CHAPTER THREE

FACILITY REQUIREMENTS

To properly plan for the future of the Georgetown Municipal Airport, it is necessary to translate forecast aviation demand into the specific types and quantities of facilities that can adequately serve the identified demand. This chapter uses the results of the forecasts presented in Chapter Two, as well as established planning criteria, to determine the airside (i.e., runways, taxiways, navigational aids, marking and lighting) and landside (i.e., hangars, aircraft parking apron, and automobile parking) facility requirements.

The objective of this effort is to identify the adequacy of existing airport facilities and outline what new facilities may be needed, and when these may be needed, to accommodate forecast demands. Having established these facility requirements, alternatives for providing these facilities will be evaluated in the next chapter.

The facility requirements at Georgetown Municipal Airport were evaluated using guidance contained in several Federal Aviation Administration (FAA) publications, including the following:

- Advisory Circular (AC) 150/5300-13A, *Airport Design*
- AC 150/5060-5, *Airport Capacity and Delay*
- AC 150/5325-4B , *Runway Length Requirements for Airport Design*
- Federal Aviation Regulation (FAR) Part 77, *Objects Affecting Navigable Airspace*
- FAA Order 5090.3C, *Field Formulation of the National Plan of Integrated Airport Systems (NPIAS)*

PLANNING HORIZONS

An updated set of aviation demand forecasts for the Airport has been established, with a summary of the primary forecasting elements presented previously on Exhibit 2F. These activity forecasts include annual operations, based aircraft, fleet mix, and peak periods. With this information, specific components of the airfield and landside systems can be evaluated to determine their capacity to accommodate future demand.

Cost-effective, efficient, and orderly development of an airport should rely more upon actual demand rather than on a time-based forecast figure. In order to develop a master plan that is demand-based rather than time-based, a series of planning horizon milestones has been established that take into consideration the reasonable range of aviation demand projections. The planning horizons presented in **Table 3A** are segmented as the Short Term (approximately years 1-5), the Intermediate Term (approximately years 6-10), and the Long Term (years 11-20 and possibly beyond).

TABLE 3A
Planning Horizon Activity Levels
Georgetown Municipal Airport

		PLANNING HORIZON		
	Base Year 2016	Short Term	Intermediate Term	Long Term
ANNUAL OPERATIONS				
Itinerant				
General Aviation	45,006	48,700	53,400	57,500
Air Taxi	811	800	1,100	1,500
Military	207	200	200	200
Local				
General Aviation	50,972	58,000	67,200	74,000
Military	350	200	200	200
Total Annual Operations	97,346	107,900	122,100	133,400
BASED AIRCRAFT	318	340	370	400

Source: Coffman Associates analysis

It is important to consider that actual activity at the Airport may be higher or lower than what the annualized forecast portrays. By planning according to activity milestones, the resultant plan can accommodate unexpected shifts or changes in the area's aviation demand. It is important for the plan to accommodate these changes so that Airport officials can respond in a timely fashion.

The most important reason for utilizing milestones is it allows airport management the flexibility to make decisions and develop facilities according to needs generated by actual demand levels. The demand-based schedule provides flexibility in development, as development schedules can be slowed or expedited according to demand at any given time over the planning period. The resultant plan provides airport officials with a financially responsible and needs-based program.

AIRFIELD CAPACITY

An airfield's capacity is expressed in terms of its annual service volume (ASV). ASV is a reasonable estimate of the maximum level of aircraft operations that can be accommodated in a year without incurring significant delay factors. As operations near, or surpass, the ASV, delay factors increase exponentially. The Airport's ASV was examined utilizing the FAA's Advisory Circular (AC) 150/5060-5, *Airport Capacity and Delay*.

FACTORS AFFECTING ANNUAL SERVICE VOLUME

This analysis takes into account specific factors about the airfield in order to calculate the Airport's ASV. These various factors are depicted in **Exhibit 3A**. The following describes the input factors as they relate to the Airport and include airfield layout, weather conditions, aircraft mix, and operations.

- **Runway Configuration** – The Airport has a two-runway configuration with primary Runway 18-36 and crosswind Runway 11-29. The runways intersect approximately 1,900 feet from the Runway 36 end and 1,300 feet from the Runway 29 end. Runway 18-36 is 100 feet wide and Runway 11-29 is 75 feet wide. All four runway ends have non-precision instrument approach capability. Both ends of Runway 18-36 have GPS/LPV approaches with visibility minimums as low as 1-mile. Both ends of Runway 11-29 have GPS/LNAV approaches with not lower than 1-mile visibility minimums.

- **Runway Use** – Runway usage is affected by several factors. Safe operations are the highest priority, so the runway's ability to accommodate a variety of aircraft is first and foremost. For example, at 4,099 feet in length, Runway 11-29 will not be as capable of accommodating the full variety of aircraft that operate at the Airport as will Runway 18-36 at 5,004 feet in length. Wind direction is another operational factor for runway selection. The location of the runway in proximity to services and hangars is also a factor to runway use. During active periods when delay may be a factor, air traffic control will operate runway combinations that can safely provide adequate capacity to minimize delays.

  Runway 18-36 is the primary runway providing adequate wind coverage 98.64 percent of the time. Runway 18 is the designated calm wind runway and it is used approximately nine months of the year.

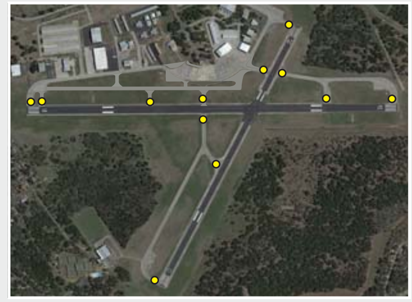
- **Exit Taxiways**– Based upon the aircraft mix using the Airport, taxiways located between 2,000 and 4,000 feet from the landing threshold, and separated by at least 750 feet, are factored in the exit rating for the airfield. Runway 18-36 has two qualifying exits and Runway 11-29 has one qualifying taxiway exit. The greater the number of taxiway exits that are appropriately spaced, the lower the runway occupancy time for an aircraft, which contributes to a higher overall capacity for the airfield.

AIRFIELD LAYOUT

Runway Configuration

Runway Use

Number of Exits



WEATHER CONDITIONS

VMC (VFR)

Visual Meteorological Conditions

IMC (IFR)

Instrument Meteorological Conditions

PVC

Poor Visibility Conditions

AIRCRAFT MIX

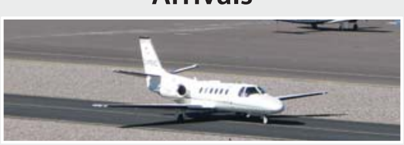
Category A & B Aircraft

Category C Aircraft

Category D Aircraft

OPERATIONS

Arrivals



Departures

Touch-and-Go Operations

Total Annual Operations

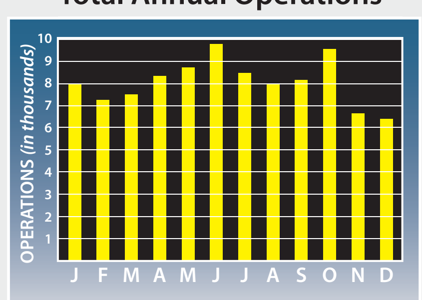


Exhibit 3A
AIRFIELD CAPACITY FACTORS

- **Weather Conditions** – Visual meteorological conditions are defined as conditions when cloud ceilings are 1,000 feet or above and/or visibility is at least three statute miles (also referred to as visual flight rules [VFR]). Instrument meteorological conditions occur when cloud ceilings are between 500 and 1,000 feet and visibility is between one and three statute miles (also referred to as instrument flight rules [IFR]). Poor visibility conditions (PVC) apply for minimums below 500 feet and one mile.

  As shown in **Table 3B**, weather data indicates that the Airport is in VFR approximately 92.52 percent of the year, IFR approximately 4.54 percent of the year, and PVC 2.94 percent of the year.

TABLE 3B
Annual Weather Conditions
Georgetown Municipal Airport

Condition	Cloud Ceiling	Visibility	Observations	Percent
Visual (VFR)	>1,000'	> 3 mi.	149,508	92.52%
Instrument (IFR)	≤ 1,000' and > 500'	≤ 3 mi. and Vis > 1 mi.	7,340	4.54%
Poor Visibility (PVC)	≤ 500'	≤ 1 mi.	4,756	2.94%
		TOTAL	**161,604**	**100.00%**

Source: National Oceanic and Atmospheric Administration (NOAA). Ten years of data from the on-airport AWOS from January 1, 2006-December 31, 2015.

- **Aircraft Mix** - Descriptions of the classifications and the percentage mix for 2016 and long term planning horizon are presented in **Table 3C**. This classification system is based on aircraft weight and not the aircraft approach speed as used in the critical aircraft determination. The vast majority of operations are forecast to be by aircraft weighing less than 12,500 pounds. This includes most small business jets. The C category includes medium and large business jets and large turboprops. The D category of aircraft is not expected to impact capacity at the Airport.

TABLE 3C
Aircraft Operational Mix for Capacity
Georgetown Municipal Airport

	A & B	C
2016	97.1%	2.9%
Short Term	97.3%	2.7%
Intermediate Term	97.1%	2.9%
Long Term	96.9%	3.1%

A&B - 12,500 pounds or less (Includes helicopters)
C - 12,500 to 300,000 pounds
D - Over 300,000 pounds

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

- **Percent Arrivals** - The percentage of arrivals as they relate to total operations at the Airport is important in determining airfield capacity. Under most circumstances, the lower the percentage of arrivals, the higher the hourly capacity. The aircraft arrival-departure percentage split is typically 50/50, which is the case at the Airport.

- **Touch-and-Go Activity** – A touch-and-go operation involves an aircraft making a landing and then an immediate takeoff without coming to a full stop or exiting the runway. A high percentage of touch-and-go traffic normally results in a higher operational capacity because one landing and one takeoff occurs within a shorter time period than individual operations. Touch-and-go operations at the Airport have historically averaged approximately 46.5 percent of total annual operations. This is forecast to progressively increase to 49.2 percent by the long-term planning period.

- **Operational Levels** – For the airfield capacity analysis, average daily operations and average peak hour operations during the peak month are utilized. Typical operations activity is important in the calculation of an airport's ASV as "peak demand" levels occur sporadically. The peak periods used in the capacity analysis are representative of normal operational activity and can be exceeded at various times throughout the year. At Georgetown Municipal Airport, the peak periods typically occur during the spring and summer months.

ANNUAL SERVICE VOLUME

The following formula is used to determine the annual service volume:

Annual Service Volume (ASV) = C x D x H
C = weighted hourly capacity
D = ratio of annual demand to the average daily demand during the peak month
H = ratio of average daily demand to the design hour demand during the peak month

Following this formula, the current ASV for Georgetown Municipal Airport has been calculated at approximately 293,000 operations. By the long-term planning period, the ASV would decrease slightly to 290,000 annual operations as shown in **Table 3D**. By the long-term planning horizon, total operations are forecast to represent 47.38 percent of the ASV. The ASV is the point at which delay grows exponentially, thereby constraining capacity.

TABLE 3D
Airfield Demand/Capacity Summary
Georgetown Municipal Airport

	PLANNING HORIZON			
	2015	Short Term	Intermediate Term	Long Term
Operational Demand				
Annual*	100,250	111,125	125,751	137,390
Design Hour	35	39	44	48
Capacity				
Annual Service Volume	293,000	293,000	290,000	290,000
Percent Capacity	34.2%	37.9%	43.4%	47.4%
Weighted Hourly Capacity	102	102	101	101
Delay				
Per Operation (Seconds)	24	27	30	36
Total Annual (Hours)	668	833	1,048	1,374

*Includes 3% nighttime increase for general aviation and air taxi operations.
Source: FAA AC 150/5060-5, Airport Capacity and Delay

An additional capacity analysis was undertaken to examine what the ASV would be if only Runway 18-36 were considered. The estimated ASV under this condition is 292,000 operations currently, decreasing to 283,000 by the long-term planning period.

AIRCRAFT DELAY

As the number of annual aircraft operations approaches the airfield's capacity, increasing amounts of delay to aircraft operations begin to occur. Delays occur to arriving and departing aircraft in all weather conditions. Arriving aircraft delays may result in aircraft holding outside of the airport traffic area. Departing aircraft delays result in aircraft holding at the runway end until released by air traffic control.

Annual delay at the Airport now and into the forecast planning horizons is negligible. Over the course of a year, it is estimated that a total of 668 hours of delay are experienced. This equates to approximately 24 seconds per operation. In the future, approximately 36 seconds of delay per operations may be anticipated. Some individual operations may experience a significant delay but overall delay as a result of airfield capacity constraint is a minor factor at the Airport.

CAPACITY ANALYSIS CONCLUSION

Projects specifically designed to improve overall capacity, such as additional taxiway exits and additional runways beyond current planned projects, are not necessary.

According to FAA Order 5090.3C, *Field Formulation of the National Plan of Integrated Airport Systems* (NPIAS), consideration should be given to projects specifically designed to increase overall airfield capacity when operations reach 60-75 percent of the ASV. Since this range is not anticipated to be reached at the Airport, capacity improvement projects, such as additional taxiway exits and additional runways, beyond current planned projects, are not necessary over the course of the planning horizons.

AIRFIELD REQUIREMENTS

As indicated earlier, airport facilities include both airfield and landside components. Airfield facilities are those related to the arrival, departure, and ground movement of aircraft. The FAA has established various dimensional design standards related to the airfield to ensure the safe operations of aircraft.

The FAA design standards impact the design of each of the airfield components to be analyzed. The following airfield components are analyzed for compliance to FAA design standards in detail:

- Runway Configuration
- Runway Design Standards
- Runways
- Taxiways
- Navigational and Weather Aids
- Instrument Approaches

RUNWAY CONFIGURATION

The Airport's airfield system has two runways. Primary Runway 18-36 is oriented in a north/south manner. Crosswind Runway 11-29 is oriented in a northwest/southeast manner. The runways intersect approximately 1,900 feet from the Runway 36 end and 1,300 feet from the Runway 29 end. Runway 18-36 is 5,004 feet in length and 100 feet wide. Runway 11-29 is 4,099 feet long and 75 feet wide.

A crosswind runway configuration is very common in locations with variable wind patterns. A crosswind configuration is generally required to meet local wind conditions as detailed below. For the operational safety and efficiency of an airport, it is desirable for the primary runway to be oriented as close as possible to the direction of the prevailing winds. This reduces the impact of wind components perpendicular to the direction of travel of an aircraft that is landing or taking off.

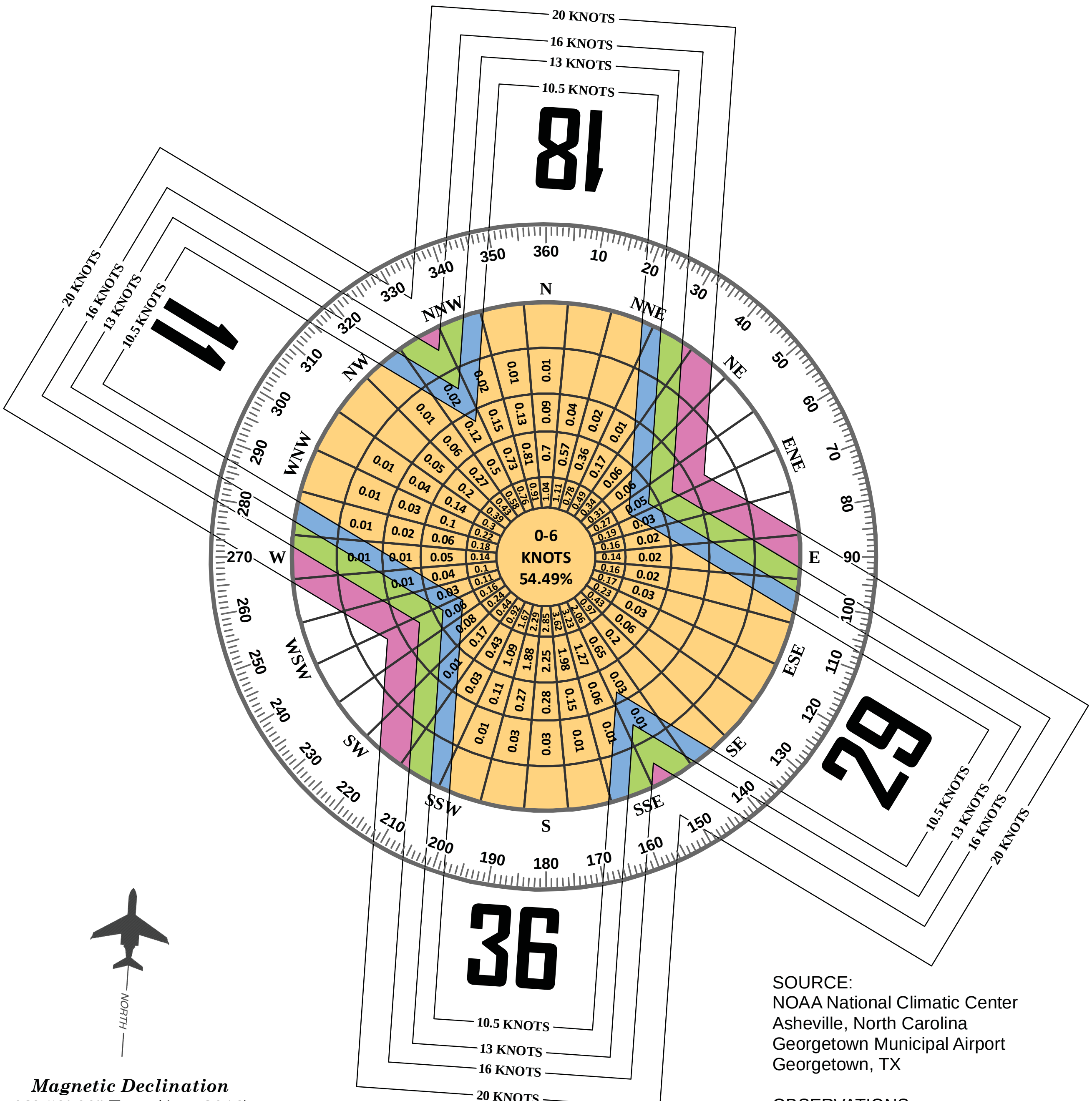
FAA AC 150/5300-13A, *Airport Design,* recommends that a crosswind runway be made available when the primary runway orientation provides for less than 95 percent wind coverage for specific crosswind components. The 95 percent wind coverage is computed on the basis of not exceeding a 10.5-knot (12 mph) component for runway design code (RDC) A-I and B-I, 13-knot (15 mph) component for RDC A-II and B-II, 16-knot (18 mph) component for RDC A-III, B-III, C-I through C-III, and D-I through D-III, and 20 knots for larger wingspans.

Exhibit 3B presents both an all-weather and IFR wind rose. A wind rose is a graphic tool that gives a succinct view of how wind speed and direction are historically distributed at a particular location. The table at the top of the wind rose indicates the percent of wind coverage for each runway at specific wind intensity.

As can be seen, Runway 18-36 provides greater than 95 percent wind coverage for both all-weather and IFR conditions. Runway 11-29 does not meet the 95 percent threshold at 10.5 knots but it does for all other wind intensity levels. If wind were the only consideration, then there would not be justification for FAA/TxDOT financial participation in Runway 11-29; however, many busy airports will maintain a second runway in order to remain open during times when the primary runway is closed or to increase operational efficiency. Runway closures may be related to planned construction/resurfacing or for emergencies. As a busy general aviation reliever airport, Georgetown Municipal Airport should consider maintaining a two-runway system.

The wind data for Georgetown Municipal Airport was further analyzed on a monthly and seasonal basis. The purpose of this analysis is to determine if there are monthly or seasonal wind patterns that would favor use of Runway 11-29. Wind patterns were found to be fairly consistent throughout the year. The peak time winds favor Runway 11-29 is in the spring (March, April, May) when approximately 4.5 percent of the time crosswinds exceed 10.5 knots, thus indicating that Runway 11-29 would be the optimal runway. All other months were below four percent of the time. Therefore, there is not a seasonal justification for Runway 11-29 as a crosswind runway.

ALL WEATHER WIND COVERAGE				
Runways	10.5 Knots	13 Knots	16 Knots	20 Knots
Runway 18-36	98.64%	99.37%	99.81%	99.95%
Runway 11-29	90.10%	95.25%	99.03%	99.84%
All Runways	97.19%	99.95%	99.99%	100.00%



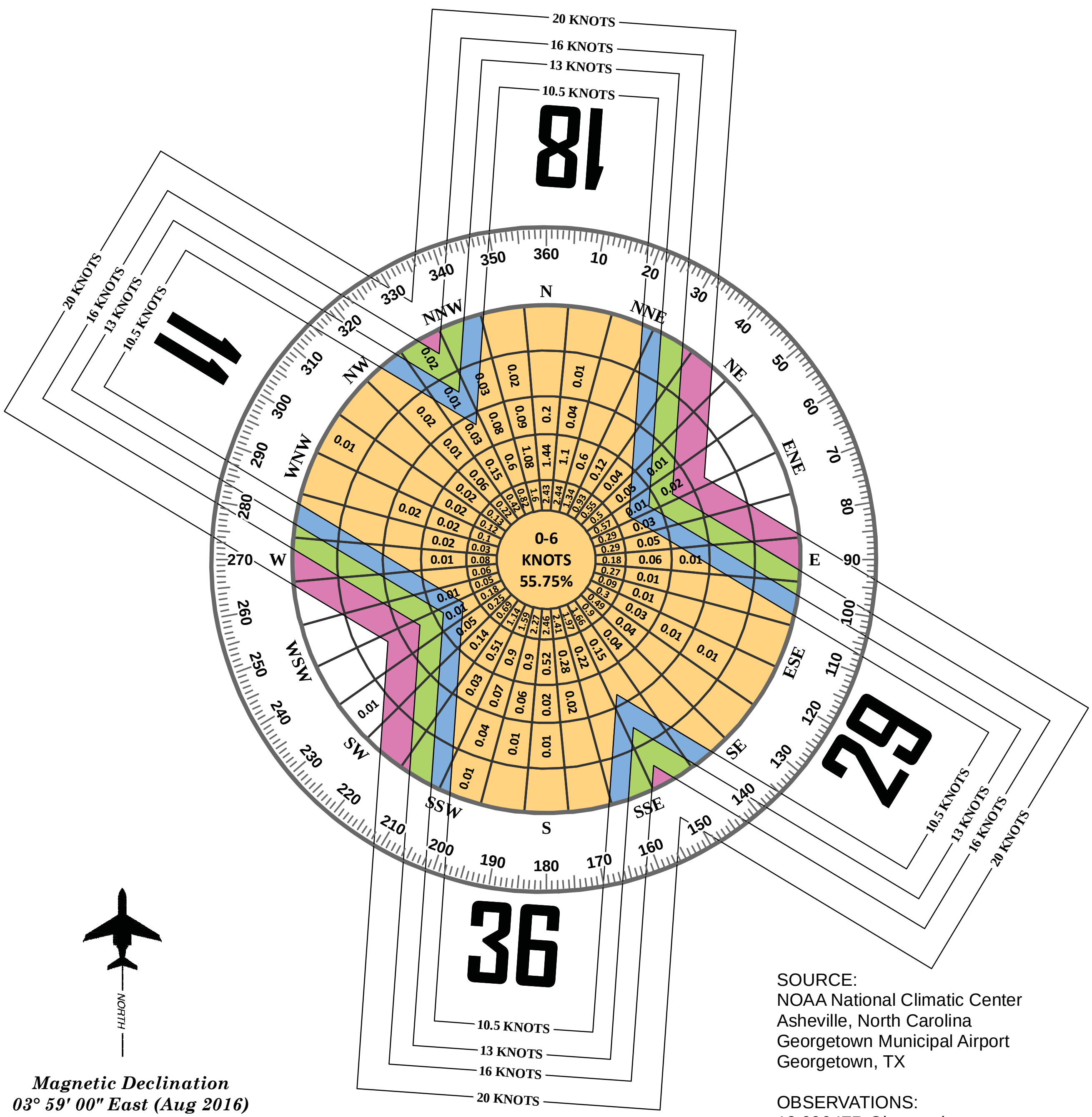
Magnetic Declination
03° 59' 00" East (Aug 2016)
Annual Rate of Change
00° 07' 00" West (Aug 2016)

SOURCE:
NOAA National Climatic Center
Asheville, North Carolina
Georgetown Municipal Airport
Georgetown, TX

OBSERVATIONS:
161,604 All Weather Observations
Jan. 1, 2006 - Dec, 31 2015

Exhibit 3B
WINDROSES

IFR COVERAGE				
Runways	10.5 Knots	13 Knots	16 Knots	20 Knots
Runway 18-36	99.42%	99.68%	99.88%	99.96%
Runway 11-29	92.46%	96.17%	99.37%	99.88%
All Runways	99.83%	99.94%	99.98%	99.99%



Magnetic Declination
03° 59' 00" East (Aug 2016)
Annual Rate of Change
00° 07' 00" West (Aug 2016)

SOURCE:
NOAA National Climatic Center
Asheville, North Carolina
Georgetown Municipal Airport
Georgetown, TX

OBSERVATIONS:
12,096 IFR Observations
Jan. 1, 2006 - Dec, 31 2015

According to FAA Order 5100.38D, *Airport Improvement Handbook*, only one runway at any NPIAS airport is eligible for ongoing maintenance and rehabilitation funding unless the FAA Airport District Office has made a specific determination that an additional runway is justified. A runway that is not a primary runway, a secondary runway, or a crosswind runway is considered to be an *additional* runway. It is not unusual for a two-runway airport to have a primary runway and an additional runway, and no secondary or crosswind runway. **Table 3E** presents the eligibility requirements for runway types.

TABLE 3E
Runway Eligibility

For the following runway type…	Must meet all of the following criteria…	And is…
Primary Runway	1. A single runway at an airport is eligible for development consistent with FAA design and engineering standards.	Eligible
Crosswind Runway	1. The wind coverage on the primary runway is less than 95%	Eligible if justified
Secondary Runway	1. There is more than one runway at the airport. 2. The non-primary runway is not a crosswind runway. 3. Either of the following: a) The primary runway is operating at 60% or more of its annual capacity. b) FAA has made a specific determination that the runway is required.	Eligible if justified
Additional Runway	1. There is more than one runway at the airport. 2. The non-primary runway is not a crosswind runway. 3. The non-primary runway is not a secondary runway.	Ineligible

Source: FAA Order 5100.38D, AIP Handbook

Runway 11-29 falls in the category of "additional runway" and is therefore not eligible for FAA/TxDOT funding unless specifically determined to be eligible by FAA/TxDOT. Runway 11-29 is considered an 'additional runway' for the following reasons:

- It is not a crosswind runway since the primary runway has greater than 95 percent wind coverage;
- It is not a secondary runway because the primary runway is operating at less than 60 percent of capacity;
- The FAA/TxDOT has not yet made a special determination that the runway is required.

As a busy reliever general aviation airport with a significant level of flight training, the airport sponsor may make an appeal to the FAA that the runway is necessary. That effort should take place prior to the need for a significant investment in the runway. Interviews with control tower personnel has indicated that Runway 11-29 is vital to their ability to coordinate, sequence, and otherwise control aircraft operating at the airport.

RUNWAY DESIGN STANDARDS

The FAA has established several design standards to protect aircraft operational areas and keep them free from obstructions that could affect their safe operation. These include the runway safety area (RSA), runway object free area (ROFA), runway obstacle free zone (OFZ), and runway protection zone (RPZ).

The FAA has established several design standards to protect aircraft operational areas and keep them free from obstructions that could affect their safe operation.

The entire RSA, ROFA, and ROFZ should be under the direct ownership of the airport sponsor to ensure these areas remain free of obstacles and can be readily accessed by maintenance and emergency personnel. The RPZ for each runway end should also be under airport ownership. An alternative to outright ownership of the RPZ is the purchase of avigation easements (acquiring control of designated airspace within the RPZ) or having sufficient land use control measures in place which ensure the RPZ remains free of incompatible development. Dimensional standards for the various safety areas associated with the runways are a function of the type of aircraft expected to use the runways, as well as the instrument approach capability. **Exhibit 3C** presents the dimensional design standards for both runways at the Airport.

As discussed in the previous chapter the applicable design standards are primarily based upon the critical design aircraft and the instrument approach visibility minimums. The critical design aircraft is that aircraft or group of aircraft with similar characteristics, accounting for 500 or more annual operations. Runway 18-36 has long been designed to meet C-II standards. However, in the last four years, C-II operations have been below the 500 operations threshold; therefore, the currently applicable design standards are B-II. Future planning will consider a return to C-II standards. Runway 11-29 has been designed to B-I(s) standards. This design standard is planned to be maintained through the planning period.

Operational levels will fluctuate from year to year, and at times fall below the 500 operations threshold for a variety of reasons (as is the case for C-II operations at the Airport). A decision on physical changes to the runway and taxiway systems becomes necessary when reconstruction is needed. There is not a compelling interest in pursuing changes in advance of that based on short-term fluctuations in operations.

Runway Safety Area (RSA)

The current design standards to be applied are:
Runway 18-36 – ARC B-II
Runway 11-29 – ARC B-I(s)

The RSA is defined in FAA Advisory Circular (AC) 150/5300-13A, *Airport Design,* as a "surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of undershoot, overshoot, or excursion from the runway." The RSA is centered on the runway and dimensioned in accordance to the approach speed of the critical design aircraft using the runway. The FAA requires the RSA to be cleared and graded, drained by grading or

CURRENT AIRPORT DATA	Runway 11-29 Current/ Future	Runway 18-36 Current	Runway 18-36 Future
Design Aircraft	B-I-1B	B-II-2	C-II-2
Runway Design Code	B-I-5000	B-II-5000	C-II-5000
Visibility Minimums	1-mile	1-mile	1-mile
RUNWAY DESIGN			
Runway Width	60 **(75)**	75 **(100)**	100
Runway Shoulder Width	10	10	10
RUNWAY PROTECTION			
Runway Safety Area (RSA)			
Width	120	150 **(400)**	400
Length Beyond Departure End	240	300 **(1,000)**	1,000
Length Prior to Threshold	240	300 **(1,000)**	600
Runway Object Free Area (ROFA)			
Width	400	500 **(800)**	800
Length Beyond Departure End	240	300 **(1,000)**	1,000
Length Prior to Threshold	240	300 **(1,000)**	600
Runway Obstacle Free Zone (ROFZ)			
Width	250	400	400
Length Beyond End	200	200	200
Approach Runway Protection Zone (RPZ)			
Length	1,000	1,000	1,700
Inner Width	500	500	500
Outer Width	700	700	1,010
Departure Runway Protection Zone (RPZ)			
Length	1,000	1,000	1,700
Inner Width	500	500	500
Outer Width	700	700	1,010
RUNWAY SEPARATION			
Runway Centerline to:			
Holding Position	200 **(156)**	200 **(250)**	250
Parallel Taxiway	225 **(375)**	240 **(300)**	300
Aircraft Parking Area	200	250 **(400)**	400

Bold figures are existing conditions
Note: All dimensions in feet

Source: FAA AC 150/5300-13A, Airport Design storm sewers, capable of accommodating the design aircraft and fire and rescue vehicles, and free of obstacles not fixed by navigational purpose, such as runway edge lights or approach lights.

The B-II RSA for Runway 18-36 is 150 feet wide, extending 300 feet beyond the runway ends. The RSA meets standard and should be maintained.

The RSA for both runways meets standard.

The RSA for Runway 18-36 has historically been maintained to C-II standards. The standard width for a C-II RSA is 500 feet; however, it is permissible for the RSA to be 400 feet wide. This is the case at the Airport where a 400-foot wide RSA is utilized because of recent drainage design considerations. Improvements to the drainage system for the Airport necessitated locating culverts on both sides of Taxiway A. By utilizing a 400-foot wide RSA, the culverts remain outside the RSA. The C-II RSA extends 1,000 feet beyond the runway ends. In a future condition, the C-II RSA meets design standards. Airport management has indicated that it is their intent to maintain the more restrictive C-II RSA in order to provide an additional safety margin.

The RSA for Runway 11-29 is 120 feet wide, as centered on the runway, and it extends 240 feet beyond the runway end. This RSA meets standard and should be maintained.

Runway Object Free Area (ROFA)

The ROFA is "a two-dimensional ground area surrounding runways, taxiways, and taxilanes, which is clear of objects except for objects whose location is fixed by function (i.e., airfield lighting)." The ROFA does not have to be graded and level like the RSA; instead, the primary requirement for the ROFA is that no object in the ROFA penetrates the lateral elevation of the RSA. The ROFA is centered on the runway, extending out in accordance to the critical design aircraft utilizing the runway.

The ROFA for both runways meets standards.

The B-II ROFA surrounding Runway 18-36 is 500 feet wide, extending 300 feet beyond the runway ends. The B-II ROFA meets standard and should be maintained.

Future planning considers a return to C-II standards. The C-II ROFA for Runway 18-36 is 800 feet wide and it extends 1,000 feet beyond the runway end. The northwest side of the ROFA extends approximately 200 feet beyond the lateral edge of the Runway 18 threshold where it then crosses the airport property line. It extends for an additional 800 feet off the airport, encompassing all or part of seven residential property parcels. The southeast corner of the C-II ROFA extends off airport property and extends across Lakeway Drive. A return to C-II design standards would require consideration of a clear ROFA through property acquisition.

The ROFA for Runway 11-29 is 250 feet wide and it extends 240 feet beyond the runway ends. The ROFA for Runway 11-29 meets standard and should be maintained.

Runway Obstacle Free Zone (OFZ)

The OFZ is an imaginary volume of airspace which precludes object penetrations, including taxiing and parked aircraft. The only allowance for ROFZ obstructions is navigational aids mounted on frangible bases which are fixed in their location by function, such as airfield signs. The OFZ is established to ensure the safety of aircraft operations. If the OFZ is obstructed, the airport's approaches could be removed or approach minimums could be increased.

The OFZ for Runway 18-36 is 400 feet wide and it extends 200 feet beyond the runway ends. The OFZ for Runway 11-29 is 250 feet wide and it extends 200 feet beyond the runway ends. The OFZ for both runways meet current design standards.

Runway Protection Zones (RPZ)

The RPZ is a trapezoidal area centered on the runway, typically beginning 200 feet beyond the runway end. The RPZ has been established by the FAA to provide an area clear of obstructions and incompatible land uses in order to enhance the protection of people and property on the ground. The RPZ is comprised of the central portion of the RPZ and the controlled activity area. The central portion of the RPZ extends from the beginning to the end of the RPZ, is centered on the runway, and is the width of the ROFA. The controlled activity area is any remaining portions of the RPZ. The dimensions of the RPZ vary according to the visibility minimums serving the runway and the type of aircraft (design aircraft) operating on the runway.

While the RPZ is intended to be clear of incompatible objects or land uses, some uses are permitted with conditions and other land uses are prohibited. According to FAA AC 150/5300-13A, *Airport Design*, the following land uses are permissible within the RPZ:

- Farming that meets the minimum buffer requirements;
- Irrigation channels as long as they do not attract birds;
- Airport service roads, as long as they are not public roads and are directly controlled by the airport operator;
- Underground facilities, as long as they meet other design criteria, such as RSA requirements, as applicable; and
- Unstaffed navigational aids (NAVAIDs) and facilities, such as required for airport facilities that are fixed by function in regard to the RPZ.

Any other land uses considered within RPZ land owned by the airport sponsor must be evaluated and approved by the FAA Office of Airports. The FAA has published *Interim Guidance on Land Uses within a Runway Protection Zone* (9.27.2012), which identifies several potential land uses that must be evaluated and approved prior to implementation. The specific land uses requiring FAA evaluation and approval include:

- Buildings and structures (examples include, but are not limited to: residences, schools, churches, hospitals or other medical care facilities, commercial/industrial buildings, etc.)
- Recreational land use (examples include, but are not limited to: golf courses, sports fields, amusement parks, other places of public assembly, etc.)
- Transportation facilities. Examples include, but are not limited to:
  - Rail facilities - light or heavy, passenger or freight
  - Public roads/highways
  - Vehicular parking facilities
- Fuel storage facilities (above and below ground)
- Hazardous material storage (above and below ground)
- Wastewater treatment facilities
- Above-ground utility infrastructure (i.e., electrical substations), including any type of solar panel installations.

The *Interim Guidance* states, "RPZ land use compatibility also is often complicated by ownership considerations. Airport owner control over the RPZ land is emphasized to achieve the desired protection of people and property on the ground. Although the FAA recognizes that in certain situations the airport sponsor may not fully control land within the RPZ, the FAA expects airport sponsors to take all possible measures to protect against and remove or mitigate incompatible land uses."

Currently, the RPZ review standards are applicable to any new or modified RPZ. The following actions or events could alter the size of an RPZ, potentially introducing an incompatibility:

- An airfield project (e.g., runway extension, runway shift),
- A change in the critical design aircraft that increases the RPZ dimensions,
- A new or revised instrument approach procedure that increases the size of the RPZ, and/or
- A local development proposal in the RPZ (either new or reconfigured).

Since the *Interim Guidance* only addresses new or modified RPZs, existing incompatibilities are generally (but not always) grandfathered. While it is still necessary for the airport sponsor to take all reasonable actions to meet the RPZ design standard, FAA funding priority for certain actions, such as relocating roads or acquiring land and structures, are typically determined on a case-by-case basis.

The introduction of new or additional RPZ land use incompatibilities may require FAA headquarters' review.

Table 3F presents detail about the existing RPZs at the Airport. Because the approach RPZs to each runway end encompass the departure RPZs as well, the following discussion addresses only the approach RPZs.

The Airport owns 100 percent of the Runway 18 RPZ land. The Airport owns approximately 86.6 percent of the Runway 36 RPZ land. Lakeway Drive is the only incompatible land use which traverses the end of the Runway 36 RPZ. The Airport owns an avigation easement over Lakeway Drive.

The Airport owns 86.4 percent of the Runway 11 RPZ. Northwest Boulevard crosses the RPZ and is considered an incompatible land use. The Airport owns 85.6 percent of the Runway 29 RPZ. A residential home and Lakeway Drive are existing incompatibilities.

TABLE 3F
Runway Protection Zone Detail
Georgetown Municipal Airport

Runway	RPZ Dimensions (ft.)		RPZ Size (ac.)	Owned in Fee (ac.)	Existing Incompatibilities
18	Inner Width:	500	13.77	13.77ac/ 100%	None
	Outer Width:	700			
	Length:	1,000			
36	Inner Width:	500	13.77	11.92ac/ 86.56%	Lakeway Dr. (City Owned)
	Outer Width:	700			
	Length:	1,000			
11	Inner Width:	250	8.04	6.95ac/ 86.4%	Northwest Blvd. (City Owned)
	Outer Width:	450			
	Length:	1,000			
29	Inner Width:	250	8.04	6.88ac/ 85.6%	1 Residential Structure
	Outer Width:	450			Lakeway Dr. (City Owned)
	Length:	1,000			[redacted]

In the Alternatives chapter of this Master Plan, consideration will be given to mitigating existing RPZ incompatibilities. When this Master Plan began (August 2016), the visibility minimum to both ends of Runway 18-36 was ⅞-mile. The associated RPZs were much larger, encompassing numerous incompatible land uses including 40 homes and numerous residential streets. The Runway 36 RPZ encompassed eight (8) homes and Lakeway Drive. An analysis of the operational impact of raising the visibility minimums to 1-mile indicated that over the last 10 years, aircraft would have encountered visibility minimums between ⅞-mile and 1-mile 0.155 percent of the time. Because of the minimal operational impact, it was recommended, later in this master plan, to raise the visibility minimums to 1-mile to reduce the incompatible land uses in the RPZs. On June 26, 2018, FAA Flight Procedures issued a NOTAM indicating that the lowest minimum to both ends of Runway 18-36 is 1-mile. Ultimately, new instrument approach plates will be developed and published by FAA.

RUNWAY SEPARATION STANDARDS

There are several other standards related to separation distances from runways. Each of these is designed to enhance the safety of the airfield.

Runway/Taxiway Separation

The design standard for the separation between runways and parallel taxiways is a function of the critical design aircraft and the instrument approach visibility minimums. Currently, Taxiway A is 300 feet from the Runway 18-36 centerline. Taxiway J is the partial parallel taxiway to Runway 11-29 and is 375 feet from the runway centerline. By design standard, the parallel taxiway segments for Runway 18-36 should be at least 240 feet for B-II and 300 feet for C-II, centerline to centerline. For Runway 11-29, the parallel taxiway segments should be at least 225 feet. The separation distance for the parallel taxiway segments meets the design standards and should be maintained.

Hold Line Separation

The hold lines on taxiways leading to Runway 18-36 are 250 feet from the runway centerline which meets C-II standard. The B-II standard is 200 feet. The hold lines on taxiways leading to Runway 11-29 are 200 feet from the runway centerline, which meets standard. The location of the hold lines should be maintained.

Aircraft Parking Area Separation

The minimum standard distance from the Runway 18-36 centerline to aircraft parking areas is 250 feet for B-II and 400 feet for C-II. The airport meets the C-II standards currently. Aircraft parking areas should be no closer than 200 feet from the Runway 11-29 centerline. All aircraft parking areas meet this standard.

Runway Visibility Zone

The RVZ is an area formed by imaginary lines connecting the line-of-sight points of intersecting runways. The purpose of the RVZ is to facilitate coordination among aircraft and between aircraft and vehicles that are operating on active runways. Having a clear line-of-sight allows departing aircraft and arriving aircraft to verify the location and actions of other aircraft and vehicles on the ground that could create a conflict. Within the RVZ, any point five feet above the runway centerline must be mutually visible with any other point five feet above the centerline of the crossing runway. There are some trees on the west side of the Airport within the RVZ which may obstruct the view between Runway 11 and Runway 36.

Building Restriction Line (BRL)

The BRL identifies suitable building area locations on an airport. The BRL encompasses the RPZs, the ROFA, navigational aid critical areas, areas required for terminal instrument procedures, and other areas necessary for meeting airport line-of-sight criteria, such as the RVZ.

Two primary factors contribute to the determination of the BRL: type of runway (utility or other-than-utility) and the capability of the instrument approaches. Runway 11-29 is considered a “utility” runway because it has a pavement strength of 12,500 pounds. Runway 18-36 is considered an “other-than-utility" runway because it has a pavement strength above 12,500 pounds. Both runways have non-precision instrument approaches.

The BRL is the product of the Code of Federal Regulations (CFR) Part 77 transitional surface clearance requirements. These requirements stipulate that no object be located in the primary surface, defined as being 500 feet wide for both runways. From the primary surface, the transitional surface extends upward and outward at a slope of one vertical foot for every seven horizontal feet. Therefore, the BRL is a sloping surface with variable height restrictions based upon the distance from the edge of the primary surface.

The BRL line represents an elevation that structures should remain below.

Common practice is to depict a BRL as a single line; however, this is frequently misinterpreted to mean that no structures can be located in front (closer to the runway) of the BRL. Instead, the BRL line represents an elevation that structures should remain below. The 35-foot BRL for both runways is 495 feet from the runway centerline. All structures at the airport are clear of the BRL.

RUNWAYS

The adequacy of the existing runway system at Georgetown Municipal Airport has been analyzed from a number of perspectives, including runway orientation and adherence to safety area standards. From this information, requirements for runway improvements will be determined for the Airport. Runway elements, such as length, width, and strength, are now presented.

Runway Length

FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design*, provides guidance for determining runway length needs. A draft revision of this AC is currently available (150/5325-4C). This runway length analysis will consider the recommendations from both versions.

There is not a direct relationship between the classification of the design aircraft (e.g., B-II, C-II, C-III) and runway length as airplanes operate on a wide variety of available runway lengths. The suitability of the runway length is governed by many factors, including elevation, temperature, wind, aircraft weight, wing flap settings, runway condition (wet or dry), runway gradient, vicinity airspace obstructions, useful load, and any special operating procedures.

Airport sponsors can pursue policies that can maximize the suitability of the runway length. Policies, such as area zoning and height and hazard restrictions, can protect an airport's runway length. Airport ownership (fee simple or easement) of land leading to the runway ends can reduce the possibility of natural growth or man-made obstructions. Planning of runways should include an evaluation of aircraft types expected to use the airport, or a particular runway now and in the future. Future plans should be realistic and supported by the FAA-approved forecasts and should be based on the critical design aircraft (or family of aircraft).

FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design*, provides guidance for determining runway length needs. The AC provides a general formula for determining runway length needs for general aviation aircraft weighing up to 60,000 pounds. Individual aircraft flight planning manuals are to be utilized for aircraft weighing more than 60,000 pounds.

The determination of runway length requirements is based on five primary factors:

- Mean maximum temperature of the hottest month
- Airport elevation
- Runway gradient
- Critical aircraft type expected to use the runway
- Stage length of the longest nonstop destination (specific to larger aircraft)

Aircraft performance declines as elevation, temperature, and runway gradient factors increase. For the Airport, the mean maximum daily temperature of the hottest month is 96.2 degrees Fahrenheit (F), which occurs in August. The Airport elevation is 790 feet above mean sea level (MSL). The gradient of Runway 18-36 is 0.76 percent and for Runway 11-29 it is 0.75 percent, both of which conform to FAA design standards for gradient. The RDC for Runway 18-36 is B-II-5000 and for Runway 11-29, it is B-I-5000. Aircraft stage lengths can vary, but for planning purposes it is common to utilize increments of 500 miles.

The AC provides a distinction between runway length needs for small aircraft of 12,500 pounds or less and those between 12,500 pounds and 60,000 pounds. **Table 3G** presents the minimum runway length requirements for small aircraft.

TABLE 3G
Small Aircraft Runway Length Requirements
Georgetown Municipal Airport

Small Aircraft Fleet Mix Category	Runway Length
95% of small aircraft	3,400'
100% of small aircraft	4,100'
10+ Passenger Seats	4,400'

Source: FAA AC 150/5325-4B, Runway Length Requirements for Airport Design

Table 3H presents the runway length recommendations for general aviation jet aircraft weighing between 12,500 pounds and 60,000 pounds, which includes most small- and medium-sized business jets. Two categories of general aviation jet aircraft are identified: those making up 75 percent of the national fleet and those making up 100 percent of the national fleet. The 75 percent category includes most small- and some medium-sized business jets. Examples include Cessna Citation jets (models 500, 510, 525, 550, 560, 650), Learjets (models 31, 35, 45), Beechjet 400, and Falcon jets (models 10, 20, 50). The 100 percent category includes the remaining medium and most larger business jets (those under 60,000 pounds). Examples include Cessna Citation jets (models 650, 680, X), Learjets (models 55, 60), Hawker jets (models 800XP, 1000, 4000), and Challenger 600s.

To accommodate 75 percent of the general aviation jet fleet at 60 percent useful load, a runway length of 5,500 feet is recommended. To accommodate 100 percent at 60 percent useful load, a runway length of 6,400 feet is recommended. To accommodate 75 percent of the general aviation jet fleet at 90 percent useful load, a runway length of 7,600 feet is recommended, and for 100 percent at 90 percent useful load, a length of 9,900 feet is recommended. The FAA typically would only consider the 90 percent useful load categories if there was an identified specific need, such as air cargo activity or specific operators flying heavy loads long distances.

TABLE 3H
Runway Length Requirements
Georgetown Municipal Airport

Airport Elevation	790' feet above mean sea level			
Average High Monthly Temp.	96.2 degrees (August)			
Runway Gradient	0.76% Runway 18-36/0.75% Runway 11-29			
Fleet Mix Category	**Raw Runway Length from FAA AC**	**Runway Length with Gradient Adjustment**	**Wet Surface Landing Length for Jets (+15%)***	**Final Runway Length**
75% of fleet at 60% useful load	4,879'	5,261'	5,500'	5,500'
100% of fleet at 60% useful load	5,964'	6,346'	5,500'	6,400'
75% of fleet at 90% useful load	7,196'	7,578'	7,000'	7,600'
100% of fleet at 90% useful load	9,506'	9,888'	7,000'	9,900'

*Max 5,500' for 60% useful load and max 7,000' for 90% useful load in wet conditions
Source: FAA AC 150/5325-4B, Runway Length Requirements for Airport Design.

The vast majority of operations by business jets fall into the zero-75 percent category. On occasion, the Airport will have operations by business jets in the 75-100 percent category but the total combined operations by these aircraft is well below the 500 operations threshold. Therefore, a minimum recommended runway length for the Airport would be 5,500 feet. At 5,004 feet in length, primary Runway 18-36 is approximately 500 feet shorter than would normally be recommended.

In addition to using the general runway length categories listed in **Table 3H**, an analysis of the flight planning manuals for common business jets has been prepared. This method for determining runway length requirements follows FAA Draft AC 150/5325-4C, *Runway Length Requirements for Airport Design.* **Exhibit 3D** presents the takeoff and landing length requirements for the most common business jets in the national fleet, many of which operate at the Airport. The calculations are based on a maximum takeoff and landing weight; therefore, these lengths are the most conservative for each aircraft.

The takeoff and landing lengths highlighted in red indicate a runway length requirement that exceeds 5,004 feet, which is the length of the longest runway at the Airport. Other than the smallest business jets, most would be weight-restricted to some degree under heavy loading conditions.

Business jets may operate under different regulations depending on the type of flight being conducted. These regulations may impact the calculated runway length available for landing. An analysis of Title 14 Code of Federal Regulations (CFR), Part 91k and Part 135 landing length restrictions was conducted. Title 14 CFR Part 91k refers to operations conducted via fractional ownership, and Part 135 refers to commuter/on-demand (charter) operations. Both operation types are required to meet specific landing length standards for safety purposes. Fractional operations must be capable of landing within 80 percent of the landing distance available (LDA), and commuter/on-demand operations must be capable of landing within 60 percent of the LDA. Operations conducted under CFR Part 25 are general aviation operations conducted by private owners, including companies.

The landing length requirements for the select business jets, under both dry and wet conditions, are also presented in **Exhibit 3D**. All the business jets listed are capable of landing at the Airport in dry conditions regardless of the CFR type restrictions. In wet conditions, we begin to see limitations on landing length but it should be understood that aircraft typically weigh less when landing, as aircraft burn fuel during flight thereby reducing their weight. When factoring the Part 135 and Part 91 flight restrictions in wet conditions, more of the business jet fleet would be weight-restricted for landing.

Nearly all the business jets considered are capable of landing within the 5,004-foot length of Runway 18-36 in dry conditions. When operating under CFR Part 91k and CFR 135, more runway length is necessary. Generally, a runway length of 5,500 feet is considered reasonable to accommodate business jet activity at the Airport.

Council Resolution on Runway Length

In the early 1990s, the primary runway at the Airport was extended from 4,100 feet to 5,000 feet in length to accommodate and facilitate economic development. According to Resolution 960123-JJ, dated January 23, 1996, the City Council "accepted the recommendation of a Citizens' Advisory Committee that the Century Plan (Comprehensive Plan name at the time) objectives which state that the north/south runway shall be extended to 5,000 feet is to be interpreted as setting a maximum length".

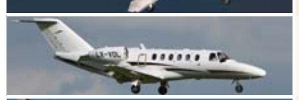
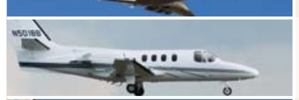
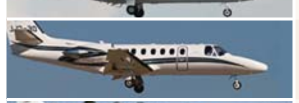
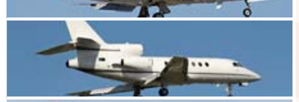
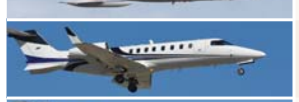
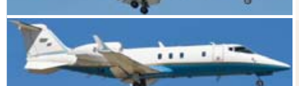
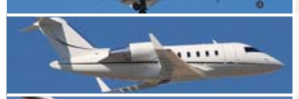
The resolution is a local determination and is not directed by any Federal agency or policy, nor is it based on aviation demand or economic development. Current and/or future Councils may choose to maintain the runway length limitation or make a different determination based on economic development needs of the City and region.

Runway Length Conclusion

In an unconstrained environment, the minimum recommended primary runway length for Georgetown Municipal Airport would be approximately 5,500 feet. At 5,004 feet, Runway 18-36 is shorter than the recommended length. The approximate 500-foot difference does negatively impact some users, particularly operators of medium-sized business jets intending to travel longer distances. The impacts would

AIRFIELD PARAMETERS

Elevation: 790' MSL **Temp: 96.2°F** **Gradient: 0.76% (38.2')**

RUNWAY PARAMETERS		Take-off Length Required at MTOW		% Useful Load for Takeoff on 5,004'		Landing Length Requirements: C.F.R. Part 25 (Unfactored)		Landing Length Requirements: C.F.R. Part 135 (60% factored)		Landing Length Requirements: C.F.R. Part 91k (80% factored)	
Runway Condition		Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet
	Beechjet 400A	5,865	7,550	80.6	Off Chart	3,718	5,377	6,197	8,962	4,648	6,721
	CJ1	No Data	No Data	No Data	No Data	2,951	3,989	4,918	6,648	3,689	4,986
	CJ2	4,778	5,086	100.0	97.7	3,644	5,266	6,073	8,777	4,555	6,583
	CJ3	3,956	4,383	100.0	100.0	3,454	4,731	5,757	7,885	4,318	5,914
	Citation ISP	4,289	4,993	100.0	100.0	2,482	2,854	4,137	4,757	3,103	3,568
	Citation Bravo	5,827	6,032	79.4	77.0	4,112	6,482	6,853	10,803	5,140	8,103
	Citation Encore/Ultra (Encore)	5,060	5,373	98.8	91.5	3,478	5,281	5,797	8,802	4,348	6,601
	Citation Excel/XLS (XLS)	5,259	5,259	87.0	87.0	3,800	6,000	6,333	10,000	4,750	7,500
	Citation Sovereign	4,782	5,053	100.0	89.2	3,294	4,303	5,490	7,172	4,118	5,379
	Citation X	7,934	8,642	50.9	Off Chart	4,444	6,424	7,407	10,707	5,555	8,030
	Falcon 10	4,580*	4,970*	72.6	72.6	2,807	3,228	4,678	5,380	3,509	4,035
	Falcon 20/50 (50)	6,899*	7,444*	64.6	Off Chart	2,974	3,420	4,957	5,700	3,718	4,275
	Lear 35	8,092*	No Data	45.6	No Data	3,332	4,665	5,553	7,775	4,165	5,831
	Lear 45	8,091	8,176	57.5	Off Chart	2,925	3,780	4,875	6,300	3,656	4,725
	Lear 55	Off Chart	Off Chart	Off Chart	Off Chart	3,455	5,529	5,758	9,215	4,319	6,911
	Lear 60	8,728	9,616	44.7	34.3	3,707	5,060	6,178	8,433	4,634	6,325
	Challenger 300/600 (300)	7,064	7,064	60.1	47.4	2,646	5,071	4,410	8,452	3,308	6,339
	Gulfstream IV	6,697*	7,657*	64.5	45.7	3,674	7,043	6,123	11,738	4,593	8,804
	Gulfstream V (550)	8,245	8,257	61.2	58.3	2,817	5,490	4,695	9,150	3,521	6,863

Red Numbers: Indicate the length exceeds 5,004 feet.
*Weight limited due to climb performance
Source: Aircraft operating manuals.

KEY
MSL - Mean Sea Level
CFR Part 25: Standard unfactored landing lengths.
MTOW - Maximum takeoff weight
CFR Part 135: 60% factored landing length as required by commuter/on-demand operators.
CFR - Code of Federal Regulations
CFR Part 91k: 80% factored as required by fractional operators.
No Data - No Ultranav calculation available;
Off Chart - Calculator result out of limits for aircraft

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include the need to take on less fuel, baggage, and passengers, and potentially make an intermediate stop to refuel before proceeding on to a final destination.

There are several reasons that extending Runway 18-36 to 5,500 feet may be challenging. The previously cited council resolution from January 23, 1996 indicates that 5,000 feet is the maximum length. Extending the runway may require road relocations and significant property acquisition. Significant political and community support to successfully extend the runway would be needed. It is recommended that, at a minimum, the Airport maintain the existing minimum runway length of 5,004 feet. At least one option will be presented in the Alternatives chapter that considers the impacts to extending Runway 18-36 to 5,500 feet.

Runway Width

Runway 18-36 is currently 100 feet wide. The B-II design standard is 75 feet wide. The design standard for a RDC C-II runway is 100 feet, regardless of the visibility minimums. This existing width should be maintained because the Airport could transition back to C-II in the future. At the time of the next reconstruction of the runway (likely more than 20 years out), an analysis of the applicable RDC will need to be made. If the RDC were determined to still be B-II, then the applicable design standard is 75 feet (100 feet for ½-mile visibility minimums). A full benefit-cost analysis should be undertaken at that time, which will determine if narrowing the runway and moving the edge lights is less expensive than maintaining the existing width.

Runway 11-29 is currently 75 feet wide. The runway width design standard for RDC B-I is 60 feet (100 feet for ½-mile visibility minimums). At the time of the next major reconstruction, a determination will need to be made whether to maintain the 75-foot width or reduce it to 60 feet. For purposes of this Master Plan, the runway is planned to be maintained at its current width.

Runway Strength

An important feature of airfield pavement is its ability to withstand repeated use by aircraft. The current pavement rating of Runway 18-36 is 30,000 pounds (S) and for Runway 11-29, it is 12,500 pounds (S). Additional engineering studies associated with future runway rehabilitation projects will determine the necessary pavement strength to accommodate the useful life of the pavement utilizing the fleet mix operations forecast.

TAXIWAYS

The design standards associated with taxiways are determined by the ADG of the critical design aircraft and the taxiway design group (TDG). Since all aircraft can and do access all taxiways and both runways, the taxiway design standards to be applied should be the most restrictive based on airport design aircraft.

Table 3J presents the taxiway design standards. The standards based on wingspan apply to all taxiways at the Airport as all taxiways are utilized by all aircraft types. Standards based on the TDG indicate the standard taxiway width. The current and future TDG for operations at the airport is '2' which is determined by the more than 500 annual operations by the King Air 200 turboprop. As noted in Chapter One – Inventory, all taxiways are 50 feet wide except for Taxiway G and that portion of Taxiway L that serves as the threshold to Runway 36, both of which are 100 feet wide. At the time of the next major rehabilitation of any of the taxiways, a determination will need to be made whether to apply the 35-foot TDG '2' standard or the 50-foot TDG '3' standard.

TABLE 3J
Taxiway Dimensions and Standards
Georgetown Municipal Airport

STANDARDS BASED ON WINGSPAN	ADG II	
Taxiway Protection		
Taxiway Safety Area (TSA) width	79'	
Taxiway Object Free Area (TOFA) width	131'	
Taxilane Object Free Area width	115'	
Taxiway Separation		
Taxiway Centerline to:		
Fixed or Movable Object	65.5'	
Parallel Taxiway/Taxilane	105'	
Taxilane Centerline to:		
Fixed or Movable Object	57.5'	
Parallel Taxilane	97'	
Wingtip Clearance		
Taxiway Wingtip Clearance	26'	
Taxilane Wingtip Clearance	18'	
STANDARDS BASED ON TDG	**TDG 3**	**TDG 2**
Taxiway Width Standard	50'	35'
Taxiway Edge Safety Margin	10'	7.5'
Taxiway Shoulder Width	20'	15'

ADG: Airplane Design Group
TDG: Taxiway Design Group
Source: FAA AC 150/5300-13A, Airport Design

Taxiway Design Considerations

FAA AC 150/5300-13A, *Airport Design*, provides guidance on recommended taxiway and taxilane layouts to enhance safety by avoiding runway incursions. A runway incursion is defined as "any occurrence at an airport involving the incorrect presence of an aircraft, vehicle, or person on the protected area of a surface designated for the landing and takeoff of aircraft."

The taxiway system at the Airport generally provides for the efficient movement of aircraft; however, recently published FAA AC 150/5300-13A, *Airport Design*, provides recommendations for taxiway design.

The following is a list of the taxiway design guidelines and the basic rationale behind each recommendation:

1. **Taxi Method**: Taxiways are designed for "cockpit over centerline" taxiing with pavement being sufficiently wide to allow a certain amount of wander. On turns, sufficient pavement should be provided to maintain the edge safety margin from the landing gear. When constructing new taxiways, upgrading existing intersections should be undertaken to eliminate "judgmental over-steering," which is where the pilot must intentionally steer the cockpit outside the marked centerline in order to assure the aircraft remains on the taxiway pavement.
2. **Steering Angle**: Taxiways should be designed such that the nose gear steering angle is no more than 50 degrees, the generally accepted value to prevent excessive tire scrubbing.
3. **Three-Node Concept**: To maintain pilot situational awareness, taxiway intersections should provide a pilot a maximum of three choices of travel. Ideally, these are right- and left-angle turns and a continuation straight ahead.
4. **Intersection Angles**: Design turns to be 90 degrees wherever possible. For acute-angle intersections, standard angles of 30, 45, 60, 120, 135, and 150 degrees are preferred.
5. **Runway Incursions**: Design taxiways to reduce the probability of runway incursions.
   - *Increase Pilot Situational Awareness*: A pilot who knows where he/she is on the airport is less likely to enter a runway improperly. Complexity leads to confusion. Keep taxiway systems simple using the "three-node" concept.
   - *Avoid Wide Expanses of Pavement*: Wide pavements require placement of signs far from a pilot's eye. This is especially critical at runway entrance points. Where a wide expanse of pavement is necessary, avoid direct access to a runway.
   - *Limit Runway Crossings*: The taxiway layout can reduce the opportunity for human error. The benefits are twofold – through simple reduction in the number of occurrences, and through a reduction in air traffic controller workload.
   - *Avoid "High-Energy" Intersections*: These are intersections in the middle third of runways. By limiting runway crossings to the first and last thirds of the runway, the portion of the runway where a pilot can least maneuver to avoid a collision is kept clear.
   - *Increase Visibility*: Right-angle intersections, both between taxiways and runways, provide the best visibility. Acute-angle runway exits provide for greater efficiency in runway usage, but should not be used as runway entrance or crossing points. A right-angle turn at the end of a parallel taxiway is a clear indication of approaching a runway.
   - *Avoid "Dual Purpose" Pavements*: Runways used as taxiways and taxiways used as runways can lead to confusion. A runway should always be clearly identified as a runway and only a runway.
   - *Indirect Access*: Do not design taxiways to lead directly from an apron to a runway. Such configurations can lead to confusion when a pilot typically expects to encounter a parallel taxiway.
   - *Hot Spots*: Confusing intersections near runways are more likely to contribute to runway incursions. These intersections must be redesigned when the associated runway is subject to reconstruction or rehabilitation. Other "hot spots" should be corrected as soon as practicable.

6. **Runway/Taxiway Intersections**:
   - *Right-Angle*: Right-angle intersections are the standard for all runway/taxiway intersections, except where there is a need for a high-speed exit. Right-angle taxiways provide the best visual perspective to a pilot approaching an intersection with the runway to observe aircraft in both the left and right directions. They also provide optimal orientation of the runway holding position signs so they are visible to pilots.
   - *Acute-Angle*: Acute angles should not be larger than 45 degrees from the runway centerline. A 30-degree taxiway layout should be reserved for high-speed exits. The use of multiple intersecting taxiways with acute angles creates pilot confusion and improper positioning of taxiway signage.
   - *Large Expanses of Pavement*: Taxiways must never coincide with the intersection of two runways. Taxiway configurations with multiple taxiway and runway intersections in a single area create large expanses of pavement, making it difficult to provide proper signage, marking, and lighting.
7. **Taxiway/Runway/Apron Incursion Prevention**: Apron locations that allow direct access into a runway should be avoided. Increase pilot situational awareness by designing taxiways in such a manner that forces pilots to consciously make turns. Taxiways originating from aprons and forming a straight line across runways at mid-span should be avoided.
8. **Wide Throat Taxiways**: Wide throat taxiway entrances should be avoided. Such large expanses of pavement may cause pilot confusion and makes lighting and marking more difficult.
9. **Direct Access from Apron to a Runway**: Avoid taxiway connectors that cross over a parallel taxiway and directly onto a runway. Consider a staggered taxiway layout that forces pilots to make a conscious decision to turn.
10. **Apron to Parallel Taxiway End**: Avoid direct connection from an apron to a parallel taxiway at the end of a runway.

FAA AC 150/5300-13A, *Airport Design*, states that, "existing taxiway geometry should be improved whenever feasible." To the extent practicable, the removal of existing pavement may be necessary to correct confusing layouts. **Exhibit 3E** identifies all airfield areas of concern.

Exhibit 3E also highlights the location of the "high-energy" portion of each runway (middle third). As noted above, FAA airfield geometry standards indicate that taxiways crossing a runway in the high-energy area should be avoided. Taxiway J crosses Runway 18-36 within the "high-energy" portion of the runway.

All entrance/exit taxiways should interface the runway to allow aircraft to hold at a 90-degree orientation with the runway centerline. This allows the pilot full operational view of the runway in both directions. Access to runways is preferred to be at a 90-degree angle, unless a high-speed exit is needed. Both Taxiways K and L intersect Runway 11-29 at an angle. Options will be considered in the Alternatives chapter to provide taxiways that allow aircraft to hold at a 90-degree angle to the runway.

Taxiway G and the threshold portion of Taxiway L are both 100 feet wide, thus being a wide expanse of pavement. These should be narrowed to the 50-foot design standard.

Analysis in the following chapter will outline options for correcting the nonstandard taxiway alignments.

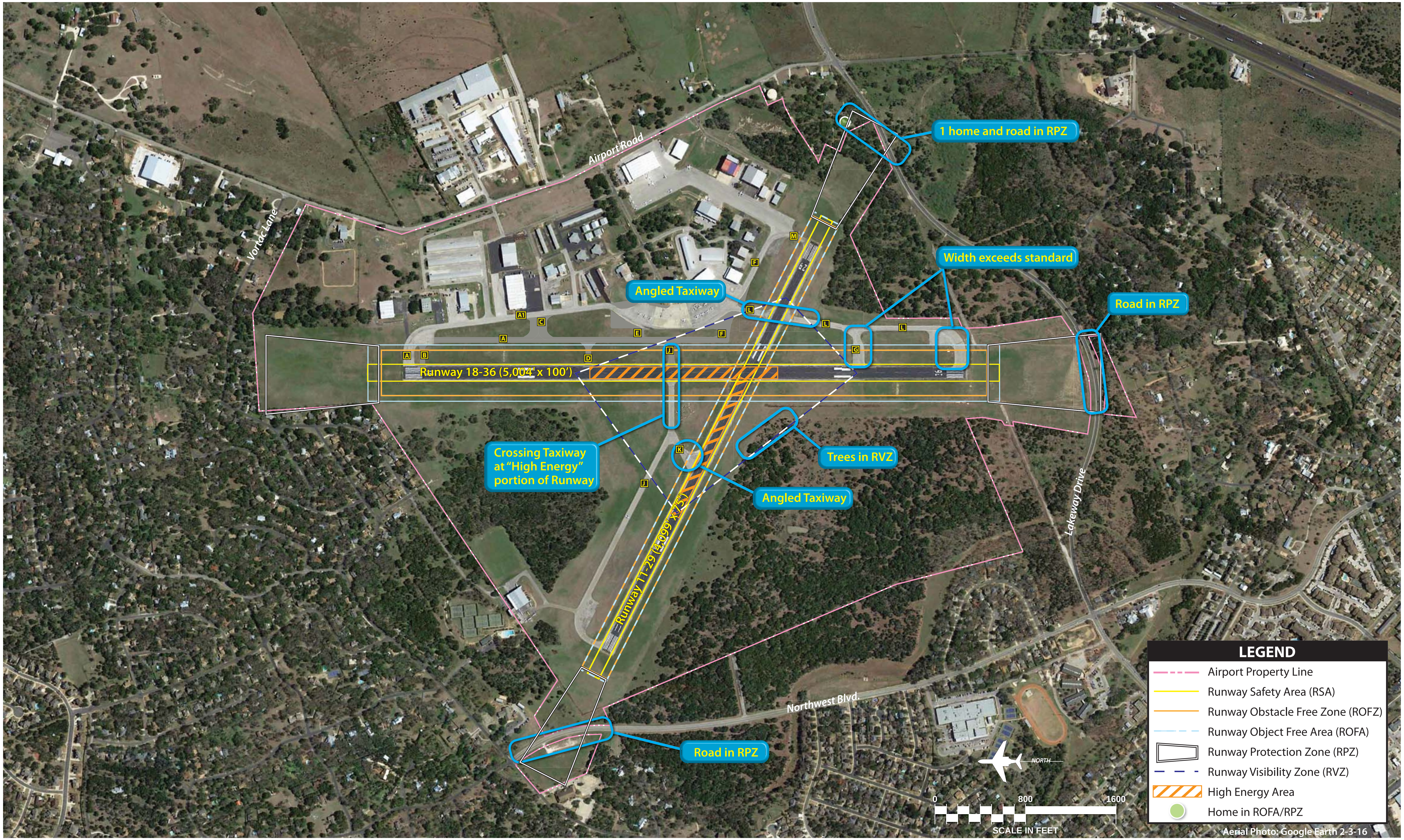

Exhibit 3E
GEOMETRY AND DESIGN STANDARD
- AREAS OF INTEREST

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HOLDING BAYS

Holding bays are locations on the airfield where aircraft pull to the side of primary taxiways to perform pre-flight checks, run-ups, and to await departure clearance. FAA AC 150/5300-13A, *Airport Design*, suggests that hold bays should be provided when runway operations reach a level of 30 per hour. Analysis in Chapter Two, Forecasts, presented the operational peaking characteristics in which it was determined that the current design hour is 34, increasing to 59 by the long-term planning period. Development of hold bays at the airport will be considered in the Alternatives chapter of this Master Plan.

The most advantageous location for hold bays is adjacent to the taxiway serving the runway end. Hold bays must be designed in such a manner to keep aircraft out of the RSA and OFZ. They should also be designed such that the TOFA is clear and aircraft can safely pass aircraft positioned in the hold bay.

There are hold bays at the end of the taxiways serving all four runway ends. These hold bays are on the "inside" of the taxiways between the taxiway and the runway. This layout is typically only supported in constrained environments. Taxiway C has been widened to 150 feet to accommodate holding aircraft to each side of the taxiway. Taxiway B serves as a bypass taxiway however only one aircraft can hold at a time. Options for redesigning and relocating the hold bays will be considered in the Alternatives chapter.

INSTRUMENT APPROACH CAPABILITY

Instrument approaches are classified as either precision or non-precision. Precision instrument approaches provide both vertical and horizontal guidance. Currently, precision approaches require an instrument landing system (ILS); however, advances in GPS technology may soon make precision approaches available without costly ground-based equipment, such as a localizer and glide slope antenna. Precision approaches typically provide for visibility minimums of ½-mile or lower and cloud ceiling minimums of 200 feet. This is typically the lowest visibility minimums available to general aviation airports and is common at reliever airports.

Non-precision instrument approaches typically provide only horizontal guidance; however, relatively new non-precision GPS localizer performance with vertical guidance (LPV) approaches do provide both horizontal and vertical guidance. Non-precision instrument approaches typically have visibility minimums of greater than ½-mile and cloud ceiling minimums higher than 200 feet.

Several design requirements are associated with the instrumentation of a runway. Visibility minimums of ½-mile require an approach lighting system (ALS) and they are recommended for ¾-mile. Visibility minimums above ¾-mile do not need an ALS. The size of the RPZs can change based on the visibility minimums. At Georgetown Municipal Airport, all four runway ends have non-precision instrument approaches with 1-mile visibility minimums.

NOTE: At the beginning of this Master Plan project (August 2016), the visibility minimums to both ends of Runway 18-36 were ⅞-mile. The following discussion makes the case for raising the visibility minimums to 1-mile. On June 26, 2018, the minimums were raised to 1-mile.

For Runway 18-36, ⅞-mile visibility minimums are excellent; however, there are impacts that should be considered. The size of the RPZ associated with the ⅞-mile visibility minimums is approximately 50 acres, while the size of an RPZ associated with a 1-mile visibility minimum is approximately 30 acres. The larger RPZ, which exists today for both ends of Runway 18-36, encompasses numerous homes and roads. There are 40 homes in the Runway 18 RPZ and seven in the Runway 36 RPZ. If the visibility minimums were 1-mile, then there would be 17 homes in the Runway 18 RPZ and five in the Runway 36 RPZ. There is one home in the Runway 29 RPZ.

The visibility minimums for Runway 18-36 were raised from ⅞-mile to 1-mile in June 2018.

The wind observation data for the Airport was analyzed to determine what the operational difference would be if the visibility minimums for Runway 18-36 were raised from ⅞-mile to 1-mile. Over the last 10 years, there were a total of 161,604 weather observations made by the on-airport AWOS. Of this total, 215 or 0.155 percent were observations of a visibility minimum within this range. This is a very small number and likely had very limited or no impact to actual operations. Consideration will be given to increasing the visibility minimums on Runway 18-36 to 1-mile.

As a crosswind runway, the non-precision instrument approaches with 1-mile visibility minimums are appropriate and should be maintained.

A variety of options will be considered in the Alternatives chapter to increase the compatibility of RPZ lands, including the possibility of raising visibility minimums. Visibility minimums that are lower than what is available today are not considered feasible.

VISUAL NAVIGATION AIDS

The location of the airport at night is universally indicated by a rotating beacon, which is located on top of the control tower. The beacon should be maintained through the planning period.

Both ends of Runway 18-36 are equipped with precision approach path indicator (PAPI) lights. This visual approach lighting system should be maintained through the long-term planning period. PAPIs are planned for Runway 11-29 in 2018.

Runway end identification lights (REIL) are strobe lights set to either side of the runway. These lights provide rapid identification of the runway threshold. REILs should be installed at runway ends not currently providing an approach lighting system but supporting instrument operations. REILs are currently available for both ends of Runway 18-36 and should be considered for Runway 11-29, which has instrument approach capability.

AIRFIELD LIGHTING, MARKING, AND SIGNAGE

Airfield lighting, signage, and markings aids pilots when navigating the airport environment.

Runway and Taxiway Lighting

Runway lighting provides the pilot with positive identification of the runway and its alignment. Both runways are equipped with medium intensity runway lighting (MIRL). This is the appropriate intensity for the Airport and the edge lighting should be maintained.

Taxiway edge lighting provides for safe and efficient ground movements at night and at times of poor visibility. All taxiways are planned to have medium intensity taxiway lighting (MITL) installed in 2018. These should be maintained through the long-term planning period.

Pavement Markings

Runway markings are typically designed to the type of instrument approach available on the runway. FAA AC 150/5340-1K, *Standards for Airport Markings*, provides guidance necessary to design airport markings. All runways are served by non-precision markings. These are the appropriate runway markings and should be maintained through the long-term planning period.

Airfield Signs

Airfield identification signs assist pilots in identifying their location on the airfield and directing them to their desired location. Lighted signs are installed on the runway and taxiway systems on the airfield. The signage system includes runway and taxiway designations, holding positions, routing/directional, and runway exits. All these signs should be maintained throughout the planning period.

Consideration should be given to installing distance remaining signage for the primary runways. These lighted signs alert pilots to how much runway length remains in 1,000-foot increments.

WEATHER AND COMMUNICATION AIDS

Georgetown Municipal Airport has a lighted windsock centrally located on the airfield. Because wind patterns can vary and change rapidly, it is common to provide supplemental windsocks. It is recommended that a supplemental windsock be installed in proximity to the four runway ends.

Georgetown Municipal Airport is equipped with an Automated Weather Observing System (AWOS). This is an important system that automatically records weather conditions, such as wind speed, wind gust, wind direction, temperature, dew point, altimeter setting, visibility, fog/haze condition, precipitation, and cloud height. This information can be accessed by pilots and individuals via an automated voice recording on a published telephone number. This system should be maintained through the planning period.

Originally, the AWOS was to be relocated as part of the current parallel taxiway/apron project. This would have several benefits, including opening up additional apron construction space and providing an unobstructed area around the sensors. In the future, the AWOS should be planned to be relocated.

AIRSIDE SUMMARY

The Georgetown Municipal Airport is an asset to the community and the region. It is also important to the National Airspace System as a designated reliever airport. It is an important economic development engine for the region.

Runway 18-36, at 5,004 feet in length, is approximately 500 feet shorter than what would be recommended in an unconstrained environment. At least one option for extending the runway will be considered in the Alternatives chapter; however, considering the known constraints (i.e., surrounding developed land, homes, roads, etc.), it may be a challenge to implement.

Runway 11-29 is designed to accommodate small aircraft, those less than 12,500 pounds. At 4,099 feet in length, it can fully accommodate small aircraft. Analysis of 10 years of wind data at the Airport indicated that a crosswind runway is not required; however, at a busy airport like Georgetown, it should be maintained. Eligibility for continued maintenance and rehabilitation funding will need to be determined by the FAA. The availability of Runway 11-29 allows the airport to remain operational when the primary runway is closed (typically due to a construction project or an emergency) and it provides a safer landing option when winds dictate. Tower staff have also indicated that Runway 11-29 is critical to aircraft sequencing and ground movement efficiency.

The FAA places a high priority on airports having control over land uses within RPZs. The RPZs at the Airport have incompatible land uses within them. It is the responsibility of the Airport to have a plan in place to meet RPZ land use standards to the greatest degree feasible; however, it is often a function of funding availability that determines when a mitigating solution can be pursued.

The FAA is also placing a high priority on mitigating or eliminating through redesign, potentially confusing geometry at airports. Several taxiways do not meet current geometric design standards. The long-term plan for the airport will consider implementation of taxiway geometry that meets standards.

The airport has available non-precision instrument approaches to all runway ends. This is an important feature that extends the availability of the airport to times of poor visibility conditions. The instrument approaches to Runway 11-29 provide for 1-mile visibility minimums, which is appropriate for this runway. The approaches should be maintained.

Both ends of Runway 18-36 have non-precision instrument approaches with visibility minimums of 1-mile. As discussed previously in this chapter, the visibility minimums to Runway 18-36 were raised to 1-mile as recommended in this Master Plan.

A summary of the airside needs at Georgetown Municipal Airport is presented on **Exhibit 3F**.

LANDSIDE REQUIREMENTS

Landside facilities are those necessary for handling aircraft and passengers while on the ground. These facilities provide the essential interface between the air and ground transportation modes. The capacities of the various components of each area were examined in relation to projected demand to identify future landside facility needs. This analysis is focused on the needs to support general aviation activity, which includes recreational flying, business aviation, charter, military, and some portions of air cargo and air ambulance activity. The landside components include:

- Aircraft Hangars
- Aircraft Parking Apron
- Auto Parking and Access
- General Aviation Terminal Building Services

AIRCRAFT HANGARS

Owning an aircraft represents a significant financial investment. Most aircraft owners prefer to store their aircraft in an enclosed hangar space as opposed to utilizing outside aircraft tie-down positions. In more mild climates, such as central Texas, some owners will prefer a less expensive outside tie-down position. Enclosed hangar space provides protection from the elements and an increased level of security. It is estimated that 85 percent of based aircraft are stored in hangars. This is forecast to increase to approximately 90 percent by the long-term planning period.

There are three general types of aircraft storage hangars: T-hangars, box hangars, and conventional hangars. T-hangars are similar in size and will typically house a single engine piston-powered aircraft. Some multi-engine aircraft owners may elect to utilize these facilities as well. There are typically many T-hangar units "nested" within a single structure. Box hangars are larger open space hangars typically used to store somewhat larger personal/business aircraft and/or to house aviation businesses. Conventional hangars are the familiar large hangars with open floor plans that can store several aircraft.

Calculations of current and future hangar needs by hangar type have been developed. Currently, there is approximately 156,300 square feet of T-hangar aircraft storage space at the Airport. Future estimates are based on providing 1,400 square feet per T-hangar unit. Approximately 130,700 square feet of additional T-hangar space is needed to meet the short-term demand. By the long-term planning horizon, a total of 334,000 square feet of T-hangar space is estimated to be needed.

CATEGORY	AVAILABLE	POTENTIAL IMPROVEMENT/CHANGE

RUNWAYS

	RUNWAY 18-36	
	RDC: B-II-5000	Consider RDC C-II-5000
	Runway length/width: 5,004' x 100'	Consider extension to 5,500' but no less than the current length
	Pavement strength: 30,000 lbs. single wheel	Engineering Design Study determination
	[1]RSA: 400' wide x 1,000' beyond runway ends	Meets standard - maintain
	[1]ROFA: 800' wide x 1,000' beyond runway ends	Non-standard: ROFA extends over homes on the northwest, examine solutions
	OFZ: 400' wide x 200' beyond runway ends	Meets standard - maintain
	RPZ ownership: partial ownership	Acquire if feasible.
	RPZ Incompatibilities: roads	Remove RPZ incompatibilities if feasible
	Non-precision markings	Meets standard - Maintain
	Medium intensity runway lighting (MIRL)	Meets standard - Maintain
	RUNWAY 11-29	
	RDC: B-I-5000	Maintain
	Runway length/width: 4,099' x 75'	Maintain (width exceeds 60' standard)
	Pavement strength: 12,500 lbs. single wheel	Maintain
	Standard RSA, OFA, OFZ	Meets standard - Maintain
	RPZ ownership: partial ownership	Acquire if feasible.
	RPZ Incompatibilities: Roads, homes	Remove RPZ incompatibilities if feasible
	Non-precision marking	Meets standard - Maintain
	Medium intensity runway lighting (MIRL)	Meets standard - Maintain

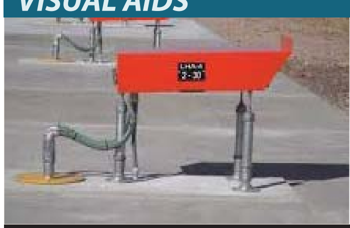
TAXIWAYS

	TDG-2	Meets standard - maintain
	Centerline markings	Meets standard - maintain
	Width standard is 35 feet	Implement uniform 35' taxiway width
	Medium intensity taxiway lighting (MITL)	Unavailable - MITL planned for 2018
	Taxiway layout/geometry deficiencies	Redesign taxiway layout/geometry

INSTRUMENT NAVIGATION AND WEATHER AIDS

	AWOS	Maintain system - consider relocation
	Beacon	Maintain
	1 Windsock	Add supplemental windsocks near runway ends
	RUNWAY 18-36	
	⅞ - mile non-precision GPS	Consider increasing to 1-mile[2]
	RUNWAY 11-29	
	1-mile non-precision GPS	Maintain

VISUAL AIDS



	RUNWAY 18-36	
	PAPI-4L	Maintain
	REILs	Maintain
	RUNWAY 11-29	
	None	PAPI-2L planned for 2018
	REILS	Maintain

KEY

AWOS - Automated Weather Observing System
MIRL/HIRL - Medium/High Intensity Runway Lighting
MITL - Medium Intensity Taxiway Lighting
OFZ - Obstacle Free Zone
PAPI - Precision Approach Path Indicator
RDC - Runway Design Code
REIL - Runway End Identification Lights
ROFA - Runway Object Free Area
RPZ - Runway Protection Zone
RSA - Runway Safety Area
TDG - Taxiway Design Code

Exhibit 3F
AIRSIDE FACILITY REQUIREMENTS

[1] C-II standard to be maintained
[2] Raised to 1-mile (June 26, 2018)

Executive/box hangars are a popular storage option. Estimates of future needs are based on providing 2,200 square feet per aircraft. There is a current need for approximately 28,000 square feet of executive/box hangar space. By the long-term planning period, there is a total need for 119,000 square feet.

Conventional hangar aircraft parking space is estimated by providing 2,500 square feet per aircraft. The calculations indicate that the current supply of conventional hangars is adequate through the long-term planning period.

An additional 220,500 square feet of hangar space is needed.

Table 3K presents aircraft storage needs based on the demand forecasts. Estimates indicate a long term need for an additional 220,500 square feet of aircraft storage space to accommodate the forecast growth at the Airport.

TABLE 3K
Hangar Needs
Georgetown Municipal Airport

	Currently Available	Short Term	Intermediate Term	Long Term	Total Need Less Current Supply
Based Aircraft	318	340	370	400	
Aircraft to be Hangared	273	296	326	360	87
T-Hangar Positions	140	205	223	238	98
Box Hangar Positions	32	46	50	54	22
Conventional Hangar Positions	110	89	98	108	-2
Hangar Area Requirements					
T-Hangar Area	156,300	287,000	312,000	334,000	177,700
Box Hangar Area	73,000	101,000	109,000	119,000	46,000
Conventional Hangar Area	272,200	223,000	244,000	269,000	-3,200
Total Storage Area (s.f.)	**501,500**	**611,000**	**665,000**	**722,000**	**220,500**
Maintenance Area	52,200	60,000	65,000	70,000	17,800

Source: Coffman Associates analysis.

Most hangars will have some space dedicated for non-aircraft storage purposes. This may include an office or lounge area. Active airports with a significant general aviation presence, such as Georgetown Municipal Airport, will also have a variety of aviation businesses on the airfield. These operators typically dedicate hangar space for this purpose, rather than storage. Future office/maintenance hangar space needs are calculated at 175 square feet per based aircraft. This shows that there is a need for approximately 17,800 square feet of additional office/maintenance hangar space by the long term.

Hangar requirements are general in nature and are based on standard hangar size estimates and typical user preferences. If a private developer desires to construct or lease a large hangar to house one plane, any extra space in that hangar may not be available for other aircraft. The actual hangar area needs will be dependent on the usage within each hangar.

GENERAL AVIATION AIRCRAFT APRON

Aircraft aprons are paved areas utilized for access, circulation, and aircraft parking needs. Calculations of future aircraft apron needs takes into consideration the space necessary to meet these needs. The main terminal apron encompasses approximately 36,000 square yards of pavement. There are nine dedicated transient positions in front of the terminal building and 22 marked positions for local and transient needs on the south portion of the main apron (considered local for planning purposes). The east apron has a 5,000-square-yard pavement area with 11 marked tie-down positions. In addition, there are four transient positions located in the grass east of the T-hangar building #24 (which are not included in apron need calculations). There is a total of 42 aircraft tie-down positions at the Airport, not including the grass positions.

An important consideration when planning aircraft apron demand is to distinguish between the space needed for small and large aircraft. Small aircraft space is needed for both transient and local aircraft. Large aircraft space is needed for transient operators as based large aircraft, such as business jets and turboprops, are rarely stored outside at a tie-down position. Therefore, two separate calculations are employed to determine local and transient apron needs and transient apron needs are further classified for small and large aircraft. Currently, all aircraft tie-down positions are sized for smaller single and multi-engine piston aircraft.

Transient Apron Requirements

FAA AC 150/5300-13A, *Airport Design*, suggests a methodology by which transient apron requirements can be determined from knowledge of busy-day operations. At the Airport, the number of transient spaces required is estimated at 15 percent of the busy-day transient general aviation/other air taxi operations. Busy day operations are calculated by multiplying the design day by 1.34 (derived from analysis of tower operations). This results in a current need for 31 transient aircraft positions and a long term need for 51 positions.

A planning criterion of 800 square yards per small aircraft and 1,600 square yards for large aircraft was applied to determine current and future transient apron area requirements. These area estimates include circulation areas and take into account the higher frequency of ground movements by transient aircraft. Small aircraft are estimated to account for 80 percent of transient operations and larger business jets and turboprops account for the remaining 20 percent. There is a current need for a total of 25 transient positions for small aircraft. By the long-term planning period, there is a forecast need for a total of 51 positions for small aircraft. There is a current need for six large aircraft positions and by the long term, a need for 10 large aircraft transient positions. When considering existing capacity, there is a long term need for 36 small aircraft and 10 large aircraft transient positions.

Transient apron needs have also been calculated in terms of area requirements. Existing transient apron area is estimated at 17,100 square yards. The current need is for 30,100 square yards and the long-term need is for 48,800 square yards.

Additional aircraft apron is needed, especially for transient operators.

When considering what is currently available, there is a long-term need for an additional 31,700 square yards of transient apron.

Local Apron Requirements

Local tie-down positions are assumed to be utilized by owners of small single engine aircraft and, therefore, a planning criterion of 350 square yards per aircraft is utilized. An additional 10 spaces are planned to accommodate temporary usage by local users. Future local tie-down apron needs are estimated based on an increasing number of aircraft owners desiring to have a hangar. Currently, approximately 86 percent of based aircraft are stored in hangars. Over time, this is forecast to increase to 90 percent. Because of the relatively warm climate, there will always be a demand for local tie-down positions to some degree.

Currently, there are 27 local tie-down positions and a calculated need for 55. By the long term, there is a need for 50 local tie-down positions. While based aircraft are forecast to increase, the need for local tie-down positions is forecast to decrease slightly based on the assumption that aircraft owners would rent a hangar if one were available. In terms of apron area needed to accommodate local tie-down needs, there is currently a supply of 23,900 square yards and a long term need for 32,500 square yards.

Aircraft Apron Summary

There is currently 41,000 square feet of aircraft apron space available at the Airport and a long term need for 81,300 square yards. While the forecast distinguishes between local and transient apron, operationally it is common for pilots to utilize an available space. **Table 3L** summarizes the aircraft apron needs at the Airport.

TABLE 3L
Aircraft Apron Requirements
Georgetown Municipal Airport

			FORECAST		
	Currently Available (2016)	Calculated Need (2016)	Short Term	Intermediate Term	Long Term
Local Apron Positions	27	55	54	54	50
Local Apron Area (s.y.)	23,900	24,500	35,200	35,400	32,500
Transient Apron Positions	15	31	43	47	51
Piston Transient Positions	15	25	34	38	41
Turbine Transient Positions	0	6	9	9	10
Transient Apron Area (s.y.)	17,100	30,100	41,000	45,100	48,800
Total Apron Area (s.y)	41,000	54,600	76,200	80,500	81,300

Source: Coffman Associates analysis

GENERAL AVIATION VEHICLE ACCESS AND PARKING

General aviation parking needs are attributable to locally based users, transient airport users, and aviation businesses. Locally based users primarily include those attending to their based aircraft. As with many airports that cater to general aviation, most based aircraft owners at the Airport will park their vehicles in or adjacent to their hangar when attending to or flying their aircraft. Current planning standards suggest that dedicated vehicle parking lots and access roads be made available to hangar owners/occupants. This has the positive effect of removing vehicular traffic from aircraft movement areas.

Vehicle parking needs for locally based aircraft operators is estimated at half of the total number of based aircraft. If feasible, future hangar development should consider dedicated road access and parking lots.

Transient users will require vehicle parking lots as they may be passengers on a private aircraft. This space is typically provided by airport FBOs, although some spaces may be available at a terminal building. Calculations of future transient vehicle parking needs are a function of the number of potential general aviation passengers during the design hour. The number of design hour itinerant passengers is multiplied by 1.9 (average vehicle occupants), which results in a total number of vehicle parking spaces needed. Calculations of vehicle parking area (in square feet) needed are estimated at 315 square feet per parking space.

It is estimated that there are 216 vehicle parking spaces available at the FBOs and other airport businesses and 38 spaces at the terminal building, for a total of 254 transient spaces. The estimate of future needs indicates that the available transient vehicle parking needs are met at the Airport through the short-term planning period. By the intermediate and long term, additional parking may be needed. Generally, as new hangars are constructed, associated vehicle parking should also be included. **Table 3M** presents the vehicle parking estimates.

TABLE 3M
GA Vehicle Parking Requirements
Georgetown Municipal Airport

	Existing	Short Term	Intermediate Term	Long Term
Design Hour Itinerant Passengers	31	43	51	60
VEHICLE PARKING SPACES				
GA Itinerant Spaces	254	82	97	114
GA Based Spaces		170	185	200
Total Parking Spaces	254	252	282	314
VEHICLE PARKING AREA (s.f.)				
GA Itinerant Parking Area	80,010	26,000	30,000	36,000
GA Based Parking Area		54,000	58,000	63,000
Total Parking Area (s.f.)	80,010	80,000	88,000	99,000

Source: Coffman Associates analysis

GENERAL AVIATION TERMINAL SERVICES

Typically, certain services will be made available to general aviation users. This may include a pilot's lounge, flight planning station, line services, conference room, and restrooms. These facilities may be provided by a dedicated terminal building and/or shared with FBO facilities. At Georgetown Municipal Airport, these services are shared among the FBOs and the City-operated terminal building. It is estimated that pilot service functions currently account for approximately 1,000 square feet in the main terminal building with an additional 6,000 square feet of space estimated to be available at the FBOs.

General aviation terminal needs are a function of the average number of general aviation passengers that may use the facilities during the design hour. It is estimated that there is a need to accommodate up to 31 people at any one time in the short term and 60 by the long term. Calculating 120 square feet of space per person results in the general aviation terminal building space requirements of 5,200 square feet, 6,100 square feet, and 7,200 square feet in the short, intermediate and long-term planning horizons, respectively, as shown on **Table 3N**. The Airport has adequate space for general aviation services through the long-term planning period; however, FBO operators will determine their own business needs for additional general aviation terminal space.

TABLE 3N
General Aviation Terminal Area Facilities
Georgetown Municipal Airport

	Existing	Short Term	Intermediate Term	Long Term
Design Hour Operations	34	47	54	59
Design Hour Itinerant Operations	16	22	24	26
Multiplier	1.9	2.0	2.1	2.3
Total Design Hour Itinerant Passengers	31	43	51	60
Terminal Building Public Space (s.f.)	1,000	780	915	1080
FBO GA Services Space (s.f.)	6,000	4,420	5,185	6,120
Total Terminal Building Space (s.f.)	7,000	5,200	6,100	7,200

Source: Coffman Associates analysis

LANDSIDE SUMMARY

An analysis of the required landside facilities necessary to meet projected demand has been presented. Currently, it is estimated that there is approximately 501,500 square feet of aircraft storage space in existing hangars. By the long-term planning period, an additional 220,500 square feet is forecast to be needed.

General aviation aircraft apron requirements are shown to be deficient currently. There is approximately 41,000 square yards of general aviation apron area and the current need has been calculated at 54,600 square yards. By the long term, a total of 81,300 square yards is required. When adding apron space, consideration should be given to segmenting it between local and transient users. Both are needed but transient space is a pressing issue. In addition, dedicated spaces for larger aircraft should be identified.

The need for vehicle parking space was analyzed for both locally based users and transient users. At the terminal building, there are approximately 38 spaces and the FBOs provide an additional 216 for a total of 254. This meets the estimated need in the short term. Additional parking will be needed as additional hangars are constructed. While many locally based aircraft owners will park their vehicle in their hangar when utilizing their aircraft, it is preferred to have dedicated parking for these users. Planning for future hangars will include the feasibility of providing dedicated parking.

Those landside facilities necessary to meet current and future demand should be maintained to a high standard. The Airport has a maintenance priority list that is updated regularly.

Exhibit 3G presents a summary of the landside requirements, as well as the support requirements that are discussed in the next section.

AIRPORT SUPPORT REQUIREMENTS

Various facilities that do not logically fall within classifications of airside or landside facilities have also been identified. These other areas provide certain support functions related to the overall operation of the Airport.

AIRCRAFT RESCUE AND FIREFIGHTING (ARFF) FACILITIES

Since the Airport is not a Part 139 commercial service airport, it is not required to have on-site ARFF. However, it is a busy general aviation airport and does benefit from having Fire Station No. 4 physically located on the north side of Airport property. Currently, direct access to the runway/taxiway system is not available. Future considerations will be given to providing a route for firefighters to access the airfield more directly.

MAINTENANCE BUILDING

Currently, Airport maintenance equipment, such as mowers and agents, are stored in two City-owned T-hangars. These T-hangars would be better utilized as leasable aircraft hangar space. For a general aviation airport, a maintenance facility encompassing approximately 5,000 square feet would meet the long-term needs. Consideration will be given to properly locating a dedicated maintenance facility on the Airport.

FUEL STORAGE

The Airport owns the newly constructed fuel farm located just north of the terminal building. Two above-ground fuel tanks are available, one dedicated to Jet A (20,000-gallon capacity) and the other to

	Available	Short Term	Intermediate Term	Long Term
Based Aircraft	**318**	**340**	**370**	**400**
Hangar Positions				
T-Hangars	140	205	223	238
Executive/Box Hangars	32	46	50	54
Conventional Hangar Positions	110	89	98	108
Hangar Area				
T-Hangars	156,300	287,000	312,000	334,000
Executive/Box Hangars	272,200	223,000	244,000	269,000
Conventional Hangar (s.f.)	73,000	101,000	109,000	119,000
Total Hangar Area (s..f)	501,500	611,000	665,000	722,000
Maintenance Area (s.f.)	52,200	60,000	65,000	70,000

Aircraft Parking Positions				
GA Local Positions	27	54	54	50
GA Transient Piston Positions	15	34	38	41
GA Transient Business Jet Positions	0	9	9	10
Aircraft Parking Apron				
GA Local Apron Area (s.y.)	23,900	35,200	35,400	32,500
GA Transient Apron Area (s.y.)	17,100	41,000	45,100	48,800
GA Total Apron (s.y.)	41,000	76,200	80,500	81,300
Auto Parking				
Total GA Parking Spaces	254	252	282	314
GA Total Parking Area (s.f.)	80,010	80,000	88,000	99,000
GA Terminal Building				
Area (s.f.)	7,000	5,200	6,100	7,200
Fuel Storage				
Storage Type	Above Ground	Maintain	Maintain	Maintain
Jet A Capacity (Static Tank)	20,000 gal.	Maintain	Add 12,000 gal. tank	Maintain
Jet A Capacity (Trucks)	11,500 gal.	Add as needed	Add as needed	Add as needed
AvGas Capacity (Static Tank)	15,000 gal.	Maintain	Maintain	Add 8,000 gal. tank
AvGas Capacity (Truck)	2,550 gal.	Add as needed	Add as needed	Add as needed
Perimeter Fencing				
Linear Feet	23,000	Maintain and Replace As Needed		

Exhibit 3G
LANDSIDE AND SUPPORT REQUIREMENTS

AvGas (15,000-gallon capacity) fuel. The FBOs own and operate fuel trucks. Jet A fuel trucks have a total capacity of 11,500 gallons and AvGas trucks have a capacity of 2,550 gallons.

Additional fuel storage capacity should be planned when the Airport is unable to maintain an adequate supply and reserve. A 14-day reserve is common; however, more frequent deliveries can be arranged to make up for times when reserves are low. When additional capacity is needed, it should be planned in 10,000- to 12,000-gallon increments, which can accommodate common fuel tanker trucks that typically have an 8,000-gallon capacity. Fuel storage requirements can vary based upon individual supplier and distributor policies.

Projections of future fuel supply needs are a function of the aircraft fleet mix operations at the Airport. Assumptions of fuel usage are based upon historical averages. It is forecast that the Airport may need additional Jet A fuel storage capacity by the intermediate planning horizon, if they are to maintain a 14-day supply. By the long-term planning period, an additional AvGas tank may be needed. **Table 3P** presents the fuel storage requirements.

TABLE 3P
Fuel Storage Requirements
Georgetown Municipal Airport

			Planning Horizon		
	Current Capacity	**Baseline Consumption (2016)[1]**	**Short Term**	**Intermediate Term**	**Long Term**
Jet A Requirements	31,500				
Annual Usage (gal.)		511,418	564,200	644,800	756,400
Daily Usage (gal.)		1,401	1,546	1,767	2,072
14-Day Storage (gal.)		19,616	21,641	24,732	29,013
Avgas Requirements	17,550				
Annual Usage (gal.)		301,502	296,400	335,100	363,600
Daily Usage (gal.)		826	812	918	996
14-Day Storage (gal.)		11,564	11,369	12,853	13,946

Assumptions:
Jet A — 62 gallons per operation by jet/turbo engine.
Avgas — 3 gallons per operation by AvGas engine.

Source: [1]Airport fuel report; Coffman Associates analysis

PERIMETER FENCING

Perimeter fencing is used at airports primarily to secure the aircraft operational area. The physical barrier of perimeter fencing has the following functions:

- Gives notice of the legal boundary of the outermost limits of a facility or security-sensitive area.
- Assists in controlling and screening authorized entries into a secured area by deterring entry elsewhere along the boundary.

- Supports surveillance, detection, assessment, and other security functions by providing a zone for installing intrusion-detection equipment and closed-circuit television (CCTV), if necessary.
- Deters casual intruders from penetrating a secured area by presenting a barrier that requires an overt action to enter.
- Demonstrates the intent of an intruder by their overt action of gaining entry.
- Causes a delay to obtain access to a facility, thereby increasing the possibility of detection.
- Creates a psychological deterrent.
- Optimizes the use of security personnel, while enhancing the capabilities for detection and apprehension of unauthorized individuals.
- Demonstrates a corporate concern for facility security.
- Limits inadvertent access to the aircraft operations area by wildlife.

The Airport is served by perimeter fencing. The fencing serves to provide both operational security, as well as a deterrent to wildlife accessing the airfield movement areas. Areas of the Airport with public visibility have 8-foot high security/wildlife fencing. Interior areas have 3-foot high chain-link. It is estimated that there is over 23,000 linear feet of fencing.

General aviation airports are not required to have full perimeter security fencing. Those airports located in more urban areas will often prioritize security fencing. Full perimeter security/wildlife fencing is recommended for Georgetown Municipal Airport and the existing fencing should be maintained.

SUMMARY

This chapter has outlined the facilities required to meet potential aviation demands projected for the Airport for the next 20 years. The next chapter, Chapter Four - Alternatives, examines potential improvements to the airfield system and the landside area. Most of the discussion focuses on those capital improvements that would be eligible for federal grant funds as administered by TxDOT. Other projects of local concern will be considered on a limited basis. Several facility layouts that meet the forecast demands over the next 20 years are presented and an overall ALP that presents a long-term vision will ultimately be developed.