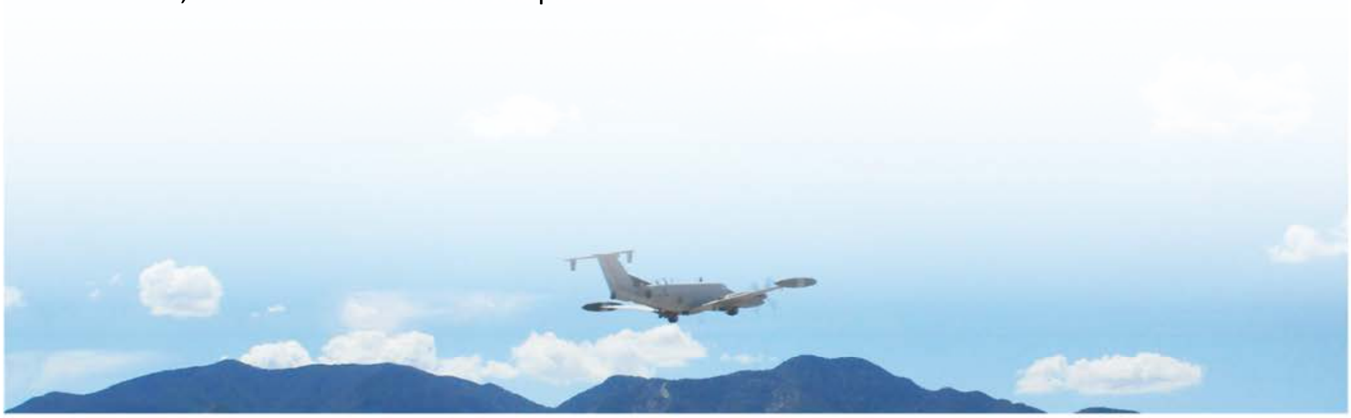
CHAPTER 3
FACILITY REQUIREMENTS

Proper airport planning requires the translation of forecast aviation demand into the specific types and quantities of facilities that can adequately serve the identified demand. This chapter will analyze the existing capacities of the facilities at Sierra Vista Municipal Airport (FHU). The existing capacities will then be compared to the forecast activity levels prepared in Chapter Two to determine the adequacy of existing facilities, as well as to identify whether deficiencies currently exist or may be expected to materialize in the future. This chapter will present the following elements:

- Planning Horizon Activity Levels
- Airfield Capacity
- Airport Physical Planning Criteria
- Airside and Landside Facility Requirements

This exercise is intended to identify the adequacy of existing airport facilities, outline what new facilities may be needed, and determine when they may be needed to accommodate forecast demands. Once the facility needs have been identified, various alternatives for providing these facilities will be detailed for both the airside and the landside. Each alternative will be evaluated to determine the most feasible, cost-effective, and efficient means for implementation.



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

- Advisory Circular (AC) 150/5300-13B, *Airport Design*
- AC 150/5060-5, *Airport Capacity and Delay*
- AC 150/5325-4B, *Runway Length Requirements for Airport Design*
- Federal Aviation Regulation (FAR) Part 77, *Objects Affecting Navigable Airspace*
- FAA Order 5090.5, *Formulation of the National Plan of Integrated Airport Systems* (*NPIAS) and the Airports Capital Improvement Plan (ACIP)*

DEMAND-BASED PLANNING HORIZONS

An updated set of aviation demand forecasts for Sierra Vista Municipal Airport has been established and was detailed in Chapter Two. These activity forecasts include annual aircraft operations, based aircraft, aircraft fleet mix, and peaking characteristics. With this information, specific components of the airfield and landside system can be evaluated to determine their capacity to accommodate future demand.

Cost-effective, efficient, and orderly development of an airport should be based more on actual demand at an airport than on a time-based forecast figure. In order to develop a master plan that is demand-based, rather than time-based, a series of planning horizon milestones has been established which takes into consideration the reasonable range of aviation demand projections. The planning horizons are the short term (years 1-5), the intermediate term (years 6-10), and the long term (years 11-20).

It is important to consider that the actual activity at the airport may be higher or lower than what the annualized forecast portrays. By planning according to activity milestones, the resultant plan can accommodate unexpected shifts or changes in the area's aviation demand by allowing airport management the flexibility to make decisions and develop facilities based on need generated by actual demand levels, rather than dates in time. The demand-based schedule provides flexibility in development, as development schedules can be slowed or expedited according to demand at any given time over the planning period. The resultant plan provides airport officials with a financially responsible and needs-based program. **Table 3A** presents the short-, intermediate-, and long-term planning horizon milestones for each aircraft activity level forecasted in Chapter Two.

TABLE 3A | Aviation Demand Planning Horizons

	Base Year (2023)	Short Term (1-5 Years)	Intermediate Term (6-10 Years)	Long Term (11-20 Years)
BASED AIRCRAFT				
Single-Engine	51	53	55	60
Multi-Engine	5	4	3	1
Turboprop	0	1	2	4
Jet	0	1	2	3
Helicopter	1	1	2	3
Other[1]	4	4	4	4
TOTAL BASED AIRCRAFT	**61**	**64**	**68**	**75**

(Continues on next page)

TABLE 3A | Aviation Demand Planning Horizons (continued)

	Base Year (2023)	Short Term (1-5 Years)	Intermediate Term (6-10 Years)	Long Term (11-20 Years)
ANNUAL OPERATIONS[2]				
General Aviation				
General Aviation, Itinerant	1,411	1,480	1,560	1,730
General Aviation, Local	26,800	28,200	29,670	32,840
After-Hours Adjustment	3,526	3,710	3,904	4,321
Total General Aviation	*31,737*	*33,400*	*35,100*	*38,900*
Air Taxi				
Air Carrier	0	0	0	0
Air Taxi	5,394	5,620	5,850	6,350
After-Hours Adjustment	270	281	293	318
Total Air Taxi	*5,664*	*5,900*	*6,100*	*6,700*
Military				
Military, Itinerant	3,878	4,700	4,700	4,700
Military, Local	73,685	89,775	89,775	89,775
After-Hours Adjustment	1,939	2,362	2,362	2,362
Total Military	*79,502*	*96,800*	*96,800*	*96,800*
TOTAL OPERATIONS	**116,903**	**136,100**	**138,000**	**142,400**

[1] Other includes gliders, experimental aircraft, light sport aircraft, etc.
[2] Total operations have been rounded

Source: Coffman Associates analysis

AIRFIELD CAPACITY

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

FACTORS AFFECTING ANNUAL SERVICE VOLUME

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

- **Runway Configuration** – The existing airfield configuration consists of three runways: primary Runway 8-26 (which is supported by a full-length parallel taxiway), Runway 12-30, and Runway 3-21. Runway 12-30 intersects Runway 8-26 approximately 2,000 feet from Runway 26. Runway 3-21 intersects Runway 12-30 at the Runway 12 threshold.

- **Runway Use** – Runway use in capacity conditions is controlled by wind and/or airspace conditions. For FHU, the direction of takeoffs and landings is typically determined by the speed and direction of the wind. It is generally safest for aircraft to take off and land into the wind, avoiding a crosswind (wind that is blowing perpendicular to the travel of the aircraft) or tailwind components during these operations. Winds dictate the use of each runway, as follows:

AIRFIELD LAYOUT

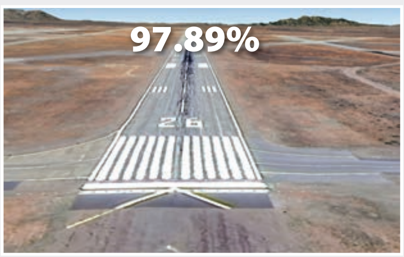
Runway Configuration

Runway Use

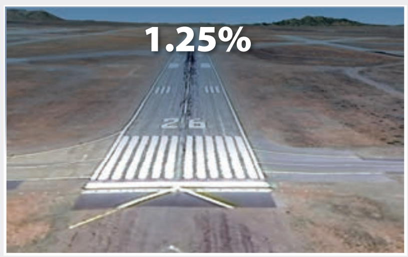
Number of Exits

WEATHER CONDITIONS

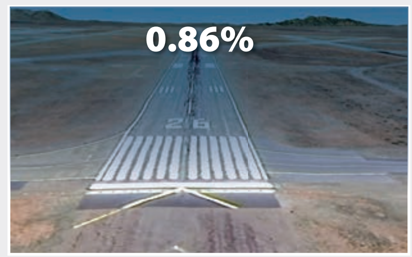
VMC (VFR)
Visual Meteorological Conditions



IMC (IFR)
Instrument Meteorological Conditions

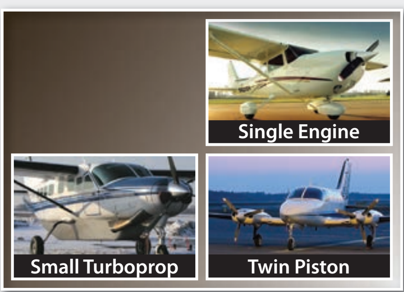


PVC
Poor Visibility Conditions



AIRCRAFT MIX

Category A & B Aircraft

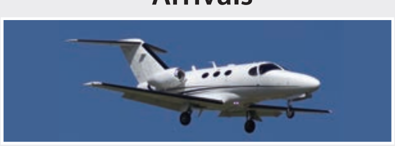


Category C Aircraft

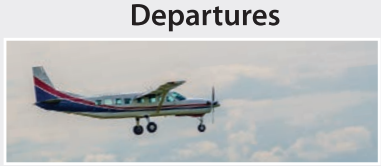
Category D Aircraft

OPERATIONS

Arrivals



Departures



Touch-and-Go Operations

2019-23 Monthly Average Operations

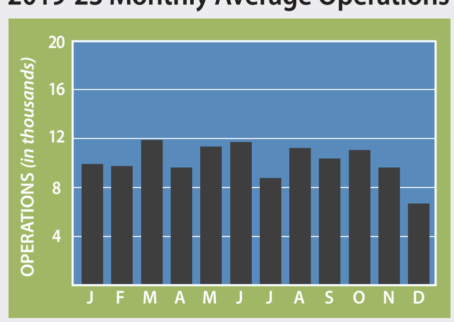


Exhibit 3A
AIRFIELD CAPACITY FACTORS

- Runway 8: 7.19%
- Runway 26: 26.40%
- Runway 12: 12.97%
- Runway 30: 10.20%
- Runway 3: 5.71%
- Runway 21: 21.71%
- Calm/variable winds: 15.82%[1]

- **Exit Taxiways** – Exit taxiways have a significant impact on airfield capacity because the number and location of exits directly determine the occupancy time of an aircraft on the runway. The airfield capacity analysis gives credit to taxiway exits located within the prescribed range from a runway's threshold. This range is based on the mix index of the aircraft that use the runways. Based on mix, only exit taxiways between 3,500 feet and 6,500 feet from the landing threshold count in the exit rating at FHU. The exits must be at least 750 feet apart to count as separate exit taxiways. Utilizing these criteria, Runway 8 is credited with one exit taxiway (Taxiway C) and Runway 26 is credited with two exit taxiways (Taxiways C and D). Using these same criteria, Runway 12-30 has one exit for landing operations to either runway, as does Runway 3-21.

- **Meteorological Conditions** – Meteorological conditions can have a significant impact on airfield capacity. Airfield capacity is usually highest in clear weather, when flight visibility is at its best, and is diminished as weather conditions deteriorate and cloud ceilings and visibility are reduced. As weather conditions deteriorate, the spacing of aircraft must increase to provide allowable margins of safety and air traffic vectoring. The increased distance between aircraft reduces the number of aircraft that can operate at the airport during any given period, thus reducing overall airfield capacity.

  According to local meteorological data, the airport operates under visual meteorological conditions (VMC) approximately 97.89 percent of the time. VMC exist whenever the cloud ceiling is greater than 1,000 feet above ground level (AGL) and visibility is greater than three statute miles. Instrument meteorological conditions (IMC) are defined when cloud ceilings are between 500 and 1,000 feet AGL or visibility is between one and three miles. IMC are present at the airport 1.25 percent of the time. Poor visibility conditions (PVC) apply for cloud ceilings below 500 feet and visibility minimums below one mile and occur 0.86 percent of the time. (Refer to Table 1A in Chapter One for additional information.)

- **Aircraft Mix** – The aircraft mix for the capacity analysis is defined in terms of four aircraft classifications. Classes A and B consist of small- and medium-sized propeller aircraft and some jet aircraft, all of which weigh 12,500 pounds or less. These aircraft are primarily associated with general aviation activity, but also include some air taxi, air cargo, and commuter aircraft. Class C consists of aircraft that weigh between 12,500 pounds and 300,000 pounds. These aircraft include most business jets and some turboprop aircraft that utilize the airport on a regular basis. Class D consists of aircraft that weigh more than 300,000 pounds.

[1] Usage is based on 132,418 observations collected from the on-airport weather observation station from January 1, 2014, through December 31, 2023.

Most operations at FHU are by Class C aircraft; this is true for both military and civilian activity. According to the FAA's Traffic Flow Management System Counts (TFMSC) data for 2023, there were approximately 1,862 total operations by Class C aircraft at FHU, which represents approximately 75 percent of all operations. Classes A and B comprise approximately 24 percent of total operations, while Class D comprises less than one percent of total operations at FHU.

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

- **Touch-and-Go Activity** – A touch-and-go operation involves an aircraft making a landing and then an immediate takeoff without coming to a full stop or exiting the runway. As previously discussed in Chapter Two, these operations are normally associated with training activities and are classified as local operations. A high percentage of touch-and-go traffic normally results in a higher operational capacity because one landing and takeoff operation occurs within a shorter time period than individual operations. The majority of operations at FHU are local in nature, for both military and general aviation. For capacity planning, 85.5 percent of total operations are considered touch-and-go. This percentage is anticipated to remain steady throughout the plan years.

- **Peak Period Operations** – Average daily operations and average peak hour operations during the peak month are utilized for the airfield capacity analysis. Operations activity is important in the calculation of an airport's ASV, as peak demand levels occur sporadically. The peak periods used in the capacity analysis are representative of normal operational activity and can be exceeded at various times throughout the year.

CALCULATION OF ANNUAL SERVICE VOLUME

The preceding information was used in conjunction with the airfield capacity methodology developed by the FAA to determine airfield capacity for FHU.

Hourly Runway Capacity

The first step in determining ASV involves the computation of the hourly capacity of the runway configuration. The percentage use of the runway, the amount of touch-and-go activity, and the number and locations of runway exits are the important factors in determining hourly capacity.

The current and future hourly capacities for FHU were determined based on these factors. The operational mix of aircraft at the airport is anticipated to continue to be comprised of Class C aircraft, with an increase in these types of operations over the next 20 years. Compared to smaller aircraft in Classes A and B, Class C aircraft require additional spacing and time in the traffic pattern and on the runway, resulting in increasing capacity constraints.

The current and future weighted hourly capacities are presented in **Table 3B**. Weighted hourly capacity is the measure of the maximum number of aircraft operations that can be accommodated on the airfield in a typical hour. It is a composite of estimated hourly capacities for different airfield operating configurations, adjusted to reflect the percentage of time in an average year that the airfield operates under each specific configuration. The weighted hourly capacity on the airfield is projected to remain at 89 operations for the duration of the planning period.

TABLE 3B | Airfield Capacity Summary

	Base Year	Short Term	Intermediate Term	Long Term
OPERATIONAL DEMAND				
Annual	116,903	136,100	138,000	142,400
CAPACITY				
Annual Service Volume	183,000	183,000	183,000	183,000
Percent Capacity	63.9%	74.3%	75.4%	77.8%
Weighted Hourly Capacity	89	89	89	89

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

Annual Service Volume

The ASV is determined by the following equation:

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

The current ASV for the airfield has been estimated at 183,000 operations in the base year and is anticipated to remain at this level throughout the planning period. This is primarily a result of the flatlined military operations forecast, which was derived from the average of the last five years of military activity and was presented previously in Chapter Two. Additionally, Class C aircraft are expected to remain the dominant aircraft type operating at FHU. With 116,903 operations in 2023, the airport is currently at 63.9 percent of its ASV. Long-range annual operations are forecast to reach 142,400, which would equate to 77.8 percent of the airport's ASV.

AIRCRAFT DELAY

The effect the anticipated ratio of demand to capacity will have on users of FHU can be measured in terms of delay. As the number of annual aircraft operations approaches the airfield's capacity, increasing operational delays begin to occur. Delays occur to arriving and departing aircraft in all weather conditions. Arriving aircraft delays result in aircraft holding outside the airport traffic pattern area and departing aircraft delays result in aircraft holding at the runway end until they can safely take off.

Aircraft delay can vary, depending on different operational activities at an airport. At airports where large air carrier aircraft are the dominant aircraft type, delay can be greater because of the amount of time these aircraft require in the traffic pattern and on approach to land. For airports that accommodate primarily small general aviation aircraft, delay is typically lower because these aircraft are more maneuverable and require less time in the airport traffic pattern.

Table 3C summarizes the potential aircraft delay for FHU. Estimates of delay provide insight into the impacts that steady increases in aircraft operations have on the airfield and signify the airport's ability to accommodate projected annual aircraft operations. The delay per operation represents an average delay per aircraft. It should be noted that delays of five to 10 times the average could be experienced by individual aircraft during peak periods. As an airport's percent capacity increases toward the ASV, delay exponentially increases. Complexities in the airspace system that surrounds an airport can also factor into additional delay experienced at the facility.

TABLE 3C | Airfield Delay Summary

	Base Year	Short Term	Intermediate Term	Long Term
Percent Capacity	63.9%	74.3%	75.4%	77.8%
DELAY				
Per Operation (Minutes)	0.33	0.42	0.46	0.48
Total Annual (Hours)	643	953	1,058	1,139

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

Current annual delay is estimated at 0.33 minutes per aircraft operation, or 643 annual hours. Analysis of delay factors for the long-term planning horizon indicates that annual delays can be expected to reach 0.48 minutes per aircraft operation, or 1,139 annual hours.

CAPACITY ANALYSIS CONCLUSION

Exhibit 3B compares the ASV to existing and forecast operational levels at FHU. The 2023 operations level equates to 63.9 percent of the airfield's ASV. By the long-term planning horizon, total annual operations are expected to represent 77.8 percent of the ASV.

FAA Order 5090.5, *Field Formulation of the National Plan of Integrated Airport Systems (NPIAS) and the Airports Capital Improvement Plan (ACIP)*, indicates that improvements for airfield capacity purposes should begin to be considered once operations reach 60 to 75 percent of the annual service volume, which is an approximate level to begin the detailed planning of capacity improvements. At the 80 percent level, the planned improvements should be made. As such, capacity improvements may already be necessary. As discussed previously, Fort Huachuca/Libby Army Airfield is responsible for the runways and taxiways at FHU, so airfield development to improve capacity would likely fall under Fort Huachuca's purview; nevertheless, options to improve airfield efficiency will be considered in the next chapter as part of a comprehensive planning process.

AIRSIDE FACILITY REQUIREMENTS

Airside facilities include those facilities related to the arrival, departure, and ground movement of aircraft. Airside facility requirements are based primarily on the runway design code (RDC) for each runway. Analysis in Chapter Two identified the existing and ultimate RDCs for each runway, based on both military and civilian usage. These are detailed in **Table 3D**.

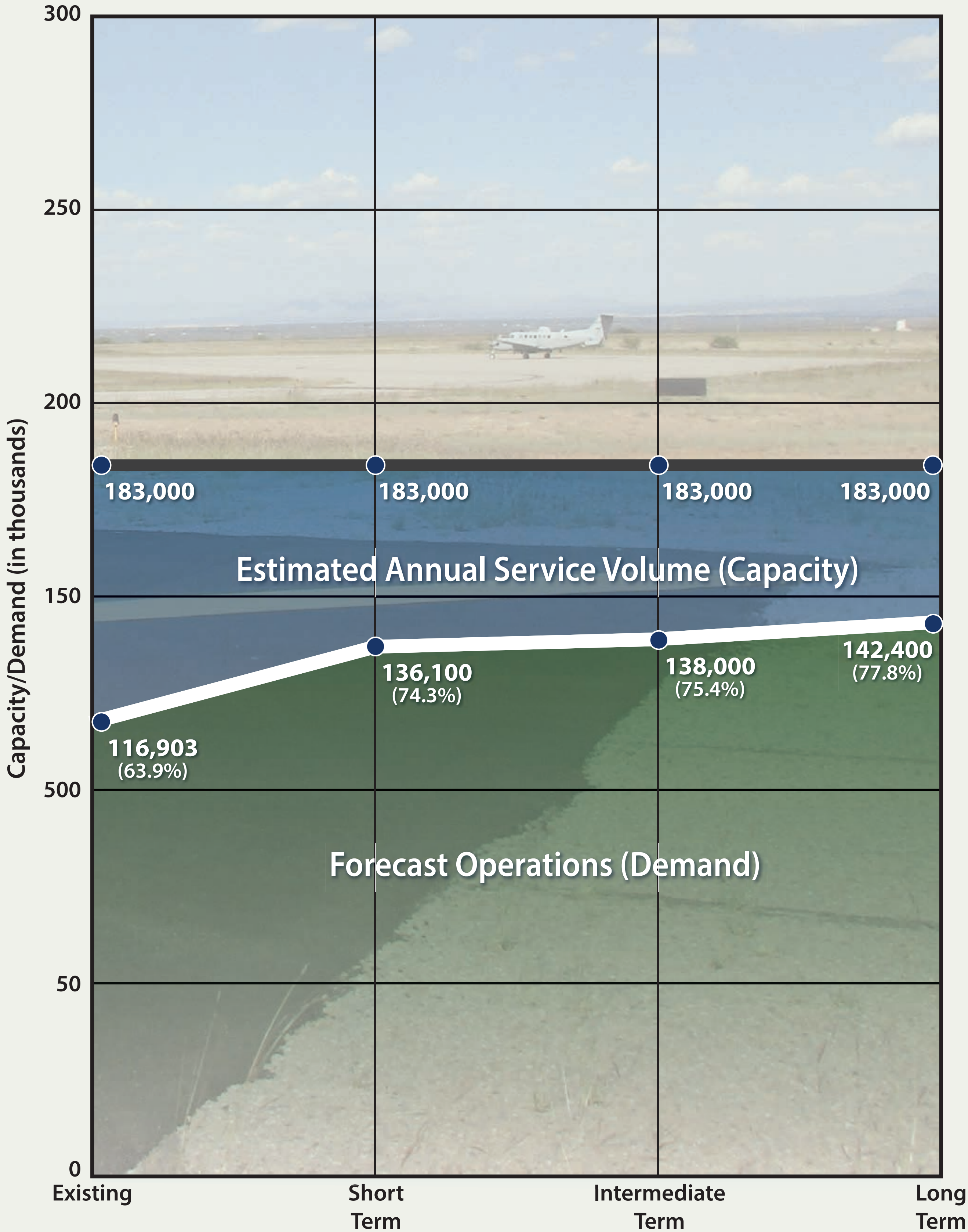


Exhibit 3B
DEMAND/CAPACITY ANALYSIS

TABLE 3D | Runway Design Codes

	Runway 8-26 (existing/ultimate) Planning Purposes (includes military)	Runway 8-26 (existing/ultimate) AIP Eligible	Runway 12-30 (existing/ultimate) Planning Purposes (includes military)	Runway 12-30 (existing/ultimate) AIP Eligible	Runway 3-21 (existing/ultimate)
RDC	E-V-4000	B-II-4000	C-III-VIS (existing) C-III-5000 (ultimate)	B-II-VIS (existing) B-II-5000 (ultimate)	B-II-VIS

Sources: FAA AC 150/5300-13B, Airport Design; Coffman Associates analysis

As discussed in the last chapter, military aircraft cannot be considered by the FAA when justifying Airport Improvement Program (AIP) funding allowances. As such, airside facility needs will be primarily based on the AIP-eligible RDC, with the design standards based on the military RDC for Runways 8-26 and 12-30 included for informational purposes only.

RUNWAYS

Runway conditions, such as orientation, length, width, and pavement strength, were analyzed at Sierra Vista Municipal Airport. From this information, requirements for runway improvements were determined for the airport.

Runway Orientation

Key considerations in the runway configuration of an airport involve the orientation for wind coverage and the operational capacity of the runway system. FAA AC 150/5300-13B, *Airport Design*, recommends that a crosswind runway should be made available when the primary runway orientation provides less than 95 percent crosswind component coverage for an aircraft design group. **Table 3E** details the allowable crosswind component for each RDC.

TABLE 3E | Allowable Crosswind Component by RDC

RDC	Allowable Crosswind Component
A-I and B-I (includes small aircraft)	10.5 knots
A-II and B-II	13 knots
A-III and B-III C-I through D-III	16 knots
A-IV and B-IV C-IV through C-VI D-IV through D-VI E-I through E-VI	20 knots

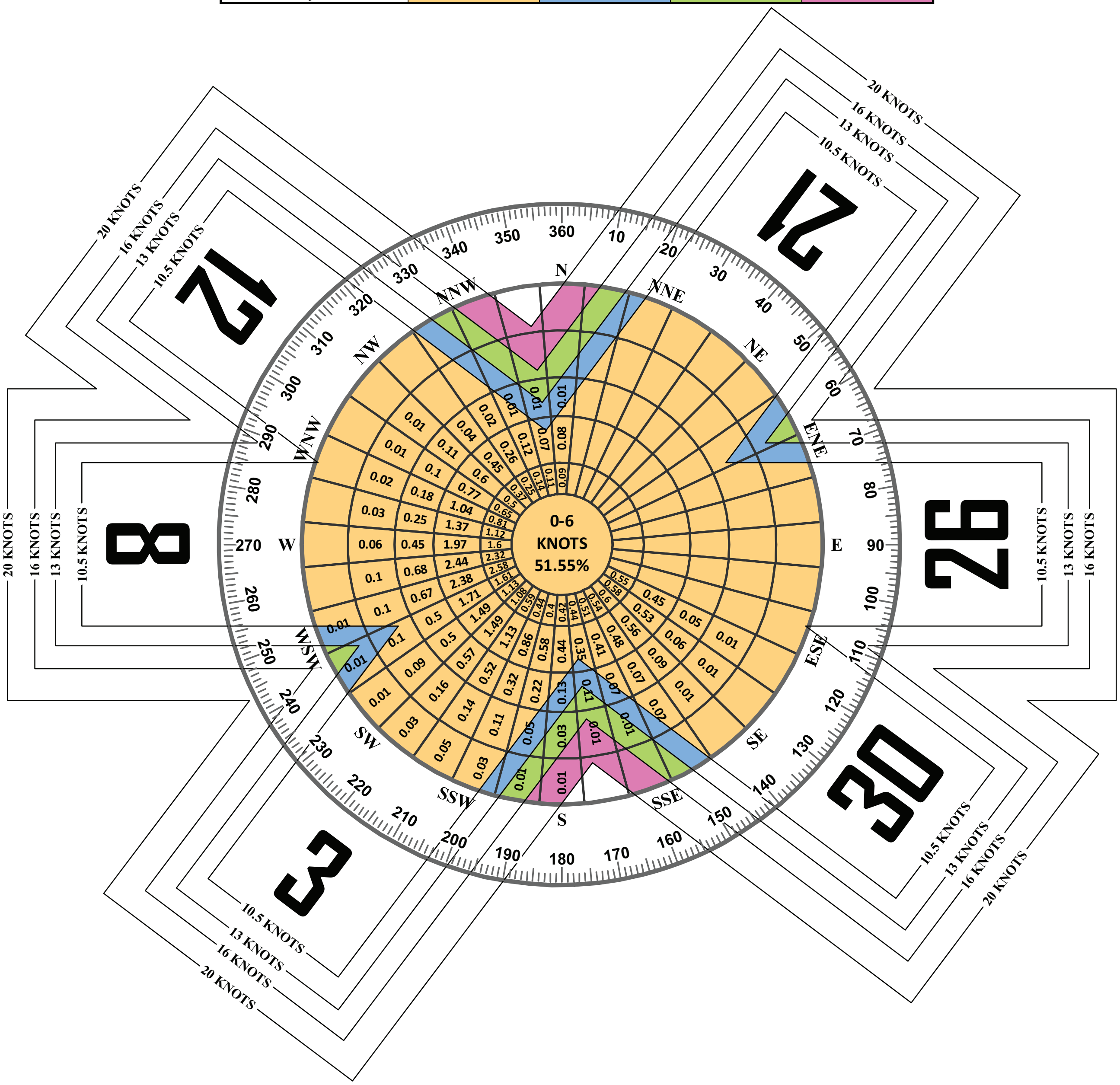
Source: FAA AC 150/5300-13B, Airport Design

Exhibit 3C presents the generalized, FAA-accepted all-weather and instrument flight rules (IFR) wind roses for the airport. The previous 10 years of wind data[2] were obtained from the on-airport weather observation system and have been analyzed to identify wind coverage provided by the existing runway orientations. At FHU, the orientation of Runway 8-26 provides 91.45 percent coverage for the 10.5-knot component and greater than 95 percent coverage for 13-, 16-, and 20-knot components in all weather

[2] 132,418 observations were collected for the period from January 1, 2014, through December 31, 2023.

ALL WEATHER WIND COVERAGE

Runways	10.5 Knots	13 Knots	16 Knots	20 Knots
Runway 8-26	91.45%	95.22%	98.05%	99.37%
Runway 12-30	85.82%	91.36%	96.23%	98.76%
Runway 3-21	89.15%	94.32%	98.50%	99.69%
All Runways	99.54%	99.87%	99.97%	100.00%

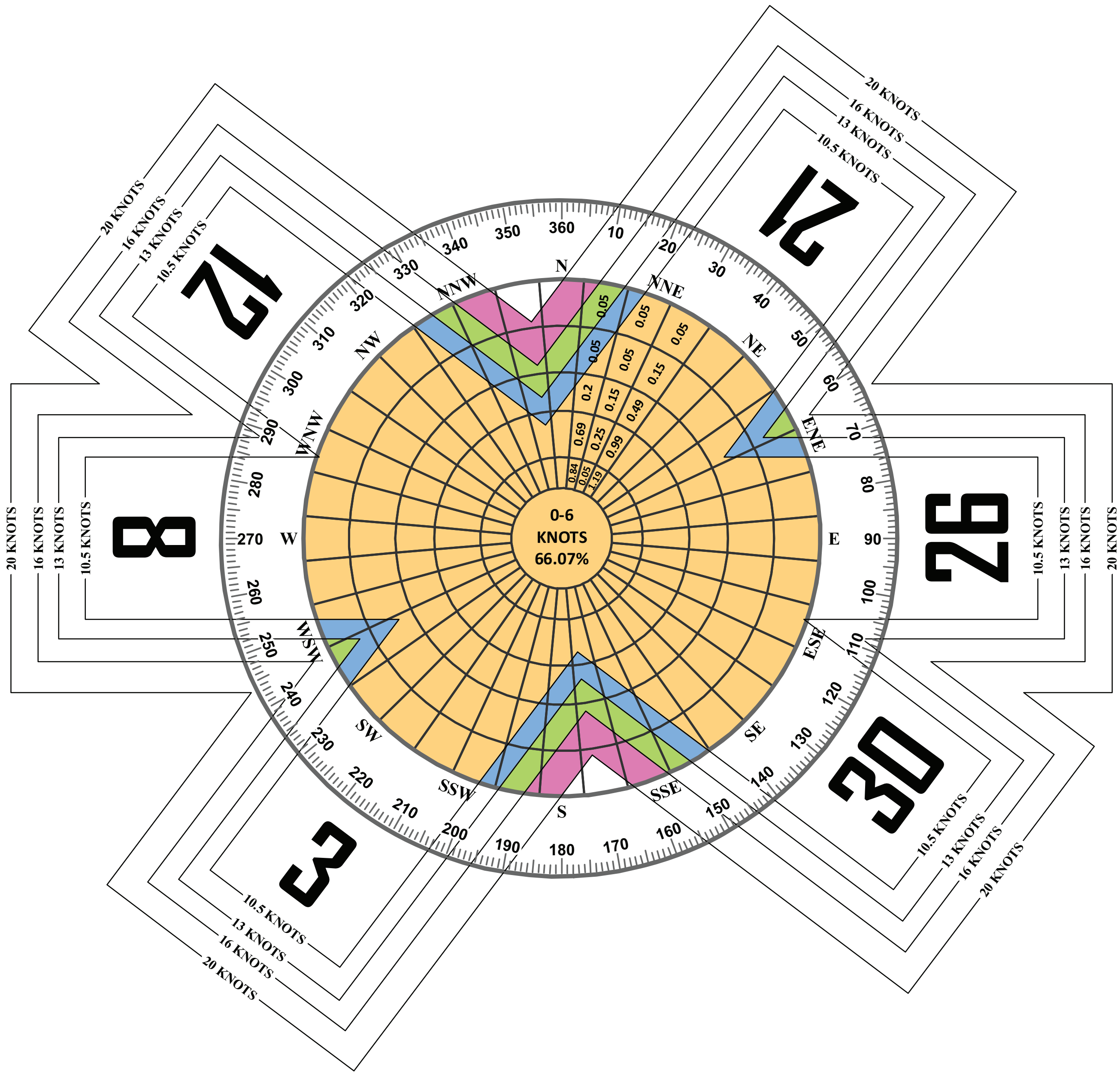


SOURCE:
NOAA National Climatic Center
Asheville, North Carolina
Sierra Vista Municipal Airport-Libby Army Airfield
Sierra Vista, Arizona

OBSERVATIONS:
132,418 All Weather Observations
Jan. 1, 2014 - Dec, 31 2023

IFR WIND COVERAGE

Runways	10.5 Knots	13 Knots	16 Knots	20 Knots
Runway 8-26	93.02%	96.17%	98.57%	99.47%
Runway 12-30	86.39%	91.32%	95.40%	98.33%
Runway 3-21	81.58%	88.49%	95.31%	98.74%
All Runways	99.35%	99.81%	99.96%	100.00%



SOURCE:
NOAA National Climatic Center
Asheville, North Carolina
Sierra Vista Municipal Airport-Libby Army Airfield
Sierra Vista, Arizona

OBSERVATIONS:
3,504 IFR Observations
Jan. 1, 2014 - Dec, 31 2023

conditions. Runway 12-30 provides 85.82 percent coverage in 10.5-knot conditions, 91.36 percent coverage in 13-knot conditions, and greater than 96 percent coverage in 16-knot and higher conditions. Runway 3-21 provides 89.15 percent coverage in 10.5-knot conditions, 94.32 percent coverage in 13 knot conditions, and greater than 98 percent coverage in 16-knot and higher conditions. Combined, the three runways provide 99.54 percent coverage in all-weather conditions. In IFR conditions, the data indicate a similar scenario, with no single runway providing greater than 95 percent coverage at the 10.5-knot component. Primary Runway 8-26 provides greater than 96 percent coverage at 13 knots and above, while Runways 12-30 and 3-21 do not provide 95 percent or greater coverage until the 16-knot condition. Combined, the three runways offer greater than 99 percent coverage for each crosswind component in IFR conditions.

While the runways at FHU are owned and maintained by Fort Huachuca, it is also worth noting runway eligibility from an FAA standpoint. Based on the wind rose data presented in **Exhibit 3C**, a crosswind runway at FHU is eligible for grant consideration, with specific FAA justification analysis needed for federal funding assistance; however, the third runway must be examined to determine eligibility and justification. According to FAA Order 5100.38D, *Airport Improvement Program Handbook*, only one runway at any NPIAS airport is eligible for ongoing maintenance and rehabilitation funding, unless the FAA Airports District Office (ADO) has made a specific determination that a crosswind or secondary runway is justified. A runway that is not a primary runway, crosswind runway, or secondary runway is considered an additional runway and is not eligible for FAA funding. It is not unusual for a two-runway airport to have a primary runway and an additional runway, and no crosswind or secondary runway. **Table 3F** presents the eligibility requirements for runway types.

TABLE 3F | Runway Eligibility

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

Source: FAA Order 5100.38D, AIP Handbook

According to the information provided in **Table 3F**, Runway 3-21 could qualify as a secondary runway, based on the primary runway's existing capacity, which is currently at 63.9 percent; however, discussions with Libby Army Airfield personnel have indicated a desire to decommission Runway 3-21. Additional wind analysis was conducted based on a potential two-runway system, as shown in **Table 3G**. Assuming a scenario in which Runway 3-21 is closed, the combined wind coverage provided by Runways 8-26 and 12-30 is 93.91 percent during all-weather conditions in the 10.5-knot condition, and greater than 96.00 percent during 13-knot and higher conditions. The combination of Runways 8-26 and 3-21 was also evaluated for comprehensive planning purposes. This scenario provides greater than 97.00 percent coverage during all-weather conditions at 10.5 knots and higher. While this dual runway combination provides better coverage during crosswind conditions, Runway 12-30 offers more utility to both military and general aviation operators, due to its greater length and width and visual glide slope indicators (four-light precision approach path indicators [PAPI-4s] at each runway end). For these reasons, and because the U.S. Army is the final arbiter in the runways' continued maintenance, the alternatives presented in the next chapter will include development options that consider closure of Runway 3-21.

TABLE 3G | Dual Runway Wind Coverage

	ALL-WEATHER WIND COVERAGE				IFR WIND COVERAGE			
	10.5 Knots	13 Knots	16 Knots	20 Knots	10.5 Knots	13 Knots	16 Knots	20 Knots
Runways 8-26 and 12-30								
8-26	91.45%	95.22%	98.05%	99.37%	93.02%	96.17%	98.57%	99.47%
12-30	85.82%	91.36%	96.23%	98.76%	86.39%	91.32%	95.40%	98.33%
Combined	93.91%	96.67%	98.57%	99.58%	95.99%	97.98%	99.14%	99.73%
Runways 8-26 and 3-21								
8-26	91.45%	95.22%	98.05%	99.37%	93.02%	96.17%	98.57%	99.47%
3-21	89.15%	94.32%	98.50%	99.69%	81.58%	88.49%	95.31%	98.74%
Combined	97.64%	99.20%	99.80%	99.96%	96.92%	98.77%	99.60%	99.89%

Runway Designations

A runway's designation is based on its magnetic headings, which are determined by the magnetic declination for the area. The magnetic declination near Sierra Vista Municipal Airport is 8° 52' E ± 0° 6' W per year. Runway 8-26 has a true heading of 090°/270°. Adjusting for the magnetic declination, the current magnetic heading of Runway 8-26 is 081°/261°. Runway 12-30 has a true heading of 127°/307° and a magnetic heading of 118°/298°, while Runway 3-21 has a true heading of 037°/217° and a magnetic heading of 028°/208°. Based on this information, no changes to any of the current runway designations are necessary.

Runway Length

FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design*, provides guidance for determining runway length needs. The determination of runway length requirements for the airport is based on five primary factors:

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

The mean maximum daily temperature of the hottest month for Sierra Vista Municipal Airport is 93.9 degrees Fahrenheit (°F), which occurs in June. The airport elevation is 4,719.1 feet mean sea level (MSL). Runway 8-26 has a longitudinal gradient of 1.00 percent; Runway 12-30 has a gradient of 0.06 percent; and Runway 3-21 has a gradient of 1.99 percent. Longitudinal runway gradient will be discussed further in a later section.

Airplanes operate on a wide variety of available runway lengths. Many factors govern the sustainability of runway lengths for aircraft, such as elevation, temperature, wind, aircraft weight, wing flap settings, runway condition (wet or dry), runway gradient, vicinity airspace obstructions, and any special operating procedures. Airport operators can pursue policies that maximize the sustainability of runway length. Policies such as area zoning and height and hazard restricting can protect an airport's runway length. Airport ownership (fee simple easement) of land leading to the runway ends reduces the possibility of natural growth or human-made obstructions. Planning for runways should include an evaluation of the aircraft types that are expected to use the airport now and in the future. Future planning should be realistic, supported by the FAA-approved forecasts, and based on the critical aircraft (or family of aircraft). **For this master plan, the runway length requirements are being calculated for civilian aircraft only.**

General Aviation Aircraft

Many of the general aviation (GA) operations occurring at Sierra Vista Municipal Airport are conducted using smaller GA aircraft that weigh less than 12,500 pounds. Following guidance from AC 150/ 5325-4B, to accommodate 95 percent of these small aircraft with fewer than 10 passenger seats, a runway length of 6,000 feet is recommended. For 100 percent of these small aircraft, a runway length of 6,200 feet is recommended; this is also the recommended runway length for small aircraft with 10 or more passenger seats.

The airport is also utilized regularly by civilian aircraft that weigh more than 12,500 pounds, including small- to medium-sized business jet aircraft. Runway length requirements for business jets that weigh less than 60,000 pounds have also been calculated. These calculations take into consideration the runway gradient and landing length requirements for contaminated (wet) runways. Business jets tend to need greater runway length when landing on wet surfaces because of their increased approach speeds. AC 150/5325-4B stipulates that runway length determination for business jets considers a grouping of airplanes with similar operating characteristics. The AC provides two separate family groupings of airplanes, each of which is based on its representative percentage of aircraft in the national fleet. The first group is those business jets that comprise 75 percent of the national fleet, and the second group is those that comprise 100 percent of the national fleet. **Table 3H** presents a partial list of common aircraft in each aircraft grouping. A third group considers business jets that weigh more than 60,000 pounds. Runway length determination for these aircraft must be based on the performance characteristics of the individual aircraft.

TABLE 3H | Business Jet Categories for Runway Length Determination

AIRCRAFT	MTOW (LBS.)
75 Percent of the National Fleet	
Lear 35	20,350
Lear 45	20,500
Cessna 550	14,100
Cessna 560XL	20,000
Cessna 650 (VII)	22,000
IAI Westwind	23,500
Beechjet 400	15,800
Falcon 50	18,500
75-100 Percent of the National Fleet	
Lear 55	21,500
Lear 60	23,500
Hawker 800XP	28,000
Hawker 1000	31,000
Cessna 650 (III/IV)	22,000
Cessna 750 (X)	36,100
Challenger 604	47,600
IAI Astra	23,500
Greater than 60,000 Pounds	
Gulfstream II	65,500
Gulfstream IV	73,200
Gulfstream V	90,500
Global Express	98,000
Gulfstream 650	99,600
MTOW = maximum takeoff weight	

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

Table 3J presents the results of the runway length analysis for business jets that was developed following the guidance provided in AC 150/5325-4B. To accommodate 75 percent of the business jet fleet at 60 percent useful load, a runway length of 6,700 feet is recommended. This length is derived from a raw length of 6,712 feet, which is adjusted, as recommended, for runway gradient and consideration of landing length needs on a contaminated (wet and slippery) runway. To accommodate 100 percent of the business jet fleet at 60 percent useful load, 10,400 feet is the recommended runway length.

TABLE 3J | Runway Length Requirements

Fleet Mix Category	TAKEOFF LENGTHS		LANDING LENGTHS	Final Runway Length
	Raw Runway Length from FAA AC	Runway Length with Gradient Adjustment (+360')	Wet Surface Landing Length for Jets (+15%)*	
75% of Fleet at 60% Useful Load	6,712'	6,713'	5,500'	6,700'
100% of Fleet at 60% Useful Load	10,342'	10,343'	5,500'	10,400'
75% of Fleet at 90% Useful Load	8,600'	8,601'	7,000'	8,600'
100% of Fleet at 90% Useful Load	10,737'	10,738'	7,000'	10,800'

*Max. 5,500' for 60% useful load and max. 7,000' for 90% useful load in wet condition

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

Utilization of the 90 percent category for runway length determination is generally not considered by the FAA unless there is a demonstrated need at an airport, such as documented activity by a business jet operator that flies out frequently with heavy loads. To accommodate 75 percent of the business jet fleet at 90 percent useful load, a runway length of 8,600 feet is recommended. To accommodate 100 percent of business jets at 90 percent useful load, a runway length of 10,800 feet is recommended.

Another method to determine runway length requirements for civilian aircraft at FHU is to examine aircraft flight planning manuals under conditions specific to the airport. Several aircraft were analyzed for takeoff length requirements at a design temperature of 93.9°F and a field elevation of 4,719 feet MSL with a 1.00 percent runway grade. **Table 3K** provides a detailed runway length analysis for some of the most common civilian turbine aircraft in the national fleet. This data was obtained from Ultranav software, which computes operational parameters for specific aircraft based on flight manual data. The analysis includes the maximum takeoff weight (MTOW) allowable and the percent useful load from 60 percent to 100 percent.

Nearly all of the aircraft analyzed are capable of departing at MTOW on the existing runway length during hot weather with useful loads up to 70 percent; however, several are climb-limited or performance-limited. At useful loads greater than 70 percent, more of the fleet becomes climb- or performance-limited, with just 12 of the 39 aircraft analyzed capable of operating at MTOW.

Table 3L presents the runway length required for landing under three operational categories: Title 14 Code of Federal Regulations (CFR) Part 91, CFR Part 135, and CFR Part 91k. CFR Part 91 operations are those conducted by private individuals or companies that own their aircraft. CFR Part 135 applies to all for-hire charter operations, including most fractional ownership operations. CFR Part 91k includes operations in fractional ownership that utilize their own aircraft under the direction of pilots specifically assigned to said aircraft. Part 91k and Part 135 rules regarding landing operations require operators to land at the destination airport within 60 percent of the effective runway length. An additional rule allows for operators to land within 80 percent of the effective runway length if the operator has an approved destination airport analysis in the aircraft's program operating manual. The landing length analysis accounts for both scenarios.

TABLE 3K | Business Aircraft Takeoff Length Requirements – Runway 8-26

		TAKEOFF LENGTH REQUIREMENTS (feet)				
		Useful Load				
Aircraft Name	MTOW	60%	70%	80%	90%	100%
Pilatus PC-12[2]	9,921	3,085	3,370	3,672	3,990	4,325
King Air C90GTi[1]	10,100	3,411	3,666	3,945	4,225	4,504
King Air 200 GT[1]	12,500	4,615	4,735	4,858	4,991	5,137
Citation CJ3	13,870	4,589	5,187	5,887	6,698	7,609
King Air 1900D	17,120	5,753	6,185	6,631	7,121	7,626
Citation Sovereign	30,300	4,702	5,179	5,785	6,629	7,749
Citation Encore	16,630	4,971	5,563	6,218	6,980	7,928
Citation II (550)	13,300	5,135	5,775	6,464	7,374	8,193
Gulfstream II (with tip tanks)	65,500	5,306	5,876	6,590	7,447	8,448
Gulfstream 350	70,900	6,032	6,646	7,332	8,066	8,888
Gulfstream 450	74,600	6,535	7,302	8,126	9,069	10,064
Gulfstream 300	72,000	6,279	6,874	7,614	8,764	10,399
Beechjet 400A	16,300	6,008	6,629	CL	CL	CL
Citation V (Model 560)	15,900	4,490	4,897	5,338	5,800	CL
Citation 560 XLS	20,200	5,415	5,895	6,505	CL	CL
Citation X	35,700	7,686	CL	CL	CL	CL
Citation Bravo	14,800	5,936	6,472	7,071	7,726	CL
Challenger 604/605	48,200	7,650	8,469	9,419	10,430	CL
Gulfstream 550	91,000	6,782	8,095	9,737	11,142	CL
Gulfstream 650	99,600	6,780	7,618	8,605	CL	CL
Gulfstream II/IISP	65,500	CL	CL	CL	CL	CL
Gulfstream IIB	69,700	6,182	6,842	CL	CL	CL
Gulfstream III	69,700	6,179	6,849	CL	CL	CL
Gulfstream IV	74,600	6,714	CL	CL	CL	CL
Gulfstream IV/SP	74,600	7,466	8,286	9,212	CL	CL
Hawker 800 (non-T/R)	27,400	10,391	CL	CL	CL	CL
King Air 350	15,000	5,431	5,657	5,905	6,291	CL
King Air C90B[1]	10,100	3,880	4,165	4,453	CL	CL
Premier 1A	12,500	8,115	9,331	CL	CL	CL
Westwind I[3]	22,850	CL	CL	CL	CL	CL
Citation I/SP	11,850	4,246	FLL	FLL	FLL	FLL
Citation VII	23,000	7,701	FLL	FLL	FLL	FLL
Citation (525) CJ1	10,600	FLL	FLL	FLL	FLL	FLL
Citation (525A) CJ2	12,375	4,766	5,265	5,820	FLL	FLL
Challenger 300	38,850	6,977	7,767	8,411	9,347	FLL
Canadair 601-3A/R (Challenger 601)	45,100	8,510	10,200	FLL	FLL	FLL
Lear 45	21,500	9,125	11,338	FLL	FLL	FLL
Lear 60	23,500	10,080	10,080	11,734	FLL	FLL
Sabreliner 65	24,000	8,860	FLL	FLL	FLL	FLL

CL = aircraft unable to meet required climb gradient at this weight
FLL = aircraft performance limited in this condition
MTOW = maximum takeoff weight

Notes:
Green cell values are less than or equal to the length of the primary runway at FHU.
[1] No runway slope option available
[2] No runway distance option available
[3] Calculator MTOW 23,500 lbs.

Source: Ultranav

TABLE 3L | Business Aircraft Landing Length Requirements – Runway 8-26

		LANDING LENGTH REQUIREMENTS (feet)					
		Dry			Wet		
Aircraft Name	MLW	Part 91	80% Rule	60% Rule	Part 91	80% Rule	60% Rule
Westwind I	19,000	2,690	3,363	4,483	3,090	3,863	5,150
Citation I/SP	11,350	2,756	3,445	4,593	3,163	3,954	5,272
King Air 350	15,000	3,389	4,236	5,648	3,897	4,871	6,495
King Air 1900D	16,765	3,562	4,453	5,937	4,097	5,121	6,828
Gulfstream 350	66,000	3,613	4,516	6,022	4,155	5,194	6,925
Hawker 800 (non-T/R)	23,350	3,370	4,213	5,617	4,370	5,463	7,283
Lear 45	19,200	3,352	4,190	5,587	4,414	5,518	7,357
Canadair 601-3A/R (Challenger 601)	36,000	3,883	4,854	6,472	4,660	5,825	7,767
Premier 1A	11,600	3,857	4,821	6,428	5,014	6,268	8,357
Challenger 604/605	38,000	3,181	3,976	5,302	5,118	6,398	8,530
Citation Sovereign	27,100	3,787	4,734	6,312	5,177	6,471	8,628
Sabreliner 65	21,755	4,030	5,038	6,717	5,518	6,898	9,197
Challenger 300	33,750	2,884	3,605	4,807	5,527	6,909	9,212
Citation CJ3	12,750	4,035	5,044	6,725	5,603	7,004	9,338
Lear 60	19,500	4,188	5,235	6,980	5,785	7,231	9,642
Citation (525) CJ1	9,800	4,217	5,271	7,028	5,825	7,281	9,708
Citation V (Model 560)	15,200	4,074	5,093	6,790	6,068	7,585	10,113
Citation (525A) CJ2	11,500	4,229	5,286	7,048	6,131	7,664	10,218
Gulfstream 650	83,500	4,831	6,039	8,052	6,353	7,941	10,588
Citation Encore	15,200	4,163	5,204	6,938	6,388	7,985	10,647
Gulfstream 550	75,300	3,081	3,851	5,135	6,436	8,045	10,727
Gulfstream II/IISP	58,500	3,425	4,281	5,708	**6,565**	**8,206**	**10,942**
Gulfstream II (with tip tanks)	58,500	3,425	4,281	5,708	**6,565**	**8,206**	**10,942**
Gulfstream 300	66,000	3,466	4,333	5,777	**6,643**	**8,304**	**11,072**
Gulfstream IV/SP	66,000	3,466	4,333	5,777	**6,643**	**8,304**	**11,072**
Gulfstream IIB	58,500	3,546	4,433	5,910	**6,797**	**8,496**	**11,328**
Gulfstream III	58,500	3,546	4,433	5,910	**6,797**	**8,496**	**11,328**
Citation 560 XLS	18,700	4,397	5,496	7,328	6,896	8,620	11,493
Gulfstream 450	66,000	3,613	4,516	6,022	7,116	8,895	11,860
Citation II (550)	12,700	3,110	3,888	5,183	**7,517**	**9,396**	**12,528**
Gulfstream IV	66,000	3,966	4,958	6,610	**7,602**	**9,503**	**12,670**
Citation X	31,800	5,461	6,826	9,102	8,121	10,151	13,535
Citation Bravo	13,500	5,275	6,594	8,792	8,381	10,476	13,968
Beechjet 400A	15,700	ND	ND	ND	ND	ND	ND
King Air C90GTi[1]	9,600	1,614	2,018	2,690	ND	ND	ND
King Air 200 GT[1]	12,500	2,227	2,784	3,712	ND	ND	ND
King Air C90B[1]	9,600	1,585	1,981	2,642	ND	ND	ND
Pilatus PC-12	9,921	2,705	3,381	4,508	ND	ND	ND
Citation VII	20,000	O/L	O/L	O/L	O/L	O/L	O/L

MLW = maximum landing weight
ND = no data
O/L = temperature off the landing distance chart

Notes:
Green cell values are less than or equal to the length of the primary runway at FHU; orange cell values are greater than the length of the primary runway at FHU. Values in boldface indicate the wet distance is the field length required for aircraft to attempt a landing (not actual landing distance).
[1] No runway slope option available

Source: Ultranav

The landing length analysis shows nearly all of the aircraft analyzed can land on the available runway length at FHU during both dry and wet runway conditions. Only the Citation II, X, and Bravo models, as well as the Gulfstream IV, have landing length requirements that exceed the current runway length, and then only when operating under Part 91k or Part 135 (60 percent rule) during contaminated runway conditions.

Runway Length Summary

Many factors are considered when determining appropriate runway length for safe and efficient operations of civilian aircraft at FHU. The airport should strive to accommodate smaller business jets and turboprop aircraft to the greatest extent possible, as demand dictates. Primary Runway 8-26 is currently 12,001 feet long and, as detailed in the tables above, can accommodate many of the more common business jets operating at the airport under moderate loading conditions. Because the runways at FHU are owned and maintained by the U.S. Army, they are designed to meet the needs of the military aircraft that operate at the airport. Runway length requirements for these aircraft will generally exceed the needs of any of the civilian aircraft that operate regularly at FHU; therefore, the current length of Runway 8-26 is considered sufficient for civilian operators.

Based on discussions with Fort Huachuca personnel, this master plan will also consider the potential for extending Runway 12-30, which is currently 5,366 feet long. As detailed previously, guidance from AC 150/ 5325-4B recommends a length of 6,000 feet to accommodate 95 percent of small aircraft with fewer than 10 passenger seats. For aircraft that weigh over 12,500 pounds, a length of 6,700 feet is recommended to accommodate 75 percent of the fleet at 60 percent useful load, and a length of 10,400 feet is recommended to accommodate 100 percent of the fleet at 60 percent useful load. As such, the alternatives in the next chapter will examine potential extensions for Runway 12-30. It should be noted that, if the FAA were to participate in funding an extension to Runway 12-30, justification in the form of regular use (500 annual itinerant operations) by civilian aircraft that require the additional length would be necessary. This is the minimum threshold required to obtain FAA grant funding assistance. Given the joint-use nature of FHU, additional justification may be required, and coordination between the airport sponsor, the FAA, and the U.S. Army will be necessary.

Runway Width

Runway width design standards are primarily based on the critical aircraft but can also be influenced by the visibility minimums of published instrument approach procedures. For planning purposes, runway width standards for Runways 8-26 and 12-30 will be based on the RDC associated with military aircraft usage.

Runway 8-26 | For primary Runway 8-26, existing/ultimate RDC E-V-4000 design criteria stipulate a runway width of 150 feet. Runway 8-26 is currently 150 feet wide. The AIP-eligible width for Runway 8-26 is based on existing/ultimate RDC B-II-4000, which has a width standard of 75 feet.

Runway 12-30 | For crosswind Runway 12-30, the RDC is C-III-VIS in the existing condition, with the potential to convert to C-III-5000 in the ultimate condition if an instrument approach procedure with minimums not lower than one mile were to be implemented. The runway width standard for both scenarios is 100 feet. Runway 12-30 is currently 100 feet wide. The AIP-eligible width for Runway 12-30 is based on ultimate RDC B-II-5000, which has a width standard of 75 feet.

Runway 3-21 | Runway 3-21 has an existing/ultimate RDC of B-II-VIS, which corresponds to a standard width of 75 feet. This runway is currently 75 feet wide and should be maintained at this width, unless the decision is made to decommission the runway.

Pavement Strength

An important feature of airfield pavement is its ability to withstand repeated use by aircraft of varying weights. The FAA reports the pavement strength for primary Runway 8-26 as 75,000 pounds for single wheel aircraft (S), 200,000 pounds for dual wheel aircraft (D), 450,000 pounds for dual tandem wheel aircraft (2D), and 700,000 pounds for double dual tandem wheel aircraft (2D2). Crosswind Runway 12-30 is reported to have a weight-bearing capacity of 46,000 pounds S, 106,000 pounds D, 137,000 pounds 2D, and 172,000 pounds 2D2. Runway 3-21 does not have a reported weight-bearing capacity.

The strength rating of a runway does not preclude aircraft that weigh more than the published strength rating from using the runway. All federally obligated airports must remain open to the public, and it is typically up to the pilot of an aircraft to determine if a runway can safely support their aircraft. An airport sponsor cannot restrict an aircraft from using the runway simply because its weight exceeds the published strength rating. On the other hand, the airport sponsor has an obligation to properly maintain and protect the useful life of the runway (typically for 20 years).

The strength rating of a runway can change over time. Regular usage by heavier aircraft can decrease the strength rating, while periodic runway resurfacing can increase the strength rating. The current runway strength rating of Runways 8-26 and 12-30 is adequate to accommodate the aircraft that currently operate and are anticipated to operate at the airport. If Runway 3-21 remains open, it should be planned to a strength rating of at least 30,000 pounds S.

Runway Line-of-Sight and Gradient

The FAA has instituted various line-of-sight requirements to facilitate coordination among aircraft and between aircraft and vehicles that are operating on active runways. This allows departing and arriving aircraft to verify the locations and actions of other aircraft and vehicles on the ground that could create a conflict.

Line-of-sight standards for an individual runway are based on whether a parallel taxiway is available. When a full-length parallel taxiway is available, thus facilitating faster runway exit times, any point five feet above the runway centerline must be mutually visible with any other point five feet above the runway centerline that is located at less than half the length of the runway. Preliminary analysis indicates the potential for a slight deviation from the design standard on a portion of Runway 12-30 near the intersection with Runway 8-26. Additional engineering analysis should be conducted to determine the full extent of any non-standard line-of-sight conditions.

The surface gradient of a runway affects aircraft performance and pilot perception. The surface gradient is the maximum allowable slope for a runway. For runways designated for approach categories A and B, the maximum longitudinal grade is 2.0 percent. For AIP-eligible planning purposes, which indicate approach category B aircraft for the existing/ultimate periods, each runway at FHU meets the gradient standard.

Runway Visibility Zone

The runway visibility zone (RVZ) is an area formed by imaginary lines connecting the line-of-sight points of intersecting runways. The purpose of the RVZ is to facilitate coordination among aircraft and between aircraft and vehicles that are operating on active runways. Having a clear line of sight allows departing aircraft and arriving aircraft to verify the locations and actions of other aircraft and vehicles on the ground that could create a conflict. Within the RVZ, any point five feet above the runway centerline must be mutually visible with any other point five feet above the centerline of the crossing runway. These standards apply to airports without airport traffic control towers (ATCTs) or with part-time ATCT operations. The RVZ at FHU is depicted on **Exhibit 3D**. The RVZ at FHU is generally unobstructed; however, the precision approach radar (PAR) equipment located near Runway 3 and Taxiway C is located within the RVZ. This equipment is planned to be removed, which will mitigate this non-standard condition.

Blast Pads

Each runway end at FHU is equipped with blast pads. Blast pads are marked with yellow chevrons and function to reduce the erosive effect of jet blast and propeller wash. FAA AC 150/5300-13B, *Airport Design*, recommends the following dimensions for blast pads:

Runway 8-26 | Blast pad design standards for RDC E-V-4000 measure 400 feet long by 220 feet wide. The blast pads on Runway 8-26 measure 1,000 feet long by 150 feet wide. For RDC B-II-4000, the AIP-eligible design standard, the standards call for blast pad dimensions to be 150 feet long by 95 feet wide.

Runway 12-30 | The design standard for aircraft approach category (AAC)/airplane design group (ADG) C-III calls for blast pads to be 200 feet long by 200 feet wide.[3] The blast pad associated with Runway 12 is 500 feet long by 150 feet wide, and the blast pad beyond the Runway 30 threshold measures 200 feet long by 100 feet wide. The AIP-eligible design standard associated with ultimate B-II-5000 is for blast pads to measure 150 feet long by 95 feet wide.

Runway 3-21 | Runway 3-21 has an existing/ultimate RDC of B-II-VIS, which corresponds to 150-foot-long and 95-foot-wide blast pads. The blast pad on Runway 3 measures 250 feet long by 125 feet wide and is not marked with chevrons. The blast pad on Runway 21 is 475 feet long by 125 feet wide. If this runway remains active, consideration should be given to resizing the blast pads to meet the standard, as well as marking the Runway 3 blast pad with standard yellow chevrons.

SAFETY AREA DESIGN STANDARDS

The FAA has established several imaginary surfaces to protect aircraft operational areas and keep them free from obstructions. These include the runway safety area (RSA), runway object free area (ROFA), runway obstacle free zone (ROFZ), and runway protection zone (RPZ).

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[3] The design standard for AAC/ADG C-III calls for 140-foot-wide blast pads; however, for airplanes with maximum certificated takeoff weight greater than 150,000 lbs., the runway blast pad width is 200 feet.

The entire RSA, ROFA, and ROFZ must be under the direct ownership of the airport sponsor to ensure these areas remain free of obstacles and can be readily accessed by maintenance and emergency personnel. RPZs should also be under airport ownership. An alternative to outright ownership of the RPZ is the purchase of avigation easements (acquiring control of designated airspace within the RPZ) or having sufficient land use control measures in place that ensure the RPZ remains free of incompatible development. The various airport safety areas and their dimensions, as sourced from FAA AC 150/5300-13B, *Airport Design*, are presented graphically on **Exhibit 3D** and are detailed in **Table 3M**.[4] For comparison purposes, the reverse side of the exhibit details the extent of the AIP-eligible safety areas, shown in blue shading.

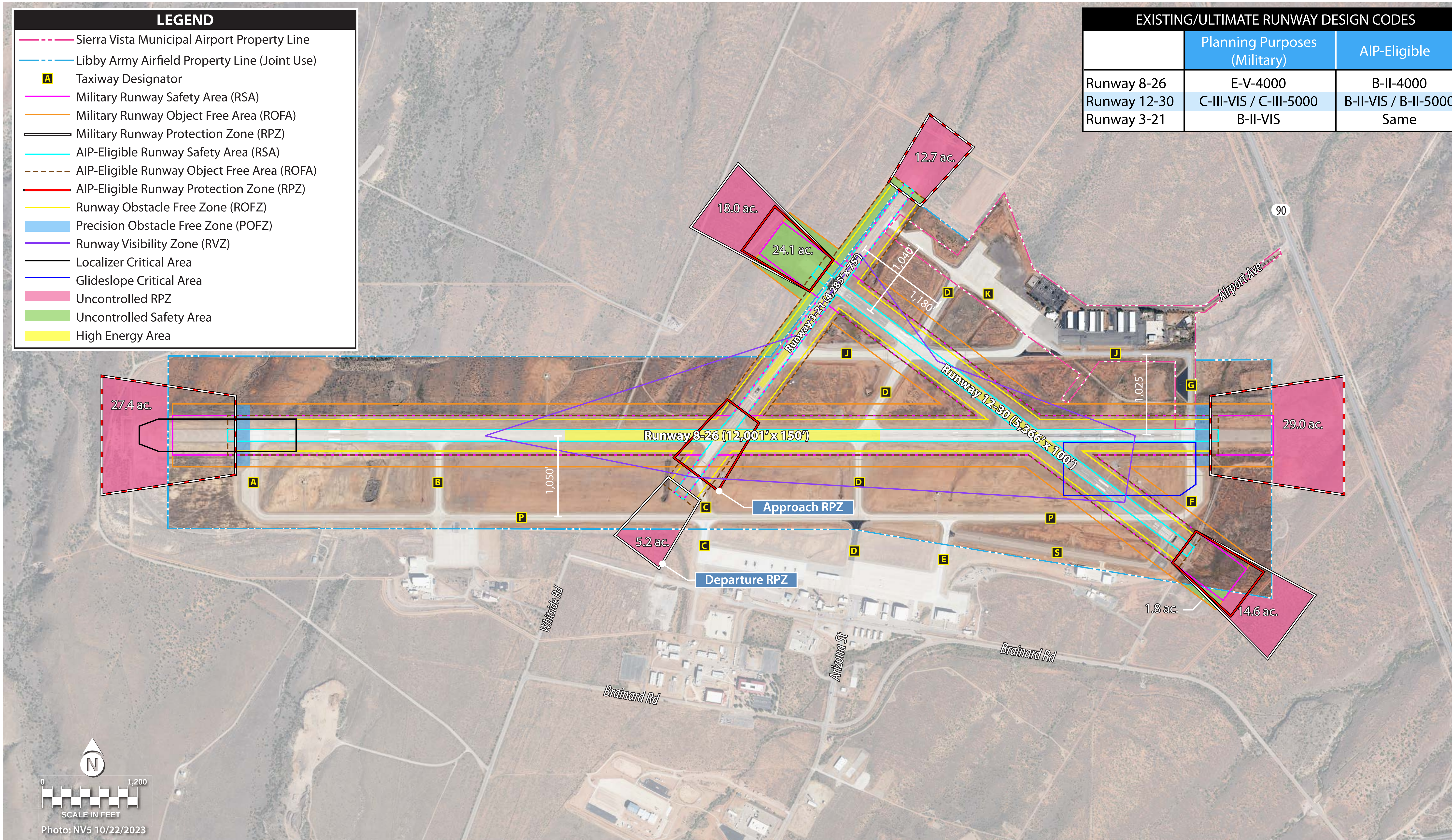
TABLE 3M | Runway Design Standards

	EXISTING/ULTIMATE				
	Runway 8-26 Planning Purposes (includes military)	**Runway 8-26** AIP Eligible	**Runway 12-30** Planning Purposes (includes military)	**Runway 12-30** AIP Eligible	**Runway 3-21**
Runway Design Code	E-V-4000	B-II-4000	C-III-VIS / C-III-5000	B-II-VIS/B-II-5000	B-II-VIS
Visibility Minimums	¾-mile	¾-mile	Visual / 1-mile	Visual / 1-mile	Visual
RUNWAY DESIGN					
Runway Width	150	75	100[1]	75	75
Shoulder Width	35	10	20[1]	10	10
Blast Pad Width	220	95	140[1]	95	95
Blast Pad Length	400	150	200	150	150
RUNWAY PROTECTION					
Runway Safety Area (RSA)					
Width	500	150	500	150	150
Length Beyond Departure End	1,000	300	1,000	300	300
Length Prior to Threshold	600	300	600	300	300
Runway Object Free Area (ROFA)					
Width	800	500	800	500	500
Length Beyond Departure End	1,000	300	1,000	300	300
Length Prior to Threshold	600	300	600	300	300
Runway Obstacle Free Zone (ROFZ)					
Width	400	400	400	400	400
Length Beyond End	200	200	200	200	200
Precision Obstacle Free Zone (POFZ)					
Width	800	800	N/A	N/A	N/A
Length Beyond End	200	200	N/A	N/A	N/A
Approach Runway Protection Zone (RPZ)					
Length	1,700	1,700	1,700	1,000	1,000
Inner Width	1,000	1,000	500	500	500
Outer Width	1,510	1,510	1,010	700	700
Departure Runway Protection Zone (RPZ)					
Length	1,700	1,000	1,700	1,000	1,000
Inner Width	500	500	500	500	500
Outer Width	1,010	700	1,010	700	700
RUNWAY SEPARATION					
Runway Centerline to:					
Holding Position	250[2]	200	250	200	200
Parallel Taxiway	450	240	400	240	240

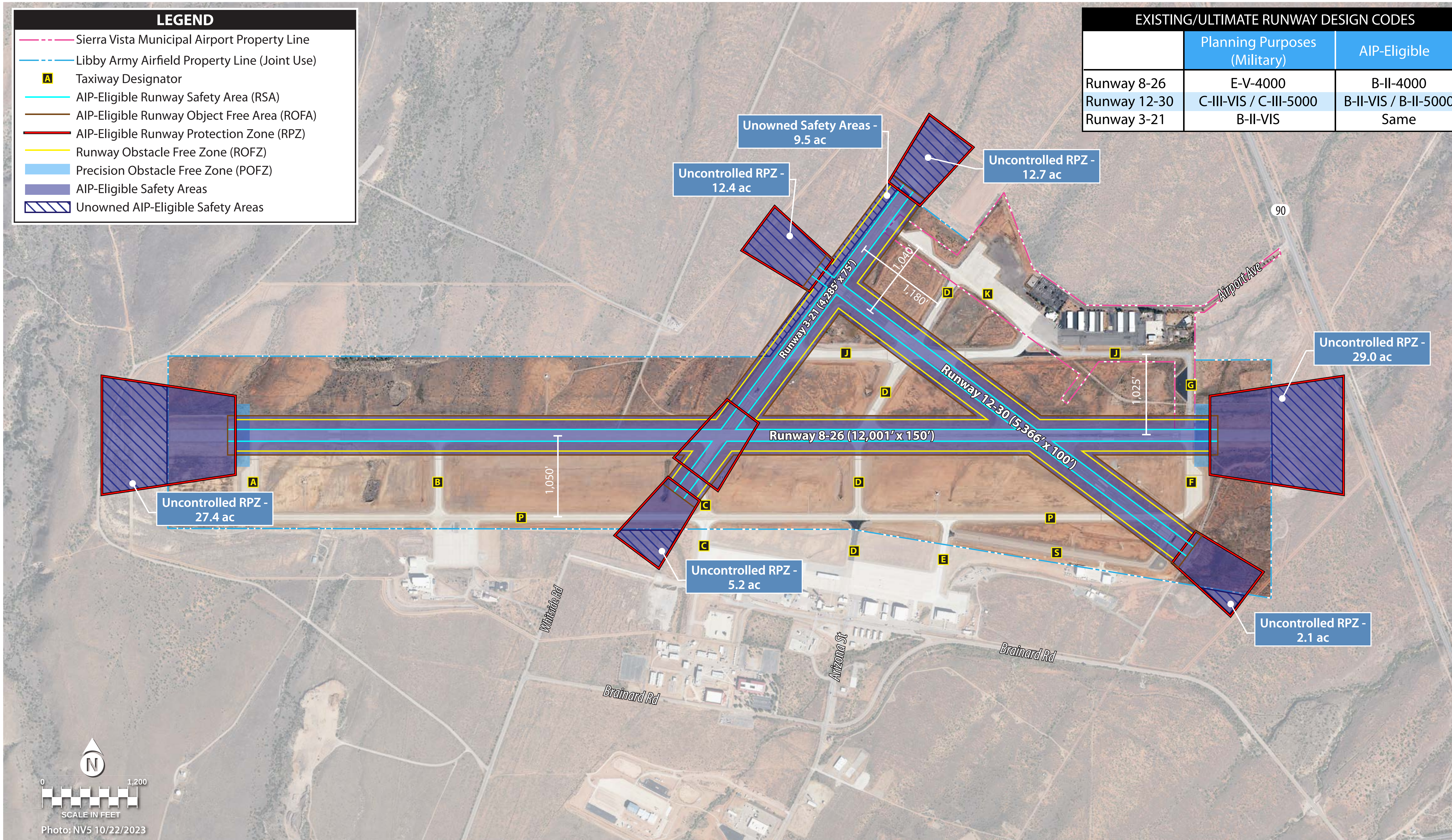
N/A = not applicable
Notes:
All dimensions are in feet.
[1] For airplanes with maximum certificated takeoff weights greater than 150,000 lbs., the standard runway width is 150 feet, the shoulder width is 25 feet, and the runway blast pad width is 200 feet.
[2] This distance is increased by one foot for every 100 feet above sea level.
Source: FAA AC 150/5300-13B, Airport Design

[4] While the U.S. Army has indicated that closure of Runway 3-21 is likely to occur, safety areas for this runway are still evaluated as part of this master plan, as this runway is currently active.

EXISTING/ULTIMATE RUNWAY DESIGN CODES	Planning Purposes (Military)	AIP-Eligible
Runway 8-26	E-V-4000	B-II-4000
Runway 12-30	C-III-VIS / C-III-5000	B-II-VIS / B-II-5000
Runway 3-21	B-II-VIS	Same



Note: Acreages depicted are approximate.



EXISTING/ULTIMATE RUNWAY DESIGN CODES	Planning Purposes (Military)	AIP-Eligible
Runway 8-26	E-V-4000	B-II-4000
Runway 12-30	C-III-VIS / C-III-5000	B-II-VIS / B-II-5000
Runway 3-21	B-II-VIS	Same

Note: Acreages depicted are approximate.

Runway Safety Area

The RSA is defined in FAA AC 150/5300-13B, *Airport Design*, as a "defined area surrounding the runway consisting of a prepared surface suitable for reducing the risk of damage to aircraft in the event of undershoot, overshoot, or excursion from the runway." The RSA is centered on the runway and dimensioned in accordance with the approach speed of the critical aircraft using the runway. The FAA requires the RSA to be cleared and graded, drained by grading or storm sewers, capable of accommodating the critical aircraft and fire and rescue vehicles, and free of obstacles not fixed by navigational purpose, such as runway edge lights or approach lights.

The FAA places high significance on maintaining adequate RSA at all airports. Under Order 5200.8 (effective October 1, 1999), the FAA established the *Runway Safety Area Program.* The Order states: "The objective of the Runway Safety Area Program is that all RSAs at federally obligated airports…shall conform to the standards contained in AC 150/5300-13, *Airport Design*, to the extent practicable." Each Regional Airports Division of the FAA is obligated to collect and maintain data on the RSAs for all runways and perform airport inspections.

Runway 8-26 | For existing/ultimate RDC E-V-4000 design standards on primary Runway 8-26, the FAA calls for the RSA to be 500 feet wide and extend 1,000 feet beyond the runway ends. The AIP-eligible RSA dimensions, which correspond to RDC B-II-4000, measure 150 feet wide and 300 feet beyond the runway ends. In both instances, the RSA associated with Runway 8-26 is fully contained within airport property and is generally free of obstructions. While the AIP-eligible RSA does not contain any obstructions, sparse vegetation is present within the E-V-4000 RSA east of the Runway 26 threshold.

Runway 12-30 | For Runway 12-30 in both the existing and ultimate C-III runway environment, the RSA dimensions are 500 feet wide, extending 1,000 feet beyond the runway ends. The AIP-eligible B-II RSA is smaller, measuring 150 feet wide and 300 feet beyond the runway ends. In both scenarios, a portion of the RSA extends beyond the airport property boundary. There is sparse vegetation within the C-III RSA, near the juncture of Runway 12, Runway 3-21, and Taxiway J.

Runway 3-21 | Runway 3-21 has an RDC of B-II-VIS in the existing and ultimate condition, for both military planning and AIP planning purposes. B-II design standards call for RSA dimensions to be 150 feet wide and extend 300 feet beyond the end of the runway. While the Runway 3-21 RSA is free from obstructions, it extends beyond the airport property along the northwest side of the runway and northeast of the Runway 21 threshold.

Runway Object Free Area

The ROFA is "a clear area limited to equipment necessary for air and ground navigation and provides wingtip protection in the event of an aircraft excursion from the runway." It is a two-dimensional ground area surrounding runways, taxiways, and taxilanes that is clear of objects, except objects with locations that are fixed by function (i.e., airfield lighting). The ROFA does not have to be graded and level like the RSA; instead, the primary requirement for the ROFA is that no object in the ROFA penetrates the lateral elevation of the RSA. The ROFA is centered on the runway, extending out in accordance with the critical aircraft utilizing the runway.

Runway 8-26 | For existing/ultimate RDC E-V-4000 design standards on primary Runway 8-26, the FAA calls for the ROFA to be 800 feet wide and extend 1,000 feet beyond the runway ends. The AIP-eligible ROFA dimensions, which correspond to RDC B-II-4000, measure 500 feet wide and 300 feet beyond the runway ends. In both instances, the ROFA associated with Runway 8-26 is fully contained within airport property but contains obstructions in the form of sparse vegetation at various points along the runway.

Runway 12-30 | For Runway 12-30 in the existing and ultimate C-III runway environment, the ROFA dimensions are 800 feet wide, extending 1,000 feet beyond the runway ends. The AIP-eligible B-II ROFA is 500 feet wide and extends 300 feet beyond the runway ends. Similar to the RSA, at these dimensions, a portion of the ROFA extends beyond the airport property boundary in both the military and the AIP-eligible planning scenarios. There is also vegetation present within the ROFA, primarily near the runway ends.

Runway 3-21 | Runway 3-21 has an RDC of B-II-VIS in the existing and ultimate condition, which calls for ROFA dimensions at 500 feet wide and extending 300 feet beyond the end of the runway. This applies for both military and AIP-eligible planning purposes. As with the RSA, the ROFA on the northwest side of the runway extends beyond the airport property, along with an additional area northeast of the Runway 21 threshold. The Runway 3-21 ROFA contains vegetation near the intersection with Runway 12-30 and Taxiway J.

Runway Obstacle Free Zone

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

For all runways that serve aircraft over 12,500 pounds, the ROFZ is 400 feet wide, centered on the runway, and extends 200 feet beyond the runway ends. This standard applies to all runways at FHU for both military and AIP-eligible planning purposes. In several locations on the airfield, sparse vegetation is located within the ROFZ, including near the Runway 26 threshold and near the intersection of Runways 12-30 and 3-21.

A precision obstacle free zone (POFZ) is applicable to any runway served by a vertically guided approach with landing minimums less than 250 feet or visibility less than ¾-mile. This safety area is in effect on runways that meet these criteria when an aircraft is on final approach within two miles of the runway threshold. When the POFZ is in effect, a wing of an aircraft holding on a taxiway may penetrate the POFZ; however, neither the fuselage nor the tail may infringe on the POFZ. The POFZ is 800 feet wide, centered on the runway, and extends from the runway's threshold for 200 feet. POFZ standards currently apply to Runways 8 and 16, as each is equipped with vertically guided instrument approaches with landing minimums less than 250 feet.

Runway Protection Zone

An RPZ is a trapezoidal area centered on the extended runway centerline beginning 200 feet from the end of the runway. This safety area is established to protect the end of the runway from airspace penetrations and incompatible land uses. The RPZ dimensions are based on the established RDC and the approach visibility minimums serving the runway. While the RPZ is intended to be clear of incompatible objects or land uses, some uses are permitted with conditions and other land uses are prohibited. According to AC 150/5300-13B, the following land uses are permissible within the RPZ:

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

In September 2022, the FAA published AC 150/5190-4B, *Airport Land Use Compatibility Planning*, which states that airport owner control over RPZs is preferred. Airport owner control over RPZs may be achieved through:

- Ownership of the RPZ property in fee simple;
- Possessing sufficient interest in the RPZ property through easements, deed restrictions, etc.;
- Possessing sufficient land use control authority to regulate land use in the jurisdiction containing the RPZ;
- Possessing and exercising the power of eminent domain over the property; or
- Possessing and exercising permitting authority over proponents of development within the RPZ (e.g., where the sponsor is a state).

AC 150/5190-4B further states that "control is preferably exercised through acquisition of sufficient property interest and includes clearing RPZ areas (and keeping them clear) of objects and activities that would impact the safety of people and property on the ground." The FAA recognizes that land ownership, environmental, geographical, and other considerations can complicate land use compatibility within RPZs; regardless, airport sponsors must comply with FAA grant assurances, including (but not limited to) Grant Assurance 21, Compatible Land Use. Sponsors are expected to take appropriate measures to "protect against, remove, or mitigate land uses that introduce incompatible development within RPZs." For proposed projects that would shift an RPZ into an area with existing incompatible land uses, such as a runway extension or construction of a new runway, the sponsor is expected to have or secure sufficient control of the RPZ, ideally through fee simple ownership. Where existing incompatible land uses are present, the FAA expects sponsors to "seek all possible opportunities to eliminate, reduce, or mitigate existing incompatible land uses" through acquisition, land exchanges, right-of-first-refusal to purchase, agreement with property owners on land uses, easements, or other such measures. These efforts should be revisited during master plan or airport layout plan (ALP) updates, and periodically thereafter, and should be documented to demonstrate compliance with FAA grant assurances. If new or proposed incompatible land uses impact an RPZ, the FAA expects the airport to take the above actions to control the property within the RPZ, along with adopting a strong public stance opposing the incompatible land uses.

For new incompatible land uses that result from a sponsor-proposed action (i.e., an airfield project, such as a runway extension, a change in the critical aircraft that increases the RPZ dimension, or lower minimums that increase the RPZ dimension), the airport sponsor is expected to conduct an alternatives evaluation. The intent of the alternatives evaluation is to "proactively identify a full range of alternatives and prepare a sufficient evaluation to be able to draw a conclusion about what is 'appropriate and reasonable.'" For incompatible development off-airport, the sponsor should coordinate with the FAA Airports District Office (ADO) as soon as the sponsor is aware of the development, with the alternatives evaluation conducted within 30 days of the sponsor's first awareness of the development within the RPZ. The following items are typically necessary in an alternatives evaluation:

- Sponsor's statement of the purpose and need of the proposed action (airport project, land use change, or development)
- Identification of any other interested parties and proponents
- Identification of any federal, state, and local transportation agencies involved
- Analysis of sponsor control of the land within the RPZ
- Summary of all alternatives considered, including:
    - Alternatives that preclude introducing the incompatible land use within the RPZ (e.g., zoning action, purchase, and design alternatives, such as implementation of declared distances, displaced thresholds, runway shift or shortening, raising minimums)
    - Alternatives that minimize the impact of the land use in the RPZ (e.g., rerouting a new roadway through less of the RPZ, etc.)
    - Alternatives that mitigate risk to people and property on the ground (e.g., tunnelling, depressing, and/or protecting a roadway through the RPZ, implementing operational measures to mitigate any risks, etc.)
- Narrative discussion and exhibits or figures depicting the alternative
- Rough order of magnitude cost estimates associated with each alternative, regardless of potential funding sources
- Practicability assessment based on the feasibility of the alternative in terms of cost, constructability, operational impacts, and other factors

Once the alternatives evaluation has been submitted to the ADO, the FAA will determine whether the sponsor has made an adequate effort to pursue and consider appropriate and reasonable alternatives. **The FAA will not approve or disapprove the airport sponsor's preferred alternative; rather, the FAA will only evaluate whether an acceptable level of alternatives analysis has been completed before the sponsor makes the decision to allow or not allow the proposed land use within the RPZ.**

In summary, the RPZ guidance published in September 2022 shifts the responsibility of protecting the RPZ to the airport sponsor. The airport sponsor is expected to take action to control the RPZ or demonstrate that appropriate actions have been taken. The decision to permit or disallow existing or new incompatible land uses within an RPZ is ultimately up to the airport sponsor, with the understanding that the sponsor still has grant assurance obligations, and the FAA retains the authority to review and approve or disapprove portions of the ALP that would adversely impact the safety of people and property within the RPZ.

RPZs have been further designated as approach and departure RPZs. The approach RPZ is a function of the AAC and approach visibility minimums associated with the approach runway end. The departure RPZ is a function of the AAC and departure procedures associated with the runway. For a particular runway end, the more stringent RPZ requirements (usually associated with the approach RPZ) will govern the property interests and clearing requirements the airport sponsor should pursue.

As shown on **Exhibit 3D**, each of the existing and ultimate RPZs associated with each runway end extend beyond the airport property line to varying degrees. Public roadways pass through the RPZs associated with Runways 8, 26, and 12. In terms of potentially incompatible land uses, State Highway 90 traverses the northeast corner of the Runway 26 RPZ, and an unnamed road passes through the RPZs at the ends of Runways 8 and 12. As mentioned previously, public roadways are generally considered incompatible uses within an RPZ; however, the FAA considers existing roads to be grandfathered so that no corrective action is necessary. It should be noted that a change to the runway environment, such as an extension or implementation of a new instrument approach procedure or lower visibility minimums, may negate the grandfathered condition.

SEPARATION STANDARDS

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

Runway/Taxiway Separation

The design standard for the separation between runways and parallel taxiways is a function of the critical aircraft and the instrument approach visibility minimum. The separation standard for primary Runway 8-26 in the existing/ultimate RDC E-V-4000 condition (military planning purposes) is 450 feet from the runway centerline to the parallel taxiway centerline. For Runway 12-30, the runway-to-taxiway separation standard in the existing and ultimate C-III conditions (military) is 400 feet. Runway 3-21, with an existing/ultimate RDC of B-II-VIS for both military and AIP planning purposes, has a separation standard of 240 feet. Each of the parallel and partial-parallel taxiways at FHU exceeds the design standard for both military and AIP planning purposes.

Hold Line Position Separation

Hold line position markings are placed on taxiways leading to runways. When instructed, pilots are to stop short of the holding position marking line. The separation between holding positions and the runway centerline is based on the runway's RDC. For Runway 8-26, with an existing and ultimate design standard of E-V-4000 (military planning purposes), the standard calls for holding positions to be set back 250 feet from the runway centerline; however, this distance is based on airports at sea level and is increased by one foot for every 100 feet above sea level, so the standard separation for hold lines serving Runway 8-26 is 297 feet, due to the airport's elevation of 4,719.1 feet MSL. In a B-II scenario, which applies to the AIP eligibility for this runway, the separation standard is 200 feet. Hold lines serving Runway 8-26 are currently situated at least 300 feet from the runway centerline and should be maintained in their existing placements.

The separation standards for holding positions serving Runway 12-30 are 250 feet for RDC C-III (military) and 200 feet for B-II (AIP-eligible); all holding positions prior to Runway 12-30 are separated by at least 250 feet from the runway centerline and should be maintained.

B-II design standards for Runway 3-21 call for holding positions to be separated from the runway by 200 feet. All taxiways serving this runway are marked with hold lines ranging from 200 to 250 feet, as separated from the runway, and should be maintained at these locations.

Aircraft Parking Area Separation

According to FAA AC 150/5300-13B, aircraft parking positions should be located to ensure that aircraft components (wings, tail, and fuselage) do not:

1. Conflict with the object free area for adjacent runway or taxiways:
   a. Runway object free area (ROFA)
   b. Taxiway object free area (TOFA)
   c. Taxilane object free area (TLOFA)

2. Violate any of the following aeronautical surfaces and areas:
   a. Runway approach or departure surface
   b. Runway visibility zone (RVZ)
   c. Runway obstacle free zone (ROFZ)
   d. Navigational aid equipment critical areas

Marked aircraft parking positions are only being evaluated for the general aviation portion of the airport. Currently, the only marked tiedowns are located on the hangar apron and the Air Evac apron. The hangar apron has 37 tiedowns and the Air Evac apron has four tiedowns. In their existing locations, each marked aircraft parking position at FHU is clear of the safety areas, as well as the aeronautical surfaces and areas detailed above.

TAXIWAYS

The design standards associated with taxiways are determined by the taxiway design group (TDG) or the ADG of the critical aircraft. As determined previously, the applicable existing/ultimate ADG for Runway 8-26 is V, based on military planning standards, and II for AIP-eligible planning; Runway 12-30 is ADG III for military planning and ADG II for AIP planning purposes; and Runway 3-21 should be planned to ADG II standards in both scenarios for the remainder of this runway's useful life.

Table 3N presents the various taxiway design standards related to the applicable ADGs for the taxiway system at FHU. The table also shows the taxiway design standards that are related to the TDG. The TDG standards are based on the main gear width (MGW) and cockpit to main gear (CMG) distance of the critical aircraft expected to use those taxiways. Different taxiway and taxilane pavements can and should be planned to the most appropriate TDG design standards, based on usage.

Generally, the military design standard for taxiways serving Runways 8-26 and 12-30 is TDG 5, which dictates a width of 75 feet. The exception to this is Taxiway G, which provides access to Runway 26 from the north, where general aviation facilities are located. This taxiway is designed to meet AIP-eligible TDG 3 standards, with a 50-foot width. This is also the case for Taxiway K and the eastern portion of Taxiway J, which are 50 feet wide and primarily serve general aviation users. All taxiways at FHU currently meet design standards for width, based on their usage (i.e., military or civilian), and these widths should be maintained throughout the planning period. Certain portions of the landside area that are utilized exclusively by small aircraft, such as the T-hangar areas, should adhere to TDG 1A/1B standards.

TABLE 3N | Taxiway Dimensions and Standards

STANDARDS BASED ON WINGSPAN	ADG II	ADG III	ADG V
Taxiway and Taxilane Protection			
Taxiway Safety Area Width (TSA)	79	118	214
Taxiway Object Free Area Width (TOFA)	124	171	285
Taxilane Object Free Area Width (TLOFA)	110	158	270
Taxiway and Taxilane Separation			
Taxiway Centerline to Parallel Taxiway Centerline	101.5	144.5	249.5
Taxiway Centerline to Fixed or Moveable Object	62	85.5	142.5
Taxilane Centerline to Parallel Taxilane Centerline	94.5	138	242
Taxilane Centerline to Fixed or Moveable Object	55	79	135
Wingtip Clearance			
Taxiway Wingtip Clearance (feet)	22.5	26.5	35.5
Taxilane Wingtip Clearance (feet)	15.5	20	28
STANDARDS BASED ON TDG	**TDG 1A/B**	**TDG 3**	**TDG 5**
Taxiway Width Standard	25	50	75
Taxiway Edge Safety Margin	5	10	14
Taxiway Shoulder Width	10	20	30

ADG = airplane design group
TDG = taxiway design group

Note:
All dimensions are in feet.

Source: FAA AC 150/5300-13B, Airport Design

Exhibit 3E depicts the AIP-eligible TOFA and TLOFA associated with taxiway and taxilane pavements. These are based on ADG II standards in the existing and ultimate conditions, with the exception of the

TLOFA between hangars, which is based on ADG I standards. The TOFA width is 124 feet, while the TLOFA on the aprons is 110 feet wide. The TLOFA for taxilanes serving the linear box hangars is 79 feet wide. Like the ROFA, these areas should be cleared of objects and parked aircraft, except for objects needed for air navigation or aircraft ground maneuvering purposes.

The TOFAs associated with the airfield taxiways are clear of obstructions. There are potential penetrations to the TLOFAs associated with the general aviation apron and hangar areas, as shown on **Exhibit 3E**. An ADG II TLOFA (110 feet wide) is applied to the centerlines on the apron (shown in green shading on the exhibit). Several of the linear box hangars are located within the TLOFA, which is a non-standard condition. An ADG I TLOFA (79 feet wide) is applied to the taxilanes serving the linear box hangars. This TLOFA has a standard width of 79 feet. Several of these hangars have less than 79 feet of separation between them, resulting in a potential penetration to the TLOFA; however, taxilanes can be designed based on the types of aircraft using that pavement, meaning that a smaller TLOFA standard could apply, depending on the type(s) of aircraft using those taxilanes.

Taxiway and Taxilane Design Considerations

FAA AC 150/5300-13B, Airport Design, provides guidance on recommended taxiway and taxilane layouts to enhance safety by avoiding runway incursions. A runway incursion is defined as "any occurrence at an airport involving the incorrect presence of an aircraft, vehicle, or person on the protected area of a surface designated for the landing and takeoff of aircraft." The following is a list of the taxiway design guidelines and the basic rationale behind each recommendation included in the current AC, as well as previous FAA safety and design recommendations.

1. **Taxiing Method**: Taxiways are designed for cockpit-over-centerline taxiing with pavement that is wide enough to allow a certain amount of wander. On turns, sufficient pavement should be provided to maintain the edge safety margin from the landing gear. When constructing new taxiways, existing intersections should be upgraded to eliminate judgmental oversteering, which is when a pilot must intentionally steer the cockpit outside the marked centerline to ensure the aircraft remains on the taxiway pavement.

2. **Curve Design**: Taxiways should be designed so that the nose gear steering angle is no more than 50 degrees, which is the generally accepted value to prevent excessive tire scrubbing.

3. **Three-Path Concept**: To maintain pilot situational awareness, taxiway intersections should provide a pilot with a maximum of three choices of travel. Ideally, these are right, left, and a continuation straight ahead.

4. **Channelized Taxiing**: To support visibility of airfield signage, taxiway intersections should be designed to meet standard taxiway width and fillet geometry.

5. **Designated Hot Spots and Runway Incursion Mitigation (RIM) Locations**: A hot spot is a location on the airfield with elevated risk of a collision or runway incursion. Mitigation measures should be prioritized for areas the FAA designates as hot spots or RIM locations.

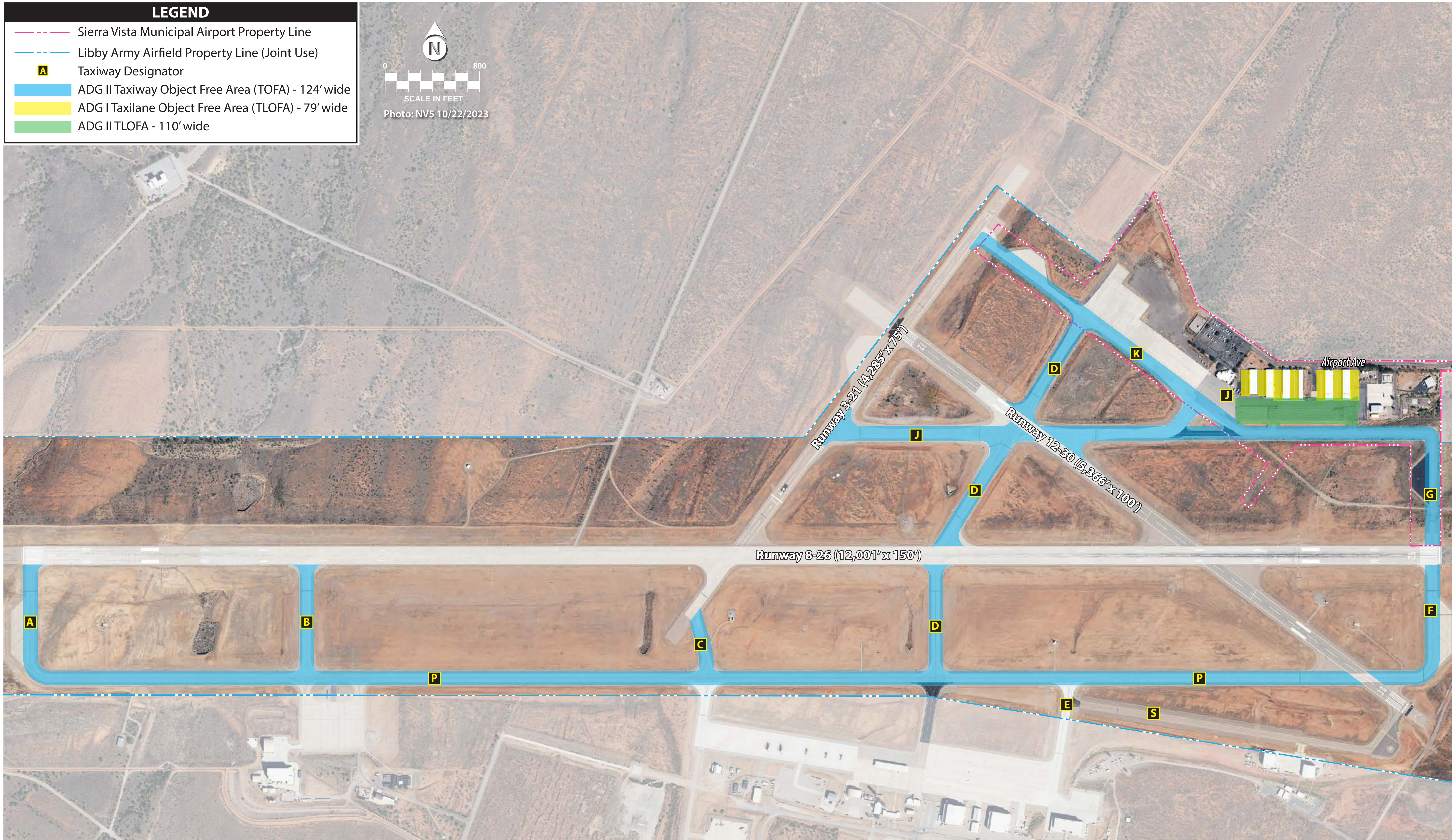


Exhibit 3E
AIP-ELIGIBLE TAXIWAY/TAXILANE OBJECT FREE AREAS

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6. **Intersection Angles**: Design turns to be 90 degrees wherever possible. For acute-angle intersections, standard angles of 30, 45, 60, 120, 135, and 150 degrees are preferred.

7. **Runway Incursions**: Design taxiways to reduce the probability of runway incursions.

   - *Increase Pilot Situational Awareness*: A pilot who knows where he/she is on the airport is less likely to improperly enter a runway. Complexity leads to confusion. Keep taxiway systems simple by using the three-path concept.
   - *Avoid Wide Expanses of Pavement*: Wide pavements require placement of signs far from a pilot's eye. This is especially critical at runway entrance points. Where a wide expanse of pavement is necessary, avoid direct access to a runway.
   - *Limit Runway Crossings*: The taxiway layout can reduce the opportunity for human error. The benefits are twofold: through a simple reduction in the number of occurrences and a reduction in air traffic controller workload.
   - *Avoid High-Energy Intersections*: These are intersections in the middle thirds of runways. By limiting runway crossings to the first and last thirds of the runway, the portion of the runway where a pilot can least maneuver to avoid a collision is kept clear.
   - *Increase Visibility*: Right-angle intersections between both taxiways and runways provide the best visibility. Acute-angle runway exits provide greater efficiency in runway usage but should not be used as runway entrance or crossing points. A right-angle turn at the end of a parallel taxiway is a clear indication of approaching a runway.
   - *Avoid Dual Purpose Pavements*: Runways used as taxiways and taxiways used as runways can lead to confusion. A runway should always be clearly identified as a runway, and only a runway.
   - *Direct Access*: Do not design taxiways to lead directly from an apron to a runway. Such configurations can lead to confusion when a pilot typically expects to encounter a parallel taxiway.
   - *Hot Spots*: Confusing intersections near runways are more likely to contribute to runway incursions. These intersections must be redesigned when the associated runway is subject to reconstruction or rehabilitation. Other hot spots should be corrected as soon as practicable.

8. **Runway/Taxiway Intersections**

   - *Right Angle*: Right-angle intersections are the standard for all runway/taxiway intersections, except where there is a need for an acute-angled exit. Right-angle taxiways provide the best visual perspective to a pilot approaching an intersection with the runway to observe aircraft in both the left and right directions. They also provide optimal orientation of the runway holding position signs so they are visible to pilots.
   - *Acute Angle*: Acute angles should not be larger than 45 degrees from the runway centerline. A 30-degree taxiway layout should be reserved for high-speed exits. The use of multiple intersecting taxiways with acute angles creates pilot confusion and improper positioning of taxiway signage. The construction of high-speed exits is typically only justified for runways with regular use by jet aircraft in approach categories C and above.

- *Large Expanses of Pavement*: Taxiways must never coincide with the intersection of two runways. Taxiway configurations with multiple taxiway and runway intersections in a single area create large expanses of pavement, making it difficult to provide proper signage, marking, and lighting.

9. **Taxiway/Runway/Apron Incursion Prevention**: Apron locations that allow direct access to a runway should be avoided. Increase pilot situational awareness by designing taxiways in a manner that forces pilots to consciously make turns. Taxiways originating from aprons and forming a straight line across runways at mid-span should be avoided.
   - *Wide Throat Taxiways*: Wide throat taxiway entrances should be avoided. Such large expanses of pavement may cause pilot confusion and make lighting and marking more difficult.
   - *Direct Access from Apron to a Runway*: Avoid taxiway connectors that cross over a parallel taxiway and directly onto a runway. Consider a staggered taxiway layout or a no-taxi island that forces pilots to make a conscious decision to turn.
   - *Apron to Parallel Taxiway End*: Avoid direct connection from an apron to a parallel taxiway at the end of a runway.

The taxiway system at FHU generally provides for the efficient movement of aircraft, and there are no FAA-designated hot spots at the airport; however, several non-standard taxiway conditions do exist. These are identified on **Exhibit 3F** and are detailed below:

- The intersection of Runway 12-30 and Taxiways D and J does not follow the three-path concept
- There is direct access from the apron to Runway 12-30 via Taxiway D
- Taxiway D crosses Runway 8-26 in the high-energy area

Potential solutions to correct these issues will be examined in the alternatives chapter. Analysis in the next chapter will also consider improvements that could be implemented on the airfield to minimize runway incursion potential, improve efficiency, and conform to FAA standards for taxiway design.

Taxilane Design Considerations

Taxilanes are distinguished from taxiways in that they do not provide access directly to or from the runway system. Taxilanes typically provide access to hangar areas and can be planned to varying design standards, depending on the type(s) of aircraft utilizing the taxilane, as described previously.

NAVIGATIONAL AND APPROACH AIDS

Navigational aids are devices that provide pilots with guidance and position information when utilizing the runway system. Electronic and visual guidance to arriving aircraft enhance the safety and capacity of the airfield. Such facilities are vital to the success of an airport and provide additional safety to pilots and passengers using the air transportation system. While instrument approach aids are especially helpful during poor weather, they are often used by pilots conducting flight training and operating larger aircraft when visibility is good.

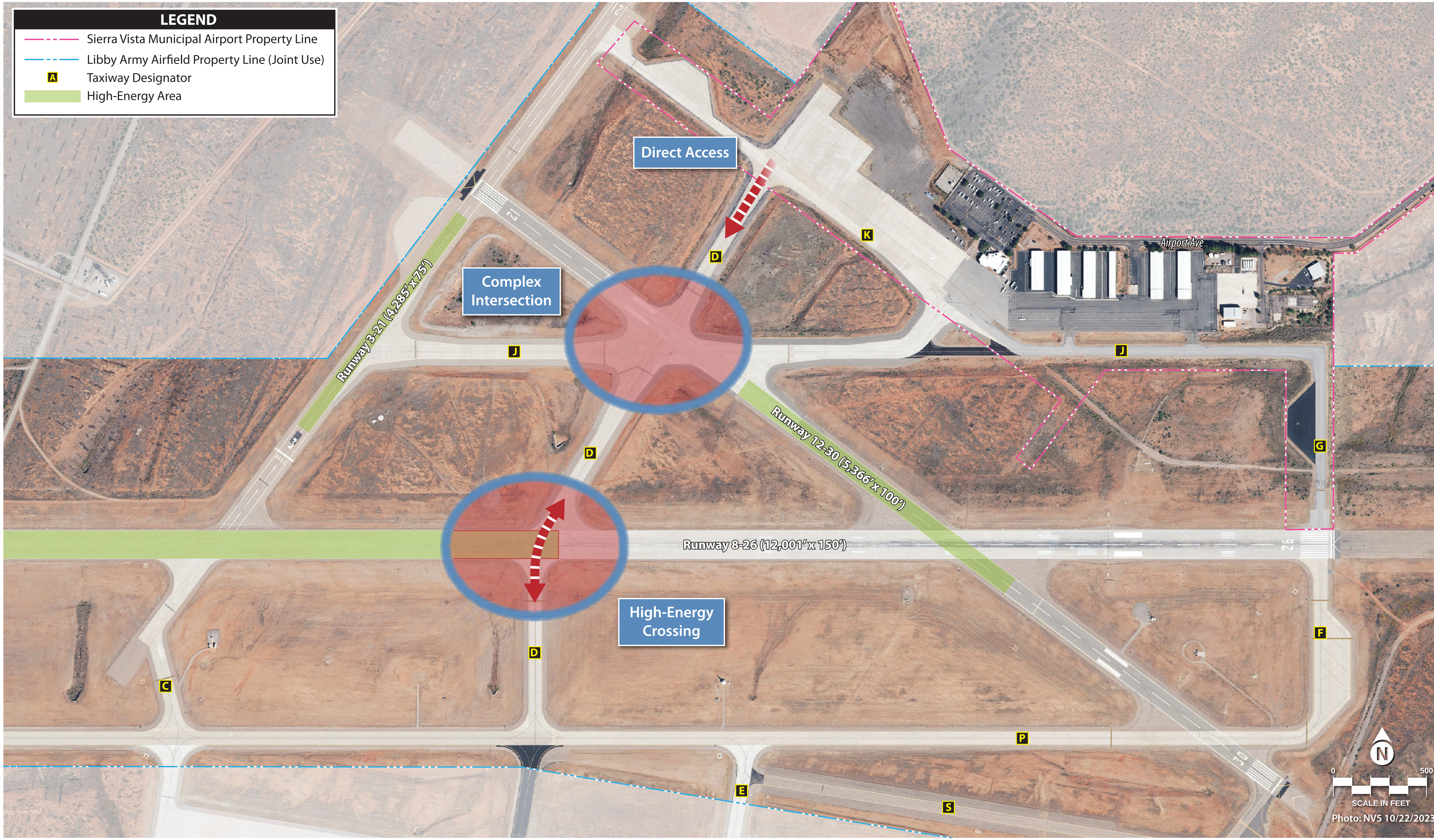

Exhibit 3F
NON-STANDARD TAXIWAY CONDITIONS

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Instrument Approach Aids

FHU has four published instrument approaches. Runway 26 is equipped with an instrument landing system (ILS) approach with visibility minimums down to ¾-mile, as well as a lateral navigation (LNAV) global positioning system (GPS) approach with one-mile minimums for Categories A and B aircraft and 1¼-mile minimums for Categories C and D aircraft. A very high omnidirectional range (VOR) approach is also available to Runway 26. A localizer performance with vertical guidance (LPV) via an area navigation (RNAV) GPS instrument approach is available to Runway 8, with visibility minimums down to ¾-mile. Tactical air navigation system (TACAN) approaches are available to military operators on Runways 8 and 26.

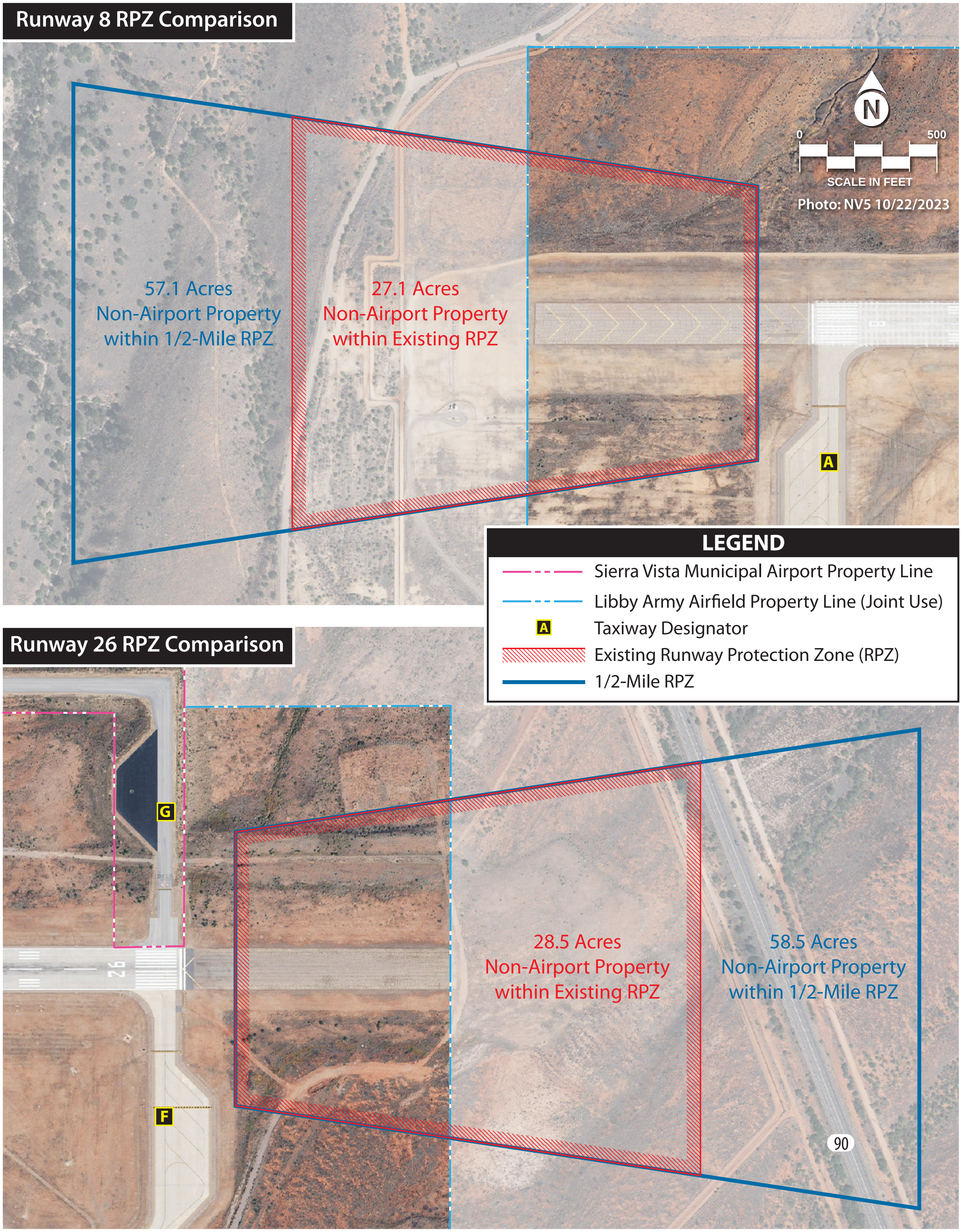
These approaches are considered adequate for primary Runway 8-26 at this time; however, if a reduction in the visibility minimums to not below ½-mile were implemented, it would result in an increase to the RPZ dimensions for the affected runway. **Exhibit 3G** presents a comparison of the RPZs currently serving Runways 8 and 26 versus what they would be if visibility minimums not lower than ½-mile were to be implemented. As can be seen in the graphic, the RPZs would increase significantly in size, resulting in additional areas of uncontrolled property and encompassing a larger portion of State Highway 90. A full approach lighting system would also be necessary to support the new approach, which would require additional property acquisition. As with previous considerations pertaining to the runway system at FHU, this would fall under the purview of the U.S. Army, and it is unlikely the FAA would assist in funding the development of an improved instrument approach procedure that would require additional property and ground-based infrastructure.

Runway 12-30 is currently a visual runway with no published instrument approach procedures. For future planning purposes, the alternatives will consider the possible implementation of an instrument approach procedure with visibility minimums not lower than one mile. This would not alter the size of the existing RPZs associated with Runway 12-30.

Visual Approach Aids

In most instances, the landing phase of any flight must be conducted in visual conditions. To provide pilots with visual guidance information during landings to the runway, electronic visual approach aids are commonly provided at airports. Each end of primary Runway 8-26 and Runway 12-30 is currently equipped with a four-box precision approach path indicator (PAPI-4), which should be maintained throughout the planning period.

Runway end identification lights (REILs) are flashing lights located at the runway threshold end that facilitate rapid identification of the runway end at night and during poor visibility conditions. REILs provide pilots with the ability to identify the runway thresholds and distinguish the runway end lighting from the other lighting on the airport and in the approach areas. The FAA indicates that REILs should be considered for all lighted runway ends not planned for more sophisticated approach lighting systems. None of the runways at FHU are equipped with REILs. Consideration should be given to the inclusion of these systems on Runways 8-26 and 12-30.


Runway 8 RPZ Comparison
57.1 Acres
Non-Airport Property
within 1/2-Mile RPZ
27.1 Acres
Non-Airport Property
within Existing RPZ
N
0
500
SCALE IN FEET
Photo: NV5 10/22/2023
A
LEGEND
Sierra Vista Municipal Airport Property Line
Libby Army Airfield Property Line (Joint Use)
A Taxiway Designator
Existing Runway Protection Zone (RPZ)
1/2-Mile RPZ
Runway 26 RPZ Comparison
G
26
F
28.5 Acres
Non-Airport Property
within Existing RPZ
58.5 Acres
Non-Airport Property
within 1/2-Mile RPZ
90

Runway 3-21 is not equipped with any visual approach aids. As this runway is planned to be decommissioned at some time in the future, the master plan will not consider the addition of these systems to this runway.

Weather Reporting Aids

FHU has six lighted wind cones located at various points on the airfield, as well as three unlit wind cones, as previously identified in Chapter One on Exhibit 1B. Wind cones provide information to pilots regarding wind speed and direction, and these should be maintained through the planning period. A segmented circle is often co-located with an airport's primary wind cone. The segmented circle consists of a system of visual indicators designed to provide traffic pattern information to pilots. FHU does not have a segmented circle, and consideration should be given to installing one.

The airport is also equipped with a fixed base weather observation system (AN/FMQ-23), which provides detailed weather conditions to pilots operating in the area. Previously, the airport was equipped with an automated weather observation station (AWOS) near the intersection of Runway 12-30 and 3-21; this system is nonfunctional. Consideration should be given to restoring the functionality of the AWOS, as well as the potential for additional weather-reporting equipment, as deemed necessary.

AIRFIELD LIGHTING, MARKING, AND SIGNAGE

Several lighting and pavement marking aids serve pilots using the airport. These aids assist pilots in locating the airport and runway at night or in poor visibility conditions. They also serve aircraft navigating the airport environment on the ground when transitioning to/from aircraft parking areas to the runway.

Airport Identification Lighting

FHU's rotating beacon is located southeast of the airport off Brainard Road, approximately 1,300 feet from the Runway 30 threshold. The condition of the beacon is unknown. The beacon should be maintained in its current location.

Runway and Taxiway Lighting

All runways are equipped with runway lighting systems. Runway 8-26 is equipped with high intensity runway lighting (HIRL), while Runways 12-30 and 3-21 have medium intensity runway lighting (MIRL). These systems are adequate and should be maintained. All taxiways at FHU are equipped with medium intensity taxiway lighting (MITL), with the exception of Taxiways P and S, which are used primarily by military aircraft. The existing taxiway lighting systems are adequate and should be maintained; however, consideration should be given to installing MITL on Taxiways P and S. Planning should also consider expansion of both runway and taxiway lighting systems if/when new pavements are constructed.

Airfield Signs

Airfield identification signs assist pilots in identifying their locations on the airfield and directing them to their desired locations. FHU is equipped with lighted runway and taxiway designation, routing/directional, holding position, and runway exit signage. All of these signs should be maintained throughout the planning period and incandescent bulbs should be upgraded to light emitting diode (LED) systems when replacement is necessary. LEDs have many advantages, including lower energy consumption, longer lifespan, increased durability, reduced size, greater reliability, and faster switching. While a larger initial investment is required up front, the energy savings and reduced maintenance costs will outweigh any additional costs in the long run.

Pavement Markings

Runway markings are typically designed to the type of instrument approach available on the runway. FAA AC 150/5340-1K, *Standards for Airport Markings*, provides guidance necessary to design airport markings. Runway 8-26 is equipped with precision markings, while Runway 12-30 has non-precision markings and Runway 3-21 has basic markings. These markings should be maintained throughout the planning period.

A summary of the AIP-eligible airside facility needs at FHU is presented on **Exhibit 3H**.

LANDSIDE FACILITY REQUIREMENTS

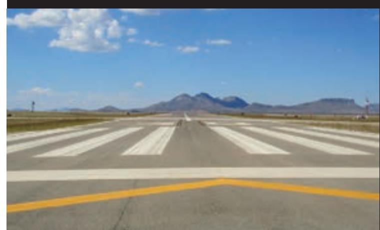
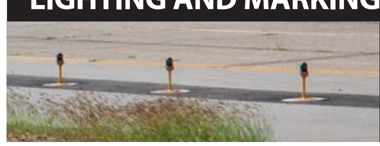
Landside facilities are those necessary for the handling of aircraft and passengers while on the ground. These facilities provide the essential interface between the air and ground transportation modes. The capacity of the various components of each element was examined in relation to projected demand to identify future landside facility needs. At FHU, specifically Sierra Vista Municipal Airport,[5] this includes components for general aviation needs, such as:

- General aviation terminal facilities and auto parking
- Aircraft storage hangars
- Aircraft parking aprons
- Airport support facilities

Projections made for aircraft storage hangars, aircraft parking aprons, and marked parking positions are based on the number of aircraft currently based and forecast to base on the airport property over the 20-year planning horizon. Terminal facilities, auto parking, and other airport support facilities are based on the number of annual operations projected to occur over the planning period.

In addition to landside facility requirements, potential non-aeronautical land uses will also be evaluated in subsequent chapters. These are portions of airport property that are suitable for non-aviation purposes and can generate revenue for the airport, such as agriculture or industrial uses. While airport

[5] Landside needs are only considered for the general aviation facilities at FHU.

		EXISTING	ULTIMATE	EXISTING	ULTIMATE	EXISTING	ULTIMATE
RUNWAYS		**8-26**	**8-26**	**12-30**	**12-30**	**3-21**	**3-21**
	Runway Design Code (RDC)	B-II-4000	Same	B-II-VIS	B-II-5000	B-II-VIS	Close Runway
	Dimensions	12,001' x 150'	Maintain	5,366' x 100'	Maintain	4,285' x 75'	
	Pavement Strength	75,000 lbs S | 200,000 lbs D 450,000 lbs 2D | 700,000 2D2	Maintain	46,000 lbs S | 106,000 lbs D 137,000 lbs 2D | 172,000 2D2	Consider extension; maintain width	N/A	
	Blast Pads	1,000' x 150'	Maintain	500' x 150' (Runway 12) 200' x 100' (Runway 30)	Maintain	250' x 125' (Runway 3) 475' x 125' (Runway 21)	
SAFETY AREAS							
	Runway Safety Area (RSA)	Standard RSA	Maintain	Portion of RSA unowned	Acquire property within RSA	Portion of RSA unowned	
	Runway Object Free Area (ROFA)	Obstructions (vegetation) in ROFA	Remove obstructions	Portion of ROFA unowned and contains obstructions (vegetation)	Acquire property within ROFA and remove obstructions	Portion of ROFA unowned and contains obstructions (vegetation)	
	Runway Obstacle Free Zone (ROFZ)	Obstructions (vegetation) in ROFZ	Remove obstructions	Obstructions (vegetation) in ROFZ	Remove obstructions	Obstructions (vegetation) in ROFZ	
	Runway Protection Zone (RPZ)	Portion of RPZs unowned and contains potentially incompatible land uses	Consider property acquisition of unowned portions & mitigation of potential incompatible use	Portion of RPZs unowned and contains potentially incompatible land uses	Consider property acquisition of unowned portions & mitigation of potential incompatible use	Portion of RPZs unowned	
TAXIWAYS							
	Design Group	3	Maintain	3	Maintain	3	
	Parallel Taxiway	Taxiway P (full-length parallel)	Maintain	Taxiway K (partial parallel)	Maintain	Taxiway D (partial parallel)	
	Parallel Taxiway Separation from Runway	1,050'	Maintain	1,040'	Maintain	1,180'	
	Widths	50'-75'	Maintain	50'-75'	Maintain if feasible	50'-75'	
	Holding Position Separation	Minimum 300'	Maintain	Minimum 250'	Maintain	Minimum 200'	
	Notable Conditions	High-energy crossing (Taxiway D)	Consider corrective measures	Confusing intersection between Runway 12-30 and Taxiways D and J; direct access from apron via Taxiway D	Consider corrective measures	None	
NAVIGATIONAL AND WEATHER AIDS							
	Instrument Approaches	Runway 8 - LPV; Runway 26 - ILS, LNAV, VOR	Maintain	Visual only	Consider GPS approach	Visual only	
	Weather Aids	AN/FMQ-23; AWOS, wind cones, rotating beacon	Maintain equipment				
	Approach Aids	PAPI-4	Maintain PAPIs; consider installation of REILs	PAPI-4	Maintain PAPIs; consider installation of REILs	None	
LIGHTING AND MARKING							
	Runway Lighting	HIRL	Maintain	MIRL	Maintain	MIRL	
	Runway Marking	Precision	Maintain	Non-precision	Maintain	Basic	
	Taxiway Lighting	MITL (except Taxiways P and S)	Maintain	MITL	Maintain	MITL	

Note: The standards referenced above apply only to the AIP-eligible RDC for each runway.

KEY:

AWOS - Automated Weather Observation Station
GPS - Global Positioning System
HIRL - High Intensity Runway Edge Lighting
ILS - Instrument Landing System
LNAV - Lateral Navigation
LPV - Localizer Performance with Vertical Guidance
MIRL - Medium Intensity Runway Lighting
MITL - Medium Intensity Taxiway Lighting
PAPI - Precision Approach Path Indicator
REIL - Runway End Identification Lights
RVZ - Runway Visibility Zone
VOR - Very High Frequency Omnidirectional Range
N/A - Not Applicable

Exhibit 3H
AIP-ELIGIBLE AIRSIDE FACILITY REQUIREMENTS

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property is generally subject to AIP grant assurances, an airport can request a release from aeronautical federal obligations for certain areas of property that are not necessary for aviation uses. These requests are facilitated under the *FAA Reauthorization Act of 2024*, Section 743, which governs the FAA's authority over non-aeronautical development. There is also potential opportunity for Sierra Vista Municipal Airport to acquire land adjacent to the airport for future development; this will be explored in Chapter Four.

GENERAL AVIATION TERMINAL SERVICES

The terminal facilities at an airport often provide corporate officials and visitors with their first impression of the community. General aviation terminal facilities at an airport provide space for passenger waiting, a pilots' lounge, flight planning, concessions, management, storage, and many other various needs. This space is not necessarily limited to a single, separate terminal building, but can include space offered by fixed base operators (FBOs) and other specialty operators for these functions and services. At Sierra Vista Municipal Airport, general aviation terminal services are provided in the terminal building, which includes a lobby area, administrative office space, a pilots' lounge, a flight planning room, and restrooms. Because the airport previously offered scheduled passenger flights, the terminal also includes features typically found at commercial airports, such as ticketing, a baggage claim, and rental car counters.

The methodology used in estimating general aviation terminal facility needs was based on the number of airport users expected to utilize general aviation facilities during the design hour. This methodology is a general airport planning practice and is not considered exacting, as each airport terminal serves unique functions. The space requirements for terminal building facilities were based on providing 125 square feet (sf) per design hour itinerant passenger. A multiplier of 3.0 in the short term, increasing to 4.0 in the long term, was also applied to terminal facility needs to better determine the number of passengers associated with each itinerant aircraft operation. This increasing multiplier indicates an expected increase in larger aircraft operations throughout the long term. These operations typically support larger turboprop and jet aircraft, which can accommodate an increasing passenger load factor. Such is the case at Sierra Vista Municipal Airport, where an increasing number of turbine operations are anticipated.

Table 3P outlines the space requirements for general aviation terminal services at Sierra Vista Municipal Airport through the long-term planning period. The amount of space currently offered in the terminal building is approximately 9,500 sf. As shown in the table, this space is adequate through the long-term planning period.

TABLE 3P | General Aviation Terminal Area Facilities

	Currently Available	Short-Term Need	Intermediate-Term Need	Long-Term Need
Terminal Building (sf)	9,500	1,100	1,400	1,800
General Aviation Design Hour Passengers	–	9	11	14
Passenger Multiplier	–	3.0	3.5	4.0
Visitor/Tenant Vehicle Parking	298	62	72	80

Source: Coffman Associates analysis

General aviation vehicle parking demands have also been determined for the airport. Space determinations for passengers were based on an evaluation of existing airport use, as well as standards set forth to help calculate projected terminal facility needs. There are currently 298 marked individual vehicle spaces provided at the airport, the majority of which are located at the terminal building. As can be seen in the table, vehicle parking is another segment that is adequate throughout the planning period; nevertheless, proposed hangar facility layouts will include dedicated vehicle parking for tenants, as will be illustrated in the next chapter.

AIRCRAFT HANGARS

Utilization of hangar space varies as a function of local climate, security, and owner preference. The trend in general aviation aircraft is toward more sophisticated (and consequently, more expensive) aircraft; therefore, many aircraft owners prefer enclosed hangar space, as opposed to outside tiedowns.

The demand for aircraft storage hangars is dependent on the number and type(s) of aircraft expected to be based at the airport in the future. For planning purposes, it is necessary to estimate hangar requirements based on forecast operational activity; however, hangar development should be based on actual demand trends and financial investment conditions.

While most aircraft owners prefer enclosed aircraft storage, some will still use outdoor tiedown spaces, usually due to lack of available hangar space, high hangar rental rates, or operational needs; therefore, enclosed hangar facilities do not necessarily need to be planned for each based aircraft.

Hangar types vary greatly in size and function. T-hangars, box hangars, and shade hangars are popular with aircraft owners who need to store individual private aircraft. These hangars often provide single spaces within a larger structure or in standalone portable buildings. There is approximately 87,300 sf of linear box storage space at the airport. For determining future aircraft storage needs, a planning standard of 1,200 sf per aircraft is utilized for this type of hangar.

Executive box hangars are open-space facilities with no interior supporting structure. These hangars can vary in size from 1,500 and 2,500 sf to nearly 10,000 sf. They are typically able to house single-engine, multi-engine, turboprop, and jet aircraft, as well as helicopters. Executive box hangar space at Sierra Vista Municipal Airport is estimated at 5,000 sf and consists of a single hangar. For future planning, a standard of 3,000 sf per turboprop, 5,000 sf per jet, and 1,500 sf per helicopter is utilized for executive box hangars.

Conventional hangars are large open-space facilities with no supporting interior structure. These hangars provide for bulk aircraft storage and are often utilized by airport businesses, such as FBOs or aircraft maintenance operators. Conventional hangars are generally larger than executive box hangars and can range in size from 10,000 sf to more than 20,000 sf. Often, a portion of a conventional hangar is utilized for non-aircraft storage needs, such as maintenance or office space. There are no conventional hangars at Sierra Vista Municipal Airport. For planning purposes, the same aircraft sizing standards utilized for executive hangars are also utilized for conventional hangars.

Future hangar requirements for the airport are summarized in **Table 3Q**. While most based aircraft owners prefer enclosed hangar space, it is assumed that some will use tiedowns on the apron. The analysis shows that future hangar requirements indicate a potential need for more than 52,000 sf of new hangar storage capacity through the long-term planning period. This includes a mixture of hangar types, with the largest need projected in the executive/conventional hangar category. Due to the projected increase in based aircraft, the existing demand for hangar space, annual general aviation operations, and hangar storage needs, facility planning will consider additional hangars at the airport. It is expected that the aircraft storage hangar requirements will continue to be met through a combination of hangar types.

TABLE 3Q | Aircraft Hangar Requirements

	Currently Available	Short-Term Need	Intermediate-Term Need	Long-Term Need	Difference
Total Based Aircraft	61	64	68	75	+14
Hangar Area Requirements					
Linear Box/T-Hangar Area (sf)	87,300	90,900	95,400	96,900	+9,600
Executive Box/Conventional Hangar Area (sf)	5,000	21,000	35,300	47,800	+42,800
Total Hangar Area (sf)	**92,300**	**111,900**	**130,700**	**144,700**	**+52,400**

Source: Coffman Associates analysis

It should be noted that hangar requirements are general in nature and are based on the aviation demand forecasts. The actual need for hangar space will further depend on the usage within the hangars. For example, some hangars may be utilized entirely for non-aircraft storage, such as maintenance, but they have an aircraft storage capacity from a planning standpoint; therefore, the needs of an individual user may differ from the calculated space necessary.

AIRCRAFT PARKING APRONS

The aircraft parking apron is an expanse of paved area intended for aircraft parking and circulation. Typically, a main apron is centrally located near the airside entry point, such as the terminal building or FBO facility. Ideally, the main apron is large enough to accommodate transient airport users, as well as a portion of locally based aircraft. Smaller aprons are often available adjacent to FBO or specialty aviation service operator (SASO) hangars and at other locations around the airport. The apron layout at Sierra Vista Municipal Airport generally follows this typical pattern, with aprons adjacent to the terminal and hangar facilities. A third apron (Air Evac) provides additional dedicated aircraft parking space.

To determine future apron needs, the FAA-recommended planning criterion[6] of 705 square yards (sy) was used for single- and multi-engine itinerant aircraft, while a planning criterion of 1,508 sy was used to determine the area for transient turboprop and jet aircraft. A parking apron should also provide space for locally based aircraft that require temporary tiedown storage. Locally based tiedowns typically will be utilized by smaller single-engine aircraft; thus, a planning standard of 330 sy per position is utilized.

The total apron parking requirements are presented in **Table 3R**. The existing apron pavement area at Sierra Vista Municipal Airport currently encompasses approximately 66,900 sy of space divided among the three apron areas. Approximately 14,500 sy of this space is used exclusively for aircraft parking. Using

[6] Refer to FAA AC 150/5300-13B, Airport Design, Appendix E.

the planning standards described above and factoring in assumptions regarding operational and based aircraft growth, additional apron space dedicated for aircraft parking is projected to be needed over the next 20 years. This could be accomplished by reconfiguring and/or adding marked parking positions to existing apron pavement.

There are currently 41 marked parking positions available for based and itinerant fixed-wing aircraft at the airport. As shown in the table, there may be a need for additional marked aircraft parking in the future. Consideration should also be given to including dedicated parking for helicopters and small corporate jets.

TABLE 3R | Aircraft Parking Apron Requirements

	Available	Short Term	Intermediate Term	Long Term
Aircraft Parking Positions				
Based/Local GA Aircraft	–	3	3	4
Transient GA Aircraft	–	24	25	27
Corporate Jet Aircraft	–	2	4	9
Helicopter	–	2	3	5
Total Parking Positions	**41**	**31**	**35**	**45**
Total Apron Area	**14,500**	**21,600**	**25,700**	**35,500**

Source: Coffman Associates analysis

SUPPORT FACILITIES

Various other landside facilities that play a supporting role in overall airport operations have also been identified. These support facilities include:

- Aviation fuel storage
- Perimeter fencing

Aviation Fuel Storage

The City of Sierra Vista provides fuel for the airport and owns the fuel storage tanks located on the north side of the airfield. In total, there is a capacity of 20,000 gallons of 100LL fuel storage and 60,000 gallons of Jet A fuel storage. Based on historical fuel flowage records from the last three years, the airport pumped an average of 395,797 gallons of Jet A fuel and 26,973 gallons of 100LL fuel per year. Dividing the total fuel flowage by the total number of operations provides a ratio of fuel flowage per operation. Between 2021 and 2023, the airport pumped approximately 10.58 gallons of Jet A fuel per turbine operation and 0.72 gallons of 100LL fuel per piston operation.

Maintaining a 14-day fuel supply would allow the airport to limit the impact of a disruption of fuel delivery. The airport currently has enough static fuel storage to meet the 14-day supply criteria for both Jet A and 100LL fuel. Based on these usage assumptions and projected design day operations, no additional storage for either Jet A or 100LL fuel is projected to be needed. **Table 3S** summarizes the forecasted fuel storage requirements through the planning period.

TABLE 3S | Fuel Storage Requirements

	Capacity	2023 Need	PLANNING HORIZON		
			Short-Term	Intermediate-Term	Long-Term
Jet A					
Daily Usage (gal.)	60,000	1,334	1,402	1,469	1,626
14-Day Supply (gal.)		18,676	19,624	20,572	22,769
Annual Usage (gal.)		33,100	34,800	36,500	40,300
AvGas (100LL)					
Daily Usage (gal.)	20,000	91	96	100	111
14-Day Supply (gal.)		1,273	1,337	1,402	1,552
Annual Usage (gal.)		33,100	34,800	36,500	40,300

Sources: Historical fuel flowage data provided by airport staff; fuel supply projections prepared by Coffman Associates

Fuel storage requirements are typically based on keeping a two-week supply of fuel during an average month; however, more frequent deliveries can reduce the fuel storage capacity requirements. Generally, fuel tanks should be of adequate capacity to accept a full refueling tanker, which holds approximately 8,000 gallons, while maintaining a reasonable level of fuel in the storage tank. Future aircraft demand experienced at the airport will determine the need for additional fuel storage capacity. It is important that airport personnel work with the city to plan for adequate levels of fuel storage capacity through the long-term planning period of this study. Planning should also consider an additional tank to store unleaded aviation fuel (100UL). The FAA has recently approved the use of 100UL in piston-powered aircraft, although unknowns regarding infrastructure and distribution remain.

Perimeter Fencing and Gates

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

- Gives notice of legal boundary of the outermost limits of the facility or security-sensitive areas;
- Assists in controlling and screening authorized entries into a secured area by deterring entry elsewhere along the boundary;
- Supports surveillance, detection, assessment, and other security functions by providing a zone for installing intrusion detection equipment and closed-circuit television (CCTV);
- Deters casual intruders from penetrating the aircraft operations areas on the airport;
- Creates a psychological deterrent;
- Demonstrates a corporate concern for facilities; and
- Limits inadvertent access to the aircraft operations area by wildlife.

As detailed in Chapter One, FHU operations areas are completely enclosed by security fencing, and controlled access gates are available for use at the airport. All fencing and gates should be maintained throughout the planning period and should be regularly inspected to ensure they are functioning properly and are undamaged.

A summary of the overall general aviation landside facilities is presented on **Exhibit 3J**.

	Available	Short Term	Intermediate Term	Long Term
Aircraft Storage Hangar Requirements				
Aircraft to be Hangared	61	61	65	71
Linear/Box T-Hangar Area (sf)	87,300	90,900	95,400	96,900
Executive/Conventional Hangar Area (sf)	5,000	21,000	35,300	47,800
Total Hangar Storage Area (sf)	**92,300**	**111,900**	**130,700**	**144,700**

	Available	Short Term	Intermediate Term	Long Term
Aircraft Parking Apron				
Aircraft Parking Positions	41	31	35	45
Total Public Aircraft Parking Area (sy)	14,500	21,600	25,700	35,500

	Available	Short Term	Intermediate Term	Long Term
General Aviation Terminal Facilities and Parking				
Building Space (sf)	9,500	1,100	1,400	1,800
Total GA Parking Spaces	298	62	72	80

	Available	Short Term	Intermediate Term	Long Term
Fuel Storage				
14-Day Fuel Storage - 100LL (gallons)	20,000	1,337	1,402	1,552
14-Day Fuel Storage - Jet A (gallons)	60,000	19,624	20,572	22,769

Exhibit 3J
LANDSIDE FACILITY REQUIREMENTS

SUMMARY

This chapter has outlined the safety design standards and general aviation facilities required to meet potential aviation demand projected at FHU for the next 20 years. In an effort to provide a more flexible master plan, the yearly forecasts from Chapter Two have been converted to planning horizon levels. The short term roughly corresponds to a five-year timeframe, the intermediate term is approximately 10 years, and the long term is 20 years. By utilizing planning horizons, airport management can focus on demand indicators for initiating projects and grant requests, rather than on specific dates in the future.

In Chapter Four, potential improvements to the airside and landside systems will be examined through a series of airport development alternatives. Most of the alternatives discussion will focus on those capital improvements that would be eligible for federal and state grant funds. Other projects of local concern will also be presented. Ultimately, an overall airport development plan that presents a vision beyond the 20-year scope of this master plan will be developed for FHU.