Sierra Vista
MUNICIPAL AIRPORT

AIRPORT MASTER PLAN

AIRPORT MASTER PLAN

for

SIERRA VISTA MUNICIPAL AIRPORT
Sierra Vista, Arizona

Prepared for

THE CITY OF SIERRA VISTA

by

Coffman Associates, Inc.

Approved by the

SIERRA VISTA CITY COUNCIL
on

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INTRODUCTION

Sierra Vista
MUNICIPAL AIRPORT
AIRPORT MASTER PLAN

Introduction

An Airport Master Plan is an evaluation of the airport's aviation demand and an overview of the systematic airport development that will best meet those demands. The Master Plan establishes development objectives and provides for a 20-year planning period that entails the rationale for various study elements to include airfield configuration, facility development, land use recommendations, and support facilities. It also serves as a strategic tool for establishing airport improvement priorities and obtaining funding.

The Sierra Vista Municipal Airport Master Plan Update has been undertaken to evaluate the airport's capabilities and role, to forecast future aviation demand, and to plan for the timely development of new or expanded facilities that may be required to meet that demand. The ultimate goal of the Master Plan is to provide systematic guidelines for the airport's overall maintenance, development, and operation in an environmentally and fiscally responsible manner. Furthermore, the *City of Sierra Vista Strategic Leadership Plan: 2012-2013* has identified strategic focus areas, one of which is a comprehensive update of the Airport Master Plan, to help guide the community into the future by working jointly with Fort Huachuca/Libby Army Airfield officials to identify long-term usage as well as infrastructure and safety improvements needed for the airport to continue serving the surrounding region.

The preparation of this Master Plan Update is necessary as a timely reassessment of the development direction of Sierra Vista Municipal Airport and Libby Army Airfield that will meet the needs of a dynamic local economy and an ever-changing air transportation industry. Furthermore, it is evidence that the City of Sierra Vista recognizes the importance of the Army's testing missions as well as the unique challenges operating an airport presents. The investment in an airport yields many benefits to the commu-

nity and region in which it serves. With a sound and realistic plan in place, Sierra Vista Municipal Airport will remain an important link to the air transportation system for the community and maintain the existing public and private investments in its facilities.

The airport serves as a vital economic asset for the City and surrounding areas. Furthermore, Fort Huachuca, an active U.S. Army installation that is headquarters to the U.S. Army Intelligence Center and School and a major unmanned aerial system (UAS) test center, maintains an important presence at Libby Army Airfield, and shares runways and taxiways with Sierra Vista Municipal Airport. Together, these two entities make up the military/civilian joint-use facility that exists today, being one of only 23 reported joint-use airports in the country. As such, the airport should be carefully and thoughtfully planned and subsequently developed in a manner which matches the development goals of the City and Fort Huachuca. The City of Sierra Vista initiated this Master Plan Update to reevaluate and adjust, as necessary, the future development plan for Sierra Vista Municipal Airport, in conjunction with Libby Army Airfield. The last Master Plan for the airport was completed in 2002. Since that time, the City of Sierra Vista has invested considerable funds into the continued growth and development of the airport.

The City of Sierra Vista is responsible for funding capital improvements at the airport and obtaining Federal Aviation Administration (FAA) and Arizona Department of Transportation–Multi-Modal Planning Division–Aeronautics Group (ADOT-MPD-Aeronautics Group) development grants. The Master Plan is intended to provide guidance through an updated capital improvement program (CIP) to demonstrate the future investments required by the City at Sierra Vista Municipal Airport. Many national, regional, and local aviation factors have changed since the completion of the previous Master Plan. The City has undertaken this Master Plan to account for those changes as they relate to future planning for the airport.

STUDY COORDINATION

Sierra Vista Municipal Airport is of interest to many stakeholders within the surrounding area, including local citizens, community organizations, Fort Huachuca/Libby Army Airfield, airport users, airport tenants, area-wide planning agencies, and aviation organizations. As an important component of the regional, state, and national aviation systems, Sierra Vista Municipal Airport is also of importance to both the FAA and ADOT-Aeronautics Group, who are responsible for overseeing air transportation systems for federal and state governments, respectively.

To assist in the development of the Master Plan Update, a cross section of community members and aviation interest groups with a vested interest in Sierra Vista Municipal Airport has been identified by the City of Sierra Vista to act in an advisory role in the development of the Master Plan. Members of this Planning Advisory Committee (PAC) will review working papers and provide comments throughout the study to help ensure that a realistic, viable plan is developed.

To assist in the review process, draft working papers will be prepared at various milestones in the planning process. This process allows for timely input and review during each step within the Mas-

ter Plan to ensure that all issues are fully addressed as the recommended program develops. A series of public workshops are also included as part of the plan coordination so that information can be presented to the public.

MASTER PLAN GOALS AND OBJECTIVES

The vision statement for the airport reads:

"The Sierra Vista Municipal Airport is an exemplary model of a joint-use military, commercial, and general aviation airport. The airport provides a proactive and flexible management atmosphere for businesses and entrepreneurs, demonstrating a willingness to attract new ventures. The airport's friendly, service-orientated atmosphere, attractive and accessible facilities, variety of on-site services, and convenient access to nearby attractions facilitates and encourages frequent visitor returns. There is great community pride in the knowledge that Sierra Vista Municipal Airport is the most premiere aviation facility in southeastern Arizona."

The overall objective of the Airport Master Plan Update is to provide the City of Sierra Vista with guidance for future development of the airport and meeting the needs of existing and future users, while also being compatible with area development, other transportation modes, the UAS missions of Libby Army Airfield, and the environment. It is important that this study reflect the airport's vision statement as it analyzes and identifies long term facility needs.

As mentioned earlier, the previous Master Plan was done in 2002. The Airport Layout Plan (ALP) for the airport was more recently updated in 2011. This Master Plan will identify and provide justification for new priorities. The plan will be closely coordinated with other existing or ongoing planning studies in the area and with aviation plans developed by the FAA and the state. Coordination between the City, FAA, ADOT-MPD-Aeronautics Group, Fort Huachuca/Libby Army Airfield, and other airport stakeholders will be essential throughout the master planning process.

Specific goals and objectives of the study include:

- Research factors likely to affect air transportation demand in the City of Sierra Vista and surrounding area over the next 20 years and develop updated operational and based aircraft forecasts.

- Determine projected needs of airport users, taking into consideration continued maintenance, as well as necessary improvements, to the airport's infrastructure to ensure maximum utility of public and private facilities at Sierra Vista Municipal Airport.

- Be reflective of the goals and visions of the surrounding area (to include Fort Huachuca/Libby Army Airfield), especially those related to use of restricted airspace, quality of life, business and development, and land use.

- Identify long-term usage of the airport as well as future infrastructure and safety improvements through joint coordination with Fort Huachuca/Libby Army Airfield officials.

- Establish a schedule of development priorities, a financial program for implementation of development, and an-

alyze potential funding sources, consistent with FAA, ADOT-Aeronautics Group, and Fort Huachuca/Libby Army Airfield planning.

- Maintain safety as an essential consideration in the planning and development at the airport.

- Be mindful of environmental sensitivities related to proposed improvements with the overall goal of protecting and preserving the environment.

- Develop active and productive public involvement throughout the planning process.

MASTER PLAN TASKS

The Master Plan Update will accomplish these goals and objectives by carrying out the following:

- Determine projected needs of airport users through the year 2032.

- Analyze socioeconomic factors likely to affect air transportation demand in the surrounding region.

- Evaluate existing and future aviation demand in order to provide a vision for future airport development that will optimize undeveloped airport property and promote aircraft safety.

- Analyze airport safety and security measures and consider further enhancements to accommodate the general aviation needs of the airport.

- Evaluate land acquisition requirements (if any) for future aviation facility development and/or safety requirements.

- Produce current and accurate base maps and ALP drawings.

BASELINE ASSUMPTIONS

A study such as this typically requires some baseline assumptions that will be used throughout the analysis. The baseline assumptions for the Sierra Vista Municipal Airport Master Plan Update include:

- Sierra Vista Municipal Airport will continue to operate as a publically owned general aviation joint-use facility with Libby Army Airfield through the planning period.

- The other regional general aviation airports in the surrounding area will remain open for the foreseeable future.

- Sierra Vista Municipal Airport will continue to seek general aviation and corporate business aviation based tenants and transient operations.

- The aviation industry on the national level will grow as forecast by the FAA in its annual Aerospace Forecasts.

- The socioeconomic characteristics of the region will remain as forecast in Chapter Two.

- Both a federal and state program will be in place through the planning period to assist in funding future capital development needs.

MASTER PLAN ELEMENTS AND PROCESS

To achieve the goals and objectives described earlier, the Master Plan is being prepared in a systematic fashion pursuant to the Scope of Services that has been coordinated with the City of Sierra Vista, the FAA, and the ADOT-MPD-Aeronautics Group. The study has ten elements that are intended to assist in the discovery of future facility needs and provide the supporting rationale for their implementation.

Element 1 – Study Initiation includes the development of the scope of services, budget, and schedule. A kickoff meeting with the PAC will be held at the study's initiation to obtain a more comprehensive understanding of local issues. A dedicated project website will also be established.

Element 2 – Inventory summarizes facilities and operational data, weather conditions, population and economic data, vicinity land uses, and environmental conditions of the airport and surrounding area.

Element 3 – Forecasts examines the potential aviation demand for based aircraft, annual operations, air cargo, and peaking characteristics at the airport over a 20-year period.

Element 4 – Facility Requirements establishes the critical aircraft and physical planning criteria in preparation of a facility needs assessment for airside and landside facilities. The information and analysis developed in Elements 1 through 4 will be organized into a draft working paper. The report will be submitted to the PAC, at which time the second PAC meeting will be held.

Element 5 – Airport Alternatives considers a variety of solutions to accommodate the projected airside and landside facility needs through the long term planning period. An analysis is completed to identify the strengths and weaknesses of each proposed development alternative, with the intention of determining a single direction for development. Upon completion of the work tasks in this element, a set of draft working papers will be prepared to outline the analysis, methodologies, and findings of the airport alternatives chapter. The third PAC meeting and first Public Information Workshop will be conducted during this time.

Element 6 – Recommended Development provides both a graphic and narrative description of the recommended plan for the use, development, and operation of the airport following input from the PAC, FAA, ADOT-MPD-Aeronautics Group, and City of Sierra Vista officials.

Element 7 – Environmental Overview analyzes any potential environmental impacts generated by the recommended development concept.

Element 8 – Financial Plan focuses on the capital needs program which defines the schedules, costs, and funding sources for the recommended development projects. A detailed CIP will be included in this element. In addition, an economic benefit analysis will be conducted to measure and analyze the economic impacts of Sierra Vista Municipal Airport on its service area. Benefit measures will include total economic activity (revenues), payroll, employment, and tax revenues generated by the presence of the airport. The findings of Elements 6 through 8 will be organized into a set of draft working papers. The fourth and final PAC meeting

and second and final Public Information Workshop will be scheduled during this time.

Element 9 – Airport Plans will be developed to depict existing and proposed facilities. The drawing set will meet the requirements of the FAA and ADOT-MPD-Aeronautics Group and will replace the ALP drawings approved by the FAA in 2011.

Element 10 – Final Documentation and Presentation provides documents which depict all the findings of the study effort and present the study and its recommendations to appropriate local organizations. The final document shall incorporate the revisions to previous working papers prepared under earlier elements into a usable Master Plan document. An executive summary brochure and pilot guide have also been prepared.

Exhibit A provides a graphical depiction of the elements and process involved with the study. The draft working papers were made available to the public on the internet via a website dedicated to the study: www.sierravista.airportstudy.com.

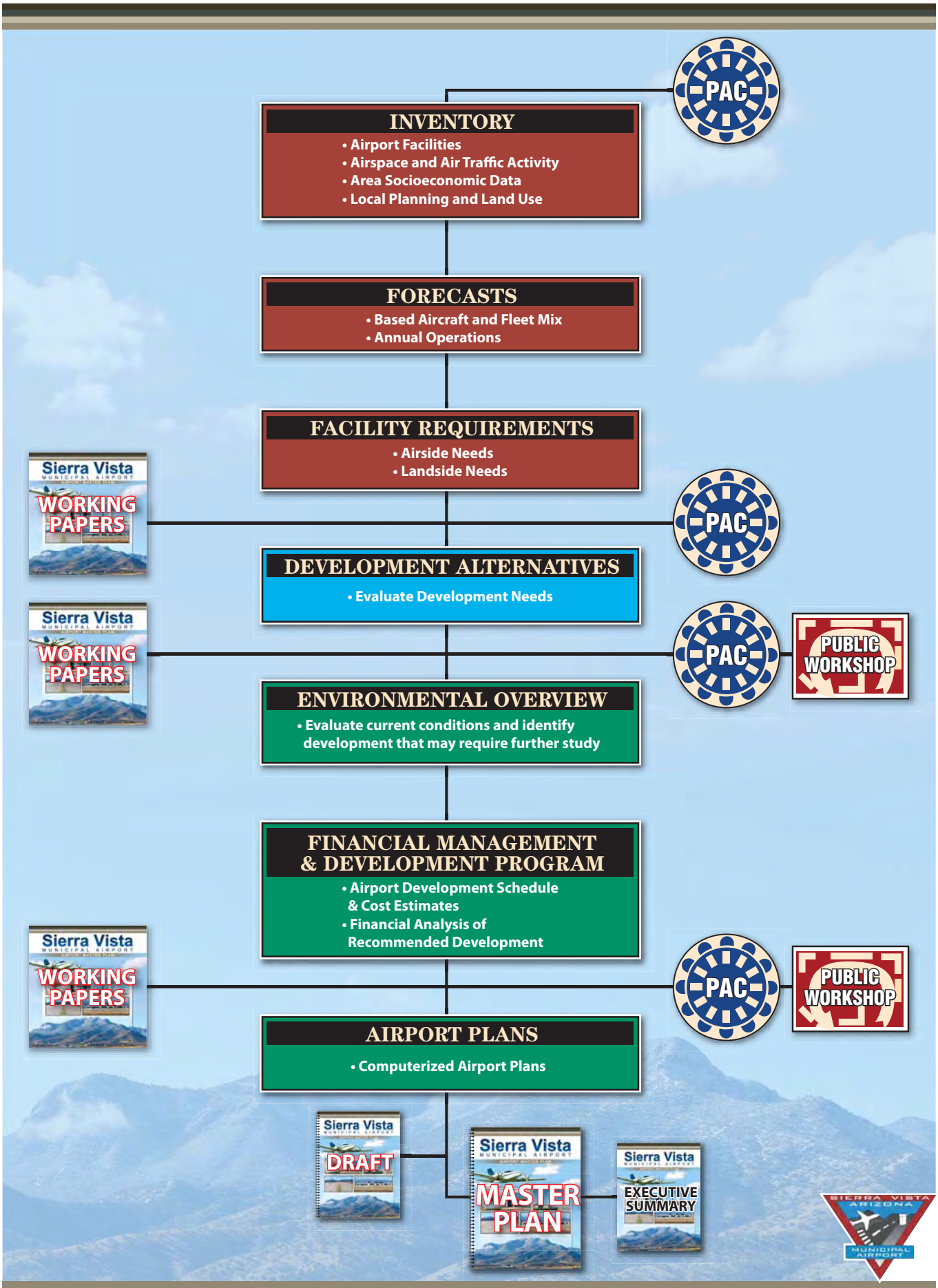


Exhibit A: PROJECT WORK FLOW

Chapter One

INVENTORY

Sierra Vista
MUNICIPAL AIRPORT
AIRPORT MASTER PLAN

CHAPTER ONE

Inventory

The inventory of existing conditions is the initial step in the preparation of the Sierra Vista Municipal Airport Master Plan Update. Information has been gathered for the airport as well as the region it serves. The inventory will serve as an overview of the airport, its facilities, its role in the regional and national airport systems, and the relationship to development which has occurred around the airport in the past.

The update of this Master Plan requires a comprehensive collection and evaluation of information relating to Sierra Vista Municipal Airport. This chapter will begin with an overview of the existing conditions at the airport consisting of descriptions of airport facilities, regional airspace, air traffic activity, and the airport's role in the regional, state, and national aviation systems. This will be followed by background information regarding the airport and surrounding area, including airport location, history, regional climate, and adjacent land use. Finally, information regarding the area's socioeconomic profile and an inventory of environmental conditions will be presented.

The information outlined in this chapter was obtained through on-site inspections of the airport including interviews with airport management, airport tenants, and representatives of various government agencies. Additional information and documents were provided by the Federal Aviation Administration (FAA), Arizona Department of Transportation - Multi-Modal Planning Division - Aeronautics Group (ADOT-MPD - Aeronautics Group), the City of Sierra Vista, and Fort Huachuca.

AIRPORT FACILITIES

This section provides a description of the existing facilities at Sierra Vista Municipal Airport and Libby Army Airfield. As previously outlined, Sierra Vista Municipal Airport and Fort Huachuca make up the joint-use facility that currently exists at Libby Army Airfield. Through the use of a non-exclusive easement, the Sierra Vista Municipal Airport has access to the runway and taxiway system.

Airport facilities can be divided into two distinct categories: airside and landside. Airside facilities include those directly associated with aircraft operation such as runways, taxiways, lighting and marking, and navigational aids. Landside facilities include those necessary to provide a safe transition from surface to air transportation and support aircraft servicing, storage, maintenance, and operational safety on the ground.

AIRSIDE FACILITIES

Airside facilities are depicted on **Exhibit 1A**. These facilities include runways, taxiways, airfield lighting and marking aids, and navigational aids. Airside facility data is discussed in detail in the following sections.

Runways

Sierra Vista Municipal Airport/Libby Army Airfield is served by three active runways: Runway 3-21, Runway 8-26, and Runway 12-30. Primary Runway 8-26 is 12,001 feet long by 150 feet wide and orientated east to west. Runway 12-30 measures 5,366 feet long by 100 feet wide and is orientated southeast to northwest. Runway 3-21 is 4,285 feet long by 75 feet wide and aligned northeast to southwest. It should be noted that the Runway 3 threshold is displaced 1,253 feet, allowing for 3,032 feet of landing distance available.

Exhibit 1B presents data specific to each runway. Other than the lengths and widths of each surface, the following items are included as detailed.

- *Pavement type* – Indicates the surface material type.
- *Pavement condition* – The FAA's current rating of runway pavement material.
- *Pavement strength* – Based on the construction of the pavement, a runway can provide differing load bearing capacities. Single wheel gear loading (SWL) refers to having one wheel per landing gear strut. Dual wheel loading (DWL), dual tandem wheel loading (DTWL), and double dual tandem wheel loading (DDTWL) include the design of aircraft landing gear with additional wheels on each landing gear strut, which distributes the aircraft weight across more of the pavement surface; thus, the surface itself can support a greater total aircraft weight. A pavement classification number (PCN) system is also assigned for each runway on the airfield. This is the International Civil Aviation Organization's (ICAO) standard method of reporting pavement strengths for pavement surfaces providing load bearing capacities greater than 12,500 pounds. The PCN is shown as a five-part code that accounts for the PCN number, type of pavement, pavement subgrade, maximum tire pressure, and pavement evaluation method.
- *Pavement markings* – Pavement markings aid in the movement of aircraft along airport surfaces and identify

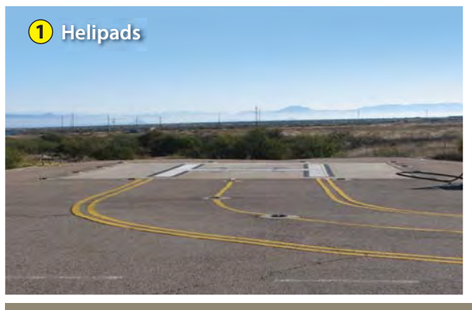
LEGEND

- Sierra Vista Municipal Airport Property Line
- Libby Army Airfield Property Line (Joint Use)

KEY

ASOS	-	Automated Surface Observation Station
ASR	-	Airport Surveillance Radar
ATCT	-	Airport Traffic Control Tower
AWOS	-	Automated Weather Observation Station
ILS	-	Instrument Landing System
NDB	-	Nondirectional Radio Beacon
PAR	-	Precision Approach Radar
REIL	-	Runway End Identifier Lighting
TACAN	-	Tactical Air Navigation Aid
VOR	-	Very high frequency Omni-directional Range

Blast Pad
Hold Apron
State Highway 90
Blast Pad
REILs
AWOS-III
PAPI-4
K
Helipads
Airport Ave
D
Hold Apron
5
Wind Cone
ASR Equipment
Runway 3-21 (4,285' x 75')
Runway 12-30 (5,366' x 100')
J
3
L
J
1
ASOS
4
VOR
D
Localizer
Displaced Threshold
Hold Apron
G
Blast Pad
2
PAPI-4
Blast Pad
Runway 8-26 (12,001 x 150')
REILs
REILs
PAPI-4
A
ASOS
B
Blast Pad
PAR Equipment
D
TACAN
F
ILS Glideslope Antenna
C
NDB
PAPI-4
Hold Apron
Hold Apron
P
P
REILs
C
D
E
S
Blast Pad
Hold Apron
ATCT
Rotating Beacon
NORTH
0
1,000
2,000
SCALE IN FEET



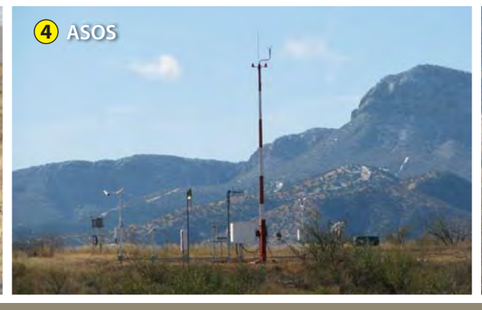


Exhibit 1A: AIRSIDE FACILITIES

RUNWAY 8-26

DATA

Length: 12,001'
Width: 150'
Pavement Type: Concrete
Pavement Condition: Good
Pavement Strength: 70,000 lbs SWL
200,000 lbs DWL
400,000 lbs DTWL
700,000 lbs DDTWL
Markings: Precision
Lighting: HIRL
Elevation: 4,719' MSL (Runway 8)
4,599' MSL (Runway 26)
Gradient: 1.0%
Blast Pad: 1,000' x 150' (each end)
Traffic Pattern: Left (Runway 8)
Right (Runway 26)

RUNWAY 12-30

DATA

Length: 5,366'
Width: 100'
Pavement Type: Asphalt/Concrete
Pavement Condition: N/A
Pavement Strength: 46,000 lbs SWL
106,000 lbs DWL
137,000 lbs DTWL
172,000 lbs DDTWL
Markings: Non-Precision
Lighting: MIRL
Elevation: 4,612' MSL (Runway 12)
4,615' MSL (Runway 30)
Gradient: 0.1%
Blast Pad: 500' x 150' (Runway 12)
200' x 100' (Runway 30)
Traffic Pattern: Left (Runway 12)
Right (Runway 30)

RUNWAY 3-21

DATA

Length: 4,285'
Width: 75'
Displaced Threshold: Runway 3 - 1,253'
Pavement Type: Asphalt/Concrete
Pavement Condition: N/A
Pavement Strength: N/A
Markings: Basic - Both Runways
Lighting: MIRL
Elevation: 4,671' MSL (Runway 3)
4,585' MSL (Runway 21)
Gradient: 2.0%
Blast Pad: 250' x 125' (Runway 3)
475' x 125' (Runway 21)
Traffic Pattern: Left (Runway 3)
Right (Runway 21)

TAXIWAYS

DATA

Taxiway	Length	Width	Pavement Strength
A	1,050'	75'	N/A
B	1,050'	75'	N/A
C	500'	75'	N/A
D	4,000'	75'	175,000 lbs. DWL
E	1,000'	75'	N/A
F	1,050'	75'	N/A
G	1,000'	50'	33,000 lbs. SWL
J	5,000'	50-75'	175,000 lbs. DWL
K	2,800'	50'	30,000 lbs. DWL
L	200'	75'	175,000 lbs. DWL
P	12,000'	75'	N/A
S	3,700'	50'	N/A

KEY

SWL - Single Wheel Loading
DWL - Dual Wheel Loading
DTWL - Dual Tandum Wheel Loading
DDTWL - Double Dual Tandum Wheel Loading

HIRL - High Intensity Runway Lighting
MIRL - Medium Intensity Runway Lighting
MSL - Mean Sea Level

closed or hazardous areas on the airport. Runway markings provide pilots with designation and centerline stripes in basic form, while non-precision and precision markings add threshold bars, edges, touchdown zone, and aiming points.

- *Lighting* – Runway lighting is placed near the pavement edge to define the lateral limits of the pavement surface. High intensity runway lighting (HIRL) is common on runways that support a precision instrument approach. Runway end lights also demark end of pavements.
- *Elevation* – Each runway end is situated at a specific point above mean sea level (MSL). Those listed on the exhibit identify the MSL location of each runway end.
- *Gradient* – Runway gradient describes the effective slope of a runway surface. Runway pavement should be moderately sloped to allow for effective drainage, but not so as to reduce visibility from end to end.
- *Blast pad* – The blast pad is a surface adjacent to the end of the runway provided to reduce the erosive effect of jet blast and propeller wash. Each runway end is equipped with a blast pad.
- *Traffic Pattern* – Runway traffic patterns are established to control movements in the immediate vicinity of the airport area. Left-hand patterns are standard and allow the pilot to make left-hand turns throughout the traffic pattern.

Taxiways

The airfield taxiway system includes parallel, entrance/exit, access, and connector taxiways. Taxiway P serves as the parallel taxiway for Runway 8-26 and is located 1,050 feet south of the runway (centerline to centerline). There are five entrance/exit taxiways linking parallel Taxiway P with Runway 8-26 and are designated as A, B, C, D, and F (as one moves from west to east). Furthermore, Taxiways D and G provide access to/from Runway 8-26 which lead to facilities on the northeast side of the airport owned and operated by the City of Sierra Vista.

Taxiway K serves as a partial parallel taxiway for Runway 12-30, located 1,025 feet north of its centerline. Entrance/exit taxiways serving Runway 12-30 include Taxiways S, P, J, and D moving southeast to northwest. In addition, Runway 3-21 provides access to/from the Runway 12 threshold.

Taxiway D serves as the parallel taxiway for Runway 3-21 and is located between 1,200 and 1,300 feet east of its centerline. Access to Runway 3 can be achieved via Taxiway C. Taxiway K leads to the Runway 21 threshold. Taxiway J and Runway 12-30 also provide entrance/exit access to Runway 3-21.

All active taxiways with their associated dimensions are listed on **Exhibit 1B**. There are several other taxiways and taxilanes that serve more remote areas of the airfield, such as hangar complexes and aircraft parking aprons. In addition, several hold aprons are available on the airfield serving particular runway ends. The hold aprons allow pilots to perform flight checks, including engine run-ups and a location where airport traffic control tower (ATCT) personnel can instruct pilots to wait for clearance to enter the runway.

Taxiway and taxilane centerline markings are provided to assist pilots in maintaining proper clearance from pavement edg-

es and objects near the taxiways/taxilanes. Taxiway markings also include hold lines located on the entrance/exit taxiways serving all three runways. The hold lines on entrance/exit taxiways serving Runway 8-26 range from a distance of 175 feet to 318 feet from the runway centerline. The hold lines associated with Runway 12-30 range from 175 to 250 feet from the runway centerline. Finally, the hold lines associated with Runway 3-21 are situated 250 feet from the runway centerline.

Helipads

Two civilian helipads are located on the northeast side of the airport, approximately 1,200 feet north of the Runway 26 threshold. The helipads are mainly utilized by on-site emergency medical transport helicopters.

Airfield Lighting and Marking

Airfield lighting systems extend an airport's usefulness into periods of darkness and/or poor visibility. A variety of lighting systems are installed on the airfield for this purpose. These lighting systems at the airport, categorized by function, are summarized as follows.

Identification Lighting

The location of an airport at night is universally indicated by a rotating beacon. The airport is equipped with a military airport beacon in which a white light is dual peaked (two quick beams) after a green light since it is a joint-use facility. The rotating beacon is located on the south side of the airfield, approximately 1,800 feet southwest of the ATCT.

Runway and Taxiway Lighting

Runway and taxiway edge lighting utilizes light fixtures placed near the pavement edge to define the lateral limits of the pavement. This lighting is essential for maintaining safe operations at night and/or during times of poor visibility in order to maintain safe and efficient access from the runway and aircraft parking areas. Runway 8-26 is equipped with high intensity runway lighting (HIRL) because it supports a precision instrument approach to Runway 26. Runways 12-30 and 3-21 are served by medium intensity runway lighting (MIRL). Medium intensity taxiway lighting (MITL) has been installed on all active taxiways leading to landside facilities on the north side of Runway 8-26. In addition, MITL is provided on the entrance/exit taxiways on the south side of Runway 8-26.

Each runway end is equipped with threshold lighting to identify the landing threshold. Threshold lighting consists of specially designed light fixtures that are red on one half of the lens and green on the other half of the lens. The green portion of the lights are turned towards the approach surface and intended to be seen from landing aircraft, while the red portion is visible to aircraft on the runway surface.

Airfield Signage

Airfield identification signs assist pilots in identifying their location on the airfield and directing them to their desired location. The presence of runway/taxiway signage is an essential component of a surface movement guidance control system necessary for the safe and efficient operation of the airport. The lighted signage system installed on the airfield

includes runway and taxiway designations, holding positions, routing/directional, and runway exits.

Visual Approach Lighting

A four-box precision approach path indicator (PAPI-4) serves each end of Runways 8-26 and 12-30. The PAPI-4 consists of a series of four lights that, when interpreted by pilots, give an indication of being above, below, or on the designated descent path to the runway. PAPI systems have a range of five miles during the day and up to 20 miles at night.

The PAPI-4s serving Runway 8-26 are located approximately 1,200 feet from each runway threshold. The PAPI-4s on Runway 12-30 are situated approximately 400 feet and 700 feet, respectively, from each runway threshold.

Runway End Identification Lights

Runway end identification lights (REILs) provide rapid and positive identification of the approach end of a runway. A REIL system has been installed on each end of Runways 8-26 and 12-30. A REIL consists of two synchronized flashing lights, located laterally on each side of the runway threshold, facing the approach aircraft.

Pilot-Controlled Lighting

The airport's lighting system is connected to a pilot-controlled lighting (PCL) system. The PCL system allows pilots to increase the intensity of the runway and helipad lighting and PAPI-4s from the aircraft with the use of the aircraft's radio transmitter. The PCL can be accessed on the common traffic advisory frequency (CTAF) 124.95 MHz.

Weather Facilities

An automated weather observation system (AWOS-III) is located on the airfield, approximately 700 feet west of the Runway 12 threshold. The AWOS-III automatically records weather conditions such as wind speed, wind gusts, wind direction, temperature, dew point, altimeter setting, density altitude, visibility, precipitation, sky condition, and cloud height.

In addition to the AWOS-III, an automated surface observation system (ASOS) is located at the airport. The ASOS records current weather information similar to the AWOS-III. This information is then transmitted at regular intervals on radio frequency 119.675 MHz and on the automated terminal information service (ATIS). The ASOS is a dual-instrumented system with sensors at both ends of Runway 8-26. One ASOS sensor is located approximately 1,000 feet southeast of the Runway 8 threshold and the other is situated approximately 1,000 feet northwest of the Runway 26 threshold.

There are also nine wind cones (six lighted) spread out in different locations on the airfield, allowing wind conditions to be visually interpreted by pilots anywhere along the runway system.

Air Traffic Control

The ATCT is located on the south side of the airfield, approximately 2,100 feet south of the intersection of Runway 8-26 and Taxiway D. The ATCT currently operates from 12:00 a.m. Monday through 11:00 p.m. Friday, and occasionally oper-

ates on weekends to accommodate special military operations. The ATCT provides an array of control services, including ground control (121.7 MHz) and ATIS information (134.75 MHz). Outside these times, there are no formal air traffic control services available at the airport. When the ATCT is closed, air traffic advisories are made using the CTAF, which is the same frequency as the tower (124.95 MHz). The ATCT is operated by the U.S. Army.

The ATCT located on the airfield controls air traffic within the Class D airspace that surrounds the airport. Approach and departure control services for arriving and departing aircraft on an instrument flight plan are provided by Albuquerque Air Route Traffic Control Center (ARTCC), which controls aircraft in a large multi-state area.

Navigational Aids

Navigational aids are electronic devices that transmit radio frequencies, which pilots of properly equipped aircraft can translate into point-to-point guidance and position information. The types of electronic navigational aids available for aircraft flying to or from the airfield include the non-directional beacon (NDB), very high frequency omnidirectional range (VOR), global positioning system (GPS), and localizer and associated glideslope antenna.

The NDB transmits non-directional radio signals whereby the pilot of an aircraft equipped with direction-finding equipment can determine their bearing to or from the NDB facility in order to track to the beacon station. The Dragoo NDB is located on the airfield, approximately 1,300 feet north of the ATCT. It serves the NDB approach to Runway 26.

The VOR, in general, provides azimuth reading to pilots of properly equipped aircraft by transmitting a radio signal at every degree to provide 360 individual navigational courses. Distance measuring equipment (DME) can be combined with a VOR facility (VOR/DME) to provide distance as well as directional information to the pilot. Military tactical air navigation aids (TACANs) and VORs are commonly combined to form a VORTAC. The VORTAC provides distance and direction information to both civil and military pilots. The Libby VOR is located on the airfield, approximately 4,500 feet northwest of the ATCT and serves the VOR approach to Runway 26. It should be noted that a TACAN is also located on the airfield, approximately 2,000 feet northeast of the ATCT; however, navigational information related to the TACAN is unavailable.

GPS was initially developed by the United States Department of Defense for military navigation around the world and is currently being utilized more and more in civilian aircraft. GPS differs from an NDB or VOR in that pilots are not required to navigate using a specific ground-based facility. GPS uses satellites placed in orbit around the earth to transmit electronic radio signals, which pilots of properly equipped aircraft use to determine altitude, speed, and other navigational information. The FAA is proceeding with a program to gradually replace all traditional enroute navigational aids with GPS over the next 20 years.

A localizer and glideslope antenna are located on the airport and provide the necessary components for an instrument landing system (ILS) serving Runway 26. The localizer antenna emits signals that

provide the pilot with course deviation left or right of the runway centerline and the degree of deviation. The glideslope antenna provides a signal indicating whether the aircraft is above or below the desired glide path. The localizer is situated approximately 1,300 feet west of the Runway 8 threshold. The glideslope antenna is located approximately 1,000 feet southwest of the approach end of Runway 26. Airfield lighting and marking, weather, and navigational aids are summarized in **Table 1A**.

TABLE 1A
Airside Facility Data
Sierra Vista Municipal Airport/Libby Army Airfield

	Runway 8-26	Runway 12-30	Runway 3-21
Runway Lighting	HIRL	MIRL	MIRL
Taxiway Lighting	MITL (entrance/exit taxiways)	MITL	MITL
Visual Approach Aids:			
Approach Slope Indicators	PAPI-4 (Both Ends)	PAPI-4 (Both Ends)	None
REILs	Yes (Both Ends)	Yes (Both Ends)	None
Instrument Approach Aids	ILS or LOC (26) VOR (26) RNAV/GPS (8 & 26) NDB (26)	None	None
Weather / Navigational Aids	AWOS-III, ASOS, ATCT, GPS, VOR, NDB, ILS, PAR, ASR		
Visual Aids	Lighted Wind Cones, Rotating Beacon		

HIRL –High Intensity Runway Lighting
MIRL - Medium Intensity Runway Lighting
MITL - Medium Intensity Taxiway Lighting
PAPI - Precision Approach Path Indicator
REIL – Runway End Identification Light
ILS - Instrument Landing System
LOC - Localizer
GPS - Global Positioning System
VOR - Very High Frequency Omnidirectional Range
NDB – Non-Directional Beacon
RNAV - Area Navigation
PAR – Precision Approach Radar
ASR – Airport Surveillance Radar
AWOS - Automated Weather Observation System
ASOS – Automated Surface Observation System
ATCT - Airport Traffic Control Tower

Source: Airport Facility Directory - Southwest U.S. (February 2012); FAA Form 5010-1, *Airport Master Record*

Instrument Approach Procedures

Instrument approach procedures are a series of predetermined maneuvers established by the FAA which utilize electronic navigational aids (such as those discussed in the previous section) to assist pilots in locating and landing at an airport during low visibility and cloud ceiling conditions. The capability of an instrument approach is defined by the visibility and cloud ceiling minimums associated with the approach. Visibility minimums define the horizontal distance that the pilot must be able to see to complete the approach. Cloud ceilings define the lowest level a cloud layer (defined in feet above the ground) can be situated for a pilot to complete the approach. If the observed visibility or cloud ceilings are below the minimums prescribed for the

approach, the pilot cannot complete the instrument approach.

There are five approved instrument approach procedures for Sierra Vista Municipal Airport/Libby Army Airfield. Runway 26 is served by a precision ILS approach, which provides both course and vertical descent information to pilots. The ILS system consists of the localizer and glideslope antenna previously discussed. The ILS approach to Runway 26 allows for landings when cloud ceilings are as low as 200 feet above ground level (AGL) and the visibility is restricted to ¾-mile. This type of approach provides enhanced safety for users of the airport during poor weather. Runway 26 is also served by non-precision instrument approach procedures providing course guidance. These include RNAV (GPS), VOR, and NDB approaches.

Runway 8 is served by an area navigation (RNAV) GPS approach. The localizer performance with vertical guidance (LPV) approach minimum provides both course and vertical guidance to a pilot. Similar to the ILS approach on Runway 26, the LPV approach provides minimums down to 200 feet and ¾-mile visibility, for cloud ceiling and visibility respectively. The lateral navigation (LNAV) / vertical navigation (VNAV) approach minimums provide for course or vertical guidance.

Each approach also has circling minimums. Circling minimums allow pilots to land on any active runway at the airport. While providing flexibility for the pilot to land on the runway most closely aligned with the prevailing wind at that time, a circling approach will have higher visibility minimums that other straight-in instrument approaches in order to provide pilots with sufficient visibility and ground clearance to navigate visually from the approach to the desired runway end for landing. **Table 1B** summarizes the approach capabilities at the airport.

Precision approach radar (PAR) and airport surveillance radar (ASR) approaches are also provided during hours when the ATCT is operational. These radar approaches may be given to any aircraft at the pilot's request, and ATCT personnel may also offer radar approach options to aircraft in distress regardless of the weather conditions or as necessary to expedite traffic. During a radar approach, ATCT personnel monitors aircraft position and issues specific heading and altitude information throughout the entire approach; however, it remains the pilot's responsibility to ensure the approach and landing minimums are met.

Precision approach radar provides both vertical and course descent guidance, similar to a precision ILS approach. ASR approaches only provide course descent information, although the controller can advise the pilot of the altitude where the aircraft should be based on the distance from the runway threshold. PAR and ASR approaches are approved for each end of Runway 8-26. PAR approach minimums allow for landings when cloud ceilings are as low as 200 feet AGL and visibility is restricted to ¾-mile for aircraft in approach categories A, B, C, D, and E. ASR minimums are increased, ranging from 400- to 800-foot cloud ceilings and one- to 2.5-mile visibility minimums depending on the aircraft's approach category.

TABLE 1B
Instrument Approach Data
Sierra Vista Municipal Airport/Libby Army Airfield

	Weather Minimums by Aircraft Type							
	Category A		Category B		Category C		Category D	
	Cloud Height (feet AGL)	Visibility (miles)	Cloud Height (feet AGL)	Visibility (miles)	Cloud Height (feet AGL)	Visibility (miles)	Cloud Height (feet AGL)	Visibility (miles)
ILS or LOC Runway 26								
Straight ILS	200	0.75	200	0.75	200	0.75	200	0.75
Straight LOC	291	1	291	1	291	1	291	1
Circling	441	1	461	1	461	1.5	561	2
RNAV (GPS) Runway 26								
LNAV MDA	411	1	411	1	411	1.25	411	1.25
Circling	441	1	461	1	461	1.5	561	2
VOR Runway 26								
Straight	511	1	511	1	511	1.5	511	1.5
Circling	441	1	461	1	461	1.5	561	2
NDB Runway 26								
Straight	671	1	671	1	671	2	671	2.25
Circling	581	1	581	1	581	2	581	2.25
RNAV (GPS) Runway 8								
LPV DA	200	0.75	200	0.75	200	0.75	200	0.75
LNAV/VNAV DA	340	1.125	340	1.125	340	1.125	340	1.125
LNAV MDA	561	1	561	1	561	1.625	561	1.625
Circling	561	1	561	1	561	1.625	561	2

Aircraft categories are established based on 1.3 times the aircraft's stall speed in landing configuration as follows:
Category A: 0-90 knots
Category B: 91-120 knots
Category C: 121-140 knots
Category D: 141-166 knots
AGL - Above Ground Level
ILS - Instrument Landing System
RNAV – Area Navigation
GPS - Global Positioning System
LPV – Localizer Performance with Vertical Guidance
LNAV – Lateral Navigation
VNAV – Vertical Navigation
DA – Decision Altitude
MDA – Minimum Descent Altitude
VOR – Very High Frequency Omnidirectional Range
NDB – Non-Directional Beacon

Source: U.S. Terminal Procedures SW-4 (February 2012)

Local Operating Procedures

The airfield is situated at 4,719 feet MSL. The published traffic pattern at the airport is maintained to provide the safest and most efficient use of the airspace surrounding the airport and to minimize aircraft overflying Fort Huachuca installations. A standard left-hand traffic pattern is published for Runways 3, 8, and 12. In doing so, the approach to landing is made using a series of left turns. Runways 21, 26, and 30 have published right-hand traffic patterns. Wind conditions warrant the predominant use of a westerly aircraft flow. According to ATCT personnel, approximately 75 percent of all aircraft operations utilize Runway 26. Another ten percent of aircraft operations utilize Runway 8. Given the length of Runway 8-26, all military aircraft and a large majority of general aviation jet aircraft utilize this runway. The remaining 15 percent of aircraft operations at the airport utilize crosswind Runways 12-30 and 3-21, which are primarily smaller general aviation aircraft.

LANDSIDE FACILITIES

Landside facilities are the ground-based facilities that support the aircraft and pilot/passenger handling functions. These facilities typically include a terminal building, fixed base operators (FBOs), aircraft storage hangars, aircraft maintenance hangars, aircraft parking aprons, and support facilities such as fuel storage, automobile parking, utilities, and aircraft rescue and firefighting. Landside facilities at Sierra Vista Municipal Airport are identified on **Exhibit 1C**.

Airport Terminal Building

The terminal building was expanded in 1992 and includes approximately 7,000 square feet of space. The terminal provides space for airport administration, a flight planning room, a pilot's lounge, a vending area, and restrooms to accommodate general aviation activities.

The facility also consists of several features related to commercial passenger service activities to include airline counters, baggage handling area, waiting areas, and rental car counters. Currently, there are no airline activities at the airport; thus, these facilities can accommodate other aviation activities if needed.

The terminal building is directly accessible from Airport Avenue, which extends west from State Highway 90. A one-way circulation pattern has been established in the vicinity of the terminal building to allow for efficient automobile access to and from the facility.

Aircraft Hangar Facilities

Hangar facilities at Sierra Vista Municipal Airport are comprised of a series of linear box hangars and one larger conventional-style hangar. Linear box hangars provide for separate storage facilities within a larger hangar complex. These hangars typically provide space for only one aircraft and are used for private storage. Conventional hangars provide a large open space, free from roof support structures, and have the capability to store several aircraft simultaneously. Often, conventional hangars are utilized by airport businesses such as FBOs and specialty aviation operators in order to provide aircraft maintenance services.

As shown on **Exhibit 1C**, there are seven separate hangar facilities at Sierra Vista Municipal Airport providing more than 90,000 square feet of hangar, maintenance, storage, and office space. Six separate linear box hangars are on the airport and provide 62 separate storage units comprising approximately 85,000 square feet. The one conventional hangar totals approximately 5,000 square feet.

It should be noted that other facilities are located at Sierra Vista Municipal Airport that support specialty aviation operations but are not configured to accommodate aircraft. A modular unit adjacent to the south side of the conventional hangar accommodates on-site emergency medical operations, personnel, and equipment related to Air Evac. To the north of the helipads, the Civil Air Patrol conducts its activities out of three modular units.

No.	Hangar Type (Number of Units)	Total Building Size (square feet)
1	Linear Box (10)	13,160
2	Linear Box (10)	15,806
3	Linear Box (12)	15,792
4	Linear Box (6)	7,896
5	Linear Box (12)	16,182
6	Linear Box (12)	16,182
7	Conventional (1)	5,000

LEGEND

- Existing Property Line
- Libby Army Airfield Property Line (Joint Use)

NORTH

0 400 800

SCALE IN FEET

Runway 3-21 (4,285' x 75')

Runway 12-30 (5,366' x 100')

Runway 8-26 (12,001 x 150')

Wash Rack/ Deicing Area

Aircraft Parking Apron

Auto Parking

Self-Service Fuel Facility/Farm

Linear Box Hangars

Aircraft Parking

Fuel Farm

Airport Avenue

Civil Air Patrol

Airport Terminal Building

Terminal Aircraft Parking

Transient Aircraft Parking

Based Aircraft Parking

Auto Parking

Air Evac

Conventional Hangar

D K L J J G

1 Airport Terminal Building

2 Self-Service Fuel Facility

3 Linear Box Hangars

4 Conventional Hangar

5 Fuel Farm

Exhibit 1C: LANDSIDE FACILITIES

Aircraft Parking Apron

There are several designated aircraft parking apron areas for aviation activities at Sierra Vista Municipal Airport. An area of parking apron space dedicated for commercial aircraft to park, deplane, and board passengers is located directly south of the terminal building and encompasses approximately 2,500 square yards. This includes space for parking and circulation of aircraft and support equipment. There are currently two marked parking positions for commercial aircraft.

To the east of the terminal area are several parking areas for general aviation aircraft. One area is designated for transient aircraft parking and consists of 10 marked tiedowns and approximately 3,300 square yards of apron area. Farther east, approximately 8,300 square yards of apron space accommodate 26 individual tiedowns dedicated for based aircraft. Adjacent to the conventional hangar, five marked tiedowns are contained within 3,300 square yards of apron area.

To the west of the terminal building, another large area of parking apron space encompassing approximately 30,000 square yards of parking and circulation is offered. There are additional parking areas located throughout the airport in close proximity to the linear box and conventional hangar facilities.

Aviation Services

An array of aviation services is available at Sierra Vista Municipal Airport. This includes flight training, aircraft maintenance, aircraft avionics, aircraft fueling, air cargo, hangar rental, pilot supplies, and emergency medical transport. The City of Sierra Vista operates from the terminal building and provides full service Jet A and 100LL fuel from 7:00 a.m. to 5:00 p.m., seven days per week. Self-service 100LL fueling capability is also offered through the City of Sierra Vista and is available 24 hours per day.

There is a full range of specialty aviation businesses located on the airport that provide aviation services, including those previously mentioned. The City of Sierra Vista provides airport management and oversees the day-to-day operations at the airport.

Automobile Parking

There are three dedicated automobile parking lots available for vehicle use at Sierra Vista Municipal Airport. A large parking area for automobiles adjacent to the north side of the terminal building is accessible via Airport Avenue. A total of 251 parking spaces is included in this area.

Other public parking areas on the airport are located adjacent to aircraft hangars and aviation-related businesses farther east. There are 14 marked parking spaces adjacent to the linear box hangars and based aircraft parking apron. In addition, 18 parking spaces are provided between the conventional hangar and helipads on the east side of Sierra Vista Municipal Airport. When combined, approximately 283 marked spaces are provided, with ten of these being designated as handicap.

Fuel Facilities

There are two fuel farms located on the airport that store aviation fuels. One fuel farm is located approximately 250 feet north of the conventional hangar and con-

tains five aboveground fuel storage tanks: two 15,000-gallon capacity tanks are dedicated for the storage of 100LL fuel, and three 15,000-gallon capacity tanks are dedicated for Jet A fuel. This fuel farm is enclosed with chain link fence to prevent inadvertent access and improved security. The second fuel farm is located adjacent to the southeast side of the terminal building and consists of a 5,000-gallon capacity storage tank dedicated to 100LL fuel. A self-service fuel dispenser is directly connected to this storage tank. The City of Sierra Vista owns and operates the fuel farms.

The City also owns and operates two refueling trucks to deliver fuel to aircraft. One truck is dedicated for 100LL fuel and allows for 2,000 gallons of storage capacity. The other truck is dedicated for Jet A fuel and contains 3,000 gallons of capacity.

Aircraft Rescue and Firefighting

Sierra Vista Municipal Airport has historically been certificated under Title 14 Code of Federal Regulations (CFR) Part 139. Although the airport does not currently accommodate scheduled air carrier operations, it is provided aircraft rescue and firefighting (ARFF) support by the U.S. Army.

There are five ARFF indices, designated as A through E, with A applicable to the smallest aircraft and E to the largest (based on aircraft length). According to the Airport/Facility Directory, Sierra Vista Municipal Airport/Libby Army Airfield is categorized within ARFF Index A. As such, the airport is required to maintain equipment and personnel consistent with this standard.

The ARFF facility and equipment is located on the south side of Libby Army Airfield approximately 350 feet east of the ATCT. ARFF equipment is operational daily and includes the following equipment according to the *Libby Army Airfield: Airfield Operations Manual*:

- Crash 32 – 3,000 gallons of water / 400 gallons of firefighting foam
- Crash 31 – 1,000 gallons of water / 130 gallons of firefighting foam
- Crash 30 – 1,000 gallons of water / 130 gallons of firefighting foam

Fencing / Gates

Sierra Vista Municipal Airport and Libby Army Airfield's operations areas are completely enclosed with chain link fence topped by three-strand barbed wire to prevent the inadvertent access onto the airport by vehicles and pedestrians. The fence does not always follow the legal boundary due to the layout of physical features and infrastructure development.

There are three controlled-access vehicle gates and two manual vehicle gates serving different areas on Sierra Vista Municipal Airport. In addition, there are four controlled-access pedestrian gates and two manual pedestrian gates. These facilities are controlled by Sierra Vista Municipal Airport personnel as well as private airport tenants.

Utilities

The availability and capacity of the utilities serving the airport are factors in determining the development potential of the airport, as well as the land immediately adjacent to the facility. Utility availability is a critical element when considering future expansion capabilities for both airside and landside components.

The airport is supplied with water via an on-site, city-owned well. The well, related pump house, and 60,000-gallon capacity storage tank are located adjacent to the west side of the fuel farm. An additional well is located adjacent to the northwest side of the automobile parking lot serving the terminal building; however, no water storage is associated with this well. The water supply system for Sierra Vista Municipal Airport is separate from Libby Army Airfield and Fort Huachuca.

The terminal building and conventional hangar are connected to individual sewage disposal systems. There is currently no municipal sewer service to the airport.

Southwest Gas provides natural gas to Sierra Vista Municipal Airport through a two-inch gas line constructed along the south side of Airport Avenue extending west from State Highway 90.

Electricity is supplied to Sierra Vista Municipal Airport by the Sulphur Springs Valley Electrical Cooperative. Tucson Electric Power provides electricity to Libby Army Airfield.

VICINITY AIRSPACE

To ensure a safe and efficient airspace environment for all aspects of aviation, the FAA has established an airspace structure that regulates and establishes procedures for aircraft using the national airspace system. The U.S. airspace structure provides for two basic categories of airspace, controlled and uncontrolled, and identifies them as Classes A, B, C, D, E, and G as described below.

- Class A airspace is controlled airspace and includes all airspace from 18,000 feet MSL to Flight Level 600 (approximately 60,000 feet MSL).

- Class B airspace is controlled airspace surrounding high capacity commercial service airports (i.e., Phoenix Sky Harbor International Airport).

- Class C airspace is controlled airspace surrounding lower activity commercial service airports and some military airports (i.e., Tucson International Airport and Davis Monthan Air Force Base).

- Class D airspace is controlled airspace surrounding airports with an ATCT and not classified under Class B or C airspace designations (i.e., Sierra Vista Municipal Airport/Libby Army Airfield).

All aircraft operating within Classes A, B, C, and D airspace must be in contact with the air traffic control facility responsible for that particular airspace.

- Class E is controlled airspace that encompasses all instrument approach procedures and low altitude federal airways. Only aircraft conducting instrument flights are required to be in contact with air traffic control when operating within Class E airspace. While aircraft conducting visual flights in Class E airspace are not required to be in radio communications with air traffic control facilities, visual flights can only be conducted if minimum visibility and cloud ceilings exist.

- Class G airspace is uncontrolled airspace that does not require contact with an air traffic control facility.

Airspace within the vicinity of Sierra Vista Municipal Airport/Libby Army Airfield is depicted on **Exhibit 1D**. Due to the presence of the ATCT, the airspace around the airport is Class D. Class D airspace extends to a five nautical mile radius around

the airport with an elevation beginning at the surface and extending up to 7,200 feet MSL. It is then buffered by transitional Class E airspace to protect approaches to the runways, generally having a floor of 700 feet AGL. Small portions of Class E airspace extend to the surface on the east and west sides of Class D airspace to further protect the instrument approaches to Runway 8-26. When the ATCT is closed, Class D airspace reverts to Class G airspace.

SPECIAL USE AIRSPACE

Special use airspace is defined as airspace where activities must be confined because of their nature and where limitations are imposed on aircraft not taking part in those activities. These areas are depicted on **Exhibit 1D**.

Restricted Areas

Restricted areas contain airspace in which the flight of aircraft, while not wholly prohibitive, is subject to restrictions. Activities within these areas must be confined because of their nature, and limitations to aircraft operations may be imposed on those aircraft that are not a part of these activities. Restricted airspace is off-limits for public use unless granted permission from the controlling agency. The restricted areas in the vicinity of the airport are used by the military.

The ARTCC facility having jurisdiction over the restricted airspace needs to authorize clearances to aircraft that cannot avoid the restricted area, unless the aircraft is on a previously approved altitude reservation mission or is part of the activity within the restricted area. If the restricted area is not active, the ARTCC facility will allow aircraft to transition through the airspace without issuing special clearances.

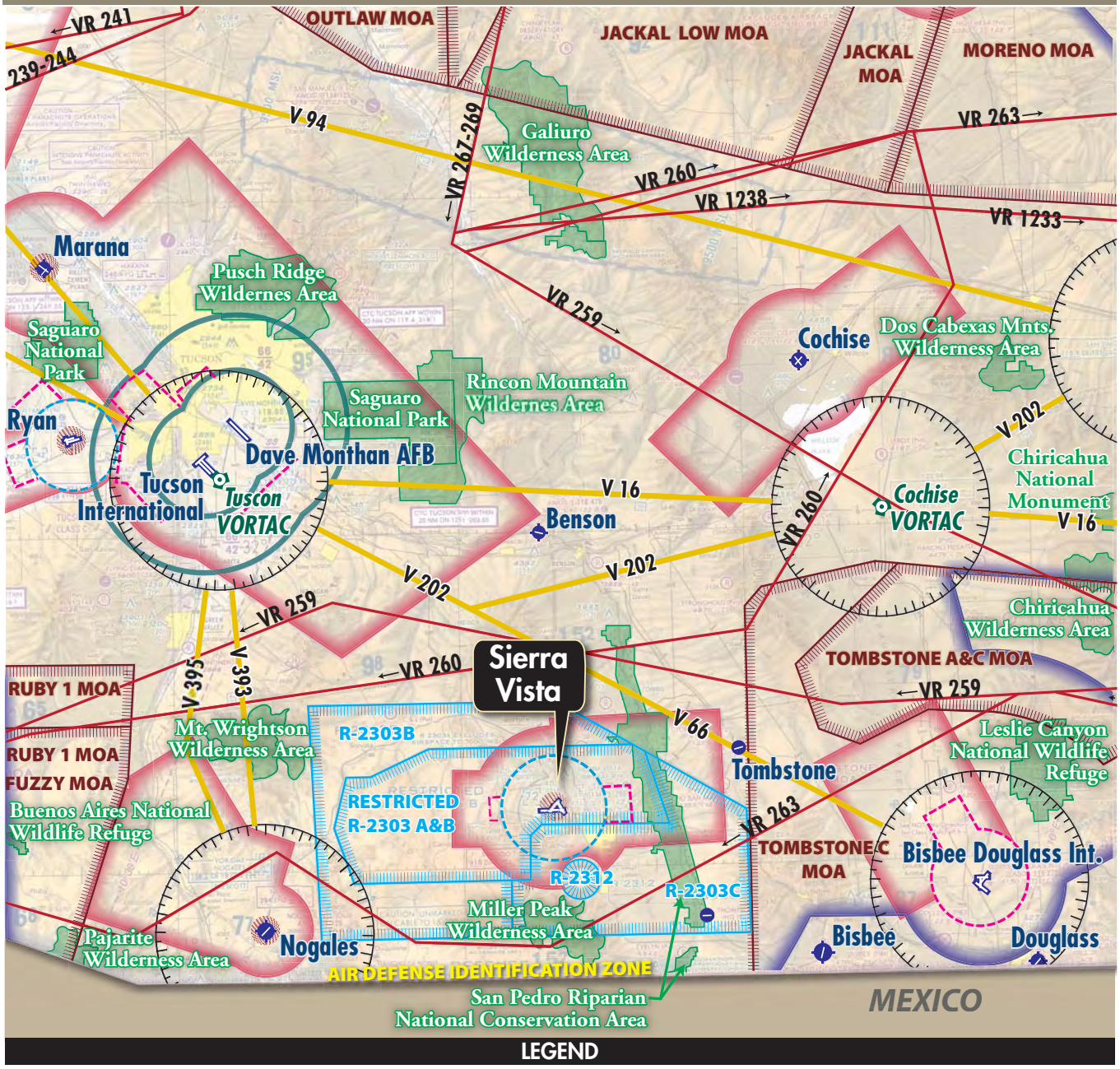
Four restricted areas are located within the vicinity of Sierra Vista Municipal Airport/Libby Army Airfield. **Table 1C** presents these restricted areas and their pertinent information as it relates to time of designation, designated altitudes, controlling agency, and using agency. As noted, R-2303A excludes the airspace from the surface to 7,000 feet MSL within a three nautical mile radius of the airport and within one nautical mile on either side of State Highway 90 as it extends north of the airport. This results in an unrestricted, visual flight rule (VFR) route into and out of the airport for aviation activity.

TABLE 1C
Restricted Airspace
Sierra Vista Municipal Airport/Libby Army Airfield

Airspace Name	Time of Designation (Local)*	Designated Altitude	Controlling Agency	Using Agency
R-2303A**	7:00 a.m. - 11:00 p.m. Monday-Friday	Surface to 15,000' MSL	FAA, Albuquerque ARTCC	U.S. Army Intelligence Center
R-2303B	7:00 a.m. - 11:00 p.m. Monday-Friday	8,000' MSL to Flight Level 300	FAA, Albuquerque ARTCC	U.S. Army Intelligence Center
R-2303C	7:00 a.m. - 11:00 p.m. Monday-Friday	15,000' MSL to Flight Level 300	FAA, Albuquerque ARTCC	U.S. Army Intelligence Center
R-2312	Continuous	Surface to 15,000' MSL	Albuquerque ARTCC	U.S. Air Force, Western Air Defense Sector

*Other times by NOTAM at least 24 hours in advance
** Excludes airspace within a three nautical mile radius of the airport and one nautical mile radius either side of State Highway 90

Source: FAA Order JO 7400.8U, *Special Use Airspace* (January 2012).



LEGEND

- Airport with hard-surfaced runways 1,500' to 8,069' in length
- Airports with hard-surfaced runways greater than 8,069' or some multiple runways less than 8,069'
- Non-Directional Radiobeacon (NDB)
- VORTAC
- Compass Rose
- Victor Airways
- Class C Airspace (Mode C)
- Class D Airspace
- Class E Airspace
- Class E Airspace with floor 700 ft. above surface
- Class E Airspace with floor 1200 ft. or greater above surface that abuts Class G Airspace
- Military Training Routes
- MOA - Military Operations Area
- Prohibited, Restricted, Warning and Alert Areas

NORTH

NOT TO SCALE

Source: South Pheonix Sectional Charts, US Department of Commerce, National Oceanic and Atmospheric Administration October 2011

Exhibit 1D: VICINITY AIRSPACE

Victor Airways

Victor Airways are designated navigational routes extending between VOR facilities. Victor Airways have a floor of 1,200 feet AGL and extend upward to an altitude of 18,000 feet MSL and are eight nautical miles wide. V66 transitions northwest to southeast approximately 12 nautical miles north of Sierra Vista Municipal Airport and is associated with the Tucson VOR and Douglas VORTAC.

Military Training Routes

Military training routes (MTRs) are used by the Department of Defense and associated Reserve and Air Guard units for the purpose of conducting low-altitude navigation and tactical training under VFR below 10,000 feet MSL at airspeeds in excess of 250 knots. MTRs near Sierra Vista Municipal Airport/Libby Army Airfield include VR259, VR260, and VR263.

Military Operations Areas

Military Operating Areas (MOAs) are designated areas of airspace established outside of Class A airspace to separate or segregate certain military activities from instrument flight rule (IFR) traffic and to identify for VFR traffic where these activities are conducted. While the FAA does not prohibit civilian VFR traffic from transiting an active MOA, it is strongly discouraged.

MOAs in the vicinity of Sierra Vista Municipal Airport/Libby Army Airfield include the Tombstone C MOA located 16 nautical miles east and the Tombstone A MOA beginning approximately 24 nautical miles to the northeast. The Ruby 1 and Fuzzy MOAs are located approximately 38 nautical miles west of the airport.

Wilderness Areas

Several wilderness areas exist around the Sierra Vista area. Aircraft are requested to maintain a minimum altitude of 2,000 feet above the surface of designated National Park areas, which includes wilderness areas and designated breeding grounds. FAA Advisory Circular (AC) 91-36C defines the "surface" as the highest terrain within 2,000 feet laterally of the route of flight or the uppermost rim of a canyon or valley.

Air Defense Identification Zone

Approximately 15 nautical miles south of the airport is the Air Defense Identification Zone (ADIZ). The ADIZ is an area of airspace defined by the United States within which the identification, location, and control of aircraft are required in the interest of national security. An aircraft entering an ADIZ is required to radio its planned course, destination, and any additional details about its trip to the controlling ARTCC agency. The ADIZ south of the airport helps to control the United States boundary with Mexico.

VICINITY AIRPORTS

There are other airports of various sizes, capacities, and functions within the vicinity of Sierra Vista Municipal Airport. It is important to consider the capabilities and limitations of these airports when determining the service area and planning for future changes and improvements at Sierra Vista Municipal Airport. **Exhibit 1E**

provides information on the four public-use airports within 30 nautical miles of Sierra Vista Municipal Airport. Information pertaining to each airport was obtained from FAA Form 5010-1, *Airport Master Record*.

From this analysis of public-use airports in the region, it is evident that there are several facilities serving the needs of general aviation; however, Sierra Vista Municipal Airport is positioned well due to the array of services and facilities it has to offer, in addition to a 12,001-foot long runway. These factors must be considered carefully in determining the service area for Sierra Vista Municipal Airport, which will be discussed in the next chapter.

AIRPORT CHARACTERISTICS

The purpose of this section is to summarize various studies and data collected to provide an understanding of the characteristics of the airport and the regional area. Within this section is a description of the airport's history, climate, documentation and activity, role, and surrounding land use. This information serves as an important baseline when developing forecasts for critical airport infrastructure to support demand over the planning period.

AIRPORT HISTORY

The present day Sierra Vista Municipal Airport began during the early 1970s, when the City of Sierra Vista signed a 20-year lease agreement with the U.S. Army's Fort Huachuca for 10.5 acres of land adjacent to Libby Army Airfield. In 1982, the U.S. Army officially deeded to the City of Sierra Vista 29.08 acres of land located on the north side of Libby Army Airfield, which transformed the airport into a City-owned, joint-use facility, and qualified the airport for grant funding assistance from the FAA's Airport Improvement Program (AIP). At that time, the Army granted joint use of the runways and taxiways to the City of Sierra Vista for use by civilian aircraft. Included in the joint use agreement were the requirements for the city to construct a terminal facility and an access road.

In 1989, an additional 43.05 acres of land were deeded to the city for the sole purpose of expanding the existing civilian aviation facilities. This additional land acquisition has allowed the City of Sierra Vista to secure FAA and ADOT-MPD – Aeronautics Group grants to develop airside and landside infrastructure at the airfield.

The following conditions are among the primary covenants that regulate civilian use of the land and which are tied to the land under the Joint Use Agreement of 1982:

- The use of the land is limited to public airport purposes.
- The City of Sierra Vista is permitted to improve or alter the existing runways, taxiways, and appurtenances thereto, or to construct new facilities, in accordance with FAA and Department of the Army design specifications.
- Prior to the construction of any improvements on the property, the City of Sierra Vista is required to coordinate the general design of the improvements with the Commander of Fort Huachuca.

Tombstone Municipal Airport (P29)

Airport Sponsor: City of Tombstone
Distance from FHU: 17 nm NE
Airport Classification: General Aviation
Primary Runway: 6-24
Length: 4,430′
Width: 60′

Surface Type / Condition: Asphalt / Good
Strength Rating: N/A
Marking: Basic
Runway Lighting: None
Visual Navaids: None
Based Aircraft: 2
Estimated Annual Operations: 340
Services Provided: Tiedowns

Instrument Approaches	Weather Minimums*	
Type	*Cloud Height*	*Visibility*
None		

Benson Municipal Airport (E95)

Airport Sponsor: City of Benson
Distance from FHU: 25 nm N
Airport Classification: General Aviation
Primary Runway: 10-28
Length: 4,002′
Width: 75′

Surface Type / Condition: Asphalt / Excellent
Strength Rating: 12,500 lbs. SWL
Marking: Basic
Runway Lighting: MIRL
Visual Navaids: PAPI-2 (10 & 28)
Based Aircraft: 42
Estimated Annual Operations: 7,700
Services Provided: Aircraft Fuel (100LL & Jet A), Hangars, Tiedowns, Aircraft Maintenance, Flight Instruction, Aircraft Rental

Instrument Approaches	Weather Minimums*	
Type	*Cloud Height*	*Visibility*
None		

Bisbee Municipal Airport (P04)

Airport Sponsor: City of Bisbee
Distance from FHU: 27 nm SE
Airport Classification: General Aviation
Primary Runway: 17-35
Length: 5,929′
Width: 60′

Surface Type / Condition: Asphalt / Good
Strength Rating: 12,000 lbs. SWL
Marking: Basic
Runway Lighting: MIRL
Visual Navaids: PAPI-2 (17 & 35)
Based Aircraft: 10
Estimated Annual Operations: 4,900
Services Provided: Aircraft Fuel (100LL), Tiedowns, Flight Instruction

Instrument Approaches	Weather Minimums*	
Type	*Cloud Height*	*Visibility*
None		

Nogales International Airport (OLS)

Airport Sponsor: Santa Cruz County
Distance from FHU: 28 nm SW
Airport Classification: General Aviation
Primary Runway: 3-21
Length: 7,199′
Width: 100′

Surface Type / Condition: Asphalt / Good
Strength Rating: 21,000 lbs. SWL
Marking: Non-Precision
Runway Lighting: MIRL
Visual Navaids: PAPI-4 (3 & 21)
Based Aircraft: 23
Estimated Annual Operations: 27,000
Services Provided: Aircraft Fuel (100LL & Jet A), Tiedowns, Aircraft Maintenance, Flight Instruction, Aircraft Rental

Instrument Approaches	Weather Minimums*	
Type	*Cloud Height*	*Visibility*
VOR/DME or GPS (circling)	1,268 (A/B/C/D)	1.25 (A); 1.5 (B); 3 (C/D)
VOR or GPS (circling)	1,568 (A/B/C/D)	1.25 (A); 1.5 (B); 3 (C/D)
NDB or GPS (circling)	2,648 (A/B/C/D)	1.25 (A); 1.5 (B); 3 (C/D)

KEY

DME - Distance Measuring Equipment
GPS - Global Positioning System
MIRL - Medium Intensity Runway Lighting
NDB - Non-Directional Beacon
PAPI - Precision Approach Path Indicator
SWL - Single Wheel Loading
VOR - Very High Frequency Omnidirectional Range

** Denotes lowest approved cloud heights in feet AGL and visibility minimums in miles*

- Unless otherwise approved by the Department of the Army, all air traffic in the restricted airspace and the air pattern, and on the runways and taxiways at Libby Army Airfield, are under the sole operational control of the Army.

- The City of Sierra Vista is required to maintain security fences around their property in accordance with specifications approved by the Army.

- The City of Sierra Vista is not permitted to construct or allow to be constructed, any facilities at the airport that are within the primary surface without prior approval of the FAA and/or applicable military regulations. The primary surface is defined in the agreement as being "located on the ground longitudinally centered on the runway with the same length as the runway and having 2,000 feet (1,000 feet either side of the centerline of the runway)."

- The Commander of Fort Huachuca may require the City of Sierra Vista to reduce the total volume of water extracted from any well(s) on site to that which is absolutely essential to the operation of the public airport facilities, if it is deemed to be in the best interest of the federal government.

- The City of Sierra Vista is required to provide accommodations to the Civil Air Patrol, Inc. for as long as necessary.

- Unless otherwise approved by the Department of the Army, the City of Sierra Vista cannot charge landing fees on runways it does not operate or maintain.

AIRPORT SETTING

Sierra Vista Municipal Airport sits on approximately 72 acres of property and is located three miles northwest of the City of Sierra Vista's central business district. The airport is situated within the north-central portion of the Fort Huachuca Military Reservation and approximately 15 miles from the United States border with Mexico.

Sierra Vista Municipal Airport is provided with excellent access to regional highway infrastructure. As depicted on **Exhibit 1F**, direct access to the airport is provided by Airport Avenue, which extends west of State Highway 90. State Highway 90 provides direct access to U.S. Interstate 10 approximately 25 miles north of the airport. From there, U.S. Interstate 10 provides access to the cities of Tucson and Phoenix to the west and the State of New Mexico to the east.

REGIONAL CLIMATE

Weather conditions must be considered in the planning and development of an airport, as daily operations are affected by local weather. Temperature is a significant factor in determining runway length needs, while local wind patterns (both direction and speed) can affect the operation and capabilities of the runway system. The need for navigational aids and lighting is determined by the percentage of time the visibility is impaired due to cloud coverage and other conditions.

The City of Sierra Vista experiences a relatively mild climate that is influenced by its high elevation and nearby mountains. Summers are quite warm with rain and

thunderstorms occurring during the late summer monsoon season. The spring and fall are typically drier and winters are usually mild with little rain. The area does occasionally experience winter weather in the form of snow, which usually occurs during December and January.

The average annual daily high temperature is 77.2 degrees F, ranging from 61.1 degrees F in December and January to 92.8 degrees F in June. Average low temperatures range between 33.1 degrees F in December to 65.9 degrees F in July, leading to an average annual daily low temperature of 49.2 degrees F. Average annual precipitation in the area is 14.05 inches. As previously mentioned, the area occasionally experiences snowfall during the winter months. Winds in the area are generally from the south and southwest, averaging 8.2 miles per hour (mph). A summary of climatic data specific to the City of Sierra Vista is presented in **Table 1D**.

TABLE 1D
Climate Summary
Sierra Vista, AZ

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
Avg. High Temp. (F)	61.1	64.6	69.6	76.9	85.1	92.8	91.7	89.1	87.0	79.4	68.4	61.1	77.2
Avg. Low Temp. (F)	33.5	36.5	41.0	46.9	54.7	62.9	65.9	64.6	60.2	50.7	40.1	33.1	49.2
Avg. Precip. (in.)	0.91	0.62	0.46	0.43	0.28	0.52	3.20	3.75	1.40	0.97	0.49	1.02	14.05
Wind Speed (mph)	7.8	8.0	8.5	8.9	8.8	8.6	8.4	7.9	8.0	8.0	7.9	7.8	8.2

Source: Western Regional Climate Center and www.weather.com

AREA LAND USE AND ZONING

The area land use surrounding Sierra Vista Municipal Airport can have a significant impact on airport operations and growth. The following section identifies baseline information related to generalized land uses in the vicinity of the airport. By understanding the land use issues surrounding the airport, more appropriate recommendations can be made for the future of the airport.

Sierra Vista Municipal Airport is surrounded by the Fort Huachuca Military Reservation. Land around the airport is primarily undeveloped, with the exception of the military facilities that make up Libby Army Airfield and Fort Huachuca located directly south of the airport. Huachuca City is located approximately two miles north of the airport and the City of Sierra Vista is located approximately two miles southeast of the airport. **Exhibit 1G** further details land designations in proximity to Sierra Vista Municipal Airport.

Under ideal conditions, the development immediately adjacent to the airport would be controlled and limited to compatible land uses. Compatible uses would include light and heavy industrial development and some commercial development. Land use zoning is the most common land use control. The City of Sierra Vista has zoned the 72 acres of airport property as a Light Industrial District. This district is comprised of property suitable for industrial and higher-intensity commercial development. Regulations are intended to encourage development such as manufacturing, fabricating, processing, packaging, and other industries, all of which are compatible with airport operations. The area of Fort Huachuca is zoned as Military Reservation. As previously discussed, any pro-

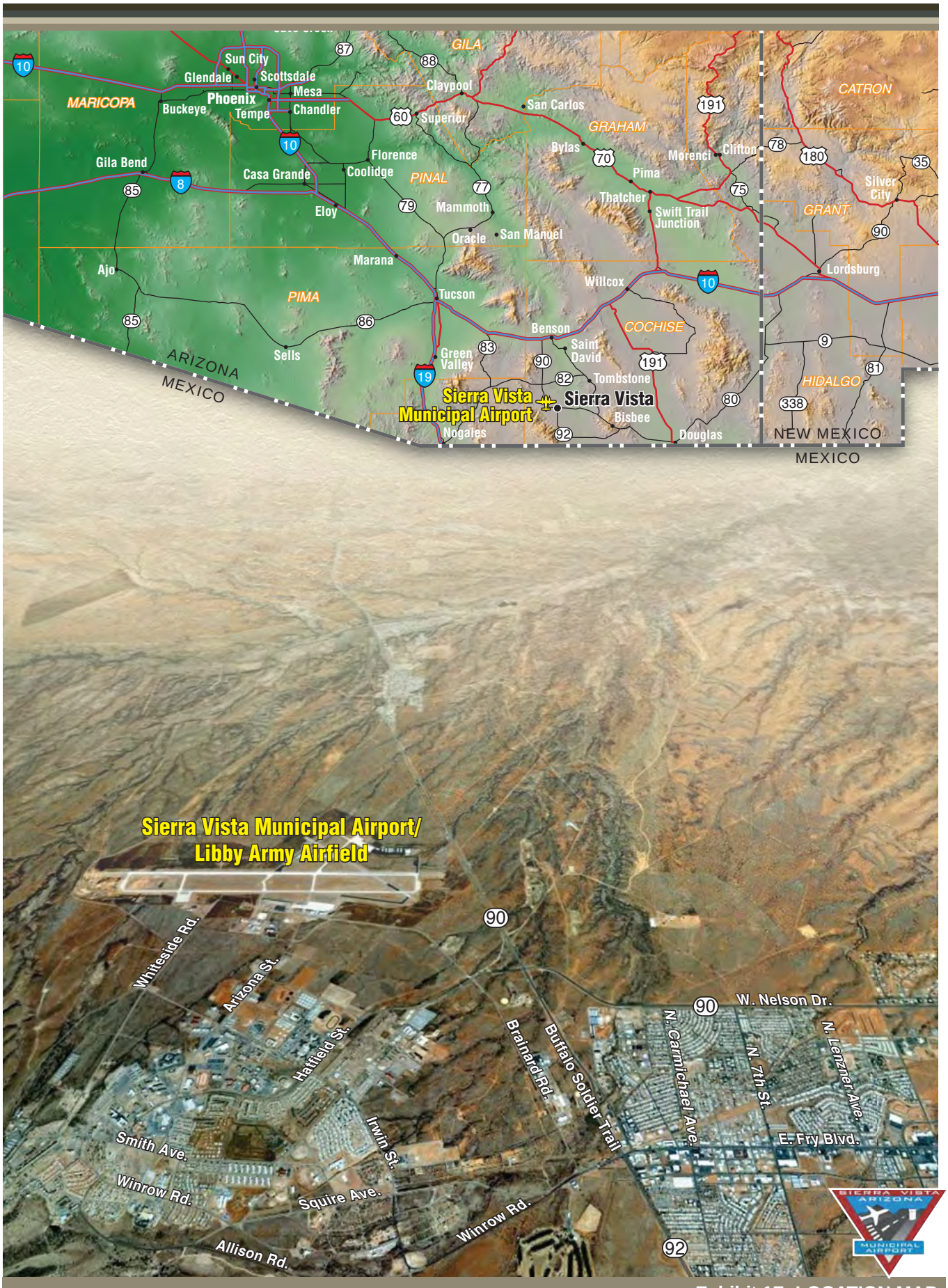
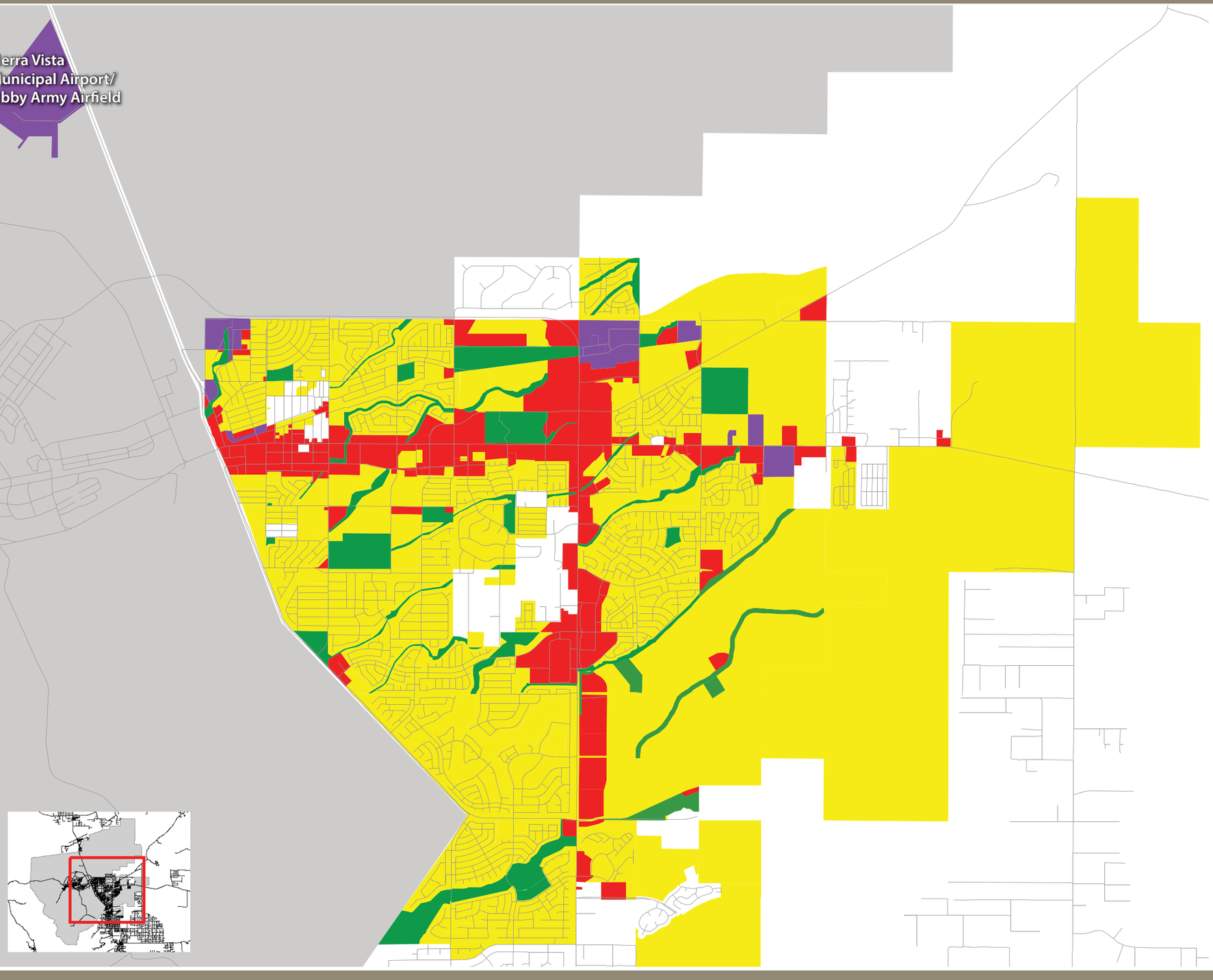


Exhibit 1F: LOCATION MAP

Sierra Vista
Municipal Airport/
Libby Army Airfield



LEGEND

- Fort Huachuca Boundary

Zoning for Sierra Vista:

- Commercial
- Industrial
- Open Space
- Residential
- Residential
- Unincorporated

NORTH

NOT TO SCALE

Source: Vista 2020 Map;
City of Sierra Vista GIS

This document is a graphic representation only of best available sources. Cit of Sierra Vista assumes no responsibilirty for any errors..The Land Use designations for the areas outside the Ciyy limits may not be consistent with adopted Cochise County Land Use Plans.

Exhibit 1G: LAND USE PLAN

posed development on the airport must be coordinated with Fort Huachuca.

AIRPORT HEIGHT AND HAZARD ZONING

Height and hazard zoning establishes height limits for new construction near the airport and within the runway approaches. It is based upon an approach plan which describes artificial surfaces defining the edges of airspace, which are to remain free of obstructions for the purpose of safe navigation. It requires that anyone who is proposing to construct or alter an object that affects airspace must notify the FAA prior to its construction.

Height restrictions are necessary to ensure that objects will not impair flight safety or decrease the operational capability of the airport. Title 14 CFR Part 77, *Objects Affecting Navigable Airspace*, defines a series of imaginary surfaces surrounding airports. The imaginary surfaces consist of the approach zones, conical zones, transitional zones, and horizontal zones. Their respective dimensions are based upon the type of approach serving each particular runway at the airport.

The City of Sierra Vista has enacted height hazard zoning guidelines surrounding the airport as set forth in Title 14 CFR Part 77 through the adoption of an Airport Airspace District. The purpose of the Airport Airspace District is to regulate and restrict the height of structures and objects of natural growth through the application of Part 77 and military runway approach zone guidelines.

AIRCRAFT ACTIVITY

The ATCT located on the airport records data regarding aircraft operations (take-offs and landings). **Table 1E** summarizes historical annual operations at the airport since 2006. During this timeframe, annual aircraft operations have averaged approximately 143,000. Of this total, approximately 75 percent of total operations are related to military activity and the remaining 25 percent consists of civilian (general aviation and air taxi) activity. It should be noted that the operations presented are only those logged during hours when the ATCT is operational.

TABLE 1E
Historical Aircraft Operations
Sierra Vista Municipal Airport/Libby Army Airfield

Year	Civilian	Military	Total Operations
2006	40,128	116,145	156,273
2007	40,216	107,298	147,514
2008	33,042	100,368	133,410
2009	36,903	99,302	136,205
2010	32,159	112,186	144,345
2011	33,507	107,066	140,573

Source: ATCT Records

AIRPORT ADMINISTRATION

Sierra Vista Municipal Airport is owned and operated by the City of Sierra Vista. The Airport Manager has responsibility for the overall management, maintenance, and operation of the airport. In addition, there are one full-time and two part-time employees at the airport who conduct aircraft fueling, maintain the fuel farm and fuel servicing equipment, and maintain the grounds and city-owned infrastructure on the airport. Airport staff maintains a presence on the airport seven days a week and are on call 24 hours a day. The airport is an independent division within the City's Department of Public Works.

An Aviation Commission was originally created in 1973 and later re-established as the Airport Commission in 1996. The Airport Commission consists of seven members and meets on the second Wednesday of each month. It is an advisory body to the Sierra Vista City Council, and members are appointed by the elected body. The Commission's purpose it to:

- Provide public input and citizen participation on the policies and procedures that affect the operation and use of Sierra Vista Municipal Airport; and
- Promote the growth and expansion of airport services to the general public.

CAPITAL IMPROVEMENT HISTORY

To assist in funding capital improvements, the FAA and ADOT-MPD – Aeronautics Group have provided funding assistance to the City of Sierra Vista through the AIP and Arizona Aviation Fund. **Table 1F** summarizes more than $14.68 million in capital improvement projects undertaken at the airport over the past ten years.

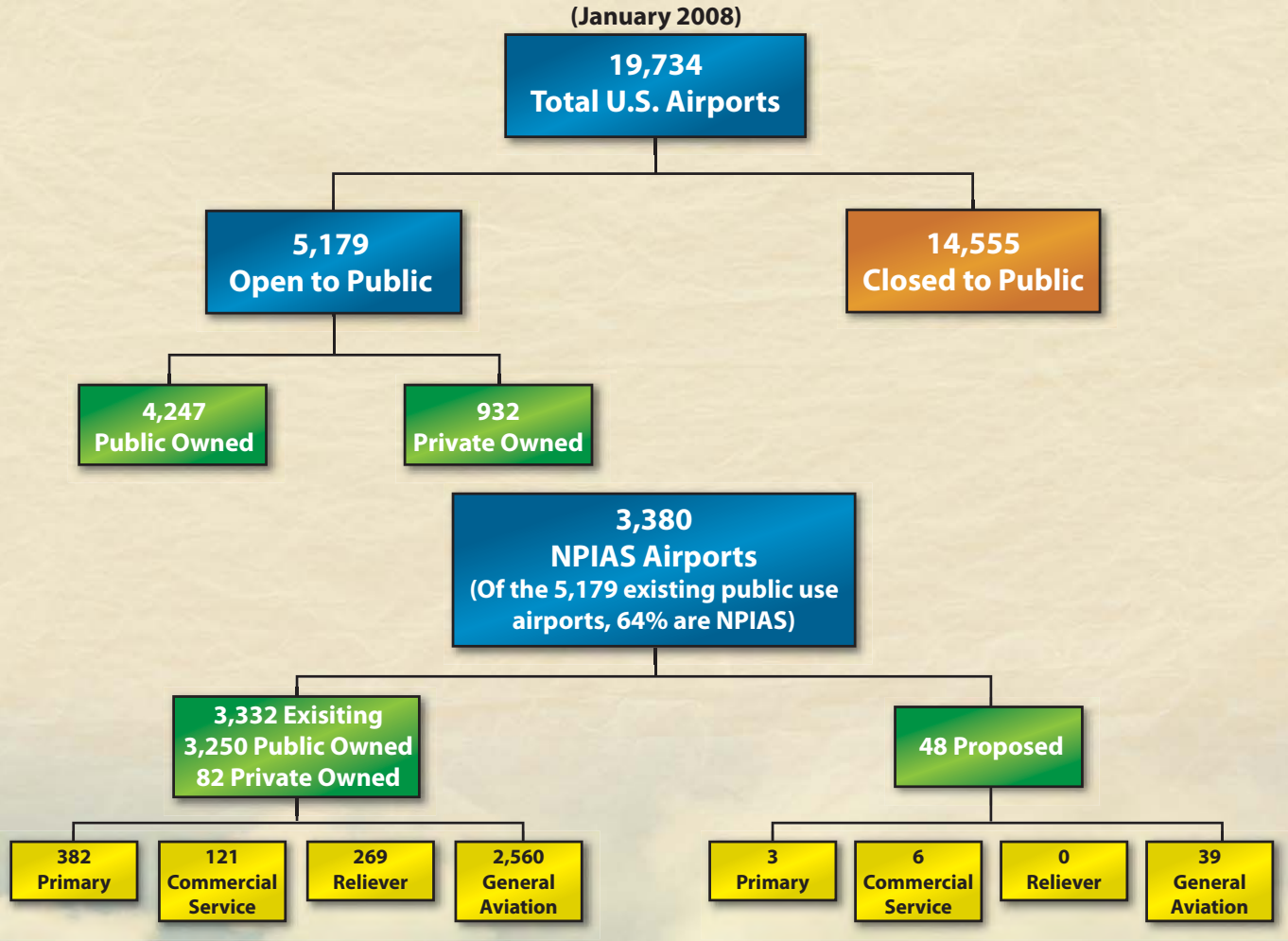
AIRPORT SYSTEM PLANNING ROLE

Airport planning exists on many levels to include local, state, and national. Each level has a different emphasis and purpose. An Airport Master Plan is the primary local airport planning document. This Master Plan will provide a vision of both airside and landside facilities over the course of the next 20 years.

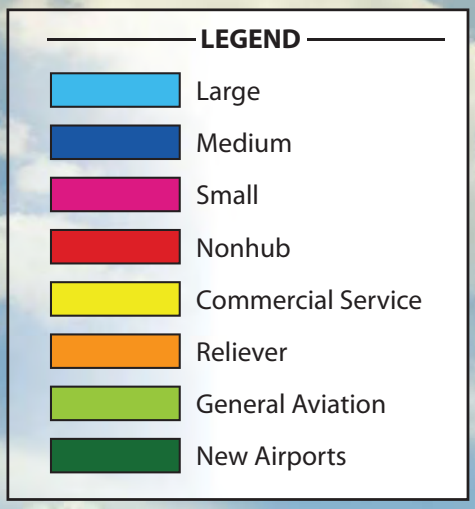
At the national level, the airport is included in the *National Plan of Integrated Airport Systems* (NPIAS). The NPIAS includes 3,332 existing airports which are significant to national air transportation. Sierra Vista Municipal Airport is classified as a general aviation airport within the NPIAS. Inclusion within the NPIAS is required to be eligible for AIP funding. The top half of **Exhibit 1H** shows the system breakdown of NPIAS airports.

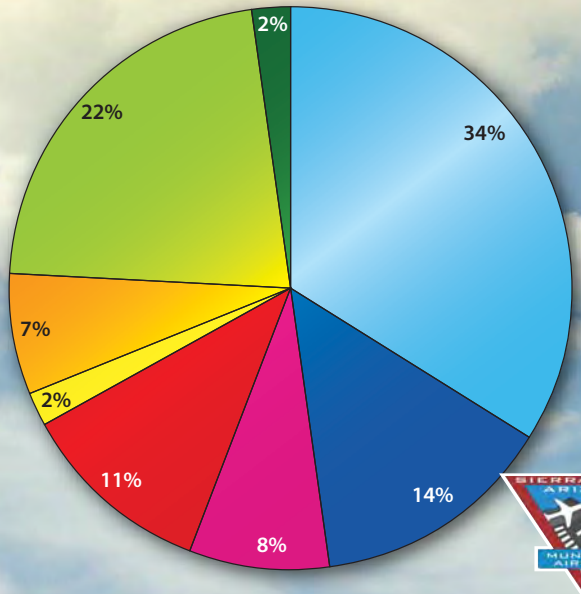
The 2011-2015 NPIAS identifies $52.2 billion for airport development across the country. Of that total, approximately $11.15 billion (21 percent) is designated for the 2,560 general aviation airports identified. To be eligible as a general aviation facility in the NPIAS, an airport typically has at least ten locally based aircraft and is at least 20 miles from the nearest NPIAS airport. General aviation airports included in the NPIAS have an average of 31 based aircraft and account for 34 percent of the nation's general aviation fleet. They are the closest source of air transportation for approximately 20 percent of the nation's population and are particularly important to rural areas. The bottom half of **Exhibit 1H** shows the NPIAS funding need by airport category.

U.S. AIRPORT COMPOSITION



FEDERAL FUNDING BY AIRPORT TYPE





Source: FAA NPIAS 2011-2015

Exhibit 1H: NPIAS COMPOSITION AND FUNDING LEVELS

TABLE 1F
Capital Improvement History
Sierra Vista Municipal Airport

Year	Project Description	FAA Grant Number	ADOT Grant Number	Total Grant Funds
2002	VOR Construction	03-04-0060-11	E1153	$74,494
2002	Terminal Security Improvements	03-01-0060-11	E1153	$7,562
2002-2003	Design - Taxiway J	03-04-0060-11	E1153	$82,671
2002-2005	Airport Security Fence	03-04-0060-12	E3F45	$1,318,028
2002-2005	Airfield Beacon Replacement	03-04-0060-12	E3F45	$19,876
2004-2005	VOR Construction	03-04-0060-13	E3F46	$549,089
2005-2007	Airfield Improvements - Security Fence, Cameras, Gates, Electrical, Trenching	03-04-0060-14	E3F47	$803,577
2005-2007	Airfield Improvements - Security Fence, Cameras, Gates, Microwave Tower	03-04-0060-15	E3F47/E4F47	$393,436
2005-2007	Construction - Taxiway J	03-04-0060-16	E5F50	$2,400,000
2006-2007	Construction - Taxiway J	03-04-0060-17	E6F62	$1,240,382
2006-2007	Aircraft Parking Apron Expansion	03-04-0060-17	E6F62	$508,738
2006-2007	Air Services Development Program Communication	N/A	IGA-05-01	$58,675
2007	Aircraft Rescue and Firefighting Vehicle	03-04-0060-17	E6F62	$800,873
2007	Aircraft Parking Apron Rehabilitation	03-04-0060-19	E7F51	$414,649
2008-2012	Airport Master Plan Update	03-04-0060-20	E8F69	$157,895
2008-2009	Distance Remaining Markers	03-04-0060-21	E9F09	$264,344
2009-2010	AWOS Upgrade	03-04-0060-22	E9F58	$236,488
2009-2010	Airport Minimum Standards Development	N/A	E8S1A	$84,925
2007-2011	Runway 12-30 and Taxiway J Improvements	03-04-0060-23	E10F17	$5,145,728
2010-2011	Design - Taxiway G	03-04-0060-24	E10F17	$127,039
Total Grant Funds				**$14,688,469**

Source: Airport Records

At the state level, Sierra Vista Municipal Airport is included in the 2008 *Arizona State Airports System Plan* (SASP). The purpose of the SASP is to provide a framework for the integrated planning, operation, and development of Arizona's aviation assets. The SASP defines the specific role of each airport in the state's aviation system and established funding needs. The SASP provides policy guidelines that promote and maintain a safe aviation system in the state, assess the state's airport capital improvement needs, and identify resources and strategies to implement the plan. Sierra Vista Municipal Airport is one of 83 airports in the 2008 SASP, which includes nine primary commercial service airports, three commercial service airports, eight reliever airports, 38 general aviation airports, and 24 non-NPIAS airports. Sierra Vista

Municipal Airport is included in the general aviation airports category.

SOCIOECONOMIC CHARACTERISTICS

Socioeconomic characteristics are collected and examined to derive an understanding of the dynamics of growth within the vicinity of Sierra Vista Municipal Airport. This information is essential in determining aviation demand level requirements, as most general aviation demand can be directly related to the socioeconomic condition of the area. Statistical analysis of population, employment, and income trends can define the economic strength of the region and the ability of the region to sustain a strong economic base over an extended period of time.

Whenever possible, local or regional data is used for analysis. For this study, socioeconomic data was gathered from various sources, including the Cochise College Center for Economic Research, Arizona Department of Commerce, Arizona Office of Employment and Population Statistics, and United States Census Bureau. It should be noted that only historical figures are presented in this section. Future socioeconomic projections will be outlined in Chapter Two.

POPULATION

Population is one of the most important socioeconomic factors to consider when planning for future needs of an airport. Trends in population provide an indication of the potential of the region to sustain growth in aviation activity. Historical population data for the City of Sierra Vista and Cochise County is presented in **Table 1G**. Additional population data for the State of Arizona and the United States is also included.

TABLE 1G
Historical Population Statistics

	1990	2000	2005	2011	Average Annual Growth Rate
City of Sierra Vista	32,983	37,775	43,690	45,098	1.50%
Cochise County	97,624	117,755	131,790	130,537	1.39%
State of Arizona	3,665,228	5,130,632	6,077,740	6,438,178	2.72%
United States	248,709,873	281,421,906	296,507,061	311,591,917	1.08%

Source: Cochise College Center for Economic Research; U.S. Census Bureau

As shown in the table, all reporting entities have experienced positive growth in population since 1980. In fact, the City of Sierra Vista and Cochise County have grown at a rate greater than the national average over the past 20 years. During this time, the population of Sierra Vista has increased at an average annual growth rate (AAGR) of 1.50 percent annually. This translates to the addition of 12,115 new residents. Cochise County has grown at a slightly slower rate during the same time period, at 1.39 percent annually.

The State of Arizona exhibited very strong growth during the time period, averaging a 2.72 percent AAGR. It should be noted that the state's overall population growth has slowed in recent years due to the economic recession the entire country has been experiencing. The positive

growth trends at the local, regional, and national levels have been attributed to the availability of affordable quality homes, excellent educational institutions, recreational amenities, and employment opportunities.

EMPLOYMENT

Analysis of a region's employment base can be valuable in determining the overall well-being of the general area. In most cases, the area's makeup and health is significantly impacted by the availability of jobs, variety of employment opportunities, and types of wages provided by local employers. **Table 1H** provides historical employment characteristics for the City of Sierra Vista from 2006 to 2010 in five analysis categories.

TABLE 1H
Historical Employment Characteristics
City of Sierra Vista

	2006	2007	2008	2009	2010
Civilian Labor Force	17,967	18,157	19,050	19,733	19,812
Employment	17,500	17,720	18,411	18,856	18,832
Unemployment	467	437	639	877	980
Job Gains	487	220	691	445	-24
Job Growth Rate	2.9%	1.3%	3.9%	2.4%	-0.1%

Source: Cochise College Center for Economic Research; Arizona Department of Commerce

Total employment for Sierra Vista grew by 1,332 jobs between 2006 and 2010. During that same time, the labor force increased by 1,845. Signs of the economic recession are evident in the unemployment and job growth trends as presented. Since 2008, unemployment numbers have increased and overall job growth has decreased.

Although the unemployment rate for Sierra Vista has increased in the recent past, it still remains well below the unemployment rates when compared to Cochise County, the State of Arizona, and the United States. As detailed in **Table 1J**, the city's unemployment rate has increased from a low of 2.4 percent in 2007 to a high of 4.8 percent in 2010. This trend follows unemployment rates for Cochise County, which increased from 4.0 percent to 8.1 percent during the same time period. The State of Arizona and United States have experienced even higher unemployment rates in the recent past, both exceeding nine percent in 2009 and 2010.

TABLE 1J
Unemployment Rate

	2006	2007	2008	2009	2010
City of Sierra Vista	2.6%	2.4%	3.4%	4.4%	4.8%
Cochise County	4.4%	4.0%	5.3%	7.4%	8.1%
State of Arizona	4.1%	3.8%	5.9%	9.0%	9.6%
United States	4.6%	4.6%	5.8%	9.3%	9.7%

Source: Cochise College Center for Economic Research; Arizona Department of Commerce

Locally, the City of Sierra Vista is the center of commerce for the area. Sierra Vista is a regional hub for retail shopping, medical facilities, industry, government, and much more. The major employers in Sierra Vista are presented in **Table 1K**. Understanding the types of employment opportunities will aid in identifying demand for aviation services in the area.

TABLE 1K
Major Employers
City of Sierra Vista

Company Name	Type of Industry	Number of Employees
Fort Huachuca	Military / U.S. Army	9,438
General Dynamics Information Technology	Information Technology	1,022
Sierra Vista Unified School District #68	Education	770
Sierra Vista Regional Health Center	Health Services	669
ManTech Telecommunications and Information Systems Corp.	Information Technology	482
Northrop Grumman Corporation	Information Technology	475
Newtec, LLC	Communications	453
City of Sierra Vista	Government	437
Aegis Communications Group, Inc.	Business Solutions	407
Science Applications International Corp.	Business Solutions	302
Wal-Mart	Retail	298
NCI Information Systems, Inc.	Technology Services	233

Source: Cochise College Center for Economic Research

Fort Huachuca, which includes active duty military personnel and Department of the Army civilian employees, constitutes the top employer in the area. Fort Huachuca also has a large indirect employment impact on Cochise County, supporting approximately 26,900 jobs in the county. This includes the Fort's direct employees, as well as those employed due to government contracts and spending by the Fort and its employees.

The second largest employer is General Dynamics Information Technology, which employs over 1,000 people, followed by the Sierra Vista School District and Sierra Vista Regional Health Center. As presented in the table, the largest employers are diverse, providing opportunities for a wide array of economic centers.

PER CAPITA PERSONAL INCOME

Table 1L compares per capita personal income (PCPI) for Cochise County, the State of Arizona, and the United States since 1990. PCPI is determined by dividing total income by population. In order for PCPI to grow, income growth must outpace population growth significantly. As shown in the table, while the overall PCPI for Cochise County is below that of Arizona and the United States, the county has experienced a strong AAGR that has outpaced the state and national average since 1990. This can be attributed to the employment opportunities related to the City of Sierra Vista and Fort Huachuca.

TABLE 1L
Historical Per Capita Income (adjusted to 2005 dollars)

	1990	2000	2005	2011	Average Annual Growth Rate
Cochise County	$19,051	$22,394	$27,980	$31,167	2.37%
State of Arizona	$23,295	$29,287	$32,223	$32,071	1.53%
United States	$25,826	$33,771	$35,452	$37,596	1.80%

Source: Woods & Poole Complete Economic Demographic Data Source (2012)

ENVIRONMENTAL INVENTORY

Available information regarding the existing conditions at Sierra Vista Municipal Airport has been derived from internet resources, agency maps, and existing literature. The intent of this task is to inventory potential environmental sensitivities that might affect future improvements at the airport.

AIR QUALITY

The United States Environmental Protection Agency (EPA) has established National Ambient Air Quality Standards (NAAQS) based on health risks for six pollutants: carbon monoxide (CO); nitrogen dioxide (NO_2); sulfur dioxide (SO_2); lead (Pb); ozone (O_3); and two sizes of particulate matter (PM), PM measuring 10 micrometers or less in diameter (PM_{10}) and PM measuring 2.5 micrometers in diameter ($PM_{2.5}$).

An area with ambient air concentrations exceeding the NAAQS for a criteria pollutant is said to be a nonattainment area for the pollutant's NAAQS, while an area where ambient concentrations are below the NAAQS is considered an attainment area. The EPA requires areas designated as nonattainment to demonstrate how they will attain the NAAQS by an established deadline. To accomplish this, states prepare State Implementation Plans (SIPs). SIPs are typically a comprehensive set of reduction strategies and emissions budgets designed to bring the area into attainment.

Various levels of review apply within both the *National Environmental Policy Act* (NEPA) and permitting requirements for airport development projects. Potentially significant air quality impacts associated with an FAA project or action would be demonstrated by the project or action exceeding one or more of the NAAQS for any of the time periods analyzed.

The airport is located in the southwestern corner of Cochise County. According to the EPA's *Green Book – Nonattainment Status for Each County by Year for Arizona*, this portion of Cochise County is in attainment for all NAAQS standards.[1] (The Douglas area of Cochise County is listed as a moderate nonattainment area for PM-10.)

COASTAL RESOURCES

The airport is located approximately 165 miles from the nearest coastal body of water, which is the Gulf of California. It is located more than 400 miles from the Pacific Ocean, the nearest U.S. protected

[1] http://www.epa.gov/oar/oaqps/greenbk/anay_az.html, dated August 31, 2011, accessed March 2012.

coastal area. Thus, the airport is not located within a Coastal Zone.

FARMLAND

According to the U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS), the airport consists primarily of the following soils: Terrarossa complex and White House complex, neither of which is prime farmland.[2] Therefore, the *Farmland Protection Policy Act* is not applicable to development at the airport.

FISH, WILDLIFE, AND PLANTS

The U.S. Fish and Wildlife Service (FWS) is charged with overseeing the requirements of the *Endangered Species Act*, specifically Section 7, which sets forth requirements for consultation to determine if a proposed action "may affect" a federally endangered or threatened species. If an agency determines that an action "may affect" a federally protected species, then Section 7(a)(2) requires the agency to consult with the FWS to ensure that any action the agency authorizes, funds, or carries out is not likely to jeopardize the continued existence of any federally listed endangered or threatened species, or result in the destruction or adverse modification of critical habitat. If a species has been listed as a candidate species, Section 7(a)(4) states that each agency must confer with the FWS.

According to the Arizona Ecological Service's data base of the FWS, dated March 5, 2012, there are fifteen species that are listed as endangered (E), one species proposed for endangered (PE), six listed as threatened (T), and seven candidate (C) species known to occur within Cochise County.[3] There are no designated critical habitats. These species are identified in **Table 1M**. Of the species identified**,** only the lesser long-nosed bat has the potential to occur at the airport. Although the airport lacks potential roost sites and foraging habitat, this species is present in the area seasonally from April to October (EcoPlan Associates, Inc. 2000).

The Arizona Department of Game and Fish's (ADGF) On-line Environmental Review Tool was used to ascertain if there have been known occurrences of special status species or critical habitats within three miles of the airport. According to this data base, there have been occurrences within three miles of the Airport of the following federally listed species: lesser long-nosed bat (E), Huachuca water-umbel (E), and Chircahua leopard frog (T). Additional wildlife of special concern in Arizona (WSC), such as Mexican long-tongued bat, Western red bat, and the Northern Mexican garter snake, are also known to occur within three miles of the airport.

Other federal laws potentially applicable to the airport include the *Migratory Bird Treaty Act,* which prohibits activities that would harm migratory birds, their eggs or nests, and the *Fish and Wildlife Coordination Act,* which requires consultation with state wildlife agencies concerning wildlife resources if impacts to water resources might occur. Executive Order (EO) 13312, *Invasive Species,* aims to prevent the introduction of invasive species as a result of a proposed action.

[2] http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx, accessed March 2012.

[3] http://www.fws.gov/southwest/es/arizona/Documents/CountyLists/Cochise.pdf, dated March 5, 2012, accessed March 2012.

TABLE 1M
Endangered, Threatened and Candidate Species
Cochise County, Arizona

Common Name	Status	Habitat	Potential for Occurrence at Airport[1]
Beautiful shiner	Threatened	Small to medium sized streams and ponds with sand, gravel, and rock bottoms.	Unlikely to Occur
Canelo Hills ladies' tresses	Endangered	Finely grained, highly organic, saturated soils of cienegas.	Unlikely to Occur
Chiricahua leopard frog	Threatened	Streams, rivers, backwaters, ponds, and stock tanks that are mostly free from introduced fish, crayfish, and bullfrogs.	Unlikely to Occur
Cochise pincushion cactus	Threatened	Semidesert grassland with small shrubs, agave, other cacti, and grama grass. Grows on gray limestone hills.	Unlikely to Occur
Desert pupfish	Endangered	Shallow springs, small streams, and marshes. Tolerates saline and warm water.	Unlikely to Occur
Gila chub	Endangered	Pools, springs, cienegas, and streams.	Unlikely to Occur
Gila topminnow	Endangered	Small streams, springs, and cienegas vegetated shallows.	Unlikely to Occur
Huachuca water umbel	Endangered	Cienegas, perennial low gradient streams, wetlands.	Unlikely to Occur
Jaguar	Endangered	Found in Sonoran desert scrub up through subalpine conifer forest	Unlikely to Occur
Lesser long-nosed bat	Endangered	Desert scrub habitat with agave and columnar cacti present as food plants. Day roosts in caves and abandoned tunnels.	Potential to Occur
Loach minnow	Endangered	Benthic species of small to large perennial streams with swift shallow water over cobble and gravel. Recurrent flooding and natural hydrograph important.	Unlikely to Occur
Mexican spotted owl	Threatened	Nests in canyons and dense forests with multilayered foliage structure.	Unlikely to Occur
New Mexico ridge-nosed rattlesnake	Threatened	Primarily canyon bottoms in pine-oak communities.	Unlikely to Occur
Northern aplomado falcon	Endangered	Grassland and savannah. Currently extirpated from AZ with unconfirmed sightings occasionally reported in Cochise County.	Unlikely to Occur
Ocelot	Endangered	Desert scrub in Arizona. Humid tropical and subtropical forests, and savannahs in areas south of the U.S. Universal component is presence of dense cover.	Unlikely to Occur
San Bernardino spring-snail	Proposed Endangered	Springs with firm substrate composed of cobble, gravel, woody debris, and aquatic vegetation.	Unlikely to Occur
Sonoran tiger salamander	Endangered	Stock tanks and impounded cienegas; rodent burrows, rotted logs, and other moist cover sites.	Unlikely to Occur

The airport is located in Semidesert Grassland with elements of Chihuahuan Desert scrub; elevations on-site range from approximately 4,725 feet above mean sea level (MSL) at the western end of Runway 8 to approximately 4,570 feet MSL at the eastern end of Runway 26. Several unnamed ephemeral washes cross the airport from south to north, eventually draining into tributaries of the San Pedro River.

The study area is primarily disturbed or developed. However, species that may have re-established in areas left to naturally revegetate include small velvet mesquite, whitethorn acacia, soaptree yucca, four-wing saltbush, burroweed, Lehmann lovegrass, bush muhly, and cane beardgrass. North of the airport, desert broom dominates while Palmer amaranth exists within the linear depression of an arroyo to the northwest of the airport (EcoPlan Associates, Inc. 2000).

FLOODPLAINS

EO 11988, *Floodplain Management*, directs federal agencies to take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by the floodplains.

Since military reservations are not mapped for the National Flood Insurance Program, there are no Federal Emergency Management Agency maps available for the airport. However, based on the existing drainage patterns, no flooding is anticipated to occur. Water from storm events is expected to run northeast from the Huachuca Mountains located southwest of the airport, across the airport via ephemeral washes and on-site drainage features, continuing northeast into the Babocomari River, which is a tributary to the San Pedro River.

HAZARDOUS MATERIALS AND WASTES

Federal, state, and local laws, including the *Resource Conservation Recovery Act* (RCRA) and the *Comprehensive Environmental Response, Compensation, Liability Act* (CERCLA), as amended (also known as the Superfund), regulate hazardous materials use, storage, transport, and disposal. These laws may extend to past and future landowners of properties containing these materials. Disturbing areas that contain hazardous materials or contaminants may cause significant impacts to soil, surface water, groundwater, air quality, and the organisms using these resources.

According to the EPA's EJ View Enviromapper web site, within the Fort Huachuca military installation and airport, there are several businesses that currently report to the EPA for their handling of hazardous materials or wastes.[4] There are no mapped Superfund or Brownfield sites in proximity to the airport.

Fuel storage facilities are located at the airport and are required to comply with all applicable regulations.

HISTORICAL, ARCHITECTURAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

Determination of a project's environmental impact to historic and cultural resources is made under guidance in the *National Historic Preservation Act* (NHPA) *of 1966*, as amended, the *Archaeological and Historic Preservation Act* (AHPA) *of 1974*, the *Archaeological Resources Protection Act* (ARPA), and the *Native American Graves Protection and Repatriation Act* (NAGPRA) *of 1990*, among others. Impacts may occur when the proposed project causes an adverse effect on a property which has been identified (or is unearthed during construction) as having

[4] http://epamap14.epa.gov/ejmap/ejmap.aspx?wherestr=Sierra%20Vista%20Municipal%20Airport%2C%20Fort%20Huachuca%2C%20AZ, accessed March 2012.

historical, architectural, archaeological, or cultural significance.

No cultural resources have been identified on the airport property to date and Native American consultation is an ongoing process at Fort Huachuca. However, according to a previous Environmental Assessment done at the Airport in 2000, the City of Sierra Vista is responsible for conducting Native American consultation should buried historic resources or human remains be discovered during development of city property (City of Sierra Vista, FAA and U.S. Department of the Army, 2001).

According to the National Register of Historic Places (NRHP), there are no federally registered properties at the airport.[5] The nearest listed property is the Fort Huachuca Museum, located approximately 2½ miles to the south.

U.S. DEPARTMENT OF TRANSPORTATION (DOT) ACT: SECTION 4(f)

Section 4(f) of the DOT Act, which was recodified and renumbered as Section 303(c) of 49 United States Code (USC), provides that the Secretary of Transportation will not approve any program or project that requires the use of any publicly owned land from a historic site, public park, recreation area, or waterfowl and wildlife refuge of national, state, regional, or local importance unless there is no feasible and prudent alternative to the use of such land, and the project includes all possible planning to minimize harm resulting from the use.

The term "use" includes not only the physical taking of such lands, but "constructive use" of such lands. "Constructive use" of lands occurs when "a project's proximity impacts are so severe that the protected activities, features, or attributes that qualify a resource for protection under Section 4(f) are substantially impaired" (23 Code of Federal Regulations [CFR] Part 771.135).

In the case of the airport, the San Pedro Riparian National Conservation Area is located approximately six nautical miles to the east; the Miller Peak Wilderness Area is located approximately eight nautical miles to the south. There are also two wilderness areas (Mt. Wrightson and Rincon Mountain), the Saguaro National Monument, and Kartchner Caverns State Park, located within 20-35 nautical miles of the airport. The takeoff and landing of aircraft over national conservation areas, wilderness areas, or national monument areas is prohibited and aircraft are requested to maintain altitudes of at least 2,000 feet above ground level from the highest elevation in the protected area.

The nearest NRHP-listed historic site, as discussed previously, is the Fort Huachuca Museum, located 2½ miles to the south. The next closest NRHP-listed historic sites are the Canelo School and Ranger Station located over nine miles to the southwest.

WATER QUALITY

Under the *Clean Water Act* (CWA), the State of Arizona has been given authority by the EPA to establish water quality standards, control discharges, and regulate other issues concerning water quality. The use of best management practices (BMPs) during construction is a require-

[5] http://nrhp.focus.nps.gov/natreg/docs/Download.html, accessed March 2012.

ment of construction-related permits such as Arizona Pollutant Discharge Elimination System (AZPDES) Construction General Permit (AZG2003-001) and is incorporated into an airport's storm water pollution prevention plan (SWPPP).

There are several ephemeral washes located on, or adjacent to, the airport that convey storm water north and east of the airport property. The airport is located within the Upper San Pedro Watershed (Hydrologic Unit Code [HUC] No. 15050202). The San Pedro River is located approximately twelve miles downstream from the airport. Babocamari River, a tributary to the San Pedro River, is approximately four miles downstream from the airport.

There are two segments of San Pedro River listed on the EPA's CWA, Section 303(d) Listed Waters for Arizona for Reporting Year 2008: from Babocamari Creek to Dragoon Wash; and from Dragoon Wash to Tres Alamos Wash.[6] The first segment is listed for pathogens (i.e., Escherichia Coli [E. Coli]) and the second is listed for nutrients (nitrates).

The Arizona Department of Environmental Quality's (ADEQ) 2010 Assessment for Streams and Lakes identifies the San Pedro River as "impaired" and Babocomari River as "attaining".[7] The methodology and definitions for these designations can be found in ADEQ's *Surface Water Assessment Methods and Technical Support* (2011), available at: http://www.azdeq.gov/environ/water/assessment/assess.html.

WETLANDS/WATERS OF THE U.S.

Certain drainages (both natural and human-made) come under the purview of the U.S. Army Corps of Engineers (ACOE) under Section 404 of the CWA; wetlands are also protected. In addition, EO Order 11990, *Protection of Wetlands*, also provides definitions and protection of wetlands. Wetlands typically exhibit three characteristics: hydrology, hydropytes (plants able to tolerate various degrees of flooding or frequent saturation), and poorly drained or "hydric" soils.

As mentioned previously, there are several unnamed washes present on, or adjacent to, the airport that may be considered "waters of the U.S" by the ACOE. Airport activities affecting these washes could require a Section 404 permit. According to the NRCS soils survey, there are soils of the Haplustolls-Fluvaquents association within an on-site wash that are partially hydric. This wash crosses the airport and Runway 8-26 near the western end of the runway.

WILD AND SCENIC RIVERS

Wild and scenic rivers refer to designations within the U.S. Department of the Interior, National Park Service's *Nationwide Rivers Inventory*. Public Law 90-542 states that such rivers are free flowing and possess "outstanding remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural or other similar values."

The State of Arizona has two designated Wild and Scenic Rivers: Fossil Creek and the Verde River.[8] These resources are located over 200 miles north of the air-

[6] http://iaspub.epa.gov/tmdl_waters10/attains_watershed.control?p_huc=15050202&p_cycle=&p_report_type=T, accessed March 2012.

[7] http://www.azdeq.gov/environ/water/assessment/download/spw.pdf, accessed March 2012.

[8] http://www.rivers.gov/wildriverslist.html, accessed March 2012.

port and are located in a separate drainage basin.

SUMMARY

The information discussed on the previous pages provides a foundation upon which the remaining elements of the planning process for Sierra Vista Municipal Airport will be constructed. Information on current airport facilities and utilization will serve as a basis, with additional analysis and data collection, for the development of forecasts of aviation activity and facility requirements determinations.

REFERENCES

A variety of different sources were utilized in the inventory process. The following listing reflects a partial compilation of these sources. This does not include data provided by airport management as part of their records, nor does it include airport drawings or photographs which were referenced for information. On-site inventory and interviews with Sierra Vista Municipal Airport and Libby Army Airfield staff and tenants contributed to the inventory effort.

Airport / Facility Directory, Southwest U.S., U.S. Department of Transportation, Federal Aviation Administration, National Aeronautical Charting Office, December 2011.

Phoenix Aeronautical Chart, U.S. Department of Transportation, Federal Aviation Administration, National Aeronautical Charting Office, December 2011.

National Plan of Integrated Airport Systems (NPIAS), U.S. Department of Transportation, Federal Aviation Administration, 2011-2015.

U.S. Terminal Procedures, Southwest-4, U.S. Department of Transportation, Federal Aviation Administration, National Aeronautical Charting Office, December 2011.

Sierra Vista Municipal Airport Master Plan, 2002.

2008 *Arizona State Airports System Plan.* Prepared by Wilbur Smith Associates.

Woods & Poole Economics, *The Complete Economic and Demographic Data Source, 2012*.

Sierra Vista Economic Outlook 2011. Prepared by the Cochise College Center for Economic Research.

City of Sierra Vista, FAA and U.S. Department of the Army, 2001. *Environmental Assessment for the Transfer and Development of 203 Acres of Property Adjacent to Sierra Vista Municipal Airport, Sierra Vista, Arizona,* October.

EcoPlan Associates, Inc., 2000. *Biological Assessment of the Effects on Federally Endangered and Threatened Species from Expansion of the Sierra Vista Municipal Airport, Fort Huachuca Military Reservation, Cochise County, Arizona*, prepared for City of Sierra Vista, Federal Aviation Administration, and U.S. Department of the Army, October 5.

A number of internet websites were also used to collect information for the inventory. These include the following:

FAA 5010 Data
http://www.airnav.com
http://www.gcr1.com/5010Web

Arizona Department of Transportation – Multi-Modal Planning Division – Aeronautics Group
http://www.azdot.gov/MPD/airport development/index.asp

U.S. Census Bureau
http://www.census.gov

Arizona Department of Commerce
http://www.azcommerce.com

City of Sierra Vista
http://www.sierravistaaz.gov

Chapter Two

FORECASTS

CHAPTER TWO

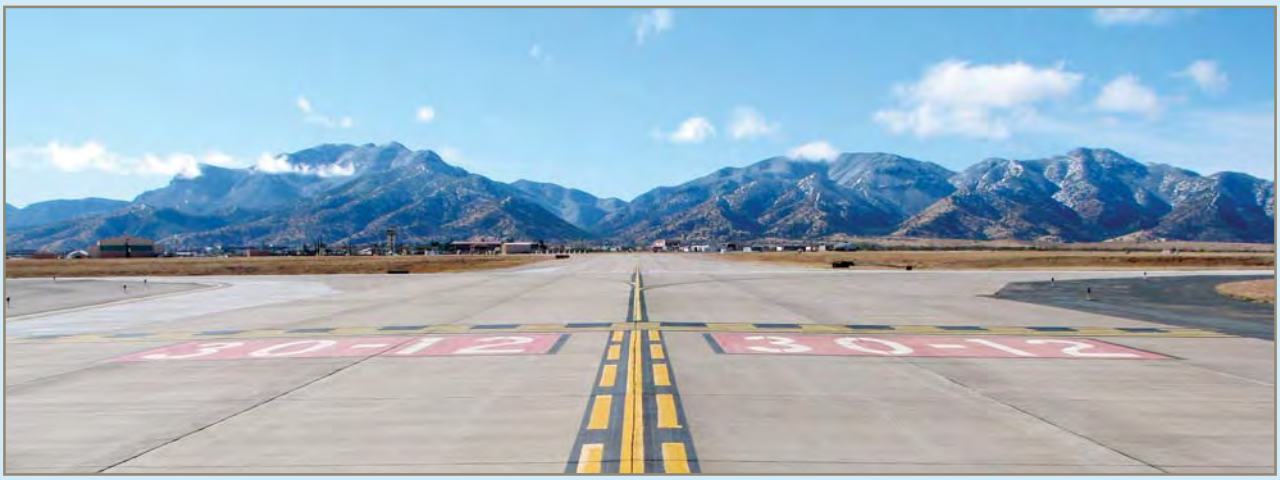
Forecasts

A very important factor in facility planning involves a definition of demand that may reasonably be expected to occur during the useful life of the facility's key components. In airport master planning, this involves projecting potential aviation activity for a 20-year timeframe. In fact, only two components of a Master Plan are actually approved by the Federal Aviation Administration (FAA): the aviation demand forecasts and the airport layout plan (ALP) drawing set. The ALP drawing set will be updated later in this study. For Sierra Vista Municipal Airport, forecasts of general aviation activities for based aircraft and annual aircraft operations (takeoffs and landings) serve as the basis for facility planning. Due to the significant military presence associated with Fort Huachuca and Libby Army Airfield, forecasts for military operations are also considered in order to properly plan for overall future facility needs on the airfield.

The FAA has oversight responsibility to review and approve aviation forecasts developed in conjunction with airport planning studies. The FAA reviews individual airport forecasts with the objective of comparing them to its Terminal Area Forecasts (TAF) and the National Plan of Integrated Airport Systems (NPIAS). In addition, aviation activity forecasts are an important input to the benefit-cost analyses associated with airport development, and FAA reviews these analyses when federal funding requests are submitted.

As stated in FAA Order 5090.3C, Field Formulation of the National Plan of Integrated Airport Systems, forecasts should:

- Be realistic
- Be based on the latest available data
- Be reflective of current conditions at the airport
- Be supported by information in the study



- Provide adequate justification for airport planning and development

The forecast process for an Airport Master Plan consists of a series of basic steps that can vary depending upon the issues to be addressed and the level of effort required to develop the forecasts. The steps include a review of previous forecasts, determination of data needs, identification of data sources, collection of data, selection of forecast methods, preparation of the forecasts, and evaluation and documentation of the results.

FAA Advisory Circular (AC) 150/5070-6B, *Airport Master Plans*, outlines six standard steps involved in the forecast process, including:

1) Obtain existing FAA and other related forecasts for the area served by the airport.

2) Determine if there have been significant local conditions or changes in the forecast factors.

3) Make and document any adjustments to the aviation activity forecasts.

4) Where applicable, consider the effects of changes in uncertain factors affecting demand for airport services.

5) Evaluate the potential for peak loads within the overall forecasts of aviation activity.

6) Monitor actual activity levels over time to determine if adjustments are necessary in the forecasts.

Aviation activity can be affected by many influences on the local, regional, and national level, making it virtually impossible to predict year-to-year fluctuations in activity over 20 years with any certainty. Therefore, it is important to remember that forecasts are to serve only as guidelines, and planning must remain flexible enough to respond to a range of unforeseen developments.

The following forecast analysis for Sierra Vista Municipal Airport was produced following these basic guidelines. Previous forecasts dating back several years were also examined and compared against current and historical activity. The historical aviation activity is then examined along with other factors and trends that can affect demand. The intent is to provide an updated set of aviation demand projections for Sierra Vista Municipal Airport that will permit the City of Sierra Vista to make planning adjustments necessary to maintain a viable, efficient, and cost-effective facility.

FAA NATIONAL FORECASTS

Each year, the FAA updates and publishes a national aviation forecast. Included in this publication are forecasts for the large air carriers, regional/commuter air carriers, general aviation, and FAA workload measures. The forecasts are prepared to meet budget and planning needs of the constituent units of the FAA and to provide information that can be used by state and local authorities, the aviation industry, and the general public. The current edition when this chapter was prepared was FAA *Aerospace Forecasts – Fiscal Years 2012-2032*, published in March 2012. The FAA primarily uses the economic performance of the United States as an indicator of future aviation industry growth. Similar economic analyses are applied to the outlook for aviation growth in international markets.

Over the past decade, the aviation industry has experienced a series of setbacks. Following the devastating impact of the terrorist attacks of September 11, 2001, the industry rebounded for a time, only to then experience a spike in oil and fuel prices in 2004-2005. In late 2007, the country entered the most significant economic recession since the Great Depression of the 1930s. The recovery from the recession has been slow to date. Nonetheless, the FAA has "cautious optimism that the industry has transformed from one of a boom-to-bust cycle to one of sustainable profits."

GENERAL AVIATION TRENDS

The passage of the *General Aviation Revitalization Act of 1994* (federal legislation which limits the liability on general aviation aircraft to 18 years from the date of manufacture) successfully infused new life into the general aviation industry after many years of decline. This legislation sparked an interest to renew the manufacturing of general aviation aircraft due to the reduction in product liability, as well as renewed optimism for the industry. After the passage of this legislation, annual shipments of new aircraft rose every year between 1994 and 2000. The industry then stagnated in the aftermath of 9/11, but recovered to new production highs from 2005 through 2007.

The economic recession beginning in late 2007 has had a negative impact on general aviation aircraft production, and the industry has been slow to recover. Aircraft manufacturing declined for three straight years from 2008 through 2010. Since 2008, manufacturing is down more than 61 percent. General aviation billings were down 21 percent from 2008 to 2009, but showed growth in 2010. **Table 2A** presents historical data related to aircraft shipments.

TABLE 2A
Annual General Aviation Airplane Shipments
Manufactured Worldwide and Factory Net Billings

Year	Total	SEP	MEP	TP	J	Net Billings ($millions)
1994	1,132	544	77	233	278	3,749
1995	1,251	605	61	285	300	4,294
1996	1,437	731	70	320	316	4,936
1997	1,840	1043	80	279	438	7,170
1998	2,457	1508	98	336	515	8,604
1999	2,808	1689	112	340	667	11,560
2000	3,147	1,877	103	415	752	13,496
2001	2,998	1,645	147	422	784	13,868
2002	2,677	1,591	130	280	676	11,778
2003	2,686	1,825	71	272	518	9,998
2004	2,961	1,999	52	319	591	11,918
2005	3,590	2,326	139	375	750	15,156
2006	4,053	2,513	242	412	886	18,815
2007	4,270	2,417	258	459	1,136	21,826
2008	3,967	1,943	176	535	1,313	24,766
2009	2,274	893	70	441	870	19,465
2010	2,015	781	108	363	763	19,705

SEP - Single Engine Piston; MEP - Multi-Engine Piston; TP - Turboprop; J - Turbofan/Turbojet
Source: General Aviation Manufacturers Association 2011 Statbook

Worldwide shipments of general aviation airplanes fell for the second year in a row in 2010. A total of 2,015 units were delivered around the globe, as compared to 2,274 units in 2009, an 11.4 percent decline. Worldwide general aviation billings, nevertheless, rose by 1.2 percent in 2010 to $19.7 billion. This increase in billings, as compared to the reduction in shipments, is in large part due to deliveries of large-cabin, long-range aircraft remaining relatively stable during the recession and their delivery rates increasing in 2010.

Business Jets: The business jet sector declined for the second year in a row. Manufacturers shipped 763 units, as compared to 870 jets in 2009. This is a 12.3 percent decline. Light business jets were impacted most, due in part to higher dependence on third-party financing, which became more difficult to secure in the economic downturn. This segment of business jets typically has more exposure to the fractional market.

Turboprops: There were 363 turboprop airplane deliveries in 2010, a 17.7 percent decline from 441 units shipped in 2009. The total value of turboprop deliveries in 2010 was $1.3 billion.

Pistons: In years past, the piston market has reacted positively to an improving economy ahead of the other two sectors. It is too early to determine if this will hold true for the current economic downturn, but the piston segment continued to suffer in 2010. Shipments totaled 889 units, a 7.7 percent decrease from 963 units in 2009.

Throughout the first decade of the 2000s, many capable general aviation airports have seen an upward trend in activity by business jets. There are numerous factors that have led to this trend, including the growth of fractional aircraft ownership and a desire by frequent travelers to save time by avoiding commercial service airports. **Table 2B** presents growth trends in fractional aircraft ownership.

TABLE 2B
Fractional Shares and Number of Aircraft in Use

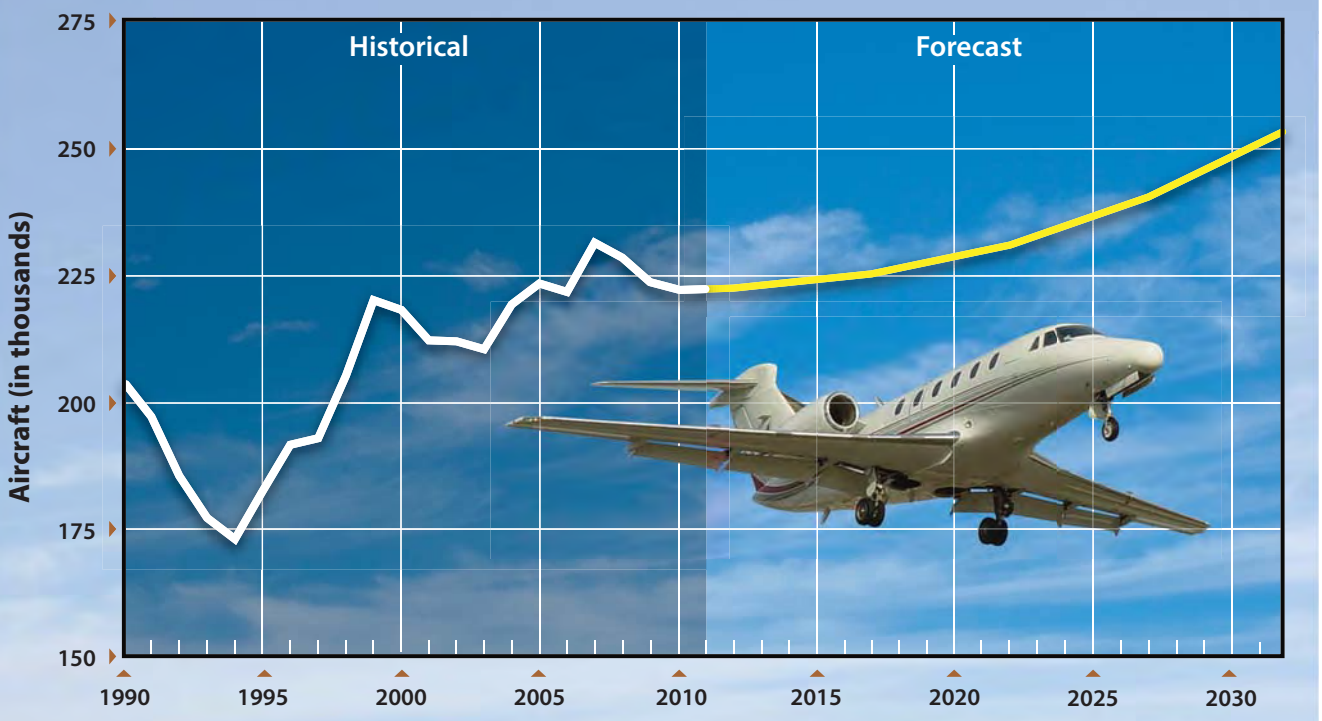
Year	Number of Shares	Number of Aircraft
1986	3	NA
1987	5	NA
1988	26	NA
1989	51	NA
1990	57	NA
1991	71	NA
1992	84	NA
1993	110	NA
1994	158	NA
1995	285	NA
1996	548	NA
1997	957	NA
1998	1,551	NA
1999	2,607	NA
2000	2,810	574
2001	3,601	689
2002	4,244	780
2003	4,516	826
2004	4,765	870
2005	4,828	945
2006	4,863	984
2007	5,168	1,030
2008	5,179	1,094
2009	4,881	1,037
2010	4,862	1,027

Source: GAMA/JETNET LLC

The FAA forecasts the fleet and hours flown for single-engine piston aircraft, multi-engine piston aircraft, turboprops, business jets, piston and turbine helicopters, light sport, experimental, and others (gliders and balloons). The FAA forecasts "active aircraft," not total aircraft. An active aircraft is one that is flown at least one hour during the year. **Exhibit 2A** presents the historical and forecast U.S. active general aviation aircraft.

U.S. Active General Aviation Aircraft

	2012	2017	2022	2027	2032
FIXED WING					
Piston					
Single Engine	137,600	133,650	132,010	132,660	135,340
Multi-Engine	15,735	15,425	15,010	14,680	14,350
Turbine					
Turboprop	9,505	9,870	10,300	10,860	11,445
Turbojet	12,050	14,470	17,620	21,760	26,935
ROTORCRAFT					
Piston	3,780	4,250	4,680	5,180	5,705
Turbine	6,940	8,180	9,465	10,965	12,550
EXPERIMENTAL					
	24,480	26,165	27,825	29,480	31,140
SPORT AIRCRAFT					
	6,930	7,845	8,630	9,410	10,195
OTHER					
	5,670	5,635	5,605	5,575	5,545
TOTAL	**222,690**	**225,490**	**231,145**	**240,570**	**253,205**



Source: FAA Aerospace Forecasts, Fiscal Years 2012-2032.

Notes: An active aircraft is one that has a current registration and was flown at least one hour during the calendar year.

Exhibit 2A: U.S. ACTIVE GENERAL AVIATION AIRCRAFT FORECASTS

After growing rapidly for most of the decade, the demand for business jet aircraft has slowed over the past few years as the industry has been hard hit by the economic recession. Nonetheless, the FAA forecast calls for robust growth in the long-term, driven by higher corporate profits and continued concerns about safety, security, and flight delays. Overall, business aviation is projected to outpace personal/recreational use.

The active general aviation fleet is projected to increase at an average annual rate of 0.6 percent through 2032, growing from a 2011 estimate of 222,520 to 253,205 in 2032. The turbine fleet, including helicopters, is forecast to grow annually at 2.9 percent, with the jet portion increasing at 4.0 percent a year.

Piston-powered aircraft are projected to decrease from the 2011 total of 158,055 through 2024, with declines in both single and multi-engine fixed wing aircraft but growth in piston helicopters. Starting in 2025, active piston-powered aircraft are forecast to increase to 155,395 in 2032, still below the current number in the fleet. Fixed-wing single and multi-engine piston aircraft are forecast to decline annually at 0.1 percent and 0.5 percent, respectively.

The FAA began tracking the light sport aircraft segment of the general aviation fleet in 2005. At the end of 2011, a total of 6,645 aircraft were estimated in this category. By 2032, a total of 10,195 light sport aircraft are forecast to be in the fleet.

AIRPORT SERVICE AREA

The initial step in determining the aviation demand for an airport is to define its generalized service area for various segments of aviation the airport can accommodate. The airport service area is determined primarily by evaluating the location of competing airports, their capabilities, their services, and their relative attraction and convenience. In determining the aviation demand for an airport, it is necessary to identify the role of that airport as well as the specific areas of aviation demand the airport is intended to serve. The primary role of Sierra Vista Municipal Airport is to serve general aviation demand in the area.

The airport service area is a geographical area where there is a potential market for airport services. Access to general aviation airports and transportation networks enter into the equation to determine the size of a service area. Also to be factored are subjective criteria, such as the quality of aviation facilities and services.

As in any business enterprise, the more attractive the facility is in terms of services and capabilities, the more competitive it will be in the market. If an airport's attractiveness increases in relation to nearby airports, so will the size of the service area. If facilities are adequate and rates and fees are competitive at Sierra Vista Municipal Airport, some level of aviation activity might be attracted to the airport from more distant locales.

Typically, the general aviation service area for more rural and regionalized airports can extend up to 30 miles. The proximity and level of general aviation services are largely the defining factors when describing the general aviation service area. A description of airports within an approximate 30-nautical mile radius of Sierra Vista Municipal Airport was discussed in Chapter One. The airport fares well in comparison to these other airports

given its longer runways, services provided, and hangar facilities.

A defined service area is developed for the purposes of identifying a geographic area from which to further develop aviation demand projections. The service area will generally represent where most, but not all, based aircraft will come from. It is not unusual for some based aircraft to be registered outside the region or even outside the state. Most pilots who choose to base their aircraft at an airport do so because of the convenience of the airport to their residence or place of business. With that said, some aircraft owners may have other priorities, such as runway length, specific services, hangar availability, airport congestion, etc.

The airport maintains a database of the aircraft based at the airport. Analysis of this data shows that there were 66 based aircraft in 2011. Of this total, 48 have primary addresses in the City of Sierra Vista (73 percent). Of the remaining 18 based aircraft, 12 have addresses in greater Cochise County, including Benson, Hereford, and Tombstone, and one in neighboring Santa Cruz County. The remaining based aircraft have primary addresses that are out-of-state. Therefore, 60 of the 66 based aircraft have a primary mailing address in Cochise County, within proximity of Sierra Vista.

The City of Sierra Vista and greater Cochise County are clearly the areas where the vast majority of based aircraft owners are located. As a result, the primary service area for the airport will be considered Cochise County.

SOCIOECONOMIC FORECASTS

The socioeconomic conditions for the area provide an important baseline for preparing aviation demand forecasts. Local socioeconomic variables such as population, employment, and income are indicators for understanding the dynamics of the county and, in particular, the trends in aviation growth. The socioeconomic data presented below will be utilized in various statistical analyses to develop forecasts of aviation demand for Sierra Vista Municipal Airport. Due to outdated and insufficient socioeconomic projections made for the regional area through the long term planning period of this study, forecasts were obtained from Woods & Poole, an independent firm that specializes in long term socioeconomic and demographic projections for metropolitan areas, counties, and states.

POPULATION

Table 2C summarizes historical and forecast population estimates for Cochise County and the State of Arizona. As presented in the table, the county experienced an average annual growth rate (AAGR) of 0.94 percent between 2000 and 2011. The growth rate for the state over the same period was 2.09 percent.

The overall population for Cochise County is forecast to increase by nearly 54,360 people over the next 20-plus years, representing a 1.67 percent AAGR. This rate trails the 1.72 percent AAGR projected for the population of the state as a whole over the next 20 years; however, a steady projected increase in population for the county is a sign of continued economic growth in the region.

TABLE 2C
Socioeconomic Forecasts

	HISTORICAL			PROJECTIONS			
	2000	2011	AAGR (2000-2011)	2017	2022	2032	AAGR (2011-032)
Cochise County							
Population	117,755	130,537	0.94%	148,429	160,512	184,900	1.67%
Employment	50,370	58,550	1.38%	64,776	70,627	84,245	1.75%
PCPI	$22,394	$31,167	3.05%	$33,002	$35,638	$42,524	1.49%
State of Arizona							
Population	5,130,632	6,438,178	2.09%	7,288,976	7,922,881	9,202,843	1.72%
Employment	2,795,766	3,237,042	1.34%	3,617,335	3,966,223	4,752,153	1.85%
PCPI	$29,287	$32,071	0.83%	$33,686	$36,395	$43,491	1.46%

AAGR - Average Annual Growth Rate
PCPI - Per Capita Personal Income (adjusted to 2005 dollars)

Source: Historical Population - Cochise College Center for Economic Research and U.S. Census Bureau; Historical Employment, PCPI, and Future Projections - Woods & Poole Complete Economic and Demographic Data Source (2012)

EMPLOYMENT

Historical and forecast employment data for Cochise County and the State of Arizona are also presented in **Table 2C**. Between 2000 and 2011, Cochise County employment grew by an average of 1.38 percent annually. This growth accounted for nearly 8,200 new jobs over an 11-year period. This growth rate exceeded overall employment in the state, which grew at 1.34 percent annually. Through the next 20 years, Cochise County employment is forecast to continue to grow at an even stronger pace than what has been experienced since 2000. Similarly, the state's employment is forecast to increase at a higher rate when compared to the past 11 years. From the data presented, Cochise County should continue to foster job opportunities well into the future. The City of Sierra Vista and Fort Huachuca should serve as a major hub for this employment growth.

PER CAPITA PERSONAL INCOME

Table 2C also compares per capita personal income (PCPI) (adjusted to 2005 dollars) for the county and the state. Cochise County's adjusted PCPI for 2011 was $31,167, only slightly lower than the State of Arizona at $32,071. Between 2000 and 2011, however, the Cochise County PCPI increased by 3.05 percent annually, much higher than the 0.83 percent annual rate of the state. In the future, income growth for Cochise County is forecast to increase at 1.49 percent annually, while the State of Arizona is forecast to grow annually at 1.46 percent.

FORECASTING APPROACH

The development of aviation forecasts proceeds through both analytical and judgmental processes. A series of mathematical relationships is tested to establish statistical logic and rationale for projected growth. However, the judgment of the forecast analyst, based upon professional experience, knowledge of the aviation industry, and assessment of the local situation, is important in the final determination of the preferred forecast.

The most reliable approach to estimating aviation demand is through the utilization of more than one analytical technique.

Methodologies frequently considered include trend line projections, correlation/regression analysis, and market share analysis. By developing several projections for each aviation demand indicator, a reasonable planning envelope will emerge. The selected forecast may be one of the individual projections or a combination of several projections based on local conditions. The selected forecast will almost always fall within the planning envelope. Some combination of the following forecasting techniques is utilized to develop the planning envelope for each demand indicator.

Trend line projections are probably the simplest and most familiar of the forecasting techniques. By fitting growth curves to historical demand data and then extending them into the future, a basic trend line projection is produced. A basic assumption of this technique is that outside factors will continue to affect aviation demand in much the same manner as in the past. As broad as this assumption may be, the trend line projection does serve as a reliable benchmark for comparing other projections.

Correlation analysis provides a measure of the direct relationship between two separate sets of historic data. Should there be a reasonable correlation between the data, further evaluation using regression analysis may be employed.

Regression analysis measures the statistical relationship between dependent and independent variables, yielding a "correlation coefficient." The correlation coefficient (Pearson's "r") measures associations between the changes in a dependent variable and independent variable(s). If the r-squared (r^2) value (coefficient determination) is greater than 0.90, it indicates good predictive reliability. A value below 0.90 may be used with the understanding that the predictive reliability is lower.

Market share analysis involves a historical review of aviation activity as a percentage, or share, of a larger regional, state, or national aviation market. A historical market share trend is determined providing an expected market share for the future. These shares are then multiplied by the forecasts of the larger geographical area to produce a market share projection. This method has the same limitations as trend line projections, but can provide a useful check on the validity of other forecasting techniques.

It is important to note that one should not assume a high level of confidence in forecasts that extend beyond five to seven years. Facility and financial planning usually require at least a ten-year view, since it often takes more than five years to complete a major facility development program. However, it is important to use forecasts which do not overestimate revenue-generating capabilities or understate demand for facilities needed to meet public (user) needs.

A wide range of factors is known to influence the aviation industry and can have significant impacts on the extent and nature of air service provided in both the local and national markets. Technological advances in aviation have historically altered, and will continue to change, the growth rates in aviation demand over time. The most obvious example is the impact of jet aircraft on the aviation industry, which resulted in a growth rate that far exceeded expectations. Such changes are difficult, if not impossible, to predict, and there is simply no mathematical way to estimate their impacts.

Utilizing these statistical methods, available existing forecasts, and analyst expertise, forecasts of aviation demand for Sierra Vista Municipal Airport have been developed. The remainder of this chapter presents the aviation demand forecasts and includes activity in two broad categories: based aircraft and annual operations.

GENERAL AVIATION FORECASTS

Several aviation demand indicators must be forecast to determine the future needs of the airport. As a general aviation airport, the most important demand indicators are based aircraft and operations. The following sections will present forecasts of these and other demand indicators following guidelines from the FAA and accepted statistical methods. It should be noted that for many of the demand indicators, several forecasting methods are utilized in order to create a planning envelope. From there, a single forecast is selected based on the reliability of the statistical method employed and upon the judgment of the forecast analyst.

HISTORICAL AIRCRAFT OWNERSHIP

The number of based aircraft is the most basic indicator of general aviation demand. One method of forecasting based aircraft for an airport is to first examine historical local aircraft ownership, or aircraft registrations in the airport's service area. Since the primary airport service area is Cochise County, an examination of registered aircraft in the county has been undertaken.

Any serviceable aircraft is required to be registered with the FAA, and an N-number is assigned. The FAA maintains a database of registered aircraft which includes the resident location by county for each certificated aircraft in the United States. Although this information generally provides a correlation to based aircraft, it is not uncommon for some aircraft to be registered in the county, but based at an airport outside the county. **Table 2D** presents the history of registered aircraft in Cochise County.

TABLE 2D
Historical Aircraft Registrations by Type
Cochise County

Year	SEP	MEP	Jet	Turboprop	Helicopter	Other	Total
2000	199	16	0	2	7	13	**237**
2001	206	10	0	9	7	12	**244**
2002	206	10	0	9	7	12	**244**
2003	214	10	0	16	7	11	**258**
2004	232	10	0	16	6	11	**275**
2005	261	9	1	16	7	9	**303**
2006	281	12	1	1	7	11	**313**
2007	272	13	1	1	9	23	**319**
2008	269	12	1	4	10	26	**322**
2009	272	11	1	3	16	21	**324**
2010	261	11	1	3	17	19	**312**
2011	252	12	1	3	15	17	**300**

SEP - Single Engine Piston
MEP - Multi-Engine Piston

Source: FAA Aircraft Registration Database

Cochise County has realized an increase in registered aircraft from 237 in 2000 to 300 in 2011. This represents an AAGR of 2.17 percent. As of 2011, single engine piston-powered aircraft constituted 252 aircraft in Cochise County, which represents approximately 84 percent of the registered aircraft fleet. There were 12 multi-engine piston aircraft, one jet aircraft, three turboprops, and 15 helicopters registered as well. The remaining registrations for 2011 were represented by balloons, gliders, and experimental aircraft in the "other" category.

REGISTERED AIRCRAFT FORECASTS

Now that the history of aircraft ownership in Cochise County has been established, projections for future ownership, as defined by registered aircraft, can be made. A multitude of statistical methods has been employed to forecast registered aircraft growth.

Regression Analysis

Two regression techniques were utilized to develop forecasts of registered aircraft. These include simple time-series analysis, as well as regression analysis comparing historical registered aircraft with various socioeconomic factors. The results of these methods are presented in **Table 2E**.

The first statistical measure presented is the time-series analysis. A time-series is a sequence of data points measured at successive times spaced at uniform time intervals. Time-series forecasting is the use of a statistical model to forecast future events based on known past events to predict data points before they are measured. The time-series analysis presented in the table considers the yearly aircraft registrations for Cochise County from 2000 to 2011. The plotted line is then continued into the future; in this case, to the year 2032. This analysis results in registered aircraft increasing from 300 in 2011 to 381 in 2017, 422 in 2022, and 503 in 2032.

TABLE 2E
Registered Aircraft Time-Series and Regression Analysis
Cochise County

		Forecast		
	r^2	2017	2022	2032
Time-Series				
Year - Time-Series	0.756	381	422	503
Regression Variables				
Population, Employment	0.977	354	402	518
Employment, Active Aircraft	0.976	364	416	537
Employment, PCPI	0.974	369	425	554
Employment	0.973	366	419	542
PCPI	0.900	340	367	436
Total Regression Average	**0.960**	**359**	**406**	**517**

PCPI - Per Capita Personal Income

Source: Coffman Associates analysis

A measure of the statistical reliability of the forecast is Pearson's "r." If the r^2 equals 90 percent or higher, the statistical reliability is considered high. The time-series projection results in an r^2 value of 0.756, indicating the statistical reliability is limited.

Next, a series of single and multiple variable correlation analyses were run to examine the relationship between historic registered aircraft and independent variables. The independent variables considered were population, employment, U.S. active aircraft, and PCPI. **Table 2E** presents five regression analyses that constituted an r^2 value of at least 0.900. The separate regression analyses project registered aircraft in Cochise County to increase to between 436 and 554 aircraft through 2032. The average of the five regressions yields an r^2 value of 0.960 and results in 517 registered aircraft in the county through 2032.

Historical Growth Projection

From 2000 to 2011, registered aircraft in the county grew from 237 to 300, for an AAGR of 2.17 percent. The high year for registrations was 2009, with 324 aircraft registered to Cochise County. By extrapolating the overall annual growth rate through 2032, a forecast can be made. As presented in **Table 2F**, the result is 341 registered aircraft in 2017, 380 in 2022, and 471 in 2032.

TABLE 2F
Registered Aircraft Forecasts
Cochise County

Year	County Registered Aircraft	U.S. Active Aircraft	Market Share of U.S. Active Aircraft	County Population	Aircraft per 1,000 Population
2000	237	217,533	0.1089%	117,755	2.01
2001	244	211,446	0.1154%	118,798	2.05
2002	244	211,244	0.1155%	119,847	2.04
2003	258	209,606	0.1231%	120,638	2.14
2004	275	219,319	0.1254%	123,234	2.23
2005	303	224,257	0.1351%	125,786	2.41
2006	313	221,942	0.1410%	127,241	2.46
2007	319	231,606	0.1377%	128,206	2.49
2008	322	228,664	0.1408%	129,023	2.50
2009	324	223,876	0.1447%	130,081	2.49
2010	312	223,370	0.1397%	131,346	2.38
2011	300	222,520	0.1348%	130,537	2.30
Historic Growth Scenario 2000-2011 (AAGR = 2.17%)					
2017	341	225,490	0.1512%	148,429	2.30
2022	380	231,145	0.1644%	160,512	2.37
2032	471	253,205	0.1860%	184,900	2.55
Constant Share of U.S. Active Fleet (AAGR = 0.62%)					
2017	304	225,490	0.1348%	148,429	2.05
2022	312	231,145	0.1348%	160,512	1.94
2032	341	253,205	0.1348%	184,900	1.85
Constant Ratio of Aircraft per 1,000 Population (AAGR = 1.68%)					
2017	341	225,490	0.1514%	148,429	2.30
2022	369	231,145	0.1597%	160,512	2.30
2032	425	253,205	0.1680%	184,900	2.30
Regression Average (AAGR = 2.63%)					
2017	359	225,490	0.1592%	148,429	2.42
2022	406	231,145	0.1756%	160,512	2.53
2032	517	253,205	0.2042%	184,900	2.80
Selected Forecast (AAGR = 1.95%)					
2017	335	225,490	0.1486%	148,429	2.26
2022	370	231,145	0.1601%	160,512	2.31
2032	450	253,205	0.1777%	184,900	2.43

Source: County Aircraft Registrations from FAA Aircraft Registration Database; U.S. Active Aircraft from FAA Aerospace Forecasts - Fiscal Years 2012-2032; County Population from Woods & Poole CEDDS; Coffman Associates analysis

Market Share Projections

Two market share projections have been developed: one that compares the U.S. active general aviation aircraft fleet to historical registered aircraft and one that compares historical population to registered aircraft. The first market share forecast considers the relationship between historic registered aircraft in the county and the U.S. active general aviation fleet. A constant market share projection (0.1348 percent) results in 341 registered aircraft by 2032.

Utilizing population, a constant ratio projection was made. As of 2011, there were 2.30 aircraft per 1,000 people in Cochise County. By maintaining this ratio as a constant, in 2032, 425 registered aircraft are forecast, as shown in **Table 2F**.

Selected Registered Aircraft Forecast

The forecasts of registered aircraft presented consider major factors that can influence aircraft ownership in Cochise County. Local socioeconomic measures such as population, employment, and income have also been considered. Additional population measures are analyzed in the market share forecasts. Historical growth trends have also been considered, and national aircraft ownership is also considered based on the FAA forecasts.

The four different forecasts highlighted on **Table 2F** and **Exhibit 2B** present a reasonable planning envelope. The selected forecast represents an overall mid-range of the four different forecasts generated for this analysis. By 2017, the forecast considers 335 registered aircraft in the county. In 2022, there are 370 registered aircraft forecast, and by 2032, it is forecast that there will be 450 registered aircraft. This forecast results in a 1.95 percent AAGR, slightly lower than what Cochise County has experienced since 2000. With an established registered aircraft forecast, a forecast for future based aircraft at Sierra Vista Municipal Airport can be made.

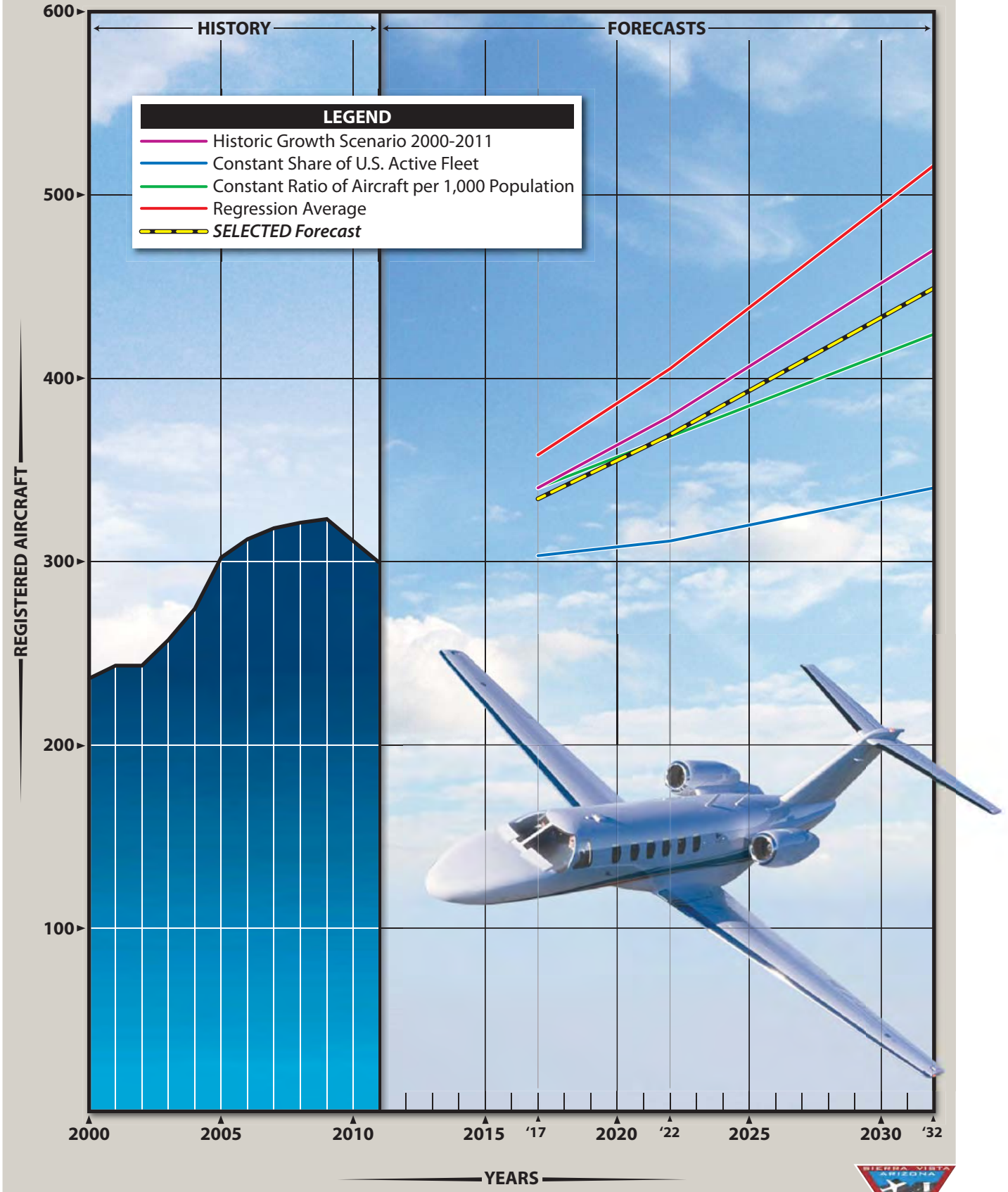
BASED AIRCRAFT FORECASTS

The based aircraft forecast for Sierra Vista Municipal Airport is a function of the registered aircraft forecast completed in the previous section. Determining the number of based aircraft at an airport can be a challenging task. With the transient nature of based aircraft due to the availability and cost of aircraft storage, it can be hard to arrive at an exact number of based aircraft. Fortunately, airport staff has kept a detailed record of based aircraft at Sierra Vista Municipal Airport over the past several years. In 2011, there were a total of 66 aircraft based at the airport.

Two market share forecasts of registered aircraft have been developed for based aircraft and are presented in **Table 2G**. The first market share forecast considers the airport maintaining its 2011 share of registered aircraft in the county (22.00 percent). This forecast results in 74 based aircraft in 2017, 81 in 2022, and 99 in 2032.

The based aircraft forecast also considers an increasing market share of registered aircraft. This forecast presents a projection based on market shares that were realized by the airport in the past. This forecast results in 113 based aircraft by 2032.

The selected forecast closely mirrors the constant market share of registered aircraft forecast. The subsequent chapters



Source: County Aircraft Registrations from FAA Aircraft Registration Database

Exhibit 2B: REGISTERED AIRCRAFT FORECASTS

of this Master Plan will utilize the selected forecast of 75 based aircraft by 2017, 84 based aircraft by 2022, and 100 based aircraft by 2032. The AAGR of this forecast is 2.00 percent.

TABLE 2G
Based Aircraft Forecasts
Sierra Vista Municipal Airport

Year	Sierra Vista Based Aircraft	County Registered Aircraft	Market Share of Registered Aircraft
2007	80	319	25.08%
2008	84	322	26.09%
2009	72	324	22.22%
2010	75	312	24.04%
2011	66	300	22.00%
Constant Share of Registered Aircraft (AAGR = 1.95%)			
2017	74	335	22.00%
2022	83	370	22.00%
2032	99	450	22.00%
Increasing Share of Registered Aircraft (AAGR = 2.57%)			
2017	77	335	23.00%
2022	89	370	24.00%
2032	113	450	25.00%
Selected Forecast (AAGR = 2.00%)			
2017	75	335	22.39%
2022	84	370	22.70%
2032	100	450	22.22%

Source: Based Aircraft from Airport Records; County Aircraft Registrations from FAA Aircraft Registration Database; Coffman Associates analysis.

Comparative Based Aircraft Forecasts

There are several forecasts of based aircraft for Sierra Vista Municipal Airport that were completed in previous studies and reports. These are presented in **Table 2H** and have been interpolated and extrapolated to the plan years of this Master Plan. These include the 2002 Airport Master Plan, 2008 Arizona State Airports System Plan (SASP) and the 2012 FAA TAF.

TABLE 2H
Previous Based Aircraft Projections
Sierra Vista Municipal Airport

	2007	2011	2017	2022	2032
Actual Based Aircraft	80	66			
2002 Airport Master Plan	78*	94*	123*	148**	
2008 Arizona State Airports System Plan - Low	82	86	93	99*	110**
2008 Arizona State Airports System Plan - Medium	82	86	94	101*	115**
2008 Arizona State Airports System Plan - High	82	86	100	111*	135**
2012 FAA Terminal Area Forecast	70	56	56	56	56

*Interpolated; **Extrapolated

Since these forecasts were prepared at different times, it is expected that they will be different from each other and may not match recent historical counts. Ac-

cording to airport records, the based aircraft count in 2011 was 66. The 2008 SASP considered 82 aircraft for 2011, which is significantly higher than the actual based aircraft count. The FAA TAF projection has based aircraft at Sierra Vista Municipal Airport remaining constant at 56 through the planning period. It should be noted that the 2002 Master Plan presented an aggressive rate of growth for based aircraft given aviation industry trends that were occurring in the late 1990s and early 2000s when the study was conducted.

As previously discussed, the recent economic recession has directly affected the aviation industry. A decreasing trend in based aircraft at many general aviation airports across the country has been an indicator of the economic downturn. This is the case for Sierra Vista Municipal Airport, as based aircraft have declined from as many as 84 in 2008, to the current total of 66. During this same time, the airport has gone from experiencing a waiting list for aircraft storage space to an 18 percent hangar vacancy rate. As the following section details, the selected based aircraft forecast for this study has taken a more moderate approach to based aircraft growth that factors current economic conditions as well as local trends.

Based Aircraft Summary

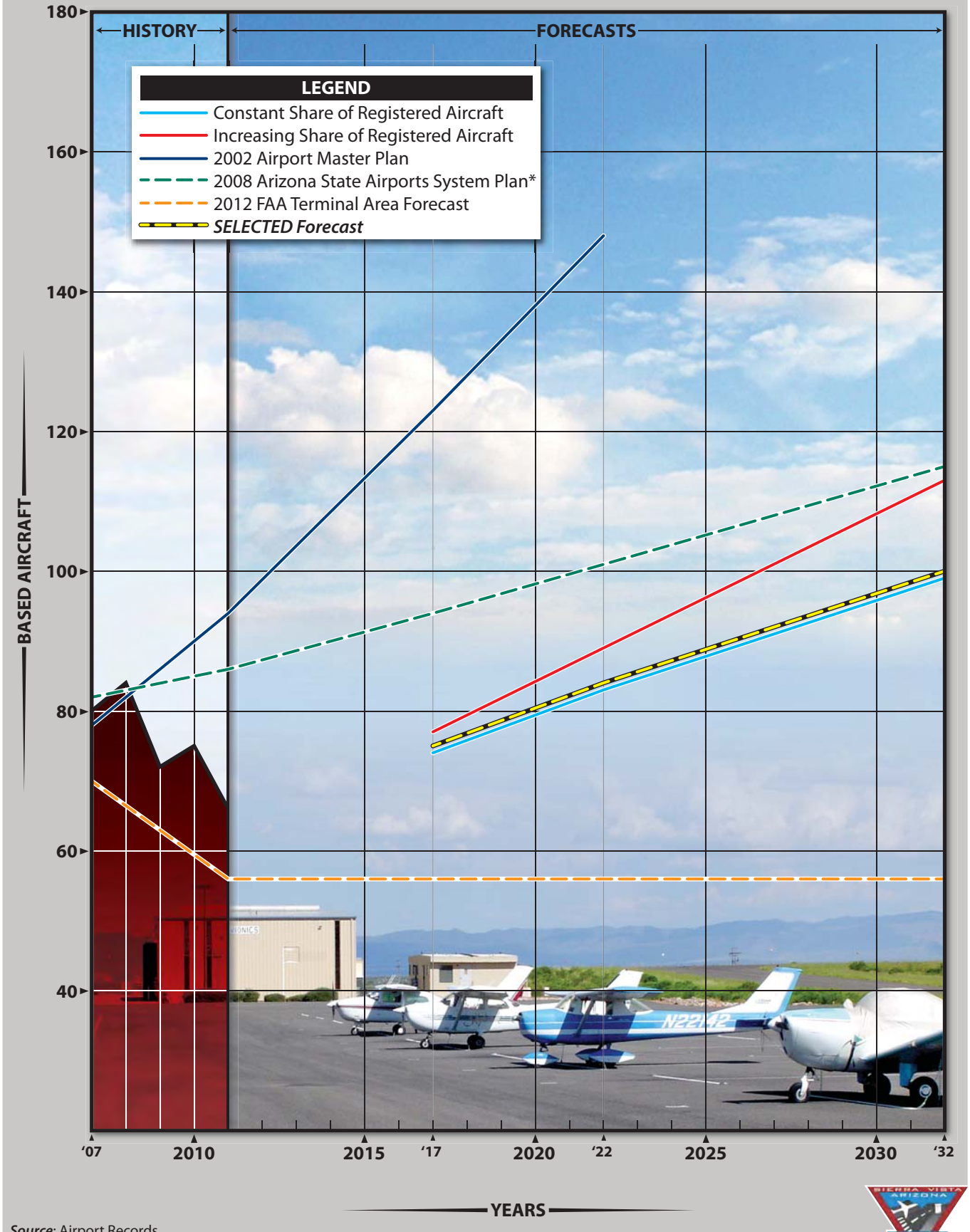
Future based aircraft at Sierra Vista Municipal Airport will depend on several factors, including the state of the economy, fuel costs, available airport facilities, and competing airports. Forecasts assume a slowly improving economy in the coming years, as well as reasonable development of airport facilities necessary to accommodate aviation demand. Competing airports could play a role in deciding regional demand shifts; however, Sierra Vista Municipal Airport should fare well in this competition as it is served by multiple, long runways and is capable of accommodating development to meet future demand.

As such, the forecast of based aircraft for Sierra Vista Municipal Airport calls for an estimate of 100 based aircraft by 2032, the long term planning period for this Master Plan. The based aircraft forecasts have been compared with several other existing forecasts. These forecasts assume that as demand dictates, more aircraft storage will be made available. If new hangar construction is not undertaken, forecast growth could be slowed. The selected based aircraft forecast is depicted on **Exhibit 2C**.

BASED AIRCRAFT FLEET MIX PROJECTIONS

Forecasting the general aviation based aircraft fleet mix expected to utilize the airport is necessary to properly plan facilities that will best serve the level and type of activity occurring at the airport. The FAA expects business jets will continue to be the fastest growing general aviation aircraft type in the future. Sport aviation and experimental aircraft, helicopters, and turboprop aircraft are expected to grow at slower rates. The number of single engine piston and multi-engine piston aircraft in the U.S. are projected to decrease as older aircraft are retired. Growth within each based aircraft category at the airport has been determined, in part, by comparison with national projections and consideration of local conditions.

There were 66 aircraft based at the airport in 2011. The existing based aircraft fleet mix is comprised of 60 single engine piston-powered aircraft, three multi-engine piston-powered aircraft, and three helicopters.



Source: Airport Records

* Depicts the Medium Range Forecast

Exhibit 2C: BASED AIRCRAFT FORECASTS

Table 2J presents the forecast fleet mix for the 20-year planning horizon of the Master Plan. Single engine piston-powered aircraft will continue to account for the majority of based aircraft at the airport. A total of four multi-engine piston aircraft are forecast by the long term. Given the facilities present on the airfield, the airport could accommodate based turboprop and jet aircraft, especially if additional hangar infrastructure is constructed. By the long term, four turboprops and four jets are forecast. Additional growth in based helicopters can also be expected during the planning period.

TABLE 2J
Based Aircraft Fleet Mix
Sierra Vista Municipal Airport

Aircraft Type	2011	Percent	2017	Percent	2022	Percent	2032	Percent
Single Engine Piston	60	90.9%	67	89.3%	72	85.7%	83	83.0%
Multi-Engine Piston	3	4.5%	3	4.0%	4	4.8%	4	4.0%
Turboprop	0	0.0%	1	1.3%	2	2.4%	4	4.0%
Jet	0	0.0%	1	1.3%	2	2.4%	4	4.0%
Helicopter	3	4.5%	3	4.0%	4	4.8%	5	5.0%
Total	**66**	**100.0%**	**75**	**100.0%**	**84**	**100.0%**	**100**	**100.0%**

Source: Coffman Associates analysis

ANNUAL GENERAL AVIATION OPERATIONS

Airport operations can be broken down into distinct groups. For airports such as Sierra Vista Municipal Airport/Libby Army Airfield, operations typically include general aviation and air taxi. General aviation operations are those conducted by private individuals or companies not flying commercially. Air taxi refers to those operators that are certified in accordance with Federal Aviation Regulation (FAR) Part 135 and are authorized to provide on-demand public transportation of persons and property by aircraft. As previously discussed, given the nature of the joint-use facility at Sierra Vista Municipal Airport/Libby Army Airfield, military activity is also an important component to consider that will be detailed later in this chapter. **Table 2K** depicts the history of all aircraft operations, as counted by the airport traffic control tower (ATCT), at Sierra Vista Municipal Airport/Libby Army Airfield since 2005, broken down into general aviation, air taxi, and military categories.

TABLE 2K
Historical Aircraft Operations
Sierra Vista Municipal Airport/Libby Army Airfield

Year	General Aviation	Air Taxi	Military	Total Operations
2005	23,817	8,797	113,067	145,681
2006	31,083	9,045	116,145	156,273
2007	34,757	5,459	107,298	147,514
2008	28,478	4,564	100,368	133,410
2009	31,856	5,047	99,302	136,205
2010	26,548	5,611	112,186	144,345
2011	27,736	5,771	107,066	140,573

Source: ATCT Records

These operational statistics are the actual ATCT counts conducted when the tower is open and do not reflect operations that occur while the tower is closed. Currently, the ATCT is operational Monday through Friday from 7:00 a.m. to 11:00 p.m., and according to tower personnel, the facility is occasionally operational on weekends. An adjustment will be added to the final operations forecast to account for operations that occur when the tower is closed.

As recorded by the ATCT, the airport has experienced an average of approximately 29,200 annual general aviation operations since 2005. **Table 2L** outlines general aviation operations over the past five years in relation to the total general aviation operations at towered airports in the United States. The airport's market share, as a percentage of total general aviation operations, has fluctuated from a high of 0.1137 percent in 2009 to a low of 0.0902 percent in 2008. The table also depicts the ratio of operations per based aircraft. Similar to the market share of total operations, the ratio of operations per based aircraft has fluctuated, from a high of 442 in 2009 to a low of 339 in 2008.

TABLE 2L
General Aviation Operations Forecasts
Sierra Vista Municipal Airport/Libby Army Airfield

Year	GA Operations	U.S. GA Operations (millions)	Market Share Operations	Based Aircraft	Operations per Based Aircraft
2007	34,757	33.13	0.1049%	80	434
2008	28,478	31.57	0.0902%	84	339
2009	31,856	28.02	0.1137%	72	442
2010	26,548	26.58	0.0999%	75	354
2011	27,736	25.96	0.1068%	66	420
Constant Market Share of Total Operations (AAGR = 0.32%)					
2017	27,709	25.94	0.1068%	75	369
2022	28,326	26.52	0.1068%	84	337
2032	29,653	27.77	0.1068%	100	297
Increasing Market Share of Total Operations (AAGR = 0.71%)					
2017	28,280	25.94	0.1090%	75	377
2022	29,838	26.52	0.1125%	84	355
2032	32,208	27.77	0.1160%	100	322
Constant Operations per Based Aircraft (AAGR = 2.00%)					
2017	31,500	25.94	0.1214%	75	420
2022	35,280	26.52	0.1330%	84	420
2032	42,000	27.77	0.1513%	100	420
Selected Forecast (AAGR = 1.76%)					
2017	30,000	25.94	0.1156%	75	400
2022	33,500	26.52	0.1263%	84	399
2032	40,000	27.77	0.1441%	100	400

Source: FAA Aerospace Forecasts - Fiscal Years 2012-2032; FAA TAF; ATCT Records; Coffman Associates analysis

Two market share forecasts have been developed for general aviation operations and are presented in **Table 2L**. The first market share forecast considers the airport maintaining its 2011 share of general aviation operations counted by ATCTs across the country. This forecast results in minimal growth, increasing to only 29,653 general aviation operations by 2032. The second forecast considers a projection that increases the airport's market share to levels experienced back

in 2009. This forecast results in approximately 32,200 general aviation operations by 2032. A third forecast was prepared, which maintains a constant ratio of 420 operations per based aircraft, and yields a higher forecast than the market share operations per based aircraft, approaching 42,000 annual general aviation operations through the long term.

The selected forecast tends to follow the constant operations per based aircraft forecast and considers general aviation operations increasing to 40,000 by 2032. This represents a 1.76 percent AAGR. Over the past five years, the number of general aviation operations per based aircraft has averaged 400 at the airport. As presented in **Table 2L**, the selected forecast generally holds to this ratio through the long term planning period.

Comparative General Aviation Operations Forecasts

Existing forecasts for general aviation operations at Sierra Vista Municipal Airport/Libby Army Airfield were reviewed and are presented in **Table 2M**. Projections from the 2002 Airport Master Plan, 2008 SASP, and the 2012 FAA TAF were reviewed. Similar to based aircraft comparisons, the data was interpolated and extrapolated as needed to meet the planning years of this study.

TABLE 2M
Previous General Aviation Operations Projections
Sierra Vista Municipal Airport/Libby Army Airfield

	2007	2011	2017	2022	2032
General Aviation Operations Logged by ATCT	34,757	27,736			
2002 Airport Master Plan	25,600*	30,700*	40,300*	50,500**	
2008 Arizona State Airports System Plan - Low	38,987	41,600	44,400	47,400*	53,900**
2008 Arizona State Airports System Plan - Medium	38,987	43,100	47,700	52,700*	64,400**
2008 Arizona State Airports System Plan - High	38,987	44,400	50,500	57,400*	74,200**
2012 FAA Terminal Area Forecast	38,175	32,506	32,506	32,506	32,506

*Interpolated; **Extrapolated

Annual General Aviation Operations Summary

While general aviation operations have fluctuated annually the past several years, the selected forecast shows a return to positive growth. The FAA projects an increase nationally in general aviation operations through the planning period. This trend, along with projected growth in based aircraft, supports future growth in annual general aviation operations at Sierra Vista Municipal Airport/Libby Army Airfield. The selected forecast results in 40,000 annual general aviation operations by 2032. **Exhibit 2D** depicts the selected general aviation operations forecast, in addition to other projections that were made.

Aviation operations are further classified by the ATCT as either local or itinerant. A local operation is a take-off or landing performed by an aircraft that operates within sight of the airport or which executes simulated approaches or touch-and-go operations. Itinerant operations are those performed by aircraft with a specific origin or destination away from the airport. Generally, local operations are characterized by training operations. Typically, itinerant operations increase with business and commercial use.

According to ATCT personnel, approximately 70 percent of general aviation operations are local in nature. These findings support the historical operations per

based aircraft thresholds that the airport has experienced in previous years. It is common that operations per based aircraft range between 200 and 500 at civilian and joint-use airports. The higher thresholds of operations per based aircraft are experienced at airports with higher numbers of local operations than itinerant operations, which is the case at Sierra Vista Municipal Airport/Libby Army Airfield. As such, future planning will consider maintaining a 70 percent and 30 percent split for general aviation local and itinerant operations, respectively.

AIR TAXI OPERATIONS

The air taxi category includes aircraft involved in on-demand passenger, small parcel transport, and air ambulance activity. For Sierra Vista Municipal Airport/Libby Army Airfield, a variety of aircraft operations qualify as air taxi activities. Ameriflight is a certificated on-demand Part 135 air cargo carrier that operates daily to/from Phoenix Sky Harbor International Airport. Seasonal operations by the U.S. Forest Service to provide fire suppression needs to the region also account for air taxi activity at the airport. Finally, air ambulance aircraft and medical helicopters that qualify as air taxi operations frequent the facility. The history of air taxi operations at Sierra Vista Municipal Airport/Libby Army Airfield was previously presented in **Table 2K**. Since 2005, air taxi operations have averaged approximately 6,300 per year.

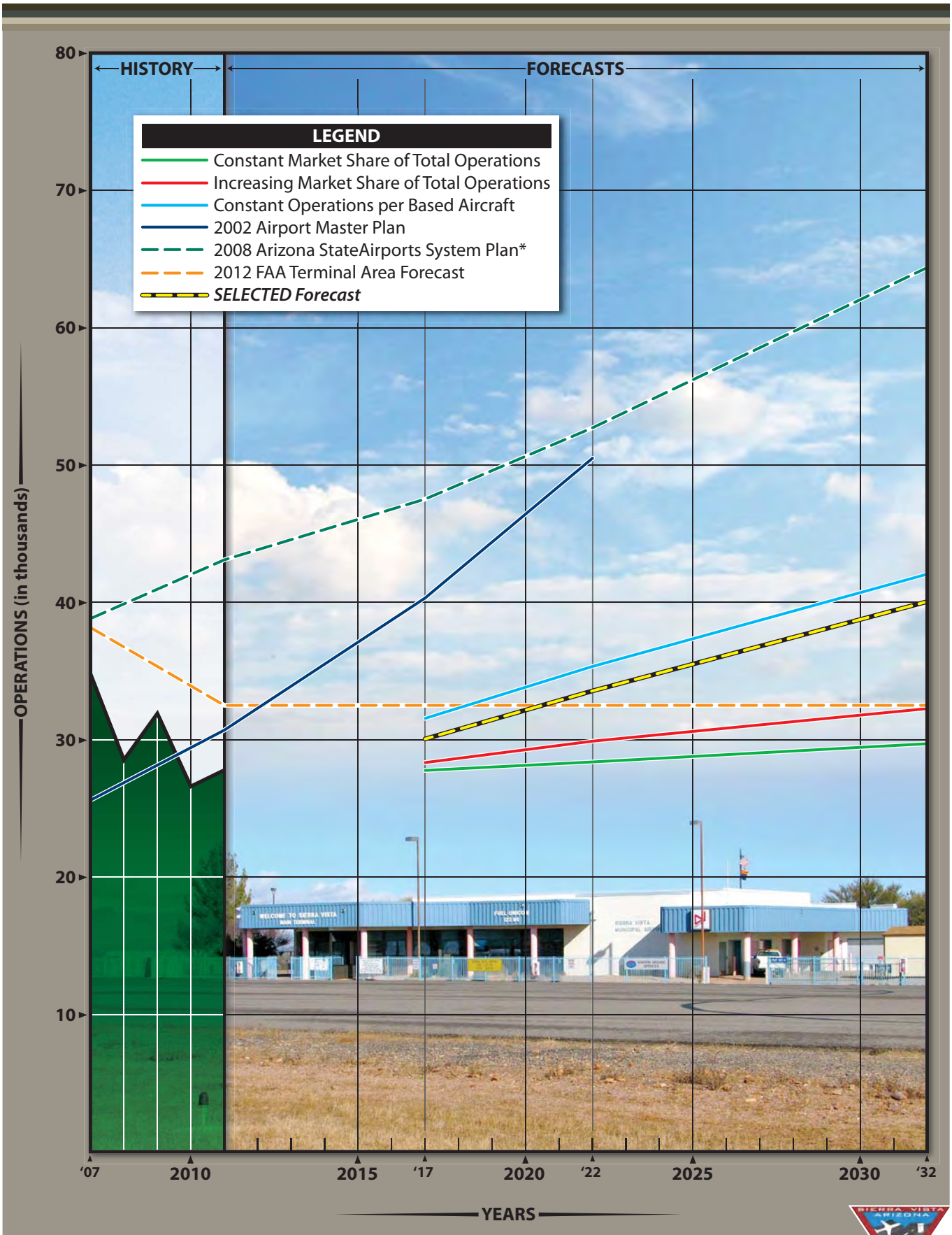
Many airports experienced significant air taxi activity during the mid to late 2000s. This can be attributed to the increased popularity of on-demand air travel for time savings and due to scheduled airline security procedures. Beginning in 2009, however, total air taxi operations dipped to their lowest in several years, due mainly to the economic downturn. After a few years of decline, the FAA forecasts modest growth in total air taxi operations in the United States through 2032.

The historic up and down air taxi activity at Sierra Vista Municipal Airport/Libby Army Airfield over the previous several years does not produce a statistical trend line that can be relied upon to predict future activity levels. As presented in **Table 2N**, a forecast was developed that considers the airport maintaining the average market share that has been experienced since 2005 (0.0584 percent). As a result, the forecast for air taxi operations includes 7,400 operations by 2032.

TABLE 2N
Air Taxi Forecast
Sierra Vista Municipal Airport/Libby Army Airfield

Year	Air Taxi Operations	U.S. Air Taxi/Commuter Operations (millions)	Market Share Air Taxi Operations
2005	8,797	12.55	0.0701%
2006	9,045	11.97	0.0756%
2007	5,459	11.67	0.0468%
2008	4,564	11.03	0.0414%
2009	5,047	9.52	0.0530%
2010	5,611	9.41	0.0596%
2011	5,771	9.28	0.0622%
Selected Forecast (AAGR = 1.19%)			
2017	5,900	10.09	0.0584%
2022	6,400	10.88	0.0584%
2032	7,400	12.74	0.0584%

Source: FAA Aerospace Forecasts - Fiscal Years 2012-2032; Coffman Associates analysis



Source: FAA Aerospace Forecasts - Fiscal Years 2012-2032

* Depicts the Medium Range Forecast

Exhibit 2D: GENERAL AVIATION OPERATIONS FORECASTS

MILITARY OPERATIONS

Military activity has historically accounted for a large majority of overall aircraft operations at Sierra Vista Municipal Airport/Libby Army Airfield. In fact, since 2005, approximately 75 percent of total annual operations have been military-related in nature. The airport experiences a wide variety of military activity ranging from smaller fighter jets (F-16) up to large wide-body refueling aircraft (KC-135). In addition, Fort Huachuca is home to an unmanned aerial system (UAS) test center; thus, these aircraft contribute to military activity on the airfield as well.

The level of military operations is not a function of demographics, but rather a function of the Department of Defense (DOD). Forecasting for military activity is particularly challenging since the mission of the DOD can change rapidly, affecting the potential for military activity.

Table 2K presents the history of military operations at the airport since 2005. Over that time period, military operations have averaged approximately 108,000 annually, with a low of 99,302 operations in 2009 and a high of 116,145 operations in 2006. Due to the unpredictable nature of military operations, annual military activity is forecast as an average of the total annual operations experienced since 2005. As such, 108,000 military operations are forecast annually through 2032. According to ATCT personnel, approximately 60 percent of military operations are transient in nature, and the remaining 40 percent are local.

OPERATIONS ADJUSTMENT AND SUMMARY

Since the ATCT is not a 24-hour tower, its air traffic counts are not all-inclusive of aircraft operations at Sierra Vista Municipal Airport/Libby Army Airfield. Some aspects of the Master Plan require that all airport activity be considered. For these evaluations, it is necessary to estimate and adjust for operations that occur when the tower is closed. As previously discussed, the ATCT operates from 7:00 a.m. to 11:00 p.m., Monday through Friday, and is sometimes operational during certain periods on the weekends.

After comparing weekday versus weekend aircraft operational statistics at other control-towered airports in the region (i.e., Tucson Ryan Airfield) and in having discussions with ATCT personnel at Sierra Vista Municipal Airport/Libby Army Airfield, operations after the tower has closed and on the weekends are estimated at 20 percent of total operations. Furthermore, tower personnel have acknowledged that a large majority of these operations are general aviation in nature. As such, a 15 percent adjustment is being added to general aviation operations, and a 2.5 percent adjustment is being made to both air taxi and military operations, to provide a more realistic representation of annual operations experienced at the airport.

Total operations for Sierra Vista Municipal Airport/Libby Army Airfield have been forecast through 2032. A number of sources have been consulted for this fore-

cast analysis. **Table 2P** presents a summary of forecast annual operations at the airport. As can be seen from the table, total annual operations are forecast to increase to 164,300 by 2032. This equates to a 0.51 AAGR.

TABLE 2P
Operations Activity Forecast Summary
Sierra Vista Municipal Airport/Libby Army Airfield

	Base Year	Forecast		
ANNUAL OPERATIONS	**2011**	**2017**	**2022**	**2032**
General Aviation				
Itinerant	8,321	9,000	10,100	12,000
Local	19,415	21,000	23,500	28,000
ATCT After-Hours/Weekend Adjustment	4,160	4,500	5,000	6,000
Air Taxi	5,771	5,900	6,400	7,400
ATCT After-Hours/Weekend Adjustment	144	200	200	200
Military				
Itinerant	64,240	64,800	64,800	64,800
Local	42,826	43,200	43,200	43,200
ATCT After-Hours/Weekend Adjustment	2,677	2,700	2,700	2,700
Total Operations	**147,554**	**151,300**	**155,900**	**164,300**

Note: Forecast operations totals are rounded to the nearest 100

COMMERCIAL AND AIR CARGO ACTIVITY

Sierra Vista Municipal Airport historically accommodated commercial airline activities during the 1980s, 1990s, and early 2000s. During these times, commuter air carriers such as Mesa Airlines and Great Lakes Airlines provided service to Phoenix Sky Harbor International Airport through the Essential Air Service (EAS) and Small Community Air Service Development (SCASD) programs. Between 1990 and 1997, the airport experienced approximately 11,500 annual enplanements, qualifying it as a primary commercial service airport. However, in the late 1990s and early 2000s, enplanement levels decreased considerably, at which time regularly scheduled commuter airline service was discontinued.

The EAS and SCASD programs were essential to providing commuter airline service to Sierra Vista Municipal Airport. The EAS program is administered by the Department of Transportation (DOT) and subsidizes airline operational costs for small community airports. Similarly, the SCASD program is intended to provide temporary grant-in-aid financial assistance to small communities in order to achieve sustainable air service, thereby avoiding the need for ongoing federal subsidies. An additional goal of the program was to generate creative air service development proposals that could possibly be implemented in other similar small communities.

In recent years, these programs have come under heavy scrutiny, and the federal government has placed strict measures on eligibility to participate in these programs. Provisions within the EAS program that include being located fewer than 70 miles from the nearest large- or medium-hub airport or not having EAS service between September 30, 2010, and September 30, 2011 disqualify an airport from being eligible to participate under the recently passed FAA reau-

thorization bill. Due to the fact that Sierra Vista is located less than 70 miles from Tucson International Airport (medium-hub) and has not participated in the program for several years, it is ineligible for EAS assistance for at least the next four years. Although eligible for SCASD assistance, it is unlikely the airport will be selected to participate due to unsuccessful attempts in the past. Given these considerations, in addition to being located in close proximity to Tucson International Airport, is it unlikely that Sierra Vista Municipal Airport will serve regularly scheduled commuter airline activities in the foreseeable future. As a result, planning related to commercial airline service will no longer be considered in this study.

Air cargo activity is typically comprised of freight carried by the passenger airlines, as well as freight transported by all-cargo carriers. As indicated earlier, Sierra Vista Municipal Airport is currently served by Ameriflight, an on-demand cargo carrier that has historically used a variety of smaller commuter turboprops (i.e., Beech 1900 and King Air 200), as well as multi-engine piston aircraft.

There is no historical data on cargo volumes processed through Sierra Vista Municipal Airport. Since planning forecasts are developed for the purpose of determining facility needs, the low level of air cargo activity indicates that air cargo forecasts are not critical. Projected air cargo at the airport is not expected to reach levels that will produce major air cargo facility needs. The existing fleet of turboprops and twin-engine piston aircraft operated by Ameriflight will be capable of accommodating the projected air cargo needs through 2032, and the large amount of parking apron space provided at Sierra Vista Municipal Airport will satisfy future demands that may be needed for cargo activities.

PEAKING CHARACTERISTICS

Many airport facility needs are related to the levels of activity during peak periods (busy times). For this study, facility needs specific to Sierra Vista Municipal Airport are analyzed. Given that landside military movements primarily occur on the south side of the airfield (associated with Fort Huachuca), this analysis considers only general aviation and air taxi operations which utilized facilities on Sierra Vista Municipal Airport. The airfield capacity analysis, to be conducted in the next chapter, will consider total aircraft activity to include general aviation, air taxi, and military operations. The periods used in developing facility requirements for this study are as follows:

- **Peak Month** – The calendar month when peak aircraft operations occur.

- **Design Day** – The average day in the peak month. This indicator is derived by dividing the peak month operations by the number of days in the month.

- **Busy Day** – The busy day of a typical week in the peak month.

- **Design Hour** – The peak hour within the design day.

The peak month is an absolute peak within a given year. All other peak periods will be exceeded at various times during the year. However, they do represent reasonable planning standards that can be applied without overbuilding or being too restrictive. The peak periods forecast

has been determined utilizing operations reports from the ATCT.

The peak month for general aviation and air taxi activity has historically occurred during the last spring and summer months and accounted for an average of 12 percent of the annual operations. The design day was calculated by dividing the peak month by the number of days in the month (31).

The busy day provides information for use in determining aircraft parking apron requirements. The busiest day of each week accounts for approximately 18 percent of weekly operations. Thus, to determine the typical busy day, the design day is multiplied by 1.25, which represents approximately 18 percent of the days in a week (7 x 0.18). Design hour operations were determined to be approximately 13 percent of the design day operations. The peaking characteristics for general aviation and air taxi activity are summarized in **Table 2Q** for each planning year period.

TABLE 2Q
General Aviation and Air Taxi Peaking Forecasts
Sierra Vista Municipal Airport

	2011	2017	2022	2032
Annual Operations	37,811	40,600	45,200	53,600
Peak Month	4,537	4,872	5,424	6,432
Busy Day	183	196	219	259
Design Day	146	157	175	207
Design Hour	19	20	23	27

ANNUAL INSTRUMENT APPROACHES

An instrument approach, as defined by the FAA, is "an approach to an airport with the intent to land by an aircraft in accordance with an Instrument Flight Rule (IFR) flight plan, when visibility is less than three miles and/or when the ceiling is at or below the minimum initial approach altitude." To qualify as an instrument approach, aircraft must land at the airport after following one of the published instrument approach procedures in less than visual conditions. Forecasts of annual instrument approaches (AIAs) provide guidance in determining an airport's requirements for navigational aid facilities, such as an instrument landing system. It should be noted that practice or training approaches do not count as annual AIAs, nor do instrument approaches conducted in visual conditions.

During poor weather conditions, pilots are less likely to fly and rarely would perform training operations. As a result, an estimate of the total number of AIAs can be made based on a percent of itinerant operations regardless of the frequency of poor weather conditions. An estimate of one percent of total itinerant (general aviation, air taxi, and military) operations is utilized to forecast AIAs at Sierra Vista Municipal Airport/Libby Army Airfield, as presented in **Table 2R**.

TABLE 2R
Annual Instrument Approaches (AIAs)
Sierra Vista Municipal Airport/Libby Army Airfield

	AIAs	Itinerant Operations	Ratio
2017	829	82,870	1.00%
2022	846	84,620	1.00%
2032	879	87,820	1.00%

Source: Coffman Associates analysis

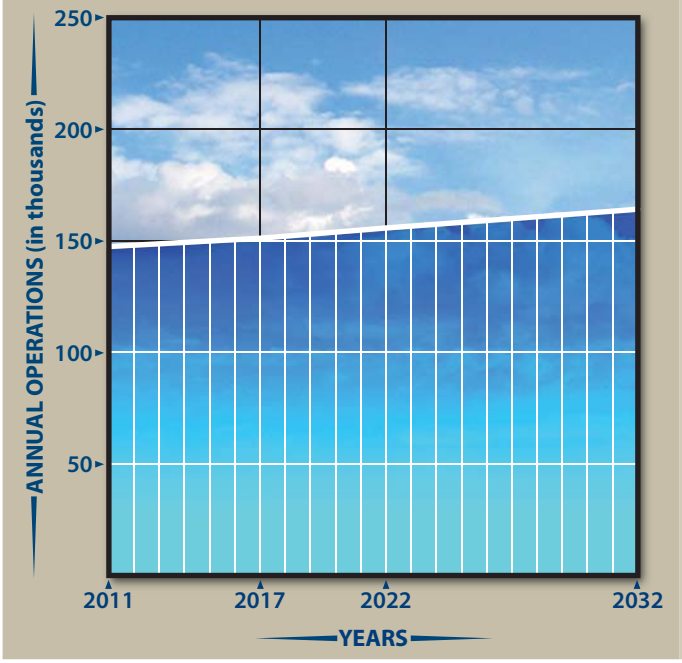
SUMMARY

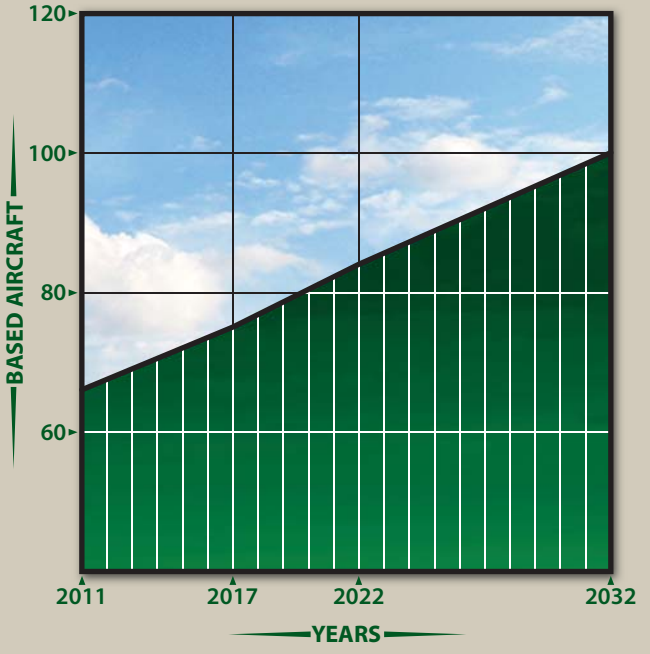
This chapter has provided demand-based forecasts of aviation activity at Sierra Vista Municipal Airport/Libby Army Airfield over the next 20 years. An attempt has been made to define the projections in terms of short (1-5 years), intermediate (6-10 years), and long (11-20 years) term expectations. Elements such as local socioeconomic indicators, anticipated regional development, and historical aviation data, as well as national aviation trends, were all considered when determining future conditions.

The next step in the master planning process will be to assess the capacity of existing facilities, their ability to meet forecast demand, and to identify changes to the airfield and/or landside facilities which will create a more functional aviation facility. A summary of aviation forecasts is depicted on **Exhibit 2E**.

	Base Year	2017	2022	2032
ANNUAL OPERATIONS				
Itinerant Operations				
General Aviation	9,570	10,350	11,600	13,800
Air Taxi	5,920	6,100	6,600	7,600
Military	65,820	66,400	66,400	66,400
Total Itinerant Operations	**81,310**	**82,850**	**84,600**	**87,800**
Local Operations				
General Aviation	22,330	24,150	27,000	32,200
Military	43,920	44,300	44,300	44,300
Total Local Operations	**66,250**	**68,450**	**71,300**	**76,500**
Total Annual Operations*	**147,560**	**151,300**	**155,900**	**164,300**
BASED AIRCRAFT FLEET MIX				
Single Engine Piston	60	67	72	83
Multi-Engine Piston	3	3	4	4
Turboprop	--	1	2	4
Jet	--	1	2	4
Helicopter	3	3	4	5
Total Based Aircraft	**66**	**75**	**84**	**100**
PEAKING CHARACTERISTICS				
Annual Operations	37,811	40,600	45,200	53,600
Peak Month	4,537	4,872	5,424	6,432
Busy Day	183	196	219	259
Design Day	146	157	175	207
Design Hour	19	20	23	27
ANNUAL INSTRUMENT APPROACHES	**N/A**	**829**	**846**	**879**

* Includes ATCT After-Hours / Weekend Adjustment





Chapter Three

FACILITY REQUIREMENTS

Sierra Vista
MUNICIPAL AIRPORT

AIRPORT MASTER PLAN

CHAPTER THREE

Facility Requirements

In this chapter, existing components of the airport are evaluated so that the capacities of the overall system are identified. Once identified, the existing capacity is compared to the forecast activity levels to determine where deficiencies currently exist or may be expected to materialize in the future. Once deficiencies in a component are identified, a more specific determination of the appropriate sizing and timing of the new facilities can be made.

As indicated previously in Chapter One, airport facilities include both airside and landside components. Airside facilities include those that are related to the arrival, departure, and ground movement of aircraft. The components include:

- Runways
- Taxiways
- Navigational Approach Aids
- Airfield Lighting, Marking, and Signage

Landside facilities are needed for the interface between air and ground transportation modes. This includes components for general aviation needs such as:

- General Aviation Terminal Services
- Aircraft Hangars
- Aircraft Parking Aprons
- Airport Support Facilities

The objective of this effort is to identify, in general terms, the adequacy of the existing airport facilities and outline what new facilities may be needed and when they may be needed to accommodate forecast demand. Having established these facility requirements, alternatives for providing these facilities will be evaluated in Chapter Four to determine the most practical, cost-effective, and efficient direction for future development.

PLANNING HORIZONS

An updated set of aviation demand forecasts for Sierra Vista Municipal Airport/Libby Army Airfield has been established. The activity forecasts include annual aircraft operations and annual instrument approaches (AIAs) for the airfield system. Furthermore, general aviation projections for civilian based aircraft, fleet mix, and peaking characteristics are realized for Sierra Vista Municipal Airport. With this information, specific components of the airside and landside system can be evaluated to determine their capacity to accommodate future demand.

Cost-effective, safe, efficient, and orderly development of an airport should rely more upon actual demand at an airport than a time-based forecast figure. In order to develop a Master Plan that is demand-based rather than time-based, a series of planning horizon milestones has been established that takes into consideration the reasonable range of aviation demand projections prepared in Chapter Two. It is important to consider that the actual activity at any given time at the airport may be higher or lower than projected activity levels. By planning according to activity milestones, the resulting plan can accommodate unexpected shifts or changes in the area's aviation demand.

The most important reason for utilizing milestones is that they allow the airport to develop facilities according to need generated by actual demand levels. The demand-based schedule provides flexibility in development, as development schedules can be slowed or expedited according to actual 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 planning horizon milestones of short, intermediate, and long term for each aircraft activity category. These milestones generally correlate to five, ten, and 20-year periods used in the previous chapter.

TABLE 3A
Planning Horizon Activity Summary
Sierra Vista Municipal Airport/Libby Army Airfield

	Current	Short Term (1-5 years)	Intermediate Term (6-10 years)	Long Term (11-20 years)
BASED AIRCRAFT				
Single Engine Piston	60	67	72	83
Multi-Engine Piston	3	3	4	4
Turboprop	--	1	2	4
Jet	--	1	2	4
Helicopter	3	3	4	5
TOTAL BASED AIRCRAFT	**66**	**75**	**84**	**100**
ANNUAL OPERATIONS				
Itinerant	81,310	82,850	84,600	87,800
Local	66,250	68,450	71,300	76,500
TOTAL OPERATIONS*	**147,560**	**151,300**	**155,900**	**164,300**
GENERAL AVIATION AND AIR TAXI PEAKING CHARACTERISTICS				
Peak Month	4,537	4,872	5,424	6,432
Busy Day	183	196	219	259
Design Day	146	157	175	207
Design Hour	19	20	23	27
ANNUAL INSTRUMENT APPROACHES	**N/A**	**829**	**846**	**879**

* Includes ATCT After-Hours/Weekend Adjustment

CRITICAL DESIGN AIRCRAFT

The design standards applied to an airport are based on the type of aircraft with the most demanding Airport Reference Code (ARC) expected to regularly use the facility. Regular use is defined by the Federal Aviation Administration (FAA) as that aircraft or family of aircraft that will perform at least 500 annual operations at the airport.

The ARC, as described in FAA Advisory Circular (AC) 150/5300-13, *Airport Design*, is a coding system to help identify and determine the appropriate design criteria for an individual airport. The ARC correlates the design and layout of the airport to the operational and physical characteristics of the critical design aircraft. The identified critical design aircraft directly influences pertinent safety criteria such as runway length, runway width, separation distances, building setbacks, and the dimensions of required safety areas surrounding the runway and taxiway system.

The ARC has two components. The first component, depicted by a letter, is the aircraft approach category, which relates to aircraft approach speed (operational characteristic). The second component, depicted by a Roman numeral, is the airplane design group (ADG), which relates to aircraft wingspan and tail height (physical characteristics). Generally, aircraft approach speed applies to runways and runway-related facilities, while airplane wingspan primarily relates to separation criteria involving taxiways, taxilanes, and landside facilities. **Table 3B** presents the ARC criteria.

TABLE 3B
Airport Reference Codes

Aircraft Approach Category		
Category	*Speed*	
A	< 91 Knots	
B	91- < 121 Knots	
C	121- < 141 Knots	
D	141- <166 Knots	
E	> 166 Knots	
Airplane Design Group[1]		
Group	*Tail Height (ft)*	*Wingspan (ft)*
I	< 20	< 49
II	20- < 30	49- < 79
III	30- < 45	70- < 118
IV	45- < 60	118- < 171
V	60- < 66	171- < 214
VI	66- < 80	214- < 262

Source: FAA Advisory Circular (AC) 150/5300-13, *Airport Design*
[1] Utilize the most demanding category.

As an example, a Beech King Air 200 with an approach speed of 103 knots and wingspan of 54.5 feet is categorized in ARC B-II, while a larger corporate jet, such as a Gulfstream V, with an approach speed of 145 knots and a wingspan of 93.5 feet, is included in ARC D-III. **Exhibit 3A** presents examples of ARC categories and their corresponding aircraft type.

The FAA recommends designing airport functional elements to meet the requirements for the most demanding ARC for that airport. Currently, the airport is served by a wide variety of general aviation, air taxi, and military aircraft ranging from small piston-engine aircraft to large wide-body transport jets.

In order to determine airfield design requirements, the critical aircraft and critical ARC should first be determined, and then appropriate airport design criteria can be applied. This process begins with a review of aircraft currently using the airport and those expected to use the air-

port through the long term planning period.

As of December 2011, there were 66 based aircraft at Sierra Vista Municipal Airport. The majority of these are single and multi-engine piston-powered aircraft which fall within approach categories A and B and ADG I. There are three helicopters that are also based at the airport; however, they are not included in this determination as they are not assigned an ARC. Before making a final determination of the critical aircraft family, an examination of the itinerant turboprop and jet aircraft using the airport should also be considered.

CHARTER AND AIR TAXI

Charter and air taxi operations utilize Sierra Vista Municipal Airport/Libby Army Airfield. Charter operations are associated with military personnel transport and utilize the south side of the airfield in conjunction with Fort Huachuca. Between January 1, 2011 and December 31, 2011, the airport experienced several large aircraft charter operations. Representative airlines included Continental Airlines, Delta Airlines, Miami Air, Omni Air International, Sierra Pacific Airlines, and United Airlines. The operators utilize an array of large airline transport aircraft, including Boeing 737, 757, 767, and 777 aircraft, as well as the Airbus A-320 and DC-10 aircraft. The majority of air taxi operations at the airport are associated with Ameriflight, the on-demand air cargo operator utilizing Beech 1900 and King Air turboprop aircraft. **Table 3C** presents information specific to charter and air taxi operations, including destinations to/from the airport.

TABLE 3C
Representative Air Charter and Air Taxi Usage (Minimum)
January 1, 2011 - December 31, 2011
Sierra Vista Municipal Airport/Libby Army Airfield

Operator	Aircraft	ARC	Destination(s)
Ameriflight	Beech 1900 King Air 200	B-II B-II	Phoenix, AZ
Continental Airlines	Boeing 737-800	C-III	Phoenix, AZ; Columbia, SC
Delta Airlines	Airbus A-320 Boeing 757-200 Boeing 767-300	C-III C-IV C-IV	Columbia, SC; Atlanta, GA; Seattle, WA
Miami Air	Boeing 737-800	C-III	Columbia, SC; Atlanta, GA; Seattle, WA; Boston, MA; Milwaukee, WI; Nashville, TN
Omni Air International	Boeing 777-200 DC-10	D-V D-IV	Atlanta, GA; Washington, DC; Cherry Point MCAS (NC)
Sierra Pacific Airlines	Boeing 737-200	C-III	Columbia, SC
United Airlines	Boeing 737-700	C-III	Houston, TX

Source: Airport IQ

GENERAL AVIATION

The majority of general aviation operations were conducted by light aircraft, or those weighing less than 12,500 pounds. Some of these operations, however, are conducted by the full array of business jet aircraft. **Table 3D** presents business jet

A-I

- Beech Baron 55
- **Beech Bonanza**
- Cessna 150
- Cessna 172
- Cessna Citation Mustang
- Eclipse 500
- Piper Archer
- Piper Seneca

B-I *less than 12,500 lbs.*

- Beech Baron 58
- Beech King Air 100
- Cessna 402
- **Cessna 421**
- Piper Navajo
- Piper Cheyenne
- Swearingen Metroliner
- Cessna Citation I

B-II *less than 12,500 lbs.*

- **Super King Air 200**
- Cessna 441
- DHC Twin Otter

B-I, B-II *over 12,500 lbs.*

- Super King Air 350
- Beech 1900
- Jetstream 31
- Falcon 10, 20, 50
- Falcon 200, 900
- **Citation II**, III, IV, V
- Saab 340
- Embraer 120

A-III, B-III

- DHC Dash 7
- **DHC Dash 8**
- DC-3
- Convair 580
- Fairchild F-27
- ATR 72
- ATP

C-I, D-I

- Beech 400
- **Lear 25, 31, 35, 45, 55, 60**
- Israeli Westwind
- HS 125-400, 700

C-II, D-II

- Cessna Citation III, VI, VIII, X
- **Gulfstream II, III, IV**
- Canadair 600
- ERJ-135, 140, 145
- CRJ-200/700
- Embraer Regional Jet
- Lockheed JetStar

C-III, D-III

- ERJ-170, 190
- CRJ 700, 900
- Boeing Business Jet
- **B 737-300 Series**
- MD-80, DC-9
- Fokker 70, 100
- A319, A320
- Gulfstream V
- Global Express

C-IV, D-IV

- **B-757**
- B-767
- C-130
- DC-8-70
- MD-11

D-V

- **B-747** Series
- B-777

Note: Aircraft pictured is identified in bold type.

operations at the airport over the last year. Data was obtained from *Enhanced Traffic Management System Counts* (ETMSC). Data available through this program is created when pilots file flight plans and/or when flights are detected by the National Airspace System, usually via radar. It includes documentation of commercial traffic (air carrier and air taxi), general aviation, and military aircraft. Due to factors such as incomplete flight plans and limited radar coverage, ETMSC data cannot account for all aircraft activity at an airport. Therefore, it is likely that there are more jet operations at the airport that are not captured by this methodology.

TABLE 3D
General Aviation Jet Operations by Airport Reference Code (Minimum)
January 1, 2011 – December 31, 2011
Sierra Vista Municipal Airport/Libby Army Airfield

ARC	Aircraft Type	Annual Operations	% of Total Operations
A-I	Eclipse 500	32	14.5%
Total A-I		**32**	**14.5%**
B-I	Beechjet 400	6	2.7%
	Cessna 500	4	1.8%
	Cessna 501	2	0.9%
	Cessna 510	15	6.8%
	Cessna 525 (CJ I)	7	3.2%
Total B-I		**34**	**15.5%**
B-II	Cessna 525 (CJ II)	2	0.9%
	Cessna 550	78	35.4%
	Cessna 560	21	9.5%
	Falcon 50	2	0.9%
Total B-II		**103**	**46.8%**
C-I	Learjet 25	2	0.9%
	Learjet 40	2	0.9%
Total C-I		**4**	**1.8%**
C-II	Cessna 750 (X)	8	3.6%
	Challenger 600/604	8	3.6%
Total C-II		**16**	**7.2%**
D-I	Learjet 35/36	9	4.1%
	Learjet 45	10	4.5%
	Learjet 60	8	3.6%
Total D-I		**27**	**12.3%**
D-II	Gulfstream II	2	0.9%
Total D-II		**2**	**0.9%**
D-III	Gulfstream V	2	0.9%
Total D-III		**2**	**0.9%**
Total Activity		**220**	**100.0%**

Source: Enhanced Traffic Management System Counts (ETMSC)

As detailed in the table, itinerant aircraft utilizing the airport include a wide array of jets including several different makes and models of Cessna Citations, Falcons, Learjets, Challengers, and Gulfstreams, among others. There were a total of 220 operations logged by ETMSC during the one-year timeframe. The greatest num-

ber of operations in any single ARC family was 103 in ARC B-II. These accounted for approximately 47 percent of logged jet activity.

The table also presents the number of operations by specific aircraft type. The Cessna 550 model performed the most operations (78) of any jet aircraft at the airport. The most demanding business jet aircraft, in terms of ARC design standard, to operate at the airport during the time period was the Gulfstream V. The Gulfstream V is classified by the FAA as ARC D-III.

MILITARY

As presented in the previous chapter, Libby Army Airfield is heavily utilized by military aircraft. These aircraft range from smaller jets such as the F-16 (ARC E-1) to large refueling tankers and transport aircraft such as the KC-135 Stratotanker and C-5 Galaxy (ARCs D-IV and C-VI, respectively). In addition, with Fort Huachuca being home to an unmanned aerial system (UAS) test center, these aircraft (ranging from ARC A-1 through B-II) operate at the airport on a frequent basis.

CRITICAL AIRCRAFT SUMMARY

It is evident from the discussion above that the military and charter aircraft associated with Fort Huachuca will be the critical design aircraft through the planning period. Even if Sierra Vista Municipal Airport attracts larger air taxi or general aviation aircraft, those which could potentially be attracted will be no larger than ARC C/D-III. The airfield can accommodate this design standard.

- Future operations related to military air charter and transport activity, represented by a combination of aircraft in ARCs C-III through D-V, including the Boeing 737, 757, 767, and 777 as well as the C-5 and KC-135, will likely continue to operate at the airport. Furthermore, smaller military jets such as the F-16 and A-10, which fall in ARCs E-I and D-I, respectively, will likely continue to utilize the airport for training purposes on a regular basis.

- Future general aviation aircraft operations could realistically include a larger percentage of aircraft in ARC C/D-I through C/D-III. For this reason, the general aviation critical aircraft operations will consider ARC C/D-III.

According to the recently updated 2011 Airport Layout Plan (ALP), and based upon operational activity detailed previously, the existing critical aircraft for Sierra Vista Municipal Airport/Libby Army Airfield is ARC E-V. Based upon the types of activity that can be expected at the airport in the future, ultimate planning will continue to designate ARC E-V as the critical design aircraft for the airfield.

While the airport in general will be planned to meet ARC E-V standards, each runway will be individually analyzed based on function. Runway 8-26 provides 12,001 feet of usable runway length at the airport and serves as the primary runway for military and air charter aircraft. As a result, this runway should ultimately conform to ARC E-V standards.

Runways 12-30 and 3-21 are the other two runways serving the airport with lengths of 5,366 feet and 4,285 feet, respectively. While these runway lengths will limit the use of some larger jets, they can accommodate smaller military, air taxi, and general aviation aircraft. These runways can also provide a vital role of serving aircraft operations when the primary runway is closed for maintenance or emergencies. As such, Runway 12-30 should be designed to ultimately conform to ARC C-III standards. Runway 3-21 serves to accommodate mainly smaller aircraft, especially when crosswinds prohibit or limit the use of Runways 8-26 and 12-30. Runway 3-21 should be planned to conform to ARC B-II design standards. **Table 3E** presents the existing and ultimate ARCs for each runway at Sierra Vista Municipal Airport/Libby Army Airfield based upon the 2011 ALP.

TABLE 3E
Runway Airport Reference Codes
Sierra Vista Municipal Airport/Libby Army Airfield

	Runway 8-26	Runway 12-30	Runway 3-21
	Existing / Ultimate	Existing / Ultimate	Existing / Ultimate
ARC	E-V	C-III	B-II
Critical Aircraft	F-16 and Boeing 747-400	Boeing 737-300 and C-130	King Air 200

Source: 2011 Airport Layout Plan

AIRFIELD CAPACITY

Airfield capacity is measured in a variety of different ways. The hourly capacity of a runway measures the maximum number of aircraft operations that can take place in an hour. The annual service volume (ASV) is an annual level of service that may be used to define airfield capacity needs. Aircraft delay is the total delay incurred by aircraft using the airfield during a given timeframe. FAA AC 150/5060-5, *Airport Capacity and Delay*, provides a methodology for examining the operational capacity of an airfield for planning purposes.

FACTORS AFFECTING ANNUAL SERVICE VOLUME

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

Runway Configuration

The existing runway configuration consists of three intersecting runways. Primary Runway 8-26 is 12,001 feet long and can accommodate the full mix of military and general aviation aircraft that utilize the airport. Runway 12-30 is 5,366 feet long and capable of serving smaller general aviation and military aircraft. At 4,285 feet, Runway 3-21 mainly serves smaller general aviation aircraft to include piston-powered and turboprop aircraft.

Runway Use

Runway use in capacity conditions will be controlled by wind and/or airspace conditions. It is generally safest for aircraft to take-off and land into the wind, avoiding crosswind (wind that is blowing perpendicular to the travel of the aircraft) or tailwind components during these operations. In addition, aircraft flow is often times dictated by air traffic control when wind conditions are calm. Based upon information received from the airport traffic control tower (ATCT), Runway 26 is utilized approximately 80 percent of the time, with Runway 8 being utilized approximately ten percent of the time. Runway 12-30 is estimated to be in use approximately seven percent of the time and Runway 3-21 is utilized the remaining three percent of the time. The availability of instrument approaches is also considered. Runway 8-26 is the only runway served by straight-in instrument approach procedures, one of which is a precision instrument landing system (ILS) approach.

Exit Taxiways

Exit taxiways have a significant impact on airfield capacity since the number and location of exits directly determine the occupancy time of an aircraft on the runway. The airfield capacity analysis gives credit to exits located within the prescribed range from a runway's threshold. This range is based upon the mix index of the aircraft that use the runways. The exits must be at least 750 feet apart to count as separate exits. For Sierra Vista Municipal Airport/Libby Army Airfield, one exit taxiway is credited for each runway in this analysis.

Weather Conditions

Weather conditions can have a significant impact on airfield capacity. Airport capacity is usually highest in clear weather, when flight visibility is at its best. Airfield capacity 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. The increased distance between aircraft reduces the number of aircraft which can operate at the airport during any given period, thus reducing overall airfield capacity.

According to meteorological data collected from the airport, the airport operates under visual flight rule (VFR) conditions approximately 99 percent of the time. VFR conditions exist whenever the cloud ceiling is greater than 1,000 feet above ground level (AGL) and visibility is greater than three statute miles. Instrument flight rule (IFR) conditions are defined when cloud ceilings are between 500 and 1,000 feet AGL or visibility is between one and three miles and occurs less than one percent of the year at the airport. Poor visibility conditions (PVC) apply for cloud ceilings below 500 feet and visibility below one mile. PVC also occurs less than one percent of the year. **Table 3F** summarizes the weather conditions experienced at the airport over a ten-year period of time.

AIRFIELD LAYOUT

Runway Configuration

Runway Use

Number of Exits

WEATHER CONDITIONS

VMC
Visual Meteorological Conditions

IMC
Instrument Meteorological Conditions

PVC
Poor Visibility Conditions

AIRCRAFT MIX

Category A & B Aircraft

Category C Aircraft

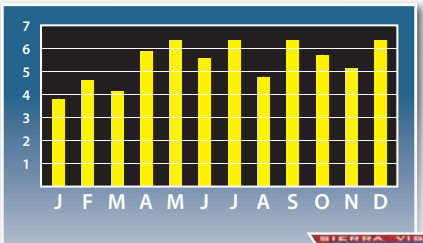
Category D Aircraft

OPERATIONS

Arrivals

Departures

Total Annual Operations



Touch-and-Go Operations

TABLE 3F
Weather Conditions
Sierra Vista Municipal Airport/Libby Army Airfield

Condition	Cloud Ceiling	Visibility	Observations	Percent of Total
VFR	> 1,000' AGL	> 3 statute miles	54,524	99.3%
IFR	≥ 500' AGL and ≤ 1000' AGL	1-3 statute miles	225	0.4%
PVC	< 500' AGL	< 1 statute mile	143	0.3%

VFR - Visual Flight Rules
IFR - Instrument Flight Rules
PVC - Poor Visibility Conditions
AGL - Above Ground Level

Source: National Oceanic and Atmospheric Administration (NOAA) - National Climatic Data Center. Airport observations from 2001-2011

Aircraft Mix

Aircraft mix for the capacity analysis is defined in terms of four aircraft classes. Classes A and B consist of small and medium-sized propeller-driven and some jet aircraft, all weighing 12,500 pounds or less. These aircraft are associated primarily with general aviation activity, but do include some air taxi and military aircraft. Class C consists of aircraft weighing between 12,500 pounds and 300,000 pounds. These aircraft include most business jets and large turboprop aircraft, in addition to a large majority of military aircraft. Class D aircraft consists of large aircraft weighing more than 300,000 pounds. These aircraft are associated with military transport activities, and include aircraft such as the Boeing 767 and C-5, among others. A description of the classifications and the percentage mix for each planning horizon is presented in **Table 3G**.

TABLE 3G
Aircraft Operational Mix - Capacity Analysis
Sierra Vista Municipal Airport/Libby Army Airfield

Aircraft Classification	Current	Short Term (1-5 Years)	Intermediate Term (6-10 Years)	Long Term (11-20 Years)
Classes A & B	86.0%	83.8%	81.5%	79.0%
Class C	12.0%	14.0%	16.0%	18.0%
Class D	2.0%	2.2%	2.5%	3.0%

Class A - Small single engine aircraft with gross weights of 12,500 pounds or less
Class B - Small multi-engine aircraft with gross weights of 12,500 pounds or less
Class C - Large aircraft with gross weights over 12,500 pounds up to 300,000 pounds
Class D - Large aircraft with gross weights over 300,000 pounds

Source: Coffman Associates analysis

For the capacity analysis, the percentage of Classes C and D aircraft operating at Sierra Vista Municipal Airport/Libby Army Airfield is critical in determining the ASV, as this class includes the larger and faster aircraft in the operational mix. The percentage of Classes C and D aircraft is expected to increase through the planning period as overall jet aircraft increases at the airport.

Percent Arrivals

The aircraft arrival/departure split is typically 50/50 in the design hour. At Sierra Vista Municipal Airport/Libby Army Airfield, traffic information indicated no major deviation from this pattern. As a result, arrivals were estimated to account for 50 percent of design period operations.

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 indicated in Chapter Two, these operations are normally associated with training operations. A high percentage of touch-and-go traffic normally results in a higher operational capacity because one landing and one takeoff occurs within a shorter time period than individual operations. Touch-and-go operations account for approximately 50 percent of total annual operations. A similar ratio is expected in the future.

Peak Period Operations

For the airfield capacity analysis, average daily operations and average peak hour operations during the peak month, as calculated in the previous chapter, are utilized. Typical operations activity is important in the calculation of an airport's ASV as "peak demand" levels occur sporadically. The peak periods used in the capacity analysis are representative of normal operational activity and can be exceeded at various times throughout the year.

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 Sierra Vista Municipal Airport/Libby Army Airfield.

Hourly Runway Capacity

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

Based upon the input factors, current and future hourly capacities on the airfield were determined. As the mix of aircraft operating at the airport changes to include a higher percentage of large aircraft weighing over 12,500 pounds, the hourly capacity of the system declines slightly. As indicated in **Table 3G**, the percentage of Classes C and D aircraft will increase with the planning horizon activity milestones. This results in a slight decline in the hourly capacity.

The current and future hourly capacities are depicted in **Table 3H**. The current hourly capacity on the airfield is 100 operations during VFR conditions. This is expected to decline to 96 operations in the long term planning horizon as the fleet mix changes to include more Class C and D aircraft. The projected increase in jet activity and UAS operations, which typically require additional spacing and time in the aircraft traffic pattern and on the runway system, attributes to this decline.

TABLE 3H
Airfield Demand/Capacity Summary
Sierra Vista Municipal Airport/Libby Army Airfield

	Current (2009)	Short Term (1-5 Years)	Intermediate Term (6-10 Years)	Long Term (11-20 Years)
Operational Demand				
Annual	147,560	151,300	155,900	164,300
Design Hour	61	63	65	69
Capacity				
Annual Service Volume	241,000	237,000	234,000	228,000
Percent Capacity	61.2%	63.8%	66.7%	72.1%
Weighted Hourly Capacity	100	99	98	96
Delay				
Per Operation (Minutes)	0.3	0.4	0.5	0.6
Total Annual (Hours)	738	1,009	1,299	1,643

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

Annual Service Volume

Once the hourly capacity is known, the ASV can be determined. ASV is calculated 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 241,000 operations. The increasing percentage of larger Classes C and D aircraft over the planning period will contribute to a decline in ASV, lowering it to a level of 228,000 operations by the end of the planning period. With operations in 2011 projected at 147,560 (factoring in 20 percent adjustment for operations when the ATCT is closed and on weekends), the airport is currently at 61.2 percent of its ASV. Long range annual operations are forecast to reach 164,300, which would be 72.1 percent of the airport's ASV. **Table 3H** summarizes the airport's ASV over the long range planning horizon.

Aircraft 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 area. Departing aircraft delays result in aircraft holding at the runway end until they can safely takeoff.

Table 3H summarizes the aircraft delay analysis for Sierra Vista Municipal Airport/Libby Army Airfield. Currently, total annual delay at the airport is estimated at 738 hours. If no capacity improvements are made, annual delay can be expected to reach 1,643 hours by the long range planning horizon. This calculates to a current average delay per aircraft of 0.3 minutes and a long term delay of 0.6 minutes per

aircraft. The FAA threshold for significant delay is four minutes per aircraft. The current level of delay may not be noticeable by pilots and is not forecast to reach the FAA level of significance.

CAPACITY ANALYSIS CONCLUSIONS

FAA Order 5090.3C, *Field Formulation of the National Plan of Integrated Airport Systems*, indicates that improvements for airfield capacity be considered when operations reach 60 to 75 percent of the ASV. This is an approximate level to begin the detailed planning of capacity improvements. Actual implementation may be deferred until such time that the improvement is considered timely and cost-beneficial. When 80 percent of the ASV is reached, capacity improvement projects should become high priority capital improvements and should be addressed as soon as possible.

Exhibit 3C compares ASV to existing and forecast operational levels at Sierra Vista Municipal Airport/Libby Army Airfield. The current operations level represents approximately 61 percent of the airfield's ASV. By the end of the planning period, total annual operations are expected to represent approximately 72 percent of ASV. Options to improve airfield capacity and efficiency will be considered and evaluated in the next chapter.

SAFETY AREA DESIGN STANDARDS

The FAA has established several imaginary surfaces to protect aircraft operational areas and keep them free from obstructions or incompatible land uses that could affect an aircraft's safe operation. These include the runway safety area (RSA), object free area (OFA), obstacle free zone (OFZ), and runway protection zone (RPZ).

The entire RSA, OFA, and OFZ should be under the direct control of the airport sponsor to ensure these areas remain free of obstacles and can be readily accessed by maintenance and emergency personnel. It is not required that the RPZ be under airport ownership, but it is strongly recommended. An alternative to outright ownership of the RPZ is the purchase of avigation easements (acquiring control of designated airspace within the RPZ) or having sufficient land use control measures in place which ensure that the RPZ remains free of incompatible development.

Dimensional standards for the various safety areas associated with the runways are a function of the ARC as well as the approach visibility minimums. Primary Runway 8-26 should currently meet design standards for ARC E-V and ¾-mile visibility minimums. Runway 12-30 should presently meet ARC C-III standards and Runway 3-21 should meet ARC B-II standards for visual runways with not lower than one-mile visibility minimums.

RUNWAY SAFETY AREA

The RSA is defined in FAA AC 150/5300-13, *Airport Design*, as a "surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway." The RSA is centered on the runway, dimensioned in accordance with the approach speed of the critical aircraft using the runway. The

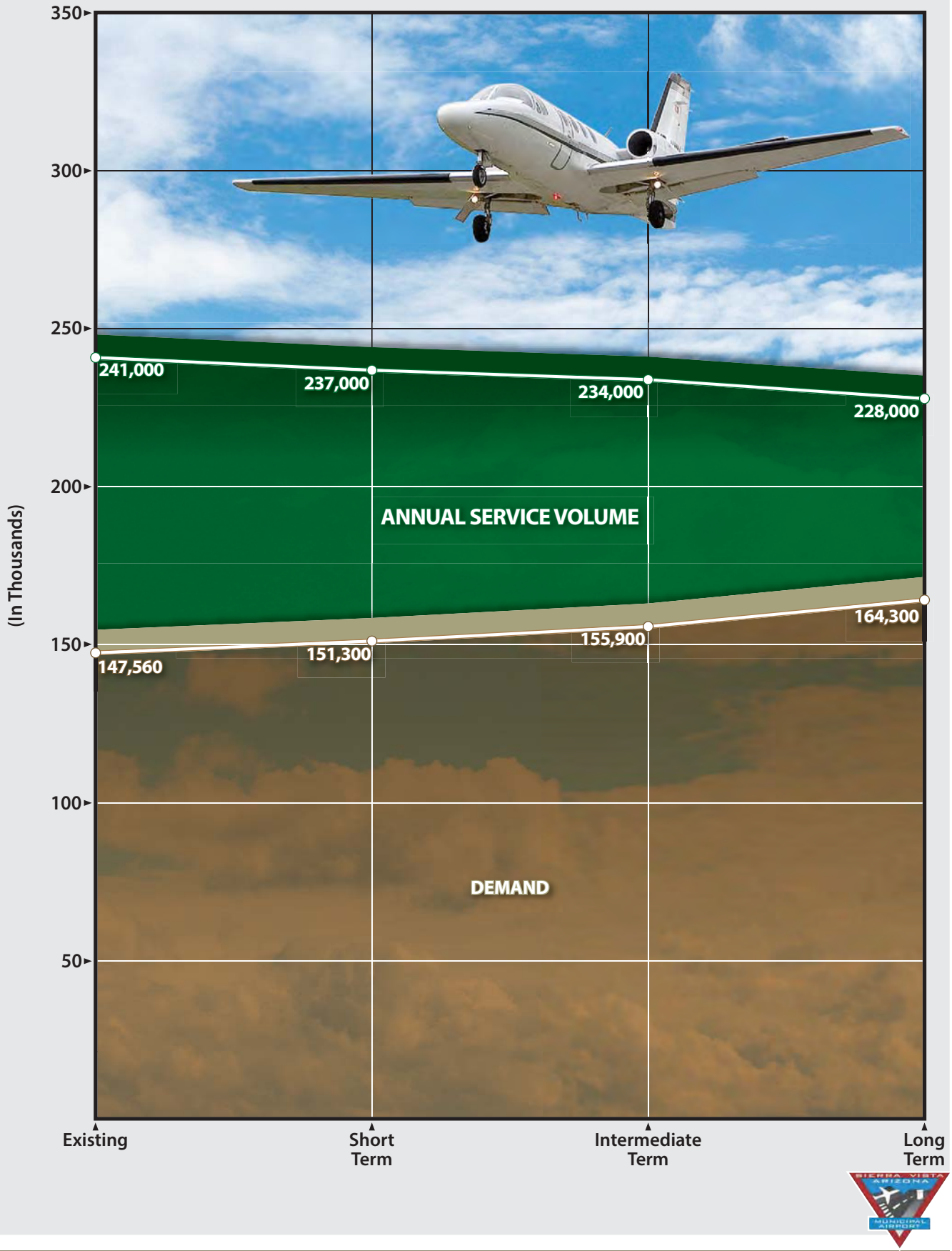


Exhibit 3C: AIRFIELD DEMAND VS. CAPACITY

FAA requires the RSA to be cleared and graded, drained by grading or storm sewers, capable of accommodating the design aircraft and fire and rescue vehicles, and free of obstacles not fixed by navigational purpose.

The FAA has placed a higher significance on maintaining adequate RSAs at all airports due to previous aircraft accidents. Under Order 5200.8, effective October 1, 1999, the FAA established a *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 RSA for each runway at the airport and perform airport inspections.

For ARC E-V and C-III aircraft, the FAA calls for the RSA to be 500 feet wide and extend 1,000 feet beyond the runway ends. Analysis in the previous section indicated that Runways 8-26 and 12-30 should continue to be planned to accommodate aircraft in ARC E-V and C-III, respectively. ARC B-II design standards call for the RSA to be 150 feet wide, extending 300 feet beyond the runway ends and apply to Runway 3-21.

As depicted on **Exhibit 3D**, there are four areas on the airfield that do not conform to existing and ultimate RSA standards. On Runway 8-26, two wind cones (one associated with each end of the runway) are located within 200 feet of the runway centerline and penetrate the RSA. A third wind cone is located approximately 150 feet from the runway centerline near the Runway 30 threshold. In addition, a portion of the access road leading to the automated weather observation system (AWOS-III), located approximately 700 feet west of the Runway 12 threshold, also penetrates the RSA. It should be noted that this access road is restricted to authorized airport personnel and is not open to the public.

OBJECT FREE AREA

The FAA defines the runway OFA as an area centered on the runway extending laterally and beyond each runway end, in accordance with the critical aircraft design category utilizing the runway. The OFA must provide clearance of all ground-based objects protruding above the RSA edge elevation, unless the object is fixed by function (i.e., airfield lighting) serving air or ground navigation.

For ARC E-V and C-III aircraft, the FAA calls for the OFA to be 800 feet wide, extending 1,000 feet beyond each runway end. The standard for ARC B-II aircraft requires the OFA to be a cleared area 500 feet wide and 300 feet beyond each runway end.

Exhibit 3D also depicts the OFA for all three runways at Sierra Vista Municipal Airport/Libby Army Airfield. It appears that all three runways conform to respective OFA standards for current and future critical aircraft design.

OBSTACLE FREE ZONE

The OFZ is an imaginary surface which precludes object penetrations, including taxiing and parked aircraft. The only allowance for OFZ obstructions is navigational aids mounted on frangible basis which are fixed in their location by func-

tion, such as airfield signs. The OFZ is established to ensure the safety of aircraft operations. If the OFZ is obstructed, the airport's approaches could be removed or approach minimums could be increased.

The FAA's criterion for runways utilized by small airplanes (those weighing less than 12,500 pounds) with approach speeds greater than 50 knots requires a clear OFZ to extend 200 feet beyond the runway ends and 250 feet wide (125 feet on either side of the runway centerline). The OFZ width increases to 400 feet (200 feet on either side of the runway centerline) for runways serving aircraft over 12,500 pounds. Currently, all three runways meet the 400-foot width needed to accommodate aircraft weighing more than 12,500 pounds.

It should be noted that for runways providing a vertically guided approach, a precision obstacle free zone (POFZ) is required. The POFZ is defined as "a volume of airspace above an area beginning at the runway threshold, at the threshold elevation, and centered on the extended runway centerline, 200 feet long by 800 feet wide." The POFZ is only in effect when the following conditions are met:

- Vertically guided approach.
- Reported ceiling below 250 feet and/or visibility less than ¾-mile.
- An aircraft on final approach within two miles of the runway threshold.

Currently at Sierra Vista Municipal Airport/Libby Army Airfield, the area navigation (RNAV) global positioning system (GPS) approach with localizer performance with vertical guidance (LPV) capabilities serving Runway 8 and the precision ILS approach serving Runway 26 provide access to each runway end when cloud ceilings are down to 200 feet and visibility minimums are as low as ¾-mile. As a result, when this cloud ceiling is being reported and an aircraft is conducting either of these approaches, the POFZ would apply to that specific runway end.

RUNWAY PROTECTION ZONE

The RPZ is a trapezoidal area centered on the runway, typically beginning 200 feet beyond the runway end. The RPZ has been established by the FAA to provide an area clear of obstructions and incompatible land uses in order to enhance the protection of approaching aircraft, as well as people and property on the ground. The dimensions of the RPZ vary according to the visibility requirements serving the runway and the type of aircraft operating on the runway.

As previously discussed, the lowest existing visibility minimums are ¾-mile with 200-foot cloud ceilings on Runway 8-26. The corresponding RPZ dimension calls for a 1,000-foot inner width, extending outward 1,700 feet to a 1,510-foot outer width. For the not lower than one mile visibility minimums and ARC C-III on Runway 12-30, the existing RPZs have an inner width of 500 feet, overall length of 1,700 feet, and an outer width of 1,010 feet. The RPZs associated with Runway 3-21 call for a 500-foot inner width, extending outward 1,000 feet to an outer width of 700 feet. The existing RPZs corresponding to each runway end are depicted on **Exhibit 3D**.

Future planning should consider improved approach minimums to the airport, in particular on Runway 26. According to the ATCT, Runway 26 is utilized

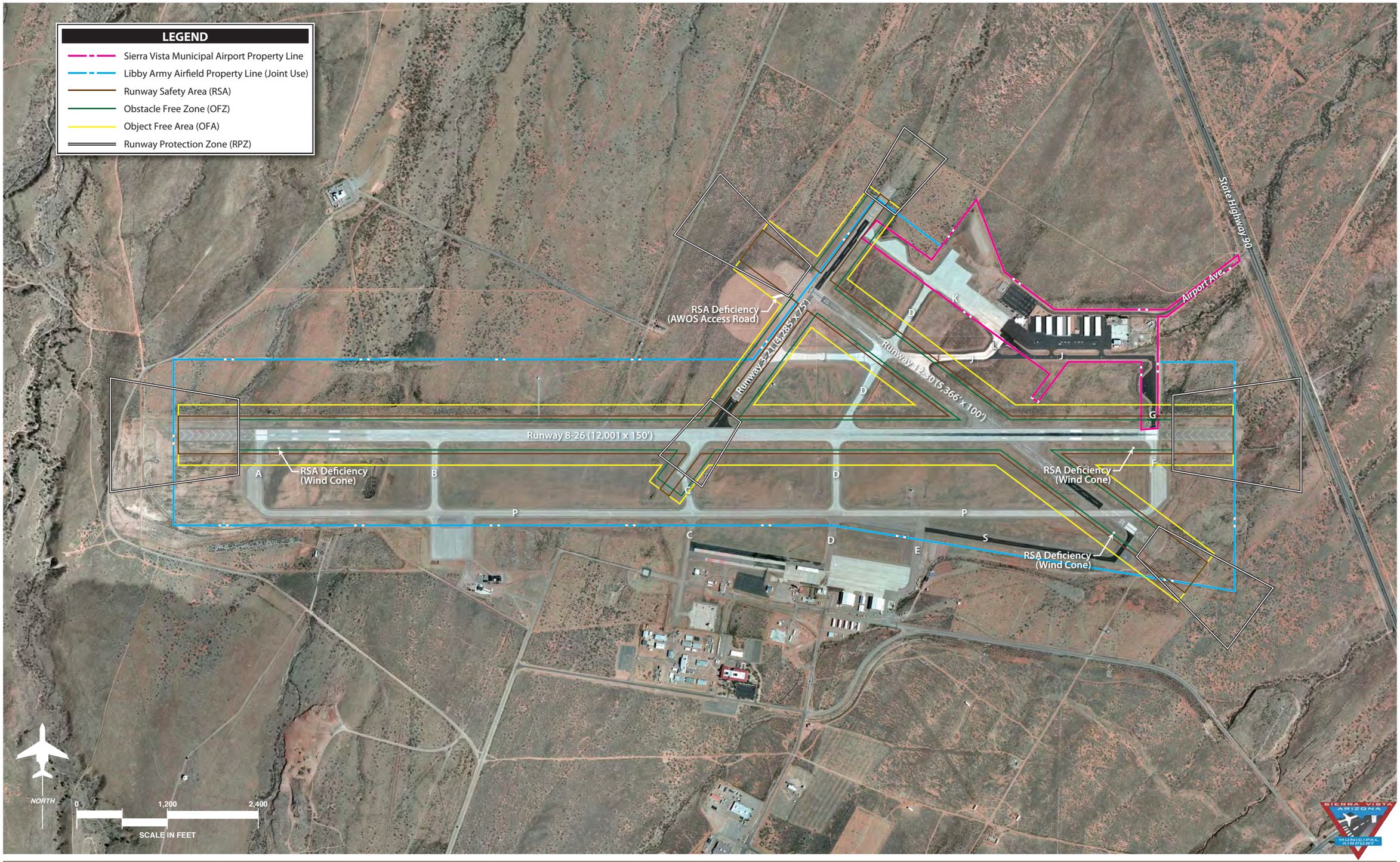


Exhibit 3D: EXISTING SAFETY AREAS

approximately 80 percent of the time due to prevailing wind conditions flowing from west to east. With Runway 8-26 being the primary runway serving a large majority of jet and military aircraft that utilize the airport, it is desirable to provide approach minimums that allow aircraft access to the runway during poor weather conditions. For Runway 26, future planning should consider a ½-mile visibility approach. In order to achieve these visibility minimums, an approach lighting system leading to Runway 26 would be needed. As such, the corresponding RPZ would increase in size to include an inner width of 1,000 feet, overall length of 2,500 feet, and an outer width of 1,750 feet.

Whenever possible, the airport should maintain positive control over the RPZs through fee simple acquisition; however, avigation easements (acquiring control of designated airspace rights within the RPZ) can be pursued if fee simple acquisition is not feasible. The existing RPZs are controlled by Libby Army Airfield and Fort Huachuca Military Reservation and remain clear of incompatible land uses. If a ½-mile visibility approach is implemented on Runway 26 as previously discussed, the corresponding RPZ would expand and extend farther east, over State Highway 90.

SAFETY AREA DESIGN STANDARDS SUMMARY

Table 3J summarizes the design requirements for each runway on the airfield according to the associated ARC and instrument approach minimums (where applicable). Further analysis in Chapter Four will show alternatives for meeting the existing RSA deficiencies previously called out.

TABLE 3J
Safety Area Design Standards
Sierra Vista Municipal Airport/Libby Army Airfield

	Runway 8-26		Runway 12-30	Runway 3-21
	Existing	**Ultimate**	**Existing/ Ultimate**	**Existing/ Ultimate**
Airport Reference Code (ARC)	ARC E-V	ARC E-V	ARC C-III	ARC B-II
Approach Visibility Minimums	3/4-mile - Rwy 8 3/4-mile - Rwy 26	3/4-mile - Rwy 8 1/2-mile - Rwy 26	≥ 1-mile	≥ 1-mile
Runway Safety Area				
Width (feet)	500	500	500	150
Length Beyond Runway End (feet)	1,000	1,000	1,000	300
Object Free Area				
Width (feet)	800	800	800	500
Length Beyond Runway End (feet)	1,000	1,000	1,000	300
Obstacle Free Zone				
Width (feet)	400	400	400	400
Length Beyond Runway End (feet)	200	200	200	200
Precision Obstacle Free Zone	Both Ends	Both Ends		
Width (feet)	800	800	N/A	N/A
Length Beyond Runway End (feet)	200	200	N/A	N/A
Runway Protection Zone	Both Ends	Rwy 8 / Rwy 26	Both Ends	Both Ends
Inner Width (feet)	1,000	1,000 / 1,000	500	500
Outer Width (feet)	1,510	1,510 / 1,750	1,010	700
Length (feet)	1,700	1,700 / 2,500	1,700	1,000

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

AIRSIDE FACILITIES

Airside facilities include those facilities related to the arrival, departure, and ground movement of aircraft. This section focuses on the entirety of the airfield which is utilized for military and civilian purposes. The adequacy of existing airfield facilities has been analyzed from a number of perspectives, including:

- Runways
- Taxiways
- Navigational Approach Aids
- Airfield Lighting, Marking, and Signage

RUNWAYS

Runway conditions such as orientation, length, width, and pavement strength on the airfield were analyzed. From this information, requirements for runway improvements were determined for the airport.

Runway Orientation

For the operational safety and efficiency of an airport, it is desirable for the primary runway to be orientated as closely as possible to the direction of the prevailing winds. This reduces the impact of wind components perpendicular to the direction of travel of an aircraft that is landing or taking off (defined as a crosswind).

FAA Advisory Circular 150/5300-13, *Airport Design*, recommends that a crosswind runway should be made available when the primary runway orientation provides for less than 95 percent wind coverage for specific crosswind conditions. The 95 percent wind coverage is computed on the basis of the crosswind component not exceeding 10.5 knots (12 mph) for ARC A-I and B-I; 13 knots (15 mph) for ARC A-II and B-II; 16 knots (18 mph) for ARC C-I through D-II; and 20 knots for ARC A-IV through D-VI. Wind data specific for the airport was obtained from the airport's weather reporting stations and is depicted on **Exhibit 3E.**

The orientation of Runway 8-26 provides 93.29 percent coverage for the 10.5 knot component and greater than 96 percent coverage for crosswind components of 13, 16, and 20 knots. Runway 12-30 provides 88.02 percent coverage for the 10.5 knot crosswind component, 92.68 percent at 13 knots, and greater than 96 percent at 16 knots or higher. Finally, Runway 3-21 provides for 88.44 percent coverage at 10.5 knots, 93.99 percent at 13 knots, and greater than 98 percent at 16 knots or higher. The combination of all three runways provides for greater than 99 percent wind coverage for all crosswind components. Thus, the three runways at Sierra Vista Municipal Airport/Libby Army Airfield provide adequate wind coverage. As a result, no additional runway orientations need to be planned.

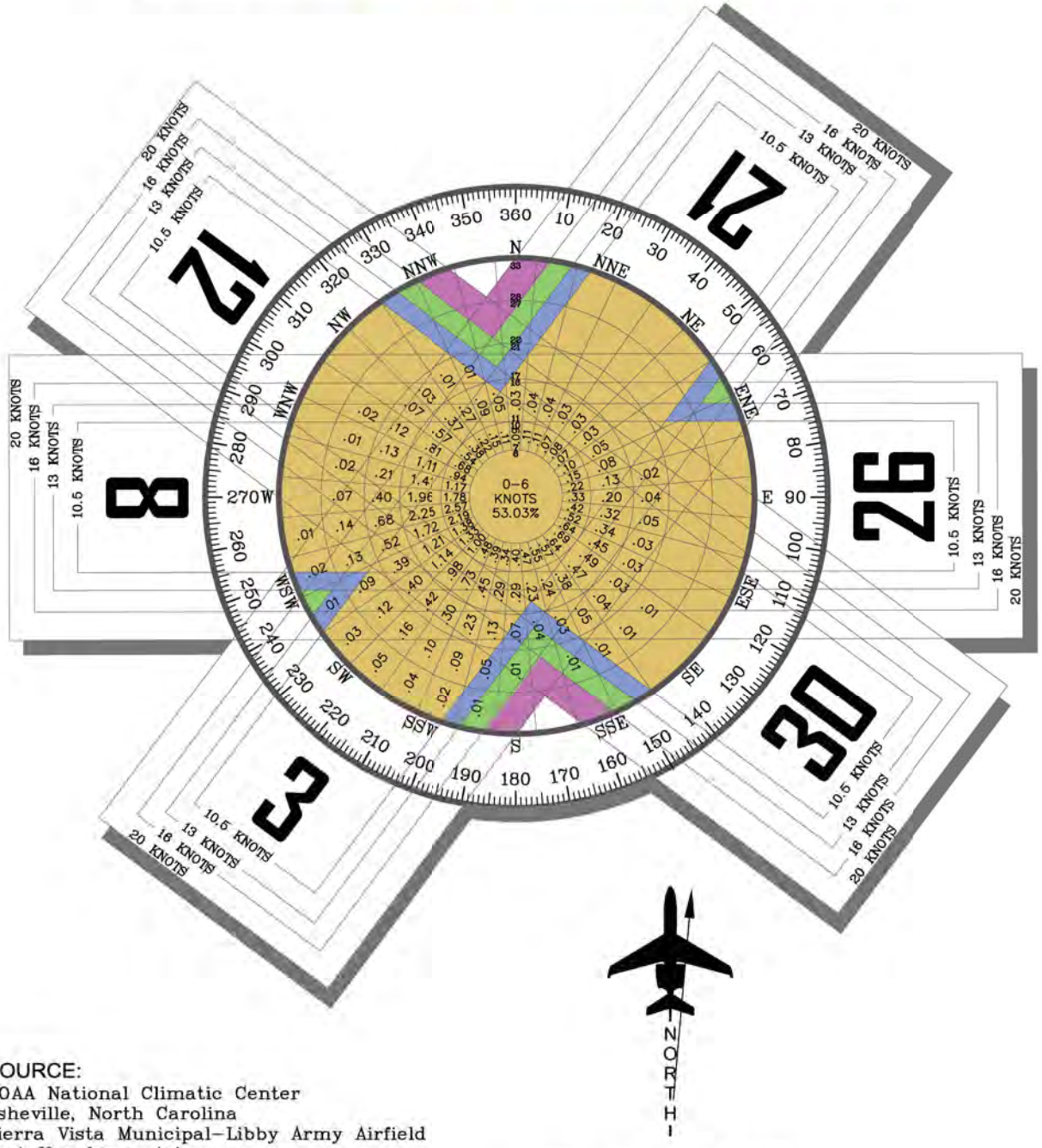
Runway Length

Runway length is the most important consideration when evaluating the airside facility requirements for future aircraft serving the airfield. Runway length requirements are based upon five primary elements that include:

- Mean maximum temperature of the hottest month
- Airport elevation
- Runway gradient

ALL WEATHER WIND COVERAGE

Runways	10.5 Knots	13 Knots	16 Knots	20 Knots
Runway 3–21	*88.44%*	*93.99%*	*98.59%*	*99.75%*
Runway 8–26	*93.29%*	*96.36%*	*98.48%*	*99.47%*
Runway 12–30	*88.02%*	*92.68%*	*96.63%*	*98.74%*
Combined	*99.70%*	*99.94%*	*99.99%*	*100.00%*



SOURCE:
NOAA National Climatic Center
Asheville, North Carolina
Sierra Vista Municipal–Libby Army Airfield
Fort Huachuca, Arizona

OBSERVATIONS:
54,892 All Weather Observations
2001–2011

Magnetic Declination
10° 02' 12" East (June 2012)
Annual Rate of Change
00° 06.3' West (June 2012)

- Critical aircraft type expected to use the airport
- Stage length of the longest nonstop destination (specific to larger aircraft)

Aircraft performance declines as elevation, temperature, and runway gradient factors increase. For calculating runway length requirements, the airport is at an elevation of 4,719 feet mean sea level (MSL), and the mean daily maximum temperature of the hottest month is 93 degrees Fahrenheit (F). The maximum effective gradients for Runways 8-26, 12-30, and 3-21 are 1.0 percent, 0.1 percent, and 2.0 percent, respectively.

The FAA provides general runway length curves in AC 150/5325-4B, *Runway Length for Airport Design*, for groupings of general aviation aircraft with similar characteristics. **Table 3K** outlines the runway length requirements for various classifications of aircraft that utilize Sierra Vista Municipal Airport/Libby Army Airfield.

TABLE 3K
Runway Length Requirements
Sierra Vista Municipal Airport/Libby Army Airfield

Airport and Runway Data	
Airport elevation	4,719 feet MSL
Mean daily maximum temperature of the hottest month	93 degrees F
Maximum difference in runway centerline elevation:	
Runway 8-26	120 feet
Runway 12-30	3 feet
Runway 3-21	86 feet
Runway Length Recommended for Airport Design	
Small airplanes with less than 10 passenger seats:	
95 percent of these small airplanes	6,000 feet
100 percent of these small airplanes	6,200 feet
Large airplanes of 60,000 pounds or less:	
75 percent of business jets at 60 percent useful load	6,600 feet
100 percent of business jets at 60 percent useful load	10,500 feet
Airplanes of more than 60,000 pounds	7,900 feet

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

For large general aviation aircraft, the appropriate FAA runway length planning category for primary Runway 8-26 is "100 percent of large airplanes 60,000 pounds or less at 60 percent useful load." As shown in the table, the recommended runway length for this category is 10,500 feet. In examining runway length requirements at the airport, the primary runway should be designed to accommodate the most demanding aircraft currently serving the airport. This includes aircraft operated by air charter companies as well as the full array of business jets in the fleet.

The generalized required take-off and landing lengths for many air charter aircraft utilizing Sierra Vista Municipal Airport/Libby Army Airfield are shown in **Table 3L**. The table presents information obtained from aircraft-specific operating

manuals and includes many large aircraft which occasionally use the airport for air charter and military transport purposes. It should be noted that this information considers heavy loading conditions assuming long stage lengths. It appears the current runway length of 12,001 feet on Runway 8-26 is adequate to meet general aviation and air charter operator needs through the long term planning period of this study.

TABLE 3L
Specific Aircraft Runway Length Requirements

Aircraft Type	Take-off Length	Landing Length
Boeing 737-200	9,000	5,000
Boeing 737-300	8,500	5,500
Boeing 737-700	6,900	4,900
Boeing 737-800	7,400	5,500
Boeing 757-200	8,700	6,100
Boeing 767-300	9,600	7,600
Boeing 777-200	9,900	6,300
DC-10	10,500	8,200
Airbus A-320	6,900	5,800

Source: Aircraft Operating Manuals

Large military transport aircraft runway length needs could exceed the existing runway length on primary Runway 8-26. The FAA, however, does not provide funding assistance for runway lengths necessary to accommodate military aircraft. If the military required longer runway length, funding would need to be provided through military resources.

As previously discussed, in order to serve 75 percent of business jets at 60 percent useful load, 6,600 feet of runway length is required. It has been determined that Runway 12-30 should be capable of accommodating a large majority of aircraft, especially in the event that the primary runway is closed for maintenance or emergencies. While the existing length of 5,366 feet does allow for the operation of smaller single engine and multi-engine general aviation aircraft, it does limit jet aircraft, especially during the summer months when temperatures exceed 90 degrees F. Alternative analysis should consider the possibility of lengthening Runway 12-30 to provide an optimal length of up to 6,600 feet. In doing so, this length would enable a larger portion of the jet aircraft fleet mix to utilize the runway. Analysis in the next chapter will examine potential runway extensions that could be achieved on Runway 12-30.

Runway 3-21 is currently 4,285 feet long. This falls short of the length needed to satisfy the needs of small aircraft, as outlined in **Table 3K**. This runway functions to primarily serve the needs of smaller aircraft for times when crosswinds prohibit the use of Runways 8-26 and 12-30. In this capacity, the existing length of Runway 3-21 should be adequate.

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 approach categories A and B, a wider runway is required for lower approach minimums. For approach categories C and D, however, runway widths are fixed by aircraft type only.

For Runway 8-26, ARC E-V design criteria stipulate a runway width of 150 feet. Runway 8-26 currently meets the standards and should satisfy future needs with normal maintenance. ARC C-III design on Runway 12-30 calls for a runway width of 100 feet, which it currently meets. Finally, Runway 3-21, which is designed to ARC B-II standards, should provide a runway width of 75 feet, which it also currently meets. As such, all runways at Sierra Vista Municipal Airport/Libby Army Airfield meet the criteria for existing and ultimate design and should be maintained through the long term planning period.

Runway Strength

An important feature of airfield pavement is its ability to withstand repeated use by aircraft. The pavement strength rating for Runway 8-26 is 70,000 pounds single wheel loading (SWL), 200,000 pounds dual wheel loading (DWL), 400,000 pounds dual tandem wheel loading (DTWL), and 700,000 pounds double dual tandem wheel loading (DDTWL). Runway 12-30 is pavement strength rated at 46,000 pounds SWL and 106,000 pounds DWL, 137,000 pounds DTWL, and 172,000 pounds DDTWL. Runway 3-21 does not currently have a published pavement strength rating.

The strength rating of a runway does not preclude aircraft weighing 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 the aircraft to determine if a runway can support their aircraft safely. 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 the runway and protect the useful life of the runway, typically for 20 years.

According to the FAA publication, *Airport/Facility Directory*, "Runway strength rating is not intended as a maximum allowable weight or as an operating limitation. Many airport pavements are capable of supporting limited operations with gross weights in excess of the published figures." The directory goes on to say that those aircraft exceeding the pavement strength should contact the airport sponsor for permission to operate at the airport.

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 strength rating on Runways 8-26 and 12-30 is adequate to serve the existing and ultimate types of aircraft operations at the airfield. Runway 3-21 functions to primarily serve smaller aircraft. This runway should ultimately plan for a pavement strength rating of 12,500 pounds SWL.

Runway Blast Pads

As previously discussed, a runway blast pad is a surface adjacent to the ends of the runways provided to reduce the ero-

sive effect of jet blast and propeller wash. All runway ends on the airfield are currently equipped with blast pads. The blast pads on each end of Runway 3-21 and on Runway 12 meet or exceed the design standards for length and width according to the runways' ARC. Future planning should consider increasing the width of the blast pad on Runway 30 from 100 feet to 140 feet. In addition, the blast pads serving Runway 8-26 should be widened to 220 feet to meet ARC E-V design standards.

TAXIWAYS

Taxiways are constructed primarily to facilitate aircraft movements to and from the runway system. Some taxiways are necessary simply to provide access between the aprons and runways, whereas other taxiways become necessary as activity increases at an airport to provide safe and efficient use of the airfield. Discussion in Chapter One highlighted the taxiways and their relationship to each runway on the airfield.

Exit taxiways provide a means to exit the runways at various points on the airfield. The type and number of exit taxiways can have a direct impact on the capacity and efficiency of the airport as a whole. Analysis earlier in this chapter indicated that, while projected aircraft operations will remain below the airport's ASV through the long term planning period of this study, planning should consider improvements to airfield capacity on the airfield. Exit taxiways are most effective when planned at least 750 feet apart. Potential locations for new exit taxiways that may improve airfield efficiency will be examined in Chapter Four. In addition, in the event that Runway 12-30 is to be extended, taxiway access would need to be provided to the new runway end.

Hold aprons can also improve the efficiency of the taxiway system by allowing aircraft to prepare for departure off the taxiway surface. This allows aircraft ready to depart to bypass the aircraft in the hold apron. Currently, there are six hold aprons on the airfield in various locations serving the three runways. The location of these existing hold aprons and the potential for additional hold aprons will be discussed further in the next chapter.

Taxiway width is determined by the ADG of the most demanding aircraft to use the taxiway. As mentioned previously, the current critical aircraft falls within ADG V on Runway 8-26. FAA criteria call for a width of 75 feet for taxiways serving aircraft within this design group. All taxiways associated with Runway 8-26 currently meet this requirement. Current and future planning considers ADG II and III aircraft for Runways 3-21 and 12-30, respectively. In order to meet this design group, the taxiways serving these runways should be at least 35 feet wide for ADG II and 50 feet wide for ADG III. All taxiways associated with these runways are at least 50 feet in width and, as such, should be maintained accordingly through the long term planning period. Any future taxiways serving an extension to Runway 12-30 should be constructed to at least 50 feet in width.

FAA AC 150/5300-13, *Airport Design*, also discusses separation distances between aircraft and various areas on the airport. The separation distances are a function of the approaches provided for the airport and the runway's designated ARC. Under current and future conditions, parallel

taxiways serving Runway 8-26 need to be at least 450 feet from the runway centerline. For Runway 12-30, parallel taxiways should be at least 400 feet from the runway centerline. Finally, parallel taxiways serving Runway 3-21 should be located at least 240 feet from the runway centerline.

All full-length and partial parallel taxiways serving the three runways exceed the existing and ultimate separation standards for each runway. Taxiway requirements are summarized on **Table 3M**.

TABLE 3M
Taxiway Design Standards
Sierra Vista Municipal Airport/Libby Army Airfield

	Runway 8-26*		Runway 12-30**		Runway 3-21**	
	Existing	Ultimate ADG V	Existing	Ultimate ADG III	Existing	Ultimate ADG II
Taxiway Width (feet)	75	75	50-75	50	50-75	35
Taxiway Safety Area Width (feet)	214	214	118	118	79	79
Taxiway Object Free Area Width (feet)	320	320	186	186	131	131
Taxiway Centerline to:						
Fixed or Moveable Object (feet)	160	160	93	93	65.5	65.5
Runway Centerline to:						
Parallel Taxiway Centerline (feet)	1,033	450	1,025	300	1,200-1,300	240
Holding Positions (feet)	175-318	327	175-250	250	250	200

Note: *Critical design aircraft in approach category E; Ultimate approach lower than ¾-mile
**Approaches not lower than ¾-mile

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

NAVIGATIONAL APPROACH AIDS

Electronic and visual guidance to arriving aircraft enhance the safety and capacity of the airfield. Such facilities are vital to the success of the airport and provide additional safety to 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 jet aircraft when visibility is good.

Instrument Approach Procedures

Instrument approaches are categorized as either precision or non-precision. Precision instrument approach aids provide an exact course alignment and vertical descent path for an aircraft on final approach to a runway, while non-precision instrument approach aids provide only course alignment information. In the past, most existing precision instrument approaches in the United States have been the ILS, similar to what is currently in place on Runway 26 at the airport. It should be noted, GPS is now used to provide both vertical and lateral navigation for pilots. In fact, the RNAV (GPS) approach serving Runway 8 provides LPV minimums.

At Sierra Vista Municipal Airport/Libby Army Airfield, there are five published approaches. Runway 26 is served by ILS, RNAV (GPS), very high frequency omnidirectional range (VOR), and non-directional beacon (NDB) approaches. Runway 8 is served by an RNAV (GPS) approach. In addition, precision approach radar (PAR) and airport surveillance ra-

dar (ASR) approaches are also provided by ATCT personnel, as detailed in Chapter One. The ILS approach to Runway 26 and RNAV (GPS) approach to Runway 8 provide for the lowest minimums with ¾-mile visibility minimums and 200-foot cloud ceilings.

Ultimately, it would be preferable to improve the straight-in instrument approach minimums on Runway 26 to include visibility minimums down to ½-mile, which would better serve military and general aviation activities. Furthermore, wind conditions at the airport favor the use of Runway 26 approximately 80 percent of the time. In addition, GPS-based straight-in instrument approaches with not lower than one-mile visibility minimums should be considered on each end of Runway 12-30. Analysis in the next chapter will consider improvements necessary for improved instrument approaches to the runway system.

Weather Reporting

There are several wind cones in various locations on the airfield. The wind cones provide information to pilots regarding wind conditions, such as direction and speed. These should be maintained throughout the planning period.

The airport is equipped with an AWOS-III and automated surface observation system (ASOS), both of which provide weather observations 24 hours per day. The system updates weather observations every minute, continuously reporting significant weather changes as they occur. This information is then transmitted at regular intervals on the automated terminal information service (ATIS), which is broadcast on radio frequency 134.75 MHz. These systems should be maintained through the planning period.

Communication Facilities

An operational ATCT is located on the south side of the airfield. The ATCT is staffed with U.S. Army personnel from 7:00 a.m. to 11:00 p.m. local time, Monday through Friday, and occasionally on the weekends to accommodate special military operations. The existence of an ATCT enhances safety at the airport and should be maintained through the planning period.

AIRFIELD LIGHTING, MARKING, AND SIGNAGE

There are a number of lighting and pavement marking aids serving pilots using the airport. These aids assist pilots in locating the airport and runway at night or in poor visibility conditions. They also assist in the ground movement of aircraft.

Airport Identification Lighting

The location of an airport at night is universally indicated by a rotating beacon. The airport is equipped with a military airport beacon in which a white light is dual peaked (two quick beams) after a green light since it is a joint-use facility. The rotating beacon is located on the south side of the airfield, approximately 1,800 feet southwest of the ATCT. The existing beacon should be maintained through the planning period.

Runway and Taxiway Lighting

Runway identification lighting provides the pilot with a rapid and positive identification of the runway and its alignment. Runway 8-26 is equipped with high intensity runway lighting (HIRL). Runways with an ILS benefit from this type of runway lighting as better visual guidance is given during poor weather conditions. Runways 12-30 and 3-21 are served by medium intensity runway lighting (MIRL). Each of these systems should be maintained through the planning period.

Medium intensity taxiway lighting (MITL) is provided on all active taxiways on the north side of Runway 8-26. In addition, MITL is provided on the entrance/exit taxiways on the south side of Runway 8-26. MITL should be planned on all taxiways at the airport in the future, including parallel Taxiway P located on the south side of Runway 8-26.

Visual Approach Lighting

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. Currently, Runways 8-26 and 12-30 are served by four-box precision approach path indicators (PAPI-4s). The four-box systems are better to serve the military and corporate aircraft currently using the airport because they are more visible for these faster approaching aircraft.

The existing PAPI units should be maintained through the long term planning period. In addition, a PAPI-2 should be planned for implementation on Runway 3-21.

Approach and Runway End Identification Lighting

To improve instrument approach minimums at the airport, an approach lighting system may ultimately be required. Therefore, a medium intensity approach lighting system with runway alignment indicator lights (MALSR) should be planned for Runway 26. A MALSR provides visual guidance to landing aircraft by radiating light beams in a directional pattern by which the pilot aligns the aircraft with the extended centerline of the runway. A MALSR is required in order for a runway to achieve ½-mile visibility minimums.

Runway end identification lights (REILs) are flashing lights located at each runway end that facilitate identification of the runway end at night and during poor visibility conditions. REILs provide pilots with the ability to identify the runway ends and distinguish the runway end lighting from 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 a more sophisticated approach lighting system. Runways 8-26 and 12-30 are currently served by REILs. Future planning should consider REILs for each end of Runway 3-21. In the event that a MALSR is implemented on Runway 26, then the REILs serving this runway end would no longer be needed.

Pilot-Controlled Lighting

The airfield is equipped with pilot-controlled lighting (PCL). With PCL, a pilot can control the intensity of airfield lights and approach aids from their aircraft through a series of clicks of their radio transmitter. This system should be maintained through the planning period.

Airfield Signs

Airfield identification signs assist pilots in identifying their location on the airfield and directing them to their desired location. Lighted signs are installed on all runways and taxiways on the airfield. All of these signs should be maintained throughout the planning period.

It should be noted that a taxiway construction project is currently underway on the north side of the airfield that will extend Taxiway J east to connect with Taxiway G. As a result of this project, new designations will be assigned to those taxiways affected by the project. The Master Plan will re-designate the taxiways accordingly once the project is complete.

Pavement Markings

Runway markings are designed according to the type of instrument approach available on the runway. FAA AC 150/5340-1J, *Marking of Paved Areas on Airports*, provides guidance necessary to design airport markings. Runway 8-26 is served by precision markings to accommodate the ILS approach. Runway 12-30 currently has non-precision markings, and Runway 3-21 has basic runway markings. These runway markings should be maintained through the long term planning period.

The current hold positions associated with Runway 8-26 range from 175 feet to 318 feet from the runway centerline. The standard for hold lines associated with runways in approach category E-V with not lower than ¾-mile visibility minimums is 250 feet plus one foot for each additional 100 feet above sea level. As a result, hold lines associated with Runway 8-26 should be at least 297 feet from the runway centerline. In the event that ½-mile visibility minimums were provided on Runway 8-26, hold lines should be located 327 feet from the runway centerline.

Currently, hold lines associated with Runway 12-30 range from 175 feet to 250 feet from the runway centerline. Hold position markings should be planned at least 250 feet from the runway centerline. Hold lines associated with Runway 3-21 are currently 250 feet from the runway centerline, which exceed the 200-foot standard called for by the FAA. A summary of the airside facilities previously discussed is presented on **Exhibit 3F**.

LANDSIDE FACILITIES

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 area was examined in relation to projected demand to identify future landside facility needs. This section includes components for general aviation needs

	AVAILABLE	FUTURE
RUNWAYS 	**Runway 8-26** ARC E-V 12,001' x 150' 70,000 lbs. SWL 200,000 lbs. DWL 400,000 lbs. DTWL 700,000 lbs. DDTWL **Runway 12-30** ARC C-III 5,366' x 100' 46,000 lbs. SWL 106,000 lbs. DWL 137,000 lbs. DTWL 172,000 lbs. DDTWL **Runway 3-21** ARC B-II 4,285' x 75' (Rwy 3 displaced threshold - 1,253') Pavement Strength - N/A	**Runway 8-26** ARC E-V - Improve RSA (relocate wind cones) Maintain Maintain Maintain Maintain Maintain **Runway 12-30** ARC C-III - Improve RSA (relocate wind cones & AWOS access road) Examine potential to extend to 6,600' Maintain Maintain Maintain Maintain **Runway 3-21** ARC B-II Maintain 12,500 lbs. SWL
TAXIWAYS 	All taxiways 50' - 75' wide Full-length and partial parrallel taxiways range from 1,025' - 1,300' from runway centerlines Six Hold Aprons serving runway ends	Taxiways associated with Runway 8-26 - 75' wide / Others maintained at 50' Maintain Consider Hold Apron serving Runway 3 Examine potential for additional taxiway exits to improve airfield capacity Examine full-length parallel Taxiway J serving north side of Runway 8-26
NAVIGATIONAL & WEATHER AIDS 	RNAV (GPS) - Rwy 8 ILS or LOC - Rwy 26 RNAV (GPS) - Rwy 26 VOR - Rwy 26 NDB - Rwy 26 Precision Approach Radar Airport Surveillance Radar ATCT, ATIS, AWOS-III, ASOS	Maintain Maintain Maintain Maintain Maintain Maintain Maintain RNAV (GPS) - Rwy 12-30 Maintain
LIGHTING & MARKING 	**Runway 8-26** Precision Markings PAPI-4 - both ends REILs - both ends HIRL Hold position markings between 175' - 318' from runway centerline **Runway 12-30** Non-Precision Markings PAPI-4 - both ends REILs - both ends MIRL Hold position markings between 175' - 250' from runway centerline **Runway 3-21** Basic Markings MIRL Hold position markings at 250' from runway centerline	**Runway 8-26** Maintain Maintain Maintain Maintain Hold position markings at 327' from runway centerline Consider MALSR on Runway 26 **Runway 12-30** Maintain Maintain Maintain Maintain Hold position markings at 250' from runway centerline **Runway 3-21** Maintain Maintain Maintain Consider PAPI-2 & REILs serving both runway ends

KEY

ARC - Airport Reference Code
ATCT - Airport Traffic Control Tower
ATIS - Automated Terminal Information Service
ASOS - Automated Surface Observation System
AWOS - Automated Weather Observation System
DWL - Dual Wheel Loading
DTWL - Dual Tandem Wheel Loading
DDTWL - Double Dual Tandem Wheel Loading
GPS - Global Positioning System
HIRL - High Intensity Runway Lighting
ILS - Instrument Landing System
LOC - Localizer
MALSR - Medium Intensity Approach Lighting System w/ Runway Alignment Indicator Lights
MIRL - Medium Intensity Runway Edge Lighting
NDB - Non-Directional Beacon
PAPI - Precision Approach Path Indicator Lights
REIL - Runway End Identification Lights
RNAV - Area Navigation
RSA - Runway Safety Area
SWL - Single Wheel Loading
VOR - Very High Frequency Omni-Directional Range

that affect civilian facilities at Sierra Vista Municipal Airport such as:

- Terminal Services
- Aircraft Hangars
- Aircraft Parking Aprons
- Airport Support Facilities

TERMINAL SERVICES

The terminal facilities at the airport are often the first impression of the community that corporate officials and other visitors will encounter. General aviation terminal facilities at an airport provide space for passenger waiting, pilots' lounge, pilot flight planning, concessions, management, storage, and various other 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 by the City of Sierra Vista within a dedicated terminal building.

The methodology used in estimating general aviation terminal facility needs was based upon the number of airport users expected to utilize general aviation facilities during the design hour. Space requirements for terminal facilities were based on providing 150 square feet per design hour itinerant passenger. **Table 3N** outlines the space requirements for general aviation terminal services at Sierra Vista Municipal Airport through the long term planning horizon. As shown in the table, up to 3,400 square feet of space could be needed in the long term for general aviation passengers. Given the size of the existing terminal facility, there should be adequate terminal area provided at the airport through the long term planning period.

TABLE 3N
General Aviation Terminal Area Facilities
Sierra Vista Municipal Airport

	Currently Available	Short Term Need	Intermediate Term Need	Long Term Need
General Aviation Services Facility Area (s.f.)	7,000	2,200	2,700	3,400
Design Hour Passengers	13	15	18	23
Auto Parking Spaces	283	78	88	104

Source: Coffman Associates analysis

General aviation vehicular parking demands have also been determined for Sierra Vista Municipal Airport. Space determinations were based on an evaluation of existing airport use, as well as industry standards. Terminal automobile parking spaces required to meet general aviation itinerant, FBO, and specialty aviation operator demands were calculated by multiplying design hour itinerant passengers by 2.0 in the short term, increasing to 2.4 for the long term as corporate operations can be expected to increase.

The parking requirements of based aircraft owners should also be considered. Although some owners prefer to park their vehicles in their hangar, safety can be compromised when automobile and aircraft movements are intermixed. For

this reason, separate parking requirements, which consider one-half of based aircraft at the airport, were applied to general aviation automobile parking space requirements. Utilizing this methodology, parking requirements for general aviation activity call for 78 spaces in the short term planning horizon, 88 spaces in the intermediate term planning horizon, and 104 spaces in the long term planning horizon. It is estimated that there are 283 marked automobile parking spaces at Sierra Vista Municipal Airport currently serving airport users. Automobile parking requirements are summarized in **Table 3N**.

AIRCRAFT HANGARS

Utilization of hangar space varies as a function of local climate, security, and owner preferences. The trend in general aviation aircraft, whether single or multi-engine, is toward more sophisticated aircraft (and, consequently, more expensive aircraft); therefore, many aircraft owners prefer enclosed hangar space to outside tie-downs.

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

While the majority of aircraft owners prefer enclosed aircraft storage, a number of based aircraft will still tiedown outside (due to lack of hangar availability, hangar rental rates, and/or operational needs). Therefore, enclosed hangar facilities do not necessarily need to be planned for each based aircraft. At Sierra Vista Municipal Airport, approximately ten aircraft currently base on the aircraft parking apron with the remainder housed in hangar spaces.

Hangar types vary in size and function. T-hangars and linear box hangars are popular with aircraft owners having only one small aircraft. These hangars provide individual spaces within a larger structure. Aircraft owners are allowed privacy and individual access to their space. Conventional hangars are open space facilities with no supporting structure interference. Often, other airport services are offered from the conventional hangars.

Currently, there are 62 linear box hangar positions available on the airport. For these hangars, a planning standard of 1,400 square feet per based aircraft will be used to determine future requirements.

As the trend toward more sophisticated aircraft continues throughout the planning period, it is important to determine the need for more conventional-style hangars. For these hangars, a planning standard of 2,500 square feet per aircraft was utilized.

Since portions of conventional hangars are also used for aircraft maintenance servicing, requirements for maintenance/service hangar area was estimated using a planning standard of 150 feet per based aircraft. Future hangar requirements for the airport are summarized in **Table 3P**.

TABLE 3P
Aircraft Hangar Requirements
Sierra Vista Municipal Airport

	Currently Available	Short Term Need	Intermediate Term Need	Long Term Need
Total Based Aircraft	66	75	84	100
Aircraft To Be Hangared	56	65	74	90
Hangar Area Requirements				
Linear Box Hangar Area (s.f.)	85,000	86,800	92,400	106,400
Conventional Hangar Area (s.f.)	5,000	6,000	16,000	28,000
Maintenance Area (s.f.)		11,250	12,600	15,000
Total Hangar Area (s.f.)	**90,000***	**104,100**	**121,000**	**149,400**

Note: *Includes total hangar/office/maintenance area currently at airport

Source: Coffman Associates analysis

The analysis shows that there is currently a need for approximately 21,400 square feet of hangar storage space in the form of linear box hangars through the long term planning horizon. Conventional hangar space needs are projected at approximately 43,000 square feet of space through the long term. This includes a mixture of hangar and maintenance areas. Due to the projected increase in based aircraft, 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.

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

AIRCRAFT PARKING APRONS

A parking apron should be provided for based aircraft, as well as some daytime apron space to hold transient aircraft. At the present time, approximately ten based aircraft are stored on parking apron space at Sierra Vista Municipal Airport. Although many aircraft are stored in hangars, they are regularly moved to the ramp during the day to provide space for aircraft maintenance operations.

The total general aviation apron area at Sierra Vista Municipal Airport is approximately 47,400 square yards. FAA Advisory Circular 150/5300-13, *Airport Design*, suggests a methodology by which transient apron requirements can be determined from knowledge of busy-day operations. At Sierra Vista Municipal Airport, the number of itinerant spaces required was estimated at 20 percent of the busy-day itinerant operations. A planning criterion of 800 square yards was used for single and multi-engine itinerant aircraft, while a planning criterion of 1,600 square yards was used to determine the area for transient jet aircraft. Locally based tiedowns typically will be utilized

by smaller single engine aircraft; thus, a planning standard of 360 square yards per position is utilized. As shown in **Table 3Q**, additional apron space may not be needed during the planning period of this study.

TABLE 3Q
Aircraft Parking Apron Requirements
Sierra Vista Municipal Airport

	Available	Short Term	Intermediate Term	Long Term
Single, Multi-engine				
Transient Aircraft Positions		13	14	17
Apron Area (s.y.)		10,400	11,600	13,500
Transient Business Jet Positions		4	5	6
Apron Area (s.y.)		6,900	7,700	9,000
Locally-Based Aircraft Positions		14	15	15
Apron Area (s.y.)		5,000	5,400	5,400
Total Marked Positions	45	31	34	38
Total Apron Area (s.y.)	47,400	22,300	24,700	27,900

Source: Coffman Associates analysis

Based on the analysis above, the current apron is sufficient to accommodate forecast demand. Future needs are estimated at 38 spaces and 27,900 square yards. As such, planning for additional general aviation apron space is not necessary. **Exhibit 3G** further details landside facility requirements previously discussed.

AIRPORT SUPPORT FACILITIES

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

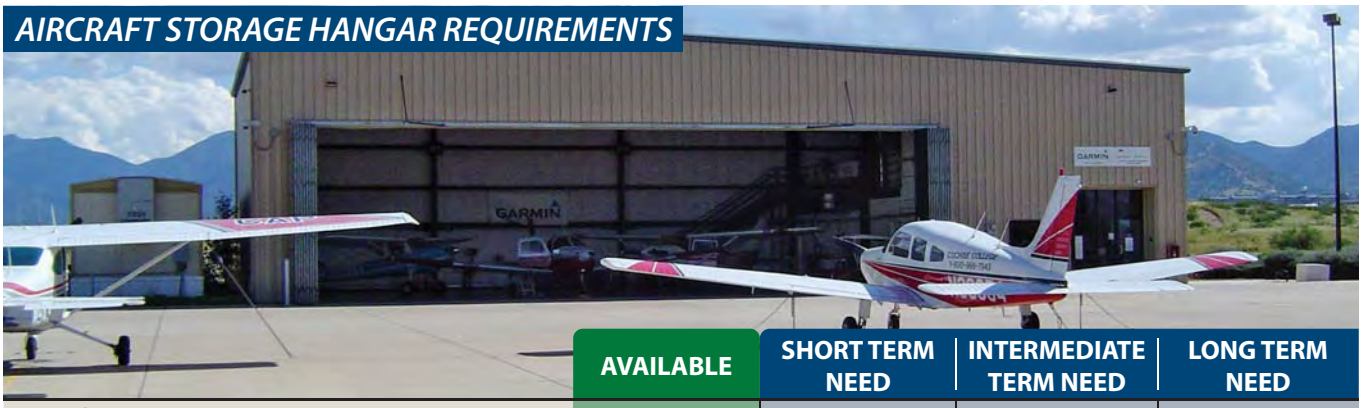
Aviation Fuel Storage

As previously discussed in Chapter One, there are currently two fuel farms located on the airport that store aviation fuel. The fuel farms provide a total storage capacity of 80,000 gallons. Of this total, 45,000 gallons is dedicated to Jet A fuel and 35,000 gallons is dedicated to 100LL fuel. These fuel storage facilities contain 100LL and Jet A fuel.

Table 3R summarizes the fueling activity for Sierra Vista Municipal Airport since 2006. It should be noted that the airport experienced a significant increase in fuel sales in 2009 and 2011. This can be attributed to higher-than-normal fire hazards in the region during these years and the need for the U.S. Forest Service to increase its aircraft utilization to provide fire suppression support.

Additional fuel storage capacity should be planned when the airport is unable to maintain an adequate supply and reserve. While each airport determines their own desired reserve, a 14-day reserve is common for general aviation airports. When additional capacity is needed, it should be planned in 10,000- to 12,000-gallon increments, which allows for taking the capacity of common fuel tanker trucks. Giv-

AIRCRAFT STORAGE HANGAR REQUIREMENTS



	AVAILABLE	SHORT TERM NEED	INTERMEDIATE TERM NEED	LONG TERM NEED
Aircraft to be Hangared	56	65	74	90
Linear Box Hangar Area (s.f.)	85,000	86,800	92,400	106,400
Conventional Hangar Area (s.f.)	5,000	6,000	16,000	28,000
Maintenance Area	N/A	11,250	12,600	15,000
Total Hangar Area (s.f.)	**90,000**	**104,100**	**121,000**	**149,400**

AIRCRAFT PARKING APRON REQUIREMENTS

Single, Multi-Engine Transient Aircraft Positions		13	14	17
Apron Area (s.y.)		10,400	11,600	13,500
Transient Business Jet Positions		4	5	6
Apron Area (s.y.)		6,900	7,700	9,000
Locally Based Aircraft Positions		14	15	15
Apron Area (s.y.)		5,000	5,400	5,400
Total Positions	**45**	**31**	**34**	**38**
Total Apron Area (s.y.)	**47,400**	**22,300**	**24,700**	**27,900**

GENERAL AVIATION TERMINAL AREA FACILITIES

General Aviation Building Space (s.f.)	7,000	2,200	2,700	3,400

VEHICLE PARKING REQUIREMENTS

General Aviation Parking Spaces	283	78	88	104
General Aviation Parking Area (s.f.)	99,300	27,100	35,200	41,600

en the existing and future operational level estimates, the current fuel storage capacity should be adequate to meet demand.

TABLE 3R
Annual Fuel Sales
Sierra Vista Municipal Airport

	100LL		Jet A		
Year	Annual Sales (gallons)	Monthly Average (gallons)	Annual Sales (gallons)	Monthly Average (gallons)	Totals
2006	81,509	6,792	92,888	7,741	174,397
2007	83,290	6,941	67,287	5,607	150,577
2008	77,908	6,492	87,261	7,272	165,169
2009	78,903	6,575	113,634	9,470	192,537
2010	74,650	6,221	86,488	7,207	161,138
2011*	186,214	15,518	136,643	11,387	322,857

*January - November

Source: Airport Records

Aircraft Wash Rack/Deicing Area

A designated aircraft wash rack/deicing area is currently located approximately 600 feet northwest of the terminal building adjacent to the large aircraft parking apron on the northwest side of the airport. This facility should be maintained through the planning period.

Fencing/Gates

Sierra Vista Municipal Airport's operations areas are completely enclosed by chain link fence topped with three-strand barbed wire. The fence does not always follow the legal airport boundary due to the layout of physical features and infrastructure development. Three functioning automated access gates are also located at the airport, in addition to two manually controlled access gates. These facilities should be maintained through the long term planning period.

Aircraft Rescue and Firefighting

Aircraft rescue and firefighting (ARFF) support is provided by the U.S. Army in a facility located on the south side of Libby Army Airfield. Federal regulations do not require ARFF services to be provided to Sierra Vista Municipal Airport since the airport does not currently accommodate scheduled air carrier service.

Unless federal regulations change, there will not be a regulatory requirement for ARFF facilities on the airport. Emergency services will continue to be met with personnel and equipment stationed at the fire station on the south side of Libby Army Airfield. Therefore, no additional requirements for ARFF services are needed at Sierra Vista Municipal Airport.

Utilities

Electrical, water, natural gas, sewage disposal, and telecommunications services

are available at Sierra Vista Municipal Airport. The availability and capacity of the utilities serving the airport are factors in determining the development potential of the airport. Utility extensions to new development areas may be needed through the planning period.

SUMMARY

The intent of this chapter has been to outline the facilities required to meet potential aviation demands through the 20-year planning horizon. Following the facility requirements determination, the next step is to determine a direction of development which best meets these projected needs through a series of airport development alternatives. The remainder of the Master Plan will be devoted to outlining this direction, its schedule, and its costs.

Chapter Four

AIRPORT ALTERNATIVES

CHAPTER FOUR

Airport Alternatives

Prior to defining the recommended development program for Sierra Vista Municipal Airport, it is important to analyze development options as well as limitations and constraints at the airport. Some airports are relatively constrained due to limited space available. While Sierra Vista Municipal Airport has adequate land available to satisfy projected needs through the planning period of this study, careful consideration should be given to the layout of future facilities.

In this chapter, several airport development alternatives are considered for the airport. Each alternative provides a differing approach for the required facility, and the layouts are presented for the purposes of evaluation. The ultimate goal is to develop the underlying rationale which supports the final recommended development concept. Through this process, an evaluation of the highest and best uses of airport property is made while considering local development goals, physical and environmental constraints, and appropriate airport design standards.

The alternatives presented in this chapter have been developed to meet the overall program objectives for Sierra Vista Municipal Airport in a balanced manner. Through coordination with the Planning Advisory Committee (PAC), City of Sierra Vista, Fort Huachuca/Libby Army Airfield, the Federal Aviation Administration (FAA), Arizona Department of Transportation - Multi-Modal Planning Division - Aeronautics Group (ADOT-MPD - Aeronautics Group), and the general public, the alternatives (or a combination thereof) will be refined and modified as necessary to prepare the recommended development concept. Therefore, the alternatives presented in this chapter are simply a stimulating process aimed at focusing efforts to reach the recommended concept for the future development of the airport. Input from the members of the PAC and general public will be useful and

even necessary to define this concept and the resultant capital improvement program to be presented later in the study.

REVIEW OF PREVIOUS MASTER PLAN AND AIRPORT LAYOUT PLAN

The previous Master Plan for Sierra Vista Municipal Airport was completed in 2002. More recently, the Airport Layout Plan (ALP) has been revised and approved by the FAA in August 2011.

The 2002 Master Plan recommended airfield improvements to include upgrading navigational aids and reconstructing airfield pavements. The plan also identified additional taxiway construction to improve airfield efficiency and accommodate landside development. Since the time of these recommendations, significant investments have been made for improvements to the airfield, including the reconstruction and rehabilitation of runway and taxiway pavements and additional taxiway development. Aircraft storage hangars have also been constructed to accommodate increased based aircraft demand and a self-service fuel facility has been installed near the terminal building. The 2011 ALP, shown on **Exhibit 4A,** depicts improvements recommended in the previous Master Plan.

It should be noted that the 2002 Master Plan dedicated considerable planning effort related to the acquisition of 203 acres proposed for transfer to the City of Sierra Vista from the Department of the Army. This land was located north of the existing 72 acres that encompass Sierra Vista Municipal Airport. The land transfer was never completed and is currently not available for acquisition. As such, this Master Plan will not pursue development alternatives for this property.

AIRPORT DEVELOPMENT OBJECTIVES

It is the overall objective of this effort to produce a balanced airport complex to serve forecast aviation demands while also providing a vision for ultimate build-out of the facility. However, before defining and evaluating specific alternatives, airport development objectives should be established. The primary goal for the Master Plan is to define a development concept which allows for the airport to be marketed, developed, and safely operated for the betterment of the surrounding region and its users. With this in mind, the following development objectives have been defined for this planning effort.

- Conform to FAA and ADOT-MPD – Aeronautics Group design and safety standards for the mix of aircraft that could potentially use the airport during the 20-year planning period of the Master Plan.

- Analyze procedures for allowing maximum use of the airport during inclement weather conditions and for potential airfield emergencies or maintenance.

- Develop facilities to safely and efficiently serve aviation users and support the potential for increased use of the airport.

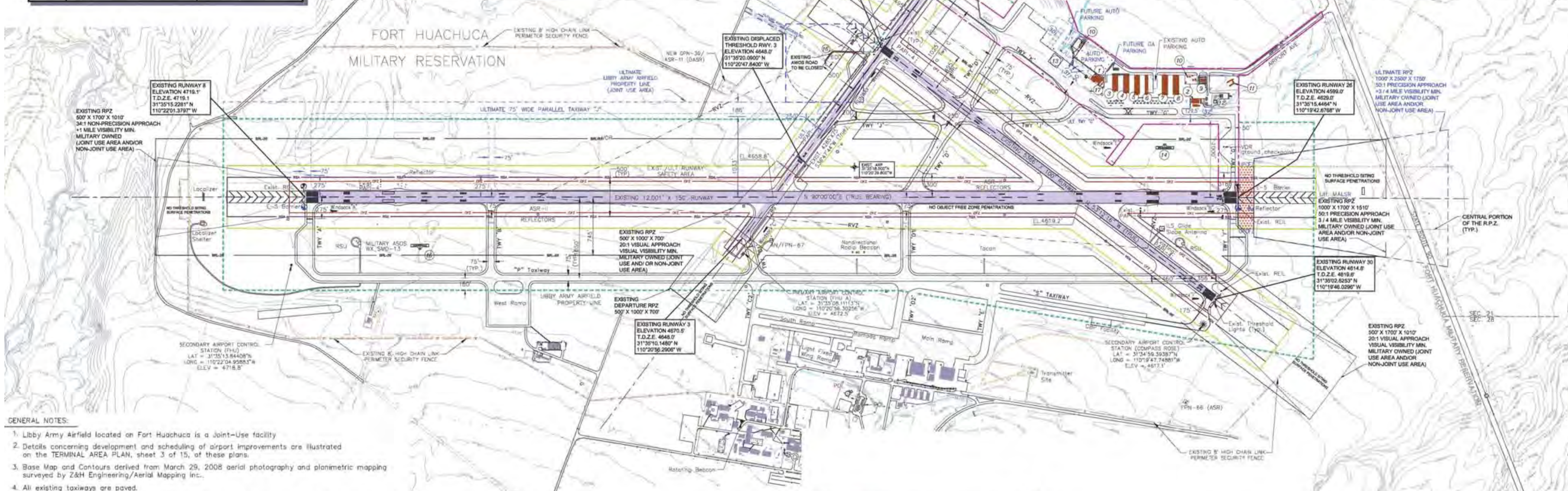
- Provide sufficient airport capacity through additional facility improvements which will meet the long term planning horizon demand levels.

LEGEND		
EXISTING	ULTIMATE	DESCRIPTION
		AIRPORT PROPERTY LINE
		AWOS LEASE BOUNDARY
		BUILDING RESTRICTION LINE
		SECTION CORNERS
		AIRPORT REFERENCE POINT (ARP)
		AIRPORT ROTATING BEACON
		AVIGATION EASEMENT (IF APPLICABLE)
		BUILDING ON AIRPORT
N/A		ABANDON/REMOVE
		BLOCK FENCE
		WIRE FENCE
		AIRPORT PAVEMENT
		HOLD MARKING
		OBSTACLE FREE ZONE
		RUNWAY SAFETY AREA
		OBJECT FREE AREA
		PRECISION OBSTACLE FREE ZONE
		WINDSOCK
		RUNWAY PROTECTION ZONE
PAPI-4	PAPI-4	PAPI
		RUNWAY THRESHOLD LIGHTS & REIL
		TIEDOWNS
		TOPOGRAPHY
		JOINT USE RWY/TWY AREA
H	H	HELIPAD
		AUTOMATED WEATHER OBSERVATION STATION (AWOS)
		MALS
		PRIMARY AIRPORT CONTROL STATION (PACS)
		SECONDARY AIRPORT CONTROL STATION (SACS)

EXISTING BUILDINGS/FACILITIES		
EXISTING	DESCRIPTION	EL.
1	ADMINISTRATION/TERMINAL BUILDING	4606.0'
2	FIXED BASE OPERATION HANGAR	4590.9'
3	BOX HANGAR	4602.9'
4	BOX HANGAR	4604.2'
5	BOX HANGAR	4599.9'
6	BOX HANGAR	4596.5'
7	BOX HANGAR	4595.8'
8	BOX HANGAR	4597.4'
9	FUEL FACILITY (ABOVE GROUND)	4595.4'
10	WATER WELL/STORAGE TANK AND PUMP UNIT	4688.9'
11	CIVIL AIR PATROL	4576.8'
12	HELIPORT AREA	AT GRADE
13	WASH RACK/DEICING AREA	AT GRADE
14	AWOS Data Collection Package (DCP) #1	4630.0'
15	AWOS Data Collection Package (DCP) #2	4730.0'
16	AWOS Data Collection Package (DCP) #3	4650.0'
17	SELF FUELING STATION	4498.0'

ULTIMATE BUILDINGS/FACILITIES	
ULTIMATE	DESCRIPTION
30	BOX HANGARS
31	LARGE AIRCRAFT BOX HANGARS
32	HELICOPTER EMS TRANSPORT OPERATOR

OBSTACLE FREE ZONE (OFZ) PENETRATIONS		
NO.	OBJECT	ACTION
1	EXISTING OFZ RWY 3-21 AND 12-30 PENETRATED BY AWOS ACCESS RD.	RELOCATE AWOS ACCESS RD. OUTSIDE OF EXISTING RWY OFZ



GENERAL NOTES:

1. Libby Army Airfield located on Fort Huachuca is a Joint-Use facility
2. Details concerning development and scheduling of airport improvements are illustrated on the TERMINAL AREA PLAN, sheet 3 of 15, of these plans.
3. Base Map and Contours derived from March 29, 2008 aerial photography and planimetric mapping surveyed by Z&H Engineering/Aerial Mapping Inc..
4. All existing taxiways are paved.
5. Civilian aircraft parking aprons and ramp space are limited to the areas within Sierra Vista Municipal Airport Property Line boundary, while military aircraft parking areas and ramp space are confined to the area south of the Libby Army Airfield Property Line (Joint Use Area).
6. All elevations are in NAVD 88 and all horizontal coordinates are in NAD 83.
7. All survey monuments enclosed in concrete casings.
8. Taxiway CL to fixed or moveable object 129.5'.
9. The Ultimate Taxiway "J" wil not be eligible for Airport Improvement Program (AIP) funding until it is included in the expanded Joint-Use Area.
10. There are no Non-aeronautical uses on civilian airport land.
11. An Environmental Assessment (EA) will be conducted prior to expanding the Joint Use Easement Area for the construction of ultimate taxiway "J".
12. The City of Sierra Vista will provide the appropriate level of environmental documentation to the FAA for the existing 500-foot AWOS radius area and the existing and future AWOS access road.
13. The entire length of Taxiway "P", including Taxiways "A" and "F" are included in the Joint Use Area. The Taxiway Object Free Areas for each of these taxiways is also included in the Joint Use Area.

FAA APPROVAL STAMP

NOV 21 2011
Approved conditionally
Subject to comments contained in our letter dated: NOV 21 2011
FEDERAL AVIATION ADMINISTRATION
Western-Pacific Region
By [signature]
for Manager - LAX/ADO

SUBMITTED BY:
Coffman Associates
FOR APPROVAL BY:

APPROVED BY: [signature] ON THE DATE OF: 8/19/2011
Michael Hemeseth, P.E.
Director of Public Works/Airport Director

No.	REVISIONS	DATE	BY	APP'D.

"THE PREPARATION OF THESE DOCUMENTS WAS FINANCED IN PART THROUGH A PLANNING GRANT FROM THE FEDERAL AVIATION ADMINISTRATION AS PROVIDED UNDER SECTION 505 OF THE AIRPORT AND AIRWAY IMPROVEMENT ACT OF 1982, AS AMENDED. THE CONTENTS DO NOT NECESSARILY REFLECT THE OFFICIAL VIEWS OR POLICY OF THE FAA. ACCEPTANCE OF THESE DOCUMENTS BY THE FAA DOES NOT IN ANY WAY CONSTITUTE A COMMITMENT ON THE PART OF THE UNITED STATES TO PARTICIPATE IN ANY DEVELOPMENT DEPICTED HEREIN NOR DOES IT INDICATE THAT THE PROPOSED DEVELOPMENT IS ENVIRONMENTALLY ACCEPTABLE IN ACCORDANCE WITH APPROPRIATE PUBLIC LAWS."

SIERRA VISTA MUNICIPAL AIRPORT
LIBBY ARMY AIRFIELD

AIRPORT LAYOUT PLAN

SIERRA VISTA, ARIZONA

PLANNED BY: James M. Harris P.E.
DETAILED BY: Maggie Beaver
APPROVED BY: James M. Harris P.E.
July 28, 2011 | SHEET 2 OF 15

Coffman Associates
Airport Consultants
www.coffmanassociates.com

Exhibit 4A: 2011 ALP DRAWING

- Identify any future land acquisition needs to protect safety areas.

- Ensure that any recommended future development is environmentally compatible.

AIRPORT ALTERNATIVE CONSIDERATIONS

The development alternatives are categorized into two functional areas: airside and landside. Airside considerations relate to runways, taxiways, navigational aids, etc. and require the greatest commitment of land area to meet the physical layout of the airport as well as the required airfield safety standards. The design of the airfield also defines minimum set-back distances from the runway and object clearance standards. These criteria are defined first to ensure that the fundamental needs of the airport are met. Landside considerations include hangars, aircraft parking aprons, terminal services, as well as the utilization of remaining airport property to provide revenue support for the airport and to benefit the economic development and well-being of the regional area.

Each functional area interrelates and affects the development potential of the others. Therefore, all areas must be examined individually and then coordinated as a whole to ensure the final plan is functional, efficient, and cost-effective. The total impact of all these factors on the existing airport must be evaluated to determine if the investment in Sierra Vista Municipal Airport will meet the needs of the surrounding area, both during and beyond the planning period of this study.

Exhibit 4B presents both airside and landside planning considerations that will be specifically addressed in this analysis. These issues are the result of the findings of the aviation demand forecasts and airport facility requirements evaluations, as well as input from the PAC.

The remainder of this chapter will describe various development alternatives for airside and landside facilities. Although each area is treated separately, ultimate planning will integrate the individual requirements so that they can complement one another.

AIRSIDE DEVELOPMENT CONSIDERATIONS

This section identifies and evaluates various airside development factors at Sierra Vista Municipal Airport/Libby Army Airfield to meet the requirements set forth in Chapter Three. Airside facilities are, by nature, the focal point of an airport complex. Because of their primary role and the fact that they physically dominate airport land use, airfield facility needs are often the most critical factor in the determination of viable airport development options.

FAA AIRPORT DESIGN CRITERIA

At the time of writing this report, applicable standards for airport design are outlined in FAA Advisory Circular (AC) 150/5300-13, *Airport Design*, Change 18. Since its inception in 1989, this document has provided the general guidance for airport planning and design. The FAA has recently released AC 150/5300-13A, *Airport Design*, which is in "draft" form. This draft guidance contains most of that included in the current AC, however, some significant changes include the introduction of the Runway Design Code (RDC)

and Taxiway Design Group (TDG), in addition to changes to standards for taxiway design and runway protection zones (RPZs). Pending any revisions, this document will replace the former design guide once it is officially approved for use. The degree to which this guidance is approved and implemented will be dependent on the FAA. As such, certain sections of this chapter only serve to outline some of the potential changes that relate to airfield design at Sierra Vista Municipal Airport/Libby Army Airfield according to the draft AC.

AIRPORT REFERENCE CODE DESIGN STANDARDS

The design of airfield facilities is primarily based on the physical and operational characteristics of aircraft using the airport. The Airport Reference Code (ARC) system is utilized to relate airport design requirements to the physical (wingspan and tail height) and operational (approach speed) characteristics of the largest and fastest aircraft conducting 500 or more operations annually at the airport as defined by FAA. While this can, at times, be represented by one specific make and model of aircraft, most often the airport's ARC is represented by several different aircraft, which collectively conduct more than 500 annual operations at the airport.

As previously noted, the FAA is transitioning into a new design guidance document, AC 150/5300-13A. This document includes planning for the airport's design aircraft utilizing the ARC; however, it stipulates that the ARC should be determined as the highest Runway Design Code (RDC) if the airport is served by two or more runways. The RDC is analogous to the ARC and is applied individually to a runway. Thus, the RDC for one runway could be different than another.

Analysis in the previous chapter indicated that the current critical aircraft on the airfield falls within ARC E-V based on historical military usage. The airfield should continue to be planned for most types of military aircraft as well as an array of air taxi and general aviation activities. Runway 8-26 provides the best wind coverage and greatest runway length as it is the primary runway. Alternative analysis will evaluate facility development that will meet ARC/RDC E-V aircraft standards for primary Runway 8-26.

Sierra Vista Municipal Airport/Libby Army Airfield is also served by crosswind Runways 12-30 and 3-21. These runways can accommodate smaller military, air taxi, and general aviation operations and can also provide an important role in serving aircraft operations when the primary runway is closed for maintenance or emergencies. Runway 12-30 should primarily be designed to meet the needs of aircraft up to ARC/RDC C-III. Being the shortest runway, Runway 3-21 should be planned to conform to ARC/RDC B-II design standards.

SAFETY AREAS

The design of airfield facilities includes both the pavement areas to accommodate landing and ground operations of aircraft, as well as the required safety areas to protect aircraft operational areas and keep them free of obstructions that could affect the safe operation of aircraft at the airport. The safety areas include the runway safety area (RSA), object free area (OFA), and obstacle free zone (OFZ), as previously discussed in Chapter Three.

Airside Considerations

- Meet appropriate Federal Aviation Administration (FAA) design standards for each runway
- Consider the potential for a runway extension providing up to 6,600 feet of operational length on Runway 12-30 to meet general aviation demand. Additional length up to 8,000 feet may be warranted for military operations
- Analyze improved instrument approach considerations for Runway 26 and Runway 12-30
- Analyze the installation of an approach lighting system on Runway 26
- Improve visual approach aids to include the installation of precision approach path indicators (PAPIs) and runway end identification lights (REILs) on Runway 3-21
- Evaluate the taxiway system to improve circulation, efficiency, and safety
- Locate runway/taxiway hold lines per FAA criteria
- Install taxiway lighting on all active taxiways

Landside Considerations

- Analyze property west of the terminal area for future aviation use
- Identify locations for future hangar development including those used by aviation businesses and those for general aviation storage needs
- Identify locations suitable for airport support facilities to include air cargo operations and terminal concessions
- Consider dedicating portions of airport property for U.S. Forest Service activities (fire fighting)
- Plan for land uses that can increase airport revenues and add value to community resources

As depicted on **Exhibit 4C**, there are four areas on the airfield that do not conform to existing and ultimate RSA standards. Two wind cones are located within 200 feet of the runway centerline and penetrate the RSA on Runway 8-26 (one associated with each end of the runway). Another wind cone is located approximately 150 feet from the runway centerline near the Runway 30 threshold. Future planning should consider relocating the wind cones outside the RSA for each respective runway.

A fourth RSA deficiency involves the existing road providing access to the automated weather observation system (AWOS-III) located west of the Runway 12 threshold. As presented on **Exhibit 4C**, ultimate planning shows the construction of a road extending southeast of Eleven Mile Road that would provide access to the AWOS-III. This access road should be restricted to authorized airport personnel only. The City of Sierra Vista should coordinate the construction of this road with Fort Huachuca, and a license agreement or easement over the affected property would most likely be needed in order for the City of Sierra Vista to obtain FAA and/or ADOT-MPD – Aeronautics Group grant funding to aid in construction.

TAXIWAYS

Taxiway design has historically followed the critical aircraft, or ARC, utilizing the taxiway. Common design issues have included parallel taxiway separation from the runway, taxiway width, and overall system efficiency. Recently, the FAA has made changes to the current airport design guidance (AC 150/5300-13, Changes 17 and 18) and has carried these changes forward to the proposed new design guidance in draft AC 150/5300-13A.

The FAA has committed to reducing and/or eliminating runway incursions at airports across the country. The Runway Safety Action Team (RSAT) is FAA's focus group, which studies runway incursions and makes recommendations for improvements. Based on RSAT findings, many, if not most, runway incursions are the symptom of poor taxiway system design. As a result, the FAA has made changes to its taxiway design principles. The following are now basic taxiway design criteria:

Taxi Method – Allow for adequate pavement and fillet widths to provide for "wander" and "oversteering."

Steering Angle – Taxiways should be designed such that the nose gear steering angle is no more than 50 degrees to prevent excessive tire scrubbing.

Three Node Concept – Taxiway intersections should not have more than three choices of travel. Ideally, these are right and left 90-degree angle turns and continuation straight ahead.

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

Runway Incursions – Keep the system basic so as to minimize the potential for runway incursions as complexity reduces pilot situational awareness. Avoid wide expanses of pavement where lighting and signage can be located at a distance from the aircraft. Limit runway crossings. Avoid high energy intersections, which are runway crossings in the middle third of the runway. Increase visibility such as using 90-degree intersections. Avoid dual purpose pavements, such as runways

used as taxiways and taxiways used as runways. Do not allow direct access between the runway and an apron. Do not create a hot spot with a confusion intersection.

Coordination – Coordinate with ATCT personnel where applicable.

Operational Requirement – Changes in taxiway geometry must be analyzed for possible effects on runway incursions. Coordinate with the Safety Risk Management (SRM) team when analyzing proposed taxiway geometry.

Sierra Vista Municipal Airport/Libby Army Airfield is served by an extensive taxiway system, which includes parallel, entrance/exit, access, and connector taxiways serving all three runways. While the existing taxiway system meets most of the standards previously mentioned, there are some issues that should be addressed. First, the intersection of Runway 12-30 and Taxiways D and J exceed the three node concept mentioned earlier as there are currently five choices of travel for an aircraft to take as it enters this intersection. As such, **Exhibit 4C** depicts the removal of Taxiway D on the north side of Runway 8-26. In doing so, an aircraft transitioning through this intersection on Taxiway J would be allowed three choices of travel, turning either direction onto Runway 12-30 or continuing straight ahead on Taxiway J.

Additional taxiways are shown west of the proposed Taxiway D closure/removal to support airfield circulation. Based on the taxiway criteria, it is recommended that an entrance/exit taxiway be situated at a right angle with the runway it connects to. On the north side of Runway 8-26, Taxiway D currently connects at an acute angle. The construction of a taxiway replacement immediately west of Taxiway D proposes a 90-degree connection, which is preferred. Furthermore, two taxiways are proposed farther north connecting Runway 12-30 with Taxiways J and K. These taxiways are aligned at right angles to Runway 12-30 and situated 400 feet from Runway 3-21 (runway centerline to taxiway centerline). Serving as exit taxiways for aircraft landing on Runway 30, they would limit aircraft from utilizing Runway 3-21 as a taxiway, therefore, increasing airfield capacity and safety.

The extension of Taxiway J to the west serving Runway 8-26 is also proposed, as depicted on **Exhibit 4C**. Located 1,033 feet (runway centerline to taxiway centerline) north of Runway 8-26, this taxiway would extend the full length of Runway 8-26 and exceed the required runway-to-parallel taxiway separation criteria. The construction of this taxiway would better serve aircraft associated with Sierra Vista Municipal Airport and limit the number of runway crossings on primary Runway 8-26, further increasing capacity and safety on the airfield. In addition, the full length parallel taxiway would provide increased separation between civilian and military operations, as civilian activity would be confined to the north side of the runway. In order for the proposed parallel Taxiway J extension to be eligible for Airport Improvement Program (AIP) funding, the joint-use area must be expanded as presented on the exhibit. In conjunction with this proposed taxiway extension, an additional exit taxiway is depicted approximately 2,400 feet east of the Runway 8 threshold, immediately north of Taxiway B serving the south side of the runway.

It should be noted that the Libby VOR is located approximately 260 feet south of the proposed parallel taxiway extension

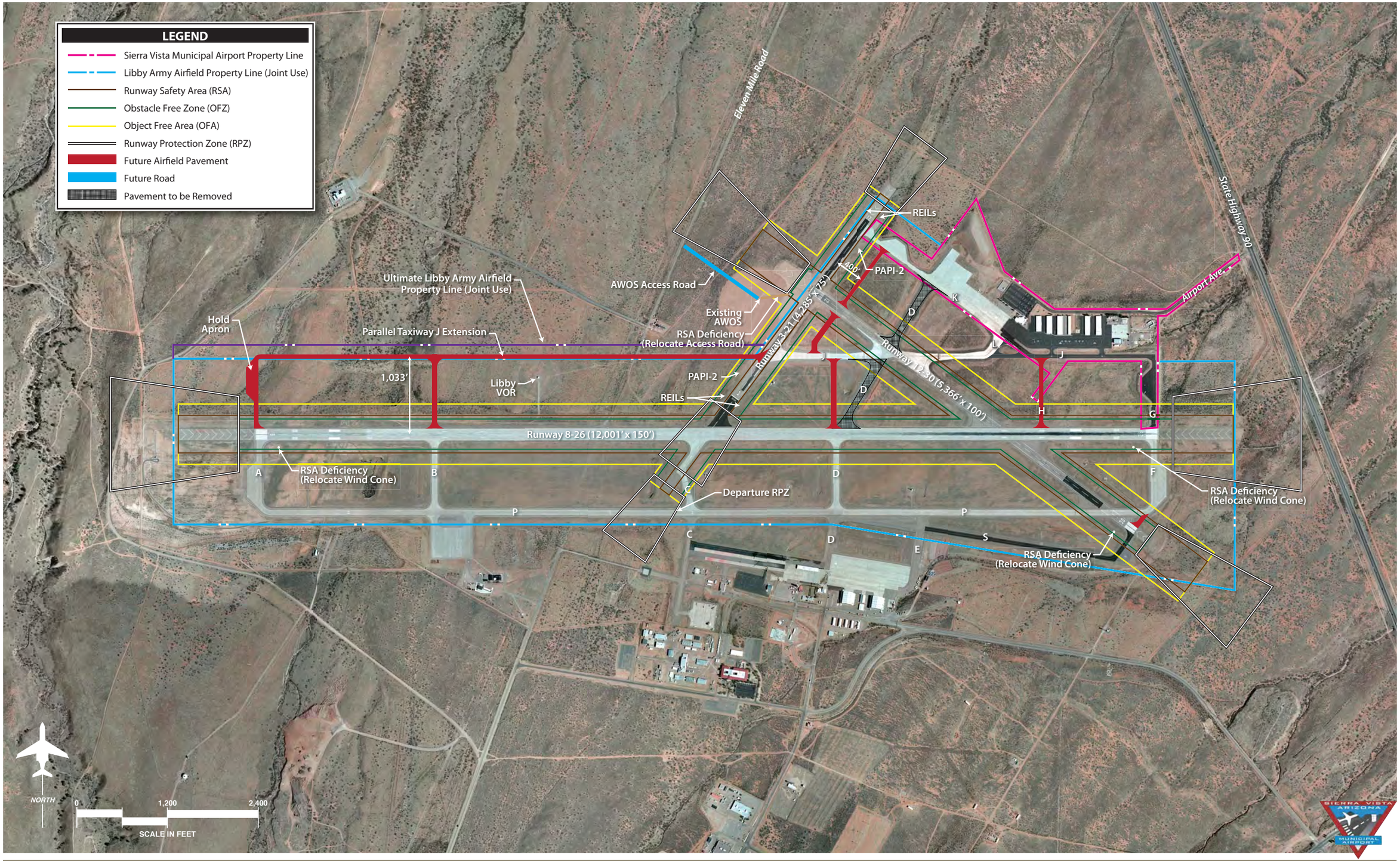


Exhibit 4C: AIRSIDE CONSIDERATIONS

on the west side of the airfield. While the VOR remains clear of safety areas associated with the proposed taxiway, further determination outside this study will determine whether the VOR can remain in its current location if Taxiway J is extended farther west.

Exhibit 4C also presents the construction of an additional exit taxiway extending north of Runway 8-26, located approximately 1,600 feet west of the Runway 26 threshold. This taxiway would allow aircraft access to landside facilities farther north without having to cross or taxi on Runway 12-30 to do so. An entrance/exit taxiway is also proposed extending south of Taxiway F, connecting to the Runway 30 threshold at a 90-degree angle. As a result, aircraft taxiing from the north that desire to utilize the full length of Runway 30 for takeoff would not have to back-taxi on the runway coming from Taxiway P.

All future taxiways serving the airfield should be constructed to at least 50 feet in width to meet airplane design group (ADG) III standards. The proposed Taxiway J extension associated with Runway 8-26 should consider meeting ADG V standards, which call for a 75-foot taxiway width.

It should be noted that the new FAA design guidance that is still in draft format introduces the taxiway design group (TDG), which will be utilized to set taxiway width and pavement fillet design criteria. The TDG criteria is set based on the dimensions of the design aircraft's undercarriage, or wheel base, in addition to the ADG which considers aircraft wingspan and tail height. The wheel base includes a triangular system of a "cockpit" strut located under the nose of the aircraft and two struts under the wing signified as the "main gear." The distance between the main gear, or main gear width (MGW), and the distance between the cockpit and main gear (CMG) are important factors when designing taxiway pavements. Larger dimensions will require wider pavements so as to accommodate aircraft turning radii.

RUNWAY VISUAL APPROACH AIDS

Runway end identification lights (REILs) should be considered for all lighted runway ends not planned for a more sophisticated approach lighting system. Runways 8-26 and 12-30 are currently provided with REILs, and facility planning considers the implementation of REILs on each end of Runway 3-21.

A two-box precision approach path indicator (PAPI-2) system should also serve each end of Runway 3-21. This will enhance safety by providing pilots with visual guidance information during landings to the runway. PAPI-4s currently serve each end of Runways 8-26 and 12-30.

HOLD APRONS

Hold aprons provide a location for aircraft to prepare for departure and/or bypass other aircraft. Currently, there are six hold aprons on the airfield serving the three runways. As depicted on **Exhibit 4C**, the construction of a new hold apron is being proposed on the airfield that would serve Runway 8 in the event that parallel Taxiway J is extended to the west.

HOLD POSITION MARKINGS

The current hold position markings associated with Taxiways D and G on the north side of Runway 8-26 are located

300 feet and 318 feet, respectively, from the runway centerline. The standard for hold lines associated with runways in ARC E-V with not lower than ¾-mile visibility minimums is 250 feet plus one foot for each additional 100 feet above sea level. With Sierra Vista Municipal Airport situated at 4,719 feet above mean sea feet level (MSL), hold lines should be at least 297 feet from the runway centerline. In the event that ½-mile visibility minimums were provided on Runway 8-26, hold lines should be located at least 327 feet from the runway centerline (280 feet plus one foot for each additional 100 feet above sea level). The hold lines associated with Taxiways A, B, D and F on the south side of Runway 8-26 range from 175 feet to 275 feet from the runway centerline. As such, they all fall short of the current FAA standard of 297 feet for ARC E-V design with not lower than ¾-mile visibility minimums.

Hold lines associated with each side of Taxiways D and J as they intersect Runway 12-30 are 250 feet from the runway centerline. The hold lines associated with Taxiways S and P as they relate to Runway 12-30 on the southeast side of the airfield range from 175 feet to 250 feet from the runway centerline. For ARC C-III standards which apply to this runway, hold lines should be located at least 250 feet from the runway centerline. The hold lines associated with Runway 3-21 are spaced 250 feet from the runway centerline on Taxiways J and K, exceeding the FAA standard of 200 feet.

RUNWAY PROTECTION ZONES

The goal of the RPZ standard is to increase safety for both pilots and people on the ground by maintaining the RPZ free of items that attract groupings of people or property on the ground. FAA AC 150/5300-13A defines the RPZ as *"An area at ground level off the runway end to enhance the safety and protection of people and property on the ground."*

The FAA does not necessarily require the fee simple property acquisition of the RPZ area, but highly recommends that the airport have positive control over development within the RPZ. Positive control techniques could include avigation easements and/or zoning measures which prohibit the placement of land uses which attract groupings of people. It should be noted that avigation easements can sometimes cost up to 80 percent of the real property value and do not offer the same level of control as would fee simple acquisition.

All runway ends have two RPZs: an approach RPZ and a departure RPZ. The size of each is dependent upon the type of aircraft or ARC for which the runway is being designed. The approach RPZ is also sized according to the lowest visibility minimums provided by the approved instrument approach procedure(s). FAA's RPZ criteria applies to both the approach and departure RPZ.

In the past, FAA guidance did not clearly identify all objects which could be located inside the RPZ except to qualify that the object could not be an attractant to a congregation of people. In the new guidance, the FAA stipulates that the following land uses are permissible without further evaluation:

- Farming that meets established buffer criteria;
- Vehicular parking and storage in the controlled activity area (outside the OFA and extended OFA to RPZ end);

- Irrigation channels as long as they do not attract birds;
- Airport service roads, as long as they are not public roads and are under the direct control of the airport operator;
- Underground facilities as long as they meet other applicable design criteria; and
- Unstaffed navigation aids (NAVAIDs) and facilities, such as equipment for airport facilities that are considered fixed by function (i.e., localizer antenna and equipment shelter).

If the airport cannot fully control the entirety of the RPZ, the RPZ land use standards have recommendation status for that portion of the RPZ not controlled by the airport owner. In essence, this means that the FAA can require a change to the runway environment so as to properly secure the entirety of the RPZ. The FAA has always held that residences, businesses, and similar uses are prohibited from the RPZ. Objects such as public roads, however, have been allowed. FAA's new draft guidance does not readily allow for public roads in the RPZ.

As shown on **Exhibit 4C**, portions of all RPZs associated with each runway end on the airfield extend beyond the Libby Army Airfield joint use property line. The portions of the RPZs that fall outside the property line are under the control of the Fort Huachuca Military Reservation/ Department of the Army. The majority of these areas encompass vacant land; however, Eleven Mile Road does penetrate the RPZs associated with Runway 12. On the east side of the airfield, a very small area of State Highway 90 falls under the Runway 26 RPZ. If a runway extension or improved instrument approach procedure were to be implemented on any of the runways, the RPZs would encompass even greater area outside the property line. A potential runway extension and improved instrument approach procedures at the airport will be further discussed in the following sections.

RUNWAY LENGTH

Analysis in the previous chapter recommended a minimum of 6,600 feet for Runway 12-30 to enable a larger portion of the aircraft fleet mix to utilize the runway when needed. This runway length is consistent with the FAA runway length requirements contained in AC 150/5325-4B, *Runway Length Requirements for Airport Design*. The alternatives to follow analyze two separate runway extension scenarios on Runway 12-30. One calls for a 1,234-foot extension to the northwest, while the other depicts the same extended length on the southeast side of the runway. It should be noted that Libby Army Airfield officials have indicated a potential need of up to 8,000 feet of length on Runway 12-30 to accommodate special military operations that could be associated with this runway in the future.

Runway 12-30 Extension - Northwest

Alternative 1, depicted on the left side of **Exhibit 4D**, considers a 1,234-foot extension on Runway 12-30 to the northwest that provides 6,600 feet of runway length. As presented, the proposed extension and associated RSA, OFA, OFZ, and RPZ would all extend beyond the current Libby Army Airfield joint use property boundary. At the very least, positive control over these areas should be obtained through an agreement or easement, and the joint use property line should be extended to encompass the improvements. As previously stated, all land in this area is currently owned and controlled by the Fort

Huachuca Military Reservation/ Department of the Army. Those areas containing the RSA and OFA would need to be cleared and graded of any obstructions that could negatively affect the operation of aircraft and/or emergency response vehicles.

The proposed RSA and OFA would extend over Eleven Mile Road farther northwest. As a result, this runway extension would warrant relocating portions of this road. As previously discussed, the FAA has indicated that any changes to the runway environment must also conform to an RPZ free of incompatible uses including public roads. In order to provide the highest level of safety, this alternative depicts the relocated road outside all safety areas including the RPZ. It should be noted that the size of the RPZ will depend upon the approach visibility minimums serving the runway. Further discussion on instrument approach considerations will be detailed in the next section.

The runway extension would also warrant the need to extend parallel Taxiway K. As depicted, the taxiway would extend northwest of Runway 3-21, connecting to the Runway 12 threshold. A hold apron is also proposed to allow aircraft the opportunity to prepare for departure and/or bypass other aircraft.

Advantages: The extension would separate the existing Runway 12 threshold from Runway 3-21, which is a desirable safety improvement. Extending the runway to the northwest should not affect future landside development related to Fort Huachuca operations.

Disadvantages: This alternative would likely be the most expensive as it would require the relocation of portions of Eleven Mile Road in order to accommodate the safety areas associated with the runway extension.

Runway 12-30 Extension – Southeast

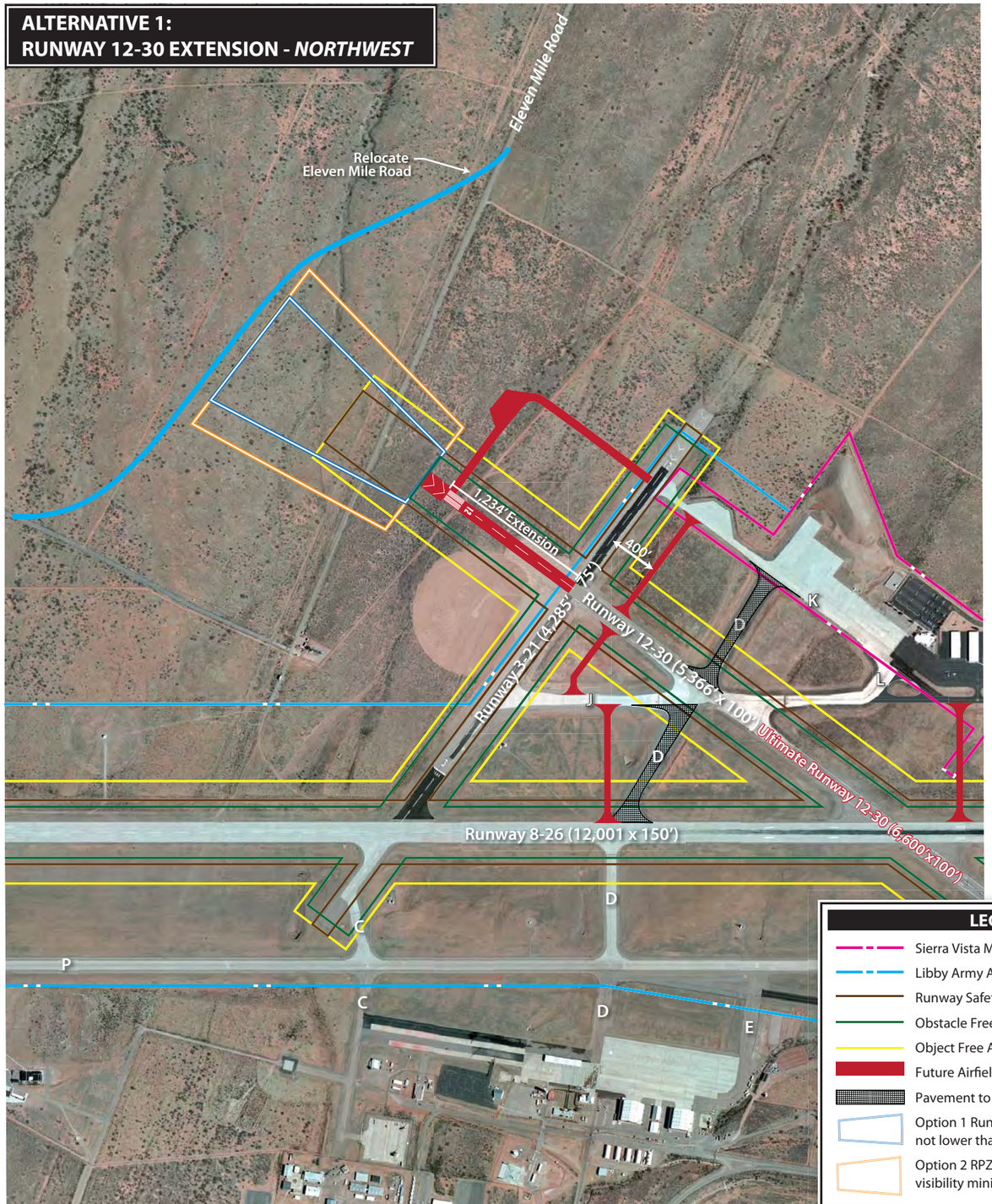
As shown on the right side of **Exhibit 4D**, a second alternative for accommodating an extension is to provide for a 1,234-foot extension off the southeast end of Runway 12-30. As with the previous alternative, the proposed extension and associated safety areas would all extend beyond the existing Libby Army Airfield joint use property boundary, although not to the extent that Alternative 1 does. Nonetheless, an agreement or easement should be obtained and the joint use area be expanded in order to obtain positive control over the affected property.

Alternative 2 calls for modifications to the taxiway system serving the proposed runway extension. The existing portion of Taxiway S that connects perpendicularly to the current Runway 30 threshold could be replaced by the extension of the taxiway farther southeast, at a distance of 400 feet from the runway centerline. On the north side of the runway, a taxiway extending southeast of Taxiway F would allow aircraft access to the Runway 30 threshold coming from the north side of the airfield. This taxiway is also proposed at 400 feet from the runway centerline.

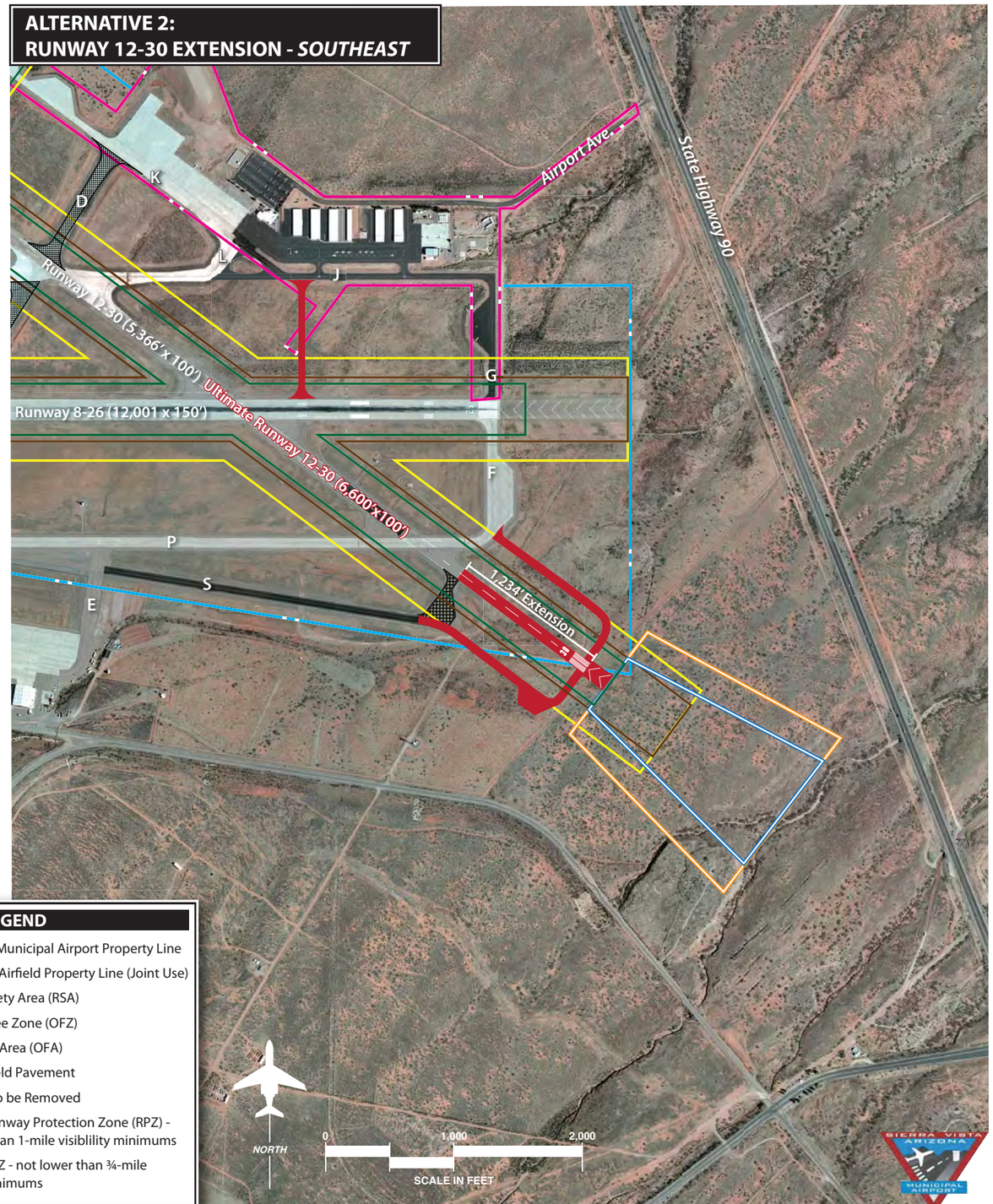
Advantages: The proposed safety areas and RPZ associated with this runway extension does not penetrate incompatible land uses.

Disadvantages: This alternative would shift aircraft activity closer to more highly populated areas associated with the City of Sierra Vista located southeast of the airfield. The proposed extension could limit future opportunities for Fort

ALTERNATIVE 1: RUNWAY 12-30 EXTENSION - *NORTHWEST*



ALTERNATIVE 2: RUNWAY 12-30 EXTENSION - *SOUTHEAST*



LEGEND

- Sierra Vista Municipal Airport Property Line
- Libby Army Airfield Property Line (Joint Use)
- Runway Safety Area (RSA)
- Obstacle Free Zone (OFZ)
- Object Free Area (OFA)
- Future Airfield Pavement
- Pavement to be Removed
- Option 1 Runway Protection Zone (RPZ) - not lower than 1-mile visiblility minimums
- Option 2 RPZ - not lower than ¾-mile visibility minimums

Exhibit 4D: RUNWAY 12-30 EXTENSION ALTERNATIVES

Huachuca in the event that its mission would warrant the expansion of landside development adjacent to Taxiway S and farther southeast toward State Highway 90.

INSTRUMENT APPROACH CONSIDERATIONS

This section will present information regarding the potential for improved instrument approach procedures. Where possible, approach minimums should be as low as possible or practical considering safety and financial constraints. The best approach minimums possible will prevent aircraft from having to divert to another airport, which can cause financial hardship for the aircraft operator, on-airport businesses, and the City of Sierra Vista.

As previously discussed, Sierra Vista Municipal Airport/Libby Army Airfield has five published instrument approaches, all serving Runway 8-26. In addition, precision approach radar (PAR) and airport surveillance radar (ASR) approaches are also provided by airport traffic control tower (ATCT) personnel during hours of operation. Of these approaches, the instrument landing system (ILS) and area navigation (RNAV) global positioning system (GPS) approaches are considered precision instrument approaches. A precision instrument approach provides both vertical descent and course guidance information to pilots. Currently, the precision ILS approach provides the lowest approach minimums (200-foot cloud heights and ¾-mile visibility) on Runway 26, while the RNAV GPS approach provides the same approach minimums for Runway 8. Analysis in the previous chapter indicated that the plan should consider improved instrument approach capabilities for primary Runway 26 as well as crosswind Runway 12-30.

Runway 12-30

Runway 12-30 does not currently provide a straight-in instrument approach procedure. During times when winds favor the use of this runway and weather conditions are below existing approach minimums, Runway 12-30 is effectively closed for aircraft landing. As previously discussed, this can become a financial and safety burden for aircraft and businesses operating on the airfield. As a result, it is desirable to provide a straight-in instrument approach procedure to each end of Runway 12-30, especially in the event that this runway is extended and can accommodate a larger percentage of the aircraft fleet mix utilizing Sierra Vista Municipal Airport/Libby Army Airfield.

Significant advancements continue to be made in GPS navigation that can provide a more cost-effective and attractive means of obtaining instrument approaches. This includes the continued development of the Wide Area Augmentation System (WAAS). WAAS provides for approaches with both course and vertical navigation. This capability was historically only provided by an ILS, which requires extensive on-airport facilities. The GPS-WAAS could allow for approach minimums to be lower than ¾-mile visibility. For purposes of this study, the alternatives will consider approaches to each end of Runway 12-30 providing for not lower than one mile visibility minimums and not lower than ¾-mile visibility minimums. It should also be noted that the proposed runway extension alternatives previously discussed will be considered during this analysis.

Exhibit 4D depicts two options for obtaining a straight-in instrument approach procedure to each end of Runway 12-30. The major difference in the two options corresponds to the size of the RPZ associated with the approach visibility minimums. As previously discussed, the FAA strongly recommends fee-simple ownership of the RPZ by the airport. In cases where outright ownership is not feasible, other land use control measures can be pursued, such as avigation easements or land use zoning. For Sierra Vista Municipal Airport/Libby Army Airfield, this is not possible, as land is under the direct control of the Department of the Army. As such, the City of Sierra Vista should continue to work with Fort Huachuca to make sure any future improvements to the runway system and associated safety areas are protected from incompatible land uses as defined by the FAA.

For Runway 12, Alternative 1 depicted on the left side of **Exhibit 4D** presents two RPZ options: one for a not lower than one-mile visibility minimum approach (smaller) and one for a not lower than ¾-mile visibility minimum approach, similar to what currently exists on each end of Runway 8-26. As shown, both start 200 feet beyond the proposed runway end, and extend 1,700 feet in length. For Option 1, the RPZ has an inner width of 500 feet and an outer width of 1,010 feet. The RPZ associated with Option 2 is wider, encompassing a 1,000-foot inner width and a 1,510-foot outer width. As previously discussed, the relocation of Eleven Mile Road is proposed so as to remain clear of either RPZ.

In order to achieve an approach providing less than one-mile visibility minimums, the corresponding runway end generally recommends the installation of an approach lighting system. Examples of approach lighting systems for approaches with not lower than ¾-mile visibility minimums would include a medium intensity approach lighting system (MALS), omnidirectional approach lighting system (ODALS), or a lead-in light system (LDIN). Although a recommendation according to FAA standards, recent experience indicates that several new approaches with not lower than ¾-mile visibility minimums have been implemented without the support of an approach lighting system. This is currently the case on each end of Runway 8-26. As a result, an approach lighting system is not depicted.

Alternative 2, on the right side of **Exhibit 4D**, presents similar options for obtaining a straight-in instrument approach procedure on Runway 30. In this case, both RPZs remain clear of incompatible land uses, as only vacant land is located in the affected area southeast of Runway 12-30.

Preliminary Obstruction Analysis

The FAA has established criteria aimed at protecting the airport from these flight obstructions. First, FAA criterion stipulates that obstructions not be placed too near the runway ends or parallel to the runway. The obstruction clearance requirements are based on the ARC and/or the weight of the critical aircraft, as well as the type of approaches established or planned for the airport. For visual approaches and/or approaches not lower than one-mile visibility, minimum obstruction clearance is required. However, for ARC C-III aircraft with approach minimums lower than one-mile visibility, the obstruction criterion is more protective.

The two primary resources for determining airspace obstructions are the FAA's FAR Part 77, *Objects Affecting Navigable*

Airspace and *Terminal Instrument Procedures* (TERPS). Part 77 is more of a filter which identifies potential obstructions, whereas TERPS is the critical tool in determining actual flight obstructions. In fact, TERPS analysis is used to evaluate and develop instrument approach procedures including visibility minimums and cloud heights associated with approved approaches.

The first step in identifying potential airspace obstructions is the evaluation of the appropriate Part 77 and threshold siting surfaces (TSS). TSS is an imaginary surface which represents the most critical approach area nearest the runway end. The associated TSS size and slope angle is defined by the visibility minimums of the approach and aircraft type utilizing the approach. The departure surface is another consideration which should be analyzed. In some cases, the departure surface beyond the far end of the runway can be the critical factor in establishing the minimums for the approach end of the runway. This is due to the need to have a cleared area for the missed approach procedure.

An examination has been made of the Part 77 primary approach surface, TSS, and departure surfaces for alternative considerations beyond each end of Runway 12-30 when considering a 1,234-foot extension. As presented on the top half of **Exhibit 4E**, an obstruction analysis was determined for two different instrument approach procedures on Runway 12. Option 1 includes the 20:1 Part 77 approach surface and applies to a not lower than one-mile visibility minimum approach. Option 2 entails a 34:1 approach surface that would be associated with a not lower than ¾-mile visibility minimum instrument approach. The 20:1 TSS surface and 40:1 departure surface apply to both approach options. As presented, Eleven Mile Road would penetrate all imaginary surfaces in its current location. As previously discussed, however, this road, in addition to the other obstructions realized, would be relocated and/or removed prior to constructing a runway extension off the northwest end of Runway 12-30. Further determination by the FAA is needed to determine the extent of removing or lowering these obstructions in order to support a straight-in instrument approach procedure serving the extended Runway 12 end.

An obstruction analysis was also conducted off the southeast end of Runway 12-30 in consideration of an instrument approach procedure serving the proposed end of Runway 30, as depicted on the bottom half of **Exhibit 4E**. The 20:1 approach surface and corresponding 20:1 TSS do not call out any obstructions for a not lower than one-mile visibility minimum approach. Minor ground features obstruct the 34:1 approach surface. In addition, two ground features obstruct the 40:1 departure surface. Similar to the obstructions realized off the northwest end of the runway, grading and improving the terrain to accommodate a runway extension would likely remove these obstructions.

Runway 26

Currently, Runway 26 has four published straight-in instrument approach procedures and visibility minimums not lower than ¾-mile. **Exhibit 4F** illustrates two options for instrument approach procedures on Runway 26. Option 1 depicts the existing RPZ and safety areas for a not lower than ¾-mile visibility minimum approach associated with the ILS. As depicted, the RPZ extends beyond existing

Libby Army Airfield joint use property to include approximately 27.1 acres of mainly vacant land, which is desirable. Only the northeastern corner of the RPZ is penetrated by State Highway 90.

In Option 2, the RPZ would expand due to approach visibility minimums decreasing to ½-mile. This option is currently depicted on the airport's approved ALP. The proposed RPZ serving Runway 26 would extend farther east and encompass approximately 52.2 acres of land currently not contained on airport property. An approach lighting system is needed in order to achieve an approach providing less than ¾-mile visibility minimums. As a result, a medium intensity approach lighting system with runway alignment indicator lights (MALSR) is depicted off the end of Runway 26. This approach lighting system begins 200 feet from the landing threshold and extends approximately 2,400 feet into the approach area. A preliminary obstruction analysis, similar to that evaluated for Runway 12-30, was applied to a ½-mile visibility minimum approach serving Runway 26. There were no penetrations observed within the associated Part 77 approach surface, TSS, or departure surface.

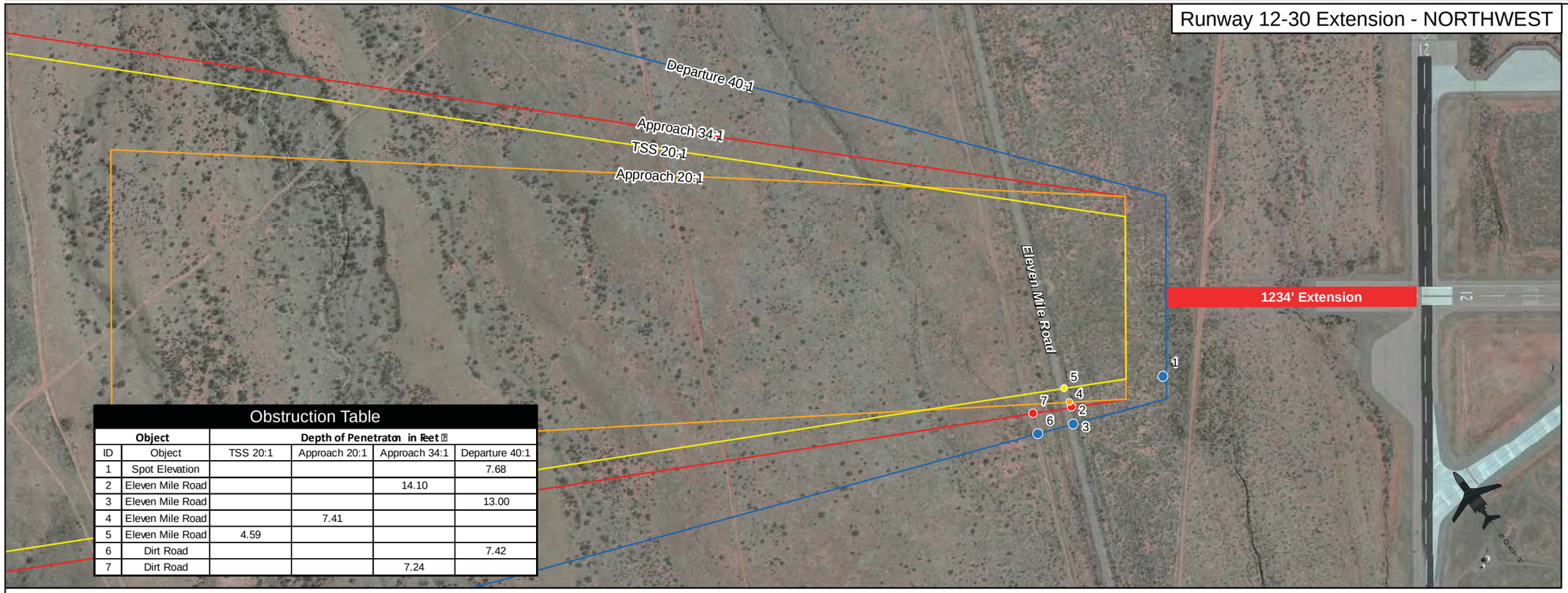
As previously discussed, the FAA has indicated that any changes to the runway environment should conform to an RPZ free of incompatible uses including public roads. Depicted in Option 2, a ½-mile visibility minimum approach would expand the RPZ over State Highway 90. Under FAA guidelines, there are three options for removing State Highway 90 from the proposed RPZ: reduce the runway length, move the highway, or displace the Runway 26 threshold and apply declared distance criteria.

Reducing the length of Runway 8-26 is not ideal and/or practicable as a sizable investment would be lost. Furthermore, its current length is needed to support large-scale military transport aircraft that operate at Libby Army Airfield on a regular basis. Relocating State Highway 90 to meet the RPZ standards for Runway 26 would also be costly. Finally, displacing the Runway 26 threshold and applying declared distances may be the simplest and least costly option; however, this may prove otherwise since this runway end is served by an ILS approach which would require the relocation of approach aids.

Although not depicted on the alternatives, a series of declared distances could apply to Runway 8-26 as a result of an expanded RPZ serving a ½-mile instrument approach procedure to Runway 26. Declared distances are the effective runway length that the airport operator declares available for take-off run, take-off distance, accelerate stop distance, and landing distance requirements. Pilots utilize these measurements in their runway length calculations. Furthermore, the Runway 26 landing threshold may need to be displaced in order to relocate the RPZ from extending over State Highway 90. This could also necessitate the need for the ILS glideslope antenna to be relocated, which can cost upwards of $1 million. These factors should be considered when evaluating the potential for improved instrument approach procedures on Runway 26, especially when the airfield experiences visual flight rules (VFR) weather conditions a large majority of the time.

While it is prudent to discuss potential ramifications associated with an RPZ extending over incompatible land uses per

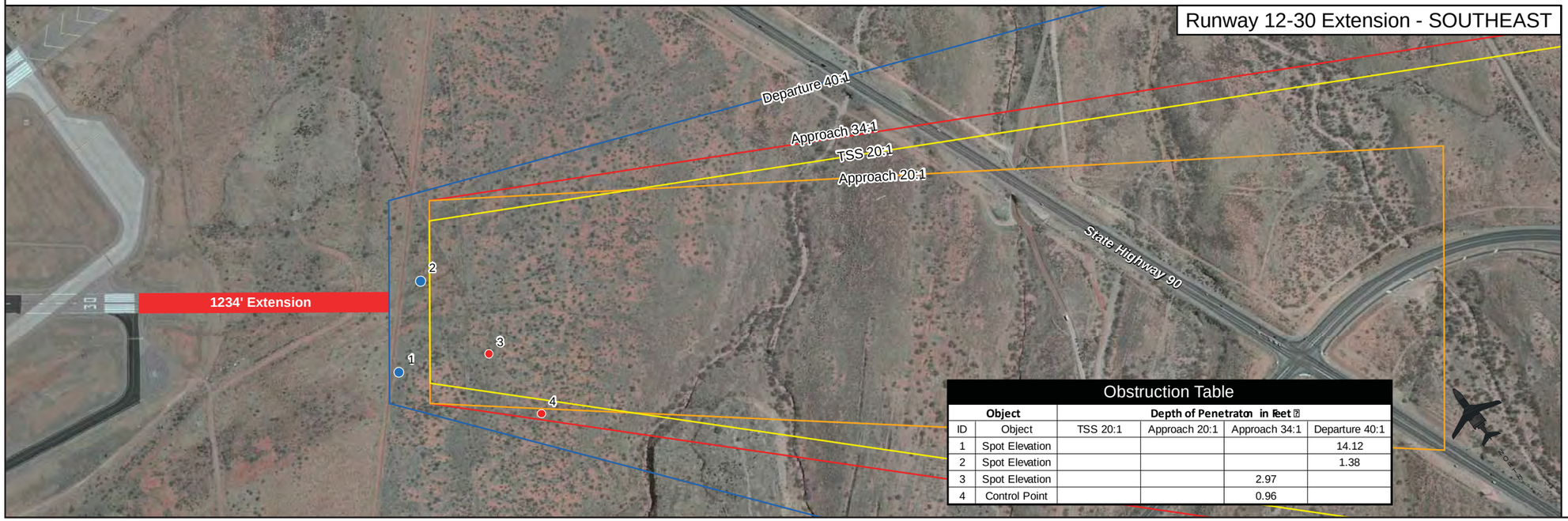
Runway 12-30 Extension - NORTHWEST



Obstruction Table

Object		Depth of Penetration in Feet			
ID	Object	TSS 20:1	Approach 20:1	Approach 34:1	Departure 40:1
1	Spot Elevation				7.68
2	Eleven Mile Road			14.10	
3	Eleven Mile Road				13.00
4	Eleven Mile Road		7.41		
5	Eleven Mile Road	4.59			
6	Dirt Road				7.42
7	Dirt Road			7.24	

Runway 12-30 Extension - SOUTHEAST



Obstruction Table

Object		Depth of Penetration in Feet			
ID	Object	TSS 20:1	Approach 20:1	Approach 34:1	Departure 40:1
1	Spot Elevation				14.12
2	Spot Elevation				1.38
3	Spot Elevation			2.97	
4	Control Point			0.96	

Legend

- TSS Obstruction
- Approach Obstruction
- Approach Obstruction
- Departure Obstruction
- TSS 20:1
- Option 1 Approach Surface (Not Lower than 1 Mile Visibility Minimums)
- Option 2 Approach Surface (Not Lower than 3/4 Mile Visibility Minimums)
- Departure Surface
- Runway Extension

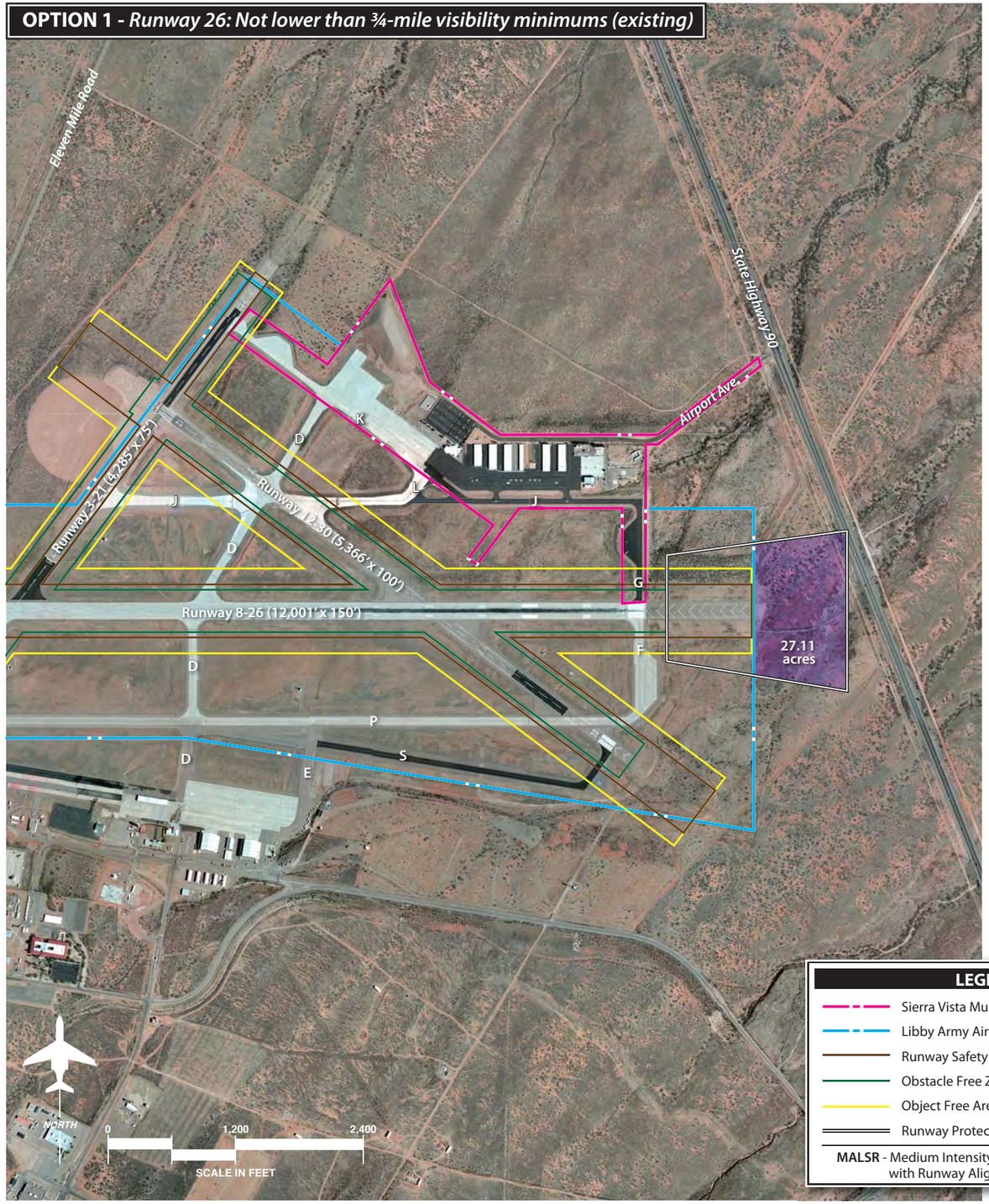
0 1,200

1" = 600'

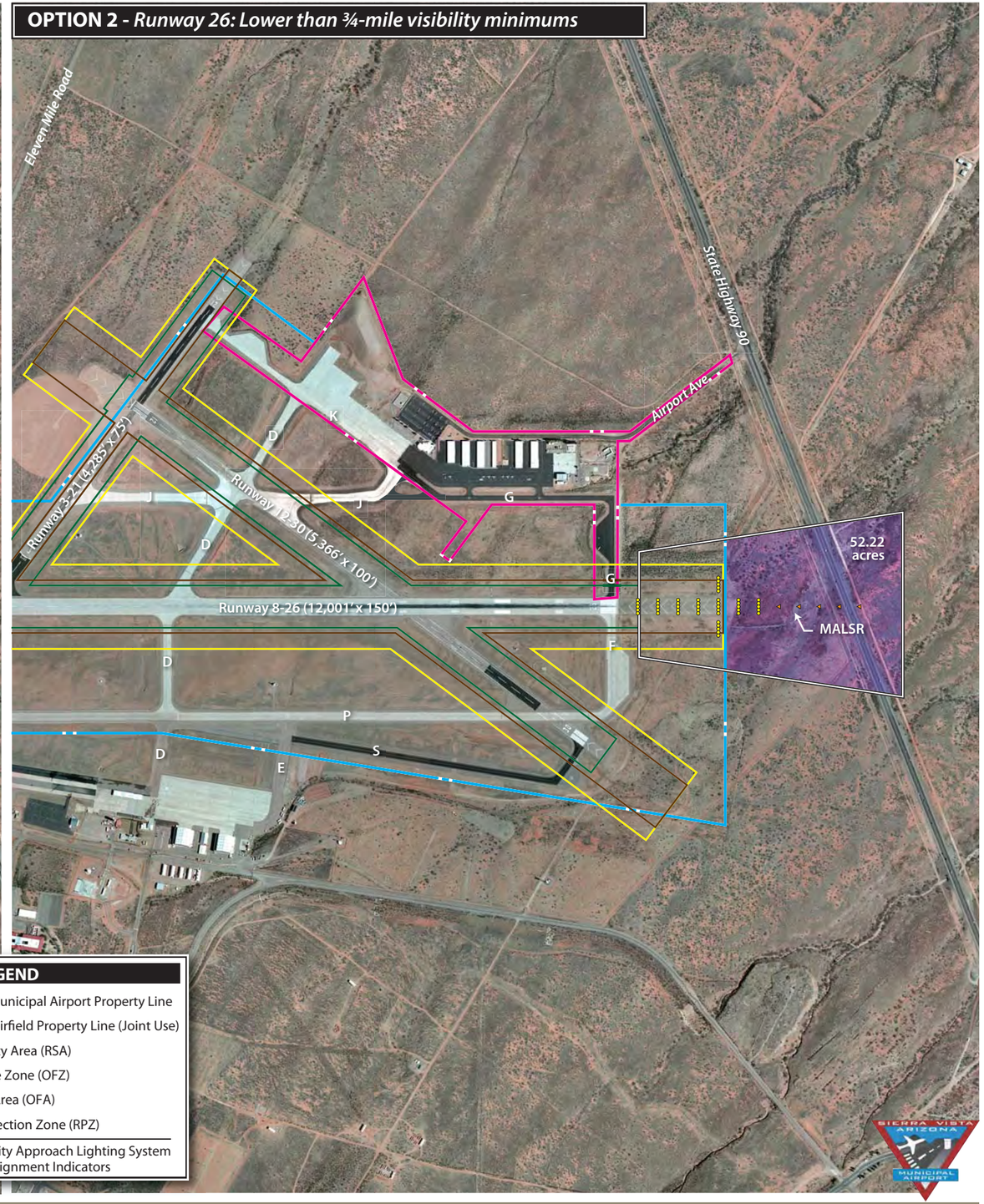
SIERRA VISTA ARIZONA MUNICIPAL AIRPORT

Exhibit 4E: OBSTRUCTIONS TO RUNWAY 12-30 EXTENSION

OPTION 1 - *Runway 26: Not lower than ¾-mile visibility minimums (existing)*



OPTION 2 - *Runway 26: Lower than ¾-mile visibility minimums*



LEGEND

- Sierra Vista Municipal Airport Property Line
- Libby Army Airfield Property Line (Joint Use)
- Runway Safety Area (RSA)
- Obstacle Free Zone (OFZ)
- Object Free Area (OFA)
- Runway Protection Zone (RPZ)

MALSR - Medium Intensity Approach Lighting System with Runway Alignment Indicators

Exhibit 4F: RUNWAY 26 STRAIGHT-IN APPROACH

FAA guidance contained in AC 150/5300-13, *Airport Design*, and draft AC 150/5300-13A, one must keep in mind that, ultimately, the runway and taxiway system and their associated safety areas are under the direct control of Libby Army Airfield and the Department of the Army and subject to standards that ultimately apply to military airfields. As such, any proposed airfield improvements would need to be coordinated and approved by Fort Huachuca and Libby Army Airfield personnel prior to implementation.

AIRSIDE SUMMARY

The airside alternatives have focused on three major elements that include improvements to existing and future taxiway development on the airfield, a potential runway extension on Runway 12-30, and improved instrument approach considerations to Runway 26 and Runway 12-30. These airside alternatives will be considered by the PAC. Following discussion and review, a preferred alternative, or a combination thereof, will be carried through in the recommended development concept to be presented in the next chapter.

LANDSIDE DEVELOPMENT CONSIDERATIONS

Generally, landside issues are related to those airport facilities necessary, or desired, for the safe and efficient parking and storage of aircraft, movement of passengers and pilots to and from aircraft, airport land use, and overall revenue support functions. Landside planning considerations, summarized on **Exhibit 4B**, will focus on facility locating strategies following a philosophy of separating activity levels. To maximize airport efficiency, it is important to locate facilities intended to serve similar functions. Due to the limited amount of developable land available at Sierra Vista Municipal Airport, consideration will also be given to only aviation-related uses that can provide additional revenue support to the airport and support economic development for the region.

AVIATION ACTIVITY LEVELS

The aviation development areas should be divided into high, medium, and low activity levels at the airport. The high activity area should be planned and developed to provide aviation services on the airport. An example of the high activity areas is the airport terminal building and adjoining aircraft parking apron, which provides tiedown locations and circulation for aircraft. In addition, large conventional hangars used for fixed base operators (FBOs), corporate aviation departments, or storing a large number of aircraft would be considered a high activity use area. The best location for high activity areas is along the flight line near midfield, for ease of access to all areas on the airfield. All major utility infrastructure would need to be provided to these areas.

The medium activity use category defines the next level of airport use and primarily includes smaller corporate aircraft that may desire their own box hangar storage on the airport. The best location for medium activity use is off the immediate flight line, but still readily accessible to aircraft including corporate jets. Due to an airport's layout and other existing conditions, if this area is to be located along the flight line, it is best to keep it out of the midfield area of the airport, so as to not cause congestion with transient aircraft utilizing the airport. Parking and

utilities, such as water and sewer, should also be provided in this area.

The low activity use category defines the area for storage of smaller single and multi-engine aircraft. Low activity users are personal or small business aircraft owners who prefer individual space in linear box hangars or T-hangars. Low activity areas should be located in less conspicuous areas. This use category will require electricity, but generally does not require water or sewer utilities.

In addition to the functional compatibility of the aviation development areas, the proposed development concept should provide a first-class appearance for Sierra Vista Municipal Airport. As previously mentioned, the airport serves as a very important link to the entire region, whether it is for business or pleasure. Consideration to aesthetics should be given high priority in all public areas, as the airport can serve as the first impression a visitor may have of the community.

Sierra Vista Municipal Airport is located on approximately 72 acres. In order to allow for maximum development of the airport while keeping with mandated safety design standards, it is very important to devise a plan that allows for the orderly development of airport facilities.

AIRCRAFT HANGAR DEVELOPMENT

Landside alternatives to follow will consider the construction of additional aircraft hangars at Sierra Vista Municipal Airport. Hangar development takes on a variety of sizes corresponding with several different uses.

Commercial general aviation activities are essential to providing the necessary services needed on an airport. This includes businesses involved with, but not limited to, aircraft rental and flight training, aircraft charters, aircraft maintenance, line service, and aircraft fueling. These types of operations are commonly referred to as FBOs. The facilities associated with businesses such as these include large conventional type hangars that hold several aircraft. High levels of activity often characterize these operations, with a need for apron space for the storage and circulation of aircraft. These facilities are best placed along ample apron frontage with good visibility from the runway system for transient aircraft. Utility services are needed for these types of facilities, as well as automobile parking areas.

The mix of aircraft using Sierra Vista Municipal Airport is expected to continue to include business class aircraft which have larger wingspans. These larger aircraft require greater separation distances between facilities, larger apron areas for parking and circulation, and larger hangar facilities.

Aircraft hangars used for the storage of smaller aircraft primarily involve T-hangars or linear box hangars. Since storage hangars often have lower levels of activity, these types of facilities can be located away from the primary apron areas in more remote locations of the airport. Limited utility services are needed for these areas.

Other types of hangar development can include box hangars for accommodating either one larger aircraft or multiple smaller aircraft. Typically, these types of hangars are used by corporations with

company-owned aircraft or by an individual or group of individuals with multiple aircraft. These hangar areas typically require all utilities and segregated roadway access. Currently, there is approximately 90,000 square feet of hangar space provided at Sierra Vista Municipal Airport made up of a combination of the hangar types previously discussed.

HELICOPTER OPERATIONS

Sierra Vista Municipal Airport currently accommodates helicopter operations, a large majority of which are related to emergency medical transport activities. Two helipads are located on the east side of the airport. Ideally, separate parking areas are provided to better segregate helicopter activity from fixed-wing aircraft. Such is the case at Sierra Vista Municipal Airport, as these helipads are situated on a separate parking apron east of fixed-wing aircraft operations.

AIR CARGO ACTIVITIES

Currently, there are no air cargo facilities at Sierra Vista Municipal Airport. As previously discussed, the airport is served by Ameriflight, an on-demand air cargo carrier that utilizes smaller commuter turboprops and multi-engine aircraft providing daily service to/from Phoenix Sky Harbor International Airport. Air cargo aircraft currently utilize a small portion of the parking apron immediately west of the terminal building. Trucks enter through a controlled access gate located adjacent to the northwest side of the terminal parking lot to access the parking apron to unload and pick up cargo.

The existing fleet of turboprops and multi-engine aircraft, currently operated by Ameriflight, should be capable of accommodating projected air cargo needs through the long term period of this study. As a result, no dedicated facility planning is analyzed for air cargo activities. In the event that hangars or other high activity general aviation functions

are situated in the area west of the terminal building, air cargo operations would need to be relocated. As such, the alternatives to follow consider certain portions of airport property for potential placement of these activities should they need to be relocated in the future.

U.S. FOREST SERVICE

The U.S. Forest Service operates seasonally at Sierra Vista Municipal Airport/Libby Army Airfield in order to provide fire suppression needs to the region. The majority of these operations occur on the south side of the airfield; however, in order to better segregate these activities from high volume military operations that also occur on the south of Runway 8-26, the landside alternatives evaluate portions of property on Sierra Vista Municipal Airport to accommodate the needs of the U.S. Forest Service.

LANDSIDE ALTERNATIVES

Currently, land east of the terminal building is comprised of an array of aviation-related functions including a series of aircraft storage hangars, dedicated aircraft parking areas, an aircraft maintenance facility, fuel farm, helipads and associated on-site emergency medical operations, and a parcel of property dedicated to the Civil Air Patrol. This combination of facilities and activities leaves little space for future aviation development on the east

side of the airport. As a result, three landside alternatives have been examined for Sierra Vista Municipal Airport that focus on the remaining developable property northwest of the terminal building. Based on forecast airport activity presented in Chapter Two of this study, this area could support the projected demand through the long term planning period.

The alternatives to be presented are not the only options for development. In some cases, a portion of one alternative could be intermixed with another. Also, some development concepts could be replaced with others. The final recommended plan only serves as a guide for the airport. Many times, airport operators change their plan to meet the need of specific users. The goal in analyzing landside development alternatives is to focus future development so that airport property can be maximized.

Landside Alternative A

Landside Alternative A, as depicted on **Exhibit 4G**, proposes a series of five conventional hangars extending northwest of the terminal building. With their proposed location adjacent to the large aircraft parking apron, the hangars could handle a high volume of aircraft activity associated with FBO or other specialty aviation operations, such as corporate flight departments, aircraft maintenance and avionics, or flight training. Vehicle access to at least two of these hangars would already be provided by the terminal parking lot located directly north. Extending a roadway and parking spaces to the northwest would provide access to the three other proposed conventional hangars.

In order to provide aircraft access to remaining portions of developable property, a taxiway is proposed extending north of the aircraft parking apron that would lead to separate box hangar and T-hangar/linear box hangar development. Seven box hangars are depicted that could accommodate corporate flight departments that possess aircraft, or an individual or group of individuals, that have multiple aircraft. Northwest of these box hangars, four separate hangars are considered that would satisfy projected aircraft storage demand well into the future. These T-hangars/linear box hangars typically are utilized exclusively for low activity private aircraft storage, and are ideally segregated from the main aircraft parking and circulation areas. Vehicle access to proposed landside development depicted could be provided by extending a road northwest of the terminal parking area.

In order to accommodate air cargo activities in the event that conventional hangars are constructed west of the terminal building, Landside Alternative A considers relocating air cargo activities farther northwest. As proposed, these activities that would occupy a small portion of the existing aircraft parking apron. The roadway extension serving conventional hangar development would lend truck access to/from the cargo aircraft. This location would be easily accessible for the aircraft that are operated by Ameriflight, such as the Beech 1900 and King Air 200.

Moving farther northwest, a 2.3-acre parcel is depicted that could support specialty aviation operations such as those related to the U.S. Forest Service. Adequate space is available to build hangar and operations facilities that would be provided immediate access to the aircraft parking

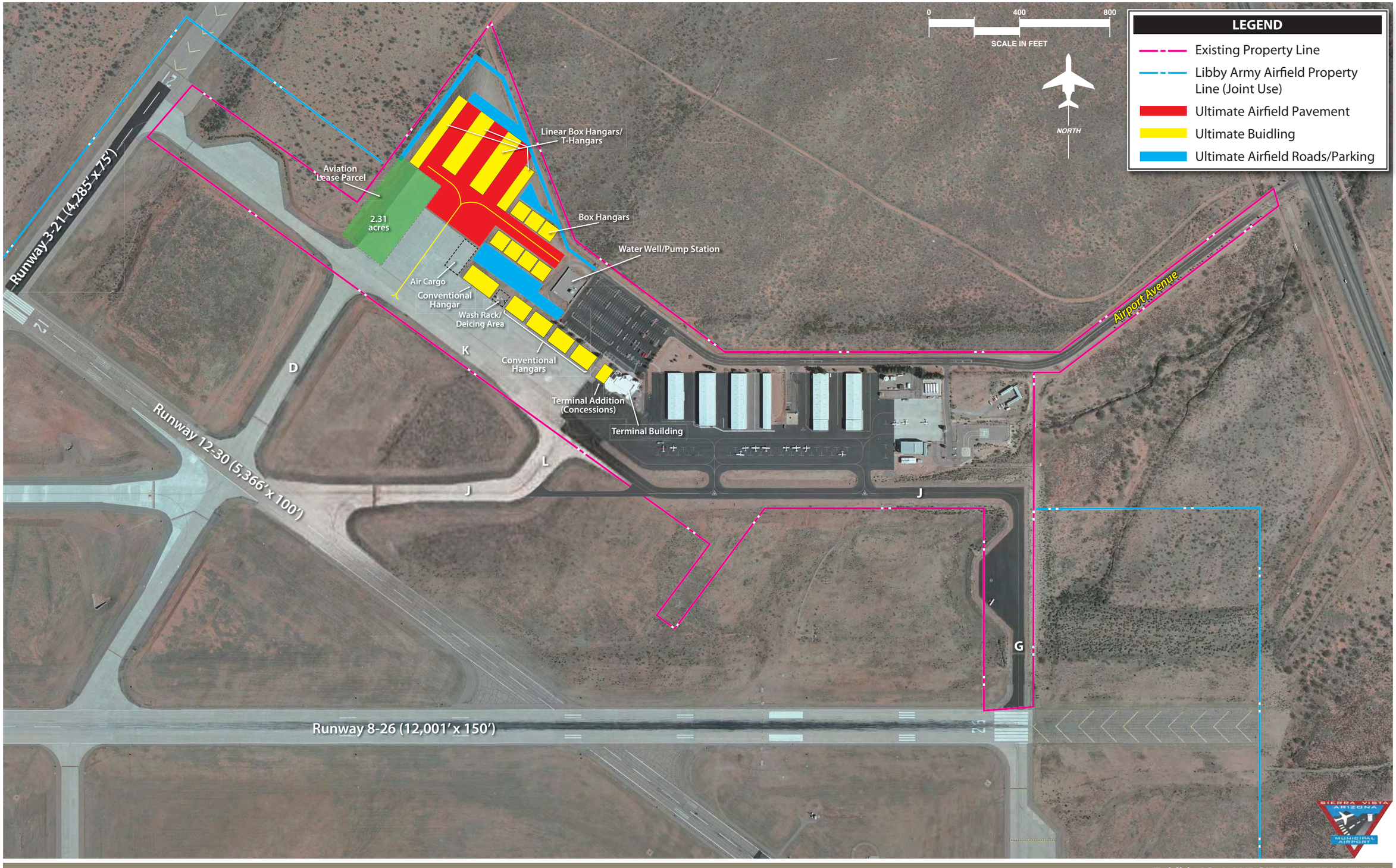


Exhibit 4G: LANDSIDE ALTERNATIVE A

apron. In turn, aircraft would have desirable access to the runway and taxiway system on the airfield, which is required for their operations. A roadway extending around the edge of airport property would lead to this lease parcel.

Finally, this alternative dedicates a portion of land adjacent to the northwest side of the terminal building for expansion that could support public concessions such as a restaurant. Analysis in Chapter Three indicated that the existing terminal facility provides adequate space to accommodate existing and future general aviation demands through the next 20 years. In fact, the facility encompasses almost double the space that is programmed for actual need. As such, another option would be to remodel existing portions of the building in order to lease to a private entity that may be interested in providing concessions on the airport. In either case, an expansion or remodel to the facility to accommodate such activity would need local funding, as federal and state grant eligibility would not be available.

Landside Alternative B

Exhibit 4H depicts Landside Alternative B, which follows the principal philosophy to group facilities supporting similar activity levels together. In this alternative, two large conventional hangars are proposed northwest of the terminal building adjacent to the main aircraft parking apron. These hangars could support an array of aviation activities that could accommodate aircraft ranging from small single engine piston to large business jets. The existing terminal parking lot could satisfy vehicle demands for one hangar. Additional road and parking access is proposed for the second hangar.

With this alternative, two separate taxiways are shown extending north from Taxiway K leading to future aviation development. One taxiway is proposed adjacent to the northwest of the existing wash rack/deicing area that would provide aircraft access to two conventional hangars and four box hangars. These facilities could support FBO and specialty aviation operations in addition to bulk aircraft storage.

The second taxiway would extend into a more remote area on the airport that would provide access to lower activity aviation functions primarily in the form of aircraft storage. Six separate box hangars and two T-hangars/linear box hangars are depicted in this area.

A dedicated air cargo bay is located in the same area as in the previous alternative. The only difference is in how the air cargo area is accessed by vehicle traffic. In this alternative, a road extending from the west would provide access to the air cargo operations area in addition to the box hangars depicted. Similar to Landside Alternative A, this alternative also shows a 2.3-acre parcel on the northwest side of the airport that could provide additional revenue to the airport, while being able to accommodate the needs of a specialty aviation operator such as the U.S. Forest Service.

Landside Alternative C

Exhibit 4J depicts the final landside alternative for this study. Similar to the previous alternatives, a series of conventional hangars are proposed immediately northwest of the terminal building that could accommodate high activity aviation functions.

Similar to Alternative B, two taxiways are proposed extending north of Taxiway K. One is shown leading to an area comprised of five separate box hangars and two T-hangars/linear box hangars. A combination of roads and vehicle parking would be provided extending northwest of the terminal parking lot. In addition, this road would lead to the relocated air cargo operations area on the parking apron.

The second taxiway extends off the northwest corner of the parking apron and would provide aircraft access to a 2.5-acre parcel that is large enough to support an array of aviation-related activities. The segregation of the proposed aviation lease parcel is given higher priority than in the alternatives previously depicted. As a result, a larger portion of developable property on the northwest side of the airport is dedicated to this cause, which could be desirable for a large-scale operator such as the U.S. Forest Service, that operates not only fixed-wing aircraft but also helicopters. In doing so, Alternative C does not propose as much hangar development as in the other landside alternatives.

LANDSIDE SUMMARY

Landside facility layout should follow basic industry standards, such as locating high activity hangars on or near main apron areas with desirable access to the runway and taxiway system. Medium activity box hangars should then be set back from the flight line, and low activity T-hangars/linear box hangars should be farthest from the flight line. Sustainability in planning should also be considered by such means as maximizing available land area and limiting the need to extend utilities.

Each of the landside alternatives follows these basic airport planning principles primarily by utilizing vacant airport property located northwest of the developed terminal area. This property provides adequate space to easily accommodate forecast growth in based aircraft at the airport through the long term planning period of this Master Plan. Only under some unpredictable circumstance, such as the addition of a very large commercial aviation operator to the field, would the full build-out of this development area be necessary within the foreseeable future.

As discussed in Chapter Three, the airport is forecast to need approximately 59,400 square feet of additional hangar space through the long term planning horizon. When combined with the 90,000 square feet of existing hangar area, this would provide a total of 149,400 square feet of hangar space at the airport. **Table 4A** presents a summary of the total hangar area proposed for each alternative. Landside Alternatives A and B each provide approximately 150,000 square feet of additional hangar space. The main difference between these two alternatives is in the number of taxiways that would provide aircraft access to proposed hangar development. Alternative A calls for one taxiway, and Alternative B presents two taxiways. As previously mentioned, Alternative C proposes considerably less space, but in doing so, allows for additional land and better segregation related to a lease parcel that could satisfy the needs of a large-scale specialty aviation operator. While the long term vision for each alternative exceeds the 20-year forecast need, the potential layouts presented allow development to follow a phased approach for each hangar type.

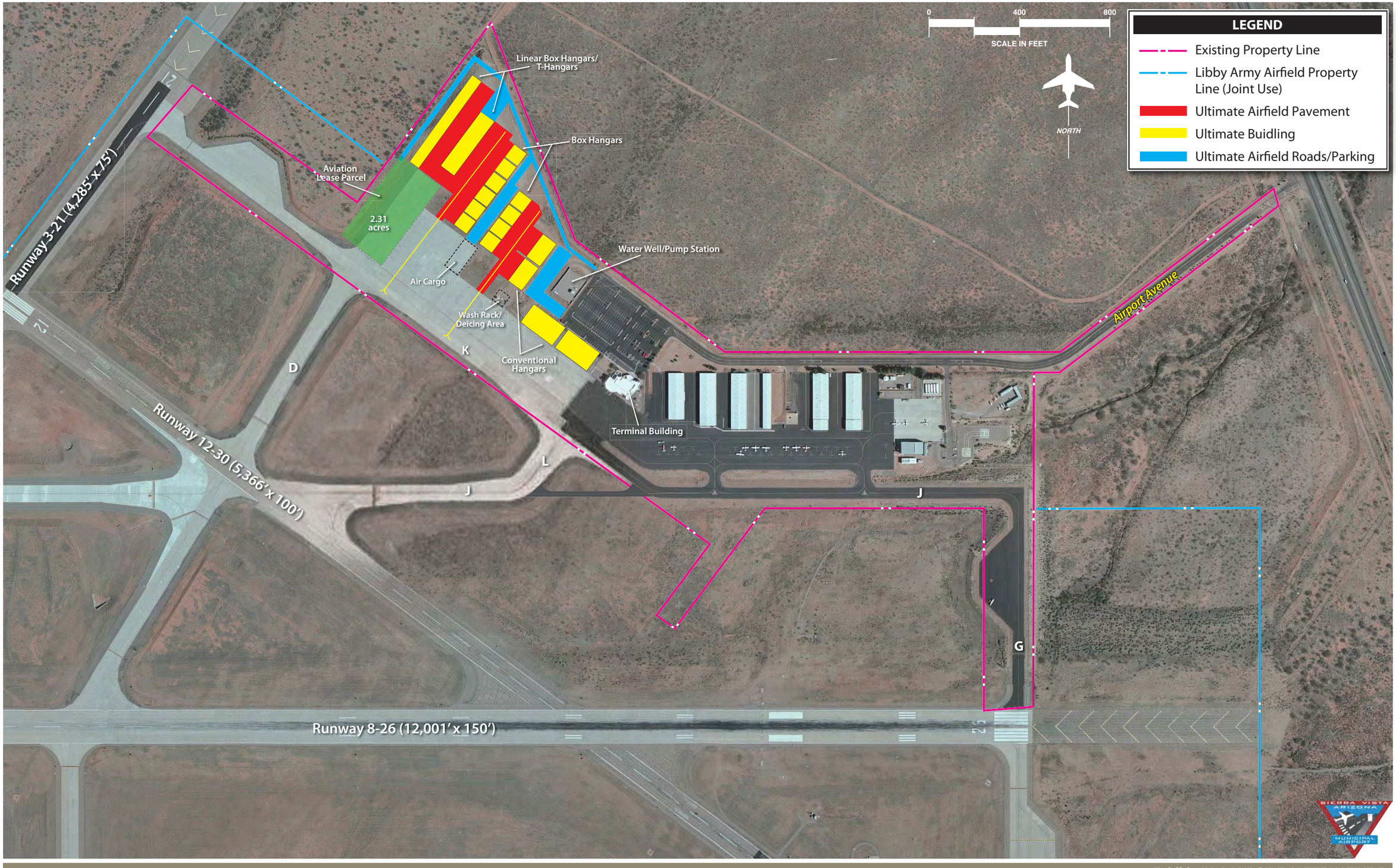


Exhibit 4H: LANDSIDE ALTERNATIVE B

Exhibit 4J: LANDSIDE ALTERNATIVE C

TABLE 4A
Landside Hangar Summary
Sierra Vista Municipal Airport

	Alternative A	Alternative B	Alternative C
T-Hangar/Linear Box Hangar	41,200	46,000	30,000
Separate Box Hangar	34,300	49,000	24,500
Conventional Hangar	74,500	52,500	24,000
Total Square Feet	150,000	147,500	78,500

Source: Coffman Associates analysis

SUMMARY

The process utilized in assessing the airside and landside development alternatives involved a detailed analysis of short and long term requirements, as well as future growth potential. Safety, both in the air and on the ground, was given a high priority in the analysis of alternatives. Every effort has been made to meet design standards for the types of aircraft that are expected to utilize Sierra Vista Municipal Airport/Libby Army Airfield.

After an appropriate review is made and input is gathered, a recommended concept will be developed by the consultant. The resultant plan will represent an airside facility that fulfills safety standards, capacity, and efficiency on the airfield, and a landside complex that can be developed as demand dictates. The development must represent a means by which the airport can evolve in a balanced manner, both on the airside and landside, to accommodate the forecast demand. In addition, the plan must provide flexibility to meet activity growth beyond the long range planning horizon where possible. The following chapters will be dedicated to refining the basic concept into a final plan with recommendations to ensure proper implementation and timing for a demand-based program.

Chapter Five

RECOMMENDED DEVELOPMENT

CHAPTER FIVE

Recommended Development

The Airport Master Plan study for Sierra Vista Municipal Airport has included the development of aviation demand forecasts, an assessment of future facility needs, and the evaluation of airport development alternatives to meet those future facility needs. The planning process has included the development of draft working papers. These have been presented to the Planning Advisory Committee (PAC), which is comprised of several constituents with an investment or interest in Sierra Vista Municipal Airport. Furthermore, a series of Public Information Workshops are being conducted as a part of this planning process that allows the general public an opportunity to be involved and educated about the study.

As previously detailed, Sierra Vista Municipal Airport, in conjunction with Fort Huachuca, maintains a presence at Libby Army Airfield. Together, these entities make up the military/civilian joint-use facility that exists on the airfield. As such, it is important that Fort Huachuca and Libby Army Airfield officials be involved in the master planning process, resulting in a coordinated effort to further improve Sierra Vista Municipal Airport/Libby Army Airfield while meeting the development goals of the both the City of Sierra Vista and Fort Huachuca.

In the previous chapter, several alternatives were analyzed to explore different options for the future growth and development of the airport. Each alternative provided a differing approach to facility development, and the layouts were presented for the purposes of evaluation. Since then, the airport alternatives have been refined into a single development concept for the Master Plan, which is included for presentation in this chapter.

An objective of this planning effort is to equip decision-makers with the ability to either accelerate or slow development goals based on actual demand. If demand slows, the obvious result would be minimized development of the airport beyond routine airport safety and maintenance. If, however, aviation demand accelerates, development could need to be expedited.

Any plan can account for limited or no development, but the lack of a plan for accelerated growth can sometimes be challenging for decision-makers. Therefore, to ensure flexibility in planning and development in order to respond to unforeseen needs, the Master Plan Concept considers the full and balanced development potential of Sierra Vista Municipal Airport.

MASTER PLAN CONCEPT

The Master Plan Concept preserves the current nature of the airport by maintaining the focus on supporting the full range of general aviation and air cargo activities that the airport accommodates. In addition, the recommended plan accounts for military activity associated with Fort Huachuca and Libby Army Airfield, in particular, those related to missions involving unmanned aerial systems (UAS). Furthermore, it represents an ultimate configuration for the airport that meets Federal Aviation Administration (FAA) and Arizona Department of Transportation – Multi-Modal Planning Division – Aeronautics Group (ADOT-MPD – Aeronautics Group) design and safety standards and provides landside development options to meet increasing demands on the airport by different aviation activities.

When assessing development needs, this study has separated the airport system into airside and landside functional areas. Airside components relate to runways, taxiways, navigational aids, etc., and require the greatest commitment of land area to meet the physical layout of the airport. Landside components include hangars, aircraft parking aprons, terminal services, as well as the utilization of remaining airport property to provide revenue support and to benefit the economic development and well-being of the regional area.

The Master Plan Concept is a consolidation of these airside and landside functions as depicted on **Exhibit 5A**. A phased program to implement this development concept will be presented in Chapter Six. The following sections will describe, in narrative and graphic form, the recommended plan for the future use of Sierra Vista Municipal Airport.

AIRSIDE DEVELOPMENT CONCEPT

The major airside issues addressed in the Master Plan Concept include the following:

- Adhere to ultimate Airport Reference Code (ARC) / Runway Design Code (RDC) E-V design standards on Runway 8-26, C-III design standards on Runway 12-30, and B-II design standards on Runway 3-21.

- Extend Taxiway J farther west serving the full length of Runway 8-26.

- Improve safety area deficiencies that currently exist on the airfield.

- Extend Runway 12-30 2,634 feet to the northwest to enable a larger portion of the general aviation fleet mix to utilize the runway when needed in

LEGEND

- Sierra Vista Municipal Airport Property Line
- Libby Army Airfield Property Line (Joint Use)
- Runway Safety Area (RSA)
- Obstacle Free Zone (OFZ)
- Object Free Area (OFA)
- Runway Protection Zone (RPZ)
- Future Airfield Pavement
- Future Road
- Acquire Property Interest

KEY

- **AWOS** - Automated Weather Observation System
- **ASR** - Airport Surveillance Radar
- **ATCT** - Airport Traffic Control Tower
- **MALSR** - Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights
- **PAPI** - Precision Approach Path Indicator
- **REIL** - Runway End Identification Lights
- **RPZ** - Runway Protection Zone
- **VOR** - Very High Frequency Omni-directional Range

Relocated Eleven Mile Road
Eleven Mile Road
Hold Apron
Parallel Taxiway K Extension
500' Overrun
2,634' Extension
1,025'
REILs
PAPI-2
Ultimate Libby Army Airfield Property Line (Joint Use)
AWOS Access Road
ASR Equipment
Existing AWOS
Hold Apron
Parallel Taxiway J Extension
1,033'
Libby VOR
PAPI-2
REILs
Runway 3-21 (4,285' x 75')
Runway 12-30 (5,366' x 100') Ultimate (8,000' x 100')
Runway 8-26 (12,001' x 150')
Airport Ave
State Highway 90
52.22 acres
MALSR
Relocated Wind Cone
Departure RPZ
ATCT
Relocated Wind Cone
Relocated Wind Cone
NORTH
0 1,200 2,400
SCALE IN FEET

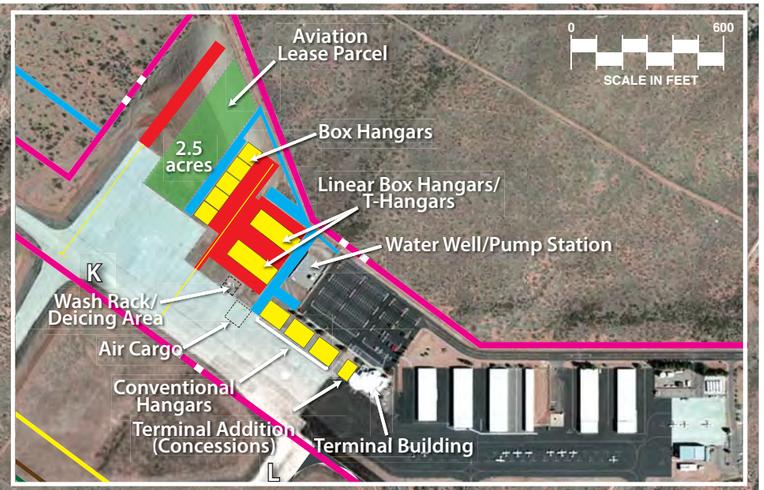


Exhibit 5A: MASTER PLAN CONCEPT

addition to better meeting the ultimate goals of Fort Huachuca and Libby Army Airfield.

- Construct additional taxiways to provide enhanced safety and efficiency on the airfield.

- Implement an approach lighting system on Runway 26.

- Establish straight-in instrument approach procedures on Runway 12-30.

- Upgrade lighting, marking, and visual approach aids on the runway and taxiway systems.

Airfield Design Criteria

The design of numerous airfield elements such as runway length, runway safety area (RSA), object free area (OFA), obstacle free zone (OFZ), runway protection zones (RPZs), as well as various setbacks are based on the applicable airfield design categories which were described in Chapters Three and Four. The ARC system has traditionally been utilized to relate airport design requirements to the physical (wingspan and tail height) and operational (approach speed) characteristics of the largest and fastest aircraft conducting 500 or more operations annually at the airport.

The FAA is transitioning into a new design guidance document as detailed in the previous chapter (Advisory Circular [AC] 150/5300-13A, *Airport Design*). This document introduces new terminology that is used in conjunction with the ARC classification to include the RDC, which is the code that signifies the design standards to which a runway is to be built. As a joint-use facility, development on the airfield is also subject to military design and safety standards.

Analysis in Chapter Three concluded that Sierra Vista Municipal Airport/Libby Army Airfield is presently used by a wide range of general aviation, air cargo, and military aircraft. The majority of the general aviation fleet mix include single and multi-engine aircraft which fall into ARC/RDC A-I and B-I categories. In addition, larger business jets that fall within approach categories B, C, and D and airplane design groups (ADGs) II and III also utilize the airport, but on a less frequent basis.

As detailed in Chapter Two, since 2005 military aircraft have accounted for approximately 75 percent of total annual operations on the airfield. The airport experiences a wide variety of military activity ranging from smaller fighter jets up to large wide-body refueling and cargo aircraft. In addition, UAS operations are prevalent on the airfield with Fort Huachuca being home to a UAS test center.

When considering existing military activity at the airport, the airport's current ARC falls in E-V. The Master Plan anticipates that military aircraft operations will continue to determine the ultimate ARC at Sierra Vista Municipal Airport/Libby Army Airfield. As a result, primary Runway 8-26 should be planned and designed to ARC/RDC E-V standards to accommodate the most demanding ultimate design aircraft given that its length of 12,001 feet is capable of handling the full array of military, air cargo, and general aviation fleet mixes. Runways 12-30 and 3-21 will continue to accommodate general aviation aircraft as well as some air cargo operations; however, their lengths will limit the use of larger business jets and the majori-

ty of military aircraft. As a result, Runway 12-30 will be ultimately planned to ARC/RDC C-III standards, while Runway 3-21 should conform to ARC/RDC B-II standards. **Table 5A** presents the design standards to be applied to the ultimate airfield configuration at Sierra Vista Municipal Airport/Libby Army Airfield based upon FAA design standards.

TABLE 5A
Ultimate Airfield Planning Design Standards
Sierra Vista Municipal Airport/Libby Army Airfield

	Runway 8-26	Runway 12-30	Runway 3-21
Runways			
Design Category	ARC/RDC E-V	ARC/RDC C-III	ARC/RDC B-II
Approach Visibility Minimums	≥ 3/4-mile - Rwy 8 1/2-mile - Rwy 26	≥ 1-mile – Both Ends	≥ 1-mile – Both Ends
Runway Safety Area			
Width (feet)	500	500	150
Length Beyond Runway End (feet)	1,000	1,000	300
Object Free Area			
Width (feet)	800	800	500
Length Beyond Runway End (feet)	1,000	1,000	300
Obstacle Free Zone			
Width (feet)	400	400	400
Length Beyond Runway End (feet)	200	200	200
Precision Obstacle Free Zone	Both Ends		
Width (feet)	800	N/A	N/A
Length Beyond Runway End (feet)	200	N/A	N/A
Runway Protection Zone	Rwy 8 / Rwy 26	Both Ends	Both Ends
Inner Width (feet)	1,000 / 1,000	500	500
Outer Width (feet)	1,510 / 1,750	1,010	700
Length (feet)	1,700 / 2,500	1,700	1,000
Runway Centerline to:			
Holding Positions (feet)	327*	250	250**
Parallel Taxiway Centerline (feet)	1,033***	1,025***	240
Taxiways			
Width (feet)	75	50	35
Safety Area Width (feet)	214	118	79
Object Free Area Width (feet)	320	186	131
Taxiway Centerline to:			
Fixed or Moveable Object (feet)	160	93	65.5

* In the event Runway 26 is served by ½-mile visibility minimums. A separation of 297 feet from the runway centerline is required for ¾-mile visibility minimums that currently exist.
** Represents the actual separation distance which exceeds the 200-foot requirement for ARC/RDC B-II design.
*** Represents the actual separation distance which exceeds FAA design standard requirements.

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

Runway 8-26

Runway 8-26 is currently 12,001 feet long by 150 feet wide and serves as the primary runway at Sierra Vista Municipal Airport/Libby Army Airfield. Analysis in the previous chapter included improvements to the runway in the form of improved approach visibility minimums on Runway 26. Currently, Runway 26 has four published straight-in instrument approach procedures and visibility minimums not lower than ¾-mile.

Exhibit 5A shows the installation of a medium intensity approach lighting system with runway alignment indicator lights (MALSR) that would allow for approach visibility minimums below ¾-mile. As noted previously, Runway 26 is the primary runway at the airport due to prevailing wind conditions. The MALSR would further complement the primary runway use as well as the precision instrument landing system (ILS) approach serving Runway 26. It should be noted that the implementation of a MALSR serving Runway 26 is depicted on the airport's approved Airport Layout Plan (ALP).

In the event that visibility minimums were to go below ¾-mile, the proposed RPZ serving Runway 26 would expand. In a memorandum dated September 27, 2012, entitled *Interim Guidance on Land Uses Within a Runway Protection Zone*, the FAA indicates that any changes to the runway environment as a result of a new or revised instrument approach procedure that increases the RPZ dimensions should conform to an RPZ free of incompatible land uses including public roads/highways. As depicted on the development concept, the ½-mile visibility minimum approach would expand the RPZ over State Highway 90.

In Chapter Four, three options for removing State Highway 90 from the proposed RPZ were discussed. These options included moving the highway, reducing the runway length, or displacing the Runway 26 threshold and applying declared distances. It was determined that none of these were viable solutions as it would be very costly to relocate State Highway 90 and the current runway length is needed to support large-scale military transport aircraft that operate at Libby Army Airfield on a regular basis. If its implementation would require any reduction in runway length, either physical or through a displaced threshold and declared distances, it may not be in the best interest of the City of Sierra Vista or Libby Army Airfield to pursue this improvement. In any event, future coordination with the FAA and Libby Army Airfield officials will be needed as it relates to the potential implementation of a MALSR on Runway 26.

As previously mentioned, the RPZ associated with a precision instrument approach containing Category I minimums (200-foot cloud ceilings and ½-mile visibility minimums) is larger than the RPZ currently required for Runway 26. **Exhibit 5A** depicts the larger RPZ beyond the runway and identifies approximately 52.2 acres of land that should be acquired to protect the RPZ from incompatible development. Besides State Highway 90, this property is controlled by the Fort Huachuca Military Reservation/ Department of the Army. If the RPZ were to expand to accommodate Category I minimums, it is recommended that the City of Sierra Vista and/or Libby Army Airfield gain control over these areas through at least an easement.

Two wind cones (one serving each runway end) are currently situated within 200 feet of the Runway 8-26 centerline.

As such, they serve as penetrations to the RSA. The Master Plan Concept depicts the relocation of these wind cones outside the RSA and associated OFA. Further coordination with Libby Army Airfield officials will be needed prior to their relocation.

Runway 12-30

The development concept includes an extension to Runway 12-30 and partial parallel Taxiway K 2,634 feet northwest to provide a total runway length of 8,000 feet. A 500-foot paved overrun is also considered with this extension. Runway 12-30 should be planned to accommodate a large majority of aircraft in the event that primary Runway 8-26 is closed for maintenance or emergencies. Extending this runway to better meet the needs of general aviation aircraft would enhance airfield capacity and better segregate military and civilian operations since Runway 8-26 is predominantly utilized by the military. Runway 12-30's current length of 5,366 feet limits business jet and larger turboprop aircraft, especially during the summer months when temperatures exceed 90 degrees Fahrenheit (F).

While **Exhibit 5A** depicts an ultimate runway length of 8,000 feet, analysis in Chapter Three indicated that in order to meet the needs of general aviation aircraft, an optimal length of 6,600 feet should be considered on Runway 12-30. Libby Army Airfield officials have further indicated an ultimate need of up to 8,000 feet to accommodate special military operations that could be associated with this runway in the future. Chapter Six will provide further details as to the phasing of the potential runway and associated taxiway extension.

It is important to note that any capital expenditures required to meet the needs of general aviation aircraft will require specific justification. The FAA typically stipulates that if a runway extension is planned, documentation of 500 annual itinerant operations of the design aircraft will be required. There are several methods to track aircraft activity. In Chapter Three, business jet activity was collected from an online database maintained by the FAA. The FAA has recently made available a more comprehensive database called Traffic Flow Management Systems Counts (TFMSC), which documents flight plans filed (the ETMSC database used in preparing Table 3D was renamed to the TFMSC). This is a public database accessible at: http://aspm.faa.gov/tfms/sys. There are also several user subscription services that offer similar services but require payment for access. The airport fixed base operator (FBO) can also track individual activity by business jets. This would be recommended as some aircraft operating under visual flight rules (VFR) may not be documented in the FAA database. Finally, letters from operators addressing their runway needs can provide supporting documentation for justification of FAA participation.

It should be noted that, although 12,001 feet of length provided on Runway 8-26 accommodates the entire general aviation fleet mix that would operate at Sierra Vista Municipal Airport, additional consideration should be given to being able to better segregate military and civilian operations. Fort Huachuca and Libby Army Airfield officials have indicated that military activity related to the UAS missions are expected to increase in the future, thereby putting additional demand on Runway 8-26. Having a secondary

runway that is capable of satisfying a large majority of the general aviation fleet mix would increase safety and enhance capacity on the airfield. It will be important that the airport work with FAA and Libby Army Airfield officials to ensure funding assistance for a future runway extension project is properly vetted.

In order to accommodate a 2,634-foot extension on Runway 12-30, Eleven Mile Road would need to be relocated. **Exhibit 5A** depicts a proposed route for the road that keeps it clear of all safety areas associated with the runway extension.

In Chapter Four, an obstruction analysis was performed to identify any known obstructions that penetrate an approach or departure associated with a proposed 1,234-foot northwesterly extension on Runway 12-30 that would provide an ultimate length of 6,600 feet. Additional analysis has been done to determine if any obstructions are present on a 2,634-foot northwesterly extension as depicted on the Master Plan Concept. As presented on **Exhibit 5B**, an obstruction analysis was performed for two different instrument approach procedures on Runway 12. Option 1 includes the 20:1 Part 77 approach surface that applies to a not lower than one-mile visibility minimum approach. Option 2 considers a 34:1 approach surface that would be associated with a not lower than ¾-mile visibility minimum instrument approach. The 20:1 threshold siting surface (TSS) and 40:1 departure surface apply to both approach options. As depicted, the analysis indicates that there are no obstructions within the approach and departure surfaces outlined. Further determination by the FAA would be needed in order to implement an instrument approach procedure on Runway 12.

Additional improvements on Runway 12-30 include mitigating a safety area deficiency in the form of a wind cone located approximately 150 feet from the Runway 12-30 centerline near the Runway 30 threshold. The Master Plan Concept considers relocating the wind cone outside the RSA and OFA.

Runway 3-21

Runway 3-21 should be maintained in its existing condition in order to provide an alternative means of accessing Sierra Vista Municipal Airport during those times when wind conditions may warrant its use. The 4,285 feet of length provided on the runway limits its use to primarily smaller general aviation aircraft.

The Master Plan Concept includes the installation of runway end identification lights (REILs) on both ends of the runway. This will provide pilots with the improved ability to distinguish the runway ends during nighttime conditions. Furthermore, two-box precision approach path indicator (PAPI-2) systems are proposed to serve each runway end. These systems provide pilots with visual guidance information during landings to the runway. Upon implementation of the REILs and PAPI-2s on Runway 3-21, all six runway ends at the airport would be provided with REIL and PAPI systems.

Taxiways

Chapter Three indicated that by the end of the planning period, total annual operations are expected to represent approximately 72 percent of the airfield annual service volume (ASV). The FAA indicates that improvements to airfield capacity

should be considered when operations reach 60 to 75 of the ASV. The following taxiway improvements being proposed on the Master Plan Concept would improve airfield capacity and efficiency.

Exhibit 5A shows the extension of Taxiway J approximately 6,700 feet to the west, serving the north side of primary Runway 8-26. Upon completion, Taxiway J would extend the full length of Runway 8-26 and better serve aircraft associated with Sierra Vista Municipal Airport. Due to a decreased need for aircraft having to cross Runway 8-26 (especially civilian aircraft desiring to utilize Sierra Vista Municipal Airport), capacity and safety on the airfield would be increased. According to Libby Army Airfield officials, Taxiway P, which currently serves as the only full-length parallel taxiway to Runway 8-26, is periodically closed to meet the mission of the military. During these times, having a full-length parallel taxiway, such as Taxiway J, on the north side of the runway, would allow full use of Runway 8-26 without aircraft having to back-taxi. Furthermore, the proposed taxiway extension would better segregate military and civilian operations while increasing security specific to military activity on the south side of the airfield, as civilian activity would be confined to the north side of the runway.

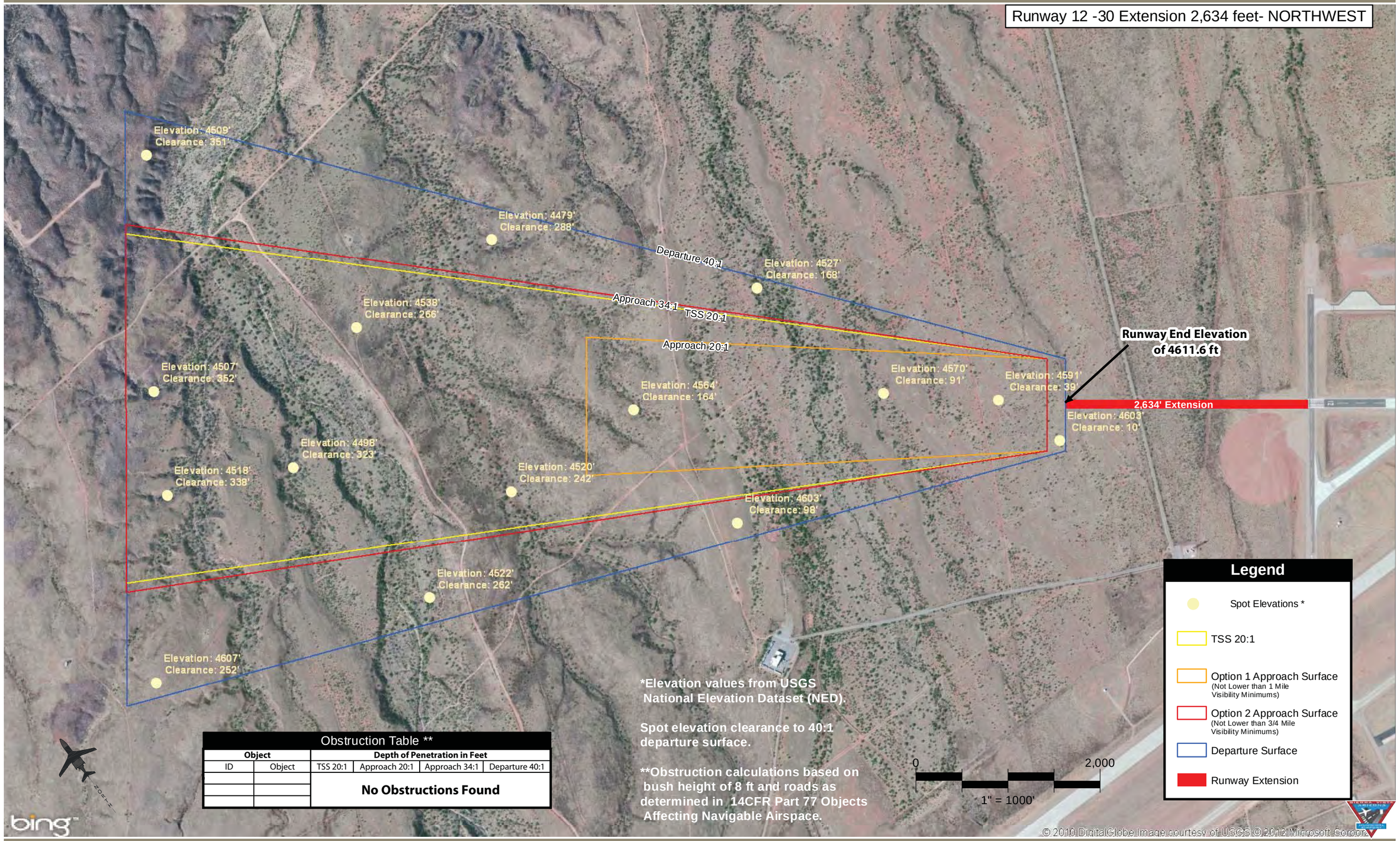
As presented on the exhibit, the joint-use area must be expanded farther north to accommodate the proposed taxiway. In doing so, the extension would be eligible for funding through the Airport Improvement Program (AIP). Associated with the proposed taxiway extension, a hold apron is depicted adjacent to Taxiway A leading to the Runway 8 threshold. An additional exit taxiway (Taxiway B) is proposed 2,400 feet east of the Runway 8 threshold.

As previously discussed, an extension on Runway 12-30 would necessitate the need for a taxiway extending northwest to serve its ultimate configuration. As such, an extension to Taxiway K is presented on the development plan. An additional exit taxiway is shown approximately 1,400 feet from the Runway 12 threshold. This taxiway is related to the phasing of the runway extension which will be further detailed in Chapter Six. A hold apron is also called for serving the ultimate Runway 12 threshold.

An entrance/exit taxiway is also proposed extending south of Taxiway F, connecting to the Runway 30 threshold at a 90-degree angle. This will provide an opportunity for aircraft taxiing from the north to utilize the full length of Runway 30 for takeoff to not have to back-taxi on the runway coming from Taxiway P. Back-taxiing involves turning around on the runway and using the runway for relatively slow taxiing operations. While these operations are fairly common at smaller airports, they reduce the operational capacity of a runway system and increase the chance of runway incursions.

All future taxiways serving the airfield should be constructed to meet at least taxiway design group (TDG) 3 and airplane design group (ADG) III standards. A taxiway width of 50 feet typically satisfies these standards. Larger aircraft included in TDG 5 and ADG V also frequent the airfield, mainly associated with military activities. A taxiway width of 75 feet meets these respective standards. The proposed Taxiway J extension on the north side of Runway 8-26 considers a width of 75 feet to meet TDG 5 and ADG V. Medium intensity taxiway lighting (MITL) should be applied to all active taxiways at the airport during the planning period. Sierra Vista Municipal Airport and FAA officials

Runway 12 -30 Extension 2,634 feet- NORTHWEST



Obstruction Table **					
Object		Depth of Penetration in Feet			
ID	Object	TSS 20:1	Approach 20:1	Approach 34:1	Departure 40:1
		No Obstructions Found			

*Elevation values from USGS National Elevation Dataset (NED).

Spot elevation clearance to 40:1 departure surface.

**Obstruction calculations based on bush height of 8 ft and roads as determined in 14CFR Part 77 Objects Affecting Navigable Airspace.

0 2,000

1" = 1000'

Legend

- Spot Elevations *
- TSS 20:1
- Option 1 Approach Surface (Not Lower than 1 Mile Visibility Minimums)
- Option 2 Approach Surface (Not Lower than 3/4 Mile Visibility Minimums)
- Departure Surface
- Runway Extension

DRAFT

Exhibit 5B: OBSTRUCTION ANALYSIS OF PROPOSED RUNWAY 12-30 EXTENSION

will need to coordinate planned improvements to the taxiway system with Libby Army Airfield personnel prior to actual construction or reconfiguration.

Pavement strength associated with portions of Taxiways G, J, and K should be increased to accommodate larger aircraft operations in the future. Currently, portions of these taxiways are designed for approximately 30,000 pounds single wheel loading (SWL). Larger aircraft could begin traversing these pavements with more frequency as it is anticipated that the U.S. Forest Service will be basing its operations on the north side of the airfield in the future. As a result, the weight bearing capacity on certain portions of these taxiways (detailed in Chapter Six) should be increased to support heavier aircraft.

Analysis in Chapters Three and Four indicated that the hold position markings on Taxiways A, B, D and F on the south side of Runway 8-26 be relocated to at least 297 feet from the runway centerline to meet current standards for ARC/RDC E-V design with not lower than ¾-mile visibility minimums. In the event that ½-mile visibility minimums are provided on Runway 26, hold lines should be located at least 327 feet from the runway centerline. Under this scenario, the hold lines associated with Taxiways D and G on the north side of Runway 8-26 would need to be relocated to 327 feet from the runway centerline as well. In addition, the hold line on Taxiway S as it relates to the Runway 30 threshold should be distanced 250 feet from the runway centerline to meet ARC/RDC C-III design standards.

Other Taxiways Considered During Alternatives Analysis

During the alternatives analysis in Chapter Four, other taxiway configurations were studied per new guidance in AC 150/5300-13A, *Airport Design*. As depicted on **Exhibit 5C**, these configurations were studied to enhance safety at the intersection of Runway 12-30 and Taxiways D and J and increase overall airfield capacity. The taxiway design criteria related to taxi method, steering angle, three node concept, intersection angles, and runway incursions were all taken into consideration. Based upon discussions with FAA and Libby Army Airfield officials, the Master Plan Concept does not include the taxiway layouts proposed on the exhibit.

The FAA stated that Taxiway H would not be approved on the ALP due to its location in relationship to existing Taxiway J and the intersection of Runways 8-26 and 12-30. Regarding the reconfiguration of Taxiway D, Libby Army Airfield officials have indicated that airfield safety has not been compromised as a result of the multiple-node intersection involving Runway 12-30 and Taxiways D and J. Furthermore, the airport traffic control tower (ATCT) is planning to extend its operations to 24 hours a day, seven days per week this year. In doing so, this intersection will be continuously monitored and controlled by ATCT personnel. It is recommended that additional airfield markings and caution zone lighting be provided at this intersection to allow pilots enhanced situational awareness when taxiing on this area of the airfield. Finally,

Libby Army Airfield officials did not approve of the proposed partial parallel taxiway serving the north side of Runway 3-21. Considerable terrain issues and the infrequent use of Runway 3-21 were cited as reasons for not justifying the existence of this taxiway.

AWOS Access Road

Exhibit 5A depicts the construction of an access road leading to the automated weather observation system (AWOS). This would further enhance safety on the airfield as the only way to gain current access to the AWOS is by traversing the RSAs associated with Runways 12-30 and 3-21. The proposed access road extends east from the roadway that serves the airport surveillance radar (ASR) equipment. The City of Sierra Vista should coordinate the construction of this road with Fort Huachuca officials, and a license agreement or easement over the affected property will be needed in order for Sierra Vista Municipal Airport to obtain FAA and/or ADOT-MPD – Aeronautics Group grant funding to aid in the construction.

Airport Traffic Control Tower

The U.S. Army operates and maintains the ATCT at Sierra Vista Municipal Airport/Libby Army Airfield. Upgrades are being considered for the ATCT in the future that include the construction of a new facility. The ATCT is the focal point for controlling flight operations within the airport's designated airspace and all aircraft and vehicle movement on the airport's runways and taxiways. Site selection involves meeting certain mandatory requirements concerning the ultimate planned development of the airport. Every effort is made to meet certain non-mandatory requirements as well. The following provides information related to the potential relocation and height of a new ATCT. The operational and spatial requirements are identified in FAA Order 6480.4, *Airport Traffic Control Tower Siting Criteria*.

Mandatory Siting Requirements

A. There must be maximum visibility of airport traffic patterns.

B. There must be a clear, unobstructed, and direct view of the approaches to all runways or landing areas and to all runway and taxiway surfaces.

C. The proposed site must be large enough to accommodate current and future building needs including employee parking spaces.

D. The proposed tower must not violate Federal Aviation Regulation (FAR) Part 77 surfaces unless it is absolutely necessary.

E. The proposed tower must not derogate the signal generated by any existing or planned electronic navigational aid.

Non-mandatory Siting Requirements

A. To assure adequate depth perception, the line-of-sight to aircraft movement areas should be perpendicular to the direction of aircraft travel.

B. The tower cab should be oriented to face north or alternatively to the east, south, or west. Every effort

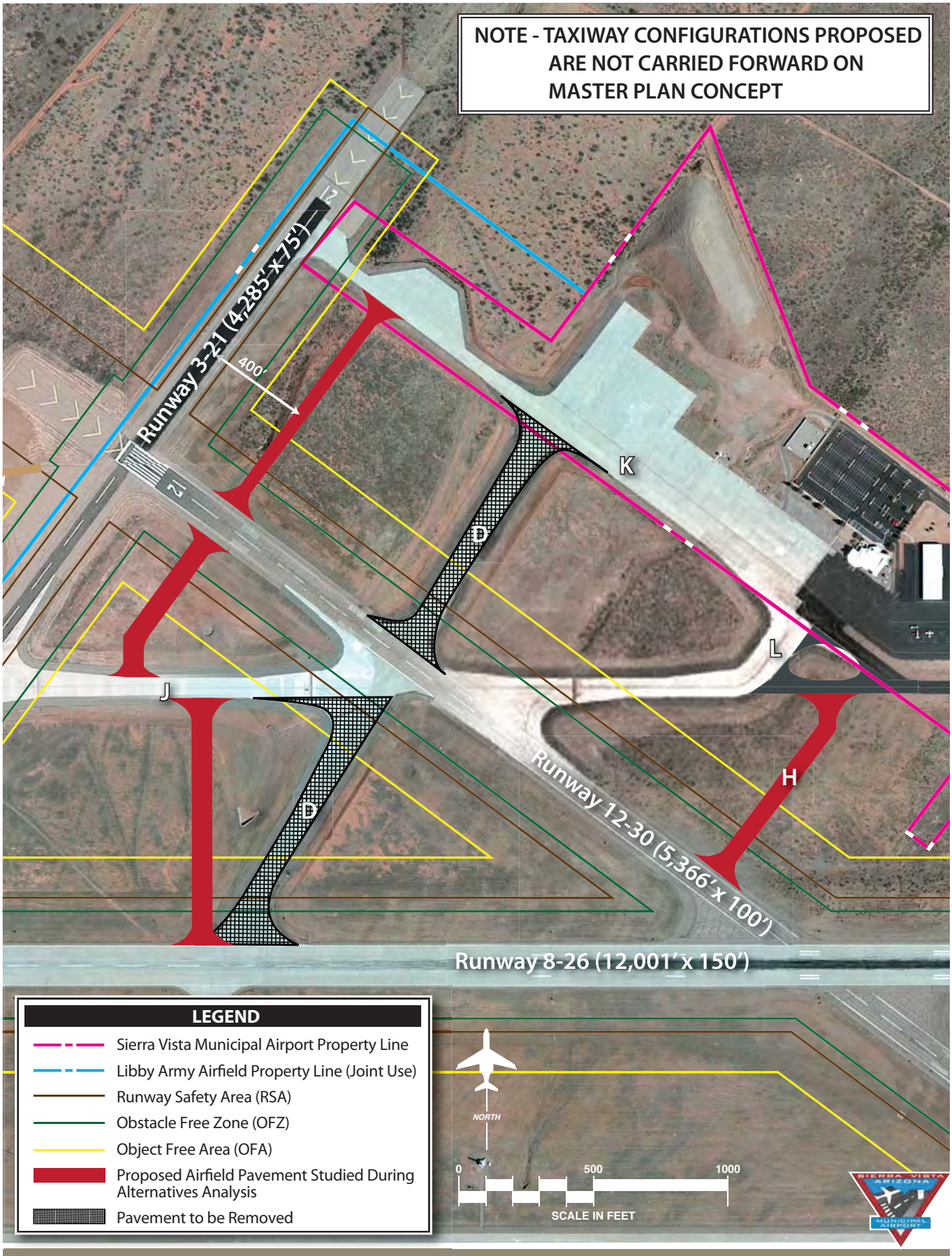


Exhibit 5C: OTHER TAXIWAY CONSIDERATIONS

should be made to prevent an aircraft approach from being aligned with the rising or setting sun.

C. The controller's visibility should not be impaired by direct or indirect external lighting sources.

D. All aircraft movement areas including parking aprons, tie-down spaces, run-up pads, etc., should be visible from the ATCT.

E. Consideration must be given to local weather phenomena to preclude restriction to visibility due to fog or ground haze.

F. Exterior noise should be at a minimum and sites should be evaluated for expected noise levels.

G. Access to the site should not require controllers to cross a runway or taxiway.

H. Consideration should be given to planned airport expansion, especially for the construction of buildings, hangars, runway/ taxiway extensions, etc. to preclude the relocation of the ATCT at a later date.

I. Potential visibility impairments such as smoke or dust should be avoided.

When determining appropriate locations for a replacement tower, two key factors are considered: cab-eye-elevation and line-of-sight. Cab-eye-elevation considers the height of the tower at the controller's eye level. The tower itself will be taller than the cab-eye-elevation to account for the roof and any antennas on the roof. Controllers must be able to see the airport operations area (AOA) which includes all runway ends, primary taxiways, aprons, and object clearing areas. Line-of-sight considers the visual coverage of the AOA and takes into consideration the elevation of existing and planned facilities. All existing or planned facilities will create a line-of-sight shadow to some degree. A shadow is the area beyond a structure that the controller cannot see due to the height of the structure. The shadow should not extend to the AOA. A tall structure which casts a shadow or loss of view of a particular surface area would require the cab-eye-elevation to be increased in order to view the surface area in question.

LANDSIDE DEVELOPMENT CONCEPT

The major landside issues addressed in the Master Plan Concept include the following:

- Construct additional aircraft storage hangars.
- Extend aircraft access to the northwest portion of airport property providing for additional aviation development.
- Expand the existing terminal building to accommodate future revenue-enhancing activities.
- Continue to provide a location suitable for air cargo operations.
- Designate an area on airport property for U.S. Forest Service activities.

Hangars

The recommended development concept shows the location of certain hangar

types as depicted on **Exhibit 5A**. Following the philosophy of separation of activity levels, larger high-activity conventional hangars are located adjacent to the large aircraft parking apron extending northwest of the terminal building. Separate box hangars and T-hangars/linear box hangars that typically accommodate lower activity levels are proposed farther northwest in a proposed location away from the main aircraft parking apron. **Table 5B** presents the total hangar area provided in the landside development concept.

TABLE 5B
Hangar Space Planned
Sierra Vista Municipal Airport

	Current Supply Estimate	20-Year Supply Forecast	Total 20-Year Need	Provided in Master Plan
Hangar Area Requirements				
T-Hangar/Linear Box Hangar (s.f.)	85,000	106,400	21,400	30,000
Conventional/Box Hangar (s.f.)	5,000	28,000	23,000	48,500
Maintenance/Office Area (s.f.)	-	15,000	15,000	*
Total Hangar Storage Area (s.f.)	90,000	149,400	59,400	78,500

*Expected to be met within conventional and box hangar development.

Source: Coffman Associates analysis

As can be seen from the table, the Master Plan Concept provides more than 78,500 square feet of additional hangar space. The need over the next 20 years is estimated at 59,400 square feet. Therefore, the hangar layout presented represents a vision for the airport that could extend beyond the scope of this Master Plan. The reason for this is to provide decision-makers with dedicated areas on the airport that should be reserved for certain hangar types. As noted in the table, it can be expected that certain portions of the larger conventional and box hangars will provide adequate space to accommodate maintenance/office area demands for specific aviation activities.

Three large conventional hangars are proposed that open to the large aircraft parking apron capable of handling high-activity operations including FBOs, corporate flight departments, air charter, aircraft maintenance, and large aircraft storage, among others. Farther northwest, five separate box hangars are proposed. A taxiway extending north of the aircraft parking apron would allow access to these hangar facilities.

The forecast for based aircraft at Sierra Vista Municipal Airport continues to show single engine aircraft dominating the fleet mix. As a result, T-hangars/linear box hangars should continue to meet the needs of many of these smaller based aircraft at the airport for the foreseeable future. Given the low-activity levels generally associated with these storage hangars, the development plan depicts the construction to two T-hangars/linear box hangars in an area removed from the main aircraft parking apron. These hangars would be provided access to the air-

field via the same taxiway lending access to the proposed box hangars. Prior to development in the northwest landside area, significant improvements will be needed for the utilization of this land to include site preparation, roadway access, and utility extensions.

Aviation Development Parcel

Also included on **Exhibit 5A** is a 2.5-acre parcel dedicated for aviation-related activities. This parcel would be provided aircraft access by extending a taxiway off the northwest corner of the existing aircraft parking apron. Vehicle access would be provided by the roadway being proposed to serve box hangar development in the area. While the development plan includes one parcel, this area could be further broken down into multiple parcels depending on operator demands.

As previously discussed, the U.S. Forest Service could base its seasonal firefighting operations on the north side of the airport in the future. The 2.5-acre parcel and adjacent aircraft parking apron would be ideal for such activity. This parcel is segregated from other proposed landside development to the southeast which is desirable for a large-scale operator such as the U.S. Forest Service, which operates fixed-wing aircraft as well as helicopters.

Previous planning also considered 203 acres of land north of Sierra Vista Municipal Airport for future acquisition and transfer to the City of Sierra Vista from the Department of the Army. While this land transfer was never completed, the proposed taxiway serving the 2.5-acre parcel, as shown on the Master Plan Concept, could be extended allowing for future aircraft access to portions of this property. As detailed earlier in this study, although land north of the airport is currently not available to the city for acquisition, prudent planning should consider its future use to satisfy potential aviation demand beyond the scope of this Master Plan.

Terminal Building Expansion

The Master Plan Concept dedicates a portion of land adjacent to the northwest side of the terminal building for expansion of the facility that could support public concessions such as a restaurant. Analysis in Chapter Three indicated that the existing terminal building provided sufficient space to accommodate aviation activities forecast through the planning period of the Master Plan. As such, an expansion of the facility designed to support revenue-enhancing activities would not be eligible for federal and state grant eligibility. It should be noted that there is adequate vehicle parking adjacent to the existing facility to accommodate any increased demand that may be experienced as a result of the proposed terminal expansion.

Airport Support Facilities

Exhibit 5A continues to dedicate an area for air cargo activities at Sierra Vista Municipal Airport. As depicted, a future roadway/parking area extending northwest of the terminal parking lot would provide access to the aircraft parking apron. Trucks could enter through a controlled access gate to unload and pick up cargo. It is forecast that the existing fleet of turboprops and multi-engine aircraft should be capable of accommodating air cargo needs through the 20-year planning period of this study. As a result, no further consideration was given to con-

structing dedicated air cargo facilities on the airfield.

SECURITY RECOMMENDATIONS

Given that Sierra Vista Municipal Airport operates jointly with Fort Huachuca at Libby Army Airfield, providing a secure facility to protect not only the interests of civilian aviation but also specialized military activities is extremely important. The following details recommendations that would provide proper levels of security to protect civilian and military interests.

In cooperation with representatives of the general aviation community, the Transportation Security Administration (TSA) published security guidelines for general aviation airports. These guidelines are contained in the publication entitled, *Security Guidelines for General Aviation Airports*, published in May 2004. Within this publication, the TSA recognized that general aviation is not a specific threat to national security. However, the TSA does believe that general aviation may be vulnerable to misuse by terrorists as security is enhanced in the commercial portions of aviation and at other transportation links.

To assist in defining which security methods are most appropriate for a general aviation airport, the TSA defined a series of airport characteristics that potentially affect an airport's security posture. These include:

1. **Airport Location** – An airport's proximity to areas with over 100,000 residents or sensitive sites can affect its security posture. Greater security emphasis should be given to airports within 30 miles of mass population centers (areas with over 100,000 residents) or sensitive areas such as military installations, nuclear and chemical plants, centers of government, national monuments, and/or international ports.

2. **Based Aircraft** – A smaller number of based aircraft increases the likelihood that illegal activities will be identified more quickly. Airports with based aircraft over 12,500 pounds warrant greater security.

3. **Runways** – Airports with longer paved runways are able to serve larger aircraft. Shorter runways are less attractive as they cannot accommodate the larger aircraft which have more potential for damage.

4. **Operations** – The number and type of operations should be considered in the security assessment.

Table 5C summarizes the recommended airport characteristics and ranking criterion. The TSA suggests that an airport rank its security posture according to this scale to determine the types of security enhancements that may be appropriate. As shown in the table, Sierra Vista Municipal Airport/Libby Army Airfield's ranking on this scale is 43. Points are assessed for the airport being located adjacent to a military installation that falls within the boundaries of restricted airspace, having a certain number of based aircraft, and having at least one runway that is longer than 5,001 feet and made of asphalt/concrete. The ATCT has historically reported more than 50,000 annual operations, and the airport does accommodate Part 125, 135, and 137 operations, flight training, and rental aircraft. During times of the year when the U.S. Forest Service is conducting firefighting operations from the airfield, larger aircraft over 12,500 pounds are based and maintained on the airfield.

TABLE 5C
Airport Characteristics Measurement Tool
Sierra Vista Municipal Airport/Libby Army Airfield (FHU)

Security Characteristics	Assessment Scale: Public Use Airport	Assessment Scale: FHU
Location		
Within 30 nm of mass population areas[1]	5	0
Within 30 nm of a sensitive site[2]	4	4
Falls within outer perimeter of Class B airspace	3	0
Falls within boundaries of restricted airspace	3	3
Based Aircraft		
Greater than 101 based aircraft	3	0
26-100 based aircraft	2	2
11-25 based aircraft	1	0
10 or fewer based aircraft	0	0
Based aircraft over 12,500 pounds	3	3
Runways		
Runway length greater than 5,001 feet	5	5
Runway length less than 5,000 feet, greater than 2,001 feet	4	0
Runway length 2,000 feet or less	2	0
Asphalt or concrete runway	1	1
Operations		
Over 50,000 annual operations	4	4
Part 135 operations (air taxi and fractionals)	3	3
Part 137 operations (agricultural)	3	3
Part 125 operations (20 or more passenger seats)	3	3
Flight training	3	3
Flight training in aircraft over 12,500 pounds	4	0
Rental aircraft	4	4
Maintenance, repair, and overhaul facilities conducting long-term storage of aircraft over 12,500 pounds	4	4
Totals		**42**

Source: *Security Guidelines for General Aviation Airports*
[1] An area with a total population over 100,000.
[2] Sensitive sites include military installations, nuclear and chemical plants, centers of government, national monuments, and/or international ports.

As shown in **Table 5D**, a rating of 42 points places Sierra Vista Municipal Airport/Libby Army Airfield in the third tier ranking of security measures by the TSA. This tier includes 13 security enhancements recommended by the TSA as shown in the table. A review of each recommended security procedure is described in the following sections.

TABLE 5D
Recommended Security Enhancements Based on Airport Characteristics Assessment Results

	Points Determined Through Airport Characteristics Assessment			
Security Enhancements	**> 45**	**25-44**	**15-24**	**0-14**
Fencing	✓	--	--	--
Hangars	✓	--	--	--
Closed-Circuit Television (CCTV)	✓	--	--	--
Intrusion Detection System	✓	--	--	--
Access Controls	✓	✓	--	--
Lighting System	✓	✓	--	--
Personal ID System	✓	✓	--	--
Challenge Procedures	✓	✓	--	--
Law Enforcement Support	✓	✓	✓	--
Security Committee	✓	✓	✓	--
Transient Pilot Sign-In/Sign-Out Procedures	✓	✓	✓	--
Signs	✓	✓	✓	✓
Documented Security Procedures	✓	✓	✓	✓
Positive/Passenger/Cargo/Baggage ID	✓	✓	✓	✓
Aircraft Security	✓	✓	✓	✓
Community Watch Program	✓	✓	✓	✓
Contact List	✓	✓	✓	✓

Source: *Security Guidelines for General Aviation Airports*

Access Controls: To delineate and adequately protect security areas from unauthorized access, it is important to consider boundary measures such as fencing, walls, or other physical barriers, electronic boundaries (e.g., sensor lines, alarms), and/or natural barriers. Physical barriers can be used to deter and delay the access of unauthorized persons onto sensitive areas of airports. Such structures are usually permanent and are designed to be a visual and psychological deterrent as well as a physical barrier.

Lighting System: Protective lighting provides a means of continuing a degree of protection from theft, vandalism, or other illegal activity at night. Security lighting systems should be connected to an emergency power source, if available.

Personal ID System: This refers to a method of identifying airport employees or authorized tenant access to various areas of the airport through badges or biometric controls.

Vehicle ID System: This refers to an identification system which can assist airport personnel and law enforcement in identifying authorized vehicles. Vehicles can be identified through use of decals, stickers, or hang tags.

Challenge Procedures: This involves an airport watch program which is implemented in cooperation with airport users and tenants to be on guard for unauthorized and potentially illegal activities on the airfield.

Law Enforcement Support: This involves establishing and maintaining a liaison with appropriate law enforcement agencies at the local, state, and federal levels. These organizations can better

serve the airport when they are familiar with airport operating procedures, facilities, and normal activities. Procedures may be developed to have local law enforcement personnel regularly or randomly patrol ramps and aircraft hangar areas, with increased patrols during periods of heightened security.

Security Committee: This committee should be composed of airport tenants and users drawn from all segments of the airport community. The main goal of this group is to involve airport stakeholders in developing effective and reasonable security measures and disseminating timely security information.

Transient Pilot Sign-In/Sign-Out Procedures: This involves establishing procedures to identify non-based pilots and aircraft using their facilities, and implementing sign-in/sign-out procedures for all transient operators and associating them with their parked aircraft. Having assigned spots for transient parking areas can help to easily identify transient aircraft on an apron.

Signs: The use of signs provides a deterrent by warning of facility boundaries as well as notifying of the consequences for violation.

Documented Security Procedures: This refers to having a written security plan. This plan would include documenting the security initiatives already in place at the airport, as well as any new enhancements. This document could consist of, but is not limited to, airport and local law enforcement contact information, including alternates when available, and utilization of a program to increase airport user awareness of security precautions such as an airport watch program.

Positive/Passenger/Cargo/Baggage ID: A key point to remember regarding general aviation passengers is that the persons on board these flights are generally better known to airport personnel and aircraft operators than the typical passenger on a commercial airliner. Recreational general aviation passengers are typically friends, family, or acquaintances of the pilot in command. Charter/sightseeing passengers typically will meet with the pilot or other flight department personnel well in advance of any flights. Suspicious activities, such as use of cash for flights or probing or inappropriate questions, are more likely to be quickly noted and authorities could be alerted. For corporate operations, typically all parties onboard the aircraft are known to the pilots. Airport operators should develop methods by which individuals visiting the airport can be escorted into and out of aircraft movement and parking areas.

Aircraft Security: The main goal of this security enhancement is to prevent the intentional misuse of general aviation aircraft for terrorist purposes. Proper securing of aircraft is the most basic method of enhancing general aviation airport security. Pilots should employ multiple methods of securing their aircraft to make it as difficult as possible for an unauthorized person to gain access to it. Some basic methods of securing a general aviation aircraft include: ensuring that door locks are consistently used to prevent unauthorized access or tampering with the aircraft; using keyed ignitions where appropriate; storing the aircraft in a hangar, if available; locking hangar doors, using an auxiliary lock to further protect aircraft from unauthorized use (i.e., propeller, throttle, and/or tie-down locks); and ensuring that aircraft ignition keys are not stored inside the aircraft.

Community Watch Program: The vigilance of airport users is one of the most prevalent methods of enhancing security at general aviation airports. Typically, the user population is familiar with those individuals who have a valid purpose for being on airport property. Consequently, new faces are quickly noticed. A watch program should include elements similar to those listed below. These recommendations are not all-inclusive. Additional measures that are specific to each airport should be added as appropriate, including:

- Coordinate the program with all appropriate stakeholders including airport officials, pilots, businesses, and/or other airport users.
- Hold periodic meetings with the airport community.
- Develop and circulate reporting procedures to all who have a regular presence on the airport.
- Encourage proactive participation in aircraft and facility security and heightened awareness measures. This should include encouraging airport and line staff to "query" unknowns on ramps, near aircraft, etc.
- Post signs promoting the program, warning that the airport is watched. Include appropriate emergency phone numbers on the sign.
- Install a bulletin board for posting security information and meeting notices.
- Provide training to all involved for recognizing suspicious activity and appropriate response tactics.

Contact List: This involves the development of a comprehensive list of responsible personnel/agencies to be contacted in the event of an emergency procedure. The list should be distributed to all appropriate individuals. Additionally, in the event of a security incident, it is essential that first responders and airport management have the capability to communicate. Where possible, coordinate radio communication and establish common frequencies and procedures to establish a radio communications network with local law enforcement.

SUMMARY

The resultant plan represents an airfield facility that fulfills aviation needs for Sierra Vista Municipal Airport/Libby Army Airfield and preserves long range viability while conforming to safety and design standards. It also maintains a landside complex that can be developed as demand dictates. Because the Master Plan is conceptual in nature, it allows for flexibility rather than dictating specific types and exact square footages of future land uses at the airport.

The next chapter of this Master Plan will consider strategies for funding the recommended improvements and will provide a reasonable schedule for undertaking the projects based on demand over the course of the next 20 years.

Chapter Six

CAPITAL IMPROVEMENTS/ FINANCIAL PROGRAM

CHAPTER SIX

Capital Improvements/ Financial Program

The previous analyses outlined airport development needs on both the airside and landside to meet projected aviation demand for the next 20 years based on forecast activity, facility needs, and operational safety and efficiency. In this chapter, basic economic, financial, and management rationale is applied to the development items so that the feasibility of each item contained in the plan can be assessed.

The capital improvements and financial program have been organized into three sections. First, the airport's capital program needs are categorically recognized. Second, the capital improvement program (CIP) projects and their allocated cost estimates are itemized into planning horizons that extend through the planning period of the Master Plan, and finally, funding sources on the federal, state, and local levels are identified and discussed. The vision of the Master Plan is based on the airport achieving specific demand-based triggers such as growth in based aircraft and an increase in aviation and potential non-aviation business development.

The Sierra Vista Municipal Airport Master Plan has been developed according to a demand-based schedule. Demand-based planning establishes guidelines for capital investments at the airport based upon airport activity levels instead of subjective factors such as dates in time. By doing so, the levels of activity derived from the demand forecasts can be related to the actual capital investments needed to safely and efficiently accommodate the level of demand being experienced at the airport. More specifically, the intention of the Master Plan is that facility improvements needed to serve new levels of demand should only be undertaken when the levels of demand experienced at the

airport justify their implementation. Obviously, some projects related to maintenance efforts will follow more closely to a timeline schedule due to general wear and tear requiring routine upkeep. Airport maintenance projects have been factored into the CIP and should be closely monitored by airport management.

As discussed, many development items included in the Master Plan Concept will need to follow demand indicators. For example, the plan includes the construction of new taxiways leading to potential aviation infrastructure development. An increasing number of based aircraft and business aviation demand will be the indicator for these needs. If based aircraft growth occurs as projected, additional hangars will need to be constructed to meet the demand; thus, taxiway development would be necessary to access hangar construction. If growth slows or does not occur as projected, these projects can be delayed.

Other projects, especially those related to the continued development of airside facilities such as a runway extension, will also be demand-driven and tied directly to the number of annual aircraft operations and types of aircraft that may utilize Sierra Vista Municipal Airport. As a result, capital expenditures will be undertaken as needed, which leads to a responsible use of capital assets.

A demand-based Master Plan does not specifically require the implementation of any of the demand-based improvements. Instead, it is envisioned that implementation of any improvements would be examined against the demand levels prior to implementation. The Master Plan establishes a plan for the use of airport facilities consistent with the potential aviation needs and capital needs required to support that specific use. However, individual projects in the plan are not implemented until the need is demonstrated and the project is approved for funding. **Table 6A** summarizes the key demand milestones for each of the three planning horizons.

AIRPORT DEVELOPMENT NEEDS

In an effort to identify capital needs at the airport, this section provides analysis regarding the associated development needs of those projects included in the CIP. While some projects will be demand-based, others will be dictated by design standards, safety, or rehabilitation needs. Each development need is categorized according to this schedule. The applicable category (or categories) included are presented on **Exhibit 6A**. The proposed projects can be categorized as follows:

1) **Safety/Security (SS)** – these are capital needs considered necessary for operational safety and protection of aircraft and/or people and property on the ground near the airport.

2) **Environmental (EN)** – these are capital needs which are identified to enable the airport to operate in an environmentally acceptable manner or meet needs identified in the Environmental Overview outlined in Appendix B.

3) **Maintenance (MN)** – these are capital needs required to maintain the existing infrastructure at the airport.

4) **Efficiency (EF)** – these are capital needs intended to optimize aircraft ground operations or passengers' use of the terminal building.

	PROJECT DESCRIPTION	DEVELOPMENT CATEGORY	TOTAL PROJECT COST	FAA ELIGIBLE	ADOT ELIGIBLE**	LOCAL SHARE
	SHORT TERM PROGRAM (1-5 YEARS)					
	2014					
1	Install MITL and Signage on Taxiway P (Phase I - 6,000')	SS	$1,200,000	$1,092,720	$53,640	$53,640
2	Design Only - Water Storage Tank and Fire Pump Including 8-Inch Water Line and Hydrants	DM/OP	150,000	136,590	6,705	6,705
3	Environmental Only - Taxiway J Extension and Entrance/Exit Taxiways Serving North Side of Runway 8-26	EN	400,000	364,240	17,880	17,880
	2014 Total		**$1,750,000**	**$1,593,550**	**$78,225**	**$78,225**
	2015					
4	Install MITL and Signage on Taxiway P (Phase II - 6,000')	SS	$1,200,000	$1,092,720	$53,640	$53,640
5	Construct Water Storage and Fire System Upgrades on Northwest Side of Airport	DM/OP	750,000	682,950	33,525	33,525
6	Improve RSA Deficiencies on Runways 8-26 and 12-30 (Relocate Wind Cones)	SS	78,000	71,027	3,487	3,487
	2015 Total		**$2,028,000**	**$1,846,697**	**$90,652**	**$90,652**
	2016					
7	Design Only - Parallel Taxiway J Extension and Associated Entrance/Exit Taxiways Serving North Side of Runway 8-26 (Phases IV and V)	SS/EF	$450,000	$409,770	$20,115	$20,115
8	Relocate Hold Lines Associated with Runways 8-26 and 12-30	SS	78,000	71,027	3,487	3,487
9	Design Only - Increase Pavement Strength on Portions of Taxiways G, J, and K to Support U.S. Forest Service Aircraft Operations	MN	114,300	104,082	5,109	5,109
10	Conduct Environmental Assessment for Relocation of Eleven Mile Road	EN	100,000	91,060	4,470	4,470
	2016 Total		**$742,300**	**$675,938**	**$33,181**	**$33,181**
	2017					
11	Construct Parallel Taxiway J (Phase IV) and Exit Taxiway B Serving North Side of Runway 8-26	SS/EF	$2,250,000	$2,048,850	$100,575	$100,575
12	Reconstruct/Rehabilitate Portions of Taxiways G, J, and K to Increase Pavement Strength	MN	799,300	727,843	35,729	35,729
13	Conduct Environmental Assessment for Runway 12-30 and Taxiway K Extensions (Phase I)	EN	200,000	182,120	8,940	8,940
	2017 Total		**$3,249,300**	**$2,958,813**	**$145,244**	**$145,244**
	2018					
14	Relocate Eleven Mile Road*	SS	$2,575,200	$2,344,977	$115,111	$115,111
15	Extend Runway 12-30 and Taxiway K 1,234' Northwest and Construct Hold Apron and 500' Overrun (Phase I)	DM	6,366,400	5,797,244	284,578	284,578
	2018 Total		**$8,941,600**	**$8,142,221**	**$399,690**	**$399,690**
	TOTAL SHORT TERM PROGRAM		***$16,711,200***	***$15,217,219***	***$746,991***	***$746,991***
	INTERMEDIATE TERM PROGRAM (6-10 YEARS)					
1	Construct Parallel Taxiway J (Phase V), Entrance/Exit Taxiway A, and Hold Apron Serving North Side of Runway 8-26	SS/EF	$1,250,000	$1,138,250	$55,875	$55,875
2	Construct Access Road Leading to Automated Weather Observation System	SS	129,100	117,558	5,771	5,771
3	Install PAPI-2s and REILs on Runway 3-21	SS	148,200	134,951	6,625	6,625
4	Improve Circulation and Awareness at Intersection of Runway 12-30 and Taxiways D and J (Caution Lights and Signage)	SS	156,000	142,054	6,973	6,973
5	Construct Road Access/Parking to Support Landside Development on Northwest Side of Airport	DM/OP	123,800	112,732	5,534	5,534
6	Construct Taxiway Leading to Landside Development on Northwest Side of Airport	DM	222,400	202,517	9,941	9,941
7	Construct New ATCT on South Side of Airfield*	SS	-	-	-	-
8	General Pavement Maintenance	MN	1,000,000	910,600	44,700	44,700
	TOTAL INTERMEDIATE TERM PROGRAM		***$3,029,500***	***$2,758,663***	***$135,419***	***$135,419***
	LONG TERM PROGRAM (11-20 YEARS)					
1	Expand Terminal Building to Include Concessions/Restaurant Area	DM/OP	$459,300	-	-	$459,300
2	Construct Taxiway Connecting Runway 30 Threshold and Taxiway P Leading to Taxiway F and Install MITL	SS	201,100	183,122	8,989	8,989
3	Conduct Environmental Assessment for Runway 12-30 and Taxiway K Extensions (Phase II)	EN	250,000	227,650	11,175	11,175
4	Extend Runway 12-30 and Taxiway K 1,400' Northwest and Construct Hold Apron and 500' Overrun (Phase II)*	DM	6,907,600	6,290,061	308,770	308,770
5	Construct Road Access/Parking to Support Landside Development on Northwest Side of Airport	DM/OP	240,200	218,726	10,737	10,737
6	Construct Taxiway Leading to Landside Development on Northwest Side of Airport	DM	290,200	264,256	12,972	12,972
7	Install MALSR on Runway 26	SS	900,000	819,540	40,230	40,230
8	General Pavement Maintenance	MN	2,000,000	1,821,200	89,400	89,400
	TOTAL LONG TERM PROGRAM		***$11,248,400***	***$9,824,554***	***$482,273***	***$941,573***
	TOTAL PROGRAM COSTS		**$30,989,100**	**$27,800,436**	**$1,364,682**	**$1,823,982**

KEY

ATCT - Airport Traffic Control Tower
AWOS - Automated Weather Observation System
MITL - Medium Intensity Taxiway Lighting
MALSR - Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights
RSA - Runway Safety Area
PAPI - Precision Approach Path Indicator
REIL - Runway End Identification Lights
SS - Safety/Security
EF - Efficiency
MN - Maintenance
EN - Environmental
DM - Demand/Capacity
OP - Opportunity

* Partner with the U.S. Army in sponsoring planned improvements that will accommodate both general aviation and military activities.
** The funding of projects will be subject to the Arizona Revised Statutes, Arizona Transportation Board Policies, and Administrative policies as will as funds available.

5) **Demand (DM)** – these are capital needs required to accommodate levels of aviation demand. The implementation of these projects should only occur when demand for these needs is verified.

6) **Opportunities (OP)** – these are capital needs intended to take advantage of opportunities afforded by the airport setting. Typically, this will involve improvements to property intended for lease to aviation or non-aviation related development.

TABLE 6A
Planning Horizon Activity Summary
Sierra Vista Municipal Airport/Libby Army Airfield

	Base Year	2017	2022	2032
BASED AIRCRAFT				
Single Engine	60	67	72	83
Multi-Engine	3	3	4	4
Turboprop	--	1	2	4
Jet	--	1	2	4
Helicopter	3	3	4	5
Total Based Aircraft	**66**	**75**	**84**	**100**
ANNUAL OPERATIONS				
Itinerant Operations				
General Aviation	9,570	10,350	11,600	13,800
Air Taxi	5,920	6,100	6,600	7,600
Military	65,820	66,400	66,400	66,400
Total Itinerant Operations	**81,310**	**82,850**	**84,600**	**87,800**
Local Operations				
General Aviation	22,330	24,150	27,000	32,200
Military	43,920	44,300	44,300	44,300
Total Local Operations	**66,250**	**68,450**	**71,300**	**76,500**
Total Annual Operations*	**147,560**	**151,300**	**155,900**	**164,300**

* Includes ATCT After-Hours/Weekend Adjustment

CAPITAL IMPROVEMENT SCHEDULE AND COST SUMMARIES

Now that the specific needs for the airport have been established, the next step is to determine a realistic capital improvement schedule and associated costs for implementing the plan. This section will identify these projects and the overall costs of each item in the development plan. The program outlined in the following pages has been evaluated from a variety of perspectives and represents the culmination of a comparative analysis of basic budget factors, demand, and priority assignments.

The recommended improvements are grouped by the planning horizons: short term, intermediate term, and long term. It is important to note that the CIP provided here presents current and projected needs at this point in time. The very nature of the aviation industry is always

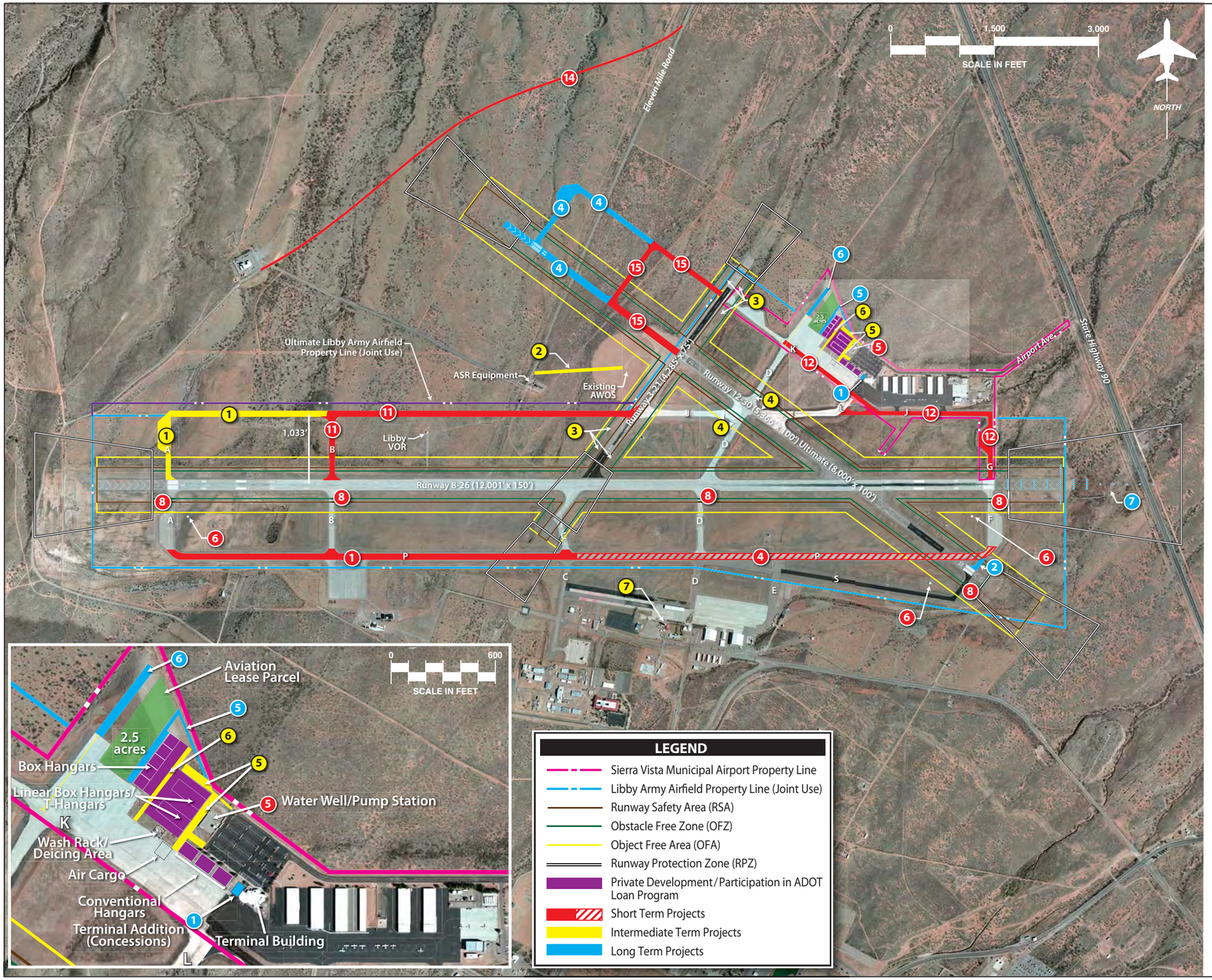
changing, and as such, so too could the needs of the airport. As a result, the City of Sierra Vista and Libby Army Airfield officials should re-examine the priorities each year for funding, adding or removing projects to the capital programming lists based on needs/ demands at that point in time.

Once the list of necessary projects was identified and refined, project-specific cost estimates were developed. The cost estimates include design, engineering, construction administration, and contingencies that may arise on the project. Capital costs presented here should be viewed only as estimates subject to further refinement during design. Nevertheless, these estimates are considered sufficient for planning purposes. Cost estimates for each of the development projects listed are in current (2012) dollars. Adjustments will need to be applied over time as construction costs or capital equipment costs change. Cost estimates for some projects included in the short term have been previously prepared by the City of Sierra Vista and included in the airport's latest capital program for fiscal years (FY) 2014-2018.

Exhibit 6A presents the proposed CIP for Sierra Vista Municipal Airport. An estimate of Federal Aviation Administration (FAA) and Arizona Department of Transportation – Multi-Modal Planning Division – Aeronautics Group (ADOT-MPD – Aeronautics Group) funding eligibility has been included, although actual funding is not guaranteed. For those projects that would be eligible for federal funding, Airport Improvement Program (AIP) reauthorization (to be discussed later in this chapter) allocates 91.06 percent of the total project cost to Arizona airports. The remaining amount would be equally shared between the state and local sponsor, at 4.47 percent each. **Exhibit 6B** graphically depicts the development staging by overlaying each project onto the aerial photography of the airport.

It should be noted that future hangar development, although called for on the Master Plan Concept, is not included in the CIP. Historically, the City of Sierra Vista has been involved in funding the construction of hangar storage facilities at the airport. The proposed capital plan presented in this chapter does not include the construction of hangars; however, the City of Sierra Vista could still participate in hangar development through the ADOT-MPD – Aeronautics Group airport loan program (detailed later in this chapter) should the demand for additional hangar storage materialize. Future hangar construction could also be completed by the private sector, which is becoming a more common trend at airports across the country. In any event, the CIP does provide for the airport to construct taxiway improvements leading to proposed hangar development as these items are eligible for federal and state grant funding. This can help reduce the overall development costs for private hangar construction.

As detailed in the CIP, the majority of projects listed are eligible for federal and state funding. Obviously, demand and justification for these projects must be provided prior to a grant being administered by the FAA and/or ADOT-MPD – Aeronautics Group. Some projects listed would also support military activities on the airfield. As such, it is important that the City of Sierra Vista coordinate with Fort Huachuca and Libby Army Airfield officials to work together in sponsoring certain projects that will benefit military and civilian interests alike.



SHORT TERM PROGRAM (1-5 YEARS)

2014

1. Install MITL and Signage on Taxiway P (Phase I - 6,000')
2. Design Only - Water Storage Tank and Fire Pump Including 8-Inch Water Line and Hydrants - *NP*
3. Environmental Only - Taxiway J Extension and Entrance/Exit Taxiways Serving North Side of Runway 8-26 - *NP*

2015

4. Install MITL and Signage on Taxiway P (Phase II - 6,000')
5. Construct Water Storage and Fire System Upgrades on Northwest Side of Airport
6. Improve RSA Deficiencies on Runways 8-26 and 12-30 (Relocate Wind Cones)

2016

7. Design Only - Parallel Taxiway J Extension and Associated Entrance/Exit Taxiways Serving North Side of Runway 8-26 - *NP*
8. Relocate Hold Lines Associated with Runways 8-26 and 12-30
9. Design Only - Increase Pavement Strength on Portions of Taxiways G, J, and K to Support U.S. Forest Service Aircraft Operations - *NP*
10. Conduct Environmental Assessment for Relocation of Eleven Mile Road - *NP*

2017

11. Construct Parallel Taxiway J (Phase IV) and Exit Taxiway B Serving North Side of Runway 8-26
12. Reconstruct/Rehabilitate Portions of Taxiways G, J, and K to Increase Pavement Strength
13. Conduct Envirnmental Assessment for Runway 12-30 and Taxiway K Extensions (Phase I) - *NP*

2018

14. Relocate Eleven Mile Road
15. Extend Runway 12-30 and Taxiway K 1,2341 Northwest and Construct Hold Apron and 500' Overrun (Phase 1)

INTERMEDIATE TERM PROGRAM (6-10 YEARS)

1. Construct Parallel Taxiway J (Phase V), Entrance/Exit Taxiway A, and Hold Apron Serving North Side of Runway 8-26
2. Construct Access Road Leading to AWOS
3. Install PAPI-2s and REILs on Runway 3-21
4. Improve Circulation and Awareness at Intersection of Runway 12-30 and Taxiways D and J (Caution Lights and Signage)
5. Construct Road Access/Parking to Support Landside Development on Northwest Side of Airport
6. Construct Taxiway Leading to Landside Development on Northwest Side of Airport
7. Construct New ATCT on South Side of Airfield
8. General Pavement Maintenance - *NP*

LONG TERM PROGRAM (11-20 YEARS)

1. Expand Terminal Building to Include Concessions/Restaurant Area
2. Construct Taxiway Connecting Runway 30 Threshold and Taxiway P Leading to Taxiway F and Install MITL
3. Conduct Environmental Assessment for Runway 12-30 and Taxiway K Extensions (Phase II) - *NP*
4. Extend Runway 12-30 and Taxiway K 1,400' Northwest and Construct Hold Apron and 500' Overrun (Phase II)
5. Construct Road Access/Parking to Support Landside Development on Northwest Side of Airport
6. Construct Taxiway Leading to Landside Development on Northwest Side of Airport
7. Install MALSR on Runway 26
8. General Pavement Maintenance - *NP*

NP - Not Pictured

The FAA and ADOT-MPD – Aeronautics Group utilize a national priority ranking system to help objectively evaluate potential airport projects. Projects are weighted toward safety, infrastructure preservation, standards, and capacity enhancement. These entities will participate in the highest priority projects before considering lower priority projects, even if a lower priority project is considered a more urgent need by the local sponsor. Nonetheless, the project should remain a priority for the airport and funding support should continue to be requested in subsequent years. More information related to the priority of projects will be outlined later in this chapter.

Some projects identified in the CIP will require environmental documentation. The level of documentation necessary for each project must be determined in consultation with the FAA and ADOT-MPD – Aeronautics Group. There are three major levels of environmental review to be considered under the *National Environmental Policy Act* (NEPA) that include categorical exclusions (CATEX), environmental assessments (EA), and environmental impact statements (EIS). Each level requires more time to complete and more detailed information. Guidance on what level of documentation is required for a specific project is provided in FAA Order 1050.1E, *Environmental Impacts: Policies and Procedures*. The Environmental Overview presented in Appendix B addresses NEPA and provides an evaluation of potential environmental impacts for Sierra Vista Municipal Airport.

SHORT TERM IMPROVEMENTS

The short term horizon considers 15 projects for the five-year planning period as presented on **Exhibit 6A** and illustrated on **Exhibit 6B**. The short term planning period is the only planning horizon separated into single years. This is to allow the CIP to be coordinated with the five-year planning cycle of the FAA and ADOT-MPD – Aeronautics Group programs.

2014 Projects

The first year of the CIP considers projects that may be accomplished in the 2014 federal funding cycle (October 2013 through September 2014). Projects called out during this timeframe are very specific in terms of actual design and construction. Several projects in the short term may also need to be addressed in a CATEX or an EA. As such, most projects are initially put through a design and environmental phase and then followed up with actual construction. This is evident with the projects listed in FY 2014. As proposed, the design of utility infrastructure improvements on the northwest side of the airport is called for. In addition, environmental analysis associated with the extension of Taxiway J on the north side of Runway 8-26 is programmed.

The Phase I installation of medium intensity taxiway lighting (MITL) and signage on Taxiway P is also included in FY 2014. The plan calls for the portion of Taxiway P, between entrance/exit Taxiways A and C on the south side of Runway 8-26, to be upgraded with proper lighting and signage that meets FAA standards.

2015 Projects

The Phase II implementation of MITL and signage on Taxiway P is the first project identified in FY 2015. This entails the portion of Taxiway P between Taxiways C and F. Upon completion, the entirety of

Taxiway P serving the south side of Runway 8-26 will be provided with MITL and signage that will allow for safer and more efficient use of the airfield.

Once the design work proposed in FY 2014 is complete for the utility upgrades, actual construction of a water storage tank and upgrades to the fire system is proposed in 2015. This project will provide additional utility capacity and safety for future landside development that could occur on the northwest side of the airport. It is important to enhance utility service into these areas, as this is the only conducive property available to meet future aviation demand at Sierra Vista Municipal Airport.

The final project in 2015 involves mitigating safety area deficiencies that exist on the airfield. As previously discussed, three wind cones are located within the runway safety area (RSA) on Runways 8-26 and 12-30. FAA design criteria require an area extending 250 feet either side of the runway centerline to be cleared and graded and free of objects to the extent practicable. The plan calls for the relocation of the wind cones outside the RSA and associated object free area (OFA) for both runways.

2016 Projects

The 2016 CIP focuses on runway and taxiway improvements to the airfield. Upon completion of the environmental work associated with Taxiway J, the first project in FY 2016 calls for coordinating the design of the parallel Taxiway J extension serving the north side of Runway 8-26. Two entrance/exit taxiways (Taxiways A and B) and a hold apron are also included in this project.

Another safety-related project in the short term deals with the current hold position markings associated with Runways 8-26 and 12-30. Currently, hold lines on Taxiways A, B, D, and F on the south side of Runway 8-26 range from 175 feet to 275 feet from the runway centerline. The FAA standard for hold lines on a runway meeting Airport Reference Code (ARC) / Runway Design Code (RDC) E-V standards is 297 feet when approach visibility minimums are not less than ¾-mile. In the event that ½-mile visibility minimums are provided on the runway, the hold lines would need to be further relocated to 327 feet from the runway centerline. The hold line on Taxiway S serving the Runway 30 threshold is to be relocated to 250 feet from the runway centerline.

A maintenance-related project in the short term program includes improving existing pavements at the airport. This includes increasing the weight-bearing capacity on certain portions of Taxiways G, J, and K serving the north side of the airfield. Historically, the U.S. Forest Service has based its seasonal firefighting operations on the south side of the airfield adjacent to Fort Huachuca. In an effort to better segregate this activity from special military operations, airfield officials are proposing the U.S. Forest Service relocate its operations to Sierra Vista Municipal Airport. Currently, portions of Taxiways G, J, and K are designed to 30,000 pounds single wheel loading (SWL). Due to the large and heavy tanker aircraft that provide aerial application of firefighting retardant, the pavement strength should be increased to better accommodate the safe and efficient operation of these aircraft. **Exhibit 6B** depicts the areas of Taxiways G, J, and K that should be further studied during the design phase.

The final project in 2016 involves an EA for the relocation of Eleven Mile Road. The relocation of this road will be required prior to extending Runway 12-30.

2017 Projects

Projects in FY 2017 include the construction and rehabilitation of taxiway pavements previously designed in 2016. The Phase IV construction of Taxiway J includes extending the taxiway approximately 4,400 feet west of Runway 3-21. The construction of Taxiway B is also called for that will connect Taxiway J with Runway 8-26. The extension of this taxiway as proposed will benefit all aircraft operations on the airfield.

The reconstruction and/or rehabilitation of Taxiways G, J, and K are also programmed during this time to provide enhanced use of the north side of the airfield for larger aircraft. In the event that the U.S. Forest Service relocates to the north side, it can be assumed that a large majority of its aircraft will utilize primary Runway 8-26 due to the length of 12,001 feet offered. As such, increasing the pavement strength on portions of these taxiways that provide access from the north side of the airfield to Runway 8-26 would better accommodate these activities while expanding the life of these pavements.

The next project involves evaluating environmental impacts related to an extension on Runway 12-30. Previous analysis indicated a potential need to extend this runway in the future to meet the needs of a larger majority of general aviation aircraft, especially in the event that primary Runway 8-26 is closed for maintenance or emergencies. Further consideration should be given to better segregating military and civilian operations given the fact that Runway 8-26 is utilized heavily by military aircraft. This determination would focus on the environmental impacts of a 1,234-foot northwesterly extension that would satisfy general aviation demands.

2018 Projects

Once the environmental documentation has been approved for the proposed Runway 12-30 extension, actual implementation of projects associated with the extension can begin. The first involves the relocation of Eleven Mile Road farther northwest so it remains clear of the ultimate safety areas associated with the runway. It is important that the City of Sierra Vista coordinate this road relocation with Fort Huachuca and FAA officials. Next, the Phase I construction of the runway involving a 1,234-foot extension, as well as the extension of partial parallel Taxiway K, and the associated entrance/exit taxiway is planned. A hold apron serving the proposed runway extension is also included with this project.

Short Term CIP Summary

The short term CIP includes projects that enhance the overall safety, efficiency, and maintenance of the airfield. It also positions Sierra Vista Municipal Airport to readily accept an increase in aviation demand by preparing the northwest side of the airport for future growth. The total investment necessary for the short term CIP is approximately $16.71 million. Of this total, approximately $15.96 million is eligible for FAA/ADOT-MPD – Aeronautics Group funding. At a minimum, the remaining $746,991 would need to be provided through local funding outlets.

INTERMEDIATE TERM IMPROVEMENTS

The intermediate term covers the period six through ten years. Planning new projects beyond a five-year timeframe can be challenging. Project need is heavily dependent upon local demand and the economic outlook of the aviation industry. The use of planning horizons to group potential airport projects provides the City of Sierra Vista the flexibility to accelerate those projects that are needed immediately and delay those projects that no longer have a high priority. Due to the fluid nature of aviation growth and the uncertainty of infrastructure and development needs more than five years into the future, the projects in the intermediate term were combined into a single project listing and not prioritized by year.

The intermediate term CIP considers eight projects for the five-year timeframe and is presented on **Exhibit 6A** and illustrated on **Exhibit 6B**. The first project included in the intermediate term program entails the Phase V construction of Taxiway J serving the north side of Runway 8-26. An additional 2,400 feet of taxiway pavement is to be extended to the west. Taxiway A is also constructed at this time, which serves as the entrance/exit taxiway serving the west end of the runway. The implementation of a hold apron adjacent to the west side of Taxiway A is also called for. The hold apron can improve efficiency by allowing aircraft run-ups while other aircraft can proceed to take-off. Upon completion, Taxiway J and associated Taxiways A and B will provide improved segregation of military and civilian aircraft utilizing the joint-use facility.

The next three projects call for safety-related improvements on Runways 12-30 and 3-21. The construction of a road extending east from the roadway serving the airport surveillance radar (ASR) equipment is proposed that would provide direct access to the automated weather observation system (AWOS). This will prevent technicians servicing the AWOS equipment from having to traverse the safety areas associated with Runways 12-30 and 3-21, further enhancing airfield safety.

As previously discussed, Runway 3-21 is currently not provided with approach and visual guidance. The intermediate term plan proposes improving the operational efficiency of this runway by providing two-box precision approach path indicator (PAPI-2) systems and runway end identification lights (REILs) on each end. The plan also implements improved awareness of the multiple-node intersection related to Runway 12-30 and Taxiways D and J. It is recommended that caution lighting and additional signage be made available to pilots utilizing this portion of the airfield in the future. Further coordination with FAA and Libby Army Airfield officials will be needed to best determine the extent of improvements at this intersection based upon FAA and military standards.

During this time, the plan proposes landside development on the northwest side of the airport. The construction of a vehicle roadway access serving this area is planned in addition to providing taxiway access leading to potential aviation development. Demand will dictate the magnitude and degree to which this infrastructure is developed.

As discussed in Chapter Five, the U.S. Army operates and maintains the airport traffic control tower (ATCT) on the south side of the airfield. Libby Army Airfield

officials have indicated that the equipment used to coordinate aircraft activities is outdated and the facility is undersized to accommodate advances in technology that will better meet the missions of military and civilian aircraft operations. Toward the end of the intermediate term, the construction of a new ATCT is proposed. Prior to actual construction, significant evaluations related to the location and height of the facility would need to be made. While the FAA is willing to participate with up to 90 percent funding for the construction of a federal control tower, this would not be the case at Sierra Vista Municipal Airport/Libby Army Airfield since the military is in charge of the airfield. Actual levels of general aviation aircraft operations being experienced at the time of this proposed project would determine the amount of grant funding that the FAA may contribute toward the construction of a control tower. If future general aviation and air taxi activity is consistent with the demand forecasts derived in Chapter Two of this study, the FAA will likely not participate in funding the construction of a new ATCT within the next 20 years as these operational levels are well below the typical levels needed to warrant justification for the use of FAA funds to help construct a tower facility. Although the construction of an ATCT is included in the CIP, its associated cost is not, due to the unknowns of this facility in relationship to the mission of military activities that would warrant its construction.

Miscellaneous pavement maintenance projects are also included as the final project. A substantial amount of funding is programmed for this line item to account for the large amount of pavement associated with the extensive runway and taxiway system on the airfield, as well as parking aprons situated on Sierra Vista Municipal Airport. Although listed as one project at the end of the intermediate term, it is conceivable that multiple pavement preservation projects could occur during this timeframe, utilizing portions of the funding set aside in this particular CIP item. The total costs associated with the intermediate term program are estimated at $3.03 million. Of this total, approximately $2.89 million could be eligible for federal/state grant funding, and the local share is projected to be $135,419.

LONG TERM IMPROVEMENTS

The long term planning horizon considers eight projects for the ten-year period. Several of these projects are demand-driven and involve continued landside development on the northwest side of the airport. The improvements are listed on **Exhibit 6A** and depicted on **Exhibit 6B**.

In the event the airport would like to provide dedicated concessions to pilots, passengers, and the general public, the first project in the long term includes the expansion of the terminal building to provide additional space for a restaurant facility. The costs associated with constructing additional space to accommodate such activities would fall solely on the City of Sierra Vista.

An entrance/exit taxiway connecting at a 90-degree angle to the Runway 30 threshold is scheduled at this time. Currently, aircraft taxiing from the north side of the airfield and desiring to depart on Runway 30 must back-taxi on a portion of the runway in order to utilize its full length for take-off. Constructing a taxiway that connects Taxiway F to the runway end will eliminate the need for aircraft to have to back-taxi, thus further enhancing airfield safety and efficiency.

The next two projects relate to the continued extension of Runway 12-30 to the northwest. During this phase, a 1,400-foot extension is called for that would allow 8,000 feet of usable length on Runway 12-30. Taxiway K would also need to be extended and the construction of an additional entrance/exit taxiway serving the ultimate Runway 12 threshold is also included with this project. As discussed in Chapter Five, Libby Army Airfield officials have indicated a need for 8,000 feet on Runway 12-30 to meet the demands of military operations planned on the airfield in the future. While a runway extension is eligible for federal and state funding, the U.S. Army would likely be responsible for the Phase II extension since the proposed length exceeds that needed to meet civilian aircraft demands.

The long term plan proposes the continued build-out of aviation landside development on the northwest side of the airport as demand will warrant. Roadway access and a taxiway extension is planned to accommodate hangar development and other aviation activities.

In an effort to improve airport utilization and safety, the long term CIP calls for an improved straight-in instrument approach procedure to Runway 26 with the potential for Category I approach minimums (200-foot cloud ceilings and ½-mile visibility minimums). As such, the plan proposes the installation of a medium intensity approach lighting system with runway alignment indicator lights (MALSR) serving Runway 26. This approach lighting system begins 200 feet from the runway threshold and extends approximately 2,400 feet into the approach area. At a minimum, an easement would be needed to control portions of the property east of the runway to accommodate the MALSR equipment. As with the intermediate term program, general pavement maintenance is also included in the long term to account for ongoing and preventative pavement repairs during the ten-year period.

Total long term program costs are estimated at $11.25 million with approximately $10.31 million eligible for FAA/ADOT-MPD – Aeronautics Group funding assistance. The remaining $941,573 would be the responsibility of the airport sponsor.

CAPITAL IMPROVEMENTS SUMMARY

The CIP is intended as a road map of airport improvements to help guide the airport sponsor, the FAA, and ADOT-MPD – Aeronautics Group on needed projects. The plan as presented will meet the forecast demand at Sierra Vista Municipal Airport over the next 20 years and, in many respects, beyond. It should be noted that the sequence of projects will likely change due to availability of funds or changing priorities. Nonetheless, this is a comprehensive list of capital projects the airport should consider in the next 20 years.

The total 20-year CIP proposes approximately $30.99 million in airport development. Of this total, approximately $29.17 million could be eligible for federal/state funding. The local funding requirement for the proposed 20-year CIP is $1.82 million.

CAPITAL IMPROVEMENT FUNDING SOURCES

There are generally four sources of funds used to finance airport development: airport cash flow, revenue and general obli-

gation bonds, federal/state/local grants, and passenger facility charges (PFCs), which are reserved for commercial service airports. Access to these sources of financing varies widely among airports, with some large airports maintaining substantial cash reserves and the small commercial service and general aviation airports often requiring subsidies from local and state governments to fund operating expenses and finance modest improvements.

Financing capital improvements at the airport will not rely solely on the financial resources of the airport or the city. Capital improvement funding is available through various grant-in-aid programs on both the state and federal levels. Historically, Sierra Vista Municipal Airport has received federal and state grants. While some years more funds could be available, the CIP was developed with project phasing in order to remain realistic and within the range of anticipated grant assistance. The following discussion outlines key sources of funding potentially available for capital improvements at Sierra Vista Municipal Airport.

FEDERAL GRANTS

Through federal legislation over the years, various grant-in-aid programs have been established to develop and maintain a system of public use airports across the United States. The purpose of this system and its federally based funding is to maintain national defense and to promote interstate commerce. The most recent legislation affecting federal funding was enacted on February 17, 2012 and is titled the *FAA Modernization and Reform Act of 2012*.

The law authorizes the FAA's Airport Improvement Program (AIP) at $3.35 billion for fiscal years 2012 through 2015. Eligible airports, which included those in the *National Plan of Integrated Airports Systems* (NPIAS), such as Sierra Vista Municipal Airport/Libby Army Airfield, can apply for airport improvement grants. **Table 6B** presents the approximate distribution of the AIP funds. Sierra Vista Municipal Airport is eligible to apply for grants which may be funded through state apportionments, the small airport fund, and/or discretionary categories.

Funding for AIP-eligible projects is undertaken through a cost-sharing arrangement in which FAA provides up to 90 percent of the cost and the airport sponsor invests the remaining 10 percent. In exchange for this level of funding, the airport sponsor is required to meet various grant assurances, including maintaining the improvement for its useful life, usually 20 years. As discussed earlier in this chapter, the FAA provides up to 91.06 percent of the cost of eligible projects for Arizona airports.

The source for AIP funds is the Aviation Trust Fund. The Aviation Trust Fund was established in 1970 to provide funding for aviation capital investment programs (aviation development, facilities and equipment, and research and development). The Aviation Trust Fund also finances the operation of the FAA. It is funded by user fees, including taxes on airline tickets, aviation fuel, and various aircraft parts.

TABLE 6B
Federal AIP Funding Distribution

Funding Category	Percent of Total	Funds*
Apportionment/Entitlement		
Passenger Entitlements	29.19%	$977,865,000
Cargo Entitlements	3.00%	$100,500,000
Alaska Supplemental	0.65%	$21,775,000
State Apportionment for Non-Primary Entitlements	10.35%	$346,725,000
State Apportionment Based on Area and Population	9.65%	$323,275,000
Carryover	10.77%	$360,795,000
Small Airport Fund		
Small Hubs	1.67%	$55,945,000
Non-hubs	6.68%	$223,780,000
Non-Primary (GA and Reliever)	3.34%	$111,890,000
Discretionary		
Capacity/Safety/Security/Noise	11.36%	$380,560,000
Pure Discretionary	3.79%	$126,965,000
Set Asides		
Noise	8.40%	$281,400,000
Military Airports Program	0.99%	$33,165,000
Reliever	0.16%	$5,360,000
Totals	100.00%	$3,350,000,000

**FAA Modernization and Reform Act of 2012*
AIP: Airport Improvement Program

Source: FAA Order 5100.38C, *Airport Improvement Program Handbook*

Apportionment (Entitlement) Funds

Federal AIP funds are distributed each year by the FAA from appropriations by Congress. A portion of the annual distribution is to primary commercial service airports based upon minimum enplanement levels of at least 10,000 passengers annually. Other entitlement funds are distributed to cargo service airports, states and insular areas (state apportionment), and Alaska airports.

General aviation airports included in the NPIAS can receive up to $150,000 each year in Non-Primary Entitlement (NPE) funds. These funds can be carried over and combined for up to four years, thereby allowing for completion of a more expensive project. In the past, Sierra Vista Municipal Airport has received NPE funding.

The states also receive a direct apportionment based on a federal formula that takes into account area and population. The states can then distribute these funds for projects at various airports throughout the state.

Small Airport Fund

If a large or medium hub commercial service airport chooses to institute a passenger facility charge (PFC), which is a fee of up to $4.50 on each airline ticket, for funding of capital improvement projects, then their apportionment is reduced. A portion of the reduced apportionment

goes to fund the small airport fund. The small airport fund is reserved for small-hub primary commercial service airports, non-hub commercial service airports, and general aviation airports.

Discretionary Funds

The remaining AIP funds are distributed by the FAA based on the priority of the project for which they have requested federal assistance through discretionary apportionments. A national priority ranking system is used to evaluate and rank each airport project. Those projects with the highest priority from airports across the country are given preference in funding. High priority projects include those related to meeting design standards, capacity improvements, and other safety enhancements.

Under the AIP program, examples of eligible development projects include the airfield, public aprons, and access roads. Additional buildings and structures may be eligible if the function of the structure is to serve airport operations in a non-revenue generating capacity, such as maintenance facilities. Some revenue-enhancing structures, such as T-hangars, may be eligible if all airfield improvements have been made but the priority ranking of these facilities is very low.

Whereas entitlement monies are guaranteed on an annual basis, discretionary funds are not assured. If the combination of entitlement, discretionary, and airport sponsor match does not provide enough capital for planned development, projects may be delayed.

Set-Aside Funds

Portions of AIP funds are set-asides designed to achieve specific funding minimums for noise compatibility planning and implementation, select former military airfields (Military Airport Program), and select reliever airports. Sierra Vista Municipal Airport does not qualify for set-aside funding.

FAA Facilities and Equipment Program

The Airway Facilities Division of the FAA administers the Facilities and Equipment (F&E) Program. This program provides funding for the installation and maintenance of various navigational aids and equipment of the national airspace system. Under the F&E program, funding is provided for FAA ATCTs, enroute navigational aids, on-airport navigational aids, and approach lighting systems.

While F&E still installs and maintains some navigational aids, on-airport facilities at general aviation airports have not been a priority. Therefore, airports often request funding assistance for navigational aids through AIP and then maintain the equipment on their own.

STATE FUNDING PROGRAMS

The ADOT-MPD – Aeronautics Group recognizes the valuable contribution to the state's transportation economy that airports make. Therefore, it administers several programs to aid in maintaining airports in the state. The source for state airport improvement funds is the Arizona

Aviation Fund. Taxes levied by the state on aviation fuel, flight property, aircraft registration tax, and registration fees (as well as interest on these funds) are deposited in the Arizona Aviation Fund. The State Transportation Board establishes the policies for distribution of these state funds.

Under the State of Arizona's grant program, an airport can receive funding for one-half (currently 4.47 percent) of the local share of projects receiving federal AIP funding. The state also provides 90 percent funding for projects which are typically not eligible for federal AIP funding or have not received federal funding.

Pavement Maintenance Program

The airport system in Arizona is a multi-million dollar investment of public and private funds that must be protected and preserved. State aviation fund dollars are limited and the State Transportation Board recognizes the need to protect and extend the maximum useful life of the airport system's pavement. The Arizona Pavement Management System (APMS) has been established to assist in the preservation of Arizona airports' system infrastructure.

Public Law 103-305 requires that airports requesting federal AIP funding for pavement rehabilitation or reconstruction have an effective pavement maintenance program system. To this end, ADOT-MPD – Aeronautics Group maintains the APMS. This system requires monthly airport inspections which are conducted by airport management and supplied to ADOT.

The Arizona APMS uses the Army Corps of Engineers' "Micropaver" program as a basis for generating a Five-Year APPP. The APMS consists of visual inspections of all airport pavements. Evaluations are made of the types and severities observed and entered into a computer program database. Pavement Condition Index (PCI) values are determined through the visual assessment of pavement conditions in accordance with the most recent FAA Advisory Circular 150/5380-7, *Pavement Management System*, and range from 0 (failed) to 100 (excellent). Every three years, a complete database update with new visual observations is conducted. Individual airport reports from the update are shared with all participating system airports. ADOT-MPD – Aeronautics Group ensures that the APMS database is kept current, in compliance with FAA requirements.

Every year, ADOT-MPD – Aeronautics Group, utilizing the APMS, will identify airport pavement maintenance projects eligible for funding for the upcoming five years. These projects will appear in the state's Five-Year Airport Development Program. Once a project has been identified and approved for funding by the State Transportation Board, the airport sponsor may elect to accept a state grant for the project and not participate in the APPP, or the airport sponsor may sign an Inter-Government Agreement (IGA) with ADOT-MPD – Aeronautics Group to participate in the APPP.

State Airport Loan Program

The ADOT Airport Loan Program was established to enhance the utilization of state funds and provide a flexible funding mechanism to assist airports in funding revenue-generating projects, such as hangars and fuel storage facilities. Projects which are not currently eligible for the State Airport Loan Program are con-

sidered if the project would enhance the airport's ability to be financially self-sufficient. As previously discussed, current limitations on the state funding program could affect this program.

LOCAL FUNDING

The balance of project costs, after consideration has been given to grants, must be funded through local resources. Sierra Vista Municipal Airport is owned and operated by the City of Sierra Vista and receives assistance from the city for both operational and capital expenditures. A goal for the airport is to generate enough revenue to cover all operating and capital expenditures. As with many general aviation airports, however, this is not always possible and other financial methods are needed.

There are several alternatives for local financing options for future development at the airport, including airport revenues, direct funding (subsidizing) from the city, issuing bonds, and leasehold financing. These strategies could be used to fund the local matching share, or complete the project if grant funding cannot be arranged.

There are several municipal bonding options available, including general obligation bonds, limited obligation bonds, and revenue bonds. General obligation bonds are a common form of municipal bond which is issued by voter approval and secured by the full faith and credit of the county, and future tax revenues are pledged to retire the debt. As instruments of credit and because the community secures the bonds, general obligation bonds reduce the available debt level of the community. Due to the community pledge to secure and pay general obligation bonds, they are the most secure type of municipal bond and are generally issued at lower interest rates and carry lower costs of issuance. The primary disadvantage of general obligation bonds is that they require voter approval and are subject to statutory debt limits. This requires that they be used for projects that have broad support among the voters, and that they are reserved for projects that have the highest public priorities.

In contrast to general obligation bonds, limited obligation bonds (sometimes referred to as self-liquidating bonds) are secured by revenues from a local source. While neither general fund revenues nor the taxing power of the local community is pledged to pay the debt service, these sources may be required to retire the debt if pledged revenues are insufficient to make interest and principal payments on the bonds. These bonds still carry the full faith and credit pledge of the local community and are considered, for the purpose of financial analysis, as part of the debt burden of the local community. The overall debt burden of the local community is a factor in determining interest rates on municipal bonds.

There are several types of revenue bonds, but in general, they are a form of municipal bond which is payable solely from the revenue derived from the operation of a facility that was constructed or acquired with the proceeds of the bonds. For example, a lease revenue bond is secured with the income from a lease assigned to the repayment of the bonds. Revenue bonds have become a common form of financing airport improvements. Revenue bonds present the opportunity to provide those improvements without direct burden to the taxpayer. Revenue bonds normally carry a higher interest rate because they lack the guarantees of general and limited obligation bonds.

Leasehold financing refers to a developer or tenant financing improvements under a long term ground lease. The obvious advantage of such an arrangement is that it relieves the community of all responsibility for raising the capital funds for improvements. However, the private development of facilities on a ground lease, particularly on property owned by a government agency, produces a unique set of concerns.

In particular, it is more difficult to obtain private financing as only the improvements and the right to continue the lease can be claimed in the event of a default. Ground leases normally provide for the reversion of improvements to the lessor at the end of the lease term, which reduces their potential value to a lender taking possession. Also, companies that want to own their property as a matter of financial policy may not locate where land is only available for lease.

In addition to leasehold financing, it is acceptable for the airport to enter into some form of public/private partnership for various airport projects. Typically, this would be limited to hangar construction, but there are some examples where a private developer constructs, for example, a taxilane, then deeds it to the airport for ongoing maintenance. When entering any such arrangement, the airport must be sure that the private developer does not gain an economic advantage over other airport tenants.

LOCAL FINANCIAL CONSIDERATIONS

Sierra Vista Municipal Airport is operated by the City of Sierra Vista's Public Works Department. Its daily operations are conducted through the collection of various rates and charges. These revenues are generated specifically by airport operations. There are, however, restrictions on the use of revenues collected by the airport. All receipts, excluding bond proceeds or related grants and interest, are irrevocably pledged to the punctual payment of operating and maintenance expenses, payment of debt service for as long as bonds remain outstanding, or for additions or improvements to airport facilities.

All general aviation airports should establish standard basis rates for various leases. All lease rates should be set to adjust to a standard index such as the consumer price index (CPI) to assure that fair and equitable rates continue to be charged into the future. Many factors will impact what the standard lease rate should be for a particular facility or ground parcel. For example, ground leases for aviation-related facilities should have a different lease rate than for non-aviation leases. When airports own hangars, a separate facility lease rate should be charged. The lease rate for any individual parcel or hangar can vary due to availability of utilities, condition, location, and other factors. Nonetheless, standard lease rates should fall within an acceptable range.

Operating Revenues and Expenses

Table 6C presents the budgeted revenue and expenses projections for the airport over the past three years, including any capital grants (FAA/State funding), transfers in to match the grants, and capital outlays. Besides the proposed grant amounts, the largest budgeted revenue center for the airport is the sale of aviation fuel (Jet A and 100LL), accounting for over 80 percent of overall operating revenues during each FY. Revenue related to hangar rental, as well as ground/terminal leases, also serve as a substantial revenue generator budgeted by the City of Sierra Vista.

TABLE 6C
Operating Revenue and Expenses
Sierra Vista Municipal Airport

	FY 2010/2011	FY 2011/2012	FY 2012/2013
BUDGETED OPERATING REVENUES			
FAA and ADOT Grants	$309,750	$780,000	$2,190,716
Gas and Oil Revenues	900,000	1,070,216	1,066,568
Leases	225,000	211,000	211,000
Transfers In - CIP		20,000	18,750
Miscellaneous Revenue	5,000	5,000	5,000
Total Operating Revenues	**$1,439,750**	**$2,086,216**	**$3,492,034**
BUDGETED OPERATING EXPENSES			
Personnel Services	$126,539	$128,895	$131,248
Professional Services	17,900	17,900	17,400
Utilities	48,950	48,950	48,950
Building and Infrastructure Maintenance	20,600	15,600	13,100
Equipment Rentals	40,000	40,000	40,000
Advertising	5,000	5,000	5,000
Specialized Supplies	15,000	15,000	12,000
Travel and Training	2,500	2,500	2,500
Fuel	750,000	900,000	900,000
Donations	2,000	2,000	1,650
Capital Outlay	300,000	800,000	2,209,465
Total Operating Expenses	**$1,328,489**	**$1,975,845**	**$3,381,313**
Budgeted Income/(Loss)	**$111,261**	**$110,371**	**$110,721**

Source: City of Sierra Vista Proposed 2013 Fiscal Year Budget Report

Generalized operating expenses for the airport include personnel and professional services, utilities, building and infrastructure maintenance, equipment rental, advertising, specialized supplies, travel and training, fuel, donations, and capital outlays. The purchase of aviation fuel for re-sale is the largest budgeted expense category aside from the proposed capital expenditures related to projects that would be reimbursed through federal and/or state grants. Personnel services, which includes salaries and benefits associated with all those individuals who help operate and maintain Sierra Vista Municipal Airport, including the FBO operations, is also a substantial expense category. Utilities (electricity, natural gas, telephone, etc.), equipment rentals, and maintenance also account for major expense items within the operating budget.

Although the budget projections show airport revenues exceeding expenses over the past three years, according to city officials the amount of fuel the airport sells each year usually determines the profit/loss margin experienced at the facility. Historically, the airport is subsidized by the city's general fund if its expenses ex-

ceed revenues. It should be noted that during an extreme fire outbreak that occurred in the region two years ago, the airport experienced a net profit of over $300,000 due to the large volume of fuel sold to the U.S. Forest Service.

Financial Summary

The above financial discussion is intended to show that the operation of Sierra Vista Municipal Airport meets various requirements and goals set forth by the FAA.

Grant Assurance #24 – Fee and Rental Structure: Requires the airport sponsor to set fees, lease rates, and other charges that are directed at making the airport as self-sustaining as possible. As demonstrated through an evaluation of the airport's rates and charges, the fee and rental structure for airport property and facilities is fair and equitable.

Grant Assurance #25 – Airport Revenues: Restricts the use of airport revenue generated by the airport and local taxes on aviation fuel to be expended for the capital or operating costs of the airport, the local airport system, or other facilities owned or operated by the airport sponsor, which directly and substantially relate to the actual air transportation of passengers or property or noise mitigation efforts. In general, revenue generated by the airport may not be diverted to functions unrelated to the operation and maintenance of the airport. Examples of revenue diversion include:

a) General economic development;
b) Marketing and promotional activities unrelated to the airport;
c) Payments in lieu of taxes or other assessments that exceed the value of services;
d) Payments to compensate sponsoring governmental bodies for lost tax revenues exceeding stated tax rates; and
e) Direct or indirect payments of airport revenue beyond that which is required to pay for services and facilities provided to the airport.

The City of Sierra Vista maintains a special fund (Airport Fund) for accounting of airport revenues and expenses.

SUMMARY

There is a continuous debate in communities across the country about the mission of local airports. Many communities view the local airports as assets and treat them as another department within the local government structure. Under this structure, like parks, the airport is not expected to be a profit center. Other communities view the airport as a business center where profit is the goal. Most communities settle on some combination where revenue generation is maximized and any additional funds needed come from the general operating budget of the sponsoring community.

The best means to begin implementation of the recommendations in this Master Plan is to first recognize that planning is a continuous process that does not end with completion and approval of this document. Rather, the airport should implement measures that allow them to track various demand indicators, such as based aircraft, hangar demand, and operations. The issues upon which this Master

Plan is based will remain valid for a number of years. The primary goal is for the airport to best serve the air transportation needs of the region, while continuing to be economically self-sufficient.

The actual need for facilities is most appropriately established by airport activity levels rather than a specified date. For example, projections have been made as to when additional hangars may be needed at the airport. In reality, however, the timeframe in which the development is needed may be substantially different. Actual demand may be slower to develop than expected. On the other hand, high levels of demand may establish the need to accelerate development. Although every effort has been made in this master planning process to conservatively estimate when facility development may be needed, aviation demand will dictate when facility improvements need to be delayed or accelerated.

The real value of a usable Master Plan is in keeping the issues and objectives in the minds of the managers and decision-makers so that they are better able to recognize change and its effect. In addition to adjustments in aviation demand, decisions made as to when to undertake the improvements recommended in this Master Plan will impact how long the plan remains valid. The format used in this plan is intended to reduce the need for formal and costly updates by simply adjusting the timing of project implementation. Updating can be done by the manager, thereby improving the plan's effectiveness.

In summary, the planning process requires the City of Sierra Vista to consistently monitor the progress of the airport in terms of aircraft operations and based aircraft. Analysis of aircraft demand is critical to the timing and need for new airport facilities. The information obtained from continually monitoring airport activity will provide the data necessary to determine if the development schedule should be accelerated or delayed.

Appendix A

GLOSSARY OF TERMS

Glossary of Terms

A

ABOVE GROUND LEVEL: The elevation of a point or surface above the ground.

ACCELERATE-STOP DISTANCE AVAILABLE (ASDA): See declared distances.

ADVISORY CIRCULAR: External publications issued by the FAA consisting of nonregulatory material providing for the recommendations relative to a policy, guidance and information relative to a specific aviation subject.

AIR CARRIER: An operator which: (1) performs at least five round trips per week between two or more points and publishes flight schedules which specify the times, days of the week, and places between which such flights are performed; or (2) transports mail by air pursuant to a current contract with the U.S. Postal Service. Certified in accordance with Federal Aviation Regulation (FAR) Parts 121 and 127.

AIRCRAFT: A transportation vehicle that is used or intended for use for flight.

AIRCRAFT APPROACH CATEGORY: A grouping of aircraft based on 1.3 times the stall speed in their landing configuration at their maximum certificated landing weight. The categories are as follows:

- Category A: Speed less than 91 knots.
- Category B: Speed 91 knots or more, but less than 121 knots.
- Category C: Speed 121 knots or more, but less than 141 knots.
- Category D: Speed 141 knots or more, but less than 166 knots.
- Category E: Speed greater than 166 knots.

AIRCRAFT OPERATION: The landing, takeoff, or touch-and-go procedure by an aircraft on a runway at an airport.

AIRCRAFT OPERATIONS AREA (AOA): A restricted and secure area on the airport property designed to protect all aspects related to aircraft operations.

AIRCRAFT OWNERS AND PILOTS ASSOCIATION: A private organization serving the interests and needs of general aviation pilots and aircraft owners.

AIRCRAFT RESCUE AND FIRE FIGHTING: A facility located at an airport that provides emergency vehicles, extinguishing agents, and personnel responsible for minimizing the impacts of an aircraft accident or incident.

AIRFIELD: The portion of an airport which contains the facilities necessary for the operation of aircraft.

AIRLINE HUB: An airport at which an airline concentrates a significant portion of its activity and which often has a significant amount of connecting traffic.

AIRPLANE DESIGN GROUP (ADG): A grouping of aircraft based upon wingspan. The groups are as follows:

- Group I: Up to but not including 49 feet.
- Group II: 49 feet up to but not including 79 feet.
- Group III: 79 feet up to but not including 118 feet.
- Group IV: 118 feet up to but not including 171 feet.
- Group V: 171 feet up to but not including 214 feet.
- Group VI: 214 feet or greater.

AIRPORT AUTHORITY: A quasi-governmental public organization responsible for setting the policies governing the management and operation of an airport or system of airports under its jurisdiction.

AIRPORT BEACON: A navigational aid located at an airport which displays a rotating light beam to identify whether an airport is lighted.

AIRPORT CAPITAL IMPROVEMENT PLAN: The planning program used by the Federal Aviation Administration to identify, prioritize, and distribute funds for airport development and the needs of the National Airspace System to meet specified national goals and objectives.

AIRPORT ELEVATION: The highest point on the runway system at an airport expressed in feet above mean sea level (MSL).

AIRPORT IMPROVEMENT PROGRAM: A program authorized by the Airport and Airway

Improvement Act of 1982 that provides funding for airport planning and development.

AIRPORT LAYOUT DRAWING (ALD): The drawing of the airport showing the layout of existing and proposed airport facilities.

AIRPORT LAYOUT PLAN (ALP): A scaled drawing of the existing and planned land and facilities necessary for the operation and development of the airport.

AIRPORT LAYOUT PLAN DRAWING SET: A set of technical drawings depicting the current and future airport conditions. The individual sheets comprising the set can vary with the complexities of the airport, but the FAA-required drawings include the Airport Layout Plan (sometimes referred to as the Airport Layout Drawing (ALD), the Airport Airspace Drawing, and the Inner Portion of the Approach Surface Drawing, On-Airport Land Use Drawing, and Property Map.

AIRPORT MASTER PLAN: The planner's concept of the long-term development of an airport.

AIRPORT MOVEMENT AREA SAFETY SYSTEM: A system that provides automated alerts and warnings of potential runway incursions or other hazardous aircraft movement events.

AIRPORT OBSTRUCTION CHART: A scaled drawing depicting the Federal Aviation Regulation (FAR) Part 77 surfaces, a representation of objects that penetrate these surfaces, runway, taxiway, and ramp areas, navigational aids, buildings, roads and other detail in the vicinity of an airport.

AIRPORT REFERENCE CODE (ARC): A coding system used to relate airport design criteria to the operational (Aircraft Approach Category) to the physical characteristics (Airplane Design Group) of the airplanes intended to operate at the airport.

AIRPORT REFERENCE POINT (ARP): The latitude and longitude of the approximate center of the airport.

AIRPORT SPONSOR: The entity that is legally responsible for the management and operation of an airport, including the fulfillment of the requirements of laws and regulations related thereto.

AIRPORT SURFACE DETECTION EQUIPMENT: A radar system that provides air traffic controllers with a visual representation of the movement of aircraft and other vehicles on the ground on the airfield at an airport.

AIRPORT SURVEILLANCE RADAR: The primary radar located at an airport or in an air traffic control terminal area that receives a signal at an antenna and transmits the signal to air traffic control display equipment defining the location of aircraft in the air. The signal provides only the azimuth and range of aircraft from the location of the antenna.

AIRPORT TRAFFIC CONTROL TOWER (ATCT): A central operations facility in the terminal air traffic control system, consisting of a tower, including an associated instrument flight rule (IFR) room if radar equipped, using air/ground communications and/or radar, visual signaling and other devices to provide safe and expeditious movement of terminal air traffic.

AIR ROUTE TRAFFIC CONTROL CENTER: A facility which provides en route air traffic control service to aircraft operating on an IFR flight plan within controlled airspace over a large, multi-state region.

AIRSIDE: The portion of an airport that contains the facilities necessary for the operation of aircraft.

AIRSPACE: The volume of space above the surface of the ground that is provided for the operation of aircraft.

AIR TAXI: An air carrier certificated in accordance with FAR Part 121 and FAR Part 135 and authorized to provide, on demand, public transportation of persons and property by aircraft. Generally operates small aircraft "for hire" for specific trips.

AIR TRAFFIC CONTROL: A service operated by an appropriate organization for the purpose of providing for the safe, orderly, and expeditious flow of air traffic.

AIR ROUTE TRAFFIC CONTROL CENTER (ARTCC): A facility established to provide air traffic control service to aircraft operating on an IFR flight plan within controlled airspace and principally during the en route phase of flight.

AIR TRAFFIC CONTROL SYSTEM COMMAND CENTER: A facility operated by the FAA which is responsible for the central flow control, the central altitude reservation system, the airport reservation position system, and the air traffic service contingency command for the air traffic control system.

AIR TRAFFIC HUB: A categorization of commercial service airports or group of commercial service airports in a metropolitan or urban area based upon the proportion of annual national enplanements existing at the airport or airports. The categories are large hub, medium hub, small hub, or non-hub. It forms the basis for the apportionment of entitlement funds.

AIR TRANSPORT ASSOCIATION OF AMERICA: An organization consisting of the principal U.S. airlines that represents the interests of the airline industry on major aviation issues before federal, state, and local government bodies. It promotes air transportation safety by coordinating industry and governmental safety programs and it serves as a focal point for industry efforts to standardize practices and enhance the efficiency of the air transportation system.

ALERT AREA: See special-use airspace.

ALTITUDE: The vertical distance measured in feet above mean sea level.

ANNUAL INSTRUMENT APPROACH (AIA): An approach to an airport with the intent to land by an aircraft in accordance with an IFR flight plan when visibility is less than three miles and/or when the ceiling is at or below the minimum initial approach altitude.

APPROACH LIGHTING SYSTEM (ALS): An airport lighting facility which provides visual guidance to landing aircraft by radiating light beams by which the pilot aligns the aircraft with the extended centerline of the runway on his final approach and landing.

APPROACH MINIMUMS: The altitude below which an aircraft may not descend while on an IFR approach unless the pilot has the runway in sight.

APPROACH SURFACE: An imaginary obstruction limiting surface defined in FAR Part 77 which is longitudinally centered on an extended runway centerline and extends outward and upward from the primary surface at each end of a runway at a designated slope and distance based upon the type of available or planned approach by aircraft to a runway.

APRON: A specified portion of the airfield used for passenger, cargo or freight loading and unloading, aircraft parking, and the refueling, maintenance and servicing of aircraft.

AREA NAVIGATION: The air navigation procedure that provides the capability to establish and maintain a flight path on an arbitrary course that remains within the coverage area of navigational sources being used.

AUTOMATED TERMINAL INFORMATION SERVICE (ATIS): The continuous broadcast of recorded non-control information at towered airports. Information typically includes wind speed, direction, and runway in use.

AUTOMATED SURFACE OBSERVATION SYSTEM (ASOS): A reporting system that provides frequent airport ground surface weather observation data through digitized voice broadcasts and printed reports.

AUTOMATIC WEATHER OBSERVATION STATION (AWOS): Equipment used to automatically record weather conditions (i.e. cloud height, visibility, wind speed and direction, temperature, dew point, etc.)

AUTOMATIC DIRECTION FINDER (ADF): An aircraft radio navigation system which senses and indicates the direction to a non-directional radio beacon (NDB) ground transmitter.

AVIGATION EASEMENT: A contractual right or a property interest in land over which a right of unobstructed flight in the airspace is established.

AZIMUTH: Horizontal direction expressed as the angular distance between true north and the direction of a fixed point (as the observer's heading).

B

BASE LEG: A flight path at right angles to the landing runway off its approach end. The base leg normally extends from the downwind leg to the intersection of the extended runway centerline. See "traffic pattern."

BASED AIRCRAFT: The general aviation aircraft that use a specific airport as a home base.

BEARING: The horizontal direction to or from any point, usually measured clockwise from true north or magnetic north.

BLAST FENCE: A barrier used to divert or dissipate jet blast or propeller wash.

BLAST PAD: A prepared surface adjacent to the end of a runway for the purpose of eliminating the erosion of the ground surface by the wind forces produced by airplanes at the initiation of takeoff operations.

BUILDING RESTRICTION LINE (BRL): A line which identifies suitable building area locations on the airport.

C

CAPITAL IMPROVEMENT PLAN: The planning program used by the Federal Aviation Administration to identify, prioritize, and distribute Airport Improvement Program funds for airport development and the needs of the National Airspace System to meet specified national goals and objectives.

CARGO SERVICE AIRPORT: An airport served by aircraft providing air transportation of property only, including mail, with an annual aggregate landed weight of at least 100,000,000 pounds.

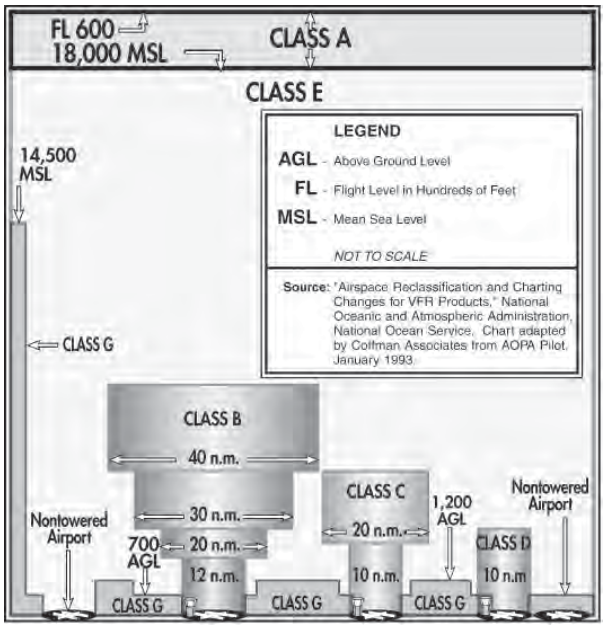
CATEGORY I: An Instrument Landing System (ILS) that provides acceptable guidance information to an aircraft from the coverage limits of the ILS to the point at which the localizer course line intersects the glide path at a decision height of 100 feet above the horizontal plane containing the runway threshold.

CATEGORY II: An ILS that provides acceptable guidance information to an aircraft from the coverage limits of the ILS to the point at which the localizer course line intersects the glide path at a decision height of 50 feet above the horizontal plane containing the runway threshold.

CATEGORY III: An ILS that provides acceptable guidance information to a pilot from the coverage limits of the ILS with no decision height specified above the horizontal plane containing the runway threshold.

CEILING: The height above the ground surface to the location of the lowest layer of clouds which is reported as either broken or overcast.

CIRCLING APPROACH: A maneuver initiated by the pilot to align the aircraft with the runway for landing when flying a predetermined circling instrument approach under IFR.



CLASS A AIRSPACE: See Controlled Airspace.

CLASS B AIRSPACE: See Controlled Airspace.

CLASS C AIRSPACE: See Controlled Airspace.

CLASS D AIRSPACE: See Controlled Airspace.

CLASS E AIRSPACE: See Controlled Airspace.

CLASS G AIRSPACE: See Controlled Airspace.

CLEAR ZONE: See Runway Protection Zone.

COMMERCIAL SERVICE AIRPORT: A public airport providing scheduled passenger service that enplanes at least 2,500 annual passengers.

COMMON TRAFFIC ADVISORY FREQUENCY: A radio frequency identified in the appropriate aeronautical chart which is designated for the purpose of transmitting airport advisory information and procedures while operating to or from an uncontrolled airport.

COMPASS LOCATOR (LOM): A low power, low/medium frequency radio-beacon installed in conjunction with the instrument landing system at one or two of the marker sites.

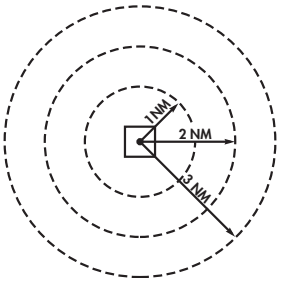
CONICAL SURFACE: An imaginary obstruction-limiting surface defined in FAR Part 77 that extends from the edge of the horizontal surface outward and upward at a slope of 20 to 1 for a horizontal distance of 4,000 feet.

CONTROLLED AIRPORT: An airport that has an operating airport traffic control tower.

CONTROLLED AIRSPACE: Airspace of defined dimensions within which air traffic control services are provided to instrument flight rules (IFR) and visual flight rules (VFR) flights in accordance with the airspace classification. Controlled airspace in the United States is designated as follows:

- **CLASS A**: Generally, the airspace from 18,000 feet mean sea level (MSL) up to but not including flight level FL600. All persons must operate their aircraft under IFR.

- **CLASS B**: Generally, the airspace from the surface to 10,000 feet MSL surrounding the nation's busiest airports. The configuration of Class B airspace is unique to each airport, but typically consists of two or more layers of air space and is designed to contain all published instrument approach procedures to the airport. An air traffic control clearance is required for all aircraft to operate in the area.



- **CLASS C**: Generally, the airspace from the surface to 4,000 feet above the airport elevation (charted as MSL) surrounding those airports that have an operational control tower and radar approach control and are served by a qualifying number of IFR operations or passenger enplanements. Although individually tailored for each airport, Class C airspace typically consists of a surface area with a five nautical mile (nm) radius and an outer area with a 10 nautical mile radius that extends from 1,200 feet to 4,000 feet above the airport elevation. Two-way radio communication is required for all aircraft.

- **CLASS D**: Generally, that airspace from the surface to 2,500 feet above the air port elevation (charted as MSL) surrounding those airports that have an operational control tower. Class D airspace is individually tailored and configured to encompass published instrument approach procedure . Unless otherwise authorized, all persons must establish two-way radio communication.

- **CLASS E**: Generally, controlled airspace that is not classified as Class A, B, C, or D. Class E airspace extends upward from either the surface or a designated altitude to the overlying or adjacent controlled airspace. When designated as a surface area, the airspace will be configured to contain all instrument procedures. Class E airspace encompasses all Victor Airways. Only aircraft following instrument flight rules are required to establish two-way radio communication with air traffic control.

- **CLASS G**: Generally, that airspace not classified as Class A, B, C, D, or E. Class G airspace is uncontrolled for all aircraft. Class G airspace extends from the surface to the overlying Class E airspace.

CONTROLLED FIRING AREA: See special-use airspace.

CROSSWIND: A wind that is not parallel to a runway centerline or to the intended flight path of an aircraft.

CROSSWIND COMPONENT: The component of wind that is at a right angle to the runway centerline or the intended flight path of an aircraft.

CROSSWIND LEG: A flight path at right angles to the landing runway off its upwind end. See "traffic pattern."

D

DECIBEL: A unit of noise representing a level relative to a reference of a sound pressure 20 micro newtons per square meter.

DECISION HEIGHT: The height above the end of the runway surface at which a decision must be made by a pilot during the ILS or Precision Approach Radar approach to either continue the approach or to execute a missed approach.

DECLARED DISTANCES: The distances declared available for the airplane's takeoff runway, takeoff distance, accelerate-stop distance, and landing distance requirements. The distances are:

- **TAKEOFF RUNWAY AVAILABLE (TORA)**: The runway length declared available and suitable for the ground run of an airplane taking off.
- **TAKEOFF DISTANCE AVAILABLE (TODA)**: The TORA plus the length of any remaining runway and/or clear way beyond the far end of the TORA.
- **ACCELERATE-STOP DISTANCE AVAILABLE (ASDA)**: The runway plus stopway length declared available for the acceleration and deceleration of an aircraft aborting a takeoff.
- **LANDING DISTANCE AVAILABLE (LDA)**: The runway length declared available and suitable for landing.

DEPARTMENT OF TRANSPORTATION: The cabinet level federal government organization consisting of modal operating agencies, such as the Federal Aviation Administration, which was established to promote the coordination of federal transportation programs and to act as a focal point for research and development efforts in transportation.

DISCRETIONARY FUNDS: Federal grant funds that may be appropriated to an airport based upon designation by the Secretary of Transportation or Congress to meet a specified national priority such as enhancing capacity, safety, and security, or mitigating noise.

DISPLACED THRESHOLD: A threshold that is located at a point on the runway other than the designated beginning of the runway.

DISTANCE MEASURING EQUIPMENT (DME): Equipment (airborne and ground) used to measure, in nautical miles, the slant range distance of an aircraft from the DME navigational aid.

DNL: The 24-hour average sound level, in Aweighted decibels, obtained after the addition of ten decibels to sound levels for the periods between 10 p.m. and 7 a.m. as averaged over a span of one year. It is the FAA standard metric for determining the cumulative exposure of individuals to noise.

DOWNWIND LEG: A flight path parallel to the landing runway in the direction opposite to landing. The downwind leg normally extends between the crosswind leg and the base leg. Also see "traffic pattern."

E

EASEMENT: The legal right of one party to use a portion of the total rights in real estate owned by another party. This may include the right of passage over, on, or below the property; certain air rights above the property, including view rights; and the rights to any specified form of development or activity, as well as any other legal rights in the property that may be specified in the easement document.

ELEVATION: The vertical distance measured in feet above mean sea level.

ENPLANED PASSENGERS: The total number of revenue passengers boarding aircraft, including originating, stop-over, and transfer passengers, in scheduled and nonscheduled services.

ENPLANEMENT: The boarding of a passenger, cargo, freight, or mail on an aircraft at an airport.

ENTITLEMENT: Federal funds for which a commercial service airport may be eligible based upon its annual passenger enplanements.

ENVIRONMENTAL ASSESSMENT (EA): An environmental analysis performed pursuant to the National Environmental Policy Act to determine whether an action would significantly affect the environment and thus require a more detailed environmental impact statement.

ENVIRONMENTAL AUDIT: An assessment of the current status of a party's compliance with applicable

environmental requirements of a party's environmental compliance policies, practices, and controls.

ENVIRONMENTAL IMPACT STATEMENT (EIS): A document required of federal agencies by the National Environmental Policy Act for major projects are legislative proposals affecting the environment. It is a tool for decision-making describing the positive and negative effects of a proposed action and citing alternative actions.

ESSENTIAL AIR SERVICE: A federal program which guarantees air carrier service to selected small cities by providing subsidies as needed to prevent these cities from such service.

F

FEDERAL AVIATION REGULATIONS: The general and permanent rules established by the executive departments and agencies of the Federal Government for aviation, which are published in the Federal Register. These are the aviation subset of the Code of Federal Regulations.

FEDERAL INSPECTION SERVICES: The provision of customs and immigration services including passport inspection, inspection of baggage, the collection of duties on certain imported items, and the inspections for agricultural products, illegal drugs, or other restricted items.

FINAL APPROACH: A flight path in the direction of landing along the extended runway centerline. The final approach normally extends from the base leg to the runway. See "traffic pattern."

FINAL APPROACH AND TAKEOFF AREA (FATO). A defined area over which the final phase of the helicopter approach to a hover, or a landing is completed and from which the takeoff is initiated.

FINAL APPROACH FIX: The designated point at which the final approach segment for an aircraft landing on a runway begins for a non-precision approach.

FINDING OF NO SIGNIFICANT IMPACT (FONSI): A public document prepared by a Federal agency that presents the rationale why a proposed action will not have a significant effect on the environment and for which an environmental impact statement will not be prepared.

FIXED BASE OPERATOR (FBO): A provider of services to users of an airport. Such services include, but are not limited to, hangaring, fueling, flight training, repair, and maintenance.

FLIGHT LEVEL: A designation for altitude within controlled airspace.

FLIGHT SERVICE STATION: An operations facility in the national flight advisory system which utilizes data interchange facilities for the collection and dissemination of Notices to Airmen, weather, and administrative data and which provides pre-flight and in-flight advisory services to pilots through air and ground based communication facilities.

FRANGIBLE NAVAID: A navigational aid which retains its structural integrity and stiffness up to a designated maximum load, but on impact from a greater load, breaks, distorts, or yields in such a manner as to present the minimum hazard to aircraft.

G

GENERAL AVIATION: That portion of civil aviation which encompasses all facets of aviation except air carriers holding a certificate of convenience and necessity, and large aircraft commercial operators.

GENERAL AVIATION AIRPORT: An airport that provides air service to only general aviation.

GLIDESLOPE (GS): Provides vertical guidance for aircraft during approach and landing. The glideslope consists of the following:

1. Electronic components emitting signals which provide vertical guidance by reference to airborne instruments during instrument approaches such as ILS; or

2. Visual ground aids, such as VASI, which provide vertical guidance for VFR approach or for the visual portion of an instrument approach and landing.

GLOBAL POSITIONING SYSTEM (GPS): A system of 24 satellites used as reference points to enable navigators equipped with GPS receivers to determine their latitude, longitude, and altitude.

GROUND ACCESS: The transportation system on and around the airport that provides access to and

from the airport by ground transportation vehicles for passengers, employees, cargo, freight, and airport services.

H

HELIPAD: A designated area for the takeoff, landing, and parking of helicopters.

HIGH INTENSITY RUNWAY LIGHTS: The highest classification in terms of intensity or brightness for lights designated for use in delineating the sides of a runway.

HIGH-SPEED EXIT TAXIWAY: A long radius taxiway designed to expedite aircraft turning off the runway after landing (at speeds to 60 knots), thus reducing runway occupancy time.

HORIZONTAL SURFACE: An imaginary obstruction- limiting surface defined in FAR Part 77 that is specified as a portion of a horizontal plane surrounding a runway located 150 feet above the established airport elevation. The specific horizontal dimensions of this surface are a function of the types of approaches existing or planned for the runway.

I

INITIAL APPROACH FIX: The designated point at which the initial approach segment begins for an instrument approach to a runway.

INSTRUMENT APPROACH PROCEDURE: A series of predetermined maneuvers for the orderly transfer of an aircraft under instrument flight conditions from the beginning of the initial approach to a landing, or to a point from which a landing may be made visually.

INSTRUMENT FLIGHT RULES (IFR): Procedures for the conduct of flight in weather conditions below Visual Flight Rules weather minimums. The term IFR is often also used to define weather conditions and the type of flight plan under which an aircraft is operating.

INSTRUMENT LANDING SYSTEM (ILS): A precision instrument approach system which normally consists of the following electronic components and visual aids:

1. Localizer.
2. Glide Slope.
3. Outer Marker.
4. Middle Marker.
5. Approach Lights.

INSTRUMENT METEOROLOGICAL CONDITIONS: Meteorological conditions expressed in terms of specific visibility and ceiling conditions that are less than the minimums specified for visual meteorological conditions.

ITINERANT OPERATIONS: Operations by aircraft that are not based at a specified airport.

K

KNOTS: A unit of speed length used in navigation that is equivalent to the number of nautical miles traveled in one hour.

L

LANDSIDE: The portion of an airport that provides the facilities necessary for the processing of passengers, cargo, freight, and ground transportation vehicles.

LANDING DISTANCE AVAILABLE (LDA): See declared distances.

LARGE AIRPLANE: An airplane that has a maximum certified takeoff weight in excess of 12,500 pounds.

LOCAL AREA AUGMENTATION SYSTEM: A differential GPS system that provides localized measurement correction signals to the basic GPS signals to improve navigational accuracy integrity, continuity, and availability.

LOCAL OPERATIONS: Aircraft operations performed by aircraft that are based at the airport and that operate in the local traffic pattern or within sight of the airport, that are known to be departing for or arriving from flights in local practice areas within a prescribed distance from the airport, or that execute simulated instrument approaches at the airport.

LOCAL TRAFFIC: Aircraft operating in the traffic pattern or within sight of the tower, or aircraft known to be departing or arriving from the local practice areas, or aircraft executing practice instrument

approach procedures. Typically, this includes touch and-go training operations.

LOCALIZER: The component of an ILS which provides course guidance to the runway.

LOCALIZER TYPE DIRECTIONAL AID (LDA): A facility of comparable utility and accuracy to a localizer, but is not part of a complete ILS and is not aligned with the runway.

LONG RANGE NAVIGATION SYSTEM (LORAN): Long range navigation is an electronic navigational aid which determines aircraft position and speed by measuring the difference in the time of reception of synchronized pulse signals from two fixed transmitters. Loran is used for en route navigation.

LOW INTENSITY RUNWAY LIGHTS: The lowest clas- sification in terms of intensity or brightness for lights designated for use in delineating the sides of a runway.

M

MEDIUM INTENSITY RUNWAY LIGHTS: The middle classification in terms of intensity or brightness for lights designated for use in delineating the sides of a runway.

MICROWAVE LANDING SYSTEM (MLS): An instrument approach and landing system that provides precision guidance in azimuth, elevation, and distance measurement.

MILITARY OPERATIONS: Aircraft operations that are performed in military aircraft.

MILITARY OPERATIONS AREA (MOA): See special-use airspace

MILITARY TRAINING ROUTE: An air route depicted on aeronautical charts for the conduct of military flight training at speeds above 250 knots.

MISSED APPROACH COURSE (MAC): The flight route to be followed if, after an instrument approach, a landing is not affected, and occurring normally:

1. When the aircraft has descended to the decision height and has not established visual contact; or

2. When directed by air traffic control to pull up or to go around again.

MOVEMENT AREA: The runways, taxiways, and other areas of an airport which are utilized for taxiing/hover taxiing, air taxiing, takeoff, and landing of aircraft, exclusive of loading ramps and parking areas. At those airports with a tower, air traffic control clearance is required for entry onto the movement area.

N

NATIONAL AIRSPACE SYSTEM: The network of air traffic control facilities, air traffic control areas, and navigational facilities through the U.S.

NATIONAL PLAN OF INTEGRATED AIRPORT SYSTEMS: The national airport system plan developed by the Secretary of Transportation on a biannual basis for the development of public use airports to meet national air transportation needs.

NATIONAL TRANSPORTATION SAFETY BOARD: A federal government organization established to investigate and determine the probable cause of transportation accidents, to recommend equipment and procedures to enhance transportation safety, and to review on appeal the suspension or revocation of any certificates or licenses issued by the Secretary of Transportation.

NAUTICAL MILE: A unit of length used in navigation which is equivalent to the distance spanned by one minute of arc in latitude, that is, 1,852 meters or 6,076 feet. It is equivalent to approximately 1.15 statute mile.

NAVAID: A term used to describe any electrical or visual air navigational aids, lights, signs, and associated supporting equipment (i.e. PAPI, VASI, ILS, etc.)

NAVIGATIONAL AID: A facility used as, available for use as, or designed for use as an aid to air navigation.

NOISE CONTOUR: A continuous line on a map of the airport vicinity connecting all points of the same noise exposure level.

NON-DIRECTIONAL BEACON (NDB): A beacon transmitting nondirectional signals whereby the pilot of an aircraft equipped with direction finding equipment can determine his or her bearing to and from the radio beacon and home on, or track to, the station. When the radio beacon is installed in conjunction with the Instrument Landing System marker, it is normally called a Compass Locator.

NON-PRECISION APPROACH PROCEDURE: A standard instrument approach procedure in which no electronic glide slope is provided, such as VOR, TACAN, NDB, or LOC.

NOTICE TO AIRMEN: A notice containing information concerning the establishment, condition, or change in any component of or hazard in the National Airspace System, the
timely knowledge of which is considered essential to personnel concerned with flight operations.

O

OBJECT FREE AREA (OFA): An area on the ground centered on a runway, taxiway, or taxilane centerline provided to enhance the safety of aircraft operations by having the area free of objects, except for objects that need to be located in the OFA for air navigation or aircraft ground maneuvering purposes.

OBSTACLE FREE ZONE (OFZ): The airspace below 150 feet above the established airport elevation and along the runway and extended runway centerline that is required to be kept clear of all objects, except for frangible visual NAVAIDs that need to be located in the OFZ because of their function, in order to provide clearance for aircraft landing or taking off from the runway, and for missed approaches.

ONE-ENGINE INOPERABLE SURFACE: A surface emanating from the runway end at a slope ratio of 62.5:1. Air carrier airports are required to maintain a technical drawing of this surface depicting any object penetrations by January 1, 2010.

OPERATION: The take-off, landing, or touch-and-go procedure by an aircraft on a runway at an airport.

OUTER MARKER (OM): An ILS navigation facility in the terminal area navigation system located four to seven miles from the runway edge on the extended centerline, indicating to the pilot that he/she is passing over the facility and can begin final approach.

P

PILOT CONTROLLED LIGHTING: Runway lighting systems at an airport that are controlled by activating the microphone of a pilot on a specified radio frequency.

PRECISION APPROACH: A standard instrument approach procedure which provides runway alignment and glide slope (descent) information. It is categorized as follows:

- **CATEGORY I (CAT I)**: A precision approach which provides for approaches with a decision height of not less than 200 feet and visibility not less than 1/2 mile or Runway Visual Range (RVR) 2400 (RVR 1800) with operative touchdown zone and runway centerline lights.

- **CATEGORY II (CAT II)**: A precision approach which provides for approaches with a decision height of not less than 100 feet and visibility not less than 1200 feet RVR.

- **CATEGORY III (CAT III)**: A precision approach which provides for approaches with minima less than Category II.

PRECISION APPROACH PATH INDICATOR (PAPI): A lighting system providing visual approach slope guidance to aircraft during a landing approach. It is similar to a VASI but provides a sharper transition between the colored indicator lights.

PRECISION APPROACH RADAR: A radar facility in the terminal air traffic control system used to detect and display with a high degree of accuracy the direction, range, and elevation of an aircraft on the final approach to a runway.

PRECISION OBJECT FREE AREA (POFA): An area centered on the extended runway centerline, beginning at the runway threshold and extending behind the runway threshold that is 200 feet long by 800 feet wide. The POFA is a clearing standard which requires the POFA to be kept clear of above ground objects protruding above the runway safety

area edge elevation (except for frangible NAVAIDS). The POFA applies to all new authorized instrument approach procedures with less than 3/4 mile visibility.

PRIMARY AIRPORT: A commercial service airport that enplanes at least 10,000 annual passengers.

PRIMARY SURFACE: An imaginary obstruction limiting surface defined in FAR Part 77 that is specified as a rectangular surface longitudinally centered about a runway. The specific dimensions of this surface are a function of the types of approaches existing or planned for the runway.

PROHIBITED AREA: See special-use airspace.

PVC: Poor visibility and ceiling. Used in determining Annual Service Volume. PVC conditions exist when the cloud ceiling is less than 500 feet and visibility is less than one mile.

R

RADIAL: A navigational signal generated by a Very High Frequency Omni-directional Range or VORTAC station that is measured as an azimuth from the station.

REGRESSION ANALYSIS: A statistical technique that seeks to identify and quantify the relationships between factors associated with a forecast.

REMOTE COMMUNICATIONS OUTLET (RCO): An unstaffed transmitter receiver/facility remotely controlled by air traffic personnel. RCOs serve flight service stations (FSSs). RCOs were established to provide ground-to-ground communications between air traffic control specialists and pilots at satellite airports for delivering en route clearances, issuing departure authorizations, and acknowledging instrument flight rules cancellations or departure/landing times.

REMOTE TRANSMITTER/RECEIVER (RTR): See remote communications outlet. RTRs serve ARTCCs.

RELIEVER AIRPORT: An airport to serve general aviation aircraft which might otherwise use a congested air-carrier served airport.

RESTRICTED AREA: See special-use airspace.

RNAV: Area navigation - airborne equipment which permits flights over determined tracks within prescribed accuracy tolerances without the need to overfly ground-based navigation facilities. Used en route and for approaches to an airport.

RUNWAY: A defined rectangular area on an airport prepared for aircraft landing and takeoff. Runways are normally numbered in relation to their magnetic direction, rounded off to the nearest 10 degrees. For example, a runway with a magnetic heading of 180 would be designated Runway 18. The runway heading on the opposite end of the runway is 180 degrees from that runway end. For example, the opposite runway heading for Runway 18 would be Runway 36 (magnetic heading of 360). Aircraft can takeoff or land from either end of a runway, depending upon wind direction.

RUNWAY ALIGNMENT INDICATOR LIGHT: A series of high intensity sequentially flashing lights installed on the extended centerline of the runway usually in conjunction with an approach lighting system.

RUNWAY DESIGN CODE: A code signifiying the design standards to which the runway is to be built.

RUNWAY END IDENTIFICATION LIGHTING (REIL): Two synchronized flashing lights, one on each side of the runway threshold, which provide rapid and positive identification of the approach end of a particular runway.

RUNWAY GRADIENT: The average slope, measured in percent, between the two ends of a runway.

RUNWAY PROTECTION ZONE (RPZ): An area off the runway end to enhance the protection of people and property on the ground. The RPZ is trapezoidal in shape. Its dimensions are determined by the aircraft approach speed and runway approach type and minima.

RUNWAY REFERENCE CODE: A code signifying the current operational capabilities of a runway and associated taxiway.

RUNWAY SAFETY AREA (RSA): A defined surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the

event of an undershoot, overshoot, or excursion from the runway.

RUNWAY VISIBILITY ZONE (RVZ): An area on the airport to be kept clear of permanent objects so that there is an unobstructed line of- site from any point five feet above the runway centerline to any point five feet above an intersecting runway centerline.

RUNWAY VISUAL RANGE (RVR): An instrumentally derived value, in feet, representing the horizontal distance a pilot can see down the runway from the runway end.

S

SCOPE: The document that identifies and defines the tasks, emphasis, and level of effort associated with a project or study.

SEGMENTED CIRCLE: A system of visual indicators designed to provide traffic pattern information at airports without operating control towers.

SHOULDER: An area adjacent to the edge of paved runways, taxiways, or aprons providing a transition between the pavement and the adjacent surface; support for aircraft running off the pavement; enhanced drainage; and blast protection. The shoulder does not necessarily need to be paved.

SLANT-RANGE DISTANCE: The straight line distance between an aircraft and a point on the ground.

SMALL AIRPLANE: An airplane that has a maximum certified takeoff weight of up to 12,500 pounds.

SPECIAL-USE AIRSPACE: Airspace of defined dimensions identified by a surface area wherein activities must be confined because of their nature and/or wherein limitations may be imposed upon aircraft operations that are not a part of those activities. Special-use airspace classifications include:

- **ALERT AREA**: Airspace which may contain a high volume of pilot training activities or an unusual type of aerial activity, neither of which is hazardous to aircraft.

- **CONTROLLED FIRING AREA**: Airspace wherein activities are conducted under conditions so controlled as to eliminate hazards to nonparticipating aircraft and to ensure the safety of persons or property on the ground.

- **MILITARY OPERATIONS AREA (MOA)**: Designated airspace with defined vertical and lateral dimensions established outside Class A airspace to separate/segregate certain military activities from instrument flight rule (IFR) traffic and to identify for visual flight rule (VFR) traffic where these activities are conducted.

- **PROHIBITED AREA**: Designated airspace within which the flight of aircraft is prohibited.

- **RESTRICTED AREA**: Airspace designated under Federal Aviation Regulation (FAR) 73, within which the flight of aircraft, while not wholly prohibited, is subject to restriction. Most restricted areas are designated joint use. When not in use by the using agency, IFR/VFR operations can be authorized by the controlling air traffic control facility.

- **WARNING AREA**: Airspace which may contain hazards to nonparticipating aircraft.

STANDARD INSTRUMENT DEPARTURE (SID): A preplanned coded air traffic control IFR departure routing, preprinted for pilot use in graphic and textual form only.

STANDARD INSTRUMENT DEPARTURE PROCEDURES: A published standard flight procedure to be utilized following takeoff to provide a transition between the airport and the terminal area or en route airspace.

STANDARD TERMINAL ARRIVAL ROUTE (STAR): A preplanned coded air traffic control IFR arrival routing, preprinted for pilot use in graphic and textual or textual form only.

STOP-AND-GO: A procedure wherein an aircraft will land, make a complete stop on the runway, and then commence a takeoff from that point. A stop-and-go is recorded as two operations: one operation for the landing and one operation for the takeoff.

STOPWAY: An area beyond the end of a takeoff runway that is designed to support an aircraft during

an aborted takeoff without causing structural damage to the aircraft. It is not to be used for takeoff, landing, or taxiing by aircraft.

STRAIGHT-IN LANDING/APPROACH: A landing made on a runway aligned within 30 degrees of the final approach course following completion of an instrument approach.

T

TACTICAL AIR NAVIGATION (TACAN): An ultrahigh frequency electronic air navigation system which provides suitably-equipped aircraft a continuous indication of bearing and distance to the TACAN station.

TAKEOFF RUNWAY AVAILABLE (TORA): See declared distances.

TAKEOFF DISTANCE AVAILABLE (TODA): See declared distances.

TAXILANE: The portion of the aircraft parking area used for access between taxiways and aircraft parking positions.

TAXIWAY: A defined path established for the taxiing of aircraft from one part of an airport to another.

TAXIWAY DESIGN GROUP: A classification of airplanes based on outer to outer Main Gear Width (MGW) and Cockpit to Main Gear (CMG) distance.

TAXIWAY SAFETY AREA (TSA): A defined surface alongside the taxiway prepared or suitable for reducing the risk of damage to an airplane unintentionally departing the taxiway.

TERMINAL INSTRUMENT PROCEDURES: Published flight procedures for conducting instrument approaches to runways under instrument meteorological conditions.

TERMINAL RADAR APPROACH CONTROL: An element of the air traffic control system responsible for monitoring the en-route and terminal segment of air traffic in the airspace surrounding airports with moderate to high levels of air traffic.

TETRAHEDRON: A device used as a landing direction indicator. The small end of the tetrahedron points in the direction of landing.

THRESHOLD: The beginning of that portion of the runway available for landing. In some instances the landing threshold may be displaced.

TOUCH-AND-GO: An operation by an aircraft that lands and departs on a runway without stopping or exiting the runway. A touch-and go is recorded as two operations: one operation for the landing and one operation for the takeoff.

TOUCHDOWN: The point at which a landing aircraft makes contact with the runway surface.

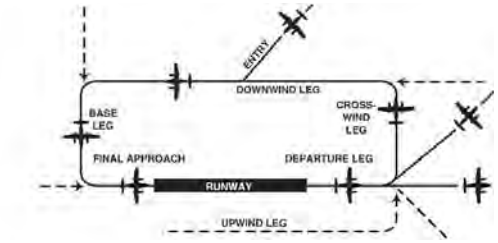
TOUCHDOWN AND LIFT-OFF AREA (TLOF): A load bearing, generally paved area, normally centered in the FATO, on which the helicopter lands or takes off.

TOUCHDOWN ZONE (TDZ): The first 3,000 feet of the runway beginning at the threshold.

TOUCHDOWN ZONE ELEVATION (TDZE): The highest elevation in the touchdown zone.

TOUCHDOWN ZONE (TDZ) LIGHTING: Two rows of transverse light bars located symmetrically about the runway centerline normally at 100- foot intervals. The basic system extends 3,000 feet along the runway.

TRAFFIC PATTERN: The traffic flow that is prescribed for aircraft landing at or taking off from an airport. The components of a typical traffic pattern are the upwind leg, crosswind leg, downwind leg, base leg, and final approach.



U

UNCONTROLLED AIRPORT: An airport without an air traffic control tower at which the control of Visual Flight Rules traffic is not exercised.

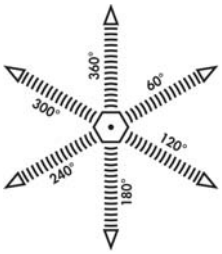
UNCONTROLLED AIRSPACE: Airspace within which aircraft are not subject to air traffic control.

UNIVERSAL COMMUNICATION (UNICOM): A nongovernment communication facility which may provide airport information at certain airports. Locations and frequencies of UNICOM's are shown on aeronautical charts and publications.

UPWIND LEG: A flight path parallel to the landing runway in the direction of landing. See "traffic pattern."

V

VECTOR: A heading issued to an aircraft to provide navigational guidance by radar.



VERY HIGH FREQUENCY/ OMNIDIRECTIONAL RANGE (VOR): A ground-based electronic navigation aid transmitting very high frequency navigation signals, 360 degrees in azimuth, oriented from magnetic north. Used as the basis for navigation in the national airspace system. The VOR periodically identifies itself by Morse Code and may have an additional voice identification feature.

VERY HIGH FREQUENCY OMNI-DIRECTIONAL RANGE/ TACTICAL AIR NAVIGATION (VORTAC): A navigation aid providing VOR azimuth, TACAN azimuth, and TACAN distance-measuring equipment (DME) at one site.

VICTOR AIRWAY: A control area or portion thereof established in the form of a corridor, the centerline of which is defined by radio navigational aids.

VISUAL APPROACH: An approach wherein an aircraft on an IFR flight plan, operating in VFR conditions under the control of an air traffic control facility and having an air traffic control authorization, may proceed to the airport of destination in VFR conditions.

VISUAL APPROACH SLOPE INDICATOR (VASI): An airport lighting facility providing vertical visual approach slope guidance to aircraft during approach to landing by radiating a directional pattern of high intensity red and white focused light beams which indicate to the pilot that he is on path if he sees red/white, above path if white/white, and below path if red/red. Some airports serving large aircraft have three-bar VASI's which provide two visual guide paths to the same runway.

VISUAL FLIGHT RULES (VFR): Rules that govern the procedures for conducting flight under visual conditions. The term VFR is also used in the United States to indicate weather conditions that are equal to or greater than minimum VFR requirements. In addition, it is used by pilots and controllers to indicate type of flight plan.

VISUAL METEOROLOGICAL CONDITIONS: Meteorological conditions expressed in terms of specific visibility and ceiling conditions which are equal to or greater than the threshold values for instrument meteorological conditions.

VOR: See "Very High Frequency Omnidirectional Range Station."

VORTAC: See "Very High Frequency Omnidirectional Range Station/Tactical Air Navigation."

W

WARNING AREA: See special-use airspace.

WIDE AREA AUGMENTATION SYSTEM: An enhancement of the Global Positioning System that includes integrity broadcasts, differential corrections, and additional ranging signals for the purpose of providing the accuracy, integrity, availability, and continuity required to support all phases of flight.

Abbreviations

AC: advisory circular

ADF: automatic direction finder

ADG: airplane design group

AFSS: automated flight service station

AGL: above ground level

AIA: annual instrument approach

AIP: Airport Improvement Program

AIR-21: Wendell H. Ford Aviation Investment and Reform Act for the 21st Century

ALS: approach lighting system

ALSF-1: standard 2,400-foot high intensity approach lighting system with sequenced flashers (CAT I configuration)

ALSF-2: standard 2,400-foot high intensity approach lighting system with sequenced flashers (CAT II configuration)

AOA: Aircraft Operation Area

APV: instrument approach procedure with vertical guidance

ARC: airport reference code

ARFF: aircraft rescue and fire fighting

ARP: airport reference point

ARTCC: air route traffic control center

ASDA: accelerate-stop distance available

ASR: airport surveillance radar

ASOS: automated surface observation station

ATCT: airport traffic control tower

ATIS: automated terminal information service

AVGAS: aviation gasoline - typically 100 low lead (100L)

AWOS: automatic weather observation station

BRL: building restriction line

CFR: Code of Federal Regulation

CIP: capital improvement program

DME: distance measuring equipment

DNL: day-night noise level

DWL: runway weight bearing capacity of aircraft with dual-wheel type landing gear

DTWL: runway weight bearing capacity of aircraft with dual-tandem type landing gear

FAA: Federal Aviation Administration

FAR: Federal Aviation Regulation

FBO: fixed base operator

FY: fiscal year

GPS: global positioning system

GS: glide slope

HIRL: high intensity runway edge lighting

IFR: instrument flight rules (FAR Part 91)

ILS: instrument landing system

IM: inner marker

LDA: localizer type directional aid

LDA: landing distance available

LIRL: low intensity runway edge lighting

LMM: compass locator at ILS outer marker

LORAN: long range navigation

MALS: midium intensity approach lighting system with indicator lights

MIRL: medium intensity runway edge lighting

MITL: medium intensity taxiway edge lighting

MLS: microwave landing system

MM: middle marker

MOA: military operations area

MSL: mean sea level

NAVAID: navigational aid

NDB: nondirectional radio beacon

NM: nautical mile (6,076.1 feet)

NPES: National Pollutant Discharge Elimination System

NPIAS: National Plan of Integrated Airport Systems

NPRM: notice of proposed rule making

ODALS: omnidirectional approach lighting system

OFA: object free area

OFZ: obstacle free zone

OM: outer marker

PAC: planning advisory committee

PAPI: precision approach path indicator

PFC: porous friction course

PFC: passenger facility charge

PCL: pilot-controlled lighting

PIW public information workshop

PLASI: pulsating visual approach slope indicator

POFA: precision object free area

PVASI: pulsating/steady visual approach slope indicator

PVC: poor visibility and ceiling

RCO: remote communications outlet

RRC: Runway Reference Code

RDC: Runway Design Code

REIL: runway end identification lighting

RNAV: area navigation

RPZ: runway protection zone

RSA: runway safety area

RTR: remote transmitter/receiver

RVR: runway visibility range

RVZ: runway visibility zone

SALS: short approach lighting system

SASP: state aviation system plan

SEL: sound exposure level

SID: standard instrument departure

SM: statute mile (5,280 feet)

SRE: snow removal equipment

SSALF: simplified short approach lighting system with runway alignment indicator lights

STAR: standard terminal arrival route

SWL: runway weight bearing capacity for aircraft with single-wheel tandem type landing gear

TACAN: tactical air navigational aid

TAF: Federal Aviation Administration (FAA) Terminal Area Forecast

TDG: Taxiway Design Group

TLOF: Touchdown and lift-off

TDZ: touchdown zone

TDZE: touchdown zone elevation

TODA: takeoff distance available

TORA: takeoff runway available

TRACON: terminal radar approach control

VASI: visual approach slope indicator

VFR: visual flight rules (FAR Part 91)

VHF: very high frequency

VOR: very high frequency omni-directional range

VORTAC: VOR and TACAN collocated

Appendix B

ENVIRONMENTAL OVERVIEW

Appendix B
ENVIRONMENTAL OVERVIEW

Analysis of the potential environmental impacts of proposed airport development projects, as discussed in Chapter Five and depicted in Exhibit 5A, is an important component of the Airport Master Plan process. The primary purpose of this appendix is to evaluate the development program to determine whether proposed actions could individually or collectively affect the quality of the environment.

Construction of the improvements depicted on the recommended development plan will require compliance with the *National Environmental Policy Act* (NEPA) *of 1969*, as amended, to receive federal financial assistance. For projects not "categorically excluded" under Federal Aviation Administration (FAA) Order 1050.1E, *Environmental Impacts: Policies and Procedures*, compliance with NEPA is generally satisfied through the preparation of an Environmental Assessment (EA). In instances where significant environmental impacts are expected, an Environmental Impact Statement (EIS) may be required. While this portion of the Master Plan is not designed to satisfy the NEPA requirements for a categorical exclusion, EA, or EIS, it is intended to supply a preliminary review of environmental issues that would need to be analyzed in more detail within the NEPA process. This overview considers all environmental categories required for the NEPA process as outlined in FAA Order 1050.1E and Order 5050.4B, *National Environmental Policy Act* (NEPA) *Implementation Instructions for Airport Actions.*

AIR QUALITY

The United States (U.S.) Environmental Protection Agency (EPA) has adopted air quality standards that specify the maximum permissible short-term and long-term concentrations of various air contaminants based on potential health effects. The National Ambient Air Quality Standards (NAAQS) consist of primary and secondary standards for six criteria pollutants, which include: ozone (O_3), carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen oxide (NO), particulate matter (PM_{10} and $PM_{2.5}$), and lead (Pb). Potentially significant air quality impacts associated with an FAA project or action is demonstrated by the project or action exceeding one or more of the NAAQS for any of the time periods analyzed.

To ensure that a federal action complies with the NAAQS, the *Clean Air Act* (CAA) establishes a General Conformity Rule for all general federal actions, including airport improvement projects, if the action is located within a nonattainment area. Sierra Vista Municipal Airport is located within the southwestern corner of Cochise County, which is in attainment for all NAAQS standards.

Under NEPA, the FAA requires that an air quality emissions inventory be prepared for federal actions at airports where forecast general aviation operations exceed 180,000. At this time, as discussed in Chapter Two of this Master Plan, the airport is forecast to have future operations of 53,600 by the year 2032. Therefore, operational air quality emission inventories would not be required for future projects under NEPA. However, air quality impacts could still occur as a result of proposed airport development projects in the short-term. Construction-related air quality impacts are discussed below in the section on construction impacts.

Additionally, of growing concern is the impact of proposed projects on climate change. Greenhouse gases (GHGs) are those that trap heat in the earth's atmosphere. Greenhouse gases can be either naturally occurring or anthropogenic (man-made) and include water vapor (H_2O) and carbon dioxide (CO_2). Several classes of halogenated substances that contain fluorine, chlorine, or bromine are also GHGs, but they are, for the most part, solely a product of industrial activities. All GHG inventories measure CO_2 emissions, but beyond CO_2, different inventories include different greenhouse gases (such as methane [CH_4], nitrous oxide [N_2O], and O_3).

No significance thresholds for the creation of GHG have been promulgated to date. However, research has shown that there is a direct link between fuel combustion and GHG emissions. Therefore, sources that require fuel or power at an airport are the primary sources that would generate GHGs. Aircraft are probably the most often cited air pollutant source, but they produce the same types of emissions as cars. Aircraft jet engines, like many other vehicle engines, produce CO_2, H_2O, nitrogen oxides (NO_x), CO, oxides of sulfur (SO_x), unburned or partially combusted hydrocarbons (known as volatile organic compounds, VOCs), particulates, and other trace compounds.

The scientific community is developing areas of further study to enable them to more precisely estimate aviation's effects on the global atmosphere. The FAA is currently leading or participating in several efforts intended to clarify the role that commercial aviation plays in

greenhouse gases and climate changes. The most comprehensive and multi-year program geared towards quantifying climate change effects of aviation is the Aviation Climate Change Research Initiative (ACCRI) funded by the FAA and the National Aeronautics and Space Administration (NASA). ACCRI hopes to reduce key scientific uncertainties in quantifying aviation-related climate impacts and provide timely scientific input to inform policy-making decisions. The FAA also funds Project 12 of the Partnership for Air Transportation Noise & Emissions Reduction (PARTNER) Center of Excellence research initiative to quantify the effects of aircraft exhaust and contrails on global and U.S. climate and atmospheric composition.

COASTAL RESOURCES

Federal activities involving or affecting coastal resources are governed by the *Coastal Barriers Resource Act* (CBRA), the *Coastal Zone Management Act* (CZMA), and Executive Order (E.O.) 13089, *Coral Reef Protection*.

Sierra Vista Municipal Airport is not located within a Coastal Management Zone or Coastal Barrier Area. The City of Sierra Vista lies approximately 165 miles northeast of the nearest coastal body of water, which is the Gulf of California.

COMPATIBLE LAND USE/NOISE

The compatibility of existing and planned land uses in the vicinity of an airport is usually associated with the extent of the airport's noise impacts. Typically, significant impacts will occur over noise-sensitive areas within the 65 decibel (dB) day-night noise exposure level (DNL) contour. (DNL is the metric currently accepted by the FAA, the EPA, and the Department of Housing and Urban Development [HUD] as an appropriate measure of cumulative noise exposure.) FAA Orders 1050.1E and 5050.4B define a significant noise impact as one which would occur if the proposed action would cause noise-sensitive areas to experience an increase in noise of 1.5 DNL or more at or above the 65 DNL noise contour when compared to a No Action alternative for the same timeframe. Noise-sensitive land uses include residences, schools, hospitals, and places of worship.

The land surrounding Sierra Vista Municipal Airport is primarily vacant to the north, east, and west, with areas of commercial development to the south. The nearest noise-sensitive land use to the airport are residential neighborhoods associated with Fort Huachuca approximately 1.8 miles to the south. Due to the distance from the airport to the nearest noise-sensitive land uses, none of the proposed projects in this Master Plan are anticipated to result in significant noise impacts.

Compatible land use also addresses nearby features that could pose a threat to safe aircraft operations. These features include land uses that attract wildlife (for example, landfills and water features) or structures within approach and departure zones. There are no wildlife attractants such as landfills or water features located on airport property. Aerial photography was analyzed for water features in the vicinity of the airport. The closest such water

feature is a 0.3-acre pond, located approximately one mile southwest of the Runway 8 threshold. Several larger (0.4-acre to 11-acre) ponding areas are located approximately one mile east of the Runway 26 threshold; however, these ponds are presently dry.

CONSTRUCTION IMPACTS

Airport construction impacts can include dust, air emissions, traffic, storm water runoff, and noise. Construction-related dust impacts are typically mitigated below a level of significance through the use of best management practices (BMPs), some of which are identified in Arizona Administrative Code R18-2-604 through 607, and FAA Advisory Circular (AC) 150/5371-10, *Standards for Specifying Construction of Airports, Item P-156, Temporary Air and Water Pollution, Soil Erosion and Siltation Control*.

A generalized list of BMPs is as follows:

Site Preparation and Construction

- Minimize land disturbance
- Suppress dust on traveled paths which are not paved through wetting, use of watering trucks, chemical dust suppressants, or other reasonable precautions to prevent dust from entering ambient air
- Cover trucks when hauling soil
- Minimize soil track-out by washing or cleaning truck wheels before leaving construction site
- Stabilize the surface of soil piles
- Create windbreaks

Site Restoration

- Revegetate or stabilize any disturbed land not used
- Remove unused material
- Remove soil piles via covered trucks or stockpile dirt in a protected area

In addition to the creation of dust, construction projects planned at the airport could have temporary air quality impacts due to emissions from the operation of construction vehicles and equipment. Air emissions related to construction activities, although short-term in nature, should be included in any air emission inventories required for NEPA documentation efforts. Emissions from mobile sources, including construction equipment, are also regulated by Arizona Administrative Code R18-2-804.

Construction traffic impacts occur when trucks or heavy equipment need to access the site through a residential neighborhood, other sensitive area, or on already congested streets or intersections. In the case of Sierra Vista Municipal Airport, no construction traffic impacts are anticipated. Airport access is via roadways (Brainard Road and Airport Avenue) which do not extend through residential neighborhoods, nor are they heavily congested streets or intersections.

Water quality concerns occur if there are storm events during the construction period. There are several ephemeral washes located on or adjacent to the airport that convey storm water north and east of airport property. Drainage in the area ultimately drains into the Babocamari River (a tributary of the San Pedro River), approximately four miles downstream from the airport. Under the *Clean Water Act* (CWA), the State of Arizona has been given authority by the EPA to establish water quality standards, control discharges, and regulate other issues concerning water quality. The use of BMPs during construction is a requirement of construction-related permits such as Arizona Pollutant Discharge Elimination System (AZPDES) Construction General Permit (AZG2003-001) and is incorporated into general or project-specific storm water pollution prevention plans (SWPPPs). As previously mentioned, FAA AC 150/5371-10 also requires the implementation of BMPs to control erosion and siltation. BMPs could include temporary measures such as the use of berms, fiber mats, gravels, mulches, and slope drains.

Finally, construction-related noise is not expected to be significant since no noise-sensitive land uses are located within one mile of the airport.

DEPARTMENT OF TRANSPORTATION (DOT) ACT: SECTION 4(f)

Section 4(f) of the *Department of Transportation Act of 1966* (49 USC 303) protects against the loss of significant publicly owned parks and recreation areas, publicly owned wildlife and waterfowl refuges, and historic sites as a result of federally funded transportation projects. The Act states that a project that requires the "use" of such lands shall not be approved unless there is no "feasible and prudent" alternative and the project includes all possible planning to minimize harm from such use. In addition, the term "use" includes not only the physical taking of such lands, but "constructive use" of such lands. "Constructive use" of lands occurs when "a project's proximity impacts are so severe that the protected activities, features, or attributes that qualify a resource for protection under Section 4(f) are substantially impaired" (23 CFR Part 771.135).

The nearest Section 4(f) property to the airport is the Fort Huachuca Museum, which is listed on the National Register of Historic Places (NRHP). This property is located approximately 2½ miles to the south.

No direct impact to Section 4(f) land would occur as a result of the Airport Master Plan. In addition, no constructive use of Section 4(f) lands are anticipated since the nearest Section 4(f) property is located well out of potential noise impact range (2½ miles).

FARMLAND

Based on the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service's soil survey map, the airport consists primarily of two soils: Terrarossa complex and White House complex. Neither of these soils are prime farmland and no crop production currently occurs at the airport. Therefore, the *Farmland Protection Policy Act* is not applicable to development at Sierra Vista Municipal Airport.

FISH, WILDLIFE, AND PLANTS

Section 7 of the *Endangered Species Act* (ESA), as amended, applies to federal agency actions and sets forth requirements for consultation to determine if a proposed action "may affect" a federally endangered or threatened species. If an agency determines that an action "may affect" a federally protected species, then Section 7(a)(2) requires the agency to consult with the U.S. Fish and Wildlife Service (USFWS) to ensure that any action the agency authorizes, funds, or carries out is not likely to jeopardize the continued existence of any federally listed endangered or threatened species, or result in the destruction or adverse modification of critical habitat. If a species has been listed as a candidate species, Section 7(a)(4) states that each agency must confer with the USFWS.

The *Fish and Wildlife Coordination Act* requires that agencies consult with the state wildlife agencies and the Department of the Interior concerning the conservation of wildlife resources where the water of any stream or other water body is proposed to be controlled or modified by a federal agency or any public or private agency operating under a federal permit.

The *Migratory Bird Treaty Act* (MBTA) prohibits private parties and federal agencies in certain judicial circuits from intentionally taking a migratory bird, their eggs, or nests. The MBTA prohibits activities which would harm migratory birds, their eggs, or nests unless the Secretary of the Interior authorizes such activities under a special permit.

E.O. 13112, *Invasive Species*, directs federal agencies to use relevant programs and authorities, to the extent practicable and subject to available resources, to prevent the introduction of invasive species and provide for restoration of native species and habitat conditions in ecosystems that have been invaded. FAA is to identify proposed actions that may involve risks of introducing invasive species on native habitat and populations. "Introduction" is the intentional or unintentional escape, release, dissemination, or placement of a species into an ecosystem as a result of human activity. "Invasive species" are alien species whose introduction does, or is likely to, cause economic or environmental harm or harm to human health.

Finally, the *Arizona Native Plant Law* (Arizona Revised Statutes [ARS], Section 3-904) protects certain native plants classified by the Arizona Department of Agriculture (ADA). This law states that protected plants cannot be removed from any lands, including private lands, without permission and a permit from the ADA. Four categories of protected plants include: highly safeguarded, salvage restricted, salvage assessed, and harvest restricted. Some plants are in more than one category. The types of desert plants protected include various types of cacti, ocotillo, and trees like ironwood, palo verde, and mesquite.

Table B1 identifies federally listed species for Cochise County as published on the USFWS Arizona Ecological Service's data base, dated September 18, 2012[1]. There are currently 15 endangered species and seven threatened species known to occur in Cochise County. Of these listed species, only one has the potential to occur at the airport (lesser long-nosed bat). The airport is either beyond the known geographic or elevation range of the species or it does not contain vegetation or landscape features known to support these species, or both.

[1] http://www.fws.gov/southwest/es/arizona/Threatened.htm#CountyList, accessed December 10, 2012.

TABLE B1
Endangered, Threatened and Candidate Species
Cochise County, Arizona

Common Name	Status	Habitat	Potential for Occurrence at Airport[1]
Beautiful shiner	Threatened	Small to medium sized streams and ponds with sand, gravel, and rock bottoms.	Unlikely to Occur
Canelo Hills ladies' tresses	Endangered	Finely grained, highly organic, saturated soils of cienegas.	Unlikely to Occur
Chiricahua leopard frog	Threatened	Streams, rivers, backwaters, ponds, and stock tanks that are mostly free from introduced fish, crayfish, and bullfrogs.	Unlikely to Occur
Cochise pincushion cactus	Threatened	Semidesert grassland with small shrubs, agave, other cacti, and grama grass. Grows on gray limestone hills.	Unlikely to Occur
Desert pupfish	Endangered	Shallow springs, small streams, and marshes. Tolerates saline and warm water.	Unlikely to Occur
Gila chub	Endangered	Pools, springs, cienegas, and streams.	Unlikely to Occur
Gila topminnow	Endangered	Small streams, springs, and cienegas vegetated shallows.	Unlikely to Occur
Huachuca water umbel	Endangered	Cienegas, perennial low gradient streams, wetlands.	Unlikely to Occur
Jaguar	Endangered	Found in Sonoran desert scrub up through subalpine conifer forest	Unlikely to Occur
Lesser long-nosed bat	Endangered	Desert scrub habitat with agave and columnar cacti present as food plants. Day roosts in caves and abandoned tunnels.	Potential to Occur
Loach minnow	Endangered	Benthic species of small to large perennial streams with swift shallow water over cobble and gravel. Recurrent flooding and natural hydrograph important.	Unlikely to Occur
Mexican spotted owl	Threatened	Nests in canyons and dense forests with multilayered foliage structure.	Unlikely to Occur
New Mexico ridge-nosed rattlesnake	Threatened	Primarily canyon bottoms in pine-oak communities.	Unlikely to Occur
Northern aplomado falcon	Endangered	Grassland and savannah. Currently extirpated from AZ with unconfirmed sightings occasionally reported in Cochise County.	Unlikely to Occur
Ocelot	Endangered	Desert scrub in Arizona. Humid tropical and subtropical forests and savannahs in areas south of the U.S. Universal component is presence of dense cover.	Unlikely to Occur
San Bernardino spring-snail	Threatened	Springs with firm substrate composed of cobble, gravel, woody debris, and aquatic vegetation.	Unlikely to Occur
Sonoran tiger salamander	Endangered	Stock tanks and impounded cienegas; rodent burrows, rotted logs, and other moist cover sites.	Unlikely to Occur
Southwestern willow flycatcher	Endangered	Cottonwood/willow and tamarisk vegetation communities along rivers and streams.	Unlikely to Occur
Spikedance	Endangered	Medium to large perennial streams with moderate to swift velocity waters over cobble and gravel substrate. Recurrent flooding and natural hydrograph important to withstand invading exotic species.	Unlikely to Occur
Yaqui catfish	Threatened	Moderate to large streams with slow current over sand and rock bottoms.	Unlikely to Occur
Yaqui chub	Endangered	Deep pools of small streams near undercut banks and debris; pools associated with springheads, and artificial ponds.	Unlikely to Occur
Yaqui topminnow	Endangered	Small to moderate sized streams, springs, and cienegas. Generally found in shallow areas with aquatic vegetation or debris. Tolerates relatively high water temperature and low dissolved oxygen.	Unlikely to Occur

According to the Arizona Department of Game and Fish's Online Environmental Review Tool, there are known occurrences of the lesser long-nosed bat within three miles of the airport.[2] Therefore, the USFWS will need to be apprised of airport development projects, per Section 7(a)(4) of the ESA, and biological surveys of impact areas may be required.

Migratory birds protected under the MBTA may or may not be present at the airport. If birds protected under the MBTA are identified at the airport and ground disturbance is planned during the nesting period for such birds, a certified biologist should conduct pre-construction surveys for the presence of the protected nesting bird species within 500 feet of the construction areas. If active nests are found, further coordination with the USFWS to address the requirements of the MBTA should occur.

No invasive species are likely to be introduced into native habitats as a result of airport development projects. The ADA "Notice of Intent to Clear Land" form will be required if the construction of airport projects requires the removal of any protected plants. It is recommended that this form be completed and submitted to the ADA at least 60 days prior to vegetation removal activities, in accordance with the *Arizona Native Plant Law*. If native plants will be salvaged and replanted in the project area, then the applicant needs to include this information with the "Notice of Intent to Clear Land" form at the time of its submittal and request salvage permits.

FLOODPLAINS

As defined in FAA Order 1050.1E, agencies are required to "make a finding that there is no practicable alternative before taking action that would encroach on a base floodplain based on a 100-year flood." E.O. 11988, *Floodplain Management,* directs federal agencies to reduce the risk of flood loss, minimize the impact of floods on human safety, health and welfare, and restore and preserve the natural and beneficial values served by the floodplains. Natural and beneficial values of floodplains include providing ground water recharge, water quality and maintenance, fish, wildlife and plants, open space, natural beauty, outdoor recreation, agriculture, and forestry. FAA Order 1050.1E (9.2b) indicates that "if the proposed action and reasonable alternatives are not within the limits of, or if applicable, the buffers of a base floodplain, a statement to that effect should be made," no further analysis is necessary. The limits of base floodplains are determined by Flood Insurance Rate Maps (FIRMs) prepared by the Federal Emergency Management Agency (FEMA).

As was stated in the *Environmental Inventory* section of Chapter One, military reservations are not mapped for the National Flood Insurance Program; therefore, no FEMA maps are available for the airport. Based upon existing drainage patterns, no flooding is anticipated to occur on existing airport property and no impacts are anticipated as a result of proposed projects in this Master Plan.

[2] http://www.azgfd.gov/hgis/, accessed December 10, 2012.

HAZARDOUS MATERIALS, POLLUTION PREVENTION, AND SOLID WASTE

There are four primary federal laws that govern the handling and disposal of hazardous materials, chemicals, substances, and wastes, all of which fall under the jurisdiction of the U.S. EPA. The two statutes of most importance to the FAA in proposing actions to construct and operate facilities and navigational aids are the *Resource Conservation Recovery Act* (RCRA) (as amended by the *Federal Facilities Compliance Act of 1992*) and the *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA), as amended (also known as Superfund). RCRA governs the generation, treatment, storage, and disposal of hazardous wastes, while CERCLA provides for cleanup of any release of a hazardous substance (excluding petroleum) into the environment. Other laws include the *Hazardous Materials Transportation Act*, which regulates the handling and transport of hazardous materials and wastes, and the *Toxic Substances Control Act* (TSCA), which regulates and controls the use of polychlorinated biphenyls (PCBs) as well as other chemicals or toxic substances in commercial use.

Per FAA Order 1050.1E, Appendix A, thresholds of significance are typically only reached when a resource agency has indicated that it would be difficult to issue a permit for the proposed development. A significant impact may also be realized if the proposed action would affect a property listed on the National Priorities List (NPL).

According to the EPA's EJView tool, there are no Superfund or NPL sites on or near airport property. The United States Air Force (USAF) is listed as a reporting site to the EPA regarding the handling or disposal of hazardous materials under RCRA or ACRES (Assessment, Cleanup and Redevelopment Exchange System).[3]

Construction of proposed airport development projects such as the extension of Taxiway J, the extension of Runway 12-30, the extension of Taxiway K, and proposed landside developments would result in earthwork disturbances. Some areas planned to be disturbed are currently undeveloped and in a natural state. Other projects would involve development of graded areas. In the event of a discovery of a hazardous substance during construction, the contractor should notify the engineer's designated person responsible for the administration of the Spill Prevention Control Plan, and a representative of the City of Sierra Vista should contact the EPA's National Response Center and provide details of the incident and measures being taken to reduce the impact of the release. Future airport operations occurring as part of the Master Plan could involve the use of additional hazardous materials at the airport. Airport facilities and businesses would be required to comply with all applicable laws and permitting requirements.

Pollution prevention at the airport is regulated through several laws, including the hazardous materials regulations cited above and an AZPDES Multi-sector General Action permit (Non-mining) (AZMSG2010-02). In addition, as discussed further in the Construction Impacts and Water Quality sections, water quality concerns are regulated under the CWA. The use of BMPs during construction is a requirement of construction-related permits, such

[3] http://epamap14.epa.gov/ejmap/ejmap.aspx?wherestr=sierra%20vista%2C%20az, accessed December 10, 2012.

as AZPDES Construction General Permit (AZG2003-001), and is incorporated into general and/or project-specific SWPPPs.

Finally, the closest landfill to the airport is the Western Regional Landfill, located approximately 11 miles to the northeast. The creation of additional solid waste is likely to occur as a result of future airport growth, but is not expected to cause significant impacts to the capacity of the landfill.

HISTORICAL, ARCHITECTURAL, ARCHAEOLOGICAL AND CULTURAL RESOURCES

Historical, architectural, and archaeological resources as well as Native American cultural resources are protected by several different federal laws including, but not limited to, the *Archaeological Resources Protection Act* (ARPA) *of 1979*, the *National Historic Preservation Act of 1966*, and the *Native American Graves Protection & Repatriation Act*. In particular, Section 106 of the *National Historic Preservation Act* requires the FAA to consider the effects of proposed actions on sites listed on, eligible for listing on, or potentially eligible for listing on, the NRHP. To assist with this determination, an area of potential effect (APE) is defined in consultation with the State Historic Preservation Officer (SHPO). The APE includes the areas that will be directly or indirectly impacted by proposed actions. Once the APE is defined, an inventory is taken of NRHP-eligible properties within the APE and an assessment of impacts is undertaken. The determination regarding significant impacts on protected resources occurs in consultation with the SHPO as well.

Unless airport property has already been surveyed for cultural resources, impacts could occur if potentially eligible cultural resources are disturbed. Therefore, prior to implementation of planned improvements, a cultural resources records search would be necessary. Projects identified on the recommended development concept that would occur in previously undisturbed and unsurveyed areas of the airport are likely to require a field survey as well. Impacts may occur when the proposed project causes an adverse effect on a property which has been identified (or is unearthed during construction) as having historical, architectural, archaeological, or cultural significance.

LIGHT EMISSIONS AND VISUAL EFFECTS

Airport lighting is characterized as either airfield lighting (i.e., runway, taxiway, approach and landing lights) or landside lighting (i.e., security lights, building interior lighting, parking lights, and signage). In the case of Sierra Vista Municipal Airport, the following airfield lighting is in place:

- A joint-use military rotating beacon that projects a white light dual peaked (two quick beams) after a green light, located on the south side of the airfield, approximately 1,800 feet southwest of the airport traffic control tower (ATCT);
- High-intensity runway lighting (HIRL) on Runway 8-26

- Medium intensity runway lighting (MIRL) on Runways 12-30 and 3-21;
- Medium intensity taxiway lighting (MITL);
- Precision approach path indicator lights (PAPI-4) located on both ends of Runways 8-26 and 12-30;
- Runway end identifier lights (REILs) on both ends of Runways 8-26 and 12-30;
- Lighted airfield signs located throughout the airfield system.

All airfield lighting systems at the airport are controlled through a pilot-controlled lighting system (PCL) which allows the pilot to turn on, or increase the intensity of, various airfield systems from the aircraft using the aircraft's transmitter. Limited security and building lights are also present landside.

Visual and lighting impacts relate primarily to the presence of sensitive visual receptors in proximity to the airport. These would normally be residents or users of a designated scenic resource such as a scenic corridor. The visual sight of aircraft, aircraft contrails, or aircraft or airport lighting, especially from a distance that is not normally intrusive, is not assumed to be an adverse impact.

FAA significance thresholds for light emissions are generally when an action's light emissions create an annoyance that would interfere with normal activities. For example, if a high intensity strobe light, such as a runway end identifier lighting (REIL) system, would produce glare on any adjoining site, particularly residential uses, this could constitute a significant adverse impact. For visual effects, an action is considered significant when consultation with federal, state, or local agencies, tribes, or the public shows that visual effects contrast with the existing environments and the agencies state the effect is objectionable.

Sierra Vista Municipal Airport is surrounded primarily by undeveloped open space to the north, east, and west, with Fort Huachuca facilities to the south; there are no sensitive visual receptors located near the airport. Long-term development projects proposed in the Master Plan include the extension of Runway 12-30 (MIRL), Taxiway J and Taxiway K (MITL), the installation of a medium intensity approach lighting system with runway alignment indicator lights (MALSR) in the approach of Runway 26, additional hangar development, a terminal addition, and vehicle parking construction. The additional lighting associated with these projects is not expected to significantly alter the night appearance of the airport from a distance. Visually, the airport will continue to maintain its appearance as a joint-use military/civilian airport.

NATURAL RESOURCES AND ENERGY

The FAA considers an action to have a significant impact on natural resources and energy when an action's construction, operation, or maintenance would cause demands that exceed available or future (project year) natural resource or energy supplies. Therefore, in instances when proposed actions necessitate the expansion of utilities, power companies or other suppliers of natural resources and energy would need to be contacted to determine if the proposed project demands can be met by existing or planned facilities.

The use of energy and natural resources would occur both during construction of planned facilities and during operation of the airport as it grows. However, none of the planned development projects at the airport are anticipated to result in significant increases in the demand for natural resources or energy consumption beyond what is readily available by service providers.

SECONDARY (INDUCED) IMPACTS

FAA Order 1050.1E, Appendix A, states that secondary impacts should be addressed when the proposed project is a major development proposal that could involve shifts in patterns of population movement and growth, public service demands, and changes in business and economic activity due to airport development.

Based on the forecast analysis summarized in Chapter Two of the Master Plan, the airport is expected to have an average annual growth in annual operations of approximately 0.5 percent through the year 2032; annual growth in based aircraft is expected to be less than two additional aircraft per year. This amount of annual growth at the airport for the next 20+ years would not be expected to result in secondary impacts on the City of Sierra Vista.

SOCIOECONOMIC IMPACTS, ENVIRONMENTAL JUSTICE, AND CHILDREN'S ENVIRONMENTAL HEALTH AND SAFETY RISKS

Socioeconomic impacts known to result from airport improvements are often associated with relocation activities or other community disruptions, including alterations to surface transportation patterns, division or disruption of existing communities, interferences with orderly planned development, or an appreciable change in employment related to the project. Social impacts are generally evaluated based on areas of acquisition and/or areas of significant project impact, such as areas encompassed by noise levels in excess of 65 DNL.

Per FAA Order 1050.1E, Appendix A, the thresholds of significance for this impact category are reached if the project negatively affects a disproportionately high number of minority or low-income populations or if children would be exposed to a disproportionate number of health and safety risks. E.O. 12898, *Federal Action to Address Environmental Justice in Minority Populations and Low-Income Populations,* and the accompanying Presidential Memorandum, and DOT Order 5610.2, *Environmental Justice*, require FAA to provide for meaningful public involvement by minority and low-income populations as well as analysis that identifies and addresses potential impacts on these populations that may be disproportionately high and adverse.

Pursuant to E.O. 13045, *Protection of Children from Environmental Health Risks and Safety Risks,* federal agencies are directed to identify and assess environmental health and safety risks that may disproportionately affect children. These risks include those that are attributable to products or substances that a child is likely to come in contact with or ingest, such as air, food, drinking water, recreational waters, soil, or products to which they may be exposed.

The acquisition of residences and farmland is required to conform with the *Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970* (Uniform Act). These regulations mandate that certain relocation assistance services be made available to homeowners/tenants of affected properties. This assistance includes help finding comparable and decent substitute housing for the same cost, moving expenses, and in some cases, loss of income.

The U.S. Census taken in 2010 provides information regarding socioeconomic conditions in the Sierra Vista area. General population and employment data are discussed in Chapter One of the Master Plan. According to the EPA's EJView Mapper, approximately 45 percent of the population in the block group that contains the airport is from minority groups; approximately 13 percent of the households in the same census tract as the airport are below the poverty rate.

However, since the Master Plan does not involve expanding airport operations into developed areas, no relocation of housing or businesses would be necessary to implement the recommended development concept plan. Existing communities, transportation patterns, and planned development would not be disrupted. The airport's projected 0.5 percent average annual growth for the next 20+ years would not significantly change future growth in the Sierra Vista area or have disproportionate adverse impacts on minority or low-income populations or on children.

WATER QUALITY

As discussed previously, water quality in Arizona is monitored and protected by the U.S. EPA and the Arizona Department of Environmental Quality (ADEQ) under the authority of the CWA and the AZPDES permitting process. The airport is located within the Upper San Pedro Watershed (HUC 15050202). The closest CWA Section 303(d) Impaired Water to the airport is a segment of the San Pedro River from Babocamari Creek to Dragoon Wash, which is listed for pathogens.[4]

An updated AZPDES Multi-sector General Action non-mining permit (AZMSG2010-02) became effective in 2011. This is one large permit divided into numerous separate sectors and is designed for discharges of storm water from certain industrial sites that are of a non-construction nature. Each sector represents a different type of activity and is dependent upon its Standard Industrial Classification (SIC) code or narrative description. Airports are classified as a Sector S industry by the ADEQ.

Future development projects should be evaluated to address their interface with the airport's storm water drainage system and should be incorporated into a SWPPP. The construction and maintenance of additional storm water drainage features would be required, as necessary, to limit the potential for storm water runoff to cross exposed, sloping areas, and to control the release of storm water. Conditions of the AZMSG permit would be applicable to all new development at the airport.

[4] http://watersgeo.epa.gov/mwm/, accessed December 11, 2012.

WETLANDS AND WATERS OF THE U.S.

Certain drainages (both natural and human-made) come under the purview of the U.S. Army Corps of Engineers (USACE) under Section 404 of the CWA; wetlands are also protected. There are several unnamed washes present on or adjacent to the airport that may be considered "waters of the U.S." by the USACE. Proposed projects, including the extension of Runway 12-30 and Taxiway K and Taxiway J that could involve placing fill within these drainages, may require a Section 404 permit. It is expected that the USACE would allow these additional impacts under Nationwide Permit (NWP) 39 of the CWA, as long as the area of impact is less than ½ acre or 300 linear feet of stream bed. This assumption would need to be confirmed with the USACE at the time that the projects move forward. Jurisdictional delineations would be required at that time.

WILD AND SCENIC RIVERS

The State of Arizona has two designated Wild and Scenic Rivers: Verde River and Fossil Creek. The nearest segment is the Verde River, which is approximately 187 miles to the northeast of Sierra Vista Municipal Airport. No impacts to designated Wild and Scenic Rivers would occur as a result of proposed airport development.

Appendix C

AIRPORT ASSET MARKETABILITY

Appendix C
AIRPORT ASSET MARKETABILITY

An objective of this Airport Master Plan is to conduct an evaluation of the assets available at Sierra Vista Municipal Airport and identify methods to market the facilities and services that are offered. In recent years, airports across the country have been responding to an environment where demand for facilities is not only less predictable, but often reduced. This can be attributed to the economic recession that the United States has recently experienced, which has caused bankruptcies, capacity cuts, etc., further resulting in reduced occupancy of airport terminal facilities, maintenance facilities, hangars, and other support centers.

Similar to national aviation trends, Sierra Vista Municipal Airport has experienced a decrease in aviation demand over the past few years. For the airport, this has largely equated to a decrease in hangar storage demand. It is important for an airport to monitor trends in aviation demand and best position the facility to capture any growing demand that might be occurring in its service area. As a result, the following describes the aviation assets available at Sierra Vista Municipal Airport and generalized marketing strategies that maximize their potential.

AIRPORT ASSETS

Landside facilities and property currently available at Sierra Vista Municipal Airport are depicted on **Exhibit C1**. These are the ground-based facilities that are essential to the daily operations at the airport in order to accommodate aircraft, pilots and passengers, and businesses that utilize the facility.

Terminal Building

The terminal building is centrally located on the north side of the airfield, providing ideal access to the runway and taxiway system at Sierra Vista Municipal Airport/Libby Army Airfield. The facility encompasses approximately 7,000 square feet of enclosed space and includes areas for fixed base operator (FBO) activities, classrooms, rental car counters, restrooms, a pilot's lounge, snooze room, and vending machines. The facility was originally constructed to accommodate commercial airline activities; therefore, space dedicated to airline ticketing and passenger service is also available.

Aircraft Storage Hangars

Aircraft storage hangars at Sierra Vista Municipal Airport are comprised of six linear box hangars and one conventional hangar. The linear box hangars typically provide space for the private storage of one aircraft. Conventional hangars provide a larger open space and have the capability to store several aircraft. The six linear box hangars on the airport provide 62 separate storage units comprising approximately 85,000 square feet. and the lone conventional hangar totals approximately 5,000 feet, providing enough space to store between two and four aircraft depending on their size. All total, 90,000 square feet of enclosed storage hangar space is provided.

Aircraft Parking Aprons

There are several dedicated aircraft parking aprons located at Sierra Vista Municipal Airport that accommodate different functions. East of the terminal building, a large parking area is dedicated for individual marked tiedown spaces. All total, 41 tiedown spaces are offered, encompassing approximately 14,900 square yards of space. These tiedowns are further designated for transient aircraft parking, based aircraft parking, and parking associated with those aircraft getting serviced (avionics and/or maintenance) on the airfield.

Immediately adjacent to and west of the terminal building, an even larger area of parking apron space is provided. Approximately 32,500 square yards of parking and circulation encompass this area. Currently, activities related to loading/unloading air cargo and washing aircraft occupy only small portions of this parking apron. During certain times of the year, specialty aviation operations related to the U.S. Forest Service (firefighting) are also conducted from the western portions of this parking apron.

Aircraft parking apron space at Sierra Vista Municipal Airport includes approximately 47,400 square yards. It should be noted that two helipads are located on the northeast side of the airport and are utilized by on-site emergency medical transport helicopters.

LEGEND

- Sierra Vista Municipal Airport Property Line
- Libby Army Airfield Property Line (Joint Use)
- Developable Property
- Hangar Storage

0 300 600
SCALE IN FEET

NORTH

11.36 acres

TO RUNWAY 3-21

TO RUNWAY 8-26

RUNWAY 12-30

TO RUNWAY 8-26

K

D

L

J

G

Wash Rack Deing Area

Aircraft Parking Apron

Auto Parking

Terminal Building

Self-Serve Fuel Facility

Linear Box Hangars

Fuel Farm

Civil Air Patrol

Auto Parking

Aircraft Parking Apron (Individual Tiedowns)

Helipads

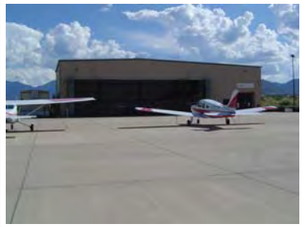
Auto Parking

Conventional Hangar

Airport Ave.

Linear Box Hangars

Fuel Farm



Conventional Hangar

Terminal Building

Self Serve Fuel Facility

Aircraft Parking Apron (Individual Tiedowns)

Civil Air Patrol

Helipad

Exhibit C1: AIRPORT ASSETS

Fuel Facilities

Two fuel farms located at Sierra Vista Municipal Airport provide a total storage capacity of 80,000 gallons for Jet A and 100LL fuel combined (45,000 gallons for Jet A and 35,000 gallons for 100LL). The fuel facility located closest to the terminal building consists of a 5,000-gallon capacity storage tank connected to a self-service fuel dispenser, allowing pilots the opportunity to fuel their aircraft with 100LL fuel 24 hours a day/seven days per week.

Two refueling trucks are also available to deliver fuel to aircraft, providing "full" service fueling capabilities. One truck is dedicated to 100LL and the other for Jet A fuel.

Developable Property

One of the most valuable assets available on an airport is land that is readily accessible to the runway and taxiway system. Some airports sit on large parcels of property that encompass hundreds of acres. As such, they are provided with seemingly "endless" opportunities for development, both aviation and non-aviation in nature. Sierra Vista Municipal Airport, on the other hand, is comprised of only 72 acres. As such, careful consideration must be given to its orderly development in order to maximize the amount of space that is provided. As previously discussed, a detailed evaluation has been made on available land that is developable on the airport. Approximately 11 acres of property northwest of the terminal building was the focus of this evaluation. Due to the limited amount of land available, it is important that the City of Sierra Vista reserve this property for aviation-related uses in order to satisfy future demand that could materialize in the future.

Airside Facilities

The landside assets on airport must be supported by an airside facility network (runways, taxiways, and navigational aids) that allows for their maximum usage. As detailed throughout the Master Plan, an extensive runway and taxiway system provides ideal opportunities for future growth and development at Sierra Vista Municipal Airport. Primary Runway 8-26 provides 12,001 feet of usable runway length, which satisfies the full array of general aviation, air taxi, and military operations that utilize the airfield. In addition, two secondary runways are offered which further enhance the airport's capabilities, especially during times when the primary runway is closed for maintenance or emergencies. Runway 8-26 is also provided with a precision instrument landing system (ILS) approach, allowing aircraft to utilize the airport during poor weather conditions.

Aviation Services

An array of aviation services are provided at Sierra Vista Municipal Airport that include flight training, aircraft maintenance and avionics, aircraft fueling, air cargo, hangar rental,

and pilot supplies. Furthermore, given the joint-use nature of the airfield, aircraft rescue and firefighting (ARFF) capabilities are provided by the U.S. Army. Although ARFF facilities and equipment are located on the south side of the airfield, they are available for civilian activities associated with Sierra Vista Municipal Airport when needed.

MARKETING ASSETS

Most airports have a Master Plan and/or Airport Layout Plan (ALP) that identifies existing and future land uses on airport property. Such is the case for Sierra Vista Municipal Airport, as this Master Plan and associated ALP drawing set details future landside development potential. Under market conditions present from 2008 to 2011, it has been difficult for airports across the country to utilize vacant property for revenue-generating activities or find replacement tenants to fill empty storage hangars.

An airport should consider the following practices in order to best position itself for challenges associated with marketing available assets:

- Keep a facility or developable property "alive." Keeping a building alive promotes safety, prevents future expenses for costly repairs, and creates a positive environment on airport property, which will attract future tenants. In addition, extending utility infrastructure to vacant land instills a proactive attitude that encourages private investors to build on through the development of facilities and hangars.

- Maintain an aesthetically-appealing appearance on existing facility infrastructure and institute guidelines/recommendations for the orderly development and appearance of future facilities.

- Keep the Federal Aviation Administration (FAA) and associated state aviation department informed throughout the marketing process. This allows an effective dialogue that demonstrates the airport's efforts in attracting aviation uses to the airfield before seeking a conversion to non-aviation development in the event that the airport has excess property or facilities to justify non-aviation uses.

- Consider aviation trends and the regional economic market when planning for a new facility or setting design standards for development.

- Have an effective means of regulating activities associated with aviation and non-aviation uses through the implementation of Airport Rules and Regulations and Minimum Standards.

Strategies for Sierra Vista Municipal Airport

As detailed during this evaluation, Sierra Vista Municipal Airport provides an array of facilities and amenities that allows it to be competitive in the aviation market. The combination of a functional terminal building accommodated by a large automobile

parking lot should allow it to continue to meet the needs of existing and projected aviation demand through the foreseeable future. In addition, the airport is provided with adequate aircraft storage hangar facilities and expansive aircraft parking apron areas.

In an effort to continue to attract activities to the airport to meet aviation demand and enhance revenue production, the following strategies are provided for those landside assets at Sierra Vista Municipal Airport.

Terminal Building

The airport terminal building's primary role is to serve the aviation public utilizing Sierra Vista Municipal Airport. As such, space should continue to be allocated for FBO activities (currently conducted by the City of Sierra Vista) that include offices for FBO management, a sales counter that allows for transactions between FBO personnel and pilots/passengers utilizing its services, a flight planning room, pilot's lounge, and public lobby/waiting area.

The terminal building is afforded additional space, mainly due to the fact that it was constructed to accommodate commercial airline activities and those services which are typically associated with scheduled airline service, such as rental cars and baggage claim. There is also classroom space included in the facility. The city has been successful in leasing portions of these areas to private entities in the past. This practice should be continued in order to maximize the potential of the facility while providing additional revenue for the airport. Further consideration could be given to modifying and dedicating portions of the building to be utilized for a conference room/center in addition to providing specialty concessions in the form of a restaurant. **Table C1** provides a list of essential and ancillary functions that a terminal facility should consider when its primary function is to accommodate general aviation activities.

TABLE C1
Asset Marketability - Terminal Building
Sierra Vista Municipal Airport

Essential Functions
Meet the needs of FBO-related activities
Public lobby/Waiting area
Flight planning
Pilot's lounge
Ancillary Functions
Classroom space for flight training, college courses, special activities, etc.
Conference room/center
Concessions/Restaurant
Rental car counter

Aircraft Storage Hangars

Hangar storage space is comprised of approximately 90,000 square feet in seven separate facilities at Sierra Vista Municipal Airport. The conventional hangar is currently being leased to a private entity that performs aircraft maintenance and avionics services. This type of activity is ideal in a facility such as this, as it provides adequate storage space for multiple aircraft in addition to a public lobby and office space.

Other aviation activities that are common in conventional hangars made up of at least 5,000 square feet include corporate flight departments, FBO operations, multiple/group aircraft storage, and air charter service. Since this hangar is the only one of its kind currently at the airport, it is important that the City of Sierra Vista dedicate its use to aviation-related activities.

Six linear box hangars at the airport provide private storage for individual aircraft owners. Due to the economic recession, many airports have experienced a decline in demand for private aircraft storage space, often times leaving many individual hangar storage spaces vacant. Sierra Vista Municipal Airport is currently experiencing an approximate 18 percent vacancy rate in its private storage hangars.

Table C2 provides a breakdown of hangar types at Sierra Vista Municipal Airport, including their sizes and monthly rental rates.

TABLE C2
Hangar Rate/Size Information – 2013

Hangar #s	# of Hangars	Size	Approx. Square Footage	Monthly Rent	Monthly Rental Tax	Electricity Monthly	Monthly Electric Rental Tax	Total Monthly Rate
1-10	10	Old Small	1,332	255.00	2.55	6.18	0.06	**$263.79**
10A	1	New Large	1,551	355.00	3.55	4.89	0.05	**$363.49**
11-14	4	Old Large	1,518	285.00	2.85	4.89	0.05	**$292.79**
15-18	4	Old Ex-Large	1,656	315.00	3.15	4.89	0.05	**$323.09**
19	1	New Ex-Large	1,656	355.00	3.55	4.89	0.05	**$363.49**
20-31	12	New Small	1,332	305.00	3.05	3.82	0.04	**$311.91**
32-37	6	New Small	1,332	305.00	3.05	5.65	0.06	**$313.76**
A & L	2	Old Large	1,518	285.00	2.85	5.48	0.05	**$293.38**
B-K	10	Old Small	1,332	255.00	2.55	5.48	0.05	**$263.08**
M & X	2	Old Large	1,518	285.00	2.85	6.08	0.06	**$293.99**
N-W	10	Old Small	1,332	255.00	2.55	6.08	0.06	**$263.69**
Total	**62**							

VACANT AS OF 12-31-12
10A, 12, 14, 20, 23, 26, 32, 33, 34, A, H, S, T, U

In order to make the best use of vacant storage space, some airports have historically allowed for the storage of non-aviation uses within T-hangars or linear box hangars. The Sierra Vista Municipal Airport Rules and Regulations state that the primary use of its aircraft storage hangars is to store aircraft and items incidental to the operation and maintenance of the stored aircraft. The Rules and Regulations go on to state that during times when there are no assigned aircraft occupying a hangar, only items subject to approval by the Airport Manager may be kept in the hangar. In any event, activity

occurring in the hangars shall not interfere with or constitute a safety hazard with aviation-related activities. It is recommended that the City of Sierra Vista allow for only the storage of aircraft in its linear box hangars. In the event that it allows for other types of storage, the terms of these leases should not extend more than month-to-month and allow for termination when the need for aviation demand arises.

Aircraft Parking Aprons

Over 47,000 square yards of parking pavement is provided to aviation activities at Sierra Vista Municipal Airport. The parking apron space east of the terminal building should continue to be dedicated for based and transient aircraft parking, in addition to parking associated with maintenance and avionics services offered in the conventional hangar on the east side of the airport. Furthermore, parking apron space immediately adjacent to the terminal building should remain available for use by larger business/corporate jets and air cargo aircraft.

Approximately 30,000 square yards of pavement space west of the terminal building is vacant a large majority of the time. As previously discussed, the U.S. Forest Service does utilize portions of this pavement during its seasonal firefighting operations. Furthermore, there is a strong possibility that the U.S. Forest Service could begin basing its operations on a larger-scale basis on the north side of the airport, creating a need for additional use of the aircraft parking apron.

The airport should continue to accommodate the needs of the U.S. Forest Service given their safety-sensitive operational missions by dedicating portions of the west aircraft parking apron for its activities. Historically, other airports have also marketed vacant parking apron areas for the temporary storage of large aircraft that cannot be accommodated at other facilities. It is important to note that additional safety and security measures could be needed to support such storage activities, since these aircraft are not kept within the confines of a controlled access/locked facility. In any event, the use of aircraft parking apron space on the west side of Sierra Vista Municipal Airport should conform to the ultimate use of adjacent developable property in the northwest area of the airport.

Developable Property

As detailed earlier on, it is extremely important for the City of Sierra Vista to evaluate future development on the northwest side of the airport since this is the only vacant property left that is conducive to development. The Master Plan provided a detailed evaluation of this approximate 11-acre parcel and recommended a future development plan for this area as depicted on **Exhibit C2**.

In order to successfully market this area for future aviation use, it is important that this property is made "alive." The City of Sierra Vista is in the process of adhering to this principle by designing utility infrastructure improvements that will extend to this property.

By 2015, this area should be capable of accommodating the utility demands of large-scale aviation operators and their facilities. Furthermore, the airport's capital improvement program (CIP) calls for additional infrastructure improvements in the form of public roadway access to strategic locations allowing them to serve potential aviation demand.

The following further details priorities that should be considered when developing this property:

- Reserve land immediately adjacent to the northwest side of the terminal building for conventional hangar development that could satisfy specialty aviation operations needing aircraft parking apron space.

- Hangars planned for private aircraft storage should be set back from the aircraft parking apron since these facilities typically do not require the need for aircraft parking apron space and circulation.

- Continue to monitor the needs of the U.S. Forest Service and make land available for lease to further accommodate its firefighting activities. Given the nature of these operations, it is recommended that they be segregated to the extent possible from other aviation-related activities that could occur in this area.

- Position future development to allow for continued expansion of Sierra Vista Municipal Airport. This includes reserving the option to pursue the acquisition of additional property north of the facility from the Department of the Army should demand dictate.

SUMMARY

The City of Sierra Vista should continue to monitor its facilities and property in an effort to capitalize on accommodating the needs of future demand in the area. Given that the airport encompasses only 72 acres of property, it is in the best interest of the City of Sierra Vista to dedicate as much land as possible to meeting the needs of aviation-related activities. The recommendations in this analysis will assist Sierra Vista Municipal Airport in continuing to offer public aviation facilities and services that remain competitive with the regional area.

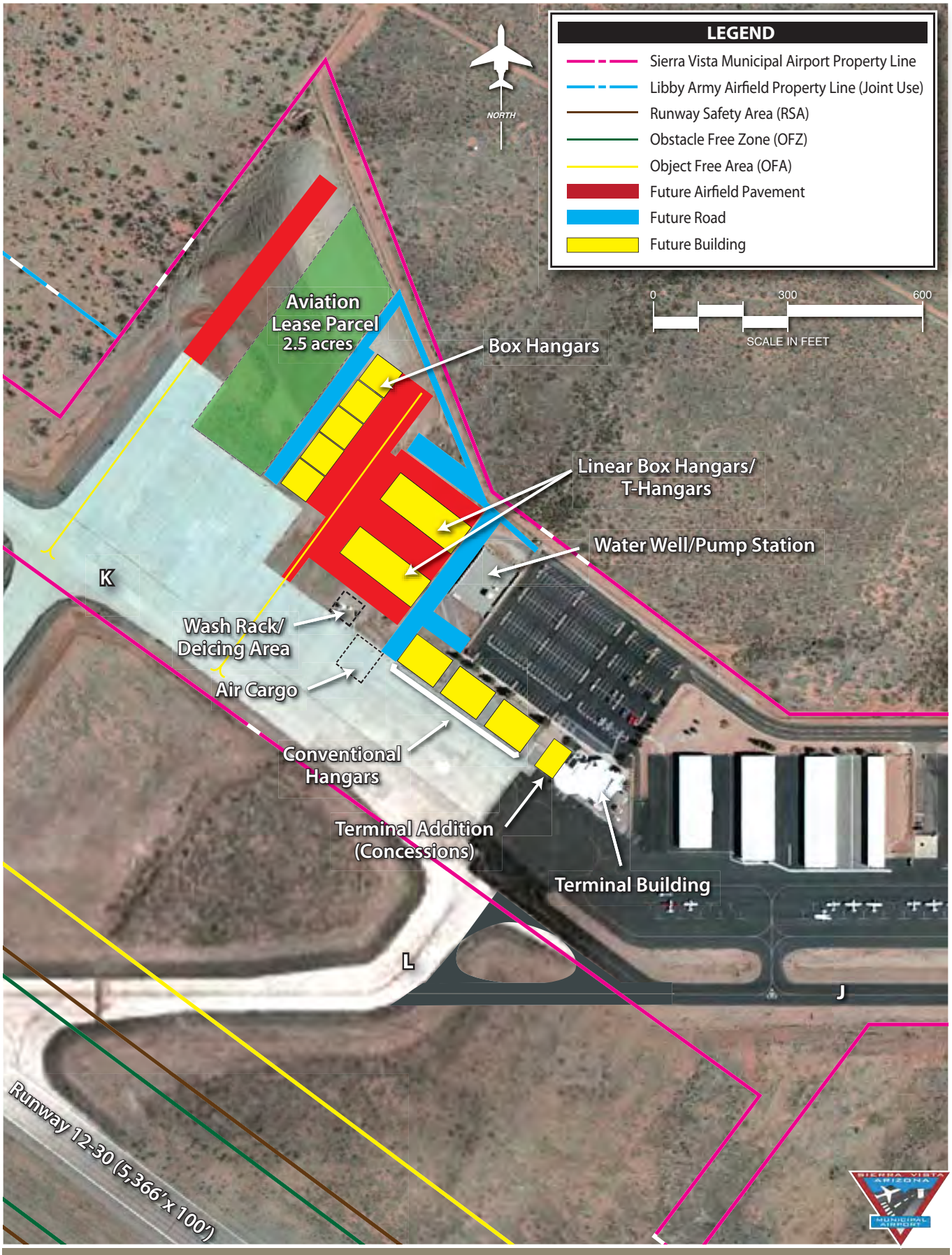


Exhibit C2: PROPOSED LANDSIDE DEVELOPMENT

Appendix D

ECONOMIC BENEFIT ANALYSIS

Appendix D

SIERRA VISTA MUNICIPAL AIRPORT

Economic Benefit Analysis

Contents

HIGHLIGHTS

This report presents an analysis of the economic benefits of Sierra Vista Municipal Airport for the economy of the airport service area, which includes the City of Sierra Vista and nearby communities in Cochise County in Arizona. No information was compiled for joint use military activity related to Fort Huachuca.

Sierra Vista Municipal Airport serves as a gateway that welcomes commerce and visitors into the region and provides access for citizens and businesses to travel outward via general aviation. Economic benefits (revenues, employment and income) are created when economic activity takes place both on and off the airport. The highlights of the economic benefit analysis for 2011 follow.

HIGHLIGHTS

Economic Benefit Analysis
Sierra Vista Municipal Airport

- **The total economic benefits (including all secondary or multiplier effects) of activity due to the presence of Sierra Vista Municipal Airport summed to $11.4 million in 2011, supporting 82 jobs in the airport service area.**
- **The primary economic benefits (not including multiplier effects) of all on-airport activity totaled $7.8 million. Employment on the airport (including jobs from airport improvement projects) was 45 workers, who received compensation of $2.3 million.**
- **Private on-airport aviation employers produced $4.2 million of economic output in 2011, with income to 23 workers and proprietors of $1.7 million.**
- **Annual average construction, maintenance and capital improvements at Sierra Vista Municipal Airport in recent years have averaged $1.9 million, supporting 18 construction industry jobs related to the presence of the airport.**
- **General aviation travelers using Sierra Vista Municipal Airport accounted for 2,940 visitor days in the airport service area; visitor expenditures were $313,000 in 2011, creating 6 off-airport jobs in the hospitality sector of the economy.**
- **Seasonal fire-fighting crews numbering over 100 workers incurred expenses for vehicle rental, food, and lodging of $210,000 while they were based at Sierra Vista Municipal Airport.**

MEASURING BENEFITS

The presence of an airport creates benefits for a community in many ways. Sierra Vista Municipal Airport supports essential services, including enhanced medical care (air ambulance service), access for law enforcement and fire control, and courier delivery of mail and high value parcels. These services raise the quality of life for residents and maintain a competitive environment for economic development.

General aviation at the airport allows business travelers to reach destinations without the delays and uncertainty of today's airline flights and provides access to more than 5,300 airports in the nation, compared to approximately 565 served by scheduled airlines.

Although qualitative advantages created by the presence of an airport are important, they are also difficult to measure. In studying airport benefits, regional analysts have emphasized indicators of economic activity for airports that can be quantified, such as dollar value of output, number of jobs created, and income of workers and proprietors of businesses.

Economic benefit studies differ from cost-benefit analyses, which are often called for to support decision-making, typically for public sector capital projects.

Study of economic benefit is synonymous with measurement of economic performance. The methodology was standardized in the publication by the Federal Aviation Administration, *Estimating the Regional Economic Significance of Airports*, Washington DC, 1992.

Following the FAA methodology, this study views Sierra Vista Municipal Airport as a source of measurable economic output (the production of aviation services) that creates revenues for firms, and employment and income for workers on and off the airport. Aviation spending on the airport injects revenues into the community when firms buy products from suppliers and again when employees of the airport spend for household goods and services. In addition, spending by air visitors produces revenues for firms in the hospitality sector as well as employment and income for workers.

Quantitative Benefit Measures

The quantitative measures of economic benefits of the Sierra Vista Municipal Airport are each described below.

Revenue is the value in dollars of the output of goods and services produced by businesses. For government units, the budget is used as the value of output.

Output is equivalent to revenue or spending or sales. From the perspective of the business that is the supplier of goods and services, the dollar value of output is equal to the revenues received by that producer. From the viewpoint of the consumer, the dollar value of the output is equal to the amount that the consumer spent to purchase those goods and services from the business.

Income is a second benefit measure, made up of employee compensation (the dollar value of payments received by workers as wages and benefits) and proprietor's income of business owners.

Employment is the third benefit measure, the number of jobs supported by the economic activity created by the airport.

To measure the economic benefits of the airport, information on revenues, employment and income was obtained directly from suppliers and users of aviation services through on-site interviews and mailed survey forms.

Those contacted included private sector firms on the airport, government agencies, general aviation air travelers, and based aircraft owners. City of Sierra Vista staff provided valuable assistance with data collection.

TABLE D1
Summary of Economic Benefits: 2011
Sierra Vista Municipal Airport

	BENEFIT MEASURES		
Source	**Revenues**	**Income**	**Employment**
On-Airport Economic Benefits **- Private Employers** **- Airport Administration** **- Capital Improvements**	**$7,806,000**	**$2,330,000**	**45**
Air Visitor Benefits	**313,000**	**86,000**	**6**
Seasonal Fire Crews	**210,000**	**53,000**	**3**
Primary Benefits: Sum of On-Airport & Air Visitor Benefits	**8,329,000**	**2,469,000**	**54**
Secondary Benefits (Multiplier Effects)	***3,126,000***	***1,151,000***	***28***
TOTAL BENEFITS	**$11,455,000**	**$3,620,000**	**82**

ECONOMIC BENEFIT SUMMARY

The economic benefits of Sierra Vista Municipal Airport for 2011 are shown in Table D1. The total benefits of the airport, including on-airport, air visitor, and secondary benefits (which result as dollars recirculate in the regional economy), were calculated to be:

- **$11.4 Million Revenues**
- **$3.6 Million Worker Income**
- **82 Jobs Supported**

On-Airport Benefits

Operations on Sierra Vista Municipal Airport supported a total of eight private and public employers including FBO services such as fueling and maintenance, pilot training and supplies, medical air evacuation, as well as airport administration. Including spending and employment related to capital improvement projects, on-airport economic benefits were:

- **$7.8 Million Revenues**
- **$2.3 Million Worker Income**
- **45 On-Airport Jobs**

Air Visitor Benefits

An important source of aviation-related spending comes from the more than 2,000 air visitors that arrive at the airport each year on general aviation aircraft. Visitors traveling for business or personal reasons spend for lodging, food and drink, entertainment, retail goods and services, and ground transportation, creating annual airport service area output, employment and income of:

- **$0.313 Million Revenues**
- **$0.086 Million Worker Income**
- **6 Hospitality Sector Jobs**

Seasonal Fire-Fighting

Forest fires inflict massive losses to private property and natural resources in Arizona. The response to the Murphy and Monument fires by the Forest Service in 2011 brought over 100 personnel to the airport, operating five to ten aircraft, depending on conditions. Vehicle rental and per diem food and lodging spending by the Forest Service created

- **$0.210 Million Revenues**
- **$0.053 Million Worker Income**
- **3 Hospitality Sector Jobs**

Primary Benefits

The primary benefits represent the sum of on-airport and air visitor revenues, income and employment due to the presence of the airport. Primary benefits are the "first round" impacts and do not include any multiplier effects of secondary spending. The primary benefits of economic activity related to the airport in 2011 were:

- **$8.3 Million Revenues**
- **$2.5 Million Worker Income**
- **54 Jobs**

Combined revenue flows for businesses and employers on and off the airport sum to a value of $8.3 million. The airport presence created benefits to workers by providing

incomes of $2.5 million. There were 54 jobs supported directly by the suppliers and users of aviation services.

Secondary Benefits

Secondary benefits or multiplier effects are created when the initial spending by airport employers or visitors circulates and recycles through the economy. In contrast to initial or primary benefits, the secondary benefits measure the magnitude of successive rounds of re-spending by those who work for or sell products to airport employers or the hospitality sector.

Input-output analysis shows the initial revenue stream of $8.3 million created by the presence of the airport stimulated secondary benefits from multiplier effects within the service area of:

- **$3.1 Million Revenues**
- **$1.1 Million Worker Income**
- **28 Jobs**

ON-AIRPORT BENEFITS

Table D2 illustrates the annualized employment, income and value of output (revenues) produced by Sierra Vista Municipal Airport tenants in 2011. Values shown for revenues, employment and income are the primary benefits and do not include multiplier effects of secondary benefits.

Surveys were distributed to airport employers to collect data on employment and economic activity. In addition, interviews were conducted and telephone follow-up contact was made to supplement the surveys in some cases. Respondents were informed that the survey results were confidential and only aggregate totals would appear in the written report.

On-airport economic activity created annual benefits of $7.8 million. Private sector aviation revenues were $4.2 million and government budgets were $1.6 million. Annual average capital improvement outlays added an additional $1.9 million to total on-airport economic benefits.

Private Employers

There were seven private employers and proprietors located at Sierra Vista Municipal Airport in 2011, offering a range of services available for the aviation community. FBO services include general aviation aircraft maintenance, servicing, and inspections for various categories of aircraft. Flight training from introductory to advanced instruction is provided. Other services include aircraft charter and rental, as well as pilot supplies. Medical air evacuation services operate from the airport to serve the residents of the region. Private employers on the airport employ 23 workers with income of $1.7 million, which creates additional spending in their home communities.

Public Sector Employers

The overall operation of the airport is under the responsibility of the Department of Public works of the City of Sierra Vista. There were four on-airport employees at the airport (including full and part time workers) and several support staff for airport financing and management located at city offices of the airport, including the Director of Public Works who also serves as Airport Manager. The airport budget included many components that supported jobs and incomes in the local economy. Examples are spending for utilities, equipment rentals, advertising, specialized supplies, and fuel

purchases for resale to based and transient aircraft.

Capital Projects

Capital projects are vital for airports to maintain safety and provide for growth. Airport improvements also create jobs and inject dollars into the local economy. Recent projects have included improvements to runway 12/30 and taxiway J, upgrade of the automated weather observation (AWOS) station, and distance markers improvement.

A three year annual average for capital projects was applied to smooth out the variability of construction spending on the airport. The $1.9 million annual average outlays supported 18 jobs related to capital improvement on the airport, with payroll income to workers of $475,000.

On-Airport Summary

The on-airport economic benefits of Sierra Vista Municipal Airport sum to revenues/output of $7.8 million, with 45 on-airport workers and proprietors earning incomes of $2.3 million.

TABLE D2
On-Airport Economic Benefits: Revenues, Income and Employment
Sierra Vista Municipal Airport

	BENEFIT MEASURES		
Sources of On-Airport Benefits	**Revenues**	**Income**	**Employment**
Private On-Airport Employers **FBO Services, Maintenance & Repair** **Aircraft Charter & Rental** **Pilot Training & Supplies** **Aviation Support Activities** **Medical Air Services**	**$4,217,000**	**$1,700,000**	**23**
Construction & Capital Improvements	**1,966,000**	**475,000**	**18**
Airport Administration	**1,623,000**	**155,000**	**4**
All On-Airport Economic Benefits	**$7,806,000**	**$2,330,000**	**45**

AIR VISITOR BENEFITS AND FIRE-FIGHTING

Sierra Vista Municipal Airport attracts general aviation visitors from throughout the region and the nation who come to the area for business, recreational and personal travel, including visiting relatives, touring Southeast Arizona, or meeting with clients and customers.

This section provides detail on economic benefits from general aviation air travelers who use the airport. Values shown for spending (revenues), employment and income are benefits of initial visitor outlays and do not include secondary benefits of multiplier effects.

General Aviation Visitors

In order to analyze general aviation traffic patterns at the airport, a database of general aviation flight plans involving Sierra Vista Municipal Airport as either the destination or origin for travel was obtained from FAA records.

In this sample, the most frequent source of itinerant flights arriving at Sierra Vista Municipal Airport was Phoenix Sky Harbor Airport (Table D3). Second in importance was Falcon Field, in Mesa, Arizona. Overall, general aviation aircraft arriving at Sierra Vista Municipal during the study period originated at more than 40 airports around the Western region and the nation.

Past years have often seen more than 15,000 itinerant general aviation operations annually at Sierra Vista Municipal Airport. Operations involve both arrivals and departures.

It is useful to differentiate between itinerant operations by based and transient aircraft. An itinerant operation involves an origination or destination airport other than Sierra Vista Municipal Airport. However, both based and non-based aircraft contribute to itinerant activity in any given day.

TABLE D3
GA Aircraft Itinerant Origination
Sierra Vista Municipal Airport

Ranked By Origin	State
1. PHOENIX SKY HARBOR	AZ
2. FALCON FIELD	AZ
3. COLUMBIA	SC
4. PHOENIX-MESA GATEWAY	AZ
5. LAMAR	CO
6. SCOTTSDALE	AZ
7. MONTGOMERY FIELD	CA
8. LAKE HAVASU CITY	AZ
9. COLORADO SPRINGS	CO
10. CHANDLER	AZ

Source: FAA Flight Plan Data Base and Sierra Vista Municipal Airport Records

When a Sierra Vista based aircraft returns to Sierra Vista Municipal Airport from a flight to Scottsdale, for example, that is an itinerant operation. When an aircraft based at an airport other than Sierra Vista Municipal arrives at Sierra Vista Municipal Airport, that aircraft is classified as a transient itinerant.

Based aircraft contribute to the economic benefits of the airport through spending by owners for fuel, storage, maintenance, insurance, and other outlays in the Sierra Vista Municipal area.

Transient aircraft bring benefits to the airport service area when they spend for fuel or maintenance while at the airport, or when

visitors spend for food, lodging, and other expenses such as auto rental in the Sierra Vista Municipal area. Overnight transient visitors typically have much larger expenditures than transient visitors who stay for a day or portion of a day.

According to analysis of flight records, there were 3,098 transient aircraft arrivals at Sierra Vista Municipal Airport during 2011. Of these, 465 brought overnight visitors and 2,633 were one-day visitors (Table D4).

TABLE D4
General Aviation Transient Aircraft
Sierra Vista Municipal Airport

Item	Annual Value
Itinerant AC Arrivals	7,745
Transient AC Arrivals	3,098
Overnight Transient AC	465
One Day Transient AC	2,633

Source: Derived from FAA Data and Sierra Vista Municipal Airport Records

Separate analyses were conducted for those GA visitors with an overnight stay and those whose visit was one day or less in duration. Information on visiting general aviation aircraft was derived from a mail survey of visiting aircraft owners and pilots. Visitors were asked about the purpose of their trip, the size of the travel party, length of stay, type of lodging, and outlays by category.

Overnight GA Visitors

The travel patterns underlying the calculation of overnight GA visitor economic benefits are shown in Table D5, for the 465 transient overnight aircraft

TABLE D5
General Aviation Overnight Visitors
Sierra Vista Municipal Airport

Item	Annual Value
Transient AC Arrivals	3,098
Overnight Transient AC	465
Avg. Party Size	2.3
Number of Visitors	1,069
Average Stay (Days)	1.7
Visitor Days	1,817
Spending per Aircraft	$549
Total Expenditures	$255,000

Source: Derived from FAA Data, Sierra Vista Municipal Airport Records and GA Visitor Survey, some figures are rounded.

arrivals during the year. The average party size was 2.3 persons and the average overnight travel party stayed in the area for 1.7 days. There were 1,069 overnight visitors for the year, with a combined total of 1,817 visitor days.

Spending per travel party per aircraft averaged $549. Total spending by all GA overnight visitors summed to $255,000 for the year.

Table D6 shows the percentage distribution of spending categories by overnight travel parties at Sierra Vista Municipal Airport. Lodging accounts for the greatest percentage of the visitor dollar, 36 percent, averaging $198 per aircraft travel party. Food and drink, at $189 per overnight aircraft made up 34 percent of expenditures. Ground transportation, at $73 per overnight aircraft,

made up 13 percent. Overnight visitors spent an average on $48 on retail goods and services. Entertainment was the smallest expenditure category, at $41 for each visiting overnight general aviation travel party.

TABLE D6
Spending Per Overnight GA Aircraft
Sierra Vista Municipal Airport

Category	Spending	Percent
Lodging	**$198**	**36**
Food/Drink	**189**	**34**
Retail	**48**	**9**
Entertainment	**41**	**8**
Transportation	**73**	**13**
TOTAL	**$549**	**100**

Source: GA Visitor Survey

Day GA Visitors

According to flight operations records, more than two thirds of transient general aviation aircraft arriving at Sierra Vista Municipal Airport stayed on the airport for one day or less.

The economic benefits from arriving transient aircraft travel parties are of two types. Those pilots or aircraft owners that buy fuel or have their aircraft serviced on the airport are making purchases which contribute to the revenue stream received by aviation businesses on the airport. That type of spending creates output, employment, and worker income on the airport. Those economic benefits are shown in Table D2 as on-airport benefits.

However, if the aircraft travel party leaves the airport to visit a corporate site, conduct a business meeting, or purchase retail goods and services, these activities generate off-airport spending that create jobs and income in the local community.

During the year, there were 2,633 transient aircraft that stopped at the airport for one day. Some were only on the ground for a few minutes while others were parked several hours when the travel party had their aircraft serviced or traveled away from the airport.

TABLE D7
General Aviation Day Visitors
Sierra Vista Municipal Airport

Item	Annual Value
Transient AC Arrivals	**3,098**
One Day Transient AC	**2,633**
Length of Stay 4 Hours or More	
AC Stayed 4 Hours or More	**623**
Avg. Party Size	**1.8**
Number of GA Visitors	**1,121**
Spending per Aircraft	**$93**
Total Expenditures	**$58,000**

Source: Derived from FAA Data, Sierra Vista Municipal Airport Records and GA Visitor Survey, some figures are rounded.

Detailed arrival and departure records were analyzed to estimate the number of aircraft parked for four hours or more (but not overnight), a period of sufficient duration to allow off-airport spending. During 2011, there were 623 day visitor aircraft (four hour stay) identified.

The 623 day trip aircraft brought 1,121 visitors to the Sierra Vista Municipal area during the year. The average party size was 1.8 persons, including the pilot. The average spending per one-day aircraft that stayed four hours or more was reported from visitor surveys as $93 (Table D7). The total economic benefits created by off-airport spending by one-day general aviation visitors tallied to $58,000.

TABLE D8
Spending Per Day Visitor Aircraft
Sierra Vista Municipal Airport

Category	Spending	Percent
Food/Drink	**49**	**50**
Retail	**13**	**13**
Entertainment	**4**	**4**
Transportation	**33**	**31**
TOTAL	**$93**	**100**

Source: GA Visitor Survey

The largest expenditure category for one-day visiting travel parties was purchase of food and beverages, which averaged $49 per aircraft travel party for the day and accounted for 50 percent of outlays (Table D8). Spending for ground transportation (automobile rental or taxi) was the second largest category, at $33 per aircraft.

Combined GA Visitor Spending

Table D9 shows the economic benefits resulting from spending in the region by combined overnight and day general aviation visitors arriving at Sierra Vista Municipal Airport, as well as seasonal fire crews based at the airport.

To recap, there were 3,098 transient general aviation aircraft that brought visitors to the airport during the year. Of these, 465 were arriving overnight general aviation aircraft and 623 were one day visiting aircraft that were parked long enough to make off-airport expenditures.

Each overnight travel party spent an average of $549 during their trip to the airport service area and travel parties on each day visitor aircraft reported spending of $93 per trip.

Multiplying the expenditures for each category of spending by the number of aircraft yields the total outlays for lodging, food and drink, entertainment, retail spending and ground transportation due to GA visitors during the year. This spending summed to $313,000 in annual revenues.

There were 2,940 visitor days attributable to general aviation travelers during the year. Sixty-two percent of visitor days (1,818) were due to overnight GA travelers and thirty-eight percent (1,121) were from one-day visitors.

On an average day, there were eight visitors in the service area that had arrived by general aviation aircraft. Average daily revenue created by all GA air travelers was $857 of spending injected into the local economy.

The average economic impact of any

arriving GA transient aircraft (combined overnight and day visitor) at Sierra Vista Municipal Airport was $288. This impact, multiplied over 1,088 arriving transient aircraft, yields the annual spending by GA visitors of $313,000 (figures rounded).

Expenditures by GA visitors created six jobs in the tourist sector in the Sierra Vista Municipal Airport service area. Food and drink spending created the greatest number of visitor jobs and the largest dollar value of income received by workers and proprietors ($35,000).

Fire-Fighting Expenditures

Fire-fighting crews from the U. S. Forest service were based at Sierra Vista Municipal Airport in response to two major fires in 2011, the Murphy fire and the Monument fire. For the large Monument fire, Forest Service records show that as many as 115 persons were operating from the airport. Aircraft included nine helicopters and 4 large fixed wing aircraft. In addition, a mobile retardant plant was set up on site at the airport.

Seasonal fire-fighting expenditures by the Forest Service for vehicle rental and food and lodging summed to $210,000, supporting the annual equivalent of 3 jobs and worker income of $53,000.

Adding fire-fighter expenditures to GA visitor spending brings annual hospitality sector revenues to $523,000, with income of $139,000 and 9 jobs.

TABLE D9
Economic Benefits from GA Visitors & Fire-Fighting: Revenues, Income and Employment
Sierra Vista Municipal Airport

Category	Overnight AC Expenditures	One Day AC Expenditures	Total Visitor Expenditures	Income	Employment
Lodging	**$92,100**		**$92,100**	**$16,000**	**1**
Food/Drink	**87,800**	**$28,700**	**116,500**	**35,000**	**2**
Retail Sales	**22,200**	**7,500**	**29,700**	**13,000**	**1**
Entertainment	**19,100**	**2,500**	**21,600**	**8,000**	**1**
Ground Trans.	**33,800**	**19,300**	**53,100**	**14,000**	**1**
Visitor Benefits	**$255,000**	**$58,000**	**$313,000**	**$86,000**	**6**
Seasonal Fire-Fighting Crews			**$210,000**	**$53,000**	**3**
Combined Visitors and Fire Fighters			**$523,000**	**$139,000**	**9**

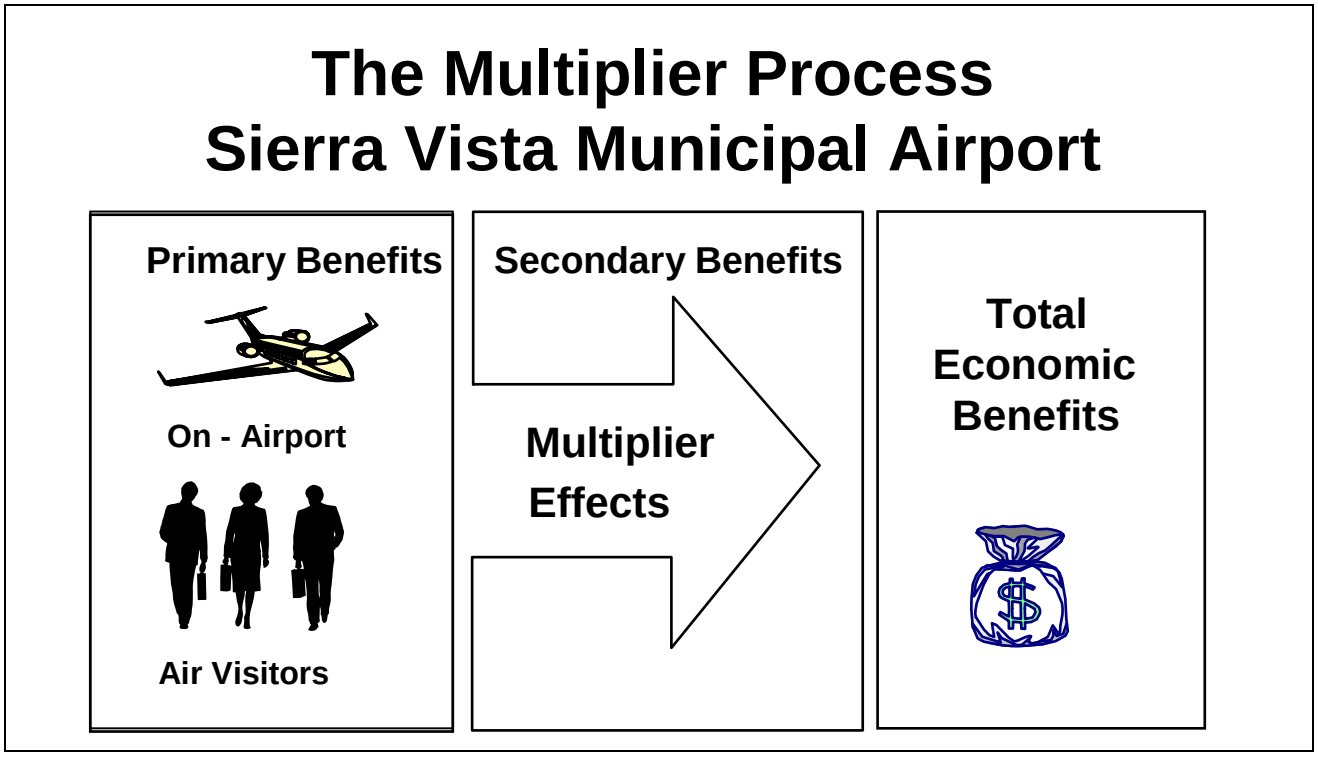
Source: Derived from GA Visitor Survey and U.S. Forest Service reports, some figures are rounded.

SECONDARY BENEFITS

The output, employment, and income from on-airport activity and off-airport visitor spending represent the computed primary benefits from the presence of Sierra Vista Municipal Airport. For the service area, these primary benefits summed to $8.3 million of output (measured as revenues to firms and budgets of administrative units), 54 jobs, and income to workers and proprietors of $2.5 million. These figures for initial economic activity created by the presence of the airport do not include the "multiplier effects" that result from additional spending induced in the economy to produce the initial goods and services.

Production of aviation output requires inputs in the form of supplies and labor. Purchase of inputs by aviation firms creates secondary or multiplier revenues and employment that should be included in total benefits of the airport. Airport benefit studies rely on multiplier factors from input-output models to estimate the impact of secondary spending on output, income and employment to determine benefits, as illustrated in the figure below.

The multipliers used for this study were from the IMPLAN input-output model based on data for Cochise County from the U. S. Bureau of Economic Analysis. To demonstrate the methodology, average Cochise County multipliers are shown in Table D10.



The multipliers represent weighted averages for combined industries in each category. For example, the visitor benefits multipliers shown combine lodging, food services, retailing, auto rental and entertainment multipliers used in the analysis.

The multipliers in this table illustrate the process for calculating the secondary and total impacts on all industries of the regional economy resulting from the primary or initial impact of each aviation related industry. The multipliers for output show the average dollar change in revenues for all firms in the service area due to a one-dollar increase in revenues either on the airport or through visitor spending.

For example, each dollar of new output (revenue) created by on-airport employers circulates through the economy until it has stimulated *total* output in all industries in the service area of $1.379 or, put differently, the revenue multiplier of 1.379 for on-airport activity shows that for each dollar spent on the airport there is *additional* spending created as $0.379 of secondary or multiplier spending.

Primary revenues from all sources associated with the presence of Sierra Vista Municipal Airport were $8.3 million for the year. After accounting for the multiplier effect, total revenues created within the service area were $11.4 million. Secondary revenues were $3.0 million, the difference between total and initial revenues.

The multiplier for income shows the dollar change in income for the economy due to a one-dollar increase in pay to workers either on the airport or in the visitor sector. The income multipliers determine how wages paid to workers on or off the airport stay within the economy and create additional spending and income for workers in other industries. For example, each dollar of wages paid for workers on the airport stimulates a total of 1.466 of income in the total economy.

The initial wages of $2.3 million for aviation workers and proprietors on the airport were spent for consumer goods and services that in turn created additional income of $1.1 million for workers in the general economy. The total income benefit of the airport was $3.4 million, consisting of $2.3 million of initial benefits and the $1.1 million of secondary benefits. The economic interpretation is that the presence of the airport provided employment and income for workers, who then re-spent these dollars, creating income for others.

The multipliers for employment show the total change in jobs for the service area due to an increase of one job on or off the airport. Each job on the airport is associated with 1.55 total jobs in the rest of the airport service area. Similarly, each job in the hospitality industry supported by air visitor spending is associated with 1.333 total jobs (primary + secondary) in the general economy.

The overall result is that the 54 initial jobs created by the airport supported an additional 28 jobs in the service area as secondary employment. The sum of the initial jobs and secondary jobs created in the general economy is the total employment of 82 workers that can be attributed to the presence of the airport.

The information above is intended for illustration only. In the full analysis, appropriate separate multipliers were used for on-airport aviation employers and visitor spending categories (lodging, eating places, retail, entertainment, and ground transportation).

TABLE D10
Average Multipliers and Secondary Benefits Within the Airport Service Area
Sierra Vista Municipal Airport

Revenue Source	Primary Revenues	Average Output Multipliers	Secondary Revenues	Total Revenues
On-Airport Benefits	$7,806,000	1.379	$2,955,000	$10,761,000
Visitor Benefits	523,000	1.327	105,000	694,000
Revenues	$8,329,000	1.375	$3,060,000	$11,455,000
Income Source	**Primary Income**	**Average Income Multipliers**	**Secondary Income**	**Total Income**
On-Airport Benefits	$2,330,000	1.466	$1,086,000	$3,416,000
Visitor Benefits	139,000	1.468	45,000	204,000
Income	$2,469,000	1.466	$1,151,000	$3,620,000
Employment Source	**Primary Employment**	**Average Employment Multipliers**	**Secondary Employment**	**Total Employment**
On-Airport Benefits	45	1.556	25	70
Visitor Benefits	9	1.333	3	12
Employment	54	1.519	28	82

Notes: Multipliers above are weighted averages intended to illustrate how secondary and total benefits were calculated for Sierra Vista Municipal Airport. In the full analysis, separate multipliers were used for on-airport employers (FBO and other airport businesses), and visitor spending (lodging, eating places, retailing, entertainment, and ground transportation). Multipliers were for Cochise County as produced by the IMPLAN input-output model based on data from the U. S. Bureau of Economic Analysis.

BASED AIRCRAFT BENEFITS

A survey of owners of aircraft based at Sierra Vista Municipal Airport was conducted to compile information on private aircraft usage patterns, including number of hours flown per year, average party size, and hours flown per trip.

TABLE D11
Based Aircraft Profile
Sierra Vista Municipal Airport

Type	Number
Total Based Aircraft	**65**
Single Engine Piston	**60**
Multi-Engine Piston	**3**
Jet	**-**
Helicopter	**2**

Source: Sierra Vista Municipal Airport

Mailing addresses were obtained through the assistance of the Sierra Vista Municipal Airport administration.

There were 65 based-aircraft at Sierra Vista Municipal Airport (Table D11). Of these, 60 were single engine, 3 were multi-engine, and 2 were helicopters.

The survey of based aircraft owners found that several aircraft were used exclusively for business purposes, medical air evacuation services, flight training and rental by FBO's, or other commercial or contract activity by owners.

Overall, most private aircraft were used for a mix of business and personal travel. The average annual usage reported by these aircraft owners was 86 hours per year, excluding training and local flights (Table D12).

TABLE D12
Based Aircraft Use Patterns
Sierra Vista Municipal Airport

Usage Measure	Annual Hours
Total Number of Hours	**5,601**
Average Annual Hours	**86**
Average Party Size	**1.6**
Passenger Hours Flown	**8,944**

Source: Based Aircraft Owner Survey, figures do not include flights by aircraft used solely for business (such as medical transit or flight instruction)

The total number of hours flown by private aircraft owners was 5,601 in 2011, according to the survey of aircraft owners. Average party size on flights was 1.6 persons. The total passenger hours flown summed to 8, 944.

Based aircraft are viewed as investments by their owners that provide returns through enhanced revenues and time savings when compared to scheduled airline travel. Entries in Table D13 illustrate the relation between private aircraft ownership and business activity in the area served by the airport.

TABLE D13
Based Aircraft Characteristics and Business Activity
Sierra Vista Municipal Airport

Category	All Based AC
Average Aircraft Value	**$81,200**
Average Maintenance & Expenses per Year	**$9,400**
Total Business Hours Flown per Year	**1,735**
Business Hours as Percent of All Hours	**31%**
Employment at Local Firms With Based Aircraft	**486**
Annual Sales at Firms With Based Aircraft	**$12,200,000**

Source: Figures derived from Based Aircraft Owner Survey

The average reported value for an aircraft was $81,200 and annual outlays were $9,400 for maintenance, storage, and other expenses such as insurance. Multiplying the average expenditures per aircraft by 65 aircraft gives total outlays by these aircraft owners of $611,000 injected into the local economy.

Based aircraft were used for business for 1,735 hours, or 31 percent of the total hours flown. Local firms with based aircraft accounted for nearly 500 employees with sales exceeding $12 million.

An estimate of the value of travel on based aircraft may be obtained by computing the cost of making these same trips on a chartered flight. This approach is approved by the Internal Revenue Service for valuation of aircraft travel use by corporate executives.

The cost of charter flights varies by time, distance and type of aircraft. Typical charter rates for a single engine piston aircraft in Arizona are currently in the range of $400 per hour.

Applying this rate to the 5,601 hours flown by Sierra Vista Municipal based aircraft yields a "charter equivalent value" of $2,240,400.

Several caveats apply to this estimate. Often additional fees (such as wait time) are applied for charter services. Moreover, this estimate does not accurately measure all the associated economic gains and benefits that result from air travel. A single air trip can result in additional income for an individual through improved contacts or more efficient job performance. Trips for medical reasons have high economic value as well. Further, the flexibility compared to scheduled airline travel and the time saved by general aviation travel compared to automobile use is not calculated here, but has economic significance.

SUMMARY & FUTURE BENEFITS

Airports are available to serve the flying public and support the regional economy every day of the year. On a typical day at Sierra Vista Municipal Airport, there are more than 100 operations by private aircraft involved in local or itinerant activity including flight instruction, touch and go operations, corporate travel, or transient aircraft bringing passengers visiting the area for personal travel or on business.

During each day of the year, Sierra Vista Municipal Airport generates $38,000 of revenues within its service area (see box). Revenues and production support jobs, not only for the suppliers and users of aviation services, but throughout the economy.

Each day Sierra Vista Municipal Airport provides 45 jobs on the airport and in total supports 82 area workers bringing home daily income of $9,900 for spending in their home communities.

On an average day during the year, there are eight visitors in the area who arrived at Sierra Vista Municipal Airport. Some will stay in the area for only a few hours while they conduct their business, and others will stay overnight. The average spending by these visitors on a typical day injects $858 into the service area economy.

Sierra Vista Municipal Airport Daily Economic Benefits

- **$38,000 Revenue**
- **82 Local Jobs Supported**
- **$9,900 Worker Income**
- **$858 Visitor Spending**
- **8 Air Visitors to Service Area**

TABLE D14
Baseline Economic Benefits: 2011
Sierra Vista Municipal Airport

	Revenues	Income	Employment
On-Airport (No CIP)	**$5,840,000**	**$1,855,000**	**27**
Air Visitors	**523,000**	**139,000**	**9**
Primary Benefits	**6,363,000**	**1,994,000**	**36**
Secondary Benefits	**2,505,000**	**865,000**	**24**
Total Benefits	**$8,868,000**	**$2,859,000**	**60**

Note: Revenues, income and employment benefits reflect activity associated with 37,820 GA and air taxi operations, excluding capital projects.

In addition to the quantitative benefits calculated here for Sierra Vista Municipal Airport, it is important for citizens and policy makers to be aware that there are unmeasured but qualitative benefits from aviation that represent significant social and economic value created by airports for the regions which they serve.

Sierra Vista Municipal Airport is the origin and destination of thousands of general aviation trips per year. Corporate and other private aircraft are used to visit other parts of the nation, and to bring visitors, customers and employees to the Sierra Vista Municipal area.

The presence of the Sierra Vista Municipal Airport provides unmeasured benefits in the form of flexibility in travel not found through reliance on scheduled air carriers. An estimate of the charter value of travel originating at Sierra Vista Municipal Airport exceeds $2 million.

Airports are recognized to have a very positive influence on economic development and sustainable growth is difficult without access to air travel.

Further, aviation often reduces costs and increases efficiency in individual firms. Annual studies by the National Business Aviation Association show that those firms with business aircraft have sales 4 to 5 times larger than those that do not operate aircraft. In 2010, the net income of aircraft operating companies was 6 times larger than non-operators (see National Business Aviation Association, *Fact Book*, 2010).

Future Benefits

Sierra Vista Municipal Airport is located in one of the strongest states in the nation for potential growth. Although the current national recession has affected Arizona more than some other states, the area served by the airport remains in the longer term an attractive location for business and newcomers

Table D14 shows a baseline summary of current economic benefits associated with

the airport. This baseline excludes expenditures for capital improvement projects, which can vary from year to year. Primary benefits to the service area, without multiplier effects, include revenues of $6.4 million, 36 jobs and income to workers and proprietors of $2.0 million.

Including secondary or multiplier effects, total baseline benefits to the service area are $8.9 million in revenues, 60 jobs supported and income to workers and proprietors of $2.8 million.

Tables D15 through D17 illustrate the future benefits of the Sierra Vista Municipal airport based on short term, intermediate term and long term operations forecasts.

The short term planning horizon is a demand driven increase of operations from the current level of 147,560 to 151,300. As operations increase, on-airport and visitor activity would be expected to increase as well.

The methodology for estimating future economic benefits is a linear extrapolation of current baseline values (Table D14) increased by the growth rate of general aviation operations, including itinerant, air taxi, and local.

In the short term planning horizon, this rate of increase is 7.3 percent as non-military operations rise from 37,820 to 40,600. Total revenues (including all multiplier effects) associated with general aviation activity increase to $9.4 million in the short run (Table D15).

The intermediate and long term economic benefits are computed with a similar methodology. In the intermediate term, with 45,200 general aviation operations, total revenues rise to $10.4 million (Table D16). In the long term, with 53,600 operations, revenues are $12.4 million and 77 total jobs (Table D17) are supported within the service area by the presence of the airport (excluding all effects of capital improvement projects).

TABLE D15
Future Economic Benefits: Short Term Demand Planning Horizon
Sierra Vista Municipal Airport

	Revenues	Income	Employment
On-Airport (No CIP)	**$6,269,000**	**$1,991,000**	**29**
Visitor Benefits	**561,000**	**149,000**	**10**
Primary Benefits	**6,830,000**	**2,140,000**	**39**
Secondary Benefits	**2,563,000**	**803,000**	**20**
Total Benefits	**$9,393,000**	**$2,943,000**	**59**

Note: Revenues, income and employment benefits exclude capital projects. Values shown are constant 2011 dollars.

TABLE D16
Future Economic Benefits: Intermediate Term Demand Planning Horizon
Sierra Vista Municipal Airport

	Revenues	Income	Employment
On-Airport Benefits	**$6,979,000**	**$2,217,000**	**32**
Visitor Benefits	**625,000**	**166,000**	**11**
Primary Benefits	**7,604,000**	**2,383,000**	**43**
Secondary Benefits	**2,854,000**	**1,111,000**	**22**
Total Benefits	**$10,458,000**	**$3,494,000**	**65**

Note: Revenues, income and employment benefits exclude capital projects. Values shown are constant 2011 dollars.

TABLE D17
Future Economic Benefits: Long Term Demand Planning Horizon
Sierra Vista Municipal Airport

	Revenues	Income	Employment
On-Airport Benefits	**$8,276,000**	**$2,629,000**	**38**
Visitor Benefits	**741,000**	**197,000**	**13**
Primary Benefits	**9,017,000**	**2,826,000**	**51**
Secondary Benefits	**3,384,000**	**1,061,000**	**26**
Total Benefits	**$12,401,000**	**$3,887,000**	**77**

Note: Revenues, income and employment benefits exclude capital projects. Values shown are constant 2011 dollars.

Tax Impacts

Because of the spending, jobs, and income created by the presence of Sierra Vista Municipal Airport, the facility is an important source of public revenues. As airport activity expands, tax revenues will continue to grow.

Estimated tax potential is set out in Table D18. The table shows the revenues for each tax category based on current average tax rates relative to output and personal income (income) for Cochise County and Arizona. Federal taxes are applied using current federal rates.

The first column in Table D18 shows tax revenues associated with the baseline level of airport activity and total economic benefits of $11.4 million (as seen in Table D1). The 82 workers in the service area have income of $3.6 million. Employers and workers are subject to various Federal, state and local taxes.

Federal social security taxes are estimated at $329,000, the largest component of federal taxes. The second largest federal tax category is the personal income tax of $162,000.

Overall, federal tax revenues currently collected due to economic activity associated with Sierra Vista Municipal Airport are calculated to be $597,000.

State and local tax revenues, shown in the lower portion of the table, sum to $239,000 at the current level of operations. The largest single component is sales taxes of $85,000. Combined federal, state, and local taxes are $836,000 at the current level of operations.

Projected tax revenues for future demand based activity levels increase as air operations rise. From $898,000 for short term activity, total taxes rise to $998,000 as demand and airport activity rise to higher operations in the intermediate term.

In the long term planning period, federal taxes are $846,000 and state and local tax revenues reach $339,000, for a combined value of $1.2 million.

TABLE D18
Tax Impacts from On Airport and Visitor Economic Activity
Sierra Vista Municipal Airport

Federal Taxes				
Revenue Category	**Current**	**Short Term**	**Intermediate Term**	**Long Term**
Corporate Profits Tax	$88,000	$94,000	$105,000	$125,000
Personal Income Tax	162,000	174,000	194,000	230,000
Social Security Taxes	329,000	353,000	393,000	466,000
All Other Federal Taxes	18,000	19,000	21,000	25,000
Total Federal Taxes	**$597,000**	**$640,000**	**$713,000**	**$846,000**
State and Local Taxes				
Revenue Category	**Current**	**Short Term**	**Intermediate Term**	**Long Term**
Corporate Profits Tax	$11,000	$12,000	$13,000	$16,000
Motor Vehicle Taxes	3,000	3,000	3,000	4,000
Property Taxes	60,000	65,000	72,000	85,000
Sales Taxes	85,000	92,000	102,000	121,000
Personal Income Tax	31,000	34,000	37,000	44,000
All Other S & L	49,000	52,000	58,000	69,000
Total S & L	**$239,000**	**$258,000**	**$285,000**	**$339,000**
Total Taxes	**$836,000**	**$898,000**	**$998,000**	**$1,185,000**

Note: All figures are in 2011 dollars. Derived from average tax rates in Arizona, Cochise County and Federal sources. Current impact estimate based on economic activity associated with 37,820 private GA operations; short term operations of 40,600; intermediate operations of 45,200 and long term operations of 53,600 for general aviation and air taxi.

Appendix E

AIRPORT LAYOUT PLAN

Appendix E
AIRPORT LAYOUT PLAN DRAWINGS

Per Federal Aviation Administration (FAA) requirements, an official Airport Layout Plan (ALP) has been developed for Sierra Vista Municipal Airport. The ALP is used in part by the FAA to determine funding eligibility for future development projects.

These drawings were created on a computer-aided drafting system (CAD) and serve as the official depiction of the current and planned condition of the airport. These drawings will be delivered to the FAA for their review and inspection. The FAA will critique the drawings from a technical perspective to be sure all applicable federal regulations are met.

The following is a description of the ALP drawings included with this Master Plan.

Airport Data Sheet (Sheet 1 of 15) – The Data Sheet provides existing and ultimate conditions for the airport as they relate to the runways, taxiways, navigational aids, and wind data tabulations.

Airport Layout Plan (Sheet 2 of 15) – An official ALP drawing has been developed for Sierra Vista Municipal Airport, a draft of which is included in this appendix. The ALP drawing graphically presents the existing and ultimate layout plan of the airport. The ALP drawing will include such elements as the physical airport features, location of airfield facilities (i.e., runways, taxiways, navigational aids), and existing general aviation development. Also presented on the ALP are the runway safety areas, airport property boundary, and revenue support areas. The ALP is used by the FAA to determine funding eligibility for future capital projects.

Terminal Area Drawing (Sheet 3 of 15) – The Terminal Area Drawing provides greater detail concerning landside improvements at a larger scale than on the ALP drawing.

Part 77 Airspace Drawings (Sheets 4 and 5 of 15) – The Part 77 Airspace Drawings are a graphic depiction of the Title 14 Code of Federal Regulations (CFR) Part 77, *Objects Affecting Navigable Airspace*, regulatory criterion. These drawings are intended to aid local authorities in determining if proposed development could present a hazard to the airport and obstruct the approach path to a runway end. These plans should be coordinated with local land use planners.

Approach Zone Profiles and Clear Zone Plans (Sheets 6, 7, and 8 of 15) – The Approach Zone Profiles and Clear Zone Plans contain plan and profile views of the approach and clear zone surfaces as recognized by the FAA and Department of Defense. Detailed obstruction and facility data is provided to identify planned improvements and the disposition of obstructions. Obstructions and clearances over roads are shown as appropriate.

Runway Departure Surface Drawings (Sheets 9, 10, 11, 12, and 13 of 15) – The Runway Departure Surface Drawings provide detailed analysis of the existing and ultimate departure surface for each corresponding runway end. A composite profile of the extended ground line is depicted. Obstructions are shown where appropriate. The departure surface is only applicable to a runway with instrument departure procedures in place.

Land Use Plan (Sheet 14 of 15) – The Land Use Plan is a geographic depiction of the land use recommendations. The objective of this drawing is to coordinate uses of the airport property in a manner compatible with the functional design of the airport facility. When development is proposed, it should be directed to the appropriate land use area depicted on this plan.

Airport Property Map (Sheet 15 of 15) – The "Exhibit A" Property Map provides information on the acquisition and identification of all land tracts under the control of the airport. Both existing and future property holdings are identified on the Property Map.

SIERRA VISTA MUNICIPAL AIRPORT
and LIBBY ARMY AIRFIELD
AIRPORT LAYOUT PLAN

SIERRA VISTA, ARIZONA

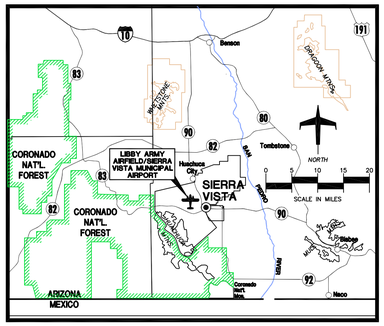
AIRPORT LAYOUT PLANS INDEX OF DRAWINGS

Coffman Associates
Airport Consultants

RUNWAY DATA

	RUNWAY 8-26				RUNWAY 12-30				RUNWAY 3-21			
	EXISTING		ULTIMATE		EXISTING		ULTIMATE		EXISTING		ULTIMATE	
	8	26	8	26	12	30	12	30	3	21	3	21
RUNWAY DESIGN CODE/MILITARY CLASS	E-V-4000		E-V-4000		C-III-VIS		C-III-NPI		B-II-VIS		SAME	
CRITICAL AIRCRAFT	F16/C-17		SAME		B-737-300/C-130		SAME		KING AIR 200		SAME	
CRITICAL AIRCRAFT WINGSPAN (FEET)	172		SAME		94.75		SAME		50.2		SAME	
CRITICAL AIRCRAFT UNDERCARRIAGE WIDTH (FEET)	33.7		SAME		14.3'		SAME		12.7		SAME	
CRITICAL AIRCRAFT APPROACH SPEED (KNOTS)	> 166		SAME		135		SAME		100		SAME	
CRITICAL AIRCRAFT MAXIMUM CETIFIED TAKEOFF WEIGHT (1,000 LBS.)	585		SAME		139.5		SAME		9.65		SAME	
APPROACH VISIBILITY MINIMUMS (LOWEST)	3/4 MILE	3/4 MILE	SAME	1/2 MILE	VISUAL	VISUAL	>=1 MILE	>=1 MILE	VISUAL	VISUAL	SAME	SAME
F.A.R. PART 77 CATEGORY	NON-PREC	PRECISION	SAME	SAME	NON-PREC	NON-PREC	SAME	SAME	UTILITY	UTILITY	SAME	SAME
PERCENTAGE OF WIND COVERAGE (ALL WEATHER IN MPH)	SEE THE ALL WEATHER AND IFR WINDROSE											
LINE OF SIGHT REQUIREMENT MET	YES		SAME		YES		SAME		YES		SAME	
MAXIMUM ELEVATION (ABOVE MSL) (NAVD 88)	4719.1'		SAME		4619.6'		SAME		4670.5'		SAME	
LOWEST ELEVATION (ABOVE MSL) (NAVD 88)	4599.0'		SAME		4611.6'		4600.0'		4585.2'		SAME	
RUNWAY DIMENSIONS	12,001' x 150'		SAME		5,366' x 100'		8,000' x 100'		4,285' x 75'		SAME	
RUNWAY BEARING (TRUE BEARING - DECIMAL DEGREES)	89.88	269.90	SAME	SAME	126.68	306.69	SAME	SAME	36.69	216.69	SAME	SAME
RUNWAY APPROACH SURFACES (F.A.R. PART 77)	34:1	50:1	SAME	SAME	34:1	34:1	SAME	SAME	20:1	20:1	SAME	SAME
RUNWAY END ELEVATION (NAVD 88)	4719.1'	4599.0'	SAME	SAME	4611.6'	4614.5'	4600.0'	SAME	4670.5'	4585.2'	SAME	SAME
RUNWAY THRESHOLD DISPLACEMENT	0'	0'	SAME	SAME	0'	0'	SAME	SAME	1253'	0'	SAME	SAME
RUNWAY THRESHOLD SITING REQUIREMENTS (APPENDIX 2, CATEGORY)	6	6	SAME	SAME	1	1	SAME	SAME	1	1	SAME	SAME
RUNWAY STOPWAY	0'	0'	SAME	SAME	0'	0'	SAME	SAME	0'	0'	SAME	SAME
RUNWAY SAFETY AREA WIDTH (RSA)	500'		SAME		500'		SAME		150'		SAME	
RUNWAY SAFETY AREA (RSA) BEYOND RUNWAY STOP END	1000'	1000'	SAME	SAME	1000'	1000'	SAME	SAME	300'	300'	SAME	SAME
RUNWAY OBSTACLE FREE ZONE WIDTH (OFZ)	400'		SAME		400'		SAME		250'		SAME	
RUNWAY OBSTACLE FREE ZONE (OFZ) BEYOND RUNWAY STOP END	200'	200'	SAME	SAME	200'	200'	SAME	SAME	200'	200'	SAME	SAME
RUNWAY OBJECT FREE AREA WIDTH (OFA)	800'		SAME		800'		SAME		500'		SAME	
RUNWAY OBJECT FREE AREA (OFA) BEYOND RUNWAY STOP END	1,000'	1,000'	SAME		1000'	1000'	SAME	SAME	300'	300'	SAME	SAME
RUNWAY PAVEMENT SURFACE MATERIAL	ASPHALT/CONCRETE		SAME		ASPHALT/CONCRETE		SAME		ASPHALT/CONCRETE		SAME	
RUNWAY PAVEMENT STRENGTH (IN THOUSAND LBS.)[1]	76(S)/200(D)/450(DT)/700(DDT)		SAME		46(S)/106(D)/137(DT)/172(DDT)		SAME		UNKNOWN		12.5(S)	
RUNWAY EFFECTIVE GRADIENT	1.0%		SAME		0.1%		SAME		2.0%		SAME	
RUNWAY MAXIMUM GRADIENT	0.58%		SAME		0.48%		SAME		0.48%		SAME	
RUNWAY TOUCHDOWN ZONE ELEVATION (ABOVE MSL)	4719.1	4629.0	SAME	SAME	4618.6	4619.6	SAME	SAME	4648.0	4647.4	SAME	SAME
RUNWAY MARKING	PRECISION	PRECISION	SAME	SAME	NON-PREC	NON-PREC	SAME	SAME	VISUAL	VISUAL	SAME	SAME
RUNWAY LIGHTING	HIRL		SAME		MIRL		SAME		MIRL		SAME	
RUNWAY APPROACH LIGHTING	NONE	NONE	SAME	MALSR	NONE	NONE	SAME	SAME	NONE	NONE	SAME	SAME
RUNWAY TO TAXIWAY SEPARATION (FROM CENTERLINE TO CENTERLINE)	1035'-1050'		SAME		1025'		SAME		1170'		SAME	
RUNWAY HOLD LINE POSITION (FROM RUNWAY CENTERLINE)	175'-318'		328'		175'-250'		250'		250'		SAME	
TAXIWAY TO TAXILANE SEPARATION (FROM CENTERLINE TO CENTERLINE)	267'		SAME		152'		SAME		105'		SAME	
TAXIWAY CENTERLINE TO FIXED OR MOVEABLE OBJECT	160'		SAME		93'		SAME		65.5'		SAME	
TAXIWAY LIGHTING	MITL/REFLECTORS		SAME		MITL/REFLECTORS		SAME		MITL/REFLECTORS		SAME	
TAXIWAY MARKING	CENTERLINE/EDGE		SAME		CENTERLINE/EDGE		SAME		CENTERLINE/EDGE		SAME	
TAXIWAY SURFACE MATERIAL	ASPHALT/CONCRETE		SAME		ASPHALT/CONCRETE		SAME		ASPHALT/CONCRETE		SAME	
TAXIWAY WINGTIP CLEARANCE	53'		SAME		34'		SAME		26'		SAME	
TAXIWAY WIDTH	75'		SAME		50'-75'		SAME		50'-75'		SAME	
TAXIWAY SAFETY AREA WIDTH	214'		SAME		118'		SAME		79'		SAME	
TAXIWAY OBJECT FREE AREA WIDTH	320'		SAME		186'		SAME		131'		SAME	
RUNWAY VISUAL NAVIGATIONAL AIDS	PAPI-4 REIL --	PAPI-4 REIL --	SAME SAME --	SAME DIFFERENTIAL UNIT MALSR	PAPI-4 REIL --	PAPI-4 REIL --	SAME SAME SAME	SAME SAME SAME	NONE NONE	NONE NONE	PAPI-2 REIL	PAPI-2 REIL
RUNWAY ELECTRONIC NAVIGATIONAL AIDS	GPS ASR/PAR TACAN --	GPS ASR/PAR ILS/LOC NDB	GPS SAME SAME SAME	GPS ILS SAME SAME MALSR			GPS	GPS				

[1] Pavement strengths are expressed in Single(S), Dual(D), Dual Tandem(DT) and Double Dual Tandem(DDT) wheel loading capacities.



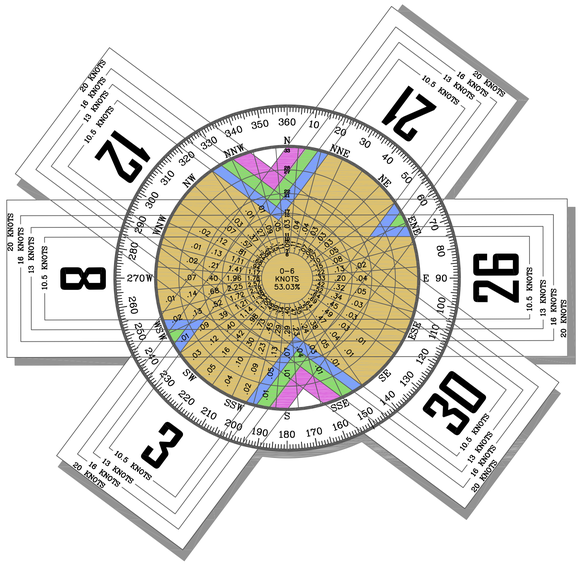
LOCATION MAP

RUNWAY END COORDINATES (NAD 83)

RUNWAY 8	Latitude	31° 35' 15.228"N	SAME
	Longitude	110° 22' 01.3797"W	SAME
RUNWAY 26	Latitude	31° 35' 15.4464"N	SAME
	Longitude	110° 19' 42.6768"W	SAME
RUNWAY 12	Latitude	31° 35' 34.3510"N	31°35'49.9200"N
	Longitude	110° 20' 35.7654"W	110°21'00.1944"W
RUNWAY 30	Latitude	31° 35' 02.6253"N	SAME
	Longitude	110° 19' 46.0296"W	SAME
RUNWAY 3	Latitude	31° 35' 10.1480"N	SAME
	Longitude	110° 20' 56.2906"W	SAME
RUNWAY 3 (Displaced threshold)	Latitude	31° 35' 20.0878"N	SAME
	Longitude	110° 20' 47.6401"W	SAME
RUNWAY 21	Latitude	31° 35' 44.1424"N	SAME
	Longitude	110° 20' 26.7031"W	SAME

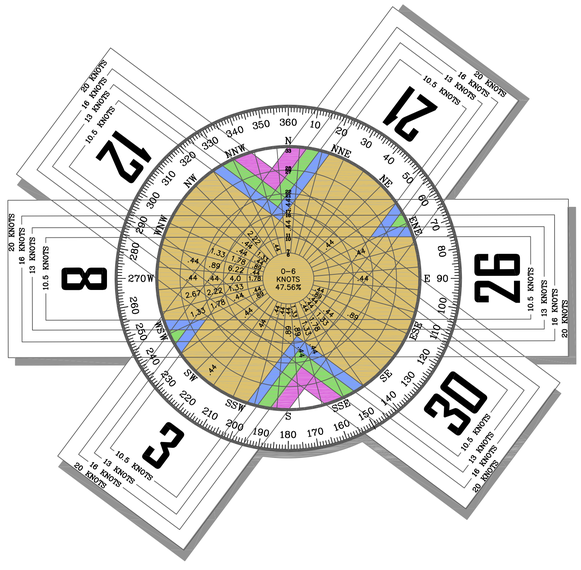
ALL WEATHER WIND COVERAGE

Runways	10.5 Knots	13 Knots	16 Knots	20 Knots
Runway 3-21	88.44%	93.99%	98.59%	99.75%
Runway 8-26	93.29%	96.36%	98.48%	99.47%
Runway 12-30	88.02%	92.68%	96.63%	98.74%
Combined	99.70%	99.94%	99.99%	100.00%



IFR WIND COVERAGE

Runways	10.5 Knots	13 Knots	16 Knots	20 Knots
Runway 3-21	69.49%	82.16%	93.64%	98.96%
Runway 8-26	90.83%	95.47%	98.09%	99.27%
Runway 12-30	85.37%	89.54%	94.34%	98.48%
Combined	98.75%	99.75%	100.00%	100.00%



SOURCE:
NOAA National Climatic Center
Asheville, North Carolina
Ft. Huachuca (FHU)
Ft. Huachuca, Arizona

OBSERVATIONS:
54,892 All Weather Observations
2001-2011

225 IFR Observations
2001-2011

NORTH

Magnetic Declination
10° 02' 12" East (June 2012)
Annual Rate of Change
00° 06.3' West (June 2012)

AIRPORT DATA

SIERRA VISTA MUNICIPAL AIRPORT, LIBBY army AIRFIELD (FHU)

CITY: SIERRA VISTA — COUNTY: COCHISE, ARIZONA
RANGE: R 20E — TOWNSHIP: T 21S — CIVIL TOWNSHIP: N/A

		EXISTING	ULTIMATE
AIRPORT SERVICE LEVEL		COMMERCIAL	SAME
AIRPORT REFERENCE CODE		E-V	SAME
DESIGN AIRCRAFT		MILITARY (E-V) F-16/C-17 CIVILIAN (D-IV) BOEING 767	SAME SAME
AIRPORT ELEVATION (NAVD 88)		4719.1' (MSL)	SAME
MEAN MAXIMUM TEMPERATURE OF HOTTEST MONTH		93°F (July)	SAME
AIRPORT REFERENCE POINT (ARP) COORDINATES (NAD 83)	Latitude	31°35'18.5000"N	31°35'21.02"N
	Longitude	110°20'39.8000'W	110°20'40.65"W
AIRPORT and TERMINAL NAVIGATIONAL AIDS		ILS (26)	SAME
		VOR	SAME
		NDB	SAME
		BEACON	SAME
		ASR/PAR	SAME
		GPS	SAME

NON STANDARD TABLE

NON-STANDARD CONDITION	EFFECTED DESIGN STANDARD	STANDARD	EXISTING	ACTION
WINDCONE A, B AND F IN RSA	RUNWAY SAFETY AREA (RSA)	OUTSIDE OF RSA	INSIDE RSA	RELOCATE WINDCONE OUTSIDE OF RSA
AWOS ACCESS ROAD INSIDE RSA	RUNWAY SAFETY AREA (RSA)	OUTSIDE OF RSA	INSIDE RSA	RELOCATE AWOS ROAD OUTSIDE OF RSA
HOLD POSITION MARKINGS ON TAXIWAYS A, B, D1 AND F	LOCATION DISTANCES FOR HOLD MARKINGS FOR APPROACH CATEGORY "E"	250' + 1' FOR EVERY 100' ABOVE SEA LEVEL	TWY A AND F 275' TWY B AND D1 175'	RELOCATE HOLD MARKINGS
HOLD POSITION SIGNS ON TAXIWAYS A, B, D1 AND F	LOCATION DISTANCES FOR HOLD SIGNS FOR APPROACH CATEGORY "E"	250' + 1' FOR EVERY 100' ABOVE SEA LEVEL	TWY A AND F 275' TWY B AND D1 175'	RELOCATE HOLD POSITION SIGNS
HOLD POSITION MARKINGS ON TAXIWAY S	LOCATION DISTANCES FOR HOLD MARKINGS FOR APPROACH CATEGORY "C"	250'	TWY S 175'	RELOCATE HOLD MARKINGS

No.	REVISIONS	DATE	BY	APP'D.
2	-	-	-	
1	FAA APPROVED ALP	7-28-11	JMH	8-19-11

"THE PREPARATION OF THESE DOCUMENTS WAS FINANCED IN PART THROUGH A PLANNING GRANT FROM THE FEDERAL AVIATION ADMINISTRATION AS PROVIDED UNDER SECTION 505 OF THE AIRPORT AND AIRWAY IMPROVEMENT ACT OF 1982, AS AMENDED. THE CONTENTS DO NOT NECESSARILY REFLECT THE OFFICIAL VIEWS OR POLICY OF THE FAA. ACCEPTANCE OF THESE DOCUMENTS BY THE FAA DOES NOT IN ANY WAY CONSTITUTE A COMMITMENT ON THE PART OF THE UNITED STATES TO PARTICIPATE IN ANY DEVELOPMENT DEPICTED HEREIN NOR DOES IT INDICATE THAT THE PROPOSED DEVELOPMENT IS ENVIRONMENTALLY ACCEPTABLE IN ACCORDANCE WITH APPROPRIATE PUBLIC LAWS."

SIERRA VISTA MUNICIPAL AIRPORT
LIBBY ARMY AIRFIELD

AIRPORT DATA SHEET

SIERRA VISTA, ARIZONA

PLANNED BY: Matt Quick
DETAILED BY: Maggie Beaver
APPROVED BY: James M. Harris P.E.

January 31, 2014 — SHEET 1 OF 15

Coffman Associates
Airport Consultants
www.coffmanassociates.com

LEGEND

EXISTING	ULTIMATE	DESCRIPTION
		AIRPORT PROPERTY LINE
		AWOS LEASE BOUNDARY
		BUILDING RESTRICTION LINE
32133 / 514	32133 / 514	SECTION CORNERS
		AIRPORT REFERENCE POINT (ARP)
		AIRPORT ROTATING BEACON
		AVIGATION EASEMENT (IF APPLICABLE)
		BUILDING ON AIRPORT
N/A		ABANDON/REMOVE
		BLOCK FENCE
		WIRE FENCE
		AIRPORT PAVEMENT
		HOLD MARKING
OFZ	OFZ	OBSTACLE FREE ZONE
RSA	RSA	RUNWAY SAFETY AREA
OFA	OFA	OBJECT FREE AREA
		PRECISION OBSTACLE FREE ZONE
		WINDSOCK
		RUNWAY PROTECTION ZONE
PAPI-4	PAPI-4	PAPI
		RUNWAY THRESHOLD LIGHTS & REIL
		TIEDOWNS
5600	5600	TOPOGRAPHY
		JOINT USE RWY/TWY AREA
H	H	HELIPAD
		AUTOMATED WEATHER OBSERVATION STATION (AWOS)
		MALS
		PRIMARY AIRPORT CONTROL STATION (PACS)
		SECONDARY AIRPORT CONTROL STATION (SACS)

ULTIMATE BUILDINGS/FACILITIES

ULTIMATE	DESCRIPTION
30	BOX HANGARS
31	CONVENTIONAL HANGARS
32	HELICOPTER EMS TRANSPORT OPERATOR
33	TERMINAL ADDITION
34	T-HANGARS/LINEAR BOX HANGARS

OBSTACLE FREE ZONE (OFZ) PENETRATIONS

NO.	OBJECT	ACTION
1	EXISTING OFZ RWY 3-21 AND 12-30 PENETRATED BY AWOS ACCESS RD.	RELOCATE AWOS ACCESS RD. OUTSIDE OF EXISTING RWY OF

EXISTING BUILDINGS/FACILITIES

EXISTING	DESCRIPTION	EL.
1	ADMINISTRATION/TERMINAL BUILDING	4606.0'
2	FIXED BASE OPERATION HANGAR	4590.9'
3	LINEAR BOX HANGAR	4602.9'
4	LINEAR BOX HANGAR	4604.2'
5	LINEAR BOX HANGAR	4599.9'
6	LINEAR BOX HANGAR	4596.5'
7	LINEAR BOX HANGAR	4595.8'
8	LINEAR BOX HANGAR	4597.4'
9	FUEL FACILITY (ABOVE GROUND)	4595.4'
10	WATER WELL/STORAGE TANK AND PUMP UNIT	4688.9'
11	CIVIL AIR PATROL	4576.8'
12	HELIPORT AREA	AT GRADE
13	WASH RACK/DEICING AREA	AT GRADE
14	AWOS Data Collection Package (DCP) #1	4630.0'
15	AWOS Data Collection Package (DCP) #2	4730.0'
16	AWOS Data Collection Package (DCP) #3	4650.0'
17	SELF FUELING STATION	4498.0'

GENERAL NOTES:

1. Libby Army Airfield located on Fort Huachuca is a Joint–Use facility
2. Details concerning development and scheduling of airport improvements are illustrated on the TERMINAL AREA PLAN, sheet 3 of 15, of these plans.
3. Base Map and Contours derived from March 29, 2008 aerial photography and planimetric mapping surveyed by Z&H Engineering/Aerial Mapping Inc..
4. All existing taxiways are paved.
5. Civilian aircraft parking aprons and ramp space are limited to the areas within Sierra Vista Municipal Airport Property Line boundary, while military aircraft parking areas and ramp space are confined to the area south of the Libby Army Airfield Property Line (Joint Use Area).
6. All elevations are in NAVD 88 and all horizontal coordinates are in NAD 83.
7. All survey monuments enclosed in concrete casings.
8. Taxiway CL to fixed or moveable object 129.5'.
9. The Ultimate Runway 12–30, Taxiway "K" and Taxiway "J" Extensions wil not be eligible for Airport Improvement Program (AIP) funding until it is included in the expanded Joint–Use Area.
10. There are no Non–aeronautical uses on civilian airport land.
11. An Environmental Assessment (EA) will be conducted prior to expanding the Joint Use Easement Area for the construction of Ultimate Runway 12–30, Taxiway "K" and Taxiway "J".
12. The City of Sierra Vista will provide the appropriate level of environmental documentation to the FAA for the existing 500–foot AWOS radius area and the existing and future AWOS access road.
13. The entire length of Taxiway "P", including Taxiways "A" and "F" are included in the Joint Use Area. The Taxiway Object Free Areas for each of these taxiways is also included in the Joint Use Area.
14. The City of Sierra Vista has entered into a site license agreement (DACA09–3–13–0100) with the U.S. Army for the installation of the AWOS and future AWOS access road.

FAA APPROVAL STAMP

Approved conditionally April 8, 2014

Subject to comments contained in our letter dated: 4-8-2014

FEDERAL AVIATION ADMINISTRATION

Western-Pacific Region

By [signature]

Manager / Assistant Manager – Phoenix/ADO

SUBMITTED BY:

Coffman Associates

FOR APPROVAL BY:

APPROVED BY: [signature] ON THE DATE OF: 3-7-14

Scott Dooley, P.E.
Director of Public Works/Airport Director

No.	REVISIONS	DATE	BY	APP'D.
2	–	–	–	–
1	FAA APPROVED ALP	7–28–11	JMH	8–19–11

"THE PREPARATION OF THESE DOCUMENTS WAS FINANCED IN PART THROUGH A PLANNING GRANT FROM THE FEDERAL AVIATION ADMINISTRATION AS PROVIDED UNDER SECTION 505 OF THE AIRPORT AND AIRWAY IMPROVEMENT ACT OF 1982, AS AMENDED. THE CONTENTS DO NOT NECESSARILY REFLECT THE OFFICIAL VIEWS OR POLICY OF THE FAA. ACCEPTANCE OF THESE DOCUMENTS BY THE FAA DOES NOT IN ANY WAY CONSTITUTE A COMMITMENT ON THE PART OF THE UNITED STATES TO PARTICIPATE IN ANY DEVELOPMENT DEPICTED HEREIN NOR DOES IT INDICATE THAT THE PROPOSED DEVELOPMENT IS ENVIRONMENTALLY ACCEPTABLE IN ACCORDANCE WITH APPROPRIATE PUBLIC LAWS."

SIERRA VISTA MUNICIPAL AIRPORT
LIBBY ARMY AIRFIELD

AIRPORT LAYOUT PLAN

SIERRA VISTA, ARIZONA

PLANNED BY: Matt Quick
DETAILED BY: Maggie Beaver
APPROVED BY: James M. Harris P.E.

January 31, 2014 SHEET 2 OF 15

Coffman Associates Airport Consultants www.coffmanassociates.com

LEGEND

EXISTING	ULTIMATE	DESCRIPTION
		AIRPORT PROPERTY LINE
		AWOS LEASE BOUNDARY
		BUILDING RESTRICTION LINE
32133 151°	32133 151°	SECTION CORNERS
		AIRPORT REFERENCE POINT (ARP)
		AIRPORT ROTATING BEACON
		AVIGATION EASEMENT (IF APPLICABLE)
		BUILDING ON AIRPORT
N/A		ABANDON/REMOVE
		BLOCK FENCE
		WIRE FENCE
		AIRPORT PAVEMENT
		HOLD MARKING
OFZ	OFZ	OBSTACLE FREE ZONE
RSA	RSA	RUNWAY SAFETY AREA
OFA	OFA	OBJECT FREE AREA
		PRECISION OBSTACLE FREE ZONE
		WINDSOCK
		RUNWAY PROTECTION ZONE
PAPI-4	PAPI-4	PAPI
		RUNWAY THRESHOLD LIGHTS & REIL
		TIEDOWNS
6650	6650	TOPOGRAPHY
		JOINT USE RWY/TWY AREA
H	H	HELIPAD
AWOS	AWOS	AUTOMATED WEATHER OBSERVATION STATION (AWOS)
		MALS
		PRIMARY AIRPORT CONTROL STATION (PACS)
		SECONDARY AIRPORT CONTROL STATION (SACS)

EXISTING BUILDINGS/FACILITIES

EXISTING	DESCRIPTION	EL.
1	ADMINISTRATION/TERMINAL BUILDING	4606.0'
2	FIXED BASE OPERATION HANGAR	4590.9'
3	LINEAR BOX HANGAR	4602.9'
4	LINEAR BOX HANGAR	4604.2'
5	LINEAR BOX HANGAR	4599.9'
6	LINEAR BOX HANGAR	4596.5'
7	LINEAR BOX HANGAR	4595.8'
8	LINEAR BOX HANGAR	4597.4'
9	FUEL FACILITY (ABOVE GROUND)	4595.4'
10	WATER WELL/STORAGE TANK AND PUMP UNIT	4688.9'
11	CIVIL AIR PATROL	4576.8'
12	HELIPORT AREA	AT GRADE
13	WASH RACK/DEICING AREA	AT GRADE
14	AWOS Data Collection Package (DCP) #1	4630.0'
15	AWOS Data Collection Package (DCP) #2	4730.0'
16	AWOS Data Collection Package (DCP) #3	4650.0'
17	SELF FUELING STATION	4498.0'

ULTIMATE BUILDINGS/FACILITIES

ULTIMATE	DESCRIPTION
30	BOX HANGARS
31	CONVENTIONAL HANGARS
32	HELICOPTER EMS TRANSPORT OPERATOR
33	TERMINAL ADDITION
34	T-HANGARS/LINEAR BOX HANGARS

EXISTING 8' HIGH CHAIN LINK PERIMETER SECURITY FENCE

FORT HUACHUCA MILITARY RESERVATION

17 16 20 21

NORTH MAG NORTH

MAGNETIC VARIANCE-10° 33'E (2008)
RATE OF CHANGE 0.3' WEST

0 300 600

ULTIMATE 8,000' X 100' RUNWAY

NO THRESHOLD SITING SURFACE PENETRATIONS

FUTURE AMOS ACCESS RD

EXISTING AMOS ROAD TO BE CLOSED

NEW GPN-30/ ASR-11 (DASR)

EL.4614.6'

Ult. REILs (Typ.)

Exist. REIL (Typ.)

Exist. PAPI-4

1025' to TWY C

495' to BRL

75' (TYP.)

TWY 'D'

TWY 'K'

TWY 'L'

TWY 'J'

RVZ

Windcone 'C'

Windcone 'E'

AUTO PARKING

EXISTING PARKING

EXISTING AUTO PARKING

AIRPORT AVE.

129.5'

50'

100'

VOR ground checkpoint

UPOEZ

NO THRESHOLD SITING SURFACE PENETRATIONS

Ult. MALSR

E-5 Barrier

Reflector

Ult. PAPI (TYP.)

Ult. ARP 31°35'21.02"N 110°20'40.63"W

EXIST. ARP 31°35'18.500"N 110°20'39.800"W

EXIST. 4285'X75' RUNWAY S35°47'44"W (True)

EXISTING 5366' X 100' RUNWAY

ASR-11 REFLECTORS

EL.4658.8'

1033'

EXISTING 12,001' X 150' RUNWAY

N 90°00'00"E (TRUE BEARING)

N 126°40'48" E (TRUE)

1289'

NO OBJECT FREE ZONE PENATRATIONS

EL.4619.2'

Exist. PAPI-4

ILS Glide Slope Antenna

KSU

AN/FPN-67

Nondirectional Radio Beacon

Tacan

No.	REVISIONS	DATE	BY	APP'D

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SIERRA VISTA MUNICIPAL AIRPORT
LIBBY ARMY AIRFIELD

TERMINAL AREA PLAN

SIERRA VISTA, ARIZONA

PLANNED BY: Matt Quick
DETAILED BY: Maggie Beaver
APPROVED BY: James M. Harris P.E.

January 31, 2014 | SHEET 3 OF 15

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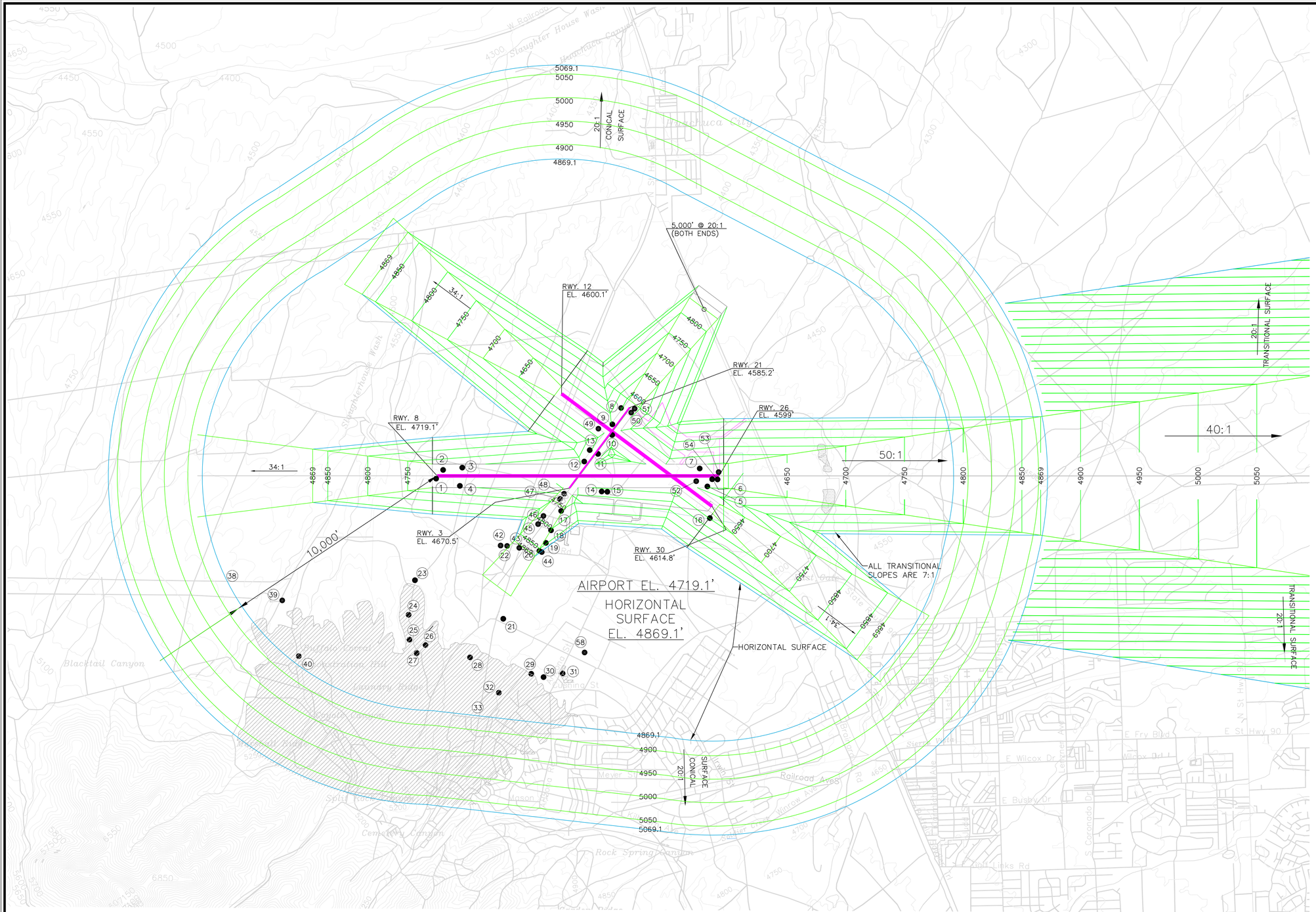

OBSTRUCTION TABLE

Description	Elevation (MSL)	Obstruction	Recommendation
1. REFLECTOR	4730'	UP TO 11' TO THE PRIMARY SURFACE.	REQUEST FAA AERONAUTICAL STUDY
2. REFLECTOR	4723'	UP TO 19' TO THE PRIMARY SURFACE.	
~~3. BUSH *~~	~~4722'~~	~~UP TO 1' TO THE PRIMARY SURFACE.~~	
4. ANTENNA	4727'	UP TO 17' TO THE PRIMARY SURFACE.	
5. ANEMOMETER	4618'	UP TO 3' TO THE PRIMARY SURFACE.	
6. WINDSOCK	4627'	UP TO 15' TO THE PRIMARY SURFACE.	
7. REFLECTOR	4610'	UP TO 6' TO THE PRIMARY SURFACE.	
~~8. TREE *~~	~~4595'~~	~~UP TO 12' TO THE PRIMARY SURFACE.~~	
9. WINDSOCK	4624'	UP TO 24' TO THE PRIMARY SURFACE.	
10. SIGN	4615'	UP TO 15' TO THE PRIMARY SURFACE.	
11. SIGN	4635'	UP TO 1' TO THE PRIMARY SURFACE.	
12. WINDSOCK	4664'	UP TO 20' TO THE PRIMARY SURFACE.	
~~13. BUSH*~~	~~4638'~~	~~UP TO 9' TO THE PRIMARY SURFACE.~~	
14. NDB POLE(OL)	4697'	UP TO 35' TO THE PRIMARY SURFACE.	
15. NDB POLE(OL)	4696'	UP TO 40' TO THE PRIMARY SURFACE.	
16. REFLECTOR	4618'	UP TO 6' TO THE APPROACH SURFACE	
~~17. TREE *~~	~~4705'~~	~~UP TO 18' TO THE APPROACH SURFACE~~	
~~18. TREE*~~	~~4732'~~	~~UP TO 23' TO THE APPROACH SURFACE~~	
~~19. TREE*~~	~~4748'~~	~~UP TO 25' TO THE APPROACH SURFACE~~	
20. POLE	4770'	UP TO 36' TO THE APPROACH SURFACE	
21. POLE	4861'	UP TO 22' TO THE TRANSITION SURFACE	
22. POLE	4780'	UP TO 30' TO THE APPROACH SURFACE	
23. ANTENNA	4903'	UP TO 37' TO THE INNER HORIZONTAL SURFACE	
24. ANTENNA	4968'	UP TO 102' TO THE INNER HORIZONTAL SURFACE	
25. POLE	4997'	UP TO 131' TO THE INNER HORIZONTAL SURFACE	
26. POLE	5003'	UP TO 137' TO THE INNER HORIZONTAL SURFACE	
27. ANTENNA	5018'	UP TO 147' TO THE CONICAL SURFACE	
28. POLE	4958'	UP TO 89' TO THE CONICAL SURFACE	
29. POLE	4939'	UP TO 49' TO THE CONICAL SURFACE	
30. ROD	4934'	UP TO 39' TO THE CONICAL SURFACE	
31. ROD (OL)	4911'	UP TO 27' TO THE CONICAL SURFACE	
32. POLE	4963'	UP TO 26' TO THE CONICAL SURFACE	
33. POLE	4986'	UP TO 12' TO THE CONICAL SURFACE	
~~34. TREE*~~	~~5165'~~	~~UP TO 72' TO THE CONICAL SURFACE~~	
~~35. TREE*~~	~~5426'~~	~~UP TO 232' TO THE CONICAL SURFACE~~	
~~36. TREE*~~	~~5320'~~	~~UP TO 148' TO THE CONICAL SURFACE~~	
37. POLE	4942'	UP TO 20' TO THE CONICAL SURFACE	
38. POLE	4919'	UP TO 76' TO THE CONICAL SURFACE	
39. POLE	4951'	UP TO 37' TO THE CONICAL SURFACE	
40. POLE	4996'	UP TO 21' TO THE CONICAL SURFACE	
~~41. TREE*~~	~~5313'~~	~~UP TO 136' TO THE CONICAL SURFACE~~	
42. POLE	4797'	UP TO 29' TO THE TRANSITION SURFACE	
43. POLE	4789'	UP TO 45' TO THE APPROACH SURFACE	
44. POLE	4782'	UP TO 46' TO THE TRANSITION SURFACE	
~~45. TREE*~~	~~4731'~~	~~UP TO 19' TO THE APPROACH SURFACE~~	
~~46. TREE*~~	~~4722'~~	~~UP TO 20' TO THE APPROACH SURFACE~~	
47. GROUND	4683'	UP TO 7' TO THE APPROACH SURFACE	
48. GROUND	4672'	UP TO 2' TO THE APPROACH SURFACE	
49. BUSH	4621'	UP TO 5' TO THE APPROACH SURFACE	
50. BUSH	4593'	UP TO 13' TO THE PRIMARY SURFACE	
~~51. TREE*~~	~~4592'~~	~~UP TO 12' TO THE PRIMARY SURFACE~~	
52. REFLECTOR	4616'	UP TO 10' TO THE PRIMARY SURFACE	
53. REFLECTOR	4598'	UP TO 2' TO THE PRIMARY SURFACE	
54. REFLECTOR	4600'	UP TO 4' TO THE PRIMARY SURFACE	

REQUEST FAA AERONAUTICAL STUDY

* Obstructions have been removed based on Libby Airfield personel, however they are still present on the mapping done March 29, 2008.

OBSTRUCTION LEGEND

- ① OBSTRUCTION
- ① GROUP or MULTIPLE OBSTRUCTIONS

GENERAL NOTES:

1. Obstructions, clearances, and locations are calculated from ultimate runway end elevations and ultimate approach surfaces, unless otherwise noted.
2. Depiction of features and objects within the outer portion of the approach surfaces, is illustrated on the APPROACH ZONES PLAN Sheet 6 of these plans.
3. Depiction of features and objects within the inner portion of the approach surfaces, is illustrated on the INNER APPROACH SURFACE PLAN AND PROFILES, Sheets 7 and 8 of these plans.

0 2000 4000 6000
SCALE IN FEET

NORTH MAG. NORTH

No.	REVISIONS	DATE	BY	APP'D.

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SIERRA VISTA MUNICIPAL AIRPORT
LIBBY army AIRFIELD
F.A.R. PART 77
AIRSPACE PLAN
SIERRA VISTA, ARIZONA

PLANNED BY:
DETAILED BY: Maggie Beaver
APPROVED BY: James M. Harris P.E.
January 31, 2014 SHEET 4 OF 15

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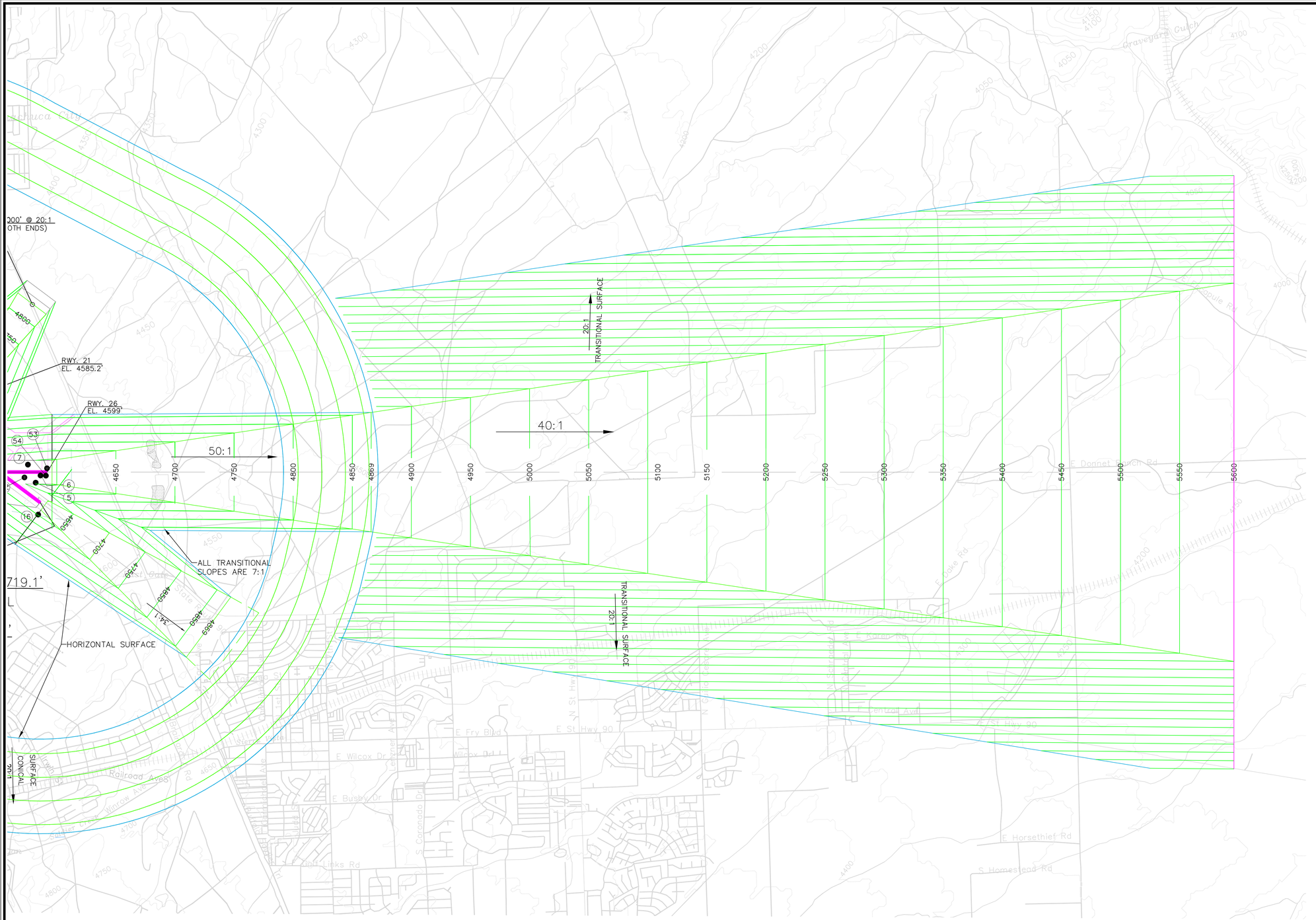

OBSTRUCTION TABLE

Description	Elevation (MSL)	Obstruction	Recommendation
1. REFLECTOR	4730'	UP TO 11' TO THE PRIMARY SURFACE.	REQUEST FAA AERONAUTICAL STUDY
2. REFLECTOR	4723'	UP TO 19' TO THE PRIMARY SURFACE.	
~~3. BUSH *~~	~~4722'~~	~~UP TO 1' TO THE PRIMARY SURFACE.~~	
4. ANTENNA	4727'	UP TO 17' TO THE PRIMARY SURFACE.	
5. ANEMOMETER	4618'	UP TO 3' TO THE PRIMARY SURFACE.	
6. WINDSOCK	4627'	UP TO 15' TO THE PRIMARY SURFACE.	
7. REFLECTOR	4610'	UP TO 6' TO THE PRIMARY SURFACE.	
~~8. TREE *~~	~~4595'~~	~~UP TO 12' TO THE PRIMARY SURFACE.~~	
9. WINDSOCK	4624'	UP TO 24' TO THE PRIMARY SURFACE.	
10. SIGN	4615'	UP TO 15' TO THE PRIMARY SURFACE.	
11. SIGN	4635'	UP TO 1' TO THE PRIMARY SURFACE.	
12. WINDSOCK	4664'	UP TO 20' TO THE PRIMARY SURFACE.	
~~13. BUSH*~~	~~4638'~~	~~UP TO 9' TO THE PRIMARY SURFACE.~~	
14. NDB POLE(OL)	4697'	UP TO 35' TO THE PRIMARY SURFACE.	
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16. REFLECTOR	4618'	UP TO 6' TO THE APPROACH SURFACE	
~~17. TREE *~~	~~4705'~~	~~UP TO 19' TO THE APPROACH SURFACE~~	
~~18. TREE*~~	~~4732'~~	~~UP TO 23' TO THE APPROACH SURFACE~~	
~~19. TREE*~~	~~4748'~~	~~UP TO 25' TO THE APPROACH SURFACE~~	
20. POLE	4770'	UP TO 36' TO THE APPROACH SURFACE	
21. POLE	4861'	UP TO 22' TO THE TRANSITION SURFACE	
22. POLE	4780'	UP TO 30' TO THE APPROACH SURFACE	
23. ANTENNA	4903'	UP TO 37' TO THE INNER HORIZONTAL SURFACE	
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28. POLE	4958'	UP TO 89' TO THE CONICAL SURFACE	
29. POLE	4939'	UP TO 49' TO THE CONICAL SURFACE	
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~~35. TREE*~~	~~5420'~~	~~UP TO 237' TO THE CONICAL SURFACE~~	
~~36. TREE*~~	~~5320'~~	~~UP TO 148' TO THE CONICAL SURFACE~~	
37. POLE	4942'	UP TO 20' TO THE CONICAL SURFACE	
38. POLE	4919'	UP TO 76' TO THE CONICAL SURFACE	
39. POLE	4951'	UP TO 37' TO THE CONICAL SURFACE	
40. POLE	4996'	UP TO 21' TO THE CONICAL SURFACE	
~~41. TREE*~~	~~5313'~~	~~UP TO 130' TO THE CONICAL SURFACE~~	
42. POLE	4797'	UP TO 29' TO THE TRANSITION SURFACE	
43. POLE	4789'	UP TO 45' TO THE APPROACH SURFACE	
44. POLE	4782'	UP TO 46' TO THE TRANSITION SURFACE	
~~45. TREE*~~	~~4731'~~	~~UP TO 19' TO THE APPROACH SURFACE~~	
~~46. TREE*~~	~~4722'~~	~~UP TO 20' TO THE APPROACH SURFACE~~	
47. GROUND	4683'	UP TO 7' TO THE APPROACH SURFACE	
48. GROUND	4672'	UP TO 2' TO THE APPROACH SURFACE	
49. BUSH	4621'	UP TO 5' TO THE APPROACH SURFACE	
50. BUSH	4593'	UP TO 13' TO THE PRIMARY SURFACE	
~~51. TREE*~~	~~4592'~~	~~UP TO 12' TO THE PRIMARY SURFACE~~	
52. REFLECTOR	4616'	UP TO 10' TO THE PRIMARY SURFACE	REQUEST FAA AERONAUTICAL STUDY
53. REFLECTOR	4598'	UP TO 2' TO THE PRIMARY SURFACE	
54. REFLECTOR	4600'	UP TO 4' TO THE PRIMARY SURFACE	

* Obstructions have been removed based on Libby Airfield personel, however they are still present on the mapping done March 29, 2008.

OBSTRUCTION LEGEND

- ① OBSTRUCTION
- [①] GROUP or MULTIPLE OBSTRUCTIONS

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0 2000 4000 6000
SCALE IN FEET

GRID NORTH
MAG NORTH

No.	REVISIONS	DATE	BY	APP'D.

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SIERRA VISTA MUNICIPAL AIRPORT
LIBBY army AIRFIELD

F.A.R. PART 77 AIRSPACE
RUNWAY 26 FAN

SIERRA VISTA, ARIZONA

PLANNED BY: Matt Quick
DETAILED BY: Maggie Beaver
APPROVED BY: James M. Harris P.E.
January 31, 2014 SHEET 5 OF 15

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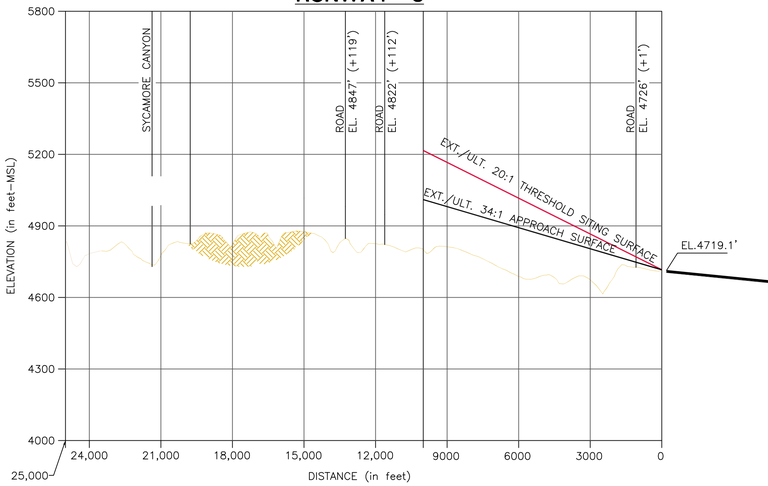
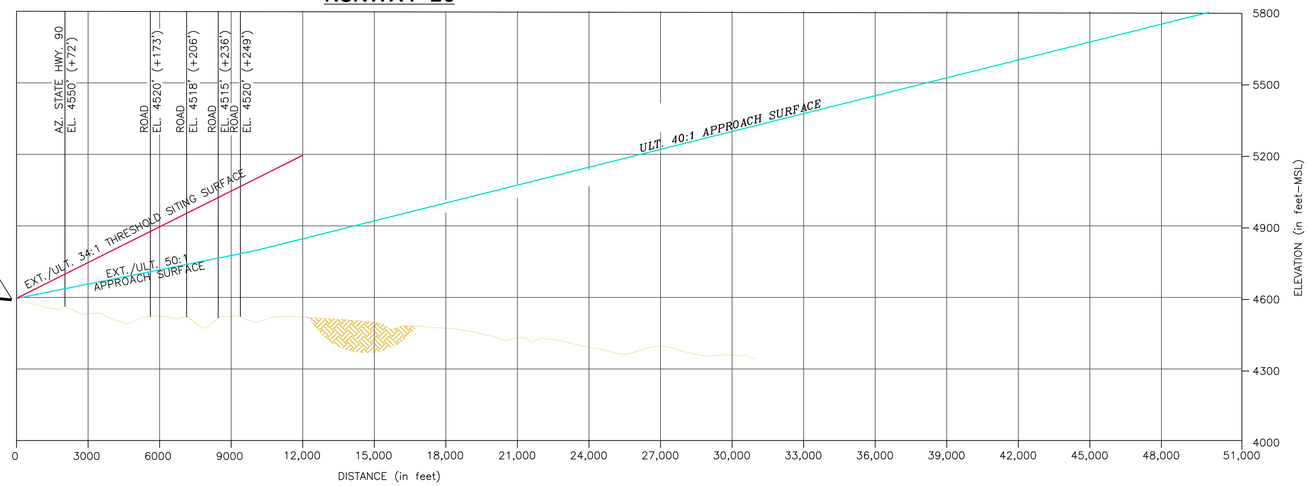
RUNWAY 8

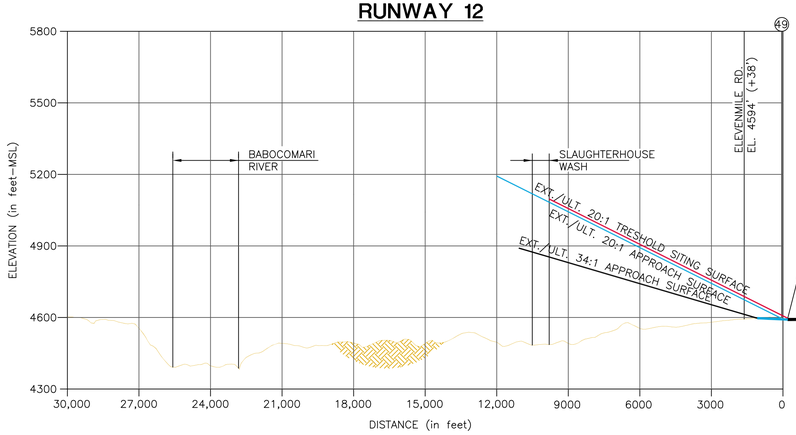


RUNWAY 26

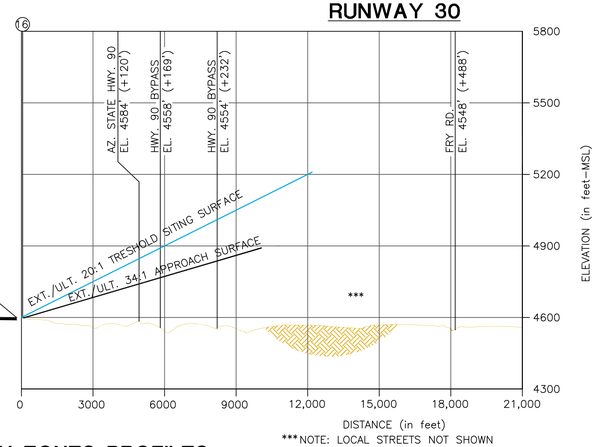


RUNWAY 8-26 APPROACH ZONES PROFILES

RUNWAY 12



RUNWAY 30



***NOTE: LOCAL STREETS NOT SHOWN

RUNWAY 12-30 APPROACH ZONES PROFILES

OBSTRUCTION TABLE

APPROACH ZONE RUNWAY 12

Description	Elevation (MSL)	Obstruction	Recommendation
49. BUSH	4621'	UP TO 5' TO THE APPROACH SURFACE	REQUEST FAA AERONAUTICAL STUDY

APPROACH ZONE RUNWAY 3

Description	Elevation (MSL)	Obstruction	Recommendation
~~17. TREE*~~	~~4705'~~	~~UP TO 19'~~ TO THE APPROACH SURFACE	REQUEST FAA AERONAUTICAL STUDY
~~18. TREE*~~	~~4732'~~	~~UP TO 23'~~ TO THE APPROACH SURFACE	
~~19. TREE*~~	~~4748'~~	~~UP TO 25'~~ TO THE APPROACH SURFACE	
20. POLE	4770'	UP TO 36' TO THE APPROACH SURFACE	
22. POLE	4780'	UP TO 30' TO THE APPROACH SURFACE	
~~45. TREE*~~	~~4731'~~	~~UP TO 19'~~ TO THE APPROACH SURFACE	
~~46. TREE*~~	~~4722'~~	~~UP TO 20'~~ TO THE APPROACH SURFACE	
47. GROUND	4683'	UP TO 7' TO THE APPROACH SURFACE	
48. GROUND	4672'	UP TO 2' TO THE APPROACH SURFACE	

APPROACH ZONE RUNWAY 30

Description	Elevation (MSL)	Obstruction	Recommendation
16. REFLECTOR	4618'	UP TO 6' TO THE APPROACH SURFACE	REQUEST FAA AERONAUTICAL STUDY

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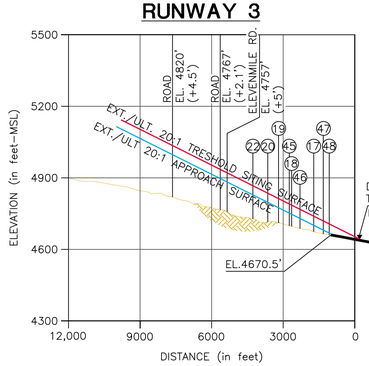
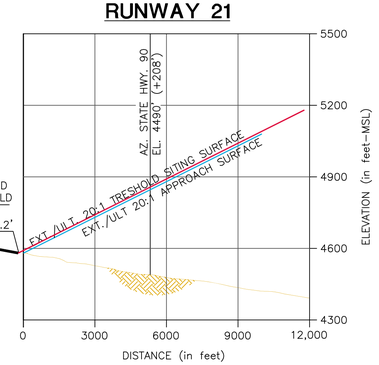
GENERAL NOTES:

1. Obstructions, clearances, and locations are calculated from ultimate runway end elevations and ultimate approach surfaces, unless otherwise noted.
2. Depiction of features and objects within the primary, transitional, and horizontal surfaces, is illustrated on the AIRSPACE PLAN, sheets 4 and 5 of these plans.
3. Depiction of features and objects within the inner portion of the approach surfaces, is illustrated on the INNER APPROACH SURFACE PLAN AND PROFILE 7 and 8 of these plans.

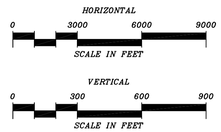
RUNWAY 3



RUNWAY 21



RUNWAY 3-21 APPROACH ZONES PROFILES



No.	REVISIONS	DATE	BY	APP'D.
1	FAA APPROVED ALP	7-28-11	JMH	8-19-11

"THE PREPARATION OF THESE DOCUMENTS WAS FINANCED IN PART THROUGH A PLANNING GRANT FROM THE FEDERAL AVIATION ADMINISTRATION AS PROVIDED UNDER SECTION 505 OF THE AIRPORT AND AIRWAY IMPROVEMENT ACT OF 1982, AS AMENDED. THE CONTENTS DO NOT NECESSARILY REFLECT THE OFFICIAL VIEWS OR POLICY OF THE FAA. ACCEPTANCE OF THESE DOCUMENTS BY THE FAA DOES NOT IN ANY WAY CONSTITUTE A COMMITMENT ON THE PART OF THE UNITED STATES TO PARTICIPATE IN ANY DEVELOPMENT DEPICTED HEREIN NOR DOES IT INDICATE THAT THE PROPOSED DEVELOPMENT IS ENVIRONMENTALLY ACCEPTABLE IN ACCORDANCE WITH APPROPRIATE PUBLIC LAWS."

SIERRA VISTA MUNICIPAL AIRPORT
LIBBY army AIRFIELD

APPROACH ZONE PROFILES

SIERRA VISTA, ARIZONA

PLANNED BY: Matt Quick
DETAILED BY: Maggie Beaver
APPROVED BY: James M. Harris P.E.
January 31, 2014 SHEET 6 OF 15

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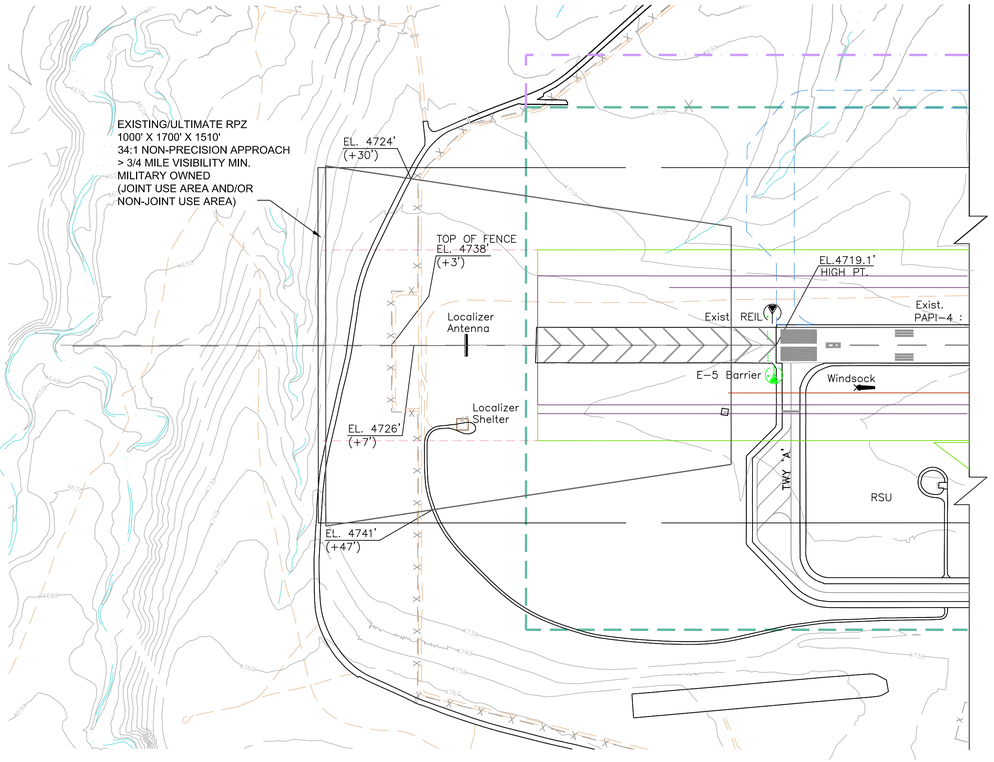
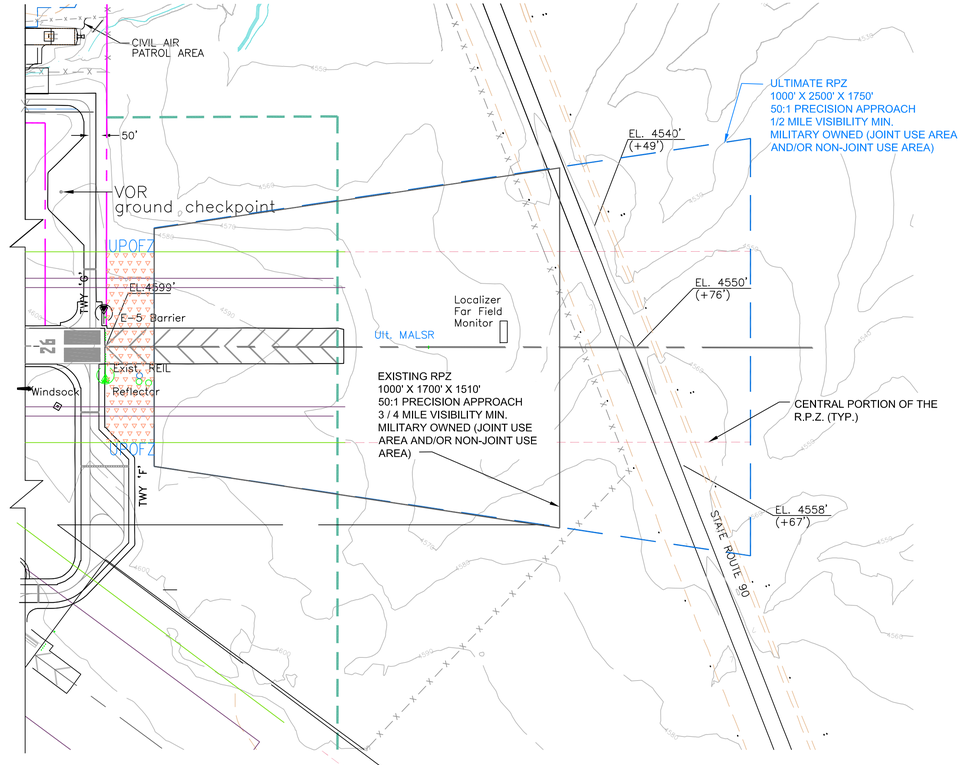
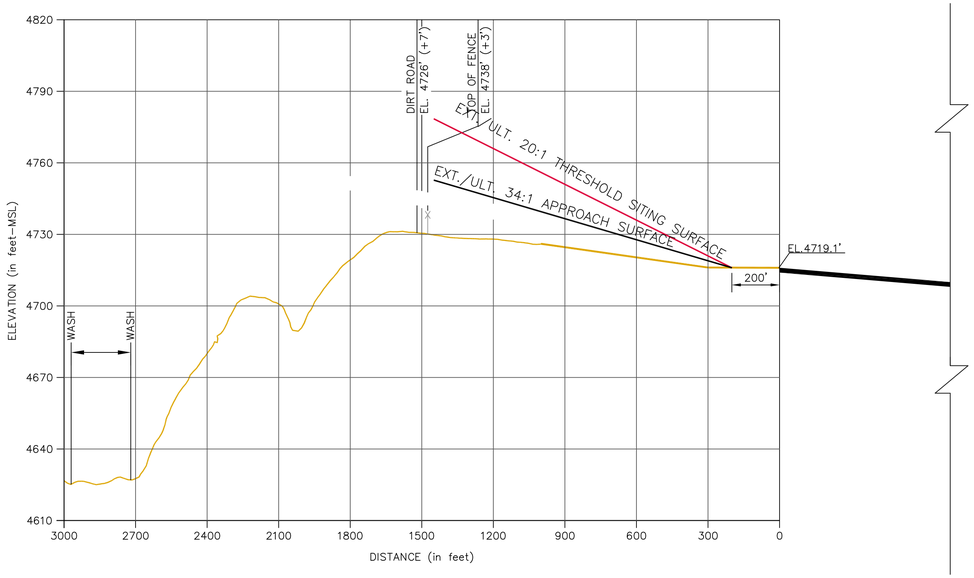
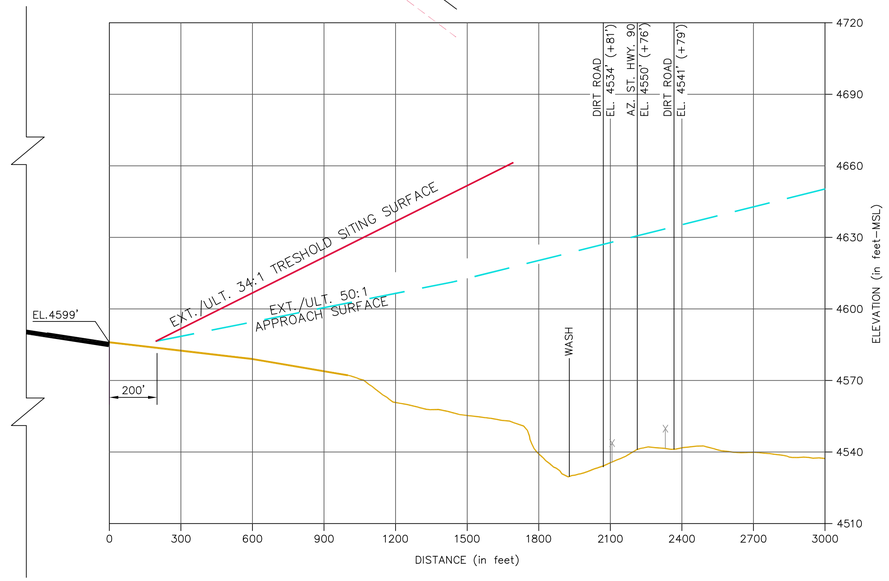




RUNWAY 8-26 APPROACH ZONES PLANS AND PROFILES





GENERAL NOTES:

1. Obstructions, clearances, and locations are calculated from ultimate runway end elevations and ultimate approach surfaces, unless otherwise noted.
2. Depiction of features and objects within the primary, transitional, and horizontal surfaces, is illustrated on the AIRSPACE PLAN, sheets 4 and 5 of these plans.
3. Depiction of features and objects within the outer portion of the approach surfaces, is illustrated on the APPROACH ZONE PROFILES, sheet 6, of these plans.

NORTH

HORIZONTAL
0 300 600 900
SCALE IN FEET

VERTICAL
0 30 60 90
SCALE IN FEET

No.	REVISIONS	DATE	BY	APP'D.
	FAA APPROVED ALP			

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SIERRA VISTA MUNICIPAL AIRPORT
LIBBY army AIRFIELD

INNER APPROACH SURFACE PLAN AND PROFILE FOR RUNWAY 8-26

SIERRA VISTA, ARIZONA

PLANNED BY: Matt Quick
DETAILED BY: Maggie Beaver
APPROVED BY: James M. Harris P.E.

January 31, 2014 | SHEET 7 OF 15

Coffman Associates
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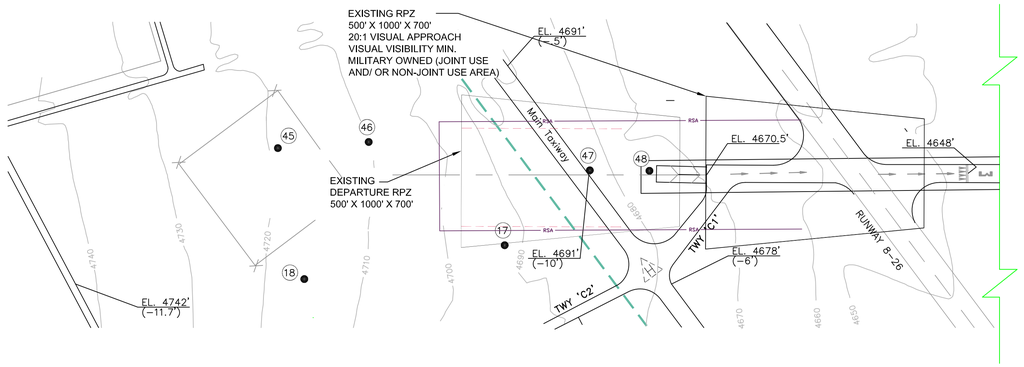
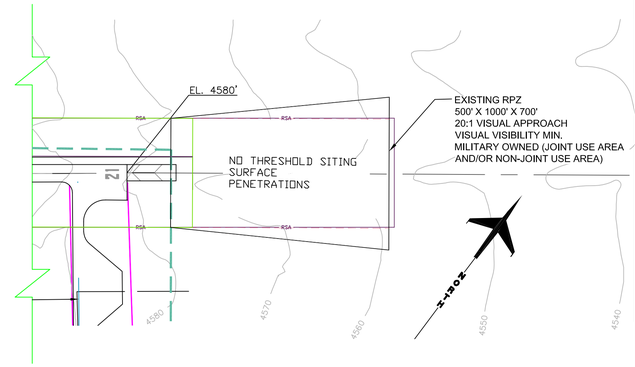




OBSTRUCTION TABLE

CLEAR ZONE RUNWAY 12

Description	Elevation (MSL)	Obstruction	Recommendation
~~49. BUSH~~ *	~~4621'~~	~~UP TO 5' TO THE APPROACH SURFACE~~	REQUEST FAA AERONAUTICAL STUDY

CLEAR ZONE RUNWAY 3

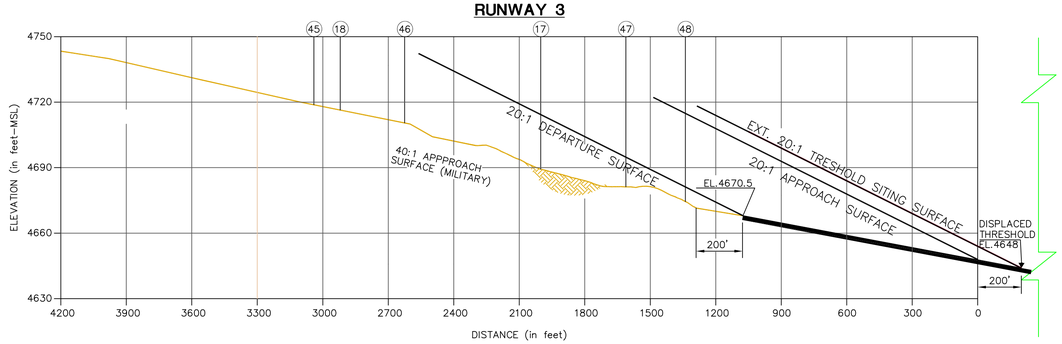
Description	Elevation (MSL)	Obstruction	Recommendation
~~18. TREE~~ *	~~4732'~~	~~UP TO 23' TO THE APPROACH SURFACE~~	REQUEST FAA AERONAUTICAL STUDY
~~45. TREE~~ *	~~4731'~~	~~UP TO 19' TO THE APPROACH SURFACE~~	
~~46. TREE~~ *	~~4729'~~	~~UP TO 20' TO THE APPROACH SURFACE~~	
48. GROUND	4672'	UP TO 2' TO THE APPROACH SURFACE	

CLEAR ZONE RUNWAY 30

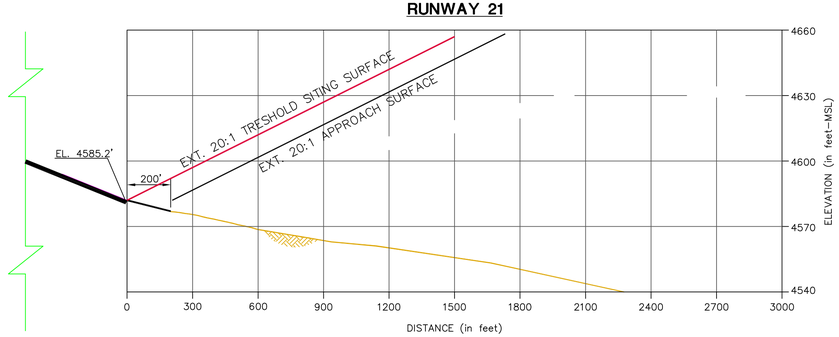
Description	Elevation (MSL)	Obstruction	Recommendation
16. REFLECTOR	4618'	UP TO 6' TO THE APPROACH SURFACE	REQUEST FAA AERONAUTICAL STUDY

* Obstructions have been removed based on Libby Airfield personel, however they are still present on the mapping done March 29, 2008.

RUNWAY 3



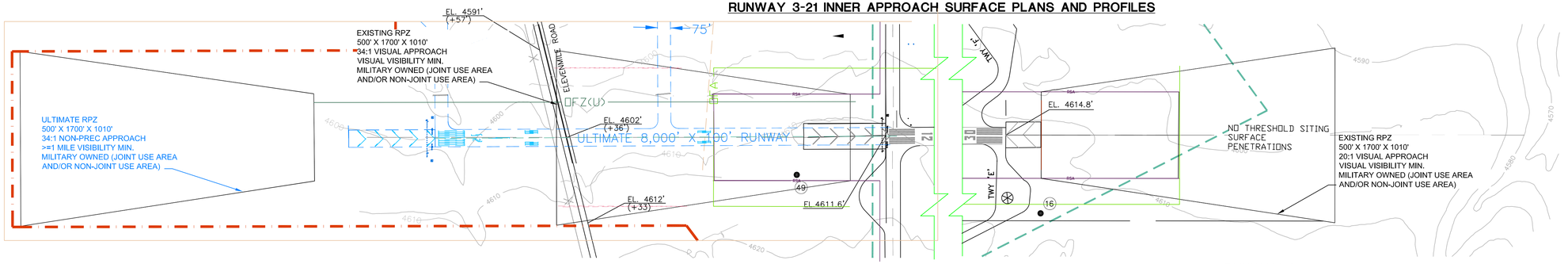
RUNWAY 21



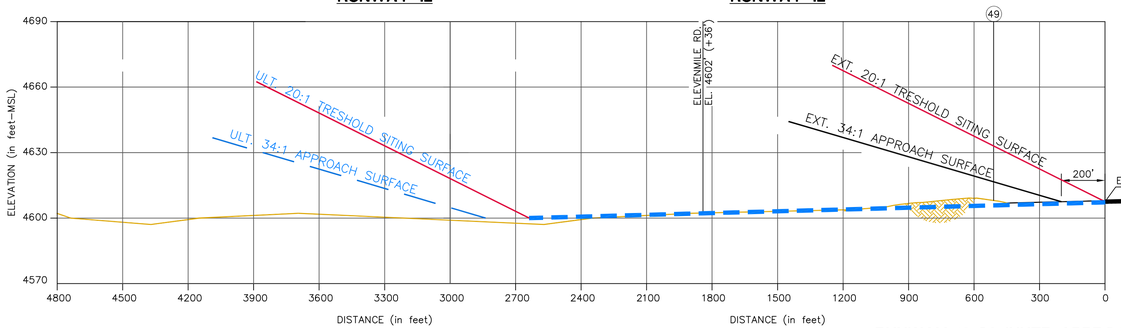
LEGEND:

(16) Obstruction

RUNWAY 3-21 INNER APPROACH SURFACE PLANS AND PROFILES

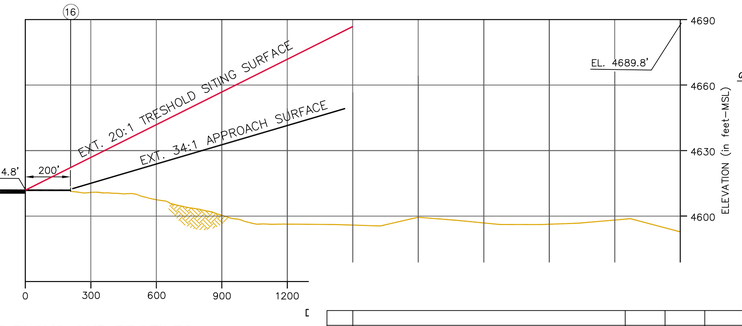


RUNWAY 12

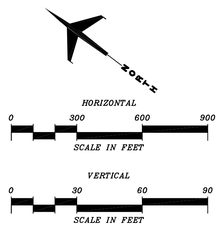


RUNWAY 12

RUNWAY 30



RUNWAY 12-30 INNER APPROACH SURFACE PLANS AND PROFILES



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3. Depiction of features and objects within the inner portion of the approach surfaces, is illustrated on the APPROACH ZONE PROFILES sheet 6 of these plans.

No.	REVISIONS	DATE	BY	APP'D.

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SIERRA VISTA MUNICIPAL AIRPORT
LIBBY army AIRFIELD

INNER APPROACH SURFACE PLANS AND PRFILES RUNWAYS 12-30 and 3-21

SIERRA VISTA, ARIZONA

PLANNED BY: Matt Quick
DETAILED BY: Maggie Beaver
APPROVED BY: James M. Harris P.E.
January 31, 2014 | SHEET 8 OF 15

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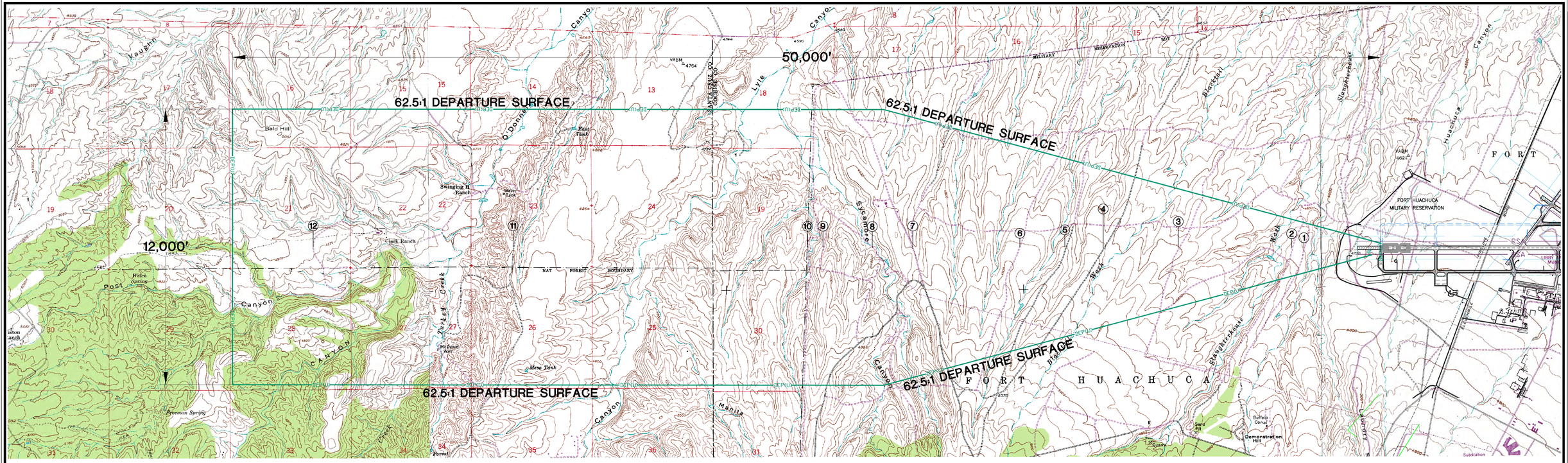
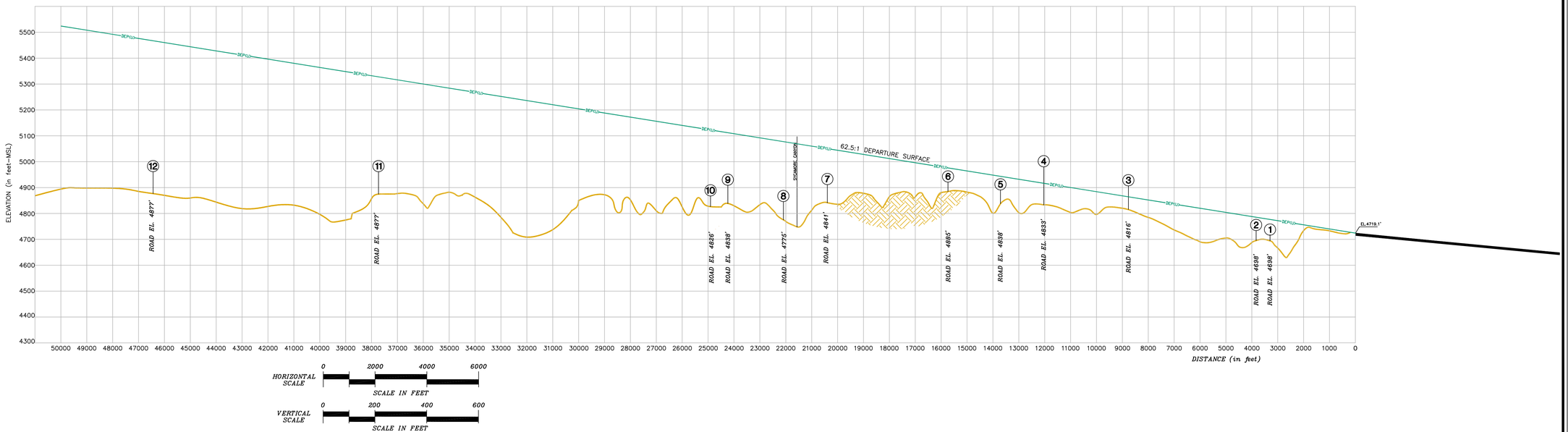


RUNWAY 8



OBSTACLE IDENTIFICATION SURFACE (OIS)			
Object Description/Elevation	40:1 Departure Surface Elevation	40:1 Departure Surface Penetrations	Obstacle Clearance Requirements (Remove, Relocate, or Lower Object)
– None	–	–	–
– –	–	–	–
– –	–	–	–
– –	–	–	–
– –	–	–	–
– –	–	–	–
– –	–	–	–
– –	–	–	–
– –	–	–	–

GENERAL NOTES:

1. Obstructions, clearances, and locations are calculated from ultimate runway end elevations and ultimate approach surfaces, unless otherwise noted. Road obstructions reflect a safety clearance of 10' for dirt roads or private roads, 15' for noninterstate roads, 17' for interstate roads, and 23' for railroad.
2. Standard in AC 150/5300-13 CHG 11 Appendix 2, Runway End Siting Requirements are not appliable for identifying objects affecting navigable airspace. See CFR Part 77 Title 14.
3. Roads and Buildings Clearance of more than 50 feet AGL are not detail in Departure Surface Profiles.

No.	REVISIONS	DATE	BY	APP'D.

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SIERRA VISTA MUNICIPAL AIRPORT
LIBBY ARMY AIRFIELD

RUNWAY 8 DEPARTURE SURFACE DRAWING

SIERRA VISTA, ARIZONA

PLANNED BY: Matt Quick
DETAILED BY: Maggie Beaver
APPROVED BY: James M. Harris P.E.
January 31, 2014

Coffman Associates
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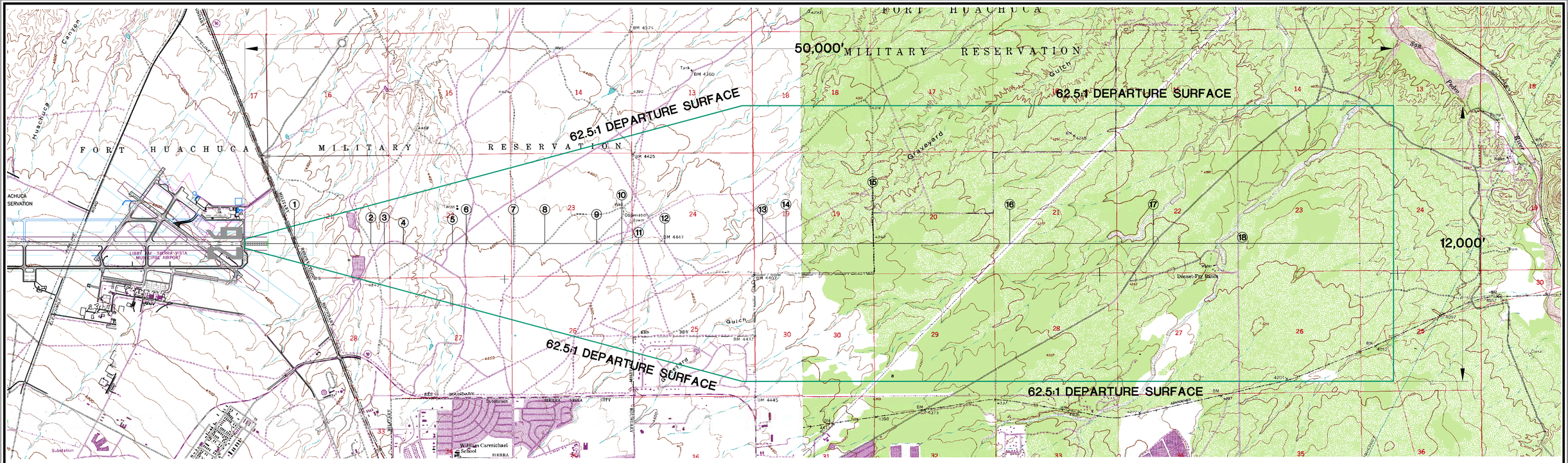
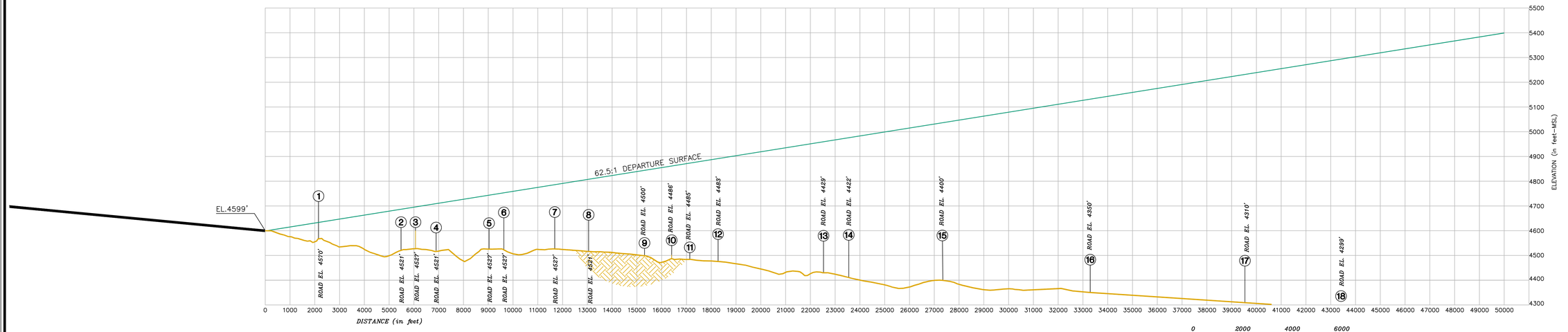


RUNWAY 26



OBSTACLE IDENTIFICATION SURFACE (OIS)			
Object Description/Elevation	40:1 Departure Surface		Obstacle Clearance Requirements (Remove, Relocate, or Lower Object)
	Elevation	Penetrations	
– None	–	–	–
– –	–	–	–
– –	–	–	–
– –	–	–	–
– –	–	–	–
– –	–	–	–
– –	–	–	–
– –	–	–	–
– –	–	–	–

GENERAL NOTES:

1. Obstructions, clearances, and locations are calculated from ultimate runway end elevations and ultimate approach surfaces, unless otherwise noted. Road obstructions reflect a safety clearance of 10' for dirt roads or private roads, 15' for noninterstate roads, 17' for interstate roads, and 23' for railroad.
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No.	REVISIONS	DATE	BY	APP'D.
1	FAA APPROVED ALP	7-28-11	JMH	8-19-11

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SIERRA VISTA MUNICIPAL AIRPORT
LIBBY army AIRFIELD

RUNWAY 26
DEPARTURE SURFACE DRAWING

SIERRA VISTA, ARIZONA

PLANNED BY: Matt Quick
DETAILED BY: Maggie Beaver
APPROVED BY: James M. Harris P.E.
January 31, 2014 SHEET 10 OF 15

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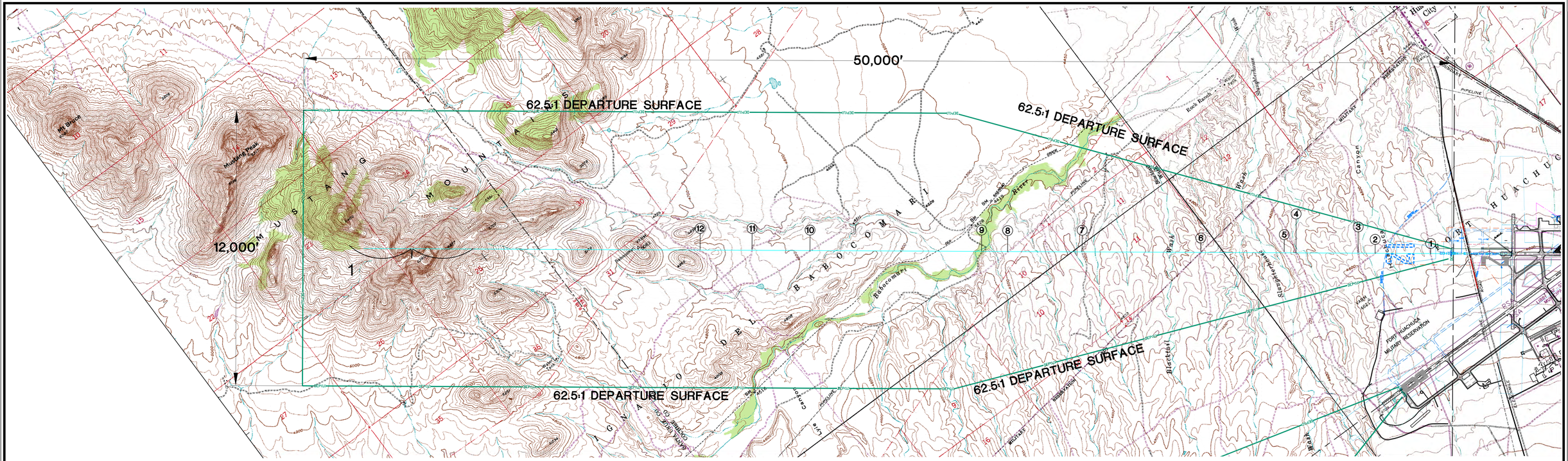

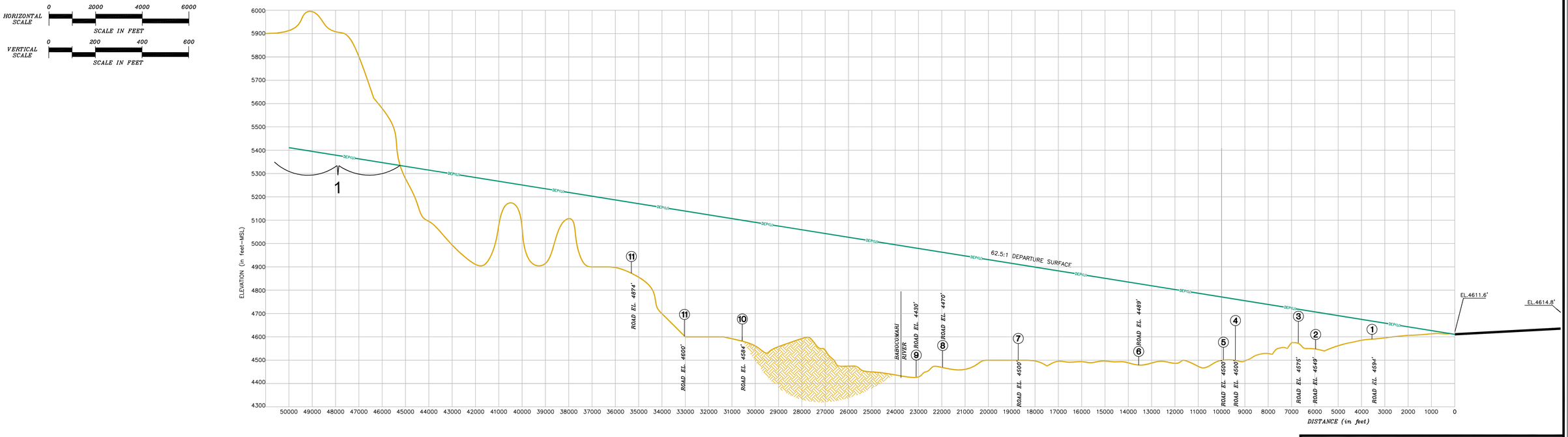

OBSTACLE IDENTIFICATION SURFACE (OIS)

	Object Description/Elevation	62.5:1 Departure Surface Elevation	62.5:1 Departure Surface Penetrations	Obstacle Clearance Requirements (Remove, Relocate, or Lower Object)
1	MUSTANG MOUNTAINS/ 5334' TO 6000'	5334.6' TO 5410.9'	1' TO 600'	

GENERAL NOTES:

1. Obstructions, clearances, and locations are calculated from ultimate runway end elevations and ultimate approach surfaces, unless otherwise noted. Road obstructions reflect a safety clearance of 10' for dirt roads or private roads, 15' for noninterstate roads, 17' for interstate roads, and 23' for railroad.
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No.	REVISIONS	DATE	BY	APP'D.

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SIERRA VISTA MUNICIPAL AIRPORT
LIBBY army AIRFIELD

RUNWAY 12 DEPARTURE SURFACE DRAWING

SIERRA VISTA, ARIZONA

PLANNED BY: Matt Quick
DETAILED BY: Maggie Beaver
APPROVED BY: James M. Harris P.E.

January 31, 2014 | SHEET 11 OF 15

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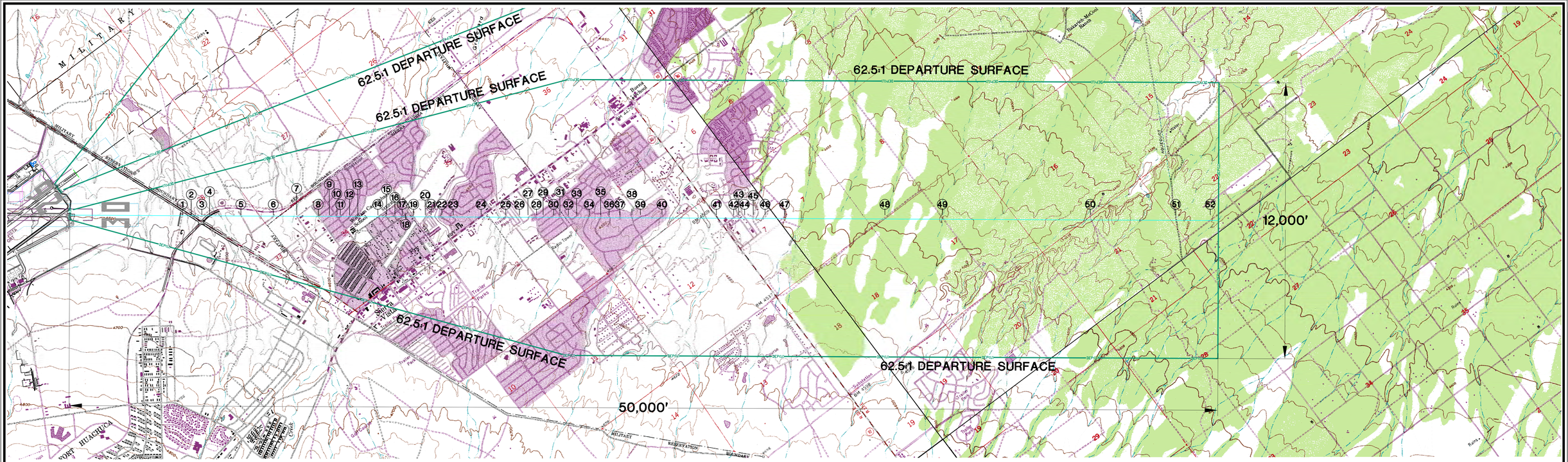
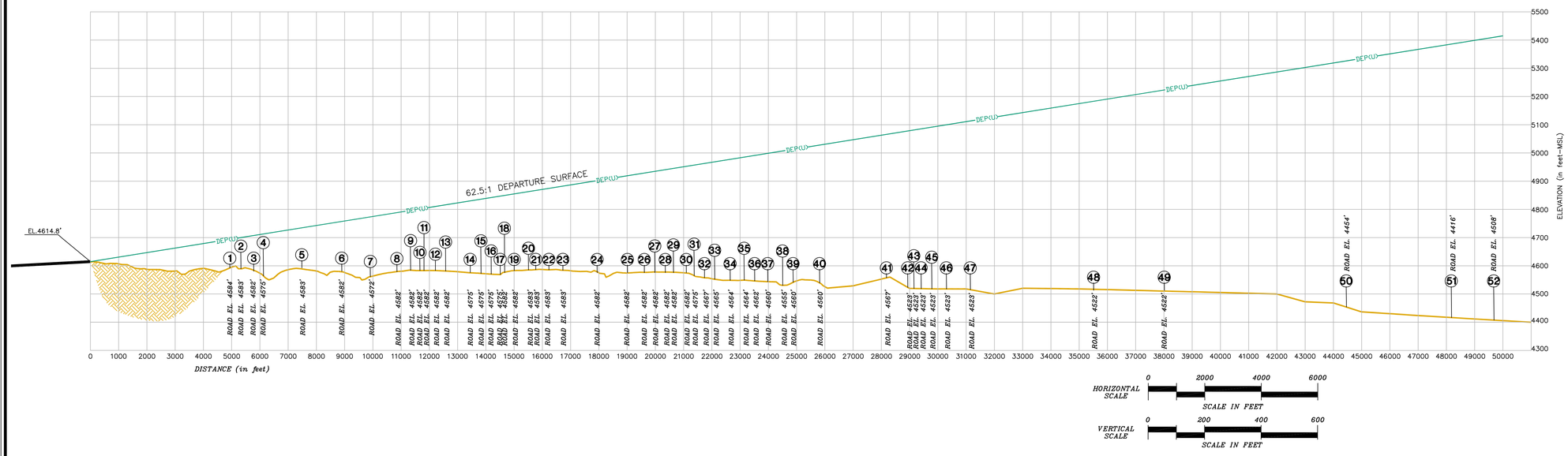


RUNWAY 30



OBSTACLE IDENTIFICATION SURFACE (OIS)

Object Description/Elevation	40:1 Departure Surface Elevation	40:1 Departure Surface Penetrations	Obstacle Clearance Requirements (Remove, Relocate, or Lower Object)
None	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–

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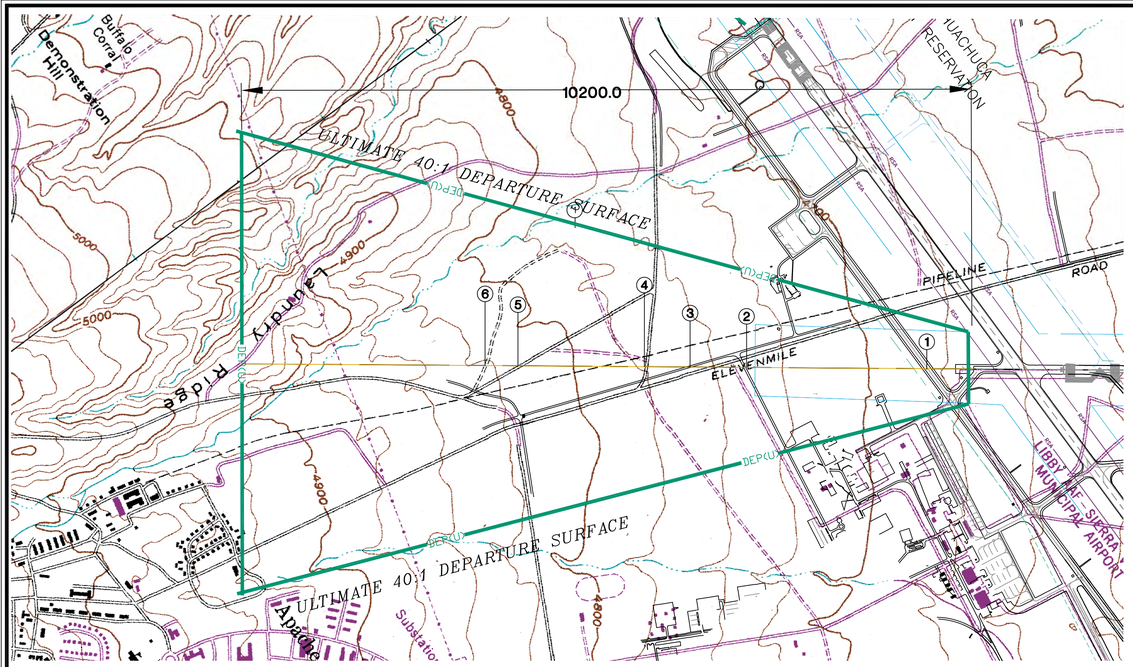
SIERRA VISTA MUNICIPAL AIRPORT
LIBBY army AIRFIELD

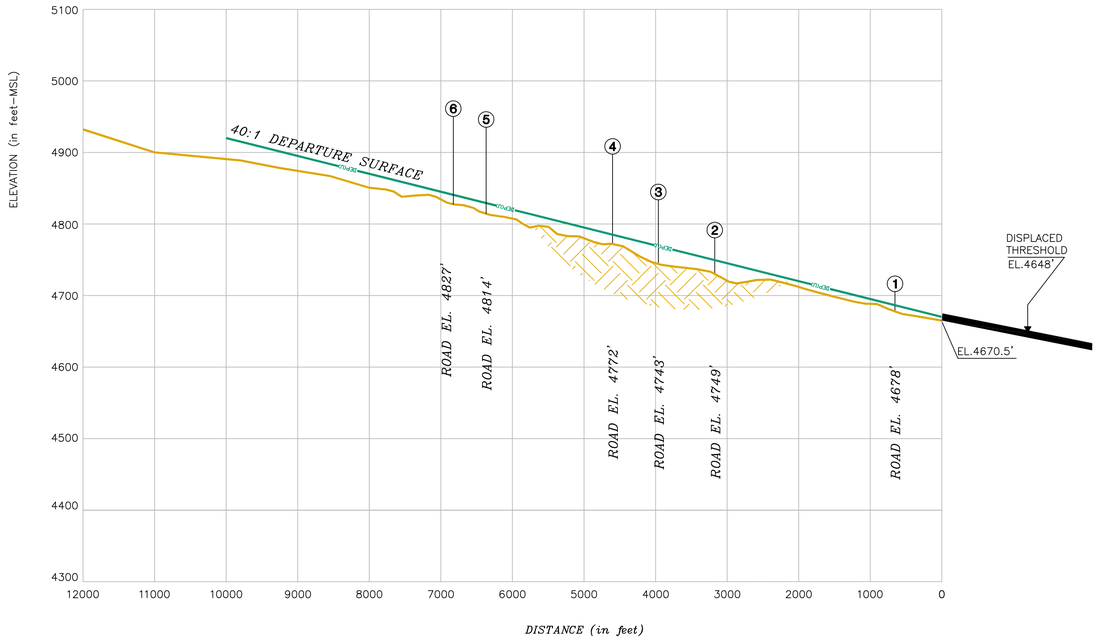
RUNWAY 30 DEPARTURE SURFACE DRAWING

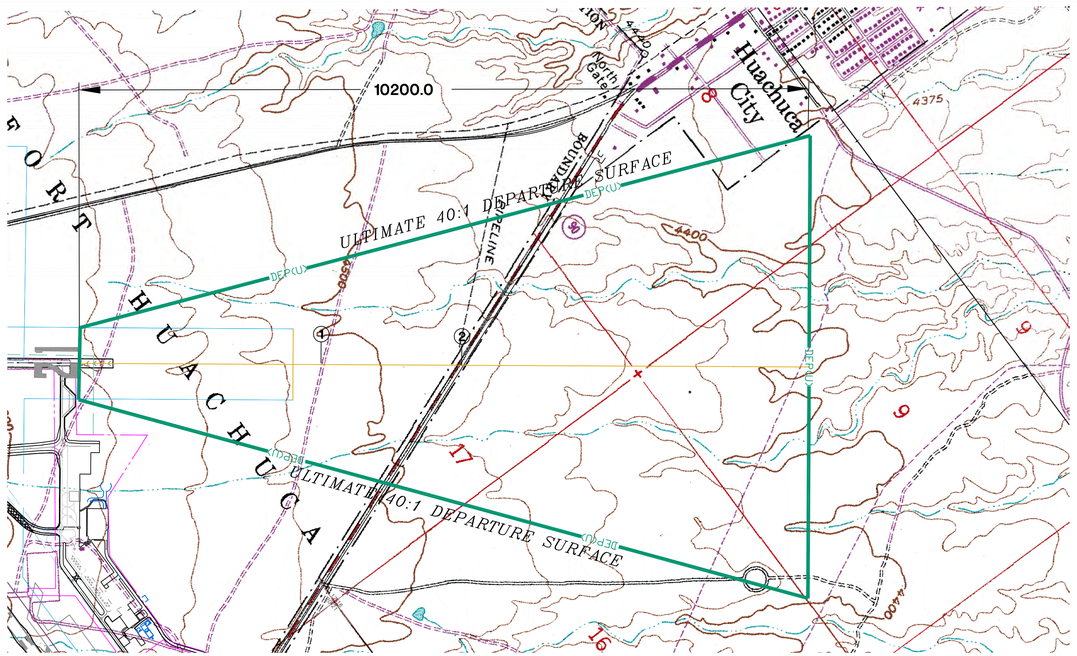
SIERRA VISTA, ARIZONA

PLANNED BY: Matt Quick
DETAILED BY: Maggie Beaver
APPROVED BY: James M. Harris P.E.
January 31, 2014

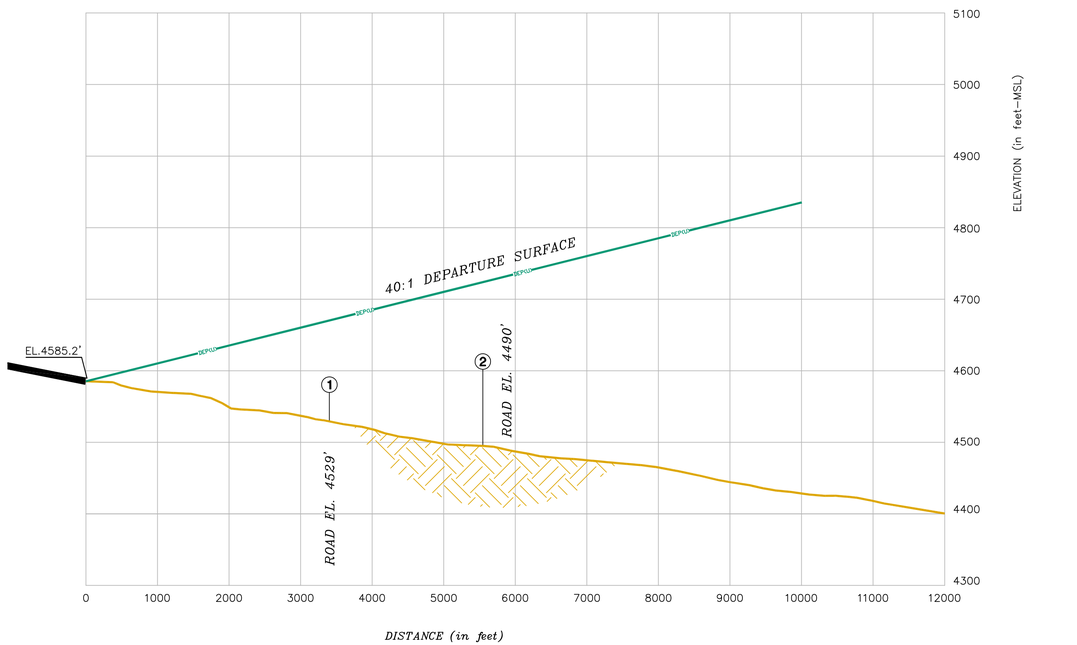


RUNWAY 3





RUNWAY 21



OBSTACLE IDENTIFICATION SURFACE (OIS)

Object Description/Elevation	40:1 Departure Surface		Obstacle Clearance Requirements (Remove, Relocate, or Lower Object)
	Elevation	Penetrations	
None	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–
–	–	–	–

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HORIZONTAL SCALE 0 1000 2000 3000 SCALE IN FEET

VERTICAL SCALE 0 100 200 300 SCALE IN FEET

No.	REVISIONS	DATE	BY	APP'D.

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SIERRA VISTA MUNICIPAL AIRPORT
LIBBY army AIRFIELD

RUNWAY 3-21 DEPARTURE SURFACE DRAWING

SIERRA VISTA, ARIZONA

PLANNED BY: Matt Quick
DETAILED BY: Maggie Beaver
APPROVED BY: James M. Harris, P.E.
January 31, 2014

Coffman Associates
Airport Consultants
www.coffmanassociates.com

ON-AIRPORT LAND USE LEGEND

- AIRFIELD OPERATIONS (864 ACRES)
- GENERAL AVIATION AREA (26.7 ACRES)
- COMMERCIAL SERVICE AREA (8 ACRES)
- R & D UTILITIES & GOVERNMENT (8 ACRES)

Arial Photo taken 2008

NORTH MAG. NORTH

0 600 1200 1800
SCALE IN FEET

DEFINITIONS LEGEND

Airport Operations: This category encompasses those aviation facilities which are essential to the operation of the Airport. At Sierra Vista Municipal Airport/Libby Army Airfield, this area has been designated for Joint-Use, supporting both Military and civilian use. The Joint-Use area includes the runways, taxiways, and "runway lateral clearance area" (per DOD planning requirements).

Commercial Service Area: The Commercial Service Area is reserved for aircraft providing scheduled and/or charter passenger air carrier service, as well as other large aircraft operators. In order to accommodate larger aircraft, this apron area is, or should be, constructed to a higher pavement strength.

General Aviation Area: Typically the General Aviation (GA) land use category includes aircraft parking aprons, aircraft storage hangars and tiedowns, Fixed Base Operations (FBO) lease areas, airport operations and maintenance facilities, GA terminal building, and vehicle parking areas. Primarily, the purpose of these sites is to store, service, and support general aviation aircraft and activities.

UAS/R&D Utilities and Government: This area is reserved for Unmanned Aerial Utilities (UAS) research and development, government agencies and utilities.

LEGEND

- EXISTING AIRPORT PROPERTY LINE
- LIBBY ARMY AIRFIELD PROPERTY LINE (JOINT USE AREA)
- ULTIMATE LIBBY ARMY AIRFIELD PROPERTY LINE (JOINT USE AREA)

No.	REVISIONS	DATE	BY	APP'D.
1	FAA APPROVED ALP	7-28-11	JMH	8-19-11

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SIERRA VISTA MUNICIPAL AIRPORT
LIBBY army AIRFIELD

LAND USE PLAN

SIERRA VISTA, ARIZONA

PLANNED BY: Matt Quick
DETAILED BY: Maggie Beaver
APPROVED BY: James M. Harris P.E.
January 31, 2014 SHEET 14 OF 15

Coffman Associates
Airport Consultants
www.coffmanassociates.com

LEGEND

EXISTING	ULTIMATE	DESCRIPTION
		AIRPORT PROPERTY LINE
		AWOS LEASE BOUNDARY
		BUILDING RESTRICTION LINE
32|33 / 21|14	32|33 / 21|14	SECTION CORNERS
		AIRPORT REFERENCE POINT (ARP)
		AIRPORT ROTATING BEACON
		AVIGATION EASEMENT (IF APPLICABLE)
		BUILDING ON AIRPORT
		ABANDON/REMOVE
		BLOCK FENCE
		WIRE FENCE
		AIRPORT PAVEMENT
		HOLD MARKING
OFZ	OFZ	OBSTACLE FREE ZONE
RSA	RSA(U)	RUNWAY SAFETY AREA
OFA	OFA	OBJECT FREE AREA
		PRECISION OBSTACLE FREE ZONE
		WINDSOCK
		RUNWAY PROTECTION ZONE
		PAPI
		RUNWAY THRESHOLD LIGHTS & REIL
TIE	TIE	TIEDOWNS
TOPO	TOPO	TOPOGRAPHY
		JOINT USE RWY/TWY AREA
H	H	HELIPAD
AWOS	AWOS	AUTOMATED WEATHER OBSERVATION STATION (AWOS)
		MALS
		PRIMARY AIRPORT CONTROL STATION (PACS)
		SECONDARY AIRPORT CONTROL STATION (SACS)

RELOCATATED ELEVEN MILE ROAD

RELOCATATED ELEVEN MILE ROAD

ELEVENMILE ROAD

0 600 1200 1800

SCALE IN FEET

EXISTING 8' HIGH CHAIN LINK PERIMETER SECURITY FENCE

17 16 20 21

FORT HUACHUCA

MILITARY RESERVATION

75'

1,025'

ULTIMATE 8,990' X 200' RUNWAY

RPZ(U)

ULTIMATE LIBBY ARMY AIRFIELD PROPERTY LINE (JOINT USE AREA)

ULTIMATE 75' WIDE PARALLEL TAXIWAY "J"

ULT. PAPI (2) (TYP.)

EXIST. 4285'X75' S36°17'44"W (True)

ULT. ARP 31°35'21.02"N 110°20'40.65"W

EXIST. ARP 31°35'18.500"N 110°20'39.800"W

RUNWAY Windcone"D"

TWY 'D'

TWY 'K'

TWY 'J'

TWY 'J1'

TWY 'J'

TWY 'J'

RVZ

EXISTING 5366' X 100' RUNWAY

N 126°40'45" E (TRUE)

ASR-II REFLECTORS

Windcone"E"

Windcone"B"

Windcone"F"

Windcone"A"

EXISTING 12,001' X 150' RUNWAY

N 90°00'00"E (TRUE BEARING)

TWY 'A'

TWY 'B'

TWY 'C'

TWY 'C1'

Windcone"C"

AN/FPN-67

TWY 'D1'

TWY 'F'

Tacan

"P" Taxiway

West Ramp

LIBBY ARMY AIRFIELD PROPERTY LINE

TWY 'C2'

TWY 'D2'

TWY 'E'

"S" TAXIWAY

Relocated windcone

CBP Facility

STATION (COMPASS ROSE)

Transmitter Site

POL

POL

Rotating Beacon

SECONDARY AIRPORT CONTROL STATION (FHU)
LAT = 31°35'13.84408"N
LONG = 110°22'04.95883"W
ELEV = 4718.8'

EXISTING 8' HIGH CHAIN LINK PERIMETER SECURITY FENCE

EXISTING 8' HIGH CHAIN LINK PERIMETER SECURITY FENCE

STATE ROUTE 90

RECORDING INFORMATION (County Assessor - Cochise County, Arizona.)

Parcel	Owner:	Acreage	Date Recorded	Recording Information	Grantor/Method	Notes:
1	City of Sierra Vista	29.08	12/2/1982	Parcel # A-D Docket# :1635 Page: 266-274	United States of America (through Secretary of the Army/ Deed without Warranty (dated September 16, 1982)	The Property was transferred under the powers and authority contained in Section 23 of the Airport and Airways Development Act of 1970 and in conformity with Part 154 of the Title 14 and Section 0.67 of Title 28 of Federal Regulations and Executive Order No. 12079, 43, Fed. Reg. 42233 (1978) and in accordance with the request of the Administration of the Federal Aviation Administration.
2	City of Sierra Vista	43.05	08/31/1989	Parcel # 1-2 Fee Title No. 890817709	United States of America (through Secretary of the Army/ Deed without Warranty (dated August 1, 1982)	The Property was transferred under the powers and authority contained in Section 516 of the Airport and Airways Development Act of 1982 and in conformity with Part 154 of the Title 14 and Section 0.67 of Title 28 of Federal Regulations and in accordance with the request of the Administation of the Federal Aviation. Aviation Administration.
Total Acreage		: 72.13				

Please note: The total acreage shown in this table is the cumulative sum of the above described parcels, whose individual acreages were obtained from the City of Sierra Vista.

LEGEND:

EXISTING AIRPORT PROPERTY

ULTIMATE AWOS LEASE BOUNDARY

PARCEL LINE

No.	REVISIONS	DATE	BY	APP'D.
2	-	-	-	-
1	-	-	-	-

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SIERRA VISTA MUNICIPAL AIRPORT
LIBBY army AIRFIELD

EXHIBIT "A" PROPERTY MAP

SIERRA VISTA, ARIZONA

PLANNED BY: Matt Quick
DETAILED BY: Maggie Beaver
APPROVED BY: James M. Harris P.E.
January 31, 2014
SHEET 15 OF 15

Coffman Associates
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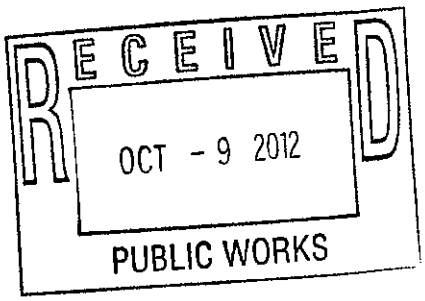
Appendix F

FAA FORECAST APPROVAL LETTER

U.S. Department
of Transportation
**Federal Aviation
Administration**

Western-Pacific Region
Los Angeles Airports
District Office

P.O. Box 92007
Los Angeles, CA 90009



October 5, 2012

Mr. Michael Hemesath
Public Works Director
City of Sierra Vista
401 Giulio Cesare
Sierra Vista, AZ 85635

Sierra Vista Airport
AIP-03-04-0060-25-2011
Airport Master Plan Update, Phase 2
Forecast Submittal

Dear Mr. Hemesath:

The Federal Aviation Administration (FAA) is in receipt of your letter dated July 11, 2012, requesting approval of Sierra Vista Municipal Airport's (FHU) aviation forecast. We understand that FHU's overall fleet mix is unique since the airport is a joint use facility with the military.

The Los Angeles District Office's (ADO) role is to determine whether or not the proposed 5-year and 10-year civil aviation forecasts are reasonable and within parameters of acceptance in order to plan future airport capital improvements for FHU. Please note, by federal law, the FAA cannot fund airport capital improvements for military aircraft.

Your letter states that the total number of civilian operations is estimated to be 40,600 by 2017 and approximately 45,200 by 2022, in comparison to the base year (2011) of 37,811. In other words, the five-year aviation forecast estimates a 7-percent increase and the ten-year aviation forecast estimates a 20-percent increase in comparison to the base year of actual operations which appears more accurate than the FAA's flat lined Terminal Air Forecast (TAF) data. The total number of based aircraft in the base year (2011) is 66, and is forecasted to be about 75 in 2017 and 84 in 2022.

Your forecasts exceed standard TAF tolerances due to the flat line method employed by the TAF. However LAX ADO can make a local determination about the acceptability of the forecast without headquarter consultation because FHU is a general aviation airport, with no FAA Airport Traffic Control Tower, and because your 10-year forecast doesn't exceed 200,000 operations or 200 based aircraft. We reviewed your forecast and find it to be acceptable. In the future we will continue to review you annual airport capital improvement plan submissions to verify proposed projects are justified based upon current facility requirements and activity levels.

If we can be of any further assistance please call Mr. George Buley, Airport Planner, at 310-725-3771.

Sincerely,

David F. Cushing
Manager, Los Angeles Airports District Office

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