes of this analysis, requirements associated with 2014 are based on actual demand rather than existing capacity in order to identify existing deficiencies.

Table 6.1: Existing and Forecast General Aviation Operations

Year	Total Operations	Itinerant	Local	Total	Percentage (%)	Air Taxi Operations Total	Air Taxi Operations Percentage (%)
2014	139,712	58,358	745	59,103	42.30%	27,157	19.44%
2015	139,734	58,481	720	59,201	42.37%	27,451	19.65%
2020	149,122	59,166	728	59,894	40.16%	29,893	20.05%
2025	159,066	61,566	758	62,324	39.18%	32,553	20.47%
2030	171,230	65,690	809	66,499	38.84%	35,450	20.70%
2035	185,788	71,592	881	72,474	39.01%	38,604	20.78%

Notes:

(1) Refer to the Aviation Activity Forecasts chapter for more detailed information
(2) Local operations are those that are conducted within a 20-mile radius of an airport's airspace
(3) Itinerant operations are all GA operations other than local and do not include Air Taxi

38 Aviation Week Network - Top 50 Business Aviation Airports in North America in March 2015.

6.1.1.1. Aircraft Parking and Hangar Storage

The aircraft parking apron typically requires the largest area of a GA Terminal facility because it requires adequate aircraft parking positions, clearance from other fixed and/or movable objects, and access to/from the airfield. Storage of GA aircraft is typically provided via two types of aprons, transient and based, as well as storage hangars. Transient aprons are utilized by aircraft that are only at the airport on a short-term basis and usually have higher activity and turnover but lower density. Transient aprons are best located near GA terminal buildings. On the other hand, based aircraft are stored at the airport and typically require both parking positions on the apron and hangar storage. Based aircraft parking aprons normally have lower activity but with a higher density as aircraft are parked for longer periods of time.

Hangar Storage

Two types of GA hangars typically provided at airports include conventional and T-Hangars. PBI does not currently provide T-Hangars for aircraft storage due to the nature of operations. Therefore, this analysis only considers the requirement for conventional hangars to accommodate anticipated demand.

The size of a conventional hangar is dependent upon the type and number of aircraft to be stored. For the purposes of this Master Plan, an overall hangar space requirement is provided in lieu of a specific number of hangar units since a single hangar can be sized to accommodate multiple aircraft.

The following planning parameters were used to identify hangar storage requirements:

- 6,400 SF (80-feet x 80-feet) for based single-engine aircraft and helicopters
- 10,000 SF (100-feet x 100-feet) for based multi-engine aircraft
- 14,400 SF (120-feet by 120-feet) for based jet aircraft
- 10% of the total hangar size is dedicated as office/operations area
- 5% of the total hangar size is dedicated as maintenance area
- 50% of based aircraft are stored in a hangar
- 75% of based helicopters are stored in a hangar

According to the DOA, all hangars are currently occupied and operating at full capacity. The DOA is currently in the process of providing more hangars in the Golfview area based on existing demand. The required hangar space summarized in **Table 6.2** verifies the lack of existing hangar capacity (approximately 735,000 SF) based on existing and anticipated 2035 demand (1.0 million SF and 1.24 million SF respectively).

Number of Parking Spaces

Aircraft that are not stored in a hangar utilize an open-air aircraft parking apron. Insufficient hangar capacity translates to additional demand on the parking apron. Without sufficient apron capacity the apron will become constrained as well. Therefore, adequate sizing of the parking apron is required to maximize efficiency. The first element in determining an adequate size of an aircraft parking apron is identifying the number of required aircraft positions.

The number of aircraft parking positions required for other aircraft is determined utilizing the methods provided in Appendix C of the ACRP Guidebook for General Aviation Facility Planning. The ACRP method utilizes annual transient operations (itinerant general aviation and Air Taxi are considered transient) to identify an adequate number of parking positions.

The ACRP formula is:

(X / 2*T) / 365 * P = Number of Transient Parking Positions

Where,

X = number of operations (general aviation)

T = percent of operations which are transient

P = percent of transient aircraft that are parked on the apron at any one time

Table 6.3 summarizes the number of parking positions required throughout the planning horizon. For the purposes of this analysis, it is assumed that 60% of transient aircraft could be parked on the apron at any one time and 2 single or multi-engine aircraft and 3 helicopters can park in one jet parking position as described in the following section.

Table 6.2: Aircraft Hangar Storage Requirements

Item	Existing 2014	Forecast				
		2015	2020	2025	2030	2035
Single-Engine	6	6	6	6	6	6
Multi-Engine	8	8	8	8	8	8
Jets	117	118	126	135	143	153
Helicopter	17	17	17	17	17	17
Total Based Aircraft	**148**	**149**	**157**	**166**	**174**	**184**
Total Aircraft in Hangars[1]	78	79	83	87	91	96
Recommended Hangar Space (SF)	**983,200[3]**	**990,400**	**1,048,000**	**1,112,800**	**1,170,400**	**1,242,400**

Notes:

(1) 50% of based single-engine, multi-engine, and jets and 75% of helicopters will be stored a hangar
(2) Additional Hangar Area is 15% of hangar space
(3) Existing hangar space available at PBI is approximately 735,000 SF

Table 6.3: General Aviation Aircraft Parking Apron Positions

Year	GA Itinerant / Air Taxi	GA Local & Military	Total (X)	% Itinerant (T)	Required Transient Aircraft Positions[1]	Required Based Aircraft Positions[2]
2014	85,543	2,063	87,606	97.65%	70	65
2015	85,932	2,066	87,998	97.65%	71	65
2020	91,134	2,074	93,208	97.77%	75	69
2025	96,223	2,104	98,327	97.86%	79	74
2030	101,140	2,155	103,295	97.91%	83	78
2035	110,197	2,227	112,424	98.02%	91	83

Notes:

(1) Assumes 60% of transient aircraft will be parked on the apron at any one time (P)
(2) Assumes 2 single/multi-engine aircraft or 3 helicopters can utilize one jet parking position

Apron Size

The second element in identifying an adequate aircraft parking apron is the size of the parking areas. The size of the apron is dependent on the type of aircraft that will utilize the facilities. As one of the premier business aviation airports, the GA aircraft operating at PBI primarily consists of medium to large corporate jets, such as Gulfstreams, LearJets, and Cessna Citations. **Table 6.4** provides characteristics for six of the predominant jet aircraft currently operating at PBI.

As there are a few ADG III aircraft consistently operating on the GA aircraft parking apron, the size of the aircraft parking apron is based on ADG III and TDG 2 FAA design standards as summarized in **Table 6.5**.

The FBOs have indicated that the aircraft types and size will likely remain similar to existing or even increase in some cases. Therefore, an aircraft parking position of approximately 3,200 square yards (SY) was used as the basis for this analysis. As illustrated in **Figure 6.1**, the 3,200 SY parking position consists of the following:

- Single row of parking positions sized for the Global Express aircraft (94-feet wingspan)
- 15-feet of wingtip clearance between adjacent aircraft
- 2 taxilanes with the standard ADG III taxilane object free area (TOFA) of 81-feet

The 3,200 SY parking position can also accommodate a mix of single-engine and multi-engine aircraft as well as helicopters as illustrated in **Figure 6.2.** Accordingly, the number of based aircraft parking positions was adjusted for single-engine, multi-engine, and helicopters to identify a recommended apron size. **Table 6.6** summarizes the apron requirements.

Given that the existing GA apron areas provide a total of approximately 83 acres, existing demand (89 acres) exceeds current capacity. Provision for another 26 acres of apron area (115 in total) is also recommended to accommodate the anticipated increase in demand. However, other factors such as land/apron configuration and available hangar storage may increase or decrease the apron size.

Table 6.4: General Aviation Aircraft Characteristics

Aircraft	2014 Operations[1]	ADG	TDG	Wingspan (ft)	Length (ft)
Gulfstream 5	1,852	III	2	93.5	96.4
Global Express	703	III	2	94	99.5
Cessna Citation V	5,507	II	2	55.7	52.1
Gulfstream 4	3,760	II	2	77.82	88.33
Cessna Citation X	2,865	II	1B	63.91	72.34
Gulfstream 159	981	II	3	78.51	63.75
Cessna Caravan 208	1,002	II	1A	52.09	37.6

Notes:

(1) Based on 2014 ANOMS data

Table 6.5: FAA Design Standards

Item	ADG III (TDG 2) Requirement (ft)
Taxiway/Taxilane Safety Area Width (TSA)	118
Taxilane Object Free Area (TOFA)	162
Taxilane Centerline to Fixed or Movable Object	81
Taxilane Wingtip Clearance	27

Table 6.6: Apron Size Requirements

Year	Required Transient Aircraft Positions	Required Based Aircraft Positions[1]	Apron Size	
			SY	Acres
2014	70	65	432,456	89
2015	71	65	435,080	90
2020	75	69	461,562	95
2025	79	74	489,346	101
2030	83	78	515,079	106
2035	91	83	554,900	115

Note:

(1) Includes 2 based single or multi-engine aircraft and 3 helicopters per 3,200 SY position

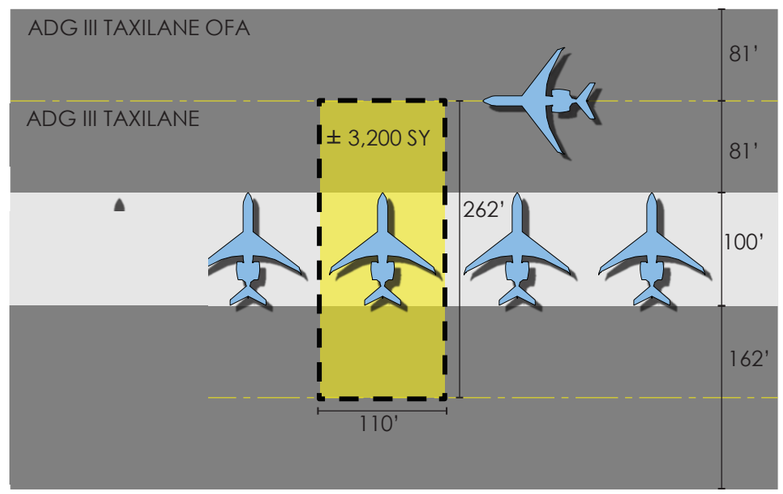


Figure 6.1: Standard GA Parking Position (Global Express)
Source: AECOM (2015)

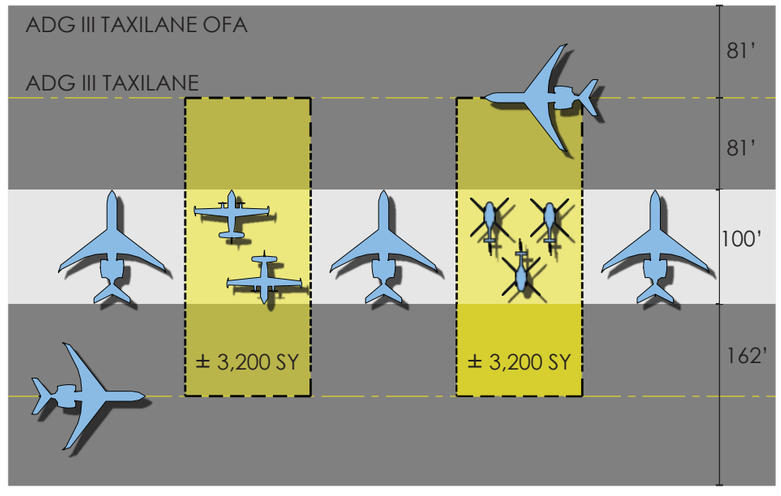


Figure 6.2: Alternate Parking Position Layout

Source: AECOM (2015)

6.1.1.2. FBO Terminal Buildings

PBI is unique in that it has 3 FBOs operating at the airport, not including NetJets which leases space from Signature Flight Support. Each FBO operates from a main terminal building that consists of offices, meeting rooms, waiting areas, pilot briefing rooms, restrooms, and so forth. The required size of an FBO terminal is largely based on the needs of the FBO. The existing cumulative terminal space between the 3 FBOs is approximately 48,000 SF, including the NetJets terminal. However, the Signature Flight Support terminal is less than half the size of the Jet Aviation and Atlantic Aviation terminals. In order to account for this deficit and provide an adequately sized terminal for all FBOs, a planning factor of 450 SF per person was utilized. **Table 6.7** summarizes the FBO terminal requirements based on 2.5 persons per peak hour operation as recommended by the ACRP Report 113.

6.1.1.3. Vehicle Parking Area

An adequate vehicle parking area is required to provide safe and efficient access to the facility. The two elements used to determine the overall size of a parking area include the number of parking spaces required and the dimensions used for each parking space and driving lane. Per Exhibit 5-48 of ACRP Report 113, the number of parking spaces required differs for each type of GA facility including terminals, hangars, and parking positions.

For the purposes of this analysis, the required vehicle parking area includes the following planning factors:

- Hangars
  - 1 space per 1,000 SF of hangar floor area (85% of total hangar)
  - 1 space per 200 SF of office/operations area (5% of total hangar)
  - 1 space per 750 SF of maintenance area (10% of total hangar)
- FBO Terminals
  - 2.5 spaces per peak hour operation
  - 1 space per 200 SF of office space 60% of terminal)

As depicted in **Figure 6.3**, the standard parking space size (10-feet by 20-feet) and driving lane width (25-feet) used in ACRP Report 113 were used to determine the size of each parking space. Each 140-feet of parking lot length can accommodate 4 parking spaces. Therefore, a parking space size of 350 SF (1,400 SF divided by 4) was used for the purposes of this analysis.

Table 6.7: FBO Terminal Size

Year	Peak Hour Operations	Persons per Peak Hour Operation	Space Per Person (SF)	Required Terminal Size (SF)
2014	49	2.5	450	55,125
2015	53	2.5	450	59,951
2020	55	2.5	450	61,742
2025	59	2.5	450	66,194
2030	63	2.5	450	71,064
2035	68	2.5	450	76,370

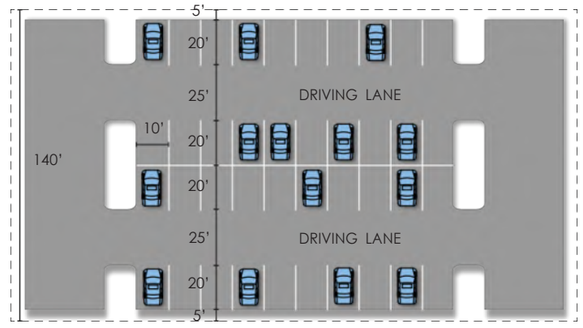


Figure 6.3: Standard Vehicle Parking Layout
Source: AECOM (2015)

Table 6.8: Recommended Vehicle Parking Spaces

Parameters	Existing 2014	Forecast 2015	2020	2025	2030	2035
Hangar						
Total Hangar Size	983,200	990,400	1,048,000	1,112,800	1,170,400	1,242,400
1 space per 1,000 SF of Hangar Floor Area	836	842	891	946	995	1,056
1 space per 200 SF of Office/Operations Area[1]	246	248	262	278	293	311
1 space per 750 SF of Maintenance Area[2]	131	132	140	148	156	166
Total Vehicle Parking Spaces for Hangars	**1,213**	**1,221**	**1,293**	**1,372**	**1,443**	**1,532**
FBO Terminal Buildings						
Terminal Size	55,125	59,951	61,742	66,194	71,064	76,370
Peak Hour Operations	49	53	55	59	63	68
2.5 spaces per peak-hour operation	123	133	137	147	158	170
1 space per 200 SF of office space	165	180	185	199	213	229
Total Vehicle Parking Spaces for Terminal	**288**	**313**	**322**	**346**	**371**	**399**
Based Aircraft Apron						
Total Apron Tie-Down Spaces	135	136	144	153	161	173
1 space for 50% of based tie-down spaces	**68**	**68**	**72**	**76**	**80**	**87**
Total Vehicle Parking Spaces	**1,568**	**1,603**	**1,687**	**1,795**	**1,895**	**2,018**
Total Parking Area (SF)[3]	548,796	560,900	590,437	628,121	663,288	706,341

Notes:

(1) Office / Operations Area is assumed to be 5% of the total hangar space
(2) Maintenance Area is assumed to be 10% of the total hangar space
(3) FBO Terminal Office Area is assumed to be 60% of the overall terminal size
(4) Based on 350 SF per parking space

6.1.1.4. U.S. Customs and Border Protection (CBP)

The U.S. CBP GAFIS facility at PBI is a "Port of Entry" as it serves both international GA operations and marine traffic. The CBP indicated that the existing facility (3,650 gross SF) at PBI is insufficient for the number of operations and passengers that require processing during peak times.

The size of a U.S. CBP GAFIS is dependent upon the level of expected activity as well as the guidelines provided in the CBP's June 2012 ATDS. Based on information received from the DOA, the U.S. CBP is expected to process between 2 and 3 aircraft with up to 20 passengers each during the peak hour. Utilizing the same aircraft parking position size as that for GA aircraft, a 9,600 SY apron is required to support 3 aircraft. The recommended size of the GAFIS terminal is summarized in **Table 6.9** per the CBP ATDS for a large GA processing facility and an additional 20% to account for circulation areas, mechanical rooms, structural elements, etc. Additionally, vehicle parking requirements utilize a planning factor of 2 spaces per 200 SF of building which is consistent with the existing facility.

Table 6.9: U.S. CBP General Aviation Facility Requirements

Room Number	Space	Quantity	Size (NSF)
GAF-01	Pre-Processing Passenger Waiting	25 nsf/pax	500
GAF-02	Post-Processing Passenger Waiting	25 nsf/pax	500
GAF-03	CBP Processing Area	1	2,160
GAF-04	Public Restrooms (Male and Female)	1	500
GAF-05	Interview Room	1	80
GAF-06	Search Room	1	80
GAF-07	Male Hold Room	1	115
GAF-08	Female Hold Room	1	115
GAF-09	CBP Agriculture Laboratory (AQI)	1	150
GAF-10	CBP General Office	3	675
GAF-11	Male and Female Staff Locker Room	2	300
GAF-12	Staff Break Room	1	500
GAF-13	LAN/Telecom	1	120
GAF-14	General Storage / File Room	1	150
GAF-15	Exit Vestibule	1	80
GAF-16	Entry Vestibule	1	80
GAF-17	Lactation Support Room	1	80
		Subtotal	**6,185**
Allowance for circulation / MEPT / Structural elements		20%	1,237
		Total Building Size (Gross SF)	**7,422**
		Vehicle Parking Spaces	23
		Vehicle Parking Area (350 SF per space)	8,157

Source: June 2012 CBP ATDS

6.1.1.5. Fuel Storage Facilities

Each FBO owns and maintains fuel storage facilities. Fuel storage requirements are dependent upon the type of aircraft, number of operations, and demand for fuel at each FBO. According to monthly fuel flow data obtained for each of the 3 FBOs between 2008 and 2014, the average annual fuel demand per operation is increasing. As depicted in **Figure 6.4**, December and March are consistently the peak months for GA fuel with an average of approximately 220 gallons of fuel per operation. The 2006 Master Plan indicated that 64% (148 gallons per operation) of the average fuel demand (233 gallons per operation) was for Jet-A. While the current fuel flow data does not provide a percentage for Jet-A and AvGas distribution, the percentage demand for Jet-A was increased to 80% due to the expected increase in jet aircraft operations and associated decrease in single and multi-engine aircraft operations.

Table 6.10 summarizes the general fuel storage requirements for the FBOs throughout the planning horizon based on a recommended 3 day supply for both Jet-A and AvGas. The existing fuel storage capacity is sufficient to maintain a 3 day supply. However, additional storage may be required within the planning horizon since the number of operations and fuel demand will vary for each FBO. **Figure 6.5** depicts the percentage of fuel distribution for each FBO compared to their respective percentage of capacity. Both Jet Aviation (25% vs. 23%) and Signature (43% vs. 38%) distribute a larger percentage of fuel than their respective percentage of overall capacity. On the other hand, Atlantic Aviation (32% vs. 38%) distributes less than their respective percentage in capacity.

Accordingly, Signature and Jet Aviation may require additional fuel storage facilities within the planning horizon.

For the purposes of this Master Plan, a minimum of 1 acre (45,000 SF) will be included for each FBO in the event the existing facilities are relocated as part of the preferred development plan.

Furthermore, all existing fuel storage facilities comply with National Fire Protection Association (NFPA) for the design, operation, maintenance, location, and aircraft fueling devices. As required by U.S. CFR Title 14 Part 139.321(e)(1), the airport has written regulations covering fuel handling procedures, including the need to complete company training for fuel handling, with documentation on file with airport management. In addition, airport regulations specify the use of fuel servicing vehicles, restrictions on where aircraft can and cannot be fueled, and procedures for lightning and spills.

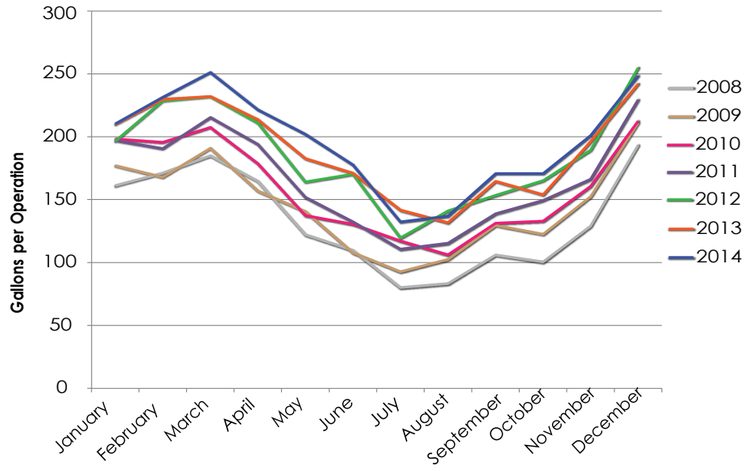


Figure 6.4: Average Monthly Fuel Demand
Source: AECOM (2015)

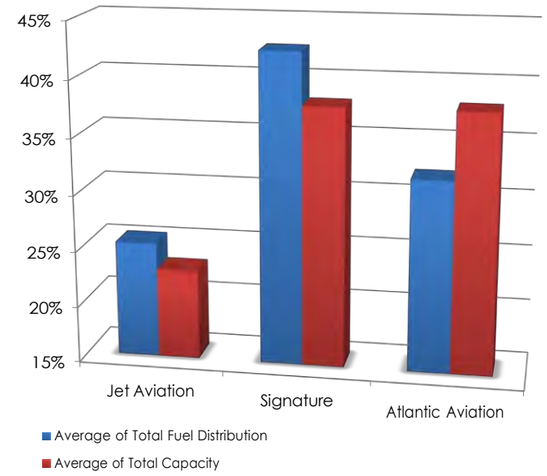


Figure 6.5: FBO Fuel Storage Capacity/Distribution
Source: AECOM (2015)

Table 6.10: Fuel Storage Capacity Analysis

Item	Existing 2014	Forecast Demand				
		2015	2020	2025	2030	2035
Average Day Peak Month (ADPM) Operations	335	363	376	397	427	464
ADPM Jet-A Operations	308	334	346	365	393	427
Average Jet-A Fuel Demand per Operation (gallons/ops)[1]	176	176	176	176	176	176
Average Daily Jet-A Fuel Demand (gallons)	54,243	58,777	60,882	64,282	69,140	75,131
Existing Jet-A Storage Capacity (gallons)	280,000	280,000	280,000	280,000	280,000	280,000
Existing Jet-A Storage Capacity (days)[2]	5	5	5	4	4	4
Jet-A Storage Capacity Recommended for 3-day supply(gallons)	162,730	176,331	182,646	192,847	207,420	225,393
Jet-A Storage Surplus / (Deficit)	117,270	103,669	97,354	87,153	72,580	54,607
ADPM AvGas Operations	27	29	30	32	34	37
Average AvGas Fuel Demand per Operation (gallons/ops)[1]	44	44	44	44	44	44
Average Daily AvGas Demand (gallons)	1,179	1,278	1,324	1,397	1,503	1,633
Existing AvGas Storage Capacity (gallons)	32,000	32,000	32,000	32,000	32,000	32,000
Existing AvGas Storage Capacity (days)[2]	27	25	24	23	21	20
AvGas Storage Capacity Recommended for a 3-day Supply (gallons)	3,538	3,833	3,971	4,192	4,509	4,900
AvGas Storage Surplus / (Deficit)	28,462	28,167	28,029	27,808	27,491	27,100

Notes:

(1) Based on 2008-2014 Fuel Sales data
(2) A storage capacity of 3 days is recommended

6.1.1.6. Summary of GA Facility Requirements

The GA facility requirements are summarized in **Table 6.11**. In order to evaluate the general viability of potential GA development sites, **Table 6.12** summarizes the facility requirements in terms of the acres associated with each of the functional areas, including a 10% contingency for drainage, building buffers, service roads and other design factors not included in the facility requirements. An area(s) of approximately 185 acres is recommended for anticipated GA development needs within the planning horizon.

In relation to existing capacity, the following GA facilities are recommended to accommodate existing and future demand:

- Additional hangars and aircraft parking apron
- Additional FBO terminal space, particularly for Signature Flight Support
- Expanded CBP GAFIS facility and apron
- Space reserved for Aircraft Wash Rack and Fuel Storage in the event existing facilities are relocated as a result of the new runway

Table 6.11: Recommended GA Facility Improvements

Facility Requirement	Units	Existing	Forecast				
		2014	2015	2020	2025	2030	2035
Hangars							
Based Aircraft in Hangars	Aircraft	78	79	83	87	91	96
Total Hangar Area (SF)	SF	983,200	990,400	1,048,000	1,112,800	1,170,400	1,242,400
Aircraft Parking Area							
Total Aircraft Parking Positions	Positions	135	136	144	153	161	173
Associated Apron Size	SY	432,456	435,080	461,562	461,562	461,562	461,562
FBO Terminals							
Required Terminal Size	SF	55,125	59,951	61,742	66,194	71,064	76,370
Vehicle Parking Area							
Total Vehicle Parking Spaces	Spaces	1,568	1,603	1,687	1,795	1,895	2,018
Associated Vehicle Parking Area Size	SF	548,796	560,900	590,437	628,121	663,288	706,341
Customs and Border Protection (CBP)							
CBP Terminal	SF	7,422	7,422	7,422	7,422	7,422	7,422
Associated Apron Size	SY	9,600	9,600	9,600	9,600	9,600	9,600
Vehicle Parking Spaces	Spaces	23	23	23	23	23	23
Vehicle Parking Area	SF	8,157	8,157	8,157	8,157	8,157	8,157
Fuel Storage							
Fuel Storage Facility	SF	135,000	135,000	135,000	135,000	135,000	135,000
Aircraft Wash Rack							
Total Aircraft Wash Rack Area[1]	SF	27,225	27,225	27,225	27,225	27,225	27,225

Notes:

(1) A single 165-foot by 165-foot area will be designated as an aircraft wash rack for all FBOs to clean aircraft in an environmentally compatible manner

Table 6.12: Recommended Land Area for GA Facilities (Acres)

GA Requirement (Acres)	Existing	Forecast				
	2014	2015	2020	2025	2030	2035
Hangars	23	23	24	26	27	29
Aircraft Parking Area	89	90	95	101	106	115
FBO Terminals	1	1	1	2	2	2
Vehicle Parking Area	13	13	14	14	15	16
U.S. CBP	2	2	2	2	2	2
Fuel Storage	3	3	3	3	3	3
Wash Rack	2	2	2	2	2	2
Subtotal	**133**	**134**	**141**	**149**	**157**	**168**
Contingency (10%)[1]	13	13	14	15	16	17
Total Acreage	**146**	**147**	**155**	**164**	**173**	**185**

Notes:

(1) Contingency provides a buffer for drainage, building buffers, service roads, etc.

6.1.2 General Aviation Development Plan

The preferred GA Development Plan represents a feasible solution for the DOA to provide the recommended size and quantity of GA facilities. Similar to the airside development plan, the relocation and/or expansion of existing GA facilities is subject to several constraints and opportunities.

6.1.2.1. Development Constraints

The following sections summarize the constraints and opportunities considered governed the subsequent alternatives analysis and selection of the preferred layout. As illustrated in **Figure 6.6**, there are numerous environmental and infrastructure constraints at PBI which may limit GA development.

Environmental constraints can be impacted but will require mitigation which may outweigh the benefits of proposed developments. While some infrastructure constraints are considered secondary as they can be impacted in order to accommodate new and/or relocated facilities (such as some on-airport and adjacent roadways), others are considered primary as they are more restrictive (such as Interstate 95) and proposed infrastructure improvements must avoid impacts to these features. The following sections summarize the environmental, infrastructure, and airspace constraints identified for the purposes of this analysis.

Environmental

The majority of environmental constraints at PBI are located to the east of the airfield where there are a few large retention ponds as well as Pine Lake. However, the primary constraints associated with GA development are located to the west and south of the airfield and include the existing drainage canal and other wetlands. These environmentally-sensitive areas were considered and wetlands mitigation options explored in order to help streamline future GA development projects and attain regulatory compliance. Chapter 9 provides more detail on the existing environmental features at PBI as well as mitigation options for any proposed development which impact them.

Infrastructure

The GA Development Plan avoids impacts to recently completed and/or proposed infrastructure (whether as part of this Master Plan or the existing airport capital improvement program). For example, the recommended parallel Runway 10R-28L and its associated taxiway system necessitate the relocation of all existing Southeast GA facilities as well as the relocation and/or reconfiguration of some existing Southwest facilities. Similarly, the DOA has completed preliminary planning and design for Taxiway W and new Signature Flight Support and Jet Aviation facilities in the Golfview site which are incorporated into this analysis[39].

Other existing infrastructure constraints include the ATCT, Passenger Terminal, Interstate 95, Southern Boulevard, and the fuel farm as these facilities are cost prohibitive to relocate. While Belvedere Road, Australian Avenue, and James L. Turnage Boulevard are identified as constraints, these can be realigned if deemed essential to the development of GA facilities.

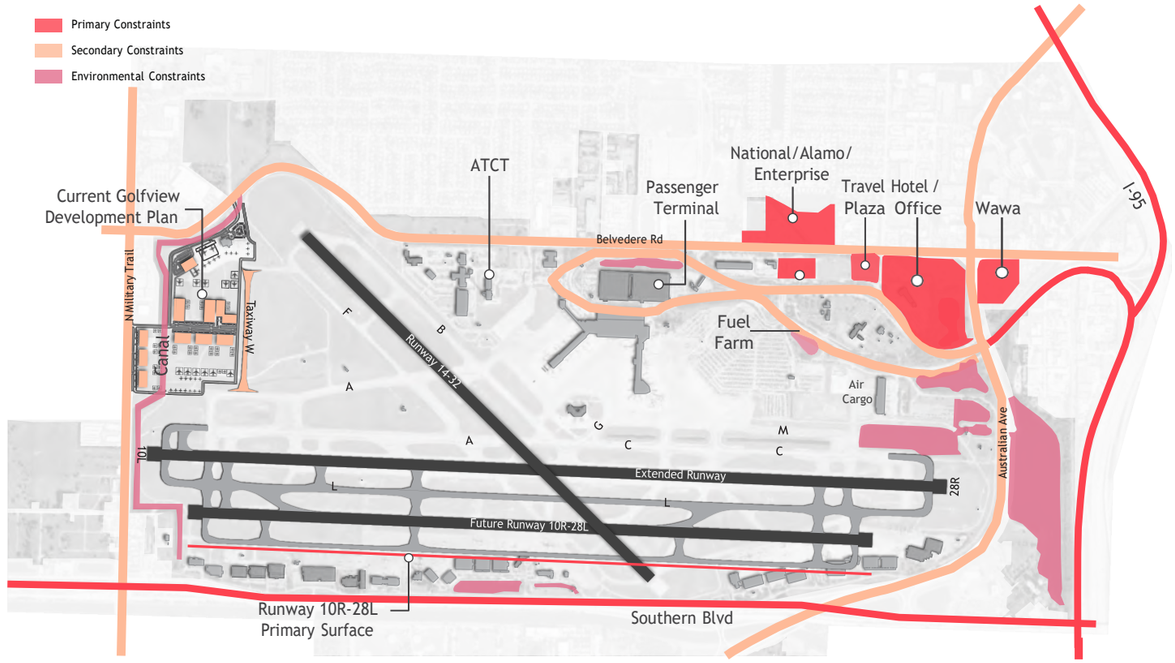


Figure 6.6: General Aviation Development Constraints
Source: AECOM (2015)

39 *Includes hangars (±257,000 SF), FBO Terminal (±21,000 SF), apron (±146,000 SY), and vehicle parking spaces (±250)*

Airspace

The U.S. CFR Title 14 Part 77 establishes standards for determining obstructions[40] to the navigable airspace around airports by way of imaginary surfaces that extend outward and upward from each runway. Additionally, FAA Order 8260.3B establishes the U.S. Standard for Terminal Instrument Procedures (TERPS) which provide obstruction clearance surfaces for runways with instrument approach and departure procedures. The existing Southwest GA facilities are within the Part 77 Transitional Surface[41] of proposed Runway 10R-28L as well as the TERPS missed approach surface for Runways 10R and 28L. As the future approach for Runway 10R-28L can be either non-precision (without vertical guidance) or precision (with vertical guidance), **Figure 6.7** and **Figure 6.8** illustrates the impacts associated with each.

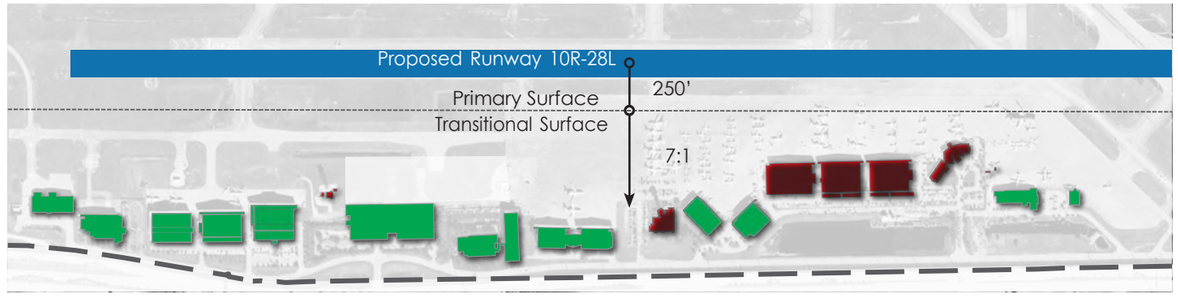
While the incline of the Transitional Surface is the same regardless of approach type (7:1), the Transitional Surface begins at either 500-feet (non-precision approach) or 1,000-feet (precision approach) from the runway centerline. Accordingly, the Precision approach Transitional Surface impacts more of the existing facilities. Buildings which penetrate the Transitional Surface must be either removed or lighted. For the purposes of this analysis, buildings which penetrate the Transitional Surface by more than 10-feet are proposed to be removed and/or relocated and those that penetrate less than 10-feet are proposed to remain in place but with the required obstruction lighting installed.

The Atlantic Aviation terminal building, three adjacent hangars and the Airport Surveillance Radar (ASR) penetrate the Transitional Surface regardless of the approach type and must be relocated. The former ATCT is no longer in use and will be removed to mitigate the impact to the Transitional Surface. A precision approach also requires the existing Rotortech and two adjacent Atlantic Aviation hangars to be removed and the lighting of numerous other facilities if they are not removed or replaced.

40 *Subpart C—Standards for Determining Obstructions to Air Navigation or Navigational Aids or Facilities*

41 *A 7:1 (Horizontal: Vertical) surface beginning at the edge of the Primary Surface and extending outward and upward to a point 150-feet above the airport's elevation (Horizontal Surface)*

Impact of Proposed Runway 10R-28L with Non-Precision Approach



Impact of Proposed Runway 10R-28L with Precision Approach

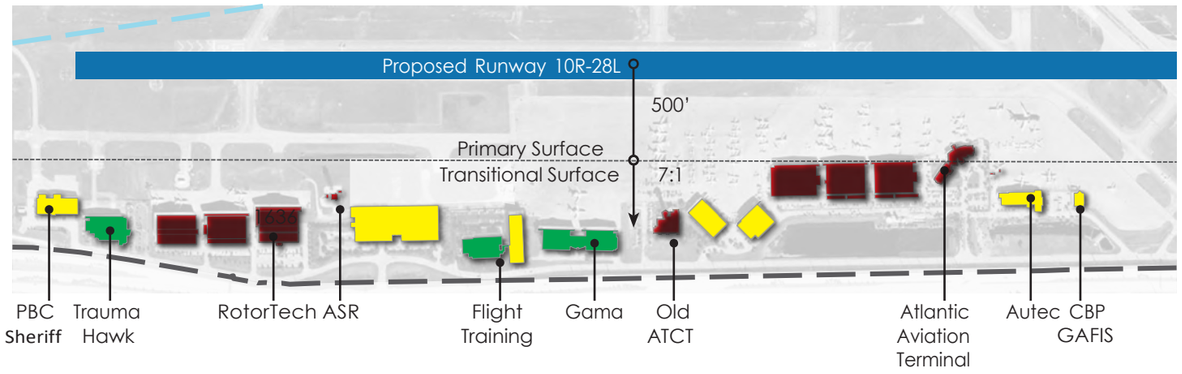


Figure 6.7: Airspace Impacts on Existing Southwest GA Facilities (Plan View)
Source: AECOM (2015)

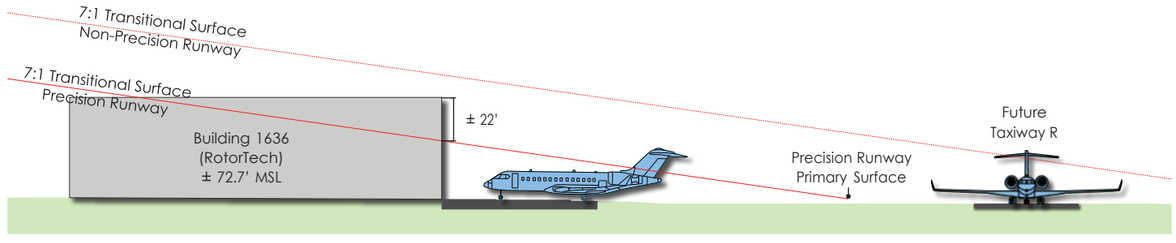


Figure 6.8: Airspace Impacts on Existing Southwest GA Facilities (Profile View)
Source: AECOM (2015)

6.1.2.2. Development Opportunities

In addition to the restrictions on GA development, there are also several opportunities which can potentially offset the constraints and support accommodation of the facility requirements. As illustrated in **Figure 6.9**, the opportunities identified for the purposes of this Master Plan include the following:

- Additional land acquisition at the Golfview site to support expansion of Signature Flight Support or other GA facilities as needed (parcel bordered by Military Trail, Belvedere Road, the canal, and the extension of Green Street to access the site)
- Additional land acquisition at the intersection of Southern Boulevard and Military Trail
- Removal of the old ATCT and the adjacent hangars
- Realignment of Taxiway A
- Closure of Runway 14-32 for the expansion of both the Golfview site and the Southwest GA facilities
- Redevelopment of the existing airport maintenance area
- Development within the DOA-owned parcel west of Military Trail along the extended runway centerlines of Runway 10L and proposed Runway 10R

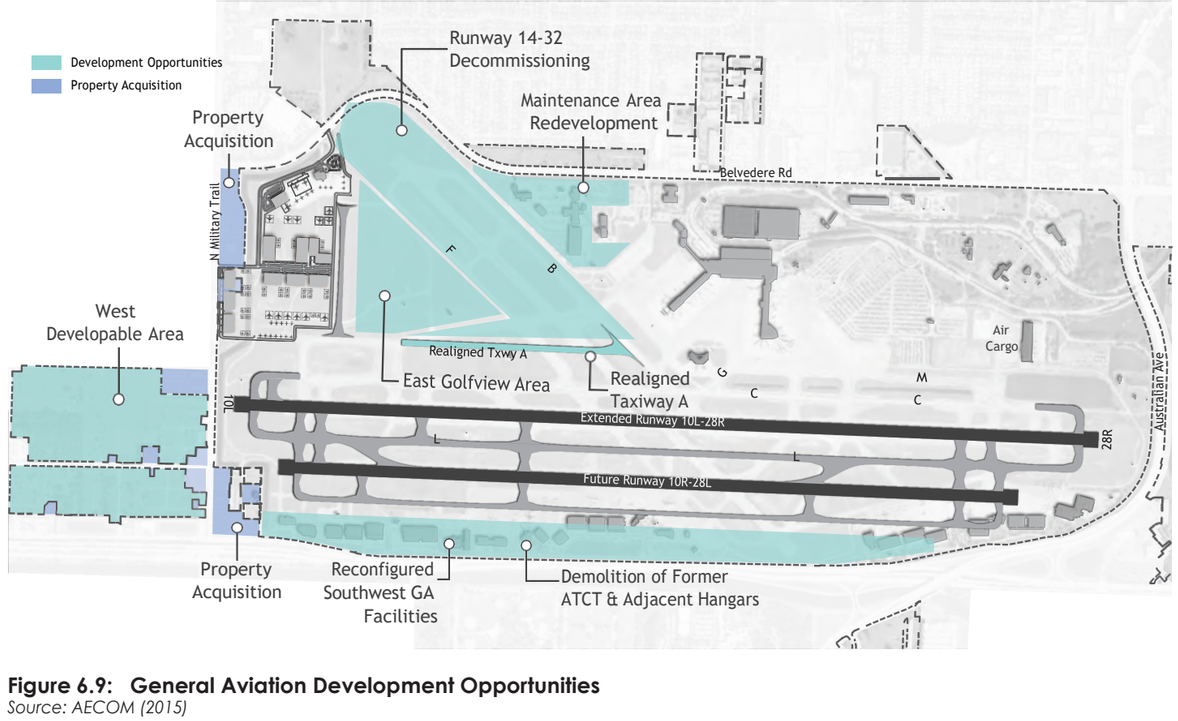


Figure 6.9: General Aviation Development Opportunities
Source: AECOM (2015)

Golfview Area
Source: AECOM (2014)

Southwest GA Area
Source: AECOM (2014)

6.1.2.3. General Aviation Alternatives Analysis

As a base for three FBOs, the PBI GA development plan must provide sufficient facilities for each while also allowing for relatively autonomous operations. Given the constraints and opportunities available, the existing Southwest GA area and Golfview site were identified as the only feasible sites for future GA development.

Golfview

Figure 6.10 illustrates four development alternatives for the existing Golfview site which accommodates the relocation of all existing FBO facilities (light blue) and, in some instances, the potential for additional expansion (dark blue) prior to the closure of Runway 14-32. The selected alternative is subsequently refined and progressed to accommodate the 2035 facility requirements in conjunction with the closure of Runway 14-32. Each alternative includes the following:

- New GAFIS adjacent to the existing NetJets facility
- Conversion of Taxiway W to a taxilane
- Common fuel farm and aircraft wash rack

Alternative 1 proposes a hangar layout which parallels Taxiway W and provides a large apron area north of Taxiway A and west of Taxiway F. This alternative can accommodate relocation of all existing FBO facilities, but is limited in expansion capability without the closure of Runway 14-32. This alternative is less convenient for FBO operations as there is no public access to the facilities.

Alternative 2 continues the current development plan with hangar and apron development parallel to an extended Green Street, in effect creating a "hangar row". In order to provide a sufficient apron for aircraft parking, this alternative includes the realignment of existing Taxiway A which will, in turn, require the relocation of an existing electrical vault (Building 1200). Similar to Alternative 1, this alternative can accommodate relocation of all existing FBO facilities but has limited expansion capability without the closure of Runway 14-32. Alternative 2 also maintains Taxilane W which does not provide public access to the new facilities.

Alternative 3 is similar to Alternative 2 but shifts Taxilane W to the east to improve public access. Meanwhile, a dual parallel taxilane is provided next to Taxilane W to accommodate an anticipated high volume of aircraft movement in the future. Access to the three hangars east of the dual taxilanes will still require security control until the closure of Runway 14-32. The existing Airport Maintenance facilities are relocated to accommodate development of a FBO terminal and two GA hangars. This near-term layout requires separate GA operations from both sides of Runway 14-32. In the ultimate phase, when Runway 14-32 is decommissioned, GA development will expand to become one continuous area.

Alternative 4 was developed based on input from the existing FBO operators and does not incorporate the current development plan. Similar to Alternatives 2 and 3, this alternative proposes a "hangar row" parallel to a realigned Taxiway A which creates an open and flexible apron area. Similar to all three other alternatives, the extension of Green Street across Taxilane W will require controlled airfield access and a signalized intersection.

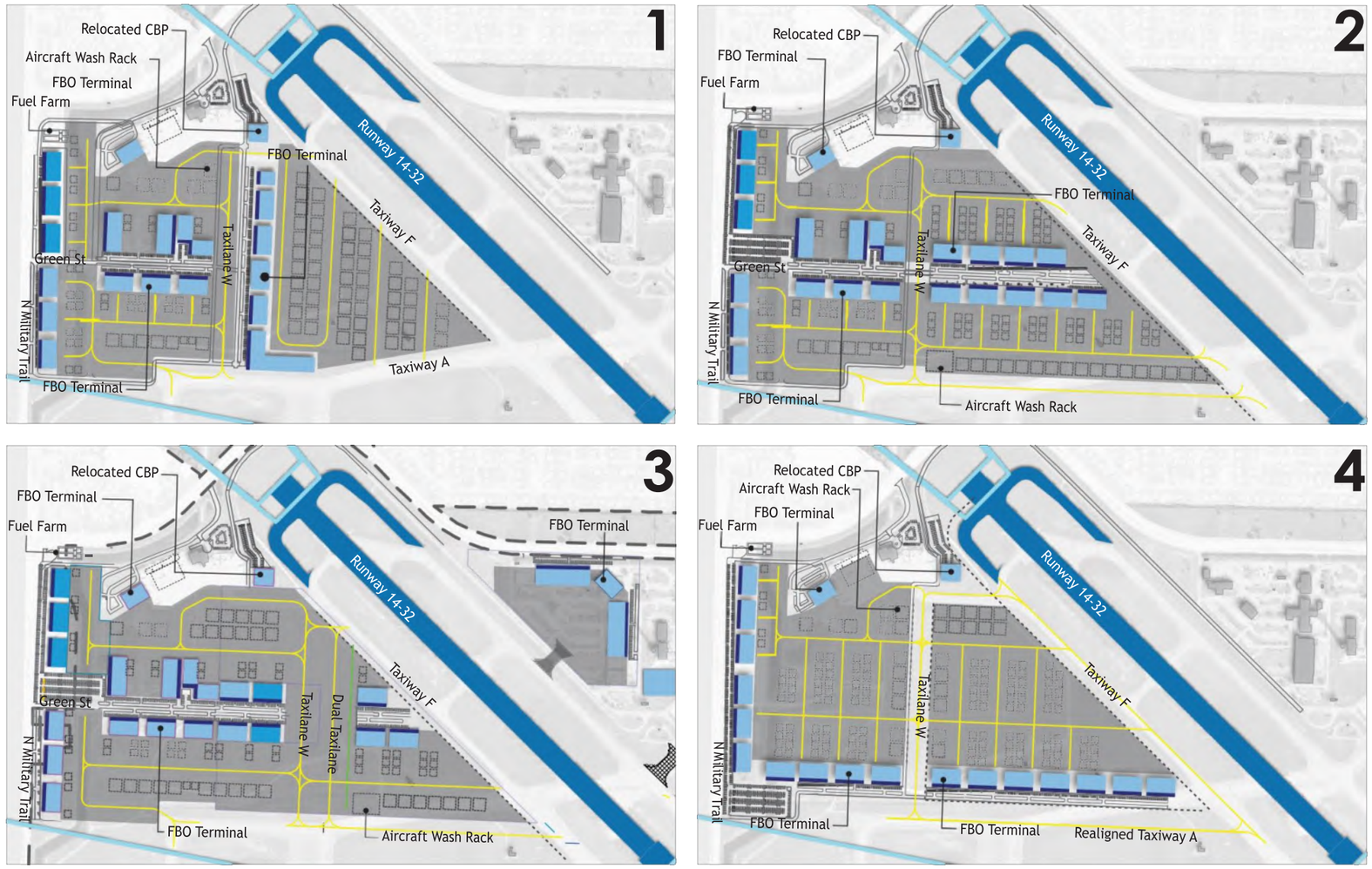


Figure 6.10: Near-Term Golfview Development Alternatives

Note:

(1) Since direct taxiways from parking area / terminal ramp across a runway are not recommended, the connecting taxiways to Runway 14-32 will be a non-factor once the runway is decommissioned

Source: AECOM (2015)

As summarized in **Table 6.13**, each alternative was evaluated utilizing a set of qualitative criteria based on the DOA's goals and objectives.

While each alternative can accommodate the relocation of existing FBO facilities and support development of the proposed Runway 10R-28L, Alternative 1 is least suited to accommodate the long-term aviation needs due to its segregated operational areas and lack of flexibility. On the other hand, Alternative 4 is best suited to accommodate change due to its contiguous apron area but is not compatible with the current Golfview development plan.

Alternative 2 and 3 were selected for further refinement to include the ultimate configuration with the recommended decommissioning of Runway 14-32. The ultimate Golfview configuration, as depicted in **Figure 6.11**, continues the Green Street "hangar row" development and adds another hangar row adjacent to a new GAFIS. Alternative 2 suffers from restricted landside access to the facilities east of Taxilane W, while Alternative 3 provides convenient landside access to all the proposed facilities.

Alternative 3 was selected by the DOA as the preferred alternative for Golfview GA development. This configuration accommodates approximately 41 hangars (± 1.5 million SF) and over 880,000 SY of apron.

Table 6.13: Near-Term Golfview Development Alternatives Evaluation

Evaluation Criteria	Alternative			
	1	2	3	4
Long-Term Aviation Needs	NEGATIVE	POSITIVE	POSITIVE	POSITIVE
Compatibility with Current Development	POSITIVE	POSITIVE	POSITIVE	NEGATIVE
Flexibility to Accommodate Change	NEGATIVE	NEUTRAL	POSITIVE	POSITIVE
Airside Operational Efficiency	NEUTRAL	POSITIVE	NEUTRAL	POSITIVE
Public Access	NEUTRAL	NEGATIVE	POSITIVE	NEUTRAL

POSITIVE NEUTRAL NEGATIVE

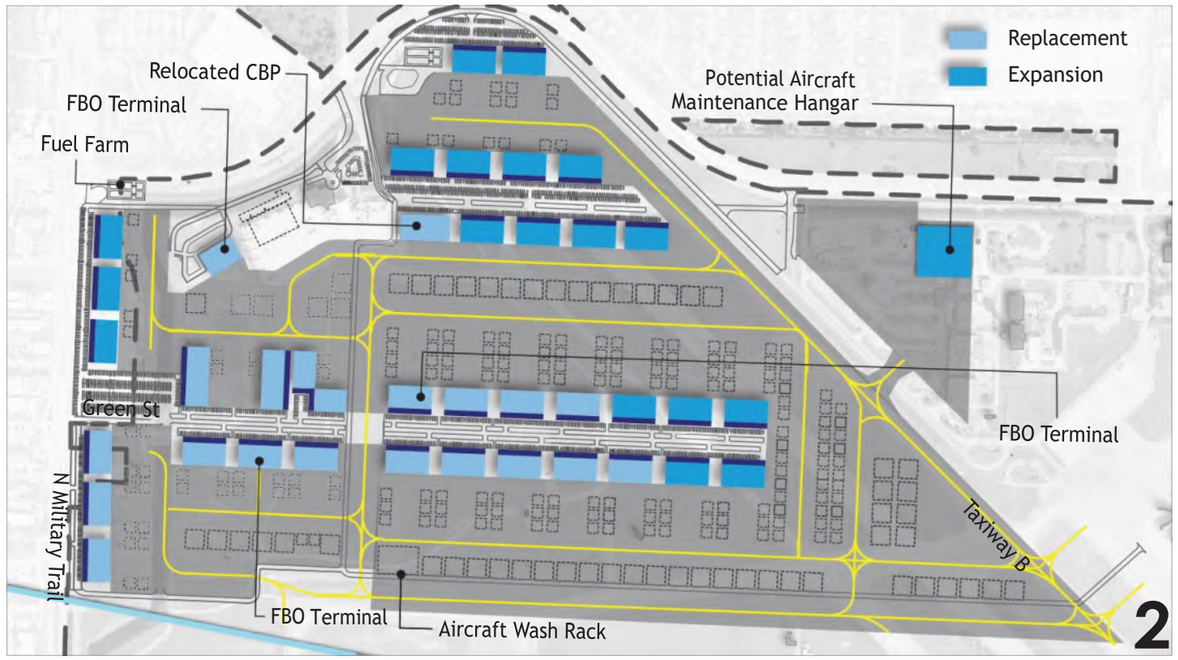


Figure 6.11: Ultimate Golfview Development Alternatives
Source: AECOM (2015)

Southwest GA Site

As previously noted, the reconfiguration of the existing Southwest GA site is limited by proposed Runway 10R-28L and its parallel taxiway. The three alternatives illustrated in **Figure 6.12** incorporate these limitations, particularly the type of aircraft that could utilize the Southwest GA facilities.

Alternative 1 maintains several of the existing facilities and reconfigures others in the same alignment (parallel to the airfield) to support aviation related activities. While this alternative provides a contiguous apron for all existing and proposed facilities to maximize flexibility, the aircraft parking on the apron is restricted to ADG II due to the airspace impacts previously discussed.

Similar to Alternative 1, Alternative 2 maintains several of the existing facilities but realigns the hangars perpendicular to the airfield in order to accommodate ADG III aircraft. The primary ADG III aircraft parking area is between two adjacent hangars which are connected by an apron edge taxilane and a small ADG II aircraft parking apron. Also, Alternative 2 provides larger apron area west of the AUTEC hangar for ADG III aircraft.

Although the Golfview site development plan accounted for the relocation of all three existing FBOs, Atlantic Aviation indicated they would continue operations from the Southwest GA site if it is operationally feasible. Accordingly, Alternative 3 includes a potential layout for this scenario. This alternative will require a second GAFIS facility, fuel farm, and aircraft wash rack in order to service Atlantic Aviation.

As summarized in **Table 6.14**, each alternative was evaluated using the same qualitative criteria as the Golfview alternatives. Each alternative maintains the existing roadway access and are rated neutral accordingly. Since Alternative 1 restricts parking of ADG III, it was given a negative rating for long-term aviation needs. While both Alternatives 2 and 3 accommodate the long-term facility requirements, Alternative 3 impacts all but one existing facility and is thus given a negative rating for compatibility with current development plans. Alternatives 1 and 2 are intended for non-FBO GA activities and are each given a positive rating for flexibility as there is typically less demand for multiple facilities by a single user. Based on this evaluation and input from the DOA, Alternative 2 was selected as the preferred development plan for the Southwest GA facilities since it can accommodate ADG III aircraft and maintains several existing facilities.

Table 6.14: Southwest GA Development Alternatives Evaluation

Evaluation Criteria	Alternative 1	Alternative 2	Alternative 3
Long-Term Aviation Needs	NEGATIVE	POSITIVE	POSITIVE
Compatibility with Current Development	NEUTRAL	POSITIVE	NEGATIVE
Flexibility to Accommodate Change	POSITIVE	POSITIVE	NEUTRAL
Airside Operational Efficiency	POSITIVE	NEUTRAL	NEUTRAL
Public Access	NEUTRAL	NEUTRAL	NEUTRAL

POSITIVE NEUTRAL NEGATIVE

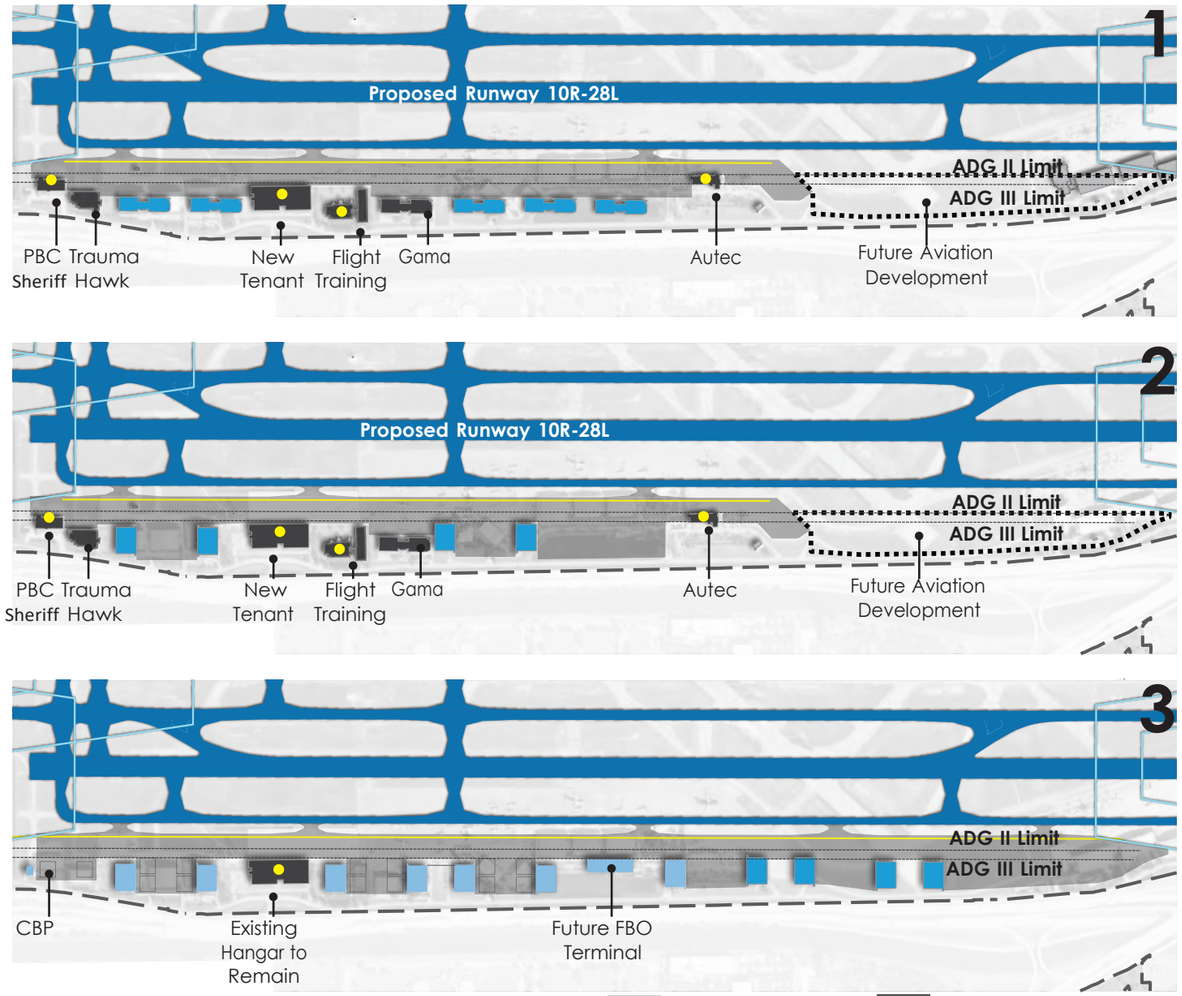


Figure 6.12: Southwest GA Development Alternatives
Source: AECOM (2015)

6.2 Cargo Facilities

Cargo service is largely driven by factors external to the airport, such as geographic location, competing airports, the availability of other modes of transport (such as rail), supporting transportation networks (highways and railways), and the presence of industries which drive the demand for cargo services. The type and level of cargo service demand will subsequently drive the size and type of cargo facilities provided at an airport. The primary cargo operators at PBI consist of freight forwarders, all-cargo, belly-cargo, and integrated carriers.

Freight forwarders, such as Lund and Pullara, broker and coordinate the shipment of cargo typically by purchasing space with all-cargo or belly-cargo operators. While all-cargo operators, such as Kalitta Charters, only transport cargo, the primary business of belly-cargo operators (e.g. Delta Cargo) is the transportation of passengers but they also utilize the lower deck (belly) of their aircraft to ship cargo. Processing and sortation for freight forwarder, all-cargo, and belly-cargo occurs at the Air Freight facility (Building 1300). On the other hand, integrated carrier service refers to operators that only transport cargo (e.g. UPS and FedEx). Integrated carrier operations are typically supported at dedicated cargo facilities separate from the passenger terminal area but with direct access to the airfield. This activity occurs at the existing Air Cargo Facility (Building 1475).

Integrated carrier facilities typically include an aircraft parking apron; a processing building for the sortation, screening, and transitioning cargo between the secure airside and landside ground transportation connections; and adequate landside operating areas to accommodate large cargo delivery/ transfer vehicles during peak hours; and private vehicle parking areas.

Figure 6.13 depicts the existing conditions for both the Air Cargo and Air Freight buildings. The following sections summarize the facility requirements based on forecast demand and a recommended cargo development plan accordingly.

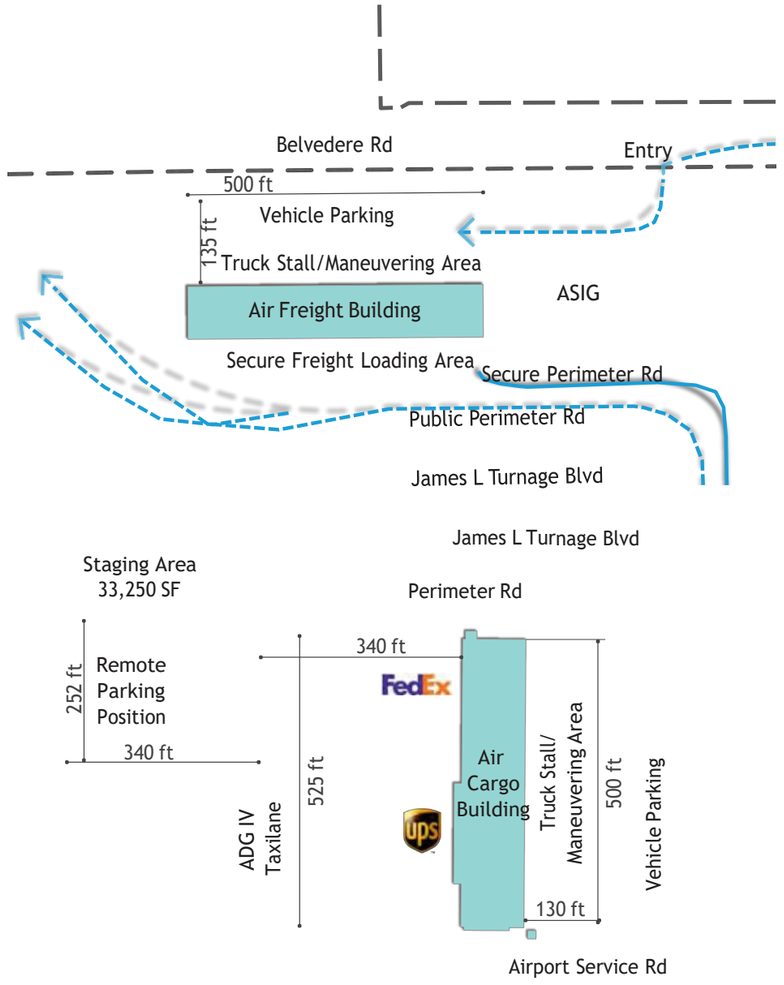


Figure 6.13: Existing Cargo Facilities
Source: AECOM (2015)

6.2.1 Cargo Facility Requirements

The facility requirements utilize industry guidelines as well as site specific conditions to assess the capacity of the existing cargo facilities and the need for new or updated facilities. While there are numerous variables which may impact the specific needs for air cargo facilities, the Airports Council International – North America's (ACI-NA) 2013 Air Cargo Guide provides general 'rules of thumb' and are used to the extent practical for the purposes of this analysis. Similar to the GA analysis, the requirements associated with 2014 are based on actual demand rather than existing capacity in order to identify existing deficiencies as applicable.

6.2.1.1. Cargo Aircraft Parking Apron

The aircraft parking apron not only supports aircraft operations but also the associated ground support equipment (GSE) for aircraft servicing and loading of cargo onto the aircraft. As such, the size of the parking apron is dependent upon the number of aircraft parking positions, the size of the aircraft, and a sufficient GSE operating area for each.

Aircraft Parking Positions

The number of aircraft parking positions required is based on the ADPM operations. The existing Air Cargo apron provides 3 aircraft parking positions for 10 ADPM operations and 3 peak hour arrivals. The existing aircraft parking positions are sufficient for 10 ADPM and therefore, a proportionate amount of parking positions is provided for the expected ADPM operation throughout the planning horizon. As summarized in **Table 6.15**, 6 aircraft parking positions may be needed in order to accommodate an estimated 17 ADPM operations in 2035, including 5 peak hour arrivals and the potential overlap of another arrival in the hour following the peak. However, actual demand will be based on market conditions, such as new or expanded industries generating air cargo demand in the West Palm Beach area, which could increase the minimum number of positions required.

Apron Size

The air cargo aircraft fleet presented in **Table 6.16** was used to determine an adequate apron area for each peak hour cargo aircraft operation.

Both FedEx and UPS are predominantly operating Airbus 300 and 310 cargo aircraft at PBI. However, FedEx indicated they will soon change to B757-200Fs while UPS as well as other air cargo providers at PBI occasionally operate the B767-300F. Furthermore, as demand increases air cargo operators typically utilize larger aircraft, if able, in lieu of increasing the number of operations. Accordingly, the B767-300F was selected as the design aircraft for the air cargo apron.

As depicted in **Figure 6.14**, the size for each B767-300F aircraft parking position is 10,000 SY (226-feet by 398-feet) which is consistent with the existing apron size for each parking position and includes:

- ADG IV Taxilane clearance (112.5-feet)
- 195.5-foot aircraft stand (including 15-foot aircraft nose clearance)
- 25-foot head of stand service road for GSE operations
- 65-feet of clearance from head of stand service road to building for marshaling and other support functions
- 25-feet of clearance between aircraft wingtips and fixed/movable objects
- 20-foot GSE maneuvering/staging area between aircraft parking positions

Table 6.17 summarizes the cargo apron requirements which show that the existing all-cargo apron (35,000 SY) is sufficient to accommodate existing demand but 3 additional parking positions and approximately 22,900 additional SY may be needed by 2030.

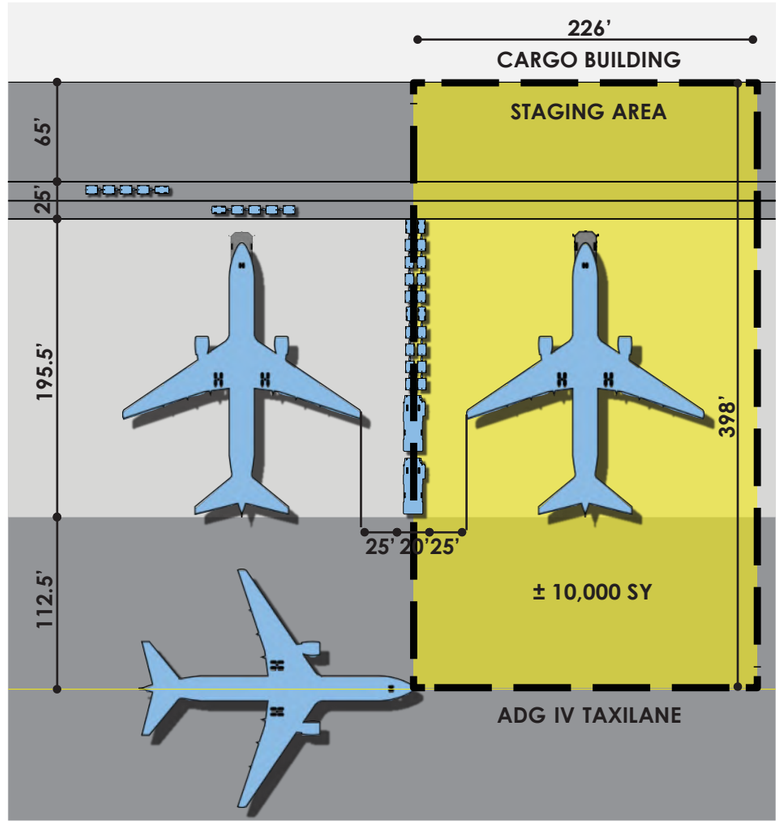


Figure 6.14: Cargo Aircraft Parking Position
Source: AECOM (2015)

Table 6.15: Air Cargo Apron Aircraft Parking Position Requirements

Item	Existing	Forecast				
	2014	2015	2020	2025	2030	2035
ADPM Operations	10	11	12	14	15	17
Aircraft Parking Positions	3	4	4	5	5	6

Table 6.16: Air Cargo Aircraft Characteristics

Aircraft Type	2014 Cargo Operations	ADG	TDG	Wingspan (ft)	Length (ft)
A300 -600F	424	IV	5	147.1	177.5
A310-200F	435	IV	5	144	153.1
757-200F	282	IV	4	124.1	155.3
B767-200/300F	30	IV	5	156.1	180.5

Table 6.17: Air Cargo Aircraft Parking Apron Requirements

Year	ADPM Operations	Required Parking Positions	Apron Size		
			SF	SY	Acres
2014	10	3	270,000	30,000	6
2015	11	4	360,000	40,000	8
2020	12	4	360,000	40,000	8
2025	14	5	450,000	50,000	10
2030	15	5	450,000	50,000	10
2035	17	6	540,000	60,000	12

6.2.1.2. Cargo Processing Buildings

Cargo warehouse space requirements vary significantly among air cargo operators and the type of operations being conducted. Typically, the size of a cargo building is evaluated based on utilization rates (tons of cargo per square feet of building).

The Air Freight building at PBI is unique in that space is leased to companies other than cargo operators. For example, both the FAA and U.S. CBP lease space in the Air Freight building as well as two aircraft maintenance companies (Big Sky and A&M Management). These agencies/companies do not provide cargo services and are therefore not included in the utilization rate in order to better analyze capacity against demand.

As the sole occupants of the Air Cargo building, the percentage of cargo shipments conducted by UPS and FedEx is the primary factor in determining the requirements for each facility. The Aviation Activity Forecasts noted that UPS and FedEx have historically accounted for roughly 97% of the annual cargo market at PBI. However, new service by IBC Airways and Flight Express in 2012 will likely reduce that percentage slightly moving forward. As such, a market share of 93% is used to determine the facility requirements for the Air Cargo building and 7% for the Air Freight building.

Table 6.18 provides the utilization rates of the existing buildings based on a 2014 annual cargo volume of 27,642 tons and an estimated 93% share occurring at the Air Cargo building.

Furthermore, utilization rates provide a mechanism to evaluate the efficiency of a building and the need for additional space. **Table 6.19** summarizes standard industry utilization thresholds to identify if a facility is not utilized, under-utilized, adequately utilized, or over-utilized. Based on these thresholds, the existing Air Cargo building is adequately-utilized while the Air Freight building is under-utilized.

ACI-NA's Air Cargo Guide notes that utilization rates typically range from 0.5 tons per SF at smaller airports to over 1.0 ton per SF at larger airports. For planning purposes, the ACI-NA recommended utilization rate of 1.0 ton per SF is used to determine the size of the Air Cargo building. While a planning factor of 0.50 tons per SF has been used as the industry standard for belly-cargo (Air Freight) at peer airports, a factor of 0.25 tons per SF is used for the purposes of this analysis so as to provide an adequately sized facility based on existing operations.

As summarized in **Table 6.20**, the existing Air Cargo building will become over-utilized when the annual cargo volume is approximately 34,000 tons (expected sometime after 2020). While the Air Freight building is expected to remain under-utilized throughout the planning horizon, a new and appropriately sized building is recommended due to the age of the existing facility as well as its location. The Air Freight building site is recommended for non-aviation commercial development in order to enhance airport revenues.

Table 6.18: Cargo Building 2014 Utilization Rates

Cargo Building	Existing Warehouse (SF)[1]	Vacant (SF)	2014 Cargo Tonnage	Utilization Rate
Air Freight[2]	27,433	8,020	1,935	0.07
Air Cargo	50,408	4,071	25,707	0.51

Notes:

(1) Does not include exterior loading dock area
(2) Includes only cargo operators and vacant space

Table 6.19: Facility Efficiency Thresholds

Category	Threshold
Over-Utilized	>85%
Adequately-Utilized	50-85%
Under-Utilized	10-50%
Not Utilized	10%

Source: ACI-NA Air Cargo Guide

Table 6.20: Cargo Processing Building Requirements

Item	Units	Existing	Forecast				
		2014	2015	2020	2025	2030	2035
Annual Volume	Tons	27,642	28,775	35,179	43,006	52,575	64,274
-Air-Cargo	Tons	25,707	26,761	32,716	39,996	48,895	59,775
-Air Freight	Tons	1,935	2,014	2,463	3,010	3,680	4,499
Air Cargo Facility Requirements							
Building Size[1]	SF	25,707	26,761	32,716	39,996	48,895	59,775
Utilization	%	64%	66%	81%	99%	121%	148%
Air Freight Facility Requirements							
Building Size[1]	SF	7,740	8,057	9,850	12,042	14,721	17,997
Utilization	%	7%	7%	9%	11%	13%	16%

Note:

(1) Includes exterior loading dock area

6.2.1.3. Cargo Landside Facilities

The landside facilities are a key element in evaluating the overall efficiency of cargo operations. As noted in the ACI-NA Air Cargo Guide, the ground networks of integrated carriers are expanding and increasing the demand for adequate landside facilities at key junction points, such as airports. Landside facilities include truck stalls and the associated maneuvering area, vehicle parking, and roadway access.

Truck Stalls and Vehicle Parking

Per the guidelines provided in the ACI-NA Air Cargo Guide and ACRP Report 113, the following planning factors were used to determine the landside facility requirements:

- 0.6 truck stalls per 1,000 SF of building
- 30 linear feet per truck stall
- 150-foot truck stall depth for truck parking/staging/maneuvering
- 4 vehicle parking spaces per 1,000 SF of building
- 350 SF per vehicle parking space
- 15% contingency for other areas

Table 6.21 summarizes the cargo landside facility requirements based on these parameters. While the existing 17 truck stalls at the Air Cargo building are sufficient based on existing demand, 3 additional stalls are recommended when annual cargo volume approaches 33,000 tons (2020) and another 16 are recommended when it approaches 60,000 tons (2035).

The existing number of vehicle parking spaces (60) is less than the recommended number (103) based on the existing building size. However, there is a secondary lot available to the east that can be used for overflow parking as needed.

On the other hand, the existing Air Freight building has sufficient truck stalls (17) to accommodate expected demand throughout the planning horizon. The existing truck stall maneuvering area is also used for informal vehicle parking (no painted lines).

Roadway Access

The ACI-NA Air Cargo Guide recommends using a 0.95 peak hour vehicle volume for every 1,000 SF of building and in each direction. Accordingly, **Table 6.22** summarizes the anticipated vehicle volume for the planning horizon.

As described in the Cargo Facility Inventory section, existing non-secure access is provided via Belvedere Road to the Air Freight building and Perimeter Road to the Air Cargo building. Based on observations and input from the integrated carriers at PBI, the capacity of the road is sufficient for existing operations. However, the primary concern is the lack of a direct connection to Interstate 95. Utilizing existing access points requires multiple stops and turns which increases transit times, fuel costs, and labor costs. As such, an expedited route with direct access to Interstate 95 is recommended.

Table 6.21: Cargo Landside Facility Requirements

Item	Units	Existing	Forecast				
		2014	2015	2020	2025	2030	2035
Air Cargo Facility Requirements							
Truck Stalls	Stalls	16	17	20	24	30	36
Truck Stall Length	FT	480	510	600	720	900	1,080
Truck Circulation	SF	72,000	76,500	90,000	108,000	135,000	162,000
Vehicle Parking	Spaces	103	107	131	160	196	239
	SF	35,990	37,465	45,803	55,994	68,453	83,685
Other	SF	20,055	21,109	25,278	30,598	37,852	45,819
Air Freight Facility Requirements							
Truck Stalls	Stalls	5	5	6	8	9	11
Truck Stall Length	FT	150	150	180	240	270	330
Truck Circulation	SF	22,500	22,500	27,000	36,000	40,500	49,500
Vehicle Parking	Spaces	31	32	39	48	59	72
	SF	10,836	11,280	13,790	16,858	20,609	25,195
Other	SF	6,161	6,276	7,596	9,735	11,375	13,904

Table 6.22: Projected Cargo Facility Peak Hour Roadway Volume

Item	Units	Existing	Forecast				
		2014	2015	2020	2025	2030	2035
Air Cargo Facility Requirements							
Building Size[1]	SF	25,707	26,761	32,716	39,996	48,895	59,775
Peak Hour Volume[2]	Vehicles	25	26	32	38	47	57
Air Freight Facility Requirements							
Building Size[1]	SF	7,740	8,057	9,850	12,042	14,721	17,997
Peak Hour Volume[2]	Vehicles	8	8	10	12	14	18

Note:

(1) Includes exterior loading dock area
(2) Each direction

6.2.1.4. Cargo Facility Requirements Summary

The Cargo facility requirements are summarized in **Table 6.23**. In order to evaluate the general viability of potential Cargo development sites (if applicable), the total acreage required is also provided. Accordingly, a minimum site(s) totaling approximately 23 acres is required to accommodate all Cargo facilities through the planning horizon.

In relation to existing capacity, the following Cargo facilities are recommended to accommodate existing and future demand:

- Additional Air Cargo building space along with associated truck stalls , maneuvering area, and vehicle parking
- 3 additional aircraft parking positions (25,000 SY)
- Direct connection to Interstate 95

Table 6.23: Cargo Facility Requirements Summary

Item	Units	Existing	Forecast				
		2014	2015	2020	2025	2030	2035
Air Cargo Facility Requirements							
Building Size[1]	SF	25,707	26,761	32,716	39,996	48,895	59,775
Truck Stalls	Stalls	16	17	20	24	30	36
Truck Circulation	SF	72,000	76,500	90,000	108,000	135,000	162,000
Vehicle Parking	Spaces	103	107	131	160	196	239
	SF	35,990	37,465	45,803	55,994	68,453	83,685
Other Areas	SF	20,055	21,109	25,278	30,598	37,852	45,819
Aircraft Parking Positions	Positions	3	4	4	5	5	6
Airside Apron	SF	270,000	360,000	360,000	450,000	450,000	540,000
Total Air Cargo	SF	423,751	521,835	553,797	684,588	740,200	891,279
	Acres	10	12	13	16	17	20
Air Freight Facility Requirements							
Building Size[1]	SF	7,740	8,057	9,850	12,042	14,721	17,997
Truck Stalls	Stalls	5	5	6	8	9	11
Truck Circulation	SF	22,500	22,500	27,000	36,000	40,500	49,500
Vehicle Parking	Spaces	31	32	39	48	59	72
	SF	10,836	11,280	13,790	16,858	20,609	25,195
Other Areas	SF	6,161	6,276	7,596	9,735	11,375	13,904
Total Air Freight	SF	47,237	48,112	58,236	74,635	87,205	106,596
	Acres	1	1	1	2	2	2
Total Cargo	SF	470,988	59,405	72,042	91,513	107,837	131,820
	Acres	11	13	14	17	19	23

Note:

(1) Includes exterior loading dock area

6.2.2 Cargo Facilities Development Plan

The PBI aviation activity demand forecast did not include a significant increase in demand for air cargo. However, there are several circumstances that could cause a relatively rapid change in the Airport's role in regional air cargo demand, such as capacity shortfalls at MIA and/or FLL. The intent of the air cargo development plan is to prepare PBI for the anticipated demand within the planning horizon as well as the potential emergence of unanticipated demand within or beyond the planning horizon.

6.2.2.1. Cargo Alternatives Analysis

The cargo alternatives analysis focused on the existing location for air cargo activities. While the DOA-owned parcel west of North Military Trail is available for development, the existing location of air cargo facilities provides a more efficient operation. Therefore, 2 alternatives for the expansion of the existing location were developed to accommodate the anticipated demand.

Each alternative provides a consolidated air cargo and air freight building to improve operational efficiency and allow the DOA to utilize the existing Air Freight Building parcel for other non-aviation development. The analysis for the recommended direct connection to Interstate 95 is provided in **Chapter 7**.

Alternative 1 (**Figure 6.15**) matches the 2006 Master Plan by mirroring the existing air cargo building and utilizing the existing west cargo apron. The existing building is reconfigured in order to transfer a surplus of space to the tenants of the air freight building and the new facility constructed when necessitated by demand. The new building is partially located in an existing parking lot which is utilized occasionally for economy parking overflow or as a contractor staging area.

Alternative 2 (**Figure 6.16**) maintains the existing air cargo building as well but reorients the proposed air cargo building parallel to the airfield. The aircraft parking apron is accessed via existing Taxiway M but also includes sufficient depth to allow pushback operations without impacting aircraft movement on Taxiway M. Similar to Alternative 1, the existing building is reconfigured to provide operating space for the air freight tenants and the new building is located in the existing overflow parking lot.

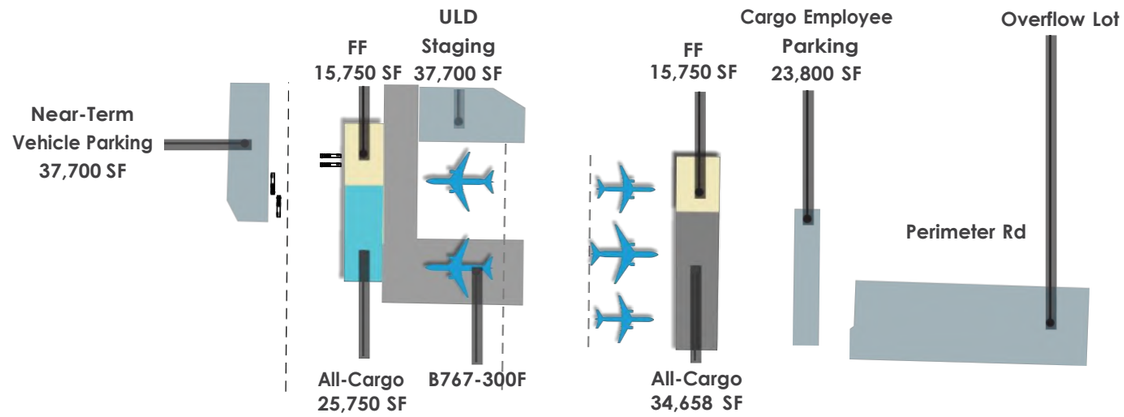


Figure 6.15: Cargo Facility Development - Alternative 1
Source: AECOM (2015)

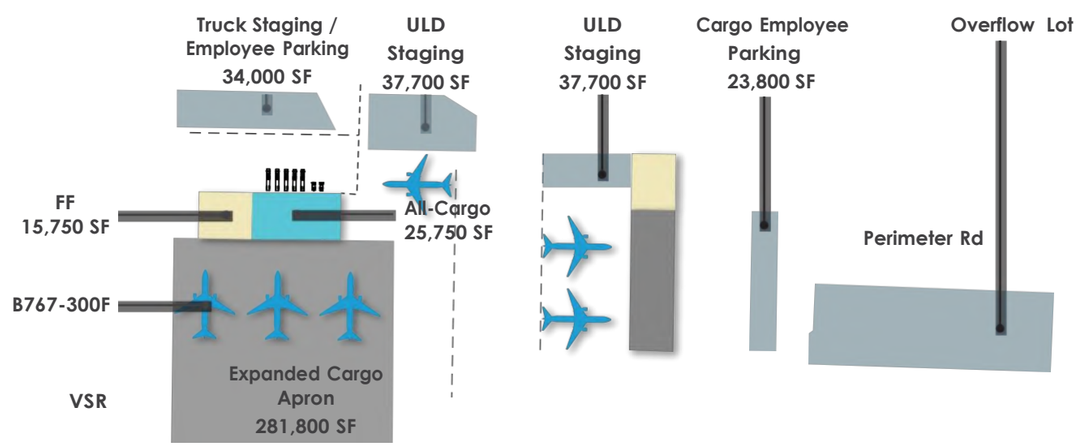


Figure 6.16: Cargo Facility Development - Alternative 2
Source: AECOM (2015)

6.2.2.2. Cargo Alternatives Evaluation

As summarized in **Table 6.24**, Alternative 2 is recommended for future development of air cargo facilities. While each alternative can accommodate the long-term aviation needs and improved landside access, Alternative 2 significantly improves the operational efficiency of the facility and maximizes the flexibility to accommodate change.

As depicted in **Figure 6.17**, the proposed building in Alternative 2 can be extended in both directions (east and west) to provide additional cargo capacity when necessitated by demand or the replacement of the existing air cargo building. However, expansion to the west is dependent upon the relocation of the existing economy parking lot. When the existing building is replaced, the existing air cargo building parcel can be re-purposed for other functions.

Table 6.24: Cargo Development Alternatives Evaluation

Evaluation Criteria	Alternative	
	1	2
Long-Term Aviation Needs	○	○
Compatibility with Current Development Plans	●	○
Flexibility to Accommodate Change	●	●
Airside Operational Efficiency	●	●
Public Access	○	○

● POSITIVE ○ NEUTRAL ● NEGATIVE

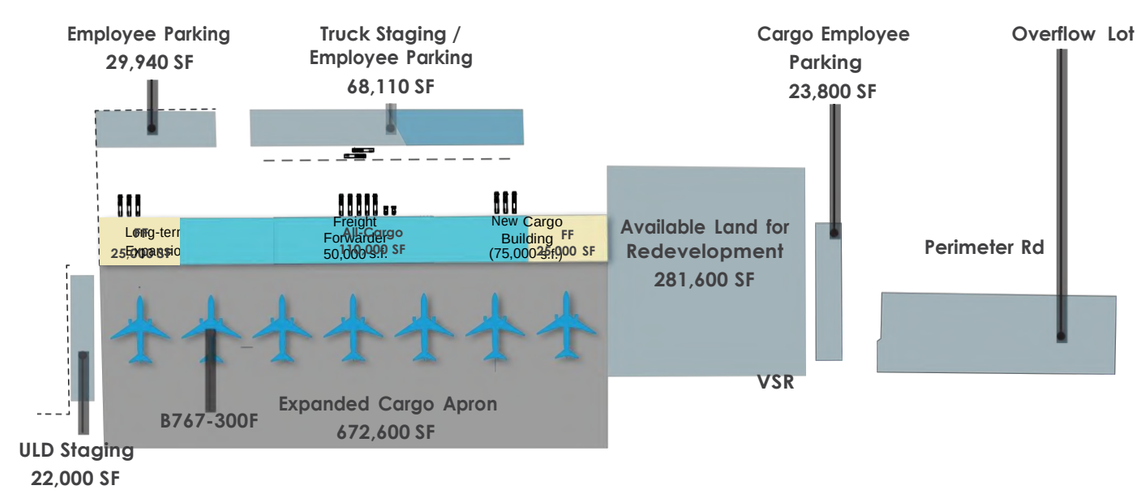


Figure 6.17: Ultimate Cargo Facility Plan
Source: AECOM (2015)

6.3 Aviation Support Facilities

Support facilities provide necessary ancillary functions to assist in the efficient operation of an airport. While the requirements for support facilities are typically a reflection of airport activity levels, some facilities, such as the ARFF station must also adhere to specific FAA requirements. Other primary support facilities analyzed in this section include fuel storage and distribution as well as airport maintenance facilities.

6.3.1 Facility Requirements

The facility requirements for aviation support facilities are based on a combination of FAA and other government standards/guidelines as well as site specific conditions, such as building location and/or condition. The following FAA and government standards/guidelines were referenced to determine the requirements for these facilities:

- U.S. Code of Federal Regulations (CFR) Title 14, Part 139, Airport Certification
- FAA Advisory Circular 150/5210-15A, Aircraft Rescue and Firefighting Station Building Design
- National Fire Protection Association (NFPA) 403, Standard for Aircraft Rescue and Fire-Fighting Services at Airports
- FAA Advisory Circular 150/5230-4B, Aircraft Fuel Storage, Handling, Training, and Dispensing on Airports
- NFPA 407, Standard for Aircraft Fuel Servicing

6.3.1.1. Aircraft Rescue and Firefighting (ARFF)

Airport ARFF facilities provide first response services for aircraft involved in emergencies as well as a wide variety of other incidents such as building fires and medical emergencies.

Specific requirements for airport ARFF services are established in CFR Part 139; however, the FAA and NFPA also provide guidance for ARFF facilities. Two of the primary elements used to evaluate ARFF facilities include: (1) the applicable ARFF Index and associated equipment (vehicles and fire extinguishing agents) requirements and personnel as well as (2) the ARFF Station's location on the airfield.

ARFF Index

An airport's ARFF Index is based on the length of the largest aircraft conducting an average of 5 or more daily departures. **Figure 6.18** depicts the aircraft characteristics and examples for the 5 ARFF Indexes.

The existing design aircraft at PBI is the B757-200 (length of 155-feet) which supports the existing ARFF Index C (NFPA Airport Category 7) determination.

Aircraft that would necessitate an ARFF Index D are typically utilized for international flights, particularly at airports the size of PBI. While 2014 aircraft operations at PBI include approximately 6 international departures for the ADPM, these are predominantly to the Caribbean and Eastern Canada on aircraft less than 159-feet in length. While international departures are expected to increase to approximately 9 by 2035, the size of the aircraft utilized for these flights will be dependent on the airline(s) providing the service. Therefore, it is expected that PBI will remain at an ARFF Index C throughout the planning horizon.

The Palm Beach County Fire Rescue (PBCFR) Aviation Battalion maintains a fleet of 7 vehicles at PBI, 5 of which are used for aircraft firefighting. Given that the FAA reduced PBI's ARFF Index from a D to a C in 2013, the existing vehicle inventory still satisfies the requirements for ARFF Index D, including:

- 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 (Dragon 4 and 5); and
- Two vehicles carrying an amount of water and the commensurate quantity of AFFF so the total quantity of water for foam production carried by all three vehicles is at least 4,000 gallons (Dragon 1, 2, and 3)

Furthermore, Part 139 does not specify a required number of personnel but only a sufficient number of trained personnel for each shift to adequately respond to an emergency and satisfy the requirements of Part 139, including at least one properly trained in basic emergency medical services. However, NFPA 403 states that a minimum of 12 firefighters should be present for each shift based on an ARFF Index of C or D. Therefore, it is not anticipated that PBI will require additional personnel or equipment for ARFF functions throughout the planning horizon.

ARFF Station Location

The ARFF station itself must be located so that the first response vehicle can reach the midpoint of the farthest runway within 3 minutes. While the existing location of the PBI ARFF station allows for a response time within the maximum allowed, the proposed Runway 10R-28L and Runway 10L-28R extension may increase it.

Depending on its location and accessibility, Airport ARFF stations can also have a dual role in providing emergency services to the local community. As the existing ARFF station is located within the secure Airport Operations Area (AOA) between Concourses B and C, emergency service is limited to the airport. However, the DOA indicated that PBCFR would like to combine the PBI ARFF facility (Station 81) with Station 24 (located in the neighborhood north of Belvedere Road). Given that the existing ARFF Station is located on a site which is not suitable for this combined service, it is recommended that a new location is identified and the existing site recapitalized for aircraft movement purposes.

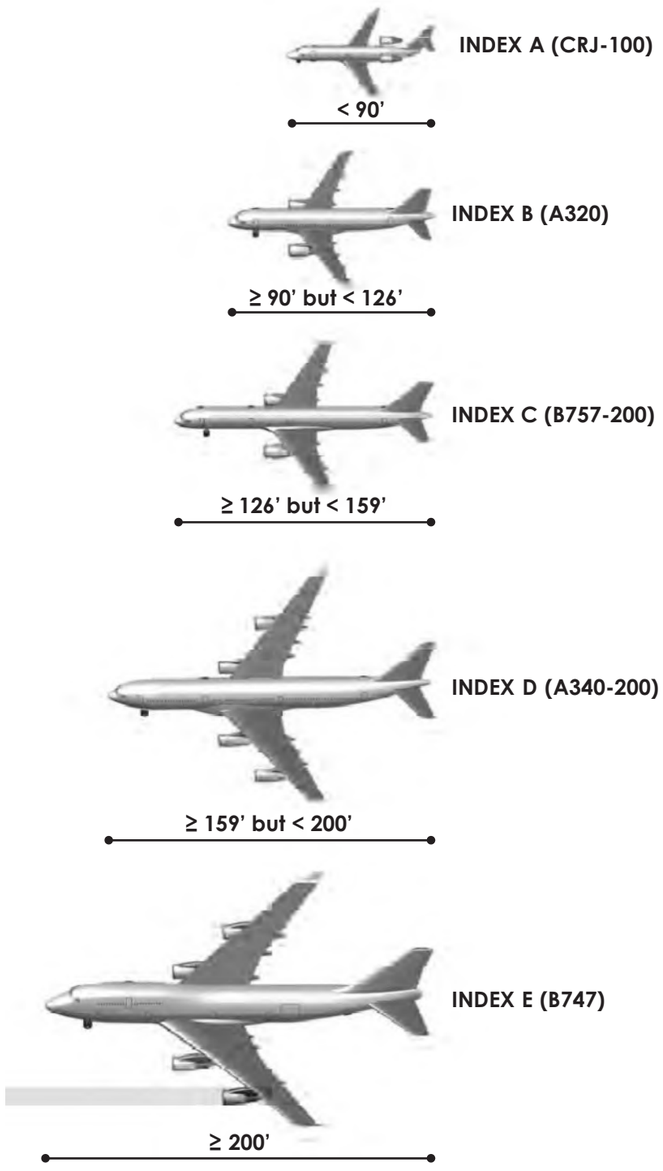


Figure 6.18: ARFF Index Categories
Source: AECOM (2015); FAA

6.3.1.2. Fuel Storage

In addition to the fuel storage facilities located at each of the FBOs, the Aircraft Service International Group (ASIG) leases a 3.5 acre fuel storage facility located east of the Air Freight building. The ASIG facility supplies Jet-A fuel to the air carriers, commuters, and air cargo operators via 14 storage tanks with a gross capacity of 1 million gallons.

Data regarding historical fuel distribution was unavailable at the time of this analysis. Therefore, identifying fuel storage requirements based on the expected increase in aircraft operations is not possible. However, fuel storage requirements are typically based on maintaining an adequate supply level, such as the recommended 3-day supply for GA fuel storage. If the recommended supply level cannot be accommodated with the existing storage capacity, either additional fuel storage tanks or increased fuel deliveries are needed. Nevertheless, as with the 2006 Master Plan, it is recommended that the vacant parcel east of the existing facility is maintained for potential expansion.

Additionally, the NFPA 407 states that antennas of airport flight traffic surveillance radar equipment shall be located so that the beam will not be directed toward any fuel storage or loading racks within 300 feet. Accordingly, there is no existing FAA radar or any other FAA equipment within a 300-foot radius of the existing facility.

6.3.1.3. Airport and Aircraft Maintenance

The existing airport maintenance compound is located on a 22.5 acres site west of the new ATCT. Most of the airport maintenance buildings, including the airline catering and flight kitchen building, are in relatively poor condition.

The 2006 Master Plan included an update to the 1997 New Maintenance Compound Project Program and Design Criteria Manual based on interviews with PBI maintenance staff. While additional storage needs were identified, particularly covered parking for weather-sensitive equipment, the airport maintenance facilities have remained relatively the same. Given the condition of the existing facilities and their location, it is recommended that the existing facilities, including the airline catering and flight kitchen (Building 1169), are relocated and the existing site utilized for other aviation related functions.

The airport does not currently provide an aircraft maintenance facility. However, it is recommended that a site is identified to provide these facilities in the event an operator expresses interest in opening a facility at PBI.

6.3.1.4. Other Support Facilities

Due to proposed Runway 10R-28L and development of the Golfview and Southwest GA sites, the existing ASR and Remote/Transmitter Receivers (RTRs) will have to be relocated. The ASR and RTR are federal facilities owned, maintained, and operated by the FAA. Appropriate coordination will be required to confirm the selected sites for relocation of these systems.

Remote Transmitter/Receiver

The RTR is a system of equipment that provides radio communications between pilots and the ATCT. The location of the RTR must provide sufficient line of sight between the communication towers, pilots, and ATCT. The two RTRs at PBI are located in the Golfview development area and the Southwest GA area in front of existing Atlantic Aviation hangar 1640. The 2006 Master Plan identified a site south of the existing airline catering and flight kitchen (Building 1169) for relocation of the Southwest GA RTR. This Master Plan maintains the selected site for this relocated RTR. It is not anticipated that the RTR located in the Golfview development area will be impacted by proposed development.

Airport Surveillance Radar

The ASR provides pertinent information on aircraft location to the ATCT, such as azimuth, range, and elevation. The system at PBI is an ASR-11 which integrates a primary and secondary radar system to provide six-level national weather service calibrated weather capability for enhanced situational awareness. The existing ASR is approximately 108-feet above ground level (AGL) and is located in the Southwest GA area between Atlantic Aviation hangars 1636 and 1637.

The proposed Runway 10R-28L will require relocation of the ASR.

RTR at Golfview Site
Source: AECOM (2014)

RTR at Southwest GA Site
Source: AECOM (2014)

6.3.2 Aviation Support Facilities Development Plan

In contrast to the GA and Cargo facilities, support facilities typically require less space and are therefore less restricted by infrastructure and other airport features. While the ARFF facility is partially restricted by the 3 minute maximum response time mandated by the FAA, the relatively small size of the facility provides for multiple location alternatives which do not impact existing or proposed development. The following summarizes the alternatives analysis for the ARFF Facility, the recommended site for relocated airport maintenance facilities, and other support facilities.

6.3.2.1. ARFF Facility

Alternative ARFF facility locations were identified considering the requirement for access to both the airfield and adjacent public roads. Accordingly, **Figure 6.19** depicts seven potential sites. Sites 3, 4, 5, 6, and 7 are located on the south side of the airport while Sites 1 and 2 are on the north side. For the purposes of this analysis, the operational characteristics of a standard first response ARFF vehicle were used to calculate response times.

The primary ARFF vehicle characteristics include:

- Top speed of 70 miles-per-hour (MPH) with an acceleration rate of 2.1 feet-per-second square (fpss)
- A deceleration rate of -10.76 fpss[42] which will allow the vehicle to stop from 40 MPH in 160 feet or less

Additionally, the analysis included a period of 30 seconds to account for the time from the alarm to when the vehicles begin moving as well as the standard cornering speeds established by the American Association of State Highway and Transportation Officials (AASHTO) Design Criteria for Preliminary Roadway Design (refer to **Table 6.25**).

In order to determine the shortest duration from the facility to the required points on the airfield, a route which combined the shortest path available and the ability to reach top speed for the greatest distance was used.

Title 14 CFR Part 139 requires at least one ARFF vehicle to reach the midpoint of the farthest runway serving air carrier aircraft from its assigned post within the maximum 3 minutes. All other required vehicles must reach any other specified point of comparable distance on the movement area that is available to air carriers and begin application of an extinguishing agent within 4 minutes. **Table 6.26** depicts the response time to each runway end. Five of the potential ARFF sites are within the 3 minute response limit while two exceed it. Although Sites 6 and 7 provide good access to all public roads around the airport, they were eliminated from further consideration as they would exceed the 3 minute response time limit to Runway 14 and 28R respectively.

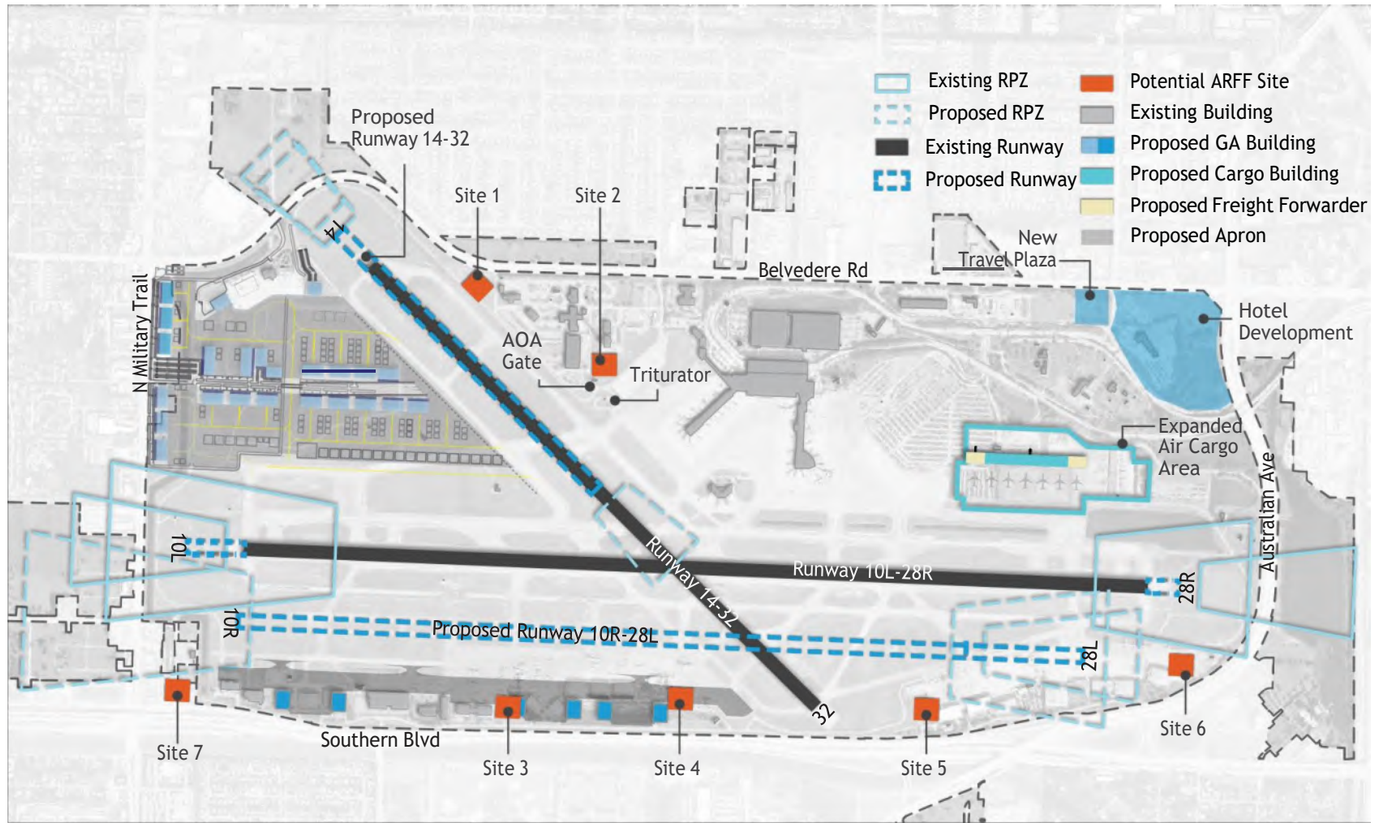


Figure 6.19: Alternative ARFF Facility Sites
Source: AECOM (2015)

Table 6.25: Design Criteria for Preliminary Roadway Design

Radius of Curve (Feet)	Design Speed (MPH)
150	25
230	30
310	35
430	40
540	45
955	50
1,910	60

Table 6.26: ARFF Site Response Times

Runway End[1]	Potential ARFF Site (min:sec)						
	1	2	3	4	5	6	7
10L	2:52	2:23	1:08	2:06	2:52	-	-
28R	2:30	2:19	2:38	2:13	1:46	-	3:36
10R	2:51	2:15	1:42	2:06	2:51	-	-
28L	2:37	2:28	2:14	2:06	1:26	-	-
14	1:16	1:47	2:38	2:12	2:43	3:04	-
32	2:05	1:54	1:51	1:24	1:20	-	-

Note:

(1) Runway Ends are based on the most critical location throughout the planning horizon (e.g., the extension of Runway 14 prior to its decommissioning)

42 *Per the Fully Loaded Vehicle Performance Parameters of the National Fire Protection Association (NFPA) Standard 414, 2007 edition, Standard for Aircraft Rescue and Fire-Fighting Vehicle*

ARFF Facility Alternatives Evaluation

Based on the evaluation summarized in **Table 6.27**, the preferred location for the new ARFF facility is Site 2.

Site 1 is located in an empty parcel west of the existing airport maintenance area. While Site 1 provides quick access to the Belvedere Road in either direction and can accommodate the new facility without impacting other existing facilities, it also impacts the ability to expand future GA facilities and is near the maximum response time allowed.

Site 2 is located on an empty parcel south of the existing ATCT and is the preferred location of the PBCFR. Site 2 provides quick access to Belvedere Road in either direction and is compatible with proposed developments. However, Site 2 requires relocation of an existing AOA gate as well as the existing triturator in order to provide unimpeded access to the airfield and is given a neutral rating for compatibility with existing conditions accordingly.

Site 3 is compatible with existing conditions as it is located on the site of the old ATCT which has existing utility service and is currently vacant. However, it is given a neutral rating for compatibility with existing conditions as well as public road access since significant improvements will be required to provide access to Southern Boulevard in both directions. Site 3 will also impact proposed GA development and is given a negative rating accordingly.

Site 4 provides the minimum response time but will impact the existing AUTEC building which is not impacted by the recommended Southwest GA development alternative. However, sufficient space can be allocated to accommodate changes in ARFF requirements if this site was utilized for a new ARFF facility. Due to the location of the site and the roadway improvements that would be required to access Southern Boulevard, this site was rated negatively for public road access.

Site 5 is located at the western edge of the existing Southeast GA facilities which will be relocated. Accordingly, this site is given a positive rating for proposed development compatibility and flexibility to accommodate change as sufficient space can be allocated. However, the response time is near the 3 minute maximum and providing adequate public road access is difficult since the site is aligned with the ramp connecting Australian Avenue with Southern Boulevard.

Table 6.27: ARFF Alternatives Evaluation

Evaluation Criteria	Sites				
	1	2	3	4	5
Maximum Response Time					
Compatibility with Proposed Developments					
Compatibility with Existing Conditions					
Flexibility to Accommodate Change					
Public Road Access					

POSITIVE NEUTRAL NEGATIVE

6.3.2.2. Airport and Aircraft Maintenance

A detailed alternatives analysis was not completed for the airport and aircraft maintenance facilities. However, sites for these functions were identified based on the operational characteristics of each, available land, and discussions with the DOA.

Airport Maintenance Compound

The location of the airport maintenance area is not restricted to the AOA although access is required. The existing airport maintenance facilities include six structures totaling approximately 106,000 SF. As depicted in **Figure 6.21**, a 13-acre site within the DOA-owned Parcel D along Belvedere Road has been identified for the relocated airport maintenance facilities. Additionally, the 13-acre DOA-owned Parcel C along 5th Street is reserved for potential development of airport/airline support facilities.

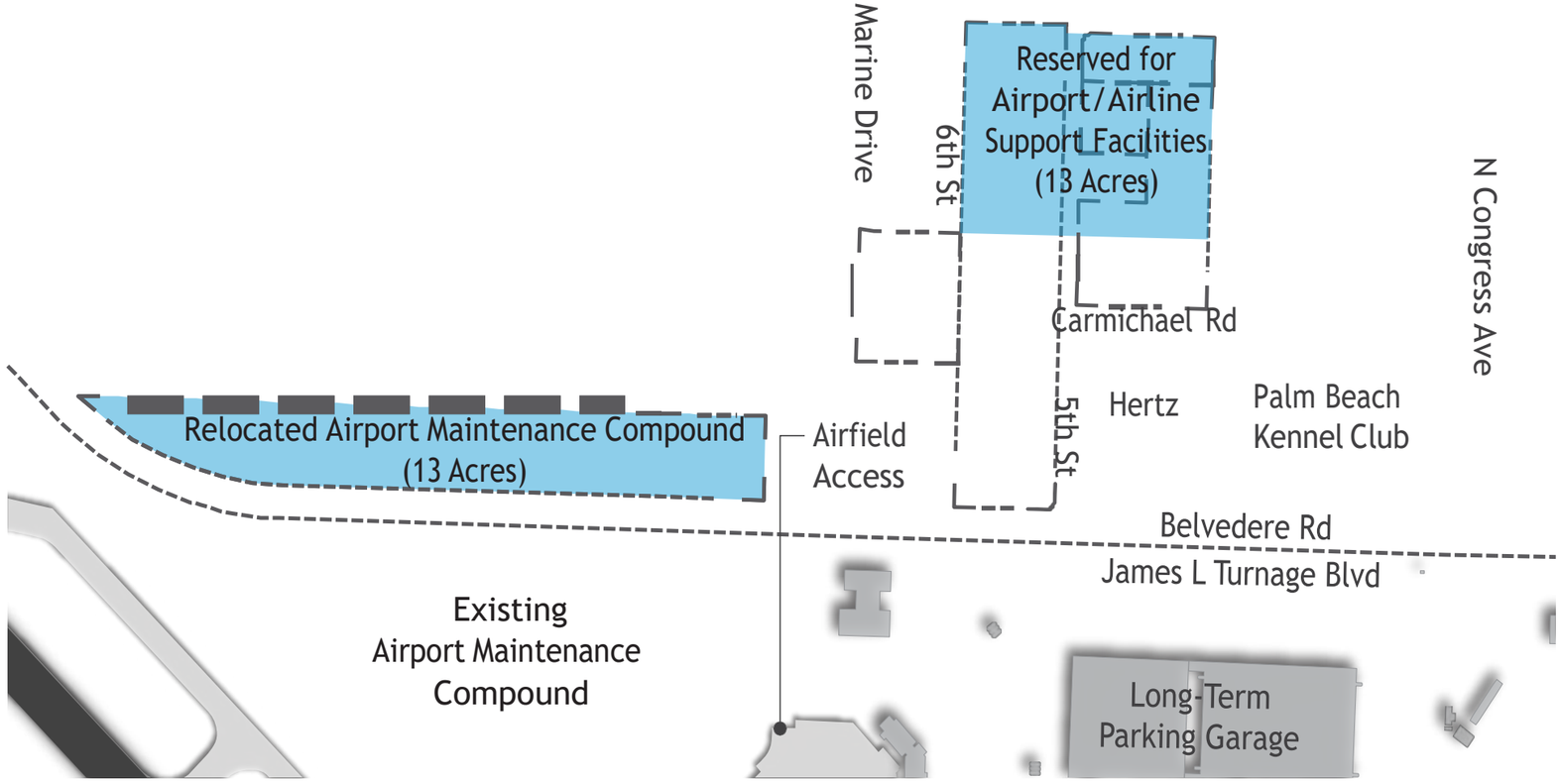


Figure 6.20: Future Airport Maintenance Compound Site
Source: AECOM (2015)

Aircraft Maintenance Facility

B. Coleman Aviation currently provides Maintenance, Repair, and Overhaul (MRO) services at PBI in Hangar 1625B which it leases from Atlantic Aviation. In the event PBI receives interest from an airline, B. Coleman Aviation, or another private MRO service company for dedicated aircraft maintenance facilities, two sites have been identified from which the DOA can select at that time.

Site 1 is located in the DOA-owned parcel west of North Military Trail as illustrated in **Figure 6.21**. The primary benefit of this site is its size. At approximately 65 acres, the site can accommodate an aircraft maintenance facility with the ability to expand and also accommodate other aviation and non-aviation development (per its current land use designation). The main disadvantage of the site is that it will require a secure Taxiway which crosses North Military Trail. While crossings will be infrequent and primarily during night time hours, a new signalized intersection on North Military Trail as well as controlled AOA gates will be required to allow aircraft to cross the public roadway. Two options for taxiway access to site are available. The first option is to extend Taxiway L which will create a taxiway within a Runway Protection Zone (RPZ). Option 2 eliminates this situation but it will impact the currently proposed Golfview development. The Taxiway A extension option will also require the acquisition of properties along North Military Trail. These properties are currently occupied by the Mounts Botanical Gardens of Palm Beach County (owned by Palm Beach County) and the Florida Highway Patrol's Division of Driver Licenses.

Site 2 is located in the north end of the Golfview area in the vacated footprint of the decommissioned Runway 14-32 as illustrated in **Figure 6.22**. The primary benefit of this site is airspace compatibility with the future airfield and convenient landside access from Belvedere Road. The disadvantage is that this site will not be available before the closure of Runway 14-32.

Figure 6.6 provides a comparison of the two alternatives. Site 1 is less ideal mainly because the taxiway/N Military Trail intersection imposes airside operational challenges. Site 2 is incompatible with the existing Runway 14-32. Given the need for replacement FBO facilities is more urgent than that for aircraft maintenance facility, it is recommended to reserve Site 2 for the future development of an aircraft maintenance facility.

Table 6.28: Aircraft Maintenance Facility Site Alternatives Evaluation

Evaluation Criteria	Site 1	Site 2
Long-Term Aviation Needs	POSITIVE	POSITIVE
Compatibility with Proposed Developments	NEUTRAL	POSITIVE
Compatibility with Existing Conditions	NEGATIVE	NEGATIVE
Airside Operational Efficiency	NEGATIVE	POSITIVE
Public Road Access	POSITIVE	POSITIVE

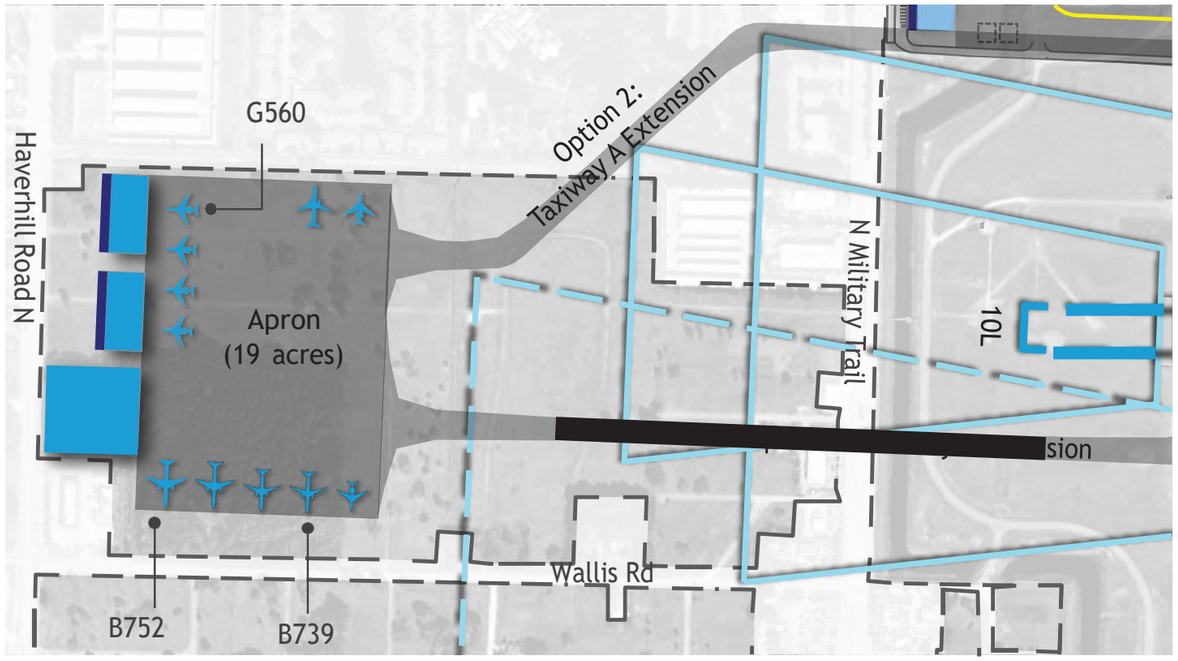


Figure 6.21: Potential Aircraft Maintenance Site 1
Source: AECOM (2015)

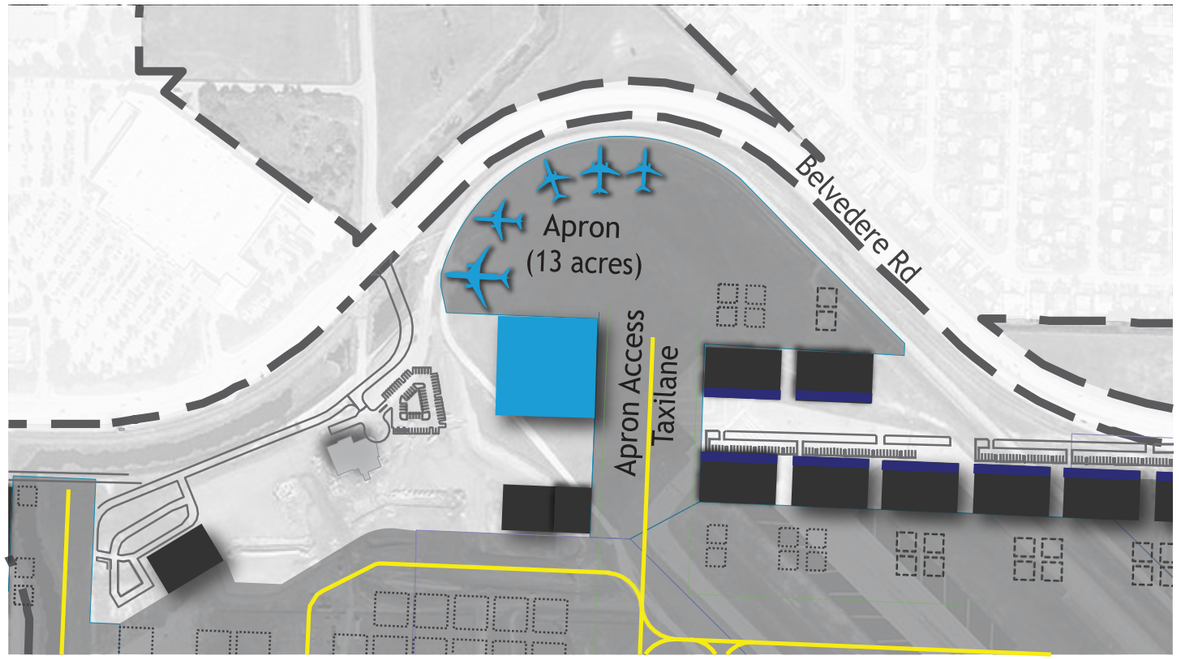


Figure 6.22: Potential Aircraft Maintenance Site 2
Source: AECOM (2015)

6.3.2.3. Other Support Facilities

Considering existing and proposed development, airspace restrictions, and ASR clearance requirements, 3 sites were identified for potential relocation of the ASR as illustrated in **Figure 6.23**.

Airport Surveillance Radar

The location of the ASR is subject to several considerations, including access to power and communications infrastructure, FAA designated clearances from structures (1,500-feet) and other electronic equipment (1/2-mile), and airspace restrictions. While the location and elevation of the relocated ASR will have to be coordinated with the FAA, the existing height was used for preliminary analysis of the 3 potential ASR sites. Due to airspace restrictions generated by existing Runway 10L-28R and future Runway 10R-28L, all sites on the Southside of the airfield were eliminated from consideration.

ASR Site 1 is located at the southeast corner of the Belvedere Road and North Military Trail intersection. While this parcel is not currently owned by the DOA, it is a proposed property acquisition for the purposes of airport development. The site can be located inside existing airport property but would require mitigation of the canal. Furthermore, there is an existing cell tower (±102-feet AGL) located at the Haverhill Town Hall building which is within the structure clearance area and may also present electrical interference to the ASR.

ASR Site 2 is located within existing airport Parcel C along 5th Street in the area identified for relocation of the airport maintenance compound. This site is closest to the ATCT and has no significant structures within either clearance area except a cell tower (±82-foot AGL) located within a one acre parcel not currently owned by the DOA. While the cell tower is more than 25-feet below the height of the ASR, the site is recommended for acquisition.

ASR Site 3 is located on a small parcel of existing airport property along Australian Avenue. While there are currently no significant structures currently located within the 1,500-foot clearance area, the proposed hotel at the corner of Belvedere Road and Australian Avenue could impact the operation of the ASR. Furthermore, there is an existing office building (±152-feet AGL) located at 1600 Centrepark Drive East which may present electrical interference to the ASR.

Based on the evaluation summarized in **Table 6.29**, the preferred ASR location is Site 2.

Table 6.29: ASR Alternatives Evaluation

Evaluation Criteria	Sites 1	2	3
Structure Clearance	NEUTRAL		NEGATIVE
Electronic Equipment Clearance	NEUTRAL		NEGATIVE
Airspace & Line of Sight	POSITIVE		NEUTRAL
Compatibility with Existing Conditions	NEGATIVE		POSITIVE

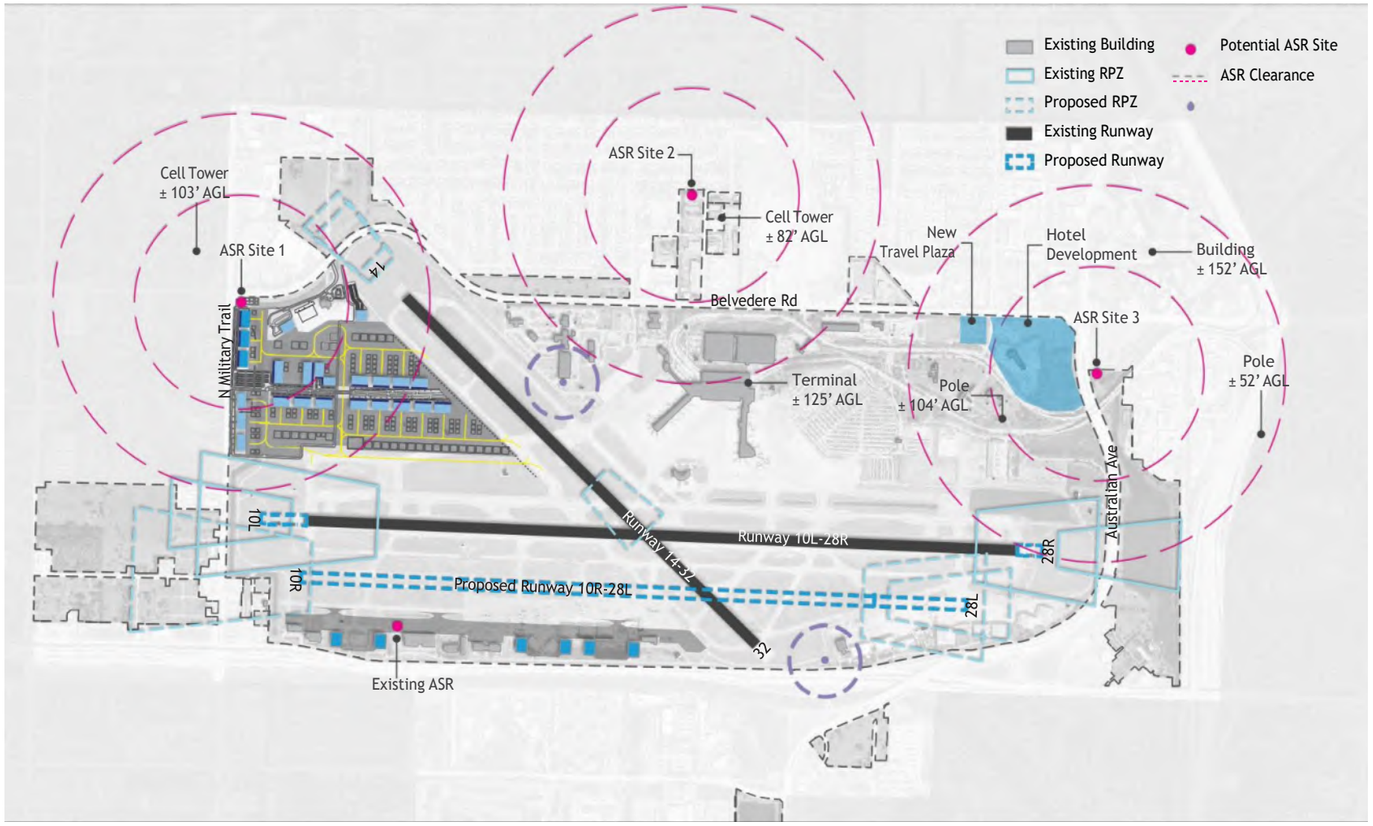


Figure 6.23: Other Support Facility Sites
Source: AECOM (2015)

Landside Analysis

07

07 Landside Analysis

Landside facilities are the junction between air and ground transportation. The perceived convenience or inconvenience of getting into and out of an airport can often have a direct impact on a passenger's perception of the airport. The principal components of the landside facilities include the local, regional, and on-airport circulation roadways as well as the terminal curbside, vehicle parking, rental cars, and public transportation services. The following sections evaluate the existing landside facilities and identify a development plan to maintain an adequate level of service throughout the planning horizon.

7.1 Facility Requirements

The facility requirements identify potential issues associated with the capacity of existing landside facilities by applying FAA, industry, and site specific planning parameters to existing and forecast demand.

Currently, one public transit operator, Palm Tran, provides service to the Airport terminals via two bus routes. Requirements for accommodating this service at the curbsides are presented in **Section 7.1.2.2**. Palm Tran has no specific plans regarding changes to its airport services. However, the Palm Beach MPO has planned two new Express Bus Service routes which would begin serving PBI in the 2031-2040 time-frame. In the event these additional bus services materialize, the curbside requirement for buses will need further evaluation.

As discussed in Chapter 2, ***Airport Inventory***, All-Abroad Florida and Tri-Rail Coastal Link have planned for a new co-located rail station 4.5 miles northeast of PBI. The Palm Beach MPO 2040 Long-Range Transportation Plan also includes an additional Tri-Rail station on the southeast corner of PBI, near the Hilton Palm Beach Airport hotel. It is expected this station will open between 2021 and 2025. A connection to the terminal complex from this station should be provided.

Palm Tran Bus Stop on Arrivals Level
Source: AECOM (2014)

7.1.1 Local and Regional Access

Convenient access to the airport is crucial to passenger satisfaction and a key focus for PBI. The airport is currently surrounded by major roads on all sides with direct access to the passenger terminal from Belvedere Road, Australian Avenue, and I-95.

The identification of roadway improvements is typically based on a Level of Service (LOS) standard. The LOS is used as an indicator of the quality of traffic service based on maximum traffic volume for a given capacity and associated delays. Per the TRB Highway Capacity Manual (HCM), the LOS ranges from A (least congested) to F (most congested). A LOS D standard is set by both the FDOT and Palm Beach County Traffic Performance Standards Ordinance (TPSO).

In November 2014, the FDOT completed an I-95 Interchange Master Plan (I-95 IMP) to identify short-term and long-term improvements to several interchanges along I-95 in Palm Beach County. Two major intersections which provide local access to PBI are included in this report. As depicted in **Figure 7.1** and **Figure 7.2**, the Belvedere Road and Australian Avenue intersection can be used as an access point to passenger terminal while the Southern Boulevard intersection with Gem Lake Drive and the I-95 ramps can be used to access the general aviation (GA) area or Australian Avenue.

The existing and future LOS ratings provided in the FDOT I-95 IMP for these interchanges are summarized in **Table 7.1**. Future LOS ratings are based on a weighted population growth rate for Palm Beach County. According to the I-95 IMP, these intersections satisfy the minimum LOS except the Belvedere Road and Australian Avenue intersection during the P.M. Peak Hour.

The FDOT I-95 IMP evaluates the overall LOS of each intersection for proposed developments. Increases in the LOS are typically associated with an increase in the amount of lanes provided and an associated decrease in overall delay. Instances where the "Build" condition maintains the same LOS as the "Existing" or "No Build" condition typically have an associated decrease in overall delay but not significant enough to increase the LOS.

The recommended improvements to these intersections are summarized in **Table 7.2**. The addition of a fourth lane in each direction and turn lanes on Belvedere Road and Australian Avenue will ease congestion and enhance the convenience of accessing the airport via Australian Avenue. The improvements to the Southern Boulevard interchange not only enhance access to/from I-95 for cargo operators but also present a potential opportunity to further enhance I-95 access for cargo operators via a flyover from southbound Australian Avenue.

Table 7.1: FDOT Intersection LOS Ratings

Intersection	Condition	Overall LOS					
		2013		2020		2040	
		A.M.	P.M.	A.M.	P.M.	A.M.	P.M.
Belvedere & Australian	Existing	D	**E**				
	No Build			D	**E**	**F**	**F**
	Build			D[1]	**E**	**E**	**E**
Southern & Gem Lake	Existing	A	B				
	No Build			B	B	B	C
	Build			B	B	C	B
Southern & I-95 SB Ramps	Existing	D	C				
	No Build			C	C	**E**	D
	Build			C	C	B	C
Southern & I-95 NB Ramps	Existing	D	D				
	No Build			D	D	**E**	**E**
	Build			C	D	C	D

Source: FDOT Interchange Concept Development Report, November 2014

Note:

(1) Build conditions where the LOS remains the same as the Existing or "No Build" condition typically include a decrease in overall delay

Table 7.2: Key FDOT I-95 IMP Recommended Improvements

Year	Belvedere Road	Southern Boulevard
2020	Add a fourth lane in each direction of Belvedere Road from just west of Australian Avenue to west of I-95 SB	Widen I-95 southbound on-ramp eastbound-to-southbound right-turn movement to dual (2) right-turn lanes and signalize
	Replace bridge structure of Belvedere Road over Stub Canal	Widen I-95 northbound off-ramp right-turn movement to dual (2) right-turn lanes
	Extend I-95 southbound off-ramp auxiliary lane (widening of I-95 required	Widen eastbound Southern Boulevard bridge over Stub Canal and SFRC
2040	Add a fourth through lane in each direction to Australian Avenue extending from 600 feet north of Australian Avenue to James L. Turnage Boulevard	Add an eastbound-to- northbound single lane flyover ramp to access I-95 northbound on-ramp (starting east of Gem Lake Drive)
	Add a third southbound and westbound left-turn lane to the intersection of Belvedere Road and Australian Avenue	Realign I-95 northbound off-ramp approach and provide 4 left turn lanes
		Widen I-95 southbound on-ramp and off ramp

Source: FDOT, Interchange Concept Development Report (2014)

Figure 7.1: Belvedere Road & Australian Avenue
Image Source: Pictometry

Figure 7.2: Southern Boulevard Intersections
Image Source: Pictometry

7.1.2 Airport Circulation Roadways

The primary airport circulation roadways at PBI include James L. Turnage Boulevard and the terminal curbsides. Data on the existing capacity of the airport circulation roadways was unavailable. However, the methodology provided in the TRB ACRP Report 40, *Airport Curbside and Terminal Operations* (2010), was used to determine their capacity and LOS.

7.1.2.1. James L. Turnage Boulevard

ACRP Report 40 recommends that a primary access road such as James L. Turnage Boulevard be maintained at a LOS C. Access to James L. Turnage Boulevard is provided from I-95, Australian Avenue, and Belvedere Road. James L. Turnage Boulevard is a 4-lane road with a speed limit of 35 miles per hour and an estimated capacity of approximately 3,000 vehicles per hour for a LOS C. The 2035 forecast demand is approximately 2,600 vehicles per hour; therefore, no improvements to James L. Turnage Boulevard are required.

7.1.2.2. Terminal Curbsides

James L. Turnage Boulevard provides direct access to the passenger terminal arrivals and departures roadways.

As illustrated in **Figure 7.3**, the upper level departures curb accommodates private automobiles on four inner lanes as well as rental car shuttles, taxi cabs, and a Southwest Airlines curbside check-in on four outer lanes.

As illustrated in **Figure 7.4**, the lower level arrivals curbs accommodates mixed use operations which includes private automobiles and limousines on four inner lanes and taxicabs, Palm Tran buses, and rental, hotel, and economy parking shuttles on four outer lanes. Taxi service is conducted from a dedicated staging lot to the west and east of the terminal building. The vertical clearance of the arrivals curb is 13 feet which can easily accommodate a full size bus and a standard firefighting vehicle (12 feet). However, the minimum vertical clearance for a typical semi-truck vehicle is 13.5 feet based on AASHTO design standards. Therefore, there is insufficient vertical clearance for these vehicles to bypass the terminal on the arrivals curb.

Curbside requirements are identified by identifying a curbside utilization factor. The curbside utilization factor is a ratio of the curbside length available and the length recommended to accommodate demand. The ACRP recommends a maximum curbside utilization factor of 1.7 (LOS D) for existing curbside roads and 1.3 for new curbside roads (LOS C).

The recommended length of the curbside roads is based on peak hour origin and destination (O&D) passengers on the average day of the peak month (ADPM). O&D passengers are those who either begin or end their travel at PBI. Based on airline O&D survey data provided by the Bureau of Transportation Statistics (BTS), approximately 97% of passengers at PBI are O&D.

In addition to peak hour O&D passengers, curbside utilization accounts for various modes of transportation, vehicle occupancy rates, and vehicle dwell

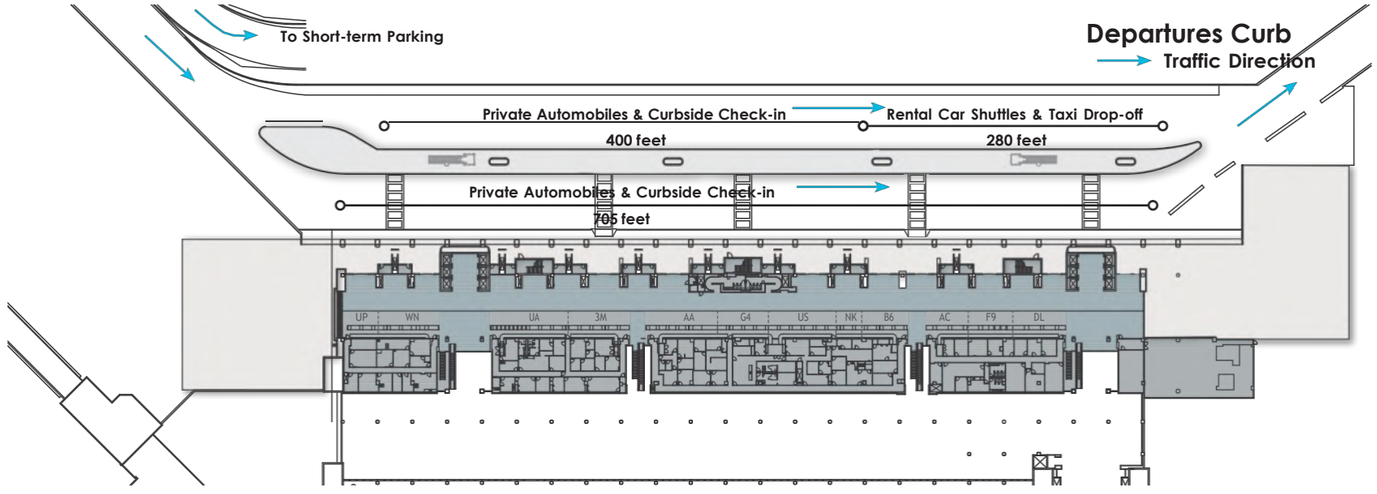


Figure 7.3: Existing Departures Curb
Source: AECOM (2014)

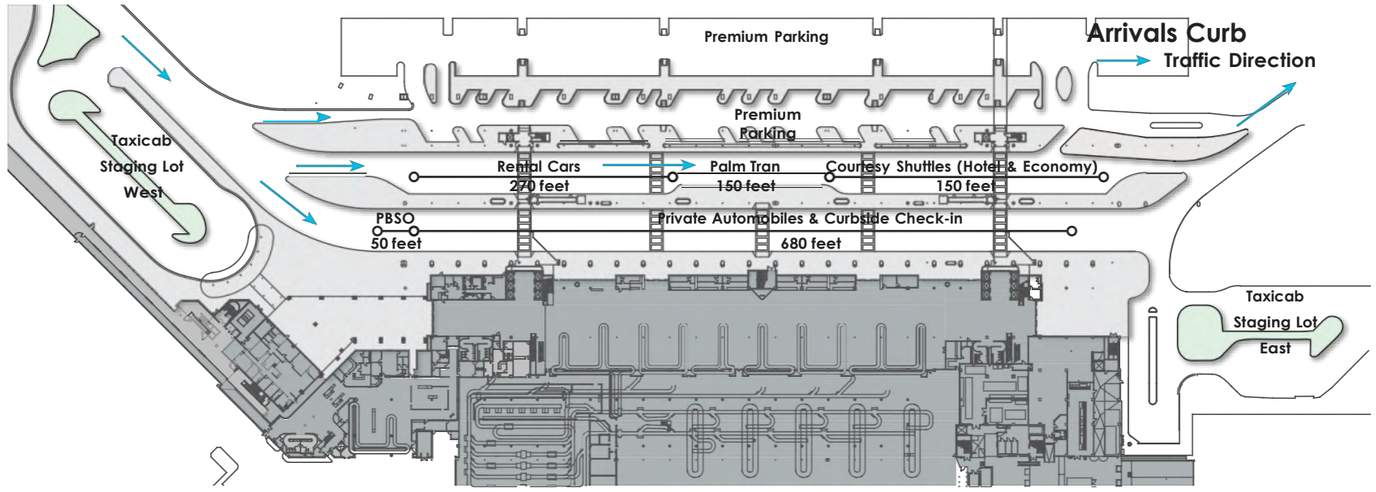


Figure 7.4: Existing Arrivals Curb
Source: AECOM (2014)

times. **Table 7.3** summarizes the estimated transportation mode usage, type of commercial service at PBI, and peer airports. The transportation modes vary between the arrivals and departures curb due to the nature of operations and space allocated for each. For example, public transit (Palm Tran) passengers are picked up and dropped off on the arrivals curb as are hotel/motel courtesy shuttles.

Similarly, average vehicle occupancy rates and dwell times are based on the ACRP report with some adjustments for conditions specific to PBI, such as the average dwell time for public transit (Palm Tran).

The recommended number of curbside stalls is determined utilizing these factors plus a 30% contingency to account for an uneven demand distribution throughout the peak hour. The associated curbside length is based on a standard vehicle stall length for each mode of transportation. **Table 7.4** summarizes the existing (2014) terminal curbside capacity (existing curb length), demand (required curb length), and associated utilization.

Table 7.5 summarizes the curbside utilization for each of the forecast years if the existing transportation mode splits are maintained. **Appendix F** provides the detailed requirements according to each mode of transportation. Based on forecast peak hour enplanements and deplanements, it is anticipated that the available curbside length on both levels is sufficient for all transportation modes. However, alternative transportation methods could impact the curbside requirements. For example, the planned Tri-Rail stations, particularly at the Hilton Palm Beach Airport hotel, could increase the use of courtesy shuttles between the station and terminal.

Occasional heavy use of the arrivals curbside for private vehicles is reflected in a peak hour utilization factor of 1.4, indicating that, on average, 40% of curbside is occupied with double parking. However, it is anticipated that the new cell phone lot in the travel plaza along Belvedere Road will reduce utilization of the arrivals curbside.

A sensitivity analysis revealed the peak hour O&D passenger threshold is 1,125 for courtesy shuttles, 294 for taxis/limos on the departures curb, and 330 for taxis/limos on the arrivals curb. The curbside utilization associated with each of these thresholds will exceed the maximum of 1.7 (LOS D) per the ACRP recommendation. Since overall demand for vehicle parking stalls on the curbside will not exceed the maximum utilization, a reallocation of the existing curbside will increase the LOS for these transportation modes. For reference purposes, the corresponding peak hour demand threshold for private vehicles and rental car shuttles is approximately 1,250 and 950 on the departures curb and 900 and 1,150 on the arrivals curb respectively. The threshold for public transit is approximately 230 on the arrivals curb.

The DOA has also recently announced a temporary agreement with the Uber Technologies to begin TNC services at PBI. While Uber drivers must remain outside a 'virtual perimeter', the continued use and growth of this service could impact the curbside length requirements for taxis/limos. The DOA has commissioned a separate ground transportation study to evaluate the impacts of TNCs on the ground transportation system and develop a plan for the future management of all ground transportation modes available at PBI.

Table 7.3: Transportation Mode Split

Transportation Mode	Arrivals Curb	Departures Curb
Private Automobile[1]	30%	40%
Taxi/Limo	10%	10%
Rental Car Shuttles	25%	25%
Courtesy Shuttles	7%	0%
Public Transit	3%	0%

Note:

(1) Another 25% of private automobiles is assumed to utilize one of the parking facilities (either on-airport or off-airport)

Table 7.5: Forecast Curbside Demand

Year	Arrivals			Departures		
	Existing Curbside Length	Required Curbside Length	Curbside Utilization Factor	Existing Curbside Length	Required Curbside Length	Curbside Utilization Factor
2020	1,510	1,185	0.8	1,235	1,170	0.9
2025	1,510	1,320	0.9	1,235	1,270	1
2030	1,510	1,420	0.9	1,235	1,400	1.1
2035	1,510	1,555	1	1,235	1,500	1.2

Table 7.4: 2014 Terminal Curbside Utilization

Transportation Mode	Average Vehicle Occupancy Rate	Arrivals								Departures							
		Peak Hour O&D Deplanements[1]	Number of Vehicles	Average Curbside Dwell Time (Minutes)	Required Curbside Stalls[2]	Average Vehicle Stall Length (ft)	Required Curb Length (ft)	Existing Curb Length (ft)	Curbside Utilization Factor	Peak Hour O&D Enplanements[1]	Number of Vehicles	Average Curbside Dwell Time (Minutes)	Required Curbside Stalls[2]	Average Vehicle Stall Length (ft)	Required Curb Length (ft)	Existing Curb Length (ft)	Curbside Utilization Factor
Private Vehicles	1.3	450	346	5.2	39	25	975	680	1.4	599	461	3	30	25	750	955	0.8
Taxi/Limo	1.5	150	100	2	5	25	125	140	0.9	150	100	2	5	25	125	140	0.9
Rental Car Shuttle	10	375	37	6	5	30	150	270	0.6	375	37	3.5	3	30	90	140	0.6
Courtesy Shuttle	10	2102	21	6	3	30	90	270	0.3	-	-	-	-	-	-	-	-
Public Transit	5	902	18	10	4	30	120	150	0.8	-	-	-	-	-	-	-	-
Total		**1,274**	**522**		**56**		**1,460**	**1,510**	**1**	**1,124**	**598**		**38**		**965**	**1,235**	**0.8**

Notes:

(1) Refer to the Aviation Activity Forecasts for existing and forecast peak hour enplanements and deplanements; Courtesy Shuttle and Public Transit includes both enplanements and deplanements since they are picked up and dropped off on one level
(2) Required number of stalls includes a 30% contingency

7.1.3 Landside Support Facilities

For the purposes of this Master Plan, landside support facilities include the airport parking facilities operated by the DOA and rental car facilities.

7.1.3.1. Airport Parking

On-airport parking at PBI consists of public parking (9,632 spaces) and employee/crew parking (954 spaces) as depicted in **Figure 7.5**. The public parking spaces are provided via four facilities: Long-Term, Economy, Short-Term, and Premium. Additionally, a cell phone lot is provided as an alternative for those waiting to pick up arriving passengers.

Public Parking

The ACRP Report 25, *Airport Passenger Terminal Planning and Design Guidebook* recommends a low of 900 or a high of 1,400 public parking spaces are provided for every one million enplanements. However, the data available on actual parking facility utilization was used as the basis for this analysis and as a comparison to the ACRP recommendation (summarized in **Table 7.6**).

The utilization of each parking facility was determined by a combination of overnight vehicles and the maximum daytime vehicle accumulation. Overnight vehicles are those that remain 24 hours or more while daytime vehicles are those that enter and exit on the same day. Overnight vehicle counts were obtained from PBI while the maximum daytime vehicle accumulation for each facility were calculated utilizing entry and exit transaction records from the parking revenue control system.

As illustrated in **Figure 7.6** and **Figure 7.7**, existing capacity is sufficient to accommodate the peak 2014 utilization for each facility except the economy parking lot which experienced a shortage around the Thanksgiving and Christmas holidays[1]. However, this analysis only incorporates the average 'busy day'[2] of the peak month as the 'design day' for the parking facility requirements.

Table 7.6: ACRP Recommended Public Parking Spaces

Year	Enplanements	ACRP Recommendation	
		Low	High
2014	2,940,798	2,647	4,117
2015	3,002,439	2,702	4,203
2020	3,401,173	3,061	4,762
2025	3,722,382	3,350	5,211
2030	4,058,835	3,653	5,682
2035	4,423,373	3,981	6,193

1 *Between November 24-30 and December 20-31 respectively*

2 *Average of the top five busiest days during the peak month*

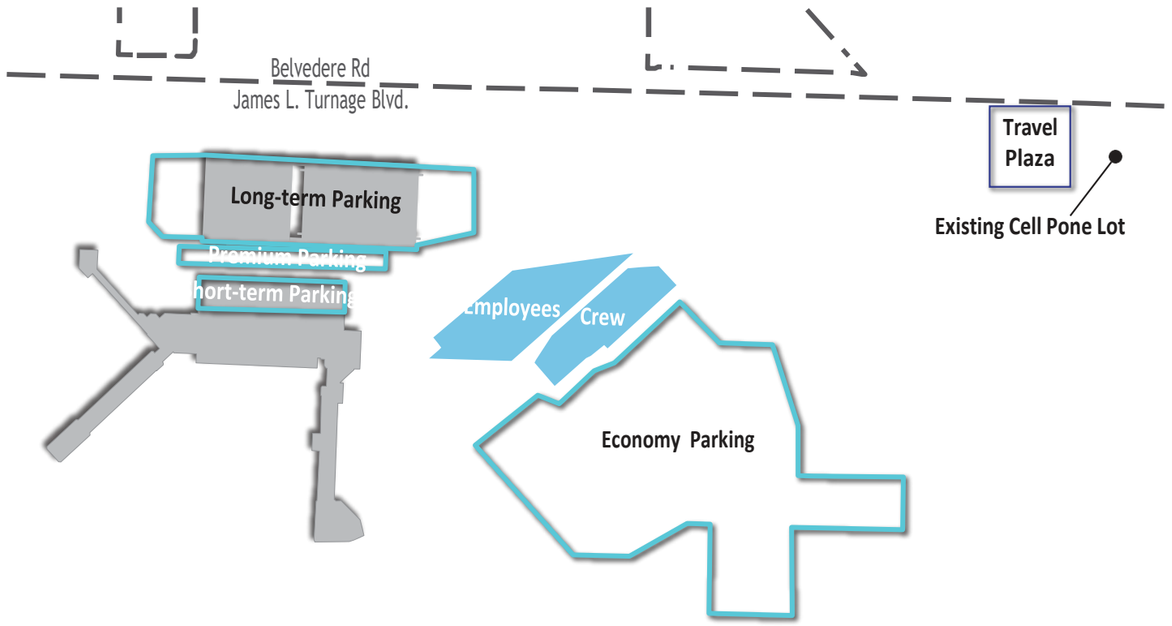


Figure 7.5: Existing Parking Facilities
Source: AECOM (2016)

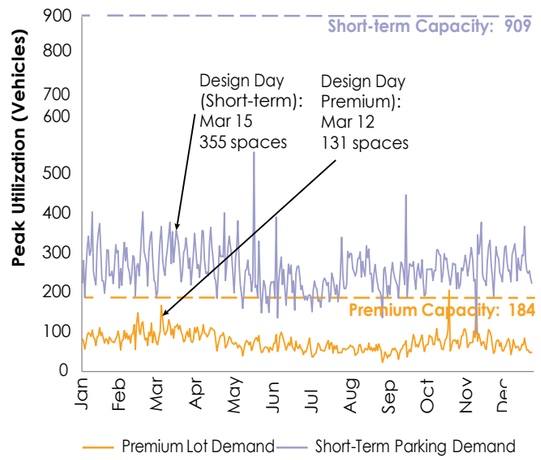


Figure 7.6: Long-Term & Economy Parking Demand
Sources:

(1) PBI 2014 overnight vehicle counts; parking entry/exit transaction records
(2) AECOM analysis

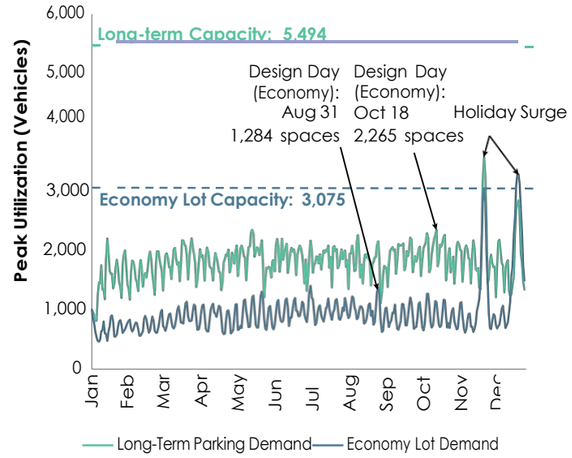


Figure 7.7: Short-Term & Premium Parking Demand
Sources:

(1) PBI 2014 overnight vehicle counts; parking entry/exit transaction records
(2) AECOM analysis

The peak months for the Long-Term and Economy parking facilities are October and August respectively. The associated 'design day' demand is 2,265 and 1,284 spaces. The peak month for Short-Term and Premium parking facilities is March with demand at 355 and 131 spaces respectively. **Table 7.7** summarizes the key 2014 parking facility utilization rates.

The number of parking spaces required for each facility during the planning horizon is based on annual enplanements. For example, each percentage increase in annual enplanements increases the parking space requirements by one percent based on 2014 demand. However, an additional buffer is added to reduce the time necessary to find a parking space and increase the LOS. For the purposes of this analysis, a 5% buffer is added to Long-Term and Economy parking while a 10% buffer is added to Short-Term and Premium parking.

Table 7.8 provides the parking requirements to accommodate demand throughout the planning horizon based on the design day while **Table 7.9** provides the requirements based on the annual peak day. Numbers in red indicate a deficiency in existing capacity. For example, 190 Premium spaces should be provided in 2025 which is more than the existing capacity of 184.

The recommended number of parking spaces for the design day is slightly more than the ACRP high estimate. The total number of parking spaces currently available is sufficient to accommodate forecast enplanements on the design day throughout the planning horizon. However, premium parking will be at full capacity when enplanements reach approximately 3.7 million. While the other parking facilities will have at least 20% capacity available for the overflow, additional premium spaces could be made available if desired.

Demand for all parking on the annual peaks will exceed the capacity of all existing parking lots when enplanements reach approximately 3.5 million.

Employee/Crew Parking

The number of employee parking spaces needed varies due to the shift nature of airport employment. As data on the usage of the employee parking lot was unavailable at the time of this analysis, industry standards were applied. The ACRP Report 25 recommends providing between 250 and 400 employee parking spaces for every one million enplaned passengers.

Table 7.10 summarizes the ACRP recommended number of employee parking spaces for both the low (250 spaces per million enplanements) and high (400 spaces per million enplanements) estimates. As illustrated in **Figure 7.8**, it is anticipated that employee/crew parking demand will exceed capacity when annual enplanements are approximately 3.8 million based on the low estimate. It is recommended that additional employee parking is provided when demand dictates.

Table 7.7: 2014 Parking Facility Utilization

Parking Facility	Average Daily Demand	Average Daily Utilization	Annual Peak Demand	Peak Utilization	Design Day Demand	Design Day Utilization
Long-Term	1,830	33%	3,573	65%	2,265	41%
Economy	961	31%	3,285	107%	1,284	42%
Short-Term	260	29%	557	61%	355	39%
Premium	75	41%	206	112%	131	71%

Table 7.8: Design Day Parking Requirements

Year	Enplanements	Recommended Public Parking Spaces				
		Long-Term	Economy	Short-Term	Premium	Total
2014	2,940,798	2,379	1,349	391	145	4,264
2015	3,002,439	2,430	1,380	400	150	4,360
2020	3,401,173	2,760	1,570	460	170	4,960
2025	3,722,382	3,030	1,720	510	190	5,450
2030	4,058,835	3,310	1,880	560	210	5,960
2035	4,423,373	3,610	2,050	620	230	6,510

Notes:

(1) Includes 5% buffer for Long-Term & Economy and 10% buffer for Short-Term & Premium

Table 7.9: Annual Peak Day Parking Requirements

Year	Enplanements	Recommended Public Parking Spaces				
		Long-Term	Economy	Short-Term	Premium	Total
2014	2,940,798	3,752	3,450	613	227	8,042
2015	3,002,439	3,840	3,530	630	240	8,240
2020	3,401,173	4,350	4,000	720	280	9,350
2025	3,722,382	4,770	4,380	790	310	10,250
2030	4,058,835	5,210	4,780	870	340	11,200
2035	4,423,373	5,680	5,210	950	380	12,220

Notes:

(1) Includes 5% buffer for Long-Term & Economy and 10% buffer for Short-Term & Premium

Table 7.10: Employee Parking Capacity & Requirements

Year	Enplanements	Recommended Employee Parking Spaces			
		Low	Surplus / (Deficit)	High	Surplus/ (Deficit)
2014	2,940,798	735	219	1,176	(222)
2015	3,002,439	751	203	1,201	(247)
2020	3,401,173	850	104	1,360	(406)
2025	3,722,382	931	23	1,489	(535)
2030	4,058,835	1,015	(61)	1,624	(670)
2035	4,423,373	1,106	(152)	1,769	(815)

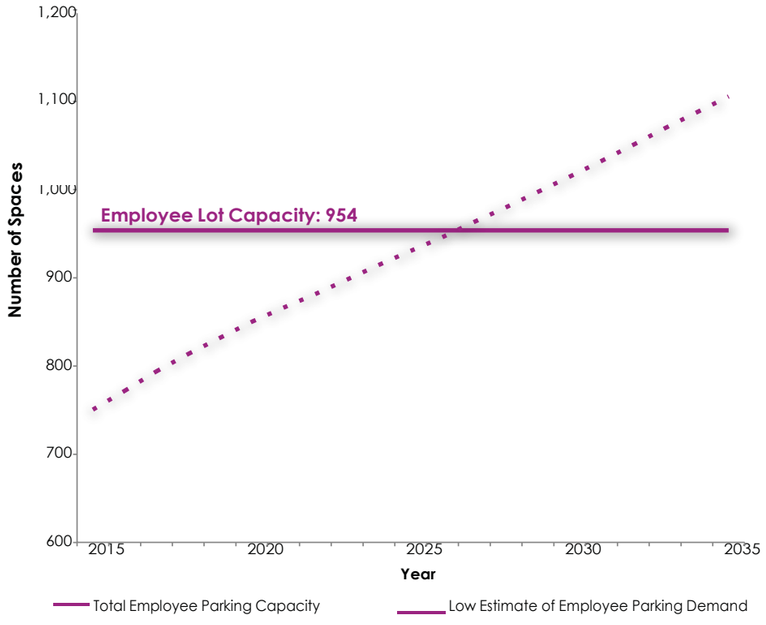


Figure 7.8: Low Estimate of Employee Parking Demand

Sources:

(1) ACRP Report 25

(2) AECOM analysis

7.1.3.2. Rental Car Facilities

Facility requirements for rental car services are ultimately determined by the business strategies of the individual rental car companies. However, it is important to allocate adequate operational space based on the future passenger volumes to enhance the overall LOS and maximize revenue potential.

Three primary rental car companies (Enterprise Rent-A-Car, Avis Rent-A-Car, and Hertz) provide service at PBI through eight brands. Enterprise provides service through the Alamo Rent-A-Car and National brands. Avis Rent-A-Car provides service through the Budget Rent-A-Car brand. Hertz provides service through the Dollar Rent-A-Car and Thrifty Car Rental brands. **Figure 7.9** identifies the locations and capacity of the rental car facilities.

Rental car facilities typically include an operations center (building), vehicle service area, and vehicle parking stalls (return, ready, and storage). After vehicles are returned and checked for mileage and damage, they are transferred to the service area for fueling, cleaning, and maintenance prior to being moved to either the ready area for subsequent rentals or the storage area. Collectively, the rental car companies provide approximately 1,012 ready stalls, 841 return stalls, and 1,720 storage stalls (not including those available in the east and west overflow lots).

For the purposes of this analysis, rental car demand is based on the following:

- Percentage of Peak hour O&D passengers renting a vehicle (Ready/Return)
- Average occupancy per vehicle (Ready/Return)
- ADPM enplanements and deplanements
- Availability of returned vehicles (Storage)

According to rental car audit reports (2012-2014,) and similar to passenger enplanements and aircraft operations, the peak month for rental car transactions has consistently occurred in March. On occasion, demand exceeds storage capacity and some rental car companies must utilize the overflow lots for storage. One lot is located to the east of air cargo building (± 356 stalls) and the other is in the airport maintenance facilities area to the west of passenger terminal building (± 269 stalls). However, demand for storage areas is based on the ADPM and not the annual peak when the extra storage is typically used.

Similar to methods incorporated at peer airports, the analysis assumes 25% to 35% of peak hour passengers rent a vehicle and that each rental is occupied by an average of 1.3 passengers. It is also assumed that 70% of rental car returns, at a minimum, are serviced and returned to ready spaces during the peak hour. The other 30% are placed in storage. Additionally, a contingency is included to account for local customer demand, flight delays, and other factors that could impact the amount of ready and return spaces needed.

Figure 7.10 illustrates the conservative scenario of required spaces (35% of passengers renting vehicle) in relation to existing capacity. It is estimated between that 700-950 return stalls, 900-1,300 ready stalls, and 1,400-1,950 storage spaces are needed to accommodate expected demand in 2035. Therefore, it is recommended that additional ready stalls are provided by 2025 and additional return and storage stalls are provided by 2030.

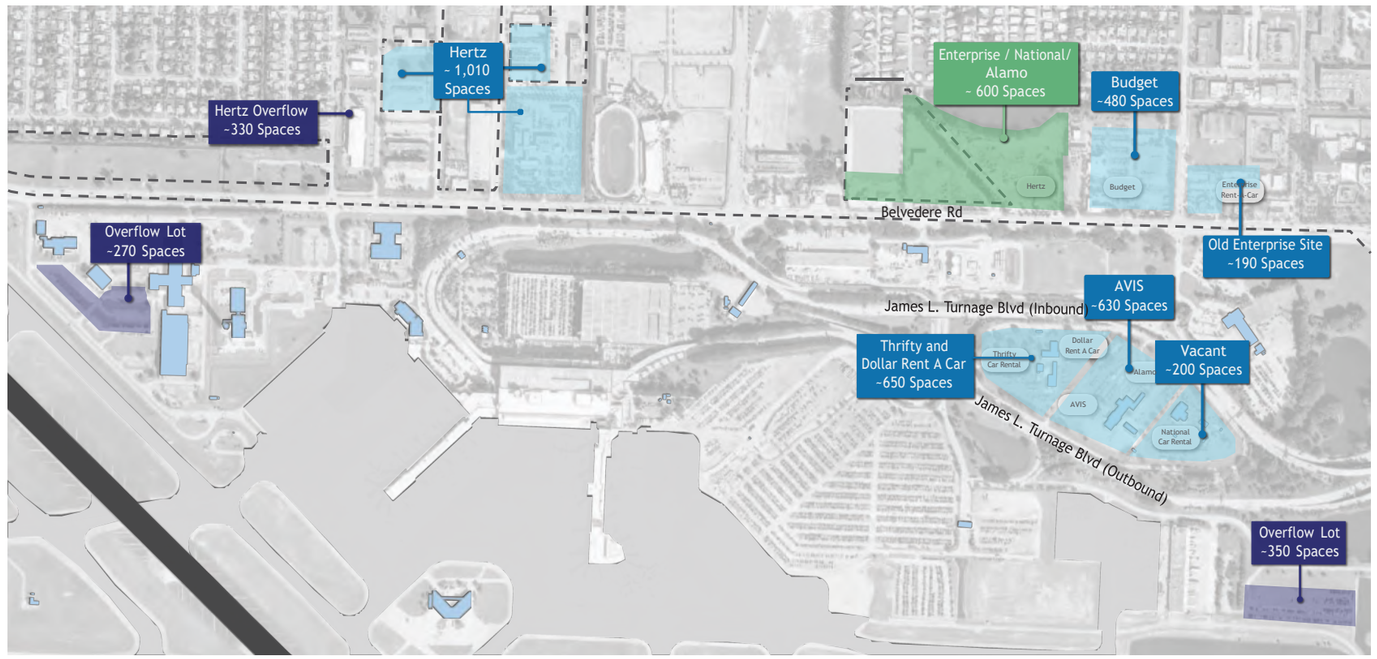


Figure 7.9: Existing Rental Car Locations and Capacity
Source: Rental car companies at PBI (2015)

Figure 7.10: Conservative Rental Car Demand Forecast
Sources:

(1) (Rental car companies at PBI (2015)
(2) AECOM Analysis

7.1.4 Summary of Landside Facility Requirements

The DOA must work closely with other transportation entities such as FDOT, Palm Tran, and rental car service providers to maximize the perceived convenience of PBI. Based on the existing facilities available and the anticipated demand, the following landside facility improvements are recommended:

- Maximize the integration of planned I-95 Interchange improvements at Belvedere Road and Southern Boulevard as well as provide a direct connection to I-95 for air cargo operators
- Provide additional employee/crew parking
- Provide additional area for rental car ready, return, and storage stalls
- Coordinate with Palm Tran to provide efficient transit services to the West Palm Beach Intermodal Transit Center and to the new stations for Tri-Rail, All-Abroad Florida, and Tri-Rail Coastal Link services

7.2 Landside Alternatives Development Plan

In conjunction with this Master Plan, the DOA initiated a separate ground transportation study to evaluate the existing ground transportation system at PBI. The intent of the study is to identify potential modifications which will improve the efficiency of the system, stimulate the DOA's goal of providing superior ground transportation services at PBI, and minimize initial capital costs as well as overall administrative costs. The following evaluates other potential improvements to landside facilities and services.

7.2.1 Air Cargo Connection to I-95

Access to the air cargo facility is provided from Perimeter Road. Access to Perimeter Road is currently provided from Belvedere Road (at N Florida Mango Road), Australian Avenue, James L. Turnage Boulevard, or Southern Boulevard (at Kirk Road). The existing ingress and egress routes between I-95 and the air cargo facility require multiple stops and turns which increases transit time as well as fuel and labor costs. The following sections summarize the analysis of alternatives which provide a direct connection to I-95.

7.2.1.1. Air Cargo Ingress

The existing ingress route from I-95 to the air cargo facility is provided via the I-95 Southern Boulevard Interchange and Australian Avenue or the I-95 James L. Turnage Boulevard Interchange. As illustrated in **Figure 7.11**, four alternative air cargo ingress routes were developed to provide a direct connection to I-95. A "no-build" alternative was also considered due to the significant costs associated with constructing elevated road structures and mitigation of environmental features as compared to the overall improvement for air cargo operations.

Alternative 1

Alternative 1 proposes a new elevated ramp on James L. Turnage Boulevard prior to the existing rental car facilities. This connection would shorten the total travel distance by approximately 3,600 feet but would require a relatively steep grade and tight turning radius which would limit travel speed to around 15 mph. Trucks typically travel at 40 mph on James L Turnage Boulevard and with a limited amount of distance for deceleration, this alternative can result in safety issues and traffic delays. Additionally, the geometry and significant elevation transitions may require complicated structural elements as well as environmental impacts.

Alternative 2

Alternative 2 proposes a new connection from Australian Avenue to Perimeter Road across a small portion of the adjacent wetland. While Alternative 2 is relatively inexpensive compared to Alternative 1, the new route does not provide a significant reduction in travel distance and also introduces three existing traffic lights on the James L. Turnage Boulevard Interchange ingress route[3].

Alternative 3

Alternative 3 introduces two new exit-ramps along the James L. Turnage Boulevard Interchange, each descending directly to a signalized intersection at Australian Avenue. Access to the air cargo facility is provided via a new connection to Perimeter Road from Australian Avenue similar to the one proposed in Alternative 2. This alternative reduces the total ingress travel distance by approximately 3,500 feet but would require significant capital investment and impact existing infrastructure between I-95 and Australian Avenue.

Alternative 4

Alternative 4 maintains the southbound exit-ramp as proposed in Alternative 3 but moves the proposed northbound exit-ramp along the Southern Boulevard Interchange south to tie into the existing Perimeter Road access point from Australian Avenue. The proposed northbound exit-ramp crosses over the existing I-95 structure, descends over Pine Lake, and connects to the Perimeter Road/Australian Avenue intersection. Compared to the existing ingress route from the James L. Turnage Boulevard northbound interchange, the new exit would reduce the total ingress travel distance by approximately 6,600 feet. However, Alternative 4 represents the most expensive and environmentally impactful alternative.

Alternatives Evaluation

Given the significant capital investment, environmental impacts, and relatively limited benefit to cargo operations, the no-build alternative was selected as summarized in **Table 7.11**.

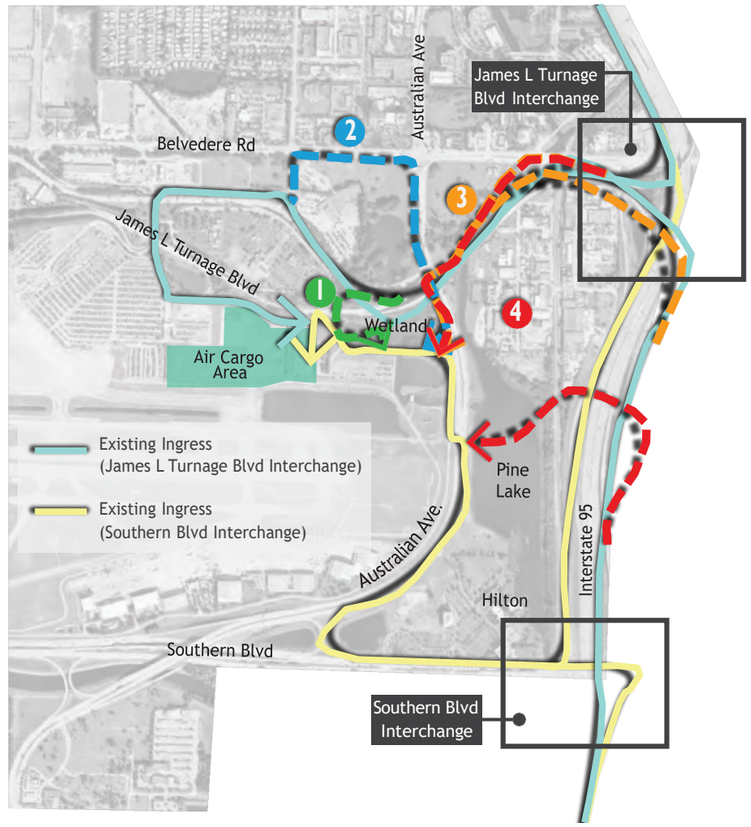


Figure 7.11: Existing & Proposed Ingress to Air Cargo Area
Source: AECOM (2015)

Table 7.11: Cargo Ingress Alternatives Evaluation

Evaluation Criteria	Alternative				
	No-Build	1	2	3	4
Total Travel Distance	Negative	Positive	Negative	Neutral	Positive
Compatibility with Existing Conditions	Neutral	Negative	Neutral	Negative	Negative
Probable Cost	Positive	Neutral	Neutral	Negative	Negative
Environmental Impact	Neutral	Negative	Neutral	Neutral	Negative

Positive Neutral Negative

3 *Perimeter Road & Belvedere Road; Belvedere Road & Australian Avenue; Australian Avenue & James L. Turnage Boulevard*

7.2.1.2. Air Cargo Egress

The existing egress route to I-95 from the air cargo facility is provided via Australian Avenue and the I-95 Southern Boulevard Interchange or Australian Avenue and I-95 Belvedere Road Interchange. As illustrated in **Figure 7.12**, two alternatives were developed to provide a direct connection to I-95 when exiting the air cargo facility. Similar to the Ingress routes, a "no-build" alternative was also considered due to the significant costs associated with constructing elevated road structures and mitigation of environmental features as compared to the overall improvement for air cargo operations.

Alternative 1 (**Figure 7.13**) proposes a reconfiguration of an existing entrance ramp to outbound James L. Turnage Boulevard from Perimeter. The existing access ramp only accommodates traffic traveling east on Perimeter Road. This alternative reconfigures the ramp to provide access from both eastbound and westbound Perimeter Road. Access to I-95 north and south is provided via the existing James L. Turnage interchange points. However, the new connection to James L. Turnage Boulevard requires the relatively low speed air cargo trucks to merge with passenger traffic traveling at a much higher speed.

Alternative 2 (**Figure 7.14**) reconfigures Perimeter Road to the northeast of the air cargo facility to provide a direct connection to the James L. Turnage Boulevard I-95 ramp. The new ramp provides an adequate acceleration lane in order to allow air cargo trucks to obtain a suitable speed for merging with passenger traffic. While this alternative reduces total egress travel distance by 4,200-feet, it will likely impact an adjacent wetland area.

Based on the alternatives evaluation summarized in **Table 7.12**, Alternative 2 was selected as it provides a significant decrease in travel distance to I-95 north and south without a significant financial investment.

Table 7.12: Air Cargo Egress Alternatives Evaluation

Evaluation Criteria	Alternative		
	No-Build	1	2
Total Travel Distance	Negative	Positive	Positive
Compatibility with Existing Conditions	Neutral	Negative	Positive
Probable Cost	Positive	Neutral	Neutral
Environmental Impact	Neutral	Positive	Neutral

Positive Neutral Negative

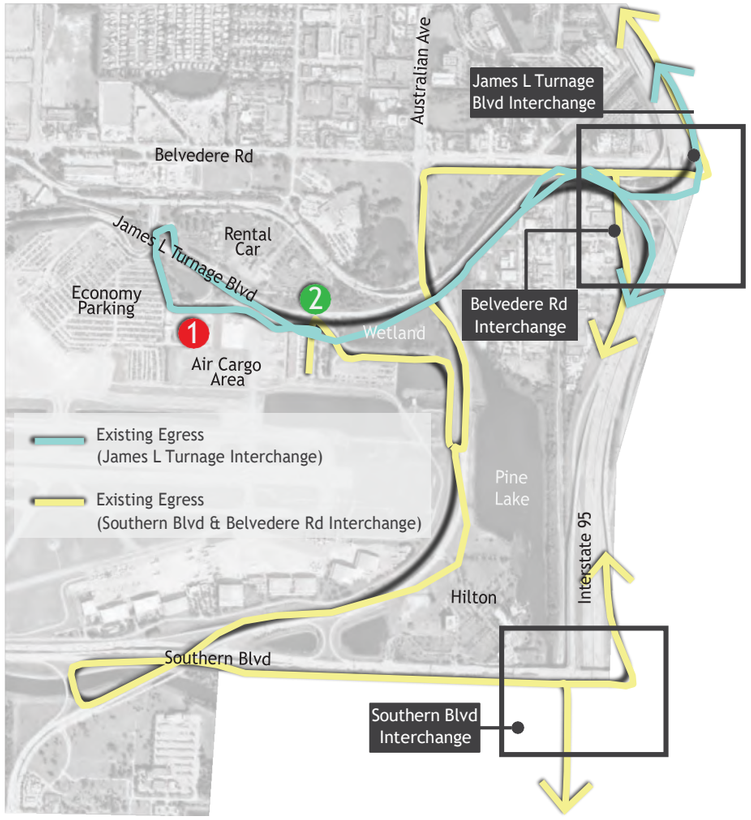


Figure 7.12: Existing & Proposed Egress from Air Cargo Area
Source: AECOM (2015)

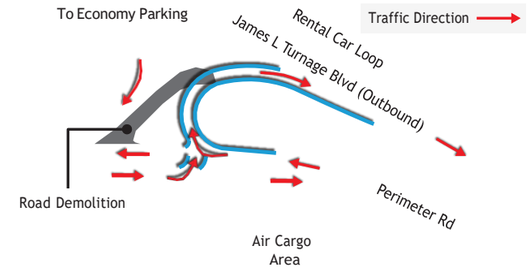


Figure 7.13: Air Cargo Egress - Alternative 1
Source: AECOM (2015)

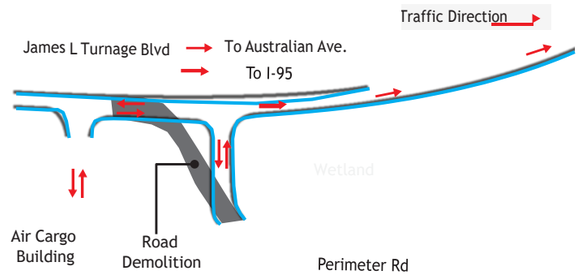


Figure 7.14: Air Cargo Egress - Alternative 2
Source: AECOM (2015)

7.2.2 Landside Support Facilities

In lieu of identifying and evaluating detailed development alternatives for each landside support facility, a comprehensive review of available parcels was conducted to determine the most suitable use for each. Proposed land uses, including the location of airport parking and rental car facilities, are depicted in **Figure 7.15** and are further discussed in the following sections.

7.2.2.1. Rental Car Facilities

The total amount of rental car spaces required is approximately 4,200 and includes ready, return, and storage spaces. Based on the size of the existing rental car facilities, 750 SF is allocated for each required space to account for vehicle parking, driving lanes, and rental car facilities among other features. Accordingly, a total of approximately 72 acres is recommended to accommodate anticipated rental car facility demand.

The existing rental car facilities total (±54 acres) are expected to remain in operation throughout the planning horizon. However, no existing airport-owned parcel is specifically allocated to rental car expansion and no additional property acquisitions are recommended for the purposes of rental car expansion. While it is possible that airport-owned parcels allocated for non-aviation / commercial development may be utilized for rental car expansion, it will ultimately be a business decision by the rental car agencies on expansion needs and methods.

7.2.2.2. Land Use Opportunities

In addition to the identification of parcels for rental car facilities, other available parcels were identified and reserved for future development, such as commercial opportunities, airport support functions, and others. Parcels which revise the current Palm Beach County zoning designation will require a Comprehensive Plan amendment. **Table 7.13** compares the existing and future on-airport land uses, including the overall percentage of land allocated to a particular land use.

Commercial/Non-Aviation Development

Planning and design for development of Parcel I is currently on-going and is expected to include a new hotel, offices, and retail facilities per the current Palm Beach County zoning. Accordingly, this site is identified for commercial development. Similarly, the site of the new Travel Plaza and the area west of it, including the existing fuel farm and air freight building, is identified as commercial. The proposed relocation of the Air Freight building to the existing Air Cargo building provides an opportunity to utilize the six acre site west of the fuel farm facility for commercial purposes.

The DOA is in the process of acquiring the remaining properties within Parcel C. It is anticipated the south portion of this parcel will be used for non-aviation/ commercial development.

For the purposes of this Master Plan, Parcels E and F are reserved for non-aviation/commercial development. However, these parcels could accommodate a relocated economy or employee/crew parking lot if needed. While development of Parcel F is possible in the near-term, development of Parcel E is restricted by the proposed decommissioning of Runway 14-32.

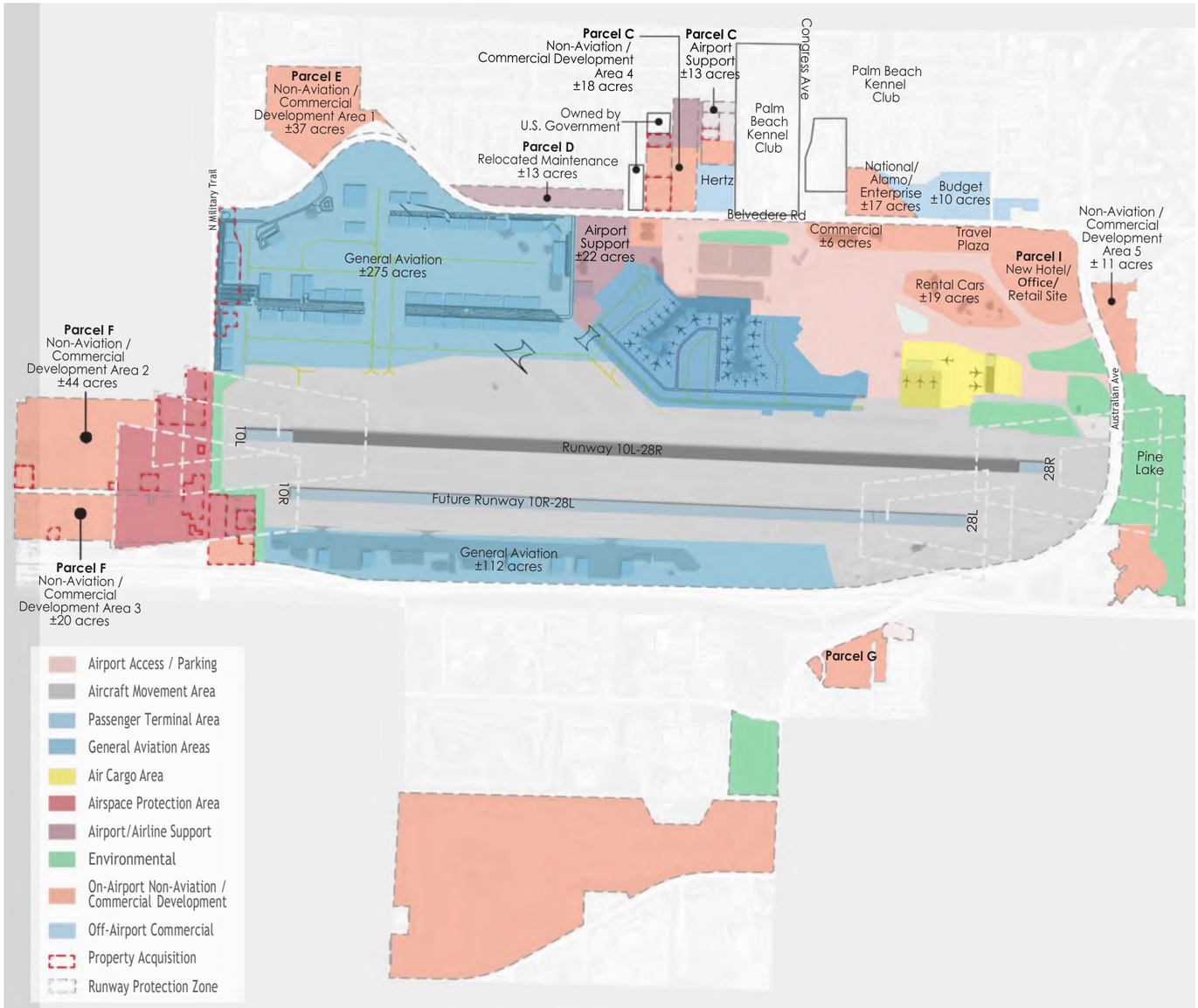


Figure 7.15: Proposed On-Airport Land Uses for Existing and Future PBI Parcels
Source: AECOM (2015)

Airport Support

As previously noted, it is recommended that the existing airport maintenance compound is relocated to existing DOA Parcel D along Belvedere Road. Therefore, Parcel D is changed to from a commercial development to airport support land use.

Parcel C, along 5th Street, will also be reserved for airport/airline support facilities. All but an approximately 1 acre parcel at the 5th Street site is currently owned by the DOA. It is recommended that this parcel is acquired and used for the support facilities.

The existing ATCT will remain as airport support and will accommodate the proposed ARFF facility.

Airspace Protection

While the existing airspace protection area north of Runway 14-32 (Parcel E) will be converted to non-aviation/commercial once Runway 14-32 is decommissioned, it is proposed that the parcels within the Runway 10L and Runway 10R Runway Protection Zones is reserved for airspace protection. This will require obtaining control of additional properties not currently owned by the DOA.

Table 7.13: Proposed On-Airport Land Uses

Land Use Type	Description	Acres		Proposed Percentage of Total	Change from Existing
		Existing	Proposed		
Aircraft Movement Area	Runways and taxiways	642.6	581.5	30.3%	-4.1%
Passenger Terminal Area	Terminal building and aircraft parking apron	100.6	105.9	5.5%	0.1%
Airport Access and Parking	Access Roads and Parking lots	145.2	145.2	7.6%	-0.2%
General Aviation Areas	Fixed base operators, and the associated hangars, terminals, aprons	183.4	387.0	20.2%	10.4%
Air Cargo Area	Distribution building, truck loading docks, and cargo apron	15.2	27.95	1.5%	0.6%
Airspace Protection	Runway protection zone for Runway 14 end	36.2	67.7	3.5%	1.6%
Airport/Airlines Support	Freight building, fuel farms, ground handling service provider, airline catering services, airport maintenance, ARFF station, ATCT	68.0	51.2	2.7%	-1.0%
Environmental	Wetlands, ponds, canals, and green space	132.1	108.9	5.7%	-1.4%
Non-Aviation / Commercial	Areas used or available for use by commercial enterprises	431.4	441.5	23.0%	-0.1%
Aviation Development	Golfview Area for future GA expansion	109.8	-		-5.9%
Total		**1,864.5**	**1,916.8**	**100.0%**	**0.0%**

7.2.2.3. Multimodal Connectivity

The current ground transportation modes at PBI include private vehicles, taxicabs/limousines, courtesy shuttles, TNCs (such as Uber), and Palm Tran buses. Direct rail service is currently unavailable at PBI. This section evaluates potential ground transportation improvements intended to maximize passenger convenience, system efficiency, and sustainability. A separate study to evaluate and recommend modifications to the DOA's management and fee structure for ground transportation services is in the process of being completed at the time of this Master Plan.

While detailed data about existing ground transportation usage is not available, public transportation at PBI is only used by a small fraction of passengers due to the relatively low frequency and long travel times associated with bus services. Accordingly, various alternatives for improving public transportation availability are explored in the following sections.

Three alternative transportation modes with the potential to improve the convenience and effectiveness of public transportation services were identified and compared for the purposes of this Master Plan. The alternatives are summarized for informational purposes as the selected alternative(s) will largely depend upon a detailed market analysis, capital availability, and the operator (whether it is a private company, Palm Beach County, or other government agency).

Alternative 1 - Express Buses

The Palm Beach MPO 2040 LRTP specifies various projects that are eligible for federal and state funding in the region. As part of the LRTP "Desired Plan", express bus routes along SR 80 and Australian Avenue which connect PBI to major destinations throughout the county are proposed.

Express buses generally operate at a higher frequency than regular bus service and only stop at major destinations, such as important landmarks, business centers, and transportation hubs. On occasion, express buses are provided designated operation lanes to mitigate otherwise congested arterial roads. These arrangements decrease transit times while increasing capacity compared to regular bus services. However, this mode of transportation maintains some level of restrictions associated with regular bus service, such as traffic lights and other route limitations.

Alternative 2 - Light Rail

Light rail, or automated people movers (APM), is another conventional ground service mode incorporated at numerous U.S. airports for over three decades. Tampa International Airport (TPA) was the first U.S. airport to implement APM service, providing a connection between the main terminal building and remote concourses. Similarly, MIA is connected to downtown Miami by Metrorail as well as various other neighborhoods and adjacent counties via Tri-Rail transfer stations.

Light rail trains operate on-schedule and stop at a series of stations along elevated or at-grade rail tracks. Each train is usually composed of several train cars accommodating approximately 60 to 100 passengers. In addition to capacity, the primary benefits of an APM are uninterrupted point-to-point service, frequency, and reliability. However, the APM system requires a significant capital investment and typically requires most passengers to stand throughout the duration of the trip.

Alternative 3 – Personal Rapid Transit (PRT)

Personal rapid transit (PRT) is an emerging category of APM. PRT is a driverless system which provides small four to six passenger vehicles that automatically transport passengers and their luggage non-stop between the terminal complex and destinations along designated guideways. Compared to the typical pre-determined operation and stops of light rail systems, the PRT systems operate on an on-demand basis. Additionally, the short wait, minimal travel time, and ability to sit during the trip maximize the passenger experience.

PRT vehicles are typically staged at a PRT station when not in use and provide bypass capability for those in use. Additionally, the required PRT infrastructure is generally smaller than light rail.

Light Rail (SkyTrain) at Miami International Airport
Source: Miami International Airport (2015)

PRT Station at London Heathrow Airport
Source: MobileMag.com (2015)

Potential Rail Alignment

While the express bus alternative can utilize existing roads, the light rail or PRT alternative will require infrastructure development. As such, a potential rail alignment was identified. As depicted in **Figure 7.16**, the proposed light rail/PRT alignment consists of an Airport Loop and a Downtown Loop. The Airport Loop connects remote parking lots and rental car facilities to the commercial passenger terminal. The Downtown Loop connects the Amtrak/Tri-Rail station, All-Aboard Florida/Tri-Rail Coastal Link station, and major destinations such as the Convention Center & City Place. Each loop is connected via the existing Amtrak/Tri-Rail link. In addition to the primary loops, an optional south branch would provide a connection to the Hilton Hotel and future Tri-Rail station (per the 2040 LRTP) at the intersection of Interstate 95, Southern Boulevard, and Australian Avenue.

Transportation Mode Comparison

Table 7.14 summarizes the characteristics, advantages, and disadvantages of each mode. Express buses provide increase the frequency of bus service at lower capital costs while light rail provides the highest capacity but is the most expensive to implement and most impactful to surrounding environments. A PRT system provides convenient service at moderate capital costs but is a relatively new mode of transport which lacks sufficient evidence to evaluate the potential benefits versus costs.

Table 7.14: Alternative Transportation Mode Comparison

	Mode Type		
	Express buses	**Light rail**	**PRT**
Nature of Service	On-Schedule, Predetermined Stops	On-Schedule, Predetermined Stops	On-Demand, Non-Stop
Capital Costs[1,2]	$0.2 ~ $28 million per one way mile	$24 ~ $75 million per one-way mile	$10~$15 million per one-way mile
Operating Costs[3]	$3.66 per passenger trip	$ 3.32 per passenger trip	No proven operating costs data
Infrastructure	Operate on public roads	Could share ROW with Tri-Rail	Must build independent ROW
Maximum Capacity (pphpd)[3,4,5]	12,000	16,000	7,200 (theoretical)
Advantages	Higher frequency and few stops than regular buses Lowest capital investments	Higher capacity Mature technology	Direct service, short wait times Lower capital costs Smaller easements, less obtrusive infrastructure
Disadvantages	Higher operating costs Higher ridership requirements	Higher capital costs Higher space requirements Higher ridership requirements	Lower capacity Technology risks Regulatory issues

Notes:

(1) NTD (2013), 2012 National Transit Summaries and Trends
(2) FDOT (2011), Bus Rapid Transit Applications Phase II Report
(3) Muller, P. J. (N.D.), A Personal Rapid Transit/Airport Automated People Mover Comparison
(4) ITDP (2013), More Development for Your Transit Dollar – An Analysis of 21 North American Transit Corridors
(5) pphpd – passengers per hour per direction; Capacity is impacted by the size of fleet and service frequency. Actual system capacity could be lower because the demand in the region would hardly be high enough to justify maximum capacity

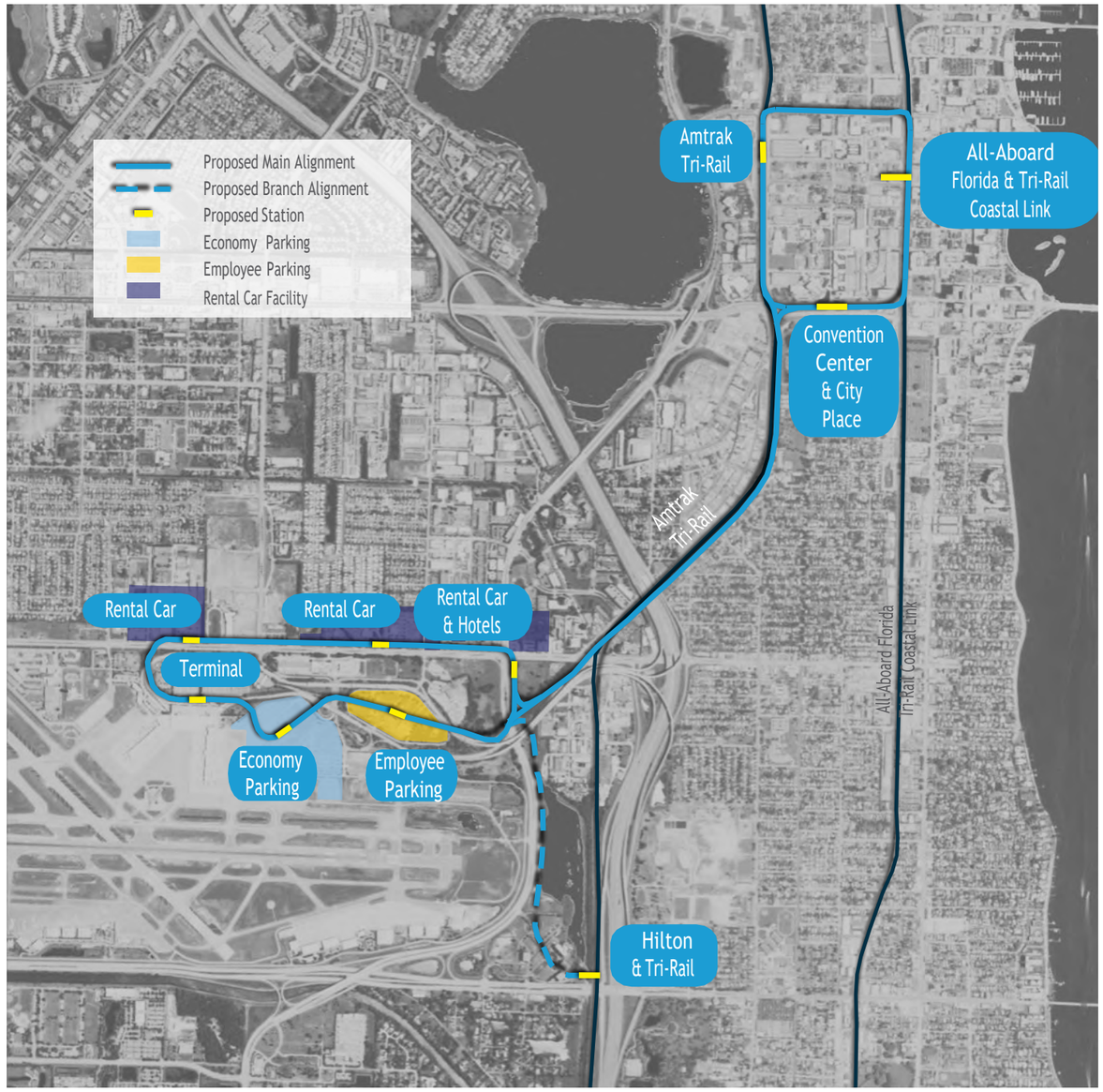


Figure 7.16: Potential Rail Alignment
Source: AECOM (2015)

Environmental Review

08

08 Environmental Review

This chapter provides preliminary information about existing environmental resources at PBI, the potential for development effects on those resources, and the rules and regulations that apply. The purpose is to identify important environmental issues for consideration early in the process and to set the stage for subsequent environmental reviews that will be necessary when proposed airport improvement projects are ready for FAA review and approval.

The environmental resources discussed in this chapter include those typically considered under FAA guidelines for implementing the National Environmental Policy Act (NEPA) pursuant to FAA Order 5050.4B, ***NEPA Implementing Instructions for Airport Actions***, and FAA Order 1050.1F, ***Environmental Impacts: Policies and Procedures***.[1] This chapter is not a NEPA document; rather, it is intended to set the stage for scoping and preparing NEPA documents if and when a proposed project or action is ready for FAA decision making. The environmental resources addressed in this chapter are:

- Air Quality
- Biotic Communities
- Floodplains
- Hazardous Materials
- Historic and Archaeological Resources
- Section 4(f) and Section 6(f) Resources
- Water Quality
- Wetlands
- Noise
- Sustainability

1 *NEPA is a federal law that promotes enhancement of the environment by requiring all branches of the government to give proper consideration to the environment prior to undertaking any major federal action that significantly affects the environment. NEPA requirements are invoked when airports, buildings, military complexes, highways, parkland purchases, and other federal activities are proposed. Environmental Assessments (EAs) and Environmental Impact Statements (EISs), which are assessments of the likelihood of impacts from alternative courses of action, are required from all Federal agencies and are the most visible NEPA requirements. [EPA]*

The inventory of existing environmental conditions was compiled based on desktop research using existing published documents including previous reports and plans, agency resource mapping, and GIS databases maintained by PBI. Other than site walks and visual inspections of key areas on the airport, no detailed surveys, delineations, or investigations were performed.

8.1 Air Quality

Airports, including aircraft, ground support equipment, and motor vehicle operations contribute emissions of air pollutants to the atmosphere and the levels of those emissions have the potential to increase or decrease as a result of airport improvements and changes. Emissions from aircraft and airport-related ground activities generally extend several miles from the airport. The air quality impact is thus a regional issue as well as a local issue. For this reason, the existing regional air quality must be considered along with that of the immediate airport vicinity.

8.1.1 Ambient Conditions

The Environmental Protection Agency (EPA) collects air quality monitoring data from various locations across each state. The results are used to calculate the Air Quality Index (AQI) rating for reporting daily air quality. As shown in **Table 8.1**, the AQI is divided into six categories with ranges from 0 to 500. The higher the AQI value, the greater the level of air pollution and the greater the health concern.

According to the 2015 AQI Summary for Palm Beach County, air quality percentage levels were "good" approximately 98% of the time and were "moderate" approximately 2% time. There were 0 days rated as "unhealthy for sensitive groups", "unhealthy", "very unhealthy", or "hazardous." The moderate days were attributable to higher than normal levels of particulate matter and/or ozone, but those levels were still within EPA-designated health standards.

8.1.2 National Ambient Air Quality Standards

The Clean Air Act is the comprehensive federal law that regulates air emissions from mobile and stationary sources. Among other things, this law requires the EPA to set National Ambient Air Quality Standards (NAAQS) and to work with state governments to improve air quality by reducing emissions in areas where the standards are not being met.

The EPA has set NAAQS for six "criteria" pollutants: ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, particulate matter, and lead. After working with states and considering information from air quality monitors, the EPA designates an area as "attainment" or "nonattainment". Geographic areas of the country where air quality is cleaner than the national standard are referred to as attainment areas. Areas that don't meet the national standard are referred to as nonattainment areas. According to the EPA and the Florida Department of Environmental Protection (FDEP), Palm Beach County (including the area surrounding PBI) is in attainment for all criteria pollutants. The general conformity requirements of the Clean Air Act do not apply to a Federal action located in an attainment area. Therefore, the requirements do not apply to projects or actions at PBI.

8.1.3 Greenhouse Gas Emissions, Climate Change and NEPA

Greenhouse gas (GHG) emissions continue to be an emerging issue for airports, the aviation industry, and the FAA. In July 2016, the EPA issued a finding that GHG emissions from aircraft endanger human health and the environment, clearing the way for a widely expected federal regulation.[2] One week later, the Council on Environmental Quality (CEQ) updated their guidance for considering the effects of GHG emissions and climate change in NEPA reviews.[3]

Pending the development and implementation of a federal standard or significance threshold for aviation-related GHG emissions, which could take several years, based on CEQ's latest guidance, there is expected to be increasing FAA requirements to quantify project-level GHG emissions and to consider the emissions in airport NEPA documents.

The FAA recommends that airports take the first step to reduce ground-based GHG emissions by estimating (or inventorying) the amount of GHG emissions from airport sources. Having a baseline inventory enables airports to do the following:

- Better understand GHG emissions trends
- Identify opportunities to reduce GHG emissions
- Set GHG reduction targets
- Track progress towards meeting targets

A baseline inventory provides the context needed to address GHG emissions in NEPA documents at the project level. The results can also be provided to Palm Beach County for inclusion in the larger, regional inventory.

Table 8.1: Air Quality Index Ratings

Range	Classification
0-50	Good
51-100	Moderate
101-150	Unhealthy for sensitive groups (children, elderly, and individuals with health conditions
151-200	Unhealthy
201-300	Very unhealthy
301-500	Hazardous

2 *Regulatory Announcement: EPA Finalizes First Steps to Address Greenhouse Gas Emissions from Aircraft Engines. EPA-420-F-16-036 (July 2016). Note: In 2009, the EPA issued a similar finding regarding new cars and light trucks.*

3 *Final Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews. Council on Environmental Quality (CEQ) Memorandum (August 2016).*

8.2 Biotic Communities

This section discusses the various fish, wildlife, and plant habitats at PBI including threatened or endangered species in the vicinity of the airport, nearby wildlife refuges and designated natural areas, and wildlife hazards specific to airport operations.

8.2.1 Cover Types and Habitat

PBI is substantially developed and covered with buildings and pavements. The remaining land use and cover patterns consists of either upland vegetation or wetlands and open waters. The upland areas are man-made or man-dominated open land covered with meadow grasses around the airfield and turf grasses in landscaped areas. A few isolated tree lines and disturbed forested areas occur along the east side and west side of the airport. The grasses are actively managed and mowed on a regular basis. Trees species include the slash pine, cabbage palm, live oak, and laurel oak. The trees are also actively managed to avoid potential obstructions and in accordance with the Airport Wildlife Management Plan.

Wetlands at PBI are associated with surface waters that function as part of the airport's stormwater management and drainage system. The surface water bodies are also man-made and include a lake, ponds, streams, and ditches used to convey or store stormwater. Agency resource mapping indicates there are three distinct types of wetlands on airport property: Lacustrine (wetlands that form around the perimeter of lakes and reservoirs); Palustrine (isolated, inland wetlands not associated with lakes or reservoirs); and Riverine (found in the channels of rivers and streams). No Marine or coastal Estuarine wetlands are mapped or reported at PBI.

Despite routine airfield maintenance practices that minimize habitat value, the surface waters within PBI are potential foraging areas for fish and wading birds such as egrets, herons, and white ibis. However, the upland areas provide very little habitat for wildlife due to the frequency of mowing and airport operations and the urban setting. Low-growing vegetation within the open areas and around the wetlands may provide habitat for a variety of local indigenous species such as lizards, snakes, and small mammals such as raccoons, rabbits, opossums, field mice, and armadillo. Large mammals that require larger areas of natural habitat and travel corridors between habitats are not expected due to habitat fragmentation and the man-dominated nature of the land uses within and surrounding PBI.

Grassland Habitat in Northwest Airport Property
Source: AECOM (2015)

Alligator along the West Canal in Southwest Airport Property
Source: AECOM (2015)

8.2.2 Threatened/Endangered Species and Critical Habitat

Under Section 7 of the Endangered Species Act, the USFWS and the NMFS have jurisdiction over federally-listed threatened, endangered, and candidate species. There are 32 listed species identified for Palm Beach County (see **Table 8.2**). Of those species, the Audubon's Crested caracara, Wood stork, and American alligator were observed during a 2010-2011 Wildlife Hazard Assessment for PBI. In addition, the USFWS has identified 34 migratory birds of concern for the Airport area. Migratory birds are protected by the Migratory Bird Treaty Act, and the Bald and Gold Eagle Protection Act. There are no known Bald eagle nests in the vicinity of PBI.[4]

Table 8.2: Federal Threatened and Endangered Species

Species	Scientific Name	Status
Birds		
Audubon's Crested caracara	Polyborus plancus audubonii	Threatened
Everglade Snail kite	Rostrhamus sociabilis plumbeus	Endangered
Florida scrub-jay	Aphelocoma coerulescens	Threatened
Ivory-Billed woodpecker	Campephilus principalis	Endangered
Kirtland's Warbler	Setophaga kirtlandii	Endangered
Piping plover	Charadrius melodus	Threatened
Red Knott	Calidris canutus rufa	Threatened
Red-Cockaded Woodpecker	Picoides borealis	Endangered
Whooping crane	Grus Americana	Experimental Population, Non-essential
Wood stork	Mycteria Americana	Threatened
Corals		
Staghorn coral	Acropora cervicornis	Threatened
Fish		
Smalltooth sawfish	Pristis pectinate	Endangered
Flowering Plants		
Beach jacquemontia	Jacquemontia reclinata	Endangered
Florida prairie-clover	Dalea carthagenensis floridana	Candidate
Four-Petal pawpaw	Asimina tetramera	Endangered
Johnson's seagrass	Halophila johnsonii	Threatened
Okeechobee gourd	Cucurbita okeechobeensis ssp. okeechobeensis	Endangered
Tiny polygala	Polygala smallii	Endangered
Insects		
Bartram's Hairstreak Butterfly	Strymon acis bartrami	Endangered
Florida Leafwing Butterfly	Anaea troglodyta floridalis	Endangered
Miami Blue Butterfly	Cyclargus thomasi bethunebakeri	Endangered
Lichens		
Florida Perforate cladonia	Cladonia perforate	Endangered
Mammals		
Florida panther	Puma concolor coryi	Endangered
Puma	Puma concolor (all subsp. Except coryi)	Similarity of Appearance (Threatened)
Southeastern Beach mouse	Peromyscus polionotus niveiventris	Threatened
West Indian Manatee	Trichechus manatus	Endangered
Reptiles		
American alligator	Alligator mississippiensis	Similarity of Appearance (Threatened)
American crocodile	Crocodylus acutus	Threatened
Eastern Indigo snake	Drymarchon corais couperi	Threatened
Green sea turtle	Chelonia mydas	Endangered
Hawksbill sea turtle	Eretmochelys imbricate	Endangered
Leatherback sea turtle	Dermochelys coriacea	Endangered

Source: USFWS, Information, Planning, and Conservation System (IPAC), Version 1.4 (retrieved 01/27/2015)

4 *FFWCC, Eagle Nest Locator (retrieved February 11, 2015)*

The FFWCC has jurisdiction over State-listed threatened and endangered species. According to the Florida Natural Areas Inventory, there are 49 State-listed species occurring in Palm Beach County (see **Table 8.3**). Of those species, the American alligator and 13 birds were observed during the 2010-2011 Wildlife Hazard Assessment. Those birds are the Endangered Wood stork, the Threatened Crested caracara, Least tern, and Southeastern American Kestrel, and the Species of Special Concern Black skimmer, Brown pelican, Burrowing owl, Limpkin, Little blue heron, Osprey, Snowy egret, Tricolored heron, and White ibis.

Under the Endangered Species Act, critical habitat is a USFWS term used to designate a habitat area essential to the conservation of a listed species, whether or not the area is actually occupied by the species at the time it is designated. There is no critical habitat at PBI. Under the Magnuson-Stevens Fishery Conservation and Management Act, essential fish habitat (EFH) includes "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity." According to the NMFS, none of the wetlands or surface water habitats at PBI are considered EFH.

Table 8.3: State Threatened and Endangered Species

Species	Scientific Name	Status	Species	Scientific Name	Status
Plants and Lichens					
Golden Leather Fern	Acrostichum aureum	Threatened	Small's Flax	Linum carteri var. smallii	Endangered
Meadow Jointvetch	Aeschynomene pratensis	Endangered	Celestial Lily	Nemastylis floridana	Endangered
Sea Lavender	Argusia gnaphalodes	Endangered	Burrowing Four-o'clock	Okenia hypogaea	Endangered
Four-petal Pawpaw	Asimina tetramera	Endangered	Hand Fern	Ophioglossum palmatum	Endangered
Many-flowered Grass-pink	Calopogon multiflorus	Endangered	Cutthroat Grass	Panicum abscissum	Endangered
Sand-dune Spurge	Chamaesyce cumulicola	Endangered	Tiny Polygala	Polygala smallii	Endangered
Perforate Reindeer Lichen	Cladonia perforata	Endangered	Bahama Brake	Pteris bahamensis	Threatened
Silver Palm	Coccothrinax argentata	Threatened	Giant Orchid	Pteroglossaspis ecristata	Threatened
Large-flowered Rosemary	Conradina grandiflora	Threatened	Fahkahatchee Ladies	Sacoila lanceolata var. paludicola	Threatened
Okeechobee Gourd	Cucurbita okeechobeensis	Endangered	Ray Fern	Schizaea pennula	Endangered
Coastal Vervain	Glandularia maritima	Endangered	Coastal Hoary-pea	Tephrosia angustissima var. curtissii	Endangered
Beach Jacquemontia	Jacquemontia reclinata	Endangered	Toothed Maiden Fern	Thelypteris serrata	Endangered
Atlantic Coast Florida Lantana	Lantana depressa var. floridana	Endangered	Banded Wild-pine	Tillandsia flexuosa	Threatened
Nodding Pinweed	Lechea cernua	Threatened	Dancing-lady Orchid	Tolumnia bahamensis	Endangered
Pine Pinweed	Lechea divaricata	Endangered			
Amphibians and Reptiles					
Gopher Frog	Rana capito	Special Concern	Florida Pine Snake	Pituophis melanoleucus mugitus	Special Concern
Gopher Tortoise	Gopherus polyphemus	Threatened			
Birds					
Limpkin	Aramus guarauna	Special Concern	Florida Sandhill Crane	Grus Canadensis pratensis	Threatened
Florida Burrowing Owl	Athene cunicularia floridana	Special Concern	American Oystercatcher	Haematopus palliatus	Special Concern
Little Blue Heron	Egretta caerulea	Special Concern	Osprey	Pandion haliaetus	Special Concern
Snowy Egret	Egretta thula	Special Concern	Brown Pelican	Pelecanus occidentalis	Special Concern
Tricolored Heron	Egretta tricolor	Special Concern	Roseate Spoonbill	Platalea ajaja	Special Concern
White Ibis	Eudocimus albus	Special Concern	Black Skimmer	Rynchops niger	Special Concern
Southeastern American Kestrel	Falco sparverius paulus	Threatened	Least Tern	Sternula antillarum	Threatened
Mammals					
Florida Mouse	Podomys floridanus	Special Concern	Florida Black Bear	Ursus americanus floridanus	Threatened
Sherman's Fox Squirrel	Sciurus niger shermani	Special Concern			

Source: FNAI Tracking List (last updated June 2014); www.fnai.org/bioticssearch.cfm (retrieved February 11, 2015)

8.2.3 Wildlife/Waterfowl Refuges and Other Natural Areas

Six wildlife refuge and/or management areas are located in Palm Beach County (see **Figure 8.1**). They include one national refuge and five State management/environmental areas:

- Arthur R. Marshall Loxahatchee National Wildlife Refuge (USFWS)
- Holey Land Wildlife Management Area (FFWCC)
- Rotenberger Wildlife Management Area (FFWCC)
- Everglades Wildlife Management Area (FFWCC)
- JW Corbett Wildlife Management Area (FFWCC)
- Dupuis Wildlife and Environmental Area (FFWCC)

In addition, the Palm Beach County Natural Area System includes 34 County-owned or County-managed natural areas that have been designated for the protection and preservation of hundreds of plant and animal species. Four such areas are located near PBI. The closest is the South Cove Natural Area, located approximately 2.5 miles northeast of the airport. Other nearby Natural Areas include Snook Islands, Pond Cypress, and Winding Waters.

8.2.4 Wildlife Hazard Management

PBI has a Wildlife Hazard Management Plan (WHMP) that identifies the specific actions the airport will take to mitigate the risk of wildlife strikes on or near the airport. The plan is based on the findings and recommendations contained in the Wildlife Hazard Assessment (WHA) completed in 2010-2011. The WHA included literature reviews, wildlife surveys, staff interviews, and a compilation and analysis of bird strike data to identify critical wildlife species and groups. These included various bird species such as wading birds, vultures, and waterfowl as well as mammals such as rabbits and foxes. Water resources both on and near PBI were identified as wildlife attractants, as was the North County Landfill located approximately five miles away. The WHA provides management recommendations to reduce wildlife hazards at PBI, including reducing habitat on the eastern portion of the property, passive and aggressive control methods during fall and winter seasons, and long-term management of the water resources.

Figure 8.17: Wildlife Refuge and Management Areas and Natural Areas
Source: Palm Beach County (2015)

8.3 Floodplains

Floodplains are defined by the Federal Emergency Management Agency (FEMA) as any land area susceptible to being inundated by floodwaters from any source. Flood zones are geographic areas that FEMA has defined according to varying levels of flood risk. These zones are identified on the official Flood Insurance Rate Map (FIRM) and each zone reflects the severity or type of flooding predicted to occur. Land area that has a 1% chance of flooding in any given year is identified as a Special Flood Hazard Area (SFHA). A SFHA is the area where floodplain management regulations must be enforced.

Floodplains are hydrologically important, environmentally sensitive, and ecologically productive areas that perform many natural and beneficial functions. These areas are mostly important for the natural storage and conveyance of floodwaters, the protection of water quality, and groundwater recharge. They also provide a unique and rich habitat for a wide variety of plants and animals. Consequently, development within floodplains potentially causes or contributes to decreases in water quality, loss of wildlife habitats, and an increase in severity and frequency of flood losses.

Executive Order 11988, Floodplain Management, directs federal agencies to avoid impacts on floodplains to the degree practicable and to minimize impacts which cannot be avoided. In such instances, the USDOT Order 5650.2, ***Floodplain Management and Protection***, requires the FAA to review potential floodplain impacts and, where encroachment would occur, to take steps to minimize potential harm.

As shown in and **Figure 8.2** and listed in **Table 8.4**, two FEMA-designated flood zones are identified on airport property:

- **Zone AE** – land area having a 1% annual chance of flooding (commonly referred to as the 100-year floodplain); this area is a designated SFHA
- **Zone X** – land area having between 0.2% and 1% annual chance of flooding (commonly referred to as the 500-year floodplain); this area is not a SFHA

The majority of the proposed development plan is located within the Zone X area. Some of the improvements would occur within or encroach upon areas designated Zone AE, where floodplain management regulations apply. If no practicable alternative outside the SFHA exists, efforts to minimize project-induced impacts on the floodplain and, where practicable, to restore and preserve the natural and beneficial values that are adversely affected by the project must be included. Mitigation measures to reduce the impact of development within floodplain areas may include the following:

- Construction controls to minimize erosion and sedimentation
- Minimum design standards to allow adequate flow circulation and to preserve free, natural drainage
- Using pervious surfaces where practicable
- Controlling runoff, waste, and spoils disposal to prevent contamination of water resources
- Land use planning and controls measures

FEMA defines a floodway as the portion of the 100-year floodplain within a channel or stream and any adjacent floodplain areas that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights. There are no defined FEMA floodway boundaries within the airport boundaries.

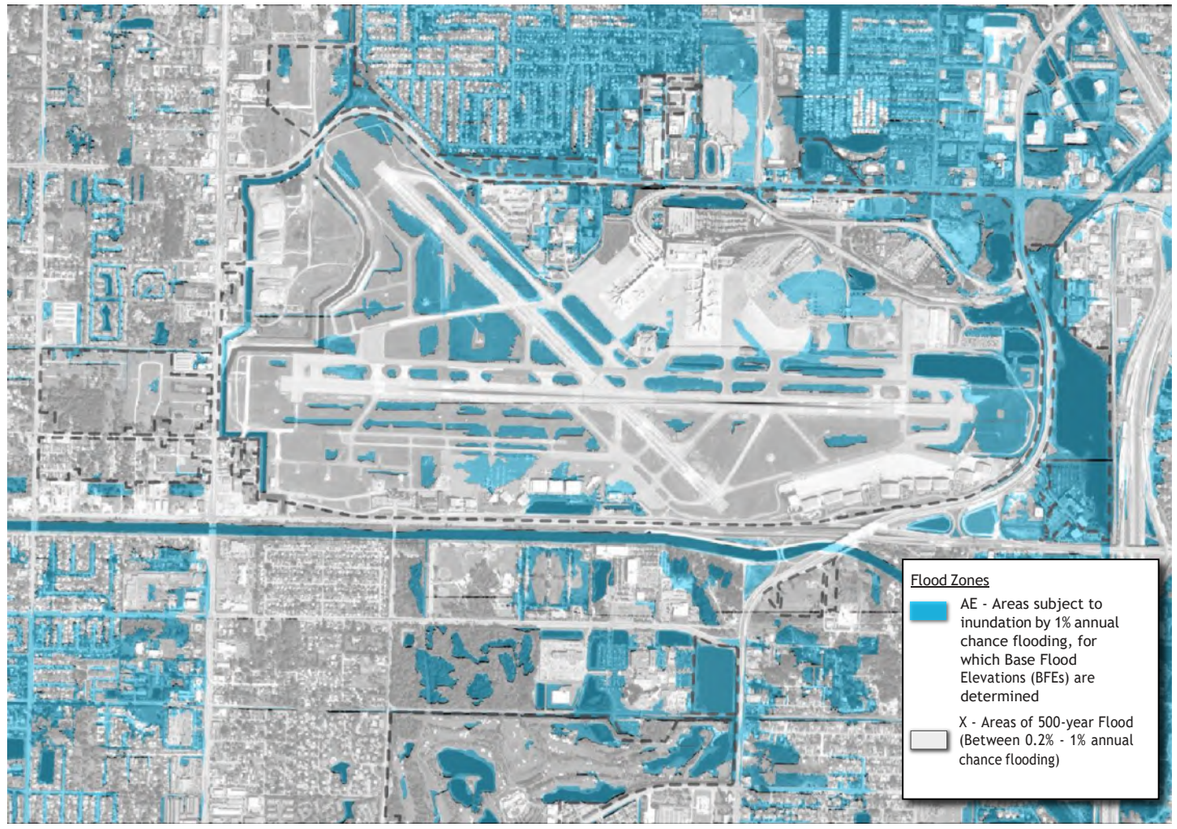


Figure 8.18: Flood Zones Near PBI
Source: Federal Emergency Management Agency (01/ 22/2015)

Table 8.4: Summary of Flood Zones and Impacts within PBI

FIRM Flood Zone	Area within PBI	Development Impacts
AE	527 acres	217 acres
X	1,338 acres	--

8.4 Hazardous Materials, Pollution Prevention, and Solid Waste

In general terms, the use, handling, storage, and disposal of hazardous materials and other regulated substances at PBI are typical of most large commercial airports. Activities that involve the use of these materials include:

- Fueling, servicing, maintenance, and repair of aircraft, GSE, and motor vehicles
- Operation and maintenance of the airfield, terminal complex, and passenger concourses
- Other special purposes connected with commercial aviation (e.g., rental car and air cargo facilities, navigation and air traffic control functions)

Hazardous materials and wastes may be stored in aboveground storage tanks (ASTs), underground storage tanks (USTs), specially-equipped vehicles, and other approved containers associated with fuel farms, maintenance facilities, warehouses, and storage buildings.

Activities with the highest involvement of hazardous and/or regulated materials include fuel storage and maintenance of aircraft, equipment, and buildings. Other, smaller amounts of petroleum-products (e.g., lubricants and solvents), waste materials (e.g., used oils, cleaning residues, spent batteries), and manufactured chemicals (e.g., herbicides, fertilizers, paints, etc.) are found at various locations throughout the airport. These are used on a routine basis in support of aircraft, GSE, and motor vehicle maintenance activities and for a range of other functions to keep the airport operational. Adjoining (non-airport) land uses include office, commercial, warehousing, light industrial and residential land uses. Some of these areas or facilities also involve the use of hazardous materials, the generation of hazardous wastes, and/or the storage of fuel.

8.4.1 Hazardous Waste Sites and Other Contaminated Areas

There are no National Priority List (NPL) sites or 'Superfund' cleanup activities involving airport property or lands adjacent to PBI. NPL sites are considered by the EPA to have the most significant public health and environmental risks to surrounding areas. Airport development projects could, however, impact other areas that are known or suspected to be contaminated, and/or properties that were contaminated and have since been cleaned up. For example, as listed in **Table 8.5**:

- Development projects or activities north of Belvedere Rd may involve the Westgate/Belvedere Homes Community Redevelopment Agency (CRA) Area, a 1,300 acre designated Brownfield area currently undergoing redevelopment for housing and mixed uses
- Designated on the federal list of Formerly Used Defense Sites (FUDS), areas of PBI are being investigated and remediated by the U.S. Army Corps of Engineers
- There are 19 records of incidents involving Leaking Underground Storage Tanks (LUST) where clean-up activities are either ongoing, completed, or the case is otherwise inactive; there are also 10 records of incidents involving reported releases or spills of hazardous materials

Because the disruption of sites or facilities containing environmental contamination can potentially have an impact on human health and the environment, FAA guidance recommends that projects avoid these areas to the extent practicable. If avoidance isn't possible, PBI should minimize the use of contaminated property and incorporate best practices for hazardous waste management into the development plans and construction documents.

8.4.2 Regulated Activities Involving Hazardous Materials and Waste

The Resource Conservation and Recovery Act (RCRA) is the public law that creates the framework for the proper management of hazardous and non-hazardous solid waste. Hazardous waste is regulated under Subtitle C of RCRA. The EPA has developed a comprehensive program to ensure that hazardous waste is managed safely from the moment it is generated to its final disposal (cradle-to-grave). Subtitle C regulations set criteria for hazardous waste generators, transporters, and treatment, storage and disposal facilities. This includes permitting requirements, enforcement and corrective action or cleanup.

Database records indicate 21 RCRA sites located within a one mile radius of PBI. The RCRA sites include Small Quantity Generators, Conditionally Exempt Generators, Non-Generators (one), and Suspect Generators (five). It should be noted that sites included in the RSRA database do not necessarily involve contamination.

8.4.3 Landfills and Other Solid Waste Facilities

There are currently no open sanitary landfills or solid waste transfer facilities located within 10,000 feet or 5 miles of the existing runways at PBI. The West Palm Beach Incinerator/Landfill, located immediately north of PBI, has been closed since 1952. The Solid Waste Authority (SWA) has six transfer stations located throughout Palm Beach County. These facilities serve as centralized locations for the efficient transfer of waste and recyclables from small collection vehicles to larger SWA transfer vehicles. The closest transfer station to PBI is the West Central Transfer Station (Royal Palm Beach), located at 9743 Fairgrounds Road, Royal Palm Beach, Florida. This facility is 5.35 miles west of Runway 10L at PBI.

The SWA also owns and operates the Palm Beach Renewable Energy Park Landfill, formerly known as the North County Landfill. It is located west of the Florida Turnpike, near the intersection of S.R. 710 and Jog Road in northern Palm Beach County. Opened in 1989, the park includes two landfill areas and two renewable energy facilities, also known as waste-to-energy (WTE) facilities. The 330 acre landfill has more than 50 million cubic yards of capacity, and the two WTE plants accept up to 6,000 tons per day of post-recycled municipal solid waste and burns it to generate power. The combined facilities are expected to provide disposal capacity through 2043 to-2045.

For reference, FAA AC 150/5200-34A, ***Construction or Establishment of Landfills Near Public Airports***, provides guidance for complying with Federal statutory requirements regarding new facilities. For existing facilities, AC 150/5200-33, ***Hazardous Wildlife Attractions On or Near Airports***, provides guidance for land use practices and control measures related to landfills, transfer stations, and other types of waste disposal operations considered incompatible with safe airport operations.

Table 8.5: Environmental Database Summary

Database	Description	< ¼ mile	¼ to ½ mile	½ to 1 mile
Resource Conservation and Recovery Act (RCRA) Small Quantity Generator	EPA database on sites which generate, trans port, store, treat and/or dispose of hazardous waste	0	5	16
Emergency Response Notification System	EPA database that stores reported releases of oil and hazardous substances	0	0	0
Leaking Underground Storage Tank (LUST)	Florida Department of Environmental Protection (DEP) database of reported LUST incidents	3	6	10
Underground Storage Tank (UST)	DEP database of registered UST's	3	13	19
Brownfields	A property, the expansion, redevelopment or reuse of which may be complicated by the presence of a hazardous substance, pollutant or contaminant	0	1	0
Formerly Used Defense Sites (FUDS)	Database of military sites where U.S. Army Corps of Engineers is actively working or will take cleanup action	1	0	0
Spills	Statewide oil and hazardous materials inland incidents	0	1	0

Source: Environmental Data Resources, Inc. (2015)

8.5 Historic and Archaeological Resources

Historic properties affected by proposed airport projects or actions are federally-regulated under the National Historic Preservation Act (NHPA), the Archaeological Resources Protection Act (ARPA), and other applicable laws and regulations intended to protect historic properties. Section 106 of the NHPA requires Federal agencies to take into account the effects of their actions on historic properties, to afford the Advisory Council on Historic Preservation (ACHP) a reasonable opportunity to comment, and include an opportunity for consultation with all interested parties. Historic properties include any prehistoric or historic district or site that is listed or eligible for listing in the National Register of Historic Places (NRHP).

Prior to undertaking any airport project, the FAA must determine if the project has the potential to affect historic properties and, if so, for making a determination about the effects of the project on historic properties. As the lead federal agency, the FAA is responsible for consulting with the Florida State Historic Preservation Office (SHPO), which oversees the NRHP program for the state. The process by which the FAA decides whether a project or action affects historic properties is called a Section 106 review.

The relationship of airport development projects to sites of historical or archaeological significance are summarized in this section. Historic resources are those limited and non-renewable districts, sites, buildings, structures and objects having significant associations with historic, architectural, or cultural events, persons, or social movements. Archaeological resources are objects or areas made or modified by humans which contain information about the past. The significance of an archaeological site is dependent on the kind of human activity that took place there and how long the site occupied.

8.5.1 Historic Resources

There are no NRHP-listed or eligible historic resources on existing airport property and no such resources have been identified within any area proposed for airport land acquisition. In addition, the FAA has determined that, due to the nature and extent of the improvements and changes that have occurred at the airport since it was opened in 1936, PBI does not retain sufficient integrity to support NRHP listing. Therefore, no physical disturbances to aboveground historic resources are anticipated, as none are present on existing airport property or land to be acquired.

Beyond the airport boundaries, seven listed or eligible historic resources are located east of PBI, generally between the airport and the Atlantic coastline. As listed in **Table 8.6**, and shown in **Figure 8.3**, these resources include six residential historic districts and one National Historic Landmark (Mar-a-Lago). Although there is no potential for physical disturbances to any of the resources, all seven resources are located within areas that experience aircraft overflights and noise. For this reason, supplemental analysis may be needed to determine if there is potential to cause or contribute to changes in the air and noise environment that could adversely affect the character or use of historic resources.

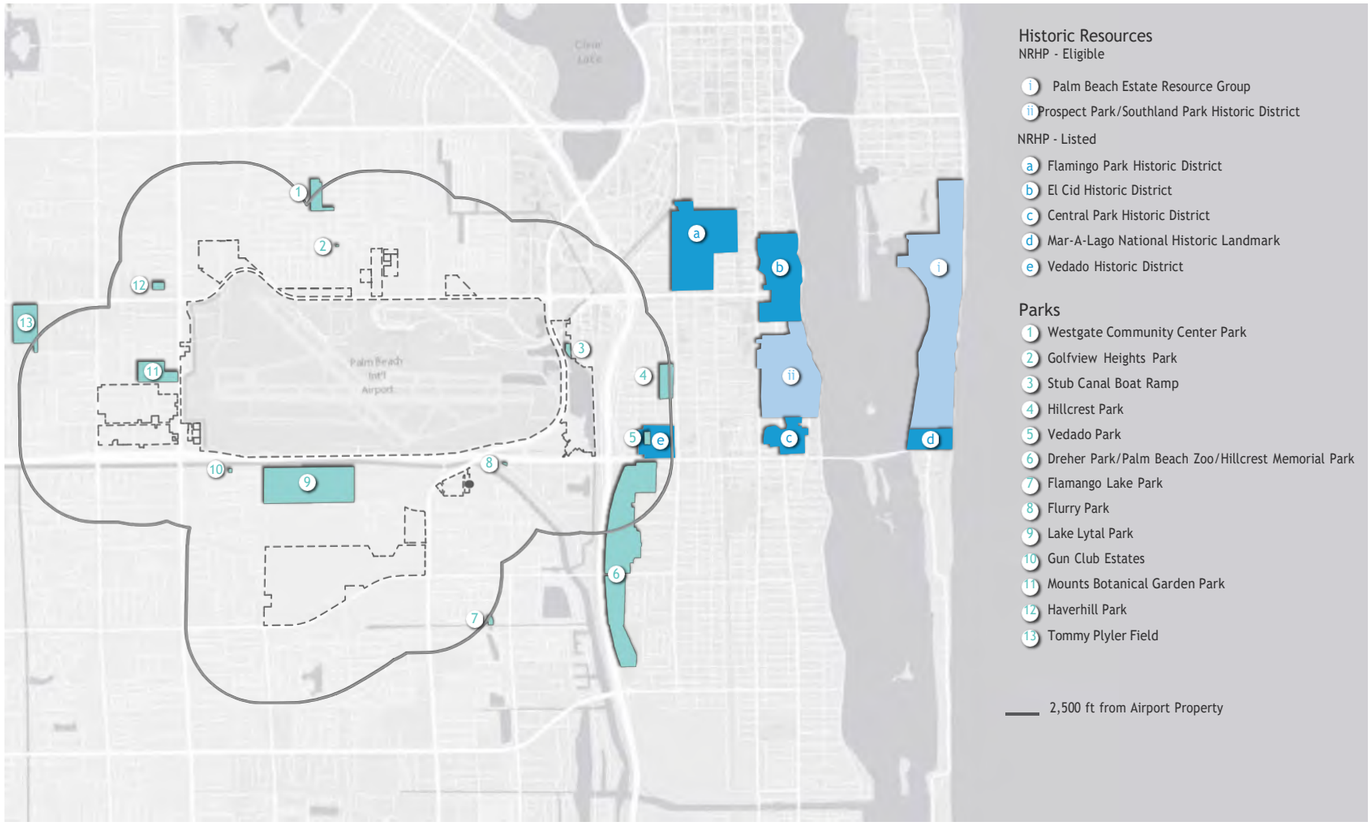


Figure 8.19: Historic Resources and Parks Around PBI
Sources: Florida Geographic Data Library (2014); Final EIS, Palm Beach International Airport (02/04/2011)

Table 8.6: National Register Status for Historic Resources

Name	Status	Type
Mar-a-Lago National Historic Landmark	Listed	National Historic Landmark
Central Park Historic District*	Listed	Residential Historic District
El Cid Historic District	Listed	Residential Historic District
Flamingo Park Historic District	Listed	Residential Historic District
Prospect Park/Southland Park Historic District*	Eligible	Residential Historic District
Palm Beach Estate Resource Group	Eligible	Residential Historic District
Vedado Historic District*	Listed	Residential Historic District

** Included in the Final Historic Architectural APE for the 2011 EIS. Archaeological Resources*

8.5.2 Archaeological Resources

An airport-wide archaeological assessment was performed in 2011 to identify the potential for archaeological resources within areas proposed for development. Based on the findings of that study, the FAA determined there were no previously recorded archaeological sites within the area of potential effect and, due to extensive ground disturbances from previous construction and demolition activities, it is unlikely the airport property contains any NRHP-eligible archaeological resources. Therefore, no impacts to archaeological resources are anticipated as there are no known archaeological sites present, there are no areas designated as sensitive for archaeological sites, and the potential to discover significant buried remains is considered to be low.

8.6 Section 4(f) and 6(f) Resources

The U.S. Department of Transportation Act (U.S. DOT Act) of 1966 included a special provision, Section 4(f), which protects the use of land from publicly-owned parks, recreation areas, wildlife and waterfowl refuge areas of national, state or local significance, and public and private historical sites. A "use" of Section 4(f) property may be a direct use (property is permanently incorporated into the transportation project), a temporary use (property is temporarily occupied in a way that is adverse to the property's purpose), or a constructive use (the project's proximity impacts substantially impair the protected activities, features, or attributes of property). **Table 8.7** summarizes the parks and recreation areas near PBI.

There are no wildlife or waterfowl refuges identified in the area surrounding PBI. These areas were discussed earlier in **Section 8.2**. There is one park within the Airport property limits–Stub Canal Boat Ramp located on the north side of Pine Lake. Several other parks are located adjacent to or in the vicinity (within 2,500 feet) of PBI. Section 4(f) also applies to historic sites, which were previously discussed in **Section 8.5**.

Because a "use" of Section 4(f) property can include "constructive use", supplemental analysis may be required to address potential effects on Section 4(f) resources further from the airport, such as aircraft overflights and noise impacts on historic sites.

Further, Section 6(f) of the Land and Water Conservation Fund Act of 1975, as amended, protects recreational lands, wildlife and waterfowl refuges and other similar resources purchased or improved by the fund from conversion to uses other than public outdoor recreation. Dreher Park (southeast of PBI), home to the Palm Beach Zoo, is a Section 6(f) resource based on two grants received by the City of West Palm Beach in 1976 and 2002.

Table 8.7: Parks and Recreation Areas Near PBI

Name	Area	Type
Stub Canal Boat Ramp	1.8 acres	Community Park
Hillcrest Park*	10 acres	Municipal Park
Vedado Park	2 acres	Neighborhood Park
Dreher Park/Palm Beach Zoo/		
Hillcrest Memorial Park	113 acres	Regional Park
Flamingo Lake Park	2.3 acres	Neighborhood Park
Flurry Park	0.3 acres	Municipal Park
Lake Lytal Park	70 acres	District Park
Gun Club Estates Park	0.5 acres	Neighborhood Park
Mounts Botanical Garden Park	15 acres	Public Garden

**As of March 15, 2015, the park has not been dedicated; therefore the name is subject to change.*

8.7 Water Resources

The construction and operation of airport projects have the potential to affect the quality and quantity of a region's water resources, both surface and subsurface. Surface water features at PBI collect and convey storm runoff towards downstream receiving waters. Ground water beneath the airport is plentiful and contributes to local drinking water supplies. Therefore, federal, state and local laws apply to any project or activity that has the potential to affect regulated water resources.

8.7.1 Surface Water

Surface water resources at PBI are related to the airport's storm drainage system. As shown in **Figure 8.4**, drainage features include a lake, ponds, canals, and ditches designed to collect, treat, store, and convey stormwater away from the airport. There are no coastal water resources on airport property. Other related water resources including floodplains and wetlands are addressed separately in **Section 8.3**, and in **Section 8.8**, respectively.

The existing stormwater management system is divided into four drainage basins. Drainage at PBI generally flows from north to south and from west to east and discharges to the C-51 Canal, which ultimately discharges to Lake Worth and the Atlantic Ocean. Water quality treatment for stormwater runoff from the drainage basins is provided by several existing detention ponds designed to reduce stormwater pollutant discharges into receiving waters.

PBI maintains a Stormwater Management Master Plan (SMMP) which identifies the stormwater management system and improvements needed to accommodate stormwater runoff from existing and proposed development in compliance with applicable permits and other regulatory requirements. The South Florida Water Management District (SFWMD) is the primary permitting agency for the stormwater management system within PBI and defines the requirements that the system must be able to accommodate.[5]

The EPA has jurisdiction over stormwater discharges associated with construction and industrial activities, as regulated by the National Pollution Discharge Elimination System(NPDES) permit program. Construction activities that disturb one acre or more require a General Construction NPDES permit that includes a Stormwater Pollution Prevention Plan (SWPPP). The SWPPP for construction activities specifies water quality best management practices (BMPs) and control measures that will occur during the construction process and after construction activities are complete and the site has been restored. PBI also maintains a SWPPP in accordance with a Multi-Sector General Permit (MSGP) for stormwater discharges associated with industrial activities.[6] The original plan was developed in 1995 and is updated as necessary to reflect changes in conditions and activities at the airport.

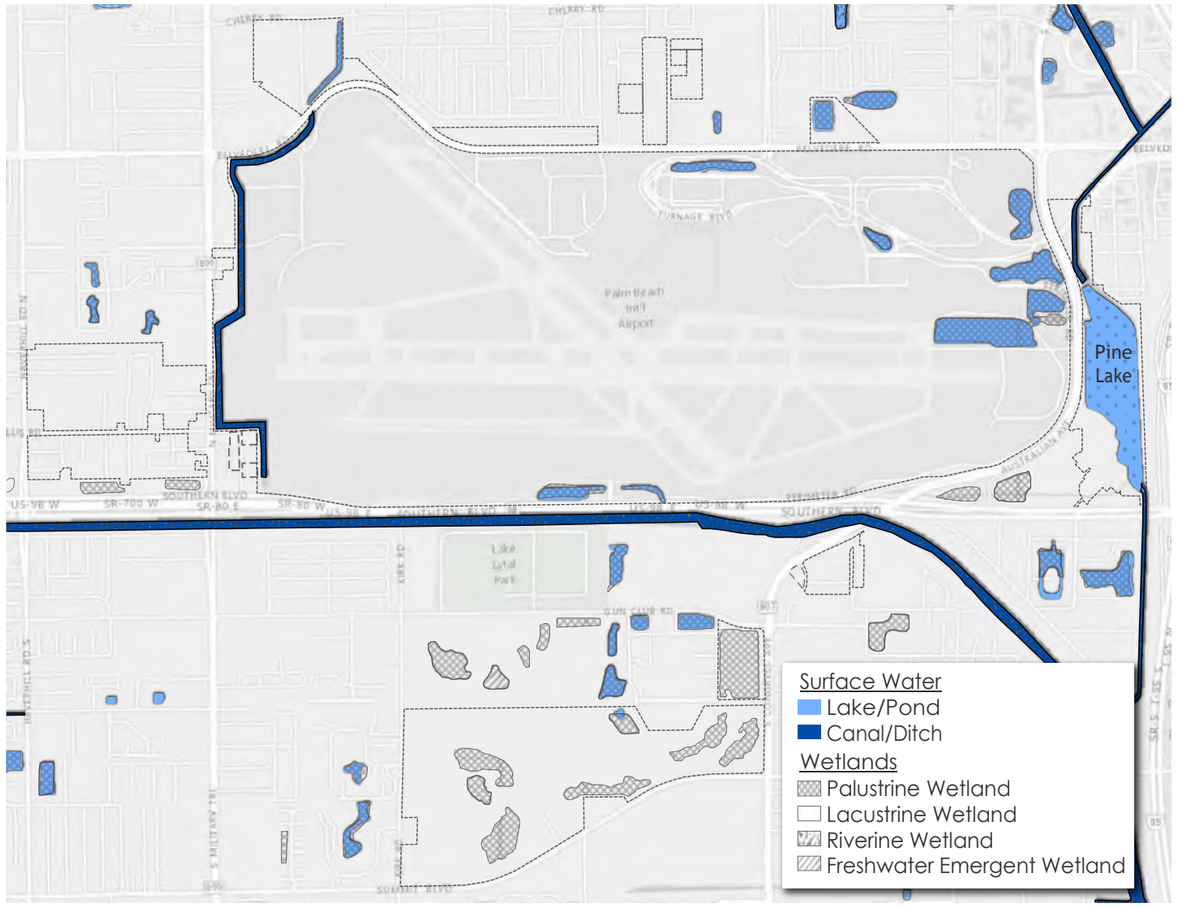


Figure 8.20: Existing Wetlands at PBI
Source: U.S. Geological Survey National Hydrography Dataset, National Wetlands Inventory (2015)

5 *SFWMD Environmental Resource Permit (ERP) No. 50-00471-S*

6 *FDEP Permit No. FLR05B933*

8.7.1.1. Short Term (Construction) Impacts

The potential for soil erosion and degradation of water quality is greatest during the construction period when topsoil is exposed, thereby making it more susceptible to erosion that can contribute to increased sediment loading on downstream receiving waters. In addition, when stormwater flows over a construction site, it can pick up other pollutants such as debris, chemicals, concrete wash-out, etc., and transport them to nearby water bodies.

Compliance with the airport's National Pollutant Discharge Elimination System (NPDES) permit requires minimal impacts to stormwater from airport activities, including construction. Under the NPDES permit process, which is administered by FDEP, the SWPPP for construction projects identifies measures to minimize erosion and sedimentation and to maintain water quality throughout the construction phase. Examples of measures typically identified in the SWPPP include project-specific design criteria, BMPs, and pollution control plans designed to prevent a project from exceeding State of Florida water quality standards. These measures are incorporated into the project's construction documents and become an obligation of the contractor. PBI monitors compliance with these practices and assures that the stormwater management system is protected.

8.7.1.2. Long Term (Operational) Impacts

After construction, the primary impacts associated with the airport development plan relate to additional impervious cover, increased storm runoff, and nonpoint source pollution. Preliminary estimates indicate that the airport development plan increases impervious cover by approximately 160 acres. The resulting increase in storm runoff volume will have to be managed on-site through project-related improvements to the drainage system including water quality BMPs and control measures as needed to permit projects to be implemented in compliance with SFWMD and NPDES requirements.

Project-related increases in surface water runoff are expected to be minor when compared to the existing area of impervious surface at PBI. It is anticipated that the current SMMP will be updated to reflect the projects shown on the ALP and that the anticipated increases in runoff can be treated adequately via overland flow and in new and/or expanded swales and detention ponds that can be incorporated into the existing stormwater collection and treatment system.

In terms of water quality, storm runoff from airport pavement has the potential to collect a number of pollutants including sediments, oils, greases, heavy metals, nutrients, and trash. PBI employs numerous techniques to protect both on-site and off-site water quality and these measures will continue to be incorporated into new project designs as appropriate. In general, stormwater collected from aircraft parking aprons will continue to be processed through subsurface oil/water separators before being discharged. These devices are designed to slow the rate of runoff and to ensure that pollutants are captured and collected during and after rainfall events. On the landside, stormwater from frontage roads and parking lots is transferred by leaders directly to landscaped areas which are sculpted to allow runoff to infiltrate into the soils. Infiltration strategies have high pollutant removal efficiency and also help recharge the groundwater below. Excess water is channeled into vegetated swales and drains to be infiltrated or, if necessary, processed through subsurface oil/water separators before being discharged.

8.7.2 Groundwater

Two major aquifers underlie PBI and Palm Beach County in general. They are the deep artesian Floridian aquifer and the surficial non-artesian aquifer. The Floridian is encountered in the Suwannee limestone and contains "brackish" groundwater. It lies beneath nearly 700 feet of confining silts and clays of the Tampa and Hawthorne formations. The surficial aquifer contains "fresh" water under unconfined or water table conditions and is approximately 200-feet thick in the study area. Only the surficial aquifer is vulnerable to potential contamination—the deeper Floridian aquifer is not susceptible to impacts from the land surface or surficial aquifer.

The principle water supply in Palm Beach County is the surficial aquifer system. The average depth to groundwater is 5 to 20 feet below land surface. PBI is served by the Palm Beach County Water Utilities Department Water Treatment Plant #8. The plant's source of raw water is the underground surficial aquifer, which has the capacity to produce approximately 20 million gallons per day (gpd). There are no public supply wells within airport property. The nearest public supply wells are approximately one mile west of PBI (Haverhill Park) and the surrounding wellfield protection zones are safeguarded by Palm Beach County's Wellfield Protection Ordinance.

With proper management and control measures, the construction and operation of projects on the ALP would not be expected to have a substantial impact on groundwater resources. To protect groundwater from sources of pollution, project-specific BMPs and SWPPPs would be designed to prevent or minimize the potential release of contaminants to groundwater. The BMPs and SWPPPs require measures to prevent spills, provide swift response to accidental spills, and define acceptable on-site storage of fuel and lubricants.

8.8 Wetlands

Wetlands are transition areas where land is covered with shallow water all or most of the time. The prolonged presence of water creates conditions that favor the growth of specially adapted plants and promote the development of characteristic wetland (hydric) soils. Wetlands are valuable ecosystems. They serve to accumulate, convert, store and supply basic nutrients. Also, they tend to be highly productive areas that provide habitat for many species of plants, fish, and waterfowl. In addition, they serve to regulate the flow of runoff waters and to clean them of contaminants. Finally, wetlands provide a buffer against storm waters and help reduce flooding.

Two general categories of wetlands are recognized: coastal or tidal wetlands and inland or non-tidal wetlands. In Palm Beach County, tidal wetlands are found primarily along the intercoastal waterway where sea water mixes with freshwater to form an environment of varying salinities—there are no tidal wetlands mapped near PBI. Non-tidal or freshwater wetlands are common on floodplains along rivers and streams, along the margins of lakes and ponds, and in other low-lying areas such as swamps and marshes. At PBI, wetlands are associated primarily with the airport's storm water drainage and management system.

Wetlands are regulated by the USACE under Section 404 of the Clean Water Act. To conduct dredge or fill activities in a regulated wetland, the USACE must issue a permit authorizing those activities. The State of Florida also regulates dredge and fill activities in wetlands. Depending on the location and nature of the activity, the dredging and filling of wetlands is regulated by either one of Florida's five Water Management Districts or the FDEP. At PBI, activities within wetlands are regulated by the SFWMD.

Two documents provide direction and instruction on assessing impacts of Federal actions on wetlands. Executive Order (EO) 11990, Protection of Wetlands, sets the standard for a Federal agency action involving any wetland, and DOT Order 5660.1A, ***Preservation of the Nation's Wetlands***, provides DOT agencies with instructions on how to carry out EO 11990. The DOT Order governs FAA approval actions. Where a proposed airport development project impacts a wetland, the Federal wetlands planning processes require that an analysis of potential wetland impacts be included in environmental documentation.

There are an estimated 119 acres of wetlands mapped on existing airport property, including PBI and outlying area (See **Figure 8.4**). These wetlands coincide with surface water bodies (lakes, ponds, canals, and ditches) associated with the airport's stormwater management and drainage system. They are man-made features which are excavated in upland soils and used to convey or store stormwater. Agency resource mapping indicates there are no natural wetlands located on airport property or any lands identified for future acquisition, although small pockets of isolated natural wetlands have been reported. Wetlands on the Trump International Golf Course (also airport property) include two wetland mitigation areas.

Implementation of the Airport Development Plan would disturb 16.8 acres of surface water and wetlands on airport property (See **Table 8.8**). The impacts include modification and/or relocation of existing lakes, ponds, streams, and ditches.

Impacts to these surface waters will require a modification to existing PBI environmental permits or issuance of new permits from both SFWMD and USACE. Several of these man-made surface water systems, including the Airport West Canal, have been permitted and modified for past airfield development. Depending on the type of wetland and degree of disturbance, and resulting effects on water conveyance and/or wildlife habitat, in-kind replacement or other mitigation measures may be required to compensate for wetland impacts that cannot be avoided.

Table 8.8: Surface Water and Wetlands at PBI

Wetland Description	Existing Area (ac.)	Development Impacts (ac.)
Palustrine (Freshwater Pond)	73.3	5.9
Lacustrine (Lake)	30.8	8.5
Riverine (River/Steam Channel)	15.1	2.3
Total	**119.2**	**16.8**

8.9 Noise

Airport development projects have the potential to change community noise levels. These changes may result from differences in aircraft type, approach and departure procedures, and/or the frequency of takeoffs and landings. Ambient noise levels may also be affected by realigned roadways as well as changes in airport traffic volumes and vehicle speeds. In addition, construction activities generate noise impacts but these are more localized, short-term or temporary in nature, and the effects diminish as projects near completion. Most often, airport noise analysis focuses on how proposed projects may change future airport operations and the levels of aircraft noise affecting communities in areas surrounding the airport.

8.9.1 Noise Contour Analysis

A preliminary noise analysis was conducted to evaluate potential changes in aircraft overflights and noise exposure attributable to the proposed runway, changes in aircraft fleet mix, and number of operations. For comparison, DNL noise contours[7] were prepared for two alternatives using the forecast operations year 2035. Under the 2035 Baseline scenario, there would be no changes to the runways at PBI. Under the 2035 Master Plan scenario, Runway 10R-28L is relocated and extended and Runway 14-32 is removed. As shown in **Figure 8.5**, the noise contours around the primary runways shift slightly south and west as a result of the Runway 10R-28L extension, and the contours around Runway 14-32 are eliminated as a result of the runway closure.

Further analysis indicates that the Master Plan scenario results in fewer homes and residents affected by noise levels above DNL 65 db. **Table 8.9** shows the count of residential population and housing units within each of the noise contours for 2035 based on 2010 U.S. Census block data. Under the 2035 Master Plan scenario, there would be 1,902 people within the DNL 65-70 db contours, which is a reduction of 274 people when compared to the 2035 Baseline scenario. In areas exposed to higher noise levels, there would be an increase of 3 people within the DNL 70-75 db contours and no change in population within the DNL 75+ db contours as no homes are present in either scenario.

Prior to implementing any airport development project that would affect existing or future noise levels, an FAA noise analysis must be prepared to determine how proposed airport actions would change cumulative noise exposure of individuals to aircraft noise in areas surrounding PBI. In addition, supplemental noise analysis may also be required to address potential effects on other environmental resources including, but not limited to, publically-owned parks and recreation areas, wildlife and waterfowl refuges, and historic districts and sites.

7 *Noise contours are a series of line superimposed on a map of the airport's environs. These lines represent various DNL levels (typically 65, 70, and 75 dBA). Day-night average sound level (Ldn or DNL) is the average noise level over a 24-`hour period. The noise between the hours of 10pm and 7am is artificially increased by 10 dB. The noise is weighted to take into account the decrease in community background noise of 10 dB during the nighttime period. It is the areas within the 65, 70, and 75 DNL noise contours that the FAA considers to be the most impacted by aircraft generated noise. Beyond the 65 DNL noise contour, noise is most noticeable in areas below established flight corridors.*

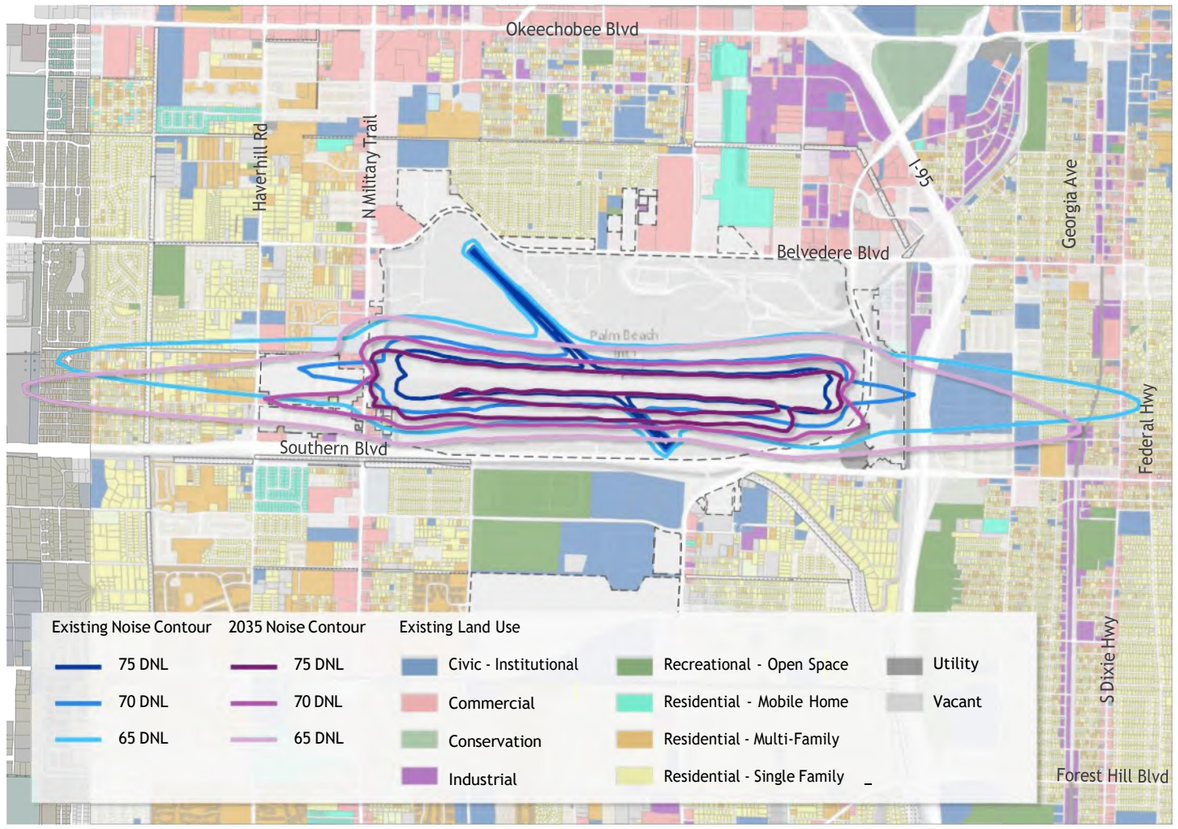


Figure 8.21: PBI Existing and Future Noise Contours
Sources: HMMH (2016); Palm Beach County (2016)

Table 8.9: Population and Housing Units within the 2035 DNL Contours

	Population		Housing Count	
	2035 Baseline	2035 Master Plan	2035 Baseline	2035 Master Plan
DNL 65-70	2,176	1,902	749	657
DNL 70-75	2	5	1	1
DNL 75+	0	0	0	0
Total	2,178	1,907	750	658
Difference	-271		-92	

Source: PBI 2035 Master Plan DNL Contours and Summary (HMMH). Noise Abatement

8.9.2 Noise Abatement

The Palm Beach County Department of Airports, Noise Abatement Office, oversees the enforcement of all noise related rules and regulations and the implementation of the Noise Abatement Program. The Noise Abatement Office uses the Airport Noise and Operations Monitoring System (ANOMS) to provide standard reporting of runway activity, nighttime activity, and noise levels from 15 noise monitoring stations around PBI. Under the Noise Abatement Program, ANOMS reports are provided to the Citizen's Committee on Airport Noise (CCAN). The purpose of the CCAN is to consider potential noise mitigation methods and to suggest programs, concepts and resolution of complaints to the Department of Airports and the PBC Board of County Commissioners. The Committee's emphasis is to obtain input from the public as to the extent of the noise problem at PBI and to make recommendations for possible noise mitigation actions.

8.10 Sustainability

Palm Beach County is a "Certified Silver" Green Local Government designated by the Florida Green Building Coalition. This highly sought after certification was achieved in September 2012 after a thorough evaluation of energy and water usage, land use practices, recycling and waste disposal practices, educational programs, purchasing practices, regulatory policies, and other initiatives designed to protect and conserve the community's natural resources, enhance the efficiency of government, and raise public awareness about the benefits of environmental stewardship.

Each County Department plays an organizational role by adopting the principles and operating within the framework for enhancing government operations. For instance, the Department of Airports has proactively implemented initiatives to reduce energy consumption at PBI. An energy audit was conducted to determine current usage and to identify opportunities for efficiency. One resulting project was the replacement of 695 lighting fixtures along the arrival/departure roadways with Light Emitting Diodes (LED) luminaries. The combined energy savings and reduced maintenance costs yielded a five-year payback period. Future improvements include relighting the baggage handling areas, roadway signage, aircraft gate parking, and the parking garage, with additional LED luminaries.

PBI is also exploring opportunities for alternative energy production. For example, solar-powered traffic flashers have been installed around the airport's roadways. Not only does solar technology reduce annual energy costs, it also eliminates the construction cost of running AC power to the remote locations where the flashers are installed. Another sustainability initiative underway is the airport/airline waste recycling program. PBI generates various types of solid waste ranging from everyday items that are used and disposed of, to green waste and food waste, to construction and demolition debris. These wastes are managed and disposed of in accordance with the airport's recycling, reuse, and waste reduction plan.

8.10.1 Airport Sustainability Planning and Management

A more targeted approach is to undertake airport sustainability planning. This is a stand-alone planning effort focusing on practices to achieve sustainable growth while reducing the airport's consumption and impacts on the environment. Emphasis is usually on practical considerations that can improve the overall efficiency of the airport by striking a balance between sustainability improvement and financial considerations. The sustainability plan incorporates results of the mission/vision development, local sustainability policies and initiatives, and the overall approach PBI would like to adopt for sustainability within the County's framework.

Implementation Plan

09

09 Implementation Plan

The improvements recommended in this Master Plan collectively comprise the PBI Development Plan illustrated in **Figure 9.1.** Some improvements are intended to address existing issues, such as non-standard taxiway configurations, while others are intended to accommodate forecast demand.

The implementation plan provides a preliminary schedule for each project based on satisfying the facility requirements and the estimated duration of the project, including typical pre-construction design and permitting activities. The program has been divided into three phases:

- Phase I is the short-term program and covers the years 2016 through 2020 with an anticipated level of demand around 6.8 million annual passengers (MAP)
- Phase II is the intermediate term program and covers the years 2021 through 2025 with an anticipated level of demand around 7.4 MAP
- Phase III is the long-term program and covers the years 2026 through 2035 with an anticipated level of demand around 8.8 MAP

The majority of development recommendations and their implementation are based on satisfying the forecast demand; however, it is actual demand that will dictate the timing of these projects. Therefore, activity levels that trigger key improvements to ensure that the Airport efficiently accommodates demand with new capacity, but not before it is needed, are also identified.

The improvements recommended to enhance operational efficiency but not tied to a specific facility requirement within the planning horizon are included in an Ultimate development phase. These projects can be implemented by the DOA at anytime but are not included as part of the financial plan summarized in Chapter 10.

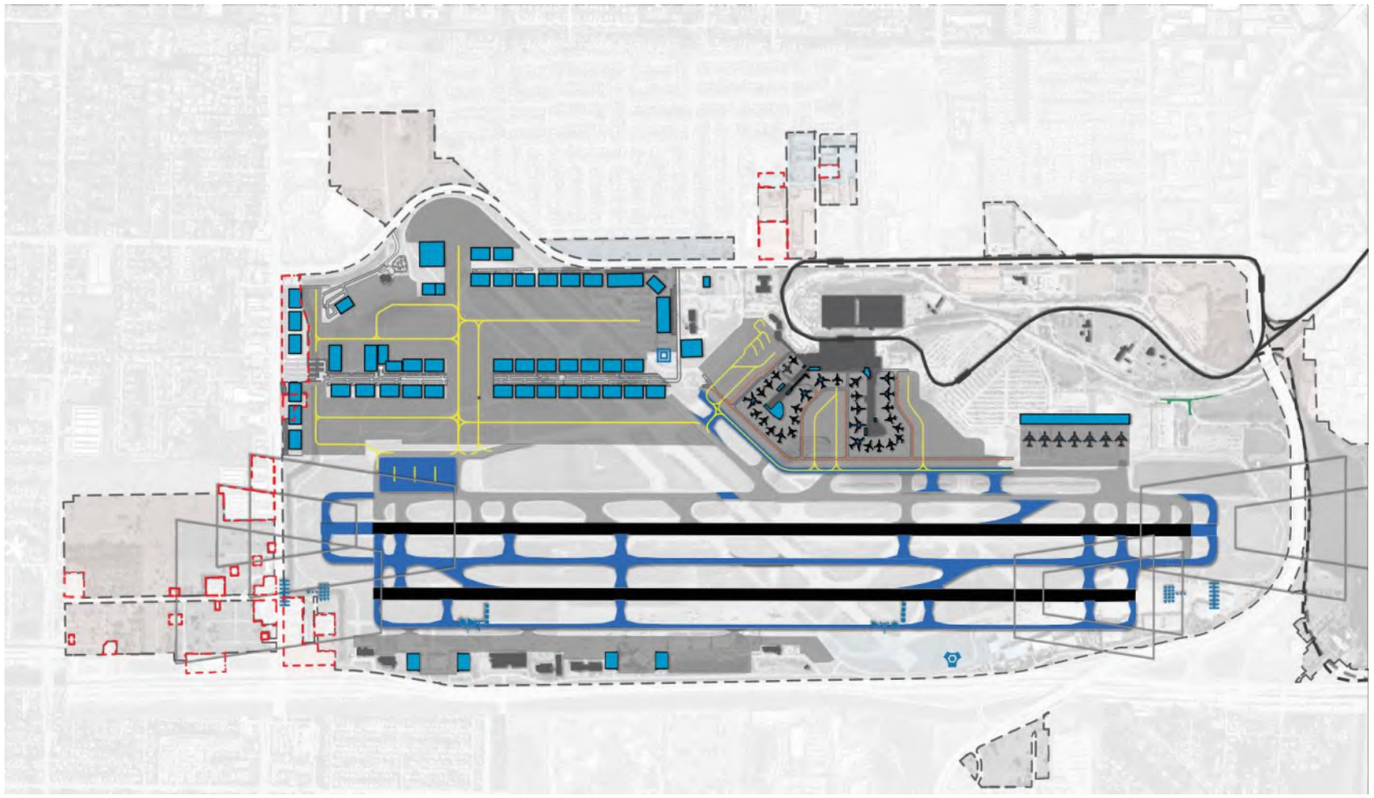


Figure 9.1: PBI Preferred Development Plan
Source: AECOM (2016)

9.1 Factors Affecting Implementation and Phasing

The DOA is committed to maintaining and developing PBI into a facility that fully serves both the local community and surrounding region as well as commercial and general aviation needs. As a strategic and complementary element to the overall regional transportation system, PBI will continue to serve as a primary contributor to local and regional economic growth.

Planning is a continuous process and changes in the aviation industry, economic environment, and numerous other factors may require adjustments in the timing of planned airport facility improvements. The fundamental elements addressed in this Master Plan will assist the DOA in responding to the continued need for modern and efficient air transportation.

The ability to efficiently phase implementation requires an understanding of the factors that prompt development. It is anticipated that the recommended projects will be constructed as the demand materializes, but it must also be recognized that PBI will also need to replace or modernize older facilities as they reach there anticipated useful life.

9.1.1 Aviation Activity Volume and Operational Characteristics

The volume and character of aviation activity, factors addressed in detail in previous chapters, determine when development should occur. Factors that could influence the volume and character of aviation activity at PBI may include:

- Changes in the aircraft fleet mix
- Addition of scheduled air carrier service by "Low Cost" or "regional" airlines
- Fluctuations in PBI's relative percentage of Origin and Destination (O&D) traffic versus connecting traffic
- Fluctuations in the type, nature, frequency and demand imposed by corporate general aviation operators

As PBI's aviation services continues to evolve, periodic reviews of the Implementation Plan should evaluate the actual aviation activity demand and its impact on the recommended improvements.

9.1.2 Relocation and Replacement of Displaced Facilities

Planned expansion of PBI's passenger terminal, airfield and support facilities may impact existing tenants or other existing facilities. Facility replacement and the need to minimize the disruption of tenant activities is a primary factor in determining project phasing. Therefore, the implementation plan accounts for "enabling projects" which should be completed prior to initiation of the primary project. For example, the relocation and/or reconfiguration of General Aviation facilities is required prior to construction of the new runway.

9.2 Implementation Triggers

Trigger points determine when a threshold is reached and an action is required to maintain the safe and efficient operation of the Airport. Trigger points result from one or more of the following three categories:

- Growth and congestion
- Facility life-cycle
- Policy and regulation changes
- Facility optimization and/or revenue generation

9.2.1 Growth and Congestion

A growth and congestion trigger is the most common trigger and occurs when demand approaches or exceeds the capacity of existing facilities. Measures of growth and congestion trigger points may include:

- Operations, passenger, and/or cargo tonnage growth
- Airfield / airspace congestion
- Tenant demand to expand their operations and facilities
- Inadequate Level of Service

9.2.2 Facility Life-Cycle

A facility life-cycle trigger occurs when an existing facility reaches or exceeds its useful life (e.g., facility is in need of rehabilitation) or when a facility no longer conveniently or efficiently serves its purpose (e.g., site reuse or lack of passenger amenities or infrastructure). An example of a facility life-cycle trigger is the rehabilitation of existing Runway 10L-28R. The rehabilitation of this runway was completed in January 2013 with an anticipated useful life of approximately 15 years. As the primary runway, it is imperative that this project does not adversely impact airport operations, particularly given the forecast increase in airport operations around the same time another rehabilitation will likely be required (2028).

9.2.3 Policy and Regulation

Changes in policy and regulations regarding airport design and/or operations may originate from local, state, or federal regulatory bodies. New or updated regulations may trigger the need to replace or modify an existing facility in order to accommodate certain activities. An example incorporated into this Master Plan includes the recent revisions and clarifications to taxiway design and configuration standards in FAA AC 150/5300-13A, ***Airport Design***, which are intended to mitigate potential runway incursion risks.

9.2.4 Facility Optimization and/or Revenue Generation

Projects are occasionally implemented for optimization and/or revenue generation purposes more so than actual demand. Underutilized or inefficient facilities are often renovated to maximize passenger/tenant convenience and airport revenues. Examples include improvements to the connection between the cargo facilities and I-95 as well as the reconfiguration of the Commercial Passenger Terminal's ticketing hall.

The implementation plan includes a schedule for the projects triggered by facility optimization and revenue generation purposes. However, since these projects are not triggered by demand, the actual timing is at the Airport's discretion depending on availability of funding and staff resources.

9.3 Phasing of the Preferred Development Plan

One of the key considerations of this Master Plan is the implementation of the proposed runway. Given the enabling projects associated with the new runway, particularly the relocation of the Fixed Base Operators (FBOs), the implementation plan must minimize operational and financial impacts to these tenants. Each of the FBOs (Jet Aviation, Signature Flight Support, and Atlantic Aviation) have existing leases with specific expiration dates and options for extensions that are considered and incorporated into the implementation plan.

The timing of the new runway is based on the hourly and annual capacity of the existing airfield as well as the rehabilitation of existing Runway 10L-28R. As summarized in Chapter 4, *Airside Analysis*, the existing hourly capacity of the airfield is approximately 60 to 65 operations. While the annual service volume (ASV) for this Master Plan is calculated as 171,000 operations based on existing FAA Advisory Circulars, the 2006 Master Plan indicated an ASV of roughly 221,000 operations. For the purposes of this Master Plan, implementation of the new runway is based on an estimated ASV of 221,000 operations.

PBI was included in the FAAs Future Airport Capacity Task (FACT) 1 and 2 reports (issued in 2004 and 2007 respectively) as one of numerous airports that were in need of airfield capacity enhancements (such as a new runway) based on anticipated demand in 2020 and 2025 respectively. However, total operations decreased enough to remove PBI from the January 2015 FACT3 report which evaluated capacity needs up to 2030.

Operations at PBI are again increasing and the FAA approved forecast includes an estimated 2035 annual demand of 186,000 operations with an estimated peak hour of 85 operations. Based on the FAA's recommended airfield capacity enhancement implementation at 80% ASV, the new runway should be available around 2032 when total annual operations are approximately 177,000. However, implementation of the new runway is recommended prior to 2032 when considering expected peak hour operations. As illustrated in **Figure 9.2**, hourly operations are expected to exceed existing capacity by approximately 21% and 34% of the primary 16-hour operational period at PBI in 2030 and 2035 respectively. Each operation that exceeds the existing hourly capacity of PBI contributes to aircraft delay and increased costs for the air carriers and other aircraft operators. Furthermore, GA operations represent a significant percentage of operations at PBI and the combination of GA aircraft with air carrier aircraft exacerbates aircraft delay due to required in-flight safety separation standards.

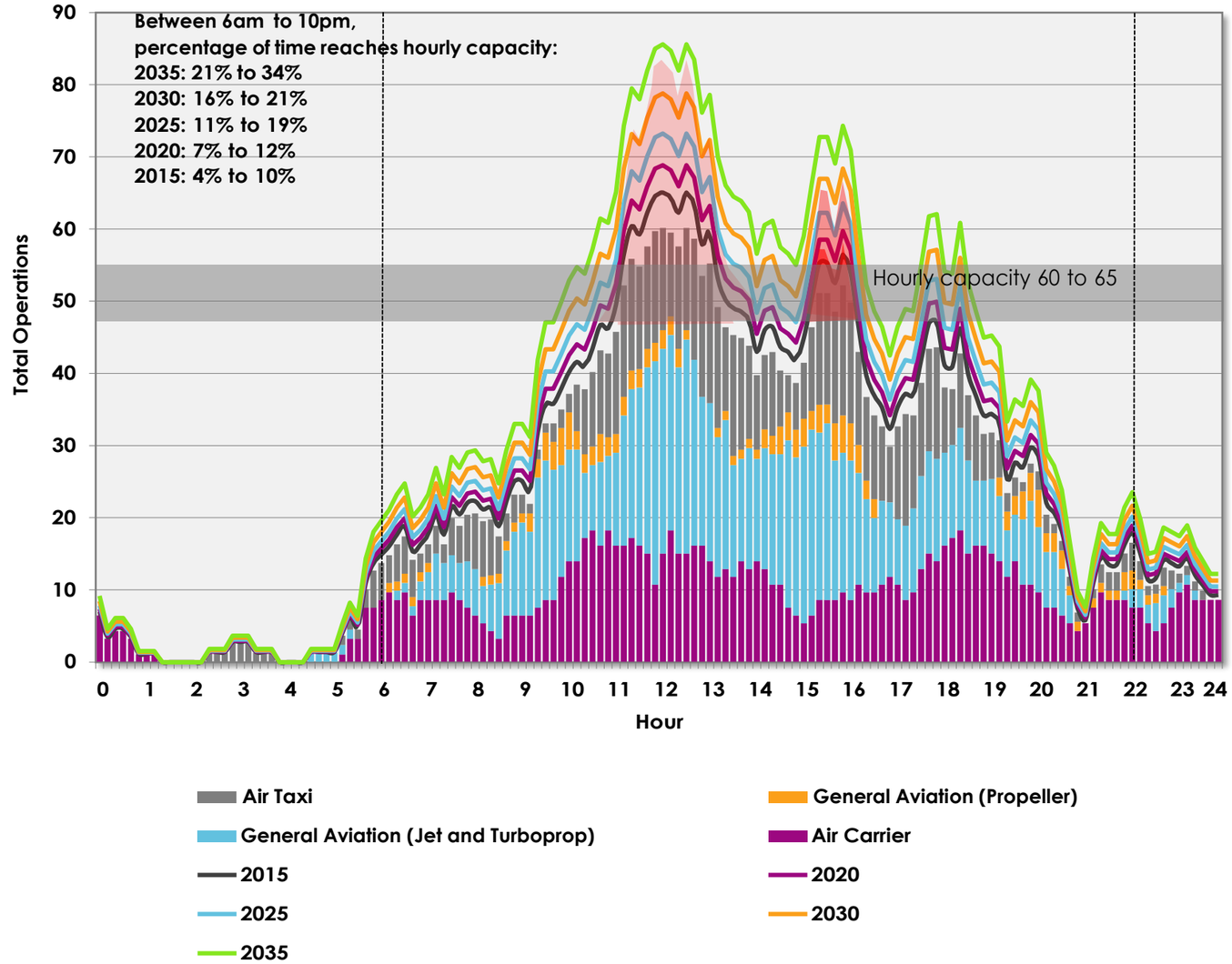


Figure 9.2: Forecast Average Day Peak Month (ADPM) Operations (Adjusted)
Source: AECOM Analysis (2016)

Although the associated aircraft delay is not quantified in this Master Plan, it is recommended that the new runway is implemented to coincide with the rehabilitation of the existing runway in 2028. Rehabilitation of the existing runway after the new runway is complete will minimize operational impacts during the rehabilitation effort and accommodate the recommended airfield capacity enhancement for anticipated peak hour operations in 2030.

As such, the implementation plan was developed based on the new runway being complete by the beginning of 2028. Given the expected construction period for the new runway is 1.5 years, all existing FBO and GA facilities impacted by the project must be relocated by mid-2026 as summarized in **Figure 9.3**.

Each FBO will operate from separate locations on a temporary basis until their facilities are consolidated at the Golfview site. Jet Aviation and Signature Flight Support will operate at separate locations until their facilities are consolidated at the Golfview site by mid-2026.

Relocation of Atlantic Aviation is dependent upon whether the proposed Runway 10R-28L accommodates a Precision Approach or only Non-Precision approaches. The implementation plan is based on the conservative scenario that the new runway will accommodate a Precision Approach. Accordingly, Atlantic Aviation operations are segregated beginning in 2025 and remain segregated until existing Runway 14-32 is decommissioned and the existing airport maintenance site (future Atlantic Aviation terminal location) is expanded.

The following sections summarize each proposed project in each implementation phase. In addition, several post-2035 "ultimate" improvement projects have been identified for implementation beyond the 20-year master planning horizon.

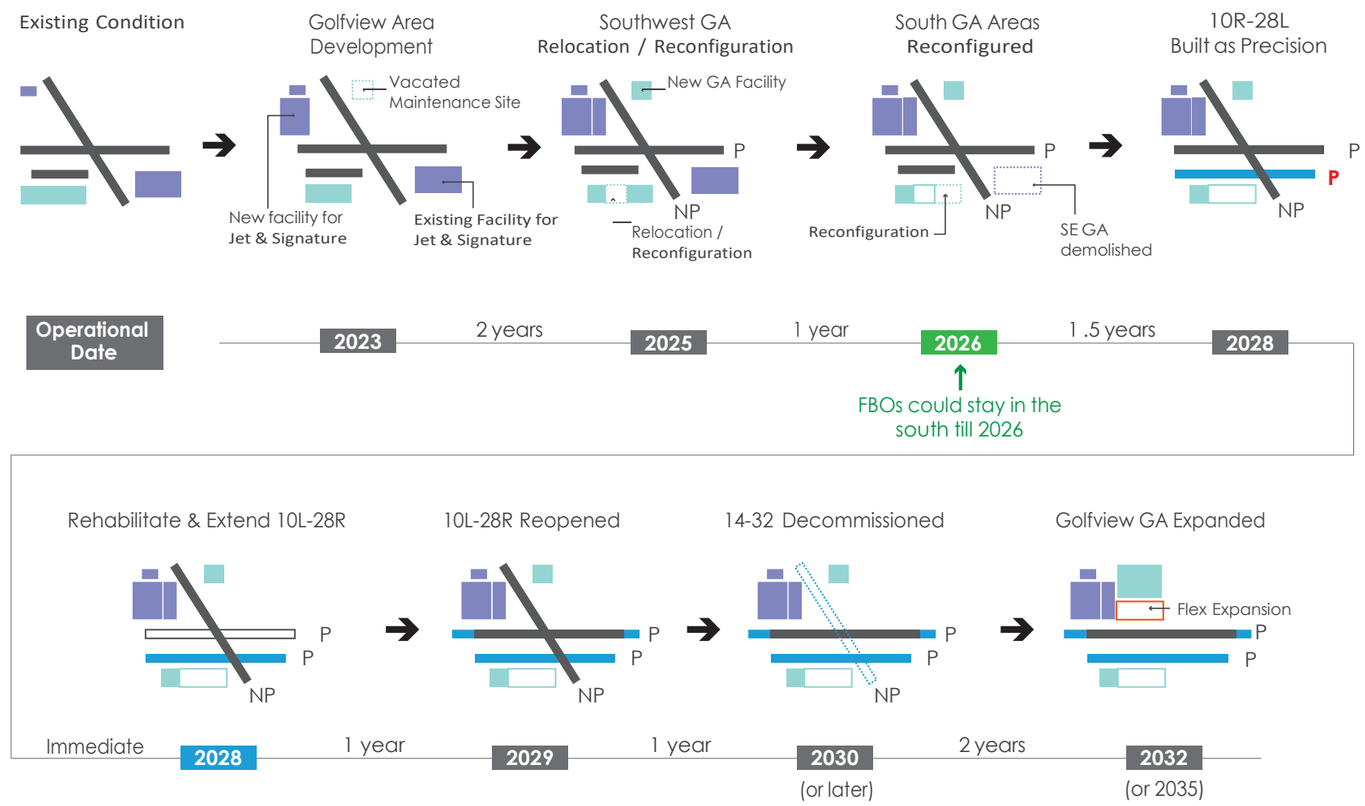


Figure 9.3: PBI Runway and General Aviation Development Phasing
Source: AECOM (2016)

9.3.1 Short-Term Implementation Plan (2019-2020)

Given the timing of completion of this Master Plan, the short-term implementation projects (Phase 1) are those planned for completion within the calendar years 2019 and 2020. Projects implemented in 2019 predominantly represent those that are currently on-going and/or in various stages of completion, such as the initial development of the Golfview site for GA facilities and mitigation of non-standard taxiway configurations. Other projects included in the short-term plan include those recommended to support projects in subsequent phases (e.g., Parcel D rezoning), those recommended to satisfy existing FAA standards (e.g., RPZ mitigation), and those recommended to accommodate the expected 2020 demand (e.g., premium parking expansion). In addition, a Sustainability Management Plan is recommended in the short-term to help the airport achieve sustainable growth while reducing consumption and environmental impact.

The short-term improvement projects are identified in **Table 9.1**.

Table 9.1: Short Term Implementation Projects

Project ID	Projected Project Initiation	Project Description	Project Purpose	Prerequisites	Dependents
Land Acquisition & Non-Aviation Development					
I-LU-01	2019	Rezone Parcel D for Airport Support	Accommodate relocated airport maintenance compound	N/A	I-S-01
I-LU-02	2019	Property acquisition along N Military Trail	Mitigation for incompatible land uses within existing RPZs	N/A	N/A
I-LU-03	2019	Property Acquisition and Rezoning of parcels along 5th and 6th Streets	Non-Aviation Development	N/A	N/A
I-LU-04	2019	Property Acquisition of parcels along N Military Trail (south of Green St.)	General Aviation Development	N/A	I-G-02
General Aviation Development					
I-G-01	2020	Relocate / Culvert Western Canal	Accommodate proposed GA development in Golfview area	N/A	I-G-02
I-G-02	2019	Phase I Golfview area development starts (west of and including Taxiway W)	New GA facilities in the Golfview area	I-G-01	N/A
I-G-03	2019	Demolish old ATCT and two GA hangars (1628 & 1629) and build new facilities	GA Expansion/Reconfiguration	N/A	N/A
Commercial Passenger Terminal Development					
I-T-01	2019	CBP expansion & reconfiguration with new sterile ramp at Gate B2	Enhance passenger processing capability and satisfy 2012 CBP Design Standards	N/A	I-T-02, I-T-03, III-T-03
I-T-02	2019	Convert Gate B1 to international gate	Accommodate two concurrent international arrivals at contact gates	I-T-01	N/A
I-T-03	2019	Construct "bump-outs" at Gates B4/B6 and B5/B7	Accommodate additional concessions	N/A	N/A
I-T-04	2019	Construct food service and specialty retail space near Checkpoint AB	Same as above	N/A	N/A
Air Cargo Development					
I-C-01	2019	I-95 connection from Air Cargo Area*	Improve access to I-95 for all-cargo operators	N/A	N/A
Airline and Airport Support Development					
I-S-01	2019	Relocate Airport Maintenance Division to Parcel D & construct storage shed south of Belvedere Road	Optimize airport maintenance facilities and accommodate proposed relocation of Atlantic Aviation	I-LU-01	II-S-01
I-S-02	2020	Develop Airport/Airline Support Facilities at 5th St. Site*	Accommodate support activities such as repair, storage, and sortation	N/A	N/A

*Note: * denotes projects proposed for facility optimization and/or revenue generation purpose, which are not driven by projected demand. The timing indicates suggested time-frame, but these projects can be implemented at any time at Airport's discretion.*

9.3.1.1. Commercial Passenger Terminal

The recommended commercial passenger terminal improvements are summarized in Chapter 5.

The primary projects proposed in the short-term involve recommended capacity enhancements (additional international arrivals gate and CBP facilities) and improved passenger convenience (increased concessions). Planning and conceptual design for the CBP project, including the conversion of Gate B1 to an international gate, is on-going and design is expected to be finalized in 2019.

As depicted in **Figure 9.4**, other terminal projects which maximize post-security concession space are also proposed in the short-term and include:

– Expansion ("bump-out") of Concourse B between Gates B4 and B6 as well as Gates B5 and B7 (I-T-03)

– The existing Concourse A/B meeter/greeter area and another small area post-security screening are converted to food service and specialty retail (I-T-04)

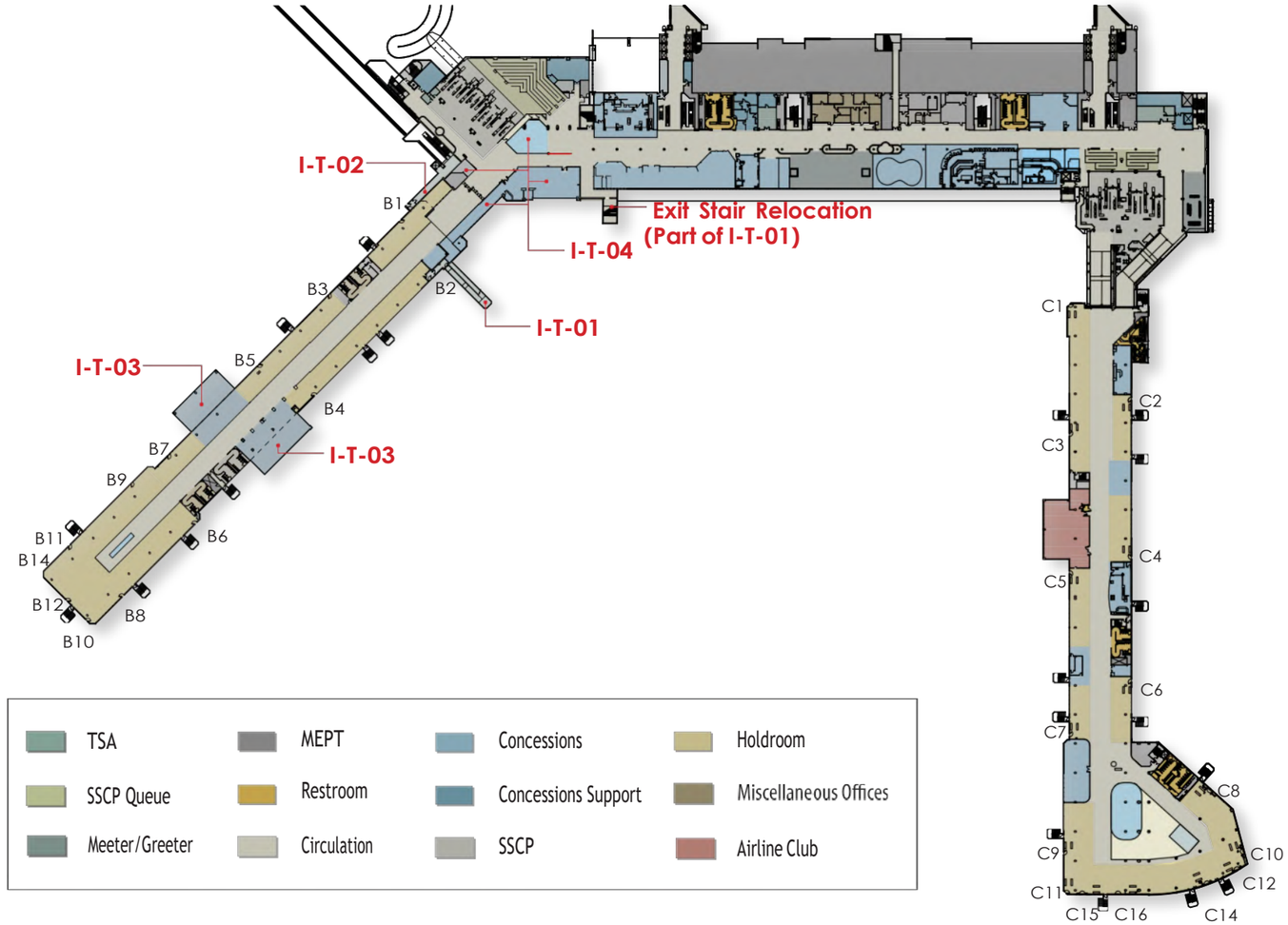


Figure 9.4: Short-Term Commercial Passenger Terminal Improvements (Departures Level)
Source: AECOM (2016)

9.3.1.2. Airside and Landside

Airside and landside projects proposed in the short-term are illustrated in **Figure 9.5.** Key projects include:

- Completion of the on-going mitigation of non-standard taxiway configurations
- New GA facilities at the old ATCT site which includes adjacent Hangars 1628 and 1629 (I-G-03)
- Rezone Parcel D and relocate the existing Airport Maintenance facilities (I-LU-01 & I-S-01)
- Relocation / culverting of western canal (I-G-01)
- Initial development of the Golfview site west of Taxiway W and preparation for future development east of Taxiway W (I-G-02)
- Acquisition of properties within existing and future Runway Protection Zones (I-LU-02)
- Acquisition of parcels for general aviation and non-aviation development (I-LU-03 & I-LU-04)
- I-95 connection from the Air Cargo facility (I-C-01)

The mitigation of other non-standard geometries (e.g., Taxiway H, Taxiway D, and Taxiway K connections with Runway 10L-28R) are not included in the implementation plan as these will be mitigated with proposed developments in the long-term. However, if the DOA rehabilitates Taxiway L or Taxiway D prior to the implementation of the new Runway 10R-28L, it is recommended these non-standard configurations are addressed at that time.

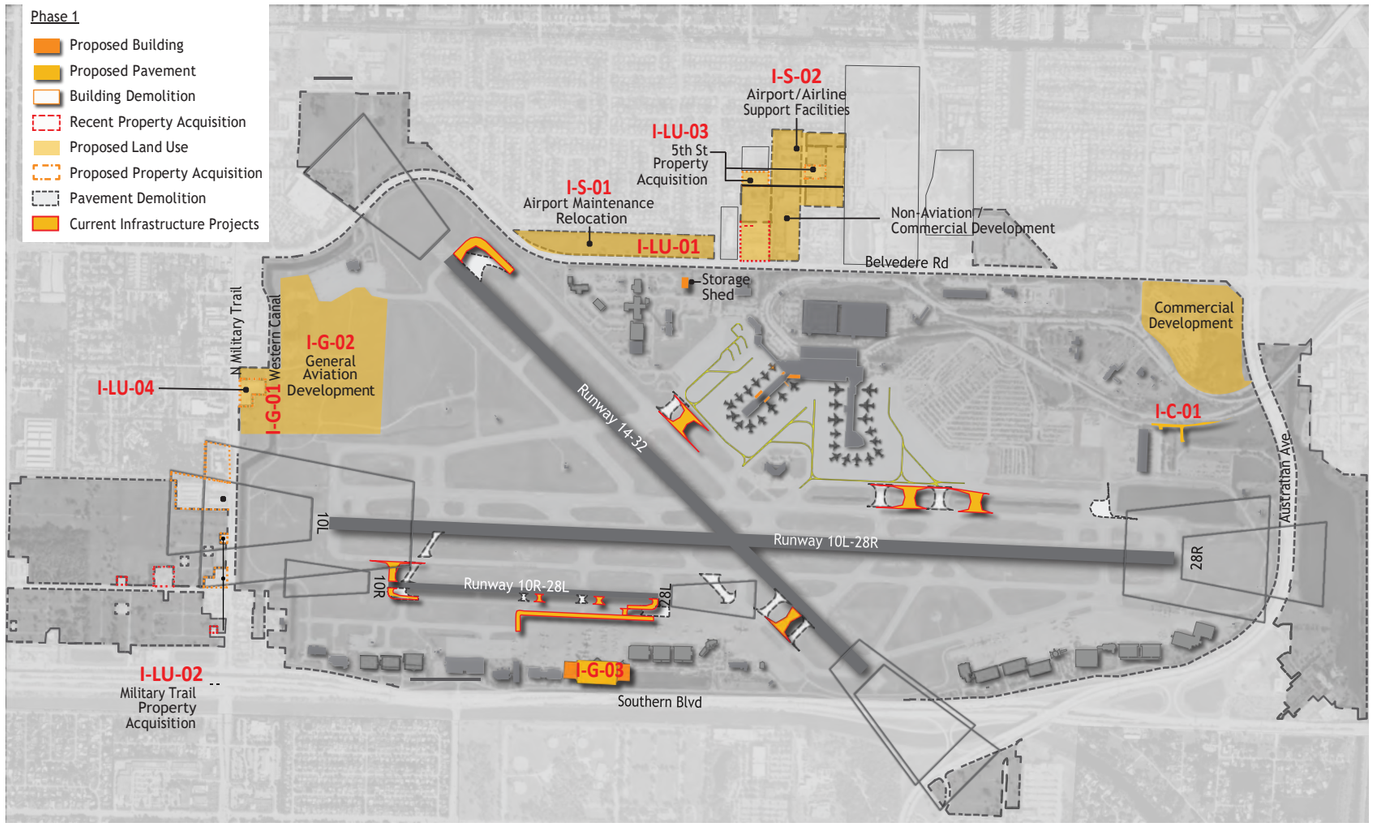


Figure 9.5: Short-Term Implementation Plan
Source: AECOM (2016)

9.3.2 Intermediate-Term Implementation Plan (2021-2025)

The intermediate-term implementation projects (Phase 2) are those planned for completion within the calendar years 2021 through 2025.

Similar to the short-term plan, the intermediate-term implementation plan includes projects which are required to enable projects proposed in the subsequent long-term phase (e.g., demolition of existing airport maintenance facilities and relocation of Atlantic Aviation) and also projects recommended to accommodate expected 2025 demand (e.g., expansion of GA facilities in at the Golfview site). The intermediate-term improvement projects are identified in **Table 9.2**.

Table 9.2: Intermediate-Term Implementation Plan Projects

Project ID	Projected Project Initiation	Project Description	Project Purpose	Prerequisites	Dependents
Land Acquisition & Non-Aviation Development					
II-LU-01	2022	Property acquisition along N Military Trail	Mitigation for incompatible land uses within future Runway 10R-28L RPZs	N/A	III-A-02
Airside Development					
II-A-01	2023	Environmental Impact Statement (EIS) for new south Runway 10R-28L	Environmental Mitigation	N/A	III-A-02
General Aviation Development					
II-G-01	2020	New CBP facility in Golfview area	Support international operations of FBOs and other GA tenants in the area	N/A	N/A
II-G-02	2023	Atlantic Aviation relocation to existing Airport Maintenance Site	Accommodate proposed Runway 10R-28L	II-S-01	II-G-04
II-G-03	2025	Demolish Hangars 1636, 1638, 1640 and site preparation	Accommodate proposed Runway 10R-28L	II-G-02	III-A-02
II-G-04	2021	Expand GA Facilities at Golfview site up to Runway 14-32	GA expansion	N/A	N/A
Commercial Passenger Terminal Development					
II-T-01	2021	Construct Concourse B Hammerhead	Additional holdroom area	N/A	N/A
II-T-02	2024	Construct secure B/C connector with integrated holdroom/concession space and relocated Gates C1 and C11	Provide operational flexibility and accommodate holdroom & concession demand	N/A	N/A
II-T-03	2021	Reconfigure retail and holdroom space at Concourse C hammerhead	Provide additional concessions space	N/A	N/A
II-T-04	2024	Construct relocated airline club and specialty retail near Checkpoint C	Accommodate additional concessions on Concourse C	N/A	III-T-01
II-T-05	2024	Reconfigure Ticketing Hall*	Optimize space utilization and enhance overall passenger experience	N/A	N/A
II-T-06	2020	Reconfigure Checkpoint C	Improve Concourse C circulation, security screening, and accommodate a secure Concourse B/C connector	N/A	N/A
Airline and Airport Support Development					
II-S-01	2020	Demolish existing Airport Maintenance buildings*	Accommodate future GA development but also provide equipment storage capacity adjacent to the airfield	I-S-01	II-G-02

*Note: * denotes projects proposed for facility optimization and/or revenue generation purpose, which are not driven by projected demand. The timing indicates suggested time-frame, but these projects can be implemented at any time at Airport's discretion.*

9.3.2.1. Commercial Passenger Terminal

The intermediate-term terminal enhancements are primarily concentrated on the Departures Level but also includes reconfiguration of the ticketing hall. As illustrated in **Figure 9.6**, the end of the Concourse B is expanded to provide additional holdroom and concessions space (II-T-01). Intermediate-term projects are identified by their identification with red text while short-term projects are identified in black text. The Concourse B expansion includes relocation of four existing gates (B6, B8, B10, and B12); therefore, it is recommended construction is phased to limit the impact to a maximum of two gates at any one time.

Since PBI has 28 existing gates, this phased approach will allow PBI to maintain a minimum of 26 active gates throughout 2025 which satisfies the anticipated demand.

Other key terminal projects in Phase 2B include the reconfiguration of concession space at the end of Concourse C, the construction of a relocated airline club with additional concessions space (II-T-03 and II-T-05), and the reconfiguration of the main terminal area to provide a secure connector between Concourse A/B and Concourse C (II-T-02). The secure connector will include two holdrooms to accommodate the relocation of Gate C1 and C11.

Concourse C SSCP is reconfigured to allow a direct exit path for arrivals on Concourse C (II-T-06).

In addition, the reconfiguration of the third level ticketing hall is proposed in order to optimize the utilization of the area, incorporate the latest technologies, and enhance the overall passenger experience. However, this enhancement is not driven by existing or anticipated demand and therefore, implementation is at the Airport's discretion and funding availability.

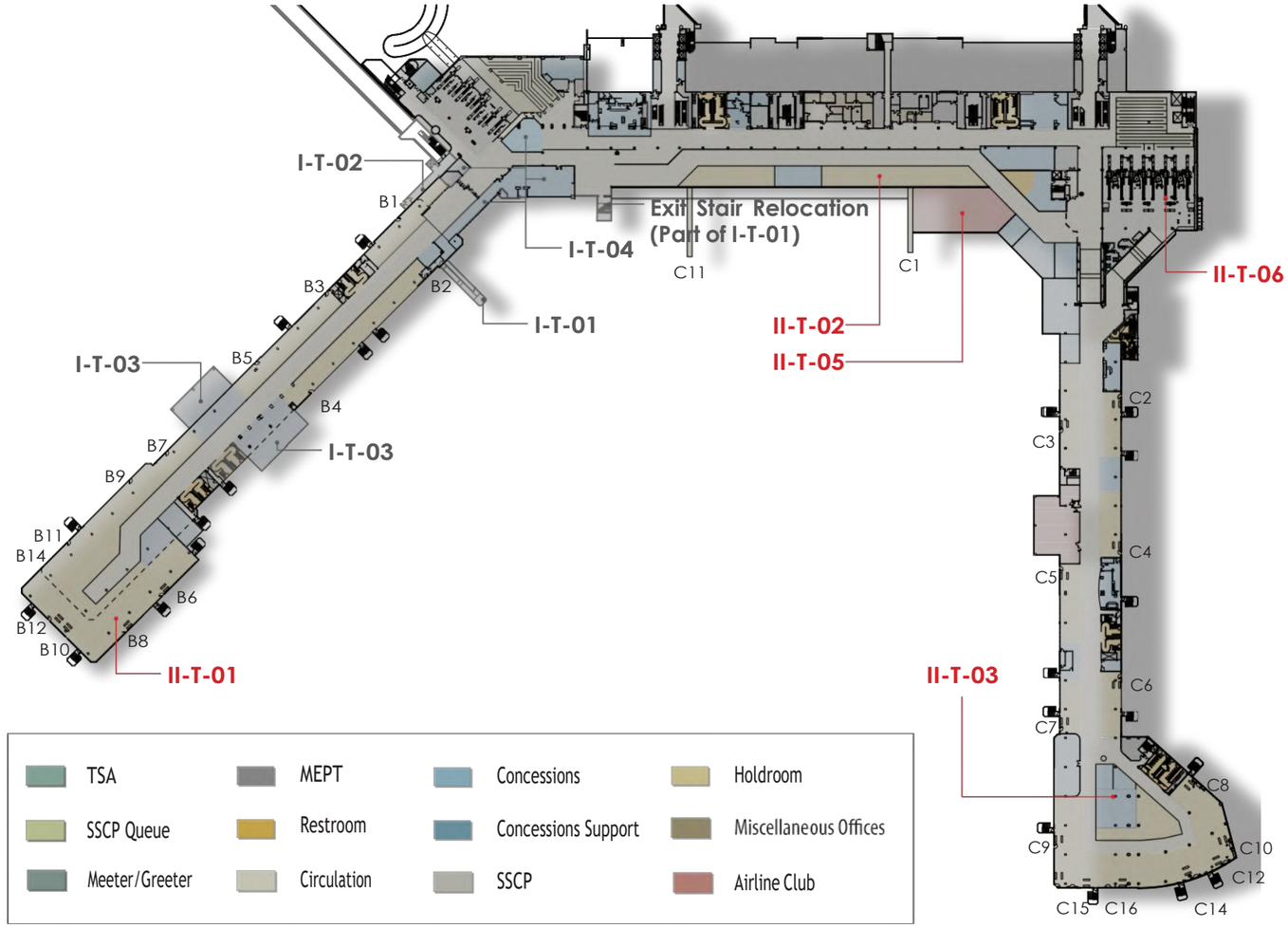


Figure 9.6: Intermediate-Term Commercial Passenger Terminal Improvements (Departures Level)
Source: AECOM (2016)

9.3.2.2. Airside and Landside

The airside and landside projects are divided into two phases, 2A and 2B, in order to delineate specific project sequencing requirements.

Phase 2A (2021 – 2023)

As illustrated in **Figure 9.7**, Phase 2A projects are those that must be completed to support the implementation of projects in Phase 2B. The key Phase 2A projects include:

- Property Acquisitions along N Military Trail to obtain control of property within the Runway Protection Zones of new Runway 10R-28L (II-LU-01)
- Demolition of the existing Airport maintenance facilities (II-S-01) to accommodate relocation of the Atlantic Aviation terminal
- Construction of a new General Aviation Federal Inspection Services building (II-G-01)

Given the FAA 2012 ROD for the 2006 PBI Master Plan postponed a decision on the proposed Runway 10R-28L, a new EIS will be required prior to initiating this project. The EIS process typically requires several years to complete and therefore, is proposed to begin in the short-term phase in order to be completed in Phase 2A.

Figure 9.7: Intermediate-Term Implementation Program - Phase 2A (2021-2023))
Source: AECOM (2016)

Phase 2B (2024-2025)

As illustrated in **Figure 9.8**, Phase 2B expand upon the projects completed in Phase 2A and also supports implementation of proposed long-term projects.

The key Phase 2B projects include:

- Expansion of the Golfview site to accommodate relocation of Jet Aviation and Signature Flight Support (II-G-04)
- Relocation of the Atlantic Aviation terminal and 2 hangars to the existing Airport maintenance site (II-G-02)
- Demolition of existing hangars 1636, 1638, and 1640 (II-G-03)

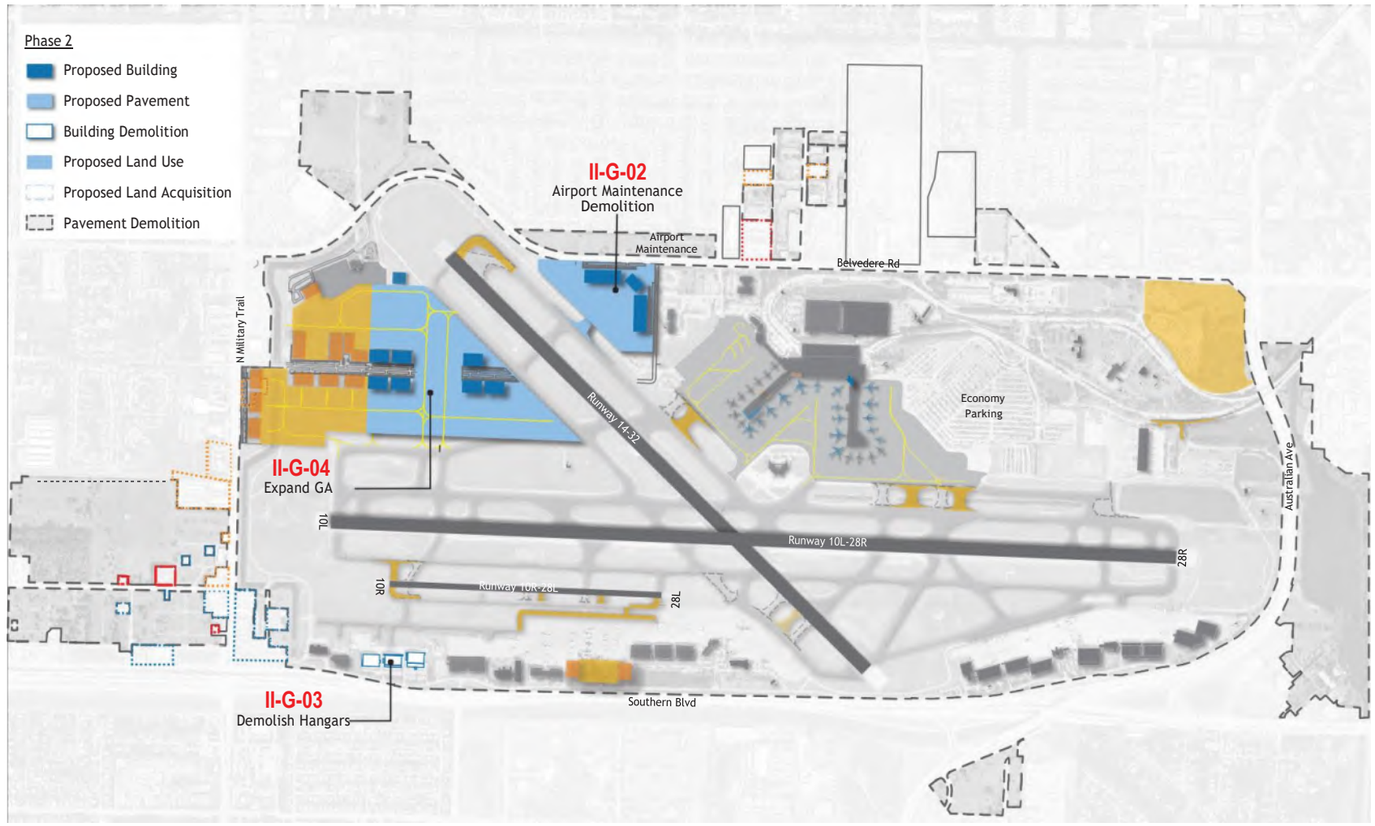


Figure 9.8: Intermediate-Term Implementation Program - Phase 2B (2024-2025)
Source: AECOM (2016)

9.3.3 Long-term Implementation Plan (2026-2036)

The long-term implementation projects (Phase 3) are those planned for completion within the calendar years 2026 through 2035.

The long-term implementation plan primarily includes projects recommended to accommodate expected 2035 demand (e.g., new Runway 10R-28L and expansion of GA facilities), those required to accommodate other projects (e.g., demolition and/or reconfiguration of the GA facilities in the south and relocation of the ARFF facility), or those recommended for facility optimization or revenue generation (e.g., holding apron and rezoning of Parcel E). The long-term improvement projects are identified in **Table 9.3**.

Table 9.3: Long-Term Implementation Plan Projects

Project ID	Projected Project Initiation	Project Description	Project Purpose	Prerequisites	Dependents
Land Acquisition & Non-Aviation Development					
III-LU-01	2031	Parcel acquisition at Belvedere Rd & N Military Trail	Aviation Development (GA Expansion)	N/A	III-G-03
III-LU-02	2031	Rezone Parcel E*	Non-Aviation Development	N/A	N/A
III-LU-03	2031	Parcel acquisition west of N Military Trail	Non-Aviation Development	N/A	N/A
III-LU-04	2031	Development of the vacated air freight area*	Non-Aviation development	III-C-03	N/A
Airfield Development					
III-A-01	2025	RTR, ASR & VOR relocation	Accommodate proposed Runway 10R-28L	N/A	III-A-02
III-A-02	2025	Relocate & extend Runway 10R-28L (construction begins at 10R end), and upgrade Taxiway Lima to TDG 5	Hourly Capacity increase and minimize operational impacts during Runway 10R-28L rehabilitation in 2027 To serve as arrival runway with 10L-28R as the departure runway	I-LU-02 II-LU-01 II-A-01 III-A-01 II-G-02 II-G-03 II-G-03 III-G-01 III-G-02	N/A
III-A-03	2031	Decommission Runway 14-32	Accommodate GA expansion	III-A-03	III-G-03
III-A-04	2033	Terminal apron edge taxilane realignment	Concourse B expansion	III-S-02	III-T-02
III-A-05	2027	Construct holding apron between Taxiways A and A1	Improve operational efficiency and capacity	N/A	N/A
III-A-06	2028	Rehabilitation of Runway 10L-28R	Extension of pavement useful life	III-A-02	N/A
General Aviation Development					
III-G-01	2024	Demolish existing southeast GA facilities	To release land for future Runway 10R-28L development	II-G-05	III-A-02
III-G-02	2024	Reconfigure southwest GA facilities	To accommodate auxiliary GA tenants	II-G-03	III-A-02 III-G-04
III-G-03	2031	Expand GA facilities in the footprint of Runway 14-32	To accommodate anticipated GA demand	III-A-04	N/A
III-G-04	2024	Expand Southwest GA Apron at site of existing Hangars 1625A, 1625B, 1625C	To provide more aircraft parking apron for Southwest GA facilities	III-G-02	N/A
Commercial Passenger Terminal Development					
III-T-01	2025	Convert existing airline club to food service	Provide additional concessions space	II-T-04	N/A
III-T-02	2033	Expand terminal apron	Concourse B hammerhead expansion	III-S-02	III-T-03
III-T-03	2032	Expand Concourse B Hammerhead	Accommodate two additional domestic gates	III-A-04 III-T-02 III-S-01	N/A
III-T-04	2032	Convert Gate B4 to International Gate	Accommodate three international arrivals	I-T-01	N/A
III-T-05	2025	Expand Gates C4 and C6 Area	Accommodate anticipated demand	N/A	N/A
III-T-06	2034	Expand Checkpoint AB	Accommodate anticipated demand	N/A	N/A
III-T-07	2034	Expand concessions space above the CBP area	Accommodate anticipated demand	I-T-01	N/A
Landside Development					
III-L-01	2034	Automated People Mover (PRT System)	Improve public transportation services	N/A	N/A
Cargo Development					
III-C-01	2028	Construct new building and aircraft parking apron	New Cargo Building to support anticipated demand	N/A	III-C-02
III-C-02	2029	Relocate air freight tenants	Consolidate cargo activities	N/A	III-C-03
III-C-03	2030	Demolish existing air freight building	Accommodate non-aviation development	III-C-02	III-LU-04
Airline and Airport Support Development					
III-S-01	2030	Relocate ARFF station	Support terminal and apron expansion	N/A	III-S-02
III-S-02	2032	Demolish existing ARFF Station	Support terminal and apron expansion	III-S-01	III-A-04 III-T-01 III-T-02

*Note: * denotes projects proposed for facility optimization and/or revenue generation purpose, which are not driven by projected demand. The timing indicates suggested time-frame, but these projects can be implemented at any time at Airport's discretion.*

9.3.3.1. Commercial Passenger Terminal

As depicted in **Figure 9.9**, the primary terminal development in Phase 3 is the continued expansion of the Concourse B hammerhead (III-T-03) completed in Phase 2A. In order to accommodate the concourse expansion and its associated aircraft parking apron, the existing ARFF station is relocated to a site south of the existing ATCT (III-S-01) and the Concourse B taxilane is relocated and connected to existing Taxiway M (III-A-05).

Other terminal projects completed in Phase 3D include:

- Conversion of Gate B4 to an international gate (III-T-04)
- Expansion ("bump-out") of Concourse C at Gate C4 and C6 to increase retail, restroom, and holdroom space (III-T-05)
- Expansion of the Security Screening Checkpoint (SSCP) at Concourse A/B to provide in total eight screening lanes and extra queue space (III-T-06)
- Expansion of concessions space above the CBP expansion (III-T-07) completed in the short-term phase

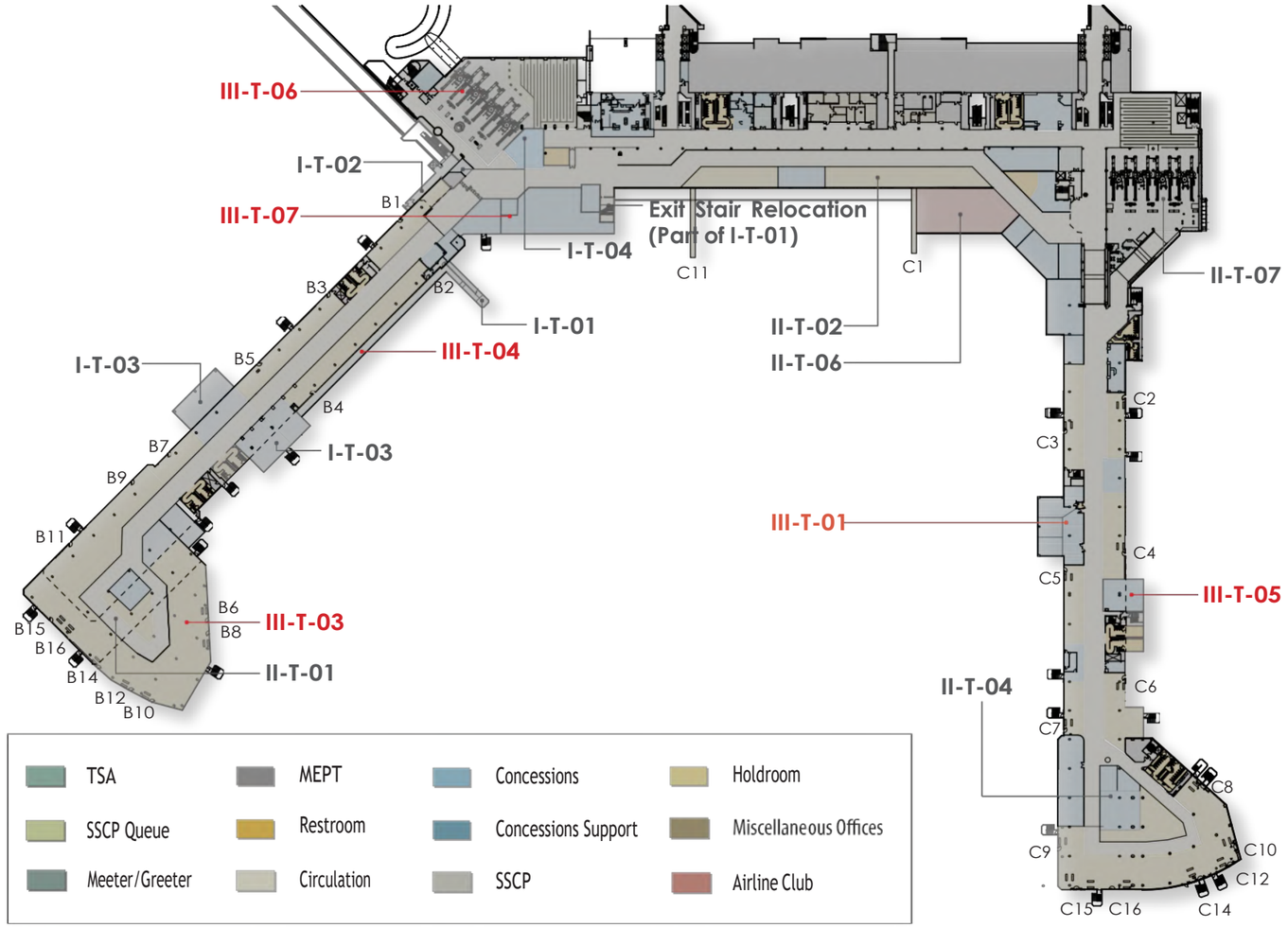


Figure 9.9: Long-Term Commercial Passenger Terminal Improvements (Departures Level)
Source: AECOM (2016)

9.3.3.2. Airside and Landside

Similar to the intermediate development period, the long-term airside and landside projects are divided into three phases in order to delineate specific project sequencing requirements.

Phase 3A (2026)

The predominant purpose of Phase 3A is to prepare the southside of the airport for the construction of proposed Runway 10R-28L. As illustrated in **Figure 9.10**, the site of the existing hangars demolished in Phase 2B (1636, 1638, and 1640) is reconfigured (III-G-02) and the existing Jet Aviation, Signature Flight Support, and Atlantic Aviation terminal and adjacent hangars (1625A, 1625B, 1625C) are demolished (III-G-01 and III-G-02).

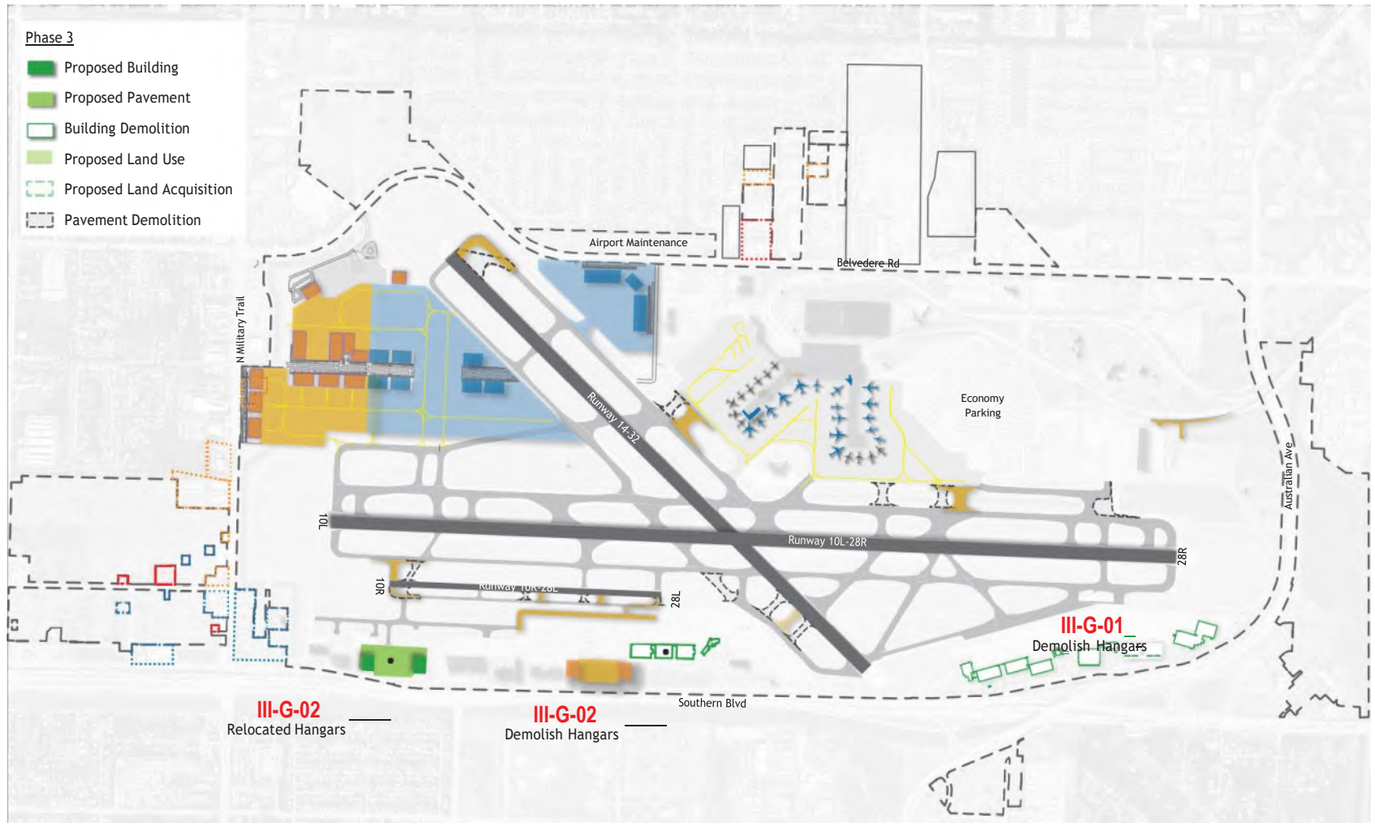


Figure 9.10: Long-Term Implementation Program - Phase 3A (2026)
Source: AECOM (2016)

Phase 3B (2027 – 2028)

As illustrated in **Figure 9.11**, Phase 3B includes the construction of proposed Runway 10R-28L as a precision runway, its associated taxiway system, and the construction/relocation of all existing and proposed NAVAIDs (III-A-01 and III-A-02). As part of this project, Taxiway L is upgraded from the current ADG III (TDG 4) to an ADG IV (TDG 5) to accommodate the aircraft that will utilize it on a regular basis.

The existing aircraft parking aprons associated with the Southwest GA facilities are reconfigured, as applicable, to accommodate a new taxiway. The site of the Atlantic Aviation terminal and the three adjacent hangars demolished in Phase 3A is converted to apron space to maximize aircraft parking capacity (III-G-02). Additionally, properties along N Military Trail are acquired to provide an expansion area for Signature Flight Support facilities (III-LU-01).

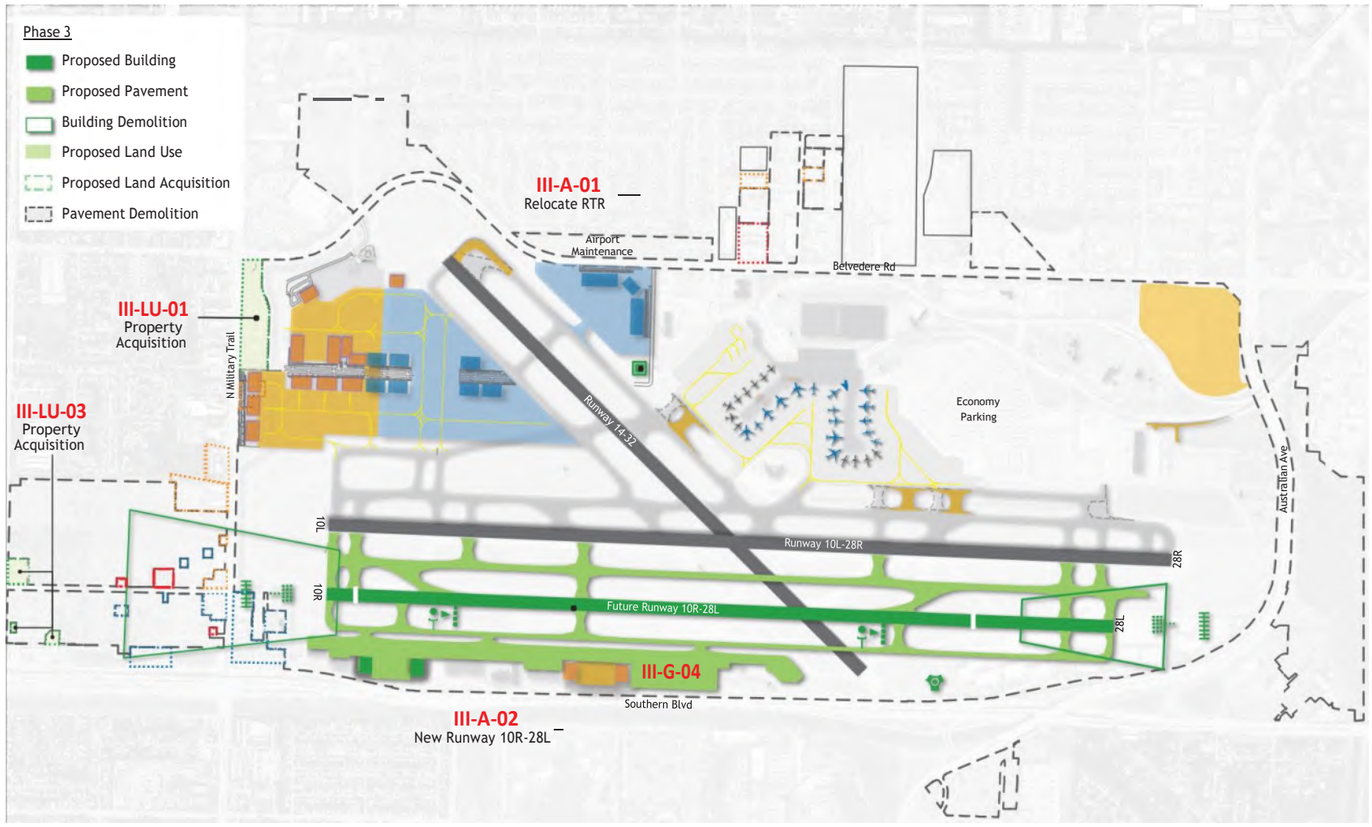


Figure 9.11: Long-Term Implementation Program - Phase 3B (2027-2028)
Source: AECOM (2016)

Phase 3C (Post 2028)

As previously noted, the rehabilitation of the existing Runway 10L-28R is anticipated in January 2028 based on the useful life of the most recent rehabilitation completed in 2013. In conjunction with the rehabilitation project, it is recommended that a holding apron is constructed between existing Taxiway A and Taxiway A1 near Runway 10L to improve operational efficiency (III-A-05) as depicted in **Figure 9.12**.

The projects included in Phase 3C include the final development of proposed GA facilities and the commercial passenger terminal (discussed in the next section). Based on anticipated GA demand, the implementation plan includes the decommissioning of Runway 14-32 in 2033 (III-A-03). Subsequently, GA facilities are expanded into the Runway 14-32 footprint (III-G-03). Parcel E, which is currently vacant and has limited use based on the location of Runway 14, is rezoned to allow commercial or other revenue generating development (III-LU-02).

The existing ARFF station is relocated (III-S-01) and the Concourse B and C apron edge taxilane is realigned (III-S-01) to allow expansion of Concourse B.

A PRT fixed guideway system (III-L-01) to transport passengers to and from the Tri-Rail Coastal Link commuter rail service and the All-Aboard Florida West Palm Beach station downtown as well as connections with airport facilities such as economy parking, employee parking, and the rental car facilities.

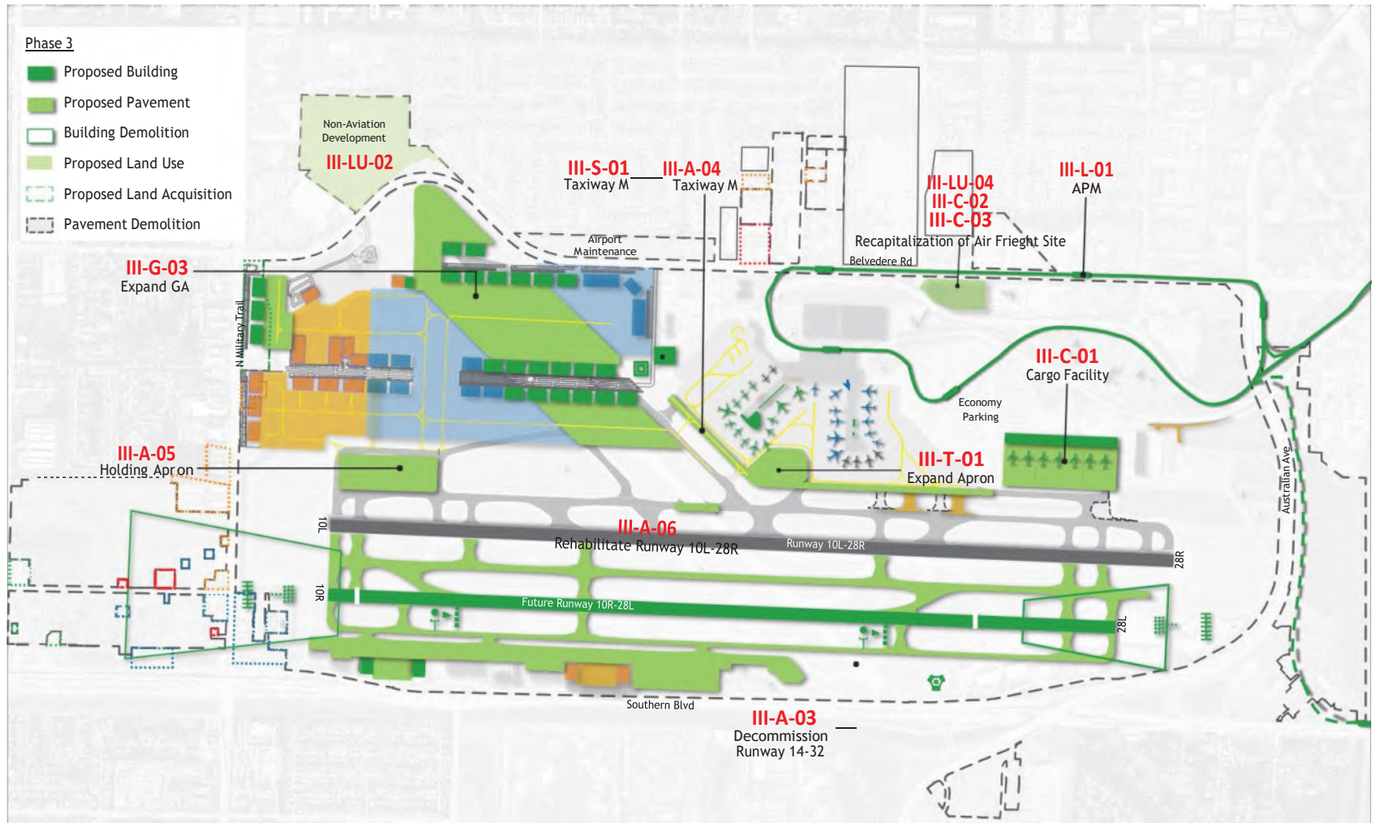


Figure 9.12: Long-Term Implementation Program - Phase 3C (Post 2028)
Source: AECOM (2016)

9.3.4 Ultimate Development Plan (Post 2035)

The Master Plan includes projects that can further improve the operational efficiency and flexibility as well as passenger convenience but are not required based on anticipated demand.

As illustrated in **Figure 9.13** the ultimate development plan includes the following projects:

- Aviation development in the footprint of Runway 32 when it is decommissioned
- Relocation and expansion of the air cargo facilities which will allow for other uses in the parcel occupied by the existing air cargo building (IV-C-01)
- Extension of Runway 10L-28R to support international operations (IV-A-02)
- A new standard high-speed exit for Runway 10L arrivals (IV-A-01)
- Development of Parcel E for non-aviation revenue (IV-LU-01)
- Development of an airline maintenance facility (IV-S-01)

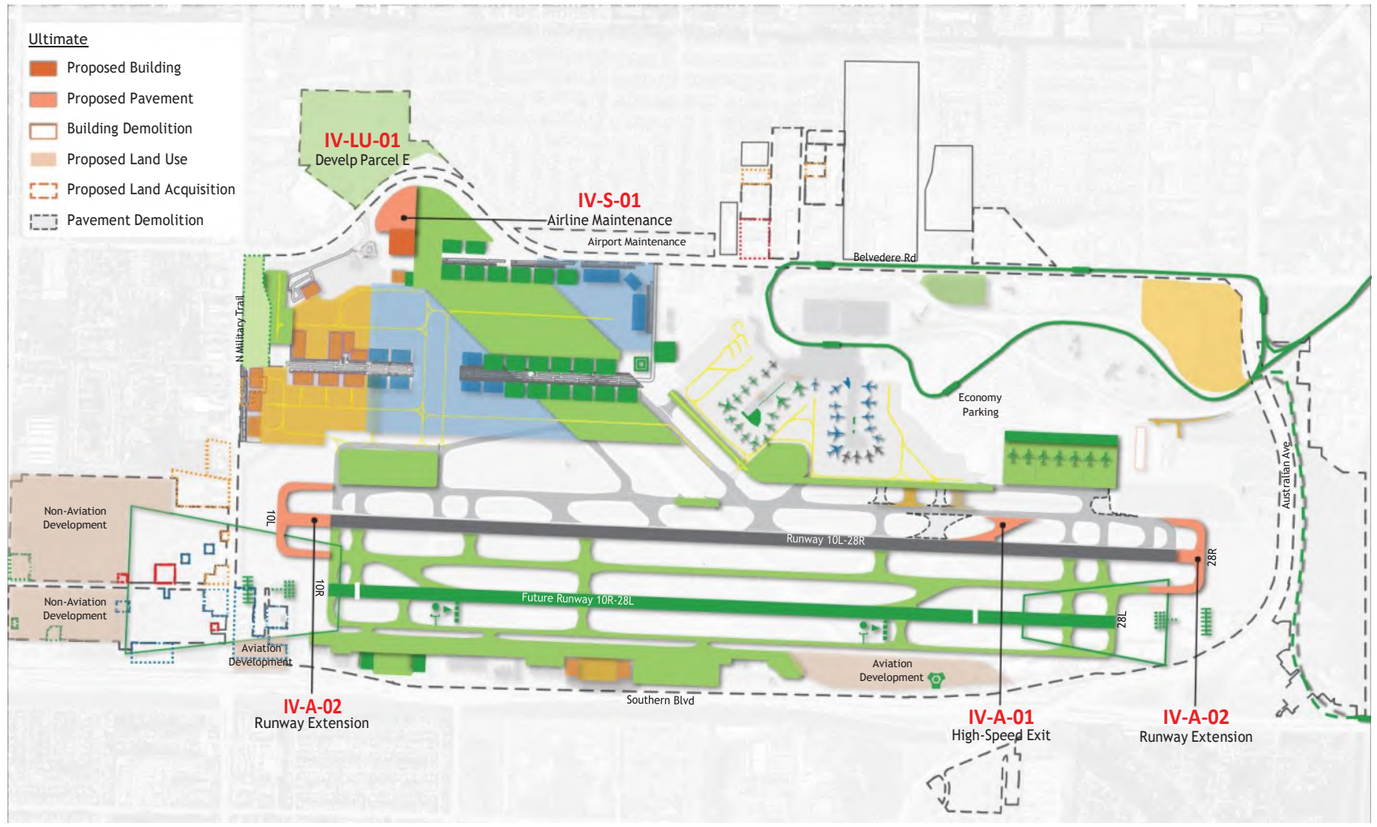


Figure 9.13: Ultimate Implementation Plan (Post 2035)
Source: AECOM (2016)

9.4 Cost Estimates

Preliminary cost estimates for each project were developed to determine the approximate overall program cost, calculated in 2016 dollars. The methodology utilized to develop the cost estimates include:

- Total property acquisition costs are based on assessed market value and potential costs associated with the following:
  - Contingency for 2015 assessed market value: 15.0%
  - Relocation or settlement costs: 35.0%
  - Management, legal, & condemnation costs: 10.0%
- Total construction costs are based on direct material costs and additional fees associated with the following:
  - Mobilization and startup: 1.2%
  - Field overhead: 10.0%
  - Demobilization: 0.8%
  - Profit: 10.0%
  - Main office overhead: 5.0%
  - Bond: 1.5%
  - Contingencies: 15.0%
- Direct material unit costs are based on R.S. Means, statewide averages, and recent construction projects completed at PBI
- Labor rates are based on project location
- Labor productivity are based on the type of work required to complete each project
- Program mark ups are as follows:
  - Change order contingency (buildings): 10.0%
  - Change order contingency (heavy civil): 5.0%
  - Design fee: 8.0%
  - Design services during construction: 4.5%
  - Program Management: 10.0%
  - Construction Inspection: 10.0%

The cost estimates are summarized per function and phase in **Table 9.4** while **Table 9.5** provides the cost estimate for each project including construction costs and program mark-ups.

It is anticipated that the funding sources for these projects will include the FAA, FDOT and/or other state participation, third party contributors such as the FBOs and other tenants, and local sources. For example, the total estimated cost for the GA development plan is nearly $490 million but the cost attributed to Government sources is only slightly above $100 million and primarily includes site preparation and airside access development. The proposed financial plan to fund these projects is presented in Chapter 10, *Financial Plan*.

Table 9.4: Cost Estimate Summary

Function	Estimated Cost				
	Short-Term	Intermediate-Term	Long-Term	Ultimate	Total by Category
Land Use / Acquisitions	$9,857,469	$9,909,900	$15,315,041	$1,818,507	**$36,900,917**
Airside	-	$3,000,000	$152,335,592	$13,042,055	**$168,377,647**
General Aviation	$139,819,795	$128,457,704	$217,501,505	-	**$485,779,005**
Terminal	$26,282,840	$48,233,372	$46,356,328	-	**$120,872,540**
Landside	-	-	-	$1,149,097,700	**$1,149,097,700**
Air Cargo	$3,060,919	-	$42,784,020	-	**$45,844,939**
Airline/Airport Support	$21,443,828	$1,551,949	$17,496,099	$32,717,091	**$73,208,967**
Total by Phase	**$200,464,851**	**$191,152,925**	**$491,788,585**	**$1,196,675,353**	**$2,080,081,714**
Anticipated General Aviation Funding Sources					
Federal, State, and/or Local Government	$25,721,002	$29,603,854	$48,826,590	-	**$104,151,446**
3rd Party	$114,098,793	$98,853,850	$168,674,915	-	**$381,627,559**

Table 9.5: Project Cost Estimates

Project ID	Project Description	Construction Cost	Change Order Contingency (5% or 10%)	Design Fee (8%)	Construction Design Services (4.5%)	Program Management (10%)	Construction Inspection (10%)	Total Project Cost
Land Acquisition & Non-Aviation Development								
Short-Term (2019-2020)								
I-LU-01	Rezone Parcel D for Airport Support	$248,918				$24,892		$273,810
I-LU-02	Property acquisition west of N Military Trail (within existing Runway 10L RPZs)	$8,712,417				$871,242		$9,583,659
I-LU-03	Property Acquisition & Rezoning of three remaining parcels along 5th and 6th Streets	$3,164,108				$316,411		$3,480,519
I-LU-04	Property Acquisition of parcels along N Military Trail (south of Green St.) for GA development	$4,577,663				$457,766		$5,035,429
Intermediate-Term (2021-2025)								
II-LU-01	Property acquisition west of N Military Trail (within future RPZs)	$9,009,000				$900,900		$9,909,900
Long-Term (2026-2035)								
III-LU-01	Parcel acquisition at southeast corner of Belvedere Rd. and N Military Trail intersection	$9,612,693				$961,269		$10,573,962
III-LU-02	Rezone Parcel E	$398,396	$39,840	$31,872	$17,928	$39,840	$39,840	$567,716
III-LU-03	Property acquisition west of N Military Trail (remainder of sites)	$3,542,630				$354,263		$3,896,893
III-LU-04	Rezoning and commercial development at the vacated air freight area	$251,336				$25,134		$276,470
Ultimate (Post 2035)								
IV-LU-01	Develop Parcel E	$1,276,145	$127,615	$102,092	$57,427	$127,615	$127,615	$1,818,507
Airfield Development								
Intermediate-Term (2021-2025)								
II-A-01	Environmental Impact Statement (EIS) for proposed Runway 10R-28L			$300,000		$2,700,000		$3,000,000
Long-Term (2026-2035)								
III-A-01	RTR, ASR & VOR relocation	$4,513,706	$225,685	$361,096	$203,117	$451,371	$451,371	$6,206,346
III-A-02	Relocate & extend Runway 10R-28L with associated taxiways (including upgrade of Taxiway Lima)	$71,612,989	$3,580,649	$5,729,039	$3,222,586	$7,161,299	$7,161,299	$98,467,861
III-A-03	Decommission Runway 14-32	$2,606,438	$130,322	$208,515	$117,290	$260,644	$260,644	$3,583,853
III-A-04	Terminal apron edge taxilane realignment with Taxiway M	$10,170,609	$508,530	$813,649	$457,677	$1,017,061	$1,017,061	$13,984,588
III-A-05	Construct holding apron at Taxiways A and C at Runway 10L end	$6,477,896	$323,896	$518,232	$291,505	$647,790	$647,790	$8,907,107
III-A-06	Rehabilitation of Runway 10L-28R	$14,867,254	$1,486,725	$1,189,380	$669,026	$1,486,725	$1,486,725	$21,185,837
Ultimate (Post 2035)								
IV-A-01	New High Speed Exit Taxiway for Runway 10L	$3,579,057	$357,906	$286,325	$161,058	$357,906	$357,906	$5,100,156
IV-A-02	Extend Runway 10L-28R	$5,573,262	$557,326	$445,861	$250,797	$557,326	$557,326	$7,941,898

Note: Costs may not add to total project cost due to rounding

Table 9.5. Project Cost Estimates (Continued)

Project ID	Project Description	Construction Cost	Change Order Contingency (5% or 10%)	Design Fee (8%)	Construction Design Services (4.5%)	Program Management (10%)	Construction Inspection (10%)	Total Project Cost
General Aviation Development								
Short-Term (2019-2020)								
I-G-01	Relocate/Culvert Western Canal	$15,728,080	$1,572,808	$1,258,246	$707,764	$1,572,808	$1,572,808	$22,412,515
I-G-02	Phase I Golfview area development	$69,595,182	$6,959,518	$5,567,615	$3,131,783	$6,959,518	$6,959,518	$99,173,135
I-G-03	Demolish old ATCT and two GA hangars (1628 & 1629) and build new facilities on site	$12,795,891	$1,279,589	$1,023,671	$575,815	$1,279,589	$1,279,589	$18,234,145
Intermediate-Term (2021-2025)								
II-G-01	New CBP facility in Golfview area	$3,665,402	$366,540	$293,232	$164,943	$366,540	$366,540	$5,223,197
II-G-02	Atlantic Aviation relocation to existing Airport Maintenance Site	$39,911,072	$3,991,107	$3,192,886	$1,795,998	$3,991,107	$3,991,107	$56,873,278
II-G-03	Demolish Hangars 1636, 1638, 1640 and Site Preparation	$2,594,768	$259,477	$207,581	$116,765	$259,477	$259,477	$3,697,544
II-G-04	Expand GA Facilities at Golfview site up to Runway 14-32	$43,974,516	$4,397,452	$3,517,961	$1,978,853	$4,397,452	$4,397,452	$62,663,685
Long-Term (2026-2035)								
III-G-01	Demolish existing southeast GA facilities	$8,629,887	$862,989	$690,391	$388,345	$862,989	$862,989	$12,297,588
III-G-02	Demolish/reconfigure southwest GA facilities impacted by the new runway	$14,660,022	$1,466,002	$1,172,802	$659,701	$1,466,002	$1,466,002	$20,890,531
III-G-03	Expand Golfview facilities in the footprint of decommissioned Runway 14-32	$118,688,415	$11,868,842	$9,495,073	$5,340,979	$11,868,842	$11,868,842	$169,130,991
III-G-04	Expand Southwest GA Apron at site of existing Hangars 1625A, 1625B, 1625C	$10,654,312	$1,065,431	$852,345	$479,444	$1,065,431	$1,065,431	$15,182,395

Note: Costs may not add to total project cost due to rounding

Table 9.5. Project Cost Estimates (Continued)

Project ID	Project Description	Construction Cost	Change Order Contingency (5% or 10%)	Design Fee (8%)	Construction Design Services (4.5%)	Program Management (10%)	Construction Inspection (10%)	Total Project Cost
Commercial Passenger Terminal Development								
Short-Term (2019-2020)								
I-T-01	CBP expansion & reconfiguration with new sterile ramp at Gate B2	$11,774,646	$1,177,465	$941,972	$529,859	$1,177,465	$1,177,465	$16,778,870
I-T-02	Convert Gate B1 to international gate	$1,576,157	$157,616	$126,093	$70,927	$157,616	$157,616	$2,246,024
I-T-03	Construct "bump-outs" at Gates B4/B6 and B5/B7	$3,996,181	$399,618	$319,694	$179,828	$399,618	$399,618	$5,694,558
I-T-04	Construct food service and specialty retail space near Checkpoint AB	$1,097,114	$109,711	$87,769	$49,379	$109,711	$109,711	$1,563,388
Intermediate-Term (2021-2025)								
II-T-01	Construct Concourse B Hammerhead	$6,200,110	$620,011	$496,009	$279,005	$620,011	$620,011	$8,835,156
II-T-02	Construct secure B/C connector and relocated Gates C1 and C11	$14,004,953	$1,400,495	$1,120,396	$630,223	$1,400,495	$1,400,495	$19,957,058
II-T-03	Reconfigure retail and holdroom space at Concourse C hammerhead	$1,748,526	$174,853	$139,882	$78,684	$174,853	$174,853	$2,491,650
II-T-04	Reconfigure Ticketing Hall	$5,819,763	$581,976	$465,581	$261,889	$581,976	$581,976	$8,293,163
II-T-05	Construct relocated airline club and specialty retail near Checkpoint C	$3,607,241	$360,724	$288,579	$162,326	$360,724	$360,724	$5,140,319
II-T-06	Reconfigure Checkpoint C	$2,467,387	$246,739	$197,391	$111,032	$246,739	$246,739	$3,516,026
Long-Term (2026-2035)								
III-T-01	Convert existing airline club in Concourse C to food service	$158,875	$15,888	$12,710	$7,149	$15,888	$15,888	$226,397
III-T-02	Expand terminal apron	$11,562,529	$1,156,253	$925,002	$520,314	$1,156,253	$1,156,253	$16,476,604
III-T-03	Expand Concourse B Hammerhead	$9,069,136	$906,914	$725,531	$408,111	$906,914	$906,914	$12,923,519
III-T-04	Convert Gate B4 to International Gate	$2,460,761	$246,076	$196,861	$110,734	$246,076	$246,076	$3,506,584
III-T-05	Expand concession and holdroom space at Gates C4 and C6	$1,820,157	$182,016	$145,613	$81,907	$182,016	$182,016	$2,593,724
III-T-06	Expand Checkpoint AB	$1,871,321	$187,132	$149,706	$84,209	$187,132	$187,132	$2,666,633
III-T-07	Construct concession space above the expanded CBP area	$5,587,977	$558,798	$447,038	$251,459	$558,798	$558,798	$7,962,867

Note: Costs may not add to total project cost due to rounding

Table 9.5. Project Cost Estimates (Continued)

Project ID	Project Description	Construction Cost	Change Order Contingency (5% or 10%)	Design Fee (8%)	Construction Design Services (4.5%)	Program Management (10%)	Construction Inspection (10%)	Total Project Cost
Landside Development								
Long-Term (2026-2035)								
III-L-01	Automated People Mover (Personal Rapid Transit System)	$806,384,351	$80,638,435	$64,510,748	$36,287,296	$80,638,435	$80,638,435	$1,149,097,700
Air Cargo Development								
Short-Term (2019-2020)								
I-C-01	I-95 connection from Air Cargo Area	$2,148,013	$214,801	$171,841	$96,661	$214,801	$214,801	$3,060,919
Long-Term (2026-2035)								
III-C-01	Construct new building and aircraft parking apron in the Air Cargo area	$28,399,412	$2,839,941	$2,271,953	$1,277,974	$2,839,941	$2,839,941	$40,469,163
III-C-02	Move tenant in the air freight area into the new consolidated air cargo facility	$397,951	$39,795	$31,836	$17,908	$39,795	$39,795	$567,081
III-C-03	Demolish existing air freight building	$1,226,509	$122,651	$98,121	$55,193	$122,651	$122,651	$1,747,776
Airline and Airport Support Development								
Short-Term (2019-2020)								
I-S-01	Relocate Airport Maintenance Division to Parcel D & construct storage shed south of Belvedere Rd	$4,588,916	$458,892	$367,113	$206,501	$458,892	$458,892	$6,539,205
I-S-02	Develop Airport/Airline Support Facilities at 5th St. Site	$10,459,384	$1,045,938	$836,751	$470,672	$1,045,938	$1,045,938	$14,904,623
Intermediate-Term (2021-2025)								
II-S-01	Demolish existing Airport Maintenance buildings	$1,089,087	$108,909	$87,127	$49,009	$108,909	$108,909	$1,551,949
Long-Term (2026-2035)								
III-S-01	Move Aircraft Rescue and Fire Fighting (ARFF) station to the new station south of ATCT	$11,390,677	$1,139,068	$911,254	$512,580	$1,139,068	$1,139,068	$16,231,715
III-S-02	Demolish existing ARFF Station	$887,287	$88,729	$70,983	$39,928	$88,729	$88,729	$1,264,384
Ultimate (Post 2035)								
IV-S-01	Construct an aircraft maintenance facility	$22,959,363	$2,295,936	$1,836,749	$1,033,171	$2,295,936	$2,295,936	$32,717,091

Note: Costs may not add to total project cost due to rounding

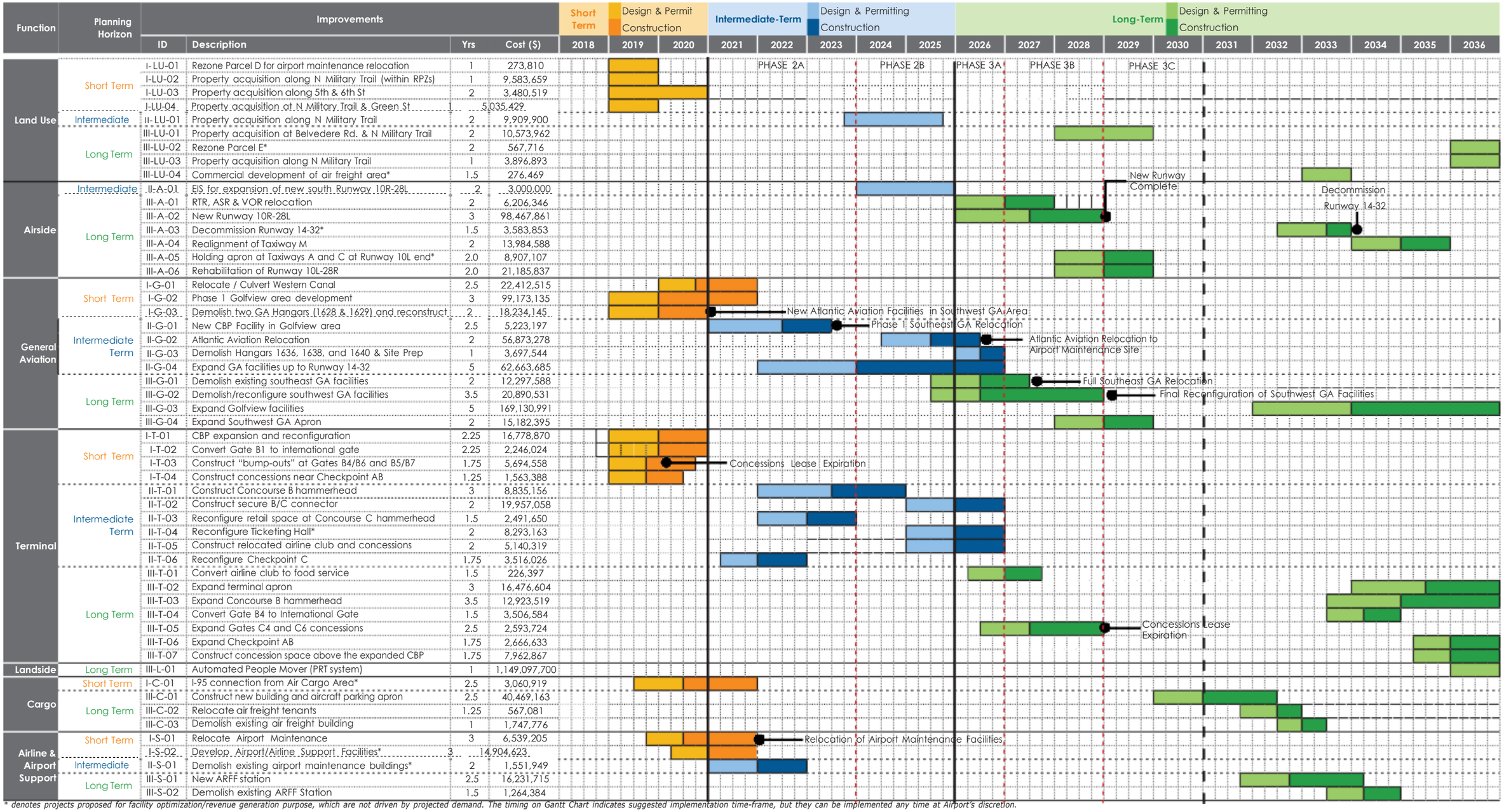
9.5 Implementation Schedule

The implementation schedule depicted in **Figure 9.14** is provided for general guidance on the phasing of the preferred development plan.

The schedule includes a project identifier, description, approximate duration (including estimated design/permitting and construction periods), and cost. As previously noted, the schedule is based on the phase in which the project is scheduled for completion but may begin in the previous phase.

Accordingly, funding for the project will need to be available in the phase in which it begins. The implementation plan is an iterative process and any deviations of actual activity or funding availability may require modifications to the overall schedule.

Function	Planning Horizon	ID	Description	Yrs	Cost ($)
Land Use	Short Term	I-LU-01	Rezone Parcel D for airport maintenance relocation	1	273,810
		I-LU-02	Property acquisition along N Military Trail (within RPZs)	1	9,583,659
		I-LU-03	Property acquisition along 5th & 6th St	2	3,480,519
		I-LU-04	Property acquisition at N Military Trail & Green St	1	5,035,429
	Intermediate	II-LU-01	Property acquisition along N Military Trail	2	9,909,900
	Long Term	III-LU-01	Property acquisition at Belvedere Rd. & N Military Trail	2	10,573,962
		III-LU-02	Rezone Parcel E*	2	567,716
		III-LU-03	Property acquisition along N Military Trail	1	3,896,893
		III-LU-04	Commercial development of air freight area*	1.5	276,469
Airside	Intermediate	II-A-01	EIS for expansion of new south Runway 10R-28L	2	3,000,000
	Long Term	III-A-01	RTR, ASR & VOR relocation	2	6,206,346
		III-A-02	New Runway 10R-28L	3	98,467,861
		III-A-03	Decommission Runway 14-32*	1.5	3,583,853
		III-A-04	Realignment of Taxiway M	2	13,984,588
		III-A-05	Holding apron at Taxiways A and C at Runway 10L end*	2.0	8,907,107
		III-A-06	Rehabilitation of Runway 10L-28R	2.0	21,185,837
General Aviation	Short Term	I-G-01	Relocate / Culvert Western Canal	2.5	22,412,515
		I-G-02	Phase 1 Golfview area development	3	99,173,135
		I-G-03	Demolish two GA Hangars (1628 & 1629) and reconstruct	2	18,234,145
	Intermediate Term	II-G-01	New CBP Facility in Golfview area	2.5	5,223,197
		II-G-02	Atlantic Aviation Relocation	2	56,873,278
		II-G-03	Demolish Hangars 1636, 1638, and 1640 & Site Prep	1	3,697,544
		II-G-04	Expand GA facilities up to Runway 14-32	5	62,663,685
	Long Term	III-G-01	Demolish existing southeast GA facilities	2	12,297,588
		III-G-02	Demolish/reconfigure southwest GA facilities	3.5	20,890,531
		III-G-03	Expand Golfview facilities	5	169,130,991
		III-G-04	Expand Southwest GA Apron	2	15,182,395
Terminal	Short Term	I-T-01	CBP expansion and reconfiguration	2.25	16,778,870
		I-T-02	Convert Gate B1 to international gate	2.25	2,246,024
		I-T-03	Construct "bump-outs" at Gates B4/B6 and B5/B7	1.75	5,694,558
		I-T-04	Construct concessions near Checkpoint AB	1.25	1,563,388
	Intermediate Term	II-T-01	Construct Concourse B hammerhead	3	8,835,156
		II-T-02	Construct secure B/C connector	2	19,957,058
		II-T-03	Reconfigure retail space at Concourse C hammerhead	1.5	2,491,650
		II-T-04	Reconfigure Ticketing Hall*	2	8,293,163
		II-T-05	Construct relocated airline club and concessions	2	5,140,319
		II-T-06	Reconfigure Checkpoint C	1.75	3,516,026
	Long Term	III-T-01	Convert airline club to food service	1.5	226,397
		III-T-02	Expand terminal apron	3	16,476,604
		III-T-03	Expand Concourse B hammerhead	3.5	12,923,519
		III-T-04	Convert Gate B4 to International Gate	1.5	3,506,584
		III-T-05	Expand Gates C4 and C6 concessions	2.5	2,593,724
		III-T-06	Expand Checkpoint AB	1.75	2,666,633
		III-T-07	Construct concession space above the expanded CBP	1.75	7,962,867
Landside	Long Term	III-L-01	Automated People Mover (PRT system)	1	1,149,097,700
Cargo	Short Term	I-C-01	I-95 connection from Air Cargo Area*	2.5	3,060,919
	Long Term	III-C-01	Construct new building and aircraft parking apron	2.5	40,469,163
		III-C-02	Relocate air freight tenants	1.25	567,081
		III-C-03	Demolish existing air freight building	1	1,747,776
Airline & Airport Support	Short Term	I-S-01	Relocate Airport Maintenance	3	6,539,205
		I-S-02	Develop Airport/Airline Support Facilities*	3	14,904,623
	Intermediate	II-S-01	Demolish existing airport maintenance buildings*	2	1,551,949
	Long Term	III-S-01	New ARFF station	2.5	16,231,715
		III-S-02	Demolish existing ARFF Station	1.5	1,264,384



** denotes projects proposed for facility optimization/revenue generation purpose, which are not driven by projected demand. The timing on Gantt Chart indicates suggested implementation time-frame, but they can be implemented any time at Airport's discretion.*

Figure 9.14: Implementation Schedule
Source: AECOM (2016)

Financial Plan

10

10 Financial Plan

This section presents a potential funding plan for implementing the recommended Airport Capital Improvement Program (ACIP) projects. These projects are designed to maintain the Airport and provide the improvements and facilities from Fiscal Year (FY) 2018 through FY 2035.

The actual implementation schedule for the various construction projects recommended in this Master Plan Update will be influenced, in part, by demand, funding availability, priorities of the DOA, and other relevant factors, and may not correspond precisely to the schedule described in this section. For purposes of the illustrative financial analysis, a specific implementation schedule was assumed. However, it should be noted that this schedule and the resulting financial analysis are intended only to demonstrate financial feasibility. Actual funding strategies for each project will be determined nearer to the time of project implementation.

In general, the financial analysis was conducted as follows:

- The Airport's existing financial structure was examined and financial information obtained
- A list of proposed capital development projects was compiled, including estimated project construction costs and construction start and end dates
- Potential funding sources were identified and the potential availability of funding from those sources was analyzed, as applicable
- Debt service was calculated for projects funded, in part, with future bond proceeds
- Amortization was calculated for Airport-funded projects
- Projections of operation and maintenance (O&M) expenses and non-airline revenues were developed
- Airline revenues and rates and charges were calculated to enable an assessment of the impact of the projects on key financial metrics, such as airline rates and charges, cost per enplaned passenger (CPE), and debt service coverage

10.1 Airport Financial Structure

In addition to PBI, Palm Beach County owns three reliever airports (collectively known as the Airport System): Palm Beach County Park Airport (Lantana Airport), Palm Beach County Glades Airport (Pahokee Airport), and North Palm Beach County General Aviation Airport (North County Airport). The County operates on a 12-month FY ending September 30th.

The Signatory Airline Agreement for the Airport (Airline Agreement) dictates the business and operational relationship between the County and the airlines that execute the Airline Agreement (the Signatory Airlines) and defines the terms under which those airlines operate at and use the Airport. Effective October 1, 2014, the County and the Signatory Airlines are operating under a five-year agreement covering FY 2015 through 2019. This Airline Agreement replaces the previous agreement that terminated on September 30, 2014. All the Signatory Airlines under the prior Airline Agreement signed on to the new five-year agreement. As of September 30, 2016, Signatory Airlines include: American Airlines, BahamasAir, Delta Air Lines, JetBlue Airways, Southwest Airlines, and United Airlines.

Revenues and expenses of the County are categorized into direct cost centers and indirect cost centers as defined in the Airline Agreement. Direct cost centers include those areas or functional activities of the Airport System used for the purposes of accounting for revenues, O&M expenses, and debt service. Indirect cost centers do not generally have revenues associated with them and include those areas or functional activities of the Airport System used for the purposes of accounting for O&M expenses and debt service. The expenses included in indirect cost centers are allocated to the direct cost centers as defined in the Airline Agreement.

10.1.1 Direct Cost Centers

Direct cost centers defined in the Airline Agreement include, but are not necessarily limited to the following:

Airfield

Those portions of the Airport provided for the arrival, departure, and taxiing of aircraft such as runways, taxiways, runway protection zones, safety areas, navigational aids, aircraft parking apron and land areas required by or related to aeronautical use of the Airport.

Terminal

The commercial airline facilities at the Airport, including the Terminal and associated land, facilities, equipment, whether owned, operated or maintained by County. This cost center includes the inbound baggage handling system (BHS) used to deliver checked baggage to arriving passengers, which includes baggage claim areas, systems, equipment and carousels, but excludes the Baggage Handling System as defined herein.

Baggage Handling System

The outbound BHS used to deliver checked baggage to departing aircraft, which includes the baggage makeup areas, systems, equipment and carousels at the Airport, exclusive of the Transportation Security Administration (TSA) inspection equipment.

Ground Transportation

Areas designated for employee and public automobile parking and rental car operations (excluding rental car ticket counters in the Terminal), and all Airport access roadways.

Aviation

Areas designated for FBOs or other aviation uses, including general aviation aprons at the Airport.

Non-Aviation

Areas designated for commercial or industrial use.

General Aviation Federal Inspection Services (FIS) Facility

The FIS building located on the south side of the Airport.

Air Cargo Building

The portion of the Airport used by air carriers specializing in air carrier delivery.

This area contains an Air Cargo Building with airside/landside access and aprons for air cargo carriers.

Lantana Airport

All properties and areas associated with Lantana Airport.

Pahokee Airport

All properties and areas associated with Pahokee Airport.

North County Airport

All properties and areas associated with North County Airport.

10.1.2 Indirect Cost Centers

Indirect cost centers defined in the Airline Agreement include, but are not necessarily limited to:

Administrative and Operations

Functions and activities associated with the general Airport Systems administration, certain indirect operation, and medic services.

Maintenance

Functions and activities associated with the general maintenance and repair of Airport properties.

Fire and Rescue

Emergency medical services and functions associated with crash, fire and rescue operations at the Airport.

10.1.3 Rate-Making Structure

The rate-making structure outlined in the Airline Agreement includes the following key components:

- A "compensatory" average terminal rental rate for the Terminal using total rentable square feet as the divisor.
- A "residual" landing fee rate for the Airfield using total landed weight as the divisor.
- A revenue sharing provision which transfers a portion of net remaining revenues after settlement equivalent to 35% to the Signatory Airlines.
- There is a majority-in-interest (MII) provision in the Airline Agreement for certain capital projects at the Airport.

10.2 Capital Improvement Program – Projects and Funding Plan

Projects included in the Master Plan Update ACIP address recommended improvements throughout the planning period, ending in FY2035. Projects are scheduled within one of three planning time periods: FY2019 – FY2020 (short-term), FY2021 – FY2025 (intermediate-term), and FY2026 – FY2035 (long-term).[1]

Although projects are organized by time period, implementation of these projects may be adjusted to accommodate differing areas of growth at the Airport. Estimated project costs were escalated for the purposes of the financial plan to consider the effect of inflation and take into account costs related to construction, engineering, construction management/ administration, and other contingencies. The costs should be considered preliminary and it must be recognized that each project may require additional planning, environmental documentation, and/or design.

10.2.1 Projects

Table 10.1 presents the estimated costs of the projects included in the Master Plan Update expected to be implemented through FY 2036. The total estimated cost of the Master Plan Update, in escalated dollars, is approximately $1.3 billion. Estimated costs were escalated from 2016 dollars at an annual rate of 3% and include construction contingencies, construction administration, and engineering/design services. For these projects, it was assumed that design would occur in one fiscal year, with construction commencing in the following fiscal year.

Recognizing the conceptual nature of a master plan, implementation of certain capital development projects would occur only after further refinement through advanced planning and programming and engineering and architectural analyses. Therefore, the estimated Master Plan Update costs developed for purposes of this funding plan must be viewed as preliminary, reflecting a master plan level of detail subject to refinement in subsequent implementation phases.

10.2.1.1. Land Acquisition and Non-Aviation Development Projects

Land Acquisition and Non-Aviation Development Projects are estimated to total approximately $61.4 million. Key Land Acquisition and Non-Aviation Development projects include the following:

- Property acquisition west of North Military Trail (within future RPZs): This approximately $16.7 million project provide mitigation for incompatible land uses within future Runway 10R-28L RPZs
- Property acquisition at Belvedere Road & North Military Trail: This approximately $15.3 million project will provide land for GA development and expansion
- Property acquisition along North Military Trail (within RPZs): This approximately $10.5 million project will provide mitigation for incompatible land uses within existing RPZs

10.2.1.2. Airfield Development Projects

Airfield Development Projects are estimated to total approximately $222.2 million. Key Airfield Development Projects include the following:

- New Runway 10R-28L: This approximately $136.3 million project will relocate and extend Runway 10R-28L and upgrade Taxiway L to support TDG 5 aircraft operations
- Rehabilitate Runway 10L-28R: This approximately $30.7 million project is to maintain the runway pavement in good condition
- Realignment of Taxiway M: This approximately $24.2 million project will realign the terminal apron edge taxilane to allow for Concourse B hammerhead expansion

10.2.1.3. General Aviation Development Projects

GA Development Projects are estimated to total approximately $677.7 million. Key General Aviation Development Projects include the following:

- Phase I Golfview area development: This approximately $111.7 million project will provide additional FBO facilities for eventual relocation from Southeast GA area
- Expand GA facilities at Golfview site up to Runway 14-32: This approximately $79.4 million project will provide expansion of the Golfview site to accommodate relocation of Jet Aviation and Signature Flight Support
- Expand Golfview facilities: This approximately $288.2 million project will expand GA facilities in the footprint of Runway 14-32 and accommodate anticipated GA demand during the master planning period

10.2.1.4. Commercial Passenger Terminal Development Projects

Commercial Passenger Terminal Development Projects are estimated to total approximately $171.6 million. Key Commercial Passenger Terminal Development Projects include the following:

- Expand terminal apron: This approximately $28.9 million project will prepare for the Concourse B hammerhead expansion.
- Construct secure B/C connector: This approximately $26.4 million project will allow for operational flexibility, meet future holdroom and concession demand, and construct relocated Gates C1 and C11.
- Expand Concourse B hammerhead: This approximately $22.5 million project will provide two additional domestic gates and associated holdrooms and concessions.

10.2.1.5. Air Cargo Development Projects

Air Cargo Development Projects are estimated to total approximately $69.9 million. Key Air Cargo Development Projects include the following:

- Construct new building and aircraft parking apron: This approximately $62.7 million project will accommodate expected cargo demand.
- I-95 connection from Air Cargo Area: This approximately $3.5 million project will improve access to I-95 for all cargo operators.
- Demolish existing air freight building: This approximately $2.9 million project will accommodate non-aviation development at the Airport.

10.2.1.6. Airline and Airport Support Development Projects

Airline and Airport Support Development Projects are estimated to total approximately $54.9 million. Key Airline and Airport Support Development Projects include the following:

- New Aircraft Rescue and Fire Fighting (ARFF) station: This approximately $26.4 million project supports expansion of Concourse B and allows the station to provide services for both the Airport and local community
- Develop Airport/Airline support facilities: This approximately $17.1 million project will accommodate support activities, such as repair, storage, and sortation.
- Relocate Airport Maintenance: This approximately $7.4 million project will relocate the Airport Maintenance Division to Parcel D and construct a storage shed south of Belvedere Road.

1 *Projects were also identified past FY 2036 (ultimate-term) but are not included in the funding plan.*

Table 10.1: Master Plan Update ACIP Estimated Costs and Annual Expenditures

Project	Project Costs [1]	Estimated Fiscal Year Project Expenditures																	
		Short-Term		Intermediate Term							Long-Term								
		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Land Acquisition and Non-Aviation Development Projects																			
Rezone Parcel D for airport Support	$299,200	$299,200																	
Property Acquisition along N Military Trail (within RPZs)	$10,472,323	$10,472,323																	
Property Acquisition along 5th & 6th St.	$3,860,306	$1,901,629	$1,958,677																
Property Acquisition at N. Military Trail & Green St.	$5,502,349	$5,502,349																	
Property Acquisition west of N. Military Trail (within RPZs)	$16,657,998					$2,006,335	$8,266,100	$6,385,563											
Property Acquisition at Belvedere Rd. & N Military Trail	$15,302,081										$7,537,971	$7,764,110							
Rezone Parcel E	$1,025,358																		$1,025,358
Property Acquisition west of N. Military Trail	$7,857,445																		$7,857,445
Commercial development of air freight area	$456,961															$456,961			
Land Acquisition and Non-Aviation Projects	**$61,434,021**	**$18,175,501**	**$1,958,677**	**$0**	**$0**	**$2,006,335**	**$8,266,100**	**$6,385,563**	**$0**	**$0**	**$7,537,971**	**$7,764,110**	**$0**	**$0**	**$0**	**$456,961**	**$0**	**$0**	**$8,882,803**
Airfield Development Projects																			
EIS for new south Runway 10R-28L	$3,857,315						$1,900,155	$1,957,160											
RTR, ASR & VOR relocation	$8,465,922								$4,170,405	$4,295,517									
New Runway 10R-28L	$136,342,248								$44,110,857	$45,434,183	$46,797,208								
Decommission Runway 14-32	$5,866,053														$1,917,011	$3,949,042			
Realignment of Taxiway M	$24,164,942																$11,903,912	$12,261,030	
Holding apron at Taxiways A and C at Runway 10L end	$12,889,895										$6,349,702	$6,540,193							
Rehabilitation of Runway 10L-28R	$30,659,027										$15,102,969	$15,556,058							
Total Airfield Development Projects	**$222,245,402**	**$0**	**$0**	**$0**	**$0**	**$0**	**$1,900,155**	**$1,957,160**	**$48,281,262**	**$49,729,700**	**$68,249,879**	**$22,096,251**	**$0**	**$0**	**$1,917,011**	**$3,949,042**	**$11,903,912**	**$12,261,030**	**$0**
General Aviation Development Projects																			
Relocate / Culvert Western Canal	$25,603,866		$12,612,742	$12,991,124															
Phase 1 Golfview area development	$111,652,748	$36,123,054	$37,206,746	$38,322,948															
Demolish two GA Hangars (1628 & 1629) and reconstruct	$20,223,816	$9,962,471	$10,261,345																
New CBP Facility in Golfview area	$6,201,530			$2,422,047	$2,494,708	$1,284,775													
Atlantic Aviation relocation	$74,222,739						$18,011,293	$37,103,264	$19,108,181										
Demolish Hangars 1636, 1638, and 1640 & Site Prep	$4,969,190								$4,969,190										
Expand GA facilities up to Runway 14-32	$79,449,855				$14,964,743	$15,413,686	$15,876,096	$16,352,379	$16,842,951										
Expand Southwest GA Apron	$21,971,161										$10,823,232	$11,147,929							
Demolish existing southeast GA facilities	$16,530,540							$4,011,391	$8,263,465	$4,255,684									
Demolish/reconfigure southwest GA facilities	$28,687,461							$3,893,915	$8,021,465	$8,262,109	$8,509,972								
Expand Golfview facilities	$288,185,828														$54,281,118	$55,909,552	$57,586,838	$59,314,443	$61,093,877
Total General Aviation Development Projects	**$677,698,734**	**$46,085,525**	**$60,080,833**	**$53,736,119**	**$17,459,451**	**$16,698,461**	**$33,887,389**	**$61,360,949**	**$57,205,252**	**$12,517,793**	**$19,333,204**	**$11,147,929**	**$0**	**$0**	**$54,281,118**	**$55,909,552**	**$57,586,838**	**$59,314,443**	**$61,093,877**

Notes:

(1) Estimated costs were escalated from 2016 dollars at an annual rate of 3%

Source: Ricondo & Associates, Inc. (March 2018)

Table 10.1: Master Plan Update ACIP Estimated Costs and Annual Expenditures (cont.)

Project	Project Costs [1]	Estimated Fiscal Year Project Expenditures																	
		Short-Term		Intermediate Term								Long-Term							
		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Commercial Passenger Terminal Development Projects																			
CBP expansion and reconfiguration	$18,609,745	$9,167,362	$9,442,383																
Convert Gate B1 to international gate	$2,491,106	$1,227,146	$1,263,960																
Construct "bump-outs" at Gates B4/B6 and B5/B7	$6,302,602	$3,555,770	$2,746,832																
Construct concessions near Checkpoint AB	$1,725,440	$1,138,904	$586,536																
Construct Concourse B hammerhead	$10,869,292				$3,516,546	$3,622,042	$3,730,704												
Construct secure B/C connector	$26,430,026							$13,019,717	$13,410,309										
Reconfigure retail space at Concourse C hammerhead	$3,019,788				$1,487,580	$1,532,208													
Reconfigure Ticketing Hall	$10,983,007							$5,410,348	$5,572,659										
Construct relocated airline club and concessions	$6,807,554							$3,353,475	$3,454,079										
Reconfigure Checkpoint C	$4,145,912			$1,746,873	$2,399,039														
Convert airline club to food service	$309,475								$130,397	$179,078									
Expand terminal apron	$28,900,240																$9,350,105	$9,630,608	$9,919,527
Expand Concourse B hammerhead	$22,481,289															$3,051,515	$6,286,122	$6,474,705	$6,668,947
Convert Gate B4 to International Gate	$5,911,766															$1,931,950	$3,979,816		
Expand Gates C4 and C6 concessions	$3,612,490								$697,150	$1,436,128	$1,479,212								
Expand Checkpoint AB	$4,756,117																	$2,003,982	$2,752,135
Construct concession space above the expanded CBP	$14,202,300																	$5,984,115	$8,218,185
Total Commercial Passenger Terminal Projects	**$171,558,149**	**$15,089,182**	**$14,039,711**	**$1,746,873**	**$7,403,165**	**$5,154,250**	**$3,730,704**	**$21,783,540**	**$23,264,594**	**$1,615,206**	**$1,479,212**	**$0**	**$0**	**$0**	**$0**	**$4,983,465**	**$19,616,043**	**$24,093,410**	**$27,558,794**
Air Cargo Development Projects																			
I-95 connection from Air Cargo Area	$3,466,365	$668,950	$1,378,037	$1,419,378															
Construct new building and aircraft parking apron	$62,693,376												$24,485,296	$25,219,855	$12,988,225				
Relocate air freight tenants	$904,698													$176,699	$727,999				
Demolish existing air freight building	$2,846,738														$1,402,334	$1,444,404			
Air Cargo Development Projects	$69,911,177	$668,950	$1,378,037	$1,419,378	$0	$0	$0	$0	$0	$0	$0	$0	$24,485,296	$25,396,554	$15,118,558	$1,444,404	$0	$0	$0
Airline and Airport Support Development Projects																			
Relocate Airport Maintenance	$7,434,247	$793,952	$3,271,081	$3,369,214															
Develop Airport/Airline support facilities	$17,062,861		$7,189,408	$9,873,453															
Demolish existing airport maintenance buildings	$1,826,121			$899,567	$926,554														
New ARFF station	$26,442,465													$2,528,848	$10,418,855	$10,731,421	$2,763,341		
Demolish existing ARFF station	$2,131,630															$696,611	$1,435,019		
Total Airline and Airport Support Development Projects	$54,897,324	$793,952	$10,460,489	$14,142,234	$926,554	$0	$0	$0	$0	$0	$0	$0	$0	$2,528,848	$10,418,855	$11,428,032	$4,198,360	$0	$0
Total Master Plan Update ACIP	**$1,257,744,807**	**$80,813,110**	**$87,917,747**	**$71,044,604**	**$25,789,170**	**$23,859,046**	**$47,784,348**	**$91,487,212**	**$128,751,108**	**$63,862,699**	**$96,600,266**	**$41,008,290**	**$24,485,296**	**$27,925,402**	**$81,735,542**	**$78,171,456**	**$93,305,153**	**$95,668,883**	**$97,535,474**

Notes:

(1) Estimated costs were escalated from 2016 dollars at an annual rate of 3%

Source: Ricondo & Associates, Inc. (March 2018)

10.2.2 ACIP Funding Plan

Airport development is often funded by a combination of public and private sources. Most airport sponsors similar in size to PBI have a variety of available funding sources and mechanisms to fund capital projects. The funding plan presented herein does not represent a final plan of finance for the Master Plan Update projects. Additional actions would be needed prior to the use of some of these funding sources for specific projects. It was assumed that the costs of these projects will ultimately be funded by a combination of sources, such as federal Airport Improvement Program (AIP) grants, state grants, passenger facility charge (PFC) revenues, Airport funds, proceeds from the issuance of airport revenue bonds, and other/third-party funds. **Table 10.2** presents the estimated funding sources for each project. Potential funding sources are described in the following subsections.

Table 10.2: Master Plan Update ACIP Funding Sources

Project	Project Costs [1]	AIP		State Grants	PFC PAYGO	Airport Funds	Future Bond Proceeds		Third Party Funding
		Entitlements	Discretionary				GARB	PFC	
Land Acquisition and Non-Aviation Development Projects									
Rezone Parcel D for airport Support	$299,200	$0	$0	$0	$0	$299,200	$0	$0	$0
Property Acquisition along N Military Trail (within RPZs)	$10,472,323	$1,714,489	$2,189,459	$0	$6,568,376	$0	$0	$0	$0
Property Acquisition along 5th & 6th St.	$3,860,306	$0	$0	$0	$0	$3,860,306	$0	$0	$0
Property Acquisition at N. Military Trail & Green St.	$5,502,349	$0	$0	$0	$0	$5,502,349	$0	$0	$0
Property Acquisition west of N. Military Trail (within future RPZs)	$16,657,998	$0	$3,325,115	$8,150,205	$5,182,678	$0	$0	$0	$0
Property Acquisition at Belvedere Rd. & N Military Trail	$15,302,081	$0	$0	$0	$0	$15,302,081	$0	$0	$0
Rezone Parcel E	$1,025,358	$0	$0	$0	$0	$1,025,358	$0	$0	$0
Property Acquisition west of N. Military Trail (remainder of sites)	$7,857,445	$3,332,275	$0	$2,398,340	$2,126,830	$0	$0	$0	$0
Commercial development of air freight area	$456,961	$0	$0	$0	$0	$456,961	$0	$0	$0
Total Land Acquisition and Non-Aviation Projects	**$61,434,021**	**$5,046,764**	**$5,514,574**	**$10,548,545**	**$13,877,884**	**$26,446,255**	**$0**	**$0**	**$0**
Airfield Development Projects									
EIS for new south Runway 10R-28L	$3,857,315	$0	$964,329	$1,880,441	$1,012,545	$0	$0	$0	$0
RTR, ASR & VOR relocation	$8,465,922	$4,583,615	$0	$1,745,261	$2,137,047	$0	$0	$0	$0
New Runway 10R-28L	$136,342,248	$0	$14,358,182	$60,489,396	$0	$0	$0	$61,494,670	$0
Decommission Runway 14-32	$5,866,053	$4,396,355	$0	$0	$1,469,697	$0	$0	$0	$0
Realignment of Taxiway M	$24,164,942	$6,279,901	$4,471,260	$7,386,325	$6,027,456	$0	$0	$0	$0
Holding apron at Taxiways A and C at Runway 10L end	$12,889,896	$0	$0	$0	$12,889,896	$0	$0	$0	$0
Rehabilitation of Runway 10L-28R	$30,659,027	$4,956,843	$2,323,118	$15,774,982	$7,604,083	$0	$0	$0	$0
Total Airfield Development Projects	**$222,245,403**	**$20,216,714**	**$22,116,889**	**$87,276,405**	**$31,140,724**	**$0**	**$0**	**$61,494,670**	**$0**
General Aviation Development Projects									
Relocate / Culvert Western Canal	$25,603,865	$0	$0	$0	$0	$25,603,865	$0	$0	$0
Phase 1 Golfview area development	$111,652,748	$0	$0	$0	$0	$0	$11,165,275	$0	$100,487,473
Demolish two GA Hangars (1628 & 1629) and reconstruct	$20,223,817	$0	$0	$0	$0	$2,123,501	$0	$0	$18,100,316
New CBP Facility in Golfview area	$6,201,530	$0	$0	$0	$0	$6,201,530	$0	$0	$0
Atlantic Aviation relocation	$74,222,739	$0	$0	$0	$0	$4,527,587	$0	$0	$69,695,151
Demolish Hangars 1636, 1638, and 1640 & Site Prep	$4,969,190	$0	$0	$3,726,892	$1,242,297	$0	$0	$0	$0
Expand GA facilities up to Runway 14-32	$79,449,855	$0	$0	$0	$0	$21,848,710	$0	$0	$57,601,145
Expand Southwest GA Apron	$21,971,162	$0	$0	$0	$21,971,162	$0	$0	$0	$0
Demolish existing southeast GA facilities	$16,530,540	$0	$0	$0	$16,530,540	$0	$0	$0	$0
Demolish/reconfigure southwest GA facilities	$28,687,460	$0	$0	$0	$0	$11,112,868	$0	$0	$17,574,592
Expand Golfview facilities	$288,185,828	$0	$0	$0	$0	$55,043,493	$0	$0	$233,142,335
Total General Aviation Development Projects	**$677,698,733**	**$0**	**$0**	**$3,726,892**	**$39,744,000**	**$126,461,554**	**$11,165,275**	**$0**	**$496,601,013**

Notes:

(1) Estimated costs were escalated from 2016 dollars at an annual rate of 3%

Source: Ricondo & Associates, Inc. (March 2018)

Table 10.2: Master Plan Update ACIP Funding Sources (cont.)

Project	Project Costs [1]	AIP		State Grants	PFC PAYGO[2]	Airport Funds	Future Bond Proceeds		Third Party Funding
		Entitlements	Discretionary				GARB	PFC	
Commercial Passenger Terminal Development Projects									
CBP expansion and reconfiguration	$18,609,745	$0	$0	$0	$13,957,309	$4,652,436	$0	$0	$0
Convert Gate B1 to international gate	$2,491,105	$0	$0	$0	$1,868,329	$622,776	$0	$0	$0
Construct "bump-outs" at Gates B4/B6 and B5/B7	$6,302,602	$0	$0	$0	$0	$6,302,602	$0	$0	$0
Construct concessions near Checkpoint AB	$1,725,440	$0	$0	$0	$0	$1,725,440	$0	$0	$0
Construct Concourse B hammerhead	$10,869,292	$0	$0	$0	$8,151,969	$2,717,323	$0	$0	$0
Construct secure B/C connector	$26,430,026	$0	$0	$0	$19,822,519	$6,607,506	$0	$0	$0
Reconfigure retail space at Concourse C hammerhead	$3,019,788	$0	$0	$0	$0	$3,019,788	$0	$0	$0
Reconfigure Ticketing Hall	$10,983,007	$0	$0	$0	$0	$10,983,007	$0	$0	$0
Construct relocated airline club and concessions	$6,807,555	$0	$0	$0	$0	$6,807,555	$0	$0	$0
Reconfigure Checkpoint C	$4,145,913	$0	$0	$0	$3,524,026	$621,887	$0	$0	$0
Convert airline club to food service	$309,474	$0	$0	$0	$0	$309,474	$0	$0	$0
Expand terminal apron	$28,900,240	$0	$0	$0	$21,675,180	$7,225,060	$0	$0	$0
Expand Concourse B hammerhead	$22,481,289	$0	$0	$0	$16,860,967	$5,620,322	$0	$0	$0
Convert Gate B4 to International Gate	$5,911,766	$0	$0	$0	$4,433,825	$1,477,942	$0	$0	$0
Expand Gates C4 and C6 concessions	$3,612,490	$0	$0	$0	$1,806,245	$1,806,245	$0	$0	$0
Expand Checkpoint AB	$4,756,116	$0	$0	$0	$3,567,087	$1,189,029	$0	$0	$0
Construct concession space above the expanded CBP	$14,202,300	$0	$0	$0	$0	$14,202,300	$0	$0	$0
Commercial Passenger Terminal Development Projects	**$171,558,149**	**$0**	**$0**	**$0**	**$95,667,456**	**$75,890,693**	**$0**	**$0**	**$0**
Air Cargo Development Projects									
I-95 connection from Air Cargo Area	$3,466,364	$0	$0	$0	$0	$3,466,364	$0	$0	$0
Construct new building and aircraft parking apron	$62,693,376	$0	$0	$0	$31,346,688	$31,346,688	$0	$0	$0
Relocate air freight tenants	$904,698	$0	$0	$0	$0	$904,698	$0	$0	$0
Demolish existing air freight building	$2,846,737	$0	$0	$0	$0	$2,846,737	$0	$0	$0
Total Air Cargo Development Projects	**$69,911,175**	**$0**	**$0**	**$0**	**$31,346,688**	**$38,564,487**	**$0**	**$0**	**$0**
Airline and Airport Support Development Projects									
Relocate Airport Maintenance	$7,434,247	$0	$0	$0	$0	$7,434,247	$0	$0	$0
Develop Airport/Airline support facilities	$17,062,861	$0	$0	$0	$0	$0	$17,062,861	$0	$0
Demolish existing airport maintenance buildings	$1,826,121	$0	$0	$0	$0	$1,826,121	$0	$0	$0
New ARFF station	$26,442,465	$0	$0	$0	$19,831,849	$6,610,616	$0	$0	$0
Demolish existing ARFF station	$2,131,631	$0	$0	$0	$1,598,723	$532,908	$0	$0	$0
Total Airline and Airport Support Development Projects	**$54,897,324**	**$0**	**$0**	**$0**	**$21,430,572**	**$16,403,892**	**$17,062,861**	**$0**	**$0**
Total Master Plan Update ACIP	**$1,257,744,806**	**$25,263,478**	**$27,631,463**	**$101,551,843**	**$233,207,323**	**$283,766,881**	**$28,228,136**	**$61,494,670**	**$496,601,013**

Notes:

(1) Estimated costs were escalated from 2016 dollars at an annual rate of 3%

(2) "Pay-as-you-go"

Source: Ricondo & Associates, Inc. (March 2018)

10.2.2.1. Federal Grants

The Airport and Airway Improvement Act of 1982 authorizes funding of the federal AIP from the Airport and Airway Trust Fund for nationwide airport development, airport planning, and noise compatibility planning and programs. The Airport and Airway Trust Fund is funded through user taxes on airfares, air freight, and aviation fuel.

On February 15, 2012, President Obama signed into law the FAA Modernization and Reform Act of 2012, which reauthorized FAA AIP funding for airport projects. Under this current reauthorization, the AIP was extended for 4 federal fiscal years, through September 30, 2015. The authorized funding levels for AIP investment were established at approximately $3.35 billion each year. The FAA Extension, Safety, and Security Act of 2016, enacted on July 15, 2016, extended the authority and provided funding at current levels through the end of September 2017. The Disaster Tax Relief and Airport and Airway Extension Act of 2017, a subsequent six-month extension, is set to expire at the end of March 2018. Long-term FAA reauthorization measures are currently under consideration. For purposes of this analysis, it was assumed that the AIP would continue to be funded throughout the planning period at a level of at least $3.2 billion per year.

The FAA distributes grants under the AIP to airport operators in two ways: entitlement grants and discretionary grants. Entitlement grants are distributed based on the number of enplaned passengers served at airports on an annual basis. Discretionary grants are distributed for individual projects based on funding availability and the priority of projects at airports nationwide. AIP grants may be used to fund eligible land acquisition, noise mitigation, airfield improvements, airport roadways, and safety and security systems and equipment. Generally, only those projects that do not generate revenues are eligible for AIP grant funding.

AIP grant eligibility is generally assumed to be 75% for eligible projects at medium-hub airports, such as PBI. Entitlement grants available to the Airport in any given year are established by a formula set forth in the FAA AIP Handbook. Entitlement grants were projected based on the following AIP formula using the enplaned passenger forecasts:

- $15.60 for each of the first 50,000 enplaned passengers
- $10.40 for each of the next 50,000 enplaned passengers
- $5.20 for each of the next 400,000 enplaned passengers
- $1.30 for each of the next 500,000 enplaned passengers
- $1.00 for each enplaned passenger beyond 1.0 million enplaned passengers

For a given year, the entitlement formula is based on the number of enplaned passengers from two years prior. For example, when calculating entitlement grants for FY 2018, the formula applies to numbers of enplaned passengers in FY 2016. The amount of entitlement grants for large- and medium-hub airports where a PFC is collected is reduced based on the PFC collection level approved for the airport. The PFC level currently authorized for the Airport is $4.50 per eligible enplaned passenger. Therefore, AIP entitlement grants would be reduced by 75%.

Annual AIP entitlement grants available to fund Master Plan Update projects at the Airport through FY 2036 are presented in **Table 10.3**. Approximately $31.8 million of AIP entitlement grants are projected to be available for funding eligible Master Plan Update projects through FY 2036. Based on project eligibility, estimated uses of these anticipated funds is approximately $25.3 million through FY 2036.

Discretionary grants (annual and multi-year commitments through FAA Letters of Intent [LOIs]) are distributed by each FAA region on the basis of availability and project priorities. Discretionary grants are generally made immediately available to fund project costs, while LOI grants are distributed to an airport sponsor over a number of years at defined annual funding levels. Approximately $27.6 million of AIP discretionary funds are anticipated for funding eligible Master Plan Update projects.

10.2.2.2. State Grants

Many states have programs to assist in airport capital development. Florida Department of Transportation (FDOT) Grants are funded from the State Transportation Trust Fund, which consists, in part, of funds collected through the State's aviation fuel tax. FDOT Grants supplement the AIP, providing a portion of the sponsor's matching share when federal funding is available and up to 80% of the overall project cost when it is not. Funding awarded via FDOT Grants is frequently distributed by the State of Florida (State) over a multi-year period for grant-approved projects. However, the availability of such funds in any given year is not guaranteed.

The Airport has historically received funds from FDOT. Since FY 2010, the Airport has received an average of approximately $7 million annually in FDOT Grants to fund eligible projects. Approximately $101.5 million of FDOT Grants were assumed to be available to fund eligible Master Plan Update projects based on historical funding awarded to the Airport by the State.

Table 10.3: Projected Airport Improvement Program Entitlement Grants

Funding Fiscal Year	Forecast Enplaned Passengers		AIP Entitlement Grants	
	Enplaned Fiscal Year[1]	Passengers	Total Calculated[2]	Adjusted[3]
2018	2016	3,228,100	$6,258,000	$1,565,000
2019	2017	3,245,850	$6,276,000	$1,569,000
2020	2018	3,218,450	$6,248,000	$1,562,000
2021	2019	3,274,273	$6,304,000	$1,576,000
2022	2020	3,401,173	$6,431,000	$1,608,000
2023	2021	3,388,839	$6,419,000	$1,605,000
2024	2022	3,447,617	$6,478,000	$1,620,000
2025	2023	3,507,414	$6,537,000	$1,634,000
2026	2024	3,568,249	$6,598,000	$1,650,000
2027	2025	3,722,382	$6,752,000	$1,688,000
2028	2026	3,693,102	$6,723,000	$1,681,000
2029	2027	3,757,157	$6,787,000	$1,697,000
2030	2028	3,822,323	$6,852,000	$1,713,000
2031	2029	3,888,619	$6,919,000	$1,730,000
2032	2030	4,058,835	$7,089,000	$1,772,000
2033	2031	4,024,682	$7,055,000	$1,764,000
2034	2032	4,094,488	$7,124,000	$1,781,000
2035	2033	4,165,505	$7,196,000	$1,799,000
2036	2034	4,237,754	$7,268,000	$1,817,000
Total			**$127,314,000**	**$31,831,000**

Notes:

(1) Entitlement Grants for a fiscal year are based on the number of enplaned passengers from two years prior

(2) Total AIP entitlement grants calculated using the methodology set forth in Federal Aviation Administration Order 5100.38D, Airport Improvement Program Handbook, September 30, 2014.

(3) Calculated entitlement grants reduced by 75 percent because a $4.50 passenger facility charge is collected at the Airport.

Source: Palm Beach County Department of Airports

10.2.2.3. Passenger Facility Charge Revenues

Since 1991, the collection of a PFC at the nation's airports has been authorized under Title 14 of the Code of Federal Regulations, Part 158, and the PFC Program has been administered by the FAA. PFCs are collected from qualified passengers to fund eligible airport projects. Since April 1, 2001, a PFC of up to $4.50 per qualified enplaned passenger can be imposed by an airport operator in the United States. In 1994, the County received approval from the FAA to impose a PFC at the Airport. Currently, the County collects a $4.50 PFC (less $0.11 airline collection fee) from qualified enplaned passengers at the Airport.

PFC revenues may be used on a "pay-as-you-go" (PAYGO) basis or leveraged to pay debt service on bonds or other debt used to pay for PFC-eligible projects. Because airport sponsors may use PFC revenues for the local matching share of AIP grants, PFCs can help airport sponsors implement AIP-financed projects sooner than they would be able to otherwise. Although the FAA is required to approve the collection of a PFC and the use of PFC revenues, the PFC Program permits local collection of PFC revenues through the airlines operating at airports and provides more flexibility to airport sponsors than the AIP funding. PFCs may be used for any AIP-eligible project, although PFC eligibility is generally broader than AIP eligibility.

The FAA has approved PFC applications (and subsequent amendments, if applicable) for the Airport, with a combined authority to impose and use approximately $256 million of PFC revenues to fund recently completed and future improvements. As of September 30, 2017, the County has yet to collect approximately $64.1 million of this PFC authority. For the purposes of this financial analysis, it was assumed that the County will continue to apply for, collect, and use PFCs at a level of $4.50 per qualified enplaned passenger throughout the planning period.

Projected PFC revenues based on the enplaned passenger forecasts presented in Section 5 are shown in **Table 10.4**. Beginning in FY 2018, the existing obligations for which PFC revenues are to be used is approximately $64.1 million for the remaining authority on existing PFC applications (PAYGO). PFC revenues were also assumed to be used to fund approximately $5.1 million of PFC eligible projects that will be included in future PFC applications as part of the existing ACIP. All remaining PFC revenues were assumed to be available for use on Master Plan Update projects. It is assumed approximately $233.2 million of available PFC revenues will be used to fund PFC eligible projects on a PAYGO basis. In addition, it is assumed available PFC revenues will be used to pay debt service on bonds for PFC-eligible projects. (See Section 10.2.2.5 more information on this funding source.) The PFC balance at the end of each fiscal year is adequate to fund existing and future projects through both PAYGO and PFC bond proceeds through FY 2036.

Table 10.4: Projected Passenger Facility Charge Revenues

	Budget	Projected																	
	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
PFC Collections																			
Enplaned Passengers[1]	3,218,450	3,274,273	3,401,173	3,388,839	3,447,617	3,507,414	3,568,249	3,722,382	3,693,102	3,757,157	3,822,323	3,888,619	4,058,835	4,024,682	4,094,488	4,165,505	4,237,754	4,423,373	4,386,033
PFC Level	$4.50	$4.50	$4.50	$4.50	$4.50	$4.50	$4.50	$4.50	$4.50	$4.50	$4.50	$4.50	$4.50	$4.50	$4.50	$4.50	$4.50	$4.50	$4.50
Less: Airline Collection Fee	$0.11	$0.11	$0.11	$0.11	$0.11	$0.11	$0.11	$0.11	$0.11	$0.11	$0.11	$0.11	$0.11	$0.11	$0.11	$0.11	$0.11	$0.11	$0.11
PFC Collected per Enplanement	$4.39	$4.39	$4.39	$4.39	$4.39	$4.39	$4.39	$4.39	$4.39	$4.39	$4.39	$4.39	$4.39	$4.39	$4.39	$4.39	$4.39	$4.39	$4.39
Percent of Passengers paying a PFC	93%	93%	93%	93%	93%	93%	93%	93%	93%	93%	93%	93%	93%	93%	93%	93%	93%	93%	93%
Enplaned Passengers paying a PFC	2,989,765	3,041,621	3,159,505	3,148,047	3,202,649	3,258,197	3,314,709	3,457,891	3,430,691	3,490,195	3,550,730	3,612,316	3,770,437	3,738,711	3,803,557	3,869,528	3,936,643	4,109,073	4,074,386
PFC Collections from Airlines	**$13,125,069**	**$13,352,717**	**$13,870,226**	**$13,819,928**	**$14,059,628**	**$14,303,486**	**$14,551,574**	**$15,180,140**	**$15,060,732**	**$15,321,954**	**$15,587,706**	**$15,858,068**	**$16,552,219**	**$16,412,941**	**$16,697,616**	**$16,987,228**	**$17,281,864**	**$18,038,831**	**$17,886,555**
PFC Balance																			
Beginning Balance	$51,811,648	$47,822,587	$29,698,055	$18,428,120	$13,652,550	$21,962,283	$33,369,963	$42,217,646	$40,731,698	$34,993,977	$39,841,123	$25,587,834	$19,434,759	$19,424,781	$17,010,912	$14,602,199	$13,972,986	$5,768,429	$3,195,434
Deposit: PFC Revenue Collected	$13,125,069	$13,352,717	$13,870,226	$13,819,928	$14,059,628	$14,303,486	$14,551,574	$15,180,140	$15,060,732	$15,321,954	$15,587,706	$15,858,068	$16,552,219	$16,412,941	$16,697,616	$16,987,228	$17,281,864	$18,038,831	$17,886,555
Deposit: PFC Interest Income	$65,625	$66,764	$69,351	$69,100	$70,298	$71,517	$72,758	$75,901	$75,304	$76,610	$77,939	$79,290	$82,761	$82,065	$83,488	$84,936	$86,409	$90,194	$89,433
Less: Existing PAYGO[2]	($16,036,156)	($16,036,156)	($16,036,156)	($16,036,156)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Less: Future PAYGO (For ACIP)	($1,143,600)	($1,143,600)	($1,143,600)	($1,143,600)	($1,143,600)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Less: Future PAYGO (For Master Plan Update ACIP)	$0	($14,364,256)	($8,029,757)	($1,484,842)	($4,676,593)	($2,967,324)	($5,776,649)	($16,741,989)	($20,873,757)	($6,149,107)	($25,516,624)	($17,688,123)	($12,242,648)	($14,506,564)	($14,787,507)	($13,299,068)	($21,170,520)	($16,299,710)	($16,632,286)
Less: PFC Applied to Debt Service (For ACIP)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Less: PFC Applied to Debt Service (For MPU)[3]	$0	$0	$0	$0	$0	$0	$0	$0	$0	($4,402,310)	($4,402,310)	($4,402,310)	($4,402,310)	($4,402,310)	($4,402,310)	($4,402,310)	($4,402,310)	($4,402,310)	($4,402,310)
Ending PFC Balance	**$47,822,587**	**$29,698,055**	**$18,428,120**	**$13,652,550**	**$21,962,283**	**$33,369,963**	**$42,217,646**	**$40,731,698**	**$34,993,977**	**$39,841,123**	**$25,587,834**	**$19,434,759**	**$19,424,781**	**$17,010,912**	**$14,602,199**	**$13,972,986**	**$5,768,429**	**$3,195,434**	**$136,826**

Notes:

(1) Projected enplaned passengers based on the Palm Beach International Airport Master Plan Update, Chapter 3 Aviation Activity Forecasts prepared September 2015.
(2) Remaining authority of $64,144,623 on existing PFC applications per the SOAR Quarterly Report as of 9/30/2017
(3) Proposed Series 2027 PFC Bonds for New Runway 10R-28L project
Source: Palm Beach County Department of Airports

10.2.2.4. Airport Funds

The Airline Agreement specifies the application of net revenues generated by the Airport System and how those revenues may be used to fund capital projects. Generally speaking, revenues remaining after the payment of O&M expenses, outstanding debt service, and transfers to other accounts, as applicable, are deposited into the County's Improvement and Development Fund. Revenues in this fund may be used to fund capital improvement projects at the Airport. For the purposes of this analysis, revenues available in the Improvement and Development Fund are identified as Airport funds and are essentially treated as cash.

It is estimated that $283.8 million in Airport funds will be available for Master Plan Update projects through the planning period. These funds will be primarily used to pay remaining costs of projects after maximizing the use of AIP grants, state grants, and PFC revenues. Airport funds expended on capital improvement projects are amortized and included in the airline rate base, as applicable, as defined in the Airline Agreement. **Table 10.5** presents projected amortization by cost center based on the assumed use of Airport funds through FY 2036. Existing and future amortization associated with the ACIP cash expenditures were included in addition to the amortization associated with the Master Plan Update. Amortization is a function of the amount of amortizable cash expended on a project, the expected useful life of the project, and an amortization rate. With regard to useful life, Master Plan Update projects were assumed to have a useful life of 20 years. An amortization rate of 3.0% was used for the duration of this funding plan (through FY 2036).

Table 10.5: Projected Amortization by Cost Center

	Budget	Projected																	
	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Existing ACIP Amortization Charges by Cost Center[1]																			
Airfield	$755,530	$902,654	$986,420	$986,420	$986,420	$731,214	$731,214	$731,214	$731,214	$731,214	$425,829	$278,705	$172,768	$127,573	$127,573	$127,573	$127,573	$43,807	$0
Terminal	$2,246,259	$3,460,265	$3,460,265	$3,460,265	$2,992,628	$2,833,443	$2,833,443	$2,762,215	$2,762,215	$2,502,173	$2,502,173	$2,209,096	$2,176,681	$2,048,115	$1,653,909	$1,486,376	$565,446	$565,446	$219,638
Baggage Handling System	$237,553	$237,553	$237,553	$237,553	$237,553	$237,553	$237,553	$237,553	$237,553	$237,553	$237,553	$237,553	$237,553	$237,553	$237,553	$237,553	$237,553	$237,553	$0
Ground Transportation	$152,400	$359,185	$548,717	$548,717	$548,717	$548,717	$451,331	$261,799	$261,799	$109,399	$109,399	$109,399	$109,399	$109,399	$109,399	$109,399	$0	$0	$0
Non-Aviation	$3,692,974	$3,896,527	$3,896,527	$3,896,527	$3,896,527	$729,294	$729,294	$729,294	$729,294	$729,294	$729,294	$729,294	$729,294	$729,294	$729,294	$729,294	$525,741	$395,007	$395,007
Aviation	$102,484	$102,484	$102,484	$102,484	$102,484	$102,484	$102,484	$102,484	$102,484	$102,484	$102,484	$102,484	$102,484	$102,484	$102,484	$102,484	$102,484	$69,010	$28,365
General Aviation FIS Facility	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Lantana (LNA)	$59,010	$397,846	$397,846	$397,846	$473,236	$473,236	$473,236	$473,236	$473,236	$473,236	$473,236	$473,236	$473,236	$473,236	$473,236	$473,236	$134,400	$134,400	$75,390
Pahokee (PHK)	$0	$0	$87,342	$87,342	$174,684	$174,684	$174,684	$87,342	$87,342	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
North County Airport (F45)	$199,496	$329,837	$396,851	$396,851	$689,927	$689,927	$689,927	$689,927	$689,927	$689,927	$689,927	$689,927	$689,927	$689,927	$396,851	$396,851	$266,510	$199,496	$199,496
Air Cargo Building	$0	$300,303	$300,303	$300,303	$300,303	$300,303	$300,303	$300,303	$300,303	$300,303	$300,303	$300,303	$300,303	$300,303	$300,303	$300,303	$0	$0	$0
Total Existing ACIP Amortization Charges	$7,445,707	$9,986,655	$10,414,308	$10,414,308	$10,402,479	$6,820,855	$6,723,468	$6,375,367	$6,375,367	$5,875,583	$5,570,198	$5,129,997	$4,991,646	$4,817,884	$4,130,602	$3,963,069	$1,959,708	$1,644,720	$917,896
Future ACIP Amortization Charges by Cost Center[1,2]																			
Airfield	$0	$0	$0	$0	$0	$122,836	$245,672	$368,508	$491,345	$614,181	$737,017	$859,853	$982,689	$1,105,525	$1,228,361	$1,228,361	$1,228,361	$1,228,361	$1,228,361
Terminal	$0	$0	$0	$0	$0	$321,583	$643,166	$964,749	$1,286,333	$1,607,916	$1,929,499	$2,251,082	$2,572,665	$2,894,248	$3,215,832	$3,215,832	$3,215,832	$3,215,832	$3,215,832
Baggage Handling System	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Ground Transportation	$0	$0	$0	$0	$0	$52,811	$105,622	$158,433	$211,244	$264,055	$316,866	$369,678	$422,489	$475,300	$528,111	$528,111	$528,111	$528,111	$528,111
Non-Aviation	$0	$0	$0	$0	$0	$359,498	$718,997	$1,078,495	$1,437,993	$1,797,491	$2,156,990	$2,516,488	$2,875,986	$3,235,485	$3,594,983	$3,594,983	$3,594,983	$3,594,983	$3,594,983
Aviation	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
General Aviation FIS Facility	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Lantana (LNA)	$0	$0	$0	$0	$0	$112,032	$224,064	$336,096	$448,128	$560,160	$672,192	$784,224	$896,256	$1,008,288	$1,120,320	$1,120,320	$1,120,320	$1,120,320	$1,120,320
Pahokee (PHK)	$0	$0	$0	$0	$0	$27,434	$54,867	$82,301	$109,734	$137,168	$164,601	$192,035	$219,468	$246,902	$274,335	$274,335	$274,335	$274,335	$274,335
North County Airport (F45)	$0	$0	$0	$0	$0	$103,848	$207,697	$311,545	$415,393	$519,242	$623,090	$726,938	$830,787	$934,635	$1,038,483	$1,038,483	$1,038,483	$1,038,483	$1,038,483
Air Cargo Building	$0	$0	$0	$0	$0	$72,262	$144,525	$216,787	$289,050	$361,312	$433,575	$505,837	$578,100	$650,362	$722,625	$722,625	$722,625	$722,625	$722,625
Total Future ACIP Amortization Charges	$0	$0	$0	$0	$0	$1,172,305	$2,344,610	$3,516,915	$4,689,220	$5,861,525	$7,033,830	$8,206,135	$9,378,441	$10,550,746	$11,723,051	$11,723,051	$11,723,051	$11,723,051	$11,723,051
Master Plan Update Amortization Charges by Cost Center[1]																			
Airfield	$0	$0	$0	$0	$0	$0	$1,762,842	$1,762,842	$2,423,394	$2,963,005	$2,963,005	$2,963,005	$2,963,005	$2,963,005	$3,407,342	$3,676,156	$3,676,156	$4,175,854	$4,318,586
Terminal	$0	$1,128,175	$1,128,175	$1,128,175	$1,128,175	$1,128,175	$1,128,175	$1,128,175	$1,128,175	$1,148,977	$1,148,977	$1,148,977	$1,148,977	$1,148,977	$1,148,977	$4,848,764	$4,848,764	$6,459,135	$6,459,135
Baggage Handling System	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Ground Transportation	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$99,341
Non-Aviation	$0	$0	$60,810	$60,810	$60,810	$60,810	$60,810	$60,810	$60,810	$60,810	$60,810	$60,810	$60,810	$60,810	$60,810	$373,527	$373,527	$373,527	$373,527
Aviation	$0	$629,317	$2,736,307	$3,344,493	$4,813,069	$4,813,069	$5,551,300	$5,733,947	$5,733,947	$5,775,747	$6,219,876	$6,219,876	$6,219,876	$6,219,876	$6,219,876	$6,219,876	$6,342,620	$6,342,620	$6,342,620
General Aviation FIS Facility	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Air Cargo Building	$0	$0	$121,408	$121,408	$121,408	$121,408	$121,408	$121,408	$121,408	$121,408	$121,408	$121,408	$121,408	$1,155,947	$1,155,947	$1,155,947	$1,155,947	$1,155,947	$1,155,947
Lantana (LNA)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Pahokee (PHK)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
North County Airport (F45)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total Master Plan Update Amortization Charges	**$0**	**$1,757,493**	**$4,046,701**	**$4,654,886**	**$6,123,463**	**$6,123,463**	**$8,624,536**	**$8,807,182**	**$9,467,734**	**$10,069,947**	**$10,514,075**	**$10,514,075**	**$10,514,075**	**$11,548,614**	**$11,992,951**	**$16,274,269**	**$16,397,013**	**$18,507,082**	**$18,749,156**

Notes:
(1) Projects shown to be amortized are $300,000 or more funded with Local Shares.
(2) Cost centers for future ACIP amortization charges based on 5-year average of existing ACIP cost center allocations.
Source: Palm Beach County Department of Airports

10.2.2.5. Revenue Bond Proceeds

For purposes of this financial analysis and funding plan, proceeds from the issuance of General Airport Revenue Bonds (GARBs) and PFC Bonds were assumed to fund projects included in the Master Plan Update ACIP. As shown in Table 10-2, approximately $28.2 million of project costs are assumed to be funded with GARBs and approximately $61.5 million of project costs are assumed to be funded with PFCs. Table 10-6 presents projected existing and future debt service by cost center through FY 2036.

Existing debt service is associated with two series of GARBs, which include the Series 2006B and Series 2016. The Series 2006B Bonds, in the amount of approximately $16.9 million, were issued by the County to refund a portion of the Series 2001 Bonds and a portion of the Series 2002 Bonds. Debt service on the Series 2006B Bonds extends through FY 2021. The Series 2016 Bonds, in the amount of approximately $57.1 million, were issued by the County to refund a portion of the Series 2006A Bonds. Debt service on the Series 2016 Bonds extends through FY 2036.

Future GARB debt service associated with the Master Plan Update ACIP projects was assumed for one series of GARBs and was calculated based on an assumed interest rate of 5.0 percent, capitalized interest of two years, and a bond term of 30 years. As shown in Table 10-6, the resulting annual debt service is approximately $2.3 million beginning in FY 2021 for the proposed Series 2019 Bonds.

Future PFC debt service associated with the Master Plan Update ACIP projects was assumed for one series of PFC bonds and was calculated based on an assumed interest rate of 5.0 percent and a bond term of 30 years. As shown in Table 10-6, the resulting annual debt service to be paid with PFC revenues is approximately $4.4 million beginning in FY 2027 for the proposed Series 2027 Bonds.

Table 10.6: Projected Debt Service by Cost Center

	Budget	Projected																	
	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Gross Debt Service																			
Series 2006B	$3,335,468	$3,335,276	$3,325,340	$3,320,218	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Series 2016	$2,947,000	$2,943,500	$2,939,500	$2,935,500	$5,173,500	$5,170,500	$5,166,375	$5,160,875	$5,158,625	$5,154,250	$5,147,500	$5,143,000	$5,140,250	$5,133,875	$5,128,500	$5,123,625	$5,113,875	$5,103,875	$5,112,625
Proposed Series 2019 GARB [1]	$0	$0	$0	$2,341,801	$2,341,801	$2,341,801	$2,341,801	$2,341,801	$2,341,801	$2,341,801	$2,341,801	$2,341,801	$2,341,801	$2,341,801	$2,341,801	$2,341,801	$2,341,801	$2,341,801	$2,341,801
Total Gross Debt Service	**$6,282,468**	**$6,278,776**	**$6,264,840**	**$8,597,519**	**$7,515,301**	**$7,512,301**	**$7,508,176**	**$7,502,676**	**$7,500,426**	**$7,496,051**	**$7,489,301**	**$7,484,801**	**$7,482,051**	**$7,475,676**	**$7,470,301**	**$7,465,426**	**$7,455,676**	**$7,445,676**	**$7,454,426**
PFC Debt Service																			
Proposed Series 2027 PFC Bonds [1]	$0	$0	$0	$0	$0	$0	$0	$0	$0	$4,402,310	$4,402,310	$4,402,310	$4,402,310	$4,402,310	$4,402,310	$4,402,310	$4,402,310	$4,402,310	$4,402,310
Total PFC Debt Service	$0	$0	$0	$0	$0	$0	$0	$0	$0	$4,402,310	$4,402,310	$4,402,310	$4,402,310	$4,402,310	$4,402,310	$4,402,310	$4,402,310	$4,402,310	$4,402,310
Total Senior Bond Debt Service	$6,282,468	$6,278,776	$6,264,840	$8,597,519	$7,515,301	$7,512,301	$7,508,176	$7,502,676	$7,500,426	$11,898,362	$11,891,612	$11,887,112	$11,884,362	$11,877,987	$11,872,612	$11,867,737	$11,857,987	$11,847,987	$11,856,737
Total Subordinate Debt	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total Indebtedness	**$6,282,468**	**$6,278,776**	**$6,264,840**	**$8,597,519**	**$7,515,301**	**$7,512,301**	**$7,508,176**	**$7,502,676**	**$7,500,426**	**$11,898,362**	**$11,891,612**	**$11,887,112**	**$11,884,362**	**$11,877,987**	**$11,872,612**	**$11,867,737**	**$11,857,987**	**$11,847,987**	**$11,856,737**
Debt Service After Allocation to Cost Centers																			
Gross Debt Service by Cost Center																			
Airfield	$333,547	$333,528	$332,534	$332,022	$0	$0	$0	$0	$0	$2,501,338	$2,501,338	$2,501,338	$2,501,338	$2,501,338	$2,501,338	$2,501,338	$2,501,338	$2,501,338	$2,501,338
Terminal	$1,934,571	$1,934,460	$1,928,697	$1,925,726	$0	$0	$0	$0	$0	$994,089	$994,089	$994,089	$994,089	$994,089	$994,089	$994,089	$994,089	$994,089	$994,089
Ground Transportation	$3,680,803	$3,677,261	$3,671,075	$3,665,948	$5,173,500	$5,170,500	$5,166,375	$5,160,875	$5,158,625	$5,154,250	$5,147,500	$5,143,000	$5,140,250	$5,133,875	$5,128,500	$5,123,625	$5,113,875	$5,103,875	$5,112,625
Other	$333,547	$333,528	$332,534	$2,673,823	$2,341,801	$2,341,801	$2,341,801	$2,341,801	$2,341,801	$3,248,685	$3,248,685	$3,248,685	$3,248,685	$3,248,685	$3,248,685	$3,248,685	$3,248,685	$3,248,685	$3,248,685
Total Gross Debt Service	**$6,282,468**	**$6,278,776**	**$6,264,840**	**$8,597,519**	**$7,515,301**	**$7,512,301**	**$7,508,176**	**$7,502,676**	**$7,500,426**	**$11,898,362**	**$11,891,612**	**$11,887,112**	**$11,884,362**	**$11,877,987**	**$11,872,612**	**$11,867,737**	**$11,857,987**	**$11,847,987**	**$11,856,737**
PFC Eligible Debt Service by Cost Center																			
Airfield	$0	$0	$0	$0	$0	$0	$0	$0	$0	$2,501,338	$2,501,338	$2,501,338	$2,501,338	$2,501,338	$2,501,338	$2,501,338	$2,501,338	$2,501,338	$2,501,338
Terminal	$0	$0	$0	$0	$0	$0	$0	$0	$0	$994,089	$994,089	$994,089	$994,089	$994,089	$994,089	$994,089	$994,089	$994,089	$994,089
Ground Transportation	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Other	$0	$0	$0	$0	$0	$0	$0	$0	$0	$906,884	$906,884	$906,884	$906,884	$906,884	$906,884	$906,884	$906,884	$906,884	$906,884
Total PFC Eligible Debt Service	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$4,402,310**	**$4,402,310**	**$4,402,310**	**$4,402,310**	**$4,402,310**	**$4,402,310**	**$4,402,310**	**$4,402,310**	**$4,402,310**	**$4,402,310**
Debt Service Net of PFC Eligibility by Cost Center																			
Airfield	$333,547	$333,528	$332,534	$332,022	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Terminal	$1,934,571	$1,934,460	$1,928,697	$1,925,726	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Ground Transportation	$3,680,803	$3,677,261	$3,671,075	$3,665,948	$5,173,500	$5,170,500	$5,166,375	$5,160,875	$5,158,625	$5,154,250	$5,147,500	$5,143,000	$5,140,250	$5,133,875	$5,128,500	$5,123,625	$5,113,875	$5,103,875	$5,112,625
Other	$333,547	$333,528	$332,534	$2,673,823	$2,341,801	$2,341,801	$2,341,801	$2,341,801	$2,341,801	$2,341,801	$2,341,801	$2,341,801	$2,341,801	$2,341,801	$2,341,801	$2,341,801	$2,341,801	$2,341,801	$2,341,801
Total Debt Service Net of PFC Eligibility	**$6,282,468**	**$6,278,776**	**$6,264,840**	**$8,597,519**	**$7,515,301**	**$7,512,301**	**$7,508,176**	**$7,502,676**	**$7,500,426**	**$7,496,051**	**$7,489,301**	**$7,484,801**	**$7,482,051**	**$7,475,676**	**$7,470,301**	**$7,465,426**	**$7,455,676**	**$7,445,676**	**$7,454,426**

Notes:

(1) Proposed debt service to fund Master Plan Update ACIP projects.

Source: Palm Beach County Department of Airports

10.2.2.6. Third-Party Funds

Private funding sources are anticipated for Master Plan projects or elements of a Master Plan project that are not eligible for federal, state, or PFC funding. General examples of projects that are often candidates for third-party funding include aircraft storage hangars, GA aircraft parking aprons, and other facilities to be constructed by tenants under a lease agreement. Facilities that are constructed with private financial contributions may also provide a financial benefit in the form of land lease revenues to the Airport.

Based on the projects proposed in this Master Plan Update, it is anticipated that third-party sources will provide approximately $496.6 million of the overall estimated Master Plan projects cost. The following GA development projects were assumed to be funded partially with third-party funding:

- Phase I Golfview area development: Approximately $100.5 million of the approximately $111.7 million project was assumed to be paid with third-party funding
- Demolish two hangars (1628 & 1629) and reconstruct: Approximately $18.1 million of this approximately $20.2 million project was assumed to be paid with third-party funding
- Atlantic Aviation relocation: Approximately $69.7 million of this approximately $74.2 million project was assumed to be paid with third-party funding
- Expand GA Facilities up to Runway 14-32: Approximately $57.6 million of this approximately $79.4 million project was assumed to be paid with third-party funding
- Demolish/reconfigure southwest GA facilities: Approximately $17.6 million of this approximately $28.7 million project was assumed to be paid with third-party funding
- Expand Golfview facilities: Approximately $233.1 million of this approximately $288.2 million project was assumed to be paid with third-party funding

10.3 Operation & Maintenance Expenses

O&M expenses for the Airport are defined as the County's costs for the operation, maintenance and repair of the Airport System and shall include, but shall not be limited to, salaries and employee benefits, utility costs, ordinary maintenance, administrative and general expenses, security, and all such other expenses as defined and determined in accordance with the Bond Resolution.

For purposes of calculating airline rates and charges, O&M expenses are allocated to direct and indirect cost centers, as previously described in Section 10.1. O&M expenses are allocated to cost centers based on percentages provided by the DOA. O&M expenses allocated to indirect cost centers are reallocated to each of the direct cost centers based on calculated percentages.

It is expected that, as certain Master Plan Update projects are completed, associated O&M expenses could change accordingly. Construction of new facilities may increase future O&M expenses, while reconstructed pavement (for example) may require less maintenance, thereby reducing future O&M expenses. For the purposes of this financial analysis, the anticipated implementation of certain Master Plan Update projects was assumed to impact future O&M expenses.

Table 10.7 presents projections of O&M expenses for the Airport System by direct and indirect cost centers. O&M expenses for Budget FY 2017 are also included for reference. Total O&M expenses for the Airport System are projected to increase from approximately $46.9 million in FY 2017 to approximately $95.4 million in FY 2035, reflecting a compound annual growth rate of 4% during that period.

10.4 Airport Revenues

Airport revenues consist of non-airline revenues and airline revenues as described in the following sections.

10.4.1 Non-airline Revenues

Non-airline revenues include those revenues obtained from sources other than airline rentals, fees, and charges for operating at the Airport. However, as specified in the rate-setting methodologies defined in the Airline Agreement, non-airline revenues affect airline rates and, therefore, airline revenues.

Projections of future non-airline revenues were developed based on a review of historical/budget data, the effects of inflation, the forecast growth in numbers of aircraft operations and enplaned passengers at the Airport, and the anticipated increases in revenue from implementation of certain Master Plan Update projects. For the purposes of this financial analysis, the anticipated implementation of certain Terminal and Air Cargo Building Master Plan Update projects were assumed to have an impact on future non-airline revenues. As a result of these projects, total non-airline revenues are projected to increase by an additional $3.1 million throughout the planning period.

Projections for all non-airline revenue categories were based on the FY 2018 Budget, as provided by the County. **Table 10.8** presents projected non-airline revenues for the Airport System. Total non-airline revenues are projected to increase from approximately $54.5 million in FY 2018 to approximately $106.9 million in FY 2036, reflecting a compound annual growth rate of 3.8% during that period.

Table 10.7: Projected Operation and Maintenance Expenses

	Budget	Projected																	
	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
O&M Direct Expenses																			
Airfield	$2,283,212	$2,354,571	$2,428,186	$2,504,128	$2,582,472	$2,663,296	$2,746,678	$2,832,701	$2,921,450	$3,013,011	$3,107,477	$3,204,939	$3,305,495	$3,409,243	$3,516,288	$3,626,734	$3,740,692	$3,858,275	$3,979,601
Terminal	$16,636,533	$17,301,844	$18,952,689	$19,710,636	$20,713,908	$21,551,141	$22,698,925	$23,606,701	$24,462,581	$25,592,765	$26,747,076	$27,816,755	$28,929,216	$30,086,168	$31,289,392	$32,540,739	$33,878,893	$35,233,806	$37,433,544
Baggage Handling System	$1,661,667	$1,712,090	$1,764,048	$1,817,589	$1,872,761	$1,929,613	$1,988,198	$2,048,569	$2,110,780	$2,174,887	$2,240,948	$2,309,024	$2,379,176	$2,451,468	$2,525,966	$2,602,737	$2,681,850	$2,763,378	$2,847,395
Ground Transportation	$6,842,655	$7,049,653	$7,262,929	$7,482,674	$7,709,087	$7,942,369	$8,182,730	$8,430,386	$8,685,558	$8,948,476	$9,219,375	$9,498,499	$9,786,098	$10,082,431	$10,387,765	$10,702,372	$11,026,537	$11,360,551	$11,704,713
Non-Aviation	$1,066,792	$1,099,561	$1,133,344	$1,168,173	$1,204,079	$1,241,097	$1,279,262	$1,318,608	$1,359,174	$1,400,997	$1,444,117	$1,488,574	$1,534,410	$1,581,668	$1,630,393	$1,680,630	$1,732,428	$1,785,835	$1,840,901
Aviation	$867,718	$902,427	$938,524	$976,065	$1,015,107	$1,055,712	$1,097,940	$1,141,858	$1,187,532	$1,235,033	$1,284,435	$1,335,812	$1,389,245	$1,444,814	$1,502,607	$1,562,711	$1,625,220	$1,690,228	$1,757,838
General Aviation FIS Facility	$214,707	$224,791	$232,866	$241,239	$249,922	$258,926	$268,262	$277,944	$287,985	$298,397	$309,196	$320,395	$332,010	$344,056	$356,549	$369,507	$382,947	$396,887	$411,346
Air Cargo Building	$112,248	$115,902	$119,677	$123,577	$127,606	$131,769	$136,071	$140,515	$145,107	$149,852	$154,755	$208,529	$265,497	$329,908	$340,282	$350,987	$362,032	$373,429	$385,190
Lantana (LNA)	$383,467	$395,384	$407,674	$420,351	$433,426	$446,912	$460,821	$475,168	$489,967	$505,231	$520,975	$537,216	$553,968	$571,248	$589,072	$607,459	$626,427	$645,993	$666,177
Pahokee (PHK)	$74,520	$77,042	$79,651	$82,350	$85,143	$88,032	$91,021	$94,114	$97,314	$100,626	$104,052	$107,597	$111,266	$115,062	$118,991	$123,056	$127,264	$131,618	$136,124
North County Airport (F45)	$500,556	$516,146	$532,226	$548,812	$565,920	$583,568	$601,771	$620,549	$639,919	$659,900	$680,512	$701,775	$723,710	$746,338	$769,681	$793,763	$818,608	$844,238	$870,681
Total O&M Direct Expenses	**$30,644,076**	**$31,749,410**	**$33,851,814**	**$35,075,595**	**$36,559,432**	**$37,892,435**	**$39,551,681**	**$40,987,114**	**$42,387,367**	**$44,079,175**	**$45,812,918**	**$47,529,115**	**$49,310,089**	**$51,162,406**	**$53,026,987**	**$54,960,696**	**$57,002,897**	**$59,084,237**	**$62,033,508**
O&M Indirect Expenses																			
Admin and Operations	$8,629,796	$9,001,800	$9,390,285	$9,795,998	$10,219,721	$10,662,273	$11,124,510	$11,607,327	$12,111,662	$12,638,496	$13,188,855	$13,763,814	$14,364,497	$14,992,080	$15,647,795	$16,332,930	$17,048,836	$17,796,923	$18,578,670
Maintenance	$3,468,366	$3,607,101	$3,751,385	$3,901,440	$4,057,498	$4,219,798	$4,388,589	$4,564,133	$4,746,698	$4,936,566	$5,134,029	$5,339,390	$5,552,966	$5,775,084	$6,006,088	$6,246,331	$6,496,184	$6,756,032	$7,026,273
Fire Rescue	$6,253,260	$6,503,390	$6,763,526	$7,034,067	$7,315,430	$7,608,047	$7,912,369	$8,228,864	$8,558,018	$8,900,339	$9,256,352	$9,626,606	$10,011,671	$10,412,138	$10,828,623	$11,261,768	$11,712,239	$12,180,728	$12,667,957
Total O&M Indirect Expenses	**$18,351,422**	**$19,112,291**	**$19,905,196**	**$20,731,505**	**$21,592,649**	**$22,490,118**	**$23,425,468**	**$24,400,324**	**$25,416,378**	**$26,475,401**	**$27,579,236**	**$28,729,810**	**$29,929,133**	**$31,179,302**	**$32,482,505**	**$33,841,030**	**$35,257,259**	**$36,733,683**	**$38,272,900**
Total O&M Expenses	**$48,995,498**	**$50,861,701**	**$53,757,010**	**$55,807,100**	**$58,152,081**	**$60,382,553**	**$62,977,149**	**$65,387,438**	**$67,803,745**	**$70,554,576**	**$73,392,154**	**$76,258,926**	**$79,239,222**	**$82,341,707**	**$85,509,492**	**$88,801,726**	**$92,260,156**	**$95,817,920**	**$100,306,408**
Total O&M Expenses After Allocation of Indirect Expenses																			
Airfield	$7,719,682	$8,007,380	$8,286,384	$8,595,507	$8,912,070	$9,244,710	$9,584,512	$9,942,807	$10,316,434	$10,699,535	$11,097,603	$11,512,399	$11,942,942	$12,389,757	$12,854,680	$13,337,305	$13,837,595	$14,357,671	$14,882,190
Terminal	$21,675,793	$22,575,724	$24,593,131	$25,613,877	$26,918,558	$28,046,174	$29,531,494	$30,758,069	$31,937,181	$33,434,900	$34,971,435	$36,417,372	$37,923,627	$39,492,033	$41,135,943	$42,848,885	$44,675,011	$46,536,585	$49,362,176
Baggage Handling System	$2,129,616	$2,197,513	$2,253,384	$2,325,210	$2,396,267	$2,472,573	$2,547,409	$2,628,713	$2,713,909	$2,798,476	$2,886,084	$2,977,688	$3,072,253	$3,169,820	$3,271,356	$3,376,204	$3,483,957	$3,595,742	$3,700,172
Ground Transportation	$11,905,350	$12,309,553	$12,669,203	$13,099,700	$13,532,400	$13,992,283	$14,451,919	$14,944,204	$15,458,782	$15,977,297	$16,515,110	$17,076,420	$17,657,252	$18,258,064	$18,883,135	$19,530,082	$20,197,557	$20,890,542	$21,562,577
Non-Aviation	$1,617,346	$1,671,452	$1,718,268	$1,775,786	$1,833,282	$1,894,643	$1,955,568	$2,021,186	$2,089,862	$2,158,708	$2,230,111	$2,304,710	$2,381,865	$2,461,628	$2,544,652	$2,630,542	$2,719,064	$2,810,980	$2,898,959
Aviation	$1,862,471	$1,938,696	$2,010,488	$2,092,751	$2,176,719	$2,265,736	$2,356,237	$2,452,689	$2,553,817	$2,657,186	$2,764,967	$2,877,839	$2,995,345	$3,117,644	$3,245,448	$3,378,522	$3,516,771	$3,661,034	$3,804,454
GA FIS Facility	$275,171	$288,526	$297,462	$308,613	$319,785	$331,783	$343,715	$356,656	$370,273	$383,955	$398,209	$413,177	$428,727	$444,874	$461,764	$479,315	$497,481	$516,434	$534,541
Air Cargo Building	$143,859	$148,763	$152,874	$158,090	$163,277	$168,847	$174,342	$180,308	$186,570	$192,818	$199,307	$268,916	$342,838	$426,581	$440,697	$455,291	$470,311	$485,911	$500,552
Lantana (LNA)	$679,054	$702,587	$723,667	$748,770	$774,048	$800,906	$827,806	$856,599	$886,709	$917,102	$948,647	$981,584	$1,015,694	$1,051,004	$1,087,761	$1,125,834	$1,165,150	$1,205,996	$1,245,731
Pahokee (PHK)	$158,039	$163,919	$169,381	$175,690	$182,098	$188,883	$195,746	$203,056	$210,701	$218,481	$226,571	$235,022	$243,796	$252,900	$262,390	$272,243	$282,449	$293,070	$303,572
Total O&M Expenses	**$48,995,498**	**$50,861,701**	**$53,757,010**	**$55,807,100**	**$58,152,081**	**$60,382,553**	**$62,977,149**	**$65,387,438**	**$67,803,745**	**$70,554,576**	**$73,392,154**	**$76,258,926**	**$79,239,222**	**$82,341,707**	**$85,509,492**	**$88,801,726**	**$92,260,156**	**$95,817,920**	**$100,306,408**

Source: Palm Beach County Department of Airports

Table 10.8: Projected Non-Airline Revenues

	Budget	Projected																	
	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Airfield																			
Airfield Services	$145,000	$147,900	$150,858	$153,875	$156,953	$160,092	$163,294	$166,559	$169,891	$173,288	$176,754	$180,289	$183,895	$187,573	$191,324	$195,151	$199,054	$203,035	$207,096
Aviation Fueling (moved to Aviation in 2016)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
GA Landing Fee	$1,225,000	$1,243,375	$1,262,026	$1,280,956	$1,300,170	$1,319,673	$1,339,468	$1,359,560	$1,379,953	$1,400,653	$1,421,663	$1,442,987	$1,464,632	$1,486,602	$1,508,901	$1,531,534	$1,554,507	$1,577,825	$1,601,492
Miscellaneous Revenues	$4,350	$4,437	$4,526	$4,616	$4,709	$4,803	$4,899	$4,997	$5,097	$5,199	$5,303	$5,409	$5,517	$5,627	$5,740	$5,855	$5,972	$6,091	$6,213
Total Airfield Revenues	**$1,374,350**	**$1,395,712**	**$1,417,409**	**$1,439,447**	**$1,461,832**	**$1,484,567**	**$1,507,660**	**$1,531,116**	**$1,554,941**	**$1,579,140**	**$1,603,719**	**$1,628,685**	**$1,654,044**	**$1,679,802**	**$1,705,965**	**$1,732,540**	**$1,759,533**	**$1,786,951**	**$1,814,801**
Terminal																			
Car Rental Terminal Rents	$370,000	$381,100	$392,533	$404,309	$416,438	$428,931	$441,799	$455,053	$468,705	$482,766	$497,249	$512,167	$527,532	$543,357	$559,658	$576,448	$593,741	$611,554	$629,900
Food and Beverage Concessions	$2,100,000	$2,189,565	$3,689,213	$3,846,558	$4,010,614	$4,214,481	$4,597,560	$4,793,646	$4,683,917	$5,460,806	$5,603,091	$5,842,063	$6,091,227	$6,351,018	$6,621,889	$6,904,312	$7,198,781	$7,505,809	$8,544,063
News & Gift Concessions	$3,100,000	$3,232,215	$3,370,069	$3,513,802	$3,663,666	$3,819,921	$3,982,841	$4,152,709	$4,329,822	$4,514,489	$4,707,032	$4,907,787	$5,117,104	$5,335,349	$5,562,901	$5,800,159	$6,047,536	$6,305,463	$6,574,391
Advertising & Other Concessions	$465,000	$484,832	$505,510	$527,070	$549,550	$572,988	$597,426	$622,906	$649,473	$677,173	$706,055	$736,168	$767,566	$800,302	$834,435	$870,024	$907,130	$945,819	$986,159
Non-Airline Miscellaneous	$1,922,000	$1,979,660	$2,039,050	$2,100,221	$2,163,228	$2,228,125	$2,294,969	$2,363,818	$2,434,732	$2,507,774	$2,583,007	$2,660,497	$2,740,312	$2,822,522	$2,907,197	$2,994,413	$3,084,246	$3,176,773	$3,272,076
Total Terminal Revenues	**$7,957,000**	**$8,267,372**	**$9,996,375**	**$10,391,961**	**$10,803,496**	**$11,264,447**	**$11,914,596**	**$12,388,133**	**$12,566,650**	**$13,643,009**	**$14,096,434**	**$14,658,682**	**$15,243,741**	**$15,852,548**	**$16,486,081**	**$17,145,356**	**$17,831,435**	**$18,545,419**	**$20,006,589**
Ground Transportation																			
Automobile Parking	$17,450,000	$18,194,243	$18,970,227	$19,779,307	$20,622,895	$21,502,461	$22,419,541	$23,375,734	$24,372,709	$25,412,206	$26,496,036	$27,626,092	$28,804,345	$30,032,850	$31,313,751	$32,649,283	$34,041,775	$35,493,656	$37,007,461
Building/Ground Rental	$1,487,000	$1,501,870	$1,516,889	$1,532,058	$1,547,378	$1,562,852	$1,578,480	$1,594,265	$1,610,208	$1,626,310	$1,642,573	$1,658,999	$1,675,589	$1,692,345	$1,709,268	$1,726,361	$1,743,624	$1,761,061	$1,778,671
On-airport Car Rental	$10,400,000	$10,843,560	$11,306,038	$11,788,240	$12,291,009	$12,815,220	$13,361,789	$13,931,670	$14,525,856	$15,145,383	$15,791,334	$16,464,834	$17,167,059	$17,899,234	$18,662,637	$19,458,598	$20,288,508	$21,153,812	$22,056,022
Off-airport Car Rental	$800,000	$818,120	$836,650	$855,601	$874,980	$894,798	$915,065	$935,792	$956,987	$978,663	$1,000,830	$1,023,499	$1,046,681	$1,070,388	$1,094,632	$1,119,426	$1,144,781	$1,170,710	$1,197,227
Taxi/Limo	$675,000	$690,289	$705,924	$721,913	$738,264	$754,986	$772,086	$789,574	$807,458	$825,747	$844,450	$863,577	$883,137	$903,140	$923,596	$944,516	$965,909	$987,787	$1,010,160
Miscellaneous	$303,000	$306,030	$309,090	$312,181	$315,303	$318,456	$321,641	$324,857	$328,106	$331,387	$334,701	$338,048	$341,428	$344,842	$348,291	$351,774	$355,291	$358,844	$362,433
Total Ground Transportation Revenues	**$31,115,000**	**$32,354,111**	**$33,644,818**	**$34,989,300**	**$36,389,829**	**$37,848,774**	**$39,368,603**	**$40,951,892**	**$42,601,324**	**$44,319,695**	**$46,109,923**	**$47,975,048**	**$49,918,239**	**$51,942,800**	**$54,052,175**	**$56,249,957**	**$58,539,888**	**$60,925,870**	**$63,411,974**
Aviation																			
Building/Hangar Rentals	$2,820,000	$2,862,300	$2,905,235	$2,948,813	$2,993,045	$3,037,941	$3,083,510	$3,129,763	$3,176,709	$3,224,360	$3,272,725	$3,321,816	$3,371,643	$3,422,218	$3,473,551	$3,525,654	$3,578,539	$3,632,217	$3,686,701
Ground Rentals	$2,050,000	$2,080,750	$2,111,961	$2,143,641	$2,175,795	$2,208,432	$2,241,559	$2,275,182	$2,309,310	$2,343,949	$2,379,109	$2,414,795	$2,451,017	$2,487,783	$2,525,099	$2,562,976	$2,601,420	$2,640,442	$2,680,048
Airline Catering	$130,000	$130,000	$130,000	$130,000	$130,000	$130,000	$130,000	$130,000	$130,000	$130,000	$130,000	$130,000	$130,000	$130,000	$130,000	$130,000	$130,000	$130,000	$130,000
FBO Apron Fee	$2,225,000	$2,291,750	$2,360,503	$2,431,318	$2,504,257	$2,579,385	$2,656,766	$2,736,469	$2,818,563	$2,903,120	$2,990,214	$3,079,920	$3,172,318	$3,267,488	$3,365,512	$3,466,478	$3,570,472	$3,677,586	$3,787,914
Aviation Fueling (From Airfield in 2016)	$900,000	$927,000	$954,810	$983,454	$1,012,958	$1,043,347	$1,074,647	$1,106,886	$1,140,093	$1,174,296	$1,209,525	$1,245,810	$1,283,185	$1,321,680	$1,361,331	$1,402,171	$1,444,236	$1,487,563	$1,532,190
Miscellaneous	$161,500	$163,115	$164,746	$166,394	$168,058	$169,738	$171,436	$173,150	$174,881	$176,630	$178,396	$180,180	$181,982	$183,802	$185,640	$187,496	$189,371	$191,265	$193,178
Total Aviation Revenues	**$8,286,500**	**$8,454,915**	**$8,627,254**	**$8,803,619**	**$8,984,113**	**$9,168,843**	**$9,357,918**	**$9,551,450**	**$9,749,557**	**$9,952,356**	**$10,159,969**	**$10,372,523**	**$10,590,146**	**$10,812,970**	**$11,041,133**	**$11,274,775**	**$11,514,039**	**$11,759,073**	**$12,010,030**
Non-Aviation																			
Building Rentals	$434,000	$442,680	$451,534	$460,564	$469,776	$479,171	$488,754	$498,530	$508,500	$518,670	$529,044	$539,624	$550,417	$561,425	$572,654	$584,107	$595,789	$607,705	$619,859
Ground Rentals	$1,788,000	$1,823,760	$1,860,235	$1,897,440	$1,935,389	$1,974,096	$2,013,578	$2,053,850	$2,094,927	$2,136,826	$2,179,562	$2,223,153	$2,267,616	$2,312,969	$2,359,228	$2,406,413	$2,454,541	$2,503,632	$2,553,704
Miscellaneous	$10,500	$10,815	$11,139	$11,474	$11,818	$12,172	$12,538	$12,914	$13,301	$13,700	$14,111	$14,534	$14,970	$15,420	$15,882	$16,359	$16,849	$17,355	$17,876
Total Non-Aviation Revenues	**$2,232,500**	**$2,277,255**	**$2,322,908**	**$2,369,478**	**$2,416,982**	**$2,465,440**	**$2,514,870**	**$2,565,293**	**$2,616,728**	**$2,669,196**	**$2,722,717**	**$2,777,312**	**$2,833,004**	**$2,889,814**	**$2,947,764**	**$3,006,878**	**$3,067,179**	**$3,128,691**	**$3,191,439**
Other Revenues																			
Air Cargo Building	$464,800	$469,448	$474,142	$478,884	$483,673	$488,509	$493,395	$498,329	$503,312	$508,345	$513,428	$518,563	$696,602	$878,151	$1,063,262	$1,073,894	$1,084,633	$1,275,141	$1,467,554
Lantana (LNA)	$751,475	$774,019	$797,240	$821,157	$845,792	$871,165	$897,300	$924,219	$951,946	$980,504	$1,009,920	$1,040,217	$1,071,424	$1,103,566	$1,136,673	$1,170,774	$1,205,897	$1,242,074	$1,279,336
Pahokee (PHK)	$58,177	$59,922	$61,720	$63,572	$65,479	$67,443	$69,466	$71,550	$73,697	$75,908	$78,185	$80,531	$82,946	$85,435	$87,998	$90,638	$93,357	$96,158	$99,042
North County Airport (F45)	$1,121,507	$1,155,152	$1,189,807	$1,225,501	$1,262,266	$1,300,134	$1,339,138	$1,379,312	$1,420,692	$1,463,312	$1,507,212	$1,552,428	$1,599,001	$1,646,971	$1,696,380	$1,747,271	$1,799,690	$1,853,680	$1,909,291
Admin. - Interest Earnings	$1,184,100	$1,207,782	$1,231,938	$1,256,576	$1,281,708	$1,307,342	$1,333,489	$1,360,159	$1,387,362	$1,415,109	$1,443,411	$1,472,280	$1,501,725	$1,531,760	$1,562,395	$1,593,643	$1,625,516	$1,658,026	$1,691,186
Other	$3,700	$3,811	$3,925	$4,043	$4,164	$4,289	$4,418	$4,551	$4,687	$4,828	$4,972	$5,122	$5,275	$5,434	$5,597	$5,764	$5,937	$6,116	$6,299
Total Other Revenues	**$3,583,759**	**$3,670,135**	**$3,758,772**	**$3,849,733**	**$3,943,082**	**$4,038,883**	**$4,137,206**	**$4,238,120**	**$4,341,695**	**$4,448,006**	**$4,557,128**	**$4,669,140**	**$4,956,974**	**$5,251,317**	**$5,552,304**	**$5,681,984**	**$5,815,030**	**$6,131,194**	**$6,452,708**
Total Non-airline Revenues	**$54,549,109**	**$56,419,500**	**$59,767,537**	**$61,843,538**	**$63,999,333**	**$66,270,954**	**$68,800,854**	**$71,226,005**	**$73,430,895**	**$76,611,402**	**$79,249,891**	**$82,081,390**	**$85,196,147**	**$88,429,250**	**$91,785,423**	**$95,091,490**	**$98,527,103**	**$102,277,198**	**$106,887,541**

Source: Palm Beach County Department of Airports

10.4.2 Airline Revenues

The remaining revenues generated at the Airport include terminal rentals, landing fees, BHS fees, as well as joint use charges and miscellaneous fees and charges, which are payable by the airlines operating at the Airport. This section summarizes the calculation of airline rates and charges for terminal rentals, landing fees, and BHS fees, as defined in the Airline Agreement.

10.4.2.1. Terminal Rental Rates

The terminal rental rate calculation combines terminal cost center-specific direct and indirect O&M expenses and O&M reserve requirement; total debt service, debt service coverage and debt service reserve requirement; non-amortized capital expenditures; and amortization charges; less: credits to the terminal total requirement (per use gate fees, air carrier FIS facility fees, and prior year debt service coverage). This net requirement is divided by the sum of terminal rentable square feet to determine the average terminal rental rate.

Table 10.9 presents projected terminal rental rates and revenue at the Airport through FY 2036. As shown, the effective Signatory terminal rental rate is projected to increase from $51.58 per square foot in FY 2018 to $112.30 per square foot in FY 2036. Total terminal rental revenues are projected to increase from approximately $11.6 million in FY 2018 to approximately $25.6 million in FY 2036, reflecting a compound annual growth rate of 4.5%.

Table 10.9: Projected Terminal Rental Rates and Revenues

	Budget	Projected																	
	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Terminal Costs																			
Operation and Maintenance Expenses	$21,675,793	$22,575,724	$24,593,131	$25,613,877	$26,918,558	$28,046,174	$29,531,494	$30,758,069	$31,937,181	$33,434,900	$34,971,435	$36,417,372	$37,923,627	$39,492,033	$41,135,943	$42,848,885	$44,675,011	$46,536,585	$49,362,176
Operation and Maintenance Reserve Charge	$115,427	$149,989	$336,234	$170,124	$217,447	$187,936	$247,553	$204,429	$196,519	$249,620	$256,089	$240,990	$251,042	$261,401	$273,985	$285,490	$304,354	$310,262	$470,932
Net Debt Service	$1,934,571	$1,934,460	$1,928,697	$1,925,726	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Debt Service Coverage (25%)	$483,643	$483,615	$482,174	$481,432	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Non-Amortized Capital Expenditures	$15,000	$15,000	$15,000	$15,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Existing ACIP Amortization Charges	$2,246,259	$3,460,265	$3,460,265	$3,460,265	$2,992,628	$2,833,443	$2,833,443	$2,762,215	$2,762,215	$2,502,173	$2,502,173	$2,209,096	$2,176,681	$2,048,115	$1,653,909	$1,486,376	$565,446	$565,446	$219,638
Future ACIP Amortization Charges	$0	$0	$0	$0	$0	$321,583	$643,166	$964,749	$1,286,333	$1,607,916	$1,929,499	$2,251,082	$2,572,665	$2,894,248	$3,215,832	$3,215,832	$3,215,832	$3,215,832	$3,215,832
Master Plan Update ACIP Amortization Charges	$0	$1,128,175	$1,128,175	$1,128,175	$1,128,175	$1,128,175	$1,128,175	$1,128,175	$1,128,175	$1,148,977	$1,148,977	$1,148,977	$1,148,977	$1,148,977	$1,148,977	$4,848,764	$4,848,764	$6,459,135	$6,459,135
Terminal Total Requirement	**$26,470,694**	**$29,747,228**	**$31,943,678**	**$32,794,600**	**$31,256,808**	**$32,517,311**	**$34,383,832**	**$35,817,637**	**$37,310,422**	**$38,943,585**	**$40,808,173**	**$42,267,517**	**$44,072,992**	**$45,844,774**	**$47,428,645**	**$52,685,347**	**$53,609,407**	**$57,087,260**	**$59,727,712**
Terminal Credits																			
Per Use Gate Fee	$550,000	$550,000	$550,000	$550,000	$550,000	$550,000	$550,000	$550,000	$550,000	$550,000	$550,000	$550,000	$550,000	$550,000	$550,000	$550,000	$550,000	$550,000	$550,000
Air Carrier FIS Facility	$70,000	$70,000	$70,000	$70,000	$70,000	$70,000	$70,000	$70,000	$70,000	$70,000	$70,000	$70,000	$70,000	$70,000	$70,000	$70,000	$70,000	$70,000	$70,000
Prior Year Debt Service Coverage (25%)	$495,266	$483,643	$483,615	$482,174	$481,432	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total Terminal Credits	$1,115,266	$1,103,644	$1,103,617	$1,102,176	$1,101,434	$620,002	$620,002	$620,002	$620,002	$620,002	$620,002	$620,002	$620,002	$620,002	$620,002	$620,002	$620,002	$620,002	$620,002
Terminal Net Requirement	$25,355,428	$28,643,585	$30,840,061	$31,692,424	$30,155,375	$31,897,309	$33,763,830	$35,197,635	$36,690,420	$38,323,583	$40,188,171	$41,647,515	$43,452,990	$45,224,772	$46,808,643	$52,065,345	$52,989,405	$56,467,258	$59,107,710
Total Rentable Space	351,500	351,500	365,235	365,235	372,603	372,888	381,972	381,972	379,438	383,678	387,203	387,203	387,203	387,203	387,203	387,203	387,983	387,983	403,818
Terminal Rental Rate (per sq ft)	$72.13	$81.49	$84.44	$86.77	$80.93	$85.54	$88.39	$92.15	$96.70	$99.88	$103.79	$107.56	$112.22	$116.80	$120.89	$134.47	$136.58	$145.54	$146.37
Signatory Airline Rented Space	153,360	153,360	153,360	153,360	154,575	155,961	155,961	155,961	157,927	160,599	163,271	165,271	165,271	165,271	165,271	165,271	165,271	165,645	165,645
Non-Signatory Airline Rented Space	7,774	7,774	7,774	7,774	8,465	9,534	9,534	9,534	9,534	9,534	9,534	9,534	9,534	9,534	9,534	9,534	9,534	9,534	9,534
Signatory Airline Share of Net Requirement	**$11,062,612**	**$12,497,240**	**$12,949,557**	**$13,307,460**	**$12,510,040**	**$13,341,093**	**$13,785,927**	**$14,371,356**	**$15,270,981**	**$16,041,384**	**$16,946,087**	**$17,776,480**	**$18,547,115**	**$19,303,367**	**$19,979,414**	**$22,223,140**	**$22,572,089**	**$24,108,053**	**$24,245,804**
Revenue Sharing																			
Signatory Airline Requirement	$11,062,612	$12,497,240	$12,949,557	$13,307,460	$12,510,040	$13,341,093	$13,785,927	$14,371,356	$15,270,981	$16,041,384	$16,946,087	$17,776,480	$18,547,115	$19,303,367	$19,979,414	$22,223,140	$22,572,089	$24,108,053	$24,245,804
Less Revenue Sharing [1]	$3,151,985	$2,621,022	$2,253,947	$1,779,842	$1,420,345	$2,549,231	$2,398,226	$2,679,577	$2,893,406	$3,287,314	$3,517,969	$3,900,965	$4,246,103	$4,384,810	$4,782,163	$4,698,623	$5,255,807	$5,491,364	$5,643,609
Net Signatory Terminal Rental Revenues	$7,910,628	$9,876,219	$10,695,610	$11,527,617	$11,089,696	$10,791,863	$11,387,701	$11,691,779	$12,377,574	$12,754,070	$13,428,118	$13,875,515	$14,301,011	$14,918,556	$15,197,251	$17,524,517	$17,316,282	$18,616,689	$18,602,195
Effective Signatory Terminal Rental Rate (per sq ft)	$51.58	$64.40	$69.74	$75.17	$71.74	$69.20	$73.02	$74.97	$78.38	$79.42	$82.24	$83.96	$86.53	$90.27	$91.95	$106.04	$104.78	$112.39	$112.30
Non-signatory Terminal Rental Revenues	$560,777	$633,500	$656,429	$674,571	$685,118	$815,568	$842,761	$878,550	$921,926	$952,321	$989,564	$1,025,498	$1,069,955	$1,113,582	$1,152,582	$1,282,019	$1,302,149	$1,387,613	$1,395,542
Total Terminal Rental Revenues	**$11,623,390**	**$13,130,741**	**$13,605,986**	**$13,982,031**	**$13,195,158**	**$14,156,661**	**$14,628,688**	**$15,249,906**	**$16,192,907**	**$16,993,705**	**$17,935,651**	**$18,801,978**	**$19,617,069**	**$20,416,948**	**$21,131,995**	**$23,505,159**	**$23,874,238**	**$25,495,666**	**$25,641,346**

Notes:

(1) Revenue Sharing allocated to Terminal and Airfield based on proportionate share of Terminal Rental Revenues plus Landing Fee Revenues

Source: Palm Beach County Department of Airports

10.4.2.2. Landing Fee Rate

The Signatory Airline landing fee calculation combines airfield cost center-specific direct and indirect O&M expenses and O&M reserve requirement; total debt service, debt service coverage and debt service reserve requirement; non-amortized capital expenditures; and amortization charges; less: credits to the airfield total requirement (non-signatory landing fees, airfield services revenues, aviation fueling, a portion (25.0%) of airline catering revenues, GA landing fee revenues, apron fees, and prior year debt service coverage. This net requirement is divided by the landed weight of all Signatory Airlines to determine the Signatory Airline landing fee rate.

Table 10.10 projected landing fee rates and revenues at the Airport through FY 2036. As shown, the effective Signatory landing fee rate is projected to increase from $1.25 per 1,000-pound units of landed weight in FY 2018 to $2.56 per 1,000-pound units of landed weight in FY 2036. Total landing fee revenues are projected to increase from approximately $6.7 million in FY 2018 to approximately $17.2 million in FY 2036, reflecting a compound annual growth rate of 5.4%.

Table 10.10: Projected Landing Fee Rates and Revenues

	Budget	Projected																	
	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Airfield Costs																			
Operation and Maintenance Expenses	$7,719,682	$8,007,380	$8,286,384	$8,595,507	$8,912,070	$9,244,710	$9,584,512	$9,942,807	$10,316,434	$10,699,535	$11,097,603	$11,512,399	$11,942,942	$12,389,757	$12,854,680	$13,337,305	$13,837,595	$14,357,671	$14,882,190
Operation and Maintenance Reserve Charge	$61,033	$47,950	$46,501	$51,520	$52,761	$55,440	$56,634	$59,716	$62,271	$63,850	$66,345	$69,133	$71,757	$74,469	$77,487	$80,438	$83,382	$86,679	$87,420
Debt Service	$333,547	$333,528	$332,534	$332,022	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Debt Service Coverage (25%)	$83,387	$83,382	$83,134	$83,005	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Non-Amortized Capital Expenditures	$58,000	$30,000	$30,000	$30,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Existing ACIP Amortization Charges	$755,530	$902,654	$986,420	$986,420	$986,420	$731,214	$731,214	$731,214	$731,214	$731,214	$425,829	$278,705	$172,768	$127,573	$127,573	$127,573	$127,573	$43,807	$0
Future ACIP Amortization Charges	$0	$0	$0	$0	$0	$122,836	$245,672	$368,508	$491,345	$614,181	$737,017	$859,853	$982,689	$1,105,525	$1,228,361	$1,228,361	$1,228,361	$1,228,361	$1,228,361
Master Plan Update ACIP Amortization Charges	$0	$0	$0	$0	$0	$0	$1,762,842	$1,762,842	$2,423,394	$2,963,005	$2,963,005	$2,963,005	$2,963,005	$2,963,005	$3,407,342	$3,676,156	$3,676,156	$4,175,854	$4,318,586
Airfield Total Requirement	**$9,011,178**	**$9,404,893**	**$9,764,973**	**$10,078,475**	**$9,951,251**	**$10,154,200**	**$12,380,874**	**$12,865,088**	**$14,024,658**	**$15,071,785**	**$15,289,798**	**$15,683,094**	**$16,133,161**	**$16,660,330**	**$17,695,443**	**$18,449,833**	**$18,953,067**	**$19,892,372**	**$20,516,558**
Airfield Credits																			
Non-Signatory Landing Fee Revenue	$417,964	$439,664	$459,299	$475,810	$464,583	$474,006	$615,640	$642,556	$711,800	$773,896	$783,838	$804,696	$829,027	$858,104	$918,981	$962,129	$989,402	$1,043,953	$1,078,607
Airfield Services	$145,000	$147,900	$150,858	$153,875	$156,953	$160,092	$163,294	$166,559	$169,891	$173,288	$176,754	$180,289	$183,895	$187,573	$191,324	$195,151	$199,054	$203,035	$207,096
Aviation Fueling	$900,000	$927,000	$954,810	$983,454	$1,012,958	$1,043,347	$1,074,647	$1,106,886	$1,140,093	$1,174,296	$1,209,525	$1,245,810	$1,283,185	$1,321,680	$1,361,331	$1,402,171	$1,444,236	$1,487,563	$1,532,190
General Aviation Landing Fee Revenue	$1,225,000	$1,243,375	$1,262,026	$1,280,956	$1,300,170	$1,319,673	$1,339,468	$1,359,560	$1,379,953	$1,400,653	$1,421,663	$1,442,987	$1,464,632	$1,486,602	$1,508,901	$1,531,534	$1,554,507	$1,577,825	$1,601,492
Prior Year Debt Service Coverage (25%)	$85,507	$85,391	$83,387	$83,382	$83,134	$83,005	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total Airfield Credits	**$2,773,471**	**$2,843,330**	**$2,910,379**	**$2,977,477**	**$3,017,797**	**$3,080,122**	**$3,193,048**	**$3,275,562**	**$3,401,737**	**$3,522,133**	**$3,591,779**	**$3,673,783**	**$3,760,739**	**$3,853,959**	**$3,980,537**	**$4,090,985**	**$4,187,199**	**$4,312,376**	**$4,419,385**
Airfield Net Requirement	**$6,237,707**	**$6,561,563**	**$6,854,593**	**$7,100,998**	**$6,933,453**	**$7,074,078**	**$9,187,826**	**$9,589,526**	**$10,622,921**	**$11,549,652**	**$11,698,019**	**$12,009,311**	**$12,372,422**	**$12,806,371**	**$13,714,906**	**$14,358,848**	**$14,765,868**	**$15,579,996**	**$16,097,173**
Signatory Landed Weight	3,536,250	3,597,585	3,659,983	3,723,464	3,788,046	3,853,748	3,920,589	3,988,590	4,057,770	4,128,150	4,199,751	4,272,594	4,346,700	4,422,092	4,498,791	4,576,821	4,656,204	4,736,963	4,819,124
Non-Signatory Landed Weight	236,950	241,060	245,241	249,494	253,822	258,224	262,703	267,259	271,895	276,611	281,409	286,289	291,255	296,307	301,446	306,674	311,994	317,405	322,910
Total Landed Weight	3,773,200	3,838,644	3,905,224	3,972,958	4,041,868	4,111,972	4,183,292	4,255,849	4,329,665	4,404,761	4,481,160	4,558,884	4,637,955	4,718,399	4,800,237	4,883,495	4,968,197	5,054,368	5,142,034
Signatory Landing Fee Rate (per 1,000 lb.)	$1.76	$1.82	$1.87	$1.91	$1.83	$1.84	$2.34	$2.40	$2.62	$2.80	$2.79	$2.81	$2.85	$2.90	$3.05	$3.14	$3.17	$3.29	$3.34
Non-Signatory Landing Fee Rate (per 1,000 lb.)	$1.76	$1.82	$1.87	$1.91	$1.83	$1.84	$2.34	$2.40	$2.62	$2.80	$2.79	$2.81	$2.85	$2.90	$3.05	$3.14	$3.17	$3.29	$3.34
Non-Signatory Landing Fee Revenue	**$417,964**	**$439,664**	**$459,299**	**$475,810**	**$464,583**	**$474,006**	**$615,640**	**$642,556**	**$711,800**	**$773,896**	**$783,838**	**$804,696**	**$829,027**	**$858,104**	**$918,981**	**$962,129**	**$989,402**	**$1,043,953**	**$1,078,607**
Revenue Sharing																			
Signatory Landing Fee Revenue	$6,237,707	$6,561,563	$6,854,593	$7,100,998	$6,933,453	$7,074,078	$9,187,826	$9,589,526	$10,622,921	$11,549,652	$11,698,019	$12,009,311	$12,372,422	$12,806,371	$13,714,906	$14,358,848	$14,765,868	$15,579,996	$16,097,173
Less Revenue Sharing [1]	$1,804,858	$1,397,512	$1,211,608	$964,490	$796,335	$1,359,205	$1,607,179	$1,797,890	$2,025,328	$2,383,905	$2,448,240	$2,658,603	$2,857,446	$2,934,627	$3,311,643	$3,062,625	$3,468,452	$3,580,536	$3,780,355
Net Signatory Landing Fee Revenues	**$4,432,849**	**$5,164,051**	**$5,642,985**	**$6,136,508**	**$6,137,119**	**$5,714,873**	**$7,580,647**	**$7,791,636**	**$8,597,593**	**$9,165,747**	**$9,249,779**	**$9,350,708**	**$9,514,976**	**$9,871,744**	**$10,403,263**	**$11,296,223**	**$11,297,416**	**$11,999,460**	**$12,316,818**
Effective Signatory Landing Fee Rate (per 1,000 lb.)	$1.25	$1.44	$1.54	$1.65	$1.62	$1.48	$1.93	$1.95	$2.12	$2.22	$2.20	$2.19	$2.19	$2.23	$2.31	$2.47	$2.43	$2.53	$2.56
Effective Non-Signatory Landing Fee Premium	40.7%	27.1%	21.5%	15.7%	13.0%	23.8%	21.2%	23.1%	23.6%	26.0%	26.5%	28.4%	30.0%	29.7%	31.8%	27.1%	30.7%	29.8%	30.7%
Signatory Landing Fee Revenue	$6,237,707	$6,561,563	$6,854,593	$7,100,998	$6,933,453	$7,074,078	$9,187,826	$9,589,526	$10,622,921	$11,549,652	$11,698,019	$12,009,311	$12,372,422	$12,806,371	$13,714,906	$14,358,848	$14,765,868	$15,579,996	$16,097,173
Non-Signatory Landing Fee Revenue	$417,964	$439,664	$459,299	$475,810	$464,583	$474,006	$615,640	$642,556	$711,800	$773,896	$783,838	$804,696	$829,027	$858,104	$918,981	$962,129	$989,402	$1,043,953	$1,078,607
Total Landing Fee Revenue	**$6,655,671**	**$7,001,227**	**$7,313,892**	**$7,576,808**	**$7,398,037**	**$7,548,083**	**$9,803,466**	**$10,232,082**	**$11,334,721**	**$12,323,548**	**$12,481,856**	**$12,814,006**	**$13,201,449**	**$13,664,475**	**$14,633,887**	**$15,320,977**	**$15,755,270**	**$16,623,949**	**$17,175,780**

Notes:

(1) Revenue Sharing allocated to Terminal and Airfield based on proportionate share of Terminal Rental Revenues plus Landing Fee Revenues

Source: Palm Beach County Department of Airports

10.4.2.3. Baggage Handling System Fee Rate

The BHS fee rate calculation combines BHS cost center-specific direct and indirect O&M expenses and O&M reserve requirement; total debt service, debt service coverage and debt service reserve requirement; non-amortized capital expenditures; and amortization charges; less: any credits to the BHS total requirement. The BHS fee rate is determined by dividing the BHS net requirement by total enplanements.

Table 10.11 presents projected BHS fees and revenues at the Airport through FY 2036. As shown, the BHS fee per enplanement is projected to fluctuate between FY 2018 and FY 2036 with a low of at $0.74 in FY 2020 and a high of $0.88 in FY 2034.

Table 10.11: Projected Baggage Handling System Fee Rates and Revenues

	Budget	Projected																	
	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Operation and Maintenance Expenses	$2,129,616	$2,197,513	$2,253,384	$2,325,210	$2,396,267	$2,472,573	$2,547,409	$2,628,713	$2,713,909	$2,798,476	$2,886,084	$2,977,688	$3,072,253	$3,169,820	$3,271,356	$3,376,204	$3,483,957	$3,595,742	$3,700,172
Operation and Maintenance Reserve Charge	$354,936	$11,316	$9,312	$11,971	$11,843	$12,718	$12,473	$13,551	$14,199	$14,095	$14,601	$15,267	$15,761	$16,261	$16,923	$17,475	$17,959	$18,631	$17,405
Debt Service	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Debt Service Coverage (25%)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Non-Amortized Capital Expenditures	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Existing ACIP Amortization Charges	$237,553	$237,553	$237,553	$237,553	$237,553	$237,553	$237,553	$237,553	$237,553	$237,553	$237,553	$237,553	$237,553	$237,553	$237,553	$237,553	$237,553	$237,553	$0
Future ACIP Amortization Charges	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Master Plan Update ACIP Amortization Charges	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
BHS Total Requirement	**$2,722,105**	**$2,446,382**	**$2,500,250**	**$2,574,734**	**$2,645,663**	**$2,722,844**	**$2,797,436**	**$2,879,816**	**$2,965,661**	**$3,050,124**	**$3,138,238**	**$3,230,508**	**$3,325,567**	**$3,423,635**	**$3,525,832**	**$3,631,232**	**$3,739,469**	**$3,851,927**	**$3,717,577**
Enplanements	3,218,450	3,274,273	3,401,173	3,388,839	3,447,617	3,507,414	3,568,249	3,722,382	3,693,102	3,757,157	3,822,323	3,888,619	4,058,835	4,024,682	4,094,488	4,165,505	4,237,754	4,423,373	4,386,033
BHS Fee Rate (per Enplanement)	$0.85	$0.75	$0.74	$0.76	$0.77	$0.78	$0.78	$0.77	$0.80	$0.81	$0.82	$0.83	$0.82	$0.85	$0.86	$0.87	$0.88	$0.87	$0.85

Source: Palm Beach County Department of Airports

10.5 Application of Revenues and Key Financial Metrics

Pursuant to the Airline Agreement, Airport System revenues are to be deposited into the Revenue Fund and applied to the following funds and accounts in the following order of priority:

- O&M Account: To pay operation and maintenance expenses for cost-center-specific items
- Debt Service Fund: To pay debt service on any bonds, notes, or debt instruments that may be issued by the County to fund Airport System capital improvements
- Debt Service Reserve Fund: To fund or restore the Debt Service Fund established in support of any bonds, notes or debt instruments
- Improvement and Development Fund: All remaining revenues are to be deposited into the Improvement and Development Fund to be used to pay revenue sharing to the Signatory Airlines and the net costs of Airport System capital improvements

Table 10.12 presents the application of revenues in accordance with the Airline Agreement. The bottom section of the table shows deposits to the Improvement and Development Fund, as well as withdrawals from the fund to pay capital project costs, as described in Section 10.2.2.4. The County intends to maintain a minimum balance of approximately $16.0 million each year in the Improvement and Development Fund.

Table 10.13 presents a summary of airline rentals, fees, and charges, as well as the projected CPE and debt service coverage. Airline CPE, after revenue sharing, is projected to increase from $5.51 in FY 2018 to $9.78 in FY 2036, reflecting a compound annual growth rate of 3.2%. Net revenues are projected to be sufficient to pay assumed debt service associated with future bonds issued to fund portions of the Master Plan Update ACIP projects, as described in Section 10.2.2.5. Debt service coverage ratios range from a high of 6.54x in FY 2036 to a low of 3.35x in FY 2021. A minimum coverage ratio of 1.25x debt service is required in accordance with the Bond Ordinance.

Table 10.12: Application of Revenues

	Budget						Projected												
	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Revenue Fund																			
Beginning Balance	$7,822,390	$8,165,916	$8,476,950	$8,959,502	$9,301,183	$9,692,014	$10,063,759	$10,496,191	$10,897,906	$11,300,624	$11,759,096	$12,232,026	$12,709,821	$13,206,537	$13,723,618	$14,251,582	$14,800,288	$15,376,693	$15,969,653
DEPOSIT: Total Revenues	$77,229,608	$80,677,184	$84,866,998	$87,656,443	$88,917,524	$92,377,876	$97,709,776	$101,267,142	$105,603,517	$110,658,111	$114,484,970	$118,607,216	$123,019,565	$127,613,641	$132,756,471	$139,228,192	$143,575,412	$149,928,073	$155,101,577
EXPEND: O&M Expenses	($48,995,498)	($50,861,701)	($53,757,010)	($55,807,100)	($58,152,081)	($60,382,553)	($62,977,149)	($65,387,438)	($67,803,745)	($70,554,576)	($73,392,154)	($76,258,926)	($79,239,222)	($82,341,707)	($85,509,492)	($88,801,726)	($92,260,156)	($95,817,920)	($100,306,408)
TRANSFER: Debt Service Account	($6,282,468)	($6,278,776)	($6,264,840)	($8,597,519)	($7,515,301)	($7,512,301)	($7,508,176)	($7,502,676)	($7,500,426)	($7,496,051)	($7,489,301)	($7,484,801)	($7,482,051)	($7,475,676)	($7,470,301)	($7,465,426)	($7,455,676)	($7,445,676)	($7,454,426)
TRANSFER: Improvement and Development Fund	($21,608,116)	($23,225,672)	($24,362,597)	($22,910,143)	($22,859,311)	($24,111,277)	($26,792,018)	($27,975,313)	($29,896,628)	($32,149,012)	($33,130,585)	($34,385,694)	($35,801,575)	($37,279,177)	($39,248,714)	($42,412,335)	($43,283,175)	($46,071,515)	($46,592,661)
Ending Balance (O&M Reserve)	**$8,165,916**	**$8,476,950**	**$8,959,502**	**$9,301,183**	**$9,692,014**	**$10,063,759**	**$10,496,191**	**$10,897,906**	**$11,300,624**	**$11,759,096**	**$12,232,026**	**$12,709,821**	**$13,206,537**	**$13,723,618**	**$14,251,582**	**$14,800,288**	**$15,376,693**	**$15,969,653**	**$16,717,735**
Debt Service Account																			
Beginning Balance	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
DEPOSIT: Transfer From Revenue Fund	$6,282,468	$6,278,776	$6,264,840	$8,597,519	$7,515,301	$7,512,301	$7,508,176	$7,502,676	$7,500,426	$7,496,051	$7,489,301	$7,484,801	$7,482,051	$7,475,676	$7,470,301	$7,465,426	$7,455,676	$7,445,676	$7,454,426
EXPEND: Revenue Bond Debt Service	($6,282,468)	($6,278,776)	($6,264,840)	($8,597,519)	($7,515,301)	($7,512,301)	($7,508,176)	($7,502,676)	($7,500,426)	($7,496,051)	($7,489,301)	($7,484,801)	($7,482,051)	($7,475,676)	($7,470,301)	($7,465,426)	($7,455,676)	($7,445,676)	($7,454,426)
Ending Balance	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Debt Service Reserve Account																			
Beginning Balance	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
DEPOSIT: From Bond Proceeds [1]	$0	$2,341,801	$0	$0	$0	$0	$0	$0	$0	$4,402,310	$0	$0	$0	$0	$0	$0	$0	$0	$0
TRANSFER: Debt Service Reserve Surety	$0	($2,341,801)	$0	$0	$0	$0	$0	$0	$0	($4,402,310)	$0	$0	$0	$0	$0	$0	$0	$0	$0
Ending Balance	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Improvement and Development Fund																			
Beginning Balance	$65,000,000	$51,425,272	$37,908,972	$27,603,081	$18,585,532	$18,965,025	$21,616,916	$28,826,851	$24,274,346	$21,203,001	$37,769,374	$40,608,041	$53,542,205	$63,280,038	$73,513,700	$77,174,823	$89,246,013	$100,955,310	$110,217,496
DEPOSIT: Transfer From Revenue Fund	$21,608,116	$23,225,672	$24,362,597	$22,910,143	$22,859,311	$24,111,277	$26,792,018	$27,975,313	$29,896,628	$32,149,012	$33,130,585	$34,385,694	$35,801,575	$37,279,177	$39,248,714	$42,412,335	$43,283,175	$46,071,515	$46,592,661
EXPEND: Revenue Sharing to Airlines	($4,956,843)	($4,018,534)	($3,465,556)	($2,744,332)	($2,216,680)	($3,498,129)	($3,184,791)	($3,246,547)	($3,277,507)	($3,619,685)	($3,504,369)	($3,687,420)	($3,821,095)	($3,626,677)	($3,990,738)	($3,658,181)	($4,621,191)	($4,968,832)	($5,320,896)
EXPEND: Capital Improvement Program [2]	($30,226,000)	($15,218,000)	($4,895,000)	($7,820,000)	($10,000,000)	($10,000,000)	($10,000,000)	($10,000,000)	($10,000,000)	($10,000,000)	($10,000,000)	($10,000,000)	($10,000,000)	($10,000,000)	($10,000,000)	($10,000,000)	($10,000,000)	($10,000,000)	($10,000,000)
EXPEND: Master Plan Update ACIP Projects [3]	$0	($17,505,439)	($26,307,932)	($21,363,360)	($10,263,139)	($7,961,256)	($6,397,291)	($19,281,271)	($19,690,466)	($1,962,954)	($16,787,549)	($7,764,110)	($12,242,648)	($13,418,838)	($21,596,852)	($16,682,963)	($16,952,687)	($21,840,498)	($25,747,626)
Ending Balance	**$51,425,272**	**$37,908,972**	**$27,603,081**	**$18,585,532**	**$18,965,025**	**$21,616,916**	**$28,826,851**	**$24,274,346**	**$21,203,001**	**$37,769,374**	**$40,608,041**	**$53,542,205**	**$63,280,038**	**$73,513,700**	**$77,174,823**	**$89,246,013**	**$100,955,310**	**$110,217,496**	**$115,741,636**

Notes:

(1) Debt service reserve requirement is equivalent to the maximum annual debt service on the proposed Series 2019 GARB and Series 2027 PFC Bonds for the funding of Master Plan Update ACIP projects.

(2) Existing capital projects funded with Airport funds.

(3) Master Plan Update ACIP projects funded with Airport funds.

Source: Palm Beach County Department of Airports

Table 10.13: Summary of Key Financial Metrics

	Budget	Projected																	
	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Airline Rates and Charges																			
Effective Signatory Terminal Rental Rate [1/]	$51.58	$64.40	$69.74	$75.17	$71.74	$69.20	$73.02	$74.97	$78.38	$79.42	$82.24	$83.96	$86.53	$90.27	$91.95	$106.04	$104.78	$112.39	$112.30
Non-signatory Terminal Rental Rate	$72.13	$81.49	$84.44	$86.77	$80.93	$85.54	$88.39	$92.15	$96.70	$99.88	$103.79	$107.56	$112.22	$116.80	$120.89	$134.47	$136.58	$145.54	$146.37
Effective Signatory Landing Fee Rate [1/]	$1.25	$1.44	$1.54	$1.65	$1.62	$1.48	$1.93	$1.95	$2.12	$2.22	$2.20	$2.19	$2.19	$2.23	$2.31	$2.47	$2.43	$2.53	$2.56
Non-signatory Landing Fee Rate	$1.76	$1.82	$1.87	$1.91	$1.83	$1.84	$2.34	$2.40	$2.62	$2.80	$2.79	$2.81	$2.85	$2.90	$3.05	$3.14	$3.17	$3.29	$3.34
BHS Fee Rate (per Enplanement)	$0.85	$0.75	$0.74	$0.76	$0.77	$0.78	$0.78	$0.77	$0.80	$0.81	$0.82	$0.83	$0.82	$0.85	$0.86	$0.87	$0.88	$0.87	$0.85
Cost Per Enplaned Passenger																			
Terminal Rentals	$11,623,390	$13,130,741	$13,605,986	$13,982,031	$13,195,158	$14,156,661	$14,628,688	$15,249,906	$16,192,907	$16,993,705	$17,935,651	$18,801,978	$19,617,069	$20,416,948	$21,131,995	$23,505,159	$23,874,238	$25,495,666	$25,641,346
Landing Fees	$6,655,671	$7,001,227	$7,313,892	$7,576,808	$7,398,037	$7,548,083	$9,803,466	$10,232,082	$11,334,721	$12,323,548	$12,481,856	$12,814,006	$13,201,449	$13,664,475	$14,633,887	$15,320,977	$15,755,270	$16,623,949	$17,175,780
BHS Fees	$2,722,105	$2,446,382	$2,500,250	$2,574,734	$2,645,663	$2,722,844	$2,797,436	$2,879,816	$2,965,661	$3,050,124	$3,138,238	$3,230,508	$3,325,567	$3,423,635	$3,525,832	$3,631,232	$3,739,469	$3,851,927	$3,717,577
Total Airline Revenues	$21,001,166	$22,578,350	$23,420,128	$24,133,572	$23,238,858	$24,427,589	$27,229,589	$28,361,804	$30,493,289	$32,367,377	$33,555,746	$34,846,493	$36,144,085	$37,505,058	$39,291,715	$42,457,369	$43,368,976	$45,971,541	$46,534,703
Less: Airline Revenue Sharing	$4,956,843	$4,018,534	$3,465,556	$2,744,332	$2,216,680	$3,498,129	$3,184,791	$3,246,547	$3,277,507	$3,619,685	$3,504,369	$3,687,420	$3,821,095	$3,626,677	$3,990,738	$3,658,181	$4,621,191	$4,968,832	$5,320,896
Adjusted Airline Revenues	$16,044,323	$18,559,817	$19,954,572	$21,389,240	$21,022,178	$20,929,460	$24,044,798	$25,115,257	$27,215,782	$28,747,692	$30,051,377	$31,159,073	$32,322,990	$33,878,382	$35,300,977	$38,799,188	$38,747,785	$41,002,709	$41,213,808
Enplanements	3,218,450	3,274,273	3,401,173	3,388,839	3,447,617	3,507,414	3,568,249	3,722,382	3,693,102	3,757,157	3,822,323	3,888,619	4,058,835	4,024,682	4,094,488	4,165,505	4,237,754	4,423,373	4,386,033
Cost Per Enplanement after Revenue Sharing	**$4.99**	**$5.67**	**$5.87**	**$6.31**	**$6.10**	**$5.97**	**$6.74**	**$6.75**	**$7.37**	**$7.65**	**$7.86**	**$8.01**	**$7.96**	**$8.42**	**$8.62**	**$9.31**	**$9.14**	**$9.27**	**$9.40**
Debt Service Coverage																			
Net Revenues less O&M Reserve Charge and Airline Revenue Sharing	$22,933,740	$25,485,915	$27,161,881	$28,763,330	$28,157,933	$28,125,449	$31,115,403	$32,231,442	$34,119,547	$36,025,378	$37,115,517	$38,183,075	$39,462,532	$41,128,177	$42,728,276	$46,219,580	$46,117,660	$48,548,360	$48,726,192
GARB Debt Service	$6,282,468	$6,278,776	$6,264,840	$8,597,519	$7,515,301	$7,512,301	$7,508,176	$7,502,676	$7,500,426	$7,496,051	$7,489,301	$7,484,801	$7,482,051	$7,475,676	$7,470,301	$7,465,426	$7,455,676	$7,445,676	$7,454,426
Debt Service Coverage Ratio	**3.65**	**4.06**	**4.34**	**3.35**	**3.75**	**3.74**	**4.14**	**4.30**	**4.55**	**4.81**	**4.96**	**5.10**	**5.27**	**5.50**	**5.72**	**6.19**	**6.19**	**6.52**	**6.54**

Notes:

(1) After Revenue Sharing is allocated to Terminal and Airfield cost centers based on proportionate share of revenues before revenue sharing.

(2) Other airline fees include joint use charges and miscellaneous fees and charges that are payable by the airlines operating at the Airport.

Source: Palm Beach County Department of Airports

10.6 Conclusion

The financial analysis presented in this section was conducted to show a feasible funding plan for implementation of the Master Plan Update recommended projects. Based on analyses of forecast activity at the Airport, in addition to projected revenues and expenses, and the Master Plan Update ACIP for FY 2018 through FY 2036, it appears that the County has adequate resources for the funding requirements. The County has access to various sources of funding, which include a mix of FAA funding, state funding, PFC revenues, Airport funds, revenue bond proceeds, and third-party funding. The airline rates and overall airline CPE remain reasonable over the planning period ending in FY 2036. Debt service coverage is projected to be significantly above the minimum 1.25 times debt service (in accordance with the Bond Ordinance) through FY 2036.

As implementation of the Master Plan Update ACIP progresses, Airport/ County staff should continually assess the financial feasibility of each project. Future considerations regarding funding of the Master Plan Update ACIP include the following:

- Enplaned passenger/traffic growth: As applicable, the funding plan was developed and analyzed on the basis of the aviation activity forecasts developed for the Airport (see Section 3); Actual year-to-year numbers of enplaned passengers and aircraft operations will likely vary from the forecasts; Significant changes in numbers of enplaned passengers and aircraft operations may affect revenues and expenses, as well as PFC revenues and AIP grants
- Availability of AIP funds: In developing the estimated funding plan for implementing the Master Plan Update ACIP, it was assumed that the FAA will continue to authorize and appropriate AIP grants for eligible projects; Because the level of authorized and appropriated AIP grant funds may vary from year to year, alternative funding sources may need to be identified if grants cannot be obtained for certain eligible projects; Conversely, the County should take full advantage of all available AIP grants, including potential discretionary grants; Obtaining such grant funding may reduce the need for PFC revenues and/or Airport cash funding for certain projects, thereby allowing those funds to be used for other projects
- Potential increase in maximum PFC level: Airport industry groups have requested that federal PFC regulations be amended to increase the maximum PFC level from the current $4.50 per eligible enplaned passenger; Although the FAA reauthorization bill enacted in February 2012 did not address this issue, it is possible that future reauthorization legislation will address it with increasing industry pressure to raise the maximum PFC level; In developing the financial projections and the funding plan reflected in this section, it was assumed that the current $4.50 PFC in effect at the Airport will remain in effect for the entire planning period; If federal PFC regulations are amended and the maximum PFC level is increased, the County may choose to apply to the FAA for authorization to impose a higher PFC at the Airport

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