CHAPTER 3: FACILITY REQUIREMENTS

3.1. CHAPTER INTRODUCTION

To accommodate growth in based aircraft and GA operations at the Airport, this chapter presents an analysis of airport demand and capacity, and identifies infrastructure needs for airside, landside, and support facilities based on FAA design standards and forecast demand over the 20-year planning horizon. Facility requirements were developed for the base year (2019), near-term (2024), mid-term (2029), and long-term (2039) timeframes. While planning milestones will allow the Airport to make informed decisions regarding the timing of development, facility needs may be adjusted to reflect deviations in forecast demand.

Demand, capacity, design standards, and overall Airport facility requirements were evaluated using guidance sourced from several FAA publications, including AC 150/5060-5, *Airport Capacity and Delay*; AC 150/5300-13A, *Airport Design*; AC 150/5325-4B, *Runway Length Requirements for Airport Design*; AC 150/5360-13, *Planning and Design Guidelines for Airport Terminal Facilities*; Federal Aviation Regulation (FAR) Part 77, Objects Affecting Navigable Airspace; and Order 5090.5 Formulation of the NPIAS and ACIP.

Table 3.1 presents a summary of based aircraft and total operations forecasts at Cottonwood Municipal Airport, approved by the FAA in November 2020. The recommendations provided in this chapter incorporate operational data and forecasts documented in **Chapter 2 - Aviation Forecasts** as well as feedback from Airport management, tenants, the Master Plan Advisory Committee, and other stakeholders. It should be noted that forecasts were submitted to the FAA in September 2020 and approved in December 2020. The Airport installed operational monitoring equipment in November 2020 that identified actual activity averaged approximately 109 daily operations between the months of November 2020 and February 2021. Extrapolated to a 12-month period, existing annual operations were estimated to be approximately 39,900. This figure is utilized as appropriate for facility needs, though the increase in operational activity is not expected to have any significant impact to airfield capacity enhancements or other facility requirements.

Table 3.1 - Forecast Summary

Year	Based Aircraft	Total Operations[1]	Peak Month Operations[2]
2019	64	18,900	2,268
2024	69	20,498	2,460
2029	75	22,232	2,668
2034	82	24,113	2,894
2039	89	26,154	3,138
AAGR 2019 - 2039	**1.64%**	**1.64%**	**1.64%**

Sources:
FAA Traffic Flow Management System Counts database.
FAA Terminal Area Forecast (Issued January 2020).
Kimley-Horn, 2022.

Notes:
GA = General aviation
AAGR = Average annual growth rate
1 = Total operations include all forecast GA and military operations.
2 = Peak month operations represent approximately 12% of annual operations.

3.2. AIRFIELD DEMAND AND CAPACITY

The analysis presented in this section reflects the Airport's ability to accommodate projected levels of activity and demand, as presented in **Chapter 2 - Aviation Forecasts**, without incurring adverse levels of aircraft delay. The methodologies used to determine capacity and potential delays are described in FAA Advisory Circular 150/5060-5, *Airport Capacity and Delay* (AC 150/5060-5).

3.2.1. Airfield Capacity

Airfield capacity, or throughput capacity, is a measure of the maximum number of aircraft operations that can be accommodated on an airfield in a specified time period (e.g., hourly or annually) without incurring substantial delays.[55] Delay may occur at an airport if the volume of activity approaches or exceeds the capacity of the airfield. This section presents an analysis that examines the capability of the airfield system at Cottonwood Municipal Airport to accommodate existing levels of activity and projected future levels of demand without incurring adverse levels of aircraft delay. Additionally, specific recommendations intended to address any deficiencies identified in this analysis are provided. Optimizing the airfield configuration to enhance traffic flow efficiency can help reduce the overall amount of aircraft delay. This evaluation will be used to help justify capacity-related airfield improvements that may be needed over the planning horizon.

The estimated airfield capacity and delay at the Airport can be expressed in the following measurements:

- **Hourly Capacity:** The maximum number of aircraft operations the airfield can safely accommodate under continuous demand in a one-hour period.
- **Annual Service Volume (ASV):** The maximum number of aircraft operations the airfield can accommodate in a one-year period without excessive delay.
- **Delay:** The time difference between an unconstrained operation (no interference from other aircraft) and the actual amount of time required to conduct an operation. Delay is typically presented in terms of minutes.

Airfield Capacity Calculation Factors

An airport's airfield characteristics and operational procedures greatly impact airfield capacity. Such characteristics include runway configuration and usage, location of exit taxiways, meteorological conditions, percentage of touch-and-go operations, and operational fleet mix. Due to their significance, these factors are considered when calculating airfield capacity and delay. Evaluations of these factors as they relate to Cottonwood Municipal Airport are provided below.

Runway Configuration and Usage

An airfield's capacity is directly related to the number and orientation of runways available during various operating conditions. An airfield may have multiple operating configurations dependent on weather conditions, time of day, and/or the type of approach procedures available. Cottonwood Municipal Airport has one runway, configured in a northwest/southeast orientation with a designation of Runway 14-32. The runway is 4,252 feet long by 75 feet wide with 10-foot unpaved shoulders and is operational for daytime and

[55] Federal Aviation Administration, Advisory Circular 150/5060-5, *Airport Capacity and Delay*, 1983.

nighttime activity. Airport management has indicated that the runway predominantly operates in a northwest flow due to heavy residential land uses immediately south of the Runway 32 end.

Runway 14-32 must accommodate all aircraft as the Airport's sole runway. However, as described in **Chapter 1 - Inventory of Existing Conditions**, the runway's pavement strength is insufficient to regularly handle some heavier aircraft that operate at the Airport. A detailed discussion of airfield pavement and associated recommendations is included in **Section 3.4** of this chapter.

Location of Exit Taxiways

Key to the capacity of an airfield is the ability to move aircraft to and from the runway system quickly and efficiently. The number and location of exit taxiways directly influences runway occupancy time and overall airfield capacity. Runway capacities are highest when the runways are complimented with full-length, parallel taxiways, ample runway exit taxiways, and no active runway crossings. These components reduce the amount of time an aircraft remains on the runway.

At Cottonwood Municipal Airport, Runway 14-32 is equipped with one partial parallel taxiway (Taxiway A) and four runway entrance/exit taxiways (Taxiways B, C, D, and E). Taxiways B and C also serve as ramp connectors between the runway and the aircraft parking apron. In addition to connecting Taxiway A with Runway 32, Taxiway E also provides airfield access to the over-the-fence taxilane and private hangars located on the southeast portion of Airport property. For the purpose of the ASV analysis, Taxiway A was considered a full-length parallel taxiway as it runs alongside approximately 90 percent of the total length of Runway 14-32. Furthermore, two taxiways were considered as potential exit taxiways for Runway 14 and two were considered exit taxiway options for Runway 32.

Meteorological Conditions

Meteorological conditions influence the utilization of an airport's runway. Variations in the weather that result in reduced visibility minimums typically reduce airfield capacity. Additionally, airfield capacity can be diminished when visibility and cloud ceilings are lower, as aircraft spacing increases under poor conditions. As noted in **Chapter 1 - Inventory of Existing Conditions**, the Airport was in the process of installing a new AWOS in late 2020/early 2021. The former AWOS did not report consistent weather data and was effectively inoperable at the time of this analysis. Therefore, weather data were collected from Sedona Airport's AWOS III P/T, located approximately 16 miles northwest of Cottonwood Municipal Airport, and Prescott Regional Airport's ASOS approximately 23 miles southwest of the Airport. The data indicate that VFR conditions occur more than 99 percent of the time, with IFR conditions occurring less than one percent of the time. During IFR conditions, only Runway 32 is equipped with the appropriate instrumentation and published approach procedures to allow operations.

Percentage of Touch-and-Go Operations

A touch-and-go operation is conducted by an aircraft that lands and departs on a runway without stopping or exiting the runway. This type of operation is typically associated with flight training. While each touch-and-go operation accounts for two runway operations (one landing and one takeoff), this procedure typically takes less time to complete than separate arrivals or departures. Therefore, airports with a high percentage of touch-and-go operations have greater airfield capacities than airports with less training activity.

Due to significant training activity associated with Embry Riddle Aeronautical University based at nearby Prescott Regional Airport, management at Cottonwood Municipal Airport has estimated that approximately 60 percent of total operations are touch and go. Since the ratio of local operations to total operations is projected to remain relatively constant over the 20-year planning horizon, touch-and-go operations are anticipated to continue to account for 60 percent of the Airport's total operations through 2039.

Aircraft Fleet Mix

Due to differing performance characteristics, the size of aircraft operating at an airport has a significant impact on an airfield's capacity. This is because heavier aircraft generate wake turbulence that requires increased spacing between large and small aircraft. The FAA has designated four categories of aircraft for capacity determinations, which are based on maximum takeoff weight (MTOW), the number of engines, and wake turbulence classifications:

- **Class A:** 12,500 lbs. or less, single engine
- **Class B:** 12,500 lbs. or less, multi-engine
- **Class C:** 12,500 to 300,000 lbs., multi-engine
- **Class D:** over 300,000 lbs., multi-engine

The aircraft fleet mix index is a ratio of the various classes of aircraft operating at an airport. For the purposes of a demand-capacity analysis, mix index is calculated by adding the percentage of class C aircraft to three-times the percentage of class D aircraft (expressed as C+3D). While the majority of the Airport's operations are conducted by Class A and B aircraft (both under 12,500 pounds), these aircraft are not considered to significantly affect airfield capacity because the wake turbulence generated by these smaller aircraft is not an issue. It should be noted that pavements at the Airport cannot accommodate Class D operations.

Data for aircraft operations by weight class were collected from the Airport's monitoring system, which was installed in November 2020. Operations between November 20, 2020 and February 24, 2021 were sampled: Existing and forecast fleet mix indices are presented below in **Table 3.2**.

Forecast operations are based on the Airport's projected rate of IFR operations (which is reflective of Class C activity). The IFR operations forecast presented in the previous chapter used the current ratio of IFR to total operations for 2019 (2.09 percent) and assumed that this ratio would remain constant over the 20-year planning period. Therefore, the percentage of Class C operations are expected to remain constant through 2039.

Table 3.2 - Aircraft Fleet Mix Demand-Capacity Analysis

Aircraft Class	2019 (Existing)	2024	2029	2034	2039
Class A and B	99.7%	99.7%	99.7%	99.7%	99.%
Class C	0.3%	0.3%	0.3%	0.3%	0.3%
Class D	0.00%	0.00%	0.00%	0.00%	0.00%
Total	100.00%	100.00%	100.00%	100.00%	100.00%
Mix Index (C+3D)	**0**	**0**	**0**	**0**	**0**

Sources:
Airport Operations Monitoring Data November 20, 2020-February 24, 2021.
FAA Advisory Circular 150/5060-5, Airport Capacity and Delay.
Kimley-Horn, 2022.

Percent Arrivals

The percentage of aircraft arrivals is the ratio of landing operations to total operations at an airport. Typically, a lower percentage of arrivals increases hourly airfield capacity since arriving aircraft must slow down to utilize exit taxiways whereas departing aircraft are generally prepared for takeoff once they enter an active runway. For the purposes of the demand/capacity analysis, it was assumed that arrivals accounted for 50 percent of total operations.

3.2.2. Airfield Capacity Analysis

In accordance with the methodologies and guidance reported in AC 150/5060-5, the preceding airfield characteristics were used to determine the Airport's hourly capacity and ASV. Peak hour capacity is determined for both VFR and IFR conditions and is a measurement of the maximum number of operations that an airfield can accommodate in a one-hour period. ASV reflects total annual operations that an airfield configuration can accommodate (accounting for the factors identified in the previous section) without incurring significant delay on a regular basis.

Hourly capacity and ASV determinations first require a selection of the appropriate airfield configuration depicted in Figure 3-2 of AC 150/5060-5. The configuration (Drawing No. 1) and the fleet mix index for the Airport as described above (0 to 20) results in an unconstrained VFR hourly capacity of 98 operations, an IFR hourly capacity of 59, and an ASV of 230,000 operations. These values are then adjusted based on factors identified above to calculate airfield capacity for a specific airport. The following assumptions were incorporated into the hourly capacities and annual service volume calculations:

- For calculation purposes, northwest flow was set at 90 percent of all operations and southwest flow at 10 percent, utilizing Runways 32 and 14 respectively.
- Each runway configuration allows for 100 percent of maximum capacity for each configuration as there are no factors that would significantly impede traffic.
- Exit Factor (E) is based on a single taxiway on each runway end given the criteria specified in AC 150/5060-5: Taxiway C for Runway 32 and Taxiway E for Runway 14. A Mix Index of 0 percent only incorporates taxiways 2000 to 4000 feet from the runway arrival threshold in the exit factor determination.

- The current ratios of VFR and IFR compared to total operations does not change over the forecast period; they are 97.91 percent and 2.09 percent, respectively
- The touch-and-go factors (T) of 1.20 for VFR and 1.00 for IFR operations remain constant over the forecast period. Through this time span, touch-and-go flights are anticipated to be 60 percent of total operations.

The values used in the airfield capacity analysis, including the ASV, are summarized below in **Table 3.3.** As shown, the Annual Service Volume of the Airport is projected to decline from 172,151 in 2019 to 163,779 in 2039.

Table 3.3 - Airfield Capacity Summary

Item	2019 (existing)	2024	2029	2034	2039
Annual Operations*	18,900	20,498	22,232	24,113	26,154
Peak Month Average Day Operations	76	82	89	96	105
Peak Hour Operations	11	12	13	14	16
Touch-and-go Factor (T)	1.20	1.20	1.20	1.20	1.20
VFR Taxiway Exit Factor (E)	0.86	0.86	0.86	0.86	0.86
IFR Taxiway Exit Factor (E)	0.95	0.95	0.95	0.95	0.95
Annual Demand/Average Daily Demand Ratio (D)	248.68	249.98	249.80	251.18	249.09
Average Daily Demand/Design Hour Demand Ratio (H)	6.91	6.83	6.85	6.86	6.56
Adjusted Hourly VFR Capacity	101.14	101.4	101.4	101.4	101.4
Adjusted Hourly IFR Capacity	56.05	56.05	56.05	56.05	56.05
Weighted Hourly Capacity (Cw)	100	100	100	100	100
Annual Service Volume (Cw x D x H)	172,151	171,148	171,347	172,569	163,779

Sources:
FAA Advisory Circular 150/5060-5, Airport Capacity and Delay.
Kimley-Horn, 2022.

Note: ** = Annual operations are derived from forecast total operations which include all GA and military operations.*

3.2.3. Aircraft Delay

Generally, as an airport's level of annual operations increases, so does the frequency of which the airfield experiences periods of delay. If aircraft delay is significant, capacity-enhancing improvements may be needed. FAA AC 150/5060-5 provides guidance to calculate annual aircraft delay in terms of minutes per aircraft operation. Delay is calculated based on the ratio of existing and forecast operations to ASV. This value is then applied to both the actual and forecast annual operational demand to calculate the total hours of annual delay for the airport. **Table 3.4** below represents the relationship between the ratio of annual demand to ASV and the subsequent average minutes of delay per aircraft operations. Forecast annual operations, expected average aircraft delay (minutes per operation), and total annual aircraft delay (hours) are depicted in Table 3.5. By 2039, it is anticipated that the Airport will incur approximately 0.06 minutes (3.6 seconds) of aircraft delay per operation and 26.1 hours of total annual aircraft delay.

Table 3.4 - Annual Service Volume and Aircraft Delay

Ratio of Annual Operations to ASV	Average Annual Aircraft Delay (Minutes per Operation)
10%	--
20%	0.1
30%	0.2
40%	0.3
50%	0.4
60%	0.5
70%	0.7
80%	0.9
90%	1.4
100%	2.6

Sources:
FAA Advisory Circular 150/5060-5, Airport Capacity and Delay.
Kimley-Horn, 2022.

Note: *ASV = Annual service volume*

Table 3.5 - Annual Service Volume, Capacity, and Annual Aircraft Delay

Year	Annual Operations*	ASV	Ratio of Operations to ASV	Delay per Aircraft Operation (minutes)	Total Annual Delay (hours)
2019	18,800	172,151	0.11	0.01	3.1
2024	20,398	171,148	0.12	0.02	6.8
2029	22,132	171,347	0.13	0.03	11.1
2034	24,013	172,569	0.14	0.04	16.0
2039	26,054	163,779	0.16	0.06	26.1

Sources:
FAA Advisory Circular 150/5060-5, Airport Capacity and Delay.
Kimley-Horn, 2022.

Notes:
** = For purposes of this analysis, annual operations only include GA operations. Military operations are not included, which are forecast to account for 100 operations per year.*
ASV = Annual service volume

3.2.4. Airfield Demand-Capacity Summary

Airfield demand that exceeds the ASV will likely result in significant delays. The FAA recommends that an Airport should begin planning for airfield capacity enhancements (such as additional exit taxiways, runways, etc.) when the ratio of annual demand to ASV reaches 60 percent and the implementation of such improvements should occur when the ratio reaches 80 percent. As shown above in **Table 3.5**, it is not anticipated that the Airport will reach the 60-percent threshold within the 20-year planning horizon. Therefore, it is expected the Airport will not require planning for or implementation of capacity-enhancing measures through 2039.

As noted previously, the Airport installed operational monitoring equipment in November 2020 and an analysis of activity from November 20, 2020 through February 24, 2021 identified average daily operations were approximately 109, which translates to approximately 39,900 annual operations. Applying this figure would result in an existing ratio of operations to ASV of 0.23 and total annual aircraft delay of 66.5 hours. If the 39,900 existing annual operations estimate increased at the same growth rate as the FAA-approved recommended operations forecast, that would translate to 55,300 operations by 2039, representing a 0.34 ratio of operations to ASV and 221.2 hours of aircraft delay. If the Airport does achieve this level of activity by 2039, it would still not likely require any capacity enhancements to the airfield.

3.3. FAA DESIGN STANDARDS

As discussed in **Chapter 1 - Inventory of Existing Conditions**, the FAA has established design criteria and guidance for airport facility planning based on the operational and physical characteristics of aircraft that operate at an airport. These design criteria and standards are contained within AC 150/5300-13A and address various airport infrastructure and their functions, including runway and taxiway dimensions, separation distances between aircraft and various objects, airspace protection requirements, and land use controls. This section presents a recap of the applicable design standards to which the Airport's facility recommendations will be based.

3.3.1. Airport Reference Code

Design standards are determined by an airport's designated critical design aircraft and ARC. The critical design aircraft is the most demanding aircraft that conducts at least 500 operations per year at an airport, excluding touch-and-go activity. This aircraft, or a combination of multiple aircraft that share similar physical and operational characteristics, is reflective of the demand that will regularly be placed on airport facilities and services. Additionally, ARC is based on the airport's critical design aircraft and is comprised of two components: the AAC and the ADG. The AAC is related to an aircraft's approach speed and the ADG is correlated to the aircraft's wingspan and tail height.

As presented in **Chapter 2 - Aviation Forecasts**, operational data obtained from the FAA TFMSC database and a linear regression analysis showed that a combination of the Cessna Citation I, Beechcraft King Air A90 and the Piper Cheyenne II represent the Airport's future critical design aircraft. All three aircraft possess an ARC of B-I (small), with the "small" designation referring to aircraft with an MTOW of 12,500 pounds or less. Therefore, for purposes of this Master Plan Update, the analyses and design standards in this chapter will utilize a future ARC of B-I (small) and the Cessna Citation I, Beechcraft King Air A90 and Piper Cheyenne II as the future critical design aircraft for Cottonwood Municipal Airport.

3.3.2. Runway Design Code and Design Standards

AC 150/5300-13A introduced RDC to expand upon the ARC. While the ARC is used to relate overall airport design criteria to the operational and physical characteristics of the aircraft types that will operate at an airport, RDC provides information needed to determine design standards that apply to a particular runway. These standards provide basic guidelines for a safe and efficient airport system and are based on the most demanding aircraft expected to use the runway. As described in **Chapter 1 - Inventory of Existing Conditions**, the ARC is comprised of two components: the aircraft approach category (AAC) and the airplane design group (ADG). AAC and ADG are also two components of an Airport's RDC, along with approach visibility. As shown in **Table 3.6**, approach visibility refers to a runway's visibility minimums expressed by runway visual range (RVR) in terms of feet.

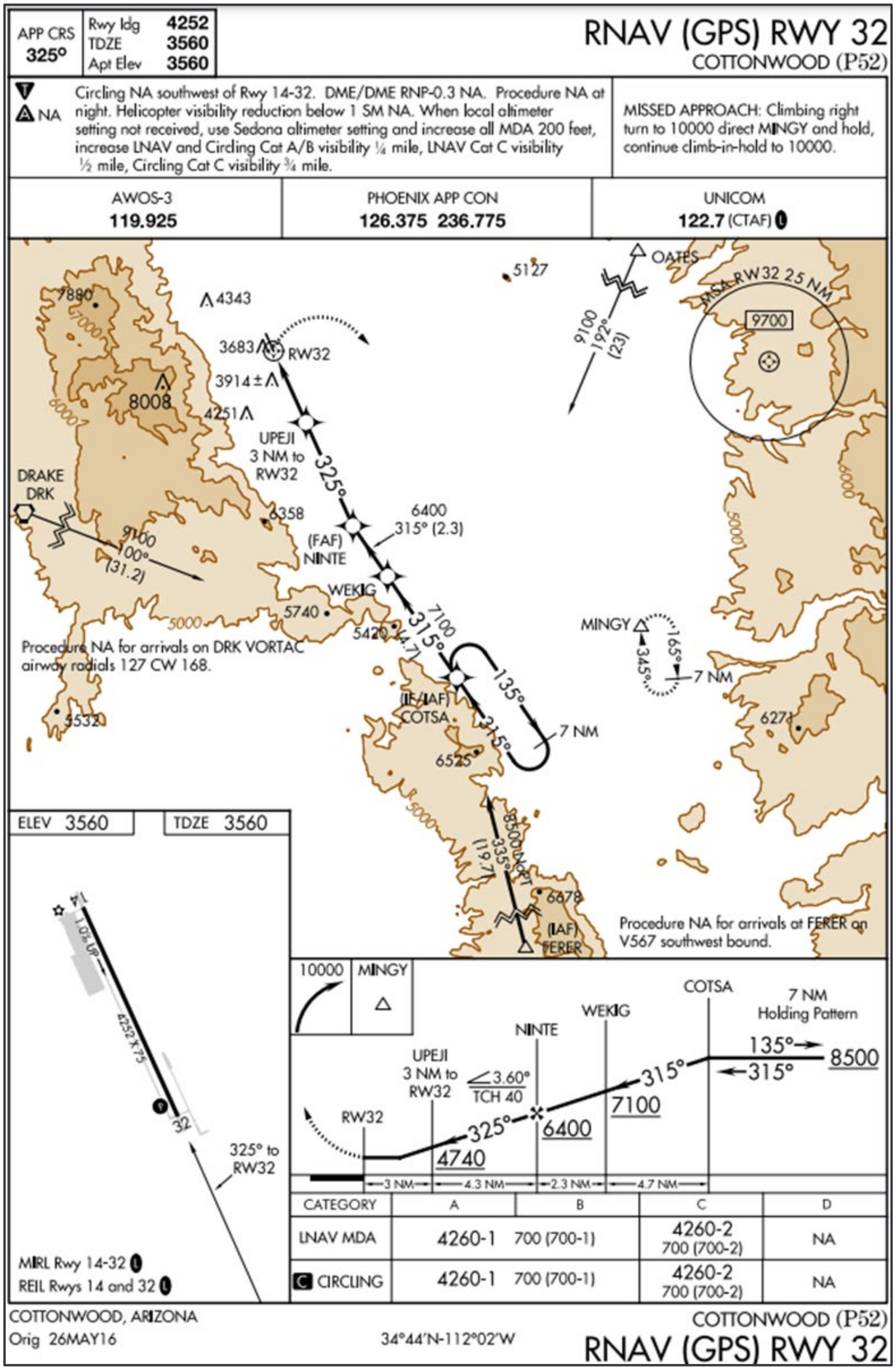
Table 3.6 - Runway Visual Range

Runway Visual Range (feet)	Approach Speed
VIS	Visual approach only
5,000	Not lower than 1 mile
4,000	Lower than 1 mile but not lower than 3/4 mile
2,400	Lower than 3/4 mile but not lower than 1/2 mile (CAT-I PA)
1,600	Lower than 1/2 mile but not lower than 1/4 mile (CAT-II PA)

Source: *FAA Advisory Circular 150/5300-13A, Change 1, Airport Design, 2014.*

The Airport has a published approach procedure for Runway 32 with a visibility minimum of 1 mile (see **Figure 3.1**); this is congruent with category 5,000 RVR. Therefore, Runway 32 has a future RDC of B-I-5000. As Runway 14 only accommodates visual approaches, the future RDC of this runway is B-I-VIS.

Figure 3.1 - Runway 32 RNAV (GPS) Approach



CATEGORY	A	B	C	D
LNAV MDA	4260-1	700 (700-1)	4260-2 700 (700-2)	NA
CIRCLING	4260-1	700 (700-1)	4260-2 700 (700-2)	NA

Source: www.airnav.com

Table 3.7 below compares existing conditions of Runway 14-32 with design and separation standards based the Airport's future ARC as described in **Section 3.3.1.**

Table 3.7 - FAA Runway Design and Separation Standards

Design Criteria		Runway 14-32	
		Existing Conditions	B-I (small) Standards
Runway Design			
Runway Width		75 feet[1]	60 feet
Shoulder Width		10 feet (unpaved)	10 feet
Blast Pad Width		75 feet	80 feet
Blast Pad Length		300 feet	100 feet
Runway Protection			
Runway Safety Area	Length Beyond Runway 14 Departure End	240 feet	240 feet
	Length Beyond Runway 32 Departure End	240 feet	240 feet
	Length Prior to Runway 14 Threshold[1]	374.5 feet	240 feet
	Length Prior to Runway 32 Threshold[1]	540 feet	240 feet
	Width	120 feet	120 feet
Runway Object Free Area	Length Beyond Runway 14 Departure End	240 feet	240 feet
	Length Beyond Runway 32 Departure End	240 feet	240 feet
	Length Prior to Runway 14 Threshold	374.5 feet	240 feet
	Length Prior to Runway 32 Threshold	540 feet	240 feet
	Width	250 feet	250 feet
Runway Obstacle Free Zone	Length Beyond Runway End	200 feet	200 feet
	Width	250 feet	250 feet
Approach Runway Protection Zone	Length	1,000 feet	1,000 feet
	Inner Width	250 feet	250 feet
	Outer Width	450 feet	450 feet
	Acres	8,035 feet	8,035 feet
Departure Runway Protection Zone	Length	1,000 feet	1,000 feet
	Inner Width	250 feet	250 feet
	Outer Width	450 feet	450 feet
	Acres	8,035 feet	8,035 feet
Runway Separation *(measured from runway centerline)*			
Holding Position		125 feet	125 feet
Parallel Taxiway Centerline		150 feet	150 feet
Aircraft Parking Area		240 feet	125 feet

Sources:
FAA Advisory Circular 150/5300-13A, Change 1, Airport Design, 2014.
Cottonwood Municipal Airport FAA-Approved Airport Layout Plan, 2006.
Kimley-Horn, 2022.

Notes:
Red text = Nonstandard condition
Black text = Standard condition
1 = While the runway width exceeds standards and does not create a nonstandard condition, the FAA may only fund the portion of the runway within design standards (i.e., 60 feet wide). The City may elect to preserve a runway width of 75 feet, however local funding may be required to maintain excess pavement beyond the 60-foot runway width standard.

3.3.3. Taxiway Design Group and Design Standards

FAA taxiway design standards are based on a combination of the ADG and the Taxiway Design Group (TDG) of the critical design aircraft. TDG is a classification applied to aircraft based on outer-to-outer main gear width (MGW) and cockpit to main gear (CMG) distance. This differs from ADG which is based on aircraft wingspan and tail height. As noted, the future critical design aircraft at the Airport is a combination of a Cessna Citation I, Beechcraft King Air A90, and the Piper Cheyenne II. The King Air A90 and Piper Cheyenne models have a TDG of 1A, and the Citation has a TDG of 2. Because the Citation requires access to various services and facilities throughout the airfield, it is recommended that the future taxiway system and applicable separations satisfy TDG 2 standards to enhance Airport safety.

Chapter 1 identified the widths of the Airport's taxiway system. It should be noted that the standard width of a TDG 2 taxiway is 35 feet. All taxiways at the Airport either exceed or do not meet this standard. It is recommended that taxiways be designed to meet the 35-foot standard at the point in time when reconstruction is required.

3.4. AIRSIDE FACILITIES

For the purposes of this Master Plan Update, airside facilities are defined as including the runway and taxiway system, safety areas, and associated equipment like airfield lighting, visual aids, and navigational aids (NAVAIDs). Aircraft aprons and storage hangars are analyzed as a landside element due to their interface with the vehicle parking facilities. The following subsections examine the ability of the present airside facilities to accommodate existing and future traffic, and the facilities required through the year 2039.

3.4.1. Runway Requirements

The existing runway system was described in **Chapter 1 - Inventory of Existing Conditions** and applicable design standards were defined in previous sections of this chapter. This section defines the runway requirements needed to satisfy forecast demand in terms of runway characteristics, pavement strength, crosswind coverage, and safety areas.

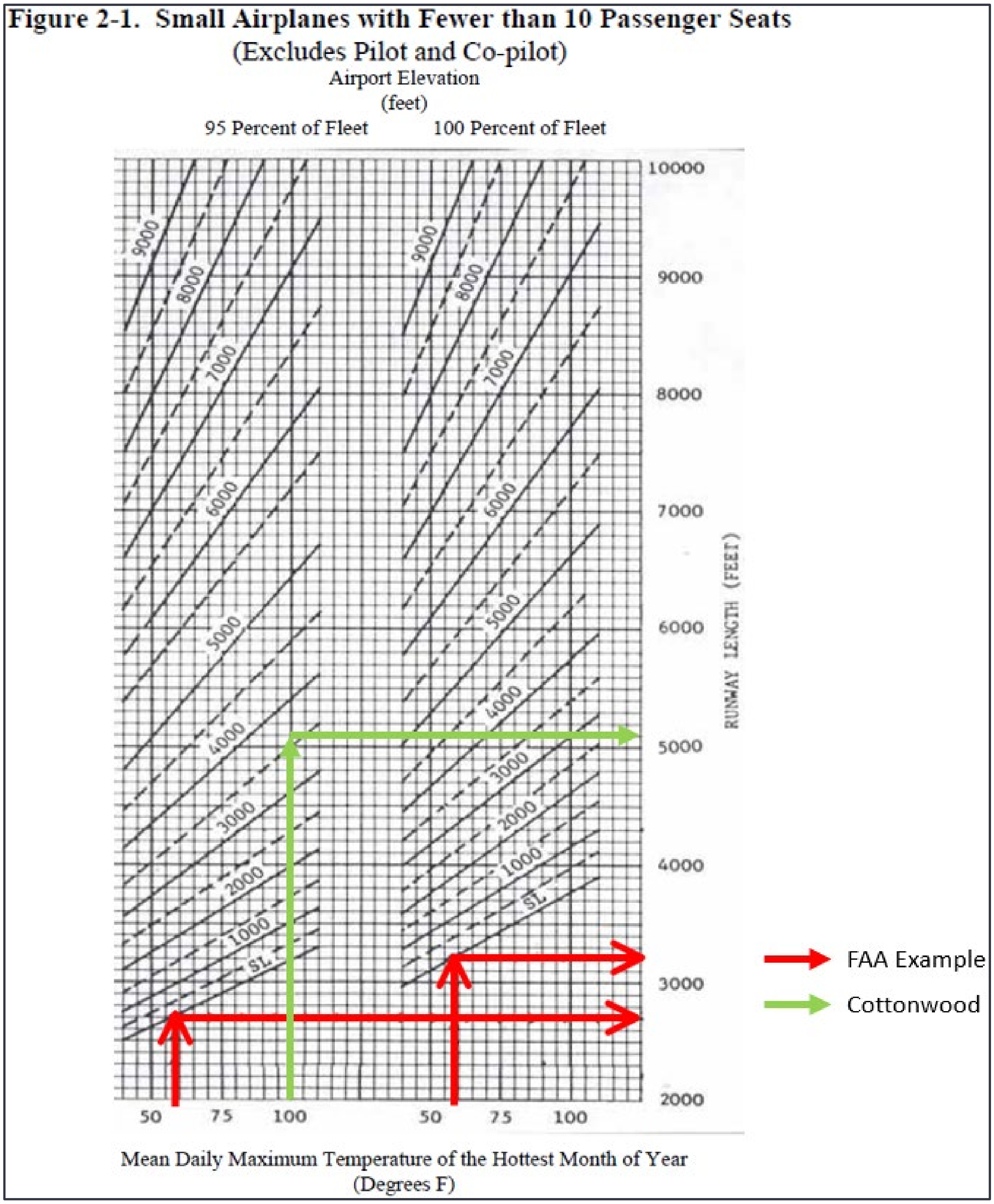
Runway Length

Runway length requirements are based on several factors including elevation, aircraft seat capacity, aircraft weight of the operational fleet, and mean daily maximum temperature of the hottest month of the year at an airport. Runway length requirements are published in FAA AC 150/5325-4B, Runway Length Requirements for Airport Design. Runway length requirements for Cottonwood Municipal Airport were determined using guidance provided in Chapter 2 of that document, which determines runway lengths for small airplanes with maximum certified takeoff weights of 12,500 pounds of less.

Figure 2-1 of AC 150/5325-4B categorizes small airplanes with less than 10 passenger seats (excludes pilot and co-pilot) into two family groupings according to "percent of fleet," namely, 95 and 100 percent of the fleet. The 95 percent category applies to airports that are primarily intended to serve medium size population communities with a diversity of usage and a greater potential for increased aviation activities. Also included in this category are those airports that are primarily intended to serve low-activity locations, small population communities, and remote recreational areas. Their inclusion recognizes that these airports in many cases develop into airports with higher levels of aviation activities. The 100 percent of fleet category includes airports that are primarily intended to serve communities located on the fringe of a metropolitan area or a relatively large population remote from a metropolitan area. Based on these criteria, the 95 percent of fleet category was utilized for the runway length determination for Cottonwood Municipal Airport.

The runway length analysis assumed a mean maximum temperature during the hottest month of 98.4 degrees Fahrenheit and an airport elevation of 3,650 feet MSL. As shown in Figure 3.2, the recommended runway length at the Airport under these conditions is 5,100 feet, which is 848 feet longer than Runway 14-32. Development alternatives for a runway extension are presented in the following Chapter.

Figure 3.2 - Runway Length Analysis



Sources:
FAA AC 150/5325-4B.
Kimley-Horn, 2020.

Runway Width

Standard runway width is defined in AC 150/5300-13A and is based on RDC, the approach visibility minimums of the runway, and the Airport's ARC relating to the critical design aircraft. The Airport's existing ARC was determined in **Chapter 2 - Aviation Forecasts** to be A-I (small), with the critical design aircraft encompassing all aircraft within the A-I (small) category. The ARC is forecast to be B-I (small) with a combination of the Cessna Citation I, Beechcraft King Air 90, and the Piper Cheyenne II representing the Airport's future critical design aircraft.

The existing width of Runway 14-32 (75 feet) can accommodate aircraft with an AAC/ADG of up to B-II per FAA design standards. While aircraft with an AAC/ADG greater than B-I (small) are not expected to breach the 500 annual operations threshold throughout the planning period, it is anticipated that B-II aircraft will continue to operate at the Airport. Operations should be monitored for deviations to the forecasts as more frequent operations by aircraft with AACs/ADGs greater than B-II may justify the existing runway width.

Runway 14-32 has an ARC of A-I (small) and its runway width is currently 75 feet, which exceeds the FAA standard width of 60 feet for this ARC. The runway has a future ARC of B-I (small), which also requires a standard runway width of 60 feet. As the current runway width exceeds the FAA standard, Runway 14-32 may need to be narrowed to meet standards, or, if the runway remains at its existing width, the portion that exceeds standard may not be eligible for FAA Airport Improvement Program (AIP) funding.

Runway Shoulders

Runway shoulders provide resistance to soil erosion and reduce the chance of engine ingestion of foreign object debris (FOD). They also accommodate the passage of maintenance and emergency equipment as well as the occasional passage of an aircraft veering from the runway. Per AC 150/5300-13A, paved shoulders are only recommended for runways that accommodate ADG-III aircraft and are required for runways that accommodate aircraft with ADGs of IV and higher. For runways that accommodate aircraft with ADGs of I and II (like Runway 14-32 at Cottonwood Municipal Airport), turf, aggregate-turf, soil cement, lime, or bituminous stabilized soil are recommended to be placed adjacent to paved runway surfaces. Like design standards for runway width, runway shoulder width is based on ARC.

The existing shoulders of Runway 14-32 are 10 feet wide and unpaved, which meets FAA standards for the current and future ARC of A-I (small) and B-I (small), respectively. If Runway 14-32 is narrowed, modifications to the shoulder areas may be needed.

Runway Blast Pads

A blast pad is defined in AC 150/5300-13A as a surface adjacent to the ends of runways provided to reduce the erosive effect of jet blast and propeller wash. Centered on the extended runway centerline, standard blast pad dimensions are 80 feet wide by 60 feet long for both A-I (small) and B-I (small) ARCs. Blast pad pavement must meet pavement strength requirements as described in AC 150/5320-6, *Airport Pavement Design and* Evaluation, which states that a blast pad may be designed according to the same procedures as for paved airfield shoulders.

Cottonwood Municipal Airport has blast pads at both ends of Runway 14-32, each constructed of asphalt concrete and measuring 300 feet long by 75 feet wide. The blast pad widths do not meet design standards, though they exceed the standard for blast pad length. While ADOT maintains an online database with pavement condition details for the Airport, the pavement conditions of the blast pads have not been evaluated. The Airport, in partnership with ADOT, should continue to evaluate the blast pads to ensure the pavement condition is compliant with FAA guidelines. Additionally, blast pad dimensions should be modified to meet FAA blast pad design standards of 80 feet wide by 60 feet long for both A-I (small) and B-I (small) ARCs. Alternatives to address the nonstandard blast pads are presented in **Chapter 4 - Alternatives.**

Runway Orientation

Runways are meant to be oriented such that aircraft can take off and land in the same direction as the prevailing wind (into the wind). The FAA recommends that a particular runway's orientation should provide at least 95 percent wind coverage for aircraft that regularly use the airport. If 95 percent wind coverage is not provided, reorienting the existing runway or constructing a new crosswind runway may be advisable.

With a future ARC of B-I (small), the runway orientation at Cottonwood Municipal Airport should provide availability of at least 95 percent on the basis of the crosswind component not exceeding 10.5 knots. AWOS data from an airport is typically used to determine a runway's wind coverage but, as previously noted, this data was not consistently available from the Airport due to an inoperative AWOS. However, historical wind data from the ASOS at the nearby Ernest A. Love Field (PRC) in Prescott was referenced to determine the wind coverage availability of Runway 14-32. As discussed in **Chapter 1 - Inventory of Existing Conditions**, runway headings represent the magnetic heading of a runway when it is created (Runway 14-32 represents the magnetic headings of 140 degrees and 320 degrees). The Earth's magnetic lines slowly drift over time, causing the true runway headings to shift while the runway's name remains. Therefore, the wind coverage analysis for existing conditions uses the Airport's true runway headings of 155 and 335 degrees.

As shown below in **Table 3.8**, Runway 14-32 does not provide the recommended 95 percent coverage for any category (VFR, IFR, and all weather) given a 10.5 knot maximum allowable crosswind component for the true runway headings of 155 and 335 degrees. **Table 3.8** also presents data to determine what runway alignments would obtain 95 percent coverage for VFR, IFR, and all-weather wind coverages for the crosswind component of 10.5 knots. The results of this analysis show that neither a clockwise nor counterclockwise rotation of five to 25 degrees would provide the recommended 95 percent wind coverage for VFR, IFR, and all-weather conditions. Providing the greatest wind coverage for VFR, IFR, and all-weather conditions for the crosswind component of 10.5 knots, a runway orientation of 4-22 (a 65-degree clockwise rotation) represents the optimal runway alignment at the Airport. This alignment would provide at least 95 percent wind coverage for VFR and all-weather conditions but falls short of the 95-percent threshold.

Table 3.8 - Runway 14-32 Wind Analysis (10.5-knot Crosswind Component)

Runway Headings (degrees)	VFR	IFR	All Weather
13-31	89.92%	87.78%	89.85%
14-32	90.55%	87.81%	90.46%
15-33	91.60%	88.11%	91.48%
155-335*	92.21%	88.45%	92.08%
16-34	92.84%	88.89%	92.71%
17-35	93.99%	89.84%	93.85%
0-18	94.84%	90.74%	94.71%
1-19	95.47%	91.53%	95.34%
2-20	95.93%	92.53%	95.82%
3-21	96.14%	93.57%	96.06%
4-22**	95.94%	94.10%	95.88%
5-23	95.28%	94.08%	95.25%
6-24	94.27%	93.72%	94.26%

Sources:
FAA Wind Rose Generator 2019 (true runway headings of 155°, 335°).
NOAA National Climate Data Center (2010-2019) (244,441 total observations at SEZ; 89,448 total observations at PRC).
Kimley-Horn, 2022.

Notes:
VFR = Visual Flight Rules
IFR = Instrument Flight Rules
Black text = wind coverage meets or exceeds the FAA's 95 percent recommendation
Yellow text = wind coverage falls between 94 percent and 95 percent
Red text = wind coverage does not meet the FAA's 95 percent recommendation
** = Existing Runway 14-32 true runway heading*
*** = Runway 4-22 represents the optimal runway orientation*
Due to an inoperable Automated Weather Observing System (AWOS) at Cottonwood Municipal Airport during the development of this Master Plan Update, data for this analysis were sourced from the Automated Surface Observing System (ASOS) at Ernest A. Love Field in Prescott, AZ. As of December 2020, a new AWOS is in the design phase at the Airport and is expected to come online in early 2021. It is recommended the Airport evaluate short- and long-term data from the new AWOS to determine the suitability of its runway orientation.

No runway orientation provides at least 95 percent coverage for VFR, IFR, and all-weather conditions for the crosswind component of 10.5 knots. According to wind data from the PRC ASOS, IFR conditions represent less than one percent of recorded weather observations.[56] This low percentage of IFR conditions, coupled with the fact that, generally, smaller aircraft that are susceptible to low crosswind components will not be operating in IFR conditions, suggests that a major realignment of the runway will likely not be beneficial. Additionally, a runway realignment would greatly impact both on- and off-Airport facilities and land uses. Therefore, while a 65-degree clockwise rotation provides optimal runway alignment, it is not likely feasible nor necessary.

As previously noted, a new AWOS is expected to be functional by early 2022. It is recommended the Airport evaluate data from the new AWOS to determine the effectiveness of the existing runway orientation. In the long term, the Airport should evaluate its AWOS data over several consecutive years (typically 10 for a standard forecast) to determine the suitability of the existing runway orientation. Reorientation of Runway

[56] IFR conditions occur when the cloud ceiling is less than 1,000 feet above ground level and/or the visibility is less than 3 statute miles. Only properly trained and equipped pilots operating aircraft using navigational systems that provide lateral and/or vertical path guidance based on specific meteorological conditions are permitted to fly under IFR conditions.

14-32 or the addition of a crosswind runway is not recommended at this time, as either action would be constrained by existing development and topography as well as incur significant, expensive off-Airport impacts.

Runway Hold Lines

Runway hold lines, also known as runway holding positions, denote the location on a taxiway where a pilot is to stop before proceeding onto or across a runway. At airports with an operating ATCT, pilots require ATC authorization before entering or crossing a runway. Alternatively, at airports without an operating ATCT, pilots should ensure they have adequate separation from other aircraft before proceeding onto or crossing a runway. Design standards for runway hold lines are listed in AC 150/5300-13A and are measured in terms of distance from the runway centerline in feet. These standards assume perpendicular distance from a runway centerline to an intersecting taxiway centerline and increase if the taxiway intersects the runway at an acute angle.

As shown in Table 3.7, the Airport's runway-centerline-to-holding-position is 125 feet for all runway hold lines. Therefore, all hold lines meet FAA requirements for the current and future ARC of A-I (small) and B-I (small), respectively, and no changes are anticipated through the planning horizon. The Airport should verify the condition and placement of the Taxiway E runway hold line on the east side of Runway 14-32 to ensure it satisfies the 125-foot from runway centerline location requirement.

Runway Safety Areas

The RSA is a two-dimensional surface on the ground surrounding a runway that is designated to mitigate the risk of damage to an aircraft in the event of an overshoot, undershoot, or excursion from the runway. This area also provides greater access to firefighting and rescue equipment in emergency situations. RSAs must be graded and cleared without any hazardous surface variations and be free of all objects except those that are needed for aircraft ground maneuvering and air navigation. Despite the intent to prevent objects in RSAs, some NAVAIDs may be located in this area if critical for their functioning—this would require NAVAIDS to have a "fixed-by-function" designation. Table 6.1 in AC 150/5300-13A provides a list of fixed-by-function NAVAIDS. Additionally, NAVAIDs present within the RSA must also be frangible. As defined by the FAA, "frangible" refers to an object that breaks, distorts, or yields when faced with a large impact, minimizing the hazard to the aircraft. RSA design standards cannot be modified via the modification of standards process (MOS).

The RSA design standard for an A-I (small) and B-I (small) ARC is 120 feet wide and extends 240 feet beyond the runway ends. The dimensions of the Runway 14-32 RSA are compliant with FAA design standards. Additionally, all objects within the RSA—including runway edge lighting, directional signage, and REIL lights at both ends of the runway—are classified as fixed-by-function. The Airport should ensure that all existing and future objects within the RSA meet frangibility requirements as delineated in AC 150/5220-23A.

Runway Gradient

Requirements for the longitudinal and traverse gradients of a runway are based on AAC and become more stringent as the AAC increases. Grading requirements are described in FAA AC 150/5300-13A, which notes that the maximum allowable longitudinal gradient for runway s is 2.0 percent. Runway 14-32 slopes from south to north and has a gradient of approximately 0.94 percent, which meets grading requirements.

Runway Obstacle Free Zones

The ROFZ is defined as a volume of airspace centered above the runway centerline, above a surface whose elevation at any point is the same as the elevation of the nearest point on the runway centerline. Its length is defined in AC 150/5300-13A as extending 200 feet beyond each runway end and its width varies based on the critical design aircraft. At Cottonwood Municipal Airport whose future critical design aircraft is classified as “small” with approach speeds of 50 knots or more, the design width is 250 feet. Similar to the RSA, this area should be kept clear with the exception of fixed-by-function NAVAIDs, lighting, and directional signage that meet frangibility requirements.

Permissible objects in the ROFZ include directional signage, runway edge lighting, a PAPI 2L system on each Runway end, and both sets of REIL lights including the associated flasher light power unit off the Runway 14 end (individual control cabinet). The Airport should ensure that any objects located in the ROFZ now and in the future are frangible. Impermissible objects include the power control units (PCU) for the PAPIs, which are not fixed-by-function and must be relocated outside of the safety area. Any additional associated equipment for the REILs beyond its flasher light power units would also need to be moved outside the area as well. Potential options are shown in **Chapter 4 - Alternatives**.

Runway Object Free Areas

The ROFA is centered about the runway centerline and is an area that must be clear of above-ground objects that protrude above the nearest point of the RSA. This includes agricultural operations, parked aircraft, and other fixed objects. Like the RSA, the ROFA may include objects with fixed-by-function designations (those objects necessary for air navigation or aircraft ground navigation) and must meet frangibility requirements. Aircraft may also taxi and hold in the ROFA. The dimensions of the ROFA are determined by the ARC and are listed in AC 150/5300-13A.

For both the current and future ARCs of A-I (small) and B-I (small), the ROFA is 250 feet wide and extends 240 feet beyond the runway end. The dimensions of the Runway 14-32 ROFA are compliant with FAA design standards. Multiple objects with fixed-by-function designations are present within the ROFA, including directional signage, runway edge lighting, a PAPI 2L system on each runway end, and REIL lights on each runway end including the associated flasher light power unit off of the Runway 14 end (individual control cabinet). It would be beneficial for the Airport to ensure that all existing and future objects allowed within the ROFA meet frangibility requirements. Additionally, there are PCUs for the PAPIs, which are not classified as fixed-by-function and need to be relocated outside the ROFA. Options to address the nonstandard ROFA and mitigate non-fixed-by-function objects are presented in **Chapter 4 - Alternatives.**

Runway Protection Zones

RPZs are intended to enhance the protection of people and property on the ground. Centered about the extended runway centerline, RPZs are trapezoidal in shape and are made up of a central portion and a controlled activity area. The central portion is rectangular in shape and is defined by an extension of the ROFA to the outer edge of the RPZ. The area outside of the central portion of the RPZ is the controlled activity area. These two areas differ in that the central portion is meant to be free and clear of all objects, while limited exceptions may be permissible in the controlled activity area. In 2012, the FAA published a memorandum identifying Interim Guidance on Land Uses Within a Runway Protection Zone. The Memorandum, which is still valid, recommends that airports own, acquire, or have land use control of areas within RPZs and implement mitigation strategies to keep these areas clear of incompatible land uses. **Table 3.9** provides examples of compatible and incompatible land use within RPZs.

Table 3.9 - RPZ Land Use Compatibility

Compatible Land Uses*	Incompatible Land Uses
Irrigation channels that meet the requirements of FAA AC 150/5200-33 and FAA/USDA manual Wildlife Hazard Management at Airports	Fuel storage facilities (above and below ground)
Underground facilities as long as they meet other design criteria, such as RSA requirements, as applicable	Wastewater treatment facilities
Unstaffed NAVAIDs and facilities, such as equipment for airports that are considered fixed-by-function in regard to the RPZ	Recreational land use (examples include, but are not limited to, sports fields, golf courses, amusement parks, or other places of public assembly, etc.)
Farming that meets airport design standards	Hazardous material storage (above and below ground)
Airport service roads as long as they are not public roads and are directly controlled by the Airport operator	Above ground utility infrastructure (i.e., electrical substations) including any type of solar panel installations
	Transportation facilities (examples include, but are not limited to, public roads/highways, vehicular parking facilities, rail facilities, etc.)
	Buildings and structures (examples include, but are not limited to, residences, schools, churches, hospitals or other medical care facilities, commercial/industrial buildings, etc.)

Sources:
FAA AC 150/5300-13A.
FAA, Interim Guidance on Land Uses Within a Runway Protection Zone, 2012.

Notes:
USDA = U.S. Department of Agriculture
RSA = Runway safety area
NAVAID = Navigational aid
RPZ = Runway protection zone
**Compatible land uses noted are those that are permissible without further evaluation*

Runway ends have two RPZs: an approach RPZ and a departure RPZ. At Cottonwood Municipal Airport, where there are no published declared distances, both the approach and departure RPZs are collocated at each runway end. For both the existing and future ARCs of A-I (small) and B-I (small), the RPZs have an inner width of 250 feet, an outer width of 450 feet, a length of 1,000 feet, and encompass approximately 8.04 acres. The approach and departure RPZs have the same dimensions and are located entirely within the Airport's property boundary.

While Mingus Avenue intersects the Runway 14 end RPZ, FAA design standards allow for a preexisting condition like Mingus Avenue to remain within the RPZ. Any major modification or roadwork on this street would require coordination with the Airport and FAA. Additionally, a gravel road that connects South Willard Street to a City-owned water well facility immediately south of the Airport intersects the RPZ south of Runway 32. Since this private service road is a preexisting condition and has minimal traffic, it is permissible without further evaluation.

3.4.2. Taxiway Requirements

Presented in this section are taxiway requirements for Cottonwood Municipal Airport, including safety areas and separation standards, and a review of the existing taxiway layout against current taxiway design guidelines found in AC 150/5300-13A.

Parallel Taxiway Separation

The partial parallel taxiway for Runway 14-32 is Taxiway A, which extends from Taxiway E to Taxiway C. Taxiway A is 40 feet wide and has a parallel taxiway centerline to runway centerline distance of 150 feet. This meets FAA separation design standards for the current and future ARC of A-I (small) and B-I (small) respectively, meaning that no changes are anticipated over the planning period. The Airport should continue to assess traffic compared to the forecast, as a larger ARC would require at least 75 additional feet of separation between the Runway centerline and parallel taxiway centerline. It is recommended that Taxiway A be reconstructed to a full-length parallel taxiway to increase operational efficiency and safety. Potential options are shown in Chapter 4 – Alternatives.

Taxiway and Taxilane Safety Areas

A taxiway/taxilane safety area (TSA) is a defined surface along a taxiway or taxilane that is designed or able to reduce the risk of damage to an aircraft that deviates from the taxiway/taxilane. It is also meant to provide room for firefighting and rescue operations. Centered on the taxiway/taxilane centerline, the TSA width is defined in AC 150-5300-13A as equivalent to the maximum wingspan of the ADG and other dimensional standards are shown in Table 4-1 of AC. The TSA surface must be cleared, graded, and without surface variations like ruts and depressions that could be hazardous. It must be graded or drained by storm sewers to prevent water accumulation. Under dry conditions, the TSA needs to be able to allow the occasional passage of aircraft without causing structural damage to the aircraft. Overall, the TSA should be free of objects except those that must be located in this area because of their function. Such objects should be constructed at grade and if not, they must be mounted on frangible mounted structures.

Both the current, A-I (small), and future, B-I (small), ADGs for the Airport are included in the ARC. Thus, the TSA standard for the Airport is 49 feet wide, centered on the centerline of each taxiway/taxilane. Taxiway and taxilane safety areas share the same dimensions.

A review of the taxiways and taxilanes at the Airport using topographic modeling and aerial imagery shows that there are no penetrations to the TSAs. No nonstandard conditions are present, though the Airport should continue to evaluate these areas to keep them in accordance with design standards. Such areas of consideration include the TSA surface condition, ensuring the areas are clear of non-frangible objects, and reevaluating adjusted TSA areas that may result from the correction of the nonstandard conditions relating to taxilane separation standards and direct runway access from the Airport's main apron (see **Table 1.9** in **Chapter 1 - Inventory of Existing Conditions**).

Taxiway and Taxilane Object Free Areas

Similar to TSAs, Taxiway Object Free Areas (TOFA) are centered on the centerlines of taxiways and taxilanes though Taxilane Object Free Areas (TLOFA) are slightly smaller in size due to the lower speeds of aircraft. As mentioned previously, the ARC for the Airport is A-I (small) and is forecast as B-I (small) over the planning period. Therefore, according to Table 4-1 in AC 150/5300-13A, the Airport TOFA and TLOFA widths are 89 feet and 79 feet respectively.

Through the use of topographic mapping and aerial imagery, the TOFAs at the Airport were determined not to have any objects inside most of their boundaries that would constitute a nonstandard condition. Objects present include taxiway lighting, PAPI-2, runway lighting, and aircraft directional signage, all of which are permissible but should be confirmed to be within height and frangibility design standards. However, there is some vegetation present at the northwest edge of the TOFA intersection of Taxiway A and D, and the helicopter operating area is also inside the TOFA.

The TLOFAs were evaluated in the same way as the TOFAs. Permissible objects in the TLOFAs include taxi lighting and aircraft directional signage, which should be verified by the airport as meeting FAA standards of frangibility and height. As discussed in Table 1.9 in **Chapter 1 - Inventory of Existing Conditions** with the taxilane centerline to fixed or movable object nonstandard condition, multiple taxilanes in the main apron have TLOFAs that are breached by multiple aircraft tie-down positions and by the marked helicopter parking position on the south end. Additionally, the TLOFA on Taxiway E parallel to the Runway on the private apron side is penetrated by vegetation and hangars. These conditions should be removed or corrected to keep the TLOFA clear of objects. This situation should be rectified to bring these taxilanes in compliance with FAA design standards. Potential options are shown in **Chapter 4 - Alternatives.**

Taxiway Geometry and Runway Incursion Mitigation

FAA Advisory Circular AC 150/5300-13A consolidates a variety of recent research findings related to airfield safety and this information is supplemented by other FAA documentation. In the past, several airfield safety enhancement bulletins had been published in FAA orders and engineering briefs and many of these remain relevant as does documentation associated with the FAA's national runway incursion program office. The research correlates existing design geometries with incursion history as well as the future potential for an incursion to take place. The FAA determined that there are specific characteristics in airfield geometry that can contribute to the potential for both surface incidents and runway incursions and considerations to address these characteristics. The FAA analyzed over six years of data to determine the most effective runway incursion mitigation techniques. Some key design principles described in AC 150/5300-13A are:

- **Indirect Access:** Taxiways should not lead directly to the runway from an apron area. An ideal scenario would be one in which a pilot exiting the apron would turn parallel with the runway, taxi to the runway end, turn perpendicular to the runway, and then make another 90-degree turn to enter the runway before initiating a takeoff.
- **Avoid 'High Energy' Intersections:** The high energy portion of the runway is the middle third of the runway in which pilots taking off or landing are least able to maneuver to avoid a collision. Therefore, runway crossings in this middle third of the runway should be avoided.
- **Standard Intersection Angles:** Turns should be designed to be 90 degrees wherever possible. Preferred intersection angles are: 30, 45, 60, 90, 120, 135, and 150 degrees.
- **Avoid 'Dual Purpose' Pavements:** Confusion can result from runways that are also used as taxiways, and vice versa. Runways should always be solely used as runways.
- **Increase Visibility:** The best visibility at an intersection between taxiways, and between taxiways and runways, is provided by right angle intersections. Runway entrances or crossing points should not be located on acute angled taxiways.
- **Three-Node Concept:** Taxiway intersections should be designed so that a pilot is only presented with three options. Ideally, these options would be left, right, and straight.
- **Limit Runway Crossings:** Minimizing runway crossings minimizes opportunities for human error.
- **Avoid Wide Expanses of Pavement:** Wide expanses of pavement involved with the taxiway to runway interface is not recommended. In such a scenario, signs are placed far from a pilot's vision and other visual cues are similarly reduced.

As part of this Master Plan Update, a review of the existing airfield layout against the guidance described above was performed. For Cottonwood Municipal Airport, Taxiways B and C provide direct access from the main apron to Runway 14-32 with no turn required. Potential options to resolve this nonstandard condition are explored in **Chapter 4 – Alternatives**.

3.4.3. Lighting and NAVAID Requirements

Airport lighting allows pilots and ground vehicles to move about the airfield more safely at night or in low lighting. NAVAIDs support instrument capabilities and desired approach minimums. Runway 14-32 is currently equipped with PAPI 2L systems on both ends. Other NAVAIDs currently present at the Airport are an AWOS (being updated to AWOS III and relocated at the time of writing), and a Segmented Circle with a Lighted Wind Indicator, in good condition. Design standards for PAPIs are presented in FAA Order 6850.2B. Important to the Airport is the requirement that the PAPI be positioned such that no obstacles penetrate its obstacle clearance surface, which begins 300 feet in front of the PAPI and extends to the approach zone. Additionally, the PAPI must be at least 50 feet from the closest runway edge and each lamp house assembly (LHA) must be 20-30 feet apart. Currently, the PAPI at the Airport meets all of these standards and requires no changes through the forecast period, though the Airport should verify the Runway and LHA spacing requirements.

The Airport's rotating beacon is located immediately north of the terminal building and is mounted on a standalone tower. To enhance energy efficiency and reduce long-term maintenance, the Airport has expressed interest in updating the existing beacon to an LED light and relocating the beacon or modernizing the tower structure. The Airport is operational at night and is equipped with runway lights. Therefore, if improvements are desired, the Airport's beacon is eligible for AIP funding.[57]

Runway 14-32 is equipped with REILs on each runway end. REILs consist of two synchronized flashing lights positioned on each corner of the runway and provide pilots with identification of the end of the landing threshold. REILs are generally positioned in line with the runway threshold lights and at least 40 feet from the edge of the runway.[58] At Cottonwood Municipal Airport, the REILs on the Runway 14 end are positioned 40 feet from the edge of the runway. On the Runway 32 end, however, the western REIL is positioned approximately 82 feet from the runway edge while the eastern REIL is positioned approximately 74 feet from the runway edge. It is recommended that these REILs be relocated so that they are 40 feet from the edge of the runway and consistent with the Runway 14 REILs. REILs are fixed-by-function and allowable within the RSA and ROFA at the Airport, although the associated PCUs would need to be relocated from these two safety areas in order to bring the RSA and ROFA into compliance with FAA design standards.

Runway 14-32 is also equipped with MIRLs to help pilots identify the edge of usable runway pavement. MIRLs are fixed-by-function and are allowable within the RSA and ROFA. Currently, the MIRLs at the Airport meet FAA design standards. The Airport is not equipped with taxiway lighting but does have taxiway reflectors installed on portions of the airfield. Airport Management has noted that installation of taxiway lighting is a high priority due to the increasing volume of nighttime operations. It is recommended that all taxiways be equipped with LED medium intensity taxiway lighting (MITL), and consideration should be given to solar-powered fixtures if eligible for FAA funding.

[57] Federal Aviation Administration, FAA Order 5100.38D, Change 1, *Airport Improvement Program Handbook*, 2019,
[58] Federal Aviation Administration, Advisory Circular 150/5300-13A, Change 1, *Airport Design*, 2014.

3.4.4. Helicopter Operating Areas

Helicopter activity at the Airport has increased significantly in recent years, driven by medical evacuation and tour operators. A helicopter operating area is located beyond the airfield fence and is used by tenants of the adjacent private hangar. A helicopter parking area is located on the southeast portion of the apron. As previously noted, the location of the helicopter parking area does not satisfy the 39.5-foot separation standard from the Taxilane OFA. It is recommended that the aircraft parking apron be reconfigured to satisfy this design standard or a different location for a helicopter parking area be identified. It is also recommended that the helicopter parking area is equipped with standard lighting to assist with nighttime operations.

3.4.5. Airfield Pavement

As presented in **Chapter 1 - Inventory of Existing Conditions**, the last pavement inspection at the Airport occurred in 2017. The pavement condition index (PCI) report indicated that Runway 14-32 was in good condition, however, the Runway's published weight bearing capacity is 4,000 pounds for aircraft equipped with a single-wheel configuration. An examination of the FAA's TFMSC database, and data available in the Airport's operational monitoring system indicates that aircraft heavier than 4,000 pounds regularly operate at the Airport. Additionally, Airport Management has indicated that the published weight bearing capacity has resulted in potential operators of corporate aircraft to avoid landing at Cottonwood Airport. It is recommended that the Airport conduct a pavement strength analysis to determine the actual weight bearing capacity of Runway 14-32 and present the results to the FAA. If the weight bearing capacity is determined to be deficient compared to the weights of regularly operating aircraft at the Airport, it is recommended that Runway 14-32 be strengthened to a minimum of 12,500 lbs. to accommodate FAA-designated "small" aircraft.

Parallel Taxiway A had an identified PCI of 55, indicating a "poor" condition. The Taxiway has cracking and generates FOD. It is recommended that Taxiway A be rehabilitated or reconstructed to accommodate appropriate pavement strength based on results of a weight bearing capacity analysis of Runway 14-32.

The aircraft parking apron and associated taxilanes were evaluated in three segments as part of the 2017 pavement inspection. The northern segment of the apron received a PCI score of 100 in 2017. The central section received a score of 50, and the southern section received a score of 46. It is recommended that the central and southern segments be rehabilitated or reconstructed. It should also be noted that portions of the apron may require reconfiguration to better accommodate forecast critical design aircraft and improve operational flow of taxiing aircraft. Options for apron configurations are presented in **Chapter 4** of this Master Plan Update.

3.4.6. Airfield Drainage

In 2021, the City of Cottonwood conducted a flood study for the Railroad Wash, which runs under the Airport via a culvert and flows east until its intersection with the Verde River. This study identified inadequacies in the culvert's ability to accommodate stormwater during the 100-year flood, causing access water to be diverted through the Airport (adjacent to the runway) and northwest into the Del Monte Wash. To mitigate this deficiency, it is recommended that a drainage study be incorporated into the environmental analysis and project design of the preferred runway alternative, identified and described in **Chapter 4** of this Master Plan Update.

3.5. AIRSPACE REQUIREMENTS

This section identifies existing obstructions to airspace. Part 77 surfaces analysis offers a basic screening for potential airspace threats. Terminal Instrument Procedures (TERPS) and Obstacle Clearance Requirements from FAA AC 150/5300-13A provide an additional level of screening. These additional screenings are stricter in that they allow less tolerance for potential airspace obstructions.

Data from aerial surveys (from Quantum Spatial, Inc. dated July 2020) were used to analyze potential obstructions to airspace at the Airport. The analysis considered FAR Part 77 Surfaces, TERPS, and FAA AC 150/5300-13A Obstacle Clearance Requirements.

It is recommended that obstacles be removed, lighted, or mitigated to the extent practicable, especially obstacles that penetrate approach and departure surfaces. Detailed graphical representations of airspace surfaces and obstacles are presented in the ALP drawing set.

3.5.1. Part 77 Requirements

FAR Part 77 establishes imaginary surfaces around an airfield to identify potential hazards to air navigation. These standards promote compatible land use and limit the height of objects on and near an airport. The surfaces can vary in shape, size, and slope depending on the available approach procedures to the runway ends. The Part 77 Surfaces are depicted in **Figure 3.3** and described as follows:

- **Primary Surface:** The surface is longitudinally centered on the runway. The elevation of any point on the surface is the same as the elevation of the nearest point on the runway centerline. Because Runway 32 is equipped with a non-precision instrument approach, the Primary Surface is 500 feet wide and extends 200 feet beyond the ends of each runway.

- **Approach Surface:** The surface is longitudinally centered on the extended runway centerline and extends outward and upward from the end of the Primary Surface. The Approach Surfaces at the Airport have the following characteristics:

    - **Runway 14:** Inner width = 500 feet, Outer width = 1,500 feet, Length = 5,000 feet, Slope = 20:1

    - **Runway 32:** inner width = 500 feet, outer width = 3,500 feet, length = 10,000 feet, slope = 34:1

- **Horizontal Surface:** The surface is a horizontal plane, 150 feet above the established Airport elevation. The Horizontal Surface extends 5,000 feet from the end of the Primary Surface of Runway 14 and 10,000 feet from the ends of the Primary Surface of Runway 32.

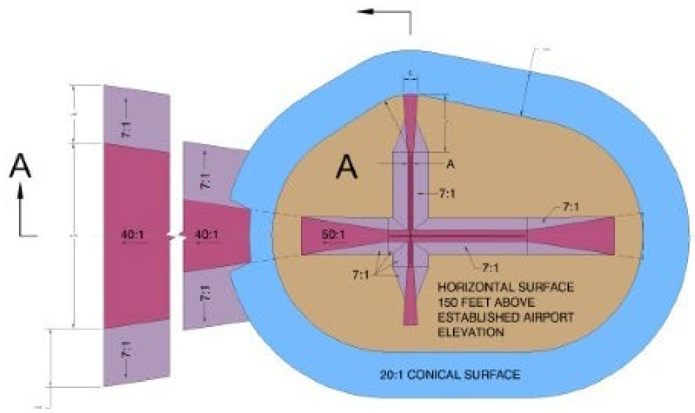
- **Conical Surface:** The surface extends outward and upward from the periphery of the Horizontal Surface. The Conical Surface extends at a slope of 20:1 for a horizontal distance of 4,000 feet.

- **Transitional Surface:** This surface extends outward and upward at a right angle to the runway centerline and the runway centerline extended at a slope of 7:1 from the sides of the primary surface and from the sides of the approach surfaces. Transitional extend a distance of 5,000 feet measured horizontally from the edge of the approach surface and at right angles to the runway centerline.

Penetrations to these imaginary surfaces, either natural or manmade, are identified as obstructions and must be evaluated by the FAA. If not removable, obstacles can be mitigated through appropriate marking and/or lighting. If not mitigated appropriately, obstacles may adversely impact approach and departure minimums and/or operational procedures.

At Cottonwood Municipal Airport, analysis reveals a total of 8,619 obstructions to Part 77 surfaces. These obstructions include trees, terrain, fencing, light poles, and Airport NAVAIDs. Additionally, several structures penetrate various Part 77 surfaces, with one hangar (the southernmost hangar on the southeast apron) penetrating the Runway 32 Part 77 Approach Surface. **Figure 3.4** shows all obstructions to Part 77 surfaces at the Airport. The ALP drawing set provides plan-view and profile-view obstruction analyses for existing and ultimate runway configurations as well as a detailed summary of all obstructions to Part 77 imaginary surfaces with recommended dispositions to address areas of concern.

Figure 3.3 - Part 77 Imaginary Surfaces Diagram

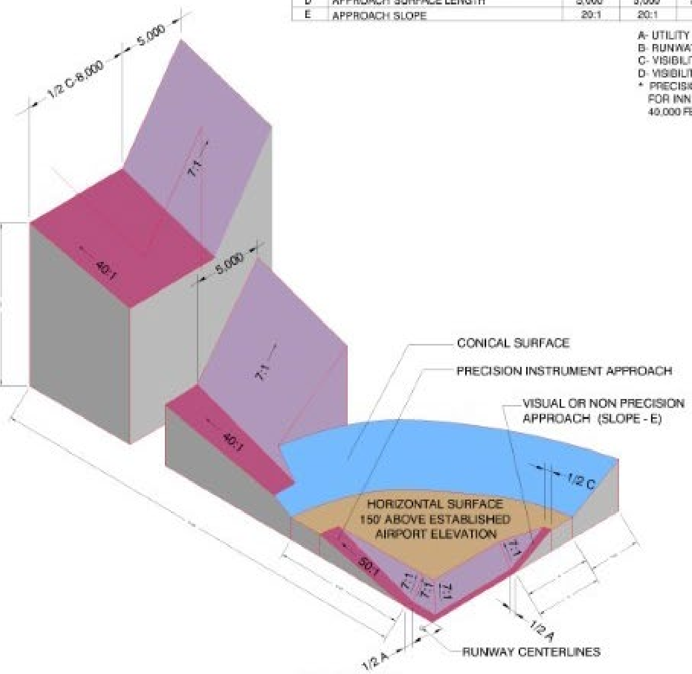


PLAN

AIRPORT AIRSPACE PLAN VIEW

DIM	ITEM	DIMENSIONAL STANDARDS (FEET)					
		VISUAL RUNWAY		NON-PRECISION INSTRUMENT RUNWAY			PRECISION INSTRUMENT RUNWAY
		A	B	A	B: C	B: D	
A	WIDTH OF PRIMARY SURFACE AND APPROACH SURFACE WIDTH AT INNER END	250	500	500	500	1,000	1,000
B	RADIUS OF HORIZONTAL SURFACE	5,000	5,000	5,000	10,000	10,000	10,000
		VISUAL APPROACH		NON-PRECISION INSTRUMENT APPROACH			PRECISION INSTRUMENT APPROACH
		A	B	A	B: C	B: D	
C	APPROACH SURFACE WIDTH AT END	1,250	1,500	2,000	3,500	4,000	16,000
D	APPROACH SURFACE LENGTH	5,000	5,000	5,000	10,000	10,000	*
E	APPROACH SLOPE	20:1	20:1	20:1	34:1	34:1	*

A- UTILITY RUNWAYS
B- RUNWAYS LARGER THAN UTILITY
C- VISIBILITY MINIMUMS GREATER THAN 3/4 MILE
D- VISIBILITY MINIMUMS AS LOW AS 3/4 MILE
* PRECISION INSTRUMENT APPROACH SLOPE IS 50:1 FOR INNER 10,000 FEET AND 40:1 FOR AN ADDITIONAL 40,000 FEET

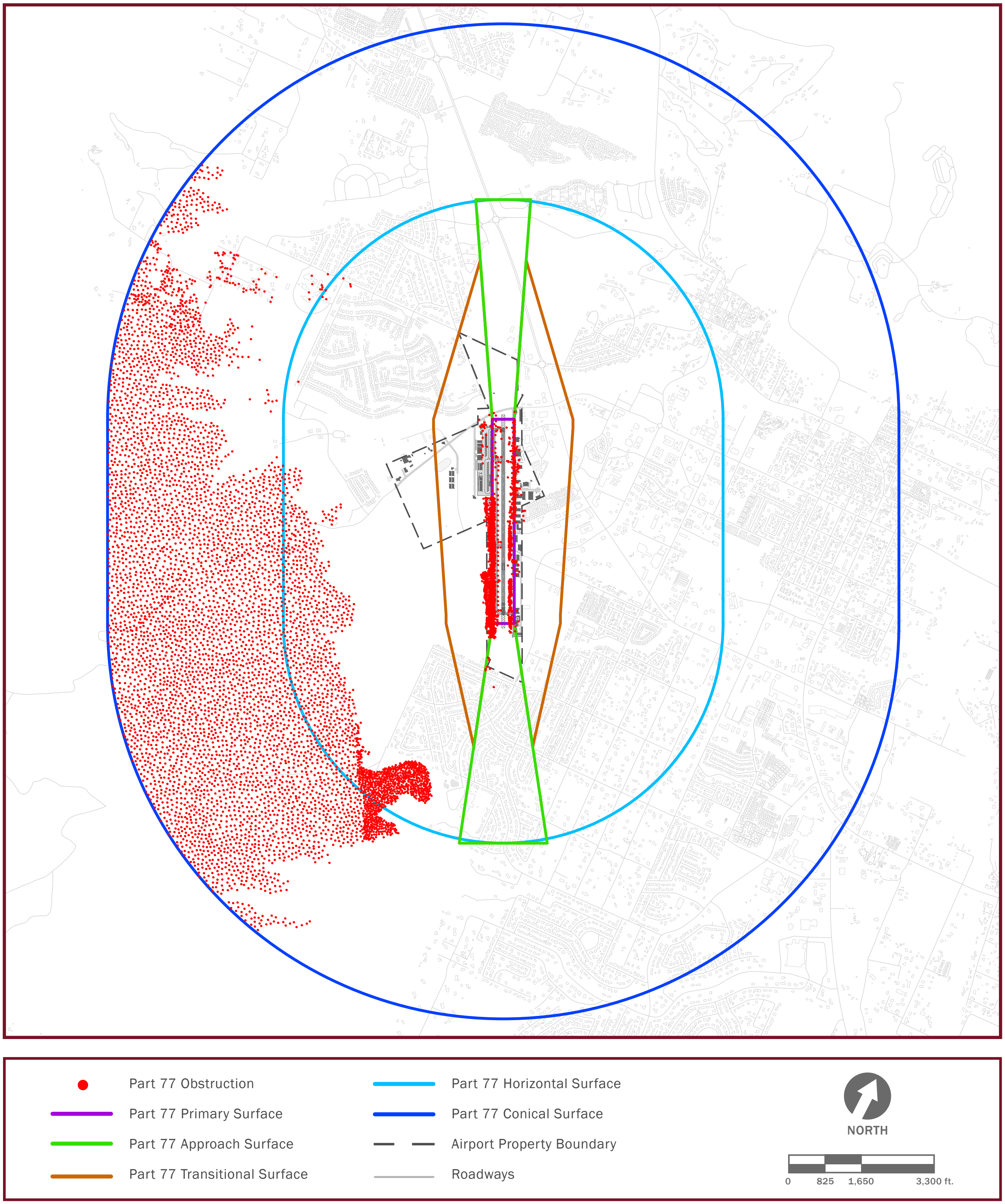


SECTION A-A

PART 77 ISOMETRIC

Sources:
14 CFR Part 77 Safe Efficient Use and Preservation of Navigable Airspace, 2015.
Kimley-Horn, 2020.

Figure 3.4 - Part 77 Imaginary Surfaces and Obstructions



Sources:
AGIS Survey, conducted by Quantum Spatial, July 2020.
14 C.F.R. § 77.
Kimley-Horn, 2022.

3.5.2. Terminal Instrument Procedures

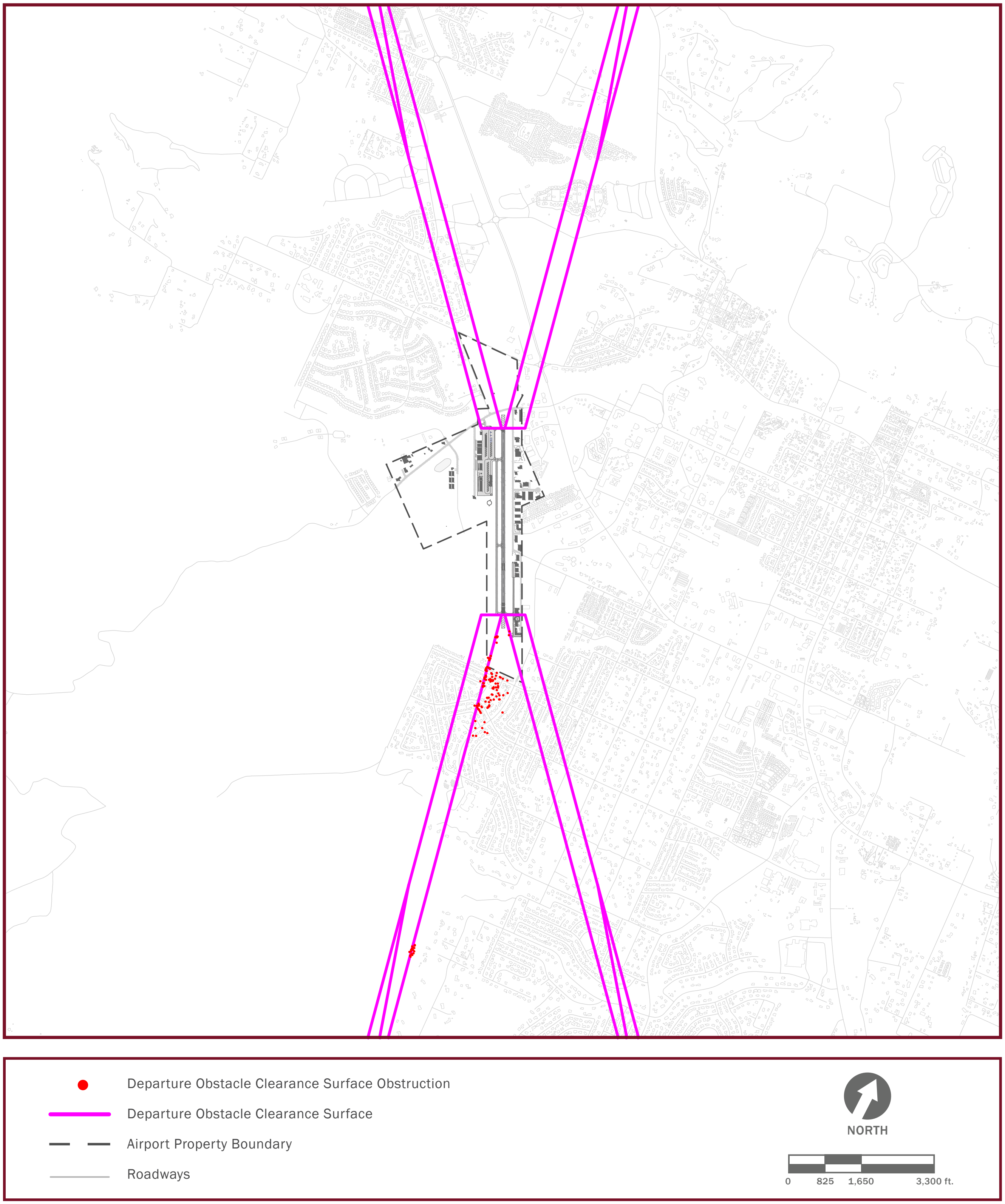
Terminal Instrument Procedures (TERPS) criteria specify the minimum measure of obstacle clearance that is considered by the FAA to provide a satisfactory level of vertical protection from obstructions. TERPS are based on normal aircraft operations. As outlined in the TERPS, the FAA has established surfaces used in the design and approval of instrument flight procedures. These procedures are intended to provide obstacle-free paths for aircraft descending on a glide path to landing or climbing in a departure or missed approach. The basic TERPS surfaces are also referenced in FAA AC 150/5300-13A, Airport Design, and are used to establish landing threshold and departure end of runway locations. Like the FAR Part 77 Surfaces, these surfaces can vary in shape, size, and slope based on the approach capability of each specific runway end.

Departure Obstacle Clearance Surface

The Departure Obstacle Clearance Surface (OCS), or departure surface, is an imaginary trapezoid that begins at the end of the runway. Since Runway 32 has an instrument approach, both Runway 14 and Runway 32 have departure surfaces, each with an inner width of 1,000 feet, an outer width of 7,512 feet, a length of 12,152 feet, and a slope of 40:1. The FAA's Engineering Brief No. 99A prescribes dimensional standards for the departure surface.

Departure surfaces, when clear, allow pilots to follow standard departure procedures with standard rates of climb. According to FAA AC 150/5300-13A, obstacles frequently penetrate departure surfaces. Known penetrations to these surfaces are identified in the FAA's flight procedure publications used by pilots for flight planning. If penetrations are substantial enough, the FAA may require nonstandard rates of climb, higher departure minimums, or reduction in runway length available for takeoff. As shown in Figure 3.5, 123 obstacles penetrate the Runway 32 departure surface and no penetrations are identified in the Runway 14 departure surface.

Figure 3.5 - Departure Obstacle Clearance Surfaces and Obstructions



Sources:
AGIS Survey, conducted by Quantum Spatial, July 2020.
Kimley-Horn, 2022.

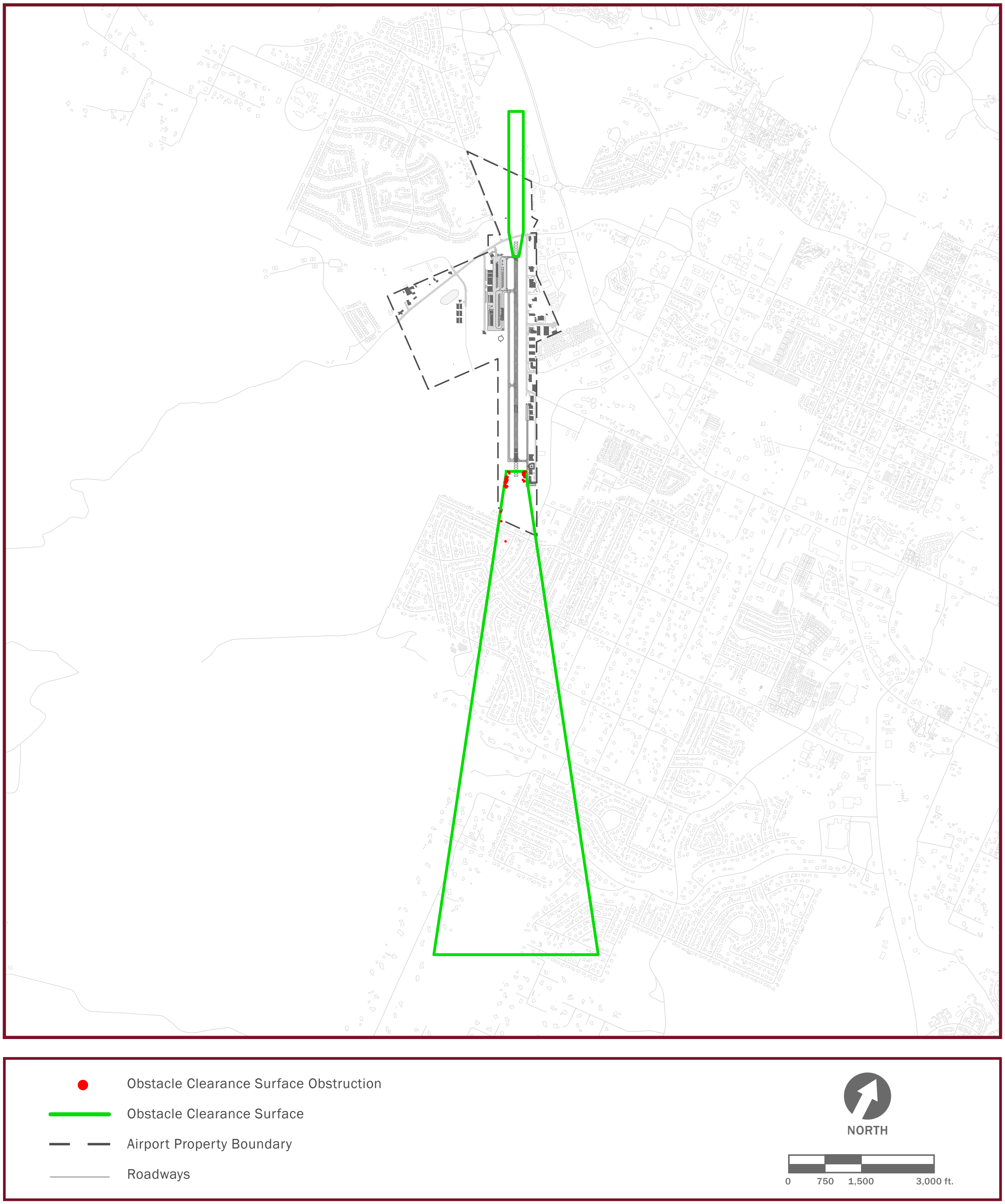
Obstacle Clearance Requirements

Dimensional standards for Obstacle Clearance Requirements have been updated to reflect recent changes identified in Engineering Brief No. 99. These obstacle clearance surfaces, also known as threshold siting surfaces, are designed to protect the use of the runway in both visual and instrument meteorological conditions near an airport. Per Engineering Brief No. 99, the surfaces at the Airport have the following characteristics:

- **Runway 14:** Approach type = 2 (accommodates visual approaches for that serve small airplanes with approach speeds of 50 knots or more), inner width = 250 feet, outer width = 700 feet, start beyond runway threshold = 0 feet, total length = 5,000 feet, slope = 20:1.
- **Runway 32:** Approach type = 4 (accommodates instrument approaches having visibility greater or equal to ¾ statute mile), inner width = 400 feet, outer width = 3,400 feet, start beyond runway threshold = 200 feet, total length = 10,000 feet, slope = 20:1.

These surfaces and the identified obstructions to these surfaces are illustrated in **Figure 3.6**. As noted above, the Airport has an RNAV (GPS) instrument approach procedure for Runway 32. However, the FAA has included a note in the procedure that states, "Procedure N/A at night." This note indicates that the Runway 32 RNAV (GPS) approach procedure is not authorized for nighttime operations. FAA-H-8083-16B, Instrument Flying Handbook (2017) states that instrument approach procedures may not be authorized at night when there is an unmarked or unlit obstacle penetration of the obstacle clearance surface. As shown in **Figure 3.6**, 49 obstacles penetrate the Runway 32 obstacle clearance surface, including trees, scrub bushes, a fence, and the ground itself. It is recommended the Airport trim or clear penetrating vegetation and grade where necessary to clear the Runway 32 threshold siting surface of penetrations and permit nighttime instrument approach procedures. A detailed analysis of obstacles, penetrations, and recommended dispositions are provided in the ALP.

Figure 3.6 - Obstacle Clearance Surfaces and Obstructions



Sources:
AGIS Survey, conducted by Quantum Spatial, July 2020.
Kimley-Horn, 2022.

3.6. LANDSIDE REQUIREMENTS

Landside facilities are considered those that are outside of the active airfield operating area. This section includes evaluations of aircraft parking aprons, aircraft storage hangars, and vehicle access and parking.

3.6.1. Aircraft Storage Hangar and Parking Apron Requirements

The requirements for aircraft storage hangar and aircraft parking apron space vary by aircraft type, numbers of based and itinerant aircraft, and the users of these aircraft. Spatial needs required per aircraft were calculated as follows:

- **Conventional hangar storage:** Based on the dimensions of a common aircraft for each type (single-engine piston, multi-engine piston, turboprop, jet, rotorcraft, other) and adding additional space for general hangar uses.
- **T-hangar storage:** Assumed to be 20 percent smaller in size than an equivalent conventional hangar.
- **Apron parking:** Determined by adding a factor of 75 percent to the conventional hangar space value to account for taxilane and movement areas.

Storage requirements by aircraft type are shown below in **Table 3.10.**

Table 3.10 - Storage Space Requirements by Aircraft Type (Square Feet)

Aircraft Type	Conventional Hangar	T-Hangar	Apron
Single-Engine Piston	1,200	960	2,100
Multi-Engine Piston	2,000	--	3,500
Turboprop	2,000	--	3,500
Jet	2,500	2,000	4,375
Rotorcraft	800	640	1,400
Other/Experimental	1,200	960	2,100

Sources:
FAA Aircraft Characteristics Database.
Kimley-Horn, 2022.

Notes:
T-hangar values were derived by reducing conventional hangar storage space values by a factor of 20 percent.
Apron values were derived by adding a factor of 75 percent to conventional hangar storage values to account for taxilane and movement areas associated with apron parking.
Jets and Turboprop aircraft are not anticipated to be stored in T-hangars.

Annual based aircraft and peak hour itinerant aircraft requiring storage by type are shown in **Table 3.11** below. These numbers are referenced throughout the following subsections.

Table 3.11 - Number of Based and Itinerant Aircraft Requiring Storage

Year	Single-Engine Piston		Multi-Engine Piston		Turboprop		Jet		Rotorcraft		Other		Total	
	BAC	ITIN	BAC	ITIN	BAC	ITIN	BAC	ITIN	BAC	ITIN	BAC	ITIN	BAC	ITIN
2019	44	8	5	1	2	0	2	0	11	2	0	0	64	11
2024	45	8	5	1	2	0	4	1	12	2	1	0	69	12
2029	47	8	6	1	2	1	5	1	13	2	2	0	75	13
2034	48	8	6	1	4	1	6	1	14	2	3	1	82	14
2039	53	9	6	1	5	1	7	1	15	+	3	0	89	15
Change 2019-2039	+9	+1	+1	0	+3	+1	+5	+1	+4	+1	+3	0	+25	+4

Sources:
FAA Form 5010-1, Airport Master Record (effective May 21, 2020).
FAA National Based Aircraft Inventory Program database
FAA Traffic Flow Management System Counts database.
Kimley-Horn, 2022.
Notes:
BAC – Based Aircraft, ITIN – Itinerant Aircraft

Separate calculations were performed for the number of aircraft requiring storage and parking, by aircraft and storage type, for based and itinerant aircraft.

Existing Based Aircraft Storage

Existing based aircraft demand and their fleet mix were derived from **Chapter 2 - Aviation Forecasts.**

In order to identify the split between conventional hangar, T-hangar, and apron parking for each aircraft type, assumptions were made based on existing tenant leases and discussions with Airport Management. The resulting based aircraft parking assumptions include:

- 95 percent of existing based aircraft stored on the apron are single-engine piston aircraft
- 5 percent of based aircraft currently stored on the apron are multi-engine piston aircraft
- Based aircraft not stored on the apron are stored in an existing hangar space
- Aircraft storage trends will remain constant over the planning horizon
- Existing hangars at the Airport are fully occupied

Future Based Aircraft Storage Requirements

Future based aircraft demand and fleet mix were derived from **Chapter 2 - Aviation Forecasts.**

In order to identify the split between conventional hangar, T-hangar, and apron parking for each aircraft type, assumptions were made based on input from Airport Management and ongoing hangar development, which include:

- Future hangar demand will require new construction (Airport hangar storage is at capacity)
- Storage trends will remain constant over the planning horizon
- 100 percent of jet aircraft will be stored in a conventional hangar

- For multi-engine piston aircraft, 50 percent will be stored in a conventional hangar and 30 percent will be stored in a T-hangar.
- 40 percent of single-engine piston aircraft will be stored in a conventional hangar and 40 percent will be stored in a T-hangar
- 100 percent of turboprop aircraft will be stored in a conventional hangar
- 100 percent of rotorcraft will be stored in a conventional hangar
- 40 percent of "other" type aircraft will be stored in conventional hangars and 40 percent in T-hangars
- Remaining aircraft will be stored on the apron

These assumptions determined the number of each aircraft requiring storage, which was multiplied by the spatial requirements in **Table 3.10** to calculate the overall apron and hangar area requirements to meet future based aircraft demand as shown in **Table 3.12**.

Itinerant Aircraft Storage Requirements

The number of itinerant aircraft requiring storage was presented in **Table 3.11**. During typical peak periods (accounting for overnight activity), approximately 11 itinerant aircraft require storage, which was forecast to increase to 15 by 2039. It was assumed that 95 percent of itinerant aircraft would be stored on the apron and the remaining 5 percent would be stored in a conventional hangar (such as an FBO). Typically, itinerant aircraft at the Airport dwell for a relatively short period of time to refuel, though itinerant aircraft that do remain at the Airport longer have a typical dwell time of approximately two days.

Total apron and hangar storage requirements for based and itinerant aircraft are shown in **Table 3.12** on the following page.

Table 3.12 - Based and Itinerant Aircraft Storage Requirements

	Number of Aircraft	SF Required
Conventional Hangar		
Based Aircraft	18	29,700
Itinerant Aircraft	1	1,200
Total	**19**	**30,900**
T-Hangar		
Based Aircraft	5	4,800
Itinerant Aircraft	0	0
Total	**5**	**4,800**
Apron		
Based Aircraft	23	53,900
Itinerant Aircraft	14	34,475
Total	**38**	**88,375**

Sources:
Kimley-Horn, 2022.

Notes:
T-hangar values were derived by reducing conventional hangar storage space values by a factor of 20 percent.
Apron values were derived by adding a factor of 75 percent to conventional hangar storage values to account for taxilane and movement areas associated with apron parking.

Comparison to Existing Facilities

Currently, there are two T-hangars on the south end of the main apron area of the Airport, one with six units and the other with ten units. The twelve covered tie-downs on the north end of the apron were counted as open apron tie-downs/apron space for this analysis. Additionally, there are six conventional hangars on the main apron area of the Airport including the FBO, and five additional private hangars on the southeast portion of the airfield. The main apron serves the northwest side of the Airport and is 210,500 square feet on its north end and 263,500 square feet on its south end, or 474,000 square feet in total. On the southeast side of the Airport, two private aprons serve the private facilities and are 22,400 square feet on the north end and 17,000 square feet on the south end. For the purpose of this analysis, the two private aprons were excluded. Overall, existing aircraft storage space includes the following, approximately:

- 144,479 square feet of conventional hangar storage
- 19,944 square feet of T-hangar storage
- 474,000 square feet of apron area

Based on forecast storage requirements and existing storage space, the existing apron area at the Airport is adequate to meet forecast demand for apron area over the next 20 years.

Based on forecast demand, by 2039 it is expected that there will be a 30,900-square-foot deficit for conventional hangar space and a 4,800-square-foot deficit for T-hangar space. Potential locations of hangars and storage facilities are presented in **Chapter 4 – Alternatives.**

3.6.2. Surface Transportation

The following subsections summarize landside access to the Airport and vehicle parking requirements.

Airport Access Roadways

Primary access to the terminal/administration building is provided by Mingus Avenue. Hangars and tenant areas on the western portion of the Airport are accessed by a secure entrance road from Mingus Avenue to the former Red Rock Skydiving building. Access to private hangars outside of the airfield fence on the southeast side of the Airport is provided by Airpark Road.

The current roadways are adequate to serve existing needs for vehicle access to the Airport. However, as the Airport moves forward with plans to build out the western side of its property, a southern extension to the secured Airport access road will likely be required to access new aircraft hangars and other development south of the existing apron. Additionally, the AOA fence on the west side of the roadway and the associated access gate off of Mingus Avenue should be removed to allow public access to existing and future hangars. AOA fencing is present on the east side of the existing Airport access roadway and thus would need to be extended south to accommodate new development, as needed. The Airport should continue to evaluate future needs and development to ensure adequate roadway access is provided.

Vehicle Parking

The amount of vehicle parking spaces and area needed to meet aviation demand varies by the amount and types of facilities at the Airport. Based on requirements from the City of Cottonwood, a standard parking space can be no less than 9 feet wide and 20 feet deep, with an area of 180 square feet. Existing Airport vehicle parking consists of:

- Eight standard marked parking spaces at the terminal/administration building, including one handicapped space
- Approximately 50 paved parking spaces along the Airport access road
- Various unpaved overflow parking areas

Future vehicle parking demand was calculated according to Exhibit 5-48 of the Airport Cooperative Research Program’s (ACRP) *Guidebook on General Aviation Facility Planning,* summarized below:

- Conventional hangar storage: One vehicle parking space per 1,000 square feet of hangar floor space.
- T-hangar storage: One vehicle parking space for 50 percent of units.
- FBO building: Two and a half vehicle parking spaces per peak-hour operation.
- Aircraft apron: One vehicle parking space for every two based aircraft tie-down spaces.

Applying the above calculations to anticipated 2039 demand results in a projected need of an additional 45 vehicle spaces and 8,100 square feet of space. Although vehicle parking may be developed concurrent with private hangar development, it is recommended that the Airport preserve areas for parking. A summary of existing conditions and future needs is shown in Table 3.13.

Table 3.13 - Vehicle Parking Requirements

	# of Spaces	Space Required (SF)
Vehicle Parking		
Total Need by 2039	103	18,540
Existing Paved Spaces	58	10,440
Additional Spaces Required	**45**	**8,100**

Sources:
ACRP Guidebook on General Aviation Facility Planning (2014)
Kimley-Horn, 2022.

Note:
The City of Cottonwood has set a standard parking space to be 9 feet wide by 20 feet deep, or 180 square feet

3.7. SUPPORT FACILITIES

Support facilities and services are those that provide direct assistance to the functionality and security of the Airport. This section addresses FBO, aircraft fueling, Airport maintenance, utilities, fencing and security, and terminal/administration building facilities.

3.7.1. FBO Facilities

The FBO occupies office space inside the terminal/administration building, and also leases an approximately 1,800 square-foot conventional hangar immediately south of that building. Based on forecast growth in itinerant activity, it is anticipated that the FBO will likely expand existing hangars or acquire additional hangars. Discussions with Airport Management indicate that the FBO has seen a rise in fuel sales and temporary aircraft services since opening in 2019.

Although FBO expansion will be funded privately, the Airport should plan to preserve logical areas that accommodate anticipated growth in FBO services and facilities.

3.7.2. Aircraft Fueling Facilities

There are two aircraft fuel facilities at the Airport. The main facility is located on the south portion of the aircraft parking apron in between the six-unit t-hangar and a conventional hangar. This aboveground fuel storage and dispensing facility consists of two 10,000-gallon tanks: one contains 100LL AvGas and is owned by the City of Cottonwood; the second contains Jet A fuel and is privately owned but is periodically made available for public use. As noted in **Chapter 1 - Inventory of Existing Conditions**, the privately-owned fuel tank was out of compliance and was in the process of being removed.

Because the location of the main fuel tanks is constricted by nearby hangars and taxilanes, it is recommended that the facility be relocated. Based on increased fuel sales in recent years, it is recommended that relocated facilities offer self-service and contain a minimum of one 12,000-gallon tank of Jet A fuel, and one 12,000-gallon tank of 100LL fuel.

3.7.3. Airport Maintenance

As noted in **Chapter 1 - Inventory of Existing Conditions**, the Airport does not have a dedicated maintenance facility however, the City's public works facility is located approximately one quarter of a mile southwest of the Airport on Mingus Avenue. Routine maintenance is addressed in a timely fashion and a dedicated on-Airport facility is not considered a need within the 20-year planning horizon.

3.7.4. Utility Infrastructure

Utility providers for water, sanitary sewer, electric, and natural gas were identified in **Chapter 1 - Inventory of Existing Conditions**. Although Airport Management has not identified any specific utility deficiencies, it should be noted that utility extensions will likely be required for future development on currently unoccupied portions of the airfield.

3.7.5. Airfield Fencing and Security

The airfield is completely enclosed by a chain link fence that varies in height from four to six feet. There are six gates along the fence's perimeter, including one security gate southwest of the terminal/administration building that provides access to the Airport's hangars, one security gate northeast of the terminal/administration building that provides vehicle access to the main apron, and four security gates on the southeast portion of the Airport that provide runway access to the private hangars outside of the AOA fence. While existing fencing has been historically adequate for airfield protection, recent weather events and subsequent ground erosion at the base of the fence line have created openings in which wildlife have entered. It is recommended the Airport considers the addition of wildlife fencing with anti-dig skirting to ensure the safety of both wildlife and all Airport users.

As previously noted, a secure airfield fence is present on the southeast side of the Airport near the private hangars. This fence restricts access between the eastern apron areas and Runway 14-32. Additionally, a portion of the fence is currently penetrating the Runway 32 obstacle clearance surface, as described in **Section 3.5.2.2**. It is recommended that the fence is shortened or relocated to mitigate the surface penetration. Additional existing perimeter fencing located between Airpark Road and the parallel taxilane can provide safety and security for hangar tenants, other Airport users, and pedestrians.

3.7.6. Terminal/Administration Building

The Airport's terminal/administration building encompasses 1,600 square feet and has areas for office space, flight planning, restrooms, and other GA services. The size of the building is typical for an airport with similar levels of activity and tenant base as Cottonwood Municipal Airport. The size and location of the terminal/administration building is anticipated to satisfy forecast demand through the 20-year planning horizon; however, routine building upkeep and improvements should be addressed as needed.

Airport Management has identified that a restaurant would be desirable at the Airport. It is recommended that an area adjacent to the terminal/administration building with public roadway access be preserved for such a facility.

3.8. SUMMARY OF FACILITY REQUIREMENTS

Based on the findings presented in this chapter, a summary of recommended facility needs is presented in **Table 3.14**.

Table 3.14 - Facility Requirements Summary

Facility Type	Recommendation
Airside Facilities	
Runway 14-32 Length	Extend Runway 14-32 to 5,100 feet
Runway 14-32 Width*	Standard runway width for ADG II is 60'. The FAA indicated that a benefit-cost analysis may be performed to determine the financial feasibility of maintaining a 75' runway.
Runway 14-32 Orientation	Airport AWOS is being replaced. Airport should monitor wind data to identify if re-orienting Runway 14-32 or addition of a crosswind runway is justifiable.
Runway 14-32 Pavement Strength	Runway strength analysis should be conducted to determine existing weight bearing capacity. Runway strengthening will be required If analysis results in less than 12,500 lbs.
Runway 14-32 Blast Pads	Modify blast pad dimensions to meet FAA design standards (from 75' wide by 300' long to 80' wide by 100' long)
Runway PAPI PCUs	Relocate PAPI power control units outside of ROFA (PAPI PCUs are not fixed-by-function)
Runway 32 REILs	Relocate Runway 32 REILs to be located 40' from runway edge
Taxiway Lighting	Replace taxiway reflectors with LED taxiway lighting (solar powered if FAA-funding eligible)
Taxiway System	Reconstruct taxiways to meet TDG 2 standard width of 35'
Taxiway A	Reconstruct parallel Taxiway A to appropriate strength, and full-length of Runway 14-32
Mitigate penetrations to Taxiway and Taxilane OFAs	Includes vegetation, helicopter operating area, and structures on eastern taxilane
Aircraft Parking Apron	Reconfigure apron to accommodate ADG II aircraft taxiing, eliminate direct runway access, and mitigate nonstandard separations (e.g., aircraft tiedowns, helicopter parking area)
Aircraft Parking Apron	Rehabilitate or reconstruct central and southern portions of apron
Helicopter Operating Area	Standardize markings and install standard lighting on helicopter operating area
Airspace Obstacles	Mitigate airspace obstacles, including vegetation, fencing, and structures
Landside Facilities	
Conventional Hangars	Construct additional 30,900 square feet of conventional hangars; preserve additional space for aircraft taxiing and maneuvering
T-Hangars	Construct additional 4,800 square feet of t-hangars (5 units); preserve additional space for aircraft taxiing and maneuvering
Support Facilities	
Airport Access	Extend Airport access roadway to new development as needed; remove AOA fence on west side of Airport access road and associated access gate off of Mingus Avenue
Vehicle Parking	Construct 45 vehicle parking spaces (8,100 square feet) adjacent to various facilities
Utilities	Extend utilities to new development as needed
Air Operations Fence	Upgrade existing fencing to prevent wildlife intrusions on airfield
Stormwater Management	Conduct stormwater management/drainage study

Source:
Kimley-Horn, 2022.

Notes:
ADG = Airplane Design Group
AWOS = Automated Weather Observing System
PAPI = Precision Approach Path Indicator
REIL = Runway End Identifier Lights
ROFA = Runway Object Free Area
TDG = Taxiway Design Group
OFA = Object Free Area
** = Standard runway width for ADG II is 60 feet. The future condition exhibits within this Master Plan Update depict a standard 60-foot-wide runway. However, the FAA has indicated that a benefit-cost analysis may be performed to determine the financial feasibility of narrowing the Airport's runway from an existing width of 75 feet to 60 feet. Overall, the ultimate width of Runway 14-32 is dependent upon the results of the benefit-cost analysis.*