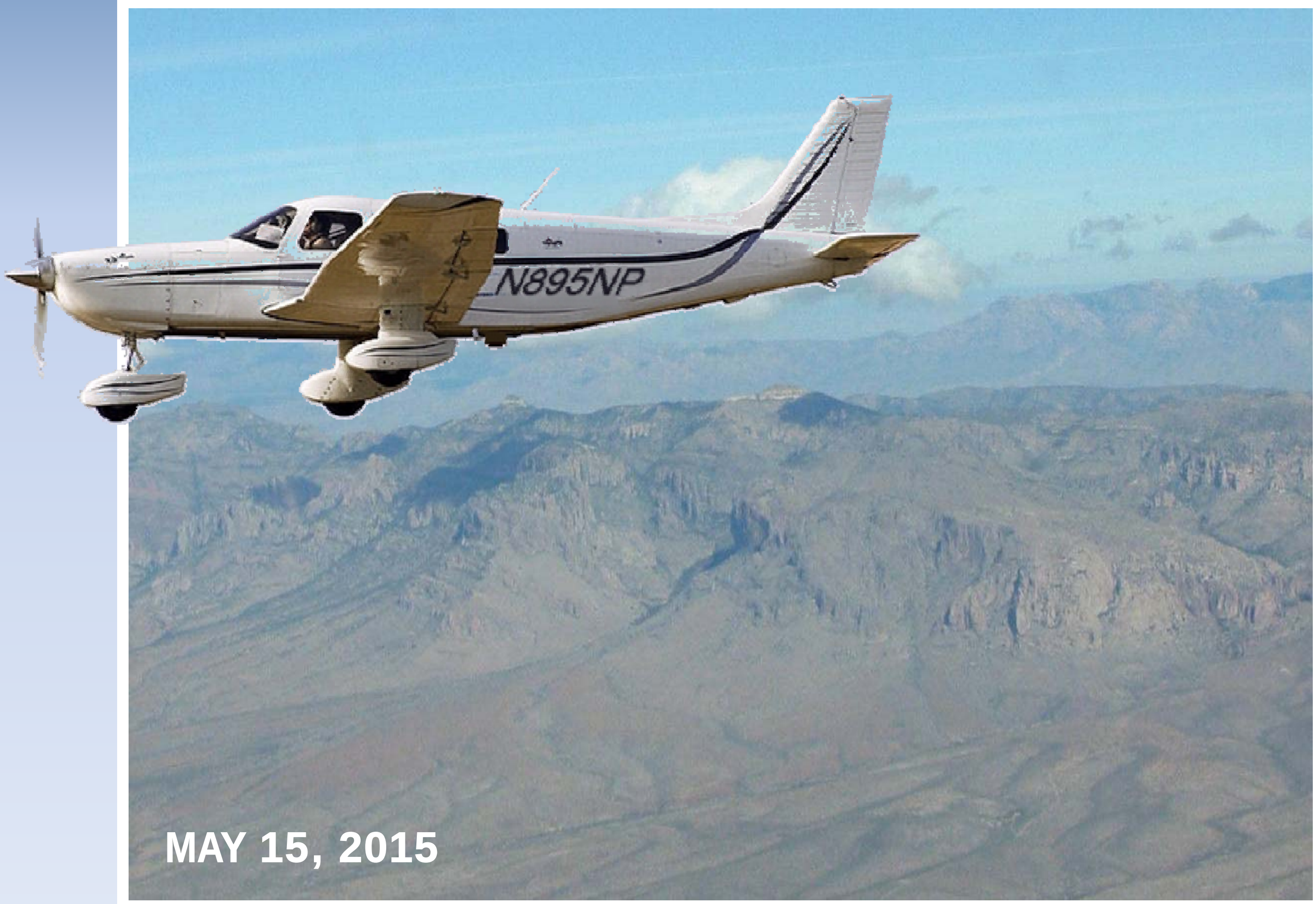
San Manuel Airport

Airport Master Plan 2014



MAY 15, 2015

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SAN MANUEL AIRPORT MASTER PLAN 2014

PREPARED FOR

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In Memoriam

This Master Plan is dedicated to Warren Traweek

Husband, Father, Grandfather, Uncle, Brother, Veteran, Friend to many, and an Aviator

The airport would not be what it is today without him.

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1 Introduction

This chapter provides a description of the purpose and need for the Airport Master Plan, provides basic information regarding the existing airport, provides a summary of the airport's development history, and describes the planning process and approach, as well as providing a summary of the contents of the Master Plan.

The twenty year planning period for this Master Plan is 2014 through 2034, inclusive.

Purpose and Need

An Airport Master Plan provides a road map for efficiently meeting present and future projected aviation demand while preserving a level of flexibility necessary to respond to changing industry and economic conditions.

A Master Plan should be updated when any significant changes in the factors that affect the airport's current or potential role occur, or when economic or industry conditions change such that they affect the planning that was accomplished in the current study. A rule of thumb is to consider updating the Master Plan after five to seven years. The last San Manuel Airport Master Plan was prepared in 2003. Over the past ten years there have been many changes in the aviation industry, significant changes in the national and regional economy, as well as significant changes in national policy and in the FAA's design standards.

The general goals and objectives to be addressed by the San Manuel Airport Master Plan include the following:

- To identify any current deficiencies in safety of operations
- To identify deficiencies for meeting the current level of aviation demand (Capacity)
- To determine the condition of the existing airport infrastructure (Condition)
- To identify any areas of noncompliance with current FAA design standards (Compliance)
- To develop a reasonable projection of potential future demand for the planning period
- To identify improvements that will be needed to accommodate potential future demand
- To develop and analyze alternative airport development concepts
- To define the purpose and need for development projects
- To plan for adjacent and on-site compatible land use development
- To identify potential impacts to the environment that may require further study
- To develop an accurate set of Airport Layout Drawings to aid in future development
- To develop a reasonable and financially feasible program of capital improvements
- To establish a framework for a continuous planning process

The San Manuel Airport Master Plan will reflect the following characteristics. The plan will be…

- **Financially Feasible** - The phasing of recommended capital projects will be aligned with the County's ability to secure available funding.

- **Balanced** - The Master Plan's recommendations will maintain a balance between airport development needs and community impacts.

- **Technically Sound** - The Master Plan's recommended improvements will comply with Federal, State, and local requirements and will be able to be constructed efficiently and cost effectively.

- **Responsive** - The Master Plan will address the physical and operational needs of the airport's stakeholders.

- **Flexible** - The Master Plan will be responsive to changes in industry dynamics. Alternative strategies and demand-based action points will be presented for the recommended improvements. The recommendations contained in the Master Plan will only be implemented as warranted by actual, measurable activity.

- **Environmentally Compatible** - The Master Plan will strive to minimize potential environmental impacts.

Location and Airport Setting

Unless indicated otherwise, the information contained in this section was gathered from research of historical records, on site observations, prior project experience, and information provided by Pinal County staff.

San Manuel Airport (FAA Identifier E77) is located in the southeastern corner of Pinal County, approximately two miles northwest of the unincorporated community of San Manuel. The airport is at an elevation of 3,271.8 feet above mean sea level (MSL), and is geographically located at 32° 38' 11.185" N Latitude, 110° 38' 50.2356 W Longitude. The airport is currently attended on a part time basis. However self service 100LL aircraft fueling is available on a 24 hour basis, seven days a week. The Common Traffic Advisory Frequency (CTAF) for arriving and departing aircraft is 122.9.[1]

The airport property encompasses approximately 54 acres of land that is currently leased from BHP Billiton Mining Company through November 1, 2040. The land surrounding the airport is predominantly undeveloped land.[2] (See **Figure 1-1, San Manuel Airport - Aerial Photo**)

The existing airport infrastructure includes a single asphalt paved and lighted runway, Runway 11-29, which is approximately 4,214 feet in length. The runway bearing is N 56° 48' 12.72" W [7]. The pavement width is 75 feet. The runway is currently classified as an Airport Reference Code (ARC) B-I landing area, designed to accommodate single wheel aircraft with gross weights of up to 12,000 pounds (Small Aircraft). There are currently no instrument approaches to San Manuel Airport and the runway markings are basic, for visual operations only. The runway's effective gradient is 0.83%, sloping to the southeast. Runway 11-29 has a Medium Intensity Runway Lighting (MIRL) system, as well as a two-light Precision Approach Path Indicator (PAPI-2) system and Runway End Identifier Lights (REIL) on both runway ends.[3]

Additional improvements include an Automated Weather Observation System (AWOS), located southwest of Runway 11-29.

Runway 29 is served by a graded partial parallel taxiway and paved entrance/exit taxiway. Runway 11 has a paved entrance/exit turnout taxiway. Taxiways are not lighted, but are equipped with retro reflective edge markers. There is also an aircraft parking apron with tiedown anchors to accommodate 26 aircraft, two County owned 10-unit Tee-hangar structures, a privately-owned 8-unit Tee-hangar structure (two units contain "Aerolifts" so they can accommodate two aircraft), two privately owned single-aircraft hangars, a restroom building, an electrical equipment vault building, a lighted wind cone and segmented circle, and a rotating beacon. There is also a privately owned mobile home residence located on the airport property (on land leased from the County).[3]

There are 11 individuals who own hangars or other structures located on leased land on the airport property.

There are currently 13 aircraft housed in the privately owned hangars at the southeast end of the airfield, with capacity for 14 aircraft. The County owned Tee-Hangars are currently full (20 aircraft) and there is a waiting list of 22 aircraft owners who desire hangar space at San Manuel Airport. The verified number of aircraft actually present at the airport on a full time basis is 36.[6] (See Chapters 2 and 3 for further discussion of based aircraft).

Airport Development History

The early development of San Manuel Airport parallels the development of copper mining in Pinal County.

The Magma Copper Company originally purchased existing mining claims in the vicinity of the airport in 1944. Exploratory work and construction of the existing mine, mill, and smelter began immediately and, because of the remote location, mine and construction workers were brought in from outside the area. The community of San Manuel was established by Magma Copper Company to support the mining activity. The Company began constructing company-owned housing for its employees in 1953. In that same year, Pinal County constructed San Manuel Airport.[2]

The original 1953 airport construction consisted of a 4,200’ long unpaved gravel runway (Runway 11-29). Although in its early days the airport was primarily used by the mining company and mining contractors, it has always been a County-operated public-use airport.[2]

The San Manuel smelter was commissioned in 1956.[4]

In 1960, the County applied a two inch asphalt surface to the airport’s gravel runway.[2]

Although the airport was constructed by the County on Magma Copper Company land, a formal lease agreement was not implemented until 1967. At that time approximately 54 acres of land encompassing the runway environment was leased for a period of 20 years (1967 through 1987).[2]

In 1983, the runway was slurry sealed. Also in 1983, the land lease was extended through the year 2010. A sand seal and crack sealing was accomplished in 1985.[2]

An Airport Master Plan was prepared in 1991. The major improvement recommendations in that plan included acquisition of land for the Runway 11 Runway Protection Zone (RPZ), reconstruction of Runway 11-29, major drainage improvements, as well as construction of aircraft parking, perimeter fencing, a partial parallel taxiway, and construction of an access road.[2]

In 1995 the Pinal County Board of Supervisors renegotiated the airport lease to a 35-year term, from 1995 to 2030. The 1995 lease included a revision to the dissolution clause. This revision states that the lessee (Pinal County) is solely able to dissolve the lease agreement. The original lease would have allowed the lessor (Magma Copper Company) to dissolve the agreement with a 30-day notice. This was not acceptable to the State of Arizona for participation in airport development grant funding at San Manuel. The airport was not included on the National Plan on Integrated Airport Systems (NPIAS) at that time, and therefore was not eligible for Federal Aviation Administration (FAA) grant funding.[2] The original dissolution clause would not have been acceptable to the FAA either.

Magma Copper Company was acquired (for $3.2 billion) by BHP Billiton Mining Company in 1996. BHP Billiton is an Australian multinational mining and petroleum company headquartered in Melbourne, Australia and with a major management office in London, United Kingdom. It is the world's largest mining company measured by 2011 revenues and as of February 2011 was the world's third-largest company measured by market capitalization.[5]

In 2000 several major airport improvements were completed. Runway 11-29’s pavement was reconstructed and the pavement width was increased to 75’. A partial parallel taxiway and aircraft parking apron were constructed. Security fencing was constructed, and a major flood control channel was constructed on the airport property.[2]

An Airport Master Plan Update was completed in November of 2003. The major recommendations in the Short Term (2004-2009) included extension of utility service to the airport, hangar access taxiways, parallel taxiway extension, installation of runway and taxiway lighting, installation of Precision Approach Path Indicators (PAPI), installation of a rotating beacon, installation of an Automated Weather Observation System (AWOS), access road paving, security fencing improvements, and acquisition of additional land. Intermediate and long term recommendations included additional utility improvements, a terminal building, paved automobile parking, additional hangars, an aircraft wash rack, a 600' extension of Runway 11-29, and construction of a lighted helipad.[2]

Historically, from 1993 until 2013, Copper averaged $1.86 per pound reaching an all time high of $4.61 per pound in February of 2011 and a record low of 60¢ per pound in November of 2001. In 2006, copper was trading in a range of 60¢ to 65¢ per pound. That compares with prices of about $1.32 a pound at the time of BHP's 1996 acquisition of Magma Copper.[4]

Driven by the depressed copper market, BHP closed operations at San Manuel in and, in January of 2007, demolished the twin 500' smokestacks that stood for more than 50 years and served as iconic beacons for both the mining company and the small town of San Manuel. The demolition marked the end of an era for San Manuel, Arizona.

On June 24, 2009, the airport lease with BHP was amended to extend the term to run through November 1, 2014. This amendment also added additional land to encompass the Runway Protection Zones and a new Automated Weather Observation System (AWOS).

In 2010, the AWOS was installed and began transmitting weather information on the airport's Unicom frequency. The AWOS can also be accessed by telephone, but it does not report data to the National Climatic Data Center.

On January 4, 2012, the airport lease was again amended to add two additional parcels of land to encompass the new rotating beacon, segmented circle, and wind cone.

In 2013, a Medium Intensity Runway Lighting (MIRL) system was installed on Runway 11-29, along with a new electrical equipment vault building, two-light Precision Approach Path Indicators (PAPI-2), and a lighted wind cone and segmented circle.[4]

An airport terminal building was constructed in 2013, during the preparation of this Master Plan.

Pinal County is currently negotiating with BHP to acquire the airport land in fee.

Project Approach – the Planning Advisory Committee Process

The preparation of this Master Plan utilizes the Planning Advisory Committee (or PAC) team approach. PAC team members are persons who have an interest in the outcome of the airport planning process ("stakeholders"), and who are willing and able to commit the time and resources necessary to provide timely review of all information submitted by the Consultant during the planning process.

The PAC member roster included representatives from a cross section of the community who may be affected by the outcome of the Master Plan. The members included Pinal County staff, a representative from the Arizona State Land Department, the Luke Air Force Base Airspace Manager, as well as local pilots' representatives. The Consultant team and representatives from the Federal Aviation Administration (FAA) and the Arizona Department of Transportation (ADOT) also served on the PAC team as non-voting, advisory members.

NOTE: The PAC functions as an ad hoc committee to the Pinal County Board of Supervisors. It does not have the authority to approve the final Master Plan, but must reach consensus within its own body, vote on, and approve each progressive element of the work. Review of the Master Plan documents by the PAC is undertaken on a progressive basis during the project term. The PAC reviews, discusses and approves each element of the Master Plan within its own body, and provides recommendations to the County Board of Supervisors through County staff. The ultimate official approval (and adoption) of the final Airport Master Plan and Airport Layout Plan is by resolution of the Board of Supervisors.

As each phase of the Master Plan was completed by the Consultant, draft Working Papers were prepared and copies were distributed to each PAC member for review.

As a means to augment the flow of information throughout the planning process, a Project Information Web Site was developed. As the work progressed, Working Papers and other information were posted on the web site for review and downloading by each PAC participant. This information was systematically added to the web site as the work progressed and the PAC participants were notified via email when new information was uploaded. The contents of the web site functioned as a status document during the progress of the work, and ultimately became a full copy of the Draft, and then Final, Master Plan.

The PAC members were individually responsible for timely review of the information, and for active participation in each PAC meeting, and for participation through e-mail via the Project Information Web Site.

Four PAC meetings were convened at key points in the planning process in order to discuss and ultimately approve each planning element Working Paper, as submitted by the Consultant via the Project Information Web Site. (see **Appendix A – Planning Advisory Committee Meetings**)

As each progressive element of the planning document was completed by the Consultant team and approved by the PAC, it became a part of the draft Master Plan. (See **Figure 1-2, Planning Advisory Committee (PAC) Process**)

Work Outline

The Airport Master Plan contains the following elements:

Phase One:

1. Introduction - This chapter provides a description of the purpose and need for the Airport Master Plan, provides basic information regarding the existing airport, provides a summary of the airport's development history, and describes the planning process and approach, as well as providing a summary of the contents of the Master Plan.

2. Inventory – This chapter provides a baseline inventory of the airport's existing facilities and infrastructure. Each facility is evaluated in terms of its condition, and for compliance with current FAA design standards. Relevant demographics are also presented in this chapter, and the airport's service area is identified.

3. Aviation Demand – This chapter presents forecasts of potential number of based aircraft, operations, and the critical design aircraft, for the Short Term (0-5 years), Intermediate Term (6-10 years), and the Long Term (11-20 years) time frames.

Phase Two:

4. Demand/Capacity Analysis - This chapter provides a projection of the airport's potential peaking tendencies, passenger volume, and identification of the airport's ability to accommodate the projected demand through the planning period.

5. Airport Facility Requirements – In this chapter, the existing airport facilities are evaluated for their ability to accommodate the current and projected demand (capacity evaluation). Concise recommendations for future airside and landside improvements which will allow the airport to effectively accommodate the present and projected demand are presented, prioritized and organized according to the Short Term, Intermediate Term, and Long Term time frames. Action points are included that will serve as "triggers" for implementing the recommended improvements based on observable and measurable condition/compliance/capacity factors.

6. Development Alternatives – This chapter identifies alternative design solutions for key elements of the development program. Planning-level cost estimates for each development alternate are presented to aid in comparative analysis of each onsite development option. This chapter also documents coordination with environmental jurisdictional agencies through distribution of alternative layouts and appropriate background information. Recommended development actions are presented based on the comparative analyses.

Phase Three:

7. Land Use – In this chapter, the use of the existing airport property and offsite adjacent land is examined for compatibility with the future airport role. Analysis includes identification of existing or planned incompatible land uses in the vicinity of the airport.

8. Environmental Evaluation – This chapter examines the potential for environmental impacts associated with the proposed improvements, and identifies any potential or existing environmental problem areas that may be encountered at the airport during the development period.

9. Airport Plans – This chapter documents the development of a set of Airport Layout Plans (ALP) in accordance with the guidelines established in FAA Advisory Circular 150/5070-6B, Appendix D. The ALP is a graphic depiction of the existing airport that also shows the ultimate improvements as determined by the Airport Master Plan.

10. Capital Improvement Program – This chapter identifies the capital improvements and costs necessary to meet the projected demand, based on the forecasts developed and approved by the PAC. The Development Schedule indicates projects, costs, and distribution of costs (federal, state, private and local funding) for each year in the short range, and for the intermediate and long range planning periods. This chapter also includes breakdowns for probable FAA, ADOT, and local shares, assuming full FAA participation in all AIP-eligible work elements.

11. Financial Plan – This chapter includes a discussion and summary of projected operating and capital improvements expenditures and sources of revenue during the 20-year planning period.

Chapter References

[1] http://www.AirNav.com, September 18, 2013
[2] San Manuel Airport – Airport Master Plan, Coffman Associates and Z&H Engineering, November 12, 2003
[3] San Manuel Airport – Airport Layout Plan, Coffman Associates, latest revision by Nicholas J. Pela & Associates May 21, 2013
[4] www.TradingEconomics.com, September 10, 2013
[5] Another Record Profit for BHP, ABC News, August 22, 2007
[6] Information provided by the Pinal County Airport Director, January 10, 2014
[7] Field surveys by Dibble Engineering, Inc. conducted in November, 2013 and May, 2014

Source: Arizona Department of Transportation (ADOT)
Date: April 21, 2005

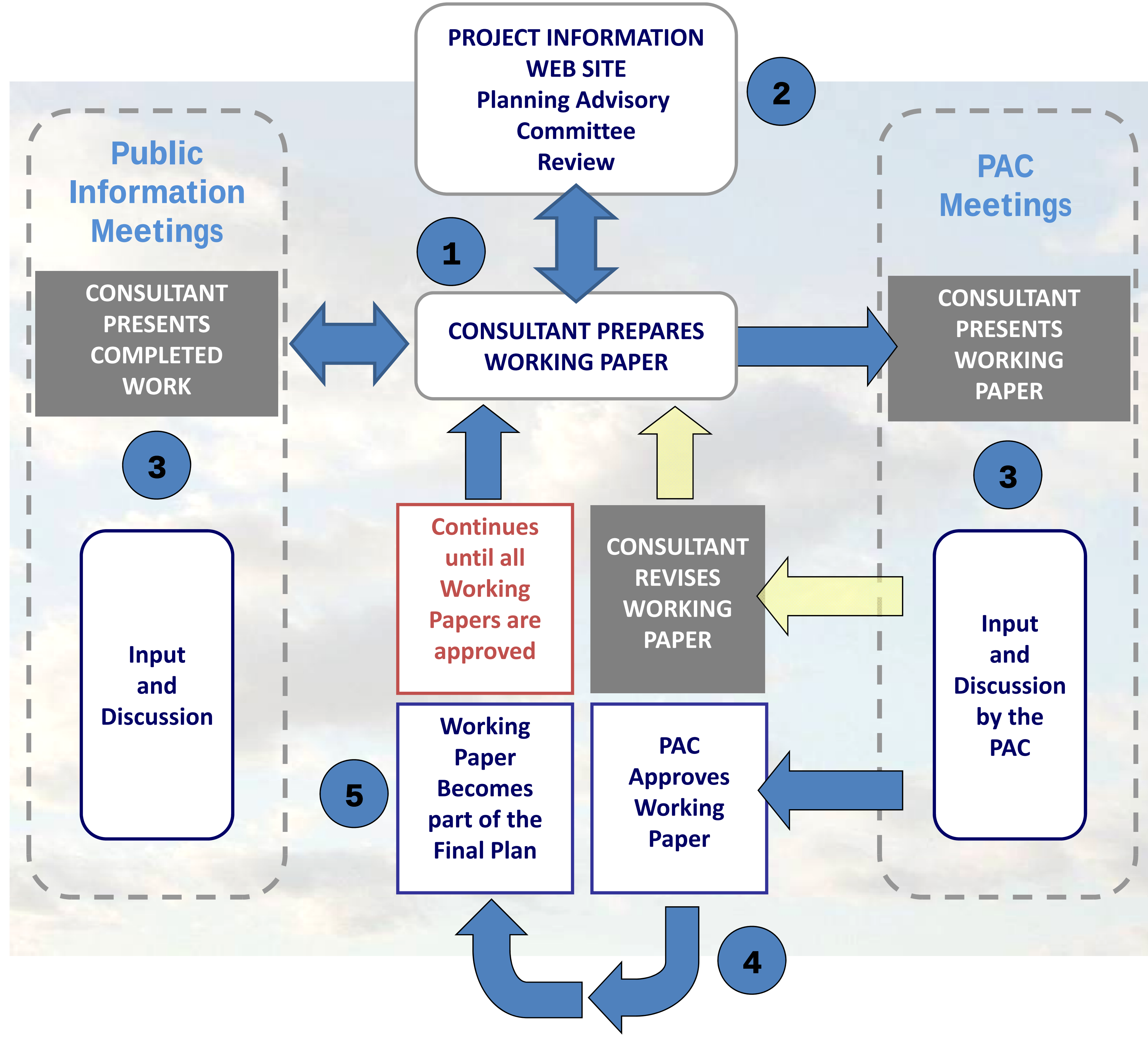
San Manuel Airport – Aerial Photo
Figure 1-1

The Master Plan Process

Planning Advisory Committee (PAC) and Public Involvement…

Four PAC Meetings and two Public Information Meetings were scheduled at strategic points in the planning process.

The purpose of the Public Information Meetings was to inform the members of the local community about the airport's future plans, and to solicit input from the public concerning the plans.



The Planning Advisory Committee (PAC) Process
Figure 1-2

2 Inventory

Introduction

This chapter of the Master Plan provides background information regarding the condition of the airport at the present time, a summary of historical trends in area demographics that may affect the airport, as well as an estimate of the current level of aviation activity.

Demographics

The various economic characteristics of the area that the airport serves will affect the demand for aviation services. National and regional economic trends also affect the airport, but several specific and identifiable local economic factors that may be unique to the geographic area served by the airport play a significant role in determining demand. The types of industry and commercial activity in an airport's service area also will affect aviation demand. Manufacturing and service industries tend to generate more aviation activity than resource industries such as mining and agriculture. [1]

The demographic characteristics of the airport's service area also affect the demand for aviation services. These characteristics can influence the level, type, and growth in both local air traffic activity and traffic from other areas. Population growth (or decline) is a simple and an important measure of the potential demand for air services. Factors such as relative available leisure time and recreational activity are important in estimating activity, but can be difficult to measure. Another important demographic factor is the service area's level of income, usually measured on a per capita basis, which is a good indicator of the propensity for the population to travel, the level of use of existing based aircraft, and also the potential for the population to purchase general aviation aircraft.[1]

A summary of historical demographic indicators for the 2001-2011 period is presented in **Table 2a**. The indicators presented include Pinal County population and Per Capita Income as well as other relevant data.

Annual population growth for the 2001 through 2011 period averaged 7.47%.

It is interesting to note that Per Capita Income growth lagged at an average of only 2.45% per year for the 2001-2011 period. This notwithstanding, there has been an observed increase in the number of based aircraft over recent years[4] even though the local and regional economy has been soft. This may indicate that although general economic growth was in decline, certain local factors continued to place demand on the airport. These local factors may include "migration" of based aircraft from more expensive Tucson area airports to San Manuel Airport. The following discussion of the Airport Service Area and discussions in **Chapter 3, Aviation Demand** present information on the residence locations of the currently based aircraft owners that tends to support this supposition.

Table 2a: DEMOGRAPHIC INDICATORS
San Manuel Airport – San Manuel, Arizona

Year	County Population [2]	Annual Growth	County Per Capita Income [2]	Annual Growth
Historical Data				
2001	187,747		$ 19,284	
2002	197,082	4.97%	$ 19,175	-0.57%
2003	207,920	5.50%	$ 19,946	4.02%
2004	219,472	5.56%	$ 21,334	6.96%
2005	235,708	7.40%	$ 23,698	11.08%
2006	271,328	15.11%	$ 23,708	0.04%
2007	306,174	12.84%	$ 23,474	-0.99%
2008	335,311	9.52%	$ 24,731	5.35%
2009	349,830	4.33%	$ 23,421	-5.30%
2010	384,236	9.84%	$ 22,752	-2.86%
2011	382,992	-0.32%	$ 24,287	6.75%
	Average Growth:	**7.47%**		**2.45%**
Projections[3]				
2012	413,584		$ 25,418	
2013	435,882		$ 25,930	
2014	458,179		$ 26,442	

Airport Service Area

The present role of the San Manuel Airport is service to the general aviation community, which includes business travel, recreational travel, sport aviation, and flight training. The geographic area that an airport serves is called its service area. The service area may be subdivided or extended into a primary service area (the owning city or town, plus any nearby population centers) and an extended service area. The extended service area may vary depending on observation of the actual locations of airport users, or other unique circumstances.

The FAA has stated that, "The airport system should be extensive, providing as many people as possible with convenient access to air transportation, typically by having most of the population within 20 miles of [an] airport".[9] In addition to this criteria, an airport service area for a particular role or function logically extends halfway to nearby airports which are capable of serving the same function ("competing" airports). An acceptable rule of thumb for establishing a primary service area is to assume that a 30 minute drive (or about 25 miles) is a reasonable drive time for potential airport users.

The procedure used to define the actual service area for San Manuel Airport was based on the actual residence addresses of the owners of the airport's 36 current based aircraft. The extent of the service area (primary plus extended) was determined by plotting the approximate locations of the addresses on a map and estimating the driving distance from each address to the airport. It is interesting to note that there are two aircraft that are owned by a resident of Green Valley, approximately 71 miles south of the airport (or a 1 ½ hour drive). There is also one aircraft owner who lists a Bend, Oregon address. These three aircraft are considered to be outliers and were not included in the service area definition. Of the remaining 33 aircraft, it was determined that 22 owners reside within about 25 miles (about a 30 minute drive) from San Manuel Airport. This is approximately 2/3 of the based aircraft. (See the tabulation of current based aircraft in **Chapter 3, Aviation Demand**.)

Based on the actual locations of the based aircraft owners, we can assume that a driving distance of up to 25 miles is a reasonable distance for most users of San Manuel Airport's services, and that a significantly longer distance is considered reasonable by many current and potential users. Therefore, the primary service area was defined as the communities nearest to the airport (San Manuel, Mammoth, and Oracle). The extended airport service area was defined as a corridor along Arizona Highway 77 extending from Dudleyville (a 24 mile drive north of the airport and approximately midway to the Kearny Airport), south through Oracle, Catalina, Oro Valley, Casas Adobes, and into the residential suburbs in north Tucson. See **Figure 2-1, Airport Service Area Map** at the end of this section for a graphic presentation of this corridor. The service area also includes the largely unpopulated areas to the east and west of the highway corridor.

The population of the extended service area was estimated by first including the total population of the communities that are within 25 miles of the airport. These communities are Dudleyville, Mammoth, San Manuel, Oracle, and Catalina.

The communities of Oro Valley and Casas Adobes are located approximately 36 and 40 miles from San Manuel Airport, respectively. Because the theoretical service area extends into a portion of northern Tucson, a reasonable percentage of the Tucson population was also included in the service area. The zip codes of the based aircraft owners who have Tucson addresses were used to estimate this population. These Tucson suburban areas are located between 27 and 54 miles from San Manuel Airport. Because there are other airports that have similar services that are in closer proximity to these outlying areas of the service area, a declining percentage of population was included for each outlying area based on its approximate distance from San Manuel Airport. The percentage of population used was prorated: 100% of population was included in the service area population estimate for communities that are within 25 miles of the airport. No population was included for a community that is 60 miles or more from the airport. The equation used to estimate the percentage of population to be used was *1 - ((Distance from Airport) – 25) ÷ 35* .

The extended service area contains airport users who will have reasonable access to multiple airports, including Tucson International Airport, Ryan Field, and Marana Regional Airport.

The 2010 U.S. Census population figures were used to estimate service area population and these values were projected for the 2014 planning year by applying the average rate of Pinal County's population growth over the 2001-2011 period (7.47% annually). See **Table 2b**, below.

Table 2b: ESTIMATED EXTENDED SERVICE AREA POPULATION - 2014
San Manuel Airport – San Manuel, Arizona

Community	2010 Total Population[2]	Distance from E77 Airport	Percentage of Population Used	2010 Service Area Population[3]	2014 Service Area Population[3]
Dudleyville	959	24	100%	959	1,279
Mammoth	1,461	10	100%	1,461	1,949
San Manuel	3,551	2	100%	3,551	4,737
Oracle	3,686	11	100%	3,686	4,917
Catalina	7,569	25	100%	7,569	10,097
Oro Valley	41,011	36	69%	28,298	37,749
Casas Adobes	66,795	40	57%	38,073	50,789
Tucson – 85704	30,929	39	60%	18,557	24,755
Tucson – 85739	17,848	27	94%	16,777	22,380
Tucson – 85755	15,107	35	71%	10,726	14,308
Tucson – 85743	29,144	47	37%	10,783	14,384
Tucson – 85742	25,212	41	54%	13,615	18,162
Tucson – 85710	54,439	54	17%	9,255	12,346
Tucson – 85719	43,989	46	40%	17,596	23,473
TOTAL POPULATION	341,700			181,906	**241,325**

The population of the primary service area was defined as the estimated 2014 population of the communities of Mammoth, San Manuel, and Oracle. See **Table 2c**, below.

Table 2c: ESTIMATED PRIMARY SERVICE AREA POPULATION - 2014
San Manuel Airport – San Manuel, Arizona

Community	2010 Total Population[2]	Distance from E77 Airport	Percentage of Population Used	2010 Service Area Population[3]	2014 Service Area Population[3]
Mammoth	1,461	10	100%	1,461	1,949
San Manuel	3,551	2	100%	3,551	4,737
Oracle	3,686	11	100%	3,686	4,917
TOTAL POPULATION	8,698			8,698	**11,603**

Established Airport Elevation

The established airport elevation is defined as the highest point on an airport's usable runway expressed in feet above mean sea level (MSL).[1] The highest point on the San Manuel Airport's existing active runway is the threshold of Runway 29, at 3,273.8' MSL.[8]

Civil Airspace

The airspace surrounding the San Manuel Airport is depicted in **Figure 2-2, Airspace Map** at the end of this section.

The airport is located beneath Class E airspace that has a floor of 9,500' MSL. Civil aircraft may be following the "Victor" airways that extend between VORTAC radio navigation facilities in the area. The nearest of these is V 94 that passes about three miles south of San Manuel Airport on a route between the Stanfield (TFD) VORTAC station at Casa Grande and the San Simon (SSO) VORTAC. Regarding the Class E airspace and Victor airways, no airspace conflicts or constraints with adjacent airspace are evident that would affect the airport's present role.

Military Airspace [18]

Military Operation Areas (MOAs) and Military Training Routes (MTRs) are established for the purpose of separating certain military training activities, which routinely necessitate acrobatic or abrupt flight maneuvers, from Instrument Flight Rules (IFR) traffic. IFR traffic can be cleared through an active MOA if IFR separation can be provided by Air Traffic Control (ATC), otherwise ATC will reroute or restrict the IFR traffic.

Directly to the north of San Manuel Airport is the Outlaw Military Operations Area (MOA), and to the northeast is the adjacent Jackal and Jackal Low MOAs (see **Figure 2-2, Airspace Map**). Extensive military training activity is conducted within the MOAs. Outlaw MOA extends from 8,000 feet MSL or 3,000 feet AGL (whichever is higher) to but not including flight level 180. Jackal Low MOA extends from 100 feet AGL to but not including 11,000 feet MSL or 3,000 feet AGL (whichever is higher). Jackal MOA lies atop Jackal Low MOA from 11,000 feet MSL or 3,000 feet AGL (whichever is higher) to but not including flight level 180. Above all of these MOAs is Air Traffic Control Assigned Airspace (ATCAA) which extends from flight level 180 to flight level 510. These MOAs are active Monday through Friday from 7:00 a.m. until 6:00 p.m. All of these MOAs may be scheduled active at other times by issuing a Notice to Airmen (NOTAM), as is done for weekend or night missions.

There are also several low-level Military Training Routes (MTRs) in the local area. The nearest of these is Visual Routes (VR) -267, -268, and -269. The centerline of these superimposed routes is located approximately ten miles east of the airport. Along this leg, VR-267, -268, and -269 are four nautical miles (nm) wide (two nautical miles east and two nautical miles west of centerline) and extend from 300 feet AGL to 1,500 feet AGL. The closest western border of these MTRs is located approximately eight nautical miles east of the Airport. Additionally, numerous other MTRs converge at Black Mountain, northwest of the Airport with the centerline of VR-239 is located 16 nautical miles northwest of the Airport. Along these legs, VR-239 is ten nautical mile wide (five nautical miles north and five nautical miles south of centerline) and extends 300 feet AGL to 9,000 feet MSL. The closest southeastern border of VR-239 is located approximately 12 nautical miles northwest of the Airport.

The centerline of a VFR Helicopter Refueling track, AR-136V, passes three nautical miles northeast of the Airport at 6,500 feet MSL. AR-136V runs a length of sixty nautical miles between the town of Hayden (23 nautical miles north of the Airport) and a 5,680 feet peak (36 nautical miles southeast of the Airport). The track is four nautical miles wide (two nautical miles either side of centerline) placing its closest point just one mile northeast of the Airport.

Although the San Manuel Airport is located in a fairly high density military training area, the Arizona Air National Guard has indicated that there are no significant airspace constraints that affect the airport's ability to function in its present role. [18]

Wind Data Analysis

The overall operational safety of an airport is affected by the direction of its runways in relationship to the prevailing wind. In general terms, smaller aircraft are affected more by wind, although wind conditions will affect operation of any aircraft to some degree. Crosswinds are often a contributing factor in light aircraft accidents. Therefore, orientation of the runway such that it is aligned with the prevailing wind for the greatest percentage of the time will add substantially to the safety and usefulness of the airport.

The crosswind component of wind direction and velocity is defined as the resultant vector which acts at right angles to the runway centerline, and is equal to the wind velocity multiplied by the sine of the angle between the wind direction and the runway direction.

Wind coverage is defined as the percentage of time that the crosswind components are below an acceptable velocity.[5] These acceptable velocities vary with the airport's design Airport Reference Code (ARC), as follows in **Table 2d**:

Table 2d: ACCEPTABLE CROSSWIND COMPONENTS FOR VARIOUS AIRPORT REFERENCE CODES (ARC) [5]

Airport Reference Code (ARC)	Acceptable Crosswind Component
ARC A-IV through D-VI	20.0 knots
ARC A-III, B-III, and C-I through D-III	16.0 knots
ARC A-II and B-II	13.0 knots
ARC A-I and B-I	10.5 knots

The most desirable runway orientation based on wind is the one which has the greatest percentage of wind coverage. The FAA recommends a minimum percentage of wind coverage of 95% on the airport's primary runway. If a single runway cannot meet this criterion, a crosswind runway is recommended. The secondary crosswind runway should be aligned such that the total wind coverage for the two runways is at least 95%.[10]

San Manuel Airport is currently designated as an ARC B-I airport (requiring 10.5 knot coverage), but prior planning identified its reclassification to an ARC B-II facility in the future (requiring 13 knot coverage).[8] The wind data analysis indicates the following results (**Table 2e**):

Table 2e: WIND DATA ANALYSIS RESULTS / 2004-2013 ALL-WEATHER DATA
San Manuel Airport – San Manuel, Arizona

Crosswind Component	Wind Coverage
20.0 knots	99.70%
16.0 knots	98.87%
13.0 knots (**ARC B-II**)	**96.90%**
10.5 knots (**ARC B-I**)	**94.62%**

See **Figure 2-3, All-Weather Wind Rose** for a graphic depiction of the airport's wind coverage.

The wind data analysis indicates that Runway 11-29 is slightly deficient in wind coverage for accommodating ARC B-I aircraft, and in compliance with the wind coverage requirement for ARC B-II aircraft.

Other Weather Conditions: Temperature

An important factor that influences operations at an airport is the maximum average temperature that occurs at the airport. **Table 2f** illustrates the average monthly high and low temperatures and the average monthly precipitation at San Manuel. The maximum average daily high temperature is 97° Fahrenheit, occurring in June and July.

The relatively high altitude (3,274' MSL) along with the high summer temperatures experienced at the airport makes it necessary to consider the effects that high ambient temperatures have on aircraft performance.

Aircraft require longer takeoff runs at higher altitudes and at higher temperatures. Because of the effect of gravity, air is less dense at higher altitudes. At an altitude of 18,000 feet the density of the air is half that of the air at sea level. Lift and drag vary directly with the density of air - as the air density increases, lift and drag increase; as the air density decreases, lift and drag decrease. If an airplane is to maintain its lift, the velocity of the air over the wings must be increased.

Therefore, an aircraft departing at an airport at a higher altitude will require a longer runway to attain flying speed.

Table 2f: TEMPERATURE AND PRECIPITATION
San Manuel Airport – San Manuel, Arizona

Month	Average Temperature		Average Precipitation
	High	Low	
January	61˚ F	35˚ F	- - -
February	65˚ F	38˚ F	- - -
March	71˚ F	42˚ F	- - -
April	79˚ F	48˚ F	- - -
May	89˚ F	56˚ F	- - -
June	**97˚ F**	65˚ F	0.2”
July	**97˚ F**	70˚ F	3.1”
August	94˚ F	67˚ F	3.1”
September	89˚ F	62˚ F	2.2”
October	80˚ F	52˚ F	- - -
November	68˚ F	42˚ F	- - -
December	60˚ F	35˚ F	2.3”

Another way to look at this is that on a hot summer day a departing airplane will behave as if it is at a much higher altitude. Because air expands when heated, warm air is less dense than cool air. When other conditions remain the same, an airplane will require a longer takeoff run on a hot day than on a cool day. This contributes to the loss of lift, but also affects engine performance. Internal combustion engines produce less power at higher altitudes because they are operating in less dense air. Propellers lose efficiency at high altitudes also, both because of engine power loss and because propellers are airfoils which suffer in the same manner as wings when operating in less dense air.

Density Altitude is the calculated altitude at which the aircraft would produce the same amount of lift and power, at standard temperature (59° F) and pressure (29.92"). For example, an aircraft departing a Sea Level airport when the air temperature is 80° F would perform as if it were at an altitude of 1,500' MSL at 59° F - a “Density Altitude” of 1,500'.

Table 2g is an example of the increased runway length needed for a typical high-performance single engine propeller aircraft. The example aircraft is a Piper PA-32-300 “Cherokee Six”, a 6 or 7 seat single engine piston aircraft. Calculations are included for takeoff run and climb to a 50 foot altitude, and for landing, as temperatures increase. The calculations are based on San Manuel

Airport's elevation of 3,274' MSL, no wind and dry, paved runway conditions (note that the existing runway is 4,214' long with a gradient of 0.515%, sloping to the southeast).

Table 2g: APPROXIMATE RUNWAY TAKEOFF REQUIREMENTS [11]
FOR EXAMPLE AIRCRAFT (PIPER PA-32-300)
San Manuel Airport – San Manuel, Arizona

Temperature	Runway Length Required (Dry Pavement, No Wind)	
	Runway 11 (-0.515%)	Runway 29 (+0.515%)
60˚ F	2,260'	2,510'
70˚ F	2,450'	2,720'
80˚ F	2,670'	2,960'
90˚ F	2,890'	3,210'
97˚ F	**3,070'**	**3,400'**
100˚ F	3,150'	3,490'

In the above calculations, it was assumed that the airplane is operating at its maximum gross takeoff weight of 3,400 pounds.

After liftoff, climb performance suffers in a similar fashion. A minimum safe rate of climb after takeoff is about 400-500 feet per minute. A heavy or lower powered aircraft on a hot summer day may not be able to attain this rate, or any rate of climb at all after leaving ground effect. Any turns that are initiated after liftoff will further erode climb performance.

Other Weather Conditions: Ceiling and Visibility

Another important factor that influences operations at an airport is the percentage of time that the airport experiences weather conditions that would require arriving and departing aircraft to fly under Instrument Flight Rules (IFR). Aircraft must operate under Instrument Flight Rules whenever the meteorological conditions are below the minimums for visual flight (conducted under Visual Flight Rules, or VFR). These conditions are termed Instrument Meteorological Conditions (IMC).[6] Visual Flight Rules are in effect when Visual Meteorological Conditions (VMC) prevail. The Federal Aviation Regulations (FARs) define the basic VFR weather minimums as follows in **Table 2h**.

According to records for Tucson International Airport, VMC weather occurs approximately 99.7 percent of the time in the general area, while IMC weather occurs approximately 0.3 percent of the time.[12]

Table 2h: BASIC VISUAL FLIGHT RULES (VFR) WEATHER MINIMUMS [7]

Airspace		Flight Visibility	Distance from Clouds
Class A		Not Applicable	Not Applicable
Class B		3 statute miles	Clear of Clouds
Class C		3 statute miles	500 feet below 1,000 feet above 2,000 feet horizontal
Class D		3 statute miles	500 feet below 1,000 feet above 2,000 feet horizontal
Class E	Less than 10,000 feet MSL	3 statute miles	500 feet below 1,000 feet above 2,000 feet horizontal
	At or above 10,000 feet MSL	5 statute miles	1,000 feet below 1,000 feet above 1 statute mile horizontal
Class G	1,200 feet or less above the surface (regardless of MSL altitude) – Day*	1 statute mile	Clear of clouds
	1,200 feet or less above the surface (regardless of MSL altitude) – Night*	3 statute miles	500 feet below 1,000 feet above 2,000 feet horizontal
	More than 1,200 feet above the surface but less than 10,000 feet MSL - Day	1 statute mile	500 feet below 1,000 feet above 2,000 feet horizontal
	More than 1,200 feet above the surface but less than 10,000 feet MSL - Night	3 statute miles	500 feet below 1,000 feet above 2,000 feet horizontal
	More than 1,200 feet above the surface and at or above 10,000 feet MSL	5 statute miles	1,000 feet below 1,000 feet above 1 statute mile horizontal

***** Except as provided in §91.155(b)

Airport Facilities Inventory

The following narrative includes a description of each of the major improvements existing at the airport. In this chapter, each element of the airport's existing infrastructure was evaluated in terms of the following two criteria:

Condition - The general condition of each element was evaluated by on site observation and, where noted, with reference to other recent field evaluations. In the narrative, each existing feature has been assigned a general condition rating. These ratings are defined as follows:

Table 2i: CONDITION RATING DEFINITIONS
San Manuel Airport – San Manuel, Arizona

RATING	DEFINITION
GOOD	May be assumed to be adequate throughout the 20-year time frame, with only normal maintenance (crack seal, seal coats, repainting, etc.).
FAIR	Item will probably require major upgrade or replacement at some time during the 20-year planning period, but is at least serviceable at the present time.
POOR	Indicates that the item is not adequate for its intended use at the present time, and should be reconstructed as soon as possible.
Maintenance	Indicates that the item is not being maintained properly. An ongoing maintenance program is recommended.

Compliance - Each element was evaluated to ascertain whether it complies with the most current FAA design criteria in its existing configuration. A notation of "NC" indicates that the item does not meet the requirements of current FAA design criteria (noncompliance). A waiver of design standards and/or reconstruction to correct the deficiency is required.

Each element will be evaluated in terms of its **Capacity** to accommodate airport demand in the present and ultimate time frames in **Chapter 5, Airport Facility Requirements**.

The following evaluation of the airport's existing infrastructure is based on field observations of existing conditions undertaken on November 11th and 12th, 2013, as well as other reference documents as noted. The pavement evaluations contained in this chapter are based on visual observations and on information contained in the Arizona Department of Transportation 2010 Airport Pavement Management System (ADOT APMS). The APMS rates airport pavements based on a Pavement Condition Index (PCI) system, as follows:

- PCI 100-86 = Routine maintenance required
- PCI 85-56 = Pavement preservation required
- PCI 55-0 = Major pavement rehabilitation required

The encircled numeric keys for each facility evaluated below are referenced to **Figure 2-4, Inventory Key Map**, at the end of this chapter. The results of the facilities evaluation are summarized in **Table 2j** at the end of this chapter.

1

Runway 11-29

Runway 11-29 was originally constructed in 1953 as a gravel landing strip. It was first paved to a 60' width in 1960.[15]

The runway pavement was fully reconstructed in 2000 (to a 75' width). A surface seal was applied in 2002 and again in 2004. Crack sealing was performed in 2005 and 2009. A rubberized slurry seal was applied in 2010.[13] The current runway pavement length is 4,214 feet.[8]

Pavement – Runway 11-29's asphaltic concrete pavement appears to be 2" in depth. It appears that some cracks were sealed since application of the 2010 seal coat. However, the pavement now exhibits significant longitudinal cracking spaced approximately 15' apart fairly consistently along the entire runway. These cracks are full depth and between ¼" and ½" wide. There is also transverse cracking spaced approximately 20-30 feet apart with crack widths of up to 1". This cracking pattern also is fairly consistent along the entire runway. The 2010 ADOT APMS rates the Runway 11-29 pavement at a PCI of 76.[13] The 2013 APMS data shows the runway at a PCI of 100 to account for a planned 2014 APMS rehabilitation project.[14] Based on field observations, the runway pavement appears to be in FAIR condition, and requires crack sealing and a seal coat (along with new pavement marking) at the present time.

Runway Safety Area (RSA) – FAA design standards indicate that an RSA must be "cleared and graded and have no potentially hazardous ruts, humps, depressions, or other surface variations; drained by grading or storm sewers to prevent water accumulation; capable, under dry conditions, of supporting … the occasional passage of aircraft without causing damage to the aircraft; and free of objects, except for objects that need to be located in the RSA because of their function."[5] The current standards also state that "RSA standards cannot be modified."[5]

The Runway 11 extended RSA is 240' long and 120' wide, conforming to ARC B-I requirements.[8] The extended RSA is graded away from the runway with no obstructions or significant erosion in evidence. There is an existing major drainage channel located approximately 300' from the end of the runway. This channel is approximately 6 to 7 feet deep, with a 30' wide bottom and 25' wide side slopes. While this channel is outside of the existing ARC B-I extended RSA, upgrading the airport to ARC B-II in the future will require a 300' long by 150' wide extended RSA. The channel will then have to be either relocated or a box culvert would need to be constructed to provide compliance with ARC B-II standards.

The Runway 29 extended RSA is also 240' long and 120' wide, conforming to ARC B-I requirements.[8] The extended RSA is graded away from the runway with no obstructions or significant erosion in evidence, with the exception of some vegetation (bushes) present. This RSA requires Maintenance to provide compliance with clearing standards.

Grading and Drainage - Runway 11-29's shoulders within the existing 120' wide ARC B-I RSA have vegetation (grass and bushes) growing up to one foot high along the pavement edges. The runway shoulders and RSAs are in GOOD condition, but require ongoing Maintenance to avoid development of hazardous conditions such as high vegetation and erosion along the pavement edges and off the runway ends.

Pavement Markings - The runway paint markings were applied after the slurry seal application in 2010. They were observed to be faded and worn. They are considered to be in POOR condition at the present time.

2

Parallel Taxiway A – Northwest End

This portion of parallel Taxiway A was originally constructed in 2000. A surface seal was applied in 2002. Crack sealing was performed in 2009. A slurry seal was applied in 2010.[13] This taxiway is equipped with retroreflective edge markers that were installed in 2013.

Pavement – The taxiway's asphaltic concrete pavement appears to be 2" in depth. It appears that some cracks were sealed since application of the 2010 seal coat. However, the pavement now exhibits transverse cracking spaced approximately 30 feet apart with crack widths of up to 1". The 2010 ADOT APMS rates this taxiway's pavement at a PCI of 86.[13] The 2013 APMS data shows the pavement condition declining to a PCI of 81.[14] Based on field observations, the pavement appears to be in FAIR condition, and requires crack sealing at the present time.

Grading and Drainage – Taxiway shoulders are in generally GOOD condition with the exception of some minor erosion on the north shoulder area of the taxiway.

Pavement Marking – The existing pavement markings (center line stripe and hold bars) are non-reflective and are faded. The markings are in POOR condition.

3
4

Parallel Taxiway A – Northwest of Taxiway A5 and
Parallel Taxiway A – Southeast of Taxiway A4

These portions of parallel Taxiway A were constructed as a graded taxiway in 2000, but were not paved until 2010 (based on aerial photo records[16]).

Pavement – Taxiway A's pavement surface does not have significant cracking. The pavement surface has not been seal coated. The ADOT APMS for 2010 and 2013 does not include these pavement areas in their evaluations. The pavement in these areas is in GOOD condition.

Grading and Drainage – Shoulder grading along the south end of this taxiway is inconsistent and becomes steep. The graded shoulder south of Taxiway A4 is quite steep. These gradients may be in noncompliance with current FAA design standards (NC).

Marking - The existing pavement markings (center line stripe and hold bars) are non-reflective and are faded. The markings are in POOR condition.

5

Taxiway A1

Taxiway A1 was originally constructed in 2000. A surface seal was applied in 2002. Crack sealing was performed in 2009. A slurry seal was applied in 2010.[13] This taxiway is equipped with retroreflective edge markers that were installed in 2013.

Pavement – It appears that some cracks were sealed since application of the 2010 seal coat. However, the pavement now exhibits transverse cracking spaced approximately 30 feet apart with crack widths of from ½” to 1” wide. There is also a longitudinal crack along the center line that is ¼” to ½” wide. The 2010 ADOT APMS rates this taxiway’s pavement at a PCI of 86.[13] The 2013 APMS data shows the pavement condition declining to a PCI of 81.[14] Based on field observations, the pavement appears to be in FAIR condition, and requires crack sealing at the present time.

Grading and Drainage – Shoulder grading is consistent with no significant erosion (GOOD).

Pavement Marking – The existing hold bar pavement markings are faded. The hold bar has been relocated in the past, but when the original markings were removed the ground pavement was not seal coated. The markings are in POOR condition.

6

Taxiway A2

Taxiway A2 was originally constructed in 2000. A surface seal was applied in 2002. Crack sealing was performed in 2009. A slurry seal was applied in 2010.[13] This taxiway is equipped with retroreflective edge markers that were installed in 2013.

Pavement – It appears that some cracks were sealed since application of the 2010 seal coat. However, the pavement now exhibits transverse cracking spaced approximately 30 feet apart with crack widths of from ¼” to ½” wide. There is also a longitudinal crack along the center line that is up to ¼” wide. The 2010 ADOT APMS rates this taxiway’s pavement at a PCI of 86.[13] The 2013 APMS data shows the pavement condition declining to a PCI of 81.[14] Based on field observations, the pavement appears to be in FAIR condition, and requires crack sealing at the present time.

Grading and Drainage - Shoulder grading is consistent with no significant erosion (GOOD).

Pavement Marking – The existing hold bar pavement markings are faded. The hold bar has been relocated in the past, but when the original markings were removed the ground pavement was not seal coated. The markings are in POOR condition.

7

Taxiway A3

Connector Taxiway A3 was constructed in 2010 when parallel Taxiway A was paved (based on aerial photo records[16]).

Pavement – Taxiway A3’s pavement surface does not have significant cracking. The pavement surface has not been seal coated. The ADOT APMS for 2010 and 2013 does not include this pavement area in their evaluations. The pavement in these areas is in GOOD condition.

Grading and Drainage – There is an 18" plastic pipe culvert under this connector taxiway. At the time of the field observation this culvert was 1/3 full of sediment. There is some erosion to the shoulder above the pipe inlet, and the slopes beyond the taxiway shoulder are steep. Rip rap slope protection is in place at both the inlet and outlet of the culvert. The pipe and rip rap are in GOOD condition. However, Maintenance is needed to keep the pipe clear of sediment and to manage erosion.

Marking - The existing pavement markings (center line stripe and hold bars) are faded. The markings are in POOR condition.

8

Taxiway A4

Midfield connector Taxiway A4 was constructed originally in 2000. A surface seal was applied in 2002. Crack sealing was performed in 2009. A slurry seal was applied in 2010.[13] This taxiway is equipped with retroreflective edge markers that were installed in 2013.

Pavement – It appears that some cracks were sealed since application of the 2010 seal coat. However, the pavement now exhibits longitudinal and transverse cracking with crack widths of from ¼" to ½" wide. The 2010 ADOT APMS rates this taxiway's pavement at a PCI of 86.[13] The 2013 APMS data shows the pavement condition declining to a PCI of 81.[14] Based on field observations, the pavement appears to be in FAIR condition, and requires crack sealing at the present time.

Grading and Drainage – Shoulder grading is consistent with no significant erosion (GOOD).

Pavement Marking – The existing hold bar pavement markings are faded. The hold bar has been relocated in the past, but when the original markings were removed the ground pavement was not seal coated. The markings are in POOR condition.

9

Taxiway A5

Connector Taxiway A5 was constructed in 2010 when parallel Taxiway A was paved (based on aerial photo records[16]).

Pavement – Taxiway A5's pavement surface does not have significant cracking. The pavement surface has not been seal coated. The ADOT APMS for 2010 and 2013 does not include this pavement area in their evaluations. The pavement in these areas is in GOOD condition.

Grading and Drainage – There is an 18" plastic pipe culvert under this connector taxiway. There is some erosion to the shoulder near the edge of pavement, and the slopes beyond the taxiway shoulders are steep. Rip rap slope protection is in place at both the inlet and outlet of the culvert and in the drainage swale. The pipe and rip rap are in GOOD condition. However, ongoing Maintenance is needed to keep the pipe clear of sediment and to manage erosion.

Marking - The existing pavement markings (center line stripe and hold bars) are faded. The markings are in POOR condition.

10

Taxiway A6

Connector Taxiway A6 was constructed originally in 2000. A surface seal was applied in 2002. Crack sealing was performed in 2009. A slurry seal was applied in 2010.[13] This taxiway serves the graded dirt hangar area and dirt parking area at the southeast end of the airfield, and has a very steep gradient from the runway to the hangar area.

Pavement – It appears that some cracks were sealed since application of the 2010 seal coat. However, the pavement now exhibits longitudinal and transverse cracking at 30’ spacing with crack widths of from ¼” to ½” wide. The 2010 ADOT APMS rates this taxiway’s pavement at a PCI of 86.[13] The 2013 APMS data shows the pavement condition declining to a PCI of 81.[14] Based on field observations, the pavement appears to be in FAIR condition, and requires crack sealing at the present time.

Grading and Drainage – Shoulder grading is consistent with no significant erosion (GOOD).

Pavement Marking – The existing hold bar pavement markings are faded. The hold bar is in the incorrect location and is nonstandard and faded. The markings are in POOR condition. The hold bar should be replaced with a standard marking, with the correct setback from the runway.

11

Aircraft Parking Apron

The Aircraft Parking Apron was constructed originally in 2000. A surface seal was applied in 2002 and again in 2004. Crack sealing was performed in 2005 and again in 2009. A slurry seal was applied in 2010.[13] There are twenty aircraft parking spaces on this apron, each with three tiedown anchors. The Apron is lighted with three area lights that are in GOOD condition.

Pavement – According to recent pavement investigations[17], the Aircraft Parking Apron pavement consists of an average of 2 ¼” of asphaltic concrete over an average of 4” of aggregate base course. It appears that some cracks were sealed since application of the 2010 seal coat. However, this pavement now exhibits longitudinal cracking at 12’ spacing with crack widths of from ¼” to ½” wide, and also transverse cracking with 20’ to 30’ spacing and crack widths ranging from ¼” up to 2”. There is also cracking around the tiedown anchors up to ½” wide. The 2010 ADOT APMS rates this taxiway’s pavement at a PCI of 79.[13] The 2013 APMS data shows the pavement condition declining to a PCI of 59.[14] Based on field observations, the pavement appears to be in POOR condition. A project is underway to rehabilitate the Aircraft Parking Apron pavement, with construction scheduled for 2014. The tiedown anchors are in GOOD condition, but may be replaced as part of the pavement rehabilitation project.

Grading and Drainage – Shoulder grading is consistent with no significant erosion (GOOD).

Pavement Marking – The existing pavement markings are faded and worn. The markings are in POOR condition.

12

Hangar Area Apron

The north end of the Hangar Area Apron (north of the northernmost Tee-Hangar building) was constructed originally in 2000. Crack sealing was performed in 2009. A slurry seal was applied in 2010.[13]

The south portion of the Hangar Area Apron (between the two Tee-Hangar buildings and south of the southernmost Tee-Hangar) was constructed in 2005. A slurry seal was applied in 2005 also. Crack sealing was performed in 2009. A slurry seal was applied in 2010.[13]

Pavement (North Portion) – According to recent pavement investigations[17] and the field inventory observations, the north end of the Hangar Area Apron has only a very thin lift of asphalt pavement, ½" to 1" thick. The pavement exhibits areas of pavement failure, and there is some alligator cracking in some areas, and also some potholing. The 2010 ADOT APMS rates this pavement at a PCI of 71.[13] The 2013 APMS data shows the pavement condition declining to a PCI of 51.[14] Based on field observations and the PCI ratings, the pavement appears to be in POOR condition.

Pavement (South Portion) – According to recent pavement investigations[17] and the field inventory observations, the south portion of the Hangar Area Apron has 1 ½" to 2 ½" of asphaltic concrete over 2" to 2 ½" of aggregate base course. This pavement exhibits some minor cracking with crack widths of less than ¼" wide. There are also some areas exhibiting raveling. The 2010 ADOT APMS rates this pavement at a PCI of 99.[13] The 2013 APMS data shows the pavement condition declining to a PCI of 89.[14] Based on field observations and the PCI ratings, the pavement appears to be in GOOD condition.

Grading and Drainage – Shoulder grading is consistent with no significant erosion (GOOD).

Pavement Marking – There are no centerline stripes to designate the hangar access taxilanes.

13
14

Access Road – Northwest of Box Culvert (to Hangar Area Apron) and Access Road – Southeast of Box Culvert (to Highway)

The airport's Access Road was constructed in 2000. It runs from State Highway 76 southwest of the airport, northeasterly approximately 2,000 feet to the airport's southeast property corner. It then turns ninety degrees to the left and continues northwesterly approximately 4,700' to the Hangar Area Apron.

Pavement – The Access Road's asphalt pavement surface does not have significant cracking. The ADOT APMS for 2010 and 2013 does not include this pavement area in their evaluations. The pavement along the straight stretches of the road is in relatively good condition. However, the ninety degree bend near the airport's southeast property corner has some potholes and evidence of pavement failure. The pavement thickness along the road is approximately 1". Because of the degradation at the ninety degree bend and the thin pavement, the Access Road pavement is rated as FAIR.

Grading and Drainage – The Access Road has a major box culvert that was constructed along with the Drainage Channel (Item 16 below). The box culvert was found to be in GOOD condition. There are two pipe culverts located at the ninety degree bend in the Access Road. The shoulder in this area has significant erosion that is threatening the roadway. A 42" pipe culvert inlet approximately 100 feet west of the box culvert is completely buried and not functional. There is evidence that storm water is now crossing the Access Road and eroding the northeast shoulder. There is also a triple pipe culvert under the Access Road downstream of the 42" culvert that has significant sediment and requires Maintenance. The general condition of the grading and drainage features of the Access Road is rated as POOR because of the need to rehabilitate some of the subsurface drainage features.

Pavement Marking – The southwesterly 2,000 feet of the Access Road (from State Highway 76 to the approach to the ninety degree bend) has a centerline stripe that is faded and worn. The remainder of the road has no center stripe. Pavement marking is in POOR condition.

15

Perimeter Fence

Most of the airport's perimeter fence consists of old four strand barbed wire fencing. The barbed wire fence along the north side of the airport (northwest of the hangars and apron) and along the northwest end of the airport property is in generally GOOD condition. The barbed wire fence along the south side of the airport (along the old railroad grade) has many gaps and areas of deterioration, and is in POOR condition. In addition to the barbed perimeter wire fence, there is a four strand smooth wire fence on either side of the Drainage Channel that is in GOOD condition. There is some chain link fencing in existence in the terminal area. The chain link fence is in GOOD condition.

16

Drainage Channel

This flood-control Drainage Channel was constructed in 2000 to protect the airport from significant storm water surface runoff that enters the airport property from the southwest. The channel bottom varies from approximately 30' to 60' feet wide. The channel includes several concrete drop/stilling structures. Field observations indicate that the Drainage Channel is functioning well and in GOOD condition, with only minor erosion evident near one of the drop structures, and in several places along the channel's south bank.

17

Auxiliary Wind Cone

An auxiliary wind cone is located near the aircraft parking apron. The wind cone is unlighted and the structure is in GOOD condition. The wind cone fabric is faded and will require replacement soon. This location previously was the primary wind cone, and had a segmented circle. The segmented circle was removed when the current lighted primary wind cone was installed in 2013. The auxiliary wind cone complies with current FAA design standards.

18

Runway 11-29 Edge Lighting

Runway 11-29 is equipped with Medium Intensity Runway Lights (MIRL). This system was installed in 2013 and is in GOOD condition. The system includes clear (white) edge lights for the entire length of the runway, as well as red/green threshold lights at each runway end. San Manuel Airport has no published instrument approaches, and this MIRL system is appropriate for a visual runway. If a nonprecision instrument approach is implemented at San Manuel in the future, the color of the edge lights will have to be changed to yellow for the last 2,000 feet of runway (this is termed the "caution zone") in each landing direction that has a nonprecision instrument approach. This will require the installation of split white/yellow lenses so that, when on approach to landing at night, the pilot can distinguish the last 2,000 feet of available landing length.

The MIRL system is in compliance with current FAA design standards for a visual runway. During the field observations, it was noted that there were bushes and grass growing near the edge lights that could obstruct them without Maintenance.

19

Segmented Circle and Lighted Wind Cone

The segmented circle and lighted wind cone were installed in 2013, just prior to the preparation of this Master Plan. The installation is enclosed by a chain link security fence. The wind cone, structure, and fence are in GOOD condition and are in compliance with current FAA design standards.

20

Automated Weather Observation System (AWOS)

The Automated Weather Observation System (AWOS) was constructed in 2011 (based on historical aerial photography[16]). The equipment, site and security fencing are in GOOD condition. The AWOS information is available to arriving pilots on radio frequency 134.125. The AWOS can also be accessed by telephone at (520) 385-4238 for pre-flight information. However, data is not transmitted to the National Climatic Data Center (NCDC) at the present time.

21

Runway 11 Precision Approach Path Indicator (PAPI)

The Runway 11 PAPI was installed in 2013, just prior to the preparation of this Master Plan. The installation is in GOOD condition and is in compliance with current FAA design standards.

22

Runway 11 Runway End Identifier Lights (REIL)

The Runway 11 REIL system was installed in 2013, just prior to the preparation of this Master Plan. The installation is in GOOD condition and is in compliance with current FAA design standards.

23

Runway 29 Precision Approach Path Indicator (PAPI)

The Runway 29 PAPI was installed in 2013, just prior to the preparation of this Master Plan. The installation is in GOOD condition and is in compliance with current FAA design standards.

24

Runway 29 Runway End Identifier Lights (REIL)
The Runway 29 REIL system was installed in 2013, just prior to the preparation of this Master Plan. The installation is in GOOD condition and is in compliance with current FAA design standards.

25

26

Storm Drainage Structures and Culverts
Two major airfield storm drainage structures were found to be in need of Maintenance during the November, 2013 field inventory. The first of these is a 30" pipe culvert located approximately 750' northwest of Taxiway A4, passing beneath parallel Taxiway A. The second is a catch basin with a 42" pipe located approximately 450' northwest of the Runway 29 end, about 70' southwest of the edge of pavement. Both of these drainage features were found to be nonfunctional because their inlets are completely clogged with dirt and debris. These features appear to be in GOOD condition, but require Maintenance. An ongoing inspection and maintenance program is recommended for all storm drainage infrastructure at the airport. (See also the discussion of drainage features that require attention under item 13/14, Access Road.)

27

Auxiliary Wind Cone
An auxiliary wind cone is located near the northwest end of Runway 11-29. The wind cone is unlighted and the structure and wind cone fabric are in GOOD condition. The auxiliary wind cone complies with current FAA design standards.

28

Rotating Beacon
A new Rotating Beacon was installed near the lighted wind cone and segmented circle in 2013, just prior to the preparation of this Master Plan. The installation is in GOOD condition and is in compliance with current FAA design standards.

A

B

Tee Hangars (Two Structures Northwest of Aircraft Parking Apron)
There are two steel-sided, steel frame Tee Hangar structures located northwest of the existing Aircraft Parking Apron. Each of these structures has ten hangar bays with sliding doors (five bays on each side of the building). At the southeast end of each structure there is a small office/storage room. Both Tee Hangar structures are in GOOD condition.

C

Tee Hangars (Southeast End of Airport)
An older privately owned Tee Hangar structure is located near Taxiway A6 at the southeast end of the airport property. The building is of steel tube frame construction with corrugated steel siding. There are eight hangar bays. This structure was in existence prior to 1992 based on historical aerial photography[16]. Based on field observations and the type of construction, the building was probably constructed in the 1960s. Extension of the parallel taxiway would require


Photo 1 - Tee Hangars at southeast end of airport

removal of this building (and also a significant amount of fill). The Tee Hangar structure is rated as being in FAIR condition.

D

Conventional Hangar

A privately owned multi-aircraft conventional hangar is located to the north of the older Tee Hangars. Based on historical aerial photography[16], this building was constructed sometime between 1996 and 2003. It is of steel frame construction and is sided with corrugated steel. The hangar is approximately 60' wide by 36' deep, with a full length sliding door on its southwest face. This hangar can accommodate two aircraft. This hangar is rated as being in FAIR condition.

Photo 2 - Conventional Hangar, Single Tee Hangar and storage container (used to store a gyrocopter)

E

Mobile Home Residence

There is a privately owned mobile home located on the airport property (on leased land), directly southeast of the older Tee Hangars. This was originally the airport manager's residence, and has been in place prior to 1992 based on historical aerial photography[16]. Two tall trees at this site may be obstructions to the Runway 11-29 transitional surface, putting the airport in noncompliance with Federal Air Regulations Part 77. Future extension of the parallel taxiway would require removal of this building (and also a significant amount of fill). The Mobile Home Residence is rated as being in POOR condition.

F

Electrical Vault

The 6'-8" X 11' Electrical Vault building was constructed and the equipment was installed in 2013. The Vault and equipment are in GOOD condition.

G

Restroom

A small Restroom building is located immediately southeast of the Conventional Hangar. This building has been in place prior to 1992 based on historical aerial photography[16]. It is in FAIR condition, but is not needed now that the airport will have a new Terminal Building.

H

Terminal Building

The Terminal Building was just completed at the time of preparation of this Master Plan. It is in GOOD condition. The building is of frame construction and includes a large meeting room/lobby, a restroom, storage room, and two large offices.

Fuel Tank and Delivery System

The airport's fuel system includes a 12,000 gallon double wall fuel tank, pump, and credit card reader equipment, as well as a fire extinguisher station. The tank and equipment are in GOOD condition. There is no secondary containment sump for the fuel tank.

Photo 3 - Fuel Tank and Pumps

Single Tee Hangar

A privately owned single-aircraft Tee Hangar is located near the Conventional Hangar at the southeast end of the airport property. The building is of light steel frame construction and is steel sided. This hangar is in POOR condition. A portable storage container is located directly southeast of the Single Tee Hangar. The storage container is used to store a gyrocopter.

❖ ❖ ❖

Facilities Evaluation Summary

The results of the facilities evaluation are summarized in **Table 2j** on the following pages.

Table 2j: FACILITIES EVALUATION SUMMARY
San Manuel Airport – San Manuel, Arizona

Key	FACILITY	Condition	NOTES	2010 APMS PCI	2013 APMS PCI
1	**Runway 11-29**				
	Pavement	FAIR	Maintenance (crack sealing)	76	None
	RWY 11 Ext. RSA	GOOD	Complies w/B-I standards, not B-II	- - -	- - -
	RSA	GOOD	Maintenance (mowing)	- - -	- - -
	RWY 29 Ext. RSA	GOOD		- - -	- - -
	Grading / Drainage	GOOD	Maintenance (mowing)	- - -	- - -
	Marking	POOR	Worn and faded	- - -	- - -
2	**Taxiway A – NW End**				
	Pavement	FAIR	Maintenance (crack sealing)	86	81
	Grading / Drainage	GOOD	Some minor erosion - north edge	- - -	- - -
	Marking	POOR	Worn and faded	- - -	- - -
3	**Taxiway A (parallel)**				
4	Pavement	GOOD		- - -	- - -
	Grading / Drainage	NC	Steep side slopes	- - -	- - -
	Marking	POOR		- - -	- - -
5	**Taxiway A1**				
	Pavement	FAIR	Maintenance (crack sealing)	86	81
	Grading / Drainage	GOOD		- - -	- - -
	Marking	POOR	Worn and faded	- - -	- - -
6	**Taxiway A2**				
	Pavement	FAIR	Maintenance (crack sealing)	86	81
	Grading / Drainage	GOOD		- - -	- - -
	Marking	POOR	Worn and faded	- - -	- - -
7	**Taxiway A3**				
	Pavement	GOOD		86	81
	Grading / Drainage	GOOD	Maintenance (erosion/sediment)	- - -	- - -
	Marking	POOR	Worn and faded	- - -	- - -

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8	**Taxiway A4**				
	Pavement	FAIR	Maintenance (crack sealing)	86	81
	Grading / Drainage	GOOD		- - -	- - -
	Marking	POOR	Worn and faded	- - -	- - -
9	**Taxiway A5**				
	Pavement	GOOD		- - -	- - -
	Grading / Drainage	GOOD	Maintenance (erosion/sediment)	- - -	- - -
	Marking	POOR	Worn and faded	- - -	- - -
10	**Taxiway A6**				
	Pavement	FAIR	Maintenance (crack sealing)	86	81
	Grading / Drainage	GOOD		- - -	- - -
	Marking	POOR	Hold bar non-standard / faded	- - -	- - -
11	**Aircraft Parking Apron**				
	Pavement	POOR	2014 rehabilitation programmed	79	59
	Grading / Drainage	GOOD		- - -	- - -
	Tiedowns	GOOD		- - -	- - -
	Marking	POOR	Worn and faded	- - -	- - -
12	**Hangar Area Apron**				
	Pavement (North)	POOR	Pavement failures	71	52
	Pavement (South)	GOOD		99	89
	Grading / Drainage	GOOD		- - -	- - -
	Marking	POOR	No center line markings	- - -	- - -
13	**Access Road**				
14	Pavement	FAIR	Thin section / POOR at 90˚ turn	- - -	- - -
	Grading / Drainage	POOR	Nonfunctional culverts	- - -	- - -
	Marking	POOR	No center stripe much of road	- - -	- - -
15	**Perimeter Fence**				
	B/W Perimeter	POOR	Gaps and aged fencing	- - -	- - -
	Channel Fence	GOOD		- - -	- - -
	Chain Link	GOOD	In terminal area	- - -	- - -

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16	**Drainage Channel**	GOOD	Monitor erosion	- - -	- - -
17	**Auxiliary Wind Cone**	GOOD		- - -	- - -
18	**Runway Edge Lighting**	GOOD	New (2013) – Mowing needed	- - -	- - -
19	**Seg. Circle/Wind Cone**	GOOD	New construction (2013)	- - -	- - -
20	**AWOS**	GOOD	No data transmission to NCDC	- - -	- - -
21	**Runway 11 PAPI**	GOOD	New construction (2013)	- - -	- - -
22	**Runway 11 REIL**	GOOD	New construction (2013)	- - -	- - -
23	**Runway 29 PAPI**	GOOD	New construction (2013)	- - -	- - -
24	**Runway 29 REIL**	GOOD	New construction (2013)	- - -	- - -
25	**30” Pipe Culvert**	GOOD	Maintenance (clogged)	- - -	- - -
26	**Catch Basin**	GOOD	Maintenance (clogged)	- - -	- - -
27	**Auxiliary Wind Cone**	GOOD		- - -	- - -
28	**Rotating Beacon**	GOOD	New construction (2013)	- - -	- - -
A	**Tee Hangars**	GOOD	County owned	- - -	- - -
B	**Tee Hangars**	GOOD	County owned	- - -	- - -
C	**Tee Hangars**	FAIR	Privately owned	- - -	- - -
D	**Conventional Hangar**	FAIR	Privately owned	- - -	- - -
E	**Residence**	POOR	Trees - FAR Part 77 obstructions	- - -	- - -
F	**Electrical Vault**	GOOD	New construction (2013)	- - -	- - -
G	**Restroom**	FAIR		- - -	- - -
H	**Terminal Building**	GOOD	New construction (2013)	- - -	- - -
I	**Fuel Tank/System**	GOOD	No secondary containment sump	- - -	- - -
J	**Single Tee Hangar**	POOR	Privately owned	- - -	- - -

Chapter References

[1] FAA Advisory Circular 150/5070-6B, Airport Master Plans, May 1, 2007

[2] U. S. Department of Commerce, Bureau of Economic Analysis, October 17, 2013 (from U.S. Census records)

[3] Calculations by Nicholas J. Pela & Associates

[4] Information provided by the Pinal County Airport Director

[5] FAA Advisory Circular 150/5300-13A, Airport Design

[6] Federal Aviation Regulations, Section 170.3, Definitions

[7] Federal Aviation Regulations, Section 91.155, Basic VFR weather minimums.

[8] San Manuel Airport – Airport Layout Plan, Coffman Associates, latest revision by Nicholas J. Pela & Associates May 21, 2013

[9] National Plan of Integrated Airport Systems (NPIAS) 2013-2017, September 27, 2012

[10] FAA Advisory Circular AC 150/5325-4B – Runway Length Requirements for Airport Design, July 1, 2005

[11] ACdata v7.00 Aircraft Performance Calculator, Nicholas J. Pela & Associates

[12] Tucson International Airport Master Plan Update, Landrum & Brown, December, 2004

[13] 2010 Airports Pavement Management System , Arizona Department of Transportation

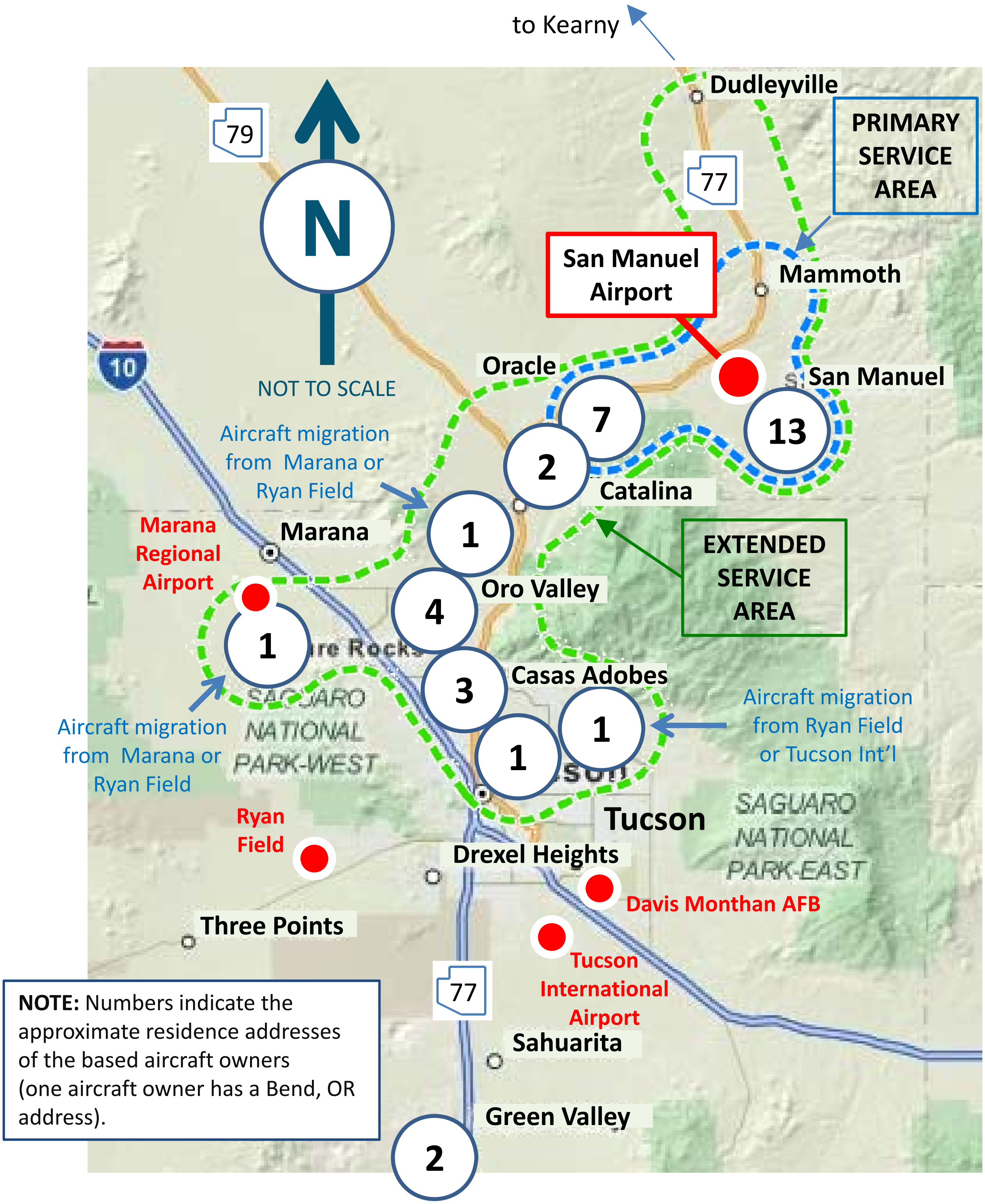
[14] 2013 Airports Pavement Management System (Raw Data), Arizona Department of Transportation

[15] San Manuel Airport – Airport Master Plan, Coffman Associates and Z&H Engineering, November 12, 2003

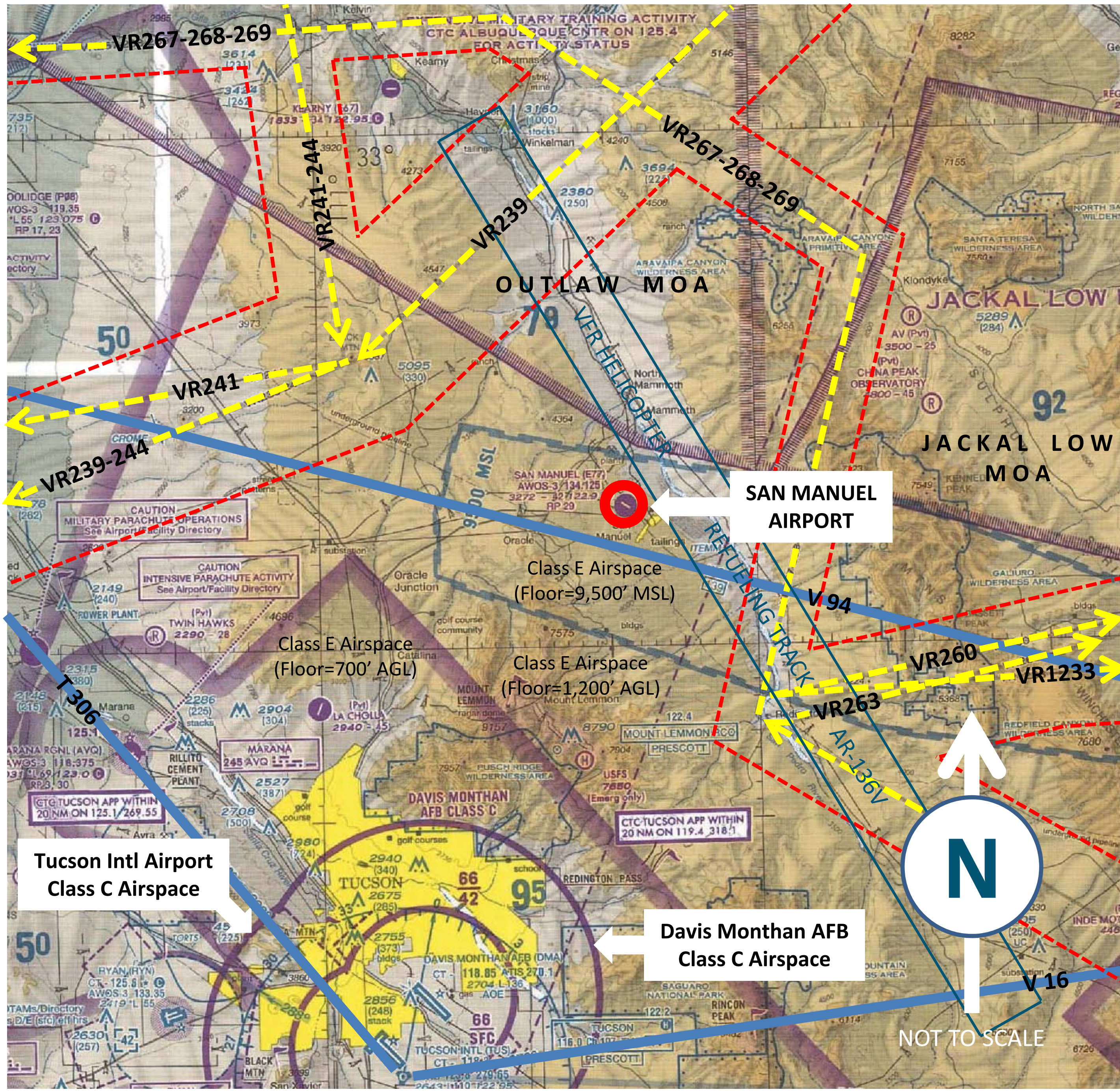
[16] Google Earth

[17] Draft Report on Pavement Investigation – San Manuel Airport Apron Rehabilitation, Speedie and Associates, November 15, 2013

[18] Information provided by Lieutenant Colonel David R. Stine, 162 FW Airspace Manager, OSS/OSOA, and 162 OG Chief of Wing Scheduling, OSS/OSOS



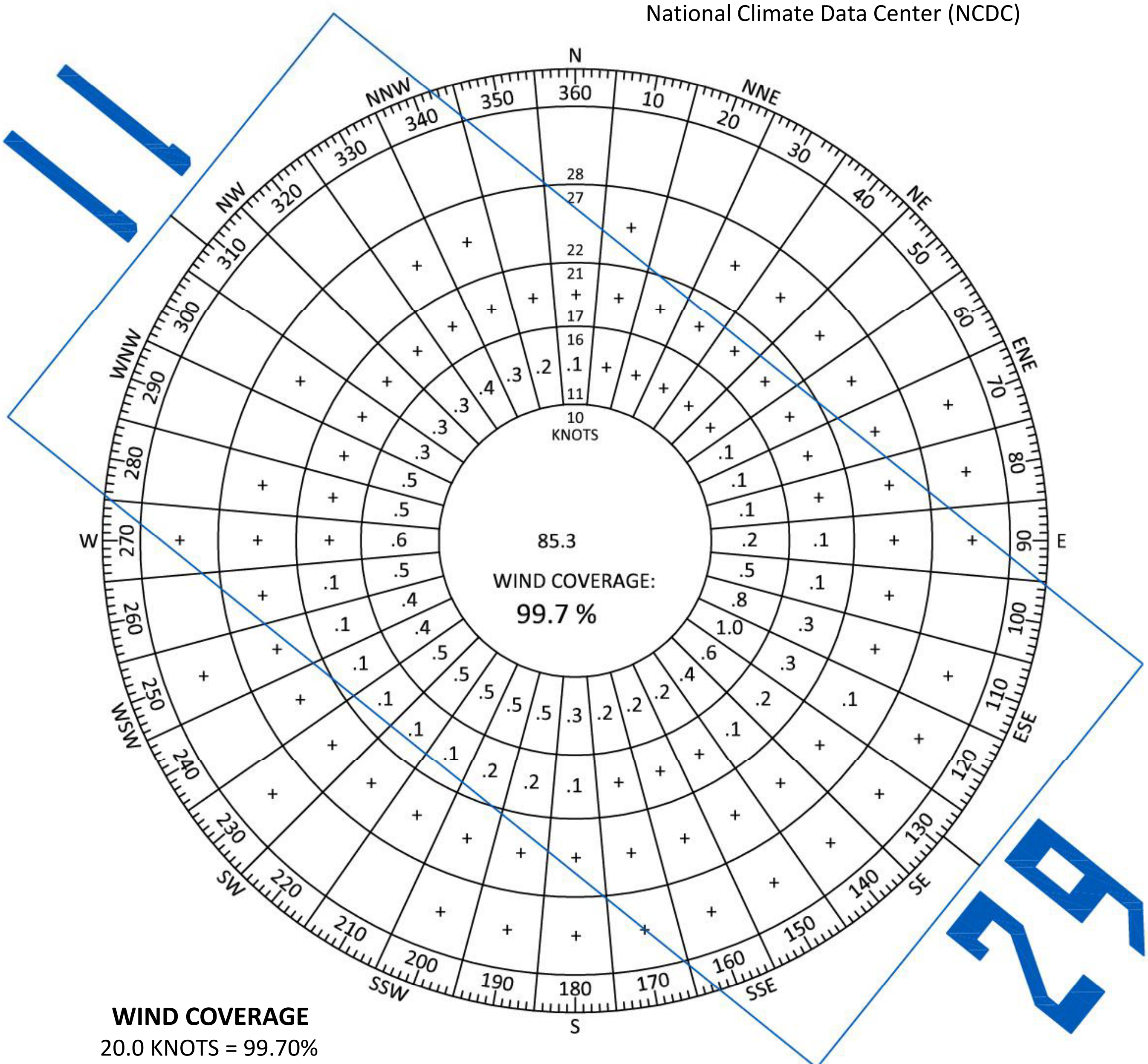
Airport Service Area Map
Figure 2-1



NOTE
This map depicts the approximate limits of civil and military airspace that may potentially impact the San Manuel Airport. The approximate widths of the military training routes are depicted by a red, dashed line.

Airspace Map
Figure 2-2

SOURCE:
ALL-WEATHER WIND DATA RECORDS FOR
TUCSON INTERNATIONAL AIRPORT
November 12, 2004 – November 12, 2013
95,911 Records
National Climate Data Center (NCDC)



WIND COVERAGE
20.0 KNOTS = 99.70%
16.0 KNOTS = 98.87%
13.0 KNOTS = 96.90%
10.5 KNOTS = 94.62%

All-Weather Wind Rose
Figure 2-3

San Manuel Airport – San Manuel, Arizona

MASTER PLAN 2014

LEGEND

1	Runway 11-29
2	Parallel Taxiway A– NW End
3	Parallel Taxiway A– NW of Taxiway A4
4	Parallel Taxiway A – SE of Taxiway A4
5	Taxiway A1
6	Taxiway A2
7	Taxiway A3
8	Taxiway A4
9	Taxiway A5
10	Taxiway A6
11	Aircraft Parking Apron
12	Hangar Area Apron
13	Access Road Northwest of Box Culvert
14	Access Road Southeast of Box Culvert
15	Perimeter Fence
16	Drainage Channel
17	Auxiliary Wind Cone
18	Runway 11-29 Edge Lighting
19	Segmented Circle and Wind Cone
20	Automated Weather Observation System
21	Runway 11 PAPI
22	Runway 11 REIL
23	Runway 29 PAPI
24	Runway 29 REIL
25	30” Pipe Culvert
26	Catch Basin
27	Auxiliary Wind Cone
28	Rotating Beacon on Tower

A	Tee Hangars
B	Tee Hangars / Pilot Room
C	Tee Hangars
D	Conventional Hangar
E	Mobile Home Residence
F	Electrical Vault
G	Restroom
H	Terminal Building
I	Fuel Tank and Delivery System
J	Single Tee Hangar

N

NOT TO SCALE

Photo date: November 25, 2013

Inventory Key Map

Figure 2-4

01/30/2014

3 Aviation Demand

Introduction

Forecasts of aviation activity serve as a guideline for the timing required for implementation of airport improvement programs. While such information is essential to successful comprehensive airport planning, it is important to recognize that forecasts are only approximations of future activity, based upon historical data and from the standpoint of present situations. They therefore must be used with careful consideration, as they may lose their validity through the passage of time. For this reason, an ongoing program of examination of local airport needs, as well as national and regional trends, is recommended and encouraged in order to promote the orderly development of the San Manuel Airport.

It is also very important to emphasize that the forecasts developed in the Master Plan are not necessarily projections of what the planner believes will occur (since no one can predict the future). They are reasonable projections of the probable maximum and minimum levels of activity that should be planned for in the present time in order to be ready to implement actions that will accommodate increases in demand if and when they actually occur.

The forecast process begins with determining what the current level of activity is at the airport. At airports which are not served by air traffic control towers, estimates of current aviation activity are necessary in order to form this basis. Following the development of a reasonable estimate of the current demand, projections are made based upon established growth rates, area demographics, industry trends and/or other important indicators.

Forecasting is a critical step in the planning process since realistic projections of aviation activity are the heart of a successful airport planning program. They are the pivot point in the planning process: Forecasts are based upon the data gathered in the research phase, and subsequent recommendations are based upon the forecasts.

Annual forecasts are prepared through the Initial Term (five-year), the Intermediate Term (ten-year) and the Ultimate Term (fifteen and twenty-year) time frames. Having forecasts within these time frames will allow the programming of airport improvements to be timed to meet demand, but not so early as to remain idle for an unreasonable length of time.

Types of General Aviation Operations

An aircraft operation (sometimes also called a “movement”) is usually defined as a departure, an arrival or a “touch-and-go” training operation. In fact, an operation is actually any time an airplane has the exclusive use of the runway. In addition to departures, arrivals, and touch-and-go activity, this can also include use of the runway for taxi operations.

Typically, there are five general types of general aviation (GA) aircraft operations that are considered in the airport master planning process. These are termed *Total Operations*, *Local*

Operations, *Based Aircraft Operations*, *Itinerant Operations*, and *Transient Operations*. They are defined as follows:

- The term *Total Operations* is defined as the summation of all types and categories of aircraft operations that occur at the airport.

- The term *Local Operations* is defined as aircraft movements for the purpose of training, pilot currency or pleasure flying, within the immediate area of the local airport. These operations typically consist of touch and go operations, practice instrument approaches, flights to and within local practice areas, and pleasure flights which originate and terminate at the airport under study.

- The term *Itinerant Operations* is defined as arrivals and departures other than local operations, as described above. This type of operation is closely tied to local demographic indicators, such as local industry and business use of aircraft and usage of the facility for recreational purposes.

- The term *Based Aircraft Operations* is defined as the total operations made by aircraft based at the airport under study, with no attempt to classify the operations as to purpose.

- The term *Transient Operations* is defined as the total operations made by aircraft other than those based at the airport under study. These operations typically consist of business or pleasure flights originating at other airports, with termination or a stopover at the study airport.

This chapter of this study will emphasize *Total Operations* as the most meaningful measure of demand that is placed on the airport's infrastructure. The reasoning behind this is that the demand placed upon the airport's runways and taxiways is not dependent upon the destination, purpose, or where the aircraft comes from, only that the facilities are used by the arriving or departing aircraft.

Transient Operations will also be quantified. These are also important because the demand upon the airport's parking aprons, terminal buildings, fueling and other landside facilities are directly impacted by the number of "out-of-town" visitors to the airport.

Review of Applicable Prior Planning Studies

Over the past several years there have been other airport and airport systems planning studies conducted that either directly or indirectly address the San Manuel Airport. In addition, the FAA keeps records of aviation activity for all airports included in the National Plan of Integrated Airport Systems (NPIAS) via the Form 5010 Airport Master Record system.

The studies and documents referenced in the following narrative include the following:

- FAA Terminal Area Forecasts (2013 TAF) [1]
- 2008 Arizona State Airports System Plan (2008 SASP)[2]
- 2003 San Manuel Airport Master Plan (2003 MP)[3]

The aviation activity estimates and projections contained in these documents are summarized in **Table 3a** on the following page, and presented graphically in **Figure 3-1, Summary of Prior Forecasts – Based Aircraft** and **Figure 3-2, Summary of Prior Forecasts – Total Operations** at the end of this section.

Estimated Current Activity – Based Aircraft

A "Based Aircraft" is defined as an aircraft that is physically present full time at the airport, stored in a hangar or tied down on an apron. The aircraft should also be registered with the Arizona Department of Transportation (ADOT) and/or the FAA as being based at the airport in order to be considered as a "Based Aircraft" there. An aircraft that is stored at an airport on a regular basis, but is registered as being "based" at another airfield must be considered to be a transient aircraft. This could occur when the aircraft owner has more than one residence. For instance, the owner may reside in a primary residence in Arizona in the winter months, but relocate seasonally to a cooler climate in the summer time. The owner may choose to register (base) his aircraft in the other state even though he owns or rents a hangar at the Arizona airport. In some cases, contrary to Arizona law, the aircraft may not be registered at all and would then be considered a transient aircraft at any airport.

The Pinal County Economic Development Director keeps a record of the aircraft that are known to be based at the San Manuel Airport. These are the aircraft owned by people who have aircraft storage leases (hangar or tiedown) and are known to be registered with ADOT as based at San Manuel. This list is updated and provided to ADOT annually in accordance with grant assurance requirements. The list of based aircraft was verified and updated on January 10, 2014. The current list of based aircraft includes 36 aircraft. These are tabulated by type in **Table 3b** on page 3-5**.**

It was determined that there are 20 aircraft housed in the County owned Tee-hangars northwest of the Aircraft Parking Apron. There are also 13 aircraft currently housed in privately owned hangars at the southeast end of the airfield, as well as 4 aircraft stored on the Aircraft Parking Apron.

At the present time, all available hangar space at the airport is full. There are currently (April, 2014) 22 aircraft owners on a waiting list for hangar space at San Manuel Airport.

Table 3a: AVIATION ACTIVITY FORECASTS – OTHER STUDIES
San Manuel Airport – San Manuel, Arizona

	Based Aircraft			Total Annual Operations		
Year	2013 TAF	2008 SASP *	2003 MP	2013 TAF	2008 SASP *	2003 MP
2001						8,800
2002						9,200
2003						9,600
2004						10,000
2005	20		31	10,410		10,400
2006	27		33	14,400		12,020
2007	27	57	35	14,400	12,080	13,640
2008	27	59	36	14,400	12,504	15,260
2009	27	60	38	14,000	12,928	16,880
2010	22	62	40	14,000	13,352	18,500
2011	22	63	42	14,000	13,776	18,930
2012	22	65	43	14,000	14,200	19,360
2013	22	67	45	14,000	14,700	19,790
2014	22	69	46	14,000	15,200	20,220
2015	22	70	48	14,000	15,700	20,650
2016	22	72	49	14,000	16,200	21,080
2017	22	74	51	14,000	16,700	21,510
2018	22	76	52	14,000	17,362	21,940
2019	22	79	54	14,000	18,023	22,370
2020	22	81	55	14,000	18,685	22,800
2021	22	84		14,000	19,346	
2022	22	86		14,000	20,008	
2023	22	88		14,000	20,669	
2024	22	91		14,000	21,331	
2025	22	93		14,000	21,992	
2026	22	96		14,000	22,654	
2027	22	98		14,000	23,315	
2028	22	100		14,000	23,977	
2029	22	103		14,000	24,639	
2030	22	105		14,000	25,300	
2031	22			14,000		
2032	22			14,000		
2033	22			14,000		
2034	22			14,000		

* The 2008 SASP included “Low”, “Medium” and “High” forecasts. The “Medium” values were used in this table.

NOTE: GREY VALUES were extrapolated to facilitate comparison across the table.

Table 3b: EXISTING BASED AIRCRAFT - VERIFIED JANUARY 10, 2014 [4]
San Manuel Airport – San Manuel, Arizona

FAA #	City	State	Zip Code	Aircraft Type
N32150	Bend	OR	97701	Piper PA-28-180
N1843D	Green Valley	AZ	85614	Beechcraft Bonanza C35
N8242P	Green Valley	AZ	85614	Piper Comanche PA-24-250
N1339K	Oracle	AZ	85623-0656	Luscombe 8A
N15664	Oracle	AZ	85623	Piper PA-28-180
N2585M	Oracle	AZ	85623-0222	Woodstock II / Homebuilt
N51450	Oracle	AZ	85623	Mara A C-2 / Homebuilt
N1115	Oracle	AZ	85623	American Legend AL3C
N5191U	Oracle	AZ	85623	Cessna 206
N5633M	Oracle	AZ	85623	Kitfox / Homebuilt
N3198H	Oro Valley	AZ	85737	Ercoupe 415-C
N5783N	Oro Valley	AZ	85755	Beechcraft 35
N701HV	Oro Valley	AZ	85737	RL-701
N2006H	San Manuel	AZ	85631	Ercoupe 415-C
N542T	San Manuel	AZ	85631-1150	Beechcraft Bonanza N35
N86780	San Manuel	AZ	85631	Bellanca 14-13
N9927C	San Manuel	AZ	85631	Luscombe 8F
N232YP	San Manuel	AZ	85631	Piper Comanche PA-24-250
N3MW	San Manuel	AZ	85631	Bede BD-4
N32693	San Manuel	AZ	85631-	Piper PA-28R-200
N33417	San Manuel	AZ	85631	Piper PA-28-151
N93569	San Manuel	AZ	85631	Ercoupe 415-C
N700H	San Manuel	AZ	85631	Homebuilt
N4588L	San Manuel	AZ	85631	RV-4
N5601W	San Manuel	AZ	85631	Piper PA-28-160
N477UC	San Manuel	AZ	85631	Breezy RLU-1
N2227K	Tucson	AZ	85704	Luscombe 8A
N5724E	Tucson	AZ	85739	Cessna 150
N71177	Tucson	AZ	85704	Luscombe 8A
N63R	Tucson	AZ	85739	Mooney M20E
N74D	Tucson	AZ	85704	Williams MM-1
N5518Z	Tucson	AZ	85755	Maule MX-7-180A
N714J	Tucson	AZ	85743-9747	Cessna 150 M
N3850E	Tucson	AZ	85742	Aeronca 11BC
N487SX	Tucson	AZ	85710-4458	Sonex
N900WH	Tucson	AZ	85719	Titan Tornado / Homebuilt

Estimated Current Activity –Aircraft Operations

Because there is no air traffic control tower at San Manuel, no actual records of the number of operations are available. A common method used to estimate total operations for non-towered airfields is the application of a reliable value for the number of annual operations per based aircraft. In reality, this value can vary widely from airport to airport. This is because the level of activity at an airport relative to the number of based aircraft is highly dependent upon several factors. These factors include the amount of flight training activity at the airport, the type and number of on-airport businesses, and the number of rental aircraft that are based at the airport.

In the process of preparing numerous airport master plans for small general aviation airports[4], a significant amount of data regarding aircraft operations have been accumulated. During the preparation of past studies over a ten year period, airport user survey questionnaires were distributed to airport owners who based their aircraft at 21 different airports around the country. The questionnaires made inquiry as to the number of total operations performed by each aircraft, and gave a good indication of the probable level of use of based aircraft at small airfields. In the surveys, it was found that airports with high levels of training operations had the highest level of use per based aircraft. The same was found to be true of airports in communities with heavily tourism-based economies. The number of based aircraft operations per based aircraft at the various airports ranged from 30 (at a little-used airport that was in disrepair) to 566 (at a busy towered regional airport with a high level of tourism and several on-airport businesses). The average of all surveys was 225 operations per based aircraft. Note that this value refers to the use of the airport by the aircraft that are based there, and does not include use by transient (non-based) aircraft.

The 2008 Arizona State Airports System Plan (SASP)[2] estimated a factor of 212 total operations by each based aircraft for San Manuel Airport for the base year of 2007. This value was based on surveys conducted as part of the SASP study, and correlates fairly well with NJP's prior survey average of 225 based aircraft operations per based aircraft. It should be noted that the SASP incorrectly shows the number of based aircraft at San Manuel to have been 57 airplanes in 2007.

For the purposes of this Master Plan, a factor of 345 operations per based aircraft was used to estimate the current (2014) number of Total Annual Operations at San Manuel Airport. This is based on the number of general aviation operations per based aircraft at the Tucson International Airport.[1] A factor of 225 operations per based aircraft was used to estimate Based Aircraft Operations. This is based on NJP's past user surveys. Total Transient Operations are simply the remainder of Total Annual Operations minus Based Aircraft Operations.

Application of these values results in the following estimated 2014 current activity (**Table 3c**). Note that the following section's forecasts may not agree with this estimate because of the various analytical methodologies that are employed in the forecast process. (See also **Figure 3-8, Estimated 2014 Aircraft Operations** for a graphic depiction of the estimate).

Table 3c: ESTIMATED EXISTING ACTIVITY
San Manuel Airport – San Manuel, Arizona

Total Annual Operations (36 based aircraft) (345 total annual operations)	12,420
Operations by Based Aircraft (36 based aircraft) (225 total annual operations)	8,100
Transient Operations	4,320
Existing Based Aircraft (January, 2014)	36

Forecasts of Aviation Demand

In order to arrive at a reasonable conclusion regarding the level of airport activity that may be planned for in the future, several alternate forecasts of activity were prepared. This method provides a range of confidence in the results that will not be evident with the use of a single forecast technique. For the purpose of this study four alternate forecasts of total aircraft operations and based aircraft were prepared. Each of the forecasts is described in the following narrative. The results of the four forecasts are compared and summarized in **Table 3k**, and are shown graphically in **Figure 3-3, Summary of Forecast Models – Based Aircraft** and **Figure 3-4, Summary of Forecast Models – Total Annual Operations** at the end of this chapter.

Forecast Model 1: Adjusted Regional Model (ARM) – Low Range Forecast

The Adjusted Regional Model (or ARM) is a forecasting tool for small non-towered airports that was developed by Nicholas J. Pela & Associates[6]. The original ARM development research consisted of two separate studies, the first study, conducted in 1995, included forty-six airports in twenty-four Metropolitan Service Areas (MSAs) in the FAA Great Lakes Region (Wisconsin, Minnesota, and Michigan with some service area overlap into North Dakota). A follow-on study was performed in 1997 for the Four Corners Region (Arizona, New Mexico, Colorado and Utah) that included thirty-one airports in fourteen MSAs. These studies derived an initial set of polynomial equations that are useful to estimate the potential activity at non-towered airfields, based on the records of activity at towered airfields in the same general regions. The latest update of the ARM Four Corners Region model was conducted in 2014. The new model incorporates adjustments that recognize certain factors that may decrease the maximum potential for activity at airports that do not have significant on-airport business activity and that are more remote from the influence of large metropolitan areas and/or other competing airports.

The current version of the 2014 Four Corners Region ARM predicts the total number of annual operations that may be expected at the study airport, as well as the total number of based aircraft. In the 2014 ARM study, reasonably high correlation (0.88) was found between the number of based aircraft and total annual operations. Fair correlation (0.71) was found between the primary service area population and the number of based aircraft at the study airports. The number of maximum potential based aircraft and total annual operations in any given planning year is computed by applying the ARM's polynomial equations and then by applying the activity adjustments, as follows:

Initial calculations:

POP = Primary Service Area Population
BAC = Based Aircraft .... BAC = 41.72 + 0.001659(POP) – 0.0000000007(POP^2)

BAC = Based Aircraft
OPS = Total Annual Operations .... OPS = 16,325 + 420(BAC) – 0.101(BAC^2)

Note that the ARM utilizes the primary service area population as opposed to the total (or extended) service area population, or other surrogates for population growth that are typically used with other forecasting methodologies.

After calculation of the initial activity prediction for the given planning year, the following activity adjustments are made to the "raw" number of based aircraft and annual operations values:

- Economic Activity Adjustment – Activity at the airport will be affected by the economic climate of the region that the airport is located in. An adjustment factor is applied to the forecasts based on the comparison of the region's per capita income as compared to the statewide average per capita income.

- Performance Limit Adjustment - Activity at the airport is then adjusted based on the elevation above sea level of the airfield location. As altitude increases, the takeoff performance of aircraft suffers. Therefore, the airfield elevation has some influence on the number of types of aircraft that will be able to operate at the facility.

- Competing Airport Adjustment – The existence of another similar airport in close proximity to the study airport will affect activity, since a nearby facility will compete with the study airport for available market share of aviation activity. An adjustment factor is applied to account for an assumed loss of market share to a competing airfield if that airfield is within 60 highway miles of the study airport.

The resulting ARM forecast of activity is presented in **Table 3d**, on page 3-10.

The ARM process began with projection of the primary service area population for the 2014-2034 planning period (see the Airport Service Area section of **Chapter 2, Inventory** for a description of how this was estimated for the current year). County per capita income was also projected by regression analysis, and this is presented in the table for reference purposes. The potential number of based aircraft and total annual operations were projected for each planning year using the ARM equations and adjustments.

The ARM forecast resulted in the number of based aircraft increasing from 35 in 2014, to 69 in 2034. Total annual operations are projected to increase from 17,521 in 2014, to 25,560 in 2034.

Forecast Model 2: Linear Regression Analysis

In this model, the number of based aircraft was generated by a simple linear regression analysis of the historical records of San Manuel Airport based aircraft and Pinal County population for the 2001 through 2011 period. A very strong correlation of 0.97 was found with these data sets. The number of total annual operations for each year was then computed using the FAA Terminal Area Forecasts value for total operations per based aircraft for Tucson International Airport (345) times the estimated number of projected based aircraft in a given year. The resulting forecast is presented in **Table 3e**, on page 3-11.

This forecast model resulted in the estimated number of based aircraft increasing from 37 in 2014, to 79 in 2034. Total annual operations are projected to increase from 12,909 in 2014, to 27,138 in 2034.

Forecast Model 3: Market Share Analysis (Based on Extended Service Area Population) – High Range Forecast

In this model, the estimated Extended Service Area Population (as determined in **Chapter 2**, **Inventory**) was assumed to grow throughout the 20 year planning period based on the average annual Pinal County population growth for 2001-2011 (7.47%). The number of Based Aircraft was assumed to grow based on the 2013 Aircraft to Extended Service Area Population Index (Actual 2014 based aircraft / calculated 2014 Extended Service Area Population). The number of total annual operations for each year was then computed using the FAA Terminal Area Forecasts value for total operations per based aircraft for Tucson International Airport (345) times the estimated number of projected based aircraft in a given year. The resulting forecast is presented in **Table 3f**, on page 3-12.

This forecast model resulted in the estimated number of based aircraft increasing from 38 in 2014, to 88 in 2034. Total annual operations are projected to increase from 13,110 in 2014, to 30,360 in 2034.

Forecast Model 4: Market Share Analysis (Based on County Population)

This model is essentially identical to Forecast Model 3 except that the market share relationship used is based upon the entire Pinal County population versus based aircraft instead of the estimated Extended Service Area Population. The resulting forecast is presented in **Table 3g**, on page 3-13.

This forecast model resulted in the estimated number of based aircraft increasing from 38 in 2014, to 75 in 2034. Total annual operations are projected to increase from 13,110 in 2014, to 25,875 in 2034.

Table 3d: FORECAST MODEL 1 (LOW RANGE FORECAST)
ADJUSTED REGIONAL MODEL FOR SMALL AIRPORTS (ARM)
San Manuel Airport - Pinal County, Arizona

Year	Primary Service Area Population (1)	County Per Capita Income (2)	Based Aircraft (3)	Total Operations (4)
2014	11,603	$ 26,442	35	17,521
2015	12,470	$ 26,954	35	17,711
2016	13,402	$ 27,466	36	17,916
2017	14,404	$ 27,978	37	18,136
2018	15,480	$ 28,490	38	18,372
2019	16,637	$ 29,002	39	18,625
2020	17,881	$ 29,514	41	18,896
2021	19,217	$ 30,026	42	19,188
2022	20,653	$ 30,538	43	19,500
2023	22,197	$ 31,050	45	19,836
2024	23,856	$ 31,562	46	20,195
2025	25,639	$ 32,074	48	20,581
2026	27,555	$ 32,586	49	20,994
2027	29,614	$ 33,098	51	21,437
2028	31,828	$ 33,610	53	21,912
2029	34,206	$ 34,122	56	22,421
2030	36,763	$ 34,634	58	22,966
2031	39,510	$ 35,146	60	23,550
2032	42,463	$ 35,658	63	24,175
2033	45,637	$ 36,170	66	24,844
2034	49,048	$ 36,682	69	25,560
Standard Error=		$ 1,207		

2011 Arizona Per Capita Income:	$ 35,062
2011 Pinal County Per Capita Income:	$ 24,287
Airport Elevation above Mean Sea Level:	3,274
Distance from Nearest Airport (between 30-60 highway miles) (5):	51

(1) Current estimated population within 25 miles of the airport (San Manuel, Mammoth, and Oracle
(2) Projected by regression analysis - Per capita income change/year 2001-2011
(3) Calculated using the 2014 Four Corners Region ARM polynomial equation for based aircraft
(4) Calculated using the 2014 Four Corners Region ARM polynomial equation for total operations
(5) Marana Regional Airport, Marana, Arizona

Table 3e: FORECAST MODEL 2
BASED AIRCRAFT LINEAR REGRESSION ANALYSIS (County Population)
San Manuel Airport - Pinal County, Arizona

Year	County Population (1)	Based Aircraft (2)	Total Operations (3)
2014	458,179	37	12,909
2015	480,477	39	13,620
2016	502,774	42	14,332
2017	525,072	44	15,043
2018	547,369	46	15,755
2019	569,666	48	16,466
2020	591,964	50	17,178
2021	614,261	52	17,889
2022	636,559	54	18,601
2023	658,856	56	19,312
2024	681,153	58	20,024
2025	703,451	60	20,735
2026	725,748	62	21,447
2027	748,046	64	22,158
2028	770,343	66	22,870
2029	792,640	68	23,581
2030	814,938	70	24,292
2031	837,235	72	25,004
2032	859,533	75	25,715
2033	881,830	77	26,427
2034	904,127	79	27,138

Standard Error=	**13,686**	**2.38**
Operations per Based Aircraft (constant):		**345**

(1) Projected by regression analysis - County Population change/year 2001-2011
(2) Projected by regression analysis - Based aircraft/County Population 2001-2011
(3) Total Annual Operations were calculated using the estimated average for operations per based aircraft for Tucson International Airport from the FAA Terminal Area Forecasts 2013-2017

Table 3f: FORECAST MODEL 3 (HIGH RANGE FORECAST)
MARKET SHARE ANALYSIS (Based on Extended Service Area Population)
San Manuel Airport - Pinal County, Arizona

Year	Extended Service Area Population (1)	Based Aircraft (2)	Total Annual Operations (3)
2014	241,356	38	13,110
2015	256,966	41	14,145
2016	272,576	43	14,835
2017	288,186	46	15,870
2018	303,796	48	16,560
2019	319,406	51	17,595
2020	335,015	53	18,285
2021	350,625	56	19,320
2022	366,235	58	20,010
2023	381,845	61	21,045
2024	397,455	63	21,735
2025	413,065	66	22,770
2026	428,675	68	23,460
2027	444,285	71	24,495
2028	459,895	73	25,185
2029	475,505	76	26,220
2030	491,115	78	26,910
2031	506,725	81	27,945
2032	522,335	83	28,635
2033	537,945	86	29,670
2034	553,554	88	30,360

Standard Error=	**12,379**	
Operations per Based Aircraft (constant):		**345**

(1) Service Area Population was assumed to grow based on the average annual Pinal County population growth for 2001-2011.
(2) The number of Based Aircraft was assumed to grow based on the 2014 Aircraft to Extended Service Area Population Index (Actual 2013 based aircraft / calculated 2013 Extended Service Area Population).
(3) Total Annual Operations were calculated using the estimated average for operations per based aircraft for Tucson International Airport from the FAA Terminal Area Forecasts 2013-2017

Table 3g: FORECAST MODEL 4
MARKET SHARE ANALYSIS (Based on County Population)
San Manuel Airport - Pinal County, Arizona

Year	County Population (1)	Based Aircraft (2)	Total Annual Operations (3)
2014	458,179	38	13,110
2015	480,477	40	13,800
2016	502,774	42	14,490
2017	525,072	43	14,835
2018	547,369	45	15,525
2019	569,666	47	16,215
2020	591,964	49	16,905
2021	614,261	51	17,595
2022	636,559	53	18,285
2023	658,856	54	18,630
2024	681,153	56	19,320
2025	703,451	58	20,010
2026	725,748	60	20,700
2027	748,046	62	21,390
2028	770,343	64	22,080
2029	792,640	65	22,425
2030	814,938	67	23,115
2031	837,235	69	23,805
2032	859,533	71	24,495
2033	881,830	73	25,185
2034	904,127	75	25,875

Standard Error=	**13,686**	
Operations per Based Aircraft (constant):		**345**

(1) County Population was assumed to grow based on the average annual Pinal County population growth for 2001- 2011.
(2) The number of Based Aircraft was assumed to grow based on the average Aircraft to County Population Index for 2001-2011 (Actual based aircraft / actual County Population).
(3) Total Annual Operations were calculated using the estimated average for operations per based aircraft for Tucson International Airport from the FAA Terminal Area Forecasts 2013-2017

Table 3h: AIRPORT DEMAND MODELS - ALTERNATIVE METHODOLOGIES SUMMARY AND COMPARISON
San Manuel Airport - Pinal County, Arizona

	BASED AIRCRAFT					TOTAL ANNUAL OPERATIONS				
	LOW RANGE		HIGH RANGE			LOW RANGE		HIGH RANGE		
Year	FORECAST MODEL 1	FORECAST MODEL 2	FORECAST MODEL 3	FORECAST MODEL 4	**AVERAGE**	FORECAST MODEL 1	FORECAST MODEL 2	FORECAST MODEL 3	FORECAST MODEL 4	**AVERAGE**
2014	35	37	38	38	**37**	17,521	12,909	13,110	13,110	**14,162**
2015	35	39	41	40	**39**	17,711	13,620	14,145	13,800	**14,819**
2016	36	42	43	42	**41**	17,916	14,332	14,835	14,490	**15,393**
2017	37	44	46	43	**42**	18,136	15,043	15,870	14,835	**15,971**
2018	38	46	48	45	**44**	18,372	15,755	16,560	15,525	**16,553**
2019	39	48	51	47	**46**	18,625	16,466	17,595	16,215	**17,225**
2020	41	50	53	49	**48**	18,896	17,178	18,285	16,905	**17,816**
2021	42	52	56	51	**50**	19,188	17,889	19,320	17,595	**18,498**
2022	43	54	58	53	**52**	19,500	18,601	20,010	18,285	**19,099**
2023	45	56	61	54	**54**	19,836	19,312	21,045	18,630	**19,706**
2024	46	58	63	56	**56**	20,195	20,024	21,735	19,320	**20,318**
2025	48	60	66	58	**58**	20,581	20,735	22,770	20,010	**21,024**
2026	49	62	68	60	**60**	20,994	21,447	23,460	20,700	**21,650**
2027	51	64	71	62	**62**	21,437	22,158	24,495	21,390	**22,370**
2028	53	66	73	64	**64**	21,912	22,870	25,185	22,080	**23,012**
2029	56	68	76	65	**66**	22,421	23,581	26,220	22,425	**23,662**
2030	58	70	78	67	**68**	22,966	24,292	26,910	23,115	**24,321**
2031	60	72	81	69	**71**	23,550	25,004	27,945	23,805	**25,076**
2032	63	75	83	71	**73**	24,175	25,715	28,635	24,495	**25,755**
2033	66	77	86	73	**75**	24,844	26,427	29,670	25,185	**26,532**
2034	69	79	88	75	**78**	25,560	27,138	30,360	25,875	**27,233**

Preferred Forecast

All four forecast methods resulted in reasonably comparable values. For the purposes of the following sections of this Master Plan, the preferred forecast is the average of the four forecast models. This will provide a balance between the high range, or maximum potential, demand and the lowest forecast projections.

As time progresses the actual changes in demand should be monitored, as should the factors that could influence an increase (or decrease) in the use of the airport. Adjustments to the Master Plan recommendations should be made as these changes occur. **Figures 3-5** and **3-6** illustrate the comparison of the preferred forecast with prior forecasts for San Manuel Airport.

Chapter 4, Demand/Capacity Analysis will present the projected demand peaking characteristics associated with the preferred forecast. **Chapter 5, Facility Requirements** will present a schedule of improvements ordered by planning year in accordance with the preferred forecast.

Aircraft Fleet Mix

The mix of General Aviation aircraft types that may use the San Manuel Airport was approximated by utilizing the fleet mix distribution of aircraft types that were registered in the State of Arizona during the preparation of the 2008 Arizona State Airports System Plan (SASP). The SASP indicates the following distribution of selected types of aircraft in Arizona (**Table 3i**):

Table 3i: AIRCRAFT DISTRIBUTION BY TYPE IN ARIZONA [2]
2008 Arizona State Airports System Plan (SASP)

Aircraft Type	**Distribution** (Rounded)
Single Engine Piston	82%
Multi Engine Piston	9%
Turbo Prop	2%
Jet	3%
Rotorcraft	4%

Local and Transient Operations and Projections of Based Aircraft and Total Annual Operations by Type

The distribution of powered General Aviation aircraft presented above was applied to the forecast of total annual operations for the immediate term (2014), the short term (2019), the intermediate term (2024), and the long term (2034) planning thresholds. This will serve as an approximation of the probable use of the airport facilities by various types of aircraft.

The 36 currently based aircraft at San Manuel are all single engine piston aircraft. Although undocumented, it is probable that there is current activity by transient multi engine aircraft, and it is possible that there is some limited use by small business jets, turboprops and rotorcraft. As future activity increases, it is assumed that there will be increased levels of use by these types of aircraft.

For the purposes of this study, the assumption was made that the fleet mix of based aircraft will tend to seek the distribution of the statewide fleet as presented in **Table 3i**. The estimated breakdown of activity by type of aircraft and the Local/Transient operations split is presented as follows in **Table 3j**.

Table 3j: ANNUAL OPERATIONS and BASED AIRCRAFT BY TYPE
PREFERRED FORECAST
San Manuel Airport – San Manuel, Arizona

	%	2014	2019	2024	2029	2034
ANNUAL OPERATIONS						
Single Engine Piston	82%	11,613	14,125	16,661	19,403	22,331
Multi Engine Piston	9%	1,275	1,550	1,829	2,130	2,451
Turbo Prop	2%	283	345	406	473	545
Jet	3%	425	517	610	710	817
Rotorcraft	4%	566	689	813	946	1,089
Total Operations (Preferred Forecast)		**14,162**	**17,225**	**20,318**	**23,662**	**27,233**
Operations by Based Aircraft		8,330	10,412	12,550	14,904	17,483
Transient Operations		5,833	6,814	7,768	8,758	9,751
BASED AIRCRAFT						
Single Engine Piston	82%	31	38	46	54	64
Multi Engine Piston	9%	3	4	5	6	7
Turbo Prop	2%	1	1	1	1	2
Jet	3%	1	1	2	2	2
Rotorcraft	4%	1	2	2	3	3
Total Based Aircraft (Preferred Forecast)		**37**	**46**	**56**	**66**	**78**

Summary of Projected Local/Transient Activity for Four Forecast Models

A summary of the Local/Transient operations breakdown for each of the four forecast models is presented as follows:

Forecast Model 1: Adjusted Regional Model (Low Range Forecast):

	2014	2019	2024	2029	2034
Total Based Aircraft	35	39	46	56	69
Total Annual Operations	17,521	18,625	20,195	22,421	25,560
Based Aircraft Operations	7,875	8,775	10,350	12,600	15,525
Transient Operations	9,646	9,850	9,845	9,821	10,035

Forecast Model 2: Linear Regression Analysis:

	2014	2019	2024	2029	2034
Total Based Aircraft	37	48	58	68	79
Total Annual Operations	12,909	16,466	20,024	23,581	27,138
Based Aircraft Operations	8,325	10,800	13,050	15,300	17,775
Transient Operations	4,584	5,666	6,974	8,281	9,363

Forecast Model 3: County Population-Based Market Share Analysis (High Range Forecast):

	2014	2019	2024	2029	2034
Total Based Aircraft	38	51	63	76	88
Total Annual Operations	13,110	17,595	21,735	26,220	30,360
Based Aircraft Operations	8,550	11,475	14,175	17,100	19,800
Transient Operations	4,560	6,120	7,560	9,120	10,560

Forecast Model 4: Service Area Population-Based Market Share Analysis:

	2014	2019	2024	2029	2034
Total Based Aircraft	38	47	56	65	75
Total Annual Operations	13,110	16,215	19,320	22,425	25,875
Based Aircraft Operations	8,550	10,575	12,600	14,625	16,875
Transient Operations	4,560	5,640	6,720	7,800	9,000

FAA Airport and Aircraft Classifications

The FAA classifies airports according to the type of aircraft they are able to accommodate. Airports that are designed to serve larger and/or faster aircraft are subject to different (stricter) design criteria than those that will serve only smaller aircraft. The various applicable design criteria are contained in FAA Advisory Circulars (ACs), as well as Federal Air Regulations (FARs).

Aircraft are grouped by the FAA by wingspan and tail height (the higher of the two values apply) into six Airplane Design Groups (ADG), and by approach speed into five Aircraft Approach Categories (AAC). The airport design criteria and dimensional standards for airport facilities are related to the Airplane Design Groups, Approach Categories, and also upon the type of approaches offered based on the Visibility Minimums required to legally execute an approach to landing. [7]

The AAC, ADG, and approach Visibility Minimums are combined to form the Runway Design Code (RDC) of a particular runway. The RDC provides the information needed to determine the appropriate FAA design standards that apply to a runway. The first component of the RDC, depicted by a letter, is the AAC and relates to aircraft approach speed (operational characteristics). The second component of the RDC, depicted by a Roman numeral, is the ADG and relates to either the aircraft wingspan or tail height (physical characteristics); whichever is most restrictive. The third component of the RDC relates to the visibility minimums expressed by RVR values in feet of 1200, 1600, 2400, and 4000 (corresponding to lower than 1/4 mile [CAT-III PA], lower than 1/2 mile but not lower than 1/4 mile [CAT-II PA], lower than 3/4 mile but not lower than 1/2 mile [CAT-I PA], and lower than 1 mile but not lower than 3/4 mile [APV ≥ 3/4 but < 1 mile], respectively). The third component will read "VIS" for runways designed with visual approach use only. [7]

The Taxiway Design Group (TDG) relates to the undercarriage dimensions of the critical aircraft that will use a specific taxiway. Taxiway and taxilane width and fillet standards, and in some instances, runway to taxiway and taxiway and taxilane separation requirements, are determined by TDG. It is appropriate for a series of taxiways on an airport to be built to a different TDG than another based on expected use.

The existing and projected Runway Design Code for San Manuel's single runway, as well as the Taxiway Design Codes for each taxiway, will be discussed in **Chapter 5, Facility Requirements**.

The six Airplane Design Groups (ADG) are categorized as follows in **Table 3k**. The five Aircraft Approach Categories are categorized as follows in **Table 3l**. Visibility Minimums are presented in **Table 3m**.

Table 3k: FAA AIRPLANE DESIGN GROUPS (ADG) [7]

ADG Classification	Tail Height Criteria	Wingspan Criteria	Examples
I	Up to but not including 20'	Up to but not including 49'	Cessna 210, Piper Cheyenne
II	From 20', up to but not including 30'	From 49', up to but not including 79'	Cessna Citation II
III	From 30', up to but not including 45'	From 79', up to but not including 118'	Boeing 737
IV	From 45', up to but not including 60'	From 118', up to but not including 171'	Boeing 707
V	From 60', up to but not including 66'	From 171', up to but not including 214'	Boeing 747
VI	From 66', up to but not including 80'	From 214', up to but not including 262'	Lockheed C5A

Table 3l: FAA AIRCRAFT APPROACH CATEGORIES (AAC) [7]

Category	Criteria	Examples
A	Approach speed less than 91 knots	Cessna 182, Beechcraft Bonanza
B	Approach speed 91 knots or more but less than 121 knots	Piper Cheyenne, Cessna Citation
C	Approach speed 121 knots or more but less than 141 knots	Learjet 25, Rockwell Sabre 75A, Boeing 737-200
D	Approach speed 141 knots or more but less than 166 knots	Learjet 35A, Grumman Gulfstream IV
E	Approach speed 166 knots or more	(pertains only to military types)

Table 3m: VISIBILITY MINIMUMS [7]

Runway Visual Range (RVR)	Criteria
4000	Lower than 1 mile but not lower than ¾mile (APV ≥ ¾ but < 1 mile)
2400	Lower than ¾ mile but not lower than ½ mile (CAT-I PA)
1600	Lower than ½ mile but not lower than ¼ mile (CAT-II PA)
1200	Lower than ¼ mile (CAT-III PA)

Critical Aircraft Determination

The Critical Aircraft (or Design Aircraft) for any given airport facility is defined as that aircraft, or group of aircraft, whose dimensional and/or performance characteristics are the basis for selection of facilities design criteria. The critical aircraft must be demonstrated to account for a minimum of 500 annual actual or forecast operations in order to justify FAA funding of improvements that are required to serve the Critical Aircraft. [9]

Different aircraft may govern the requirements for runway design, and for lateral and vertical separation standards. The factors considered to establish required runway length are the Critical Aircraft's performance requirements for takeoff at the maximum average temperature at the study airport. The design criteria for other facilities are the Critical Aircraft's maximum gross takeoff weight, approach speed category, wingspan, and tail height.

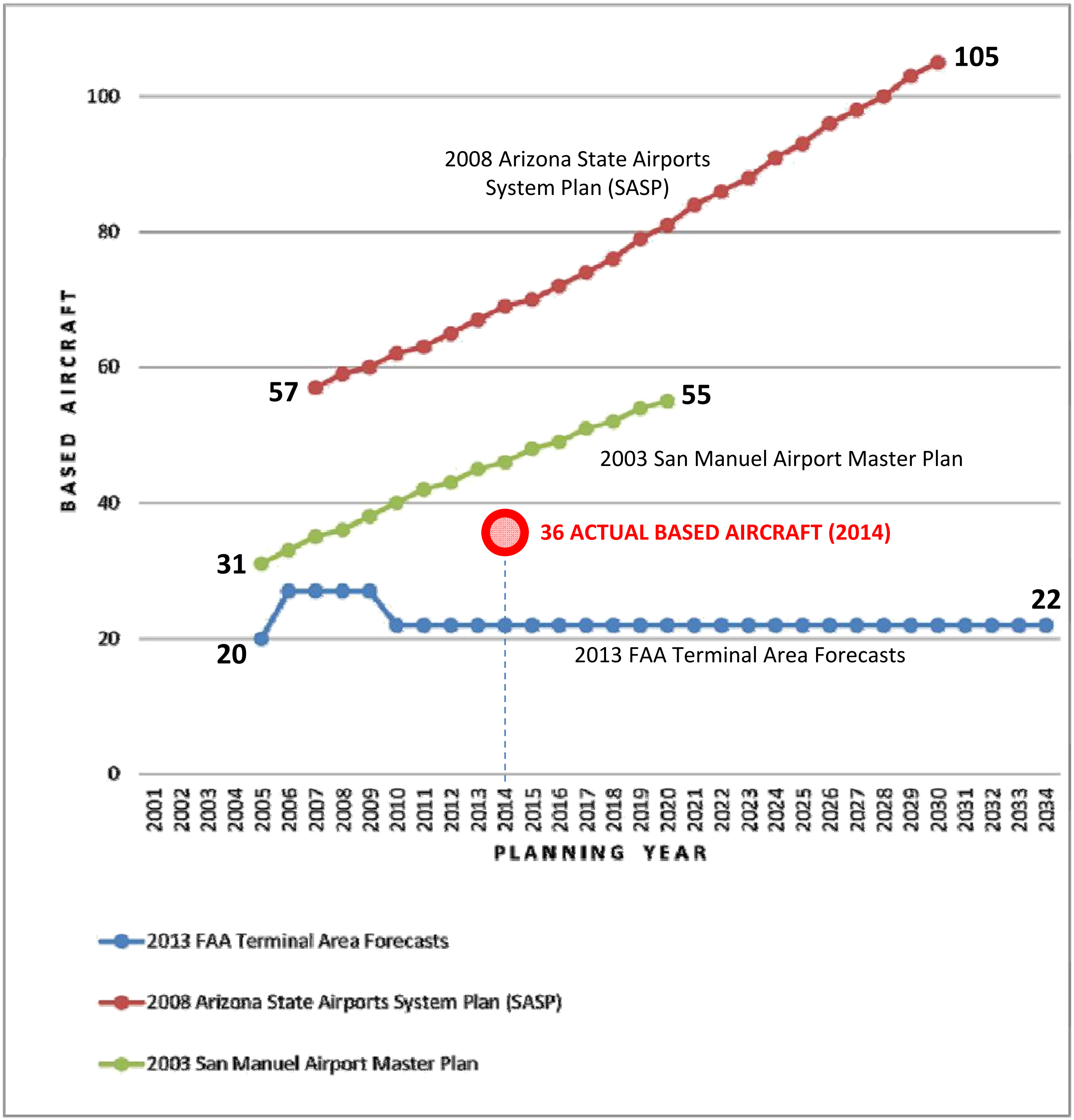
Based on a comparison between the design criteria contained in FAA Advisory Circular AC 150/5300-13A and the existing airport facilities, the San Manuel Airport is presently able to accommodate aircraft up to Approach Category B (less than 91 knot approach speeds), and Airplane Design Group I (wingspan less than 49 feet).[8] Therefore, an ARC B-I reference code is indicated as the airport's present role.

According to the observations and estimates of current activity, the Critical Aircraft currently using the airport facilities is a mix of piston-powered single and multi-engine aircraft, with gross takeoff weights less than 12,500 pounds. According to the forecasts presented above, by the year 2019 there may be an increase in activity by light business jets, with activity increasing for turboprops by later in the planning period. Some of these aircraft may be in the ARC B-II classification. Therefore, it is recommended that the ultimate classification of the airport be identified as ARC B-II.

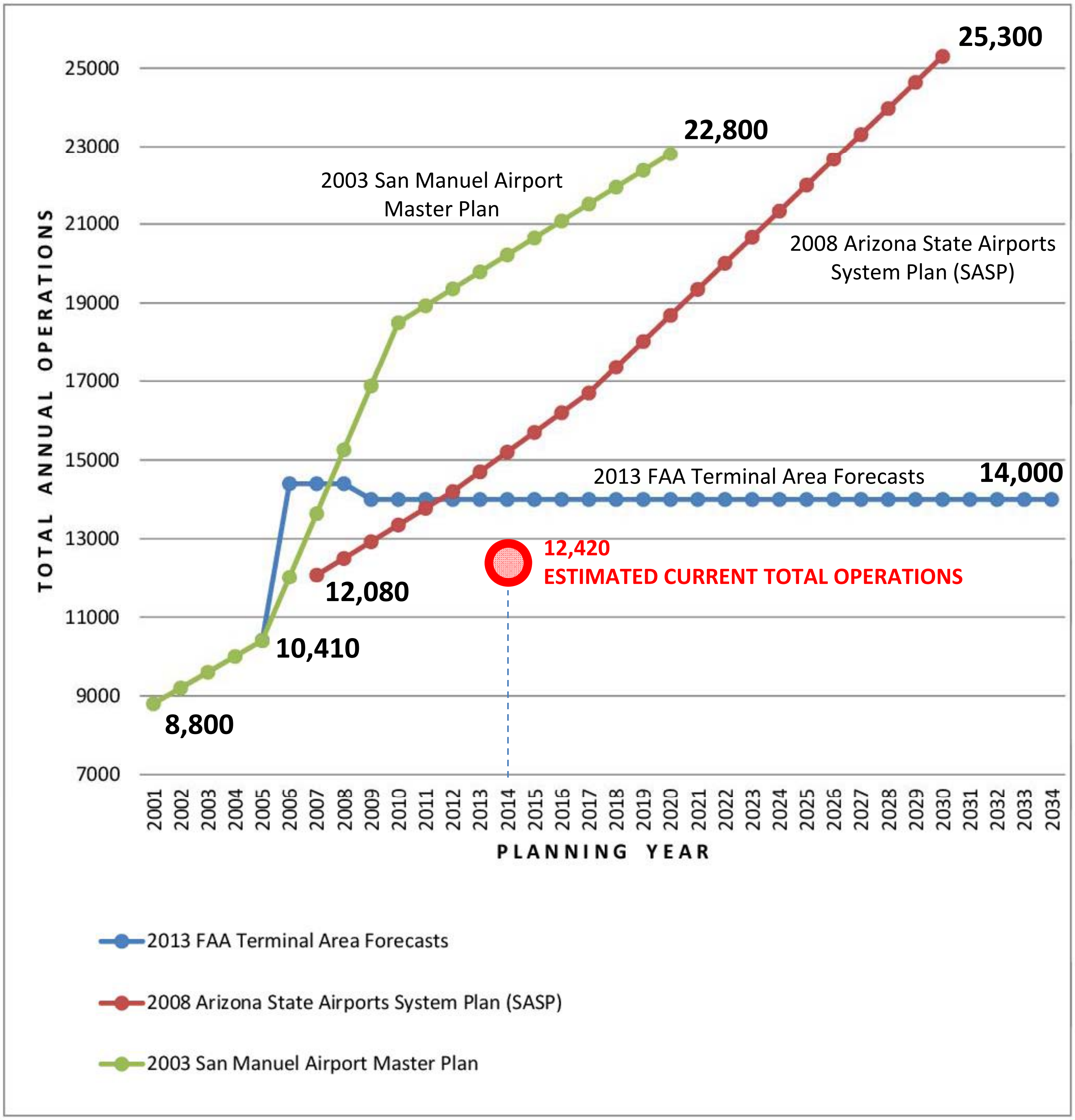
A range of Critical Aircraft for the runway and for the taxiways and aprons will be identified in **Chapter 5, Facility Requirements**.

Chapter References

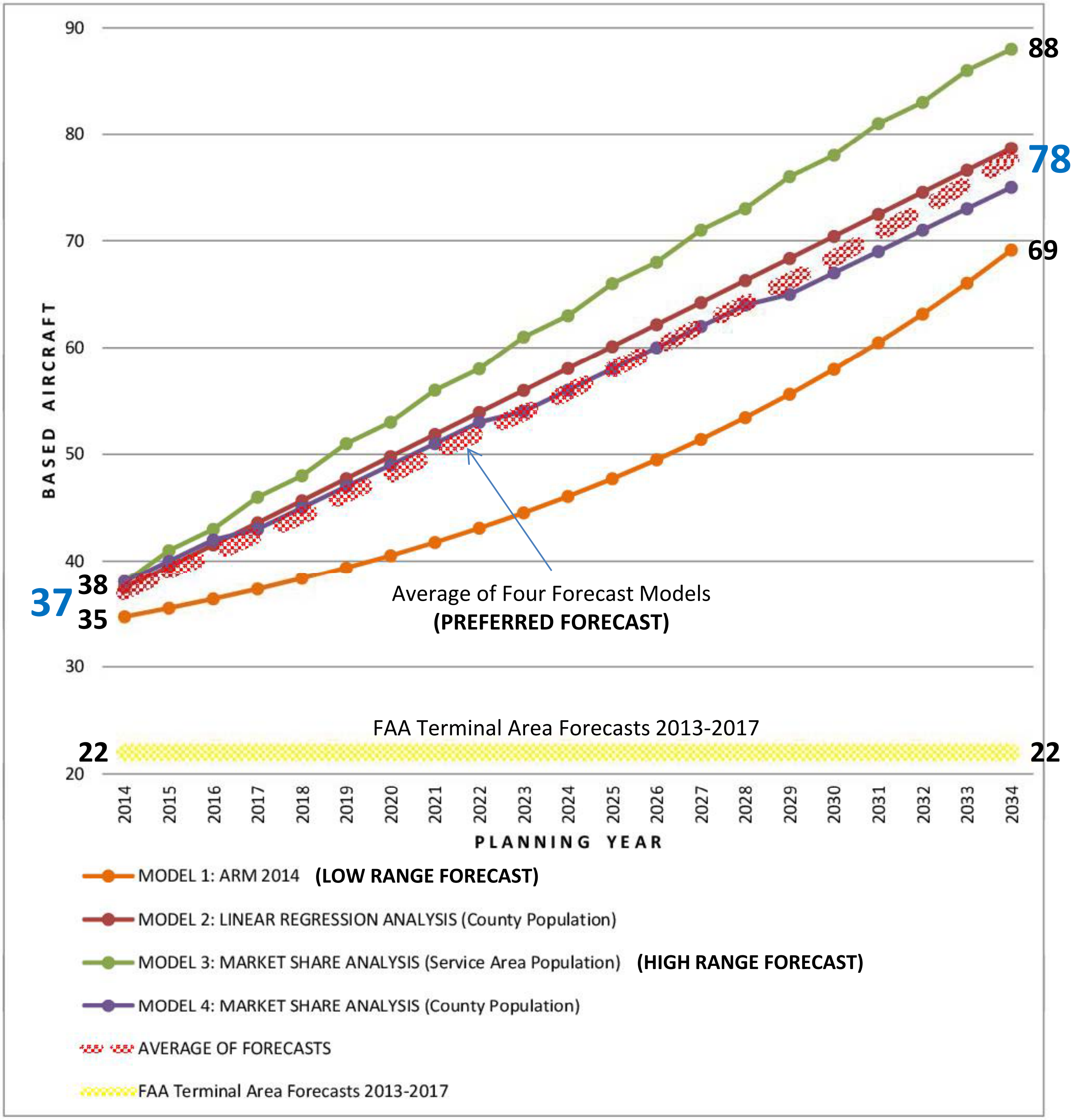
[1] FAA Terminal Area Forecasts, Issued January, 2013
[2] 2008 Arizona State Airports System Plan, Wilbur Smith Associates, Inc.
[3] San Manuel Airport – Airport Master Plan, Coffman Associates and Z&H Engineering, November 12, 2003
[4] Information provided by the Pinal County Airport Director
[5] Nicholas J. Pela & Associates' records from prior planning projects
[6] A Method of Estimating Annual Aircraft Operations at Non-Towered Airfields – Four Corners Region (AZ-NM-UT-CO), Nicholas J. Pela & Associates, July, 1997 (2014 update)
[7] FAA Advisory Circular AC 150/5300-13A, Airport Design, September 28, 2012
[8] San Manuel Airport – Airport Layout Plan, Coffman Associates, latest revision by Nicholas J. Pela & Associates May 21, 2013
[9] FAA Advisory Circular AC 150/5325-4B – Runway Length Requirements for Airport Design, July 1, 2005



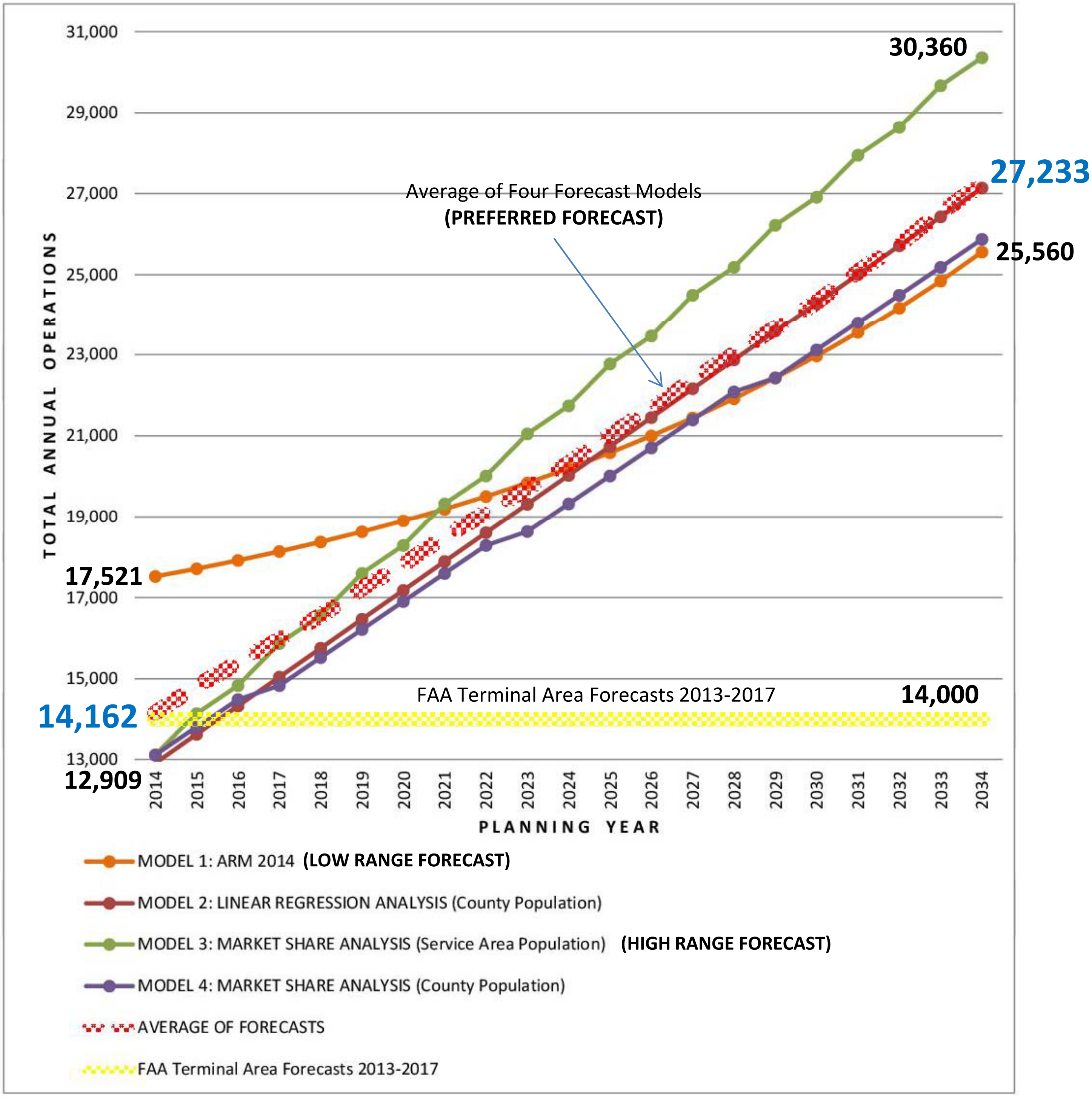
Summary of Prior Forecasts – Based Aircraft
Figure 3-1



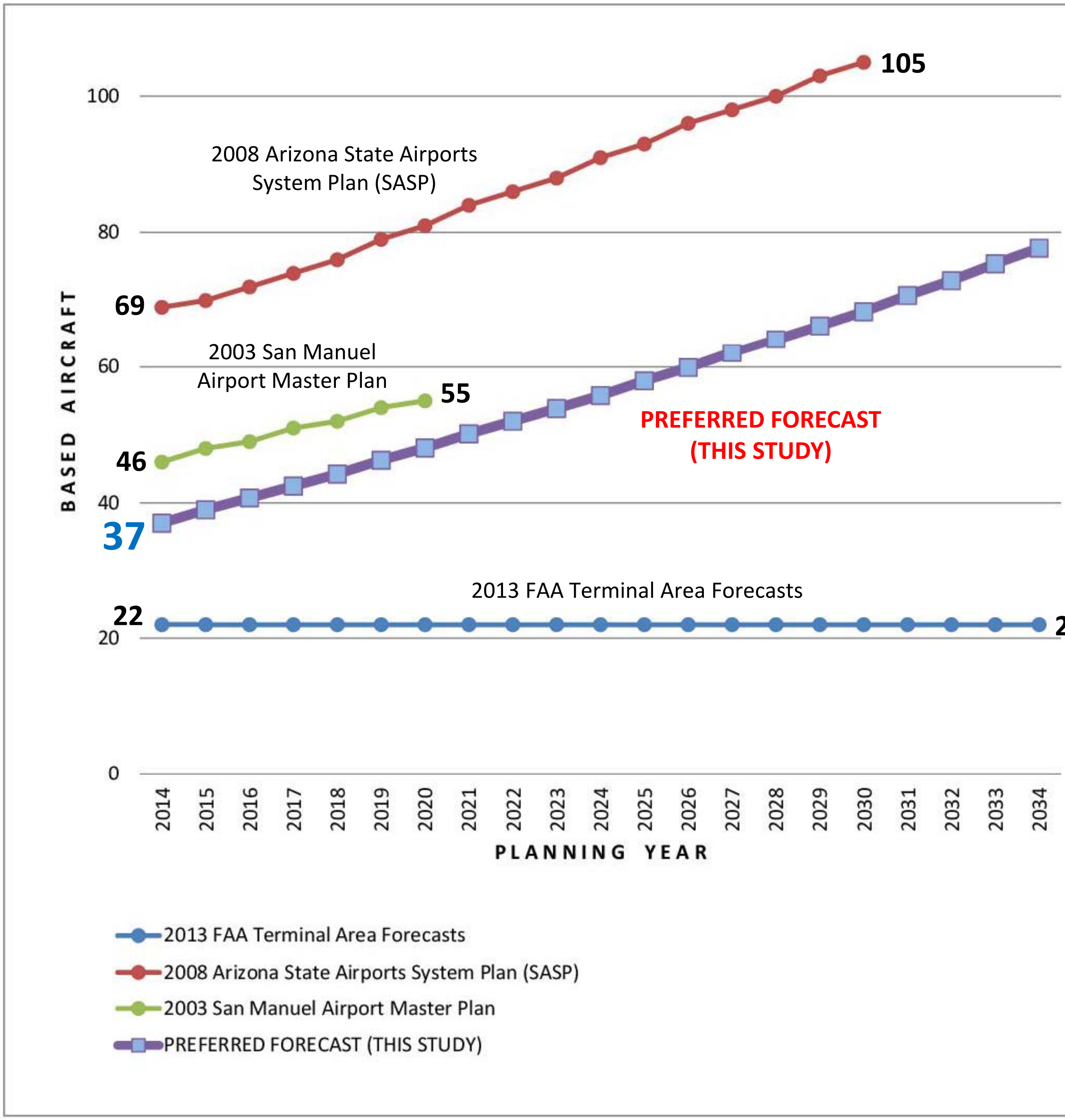
Summary of Prior Forecasts – Total Operations
Figure 3-2



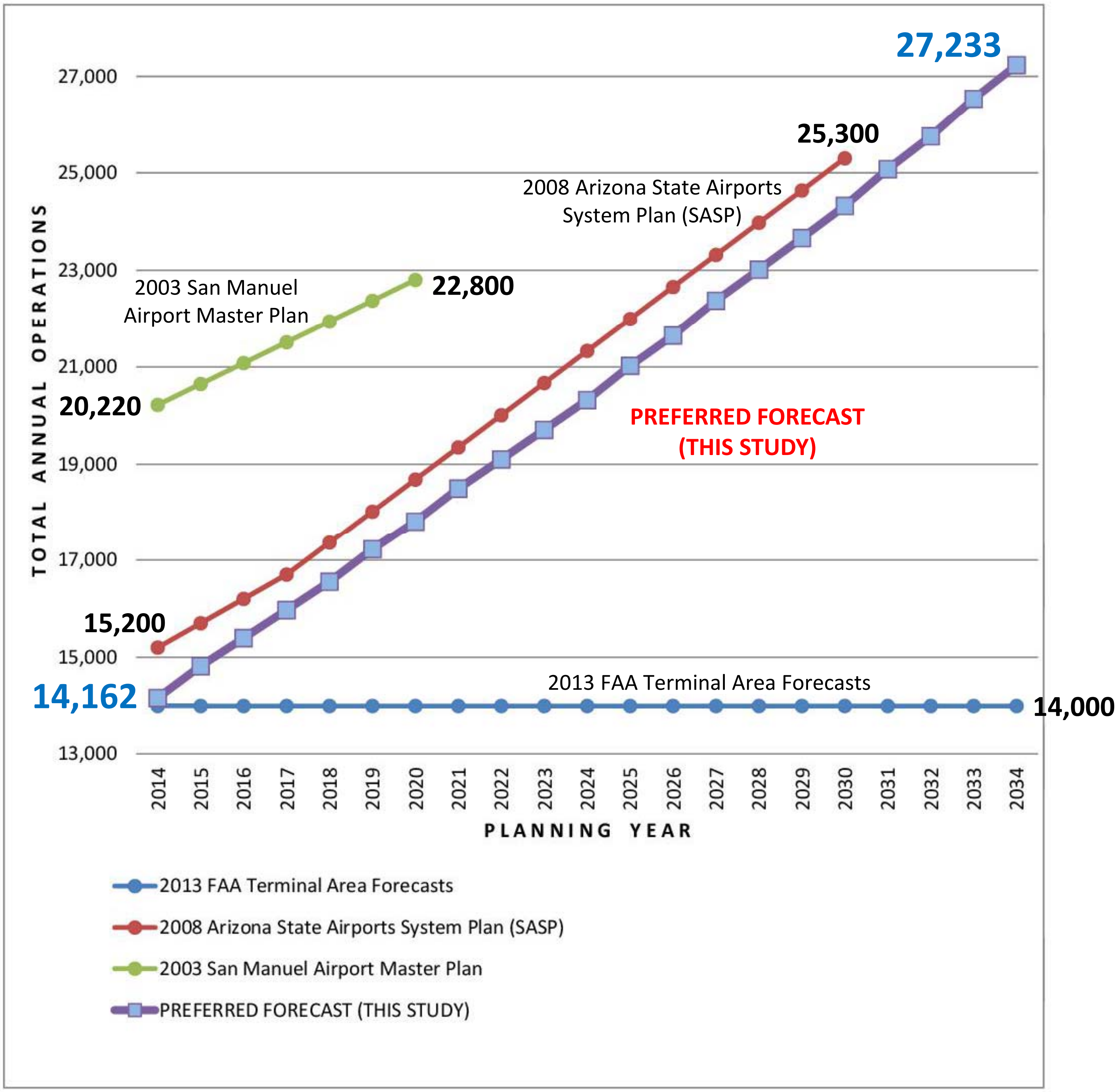
Summary of Forecast Models – Based Aircraft
Figure 3-3



Summary of Forecasts – Total Annual Operations
Figure 3-4



Comparison of Forecasts – Based Aircraft
Figure 3-5



Comparison of Forecasts – Total Operations

Figure 3-6

U.S. Department
of Transportation
Federal Aviation Administration

Federal Aviation Administration
Phoenix Airports Field Office

3800 N Central Ave
Suite 1025
Phoenix, AZ 85012

April 21, 2014

Mr. Jim Petty
Airport Economic Director
31 N Pinal Street
Building A
Florence, Arizona 85132

Dear Mr. Petty:

San Manuel Municipal Airport (E77)
Aviation Activity Forecast Approval

The Federal Aviation Administration (FAA) has reviewed the aviation forecast for the airport master plan for San Manuel (E77) dated April 1, 2014. The FAA approves these forecasts for airport planning purposes, including Airport Layout Plan development.

In summary, while the difference between the FAA Terminal Area Forecast (TAF) and San Manuel's forecast update regarding total operations isn't within the 10 percent and 15 percent allowance for 5 and 10 year planning horizons, the airport forecast update appropriately attributes these differences to variances in reported based aircraft and their associated operations as reported in the master plan update and the TAF. Therefore, for future TAF reporting years please ensure that the additional based aircraft and associated operations are included in the airport's annual operations counts.

However, regardless of this discrepancy the FAA locally approves this forecast for planning purposes at the San Manuel Municipal Airport. It is important to note that the approval of this forecast doesn't guarantee future funding for large scale capital improvements as future projects will need to be justified by current activity levels reached at the time the projects are proposed for implementation.

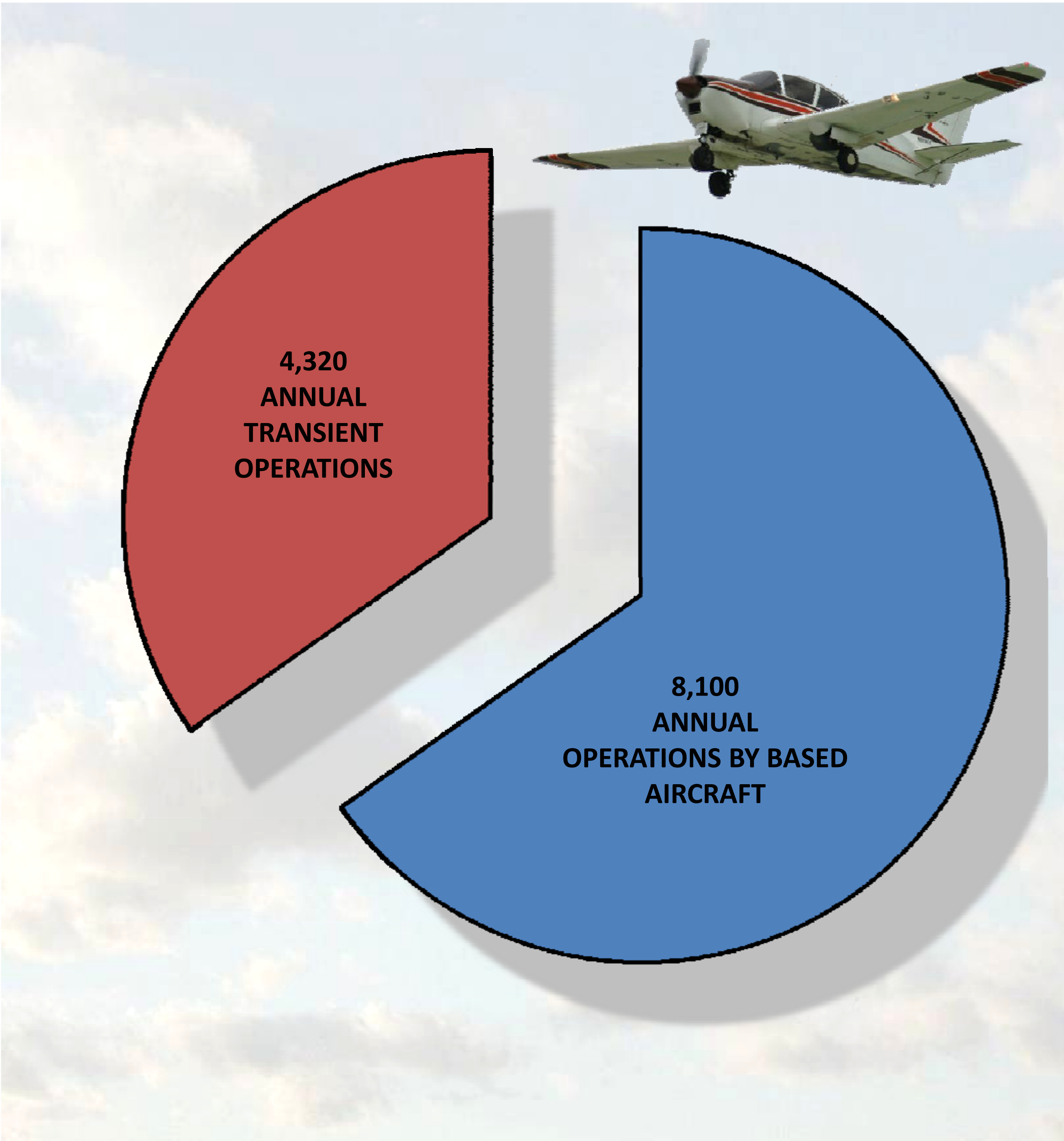
If you have any questions about this forecast approval, please call me at 602-379-3023.

Sincerely,

Kyler Erhard
Airport Planner

cc: Mr. Scott Driver, ADOT, Airport Grant Manager

FAA Forecast Approval
Figure 3-7



Estimated 2014 Aircraft Operations
Figure 3-8

4 Demand/Capacity Analysis

Introduction

The process of comparing projected demand with the airport's theoretical capacity consists of calculating the monthly, daily and hourly peak activity and comparing these values to the calculated capacity. The result is a measure of the airport facilities' capability to accommodate the projected demand through the planning period.

Demand is typically represented by the estimated peak activity that may be experienced at the airport. This value will be sensitive to the number of annual operations and also to the seasonal activity trends that the airport experiences.

Seasonal Use

Some level of seasonal fluctuation in aircraft operations may be expected at any airport. This fluctuation is most apparent in regions with severe winter weather patterns (winter or summer), and at non-towered general aviation airfields. The fluctuation is less pronounced at airports with a high percentage of commercial activity and with scheduled airline activity, and also at those facilities with a milder climate and/or a high percentage of training activity.

At airports that do not have a control tower, verifiable operational information is not available to determine the actual seasonal fluctuations. An accepted assumption that is used by many planners is that the activity in the peak month at general aviation airports is approximately 10 to 15 percent of the airport's total annual operations. This is the approach that was used in the preparation of San Manuel Airport's 2003 Master Plan[2], where it was assumed that the peak month activity would fall at the average of the range, or 13 percent of total annual operations.

The FAA Statistical Handbook of Aviation[3] (the FAA Handbook) presents national operational data broken down by months of record for the 1979-1984 period. This data is presented in **Table 4a** on the following page. The general seasonal use curve that results from the FAA's national records of operations reflects a fairly accurate approximation of the fluctuation in use that could be expected at an airport. The monthly peak activity indicated in the FAA Handbook for non-towered airports is 14.8 percent of total annual operations. This falls within the 10-15% range of the approach that was used in the 2003 Master Plan. However, according to the FAA Handbook, the monthly peak for towered airports is 9.4%. This suggests that the calculated peaking range of about 10-15% is a reasonable assumption, but that the lower end of the range represents airports with a control tower (and probably a high percentage of commercial activity and with scheduled airline activity). Therefore, it may be expected that the peak activity at a smaller, non-towered airport would tend toward the higher range.

In order to model a reasonable approximation of the potential peak demand upon San Manuel Airport's facilities, the peak monthly value of 14.8 percent from the FAA Handbook was used. It should be understood that while the FAA data indicates that this peak period occurs in the summer months, actual peaking in Arizona will tend to occur in the cooler months. So, the peak monthly value from the FAA data will be used to represent the probable peak period at San Manuel with no attempt to identify what month the peak actually occurs.

Table 4a: SEASONAL USE TREND CURVES – PERCENT USE / MONTH
FAA Statistical Handbook of Aviation (National Data)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
FAA Towered	7.2	8.2	8.6	9.0	9.1	**9.4**	9.1	8.7	8.7	7.8	7.1	7.1
Non Towered	3.5	4.0	4.8	7.5	11.3	13.5	**14.8**	13.0	10.0	8.0	5.8	3.8
Average	5.4	6.1	6.7	8.3	10.2	11.5	12.0	10.9	9.4	7.9	6.5	5.5

Peaking Characteristics

Using the Seasonal Use information, a formula was derived which will calculate the average daily operations in a peak activity month, based on the highest percentage of the total annual operations in a given month, as determined by the curve in **Table 4a**. The formula is as follows:

Where T = Monthly percent of use (from curve in **Table 4a**)
M = Average monthly operations
A = Total annual operations
D = Average Daily Operations in a given month

$M = A\,(T \div 100)$
$D = M / (365 \div 12 \text{ months})$

An assumption is made that approximately 90% of total daily operations will occur between the hours of 7:00 AM and 7:00 PM (12 hours) at a typical airport, and that the maximum peak hourly occurrence may be 50% greater than the average of the hourly operations calculated for this time period. Therefore, the Estimated Peak Hourly Demand (P) in a given month was determined by compressing 90% of the Average Daily Operations (D) in a given month into the 12 hour peak use period, reducing that number to an hourly average for the peak use period, and increasing the result by 50%, as follows:

Where D = Average Daily Operations in a given month.
P = Peak Hourly Demand in a given month.

$P = 1.5\,(0.90D \div 12 \text{ hours})$

The monthly, daily, and hourly demand was computed for the 2014 through 2034 planning period. These monthly, daily and hourly levels will be used to determine the need for additional airside and landside facilities through the planning period. The computed values are presented in **Table 4b** below.

Table 4b: PEAK DEMAND CHARACTERISTICS
San Manuel Airport – San Manuel, Arizona

YEAR	Total Annual Operations	% Use in Peak Month	PEAK ACTIVITY (OPERATIONS)		
			MONTHLY (M)	DAILY (D)	HOURLY (P)
2014	14,162	14.8%	2,096	69	8
2019	17,225	"	2,549	84	10
2024	20,318	"	3,007	99	11
2029	23,662	"	3,502	115	13
2034	27,233	"	4,031	133	15

As is evident in **Table 4b**, the maximum peak demand is approximately 8 operations (landings or takeoffs) per hour, potentially increasing to 15 operations per hour at the horizon of the planning period (2034).

Annual Service Volume (ASV)

The methodology for computing the relationship between an airport's configuration and its theoretical capacity is contained in FAA Advisory Circular AC 150/5060-5, Airport Capacity and Delay.

According to the FAA, the Annual Service Volume, or ASV, is a "calculated reasonable estimate" of an airport's total annual capacity, taking into account differences in runway utilization, weather conditions and aircraft mix that might be encountered in a year's time.[1] When compared to the existing or forecast operations of an airport, the ASV will give an indication of the adequacy of the facility in relationship to its activity level, in terms of capacity to accommodate projected operations.

For the purposes of this analysis, the following assumptions were made:

a) All operations will be by aircraft with takeoff weights less than or equal to 12,500 pounds;

b) The current runway configuration will remain in place (single runway airfield);

c) Total annual demand in the 2034 planning year could reach approximately 32,000 total annual operations;

d) The majority of the activity at the airport will be by general aviation aircraft (no air carrier operations).

e) No additional runways will be added to the airport within the planning period of this study.

The theoretical ASV for the San Manuel Airport with its present single runway configuration is 230,000 annual operations. The forecasts developed in this study indicate that total annual activity may reach approximately 27,000 operations in the year 2034, well within the airport's theoretical maximum ASV capacity.

The analysis of demand versus capacity in terms of theoretical ASV indicates that there will be no operational capacity constraints in the future in terms of the airport's physical capacity to accommodate the projected total annual traffic volume. However, a better measure of the demand/capacity relationship is the comparison of calculated hourly capacity versus projected hourly demand.

Hourly Demand

According to the FAA methodology[1], the airport's capacity in terms of operations per hour is estimated as 98 operations per hour in Visual Flight Rules (VFR) conditions, and 59 operations per hour in Instrument Flight Rules (IFR) conditions. The hourly demand estimates developed in this study indicate that activity may reach only 15 operations during a peak hour during the twenty year planning period, well within the maximum hourly capacity of the airport in its present configuration.

It is important to note that the calculated theoretical peak hourly demand would only occur during VFR weather conditions. According to records for Tucson International Airport, Visual Meteorological Conditions (VMC) weather occurs approximately 99.7 percent of the time in the general area, while Instrument Meteorological Conditions (IMC) weather occurs only approximately 0.3 percent of the time.[4]

Conclusion

Based on the analysis presented above, it is highly unlikely that hourly capacity will be exceeded during the planning period, or that there will be any operational capacity constraints caused by the annual activity exceeding the ASV.

Chapter References

[1] FAA Advisory Circular AC 150/5060-5, Airport Capacity and Delay (Change 2), December 1, 1995

[2] San Manuel Airport – Airport Master Plan, Coffman Associates and Z&H Engineering, November 12, 2003

[3] FAA Statistical Handbook of Aviation, published in 1984

[4] Tucson International Airport Master Plan Update, Landrum & Brown, December, 2004

5 Airport Facility Requirements

Introduction

This chapter of the Master Plan presents a program of recommended improvements that is initially focused on maintaining the airport's present infrastructure in order to accommodate the mix of light aircraft that currently use the airport. Recommendations are also included to provide a plan to accommodate the potential for increased activity by larger business aircraft in the future.

See **Figure 5-1, Airport Reference Map** to locate the improvement recommendation areas.

Facility requirements capital improvement recommendations are included for the Immediate Term (actions requiring immediate attention as soon as possible), the Short Term (2014-2019), the Intermediate Term (2020-2024), and the Long Term (2025-2034).

Each recommended improvement project is phased in the program, as follows:

- Year 1 – Environmental Assessment, if required
- Year 2 – Design
- Year 3 - Construction

In this chapter, the recommended projects are presented separately for each major facility (runway, taxiway, apron, etc.). One reason for this is that each will be evaluated for funding priority separately by the FAA and ADOT. In their priority calculations, runways have a higher priority than aprons, Runway Safety Area work has a higher priority than pavement rehabilitation, etc. Another reason is that it may not be economically feasible to undertake all facets of a project in a single year. For example, it may be necessary to do a runway strengthening one year and delay strengthening a taxiway until the following year. Of course, if funding is available, the projects could be combined in a single year. For example, a runway extension project and a parallel taxiway project may be listed separately in the facility requirements schedule but should be designed and constructed as a single project if it is economically feasible to do so.

Demand-Based Facility Requirements Planning

Airport planning to accommodate the airport's future activity is based upon the potential demand that may occur over time. In **Chapter 3, Aviation Demand** and **Chapter 4, Demand/Capacity Analysis**, a baseline of projected demand on the airport facilities was established. A reasonable estimate of maximum potential activity was identified that included the number of operations by specific types of aircraft.

Although care is taken to prepare forecasts that reflect a reasonable picture of the probable events that may occur in the future it is, of course, impossible to predict actual future occurrences with certainty. Recognizing this, this section of the Master Plan has been prepared using "demand-based" action points rather than only the more typical "time-based" action points. As a result, the airport's decision makers will be able to make better use of the Master Plan as a tool to program future capital improvements by reference to actual events that will trigger the need to implement recommended improvements.

The demand-based plan does not require implementation of the recommended improvements. Rather, the intent of the process is that the recommended improvements will be examined against actual demand levels on a regular basis prior to actually committing funding resources.

In this analysis, each of the various facilities has been examined in relationship to their ability to accommodate current demand, and also to continue to provide adequate service when compared to the forecast activity levels. Each recommended improvement or maintenance project is given a demand-based action point (that will trigger actual implementation) as well as an estimate of the year in which the forecasts indicate the demand may occur (this serves as an aid to long range planning).

Demand-based action points may be an increase in the number of based aircraft or the number of annual aircraft operations, observed changes in pavement conditions (cracking, surface oxidation, etc.), or may be driven by safety or security needs. An action may also be triggered by construction of another project because of impacts or for reasons of economy of scale. It is possible that some projects that have been identified as an immediate need cannot be programmed for immediate implementation because of funding availability limitations. Implementation of these items will be triggered by allocation of funding.

An analysis and recommendation of improvements and/or maintenance is included for each of the major elements of the airport's infrastructure. The demand-based recommendations are summarized at the end of this section, and sorted into probable program years. Analysis of alternative ways to achieve the recommended major improvements is included in **Chapter 6, Development Alternatives Analysis**. Funding of the recommendations contained in this chapter is addressed in **Chapter 9, Airport Development Schedule and Financial Analysis**.

Runway 11-29

Runway Design Code (RDC)
The Aircraft Approach Category (AAC), Airplane Design Group (ADG), and approach Visibility Minimums are combined to form the Runway Design Code (RDC) of a particular runway. The RDC provides the information needed to determine the appropriate FAA design standards that apply to a runway. The first component of the RDC, depicted by a letter, is the AAC and relates to aircraft approach speed (operational characteristics). The second component of the RDC, depicted by a Roman numeral, is the ADG and relates to either the aircraft wingspan or tail height (physical characteristics); whichever is most restrictive. The third component of the RDC relates to the visibility minimums expressed by RVR values in feet of 1200, 1600, 2400, 4000, and 5000 (corresponding to lower than 1/4 mile [CAT-III PA], lower than 1/2 mile but not lower than 1/4 mile [CAT-II PA], lower than 3/4 mile but not lower than 1/2 mile [CAT-I PA], lower than 1 mile but not lower than 3/4 mile [APV ≥ 3/4 but < 1 mile], and not lower than 1 mile, respectively). The

third component will read "VIS" for runways designed with visual approach use only.[5] The RDC is the code signifying the FAA design standards to which the runway design must comply.

With reference to the tables in **Chapter 3, Aviation Demand**, page 3-19, the following RDCs for San Manuel Airport in its existing and ultimate development scenarios were defined:

	Existing	Ultimate
Aircraft Approach Category (AAC)	B	B
Airplane Design Group (ADG)	I	II
Visibility Minimums	VIS	5000
Runway Design Code	**B-I-VIS**	**B-II-5000**

Approach Reference Code (APRC) and Departure Reference Code (DPRC)

The latest FAA design standards[5] define the Approach and Departure Reference Codes (APRC and DPRC). The APRC and DPRC describe the current operational capabilities of a runway and adjacent taxiways where no special operating procedures have been identified. In contrast, the RDC is based on planned development and has no operational application. The APRC and DPRC may change over time as improvements are made to the runway, taxiways, and NAVAIDs.

Like the RDC, the APRC is composed of three components: AAC, ADG, and visibility minimums. Visibility minimums are expressed as RVR values in feet of 1600, 2400, 4000, and 5000 (nominally corresponding to lower than 1/2 mile, lower than 3/4 mile but not lower than 1/2 mile, not lower than 3/4 mile, and not lower than one mile, respectively). The third component for a runway operated under visual approach conditions (including circling approaches) is "VIS."

The DPRC represents the aircraft that can take off from a runway while any aircraft are present on adjacent taxiways, under particular meteorological conditions with no special operational procedures necessary. It is similar to the APRC, but is composed of only two components, AAC and ADG.

The APRC and DPRC function as a limit as to what class of aircraft (ARC) should use the airport, and is based primarily on the existing or planned separation between the runway and parallel taxiway. The existing runway to parallel taxiway offset at San Manuel Airport is 240', indicating a current APRC of **B/II/VIS**, and a current DPRC of **B/II**. If ultimate development includes a published instrument approach procedure, the APRC will change to **B/II/5000** (assuming a nonprecision approach with visibility minimums not lower than one mile).

Runway Protection Zones (RPZs)

The FAA requires that the Runway Protection Zones (RPZs) be controlled by the airport, preferably through Fee Title ownership. RPZs may be controlled through the acquisition of Avigation Easements if it is not possible to acquire the land in Fee. Land uses within the RPZ should be limited to farming (that meets minimum buffers as specified by FAA policy), irrigation channels (as long as they do not attract birds), underground facilities, navigational aids and facilities that are considered to be "fixed by function", and airport service roads "as long as they are not public roads and are directly controlled by the airport operator" [5]

Runway 11-29's existing RPZs are encompassed within the current airport property. They are in compliance with FAA design standards, with the exception of the existing airport Access Road that is located within the approach RPZ for Runway 11. This road should be relocated as a matter of safety and compliance. See the discussion on the airport Access Road recommendations beginning on page 5-17 for additional information.

Runway Object Free Areas (OFAs)

The FAA defines the Object Free Area (OFA) as "An area centered on the ground on a runway, taxiway, or taxilane centerline provided to enhance the safety of aircraft operations by remaining clear of objects, except for objects that need to be located in the OFA for air navigation or aircraft ground maneuvering purposes."[5] The Runway OFA (ROFA) is centered about the runway centerline. The FAA's ROFA clearing standards require clearing the ROFA of above-ground objects protruding above the nearest point of the RSA. Except where precluded by other clearing standards, it is acceptable for objects that need to be located in the ROFA for air navigation or aircraft ground maneuvering purposes to protrude above the nearest point of the RSA. These "fixed-by-function" objects must be on frangible mounts. It is permissible to taxi and hold aircraft in the ROFA. However, objects that are not essential for air navigation or aircraft ground maneuvering (taxi and hold) purposes may not be placed in the ROFA. This includes parked aircraft and agricultural operations.

The existing Runway 11-29 ROFAs are in compliance with FAA standards. However, upgrade of the Airport to an ARC B-II classification in the future would require removal of the existing mobile home residence and also a privately owned eight-unit Tee Hangar structure that now houses 10 aircraft. Although clear of the present 400' wide ARC B-I ROFA, these structures would encroach into the ultimate 500' wide ARC B-II ROFA.

Runway Length

As was stated in **Chapter 3, Aviation Demand**, based on a comparison between the design criteria contained in FAA Advisory Circular AC 150/5300-13A and the existing airport facilities, the San Manuel Airport is presently able to accommodate aircraft up to Approach Category B (less than 91 knot approach speeds), and Airplane Design Group I (wingspan less than 49 feet).[2] Therefore, an ARC B-I reference code is indicated as the airport's present role. (See **Chapter 3, Aviation Demand**, beginning on page 3-18, for definitions of the FAA Aircraft Reference Code, or "ARC", system of airport classification.)

According to the observations and estimates of current activity developed in **Chapter 3, Aviation Demand**, the Critical Aircraft currently using the airport facilities is a mix of piston-powered single and multi-engine aircraft, with gross takeoff weights less than 12,500 pounds. According to the forecasts, by the year 2019 there is the <u>potential</u> for an increase in activity by light business jets, with activity potentially increasing for turboprops later in the planning period. Some of these aircraft may be in the ARC B-II classification. Therefore, it was recommended that the ultimate classification of the airport be identified as ARC B-II.

It must be emphasized that no immediate demand to accommodate jet or turboprop aircraft has been identified. The ultimate runway length recommendations contained in this chapter are included as a planning tool to be available in the event the potential for use by these aircraft becomes a reality.

A representative "design fleet" of typical aircraft that may use the existing length of Runway 11-29 is presented in **Table 5a** on page 5-6. The approximate runway length requirements for the various aircraft were computed based on a pressure altitude of 3,274' MSL on a typical average day of 68° Fahrenheit, and also on a 97° Fahrenheit day, representing the maximum mean temperature experienced at San Manuel in June and July. For the purposes of these calculations, the record length of the existing runway (4,214 feet)[10] was used, with a gradient of +0.515% to the northwest (Runway 29).[2] Dry conditions, no wind, and use of Runway 29 (uphill) were assumed for the takeoff length calculations.

Table 5a represents the aircraft that can theoretically use Runway 11-29 at the present time, as limited by performance. Many of the aircraft that are listed are able to use the airport only at reduced takeoff weights, as limited by the runway length required for takeoff. These are noted in the table (in the "Notes" column and footnotes). The calculations were first entered into assuming the aircraft's maximum allowable gross takeoff weight. If the runway length requirements exceeded the current length of Runway 11-29, the takeoff weight was reduced until the aircraft's weight would allow it to depart.

The results of the calculations in **Table 5a** suggest that many ARC B-II aircraft could use the existing Runway 11-29 at its current length of 4,214 feet[10] without a runway extension. However, the current design strength of the runway pavement is for SWG (Single Wheel Gear) aircraft with a maximum gross weight of up to 12,000 pounds.[2] Runway 11-29 would have to be strengthened to be able to accommodate most of the ARC B-II aircraft included in **Table 5a**.

In order to determine a reasonable runway extension length and pavement strength in the event that jet and/or turboprop activity becomes a reality in the future, further analysis was performed. This consists of calculations of the takeoff length requirements for the typical ARC B-II aircraft presented in **Table 5a**, as well as calculation of the landing length requirements for the jet aircraft in the table. Many fast/heavy jets require more runway length for landing than for takeoff. The results of these calculations are presented in **Table 5b** and **Table 5c**, on page 5-7. The calculations for landing distance assumed use of Runway 11 (downhill), and wet runway conditions.

The most critical aircraft for takeoff weight in **Table 5a** is the ARC B-II Cessna Citation 560 Excel, at 18,325 pounds with Single Wheel Gear.

Table 5a: TYPICAL CRITICAL AIRCRAFT FLEET (TAKEOFF PERFORMANCE LIMITS) LIMITED BY EXISTING RUNWAY LENGTH OF 4,214 FEET [10]
San Manuel Airport – San Manuel, Arizona

Aircraft	68°F			97°F		
	Takeoff Weight (pounds)	Takeoff Length Required	Notes	Takeoff Weight (pounds)	Takeoff Length Required	Notes
ARC A-I						
Cessna 172R	2,450	1,550'	GTW, GR	2,450	1,890'	GTW, GR
Cessna Cardinal 177B	2,500	1,210'	GTW, GR	2,500	1,460'	GTW, GR
Piper PA-32-300	3,400	2,680'	GTW, D50	3,400	3,400'	GTW, D50
Cirrus SR20	3,000	2,200'	GTW, GR	3,000	2,570'	GTW, GR
Cirrus SR22	3,400	1,590'	GTW, GR	3,400	1,890'	GTW, GR
ARC B-I						
Cessna 340A	5,990	2,320'	GTW, GR	5,990	2,610'	GTW, GR
Cessna 402C	6,850	2,520'	GTW, GR	6,850	2,840'	GTW, GR
Cessna 414A	6,750	3,040'	GTW, GR	6,750	3,430'	GTW, GR
Cessna 421C	7,450	2,530'	GTW, GR	7,450	2,860'	GTW, GR
Cessna 425*	8,600	3,010'	GTW, GR	8,600	3,390'	GTW, GR
Cessna Citation 525 CJ1**	9,930	4,210'	RR, D35	9,230	4,210'	RR, D35
ARC B-II						
Cessna 441*	9,850	2,540'	GTW, GR	9,850	2,940'	GTW, GR
Beechcraft B200 King Air*	12,500	4,170'	GTW, A/S	9,900	4,210'	RR, A/S
Cessna Citation 525A CJ2**	11,580	4,210'	RR, D35	10,750	4,210'	RR, D35
Cessna Citation 550 Bravo**	13,525	4,210'	RR, D35	12,625	4,210'	RR, D35
Cessna Citation 560 Encore**	15,425	4,210'	RR, D35	14,380	4,210'	RR, D35
Cessna Citation 560 Excel**	18,325	4,210'	RR, D35	16,900	4,210'	RR, D35

GTW=Maximum Gross Takeoff Weight RR=Takeoff weight reduced for runway length limits
RP=Takeoff weight reduced for aircraft performance limit
BFL=Balanced Field Length A/S=Accelerate/Stop Distance required TOD=Takeoff distance required
GR=Ground Roll Distance
D35=Distance over 35' obstacle D50=Distance over 50' obstacle
* Indicates a turboprop aircraft. ** Indicates a jet aircraft.

Note: Alternative methods of accomplishing the Runway 11-29 extension are presented in **Chapter 6, Alternatives Analysis**.

Table 5b: TYPICAL CRITICAL AIRCRAFT FLEET (TAKEOFF PERFORMANCE LIMITS)
TURBOPROPS AND JETS OPERATING AT MAXIMUM GROSS WEIGHT
San Manuel Airport – San Manuel, Arizona

Aircraft	68°F			97°F		
	Takeoff Weight (pounds)	Takeoff Length Required	Notes	Takeoff Weight (pounds)	Takeoff Length Required	Notes
ARC B-I						
Cessna 425*	8,600	3,010'	GTW, GR	8,600	3,390'	GTW, GR
Cessna Citation 525 CJ1**	10,600	5,010'	GTW, D35	10,600	6,000'	GTW, D35
ARC B-II						
Cessna 441*	9,850	2,540'	GTW, GR	9,850	2,940'	GTW, GR
Beechcraft B200 King Air*	12,500	4,170'	GTW, A/S	12,500	4,710'	GTW, A/S
Cessna Citation 525A CJ2**	12,375	4,740'	GTW, D35	12,375	5,490'	GTW, D35
Cessna Citation 550 Bravo**	14,800	4,990'	GTW, D35	14,800	5,740'	GTW, D35
Cessna Citation 560 Encore**	16,630	4,900'	GTW, D35	16,630	5,950'	GTW, D35
Cessna Citation 560 Excel**	20,000	4,940'	GTW, D35	20,000	5,820'	GTW, D35

GTW=Maximum Gross Takeoff Weight RR=Takeoff weight reduced for runway length limits
A/S=Accelerate/Stop Distance required GR=Ground Roll Distance
D35=Distance over 35' obstacle D50=Distance over 50' obstacle
* Indicates a turboprop aircraft. ** Indicates a jet aircraft.
(Takeoff distances exceeding the current runway length are shaded)

Table 5c: TYPICAL CRITICAL AIRCRAFT FLEET (LANDING PERFORMANCE LIMITS)
JETS OPERATING AT MAXIMUM GROSS WEIGHT
San Manuel Airport – San Manuel, Arizona

Aircraft	68°F			97°F		
	Landing Weight (pounds)	Landing Length Required	Notes	Landing Weight (pounds)	Landing Length Required	Notes
ARC B-I						
Cessna Citation 525 CJ1	9,800	3,750'	GLW, D50	9,800	4,050'	GLW, D50
ARC B-II						
Cessna Citation 525A CJ2	11,500	4,070'	GLW, D50	11,500	4,300'	GLW, D50
Cessna Citation 550 Bravo	13,500	4,810'	GLW, D50	13,500	5,380'	GLW, D50
Cessna Citation 560 Encore	15,200	3,900'	GLW, D50	15,200	4,160'	GLW, D50
Cessna Citation 560 Excel	18,700	4,380'	GLW, D50	18,700	4,660'	GLW, D50

GLW=Maximum Gross Landing Weight RR=Takeoff weight reduced for runway length limits
A/S=Accelerate/Stop Distance required GR=Ground Roll Distance
D35=Distance over 35' obstacle D50=Distance over 50' obstacle
(Landing distances exceeding the current runway length are shaded)

- **Short Term Runway Recommendation:** It is recommended that a pavement strengthening project be implemented when jet and/or turboprop activity of at least 500 annual operations occurs. A 20,000 pound SWG design should be planned for. The forecasts indicate the potential for this to happen in the Short Term (2014-2019) time frame. However, currently there is no documented use by heavier jets or turboprop aircraft. Tentative programming for construction in the 2019 planning year is recommended, with design in the preceding year. The airport classification should be upgraded to ARC B-II at that time. The current 75' pavement width is adequate for the ultimate airport classification of ARC B-II.

  This reclassification to ARC B-II will also require the removal/relocation of the existing 10-unit Tee Hangar and residence which will encroach into the 500' wide ROFA (see also the recommendations for Hangar development, beginning on page 5-22).

  The most critical aircraft in the maximum gross operating tabulations above (**Tables 5b** and **5c**) are the ARC B-I Cessna Citation 525 CJ1 for full gross takeoff length (6,000 feet), and the ARC B-II Cessna Citation 560 Excel for weight (20,000 pounds, Single Wheel Gear).

  Environmental Coordination: The pavement strengthening project should require only Categorically Exclusion (CatEx) documentation. This must be prepared prior to issuance of a federal grant.

- **Ultimate Term Runway Recommendation:** It is recommended that a runway extension to an ultimate length of 6,000 feet be programmed to occur coincident with an increase in annual operations to a minimum of 500 movements by jet aircraft to allow for use by larger aircraft. This may be assumed to occur at the Long Term horizon planning year for this Master Plan (2034). The current 75' pavement width is adequate for the ultimate airport classification of ARC B-II. The runway extension may require construction of major storm drainage culverts.

  Environmental Coordination: The runway extension will require the preparation of an Environmental Assessment (EA). The EA, land acquisition, design, and construction should be programmed in sequential years culminating in construction in 2034.

Runway Safety Areas (RSAs)

FAA design standards indicate that a Runway Safety Area (RSA) must be "cleared and graded and have no potentially hazardous ruts, humps, depressions, or other surface variations; drained by grading or storm sewers to prevent water accumulation; capable, under dry conditions, of supporting … the occasional passage of aircraft without causing damage to the aircraft; and free of objects, except for objects that need to be located in the RSA because of their function."[5] The current standards also state that "RSA standards cannot be modified."[5]

The Runway 11 and 29 extended RSAs are 240' long and 120' wide, clear and in conformance with ARC B-I requirements.[2] Upgrading the airport to ARC B-II will extend the RSAs to 300' long and 150' wide. No major impediments to this were found.

Summary of Recommended Runway Improvements
The recommended improvement schedule for Runway 11-29 is summarized as follows in **Table 5d**:

Table 5d: RECOMMENDED IMPROVEMENTS - RUNWAY 11-29
San Manuel Airport – San Manuel, Arizona

Project	Demand-Based Action Point	Year
Short Term (2014-2019)		
Design runway pavement strengthening	500 annual ops by heavier aircraft	2018
Construct runway pavement strengthening	500 annual ops by heavier aircraft	2019
Long Term (2025-2034)		
EA for Runway 11-29 extension	500 annual ops by critical jet aircraft	2031
Land acquisition for RWY 11-29 extension	500 annual ops by critical jet aircraft	2032
Design Runway 11-29 extension	500 annual ops by critical jet aircraft	2033
Construct Runway 11-29 extension	500 annual ops by critical jet aircraft	2034

Parallel Taxiway A and Connector Taxiways

Taxiway Design Criteria
FAA design criteria[5] establishes a Taxiway Design Group (TDG) for each taxiway on an airfield. Generally, the TDG is based on the overall Main Gear Width (MGW) and the Cockpit to Main Gear (CMG) distance of the most critical aircraft that will use the taxiway.

The critical aircraft defined for Runway 11-29 are the ARC B-I Cessna Citation 525 CJ1 for full gross takeoff length (6,000 feet), and the ARC B-II Cessna Citation 560 Excel for weight (20,000 pounds, Single Wheel Gear). Both of these aircraft are classified by the FAA[5] as TDG-2 aircraft.

Taxiway design should consider the potential for the airport's classification to be upgraded from ARC B-I to an ultimate ARC of B-II. Thus, taxiway geometry should always be based on ARC B-II design (and in this case, TDG-2 criteria) whereas the pavement design strength may be initially based on a lighter design aircraft and strengthened in the future as required by actual activity by heavier aircraft.

Taxiway Geometry
Taxiways are designed for "cockpit over centerline" taxiing with pavement being sufficiently wide to allow a certain amount of wander. The allowance for wander is provided by the "taxiway edge

safety margin," which is measured from the outside of the landing gear to the taxiway edge. Adequate pavement fillets must be provided on turns to ensure the prescribed taxiway edge safety margin is maintained when the pilot guides the aircraft around turns while the cockpit follows the centerline.

The minimum taxiway pavement width for TDG-2 is 35 feet. The critical aircraft, a Cessna Citation 560 Excel, has a Main Gear Width (MGW) of 16 feet. TDG-2 design criteria calls for a 7.5' minimum Taxiway Edge Safety Margin width. Applying these values yields a minimum required pavement width of (16')+(7.5')+(7.5'), or 31 feet. Therefore, the required taxiway pavement width at San Manuel Airport is 35 feet.

Existing parallel Taxiway A, connector Taxiways A1 through A6 have minimum pavement widths of 35 feet[2] and are therefore in compliance with current FAA design criteria for TDG-2 taxiways. Parallel Taxiway A is offset from Runway 11-29 by 240 feet[2]. It is therefore in compliance with the current ARC B-I classification and the ultimate ARC B-II classification of the airport.

The configuration of midfield connector Taxiway A4 is not in compliance with the current FAA design standards. In its present configuration aircraft departing the parking apron are allowed a direct (straight line) route from the parking apron, across parallel Taxiway A, and onto Runway 11-29. This configuration can lead to runway incursions.

✈ **Immediate Term Taxiway Recommendation:** It is recommended that the portion of Taxiway A4 between parallel Taxiway A and Runway 11-29 be relocated so that straight line access from the parking apron to Runway 11-29 does not exist. This is considered to be an Immediate Term safety project. Design should be programmed immediately (2015) with construction in the following year.

Environmental Coordination: The Taxiway A4 reconfiguration would most likely require only Categorical Exclusion (CatEx) documentation. This must be prepared prior to issuance of a federal grant.

Connector Taxiway A6 currently enters Runway 11-29 approximately 225 feet northwest of the southeast end of the runway. Departing aircraft have to taxi back on the runway to depart Runway 11. Because of this pilots may choose not to use the full length of pavement for takeoff, and larger aircraft may not be able to turn around on the runway. This constitutes a potential safety issue during times of high density altitude operation, peak activity, and usage by larger aircraft that cannot turn around within the confines of the 75' pavement width.

- ✈ **Intermediate Term Taxiway Recommendation:** It is recommended that connector Taxiway A6 be relocated in the future to allow direct access to the Runway 11 departure end without the need to taxi back and turn around on the runway. The relocation would require removal of the existing mobile home residence and a privately owned eight-unit Tee Hangar structure (which are also obstructions to the planned ARC B-II ROFA). This project may be programmed in the Intermediate Term (2020-2024). Programming for design in 2023 and construction in 2024 is recommended, but consideration of the actual activity by larger aircraft should be given before actual implementation of the project.

  Environmental Coordination: The Taxiway A6 relocation would most likely require only Categorical Exclusion (CatEx) documentation. This must be prepared prior to issuance of a federal grant.

Taxiway Strengthening and Extension
Parallel Taxiway A's pavement should be strengthened concurrent with the strengthening of the Runway 11-29 pavement.

- ✈ **Short Term Taxiway Recommendation:** It is recommended that a taxiway pavement strengthening project for all taxiways be implemented when jet and/or turboprop activity of at least 500 annual operations occurs (concurrent with the Runway 11-29 pavement strengthening). A 20,000 pound SWG design should be planned for. The forecasts indicate the potential for this to happen in the Short Term (2014-2019) time frame. However, currently there is no documented use by jets or turboprop aircraft. Programming for design in 2018 and construction in the 2019 planning year is recommended.

  Environmental Coordination: The pavement strengthening project should require only Categorically Exclusion (CatEx) documentation. This must be prepared prior to issuance of a federal grant.

Extension of parallel Taxiway A should be programmed to coincide with the ultimate Runway 11-29 extension. A new connector taxiway at the extended runway end may require renumbering of the connector taxiways.

<u>**Note**</u>**:** Alternative methods of accomplishing the Runway 11-29 and Taxiway A extension are presented in **Chapter 6, Alternatives Analysis**.

- **Ultimate Term Taxiway Recommendation:** It is recommended that parallel Taxiway A be extended concurrent with the extension of Runway 11-29, programmed to occur coincident with an increase in annual operations to a minimum of 500 movements by jet aircraft to allow for use by larger aircraft. This may be assumed to occur at the horizon planning year for this Master Plan (2034).

  Environmental Coordination: The extension of Taxiway A in itself would most likely require only Categorical Exclusion (CatEx) documentation. This must be prepared prior to issuance of a federal grant. However, since this project is recommended as part of the Runway 11-29 extension project it should be included in the 2031 Environmental Assessment for the runway extension, with design to occur in 2033.

Summary of Recommended Taxiway Improvements

The recommended improvement schedule for the airport's taxiways is summarized as follows in **Table 5e**:

Table 5e: RECOMMENDED IMPROVEMENTS - TAXIWAYS
San Manuel Airport – San Manuel, Arizona

Project	Demand-Based Action Point	Year
Immediate Need		
Design - Reconfigure Taxiway A4	Immediate Need - Safety	2015
Construct - Reconfigure Taxiway A4	Immediate Need - Safety	2016
Short Term (2014-2019)		
Design taxiway pavement strengthening	Strengthening of Runway 11-29	2018
Construct taxiway pavement strengthening	Strengthening of Runway 11-29	2019
Intermediate Term (2020-2024)		
Design Taxiway A6 relocation	Increased use by larger aircraft	2023
Construct Taxiway A6 relocation	Increased use by larger aircraft	2024
Long Term (2025-2034)		
Design Taxiway A extension	Extension of Runway 11-29	2033
Construct Taxiway A extension	Extension of Runway 11-29	2034

Aircraft Parking Apron

There are a total of twenty tiedown spaces available on the Aircraft Parking Apron at the present time. During times of peak demand, use of the Apron tiedown spaces can be at capacity. As demand increases in the future, additional aircraft parking spaces will be needed. In addition to open tiedown spaces, the County has expressed interest in constructing shaded parking on the Apron (now programmed for construction in 2015).

The number of recommended tiedown spaces for based and transient aircraft use was determined by applying the following criteria and assumptions:

a) According to the projections in **Chapter 3, Aviation Demand**, approximately 42% of the total operations are assumed to be by transient aircraft at the present time. This percentage is projected to decrease to approximately 35% throughout the planning period.

b) Most visiting aircraft will arrive and depart on the same day. The actual number of peak transient aircraft is assumed to be one-half the peak transient daily operations.

c) Seventy-five percent of the transient aircraft will be parked on the Apron at the same time during the peak period.

d) Ten percent of the based aircraft may also be parked on the Apron, instead of in hangars.

The following calculations were made to derive the recommended number of tiedown spaces to be provided on the parking apron in the present and ultimate scenarios:

Where: D = Average Peak Day Operations.
T_O = Peak Day transient operations.
T_P = Percent of operations by transient aircraft
N = Number of required tiedowns for transients.
B = Number of based aircraft.

...and

S = Total number of recommended tiedowns.

$$T_O = D\,(T_P)$$
$$N = 0.75\,(T_O / 2)$$

...and

$$S = (0.10\,B) + N$$

Table 5f (on the following page) presents the recommended number of tiedown spaces to be provided on the parking apron throughout the planning period. Based on these calculations, the number of tiedown spaces that are now available is adequate at the present time, and probably through most of the Short Term planning period. However, the space will not be adequate to meet the needs throughout the twenty-year planning period. An expansion of the Apron will be necessary when predicated by actual demand.

Table 5f: RECOMMENDED NUMBER OF TIEDOWNS
San Manuel Airport – San Manuel, Arizona

YEAR % Transient Operations (T_P)	**Average Peak Day Operations** (D)	**Peak Day Transient Operations** (T_O)	**Based Aircraft** (B)	**Transient Tiedowns** (N)	**Total Tiedowns Required** (S)
2014 (42%)	69	29	4	15	**19**
2019 (40%)	84	34	5	17	**22**
2024 (38%)	99	38	6	19	**25**
2029 (37%)	115	43	7	22	**29**
2034 (35%)	133	47	8	24	**32**

The existing Aircraft Parking Apron has a pavement design strength of 12,000 pounds, SWG.[2] However, recent field testing[6] has shown that the Apron pavement's actual strength is significantly less than that. If the runway and taxiway pavement is strengthened to accommodate heavier aircraft in the future, the areas of the Apron that would be used by these heavier types should also be strengthened. It has been recommended that Runway 11-29 and taxiways be strengthened to 20,000 pounds, SWG with design in 2018 and construction in 2019 (if there has been an actual increase in use by heavier aircraft). A concurrent Aircraft Parking Apron pavement strengthening project should also be implemented at that time.

The Aircraft Parking Apron exhibits longitudinal cracking at 12' spacing with crack widths of from ¼" to ½" wide, and also transverse cracking with 20' to 30' spacing and crack widths ranging from ¼" up to 2". There is also cracking around the tiedown anchors up to ½" wide. The 2010 ADOT APMS rates this taxiway's pavement at a PCI of 79.[13] The 2013 APMS data shows the pavement condition declining to a PCI of 59.[14] At the time of preparation of this Master Plan, a project is under design to rehabilitate the apron pavement, with construction scheduled for 2015. The Apron pavement will be designed for 12,500 pound SWG aircraft. The County is also planning to construct tiedown shades on the Apron at that time.

Aircraft Parking Apron Compliance with Current Standards

The existing Aircraft Parking Apron does not comply with the FAA's most current Taxilane Object Free Area (TOFA) clearance standards for an ARC B-I airport, and will not comply with the ARC B-II standards when the airport is upgraded to that classification. The following areas of noncompliance were found:

- The existing Terminal Building encroaches into the apron's TOFA. ARC B-I standards require that fixed or movable objects must be set back 39.5' from a taxilane center line. General ARC B-II standards require a 57.5' setback (the Apron may be designed for a specific range of B-II aircraft, which may decrease this value). The Terminal Building is approximately 33' from the center line, encroaching into the existing ARC B-I TOFA.

- The existing nose-to-nose tiedown spacing on the Apron is approximately 80'. This complies with prior FAA design standards for a light aircraft apron. However, the most current ARC B-I standards require a 79' wide TOFA that is clear of fixed or movable objects (including parked aircraft). ARC B-II requires a 115' wide TOFA. The 80' spacing does not provide these clearances.

In order to mitigate the current setback deficiencies found on the Apron, and to allow for ultimate upgrade of the airport to ARC B-II standards, it is recommended that the Apron be reconfigured as part of the current pavement rehabilitation and shade construction project (programmed for construction in 2015). Design for the Apron reconfiguration should allow for unconstrained "flow-through" taxilane access for larger ARC B-II aircraft, as well as providing tiedown parking spaces for smaller ARC A-I aircraft. The FAA requirements[5] for full general compliance with the ARC B-II design criteria specifies a 115' wide TOFA. However, the Apron "flow-through" taxilane may be designed to accommodate a specific ARC B-II critical design aircraft, or a range of ARC B-II aircraft that may reasonably be expected to use the facility. This approach may decrease the TOFA width requirements.

A range of ARC B-II aircraft that may use the San Manuel Airport in the future has been selected as representative of types that should be reasonably accommodated on the Apron. These aircraft are listed below in **Table 5g**. The Taxiway Object Free Area (TOFA) width requirements were calculated in accordance with FAA AC 150/5300-13A, Airport Design. The most critical TOFA value is shaded in the table.

Table 5g: TYPICAL ARC B-II CRITICAL AIRCRAFT FLEET
FOR APRON "FLOW-THROUGH" TAXILANE DESIGN
San Manuel Airport – San Manuel, Arizona

Aircraft	Takeoff Weight (pounds)	Wingspan	TOFA Width Required *	Length	Tail Height	Notes
Cessna 441	9,850	49.3'	**79.2'**	39.0'	13.1'	Turboprop
Beechcraft C90-1 King Air	9,650	50.2'	**80.2'**	35.5'	14.2'	Turboprop
Beechcraft B200 King Air	12,500	54.5'	**85.4'**	42.8'	15.0'	Turboprop
Cessna Citation 525A CJ2	11,580	49.8'	**79.8'**	47.7'	13.9'	Jet
Cessna Citation 550 Bravo	13,525	51.7'	**82.0'**	47.2	15.0'	Jet
Cessna Citation 560 Encore	15,425	54.1'	**84.9'**	48.9'	15.2'	Jet
Cessna Citation 560 Excel	18,325	55.7'	**86.8'**	51.8'	17.2'	Jet

* Calculated as **2 ((0.6 x Wingspan) + 10')** and rounded to the nearest 0.1'

- **Immediate Term Aircraft Parking Apron Recommendation:** It is recommended that the existing Aircraft Parking Apron be reconfigured to allow "flow-through" taxilane access for ARC B-II aircraft with wingspans of up to 55.7 feet. This work should coincide with the programmed pavement rehabilitation project that is currently in design, programmed for 2015 construction..

- **Short Term Aircraft Parking Apron Recommendation:** It is recommended that an Aircraft Parking Apron expansion be programmed for design in 2019, followed by construction in 2020. The expansion should include a minimum of 20 additional tiedown spaces including space for larger business jets and turboprops, as predicated by actual demand.

  It is also recommended that an Aircraft Parking Apron pavement strengthening project be programmed to coincide with the Runway 11-29 and taxiway pavement strengthening, with design in 2018 and construction in 2019 as predicated by actual demand.

  Environmental Coordination: The Aircraft Parking Apron expansion would most likely require only Categorical Exclusion (CatEx) documentation. This must be prepared prior to issuance of a federal grant.

Summary of Recommended Aircraft Parking Apron Improvements
The recommended improvements for the Aircraft Parking Apron are summarized as follows in **Table 5h**:

Table 5h: RECOMMENDED IMPROVEMENTS – AIRCRAFT PARKING APRON
San Manuel Airport – San Manuel, Arizona

Project	Demand-Based Action Point	Year
Short Term (2014-2019)		
Design Apron Reconfiguration	Immediate Need (Noncompliance)	2014
Construct Apron Reconfiguration	Immediate Need (Noncompliance)	2015
Design apron pavement strengthening	Actual increase in demand	2018
Construct apron pavement strengthening	Actual increase in demand	2019
Design apron expansion	Actual increase in demand	2019
Intermediate Term (2020-2024)		
Construct apron expansion	Actual increase in demand	2020

Access Road

The airport's Access Road was found to be in generally fair condition, with the exception of isolated areas that require attention. The ninety degree bend near the airport's southeast property corner has some potholes and evidence of pavement failure. No evidence of subgrade failure or stress was found along the straight stretches of the road and so the pavement structure is probably adequate for the current traffic loads. However, the asphalt pavement along the road is only approximately 1" thick. As the pavement ages and when additional vehicular traffic occurs, a structural pavement overlay should be considered.

The southwesterly 2,000 feet of the Access Road (from State Highway 76 to the approach to the ninety degree bend) has a centerline stripe that is faded and worn. The remainder of the road has no center stripe. The pavement should be marked as soon as possible as a matter of safety.

The existing Access Road is located within the approach Runway Protection Zone (RPZ) for Runway 11. The FAA specifies[5] that land uses within the RPZ should be limited to farming (that meets minimum buffers as specified by FAA policy), irrigation channels (as long as they do not attract birds), underground facilities, navigational aids and facilities that are considered to be "fixed by function", and airport service roads "as long as they are not public roads and are directly controlled by the airport operator". In the Short Term, the Access Road should be relocated as a matter of safety and compliance. This may require the acquisition of additional land.

<u>**Note**</u>**:** Alternative methods of accomplishing the Access Road relocation are presented in **Chapter 6, Alternatives Analysis**.

- ✈ **Immediate Term Access Road Recommendation:** It is recommended that the ninety degree roadway bend be reconstructed as soon as possible, with design and construction programmed to occur in 2015. This project should also include pavement marking of the entire roadway.

- ✈ **Short Term Access Road Recommendation:** It is recommended that the existing Access Road be relocated outside the Runway 11 approach RPZ. This will require land acquisition. The project should be phased to allow environmental documentation (for land acquisition) in 2015, acquisition of land in 2016, and design and construction in 2017.

- ✈ **Intermediate Term Access Road Recommendation:** It is recommended that a 1 ½" asphalt overlay be applied to the Access Road in the Intermediate Term, with design and construction programmed to occur in 2020.

  Environmental Coordination: The Access Road construction projects would most likely require only Categorical Exclusion (CatEx) documentation. However land acquisition for the Access Road relocation will require an Environmental Assessment if funded by a federal grant.

Summary of Recommended Access Road Improvements
The recommended improvements for the Access Road are summarized as follows in **Table 5i**:

Table 5i: RECOMMENDED IMPROVEMENTS – ACCESS ROAD
San Manuel Airport – San Manuel, Arizona

Project	Demand-Based Action Point	Year
Immediate Need		
Roadway bend reconstruction	Immediate Need – Pavement Failure	2015
Short Term (2014-2019)		
EA for Access Road land acquisition	Availability of funding (compliance)	2015
Land acquisition for Access Road	Availability of funding (compliance)	2016
Access Road relocation	Availability of funding (compliance)	2017
Intermediate Term (2020-2024)		
1 ½" structural asphalt overlay	Observed increase in traffic	2020

Perimeter Fence

Based on the findings contained in **Chapter 2, Inventory**, most of the airport's perimeter fence consists of old four strand barbed wire fencing. The barbed wire fence along the north side of the airport (northwest of the hangars and apron) and along the northwest end of the airport property is in generally good and serviceable condition. The barbed wire fence along the south side of the airport (along the old railroad grade) has many gaps and areas of deterioration, and is in poor condition. In addition to the barbed perimeter wire fence, there is a four strand smooth wire fence on either side of the Drainage Channel that is in good condition. There is some chain link fencing in existence in the terminal area, and that fence is in good condition.

- ✈ **Short Term Recommendation:** It is recommended that replacement of the barbed wire fence along the south side of the airport be undertaken in the Short Term to increase the security of the airport. This project should be programmed for design and construction in 2018, based on the availability of FAA and/or State funding.

  Environmental Coordination: The Perimeter Fence project would most likely require only Categorical Exclusion (CatEx) documentation. This must be prepared prior to issuance of a federal grant.

Summary of Recommended Perimeter Fence Improvements
The recommended improvements for the Perimeter Fence are summarized as follows in **Table 5j**:

Table 5j: RECOMMENDED IMPROVEMENTS – PERIMETER FENCE
San Manuel Airport – San Manuel, Arizona

Project	Demand-Based Action Point	Year
Short Term (2014-2019)		
Design/Const - Perimeter fence (South side)	Availability of FAA or State funding	2018

Airfield Lighting and Visual Aids

Runway Lighting
Runway 11-29 is equipped with Medium Intensity Runway Lights (MIRL). This system was installed in 2013. The system includes clear (white) edge lights for the entire length of the runway, as well as red/green threshold lights at each runway end. San Manuel Airport has no published instrument approaches, and this MIRL system is appropriate for a visual runway. If a nonprecision instrument approach is implemented at San Manuel in the future, the color of the edge lights will have to be changed to yellow for the last 2,000 feet of runway (this is termed the "caution zone") in each landing direction that has a nonprecision instrument approach. This will require the installation of split white/yellow lenses so that when on approach to landing at night, the pilot can distinguish the last 2,000 feet of available landing length. Establishing an instrument approach procedure may be advisable when Runway 11-29 is extended to accommodate business use jets and turboprops. This has been recommended in the Long Term planning period (2034). At that time, the MIRL system will have to also be extended and the lens color changes could be made at that time.

Other than lighting extensions concurrent with the Runway 11-29 extension, the existing MIRL system should be adequate with normal maintenance throughout the 20-year planning period.

✈ **Long Term Runway Lighting Recommendation:** It is recommended that the MIRL system be extended and upgraded for nonprecision instrument approach standards concurrent with the Runway 11-29 extension. Design should be programmed for 2033, followed by construction in 2034.

Environmental Coordination: The MIRL extension would be included in the scope of the Runway 11-29 extension Environmental Assessment.

Taxiway Lighting
Parallel Taxiway A and connector Taxiways A1 through A6 are not lighted. However, retroreflective edge markers were installed in 2013. In order to increase the safety and utility of

the airport at night, installation of a Medium Intensity Taxiway Light (MITL) system for all taxiways is encouraged in the Short Term. The MITL system would have to be extended as part of the Runway 11-29 and Taxiway A extensions that are recommended to be programmed in the Long Term (design in 2033 and construction in 2034).

- **Short Term Taxiway Lighting Recommendation:** It is recommended that an MITL system be installed on all existing taxiways. Design should be programmed for 2016, followed by construction in 2017, based upon the availability of FAA funding.

- **Long Term Term Taxiway Lighting Recommendation:** It is recommended that the MITL system be extended as necessary concurrent with the Runway 11-29 and Taxiway A extension. Design should be programmed for 2033, followed by construction in 2034.

  Environmental Coordination: The installation of the MITL system would most likely require only Categorical Exclusion (CatEx) documentation. This must be prepared prior to issuance of a federal grant. The MITL extension and modifications would be included in the scope of the Runway 11-29 extension Environmental Assessment.

Runway and Taxiway Signage

Runway 11-29 is equipped with lighted Distance Remaining signs. All taxiways are equipped with lighted signage. These improvements were installed in 2013 and should be serviceable throughout the 20-year planning period with normal maintenance.

Additional lighted signage and relocation and modification of the Distance Remaining signage will be required as part of the Runway 11-29 and Taxiway A extensions that are recommended to be programmed in the Long Term (design in 2033 and construction in 2034).

- **Long Term Runway and Taxiway Signage Recommendation:** It is recommended that the Distance Remaining and Taxiway signage be extended and modified as necessary concurrent with the Runway 11-29 and Taxiway A extension. Design should be programmed for 2033, followed by construction in 2034.

  Environmental Coordination: The signage extension and modifications would be included in the scope of the Runway 11-29 extension Environmental Assessment.

Visual Aids

The existing airport visual aids include a rotating beacon, a lighted wind cone and segmented circle, as well as Precision Approach Path Indicators (PAPIs) and Runway End Identifier Lights (REIL) at each end of Runway 11-29. These were installed in 2013. There is also an unlighted auxiliary wind cone at the northeast end of Runway 11-29. The visual aids should be adequate through the 20- year planning period with normal maintenance.

The PAPIs and REILs will need to be relocated as part of the Runway 11-29 extension project at the end of the Long Term planning period, with design in 2033 and construction in 2034.

✈ **Long Term Visual Aids Recommendation:** It is recommended that the PAPI and REIL systems be relocated concurrent with the Runway 11-29 extension. Design should be programmed for 2033, followed by construction in 2034.

Environmental Coordination: The PAPI and REIL relocations would be included in the scope of the Runway 11-29 extension Environmental Assessment.

Summary of Recommended Airfield Lighting and Visual Aids Improvements
The recommended improvements for the Airfield Lighting and Visual Aids are summarized as follows in **Table 5k**:

Table 5k: RECOMMENDED IMPROVEMENTS – AIRFIELD LIGHTING and VISUAL AIDS
San Manuel Airport – San Manuel, Arizona

Project	Demand-Based Action Point	Year
Short Term (2014-2019)		
Design – Taxiway Lighting (MITL)	Availability of FAA Funding	2016
Construction – Taxiway Lighting (MITL)	Availability of FAA Funding	2017
Long Term (2025-2034)		
Design - MIRL extension and upgrade	Concurrent with RWY extension	2033
Construction - MIRL extension and upgrade	Concurrent with RWY extension	2034
Design – PAPI and REIL relocation	Concurrent with RWY extension	2033
Construction - PAPI and REIL relocation	Concurrent with RWY extension	2034
Design – RWY/TWY signage extension	Concurrent with RWY extension	2033
Construction - RWY/TWY signage extension	Concurrent with RWY extension	2034
Design – Taxiway lighting (MITL) extension	Concurrent with RWY extension	2033
Construction – Taxiway lighting extension	Concurrent with RWY extension	2034

Automated Weather Observation System (AWOS)

The Automated Weather Observation System (AWOS) was constructed in 2011. The equipment, site and security fencing are in good and serviceable condition. The AWOS information is available to arriving pilots on radio frequency 134.125. The AWOS can also be accessed by telephone at

(520) 385-4238 for pre-flight information. However, data is not transmitted to the National Climatic Data Center (NCDC) at the present time. It is recommended that the County initiate data transmission as soon as is practical.

Hangars

There are currently two County owned 10-unit Tee Hangar structures and three privately owned hangar structures on the airfield. The County facilities can house 20 aircraft. The privately owned structures together have 11 hangar bays, two of which are equipped with “Aerolifts” that allow two aircraft to be stored in a single bay. In total, the privately owned hangars can house up to 13 aircraft. In total there is hangar space for up to 33 aircraft on the airfield at the present time, and all available space is occupied. The County has a waiting list of 22 aircraft owners who have expressed interest in relocating their aircraft to San Manuel if hangar space was available. Since the County does not require a deposit for an aircraft owner to be included on the waiting list, it is probably a valid assumption that perhaps 50% of the owners on the current waiting list (11) would actually relocate to San Manuel if space were to be made available within the next few years. If it is assumed that some current based aircraft would leave, that number may actually be slightly lower.

A recommendation has been made to relocate Taxiway A6 to the southwest end of Runway 11-29. This relocation would require removal of the existing mobile home residence and also a privately owned eight-unit Tee Hangar structure that now houses 10 aircraft. This project may be programmed in the Intermediate Term (2020-2024), with programming for design in 2023 and construction in 2024. These structures will also encroach into the Runway Object Free Area (ROFA) when the Airport is reclassified from ARC B-I to ARC B-II. This is recommended to occur in 2019, with the recommended runway pavement strengthening project. Acquisition of the existing privately owned hangar building and construction of additional County owned hangars to house the 10 aircraft that would be displaced will have to occur prior to or coincident with the reclassification of the Airport to ARC B-II or the Taxiway A-6 relocation project, whichever occurs first.

Although federal and state grant participation is not available for hangar development, hangars are an important source of revenue for a small airport. Because of the documented demand for additional hangar space, the County should consider constructing additional hangar structures.

The following tabulation (**Table 5I**) illustrates the potential projected demand for hangars that may occur at San Manuel, based on the aviation demand forecasts that were developed in **Chapter 3, Aviation Demand.** In the table, it is assumed that up to 90% of the based aircraft will require hangar space. This is in conformance with the calculation methodology used to estimate future tiedown space on the Aircraft Parking Apron.

Table 5l: ESTIMATED FUTURE HANGAR SPACE REQUIREMENTS
San Manuel Airport – San Manuel, Arizona

Year	Potential Based Aircraft	Potential Hangars Needed (90%)	Notes
2014	37*	33	There are now 33 available spaces – all are occupied
2019	46	41	44 spaces needed now if ½ of waiting list relocates w/no current based aircraft attrition
2024	56	50	
2029	66	59	
2034	78	70	

* There are currently 36 based aircraft

Hangar Area Aprons
According to recent pavement investigations[6] and the field inventory observations, the north end of the existing Hangar Area Apron has only a very thin lift of asphalt pavement, ½" to 1" thick. The pavement exhibits areas of pavement failure, and there is some alligator cracking in some areas, and also some potholing. The 2010 ADOT APMS rates this pavement at a PCI of 71.[3] The 2013 APMS data shows the pavement condition declining to a PCI of 51.[4]

The south portion of the Hangar Area Apron has 1 ½" to 2 ½" of asphaltic concrete over 2" to 2 ½" of aggregate base course[6]. This pavement exhibits some minor cracking with crack widths of less than ¼" wide. There are also some areas exhibiting raveling. The 2010 ADOT APMS rates this pavement at a PCI of 99.[3] The 2013 APMS data shows the pavement condition declining to a PCI of 89.[4] Based on field observations and the PCI ratings, the pavement appears to be in GOOD condition.

Rehabilitation of the existing Hangar Area Aprons is included in the programmed 2014 Apron reconstruction project. New Hangar Area Apron construction should be included in the recommended new Hangar development projects, with design strengths appropriate to the aircraft that will use the hangars.

- **Short Term Hangar Recommendation:** It is recommended that two 5-unit Tee Hangar structures (including paved aprons) be constructed in the Short Term, programmed for 2015 to take advantage of the current waiting list demand.

- **Intermediate Term Hangar Recommendation:** It is recommended that two 5-unit inline rectangular hangar structures (including paved aprons) be constructed in the Intermediate Term, programmed for 2024. It is also recommended that another two 5-unit inline rectangular hangar structures be constructed prior to or coincident with the Taxiway A6 relocation to house the 10 aircraft that would be displaced by removal of the existing privately owned hangar structure (either 2019 or 2024). These projects should be programmed predicated upon actual demand.

- **Long Term Hangar Recommendation:** It is recommended that four 5-unit inline rectangular hangar structures (including paved aprons) be constructed in the Long Term, two programmed for 2029 and two in 2034. These projects should be programmed predicated upon actual demand.

  Environmental Coordination: Because there will be no federal funding participation in hangar construction, Categorical Exclusion (CatEx) documentation will not be required.

Existing Hangar Area Compliance with Current Standards

The existing Hangar area (County owned hangars) does not comply with the FAA's most current Taxilane Object Free Area (TOFA) clearance standards for an ARC B-I airport, and will not comply with the ARC B-II standards when the airport is upgraded to that classification. The following areas of noncompliance were found:

- The existing Tee Hangar buildings encroach into the apron's TOFA. ARC B-I standards require that fixed or movable objects must be set back 39.5' from a taxilane center line. ARC B-II standards require a 57.5' setback. The existing Tee Hangars are approximately 35' from the taxilane center line.

- The separation between the existing Tee Hangars is approximately 65'. The most current ARC B-I standards require a 79' wide TOFA that is clear of fixed or movable objects. ARC B-II requires a 115' wide TOFA. The existing 65' spacing between buildings does not provide this clearance.

- The southwestern-most Tee Hangar building has an access taxilane that varies in width between approximately 45' and 52'. A pavement width of 56.5' would be required for compliance with ARC B-I TOFA standards.

Summary of Recommended Hangar Improvements

The recommended improvements for the Hangar improvements are summarized as follows in **Table 5m**:

Table 5m: RECOMMENDED IMPROVEMENTS - HANGARS
San Manuel Airport – San Manuel, Arizona

Project	Demand-Based Action Point	Year
Short Term (2014-2019)		
Design and Construct 2-5-unit Tee Hangars	Based on current waiting list	2015
Design and Construct 2-5-unit Hangars	Reclassification to ARC B-II	2019
Intermediate Term (2020-2024)		
Design and Construct 2-5-unit Hangars	Increase in actual demand	2024
Long Term (2025-2034)		
Design and Construct 2-5-unit Hangars	Increase in actual demand	2029
Design and Construct 2-5-unit Hangars	Increase in actual demand	2034

Terminal Building

The existing Terminal Building was completed in early 2014, during the preparation of this Master Plan. The building has approximately 1,440 square feet of space under roof. It is of frame construction and includes a large meeting room/lobby, a restroom, storage room, and two large offices.

The estimated Peak Hourly Demand, as established in **Chapter 4, Demand/Capacity Analysis**, was used to arrive at an estimate of the minimum required building area to meet the anticipated general aviation demands through the planning period. To arrive at the recommended minimum space for these features, a basic criterion of 50 square feet of building space per peak hour passenger or pilot was applied to an assumed rate of 1.75 occupants per peak hour aircraft. The estimated minimum recommended Terminal Building space for the 20-year planning period is as follows in **Table 5n**.

Table 5n: RECOMMENDED TERMINAL BUILDING SPACE
San Manuel Airport – San Manuel, Arizona

YEAR	Peak Hour GA Operations	Peak Hour GA Passengers	TOTAL MINIMUM FLOOR SPACE (SF)*
2014	8	14	700 SF
2019	10	18	900 SF
2024	11	19	950 SF
2029	13	23	1,150 SF
2034	15	26	1,300 SF

The Existing Terminal Building has 1,440 square feet under roof. The present building space appears to be adequate to accommodate current demand, and for projected demand through the 20-year planning period.

Aircraft Fueling System

The airport's existing fuel system includes a single 12,000 gallon double wall fuel tank, pump, and credit card reader equipment, as well as a fire extinguisher station. The tank and equipment are in good condition. However, there is no secondary containment sump for the fuel tank.

The system stores and dispenses 100 Low Lead Aviation Fuel. Delivery to aircraft is performed by the aircraft operators. In the event of a fuel spill, drainage will be to the northeast over undeveloped airport property and could continue downstream, leaving the airport property via several washes.

The existing fuel pump is located approximately 35 feet southwest of the fuel storage tank. The pump and piping will have to be relocated when the Aircraft Parking Apron is expanded to the southeast in order to provide an unobstructed Taxilane Object Free Area.

During the inventory phase of the Master Plan preparation, no spill kits were found at the fueling facility. The Airport Manager advised that the spill kits are in the Terminal Building.

The Airport will require the construction of an impermeable fuel spill containment system at the fuel tank location, constructed in conformance with applicable codes, rules and regulations. The containment sump should be equipped with auto close manual valves for sump drainage pump connections.

Spill kits capable of recovery of no less than 100 gallons of the material being dispensed must be easily accessible and readily available during fuel dispensing operations. Spill kits must be located within 25 feet of stationary fueling stations. At a minimum, spill kits should include the following:

- Oil absorbents capable of absorbing 15 gallons of fuel
- A storm drain plug or cover kit
- A non-water containment boom, a minimum of 10 feet in length with a 12 gallon absorbent capacity
- A non-metallic shovel
- Two five-gallon buckets with lids

- **Short Term Fueling System Recommendation:** It is recommended that an impermeable fuel spill containment system be constructed at the fuel tank location. Design and construction should be programmed as soon as possible, with recommended programming for 2015.

  Environmental Coordination: Although this project would most likely be undertaken with local funding only, if an FAA grant were to be involved the project would most likely require only Categorical Exclusion (CatEx) documentation.

Summary of Recommended Aircraft Fueling System Improvements
The recommended improvements for the Aircraft Fueling System are summarized as follows in **Table 5o**:

Table 5o: RECOMMENDED IMPROVEMENTS – AIRCRAFT FUELING SYSTEM
San Manuel Airport – San Manuel, Arizona

Project	Demand-Based Action Point	Year
Immediate Need		
Design/Construct – Fuel containment sump	Immediate Need (Compliance)	2015

Automobile Parking (for Terminal Building)

There is a small paved area adjacent to the new Terminal Building with no defined (marked) parking spaces. This area was constructed in early 2014 and is large enough to accommodate four or five parked cars.

As was the case for determining the recommended number of aircraft parking spaces, the estimated Peak Hourly Demand, as established in **Chapter 4, Demand/Capacity Analysis**, was also used as a basis to estimate the projected requirements for automobile parking. The criterion used is a factor of 1.5 automobiles per peak hour operation. This factor allows for one parking space per aircraft operation during the peak hour, plus allowance for airport/County employees and other visitors.

Note that these estimates do not account for an on-airfield restaurant or other business. The parking demand from those uses would have to be accommodated separately. It is assumed that aircraft owners who lease or own hangars will park their automobiles in their hangars when using their aircraft.

The recommended number of Terminal Building automobile parking spaces for the 20-year planning period is as follows in **Table 5p**.

It can be seen that the present number of spaces may be deficient (although cars can park along the Access Road and in unpaved areas). The Airport should plan on expanding the paved Terminal parking to accommodate the projected increased demand.

Table 5p: RECOMMENDED AUTOMOBILE PARKING SPACES
San Manuel Airport – San Manuel, Arizona

YEAR	Peak Hour GA Operations	Existing Auto Parking Spaces (Unmarked)	TOTAL RECOMMENDED MINIMUM NUMBER OF PARKING SPACES
2014	8	4 to 5	12
2019	10		15
2024	11		17
2029	13		20
2034	15		23

- ✈ **Short Term Automobile Parking Recommendation:** It is recommended that a new paved automobile parking lot be developed in the Short Term, programmed for design in 2016 and construction in 2017. The parking lot should be designed to accommodate 12 parked vehicles. This will bring the total number of parking spaces to at least 16, which should probably be adequate through 2024.

- ✈ **Long Term Term Automobile Parking Recommendation:** It is recommended that the automobile parking lot be expanded as predicated by actual increased demand. This should be programmed for design in 2025 and construction in 2026. The planned expansion should accommodate an additional seven parked vehicles.

  Environmental Coordination: The Automobile Parking Lot construction and expansion would most likely require only Categorical Exclusion (CatEx) documentation. This must be prepared prior to issuance of a federal grant.

Summary of Recommended Automobile Parking Improvements
The recommended improvements for the Automobile Parking are summarized as follows in **Table 5q**:

Table 5q: RECOMMENDED IMPROVEMENTS – AUTOMOBILE PARKING
San Manuel Airport – San Manuel, Arizona

Project	Demand-Based Action Point	Year
Short Term (2014-2019)		
Design – Automobile Parking Lot	Immediate Need (Capacity)	2016
Construction – Automobile Parking Lot	Immediate Need (Capacity)	2017
Long Term (2025-2034)		
Design – Auto Parking Expansion	Observed increase in demand	2025
Construction - Auto Parking Expansion	Observed increase in demand	2026

Rotorcraft Operations Area

It is recommended that a marked and lighted helipad and a helicopter parking area be constructed in order to accommodate future demand. FAA design standards[7] require a general aviation heliport to consist of a Touchdown and Lift-off area (TLOF), Final Approach and Takeoff area (FATO), Safety Area, VFR approach/departure airspace protection zones, lighted windsock, taxiways and a helicopter parking apron. For night operations, the proper lighting must be installed in all required areas, including floodlighting located outside of the safety area.

The assumed design helicopter used for the recommended helipad is a Bell 212 helicopter, which is classified as a Type 2 (medium) helicopter. The Bell 212 has a rotor diameter of 48', an overall length of 57.2' and an undercarriage length of 12.1'. The undercarriage includes skids as opposed to wheels.

The recommended distance between the FATO centerline and the runway centerline for an ARC B-II airport with a Type 2 design aircraft is 500 feet. The FATO and TLOF should be constructed using Portland cement Concrete (PCC) pavement capable of supporting the design aircraft, in this case a 12,000 pound Bell 212. A 110' long by 86' wide FATO with a centered 48' by 48' TLOF should be constructed in compliance with the design helicopter requirements. All markings required for a general aviation helipad should be applied accordingly.[7]

A Safety Area, encompassing an area 20' around the entire outside edge of the FATO, need not be load bearing. However, the Safety Area should be treated to prevent loose stones and other flying debris caused by rotor wash. The elevation of the Safety Area should not exceed the elevation of the FATO.

VFR approach/departure airspace paths (2) include trapezoidal 8:1 VFR approach/departure surfaces. The surfaces should be located parallel to the Runway 11-29 center line in order to align approach/departure paths with the predominant wind direction so that crosswind operations are kept to a minimum. The approach/departure paths start at the edge of the FATO and slope upward at 8:1 for a distance of 4,000'. The width of the trapezoidal surfaces is 500' at their outer extension. Transitional Surfaces begin at the edge of the FATO parallel to the flight path center line, and from the outer edge of the approach/departure surfaces, and extend outward at a 2:1 slope. The protection zones are located below the VFR surfaces. They extend 280' from the edge of the FATO. The approach/departure airspace should be free of any penetrations.

A lighted windsock conforming to AC 150/5345-27 should be installed to show the direction and magnitude of the wind. The windsock should be placed so that it is visible during an approach 500' from the TLOF.

An unpaved hover taxi route treated to prevent flying debris caused by rotor wash no less than 87' wide and a paved hover taxiway within the route no less than 24' wide should be constructed in order to provide a connecting path from the FATO to the helicopter parking area. Three "turn-around" parking spaces including tie-downs should be constructed to accommodate multiple helicopter operations. These spaces are required to be positioned outside of the VFR approach/departure surfaces to avoid surface penetration by parked rotorcraft.

An access road will be required to provide access from the airport terminal area to the rotorcraft operation area and also to the highway.

The aviation demand forecasts developed in **Chapter 3, Aviation Demand** indicate an estimated 566 current (2014) annual rotorcraft operations. This exceeds the threshold of 500 annual operations for consideration of new facility development. Local operators have indicated that current activity by the based training rotorcraft currently exceeds the Chapter 3 projections. However the based rotorcraft (3 now, increasing to 5 by 2015) are all gyroplanes that cannot use a helipad since they need a short ground roll for takeoff and landing. Local operators have also indicated that transient operations by large Air National Guard helicopters account for a significant amount of existing activity. The number of annual rotorcraft operations of all types is projected to increase to 1,089 operations by 2034.

- ✈ **Short Term Rotorcraft Operations Area Recommendation:** It is recommended that a new Rotorcraft Operations Area be developed in the Short Term, programmed for design in 2017 and construction in 2018.

  Environmental Coordination: The Rotorcraft Operations Area construction would most likely require only Categorical Exclusion (CatEx) documentation. This must be prepared prior to issuance of a federal grant.

Summary of Recommended Rotorcraft Operations Area Improvements
The recommended improvements for the Rotorcraft Operations Area are summarized as follows in **Table 5r**:

Table 5r: RECOMMENDED IMPROVEMENTS – ROTORCRAFT OPERATIONS AREA
San Manuel Airport – San Manuel, Arizona

Project	Demand-Based Action Point	Year
Short Term (2014-2019)		
Design – Helicopter Operations Area	Immediate Need (Capacity)	2017
Construction – Helicopter Operations Area	Immediate Need (Capacity)	2018

Airport Pavement Maintenance

Arizona Public Law 103-305 requires that airports requesting federal AIP funding for pavement rehabilitation or reconstruction have an effective pavement maintenance management system. To this end, ADOT's Aeronautics Group, part of MPD, has completed and is maintaining an Airport Pavement Management System (APMS) that, coupled with monthly pavement evaluations by the airport sponsors, fulfills this requirement.

The 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 condition in accordance with the most recent FAA Advisory Circular 150/5380-6 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. The Aeronautics Group ensures that that the APMS database is kept current and in compliance with FAA requirements.

Every year the ADOT Aeronautics Group, utilizing the APMS, identifies 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 APMS, or the airport sponsor may sign an intergovernmental agreement (IGA) with the Aeronautics Group to participate in the APMS. [1]

The facilities requirements recommendations that follow include specific recommendations for pavement maintenance. These recommendations should be considered a part of the airport's capital improvement program, but may or may not be funded by the APMS program. Some maintenance projects may be eligible for State grant funding, and some may be eligible for FAA funding depending upon the scope of work. The State will participate in seal coat projects, but the FAA will not. If the pavement is at or near the end if its useful life, both agencies will participate in mill/overlay or pavement reconstruction/replacement projects.

In addition to maintenance of the airfield pavement, it is necessary to regularly maintain the airfield's drainage structures and culverts, graded shoulders, and other drainage related facilities.

The following section presents an ongoing maintenance program that should be included in the airport's annual Capital Improvement Program.

Airfield Maintenance Program

Runway Pavement Maintenance
The field inventory undertaken with this Master Plan indicates that the runway pavement is in need of maintenance. The pavement exhibits significant longitudinal cracking spaced approximately 15' apart fairly consistently along the entire runway. These cracks are full depth and between ¼" and ½" wide. There is also transverse cracking spaced approximately 20-30 feet apart with crack widths of up to 1". This cracking pattern also is fairly consistent along the entire runway. The 2010 ADOT APMS rates the Runway 11-29 pavement at a PCI of 76.[3] The 2013 APMS data shows the runway at a PCI of 100 to account for a planned 2014 APMS rehabilitation project.[4]

Taxiway Pavement Maintenance
The field inventory undertaken with this Master Plan indicates that much of the taxiway pavement requires maintenance at the present time.

The newer portion of parallel Taxiway A's pavement to the northwest of Taxiway A5 and southeast of Taxiway A4 does not have significant cracking. Since its construction in 2010, the pavement surface has not been seal coated. Pavement markings are in poor condition and should be repainted.

The older portion of Taxiway A was seal coated in 2010. It appears that some cracks were sealed since application of the 2010 seal coat. However, the pavement now exhibits transverse cracking spaced approximately 30 feet apart with crack widths of up to 1". The 2010 ADOT APMS rates this taxiway's pavement at a PCI of 86.[13] The 2013 APMS data shows the pavement condition declining to a PCI of 81.[14] Based on field observations, the pavement requires crack sealing at the present time. Pavement markings are in poor condition and should be repainted. Taxiway shoulders are steep in places and should be regarded to comply with design standards.

Connector Taxiway A1 exhibits transverse cracking spaced approximately 30 feet apart with crack widths of from ½" to 1" wide. There is also a longitudinal crack along the center line that is ¼" to ½" wide. The 2010 ADOT APMS rates this taxiway's pavement at a PCI of 86.[13] The 2013 APMS data shows the pavement condition declining to a PCI of 81.[14] Based on field observations, the pavement requires crack sealing at the present time. Pavement markings are in poor condition and should be repainted.

Connector Taxiway A2 exhibits transverse cracking spaced approximately 30 feet apart with crack widths of from ¼" to ½" wide. There is also a longitudinal crack along the center line that is up to ¼" wide. The 2010 ADOT APMS rates this taxiway's pavement at a PCI of 86.[13] The 2013 APMS data shows the pavement condition declining to a PCI of 81.[14] Based on field observations, the pavement requires crack sealing at the present time. A seal coat was applied in 2010. Pavement markings are in poor condition and should be repainted.

Connector Taxiway A3's pavement does not have significant cracking. Since its construction in 2010, the pavement surface has not been seal coated. Pavement markings are in poor condition and should be repainted. Pipe culverts were found to require maintenance to remove sediment and blockage and the shoulders are in need of erosion control measures.

Midfield connector Taxiway A4 exhibits longitudinal and transverse cracking with crack widths of from ¼" to ½" wide. The 2010 ADOT APMS rates this taxiway's pavement at a PCI of 86.[13] The 2013 APMS data shows the pavement condition declining to a PCI of 81.[14] Based on field observations, the pavement requires crack sealing at the present time. Pavement markings are in poor condition and should be repainted.

Connector Taxiway A5's pavement does not have significant cracking. Since its construction in 2010, the pavement surface has not been seal coated. Pavement markings are in poor condition and should be repainted.

Connector Taxiway A6 exhibits longitudinal and transverse cracking at 30' spacing with crack widths of from ¼" to ½" wide. The 2010 ADOT APMS rates this taxiway's pavement at a PCI of 86.[13] The 2013 APMS data shows the pavement condition declining to a PCI of 81.[14] Based on field observations, the pavement requires crack sealing at the present time. Pavement markings are in poor condition and should be repainted.

Aircraft Parking Apron and Hangar Area Aprons Pavement Maintenance
The field inventory undertaken with this Master Plan indicates that the Aircraft Parking Apron requires reconstruction at the present time. A reconstruction project is currently under design in 2014, with construction programmed to occur in 2015, and this project includes rehabilitation of the Hangar Area Aprons. A program of maintenance should be implemented to begin with a seal coat, crack sealing, and pavement marking five years after new construction (2019). New construction of Hangar Area Aprons should be included in this scheduled maintenance as is appropriate.

Access Road Maintenance
The Access Road currently does not exhibit significant cracking. However, the roadway will require an ongoing program of pavement maintenance in the future. The general condition of the grading and stormwater drainage features of the Access Road is poor. Some of the existing subsurface drainage features are currently in need of rehabilitation.

Automobile Parking Lot Maintenance
The new (2014) automobile parking area as well as the recommended parking expansions will need to be on a scheduled pavement maintenance program to begin with a seal coat, crack sealing, and pavement marking five years after new automobile parking lot construction (2022).

- **Runway 11-29 Recommendations:** It is recommended that a program of pavement maintenance be implemented, to include application of a seal coat, crack sealing, and pavement marking in the Immediate Term (2015). This project is already approved for funding under the APMS program. An ongoing program of crack sealing, removal of shoulder vegetation, and maintenance of drainage structures and culverts along the runway should also be implemented. Major seal coat, crack sealing, and pavement marking projects are programmed at five year intervals for each major pavement component (beginning at five years after new construction).

- **Taxiway Recommendations:** It is recommended that a program of taxiway pavement maintenance be implemented, to begin with application of a seal coat, crack sealing, and pavement marking in the Immediate Term (2014). An ongoing program of crack sealing, removal of shoulder vegetation, and maintenance of drainage structures and culverts along the taxiways should also be implemented.

- **Aircraft Parking Apron Recommendations:** It is recommended that an ongoing program of Aircraft Parking Apron pavement maintenance be implemented, to include periodic crack sealing, removal of shoulder vegetation, and maintenance of drainage structures and culverts.

- **Access Road Recommendations:** It is recommended that a program of Access Road pavement maintenance be implemented, beginning with application of a seal coat, crack sealing, and pavement marking in the Long Term, programmed for 2031. An Immediate Term (2015) culvert maintenance project should also be programmed. An ongoing program of crack sealing, removal of shoulder vegetation, and maintenance of drainage structures and culverts along the runway should also be implemented.

- **Automobile Parking Lot Recommendations:** It is recommended that an ongoing program of pavement maintenance be implemented, to include seal coats, periodic crack sealing, and pavement marking.

  Environmental Coordination: Pavement maintenance projects typically require only Categorical Exclusion (CatEx) documentation, if funded with federal participation. This must be prepared prior to issuance of a federal grant.

Summary of Recommended Maintenance Program

The recommended pavement maintenance program is summarized as follows in **Table 5s** below:

Table 5s: RECOMMENDED MAINTENANCE PROGRAM
San Manuel Airport – San Manuel, Arizona

Project	Demand-Based Action Point	Year
Immediate Need		
Runway crack seal, seal coat, pvmt marking	Immediate need	2014
Taxiway crack seal, seal coat, pvmt marking	Immediate need	2015
Access Rd drainage structure maintenance	Immediate Need	2015
Short Term (2014-2019)		
Runway crack seal, seal coat, pvmt marking	Observed pavement condition	2019
Apron seal coat, crack seal, pvmt marking	Observed pavement condition	2019
Auto Pkg seal coat, crack seal, marking	Observed pavement condition	2022
Intermediate Term (2020-2024)		
Runway crack seal, seal coat, pvmt marking	Observed pavement condition	2024
Taxiway crack seal, seal coat, pvmt marking	Observed pavement condition	2024
Apron seal coat, crack seal, pvmt marking	Observed pavement condition	2024
Long Term (2025-2034)		
Runway crack seal, seal coat, pvmt marking	Observed pavement condition	2029
Taxiway crack seal, seal coat, pvmt marking	Observed pavement condition	2029
Apron seal coat, crack seal, pvmt marking	Observed pavement condition	2029
Access Rd crack seal, seal, pvmt marking	Observed pavement condition	2031
Auto Pkg seal coat, crack seal, marking	Observed pavement condition	2031
Seal coat, pavement marking (4,200’ RWY)	Observed pavement condition	2034
Taxiway crack seal, seal coat, pvmt marking	Observed pavement condition	2034
Apron seal coat, crack seal, pvmt marking	Observed pavement condition	2034

Airport Master Plan Updates

The recommended program includes updates of this Airport Master Plan at regular intervals of approximately six years. These updates should be implemented when changes in local economic activity, potential or actual changes in demand, or changes in national or regional policies or economic conditions suggest the potential for impacts to the airport that may invalidate the current Master Plan recommendations. Airport Master Plan updates are scheduled for 2020, 2026, and 2032.

Land Acquisition

The airport property encompasses approximately 54 acres of land that is currently leased from BHP Billiton Mining Company through November 1, 2040. The land surrounding the airport is predominantly undeveloped land.[8] Pinal County is in the process of negotiating the acquisition of the currently leased property as well as additional land that will be required for future airport development. The actual limits of the land acquisition are presented in **Chapter 7, Land Use**, and are based on the recommendations of this Chapter as well as the results of the analyses presented in **Chapter 6, Development Alternatives**.

✈ **Short Term Land Acquisition Recommendation:** It is recommended that acquisition of all land needed for ultimate airport development be acquired in fee as soon as is practical. This action should be programmed for the Short Term, allowing for an Environmental Assessment in 2015 and acquisition in 2016.

Environmental Coordination: If the land is acquired with grant participation by the FAA and/or ADOT, the action would most likely require preparation of an Environmental Assessment.

Summary of Recommended Land Acquisition Actions
The recommended timetable for land acquisition is summarized as follows in **Table 5t**:

Table 5t: RECOMMENDED IMPROVEMENTS – LAND ACQUISITION
San Manuel Airport – San Manuel, Arizona

Project	Demand-Based Action Point	Year
Short Term (2014-2019)		
EA for Land Acquisition	Availability of funding	2015
Acquisition of Airport Property	Availability of Funding	2016

Airspace

Federal Aviation Regulations (FAR) Part 77 describes the various imaginary surfaces surrounding the airport that constitute the airspace that should be clear of obstructions to air navigation. The Part 77 airspace limits are based upon the ultimate configuration of the airport's runways, including the location of the runway thresholds and the type of ultimate approach procedures planned (visual or instrument).[9] An analysis of the ultimate airspace has been performed as part of this Master Plan, and several penetrations of the airspace have been identified. **Chapter 7, Land Use** and **Chapter 9, Airport Plans** presents the results of this analysis and will provide details on the recommended disposition of the identified obstructions.

- **Short Term Airspace Recommendation:** It is recommended that the identified obstructions to FAR Part 77 airspace be mitigated as soon as is practical. This action may include obstruction removal and/or lighting, and should be programmed for the Short Term, allowing for design in 2015 and construction in 2016.

  Environmental Coordination: Categorical Exclusion (CatEx) documentation will be necessary prior to construction of the obstruction removal/lighting project.

Summary of Recommended Airspace Actions
The timetable for the recommended FAR Part 77 obstruction mitigation project is summarized as follows in **Table 5u**:

Table 5u: RECOMMENDED IMPROVEMENTS – FAR PART 77 AIRSPACE
San Manuel Airport – San Manuel, Arizona

Project	Demand-Based Action Point	Year
Short Term (2014-2019)		
Design – Obstruction Mitigation	Availability of funding	2015
Construction – Obstruction Mitigation	Availability of Funding	2016

Summary of Recommended Facility Requirements

The recommendations developed in the chapter have been entered into a custom Microsoft Access database, the CIP Integrated Management System. This database system stores the project information, including descriptions, budgets, grant and funding information, justification statements, and detailed budgets, as well as preliminary priority ratings and other information.

The CIP Integrated Management System presents a detailed six-year Capital Improvement Program, but stores information on longer term projects. This system is useful as an ongoing tool for preparation and update of annual capital improvement programs and budgets.

The database is able to generate several detailed and summary reports, including a listing of the recommended facility requirements (without budget information). This report is included on the following pages.

Final layouts for the major improvements recommended in this chapter are presented in **Chapter 9, Airport Plans**. These are based on the results of the analysis of alternatives contained in **Chapter 6, Development Alternatives**.

Cost estimates for all recommended actions are included in **Chapter 10, Capital Improvement Program**.

Chapter References

[1] Arizona Department of Transportation, Airport Pavement Management System (APMS)
[2] San Manuel Airport – Airport Layout Plan, Coffman Associates, latest revision by Nicholas J. Pela & Associates May 21, 2013
[3] 2010 Airports Pavement Management System , Arizona Department of Transportation
[4] 2013 Airports Pavement Management System (Raw Data), Arizona Department of Transportation
[5] FAA Advisory Circular 150/5300-13A, Airport Design
[6] Report on Pavement Investigation – San Manuel Airport Apron Rehabilitation, Speedie and Associates, March 5, 2014
[7] FAA Advisory Circular 150/5390-2C, Heliport Design
[8] San Manuel Airport – Airport Master Plan, Coffman Associates and Z&H Engineering, November 12, 2003
[9] Federal Aviation Regulations, Part 77 – Safe, Efficient Use, and Preservation of the Navigable Airspace,
[10] NOTE: A field survey was conducted subsequent to the preparation of this section of the Master Plan, in advance of the preparation of the Airport Layout Plan (ALP). The field survey determined that the official, monumented length of Runway 11-29 is 4,200.01 feet. The additional 14 feet that appears in this section is considered to be insignificant to the determination of the critical aircraft fleet.

E77 San Manuel Airport

Pinal County, Arizona

FACILITY REQUIREMENTS BY FISCAL YEAR

2014				
PROJECT		DESCRIPTION	ACTION POINTS (TRIGGERS)	
1	**E77-001**	Airport Master Plan	IN PROGRESS	
2	**E77-003**	Design - Aircraft Apron Reconstruction / Reconfiguration	Immediate Need (Condition/Compliance)	
			IN PROGRESS	

2015				
PROJECT		DESCRIPTION	ACTION POINTS (TRIGGERS)	
1	**E77-002**	Runway and Taxiway Pavement Rehabilitation (APMS)	Immediate Need (Condition)	
			Availability of State funding	
2	**E77-056**	Design - FAR Part 77 Obstruction Mitigation	Immediate Need (Safety)	
			Availability of FAA funding	
3	**E77-051**	Construction - Aircraft Apron Reconstruction / Reconfiguration	Immediate Need (Condition/Compliance)	
			Following completion of CIP project number	E77-003
4	**E77-008**	EA - Access Road Land Acquisition	Availability of FAA funding	
			Immediate Need (Compliance)	
5	**E77-054**	EA for Land Acquisition	Availability of FAA funding	
			Availability of Local Funding	
6	**E77-004**	Design - Reconfigure Taxiway A4	Immediate Need (Safety)	
			Availability of FAA funding	
7	**E77-201**	Maintenance - Taxiway Crack Seal, Seal Coat, Pavement Marking	Observed cracking/surface oxidation	
			Immediate Need (Condition)	
8	**E77-202**	Maintenance - Access Road Drainage Structure Maintenance	Immediate Need (Condition)	
			Availability of Local Funding	
9	**E77-022**	Design/Construction - Access Road Bend Reconstruction	Immediate Need – Pavement Failure	
			Availability of State funding	
10	**E77-024**	Design/Construction - Site Work for 2-5 Unit Tee Hangar Structure	Based on current waiting list	
			Availability of Local Funding	
11	**E77-058**	Design/Construction - 2-5 Unit Tee Hangar Structure	Following completion of CIP project number	E77-024
			Availability of Local Funding	
12	**E77-042**	Design/Construct – Fuel containment sump	Immediate Need (Compliance)	
			Availability of Local Funding	

NOTE: This listing is in the Sponsor's priority order for each Fiscal Year.

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Pinal County, Arizona

FACILITY REQUIREMENTS BY FISCAL YEAR

2016

PROJECT		DESCRIPTION	ACTION POINTS (TRIGGERS)	
1	E77-005	Construction - Reconfigure Taxiway A4	Availability of FAA funding	
			Following completion of CIP project number	E77-004
2	E77-057	Construction - FAR Part 77 Obstruction Mitigation	Following completion of CIP project number	E77-056
			Availability of FAA funding	
3	E77-009	Land Acquisition for Access Road	Following completion of CIP project number	E77-008
			Availability of FAA funding	
4	E77-055	Acquisition of Airport Land	Availability of FAA funding	
			Following completion of CIP project number	E77-054
5	E77-046	Design - Taxiway Edge Lighting System (MITL)	Immediate Need (Safety)	
			Availability of FAA funding	
6	E77-038	Design - Automobile Parking Lot	Immediate Need (Condition)	
			Availability of State funding	

2017

PROJECT		DESCRIPTION	ACTION POINTS (TRIGGERS)	
1	E77-010	Design/Construction - Access Road Relocation	Following completion of CIP project number	E77-009
			Availability of FAA funding	
2	E77-047	Construction - Taxiway Edge Lighting System (MITL)	Following completion of CIP project number	E77-046
			Availability of FAA funding	
3	E77-039	Construction - Automobile Parking Lot	Immediate Need (Capacity)	
			Following completion of CIP project number	E77-038
4	E77-052	Design - Rotorcraft Operations Area	Immediate Need (Capacity)	
			Availability of FAA funding	

2018

PROJECT		DESCRIPTION	ACTION POINTS (TRIGGERS)	
1	E77-006	Design RWY 11-29 Pavement Strengthening	500 annual ops by larger aircraft	
			Availability of FAA funding	
2	E77-016	Design - Taxiway Pavement Strengthening	500 annual ops by larger aircraft	
			Concurrent with CIP project number	E77-006
3	E77-029	Design - Aircraft Parking Apron Pavement Strengthening	Concurrent with CIP project number	E77-006
			Availability of FAA funding	
4	E77-044	Design and Construction - South Side Perimeter Fence	Availability of FAA funding	
			Availability of State funding	

NOTE: This listing is in the Sponsor's priority order for each Fiscal Year.

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FACILITY REQUIREMENTS BY FISCAL YEAR

5	**E77-053**	Construction - Rotorcraft Operations Area	Immediate Need (Capacity)	
			Following completion of CIP project number	E77-052

2019

PROJECT		DESCRIPTION	ACTION POINTS (TRIGGERS)	
1	**E77-007**	Construction - RWY 11-29 Pavement Strengthening	Following completion of CIP project number	E77-006
			Availability of FAA funding	
2	**E77-026**	Design/Construction - Site Work for 2-5 Unit Hangar Structure	Reclassification to ARC B-II	
			Concurrent with CIP project number	E77-007
3	**E77-059**	Design/Construction - 2-5 Unit Hangar Structure	Following completion of CIP project number	E77-026
			Availability of Local Funding	
4	**E77-017**	Construction - Taxiway Pavement Strengthening	Following completion of CIP project number	E77-016
			Concurrent with CIP project number	E77-007
5	**E77-030**	Construct - Aircraft Parking Apron Pavement Strengthening	Following completion of CIP project number	E77-029
			Availability of FAA funding	
6	**E77-020**	Design - Aircraft Parking Apron Expansion	Actual increase in demand	
			Availability of FAA funding	
7	**E77-203**	Maintenance - Runway Crack Seal, Seal Coat, Pavement Marking	Observed cracking/surface oxidation	
			Availability of State funding	
8	**E77-204**	Maintenance - Apron Crack Seal, Seal Coat, Pavement Marking	Observed cracking/surface oxidation	
			Availability of State funding	

2020

PROJECT		DESCRIPTION	ACTION POINTS (TRIGGERS)	
1	**E77-021**	Construction - Aircraft Parking Apron Expansion	Following completion of CIP project number	E77-020
			Availability of FAA funding	
2	**E77-023**	Design/Construction - Access Road Structural Overlay	Observed increase in traffic	
			Availability of State funding	
3	**E77-031**	Airport Master Plan Update	Availability of FAA funding	
			Availability of Local Funding	

2022

PROJECT		DESCRIPTION	ACTION POINTS (TRIGGERS)	
1	**E77-216**	Maintenance - Auto Parking Crack Seal, Seal Coat, Pvmt Marking	Observed cracking/surface oxidation	
			Availability of State funding	

NOTE: This listing is in the Sponsor's priority order for each Fiscal Year.

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FACILITY REQUIREMENTS BY FISCAL YEAR

2023

PROJECT		DESCRIPTION	ACTION POINTS (TRIGGERS)	
1	E77-014	Design - Taxiway A6 Relocation	Increased use by larger aircraft	
			Availability of FAA funding	

2024

PROJECT		DESCRIPTION	ACTION POINTS (TRIGGERS)	
1	E77-015	Construction - Taxiway A6 Relocation	Following completion of CIP project number	E77-014
			Availability of FAA funding	
2	E77-025	Design/Construction - Site Work for 2-5 Unit Hangar Structure	Increase in actual demand	
			Availability of Local Funding	
3	E77-060	Design/Construction - 2-5 Unit Hangar Structure	Following completion of CIP project number	E77-025
			Availability of Local Funding	
4	E77-205	Maintenance - Runway Crack Seal, Seal Coat, Pavement Marking	Observed cracking/surface oxidation	
			Availability of State funding	
5	E77-206	Maintenance - Taxiway Crack Seal, Seal Coat, Pavement Marking	Observed cracking/surface oxidation	
			Availability of State funding	
6	E77-207	Maintenance - Apron Crack Seal, Seal Coat, Pavement Marking	Observed cracking/surface oxidation	
			Availability of State funding	

2025

PROJECT		DESCRIPTION	ACTION POINTS (TRIGGERS)	
1	E77-040	Design - Automobile Parking Lot Expansion	Observed increase in demand	
			Availability of State funding	

2026

PROJECT		DESCRIPTION	ACTION POINTS (TRIGGERS)	
1	E77-041	Construction - Automobile Parking Lot Expansion	Following completion of CIP project number	E77-040
			Availability of State funding	
2	E77-032	Airport Master Plan Update	Availability of FAA funding	
			Availability of Local Funding	

NOTE: This listing is in the Sponsor's priority order for each Fiscal Year.

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E77 San Manuel Airport

Pinal County, Arizona

FACILITY REQUIREMENTS BY FISCAL YEAR

2029

PROJECT		DESCRIPTION	ACTION POINTS (TRIGGERS)	
1	E77-027	Design/Construction - Site Work for 2-5 Unit Hangar Structure	Increase in actual demand	
			Availability of Local Funding	
2	E77-061	Design/Construction - 2-5 Unit Hangar Structure	Following completion of CIP project number	E77-027
			Availability of Local Funding	
3	E77-209	Maintenance - Runway Crack Seal, Seal Coat, Pavement Marking	Observed cracking/surface oxidation	
			Availability of State funding	
4	E77-210	Maintenance - Taxiway Crack Seal, Seal Coat, Pavement Marking	Observed cracking/surface oxidation	
			Availability of State funding	
5	E77-211	Maintenance - Apron Crack Seal, Seal Coat, Pavement Marking	Observed cracking/surface oxidation	
			Availability of State funding	

2031

PROJECT		DESCRIPTION	ACTION POINTS (TRIGGERS)	
1	E77-011	EA - RWY 11-29 Extension	Demonstrated demand by critical aircraft	
			Availability of FAA funding	
2	E77-212	Maintenance - Access Road Crack Seal, Seal Coat, Pavement Marking	Observed cracking/surface oxidation	
			Availability of State funding	
3	E77-217	Maintenance - Auto Parking Crack Seal, Seal Coat, Pvmt Marking	Observed cracking/surface oxidation	
			Availability of State funding	

2032

PROJECT		DESCRIPTION	ACTION POINTS (TRIGGERS)	
1	E77-050	Land Acquisition - Runway 11-29 Extension/RPZs	Following completion of CIP project number	E77-011
			Availability of FAA funding	
2	E77-033	Airport Master Plan Update	Availability of FAA funding	
			Availability of Local Funding	

2033

PROJECT		DESCRIPTION	ACTION POINTS (TRIGGERS)	
1	E77-012	Design - RWY 11-29 Extension	Following completion of CIP project number	E77-011
			Availability of FAA funding	

NOTE: This listing is in the Sponsor's priority order for each Fiscal Year.

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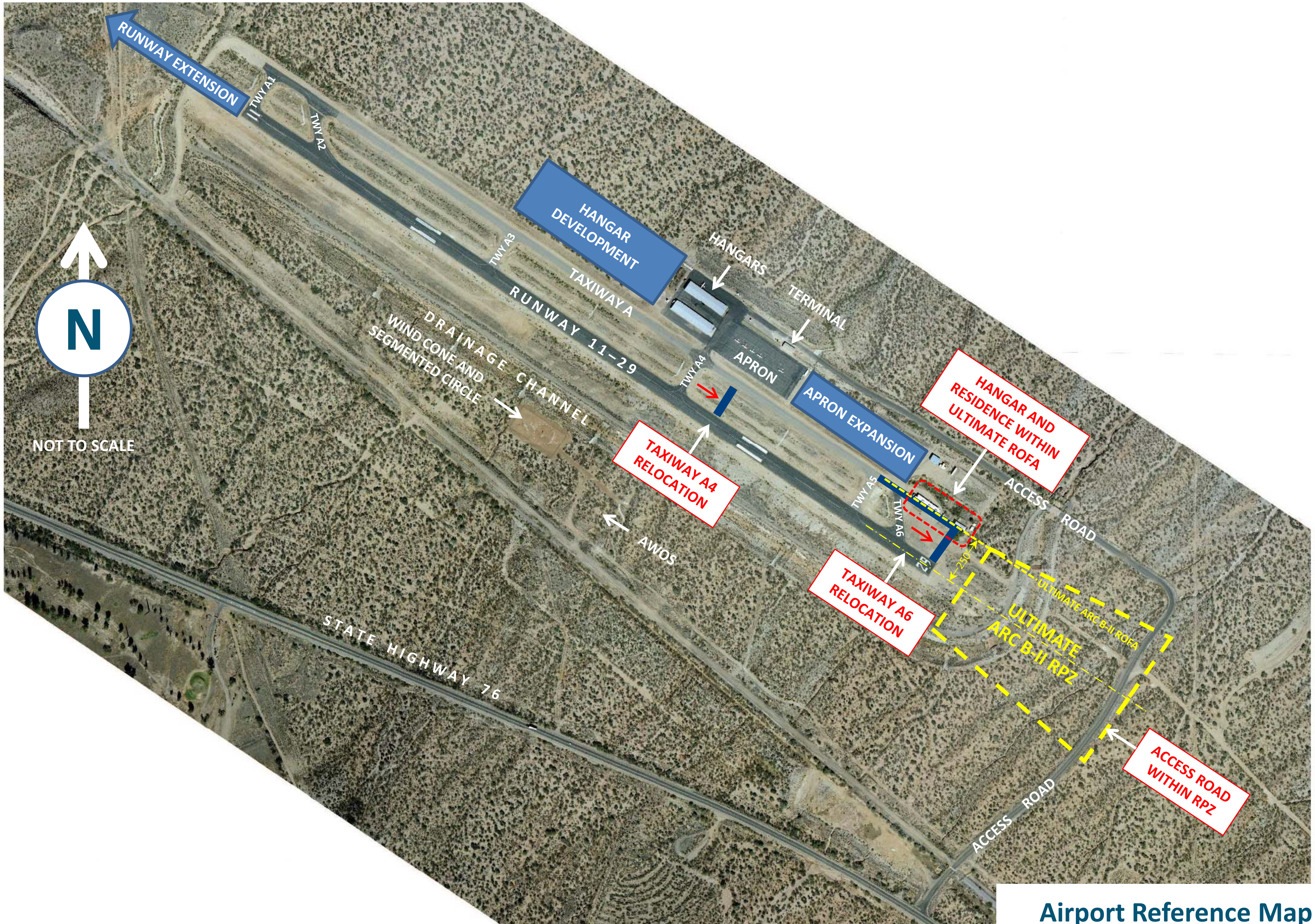
FACILITY REQUIREMENTS BY FISCAL YEAR

2	**E77-018**	Design - Taxiway A Extension	Concurrent with CIP project number	E77-012
			Availability of FAA funding	
3	**E77-034**	Design - MIRL extension and upgrade	Concurrent with CIP project number	E77-012
			Availability of FAA funding	
4	**E77-036**	Design – PAPI and REIL relocation	Concurrent with CIP project number	E77-012
			Availability of FAA funding	
5	**E77-043**	Design - Runway and Taxiway Signage Extension/Modification	Concurrent with CIP project number	E77-012
			Availability of FAA funding	
6	**E77-048**	Design – Taxiway lighting (MITL) extension	Concurrent with CIP project number	E77-012
			Availability of FAA funding	

2034

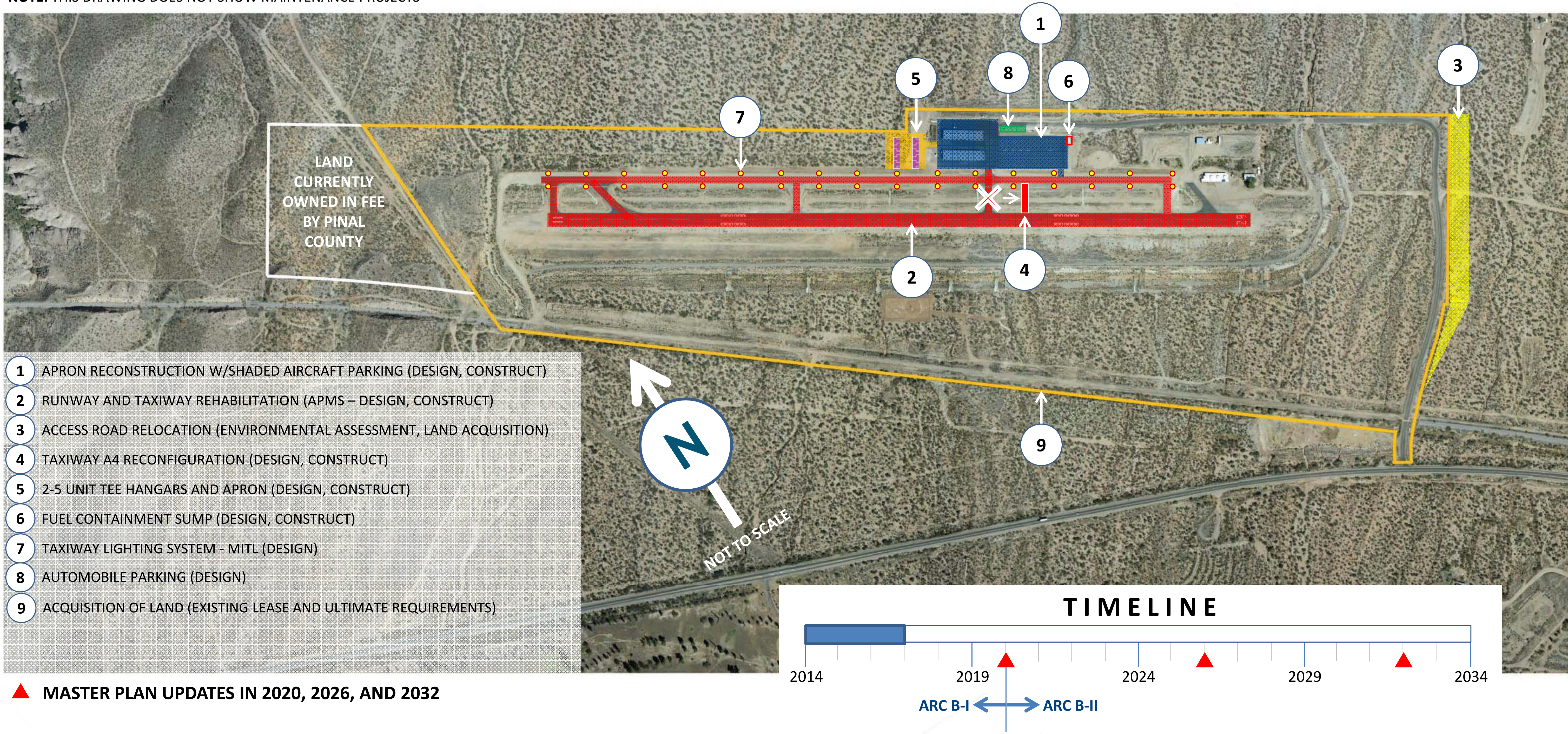
PROJECT		DESCRIPTION	ACTION POINTS (TRIGGERS)	
1	**E77-013**	Construction - RWY 11-29 Extension	Following completion of CIP project number	E77-012
			Availability of FAA funding	
2	**E77-019**	Construction - Taxiway A Extension	Concurrent with CIP project number	E77-013
			Availability of FAA funding	
3	**E77-035**	Construction - MIRL extension and upgrade	Concurrent with CIP project number	E77-013
			Availability of FAA funding	
4	**E77-037**	Construction – PAPI and REIL relocation	Concurrent with CIP project number	E77-013
			Availability of FAA funding	
5	**E77-045**	Construction - Runway and Taxiway Signage Extension/Modification	Concurrent with CIP project number	E77-013
			Availability of FAA funding	
6	**E77-049**	Construction – Taxiway lighting (MITL) extension	Concurrent with CIP project number	E77-013
			Availability of FAA funding	
7	**E77-028**	Design/Construction - Site Work for 2-5 Unit Hangar Structure	Increase in actual demand	
			Availability of Local Funding	
8	**E77-062**	Design/Construction - 2-5 Unit Hangar Structure	Following completion of CIP project number	E77-028
			Availability of Local Funding	
9	**E77-213**	Maintenance - RWY (4,214') Crack Seal, Seal Coat, Pvmt Marking	Observed cracking/surface oxidation	
			Availability of State funding	
10	**E77-214**	Maintenance - Taxiway Crack Seal, Seal Coat, Pavement Marking	Observed cracking/surface oxidation	
			Availability of State funding	
11	**E77-215**	Maintenance - Apron Crack Seal, Seal Coat, Pavement Marking	Observed cracking/surface oxidation	
			Availability of State funding	

NOTE: This listing is in the Sponsor's priority order for each Fiscal Year.



Airport Reference Map
Figure 5-1

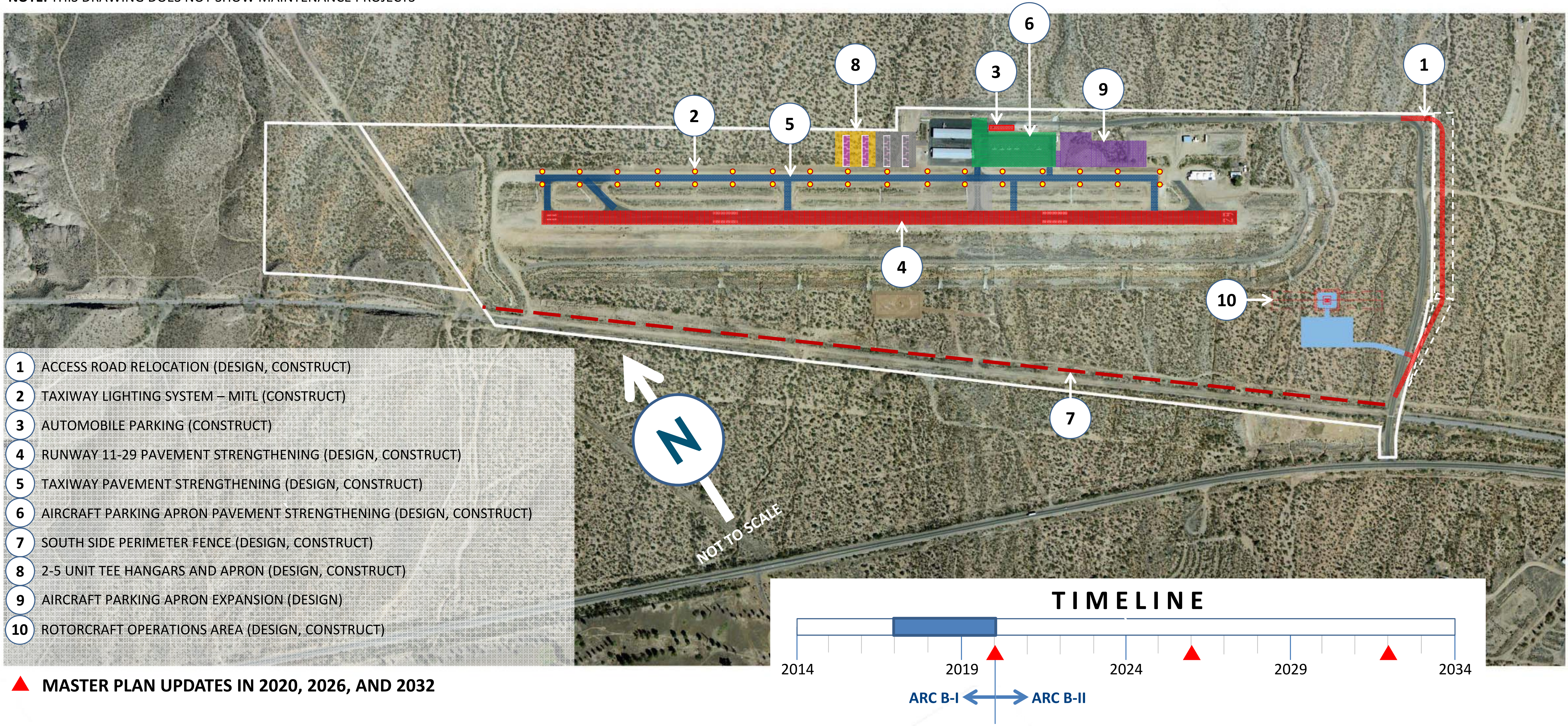
NOTE: THIS DRAWING DOES NOT SHOW MAINTENANCE PROJECTS



▲ **MASTER PLAN UPDATES IN 2020, 2026, AND 2032**

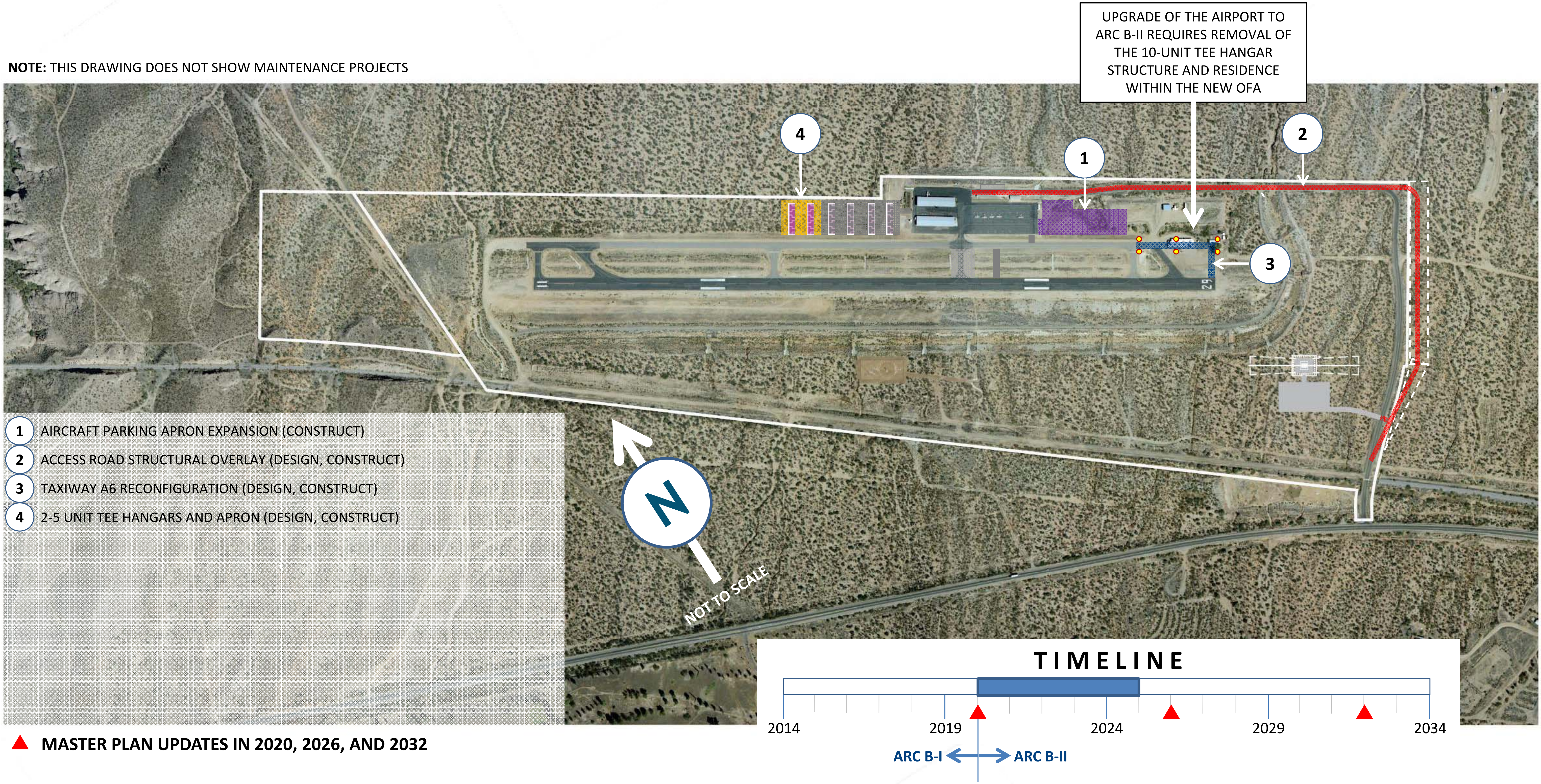
Immediate/Short Term Development Phasing Plan (2014-2016)
Figure 5-2

NOTE: THIS DRAWING DOES NOT SHOW MAINTENANCE PROJECTS



Short Term Development Phasing Plan (2017-2019)
Figure 5-3

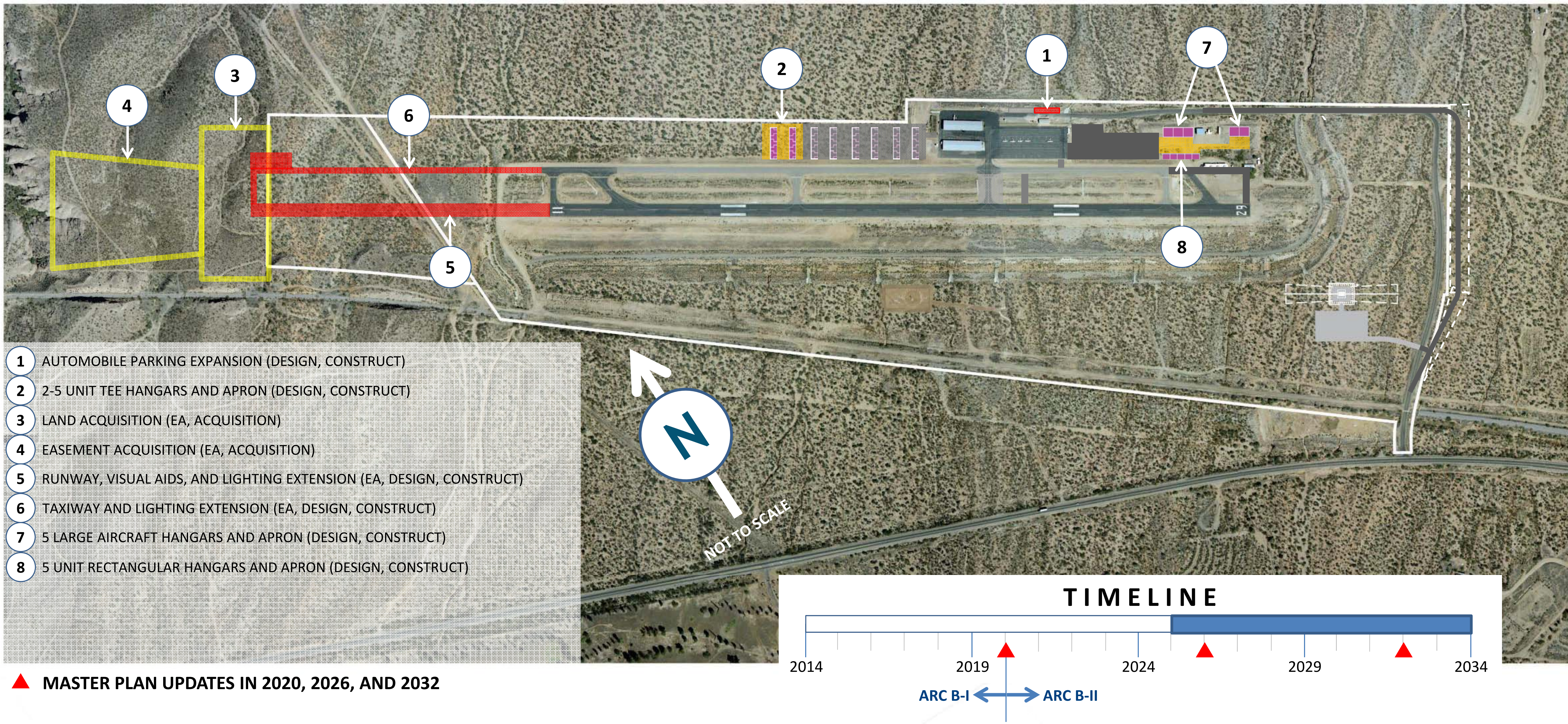
NOTE: THIS DRAWING DOES NOT SHOW MAINTENANCE PROJECTS



▲ **MASTER PLAN UPDATES IN 2020, 2026, AND 2032**

Intermediate Term Development Phasing Plan (2020-2024)
Figure 5-4

NOTE: THIS DRAWING DOES NOT SHOW MAINTENANCE PROJECTS



Long Term Development Phasing Plan (2025-2034)
Figure 5-5

6 Development Alternatives

Introduction

This chapter contains comparative evaluation of alternative methods to accomplish the major development recommendations identified in **Chapter 5, Airport Facility Requirements**. The comparative evaluation was approached from an analytical point of view, comparing several areas of potential environmental, economic, and developmental impact among the various alternatives to reach an objective baseline for selection of the most desirable options. The methodology assumes that the best alternative action is the one which exhibits the least potential for adverse impact with the most frequency when compared to the other alternates.

The selected improvements that are evaluated in this chapter include the following:

- Terminal Area Development
- Runway 11-29 Extension
- Access Road Realignment (combined with the Runway 11-29 analysis)

In addition to the comparative evaluation of the alternatives for future improvements on the present airport site, the “no development” alternative is presented.

Also included is comparative evaluation of different pavement types for the recommended future paved parking aprons, hangar aprons, roadways and automobile parking. This has been included to provide the County with information regarding the long term cost of alternative pavements, taking into account not only the initial construction cost but the maintenance costs that may be expected over the life of the pavement. The evaluation includes comparison of the life cycle cost of Asphaltic Concrete Pavement (AC) versus Portland Cement Concrete Pavement (PCCP).

The “No Development” Alternative

The “no development” option assumes maintenance of the existing airport facility as-is, with no major capital improvement investments being made to accommodate future demand. With this option, it must also be assumed that future demand would have to be accommodated by other airports, the nearest being Ryan Field, Tucson International Airport, and Marana Airpark. The existing based aircraft records for San Manuel Airport indicate that many aircraft owners are choosing to move away from these airports and are tending to base their aircraft at San Manuel. This is presented in **Chapter 2, Inventory**.

Although the “no development” option represents the least costly out-of-pocket alternative for Pinal County, the FAA, and ADOT, its selection would leave the San Manuel Airport service area without an important economic driver, and ultimately without a usable airport as the existing pavements and other facilities reach the end of their useful lives.

Adequate airport facilities are an important and undeniable factor in the consideration of site selection by new industry and commerce, and are a positive influence on tourism and the general economic health of the area[1]. The economic impacts of an inadequate (and ultimately unusable) airport are difficult to accurately quantify, but will to some degree negatively impact the business growth of the San Manuel Airport's service area.

To accept this option would adversely affect the airport's ability to safely accommodate existing and future aviation demand. The recommendation of this study is that the "no development" alternative be dismissed and eliminated from consideration.

Terminal Area Layout Alternatives

Several alternative Terminal Area layouts have been developed for evaluation. The layouts were limited to the existing airport property and are based on the recommendations for hangar, tiedown, and automobile parking contained in **Chapter 5, Facility Requirements**. The layouts are illustrated in **Figure 6-1** through **6-3** at the end of this chapter.

For this analysis, the Terminal Area was split into three development areas:

- The Terminal Development Area consists of the current "central core" developed tiedown apron, terminal building and County-owned Tee Hangars. Two alternative layouts were developed for this area.

- The Northwest Development Area is the area extending away from the Terminal Development Area towards the northwest. Three alternatives were developed for this area.

- The Southeast Development Area consists of the area extending away from the Terminal Development Area towards the southeast and into the current private hangar lease area. Two alternative layouts were developed for this area.

Reconfiguration of Taxiway A4 and removal/relocation of Taxiway A6 are incorporated into both Terminal Development Area and Southeast Development Area layouts. The alternative layouts all utilize the modular sizes for standard prefabricated Erect-a-Tube hangars[2]. The actual development may use other similar products, or may use conventional metal or wood frame construction techniques.

Alternative 1: Full ARC B-II Design Standards (Figure 6-1)
This layout includes the Terminal, Northwest, and Southeast Development Areas. It provides flow-through by the full range of ARC B-II aircraft using the full B-II standards specified in AC 150/5300-13A, Airport Design, through the Terminal Development Area and the Southeast Development Area. The critical dimension affecting the layout is the Taxilane Object Free Area (TOFA) width of 115 feet (57.5' setback from the taxilane center line). The layout requires reconfiguration of the

existing Aircraft Parking Apron, including relocation of the tiedown layout and parked aircraft shades planned for construction in 2015.

Terminal Development Area – With this alternative, the existing Aircraft Parking Apron (immediately southwest of the Terminal) would be reconfigured to allow the full ARC B-II flow-through taxilane, with ADG-I transient aircraft parking along both sides of the new taxilane.

Northwest Development Area - Features of this layout include new hangar development for the smaller ADG I aircraft extending to the northwest of the Terminal along Taxiway A. These hangars are oriented parallel to Runway 11-29. Note that because the southwesterly tier of existing County-owned Tee Hangars encroach upon the minimum setback from the Taxiway A centerline, a taxilane parallel to the hangars cannot be maintained. In order to gain compliance with the ARC B-II design standards, direct access from Taxiway A to each hangar should be constructed as shown on the Figure 6-1 layout at such time as the airport is upgraded from ARC B-I to B-II.

Southeast Development Area – This layout includes expansion of the full ARC B-II Apron toward the southeast, again with full B-II taxilane separation and ADG-I aircraft parking along both sides. Based and transient parking would be included on this expansion area, although both based and transient aircraft would use the existing reconfigured Apron if it were to be constructed as an initial phase. A pad for parking large transient aircraft is also included. The existing fuel pump would have to be relocated to provide the required taxilane wingtip clearance. A large (ADG II) aircraft hangar development area and an FBO area are located at the southeast end of this layout, along with some additional small (ADG I) aircraft hangars. These hangars could be leased or constructed by an FBO and could serve as the core of a business aviation service area.

Terminal automobile parking is included adjacent to the existing Terminal, along the southwest side of the Access Road, the current unpaved automobile parking area.

Alternative 2: Critical Aircraft Based ARC B-II Design Standards (Figure 6-2)
This layout also includes the Terminal, Northwest, and Southeast Development Areas. It provides full flow-through Terminal and existing Apron access limited to the critical ARC B-II aircraft as identified in **Chapter 5, Facility Requirements**, a range of B-II jets and turboprops with wingspans no greater than 55.7'. These aircraft are listed in **Table 5g** on page 5-15 of Chapter 5. The critical dimension affecting the existing Apron's layout is the Taxilane Object Free Area (TOFA) width of 86.8 feet (43.4' setback from the taxilane center line). This layout avoids reconfiguration of the existing Aircraft Parking Apron and relocation of the planned parked aircraft shades.

The Apron expansion area extends to the southeast, providing full flow-through Apron access by ARC B-II aircraft using the full B-II standards specified in AC 150/5300-13A, Airport Design. The critical dimension affecting this portion of the layout is the Taxilane Object Free Area (TOFA) width of 115 feet (57.5' setback from the taxilane center line).

Terminal Development Area – With this alternative, the existing Aircraft Parking Apron (immediately southwest of the Terminal) would allow the limited ARC B-II flow-through taxilane, and maintain the planned ADG-I transient aircraft parking along both sides of an ADG-II taxilane along the southwest edge of the Apron (limited to aircraft such as the Cessna 172).

Northwest Development Area - Features of the layout include new hangar development for small (ADG I) aircraft expanding towards the northwest of the Terminal Development Area, along Taxiway A. These hangars are oriented perpendicular to Runway 11-29 with the intent of minimizing pavement area. Note that because the southwesterly tier of existing County-owned Tee Hangars encroach upon the minimum setback from the Taxiway A centerline, a taxilane parallel to the hangars cannot be maintained. In order to gain compliance with the ARC B-II design standards, direct access from Taxiway A to each hangar should be constructed as shown on the Figure 6-2 layout at such time as the airport is upgraded from ARC B-I to B-II.

Southeast Development Area – This layout includes expansion of the full ARC B-II Apron toward the southeast, again with full B-II taxilane separation and ADG-I aircraft parking along both sides. Based and transient parking would be included on this expansion area, although both based and transient aircraft would use the existing reconfigured Apron if it were to be constructed as an initial phase. A pad for parking large transient aircraft is also included, just southeast of the existing fuel tanks. The existing fuel pump would have to be relocated to provide the required taxilane wingtip clearance. A large (ADG II) aircraft hangar development area and an FBO area are located at the southeast end of this layout, along with some additional small (ADG I) aircraft hangars. These hangars could be leased or constructed by an FBO and could serve as the core of a business aviation service area.

Terminal automobile parking is included adjacent to the existing Terminal, along the southwest side of the Access Road, the current unpaved automobile parking area.

Alternative 3: Modification of Alternative 1 Northwest Development Area (Figure 6-3)
This layout is a modification of the development concept for the Northwest Development Area as presented in Alternative 1. The Alternative 1 layout consists of progressive construction of nested Tee-Hangars (doors on both sides) along Taxiway A. Alternative 3 uses rectangular Hangars (doors only on one side) as an attempt to minimize the amount of earthwork fill required along the north side of Taxiway A.

Features of the Alternative 3 layout include new hangar development for the smaller ADG I aircraft extending to the northwest of the Terminal along Taxiway A. These hangars are oriented parallel to Runway 11-29.

Evaluation of Terminal Area Development Alternatives
The alternative Terminal Area layouts have components that are relatively interchangeable. Any of the three Northwest Development Area layouts could be paired with any of the two Terminal Development Area layouts, and with either of the Southeast Development Area layouts. The "core" development area that has the greatest difference between the two alternatives is the Terminal Development Area: Alternative 1 includes reconfiguration of the Apron to allow full ARC B-II flow-through and Terminal access; Alternative 2 maintains the existing Apron's current design to accommodate ARC B-II aircraft with wingspans no greater than 55.7 feet (and includes parking

for small ADG-I aircraft). Both alternates include full ARC B-II flow-through into the Southeast Development Area with taxilane access to the Northwest Development Area limited to smaller ADG-I aircraft.

With this in mind, the Terminal Area development alternatives' major components have been evaluated separately in order to identify a selected layout for future development that incorporates the best components from the various alternative layouts. The components were comparatively evaluated as follows:

1. Terminal Development Area (existing Aircraft Parking Apron) – Two alternatives

2. Northwest Development Area (ADG I Hangars) – Three alternatives

3. Southeast Development Area (Apron Expansion, FBO, and Hangars) – Two alternatives

Each of these three options were evaluated in terms of the following parameters:

- Best use of land
- Ease of sequential development (Apron and Hangar phasing)
- Development cost
- Operational constraints
- Potential environmental impacts

For each of the alternative layouts, the three components (Terminal, Northwest, Southeast Development areas) were ranked comparatively according to each of these parameters. In each case, the most desirable component was assigned the highest number of points (2 or 3) and the least desirable was assigned the lowest value (1 point). If the components are equal, each was assigned 1 point. The final selected alternative will theoretically consist of a composite of the highest rated development areas.

A description of the analysis of alternatives follows. The rankings are summarized at the end of this narrative in **Table 6b**.

Best Use of Land
In general, all of the recommended development constitutes aviation use and thus should be considered to be the "best use" of airport land. However, the San Manuel Airport is a somewhat constrained site. This would suggest that the use of less land area to achieve the same goals would be a better use of available developable land. For the purposes of this evaluation, the total paved and building area was used to compare the alternatives. With this in mind, the following comparisons were found:

- Northwest Development Area (3 alternatives):
  Alternative 2 would utilize the least amount of available land to construct the same number of Tee Hangars (16% less than Alternative 3 and 27% less than Alternative 1).

Because of this efficiency, Alternative 2 is ranked highest, and Alternative 1 is ranked the lowest.

- Terminal Development Area (2 alternatives):
  The two alternative layouts would utilize essentially the same land area, the currently developed Aircraft Apron and Tee Hangar area. The two alternatives are therefore considered to be equal with regard to the Best Use of Land parameter.

- Southeast Development Area (2 alternatives):
  Alternative 1 would utilize approximately 10% less land than Alternative 2 to achieve a similar scope of development. Because of this, Alternative 1 is ranked highest.

Ease of Sequential Development

Each of the two alternative layouts have been designed to allow phased development. Therefore it can be assumed that, in general, the various components are essentially equal with regard to this evaluation parameter. There are some differences, however, that impact the rankings. The following comparisons were found:

- Northwest Development Area (3 alternatives):
  Each of the alternatives can be easily developed sequentially, with progression of development to the northwest along Taxiway A. The three alternatives are therefore considered to be equal with regard to this parameter.

- Terminal Development Area (2 alternatives):
  The existing Terminal Area Apron is in the process of reconstruction (construction plans have been completed at this writing). The current project will configure the Apron as it is shown in the Alternative 2 layout, with ADG II aircraft access limited to those aircraft with wingspans not greater than 55.7 feet. If Alternative 1 were to be selected for ultimate development, a major construction phase would be to reconfigure the existing Terminal Area Apron such that it would accommodate the full range of potential ADG II aircraft types that may use the airfield. This may complicate development phasing, since a new apron expansion would have to be developed before closure and reconfiguration of the existing Apron. During the reconfiguration construction period, access to the Terminal Building and existing Tee Hangars would be disrupted. For this reason, Alternative 2 is ranked as the most desirable option.

- Southeast Development Area (2 alternatives):
  Each of the alternatives can be easily developed sequentially, with either progression of apron expansion followed by hangar/FBO development towards the southeast, or hangar/FBO development at the southeast end of the area followed by apron expansion infill. The two alternatives are therefore considered to be equal with regard to this parameter.

Development Cost

Planning level estimates of the approximate costs for development of each of the components of the Terminal Area are presented at the end of this chapter, in **Figures 6-7** through **6-13**. The estimates are summarized in **Table 6a** on the following page. The estimates include the cost of construction, design, and construction administration.

- <u>Northwest Development Area (3 alternatives)</u>: The most significant difference in the cost of construction of the three Northwest Development Area alternatives is earthwork. Because the terrain drops off significantly towards the north from parallel Taxiway A, deep fills are required to construct the hangar pads and access taxilanes for the 40 future hangars included in this area. This fill will primarily consist of on-site borrow with an estimated cost of $20/cubic yard (in place). The cost to construct earthwork fills for Alternative 1 would be approximately one million dollars more expensive than either of the other two alternatives.

  Alternative 2 is the least expensive of the three options analyzed, and therefore is the highest ranked option in terms of cost. This is primarily due to the smaller area of development afforded by the perpendicular configuration of the nested Tee-Hangars. This smaller development footprint minimizes the amount of pavement area required to serve the same number of hangars, as well as minimizing the amount of borrow fill required.

  In total, Alternative 2 is approximately two million dollars less expensive than either of the other two layouts.

- <u>Terminal Development Area (2 alternatives)</u>: The most significant cost difference between the two Terminal Development Area alternatives is the need to reconstruct the existing "core" apron area in order to accommodate full ARC B-II "flow-through" setback dimensions. The current design of this area will accommodate a limited number of ADG II aircraft with wingspans no greater than 55.7'. This additional cost is reflected in the $200,000 difference in cost between the two alternatives.

  Alternative 2 (limited ADG II flow-through) is the least expensive option and has been ranked accordingly.

- <u>Southeast Development Area (2 alternatives)</u>: The most significant difference in the cost of construction of the two Southeast Development Area alternatives is earthwork. Much of this development area requires deep fills for construction of hangar pads and access taxilanes. This fill will primarily consist of on-site borrow with an estimated cost of $20/cubic yard (in place). The cost to construct earthwork fills for the Alternative 2 layout would be approximately $600,000 more expensive than Alternative 1.

  In total, Alternative 1 is about 1.1 million dollars less expensive than Alternative 2 and it has been ranked accordingly.

Table 6a: ESTIMATED DEVELOPMENT COSTS
TERMINAL AREA DEVELOPMENT ALTERNATIVES
San Manuel Airport – San Manuel, Arizona

ALTERNATIVE	Estimated Development Cost	Rounded Estimated Development Cost	Ranking
Northwest Development Area Alternatives			
1	$ 9,002,117.09	$ 9.0 million	1
2	$ 6,719,308.90	$ 6.7 million	**3**
3	$ 7,196,735.65	$ 7.2 million	2
Terminal Development Area Alternatives			
1	$ 2,224,403.03	$ 2.2 million	1
2	$ 2,006,133.03	$ 2.0 million	**2**
Southeast Development Area Alternatives			
1	$ 8,010,492.56	$ 8.0 million	**2**
2	$ 9,132,778.59	$ 9.1 million	1

Operational Constraints

It is assumed that all new development will be undertaken in conformance with FAA design criteria, and that any current operational constraints will be mitigated as part of the future development program. This would suggest that all of the proposed alternatives would be essentially equal in terms of effective operations of the airport. However, there are some characteristics of the alternatives that would affect the comparisons, particularly between the two Terminal Development Area options.

- Northwest Development Area (3 alternatives):
  No operational constraints are foreseen for any of the alternative layouts, and each have been ranked as equally desirable.

- Terminal Development Area (2 alternatives):
  Because selection of Alternative 2 would limit the use of the central apron to smaller ADG II aircraft, Alternative 1 is considered to be ranked as the most desirable option with regard to this parameter.

- Southeast Development Area (2 alternatives):
  No operational constraints are foreseen for either of the alternative layouts, and each have been ranked as equally desirable.

Potential Environmental Impacts
Some of the land proposed for ultimate development is disturbed ground that is already used for aeronautical and/or vehicular access purposes. However, much of the land designated for new development is currently undisturbed with the potential for some degree of disruption of the natural environment. The potential impacts associated with new construction may include disruption of natural habitat and/or local protected plant or animal species, or changes in natural drainage patterns. Detailed environmental studies are not included as a part of this evaluation. However, the amount of land proposed to be disturbed for development may be used as an initial indicator of the potential for environmental impact (with no attempt to identify the severity or type of impacts that may occur).

The following comparisons were found:

- Northwest Development Area (3 alternatives):
  Alternative 2 would utilize the least amount of available land to construct the same number of Tee Hangars (16% less than Alternative 3 and 27% less than Alternative 1). Because of this efficiency, Alternative 2 is ranked highest (best) in terms of the potential for environmental impacts. Alternative 1 is ranked the lowest.

- Terminal Development Area (2 alternatives):
  The two alternative layouts would utilize essentially the same land area, the currently developed Aircraft Apron and Tee Hangar area. The two alternatives are therefore considered to be equal with regard to this parameter.

- Southeast Development Area (2 alternatives):
  Alternative 1 would utilize approximately 10% less land than Alternative 2 to achieve a similar scope of development. Because of this, Alternative 1 is ranked highest (best) in terms of the potential for environmental impacts.

Terminal Area - Selected Alternative
Based on results reflected in **Table 6b**, below, the selected alternative for the terminal and hangar area development is a composite of the following layouts:

- Northwest Development Area Alternative 2
- Terminal Development Area Alternative 2
- Southeast Development Area Alternative 1

This composite layout is illustrated in **Figure 6-17**, at the end of this chapter. **Figure 6-18** contains the combined development cost estimate for the selected Terminal Area Alternate. The following chapters of this document are based on this selection.

Table 6b: TERMINAL AREA LAYOUTS EVALUATION MATRIX
San Manuel Airport – San Manuel, Arizona

	Northwest Development Area			Terminal Development Area		Southeast Development Area	
	ALT 1	ALT 2	ALT 3	ALT 1	ALT 2	ALT 1	ALT 2
Best Use of Land	1	**3**	2	1	1	**2**	1
Ease of Sequential Development	1	1	1	1	**2**	1	1
Development Cost	1	**3**	2	1	**2**	**2**	1
Operational Constraints	1	1	1	**2**	1	1	1
Potential Environmental Impacts	1	**3**	2	1	1	**2**	1
TOTALS	**5**	**11**	**8**	**6**	**7**	**8**	**5**

Runway Extension and Access Road Alternatives

Three alternatives for the extension of Runway 11-29 to its ultimate potential length of 6,000 feet were developed. The alternative layouts are based on the recommendations for the potential maximum ultimate runway length contained in **Chapter 5, Facility Requirements**. These alternatives include options for the ultimate disposition of the existing Access Road so that it will be clear of the Runway 29 Runway Protection Zone (RPZ). The three alternative layouts are illustrated in **Figure 6-4** through **6-6** at the end of this chapter.

Runway Extension Alternative 1 (Figure 6-4)
Alternative 1 extends Runway 11-29 approximately 1,782 feet to the northwest, and maintains the existing threshold location of Runway 29. Parallel Taxiway A would be extended to the new Runway 11 threshold, approximately 1,743 feet to the northwest, and to the existing Runway 29 threshold, approximately 482 feet to the southeast. The taxiway extensions should include holding bays at each runway end.

In order to fully encompass the Runway Object Free Area within airport property, fee acquisition of approximately 8.2 acres of land would be required to the northwest of the present airport property line. An easement (or fee acquisition) of an additional 12.6 acres would be required to fully encompass the Runway 11 RPZ extension to the northwest.

This concept would require relocation of the Access Road approximately 120 feet to the southeast to clear the Runway 29 RPZ. Approximately 3.3 acres of fee land acquisition would be required for the Access Road right-of-way. The Access Road realignment would require approximately 1,800 feet of new roadway construction.

Runway Extension Alternative 2 (Figure 6-5)
Alternative 2 extends Runway 11-29 approximately 1,386 feet to the northwest, and approximately 400 feet to the southeast, relocating the existing threshold of Runway 29. Parallel Taxiway A would be extended to the new Runway 11 threshold, approximately 1,343 feet to the northwest, and to the existing Runway 29 threshold, approximately 884 feet to the southeast. The taxiway extensions should include holding bays at each runway end.

The ultimate Runway Object Free Area for the northwest extension would be fully encompassed within the present airport property. This alternative would require acquisition of a 12.5 acre easement (or fee acquisition) to fully encompass the Runway 11 RPZ extension to the northwest.

This concept would require relocation of the Access Road approximately 520 feet to the southeast to clear the new Runway 29 RPZ. Approximately 15.2 acres of fee land acquisition would be required for this. The Access Road realignment would require approximately 2,500 feet of new roadway construction.

Because of the extension to the southeast, the existing drainage channel would be within the Runway 29 extended Runway Safety Area (RSA). In order to comply with RSA design standards, this alternative would require construction of a major drainage structure or culverts as well as relocation/realignment of the existing drainage channel.

Runway Extension Alternative 3 (Figure 6-6)

Alternative 3 extends Runway 11-29 approximately 1,917 feet to the northwest, and relocates the existing threshold location of Runway 29 approximately 117 feet to the northwest, to allow the Access Road to remain in its present location. Parallel Taxiway A would be extended to the new Runway 11 threshold, approximately 1,860 feet to the northwest, and to the relocated Runway 29 threshold, approximately 366 feet to the southeast. The taxiway extensions should include holding bays at each runway end.

In order to fully encompass the Runway Object Free Area within airport property, fee acquisition of approximately 10.7 acres of land would be required to the northwest of the present airport property line. An easement (or fee acquisition) of an additional 12.6 acres would be required to fully encompass the Runway 11 RPZ extension to the northwest.

Evaluation of Runway Extension Alternatives

The three alternative layouts will be evaluated in terms of the following parameters:

- Best use of land
- Ease of sequential development (potential runway extension phasing)
- Development cost
- Operational constraints
- Potential environmental impacts

The three alternative layouts were ranked comparatively according to each of these parameters. In each case, the most desirable component was assigned the highest number of points (3) and the least desirable was assigned the lowest value (1 point). If the components are equal, each was assigned 1 point. The final selected alternative will theoretically consist of a composite of the highest rated development areas.

A description of the analysis of alternatives follows. The rankings are summarized at the end of this narrative in **Table 6e**.

Best Use of Land

The recommended runway extension constitutes aviation use and thus should be considered to be the "best use" of airport land or, to a lesser degree, the best use of land adjacent to the airport. However, because of the surrounding terrain the San Manuel Airport is a somewhat constrained site. This would suggest that the use of less land area to achieve the same goals would be a better use of <u>available</u> developable land. For the purposes of this evaluation, the total area of new land acquisition required for the runway extension was used to compare the alternatives.

The following (**Table 6c**) is a tabulation of the approximate new minimum land acquisitions that would be required to construct each of the runway extension alternative concepts. The tabulation includes fee acquisition of land for the Access Road relocation at the southeast end of the airport property, plus fee acquisitions and easements required for the extension of the runway to the northwest.

Table 6c: REQUIRED LAND ACQUISITIONS – RUNWAY EXTENSION ALTERNATIVES
San Manuel Airport – San Manuel, Arizona

ALTERNATIVE	Access Road Fee Acquisition (Acres)	Runway Extension Fee Acquisition (Acres)	Runway Extension Easement (Acres)	TOTAL LAND REQUIRED (Acres)	Ranking
1	3.3	8.2	12.6	**24.1**	2
2	15.2	- - -	12.5	**27.7**	1
3	- - -	10.7	12.6	**23.3**	**3**

Because of the minimal difference in the amount of land required between the three alternatives, this parameter may be considered to be essentially equal between the three. However, the three alternatives have been ranked according to the comparative amounts of total land requirements for the purpose of this evaluation.

Ease of Sequential Development
All three of the alternative layouts will allow phased development of runway extensions, with the option to build to the recommended ultimate length or to a shorter length as predicated by actual demand by larger/faster aircraft in the future. Each alternative would have periods of runway closure during construction. Although Alternative 2 would have a longer construction period because of the greater scope of work (i.e. the channel reconfiguration), the construction phasing and closure times are considered to be insignificant in terms of the long range development impacts. The three alternatives are considered to be equal in terms of this parameter.

Development Cost
Planning level estimates of the approximate costs for development of each of the runway extension alternatives are presented at the end of this chapter, in **Figures 6-14** through **6-16**. The estimates are summarized in **Table 6d** on the following page. The estimates include the cost of land acquisition, design, construction, and construction administration.

Alternative 1 is the least expensive of the three options, at $6.3 million. Primarily because of the need to relocate a portion of the major drainage channel and construct a box culvert to span the extended Runway Safety Area, Alternative 2 is the most expensive at $7.7 million. Alternative 3 is estimated at $6.5 million, approximately $218,400 more expensive than Alternative 1.

Table 6d: ESTIMATED DEVELOPMENT COSTS – RUNWAY EXTENSION ALTERNATIVES
San Manuel Airport – San Manuel, Arizona

ALTERNATIVE	Estimated Development Cost	Rounded Estimated Development Cost	Ranking
1	$ 6,297,089.50	$ 6.3 million	**3**
2	$ 7,663,145.75	$ 7.7 million	1
3	$ 6,515,509.00	$ 6.5 million	2

Operational Constraints

It is assumed that all new development will be undertaken in conformance with FAA design criteria, and that any current operational constraints will be mitigated as part of the future development program. This would suggest that all of the proposed alternatives would be essentially equal in terms of effective operations of the airport. The three alternatives have been ranked equally for this reason.

Potential Environmental Impacts

The airside (runway) components are essentially equal in scope and complexity, and will disturb essentially the same land area with similar potential for impacts to native species, drainage, and wildlife habitat. However, the scope and complexity of the landside components varies significantly between the three alternatives, most notably with regard to Alternative 2 which includes the reconfiguration of the major drainage channel and the longest Access Road reconstruction. Alternative 3 would not require reconfiguration of the Access Road at all, and neither Alternative 1 nor 3 would require modification of the drainage channel. For these reasons, Alternative 3 was ranked the highest of the three options, followed by Alternative 1.

Runway Extension - Selected Alternative

A summary of the comparative ratings is presented in **Table 6e** on the following page. Based on the ratings, the preferable development option is Alternative 1. The following chapters of this document will be based on this selection.

Table 6e: RUNWAY EXTENSION LAYOUTS EVALUATION MATRIX
San Manuel Airport – San Manuel, Arizona

	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
Best Use of Land	2	1	**3**
Ease of Sequential Development	1	1	1
Development Cost	**3**	2	1
Operational Constraints	**3**	2	1
Potential Environmental Impacts	2	1	**3**
TOTALS	**11**	**7**	**9**

The recommended alternative for the Runway Extension program is Alternative 1.

Pavement Types – Alternatives Analysis of Long Term Costs

Typically, for small General Aviation airfields, the pavement of choice is an Asphaltic Concrete section (AC Pavement). This type of pavement is economical to initially construct, and funding for improvements at smaller airports is usually quite limited. However, AC Pavement demands a regular schedule of maintenance in order to reach its planned useful life. The cost of pavement maintenance can be significant. For most airport owners, it is important to note that while the FAA and the State of Arizona will participate in the construction of pavement, they will not typically participate in the ongoing costs of pavement maintenance.

Larger Air Carrier airports will typically utilize Portland Cement Concrete Pavement (PCCP) in order to minimize ongoing maintenance costs and to gain an extended useful life of the airfield pavement PCCP pavement can last over 50 years with normal joint maintenance as opposed to AC Pavement's usual useful life of no more than 20 years (requiring a significantly greater amount of ongoing maintenance).

In order to form a basis for future decision making when considering the construction of new paved facilities at San Manuel Airport, an analysis of the life cycle costs for a typical 5,000 square yard paved area was performed. Costs were included over a 20 and 40 year cycle for both AC Pavement and PCCP. The assumed pavement section for AC Pavement was 4" of AC over 6" of Aggregate Base Course over prepared subgrade. For PCCP, the assumed section was 6" of PCCP over 6" of Aggregate Base Course over prepared subgrade. Only the variable item, the AC or PCCP is included in the cost estimates since the base course and subgrade would be constant with either of the pavement methods.

The results of the analysis are illustrated in **Figure 6-19** at the end of this chapter. The analysis considered the initial construction costs and regular maintenance costs, including joint maintenance for PCCP and a regular schedule of seal coating and crack sealing for AC Pavement. The initial analysis spans the typical 20 year life cycle that can be assumed for AC Pavement, but was expanded to show the second twenty year cycle. It was assumed that at year 20 the AC Pavement would need to be reconstructed, but that the PCCP section would be only approaching the midpoint of its useful life.

In summary, it can be seen that the cost over time can be significantly greater for the AC Pavement when compared to PCCP. For the assumed 5,000 square yard pavement area, the following relationships were found:

Initial construction cost:	AC Pavement....... $ 220,000	
	PCCP................... $ 400,000	(82% more than AC Pavement)
Total cost over 20 years:	AC Pavement........ $666,250	
	PCCP................... $ 464,000	(30% less than AC Pavement)
Total cost over 40 years:	AC Pavement.... $ 1,332,500	
	PCCP................... $ 728,000	(45% less than AC Pavement)

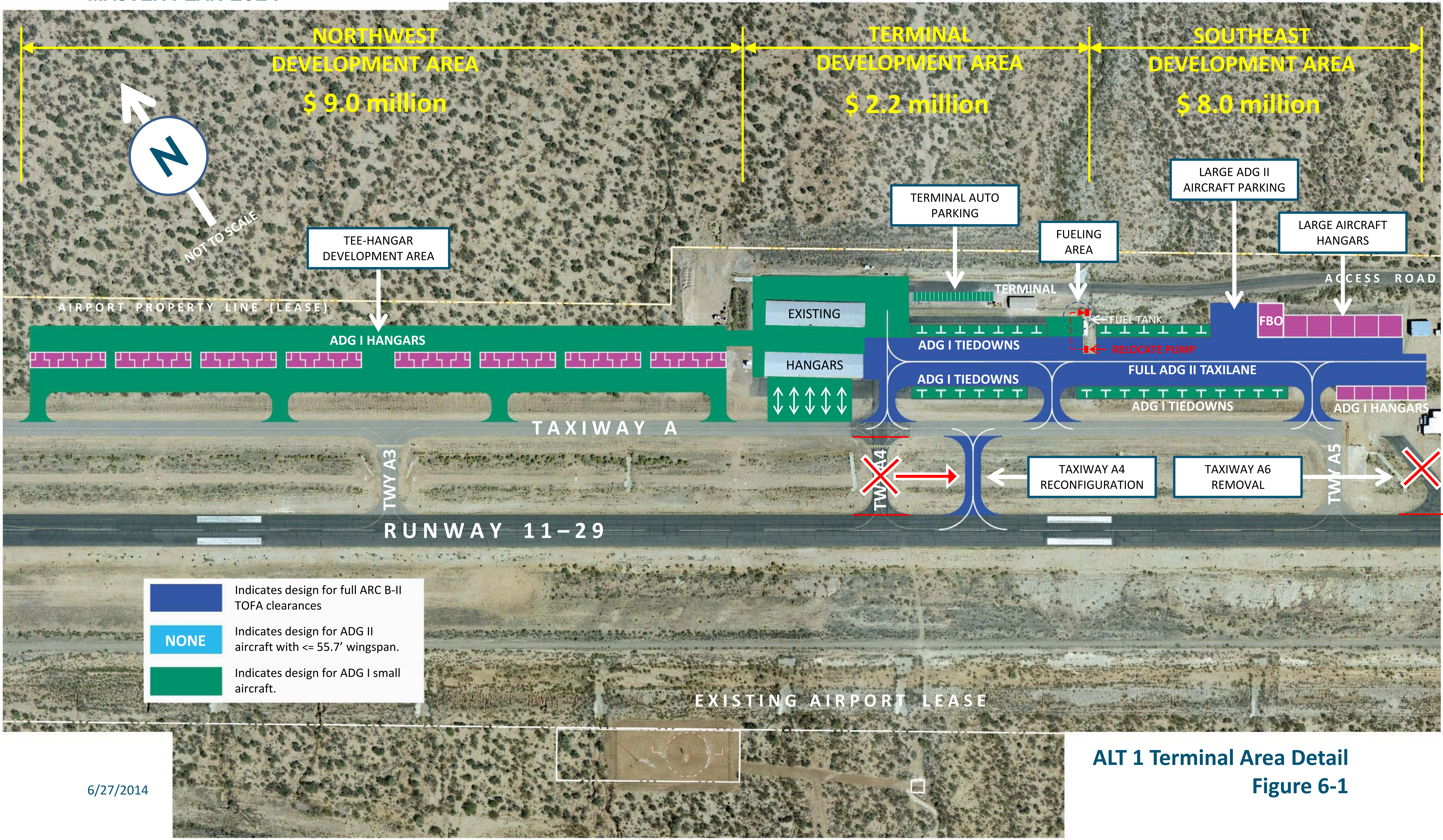
Figure 6-19 also includes approximate costs per square yard over the 20 and 40 year life cycles of the two pavement types. These can be applied to develop planning level estimates for the various pavement improvements that are included in the development schedule of this Master Plan.

Because of funding limitations at the time of project implementation, it may be realistic to identify specific limited areas for the use of PCCP sections. The use of PCCP may be considered where heavier, parked aircraft would be more frequent at the airport (i.e. fueling area, tie-downs, etc.). This would provide some savings in future maintenance costs while remaining within constrained budgets for initial construction of improvements.

Given the data presented in **Figure 6-19** and summarized above, consideration should be given to the installation of PCCP where applicable on a project-by-project basis throughout the planning period of this Master Plan.

Chapter References

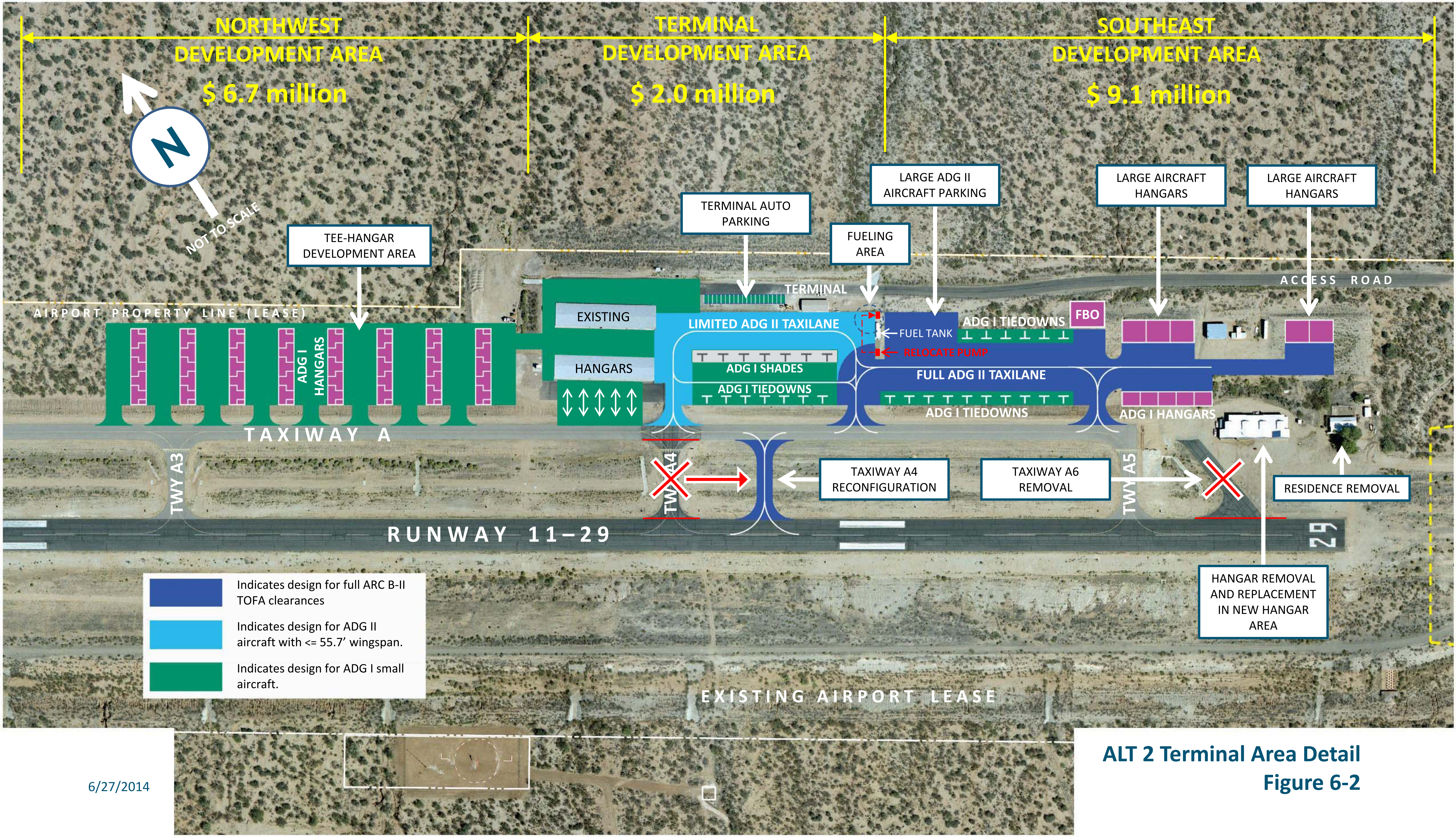
[1] The Economic Impact of Aviation in Arizona - 2012, Elliott D. Pollack & Company, May, 2013 for Arizona Department of Transportation Multimodal Planning Division.
[2] Erect-a-Tube, Inc., http://www.erect-a-tube.com , June, 2014.



6/27/2014

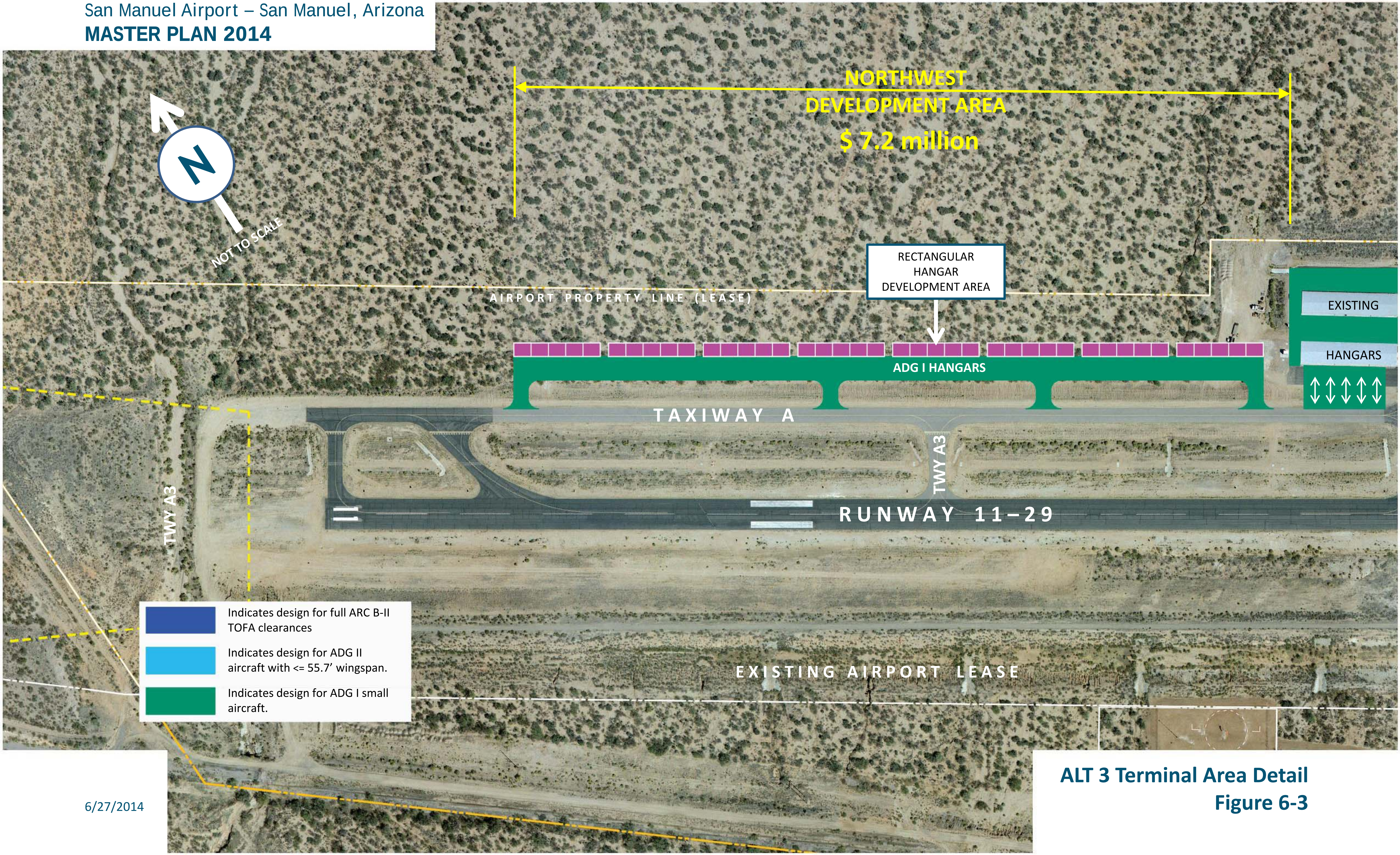
ALT 1 Terminal Area Detail
Figure 6-1

San Manuel Airport – San Manuel, Arizona
MASTER PLAN 2014



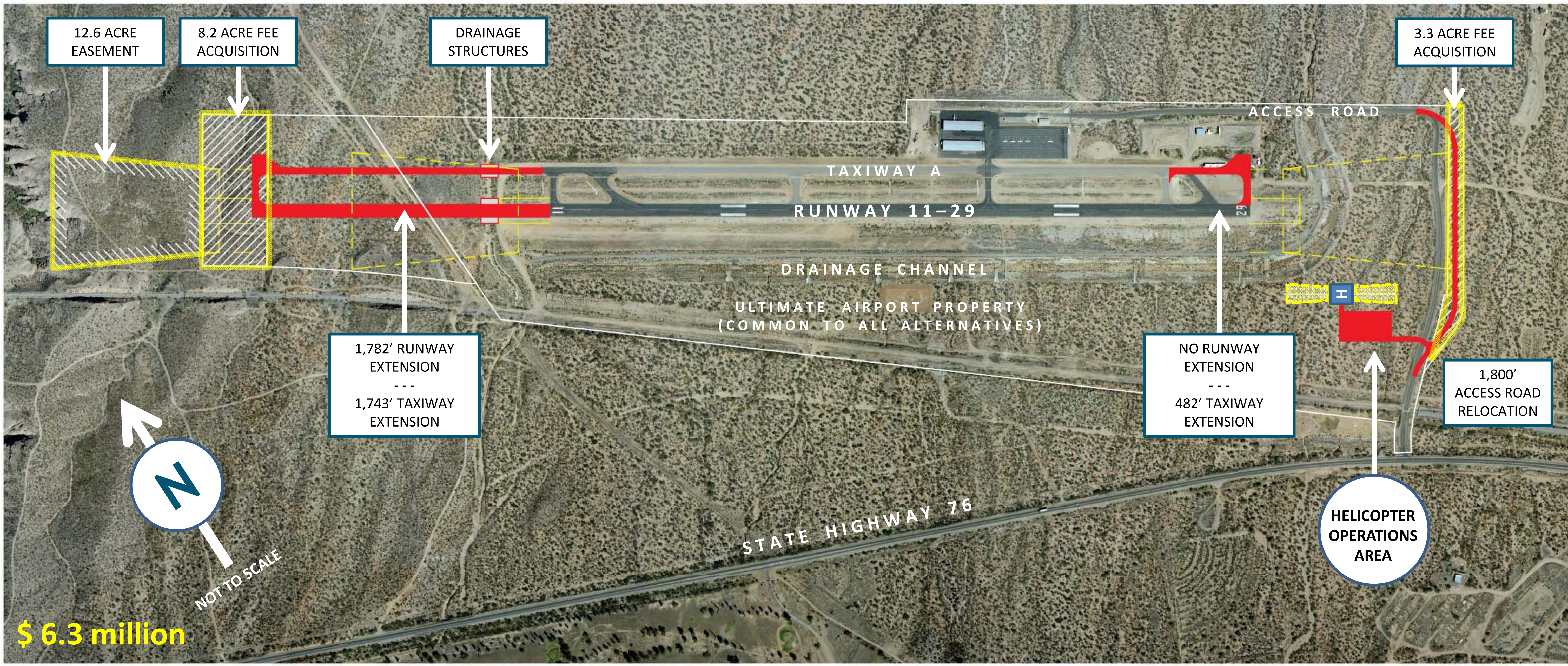
6/27/2014

ALT 2 Terminal Area Detail
Figure 6-2



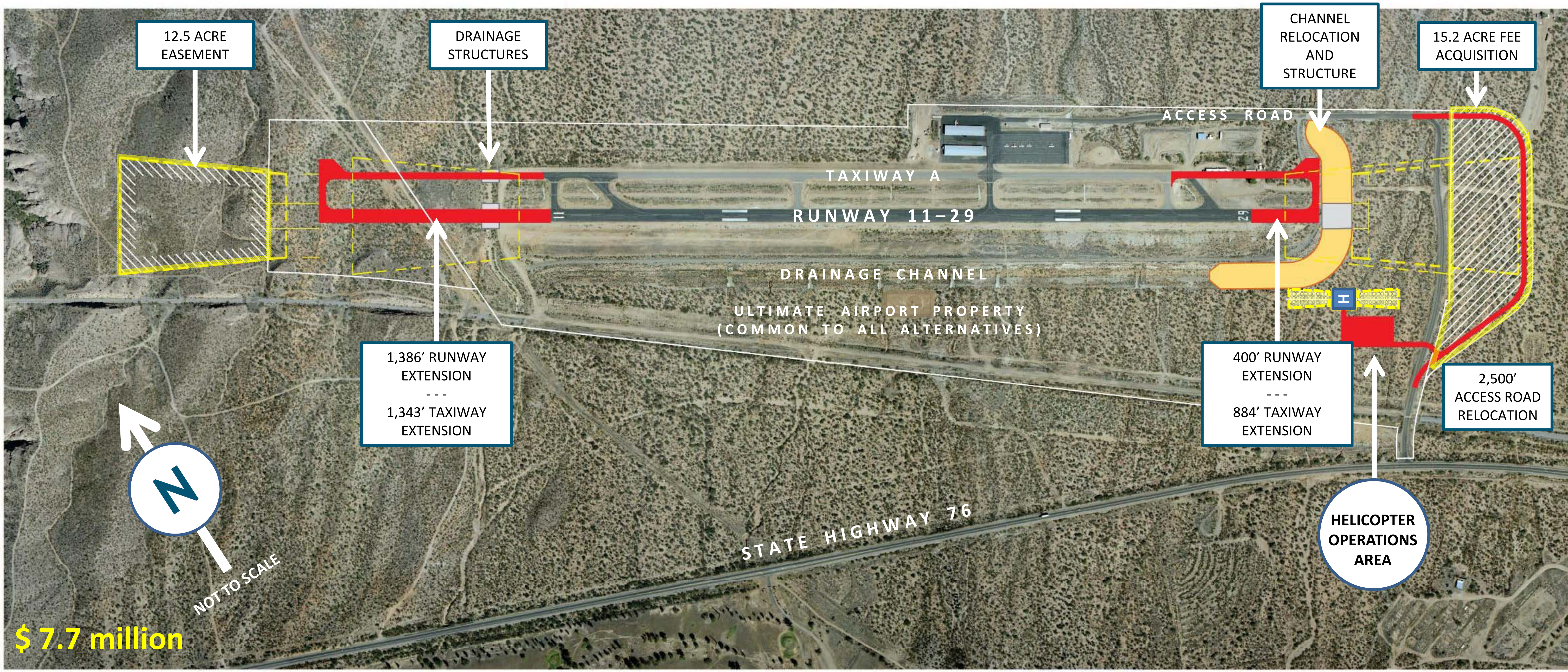
6/27/2014

ALT 3 Terminal Area Detail
Figure 6-3



SELECTED ALTERNATIVE

Runway Extension ALT 1
Figure 6-4



Runway Extension ALT 2
Figure 6-5

Runway Extension ALT 3
Figure 6-6

San Manuel Master Plan - Northwest Development Area Alt No. 1

LINE No.	ITEM No.	DESCRIPTION	APPROX. QTY.	UNIT	UNIT PRICE	AMOUNT
		CIVIL				
1	P-100	Mobilization	1	LS	$320,000.00	$320,000.00
2	P-101	Contractor's Quality Control	1	LS	$160,000.00	$160,000.00
3	P-152	Excavation	10	CY	$20.00	$200.00
4	P-152	Local Borrow	153,000	CY	$20.00	$3,060,000.00
5	P-152	Subgrade Prep (8.5-Inch Depth)	29,381	SY	$5.00	$146,905.00
6	P-201	Crushed Aggregate Base Course (6-inch Depth)	23,717	SY	$12.00	$284,604.00
7	P-403	Bituminous Base Course (4-inch depth 3/4" Mix)	23,717	SY	$22.00	$521,774.00
8	D-751/752	Drainage	1	LS	$300,000.00	$300,000.00
9	L-100	Electrical	1	LS	$300,000.00	$300,000.00
10	SP 80	Hangars	8	LS	$116,000.00	$928,000.00
					Construction Subtotal	$6,021,483.00
					15% Contingency	$903,222.45
					10.0% CA&O Fee	$692,470.55
					5% City Construction Administration Fee	$346,235.27
					CONSTRUCTION TOTAL	**$7,963,411.27**
					5% City Design Administration Fee	$346,235.27
					10.0% Design Fee	$692,470.55
					PROJECT TOTAL	**$9,002,117.09**

Dibble Engineering

$ 9.0 million

Cost Estimate
Northwest Development Area ALT 1
Figure 6-7

San Manuel Master Plan - Northwest Development Area Alt No. 2						
LINE No.	ITEM No.	DESCRIPTION	APPROX. QTY.	UNIT	UNIT PRICE	AMOUNT
		CIVIL				
1	P-100	Mobilization	1	LS	$240,000.00	$240,000.00
2	P-101	Contractor's Quality Control	1	LS	$120,000.00	$120,000.00
3	P-152	Excavation	15	CY	$20.00	$300.00
4	P-152	Local Borrow	108,500	CY	$20.00	$2,170,000.00
5	P-152	Subgrade Prep (8.5-Inch Depth)	16,123	SY	$5.00	$80,615.00
6	P-201	Crushed Aggregate Base Course (6-inch Depth)	10,459	SY	$12.00	$125,508.00
7	P-403	Bituminous Base Course (4-inch depth 3/4" Mix)	10,459	SY	$22.00	$230,098.00
8	D-751/752	Drainage	1	LS	$300,000.00	$300,000.00
9	L-100	Electrical	1	LS	$300,000.00	$300,000.00
10	SP 80	Hangars	8	LS	$116,000.00	$928,000.00
					Construction Subtotal	$4,494,521.00
					15% Contingency	$674,178.15
					10.0% CA&O Fee	$516,869.92
					5% City Construction Administration Fee	$258,434.96
					CONSTRUCTION TOTAL	**$5,944,004.02**
					5% City Design Administration Fee	$258,434.96
					10.0% Design Fee	$516,869.92
					PROJECT TOTAL	**$6,719,308.90**

Dibble Engineering

$ 6.7 million

Cost Estimate
Northwest Development Area ALT 2
Figure 6-8

San Manuel Master Plan - Northwest Development Area Alt No. 3						
LINE No.	ITEM No.	DESCRIPTION	APPROX. QTY.	UNIT	UNIT PRICE	AMOUNT
CIVIL						
1	P-100	Mobilization	1	LS	$255,000.00	$255,000.00
2	P-101	Contractor's Quality Control	1	LS	$127,500.00	$127,500.00
3	P-152	Excavation	20	CY	$20.00	$400.00
4	P-152	Local Borrow	115,000	CY	$20.00	$2,300,000.00
5	P-152	Subgrade Prep (8.5-Inch Depth)	18,984	SY	$5.00	$94,920.00
6	P-201	Crushed Aggregate Base Course (6-inch Depth)	12,825	SY	$12.00	$153,900.00
7	P-403	Bituminous Base Course (4-inch depth 3/4" Mix)	12,825	SY	$22.00	$282,150.00
8	D-751/752	Drainage	1	LS	$300,000.00	$300,000.00
9	L-100	Electrical	1	LS	$300,000.00	$300,000.00
10	SP 80	Hangars	8	LS	$125,000.00	$1,000,000.00
					Construction Subtotal	$4,813,870.00
					15% Contingency	$722,080.50
					10.0% CA&O Fee	$553,595.05
					5% City Construction Administration Fee	$276,797.53
					CONSTRUCTION TOTAL	**$6,366,343.08**
					5% City Design Administration Fee	$276,797.53
					10.0% Design Fee	$553,595.05
					PROJECT TOTAL	**$7,196,735.65**

Dibble Engineering

$ 7.2 million

Cost Estimate
Northwest Development Area ALT 3
Figure 6-9

San Manuel Master Plan - Terminal Development Area Alt No. 1

LINE No.	ITEM No.	DESCRIPTION	APPROX. QTY.	UNIT	UNIT PRICE	AMOUNT
		CIVIL				
1	P-100	Mobilization	1	LS	$80,000.00	$80,000.00
2	P-101	Contractor's Quality Control	1	LS	$40,000.00	$40,000.00
3	P-104	Pavement Removals	958	SY	$2.50	$2,395.00
4	P-151	Existing Shade Port Structure Removal	1	LS	$15,000.00	$15,000.00
5	P-152	Excavation	3,500	CY	$20.00	$70,000.00
6	P-152	Subgrade Prep (8.5-Inch Depth)	4,500	SY	$5.00	$22,500.00
7	P-201	Crushed Aggregate Base Course (6-inch Depth)	4,500	SY	$12.00	$54,000.00
8	P-403	Bituminous Base Course (4-inch depth 3/4" Mix)	4,500	SY	$22.00	$99,000.00
9	P-602	Airfield Pavement Markings & Tie-Downs	1	LS	$20,000.00	$20,000.00
10	D-751/752	Drainage	1	LS	$50,000.00	$50,000.00
11	SP 80	Fuel Pump Relocation	1	LS	$150,000.00	$150,000.00
12	SP 80	2015 Terminal Area Anticipated Improvements	1	LS	$765,000.00	$765,000.00
13	L-100	Electrical	1	LS	$120,000.00	$120,000.00
					Construction Subtotal	$1,487,895.00
					15% Contingency	$223,184.25
					10.0% CA&O Fee	$171,107.93
					5% City Construction Administration Fee	$85,553.96
					CONSTRUCTION TOTAL	**$1,967,741.14**
					5% City Design Administration Fee	$85,553.96
					10.0% Design Fee	$171,107.93
					PROJECT TOTAL	**$2,224,403.03**

Dibble Engineering

$ 2.2 million

Cost Estimate
Terminal Development Area ALT 1
Figure 6-10

06/27/2014

San Manuel Master Plan - Terminal Development Area Alt No. 2						
LINE No.	ITEM No.	DESCRIPTION	APPROX. QTY.	UNIT	UNIT PRICE	AMOUNT
		CIVIL				
1	P-100	Mobilization	1	LS	$71,000.00	$71,000.00
2	P-101	Contractor's Quality Control	1	LS	$33,000.00	$33,000.00
3	P-104	Pavement Removals	958	SY	$2.50	$2,395.00
4	P-152	Excavation	3,500	CY	$20.00	$70,000.00
5	P-152	Subgrade Prep (8.5-Inch Depth)	4,500	SY	$5.00	$22,500.00
6	P-201	Crushed Aggregate Base Course (6-inch Depth)	4,500	SY	$12.00	$54,000.00
7	P-403	Bituminous Base Course (4-inch depth 3/4" Mix)	4,500	SY	$22.00	$99,000.00
8	P-602	Airfield Pavement Markings & Tie-Downs	1	LS	$5,000.00	$5,000.00
9	D-751/752	Drainage	1	LS	$20,000.00	$20,000.00
10	SP 80	Fuel Pump Relocation	1	LS	$150,000.00	$150,000.00
11	SP 80	2015 Terminal Area Anticipated Improvements	1	LS	$765,000.00	$765,000.00
12	L-100	Electrical	1	LS	$50,000.00	$50,000.00
					Construction Subtotal	$1,341,895.00
					15% Contingency	$201,284.25
					10.0% CA&O Fee	$154,317.93
					5% City Construction Administration Fee	$77,158.96
					CONSTRUCTION TOTAL	**$1,774,656.14**
					5% City Design Administration Fee	$77,158.96
					10.0% Design Fee	$154,317.93
					PROJECT TOTAL	**$2,006,133.03**

Dibble Engineering

$ 2.0 million

Cost Estimate
Terminal Development Area ALT 2
Figure 6-11

06/27/2014

San Manuel Master Plan - Southeast Development Area Alt No. 1

LINE No.	ITEM No.	DESCRIPTION	APPROX. QTY.	UNIT	UNIT PRICE	AMOUNT
		CIVIL				
1	P-100	Mobilization	1	LS	$270,000.00	$270,000.00
2	P-101	Contractor's Quality Control	1	LS	$135,000.00	$135,000.00
3	P-104	Pavement Removals	1,326	SY	$2.50	$3,315.00
4	P-151	Existing Building Removal/Relocation	1	LS	$250,000.00	$250,000.00
5	P-152	Excavation	20	CY	$20.00	$400.00
6	P-152	Local Borrow	71,000	CY	$20.00	$1,420,000.00
7	P-152	Subgrade Prep (8.5-Inch Depth)	16,892	SY	$5.00	$84,460.00
8	P-201	Crushed Aggregate Base Course (6-inch Depth)	13,971	SY	$12.00	$167,652.00
9	P-403	Bituminous Base Course (4-inch depth 3/4" Mix)	13,971	SY	$22.00	$307,362.00
10	P-602	Airfield Pavement Markings & Tie-Downs	1	LS	$20,000.00	$20,000.00
11	D-751/752	Drainage	1	LS	$300,000.00	$300,000.00
12	L-100	Electrical	1	LS	$300,000.00	$300,000.00
13	SP 80	FBO Building	1	LS	$350,000.00	$350,000.00
14	SP 80	Large Hangars (R52-56, 5 Unit)	5	LS	$225,000.00	$1,125,000.00
15	SP 81	Small Hangars (R33-42, 5 Unit)	5	LS	$125,000.00	$625,000.00
					Construction Subtotal	$5,358,189.00
					15% Contingency	$803,728.35
					10.0% CA&O Fee	$616,191.74
					5% City Construction Administration Fee	$308,095.87
					CONSTRUCTION TOTAL	**$7,086,204.95**
					5% City Design Administration Fee	$308,095.87
					10.0% Design Fee	$616,191.74
					PROJECT TOTAL	**$8,010,492.56**

Dibble Engineering

$ 8.0 million

Cost Estimate
Southeast Development Area ALT 1
Figure 6-12

San Manuel Master Plan - Southeast Development Area Alt No. 2

LINE No.	ITEM No.	DESCRIPTION	APPROX. QTY.	UNIT	UNIT PRICE	AMOUNT
CIVIL						
1	P-100	Mobilization	1	LS	$320,000.00	$320,000.00
2	P-101	Contractor's Quality Control	1	LS	$160,000.00	$160,000.00
3	P-104	Pavement Removals	1,326	SY	$2.50	$3,315.00
4	P-151	Existing Building Removal/Relocation	1	LS	$250,000.00	$250,000.00
5	P-152	Excavation	17	CY	$20.00	$340.00
6	P-152	Local Borrow	101,732	CY	$20.00	$2,034,640.00
7	P-152	Subgrade Prep (8.5-Inch Depth)	18,459	SY	$5.00	$92,295.00
8	P-201	Crushed Aggregate Base Course (6-inch Depth)	15,538	SY	$12.00	$186,456.00
9	P-403	Bituminous Base Course (4-inch depth 3/4" Mix)	15,538	SY	$22.00	$341,836.00
10	P-602	Airfield Pavement Markings & Tie-Downs	1	LS	$20,000.00	$20,000.00
11	D-751/752	Drainage	1	LS	$300,000.00	$300,000.00
12	L-100	Electrical	1	LS	$300,000.00	$300,000.00
13	SP 80	FBO Building	1	LS	$350,000.00	$350,000.00
14	SP 80	Large Hangars (R52-56, 5 Unit)	5	LS	$225,000.00	$1,125,000.00
15	SP 81	Small Hangars (R33-42, 5 Unit)	5	LS	$125,000.00	$625,000.00
					Construction Subtotal	$6,108,882.00
					15% Contingency	$916,332.30
					10.0% CA&O Fee	$702,521.43
					5% City Construction Administration Fee	$351,260.72
					CONSTRUCTION TOTAL	**$8,078,996.45**
					5% City Design Administration Fee	$351,260.72
					10.0% Design Fee	$702,521.43
					PROJECT TOTAL	**$9,132,778.59**

Dibble Engineering

$ 9.1 million

Cost Estimate
Southeast Development Area ALT 2
Figure 6-13

RUNWAY ALTERNATE No. 1

LINE No.	ITEM No.	DESCRIPTION	APPROX. QTY.	UNIT	UNIT PRICE	AMOUNT
CIVIL						
1	P-100	Mobilization	1	LS	$155,000.00	$155,000.00
2	P-101	Contractor's Quality Control	1	LS	$77,500.00	$77,500.00
3	P-152	Earthwork (Cut/Fill)	25,000	CY	$20.00	$500,000.00
4	P-152	Local Borrow	95,000	CY	$20.00	$1,900,000.00
5	P-152	Subgrade Prep (8.5-Inch Depth)	34,800	SY	$3.00	$104,400.00
6	P-201	Crushed Aggregate Base Course (State/Local Mix)	5,800	CY	$60.00	$348,000.00
7	P-403	Bituminous Base Course (3" State/Local Mix)	5,900	TON	$90.00	$531,000.00
8	P-602	Airfield Pavement Markings	1	LS	$50,000.00	$50,000.00
9	D-701/751	Drainage	1	LS	$200,000.00	$200,000.00
10	SP 80	Land Acquistion	8.4	AC	$5,500.00	$46,200.00
11	L-100	Electrical	1	LS	$300,000.00	$300,000.00
					Construction Subtotal	$4,212,100.00
					15% Contingency	$631,815.00
					10.0% CA&O Fee	$484,391.50
					5% City Construction Administration Fee	$242,195.75
					CONSTRUCTION TOTAL	**$5,570,502.25**
					5% City Design Administration Fee	$242,195.75
					10.0% Design Fee	$484,391.50
					PROJECT TOTAL	**$6,297,089.50**

Dibble Engineering

$ 6.3 million

Cost Estimate
Runway Extension ALT 1
Figure 6-14

RUNWAY ALTERNATE No. 2

LINE No.	ITEM No.	DESCRIPTION	APPROX. QTY.	UNIT	UNIT PRICE	AMOUNT
CIVIL						
1	P-100	Mobilization	1	LS	$175,000.00	$175,000.00
2	P-101	Contractor's Quality Control	1	LS	$87,500.00	$87,500.00
3	P-152	Earthwork (Cut/Fill)	40,000	CY	$20.00	$800,000.00
4	P-152	Local Borrow	54,000	CY	$20.00	$1,080,000.00
5	P-152	Subgrade Prep (8.5-Inch Depth)	37,300	SY	$3.00	$111,900.00
6	P-201	Crushed Aggregate Base Course (State/Local Mix)	6,300	CY	$60.00	$378,000.00
7	P-403	Bituminous Base Course (3" State/Local Mix)	6,300	TON	$90.00	$567,000.00
8	P-602	Airfield Pavement Markings	1	LS	$50,000.00	$50,000.00
9	D-701/751	Drainage	1	LS	$300,000.00	$300,000.00
10	D-701/751	Channel Relocation	1	LS	$1,200,000.00	$1,200,000.00
11	SP 80	Land Acquistion	13.9	LS	$5,500.00	$76,450.00
12	L-100	Electrical	1	LS	$300,000.00	$300,000.00
					Construction Subtotal	$5,125,850.00
					15% Contingency	$768,877.50
					10.0% CA&O Fee	$589,472.75
					5% City Construction Administration Fee	$294,736.38
					CONSTRUCTION TOTAL	**$6,778,936.63**
					5% City Design Administration Fee	$294,736.38
					10.0% Design Fee	$589,472.75
					PROJECT TOTAL	**$7,663,145.75**

Dibble Engineering

$ 7.7 million

Cost Estimate
Runway Extension ALT 2
Figure 6-15

06/27/2014

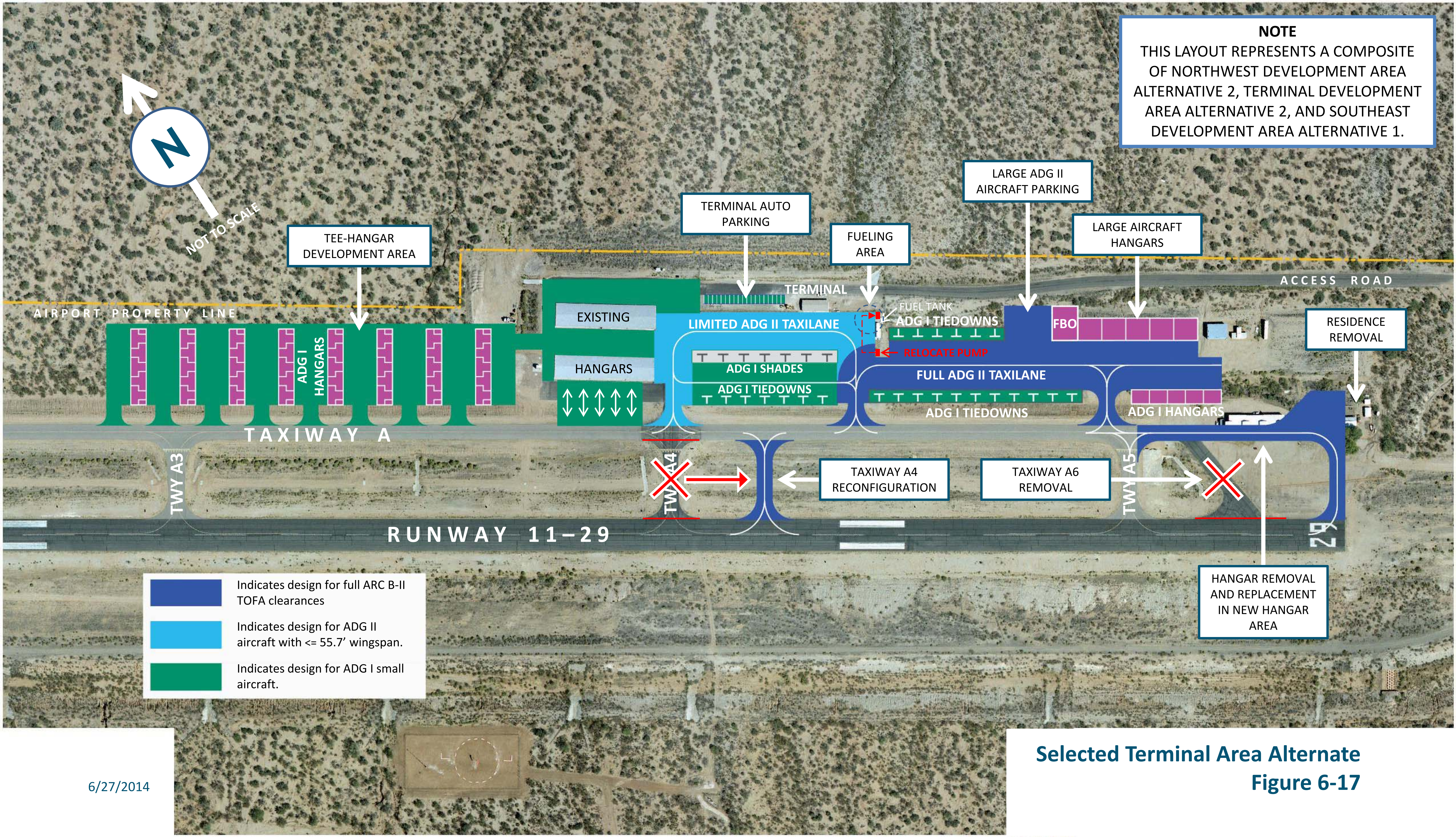
RUNWAY ALTERNATE No. 3

LINE No.	ITEM No.	DESCRIPTION	APPROX. QTY.	UNIT	UNIT PRICE	AMOUNT
		CIVIL				
1	P-100	Mobilization	1	LS	$180,000.00	$180,000.00
2	P-101	Contractor's Quality Control	1	LS	$90,000.00	$90,000.00
3	P-152	Earthwork (Cut/Fill)	94,000	CY	$20.00	$1,880,000.00
4	P-152	Local Borrow	40,000	CY	$20.00	$800,000.00
5	P-152	Subgrade Prep (8.5-Inch Depth)	31,600	SY	$3.00	$94,800.00
6	P-201	Crushed Aggregate Base Course (State/Local Mix)	5,300	CY	$60.00	$318,000.00
7	P-403	Bituminous Base Course (3" State/Local Mix)	5,400	TON	$90.00	$486,000.00
8	P-602	Airfield Pavement Markings	1	LS	$50,000.00	$50,000.00
9	D-701/751	Drainage	1	LS	$100,000.00	$100,000.00
10	SP 80	Land Acquistion	10.8	LS	$5,500.00	$59,400.00
11	L-100	Electrical	1	LS	$300,000.00	$300,000.00
				Construction Subtotal		$4,358,200.00
				15% Contingency		$653,730.00
				10.0% CA&O Fee		$501,193.00
				5% City Construction Administration Fee		$250,596.50
				CONSTRUCTION TOTAL		**$5,763,719.50**
				5% City Design Administration Fee		$250,596.50
				10.0% Design Fee		$501,193.00
				PROJECT TOTAL		**$6,515,509.00**

Dibble Engineering

$ 6.5 million

Cost Estimate
Runway Extension ALT 3
Figure 6-16



Selected Terminal Area Alternate
Figure 6-17

San Manuel Master Plan - Selected Terminal Area Alternate						
LINE No.	ITEM No.	DESCRIPTION	APPROX. QTY.	UNIT	UNIT PRICE	AMOUNT
		CIVIL				
1	P-100	Mobilization	1	LS	$581,000.00	$581,000.00
2	P-101	Contractor's Quality Control	1	LS	$288,000.00	$288,000.00
3	P-104	Pavement Removals	2,284	SY	$2.50	$5,710.00
4	P-151	Existing Building Removal/Relocation	1	LS	$250,000.00	$250,000.00
5	P-152	Excavation	3,535	CY	$20.00	$70,700.00
6	P-152	Local Borrow	179,500	CY	$20.00	$3,590,000.00
7	P-152	Subgrade Prep (8.5-Inch Depth)	37,515	SY	$5.00	$187,575.00
8	P-201	Crushed Aggregate Base Course (6-inch Depth)	28,930	SY	$12.00	$347,160.00
9	P-403	Bituminous Base Course (4-inch depth 3/4" Mix)	28,930	SY	$22.00	$636,460.00
10	P-602	Airfield Pavement Markings & Tie-Downs	1	LS	$25,000.00	$25,000.00
11	D-751/752	Drainage	1	LS	$620,000.00	$620,000.00
12	L-100	Electrical	1	LS	$650,000.00	$650,000.00
13	SP 80	Fuel Pump Relocation	1	LS	$150,000.00	$150,000.00
14	SP 80	2015 Terminal Area Anticipated Improvements	1	LS	$765,000.00	$765,000.00
15	SP 80	FBO Building	1	LS	$350,000.00	$350,000.00
16	SP 80	Large Hangars (R52-56, 5 Unit)	5	LS	$225,000.00	$1,125,000.00
17	SP 81	Small Hangars (R33-42, 5 Unit)	5	LS	$125,000.00	$625,000.00
18	SP 80	Nested Hangars	8	LS	$116,000.00	$928,000.00
					Construction Subtotal	$11,194,605.00
					15% Contingency	$1,679,190.75
					10.0% CA&O Fee	$1,287,379.58
					5% City Construction Administration Fee	$643,689.79
					CONSTRUCTION TOTAL	**$14,804,865.11**
					5% City Design Administration Fee	$643,689.79
					10.0% Design Fee	$1,287,379.58
					PROJECT TOTAL	**$16,735,934.48**

Dibble Engineering

$ 16.7 million

Cost Estimate
Selected Terminal Area Alternative
Figure 6-18

06/30/2014

	PAVEMENT MAINTENANCE MILESTONES OVER 20 YEAR PAVEMENT LIFE CYCLE (COST PER 5,000 SY OF PAVEMENT)								
	3 YEARS	5 YEARS	7 YEARS	9 YEARS	11 YEARS	13 YEARS	15 YEARS	17 YEARS	20 YEARS
Asphalt Concrete	$12,500	$25,625	$15,000	$61,500	$17,500	$107,625	$20,000	$164,000	$22,500
Portland Cement Concrete	$0	$0	$41,000	$0	$0	$0	$123,000	$0	$0

LEGEND

Green	SEAL COAT
Blue	CRACK SEAL & SEAL COAT
Peach	PCCP CRACK & SPALL REPAIR

	PAVEMENT MAINTENANCE TOTAL COST OVER 20 YEARS (PER 5,000 SY)
Asphalt Concrete	$446,250
Portland Cement Concrete	$164,000

	ORIGINAL COST (PER 5,000 SY)	TOTAL COST OVER 20 YEARS (PER 5,000 SY)	TOTAL COST OVER 40 YEARS* (PER 5,000 SY)
Asphalt Concrete	$220,000	$666,250	$1,332,500
Portland Cement Concrete	$400,000	$564,000	$728,000

*assumes replacement of AC pavement at 21 years

	PAVEMENT MAINTENANCE MILESTONES OVER 20 YEAR PAVEMENT LIFE CYCLE (APPROXIMATE COST PER SQUARE YARD OF PAVEMENT)								
	3 YEARS	5 YEARS	7 YEARS	9 YEARS	11 YEARS	13 YEARS	15 YEARS	17 YEARS	20 YEARS
Asphalt Concrete	$3	$5	$3	$12	$4	$22	$4	$33	$5
Portland Cement Concrete	$0	$0	$8	$0	$0	$0	$25	$0	$0

	PAVEMENT MAINTENANCE TOTAL COST OVER 20 YEARS (PER SQUARE YARD)
Asphalt Concrete	$89
Portland Cement Concrete	$33

	ORIGINAL COST (PER SY)	TOTAL COST OVER 20 YEARS (PER SY)	TOTAL COST OVER 40 YEARS* (PER SY)
Asphalt Concrete	$44	$133	$267
Portland Cement Concrete	$80	$113	$146

*assumes replacement of AC pavement at 21 years

NOTE: All figures are in 2014 dollars with no adjustment through the planning period.

Pavement Types – Alternatives Analysis of Long Term Costs
Figure 6-19

7 Land Use

Introduction

Land-use compatibility conflicts are a common problem around many airports. In urban areas, as well as some rural settings, airport owners find that essential expansion to meet the demands of airport traffic is difficult to achieve due to the nearby development of incompatible land uses. The issue of aircraft noise is generally the most apparent perceived environmental impact upon the surrounding community. However, conflicts may also exist in the protection of runway approach and transition zones that ensure the safety of both the flying public and the adjacent property owners. Adequate land for this use should be either acquired in fee specifically for airport use or (as a minimum) controlled by avigation easements. It is the responsibility of the airport owner to assure that reasonable and appropriate action (including the adoption of zoning laws) has been or will be taken to restrict the use of land adjacent to or in the immediate vicinity of the airport to activities and purposes compatible with normal airport operations. Ideally, the airport owner should undertake a land use study with an ultimate objective to create additional land use controls to reduce the potential for impact to future residential and high density population areas. There are several sources of information available for the planning and implementation of land use controls. These include the following:

- Appendix A, Federal Aviation Regulations (FAR), Part 150.
- FAA Advisory Circular 150/5020-1, Noise Control and Compatibility Planning for Airports.
- FAA Advisory Circular 150/5190-4A, A Model Zoning Ordinance to Limit Height of Objects around Airports.

As a minimum, the airport-related ordinances that should be considered for land use control are:

- Height hazard ordinances
- Noise ordinances
- Land use ordinances

At the present time, the area around the airport is not zoned. It is the recommendation of this study that Pinal County implement these ordinances as soon as possible in order to protect the airport from future development constraints caused by the development of incompatible land uses adjacent to, or in the vicinity of, the airport.

Potential Airport Land Use Impacts

In general, land uses adjacent to airports may be considered to be incompatible if one or both of the following two factors exist:

- Normal use of the airport has the potential for negative impacts upon the adjacent land uses; and/or

- Adjacent land uses have the potential for negative impacts upon the normal operation of the airport.

Typically, the airport may impact adjacent land uses by generation of high noise levels or by overflight of high density populations during aircraft landing and departure. Adjacent land uses may impact the airport in a number of ways, including the generation of distracting light emissions, the existence of ponds or refuse facilities that attract bird populations, and construction of objects that constitute obstructions to safe navigation of protected airspace (or the existence of high terrain that impacts the operation of the airport).

Impacts of the Airport on Adjacent Land Uses

Aircraft Noise

A noise impact evaluation is required if the projected activity at the airport is forecast to approach or exceed the FAA's minimum thresholds of 700 annual jet operations or 90,000 annual propeller operations during the planning period. The forecasts prepared in **Chapter 3, Aviation Demand** indicate the potential for jet activity to exceed 700 annual operations by the year 2029. However, in this case a noise study is not recommended at this time because there is no actual jet activity at the present time, even though the forecasts also indicate the potential for 425 annual operations in 2014. So, in theory, jet activity would have to immediately increase significantly in order to reach the FAA's minimum threshold of 700 annual jet operations during the twenty year planning period of this study.

There is little development adjacent to the airport at the present time, and the current level of activity by light piston aircraft should not generate noise levels that would constitute a negative impact to adjacent land.

Impacts to Adjacent Land by Airport Design Standards Requirements

FAA Advisory Circular AC 150/5300-13A, Airport Design, specifies the standards recommended by the FAA for use in the design of civil airports. For projects receiving federal grants, the use of these standards is mandatory. The FAA standards include the identification of minimum separation dimensions between runways, taxiways and other airport facilities, as well as identification of several physical areas that must be cleared of objects or restricted to objects with certain functions. The most critical of these include the following: [1]

- **Building Restriction Line (BRL)** - A Building restriction Line (BRL) is the line indicating where airport buildings must not be located, limiting building proximity to aircraft movement areas. A BRL should be placed on an Airport Layout Plan for identifying suitable building area locations on airports. The BRL should be set beyond the Runway Protection Zones (RPZs), the Obstacle Free Zones (OFZs), the Object Free Areas (OFAs), the Runway Visibility Zone (RVZ), Navigational Aid (NAVAID) critical areas, areas required for TERPS, and ATCT clear Line-Of-Sight (LOS). The location of the BRL is dependent upon the selected allowable structure height. The closer development is allowed to the Aircraft

Operations Area (AOA), the more impact it will have on future expansion capabilities of the airport. [1]

- **Object Free Area (OFA)** – The OFA is centered on the runway center line, is of a specified width depending upon the runway's use category, and extends out into the approach path. In general, the OFA must be clear of above ground objects. Prohibited land uses include agricultural use. [1]

- **Runway Protection Zone (RPZ)** – The RPZ's function is to enhance the protection of people and property on the ground. This is achieved through the exercise of control over the RPZ land area by the airport either through acquisition of property interest or by easement. The RPZ is a trapezoidal area that extends outward, beginning 200 feet from the end of the runway into the approach path. Some land uses within the RPZ are permitted, provided they do not attract wildlife, are outside the OFA, and do not interfere with navigational aids. Prohibited land uses include residences, fuel storage facilities, and places of public assembly. [1]

- **Runway Safety Area (RSA)** - The RSA is centered on the runway center line, is of a specified width depending upon the runway's use category, and extends out into the approach path. The RSA is encompassed within the OFA, but has stricter clearing requirements. The RSA must be graded and drained to assure safe passage and structural support of aircraft that may overshoot or undershoot the runway, and must be capable of supporting rescue and snow removal equipment. The RSA must also be clear of objects, except for objects that are required because of their function as navigational aids or lighting. [1]

The existing airport and its Runway Protection Zones, Object Free Areas, and Runway Safety Areas is contained within the present airport boundary. As such there are no current impacts to adjacent land caused by compliance with FAA design standards (see **Figure 7-2, Ultimate Airport Property**).

The recommended ultimate expansion of the airport to include extension of Runway 11-29 to the northwest will require acquisition of adequate additional land to encompass the new Runway Protection Zones, Object Free Areas, and Runway Safety Areas associated with the longer runway. A description of the recommended airport property acquisition is included in **Figure 7-2, Ultimate Airport Property**.

Impacts of Adjacent Land Uses on the Airport

Impacts by FAR Part 77 Airspace

Federal Air Regulations (FAR), Part 77, Subpart C, Section 77.25 - Civil Airport Imaginary Surfaces defines a set of "imaginary surfaces" that surround an airport. The description of the Part 77 imaginary surfaces from Section 77.25 is reproduced below.

"Sec. 77.25 Civil airport imaginary surfaces.

The following civil airport imaginary surfaces are established with relation to the airport and to each runway. The size of each such imaginary surface is based on the category of each runway according to the type of approach available or planned for that runway. The slope and dimensions of the approach surface applied to each end of a runway are determined by the most precise approach existing or planned for that runway end.

(a) Horizontal surface. A horizontal plane 150 feet above the established airport elevation, the perimeter of which is constructed by swinging arcs of specified radii from the center of each end of the primary surface of each runway of each airport and connecting the adjacent arcs by lines tangent to those arcs. The radius of each arc is:

(1) 5,000 feet for all runways designated as utility or visual;

(2) 10,000 feet for all other runways. The radius of the arc specified for each end of a runway will have the same arithmetical value. That value will be the highest determined for either end of the runway. When a 5,000-foot arc is encompassed by tangents connecting two adjacent 10,000-foot arcs, the 5,000-foot arc shall be disregarded on the construction of the perimeter of the horizontal surface.

(b) Conical surface. A surface extending outward and upward from the periphery of the horizontal surface at a slope of 20 to 1 for a horizontal distance of 4,000 feet.

(c) Primary surface. A surface longitudinally centered on a runway. When the runway has a specially prepared hard surface, the primary surface extends 200 feet beyond each end of that runway; but when the runway has no specially prepared hard surface, or planned hard surface, the primary surface ends at each end of that runway. The elevation of any point on the primary surface is the same as the elevation of the nearest point on the runway centerline. The width of a primary surface is:

(1) 250 feet for utility runways having only visual approaches.

(2) 500 feet for utility runways having nonprecision instrument approaches.

(3) For other than utility runways the width is:

(i) 500 feet for visual runways having only visual approaches.
(ii) 500 feet for nonprecision instrument runways having visibility minimums greater than three-fourths statute mile.
(iii) 1,000 feet for a nonprecision instrument runway having a nonprecision instrument approach with visibility minimums as low as three-fourths of a statute mile, and for precision instrument runways.

The width of the primary surface of a runway will be that width prescribed in this section for the most precise approach existing or planned for either end of that runway.

(d) Approach surface. A surface longitudinally centered on the extended runway centerline and extending outward and upward from each end of the primary surface. An approach surface is applied to each end of each runway based upon the type of approach available or planned for that runway end.

(1) The inner edge of the approach surface is the same width as the primary surface and it expands uniformly to a width of:

(i) 1,250 feet for that end of a utility runway with only visual approaches;
(ii) 1,500 feet for that end of a runway other than a utility runway with only visual approaches;
(iii) 2,000 feet for that end of a utility runway with a nonprecision instrument approach;
(iv) 3,500 feet for that end of a nonprecision instrument runway other than utility, having visibility minimums greater than three-fourths of a statute mile;
(v) 4,000 feet for that end of a nonprecision instrument runway, other than utility, having a nonprecision instrument approach with visibility minimums as low as three-fourths statute mile; and
(vi) 16,000 feet for precision instrument runways.

(2) The approach surface extends for a horizontal distance of:

(i) 5,000 feet at a slope of 20 to 1 for all utility and visual runways;
(ii) 10,000 feet at a slope of 34 to 1 for all nonprecision instrument runways other than utility; and,
(iii) 10,000 feet at a slope of 50 to 1 with an additional 40,000 feet at a slope of 40 to 1 for all precision instrument runways.

(3) The outer width of an approach surface to an end of a runway will be that width prescribed in this subsection for the most precise approach existing or planned for that runway end.

e) Transitional surface. These surfaces extend outward and upward at right angles to the runway centerline and the runway centerline extended at a slope of 7 to 1 from the sides of the primary surface and from the sides of the approach surfaces. Transitional surfaces for those portions of the precision approach surface which project through and beyond the limits of the conical surface, extend a distance of 5,000 feet measured horizontally from the edge of the approach surface and at right angles to the runway centerline.

[Amdt. 77-9, 36 FR 5970, Apr. 1, 1971; 36 FR 6741, Apr. 8, 1971]" [2]

An object that penetrates any of the Part 77 surfaces is defined as an “obstruction to air navigation”. The existence of an obstruction constitutes a potential hazard to the safe arrival and departure of aircraft. [2]

Figure 7-3, Airspace Impacts to Land Use illustrates the FAR Part 77 surfaces that will surround the San Manuel Airport in its ultimate configuration, with the extension of Runway 11-29 to a length of 6,000 feet. An analysis of this airspace was performed as a part of this planning process. The ultimate approach for Runways 11 and 29 is assumed to be a non-precision GPS-based procedure, with implementation to occur concurrent with the upgrade of the airport’s Airport Reference Code (ARC) from B-I to B-II. This is programmed for the year 2020, but will be predicated by actual demand by larger/faster business use aircraft.

There are existing obstructions to air navigation, both on and off the airport property. Significant penetrations of the Horizontal and Conical Surfaces by rising terrain southwest of the airport were identified in the airspace analysis. These penetrations constitute a constraint to full airport utilization because they will most probably affect the approach minimums for future instrument approach procedures. They also constitute a hazard during low visibility daytime visual flight operations, as well as night operations. The remaining obstructions to air navigation that were identified in the airspace analysis are within the ultimate airport property. These will be mitigated by removal or lighting in the future, concurrent with other airfield improvements (see **Chapter 9, Airport Plans** for a depiction and disposition of these objects.

It is recommended that height restrictions within the FAR Part 77 surfaces be incorporated into the City’s zoning ordinance.

Bird Habitat – Riparian Areas

Whenever possible, it is important to protect arriving and departing aircraft from potential hazards caused by bird populations. Bird strikes to an aircraft can cause substantial airframe or propeller damage, potentially rendering the airplane uncontrollable. Ingestion of a bird into a jet engine can cause engine stoppage. Aircraft are the most vulnerable during approach and landing phases of operation, when the aircraft is near to the ground and at a relatively low airspeed.

Naturally occurring or manmade attractions to bird populations can be hazardous to aircraft operations. Seasonal flocks of birds will be attracted to streams, ponds and marshlands, as well as waste disposal facilities and refuse transfer stations, and may also establish migratory patterns between these features.

“The habitat zones found immediately adjacent to streams and lakes are called riparian areas. Riparian areas encompass not only the bed or channel of the water body, but the surrounding banks, bars, ponded waters, and floodplain surfaces. There is a great concentration of vegetation, birds and wildlife in these areas, and because the surrounding Sonoran Desert is so arid, these areas are especially distinct and rare in Pinal County. Some of the larger riparian areas are found along the major creeks and rivers in Pinal County, including …[the] San Pedro River…” [6]

"The San Pedro River's cottonwood-shaded corridor supports about 350 bird species and provides critical stopover habitat for up to four million migrating birds each year." [6]

The San Pedro River is located approximately three miles northeast of the San Manuel Airport property. Because of its distance from the airport, it does not constitute a hazard to aviation activity (and the airport's activity most probably does not significantly impact the habitat). Several major drainage washes and other features also exist in the proximity of the airport. These include the Smelter Wash, located approximately one mile northwest of the airport, as well as large drainage detention areas located approximately 2-2½ miles east of the airport. The desert washes are normally dry except during and after major rainfall events, but do have the potential to attract birds because of the number of trees that grow along the washes. The drainage detention areas collect storm drainage from the washes and overland flow for an extended period of time after storm events and can also attract bird populations.

There are two other existing manmade features that may constitute a potential riparian habitat. The San Manuel Wastewater Treatment Plant and lagoons are located approximately 8,500 feet southeast of the existing landing threshold of Runway 29, along the extended runway centerline. The abandoned smelter lagoons (that retain storm water) are located about 9,200 feet southeast of the Runway 29 threshold. At the present time, with no documented jet aircraft operations and no published instrument approach, these features are not considered to be potential hazards. However, when the airport's activity profile changes, these features will have to be studied further in order to determine their potential affect on the safe operation of the airport.

The features discussed above are illustrated on **Figure 7-3, Airspace Impacts to Land Use** at the end of this chapter.

Bird Habitat – Solid Waste Disposal Facilities
Any solid waste disposal facility (i.e., sanitary landfill, transfer station, etc.) which is located within 5,000 feet of all runways planned to be used by piston-powered aircraft, or within 10,000 feet of all runways planned to be used by turbine-powered aircraft is considered by the FAA to be an incompatible land use because of the potential for conflicts between bird habitat and low-flying aircraft. Any waste disposal facility which is located within a 5 mile radius of any runway end "that attracts or sustains hazardous bird movements from feeding, water or roosting areas into, or across the runways and/or approach and departure patterns of aircraft" is also considered to be incompatible. [3 and 4]

There are no solid waste disposal facilities located within 10,000 feet of the San Manuel Airport runway's ultimate planned configuration. The nearest solid waste disposal site is a landfill located approximately 2 ¼ miles southeast of the airport, along the extended runway centerline. [5] This is illustrated on **Figure 7-3, Airspace Impacts to Land Use** at the end of this chapter.

Recommended On Site Airport Land Use

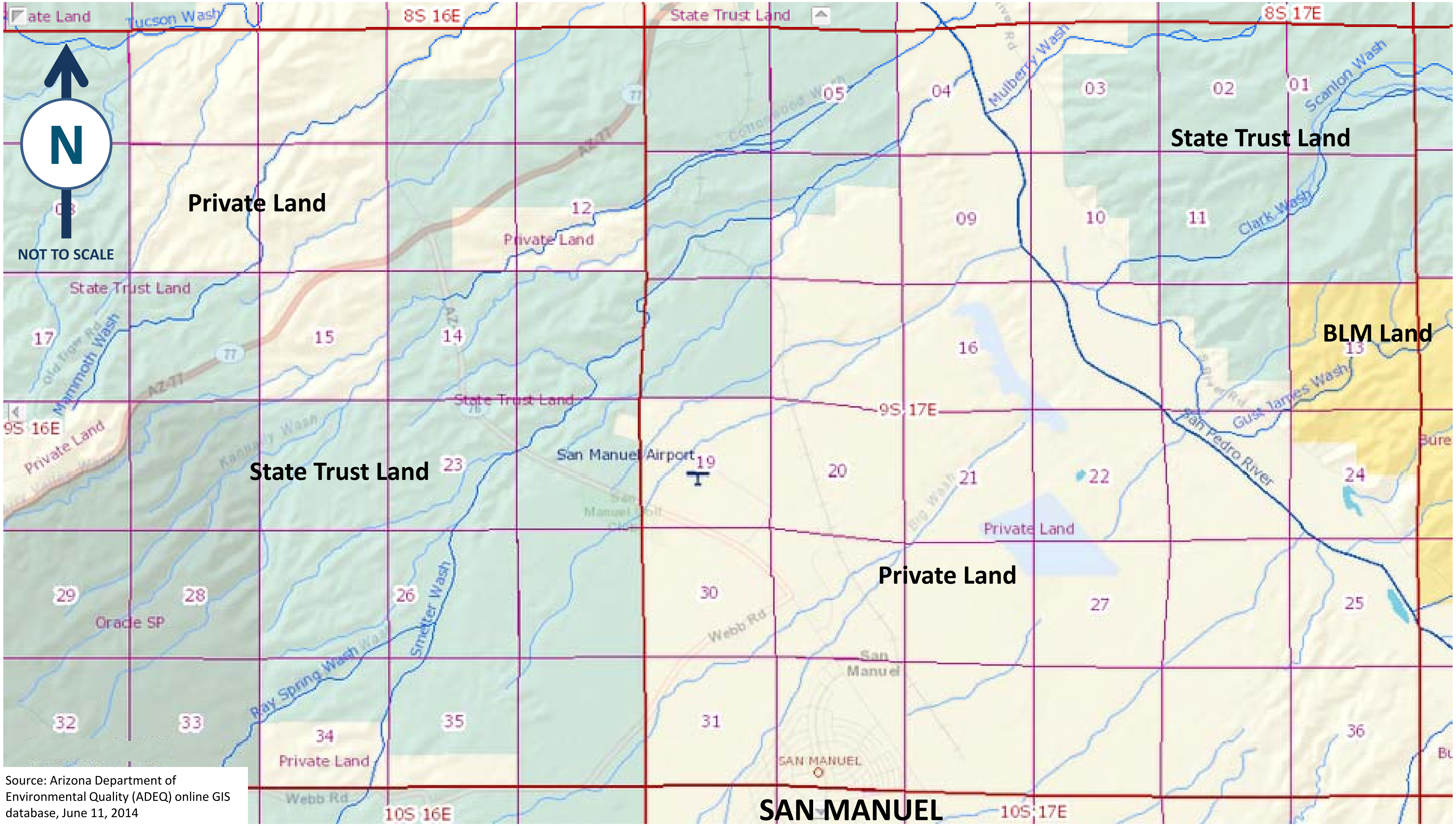
Figure 7-4, Recommended Airport Land Uses illustrates the recommendations for general areas of development within the ultimate airport property. The majority of the airport land is located within the runway and taxiway movement area. This area is restricted to the runway and taxiways, airfield lighting, and navigational aids. It is bounded by the Building Restriction Line (BRL) that is based on the required width of a Taxiway Object Free Area (TOFA) for the existing parallel Taxiway A, along the northeast side of Runway 11-29, as well as consideration of a potential future parallel taxiway along the southwest side of Runway 11-29. No buildings should be allowed within the BRL.

Most of the remaining airport property has been designated as “Airfield Development” area. Development is these areas may consist of the proposed rotorcraft operations area, hangars, parking aprons, airport buildings, vehicular parking, or roadways. Buildings and structures that are developed within these areas are subject to height limitations that are described by the FAR Part 77 Transitional Surfaces. The Transitional Surfaces emanate from the edge of the Primary surface at a slope of 20:1. For reference purposes, the 15’ and 25’ height restriction lines are shown on the drawing. It is important to note that these height restrictions are based on the nearest adjacent runway surface elevation, and not the building height above the ground at the building location.

A strip of land along the north side of the airport Access Road has been designated as “Commercial Development”. This land may be designated for lease to private commercial developers, and is also subject to the height limitations that are described by the FAR Part 77 Transitional Surfaces.

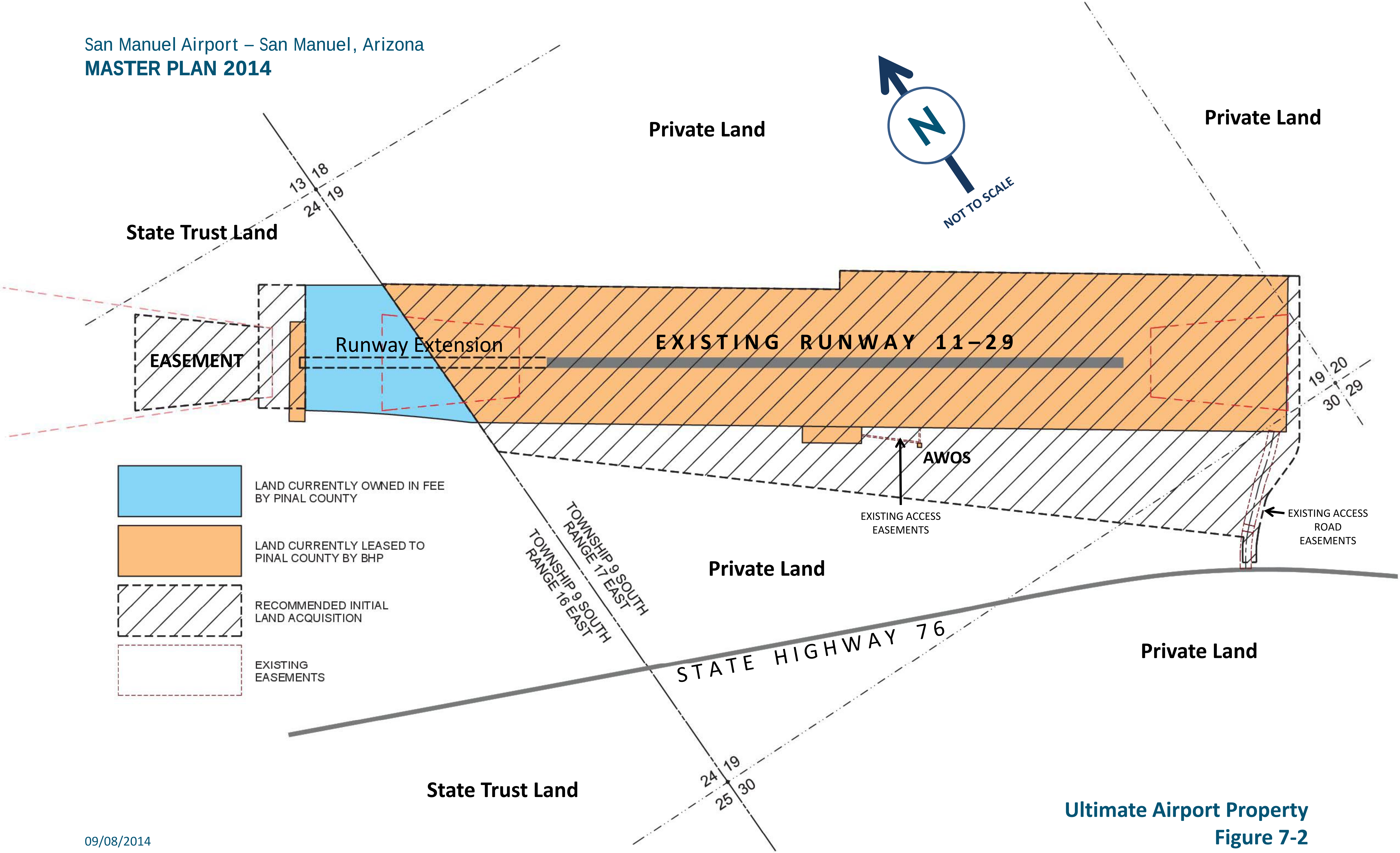
Chapter References

[1] FAA Advisory Circular 150/5300-13A, Airport Design
[2] Federal Air Regulations (FAR), Part 77, Subpart C, Section 77.25 - Civil Airport Imaginary Surfaces
[3] FAA Order 5200.5A, FAA Guidance Concerning Sanitary Landfills On or Near Airports, paragraph 5
[4] 40 CFR Part 257, Criteria for Classification of Solid Waste Disposal Facilities, section 257.3-8
[5] Arizona Department of Environmental Quality (ADEQ) online GIS database, September 4, 2014
[6] Pinal County Comprehensive Plan – January 20, 2014 Update

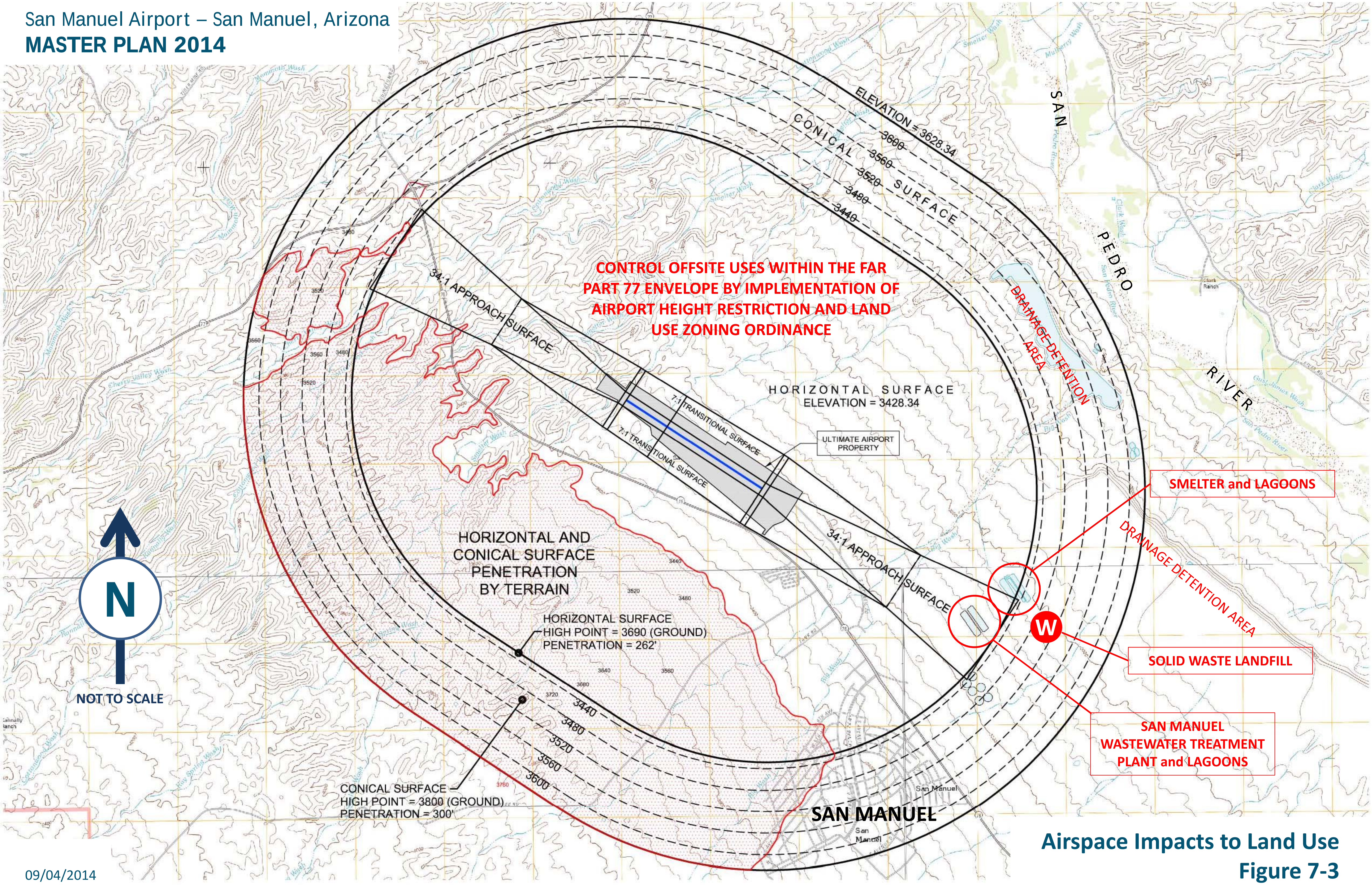


Source: Arizona Department of Environmental Quality (ADEQ) online GIS database, June 11, 2014

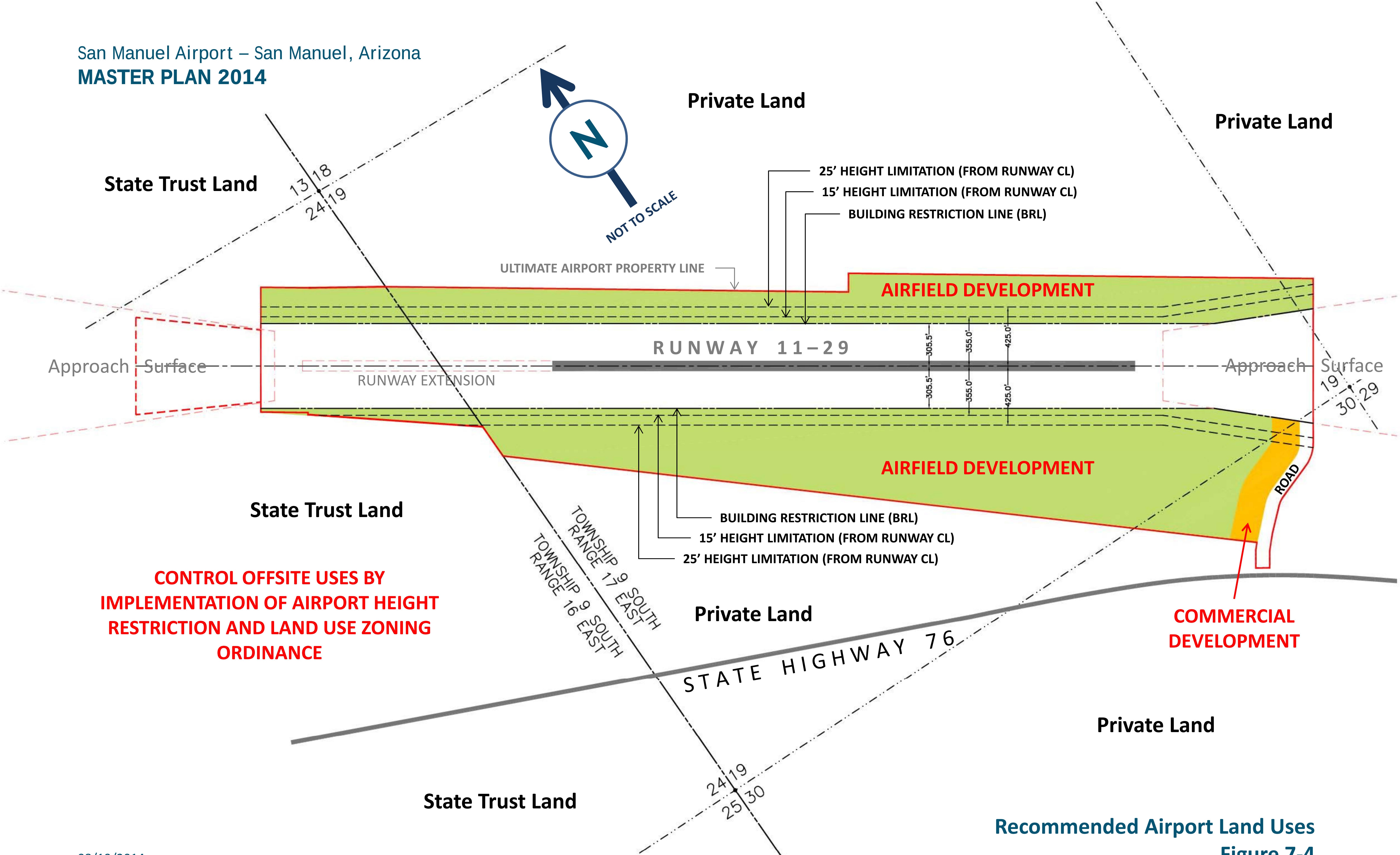
Airport Vicinity Map
Figure 7-1



Ultimate Airport Property
Figure 7-2



Airspace Impacts to Land Use
Figure 7-3



Recommended Airport Land Uses
Figure 7-4

8 Environmental Evaluation

Introduction

This section of the Airport Master Plan is intended to serve as a resource for use during the implementation of future improvement projects. It can serve as a scoping document for the preparation of required environmental documentation for the recommended improvements, and it provides references to governing federal public law and regulations pertaining to each of the areas of potential environmental impact that may be affected by the recommended actions. FAA Order 1050.1E, Environmental Impacts: Policies and Procedures, March 20, 2006 includes summaries of the applicable federal statutes and regulations listed in this chapter.

The National Environmental Policy Act (NEPA) requires that all new airport construction projects be evaluated in terms of possible environmental impacts. Thus, it is important in the master planning process to identify the environmental issues which may need to be addressed prior to the implementation of recommended airport development projects.

Federal actions fall into one of three categories:

- Categorical Exclusions;
- Actions normally requiring an Environmental Assessment (EA); and
- Actions normally requiring an Environmental Impact Statement (EIS).

In general terms, actions categorically excluded are those actions which are found to have no potential for significant environmental impact. The following items would normally be categorically excluded unless extraordinary circumstances are identified by the FAA which would create a requirement for an Environmental Assessment. (“Extraordinary circumstances” include opposition by federal, state or local government agencies, or by a significant number of persons who would be affected by the action, as well as any obvious circumstance which may indicate the potential for environmental impact.)

- Runway reconstruction or repair work where the runway’s alignment, length, capacity and classification are not affected;
- Construction or repair of taxiways, aprons or loading ramps;
- Installation or upgrade of airfield lighting systems, including runway and taxiway edge lighting systems, runway end identifier lights (REIL), visual approach aids (VASI, PAPI), rotating beacons, and electrical distribution systems;
- Installation of miscellaneous items including segmented circles, wind or landing direction indicators, weather stations, and fencing;
- Construction or expansion of buildings and passenger handling facilities, including general aviation arrival/departure building and hangars;
- Construction, relocation or repair of entrance and service roads;
- Obstruction removal on airport property;

- Erosion control actions with no off-airport impacts;
- Landscaping or construction of airport jet blast and/or noise mitigation barriers, as well as projects to carry out noise compatibility programs;
- Land acquisitions and/or relocations associated with any of the above listed items.
- Federal release of airport land, removal of a displaced threshold, airspace determinations, airport planning projects, noise compatibility programs, acquisition of security equipment required under 14 CFR Part 107 or safety equipment required under 14 CFR Part 139, acquisition of snow removal equipment, airport certifications, and preliminary or tentative engineering or design actions are also categorically excluded.

NOTE: All applications for FAA grant participation must be preceded by submittal of Categorical Exclusion (CatEx) documentation.

Actions normally requiring an Environmental Assessment are those which have been found by experience to sometimes have significant environmental impacts. Included actions are:

- Airport location or relocation (construction of a new airport);
- Construction of a new runway;
- Major runway extension;
- Runway strengthening which would result in a 1.5 Ldn or greater increase in noise over any noise sensitive area located within the 65 Ldn noise exposure contour;
- Entrance or service road development which would adversely affect the capacity of other public roads.
- Land acquisition associated with any of the above-listed items, or land acquisitions which result in relocation of residential units when there is evidence of insufficient replacement dwellings or major disruption of business activities;
- Land acquisition which involves land covered under Section 4(f) of the DOT Act (public owned land from a public park, recreation area or wildlife or waterfowl refuge, or a historical site of local state or national significance);
- Establishment or relocation of an instrument landing system, or an approach lighting system;
- Any action which would affect property included (or eligible for inclusion) on the National Register of Historic Places, property of state, local, or national historical, architectural, archeological, or cultural significance;
- Land acquisitions which involve significant conversion of farmland

Actions determined to have significant impacts during preparation of the Environmental Assessment will be required to be addressed by an Environmental Impact Statement (EIS). The preparation of the Environmental Assessment is the responsibility of the airport sponsor. Based upon the results of the Environmental Assessment, the FAA would either prepare an Environmental Impact Statement (EIS) or would issue a “Finding Of No Significant Impact“ (FONSI).

Federal regulations require that a sponsor seeking a grant for airport improvements must prepare and submit an Airport Layout Plan (ALP), showing detailed information regarding the existing and proposed facility, along with an Environmental Assessment prepared in accordance with FAA Order 5050.4B and FAA Order 1050.1E, if an assessment is required.

Projects Requiring Environmental Assessment (EA)

The recommended twenty year improvement plan for the airport includes the following projects that will probably require the preparation of an Environmental Assessment (**Table 8a**):

Table 8a: RECOMMENDED IMPROVEMENTS REQUIRING ENVIRONMENTAL ASSESSMENT
San Manuel Airport – San Manuel, Arizona

Project	Demand-Based Action Point	Year*
Short Term (2014-2019)		
Airport Land Acquisition	Availability of funding (compliance)	2015
Long Term (2025-2034)		
Runway 11-29 Extension	500 annual ops by critical jet aircraft	2031

* indicates the program year of preparation of the Environmental Assessment, programmed to precede the proposed action (design or land acquisition) by one year.

The Airport Land Acquisition project consists of acquiring fee title to the presently leased airport land, as well as acquiring additional land for future relocation of the Access Road, the ultimate Runway Extension the ultimate Runway Protection Zones, as well as future potential airport development and safety related improvements.

The Runway 11-29 Extension would be implemented when an increase in activity by larger/faster business jets and turboprops is evident. This is currently programmed to occur near the horizon of this Master Plan.

Potential Environmental Impacts

The areas of potential impact which must be addressed in an Environmental Assessment, per FAA Order 5050.4B, are as follows[1]:

A. Air Quality
B. Coastal Barriers
C. Coastal Zone Management
D. Compatible Land Use
E. Construction Impacts
F. Department of Transportation Act, Section 4(f)
G. Farmlands

H. Fish, Wildlife and Plants
I. Floodplains
J. Hazardous Materials
K. Historical, Architectural, Archaeological, and Cultural
L. Light Emissions and Visual Effects
M. Natural Resources and Energy Supply
N. Aircraft Noise
O. Socioeconomic Environmental Justice, and Children's Health and Safety Risks
P. Solid Waste
Q. Water Quality
R. Wetlands, Jurisdictional or Non-jurisdictional
S. Wild and Scenic Rivers

A general discussion of each of these areas of potential impact is included in the following narrative. For each impact area, the threshold of significance, as described by FAA Order 1050.1E[2], and the factors to be considered for airport actions, as described by FAA Order 5050.4B[1], are documented. A listing of the governing federal statutes and regulations, along with the responsible federal oversight agencies, are also included (this has been expanded in some cases to list the responsible State or County agencies).

A. Air Quality

FAA Order 1050.1E Threshold[1]: When a project or action exceeds one or more of the National Ambient Air Quality Standards (NAAQS).

Factors to be Considered[1]: For NEPA purposes: The responsible FAA official must determine if air quality impacts of a reasonable alternative would exceed a National Ambient Air Quality Standard for the time periods analyzed. For General Conformity requirements under the Clean Air Act, as amended, analyze only the proposed or preferred development alternative.

Statutes[2]: Clean Air Act (CAA), as amended [42 United States Code (U.S.C.) 7401- 7671] [Public Law (PL) 91-604, PL 101-549]

Regulations[2]: Title 40 Code of Federal Regulations (CFR) parts 9, 50-53, 60, 61, 66, 67, 81, 82, and 93 (which includes General Conformity)

Oversight Agencies[2]: Environmental Protection Agency (EPA)

- The Airport Land Acquisition project would not affect air quality.

- The Runway 11-29 Extension project's EA may require analysis of air quality impacts caused by the increase in aeronautical activity that will be required for implementation of this action. Prior FAA guidelines[3] indicated that no air quality analysis is required if the levels of activity forecast in the time frame of the proposed action are below either of the following:

- For commercial service airports: Less than 1.3 million annual passenger and less than 180,000 annual general aviation operations.

- For general aviation airports: Less than 180,000 forecast annual operations.

For the planning year 2034, the high range of the total annual operations forecast for the airport is approximately 27,233 operations. There are no commercial service operations foreseen for San Manuel Airport. It is evident from this that neither of these criteria will be exceeded. It is unlikely that an air quality assessment would be required as part of the EA.

The 1982 Airport Act[4] requires that Airport Improvement Program applications for projects involving airport location, runway location, or a major runway extension shall not be approved unless the governor of the state in which the project is located certifies that there is "reasonable assurance" that the project will be located, designed, constructed and operated in compliance with applicable air quality standards. The proposed runway extension will require preparation of an EA. The EA process will include review by appropriate state agencies, concluding with an air quality certification from the governor's office.

B. Coastal Barriers

FAA Order 1050.1E Threshold[1]: None established

Factors to be Considered[1]: FAA Order 1050.1E, Appendix A, Section 3 does not provide a threshold for these resources. After consulting with the jurisdictional U.S. Fish and Wildlife Service or Federal Emergency Management Agency office, the responsible FAA official should determine if the proposed action would cause either of the following conditions:

- An unacceptable risk to human safety or property.
- Adverse effects to the barrier's environmental resources that could not be satisfactorily mitigated.

Statutes[2]: Coastal Barrier Resources Act of 1982 as amended by the Coastal Barrier Improvement Act of 1990 [16 U.S.C. 3501-3510] [PL 97-348];
Executive Order 13089, Coral Reef Protection (63 FR 32701, June 16, 1998)

Regulations[2]: Executive Order 13089, Coral Reef Protection (63 FR 32701, June 16, 1998);
15 CFR part 930, subparts C and D 15 CFR part 923

Oversight Agencies[2]: Fish and Wildlife Service; Federal Emergency Management Agency; National Oceanic and Atmospheric Administration, Office of Coastal Zone Management; Appropriate State CZM Agency

Federal financial assistance for development within the Coastal Barrier Resources System is prohibited for actions which would impact of undeveloped coastal barriers along the Atlantic and Gulf Coasts [6].

The project area is not located within the Coastal Barrier Resource System.

C. Coastal Zone Management

<u>FAA Order 1050.1E Threshold</u>[1]: None established.

<u>Factors to be Considered</u>[1]: FAA Order 1050.1E, Appendix A, Section 3, does not provide a threshold for these resources. Because of the number of airports in coastal areas or that could affect coastal resources, ARP suggests the responsible FAA official consider the following factors, while addressing effects on coastal zone resources:

- Did the CZM agency object to the sponsor’s consistency certification?
- If yes, has the sponsor changed the project so it is consistent with the applicable coastal zone management plan(s)?
- If not, has the sponsor successfully appealed the CZM agency’s consistency objection to the NOAA Assistant Administrator?
- If the airport action includes facilities FAA will install, did the responsible FAA organization provide proof that it will install the necessary aviation facilities in a manner consistent with the approved coastal zone management plan to the maximum extent practicable?
- Did the CZM agency agree or disagree with FAA’s finding?
- If not, has FAA changed the proposed installation to meet CZM plan?

<u>Statutes</u>[2]: Coastal Barrier Resources Act of 1982 as amended by the Coastal Barrier Improvement Act of 1990 [16 U.S.C. 3501-3510] [PL 97-348];
Executive Order 13089, Coral Reef Protection (63 FR 32701, June 16, 1998)

<u>Regulations</u>[2]: Executive Order 13089, Coral Reef Protection (63 FR 32701, June 16, 1998);
15 CFR part 930, subparts C and D 15 CFR part 923

<u>Oversight Agencies</u>[2]: Fish and Wildlife Service; Federal Emergency Management Agency; National Oceanic and Atmospheric Administration, Office of Coastal Zone Management; Appropriate State CZM Agency

Federal financial assistance for development within the Coastal Barrier Resources System is prohibited for actions which would impact of undeveloped coastal barriers along the Atlantic and Gulf Coasts [6].

The project area is not located within the Coastal Barrier Resource System.

D. Compatible Land Use

FAA Order 1050.1E Threshold[1]: For most areas: When an action, compared to the no action alternative for the same timeframe, would cause noise sensitive areas located at or above DNL 65 dB to experience a noise increase of at least DNL 1.5 dB. An increase from DNL 63.5 dB to DNL 65 dB is a significant impact.

For national parks, national wildlife refuges and historic sites, including traditional cultural properties: FAA must give special consideration to these areas. The DNL 65 dB threshold may not adequately address noise effects on visitors to these areas. Consult the jurisdictional agency for more information to determine a significant noise impact.

Factors to be Considered[1]: The responsible FAA official determines if any alternative would have land use consequences such as:

- community disruption;
- business relocations;
- induced socioeconomic impacts;
- wetland, or floodplain impacts; or
- critical habitat alterations.

The information from the factors addressing these specific issues is used to determine the severity of compatible land use effects.

Statutes[2]: Aviation Safety and Noise Abatement Act of 1979, as amended (49 U.S.C. 47501-47507)

Regulations[2]: 14 CFR part 150

Oversight Agencies[2]: Federal Aviation Administration (FAA)

Land-use compatibility conflicts are a common problem around many airports and smaller General Aviation facilities. In urban areas, as well as some rural settings, airport owners find that essential expansion to meet the demands of airport traffic is difficult to achieve due to the nearby development of incompatible land uses.

The issue of aircraft noise is generally the most apparent perceived environmental impact upon the surrounding community.

Conflicts may also exist in the protection of runway approach and transition zones to assure the safety of both the flying public and the adjacent property owners. Adequate land for this use should be either acquired in fee specifically for airport use (as is recommended in this Master Plan), or controlled by avigation easements.

The FAA specifies [2] that the Compatible Land Use section of the EA shall include documentation to support the required airport sponsor's grant assurance under 49 USC 47107(a)(10), formerly section 511(a)(5) of the 1982 Airport Act, that appropriate action, including the adoption of zoning laws, has been or will be taken, to the extent reasonable, to restrict the use of land adjacent to or in the immediate vicinity of the airport to activities and purposes compatible with normal airport operations, including landing and takeoff of aircraft. The assurance must be related to existing and planned land uses.

Furthermore, the Airport Development Grant Program (49 USC 47101 et seq.) requires that a project may not be approved unless the Secretary of Transportation is satisfied that the project is consistent with plans (existing at the time the project is approved) of public agencies for development of the area in which the airport is located (49 USC 47106(a)(1)). [2]

Ideally, the County should undertake a land use study with an ultimate objective to create additional land use controls to reduce the potential for impact to future residential and high density population areas. This is recommended as a follow-on project to this Airport Master Plan.

There are several sources of information available for the planning and implementation of land use controls. These are:

- Appendix A, Federal Aviation Regulations (FAR), Part 150.
- FAA Advisory Circular 150/5070-7, The Airport System Planning Process.
- FAA Advisory Circular 150/5020-1, Noise Control and Compatibility Planning for Airports.
- FAA Advisory Circular 150/5190-4A, A Model Zoning Ordinance to Limit Height of Objects Around Airports.

As a minimum, the airport-related ordinances that should be considered for land use control are as follows:

- Height hazard ordinances
- Noise ordinances
- Land use ordinances

✐ The land surrounding the airport is either Arizona State Trust Land, or private land held by BHP Billiton Mining Company. All adjacent land is vacant. There are no existing incompatible land uses. The Runway 11-29 Extension and the Land Acquisition projects would not affect compatible land use. (NOTE: See also **Chapter 7, Land Use** for additional information on land use impacts.)

E. Construction Impacts

FAA Order 1050.1E Threshold[1]: See the significance thresholds for the resource(s) construction would affect.

Factors to be Considered[1]: Use the information for each applicable resource.

Statutes[2]: Local County and State jurisdiction

Regulations[2]: Local County and State jurisdiction

Oversight Agencies[2]: Pinal County Public Works Department

Any construction project will generate short-term (transient) environmental impacts. These may include noise and air pollution (dust and exhaust emissions) from construction equipment on the site and traversing nearby neighborhoods, air pollution from burning of refuse, and water pollution from erosion and increased siltation of downstream bodies of water. These potential impacts can be controlled by requirements and restrictions placed in the Contract Documents and Specifications for each project.

Potential erosion and siltation should be mitigated by incorporation of applicable federal and state standards into the construction contract specifications. Typically, this involves creation and implementation of a Storm Water Pollution Prevention Plan (SWPPP).

As a method of minimizing noise and air pollution caused by construction equipment, the contractor's equipment access be routed to avoid the most sensitive adjacent areas and to contain the adverse impacts as much as possible to the airport property.

The access routes and limitations should be defined on the construction plans and in the specifications, as appropriate. Dust pollution should be specifically mitigated by requiring appropriate dust control measures as part of the construction specifications.

Coordination with the Arizona Department of Environmental Quality may be necessary during the development of construction plans and during the construction activities.

Improvements involving excavation could uncover archaeological, cultural or human skeletal remains. It is recommended that any set of contract documents and specifications include a provision for the contractor to stop work and to contact the State Historic Preservation Office in the event of a potential archeological, cultural or skeletal discovery.

If construction activities involve channelization or earthmoving within a "Water of the United States", a 404 permit will need to be obtained from the U.S. Army Corps of Engineers prior to commencement of construction.

- The Airport Land Acquisition project would have no construction directly associated with it.
- The Runway 11-29 Extension project Environmental Assessment must include analysis of the potential impacts to Waters of the United States. Activities that require a Section 404 permit include placing bank protection, temporary or permanent stockpiling of excavated material, grading roads, grading (including vegetative clearing operations) that involves the filling of low areas or leveling of land, constructing weirs or diversion dikes, constructing approach fills, and discharging dredged or fill material as a part of any other activity.

F. Department of Transportation Act, Section 4(f)

FAA Order 1050.1E Threshold[1]: When the action's physical use would be more than minimal or its constructive use substantially impairs the 4(f) property. In either case, mitigation is not enough to sustain the resource's designated use.

Factors to be Considered[1]: Determine if the proposed action or a reasonable alternative would eliminate or severely degrade the intended use of the Section 4(f) resource. That is would the proposed action or alternative physically or constructively use (i.e., substantially impair the use) that resource? The responsible FAA official should determine if mitigation is satisfactory to the agency having jurisdiction over the protected resource. If mitigation is unsatisfactory, more detailed, impact analysis is likely needed.

Statutes[2]: Department of Transportation Act of 1966, section 4(f) [recodified at 49 U.S.C. 303 (c)]

Regulations[2]: None referenced.

Oversight Agencies[2]: U.S. Department of Transportation

Section 4(f) of the DOT Act states that the "Secretary shall not approve any program or project which requires the use of any publicly owned land from a public park, recreation area, or wildlife and waterfowl refuge of national, state or local significance as determined by officials having jurisdiction thereof unless there is no feasible and prudent alternative to the use of such land and such program or project includes all possible planning to minimize harm resulting from the use."

- The proposed Runway 11-29 Extension and Land Acquisition projects will have no significant impacts upon existing parks, established waterfowl/wildlife refuges or recreation areas.

G. Farmlands

FAA Order 1050.1E Threshold[1]: When the total combined score on Form AD-1006 ranges between 200 and 260. Impact severity increases as the total score approaches 260.

Factors to be Considered[1]: Factors included on the Form AD-1006 assessment

Statutes[2]: Farmland Protection Policy Act [7 U.S.C. 4201-4209] [PL 97-98, amended by section 1255 of the Food Security Act of 1985, PL 99-198]

Regulations[2]: 7 CFR part 658 (59 FR 31109, June 17, 1994); 7 CFR part 657 (43 FR 4030) CEQ Memorandum on Analysis of Impacts on Prime and Unique Agricultural Lands in Implementing the National Environmental Policy Act, August 11, 1980 (45 FR 59189, September 8, 1980)

Oversight Agencies[2]: USDA Natural Resource Conservation Service Council on Environmental Quality

The Farmland Protection Policy Act (FPPA) authorizes the U.S. Department of Agriculture to develop criteria for identifying the effects of Federal programs upon the conversion of farmland to uses other than agriculture.

✐ The project site is located in an area of undeveloped State Trust Land and privately owned land that is not used for agriculture. The proposed actions included in this Master Plan will not affect any existing farmland.

H. Fish, Wildlife and Plants

FAA Order 1050.1E Threshold[1]: For Federally-listed species: When the U.S. Fish and Wildlife Service or the National Marine Fisheries Service determines a proposed action would likely jeopardize a species' continued existence or destroy or adversely affect a species' critical habitat.

For non-listed species: Consider scientific literature on and information from agencies having expertise addressing on the affected species. Consider information on: project effects on population dynamics; sustainability; reproduction rates; natural and artificial mortality (aircraft strikes); and the minimum population size needed to maintain the affected population.

Factors to be Considered[1]: The responsible FAA official should consider the following factors in consultation with organizations having jurisdiction or special expertise concerning the protection and/or management of the affected species. The official should complete the added analysis for each reasonable alternative that would cause long-term (i.e., greater than 1 year) habitat impacts.

- Consult with the appropriate agency(ies) to determine if an area sufficient to sustain species commonly found in the affected area would remain if the alternative were implemented.
- Determine if the alternative would affect habitat supporting floral or faunal species not commonly occurring in the project area. If yes, In consultation with the appropriate agency(ies), determine if the alternative would affect a small tract of sensitive habitat needed for the survival or well-being of flora or fauna. Consider the locations of other nesting and breeding areas relative to the project's affected area and if resource agency(ies) indicate those areas could sustain the disturbed species.

Statutes[2]: Endangered Species Act of 1973 [16 U.S.C. §§1531-1544] [PL 93-205];
Marine Mammal Protection Act of 1972 [16 U.S.C. §§1361-1421h];
Related Essential Fish Habitat Requirements of the Magnuson-Stevens Act, as amended by the Sustainable Fisheries Act [16 U.S.C. §1855(b)(2)];
Sikes Act Amendments of 1974 [PL 93-452];
Fish and Wildlife Coordination Act of 1958 [16 U.S.C. §§661-666c] [PL 85-624];
Fish and Wildlife Conservation Act of 1980 [16 U.S.C. §§2901-2912] [PL 96-366];
Executive Order 13112, Invasive Species (64 FR 6183, February 8, 1999);
Migratory Bird Treaty Act of 1981 [16 U.S.C. §§703-712];
Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds [66 FR 3853, January 17, 2001];

Presidential Memorandum on Environmentally and Economically Beneficial Landscape Practices on Federally Landscaped Grounds (April 26, 1994);
Executive Order 13148, Greening the Government Through Leadership in Environmental Management (April 22, 2000);
The Animal Damage Control Act of 1931 [7 U.S.C. 426-426c] [46 stat. 1468]

Regulations[2]: 50 CFR parts 17 and 22; 50 CFR part 402; 50 CFR parts 450-453;
50 CFR 600.920;
MOU [among 14 Federal agencies] on Implementation of the Endangered Species Act, September 28, 1994;
MOU on Using an Ecosystem Approach in Agency Decision-making, December 5, 1995;
CEQ Guidance on Incorporating Biodiversity Considerations into Environmental Impact Analysis, January 1993;
50 CFR part 83 DOT Policy on Invasive Species, April 22, 1999 50 CFR Part 10 Environmental Protection Agency, Office of the Federal Environmental Executive, Guidance for Presidential Memorandum on Environmentally and Economically Beneficial Landscape Practices on Federal Landscaped Grounds (60 FR 40837, August 10, 1995);
Paragraph 3f of attachment 2; Order DOT 5610.1C

Oversight Agencies[2]: Fish and Wildlife Service Departments of the Interior, Commerce, Agriculture, and Transportation; Department of the Interior Environmental Protection Agency; Office of the Federal Environmental Executive

This section considers the impacts of proposed projects on biotic communities and has overlapping requirements with other areas of potential impact, most specifically Wetlands. The requirements of this section are as follows:

- If a proposed project takes or impacts a publicly-owned wildlife refuge, a special study needs to be prepared (NOTE: This requirement does not apply to this proposal).
- For any proposed project it is necessary to consider the impacts on endangered and threatened species, if any.
- If the proposed project would affect water resources (i.e., wetlands, groundwater, impoundment, diversion, deepening, controlling, modifying, polluting, dredging, or filling of any stream or body of water), the Fish and Wildlife Coordination Act applies. Consultation should be initiated with both
- the U.S. Fish and Wildlife Service and with the Arizona Game and Fish Department. Letters should be sought and obtained from both agencies to determine if any proposed actions will damage wildlife resources and to determine mitigating measures, if necessary (refer to the section entitled Wetlands, below).
- If the proposed action would impact only man-dominated areas such as previously disturbed airport property, populated areas, or farmland, it may be assumed that there would be no significant impact on biotic communities. If the proposed action would impact other than man-dominated areas but the impacts would be transient rather than permanent, such as dislocation or other impacts due to construction activities, it may be

assumed that there would be no significant impact. The environmental assessment must document the transient nature of the impacts and any mitigation measure.

It is also necessary for any proposed action to consider the impacts on Threatened and Endangered Species. An "Endangered Species" is defined as any member of the animal or plant kingdom determined to be in danger of extinction throughout all or a significant portion of its range. A "Threatened Species" is defined as any member of the plant or animal kingdom which is likely to become endangered in the foreseeable future.

✎ It is not known whether any protected species occur at the proposed project site. Therefore, it is recommended that the subject of potential impacts to fish, wildlife, and plants be addressed in the Environmental Assessments for the Runway 11-29 Extension and for the Land Acquisition projects. This should include a Biological Assessment Study as well as an Arizona Native Plants Site Examination Survey.

I. Floodplains

<u>FAA Order 1050.1E Threshold</u>[1]: When notable adverse impacts on natural and beneficial floodplain values would occur.

<u>Factors to be Considered</u>[1]: The a responsible FAA official must decide if a "significant floodplain encroachment" would occur. To do so, the official must decide if the action's or reasonable alternative's floodplain encroachment would cause any of the following:

- A considerable probability of loss of human life;
- Future, extensive damage that would interrupt airport service or use of the proposed runway or other proposed airport facility.
- A notable, adverse effect on the affected floodplain's natural and beneficial values.

It is critical to note that an alternative causing a significant encroachment does not necessarily trigger a significant impact for NEPA purposes. That level of impact would occur only when an action would cause notable adverse impacts on the affected floodplain's natural and beneficial values. In those instances when no significant effect under NEPA would occur, the responsible FAA official must ensure the environmental document discloses action-induce effects on human life, NAVAIDS, and transportation facilities. In this case, the official should ensure the document clearly states those effects do not trigger a significant impact under NEPA.

<u>Statutes</u>[2]: Executive Order 11988, Floodplain Management, May 24, 1977 (42 FR 26951); Appropriate State and local construction statutes

<u>Regulations</u>[2]: Order DOT 5650.2, Floodplain Management and Protection;
Federal Emergency Management Agency "Protecting Floodplain Resources: A Guidebook for Communities," 1996

Oversight Agencies[2]: Federal Aviation Administration; Federal Emergency Management Agency; Appropriate State and local agencies

Floodplains are defined by Executive Order 11988, Floodplain Management, as the lowland and relatively flat areas adjoining coastal water "...including a minimum, that area subject to a one percent or greater chance of flooding in any given year...", that is, an area which would be inundated by a 100-year flood. If a proposed development involves a 100 year floodplain, mitigating measures must be investigated in order to avoid significant changes to the drainage system.

✐ The National Flood Insurance Program's Flood Insurance Rate Maps (FIRM) for the site area indicate that the proposed extension of Runway 11-29 is not located within a designated floodplain. The nearest designated floodplain follows the Smelter Wash, approximately ¾ mile northwest of the existing northwest end of the runway. Therefore, no significant impacts are anticipated. Since there are numerous washes running through the project area, the State of Arizona Division of Emergency Management will probably require a floodplain delineation prior to development of the Runway 11-29 Extension.

J. Hazardous Materials

FAA Order 1050.1E Threshold[1]: When an action involves a property on or eligible for the National Priority List (NPL). Uncontaminated properties within a NPL site's boundary do not always trigger this significant threshold.

Factors to be Considered[1]: Historical, current and future use of the land with regards to potentially hazardous materials.

Statutes[2]: Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) (as amended by the Superfund Amendments and Reauthorization Act of 1986 and the Community Environmental Response Facilitation Act of 1992) [42 U.S.C. 9601-9675];
Pollution Prevention Act of 1990 [42 U.S.C. 1310-1319];
Toxic Substances Control Act of 1976, as amended (TSCA) [15 U.S.C. 2601-2692] [PL 94-469];
Resource Conservation and Recovery Act of 1976 (RCRA) [PL 94-580, as amended by the Solid Waste Disposal Act of 1980 (SWDA), PL 96-482, the Hazardous and Solid Waste Amendments of 1984, PL 98616, and the Federal Facility Compliance Act of 1992, (FFCA) PL 103-386] [42 U.S.C. 6901-6992(k)];
Executive Order 12088, Federal Compliance with Pollution Control Standards, October 13, 1978 (43 FR 47707), amended by Executive Order 12580, January 23, 1987 (52 FR 2923) January 29, 1987;
Executive Order 12856, Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements (58 FR 41981, August 3, 1993);
Executive Order 12580, Superfund Implementation, amended by Executive Order 13016 and 12777

Regulations[2]: 40 CFR parts 300, 311, 355, and 370;
CEQ Memorandum on Pollution Prevention and the National Environmental Policy Act, January 12, 1993 (58 FR 6478);
40 CFR parts 761 and 763;
40 CFR parts 240-280

Oversight Agencies[2]: Environmental Protection Agency (EPA)

FAA actions to fund, approve, or conduct an activity may require consideration of hazardous material, pollution prevention, and solid waste impacts in NEPA documentation. NEPA documents prepared in support of project development should include an appropriate level of review regarding the hazardous nature of any materials or wastes to be used, generated, or disturbed by the proposed action, as well as the control measures to be taken. The CEQ Memorandum on Pollution Prevention and the National Environmental Policy Act encourages early consideration, for example, during scoping, of opportunities for pollution prevention. FAA should, to the extent practicable, include pollution prevention considerations in the proposed action and its alternatives; address pollution prevention in the environmental consequences section; and disclose in the record of decision the extent to which pollution was considered. A discussion of pollution prevention may also be appropriate in an EA.

✐ The Environmental Assessments for both the Land Acquisition and for the Runway 11-29 Extension projects must address this issue. The environmental document should demonstrate that the airport sponsor has determined whether hazardous wastes will be generated, disturbed, transported or treated, stored or disposed of, by the action under consideration. If so, the proposed management of these wastes must be documented.

K. Historical, Architectural, Archaeological, and Cultural

FAA Order 1050.1E Threshold[1]: When an action adversely affects a protected property and the responsible FAA official determines that information from the State and/or Tribal Historic Preservation Officer addressing alternatives to avoid adverse effects and mitigation warrants further study.

Factors to be Considered[1]: Potential for adverse impacts to significant resources.

Statutes[2]: National Historic Preservation Act of 1966, as amended, including Executive Order 11593, Protection and Enhancement of the Cultural Environment (36 FR 8921, May 13, 1971) [16 U.S.C. 470, 470 note] [PL 102-575 (1992)];

Archaeological: Antiquities Act of 1906 [16 U.S.C. 431, 432, 433] [PL 59-209 (1906)];
Archaeological and Historic Preservation Act of 1974, as amended [16 U.S.C. 469-469c] [PL 89-665];
Archaeological Resources Protection Act of 1979, as amended [16 U.S.C. 470aa-470mm] [PL 96-95 (1979)];

Native American Graves Protection and Repatriation Act of 1990 [25 U.S.C. 3001] [PL 101-601 (1990)];
American Indian Religious Freedom Act of 1978 [42 U.S.C. 1996, 1996 note] [PL 95-341 (1978)];
Department of Transportation Act [49 U.S.C. 303];
Public Building Cooperative Use Act of 1976 [40 U.S.C. 601(a), 601(a)(1), 606, 611(c), 612(a)(4)] [PL 94-541];
Executive Order 13006, Locating Federal Facilities on Historic Properties in Our Nation's Central Cities (61 FR 26071, May 24, 1996);
Executive Order 13007, Indian Sacred Sites (61 FR 26771, May 29, 1996);
Executive Order 13175, Consultation and Coordination with Indian Tribal Governments (65 FR 67249, November 9, 2000), and the Presidential Memorandum of April 29, 1994, Government-to-government Relations with Native American Tribal Governments;
Executive Order 11593, Protection and Enhancement of the Cultural Environment (36 FR 8921, May 13, 1971) (16 U.S.C. 470 note)

Regulations[2]: 36 CFR parts 60 (National Register of Historic Places (NRHP)), 61 (State and Local Preservation Programs), 62.1 (National Natural Landmarks), 63 (NRHP), 65, 65.1 (National Historic Landmarks), 68 (standards), 73 (World Heritage Program), 78 (waiver of Federal agency section 110 responsibilities), 79 (curation) and 800 (consultation), as revised (65 FR 77697; December 12, 2000, effective January 1, 2001)

Archaeological: 43 CFR part 3; 25 CFR part 261; Guidelines for Archeology and Historic Preservation: Standards and Guidelines (DOI) (48 FR 44716, September 29, 1983) 36 CFR part 68;
43 CFR parts 3 and 7; 36 CFR part 79; 25 CFR part 262; Federal Archeological Preservation Strategy; 43 CFR 7.7 and 7.32; 25 CFR 262.7;
41 CFR parts 101-17, 10117.002(l), (m), (n) (rural areas), 101.17.002(i)(2) (urban areas), and 101-19

Oversight Agencies[2]: National Park Service, various offices; Advisory Council on Historic Preservation; State Historic Preservation Officer; Tribal Historic Preservation Officer;

Archaeological: Department of Interior, National Park Service; Departmental Consulting Archeologist and Archeological Assistance Program, National Park Service; Department of Transportation; General Services Administration; Advisory Council on Historic Preservation; Assistant to the President for Domestic Policy

It is the FAA's responsibility to determine the Area of Potential Effect (APE) for a given action. This determination is made generally in consultation with the appropriate State and Tribal offices. The APE is defined as the geographic area or areas within which an undertaking may cause changes in the character or use of historic properties, if any such properties are subsequently identified within the APE. The FAA or designee must survey the APE to identify properties potentially eligible for or listed on the NRHP. If any eligible or listed property is identified within the area of the proposed action's APE, the ACHP's regulations, Protection of Historic Properties (36 CFR part 800) must be consulted and followed.

- An archaeological survey must be conducted as a part of the Runway 11-29 Extension EA.

L. Light Emissions and Visual Effects

FAA Order 1050.1E Threshold[1]: For light emissions: When an action's light emissions create annoyance to interfere with normal activities. For visual effects: When consultation with Federal, State, or local agencies, tribes, or the public shows these effects contrast with existing environments and the agencies state the effect is objectionable.

Factors to be Considered[1]: Significance of the proposed lighting installations with respect to the existing environment and affected land uses.

Statutes[2]: There are no special purpose laws for light impacts and visual impacts.

Regulations[2]: None existing

Oversight Agencies[2]: Federal Aviation Administration (FAA)

The responsible FAA official considers the extent to which any lighting associated with an action will create an annoyance among people in the vicinity or interfere with their normal activities. Because of the relatively low levels of light intensity compared to background levels associated with most air navigation facilities (NAVAIDS) and other airport development actions, light emissions impacts are unlikely to have an adverse impact on human activity or the use or characteristics of the protected properties. Information will be included in the environmental document whenever the potential for annoyance exists, such as site location of lights or light systems, pertinent characteristics of the particular system and its use, and measures to lessen any annoyance, such as shielding or angular adjustments.

Visual, or aesthetic, impacts are inherently more difficult to define because of the subjectivity involved. Aesthetic impacts deal more broadly with the extent that the development contrasts with the existing environment and whether the jurisdictional agency considers this contrast objectionable. Public involvement and consultation with appropriate Federal, State, and local agencies and tribes may help determine the extent of these impacts. The visual sight of aircraft, aircraft contrails, or aircraft lights at night, particularly at a distance that is not normally intrusive, should not be assumed to constitute an adverse impact. The art and science of analyzing visual impacts is continuously improving and the responsible FAA official should consider, based on scoping or other public involvement, the degree to which available tools should be used to more objectively analyze subjective responses to proposed visual changes.

Aviation lighting required for the purpose of obstruction marking, security of parked aircraft and vehicles, and visual aids to navigation are the main source of light emissions emanating from airports. An analysis is necessary only if a proposal would introduce new airport lighting facilities which might affect nearby residential or other sensitive land uses. Establishment of an Instrument Landing System (ILS) or Approach Lighting System (ALS) is an action normally requiring environmental assessment. The Master Plan has not programmed an ILS or ALS.

- ✐ It is not anticipated that the proposed runway lighting and visual aids associated with the Runway 11-29 Extension will constitute a significant impact in this area.

M. Natural Resources and Energy Supply

FAA Order 1050.1E Threshold[1]: When an action's construction, operation, or maintenance would cause demands that would exceed available or future (project year) natural resource or energy supplies.

Factors to be Considered[1]: Magnitude of the proposed improvements that may impact demand on energy supply or natural resources. General aviation airport development actions typically do not cause significant impacts to this area.

Statutes[2]: There are no special purpose laws for natural resources and energy supply.

Regulations[2]: The Federal Aviation Administration encourages sustainable facilities design.

Oversight Agencies[2]: Federal Aviation Administration (FAA)

The San Manuel Airport is located in an area that is currently primarily undeveloped, but is an area that may experience rapid development in the future as the Tucson metropolitan area continues to expand toward the Airport service area. While the airport may not itself cause any significant changes in existing demands upon energy supply and natural resources, it may be a contributor to increased demand as the area develops.

- ✐ For most general aviation and non-hub air carrier airport actions, changes in energy demands or other natural resource consumption will not result in significant impacts. This is assumed to be the case for the proposed airport development. Neither the Runway 11-29 Extension nor the Land Acquisition program should have significant impacts upon natural resources and energy supply.

N. Aircraft Noise

FAA Order 1050.1E Threshold[1]: For most areas: When an action, compared to the no action alternative for the same timeframe, would cause noise sensitive areas located at or above DNL 65 dBA to experience a noise increase of at least DNL 1.5 dBA. An increase from DNL 63.5 dBA to DNL 65 dBA is a significant impact.

For national parks, national wildlife refuges and historic sites, including traditional cultural properties: FAA must give special consideration to these areas. The DNL 65 dB threshold may not adequately address noise effects on visitors to these areas. Consult the jurisdictional agency for more information to determine a significant noise impact.

Factors to be Considered[1]: For NEPA purposes, actions having a DNL 3.0 dBA increase over noise-sensitive areas located between the DNL 60 and 65 dBA contours do not cause significant adverse noise impacts below the DNL 65 dBA contour, except as noted in national parks, wildlife refuges and historic sites.

Statutes[2]: 49 U.S.C. 47501-47507 (Aviation Safety and Noise Abatement Act of 1979, as amended);
49 U.S.C. 40101 et seq., as amended by PL 103-305 (Aug. 23, 1994) (The Federal Aviation Act of 1958);
The Control and Abatement of Aircraft Noise and Sonic Boom Act of 1968;
49 U.S.C. 47101 et seq., as amended by PL 103-305 (Aug. 23, 1994) (The Airport and Airway Improvement Act);
49 U.S.C. 2101 et seq. (Airport Noise and Capacity Act of 1990);
49 U.S.C. 44715 (The Noise Control Act of 1972)

Regulations[2]: 14 CFR part 150 Noise Control and Compatibility Planning for Airports;
Advisory Circular 150/5020;
14 CFR part 161, Notice and Approval of Airport Noise and Access Restrictions.

Oversight Agencies[2]: Federal Aviation Administration (FAA)

The “DNL” noise metric (“Day-Night Average Sound Level” - sometimes called “Ldn”) is defined as the 24 hour average of an energy summation of A-weighted decibel levels (dbA), with night operations weighted by a 10 decibel penalty. The Federal Aviation Administration defines 65 DNL as the threshold of significance for noise exposure impacts, and requires that the Integrated Noise Model (INM) computer program be used to define noise exposure levels.

The Department of Housing and Urban Development (HUD), has published noise abatement and control standards[5] in an effort to separate uncontrollable noise sources from residential and other noise sensitive areas, and to prohibit HUD support for construction within sites determined to have unfavorable noise exposure conditions. A rating of less than DNL 65 is considered acceptable for residential development. DNL 65 to 75 is defined as discretionary and a rating of more than DNL 75 is considered unacceptable for residential development.

- A noise analysis is not required by the Federal Aviation Administration for airport proposals which involve utility or transport airports whose forecast annual operations within the period covered by an Environmental Assessment do not exceed 90,000 annual propeller operations or 700 jet operations. According to the forecasts developed in **Chapter 3, Aviation Demand**, total annual operations will remain well below the threshold level during the period under study. However, the projections show the potential for jet activity to exceed 900 operations per year. Therefore, a noise analysis will be necessary as part of the Runway 11-29 Extension EA process.

O. Socioeconomic Environmental Justice, and Children's Health and Safety Risks

FAA Order 1050.1E Threshold[1]: For Socioeconomic issues: When an action would cause:

- extensive relocation, but sufficient replacement housing is unavailable;
- extensive relocation of community businesses that would cause severe economic hardship for affected communities;
- disruption of local traffic patterns that substantially reduce the Levels of Service of roads serving the airport and its surrounding communities;
- a substantial loss in community tax base.

For Environmental justice issues: When an action would cause disproportionately high and adverse human health or environmental effects on minority and low-income populations, a significant impact may occur.

For Children's Health & Safety Risks: An action causing disproportionate health and safety risks to children, may indicate a significant impact.

Factors to be Considered[1]: It is important to consider the relative economic health of the area that may be impacted by development actions. In general, if socioeconomic issues are significantly impacted (relocation of residences and businesses, or relocation/closure of major thoroughfares) environmental justice issues may also be a factor. If an action would result in increased overflight of a school or playground, children's health and safety may be at risk.

Statutes[2]: Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (59 FR 7629, February 16, 1994);
Executive Order 13045, Protection of Children from Environmental Health Risks and Safety Risks (62 CFR 19883, April 23, 1997);
Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 [42 U.S.C. 4601] [PL 91-528 amended by the Surface Transportation and Uniform Relocation Act Amendments of 1987, PL 100-117]

Regulations[2]: Order DOT 5610.2, Environmental Justice in Minority and Low-Income Populations, April 15, 1997;
CEQ Environmental Justice: Guidance Under the National Environmental Policy Act, December 10, 1997;
Final Guidance For Consideration of Environmental Justice in Clean Air Act 309 Reviews, July 1999;
40 CFR 1508.27;
FAA Advisory Circular 150/5100-17;
49 CFR part 24;
FAA Order 5100.37A, Land Acquisition and Relocation Assistance for Airport Projects.

Oversight Agencies[2]: Department of Transportation; Council on Environmental Quality; Environmental Protection Agency (EPA); Federal Aviation Administration (FAA)

Factors to be considered in determining impact in this impact category include, but are not limited to, the following:

- Extensive relocation of residents is required, but sufficient replacement housing is unavailable.
- Extensive relocation of community businesses that would create severe economic hardship for the affected communities.
- Disruptions of local traffic patterns that substantially reduce the levels of service of the roads serving the airport and its surrounding communities.
- A substantial loss in community tax base.
- Disproportionately high and adverse human health or environmental effects on minority and low-income populations may represent a significant impact.
- Disproportionate health and safety risks to children may represent a significant impact.

✐ It is highly unlikely that the proposed airport development actions would have significant socioeconomic impacts, environmental justice impacts, or impacts to the health and safety of children.

P. Solid Waste

FAA Order 1050.1E Threshold[1]: None established.

Factors to be Considered[1]: Airport-generated solid waste would exceed available landfill or incineration capacities or require extraordinary effort to meet applicable solid waste permit conditions or regulations. Local, State or Federal agencies determine that substantial, unresolved waste disposal issues exist and may require more analysis.

Statutes[2]: No federal statues are established.

Regulations[2]: No federal regulations established.

Oversight Agencies[2]: Arizona Department of Environmental Quality (ADEQ)

Airport development actions which relate only to construction or expansion of runways, taxiways, and related facilities do not normally include any direct relationship to solid waste collection, control, or disposal.

Any solid waste disposal facility (i.e., sanitary landfill, transfer station, etc.) which is located within 5,000 feet of all runways planned to be used by piston-powered aircraft, or within 10,000 feet of all runways planned to be used by turbine-powered aircraft is considered by the FAA to be an incompatible land use because of the potential for conflicts between bird habitat and low-flying aircraft. Any waste disposal facility which is located within a 5 mile radius of any runway end "that attracts or sustains hazardous bird movements from feeding, water or roosting areas into, or across the runways and/or approach and departure patterns of aircraft" is also considered to be incompatible [8 and 9].

- There are no existing or planned solid waste disposal sites within 10,000 feet of the ultimate runway thresholds as they will be configured for the planned Runway 11-29 Extension. There The nearest solid waste disposal site is a landfill located approximately 2 ¼ miles southeast of the airport, along the extended runway centerline.[11] This is illustrated on **Figure 7-3, Airspace Impacts to Land Use** at the end of Chapter 7 of this Master Plan. Future area wide land use planning should address this issue in order to ensure that new disposal sites will not be developed within the airport influence area.

Q. Water Quality

FAA Order 1050.1E Threshold[1]: When an action would not meet water quality standards. Potential difficulty in obtaining a permit or authorization may indicate a significant impact.

Factors to be Considered[1]: The responsible official must also consider if a proposed action or a reasonable alternative would threaten a public drinking water supply, sole source aquifer, or waters of national significance (e.g., Wild and Scenic Rivers, national refuges, etc.).

Statutes[2]: Federal Water Pollution Control Act, as amended, known as the Clean Water Act [33 U.S.C. 1251-1387];
[PL 92-500, as amended by the Clean Water Floodplains and Floodways Act of 1977; 33 U.S.C. 1252; PL 95-217, and PL 100-4]; as amended by the Oil Pollution Act of 1990 (section 311 of the Clean Water Act. Safe Drinking Water Act, as amended (SDWA, also known as the Public Health Service Act) [42 U.S.C. 300f to 300j-26] [PL 104-182] Fish and Wildlife Coordination Act of 1980; [16 U.S.C. 661-666c]; [PL 85-624]

Regulations[2]: 40 CFR parts 110-112, 116, 117, 122, 125, 129, 130, 131,136, and 403

Oversight Agencies[2]: Environmental Protection Agency (EPA); State and Tribal Water Quality Agencies; Arizona Department of Environmental Quality (ADEQ)

The 1982 Airport Act[4] requires that Federal Airport Improvement Program (AIP) applications for projects involving airport location, runway location, or a major runway extension shall not be approved unless the governor of the state in which the project is located certifies that there is “reasonable assurance” that the project will be located, designed, constructed, and operated in compliance with all applicable water quality standards. As with the air quality assurance for the proposed runway extension, this certification should be applied for as part of an EA process, through the Arizona Department of Environmental Quality (ADEQ).

The Environmental Assessment required for an airport development action shall include descriptions of design, mitigation measures and construction controls to indicate that any water quality standards and permit requirements are met on a Federal, State, and/or local level. This stipulation can apply to storm and sanitary sewers, water supply and waste treatment, erosion controls, fuel spill containing, and drainage design.

A storm water permit must be applied for through ADEQ prior to commencement of construction activities if clearing, grubbing and excavation activities disturb more than five acres of land. Grading of less than five acres will also be required to be permitted if it is part of a larger development plan.

If construction activities involve channelization or earthmoving within a "Water of the United States", a Section 404 permit will need to be obtained from the U.S. Army Corps of Engineers prior to commencement of construction. Potential short-term impacts to water quality caused by construction activity (erosion and sediment transport) must be addressed for each construction project in the specifications (see also the section entitled Construction Impacts, below).

R. Wetlands, Jurisdictional or Non-jurisdictional

FAA Order 1050.1E Threshold[1]: When an action would:

- Adversely affect a wetland's function to a protect the quality or quantity of a municipal water supply, including sole source aquifers and a potable water aquifer.
- Substantially alter the hydrology needed to sustain the affected wetland's values and functions or those of a wetland to which it is connected.
- Substantially reduce the affected wetland's ability to retain floodwaters or storm runoff, thereby threatening public health, safety or welfare. The last term includes cultural, recreational, and scientific public resources or property.
- Adversely affect the maintenance of natural systems supporting wildlife and fish habitat or economically-important timber, food, or fiber resources of the affected or surrounding wetlands.
- Promote development that causes any of the above impacts.
- Be inconsistent with applicable State wetland strategies.

Factors to be Considered[1]: The existence of known wetland areas that would be directly or indirectly impacted by the proposed action.

Statutes[2]: Clean Water Act, section 404 [33 U.S.C. 1344] [PL 92-500, as amended by PL 95217 and PL 100-4];
Rivers and Harbors Act of 1899, section 10;
Executive Order 11990, Protection of Wetlands (May 24, 1977) (42 FR 26961)

Regulations[2]: 33 CFR parts 320–330; Order DOT 5660.1A, Preservation of the Nation's Wetlands

Oversight Agencies[2]: Army Corps of Engineers; Coast Guard; Environmental Protection Agency (EPA)

Wetlands are defined in Executive Order 11990, "Protection of Wetlands", as "those areas that are inundated by surface or ground water with a frequency sufficient to support, and under normal circumstances does or would support, a prevalence of vegetation or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs, and similar areas such as sloughs, potholes, wet meadows, river overflows, and natural ponds."

- Visual observation of the Runway 11-29 Extension project area indicates that there are no apparent wetlands that would be disturbed by the proposed development. The National Wetlands Inventory (NWI) Internet mapping database was also consulted[10]. The NWI maps indicate that no wetlands exist in the project area.

S. Wild and Scenic Rivers

FAA Order 1050.1E Threshold[1]: None established.

Factors to be Considered[1]: Existence of an established Wild and Scenic River within proximity to the proposed action.

Statutes[2]: Wild and Scenic Rivers Act of 1968 [16 U.S.C. 1271-1287] [PL 90-542 as amended by PL 96-487]

Regulations[2]: 36 CFR part 297, subpart A (USDA Forest Service) Department of the Interior and Department of Agriculture, Wild and Scenic River Guidelines for Eligibility, Classification and Management of River Areas (47 FR 39454, September 7, 1982) CEQ Memorandum on Interagency Consultation to Avoid or Mitigate Adverse Effects on Rivers in the Nationwide Inventory, August 11, 1980 (45 FR 59190, September 8, 1980)

Oversight Agencies[2]: Department of the Interior; National Park Service; Fish and Wildlife Service; and Bureau of Land Management; Department of Agriculture; Forest Service; Council on Environmental Quality

The Wild and Scenic Rivers Act describes those river areas eligible for protection from development. As a general rule these rivers possess outstanding scenic, recreational, geological, fish and wildlife, historical, cultural, or other similar value.

- There are no Wild and Scenic Rivers located in the vicinity of the airport.[7]

Chapter References

[1] FAA Order 5050.4B, National Environmental Policy Act (NEPA) Implementing Instruction for Airport Actions, April 28, 2006.
[2] FAA Order 1050.1E, Environmental Impacts: Policies and Procedures, March 20, 2006.
[3] FAA Order 5050.4A, Airport Environmental Handbook (superseded April 28, 2006)
[4] 96 STAT. 324, Airport and Airway Improvement Act of 1982.
[5] Department of Housing and Urban Affairs Circular 1390.2, Noise Abatement and Control: Department Policy, Implementation Responsibilities, and Standards.
[6] 16 U.S. Code Chapter 55 – Coastal Barrier Resources, the Coastal Barrier Resources Act (CBRA) of 1982, Coastal Barrier Improvement Act (CBIA) of 1990
[7] National Wild and Scenic Rivers web site, August 15, 2014.
[8] FAA Order 5200.5A, FAA Guidance Concerning Sanitary Landfills On or Near Airports
[9] in 40 CFR Part 257, Criteria for Classification of Solid Waste Disposal Facilities, section 257.3-8
[10] National Wetlands Inventory web site, August 18, 2014
[11] Arizona Department of Environmental Quality (ADEQ) online GIS database, September 4, 2014

9 Airport Plans

Introduction

The Airport Layout Plan (ALP) is the Federal Aviation Administration's official planning document for airport development. The ALP is a graphic depiction of the airport's existing facilities and also of the planned ultimate improvements.

The ALP is prepared with reference to FAA Advisory Circular 150/5070-6B, Airport Master Plans [1], Chapter 10 and Appendix F, as well as the design standards contained in Advisory Circular AC 150/5300-13A, Airport Design[2]. Reference was also made to Federal Air Regulations (FAR) Part 77, Objects Affecting Navigable Airspace[3], as well as related FAA and ADOT guidance documents that are used to determine the minimum design criteria for specific facilities.

Development of the San Manuel Airport Layout Plan

The Airport Layout Plan for San Manuel Airport was developed based on the recommended improvement schedule developed in **Chapter 5, Airport Facility Requirements**, and was laid out in conformance with the composite selected development alternative as presented in **Chapter 6, Development Alternatives**.

The major improvements in the Short Term (2015-2019) development plan include expansion of the airport's hangar and apron areas, relocation of the Access Road (to remove it from the Runway Protection Zone), relocation of connector Taxiway A4 for compliance with the most current FAA design standards (to mitigate a straight-through taxi path from the Apron to Runway 11-29), removal of obstructions to FAR Part 77 airspace, acquisition of airport land, a paved automobile parking lot, taxiway edge lighting installation, and development of a rotorcraft operations area, as well as pavement and drainage feature maintenance projects.

The airport is currently classified as an Airport Reference Code (ARC) B-I airfield. Current activity is limited to operations by small piston fixed wing aircraft and rotorcraft with weights of less than 12,500 pounds. The potential for a future increase in activity by larger piston and turboprop aircraft, and by business jets, has been identified. If this occurs, the airport would upgrade its classification to ARC B-II and the airfield pavements may need to be strengthened to allow operations by aircraft of up to 20,000 pounds. This is programmed for the end of the Short Term, with design in 2019, and construction in the beginning of the Intermediate Term (2020).

The major improvements in the Intermediate Term (2020-2024) development plan include the pavement strengthening, relocation of connector Taxiway A6, continued expansion of the hangar area, as well as regular pavement maintenance projects. A Master Plan update is programmed for 2020, timed to consider the reclassification of the Airport Reference Code.

The Long Term (2025-2034) development plan includes auto parking expansion, continued expansion of the hangar and apron areas, and regular pavement maintenance projects. Also included is the extension of Runway 11-29 to allow use by larger and faster turboprop and jet aircraft, if that type of activity actually occurs. Master Plan updates are programmed for 2026 and for 2032.

The Airport Layout Plan Drawing Set

The San Manuel Airport ALP consists of the following drawings:

- Title Sheet .... Sheet 1
- Airport Layout Drawing .... Sheet 2
- Airport Airspace Drawing – FAR Part 77 .... Sheet 3
- Runway 11 Inner Approach Surface Plan & Profile (Existing) .... Sheet 4
- Runway 29 Inner Approach Surface Plan & Profile (Existing) .... Sheet 5
- Runway 11 Inner Approach Surface Plan & Profile (Ultimate) .... Sheet 6
- Runway 29 Inner Approach Surface Plan & Profile (Existing) .... Sheet 7
- Terminal Area Drawing - Northwest .... Sheet 8
- Terminal Area Drawing – Southeast .... Sheet 9
- Airport Property Map and Horizontal/Vertical Control .... Sheet 10
- On Site Land Use Drawing .... Sheet 11

The full ALP is included on the following pages.

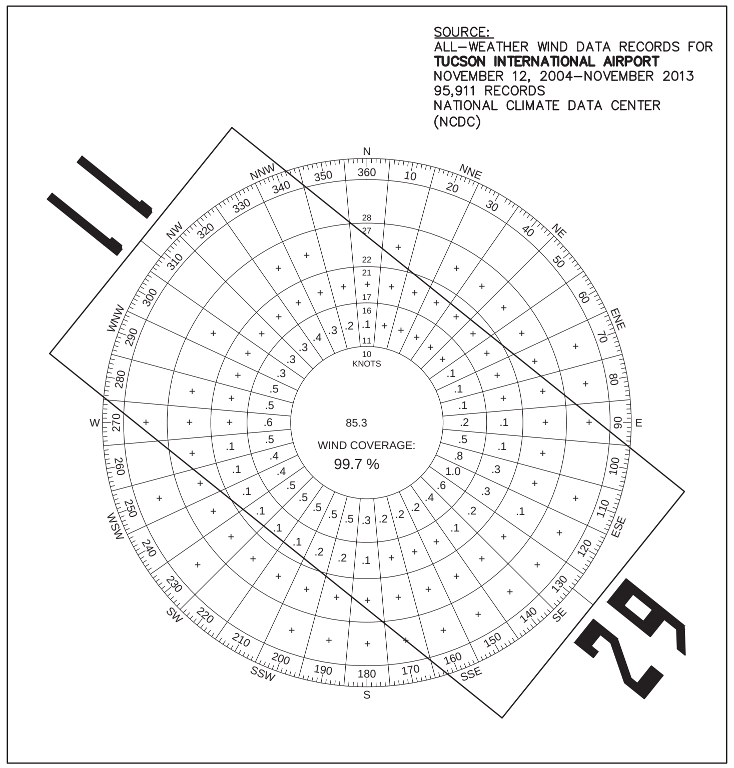
Chapter References

1 FAA Advisory Circular 150/5070-6B, Airport Master Plans, Chapter 10 and Appendix F
2 FAA Advisory Circular AC 150/5300-13A, Airport Design
3 Federal Air Regulations (FAR) Part 77, Objects Affecting Navigable Airspace

SAN MANUEL AIRPORT

AIRPORT LAYOUT PLAN

ALL WEATHER WIND ROSE



ALL WEATHER WIND COVERAGE				
Runways	10.5 Knots 12 MPH	13 Knots 15MPH	16 Knots 18MPH	20 Knots 23MPH
Runway 11-29	94.62%	96.90%	98.87%	99.70%

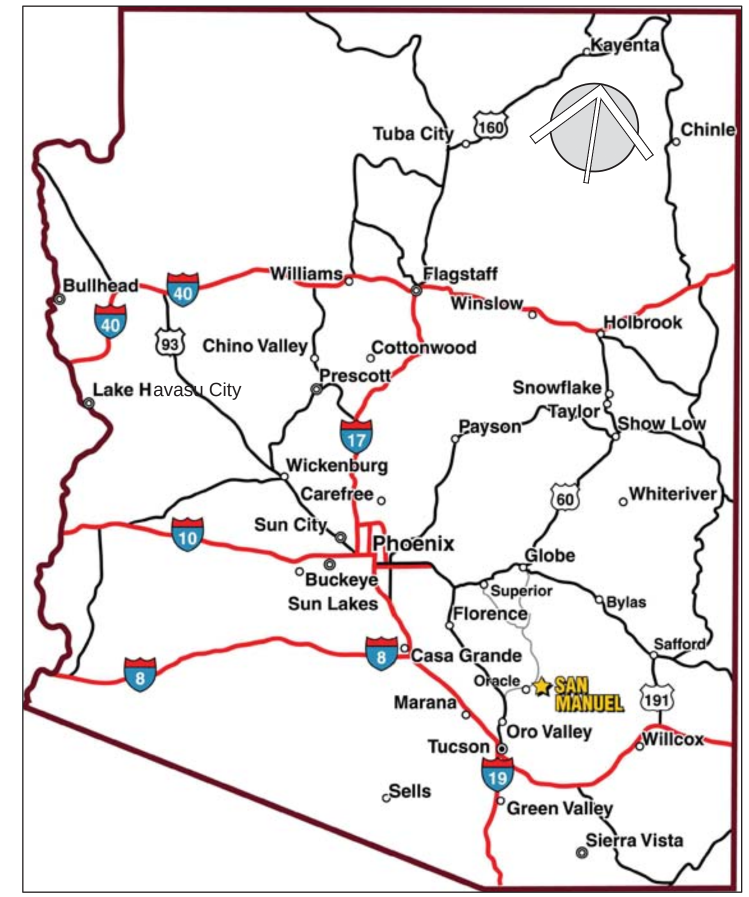
SHEET INDEX

1 . . . TITLE SHEET
2 . . . AIRPORT LAYOUT DRAWING
3 . . . AIRPORT AIRSPACE LAYOUT - FAR PART 77
4 . . . RUNWAY 11 INNER APPROACH SURFACE PLAN AND PROFILE (EXISTING)
5 . . . RUNWAY 29 INNER APPROACH SURFACE PLAN AND PROFILE (EXISTING)
6 . . . RUNWAY 11 INNER APPROACH SURFACE PLAN AND PROFILE (ULTIMATE)
7 . . . RUNWAY 29 INNER APPROACH SURFACE PLAN AND PROFILE (ULTIMATE)
8 . . . TERMINAL AREA PLAN - NORTHWEST
9 . . . TERMINAL AREA PLAN - SOUTHEAST
10 . . . AIRPORT PROPERTY MAP AND HORIZONTAL/VERTICAL CONTROL
11 . . . ON-SITE LAND USE DRAWING

LEGEND - ALL SHEETS

EXISTING	ULTIMATE	
EXPL	UPL	AIRPORT PROPERTY LINE
		EASEMENT LINE
		AIRPORT REFERENCE POINT (ARP)
	SAME	AIRPORT ROTATING BEACON
BRL	SAME	BUILDING RESTRICTION LINE (BRL)
	SAME	FENCING
PAPI-2	SAME	PRECISION APPROACH PATH INDICATOR (2 lights)
	SAME	RWY END IDENTIFICATION LIGHTS (REIL)
	SAME	RWY EDGE LIGHTS (MIRL)
	SAME	RWY THRESHOLD LIGHTS
	SAME	SECTION CORNER
1080	SAME	TOPOGRAPHIC CONTOURS
	SAME	WIND INDICATOR (Lighted)
		APPROACH SURFACE
		RUNWAY SAFETY AREA (RSA)
		RUNWAY PROTECTION ZONE (RPZ)
		OBJECT FREE AREA (OFA)
		OBSTACLE FREE ZONE (OFZ)
		BUILDING
		PAVEMENT TO BE REMOVED
	SAME	AIRPORT CONTROL STATION (PAC/SAC)

VICINITY MAP



AIRPORT DATA

		EXISTING	FUTURE
CITY: SAN MANUEL, ARIZONA		COUNTY: PINAL COUNTY, ARIZONA	
RANGE: R16E and R17E TOWNSHIP: T9S			
AIRPORT SERVICE LEVEL		GENERAL AVIATION	GENERAL AVIATION
AIRPORT REFERENCE CODE		B-I	B-II
DESIGN AIRCRAFT		Cessna 414A	Cessna Citation 560 Excel
AIRPORT ELEVATION (In feet-MSL)		3271.77	3278.34
MEAN MAXIMUM TEMPERATURE OF HOTTEST MONTH		97° F (JULY)	97° F (JULY)
AIRPORT REFERENCE POINT (ARP) COORDINATES	Latitude	32° 38' 11.17279" N	32° 38' 16.13656" N
	Longitude	110° 38' 50.21292" W	110° 38' 58.94975" W
AIRPORT and TERMINAL NAVIGATIONAL AIDS		ROTATING BEACON	ROTATING BEACON

HORIZONTAL DATUM IS NAD83. VERTICAL DATUM IS NAVD88.
SURVEY DATUM IS ARIZONA STATE PLANE.

FAA APPROVAL

SPONSOR APPROVAL

BY: ....

....
DATE

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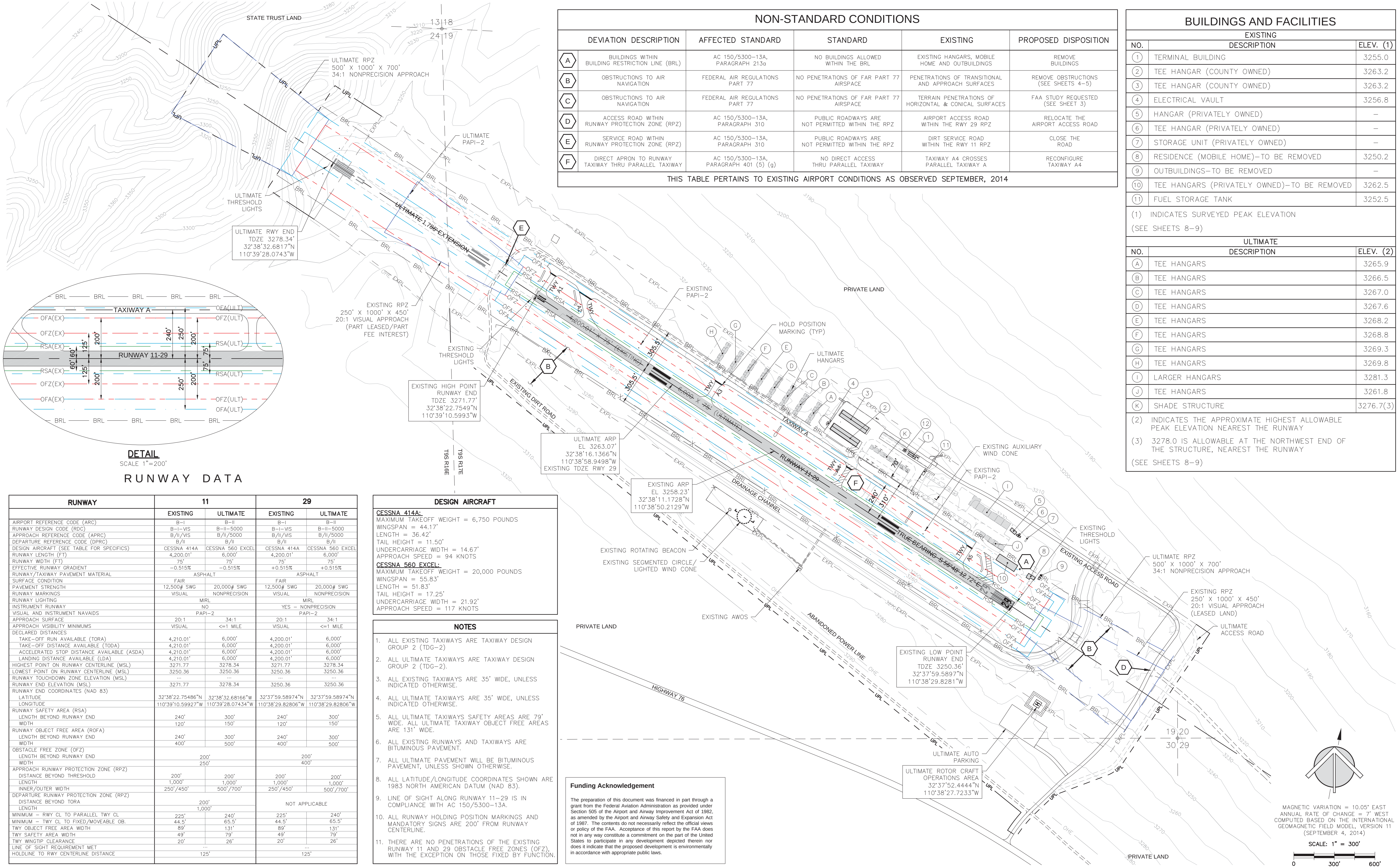
	REVISION	DATE

TITLE SHEET

SAN MANUEL AIRPORT - SAN MANUEL, ARIZONA

DESIGN:	NJP
DRAWN:	DSO
CHECK:	NJP
Date:	4/08/2015



DETAIL
SCALE 1"=200'

NON-STANDARD CONDITIONS

	DEVIATION DESCRIPTION	AFFECTED STANDARD	STANDARD	EXISTING	PROPOSED DISPOSITION
A	BUILDINGS WITHIN BUILDING RESTRICTION LINE (BRL)	AC 150/5300-13A, PARAGRAPH 213a	NO BUILDINGS ALLOWED WITHIN THE BRL	EXISTING HANGARS, MOBILE HOME AND OUTBUILDINGS	REMOVE BUILDINGS
B	OBSTRUCTIONS TO AIR NAVIGATION	FEDERAL AIR REGULATIONS PART 77	NO PENETRATIONS OF FAR PART 77 AIRSPACE	PENETRATIONS OF TRANSITIONAL AND APPROACH SURFACES	REMOVE OBSTRUCTIONS (SEE SHEETS 4-5)
C	OBSTRUCTIONS TO AIR NAVIGATION	FEDERAL AIR REGULATIONS PART 77	NO PENETRATIONS OF FAR PART 77 AIRSPACE	TERRAIN PENETRATIONS OF HORIZONTAL & CONICAL SURFACES	FAA STUDY REQUESTED (SEE SHEET 3)
D	ACCESS ROAD WITHIN RUNWAY PROTECTION ZONE (RPZ)	AC 150/5300-13A, PARAGRAPH 310	PUBLIC ROADWAYS ARE NOT PERMITTED WITHIN THE RPZ	AIRPORT ACCESS ROAD WITHIN THE RWY 29 RPZ	RELOCATE THE AIRPORT ACCESS ROAD
E	SERVICE ROAD WITHIN RUNWAY PROTECTION ZONE (RPZ)	AC 150/5300-13A, PARAGRAPH 310	PUBLIC ROADWAYS ARE NOT PERMITTED WITHIN THE RPZ	DIRT SERVICE ROAD WITHIN THE RWY 11 RPZ	CLOSE THE ROAD
F	DIRECT APRON TO RUNWAY TAXIWAY THRU PARALLEL TAXIWAY	AC 150/5300-13A, PARAGRAPH 401 (5) (g)	NO DIRECT ACCESS THRU PARALLEL TAXIWAY	TAXIWAY A4 CROSSES PARALLEL TAXIWAY A	RECONFIGURE TAXIWAY A4

THIS TABLE PERTAINS TO EXISTING AIRPORT CONDITIONS AS OBSERVED SEPTEMBER, 2014

BUILDINGS AND FACILITIES

EXISTING

NO.	DESCRIPTION	ELEV. (1)
1	TERMINAL BUILDING	3255.0
2	TEE HANGAR (COUNTY OWNED)	3263.2
3	TEE HANGAR (COUNTY OWNED)	3263.2
4	ELECTRICAL VAULT	3256.8
5	HANGAR (PRIVATELY OWNED)	–
6	TEE HANGAR (PRIVATELY OWNED)	–
7	STORAGE UNIT (PRIVATELY OWNED)	–
8	RESIDENCE (MOBILE HOME)–TO BE REMOVED	3250.2
9	OUTBUILDINGS–TO BE REMOVED	–
10	TEE HANGARS (PRIVATELY OWNED)–TO BE REMOVED	3262.5
11	FUEL STORAGE TANK	3252.5

(1) INDICATES SURVEYED PEAK ELEVATION

(SEE SHEETS 8–9)

ULTIMATE

NO.	DESCRIPTION	ELEV. (2)
A	TEE HANGARS	3265.9
B	TEE HANGARS	3266.5
C	TEE HANGARS	3267.0
D	TEE HANGARS	3267.6
E	TEE HANGARS	3268.2
F	TEE HANGARS	3268.8
G	TEE HANGARS	3269.3
H	TEE HANGARS	3269.8
I	LARGER HANGARS	3281.3
J	TEE HANGARS	3261.8
K	SHADE STRUCTURE	3276.7(3)

(2) INDICATES THE APPROXIMATE HIGHEST ALLOWABLE PEAK ELEVATION NEAREST THE RUNWAY

(3) 3278.0 IS ALLOWABLE AT THE NORTHWEST END OF THE STRUCTURE, NEAREST THE RUNWAY

(SEE SHEETS 8–9)

RUNWAY DATA

RUNWAY	11		29	
	EXISTING	ULTIMATE	EXISTING	ULTIMATE
AIRPORT REFERENCE CODE (ARC)	B–I	B–II	B–I	B–II
RUNWAY DESIGN CODE (RDC)	B–I–VIS	B–II–5000	B–I–VIS	B–II–5000
APPROACH REFERENCE CODE (APRC)	B/II/VIS	B/II/5000	B/II/VIS	B/II/5000
DEPARTURE REFERENCE CODE (DPRC)	B/II	B/II	B/II	B/II
DESIGN AIRCRAFT (SEE TABLE FOR SPECIFICS)	CESSNA 414A	CESSNA 560 EXCEL	CESSNA 414A	CESSNA 560 EXCEL
RUNWAY LENGTH (FT)	4,200.01'	6,000'	4,200.01'	6,000'
RUNWAY WIDTH (FT)	75'	75'	75'	75'
EFFECTIVE RUNWAY GRADIENT	–0.515%	–0.515%	+0.515%	+0.515%
RUNWAY/TAXIWAY PAVEMENT MATERIAL	ASPHALT		ASPHALT	
SURFACE CONDITION	FAIR		FAIR	
PAVEMENT STRENGTH	12,500# SWG	20,000# SWG	12,500# SWG	20,000# SWG
RUNWAY MARKINGS	VISUAL	NONPRECISION	VISUAL	NONPRECISION
RUNWAY LIGHTING	MIRL		MIRL	
INSTRUMENT RUNWAY	NO		YES – NONPRECISION	
VISUAL AND INSTRUMENT NAVAIDS	PAPI–2		PAPI–2	
APPROACH SURFACE	20:1	34:1	20:1	34:1
APPROACH VISIBILITY MINIMUMS	VISUAL	<=1 MILE	VISUAL	<=1 MILE
DECLARED DISTANCES				
TAKE–OFF RUN AVAILABLE (TORA)	4,210.01'	6,000'	4,200.01'	6,000'
TAKE–OFF DISTANCE AVAILABLE (TODA)	4,210.01'	6,000'	4,200.01'	6,000'
ACCELERATED STOP DISTANCE AVAILABLE (ASDA)	4,210.01'	6,000'	4,200.01'	6,000'
LANDING DISTANCE AVAILABLE (LDA)	4,210.01'	6,000'	4,200.01'	6,000'
HIGHEST POINT ON RUNWAY CENTERLINE (MSL)	3271.77	3278.34	3271.77	3278.34
LOWEST POINT ON RUNWAY CENTERLINE (MSL)	3250.36	3250.36	3250.36	3250.36
RUNWAY TOUCHDOWN ZONE ELEVATION (MSL)	...	...	...	...
RUNWAY END ELEVATION (MSL)	3271.77	3278.34	3250.36	3250.36
RUNWAY END COORDINATES (NAD 83)				
LATITUDE	32°38'22.75486"N	32°38'32.68166"W	32°37'59.58974"N	32°37'59.58974"N
LONGITUDE	110°39'10.59927"W	110°39'28.07434"W	110°38'29.82806"W	110°38'29.82806"W
RUNWAY SAFETY AREA (RSA)				
LENGTH BEYOND RUNWAY END	240'	300'	240'	300'
WIDTH	120'	150'	120'	150'
RUNWAY OBJECT FREE AREA (ROFA)				
LENGTH BEYOND RUNWAY END	240'	300'	240'	300'
WIDTH	400'	500'	400'	500'
OBSTACLE FREE ZONE (OFZ)				
LENGTH BEYOND RUNWAY END	200'		200'	
WIDTH	250'		400'	
APPROACH RUNWAY PROTECTION ZONE (RPZ)				
DISTANCE BEYOND THRESHOLD	200'	200'	200'	200'
LENGTH	1,000'	1,000'	1,000'	1,000'
INNER/OUTER WIDTH	250'/450'	500'/700'	250'/450'	500'/700'
DEPARTURE RUNWAY PROTECTION ZONE (RPZ)			NOT APPLICABLE	
DISTANCE BEYOND TORA	200'			
LENGTH	1,000'			
MINIMUM – RWY CL TO PARALLEL TWY CL	225'	240'	225'	240'
MINIMUM – TWY CL TO FIXED/MOVEABLE OB.	44.5'	65.5'	44.5'	65.5'
TWY OBJECT FREE AREA WIDTH	89'	131'	89'	131'
TWY SAFETY AREA WIDTH	49'	79'	49'	79'
TWY WINGTIP CLEARANCE	20'	26'	20'	26'
LINE OF SIGHT REQUIREMENT MET	...		...	
HOLDLINE TO RWY CENTERLINE DISTANCE	125'		125'	

DESIGN AIRCRAFT

CESSNA 414A:
MAXIMUM TAKEOFF WEIGHT = 6,750 POUNDS
WINGSPAN = 44.17'
LENGTH = 36.42'
TAIL HEIGHT = 11.50'
UNDERCARRIAGE WIDTH = 14.67'
APPROACH SPEED = 94 KNOTS

CESSNA 560 EXCEL:
MAXIMUM TAKEOFF WEIGHT = 20,000 POUNDS
WINGSPAN = 55.83'
LENGTH = 51.83'
TAIL HEIGHT = 17.25'
UNDERCARRIAGE WIDTH = 21.92'
APPROACH SPEED = 117 KNOTS

NOTES

1. ALL EXISTING TAXIWAYS ARE TAXIWAY DESIGN GROUP 2 (TDG–2)
2. ALL ULTIMATE TAXIWAYS ARE TAXIWAY DESIGN GROUP 2 (TDG–2).
3. ALL EXISTING TAXIWAYS ARE 35' WIDE, UNLESS INDICATED OTHERWISE.
4. ALL ULTIMATE TAXIWAYS ARE 35' WIDE, UNLESS INDICATED OTHERWISE.
5. ALL ULTIMATE TAXIWAYS SAFETY AREAS ARE 79' WIDE. ALL ULTIMATE TAXIWAY OBJECT FREE AREAS ARE 131' WIDE.
6. ALL EXISTING RUNWAYS AND TAXIWAYS ARE BITUMINOUS PAVEMENT.
7. ALL ULTIMATE PAVEMENT WILL BE BITUMINOUS PAVEMENT, UNLESS SHOWN OTHERWISE.
8. ALL LATITUDE/LONGITUDE COORDINATES SHOWN ARE 1983 NORTH AMERICAN DATUM (NAD 83).
9. LINE OF SIGHT ALONG RUNWAY 11–29 IS IN COMPLIANCE WITH AC 150/5300–13A.
10. ALL RUNWAY HOLDING POSITION MARKINGS AND MANDATORY SIGNS ARE 200' FROM RUNWAY CENTERLINE.
11. THERE ARE NO PENETRATIONS OF THE EXISTING RUNWAY 11 AND 29 OBSTACLE FREE ZONES (OFZ), WITH THE EXCEPTION ON THOSE FIXED BY FUNCTION.

Funding Acknowledgement

The preparation of this document was financed in part through a grant from the Federal Aviation Administration as provided under Section 505 of the Airport and Airway Improvement Act of 1982, as amended by the Airport and Airway Safety and Expansion Act of 1987. The contents do not necessarily reflect the official views or policy of the FAA. Acceptance of this report by the FAA does not in any way constitute a commitment on the part of the United States to participate in any development depicted therein nor does it indicate that the proposed development is environmentally in accordance with appropriate public laws.

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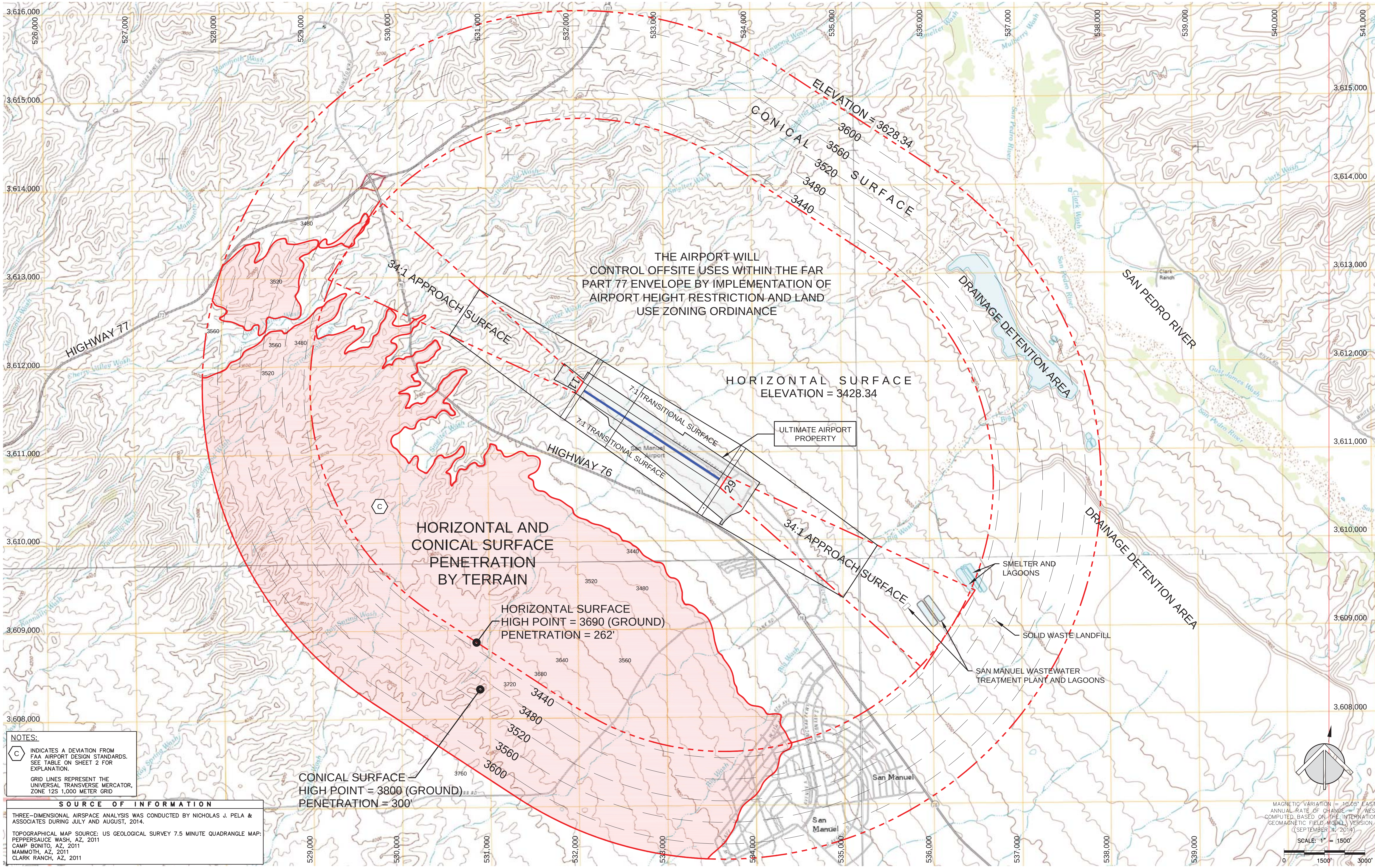
△	REVISION	DATE

AIRPORT LAYOUT DRAWING

SAN MANUEL AIRPORT - SAN MANUEL, ARIZONA

DESIGN:	NJP
DRAWN:	DSO
CHECK:	NJP
Date:	4/08/2015

SHEET
2
of
11



NOTES:

(C) INDICATES A DEVIATION FROM FAA AIRPORT DESIGN STANDARDS. SEE TABLE ON SHEET 2 FOR EXPLANATION.

GRID LINES REPRESENT THE UNIVERSAL TRANSVERSE MERCATOR, ZONE 12S 1,000 METER GRID

SOURCE OF INFORMATION

THREE-DIMENSIONAL AIRSPACE ANALYSIS WAS CONDUCTED BY NICHOLAS J. PELA & ASSOCIATES DURING JULY AND AUGUST, 2014.

TOPOGRAPHICAL MAP SOURCE: US GEOLOGICAL SURVEY 7.5 MINUTE QUADRANGLE MAP:
PEPPERSAUCE WASH, AZ, 2011
CAMP BONITO, AZ, 2011
MAMMOTH, AZ, 2011
CLARK RANCH, AZ, 2011

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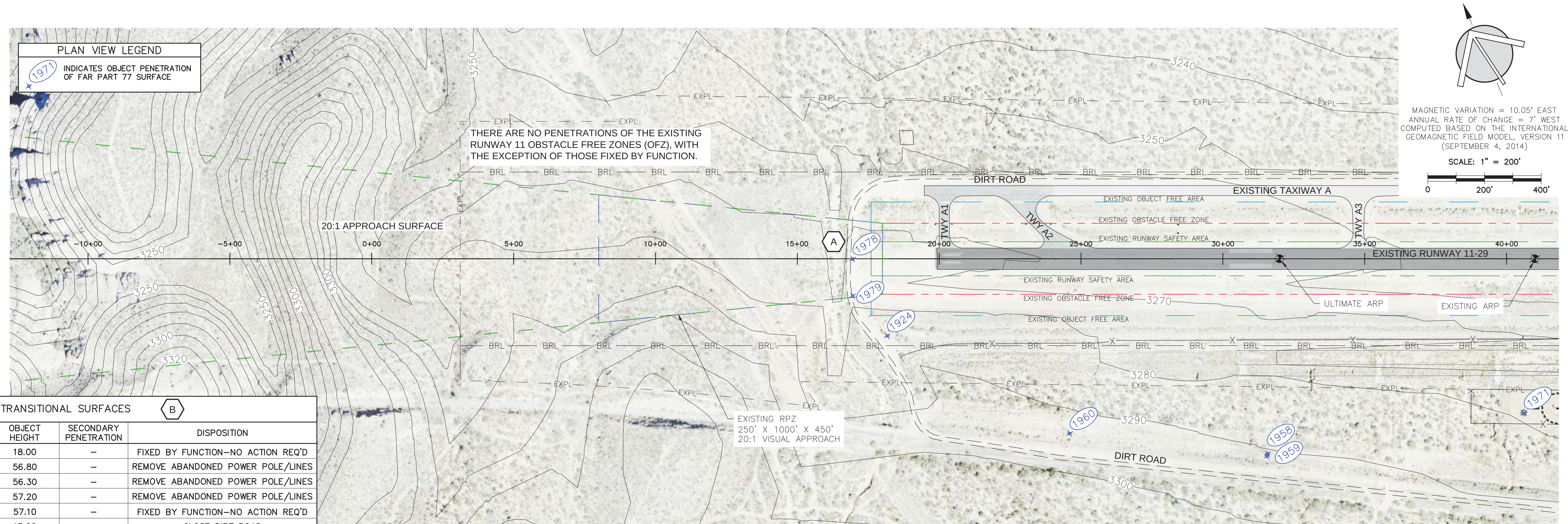
△	REVISION	DATE

AIRPORT AIRSPACE LAYOUT - FAR PART 77

SAN MANUEL AIRPORT - SAN MANUEL, ARIZONA

DESIGN:	NJP
DRAWN:	DSO
CHECK:	NJP
Date:	4/08/2015

SHEET 3 of 11



RWY 11 - PLAN

SCALE = 1:200

EXISTING APPROACH, PRIMARY AND TRANSITIONAL SURFACES (B)							
POINT	DESCRIPTION	OBJECT PENETRATION	TOP ELEVATION	GROUND ELEVATION	OBJECT HEIGHT	SECONDARY PENETRATION	DISPOSITION
1924	WINDSOCK	12.55	3305.20	3287.20	18.00	–	FIXED BY FUNCTION–NO ACTION REQ'D
1958	POWER POLE (ABANDONED)	4.49	3350.50	3293.70	56.80	–	REMOVE ABANDONED POWER POLE/LINES
1959	POWER POLE (ABANDONED)	3.22	3350.50	3294.20	56.30	–	REMOVE ABANDONED POWER POLE/LINES
1960	POWER POLE (ABANDONED)	12.18	3351.60	3294.40	57.20	–	REMOVE ABANDONED POWER POLE/LINES
1971	ROTATING BEACON	19.04	3340.00	3282.90	57.10	–	FIXED BY FUNCTION–NO ACTION REQ'D
1978	DIRT ROAD	8.18	3285.20	3270.20	15.00	–	CLOSE DIRT ROAD
1979	DIRT ROAD	12.98	3290.00	3275.00	15.00	–	CLOSE DIRT ROAD

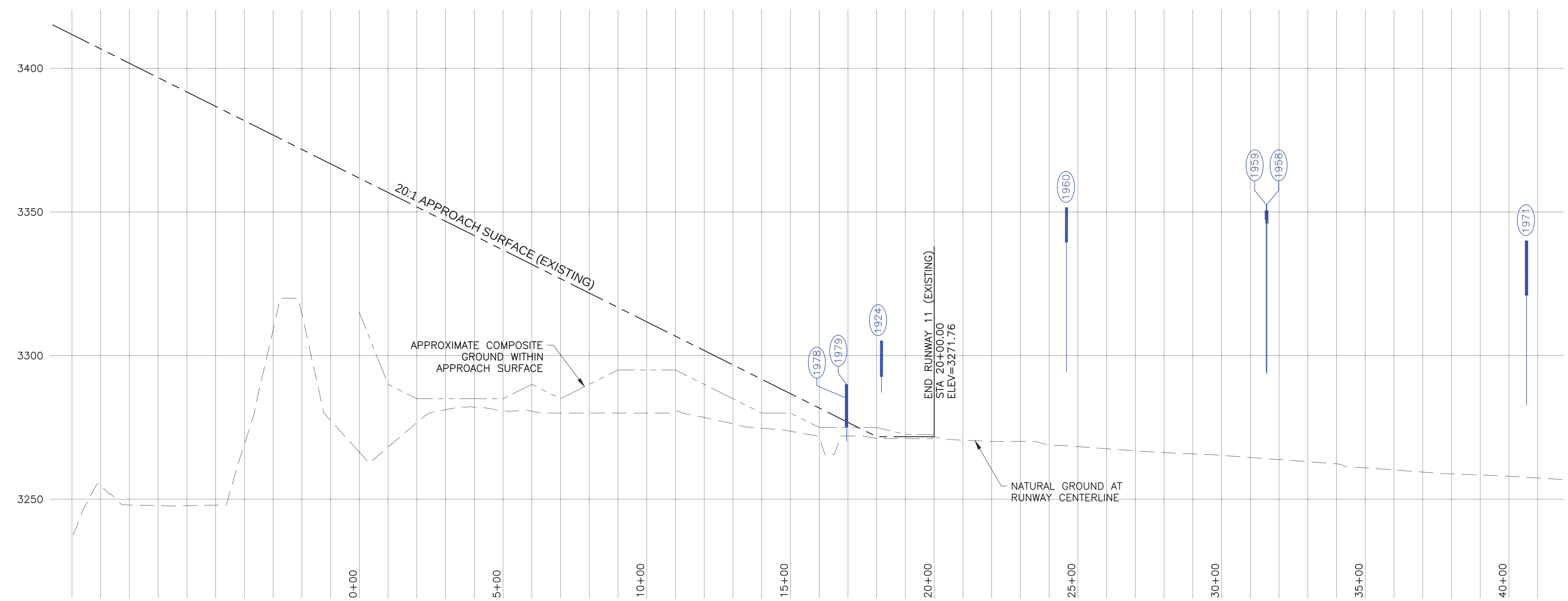
PROFILE VIEW LEGEND

1950 INDICATES OBJECT PENETRATION OF PART 77 SURFACE

TOP OF OBJECT

POINT OF PENETRATION

GROUND



RWY 11 - PROFILE

SCALE (HORIZ.) = 1:200

SCALE (VERT.) = 1:20

NOTES:

(A) INDICATES A DEVIATION FROM FAA AIRPORT DESIGN STANDARDS. SEE TABLE ON SHEET 2 FOR EXPLANATION.

SOURCE OF INFORMATION

OBJECTS WERE LOCATED BASED ON AN OBSTRUCTION SURVEY CONDUCTED BY DIBBLE ENGINEERING DURING APRIL–JUNE, 2014.

THREE–DIMENSIONAL AIRSPACE ANALYSIS WAS CONDUCTED BY NICHOLAS J. PELA & ASSOCIATES DURING JULY AND AUGUST, 2014.

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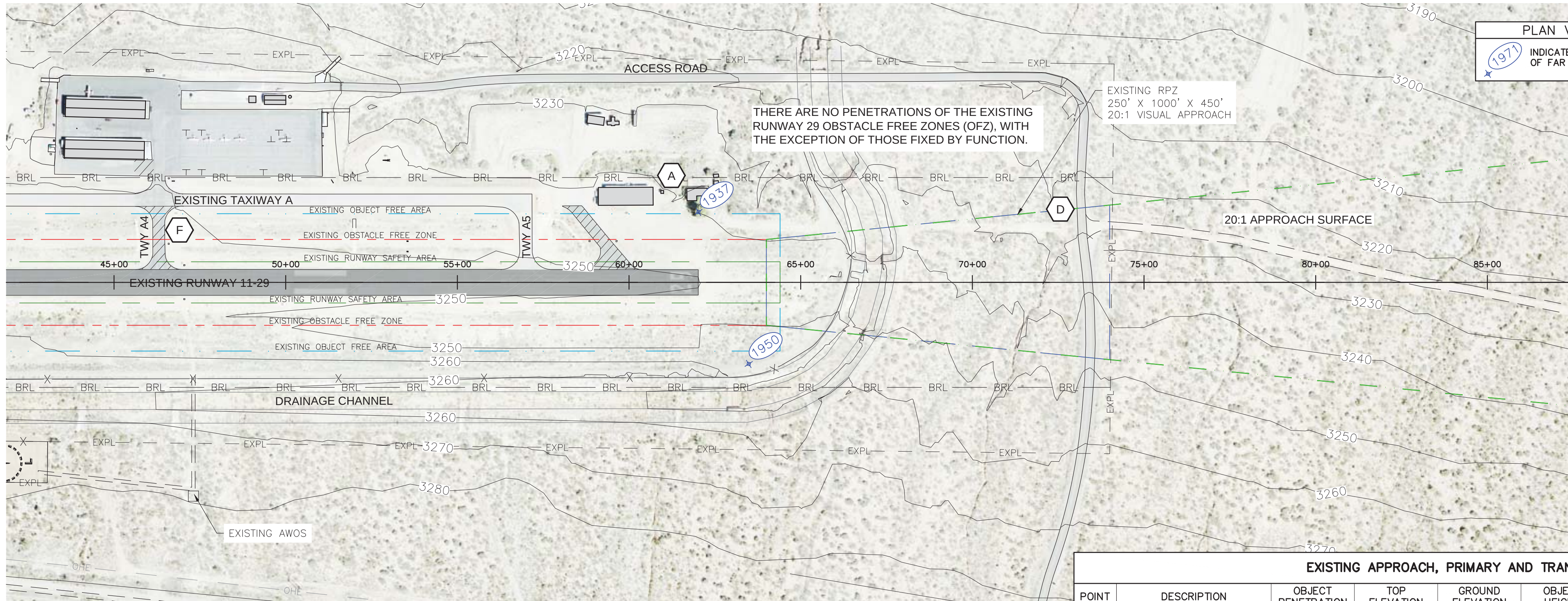
△	REVISION	DATE

RW 11 - INNER APPROACH SURFACE PLAN & PROFILE (EXISTING)

SAN MANUEL AIRPORT - SAN MANUEL, ARIZONA

DESIGN: NJP
DRAWN: DSO
CHECK: NJP
Date: 4/08/2015

SHEET 4 of 11



PLAN VIEW LEGEND

(1971) INDICATES OBJECT PENETRATION OF FAR PART 77 SURFACE

MAGNETIC VARIATION = 10.05° EAST
ANNUAL RATE OF CHANGE = 7' WEST
COMPUTED BASED ON THE INTERNATIONAL GEOMAGNETIC FIELD MODEL, VERSION 11
(SEPTEMBER 4, 2014)

SCALE: 1" = 200'

0 200' 400'

RWY 29 - PLAN

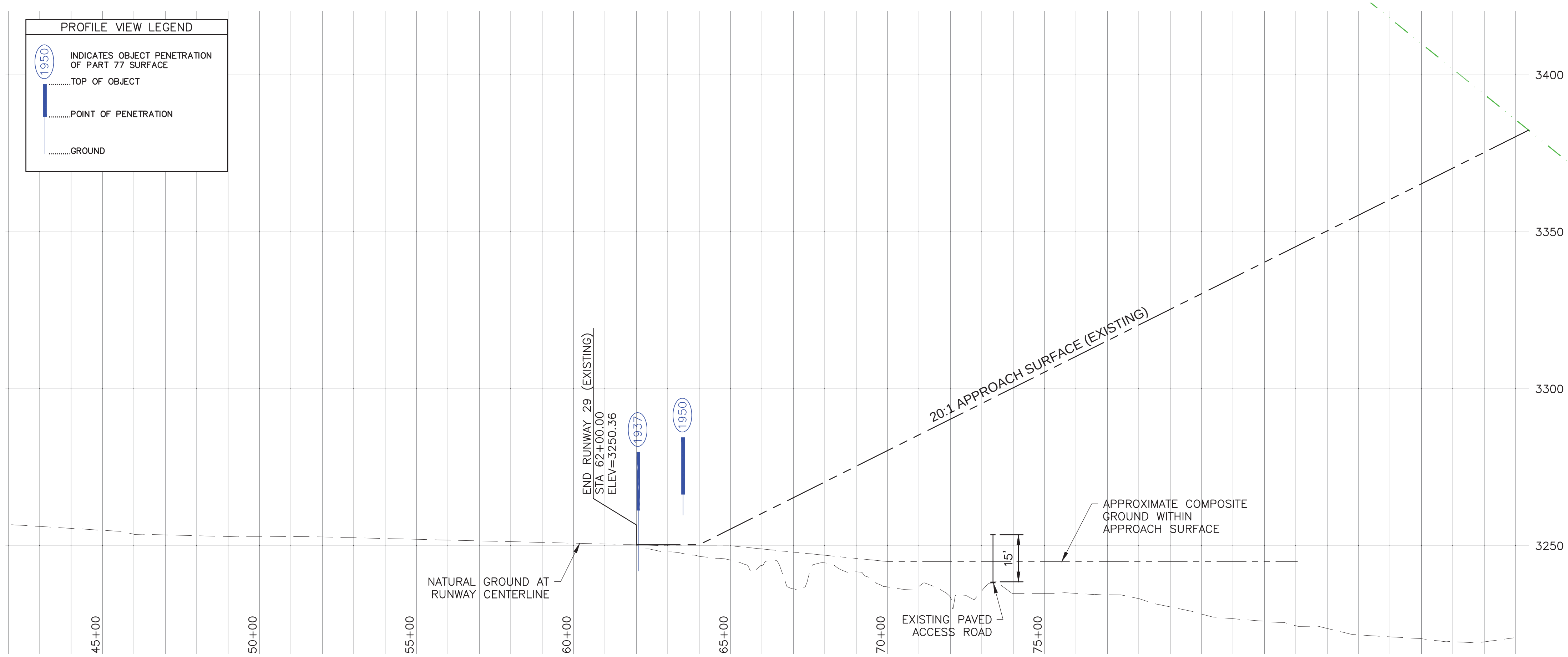
SCALE = 1:200

EXISTING APPROACH, PRIMARY AND TRANSITIONAL SURFACES (B)

POINT	DESCRIPTION	OBJECT PENETRATION	TOP ELEVATION	GROUND ELEVATION	OBJECT HEIGHT	SECONDARY PENETRATION	DISPOSITION
1937	TREE	18.62	3279.90	3242.00	37.90	–	REMOVE TREE
1950	WINDSOCK	18.08	3284.50	3259.80	24.70	–	FIXED BY FUNCTION–NO ACTION REQUIRED

PROFILE VIEW LEGEND

(1950) INDICATES OBJECT PENETRATION OF PART 77 SURFACE
TOP OF OBJECT
POINT OF PENETRATION
GROUND



RWY 29 - PROFILE

SCALE (HORIZ.) = 1:200
SCALE (VERT.) = 1:20

NOTES:

(A) INDICATES A DEVIATION FROM FAA AIRPORT DESIGN STANDARDS. SEE TABLE ON SHEET 2 FOR EXPLANATION.

SOURCE OF INFORMATION

OBJECTS WERE LOCATED BASED ON AN OBSTRUCTION SURVEY CONDUCTED BY DIBBLE ENGINEERING DURING APRIL–JUNE, 2014.

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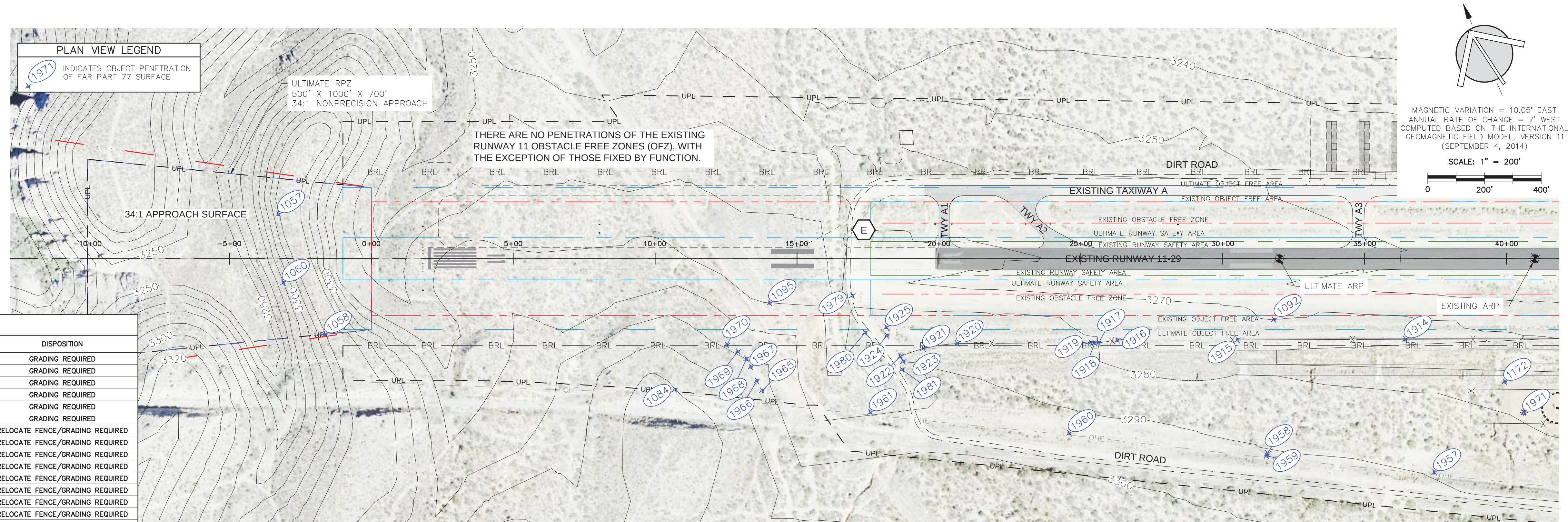
△	REVISION	DATE

RW 29 - INNER APPROACH SURFACE PLAN & PROFILE (EXISTING)

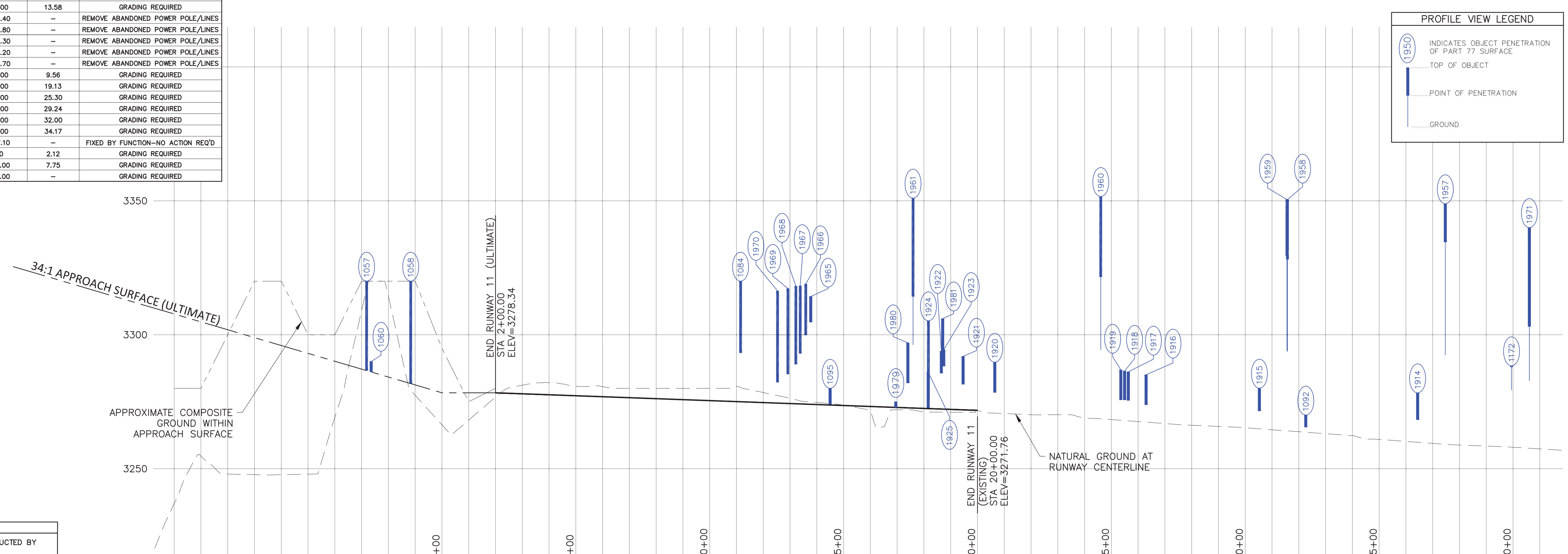
SAN MANUEL AIRPORT - SAN MANUEL, ARIZONA

DESIGN:	NJP
DRAWN:	DSO
CHECK:	NJP
Date:	4/08/2015



RWY 11 - PLAN

SCALE = 1:200



RWY 11 - PROFILE

SCALE (HORIZ.) = 1:200
SCALE (VERT.) = 1:20

EXISTING APPROACH, PRIMARY AND TRANSITIONAL SURFACES							
POINT	DESCRIPTION	OBJECT PENETRATION	TOP ELEVATION	GROUND ELEVATION	OBJECT HEIGHT	SECONDARY PENETRATION	DISPOSITION
1057	NATURAL GROUND	32.06	3320.00	3320.00	0.00	32.06	GRADING REQUIRED
1058	NATURAL GROUND	36.90	3320.00	3320.00	0.00	36.90	GRADING REQUIRED
1060	NATURAL GROUND	2.55	3290.00	3290.00	0.00	2.55	GRADING REQUIRED
1084	NATURAL GROUND	14.59	3320.00	3320.00	0.00	14.59	GRADING REQUIRED
1092	NATURAL GROUND	4.25	3270.00	3270.00	0.00	4.25	GRADING REQUIRED
1095	NATURAL GROUND	6.06	3280.00	3280.00	0.00	6.06	GRADING REQUIRED
1172	CHAIN LINK FENCE	0.49	3288.42	3279.42	9.00	–	RELOCATE FENCE/GRADING REQUIRED
1914	BARBED WIRE FENCE	10.00	3278.30	3274.30	4.00	6.00	RELOCATE FENCE/GRADING REQUIRED
1915	BARBED WIRE FENCE	8.49	3280.05	3276.05	4.00	4.49	RELOCATE FENCE/GRADING REQUIRED
1916	BARBED WIRE FENCE	11.20	3285.07	3281.07	4.00	7.20	RELOCATE FENCE/GRADING REQUIRED
1917	BARBED WIRE FENCE	10.67	3286.17	3282.17	4.00	6.67	RELOCATE FENCE/GRADING REQUIRED
1918	GATE	10.76	3286.47	3282.47	4.00	6.76	RELOCATE FENCE/GRADING REQUIRED
1919	BARBED WIRE FENCE	11.20	3286.89	3282.89	4.00	7.20	RELOCATE FENCE/GRADING REQUIRED
1920	BARBED WIRE FENCE	11.29	3289.75	3285.75	4.00	7.29	RELOCATE FENCE/GRADING REQUIRED
1921	BARBED WIRE FENCE	10.42	3291.94	3287.94	4.00	6.42	RELOCATE FENCE/GRADING REQUIRED
1922	BARBED WIRE FENCE	8.22	3293.90	3289.90	4.00	4.22	RELOCATE FENCE/GRADING REQUIRED
1923	BARBED WIRE FENCE	6.17	3294.47	3290.47	4.00	2.17	RELOCATE FENCE/GRADING REQUIRED
1924	WINDSOCK	29.75	3305.20	3287.20	18.00	11.75	FIXED BY FUNCTION–NO ACTION REQ'D
1925	SM–B1	13.58	3286.02	3286.02	0.00	13.58	GRADING REQUIRED
1957	POWER POLE (ABANDONED)	14.26	3348.90	3292.50	56.40	–	REMOVE ABANDONED POWER POLE/LINES
1958	POWER POLE (ABANDONED)	22.35	3350.50	3293.70	56.80	–	REMOVE ABANDONED POWER POLE/LINES
1959	POWER POLE (ABANDONED)	21.08	3350.50	3294.20	56.30	–	REMOVE ABANDONED POWER POLE/LINES
1960	POWER POLE (ABANDONED)	30.04	3351.60	3294.40	57.20	–	REMOVE ABANDONED POWER POLE/LINES
1961	POWER POLE (ABANDONED)	36.73	3351.00	3296.30	54.70	–	REMOVE ABANDONED POWER POLE/LINES
1965	NATURAL GROUND	9.56	3314.30	3314.30	0.00	9.56	GRADING REQUIRED
1966	NATURAL GROUND	19.13	3319.00	3319.00	0.00	19.13	GRADING REQUIRED
1967	NATURAL GROUND	25.30	3318.30	3318.30	0.00	25.30	GRADING REQUIRED
1968	NATURAL GROUND	29.24	3318.20	3318.20	0.00	29.24	GRADING REQUIRED
1969	NATURAL GROUND	32.00	3317.30	3317.30	0.00	32.00	GRADING REQUIRED
1970	NATURAL GROUND	34.17	3316.40	3316.40	0.00	34.17	GRADING REQUIRED
1971	ROTATING BEACON	36.90	3340.00	3282.90	57.10	–	FIXED BY FUNCTION–NO ACTION REQ'D
1979	OLD CLOSED DIRT ROAD	2.12	3275.00	3275.00	0	2.12	GRADING REQUIRED
1980	DIRT ROAD	22.75	3297.00	3282.00	15.00	7.75	GRADING REQUIRED
1981	DIRT ROAD	13.66	3306.00	3291.00	15.00	–	GRADING REQUIRED

NOTES:

A INDICATES A DEVIATION FROM FAA AIRPORT DESIGN STANDARDS. SEE TABLE ON SHEET 2 FOR EXPLANATION.

SOURCE OF INFORMATION

OBJECTS WERE LOCATED BASED ON AN OBSTRUCTION SURVEY CONDUCTED BY DIBBLE ENGINEERING DURING APRIL–JUNE, 2014.

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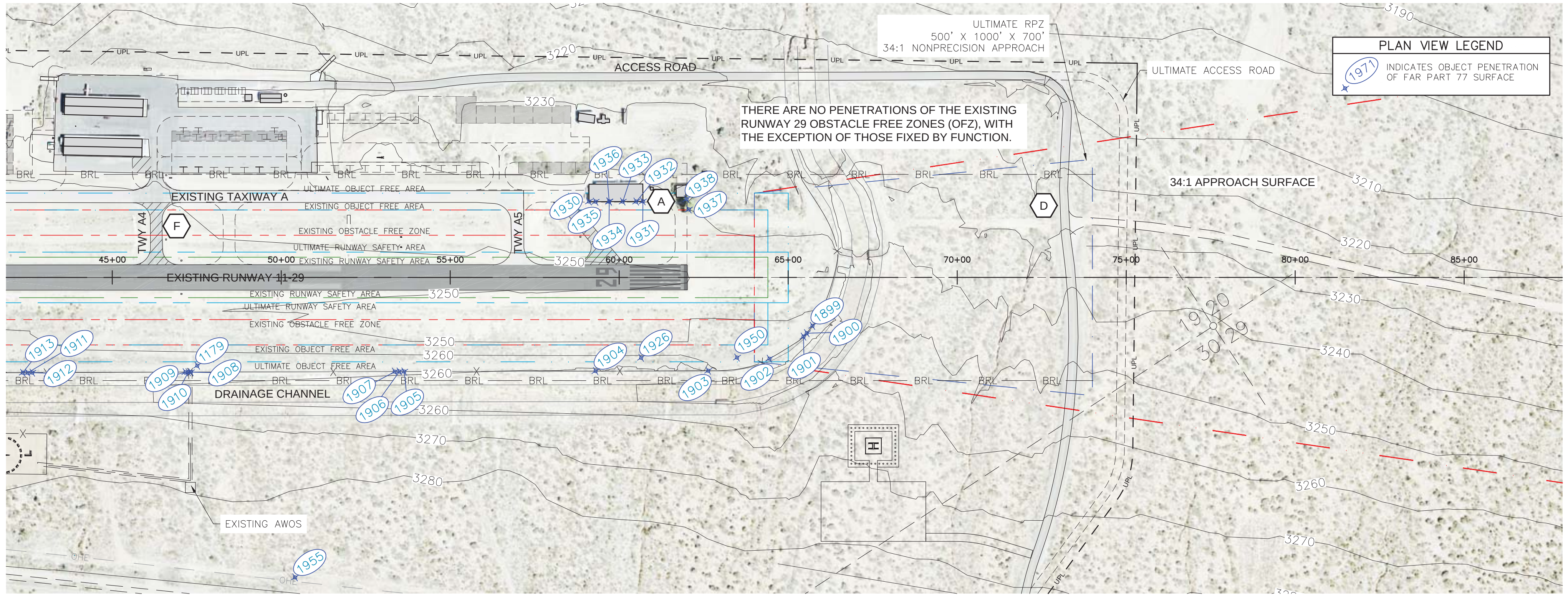
△	REVISION	DATE

RW 11 - INNER APPROACH SURFACE PLAN & PROFILE (ULTIMATE)

SAN MANUEL AIRPORT - SAN MANUEL, ARIZONA

DESIGN: NJP
DRAWN: DSO
CHECK: NJP
Date: 4/08/2015

SHEET 6 of 11



MAGNETIC VARIATION = 10.05° EAST
ANNUAL RATE OF CHANGE = 7' WEST
COMPUTED BASED ON THE INTERNATIONAL GEOMAGNETIC FIELD MODEL, VERSION 11
(SEPTEMBER 4, 2014)

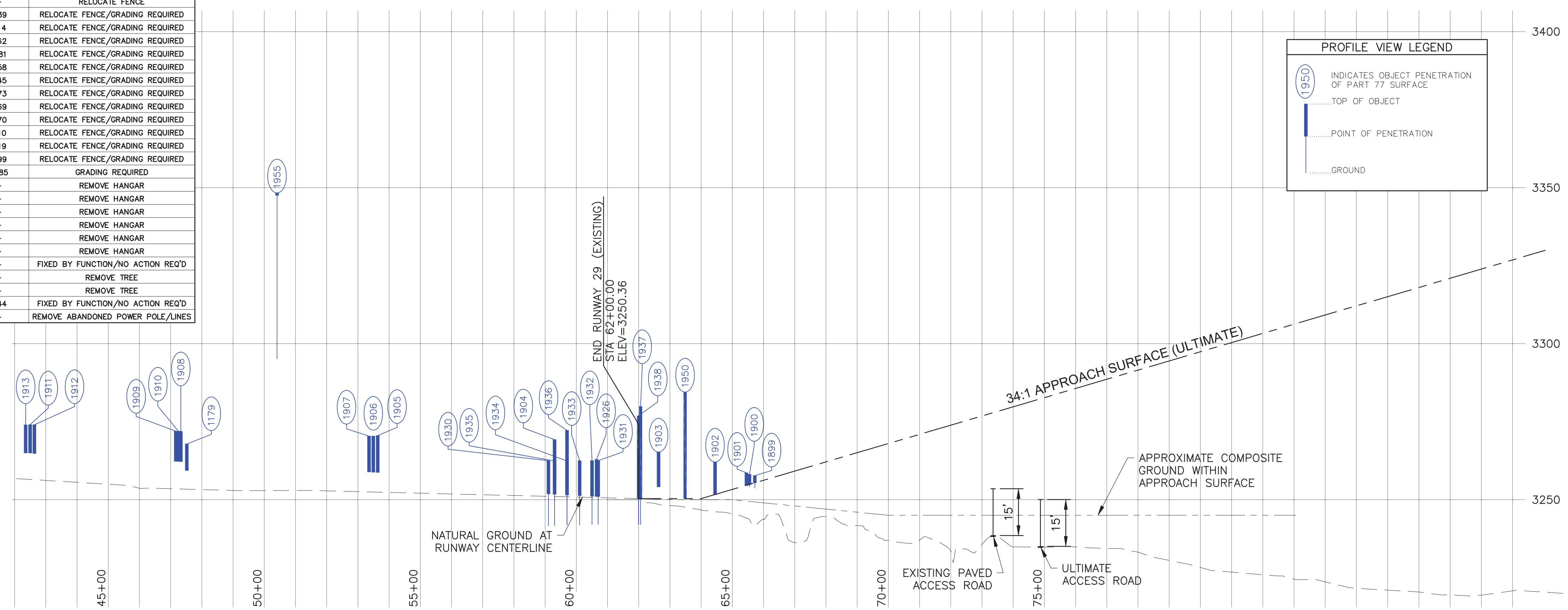
SCALE: 1" = 200'

0 200' 400'

RWY 29 - PLAN

SCALE = 1:200

EXISTING APPROACH, PRIMARY AND TRANSITIONAL SURFACES							
POINT	DESCRIPTION	OBJECT PENETRATION	TOP ELEVATION	GROUND ELEVATION	OBJECT HEIGHT	SECONDARY PENETRATION	DISPOSITION
1179	FND-NAIL PCHD	8.49	3267.86	3267.86	0.00	8.49	GRADING REQUIRED
1899	BARBED WIRE FENCE	2.31	3257.72	3253.72	4.00	–	RELOCATE FENCE
1900	GATE	3.24	3258.16	3254.16	4.00	–	RELOCATE FENCE
1901	BARBED WIRE FENCE	3.96	3258.60	3254.60	4.00	–	RELOCATE FENCE
1902	BARBED WIRE FENCE	10.39	3262.06	3258.06	4.00	6.39	RELOCATE FENCE/GRADING REQUIRED
1903	BARBED WIRE FENCE	11.14	3265.26	3261.26	4.00	7.14	RELOCATE FENCE/GRADING REQUIRED
1904	BARBED WIRE FENCE	13.62	3269.26	3265.26	4.00	9.62	RELOCATE FENCE/GRADING REQUIRED
1905	BARBED WIRE FENCE	11.81	3270.56	3266.56	4.00	7.81	RELOCATE FENCE/GRADING REQUIRED
1906	GATE	11.58	3270.38	3266.38	4.00	7.58	RELOCATE FENCE/GRADING REQUIRED
1907	BARBED WIRE FENCE	11.45	3270.37	3266.37	4.00	7.45	RELOCATE FENCE/GRADING REQUIRED
1908	BARBED WIRE FENCE	9.73	3271.93	3267.93	4.00	5.73	RELOCATE FENCE/GRADING REQUIRED
1909	BARBED WIRE FENCE	9.69	3271.99	3267.99	4.00	5.69	RELOCATE FENCE/GRADING REQUIRED
1910	GATE	9.70	3271.99	3267.99	4.00	5.70	RELOCATE FENCE/GRADING REQUIRED
1911	GATE	9.10	3274.05	3270.05	4.00	5.10	RELOCATE FENCE/GRADING REQUIRED
1912	BARBED WIRE FENCE	9.19	3274.01	3270.01	4.00	5.19	RELOCATE FENCE/GRADING REQUIRED
1913	BARBED WIRE FENCE	8.99	3273.98	3269.98	4.00	4.99	RELOCATE FENCE/GRADING REQUIRED
1926	SM-B2	11.85	3262.90	3262.90	0.00	11.85	GRADING REQUIRED
1930	BUILDING	10.66	3262.50	3241.74	20.76	–	REMOVE HANGAR
1931	BUILDING	11.48	3262.50	3242.12	20.38	–	REMOVE HANGAR
1932	HANGARS	11.38	3262.50	3242.10	20.40	–	REMOVE HANGAR
1933	HANGARS	11.17	3262.50	3241.90	20.60	–	REMOVE HANGAR
1934	HANGARS	10.87	3262.40	3241.80	20.60	–	REMOVE HANGAR
1935	HANGARS	10.66	3262.40	3241.70	20.70	–	REMOVE HANGAR
1936	WINDSOCK	20.67	3272.20	3241.90	30.30	–	FIXED BY FUNCTION/NO ACTION REQ'D
1937	TREE	29.54	3279.90	3242.00	37.90	–	REMOVE TREE
1938	TREE	26.54	3276.90	3242.00	34.90	–	REMOVE TREE
1950	WINDSOCK	34.14	3284.50	3259.80	24.70	9.44	FIXED BY FUNCTION/NO ACTION REQ'D
1955	POWER POLE (ABANDONED)	0.79	3348.30	3295.20	53.10	–	REMOVE ABANDONED POWER POLE/LINES



NOTES:

(A) INDICATES A DEVIATION FROM FAA AIRPORT DESIGN STANDARDS. SEE TABLE ON SHEET 2 FOR EXPLANATION.

SOURCE OF INFORMATION

OBJECTS WERE LOCATED BASED ON AN OBSTRUCTION SURVEY CONDUCTED BY DIBBLE ENGINEERING DURING APRIL–JUNE, 2014.

THREE-DIMENSIONAL AIRSPACE ANALYSIS WAS CONDUCTED BY NICHOLAS J. PELA & ASSOCIATES DURING JULY AND AUGUST, 2014.

RWY 29 - PROFILE

SCALE (HORIZ.) = 1:200
SCALE (VERT.) = 1:20

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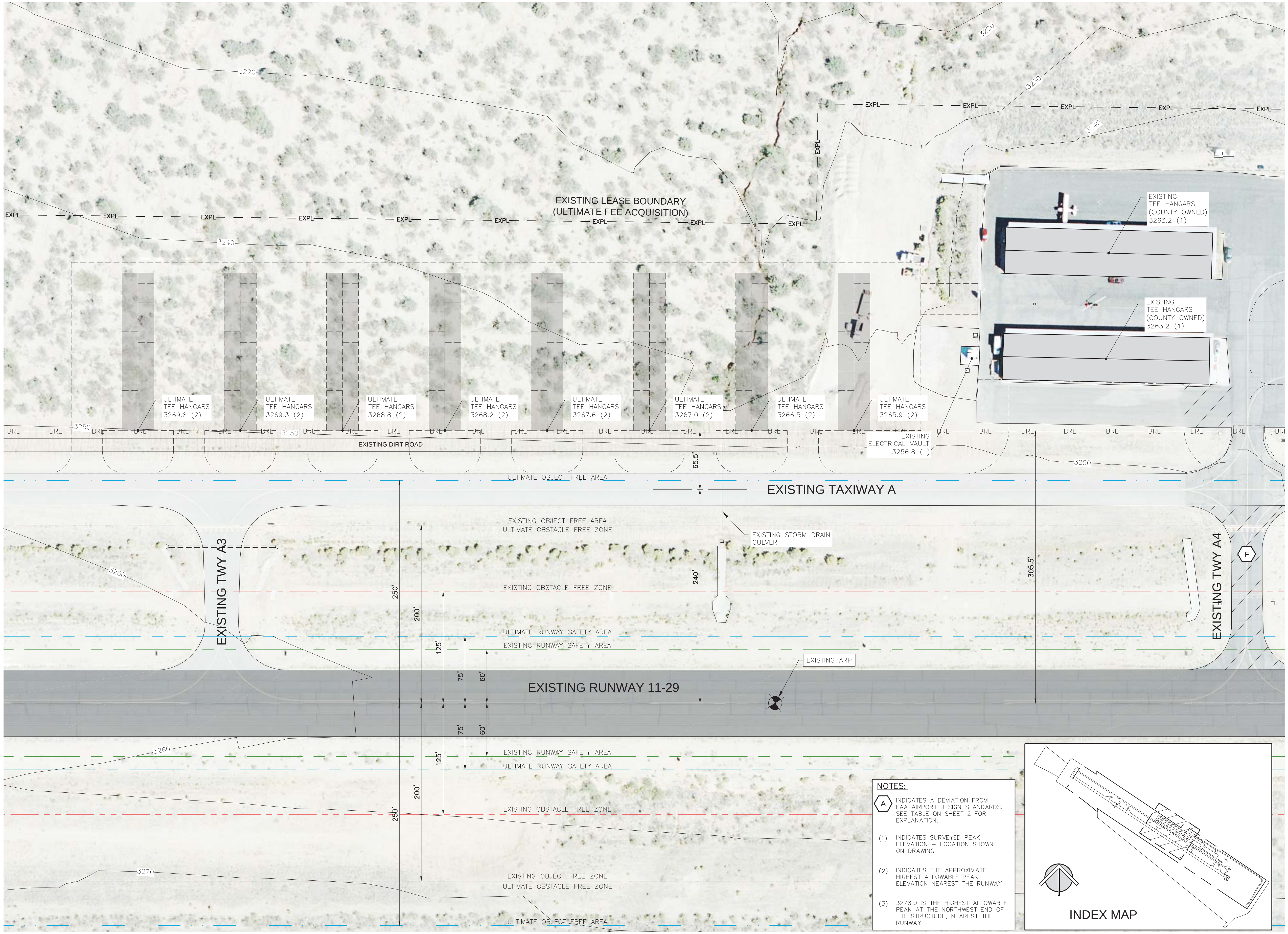
nicholas.pela@nicholaspela.com

△	REVISION	DATE

RW 29 - INNER APPROACH SURFACE PLAN & PROFILE (ULTIMATE)

SAN MANUEL AIRPORT - SAN MANUEL, ARIZONA

DESIGN: NJP
DRAWN: DSO
CHECK: NJP
Date: 4/08/2015



NOTES:

(A) INDICATES A DEVIATION FROM FAA AIRPORT DESIGN STANDARDS. SEE TABLE ON SHEET 2 FOR EXPLANATION.

(1) INDICATES SURVEYED PEAK ELEVATION – LOCATION SHOWN ON DRAWING

(2) INDICATES THE APPROXIMATE HIGHEST ALLOWABLE PEAK ELEVATION NEAREST THE RUNWAY

(3) 3278.0 IS THE HIGHEST ALLOWABLE PEAK AT THE NORTHWEST END OF THE STRUCTURE, NEAREST THE RUNWAY

MAGNETIC VARIATION = 10.05° EAST
ANNUAL RATE OF CHANGE = 7' WEST
COMPUTED BASED ON THE INTERNATIONAL GEOMAGNETIC FIELD MODEL, VERSION 11
(SEPTEMBER 4, 2014)

SCALE: 1" = 50'

0 50' 100'

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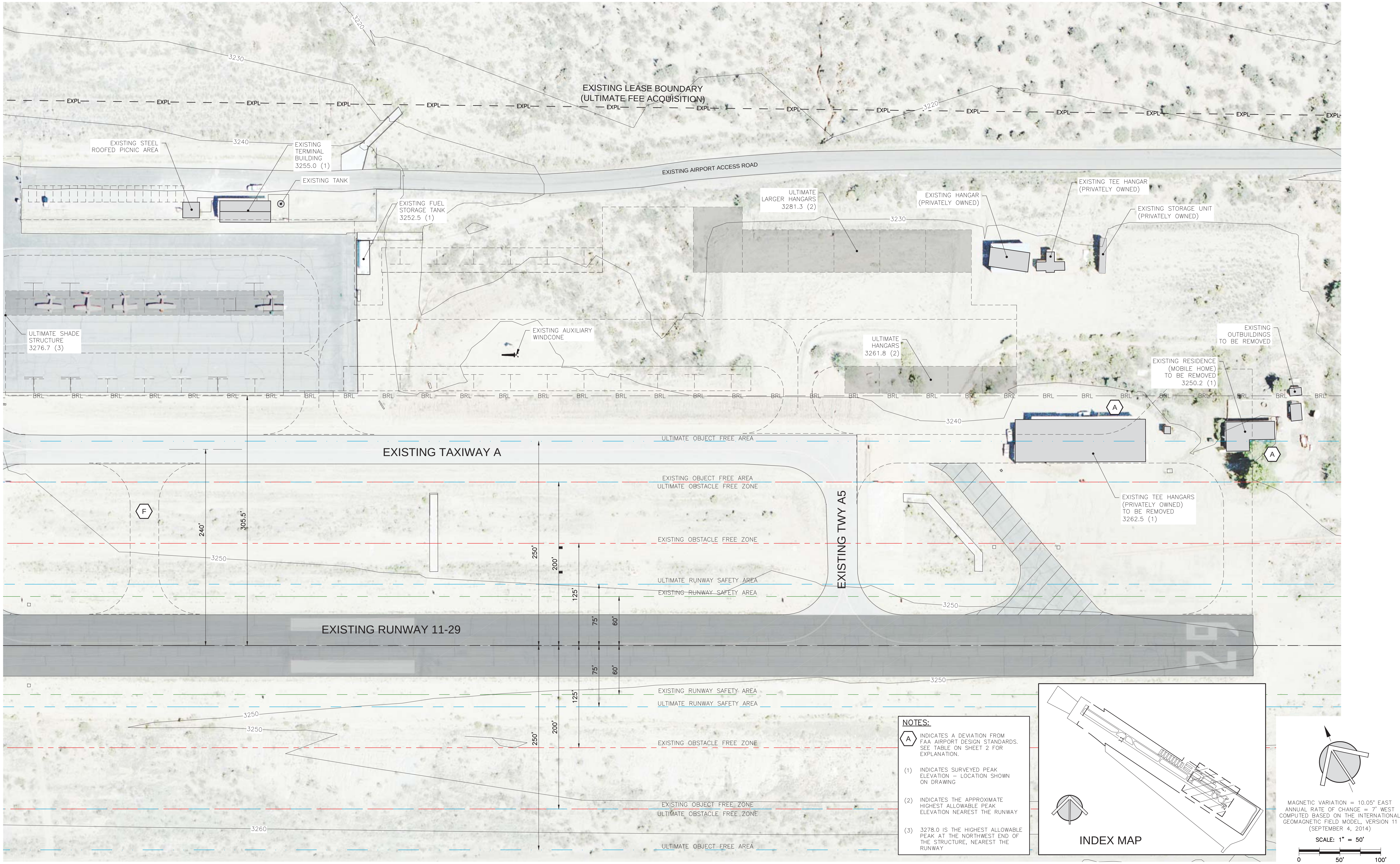
△	REVISION	DATE

TERMINAL AREA PLAN - NORTHWEST

SAN MANUEL AIRPORT - SAN MANUEL, ARIZONA

DESIGN:	NJP
DRAWN:	DSO
CHECK:	NJP
Date:	4/08/2015

SHEET
8
of
11



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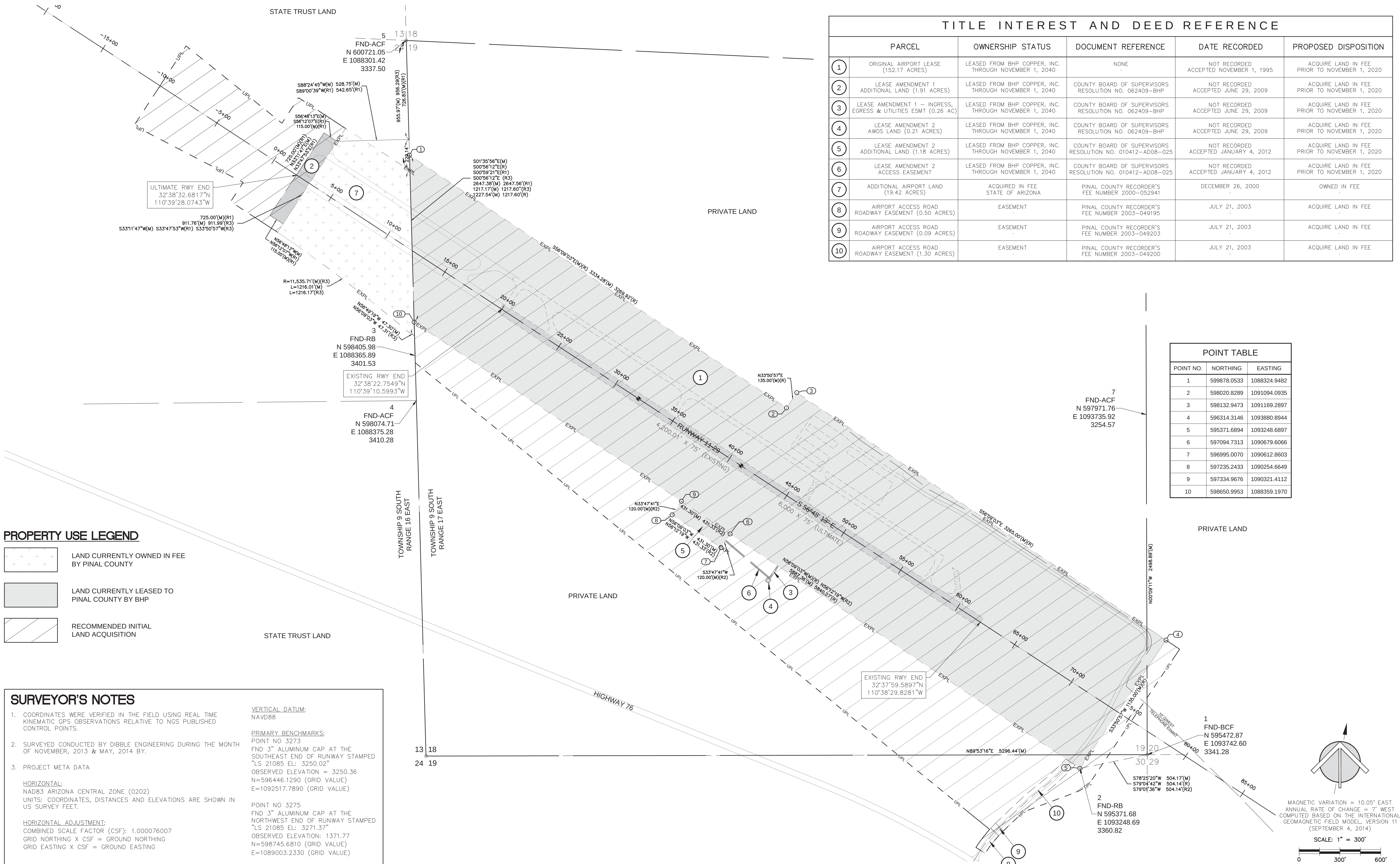
△	REVISION	DATE

TERMINAL AREA PLAN - SOUTHEAST

SAN MANUEL AIRPORT - SAN MANUEL, ARIZONA

DESIGN:	NJP
DRAWN:	DSO
CHECK:	NJP
Date:	4/08/2015



TITLE INTEREST AND DEED REFERENCE

	PARCEL	OWNERSHIP STATUS	DOCUMENT REFERENCE	DATE RECORDED	PROPOSED DISPOSITION
1	ORIGINAL AIRPORT LEASE (152.17 ACRES)	LEASED FROM BHP COPPER, INC. THROUGH NOVEMBER 1, 2040	NONE ·	NOT RECORDED ACCEPTED NOVEMBER 1, 1995	ACQUIRE LAND IN FEE PRIOR TO NOVEMBER 1, 2020
2	LEASE AMENDMENT 1 ADDITIONAL LAND (1.91 ACRES)	LEASED FROM BHP COPPER, INC. THROUGH NOVEMBER 1, 2040	COUNTY BOARD OF SUPERVISORS RESOLUTION NO. 062409–BHP	NOT RECORDED ACCEPTED JUNE 29, 2009	ACQUIRE LAND IN FEE PRIOR TO NOVEMBER 1, 2020
3	LEASE AMENDMENT 1 – INGRESS, EGRESS & UTILITIES ESMT (0.26 AC)	LEASED FROM BHP COPPER, INC. THROUGH NOVEMBER 1, 2040	COUNTY BOARD OF SUPERVISORS RESOLUTION NO. 062409–BHP	NOT RECORDED ACCEPTED JUNE 29, 2009	ACQUIRE LAND IN FEE PRIOR TO NOVEMBER 1, 2020
4	LEASE AMENDMENT 2 AWOS LAND (0.21 ACRES)	LEASED FROM BHP COPPER, INC. THROUGH NOVEMBER 1, 2040	COUNTY BOARD OF SUPERVISORS RESOLUTION NO. 062409–BHP	NOT RECORDED ACCEPTED JUNE 29, 2009	ACQUIRE LAND IN FEE PRIOR TO NOVEMBER 1, 2020
5	LEASE AMENDMENT 2 ADDITIONAL LAND (1.18 ACRES)	LEASED FROM BHP COPPER, INC. THROUGH NOVEMBER 1, 2040	COUNTY BOARD OF SUPERVISORS RESOLUTION NO. 010412–AD08–025	NOT RECORDED ACCEPTED JANUARY 4, 2012	ACQUIRE LAND IN FEE PRIOR TO NOVEMBER 1, 2020
6	LEASE AMENDMENT 2 ACCESS EASEMENT	LEASED FROM BHP COPPER, INC. THROUGH NOVEMBER 1, 2040	COUNTY BOARD OF SUPERVISORS RESOLUTION NO. 010412–AD08–025	NOT RECORDED ACCEPTED JANUARY 4, 2012	ACQUIRE LAND IN FEE PRIOR TO NOVEMBER 1, 2020
7	ADDITIONAL AIRPORT LAND (19.42 ACRES)	ACQUIRED IN FEE STATE OF ARIZONA	PINAL COUNTY RECORDER'S FEE NUMBER 2000–052941	DECEMBER 26, 2000 ·	OWNED IN FEE ·
8	AIRPORT ACCESS ROAD ROADWAY EASEMENT (0.50 ACRES)	EASEMENT ·	PINAL COUNTY RECORDER'S FEE NUMBER 2003–049195	JULY 21, 2003 ·	ACQUIRE LAND IN FEE ·
9	AIRPORT ACCESS ROAD ROADWAY EASEMENT (0.09 ACRES)	EASEMENT ·	PINAL COUNTY RECORDER'S FEE NUMBER 2003–049203	JULY 21, 2003 ·	ACQUIRE LAND IN FEE ·
10	AIRPORT ACCESS ROAD ROADWAY EASEMENT (1.30 ACRES)	EASEMENT ·	PINAL COUNTY RECORDER'S FEE NUMBER 2003–049200	JULY 21, 2003 ·	ACQUIRE LAND IN FEE ·

POINT TABLE

POINT NO.	NORTHING	EASTING
1	599878.0533	1088324.9482
2	598020.8289	1091094.0935
3	598132.9473	1091169.2897
4	596314.3146	1093880.8944
5	595371.6894	1093248.6897
6	597094.7313	1090679.6066
7	596995.0070	1090612.8603
8	597235.2433	1090254.6649
9	597334.9676	1090321.4112
10	598650.9953	1088359.1970

PROPERTY USE LEGEND

- LAND CURRENTLY OWNED IN FEE BY PINAL COUNTY
- LAND CURRENTLY LEASED TO PINAL COUNTY BY BHP
- RECOMMENDED INITIAL LAND ACQUISITION

SURVEYOR'S NOTES

1. COORDINATES WERE VERIFIED IN THE FIELD USING REAL TIME KINEMATIC GPS OBSERVATIONS RELATIVE TO NGS PUBLISHED CONTROL POINTS.
2. SURVEYED CONDUCTED BY DIBBLE ENGINEERING DURING THE MONTH OF NOVEMBER, 2013 & MAY, 2014 BY.
3. PROJECT META DATA

HORIZONTAL:
NAD83 ARIZONA CENTRAL ZONE (0202)
UNITS: COORDINATES, DISTANCES AND ELEVATIONS ARE SHOWN IN US SURVEY FEET.

HORIZONTAL ADJUSTMENT:
COMBINED SCALE FACTOR (CSF): 1.000076007
GRID NORTHING X CSF = GROUND NORTHING
GRID EASTING X CSF = GROUND EASTING

VERTICAL DATUM:
NAVD88

PRIMARY BENCHMARKS:
POINT NO 3273
FND 3" ALUMINUM CAP AT THE SOUTHEAST END OF RUNWAY STAMPED "LS 21085 EL: 3250.02"
OBSERVED ELEVATION = 3250.36
N=596446.1290 (GRID VALUE)
E=1092517.7890 (GRID VALUE)

POINT NO 3275
FND 3" ALUMINUM CAP AT THE NORTHWEST END OF RUNWAY STAMPED "LS 21085 EL: 3271.37"
OBSERVED ELEVATION: 1371.77
N=598745.6810 (GRID VALUE)
E=1089003.2330 (GRID VALUE)

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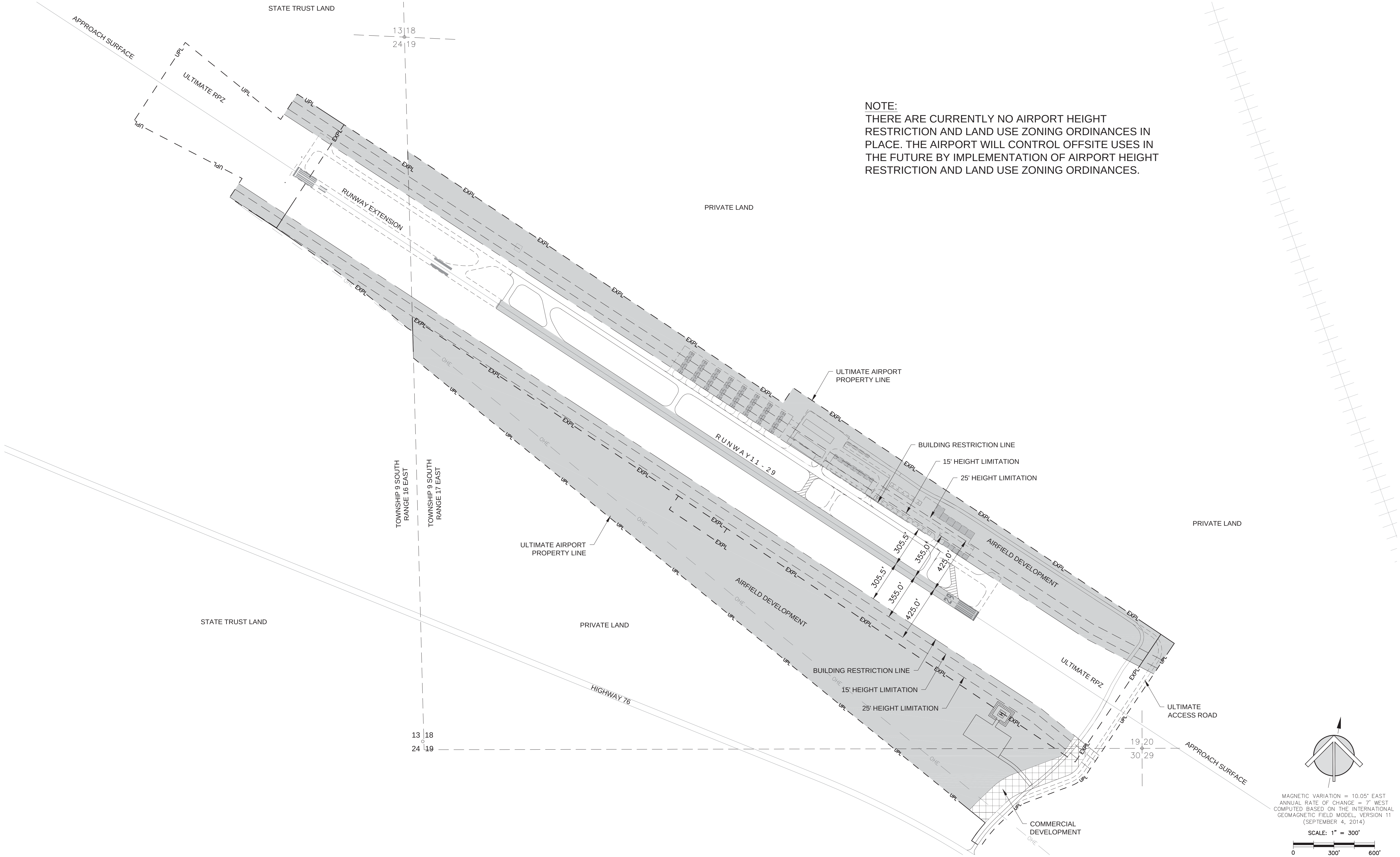
REVISION	DATE

AIRPORT PROPERTY MAP - EXHIBIT "A"

SAN MANUEL AIRPORT - SAN MANUEL, ARIZONA

DESIGN: NJP
DRAWN: DSO
CHECK: NJP
Date: 4/08/2015



NOTE:
THERE ARE CURRENTLY NO AIRPORT HEIGHT RESTRICTION AND LAND USE ZONING ORDINANCES IN PLACE. THE AIRPORT WILL CONTROL OFFSITE USES IN THE FUTURE BY IMPLEMENTATION OF AIRPORT HEIGHT RESTRICTION AND LAND USE ZONING ORDINANCES.

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REVISION	DATE

LAND USE MAP

SAN MANUEL AIRPORT - SAN MANUEL, ARIZONA

DESIGN: NJP
DRAWN: DSO
CHECK: NJP
Date: 4/08/2015

SHEET 11 of 11

10 Capital Improvement Program

Introduction

This section of the Airport Master Plan includes a detailed Capital Improvement Plan (CIP), including funding source details for each year in the twenty year planning period. The recommended demand based improvement program is also included, with listings for each project by the action points that would trigger project implementation.

Development of the Capital Improvement Program

The costs of the CIP projects are based on estimates of the cost for planning, design, construction, and construction administration of the various improvements that have been recommended in **Chapter 5, Airport Facility Requirements**. The recommended projects have been refined in **Chapter 6, Development Alternatives**, wherein various options for development of the long term extension of Runway 11-29, the Airport Access Road, and the aircraft parking apron and hangar development areas were presented. Further refinement of the recommended plans was accomplished with the development of the Airport Layout Plan (ALP), as presented in **Chapter 9, Airport Plans**.

The cost estimates presented in this chapter are based on the ALP drawings' concept layouts. Unit prices used in the construction estimating process are based on recent airport construction of similar improvements within the local geographic area. The costs are shown in current (year 2014) dollars with no attempt to predict inflation or changes in the contracting industry. The estimates should be used for planning and budgetary purposes only, with the assumption that more refined engineering estimates will be prepared as part of the preliminary and final design of the improvements as they are implemented.

Funding Sources for Airport Improvements

The Capital Improvement Program includes a breakdown of the anticipated funding sources for each project. The program was developed with the intent to maximize the utilization of grants from the Federal Aviation Administration (FAA) and the Arizona Department of Transportation (ADOT) for all grant-eligible work. The following funding sources are included:

FAA Grants-in-Aid
Funding of airport improvements by the FAA is through the Airport Improvement Program (AIP).

Shortly after the end of World War II, in order to promote the development of a system of airports to meet the Nation's needs, the Federal Government embarked on a grants-in-aid program to units of state and local governments. The early program, the Federal-Aid Airport Program (FAAP) was authorized by the Federal Airport Act of 1946 and drew its funding from the general fund of the U.S. Treasury.

In 1970, a more comprehensive program was established with the passage of the Airport and Airway Development Act of 1970. This Act provided grants for airport planning under the Planning Grant Program (PGP), and for airport development under the Airport Development Aid Program (ADAP). These programs were funded from a newly established Airport and Airway Trust Fund, into which were deposited revenues from several aviation-user taxes on such items as airline fares, air freight, and aviation fuel. The authority to issue grants under these two programs expired on September 30, 1981. During this 11-year period, 8,809 grants totaling $4.5 billion were approved.

The current program, known as the Airport Improvement Program (AIP), was established by the Airport and Airway Improvement Act of 1982 (Public Law 97-248). Since then, the AIP has been amended several times, most recently with the passage of the FAA Modernization and Reform Act of 2012. Funds obligated for the AIP are drawn from the Airport and Airway Trust fund, which is supported by user fees, fuel taxes, and other similar revenue sources.

The AIP program provides grants to public use airport owners for the planning and development of public-use airports that are included in the National Plan of Integrated Airport Systems (NPIAS). For large and medium primary hub airports, the AIP grants cover 75% of eligible costs (or 80% for noise program implementation). For small primary, reliever, and general aviation airports, the grant covers a range of 90%-95% of eligible costs, based on statutory requirements. The current funding rate for San Manuel Airport is 91.06%. It is assumed that this rate of participation will remain constant throughout the planning period.

San Manuel Airport is included as a component of the NPIAS, and is therefore eligible for AIP funding participation. The airport has a NPIAS classification of “general aviation”.

The AIP provides for two types of grants, Entitlements and Discretionary. These are described below.

FAA Entitlement Grants

While NPIAS Primary airports (those airports with airline operations) receive entitlements based on the number of enplaning passengers and landed cargo weights, Non-primary airports (all airports not categorized as Primary) receive entitlements at an amount that is computed from the needs list for the particular airport in the published NPIAS. Funding of costs exceeding an airport’s No-primary entitlements depends on available state apportionment and Discretionary funding ranked by the relative priority of a project (and competing with other airports in the State).

The current statutory annual maximum Non-primary entitlement amount is $150,000 per year. However, entitlements are not guaranteed to the maximum level, and all entitlement funded projects must be justified by actual demand. Under the current AIP program, an airport can use its entitlement in the current year, or it may allow the entitlement to be carried over for an additional three years. If not used by the fourth year, the entitlement may become available to other airports within the State or the region. For example, if a general aviation NPIAS airport does not use an annual entitlement of $150,000 for 2015 and 2016, those funds can be added to the 2017 entitlement for a total funding level of $450,000. If all of those funds are used on a project in 2017, the airport will then start over with $150,000 in 2018. If the airport chooses not to use the entitlement, it will then be redistributed to projects at other airports.

Entitlement grants are currently funded at 91.06% for San Manuel Airport.

FAA Discretionary Grants

After distribution of Primary and Non-Primary entitlements, the remaining AIP funds are distributed by the FAA based upon the application of a National Priority Ranking System. Those projects with the highest priority ranking are given preference in funding. In this system, San Manuel Airport will compete with other airport projects in Arizona for a share of AIP State Apportionment dollars and across the country for other available AIP funds.

The current federal participation rate for FAA Discretionary grant projects at San Manuel Airport is 91.06%.

State Grants (ADOT) for Capital Improvement Projects

The Arizona Department of Transportation, Multimodal Planning Division – Aeronautics Group (ADOT) provides grants to Arizona public use airports for planning, design, and construction of airport improvements. The ADOT grant program is funded by several aviation revenue sources consisting primarily of the Flight Property Tax (a tax on airline companies operating flight property in air commerce in the State of Arizona), Aircraft Registration (a tax levied on the average fair market value of aircraft based and registered in Arizona), Aviation Fuel Tax (a $0.05 per gallon of non-jet aviation fuel and motor vehicle fuel used in aircraft), as well as interest on loans to airports for improvements that are not grant eligible. [2]

ADOT provides a 50% matching share of the local share of all FAA grants (currently 4.47%), as well as providing State/Local grants on a 90% State/10% Local basis.[2]

State Airport Pavement Maintenance Program (APMS) Grants

Arizona Public Law 103-305 requires that airports requesting federal AIP funding for pavement rehabilitation or reconstruction have an effective pavement maintenance management system. To this end, ADOT's Aeronautics Group has completed and is maintaining an Airport Pavement Management System (APMS) that, coupled with monthly pavement evaluations by the airport sponsors, fulfills this requirement. [1]

Every year the ADOT Aeronautics Group, utilizing the APMS, identifies 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 APMS, or the airport sponsor may sign an intergovernmental agreement (IGA) with the Aeronautics Group to participate in the APMS. [1]

APMS projects are administered and managed by ADOT, and are currently funded 90% by the State and 10% by the airport Sponsor.

Local Funding
This category includes the County's matching share for all FAA and ADOT grants, as well as local funding of improvements that are not eligible for federal or State grant participation.

Projects that are eligible for FAA/AIP and ADOT funding participation include those improvements related to enhancing airport safety, capacity, security, and environmental concerns. In general, airport owners can use AIP funds on most airfield capital improvements or repairs and in some specific situations, for terminals, hangars, and non-aviation development. Any professional services that are necessary for eligible projects (such as planning, surveying, and design) are also eligible. Aviation demand at the airport must justify the projects, and each project must also meet federal environmental and procurement requirements.

Projects related to airport operations and revenue-generating improvements are typically not eligible for funding. Operational costs such as salaries, equipment, and supplies are also not eligible for AIP or ADOT grants.

The only ineligible items in the recommended program for San Manuel Airport include the construction of the revenue producing hangar buildings.

Capital Improvement Program Reports

The following Capital Improvement Program reports are included at the end of this chapter.

1. **Capital Improvement Program Summaries**
   These reports list the projects by year, including only the total estimated development costs. The reports include the following:

   - Short Term Capital Improvement Program – 2015 through 2019
   - Intermediate Term Capital Improvement Program – 2020 through 2024
   - Long Term Capital Improvement Program (Part 1) – 2025 through 2029
   - Long Term Capital Improvement Program (Part 2) – 2030 through 2034

2. **Funding Source Breakdown Reports**
   These reports include the proposed sources of funding for each project, broken down by FAA Entitlement grants, FAA discretionary grants, State grants for capital improvements projects, State APMS grants, and the local share amounts. The reports include the following:

   - Funding Breakdown by Project – Initial Program: 2015 through 2020
   - Funding Breakdown by Project – Extended Program: Beyond 2020

3. **Demand Based Improvement Plan - Action Point Reports**
The Action Point Report lists the projects in the entire twenty year program by their programmed planning year, but also includes the Action Points that would trigger actual implementation of each project. The reports include the following:

- CIP by Year – Sorted by ACTION POINTS

Chapter References

[1] Arizona Department of Transportation, Airport Pavement Management System (APMS)
[2] ADOT web site http://www.azdot.gov/planning/airportdevelopment/ , September 23, 2014

Capital Improvement Program Reports
are included on the following pages

E77 San Manuel Airport

Pinal County, Arizona

Short Term Capital Improvement Program

2015 through 2019

		2015	2016	2017	2018	2019
E77-002	Runway and Taxiway Pavement Rehabilitation (APMS)	$400,000				
E77-004	Design - Reconfigure Taxiway A4	$50,000				
E77-008	EA - Access Road Land Acquisition	$50,000				
E77-022	Design/Construction - Access Road Bend Reconstruction	$300,000				
E77-024	Design/Construction - Site Work for 2-5 Unit Tee Hangar Structure	$1,500,000				
E77-042	Design/Construct – Fuel containment sump	$200,000				
E77-051	Construction - Aircraft Apron Reconstruction / Reconfiguration	$600,000				
E77-054	EA for Land Acquisition	$200,000				
E77-056	Design - FAR Part 77 Obstruction Mitigation	$100,000				
E77-058	Design/Construction - 2-5 Unit Tee Hangar Structure	$135,000				
E77-201	Maintenance - Taxiway Crack Seal, Seal Coat, Pavement Marking	$100,000				
E77-202	Maintenance - Access Road Drainage Structure Maintenance	$125,000				
E77-005	Construction - Reconfigure Taxiway A4		$300,000			
E77-009	Land Acquisition for Access Road		$25,000			
E77-038	Design - Automobile Parking Lot		$40,000			
E77-046	Design - Taxiway Edge Lighting System (MITL)		$75,000			
E77-055	Acquisition of Airport Land		$550,000			
E77-057	Construction - FAR Part 77 Obstruction Mitigation		$400,000			
E77-010	Design/Construction - Access Road Relocation			$225,000		
E77-039	Construction - Automobile Parking Lot			$250,000		
E77-047	Construction - Taxiway Edge Lighting System (MITL)			$300,000		
E77-052	Design - Rotorcraft Operations Area			$75,000		
E77-006	Design RWY 11-29 Pavement Strengthening				$80,000	

E77 San Manuel Airport

Pinal County, Arizona

Short Term Capital Improvement Program

2015 through 2019

		2015	2016	2017	2018	2019
E77-016	Design - Taxiway Pavement Strengthening				$50,000	
E77-029	Design - Aircraft Parking Apron Pavement Strengthening				$50,000	
E77-044	Design and Construction - South Side Perimeter Fence				$225,000	
E77-053	Construction - Rotorcraft Operations Area				$510,000	
E77-007	Construction - RWY 11-29 Pavement Strengthening					$500,000
E77-017	Construction - Taxiway Pavement Strengthening					$250,000
E77-020	Design - Aircraft Parking Apron Expansion					$85,000
E77-026	Design/Construction - Site Work for 2-5 Unit Hangar Structure					$1,500,000
E77-030	Construct - Aircraft Parking Apron Pavement Strengthening					$250,000
E77-059	Design/Construction - 2-5 Unit Hangar Structure					$135,000
E77-203	Maintenance - Runway Crack Seal, Seal Coat, Pavement Marking					$200,000
E77-204	Maintenance - Apron Crack Seal, Seal Coat, Pavement Marking					$75,000

- - - E N D - - -

E77 San Manuel Airport

Pinal County, Arizona

Intermediate Term Capital Improvement Program

2020 through 2024

		2020	2021	2022	2023	2024
E77-021	Construction - Aircraft Parking Apron Expansion	$600,000				
E77-023	Design/Construction - Access Road Structural Overlay	$300,000				
E77-031	Airport Master Plan Update	$200,000				
E77-216	Maintenance - Auto Parking Crack Seal, Seal Coat, Pvmt Marking			$50,000		
E77-014	Design - Taxiway A6 Relocation				$60,000	
E77-015	Construction - Taxiway A6 Relocation					$350,000
E77-025	Design/Construction - Site Work for 2-5 Unit Hangar Structure					$1,500,000
E77-060	Design/Construction - 2-5 Unit Hangar Structure					$135,000
E77-205	Maintenance - Runway Crack Seal, Seal Coat, Pavement Marking					$200,000
E77-206	Maintenance - Taxiway Crack Seal, Seal Coat, Pavement Marking					$100,000
E77-207	Maintenance - Apron Crack Seal, Seal Coat, Pavement Marking					$100,000

- - - E N D - - -

E77 San Manuel Airport

Pinal County, Arizona

Long Term Capital Improvement Program (Part 1)

2025 through 2029

		2025	2026	2027	2028	2029
E77-040	Design - Automobile Parking Lot Expansion	$50,000				
E77-032	Airport Master Plan Update		$200,000			
E77-041	Construction - Automobile Parking Lot Expansion		$250,000			
E77-027	Design/Construction - Site Work for 2-5 Unit Hangar Structure					$1,500,000
E77-061	Design/Construction - 2-5 Unit Hangar Structure					$135,000
E77-209	Maintenance - Runway Crack Seal, Seal Coat, Pavement Marking					$200,000
E77-210	Maintenance - Taxiway Crack Seal, Seal Coat, Pavement Marking					$100,000
E77-211	Maintenance - Apron Crack Seal, Seal Coat, Pavement Marking					$100,000

- - - E N D - - -

E77 San Manuel Airport

Pinal County, Arizona

Long Term Capital Improvement Program (Part 2)

2030 through 2034		2030	2031	2032	2033	2034
E77-011	EA - RWY 11-29 Extension		$200,000			
E77-212	Maintenance - Access Road Crack Seal, Seal Coat, Pavement Mark		$50,000			
E77-217	Maintenance - Auto Parking Crack Seal, Seal Coat, Pvmt Marking		$50,000			
E77-033	Airport Master Plan Update			$200,000		
E77-050	Land Acquisition - Runway 11-29 Extension/RPZs			$115,000		
E77-012	Design - RWY 11-29 Extension				$400,000	
E77-018	Design - Taxiway A Extension				$150,000	
E77-034	Design - MIRL extension and upgrade				$75,000	
E77-036	Design – PAPI and REIL relocation				$10,000	
E77-043	Design - Runway and Taxiway Signage Extension/Modification				$20,000	
E77-048	Design – Taxiway lighting (MITL) extension				$20,000	
E77-013	Construction - RWY 11-29 Extension					$4,500,000
E77-019	Construction - Taxiway A Extension					$1,500,000
E77-028	Design/Construction - Site Work for 2-5 Unit Hangar Structure					$1,500,000
E77-035	Construction - MIRL extension and upgrade					$250,000
E77-037	Construction – PAPI and REIL relocation					$75,000
E77-045	Construction - Runway and Taxiway Signage Extension/Modificati					$75,000
E77-049	Construction – Taxiway lighting (MITL) extension					$50,000
E77-062	Design/Construction - 2-5 Unit Hangar Structure					$400,000
E77-213	Maintenance - RWY (4,214') Crack Seal, Seal Coat, Pvmt Marking					$200,000
E77-214	Maintenance - Taxiway Crack Seal, Seal Coat, Pavement Marking					$100,000
E77-215	Maintenance - Apron Crack Seal, Seal Coat, Pavement Marking					$100,000

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CAPITAL IMPROVEMENT PLAN - FUNDING BREAKDOWN BY PROJECT

E77 San Manuel Airport

Initial Program: 2015 through 2020

Year	No.	Project ID	Project	Funding Source	Amount
2015	1	E77-002	Runway and Taxiway Pavement Rehabilitation (APMS)	FAA Entitlement Grants	$0
				FAA Discretionary Grants	$0
				State Grants	$0
				APMS Grants	$360,000
				Customer Facility Charges	$0
				Local Funding	$40,000
					$400,000
2015	2	E77-056	Design - FAR Part 77 Obstruction Mitigation	FAA Entitlement Grants	$91,060
				FAA Discretionary Grants	$0
				State Grants	$4,470
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$4,470
					$100,000
2015	3	E77-051	Construction - Aircraft Apron Reconstruction / Reconfiguration	FAA Entitlement Grants	$0
				FAA Discretionary Grants	$0
				State Grants	$540,000
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$60,000
					$600,000
2015	4	E77-008	EA - Access Road Land Acquisition	FAA Entitlement Grants	$0
				FAA Discretionary Grants	$0
				State Grants	$45,000
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$5,000
					$50,000
2015	5	E77-054	EA for Land Acquisition	FAA Entitlement Grants	$0
				FAA Discretionary Grants	$182,210
				State Grants	$8,940
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$8,940
					$200,090

CAPITAL IMPROVEMENT PLAN - FUNDING BREAKDOWN BY PROJECT

E77 San Manuel Airport

Initial Program: 2015 through 2020

Year	#	Project ID	Description	Funding Source	Amount
2015	6	E77-004	**Design - Reconfigure Taxiway A4**	FAA Entitlement Grants	$45,530
				FAA Discretionary Grants	$0
				State Grants	$2,235
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$2,235
					$50,000
2015	7	E77-201	**Maintenance - Taxiway Crack Seal, Seal Coat, Pavement Marking**	FAA Entitlement Grants	$0
				FAA Discretionary Grants	$0
				State Grants	$0
				APMS Grants	$90,000
				Customer Facility Charges	$0
				Local Funding	$10,000
					$100,000
2015	8	E77-202	**Maintenance - Access Road Drainage Structure Maintenance**	FAA Entitlement Grants	$0
				FAA Discretionary Grants	$0
				State Grants	$112,500
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$12,500
					$125,000
2015	9	E77-022	**Design/Construction - Access Road Bend Reconstruction**	FAA Entitlement Grants	$0
				FAA Discretionary Grants	$0
				State Grants	$270,000
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$30,000
					$300,000
2015	10	E77-024	**Design/Construction - Site Work for 2-5 Unit Tee Hangar Structure**	FAA Entitlement Grants	$0
				FAA Discretionary Grants	$0
				State Grants	$1,350,000
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$150,000
					$1,500,000

CAPITAL IMPROVEMENT PLAN - FUNDING BREAKDOWN BY PROJECT

E77 San Manuel Airport

Initial Program: 2015 through 2020

Year	No.	Project	Description	Funding Source	Amount
2015	11	E77-058	**Design/Construction - 2-5 Unit Tee Hangar Structure**	FAA Entitlement Grants	$0
				FAA Discretionary Grants	$0
				State Grants	$0
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$135,000
					$135,000
2015	12	E77-042	**Design/Construct – Fuel containment sump**	FAA Entitlement Grants	$0
				FAA Discretionary Grants	$0
				State Grants	$180,000
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$20,000
					$200,000
			2015 TOTALS...	FAA Entitlement Grants	$136,590
				FAA Discretionary Grants	$182,210
				State Grants	$2,513,145
				APMS Grants	$450,000
				Customer Facility Charges	$0
				Local Funding	$478,145
					$3,760,090
2016	1	E77-005	**Construction - Reconfigure Taxiway A4**	FAA Entitlement Grants	$150,000
				FAA Discretionary Grants	$123,180
				State Grants	$13,410
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$13,410
					$300,000
2016	2	E77-057	**Construction - FAR Part 77 Obstruction Mitigation**	FAA Entitlement Grants	$0
				FAA Discretionary Grants	$0
				State Grants	$360,000
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$40,000
					$400,000

CAPITAL IMPROVEMENT PLAN - FUNDING BREAKDOWN BY PROJECT

E77 San Manuel Airport

Initial Program: 2015 through 2020

Year	Priority	Project ID	Description	Funding Source	Amount
2016	3	E77-009	**Land Acquisition for Access Road**	FAA Entitlement Grants	$0
				FAA Discretionary Grants	$0
				State Grants	$22,500
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$2,500
					$25,000
2016	4	E77-055	**Acquisition of Airport Land**	FAA Entitlement Grants	$0
				FAA Discretionary Grants	$500,830
				State Grants	$24,585
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$24,585
					$550,000
2016	5	E77-046	**Design - Taxiway Edge Lighting System (MITL)**	FAA Entitlement Grants	$0
				FAA Discretionary Grants	$0
				State Grants	$67,500
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$7,500
					$75,000
2016	6	E77-038	**Design - Automobile Parking Lot**	FAA Entitlement Grants	$0
				FAA Discretionary Grants	$0
				State Grants	$36,000
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$4,000
					$40,000

2016 TOTALS...

Funding Source	Amount
FAA Entitlement Grants	$150,000
FAA Discretionary Grants	$624,010
State Grants	$523,995
APMS Grants	$0
Customer Facility Charges	$0
Local Funding	$91,995
	$1,390,000

CAPITAL IMPROVEMENT PLAN - FUNDING BREAKDOWN BY PROJECT

E77 San Manuel Airport

Initial Program: 2015 through 2020

Year	No.	Project	Description	Funding Source	Amount
2017	1	E77-010	Design/Construction - Access Road Relocation	FAA Entitlement Grants	$0
				FAA Discretionary Grants	$0
				State Grants	$202,500
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$22,500
					$225,000
2017	2	E77-047	Construction - Taxiway Edge Lighting System (MITL)	FAA Entitlement Grants	$150,000
				FAA Discretionary Grants	$123,180
				State Grants	$13,410
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$13,410
					$300,000
2017	3	E77-039	Construction - Automobile Parking Lot	FAA Entitlement Grants	$0
				FAA Discretionary Grants	$0
				State Grants	$225,000
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$25,000
					$250,000
2017	4	E77-052	Design - Rotorcraft Operations Area	FAA Entitlement Grants	$0
				FAA Discretionary Grants	$0
				State Grants	$67,500
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$7,500
					$75,000

2017 TOTALS...

Funding Source	Amount
FAA Entitlement Grants	$150,000
FAA Discretionary Grants	$123,180
State Grants	$508,410
APMS Grants	$0
Customer Facility Charges	$0
Local Funding	$68,410
	$850,000

CAPITAL IMPROVEMENT PLAN - FUNDING BREAKDOWN BY PROJECT

E77 San Manuel Airport

Initial Program: 2015 through 2020

Year	No.	Project ID	Project	Funding Source	Amount
2018	1	E77-006	Design RWY 11-29 Pavement Strengthening	FAA Entitlement Grants	$0
				FAA Discretionary Grants	$72,848
				State Grants	$3,576
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$3,576
					$80,000
2018	2	E77-016	Design - Taxiway Pavement Strengthening	FAA Entitlement Grants	$0
				FAA Discretionary Grants	$45,530
				State Grants	$2,235
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$2,235
					$50,000
2018	3	E77-029	Design - Aircraft Parking Apron Pavement Strengthening	FAA Entitlement Grants	$0
				FAA Discretionary Grants	$45,530
				State Grants	$2,235
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$2,235
					$50,000
2018	4	E77-044	Design and Construction - South Side Perimeter Fence	FAA Entitlement Grants	$150,000
				FAA Discretionary Grants	$54,885
				State Grants	$10,058
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$10,057
					$225,000
2018	5	E77-053	Construction - Rotorcraft Operations Area	FAA Entitlement Grants	$0
				FAA Discretionary Grants	$464,406
				State Grants	$22,797
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$22,797
					$510,000

CAPITAL IMPROVEMENT PLAN - FUNDING BREAKDOWN BY PROJECT

E77 San Manuel Airport

Initial Program: 2015 through 2020

2018 TOTALS...

FAA Entitlement Grants	$150,000
FAA Discretionary Grants	$683,199
State Grants	$40,901
APMS Grants	$0
Customer Facility Charges	$0
Local Funding	$40,900
	$915,000

Year	No.	Project ID	Project	Funding Source	Amount
2019	1	E77-007	**Construction - RWY 11-29 Pavement Strengthening**	FAA Entitlement Grants	$0
				FAA Discretionary Grants	$455,300
				State Grants	$22,350
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$22,350
					$500,000
2019	2	E77-026	**Design/Construction - Site Work for 2-5 Unit Hangar Structure**	FAA Entitlement Grants	$0
				FAA Discretionary Grants	$0
				State Grants	$1,350,000
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$150,000
					$1,500,000
2019	3	E77-059	**Design/Construction - 2-5 Unit Hangar Structure**	FAA Entitlement Grants	$0
				FAA Discretionary Grants	$0
				State Grants	$0
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$135,000
					$135,000
2019	4	E77-017	**Construction - Taxiway Pavement Strengthening**	FAA Entitlement Grants	$0
				FAA Discretionary Grants	$227,650
				State Grants	$11,175
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$11,175
					$250,000

CAPITAL IMPROVEMENT PLAN - FUNDING BREAKDOWN BY PROJECT

E77 San Manuel Airport

Initial Program: 2015 through 2020

Year	Priority	Project	Description	Funding Source	Amount
2019	5	E77-030	**Construct - Aircraft Parking Apron Pavement Strengthening**	FAA Entitlement Grants	$0
				FAA Discretionary Grants	$227,650
				State Grants	$11,175
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$11,175
					$250,000
2019	6	E77-020	**Design - Aircraft Parking Apron Expansion**	FAA Entitlement Grants	$0
				FAA Discretionary Grants	$77,401
				State Grants	$3,800
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$3,799
					$85,000
2019	7	E77-203	**Maintenance - Runway Crack Seal, Seal Coat, Pavement Marking**	FAA Entitlement Grants	$0
				FAA Discretionary Grants	$0
				State Grants	$0
				APMS Grants	$180,000
				Customer Facility Charges	$0
				Local Funding	$20,000
					$200,000
2019	8	E77-204	**Maintenance - Apron Crack Seal, Seal Coat, Pavement Marking**	FAA Entitlement Grants	$0
				FAA Discretionary Grants	$0
				State Grants	$0
				APMS Grants	$67,500
				Customer Facility Charges	$0
				Local Funding	$7,500
					$75,000

2019 TOTALS...

Funding Source	Amount
FAA Entitlement Grants	$0
FAA Discretionary Grants	$988,001
State Grants	$1,398,500
APMS Grants	$247,500
Customer Facility Charges	$0
Local Funding	$360,999
	$2,995,000

CAPITAL IMPROVEMENT PLAN - FUNDING BREAKDOWN BY PROJECT

E77 San Manuel Airport

Initial Program: 2015 through 2020

Year	No.	Project	Description	Funding Source	Amount
2020	1	E77-021	**Construction - Aircraft Parking Apron Expansion**	FAA Entitlement Grants	$286,592
				FAA Discretionary Grants	$259,768
				State Grants	$26,820
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$26,820
					$600,000
2020	2	E77-023	**Design/Construction - Access Road Structural Overlay**	FAA Entitlement Grants	$0
				FAA Discretionary Grants	$0
				State Grants	$270,000
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$30,000
					$300,000
2020	3	E77-031	**Airport Master Plan Update**	FAA Entitlement Grants	$0
				FAA Discretionary Grants	$182,120
				State Grants	$8,940
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$8,940
					$200,000

2020 TOTALS...

Funding Source	Amount
FAA Entitlement Grants	$286,592
FAA Discretionary Grants	$441,888
State Grants	$305,760
APMS Grants	$0
Customer Facility Charges	$0
Local Funding	$65,760
	$1,100,000

CAPITAL IMPROVEMENT PLAN - FUNDING BREAKDOWN BY PROJECT

E77 San Manuel Airport

Extended Program: Beyond 2020

2022	1	**E77-216**	**Maintenance - Auto Parking Crack Seal, Seal Coat, Pvmt Marking**	FAA Entitlement Grants	$45,530
				FAA Discretionary Grants	$0
				State Grants	$2,235
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$2,235
					$50,000

2022 TOTALS...	FAA Entitlement Grants	$45,530
	FAA Discretionary Grants	$0
	State Grants	$2,235
	APMS Grants	$0
	Customer Facility Charges	$0
	Local Funding	$2,235
		$50,000

2023	1	**E77-014**	**Design - Taxiway A6 Relocation**	FAA Entitlement Grants	$54,636
				FAA Discretionary Grants	$0
				State Grants	$2,682
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$2,682
					$60,000

2023 TOTALS...	FAA Entitlement Grants	$54,636
	FAA Discretionary Grants	$0
	State Grants	$2,682
	APMS Grants	$0
	Customer Facility Charges	$0
	Local Funding	$2,682
		$60,000

2024	1	**E77-015**	**Construction - Taxiway A6 Relocation**	FAA Entitlement Grants	$0
				FAA Discretionary Grants	$318,710
				State Grants	$15,645
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$15,645
					$350,000

CAPITAL IMPROVEMENT PLAN - FUNDING BREAKDOWN BY PROJECT

E77 San Manuel Airport

Extended Program: Beyond 2020

Year	Priority	Project No.	Description	Funding Source	Amount
2024	2	E77-025	**Design/Construction - Site Work for 2-5 Unit Hangar Structure**	FAA Entitlement Grants	$0
				FAA Discretionary Grants	$0
				State Grants	$1,350,000
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$150,000
					$1,500,000
2024	3	E77-060	**Design/Construction - 2-5 Unit Hangar Structure**	FAA Entitlement Grants	$0
				FAA Discretionary Grants	$0
				State Grants	$0
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$135,000
					$135,000
2024	4	E77-205	**Maintenance - Runway Crack Seal, Seal Coat, Pavement Marking**	FAA Entitlement Grants	$182,120
				FAA Discretionary Grants	$0
				State Grants	$8,940
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$8,940
					$200,000
2024	5	E77-206	**Maintenance - Taxiway Crack Seal, Seal Coat, Pavement Marking**	FAA Entitlement Grants	$91,060
				FAA Discretionary Grants	$0
				State Grants	$4,470
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$4,470
					$100,000
2024	6	E77-207	**Maintenance - Apron Crack Seal, Seal Coat, Pavement Marking**	FAA Entitlement Grants	$0
				FAA Discretionary Grants	$0
				State Grants	$0
				APMS Grants	$90,000
				Customer Facility Charges	$0
				Local Funding	$10,000
					$100,000

CAPITAL IMPROVEMENT PLAN - FUNDING BREAKDOWN BY PROJECT

E77 San Manuel Airport

Extended Program: Beyond 2020

2024 TOTALS...

FAA Entitlement Grants	$273,180
FAA Discretionary Grants	$318,710
State Grants	$1,379,055
APMS Grants	$90,000
Customer Facility Charges	$0
Local Funding	$324,055
	$2,385,000

Year	#	Project	Description	Funding Source	Amount
2025	1	**E77-040**	**Design - Automobile Parking Lot Expansion**	FAA Entitlement Grants	$0
				FAA Discretionary Grants	$0
				State Grants	$45,000
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$5,000
					$50,000

2025 TOTALS...

FAA Entitlement Grants	$0
FAA Discretionary Grants	$0
State Grants	$45,000
APMS Grants	$0
Customer Facility Charges	$0
Local Funding	$5,000
	$50,000

Year	#	Project	Description	Funding Source	Amount
2026	1	**E77-041**	**Construction - Automobile Parking Lot Expansion**	FAA Entitlement Grants	$0
				FAA Discretionary Grants	$0
				State Grants	$225,000
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$25,000
					$250,000
2026	2	**E77-032**	**Airport Master Plan Update**	FAA Entitlement Grants	$182,120
				FAA Discretionary Grants	$0
				State Grants	$8,940
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$8,940
					$200,000

CAPITAL IMPROVEMENT PLAN - FUNDING BREAKDOWN BY PROJECT

E77 San Manuel Airport

Extended Program: Beyond 2020

			2026 TOTALS...	FAA Entitlement Grants	$182,120
				FAA Discretionary Grants	$0
				State Grants	$233,940
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$33,940
					$450,000
2029	1	**E77-027**	**Design/Construction - Site Work for 2-5 Unit Hangar Structure**	FAA Entitlement Grants	$0
				FAA Discretionary Grants	$0
				State Grants	$1,350,000
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$150,000
					$1,500,000
2029	2	**E77-061**	**Design/Construction - 2-5 Unit Hangar Structure**	FAA Entitlement Grants	$0
				FAA Discretionary Grants	$0
				State Grants	$0
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$135,000
					$135,000
2029	3	**E77-209**	**Maintenance - Runway Crack Seal, Seal Coat, Pavement Marking**	FAA Entitlement Grants	$182,120
				FAA Discretionary Grants	$0
				State Grants	$8,940
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$8,940
					$200,000
2029	4	**E77-210**	**Maintenance - Taxiway Crack Seal, Seal Coat, Pavement Marking**	FAA Entitlement Grants	$91,060
				FAA Discretionary Grants	$0
				State Grants	$4,470
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$4,470
					$100,000

CAPITAL IMPROVEMENT PLAN - FUNDING BREAKDOWN BY PROJECT

E77 San Manuel Airport

Extended Program: Beyond 2020

Year	Priority	Project ID	Description	Funding Source	Amount
2029	5	E77-211	**Maintenance - Apron Crack Seal, Seal Coat, Pavement Marking**	FAA Entitlement Grants	$91,060
				FAA Discretionary Grants	$0
				State Grants	$4,470
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$4,470
					$100,000

2029 TOTALS...	
FAA Entitlement Grants	$364,240
FAA Discretionary Grants	$0
State Grants	$1,367,880
APMS Grants	$0
Customer Facility Charges	$0
Local Funding	$302,880
	$2,035,000

Year	Priority	Project ID	Description	Funding Source	Amount
2031	1	E77-011	**EA - RWY 11-29 Extension**	FAA Entitlement Grants	$182,120
				FAA Discretionary Grants	$0
				State Grants	$8,940
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$8,940
					$200,000
2031	2	E77-212	**Maintenance - Access Road Crack Seal, Seal Coat, Pavement Marking**	FAA Entitlement Grants	$45,530
				FAA Discretionary Grants	$0
				State Grants	$2,235
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$2,235
					$50,000
2031	3	E77-217	**Maintenance - Auto Parking Crack Seal, Seal Coat, Pvmt Marking**	FAA Entitlement Grants	$45,530
				FAA Discretionary Grants	$0
				State Grants	$2,235
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$2,235
					$50,000

CAPITAL IMPROVEMENT PLAN - FUNDING BREAKDOWN BY PROJECT

E77 San Manuel Airport

Extended Program: Beyond 2020

Year	Priority	Project ID	Description	Funding Source	Amount
			2031 TOTALS...	FAA Entitlement Grants	$273,180
				FAA Discretionary Grants	$0
				State Grants	$13,410
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$13,410
					$300,000
2032	1	**E77-050**	**Land Acquisition - Runway 11-29 Extension/RPZs**	FAA Entitlement Grants	$104,719
				FAA Discretionary Grants	$0
				State Grants	$5,141
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$5,140
					$115,000
2032	2	**E77-033**	**Airport Master Plan Update**	FAA Entitlement Grants	$0
				FAA Discretionary Grants	$182,120
				State Grants	$8,940
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$8,940
					$200,000
			2032 TOTALS...	FAA Entitlement Grants	$104,719
				FAA Discretionary Grants	$182,120
				State Grants	$14,081
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$14,080
					$315,000
2033	1	**E77-012**	**Design - RWY 11-29 Extension**	FAA Entitlement Grants	$0
				FAA Discretionary Grants	$364,240
				State Grants	$17,880
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$17,880
					$400,000

CAPITAL IMPROVEMENT PLAN - FUNDING BREAKDOWN BY PROJECT

E77 San Manuel Airport

Extended Program: Beyond 2020

Year	#	Project ID	Description	Funding Source	Amount
2033	2	E77-018	**Design - Taxiway A Extension**	FAA Entitlement Grants	$0
				FAA Discretionary Grants	$136,590
				State Grants	$6,705
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$6,705
					$150,000
2033	3	E77-034	**Design - MIRL extension and upgrade**	FAA Entitlement Grants	$0
				FAA Discretionary Grants	$68,295
				State Grants	$3,353
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$3,352
					$75,000
2033	4	E77-036	**Design – PAPI and REIL relocation**	FAA Entitlement Grants	$0
				FAA Discretionary Grants	$9,106
				State Grants	$447
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$447
					$10,000
2033	5	E77-043	**Design - Runway and Taxiway Signage Extension/Modification**	FAA Entitlement Grants	$0
				FAA Discretionary Grants	$18,212
				State Grants	$894
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$894
					$20,000
2033	6	E77-048	**Design – Taxiway lighting (MITL) extension**	FAA Entitlement Grants	$0
				FAA Discretionary Grants	$18,212
				State Grants	$894
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$894
					$20,000

CAPITAL IMPROVEMENT PLAN - FUNDING BREAKDOWN BY PROJECT

E77 San Manuel Airport

Extended Program: Beyond 2020

2033 TOTALS...				FAA Entitlement Grants	$0
				FAA Discretionary Grants	$614,655
				State Grants	$30,173
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$30,172
					$675,000
2034	1	**E77-013**	**Construction - RWY 11-29 Extension**	FAA Entitlement Grants	$0
				FAA Discretionary Grants	$4,097,700
				State Grants	$201,150
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$201,150
					$4,500,000
2034	2	**E77-019**	**Construction - Taxiway A Extension**	FAA Entitlement Grants	$0
				FAA Discretionary Grants	$1,365,900
				State Grants	$67,050
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$67,050
					$1,500,000
2034	3	**E77-035**	**Construction - MIRL extension and upgrade**	FAA Entitlement Grants	$0
				FAA Discretionary Grants	$227,650
				State Grants	$11,175
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$11,175
					$250,000
2034	4	**E77-037**	**Construction – PAPI and REIL relocation**	FAA Entitlement Grants	$0
				FAA Discretionary Grants	$68,295
				State Grants	$3,353
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$3,352
					$75,000

CAPITAL IMPROVEMENT PLAN - FUNDING BREAKDOWN BY PROJECT

E77 San Manuel Airport

Extended Program: Beyond 2020

Year	#	Project ID	Description	Funding Source	Amount
2034	5	E77-045	**Construction - Runway and Taxiway Signage Extension/Modification**	FAA Entitlement Grants	$0
				FAA Discretionary Grants	$68,295
				State Grants	$3,353
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$3,352
					$75,000
2034	6	E77-049	**Construction – Taxiway lighting (MITL) extension**	FAA Entitlement Grants	$0
				FAA Discretionary Grants	$45,530
				State Grants	$2,235
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$2,235
					$50,000
2034	7	E77-028	**Design/Construction - Site Work for 2-5 Unit Hangar Structure**	FAA Entitlement Grants	$0
				FAA Discretionary Grants	$0
				State Grants	$1,350,000
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$150,000
					$1,500,000
2034	8	E77-062	**Design/Construction - 2-5 Unit Hangar Structure**	FAA Entitlement Grants	$0
				FAA Discretionary Grants	$0
				State Grants	$0
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$400,000
					$400,000
2034	9	E77-213	**Maintenance - RWY (4,214') Crack Seal, Seal Coat, Pvmt Marking**	FAA Entitlement Grants	$182,120
				FAA Discretionary Grants	$0
				State Grants	$8,940
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$8,940
					$200,000

CAPITAL IMPROVEMENT PLAN - FUNDING BREAKDOWN BY PROJECT

E77 San Manuel Airport

Extended Program: Beyond 2020

Year	No.	Project ID	Project	Funding Source	Amount
2034	10	E77-214	Maintenance - Taxiway Crack Seal, Seal Coat, Pavement Marking	FAA Entitlement Grants	$91,060
				FAA Discretionary Grants	$0
				State Grants	$4,470
				APMS Grants	$0
				Customer Facility Charges	$0
				Local Funding	$4,470
					$100,000
2034	11	E77-215	Maintenance - Apron Crack Seal, Seal Coat, Pavement Marking	FAA Entitlement Grants	$0
				FAA Discretionary Grants	$0
				State Grants	$0
				APMS Grants	$90,000
				Customer Facility Charges	$0
				Local Funding	$10,000
					$100,000

2034 TOTALS...		
	FAA Entitlement Grants	$273,180
	FAA Discretionary Grants	$5,873,370
	State Grants	$1,651,726
	APMS Grants	$90,000
	Customer Facility Charges	$0
	Local Funding	$861,724
		$8,750,000

E77 San Manuel Airport

Pinal County, Arizona

CIP By Year - Sorted by ACTION POINTS

	PROJECT			ACTION POINT	
2015	**E77-054**	EA for Land Acquisition		Availability of FAA funding	
			and	Availability of Local Funding	
2015	**E77-008**	EA - Access Road Land Acquisition		Availability of State funding	
			and	Immediate Need (Compliance)	
2015	**E77-024**	Design/Construction - Site Work for 2-5 Unit Tee Hangar Structure		Based on current waiting list	
			and	Availability of State funding	
2015	**E77-058**	Design/Construction - 2-5 Unit Tee Hangar Structure		Following completion of CIP project number	E77-024
			and	Availability of Local Funding	
2015	**E77-022**	Design/Construction - Access Road Bend Reconstruction		Immediate Need – Pavement Failure	
			and	Availability of State funding	
2015	**E77-042**	Design/Construct – Fuel containment sump		Immediate Need (Compliance)	
			and	Availability of State funding	
2015	**E77-002**	Runway and Taxiway Pavement Rehabilitation (APMS)		Immediate Need (Condition)	
			and	Availability of State funding	
2015	**E77-202**	Maintenance - Access Road Drainage Structure Maintenance		Immediate Need (Condition)	
			and	Availability of State funding	
2015	**E77-051**	Construction - Aircraft Apron Reconstruction / Reconfiguration		Immediate Need (Condition/Compliance)	
			and	Following completion of CIP project number	E77-003
2015	**E77-056**	Design - FAR Part 77 Obstruction Mitigation		Immediate Need (Safety)	
			and	Availability of FAA funding	

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E77 San Manuel Airport

Pinal County, Arizona

CIP By Year - Sorted by ACTION POINTS

Year	Project No.	Project		Action Point	
2015	**E77-004**	Design - Reconfigure Taxiway A4		Immediate Need (Safety)	
			and	Availability of State funding	
2015	**E77-201**	Maintenance - Taxiway Crack Seal, Seal Coat, Pavement Marking		Observed cracking/surface oxidation	
			and	Immediate Need (Condition)	
2016	**E77-005**	Construction - Reconfigure Taxiway A4		Availability of FAA funding	
			and	Following completion of CIP project number	E77-004
2016	**E77-055**	Acquisition of Airport Land		Availability of FAA funding	
			and	Following completion of CIP project number	E77-054
2016	**E77-009**	Land Acquisition for Access Road		Following completion of CIP project number	E77-008
			and	Availability of State funding	
2016	**E77-057**	Construction - FAR Part 77 Obstruction Mitigation		Following completion of CIP project number	E77-056
			and	Availability of State funding	
2016	**E77-038**	Design - Automobile Parking Lot		Immediate Need (Condition)	
			and	Availability of State funding	
2016	**E77-046**	Design - Taxiway Edge Lighting System (MITL)		Immediate Need (Safety)	
			and	Availability of State funding	
2017	**E77-047**	Construction - Taxiway Edge Lighting System (MITL)		Following completion of CIP project number	E77-046
			and	Availability of FAA funding	
2017	**E77-010**	Design/Construction - Access Road Relocation		Following completion of CIP project number	E77-009
			and	Availability of State funding	

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E77 San Manuel Airport

Pinal County, Arizona

CIP By Year - Sorted by ACTION POINTS

	PROJECT			ACTION POINT	
2017	**E77-052**	Design - Rotorcraft Operations Area		Immediate Need (Capacity)	
			and	Availability of State funding	
2017	**E77-039**	Construction - Automobile Parking Lot		Immediate Need (Capacity)	
			and	Following completion of CIP project number	E77-038
2018	**E77-006**	Design RWY 11-29 Pavement Strengthening		500 annual ops by larger aircraft	
			and	Availability of FAA funding	
2018	**E77-016**	Design - Taxiway Pavement Strengthening		500 annual ops by larger aircraft	
			and	Concurrent with CIP project number	E77-006
2018	**E77-044**	Design and Construction - South Side Perimeter Fence		Availability of FAA funding	
			and	Safety Driven (pending funding availability)	
2018	**E77-029**	Design - Aircraft Parking Apron Pavement Strengthening		Concurrent with CIP project number	E77-006
			and	Availability of FAA funding	
2018	**E77-053**	Construction - Rotorcraft Operations Area		Immediate Need (Capacity)	
			and	Following completion of CIP project number	E77-052
2019	**E77-020**	Design - Aircraft Parking Apron Expansion		Actual increase in demand	
			and	Availability of FAA funding	
2019	**E77-007**	Construction - RWY 11-29 Pavement Strengthening		Following completion of CIP project number	E77-006
			and	Availability of FAA funding	
2019	**E77-030**	Construct - Aircraft Parking Apron Pavement Strengthening		Following completion of CIP project number	E77-029
			and	Availability of FAA funding	

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E77 San Manuel Airport

Pinal County, Arizona

CIP By Year - Sorted by ACTION POINTS

	PROJECT			ACTION POINT	
2019	**E77-059**	Design/Construction - 2-5 Unit Hangar Structure		Following completion of CIP project number	E77-026
			and	Availability of Local Funding	
2019	**E77-017**	Construction - Taxiway Pavement Strengthening		Following completion of CIP project number	E77-016
			and	Concurrent with CIP project number	E77-007
2019	**E77-203**	Maintenance - Runway Crack Seal, Seal Coat, Pavement Marking		Observed cracking/surface oxidation	
			and	Availability of State funding	
2019	**E77-204**	Maintenance - Apron Crack Seal, Seal Coat, Pavement Marking		Observed cracking/surface oxidation	
			and	Availability of State funding	
2019	**E77-026**	Design/Construction - Site Work for 2-5 Unit Hangar Structure		Reclassification to ARC B-II	
			and	Concurrent with CIP project number	E77-007
2020	**E77-031**	Airport Master Plan Update		Availability of FAA funding	
			and	Availability of Local Funding	
2020	**E77-021**	Construction - Aircraft Parking Apron Expansion		Following completion of CIP project number	E77-020
			and	Availability of FAA funding	
2020	**E77-023**	Design/Construction - Access Road Structural Overlay		Observed increase in traffic	
			and	Availability of State funding	
2022	**E77-216**	Maintenance - Auto Parking Crack Seal, Seal Coat, Pvmt Marking		Observed cracking/surface oxidation	
			and	Availability of FAA funding	
2023	**E77-014**	Design - Taxiway A6 Relocation		Increased use by larger aircraft	
			and	Availability of FAA funding	

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E77 San Manuel Airport

Pinal County, Arizona

CIP By Year - Sorted by ACTION POINTS

	PROJECT			ACTION POINT	
2024	**E77-015**	Construction - Taxiway A6 Relocation		Following completion of CIP project number	E77-014
			and	Availability of FAA funding	
2024	**E77-060**	Design/Construction - 2-5 Unit Hangar Structure		Following completion of CIP project number	E77-025
			and	Availability of Local Funding	
2024	**E77-025**	Design/Construction - Site Work for 2-5 Unit Hangar Structure		Increase in actual demand	
			and	Availability of State funding	
2024	**E77-205**	Maintenance - Runway Crack Seal, Seal Coat, Pavement Marking		Observed cracking/surface oxidation	
			and	Availability of FAA funding	
2024	**E77-206**	Maintenance - Taxiway Crack Seal, Seal Coat, Pavement Marking		Observed cracking/surface oxidation	
			and	Availability of State funding	
2024	**E77-207**	Maintenance - Apron Crack Seal, Seal Coat, Pavement Marking		Observed cracking/surface oxidation	
			and	Availability of State funding	
2025	**E77-040**	Design - Automobile Parking Lot Expansion		Observed increase in demand	
			and	Availability of State funding	
2026	**E77-032**	Airport Master Plan Update		Availability of FAA funding	
			and	Availability of Local Funding	
2026	**E77-041**	Construction - Automobile Parking Lot Expansion		Following completion of CIP project number	E77-040
			and	Availability of State funding	
2026	**E77-208**	Maintenance - Access Road Crack Seal, Seal Coat, Pavement Marking		Observed cracking/surface oxidation	
			and	Availability of Local Funding	

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Pinal County, Arizona

CIP By Year - Sorted by ACTION POINTS

	PROJECT			ACTION POINT	
2029	**E77-061**	Design/Construction - 2-5 Unit Hangar Structure		Following completion of CIP project number	E77-027
			and	Availability of Local Funding	
2029	**E77-027**	Design/Construction - Site Work for 2-5 Unit Hangar Structure		Increase in actual demand	
			and	Availability of State funding	
2029	**E77-209**	Maintenance - Runway Crack Seal, Seal Coat, Pavement Marking		Observed cracking/surface oxidation	
			and	Availability of FAA funding	
2029	**E77-210**	Maintenance - Taxiway Crack Seal, Seal Coat, Pavement Marking		Observed cracking/surface oxidation	
			and	Availability of FAA funding	
2029	**E77-211**	Maintenance - Apron Crack Seal, Seal Coat, Pavement Marking		Observed cracking/surface oxidation	
			and	Availability of FAA funding	
2031	**E77-011**	EA - RWY 11-29 Extension		Demonstrated demand by critical aircraft	
			and	Availability of FAA funding	
2031	**E77-217**	Maintenance - Auto Parking Crack Seal, Seal Coat, Pvmt Marking		Observed cracking/surface oxidation	
			and	Availability of FAA funding	
2031	**E77-212**	Maintenance - Access Road Crack Seal, Seal Coat, Pavement Marking		Observed cracking/surface oxidation	
			and	Availability of State funding	
2032	**E77-033**	Airport Master Plan Update		Availability of FAA funding	
			and	Availability of Local Funding	
2032	**E77-050**	Land Acquisition - Runway 11-29 Extension/RPZs		Following completion of CIP project number	E77-011
			and	Availability of FAA funding	

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E77 San Manuel Airport

Pinal County, Arizona

CIP By Year - Sorted by ACTION POINTS

	PROJECT			ACTION POINT	
2033	**E77-018**	Design - Taxiway A Extension	 and	Concurrent with CIP project number Availability of FAA funding	E77-012
2033	**E77-034**	Design - MIRL extension and upgrade	 and	Concurrent with CIP project number Availability of FAA funding	E77-012
2033	**E77-036**	Design – PAPI and REIL relocation	 and	Concurrent with CIP project number Availability of FAA funding	E77-012
2033	**E77-043**	Design - Runway and Taxiway Signage Extension/Modification	 and	Concurrent with CIP project number Availability of FAA funding	E77-012
2033	**E77-048**	Design – Taxiway lighting (MITL) extension	 and	Concurrent with CIP project number Availability of FAA funding	E77-012
2033	**E77-012**	Design - RWY 11-29 Extension	 and	Following completion of CIP project number Availability of FAA funding	E77-011
2034	**E77-019**	Construction - Taxiway A Extension	 and	Concurrent with CIP project number Availability of FAA funding	E77-013
2034	**E77-035**	Construction - MIRL extension and upgrade	 and	Concurrent with CIP project number Availability of FAA funding	E77-013
2034	**E77-037**	Construction – PAPI and REIL relocation	 and	Concurrent with CIP project number Availability of FAA funding	E77-013
2034	**E77-045**	Construction - Runway and Taxiway Signage Extension/Modification	 and	Concurrent with CIP project number Availability of FAA funding	E77-013

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E77 San Manuel Airport

Pinal County, Arizona

CIP By Year - Sorted by ACTION POINTS

	PROJECT			ACTION POINT	
2034	**E77-049**	Construction – Taxiway lighting (MITL) extension		Concurrent with CIP project number	E77-013
			and	Availability of FAA funding	
2034	**E77-013**	Construction - RWY 11-29 Extension		Following completion of CIP project number	E77-012
			and	Availability of FAA funding	
2034	**E77-062**	Design/Construction - 2-5 Unit Hangar Structure		Following completion of CIP project number	E77-028
			and	Availability of Local Funding	
2034	**E77-028**	Design/Construction - Site Work for 2-5 Unit Hangar Structure		Increase in actual demand	
			and	Availability of State funding	
2034	**E77-213**	Maintenance - RWY (4,214') Crack Seal, Seal Coat, Pvmt Marking		Observed cracking/surface oxidation	
			and	Availability of FAA funding	
2034	**E77-214**	Maintenance - Taxiway Crack Seal, Seal Coat, Pavement Marking		Observed cracking/surface oxidation	
			and	Availability of FAA funding	
2034	**E77-215**	Maintenance - Apron Crack Seal, Seal Coat, Pavement Marking		Observed cracking/surface oxidation	
			and	Availability of State funding	

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Appendix A

Planning Advisory Committee Meetings

Meeting Notes
Initial Kick-Off Meeting

October 24, 2013

Participants: Jim Petty, Pinal County
Don Anello, Pinal County Planning & Zoning (PAC Member)
Ryan Toner, Dibble Engineering
Nicholas Pela, Nicholas J. Pela & Associates (NJP)

Location: Pinal County offices

Meeting Notes were prepared by Nicholas Pela.

1. The roles of the planning team and communication during the project was discussed. Ryan will be the primary client contact as the prime consultant with Dibble Engineering. Nick Pela will lead the planning work. All communication from the consultant team will go through Ryan. Dissemination of information to the general public will be coordinated through Jim Petty and Joe Pyritz, Public Relations person with Pinal County.

2. The Project Schedule was discussed. NJP will keep the schedule up to date and post updates on the Project Web Site as the work progresses. The original draft schedule may be modified because of unanticipated delays in scheduling field survey work and the aerial photogrammetry. These delays could potentially push the first PAC meetings from early December to mid-January, and could impact the projected project completion date.

   ACTION ITEMS: Ryan will coordinate with the Dibble survey chief and with Aerometric to determine the new schedule for these tasks.
   Nick will revise the Project Schedule and post it to the web site (with notifications to the PAC).

3. Project Web Site and its function were discussed. The link was provided to Don Anello and to Jim Petty, and will be provided to the PAC, ADOT and FAA.

   ACTION ITEMS: Nick will provide web site information and link to the PAC membership and to ADOT and FAA.

4. The Planning Advisory Committee (PAC) function was discussed. Jim Petty provided a list of the current members. This will be finalized by Jim after he contacts one remaining potential member. Nick provided CDROM copies of the audio/visual tutorial *Master Planning 101* for distribution to the PAC.

   ACTION ITEMS: Jim will finalize the PAC membership list.
   Nick will provide the list to the FAA and to ADOT, and will make initial email contact with the PAC (see Action Item at 3, above).

5. Information Needed – A preliminary list of information needed by the consultant team was discussed. In addition to the final PAC member contact list, the following information was requested from Jim:

    - Records of the number of based aircraft for at least ten years
    - The possibility of placing County-owned traffic counters at the airport was discussed
    - An email contact list of current airport users
    - The current mix of aircraft using the airport by type (if known)
    - Any available "as-built" construction plans for airport facilities
    - Any available survey records
    - Current airport leases
    - The most current ADOT pavement evaluation report
    - Any other pavement investigations that may be available

6. The next steps to be accomplished were discussed. These will include the following tasks:

    Facilities Inventory - This will include a two-day on site inspection by two consultant staff members. Field work will be scheduled as soon as possible. Loren Bunney (NJP) and Jared Bass (Dibble) will do the field work.

    Surveys – This will be scheduled as soon as possible.

    Aerial Photography – This is being coordinated to be accomplished as soon as possible.

    The consultant team will continue to move forward with work that is in progress on the first Working Paper (Introduction). This includes a discussion of the purpose and need, goals, and scope of the master plan, as well as an outline airport history and general airport information. A preliminary draft of this section is already on the project web site. This draft document will be finalized and the PAC will be notified when it is ready for review on the web site.

    Work is also in progress on the Aviation Forecasts section of the plan. This will also continue to move forward and the resultant document will be posted on the web site for review when it is ready in draft form.

❖ ❖ ❖ ❖ **END** ❖ ❖ ❖ ❖

MEETING NOTES
Planning Advisory Committee (PAC) Meeting #1

Date/Time: December 20, 2013 – 1:00 PM
Location: San Manuel Airport Terminal Building

Participants (see attached sign-in sheet):

- Jim Petty, Pinal County
- Nicholas J. Pela, Nicholas J. Pela & Associates
- Ryan Toner, Dibble Engineering
- Warren Traweek, PAC Member
- Parrish Traweek, PAC Member
- Mary Hanson, PAC Member
- Britta Panca, PAC Member
- Archie Carreon, PAC Member
- Don Anello, PAC Member (not signed in)
- Vern Stover, Guest (not signed in)

1. Introductions were made of all participants.

2. The CDROM audio/visual presentation "Master Planning 101" described and discussed. The Planning Advisory Committee (PAC) Process was described in summary.

3. The Project Web Site was described and its functions were presented.

4. The Project Schedule was discussed. Major milestones were presented as follows:

   PAC Meeting #1 .... December 20, 2013
   PAC Meeting #2 .... May 14, 2014
   Public Information Meeting/Workshop #1 .... May 14, 2014
   PAC Meeting #3 .... September 29, 2014
   Public Information Meeting/Workshop #2 .... September 29, 2014
   County Board Presentation/Approval .... December 1, 2014
   Project Completion .... December 16, 2014

5. Review of Working Paper #1 - Introduction

   The purpose and need for the Master Plan, as presented in Chapter 1, was presented and discussed.

   Prior questions and comments raised by Warren Traweek regarding Chapter 1 were discussed. These had been addressed in a written response and are included the attached "Response to Review Comments".

ACTION ITEM: The consultant team will revise Chapter 1 in accordance with comments received from the PAC (including comments in the attached "Response to Review Comments"), and will provide the final draft document to the PAC Members for final review and approval.

6. Review of Working Paper #2 – Inventory

The general demographic indicators that were presented in the Master Plan were discussed.

The development of the Airport Service Area was presented and discussed.

The proximity of military airspace was presented and discussed.

The wind data analysis was discussed.

The process of evaluating the general condition of the airport's current infrastructure was discussed.

Prior questions and comments raised by Warren Traweek regarding Chapter 2 were discussed. These had been addressed in a written response and are included the attached "Response to Review Comments".

ACTION ITEM: The consultant team will revise Chapter 2 in accordance with comments received from the PAC (including comments in the attached "Response to Review Comments")", and will provide the final draft document to the PAC Members for final review and approval.

7. Review of Working Paper #3 – Forecasts of Aviation Activity

A summary of the forecast process was presented.

The forecast projections that were developed for San Manuel Airport as well as the critical aircraft and potential mix of aircraft types that may use the airport in the future, were presented and discussed.

The PAC discussed the number of aircraft that are actually residing at the airport, versus the aircraft included on the County's list of based aircraft. The County list includes 24 aircraft, but there are now 20 aircraft in the County owned Tee-Hangars, plus 13 housed in privately owned hangars.

Jim Petty indicated that there are currently 22 aircraft on a hangar waiting list. All hangars on the airfield are full at the present time.

Some of the prior questions and comments raised by Warren Traweek regarding Chapter 3 were discussed. These had been addressed in a written response and are included the attached "Response to Review Comments".

ACTION ITEM: The consultant team will revise Chapter 3 in accordance with comments received from the PAC (including comments in the attached "Response to Review Comments"), and will provide the final draft document to the PAC Members for final review and approval. Upon approval by the PAC, the consultant team will submit the forecasts to the FAA for their review and approval.

8. Next Steps

The next steps in the planning process were presented as follows:

- Official submittal of forecasts to the FAA
- FAA Forecast Approval
- Finalize Working Papers 1, 2 and 3
- Demand/Capacity Analysis (WP 4)
- Facility Requirements (WP 5)
- Alternatives Analysis (WP 6)

May 14, 2013:

- **PAC Meeting #2**
- **Public Information Meeting #1**

Attachments:

Participants' Sign In Sheet – Planning Advisory Committee (PAC) Meeting #1

Response to Review Comments

San Manuel Airport – San Manuel, Arizona
MASTER PLAN 2014

PARTICIPANTS' SIGN IN SHEET- Planning Advisory Committee (PAC) Meeting #1

Date/Time: December 20, 2013 – 1:00 PM
Location: San Manuel Airport Terminal Building

Name	**Email Address** (update only)	**Phone** (update only)
Jim Petty (Pinal County)	jim.petty@co.pinal.az.us	(520) 866-6545
Nicholas J. Pela (Nicholas J. Pela & Associates)	nicholas.pela@nicholaspela.com	(602) 349-9967
Ryan Toner (Dibble Engineering) WT	ryan.toner@dibblecorp.com	(602) 957-1155
Warren Traweek	WTRAWEEK@GMAIL.COM	(520) 829-9865
Britta Penca	blueskygyros@gmail.com	(520-840-0951)
ARCHIE CARREON	archie.carreon@pinalcountyaz.gov	520-866-6416
Parrish Traweek	PCAIRCRAFT@Hotmail.com	520.664.4817
MARY HANSON	azhanson101@gmail.com	520-404-7118

Response to Review Comments

Comments provided by Warren Traweek, PAC Member
Responses by Nicholas J. Pela, Senior Consultant – Nicholas J. Pela & Associates

December 19, 2013

Warren:
Thanks for your interest in the project and for your very detailed review comments. We really appreciate it. I'm responding to your comments point by point below. My responses are in BLUE.

CHAPTER 1; INTRODUCTION:

Pg 1-2; "Flexible" - - - need details of what the "actual, measurable activity" is, and how, when, & by whom it will be monitored & applied. This refers to the "action points" that will be identified for each recommended improvement. This is covered in the Master Planning 101 video introduction that each PAC member was asked to review. It is also identified in our contract as part of our scope of work on the upcoming phases, as follows: *"NJP will develop concise recommendations for future airside and landside improvements which will allow the airport to effectively accommodate the projected demand, and will develop a prioritized list of improvements … Each recommended action will be assigned an 'action point'. This is the observable condition that will trigger the actual implementation of the recommended action. For example, a recommendation to expand a tiedown apron would be triggered by an observed trend increase in the actual number of based aircraft to 90% of existing capacity. A recommendation to reconstruct a taxiway would be triggered by an observed decline in the taxiway's Pavement Condition Index (PCI)."* This will be described in Chapter 5, Facility Requirements… not there yet.

Pg 1-3; paragraph 2. The "privately-owned 7-unit Tee-hangar structure" actually has 8 units, 2 of which also contain "Aerolifts". These 8 units presently house 9 aircraft, with the additional unit now vacant / undergoing storm damage renovation (normally 10 aircraft in these 8 units). Thanks for correcting this. We will revise the document to reflect the correct information.

Collectively, there are currently 13 aircraft (normally 14) housed in hangars and the container unit at the SE end of the airport. We will add this to the document.

Since it is not mentioned elsewhere, it may also be important to understand that there are 11 individuals involved in private ownership of hangars and other structures at the SE end of the field. This is good information to document since it will affect future improvements. We will request additional information from Jim Petty and will add this to the document.

The Mobile Home structure at that end is also a "privately owned/occupied" residence; not County owned as is stated (somewhere), in the draft. We understood that this was County-owned and that there was some sort of agreement concerning the occupant. We will get clarification from Jim Petty.

CHAPTER 2; INVENTORY:

Pg 2-1; paragraph 3. Discussion probably needed on actual area demographics which currently differ greatly from traditional small community parameters. There are essentially no viable employment opportunities nor industries within the immediate area at this time and the airport is remote from major metropolitan areas. this means that it is not now a "destination" airport for businesses or other transportation or airport "reliever" purposes. For several decades the San Manuel Airport has primarily served as a "private" (personal) aircraft base with a prevailing emphasis on sport / recreational aviation. We simply presented the record demographic information that the following planning work will use. There is some evidence of growth at E77 even in the face of a declining economy. On page 2-1 we do say that *"Annual population growth for the period averaged 7.47%. The growth in the number of based aircraft over the same period was very aggressive, at 13.1%. From 2001 through 2013, the average growth in the number of based aircraft was 10.6%. It is interesting to note that Per Capita Income growth lagged at an average of only 2.45% per year for the 2001-2011 period. This may indicate that although general economic growth was in decline, certain local factors continued to place demand on the airport. These local factors may include 'migration' of based aircraft from the more expensive Tucson area airports to San Manuel Airport."* We can include some of the information you've shared in the Forecasts chapter as part of a discussion of the actual activity versus the maximum projected activity, but would have to provide sources of information.

Pg 2-2; paragraph 3. As of 12-20-13 there are 39 (& possibly more) aircraft based @ E-77, of which 23 are in county hangars, 3 on tie-down and 13 in units at the SE end. I do not now the exact number of aircraft owners but some aircraft (and their owners) based at the field are not on the aircraft list contained in the present draft. The list of based aircraft that we used was provided to us by the County. It represents the aircraft that are officially based at the airport. That is, the aircraft that the County is aware of whose owners are paying fees to the County and/or are registered with ADOT. This is the list of aircraft that is reported to ADOT annually (and that they follow up on to ensure compliance with tax law). There may be other aircraft present at E77, but they may be registered as "based" at another airport. These would actually be considered to be transient aircraft until/unless the owners register them otherwise. If these aircraft are permanently located at E77 they should be registered as such with the County and ADOT. We have no way of knowing if they are based or transient without that.

Pg 2-3; Table 2b. There are a number of pilot/owners who reside within the Tucson metropolitan area. We've identified a service area based on the records of the addresses of the based aircraft owners. Again, this is from the official County list of based aircraft. Some of these were Tucson addresses, but the zip codes were Catalina, Casas Adobes, etc, as shown on Figure 2-1.

Pg 2-18; Again, there are 8 bays in the large hangar structure at the SE end (the additional one faces NW). We will make the change.

Pg. 2-19; photo. The shipping container shown in the photo is a Gyrocopter hangar/shop owned & seasonally used by an out-of-state winter visitor. Good to know. We will add this to the document.

Pg. 2-20; item J. The "single-aircraft Tee hangar" is listed as "good" condition, and externally appears to be so. However, internally there are deficiencies in comparison to the other units at the SE end. - - - We will take another look at this. Our engineers could not get into all of the hangars when they did their field work. I appreciate the additional information.

Again, the "portable storage unit" mentioned is a Gyrocopter hangar. We will make note of this.

Pg. 2-23; Again, 8 bays, etc. for privately owned Tees, SE end. We will address.

CHAPTER 3; AVIATION DEMAND:

General Comment: In general, it must be understood that the forecasts and estimates of current activity are statistical estimates of the maximum activity that may be expected. We try to identify a reasonable range of activity with the understanding that that maximum level may or may not occur. The lower end of the range is no activity at all. That is possible if the runway is rendered unusable (as happened to Kearny after the flood several years ago). The high end of the range is predicted by the statistical methods that are documented in the report, but the actual activity may be significantly affected by many factors. No on-airport businesses mean less activity. A flight school moving to an airport will, of course, significantly increase activity, as would a new on-airfield business. A declining regional economy may depress airport activity, but it may also increase it if the subject airport offers less expensive hangar space, fuel, or other services (as compared to basing at a busy metropolitan airport). We see that some aircraft owners now basing at E77 are living in the Tucson MSA, and are willing to drive farther probably to save money (and possibly to stay out of busy airspace).

I would certainly agree that the activity at E77 is now falling somewhere below the maximum level that we have identified. We will plan for the maximum level, but build in the "action points" that I have discussed above as triggers to actually implement the planned improvements.

This is covered in the Master Planning 101 video introduction that each PAC member was asked to review. It will also be addressed in the PAC Meeting 1 presentation. In retrospect, we should have included a preamble in Chapter 3 that explains all of this, and we can add that in the next draft.

Pg 3-3; 2013 listing shows 22 aircraft. As of 12/20/2013, there are 39 aircraft based at E-77 (possibly more). See my response above.

Pg 3-4; Again, there at least 39 aircraft currently based at San Manuel. The list on this draft page fails to include a number of aircraft presently based at the site. See my response above.

Pg 3-5; paragraphs 4 and 5. The estimated number of operations based at San Manuel airport was unrealistically optimistic for 2007 and appears to continue to be so for 2014 & beyond. We are simply reporting here what the 2008 SASP and the FAA came up with. With reference to the 2008 SASP, we do say "*It should be noted that the SASP shows the number of based aircraft at San Manuel to have been 57 airplanes in 2007. The actual number of based aircraft in 2007 was 18.*"

Pg 3-6; paragraph 2. The 584 operations per based aircraft is also likely unrealistic. We base this on prior research, as explained in the report, and it represents a maximum level (see general comment above).

Table 3-D: Estimated existing activity is not realistic. (see general comment above)

Pg 3-8; paragraph 2. Again, projected operations appear to be highly optimistic. (see general comment above)

Paragraph 5. The listed number of based aircraft for 2014 is inaccurate as there are 39 aircraft (or more), based at E-77 in 2013. See my response above.

Pg 3-9; Table 3e. The projected operations for 2014 and subsequent years are not reasonably realistic. For example, the 2014 number would mean 375 operations per year for every single aircraft based on E-77, including those not presently airworthy. It would actually mean an average of

212 takeoffs plus landings per year for each based aircraft, plus about 9,400 annual takeoffs and landings by transient aircraft that visit E77, per Table 3k. (also see general comment above)

Pg 3-10, 11, 12, 13. The listed number of operations, again, appear to be optimistic. (see general comment above)

Pg 3-14. Table 3j. This table does not reflect what has occurred at San Manuel Airport in the past nor is likely to occur in the reasonable future. For example, the jet operations listed at 3% have never occurred and will not within the foreseeable future. Since implementation of the 2003 Master Plan, there has been one single jet landing/takeoff (straight-wing Cessna Citation), at San Manuel Airport, which resulted in considerable damage to the aircraft. There have been no other jet operations at E-77 within the last ten years. in addition, the other projected aircraft category percentages in Table 3j have turned out to be equally inaccurate. Table 3j presents the statewide mix of aircraft types and has nothing to do with past activity at E77. Our document states "*The mix of General Aviation aircraft types that <u>may use</u> the San Manuel Airport was approximated by utilizing the fleet mix distribution of aircraft types that were registered in the State of Arizona during the preparation of the 2008 Arizona State Airports System Plan (SASP). The SASP indicates the following distribution of selected types of aircraft (Table 3j):*"

Regarding past/current activity, our document states *"Although undocumented, it is probable that there is current activity by transient multi engine aircraft, and it is possible that there is some limited use by small business jets, turboprops and rotorcraft. As future activity increases, it is assumed that there will be increased levels of use by these types of aircraft."* It goes on to state that *"For the purposes of this study,* [i.e. for planning purposes] *the assumption was made that the fleet mix of based aircraft will <u>tend to seek</u> the distribution of the statewide fleet as presented in Table 3j".*

Pg 3-15; paragraph 1. As previously stated, there are currently more than 24 aircraft based at San Manuel. This draft paragraph states it is "assumed" there will be increased levels of use by the listed aircraft. Information upon which that assumption is or will be made should be provided. This is identified as an assumption. Everything in the document that isn't assumed is sourced and explained. We could assume that no twins or jets will use the airport in the future, but that would seem unreasonable if/as the economy improves and business activity is attracted to the area. So, to be able to plan for the possibility of twins/jets we have assumed that the E77 activity may "tend to seek" the statewide averages.

Table 3k again appears to be based upon inflated numbers of annual operations. (see general comment above)

Pg 3-18; paragraph 1, 2, 3, 4. The recommended ultimate classification of the airport as ARC B-II, is certainly acceptable as we look forward to the future of E-77. However, there are essentially zero (or at least extremely limited) Class B-II operations occurring at the airport at present or in the past.. In the interest of economics and reality, ARC B-II criteria for San Manuel E-77, should be implemented "sequentially" in direct response to quantifiable future growth in airport usage. Realistic "Benchmarks" for that sequential advancement of the 2014 Plan should be established and honored in the future. You are absolutely correct. Our process moving forward includes identifying "action points" for each recommended improvement. This is covered in the <u>Master Planning 101</u> video introduction that each PAC member was asked to review. It is also identified in our contract as part of our scope of work on the upcoming phases, as follows: *"NJP will develop concise recommendations for future airside and landside improvements which will allow the airport to effectively accommodate the projected demand, and will develop a prioritized list of improvements … Each recommended action will be assigned an 'action point'. This is the observable condition that will trigger the actual implementation of the* *recommended action. For example, a recommendation to expand a tiedown apron would be triggered by an observed trend increase in the actual number of based aircraft to 90% of existing capacity. A recommendation to reconstruct a taxiway would be triggered by an observed decline in the taxiway's Pavement Condition Index (PCI)."*

Figure 3-1. The current number of aircraft shown in the FAA Terminal Area Forecast, is inaccurate. You are correct. We are simply reporting what the FAA has come up with and showing that as a point of comparison with the other prior studies.

PERSONAL OPINION; For Financial & other considerations, I recommend that the "2014, E-77 Master Plan" be oriented toward sequential implementation of all aspects of the Plan, in response to demonstrable need as the Airport evolves. Plan implementation should not be based upon a "build it and they will come basis". Again, you are absolutely correct. See my response to your Page 3-18 comments, above.

Response to Review Comments (Final Draft, Chapters 1-3)

Comments provided by Warren Traweek, PAC Member
Responses by Nicholas J. Pela, Senior Consultant – Nicholas J. Pela & Associates

January 21, 2014

Warren:
Thanks for the comments. My responses follow.

Mr. Pela,
Thank you for opportunity to review the revised (to date), 2014 Master Plan. It is a good, ongoing work and is greatly appreciated. The revisions you have made contribute to a more useful and reasonable 2014 Master Plan.

3 minor follow-up comments follow:

(1); Credibility concerns remain in relation to projected annual aircraft operations (pgs. 3-6/7, et al), as well as with the empirical data upon which such numbers are based ("empirical" defined as, "relying on experience or observation alone, often without due regard for system and theory" [Websters]). For whatever reason, "current system & theory" observed at other airfields has not in the past and does not now seem to realistically be applicable to San Manuel, E-77. As one example, 345 operations per year, per based aircraft at San Manuel is not realistic, no matter what studies at other airports may have concluded.

As I said in response to your first set of comments, it must be understood that the forecasts and estimates of current activity are statistical estimates of the <u>maximum activity</u> that may be expected. We base what we do on data gathered from the best sources that we can and have to assume that it is possible that an airport will tend to seek a similar level of activity as other airports that are in the same general geographic area. The 345 operations per year value is the most current tower record data from Tucson International Airport (GA operations only). If we had used a regional average, it would have been much higher (560 or so). So we elected to use only the value from Tucson, since the E77 service area actually "encroaches" upon the TUS service area. Probably the best way to estimate actual activity is to do a long term traffic count, but that adds many thousands of dollars to the program (and stretches it out for at least an additional year). Even then, there is room for questioning the "credibility" of the data.

(2); Along with based aircraft operations, draft Plan comments regarding past, current and projected "Turbo-Prop and Jet operations" at E-77 (pg 3-16, et al) are equally unrealistic. As stated in the previous meeting, there has been one single Jet landing / takeoff (straight-wing Cessna Citation), @ E-77 within the past 10 years. That event resulted in considerable brake, tire & wheel damage to the aircraft. No other Jet operation has occurred at E-77.
E-77 is not currently a "necessary destination" airport for business or other purposes, making it highly unlikely there will be any additional Jet operations within the foreseeable future.
There have been and will continue to be, very minimal Turbo-Prop operations at San Manuel. Although formal numbers of past Turbo-Prop operations have not been recorded, general observation indicates that on average, no more than one Turbo-Prop landing / takeoff every 2 or 3 months, has ever occurred at the airport; likely far less than that. Again, such operations would obviously be business related (although the Jet incident involved a non-business "sport" flight), and sufficient business basis for support of such operations does not presently exist in the immediate operational area. Such business flights within the "expanded" operational area would more likely use business oriented airports in the Tucson / Marana area.

You are describing the low end of activity that may continue to occur. And that may very well happen. Again, it must be understood that the forecasts and estimates of current activity are statistical estimates of the <u>maximum activity</u> that may be expected. We based the projections on the potential for E77's activity to seek the level of the Statewide fleet mix. That may or may not happen. If business activity does increase locally, and/or if Tucson businesses realize the economic benefit of basing their aircraft somewhere other than TUS or RYN it could. The truth is, we know that there is aircraft “migration” from the TUS service area happening now. So we can’t say that Jet/Turboprop activity will never occur.

(3) Despite the above comments - - - if Turbo-Prop / Jet projections remain necessary for the 2014 Plan, the projection of MORE Jet operations than Turbo-Prop seems reversed. It would seem logical that far more Turbo-Prop than Jet operations would occur at ANY airport other than airline-oriented International / Municipal airports such as Tucson International or Phoenix Sky Harbor.

That was my reaction also. However, there are more pure jets than turboprops in Arizona. We simply applied the Statewide fleet mix data. Many planners will try to include a lot of their own assumptions in areas like this, but that’s really not our job. We try to show what the potential for growth might be. As I’ve said many times, the low range of activity is zero. We try to establish a reasonable high range that the owner can plan (hope?) for. The actual activity will fall somewhere between.

It is not unreasonable for San Manuel that a very active aviation-oriented business might choose to locate there. If that happened, the Master Plan would include a plan to accommodate them. Activity would then increase (possibly including jets/turboprops), and so would revenue.

Again, Thank you for permitting additional comment.

Warren Traweek

MEETING NOTES
Planning Advisory Committee (PAC) Meeting #2

Date/Time: May 14, 2014 - 1:00 PM
Location: San Manuel Airport Terminal Building

Participants (see attached sign-in sheet):

- Jim Petty, Pinal County
- Nicholas J. Pela, Nicholas J. Pela & Associates
- Ryan Toner, Dibble Engineering
- Jared Bass, Dibble Engineering
- Scott Driver, ADOT
- Parrish Traweek, PAC Member
- Mary Hanson, PAC Member
- Britta Panca, PAC Member
- Archie Carreon, PAC Member
- Robert Metz, Sr., P.C. Aircraft

1. **Introductions** were made of all participants.

2. The revised **Project Schedule** was discussed. The schedule has been modified because of the additional time required to redo the aviation forecasts after discovering that there are more based aircraft than had been reported earlier. The new schedule is designed such that the completion date of the project will not change. The scheduled date of the first Public Information Meeting/Workshop has been moved from May 14, 2014 to July 16, 2014 so that we will have more relevant information to present to the general public. An additional modification has also been made. This is the addition of a fourth PAC Meeting (the original Scope of Work included an undesignated meeting that could be scheduled later in the project). Major project milestones were presented as follows:

   PAC Meeting #3 (new meeting)....................................... July 16, 2014
   Public Information Meeting/Workshop #1 .... July 16, 2014
   PAC Meeting #4 .... September 29, 2014 (no change)
   Public Information Meeting/Workshop #2 .... September 29, 2014 (no change)
   County Board Presentation/Approval .... December 1, 2014 (no change)
   Project Completion... December 16, 2014 (no change)

   In accordance with ADOT's policy, the Public Information Meetings will be conducted on the same day as a PAC Meeting. The PAC Meetings will continue to be scheduled for 1:00 PM, with the Public Information Meetings to be scheduled for 4:00 PM to 6:00 PM to allow for working people to be more easily able to attend. The Public Information Meetings will be advertised in accordance with ADOT and Pinal County's requirements.

3. The **Completed Work** was presented and discussed.

   Some minor corrections and modifications were made to Chapter 1, Introduction and Chapter 2, Inventory, based on information received from the PAC.

   Since the last PAC Meeting, the aviation forecasts have been significantly modified. This was necessary because of the discovery of many additional unrecorded based aircraft. Significant revisions to Chapter 3, Aviation Demand were made and were posted to the project website for PAC review. The forecasts were submitted to the FAA Phoenix AFO on January 23, 2014. The FAA responded with minor comments. These were addressed and the forecasts were resubmitted on April 1, 2014. The official FAA approval letter was received on April 21, 2014.

   The new forecasts were presented and discussed. Britta Penca informed the consultant team that her business now has three rotorcraft with one more on the way, and that her current rotorcraft activity exceeds the Master Plan's forecasts. She was asked to provide a written statement describing her activity that will be incorporated into the Master Plan. This information will not change the calculated projections, but will help to document the actual growth that is occurring at the airport, and will help to validate the forecasts.

   Mary Hanson asked about the fact that the FAA's Terminal Area Forecasts (TAF) "flat line" San Manuels's operations and number of based aircraft throughout their 20-year planning period. The FAA's forecasts indicate 14,000 annual operations and 22 based aircraft from 2014 through 2034, indicating no anticipated growth. The consultants responded that the next TAF update should include the Master Plan forecasts, since we have provided that information to the FAA (and they have approved it).

   Scott Driver was asked if ADOT has everything they need regarding the forecasts. He indicated that they have received the forecast information along with the FAA approval letter, and that that is all they need.

   ACTION ITEM: Britta Penca will provide written information regarding her company's rotorcraft activity. This will be incorporated into the Master Plan. [Information was received. See the Attachment to these notes.]

4. The consultants had intended to ask for **PAC Acceptance of Chapter 1 through 3** at this meeting. However, because several participants were absent it was suggested that an email poll be conducted. It was pointed out that the PAC does not approve the Master Plan. That will be a function of the Pinal County Board of Supervisors. However, it is important to document the PAC's consensus on completed work as the work progresses into the next phases.

   ACTION ITEM: The consultants will conduct an email poll to document consensus on approval of Chapters 1 through 3.

5. A **Review of WORKING PAPER 4 – Demand/Capacity Analysis** was presented. This included discussion of the importance of the theoretical daily and hourly peak activity that was calculated in this section. These values were used to estimate the recommended facility requirements in the following chapter. The Master Plan estimates 8 peak hourly operations at the present time, increasing to 15 by 2034. Britta Penca indicated that her training activity can account for up to 9 hourly operations when touch and go operations are being conducted (see ACTION ITEM above).

   It was also reported that a draft of Chapter 4 was provided to the FAA along with the forecasts to aid in their review process.

6. A **Review of WORKING PAPER 5 – Airport Facility Requirements** was presented. This included a description of the year-by-year schedule of improvements and maintenance projects that are recommended in the Master Plan. The recommendation to upgrade the airport classification from ARC B-I to ARC B-II was discussed. This has been designated to occur in 2020, but will be predicated upon actual changes in demand by larger aircraft. This change may consist of potential use by larger aircraft that can be documented. A reasonable typical ARC B-I design aircraft was identified as a Cessna 402. A reasonable future ARC B-II design aircraft was identified as a Beechcraft King Air 200.

   The airport's pavement strength was discussed. The design process takes into account use by a wide range of aircraft, and also considers the frequency of operations. Current pavement strength is for 12,500 pound aircraft with single-wheel landing gear. Some larger aircraft can also use the pavement infrequently without pavement damage, but this should be considered on a case by case basis.

   The PAC was informed that the draft exhibits that show hangar development were being revised because the first drafts showed development in high fill areas that would not be economically feasible. It was also pointed out that virtually all of the recommended new development will require import borrow fill material. One logical source for this material could be along the southwest side of the runway.

   Parrish Traweek requested the addition of a designated helicopter landing area. The consultants indicated that this was not included because rotorcraft can legally land and depart anywhere on the airfield that does not present a hazard, but that a designated helipad/heliport requires setback restrictions and approach surfaces that can restrict development in an already constrained site. It was suggested that a designated helipad be included to the southwest of the runway.

   Mr. Traweek also pointed out that there are several abandoned power poles and lines immediately southwest of the airport property. These are on BHP land that may be acquired by the County in the near future. It would be desirable to remove these power lines to enhance safety of operations. This would be eligible for FAA and ADOT funding participation if they are on airport property.

ACTION ITEM: A new designated helipad will be added to the Chapter 5 recommendations.

ACTION ITEM: The abandoned power lines/poles will be discussed in Chapter 5 with recommendations to remove them.

7. The **Next Steps** in the planning process were presented as follows:

    - Finalize Chapter 4, Demand/Capacity Analysis
    - Finalize Chapter 5, Airport Facility Requirements
    - Prepare draft Chapter 6, Development Alternatives

    July 16, 2014:
    - **PAC Meeting #3**
    - **Public Information Meeting #1**

8. A **Preview of Work in Progress** was presented. This included a presentation of graphics that show the present draft alternatives that are being developed for the runway extension, access road relocation, and for the terminal area development. These layouts are in the process of development and modification. The draft Development Alternatives section will be completed and provided to the PAC two weeks before the next PAC Meeting, but the new layouts will be provided in advance of that as they are refined.

9. The following items were addressed during the **General Questions and Discussion** period:

    It was noted that there is currently a high level of military activity at the airport. This includes a significant number of helicopter operations. It was suggested that a military representative be invited to attend the July 16th PAC Meeting.

    The County is in the process of negotiating with BHP to acquire the current airport property that is leased, and also to acquire additional land to allow for future development. The consultants will be developing a recommended airport property line based on the Master Plan recommendations. Scott Driver cautioned that any land acquisition that is funded by the FAA and/or ADOT would have to be preceded by an Environmental Assessment.

    Archie Carreon suggested that a left turn lane should be constructed at the airport entrance. This will be added to the Chapter 5 recommendations.

Attachment:

Correspondence from Britta Penca regarding gyroplane activity

Participants' Sign In Sheet – Planning Advisory Committee (PAC) Meeting #2

Attachment

Email correspondence regarding gyroplane activity at San Manuel Airport.

From: Britta Penca May 22, 2014 - 11:07 AM

To: Nicholas J. Pela

Hi Nick,

That was a good mtg! Here is the info that we spoke about.

There are currently 3 N#'d, registered gyroplanes in the field. N51450, N2585M, and N6149H. Currently the [Master Plan] lists only 1 and projects that there will be 3 by 2034. We will have another gyro in a few months, and Ed Marquart is about to register his which is already hangared here. So there will be 5 gyroplanes on the field in 2015. I imagine that trend may continue as we are the only gyroplane training school in the state and about to become sales reps for AutoGyro. We are attracting gyroplane pilots due to the great weather here. They come to receive training, then move here and stay!

We have been considering an addition to the AFD to say: Heavy Gyroplane Activity.

Just a note on the helicopter pad, the gyros probably wouldn't be able to land there since we need airspeed to land and cannot hover. We also must land into the wind in order to keep the appropriate blade spin. Just FYI. I didn't want there to be any confusion about that. We can set them down in a short distance provided that we have an obstacle free approach. Only mentioning it as changing the mid field entrance from the runway removes one of our existing options for landing into a cross wind from SW, which is often the case. An off ramp angled that direction would help, but only if there was an approach path free of obstacles.

Thanks so much. See you at the next mtg,
Britta Penca
[redacted]

Also, we had at least 1,500 operations last year in the gyroplanes.

Sent from my iPhone

San Manuel Airport – San Manuel, Arizona

MASTER PLAN 2014

PARTICIPANTS' SIGN IN SHEET- Planning Advisory Committee (PAC) Meeting #2

Date/Time: May 14, 2014 - 1:00 PM
Location: San Manuel Airport Terminal Building

Name	Email Address (update only)	Phone (update only)
Jim Petty (Pinal County)	jim.petty@co.pinal.az.us	(520) 866-6545
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Butta Penca, CFI		
Scott Driver	sdriver@azdot.gov	602 712-8386
Mary Hanson		
Robert Metz Sr.	Mech. P.C. Aircraft	
ARCHIE CARREON	archie.carreon@pinalcountyaz.gov	520-866-6410
Parrish Traweek		

MEETING NOTES
Planning Advisory Committee (PAC) Meeting #3

Date/Time: July 16, 2014 – 1:00 PM
Location: San Manuel Airport Terminal Building

Participants (see attached sign-in sheet):

- Jim Petty, Pinal County
- Nicholas J. Pela, Nicholas J. Pela & Associates
- Ryan Toner, Dibble Engineering
- Jared Bass, Dibble Engineering
- Scott Driver, ADOT
- Mary Hanson, PAC Member
- Britta Penca, PAC Member
- Archie Carreon, PAC Member
- Tim Bolton, Arizona State Land Department
- Robert Metz, Sr., P.C. Aircraft (not signed in)
- Parrish Traweek, PAC Member (not signed in)

1. **Introductions** were made by all participants.

2. The revised **Project Schedule** was discussed. The project is on schedule at the present time. Jim Petty suggested moving the next PAC Meeting and Public Meeting from its currently scheduled date because of scheduling conflicts. Upcoming major project milestones (as currently scheduled) were presented as follows:

   PAC Meeting #4 .... September 29, 2014 (to be changed)
   Public Information Meeting/Workshop #2 .... September 29, 2014 (to be changed)
   County Board Presentation/Approval .... December 1, 2014
   Project Completion... December 16, 2014

   ACTION ITEM: The consultant team will provide a revised meeting date for the next PAC Meeting and Public Information Meeting.

3. The completed draft of **Working Paper 6 – Development Alternatives** was presented and discussed in detail.

4. A preview of work in progress on **Working Paper 7 – Land Use** was presented. It was intended that this working paper would be submitted prior to this PAC Meeting and presented. However, the consultants found that they needed additional field survey information to adequately complete the analysis of the airport's airspace (penetrations of FAR Part 77 surfaces).

ACTION ITEM: The additional field work has been completed and the Land Use section will be completed and submitted within the next 2-3 weeks.

5. The **Next Steps** in the planning process were presented as follows:

   - Finalize draft Chapter 7, Land Use
   - Prepare draft Chapter 8, Environmental Evaluation
   - Prepare draft Chapter 9, Airport Plans
   - Prepare draft Chapter 10, Airport Development Schedule and Financial Analysis

   To be rescheduled for early October:
   - **PAC Meeting #4**
   - **Public Information Meeting #2**

8. A **Preview of Public Information Meeting #1** was presented. This included a full preview of the presentation and format for the meeting.

Attachment:

Participants' Sign In Sheet – Planning Advisory Committee (PAC) Meeting #3

San Manuel Airport – San Manuel, Arizona

MASTER PLAN 2014

PARTICIPANTS' SIGN IN SHEET- Planning Advisory Committee (PAC) Meeting #3 1

Date/Time: July 16, 2014 - 1:00 PM
Location: San Manuel Airport Terminal Building

Name	**Email Address** (update only)	**Phone** (update only)
Jim Petty (Pinal County)	jim.petty@co.pinal.az.us	(520) 866-6545
Nicholas J. Pela (Nicholas J. Pela & Associates)	nicholas.pela@nicholaspela.com	(602) 349-9967
Ryan Toner (Dibble Engineering)	ryan.toner@dibblecorp.com	(602) 957-1155
Jared Bass (Dibble Engineering)	jared.bass@dibblecorp.com	(602) 957-1155
SCOTT DRIVER	sdriver@azdot.gov	602 712 8386
Mary HANSON		
ARCHIE CARREON	archie.carreon@pinalcountyaz.gov	520-866-6416
Britta Penca	Same	Same
Tim Bolton	tbolton@azland.gov	520-209-4263

MEETING NOTES
Planning Advisory Committee (PAC) Meeting #4

Date/Time: October 22, 2014 – 1:00 PM
Location: San Manuel Airport Terminal Building

Participants (see attached sign-in sheet):

- Jim Petty, Pinal County
- Nicholas J. Pela, Nicholas J. Pela & Associates
- Ryan Toner, Dibble Engineering
- Jared Bass, Dibble Engineering
- Mary Hanson, PAC Member
- Parrish Traweek, PAC Member

1. The **Project Schedule** was discussed. The project is on schedule at the present time. There was a discussion of the upcoming Public Information Meeting and the advertising requirements related to that. Public notice will be posted in the local newspaper as was done for the first Public Meeting. The Master Plan will be presented to the Pinal County Board of Supervisors in December, 2014. The format of that meeting will be determined. Upcoming major project milestones (as currently scheduled) were presented as follows:

   Public Information Meeting/Workshop #2 .... October 29, 2014
   County Board Presentation/Approval .... December 1, 2014
   Project Completion .... December 16, 2014

   It was reported by the Consultant Team that the Airport Layout Plan has been submitted to the FAA and that they are in the process of reviewing it. [Further information received after PAC Meeting: FAA has indicated that we can expect a 45 calendar day turnaround on the review.]

   ACTION ITEM: Jim Petty will find out what will be needed for the County Board presentation, and what type of meeting it will be (i.e. Public Hearing or agenda item for a regular Board meeting).

   ACTION ITEM: Jim Petty will post the Public Notices for the October 29th Public Information Meeting later this week.

2. The Draft Executive Summary was presented to the PAC by the Consultant Team. The following questions and comments were raised:

   a) The SASP forecasts for operations for San Manuel are more aggressive than the projections developed in the Master Plan. Is this typical for other airports?

Response: Yes, in many cases they are. The latest SASP was prepared in 2007-2008, at the time that the national economy took a downturn. Forecasts in the SASP (and many other Master Plans completed during that time) were based on pre-downturn industry and socioeconomic trends.

b) Do the ADOT pavement condition values (PCN, PCI) need to be incorporated in the Master Plan?
Response: ADOT updates these values every two years and they are available via the Internet. The most current PCI values that were available last autumn are reported in the Inventory chapter of our Master Plan.

c) What is the status of the land acquisition negotiations with BHP?
Response: Jim Petty has been coordinating with BHP on this. It has been delayed because of the change in the management of BHP. He will be in contact again now that we have a survey map and the Master Plan recommendations for the extent of the land required.

d) Will a wildlife mitigation study be required since there are wastewater and mining lagoons and a waste disposal site within 10,000’ from the end of Runway 11-29?
Response: The ALP airspace mapping shows the ultimate limits of the FAR Part 77 airspace, based on the ultimate extension and upgrade of Runway 11-29 from ARC B-I to B-II, and it is based on a future nonprecision instrument approach procedure. The requirement is that there should be no features that may attract bird populations within 10,000’ of a runway end that has jet operations, or 5,000’ from a runway end that only serves propeller aircraft. The existing configuration of the airport requires only the 5,000’ threshold be observed. The lagoons and disposal site are outside of this envelope. When/if the airport is upgraded and has jet operations, a wildlife study may be required by the FAA.

e) How long will the Project Web Site remain available on the internet after the project has been completed?
Response: The Consultants will leave the site in place for as long as the airport wants it to be.

There was an extensive discussion of the Capital Improvement Program and Financial Plan. The annual Airport Capital Improvement Program (ACIP) process was explained. The airport has the opportunity each year to determine which projects will be presented to the FAA and ADOT for funding.

3. The suggested format for the upcoming **Public Information Meeting #2** was presented. This will consist of a presentation of the Executive Summary, followed by informal discussion with the participants.

Attachments:
Participants’ Sign In Sheet – Planning Advisory Committee (PAC) Meeting #4
Comments from David Stine, 162nd Wing Airspace Manager (received after the PAC Meeting)

San Manuel Airport – San Manuel, Arizona
MASTER PLAN 2014

PARTICIPANTS' SIGN IN SHEET- Planning Advisory Committee (PAC) Meeting #4 **1**

Date/Time: **October 22, 2014 - 1:00 PM**
Location: **San Manuel Airport Terminal Building**

Name	**Email Address** (update only)	**Phone** (update only)
Jim Petty (Pinal County)	jim.petty@co.pinal.az.us	(520) 866-6545
Nicholas J. Pela (Nicholas J. Pela & Associates)	nicholas.pela@nicholaspela.com	(602) 349-9967
Ryan Toner (Dibble Engineering)	ryan.toner@dibblecorp.com	(602) 957-1155
Jared Bass (Dibble Engineering)	jared.bass@dibblecorp.com	(602) 957-1155
Parrish cTeawcek	PCAircraft@Hotmail.com	520-664-4812
Mary Hanson	azhanson101@gmail.com	520-404-7118

Recommended modifications from 162nd Wing, Tucson, AZ.

p. 2-5
Airspace

Military Operation Areas (MOAs) and Military Training Routes (MTRs) are established for the purpose of separating certain military training activities, which routinely necessitate acrobatic or abrupt flight maneuvers, from Instrument Flight Rules (IFR) traffic. IFR traffic can be cleared through an active MOA if IFR separation can be provided by Air Traffic Control (ATC), otherwise ATC will reroute or restrict the IFR traffic.

Directly to the north is the Outlaw Military Operations Area (MOA), and to the northeast is the adjacent Jackal and Jackal Low MOAs (Airspace Map, Figure 2-2). Extensive military training activity is conducted within the MOAs. Outlaw MOA extends from 8,000 feet MSL or 3,000 feet AGL (whichever is higher) to but not including flight level 180. Jackal Low MOA extends from 100 feet AGL to but not including 11,000 feet MSL or 3,000 feet AGL (whichever is higher). Jackal MOA lies atop Jackal Low MOA from 11,000 feet MSL or 3,000 feet AGL (whichever is higher) to but not including flight level 180. Above all these MOAs is Air Traffic Control Assigned Airspace (ATCAA) which extends from flight level 180 to flight level 510. These MOAs are active Monday through Friday from 7:00 a.m. until 6:00 p.m. All of these MOAs may be scheduled active at other times by issuing a Notice to Airmen (NOTAM), as is done for weekend or night missions.

There are also several low-level Military Training Routes (MTRs) in the local area. The nearest of these is Visual Routes (VR) -267, -268, and -269. The centerline (green lines in depiction) of these superimposed routes is located approximately ten miles east of the airport. Along this leg, VR-267, -268, and -269 are four nautical miles (nm) wide (two nm east and two nm west of centerline) and extend from 300 feet AGL to 1,500 feet AGL. The closest western border of these MTRs (red line) is located approximately eight nm east of the Airport. Additionally, numerous other MTRs converge at Black Mountain, northwest of the Airport with the centerline of VR-239 is located 16 nm northwest of the Airport. Along these legs, VR-239 is ten nm wide (five nm north and five nm south of centerline) and extends 300 feet AGL to 9,000 feet MSL. The closest southeastern border (red line) of VR-239 is located approximately 12 nm northwest of the Airport.

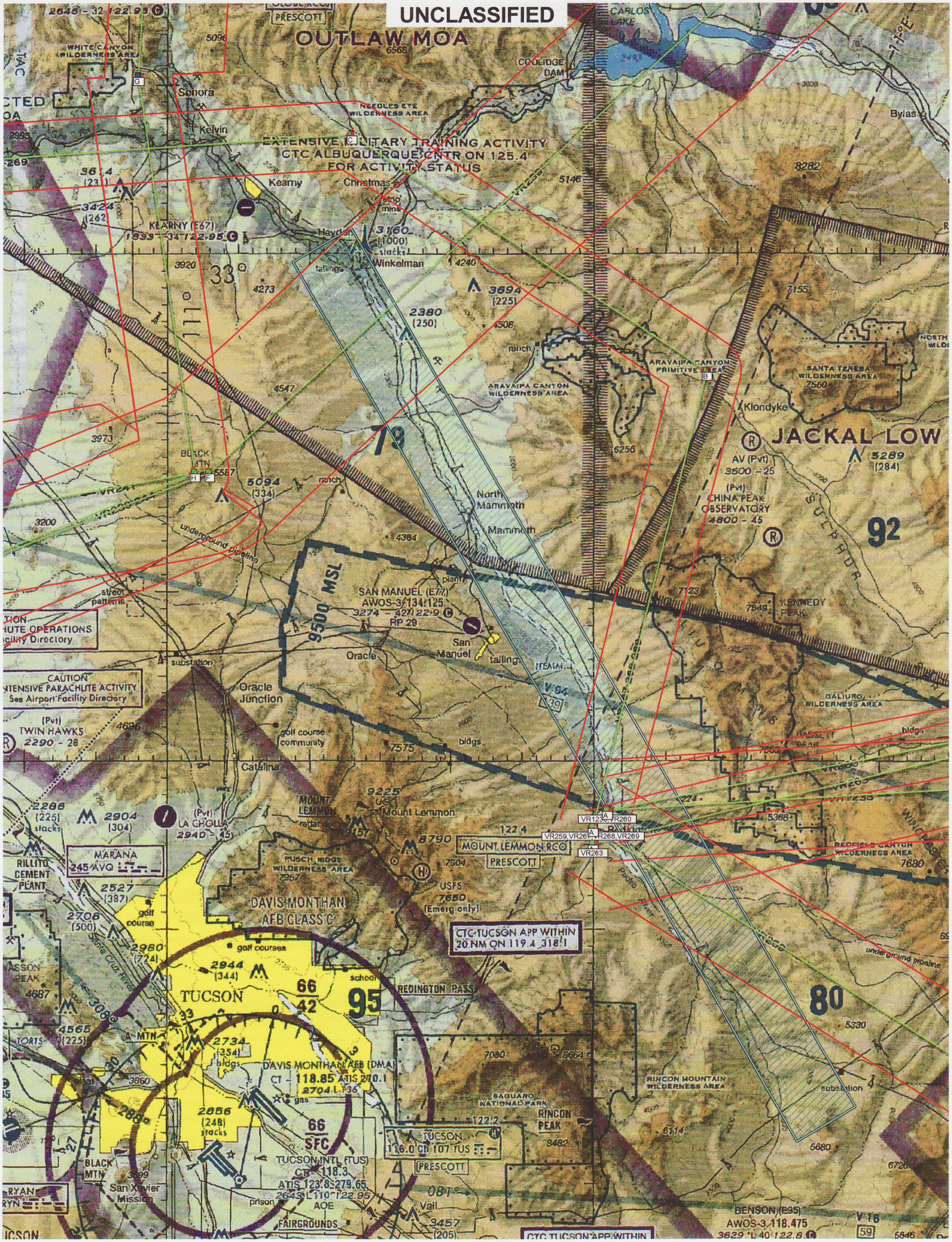
The centerline of a VFR Helicopter Refueling track, AR-136V, passes three nautical miles northeast of the Airport at 6,500 feet MSL. AR-136V runs a length of sixty nautical miles between the town of Hayden (23 nm north of the Airport) and a 5,680 feet peak (36 nm southeast of the Airport). The track is four nautical miles wide (two nm either side of centerline) placing its closest point just one mile northeast of the Airport (light blue rectangle).

Although the San Manuel Airport is located in a fairly high density military training area, there are no significant airspace constraints that affect the airport's ability to function in its present role.

Airspace Map, Figure 2-2
{The current draft airspace map should be changed to reflect the actual boundaries of the MTRs, as opposed to just their centerlines. Also, the uncharted AR-136V is not depicted. I have attached both 100% and 150% scale depictions, both in .pdf and .jpg formats.}

162nd Wing Airspace Manager, david.stine.1@ang.af.mil, Lt Col David Stine, 520-295-7078

UNCLASSIFIED



Appendix B

Public Involvement

Pinal County Board of Supervisors Actions

MEETING NOTES
Public Information Meeting #1

Date/Time: July 16, 2014 - 4:00 PM
Location: San Manuel Airport Terminal Building

Participants (see attached sign-in sheet):

- Jim Petty, Pinal County
- Nicholas J. Pela, Nicholas J. Pela & Associates
- Ryan Toner, Dibble Engineering
- Jared Bass, Dibble Engineering
- Britta Penca, PAC Member
- Parrish Traweek, PAC Member
- Mary Hanson, PAC Member
- John Hernandez
- Patricia Brower
- Vonda Blair
- Cleta Traweek
- Ehud Gavron
- Marty Robles
- Gabrielle Robles
- Phil Currier
- Mark Rhoad

1. **Introductions** were made by all participants.

2. **Formal Presentation**

   The Master Planning Process was described, including the Master Plan Goals, Master Plan Characteristics, the PAC and Public Meeting process, and the Master Plan work phases. Participants were informed that a 30 minute audio/visual presentation was available for viewing in the airport office. This presentation describes the Master Plan process in detail.

   An Executive Summary of Work Completed was presented, including descriptions of the following work phases:

   - Facilities Inventory
   - Who uses the airport? (Airport Service Area)
   - Growth Projections (Based Aircraft and Operations)
   - Recommended Improvement Program and Land Requirements

   The Project Web Site information was provided (and handouts containing the site's URL address were made available).

4. **Informal Discussion**

The formal presentation portion of the meeting was adjourned and participants were invited to visit three Information Stations that contained displays of information for the following general areas of interest:

The Plan to Date – This station included information on the existing airport as well as the project schedule, and included a full printed copy of the Master Plan to date. Handouts were available that included the Project Web Site's URL address.

Airport Activity – This station included the Service Area Map, graphic depictions of the growth projections for based aircraft and total annual operations, as well as a description of the selected design aircraft for current and future improvements.

Recommended Improvements – This station included graphic displays of the following:

- Recommended Improvements 2014-2016
- Recommended Improvements 2017-2019
- Recommended Improvements 2020-2024
- Recommended Improvements 2025-2034
- Runway Improvements
- Land Requirements
- Terminal Area Improvements
- ALT 1 Terminal Area Detail
- ALT 2 Terminal Area Detail
- ALT 3 Terminal Area Detail
- Runway Extension ALT 1
- Runway Extension ALT 2
- Runway Extension ALT 3

The consultant team and Airport Director were available at the Information Stations to engage in informal discussion of the Master Plan.

5. **Adjournment**

The Public Meeting adjourned at approximately 6:00 PM.

Attachment:

Participants' Sign In Sheet – Public Information Meeting #1

San Manuel Airport – San Manuel, Arizona

MASTER PLAN 2014

PARTICIPANTS' SIGN IN SHEET- Public Information Meeting #1

Date/Time: **July 16, 2014 - 4:00 PM**
Location: **San Manuel Airport Terminal Building**

Name	**Email Address** (update only)	**Phone**
Jim Petty (Pinal County)	jim.petty@co.pinal.az.us	(520) 866-6545
Nicholas J. Pela (Nicholas J. Pela & Associates)	nicholas.pela@nicholaspela.com	(602) 349-9967
Ryan Toner (Dibble Engineering)	ryan.toner@dibblecorp.com	(602) 957-1155
Jared Bass (Dibble Engineering)	jared.bass@dibblecorp.com	(602) 957-1155
John Hernandez	Johnh@minersonbasin.com	(520) 896-9619
Patricia Brower	PBrower247@aol.com	
Vonda Blair	runway290@aol.	520 235 7252
Cleta Traweek (WARREN)	cptraweek@gmail.com	520, 575-0314
EHUD GAVRON	you have it	520 352 1000
Britta Penca	"	"
Marcos & Gabrielle Robles	grobles38@hotmail.com / mrobles@[illegible]service.net	520-609-9113
Parrish Traweek	PCAIRCRAFT@HOTMAIL.COM	520.664.4812
MARY HANSON	azhanson107@gmail.com	520-404-7118
Phil Currier	pazcurrier60@msn.com	
Mark Rhoads	markrhoads2585@yahoo.com	520-840-0186

MEETING NOTES
Public Information Meeting #2

Date/Time: October 29, 2014 – 1:00 PM
Location: San Manuel Airport Terminal Building

Participants (see attached sign-in sheet):

- Jim Petty, Pinal County
- Nicholas J. Pela, Nicholas J. Pela & Associates
- Ryan Toner, Dibble Engineering
- Jared Bass, Dibble Engineering
- Parrish Traweek, PAC Member
- Mary Hanson, PAC Member
- Robert Brower, MD
- Jesse Wright
- Andrew Luberda
- Jim Cerovich
- Absey C. Bogle
- Bruce A. Drath
- Michael Owen
- Mark Rhoads
- David Knutson
- Brian O'Connor
- Ronald Lee
- (Several other participants chose not to sign in)

1. **Introductions** were made by all participants.

2. **Formal Presentation of the Airport Master Plan Executive Summary**

   The Draft Executive Summary was presented by the Consultant Team. The following questions and comments were raised during the formal presentation:

   a) Regarding the estimate of current aircraft operations – How do you track operations at San Manuel?
   Response: Because San Manuel is a nontowered airport, there are no records of the actual operations. We use mathematical models to estimate what the maximum potential level of activity might be at the airport. For the future projections, we ran four separate models and then we validate our results by referring to other independent forecasts. This is all documented in the Master Plan.

b) Regarding the statement that the FAA will not fund hangar development - Is it true that the FAA will provide grant funding for hangar construction if the airport foregoes future funding for other improvements?
Response: Hangar and terminal building development is eligible for FAA funding only if all airside improvements are already in place.

c) Regarding the proposed relocation of Taxiway A4 – Why are you recommending the taxiway relocation?
Response: The FAA's design standards were changed in September, 2012. We are now no longer permitted to have straight-through taxi paths to the runway from an apron. The recommended relocation puts the airport into compliance with this new standard.

d) Did you consider hangar development on the south side of the runway?
Response: Our planning work for this Master Plan focused on expansion of the present north side terminal area since that is the most efficient and economical method. The land is available, so development of a new terminal area was not indicated.

e) Construction of rectangular hangars instead of tee hangars for single aircraft would be more efficient.
Response: The hangar development areas we've identified could be used to construct any type of hangar that the County decides to build based on the actual demand. Hangars could be built by the County and rented out, or the land could be leased for private entities to build their own hangars. If the latter is done, we would recommend development of a set of minimum standards to ensure consistency in the types of hangars that will be built.

f) Is the existing airport leased from the mining company, and does the Master Plan address buying the land?
Response: The Master Plan does recommend acquiring the land from BHP. Jim Petty is in the process of negotiating that. It will be a three year process, including an environmental assessment because FAA and/or ADOT funding will be used.

g) Should the airport property be fenced with barbed wire for security?
Response: Yes, the Master Plan includes a recommendation for improving the property line fencing. This will also increase safety because it will keep cattle away from the runway.

h) Additional clarification was requested regarding the reasoning for not recommending the future runway extension to go to the east instead of the west.
Response: An extension to the east would require the acquisition of a significantly greater amount of land, would require a longer access road relocation or construction of a new access road, and would require relocation of part of the drainage channel.

i) Regarding the recommended Access Road relocation (because it is in the RPZ) – Why was the Access Road built in the RPZ in the first place?

Response: We don't know the answer to that since it was built many years ago. It is a public-use road and according to the current FAA standards it can't be within the RPZ.

j) We had heard that there would be construction of shaded tiedowns on the apron. Is that included in the Master Plan and will it be funded by the FAA or the State?
Response: Yes, that is included as a recommendation in the Immediate Term. Design is actually completed and construction should occur in 2015 or 2016. The shade structure is not funded by a grant because it will produce revenue, but the apron reconstruction is.

The Project Web Site information was provided (and handouts containing the site's URL address were made available).

3. **Informal Discussion Period**

The formal presentation portion of the meeting was adjourned and participants were invited to take part in an informal discussion period with the Consultant Team, the Airport Administrator, and the PAC members who attended the meeting.

4. **Adjournment**

The Public Meeting adjourned at approximately 3:30 PM.

Attachment:

Participants' Sign In Sheet – Public Information Meeting #2

San Manuel Airport – San Manuel, Arizona
MASTER PLAN 2014

PARTICIPANTS' SIGN IN SHEET- Public Information Meeting #2

Date/Time: October 29, 2014 – 1:00 PM
Location: San Manuel Airport Terminal Building

Name	Email Address	Phone
Jim Petty (Pinal County)	jim.petty@co.pinal.az.us	(520) 866-6545
Nicholas J. Pela (Nicholas J. Pela & Associates)	nicholas.pela@nicholaspela.com	(602) 349-9967
Ryan Toner (Dibble Engineering)	ryan.toner@dibblecorp.com	(602) 957-1155
Jared Bass (Dibble Engineering)	jared.bass@dibblecorp.com	(602) 957-1155
Robert Brower M.D.	DrRobertSMH@aol.COM	5203852182
JESSE WRIGHT	JCWRIGHT@THERIVER.COM	520-896-2337
MARY HANSON		
ANDREW LUBERDA	SPORTS@SEVLEDGER.COM	480-496-4141
JIM CEROVICH	VJC1225@GMAIL.com	520 686 3210
ABSEY C. BOGLE	acb111@Q.com	520 385 2260
Bruce A. Drath	bdrath2520@msn.com	520-722-2520
Michael Owen	desertskywater66@gmail.com	520 682 7728
Mark Rhoads	markrhoads2585@yahoo.com	520-840-0186
DAVID KNUDSON	YESOUIS12@GMAIL.com	520-442-4095
Brian O'Connor	beo_vp91@hotmail.com	816-5609816

San Manuel Airport – San Manuel, Arizona
MASTER PLAN 2014

PARTICIPANTS' SIGN IN SHEET- Public Information Meeting #2

Date/Time: **October 29, 2014 - 1:00 PM**
Location: **San Manuel Airport Terminal Building**

Name	Email Address	Phone
Ronald Lee	ronlee701@gmail.com	520400-0373

When recorded return to:
Clerk of the Pinal County
Board of Supervisors
P.O. Box 827
Florence, AZ 85132

Resolution No. 052715-MPSMA

A RESOLUTION OF THE PINAL COUNTY, ARIZONA, BOARD OF SUPERVISORS APPROVING THE MASTER PLAN 2014, UPDATED APRIL 8, 2015, FOR THE SAN MANUEL AIRPORT

WHEREAS, the Board of Supervisors is authorized to acquire, establish, construct, own, control, lease, equip, improve, maintain, operate and regulate the San Manuel Airport pursuant to the provisions of Arizona Revised Statutes Sections 28-8411, *et seq.*; and

WHEREAS, the County has prepared a Master Plan 2014, updated April 8, 2015, in connection with the San Manuel Airport (the "Master Plan"); and

WHEREAS, the Board of Supervisors has determined it is in the best interests of the County to approve and adopt such Master Plan.

THEREFORE, BE IT RESOLVED by the Pinal County Board of Supervisors that the Master Plan 2014, updated April 8, 2015, for the San Manuel Airport is hereby approved and adopted.

PASSED AND ADOPTED this 27th day of May, 2015, by the PINAL COUNTY BOARD OF SUPERVISORS.

Cheryl Chase
Chair of the Board

ATTEST:

Clerk/Deputy Clerk of the Board

APPROVED AS TO FORM:

Deputy County Attorney

THE SEAL OF PINAL COUNTY ARIZONA 1875

Appendix C
Glossary of
Aeronautical Terms

Appendix C
Glossary of Aeronautical Terms

Part I: Acronyms

AC................................Air Carrier.
ADAS ....AWOS Data Acquisition System.
ADIZ ....Air Defense Identification Zone.
AFSS ....Automated Flight Service Station.
AGL ....Above Ground Level.
AIFSS ....Automated International Flight Service Station.
AIM ....Airmen's Information Manuel.
ARSA ....Airport Radar Service.
ARTCC...........................Air Route Traffic Control Center.
ASM ....Available Seat Mile.
ASOS ....Automated Surface Observation System.
ASR ....Airport Surveillance Radar.
AT ....Air Taxi.
ATA ....Airport Traffic Area.
ATC ....Air Traffic Control.
ATCT ....Airport Traffic Control Tower.
ATIS ....Automatic Terminal Information Service.
AWOS ....Automated Weather Observation System.

CERAP ....ARTCC/TRACON.
CFR ....Code of Federal Regulation.
CRS ....Computer Reservation System.
CTAF ....Common Traffic Advisory Frequency.
CVR ....Cockpit Voice Recorder.
CY ....Calendar Year.
CZ ....Control Zone.

DEWIZ ....Distant Early Warning Identification Zone.
DFDR ....Digital Flight Data Recorder.
DOD ....Department of Defense.
DVFR ....Defense Visual Flight Rules.

FAA ....Federal Aviation Administration.
FAR ....Federal Aviation Regulations.
FDR ....Flight Data Recorder.
FBO ....Fixed Base Operator.
FL ....Flight Level.
FOIA ....Freedom of Information Act.

FSS .... Flight Service Station.
FY .... Fiscal Year.

GA .... General Aviation.
GCA .... Ground Controlled Approach.

IFR .... Instrument Flight Rules.
IFSS .... International Flight Service Station.
ILS .... Instrument Landing System.
IMC .... Instrument Meteorological Conditions.

L/MF .... Low/Medium Frequency.

MEL .... Minimum Equipment List.
MIL .... Military.
MOA .... Military Operations Area.
MSL .... Mean Sea Level.

NAS .... National Airspace System.
NDB .... Non-Directional Radio Beacon Transmitter.
NM .... Nautical Miles.
NOTAM .... Notices to Airmen.
NWS .... National Weather Service.

PAR .... Precision Approach Radar.
PCA .... Positive Control Area.
PFC .... Passenger Facility Charge
(or Porous Friction Course, in the context of pavement types).

RAPCON .... Radar Approach Control Facility.
RPM .... Revenue Passenger Mile.

TACAN .... Tactical Air Navigation Transmitter.
TAFS .... Total Automated Flight Services.
TCAS .... Traffic Alert and Collision Avoidance System.
TIBS .... Telephone Information Briefing Service.
TRACON .... Terminal Radar Approach Control.

UHF .... Ultra High Frequency.

VFR .... Visual Flight Rules.
VMC .... Visual Meteorological Conditions.
VOR .... Very High Frequency Omni Range Transmitter.
VORTAC .... VOR transmitter co-located
with a military Tactical Air Navigation (TACAN) transmitter.

Glossary of Aeronautical Terms

Part II: Definitions

Air Carrier (AC) an aircraft with seating capacity of more than 60 seats or a maximum payload capacity of more than 18,000 pounds carrying passengers or cargo for hire or compensation. This includes US and foreign flagged carriers – or - A person who undertakes directly, by lease, or other arrangement, to engage in air transportation.

Air Defense Identification Zone (ADIZ) The area of airspace over land or water, extending upward from the surface, within which the ready identification, the location, and the control of aircraft are required in the interest of national security.

1. **Domestic Air Defense Identification Zone** - An ADIZ within the United States along an international boundary of the United States.
2. **Coastal Air Defense Identification Zone** - An ADIZ over the coastal waters of the United States.
3. **Distant Early Warning Identification Zone** (DEWIZ) - An ADIZ over the coastal waters of the State of Alaska.

ADIZ locations and operating and flight plan requirements for civil aircraft operations are specified in FAR Part 99.

Air Taxi An aircraft operator who conducts operations for hire or compensation in accordance with FAR Part 135 in an aircraft with 30 or fewer passenger seats and a payload capacity of 7,500 pounds or less. An air taxi operates on an on demand basis and does not meet the "flight scheduled" qualifications of a commuter.

Air Traffic Control (ATC) A service operated by the appropriate authority to promote the safe, orderly, and expeditious flow of air traffic.

Airport An area on land or water that is used or intended to be used for the landing and takeoff of aircraft and includes its buildings and facilities, if any.

Air Traffic Control Tower (ATCT) A terminal facility that uses air/ground communications, visual signaling, and other devices to provide ATC services to aircraft operating in the vicinity of an airport or on the movement area. Authorizes aircraft to land or takeoff at the airport controlled by the tower or to transit the Class D airspace area regardless of flight plan or weather conditions (IFR or VFR). A tower may also provide approach control services (radar or non-radar).

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. When equipment capabilities and controller workload permit, certain advisory/assistance service may be provided to VFR aircraft.

Air Taxi (AT) aircraft designed to have a maximum seating capacity of 60 seats or less or a maximum payload capacity of 18,000.pounds or less carrying passengers or cargo for hire or compensation.

Air Traffic aircraft operating in the air or on airport surfaces, exclusive of loading ramps and parking areas.

Aircraft Contacted aircraft with which the flight service stations have established radio communications contact. One count is made for each en route landing or departing aircraft contacted by a flight service station regardless of the number of contacts made with an individual aircraft during the same flight. A flight contacting five FSS's would be counted as five aircraft contacted.

Aircraft Handled see IFR Aircraft Handled.

Airport an area on land or water that is used or intended to be used for the landing and takeoff of aircraft and includes its buildings and facilities, if any.

Airport Advisory Service a service provided by flight service stations at airports not served by a control tower. This service consists of providing information to arriving and departing aircraft concerning wind direction/speed-favored runway, altimeter setting, pertinent known traffic/field conditions, airport taxi routes/traffic patterns, and authorized instrument approach procedures. This information is advisory in nature and does not constitute an ATC clearance.

Airport Operations the number of arrivals and departures from the airport at which the airport traffic control tower is located. There are two types of operations: local and itinerant.

1. **Local** operations are performed by aircraft which:

   (a) operate in the local traffic pattern or within sight of the airport;

   (b) are known to be departing for, or arriving from, flight in local practice areas located within a 20-mile radius of the airport;

   (c) execute simulated instrument approaches or low passes at the airport.

2. **Itinerant** operations are all aircraft operations other than local operations.

Airport Traffic Control Tower (ATCT) A terminal facility which, through the use of air/ground communications, visual signaling, and other devices, provides air traffic control services to airborne aircraft operating in the vicinity of an airport and to aircraft operating on the movement area.

FAA-contracted are low activity VFR ATCT's providing air traffic control services for a municipality or subdivision thereof while under contract to the FAA. The municipality has the option of using its own employees or subcontracting for these services.

FAA facilities are ATCT's providing anywhere from full radar approach control services to low activity VFR air traffic control services. These towered airports are staffed by FAA air traffic controllers.

Automated Flight Service Station (AFSS) see Flight Service Station.

Automated International Flight Service Station (AIFSS) see International Flight Service Station.

Automated Surface Observing System (ASOS) – The Automated Surface Observing System (ASOS) is an automated observing system being sponsored by the Federal Aviation Administration, National Weather Service (NWS) and the Department of Defense (DOD). ASOS provides weather observations, which include: temperature, dew point, wind, altimeter setting, visibility, sky condition, and precipitation. 569 FAA-sponsored and 313 NWS-sponsored ASOS's are installed at airports throughout the country. Automated observing systems are designed to provide the pilot, and other users, airport weather observations "When they need it and where they need it." The observing systems work nonstop, updating observations every minute, 24 hours a day, every day of the year. By providing information on the atmosphere, at increasing locations, these systems are designed to improve the safety and efficiency of aviation operations as well as being the key to improving forecasts and warnings.

An ASOS includes the parameters of an AWOS III plus a freezing rain sensor and thunderstorm reporting (see "Automated Weather Observing System (AWOS)" below).

Automated Weather Observing System (AWOS) Automated Weather Observing System (AWOS) is a suite of sensors, which measures, collects and broadcasts weather data to help meteorologists, pilots and flight dispatchers prepare and monitor weather forecasts, plan flight routes, and provide necessary information for correct takeoffs and landings. AWOS units provide a minute-to-minute update to pilots by VHF radio or non-directional beacon. Each hour AWOS data is available to off-site users by means of long-line telephone communication or satellite uplink. Both Federal and nonfederal systems are in service. The FAA purchased and currently maintains the Federal AWOS equipment. State, local, and private organizations buy and maintain nonfederal AWOS's.

Six different AWOS system types are available (for Non-Federal), each of which includes a different sensor array. The differences in these models are listed below, and correspond to systems described in FAA Advisory Circular 150/5220-16B. Federal AWOS's are all AWOS III. The AWOS data acquisition system (ADAS) for the Federal AWOS is a powerful microprocessor-based computer system that collects and processes the data from the AWOS and formats it for output for dissemination into the National Airspace System (NAS).

1. **AWOS I**: Wind Speed, Wind Gust, Wind Direction, Variable Wind Direction, Temperature, Dew Point, Altimeter Setting, and Density Altitude

2. **AWOS II**: Same as AWOS I + Visibility, and Variable Visibility

3. **AWOS III**: Same as AWOS II + Sky Condition, Cloud Height and Type

4. **AWOS III-P**: Same as AWOS III + Present Weather, Precipitation Identification

5. **AWOS III-T**: Same as AWOS III + Thunderstorm and Lightning Detection

6. **AWOS III-P-T**: Same as AWOS III + Present Weather and Lightning Detection

Automatic Terminal Information Service (ATIS) The continuous broadcast of recorded non-control information in selected terminal areas. Its purpose is to improve controller effectiveness and to relieve frequency congestion by automating the repetitive transmission of essential but routine information; e.g., "Los Angeles information Alfa. One three zero zero Coordinated Universal Time. Weather measured ceiling two thousand overcast, visibility three, haze, smoke, temperature seven one, dew point five seven, wind two five zero at five, altimeter two niner six. ILS Runway Two Five Left approach in use, Runway Two Five Right closed, advise you have Alfa."

Available Seat Mile (ASM) One seat flown one mile. An airliner with 100 passenger seats, flown a distance of 100 miles, represents 10,000 available seat miles (ASM's).

Aviation Trust Fund Fund established by Congress to pay for improvements to the nation's airports and air traffic control system. Money in the fund comes solely from users of the system primarily a tax on domestic airline tickets.

Calendar Year begins January 1 of a given year and ends December 31of the same year.

Cargo Anything other than passengers, carried for hire, including both mail and freight.

Ceiling The heights above the earth's surface of the lowest layer of clouds or obscuring phenomena that is reported as "broken," "overcast," or "obscuration," and not classified as "thin" or "partial".

Center An Air Route Traffic Control Center (ARTCC). See Air Route Traffic Control Center.

Center Radar Approach Control (CERAP) an air traffic facility which combines the functions of an ARTCC with a TRACON facility.

Certificated Airport An airport operating under FAR Part 139. The FAA issues airport operating certificates to all airports serving scheduled or unscheduled air carrier aircraft designed for more than 30 passenger seats. Certificated airports must meet minimum safety standards in accordance with FAR Part 139.

Class G Airspace (Uncontrolled Airspace) The airspace not designated as Class A, B, C, D or E.

Cockpit Voice Recorder (CVR) A device that records the sounds audible in the cockpit, as well as all radio transmissions made and received by the aircraft, and all intercom and public address announcements made in the aircraft. It generally is a continuous loop recorder that retains the sounds of the last 30 minutes.

Code Sharing A marketing practice in which two airlines share the same two-letter code used to identify carriers in the computer reservation systems used by travel agents.

Combined Center/RAPCON (CERAP) An air traffic facility that combines the functions of an ARTCC and a radar approach control facility.

Common Traffic Advisory Frequency (CTAF) A frequency designed for the purpose of carrying out airport advisory practices while operating to or from an airport without an operating control tower. The CTAF may be a UNICOM, Multicom, FSS, or tower frequency and is identified in appropriate aeronautical publications. (Refer to AC 90-42)

Commuter An air carrier operator operating under 14 CFR 135 that carries passengers on at least five round trips per week on at least one route between two or more points according to its published flight schedules that specify the times, day of the week, and places between which these flights are performed. The aircraft that a commuter operates has 30 or fewer passenger seats and a payload capability of 7,500 pounds or less.

Computer Reservation System (CRS) A system for reserving seats on commercial flights electronically. Several airlines own and market such systems, which are used by travel agents.

Connecting Flight A flight requiring passengers to change aircraft and\or airlines at an intermediate stop.

Controlled Airspace An airspace of defined dimensions within which air traffic control service is provided to IFR flights and to VFR flights in accordance with the airspace classification. Controlled airspace is a generic term that covers Class A, Class B, Class C, Class D, and Class E airspace. Controlled airspace is also that airspace within which all aircraft operators are subject to certain pilot qualifications, operating rules, and equipment requirements in FAR Part 91 (for specific operating requirements, please refer to FAR Part 91). For IFR operations in any class of controlled airspace, a pilot must file an IFR flight plan and receive an appropriate ATC clearance. Each Class B, Class C, and Class D airspace area designated for an airport contains at least one primary airport around which the airspace is designated (for specific designations and descriptions of the airspace classes, please refer to FAR Part 71.

Controlled airspace in the United States is designated as follows:

1. **CLASS A (formerly PCA -Positive Control Area)** generally, that airspace from 18,000 feet mean sea level (MSL) up to and including flight level (FL) 600 (60,000 feet pressure altitude), including the airspace overlying the waters within 12 nautical miles of the coast of the 48 contiguous States and Alaska. Unless otherwise authorized, all persons must operate their aircraft under IFR.

2. **CLASS B (formerly TCA Terminal Control Area)** Generally, that airspace from the surface to 10,000 feet mean sea level (MSL) surrounding the nation's busiest airports in terms of airport operations or passenger enplanements. The configuration of each Class B airspace area is individually tailored and consists of a surface area and two or more layers (some Class B airspace areas resemble upside down wedding cakes), and is designed to contain all published instrument procedures once an aircraft enters the airspace. An ATC clearance is required for all aircraft to operate in the area, and all aircraft that are so cleared receive separation services within the airspace. The cloud clearance requirement for VFR operations is "clear of clouds."

3. **CLASS C (formerly ARSA Airport Radar Service Area)** Generally, that airspace from the surface to 4,000 feet above the airport elevation (charted in mean sea level (MSL)) surrounding those

airports that have an operational control tower, are serviced by a radar approach control, and that have a certain number of IFR operations or passenger enplanements. Although the configuration of each Class C area is individually tailored, the airspace usually consists of a surface area with a 5 nautical mile (NM) radius, an outer circle with a 10 nm radius that extends from 1,200 feet to 4,000 feet above the airport elevation and an outer area. Each person must establish two-way radio communications with the ATC facility providing air traffic services prior to entering the airspace and thereafter maintain those communications while within the airspace. VFR aircraft are only separated from IFR aircraft within the airspace.

4. **CLASS D (formerly ATA Airport Traffic Area and CZ Control Zone)** Generally, that airspace from the surface to 2,500 feet above the airport elevation (charted in mean sea level (MSL) surrounding those airports that have an operational control tower. The configuration of each Class D airspace area is individually tailored and when instrument procedures are published, the airspace will normally be designed to contain the procedures. Arrival extensions for instrument approach procedures may be Class D or Class E airspace. Unless otherwise authorized, each person must establish two-way radio communications with the ATC facility providing air traffic services prior to entering the airspace and thereafter maintain those communications while in the airspace. No separation services are provided to VFR aircraft.

5. **CLASS E (formerly General Controlled Airspace)** Generally, if the airspace is not Class A, Class B, Class C, or Class D, and it is controlled airspace, it is Class E airspace. 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. Also in this class are Federal airways, airspace beginning at either 700 or 1,200 feet AGL used to transition to/from the terminal or enroute environment, enroute domestic, and offshore airspace areas designated below 18,000 feet mean sea level (MSL). Unless designated at a lower altitude, Class E airspace begins at 14,500 feet mean sea level (MSL) over the United States, including that airspace overlying the waters within 12 nautical miles of the coast of the 48 contiguous States and Alaska, up to, but not including 18,000 feet mean sea level (MSL), and the airspace above flight level (FL) 600.

Decision Height (DH) With respect to the operation of aircraft, means the height at which a decision must be made during an ILS, MLS, or PAR instrument approach to either continue the approach or to execute a missed approach.

Delay Delays are incurred when any action is taken by a controller that prevents an aircraft from proceeding normally to its destination for an interval of 15 minutes or more. This includes actions to delay departing or enroute, or arriving aircraft as well as actions taken to delay aircraft at departing airports due to conditions en route or at destination airports.

Defense Visual Flight Rules (DVFR) Rules applicable to flights within an Air Defense Identification Zone conducted under the visual flight rules in Federal Air Regulation, Part 91.

Departure – A “takeoff” operation.

Deregulation The term commonly used in referring to the Airlines Deregulation Act of 1978, which ended government regulation of airline routes and rates.

Direct Flight A flight with one or more intermediate stops, but no change of aircraft.

Domestic Operations Operations within and between: the 50 states of the United States, the District of Columbia, the Commonwealth of Puerto Rico, and the United States Virgin Islands, Canadian transborder operations, and (for certain carriers) Mexican transborder operations.

En Route Air Traffic Control Services Air traffic control services provided aircraft on IFR flight plans, generally by centers, when these aircraft are operating between departure and destination terminal areas. When equipment, capabilities, and controller workload permit, certain advisory/assistance services may be provided to VFR aircraft.

Enplanements The number of passengers boarding a flight.

En Route Center Formally known as an Air Route Traffic Control Center (ARTCC), it houses the air traffic controllers and equipment needed to identify and direct aircraft, primarily during the en route portion of their flights.

Essential Air Service Government subsidized airline service to rural areas of the United States, which continued after the Airline Deregulation Act of 1978.

Federal Aviation Administration (FAA) The government agency responsible for air safety and operation of the air traffic control system. The FAA also administers a program that provides grants from the Airport and Airway Trust Fund for airport development.

Federal Aviation Regulations (FAR) – The following FAR's apply to various operations (CFR = Code of Federal Regulation):

14 CFR FAR Part 91 ..... General Aviation (portions apply to all operators)
14 CFR FAR Part 103 ... Ultra-light Vehicles
14 CFR FAR Part 105 ... Parachute Jumping
14 CFR FAR Part 108 ... Airplane Operator Security
14 CFR FAR Part 119 ... Certification: Air Carriers and Commercial Operators
14 CFR FAR Part 121 ... Domestic, Flag and Supplemental Air Carriers and Commercial Operators of Large Aircraft
14 CFR FAR Part 123 ... Travel Clubs
14 CFR FAR Part 125 ... US Civil Airplanes, seating 20 or more passengers or a maximum payload capacity 6,000 pounds or more.
14 CFR FAR Part 127 ... Air Carriers using helicopters for scheduled interstate flights (within the 48 contiguous states)
14 CFR FAR Part 129 ... Foreign Air Carrier and Foreign Operators of US registered aircraft engaged in common carriage
14 CFR FAR Part 133 ... Rotorcraft External Load Operations

14 CFR FAR Part 135 ... Air Taxi Operators and Commercial Operators
14 CFR FAR Part 137 ... Agricultural Aircraft Operations
14 CFR FAR Part 141 ... Pilot School

Fiscal Year – (for FAA) begins October 1 of previous calendar year and ends September 30 of the current calendar year.

Fixed Base Operator (FBO) – a business located at the airport (fixed) that provides aviation related services (i.e. aircraft maintenance, avionics installation, flight instruction, etc.).

Flight Data Recorder (FDR) Records pertinent technical information about a flight. An FDR will record information about the performance of various aircraft systems, as well as the aircraft's speed, altitude, heading and other flight parameters. Like a cockpit voice recorder (CVR), a flight data recorder is designed to withstand the forces of a crash so that its information may be used to reconstruct the circumstances leading up to the accident (in some cases, a digital flight data recorder, or DFDR).

Flight Level (FL) A level of constant atmospheric pressure related to a reference datum of 29.92 inches of mercury. Each is stated in three digits that represent hundreds of feet. For example, flight level 250 represents a barometric altimeter indication of 25,000 feet; flight level 255, an indication of 25,500 feet.

Flight Plan A required planning document that covers the expected operational details of a flight such as destination, route, fuel on board, etc. It is filed with the appropriate FAA air traffic control facility. There are both VFR and IFR flight plans. VFR plans are not mandatory.

Flight Plans Originated the first flight service station which receives a flight plan, a Special VFR clearance request, or a flight plan en route change, as long as it is not relayed by means of an automated installation or if the en route change does not impact the original route or destination. It does include an activated prefiled flight plan.

Flight Service Station (FSS) air traffic service facilities which provide preflight pilot briefings and en route communications with VFR flights, assist lost IFR/DVFR & VFR aircraft, assist aircraft having emergencies, relay air traffic control clearances, originate, classify, and disseminate NOTAMS, broadcast aviation weather and national airspace system information, receive and close flight plans, monitor radio navigational aids, notify search & rescue units of missing VFR aircraft and operate the national weather teletypewriter systems. In addition, at selected locations, FSS's take weather observations, issue airport advisories, administer airmen written examinations, and advise Customs & Immigration of transborder flights.

Freedom of Information Act (FOIA) The Freedom of Information Act (FOIA) allows all U.S. citizens and residents to request any records in possession of the executive branch of the federal government. The term "records" includes documents, papers, reports, letters, films, photographs, sound recordings, computer tapes and disks. An object that cannot be reproduced is not considered a record in this case. The federal FOIA covers the President's cabinet agencies, independent agencies, regulatory commissions and government-owned corporations. Congress is exempt, as are federal court and state and local governments. Some states and municipalities have laws modeled after the federal FOIA. The federal act includes nine exemptions that agencies may claim as a basis for withholding information. An administrative appeal can be filed that argues for disclosure based on benefits to the public vs. privacy. If a good argument is made, appellate reviewers may waive an exemption.

Freight All air cargo excluding mail.

Freight Ton Mile A ton of freight moved one mile. It is the standard measure of airfreight activity.

General Aviation (GA) That portion of civil aviation which encompasses all facets of aviation except air carriers holding a certificate of public convenience and necessity from the Civil Aeronautics Board and large aircraft commercial operators.

Glide slope The ideal descent path to a runway. It can be electronically defined by radio signals transmitted from the ground. An aircraft carrying a special radio receiver can detect this electronic glide path and follow it down to the runway.

Hub and Spoke A system for deploying aircraft that enables a carrier to increase service options at all airports encompassed by the system. It entails the use of a strategically located airport (the hub) as a passenger exchange point for flights to and from outlying towns and cities (the spokes).

IFR Aircraft Handled the number of ARTCC en route IFR departures multiplied by two, plus the number of en route IFR overs. This formula assumes that the number of departures (acceptances, extensions, and organizations of IFR flight plans) is equal to the number of arrivals (IFR flight plans closed).

IFR Departures an en route IFR flight which originates in an ARTCC's area and enters that center's airspace.

IFR Overs an en route IFR flight that originates outside the ARTCC's area and passes through the area without landing.

Instrument Approaches approach made to an airport by an aircraft with an IFR flight plan:

1. When visibility is less than 3 miles or ceiling is at or below the minimum initial approach altitude.
2. Where no weather reporting service is available at non-tower satellite airports, the following criteria, in descending order, is used to determine valid instrument approaches:

   (a) A pilot report,

   (b) If the flight has not canceled its IFR flight plan prior to reaching the initial approach fix,

   (c) The official weather as reported for any airport located within 30 miles of the airport to which the approach is made.

Instrument Flight Rules (IFR) rules governing the procedures for conducting instrument flight.

Instrument Landing System (ILS) Provides radio-based horizontal and vertical guidance to an aircraft approaching a runway. It is used to guide landing aircraft during conditions of low visibility.

Instrument Meteorological Conditions (IMC) Meteorological conditions expressed in terms of visibility, distance from clouds, and ceiling less than minima specified for visual meteorological conditions.

Instrument Operations arrivals or departures of an aircraft in accordance with an IFR flight plan or special VFR procedures or an operation where IFR separation between aircraft is provided by a terminal control facility. There are three kinds of instrument operations:

1. **Primary** Instrument Operations: departures or arrivals at the primary airport which is normally the airport at which the approach control facility is located.

2. **Secondary** Instrument Operations: arrivals and departures at all the secondary airports combined.

3. **Overflights**: operations in which an aircraft transits the area without intent to land.

International Flight Service Station (IFSS) a central operations facility in the flight advisory system, manned and equipped to control aeronautical point-to-point telecommunications, and air/ground telecommunications with pilots operating over international territory or waters, providing flight plan following, weather information, search and rescue action, and other flight assistance operations.

Itinerant see Airport Operations.

Jetway A registered trademark for a certain kind of aircraft loading bridge which allows passengers direct, protected access to an aircraft from the terminal.

Knot An abbreviation for one nautical mile per hour. Since a nautical mile is 15 percent longer than a statute mile, a speed expressed in knots is 15% higher than it would be if expressed in miles per hour.

Load Factor The percentage of available seats that are filled with paying passengers. Technically, revenue passenger miles divided by available seat-miles.

Local see Airport Operations.

Major Carrier An airline with annual revenue of more than $1 billion.

Minimum Equipment List (MEL) A list of aircraft equipment that must be in good working order before an aircraft may legally take off with passengers. Repairs to some items not essential to an aircraft's airworthiness may be deferred for limited periods of time approved by the FAA.

Military all classes of military takeoffs and landings at FAA and FAA-contracted facilities.

National Airspace System (NAS) The common network of US airspace; air navigation facilities, equipment and services, airports or landing areas; aeronautical charts, information and services; rules, regulations and procedures, technical information, and human resources and material. Included are system components shared jointly with the military.

National Carrier An airline with annual revenues of between $100 million and $1 billion.

Non-Directional Beacon (NDB) An L/MF or UHF radio beacon transmitting non-directional signals whereby the pilot of an aircraft equipped with direction finding equipment can determine his bearing to or from the radio beacon and "home" on or track to or from the station. When the radio beacon is installed in conjunction with the Instrument Landing System marker, it is normally called a Compass Locator.

Nonstop Flight A flight with no intermediate stops.

Non-Scheduled Service Revenue flights, such as charter flights, that are not operated in regular scheduled service and all non-revenue flights incident to such flights.

Notices to Airmen (NOTAM) a notice containing information (not known sufficiently in advance to publicize by other means) concerning the establishment, condition, or change in any component (facility, service or procedure of, or hazard in the national airspace system) the timely knowledge of which is essential to personnel concerned with flight operations.

Oceanic en route IFR departures or overs which occur over the ocean.

Overflights a *terminal* IFR flight that originates outside the TRACON's/RAPCON's/Radar ATCT's area and passes through the area without landing. For en route (ARTCC) overflights, see IFR OVERS.

Overs See IFR OVERS.

Part 121 of the Federal Aviation Regulations The FAA safety regulations covering operators of aircraft with 30 or more seats.

Part 135 of the Federal Aviation Regulations The FAA safety regulations covering operators of aircraft with fewer than 30 seats.

Passenger Facility Charge (PFC) is a tax authorized by Congress, approved by the Federal Aviation Administration, assessed by airports, and collected by airlines as an add-on to the fare. It is designed to help pay for airport improvements that enhance safety and capacity.

Pilot Briefings (or Briefs)-- a service provided by all types of flight service stations to assist pilots in flight planning. Briefing items may include weather information, NOTAMS, military activities, flow control information, and other items as requested.

Pilot in Command The pilot responsible for the operation and safety of an aircraft during flight time.

Positive Control The separation of all air traffic within designated airspace by air traffic control.

Profan One of several terms used to describe new generations of jet engines which typically turn very large, multi-bladed propeller-like fans in order to produce the thrust needed for flight.

Radar Term coined from the phrase "Radio Detecting and Ranging." It is based on the principle that ultra-high frequency radio waves travel at a precise speed and are reflected from objects they strike. It is used to determine an object's direction and distance.

Radar Approach Control Facility (RAPCON) A terminal ATC facility that uses radar and non-radar capabilities to provide approach control services to aircraft arriving, departing, or transiting airspace controlled by the facility. This facility provides radar ATC services to aircraft operating in the vicinity of one or more civil and/or military airports in a terminal area. The facility may provide services of a ground-controlled approach (GCA); i.e., ASR and PAR approaches. A radar approach control facility may be operated by FAA, USAF, United States Army, United States Navy, United States Marine Corp, or jointly by FAA and a military service. Specific facility nomenclatures are used for administrative purposes only and are related to the physical location of the facility and the operating service generally as follows:

Army Radar Approach Control (ARAC) (Army)
Radar Air Traffic Control Facility (RATCF) (Navy/FAA)
Radar Approach Control (RAPCON) (Air Force/FAA)
Terminal Radar Approach Control (TRACON) (FAA)
Tower/Airport Traffic Control Tower (ATCT) (FAA). (Only those towers delegated approach control authority)

Radio Contacts the initial radio call-up to a flight service station by en route aircraft, which includes a complete interchange of information and a termination of the contact.

Ramp The aircraft parking area at an airport, usually adjacent to a terminal.

Regional Carrier An airline with annual revenues of less than $100 million whose service generally is limited to a particular geographic region.

Revenue Pertaining to activities for which the carrier receives remuneration.

Rotorcraft A heavier-than-air aircraft that depends principally for its support in flight on the lift generated by one or more rotors. Includes helicopters and gyroplanes.

Runway Incursion Any occurrence at an airport involving an aircraft, vehicle, person, or object on the ground that creates a collision hazard or results in loss of separation with an aircraft taking off, intending to take off, landing or intending to land.

Scheduled Service Transport service operated pursuant to published flight schedules, including extra sections and related non-revenue flights.

Separation Minima The minimum longitudinal, lateral, or vertical distances by which aircraft are spaced through the application of air traffic control procedures.

Special Use Airspace (SUA) Airspace of defined dimensions identified by an area on the surface of the earth 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. Types of special use airspace are:

a. **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. Alert Areas are depicted on aeronautical charts for the information of nonparticipating pilots. All activities within an Alert Area are conducted in accordance with Federal Aviation Regulations, and pilots of participating aircraft as well as pilots transiting the area are equally responsible for collision avoidance.

b. **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 and property on the ground.

c. **Military Operations Area (MOA)** - An MOA is airspace established outside of Class A airspace area to separate or segregate certain non-hazardous military activities from IFR traffic and to identify for VFR traffic where these activities are conducted. (Refer to AIM)

d. **Prohibited Area** - Airspace designated under part 73 within which no person may operate an aircraft without the permission of the using agency. (Refer to Enroute Charts, AIM)

e. **Restricted Area** - Airspace designated under FAR Part 73, within which the flight of aircraft, while not wholly prohibited, is subject to restriction. Most restricted areas are designated joint use and IFR/VFR operations in the area may be authorized by the controlling ATC facility when it is not being utilized by the using agency. Restricted areas are depicted on enroute charts. Where joint use is authorized, the name of the ATC controlling facility is also shown. (Refer to FAR Part 73 and AIM)

f. **Warning Area** - A warning area is airspace of defined dimensions extending from 3 nautical miles outward from the coast of the United States, that contains activity that may be hazardous to nonparticipating aircraft. The purpose of such warning area is to warn nonparticipating pilots of the potential danger. A warning area may be located over domestic or international waters or both.

Revenue Passenger Mile (RPM) One paying passenger flown one mile. It is the principal measure of airline passenger traffic.

Stage 2 Term used to describe jets which meet certain noise parameters on takeoff and landing. Jets in this category include the Boeing 727 and McDonnell Douglas DC-9.

Stage 3 Term used to describe the quietest jets in service today, including the Boeing 757 and MD-80

Telephone Information Briefing Service (TIBS) a continuous telephone recording of meteorological and/or aeronautical information.

Traffic Alert and Collision Avoidance System (TCAS) installed in commercial jets to search for and alert pilots to the presence of other aircraft. More advanced versions of TCAS also advice pilots on actions to take to avoid aircraft that are getting too close.

Terminal Radar Approach Control (TRACON) an FAA air traffic control facility using radar and air/ground communications to provide approach control services to aircraft arriving, departing, or transiting the airspace controlled by the facility. Service may be provided to both civil and military airports.

Total Automated Flight Services (TAFS) is the sum of TFS, plus TIBS, plus NOTAMS.

Total Flight Services (TFS) is the sum of flight plans originated and pilot's briefs multiplied by two, plus the number of aircraft contacted.

Transponder An electronic device that "responds" to interrogation by ground-based radar with a special four-digit code that specifically identifies the aircraft on which it is located. Certain transponders have the ability to transmit automatically the altitude of the aircraft in addition to the special code.

Turbofan A type of jet engine in which a certain portion of the engine's airflow bypasses the combustion chamber.

Turbojet The original designation for a "pure" jet engine whose power is solely the result of its jet exhaust. This term is often used to represent all jet-powered aircraft, including Turbofan types.

Turboprop A type of engine that uses a jet engine to turn a propeller. Turboprops are often used on regional and business aircraft because of their relative efficiency at speeds slower than, and altitudes lower than, those of a typical jet.

Ultralight Vehicle An aeronautical vehicle operated for sport or recreational purposes which does not require FAA registration, an airworthiness certificate, nor pilot certification. They are primarily single occupant vehicles, although some two-place vehicles are authorized for training purposes. Operation of an ultralight vehicle in certain airspace requires authorization from ATC.

Unducted Fan A kind of engine that uses the basic core of a jet engine to drive large, fan-like blades which produce the major thrust component of the engine. A profan is one kind of unducted fan.

Vehicle/Pedestrian Deviation (VPD) An entry or movement on an airport movement area by a vehicle operator or pedestrian that has not been authorized by air traffic control (includes aircraft operated by a non- pilot).

Visual Flight Rules (VFR) rules that govern the procedures to conducting flight under visual conditions. The term is also used in the US to indicate weather conditions that are equal to or greater than minimum VFR requirements. In addition, pilots and controllers to indicate type of flight plan use it.

Visual Meteorological Conditions (VMC) Meteorological conditions expressed in terms of visibility, distance from clouds, and ceiling equal to or better than specified minima.

VOR – Very High Frequency Omni Range transmitter; 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. Voice features may be used by ATC or FSS for transmitting instructions/information to pilots.

Widebody Aircraft Generally considered to be any airliner with more than one aisle in the passenger cabin. Examples of widebody aircraft include the Boeing 747 and 767, the Lockheed L-1011, the McDonnell Douglas DC-10, and Airbus Industries' A300 and A310. Technically, any aircraft with a fuselage diameter in excess of 200 inches may be considered a widebody.

Windshear Weather phenomenon entailing a strong downdraft of air that can result in the loss of lift for an aircraft passing through it.

Yield A measure of airline revenue derived by dividing passenger revenue by passenger miles. It is expressed in cents per mile.

Yield Management The term used to describe the process airlines use to set prices for a flight. The goal is to find the mix of seat prices that produces the most revenue.