Phoenix-Mesa
Gateway
Airport

Master Plan WORKING PAPER

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FACILITY REQUIREMENTS

Introduction

Presented in the Facility Requirements Chapter are evaluations of the multiple components of the Phoenix-Mesa Gateway Airport (IWA) that afford a variety of aircraft to perform takeoff and landing operations; the ability to continue operations during inclement weather; and receive fuel, repair, and housing services. In short, these are the airside facilities, landside facilities, and airspace system and navigational aids identified in the Inventory Chapter. The purpose of the Facility Requirements Chapter is to assess the ability of existing airport facilities to accommodate current and forecasted demand. This is done in several ways, including evaluating facilities according to the design standards in Advisory Circular (AC) 150/5300-13A, *Airport Design,* that are dependent on the critical aircraft. As part of the Facility Requirements, a critical aircraft analysis and delegation has been completed. The selected critical aircraft, or critical family of aircraft, will be a driving force for the Chapter and remainder of the master plan process.

Critical Aircraft Analysis

Determining the existing and future critical aircraft is paramount during the master plan process. Federal Aviation Administration (FAA) AC 150/5000-17, *Critical Aircraft and Regular Use Determination,* defines critical aircraft as "the most demanding aircraft type, or grouping of aircraft with similar characteristics, that make regular use of the airport." Regular use translates to 500 annual operations (takeoffs and landings), excluding touch-and-go operations.

Based on operational and design characteristics, the Airport Reference Code (ARC) derives from the designated critical aircraft, and is utilized to evaluate current facilities and plan for future development needs. Due to the array of aircraft regularly conducting and predicted to conduct operations at IWA, a critical ARC representing the most demanding group of aircraft that operate at IWA, based on similar characteristics, has been chosen to be most appropriate. AC 150/5000-17 defines similar characteristics as "the practice of grouping aircraft by comparable operational performance and/or physical dimensions." Both operational performance and physical dimensions are characterized by the two components of an ARC: Aircraft Approach Category (AAC) and Airplane Design Group (ADG). Represented by a letter ranging from A-E, AAC refers to aircraft approach speed, the operational characteristic as identified in **Table 3-1**. Characterized by a roman numeral ranging from I-VI, ADG refers to two physical design components of an aircraft, tail height and wingspan as identified in **Table 3-2**.

Table 3-1: Aircraft Approach Category (AAC)

Category	VREF/Approach Speed
A	Approach speed less than 91 knots
B	Approach speed 91 knots or more but less than 121 knots
C	Approach speed 121 knots or more but less than 141 knots
D	Approach speed 141 knots or more but less than 166 knots
E	Approach speed 166 knots or more

Table 3-2: Airplane Design Group (ADG)

Group #	Tail Height (feet)	Wingspan (feet)
I	Less than 20’	Less than 49’
II	20’ - < 30’	49’ - < 79
III	30’ - < 45’	79’ - < 118’
IV	45’ - < 60’	118’ - < 171’
V	60’ - < 66’	171’ - < 214’
VI	66’ - <80’	214’ - < 262’

Source: AC 150/5300-13A, *Airport Design.*

To determine regular usage of IWA facilities, the AAC and ADG of the most demanding aircraft that regularly use IWA were chosen referencing the following:

- ✓ Traffic Flow Management System Counts (TFMSC)
- ✓ 2016 Noise Exposure and Potential Noise Policy Revisions
- ✓ Aviation Activity Forecast Chapter
- ✓ 2018 and 2019 Air Carrier Flight Schedules
- ✓ SkyBridge Arizona

Traffic Flow Management System Counts (TFMSC). The guiding AC for critical aircraft determination requires the most recent 12-month period of aircraft activity be used as a basis for critical aircraft selection. The TFMSC provides a database of arrivals to, and departures from, an airport based on filed flight plans or radar-recognition of an en route aircraft by an airport’s Airport Surveillance Radar (ASR). The database is accessible by the public, and is broken into operations by aircraft type and ARC.

According to the TFMSC summary of arriving flights, approximately 6,022 category C aircraft and 647 category D aircraft conducted landing operations at IWA. ADG-III aircraft proved to be the most demanding, with an arrival count exceeding 5,320. The following non-military C and D category aircraft reportedly operated at IWA in 2017:

- ✓ Airbus 319
- ✓ Airbus 320
- ✓ Boeing 737-400
- ✓ Boeing 737-800
- ✓ Boeing 757-200
- ✓ Bombardier Learjet 55
- ✓ Embraer ERJ-145 EX
- ✓ Gulfstream IV/G400
- ✓ MD-83 and 88

2016 Noise Exposure and Potential Noise Policy Revisions. The Aviation Environmental Design Tool (AEDT), Version 2.0(c), used in the production of updating the 2016 IWA noise contours, is software used to estimate environmental impacts, including noise. To generate aircraft noise information specific to IWA, an aircraft fleet mix projected to operate at IWA is required to be input into the AEDT software. The projected itinerant aircraft fleet input into the AEDT software consisted of 33 non-military aircraft types, and the local aircraft fleet consisted of 13 non-military aircraft types. Aircraft within the study were chosen based on the following assumptions:

- ✓ Future commercial service at IWA would mirror current service, in terms of markets served and the size of aircraft providing service.
- ✓ Older aircraft types (MD-80, B737-300, and B757), noisy business jets, and older military aircraft would be retired from the domestic fleet, and would be replaced by quieter aircraft of similar size and range.

Though the analysis was conducted in 2016, the projected aircraft fleet mix has been proven to operate at IWA through examination of the 2017 TFMSC IWA aircraft arrival database. The following is a list of C and D category aircraft from the AEDT aircraft fleet mix projection:

- ✓ Airbus 319
- ✓ Airbus 320
- ✓ Boeing 737-700
- ✓ Boeing 737-800
- ✓ Boeing 767-300
- ✓ Embraer EMB-145
- ✓ Embraer EMB-190

2018 and 2019 Air Carrier Flight Schedules. Allegiant Air has been IWA's primary air carrier service provider since 2007. During the development of the Aviation Activity Forecast (Forecast) chapter, new air carrier service to and from IWA was announced resulting in a new addition of commercial aircraft to the current fleet. Air carrier flight schedules for the remainder of 2018 and beginning months of 2019 were obtained. The following C and D air carrier fleet with an ADG-II or ADG-III classification are projected to operate at IWA for the remainder of 2018 and beginning months of 2019:

- ✓ Airbus 319 and 320
- ✓ Boeing Douglas MD-80
- ✓ Boeing 737-400
- ✓ Boeing 737-600 (passenger)
- ✓ Boeing 737-700 (winglets; passenger)
- ✓ Boeing 737-800 (scimitar winglets; passenger)
- ✓ Boeing 737-800 (winglets)
- ✓ Embraer RJ 135/140/145

Introduction of Cargo Operations. SkyBridge Arizona (SkyBridge) is the first inland U.S. air cargo hub to house both U.S. and Mexican Customs inspection services[1] and is scheduled to begin all-air cargo carrier service at IWA in the near future. SkyBridge's operational forecast projects the use of a cargo fleet comprised of Boeing 747-400 and Boeing 767-300 freighters.[2] The Boeing 747-400 has an approach speed of 158 knots and a wingspan of 213 feet, deeming it not only an AAC-D, but an ADG-V aircraft. In review of projections provided by SkyBridge, the Boeing 747-400 is anticipated to conduct 416 landings, or 832 total operations, by 2023, or within five years of service beginning, surpassing the 500 annual critical aircraft operational threshold.

Conclusion. Considering the specific safety and operation needs of all aircraft that regularly use the airfield, as required by the AC, the future ARC within this master planning horizon is determined to be D-V. A D-V ARC has been the ARC in the past two master plans, and is representative of all aircraft types that will regularly operate at IWA in the future, including the SkyBridge fleet.

Airside Facility Requirements

As identified in the Inventory Chapter, airside facilities are those that involve aiding an aircraft in transition from land to air. These facilities include runways, taxiways, and aprons. The purpose of evaluating airside facilities is to ensure they can accommodate critical aircraft and meet FAA design standards. Design standards for runways, taxiways, aprons, safety areas, object free areas, and other physical airport features are predicated on the ARC and instrument approach availability. The following narrative will detail all airside facility matters including:

- ✓ Airfield Capacity
- ✓ Runway Length and Pavement Condition
- ✓ Runway, Taxiway, and Apron Design

Airfield Capacity

Airfield capacity is defined as the maximum number of aircraft operations that a specific airfield configuration can accommodate within a specific time interval of continuous demand. Used by the FAA as an indicator of relative operating capacity, Annual Service Volume (ASV) is a reasonable estimate of an airport's annual capacity that accounts for differences in runway use, aircraft mix, weather conditions, and more encountered over a year's time. ASV assumes an acceptable level of aircraft delay, as described in FAA AC 150/5060-5, *Airport Capacity and Delay*. Existing and forecast annual demand is compared with the ASV to

[1] SkyBridge Arizona Concept Master Plan, Final Document Draft, September 2018.
[2] Preliminary projections by Mesa SkyBridge, LLC

determine the percentage capacity at which the airport is operating, and to gauge the timing of future airfield capacity improvements. As annual demand approaches ASV, average delays increase. Airport capacity is not always constant and will likely change over time depending on airfield and airspace geometry, Air Traffic Control procedures, weather, fleet mix, and airport improvements.

For this master plan, the capacity analysis utilizes conclusions provided in the January 2017, *Airport Land Use Compatibility Plan Update* prepared for IWA, in which the ASV for IWA was calculated to be 498,000 annual operations[3], as depicted in **Table 3-3**. The key variables used in calculating the ASV include:

- ✓ Operations (takeoffs and landings) by user category. This establishes a baseline annual demand level, which is then correlated with a weighted peak hour demand level as part of the ASV calculation.
- ✓ Generalized aircraft category mix. This variable accounts for the differences in required aircraft separation distances, which influence the number of operations that can be accommodated on the runway at any given time. Heavier aircraft require greater separation from lighter aircraft due to their greater wake turbulence.
- ✓ Touch-and-go activity (local operations). These types of operations require less runway occupancy time than itinerant operations. They contribute to a higher ASV on runways with high proportions of touch-and-go activity.
- ✓ Average peak hour operations during peak month. This is correlated with the average annual demand as part of the ASV calculation.
- ✓ Runway configuration (three parallel runways). The number of runways and their configuration influences ASV. The more runways an airport has, the more activity it can accommodate. Parallel runways tend to increase ASV, compared with crossing runways, because of the potential to use all simultaneously without the possibility of crossing conflicts.
- ✓ Average annual runway use by direction. Calculations of ASV for each runway direction must first be calculated to obtain the overall ASV.
- ✓ Percent arrivals and departures. Arrivals and departures are assumed to be equal.
- ✓ Qualifying exit taxiways. Exit taxiways must be within a certain location from the threshold and at a certain distance away from each other to positively contribute to ASV. Exit taxiways influence runway occupancy time for arrivals. The more qualifying exit taxiways there are, the less the runway occupancy time, and the greater the ASV for that runway.
- ✓ Weather conditions. Visual Meteorological Conditions (VMC) were assumed 100 percent of the time (Instrument Meteorological Conditions [IMC] occur less than one percent of the time over an average year, and has negligible effect on the calculation of ASV). A relatively large percentage of IMC would reduce ASV due to the greater aircraft separation distances required.

[3] Ricondo & Associates, Inc. Phoenix-Mesa Gateway Airport, *Airport Land Use Compatibility Plan Update*, January 2017.

Table 3-3: Annual Service Volume by User Category

User Category	Operations		
	Itinerant	Local	Total
Air Carrier	32,123	0	32,123
Air Taxi	50,819	0	50,819
General Aviation	159,904	247,383	407,287
Military	3,755	4,017	7,772
Total	246,600	251,400	498,000

Source: Ricondo & Associates, Inc. Phoenix-Mesa Gateway Airport, *Airport Land Use Compatibility Plan Update, January 2017.*

In 2038, the airfield will operate at 77.2 percent of its ASV when compared to IWA's Master Planning High Growth Scenario operational forecast of 384,386 annual aircraft operations[4]. No major airfield changes will be required at IWA for capacity or delay issues.

Runway Length Analysis and Pavement Condition

The performance requirements of the critical aircraft designated for a runway determines the recommended runway length. Performance capabilities of individual aircraft are, in turn, affected by factors including the aircraft payload and fuel load, runway elevation, wind conditions, and air temperature.

Currently, Runway 12R/30L is 10,401 feet long, Runway 12C/30C is 10,201 feet long, and Runway 12L/30R is 9,300 feet long. At these lengths, the runways adequately serve the aircraft now operating at IWA.

This section examines whether the available runway length meets the needs not only of existing users, but also those of future critical aircraft serving future destinations. To analyze the runway requirements for these new aircraft types, an understanding of the factors that impact aircraft performance is necessary. The following paragraphs explain the terminology and variables used in the runway length assessment.

Elevation. IWA has six runway ends from which aircraft can operate, ranging from 1,340 feet above mean sea level (AMSL) to 1,383 feet AMSL, which is the official airport elevation.

International Standard Atmosphere (ISA). This mathematical model describes how the earth's atmosphere, or air pressure and density, change depending on altitude. The atmosphere is less dense at higher elevations. ISA is frequently used in aircraft performance calculations because deviation from ISA will

[4] Ibid.

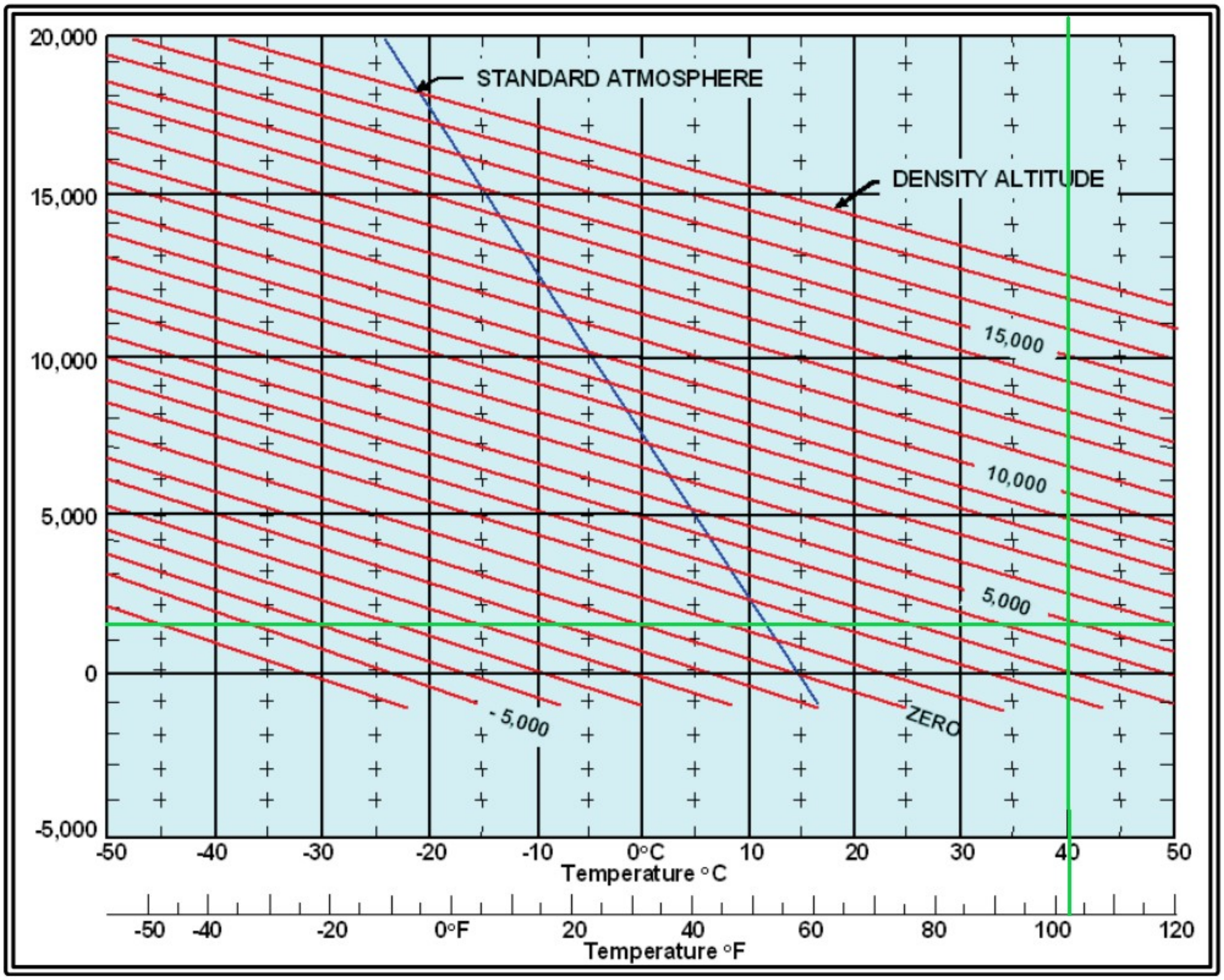
change how an aircraft performs. ISA at sea level occurs when the temperature is 59°F. ISA at IWA's 1,383 feet AMSL occurs when the temperature is 52°F.

Density Altitude (DA). This measurement comparing air density at a point in time and specific location to ISA is a critical component of aircraft performance calculations. Density altitude is used to understand how aircraft performance differs from the performance that would be expected under ISA. Density altitude is primarily influenced by elevation and air temperature. To examine the effect of changes to either variable, this calculation holds the other variable constant.

- ✓ **When elevation is constant:** When air temperature increases, DA increases. When air temperature decreases, DA decreases. This comparison is often used when analyzing aircraft performance at an airport during different times of the day and different days of the year.
- ✓ **When temperature is constant:** When elevation increases, DA increases. When elevation decreases, DA decreases. This comparison, which is not often used, can be employed to compare aircraft performance at different airports under identical climate conditions.

Figure 3-1 illustrates how DA is impacted when factoring in the average maximum daily temperature of the hottest month (103°F) for IWA. The result is a density altitude increased to approximately 4,900 feet MSL.

Figure 3-1: **Density Altitude for IWA Average Maximum Temperature**



Source: Federal Aviation Administration

For year-round planning purposes, density altitude of 4,900 feet MSL is assumed for the aircraft performance-based runway length analysis here.

Future Fleet and Range. Density altitude, aircraft takeoff weight, and aircraft performance are the three primary factors to be considered when determining runway length requirements for critical aircraft. Aircraft takeoff weight is directly related to the distance of the flight. For shorter distances, aircraft may be able to depart with a full passenger load and less than full fuel tanks. In those instances, the aircraft will typically be departing below maximum takeoff weight (MTOW) and experience better takeoff performance. Aircraft typically require more fuel for longer trips. A full passenger load and full load of fuel will be close to the aircraft's MTOW.

The Airport's most demanding route/fleet combinations are listed below, and were analyzed for this runway length analysis:

- ✓ Cargo Boeing 747-400F with a 2,000 nautical miles (nm) range (planned)
- ✓ Cargo Boeing 767-300F with a 2,000 nm range (planned)
- ✓ Boeing 737-800 to Edmonton, Canada (1,384 nm)

The following analysis documents the specific destination, equipment combination, payload available, and resulting takeoff weight. Resulting takeoff weights are then used with the aircraft manufacturer's performance tables contained in their respective airport planning manuals to determine a runway length requirement for the future.

Runway Length Recommendation. It is expected that Boeing 747-400F cargo aircraft will provide service to destinations within a 2,000 nm radius of IWA. A maximum payload for the Boeing 747-400 for a 2,000 nm destination would result in an approximate takeoff weight of 740,000 pounds. This configuration would require approximately 9,500 feet of runway length for departures.

The usage of a Boeing 767-300F cargo aircraft is also expected to serve IWA in the future. Like the Boeing 747-400F, the Boeing 767-300F will serve destinations within a 2,000 nm radius of IWA. Maximum payload for the Boeing 767-300F for destinations within 2,000 nm would result in an approximate takeoff weight of 351,000 pounds. This configuration would require approximately 8,900 feet of runway length for departures.

The most demanding route and aircraft combination currently at IWA is the Boeing 737-800 route to Edmonton, Canada (1,384 nm), operated by WestJet. Operating on this route with a maximum payload results in an approximate takeoff weight of 162,500 pounds. This configuration requires an approximate runway length of 9,500 feet for departures.

Table 3-4 summarizes the runway length and weight requirements needed for the existing and future fleet at IWA. The existing runway lengths are expected to remain adequate throughout the planning period.

Table 3-4: Runway Length Requirements

Aircraft Type	Takeoff Length Required for Farthest Expected Destination (Feet)
Existing Fleet	
Boeing 737-800	9,500’
Airbus 320	8,500’
Future Fleet	
Boeing 747-400	9,500’
Boeing 767-300 Freighter	8,900’

Source: Mead and Hunt.

Pavement Condition. In 2017, select airfield pavement at IWA underwent a Pavement Condition Index (PCI) and Airfield Classification Number-Pavement Classification Number (ACN-PCN) assessment as part of the Arizona Department of Transportation (ADOT) Airport Pavement Management System (APMS) update. Only pavement that had been constructed or reconstructed since the last APMS (2014) was assessed, excluding singular sections of Runways 12C/30C and 12R/30L that have not been reconstructed since 1958. These sections were included for reference purposes. The PCI assessment proved airfield pavement at IWA is in excellent condition, except the singular sections of Runway 12C/30C and Runway 12R/30L. These sections were identified as having lower PCIs partially due to load-related stress.

An ACN is defined as a number that expresses the relative effect of an aircraft at a given weight on a pavement structure for specified standard subgrade strength. The higher an ACN is, the greater effect that aircraft has on certain pavement. A PCN is assigned to a pavement and expresses the relative load carrying capacity of that pavement in terms of allowable load for unrestricted operations, based on aircraft departures (frequency and weight) and pavement layer properties. To avoid structural damage to airfield pavement, aircraft should only operate on pavement with a PCN equivalent to the aircraft’s ACN, or on pavement with a PCN higher than the aircraft’s ACN. Infrequent overloads are permitted, but should be avoided on a constant basis. The ACN-PCNs calculated in the APMS report are reflective of an aircraft fleet that did not include operations by Boeing 747-400F or Boeing 767-300F cargo aircraft; therefore, an ACN for neither aircraft was determined. Using a Boeing 747-400F ACN of 88 and a Boeing 767-300F ACN of 65 calculated by Transport Canada, the section of Runways 12C/30C and 12R/30L constructed in 1958 cannot support operations by either aircraft as the PCNs are 25 and 24, respectively. Though the remaining section of Runway 12C/30C is 66, the lowest PCN is considered the controlling PCN of the entire branch (comprised of sections). The highest PCN of Runway 12R/30L is 73, which is not sufficient for Boeing 747-400F operations. Taxiway C has a PCN of 55, and also cannot support Boeing 747-400F or Boeing 767-300F operations.

In addition to the PCIs and ACN-PCNs, allowable aircraft weights were calculated. The section of Runway 12C/30C and Runway 12R/30L constructed in 1958 have a dual tandem allowable aircraft weight of 140,000 and 149,000 pounds, respectively. The remaining section of Runway 12C/30C has a dual tandem allowable aircraft weight of 402,000 pounds. The remaining sections of Runway 12R/30L have a dual tandem allowable aircraft weight of 423,000 and 446,000 pounds. The 1958-constructed pavement section of Runway 12C/30C and Runway 12R/30L cannot accommodate Boeing 767-300F operations unless reconstructed. Neither Runway 12R/30L or Runway 12C/30C can accommodate Boeing 747-400F operations unless reconstructed.

Runway Design

The appropriate design of individual runways is accomplished through adherence to FAA dimensional standards based on the Runway Design Code (RDC). The RDC is comprised of three components, the AAC and ADG, known as the ARC presented earlier, and lowest visibility minimum. Visibility minimums are dependent on the lowest designated, or planned, instrument approach procedure and supporting instrumentation available to a runway end. Runway design, protection, and separation criteria, including Runway Safety Areas (RSA), parallel runway separation, and runway to taxiway separation are determined by RDC and Taxiway Design Group (TDG), which will be discussed in a later section.

Since aircraft utilization, visibility minimums, and instrumentation vary per runway, RDCs may not be the same for every runway. Though the Inventory Chapter designated Runways 12R/30L, 12C/30C, and 12L/30R as the General Aviation (GA) runway, the instrument runway, and the heavy aircraft runway respectively, runway utilization is dependent on weather conditions, pilot preference, and Air Traffic Control Tower (ATCT) instruction. As a result, all runways are D-V. Visibility minimums vary per runway at IWA; therefore, so do the third component of their RDCs.

Runway 12R/30L. Runway 12R/30L is equipped for instrument procedures with visibility minimums not lower than one mile. For RDC purposes, instrument approach visibility minimums are expressed as Runway Visual Range (RVR) values in feet. An RVR of 5,000 feet is equivalent to visibility not lower than one mile. The RDC for Runway 12R/30L is D-V-5000 and, as noted in **Table 3-5**, has no deficiencies at this time.

Table 3-5: Runway 12R/30L Runway Design Table

Runway Design Code: D-V-5000 (Not lower than 1-mile visibility)					
Design Criteria	FAA Design Standards	Existing Conditions 12R/30L		Are Standards Met? 12R/30L	
Runway Design					
Runway width	150’	150’		Yes	
Shoulder width	35’	35’		Yes	
Blast Pad length	400’	400’	400’	Yes	Yes
Blast Pad width	220’	220’	220’	Yes	Yes
Runway Protection					
Runway Safety Area (RSA)					
Length beyond departure end	1,000’	1,000’	1,000’	Yes	Yes
Length prior to threshold	600’	600’	600’	Yes	Yes
Width	500’	500’	500’	Yes	Yes
Runway Object Free Area (ROFA)					
Length beyond runway end	1,000’	1,000’	1,000’	Yes	Yes
Length prior to threshold	600’	600’	600’	Yes	Yes
Width	800’	800’	800’	Yes	Yes
Runway Obstacle Free Zone (ROFZ)					
Length beyond runway end	200’	200’	200’	Yes	Yes
Width	400’	400’	400’	Yes	Yes
Runway Protection Zone (RPZ)					
Length	1,700’	1,700’	1,700’	Yes	Yes
Inner width	500’	500’	500’	Yes	Yes
Outer width	1,010’	1,010’	1,010’	Yes	Yes
Runway Separation (Runway centerline to:)					
Parallel runway centerline (Rwy 12C/30C)	1,200’[1]	1,500’	1,500’	Yes	Yes
Holding position	250’	250’	250’	Yes	Yes
Parallel taxiway/taxilane centerline	450’	450’	450’	Yes	Yes
Aircraft parking area	500’	500’+	500’+	Yes	Yes

Source: AC 150/5300-13A and Mead and Hunt Analysis.

Note[1]: AC 150/5300-13A lists the standard separation for simultaneous parallel runway operations in Visual Flight Rules (VFR) conditions as 700 feet, but recommends 1,200 feet for ADG V and VI runways. For simultaneous departures or approaches and departures during Instrument Flight Rules (IFR) conditions, a separation of 2,700 feet must exist between Runways 12R/30L and 12C/30C. This is explained further in the *Parallel Runway Separation* section.

Runway 12C/30C. Runway 12C/30C is considered the instrument runway at IWA. An instrument approach with a visibility minimum of ¾ mile is available to Runway 30C. As a result, Runway 12C/30C has an RDC of D-V-4000 (RVR value 4,000 is equivalent to visibility lower than 1 mile, but not lower than ¾ mile). According to AC 150/5300-13A, runways with instrument approach procedures with visibility minimums below one mile are required to be served by a full parallel taxiway. Runway 12C/30C is not served by a full parallel taxiway;

however, a full parallel taxiway is shown for future development on the current Airport Layout Plan (ALP). Taxiway evaluations are discussed in the subsequent section. **Table 3-6** details the evaluation of Runway 12C/30C according to RDC D-V-4000 design standards.

Table 3-6: **Runway 12C/30C Runway Design Table**

Runway Design Code: D-V-4000 (Not lower than ¾ mile)						
Design Criteria	**FAA Design Standards**		**Existing Conditions 12C/30C**		**Are Design Standards Met? 12C/30C**	
Runway Design						
Runway width	150’		150’		Yes	
Shoulder width	35’		35’		Yes	
Blast Pad length	400’		400’	400’	Yes	Yes
Blast Pad width	220’		220’	220’	Yes	Yes
Runway Protection						
Runway Safety Area (RSA)						
Length beyond departure end	1,000’		1,000’	1,000’	Yes	Yes
Length prior to threshold	600’		600’	600’	Yes	Yes
Width	500’		500’	500’	Yes	Yes
Runway Object Free Area (ROFA)						
Length beyond runway end	1,000’		1,000’	1,000’	Yes	Yes
Length prior to threshold	600’		600’	600’	Yes	Yes
Width	800’		800’	800’	Yes	Yes
Runway Obstacle Free Zone (ROFZ)						
Length beyond runway end	200’		200’	200’	Yes	Yes
Width	400’		400’	400‘	Yes	Yes
Precision Obstacle Free Zone (POFZ)						
Length	200’		N/A	200’	N/A	Yes
Width	800’		N/A	800’	N/A	Yes
Inner-Approach Obstacle Free Zone						
Length beyond last light unit of ALS	200’		N/A	200’	N/A	Yes
Width	400’		N/A	400’	N/A	Yes
Slope	50:1		N/A	50:1	N/A	Yes
Runway Protection Zone (RPZ)						
Length	1,700’	1,700’	1,700’	1,700’	Yes	Yes
Inner width	500’	1,000’	500’	1,000’	Yes	Yes
Outer width	1,010’	1,510’	1,010’	1,510’	Yes	Yes
Runway Separation (Runway centerline to:)						
Parallel runway centerline (Rwy 12R/30L)	1,200’[1]		1,500’	1,500’	Yes	Yes
Parallel runway centerline (Rwy 12L/30R)	700’		1,000’	1,000’	Yes	Yes
Holding position	250’		400’	285’	Yes	Yes
Parallel taxiway/taxilane centerline	450’		N/A	N/A	N/A	N/A
Aircraft parking area	500’		500’+	500’+	Yes	Yes

Source: AC 150/5300-13A and Mead and Hunt Analysis

Note[1]: AC 150/5300-13A lists the standard separation for simultaneous parallel runway operations in VFR conditions as 700 feet but recommends 1,200 feet for ADG V and VI runways. For simultaneous departures or approaches and departures during IFR conditions, a separation of 2,700 feet must exist between Runways 12C/30C and 12R/30L. This is explained further in the *Parallel Runway Separation* section.

Runway 12L/30R. Unlike Runways 12R/30L and 12C/30C, Runway 12L/30R is not equipped for instrument approach procedures. As a result, the RDC for Runway 12L/30R is D-V-VIS (visual). No Runway 12L/30R deficiencies exist at this time, as seen in **Table 3-7**.

Runway Protection Zones (RPZ). Runway protection zones are located within the approach and departure path of a runway beginning 200 feet beyond the runway threshold. They are centered about the extended runway centerline and vary in dimensions depending on visibility minimums of an RDC. Trapezoidal in shape, the purpose of an RPZ is to enhance the protection of people and property on the ground. This is best achieved by minimizing and/or eliminating mandated incompatible land uses and activities set forth in AC 150/5300-13A and FAA *Interim Guidance on Land Uses Within a Runway Protection Zone* (FAA Interim Guidance).

AC 150/5300-13A and the FAA Interim Guidance provide different insights on an RPZ. The AC states it is desirable to clear the entire RPZ of all above-ground objects, then briefly lists permissible activities and land uses within an RPZ. In contrast, the FAA Interim Guidance documents incompatible land uses and activities in the event RPZ dimensions increase due to various factors, such as an airfield project or a change in critical design aircraft. This suggests incompatible land uses and activities located within an existing RPZ are permitted, given the dimensions do not increase. The FAA Interim Guidance identifies a proposal for local development within an RPZ that results in incompatible land uses as the only factor that results in a non-standard RPZ, regardless of change in dimensions.

The FAA prefers airport sponsors possess ownership of the land within RPZs to minimize and/or eliminate incompatible land use and activities. Ownership grants an airport the ability to mitigate current and preclude future incompatibilities. Land within all RPZs at IWA are on airport property and owned via fee simple title, except the RPZ of Runway 30R, as seen in **Figure 3-2**. It is intersected by a public road, Ellsworth Road, which is considered an incompatible land use. Approximately 0.56 acres of land within the RPZ is located beyond Ellsworth. Though IWA does not completely own the land within the RPZ of Runway 30R and a road within an RPZ is considered an incompatible land use, IWA owns an avigation easement for the 0.56 acres beyond airport property. The avigation easement is sufficient.

Table 3-7: **Runway 12L/30R Runway Design Table**

Runway Design Code: D-V-VIS (Visual approach only)					
Design Criteria	**FAA Design Standards**	**Existing Conditions 12L/30R**		**Are Standards Met? 12L/30R**	
Runway Design					
Runway width	150’	150’		Yes	
Shoulder width	35’	35’		Yes	
Blast Pad length	400’	400’	400’	Yes	
Blast Pad width	220’	220’	220’	Yes	
Runway Protection					
Runway Safety Area (RSA)					
Length beyond departure end	1,000’	1,000’	1,000’	Yes	Yes
Length prior to threshold	600’	600’	600’	Yes	Yes
Width	500’	500’	500’	Yes	Yes
Runway Object Free Area (ROFA)					
Length beyond runway end	1,000’	1,000’	1,000’	Yes	Yes
Length prior to threshold	600’	600’	600’	Yes	Yes
Width	800’	800’	800’	Yes	Yes
Runway Obstacle Free Zone (ROFZ)					
Length beyond runway end	200’	200’	200’	Yes	Yes
Width	400’	400’	400’	Yes	Yes
Runway Protection Zone (RPZ)					
Length	1,700’	1,700’	1,700’	Yes	Yes[1]
Inner width	500’	500’	500’	Yes	Yes
Outer width	1,010’	1,010’	1,010’	Yes	Yes
Runway Separation (Runway centerline to:)					
Parallel runway centerline (Rwy 12R/30L)	700’[2]	1,000’	1,000’	Yes	Yes
Holding position	250’	250’+	255’	Yes	Yes
Parallel taxiway/taxilane centerline	450’	450’	450’	Yes	Yes
Aircraft parking area	500’	500’+	500’	Yes	Yes

Source: AC 150/5300-13A and Mead and Hunt Analysis.

Note[1]: IWA owns an avigation easement for land within the RPZ of Runway 30R.

Note[2]: AC 150/5300-13A lists the standard separation for simultaneous parallel runway operations in VFR conditions as 700 feet but recommends 1,200 feet for ADG V and VI runways. For simultaneous departures and approaches and departures, parallel runways in IFR conditions must have a separation of 2,500 feet. This is explained further in the *Parallel Runway Separation* section.

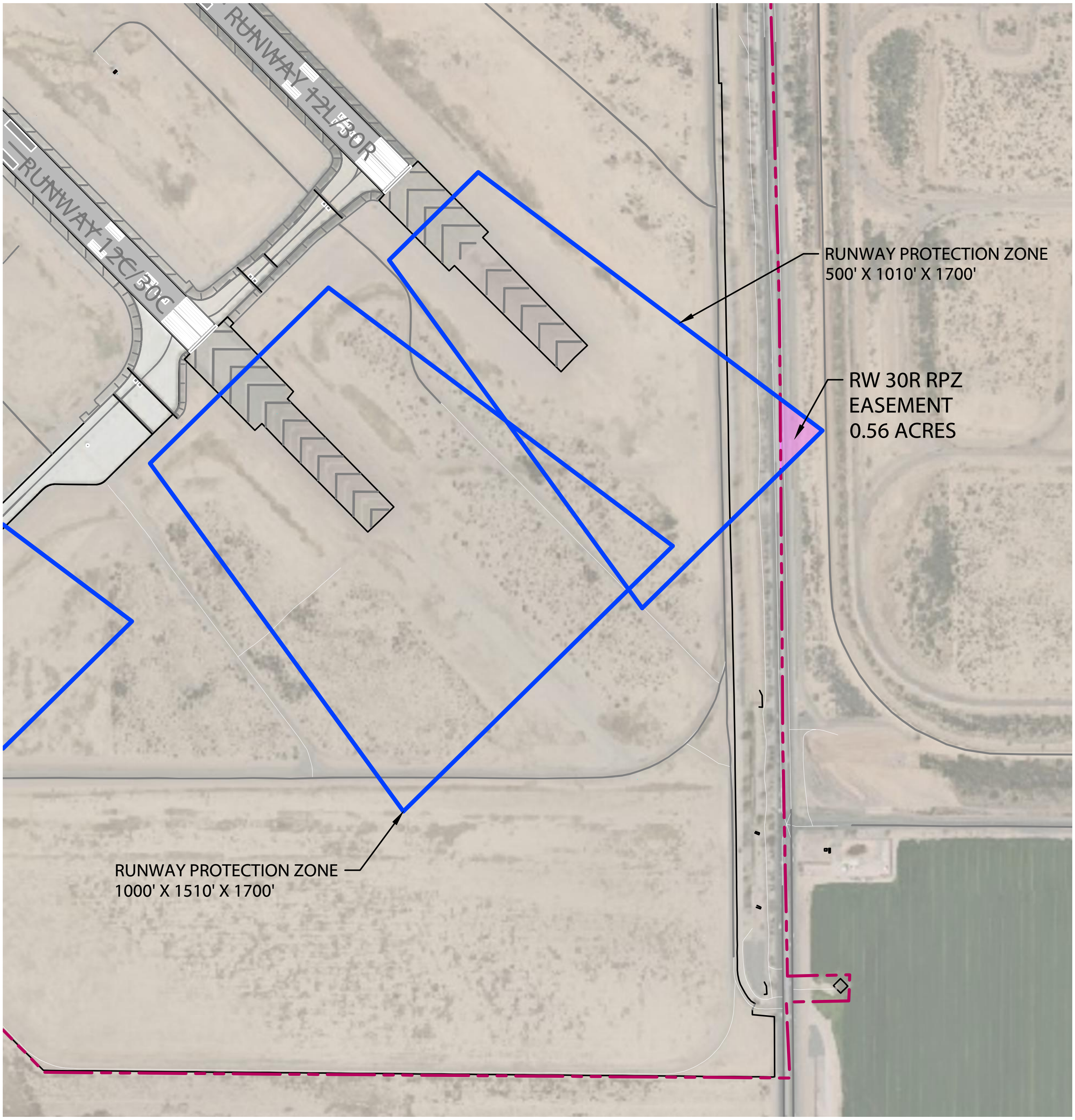


Figure 3-2:
Runway Protection Zones

Parallel Runway Separation. The following narrative details IWA's ability to accommodate simultaneous Visual Flight Rules (VFR) and Instrument Flight Rules (IFR) operations. Parallel runways are beneficial as they afford simultaneous operations and, therefore, increase airfield capacity. Due to wake vortices, various wingspans and, in some cases, aircraft not aligning on centerline on final approach or when landing, separation standards between runways have been established. Centerline-to-centerline separation for simultaneous operations on parallel runways is dependent on the type of operation. For simultaneous VFR operations on parallel runways, centerline-to-centerline separation must be 700 feet. However, AC 150/5300-13A recommends 1,200 feet separation for parallel runways having an ADG of IV or V. The existing separation distance of 1,500 feet between Runways 12R/30L and 12C/30C meets and exceeds these standards. The existing separation of 1,000 feet between Runways 12C/30C and 12L/30R meets the simultaneous VFR operations standards, but does not meet the recommended separation standard for runways having an ADG of IV or V. Since separation criteria of 700 feet is met between all runways, aircraft may conduct VFR operations simultaneously on Runways 12R/30L, 12C/30C, and 12L/30R.

Instrument procedures are established for Runways 12R/30L and 12C/30C. According to AC 150/5300-13A, parallel runways 12R/30L and 12C/30C must have a minimum centerline-to-centerline separation of 2,500 feet to accommodate simultaneous IFR departures in a radar environment. Separation requirements vary for simultaneous approach and departure operations on parallel runways that have staggered thresholds. The thresholds of Runways 12R/30L and 12C/30C are staggered and as a result, Runway 30C is considered the near threshold and Runway 30L is considered the far. To accommodate a simultaneous approach to a near threshold and departure from a far threshold, the minimum centerline to centerline separation is 2,300 feet. If an instrument approach is to the far threshold and a simultaneous departure from the near, the minimum centerline-to-centerline separation is 2,700 feet. Though a minimum of 2,500 feet is required, Runways 12R/30L and 12C/30C should be a minimum centerline-to-centerline separation of 2,700 feet to afford simultaneous IFR operations due to the staggered thresholds. The existing centerline-to-centerline separation is 1,500 feet and, therefore, does not meet separation criteria for simultaneous IFR approaches and departures. During IFR conditions, both runways will be considered as one runway requiring aircraft to approach or depart singularly per runway.

Runway combination 12R/30L and 12C/30C and runway combination 12L/30R and 12C/30C are considered singular due to a centerline-to-centerline separation requirement of 2,500 feet when wake turbulence exists. This separation requirement is met between Runways 12R/30L and 12L/30R; therefore, simultaneous operations can proceed as normal if operating on these runways.

Taxiway Design

Taxiways and taxilanes are designed according to current and future aircraft wingspans (ADG), wingtip clearance, and aircraft undercarriage, referred to as the landing gear (Taxiway Design Group [TDG]). Inclusion of wingspan and wingtip clearance in taxiway design assures adequate taxiway separation and protection. Wingtip clearance is defined as the maximum horizontal distance between wingtips. Pilots of large aircraft are typically not able to see their wingtips and, as a result, wingtip clearances are established per ADG to ensure an aircraft's wing does not collide with a fixed or movable object.

Taxiway Design Group considers aircraft undercarriage dimensions and is comprised of two components: Cockpit to Main Gear distance (CMG) and Main Gear Width (MGW). As stated in its name, CMG is the distance from the cockpit of an aircraft to the main landing gear. MGW is the distance between the outer tires of the main landing gear. Taxiways and taxilanes should be designed to accommodate the MGW of the most demanding aircraft. Though taxiways and taxilanes are designed for cockpit-over-centerline taxiing, taxiways and taxilane design should be sufficiently wide to allow for wander from the centerline. Cockpit-over-centerline taxiing is not always achieved for various reasons, such as when turning. Wander from centerline is provided by the Taxiway Edge Safety Margin (TESM), which is measured from the outside of the landing gear to the taxiway edge and should be maintained throughout the entire length of the taxiway. Taxiway widths assigned to TDGs account for TESM.

The taxiway system at IWA has been divided and evaluated using several different ADGs and TDGs, based on current and future aircraft utilization, and design limitations. Taxiways and taxilanes with ADGs and TDGs of II, III, and V are present at IWA and, therefore, taxiway separation and width requirements vary. **Figure 3-3** illustrates the various TDGs at IWA.

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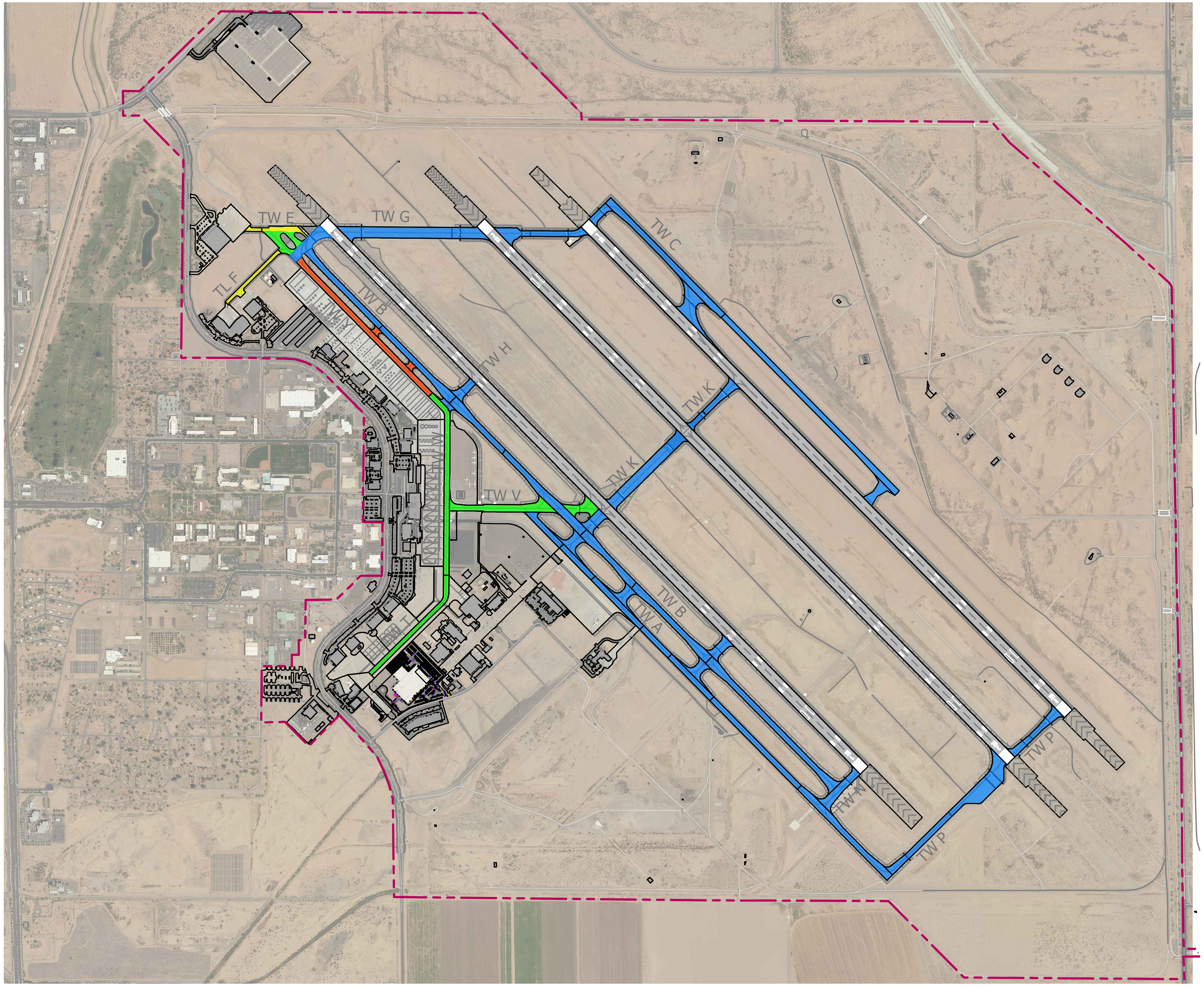


Legend

- Taxiway Design Group II
- Taxilane Design Group III
- Taxiway Design Group III
- Taxiway Design Group V

NOTE: Taxiway Design Group IV operations are permitted on Taxiway T and a segment of Taxiway W prior to Taxiway V if wing walkers are present to assist aircraft.

Phoenix-Mesa **Gateway** Airport

Figure 3-3:
Taxiway Design Group Map

ADG/TDG V Taxiways. SkyBridge's cargo fleet of Boeing 767-300 and 747-400 freighters have a TDG V classification. However, the Boeing 767-300F has an ADG IV classification. Despite its different ADG, taxiways predicted to be used by the Boeing 767-300F are evaluated using ADG and TDG V standards, as presented in **Table 3-8** and **Table 3-9.**

Taxiway B is considered an ADG and TDG V taxiway due to it serving Runway 12R/30L. Its dual taxiway, Taxiway Y, is not ADG or TDG V. According to the Airport Facilities Directory (AFD), operations on Taxiway Y are restricted to aircraft with wingspans less than 79 feet, thus indicating the taxiway is ADG and TDG I and II. Since Taxiways B and Y are parallel taxiways with differing ADGs, the wingtip clearance requirement is used for taxiway-to-taxiway separation. Using the most demanding wingspans of both ADGs, the required wingtip clearance of 53 feet is not met.

The Taxiway/Taxilane Safety Area (TSA) is centered on the taxiway/taxilane centerline, and ensures taxiway protection needed for the occasional aircraft overrun and support of airport/aircraft support vehicles/equipment, such as Aircraft Rescue and Fire Fighting (ARFF). TSAs must be:

- ✓ Cleared and graded.
- ✓ Drained by grading or storm sewers.
- ✓ In dry conditions, capable of supporting Snow Removal Equipment (SRE), ARFF equipment, and the occasional passage of aircraft without causing structural damage to the aircraft or its occupants.
- ✓ Free of objects unless an object needs to be located in the TSA because of its function. If an object needs to be located within the TSA and is taller than three inches, the object should be mounted on frangible structures.

The Taxiway Object Free Area (TOFA) guarantees taxiway protection by encompassing the TSA and wingtip clearance in its dimensions. Precluded in this area are parked aircraft, service vehicle roads/access roads, and other objects, unless the object must be located there for its function. The TSAs and TOFAs of Taxiways G, K, and P, between Runways 12R/30L and 12C/30C, and Taxiway P, between Runways 30C and 30R, are intersected by airport service roads. Markings signaling airport vehicles to stop are located on these roads outside of the TOFAs; therefore the TOFAS of the aforementioned taxiways meet design standards.

Unprotected soils adjacent to a taxiway are susceptible to jet blast erosion that could potentially lead to ingestion problems for jet engines that overhang the taxiway edge. For these reasons, paved shoulders that run the full length of the taxiway are required for taxiways/taxilanes accommodating aircraft with an ADG of IV or higher. Taxiway G's paved shoulders, between Runways 12R and 12C, and Taxiway K's paved shoulders, between Runways 12R/30L and 12C/30C, are not paved throughout the entire length of the taxiways, as noted in **Table 3-9.** The taxiway shoulders should be constructed to a width of 30 feet to meet standards.

Table 3-8: ADG V Taxiway Design Standards

Taxiway Protection			Taxiway Separation		Wingtip Clearance	Are standards met?
	Taxiway Safety Area	Taxiway Object Free Area	Taxiway Centerline to Parallel Taxiway Centerline	Taxiway Centerline to Fixed or Movable Object	Taxiway Wingtip Clearance	
Design Standards	214 feet	320 feet	267 feet	160 feet	53 feet	
Taxiway B	214’	320’	160’ (to TWY Y)[1] 340’ (to TWY A)	160’	13.5’[2]	No. (Wingtip clearance)
Taxiway B4	214’	320’	1,415’ (to TWY L) 997’ (to TWY K)	160’	Met and exceeded.	Yes
Taxiway C	214’	320’	N/A	160’	Met and exceeded.	Yes
Taxiway C1	214’	320’	1,710’ (to TWY C2)	160’	Met and exceeded.	Yes
Taxiway C2	214’	320’	1,710’ (to TWY C1) 3,600’ (to TWY C3)	160’	Met and exceeded.	Yes
Taxiway C3	214’	320’	3,600’ (to TWY C2)	160’	Met and exceeded.	Yes
Taxiway G	214	320’	1,520’ (to TWY B2)[3]	160’	Met and exceeded.	Yes
Taxiway P	214’	320’	1,270’ (to TWY N)	160’	Met and exceeded.	Yes
Taxiway A	214’	320’	340’	160’	Met and exceeded.	Yes
Taxiway H	214’	320’	2,010’ (to TWY G)	160’	Met and exceeded.	Yes
Taxiway L	214’	320’	1,416’ (to TWY B4) 2,500’ (to TWY N)	160’	Met and exceeded.	Yes
Taxiway K	214’	320’	267’[4]	160’	Met.	Yes
Taxiway N	214’	320’	2,500’ (to TWY L)	160’	Met and exceeded.	Yes

Source: AC 150/5300-13A and Mead and Hunt Analysis.

Note[1]: Taxiways B and Y are of differing ADGs and TDGs and as a result taxiway centerline to parallel taxiway centerline is dependent on taxiway wingtip clearance of the most demanding ADG.
Note[2]: Distance between the most demanding wingspans of ADG II and V.
Note[3]: The remainder of Taxiway G between Runways 12R/30L, 12C/30C, and 12L/30R exceed the 267 ft. separation standard.
Note[4]: ADG standards are met by all sections of Taxiway K. The 267 ft. taxiway centerline to parallel taxiway centerline was measured between the portion of Taxiway K leading from the cargo apron and Taxiway V. Taxiway K between Runways 12R/30L, 12C/30C, and 12L/30R exceed the 267 ft. separation standard.

Table 3-9: TDG V Taxiway Design Standards

	Taxiway Width	Taxiway Edge Safety Margin[1]	Taxiway Shoulder Width	Are Standards Met?
Design Standards	75 feet	15 feet	30 feet	
Taxiway B	75’	19’	35	Yes
Taxiway B4	130’	46.5’	35’	Yes
Taxiway C	75’	19’	35’	Yes
Taxiway C1	103’	33’	35’	Yes
Taxiway C2	325’	144’	35’	Yes
Taxiway C3	90’	26.5’	30’	Yes
Taxiway G (between RWYs 12R and 12C)	150’	56.5’	---	Shoulders are not paved throughout.
Taxiway G (between RWYs 12C and 12L)	75’	19’	35’	Yes
Taxiway P	75’	19’	35’	Yes
Taxiway H	108’	35.5’	35’	Yes
Taxiway L	130’	46.5’	35’	Yes
Taxiway K (between RWYs 12C and 12L)	75’	19’	35’	Yes
Taxiway K (between RWYs 12R and 12C)	150’	56.5’	---	Shoulders are not paved throughout.
Taxiway K (between RWY 12R and Cargo Apron)	150’	56.5’	35’	Yes
Taxiway A	75’	19’	35’	Yes
Taxiway N	100’	31.5’	35’	Yes

Source: AC 150/5300-13A and Mead and Hunt Analysis.

Note[1]: The Taxiway Edge Safety Margin is per outer tire(s). A TESM total of 30 feet should be provided for the entire length of the taxiways. An MGW of 37 feet (747-400F) was used to calculate the TESM.

ADG/TDG II and III Taxiways. The taxiways presented in **Table 3-10** were evaluated using different ADG and TDG standards due to utilization by varying aircraft and operation caveats in place. Though the ADG V wingtip clearance standard is in effect between Taxiways Y and B, remaining design standards associated with ADG and TDG II apply to Taxiway Y. Taxiway connectors B2 and B3 are classified as ADG and TDG II since aircraft in ADG V are restricted from using the connectors to access Taxiway Y. All standards are met and/or exceeded for Taxiways Y, B2, and B3, excluding the wingtip clearance between Taxiway Y and B addressed earlier.

Current and projected air carrier aircraft are classified as ADG and TDG III; therefore, Taxiway W serving the commercial service apron is evaluated using ADG and TDG III standards. Operations by aircraft with wingspans between 119-170 feet (ADG IV) are permitted on Taxiway T, south of Taxiway W, if there are wing walkers present and assisting the aircraft while taxiing. Though ADG IV aircraft are permitted to operate on Taxiway T, and on the segment of Taxiway W that adjoins Taxiway T to provide access to the remainder of the airfield, Taxiway T is evaluated using ADG and TDG III.

Though an airport service road is located within the TOFA dimensions of Taxiway W and T, road markings alerting vehicles to stop and give way to aircraft are located outside both taxiway TOFAs resulting in a standard TOFA. All ADG and TDG III taxiway design standards are met, as presented in **Tables 3-10** and **3-11**.

Table 3-10: ADG II and III Taxiway Design Standards

	Taxiway Protection		Taxiway Separation		Wingtip Clearance	Are standards met?
	Taxiway Safety Area	Taxiway Object Free Area	Taxiway Centerline to Parallel Taxiway Centerline	Taxiway Centerline to Fixed or Movable Object	Taxiway Wingtip Clearance	
Group II Design Standards	79 feet	131 feet	105 feet	65.5 feet	26 feet	
Taxiway Y	79’	131’	160’	65.5’ (to access road) 160’ (to TWY B)	13.5’	No
Taxiway B2	79’	131’	1,520’ (to TWY G) 662’ (to TWY B3)	65.5’	Met and Exceeded.	Yes
Taxiway B3	79’	131’	662’ (to TWY B2) 737’ (to TWY H)	65.5’	Met and Exceeded.	Yes
Group III Design Standards	118 feet	186 feet	152 feet	93 feet	34 feet	
Taxiway W	118’	186’	210’[1]	93’[2]	Met and Exceeded.	Yes
Taxiway T	118’	186’	N/A	93’[3]	Met.	Yes
Taxiway V	118’	186’	265’[4]	160’[5]	Met.	Yes

Source: AC 150/5300-13A and Mead and Hunt Analysis.

Note[1]: Distance ranges from 210 ft. to approximately 1,300 feet.

Note[2]: The access road west of the taxiway was used a fixed object.

Note[3]: Ibid.

Note[4]: Measured between Taxiway V and K hold short lines.

Note[5]: The access road south of Taxiway V was used as a fixed object.

Table 3-11: TDG II and III Taxiway Design Standards

	Taxiway Width	Taxiway Edge Safety Margin	Taxiway Shoulder Width	Are standards met?
Group II Design Standards	35 feet	7.5 feet per outer tire(s)[1]	15 feet	
Taxiway Y	76’	13’ per outer tire(s)	15’	Yes
Taxiway B2	90’	35’ per outer tires(s)	35’	Yes
Taxiway B3	90’	35’ per outer tire(s)	35’	Yes
Group III Design Standards	50 feet	10 feet[2]	20 feet	
Taxiway W	75’	22.5’ per outer tire(s)	35’	Yes
Taxiway V	75’[3]	22.5’ per outer tire(s)	35’	Yes
Taxiway T	60’	15’ per outer tire(s)	N/A[4]	Yes

Source: AC 150/5300-13A and Mead and Hunt Analysis.

Note[1]: The Taxiway Edge Safety Margin is per outer tire(s). A TESM total of 15 feet should be provided for the entire length of the taxiways. A MGW of 20 feet was used to calculate the TESM.

Note[2]: A TESM total of 20 feet should be provided for the entire length of the taxiways. A MGW of 30 feet was used to calculate the TESM.

Note[3]: Taxiway V ranges in width from 75 feet to 100 feet. When taxiway is 100 feet, the TESM is 35 feet per outer tire(s).

Note[4]: Taxiway T is surrounded by paved aircraft operating areas. Taxiway shoulders are not required for group III taxiways.

ADG/Taxilane Design Group (TDG) III. Taxilane design and separation standards differ from taxiways of the same ADG and TDG classification. Taxilanes E and F provide access to the Southwest Jet Center, Embraer, and Cessna. These businesses primarily service ADG and TDG III aircraft. As a result, both taxilanes are considered and evaluated using ADG and TDG III design and separation standards listed in **Tables 3-12** and **3-13**.

An airport access road intersects the taxilanes; however, paved road markings outside of the TOFA are present signaling airport vehicles to stop and give way to passing aircraft. To prevent potential taxilane protection and separation deficiencies, aircraft should not be parked near the taxilanes leading to the aprons as they may infringe upon the TSA.

Table 3-12: ADG III Taxilane Design Standards

	Taxilane Protection		Taxilane Separation		Wingtip Clearance	Are standards met?
	Taxilane Safety Area	Taxilane Object Free Area	Taxilane Centerline to Parallel Taxilane Centerline	Taxilane Centerline to Fixed or Movable Object	Taxilane Wingtip Clearance	
Design Standards	118 feet	162 feet	140 feet	81 feet	22 feet	
Taxilane E	118’	162’	382’	81’	22’	Yes
Taxilane F	118’	162’	382’	81’	22’	Yes

Source: AC 150/5300-13A and Mead and Hunt Analysis.

Table 3-13: TDG III Taxilane Design Standards

	Taxiway Width	Taxiway Edge Safety Margin	Taxiway Shoulder Width	Are standards met?
Standards	50 feet	10 feet[1]	20 feet	
Taxilane E	50’	13’ per outer tire(s)	25’	Yes
Taxilane F	50’	15’ per outer tire(s)	20’	Yes

Source: AC 150/5300-13A and Mead and Hunt Analysis.

Note[1]: The Taxiway Edge Safety Margin is 10 feet per outer tire(s). A TESM total of 20 ft. should be provided for the entire length of the taxiways. A MGW of 24 feet for Taxilane E and 20 feet for Taxilane F was used to calculate the TESM.

Taxiway Design Methodology. FAA requires simple taxiway design to prevent possible runway incursions and/or pilot confusion. Certain taxiway designs are now discouraged and are recommended to be addressed when practicable because they no longer comply with FAA design standards. Taxiway layouts no longer acceptable include those that permit or have:

- ✓ Four or more node intersections
- ✓ Direct access from a runway to an apron
- ✓ Wide expanses of pavement
- ✓ Judgmental oversteering
- ✓ Dual purpose (using a runway as a taxiway, or a taxiway as a runway)
- ✓ Acute angled intersections
- ✓ Runway crossings
- ✓ High energy intersections in the middle third of a runway
- ✓ Limited visibility.

A three-node concept that provides pilots with only three options at an intersection (straight, left, or right) is the preferable design due to its simplicity and affordability to properly place airfield signage, markings, and lighting. Complex intersections that offer more than three options, or have excess pavement, increase the possibility of pilot error. In recent years, taxiway design has been under great scrutiny to limit runway incursions and pilot error resulting from poor taxiway design. To combat these risks, the FAA established a Runway Incursion Mitigation (RIM) program to identify hot spots, defined as a location(s) on an airport movement area with history of potential collision risk or runway incursion, and where heightened attention by pilots and drivers is necessary. Certain hot spots are considered high priority for mitigation if three or more peak annual incursions, or more than eight cumulative runway incursions have occurred between fiscal year (FY) 2008 and calendar year (CY) 2015 at the hot spot location.

Hot Spot 1 (HS1) at IWA is caused by the complexity of Taxiways V, B, and K intersection, and has been identified as a high priority hot spot. At this hot spot location, three peak annual runway incursions and nine cumulative runway incursions have occurred. From Runway 12R/30L, pilots are provided more than three options as they can exit at collocated Taxiways V and K that form intersections at Taxiways A and B. Taxiway V, an acute angled high-speed taxiway, provides direct access to the commercial service apron, and results in poor visibility. Taxiway K provides direct access from Runway 12R/30L to the airport support apron.

Non-standard geometry and an acute angle intersection exist at Taxiways V and A. Despite its non-standard design, Taxiway V is used by GA aircraft, including business jets, as an exit taxiway. GA aircraft also use Taxiway K as an entrance taxiway to Runway 12R/30L for midfield takeoffs to the northwest.

In 2017, a Hot Spot Mitigation report was prepared. The report presented five alternatives to address HS1. After consultation with airport staff and ATCT personnel, a final alternative was chosen to mitigate HS1 and the issues it causes. Future remedies are illustrated in **Figure 3-4.**

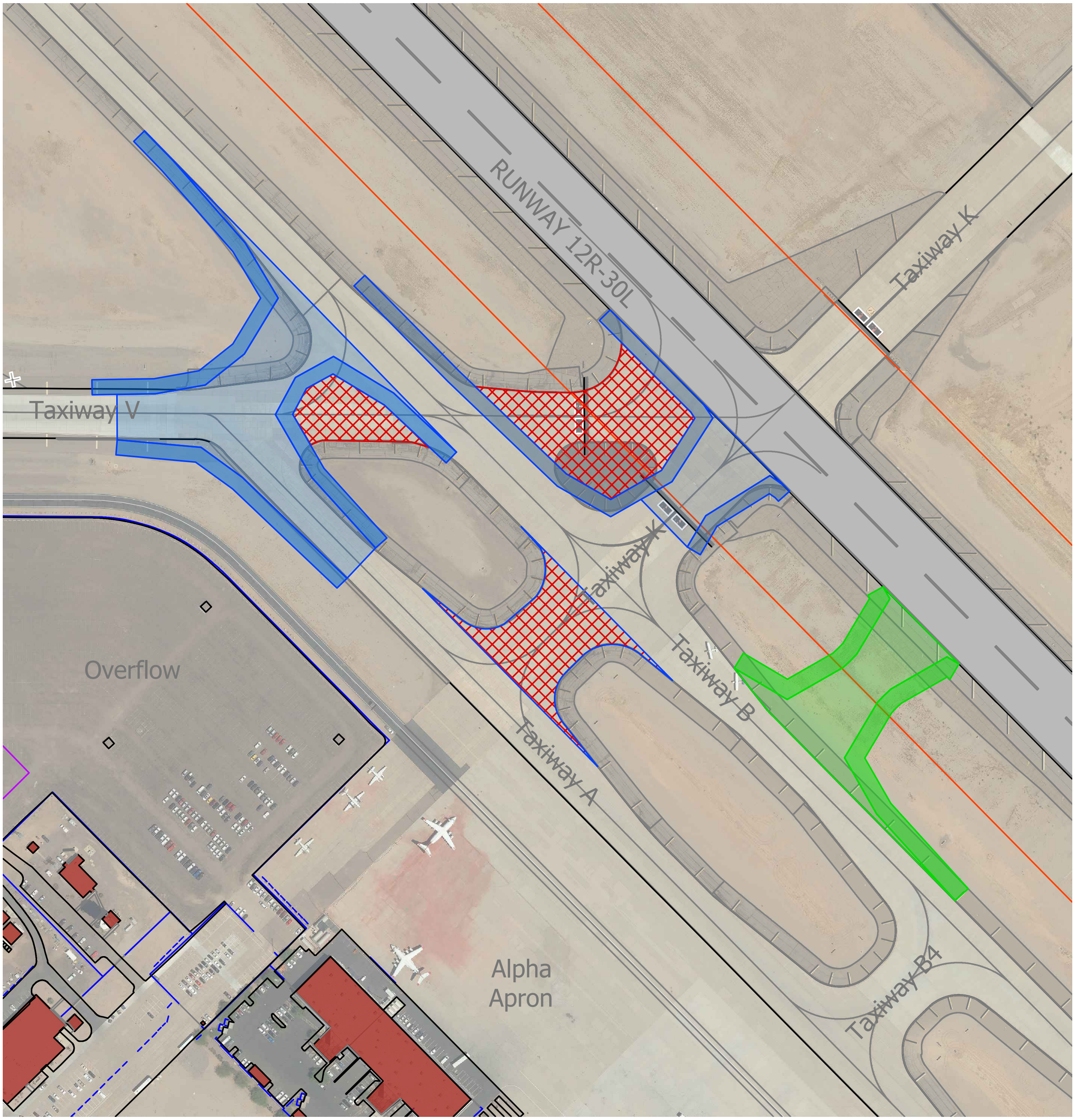


Figure 3-4:
Hotspot Mitigation

Exit Taxiway Analysis. Exit taxiways can be right or acute angled with the primary purpose of permitting aircraft free flow passage completely beyond the hold short line. Right-angled taxiways provide bi-directional use and better pilot visibility than acute angled taxiways. Acute angled taxiways are considered high-speed exit taxiways and allow aircraft to exit runways at a faster speed than right angled taxiways. Their allowance for high speed exits increase capacity by reducing an aircraft's runway occupancy time. They do not allow for bi-directional use as they only allow use by aircraft landing in the same direction the taxiway is angled.

Runway 12R/30L exit taxiways appear to be sufficient for large (12,500-300,000 pounds MTOW) and heavy (over 300,000 pounds MTOW) aircraft with long landing rollouts, but are spaced too far apart for smaller aircraft (less than 12,500 pounds MTOW). The first available exit taxiways for Runway 12R, Taxiway H, and Runway 30L, Taxiway L, are approximately 2,950 and 2,500 feet from the threshold., respectively. According to AC 150/5300-13A, most single and twin GA aircraft exit a runway 2,000 – 4,000 feet from the runway threshold. Though within the range specified by the AC, if a smaller aircraft's landing rollout continues beyond the initial exit taxiways, the next available exit taxiways for Runway 12R, Taxiway V, and Runway 30L, Taxiway K, are approximately 2,280 and 2,415 feet away, respectively. This significant distance between exit taxiways causes small aircraft to use Runway 12R/30L as a taxiway until the next taxiway connector, consequently delaying aircraft waiting to land and decreasing airport capacity.

Runway 12C/30C is served by three taxiway connectors, Taxiways G, P, and K. Taxiways G and P serve as entrance and exit taxiways for Runway 12C and 30C, respectively. Taxiway K, located approximately 3,945 feet from Runway 12C threshold and approximately 6,260 feet from Runway 30C threshold, can be used for exiting traffic if an aircraft's landing rollout commences prior to. According to AC 150/5300-13A, large aircraft exit runways within the first 4,500 feet. For both small and large aircraft, the lack of available exit taxiways cause issues identical to those faced by Runway 12R/30L.

Runway 12L/30R is currently served by a partial parallel taxiway with three exit taxiways, Taxiways C1, C2, and C3, of which one is acute angled. The first available exit taxiway, Taxiway C3, for aircraft landing on Runway 12L is 5,360 feet from the threshold. Taxiway C3 is also the first available exit taxiway for aircraft landing on Runway 30R. From Runway 30R threshold, Taxiway C3 is located 3,945 feet away. By the conclusion of this master plan, Taxiway C will be extended to the full length of Runway 12L/30R and include three additional exit taxiways. The extension and addition will not be sufficient for small aircraft, but will prove sufficient for the large and heavy aircraft that primarily operate on the runway.

Conclusion. Construction of additional exit taxiways that lessen the significant separation that currently exists for Runways 12R/30L, 12C/30C, and 12L/30R should be considered to accommodate all aircraft that operate at IWA.

Apron Design

The function of an apron is to accommodate aircraft during loading and unloading of passengers and cargo, short- and long-term aircraft storage, and other activities, such as fueling and maintenance. Similar to runways and taxiways, design standards have been established for aprons. Two main aprons paved with taxilanes providing access to designated aircraft parking exist at IWA. These taxilanes must meet TOFA and wingtip clearance standards of the ADG designated for that particular apron. Though aircraft utilization varies, it is best to design the apron to accommodate the most demanding aircraft projected to use the area to avoid collision between taxiing and parked aircraft.

In addition to the evaluation of taxilane design standards, apron capacity is also evaluated. Apron space should be able to accommodate transient and/or based aircraft, if not stored in a hangar, during the planning period. Apron design and capacity are detailed in the following sections.

Commercial Service Apron. For ease of reference, the commercial service apron is discussed within the *Landside Facility* section as part of the terminal facilities evaluation.

GA Aprons. Determining the appropriate ADG for GA aprons can prove challenging. General aviation aprons are typically adjacent to and associated with Fixed Based Operators (FBOs) that provide aircraft and pilot services, such as marshalling and fueling to transient and based aircraft. Transient aircraft ranges from light sport aircraft to business jets. Though military aircraft are not classified as GA, they can be parked on GA aprons and serviced by FBOs. General aviation aprons should be designed to accommodate transient aircraft, and designed so aircraft of similar design characteristics can be parked together.

To maximize apron capacity and comply with FAA design standards, aircraft parking space on the GA apron adjacent to the FBO and surrounding infrastructure at IWA is grouped by ADG. The GA apron is segmented by taxilanes that divide the apron into 18 rows designated for based and transient aircraft parking. Within the rows are 130 parking positions of which some are 'T' shaped (T-spots). The taxilanes positioned around the designated parking areas provide access to the taxiway system. Apron taxilanes must meet TOFA (taxilane object free area) and wingtip clearance. An evaluation of the GA apron concluded that all taxilanes meet TOFA and wingtip clearance standards associated with ADG I, excluding the taxilane that provides access to row 15. This taxilane meets TOFA and wingtip clearance standards associated with ADG II.

Rows 1 and 2 are designated as an aircraft run-up area, which helps prevent jet blast damage to surrounding aircraft and reduces apron and taxiway usage. Adjacent to the three T-hangars are rows 3 and 4 that house based aircraft classified as ADG I. Row 5 is also adjacent to the T-hangars and is reserved for larger twin aircraft classified as ADG I. Rows 6-12 are reserved for the flight school fleet comprised of Cessna and Piper Seminoles in ADG I. Currently, row 13 accommodates, three based aircraft with the remaining spaces available for future based aircraft. Rows 14-18 are available for itinerant aircraft; however, row 15 is primarily for short term transient aircraft in ADG II. Of the 130 aircraft parking positions, 77 are occupied or reserved for based and flight school aircraft resulting in an apron occupancy of 59 percent.

The manner in which itinerant GA parking position demand was determined is illustrated in **Table 3-14.** Using 2017 as the base year, due to reliable data, October was the peak month for GA operations with approximately 28,857 operations. Thirty-five percent of October 2017 GA operations were itinerant, resulting in a total of 10,188 operations and an average of 329 operations per day. To account for a busy day during the peak month and plan for the most demanding scenario, a multiplier of 10 percent was applied to the average day of peak month operations resulting in the average peak day of peak month operations provided in **Table 3-14**. A minimum of two operations per aircraft were assumed, resulting in operations by 181 aircraft. This number was further reduced to 90 aircraft, and later 45 aircraft, that would need tiedown positions.

Table 3-14: Itinerant GA Parking Demand

Year	Annual GA Itinerant Operations	Average Peak Day of Peak Month Operations	Number of Tiedowns
2017	104,927	362	45
2018	114,236	394	49
2023	115,835	399	50
2028	119,407	411	51
2038	128,625	443	55

Source: Mead and Hunt.

The calculations used to determine transient tiedown need is reflective of the most demanding scenario. Approximately 20 transient aircraft parking positions are currently available and have proven sufficient for airport needs. Additional apron space is available for use adjacent to row 18 in the event additional transient parking positions reach capacity.

Airport Support Apron. The airport support apron is not destined for use by SkyBridge. As stated in the Inventory Chapter, this apron is primarily utilized by charter operators, United States Forest Service (USFS), and Swift Air. Cargo operators also use the apron on an as-needed basis. The apron meets design standards and is sufficient for simultaneous use by charter and cargo operators, USFS, and Swift Air.

Landside Facility Requirements

Terminal Facilities

The following summarizes the passenger terminal requirements at IWA for the 20-year planning horizon from 2018 through 2038.

Methodology. The method for determining future requirements is informed by, and consistent with, guidance from the Airport Cooperative Research Program (ACRP), Report 25, *Airport Passenger Terminal Planning and Design*, as well as the International Air Transport Association (IATA), *Airport Development Reference Manual*, 10th Edition. For each passenger terminal function, specific assumptions in accordance with this guidance, industry standards, and airline input are documented. For baseline planning, terminal facilities are often sized to meet IATA's optimum Level of Service (LoS), which is a measure of the quality of service provided inside the terminal in terms of ease of flows and delays. Optimum LoS corresponds to overall good levels of service, where flows are stable, delays are acceptable, and a good level of comfort is provided. Previous versions of IATA's Airport Development Reference Manual referred to the designated optimum level of service as being LoS C.

To understand the impact of varying certain assumptions, sensitivity analyses are conducted. These sensitivities are used to inform the planning recommendation for each terminal facility. Notably, the aim of the requirements analysis is to inform the optimal capability of various terminal functions, rather than recommending solutions in light of the terminal's existing constraints. This industry practice allows solutions to be explored that would overcome existing constraints within the terminal building area, and if in the alternatives evaluation, they are found imprudent or impractical to overcome, a solution that accounts for said constraints can be identified. That said, commentary is provided as to what might be prudent given the existing terminal's physical characteristics.

To derive passenger terminal requirements, an estimate of average day, peak month (ADPM) enplanements is required. Scenario-based ADPM flight schedules provide the basis for the terminal requirements. Specifically, the ADPM flight schedule provides the basis for aircraft gates and apron parking requirements. Passenger peak hour enplanements from the ADPM flight schedule drive check-in, checked baggage, security screening, and holdroom requirements. Similarly, peak hour deplanements determine the baggage claim requirements.

Planning Activity Levels. There is a level of uncertainty associated with long-range demand forecasting and associated planning exercises. As a result, Planning Activity Levels (PALs) are identified to inform the future levels of passenger activity at which facilities become congested and expansion would be required. PALs help to disassociate projects from specific years as realized activity levels may occur earlier or later than the baseline forecast predicts. PALs were chosen to represent conditions expected within the first five years, ten years, and at the end of the planning period, according to the baseline forecast produced by Unison Consulting.

PAL 1 coincides with 925,000 enplanements, which the baseline forecast predicts would occur in 2023. PAL 2 represents 1,022,500 enplanements, which may occur in 2028, and PAL 3 coincides with 1,245,200 enplanements at the end of the 20-year forecast horizon. Annual and peak passenger airline flight operations and passenger data for each PAL are summarized in **Table 3-15**. Where appropriate, the use of PALs will be used in the identification of terminal facility requirements.

Table 3-15: Peak Period Activity Summary

	Base Year		Planning Activity Levels (PAL)		
	2018	2019	PAL 1	PAL 2	PAL 3
Annual enplanements	759,000	850,300	925,000	1,022,500	1,245,200
ADPM enplanements	2,703	3,029	3,294	3,642	4,435
Peak hour passengers					
Enplanements (Departures Peak Hour)	803	900	978	1,082	1,317
Deplanements (Arrivals Peak Hour)	606	679	738	816	994
Peak Hour Total Passengers (Total Operations Peak Hour)[1]	903	1,011	1,100	1,216	1,481
Annual passenger departure operations	5,460	5,997	6,477	7,035	8,420
ADPM passenger departure operations	21	23	25	27	32
Peak hour passenger operations					
Departures	6	7	7	8	9
Arrivals	5	5	5	6	7
Peak hour total passenger operations	7	8	8	9	11

Source: Unison, IWA MP 2018 – PMAD PH and Fleet Mix Details, October 2018.

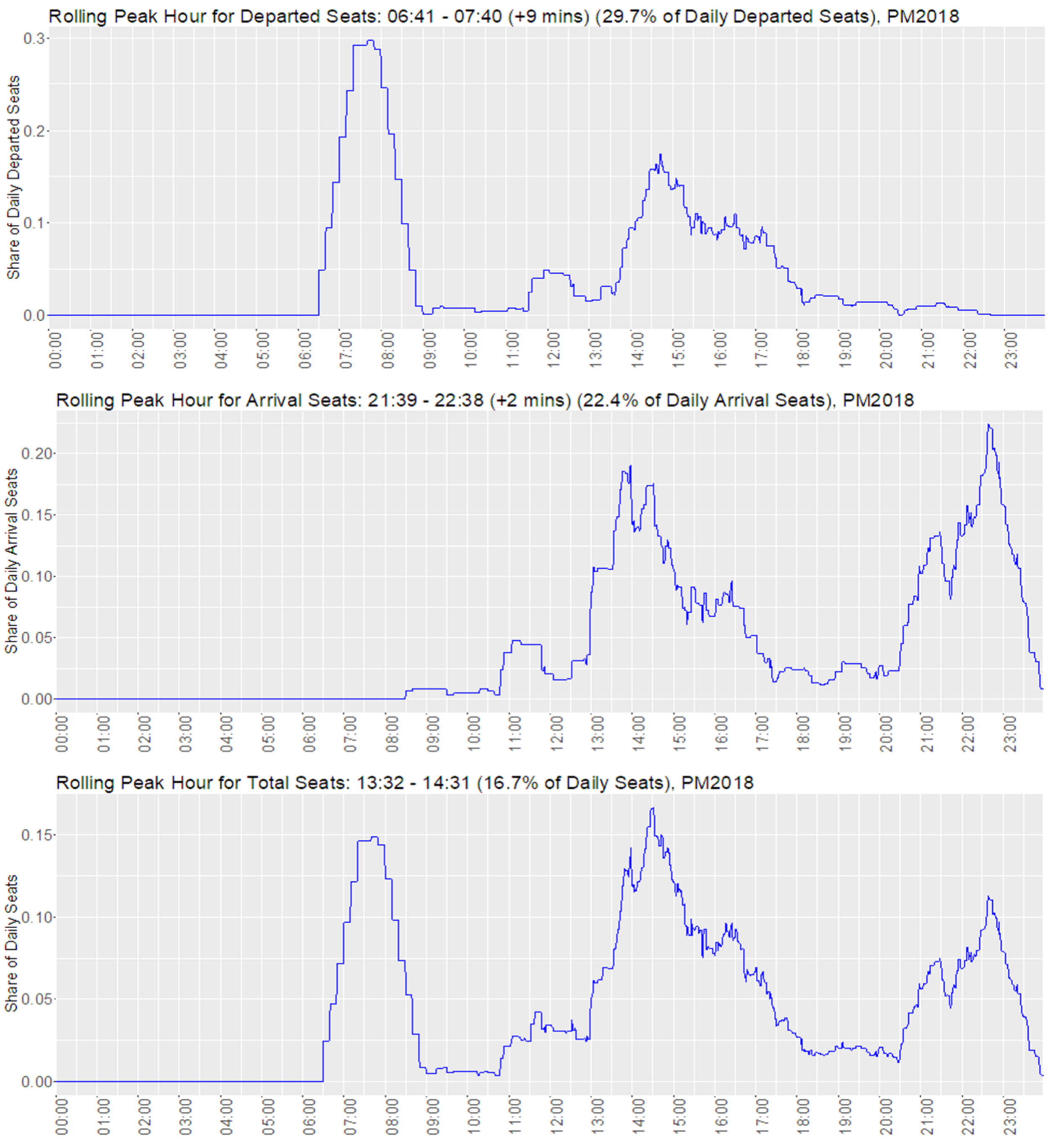
[1]Peak hour enplanements and deplanements do not equal total passengers based on peaking characteristics.

Activity Profiles. The activity profiles associated with the flight schedules for passenger seats, aircraft operations, and peak hour periods are shown in **Figure 3-5** and **Figure 3-6**, respectively. In the Peak Month Average Day Peak Hour analysis, three different peak hours are identified; a peak for departing seats (6:41am-7:40am), a peak for arriving seats (9:39pm-10:38pm), and a peak for total seats (1:32pm-2:31pm).

During the departure peak hour, it is estimated that there are 803 enplanements or 29.7% of daily departing seats. During the arrival peak hour, it is estimated that 22.4% of daily arriving seats take place, or 606 deplanements. This implies that IWA has a busier peak hour for departures compared with arrivals. The busiest peak hour for the Airport, however, occurs when both departures and arrivals both are taking place. Including both departing and arriving seats, the identified peak hour for total seats (1:32pm-2:31pm) accounts for 16.7% of total seats, or approximately 903 departing or arriving passengers.

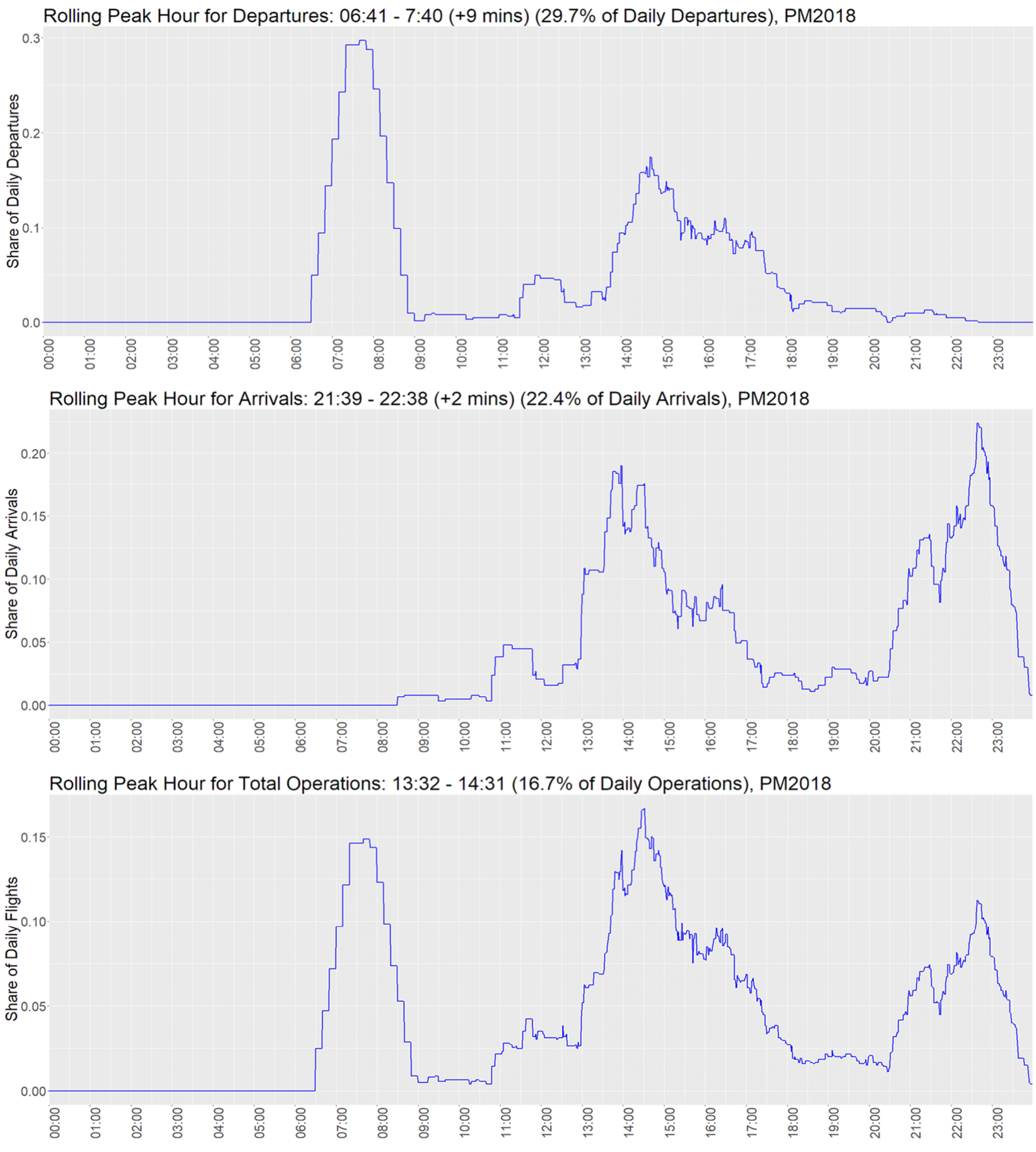
Peak hour departure and arrival times occur at different times of the day and do not directly relate with the peak number of passengers as outlined in **Table 3-15**, therefore the number of enplanements and deplanements will not equal the peak hour of total passengers. The same applies for the Peak Hour Total Passenger operations. The peak hour departures and the arrivals will not equal the peak hour total passengers.

Figure 3-5: Arriving and Departing Seats Activity Profiles



Source: Unison, IWA MP 2018 – PMAD PH and Fleet Mix Details, October 2018.

Figure 3-6: Arriving and Departing Flight Activity Profile



Source: Unison, IWA MP 2018 – PMAD PH and Fleet Mix Details, October 2018.

Passenger Terminal Requirements. This section provides the assumptions, methodology, and results associated with the analysis of the future terminal requirements for each major function within the passenger terminal building.

Check-In Lobby. The size of the check-in lobby and the number of ticket counter positions are typically a function of the number of peak departing flights; the number of peak enplaning passengers; the distribution of passenger arrival time to the terminal; and the ratio of passengers checking in at ticket counters, self-service kiosks, or via airline websites/mobile apps. The ticket lobby currently provides 32 ticketing counter positions and occupies an area of approximately 9,350 square feet (including counter positions, passenger processing, and queueing spaces). The check-in positions operate as common-use, although the existing carriers tend to utilize the same desks throughout the day. The following assumptions regarding check-in behavior were used to determine future requirements:

- ✓ 90% of passengers utilize traditional check-in desks, while the remaining 10% utilize mobile check-in, evolving to a 75%/25% split by the end of the planning period due to trends in check-in automation
- ✓ A maximum queue time of 15 minute at the check-in desk and 5 minutes at baggage-drop (for mobile check-in passengers), per IATA optimum LoS
- ✓ A transaction time of 90 seconds per passenger, improving to 80 seconds by 2038 to account for technology improvements, and greater familiarity with the process by passengers
- ✓ 14 square feet per passenger in queue, per IATA optimum LoS

Based on the above assumptions, the existing check-in lobby and the number of check-in desks can accommodate passengers throughout the planning period. The required number of desks and check-in queue area are shown in **Table 3-16**.

Table 3-16: Check-In Lobby Requirements

	Existing Facilities	Planning Activity Levels (PAL)		
		PAL 1	PAL 2	PAL 3
Number of check-in desks	32	26	27	31
Queue area (sf)	4,500	3,550	3,700	4,350

Source: Inter*VISTAS*, November 2018.

Sensitivity Analysis: If the 15-minute wait time standard were to increase to 20 minutes due to airline staffing restrictions, then 28 check-in desks and a queue of 4,900 square feet would be required. Alternatively, if the processing time were to increase from 90 seconds per passengers to 120 seconds per passenger, ten additional desks would be required.

Recommendation: The 32 existing check-in positions and the current queueing area are sufficient to accommodate demand through PAL 3. As the technology offered by the airlines evolves, some of the traditional full-service counters may be enhanced or replaced with automated bag-drop capability to provide reduced transaction times thereby enhancing the capability of the existing lobby area. As part of the alternatives evaluation, it would be prudent to explore the possibility of providing additional passenger queue space, if either (1) airport management would like to account for an airline's tendency not to staff all available positions or (2) the additional space would not inhibit other terminal functions.

Checked Baggage Screening. All checked baggage screening is performed using two CT-80 EDS machines operating in a mini in-line configuration located south of the check-in lobby. Two baggage carrying belts service the system from the check-in counters. The following planning factors are based on the Transportation Security Administration's (TSA) *Planning Guidelines and Design Standards for Checked Baggage Inspection Systems* (PGDS, v6.0) to evaluate baggage screening requirements:

- ✓ The average number of checked bags per passenger is 0.9, based on industry averages and informed by consultation with airport management and local conditions
- ✓ The certified throughput rate for the two CT-80s in a mini in-line configuration is 240 bags per hour
- ✓ The ticket counter baggage capacity is 1,000 bags per hour

EDS requirements are not based on average baggage flows, but on surged 10-minute flows to account for random variability in the expected average flow rate. The existing surged peak hour bag flow is estimated at 855 bags per hour, growing to 1,355 by the end of the planning period.

Faster speed EDS reduces the overall machine count while slower speed EDS increases the count. If optimizing the EDS system is not feasible, additional manual screening of bags by TSA in a facility at the south end of the ticketing lobby would likely be required to meet demand. Manual screening has a lower capital cost than constructing a new baggage system but would have higher operating costs requiring additional TSA staffing.

If the airport can upgrade to a medium speed (MS-EDS) inline solution with EDS throughputs of around 540 bags per hour (e.g., L-3 3DX 6600), four EDS would be required for operation by PAL 2, as shown in **Table 3-17**[5].

[5] One EDS is required per PGDS guidelines for redundancy in inline configurations

Table 3-17: **Baggage Screening Requirements**

	Existing Facilities	Planning Activity Levels (PAL)		
		PAL 1	PAL 2	PAL 3
Originating peak hour passengers	803	978	1,082	1,317
Surged peak hour flow	855	1,025	1,125	1,355
Number of EDS units	2 CT-80	3 MS-EDS	4 MS-EDS	4 MS-EDS

Source: Inter*VISTAS*, November 2018.

Sensitivity analysis: Three inline EDS, which includes one for redundancy, would be required through end of planning period with certified throughput of at least 675 bags per hour (e.g., L-3 3DX 6700 ES or MDI CTX-9800 Dsi). Five inline EDS, which includes one for redundancy, would be required through end of planning period with certified throughput of 360 bags per hour (e.g., MDI CTX-5800).

Recommendation: Further discussion with TSA is required to select the optimal baggage screening solution as existing system is likely to reach capacity in the near future. Upgrades to the ticket counter baggage feeds should be considered as the airport reaches PAL 1 to accommodate the projected peak hour bags. Further, we recommend that an inline system with four medium speed EDS be implemented prior to the airport reaching PAL 2.

Checked Baggage Makeup. In the existing condition, baggage is loaded onto carts after screening to be transported to the aircraft. The number of checked bags, the size of aircraft, and the number of departures in the peak two hours impact the number of carts required. Typically, a single cart can handle 60 bags on average given the size and type of bags checked. The number of carts required is also a function of passenger arrival times and how early check-in begins before scheduled departure time.
The following planning factors used to determine baggage makeup requirements are based on ACRP Report 25 guidance and the demand forecast:

- ✓ Each cart requires 600 square feet of space
- ✓ Nine peak hour departures would occur at PAL 3

Sensitivity analysis: At 70 bags per luggage cart, in a more efficient operation, the required baggage makeup area at PAL 3 could be reduced from 15,700 square feet to 13,500 square feet as fewer carts would be staged for peak hour flights.

Recommendation: Provide approximately 15,700 square feet of baggage makeup by PAL 3, as shown in **Table 3-18**, which includes area for the carts, the room needed to maneuver and stage baggage, and the room needed for the carts to be loaded. With the estimated shortfall occurring by PAL2, we recommend the airport implement a project to expand the baggage makeup such that it would come online as demand reaches PAL2, sized for the PAL3 requirement.

Table 3-18: Baggage Makeup Requirements

	Existing Facilities	Planning Activity Level (PAL)		
		PAL 1	PAL 2	PAL 3
Makeup area (sf)	11,500	11,400	12,800	15,700

Source: Inter*VISTAS*, November 2018.

Security Screening Checkpoint. The area dedicated to passenger security screening currently occupies approximately 8,900 square feet (of which approximately 3,800 square feet is provided for passenger queueing, the remaining space for screening and egress). This area includes five 70-foot long security lanes and space for passenger queueing. These lanes are shorter than those recommended by TSA to obtain maximum throughput in terms of passengers per hour. The following assumptions regarding passenger security screening were used to inform future requirements:

- ✓ The passenger processing rate would decrease from 26.7 seconds per passenger (135 passengers per hour) to 20 seconds per passenger (180 passengers per hour) over the planning horizon, due to technological improvements. Regular lanes, on average, process 160 passenger per hour today while Pre✓® lanes process over 205 passengers. Reduced throughputs at the Airport reflect local conditions, specifically the increased number of mobility impaired passengers and infrequent travelers.
- ✓ A maximum queue time of 10 minutes, per IATA optimum LoS
- ✓ Each security lane is 15 feet wide by 70 feet long, as recommended in the TSA *Checkpoint Design Guidelines* (CDG) v6.1

Based on these assumptions, six security lanes would be required at PAL 1, and a seventh would be required at PAL 3.

Sensitivity analysis: We conducted a number of sensitivity analyses to inform the recommendation:

1. If the airport could provide automated screening lanes (ASL), passenger throughput would likely be between 250 and 300 passenger per hour, resulting a requirement of 5 lanes and 10,610 square feet or 4 lanes and 8,960 square feet, respectively. Notably, these lanes would need to be approximately 85 feet long, as recommended in the TSA *CDG – Innovation and Concept Supplemental Information 1-2017 v.1*, which we understand may not be practical given building constraints.

2. If the wait time standard were allowed to increase by 15 minutes and throughput assumptions started at 135 passengers per hour growing to 180 passengers per hour, 5 lanes and 8,620 square feet would be required.

3. If the wait time standard were allowed to increase by 20 minutes and throughput assumptions started at 135 passengers per hour growing to 180 passengers per hour, 5 lanes and 9,000 square feet would be required.

Checkpoint dimensions corresponding to each of the sensitivity analyses are provided in **Table 3-19**.

Table 3-19: Security Screening Sensitivity Analysis Dimensions

	Lanes	Queue	Screening	Egress	Total Area
Existing	5	Approx. 45 ft deep x 80 ft wide	Approx. 70 ft deep x 90 ft wide	Variable depth x 12 ft wide	12,700 SF
Sensitivity 1	5 4	26 ft deep x 87.5 ft wide 33 ft deep x 70 ft wide	85 ft deep x 87.5 ft wide 85 ft deep x 70 ft wide	10 ft deep x 87.5 ft wide 10 ft deep x 70 ft wide	10,610 SF 8,960 SF
Sensitivity 2	5	35 ft deep x 75 ft wide	70 ft deep x 75 ft wide	10 ft deep x 75 ft wide	8,620 SF
Sensitivity 3	5	40 ft deep x 75 ft wide	70 ft deep x 75 ft wide	10 ft deep x 75 ft wide	9,000 SF

Source: Inter*VISTAS*, November 2018.

Recommendation: Plan for five lanes at a 15-minute wait time standard, assuming the lanes cannot be reconfigured with ASL technology, if practical. This wait time standard negates the need to add a sixth lane, as shown in **Table 3-20**. Notably, during the forecasted peak morning period, the wait time would exceed the airport's goal of 10 minutes; however, it would remain below 15 minutes. Throughout the rest of the day, it is expected that a 10-minute wait time level of service would be achieved.

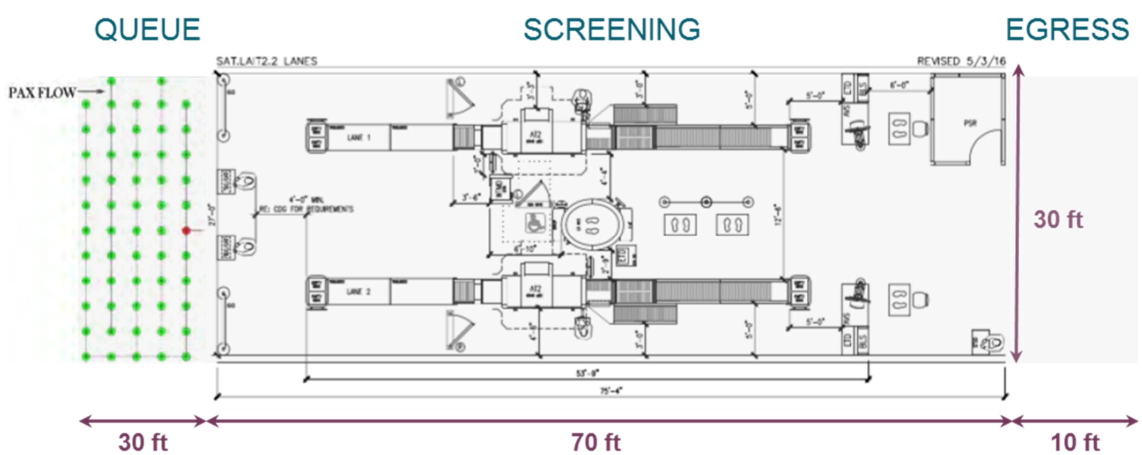
If in the alternatives evaluation, additional length for the lanes may be provided, we recommend providing additional area for queuing and re-composure to be in place no later than PAL1 to both enhance the throughput of the existing lanes and allow for the possibility of new ASL technology in the future. Relocation of the rental car counters should be evaluated to provide the additional length, as this would allow for improvement to the current screening technologies or implementation of new ASL technology. A conceptual layout is indicated in **Figure 3-7**, to achieve greater passenger throughput with existing technology.

Table 3-20: **Security Screening Requirements**

	Existing Facilities	Planning Activity Level (PAL)		
		PAL 1	PAL 2	PAL 3
Number of lanes	5	5	5	5
Screening area (sf)	6,800	5,250	5,250	5,250
Queue area (sf)	3,800	1,950	2,250	2,625
Egress area (sf)	2,100	750	750	750
Total checkpoint area (sf)	12,700	7,950	8,250	8,625

Source: Inter*VISTAS*, November 2018.

Figure 3-7: **Sample Layout for Each Pair of Lanes to Achieve Passenger Throughput with Existing Technology**



Source: TSA Checkpoint Design Guidelines v6.1, modified by Inter*VISTAS*, November 2018.

Passenger Holdroom. Holdroom requirements are derived from the design aircraft for each gate as well as the number of departures expected to occur in the peak hour. The existing holdrooms provided approximately 15,000 square feet, not accounting for queueing and egress space which occur in the circulation corridor.

Based on the future flight schedules, the design aircraft is the Airbus A320 with 186 seats, at a 90% load factor (in line with Allegiant's dense seating configuration for their Airbus A320). Nine departures are forecast to occur in the peak hour by PAL 3.

One of the most critical assumptions in determining future holdroom requirements is the percentage of passengers that may be occupying other space in the terminal prior to their departure (concessions, restrooms, et cetera). To inform this assumption, we have reviewed the proposed concession reconfiguration and estimate:

- ✓ Approximately 6,400 square feet of post-security space will be dedicated to restaurants and quick service, about 60% to 65% of which would provide public seating, as well as an additional 2,550 square feet of outdoor patio.
- ✓ These concession spaces can accommodate about 360 seated passengers, or about 36 passenger per gate, which represents approximately 20% of passengers on the design aircraft.

Given this program, the baseline assumptions include:

- ✓ Approximately 20% of passengers on a given flight will be located in the concessions or elsewhere in the terminal prior to their flight.
- ✓ Approximately 85% of passengers in the holdroom are seated, which is greater than the traditional range for optimum LoS. The remaining 15% of passengers are assumed to standing.
- ✓ Each seated passenger requires 18.5 square feet and each standing passenger 13 square feet, which is consistent with IATA optimum LoS.
- ✓ It is assumed that 5% of the seating capacity is unused to account for passenger belongings that are often placed on adjacent seats.

As shown in **Table 3-21**, using these assumptions, approximately 19,700 square feet of holdroom is required to serve the PAL 3 demand (about 2,200 square feet for each holdroom). Further, the space requirement is increased by 525 square feet at each gate to account for the requirement to accommodate boarding operations, queueing, and the gate service counter.

Sensitivity analysis: If the percentage of passengers located outside the holdroom were reduced to 15%, each holdroom would require about 2,300 square feet of space (20,800 square feet of total holdroom). Further, if 10% of passengers were located outside of the holdroom, each holdroom would require about 2,450 square feet of space (22,000 square feet of total holdroom).

Recommendation: The alternatives evaluation should provide for approximately 24,400 square feet of passenger holdroom, boarding, and queueing, which should be designed at PAL 2 and be open before PAL 3.

Table 3-21: Holdroom Requirements

	Existing Facilities	Planning Activity Level		
		PAL 1	PAL 2	PAL 3
Holding area (sf)	15,260	13,000	15,300	19,700
Podium, queuing, egress (sf)	3,950	3,150	3,675	4,725
Total holdroom area (sf)	19,210	16,150	18,975	24,425

Source: Inter*VISTAS*, November 2018.

Commercial Service Apron. The number of aircraft contact gates is the most significant factor in determining the size and configuration of the passenger terminal. The existing commercial service apron provides six aircraft parking positions capable of accommodating ADG IV[6], and four positions that can accommodate the Boeing 757-200.

The following assumptions were made to inform the future aircraft gate requirement:

- ✓ Airlines would require 45 minutes to conduct a turn (which consists of an arrival and then subsequent departure)
- ✓ A 15-minute buffer is assumed to exist between each operation to allows for aircraft towing and flight schedule delays

Using these assumptions, nine aircraft parking positions would be required to accommodate the design flight schedule through PAL3.

Sensitivity analysis: If more severe schedule perturbation were to occur and average turn times were to increase from 45 minutes to 50 minutes, then 10 aircraft parking positions would be required. If turn times were to increase to 55 minutes, then 11 aircraft parking positions would be required for PAL 3 demand.

Recommendation: To account for both schedule delays and longer turn times associated with legacy airlines, a minimum of 11 aircraft parking positions should be provided. The alternatives evaluation should identify the apron space that may be occupied should a widebody aircraft occasionally be on the ground as the result of a charter or diversion. **Table 3-22** summarizes the recommended aircraft contact gates.

[6] Most narrow body aircraft are ADG III, such as the Airbus A320 and Boeing 737 aircraft.

Table 3-22: Aircraft Parking Position Requirements

	Existing Facilities	Planning Activity Level (PAL)		
		PAL 1	PAL 2	PAL 3
Apron (gates)	6 ADG III 4 ADG IV	8 ADG III	9 ADG III	11 ADG III

Source: InterVISTAS, November 2018.

Baggage Claim. Baggage claim requirements are a function of peak hour deplaning passengers, the concentration of deplaning passengers within the peak 30-minutes, and the percentage of passengers with checked baggage. In the existing condition, two flat-plate claim devices are provided in the baggage claim. The following assumptions were utilized to determine the baggage claim device requirements:

- ✓ Three feet of claim frontage per passenger, based on ACRP 25 guidelines
- ✓ 90% of passengers are assumed to check bags (equivalent of 0.9 bags per passenger)
- ✓ An average claim device occupancy time of 10 minutes per flight
- ✓ A retrieval area between 10 to 12 feet deep around the baggage claim device to allow for active claiming of bags and maneuvering
- ✓ The two existing flat-late claim devices provide 326 feet of linear frontage combined (which accounts for the proposed expansion of the devices)
- ✓ Passengers typically arrive in the baggage claim area before bags are offloaded on the belts

Given these assumptions, two baggage claim devices are sufficient to accommodate the demand through the entire planning period based on linear frontage required.

Sensitivity analysis: If the claim occupancy time assumption was increased from 10 to 20 minutes, a third device would be required to accommodate a larger number of passengers queueing around the claim devices.

Recommendation: We recommend that a third device be evaluated within the alternatives process to accommodate seven peak hour arrivals by PAL 2, as well as any schedule perturbations. The recommended number of baggage claim devices is shown in **Table 3-23**.

Table 3-23: Baggage Claim Requirements

	Existing Facilities	Planning Activity Levels (PAL)		
		PAL 1	PAL 2	PAL 3
Claim devices (each)	2	2	3	3

Source: Inter*VISTAS*, November 2018.

Summary of Terminal Requirements. This report analyzed the passenger terminal requirements at Phoenix-Mesa Gateway Airport for the 20-year planning horizon from 2018 through 2038. The requirements and recommendations are summarized as follows, and the individual requirements are summarized in **Table 3-24**:

- ✓ Check-in lobby. The 32 existing check-in positions and the current queueing area are sufficient to accommodate demand through PAL 3. As part of the alternatives evaluation, it would be prudent to explore the possibility of providing additional passenger queue space, if either (1) airport management would like to account for airline's tendency not to staff all available positions or (2) the additional space would not inhibit other terminal functions.
- ✓ Checked baggage screening. Further discussion with TSA is required to select the optimal baggage screening solution as existing system is likely to reach capacity in the near future. Upgrades to the ticket counter baggage feeds should be considered as the airport reaches PAL 1 to accommodate the projected peak hour bags. Further, we recommend that an inline system with four medium speed EDS be implemented prior to the airport reaching PAL 2.
- ✓ Security screening checkpoint. Five lanes at a 15-minute wait time standard are sufficient, assuming the lanes cannot be reconfigured with ASL technology, if practical. Notably, during the forecasted peak morning period, the wait time would exceed the airport's preference of 10 minutes for a period of time; however, it would remain below 15 minutes. Throughout the rest of the day, it is expected that a 10-minute wait time level of service could be achieved.
- ✓ Passenger holdroom. The alternatives evaluation should provide for approximately 24,400 square feet of passenger holdroom (includes queueing and boarding operations), which should be designed at PAL 2 and be open before PAL 3.
- ✓ Aircraft gates. To account for both schedule delays and longer turn times associated with legacy airlines, we recommend that the alternatives evaluation provide at least 11 ADG III capable aircraft gates.
- ✓ Baggage claim. The possibility of a third device should be evaluated within the alternatives process to accommodate seven peak hour arrivals by PAL 2.

Landside facility requirements, financial planning, and other considerations may result in a need for new passenger terminal and support facilities in the long-term looking toward PAL 3 demand. If that is the case, the airport may well consider embarking upon a terminal enhancement over the next 10 years that would meet the most critical needs associated with PAL3, namely security checkpoint enhancement and passenger holdroom expansion, reserving the majority of financial capacity for the future passenger terminal building.

Table 3-24: Terminal Requirements Summary

Functional Areas	Existing Facilities*(a)*	Planning Activity Level (PAL)		
		PAL 1 (2023)	PAL 2 (2028)	PAL 3 (2038)
Check-in Queue (sf) Counters/Bag drops	4,500 32	3,550 26	3,700 27	4,350 31
Checked baggage EDS machines *(b)* Makeup area (sf)	2 CT-80 11,500	3 MS-EDS 11,400	4 MS-EDS 12,800	4 MS-EDS 15,700
Security screening checkpoint Queue (sf) Lanes	3,800 5	1,950 5	2,250 5	2,625 5
Passenger holdroom Holdroom (sf) Podium, queuing, egress (sf)	15,260 3,950	13,000 3,150	15,300 3,675	19,700 4,725
Apron (gates)	6 ADG III 4 B757	8 ADG III	9 ADG III	11 ADG III
Baggage claim (devices)	2	2	3	3

Source: Inter*VISTAS*, November 2018.

(a) Existing queues are estimated based on terminal drawings.

(b) Requirement, which is based on a hypothetical medium speed inline system (MS-EDS), includes one EDS machine for redundancy.

GA Facilities

Based Aircraft Storage. Located at IWA are three hangar facilities that offer 54 aircraft storage units for based aircraft. Pilots also have the opportunity to base aircraft on the GA apron. Neither the hangars nor designated based aircraft storage areas on the GA apron are at capacity, and are not projected to be in the near future. The Airport recently leased land for two new hangar developments, which will not only store aircraft for existing companies, but also for potential based aircraft. Additional hangar development for small aircraft is not needed but should be considered for larger business jets.

Cargo Facility

SkyBridge is in the planning stage of developing a currently vacant 363-acre site on IWA property, southwest of the airfield. It will become the location of an international air cargo hub that will contain both U.S. and Mexican Customs facilities. In September 2018, SkyBridge completed a Concept Master Plan for the project. Their Concept Master Plan indicated the development will contain a mix of aeronautical (24 percent) and non-aeronautical (76 percent) land uses. The conceptual plans have been designed with consideration given to Federal Aviation Regulation (FAR) Part 77 Airspace Surfaces, and taxiway and taxilane setback requirements. Additionally, the plan considers site development based on the existing ATCT line-of-sight requirements. The preferred site for the ATCT relocation will only lessen the impact on the proposed project site. No conflicts exist between preliminary plans and existing facilities at IWA.

Airport Support Facilities

Fuel Storage Facilities. IWA currently offers aircraft fueling services using AVGAS and Jet A fuel products. AVGAS and Jet A fuel are provided by the FBO from airport-owned fuel trucks that obtain fuel from fuel storage/dispensing facilities sited west of Taxiway T. According to fuel sale records provided by airport management, an average of 364,919 gallons of AVGAS and 14,856,711 gallons of Jet A has been sold per year, over the past seven years. Based on 2017 total operation counts, this equates to just under 3 gallons of AVGAS fuel sold per piston-powered aircraft operation, and just under 158 gallons of Jet A fuel sold per turbine-powered aircraft operation as seen in **Tables 3-25** and **3-26**. It is expected the ratio of both AVGAS and Jet A gallons sold per operation will slightly increase throughout the 20-year planning period, based on forecast operations and the introduction of cargo operations by Skybridge.

Table 3-25: Estimated AVGAS Fuel Storage Requirements, 2017-2038

	2017[1]	2018	2023	2028	2038
Average Day of Peak Month Operations	616	641	674	709	787
Two Week Operations	8,624	8,972	9,440	9,926	11,021
Gallons per Operation	2.7	2.7	3	3.3	3.6
Fuel Storage (Total Gallons)	**23,037**	**24,225**	**28,320**	**32,757**	**39,675**
AVGAS Storage	**12,500**				

Source: PMGAA Fuel Storage/Sales Records and Mead & Hunt.

[1]Base year estimates

Table 3-26: Estimate Jet A Fuel Storage Requirements, 2017-2038

	2017[1]	2018	2023	2028	2038
Average Day of Peak Month Operations	317	330	347	365	406
Two Week Operations	4,442	4,622	4,863	5,114	5,677
Gallons per Operation	157.9	157.9	167.9	187.9	217.9
Fuel Storage (Total Gallons)	**701,421**	**729,829**	**816,508**	**960,844**	**1,237,097**
Jet A Fuel Storage	**250,000**				

Source: PMGAA Fuel Storage/Sales Records and Mead & Hunt.

[1]Base year estimates

Using the increasing gallons sold per operation ratio, an estimate of future fuel storage is calculated based on a two-week demand during the peak month of operations. Based on this calculation, IWA's existing AVGAS and Jet A fuel storage facilities are insufficient. In a two-week span during the peak operation month of 2017, based upon a generalized planning standard, it is recommended IWA have a fuel storage of 23,037 gallons of AVGAS and 701,421 gallons of Jet A fuel. As stated in the Inventory chapter, there is one aboveground 12,500-gallon AVGAS tank, two aboveground 50,000-gallon Jet A fuel tanks, and six aboveground 25,000-gallon Jet A fuel tanks located within the fuel farm.

Aircraft Rescue and Firefighting (ARFF). As mentioned in the Inventory chapter, IWA meets and maintains ARFF Index C standards. Station 215, constructed in 2010, is a 26,000 square foot facility located on airport property west of Runway 30L. Station 215 houses all ARFF equipment within its bays. All ARFF equipment is owned by the PMGAA. ARFF Services are provided by Mesa Fire Station 215.

Transportation Facilities

The West Terminal Optimization Study, completed in 2015, details an analysis of the roadway system and parking facilities' ability to accommodate growing activity at IWA. Forecasted passenger activity was compared to the existing facilities' capacity. In conclusion, the terminal and its support facilities were determined to suit then and future aviation activity for a 10-year planning period given functional elements of the roadway system and parking facilities were modified. The study determined the following to cause and/or suffer from a degraded level of service specifically during peak times:

- ✓ S. Sossaman Road left turn pocket
- ✓ Terminal access roads
- ✓ Parking facilities.

With the coordination of a stakeholder committee comprised of airport staff, airline staff, and other businesses located at IWA, several recommendations were made to alleviate the degraded level of service, enhance the level of service within the existing terminal, and improve the traveling public's and tenant experience until a terminal on the east portion of the airfield could be planned, funded, and constructed.

The recommendations made within the West Terminal Optimization Study were further developed in the 2017 Sossaman Road and West Terminal Access Road Optimization Improvements Scoping Study (2017 Scoping Study). Using the West Terminal Optimization Study as a foundation, conceptual designs were devised to alleviate the degraded level of service of, or caused by, the S. Sossaman road left turn pocket, terminal access roads, and parking facilities. The conceptual designs proposed included alterations of existing facilities, including reconfiguring the terminal's entrance and exit, reconfiguring the southbound Sossaman

Road left turn pocket that provides access to the terminal, and reconfiguring the southbound Sossaman Road left turn pocket located at the intersection of Sossaman Road ¼-mile south of Texas Avenue.

Utilizing the conceptual designs, construction began on several of the modifications. As a result, the conceptual designs presented in the study, including those completed and awaiting construction, are considered existing conditions. The recommendations presented in the West Terminal Optimization Study, on which the conceptual designs are predicated, are to only alleviate the degraded level of service for a 10-year planning period. Due to the time that has passed since the completion of the studies and change in forecasted aviation and vehicular activity at IWA, a supplemental analysis of the transportation facilities that considers current and future activity throughout the master plan planning period has been prepared. The subsequent narrative detailing the transportation network at, and adjacent to, IWA documents the issues initially presented and suffered by the transportation system, ongoing and awaiting optimizations, followed by the supplemental transportation system capacity and parking demand analysis.

Arterial Roadway Capacity

Sossaman Road. Sossaman Road is a major four-lane arterial road divided by raised medians into two lanes for northbound and southbound traffic. Previously, a left turning pocket, approximately 150 feet in length, extended from one of the southbound through lanes to provide access to the terminal. The left turning pocket was the sole access point to the terminal for vehicles transiting southbound. From the left turn pocket, airport users would access the:

- ✓ Daily lot
- ✓ Hourly lot
- ✓ Arrivals, departures, and commercial curb

Vehicular access to the terminal was stunted due to the conditions of the southbound Sossaman Road left turn pocket. Labeled as the "most significant issue" and identified in the 2015 West Terminal Optimization Study as a "current failing service," the left turning pocket did not adequately service passenger terminal traffic during peak times due to its length and configuration. Both its length and configuration resulted in a queue of waiting vehicles that overflowed into the adjacent through lane, interrupting the free flow of traffic on Sossaman Road. Reportedly, the queue line extended 0.25 miles from the terminal entrance and into the transition area of the Texas Avenue and Sossaman Road intersection during peak hours. In the past, law enforcement had to patrol traffic to prevent congestion and delays.

The 2017 Scoping Study determined converting the north and southbound intersection, located at the southbound Sossaman Road left turn pocket, would improve both existing and future traffic operations. Since the study, the Sossaman Road left turn pocket that provides access to the terminal has been extended to a length of 250 feet to provide additional space for vehicles. A traffic light was also installed at this location to mitigate queuing and congestion.

Automobile Parking Lot Ingress/Egress

Hourly Parking Lot. The entrance of the Hourly Parking Lot was located adjacent to the entrance of the commercial curb. Both were accessed by the third lane furthest from the terminal, which is also used as a through lane for vehicles transporting arriving and departing passengers. Due to the former layout of the Hourly Parking Lot, and former location of its entrance and dual lane exit, substantial congestion was generated. Entry to the Hourly Parking Lot was gate-controlled, allowing one vehicle per entry. During peak hours, typically a three-hour span from 2pm – 5pm, multiple vehicles occupied the third lane, causing stagnated traffic flow. The third lane extends from the initial two-lane terminal entrance. During peak hours, the Hourly Parking Lot entry queue caused cars to extend beyond the sidewalk along the third lane and wrap into one of the two terminal entrance lanes. Entry to the terminal then became limited, adding to the delay and congestion of vehicles that occupied the southbound Sossaman Road left turn pocket. Commercial vehicles, including taxis and airport shuttles, were also affected by the Hourly Parking Lot queue as the third lane is used to access the commercial curb, which caused commercial vehicles to wait.

Located on the west side of the Hourly Parking Lot was a dual lane exit that only permitted one vehicle per lane. Once both exit lanes were occupied, other exiting vehicles had to queue to the left or right, causing congestion within the lot for vehicles that were actively searching for parking spots. Additionally, parked cars became blocked in for periods of time by the exiting queue of vehicles. The toll booths located at the former exit lanes were reported to constantly malfunction, which caused further delay and congestion within the lot, and led to several vehicular collisions. The dual lane exit provided exiting vehicles the option to proceed north or southbound on Sossaman Road, which posed safety concerns as exiting vehicles had to quickly merge into oncoming traffic if traveling north, or cross oncoming northbound traffic to merge into southbound traffic. As an arterial road that primarily provides access to the local colleges and IWA, traffic flow on Sossaman Road is constant. No stop signs or traffic lights are present for approximately 1.5 miles south of the former dual lane exit, which caused an influx of transiting vehicles on Sossaman Road that exiting vehicles from the Hourly Parking Lot had to yield to and merge into. Resultingly, vehicles had to wait at the Hourly Parking Lot exit for long periods time, which added to the queuing of vehicles in the lot.

Since the completion of the 2017 Scoping Study, the modifications listed below have been implemented to the Hourly Parking Lot. All issues detailed previously have been resolved, however, access to the new Hourly Parking Lot entrance, detailed below, from the terminal exit lanes is complicated. Completed modifications to the Hourly Parking Lot are as follows:

- ✓ The entrance of the Hourly Parking Lot was relocated. This was done by removing 14 parking spaces on the west half of the west aisle to construct a new dual-lane gate-controlled entrance. Access to the entrance is now provided by a left turning lane from Sossaman Road southbound at its intersection with Texas Avenue. The southbound Sossaman Road left turning pocket is 200 feet for storage of vehicles accessing the Hourly Parking Lot. The new lot entrance has the capacity to accommodate six queued cars to eliminate congestion on Sossaman Road. The new entrance also reduces vehicle utilization of the terminal lanes.
- ✓ The crosswalk area located on the north side of the west aisle was removed and six new parking spaces were added in its place. This prevents vehicles from entering the lot and immediately turning left to access the east aisle of the lot. The crosswalk was replaced.

  The dual lane exit to the north of the east aisle was relocated and replaced with eight parking spaces. A portion of the roundabout median was removed to construct three gate-controlled Hourly Parking Lot exit lanes. A lane was constructed for exiting vehicles from the Hourly Parking Lot. This lane is now a considered a third lane that adjoins with the current terminal and commercial exit lanes to provide access from the lot to Texas Avenue and Sossaman Road. This lane is a left-only turn lane. If vehicles exiting the lot desire to continue straight on Texas Avenue or northbound on Sossaman road, a single lane shift is required.

Supplemental Transportation System Capacity Analysis

Mead and Hunt has prepared the following supplemental analysis of the transportation facilities that considers current and future activity throughout the master plan planning period. The purpose of the capacity analysis is to determine the operational capacity of South Sossaman Road with and without the proposed development for the 2030 and 2040 design years.

Existing Arterial Roadway Conditions. The 2024 expected peak hour traffic volumes at the intersection of South Sossaman Road and the Texas Avenue/Airport entrance were obtained from the *Phoenix-Mesa Gateway Airport Authority Sossaman Road and West Terminal Access Road Optimization Improvements Scoping Study* dated *March 13, 2017*. An area growth rate of 2.3 percent, along with a 7 percent truck percentage was obtained from the *Arizona Department of Transportation Data Management System* web site which will be used to complete the roadway capacity analysis. By using the 2024 existing peak hour traffic volumes and applying the 2.3 percent growth rate we can determine the 2030 and 2040 design year peak hour volumes for the intersection. The 2024 existing traffic volumes and the projected 2030 and 2040 traffic volumes for the intersection of South Sossaman Road and Texas Avenue/Airport entrance are shown below in **Table 3-27,** and will be referred to as the No Build Alternative. The No Build Alternative, is the existing traffic volumes projected to the 2030 and 2040 study years using population growth and does not include any new development. The total 24-hour average daily traffic or ADT is then calculated by dividing the total approach peak hour volumes by the peak hour factor of 0.09. The ADT for South Sossaman Road northbound and southbound is shown in the table below.

Table 3-27: Texas Avenue and S. Sossaman Road Existing Conditions (No Build Alternative)

2024 Peak Hour – No Build												
Time	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
	Texas Avenue/Airport						**S. Sossaman Road**					
Peak	45	0	24	194	0	401	32	1,323	37	130	1,727	73
Total 24- hour Volume (ADT)	-			-			**15,467**			**21,444**		
2030 Peak Hour – No Build												
Time	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
	Texas Avenue/Airport						**S. Sossaman Road**					
Peak	51	0	27	221	0	457	36	1,508	42	148	1,969	83
Total 24-hour Volume (ADT)	-			-			**17,632**			**24,447**		
2040 Peak Hour – No Build												
Time	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
	Texas Avenue/Airport						**S. Sossaman Road**					
Peak	62	00	33	266	0	549	44	1813	51	178	2366	100
Total 24-hour Volume (ADT)	-			-			**21,189**			**29,379**		

Source: Mead and Hunt.

Area Developments. There are two planned expansions and one new development expected to occur within the study area. The planned expansions and the new development are listed below, along with a brief description of the expected growth:

Phoenix-Mesa Gateway Airport Terminal-Expansion. The airport expansion will result in additional traffic volumes. The projected average day peak hour passengers for IWA as listed in **Table 3-28** below. By using the predicted passenger data, we can determine the increase in traffic volumes on South Sossaman Road.

Table 3-28: **IWA Average Daily Peak Passenger Projections**

Passengers	2018	2019	2023 (PAL 1)	2028 (PAL 2)	2038 (PAL 3)
Average Day					
Deplanements	2,703	3,029	3,294	3,642	4,435
Enplanements	2,703	3,029	3,294	3,642	4,435
Passengers	5,406	6,055	6,587	7,281	8,868
Peak Hours					
Deplanements	606	679	738	816	994
Enplanements	803	900	978	1,082	1,317
Passengers	903	1,011	1,100	1,216	1,481

Source: Unison, IWA MP 2018 – PMAD PH and Fleet Mix Details; October 2018

In **Table 3-28**, the Average Day Deplanements and Enplanements do not total the number of passengers due to a rounding error that is within an acceptable range. As presented in **Table 3-15**, the peak hour for deplanements occur from 6:41am-7:40am. The peak hour of enplanements occurs from 9:39pm-10:38pm, and the peak hour for total passengers occur from 1:32pm-2:31pm. Therefore, there is no direct correlation between passengers, deplanements, and enplanements. The increase in passengers from 5,406 passengers in 2018 to 7,281 passengers in 2023 is 1,875. The increase in passengers from 2018 to 2038 is 3,462 passengers. Using an estimate of one vehicle trip per passenger the increase in trips to the airport will be 1,875 vehicles in 2028 and 3,462 vehicles in 2038.

Arizona State University Polytechnic Campus – Expansion**.** Based upon information obtained from the Board of Regents for the Arizona's Public Universities, the current and expected enrollment projections for the Arizona State University – Polytechnic Campus are shown below:

- ✓ Fall 2016 Actual full-time enrollment – 4,482
- ✓ Fall 2020 Projection full-time enrollment – 7,839
- ✓ Fall 2024 Projection full-time enrollment – 9,896

The increase in students is 5,414 by the Fall of 2024.

SkyBridge Development – New Development**.** Currently there are plans for a multi-use development referred to as the SkyBridge Development for the area south of IWA. The land use summary for the SkyBridge development is shown in **Figure 3-8**. Access to the SkyBridge Development will be from South Sossaman Road, as shown in **Figure 3-9.** SkyBridge development is currently under construction, with a three-phase construction sequence over the next 15 years. For the purpose of this study it will be assumed that 70% of the SkyBridge development will be completed by 2030 with 100% of the development completed by 2040.

Figure 3-8: **SkyBridge Development Land Use Summary**

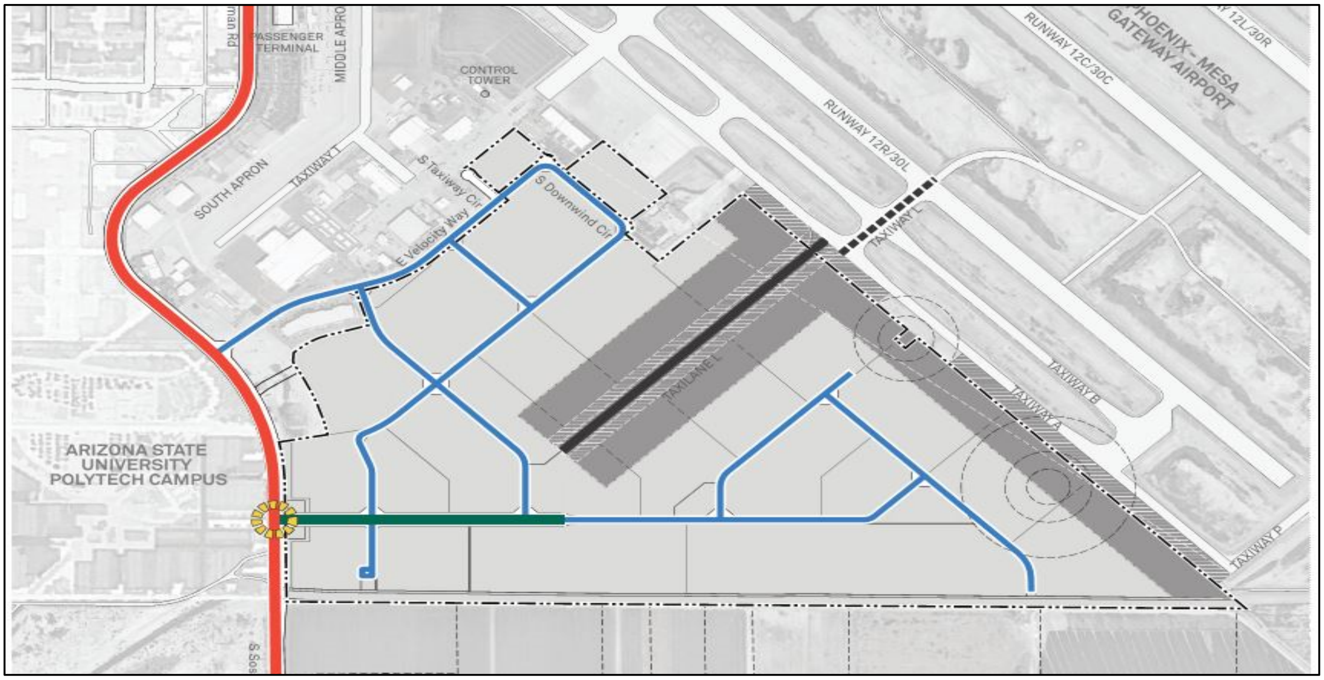
DISTRICT	LAND USE	LAND AREA (SF)	LAND AREA (AC)	LAND DISTRBUTION	GFA (SF)	FAR	NUMBER OF ROOMS *
Area A	**Non-Aeronautical Use**	**141,203**	**3.2**	**1%**	**60,000**	**0.42**	
Area B	**Aeronautical Use**	**216,666**	**5.0**	**1%**	**82,500**	**0.38**	
Area C		**15,475,937**	**355.3**	**98%**	**3,683,654**	**0.24**	**150**
	Taxilane/ Taxilane OFA	666,077	15.3	4%			
	Detention Basins	1,058,346	24.3	7%	11,158		
	Open Space	774,199	17.8	5%			
	Roadway	1,144,346	26.3	7%			
	Non-Developable Total	**3,642,968**	**83.6**	**23%**	**11,158**		
	Non-Aeronautical Use	4,797,616	110.1	30%	2,069,430	0.43	
	Aeronautical Use	3,692,787	84.8	23%	1,333,066	0.36	
	R&D / Office **	533,902	12.3	3%	200,000	0.37	
	Hotel / Retail ***	314,574	7.2	2%	70,000	0.22	150
	Ramp	2,494,090	57.3	16%			
	Developable Total	**11,832,969**	**271.7**	**75%**	**3,672,496**	**0.31**	**150**
TOTAL		**15,833,806**	**363.5**	**100%**	**3,826,154**		

Table 4.4: Land Use Summary

* Number of Room assuming hotel GFA 50,000sf and 330sf per room
** Office / R&D assuming 3 story buildings
*** Retail / Hotel assuming 3 story buildings

Source: SkyBridge Arizona, 2018.

Figure 3-9: Skybridge Development Vehicular Access



Source: SkyBridge Arizona, 2018.

Projected Traffic Volumes for the Three Plan Development (Phoenix-Mesa Gateway Airport Terminal, Arizona State University Polytechnic Campus, SkyBridge). Using the lasted edition of the Institute of Transportation Engineers Trip Generation Manual, expected average weekday peak hour trips can be calculated for each expansion or planned development, as described above. **Table 3-29** identifies the total ADT for the three planned developments for 2030 and 2040 design years.

Table 3-29: Trip Generation Table

Trip Generation			
EXISTING/PROPOSED DEVELOPMENT	**Weekday**		
	Total Daily Trips	**Entering**	**Exiting**
SkyBridge Development			
70% by 2030	9,372	4,686	4,686
100% by 2040	13,390	6,695	6,695
Arizona State University – Polytechnic Campus			
2024 -5,414 Students	8,446	4,223	4,223
Phoenix-Mesa Gateway Airport			
Passengers by 2028	1,875	938	938
Passengers by 2038	3,462	1,731	1,731
Total Development ADT by 2030		9,847	9,487
Total Development ADT by 2040		12,649	12,649

Source: Mead and Hunt.

2030 and 2040 Traffic Volumes with Development**.** The total 2030/2040 Build traffic volumes can be determined by taking the No Build 2030/2040 traffic volumes on South Sossaman Road and adding the calculated development trips determined in the trip generation. The 2030/2040 Build scenarios consist of a projection of expected progress towards the completion of planned developments highlighted in **Table 3-29.** The 2030/2040 ADT for the Build condition is shown in **Table 3-30.**

It should be noted that as a result of growing terminal and parking lot access constraints from traffic along S. Sossaman Road, discussion has begun about opportunities to mitigate truck traffic anticipated by the Skybridge Arizona development. This discussion includes the potential for building additional roadways to accommodate the development's needs. In addition, it is difficult to anticipate the impact of growing enrollment on traffic volumes along S. Sossaman Road, as a portion of this additional volume will be accommodated elsewhere in the system (Power Road, Williams Field Road). For these reasons, traffic volumes may vary in the future from values presented here.

Table 3-30: **Texas Avenue and S. Sossaman Road 2024, 2030, 2040 Peak Hour (Build Alternative)**

2024 Peak Hour – Build												
Time	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
	Texas Avenue/Airport						**S. Sossaman Road**					
Peak	45	0	24	194	0	401	32	1,323	37	130	1,727	73
Total ADT Volume	-			-			**1,392**			**1,930**		
2030 Peak Hour – Build												
Time	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
	Texas Avenue/Airport						**S. Sossaman Road**					
Peak	51	0	27	221	0	457	36	1,508	42	148	1969	83
Total ADT	-			-			**1,587**			**2,200**		
Development Volume (ADT)				-			**9,847**			**9,847**		
Total ADT w/ Development							**2,473**			**3,086**		
2040 Peak Hour – Build												
Time	**Eastbound**			**Westbound**			**Northbound**			**Southbound**		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
	Texas Avenue/Airport						**S. Sossaman Road**					
Peak	62	0	33	266	0	549	44	1,813	51	178	2,366	100
Total ADT	**-**			**-**			**1,907**			**2,644**		
Development Volume (ADT)				**-**			**12,649**			**12,649**		
Total ADT w/ Development							**3,045**			**3,783**		

Source: Mead and Hunt

Arterial Roadway Capacity Analysis Summary. The Highway Capacity Software, current edition was used to complete the capacity analysis for South Sossaman Road to determine the roadway operational level of service for the 2030 and 2040 design years. The capacity results are shown below in **Table 3-31** for the South Sossaman Road for the 2024 No Build and the 2030 and 2040 Build conditions. The results are represented in Density (passenger cars per mile per lane-pc/mi/ln) and Level of Service (LOS). A LOS of “A, B, C or D” during the peak hours can be considered an acceptable LOS.

Table 3-31: **S. Sossaman Road – Arterial Level of Service**

South Sossaman Road -Arterial Level of Service					
2024 No Build		2030 Build		2040 Build	
LOS	Density (pc/mi/ln)	LOS	Density (pc/mi/ln)	LOS	Density (pc/mi/ln)
D	26.4	E	42.6	F	-

Source: Mead and Hunt

Based upon the results of the roadway capacity analysis, South Sossaman Road from East Ray Road to East Pecos will operate at an acceptable LOS of "D" for the 2024 design year but does not operate at acceptable levels of services from 2030 and beyond. Airport generated traffic can be removed from South Sossaman Road, If the terminal entrance is relocated to east side of the airport. If the airport entrance is relocated, then South Sossaman Road would operate at an acceptable levels of service "D'" with a density of 29.4 pc/mi/ln until 2030.

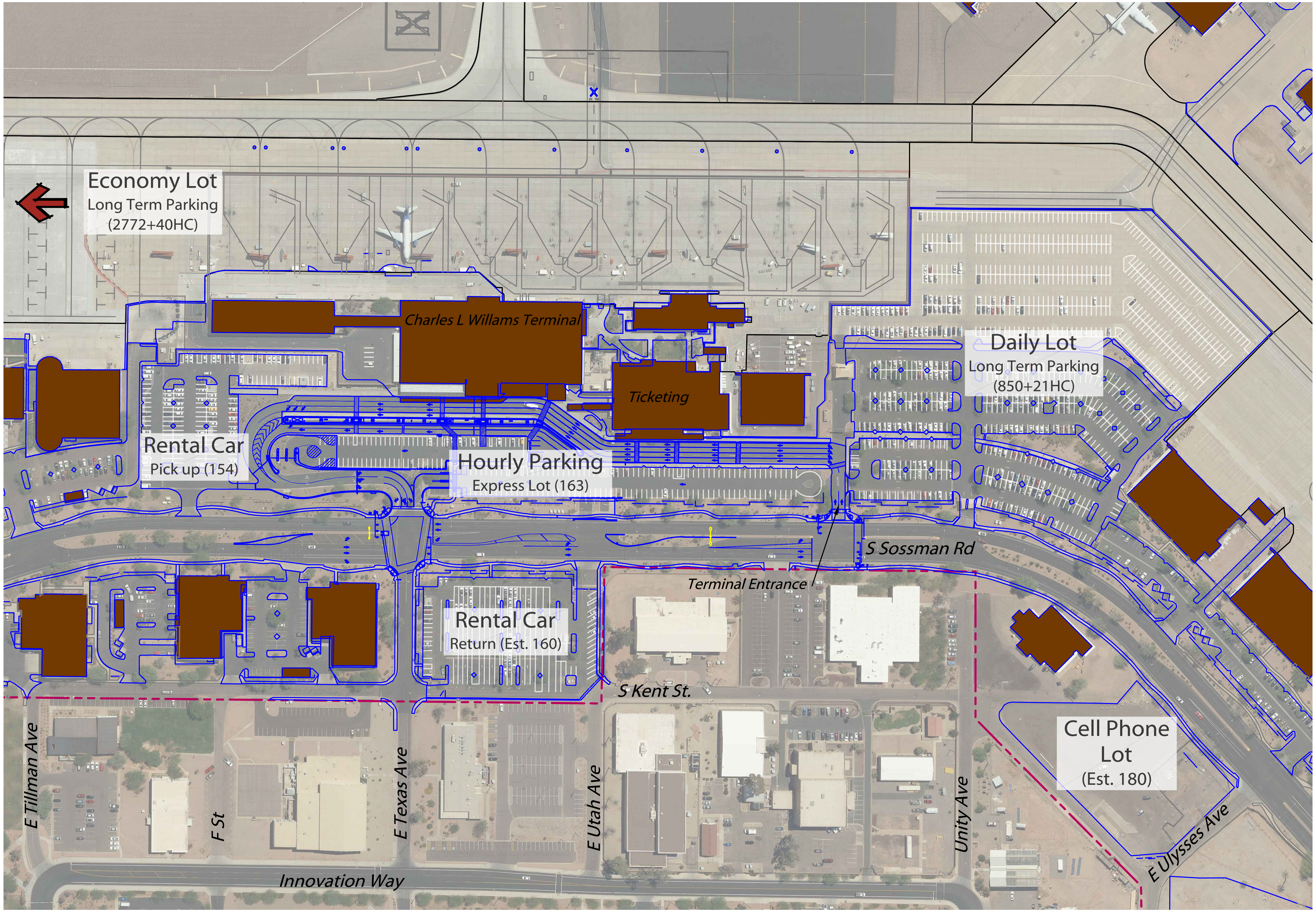
Automobile Parking Facility Needs/Demand Analysis

The Automobile Parking Facility Needs/Demand Analysis looks at the relationship of recent enplanement and parking data over a similar time period. This is done to evaluate the adequacy of existing parking supply to meet future parking needs at the Airport. This analysis will focus on four (4) primary automobile parking components found within the immediate Airport Vicinity[7].

- ✓ Public Parking
- ✓ Rental Car Parking
- ✓ Employee Parking
- ✓ Temporary Parking

Figure 3-10 shows the locations of each parking facility. **Table 3-32** shows the existing availability of parking facilities to support each automobile parking component.

[7] Commercial Tenant Parking was not included in this analysis. Parking needs are determined on a lease-by-lease basis. Parking enforcement is provided by the Airport to ensure stalls are reserved for tenants.



Economy Parking Lot Location Map

1.8 Miles from Terminal (free shuttle)

LEGEND

Existing Building

Phoenix-Mesa **Gateway** Airport

Figure 3-10
Terminal Parking

Table 3-32: IWA Existing Parking Supply

	Lot Function	Number of Spaces	ADA Spaces	Total Spaces
Public Parking				
Hourly Express Lot[8]	Short-Term	-	-	183
Daily Lot	Long-Term	850	21	871
Ray Road Economy Lot	Long-Term	2772	40	2812
Rental Car Parking				
Ready Lot	Pick-Up	154	-	
Return Lot[9]	Return	180	-	180
Temporary Parking				
Cell Phone Lot[10]	Short-Term	180	-	180
(GA) Employee Parking[11]	-	-	-	-

Source: Data provided by PMGAA

The basis for projecting parking demand in this section is forecasted enplanements versus the most recently available parking data in 2017 and 2018. For this analysis, the Master Plan forecasted growth scenario is used, with an average growth rate of 2.0%.

Table 3-33 shows forecasted enplanements and ratios that will be used to determined increase in parking demand. Ratios are presented for each planning horizon (short, mid, long) to provide an added level of analysis over time.

Table 3-33: Enplanement Projections and Ratio (Master Plan Rate)

Planning Horizon	Year	Enplanements	Demand Ratios
Current	2017	681,892	1.00
Short-Term	2023	849,894	1.25
Mid-Term	2028	933,157	1.37
Long-Term	2038	1,145,806	1.68

[8] Existing Hourly Parking Lot Supply assumes modifications recommended by the West Terminal Optimization Study are existing Conditions.

[9] There are approximately twenty-nine (29) rental car return lot spaces not included in this analysis. Parking numbers are estimated based on return lanes and an estimated ten (10) vehicle lane capacity. A total of eighteen (18) lanes are available in the rental return lot.

[10] Parking spaces have not been paved within the cell phone lot. An estimation of 180 spots has been made.

[11] Employees utilize a keycard system that provides them access to any of the public parking lots. For this analysis, employees are included as part of the parking needs projections.

Public Parking Demand. In establishing a baseline for peak public parking demand (or peak daytime occupancy), the month of July was evaluated. July was used for the baseline because it is the month the Airport experiences a confluence of high numbers for each metric that influence parking demand.

- ✓ Second highest enplanements
- ✓ Greatest frequency of overnight stays for each lot
- ✓ First or second longest duration of stays.

Table 3-34 shows historical data for enplanements by month. July enplanements for 2017 were 16-percent above the annual average. The number of parking transactions that occurred in July 2017 was 15-percent above average monthly transactions. This highlights the correlation between enplanements and parking demand. For the purpose of this analysis, it is assumed that parking demand and enplanements have a strong correlation. As such, an incremental increase in forecasted enplanements will also correlate to an increase in parking demand.

Table 3-34: Enplanements, 2012 – 2017

Month	2012	2013	2014	2015	2016	2017	2017 % to Avg.
January	36,376	47,458	62,256	51,372	51,556	52,126	92%
February	34,971	55,594	65,232	53,255	53,110	57,891	103%
March[12]	51,758	83,810	92,753	76,779	77,585	80,720	143%
April	39,613	67,281	67,327	49,973	54,579	58,345	103%
May	35,638	54,178	53,930	50,348	51,351	55,094	98%
June	42,731	57,115	56,729	55,824	56,709	65,632	116%
July	49,228	61,829	59,033	57,140	61,403	65,703	116%
August	37,371	49,570	45,653	44,531	46,575	47,023	83%
September	30,258	41,576	37,957	35,093	34,903	40,294	71%
October	32,962	49,010	40,748	45,896	45,103	48,895	87%
November	37,359	60,141	45,012	47,528	49,904	49,451	88%
December	49,191	66,688	53,573	57,580	58,482	55,957	99%
Total	**477,456**	**694,250**	**680,203**	**625,319**	**641,260**	**677,131**	-
Average	**39,788**	**57,854**	**56,684**	**52,110**	**53,438**	**56,428**	-

Source: Mead and Hunt

Peak Daytime occupancy for the Hourly Lot has been observed as full capacity, which is used as the baseline for demand in the Hourly Lot[13] The following equation is used to determine the baseline peak daytime occupancy (or peak parking demand) for the Daily and Economy Lots.

Peak Daytime Occupancy = *Average Overnight Occupancy +*
(Average Overnight Occupancy/ Average Duration of Stay)

The average duration of stay for each lot was determined from parking transaction data (2017), and the average overnight occupancy was determined from overnight vehicle counts (2017). Evaluating the overnight occupancy and lot utilization for July 2017 illustrates parking demand – and the ability for the existing parking facilities to accommodate it.

The baseline parking demand (Peak Daytime Occupancy) was determined for the short-term (2023), mid-term (2028), and long term (2038). Along with the baseline parking demand, forecasted enplanements were used to project future parking demand for each lot.

[12] March is the peak month for enplanements, however, has a lower than average number of vehicles utilizing parking overnight, and has a lower than average length of stay for each parking lot. As a result, March does not represent peak parking demand.
[13] Stakeholder meetings during the completion of the West Terminal Optimization study found that the Hourly Express Lot fills up during peak times. Additional observations from Airport staff suggest the Hourly Express Lot operates at maximum capacity. For the purpose of this analysis, effective lot supply is used as peak daytime occupancy.

Table 3-35 shows the projected peak parking demand for each public parking lot for the short-term, mid-term, long-term planning horizons.

Table 3-35: Peak Public Parking Demand (Master Plan Projection Rate)

Lot	FY 2018	Short -Term	Mid– Term	Long -Term
Hourly Express Lot	156	194	213	262
Daily Lot	717	894	982	1,205
Ray Road Economy Lot	747	931	1,022	1,255

Source: Mead and Hunt

Best practices for managing parking supply and demand suggest that a parking inventory should be considered at capacity when the demand reaches 85% utilization. This is considered the effective parking supply and should be used when determining the surplus or deficit for the parking system. The remaining 15% of inventory is the flow factor, providing enough spaces to accommodate peak period overlap of arrival and departure passengers and limits a patron's time cycling the parking field in search of the last remaining parking space. It should be noted that since the Hourly Express Lot is currently at full capacity, parking demand assumes the existing lot is 85% of demand.

Table 3-36: Peak Public Parking Demand Forecasts (Master Plan Projection Rate) shows the parking supply, demand, and corresponding surplus/deficit for each parking lot considering the effective parking supply for the Master Plan forecasted growth.

Table 3-36: Peak Public Parking Demand Forecasts (Master Plan Projection Rate)

Lot		FY 2018 Peak	Short – Term	Mid – Term	Long – Term
Hourly Express Lot	Supply	183	183	183	183
	Effective Supply	156	156	156	156
	Demand	156	194	213	262
	Surplus/Deficit	0	-38	-57	-106
Daily Lot	Supply	871	871	871	871
	Effective Supply	740	740	740	740
	Demand	717	894	982	1,205
	Surplus/Deficit	23	-154	-241	-465
Ray Road Economy Lot	Supply	2,812	2,812	2,812	2,812
	Effective Supply	2,390	2,390	2,390	2,390
	Demand	747	931	1,022	1,255
	Surplus/Deficit	1,643	1,459	1,368	1,135
Grand Total	Supply	3,866	3,866	3,866	3,866
	Effective Supply	3,286	3,286	3,286	3,286
	Demand	1,620	2,020	2,218	2,723
	Surplus/Deficit	**1,666**	**1,266**	**1,069**	**563**

Source: Mead and Hunt

Based on the analysis of parking demand for the public parking lots there is an overall surplus of parking supply in existing, short, mid, and long-term planning horizons at the Master Plan forecasted growth rate.

Despite this surplus, there is an immediate deficit in parking in the Hourly Express Lot. This is a result of the lack of parking availability for vehicle cycling (flow factor), which may be contributing to issues elsewhere in the Airport transportation network. This issue becomes exacerbated over time leading to a near doubling of parking demand in the Long-Term.

The Daily Lot is able to meet existing demand with a small surplus; however, demand quickly exceeds supply in the short-term horizon (2023). The Ray Road Economy Lot has a significant surplus of spaces through the Long-Term and will likely absorb demand from the at capacity Daily Lot. This will likely lead to a near immediate increase in shuttle service demand during peak seasons.

As might be expected, forecasts from **Table 3-36** illustrate the need for interventions in a shorter window and should be consulted if growth continually outpaces Master Plan projected growth rates.

Rental Car Parking Demand. There are four (4) rental car companies present at the Airport, with Enterprise, Alamo, and Avis falling under the Enterprise parent flag.

- ✓ Enterprise Rent-A-Car
- ✓ Alamo National
- ✓ Avis Rent-A-Car
- ✓ Hertz

Rental car parking is broken into two separate lots, the Ready Lot (Pick-up) and the Return Lot. As shown previously in **Table 3-32**, the Ready Lot has one-hundred fifty-four (154) spaces and the Return Lot has eighteen (18) return lanes that accommodate approximately ten (10) vehicles each. Enterprise has one-hundred thirty-one (131) reserved spots in the Ready Lot and twelve (12) lanes in the return lot, which it allocates to its respective brands. Hertz has twenty-three (23) reserved spots in the Ready Lot and the remaining six (6) return lanes. Each rental company has access to the recently constructed on-airport wash facility and will have access to the planned on-airport fueling facility.

The number of parking spaces required to accommodate the forecasted levels of rental car activity is dependent on several factors, including enplanements, special events, and desire/policy of each rental car operator. A survey was provided to rental car operator to determine the ability of existing facilities to meet their needs.

The results of the rental car operator survey show that the Ready Lot and Return Lot are currently operating at maximum capacity. Based on this assumption we can use existing enplanements as a basis for current demand, and enplanement projections for future rental car parking demand. Since rental car lots operate differently than public parking facilities it may be possible to accommodate an increase in demand by modifying operation of the lots, like increasing staff available for shuttling vehicles between facilities. This analysis assumes this condition for the Return Lot. Nonetheless, the demand for spaces in the Ready Lot will illustrate the capacity of existing facilities to meet future needs.

Table 3-37 shows the projected peak rental car Ready Lot parking demand for each operator in the short-term, mid-term, long-term planning horizons.

Table 3-37: Rental Car Ready Lot Parking Demand Projections (Master Plan Projection Rate)

Rental Car Operator	Existing Supply	Short – Term	Mid – Term	Long – Term
Enterprise Rent-A-Car Enterprise Rent-A-Car Alamo National Avis Rent-A-Car	131	163	180	220
Hertz	23	29	31	39
Total Demand	154	192	211	259
Surplus/Deficit	0	-38	-57	-105

Source: Mead and Hunt

Table 3-37 *s*hows that as soon as the short-term (5-years) planning horizon, demand for parking in the Ready Lot will exceed supply. It is unlikely that operational efficiencies will be able to account for this increase in demand. Additional rental car parking supply should be provided as soon as feasible. **Table 3-35** shows that if growth exceeds the Master Plan forecasts, a solution will need to be developed.

Employee Parking Demand. Employees at the Airport are provided with an electronic keycard that allows them to access the public parking lots without fee. Most employee parking transactions are sited at the Daily Lot. To establish a baseline for projecting peak daytime employee parking demand, March 2017 transaction data for the three (3) largest employers was used. An aggregate count of peak employee parking was compiled to determine the maximum number of spaces occupied by employees at a time interval, this serves as peak employee parking demand.

It is expected that the relationship between enplanements and employees staffed at the Airport are linearly correlated, as such, so is its relationship to employee parking demand. **Table 3-38** shows the projected peak employee parking demand for each operator in the short-term, mid-term, long-term planning horizons. It also shows the projected increase in employee parking demand as a result of Master Plan and 2x Master Plan projected growth.

Table 3-38: Employee Parking Demand Forecast

Scenario	Current (2018)	Short – Term	Mid – Term	Long – Term
Master Plan Projection	168	209	230	282
Added Demand	-	41	62	114

Source: Mead and Hunt

As **Table 3-38** shows, the demand for employee parking will grow to over two-hundred (200) spaces in the short-term and continue to increase by nearly 68% in by the end of the 20-year planning horizon. Since employees currently occupy spaces in the public parking lots, this demand will begin to have an immediate impact on parking supply and overall parking revenue (employees not charged to park) during peak times.

Temporary Parking (Cell Phone Lot) Demand. The Cell Phone Lot is intended as a temporary lot, where no vehicle may be left unattended. Its primary purpose is to limit demand and congestion at the arrival curb, and reduces volumes attributed to recirculating traffic. Cell phone lots are typically located with easy access to the main airport access road but are not walking distance to the terminal to discourage their use as a no-cost short-term lot. The proximity of the Cell Phone Lot at the Airport to the terminal may be having the previously mentioned effect, as it is only a quarter mile away.

In addition, as cell phone lots are meant to function as temporary parking, they do not require the same number of spaces as other parking lots. Industry standards for the development of cell phone Lots recommend a site that accommodates between twenty (20) and sixty (60) parking stalls[14]. At one-hundred eighty (180) spaces, the Cell Phone Lot is out of scale with the needs for the Airport, and functionally has a surplus of one-hundred (120) spaces. If visitors intend to stay longer than one-hour, other parking facilities at the Airport have been provided for this need.

Parking Facility Needs/ Parking Demand Summary

Table 3-39 provides a snapshot of the four primary parking facilities in the Airport vicinity, based on Master Plan Projected growth. There are a number of parking supply deficits that show up in the Short-Term (2023) planning horizon, that are projected to increase in the Mid-Term (2028), and Long-Term (2038).

[14] *National Academies of Sciences. "Guidebook for Evaluating Airport Parking Strategies and Supporting Technologies." National Academies Press: OpenBook, 21 Jan. 2010*

Table 3-39: Overall Peak Parking Surplus/Deficit (Master Plan Projection Rate)

Lot	FY 2018 Peak	Short – Term	Mid – Term	Long – Term
Public Parking Total	1,666	1,266	1,069	563
Hourly Express Lot	0	-38	-57	-106
Daily Lot	23	-154	-241	-465
Ray Road Economy Lot	1,643	1,459	1,368	1,135
Rental Parking	0	-38	-57	-105
Employee Parking	0	-41	-62	-114
Temporary Parking (Cell Phone Lot)	120	120	120	120

The following are parking facility issues that will need to be addressed through various interventions. With each listed issue, supplemental information is provided to lend context to the urgency and scale of the problem.

- ✓ Deficit in Hourly Express Lot
    - Existing Deficit (0)
        - Deficit will begin to grow as enplanements increase
            - Intervention can be seasonal or interim
        - Large proportion of overnight stays during peak times for a short-term lot.
            - Intervention can be seasonal
    - Short-Term, Mid-Term, and Long-Term Deficit (-38, -57, -106)
        - Need to increase supply by Short-Term. Intervention must be scalable for future demand.
        - Need to also address Drop-Off Curb and S. Sossaman Rd operational issues identified in the West Terminal Optimization Study.
        - If unaddressed has potential to cause future operational issues at arrival curb.
- ✓ Deficit in Daily Lot
    - Short-Term, Mid-Term, and Long-Term Deficit (-154, -241, -465)
        - Need to significantly increase supply by Short-Term. Intervention must be scalable for future demand.
            - Ray Road Economy Lot will naturally take on this demand without intervention, however, additional shuttle service will be needed.
        - Need to address increase in demand for public parking and employee parking.
            - Intervention can be seasonal or interim
- ✓ Surplus in Ray Road Economy Lot

    - Current, Short-Term, Mid-Term, and Long-Term Surplus (+1,643, +1,459, +1,368, +1,135)
        - Underutilized facility
        - Likely to absorb part if not all of deficits in other public parking areas, but only with added shuttle service.

- ✓ Deficit in Rental Car Ready Lot
    - Deficit projected to occur immediately
        - Immediate intervention needed
            - Intervention can be seasonal or interim
    - Short-Term, Mid-Term, and Long-Term Deficit (-38, -57, -105)
        - Need moderate increase in supply by Short-Term. Intervention must be scalable for future demand.
- ✓ At capacity in Rental Car Return Lot
    - Deficit projected to occur immediately
        - Immediate intervention needed
            - Intervention implemented by Rental Car Operators.
            - Can be addressed with staffing modifications.
    - Short-Term, Mid-Term, and Long-Term Deficit
        - As enplanements increase so will rental return demand. This demand will likely outpace staffing improvements in the Short-Term, and the capacity of the existing lot. Need to moderately increase supply by Short-Term. Intervention must be scalable for future demand.
- ✓ Deficit in Employee Parking
    - Deficit projected to occur immediately
        - Immediate intervention needed
            - Intervention can be seasonal or interim
            - Compounds with supply deficits in Daily Lot since this is currently designated as employee lot.
    - Short-Term, Mid-Term, and Long-Term Deficit (-41, -62, -114)
        - Need moderate increase in supply by Short-Term. Intervention must be scalable for future demand.
        - Intervention must account for flexibility and convenience for employees.
        - Increased demand will impact revenues as employees take up additional supply.
- ✓ Surplus in Temporary Parking (Cell Phone Lot)
    - Current, Short-Term, Mid-Term, and Long-Term Surplus (+120)
        - Underutilized facility

- May impact revenue in Hourly Parking Lot due to proximity to terminal
  - May account for underrepresented demand in the Hourly Parking Lot.

Airspace System and Navigational Aids (NAVAIDs)

IWA airspace and existing NAVAIDS, including instrument approach capabilities and associated equipment, airport lighting, and weather/airspace services, were detailed in the Inventory Chapter. The Airport is currently equipped for a CAT I ILS precision instrument approach, and GPS and VOR non-precision instrument approaches.

The existing precision approach procedure available for Runway 30C provides excellent instrument approach capabilities under a variety of wind conditions and operational circumstances, and should be maintained. Precision instrument approach procedures should be considered for Runway 12L/30R due to Runways 12R/30L and 12C/30C inability to support Boeing 747-400F and Boeing 767-300F cargo operations, as a result of low weight-bearing capacity. The non-precision approaches available to IWA also provide excellent instrument approach capabilities under a variety of wind conditions and operational circumstances, and should be maintained.

Air Traffic Control Tower (ATCT)

Tower height, cab size, and distance from critical operating areas, such as the traffic pattern, all runway structural pavement, final approaches to runway ends, and other operational surfaces controlled by ATCT personnel, should be sufficient to support visibility from the tower cab. It is essential for all movement areas on the airport to be visible from the tower cab; however, visibility of taxilane centerlines is preferred, not mandatory. The current ATCT at IWA was constructed in 1970 and has undergone several maintenance efforts to sustain its functionality. The existing ATCT has mechanical, electrical, and structural deficiencies that have been identified. The current ATCT height causes parallax and does not have sufficient cab capacity to accommodate planned operations and airport growth or future additional staff.

A Visibility Siting Requirement Analysis was conducted for the existing ATCT at IWA. All visibility criteria were met except line of sight (LOS) to Runways 30C and 30R, resulting in .62 and .54 angles, respectively, which is less than the required .8 angle. The existing ATCT has proven to be height deficient. The tower height fails to provide visibility to the entire airfield and lacks safety equipment, such as sprinklers and redundant cab ventilation.

An ATCT Site Survey was completed in 2016 to evaluate and determine a potential new location at IWA that would comply with visibility criteria, and eliminate the spending of additional funds on the current tower that is past its useful life. Five sites were considered and evaluated with the input of airport staff. Site 4 located southwest of Runway 12R/30L, approximately 410 feet northwest of the existing tower, was selected because it provides the best LOS to the entire airport and terminal area. The location and recommended height of 194 feet presents no site access issues; has no effect on IFR departures, non-precision instrument approaches, or precision instrument approaches; improves the parallax of the current tower; and presents no impact to communications, navigation, and surveillance equipment.

Facility Requirements Conclusion and Influence on Alternative Considerations

The purpose of this section is to succinctly describe the findings of the Facility Requirements analysis and to identify the influence these findings have on IWA development alternatives.

Airfield Configuration

Runway Orientation. In consideration of the prevailing winds, the 12/30 orientation for the existing runways at IWA provides adequate crosswind coverage for the existing and proposed aircraft fleets. An additional runway, in a different orientation is not required in the future to meet anticipated demand.

Airfield Operational Capacity. In consideration of forecast operational demand (number of forecast aircraft landings and takeoffs), the three parallel runways at IWA provide adequate capacity to accommodate demand for the 20-year planning horizon and beyond.

Runway Length. In consideration of forecast demand by the most critical aircraft in the fleet, with regard to runway length requirements and projected required payloads and stage lengths, the existing runway lengths are adequate to accommodate projected demand within the 20-year planning horizon, excluding Runway 12L/30R.

As identified previously in this chapter, a runway length requirement of 9,500 feet is required by the Boeing 747-400F on expected routes operated by SkyBridge. The existing runway with a pavement strength to accommodate anticipated payloads of the Boeing 747-400 is Runway 12L/30R, which is 9,300 feet in length, approximately 200 feet short of the identified requirement of 9,500 feet. **Therefore, the extension of Runway 12L/30R to a length of 9,500 feet will be examined as a development alternative.**

The existing ALP indicates that ultimately the following runway length improvements will be implemented:

- ✓ Runway 12L/30R: will be extended from 9,300 feet in length to 10,299 feet in length (extension to the north).
- ✓ Runway 12R/30L: will be extended from 10,401 feet in length to 12,499 feet in length (extensions to the north and the south).

These potential extensions will also be examined in the alternative analysis.

Runway Design and Dimensional Criteria (Runway Safety Areas, Runway Object Free Areas, and others). With no identified exceptions, IWA meets all runway safety and object clearing standards specified by AC 150/5300-13A.

Runway Protection Zones. The Airport owns all land contained within every runway protection zone (RPZ), excluding .56 acres of Runway 30R's RPZ. Although not owned in fee simple, the area that extends beyond airport property at the eastern corner of the Runway 30R RPZ is covered by an avigation easement.

Parallel Runway Separation. The current runway configuration provides adequate separation between parallel runways to allow for simultaneous operations during VFR conditions. However, the separation is inadequate to allow for simultaneous operations during IFR conditions.

Taxiway Design (Taxiway Safety Areas, Taxiway Object Free Areas, separation standards, and others). Taxiway dimensional criteria standards are met with the existing layout for all taxiways except Taxiways Y and B. Insufficient separation exists between Taxiways Y and B (in consideration of TDG – the wingtip clearance should be 53 feet; the existing separation is 13.5 feet).

Operational alternatives will be examined to resolve this non-standard condition.

Parallel Taxiway Improvement Considerations. The existing ALP indicates that ultimately the following parallel taxiway improvements will be implemented:

- ✓ The parallel taxiway on the west side of 12R/30L will be extended as a component of the runway extension projects proposed.
- ✓ A new parallel taxiway will be provided on the east side of Runway 12R/30L.
- ✓ New parallel taxiways are proposed for both sides of Runway 12C/30C.
- ✓ In conjunction with the proposed passenger terminal complex on the east side of the Airport, a dual parallel taxiway system is proposed for the east side of Runway 12L/30R.

FAA guidance on conditions required to enable the provision of an approach procedure with a 3/4-mile visibility minimum (existing for approaches to Runway 30C) indicate that a full parallel taxiway is required. Currently, Runway 12C/30C does not have a full parallel taxiway.

The potential benefit of each of these taxiway improvements will be examined in the alternative analysis. The addition of a full parallel taxiway serving 12C/30C will be examined as a master planning alternative.

Exit Taxiways. Due to the varying size of aircraft that operate on all runways at IWA, additional exit taxiways are recommended to reduce runway occupancy time.

Passenger Terminal

The passenger terminal requirements at IWA for the 20-year planning horizon from 2018 through 2038 is summarized below. The requirements and recommendations are summarized as follows:

- ✓ Inbound and outbound baggage improvements are required to accommodate forecast passenger growth.
- ✓ Additional concourse holdroom is required to meet level of service goals.
- ✓ Aircraft parking requirements could require one or two additional parking positions depending on future demand profiles and airline operations.
- ✓ Expansion of the security checkpoint can be mitigated by changes in level of service goals and/or investment in higher throughput technologies.
- ✓ Check-in lobby is sufficient through the planning period using conservative assumptions regarding process automation and offsite check-in.

In Summary:

- ✓ Terminal functional areas can likely be accommodated through expansions to the existing terminal complex toward or along the existing apron. A long-term solution located on the east side of IWA will be explored in the Alternatives Chapter.
- ✓ In the near-term, terminal improvements should focus on in-filling the terminal buildings and reconfiguring the existing space in a phased program to address the capacity shortfalls.

Therefore, in the short-term, terminal expansion and improvement options will focus on utilization of the existing terminal area. In the long-term, a new terminal development area on the Airport's vacant east side will be identified.

Transportation Facilities

The passenger terminal support facility requirements at IWA for the 20-year planning horizon from 2018 through 2038 is summarized below. The requirements and recommendations are summarized as follows:

Vehicular Access and Parking.

Access Roadway System. Future vehicular access was evaluated considering traffic projections from SkyBridge, Phoenix-Mesa Gateway Airport Terminal-Expansion, and Arizona State University Polytechnic Campus-Expansion. Based on these projections, S. Sossaman Road will have a failing LoS (E) in the 2030 horizon, and a LoS (F) by 2040; impacting access to the Airport.

Passenger Parking System. Needs to be optimized to address deficits projected to begin in the short-term (Hourly Express Lot, Daily Lot). These deficits will be further intensified as Daily Parking facilities on the tarmac are reclaimed by aviation uses. (Anticipated to impact approximately 141 Daily Parking spaces.)

Rental Car Parking. Projected future demand anticipated to require expansion of Ready Lot and Return Lot. The existing layout and location of Rental Parking facilities does not support this expansion. In addition, the separation of Ready and Return facilities does not meet customer standards, particularly those with limited mobility. Interventions may require relocation of rental parking or expansion elsewhere.

Employee Parking. Projected future demand for employee parking coincide with projected deficits in the Daily Parking Lot. As the primary lot used for employees, this will significantly impact parking supply and revenues (employees do not pay for parking). Interventions may require relocating employee parking in order to ensure premium spaces are reserved for passengers. ADA compliant employee parking must also be a consideration as part of interventions.

Temporary Parking (Cell Phone Lot). According to the *Guidebook for Evaluating Airport Parking Strategies and Support Technologies,* the capacity of the existing Cell Phone Lot exceeds facility needs. Additionally, the lot is too close in proximity to the terminal, which may be having undetermined impacts to passenger parking facilities (Hourly Express Lot). Interventions may require the relocation of the temporary lot and/or utilizing it for parking needs found elsewhere.

In the short-term, access and parking improvement options will focus on utilization of the existing terminal area. In the long-term, a new terminal development area (including terminal support facilities) on the Airport's vacant east side will be identified and explored in the alternatives.

Other Landside Facilities

Air Cargo Facilities. SkyBridge will be developing their own facilities that will support future cargo operations.

SRE/ARFF/Airport Maintenance. The current facilities hosting SRE, ARFF, and airport maintenance equipment are adequate.

Air Traffic Control Tower (ATCT). An ATCT siting study was completed, and a site for a new ATCT location was selected. The construction of a new ATCT will solve the existing issues presented by the current facility.

Fuel Storage. After consultation with airport staff, the current AVGAS and Jet A fueling facilities were determined to be currently inadequate in capacity.

Therefore, alternatives to expand the fuel storage facilities will be examined as a component of the master plan.

Aircraft Storage. All indications are that demand for these facilities will remain strong for the foreseeable future. Hangars, and apron space for future based small aircraft is adequate. Additional hangar space should be considered for larger aircraft.

Alternatives will be explored on how to best utilize the west side development area to accommodate this demand.

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