TECHNICAL REPORT #3

Palm Beach International Airport Demand/Capacity and Facility Requirements

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Palm Beach International Airport

Prepared for

Palm Beach County Department of Airports

OCTOBER 2006

CH2MHILL

In Association with Ricondo & Associates, Inc.

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Demand Capacity and Facility Requirements

1.1 Airfield Capacity

The purpose of this chapter is to determine the capability of Palm Beach International Airport (PBI) to meet the forecast demand over the planning period. The calculated capacity will be compared to the forecast demand from the PBI Aviation Activity Forecast[1] to determine if the airfield configuration will adequately meet those demands without creating unacceptable delays for airport users.

Due to ongoing detailed capacity and delay analyses, including SIMMOD simulations, and given that the capacity issues at PBI are well known and documented, the master plan discussion on airfield capacity is limited to what has been previously published in *PBI Airfield Improvement Project – Project Definition*.[2]

1.1.1 Existing Airfield Capacity

Airfield capacity is defined as the maximum number of aircraft operations that an airfield can accommodate during a specific period of time and operating conditions. The FAA methodology for assessing airfield capacity is delineated in Advisory Circular (AC) 150/5060-5, *Airport Capacity and Delay.*

The capacity of an airfield system, including the runways and associated taxiways, is not constant over time. There are a variety of factors that can affect airfield capacity at an airport, including:

- Runway configuration in use
- Number and location of runway exits (or exit taxiways)
- Runway use restrictions
- Weather conditions (i.e. the percentage of time the airport experiences poor weather conditions with low cloud ceilings and low visibility conditions)
- Aircraft fleet mix
- Mix of arrivals and departures
- Runway use as dictated by wind conditions
- Touch and go operations

[1] CH2M HILL and Ricondo & Associates, Inc., Palm Beach International Airport Aviation Activity Forecast, October 2005, approved by the FAA in February 2006.

[2] CH2M HILL and Ricondo & Associates, Inc. *PBI Airfield Improvement Project – Project Definition*, September 2006.

PBI's runway configuration is one of the most significant factors affecting airfield capacity, due to runway length constraints and the dependency that exists among the three runways. Runway 9L/27R and 13/31 intersect, and aircraft operations on either runway are considered dependent on operations on the other runway. Aircraft separations must be increased to allow adequate time for aircraft operations on the intersecting runway to occur safely. The amount of separation between aircraft operations is dependent on the type of operation (arrival or departure), and the distance between the runway intersection and the approach end of the runway. As the distance between the approach end of the runway and the intersection increases, the required amount of in-trail separation may also increase. This is due to the greater amount of time that an aircraft needs to travel beyond the runway intersection, and thus allows for an operation on the intersecting runway to occur. As aircraft separation increases, airfield capacity decreases.

Airports with intersecting runways may in some cases improve airfield capacity through the use of Land-and-hold-short-operations (LAHSO). LAHSO allows for an arrival and/or departure to occur on one runway independent of aircraft arrivals on the intersecting runway, where sufficient landing distance exists. However, LAHSO operations are not utilized at PBI due to the dense utilization by general aviation (GA) and air carrier aircraft and insufficient distance to the intersection.

Dependency also exists between Runway 9L/27R and Runway 9R/27L due to the close separation (700-feet) that exists between these two runways.

The assumptions used to derive the existing airfield capacity estimates for PBI include:

- 50 percent arrivals
- No touch-and-go operations
- No use of LAHSO
- 60.6 percent in east VFR, 0.4 percent in east IFR, 38.3 percent in west VFR, and 0.7 percent in west IFR (based on historical weather data)
- Operating Characteristics by Weather Condition:
  - VFR Weather Conditions
    - Mixed-use of runways 9L/27R and 9R/27L for arrivals and departures
    - 4 nautical mile in-trail separation at touchdown point
  - IFR Weather Conditions
    - Mixed-use of runways 9L/27R and 9R/27L for arrivals and departures
    - 5.5 nautical mile in-trail separations at touchdown point

The estimated VFR peak hour capacities for the existing airfield given current demand and the operating conditions and assumptions listed above are:

- 64 operations per hour when operating in the East Flow Operating Configuration
- 76 operations per hour when operating in the West Flow Operating Configuration

In both operating configurations, Runway 9L/27R is the primary runway used while Runway 9R/27L is restricted to small GA aircraft operations exclusively.

During west flow operations, the short distance between the Runway 31 end to the intersection with Runway 9L/27R provides a benefit to GA users. As aircraft quickly clear this intersection, another operation can occur on Runway 27R. This explains why peak hour capacity in the West Flow Operating Configuration yields more operations relative to the East Flow Operating Configuration.

Some departures can also occur on Runway 13 when operating to the east, but only during non-peak hours. Due to the distance of the Runway 13 and Runway 9L intersection relative to the ends of those runways, there are no departures on Runway 13 and Runway 9L between arrivals during east flow operations.

During IFR conditions, the same operating patterns are assumed except for increased in-trail separation to allow for proper spacing between aircraft. The resulting IFR peak-hour capacities are:

- 44 operations per hour when operating in the East Flow Operating Configuration
- 54 operations per hour when operating in the West Flow Operating Configuration

As described earlier, the additional capacity that is available during west flow operations is attributed to GA aircraft departures on Runway 31.

The weighted peak-hour airfield capacity estimates for the Airport form the basis for establishing the Annual Service Volume (ASV) associated with the airfield. The ASV represents an estimate of the annual number of aircraft operations the Airport can accommodate taking hourly, daily, and monthly operational patterns into consideration. As defined in the FAA's *Airport Capacity and Delay* handbook, "it is a reasonable estimate of an airport's annual capacity."

The formula for calculating ASV is comprised of two variables: the weighted hourly capacity and two peak month ratios (annual demand to average daily demand and the average peak hour demand to average daily demand).

The FAA recommends that planning for additional airfield capacity should commence when the airfield's annual demand levels exceed 60 percent of the ASV. At approximately 80 percent, delays tend to increase exponentially, and the FAA recommends that capacity enhancing facilities are operational at that point.

Table 1-1 summarizes the capacity estimates for the existing airfield, in terms of peak hour and annual capacities, as well as the projected aircraft operations volumes for years 2013, 2020 and 2025, based on the February 2006 FAA-approved PBI Forecast.

TABLE 1-1
PBI Existing Airfield Capacity

	Existing Conditions (2005 Est.)	Existing Airfield		
		Forecast Year 2013	Forecast Year 2020	Forecast Year 2025
Weighted Average Hourly Capacity	64	64	64	64
Annual Operations (Demand)	201,964	221,814	245,954	267,644
Annual Service Volume (ASV)	263,444	263,444	221,039	221,039
Annual Demand (Percent of ASV) [2/]	76.70%	84.20%	111.30%	121.10%

Notes:
[1/] Annual operations for 2013, 2020, and 2025 were derived from the baseline forecast prepared for PBI as part of the Airport System Study.
[2/] The FAA recommended threshold for commencing the planning for additional runway capacity is when annual demand reaches 60 percent of the airfield ASV.
Sources: FAA Advisory Circular 150/5060-5, *Airport Capacity and Delay* ; Ricondo & Associates, Inc., October 2005
Prepared by: Ricondo & Associates, Inc., February 2006

As shown, without any capacity improvements to the existing airfield, the projected annual aircraft operations activity for 2013 will represent 84.2 percent of the PBI ASV. Industry standard indicates that at 80 percent, capacity enhancements should be coming on line. By 2020 and 2025 demand will exceed the ASV of the existing airfield, representing 111.3 percent and 121.1 percent of the ASV, respectively, and associated congestion and delay levels will be high. [3]

1.2 Airport Design Standards

Civil airport layout and design is subject to the standards and recommendations promulgated by the FAA in Advisory Circular 150/5300-13, *Airport Design*. The specific FAA design standards that apply to an airport's facilities are based primarily upon the characteristics of the aircraft that use and are expected to use the airport. The FAA has established a two component Airport Reference Code (ARC) system to relate airport design criteria to the operational and physical characteristics of aircraft expected to use the airport: Aircraft Approach Category and Airplane Design Group. The Aircraft Approach Category, expressed by a letter, represents aircraft approach speed. The Airplane Design Group, depicted by a Roman numeral, is a physical characteristic and relates to aircraft wingspan. Generally, aircraft approach speed applies to runways and runway-related facilities, while aircraft wingspan primarily relates to physical separation criteria involving taxiways, taxilanes, and landside facilities. **Table 1-2** depicts categorized aircraft characteristics used for determining the ARC.

[3] Delay levels are being calculated as part of the Ricondo and Associates *PBI SIMMOD Simulation Data for Noise and Air Quality Analysis*, to be finalized November 2006.

Table 1-2
Aircraft Design Characteristics

Aircraft Approach Category	Aircraft Approach Speed (knots)	Aircraft Design Group	Aircraft Wingspan (feet)
A	< 91	I	< 49
B	91 < 121	II	49 < 79
C	121 < 141	III	79 < 118
D	141 < 166	IV	118 < 171
E	166 or more	V	171 < 214
		VI	214 < 262

Source: FAA AC 150/5300-13, Change 9, Airport Design
Prepared by: CH2M HILL, 2006

1.2.1 Airfield Safety Criteria Dimensioning

Airside facilities required for PBI to accommodate the projected levels of aviation demand were determined using applicable FAA design standards and requirements. The planning and design of an airport is based on the airport's role, the number of operations, and the aircraft that regularly use the airport. The design aircraft is defined as the most demanding aircraft that operates at an airport on a regular basis and is represented by the Airport Reference Code. PBI has an overall ARC of D-IV, indicating that the most demanding aircraft using the airport has a wingspan up to 171 feet and an aircraft approach speed up to 166 knots.

The Airport has three runways, two of which are capable of handling air carrier traffic and have an ARC D-IV classification (9L/27R, 13/31), and one runway primarily used by small general aviation aircraft classified as ARC B-I (9R/27L). Each runway has an ARC based on the type of traffic it serves and its visual or instrument aircraft approach visibility minimums. For airfield planning purposes, the Airport Reference Code, along with the approach visibility minimums, directly affect the size of the surfaces associated with each runway, including the Runway Safety Area (RSA), Runway Obstacle Free Zone (OFZ), Runway Object Free Area (OFA), and Runway Protection Zone (RPZ). **Table 1-3** depicts the applicable surface dimensions and separation criteria based on the ARC and approach visibility minimums for each runway at PBI.

Table 1-3
FAA Design Standards - PBI Deviations

Design Criteria	ARC D-IV STANDARDS	Runway 9L Deviation to ARC D-IV	Runway 27R Deviation to ARC D-IV	Runway 13 Deviation to ARC D-IV	Runway 31 Deviation to ARC D-IV	ARC B-I STANDARDS	Runway 9R Deviation to ARC B-I	Runway 27L Deviation to ARC B-I
Runway Width	150'	0	0	0	0	60'	+15'	+15'
Runway Safety Area								
-Width	500'	0	0	0	0	120'	+180'	+180'
-Length Beyond Runway End	1,000'	0	0	0	-650	240'	+260'	+260'
Runway Obstacle Free Zone								
-Width	400'	0	0	0	0	400'	0	0'
-Length Beyond Runway End	200'	0	0	0	0	200'	0	0'
Runway Object Free Area								
-Width	800'	0	0	0	0	400'	+100'	+100'
-Length Beyond Runway End	1,000'	0	0	0	-650	240'	+260'	+260'
Runway Protection Zone								
-Approach Inner Width	1,000'	0	0	0	0	250'	0	0'
-Approach Outer Width	1,750'	0	0	0	0	450'	0	0'
-Approach Length	2,500'	0	0	0	0	1,000'	0	0'
-Departure Inner Width	500'	0	0	0	0	250'	0	0'
-Departure Outer Width	1,010'	0	0	0	0	450'	0	0'
-Departure Length	1'700'	0	0	0	0	1,000'	0	0'
Runway Centerline to:								
-Parallel Taxiway Centerline	400'	0	0	0	0	150'	0	0'
-Aircraft Parking Area	500'	0	0	0	0	200'	0	0'
Runway Blast Pad								
-Width	200'	0	0	0	0	80'	0	0'
-Length	200'	0	0	0	0	+100'	+100'	+100'

Source: AC 150/5300-13, Change 10, *Airport Design*
Prepared By: CH2M HILL, 2006

1.2.2 Runway Safety Area (RSA)

The RSA is a defined area on the ground that surrounds the runway and serves to reduce the risk of damage to airplanes in the event of an undershoot, overshoot, or an excursion from the runway. Aside from the runway itself, the RSA is the strictest of the runway standards. The RSA is required to be clear of objects except those objects required for air and ground navigation. It also must be able to support snow removal equipment, emergency equipment, and occasional passage of aircraft without causing structural damage to the aircraft.

For ARC D-IV runways (9L/27R, 13/31), the RSA, which is centered on the runway centerline and measures 500 feet wide and extends 1,000 feet beyond the runway end. For ARC B-I runways (9R/27L) with a visual approach, the RSA measures 120 feet wide and extends 240 feet beyond the runway ends. Runways 9L/27R and 9R/27L meet or exceed current FAA Design Standards for RSAs. However, the RSA for Runway 31 extends only approximately 350 feet beyond the runway when measured on the extended centerline. As such, it does not meet the standards in FAA AC 150/5300-13, Change 10, *Airport Design*. The FAA since 1999 has made compliance with the RSA design standards a much higher national priority. Since completion of the 2001 Master Plan, the FAA no longer allows non-standard RSAs to be "waived" or to remain. PBI must plan to bring the RSA for Runway 31 into compliance in the foreseeable future.

1.2.3 Runway Obstacle Free Zone (OFZ)

The OFZ is a three-dimensional volume of airspace centered above the runway centerline that supports the transition from ground-to-air and air-to-ground aircraft operations. The OFZ clearing standards prohibit taxiing airplanes, parked airplanes, and other objects except frangible fixed-function objects, such as NAVAIDs, from penetrating this zone. Aircraft hold lines are used to keep waiting aircraft out of the OFZ.

For ARC D-IV runways (9L/27R, 13/31), the OFZ measures 400 feet wide and extends 200 feet beyond each runway end. For ARC B-I runways (9R/27L) with a visual approach, the OFZ measures 250 feet wide and extends 200 feet beyond each runway end. All runway OFZs and aircraft hold lines meet FAA Design Standards and no penetrations have been identified.

1.2.4 Runway Object Free Area (OFA)

The OFA is a two-dimensional surface centered on the runway centerline. It is provided to enhance the safety of aircraft operations and should be kept clear of above-ground objects with the exception of those objects that need to be located in the OFA for air navigation or aircraft ground maneuvering purposes. Generally, the OFA length beyond the runway end is equal to that of the RSA, but has a greater width and is less restrictive to penetrations than that of the RSA. It is acceptable to taxi and hold aircraft in the OFA, but parked aircraft and agricultural operations are not permitted.

For D-IV runways (9L/27R, 13/31), the OFA measures 800 feet wide and extends 1,000 feet beyond the runway end. For B-I runways (9R/27L) with a visual approach, the OFA measures 400 feet wide and extends 240 feet beyond the runway end. Runways 9L/27R and 9R/27L meet current FAA Design Standards for Object Free Areas. The Runway 31 OFA is only approximately 350 feet long on the extended runway centerline and does not meet FAA standards. This OFA must be brought up to standard, and the next chapter, Airport Alternatives, will consider improvement alternatives to remedy this violation.

1.2.5 Runway Protection Zone (RPZ)

The RPZ is a trapezoidal area located beyond the runway end and is centered about the extended runway centerline. The purpose of the RPZ is to enhance the protection of people and property on the ground through specific land-use limitations designed to keep the area clear of incompatible uses such as those that involve congregations of people or tall structures. Incompatible land uses include residences and places of public assembly such as churches, schools, hospitals, etc. The FAA recommends that airports obtain control of the RPZ through acquisition, easement, or zoning. The RPZ dimensions are a function of the type of aircraft and the approach visibility minimums associated with that runway end. All RPZs for PBI meet current FAA Design Standards. **Table 1-4** specifies the RPZ dimensions for the runways at PBI. Currently, all runways meet the standard dimensions.

Table 1-4
Runway Protection Zone Dimensions

Runway End	Length	Inner Width	Outer Width
Runway 9L			
-Approach	2,500'	1,000'	1,750'
-Departure	1,700'	500'	1,010'
Runway 27R			
-Approach	1,700'	1,000	1,510'
-Departure	1,700'	1,000	1,510'
Runway 9R			
-Approach	1,000'	250'	450'
-Departure	1,000'	250'	450'
Runway 27L			
-Approach	1,000'	250'	450'
-Departure	1,000'	250'	450'
Runway 13			
-Approach	1,700'	500'	1,010'
-Departure	1,700'	500'	1,010'
Runway 31			
-Approach	1,700'	500'	1,010'
-Departure	1,700'	500'	1,010'

Source: FAA AC 150/5300-13, Change 10, *Airport Design*

Prepared By: CH2M HILL, 2006

1.2.6 Runway Shoulders

Runway shoulders provide resistance to erosion caused by jet blast along with accommodating the passage of maintenance and emergency equipment and the occasional passage of an airplane veering from the runway. Paved shoulders should run the full length of the runway and should be strong enough to support the weight of the projected aircraft types serving the airport.

For Runways 9L/27R and 13/31 using ADG-IV design standards, runway shoulders should be 25 feet wide. For Runways 9R/27L using ADG-I design standards, runway shoulders should be 10 feet wide. Runway shoulder dimensions for all runways at PBI meet or exceed current FAA Design Standards.

1.2.7 Runway Blast Pads

The FAA recommends blast pads located at the end of runways to provide blast erosion protection adjacent to the runway end. For Runways 9L/27R and 13/31 using ADG-IV design standards, the blast pad dimensions should be 200 feet wide and 200 feet in length. For Runways 9R/27L using ADG-I design standards, the blast pad dimensions should be

80 feet wide and 60 feet in length. Blast pad dimensions for all runways at PBI meet or exceed current FAA Design Standards.

1.3 Runway System

1.3.1 Runway Length

FAA AC 150/5325-4B provides guidance on determining runway lengths. For airports serving aircraft over 60,000 pounds, runway length is generally calculated specifically for the most demanding aircraft operating at the airport on a regular basis, known as the critical aircraft. The FAA defines a regular basis as a minimum of 500 annual operations, or 250 departures. At PBI, the critical aircraft is the Boeing 737-800.

The December 2005 *PBI Airspace/Airfield Constraints Analysis,* prepared as part of this Master Plan Update, identified the top mid-range, mid to long-range, and long-range air service markets for PBI. In addition, this study's December 2005 *PBI Airport Forecast*, approved by the FAA on February 15, 2006, identified the fleet mix and historic load factors for PBI. The fleet mix/load factors identified were derived from recent DOA monthly activity statistics and landing reports, and information provided through the Official Airline Guide (OAG) and JP Fleets. The future fleet mix, as discussed in the *PBI Airport Forecast* and used as the basis for this analysis, was determined based on the current fleet mix/load factors, taking into consideration new aircraft orders by various airlines serving the airport, local trends observed at PBI, industry trends and publications, aircraft retirements and planned acquisitions, and projected trends defined by Boeing and Airbus aircraft manufacturers. Using this information, the future airline fleet mix through 2025 was defined.

For purposes of this analysis, the future fleet mix aircraft types were also verified with current airline flight schedules for PBI for the top markets. The 2025 fleet mix includes more than 500 annual operations by the following aircraft:

- Boeing 737, models 300, 500, 700, and 800
- Boeing 757, models 200 and 300
- Airbus A319, A320, and A321
- MD-88

Runway length requirements were evaluated using "hot day" conditions (defined in the planning manuals of the aircraft manufactures as 77 to 84 degrees Fahrenheit). At high temperatures, the relative density of the air decreases, which causes a decrease in aircraft performance and corresponding increase in required runway length. Using these defined "hot day" conditions for runway length calculations results in a conservative analysis as the actual average high temperature at PBI is 90 degrees Fahrenheit during months of July and August[4]. Consequently, actual PBI hot day conditions would warrant longer runway lengths for particular operators.

[4] Source: NOAA Comparative Climatic Data Publication, 2005.
2 Landing length requirements for GA aircraft are generally shorter and therefore are not included in this analysis.

1.3.2 Landing Runway Length Requirements

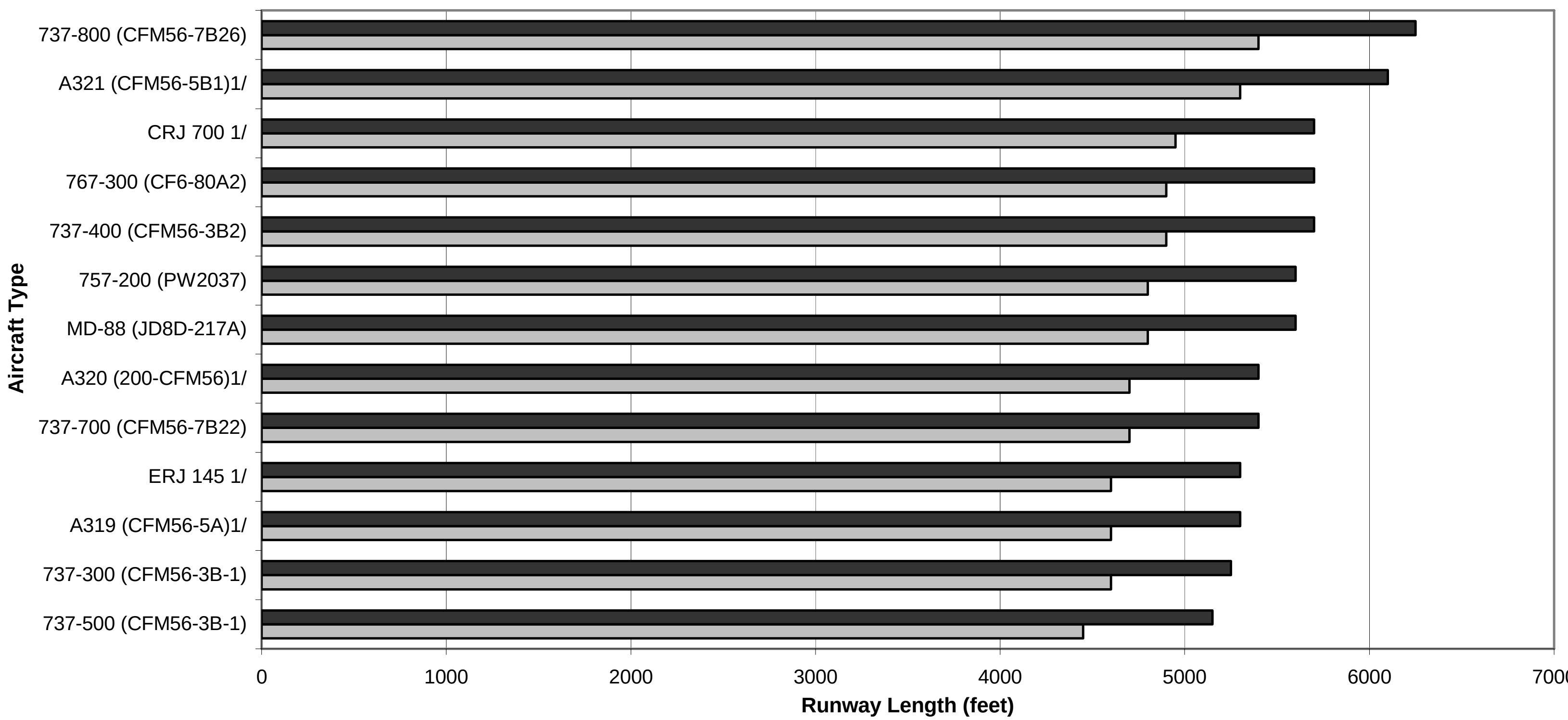
Runway length requirements were derived based on the maximum aircraft landing weight and highest flap settings for both wet and dry pavement conditions, ranging from 5,100 to 6,300 feet for all aircraft.[2] The 737-800 is the most demanding aircraft requiring 6,300 feet because the aircraft is projected to operate more than 500 times per year by 2025. **Exhibit 1-1** shows the landing length requirements for air carrier and regional jet aircraft.

However, it should also be noted that although a 6,300-foot length will theoretically be sufficient for landing aircraft, the likelihood of pilots actually accepting air traffic controllers (ATC) instructions to land on the runway could be limited for two reasons. First, a significantly longer runway is available 800 feet to the north. Second, during the busy winter months, winds are often from the north. While not strong enough to force traffic onto crosswind Runway 13/31, these conditions can add to the actual runway length required, or the length perceived by pilots to be required and safe. Specifically, the Boeing 737-800 needs up to 7,250 feet to land with the lower flap setting that would be appropriate under strong crosswind conditions. These real-world limitations would therefore reduce the capacity benefit of a 6,300 foot runway for air carrier landings. Discussions with the air traffic control tower (ATCT), several airline representatives, as well as industry experience suggest that an 8,000-foot or longer runway would be considered a true air carrier runway length, meaning that most pilots would be comfortable with the extra margin of safety provided by the length, and would not request parallel Runway 9L/27R. Therefore, the minimum safe length for arrival runways at PBI is 6,300 feet. For the planning of new runways this length would not be of full use, so a full-use arrival runway offering full capacity benefits should be longer, optimally, 8,000 feet. Existing air carrier Runways 9L/27R and 13/31 are adequate in landing length.

1.3.3 Take-Off Runway Length Requirements

1.3.3.1 Aircraft Stage Lengths

For air carrier and regional jet traffic, runway length requirements were calculated based on the distances representative of existing and likely future nonstop markets (as interpreted from the U.S. DOT O&D Survey CY2004). Three distances were selected as representative for the purposes of the calculations in this analysis: 1,000 nautical miles, 1,500 nautical miles and 2,000 nautical miles as summarized below. Representative distances are shown in **Exhibit 1-2**.



Notes:
[1/] Wet conditions calculated by adding 15% to dry conditions

Assumptions:
1. Zero wind
2. Zero runway gradient
3. Dry/wet runway surface
4. Maximum landing weight used
5. Runway elevation 19 feet MSL
6. Aircraft manufacturer's data
7. No reverse engine thrust
8. Hot day conditions
9. Antiskid operative

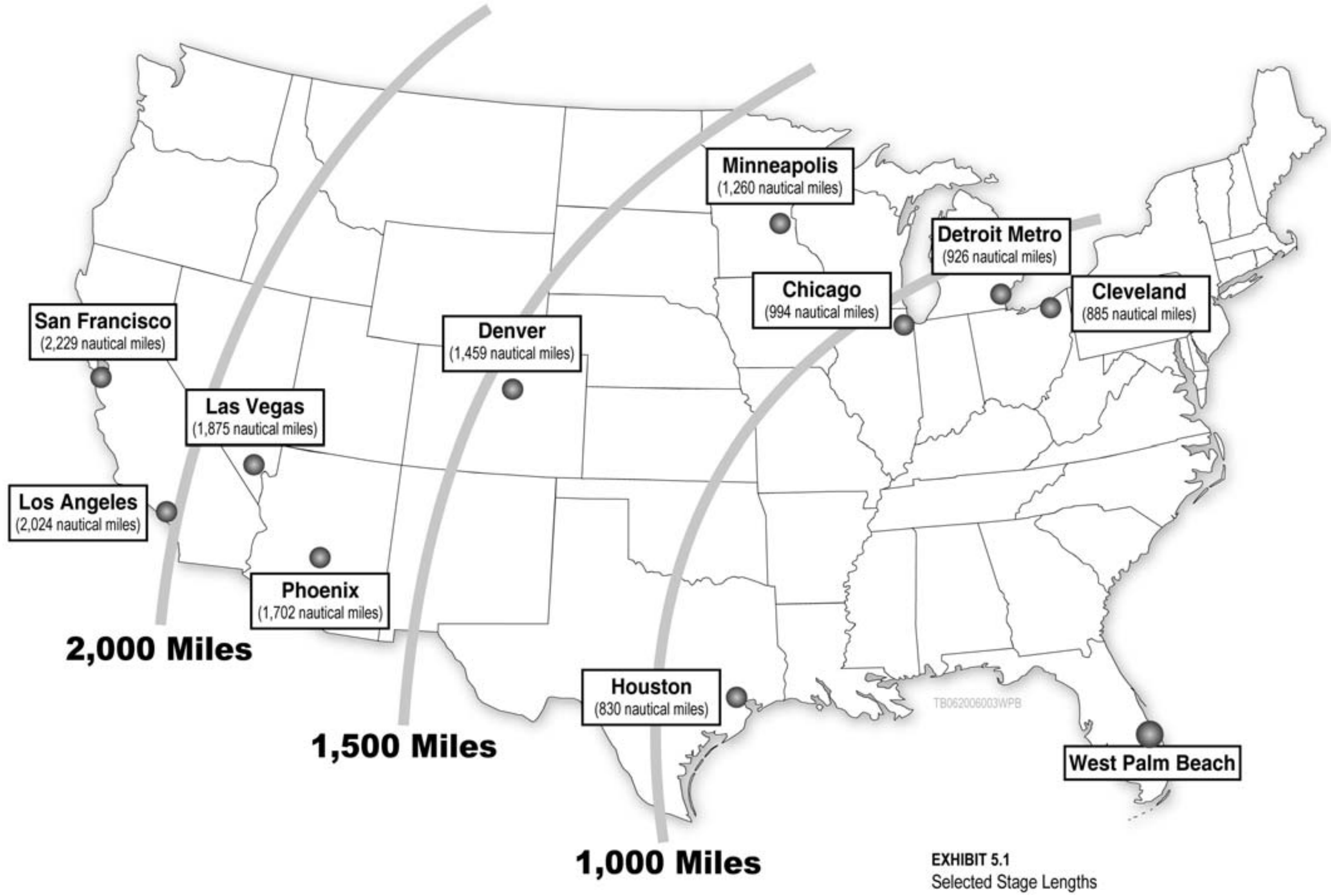
Source: Aircraft Manufacturer's Characteristics Manuals
Prepared by: CH2M HILL, October 2006.

EXHIBIT 1-1

Aircraft Landing Runway Length Requirements

Palm Beach County
Airport Master Plan Update

October 2006



Prepared by: CH2M HILL, October 2006.

EXHIBIT 1-2

Selected Stage Lengths

- Short-range stage length (1,000 nautical miles), representative of the majority of existing nonstop East Coast market destinations, including the following markets:
  - Houston (IAH) at 830 nautical miles
  - Cleveland (CLE) at 885 nautical miles
  - Detroit Metro (DTW) at 926 nautical miles
  - Chicago O'Hare (ORD) at 994 nautical miles
- Medium-range stage length (1,500 nautical miles), representative of existing nonstop market destinations and existing markets without nonstop service that are capable of supporting mainline service. These markets include:
  - Minneapolis – St. Paul (MSP) at 1,260 nautical miles
  - Denver (DEN) at 1,459 nautical miles
- Long-range stage length (2,000 nautical miles), representative of existing markets with no current nonstop service that are likely to be served by 2013:
  - Phoenix Sky Harbor (PHX) at 1,702 nautical miles
  - Las Vegas (LAS) at 1,875 nautical miles
  - Los Angeles (LAX) at 2,024 nautical miles
  - San Francisco (SFO) at 2,229 nautical miles

Although the *PBI Air Service Analysis* did not project demand by market, these stage lengths and cities are consistent with that analysis. **Table 1-5** is a list of some of the cities represented in the *PBI Air Service Analysis*, along with the number of annual origin and destination passengers (O&D) and the number of round-trip passengers per day (based on 2004 data) .

Table 1-5
Long-range Markets Expected to Have Nonstop Service by 2013

From PBI to:	Annual O&D Passengers	2004 Round-Trip Passengers Per Day
Las Vegas	76,050	209
Los Angeles	58,440	161
San Francisco	41,690	115
Denver	38,920	107

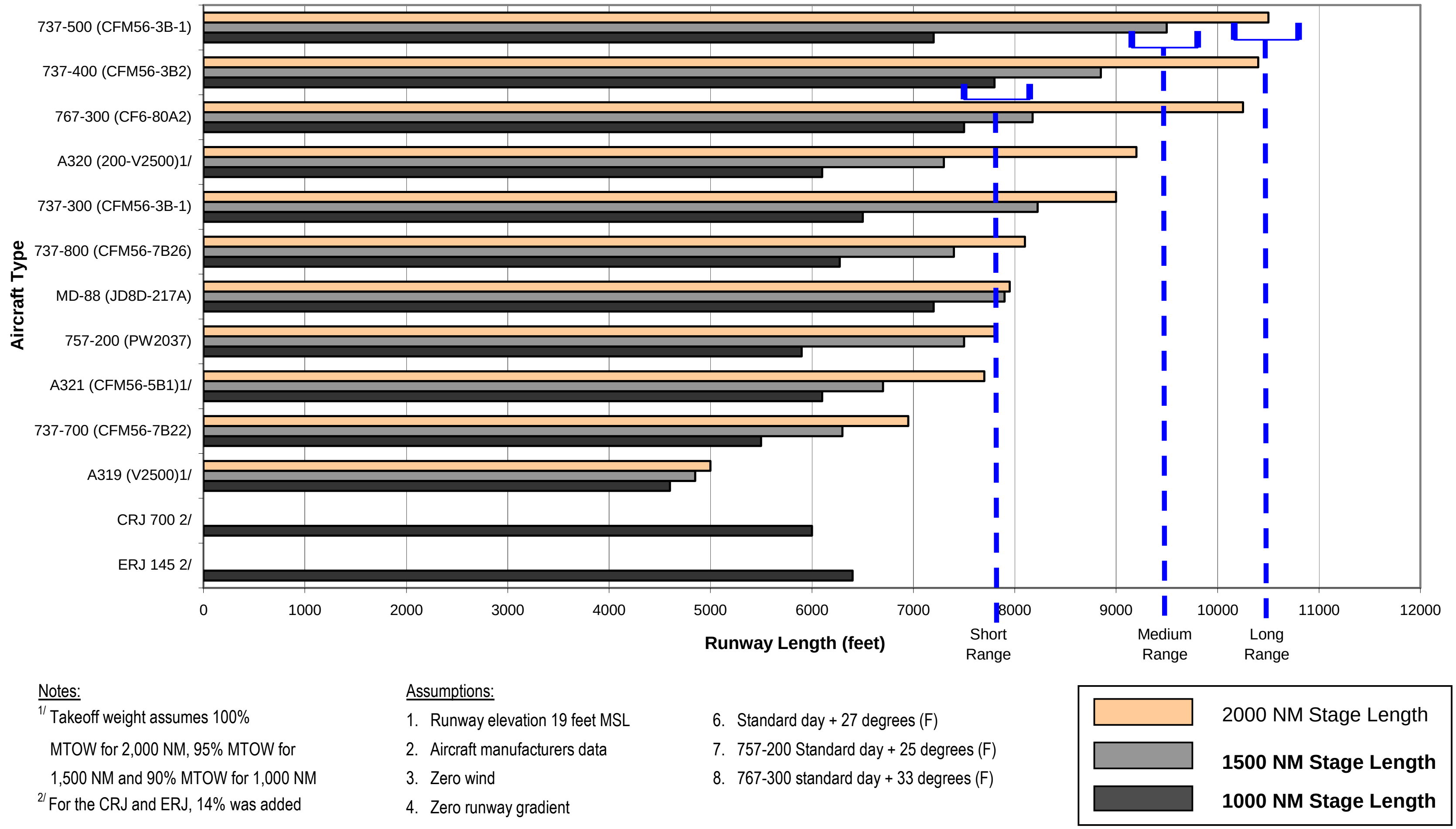
Source: PBI Air Service Analysis, Ricondo & Associates, Inc., and CH2M HILL, November 2005.
Prepared by: CH2M HILL, October 2006.

1.3.3.2 Air Carrier/Regional Jet Take-off Length Requirements

Based on the stage lengths discussed above, the take-off length requirements at maximum takeoff weight for air carrier and regional jet aircraft with destinations of 1,000, 1,500 and 2,000 nautical miles under hot day conditions are shown in **Exhibit 1-3**. The take-off runway length requirements based on the existing and projected fleet capable of serving these markets[1] are as follows:

- 7,800 feet for short-range stage lengths up to 1,000 nautical miles, driven by aircraft such as the Boeing 737-400 and Boeing 767
- 9,500 feet for medium-range stage lengths up to 1,500 nautical miles, driven by aircraft such as the Boeing 737-400 and Boeing 737-500
- 10,400 feet for long-range stage lengths up to 2,000 nautical miles, driven by aircraft such as the Boeing 737-400 and Boeing 737-500

[1] *PBI Aviation Activity Forecast*, November 2005 (approved by the FAA February 15, 2006).



Notes:

[1/] Takeoff weight assumes 100% MTOW for 2,000 NM, 95% MTOW for 1,500 NM and 90% MTOW for 1,000 NM

[2/] For the CRJ and ERJ, 14% was added to standard day conditions to represent hot day conditions

Assumptions:

1. Runway elevation 19 feet MSL
2. Aircraft manufacturers data
3. Zero wind
4. Zero runway gradient
5. Air conditioning off
6. Standard day + 27 degrees (F)
7. 757-200 Standard day + 25 degrees (F)
8. 767-300 standard day + 33 degrees (F)

Source: Aircraft Manufacturer's Characteristics Manuals
Prepared by: CH2M HILL, October 2006.

EXHIBIT 1-3

Aircraft Takeoff Runway Length requirements by Stage Length

PBI's future activity will include more medium- and long-haul air carrier service to both new destinations as well as markets already being served today, but with one-stop service. As such, the following departure runway length requirements apply at PBI, depending on the role of the runway:

- Primary departure runway-- Currently, 10,000-foot runway 9L/27R is PBI's primary air carrier departure runway. The analysis shows that by 2025, a length of approximately 10, 200 to 10,500 feet will be justified based on long-haul flights by aircraft such as the Boeing 737-300,400, and 500. Given that this need is some years out in the planning period and the current runway is very close to the ultimate length requirement, no increase in length is recommended. Future master plan updates should periodically reexamine required runway length.

- Secondary Departure Runway- A runway that is not used to accommodate all the departing aircraft, needs to only be as long as the most demanding aircraft it would regularly accommodate (more than 250 annual departures), rather than the entire airport fleet mix. The frequency of use and specific aircraft to a secondary runway therefore influence the required length:

  - Runway 13/31 is a secondary departure runway but at 6,931 feet long is too short for many of the air carrier aircraft operating at PBI today. Over the planning period, this deficiency will increase. However, the Department of Airport's (DOA's) proposed AIP will change the role of this runway to a GA runway and shorten it to 4,000 feet.

  - Runway 9R/27L in the AIP is proposed to be shifted and extended to fulfill the role of an air carrier runway. In order to provide the required capacity benefit (see Section 2 for further information on airfield capacity), the runway is proposed to serve as a segregated arrival runway, and it would accommodate limited departures. Departures would include: all traffic during maintenance or emergency closures of Runway 9L/27R; GA departures from the future Southside Aviation Development Area; and some departures by air carrier aircraft as needed. It is estimated that total air carrier departure use of the runway will constitute less than 5 percent of the departures. Given that the aircraft requiring the full-length long-haul departure runway would be assigned to Runway 9L/27R, the proposed secondary departure runway would need to be long enough to carry most, but not all of the aircraft fleet. If the runway accommodates aircraft from the short and medium haul categories, the runway should be up to 9,200 feet long, which for those stage lengths would accommodate all air carrier aircraft projected to be in the fleet.[6] The proposed 8,000-foot AIP runway is short for departure purposes, but given the runway's limited departure use, and the availability of a longer departure runway, the proposed length is acceptable.

[6] A 9,200-foot runway would also accommodate approximately 97 percent of the fleet for all stage lengths, based on existing PMAD aircraft fleet mix data in the preliminary SIMMOD findings. Refer to the Ricondo and Associates *PBI SIMMOD Simulation Data for Noise and Air Quality Analysis*, draft completed August 2006.

1.4 Runway Pavement Strength and Condition

Pavement conditions described below were obtained from the Draft January 2006 Annual Airports Pavement Evaluation prepared by Applied Pavement Technology, Inc.

1.4.1 Runway 9L/27R

Runway 9L/27R is capable of supporting single wheel, double wheel, and double tandem aircraft operations of 85,000, 200,000, and 400,000 pounds respectively. These strengths are adequate for the existing and forecast fleet mix.

Overall, Runway 9L/27R is performing well, with the exception of a few isolated areas of medium-severity to high-severity distresses, in addition to some deterioration at the intersection with Runway 13/31. It is recommended that PBI perform partial-patching, mill, and overlay maintenance and rehabilitation in the 2007 timeframe.

1.4.2 Runway 13/31

Runway 13/31 is capable of supporting single wheel, double wheel, double tandem, and dual double tandem aircraft operations of 100,000, 180,000, 325,000, and 400,000 pounds respectively. These strengths are adequate for the existing and forecast fleet mix.

Runway 13/31 is showing significant signs of deterioration on the outer portion of both runway ends. It is recommended that PBI perform crack seal, mill, and overlay maintenance and rehabilitation in the 2007 timeframe.

1.4.3 Runway 9R/27L

Runway 9R/27L is used only for non-jet general aviation aircraft traffic capable of supporting single wheel aircraft operations of 25,000 pounds and is performing relatively well. This pavement strength is adequate for the existing and forecast fleet mix.

General distresses observed include cracking, weathering, and swelling, with each distress limited to low-severity levels. No maintenance activities are necessary at this time, but these distresses should be monitored for further deterioration.

1.5 Taxiway System

Airfield taxiways are paved routes used by aircraft to move from one part of the airfield to another primarily to provide access between the terminal and the runway environment. Taxiway design and separation standards are defined by FAA AC 150/5300-13, Change 10, *Airport Design* which provides design criteria for taxiway-to-taxiway, taxiway-to-runway, and taxiway-to-fixed-or moveable-object separation. The following sections provide an overview of PBI's taxiway separation, width, and layout standards.

1.5.1 Taxiway Separation Standards and Width

The design standards for the PBI taxiway system are based on ADG-IV for Runways 9L/27R and 13/31, and ADG- I for Runways 9R/27L. All taxiways at PBI meet the current FAA Taxiway Design Standards outlined in **Table 1-6**.

TABLE 1-6
Taxiway Design Standards

	Taxiway Width	Runway-to-Taxiway Separation	Taxiway Safety Area Width	Taxiway Object Free Area Width
Aircraft Design Group I (9R/27L)	25'	225'	49'	89'
Aircraft Design Group IV (9L/27R, 13/31)	75'	400'	171'	259'

Source: FAA AC 150/5300-13, Change 10, *Airport Design*
Prepared By: CH2M HILL, 2006

1.5.2 Taxiway Layout

Airport taxiway systems are designed to maintain smooth airside traffic flow between the terminals, runways, cargo facilities, and aircraft parking areas. Design criteria are provided in FAA AC 150/5300-13, *Airport Design,* Change 10.

1.5.2.1 Runway 9L/27R

Runway 9L/27R has one full-length parallel taxiway on the north side, Taxiway C. This taxiway provides access to and from both ends of the runway, and the terminal apron. Access to the end of Runway 9L from the terminal is provided via Taxiway A. On the south side, access to the end of Runway 9L is facilitated by the new Taxiway L, which is 50 feet wide and serves Airplane Design Group (ADG) III aircraft and smaller. Taxiway M parallels Taxiway C on the north side from the western edge of the Terminal-area apron to Taxiway C6, which connects Taxiway C and Taxiway M to Runway 27R. Access to Runway 27R from the south side is provided via Taxiway E or Taxiway J.

The extended and shifted Runway 9R/27L proposed in the AIP would require the extension and upgrade of Taxiway L. While there is no need for relocation of the ARFF at this time, future master plans should reassess the need for extending Taxiway M through the area now occupied by the ARFF.

1.5.2.2 Runway 9R/27L

Parallel Runway 9R/27L is primarily used by general aviation aircraft. Access to this runway is provided by two parallel taxiways, L and R. Taxiway R serves as a southern parallel taxiway while the newer Taxiway L serves as a northern parallel taxiway between 9R/27L and 9L/27R. Taxiway S connects Runway 9R/27L to Runway 9L/27R.

The taxiway layout is sufficient for the current role of the runway. However, the role of Runway 9R/27L is proposed to change to serve as an air carrier runway, therefore, Taxiway R should be extended to a full-length parallel taxiway. As part of the AIP, Taxiway R would also be upgraded and extended.

1.5.2.3 Runway 13/31

Access to Runway 13/31 is provided via partial length parallel Taxiway B for the Runway 13 end and via partial length parallel Taxiway F to the Runway 31 end. Taxiways H, D, and

E also provide access in the southeast portion of the field for the Runway 31 end. Taxiways B, H, and D are the primary taxiways for aircraft taxiing from the passenger terminal to Runway 13/31, while Taxiways F and E primarily provide access to Runway 13/31 for the GA aircraft taxiing to or from the GA aprons.

It is recommended that Taxiway F be extended to a full-length parallel taxiway for Runway 13/31 to allow easy access to the approach end of Runway 13 (note: The AIP will shift north and shorten Runway 13/31).

1.6 Navigational Aids

Runway approach instrumentation, lighting, and other navigational aids (NAVAIDs) provide pilots with the necessary means to navigate their aircraft safely and efficiently in most weather conditions. The following sections provide an overview of the existing instrumentation, airport approach capabilities, and lighting. Existing PBI NAVAID facilities are adequate; however, in order to preserve airport approach capability, the proposed Airfield Improvement Project (AIP) includes a non-precision approach with minimums greater than ¾ mile visibility for Runway 9R/27L. Additional analysis is recommended and will be completed as part of airfield design.

1.6.1 Precision Approach NAVAIDs

Precision Approach NAVAIDs assist aircraft performing precision instrument approach procedures by providing course and glide slope information to a point just beyond the approach end of the runway. PBI has a precision Instrument Landing System (ILS) installed on Runways 9L and 27R. In addition, Runway 9L is equipped with a Medium Intensity Approach Lighting System (MALSR) with runway alignment indicator lights (RAILs). This enables the Airport to serve air traffic at weather minimums as low as a ½-mile for Runway 9L, and ¾-mile visibility for Runway 27R, and also assists pilots in safely transitioning from instrument flight to visual flight for landing. Given the low occurrence of instrument meteorological conditions (IMC), (approximately 1 percent) the ILS and MALSR equipment in use at PBI is adequate to support the Airport's mission.

1.6.2 Non-Precision Approach NAVAIDs

Non-Precision Approach NAVAIDs assist aircraft performing instrument approach procedures by providing course bearing guidance to a point near the runway environment. PBI currently has a Very High Frequency Omnidirectional Range (VOR) with Tactical Air Navigation (TACAN) facility located on the field. This facility provides support for non-precision VOR instrument approaches as well as enroute and terminal navigation support. PBI currently has a VOR instrument approach for Runways 9L/27R and 13/31. In addition to VOR facilities, PBI maintains a non-precision GPS approach for Runways 9L/27R and 13/31 as well. The nonprecision approaches at PBI are adequate to support the Airport's mission. The FAA is developing additional nonprecision approach procedures for Runway 13/31. The proposed AIP Runway 9R/27L would be adequately served by a nonprecision approach.

1.6.3 Visual Approach NAVAIDs

Visual Approach NAVAIDs provide aircraft guidance once an aircraft is within sight of an airport and aids in the orderly transfer from flight to landing. This is normally achieved through the use of visual glide slope lighting such as Precision Approach Path Indicators (PAPI). All six runway ends at PBI are equipped with PAPIs. In addition, Runway 9L/27R is equipped with High Intensity Runway Lights (HIRL), and Medium-Intensity Approach Lights (MALSR). Runways 9R/27L and 13/31 are equipped with Medium Intensity Runway Lights (MIRL), and finally, Runways 9R/27L, 13/31 and 27R have Runway End Identifier Lights (REIL).

1.6.4 Airfield Communications

Airfield communications are made possible through unmanned communications antenna facilities remotely controlled by air traffic personnel. A Remote Transmitter Receiver (RTR) provides ground-to-ground and ground-to-air communications capability between Air Traffic Control (ATC) and pilots in and around the airport. PBI ATC has indicated that the current placement of the RTR antennas does not provide for unobstructed airfield communications coverage. The DOA has requested that the FAA researches and plans for relocation of the RTR on-airport.

1.7 Part 77 Surface Areas

Federal Aviation Regulations (FAR) Part 77, "Objects Affecting Navigable Airspace," establishes standards for determining which structures pose potential obstructions to air navigation. This is accomplished by defining specific "Imaginary Surfaces" around an airport that should not contain any protruding objects. Objects affected include existing or proposed objects of natural growth, terrain, or construction, including equipment, which is permanent or temporary in character. Dimensions of FAR Part 77 surfaces vary depending on the type of runway approach. Below is a description of the surfaces. Upon completion of the Approach Plan and Profile Sheets, this section will be completed to reflect obstructions and recommendations.

1.7.1 Primary Surface

The primary surface is longitudinally centered on the runway centerline, extends 200 feet beyond each runway end, and has an elevation equal to that of the runway centerline. The width of the primary surface is that prescribed for the most precise instrument approach procedure, existing or planned, for either end of the runway.

1.7.2 Approach Surface

The approach surface is longitudinally centered on the extended runway centerline and extends outward and upward from each end of the primary surface. The size and slope of the approach surface is based on the type of approach, existing or planned, for that runway end. The inner edge of the approach surface is the same width as the primary surface. However, its overall length, slope, and outermost width may vary.

1.7.3 Transitional Surface

The transitional surface extends outward and upward from the lateral edges of all primary and approach surfaces and has a slope of 7 to 1. The transitional surface extends to where it intercepts the horizontal surface at a height of 150 feet above the runway elevation.

1.7.4 Conical Surface

The conical surface extends outward and upward from the periphery of the horizontal surface at a slope of 20 to 1, for a horizontal distance of 4,000 feet surrounding the runway.

1.7.5 Horizontal Surface

The horizontal surface is a horizontal plane located 150 feet above the established airport elevation covering an area from the transitional surface to the conical surface. The perimeter is composed of arcs from the center of each end of the primary surface and connected by lines tangent to the arcs.

SECTION 2

Terminal Area Demand/Capacity and Facility Requirements

SECTION 2

Terminal Area Demand/Capacity and Facility Requirements

The demand/capacity for the PBI terminal building analyzed as part of the 2001 Strategic Master Plan was re-analyzed for this study at a macro level. The purpose of this analysis was to determine the ultimate footprint of the terminal building and its ability to accommodate forecast demand. The analysis focused on assessing the gate requirements to meet demand projected through 2025 in the forecast.

The second focus of the analysis was on evaluating the ability of the existing terminal facilities to accommodate forecast demand. For purposes of this study, the macro-level analysis of the terminal building components analyzed ticket counters/kiosks and baggage processing and claim facilities, since the ticketing lobby and bag claim lobby at PBI are the dominant terminal components that would drive the need for expanding the Airport's terminal building. This effort does not include the assessment of passenger security screening areas, concession areas, terminal curb front, or other terminal systems.

The PBI Forecasts was approved by the Federal Aviation Administration (FAA) February 2006. **Tables 2-1 and 2-2** summarize the peaking characteristics for passenger enplanements and air carrier aircraft operations, respectively, for the forecast years. As shown, these forecast years are expressed in terms of Planning Activity Levels (PALs), defined in terms of millions of annual passengers, or MAP. Actual year 2005 corresponds to PAL 7.0, and future years 2010, 2015, 2020, and 2025 correspond to PAL 8.2 MAP, PAL 9.6 MAP, PAL 11.2 MAP, and PAL 12.9 MAP, respectively. The PBI terminal building demand/capacity characteristics were analyzed for each of the above MAPs.

TABLE 2-1
Passenger Enplanements Forecasts and Peaking Characteristics

Passenger Enplanements	2005 7.0 MAP[1/]	2010 8.2 MAP [1/]	2015 9.6 MAP	2020 11.2 MAP	2025 12.9 MAP
Annual	3,523,184	4,138,729	4,814,702	5,585,580	6,463,910
Peak Month	420,538	496,647	577,764	670,270	775,669
Peak Month Average Day	13,550	16,020	18,637	21,622	25,021
Peak Hour	1,823	2,155	2,507	2,909	3,366

Sources: Palm Beach County Department of Airports, May 2006; Ricondo & Associates, Inc., October 2005.
Prepared by: Ricondo & Associates, Inc., May 2006.

Notes:
[1/] Million Annual Passengers

TABLE 2-2
Air Carrier Aircraft Operations Forecasts and Peaking Characteristics

Air Carrier Aircraft Operations	2005 7.0 MAP	PAL 2010 8.2 MAP	PAL 2015 9.6 MAP	PAL 2020 11.2 MAP	PAL 2025 12.9 MAP
Annual	68,779	77,776	90,085	104,999	123,584
Peak Month	7,350	7,777	9,009	10,499	12,359
Peak Month Average Day	237	251	291	339	399
Peak Hour	26	27	31	36	43

Sources: Palm Beach County Department of Airports, May 2006; Ricondo & Associates, Inc., October 2005.
Prepared by: Ricondo & Associates, Inc., May 2006.

2.1 Gate Analysis

To identify future facility requirements, the design-day activity schedule developed during this Master Plan Update, as part of the Concourse C gate analysis, was used to represent aircraft operation and passenger distributions throughout the hours of a peak month, average day (PMAD). This design-day activity schedule was based on the scheduled airline activity for March 15, 2005, which is representative of the PMAD in 2005 at the Airport. No additional design-day activity schedules were reviewed as part of this analysis. Therefore, to help analyze the number of gates required to serve future demand at PBI, the March 15, 2005, scheduled design day passenger distribution was adjusted to the different projected passenger levels to determine peak-hour passenger activity and aircraft operations for the future PMADs.

The design-day activity schedule represents the aircraft operations anticipated at the Airport during the PMAD and provides information relative to arrival times, departure times, equipment type, seating capacity, and origin/destination market for each commercial flight during the design day. It is important to recognize that the design-day schedule represents the activity that could be experienced during the specified PMAD in terms of hourly arriving and departing passengers and aircraft operations. The design-day schedule also represents individual airline activity and market service patterns. However, the design-day schedule represents only one of several viable operating scenarios, identified in terms of airline composition, aircraft fleet mix, daily passenger distribution, and passenger types (i.e., domestic versus international). **Table 2-3** summarizes the March 15, 2005, design-day schedule used for this analysis.

TABLE 2-3 (1 OF 2)
March 15, 2005, Design-Day Schedule

ARRIVALS

CARRIER	OP	ARR TIME	ORIGIN	FLIGHT #	EQUIP	SEATS	GATE	LOAD FACTOR	TOTAL ARRIVING PASSENGERS
AA	AA	Overnight							
AA	AA	Overnight							
AA	AA	9:56	LGA	2061	'M80	129	C11	85.3%	110
AA	AA	11:03	BOS	615	'M80	129	C9	90.7%	117
AA	AA	12:15	DFW	1536	'M80	129	C9	96.1%	124
AA	AA	13:17	ORD	1207	'M80	129	C9	97.7%	126
AA	AA	14:10	LGA	627	'M80	129	C9	89.9%	116
AA	AA	17:15	DFW	2204	'M80	129	C9	92.2%	119
AA	AA	18:27	LGA	2271	'M80	129	C9	89.9%	116
AA	AA	21:29	ORD	786	'M80	129	C11	96.1%	124
AA	AA	23:20	DFW	2002	'M80	129	C9	85.3%	110
									1,062
AC	AC	12:49	YYZ	936	'320	140	C10	92.9%	130
									130
B6	B6	Overnight							
B6	B6	8:50	JFK	619	'320	156	B8	28.2%	44
B6	B6	10:00	JFK	621	'320	156	B8	39.7%	62
B6	B6	10:25	JFK	677	'320	156	B10	64.1%	100
B6	B6	11:05	JFK	37	'320	156	B8	85.9%	134
B6	B6	12:20	JFK	623	'320	156	B8	89.7%	140
B6	B6	13:20	JFK	57	'320	156	B8	89.7%	140
B6	B6	15:50	JFK	51	'320	156	B8	98.7%	154
B6	B6	17:00	JFK	625	'320	156	B8	92.3%	144
B6	B6	19:30	JFK	77	'320	156	B8	88.5%	138
B6	B6	20:30	JFK	601	'320	156	B8	85.3%	133
B6	B6	21:55	JFK	35	'320	156	B8	87.2%	136
									1,325
CO	CO	Overnight							
CO	CO	Overnight							
CO	CO	10:02	EWR	1254	'757	183	B4	57.9%	106
CO	CO	12:03	CLE	1643	'738	155	B6	65.8%	102
CO	CO	12:34	EWR	454	'738	155	B4	81.9%	127
CO	CO	14:07	EWR	1554	'752	172	B4	77.3%	133
CO	CO	15:40	EWR	1654	'757	183	B6	47.5%	87
CO	CO	16:32	EWR	754	'752	172	B4	38.4%	66
CO	CO	16:58	IAH	1630	'738	155	B6	95.5%	148
CO	CO	19:08	EWR	1854	'753	234	B4	65.8%	154
CO	CO	22:10	IAH	1830	'738	155	B6	59.4%	92
CO	CO	23:36	EWR	1754	'757	183	B4	49.2%	90
									1,105
CO	3M	Overnight							
CO	3M	Overnight							
CO	3M	9:55	TPA	9279	'BE1	19	B2	78.9%	15
CO	3M	10:25	NAS	9278	'BE1	19	B2	52.6%	10
CO	3M	11:15	NAS	9175	'BE1	19	B2	52.6%	10
CO	3M	12:50	FPO	9262	'BE1	19	B2	63.2%	12
CO	3M	14:30	MHH	9271	'BE1	19	B2	26.3%	5
CO	3M	15:45	MHH	9266	'BE1	19	B2	31.6%	6
CO	3M	17:50	NAS	9269	'BE1	19	B2	73.7%	14
CO	3M	18:25	TPA	9150	'BE1	19	B2	68.4%	13
CO	3M	19:35	NAS	9164	'BE1	19	B2	57.9%	11
CO	3M	20:50	NAS	9294	'BE1	19	B2	5.3%	1
									97
CO	A136	11:18	IAH	3396	'ERJ	50	B4	80%	40
CO	A136	14:13	IAH	2534	'ERJ	50	B6	80%	40
									80
DH	DH	Overnight							
DH	DH	11:30	IAD	41	'319	132	C8	67.4%	89
DH	DH	17:28	IAD	42	'319	132	C8	49.2%	65
DH	DH	23:58	IAD	43	'319	132	C8	40.2%	53
									207
DL	DL	0:21	ATL	1062	'M80	142	C2	50.0%	71
DL	DL	Overnight							
DL	DL	Overnight							
DL	DL	Overnight							
DL	DL	Overnight							
DL	DL	10:36	ATL	283	'757	188	C1	60.6%	114
DL	DL	11:35	CVG	867	'M80	142	C7	64.8%	92
DL	DL	11:58	ATL	491	'M80	142	C5	73.2%	104
DL	DL	13:50	ATL	923	'763	252	C5	70.6%	178
DL	DL	15:24	ATL	1122	'M80	142	C4	85.9%	122
DL	DL	16:45	ATL	586	'767	252	C5	78.2%	197
DL	DL	18:28	ATL	1251	'757	188	C7	97.3%	183
DL	DL	20:12	ATL	1668	'763	252	C3	95.2%	240
DL	DL	21:37	ATL	730	'763	252	C7	73.4%	185
DL	DL	22:55	ATL	259	'763	252	C5	62.3%	157
DL	DL	23:09	CVG	1403	'M80	142	C1	69.7%	99
									1,742
DL	OH	13:37	CVG	5042	'CR7	71	C2	71.8%	51
DL	OH	18:57	CVG	5295	'CR7	71	C2	93.0%	66
									117

DEPARTURES

CARRIER	OP	DEP TIME	DEST	FLIGHT #	EQUIP	SEATS	GATE	LOAD FACTOR	TOTAL DEPARTING PASSENGERS
AA	AA	8:02	DFW	1573	'M80	129	C9	90.7%	117
AA	AA	8:59	ORD	799	'M80	129	C11	88.4%	114
AA	AA	10:48	BOS	828	'M80	129	C11	98.4%	127
AA	AA	11:46	LGA	1506	'M80	129	C9	96.1%	124
AA	AA	12:57	DFW	569	'M80	129	C9	87.6%	113
AA	AA	13:59	ORD	1355	'M80	129	C9	88.4%	114
AA	AA	14:52	LGA	640	'M80	129	C9	96.9%	125
AA	AA	18:06	DFW	1599	'M80	129	C9	88.4%	114
AA	AA	19:14	LGA	1010	'M80	129	C9	86.8%	112
AA	AA	Overnight							
AA	AA	Overnight							
									1,060
AC	AC	13:40	YYZ	937	'320	140	C10	99.3%	139
									139
B6	B6	7:15	JFK	34	'320	156	B8	95.5%	149
B6	B6	9:30	JFK	618	'320	156	B8	92.3%	144
B6	B6	10:40	JFK	622	'320	156	B8	100.0%	156
B6	B6	11:10	JFK	678	'320	156	B10	96.8%	151
B6	B6	11:50	JFK	74	'320	156	B8	92.9%	145
B6	B6	13:00	JFK	624	'320	156	B8	97.4%	152
B6	B6	14:00	JFK	58	'320	156	B8	96.2%	150
B6	B6	16:40	JFK	76	'320	156	B8	98.7%	154
B6	B6	17:40	JFK	626	'320	156	B8	98.7%	154
B6	B6	20:10	JFK	70	'320	156	B8	100.0%	156
B6	B6	21:10	JFK	602	'320	156	B8	83.3%	130
B6	B6	Overnight							
									1,641
CO	CO	6:40	IAH	1731	'738	155	B6	85.2%	132
CO	CO	7:45	EWR	1755	'757	183	B4	98.9%	181
CO	CO	11:05	EWR	1255	'757	183	B4	94.5%	173
CO	CO	13:15	CLE	798	'738	155	B6	66.5%	103
CO	CO	13:35	EWR	1655	'738	155	B4	92.9%	144
CO	CO	15:10	EWR	1555	'752	172	B4	96.5%	166
CO	CO	16:40	EWR	1055	'757	183	B6	89.1%	163
CO	CO	17:30	EWR	755	'752	172	B4	62.2%	107
CO	CO	17:55	IAH	1428	'738	155	B6	72.3%	112
CO	CO	20:15	EWR	455	'753	234	B4	42.7%	100
CO	CO	Overnight							
CO	CO	Overnight							
									1,381
CO	3M	7:30	TPA	9276	'BE1	19	B2	68.4%	13
CO	3M	7:50	NAS	9277	'BE1	19	B2	57.9%	11
CO	3M	10:50	NAS	9272	'BE1	19	B2	73.7%	14
CO	3M	10:55	FPO	9279	'BE1	19	B2	36.8%	7
CO	3M	11:50	MHH	9200	'BE1	19	B2	42.1%	8
CO	3M	13:20	MHH	9265	'BE1	19	B2	63.2%	12
CO	3M	15:10	NAS	9192	'BE1	19	B2	15.8%	3
CO	3M	16:50	NAS	9163	'BE1	19	B2	5.3%	1
CO	3M	18:15	NAS	9293	'BE1	19	B2	21.1%	4
CO	3M	18:45	TPA	9155	'BE1	19	B2	73.7%	14
CO	3M	Overnight							
CO	3M	Overnight							
									87
CO	A136	11:50	IAH	2081	'ERJ	50	B4	80.0%	40
CO	A136	14:50	IAH	2348	'ERJ	50	B6	80.0%	40
									80
DH	DH	6:00	IAD	44	'319	132	C8	38.6%	51
DH	DH	12:10	IAD	45	'319	132	C8	77.3%	102
DH	DH	18:10	IAD	46	'319	132	C8	68.2%	90
DH	DH	Overnight							
									243
DL	DL	5:40	ATL	741	'M80	142	C2	81.7%	116
DL	DL	7:00	ATL	1512	'763	252	C3	93.3%	235
DL	DL	7:15	CVG	1103	'M80	142	C1	83.1%	118
DL	DL	8:20	ATL	199	'763	252	C5	91.7%	231
DL	DL	9:40	ATL	266	'763	252	C7	90.9%	229
DL	DL	11:26	ATL	1500	'757	188	C1	94.7%	178
DL	DL	12:25	CVG	448	'M80	142	C7	95.1%	135
DL	DL	12:48	ATL	617	'M80	142	C5	92.3%	131
DL	DL	14:50	ATL	1484	'763	252	C5	88.9%	224
DL	DL	16:11	ATL	970	'M80	142	C4	86.6%	123
DL	DL	17:45	ATL	756	'767	252	C5	73.8%	186
DL	DL	19:30	ATL	830	'757	188	C7	51.1%	96
DL	DL	Overnight							
DL	DL	Overnight							
DL	DL	Overnight							
DL	DL	Overnight							
									2,002
DL	OH	14:00	CVG	5042	'CR7	71	C2	88.7%	63
DL	OH	19:20	CVG	5295	'CR7	71	C2	57.7%	41
									104

TABLE 2-3 (2 OF 2)
March 15, 2005, Design-Day Schedule

ARRIVALS										DEPARTURES									
CARRIER	OP	ARR TIME	ORIGIN	FLIGHT #	EQUIP	SEATS	GATE	LOAD FACTOR	TOTAL ARRIVING PASSENGERS	CARRIER	OP	DEP TIME	DEST	FLIGHT #	EQUIP	SEATS	GATE	LOAD FACTOR	TOTAL DEPARTING PASSENGERS
DL	RP	Overnight								DL	RP	8:55	TLH	6389	'ERJ	50	C2	94.0%	47
DL	RP	11:47	TLH	6389	'ERJ	50	C2	40.0%	20	DL	RP	12:20	TLH	6393	'ERJ	50	C2	66.0%	33
DL	RP	15:37	TLH	6390	'ERJ	50	C2	42.0%	21	DL	RP	16:40	TLH	6392	'ERJ	50	C2	78.0%	39
DL	RP	21:07	TLH	6391	'ERJ	50	C2	90.0%	45	DL	RP	Overnight							
									86										
DL	A471	Overnight								DL	A471	7:40	LGA	2044	'757	199	C4	93.0%	185
DL	A471	10:17	LGA	1979	'757	199	C3	65.8%	131	DL	A471	11:15	LGA	2042	'757	199	C3	95.0%	189
DL	A471	10:43	BDL	2033	'757	199	C5	68.8%	137	DL	A471	11:33	BOS	2086	'757	199	C5	99.5%	198
DL	A471	11:45	JFK	2064	'757	199	C3	44.7%	89	DL	A471	12:35	JFK	2064	'757	199	C3	88.4%	176
DL	A471	12:10	BOS	2002	'757	199	C1	96.5%	192	DL	A471	13:00	BOS	2002	'757	199	C1	98.0%	195
DL	A471	14:13	LGA	2044	'757	199	C1	92.5%	184	DL	A471	15:05	BDL	2098	'757	199	C1	96.0%	191
DL	A471	14:46	BDL	2099	'757	199	C3	71.4%	142	DL	A471	15:40	LGA	1998	'757	199	C3	98.0%	195
DL	A471	17:47	LGA	2042	'757	199	C3	85.9%	171	DL	A471	18:53	LGA	2035	'757	199	C3	81.9%	163
DL	A471	18:38	BOS	2086	'757	199	C1	89.4%	178	DL	A471	19:30	BDL	2008	'757	199	C1	81.4%	162
DL	A471	19:01	JFK	2066	'757	199	C5	29.1%	58	DL	A471	19:55	JFK	2066	'757	199	C5	84.9%	169
DL	A471	20:07	BOS	1986	'757	199	C1	93.5%	186	DL	A471	21:00	BOS	1986	'757	199	C1	86.4%	172
DL	A471	22:26	LGA	1998	'757	199	C4	74.9%	149	DL	A471	Overnight							
									1,617										1,995
FL	FL	Overnight								FL	FL	9:00	ATL	231	'717	117	C6	96.6%	113
FL	FL	10:54	ATL	237	'717	117	C6	46.2%	54	FL	FL	11:31	ATL	232	'717	117	C6	55.6%	65
FL	FL	12:58	PHL	751	'717	117	C6	71.8%	84	FL	FL	13:35	ATL	234	'717	117	C6	70.1%	82
FL	FL	15:04	ATL	233	'717	117	C6	71.8%	84	FL	FL	15:40	PHL	752	'717	117	C6	94.0%	110
FL	FL	17:35	ATL	238	'717	117	C6	30.8%	36	FL	FL	18:10	ATL	239	'717	117	C6	43.6%	51
FL	FL	22:41	ATL	235	'717	117	C6	54.7%	64	FL	FL	Overnight							
									322										421
NK	NK	12:10	ACY	165	'M80	150	C4	94.7%	142	NK	NK	13:00	ACY	330	'M80	150	C4	100.0%	150
NK	NK	18:15	DTW	973	'M80	150	C4	84.0%	126	NK	NK	19:05	DTW	974	'M80	150	C4	96.0%	144
									268										294
NW	NW	Overnight								NW	NW	9:50	DTW	893	'320	148	B12	94.6%	140
NW	NW	12:03	DTW	890	'320	148	B12	85.1%	126	NW	NW	13:05	DTW	895	'320	148	B12	96.6%	143
NW	NW	15:18	DTW	898	'320	148	B12	85.8%	127	NW	NW	16:36	DTW	897	'320	148	B12	86.5%	128
NW	NW	23:51	DTW	892	'320	148	B12	63.5%	94	NW	NW	Overnight							
									347										411
SG	SG	18:20	YYZ	490	'100	95	B10	80%	76	SG	SG	19:15	YYZ	491	'100	95	B10	80.0%	76
									76										76
UA	UA	Overnight								UA	UA	7:10	ORD	397	'752	182	C10	81.3%	148
UA	UA	22:59	ORD	1266	'752	182	C10	81.3%	148	UA	UA	Overnight							
									148										148
UP	UP	12:20	MHH	281	'DH8	50	A6	70.0%	35	UP	UP	13:20	MHH	282	'DH8	50	B1	66.0%	33
									35										33
US	US	0:57	CLT	339	'734	144	B7	27.1%	39	US	US	6:15	CLT	418	'734	144	B10	74.3%	107
US	US	Overnight								US	US	7:00	DCA	795	'733	126	B9	75.4%	95
US	US	Overnight								US	US	7:00	PHL	358	'734	144	B14	91.7%	132
US	US	Overnight								US	US	8:10	PIT	1072	'733	126	B11	66.7%	84
US	US	Overnight								US	US	9:35	CLT	1486	'734	144	B7	77.1%	111
US	US	9:00	PHL	803	'734	144	B11	26.4%	38	US	US	10:05	PHL	1238	'734	144	B11	95.1%	137
US	US	9:49	CLT	684	'733	126	B9	49.2%	62	US	US	11:00	CLT	240	'733	126	B9	82.5%	104
US	US	11:10	DCA	381	'733	126	B11	83.3%	105	US	US	11:55	DCA	534	'733	126	B11	81.7%	103
US	US	11:43	PIT	231	'733	126	B9	77.8%	98	US	US	12:30	PIT	1466	'733	126	B9	86.5%	109
US	US	12:05	PHL	815	'734	144	B11	87.5%	126	US	US	12:55	PHL	545	'734	144	B11	100.0%	144
US	US	13:16	CLT	848	'734	144	B9	93.1%	134	US	US	14:10	CLT	904	'734	144	B9	64.6%	93
US	US	14:37	PHL	437	'733	126	B11	95.2%	120	US	US	15:30	PHL	574	'733	126	B11	100.0%	126
US	US	15:42	CLT	507	'734	144	B9	88.2%	127	US	US	16:40	CLT	1436	'734	144	B9	84.0%	121
US	US	16:13	DCA	1407	'734	144	B14	88.9%	128	US	US	17:20	PIT	1068	'734	144	B14	69.4%	100
US	US	17:16	PIT	1415	'734	144	B9	36.8%	53	US	US	18:10	DCA	1420	'734	144	B9	82.6%	119
US	US	17:32	CLT	1417	'321	169	B11	60.9%	103	US	US	18:30	CLT	770	'321	169	B11	67.5%	114
US	US	18:32	PHL	647	'733	126	B9	86.5%	109	US	US	19:20	PHL	976	'733	126	B9	95.2%	120
US	US	19:32	CLT	947	'733	126	B11	40.5%	51	US	US	20:20	CLT	404	'733	126	B11	18.3%	23
US	US	20:04	PHL	953	'733	126	B9	72.2%	91	US	US	21:00	PHL	1252	'733	126	B9	68.3%	86
US	US	20:28	PIT	991	'733	126	B11	50.8%	64	US	US	Overnight							
US	US	21:16	CLT	704	'734	144	B7	47.2%	68	US	US	Overnight							
US	US	22:03	DCA	69	'733	126	B9	74.6%	94	US	US	Overnight							
US	US	23:25	PHL	311	'734	144	B14	60.4%	87	US	US	Overnight							
									1,697										2,028
WN	WN	Overnight								WN	WN	7:05	BWI	452	'733	137	B3	83.9%	115
WN	WN	Overnight								WN	WN	7:15	TPA	616	'73G	137	B5	53.3%	73
WN	WN	Overnight								WN	WN	7:25	ISP	704	'73G	137	B1	98.5%	135
WN	WN	9:05	TPA	758	'73G	137	B3	54.0%	74	WN	WN	9:30	BWI	1879	'73G	137	B3	88.3%	121
WN	WN	9:45	BWI	510	'73G	137	B5	26.3%	36	WN	WN	10:15	TPA	2695	'73G	137	B5	67.9%	93
WN	WN	12:00	ISP	977	'73G	137	B1	88.3%	121	WN	WN	12:30	ISP	257	'73G	137	B1	94.9%	130
WN	WN	12:40	BWI	444	'733	137	B3	81.0%	111	WN	WN	13:05	BWI	1580	'733	137	B3	79.6%	109
WN	WN	13:25	TPA	1492	'73G	137	B5	94.9%	130	WN	WN	13:50	TPA	1901	'73G	137	B5	98.5%	135
WN	WN	16:55	ISP	353	'73G	137	B5	80.3%	110	WN	WN	17:25	TPA	892	'73G	137	B5	92.0%	126
WN	WN	17:35	TPA	488	'73G	137	B3	98.5%	135	WN	WN	18:00	PHL	1884	'73G	137	B3	87.6%	120
WN	WN	18:20	BWI	1171	'73G	137	B3	97.8%	134	WN	WN	18:50	BWI	2401	'73G	137	B3	95.6%	131
WN	WN	21:45	PHL	2161	'73G	137	B1	92.7%	127	WN	WN	Overnight							
WN	WN	22:20	TPA	787	'73G	137	B5	51.8%	71	WN	WN	Overnight							
WN	WN	22:40	BWI	263	'733	137	B3	44.5%	61	WN	WN	Overnight							
									1,110										1,288

Sources: Actual Airlines Data, March 15, 2005; Official Airline Guide (OAG), March 2005.
Prepared by: Ricondo & Associates, Inc., March 2005.

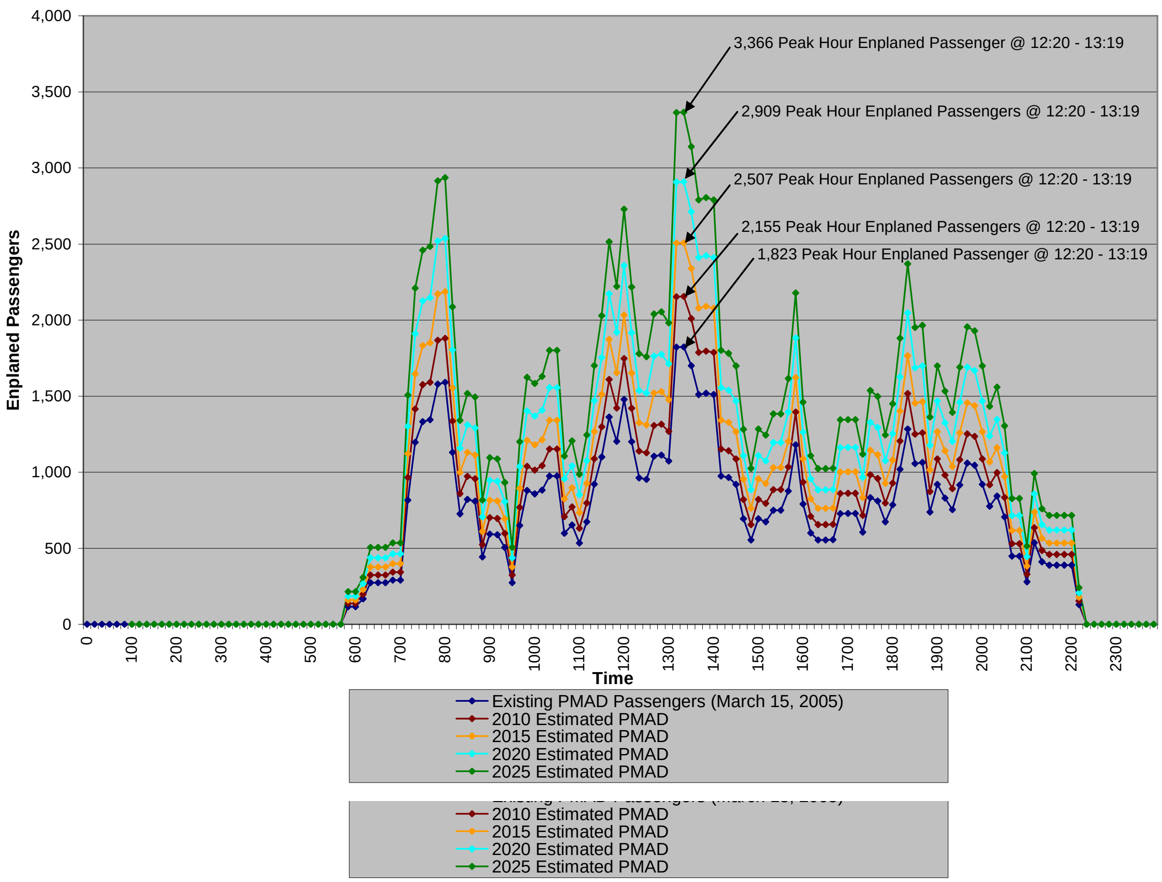
2.1.1 Assumptions and Methodology

The schedule of airline flights for March 15, 2005, was obtained from the Official Airline Guide and supplemented with data collected from the airlines currently serving PBI. March 15, 2005 was selected because March is the peak month for passenger enplanements at PBI. The schedule reflected a total of 234 scheduled aircraft operations, as well as actual load factors obtained from the airlines for that day.

No additional future design-day schedules were developed. Only the overall peaking characteristics of passengers and air carrier aircraft operations were considered. It was assumed that the market shares and operating patterns of the airlines serving PBI on March 15, 2005, would remain constant throughout the planning horizon. **Exhibits 2-1** and **2-2** illustrate the enplaned passengers and total air carrier operations rolling peaks, respectively.

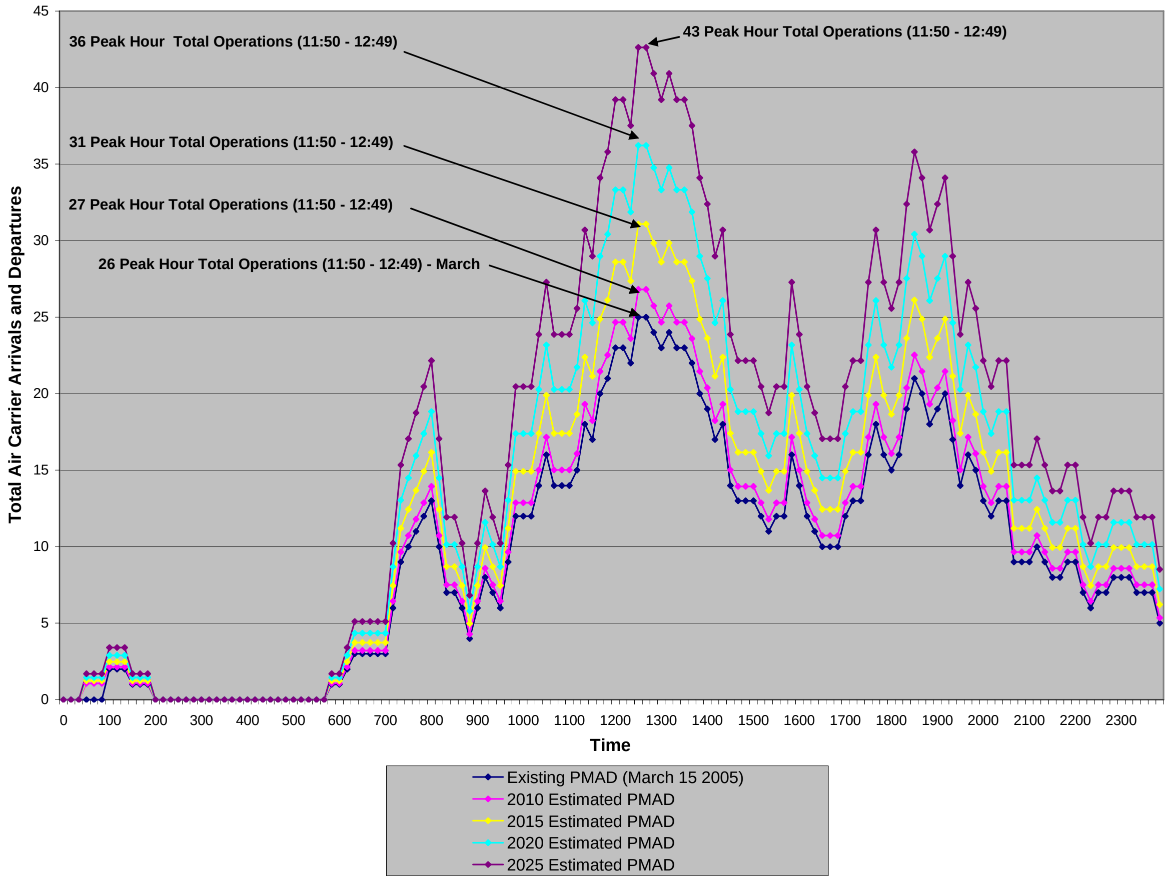
EXHIBIT 2-1
Passenger Enplanements Rolling Peaks

Sources: Official Airline Guide (OAG), March 2005; Ricondo & Associates, Inc., June 2006.



Prepared by: Ricondo &Associates, Inc., June 2006.

EXHIBIT 2-2
Total Air Carrier Operations Rolling Peaks



Sources: Official Airline Guide (OAG), March 2005; Ricondo & Associates, Inc., June 2006.
Prepared by: Ricondo &Associates, Inc., June 2006.

Consistent with the Concourse C gate analysis and the Palm Beach County Department of Airports' policy to ensure that sufficient capacity is available during peak-hour banks to serve the demand that exists during those periods, the overall gate analysis for the PBI terminal building also assumed that this DOA policy would be constant throughout the planning horizon. The purpose of the Department's policy is to preserve an unconstrained operating environment at the Airport, which is needed to sustain operational growth by the existing airlines and to attract additional air service by the existing or new entrant airlines. As such, future gate requirements at PBI were based on a ratio of peak hour air carrier aircraft operations to the number of active gates. For March 15, 2005, the peak hour air carrier aircraft operations were 26, and the number of active gates was 25 (13 gates in Concourse B and 12 gates in Concourse C [not including the additional three gates currently under construction]). Therefore, the ratio of peak-hour air carrier aircraft operations to the number of active gates was 1.04. This ratio was used to determine gate requirements for each planning year.

To analyze the sensitivity of these results, another methodology more typical for determining gate requirements was used for comparison purposes. This methodology was based on a benchmark metric of 5.5 aircraft turns per gate**.** The resulting gate requirements were then compared to a gate utilization of 175,000 to 200,000 annual enplanements per gate, which is a typical range for an east-coast, originating/ terminating airport like PBI. The use of these two methodologies provided a high and low range of gate requirements.

2.1.2 Gate Requirements Summary

Table 2-4 summarizes the gate requirements resulting from the use of each methodology described above. As shown, the additional three gates for Concourse C, currently under construction, are not under existing conditions (7 MAP 2005). The 25 gates shown reflect the total existing loading-bridge-equipped gates. The number of peak-hour air carrier aircraft operations was based on projecting the daily distribution of flights on March 15, 2005, to each planning year. Using the peak hour methodology, the total number of gates

TABLE 2-4
Gate Requirements Summary

	PAL Existing 7 MAP (2005)	PAL 8.2 MAP (2010)	PAL 9.6 MAP (2015)	PAL 11.2 MAP (2020)	PAL 12.9 MAP (2025)
Peak Hour Operations per Gate Methodology [1/]					
Total Number of Gates Required	25	28 [2/]	30	35	42
Additional Number of Gates Required	-	+3 [2/]	+2	+5	+7
Cumulative Number of Gates Required	- [3/]	- [5/]	2	7	14
Average Enplanements per Gate	140,285	147,812	160,490	159,588	153,903
Turn per Gate Methodology [4/]					
Total Number of Gates Required	25	28 [2/]	28 [2/]	31	37
Additional Number of Gates Required	-	-	-	+3	+6
Cumulative Number of Gates Required	- [3/]	-	-	3	9
Average Enplanements per Gate	140,285	147,812	171,954	180,180	174,700

Source: Ricondo & Associates, Inc., May 2006.
Prepared by: Ricondo & Associates, Inc., May 2006.
Notes:
[1/] Based on a ratio of 1.04 peak hour operations per gate.
[2/] Includes the additional three gates at Concourse C currently under construction.
[3/] Does not include the additional three gates at Concourse C currently under construction.These gates are anticipated to be operational by mid 2007.
[4/] Based on a 5.5 aircraft turns per gate.
[5/] Additional gate requirements are satisfied by the three gates for Concourse C.

required for 2010, 2015, 2020, and 2025 resulted in 28, 30, 35, and 42, respectively. The 28 gates shown for PAL 8.2 MAP include the three additional gates for Concourse C, which are currently under construction. These gates are anticipated to be operational by mid-2007. As Table 2-4 shows, the 5.5 aircraft turns per gate methodology resulted in a total of 37 gates required by PAL 12.9 MAP or nine additional gates from the existing gates at PBI (including the three gates currently under construction).

2.2 Terminal Facility Components Requirements

For purposes of determining the size of the terminal building and ultimately developing terminal expansion alternatives, the requirements determined using the peak-hour operations per gate methodology were used to allow for development of the maximum number of gates required for each demand level. This methodology demonstrated that 14 additional gates would be required by 2025 (12.9 MAP). On that basis, specific areas of the terminal building were generally analyzed. These areas included the ticket counters/ticketing lobby and baggage processing and claim facilities.

2.2.1 Ticket Counter/Kiosk Positions

Based on an inventory of terminal building conducted in April 2006, the existing ticket counter/kiosk area accommodates a total of 112 positions; 53 percent of which are ticket counter positions, and 47 percent of which are kiosk positions. This ticket counter/kiosk demand/capacity analysis undertaken also considered previous analyses conducted as part of terminal improvement planning undertaken in early 2003. At that time, it was demonstrated that the addition of three new gates at Concourse C (which are currently under construction) would require five additional ticket counter/ kiosk positions to accommodate the optimal potential passenger demand. That optimal passenger demand potential was determined on the basis of the largest aircraft type in the airlines' fleet at that time that was compatible with each gate position. Clearly, ticket counter requirements are based on the passenger volumes that are equivalent to the design aircraft for the gate inventory for additional ticket counter/kiosk positions. However, the analysis demonstrated that these additional facilities could be accommodated within the existing ticket counter/kiosk space. For purposes of this updated analysis, it was assumed that the existing conditions include the three gates under construction at Concourse C with the corresponding requirements needed to serve the passenger volumes associated with the design aircraft for PBI's existing and planned gates. Therefore, the existing ticket counter/kiosk was defined to encompass a total of 117 ticket counter/kiosk positions. **Table 2-5** summarizes the results of the analysis.

TABLE 2-5

Ticket counter/Kiosk Positions Requirements Summary

	Existing:	Forecast:			
	7.0 MAP (2005)	PAL 8.2 MAP (2010)	PAL 9.6 MAP (2015)	PAL 11.2 MAP (2020)	PAL 12.9 MAP (2025)
Ticket Counter/Kiosk Positions Required	117 [1/]	117	125	146	176
Additional Linear Footage Required of Ticket Counter/Kiosk Positions (feet)	-	-	40	145	295

Source: Ricondo & Associates, Inc., June 2006.

Prepared by: Ricondo & Associates, Inc., June 2006.

Note:

[1/] Includes ticket counter/kiosk positions required with the addition of the three new gates at Concourse C.

Based on these results and the International Air Transport Association (IATA) planning standard of 5 feet per ticket counter/kiosk position, the additional linear feet of ticket counter/kiosk space required will be 0 feet, 40 feet in 2015, 145 feet in 2020, and 295 linear feet in 2025. These dimensions do not include circulation areas between each facility. For the purposes of determining the ultimate footprint of the building (assuming the existing terminal building width), the additional linear feet of building length required for the ticketing level would be 410 feet. This length accounts for circulation areas between the building walls and the facilities.

2.2.2 Baggage Processing and Claim Facilities

Outbound and inbound baggage processing capacities were also analyzed. The outbound baggage make-up area includes the area where baggage is received from the ticket counters and curbside check-in facilities. Bags are sorted and loaded into containers or carts for subsequent delivery to aircraft. The outbound baggage area also includes all areas dedicated to the mechanical systems/tug drives used to transfer bags from the ticket counters to explosive detection systems (EDS) equipment used by the Transportation Security Administration (TSA) to screen outbound baggage prior to their transfer onto the cargo compartment of commercial aircraft. The size of the outbound baggage makeup area is directly influenced by the number of peak-hour originating passengers and the average checked bags per passenger.

The inbound baggage area is a non-public space used to offload bags from carts and containers onto claim devices or conveyor systems to transfer to the bag claim lobby. The inbound baggage area is located on the first floor of the main terminal, immediately adjacent to the baggage claim area. It is readily accessible from the aircraft apron by means of carts, tugs, or mechanical conveyors for quick and direct baggage delivery. The size of the inbound baggage area is directly influenced by the number of peak-hour terminating passengers. Baggage claim facilities are also associated with the inbound baggage system. The baggage claim facilities encompass the claim devices, and baggage claim frontage consists of the total length of baggage claim devices within the public-use bag claim area. These facilities do not include the baggage offload areas.

2.2.2.1 Assumptions and Methodology

The requirement for the outbound baggage area was quantified in terms of total EDS machines required for each PAL. Based on the recent reconfiguration of the outbound baggage area at the Airport, 50 linear feet was assumed for each EDS machine, including circulation. The first step in this analysis was to determine the amount of peak-hour checked baggage. Based on the 2005 passenger survey conducted at the Airport during the week of July 20-26, 2005, 63 percent of departing passengers checked baggage.[7] This share was applied to the number of peak-hour departing passengers for each PAL to determine the total number of passengers that check baggage. The 1.3 bags per passenger ratio recommended by the FAA in Advisory Circular (AC) 150/5360-13, *Planning and Design Guidelines for Airport Terminal Buildings*, was then used to derive the total number of peak-hour checked bags. To determine the number of EDS machines required, an average peak-

[7] If current TSA policies regarding carry-on item restrictions become permanent, then the percent of departing passengers checking baggage may increase substantially and require further analysis in the future.

hour processing rate of 150 bags per hour per EDS machine obtained from TSA staff at the Airport was applied.

The inbound baggage area analysis consisted of determining how much baggage claim frontage would be required for each PAL. It was first necessary to determine the number of claim devices required. The planning standards from the IATA *Airport Development Manual* were used. The number of inbound baggage claim devices required was calculated as follows:

$$\text{Peak Hour Baggage Claim Device Required (quantity)} = \frac{PHTP \times PNB \times CDN}{60 \times NNB}\text{, where}$$

PHTP = Peak Hour Terminating Passengers
PNB = Proportion of Passengers Arriving by Narrow Body Aircraft
CDN = Average Claim Device Occupancy Time (assumed to be 20 minutes)
NNB = Number of Passengers per Narrow Body Aircraft (assumed to be 100)

As the formula shows, the number of claim devices required is based on peak-hour conditions. Although future design-day schedules were not developed as part of this analysis, the March 15, 2005, activity schedule demonstrates that all peak-hour terminating passengers were onboard narrow body aircraft (i.e., A320, B-737, B-757). Based on the PBI forecast, the Airport is predominately served by a narrow body aircraft fleet. Therefore, the proportion of passengers arriving by narrow body aircraft corresponds to 100 percent. In lieu of actual data, IATA recommends planning factors of a 20-minute average occupancy time for baggage claim devices and 100 passengers per narrow body aircraft.

2.2.2.2 EDS Machines and Claiming Facility Requirements Summary

Currently, the Airport has a total of 11 EDS machines, with a peak-hour processing rate averaging 150 bags. **Table 2-6** on the following page summarizes the EDS requirements for each PAL. As shown, a total of 12, 14, 16, and 18 EDS machines would be required by 2010, 2015, 2020, and 2025, respectively. Therefore, over the forecast period, an additional seven EDS machines are assumed to be required. Assuming the existing terminal building width, 350 additional linear feet of lower level building space would be required to accommodate the outbound baggage system at PBI.

There are six baggage claim devices at PBI, consisting of three devices for narrow body aircraft and three devices for wide body aircraft, totaling 1,280 feet of claim frontage. **Table 2-7** on the following page shows the total baggage claim frontage required for each PAL, along with the type of claim unit assumed. The IATA planning standards for claim frontage length are also shown. An average of 130 feet is typically allocated for narrow body aircraft, while an average of 215 feet is typically allocated to wide body aircraft. As Table 2-7 shows, the total claim frontage required at PBI would be 1,815 feet in 2025, requiring an additional 535 feet over existing conditions. It should be noted that this requirement does not necessarily reflect linear feet, but typically follows the shape of the claim devices.

TABLE 2-6
Explosive Detection Systems (EDS) Requirements Summary

	Peak Hour Departing Passengers [1/]	Passengers Checking Baggage [2/]	Peak Hour Checked Baggage [3/]	Total EDS Machines Required [4/]
Existing:				
7 MAP (2005)	1,823	1,148	1,493	11 [5/]
Forecast:				
PAL 8.2 MAP (2010)	2,155	1,358	1,765	12
PAL 9.6 MAP (2015)	2,507	1,579	2,053	14
PAL 11.2 MAP (2020)	2,909	1,833	2,382	16
PAL 12.9 MAP (2025)	3,366	2,121	2,757	18

Sources: Palm Beach International Airport 2005 Passenger Survey, July 20-26 2005; Palm Beach International Airport Transportation Security Administration (TSA), May 2006; FAA 150/5360-13, Planning and Design Guidelines for Airport Terminal Buildings; Ricondo & Associates, Inc., May 2006.

Prepared by: Ricondo & Associates, Inc., May 2006.

Notes:
[1/] Based on forecast developed for PBI and the March 15, 2005 design day schedule.
[2/] Based on 2005 Passenger Survey for the Airport, 63% of passengers check baggage.
[3/] The FAA AC 150/5360, *Planning and Design Guidelines for Airport Terminal Buildings*, recommends a ratio of 1.3 bags per passenger.
[4/] EDS requirements are based on an average processing rate of 150 bags per hour. This information was obtained from the TSA at the Airport.
[5/] There are eleven EDS machines today.

TABLE 2-7
Baggage Claim Device Requirements Summary

	Peak Hour Terminating Passengers [1/]	Number of Claim Devices Required [2/]		Total Baggage Claim Frontage Required (linear feet) [3/]
Existing:				
7 MAP (2005)	1,600	6	(3 Narrow Body Aircraft + 3 Wide Body Aircraft)	1,280 [4/]
Forecast:				
PAL 8.2 MAP (2010)	2,215	8	(5 Narrow Body Aircraft + 3 Wide Body Aircraft)	1,295
PAL 9.6 MAP (2015)	2,577	9	(6 Narrow Body Aircraft + 3 Wide Body Aircraft)	1,425
PAL 11.2 MAP (2020)	2,990	10	(7 Narrow Body Aircraft + 3 Wide Body Aircraft)	1,555
PAL 12.9 MAP (2025)	3,460	12	(9 Narrow Body Aircraft + 3 Wide Body Aircraft)	1,815

Sources: International Air Transport Association (IATA) *Airport Reference Development Manual,* Ninth edition, 2004; Ricondo & Associates, Inc., June 2006.

Prepared by: Ricondo & Associates, Inc., June 2006.

Notes:
[1/] Based on forecast developed for PBI and the March 15, 2005 design day schedule.
[2/] Based on IATA formula. These claim devices requirements should not form the sole basis for determining future facility requirements.
[3/] The baggage claim frontage represents the facility requirements for determining the number of claim devices required. Per IATA planning standards, the following claim linear frontage was utilized: Wide Bodied Aircraft = 215 feet, Narrow Bodied Aircraft = 130 feet.
[4/] Actual baggage claim linear frontage.

2.3 Terminal Demand/Capacity Results Summary

For the purposes of determining the ultimate terminal building footprint, an additional 410 linear feet of terminal building space would be required to meet the PAL 12.9 MAP demand in 2025. Assuming the existing terminal building width is maintained, this additional footprint would accommodate the additional space required for ticket counter/kiosk positions, baggage claim devices, baggage make-up area, and other building support functions and public circulation areas. This analysis did not include the assessment of passenger security screening, concessions, and terminal curb front.

2.4 Remain Overnight Positions (RON)

There are currently five remain overnight positions (RON) at PBI in addition to gate-positions. As this effort does not include a ramp charts analysis, RONs were not evaluated. However, based on the current and planned (being provided through a project listed in the five-year Capital Improvement Program) RON capacity at the Airport, coupled with the gate requirement previously shown, the combination of gate and RON capacity shown for the 20-year planning horizon offers an appropriate gate and off-gate aircraft parking plan for serving the projected demand and the associated operating characteristics envisioned during the 20-year horizon.

SECTION 3

Ground Access and Transportation Networks

SECTION 3

Ground Access and Transportation Networks

Currently, PBI roads offer great access to and on the Airport, without requiring any major changes. However, it is expected that realignment of on-airport roads may be necessary in the future to serve terminal expansion and provide optimal land use opportunities.

Ground access needs from the 2001 Master Plan were summarized and are provided in Addendum A.

SECTION 4

General Aviation/Fixed Base Operator Facilities

SECTION 4

General Aviation/Fixed Base Operator Facilities

In 2005, general aviation (GA) accounted for 64 percent of total aircraft operations at PBI. This analysis of GA facilities includes tenant facilities that serve GA aircraft based at the Airport, as well as transient aircraft that require temporary storage and/or flight support services. These facilities include aircraft parking aprons, aircraft storage/maintenance hangars, fixed base operator (FBO) terminal facilities, fueling facilities, and automobile parking facilities.

The current (2006) GA area at the Airport includes three FBOs: Galaxy Aviation, Jet Aviation, and Signature Flight Support. Two GA aprons are located at PBI. The east apron is in the southeast quadrant of the airfield, east of Runway 13/31 and south of Runway 9L/27R. This apron is leased to Signature Flight Support and Jet Aviation. Signature Flight Support's main FBO operations are based on this apron. The west GA apron is located south of Runway 9R/27L and west of Runway 13/31. The FBOs on this apron are Galaxy Aviation and Signature Flight Support, which both lease remote hangars and apron areas in this location. The apron storage figure for Signature Flight Support includes approximately 180,000 square feet of space on the west ramp that is not contiguous to its main operation on the east ramp.

These three FBOs control most GA aircraft storage (based and transient aircraft) on aprons and in hangars at PBI. **Table 4-1** summarizes the total aircraft storage available at each FBO facility.

TABLE 4-1
Existing FBO Storage Space

Fixed Base Operators	Apron Area (Square Feet)	Hangar Apron (Square Feet)
Galaxy Aviation	777,150	134,151
Signature Flight Support	1,171,350 [1/]	210,005
Jet Aviation	535,500	149,500
Total	**2,484,000**	**493,656**

Sources: Inventory Report, Palm Beach International Airport April 2006, Tenant Interviews April 2006.
Prepared by: Ricondo & Associates, Inc., June 2006.

Note:
[1/] Apron area contains approximately 180,000 square feet of noncontiguous space on west ramp.

Current apron requirements determined through interviews with the FBOs in 2006 are shown in **Table 4-2**. During periods of peak demand, the GA ramps are fully occupied on a daily basis and limited area is available for the storage of additional aircraft on the FBO apron. Because these ramps are generally at capacity, limited space is available for aircraft movements on the apron.

TABLE 4-2
Tenant Aircraft Apron Requirements [1/]

Fixed Base Operators	Existing Apron Area (Square Feet)	Required Apron Area (Square Feet)	Percent Increase
Galaxy Aviation	777,150	932,610	20%
Signature Flight Support [2/]	1,171,350	1,171,350	0
Jet Aviation	535,500	696,150	30%
Total	**2,484,000**	**2,800,110**	**12.7%**

Sources: Tenant Interviews, April 2006.
Prepared by: Ricondo & Associates, Inc.

Notes:
[1/] Based on interviews with the FBOs at PBI.
[2/] Signature Flight Support requests contiguous apron space.

The guidelines in FAA AC 150/5300-13, *Airport Design,* Change 10, were used to validate the requirements for aircraft apron parking. In conjunction with specific local input, the FAA guidelines were used to determine the number of parking positions needed to accommodate aircraft based on annual demand.

FBO interviews indicated that the ramp is congested due to parking demand. In validating FBO apron requirements, consideration was given to based aircraft egress from the hangars. FBO hangars for based aircraft share the ramps with transient aircraft and are located along the southern end of both general aviation ramps.

The forecast of GA aircraft operations is presented in **Table 4-3**. Data for 2005 was used to estimate the peak number of aircraft that would require GA apron space in the future.

TABLE 4-3
General Aviation Aircraft Operations Forecast

General Aviation Operations	2005	PAL 8.2 MAP (2010)	PAL 9.6 MAP (2015)	PAL 11.2 MAP (2020)	PAL 12.9 MAP (2025)
Annual Operations	128,823	131,592	134,447	137,392	140,430
Peak Month Operations	14,557	14,870	15,193	15,525	15,869
Peak Month Average Day	470	480	490	5001	512
Busy Day	517	528	539	551	563
Number of Aircraft on the Ground	293	301	304	304	312

Source: Ricondo & Associates, *PBI Aviation Activity Forecast*, November 2005 (approved by the FAA February 2006).
Prepared by: Ricondo & Associates, Inc., June 2006.

FAA AC 150/5300-13, Change 10, guidance assumes that the busy day would be 10 percent more active than the average day in the peak month. For the busy day in 2005, Table 4-3 shows 517 operations, representing approximately 259 aircraft (assuming each aircraft performs two operations). The maximum number of aircraft on the ground during this busy day was derived using the following assumptions:

- All based aircraft would use apron space in such a way as to facilitate ingress and egress from the FBO hangars. At PBI, there are 129 based aircraft.
- Sixty-five percent of the 259 aircraft on the ground on this day were assumed to be transient aircraft.

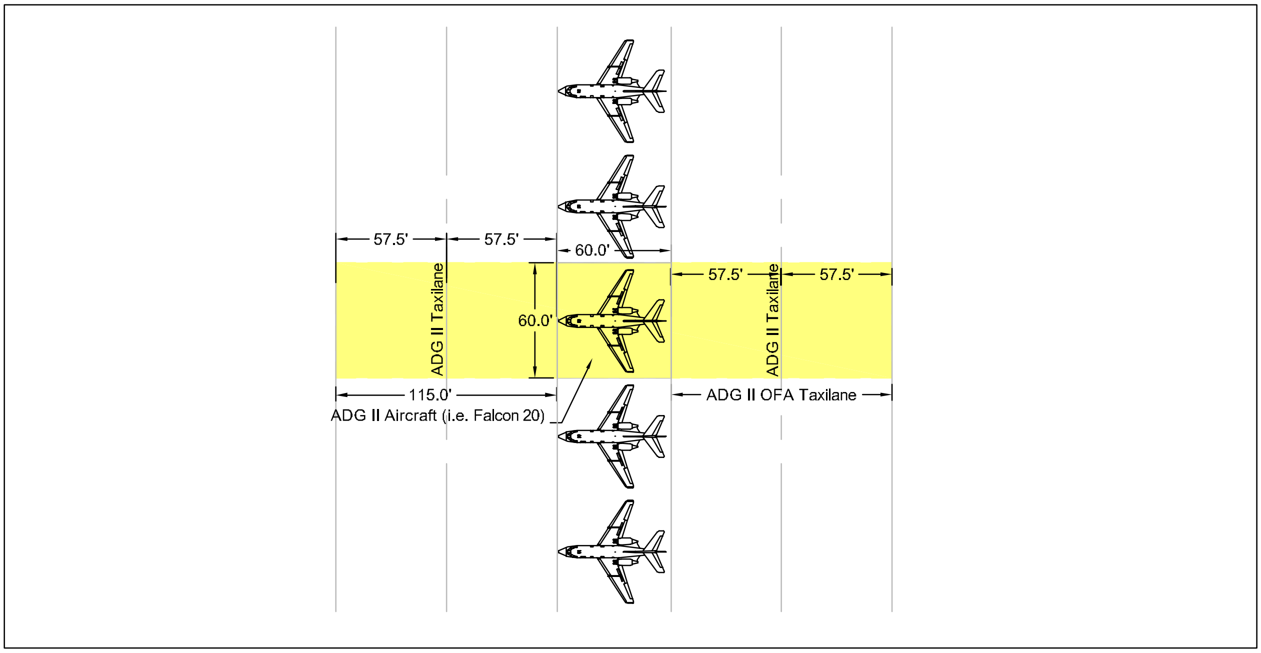
Because of the existing apron congestion, a provision must be made for the aircraft parking area, as well as the taxilanes leading to and from the parking positions. The aircraft parking apron area requirement is calculated by multiplying the number of required parking spaces by the average amount of ramp area needed to accommodate one aircraft. To determine the area required for aircraft movements between parking positions, half the width of the respective ADG taxilane object free area, and a 10-foot clearance between each aircraft parking position were applied. This is illustrated in **Exhibit 4-1**.

Using this approach, a ramp area of 3,400 square feet was applied for each ADG I aircraft (mainly piston single-engine and small piston twin-engine aircraft, and a limited number of small business jets). ADG II aircraft include most small and midsize business jets. The average ramp area required to accommodate these aircraft is estimated to be approximately 7,500 square feet each. ADG III aircraft include large business jets, such as the Gulfstream V or Boeing Business Jet; these aircraft require a minimum ramp area of 20,400 square feet each. These three values are considered adequate for determining the parking area requirements for GA aircraft at PBI within ADGs I, II, and III. It would be rare for aircraft larger than ADG III to be used for GA purposes; therefore, no allowance for larger aircraft was incorporated in the requirements.

Table 4-4 reflects the aircraft apron requirements expected at the Airport based on the data presented in Table 4-3. The required apron space for 2005 calculates to 2,640,849 square feet. This requirement is 116,848 square feet more than the existing GA apron; however, the required space is 199,261 square feet less than tenant requests. FAA AC 150/5300-13, Change 10 guidance suggests that the calculated space be increased at least 10 percent to accommodate expansion for at least the next two-year period. Increasing the 2005 apron calculation of 2,640,849 square feet by 10 percent shows an apron area of 2,904,934 square feet, resulting in the tenant request in between these two figures.

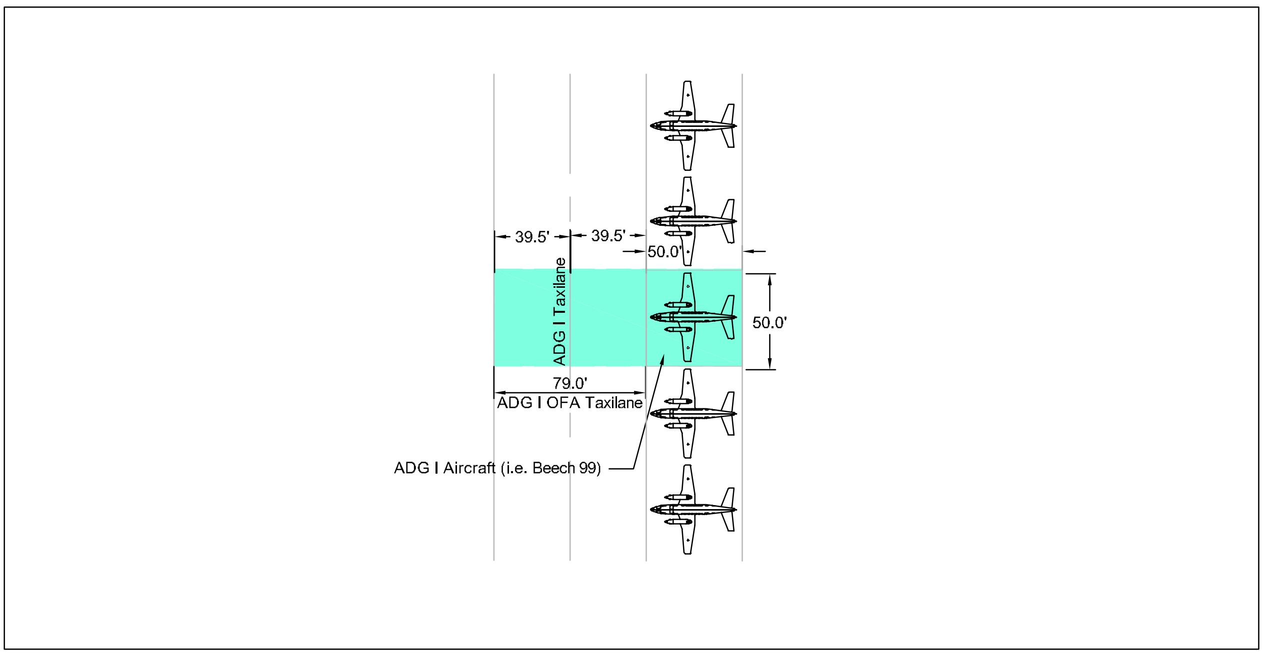
The apron requirements presented in Table 4-4 take into consideration the decrease in the share of single-engine piston and light twin-engine piston aircraft, ADG-I aircraft, due to the expected shift of this activity to the North Palm Beach County General Aviation Airport (F45) or other nearby GA airports. The number of jet aircraft based at the Airport is expected to increase, including an approximate two percent increase in large ADG III aircraft, such as the Gulfstream V and Boeing Business Jet. GA apron requirements at the Airport would be between 2,931,616 square feet and 3,224,777 square feet by 2025.

Transient Aircraft Apron



Total apron space assumed per transient aircraft: 17,400 square feet

Based Aircraft Apron



Total apron space assumed per based aircraft: 6,450 square feet

Source: FAA AC 150/5300-13, Change 9, *Airport Design;* Ricondo & Associates, Inc., June 2006.
Prepared by: Ricondo & Associates, Inc., June 2006.

Exhibit 4-1

0 100 ft.

Apron Space Assumptions per Aircraft

Drawing: P:\Airports\PalmBeach-System\PhaseII\CAD\CAD_fromRicondo\PBI\CAD\Exhibit 4-1-DemCap.dwg_Layout: 8.5 x 11_Feb 12, 2007, 5:30pm

TABLE 4-4
FBO Apron Requirements

Year (PAL)	Airplane Design Group	Percent of GA Fleet	Apron Requirement (Square Feet)	Apron Requirement Plus 10 Percent (Square Feet)
2005 (7.0)	I	29%	292,867	322,153
	II	51%	1,136,121	1,249,733
	III	20%	1,211,862	1,333,048
	Total Apron Required		2,640,849	2,904,934
2010 (8.2 MAP)	I	27%	275,951	303,546
	II	53%	1,194,885	1,314,374
	III	20%	1,266,448	1,349,093
	Total Apron Required		2,697,284	2,967,012
2015 (9.6 MAP)	I	26%	268,891	295,780
	II	53%	1,209,096	1,330,005
	III	21%	1,303,086	1,433,394
	Total Apron Required		2,781,072	3,059,179
2020 (11.2 MAP)	I	24%	251,416	276,557
	II	55%	1.270,943	1,398,038
	III	21%	1,319,933	1,451,926
	Total Apron Required		2,842,292	3,126,521
2025 (12.9 MAP)	I	23%	244,015	268,417
	II	55%	1,287,165	1,415,882
	III	22%	1,400,436	1,540,479
	Total Apron Required		2,931,616	3,224,777

Source: Ricondo & Associates, Inc., June 2006.
Prepared by: Ricondo & Associates, Inc, June 2006.

Based aircraft hangar space will similarly be affected by the increase in aircraft size over the next 20 years. The general aviation forecast assumes that based aircraft at the Airport would remain constant at 129 through PAL 12.9 MAP. The based aircraft fleet size is forecast to increase as light twin-engine piston and turboprop aircraft are replaced by larger turbine powered aircraft. All based aircraft hangar storage is provided by the three FBOs. **Table 4-5** presents the percentage increase in aircraft fleet square footage and the consequent increase in overall required hangar area. The associated automobile parking requirements are also shown.

TABLE 4-5
FBO Hangar Requirements

PAL (Year)	General Aviation Fleet Size Increase from 2005 (% Square Feet)	Hangar Requirement (Square Feet)	Additional Hangar Space Required (Square Feet)	Parking Requirement (Square Feet) [1/]
Existing 2005 (PAL 7.0 MAP	0.00%	493,656	0	29,619
2010 (PAL 8.2 MAP)	1.00%	498,209	4,553	29,893
2015 (PAL 9.6 MAP)	2.80%	507,648	13,992	30,459
2020 (PAL 11.2 MAP)	3.80%	512,201	18,545	30,732
2025 (PAL 12.9 MAP)	5.60%	521,640	27,984	31,298

Source: Ricondo & Associates, Inc., June 2006.
Prepared by: Ricondo & Associates, Inc., June 2006.

Note:
[1/] Based on ratio of automobile parking area to building area.

Existing FBO office and terminal space was deemed adequate for all three FBOs. As fleet size causes an increase in required hangar, office, and terminal space, requirements would increase proportionally. **Table 4-6** shows the increase in office and terminal space from the existing 42,636 square feet to 45,024 square feet by PAL 12.9 MAP. Associated parking requirements are also shown.

TABLE 4-6
FBO Office/Terminal Space Requirements

Fixed Based Operator	2005	PAL 8.2 MAP (2010)	PAL 9.6 MAP (2015)	PAL 11.2 MAP (2020)	PAL 12.9 MAP (2025)
Total Office/Terminal Space Required (square feet)	42,636	43,062	43,830	44,256	45,024
Total Automobile Parking Requirements (square feet) [1/]	12,791	12,919	13,149	13,277	13,507

Source: Ricondo & Associates, Inc., June 2006.
Prepared by: Ricondo & Associates, Inc., June 2006.

Note:
[1/] Based on a ratio of automobile parking area to building area.

4.1 Fueling Facilities

Currently, there are three separate general aviation fuel farms at PBI, each operated independently by the FBOs (Signature Flight Support, Jet Aviation, and Galaxy Aviation). Signature Flight Support and Jet Aviation provide both Jet-A fuel and AvGas (100 LL) to general aviation aircraft, while Galaxy Aviation only provides Jet-A fuel to general aviation aircraft.

Table 4-7 presents annual fuel flowage based on 2005 estimated demand, as well as projected fuel demand for PAL 8.2 MAP, PAL 9.6 MAP, PAL 11.2 MAP, and PAL 12.9 MAP.

By dividing existing storage capacity into total demand, a turnover rate was established along with the number of days of fueling system capacity at each PAL. FBO Jet-A fuel capacity for PAL 8.2 MAP, PAL 9.6 MAP, PAL 11.2 MAP, and PAL 12.9 MAP is 7 days for the FBOs. AvGas capacity for the FBOs is 4 days for all future PALs. Typically, a three-day fuel supply is the recommended capacity. All fuel farm facilities are expected to meet this minimum capacity requirement throughout the planning horizon; therefore, existing fuel facilities are adequate to meet future demand.

TABLE 4-7
Fuel Facility Demand/Capacity Assessment - FBO Facilities [1/]

	Jet-A	AvGas
2005 Annual GA Operations	92,910	33,326
2005 Annual Fuel Demand (gallons) [2/]	13,709,776	2,829,766
2005 Average Fuel Demand per Operation (gallons)	148	85
2010 Annual GA Operations [3/]	96,852	34,740
2010 Projected Fuel Demand (gallons) [4/]	14,291,461	2,949,828
2015 Annual GA Operations [3/]	98,953	35,494
2015 Projected Fuel Demand (gallons) [4/]	14,601,527	3,013,827
2020 Annual GA Operations [3/]	101,121	36,271
2020 Projected Fuel Demand (gallons) [4/]	14,921,366	3,079,844
2025 Annual GA Operations [3/]	103,356	37,074
2025 Projected Fuel Demand (gallons) [4/]	15,251,306	3,147,945
Existing Fuel Capacity (gallons)	280,000	32,000
Existing Fuel Supply (2005 - days)	7	4
2010 Projected Fuel Supply (days)	7	4
2015 Projected Fuel Supply (days)	7	4
2020 Projected Fuel Supply (days)	7	4
2025 Projected Fuel Supply (days)	7	4
Recommended Fuel Supply (days) [5/]	3	3

Source: Ricondo & Associates, Inc. May 2006.
Prepared by: Ricondo & Associates, Inc. May 2006.

Notes:
[1/] Assuming 73.6 percent of FBO aircraft use Jet-A fuel and 26.4 percent use AvGas based on a fleet sample of aircraft for March 14, 2005, to March 22, 2005.
[2/] Estimated 2005 annual fuel demand based on 2000 through 2004 average growth rate.
[3/] General aviation forecasts reflect baseline forecasts developed for PBI.
[4/] Projected fuel demand was obtained by multiplying the projected total operations average fuel demand per operation.
[5/] Typically, a 3-day capacity are recommended.

SECTION 5

Other Support Facilities

SECTION 5

Other Support Facilities

Airport support facilities provide services to both the Airport and the aircraft serving the Airport. Such facilities include aircraft rescue and fire fighting (ARFF), air cargo, airport maintenance, and fueling facilities, as discussed below.

5.1 ARFF Facilities

Aircraft Rescue and Fire Fighting (ARFF) facilities provide first response services for aircraft involved in emergencies. ARFF personnel respond to a wide variety of emergencies, including fires, trauma, emergency landings, and medical emergencies. The analysis of ARFF facility requirements was based on the activity forecasts previously developed for the Airport.

Airports certified under Federal Aviation Regulations (FAR) Part 139, *Certification and Operations: Land Airports Serving Certain Air Carriers*, having scheduled air carrier service are required to have an ARFF facility. As required by FAR Part 139, the ARFF station must be located so that the midpoint of each runway can be reached by fire fighting personnel in less than 3 minutes. Given the existing airfield configuration at PBI, this requirement is currently met by the ARFF station at the Airport.

A determining factor for the ARFF facility includes the airport index, which, in turn, determines the equipment required. The index of the ARFF station is based on both the number of daily departures and the length of the commercial aircraft serving the Airport. The ARFF index is determined on the basis of a minimum of five scheduled daily departures by the longest aircraft serving the airport (for PBI, the B767-300), as summarized below.

- Index A: Aircraft less than 90 feet in length
- Index B: Aircraft at least 90 feet in length, but less than 126 feet in length
- Index C: Aircraft at least 126 feet in length, but less than 159 feet in length
- Index D: Aircraft at least 159 feet in length, but less than 200 feet in length
- Index E: Aircraft at least 200 feet in length

PBI is categorized as ARFF Index D. The future fleet mix, which is based on the forecast previously developed for PBI, does not include significant operations by Index E aircraft. Therefore, PBI is expected to remain an Index D airport through the forecast period.

Equipment required for an Index D airport is specified in FAR Part 139. A summary of the minimum required equipment is provided below.

- One vehicle carrying 500 pounds of sodium-based dry chemical or 450 pounds of potassium-based dry chemical and 100 gallons of water, and an equal quantity of aqueous film forming foam (AFFF).

- Two vehicles with an equal quantity of AFFF and a combined water quantity of 4,000 gallons.

Current ARFF facilities and equipment at PBI satisfy the requirements specified in FAR Part 139 for an Index D airport, as shown in the inventory report for PBI. On this basis, the facilities and equipment are expected to be sufficient to meet the Airport's ARFF requirements.

5.2 Cargo Facilities

Cargo facilities at the Airport include those facilities dedicated to all-cargo aircraft operators, passenger airlines carrying belly cargo, and the U. S. Postal Service (USPS). These facilities include the air cargo building (Building 1475) and air freight building (Building 1300). All-cargo represents cargo transported on dedicated cargo aircraft (i.e., United Parcel Service [UPS]). Belly cargo is transported on board passenger airline aircraft. These two types of air cargo were analyzed separately. To develop requirements for cargo facilities at the Airport, the cargo forecast for the Airport was used. In addition, field visits were conducted and inputs from a limited number of tenants and Airport staff were taken into consideration in determining facility requirements for cargo activities at PBI. These facility requirement components included the cargo building (or warehouse), aircraft apron, truck loading docks, truck maneuvering area, and automobile parking.

The enplaned all-cargo forecast indicated an average annual growth of 2.3 percent from 2005 to 2025, while the enplaned belly cargo forecast reflected an average annual growth rate of 3 percent over the same time period. At PBI, only UPS has been providing all-cargo services since 1994. Discussions with Airport staff, USPS staff, and UPS staff revealed that, with the exception of apron space, the existing facilities are adequate to serve current demand. UPS often uses the remote aircraft parking positions to stage at least one of its aircraft. In addition, the apron area is used for ground service equipment storage. For those tenants that did not provide input as to their existing uses or future needs, historical and forecast data were used to determine facility requirements. The following subsections summarize the existing cargo building use, methodology used to determine future cargo facility requirements, and analysis results.

5.2.1 All-Cargo Facilities

The all-cargo activity at PBI is handled exclusively by UPS, which is located in air cargo Building 1475. This 40,000-square-foot building is approximately 80 feet wide by 500 feet long and houses three tenants: UPS, USPS, and the Airport's Maintenance Division; and they lease 6,000 square feet, 14,000 square feet, and 20,000 square feet, respectively. USPS mail, priority mail, and express packages are handled by the passenger airlines, including American, Continental, Delta, JetBlue, Southwest, and United. The Airport's Maintenance Division uses vacant space primarily for material and equipment storage. Based on the existing use of Building 1475, which has access to the airside ramp, only 15 percent of the building is dedicated to all-cargo use, while 35 percent is dedicated to belly cargo, and 50 percent is dedicated to non-cargo activities. For purposes of this analysis, space currently used for non-cargo activities in Building 1475 was assumed to be available in determining facility capacity. It was also assumed that any Palm Beach County Department of Airports maintenance office/storage space would be consolidated into the new maintenance compound facility. As such, the all-cargo facility demand/capacity and facility requirements analysis were based on the space currently leased to UPS (and not the entire footprint of Building 1475) and pre-defined ratios developed for building space, apron, truck loading docks, maneuvering area, and automobile parking. **Table 5-1** provides a summary of the all-cargo demand/capacity analysis and related facility requirements.

TABLE 5-1
All-Cargo Demand/Capacity Analysis and Facility Requirements Summary

	Annual Enplaned All-Cargo Tonnage [1/]	Building (Square Feet)	Apron (Square Yards)	Truck Loading Dock (Square Feet)	Truck Dock Maneuvering Area (Square Feet)	Automobile Parking Area (Square Feet)
Existing:						
2005		6,000	12,850	5,770	5,385	2,421
Forecast:						
2010 (8.2 MAP)	2,167	5,390	19,939	5,053	4,717	2,175
2015 (9.6 MAP)	2,421	6,022	22,276	5,646	5,269	2,430
2020 (11.2 MAP)	2,705	6,729	24,890	6,308	5,888	2,715
2025 (12.9 MAP)	3,034	7,547	27,917	7,075	6,604	3,045

MAP: Million Annual Passengers

Target Ratios

Building [2/]: 2.5 square feet per enplaned all-cargo ton

Apron [3/]: 9.2 square yards per enplaned all-cargo ton

Truck Loading Dock Depth: 75.0 linear feet (length assumed to match building length)

Truck Dock Maneuvering Area Depth: 70.0 linear feet (length assumed to match building length)

Parking [4/]: 0.4 square foot of parking area per square foot of building area

Sources: Palm Beach County Department of Airports, March 2006; Field Survey, March 2006; Ricondo & Associates, Inc., May 2006.

Prepared by: Ricondo & Associates, Inc., May 2006.

Notes:

[1/] Based on forecast developed for PBI.

[2/] The target ratio used to determine future all-cargo building needs was based on the average ratio of square feet per enplaned all-cargo tonnage at the Airport for the last 5 years.

[3/] The target ratio used to determine future all-cargo apron requirements included consideration of the need for one additional aircraft parking position. This need resulted in an additional 4,692 square yards of apron needed today. On that basis, the target ratio resulted in 9.2 square yards per enplaned all-cargo ton.

[4/] The existing automobile parking area only represents the associated parking area required for all-cargo activities (and not the parking area associated with the entire building). The target ratio used to determine the automobile parking area requirements was based on the ratio of total existing parking area to total existing area of Building 1475.

As shown, the all-cargo leased area of 6,000 square feet is expected to increase approximately 25 percent by PAL 12.9 MAP to meet future demand. The apron area would more than double during that timeframe to satisfy the existing deficiency, as well as storage for ground service equipment. Truck loading docks and maneuvering area would increase in proportion to the additional building footprint required. The required automobile parking area is also shown.

5.2.2 Belly Cargo Facilities

Belly cargo activities at the Airport are primarily handled in Building 1300. This 40,000-square-foot building is approximately 80 feet wide by 500 feet long and houses belly cargo operators (the airlines), as well as freight forwarders. However, as previously stated, 35 percent of the belly cargo activity at the Airport is also handled in Building 1475. Thus, similar to the all-cargo analysis, the demand/capacity and facility requirements analysis for belly cargo facilities was not limited to the assessment of Building 1300, but included all belly cargo activities. It should be noted that Building 1300 is also occupied by the Palm Beach County Department of Airports Maintenance Division, which uses approximately 21 percent of the building. This area was considered available for purposes of determining belly cargo facility capacity and future requirements. The demand/capacity and facility requirements analysis for belly cargo activities at PBI followed the same methodology used for all-cargo facilities. **Table 5-2** summarizes the facility requirements for belly cargo at PBI.

TABLE 5-2
Belly Cargo Demand/Capacity Analysis and Facility Requirements Summary

	Annual Enplaned All-Cargo Tonnage [1/]	Building (Square Feet)	Apron (Square Yards)	Loading Dock (Square Feet)	Truck Dock Area (Square Feet)	Automobile Parking Area (Square Feet)
Existing:						
2005	5,811	37,725	N.A.	37,500	35,000	22,190
Forecast:						
2010 (8.2 MAP)	6,478	43,307	N.A.	40,600	37,893	21,355
2015 (9.6 MAP)	7,503	50,159	N.A.	47,024	43,889	24,734
2020 (11.2 MAP)	8,746	58,469	N.A.	54,815	51,160	28,832
2025 (12.9 MAP)	10,294	68,818	N.A.	64,517	60,215	33,935

MAP: Million Annual Passengers

Target Ratios

Building [2/]: 6.7 square feet per enplaned all-cargo ton

Truck Loading Dock Depth 75.0 linear feet (length assumed to match building)

Truck Dock Maneuvering Area Depth: 70.0 linear feet (length assumed to match building)

Parking [3/]: 0.4 square foot of parking area per square foot of building area

Sources: Palm Beach County Department of Airports, March 2006; Field Survey, March 2006; Ricondo & Associates, Inc., May 2006.

Prepared by: Ricondo & Associates, Inc., May 2006.

Notes:

[1/] Based on forecast developed for PBI.

[2/] The target ratio used to determine future belly cargo building needs was based on the average ratio of square feet per enplaned belly-cargo tonnage at the Airport for the last 5 years.

[3/] The target ratio used to determine the automobile parking area requirements was based on the ratio of total existing parking area to total existing area for Building 1475.

As shown, the belly cargo building would need to increase approximately 82 percent by PAL 12.9 MAP. An apron is typically not required for belly cargo operations, as cargo loads are transferred from parked aircraft to the building via trucks and tugs. Truck docks and maneuvering areas are proportional to the building requirements. The target ratio used for automobile parking requirements at Building 1475 was also used for belly cargo facilities. It should be noted that, given the age and condition of Building 1300, a replacement belly cargo building should be anticipated within the planning horizon.

5.2.3 All-Cargo and Belly Cargo Facility Requirements Summary

The demand/capacity analysis for all-cargo and belly cargo facilities demonstrated that a combined 76,365 square feet of cargo building space would be required with a total apron need of approximately 27,917 square yards (or 251,253 square feet). Due to ongoing refinements of air cargo security regulations aiming at enhancing air cargo security[8], it was estimated that the cargo building requirements should be increased by approximately 30 percent to account for potential cargo-security requirements that may impose greater spatial needs in the future. On that basis, approximately 99,275 square feet of total cargo building space (i.e., an additional 59,275 square feet above what is provided in Building 1475) will be required by PAL 12.9 MAP.

[8] Press Release: "TSA Issues New Regulations to Substantially Strengthen Air Cargo Security, U.S. Department of Homeland Security", May 17, 2006.

5.3 Airport Maintenance

In an effort to consolidate the maintenance facilities at PBI, the *New Maintenance Compound Project Program and Design Criteria Manual* was prepared in 1997. This document cited the construction of a new maintenance compound, which would serve as the operations base for all maintenance functions. This compound would include four main facilities: administration building, workshop/storage facility, warehouse facility, and a covered parking area. Each facility would serve a different function. For example, the administrative/workshop building would house administrative offices, equipment storage, and workshop areas. The warehouse facility would serve as a shipping and receiving area, and the covered parking area would provide shelter for large weather-sensitive equipment. Based on the inventory effort conducted in April 2006, the maintenance compound facility requirements identified in 1997 were updated and summarized in **Table 5-3**. Interviews with Airport maintenance staff revealed that additional storage would be required from those identified in the 1997 study.

TABLE 5-3
Proposed Maintenance Compound –Space Requirements

Area	Space Required (Square Feet)
Administrative Office Space:	
Office Space	1,205
Conference Room	300
Break Room/Restrooms	530
Records/Mail Room	450
Circulation	475
Subtotal:	2,960
Workshop Areas:	
Supervisor’s Offices	750
Carpenter Shop	1,500
Plumbers Shop	600
Graphics/Signage Shop	450
General Maintenance/Mechanic Shop	600
Paint Shop	300
Electrical/Electronic Shop	1,950
Machine Shop	360
Key Shop	240
Field Support Crew Chiefs Shop	360
Equipment Coordinator Shop	120
Records/Storage Room	750 [1/]
Equipment Storage/Landscape	6,000

TABLE 5-3
Proposed Maintenance Compound –Space Requirements

Area	Space Required (Square Feet)
Equipment Storage/Road and Ground	2,500 [1/]
Restrooms with Showers and Locks	1,320
Multi-functional Room	1,000
Future Staff	300
Circulation	1,750
Subtotal:	20,850
Covered Storage and Warehouse Space:	
Front Offices	200
Truck Dock Bays	400
Storage Area/Heavy Storage Racks	18,000 [1/]
Chemical and Fertilizer Storage	3,000 [1/]
Tool Issue	2,000
Issue Window	400
Restrooms and Circulation	885
Storage	650 [1/]
Subtotal:	25,535
Outdoor Storage Space:	
General Parking	29,750
Covered Parking	3,000
Materials Stockpiling Bays	2,000 [1/]
Circulation	960
Subtotal:	35,710
Grand Total:	**85,055**

Source: New Maintenance Compound Project Book, August 1997.
Prepared by: Ricondo & Associates, April 2006.

Note:
[1/] Updated based on April 2006 inventory and discussions with the Airport staff.

5.4 Fueling Facilities

In addition to the FBOs, Aircraft Service International Group (ASIG) operates the primary fuel farm at the Airport, supplying Jet-A fuel exclusively to air carrier, commuter, and all-cargo aircraft. ASIG has a total Jet-A fuel storage tank capacity of 1 million gallons, and leases 3.52 acres of land at the Airport. Due to a lack of historical fuel flowage volume data, it was not possible to correlate fuel demand with aircraft operations activity to establish fueling facility requirements for PBI. However, a lease amendment for ASIG did not include revisions to or expansion of the lease premises, indicative that near term capacity improvements are not planned. Although, the lease amendment does identify planned improvements and modifications to existing facilities located within the lease premises.

As part of the current and previous Master Planning Study for PBI, a conscious effort was made to preserve the vacant parcels of land located to the east of the ASIG lease premises, in order to provide the opportunity to expand PBI's commercial fueling facilities to respond to increase activity growth and fuel demand at the Airport, which could be leased and operated by either ASIG or any other fuel operator providing these services at the Airport. Therefore, while specific facility requirements could not be derived for the fueling facilities, proper land preservation considerations were taken into account to not hinder the long-term expansion of PBI's fueling facilities.

SECTION 6

Automobile Parking and Rental Car Company Demand/Capacity and Facility Requirements

SECTION 6

Automobile Parking and Rental Car Company Demand/Capacity and Facility Requirements

6.1 Demand/Capacity Analysis

6.1.1 Existing Public Parking Facilities and Capacity

The Palm Beach County Department of Airports operates four public parking facilities at PBI, including the Premium Lot, Short-Term Lot, Long-Term Lot, and Park & Ride Lot. **Table 6-1** provides the number of parking spaces in each of these lots.

TABLE 6-1
Public Parking Spaces

Parking Facility	Parking Spaces
Premium Lot	145
Short Term Lot	909
Long Term Lot	2,686
Park & Ride Lot	4,037
Total	**7,777**

Sources: Palm Beach County Department of Airports, May 2006.
Prepared by: Ricondo & Associates, Inc., May 2006.

6.1.2 Parking Activity and Characteristics

Exhibit 6-1 shows the last 12 months of available data (from May 2005 to April 2006) regarding daily parking demand, classified by duration of stay. Total demand represents the maximum accumulation in all parking lots on a daily basis as calculated from overnight vehicle counts and hourly entry/exit data collected by the parking revenue control system. The entry/exit data were for a busy day in the peak month, on July 17, 2004. More recent data were not available for this analysis due to errors in reported data and a recent software upgrade to the parking revenue control system, which limited available data.

Public parking demand shows absolute peaks during the Thanksgiving and Christmas holiday periods, with the highest total peak accumulation estimated to be 9,849 vehicles on November 24, 2005, and the second highest peak accumulation estimated to be 8,932 vehicles on December 25, 2005.[9] Demand on both days exceeded the available capacity of the parking lots (7,777 parking spaces). During peak holiday parking events, the Palm Beach County Department of Airports allows customers to park their vehicles in other

[9] Peak accumulation is an estimated number based on actual overnight vehicle counts increased by a surge factor of 1.16 (calculated as the peak accumulation divided by the observed overnight inventory of parked vehicles). Due to limited available data representing peak parking activity, the surge factor was estimated based on actual overnight inventory and entry/exit data from a single day, July 17, 2004. It is estimated that this surge factor has resulted in a conservative estimate of the peak holiday accumulation.

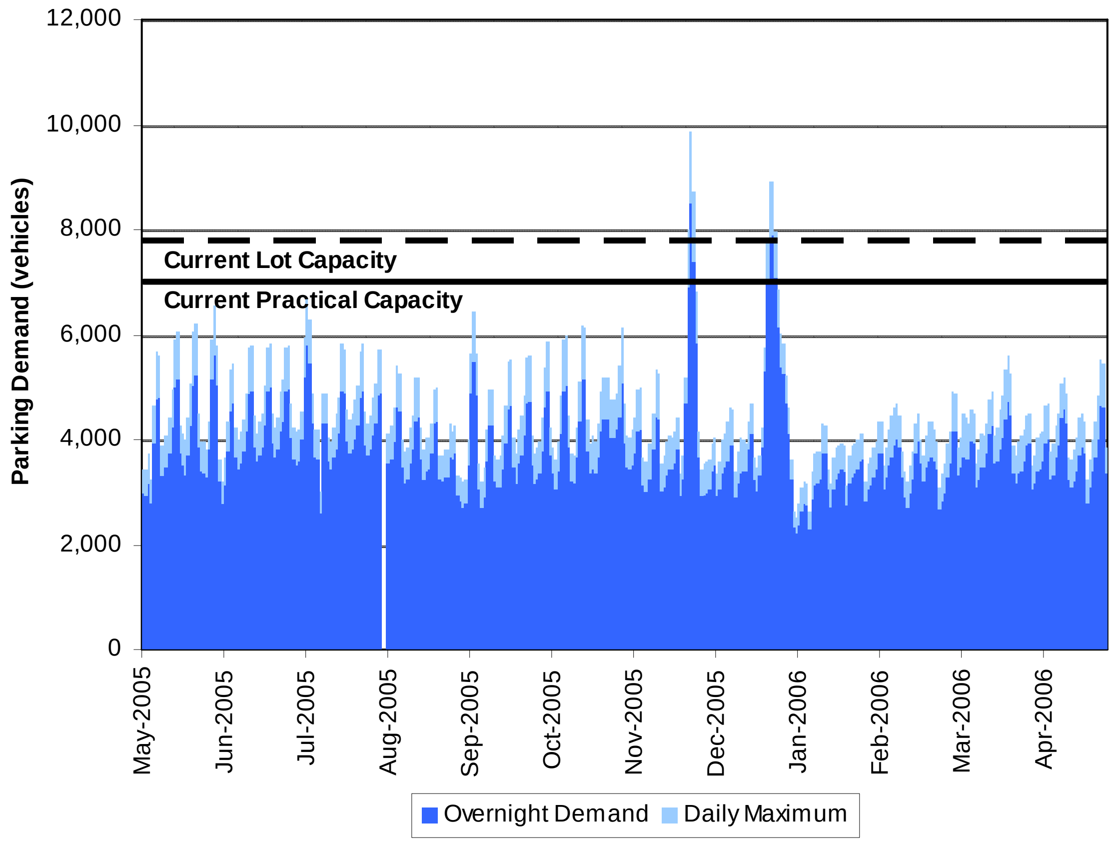


EXHIBIT 6-1
Daily Parking Demand (May 2005 to April 2006)
Sources: Palm Beach County Department of Airports, May 2006; Ricondo & Associates, Inc., May 2006.
Prepared by: Ricondo & Associates, Inc., May 2006.

designated parking areas and unpaved areas that are not part of the Airport's formal public parking system.

July is the peak month for parking demand, evidenced by the sustained period of high parking activity beginning from the Independence Day holiday weekend through the end of the month. During July, peak accumulations averaged 4,909 vehicles, with a maximum peak accumulation of 6,700 vehicles on July 2, 2005.

As shown on Exhibit 6-1, "Overnight Demand" and "Daily Maximum" represent the allocation of total demand by length of stay. Overnight demand represents the number of parked vehicles remaining 24 hours or more, as determined by the count collected at all parking lots. This demand component is referred to as "long-term" demand. Daily maximum represents the difference between total and overnight demand, including both parked vehicles remaining less than 24 hours and surges in lot accumulation during busy mid-day activity periods. This demand component is referred to as "short-term" demand. For the period May 2005 to April 2006, short-term parking demand averaged 16 percent of total parking demand, while long-term parking demand averaged 84 percent of total parking demand.

In planning parking facilities, a design day must be chosen to represent peak period demand. The design day, which is defined as the average busy day of the peak month

(July), is used to ensure that parking demand is accommodated during sustained busy periods throughout the year without overbuilding for absolute peak holiday demand days (i.e., Thanksgiving and Christmas). The average busy day of the peak month is July 1, which represents the 22nd busiest day of the year. On July 1, 2005, approximately 5,934 vehicles were parked at the Airport, consisting of 752 short-term parkers and 5,182 long-term parkers. As shown on **Exhibit 6-2**, the overnight count of 5,182 spaces on the average busy day of the peak month could be accommodated on approximately 95 percent of the parking days of the year. The colored bars to the left of the design day on Exhibit 6-2 indicate parking demand during five seasonal parking "events:" Christmas, Thanksgiving, Memorial Day, Independence Day, and Labor Day.

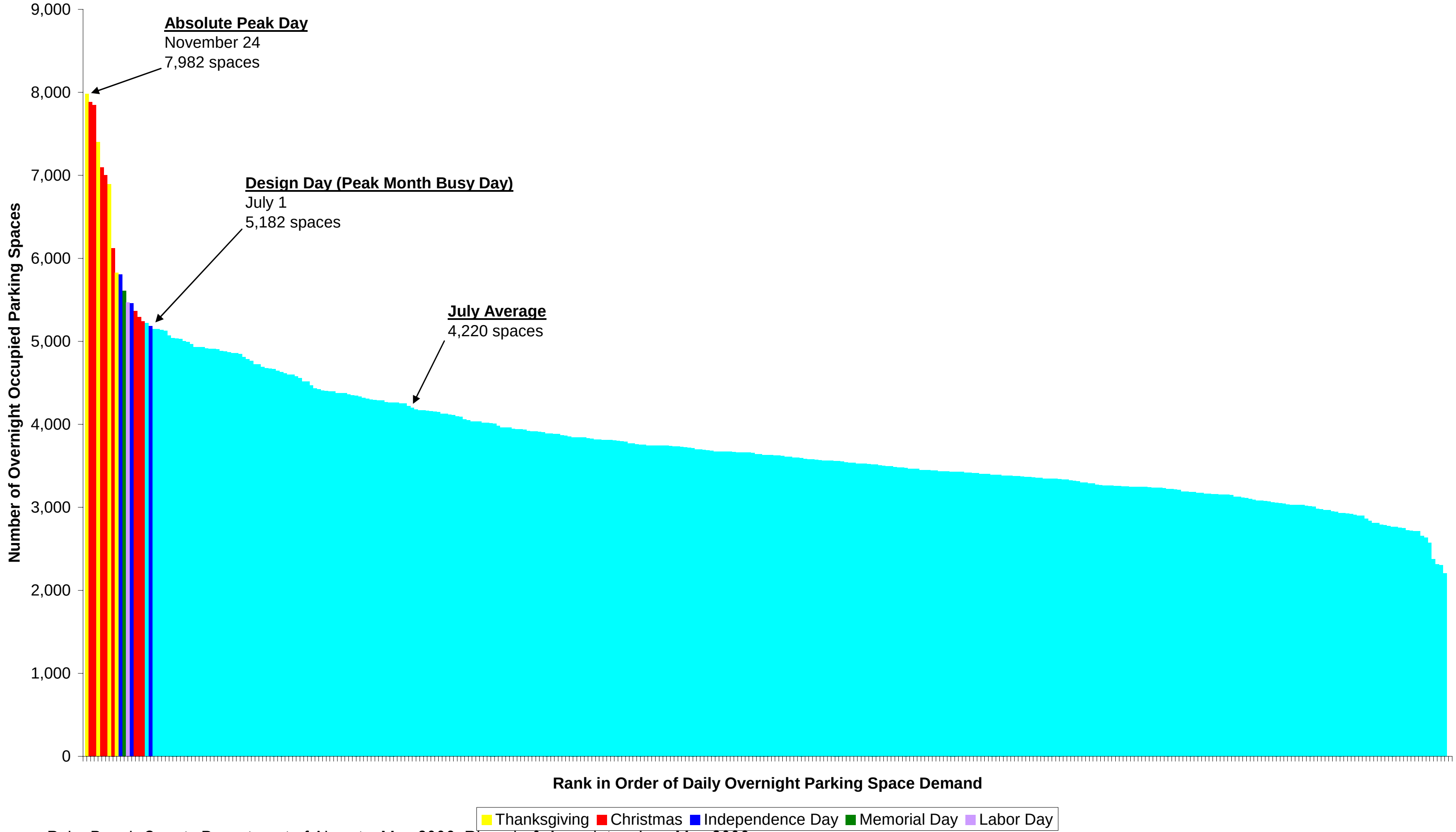
Table 6-2 and **Table 6-3** show current parking demand for the peak month busy day (July 1, 2005) and peak holiday (November 24, 2005), respectively. For the peak month busy day, demand in the Premium Lot, Short-Term Lot, and Long-Term Lot nearly reached current available capacity, with the overall parking facilities operating at about 76 percent of available capacity. Peak holiday demand of 9,849 vehicles on November 24, 2005, exceeded the Airport's parking capacity of 7,777 spaces, with the facilities operating at 127 percent of available capacity. During peak holiday events, the Airport accommodates overflow vehicles in various paved and unpaved areas surrounding the terminal. In addition, the Palm Beach County Department of Airports has an agreement to use the parking lot of a nearby racetrack in overflow situations. During the peak holiday periods, an estimated 500 vehicles were parked in these overflow areas.

6.2 Parking Facility Requirements

6.2.1 Public Parking

Future public parking requirements are based on existing demand patterns and growth rate assumptions. Parking demand was assumed to increase in direct proportion to annual originating passenger traffic. Given that PBI is primarily an origin/destination airport, total numbers of passenger enplanements can be used as a proxy for numbers of originating passengers. From the PBI forecast, the average annual growth rate for passenger enplanements from 2004 to 2025 is 3.3 percent.

Parking demand is equivalent to the number of vehicles requiring a parking space. To ensure that vehicles are adequately accommodated during peak periods, parking requirements are calculated using the demand/requirements ratio. This ratio helps to reduce parking space search times in order to ensure an adequate level of service for patrons looking for a parking space during peak accumulation periods. Common practice is to provide an additional 5 percent buffer for long-term parking demand (i.e., overnight parking with low turnover of parking spaces) and a 10 percent buffer for short-term parking demand. The weighted average of these two adjustment factors for PBI is approximately 6 percent based on the allocation of parking activity at the Airport. This corresponds to a demand/requirements ratio of approximately 0.94, meaning that a demand of 94 parking spaces requires capacity of 100 parking spaces. **Exhibit 6-3** depicts the relationship between current parking demand and current parking requirements.



Sources: Palm Beach County Department of Airports, May 2006; Ricondo & Associates, Inc., May 2006.

Prepared by: Ricondo & Associates, Inc., May 2006.

Exhibit 6-2

Overnight (Long Term) Parking Demand in Decreasing Order (May 2005-April 2006)

TABLE 6-2
Existing Public Parking Demand - Peak Month Busy Day (July 1, 2005)

Parking Facility	Peak Month Peak Day Demand			Available Capacity	Percent of Spaces Occupied
	Long-Term	Short-Term	Total		
Premium Lot	39	91	130	145	90%
Short-Term Lot	391	451	842	909	93%
Long-Term Lot	2,400	210	2,610	2,686	97%
Park & Ride Lot	2,352	---	2,352	4,037	58%
Total/Average	**5,182**	**752**	**5,934**	**7,777**	**76%**

Source: Palm Beach County Department of Airports, May 2006.
Prepared by: Ricondo & Associates, Inc., May 2006.

TABLE 6-3
Existing Public Parking Demand - Peak Holiday (November 24, 2005)

Parking Facility	Peak Holiday Demand			Available Capacity	Percent of Spaces Occupied
	Long-Term	Short-Term	Total		
Premium Lot	98	229	327	145	226%
Short-Term Lot	788	908	1,696	909	187%
Long-Term Lot	2,628	230	2,858	2,686	106%
Park & Ride Lot	4,468	---	4,468	4,037	111%
Overflow	500		500	---	---
Total/Average	**8,482**	**1,367**	**9,849**	**7,777**	**127%**

Sources: Palm Beach County Department of Airports, May 2006; Ricondo & Associates, Inc., May 2006.
Prepared by: Ricondo & Associates, Inc., May 2006.

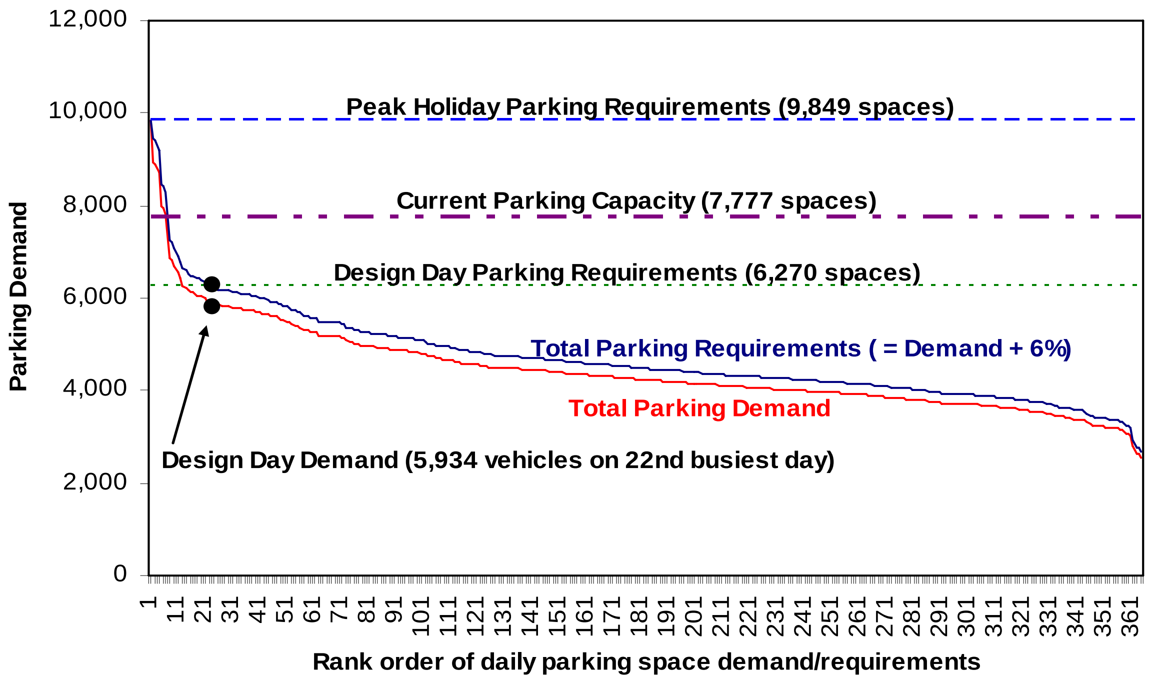


EXHIBIT 6-3
Current Parking Demand and Requirements Relationship (2005)
Sources: Palm Beach County Department of Airports, May 2006; Ricondo & Associates, Inc., May 2006
Prepared by: Ricondo & Associates, Inc., May 2006.

Table 6-4 shows public parking requirements through PAL 12.9 MAP for the design day (peak month busy day) and peak holiday. The design day requirements generally represent the facility needs to accommodate demand on approximately 94 percent of the days of the year at each PAL. The peak holiday demand represents the difference between the absolute peak accumulation and the design day requirement. As shown in Table 6-4, it is anticipated that current public parking facilities would be adequate to accommodate the typical peak month busy day parking requirements through PAL 11.2 MAP, with a deficit of about 760 spaces occurring by PAL 12.9 MAP. Parking capacity includes an additional 2,939 spaces that will be constructed in the new long-term lot garage.

As shown in Table 6-4, peak holiday peak parking requirements exceeded current public parking capacity by approximately 2,070 spaces in 2005. By PAL 12.9 MAP, it is anticipated that this peak holiday deficit (compared to the supply of formal spaces) would increase to about 7,320 spaces.

TABLE 6-4
Public Parking Requirements - Peak Month Busy Day

Duration	Existing (2005)	PAL 8.2 MAP (2010)	PAL 9.6 MAP (2015)	PAL 11.2 MAP (2020)	PAL 12.9 MAP (2025)
Design Day					
Short-Term	830	970	1,130	1,310	1,510
Long-Term	5,440	6,380	7,430	8,620	9,970
Total (Design Day) [A]	6,270	7,350	8,560	9,930	11,480
Capacity [1/] [B]	7,777	10,716	10,716	10,716	10,716
Surplus/(Deficit) [B]-[A]	1,507	3,366	2,156	786	(764)
Peak Holiday					
Holiday Demand [C]	3,579	4,200	4,890	5,660	6,560
Total [A+C]	9,849	11,550	13,450	15,590	18,040
Surplus/(Deficit) [B]-[A+C]	(2,072)	(834)	(2,734)	(4,874)	(7,324)

Sources: Palm Beach County Department of Airports, May 2006; Ricondo & Associates, Inc., May 2006.
Prepared by: Ricondo & Associates, Inc., May 2006.

Note:
[1/] Capacity increases by 2010 with 2,939 additional spaces in new long-term lot garage.

6.2.2 Employee Parking

Employee parking is provided in the main employee lot (615 spaces) and the new flight crew lot (300 spaces), for a total of 915 spaces. Although actual employee parking data were not available, guidance provided by Airport staff indicated that each lot reaches a maximum occupancy of approximately 90 percent each day. This information provided a basis for estimating baseline demand and parking space requirements. No additional surge factors or practical capacity constraints were applied in this analysis.

To forecast employee parking requirements, baseline demand was increased using the annual average rate of growth in activity at the Airport, as provided in the PBI forecast. Because of varied dependency on airline and passenger activity, future overall employee parking demand was increased using the combined average of the forecast growth rates for air carrier aircraft operations and passenger enplanements. Because flight crew activity is mostly dependent on airline activity, flight crew demand was increased using only the average growth rate forecast for air carrier aircraft operations.

Table 6-5 shows forecast enplanements, air carrier aircraft operations, and average annual growth rates used to forecast employee parking demand.

Table 6-6 depicts employee parking capacity, estimated employee parking demand, and surplus or deficit in the number of employee parking spaces through PAL 12.9 MAP.

As shown in Table 6-6, it is estimated that the employee parking areas will be operating at capacity by PAL 8.2 MAP, and by PAL 12.9 MAP, an additional 355 employee parking spaces and 170 flight crew parking spaces would be required to meet demand.

TABLE 6-5
Enplanements and Operations Forecast [1/]

	2006 (estimated)	PAL 8.2 MAP (2010)	PAL 9.6 MAP (2015)	PAL 11.2 MAP (2020)	PAL 12.9 MAP (2025)
Enplanements	3,527,170	4,138,729	4,814,702	5,585,580	6,463,910
Air Carrier Operations	69,765	77,776	90,085	104,999	123,584
Average Annual Growth Rate:					
Enplanements	-	3.2%	3.0%	3.0%	2.9%
Air Carrier Operations	-	2.1%	2.8%	2.9%	3.1%
Combined	-	2.6%	2.9%	3.0%	3.0%

Sources: Airport Traffic Report Data, May 2006; Ricondo & Associates, Inc., May 2006.
Prepared by: Ricondo & Associates, Inc., May 2006.

Note:
[1/] *PBI Aviation Activity Forecast*, November 2005 (approved by the FAA February 2006).

TABLE 6-6
Employee Parking Demand and Capacity

Lot	Capacity 2005[1/]	Demand 2006 (estimated)	PAL 8.2 MAP (2010)	PAL 9.6 MAP (2015)	PAL 11.2 MAP (2020)	PAL 12.9 MAP (2025)
Employee	615	560	620	720	840	970
Flight Crew	300	270	300	350	400	470
Surplus/(Deficit):						
Employee		55	(5)	(105)	(225)	(355)
Flight Crew		30	0	(50)	(100)	(170)

Sources: Palm Beach County Department of Airports, May 2006; Ricondo & Associates, Inc., May 2006.
Prepared by: Ricondo & Associates, Inc., May 2006.

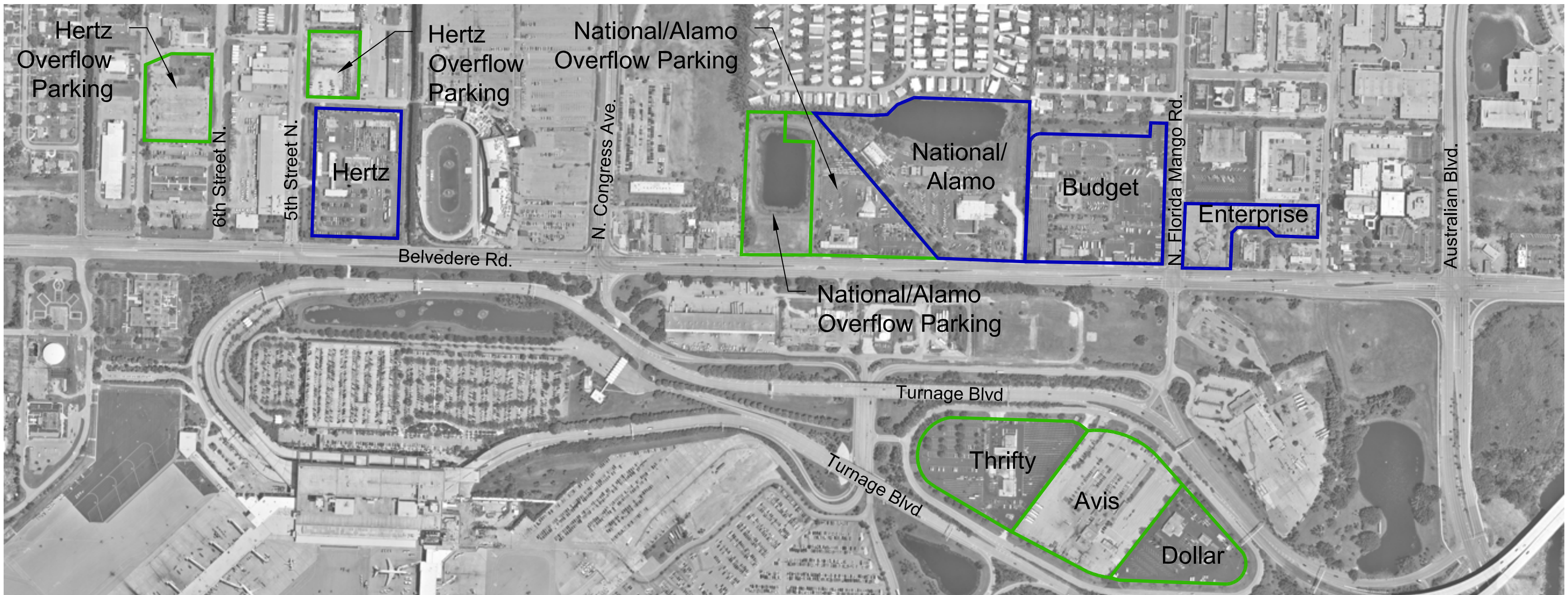
Note:
[1/] Includes new flight crew lot that opened in April 2006.

6.2.3 Rental Car Parking

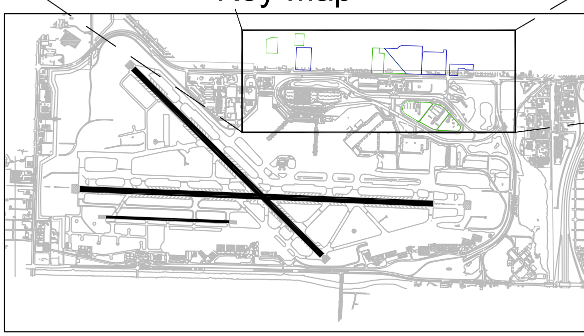
Eleven rental car companies currently conduct business at PBI, six of which operate from parcels owned by the Palm Beach County Department of Airports. Eight of the rental car company's lease counter space in the terminal; however, all of the rental car companies operate individual remote facilities outside of the terminal area that generally consist of their customer facilities (e.g., ready/return spaces, vehicle maintenance, and storage facilities). Each company operates a separate courtesy shuttle system to transport customers to and from the terminal to their remote facilities. **Exhibit 6-4** illustrates the location and respective occupant of each of the rental car locations. Thrifty, Avis, and Dollar are located off Turnage Boulevard, while Hertz, National/Alamo, Budget, and Enterprise are located north of Belvedere Road.

Total gross revenue and market share, as well as total acreage by company, are provided in **Table 6-7**. As shown, Hertz is the largest operator serving PBI in terms of revenue and market share, followed by National/Alamo and Avis. Detailed information regarding ready/return spaces, quick turn around (QTA) facilities, vehicle service, and storage facilities was not available. Therefore, rental car facility requirements were calculated based on the total rental car acreage of each company. The facilities included in the total rental car acreage are ready/return spaces, QTA areas, storage/maintenance areas, and customer service area.

Data were compared for PBI and two major airports (Denver and Washington Dulles International Airports) with rental car markets larger than that at PBI and where individual remote facilities are also operated (i.e, many airports throughout the country possess partially consolidated or fully consolidated rental car facilities). **Table 6-8,** provides total rental car revenue and the total rental car company acreage for each airport. Also provided are the ratios of total acreage per $1 million in gross revenue as a comparison of capacity. Although more recent revenue data are available for PBI, the analysis was based on 2002-2003 revenue to maintain consistency with the most recent data available for the other airports. Compared to the other airports, PBI is the least constrained generating just $1.5 million in gross revenue per acre, while the other two airports accommodate more business at their facilities. Specifically, Denver generates about $1.9 million per acre and Washington Dulles generates about $2.6 million per acre. It is worth noting that Washington Dulles earns 34 percent more gross revenue than PBI, but its total rental car area is more than 23 percent smaller. Furthermore, conversations with Airport staff also indicated that the existing rental car facilities are adequate for serving the current demand level and revenue transactions being processed for PBI.



Key Map



Legend:

Parcels owned by the Department of Airports

Parcels owned by Rental Car Agency

Sources: Palm Beach International Airport, Airport Layout Plan, Dec. 1996; Palm Beach International Airport Aerial Photo, July 2005
Properties Department, Department of Airports, May 2006
Prepared by: Ricondo & Associates, Inc., April 2006

Exhibit 6-4

0 800 ft. north

Rental Car Company Locations

Drawing: P:\PBIA\System Wide Airport Master Planning Study - Phase II\Task 3 - Demand Capacity Analyses and Facility Needs\Task 3.6 - Auto PCar Rental Agencies Inventory.dwg_Layout: Rental Car_Jun 15, 2006, 2:18pm

TABLE 6-7
Gross Rental Car Revenue and Area by Company

	Gross Revenue by Calendar Year				
Rental Car Company	**2004**	**2005**	**Market Share (2005)**	**Total Rental Car Area by Company (Acres)**	**Percent of Total Acreage**
On-Airport					
Avis	$17,000,041	$17,279,327	16.3%	8.0	15.2%
Dollar	$8,230,474	$7,442,544	7.0%	4.8	9.1%
Thrifty	$7,178,415	$6,515,096	6.2%	7.0	13.3%
On- and Off-Airport					
Hertz	$26,578,881	$28,490,873	26.9%	10.8	20.6%
National/Alamo (Vanguard)	$23,006,042	$22,985,553	21.7%	11.3	21.5%
Off-Airport					
Enterprise	$7,741,670	$9,574,383	9.1%	2.5	4.8%
Budget	$10,663,963	$12,200,135	11.5%	8.1	15.4%
E-Z Rent A Car	$237,747	$1,028,338	1.0%	N.A.	N.A.
Fort Lauderdale Auto Leasing Corp.	$121,187	$175,746	0.2%	N.A.	N.A.
Datura	$38,803	$56,905	0.1%	N.A.	N.A.
TOTAL AIRPORT MARKET	**$100,797,223**	**$105,748,900**	**100.0%**	**52.5**	**100.0%**
Growth Rate (2004-2005)		4.9%			

Sources: *Auto Rental News*, 2003; PBI lease exhibits, May 2006; Ricondo & Associates, Inc., May 2006.
Prepared by: Ricondo & Associates, Inc., May 2006.

TABLE 6-8
Comparison of Airports with Individual Remote Rental Car Facilities

Airport	Type of Facility	Gross Revenue (July 2002-June 2003)	Rental Car Area (Acres) 2005[1/]	$1 Million in Gross Revenue
Denver	Individual Remote	$232,233,587	123.0	1.9
Washington Dulles	Individual Remote	$109,308,390	42.0	2.6
Palm Beach	Individual Remote	$81,341,565	52.5	1.5

Sources: Auto Rental News, 2003; PBI lease exhibits, May 2006; Ricondo & Associates, Inc., May 2006.
Prepared by: Ricondo & Associates, Inc., May 2006.

Note:
1/ Only includes land usable for rental car operations.

Total requirements for rental car facilities at PBI are provided in **Table 6-9**. The requirements are based on the assumption that required capacity for individual remote facilities serving the Airport would be sized equivalent to that at a facility that would generate approximately $2.2 million in gross revenue per acre (assumed to be the average of the facilities at Denver and Dulles). Based on existing (2005) gross revenue of $105.7 million at PBI, this ratio generates a total existing demand for about 48 acres (about 91 percent of the existing acreage provided). Using this ratio, it is estimated that the existing acreage demand would be adequate to include market share generated by small off-Airport companies that do not occupy parcels depicted on Exhibit 6-4 (i.e., EZ Rent A Car, Fort Lauderdale Auto Leasing Corp, and Datura). As shown in Table 6-9, it is estimated that the continued operation of individual remote locations would require approximately 60 acres by PAL 8.2 MAP, while 95 acres would be required by PAL 12.9 MAP.

TABLE 6-9
PBI Rental Car Space Requirements (Acres)

Type of Facility	2005	Pal 8.2 MAP (2010)	PAL 9.6 MAP (2015)	PAL 11.2 MAP (2020)	PAL 12.9 MAP (2025)
Individual Remote	48	60	71	81	95

Source: Ricondo & Associates, Inc., June 2006
Prepared by: Ricondo & Associates, Inc., June 2006

As PBI's rental car market continues to grow and on-Airport space becomes constrained, other options for accommodating rental car demand should be explored. One way of reducing the amount of required space is to consolidate rental car operations into one facility. Typically, consolidated rental car facilities are remote from the terminal building and a common bus or automated people mover (APM) system transports customers to and from the terminal building. All rental car customer service counters are located in a common building. A limited number of ready/return spaces are provided for each company consolidated rental car facilities have been constructed or are being planned at more than 30 adjacent to the customer service building. Typically, self-contained maintenance and storage sites are provided adjacent to the ready/return area. Since the mid-1990s, airport operators have been moving toward consolidated rental car facilities for a number of key reasons. Among other things, these facilities: (a) free up land in the terminal core for additional public parking or other revenue-producing activities, (b) reduce traffic and curbside congestion in the terminal core, which, in turn, provides significant environmental benefits from reduced emissions, and (c) increase airport revenues by maximizing the number of on-airport rental car companies.

Similar to the methodology used for estimating requirements for existing rental car facilities at PBI, a comparison of the facilities at airports in large rental car markets with consolidated rental car facilities was created to estimate the amount of space that would be required for a market the size of PBI's. In **Table 6-10,** data for four airports with rental car markets larger (San Francisco and Fort Myers) and smaller (Ontario, California, and Cleveland) than PBI's are provided for comparison. Included in Table 6-10 is the type of facility, amount of gross revenue, total size of the rental car area, and ratio of acreage per $1 million of gross revenue. Even though the airports in the larger markets gross considerably more revenue than PBI, both operate from consolidated rental car facilities that are smaller in overall acreage than the total amount of individual remote facilities used by the rental car companies at PBI.

TABLE 6-10
Comparison of Airports with Consolidated Rental Car Facilities

Airport	Type of Facility	Gross Revenue (July 2002-June 2003)	Rental Car Area (Acres) 2005 [1/]	$1 Million in Gross Revenue
San Francisco	Consolidated	$190,602,492	41.5	4.6
Fort Myers	Consolidated	$111,447,036	25.0	4.4
Palm Beach	Individual Remote	$ 81,341,565	52.5	1.5
Ontario (CA)	Consolidated	$ 66,994,970	25.0	2.7
Cleveland	Consolidated	$ 58,299,548	33.0	1.8

Sources: *Auto Rental News*, 2003; PBI lease exhibits, May 2006; Ricondo & Associates, Inc., June 2006.
Prepared by: Ricondo & Associates, Inc., June 2006.

Note:
[1/] 26.2 acres are owned by PBI and leased to rental car companies; 26.3 acres are owned by the rental car companies; 5.1 acres are unusable and not included in the total rental car acreage**.**

Based on this analysis, it was assumed that the existing rental car market at PBI could be accommodated in a consolidated facility that would be able to generate approximately $3.4 million in gross revenue per acre (assumed to be the average of the facilities at San Francisco, Fort Myers, Ontario, and Cleveland). As shown in **Table 6-11,** this would provide for a consolidated facility 31 acres in size (or approximately 35 percent less than would be required with the individual facilities).

It is estimated that approximately 39 acres would be required to accommodate a consolidated facility to meet demand by 2010, while 61 acres would be required by 2025.

TABLE 6-11
PBI Rental Car Space Requirements (Acres)

Type of Facility	2005	PAL 8.2 MAP (2010)	PAL 9.6 MAP (2015)	PAL 11.2 MAP (2020)	PAL 12.9 MAP (2025)
Consolidated	31	39	46	52	61

Source: Ricondo & Associates, Inc., June 2006.
Prepared by: Ricondo & Associates, Inc., June 2006.