Glendale
MUNICIPAL AIRPORT

ALP Update and Narrative Report

AIRPORT LAYOUT PLAN
NARRATIVE REPORT

For

GLENDALE MUNICIPAL AIRPORT
Glendale Arizona

Prepared for

THE CITY OF GLENDALE

By

Coffman Associates, Inc.

May 2018

TABLE OF CONTENTS

TABLE OF CONTENTS

EXHIBITS

AIRPORT LAYOUT PLAN
NARRATIVE REPORT

ALP Update Narrative Report

The objective of this effort is to update the Glendale Municipal Airport (GEU), Airport Layout Plan (ALP) drawing set (ALP) and provide a narrative report supporting the proposed changes and/or revisions to the Glendale Municipal Airport ALP. The narrative report will focus on the facility changes and development direction of the Airport that has occurred since the preparation of the previous Airport Master Plan and subsequent ALP (2009).

The ALP Narrative Report will include the identification of future facility needs and capital improvement scheduling and costs. The ALP Narrative Report and the updated ALP drawing set will also reflect new policies and development direction provided by the City of Glendale.

BACKGROUND INFORMATION

REGIONAL SETTING

The City of Glendale is located in the greater Phoenix metropolitan area within Maricopa County. The City is bounded on the east and south sides by the City of Phoenix, on the north and west sides by Peoria, Sun City, Youngtown, El Mirage, and unincorporated Maricopa County, and on the south/southwest by Litchfield Park, Goodyear, Avondale, and Tolleson. The Airport is located six miles west of the City of Glendale's central business district.

The Airport is located only 1.5 miles west of Loop 101 and is accessed from Glendale Avenue and Glen Harbor Boulevard.

AIRPORT SERVICE AREA

The service area generally represents where most, but not all, based aircraft will come from. It is not unusual for some based aircraft to be registered outside the county or even outside the state. In regions with several airports in relatively close proximity, service areas will likely overlap to some extent. According to the FAA, the service area for an airport can generally be identified by a 20 nautical mile (nm) buffer and then refined by local factors. The defined service area helps to identify a variety of data points that are used when developing forecasts of aviation demand later in this study.

The service area for Glendale Municipal Airport is primarily limited by the proximity of other public-use airports. The following is a description of the primary public-use airports in the vicinity as reported in 2015:

Phoenix Goodyear Airport (GYR) is a general aviation airport located seven nm southwest of Glendale Municipal Airport. An 8,500-foot runway is available with area navigation approaches. A total of 206 aircraft are reported based at the facility which has an average of 331 daily operations.

Phoenix Deer Valley Airport (DVT) is a general aviation airport located 14 nm northeast of Glendale Municipal Airport. A parallel runway system is available with the longest runway at 8,200 feet. Area navigation approaches are available. A total of 951 aircraft are reported based at the facility which has an average of 956 daily operations.

Phoenix Sky Harbor International Airport (PHX) is the commercial service airport for the Phoenix metropolitan area and is located 15 nm east of Glendale Municipal Airport. A fully instrumented parallel runway system is available with the longest runway measuring 11,500 feet. A reported 69 aircraft are based at the facility which has an average of 1,183 daily operations.

Scottsdale Airport (SDL) is a general aviation airport located 20 nm northeast of Glendale Municipal Airport. An 8,250-foot runway is available with area navigation approaches. A reported 325 aircraft are based at the facility which has an average of 418 daily operations.

Luke Air Force Base is located four nm west of Glendale Municipal Airport.

Table A presents a summary of the capabilities of the public-use airports directly influencing the service area for Glendale Municipal Airport.

Exhibit A presents the approximate service area, as well as the location for Glendale Municipal Airport.

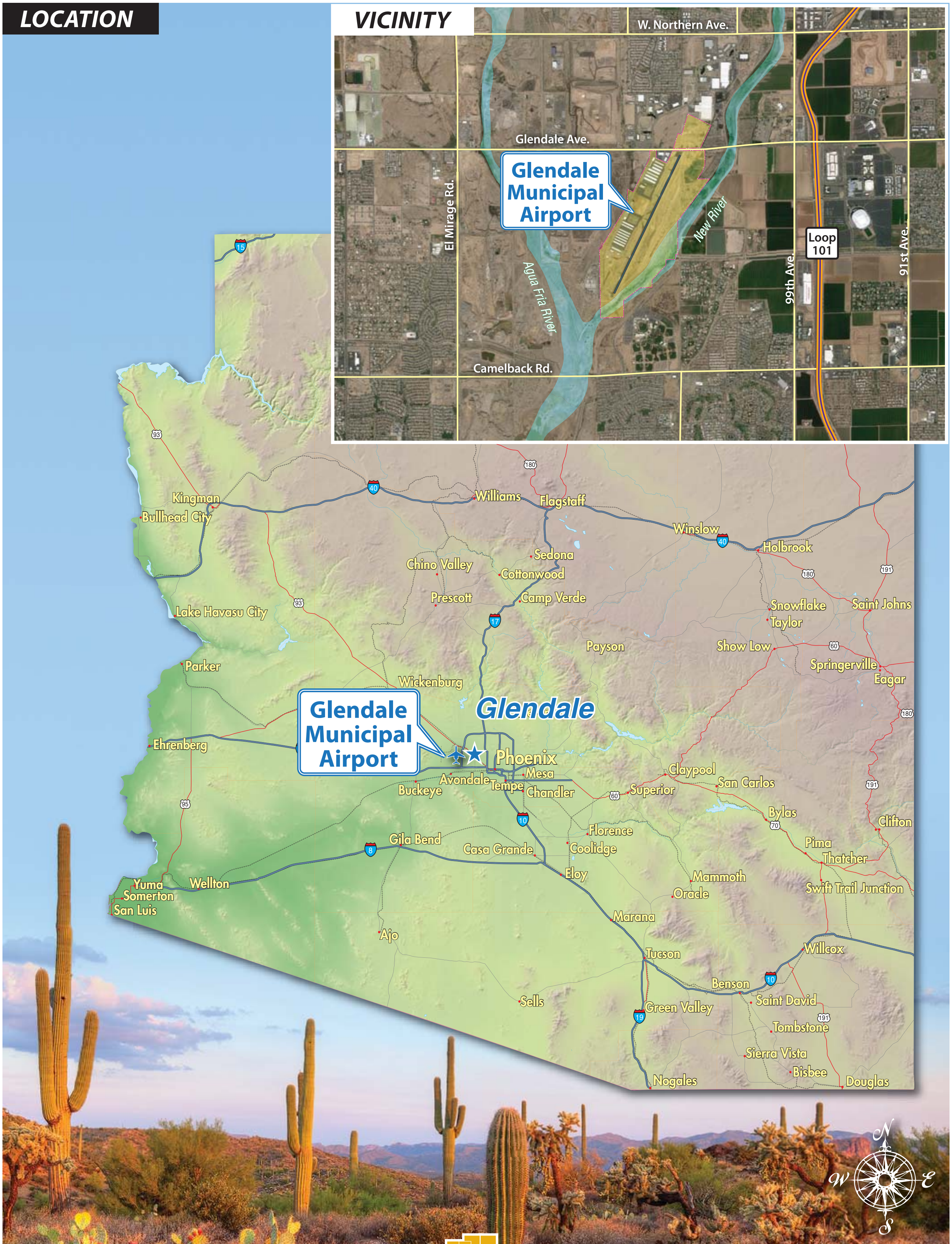

LOCATION
VICINITY
W. Northern Ave.
Glendale Ave.
Glendale Municipal Airport
El Mirage Rd.
Agua Fria River
New River
Loop 101
99th Ave.
91st Ave.
Camelback Rd.
Kingman
Bullhead City
Williams
Flagstaff
Winslow
Holbrook
Sedona
Chino Valley
Cottonwood
Prescott
Camp Verde
Lake Havasu City
Snowflake
Taylor
Saint Johns
Payson
Show Low
Springerville
Eagar
Parker
Wickenburg
Glendale
Glendale Municipal Airport
Ehrenberg
Phoenix
Mesa
Avondale
Tempe
Chandler
Buckeye
Claypool
San Carlos
Superior
Bylas
Clifton
Florence
Coolidge
Gila Bend
Casa Grande
Pima
Thatcher
Eloy
Mammoth
Oracle
Swift Trail Junction
Yuma
Somerton
San Luis
Wellton
Marana
Ajo
Tucson
Willcox
Benson
Saint David
Sells
Green Valley
Tombstone
Sierra Vista
Bisbee
Nogales
Douglas
N
W
E
S

TABLE A
Public-Use Airports Near Glendale Municipal Airport

Airport	Nautical Miles/ Direction	FAA Role	Longest Runway	Based Aircraft	Average Day Operations	Services
Glendale (Comparison)	n/a	GA Reliever	7,150	302	178	Full GA
Goodyear	7/SW	GA Reliever	8,500	206	331	Full GA
Deer Valley	14/NE	GA Reliever	8,200	951	956	Full GA
Sky Harbor	15/E	Commercial	11,500	69	1,183	Full GA
Scottsdale	20/NE	GA Reliever	8,250	325	418	Full GA

Source: Airnav.com, as published in 2015.

AIRPORT HISTORY AND OPERATION

The City of Glendale constructed its first municipal airport in 1971 on a 27-acre parcel of land obtained through a bankruptcy sale. Rapid growth and restricted expansion possibilities resulted in the current facility's siting, construction, and opening by 1986. In 1997, with federal and state assistance, the City purchased additional property on the northeast side. The runway was widened in 2003 and extended to its current length to accommodate a larger class of business jets.

The Glendale Municipal Airport is owned by the City of Glendale and is operated on a daily basis by a full-time Airport Administrator who reports to the Deputy Public Works Director – Transportation. There are four additional full-time employees and a management assistant.

A seven-member Aviation Advisory Commission studies and makes recommendations to the City Council on all matters relating to the airport. The commission meets once a month to discuss airport matters.

REGIONAL CLIMATE

Weather conditions are important to the planning and development of an airport. Temperature is an important factor in determining runway length requirements, while wind direction and speed are used to determine optimum runway orientation. **Table B** summarizes monthly climatic data for the local area, including average maximum and minimum temperatures, mean temperature, average precipitation, and total cooling degree days.

TABLE B
Climate Conditions
Glendale, Arizona

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Average Maximum	65.1	69.5	76.0	84.6	94.3	102.7	105.2	103.3	98.1	87.4	73.5	63.6
Average Minimum	41.9	45.1	50.0	55.7	63.8	72.0	79.5	79.0	71.8	59.4	47.9	40.9
Mean Temperature	53.5	57.3	63.0	70.1	79.0	87.4	92.4	91.1	84.9	73.4	60.7	52.3
Precipitation (in.)	0.99	1.23	0.97	0.37	0.11	0.04	0.83	1.23	0.95	0.49	0.68	0.99
Cooling Degree Days	0	5	48	184	438	670	848	811	599	272	29	0

Note: A degree day is a quantitative index demonstrated to reflect demand for energy to heat or cool houses or businesses. Cooling degree days indicate the number of degrees that a day's average temperature is above 65 degrees Fahrenheit and people start to use air conditioning to cool buildings.
Source: Climatography of the United States No. 81 (30-years of data from 1981-2010)—nearest station.

AIRPORT FACILITY INVENTORY

AIRSIDE FACILITIES

The existing runway (oriented at 10/190 degrees magnetic) is 7,150 feet long by 100 feet wide. The landing threshold on Runway 19 is displaced by 1,001 feet and the landing threshold on Runway 1 is displaced by 701 feet. Runway 1-19 is outfitted with medium intensity edge lights and has non-precision runway markings. Runway 1-19 is constructed of asphalt and is rated in good condition with pavement strength ratings of 40,000 pounds single wheel aircraft gear and 60,000 pounds dual wheel aircraft gear.

Runway 1-19 is 7,150 feet long and 100 feet wide.

Runway 1-19 has a full length parallel Taxiway A located at 252 feet (centerline-to-centerline separation). There are several entrance/exit and connector taxiways (A-1 through A-9) providing access to the airfield system and apron areas. The convergence of Taxiways A-4, A-5, and A-6 at midfield is considered by the FAA as a hot spot under current airfield design standards.

Helicopter traffic is segregated from fixed wing traffic—helicopter training is directed to the west side of the airfield while all fixed wing traffic operates on the east side of the airfield. Low-level hover training also occurs on the east side of the airfield. The airfield receives considerable training activity from nearby flight schools.

Precision approach path indicators (PAPI-2L) are available to each runway for visual approaches and instrument approach procedures are available to each runway using area navigation (global positioning). Other visual aids include a rotating beacon, runway end identifier lights, a segmented circle/lighted windcone, and stand-alone windcones. Furthermore, an automated weather observation system (AWOS) measures real-time weather conditions on the airfield.

A summary of existing airside facility data is provided in **Table C**. An aerial-based exhibit depicts the airport property boundary and airside facilities on **Exhibit B**.

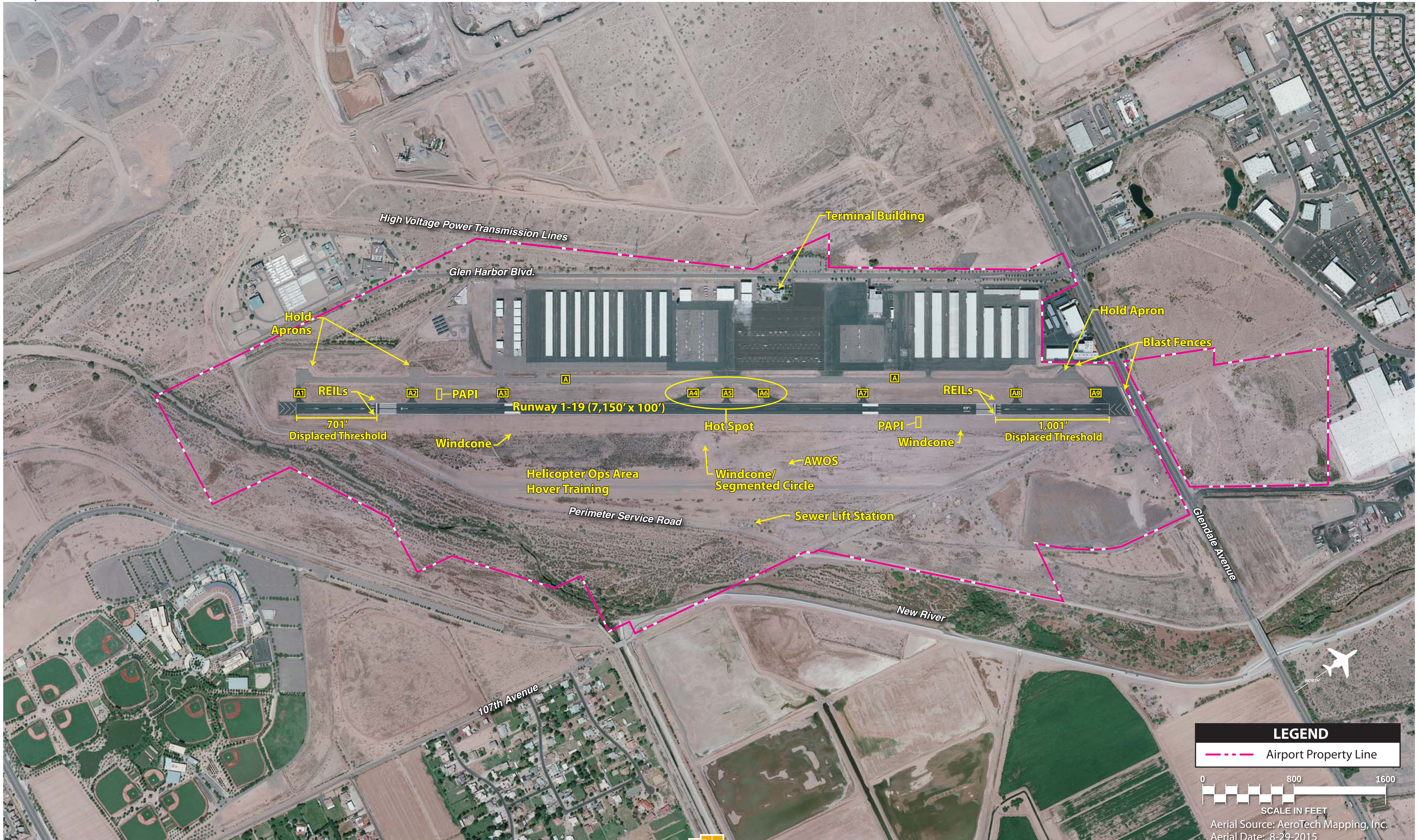
TABLE C
Airside Facilities Data
Glendale Municipal Airport

	Runway 1-19
Runway Length Runway Width Landing Threshold Displacement	7,150' 100' 1,001'(19)/701'(1)
Runway Surface Material Condition	Asphalt Good
Pavement Markings	Non-Precision
Runway Weight Bearing Capacity (lbs) Single Wheel Type Landing Gear (S) Dual Wheel Type Landing Gear (D)	 40,000 60,000
Runway Lighting	Medium Intensity
Taxiway Lighting Taxiway Type Taxiway Width Taxiway Markings Taxiway Exits	Medium Intensity Full Parallel (A) 35' Centerline, Hold Lines Nine Exits
Approach Aids	PAPI-2L (1 and 19) REIL (1 and 19)
Instrument Approach Procedures	RNAV (GPS)--Runways 1 and 19 (1 mile visibility minimums)
Weather or Navigational Aids	AWOS III Segmented Circle Lighted Windcones Rotating Beacon

Source: FAA Airport/Facility Directory, Southwest US, Effective August 20, 2015.
Abbreviations:
AWOS-Automated Weather Observation System
RNAV-Area Navigation
GPS-Global Positioning System
REIL-Runway End Identifier Lights
PAPI-Precision Approach Path Indicator

LANDSIDE FACILITIES

Landside facilities include all airport elements other than the runway/taxiway system and navigational aids. Glendale Municipal Airport has a 22,000 square foot, two-story terminal building located on Glen


High Voltage Power Transmission Lines
Glen Harbor Blvd.
Terminal Building
Hold Aprons
Hold Apron
Blast Fences
A1
A2
A3
A
A4
A5
A6
A7
A8
A9
REILs
PAPI
Runway 1-19 (7,150' x 100')
REILs
701' Displaced Threshold
Hot Spot
PAPI
1,001' Displaced Threshold
Windcone
Windcone
AWOS
Helicopter Ops Area
Hover Training
Windcone/ Segmented Circle
Perimeter Service Road
Sewer Lift Station
Glendale Avenue
New River
107th Avenue
NORTH
LEGEND
Airport Property Line
0
800
1600
SCALE IN FEET
Aerial Source: AeroTech Mapping, Inc.
Aerial Date: 8-29-2015

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Harbor Boulevard at midfield. Airport administration is located on the second floor. Several large conventional hangars sit adjacent to the terminal building, facing the main terminal area apron. Set back to the north and south from the terminal apron is a complex of T-hangars, box hangars, and shade hangars providing for both airport business operations and individual aircraft storage space.

The airport traffic control tower (ATCT) is located south of the terminal building. The tower is open from 6:00 a.m. - 8:30 p.m. Monday through Friday and from 7:00 a.m. - 7:00 p.m. Saturday and Sunday. The tower is owned by the Airport and staffed through the Contract Tower program.

A variety of aircraft storage options are available at the Airport. There are 215 individual aircraft storage positions in T-hangar/shade facilities. These units encompass approximately 242,000 square feet of space. There are approximately 10 conventional hangar positions available in several hangars, which encompass approximately 36,000 square feet of space. Within box hangars, it is estimated there are 175 positions and 363,000 square feet of space. In total, there is approximately 661,000 square feet of aircraft storage hangar space and 400 individual units. It is estimated that 20,000 square feet of space is dedicated to various aircraft maintenance activities. **Table D** summarizes existing aircraft storage and maintenance space.

TABLE D
Existing Hangar Area and Aircraft Storage Units
Glendale Municipal Airport

	T-Hangars/ Shade	Box Hangars	Conventional Hangars	Maintenance Space	Total
Area (sf)	242,000	363,000	36,000	20,000	661,000
Units	215	175	10	N/A	400

N/A: Not applicable as maintenance space is included in certain hangar facilities.
Source: Coffman Associates Analysis

The City of Glendale owns the fuel farm and leases it to the fixed base operator (FBO). There are three 20,000-gallon above-ground fuel storage tanks: two used for Jet-A and one for 100LL. There are three fuel delivery vehicles: two with 3,000-gallon capacity for Jet-A and one with 1,200-gallon capacity for 100LL. There is also a 3,600-gallon self-serve facility used for 100LL.

In the terminal area, there are 230 vehicular parking spaces. Each of the airport businesses has parking available in proximity to their operations.

Landside facilities are identified on **Exhibit C**.

INSTRUMENT APPROACH PROCEDURES

Instrument approach procedures are a series of predetermined maneuvers established by the FAA using electronic navigational aids to assist pilots in locating and landing at an airport. The capability of an instrument approach is defined by the visibility and cloud ceiling minimums associated with the approach. Visibility minimums define the horizontal distance that the pilot must be able to see to initiate the approach. Cloud ceilings, in some cases, define the lowest level a cloud layer (defined in feet above the ground) can be situated for a pilot to initiate the approach.

There are currently two published instrument approach procedures to Glendale Municipal Airport, the details of which are shown in **Table E**. The instrument approach procedure for Runway 1 provides for minimum descent to 329 feet above the ground with visibility minimums of 1.25 miles for all aircraft categories. The instrument approach procedure for Runway 19 provides for minimum descent altitude to 274 feet above the ground and visibility minimums of one mile for all aircraft categories.

TABLE E
Instrument Approach Data
Glendale Municipal Airport

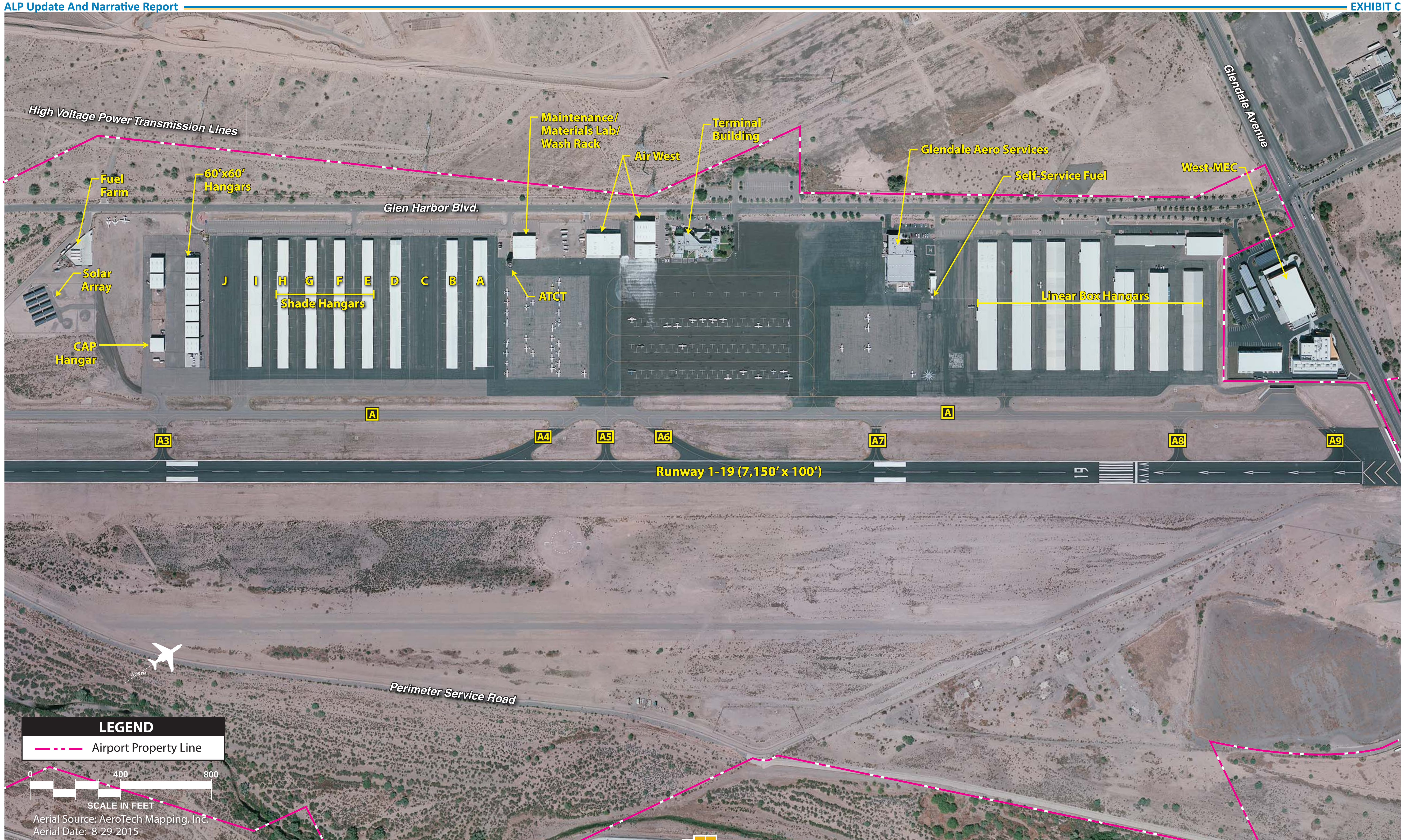
	WEATHER MINIMUMS BY AIRCRAFT TYPE							
	Category A		Category B		Category C		Category D	
	CH	VIS	CH	VIS	CH	VIS	CH	VIS
RNAV (GPS) Runway 1								
Straight-in LPV	329 / 1¼ mile							
LNAV/VNAV	408 / 1½ mile							
LNAV/MDA	391/1 mile						391	1¼ mile
Circling	449	1 mile	589	1 mile	589	1½ mile	589	2 miles
RNAV (GPS) Runway 19								
Straight-in LPV	274 / 1 mile							
LNAV/VNAV	507 / 1¾ mile							
LNAV/MDA	475 / 1 mile				475	1¼ mile	475	1½ mile
Circling	469	1 mile	589	1 mile	589	1½ mile	589	2 miles

Aircraft Categories are established based on 1.3 times the stall speed in landing configuration as follows:
Category A/B: 0-120 knots
Category C: 121-140 knots
Category D: 141-166 knots
CH - Cloud Height (in feet above ground level)
VIS - Visibility Minimums (in miles)
LPV – Localizer performance with vertical guidance
MDA – Minimum descent altitude
LNAV – Lateral navigation
VNAV – Vertical navigation

Source: U.S. Terminal Procedures; Southwest Region, Effective August 20, 2015

AREA AIRSPACE

Exhibit D depicts the regional airspace system in the vicinity of the Airport. When the tower is open, the Airport is located under Class D airspace, which extends to a three nautical mile radius on the north,


High Voltage Power Transmission Lines
Fuel Farm
60'x60' Hangars
Glen Harbor Blvd.
Maintenance/ Materials Lab/ Wash Rack
Air West
Terminal Building
Glendale Aero Services
Self-Service Fuel
West-MEC
Glendale Avenue
Solar Array
J
I
H
G
F
E
D
C
B
A
Shade Hangars
ATCT
Linear Box Hangars
CAP Hangar
A
A3
A4
A5
A6
A7
A8
A9
Runway 1-19 (7,150' x 100')
Perimeter Service Road
LEGEND
Airport Property Line
0
400
800
SCALE IN FEET
Aerial Source: AeroTech Mapping, Inc.
Aerial Date: 8-29-2015

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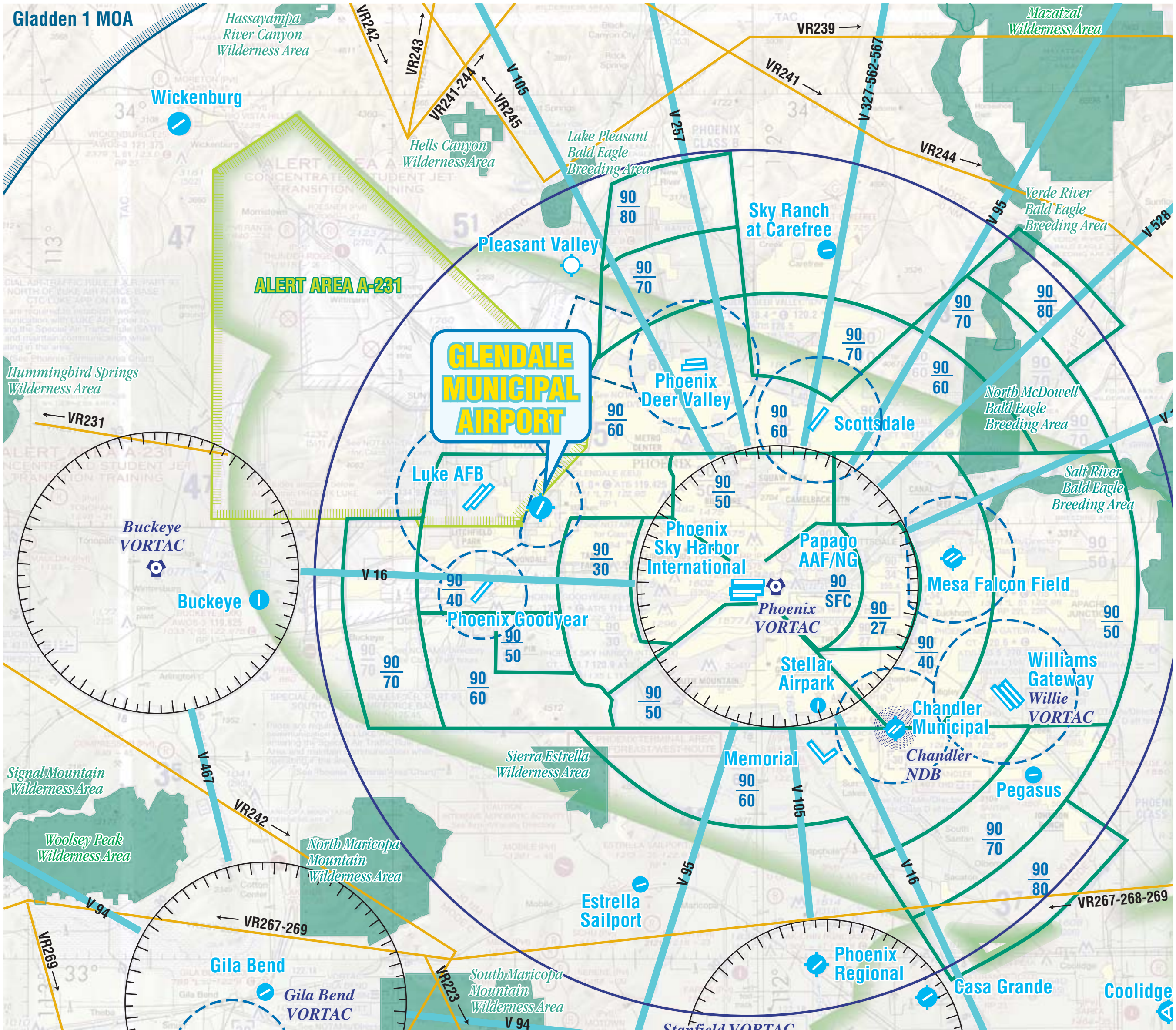


LEGEND

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

NORTH

NOT TO SCALE

Source:
Phoenix Sectional Chart,
US Department of Commerce,
National Oceanic and Atmospheric Administration, October 15, 2015

east, and south sides of the Airport and to an elevation of 1,929 feet AGL. When the tower is closed, the Airport operates in Class E airspace, with a floor of 700 feet AGL and extending to 18,000 MSL, or where Class B airspace begins. There are a number of Victor Airways in the vicinity--these are flight corridors between navigational aids depicted on **Exhibit D.** The western portion of the area airspace is overlapped and superseded by Class D airspace for Luke Air Force Base. The Airport is located near military operations areas (MOAs)—these are not restricted airspace but may contain military aircraft operating at high speeds. Also noted on **Exhibit D** is Alert Area A-231—this area is associated with Luke Air Force Base and pilots are encouraged to maintain contact with Luke radar approach control. Several military training routes are also noted on the exhibit—pilots must exercise caution when crossing these routes.

SOCIOECONOMIC TRENDS

Socioeconomic characteristics are collected and examined to derive an understanding of the dynamics of growth within the study area. This information assists in determining aviation service level requirements, as well as forecasting the number of based aircraft and operations at the Airport. Aviation forecasts are typically related to the population base, economic strength of the region, and the ability of the region to sustain a strong economic base over an extended period of time.

Historical population totals, obtained from the U.S. Census Bureau, are presented in **Table F**. According to the U.S. Census Bureau, the State of Arizona had 6.4 million residents in 2010. This is an increase of 2.7 million residents since 1990, which represents an average annual growth rate of 2.8 percent. Maricopa County experienced a 3.0 percent average annual increase in population through the same period, while the City of Glendale had an average annual growth rate of 2.2 percent. According to the Maricopa Association of Governments, the state's population was estimated at nearly 6.7 million in 2014, while Maricopa County's population was estimated at 4.0 million and the City of Glendale's population was estimated at 237,500.

TABLE F
Historical Population

Local	1990	2000	2010	Average Annual Growth Rate (1990-2010)	2014*
City of Glendale	148,000	219,000	227,200	2.17%	237,500
Maricopa County	2,122,000	3,072,000	3,817,000	2.98%	4,009,000
State of Arizona	3,665,000	5,131,000	6,392,000	2.82%	6,667,000

Source: U.S. Census Bureau, Arizona State Demographer's Office.
* Estimated by State Demographer's Office, as reported by Maricopa Association of Governments.

Table G presents forecasts of population, employment, and housing units as compiled by the U.S. Census Bureau or the Maricopa Association of Governments and interpolated for the years shown. Maricopa County population is forecast to grow at an annual rate of 1.77 percent and the City of Glendale is forecast to grow at a rate of 1.21 percent. Employment for the County is projected to grow at a rate of 1.85 percent while the City is projected to grow at a rate of 2.39 percent annually through 2035. Housing units are forecast to increase at an annual rate of 1.39 percent for the County and 0.98 percent for the City through 2035.

TABLE G
Socioeconomic Forecasts

Year	Maricopa County	City of Glendale
POPULATION		
2015	4,063,700	237,500
2025	4,935,500	277,300
2035	5,775,900	301,800
AAGR 2015-2035	1.77%	1.21%
EMPLOYMENT		
2015	2,009,500	97,500
2025	2,504,600	129,900
2035	2,896,700	156,300
AAGR 2015-2035	1.85%	2.39%
HOUSING UNITS		
2015	1,728,400	102,400
2025	1,974,300	114,300
2035	2,277,000	124,500
AAGR 2015-2035	1.39%	0.98%

AAGR: Average Annual Growth Rate
Sources: U.S. Census Bureau and Maricopa Association of Governments.

FORECASTS OF AVIATION DEMAND

An important factor in facility planning involves a definition of demand that may reasonably be expected to occur during the useful life of the facility's key components. For Glendale Municipal Airport, this involves projecting potential aviation demand for a 20-year timeframe. In this report, forecasts of annual operations, peak operational activity, based aircraft, and based aircraft fleet mix will serve as the basis for facility planning.

The resulting forecast may be used for several purposes including facility needs assessments and environmental evaluations. The forecasts will be reviewed and approved by the FAA to ensure that they are reasonable projections of aviation activity. The intent is to permit the City of Glendale to make the necessary planning adjustments to ensure the Airport facilities meets projected demands in an efficient and cost-effective manner.

Because aviation activity can be affected by many influences at the local, regional, and national levels, it is important to remember that forecasts are to serve only as guidelines, and planning must remain flexible enough to respond to unforeseen facility needs.

FORECASTING APPROACH

The development of aviation forecasts proceeds through both analytical and judgmental processes. A series of mathematical relationships is tested to establish statistical logic and rationale for projected growth. However, the judgment of the forecast analyst, based upon professional experience, knowledge of the aviation industry, and assessment of the local situation, is important in the final determination of the preferred forecast. The most reliable approach to estimating aviation demand is through the utilization of more than one analytical technique. Methodologies frequently considered include trend line/time-series projections, correlation/regression analysis, and market share analysis.

The development of aviation forecasts proceeds through both analytical and judgmental processes.

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

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

It is important to note that one should not assume a high level of confidence in forecasts that extend beyond five years. Facility and financial planning usually require at least a 10-year purview since it often takes more than five years to complete a major facility development program. However, it is important to use forecasts which do not overestimate revenue-generating capabilities or understate demand for facilities needed to meet public (user) needs.

NATIONAL AVIATION TRENDS

Each year, the FAA updates and publishes a national aviation forecast. Included in this publication are forecasts for the large air carriers, regional/commuter air carriers, general aviation, and FAA workload measures. The forecasts are prepared to meet budget and planning needs of the constituent units of the FAA and to provide information that can be used by state and local authorities, the aviation industry, and the general public. The current edition when this chapter was prepared was *FAA Aerospace Forecasts – Fiscal Years 2015-2035*, published in March 2015. The FAA primarily uses the economic performance of the United States as an indicator of future aviation industry growth. Similar economic analyses are applied to the outlook for aviation growth in international markets. The following discussion is summarized from the FAA Aerospace Forecasts.

U.S. Economic Outlook

According to the FAA Aerospace Forecasts, as the economy recovers from the most serious economic downturn and the subsequent slow recovery since the Great Depression, aviation will continue to grow over the long run. Fundamentally, demand for aviation is driven by economic activity. As economic growth picks up, so will growth in aviation activity. The FAA forecast calls for passenger growth over the next 20 years to average 2.0 percent annually. The steep decline in the price of oil in 2014 and into 2015 is a catalyst for a short-lived uptick in passenger growth; however, growth is anticipated to be somewhat muted, primarily due to the uncertainty that surrounds the U.S. and global economies.

U.S. economic performance in 2014 continued to be mixed, with modest growth in real GDP and real incomes, a slowly falling unemployment rate, and oil prices and consumer inflation remaining in check. The economy grew at an average annual rate of 2.6 percent in fiscal year (FY) 2014 after expanding 1.8 percent in FY 2013. GDP growth was strong in the second half of 2014 after shrinking in the second quarter primarily due to adverse weather conditions spurred on by the polar vortex. There were favorable signs in 2014 as the housing market continued to improve, the stock market entered record territory, and the labor market saw steady improvement with almost 2.8 million new jobs created during the year, the best figure since 1999. The unemployment rate fell steadily throughout 2014 from 7.2 percent to 5.6 percent by December.

In the medium term, (the three-year period between 2016 and 2019), U.S. economic growth is projected to average 2.6 percent per year with rates ranging between 2.4 and 2.7 percent. Income growth picks up during the same period, averaging 3.2 percent per year. For the balance of the forecast period, annual average growth of U.S. real GDP and real income slow to around 2.4 and 2.5 percent, respectively. The long-term stability of U.S. economic growth depends on sustained growth in the workforce and capital stock, along with improved productivity and competitiveness.

FAA General Aviation Forecasts

The FAA forecasts the fleet mix and hours flown for single engine piston aircraft, multi-engine piston aircraft, turboprops, business jets, piston and turbine helicopters, light sport, experimental, and others (gliders and balloons). The FAA forecasts "active aircraft," not total aircraft. An active aircraft is one that is flown at least one hour during the year. From 2010 through 2013, the FAA undertook an effort to have all aircraft owners re-register their aircraft. This effort resulted in a 10.5 percent decrease in the number of active general aviation aircraft, mostly in the piston category.

After growing rapidly for most of the decade, the demand for business jet aircraft slowed over the past few years, as the industry was hard hit by the 2008-2009 economic recession. Nonetheless, the FAA forecast calls for growth through the long-term, driven by higher corporate profits and continued concerns about safety, security, and flight delays. Overall, business aviation is projected to outpace personal/recreational use.

In 2014, the FAA estimated there were 139,890 piston-powered aircraft in the national fleet. The total number of piston-powered aircraft in the fleet is forecast to decline by 0.5 percent from 2014-2035, resulting in 125,935 by 2035. This includes -0.6 percent annually for single engine pistons and -0.4 percent for multi-engine pistons.

Total turbine aircraft are forecast to return to growth in 2014 and have an annual growth rate of 2.4 percent through 2035. The FAA estimates there were 28,085 turbine-powered aircraft in the national fleet in 2014, and there will be 45,905 by 2035. This includes annual growth rates of 1.5 percent for turboprops, 2.8 percent for business jets, and 2.8 percent for turbine helicopters.

While comprising a much smaller portion of the general aviation fleet, experimental aircraft, typically identified as home-built aircraft, are projected to grow annually by 1.4 percent through 2035. The FAA estimates there were 24,480 experimental aircraft in 2014, and these are projected to grow to 33,040 by 2035. Sport aircraft are forecast to grow 4.3 percent annually through the long term, growing from 2,200 in 2014 to 5,360 by 2035. **Exhibit E** presents the historical and forecast U.S. active general aviation aircraft.

The FAA also forecasts total operations based upon activity at control towers across the U.S. Operations are categorized as air carrier, air taxi/commuter, general aviation, and military. General aviation operations, both local and itinerant, declined significantly as a result of the 2008-2009 recession and subsequent slow recovery. Through 2035, total general aviation operations are forecast to grow 0.4 percent annually. Air taxi/commuter operations are forecast to decline by 3.6 percent through 2024, and then increase slightly through the remainder of the forecast period. Overall, air taxi/commuter operations are forecast to decline by 1.2 percent annually from 2014 through 2035.

General Aviation Aircraft Shipments and Revenue

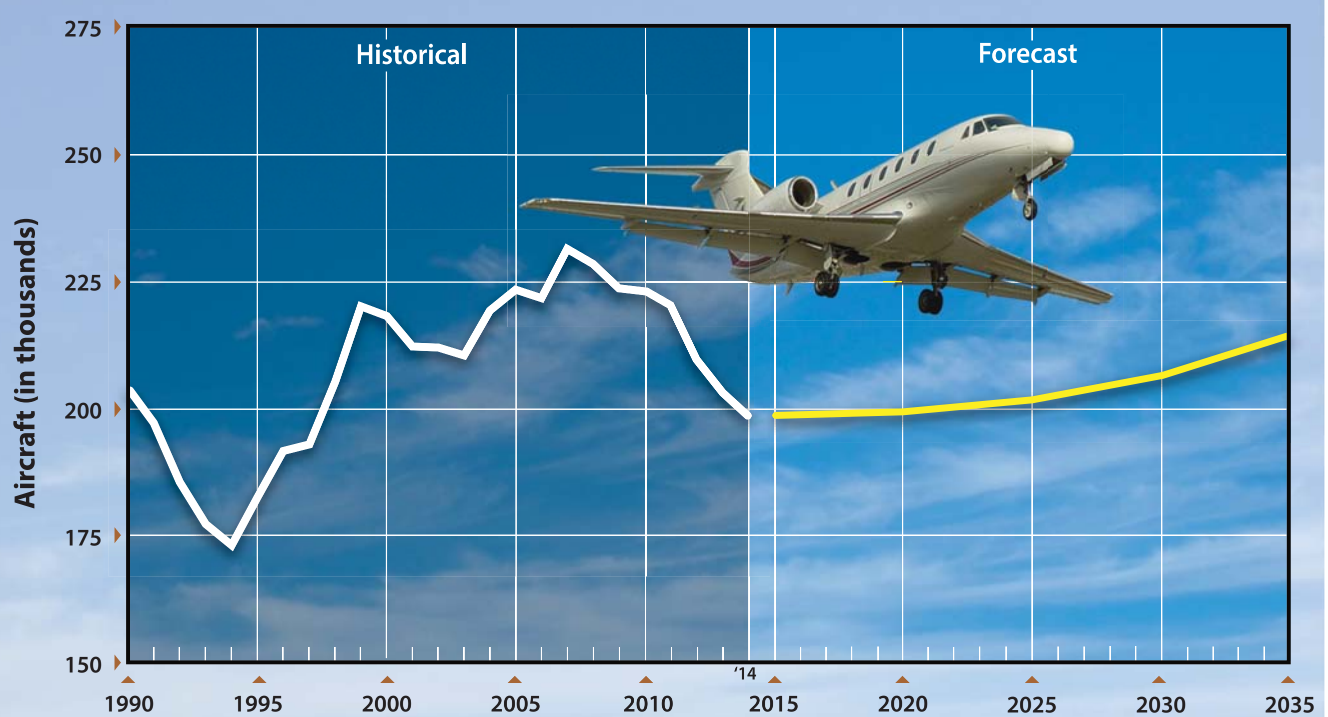
As previously discussed, the 2008-2009 economic recession has had a negative impact on general aviation aircraft production, and the industry was slow to recover. Aircraft manufacturing declined for three straight years from 2008 through 2010. According to the General Aviation Manufacturers Association (GAMA), there is optimism that aircraft manufacturing will stabilize and return to growth, which has been evidenced since 2011. **Table H** presents historical data related to general aviation aircraft shipments.

Worldwide shipments of general aviation airplanes increased for the fourth year in a row in 2014. A total of 2,445 units were delivered around the globe, as compared to 2,345 units in 2013. Worldwide general aviation billings were also higher than the previous year.

Business Jets: General aviation manufacturers delivered 722 business jets in 2014, as compared to 678 units in 2013. Similar to 2013, demand was stronger in 2014 for large-cabin business jets than it was for medium and light business jets.

U.S. Active General Aviation Aircraft

	2015	2020	2025	2030	2035
FIXED WING					
Piston					
Single Engine	122,435	117,770	113,905	110,635	108,810
Multi-Engine	13,175	12,920	12,545	12,230	12,135
Turbine					
Turboprop	9,390	9,315	9,855	11,155	12,970
Turbojet	11,915	13115	15,000	17,565	20,815
ROTORCRAFT					
Piston	3,335	3,785	4,165	4,555	4,990
Turbine	7,105	8,410	9,595	10,805	12,120
EXPERIMENTAL					
	24,880	26,795	28,875	30,975	33,040
SPORT AIRCRAFT					
	2,355	3,170	3,970	4,705	5,360
OTHER					
	4,190	4,130	4,060	4,055	4,020
TOTAL	**198,780**	**199,410**	**201,970**	**206,680**	**214,260**



Source: FAA Aerospace Forecasts, Fiscal Years 2015-2035.

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

Turboprops: In 2014, 603 turboprop airplanes were delivered to customers around the world, a slight decline from the 645 delivered in 2013. Overall, the turboprop market has experienced significant gains since 2010.

Pistons: Piston deliveries increased from 1,022 units during 2013 to 1,129 in 2014. The piston segment continued to fare best for unit deliveries among the three segments by which GAMA tracks the airplane manufacturing industry. This is due in part by deliveries to flight schools in emerging markets.

Most industry observers believe that the general aviation market, particularly the business aviation market, is in a position for sustained growth. Industry net orders are back to positive and most leading indicators continue to improve. The large jet category of the market is expected to expand faster than the other categories.

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

Year	Total	Single Engine Piston	Multi-Engine Piston	Turboprop	Jet	Net Billings ($millions)
1994	1,132	544	77	233	278	3,749
1995	1,251	605	61	285	300	4,294
1996	1,437	731	70	320	316	4,936
1997	1,840	1043	80	279	438	7,170
1998	2,457	1508	98	336	515	8,604
1999	2,808	1689	112	340	667	11,560
2000	3,147	1,877	103	415	752	13,496
2001	2,998	1,645	147	422	784	13,868
2002	2,677	1,591	130	280	676	11,778
2003	2,686	1,825	71	272	518	9,998
2004	2,963	1,999	52	321	591	11,918
2005	3,590	2,326	139	375	750	15,156
2006	4,053	2,513	242	412	886	18,815
2007	4,276	2,417	258	465	1,136	21,837
2008	3,970	1,943	176	538	1,313	24,772
2009	2,279	893	70	446	870	19,474
2010	2,020	781	108	368	763	19,715
2011	2,120	761	137	526	696	19,097
2012	2,133	790	91	580	672	18,873
2013	2,345	900	122	645	678	23,450
2014	2,445	986	143	603	722	24,499

Source: General Aviation Manufacturers Association 2013 Statbook; 2014 data from Year End Report.

FAA TERMINAL AREA FORECAST

On an annual basis, the FAA publishes the *Terminal Area Forecast* (TAF) for each airport included in the National Plan of Integrated Airport Systems (NPIAS). The TAF is a generalized forecast of airport activity used by FAA for internal planning purposes. It is available to airports and consultants to use as a point of comparison for development of local forecasts. **Table J** presents the *Terminal Area Forecast* for Glendale Municipal Airport (the most recent historical data published in the TAF is for FY 2014).

TABLE J
FAA Terminal Area Forecast
Glendale Municipal Airport

	HISTORICAL			FORECAST		
	2005	2010	2014	2020	2025	2035
OPERATIONS						
Itinerant						
Air Taxi/Commuter	1,801	1,901	851	701	701	701
GA	43,339	28,981	22,974	25,719	26,024	26,644
Military	21	53	69	52	52	52
Total Itinerant	45,161	30,935	23,894	26,472	26,777	27,397
Local						
GA	83,694	50,721	40,959	55,515	56,177	57,527
Military	29	14	90	4	4	4
Total Local	83,723	50,735	41,049	55,519	56,181	57,531
Total Operations	**128,884**	**81,670**	**64,943**	**81,991**	**82,958**	**84,928**
BASED AIRCRAFT	**269**	**196**	**289**	**311**	**330**	**360**

Source: FAA Terminal Area Forecast, issued January 2016. Fiscal year data.

GENERAL AVIATION FORECASTS

For a general aviation airport, such as Glendale Municipal Airport, forecasts of based aircraft, operations, and peak activity level are the most basic indicators of future demand. Future facility requirements, such as hangars, apron area, and terminal building needs, are derived from the general aviation forecasts.

BASED AIRCRAFT

The number of based aircraft is the most basic indicator of general aviation demand. By first developing a forecast of based aircraft for the Airport, other general aviation activity and demand can be projected. The process of developing forecasts of based aircraft begins with an analysis of aircraft ownership in the primary general aviation service area through a review of historical aircraft registrations.

The number of based aircraft is the most basic indicator of general aviation demand.

Area Aircraft Ownership (Registered Aircraft)

Analysis presented earlier indicates that the Glendale area, including portions of the West Valley west of 51st Avenue, is the primary service area for general aviation demand. Aircraft ownership trends for the primary service area typically dictate the based aircraft trends for an airport. As such, an analysis of the West Valley aircraft registrations trends was made.

Table K presents the history of registered aircraft in the West Valley area from 2008 through 2014. These figures are derived from the FAA aircraft registration database that categorized registered aircraft by county based on the geo-referenced region. Although this information generally provides a correlation to based aircraft, it is not uncommon for some aircraft to be registered in the area, but based at an airport outside the area--or vice versa.

TABLE K
West Valley Registered Aircraft

Year	SEP	MEP	TP	J	H	O	Total
2008	688	47	8	2	49	69	863
2009	659	48	7	3	53	63	833
2010	644	49	7	4	49	68	821
2011	626	48	8	5	51	67	805
2012	553	42	6	4	43	71	719
2013	512	41	6	5	38	74	676
2014	500	39	11	6	34	54	644

SEP-Single engine piston; MEP-Multi-engine Piston, TP-Turboprop, J-Jet, H-Helicopter, O-Other (ultralights, etc.)
Source: FAA Aircraft Registration Database

In 2014, there were 644 aircraft registered in the West Valley area, which is the sixth consecutive year of decline. This trend is consistent with how the national recession of 2008-2009 negatively impacted general aviation as a whole.

Two market share projections were developed as shown in **Table L**. These projections evaluate the potential growth of aircraft demand (registered aircraft) in the West Valley area over the next 20 years using previously developed FAA forecasts for active aircraft in the U.S. and locally developed population projections.

The first projection considers the county's historic share of total U.S. active aircraft. In 2014, the West Valley total of 644 registered aircraft was 0.3238 percent of the total number of U.S. active aircraft. By maintaining this ratio as a constant market share, a projection of registered aircraft is developed which has a direct correlation to national growth rates. A second projection considers the ratio between the City of Glendale's population and registered aircraft in the West Valley area. In 2014, there were 2.7510 registered aircraft per 1,000 City residents. By maintaining this ratio, a second projection emerges.

Both of the market share projections are considered reasonable. The recent declining trend in registered aircraft and U.S. active aircraft following the 2008-2009 recession is shown to slowly level off and ultimately return to growth over time. The selected forecast is an average of the two projections. In 2020, registered aircraft are forecast to increase slightly to 680. By 2035, registered aircraft for the West Valley are forecast to reach 760. Over the next 20 years, West Valley registered aircraft are forecast to grow slowly at 0.79 percent annually.

TABLE L
Registered Aircraft Projections
West Valley/Glendale Area

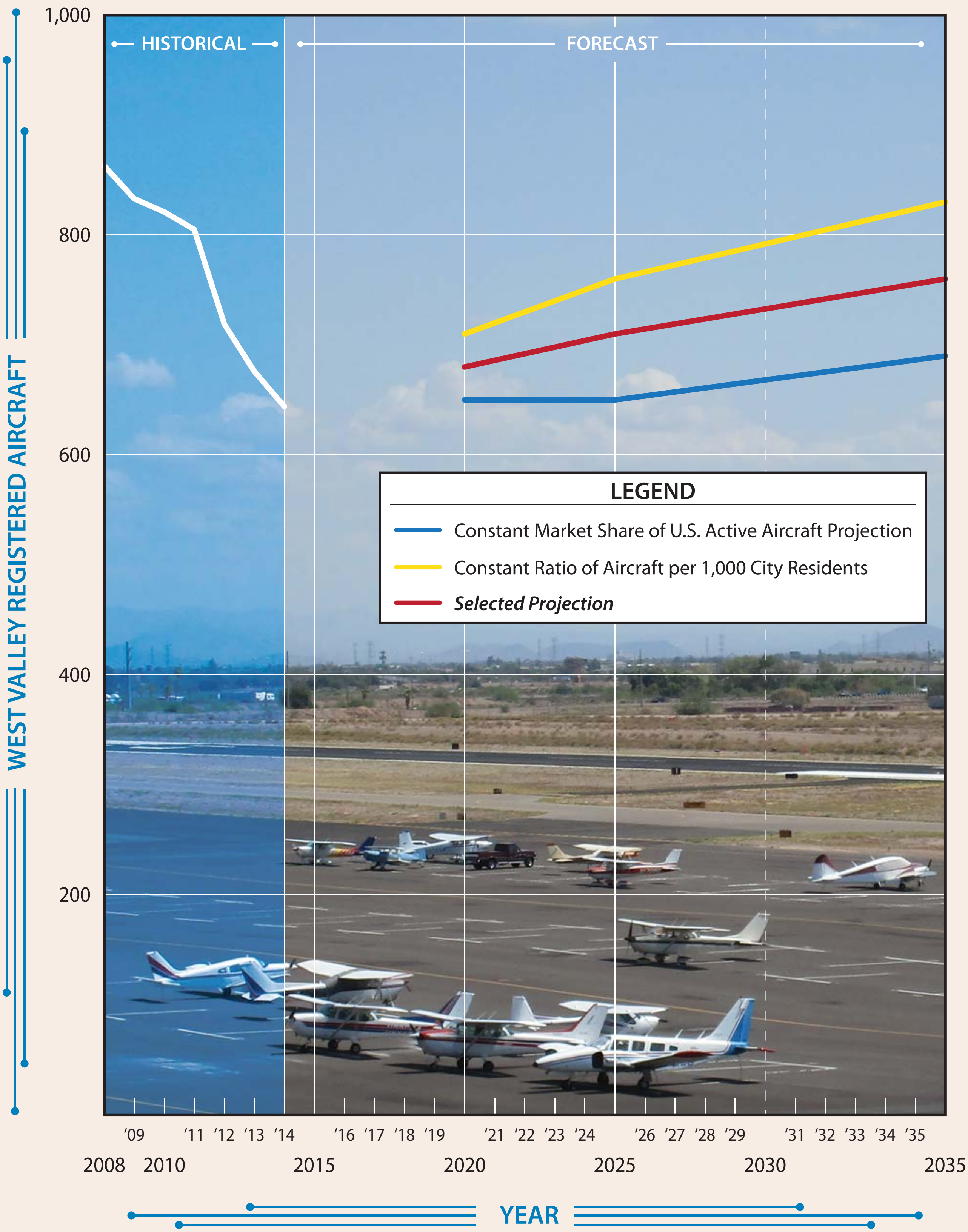
Year	West Valley Registrations[1]	U.S. Active Aircraft[2]	Market Share	Glendale Population[3]	Aircraft Per 1,000 Residents
2008	863	228,664	0.3770%		
2009	833	223,876	0.3716%		
2010	821	223,370	0.3671%	227,200	3.6092
2011	805	220,453	0.3647%	227,400	3.5356
2012	719	209,034	0.3440%	229,000	3.1397
2013	676	199,927	0.3381%	231,400	2.9213
2014	644	198,860	0.3238%	234,100	2.7510
Constant Market Share of U.S. Active Aircraft Projection					
2020	650	199,410	0.3238%		
2025	650	201,970	0.3238%		
2035	690	214,260	0.3238%		
Constant Ratio of Aircraft per 1,000 City Residents					
2020	710			259,000	2.7510
2025	760			277,300	2.7510
2035	830			301,800	2.7510
Selected Projection (AAGR = 0.79%)					
2020	***680***	199,410	0.3410%	259,000	2.6255
2025	***710***	201,970	0.3517%	277,300	2.5632
2035	***760***	214,260	0.3546%	301,800	2.5166

[1]West Valley Registrations from FAA Aircraft Registration Database (geo-referenced).
[2]U.S. Active Aircraft from FAA Aerospace Forecasts – Fiscal Years 2015-2035
[3]Historical population data from the U.S. Census Bureau or Arizona State Demographer's Office. Some figures interpolated.
AAGR: Average annual growth rate

The registered aircraft projection is one data point to be used in the development of a based aircraft forecast. The following section will develop a projection for based aircraft at Glendale Municipal Airport. **Exhibit F** graphically shows the registered aircraft forecast.

Based Aircraft Forecast

Determining the number of based aircraft at an airport can be a challenging task. Aircraft storage can be somewhat transient in nature, meaning aircraft owners can and


WEST VALLEY REGISTERED AIRCRAFT
1,000
800
600
400
200
HISTORICAL
FORECAST
LEGEND
Constant Market Share of U.S. Active Aircraft Projection
Constant Ratio of Aircraft per 1,000 City Residents
Selected Projection
'09 '11 '12 '13 '14 '16 '17 '18 '19 '21 '22 '23 '24 '26 '27 '28 '29 '31 '32 '33 '34 '35
2008 2010 2015 2020 2025 2030 2035
YEAR

do move their aircraft. Some aircraft owners may store their aircraft at an airport for only part of the year. For many years, the FAA did not require based aircraft records; therefore, historical records are often incomplete or non-existent.

As of August 2015, there were 280 based aircraft at the Airport. The aircraft mix consisted predominately of single and multi-engine piston aircraft, although three jets and a dozen helicopters were included.

The FAA TAF is an initial source for based aircraft forecasts. The 2015 TAF estimated that there were 294 based aircraft, and this figure was projected to grow to 360 by 2035. Two additional market share forecasts have been developed and are presented in **Table M**. The first considers the Airport maintaining a constant market share of West Valley registered aircraft. This results in a long term total of 320 based aircraft. The FAA indicates that applying the region's TAF annual growth rate is an acceptable forecast as well, which is shown as the selected planning forecast. By the year 2035, the Airport is projected to potentially reach 340 based aircraft. **Exhibit G** graphically shows the based aircraft forecasts.

TABLE M
Based Aircraft Forecast
Glendale Municipal Airport

Year	West Valley Registered Aircraft	Glendale Based Aircraft	Market Share
2015	644	280	42.5%
Constant Market Share Projection			
2020	680	290	42.5%
2025	710	300	42.5%
2035	760	320	42.5%
Western Pacific Region TAF Growth Rate (AAGR=0.9704%) (Selected Planning Forecast)			
2020		295	
2025		310	
2035		340	

AAGR: Average Annual Growth Rate.

Based Aircraft Fleet Mix

While the total number of general aviation aircraft based at Glendale Municipal Airport is projected to increase, it is also important to know the type of aircraft expected to base at the Airport. This will ensure the planning of proper facilities in the future.

The forecast mix of based aircraft was determined by comparing existing and forecast U.S. general aviation fleet trends to the fleet mix at Glendale Municipal Airport. The national trend in general aviation is toward a greater percentage of larger, more sophisticated aircraft as part of the national fleet—and these aircraft appear in all categories. Single engine aircraft are anticipated to continue to represent the largest portion of based aircraft. The percentages of multi-engine, jets, and helicopters are all expected to increase through the planning period. The fleet mix projections for Glendale Municipal Airport are shown in **Table N**.

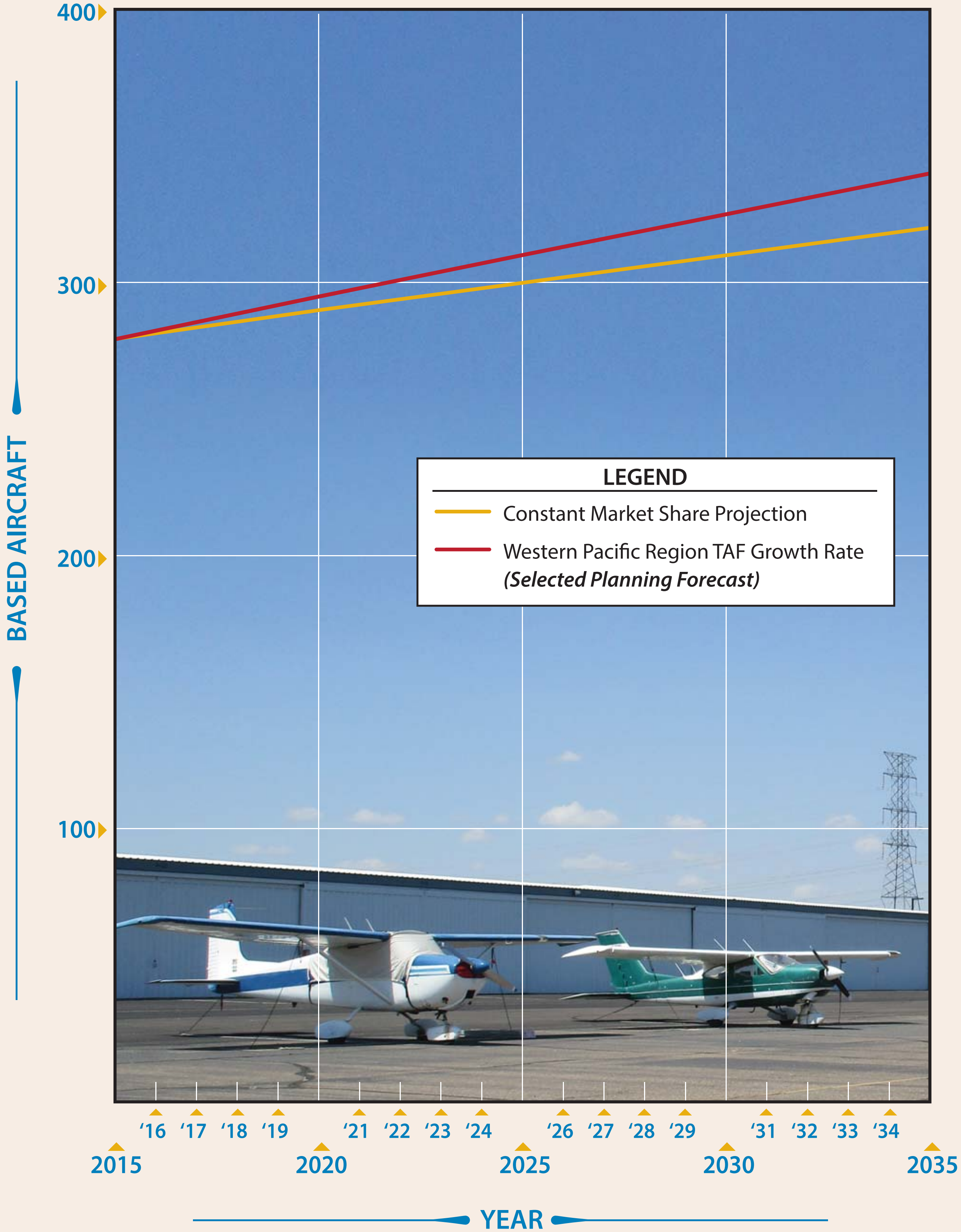

400
300
200
100
BASED AIRCRAFT
LEGEND
Constant Market Share Projection
Western Pacific Region TAF Growth Rate
(Selected Planning Forecast)
'16 '17 '18 '19 '21 '22 '23 '24 '26 '27 '28 '29 '31 '32 '33 '34
2015 2020 2025 2030 2035
YEAR

TABLE N
Fleet Mix Projections
Glendale Municipal Airport

Year	Total	Single Engine	Multi-Engine	Jets	Helicopters
2015	280	229	36	3	12
	100.0%	81.8%	12.9%	1.1%	4.2%
2020	295	237	38	6	14
2025	310	246	41	8	15
2035	340	267	43	13	17
Change	+60	+38	+7	+10	+5

ANNUAL OPERATIONS

Operations are categorized as air carrier (not applicable at Glendale), air taxi, general aviation, and military. They are further classified as local or itinerant in the general aviation and military categories. A local operation is a take-off or landing performed by an aircraft that operates within sight of the airport, or which executes simulated approaches or touch-and-go operations at the airport. Itinerant operations are those performed by aircraft with a specific origin or destination away from the airport. Generally, local operations are characterized by training operations. Itinerant operations increase with business and commercial use, since business aircraft operate on a high frequency and are not typically utilized for local training operations.

Table P summarizes historical operations at Glendale Municipal Airport since 2008. This data was obtained from the FAA Operations Network (OPSNET) database of tower operations counts. Since 2008, operations have declined; however, in 2015, the control tower recorded 77,835 operations, a 20 percent increase over the previous year.

TABLE P
Historical Operations-Calendar Year Data
Glendale Municipal Airport

	ITINERANT				LOCAL			Total Annual Operations
Year	Air Taxi/ Commuter	GA	Mil	Total Itinerant	GA	Mil	Total Local	
2008	1,873	47,266	26	49,165	87,016	31	87,047	136,212
2009	1,993	39,579	64	41,636	62,410	16	62,426	104,062
2010	1,672	28,406	57	30,135	52,058	5	52,063	82,198
2011	1,071	26,366	49	27,486	59,632	6	59,638	87,124
2012	1,019	27,837	19	28,875	47,230	22	47,252	76,127
2013	935	26,100	52	27,087	40,725	76	40,725	67,812
2014	882	26,100	69	23,296	41,757	69	41,757	65,053
2015	522	25,480	46	26,048	51,773	14	51,787	77,835

Sources: The Operations Network (OPSNET) - FAA operations database sourced from tower data.

Itinerant General Aviation Operations Forecast

Two forecasts of itinerant general aviation operations have been developed and are presented in **Table Q**. The first considers the Airport maintaining its share of total U.S. itinerant general aviation operations at a constant level. In 2015, the Airport accounted for 0.1822 percent of U.S. itinerant operations.

TABLE Q
General Aviation Itinerant Operations Forecast
Glendale Municipal Airport

Year	GEU GA Itinerant Ops[1]	US GA Itinerant Ops[2]	% of U.S. Itinerant Ops	GEU Based Aircraft	Itinerant Ops Per Based Aircraft
2015	25,480	13,977,500	0.1822%	280	91
Constant Market Share of U.S. Itinerant GA Operations					
2020	25,900	14,209,500	0.1822%		
2025	26,400	14,499,400	0.1822%		
2035	27,600	15,118,400	0.1822%		
Constant Itinerant Operations Per Based Aircraft					
2020	26,800			295	91
2025	28,200			310	91
2035	30,900			340	91
Planning Forecast (AAGR = 0.6923%)					
2020	26,400				
2025	27,300				
2035	29,300				

AAGR = Average annual growth rate
[1]FAA Operations Network (OPSNET) tower count database
[2]FAA Aerospace Forecasts 2015-2035

The second forecast considers a more localized projection by comparing the number of itinerant operations at the Airport to the number of based aircraft. There were 91 itinerant general aviation operations per based aircraft in 2015.

The selected planning forecast is the average of the two forecasts. The average annual growth rate is 0.6923 percent.

Local General Aviation Operations Forecast

A similar methodology was utilized to generate a planning forecast for local general aviation operations. Two forecasts were developed with the first considering the Airport maintaining a constant percentage of U.S. local general aviation operations. The second forecast maintains a constant number of local operations per based aircraft. Both forecasts are shown in **Table R**.

The selected planning forecast is the average of the two forecasts. The average annual growth rate is 0.7317 percent.

Exhibit H presents both the itinerant and local general aviation operations forecast in graphic form.

TABLE R
General Aviation Local Operations Forecast
Glendale Municipal Airport

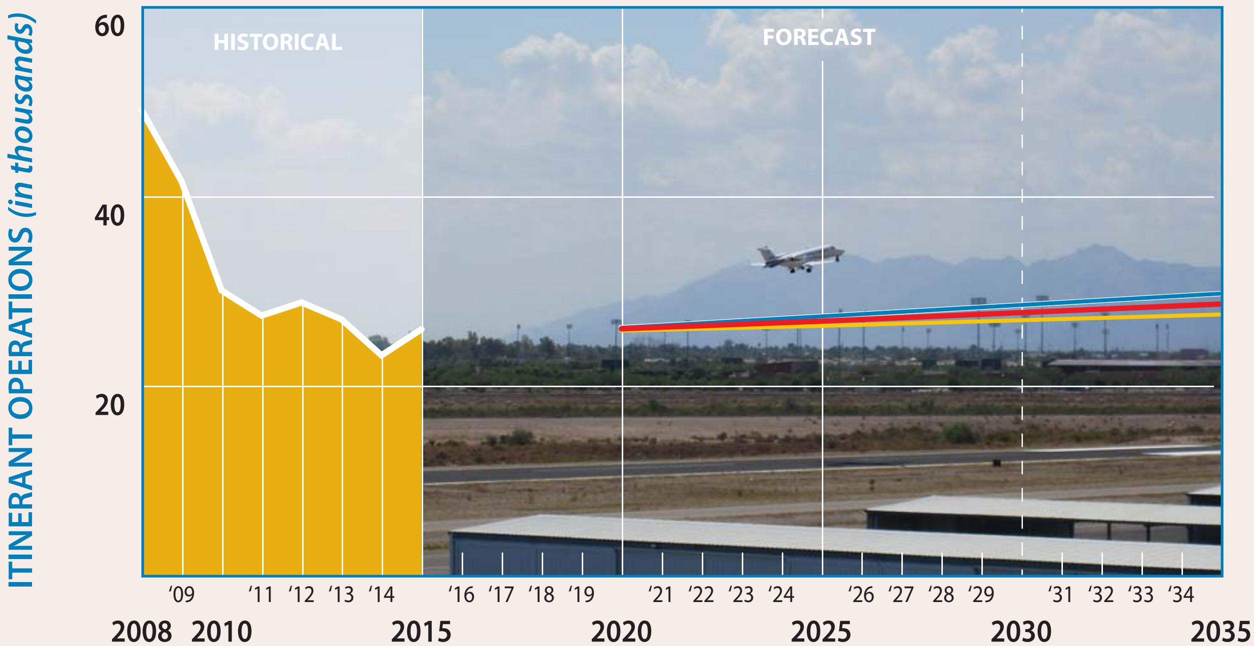
Year	GEU GA Local Ops[1]	US GA Local Ops[2]	% of U.S. Local Ops	GEU Based Aircraft	Local Ops Per Based Aircraft
2015	51,773	11,674,100	0.4435%	280	185
Constant Market Share of U.S. Local GA Operations					
2020	53,400	12,048,000	0.4435%		
2025	54,500	12,298,900	0.4435%		
2035	56,900	12,834,800	0.4435%		
Constant Local Operations per Based Aircraft					
2020	54,600			295	185
2025	57,400			310	185
2035	62,900			340	185
Planning Forecast (AAGR = 0.7317%)					
2020	54,000				
2025	56,000				
2035	59,900				

AAGR = Average annual growth rate
[1]FAA Operations Network (OPSNET) tower count database
[2]*FAA Aerospace Forecasts 2015-2035*

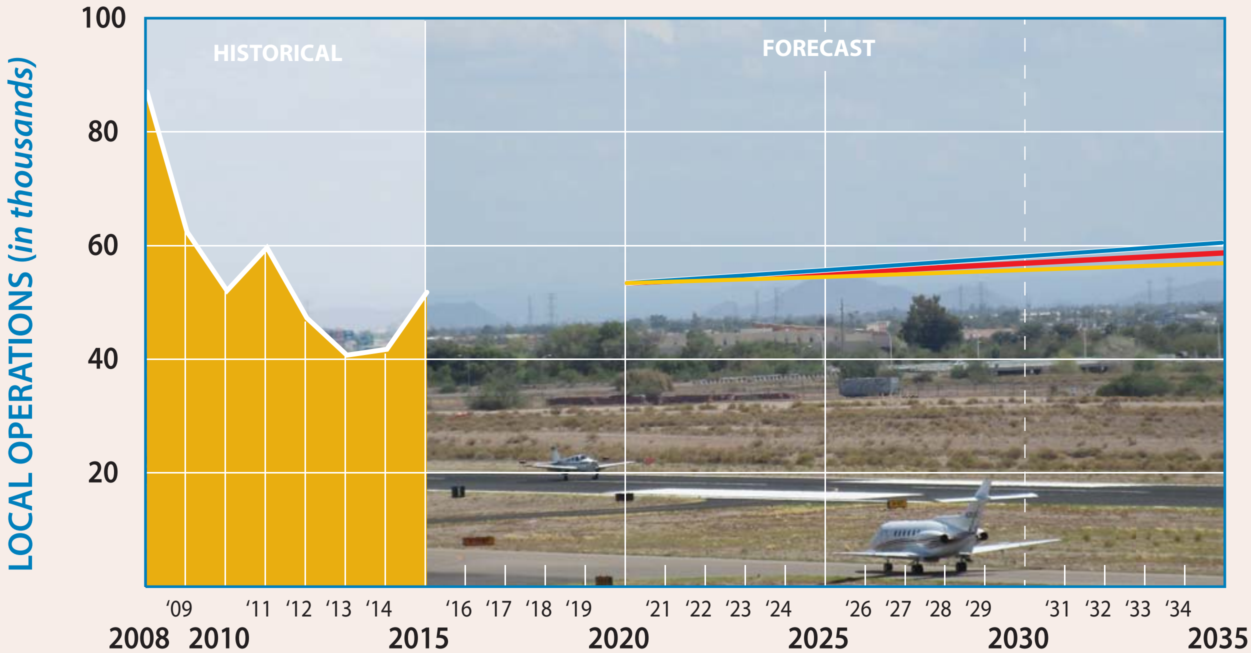
Air Taxi Operations Forecast

Air taxi operations are those with authority to provide "on demand" transportation of persons or property via aircraft. Air taxi includes a broad range of operations, including some smaller commercial service aircraft, air cargo aircraft, many fractional ownership aircraft, and air ambulance services.

The forecast of air taxi operations considers the Airport maintaining a constant share of the FAA forecast for air taxi operations nationally. Since the FAA is forecasting air taxi operations, this is reflected in a decline in air taxi operations for Glendale through the intermediate planning period. In later years, air taxi activity is forecast to reverse trend and begin increasing again. The planning forecast figures are presented in **Table S**.



Constant Share of U.S. Itinerant GA Operations
Constant Itinerant Operations Per Based Aircraft
Planning Forecast (AAGR = 0.6923%)



Constant Share of U.S. Local GA Operations
Constant Local Operations Per Based Aircraft
Planning Forecast (AAGR = 0.7317%)

TABLE S
Air Taxi Operations Forecast
Glendale Municipal Airport

Year	Glendale Air Taxi Operations[1]	U.S. Air Taxi Operations[2]	Glendale Percent
2015	522	8,439,300	0.0062%
Constant Market Share of U.S. Air Taxi Operations –Planning Forecast			
2020	440	7,075,700	0.0062%
2025	370	5,918,500	0.0062%
2035	410	6,580,200	0.0062%

AAGR = Average annual growth rate
[1] FAA Operations Network (OPSNET) tower count database
[2] FAA Aerospace Forecasts 2015-2035

Military Operations Forecast

Military aircraft will occasionally utilize the airport for both itinerant and local operations. Over the last eight years, the Airport has averaged 48 itinerant military operations and 30 local military operations. Because the mission for area military aircraft operators can change rapidly, the forecast provides only an estimated baseline for military operations. For planning purposes, 50 itinerant and 50 local military operations will be utilized for each year of the planning period.

PEAKING CHARACTERISTICS

Many airport facility needs are related to the level of activity during peak periods. The periods used in developing facility requirements for this study are as follows:

- **Peak Month –** The calendar month when peak activity occurs.
- **Design Day –** The average day in the peak month.
- **Busy Day –** The busy day of a typical week in the peak month.
- **Design Hour –** The peak hour within the design day.

It is important to realize that only the peak month is an absolute peak within the year. Each of the other periods will be exceeded at various times during the year. However, each provides reasonable planning standards that can be applied without overbuilding or being too restrictive.

A review of monthly tower reports shows that the peak month for operations is 11.1 percent of total annual operations. This factor is carried to the plan years. The design day is simply the peak month divided by the number of days in that month. The busy day is estimated at 40 percent higher than the design day, which is based on activity at comparable general aviation airports. The design hour is determined utilizing 17.5 percent of the design day as an average. **Table T** presents the peaking characteristics for the Airport.

TABLE T Peak Operations Forecast Glendale Municipal Airport	2015	2020	2025	2035
Annual Operations	77,835	80,940	83,770	89,710
Peak Month (11.1%)	8,640	8,980	9,300	9,960
Design Day	288	300	310	330
Busy Day	400	420	430	460
Design Hour (17.5%)	50	53	54	58

This section has provided forecasts for each sector of aviation demand anticipated over the planning period. A summary of the aviation forecasts developed for Glendale Municipal Airport is presented in **Exhibit J**. The FAA has approved these forecasts in a letter dated May 11, 2016. The forecast approval letter is included in **Appendix B**.

AIRCRAFT/AIRPORT/RUNWAY CLASSIFICATION

The FAA has established several aircraft classification systems that group aircraft types based on their performance (approach speed in landing configuration) and design characteristics (wingspan and landing gear configuration). These classification systems are used to determine the appropriate airport design standards for specific airport elements, such as runways, taxiways, taxilanes, and aprons.

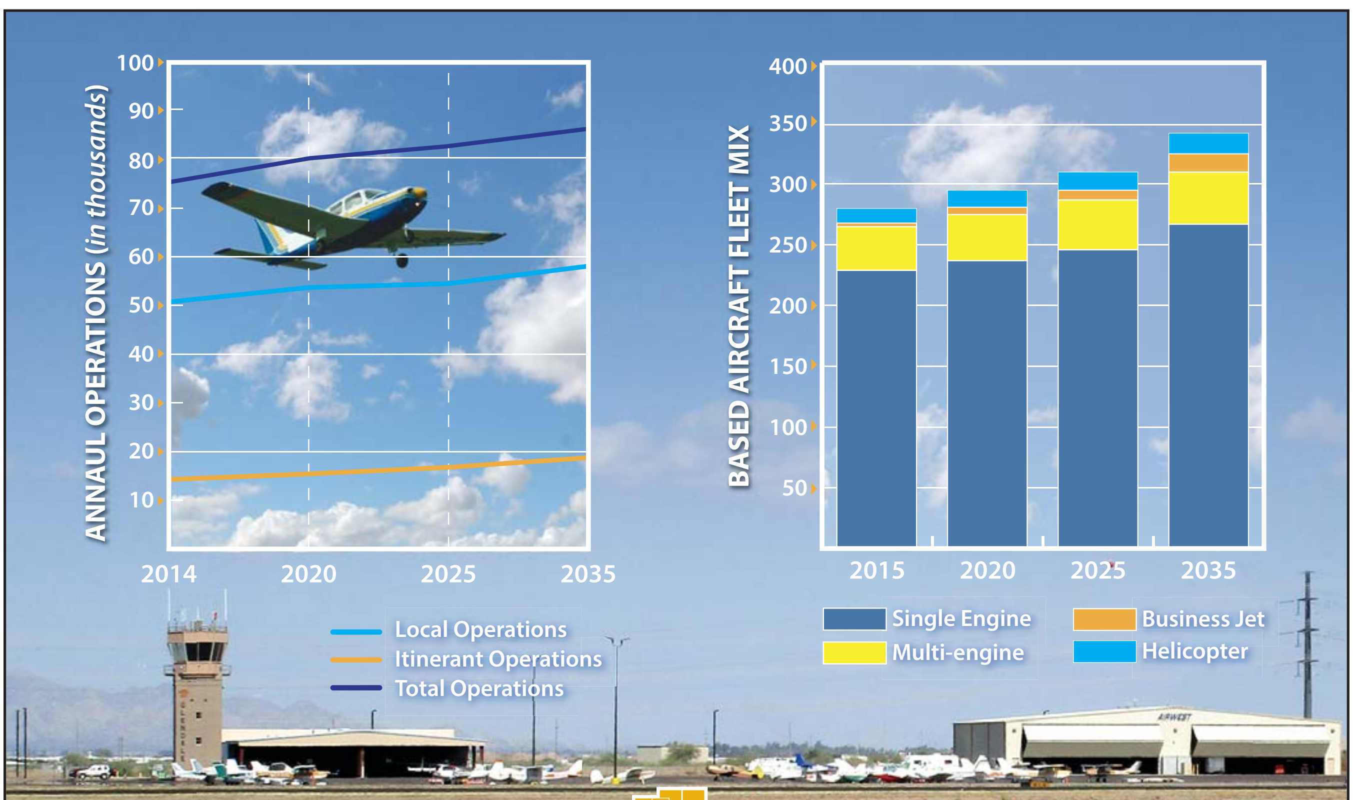
AIRCRAFT CLASSIFICATION

The selection of appropriate FAA design standards for the development and location of airport facilities is based primarily upon the characteristics of the aircraft which are currently using or are expected to use an airport. The critical design aircraft is used to define the design parameters for an airport. The design aircraft may be a single aircraft type or, more commonly, is a composite aircraft representing a collection of aircraft classified by three parameters: Aircraft Approach Category (AAC), Airplane Design Group (ADG), and Taxiway Design Group (TDG). FAA AC 150/5300-13A, *Airport Design*, describes the following airplane classification systems, the parameters of which are presented on **Exhibit K**.

Aircraft Approach Category (AAC): A grouping of aircraft based on a reference landing speed (V_{REF}), if specified, or if V_{REF} is not specified, 1.3 times stall speed (V_{SO}) at the maximum certificated landing weight. V_{REF}, V_{SO}, and the maximum certificated landing weight are those values as established for the aircraft by the certification authority of the country of registry.

The AAC generally refers to the approach speed of an aircraft in landing configuration. The higher the approach speed, the more restrictive the applicable design standards. The AAC, depicted by a letter A through E, is the aircraft approach category and relates to aircraft approach speed (operational charac-

	ACTUAL	FORECAST		
	2015	2020	2025	2035
ANNUAL OPERATIONS				
General Aviation				
Itinerant	25,480	26,400	27,300	29,300
Local	51,773	54,000	56,000	59,900
Military				
Itinerant	46	50	50	50
Local	14	50	50	50
Air Taxi (Itinerant)	522	440	370	410
Total Itinerant	*26,048*	*26,890*	*27,720*	*29,760*
Total Local	*51,787*	*54,050*	*56,050*	*59,950*
Total Operations	***77,835***	***80,940***	***83,770***	***89,710***
BASED AIRCRAFT				
Single Engine	229	237	246	267
Multi-engine	36	38	41	43
Business Jet	3	6	8	13
Helicopter	12	14	15	17
Total Based Aircraft	***280***	***295***	***310***	***340***
PEAKING CHARACTERISTICS				
Peak Month (11.1%)	8,640	8,980	9,300	9,960
Design Day	288	300	310	330
Busy Day	400	420	430	460
Design Hour (17.5%)	50	53	54	58



AIRCRAFT APPROACH CATEGORY (AAC)

Category	Approach Speed
A	less than 91 knots
B	91 knots or more but less than 121 knots
C	121 knots or more but less than 141 knots
D	141 knots or more but less than 166 knots
E	166 knots or more

AIRPLANE DESIGN GROUP (ADG)

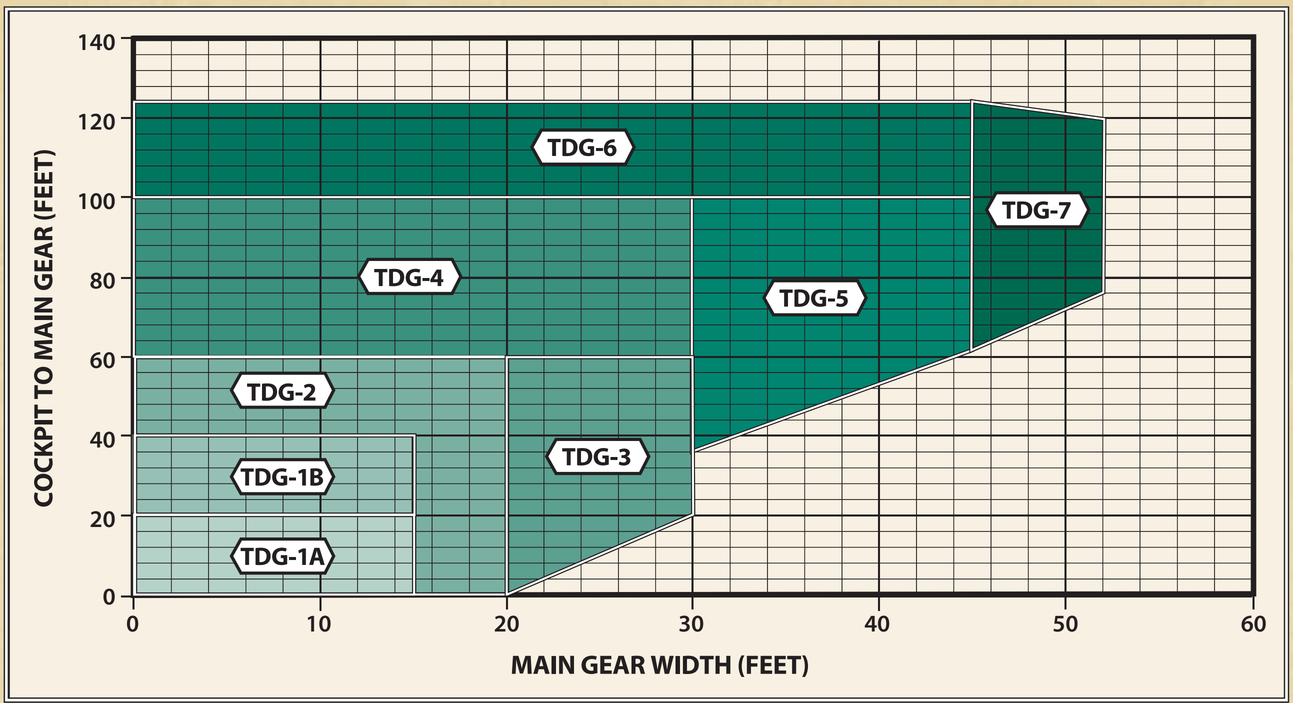
Group #	Tail Height (ft)	Wingspan (ft)
I	<20	<49
II	20-<30	49-<79
III	30-<45	70-<118
IV	45-<60	118-<171
V	60-<66	171-<214
VI	66-<80	214-<262

VISIBILITY MINIMUMS

RVR* (ft)	Flight Visibility Category (statute miles)
VIS	3-mile or greater visibility minimums
5,000	Not lower than 1-mile
4,000	Lower than 1-mile but not lower than ¾-mile
2,400	Lower than ¾-mile but not lower than ½-mile
1,600	Lower than ½-mile but not lower than ¼-mile
1,200	Lower than ¼-mile

***RVR**: Runway Visual Range

TAXIWAY DESIGN GROUP (TDG)



teristic). The AAC generally applies to runways and runway-related facilities, such as runway width, runway safety area (RSA), runway object free area (ROFA), runway protection zone (RPZ), and separation standards.

Airplane Design Group (ADG): The ADG, depicted by a Roman numeral I through VI, is a classification of aircraft which relates to aircraft wingspan or tail height (physical characteristic). When the aircraft wingspan and tail height fall in different groups, the higher group is used. The ADG influences design standards for taxiway safety area (TSA), taxiway object free (TOFA), taxilane object free area, apron wingtip clearance, and various separation distances.

Taxiway Design Group (TDG): A classification of airplanes based on outer-to-outer Main Gear Width (MGW) and Cockpit to Main Gear (CMG) distance. The TDG relates to the undercarriage dimensions of the design aircraft. The taxiway design elements determined by the application of the TDG include the taxiway width, taxiway edge safety margin, taxiway shoulder width, taxiway fillet dimensions, and, in some cases, the separation distance between parallel taxiways/taxilanes. Other taxiway elements, such as the taxiway safety area (TSA), taxiway/taxilane object free area (TOFA), taxiway/taxilane separation to parallel taxiway/taxilanes or fixed or movable objects, and taxiway/taxilane wingtip clearances are determined solely based on the wingspan (ADG) of the design aircraft utilizing those surfaces. It is appropriate for taxiways to be planned and built to different TDG standards based on expected use.

AIRPORT AND RUNWAY CLASSIFICATION

These classifications, along with the aircraft classifications defined previously, are used to determine the appropriate FAA design standards to which the airfield facilities are to be designed and built.

***Airport Reference Code (ARC)*:** An airport designation that signifies the airport's highest Runway Design Code (RDC), minus the third (visibility) component of the RDC. The ARC is used for planning and design only and does not limit the aircraft that may be able to operate safely on the airport. The ALP prepared during the previous Master Plan identifies an ARC of C-II for the Airport (existing/ultimate).

Runway Design Code (RDC): A code signifying the design standards to which the runway is to be built. The RDC is based upon planned development and has no operational component. The AAC, ADG, and runway visual range (RVR) are combined to form the RDC of a particular runway. The RDC provides the information needed to determine certain design standards that apply. The first component, depicted by a letter, is the AAC and relates to aircraft approach speed (operational characteristics). The second component, 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 relates to the visibility minimums expressed by RVR values in feet of 1,200 (⅛-mile); 1,600 (¼-mile); 2,400 (½-mile); 4,000 (¾-mile); and 5,000 (1-mile). The RVR values approximate standard visibility minimums for instrument approaches to the runways. The third component should read "VIS" for runways designed for visual approach use only.

Approach Reference Code (APRC): A code signifying the current operational capabilities of a runway and associated parallel taxiway with regard to landing operations. Like the RDC, the APRC is composed of the same three components: the AAC, ADG, and RVR. The APRC describes the current operational capabilities of a runway under particular meteorological conditions where no special operating procedures are necessary, as opposed to the RDC which is based upon planned development with no operational component. The APRC for a runway is established based upon the minimum runway-to-taxiway centerline separation.

Departure Reference Code (DPRC): A code signifying the current operational capabilities of a runway and associated parallel taxiway with regard to take-off operations. The DPRC represents those aircraft that can take off from a runway while any aircraft are present on adjacent taxiways, under particular meteorological conditions with no special operating conditions. The DPRC is similar to the APRC, but is composed of two components: ACC and ADG. A runway may have more than one DPRC depending on the parallel taxiway separation distance.

CRITICAL DESIGN AIRCRAFT

The selection of appropriate FAA design standards for the development and location of airport facilities is based primarily upon the characteristics of the aircraft which are currently using or are expected to use an airport. The critical design aircraft is used to define the design parameters for an airport. The design aircraft may be a single aircraft or a composite aircraft representing a collection of aircraft classified by the three parameters: AAC, ADG, and TDG. In the case of an airport with multiple runways, a design aircraft is selected for each runway.

The first consideration is the safe operation of aircraft likely to use an airport. Any operation of an aircraft that exceeds design criteria of an airport may result in either an unsafe operation or a lesser safety margin; however, it is not the usual practice to base the airport design on an aircraft that uses the airport infrequently.

The design aircraft type, or grouping of aircraft with similar characteristics, accounts for at least 500 annual itinerant (non –training) operations.

The critical design aircraft is the most demanding aircraft type, or grouping of aircraft with similar characteristics, that account for at least 500 annual itinerant (non-training) operations. Planning for future aircraft use is of particular importance since the design standards are used to plan separation distances between facilities. These future standards must be considered now to ensure that short term development does not preclude the reasonable long range potential needs of the airport.

According to FAA AC 150/5300-13A, *Airport Design*, "airport designs based only on existing aircraft can severely limit the ability to expand the airport to meet future requirements for larger, more demanding aircraft. Airport designs that are based on large aircraft never likely to be served by the airport are not economical." Selection of the current and future critical design aircraft must be realistic in nature and supported by current data and realistic projections.

EXISTING DESIGN AIRCRAFT

The FAA maintains the Traffic Flow Management System Count (TFMSC) database which documents certain aircraft operations at certain airports. Information is added to the TFMSC database when pilots file flight plans and/or when flights are detected by the National Airspace System, usually via radar. It includes documentation of commercial traffic (air carrier and air taxi), general aviation, and military aircraft. Due to factors, such as incomplete flight plans and limited radar coverage, TFMSC data does not account for all aircraft activity at an airport by a given aircraft type. Therefore, it is likely that there are more operations (touch and go's, for example) at the airport than are captured by this methodology. TFMSC data is available for activity at Glendale Municipal Airport and was utilized in this analysis.

Exhibit L presents the TFMSC operational mix at the Airport for business jets utilizing the facility from January through December 2015. As can be seen, the Airport experiences activity by a variety of full range of business jets, including some of the largest in the national fleet. While business jet operations in AAC C and D have remained below the 500 operations threshold for most of the past decade, in 2007 this level was exceeded, and with recent trends in economic recovery, the threshold is expected to be reached again in the short to intermediate term. Therefore, the design aircraft for the Airport are those falling in AAC/ADG B-II. Representative aircraft would be the Citation Excel/XLS, Falcon 900/2000, and Phenom 300. The main landing gear width for most of these aircraft fall in TDG 2. **Therefore, the existing design aircraft for the airport is best described as B-II-2.**

The design aircraft for the airport is best described as B-II-2.

FUTURE DESIGN AIRCRAFT

As documented previously, operations are forecast to grow modestly over the 20-year planning horizon; however, the mix of aircraft types is anticipated to remain largely unchanged. The Airport will continue to be utilized by small- and medium-sized business jets, which will continue to define the critical design aircraft. Commercial service utilizing larger transport aircraft is not anticipated. **Table U** presents the forecast of operations categorized by AAC and ADG.

The future critical design aircraft is best described as C-II-3.

For this planning effort, the future critical design aircraft is best described as C-II-3. Representative aircraft in this group include the Hawker 800/1000/4000, Challenger 300, Challenger 600/601/604, and Citation X.

TABLE U
Jet Operations Forecast by Design Category
Glendale Municipal Airport

Design Categories	HISTORICAL JET OPERATIONS[1] 2007	%	2014	2015	%	FORECAST JET OPERATIONS Short Term	Inter. Term	Long Term	%
Approach Category A/B	560	50%	480	536	60%	600	660	790	56%
Approach Category C	486	44%	268	320	35%	450	480	540	39%
Approach Category D	66	6%	36	42	5%	50	60	70	5%
Total	**1,112**	**100%**	**784**	**898**	**100%**	**1,100**	**1,200**	**1,400**	**100%**
Airplane Design Group I	430	39%	298	424	47%	500	530	600	43%
Airplane Design Group II	654	59%	470	460	51%	580	640	760	54%
Airplane Design Group III	28	2%	16	14	2%	20	30	40	3%
Total	**1,112**	**100%**	**784**	**898**	**100%**	**1,100**	**1,200**	**1,400**	**100%**

[1]*Traffic Flow Management System Count (TFMSC) - FAA activity database.*

RUNWAY DESIGN CODE

The RDC relates to specific FAA design standards that should be met in relation to the runway.

Runway 1-19 Design Aircraft

Runway 1-19 is an instrument runway with published area navigation approaches as outlined in a previous section of this report. The approach to Runway 1 provides visibility minimums of 1.25-mile with a cloud ceiling minimum of 329 feet. The approach to Runway 19 provides visibility minimums of 1-mile with a cloud ceiling minimum of 274 feet. This runway is 7,150 feet long and 100 feet wide. **The existing RDC for Runway 1-19 is B-II-5000.**

The current RDC for Runway 1-19 is B-II-5000, while the future RDC will be C-II-5000.

For future planning, the RDC for Runway 1-19 will be C-II-5000.

AIRSIDE FACILITY REQUIREMENTS

As indicated earlier, airport facilities include both airside and landside components. Airside facilities include those facilities that are related to the arrival, departure, and ground movement of aircraft. These components include:

- Safety Area Design Standards
- Runways
- Taxiways
- Navigational Approach Aids
- Instrument Approaches
- Lighting, Marking, and Signage

ARC Code	Aircraft	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
A-I	Citation Mustang	0	0	2	2	2	6	40	40	24	18	26
	Eclipse 500	0	0	0	18	14	6	14	8	10	20	32
	Total	*0*	*0*	*2*	*20*	*16*	*12*	*54*	*48*	*34*	*38*	*58*
B-I	Cessna Citation I/SP	16	40	28	12	12	10	6	2	4	6	4
	Citation CJ 1/2/3/4	28	66	96	98	104	88	90	90	78	110	102
	Mitsubishi MU-300	0	4	0	2	4	0	2	0	0	0	4
	Phenom 100	0	0	0	0	14	38	48	20	14	26	20
	Raytheon Premier 1	0	12	10	12	6	16	28	46	36	18	72
	Rockwell Sabre 40/60	4	4	0	0	0	2	0	0	4	0	0
	Beechjet 400	42	86	72	102	42	52	52	30	18	22	26
	Falcon/Mystere 10	12	12	8	6	6	0	34	2	2	2	2
	Total	*102*	*224*	*214*	*232*	*188*	*206*	*260*	*190*	*156*	*184*	*230*
B-II	Cessna Citation II/Bravo	48	30	48	28	30	30	34	24	16	22	18
	Cessna III/VI/VII	10	18	52	34	22	20	18	4	18	18	14
	Citation Excel/XLS	50	64	74	70	56	56	60	66	52	56	54
	Citation Sovereign	0	10	8	16	12	18	32	20	18	10	12
	Citation Ultra/Encore	84	58	90	78	100	62	92	90	104	106	66
	Falcon 2000	18	26	24	34	36	22	46	28	10	4	10
	Falcon 900	2	8	20	10	8	14	12	14	16	10	20
	Falcon/Mystere 20	10	6	8	10	16	8	4	10	2	4	0
	Falcon/Mystere 50	8	8	20	6	12	12	16	10	4	10	30
	Phenom 300	0	0	0	0	0	0	0	4	6	18	24
	Total	*230*	*228*	*344*	*286*	*292*	*242*	*314*	*270*	*246*	*258*	*248*
C-I	BAe HS 125-1/2/3/400/600	14	4	8	2	0	0	0	0	0	0	54
	Learjet 24/25	14	10	22	8	4	0	4	0	6	0	0
	Learjet 25/35	2	2	4	8	0	0	0	0	0	0	0
	Learjet 31/35/36	62	56	68	60	46	44	56	28	32	24	32
	Learjet 40/60	16	26	36	28	18	34	28	28	30	26	28
	Learjet 45	42	56	56	36	26	16	14	20	24	20	20
	Learjet 55	12	10	12	8	6	6	10	2	2	2	2
	IAI 1124 Westwind	4	12	8	6	8	6	2	12	6	4	0
	Total	*166*	*176*	*214*	*156*	*108*	*106*	*114*	*90*	*100*	*76*	*136*
C-II	Citation X	38	66	76	38	48	46	32	64	22	32	36
	CRJ-200	0	0	2	0	0	0	0	0	2	0	2
	Embraer ERJ 135/140/Legacy	2	12	14	8	8	2	6	4	4	4	8
	Hawker 800/1000/4000	58	46	60	54	46	78	68	62	24	76	82
	IAI Astra 1125	0	2	38	8	14	10	8	2	2	6	8
	Challenger 300	6	2	4	20	12	16	22	36	28	22	22
	Challenger 600/601/604	24	10	32	62	38	24	28	18	12	28	4
	Gulfstream G300	8	12	18	10	8	6	4	6	2	8	8
	Total	*136*	*150*	*244*	*200*	*174*	*182*	*168*	*192*	*96*	*176*	*170*
C-III	Airbus A319	0	0	0	0	2	0	0	0	0	2	0
	BD Global 5000	0	0	2	2	0	0	0	0	2	4	10
	BD Global Express	2	0	6	8	2	4	6	6	4	6	0
	Boeing 737-700	0	0	2	0	0	0	0	0	0	0	0
	CRJ-900	0	2	0	0	0	0	0	0	0	0	0
	DC-9	0	0	0	0	0	2	0	0	0	0	0
	Falcon F7X	0	0	0	0	0	0	0	2	0	2	4
	Gulfstream G500	20	10	18	18	14	6	10	6	16	2	0
	Total	*22*	*12*	*28*	*28*	*18*	*12*	*16*	*14*	*22*	*16*	*14*
D-I	F/A-18 Hornet	0	0	0	2	0	0	0	0	0	0	0
	F-15 Strike Eagle	0	0	0	0	2	0	0	0	0	0	0
	T-38 Talon	0	0	0	0	0	0	0	0	2	0	0
	Total	*0*	*0*	*0*	*2*	*2*	*0*	*0*	*0*	*2*	*0*	*0*
D-II	Gulfstream G150	0	0	0	6	4	0	0	10	10	6	8
	Gulfstream G200	6	26	26	28	14	36	16	24	26	12	12
	Gulfstream G400	44	44	40	54	48	44	30	40	32	18	30
	Total	*50*	*70*	*66*	*88*	*66*	*80*	*46*	*74*	*68*	*36*	*42*
D-IV	Boeing 767-300	0	0	0	0	0	2	0	0	0	0	0
	Total	*0*	*0*	*0*	*0*	*0*	*2*	*0*	*0*	*0*	*0*	*0*
E-I	F-16 Falcon	2	0	0	0	0	0	0	0	0	0	0
	Total	*2*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
ANNUAL TOTAL		*708*	*860*	*1,112*	*1,012*	*864*	*842*	*972*	*878*	*724*	*784*	*898*

ARC OPERATIONS SUMMARY

ARC Code	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
A-I	0	0	2	20	16	12	54	48	34	38	58
B-I	102	224	214	232	188	206	260	190	156	184	230
B-II	230	228	344	286	292	242	314	270	246	258	248
C-I	166	176	214	156	108	106	114	90	100	76	136
C-II	136	150	244	200	174	182	168	192	96	176	170
C-III	22	12	28	28	18	12	16	14	22	16	14
D-I	0	0	0	2	2	0	0	0	2	0	0
D-II	50	70	66	88	66	80	46	74	68	36	42
D-IV	0	0	0	0	0	2	0	0	0	0	0
E-I	2	0	0	0	0	0	0	0	0	0	0
Total	*708*	*860*	*1,112*	*1,012*	*864*	*842*	*972*	*878*	*724*	*784*	*898*

JET OPERATIONS BY APPROACH CATEGORY

Category	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
A	0	0	2	20	16	12	54	48	34	38	58
B	332	452	558	518	480	448	574	460	402	442	478
C	324	338	486	384	300	300	298	296	218	268	320
D	50	70	66	90	68	82	46	74	70	36	42
E	2	0	0	0	0	0	0	0	0	0	0
Total	*708*	*860*	*1,112*	*1,012*	*864*	*842*	*972*	*878*	*724*	*784*	*898*

JET OPERATIONS BY DESIGN GROUP

Group	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
I	270	400	430	410	314	324	428	328	292	298	424
II	416	448	654	574	532	504	528	536	410	470	460
III	22	12	28	28	18	12	16	14	22	16	14
IV	0	0	0	0	0	2	0	0	0	0	0
Total	*708*	*860*	*1,112*	*1,012*	*864*	*842*	*972*	*878*	*724*	*784*	*898*

KEY:
ARC - Airport Reference Code
Source: Traffic Flow Management System Counts

SAFETY AREA DESIGN STANDARDS

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

The entire RSA, ROFA, ROFZ, and POFZ should be under the direct ownership of the airport sponsor to ensure these areas remain free of obstacles and can be readily accessed by maintenance and emergency personnel. The FAA expects airport sponsors to take all possible measures to protect against and remove or mitigate incompatible land uses. The RPZ function is to enhance the protection of people and property on the ground. Therefore, the airport sponsor should own the property under the approach and departure areas to at least the limits of the RPZ.

Dimensional standards for the various safety areas associated with the runways are a function of the type of aircraft (ARC) expected to use the runways, as well as the instrument approach visibility minimums. At Glendale Municipal Airport, Runway 1-19 offers instrument approaches from each direction; therefore, it should meet the existing design standards for ARC B-II-5000 and future design standards for ARC C-II-5000.

Runway Safety Area (RSA)

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

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

For a B-II runway with instrument approaches and visibility minimums of not less than one-mile, the FAA calls for the RSA to be 150 feet wide (centered on the runway) and extending 300 feet beyond the end of the runway. The RSA for Runway 1-19 does not meet the standard for a B-II runway beyond the runway pavement ends. The RSA distance is currently 130 feet beyond the stop end of Runway 1 and 266 feet beyond the stop end of Runway 19. For a C-II runway, the RSA is 400 feet wide and extends

1,000 feet beyond the departure end of the runway (only 600 feet is required prior to the runway approach threshold). Declared distances may need to be implemented to meet RSA standards short term, while a combination of declared distances and engineered materials at runway ends may be required long term. Each of these solutions was examined in the 2009 Master Plan, with engineered materials recommended to provide adequate runway length.

Runway Object Free Area (ROFA)

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

For a B-II runway with instrument approaches and visibility minimums of not less than one-mile, the FAA calls for the ROFA to be 500 feet wide (centered on the runway) and extending 300 feet beyond the end of the runway. The ROFA on the north end of the runway is obstructed by the perimeter fence 615 feet north of the landing threshold. The ROFA on the south end of the runway is obstructed by the perimeter fence 94 feet south of the landing threshold for Runway 1. The ultimate ROFA associated with C-II standards is 800 feet wide and extends 1,000 feet beyond each runway end. This more demanding standard further impacts areas beyond each end of the runway.

Runway Obstacle Free Zone (ROFZ)

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

For all runways serving aircraft over 12,500 pounds, the ROFZ is 400 feet wide, centered on the runway, and extending 200 feet beyond each runway end. A portion of the existing perimeter road falls within the ROFZ on the south end of the runway, while the OFZ is limited on the north end of the runway by Glendale Avenue.

Runway Protection Zone (RPZ)

The RPZ is a trapezoidal area centered on the runway, typically beginning 200 feet beyond the runway end. When an RPZ begins at a location other than 200 feet beyond the end of a runway, two RPZs are required (i.e., a departure RPZ and an approach RPZ). The RPZ has been established by the FAA to provide an area clear of obstructions and incompatible land uses, in order to enhance the protection of approaching aircraft as well as people and property on the ground. The RPZ is comprised of the Central Portion of the RPZ and the Controlled Activity Area. The dimensions of the RPZ vary according to the visibility minimums serving the runway and the type of aircraft operating on the runway.

The Central Portion of the RPZ extends from the beginning to the end of the RPZ, is centered on the runway centerline, and is the width of the ROFA. Only objects necessary to aid air navigation, such as approach lights, are allowed in this portion of the RPZ. The remaining portions of the RPZ, the Controlled Activity Areas, have strict land use limitations. Wildlife attractants, fuel farms, places of public assembly, and residences are prohibited.

As previously discussed, the airport should have positive control over all safety areas, including the RPZs. Only a portion of the RPZ on the south end of the runway falls outside of the current airport property (but only when assuming full use of Runway 19 on departure). The portion outside of airport property falls within the flood hazard area for the New River (mandatory floodplain management standards apply).

The FAA has renewed its focus on improving land use compatibility in RPZs. On September 27, 2012, the FAA issued a memo entitled, *Interim Guidance on Land Use Within a Runway Protection Zone*. The Interim Guidance indicates that any new or modified RPZs that include incompatibilities must be reviewed and approved by the FAA headquarters prior to implementation. **Table V** summarizes the actions that typically trigger a change in the size and/or location of the RPZ and lists incompatible land uses.

TABLE V
New or Modified Land Uses in the RPZ

	ACTIONS TYPICALLY TRIGGERING A CHANGE IN RPZ DIMENSIONS/LOCATION	
1	An airfield project (e.g., runway extension, runway shift)	
2	A change in the critical design aircraft that increases the RPZ dimensions	
3	A new or revised instrument approach procedure that increases the RPZ dimensions	
4	A local development proposal in the RPZ (either new or configured	
	LAND USES REQUIRING COORDINATION WITH FAA HEADQUARTERS	
	Land Use	**Examples and Notes**
1	Building and Structures	Including but limited to: Residences, schools, churches, hospitals, other places of public assembly, etc.
2	Recreational Land Use	Including but not limited to: Golf courses, sports fields, amusement parks, other places of public assembly, etc.
3	Transportation Facilities	Including but not limited to: Rail facilities (light or heavy, passenger or freight), public roadways, and vehicular parking facilities.
4	Fuel Storage Facilities	Above and below ground
5	Hazardous Material Storage	Above and below ground
6	Wastewater Treatment Facilities	NA
6	Above-Ground Utility Infrastructure	Electrical substations, solar panels, etc.

Note: Airport sponsors must continue to work with FAA to remove/mitigate existing RPZ land use incompatibilities.
Source: FAA Memo: Interim Guidance on Land Uses Within a Runway Protection Zone (Sept, 27, 2012)

Runway/Taxiway Separation

The design standards for the separation between runways and parallel taxiways are determined by the critical aircraft and the instrument approach visibility minimums. The current critical aircraft is represented by those aircraft in ARC B-II. Separation requirements for B-II design standards is 240 feet.

The existing separation of 252.5 feet between Runway 1-19 and Taxiway A does not meet the recommended planning standard of 300 feet for C-II standards. Previous planning efforts (included in the Master Plan that was adopted by the City of Glendale in May 2009) have explored options for relocation of the taxiway to meet the standard, but ultimately recommended that it remain in its current location and that subsequent airport layout plan reviews request a modification to standard from the FAA.

RUNWAYS

The adequacy of the existing runway system at Glendale Municipal Airport has been analyzed from a number of perspectives, including runway orientation, runway length, pavement strength, width, and adherence to safety area standards. From this information, requirements for runway improvements were determined for the Airport.

Airfield Capacity

A demand/capacity analysis measures the capacity of the airfield facilities (i.e., runways and taxiways) in order to identify the need for additional development needs. Glendale Municipal Airport's single runway system can provide an annual service volume of nearly 300,000 operations based upon analysis undertaken in the previous Master Plan.

FAA Order 5090.3B, *Field Formulation of the National Plan of Integrated Airport Systems* (NPIAS), indicates that improvements to capacity should be considered when operations reach 60 percent of the airfield's annual service volume (ASV). At the projected long range forecast of 89,710 operations, the airfield's ASV will only reach 30 percent. As a result, there is not a need for additional capacity improvements in the form of a parallel runway or additional taxiway exits. Furthermore, the existing high speed exits provide no benefit to existing airfield capacity based upon current airfield capacity methodologies.

Runway Orientation

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

FAA Advisory Circular 150/5300-13A, *Airport Design,* recommends that the primary runway orientation provide greater than 95 percent wind coverage for specific crosswind components. The 95 percent wind coverage is computed on the basis of the crosswind component not exceeding 10.5 knots (12 mph) for ARCs A-I and B-I; 13 knots (15 mph) for ARCs A-II and B-II; and 16 knots (18 mph) for ARC C-I through D-II.

Weather data specific to the Airport was obtained from the National Oceanic Atmospheric Administration (NOAA) National Climatic Data Center. This data was collected from 2005 through 2014. A total of 47,681 observations of wind direction and intensity were made. Only 141 observations occurred during instrument or poor visibility conditions.

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

Runway 1-19 provides greater than 95 percent coverage for all crosswind components; therefore, a crosswind runway is not justified.

Runway Length

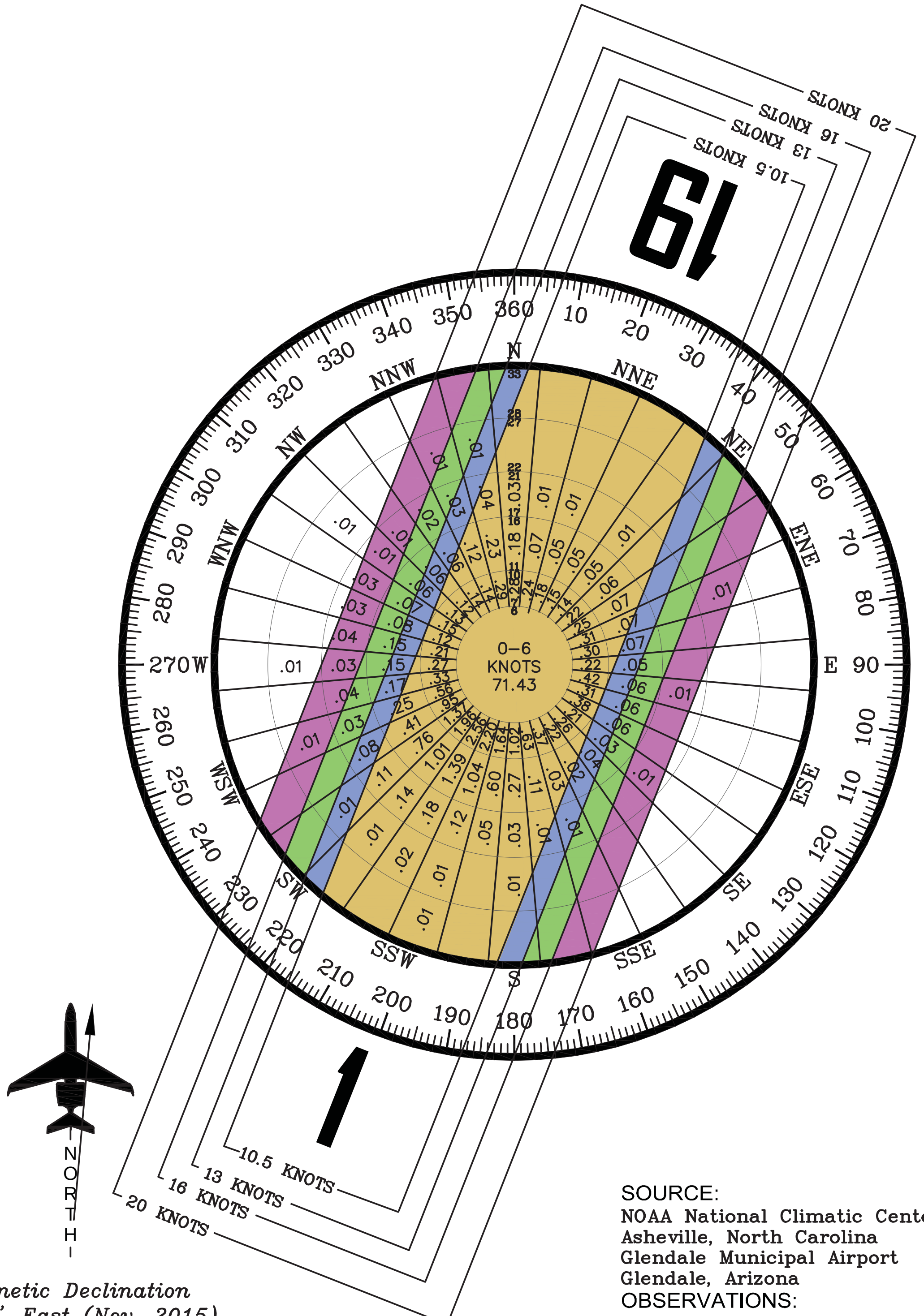
The determination of runway length requirements for airports is based on five primary factors:

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

The mean maximum daily temperature of the hottest month, as recorded at the nearest recording station, is 105 degrees Fahrenheit (F), which occurs in July. This temperature is obtained from the latest publication by the National Climatic Data Center and is based on data collected for a 30-year period (1981-2010). It is only updated every ten years. The Airport elevation is 1071 feet above mean sea level (MSL). The runway elevation difference between the high and low points is 29 feet. The critical design aircraft fall within RDC B-II (existing) and RDC C-II (future).

Advisory Circular 150/5325-4C, *Runway Length Requirements for Airport Design*, provides guidance for determining runway length needs. Airplanes operate on a wide variety of available runway lengths. Many factors will govern the suitability of those runway lengths for aircraft, such as elevation, temperature, wind velocity, aircraft operating weight, wing flap settings, runway condition, runway gradient, and any special operating procedures. Airport operators can pursue policies that can maximize the suitability of the runway length. Policies such as area zoning and height and hazard restrictions can protect an

ALL WEATHER WIND COVERAGE				
Runways	10.5 Knots	13 Knots	16 Knots	20 Knots
Runway 1–19	*98.34%*	*99.12%*	*99.70%*	*99.92%*



Magnetic Declination
10° 37' East (Nov. 2015)
Annual Rate of Change
00° 5.0' West (Nov. 2015)

SOURCE:
NOAA National Climatic Center
Asheville, North Carolina
Glendale Municipal Airport
Glendale, Arizona
OBSERVATIONS:
47,681 All Weather Observations
2005–2014

airport's runway length. Airport ownership of land leading to the runway's ends can reduce the possibility of natural growth or man-made obstructions. Future plans should be realistic and supported by the FAA-approved forecasts and should be based on the critical design aircraft (or family of aircraft).

The first step in evaluating runway length is to determine general runway length requirements for the majority of aircraft operating at the Airport. Following guidance from AC 150/5325-4C, *Runway Length Recommendations for Airport Design*, to accommodate 95 percent of small aircraft with less than 10 passenger seats, a runway length of 3,600 feet is recommended. To accommodate 100 percent of these small aircraft, a runway length of 4,200 feet is recommended. Small aircraft with 10 or more passenger seats require a runway length of 4,700 feet. To accommodate 75 percent of the business jet fleet at 60 percent useful load, the guidance material recommends a length of 5,100 feet, while 100 percent of the fleet operating at 60 percent useful load require 6,700 feet. However, length requirements for aircraft with a maximum certified takeoff weight of 12,500 pounds or greater is generally determined using flight planning manuals from the manufacturer.

Each aircraft manufacturer publishes an airport planning manual which documents various specifications for the aircraft, including landing and takeoff length estimates. **Table W** presents a summary of the estimated maximum runway length requirements for typical business jets operating at the Airport. The takeoff and landing lengths have been adjusted for maximum design temperature, elevation, and gradient. Aircraft requiring greater than 7,000 feet for takeoff when operating under maximum takeoff weights have been noted in red type.

TABLE W
Runway Length Requirements - Individual Aircraft
Glendale Municipal Airport

Aircraft	ARC	Landing Length:	Takeoff Length (MTOW):
Challenger 300/600/604	C-II	3,410	6,750
Citation CJ1 525	B-I	3,410	4,650
Citation CJ3 525B	B-II	3,640	4,560
Citation Encore 560	B-II	3,760	5,070
Citation Excel 560XL	B-II	4,170	5,110
Citation X 750	C-II	4,460	7,190
Embraer Phenom 100	B-I	3,510	4,860
Falcon 50/900	B-II	3,100	6,850
Gulfstream 200/400	D-II	4,280	7,600
Hawker 800/1000/4000	C-II	3,080	7,040
Lear 35/45/60	C-I	3,490	6,200

Note: Field Elevation: 1071' MSL; Mean Maximum Temperature: 105°F; Difference in Runway Grade: 29 Feet;
All measurements in feet.
ARC: Airport reference code
MTOW: Maximum take-off weight
Source: Individual aircraft operating manuals

Each of the representative business jets is capable of landing at the Airport at the current displaced landing thresholds without limitation. Take-off operations typically require more available runway length, and a few of the business jets examined would be weight-restricted to some degree.

Runway Width

Runway 1-19 is currently 100 feet wide, which is the design width for a C-II runway. It will be necessary to maintain the current width as the airport transitions from the B-II to C-II runway design category.

Runway Strength

The current strength rating on Runway 1-19 is 40,000-pound single wheel loading (SWL) and 60,000-pound dual wheel loading (DWL), which can accommodate activity by the family of critical design aircraft.

The FAA has recently moved to implementing the International Civil Aviation Organization (ICAO) pavement classification number (PCN) for identifying strength of airport pavements. The PCN is a five-part code described as follows:

1) PCN Numerical Value: Indicates the load-carrying capacity of the pavement expressed as a whole number. The value is calculated based on a number of engineering factors such as aircraft geometry and pavement usage.
2) Pavement Type: Expressed as either R for rigid pavement (most typically concrete) or F for flexible pavement (most typically asphalt).
3) Subgrade Strength: Expressed as A (High), B (Medium), C (Low), D (Ultra Low). So a subgrade of A would be considered very strong, like concrete-stabilized clay, and a subgrade of D would be very weak, like un-compacted soil.
4) Maximum Tire Pressure: Expressed as W (Unlimited/No Pressure Limit), X (High/254 psi), Y (Medium/181 psi), or Z (Low/72 psi), this indicates the maximum tire pressure the pavement can support. Concrete surfaces are usually rated W.
5) Process of Determination: Expressed as either T (technical evaluation) or U (physical evaluation), this indicates how the pavement was tested.

The PCN for Runway 1-19 is expressed as 6/F/C/X/T. This means that the underlying pavement's value indicating load-carrying capacity is 6 (unitless), is flexible (asphalt), is low strength, has high (254 psi) tire pressure restriction, and was calculated through a technical evaluation.

Line of Sight and Gradient

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

Individual Runways: Line of sight standards for an individual runway are based on whether there is a parallel taxiway available. If a parallel taxiway is available, thus facilitating faster runway exit times, then any point five feet above the runway centerline must be mutually visible, with any other point five feet above the runway centerline that is located at a distance of less than half the length of the runway. Runway 1-19 meets the standard for individual runway visibility.

Gradient: The maximum longitudinal grade is +/- 1.50 percent, and grade may not exceed +/- 0.80 percent in the first and last quarter of the runway length for runways in AAC C. Runway 1-19 has an elevation difference of 29 feet with the high point on the north end and the low point on the south end, for an effective gradient of 0.41 percent. This meets the gradient design standard over the entire runway length.

TAXIWAYS

The design standards associated with taxiways are determined by the TDG or the ADG of the critical design aircraft. As determined previously, the applicable ADG for Runway 1-19 is ADG II. The TDG will typically fall in category 2 or 3 depending on the specific aircraft. **Table Y** presents the various taxiway design standards related to ADGs II and TDG 2/3.

TABLE Y
Taxiway Dimensions and Standards
Glendale Municipal Airport

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

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

The table also shows those taxiway design standards related to TDG. The TDG standards are based on the Main Gear Width (MGW) and the Cockpit to Main Gear (CMG) distance of the critical design aircraft expected to use those taxiways. Different taxiway and taxilane pavements can and should be designed to the most appropriate TDG design standards based on usage.

As previously discussed, the critical design aircraft includes those planes that fall in ADG II. While most of these aircraft have a TDG 2 dimension, some have a TDG 3 dimension, including the Challenger, Hawker, and Gulfstream series aircraft. To accommodate the full range of aircraft that fall within the critical design aircraft, consideration should be given to upgrading the width of taxiway exits to 50 feet to meet the needs of larger aircraft in ADG 3. The parallel taxiway should remain at a width of 35 feet, consistent with ADG 2.

Taxiway Design Considerations

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

The taxiway system at the Airport generally provides for the efficient movement of aircraft; however, recently published AC 150/5300-13A, *Airport Design*, provides recommendations for taxiway design. The following is a list of the taxiway design guidelines and the basic rationale behind each recommendation:

1. **Taxi Method**: Taxiways are designed for "cockpit over centerline" taxiing with pavement being sufficiently wide to allow a certain amount of wander. On turns, sufficient pavement should be provided to maintain the edge safety margin from the landing gear. When constructing new taxiways, upgrading existing intersections should be undertaken to eliminate "judgmental over-steering," which is where the pilot must intentionally steer the cockpit outside the marked centerline in order to assure the aircraft remains on the taxiway pavement.
2. **Steering Angle**: Taxiways should be designed such that the nose gear steering angle is no more than 50 degrees, the generally accepted value to prevent excessive tire scrubbing.
3. **Three-Node Concept**: To maintain pilot situational awareness, taxiway intersections should provide a pilot a maximum of three choices of travel. Ideally, these are right and left angle turns and a continuation straight ahead.
4. **Intersection Angles**: Design turns to be 90 degrees wherever possible. For non-right angled intersections, standard angles of 30, 45, 60, 120, 135, and 150 degrees are preferred.
5. **Runway Incursions**: Design taxiways to reduce the probability of runway incursions.
   - *Increase Pilot Situational Awareness*: A pilot who knows where he/she is on the airport is less likely to enter a runway improperly. Complexity leads to confusion. Keep taxiway systems simple using the "three node" concept.

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

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

9. **Direct Access from Apron to a Runway**: Avoid taxiway connectors that cross over a parallel taxiway and directly onto a runway. Consider a staggered taxiway layout that forces pilots to make a conscious decision to turn.
10. **Apron to Parallel Taxiway End**: Avoid direct connection from an apron to a parallel taxiway at the end of a runway.

FAA AC 150/5300-13A, *Airport Design*, states that, "existing taxiway geometry should be improved whenever feasible, with emphasis on designated "hot spots." To the extent practicable, the removal of existing pavement may be necessary to correct confusing layouts.

The FAA has identified the following "hot spot" on the airfield as follows:

Hot Spot 1: Aircraft exiting runway will enter Taxiway A to the ramp.

This "hot spot" is compounded by the fact that Taxiways A4, A5, and A6 all converge into a wide throat taxiway prior to entering the ramp area. Simplification of the intersection could involve the closure of exit Taxiway A5 and reversing the angled exits A4 and A6. This will eliminate a direct entrance from the runway to the ramp.

Previous planning has proposed that Taxiway A9 be realigned to provide a right-angled entrance/exit at the north end of the runway. This will allow the pilot full operational view of the runway in both directions. Access to runways is preferred to be at a 90-degree angle.

APPROACH AIDS

PAPI-2L are available to each runway as an aid for visual approaches. Other visual aids include a rotating beacon, REIL, a segmented circle, lighted wind cone, and two supplemental wind cones. The segmented circle and lighted wind cones are required since the control tower is not open 24 hours. The Airport is also equipped with an AWOS III. This system provides users with wind speed, direction, temperature, dew point, barometric pressure, visibility, precipitation, and cloud height. Each of the aforementioned systems will need to be maintained.

INSTRUMENT APPROACHES

Each runway has published instrument approaches using area navigation (RNAV) and global positioning system (GPS). The approach to Runway 19 provides visibility minimums of 1.25 miles, with minimum descent altitude to 1,378 feet (329 feet above the touchdown zone elevation). The approach to Runway 1 provides visibility minimums of one mile, with minimum descent altitude to 1,339 feet (274 feet above the touchdown zone elevation). Both approaches are approved for all approach speed category aircraft. Any improvement to these instrument approach procedures will be limited by instrument approach procedures in place for Phoenix Sky Harbor International Airport and Luke Air Force Base.

AIRFIELD MARKING, LIGHTING AND SIGNAGE

Runway markings are designed according to the type of instrument approach—the RNAV/GPS approaches on Runway 1-19 require non-precision markings, which are the current markings on the runway.

LANDSIDE FACILITY REQUIREMENTS

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

- Aircraft Hangars
- Aircraft Parking Aprons
- General Aviation Terminal
- Auto Parking and Access
- Airport Support Facilities

HANGARS

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

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

While a majority of aircraft owners prefer enclosed aircraft storage, a number of based aircraft owners will still tie-down outside (due to the lack of hangar availability, hangar rental rates, and/or operational needs). Therefore, enclosed hangar facilities do not necessarily need to be planned for each based aircraft. At Glendale Municipal Airport, it is estimated that 90 percent of the based aircraft are currently stored in hangars. If facilities are available, it is estimated that 90 percent will be stored in a hangar in the future.

As presented in **Table Z**, there are a total of 400 existing aircraft storage units at the Airport. This includes a total of 215 positions which are either nested T-hangars (104 units) or shade hangars (111 units), averaging 1,125 square feet per unit. There are 175 box hangar units (either separate or connected), which average 2,075 square feet per unit. It has been estimated that there are 10 positions available within the larger conventional hangars at the Airport, taking into consideration that these facilities also are used for aircraft maintenance. In total, there is approximately 661,000 square feet of hangar space potentially available for aircraft storage. A total of 20,000 square feet of space within the conventional hangars is estimated to be dedicated to maintenance functions.

T-hangars and shade hangars are similar in size and will typically house one single engine piston-powered aircraft. Some multi-engine aircraft owners may elect to utilize these facilities as well. For determining future aircraft storage needs, a planning standard of 1,200 square feet per based aircraft is utilized for T-hangars and shade hangars.

TABLE Z
Hangar Needs
Glendale Municipal Airport

	Existing 2015	Short Term Need	Intermediate Term Need	Long Term Need
Aircraft to be Hangared		**265**	**280**	**305**
T-Hangars/Shade Hangars (1,200 sf/position)				
Total T-hangar/Shade Positions	215	125	130	140
Total Existing T-hangar/Shade/Area	242,000			
Total Square Feet Needed		150,000	156,000	168,000
Conventional Hangars (2,500 sf/position)				
Total Conventional Hangar Positions	10	12	15	17
Total Existing Conventional Hangar Area	36,000			
Total Square Feet Needed		30,000	37,500	42,500
Box Hangars (2,500 sf/unit)				
Total Box Hangar Positions	175	128	135	148
Total Existing Box Hangar Area	363,000			
Total Square Feet Needed		320,000	337,500	370,000
Dedicated Maintenance Hangar Area (sq. ft.)	20,000	51,600	54,300	59,500
Total Hangar Positions	**400**	**265**	**280**	**305**
Total Hangar Area (sq. ft.)	**661,000**	**551,600**	**585,300**	**640,000**

Source: Coffman Associates analysis

Glendale Municipal Airport provides box hangars, which are open-space facilities with no supporting structure interference. Currently, there are 175 box hangar positions. In total, these hangars provide 363,000 square feet of hangar storage space. Since a larger aircraft or multiple aircraft can be stored in a box hangar, and the forecasts assume a slightly heavier mix in future years, a planning standard of 2,500 square feet per aircraft is utilized.

There are several conventional hangars on the airfield. Conventional hangars are larger open-space structures. Approximately 36,000 square feet is estimated to be available for aircraft storage needs in these hangars. Space is available for approximately 10 aircraft in these hangars. A planning standard of 2,500 square feet per aircraft position is utilized to project conventional hangar needs in the future.

A portion of box and conventional hangars are often utilized for maintenance activities (and additional area is allocated for office space). A planning standard of 175 square feet per based aircraft is considered for these purposes and is considered in addition to the aircraft storage needs.

It should be noted that these hangar requirements are general in nature and based on the aviation demand forecasts and average space requirements. The actual need for hangar space (or the mix of hangar types) will depend on the individual tenant requirements.

AIRCRAFT PARKING APRON

The aircraft parking apron is an expanse of paved area intended for aircraft parking. Typically, a main apron is centrally located near the airside entry point, such as a terminal building. Ideally, the main apron is large enough to accommodate transient airport users, as well as a portion of locally based aircraft. Often smaller aprons are available adjacent to FBO hangars and at other locations around the airport. The apron layout at Glendale Municipal Airport follows this typical pattern.

FAA Advisory Circular 150/5300-13A, *Airport Design*, suggests a methodology by which transient apron requirements can be determined from knowledge of busy-day operations. At Glendale Municipal Airport, the number of itinerant spaces required was determined to be approximately 13 percent of the busy-day itinerant operations. This results in a current need for 17 itinerant aircraft parking spaces. For planning purposes, 60 percent of these spaces are assumed to be utilized by small aircraft (including helicopters), which is in line with airport activity levels. By the long term planning period, there is a need for 20 transient positions.

A planning criterion of 800 square yards per aircraft was applied to determine future transient apron area requirements for single and multi-engine aircraft. For turboprops and business jets (which can be much larger), a planning criterion of 1,600 square yards per aircraft position was used. The current need for transient apron area is 19,200 square yards. By the long term planning period, approximately 22,400 square yards is required on busy days. When the dedicated transient apron area does not meet the current need during peak periods, a surplus of local apron tie-down area is able to meet the need.

The apron area and positions necessary for local tie-down needs is determined by applying a planning standard of 650 square yards per position. Assuming that tie-down requirements will increase at the same ratio as current tie-down rental requirements, there is a current need for 63 local tie-down positions (based on active tie-downs) and approximately 40,950 square yards of apron area. In the long term, an estimated 77 positions and 50,050 square yards are needed.

Total apron parking requirements are presented in **Table AA**. Overall, there does not appear to be a need for additional apron area to accommodate aircraft parking needs. As transient aircraft parking needs increase, the tie-down apron can be reconfigured.

TABLE AA
Aircraft Apron Requirements
Glendale Municipal Airport

	Existing	Current Need	Short Term	Intermediate Term	Long Term
Local Apron Positions	185+	63	66	70	77
Local Apron Area (s.y.)	63,000	40,950	42,900	45,500	50,050
Transient Apron Positions	20	17	18	19	20
Small Aircraft Positions	20	10	11	11	12
Large Aircraft Positions	10	7	7	8	8
Transient Apron Area (s.y.)	28,000	19,200	20,000	21,600	22,400
Total Apron Area (s.y)	91,000	60,150	62,900	64,100	72,450

Source: Coffman Associates analysis

GENERAL AVIATION TERMINAL FACILITIES

General aviation terminal facilities have several functions. Space is required for waiting passengers, a pilots' lounge, flight planning, concessions, management, storage, and various other needs. These functions are often provided at FBO facilities, as they are at Glendale Municipal Airport. However, the FBO facilities, when catering to fractional aircraft operators, will also establish minimum standards for safety, security, catering, aircraft handling, ground transportation, and hangar and office space standards. The public terminal provides the benefit to airport administration and tenants of easily accessible public functions—restaurant, restrooms, public access and parking—and the sizing of these facilities will vary based upon local demand. The sizing of public terminal facilities will generally be based upon a solid business plan which analyzes the need for each of the aforementioned functions.

The methodology used in estimating general aviation terminal facility needs is based on the number of airport users expected to utilize these facilities during the design hour. Public general aviation space requirements are based upon providing 120 square feet per design hour itinerant pilot/passenger. Design hour itinerant pilot/ passengers are determined by multiplying design hour itinerant operations by an average of 2.5 passengers per aircraft. **Table BB** outlines the general aviation terminal facility space requirements for Glendale Municipal Airport.

The public terminal building at Glendale Municipal Airport provides approximately 22,000 square feet of total space for airport administration, restaurant, public restrooms, and other leasable office space, and only about 50 percent of this total space is considered for public use. The FBO also provides terminal services in addition to the main terminal building, which has been estimated at an additional 5,000 square feet. Planning standards indicate that the existing general aviation terminal services area is adequate through the long term planning period.

TABLE BB Public General Aviation Terminal Area Facilities Glendale Municipal Airport	Existing	Short Term	Intermediate Term	Long Term
Design Hour Operations	50	53	54	58
Design Hour Itinerant Operations	38	40	41	44
Multiplier	2.5	2.5	2.5	2.5
Total Design Hour Itinerant Pilots/Passengers	95	100	103	110
Public General Aviation Building Space (s.f.)	16,000	12,000	12,300	13,200

Source: Coffman Associates analysis

SUPPORT REQUIREMENTS

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

AUTOMOBILE PARKING

Planning for adequate automobile parking is a necessary element for any airport. Parking needs can effectively be divided between transient airport users and locally based users. Transient users include those employed at the airport and visitors, while locally based users primarily include those attending to their based aircraft. A planning standard of 1.8 times the design hour passenger count provides the minimum number of vehicle spaces needed for transient users. Locally based parking spaces are calculated as one-half the number of based aircraft.

At Glendale Municipal Airport, there are approximately 150 vehicle parking spaces available near the terminal building. The FBO, other airport business hangars, and hangar tenants located along Glen Harbor Boulevard also have access to nearby vehicle parking lots. It is estimated there are an additional 450 vehicle parking spaces available adjacent to general aviation businesses and hangars. This excludes additional vehicular parking that may be available adjacent to hangars inside the fence. A planning standard of 400 square feet is utilized to determine total vehicle parking space necessary. This includes area needed for circulation and handicap clearances. Parking requirements for the airport are summarized in **Table CC**.

The total number of parking spaces appears to be adequate through the long term planning period. While the total number of spaces appears appropriate, the location of parking spaces should be considered. Parking should be made available in close proximity to the terminal building and airport businesses.

TABLE CC
GA Vehicle Parking Requirements
Glendale Municipal Airport

	Existing	Short Term	Intermediate Term	Long Term
Design Hour Itinerant Passengers	95	100	103	110
GA Itinerant Spaces	[redacted]	180	185	200
GA Based Spaces	[redacted]	148	155	170
Itinerant Parking Area (s.f.)	[redacted]	72,000	74,000	80,000
GA Based Parking Area (s.f.)	[redacted]	59,000	62,000	68,000
Total GA Parking Area (s.f.)	[redacted]	131,000	136,000	148,000
Total Parking Spaces	600	328	340	370

Source: Coffman Associates analysis

AIRCRAFT RESCUE AND FIREFIGHTING (ARFF) FACILITIES

Only those airports that are certificated under Title 14 Code of Federal Regulations, Part 139, are required to have on-site firefighting capabilities. Glendale Municipal Airport is not a Part 139 airport and, therefore, is not required to have on-site firefighting capabilities. Instead, local fire departments respond to airport emergencies.

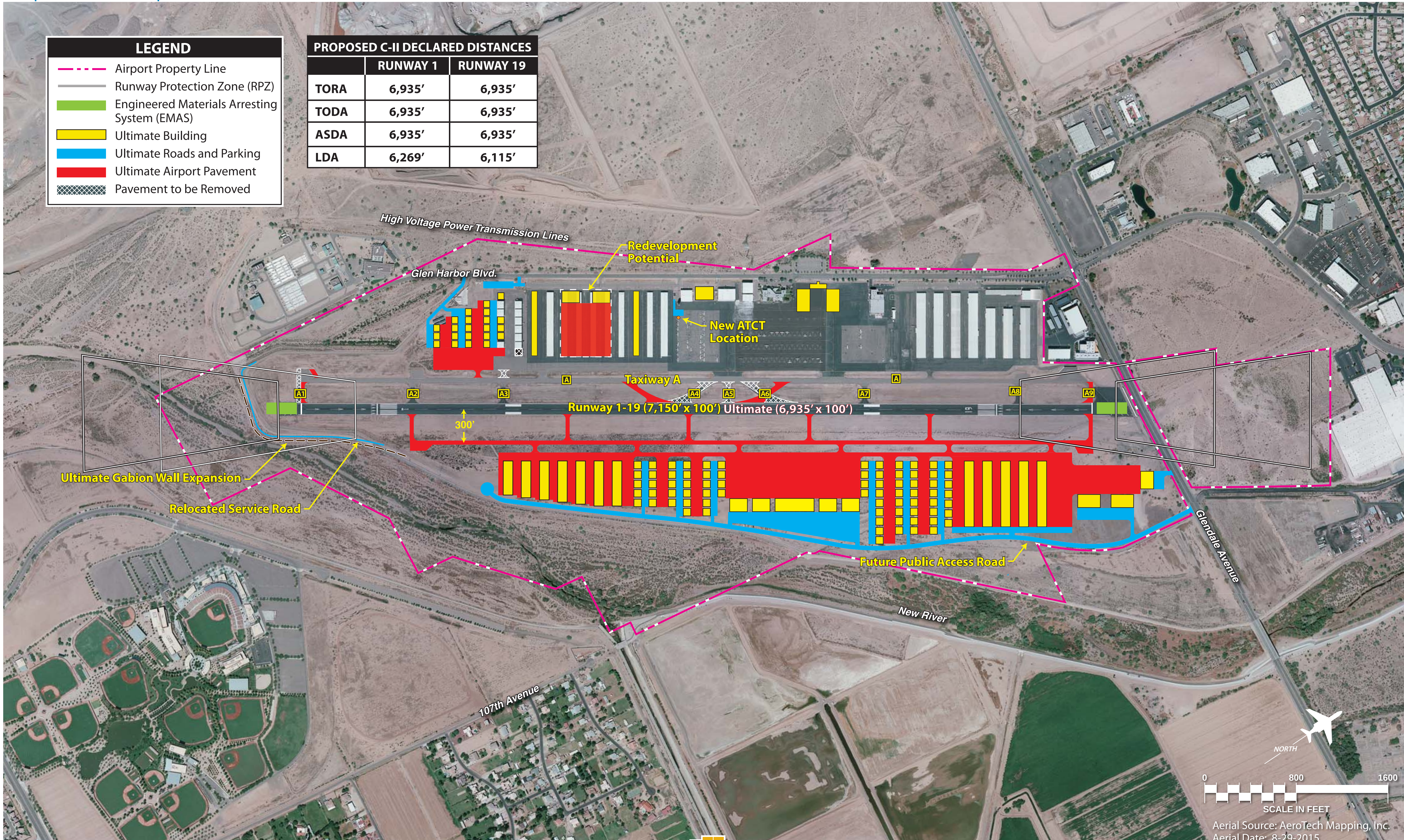
The City of Glendale Fire Station No. 158 is located approximately three miles east of the Airport. The City of Phoenix Fire Station No. 54 is located approximately three miles southeast of the Airport on Campbell Avenue. Through mutual aid agreements, fire stations in the Phoenix area are coordinated for emergency response.

FUEL STORAGE

The City of Glendale owns the fuel farm at the south end of the airfield and leases it to the FBO. There are three 20,000-gallon above-ground fuel storage tanks: two used for Jet-A and one for 100LL. There are three fuel delivery vehicles: two with 3,000-gallon capacity for Jet-A and one with 1,200-gallon capacity for 100LL. There is also a 3,600-gallon self-serve facility used for 100LL. Future storage requirements should be determined by the individual business that provide the fueling services. Additional fuel storage capacity is generally considered when the Airport is unable to maintain an adequate supply and reserve. While the FBO will determine their own desired reserve, a 14-day reserve is common.

RECOMMENDED DEVELOPMENT CONCEPT

Exhibit N depicts the overall development concept for Glendale Municipal Airport. The facility needs assessments in the previous section identified both airside and landside needs, as well as a number of facility deficiencies. The purpose of this section is to consider the actual physical facilities which are needed to accommodate projected demand and meet the program requirements.



PROPOSED C-II DECLARED DISTANCES

	RUNWAY 1	RUNWAY 19
TORA	6,935′	6,935′
TODA	6,935′	6,935′
ASDA	6,935′	6,935′
LDA	6,269′	6,115′

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IMPLEMENT DECLARED DISTANCES ON RUNWAY 1-19

With FAA approval, the runway length can be declared (published) to be shorter for certain operations in order to provide the necessary safety areas. Declared distances represent the maximum length available and suitable for meeting takeoff, rejected takeoff, and landing distance performance requirements for turbine-powered aircraft. The declared distances are defined by the FAA as:

- *Takeoff run available (TORA)* - The distance to accelerate from brake release to lift-off, plus safety factors.
- *Takeoff distance available (TODA)* - The distance from brake release past lift-off to start of takeoff climb, plus safety factors.
- *Accelerate-stop distance available (ASDA)* - The distance to accelerate from brake release to takeoff decision speed (V_1), and then decelerate to a stop, plus safety factors.
- *Landing distance available (LDA)* - The distance from the threshold to complete the approach, touchdown, and decelerate to a stop, plus safety factors.

The TORA and TODA are equal to the actual runway length unless a clearway and/or stopway is provided at an airport (there is no clearway or stopway at Glendale Municipal Airport). The ASDA and the LDA are the primary considerations in determining the runway length available for use by aircraft, as these calculations must consider providing standard safety area beyond the runway ends in operational calculations. The ASDA and LDA can be figured as the usable portions of the runway length less the distance required to maintain adequate safety area beyond the ends of the runway or prior to the landing threshold. By regulation, the full RSA must be available at the far end of a departure operation in the ASDA calculation and prior to the landing threshold in LDA calculations. Use of declared distances can impact the beginning and ending of the RSA, ROFA, and RPZ.

Reduction in the ASDA or LDA, as depicted in **Table DD**, will impact the operational capabilities of certain business jets. Some aircraft may have to take on less payload in order to safely operate on the runway. This would have a greater impact on the occasional larger business jets that typically need more runway length, and less of an impact to the small- and medium-sized business jets which represent the critical design aircraft. (Reference **Table W** for typical runway length requirements for common business jets operating at the Airport.)

TABLE DD
Potential Declared Distances Runway 1-19 – Current B-II Design
Glendale Municipal Airport

	Runway 1	Runway 19
Takeoff Run Available (TORA)	7,150	7,150
Takeoff Distance Available (TODA)	7,150	7,150
Accelerate Stop Distance Available (ASDA)	6,980	7,116
Landing Distance Available (LDA)	6,279	6,115

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

As the airport transitions to C-II design, declared distances would need to be updated to account for the more demanding safety standards. In addition, the gabion wall and service road adjacent to the south-east side of the runway should be relocated. Finally, an engineered materials arresting system (EMAS) may be installed to provide the maximum usable runway length. These improvements are called out and depicted on **Exhibit N**.

AIRSIDE IMPROVEMENTS

Closure of taxiway exit A5 and reversing angled exits A4 and A6 will alleviate the "hot spot" at midfield which has been identified by the FAA and discussed earlier in this section. The new configuration has been identified on **Exhibit N**. A taxiway entrance at the intersection of A3/Taxiway A has been identified for relocation to avoid a direct access point onto the runway.

Future development on the east side will require the construction of a parallel taxiway and exits. The parallel taxiway will need to be at a separation distance of 300 feet from the runway. The extension of the taxiway to the south end of the airfield will be limited by the location of the New River, which will require that the exit onto the runway be located 1,000 feet from the runway end and 300 feet north of the displaced landing threshold.

LANDSIDE IMPROVEMENTS

New hangar development has been depicted on **Exhibit N** on the west side (complementing existing development at the south end) and in new development areas on the east side of the airfield. While 21 additional units (3,600 square feet each) have been depicted at the south end (with additional ramp and auto parking support areas), the development will need to be coordinated with FAA for line-of-sight from the control tower (Note: the 2009 ALP identified a new location for the control tower and this location has been noted on **Exhibit N**). It is possible that additional hangar units (or larger units) can be constructed in the vicinity of the existing solar array (the existing lease expires on July 31, 2018). In addition, the area used for shade hangars has the potential to be redeveloped as noted on the exhibit. Large hangar development, nested hangars, and additional individual hangars have been depicted on the east side. New roadway access will need to be developed from Glendale Avenue to serve the east side.

CAPITAL IMPROVEMENT PROGRAM

The five-year capital improvement program is included in **Appendix C**. The timing of capacity-related projects will need to be based upon the mix of based aircraft, hangar requirements, and aviation-related business requirements. Other projects may focus on the need to improve airport security, terminal area or airfield efficiencies, rehabilitation of pavements, or other safety-related factors. Consequently, the five-year program will need to remain flexible to unforeseen changes that may occur over time. The current five-year program includes projects to rehabilitate pavements on the west side, reimbursement for land purchased in the approach to Runway 19, projects to alleviate the "hot spot," updates to weather equipment, updates to noise exposure maps, and an Environmental Assessment to examine channelization of the New River.

APPENDIX A

GLOSSARY OF TERMS

Glossary of Terms

A

ABOVE GROUND LEVEL: The elevation of a point or surface above the ground.

ACCELERATE-STOP DISTANCE AVAILABLE (ASDA): See declared distances.

ADVISORY CIRCULAR: External publications issued by the FAA consisting of nonregulatory material providing for the recommendations relative to a policy, guidance and information relative to a specific aviation subject.

AIR CARRIER: An operator which: (1) performs at least five round trips per week between two or more points and publishes flight schedules which specify the times, days of the week, and places between which such flights are performed; or (2) transports mail by air pursuant to a current contract with the U.S. Postal Service. Certified in accordance with Federal Aviation Regulation (FAR) Parts 121 and 127.

AIRCRAFT: A transportation vehicle that is used or intended for use for flight.

AIRCRAFT APPROACH CATEGORY: A grouping of aircraft based on 1.3 times the stall speed in their landing configuration at their maximum certificated landing weight. The categories are as follows:

- Category A: Speed less than 91 knots.
- Category B: Speed 91 knots or more, but less than 121 knots.
- Category C: Speed 121 knots or more, but less than 141 knots.
- Category D: Speed 141 knots or more, but less than 166 knots.
- Category E: Speed greater than 166 knots.

AIRCRAFT OPERATION: The landing, takeoff, or touch-and-go procedure by an aircraft on a runway at an airport.

AIRCRAFT OPERATIONS AREA (AOA): A restricted and secure area on the airport property designed to protect all aspects related to aircraft operations.

AIRCRAFT OWNERS AND PILOTS ASSOCIATION: A private organization serving the interests and needs of general aviation pilots and aircraft owners.

AIRCRAFT RESCUE AND FIRE FIGHTING: A facility located at an airport that provides emergency vehicles, extinguishing agents, and personnel responsible for minimizing the impacts of an aircraft accident or incident.

AIRFIELD: The portion of an airport which contains the facilities necessary for the operation of aircraft.

AIRLINE HUB: An airport at which an airline concentrates a significant portion of its activity and which often has a significant amount of connecting traffic.

AIRPLANE DESIGN GROUP (ADG): A grouping of aircraft based upon wingspan. The groups are as follows:

- Group I: Up to but not including 49 feet.
- Group II: 49 feet up to but not including 79 feet.
- Group III: 79 feet up to but not including 118 feet.
- Group IV: 118 feet up to but not including 171 feet.
- Group V: 171 feet up to but not including 214 feet.
- Group VI: 214 feet or greater.

AIRPORT AUTHORITY: A quasi-governmental public organization responsible for setting the policies governing the management and operation of an airport or system of airports under its jurisdiction.

AIRPORT BEACON: A navigational aid located at an airport which displays a rotating light beam to identify whether an airport is lighted.

AIRPORT CAPITAL IMPROVEMENT PLAN: The planning program used by the Federal Aviation Administration to identify, prioritize, and distribute funds for airport development and the needs of the National Airspace System to meet specified national goals and objectives.

AIRPORT ELEVATION: The highest point on the runway system at an airport expressed in feet above mean sea level (MSL).

AIRPORT IMPROVEMENT PROGRAM: A program authorized by the Airport and Airway Improvement Act of 1982 that provides funding for airport planning and development.

Coffman Associates
Airport Consultants

AIRPORT LAYOUT DRAWING (ALD): The drawing of the airport showing the layout of existing and proposed airport facilities.

AIRPORT LAYOUT PLAN (ALP): A scaled drawing of the existing and planned land and facilities necessary for the operation and development of the airport.

AIRPORT LAYOUT PLAN DRAWING SET: A set of technical drawings depicting the current and future airport conditions. The individual sheets comprising the set can vary with the complexities of the airport, but the FAA-required drawings include the Airport Layout Plan (sometimes referred to as the Airport Layout Drawing (ALD), the Airport Airspace Drawing, and the Inner Portion of the Approach Surface Drawing, On-Airport Land Use Drawing, and Property Map.

AIRPORT MASTER PLAN: The planner's concept of the long-term development of an airport.

AIRPORT MOVEMENT AREA SAFETY SYSTEM: A system that provides automated alerts and warnings of potential runway incursions or other hazardous aircraft movement events.

AIRPORT OBSTRUCTION CHART: A scaled drawing depicting the Federal Aviation Regulation (FAR) Part 77 surfaces, a representation of objects that penetrate these surfaces, runway, taxiway, and ramp areas, navigational aids, buildings, roads and other detail in the vicinity of an airport.

AIRPORT REFERENCE CODE (ARC): A coding system used to relate airport design criteria to the operational (Aircraft Approach Category) to the physical characteristics (Airplane Design Group) of the airplanes intended to operate at the airport.

AIRPORT REFERENCE POINT (ARP): The latitude and longitude of the approximate center of the airport.

AIRPORT SPONSOR: The entity that is legally responsible for the management and operation of an airport, including the fulfillment of the requirements of laws and regulations related thereto.

AIRPORT SURFACE DETECTION EQUIPMENT: A radar system that provides air traffic controllers with a visual representation of the movement of aircraft and other vehicles on the ground on the airfield at an airport.

AIRPORT SURVEILLANCE RADAR: The primary radar located at an airport or in an air traffic control terminal area that receives a signal at an antenna and transmits the signal to air traffic control display equipment defining the location of aircraft in the air. The signal provides only the azimuth and range of aircraft from the location of the antenna.

AIRPORT TRAFFIC CONTROL TOWER (ATCT): A central operations facility in the terminal air traffic control system, consisting of a tower, including an associated instrument flight rule (IFR) room if radar equipped, using air/ground communications and/or radar, visual signaling and other devices to provide safe and expeditious movement of terminal air traffic.

AIR ROUTE TRAFFIC CONTROL CENTER: A facility which provides en route air traffic control service to aircraft operating on an IFR flight plan within controlled airspace over a large, multi-state region.

AIRSIDE: The portion of an airport that contains the facilities necessary for the operation of aircraft.

AIRSPACE: The volume of space above the surface of the ground that is provided for the operation of aircraft.

AIR TAXI: An air carrier certificated in accordance with FAR Part 121 and FAR Part 135 and authorized to provide, on demand, public transportation of persons and property by aircraft. Generally operates small aircraft "for hire" for specific trips.

AIR TRAFFIC CONTROL: A service operated by an appropriate organization for the purpose of providing for the safe, orderly, and expeditious flow of air traffic.

AIR ROUTE TRAFFIC CONTROL CENTER (ARTCC): A facility established to provide air traffic control service to aircraft operating on an IFR flight plan within controlled airspace and principally during the en route phase of flight.

AIR TRAFFIC CONTROL SYSTEM COMMAND CENTER: A facility operated by the FAA which is responsible for the central flow control, the central altitude reservation system, the airport reservation position system, and the air traffic service contingency command for the air traffic control system.

AIR TRAFFIC HUB: A categorization of commercial service airports or group of commercial service airports in a metropolitan or urban area based upon the proportion of annual national enplanements existing at the airport or airports. The categories are large hub, medium hub, small hub, or non-hub. It forms the basis for the apportionment of entitlement funds.

AIR TRANSPORT ASSOCIATION OF AMERICA: An organization consisting of the principal U.S. airlines that represents the interests of the airline industry on major aviation issues before federal, state, and local government bodies. It promotes air transportation safety by coordinating industry and governmental safety programs and it serves as a focal point for industry efforts to standardize practices and enhance the efficiency of the air transportation system.

ALERT AREA: See special-use airspace.

ALTITUDE: The vertical distance measured in feet above mean sea level.

ANNUAL INSTRUMENT APPROACH (AIA): An approach to an airport with the intent to land by an aircraft in accordance with an IFR flight plan when visibility is less than three miles and/or when the ceiling is at or below the minimum initial approach altitude.

APPROACH LIGHTING SYSTEM (ALS): An airport lighting facility which provides visual guidance to landing aircraft by radiating light beams by which the pilot aligns the aircraft with the extended centerline of the runway on his final approach and landing.

APPROACH MINIMUMS: The altitude below which an aircraft may not descend while on an IFR approach unless the pilot has the runway in sight.

APPROACH SURFACE: An imaginary obstruction limiting surface defined in FAR Part 77 which is longitudinally centered on an extended runway centerline and extends outward and upward from the primary surface at each end of a runway at a designated slope and distance based upon the type of available or planned approach by aircraft to a runway.

APRON: A specified portion of the airfield used for passenger, cargo or freight loading and unloading, aircraft parking, and the refueling, maintenance and servicing of aircraft.

AREA NAVIGATION: The air navigation procedure that provides the capability to establish and maintain a flight path on an arbitrary course that remains within the coverage area of navigational sources being used.

AUTOMATED TERMINAL INFORMATION SERVICE (ATIS): The continuous broadcast of recorded non-control information at towered airports. Information typically includes wind speed, direction, and runway in use.

AUTOMATED SURFACE OBSERVATION SYSTEM (ASOS): A reporting system that provides frequent airport ground surface weather observation data through digitized voice broadcasts and printed reports.

AUTOMATIC WEATHER OBSERVATION STATION (AWOS): Equipment used to automatically record weather conditions (i.e. cloud height, visibility, wind speed and direction, temperature, dew point, etc.)

AUTOMATIC DIRECTION FINDER (ADF): An aircraft radio navigation system which senses and indicates the direction to a non-directional radio beacon (NDB) ground transmitter.

AVIGATION EASEMENT: A contractual right or a property interest in land over which a right of unobstructed flight in the airspace is established.

AZIMUTH: Horizontal direction expressed as the angular distance between true north and the direction of a fixed point (as the observer's heading).

B

BASE LEG: A flight path at right angles to the landing runway off its approach end. The base leg normally extends from the downwind leg to the intersection of the extended runway centerline. See "traffic pattern."

BASED AIRCRAFT: The general aviation aircraft that use a specific airport as a home base.

BEARING: The horizontal direction to or from any point, usually measured clockwise from true north or magnetic north.

BLAST FENCE: A barrier used to divert or dissipate jet blast or propeller wash.

BLAST PAD: A prepared surface adjacent to the end of a runway for the purpose of eliminating the erosion of the ground surface by the wind forces produced by airplanes at the initiation of takeoff operations.

BUILDING RESTRICTION LINE (BRL): A line which identifies suitable building area locations on the airport.

C

CAPITAL IMPROVEMENT PLAN: The planning program used by the Federal Aviation Administration to identify, prioritize, and distribute Airport Improvement Program funds for airport development and the needs of the National Airspace System to meet specified national goals and objectives.

CARGO SERVICE AIRPORT: An airport served by aircraft providing air transportation of property only, including mail, with an annual aggregate landed weight of at least 100,000,000 pounds.

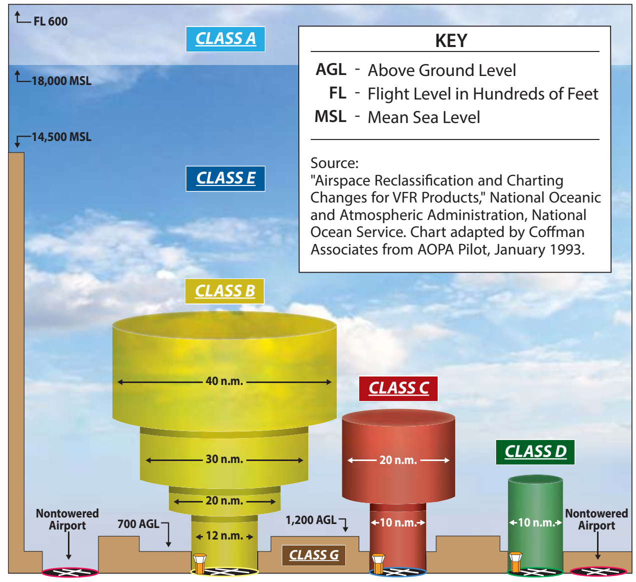
CATEGORY I: An Instrument Landing System (ILS) that provides acceptable guidance information to an aircraft from the coverage limits of the ILS to the point at which the localizer course line intersects the glide path at a decision height of 200 feet above the horizontal plane containing the runway threshold.

CATEGORY II: An ILS that provides acceptable guidance information to an aircraft from the coverage limits of the ILS to the point at which the localizer course line intersects the glide path at a decision height of 100 feet above the horizontal plane containing the runway threshold.

CATEGORY III: An ILS that provides acceptable guidance information to a pilot from the coverage limits of the ILS with no decision height specified above the horizontal plane containing the runway threshold.

CEILING: The height above the ground surface to the location of the lowest layer of clouds which is reported as either broken or overcast.

CIRCLING APPROACH: A maneuver initiated by the pilot to align the aircraft with the runway for landing when flying a predetermined circling instrument approach under IFR.



CLASS A AIRSPACE: See Controlled Airspace.

CLASS B AIRSPACE: See Controlled Airspace.

CLASS C AIRSPACE: See Controlled Airspace.

CLASS D AIRSPACE: See Controlled Airspace.

CLASS E AIRSPACE: See Controlled Airspace.

CLASS G AIRSPACE: See Controlled Airspace.

CLEAR ZONE: See Runway Protection Zone.

COMMERCIAL SERVICE AIRPORT: A public airport providing scheduled passenger service that enplanes at least 2,500 annual passengers.

COMMON TRAFFIC ADVISORY FREQUENCY: A radio frequency identified in the appropriate aeronautical chart which is designated for the purpose of transmitting airport advisory information and procedures while operating to or from an uncontrolled airport.

COMPASS LOCATOR (LOM): A low power, low/medium frequency radio-beacon installed in conjunction with the instrument landing system at one or two of the marker sites.

CONICAL SURFACE: An imaginary obstruction-limiting surface defined in FAR Part 77 that extends from the edge of the horizontal surface outward and upward at a slope of 20 to 1 for a horizontal distance of 4,000 feet.

CONTROLLED AIRPORT: An airport that has an operating airport traffic control tower.

CONTROLLED AIRSPACE: Airspace of defined dimensions within which air traffic control services are provided to instrument flight rules (IFR) and visual flight rules (VFR) flights in accordance with the airspace classification. Controlled airspace in the United States is designated as follows:

- **CLASS A**: Generally, the airspace from 18,000 feet mean sea level (MSL) up to but not including flight level FL600. All persons must operate their aircraft under IFR.
- **CLASS B**: Generally, the airspace from the surface to 10,000 feet MSL surrounding the nation's busiest airports. The configuration of Class B airspace is unique to each airport, but typically consists of two or more layers of air space and is designed to contain all published instrument approach procedures to the airport. An air traffic control clearance is required for all aircraft to operate in the area.
- **CLASS C**: Generally, the airspace from the surface to 4,000 feet above the airport elevation (charted as MSL) surrounding those airports that have an operational control tower and radar approach control and are served by a qualifying number of IFR operations or passenger enplanements. Although individually tailored for each airport, Class C airspace typically consists of a surface area with a five nautical mile (nm) radius and an outer area with a 10 nautical mile radius that extends from 1,200 feet to 4,000 feet above the airport elevation. Two-way radio communication is required for all aircraft.
- **CLASS D**: Generally, that airspace from the surface to 2,500 feet above the air port elevation (charted as MSL) surrounding those airports that have an operational control tower. Class D airspace is individually tailored and configured to encompass published instrument approach procedure. Unless otherwise authorized, all persons must establish two-way radio communication.
- **CLASS E**: Generally, controlled airspace that is not classified as Class A, B, C, or D. Class E airspace extends upward from either the surface or a designated altitude to the overlying or adjacent controlled airspace. When designated as a surface area, the airspace will be configured to contain all instrument procedures. Class E airspace encompasses all Victor Airways. Only aircraft following instrument flight rules are required to establish two-way radio communication with air traffic control.
- **CLASS G**: Generally, that airspace not classified as Class A, B, C, D, or E. Class G airspace is uncontrolled for all aircraft. Class G airspace extends from the surface to the overlying Class E airspace.

CONTROLLED FIRING AREA: See special-use airspace.

CROSSWIND: A wind that is not parallel to a runway centerline or to the intended flight path of an aircraft.

CROSSWIND COMPONENT: The component of wind that is at a right angle to the runway centerline or the intended flight path of an aircraft.

CROSSWIND LEG: A flight path at right angles to the landing runway off its upwind end. See "traffic pattern."

D

DECIBEL: A unit of noise representing a level relative to a reference of a sound pressure 20 micro newtons per square meter.

DECISION HEIGHT/ DECISION ALTITUDE: The height above the end of the runway surface at which a decision must be made by a pilot during the ILS or Precision Approach Radar approach to either continue the approach or to execute a missed approach.

DECLARED DISTANCES: The distances declared available for the airplane's takeoff runway, takeoff distance, accelerate-stop distance, and landing distance requirements. The distances are:

- **TAKEOFF RUNWAY AVAILABLE (TORA):** The runway length declared available and suitable for the ground run of an airplane taking off.

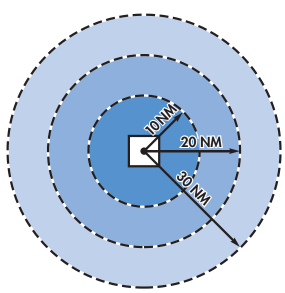
- **TAKEOFF DISTANCE AVAILABLE (TODA):** The TORA plus the length of any remaining runway and/or clear way beyond the far end of the TORA.
- **ACCELERATE-STOP DISTANCE AVAILABLE (ASDA):** The runway plus stopway length declared available for the acceleration and deceleration of an aircraft aborting a takeoff.
- **LANDING DISTANCE AVAILABLE (LDA):** The runway length declared available and suitable for landing.

DEPARTMENT OF TRANSPORTATION: The cabinet level federal government organization consisting of modal operating agencies, such as the Federal Aviation Administration, which was established to promote the coordination of federal transportation programs and to act as a focal point for research and development efforts in transportation.

DISCRETIONARY FUNDS: Federal grant funds that may be appropriated to an airport based upon designation by the Secretary of Transportation or Congress to meet a specified national priority such as enhancing capacity, safety, and security, or mitigating noise.

DISPLACED THRESHOLD: A threshold that is located at a point on the runway other than the designated beginning of the runway.

DISTANCE MEASURING EQUIPMENT (DME): Equipment (airborne and ground) used to measure, in nautical miles, the slant range distance of an aircraft from the DME navigational aid.



DNL: The 24-hour average sound level, in Aweighted decibels, obtained after the addition of ten decibels to sound levels for the periods between 10 p.m. and 7 a.m. as averaged over a span of one year. It is the FAA standard metric for determining the cumulative exposure of individuals to noise.

DOWNWIND LEG: A flight path parallel to the landing runway in the direction opposite to landing. The downwind leg normally extends between the crosswind leg and the base leg. Also see "traffic pattern."

E

EASEMENT: The legal right of one party to use a portion of the total rights in real estate owned by another party. This may include the right of passage over, on, or below the property; certain air rights above the property, including view rights; and the rights to any specified form of development or activity, as well as any other legal rights in the property that may be specified in the easement document.

ELEVATION: The vertical distance measured in feet above mean sea level.

ENPLANED PASSENGERS: The total number of revenue passengers boarding aircraft, including originating, stop-over, and transfer passengers, in scheduled and nonscheduled services.

ENPLANEMENT: The boarding of a passenger, cargo, freight, or mail on an aircraft at an airport.

ENTITLEMENT: Federal funds for which a commercial service airport may be eligible based upon its annual passenger enplanements.

ENVIRONMENTAL ASSESSMENT (EA): An environmental analysis performed pursuant to the National Environmental Policy Act to determine whether an action would significantly affect the environment and thus require a more detailed environmental impact statement.

ENVIRONMENTAL AUDIT: An assessment of the current status of a party's compliance with applicable environmental requirements of a party's environmental compliance policies, practices, and controls.

ENVIRONMENTAL IMPACT STATEMENT (EIS): A document required of federal agencies by the National Environmental Policy Act for major projects are legislative proposals affecting the environment. It is a tool for decision-making describing the positive and negative effects of a proposed action and citing alternative actions.

ESSENTIAL AIR SERVICE: A federal program which guarantees air carrier service to selected small cities by providing subsidies as needed to prevent these cities from such service.

F

FEDERAL AVIATION REGULATIONS: The general and permanent rules established by the executive departments and agencies of the Federal Government for aviation, which are published in the Federal Register. These are the aviation subset of the Code of Federal Regulations.

FEDERAL INSPECTION SERVICES: The provision of customs and immigration services including passport inspection, inspection of baggage, the collection of duties on certain imported items, and the inspections for agricultural products, illegal drugs, or other restricted items.

FINAL APPROACH: A flight path in the direction of landing along the extended runway centerline. The final approach normally extends from the base leg to the runway. See "traffic pattern."

FINAL APPROACH AND TAKEOFF AREA (FATO). A defined area over which the final phase of the helicopter approach to a hover, or a landing is completed and from which the takeoff is initiated.

FINAL APPROACH FIX: The designated point at which the final approach segment for an aircraft landing on a runway begins for a non-precision approach.

FINDING OF NO SIGNIFICANT IMPACT (FONSI): A public document prepared by a Federal agency that presents the rationale why a proposed action will not have a significant effect on the environment and for which an environmental impact statement will not be prepared.

FIXED BASE OPERATOR (FBO): A provider of services to users of an airport. Such services include, but are not limited to, hangaring, fueling, flight training, repair, and maintenance.

FLIGHT LEVEL: A measure of altitude used by aircraft flying above 18,000 feet. Flight levels are indicated by three digits representing the pressure altitude in hundreds of feet. An airplane flying at flight level 360 is flying at a pressure altitude of 36,000 feet. This is expressed as FL 360.

FLIGHT SERVICE STATION: An operations facility in the national flight advisory system which utilizes data interchange facilities for the collection and dissemination of Notices to Airmen, weather, and administrative data and which provides pre-flight and in-flight advisory services to pilots through air and ground based communication facilities.

FRANGIBLE NAVAID: A navigational aid which retains its structural integrity and stiffness up to a designated maximum load, but on impact from a greater load, breaks, distorts, or yields in such a manner as to present the minimum hazard to aircraft.

G

GENERAL AVIATION: That portion of civil aviation which encompasses all facets of aviation except air carriers holding a certificate of convenience and necessity, and large aircraft commercial operators.

GENERAL AVIATION AIRPORT: An airport that provides air service to only general aviation.

GLIDESLOPE (GS): Provides vertical guidance for aircraft during approach and landing. The glideslope consists of the following:

1. Electronic components emitting signals which provide vertical guidance by reference to airborne instruments during instrument approaches such as ILS; or

2. Visual ground aids, such as VASI, which provide vertical guidance for VFR approach or for the visual portion of an instrument approach and landing.

GLOBAL POSITIONING SYSTEM (GPS): A system of 48 satellites used as reference points to enable navigators equipped with GPS receivers to determine their latitude, longitude, and altitude.

GROUND ACCESS: The transportation system on and around the airport that provides access to and from the airport by ground transportation vehicles for passengers, employees, cargo, freight, and airport services.

H

HELIPAD: A designated area for the takeoff, landing, and parking of helicopters.

HIGH INTENSITY RUNWAY LIGHTS: The highest classification in terms of intensity or brightness for lights designated for use in delineating the sides of a runway.

HIGH-SPEED EXIT TAXIWAY: A long radius taxiway designed to expedite aircraft turning off the runway after landing (at speeds to 60 knots), thus reducing runway occupancy time.

HORIZONTAL SURFACE: An imaginary obstruction-limiting surface defined in FAR Part 77 that is specified as a portion of a horizontal plane surrounding a runway located 150 feet above the established airport elevation. The specific horizontal dimensions of this surface are a function of the types of approaches existing or planned for the runway.

I

INITIAL APPROACH FIX: The designated point at which the initial approach segment begins for an instrument approach to a runway.

INSTRUMENT APPROACH PROCEDURE: A series of predetermined maneuvers for the orderly transfer of an aircraft under instrument flight conditions from the beginning of the initial approach to a landing, or to a point from which a landing may be made visually.

INSTRUMENT FLIGHT RULES (IFR): Procedures for the conduct of flight in weather conditions below Visual Flight Rules weather minimums. The term IFR is often also used to define weather conditions and the type of flight plan under which an aircraft is operating.

INSTRUMENT LANDING SYSTEM (ILS): A precision instrument approach system which normally consists of the following electronic components and visual aids:

1. Localizer.
2. Glide Slope.
3. Outer Marker.
4. Middle Marker.
5. Approach Lights.

INSTRUMENT METEOROLOGICAL CONDITIONS: Meteorological conditions expressed in terms of specific visibility and ceiling conditions that are less than the minimums specified for visual meteorological conditions.

ITINERANT OPERATIONS: Operations by aircraft that are not based at a specified airport.

K

KNOTS: A unit of speed length used in navigation that is equivalent to the number of nautical miles traveled in one hour.

L

LANDSIDE: The portion of an airport that provides the facilities necessary for the processing of passengers, cargo, freight, and ground transportation vehicles.

LANDING DISTANCE AVAILABLE (LDA): See declared distances.

LARGE AIRPLANE: An airplane that has a maximum certified takeoff weight in excess of 12,500 pounds.

LOCAL AREA AUGMENTATION SYSTEM: A differential GPS system that provides localized measurement correction signals to the basic GPS signals to improve navigational accuracy integrity, continuity, and availability.

LOCAL OPERATIONS: Aircraft operations performed by aircraft that are based at the airport and that operate in the local traffic pattern or within sight of the airport, that are known to be departing for or arriving from flights in local practice areas within a prescribed distance from the airport, or that execute simulated instrument approaches at the airport.

LOCAL TRAFFIC: Aircraft operating in the traffic pattern or within sight of the tower, or aircraft known to be departing or arriving from the local practice areas, or aircraft executing practice instrument approach procedures. Typically, this includes touch and-go training operations.

LOCALIZER: The component of an ILS which provides course guidance to the runway.

LOCALIZER TYPE DIRECTIONAL AID (LDA): A facility of comparable utility and accuracy to a localizer, but is not part of a complete ILS and is not aligned with the runway.

LONG RANGE NAVIGATION SYSTEM (LORAN): Long range navigation is an electronic navigational aid which determines aircraft position and speed by measuring the difference in the time of reception of synchronized pulse signals from two fixed transmitters. Loran is used for en route navigation.

LOW INTENSITY RUNWAY LIGHTS: The lowest classification in terms of intensity or brightness for lights designated for use in delineating the sides of a runway.

M

MEDIUM INTENSITY RUNWAY LIGHTS: The middle classification in terms of intensity or brightness for lights designated for use in delineating the sides of a runway.

MICROWAVE LANDING SYSTEM (MLS): An instrument approach and landing system that provides precision guidance in azimuth, elevation, and distance measurement.

MILITARY OPERATIONS: Aircraft operations that are performed in military aircraft.

MILITARY OPERATIONS AREA (MOA): See special-use airspace

MILITARY TRAINING ROUTE: An air route depicted on aeronautical charts for the conduct of military flight training at speeds above 250 knots.

MISSED APPROACH COURSE (MAC): The flight route to be followed if, after an instrument approach, a landing is not affected, and occurring normally:

1. When the aircraft has descended to the decision height and has not established visual contact; or

2. When directed by air traffic control to pull up or to go around again.

MOVEMENT AREA: The runways, taxiways, and other areas of an airport which are utilized for taxiing/hover taxiing, air taxiing, takeoff, and landing of aircraft, exclusive of loading ramps and parking areas. At those airports with a tower, air traffic control clearance is required for entry onto the movement area.

N

NATIONAL AIRSPACE SYSTEM: The network of air traffic control facilities, air traffic control areas, and navigational facilities through the U.S.

NATIONAL PLAN OF INTEGRATED AIRPORT SYSTEMS: The national airport system plan developed by the Secretary of Transportation on a biannual basis for the development of public use airports to meet national air transportation needs.

NATIONAL TRANSPORTATION SAFETY BOARD: A federal government organization established to investigate and determine the probable cause of transportation accidents, to recommend equipment and procedures to enhance transportation safety, and to review on appeal the suspension or revocation of any certificates or licenses issued by the Secretary of Transportation.

NAUTICAL MILE: A unit of length used in navigation which is equivalent to the distance spanned by one minute of arc in latitude, that is, 1,852 meters or 6,076 feet. It is equivalent to approximately 1.15 statute mile.

NAVAID: A term used to describe any electrical or visual air navigational aids, lights, signs, and associated supporting equipment (i.e. PAPI, VASI, ILS, etc.)

NAVIGATIONAL AID: A facility used as, available for use as, or designed for use as an aid to air navigation.

NOISE CONTOUR: A continuous line on a map of the airport vicinity connecting all points of the same noise exposure level.

NON-DIRECTIONAL BEACON (NDB): A beacon transmitting nondirectional signals whereby the pilot of an aircraft equipped with direction finding equipment can determine his or her bearing to and from the radio beacon and home on, or track to, the station. When the radio beacon is installed in conjunction with the Instrument Landing System marker, it is normally called a Compass Locator.

NON-PRECISION APPROACH PROCEDURE: A standard instrument approach procedure in which no electronic glide slope is provided, such as VOR, TACAN, NDB, or LOC.

NOTICE TO AIRMEN: A notice containing information concerning the establishment, condition, or change in any component of or hazard in the National Airspace System, the timely knowledge of which is considered essential to personnel concerned with flight operations.

O

OBJECT FREE AREA (OFA): An area on the ground centered on a runway, taxiway, or taxilane centerline provided to enhance the safety of aircraft operations by having the area free of objects, except for objects that need to be located in the OFA for air navigation or aircraft ground maneuvering purposes.

OBSTACLE FREE ZONE (OFZ): The airspace below 150 feet above the established airport elevation and along the runway and extended runway centerline that is required to be kept clear of all objects, except for frangible visual NAVAIDs that need to be located in the OFZ because of their function, in order to provide clearance for aircraft landing or taking off from the runway, and for missed approaches.

ONE-ENGINE INOPERABLE SURFACE: A surface emanating from the runway end at a slope ratio of 62.5:1. Air carrier airports are required to maintain a technical drawing of this surface depicting any object penetrations by January 1, 2010.

OPERATION: The take-off, landing, or touch-and-go procedure by an aircraft on a runway at an airport.

OUTER MARKER (OM): An ILS navigation facility in the terminal area navigation system located four to seven miles from the runway edge on the extended centerline, indicating to the pilot that he/she is passing over the facility and can begin final approach.

P

PILOT CONTROLLED LIGHTING: Runway lighting systems at an airport that are controlled by activating the microphone of a pilot on a specified radio frequency.

PRECISION APPROACH: A standard instrument approach procedure which provides runway alignment and glide slope (descent) information. It is categorized as follows:

- **CATEGORY I (CAT I)**: A precision approach which provides for approaches with a decision height of not less than 200 feet and visibility not less than 1/2 mile or Runway Visual Range (RVR) 2400 (RVR 1800) with operative touchdown zone and runway centerline lights.

- **CATEGORY II (CAT II)**: A precision approach which provides for approaches with a decision height of not less than 100 feet and visibility not less than 1200 feet RVR.

- **CATEGORY III (CAT III)**: A precision approach which provides for approaches with minima less than Category II.

PRECISION APPROACH PATH INDICATOR (PAPI): A lighting system providing visual approach slope guidance to aircraft during a landing approach. It is similar to a VASI but provides a sharper transition between the colored indicator lights.

PRECISION APPROACH RADAR: A radar facility in the terminal air traffic control system used to detect and display with a high degree of accuracy the direction, range, and elevation of an aircraft on the final approach to a runway.

PRECISION OBJECT FREE AREA (POFA): An area centered on the extended runway centerline, beginning at the runway threshold and extending behind the runway threshold that is 200 feet long by 800 feet wide. The POFA is a clearing standard which requires the POFA to be kept clear of above ground objects protruding above the runway safety area edge elevation (except for frangible NAVAIDS). The POFA applies to all new authorized instrument approach procedures with less than 3/4 mile visibility.

PRIMARY AIRPORT: A commercial service airport that enplanes at least 10,000 annual passengers.

PRIMARY SURFACE: An imaginary obstruction limiting surface defined in FAR Part 77 that is specified as a rectangular surface longitudinally centered about a runway. The specific dimensions of this surface are a function of the types of approaches existing or planned for the runway.

PROHIBITED AREA: See special-use airspace.

PVC: Poor visibility and ceiling. Used in determining Annual Service Volume. PVC conditions exist when the cloud ceiling is less than 500 feet and visibility is less than one mile.

R

RADIAL: A navigational signal generated by a Very High Frequency Omni-directional Range or VORTAC station that is measured as an azimuth from the station.

REGRESSION ANALYSIS: A statistical technique that seeks to identify and quantify the relationships between factors associated with a forecast.

REMOTE COMMUNICATIONS OUTLET (RCO): An unstaffed transmitter receiver/facility remotely controlled by air traffic personnel. RCOs serve flight service stations (FSSs). RCOs were established to provide ground-to-ground communications between air traffic control specialists and pilots at satellite airports for delivering en route clearances, issuing departure authorizations, and acknowledging instrument flight rules cancellations or departure/landing times.

REMOTE TRANSMITTER/RECEIVER (RTR): See remote communications outlet. RTRs serve ARTCCs.

RELIEVER AIRPORT: An airport to serve general aviation aircraft which might otherwise use a congested air-carrier served airport.

RESTRICTED AREA: See special-use airspace.

RNAV: Area navigation - airborne equipment which permits flights over determined tracks within prescribed accuracy tolerances without the need to overfly ground-based navigation facilities. Used en route and for approaches to an airport.

RUNWAY: A defined rectangular area on an airport prepared for aircraft landing and takeoff. Runways are normally numbered in relation to their magnetic direction, rounded off to the nearest 10 degrees. For example, a runway with a magnetic heading of 180 would be designated Runway 18. The runway heading on the opposite end of the runway is 180 degrees from that runway end. For example, the opposite runway heading for Runway 18 would be Runway 36 (magnetic heading of 360). Aircraft can takeoff or land from either end of a runway, depending upon wind direction.

RUNWAY ALIGNMENT INDICATOR LIGHT: A series of high intensity sequentially flashing lights installed on the extended centerline of the runway usually in conjunction with an approach lighting system.

RUNWAY DESIGN CODE: A code signifiying the design standards to which the runway is to be built.

RUNWAY END IDENTIFICATION LIGHTING (REIL): Two synchronized flashing lights, one on each side of the runway threshold, which provide rapid and positive identification of the approach end of a particular runway.

RUNWAY GRADIENT: The average slope, measured in percent, between the two ends of a runway.

RUNWAY PROTECTION ZONE (RPZ): An area off the runway end to enhance the protection of people and property on the ground. The RPZ is trapezoidal in shape. Its dimensions are determined by the aircraft approach speed and runway approach type and minima.

RUNWAY REFERENCE CODE: A code signifying the current operational capabilities of a runway and associated taxiway.

RUNWAY SAFETY AREA (RSA): A defined surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway.

RUNWAY VISIBILITY ZONE (RVZ): An area on the airport to be kept clear of permanent objects so that there is an unobstructed line of- site from any point five feet above the runway centerline to any point five feet above an intersecting runway centerline.

RUNWAY VISUAL RANGE (RVR): An instrumentally derived value, in feet, representing the horizontal distance a pilot can see down the runway from the runway end.

S

SCOPE: The document that identifies and defines the tasks, emphasis, and level of effort associated with a project or study.

SEGMENTED CIRCLE: A system of visual indicators designed to provide traffic pattern information at airports without operating control towers.

SHOULDER: An area adjacent to the edge of paved runways, taxiways, or aprons providing a transition between the pavement and the adjacent surface; support for aircraft running off the pavement; enhanced drainage; and blast protection. The shoulder does not necessarily need to be paved.

SLANT-RANGE DISTANCE: The straight line distance between an aircraft and a point on the ground.

SMALL AIRCRAFT: An aircraft that has a maximum certified takeoff weight of up to 12,500 pounds.

SPECIAL-USE AIRSPACE: Airspace of defined dimensions identified by a surface area wherein activities must be confined because of their nature and/or wherein limitations may be imposed upon aircraft operations that are not a part of those activities. Special-use airspace classifications include:

- **ALERT AREA**: Airspace which may contain a high volume of pilot training activities or an unusual type of aerial activity, neither of which is hazardous to aircraft.

- **CONTROLLED FIRING AREA**: Airspace wherein activities are conducted under conditions so controlled as to eliminate hazards to nonparticipating aircraft and to ensure the safety of persons or property on the ground.

- **MILITARY OPERATIONS AREA (MOA)**: Designated airspace with defined vertical and lateral dimensions established outside Class A airspace to separate/segregate certain military activities from instrument flight rule (IFR) traffic and to identify for visual flight rule (VFR) traffic where these activities are conducted.

- **PROHIBITED AREA**: Designated airspace within which the flight of aircraft is prohibited.

- **RESTRICTED AREA**: Airspace designated under Federal Aviation Regulation (FAR) 73, within which the flight of aircraft, while not wholly prohibited, is subject to restriction. Most restricted areas are designated joint use. When not in use by the using agency, IFR/VFR operations can be authorized by the controlling air traffic control facility.

- **WARNING AREA:** Airspace which may contain hazards to nonparticipating aircraft.

STANDARD INSTRUMENT DEPARTURE (SID): A preplanned coded air traffic control IFR departure routing, preprinted for pilot use in graphic and textual form only.

STANDARD INSTRUMENT DEPARTURE PROCEDURES: A published standard flight procedure to be utilized following takeoff to provide a transition between the airport and the terminal area or en route airspace.

STANDARD TERMINAL ARRIVAL ROUTE (STAR): A preplanned coded air traffic control IFR arrival routing, preprinted for pilot use in graphic and textual or textual form only.

STOP-AND-GO: A procedure wherein an aircraft will land, make a complete stop on the runway, and then commence a takeoff from that point. A stop-and-go is recorded as two operations: one operation for the landing and one operation for the takeoff.

STOPWAY: An area beyond the end of a takeoff runway that is designed to support an aircraft during an aborted takeoff without causing structural damage to the aircraft. It is not to be used for takeoff, landing, or taxiing by aircraft.

STRAIGHT-IN LANDING/APPROACH: A landing made on a runway aligned within 30 degrees of the final approach course following completion of an instrument approach.

T

TACTICAL AIR NAVIGATION (TACAN): An ultrahigh frequency electronic air navigation system which provides suitably-equipped aircraft a continuous indication of bearing and distance to the TACAN station.

TAKEOFF RUNWAY AVAILABLE (TORA): See declared distances.

TAKEOFF DISTANCE AVAILABLE (TODA): See declared distances.

TAXILANE: The portion of the aircraft parking area used for access between taxiways and aircraft parking positions.

TAXIWAY: A defined path established for the taxiing of aircraft from one part of an airport to another.

TAXIWAY DESIGN GROUP: A classification of airplanes based on outer to outer Main Gear Width (MGW) and Cockpit to Main Gear (CMG) distance.

TAXIWAY SAFETY AREA (TSA): A defined surface alongside the taxiway prepared or suitable for reducing the risk of damage to an airplane unintentionally departing the taxiway.

TERMINAL INSTRUMENT PROCEDURES: Published flight procedures for conducting instrument approaches to runways under instrument meteorological conditions.

TERMINAL RADAR APPROACH CONTROL: An element of the air traffic control system responsible for monitoring the en-route and terminal segment of air traffic in the airspace surrounding airports with moderate to high levels of air traffic.

TETRAHEDRON: A device used as a landing direction indicator. The small end of the tetrahedron points in the direction of landing.

THRESHOLD: The beginning of that portion of the runway available for landing. In some instances the landing threshold may be displaced.

TOUCH-AND-GO: An operation by an aircraft that lands and departs on a runway without stopping or exiting the runway. A touch-and go is recorded as two operations: one operation for the landing and one operation for the takeoff.

TOUCHDOWN: The point at which a landing aircraft makes contact with the runway surface.

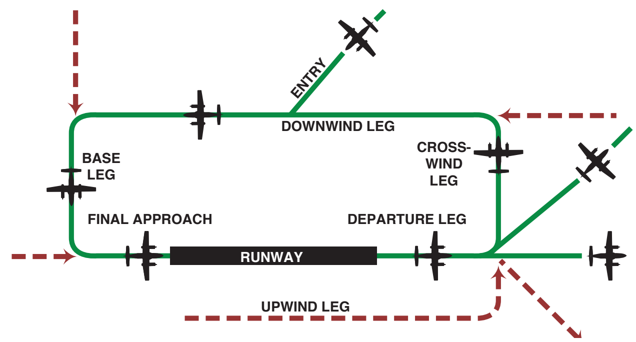
TOUCHDOWN AND LIFT-OFF AREA (TLOF): A load bearing, generally paved area, normally centered in the FATO, on which the helicopter lands or takes off.

TOUCHDOWN ZONE (TDZ): The first 3,000 feet of the runway beginning at the threshold.

TOUCHDOWN ZONE ELEVATION (TDZE): The highest elevation in the touchdown zone.

TOUCHDOWN ZONE (TDZ) LIGHTING: Two rows of transverse light bars located symmetrically about the runway centerline normally at 100- foot intervals. The basic system extends 3,000 feet along the runway.

TRAFFIC PATTERN: The traffic flow that is prescribed for aircraft landing at or taking off from an airport. The components of a typical traffic pattern are the upwind leg, crosswind leg, downwind leg, base leg, and final approach.



U

UNCONTROLLED AIRPORT: An airport without an air traffic control tower at which the control of Visual Flight Rules traffic is not exercised.

UNCONTROLLED AIRSPACE: Airspace within which aircraft are not subject to air traffic control.

UNIVERSAL COMMUNICATION (UNICOM): A nongovernment communication facility which may provide airport information at certain airports. Locations and frequencies of UNICOM's are shown on aeronautical charts and publications.

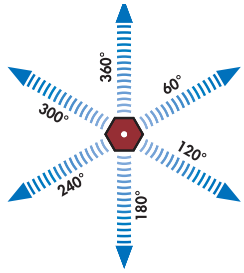
UPWIND LEG: A flight path parallel to the landing runway in the direction of landing. See "traffic pattern."

V

VECTOR: A heading issued to an aircraft to provide navigational guidance by radar.

VERY HIGH FREQUENCY/ OMNIDIRECTIONAL RANGE (VOR): A ground-based electronic navigation aid transmitting very high frequency navigation signals, 360 degrees in azimuth, oriented from magnetic north. Used as the basis for navigation in the national airspace system. The VOR periodically identifies itself by Morse Code and may have an additional voice identification feature.

VERY HIGH FREQUENCY OMNI-DIRECTIONAL RANGE/ TACTICAL AIR NAVIGATION (VORTAC): A navigation aid providing VOR azimuth, TACAN azimuth, and TACAN distance-measuring equipment (DME) at one site.



VICTOR AIRWAY: A control area or portion thereof established in the form of a corridor, the centerline of which is defined by radio navigational aids.

VISUAL APPROACH: An approach wherein an aircraft on an IFR flight plan, operating in VFR conditions under the control of an air traffic control facility and having an air traffic control authorization, may proceed to the airport of destination in VFR conditions.

VISUAL APPROACH SLOPE INDICATOR (VASI): An airport lighting facility providing vertical visual approach slope guidance to aircraft during approach to landing by radiating a directional pattern of high intensity red and white focused light beams which indicate to the pilot that he is on path if he sees red/ white, above path if white/white, and below path if red/red. Some airports serving large aircraft have three-bar VASI's which provide two visual guide paths to the same runway.

VISUAL FLIGHT RULES (VFR): Rules that govern the procedures for conducting flight under visual conditions. The term VFR is also used in the United States to indicate weather conditions that are equal to or greater than minimum VFR requirements. In addition, it is used by pilots and controllers to indicate type of flight plan.

VISUAL METEOROLOGICAL CONDITIONS: Meteorological conditions expressed in terms of specific visibility and ceiling conditions which are equal to or greater than the threshold values for instrument meteorological conditions.

VOR: See "Very High Frequency Omnidirectional Range Station."

VORTAC: See "Very High Frequency Omnidirectional Range Station/Tactical Air Navigation."

W

WARNING AREA: See special-use airspace.

WIDE AREA AUGMENTATION SYSTEM: An enhancement of the Global Positioning System that includes integrity broadcasts, differential corrections, and additional ranging signals for the purpose of providing the accuracy, integrity, availability, and continuity required to support all phases of flight.

Abbreviations

AC: advisory circular

ADF: automatic direction finder

ADG: airplane design group

AFSS: automated flight service station

AGL: above ground level

AIA: annual instrument approach

AIP: Airport Improvement Program

AIR-21: Wendell H. Ford Aviation Investment and Reform Act for the 21st Century

ALS: approach lighting system

ALSF-1: standard 2,400-foot high intensity approach lighting system with sequenced flashers (CAT I configuration)

ALSF-2: standard 2,400-foot high intensity approach lighting system with sequenced flashers (CAT II configuration)

AOA: Aircraft Operation Area

APV: instrument approach procedure with vertical guidance

ARC: airport reference code

ARFF: aircraft rescue and fire fighting

ARP: airport reference point

ARTCC: air route traffic control center

ASDA: accelerate-stop distance available

ASR: airport surveillance radar

ASOS: automated surface observation station

ATCT: airport traffic control tower

ATIS: automated terminal information service

AVGAS: aviation gasoline - typically 100 low lead (100LL)

AWOS: automatic weather observation station

BRL: building restriction line

CFR: Code of Federal Regulation

CIP: capital improvement program

DME: distance measuring equipment

DNL: day-night noise level

DWL: runway weight bearing capacity of aircraft with dual-wheel type landing gear

DTWL: runway weight bearing capacity of aircraft with dual-tandem type landing gear

FAA: Federal Aviation Administration

FAR: Federal Aviation Regulation

FBO: fixed base operator

FY: fiscal year

GPS: global positioning system

GS: glide slope

HIRL: high intensity runway edge lighting

IFR: instrument flight rules (FAR Part 91)

ILS: instrument landing system

IM: inner marker

LDA: localizer type directional aid

LDA: landing distance available

LIRL: low intensity runway edge lighting

LMM: compass locator at middle marker

LOM: compass locator at outer marker

LORAN: long range navigation

MALS: medium intensity approach lighting system with indicator lights

MIRL: medium intensity runway edge lighting

MITL: medium intensity taxiway edge lighting

MLS: microwave landing system

MM: middle marker

MOA: military operations area

MSL: mean sea level

NAVAID: navigational aid

NDB: nondirectional radio beacon

NM: nautical mile (6,076.1 feet)

NPES: National Pollutant Discharge Elimination System

NPIAS: National Plan of Integrated Airport Systems

NPRM: notice of proposed rule making

ODALS: omnidirectional approach lighting system

OFA: object free area

OFZ: obstacle free zone

OM: outer marker

PAC: planning advisory committee

PAPI: precision approach path indicator

PFC: porous friction course

PFC: passenger facility charge

PCL: pilot-controlled lighting

PIW public information workshop

PLASI: pulsating visual approach slope indicator

POFA: precision object free area

PVASI: pulsating/steady visual approach slope indicator

PVC: poor visibility and ceiling

RCO: remote communications outlet

RRC: Runway Reference Code

RDC: Runway Design Code

REIL: runway end identification lighting

RNAV: area navigation

RPZ: runway protection zone

RSA: runway safety area

RTR: remote transmitter/receiver

RVR: runway visibility range

RVZ: runway visibility zone

SALS: short approach lighting system

SASP: state aviation system plan

SEL: sound exposure level

SID: standard instrument departure

SM: statute mile (5,280 feet)

SRE: snow removal equipment

SSALF: simplified short approach lighting system with runway alignment indicator lights

STAR: standard terminal arrival route

SWL: runway weight bearing capacity for aircraft with single-wheel tandem type landing gear

TACAN: tactical air navigational aid

TAF: Federal Aviation Administration (FAA) Terminal Area Forecast

TDG: Taxiway Design Group

TLOF: Touchdown and lift-off

TDZ: touchdown zone

TDZE: touchdown zone elevation

TODA: takeoff distance available

TORA: takeoff runway available

TRACON: terminal radar approach control

VASI: visual approach slope indicator

VFR: visual flight rules (FAR Part 91)

VHF: very high frequency

VOR: very high frequency omni-directional range

VORTAC: VOR and TACAN collocated

GLENDALE AZ

APPENDIX B

FAA FORECAST APPROVAL LETTER

U.S. Department
of Transportation
**Federal Aviation
Administration**

Federal Aviation Administration
Phoenix Airports Field Office

3800 N Central Ave
Suite 1025
Phoenix, AZ 85012

May 11, 2016

Mr. Kenneth Potts
Airport Administrator
6801 N Glen Harbor Blvd., Suite 201
Glendale, AZ 85307

Dear Mr. Potts:

Glendale Municipal Airport (GEU)
Aviation Activity Forecast Approval

The Federal Aviation Administration (FAA) has reviewed the aviation forecast for the Glendale Municipal Airport (GEU) dated March 2, 2016. The FAA approves these forecasts for airport planning purposes, including Airport Layout Plan development.

The forecast was developed using current data and appropriate methodologies, therefore the FAA locally approves this forecast for planning purposes at the Glendale 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. Matt Smith, ADOT, Airport Grant Manager

GLENDALE AZ

APPENDIX C

CAPITAL IMPROVEMENT PROGRAM

Appendix C
Capital Improvement Program

AZ FY	Project Component	Project Description	State Share	Local Share	Federal Share	Total
2017	Apron Reconstruction	North Apron Phase 1	$191,895	$191,895	$3,909,160	$4,292,950
2017	Equipment	Replace AWOS and Windcone	$315,000	$35,000	$0	$350,000
2017	Planning	Part 150 Update	$15,645	$15,645	$318,710	$350,000
2017	Land for Protection	Conair land Acquisition	$1,611,000	$179,000	$0	$1,790,000
		2017 Total	**$2,133,540**	**$421,540**	**$4,227,870**	**$6,782,950**
2018	Apron Rehab	North Apron Phase 2	$48,835	$48,835	$994,831	$1,092,500
2018	Land for Protection	Conair land Acquisition	$2,087,550	$231,950	$0	$2,319,500
		2018 Total	**$2,136,385**	**$280,785**	**$994,831**	**$3,412,000**
2019	Apron Rehab	South Apron Phase 1/Exits A4/A6	$154,394	$154,394	$3,145,212	$3,454,000
2019	Land for Protection	Conair land Acquisition	$2,070,000	$230,000	$0	$2,300,000
		2019 Total	**$2,224,394**	**$384,394**	**$3,145,212**	**$5,754,000**
2020	Apron Rehab	South Apron Phase 2	$87,131	$87,131	$1,774,987	$1,949,250
2020	Land for Protection	Conair land Acquisition	$2,070,000	$230,000	$0	$2,300,000
		2020 Total	**$2,157,131**	**$317,131**	**$1,774,987**	**$4,249,250**
2021	Land for Protection	Conair land Acquisition	$2,070,000	$230,000	$0	$2,300,000
2021	Planning	Environmental Assessment for Proposed RDC C-II Improvements (Gabion Wall and Relocated Service Road) for Channelization	$13,410	$13,410	$273,180	$300,000
		2021 Total	**$2,083,410**	**$243,410**	**$273,180**	**$2,600,000**
		Capital Improvement Program Total	**$10,734,860**	**$1,647,260**	**$10,416,080**	**$22,798,200**

Footnotes:
2019 apron rehab project to include realignment of Exits A4 & A6 / closure of A5.
Total added pavement area: 4,640 sq. yd. @ $100/sq. yd. = $464,000

APPENDIX D

AIRPORT LAYOUT PLANS

U.S. Department
of Transportation
**Federal Aviation
Administration**

Western-Pacific Region
Office of Airports
Phoenix Airports District Office

3800 N. Central Ave
Suite 1025
Phoenix, AZ 85012

April 27, 2018

Joseph Husband
Glendale Municipal Airport
6801 N Glen Harbor Blvd., Suite 201
Glendale, AZ 85307

Dear Mr. Husband:

The Glendale Airport Layout Plan (ALP), prepared by Coffman Associates, and bearing your signature, is approved and the master plan is accepted. A signed copy of the approved ALP is enclosed.

An aeronautical study (no.2017-AWP-3455-NRA) was conducted on the proposed development. This determination does not constitute FAA approval or disapproval of the physical development involved in the proposal. It is a determination with respect to the safe and efficient use of navigable airspace by aircraft and with respect to the safety of persons and property on the ground.

In making this determination, the FAA has considered matters such as the effects the proposal would have on existing or planned traffic patterns of neighboring airports, the effects it would have on the existing airspace structure and projected programs of the FAA, the effects it would have on the safety of persons and property on the ground, the effects that existing or proposed manmade objects (on file with the FAA), and known natural objects within the affected area would have on the airport proposal.

The FAA has only limited means to prevent the construction of structures near an airport. The airport sponsor has the primary responsibility to protect the airport environs through such means as local zoning ordinances, property acquisition, avigation easements, letters of agreement or other means.

Approval of the plan does not indicate that the United States will participate in the cost of any development proposed. Additionally, the United States will only participate in the cost of projects that meet the standards for which that airport is designed. Associated costs for any projects that exceed the appropriate airport design standard will be the responsibility of the airport sponsor.

This ALP approval is conditioned on acknowledgement that any development on airport property requiring Federal environmental approval must receive such written approval from FAA prior to commencement of the subject development. This ALP approval is also conditioned on acceptance of the plan under local land use laws. We

encourage appropriate agencies to adopt land use and height restrictive zoning based on the plan.

AIP funding requires evidence of eligibility and justification at the time a funding request is ripe for consideration. When construction of any proposed structure or development indicated on the plan is undertaken, such construction requires normal 45-day advance notification to FAA for review in accordance with applicable Federal Aviation Regulations (i.e., Parts 77, 157, 152, etc.). More notice is generally beneficial to ensure that all statutory, regulatory, technical and operational issues can be addressed in a timely manner. Additionally, any future development that will require amendments to instrument flight procedures must be coordinated by the airport district office and the airport manager to ensure those changes are made in a timely manner.

Please attach this letter to the Airport Layout Plan and retain it in the airport. We wish you great success in your plans for the development of the airport. If we can be of further assistance, please do not hesitate to call Mr. Kyler Erhard, Lead Program Manager, at 602-792-1073.

Sincerely,

Holly L. Dixon

Holly L. Dixon
Assistant Manager, Phoenix Airports District Office

cc: ADOT

Enclosure: Airport Layout Plan

AIRPORT LAYOUT PLANS

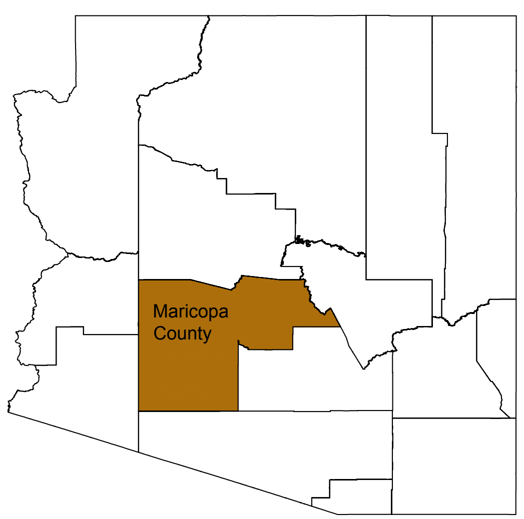
FOR THE

GLENDALE MUNICIPAL AIRPORT

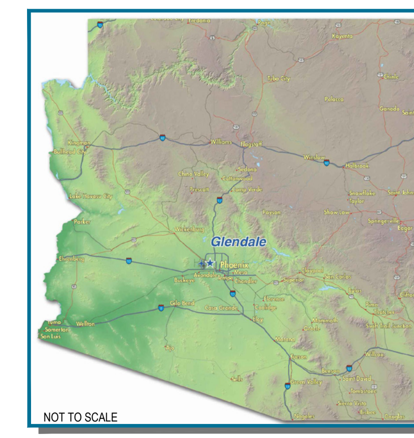
Glendale, Arizona

Prepared for the City of

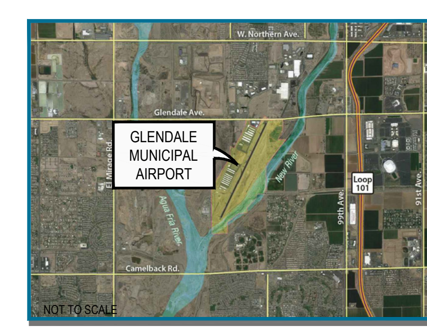
GLENDALE AZ



LOCATION MAP



VICINITY MAP



DRAWING INDEX

1. TITLE SHEET
2. AIRPORT DATA SHEET
3. AIRPORT LAYOUT PLAN DRAWING
4. AIRPORT AIRSPACE DRAWING
5. APPROACH PROFILE DRAWING
6. RUNWAY 1
   INNER PORTION OF THE APPROACH SURFACE DRAWING
7. RUNWAY 19
   INNER PORTION OF THE APPROACH SURFACE DRAWING
8. DEPARTURE SURFACE DRAWING
9. TERMINAL AREA DRAWING
10. AIRPORT LAND USE DRAWING
11. EXHIBIT "A" AIRPORT PROPERTY MAP
12. EXISTING/ULTIMATE DECLARED DISTANCES

NO.	REVISIONS	DATE	BY	APP'D.

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GLENDALE MUNICIPAL AIRPORT

TITLE SHEET

GLENDALE, ARIZONA

PLANNED BY: Matt R. Quick
DETAILED BY: Diana L. Przybycien
APPROVED BY: Stephen C. Wagner

APRIL 2018 SHEET 1 OF 12

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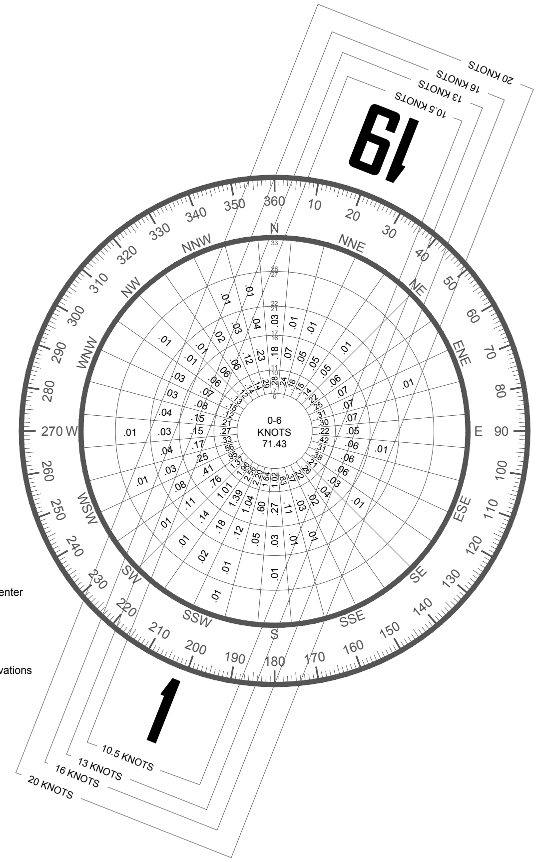
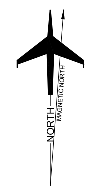
ALL WEATHER WIND COVERAGE

Runways	10.5 Knots	13 Knots	16 Knots	20 Knots
Runway 1-19	98.34%	99.12%	99.70%	99.92%





Magnetic Declination
10° 36' East (December 2015)
Annual Rate of Change
0° 5' West (December 2015)

SOURCE:
NOAA National Climatic Center
Asheville, North Carolina
Glendale Municipal Airport
Glendale, Arizona

OBSERVATIONS:
47,681 All Weather Observations
2005-2014

AIRPORT DATA

OWNER: City of Glendale CITY: Glendale, AZ COUNTY: Maricopa
NPIAS SERVICE LEVEL: Reliever STATE EQUIVALENT SERVICE ROLE: Reliever

GLENDALE MUNICIPAL AIRPORT (KGEU)		EXISTING	ULTIMATE
AIRPORT REFERENCE CODE		B-II	C-II
CRITICAL AIRCRAFT		Citation V Encore	Hawker 800
AIRPORT ELEVATION		1071.3' MSL	1070.7' MSL
MEAN MAXIMUM TEMPERATURE OF HOTTEST MONTH[1]		105.2° July	105.2° July
AIRPORT REFERENCE POINT (NAD 83)	Latitude	N 33° 31' 36.9"	N 33° 31' 36.2"
	Longitude	W 112° 17' 42.5"	W 112° 17' 42.8"
AIRPORT INSTRUMENT APPROACH PROCEDURES		GPS (1, 19)	GPS (1, 19)
AIRPORT NAVAIDS		PAPI-2 (1, 19) REIL (1, 19) Airport Beacon	PAPI-2 (1, 19) REIL (1, 19) Airport Beacon
MISCELLANEOUS FACILITIES		AWOS III Lighted Windcone/ Segmented Circle MIRL, MITL	AWOS III Lighted Windcone/ Segmented Circle MIRL, MITL

RUNWAY COORDINATES (NAD 83)

RUNWAY	LATITUDE	LONGITUDE	ELEV.
EXISTING RUNWAY 1	33° 31' 05.0154" N	112° 18' 00.7754" W	1041.4
EXISTING RUNWAY 1 DISPLACED THRESHOLD	33° 31' 11.2609" N	112° 17' 57.1864" W	1042.9
EXISTING RUNWAY 19	33° 32' 08.7476" N	112° 17' 24.1442" W	1071.3
EXISTING RUNWAY 19 DISPLACED THRESHOLD	33° 31' 59.8267" N	112° 17' 29.2726" W	1065.4
ULTIMATE RUNWAY 1	33° 31' 05.3200" N	112° 18' 00.5700" W	1041.5
ULTIMATE RUNWAY 19	33° 32' 07.1390" N	112° 17' 25.0590" W	1070.7

DECLARED DISTANCES

DECLARED DISTANCES	RUNWAY 1-19			
	EXISTING		ULTIMATE	
	1	19	1	19
TAKEOFF RUN AVAILABLE (TORA)	7150	7150	6935	6935
TAKEOFF DISTANCE AVAILABLE (TODA)	7150	7150	6935	6935
ACCELERATE STOP DISTANCE AVAILABLE (ASDA)	6980	7116	6935	6935
LANDING DISTANCE AVAILABLE (LDA)	6279	6115	6269	6115

[1] There currently are no published existing declared distances for Glendale Municipal Airport. Those identified in this table as existing are based on B-II RSA conditions.

RUNWAY DATA

RUNWAY DATA	RUNWAY 1-19			
	EXISTING		ULTIMATE	
	1	19	1	19
DESIGN AIRCRAFT	B-II-2		C-II-2	
APPROACH REFERENCE CODE (APRC)	B-II-5000		B-II-5000	
DEPARTURE REFERENCE CODE (DPRC)	B-II		B-II	
RUNWAY DESIGN CODE (RDC)	B-II-5000		C-II-5000	
PERCENT WIND COVERAGE	13 Knots		16 Knots	
14 CFR PART 77 CATEGORY	34:1	34:1	34:1	34:1
APPROACH VISIBILITY MINIMUMS	1 Mile	1 Mile	1 Mile	1 Mile
APPROACH TYPE	Nonprecision	Nonprecision	Nonprecision	Nonprecision
TYPE OF AERONAUTICAL SURVEY REQUIRED FOR APPROACH	VG	VG	VG	VG
DEPARTURE SURFACE	Yes	Yes	Yes	Yes
THRESHOLD SITING SURFACE	20:1	20:1	20:1	20:1
CRITICAL AIRCRAFT	Citation V Encore		Hawker 800	
WINGSPAN OF DESIGN AIRCRAFT	54'-1"		51'-4"	
TAIL HEIGHT OF DESIGN AIRCRAFT	15'-2"		18'-1"	
APPROACH SPEED (KNOTS) OF DESIGN AIRCRAFT	108		131	
MAXIMUM CERTIFIED TAKEOFF WEIGHT (LBS) OF DESIGN AIRCRAFT (lbs)	16830		28000	
RUNWAY DIMENSIONS	7150' x 100'		6935' x 100'	
RUNWAY BEARING (TRUE)	25.71°	205.71°	25.71°	205.71°
RUNWAY END ELEVATION (MSL)	1041.4'	1071.3'	1041.5'	1070.7'
RUNWAY THRESHOLD DISPLACEMENT	701'	1001'	666'	820'
DISPLACED THRESHOLD ELEVATION (MSL)	1042.9'	1065.4'	1042.9'	1065.4'
RUNWAY TOUCHDOWN ZONE ELEVATION (MSL)	1049.0'	1065.4'	1047.5'	1070.7'
RUNWAY HIGH POINT ELEVATION (MSL)	1071.3'		1070.7'	
RUNWAY LOW POINT ELEVATION (MSL)	1041.4'		1041.5'	
RUNWAY EFFECTIVE GRADIENT (MAXIMUM)	0.4%		0.4%	
LINE OF SIGHT REQUIREMENT MET	Yes		Yes	
RUNWAY MARKING	Nonprecision	Nonprecision	Nonprecision	Nonprecision
RUNWAY SURFACE MATERIAL	Asphalt		Asphalt	
PAVEMENT DESIGN STRENGTH (in thousand lbs.)	40 (S), 60 (DW)		40 (S), 60 (DW)	
STRENGTH BY PCN	6/F/C/X/T		6/F/C/X/T	
RUNWAY PAVEMENT SURFACE TREATMENT	None		None	
RUNWAY SAFETY AREA LENGTH BEYOND RUNWAY END (STANDARD)	300'	300'	1000'	1000'
RUNWAY SAFETY AREA LENGTH BEYOND RUNWAY END (ACTUAL)	266'	130'	300'[1]	300'[1]
RUNWAY SAFETY AREA WIDTH (STANDARD)	150'		400'	
RUNWAY OBJECT FREE AREA LENGTH BEYOND RUNWAY END (STANDARD)	300'	300'	1000'	1000'
RUNWAY OBJECT FREE AREA LENGTH BEYOND RUNWAY END (ACTUAL)	0'	83'	300'[1]	300'[1]
RUNWAY OBJECT FREE AREA WIDTH	500'		800'	
RUNWAY OBSTACLE FREE ZONE LENGTH BEYOND RUNWAY END (STANDARD)	200'	200'	200'	200'
RUNWAY OBSTACLE FREE ZONE LENGTH BEYOND RUNWAY END (ACTUAL)	0'	0'	200'	200'
RUNWAY OBSTACLE FREE ZONE WIDTH	400'		400'	
RUNWAY PROTECTION ZONE	500'x700'x1000' (1) 500'x700'x1000' (19)		500'x1010'x1700' (1) 500'x1010'x1700' (19)	
DISTANCE FROM RUNWAY CENTERLINE TO HOLD BARS AND SIGNS	200'		200' (250' Standard)	
RUNWAY MARKING	Nonprecision	Nonprecision	Nonprecision	Nonprecision
RUNWAY CL TO PARALLEL TAXIWAY CL	252.5' (240' Standard)		252.5' & 300' (300' Standard)	
RUNWAY LIGHTING	MIRL		MIRL	
TAXIWAY DESIGN GROUP	TDG2		TDG2	
TAXIWAY WIDTH	35'		35'	
TAXIWAY SURFACE MATERIAL	Asphalt		Asphalt	
TAXIWAY OBJECT FREE AREA WIDTH	131'		131'	
TAXIWAY SAFETY AREA WIDTH	79'		79'	
TAXIWAY WING TIP CLEARANCE	26'		26'	
TAXIWAY CENTERLINE TO FIXED OR MOVEABLE OBJECT	65.5'		65.5'	
TAXIWAY SHOULDER WIDTH	15'		15'	
TAXIWAY EDGE SAFETY MARGIN	7.5'		7.5'	
TAXILANE OBJECT FREE AREA WIDTH	115'		115'	
TAXILANE CENTERLINE TO FIXED OR MOVEABLE OBJECT	57.5'		57.5'	
TAXIWAY MARKING	Centerline		Centerline	
TAXIWAY LIGHTING	MITL		MITL	
RUNWAY INSTRUMENT NAVIGATIONAL AIDS	GPS (1,19)		GPS (1,19)	
RUNWAY VISUAL AIDS	Airport Beacon PAPI-2L (1, 19) REIL (1, 19) Lighted Wind Cone Segmented Circle		Airport Beacon PAPI-2L (1, 19) REIL (1, 19) Lighted Wind Cone Segmented Circle	

[1]Installation of Standard Engineering Materials Arresting System (EMAS) allows for use of 300 foot RSA and ROFA length beyond stop end of runway.

NAVAID OWNERSHIP

NAVAID	OWNER
PAPI	City of Glendale
REIL	City of Glendale
Airport Beacon	City of Glendale
Lighted Windcones	City of Glendale
Segmented Circle	City of Glendale
-	-

THRESHOLD SITING SURFACE OBJECT PENETRATIONS

NO.	OBJECT	PENETRATION	REMEDIATION
2	GLENDALE AVE	1' (ULT)	APPLY CRITERIA PER AC 150/5300-13, PG 100, PAR 4A1C, ADJUST GPA AND/OR TCH FOR CLEARANCE
28	EXISTING TW A9	13' (ULT)	TO BE CLOSED
29	ULT TW	18' (ULT)	ADD HOLD LINE OUTSIDE TSS
30	ULT TW	18' (ULT)	ADD HOLD LINE OUTSIDE TSS

LINE OF SIGHT OBSTRUCTIONS FROM ATCT

LOCATION	OBSTRUCTION	ACTION
TAXIWAY A SOUTH END	BOX HANGARS	RAISE TOWER CAB ELEVATION AND/OR RELOCATE ATCT

NON-STANDARDS TABLE

NONSTANDARD CONDITION	APPLICABLE DESIGN STANDARD	STANDARD	CURRENT	ACTION
RSA LENGTH BEYOND STOP END OF RW 1	RW DESIGN STANDARDS FOR ULTIMATE ARC C-II	300' BEYOND RUNWAY PAVEMENT ENDS	130' AND 266'	IMPLEMENT DECLARED DISTANCES, IMPROVE TO EXTENT PRACTICABLE, ADD EMAS
RSA LENGTH BEYOND STOP END OF RW 19	RW DESIGN STANDARDS FOR ULTIMATE ARC C-II	300' BEYOND RUNWAY PAVEMENT ENDS	94'-615'	IMPLEMENT DECLARED DISTANCES, IMPROVE TO EXTENT PRACTICABLE, ADD EMAS
RW CL TO PARALLEL TW CL	RW DESIGN STANDARDS FOR ULTIMATE ARC C-II	300'	252.5'	SAFETY INTENT MET, MAINTAIN OPERATIONAL AGREEMENT WITH ATCT. REQUEST MODIFICATION TO STANDARD
DISTANCE FROM RUNWAY CL TO HOLD BARS	RW DESIGN STANDARDS FOR ULTIMATE ARC C-II	250'	200'	SAFETY INTENT MET, MAINTAIN OPERATIONAL AGREEMENT WITH ATCT. REQUEST MODIFICATION TO STANDARD

NO.	REVISIONS	DATE	BY	APP'D.

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GLENDALE MUNICIPAL AIRPORT

AIRPORT DATA SHEET

GLENDALE, ARIZONA

PLANNED BY: Matt R. Quick
DETAILED BY: Diana L. Przybycien
APPROVED BY: Stephen C. Wagner

APRIL 2018 SHEET 2 OF 12

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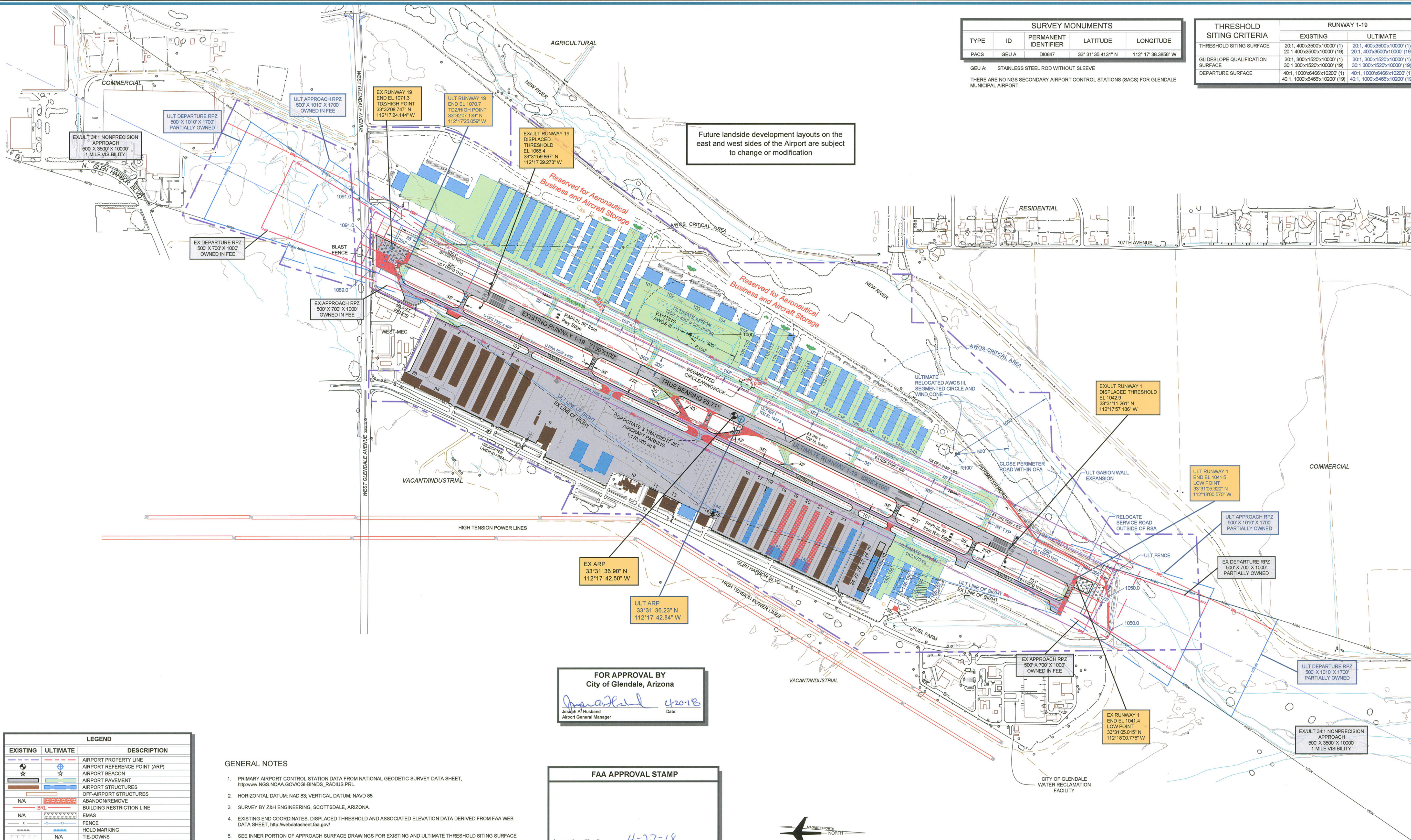

FOR APPROVAL BY
City of Glendale, Arizona

Joseph A. Husband — Airport General Manager — Date: 4-20-18

FAA APPROVAL STAMP

Approved conditionally 4-27-18

Subject to comments contained in our letter dated: 4-27-18

FEDERAL AVIATION ADMINISTRATION

Western-Pacific Region

By Holly L. Dixon — Manager / Assistant Manager – Phoenix/ADO

MAGNETIC NORTH / TRUE NORTH

Magnetic Declination
10° 36' East (December 2015)
Annual Rate of Change
0° 05' West (December 2015)

0 200 400 800
SCALE IN FEET

SURVEY MONUMENTS				
TYPE	ID	PERMANENT IDENTIFIER	LATITUDE	LONGITUDE
PACS	GEU A	DI0647	33° 31' 35.4131" N	112° 17' 38.3856" W

GEU A: STAINLESS STEEL ROD WITHOUT SLEEVE

THERE ARE NO NGS SECONDARY AIRPORT CONTROL STATIONS (SACS) FOR GLENDALE MUNICIPAL AIRPORT.

THRESHOLD SITING CRITERIA	RUNWAY 1-19	
	EXISTING	ULTIMATE
THRESHOLD SITING SURFACE	20:1, 400'x3500'x10000' (1) 20:1 400'x3500'x10000' (19)	20:1, 400'x3500'x10000' (1) 20:1, 400'x3500'x10000' (19)
GLIDESLOPE QUALIFICATION SURFACE	30:1, 300'x1520'x10000' (1) 30:1 300'x1520'x10000' (19)	30:1, 300'x1520'x10000' (1) 30:1 300'x1520'x10000' (19)
DEPARTURE SURFACE	40:1, 1000'x6466'x10200' (1) 40:1, 1000'x6466'x10200' (19)	40:1, 1000'x6466'x10200' (1) 40:1, 1000'x6466'x10200' (19)

LEGEND

EXISTING	ULTIMATE	DESCRIPTION
		AIRPORT PROPERTY LINE
		AIRPORT REFERENCE POINT (ARP)
		AIRPORT BEACON
		AIRPORT PAVEMENT
		AIRPORT STRUCTURES
		OFF-AIRPORT STRUCTURES
N/A		ABANDON/REMOVE
BRL		BUILDING RESTRICTION LINE
N/A		EMAS
X		FENCE
		HOLD MARKING
	N/A	TIE-DOWNS
GEU A		SURVEY MONUMENT WITH IDENTIFIER
		LINE OF SIGHT
OFA	OFA(U)	OBJECT FREE AREA
RSA	RSA(U)	RUNWAY SAFETY AREA
OFZ	OFZ(U)	OBSTACLE FREE ZONE
RPZ	RPZ(U)	RUNWAY PROTECTION ZONE
AS	AS(U)	APPROACH SURFACE
TOFA	TOFA	TAXIWAY OBJECT FREE AREA
TSA	TSA	TAXIWAY SAFETY AREA
		PAPI-2
		RUNWAY END IDENTIFIER LIGHTS (REILS)
		LIGHTED WINDCONE/SEGMENTED CIRCLE
		LIGHTED WINDSOCK
1030		TOPOGRAPHY
		VEGETATION

GENERAL NOTES

1. PRIMARY AIRPORT CONTROL STATION DATA FROM NATIONAL GEODETIC SURVEY DATA SHEET, http:www.NGS.NOAA.GOV/CGI-BIN/DS_RADIUS.PRL.
2. HORIZONTAL DATUM: NAD 83; VERTICAL DATUM: NAVD 88
3. SURVEY BY Z&H ENGINEERING, SCOTTSDALE, ARIZONA.
4. EXISTING END COORDINATES, DISPLACED THRESHOLD AND ASSOCIATED ELEVATION DATA DERIVED FROM FAA WEB DATA SHEET, http://webdatasheet.faa.gov/
5. SEE INNER PORTION OF APPROACH SURFACE DRAWINGS FOR EXISTING AND ULTIMATE THRESHOLD SITING SURFACE PENETRATIONS
6. SEE SHEET 9 FOR TERMINAL AREA DETAILS AND BUILDING/STRUCTURE TABLES.
7. BRL COLOCATED WITH ROFA AT 400' FROM RUNWAY CENTERLINE, RESTRICTS BUILDINGS TO 21'.
8. SHOULD A NEW STRUCTURE BE PROPOSED BETWEEN THE LINE OF SIGHT AND THE MOVEMENT AREAS, THE PROPONENT WILL BE REQUIRED TO CONDUCT A STUDY TO CONFIRM THAT NO OBSTRUCTIONS TO THE LINE OF SIGHT WILL OCCUR. SHOULD A CONSTRUCTED HANGAR BLOCK THE ATCT LOS, IT WOULD BE REMEDIED AT THE PROPONENTS EXPENSE.
9. UTIMATE RUNWAY ELEVATIONS ARE ESTIMATES AND CONTINGENT UPON DEVELOPMENT, APPROVAL, IMPLEMENTATION AND CONSTRUCTION OF AN ENGINEERED DESIGN OF THE ULTIMATE PLAN AS PROPOSED BY THIS ALP.
10. AIRPORT PERIMETER FENCING HEIGHT RANGES BETWEEN 6' TO 8' FEET.
11. A LETTER OF AGREEMENT (LOA) EFFECTIVE AUGUST 1, 2009, BETWEEN THE GLENDALE AIRPORT FAA CONTRACT TOWER (FCT) AND THE CITY OF GLENDALE, IDENTIFIES OPERATING PROCEDURES THAT ARE IN EFFECT ON TAXIWAY 'A' WHEN AIRCRAFT CLASSIFIED AS B-III OR GREATER ARE ARRIVING OR DEPARTING FROM THE GLENDALE MUNICIPAL AIRPORT. THE INTENT OF THE LOA IS TO PROVIDE AN EQUIVALENT/ACCEPTABLE LEVEL OF SAFETY ASSOCIATED WITH THE SEPARATION BETWEEN RUNWAY 1-19 AND PARALLEL TAXIWAY 'A'.

NO.	REVISIONS	DATE	BY	APP'D.

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GLENDALE MUNICIPAL AIRPORT
AIRPORT LAYOUT PLAN DRAWING
GLENDALE, ARIZONA

PLANNED BY: Matt R. Quick
DETAILED BY: Diana L. Przybycien
APPROVED BY: Stephen C. Wagner

APRIL 2018 — SHEET 3 OF 12

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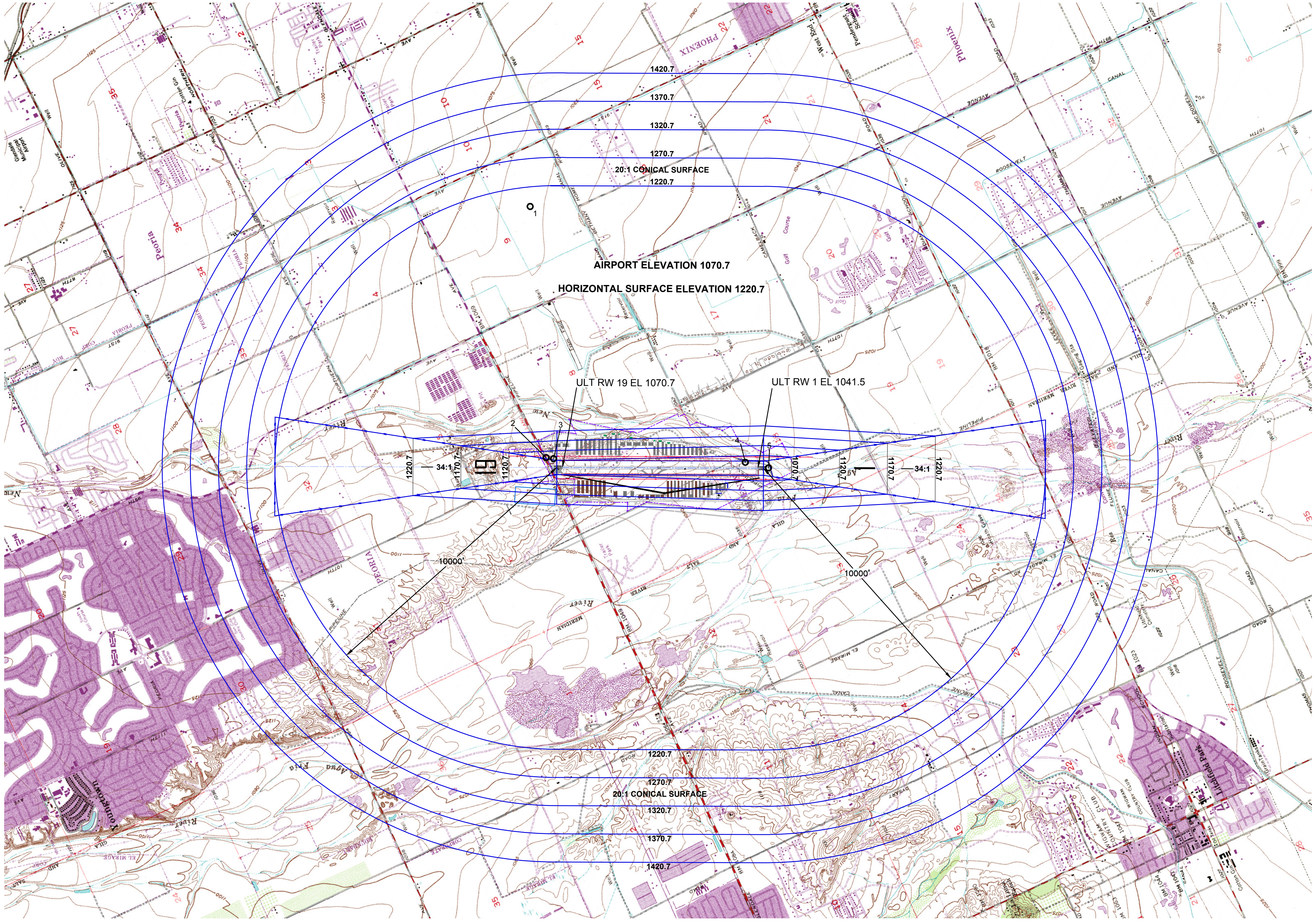
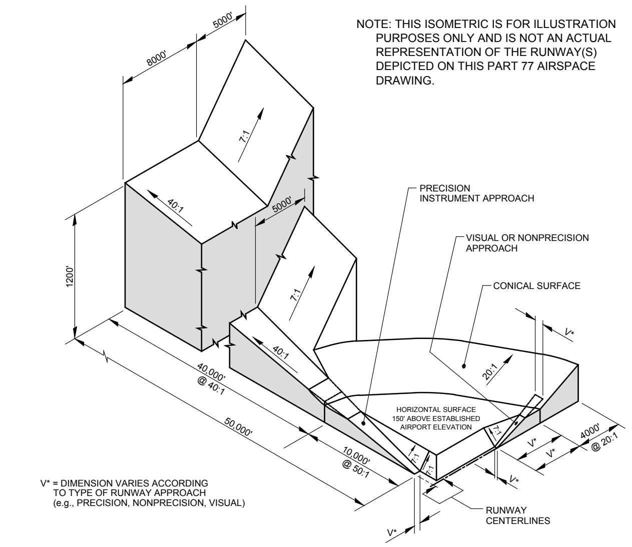


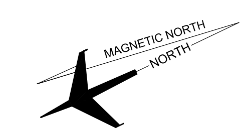


ISOMETRIC VIEW OF PART 77 SURFACES

NOT TO SCALE

GENERAL NOTES:

1. HORIZONTAL DATUM: NORTH AMERICAN DATUM 1983 - NAD83; VERTICAL DATUM: NORTH AMERICAN DATUM 1988 - NAVD88
2. OSTRUCTIONS IDENTIFIED BY COFFMAN ASSOCIATES FROM SURVEY BY Z&H ENGINEERING, SCOTTSDALE, ARIZONA, 2006; SUPPLEMENTED WITH DATA FROM THE FAA DIGITAL OBSTACLE FILE (DOF), RELEASE DATE JUNE 19, 2016.
3. ALL ELEVATIONS IN MSL FEET.
4. THE FOLLOWING USGS QUAD MAP APPLIED AS BACKGROUND: EL MIRAGE, GLENDALE, AND TOLLESON.
5. SEE THE INNER PORTION OF THE APPROACH SURFACE DRAWINGS FOR CLOSE-IN OBSTRUCTIONS.



Magnetic Declination
10° 36' East (December 2015)
Annual Rate of Change
0° 05' West (December 2015)

0 1000 2000 4000
SCALE IN FEET

OBSTRUCTION TABLE

No.	Description	Top Elevation	Obstructed PT 77 Surface	Object Penetration	Proposed Remediation	Data Source
1	University of Phoenix Stadium	1276.0	Horizontal	55.9	To Remain Lighted	FAA Digital Obstacle File
2	Light Pole	1114.0	Inner Transitional	26.7	To Remain	FAA Digital Obstacle File
3	Fence	1220.1	Inner Transitional	12.7	Add Obstruction Light	Woolpert Survey
4	Fence	1047.0	Primary	3.0	Relocate Fence out of Primary Surface	FAA Digital Obstacle File
5	Fence	1048.0	Approach	1.3	Relocate Fence	FAA Digital Obstacle File

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GLENDALE MUNICIPAL AIRPORT

AIRPORT AIRSPACE DRAWING

GLENDALE, ARIZONA

PLANNED BY: Matt R. Quick
DETAILED BY: Diana L. Przybycien
APPROVED BY: Stephen C. Wagner

APRIL 2018 SHEET 4 OF 12

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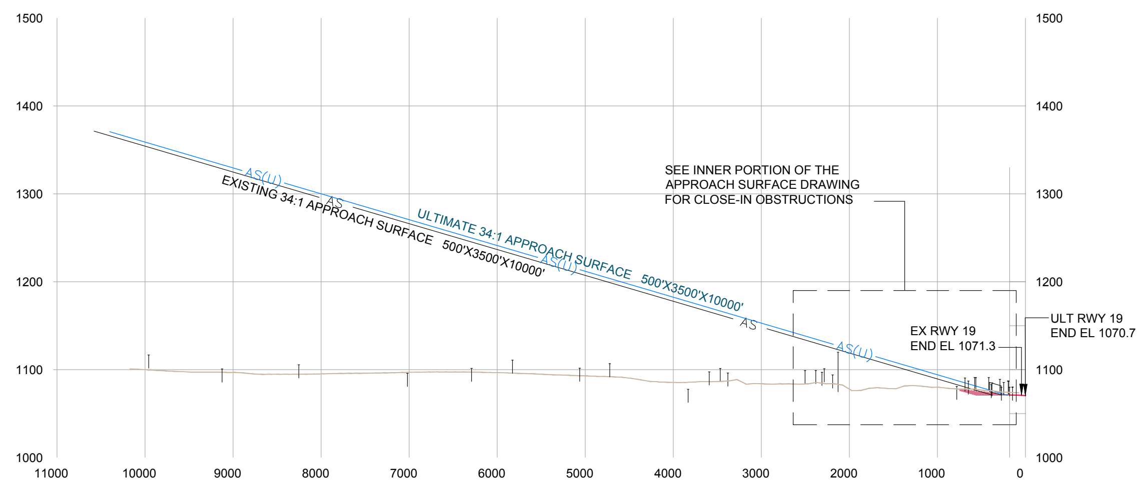
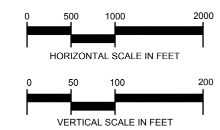
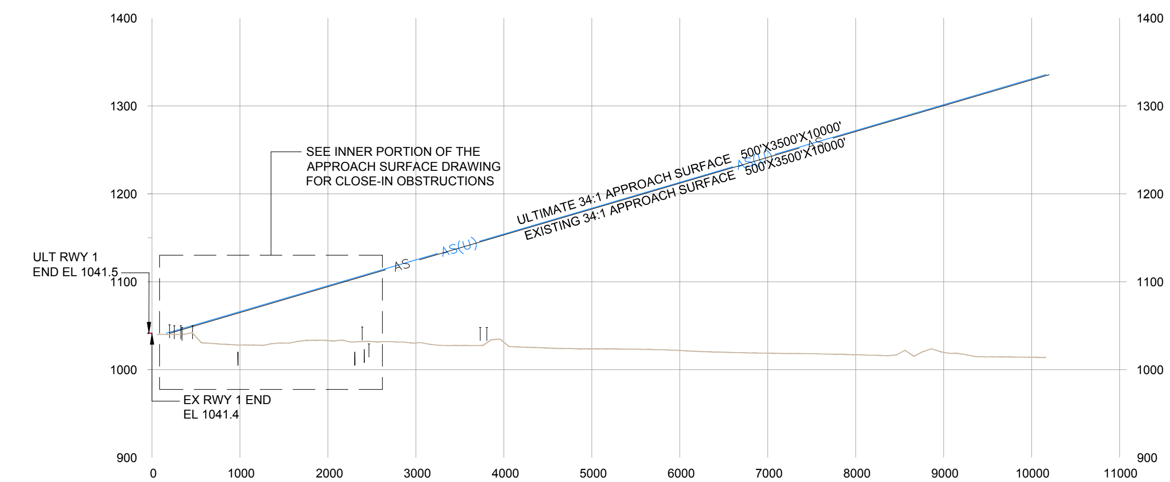


RUNWAY 19 PROFILE

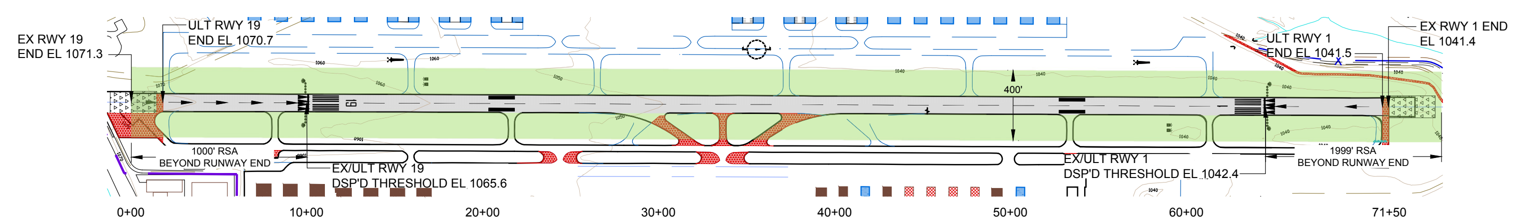




RUNWAY 1 PROFILE

EXISTING RUNWAY 19 OBSTRUCTION TABLE				
No.	Description	Top Elevation	Penetration	Proposed Remediation
	See Inner Portion of the Approach Surface Drawings for Close-In Obstructions			

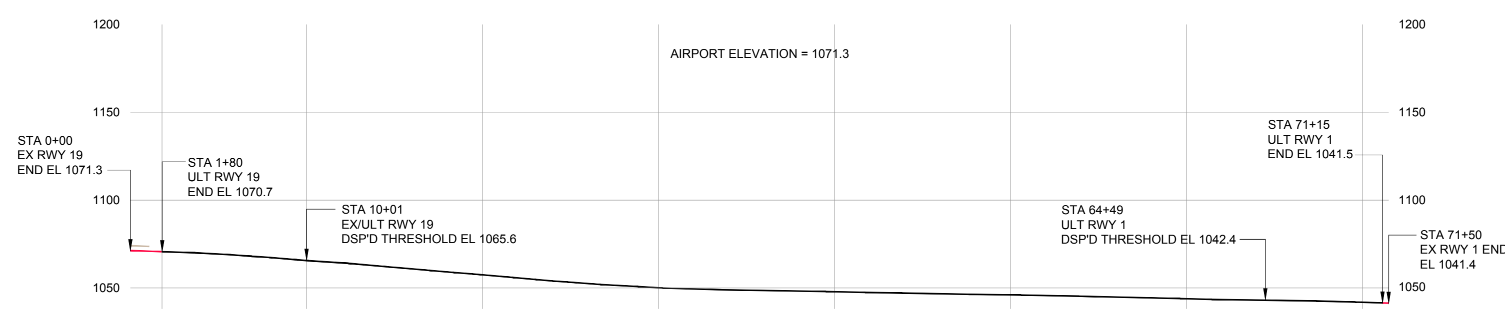
ULTIMATE RUNWAY 19 OBSTRUCTION TABLE				
No.	Description	Top Elevation	Penetration	Proposed Remediation
	See Inner Portion of the Approach Surface Drawings for Close-In Obstructions			



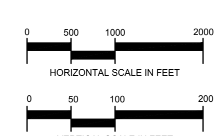
RUNWAY 1-19 RSA

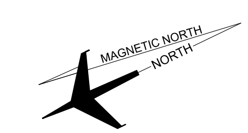
EXISTING RUNWAY 1 OBSTRUCTION TABLE				
No.	Description	Top Elevation	Penetration	Proposed Remediation
	See Inner Portion of the Approach Surface Drawings for Close-In Obstructions			

ULTIMATE RUNWAY 1 OBSTRUCTION TABLE				
No.	Description	Top Elevation	Penetration	Proposed Remediation
	See Inner Portion of the Approach Surface Drawings for Close-In Obstructions			



RUNWAY 1-19 PROFILE





Magnetic Declination
10° 36' East (December 2015)
Annual Rate of Change
0° 05' West (December 2015)

GENERAL NOTES

1. HORIZONTAL DATUM: NORTH AMERICAN DATUM 1983 - NAD83; VERTICAL DATUM: NORTH AMERICAN DATUM 1988 - NAVD88
2. OSTRUCTIONS IDENTIFIED BY COFFMAN ASSOCIATES FROM SURVEY BY Z&H ENGINEERING, SCOTTSDALE, ARIZONA, 2006; SUPPLEMENTED WITH DATA FROM THE FAA DIGITAL OBSTACLE FILE (DOF), RELEASE DATE JUNE 19, 2016.
3. ELEVATIONS ADJUSTED UPWARD 10' FOR PRIVATE ROAD, 15' FOR PUBLIC ROADWAY, 17' FOR INTERSTATE HIGHWAY, 23' FOR RAILROADS
4. ALL ELEVATIONS IN MSL FEET.

NO.	REVISIONS	DATE	BY	APP'D.

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GLENDALE MUNICIPAL AIRPORT

APPROACH PROFILE DRAWING

GLENDALE, ARIZONA

PLANNED BY: Matt R. Quick
DETAILED BY: Diana L. Przybycien
APPROVED BY: Stephen C. Wagner

APRIL 2018 SHEET 5 OF 12

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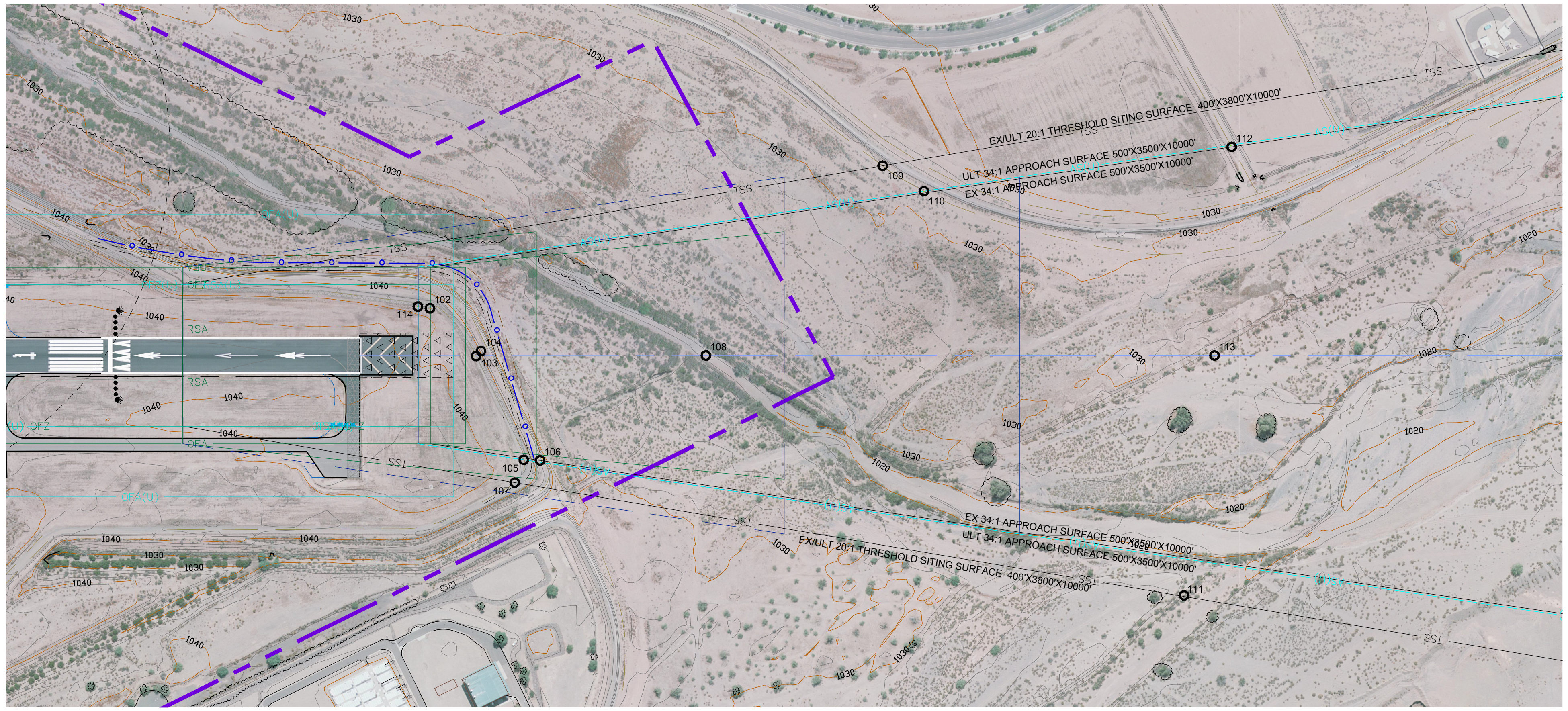


RUNWAY 1 PLAN

EXISTING RUNWAY 1 OBSTRUCTION TABLE

No.	Description	Top Elevation	Surface Penetration	Triggering Event	Proposed Remediation	Source
101	AIRPORT SVC RD	1046.7	3.7 - TSS	ALP UPDATE	CLOSE/RELOCATE ROAD	Z & H SURVEY (2006)
102	AIRPORT SVC RD	1042.7	1.2 - APPROACH	ALP UPDATE	CLOSE/RELOCATE ROAD	Z & H SURVEY (2006)
104	FENCE	1042.0	2.4 - APPROACH	ALP UPDATE	RELOCATE FENCE	Z & H SURVEY (2006)

ULTIMATE RUNWAY 1 OBSTRUCTION TABLE

No.	Description	Top Elevation	Surface Penetration	Triggering Event	Proposed Remediation	Source
101	AIRPORT SVC RD	1046.7	3.7 - TSS	ALP UPDATE/EMAS INSTALLATION	RELOCATE ROAD	Z & H SURVEY (2006)
104	FENCE	1048.0	1.3 - APPROACH	ALP UPDATE/EMAS INSTALLATION	RELOCATE FENCE	Z & H SURVEY (2006)
114	AIRPORT SVC RD	1042.2	1.2 - APPROACH	ALP UPDATE/EMAS INSTALLATION	RELOCATE ROAD	Z & H SURVEY (2006)

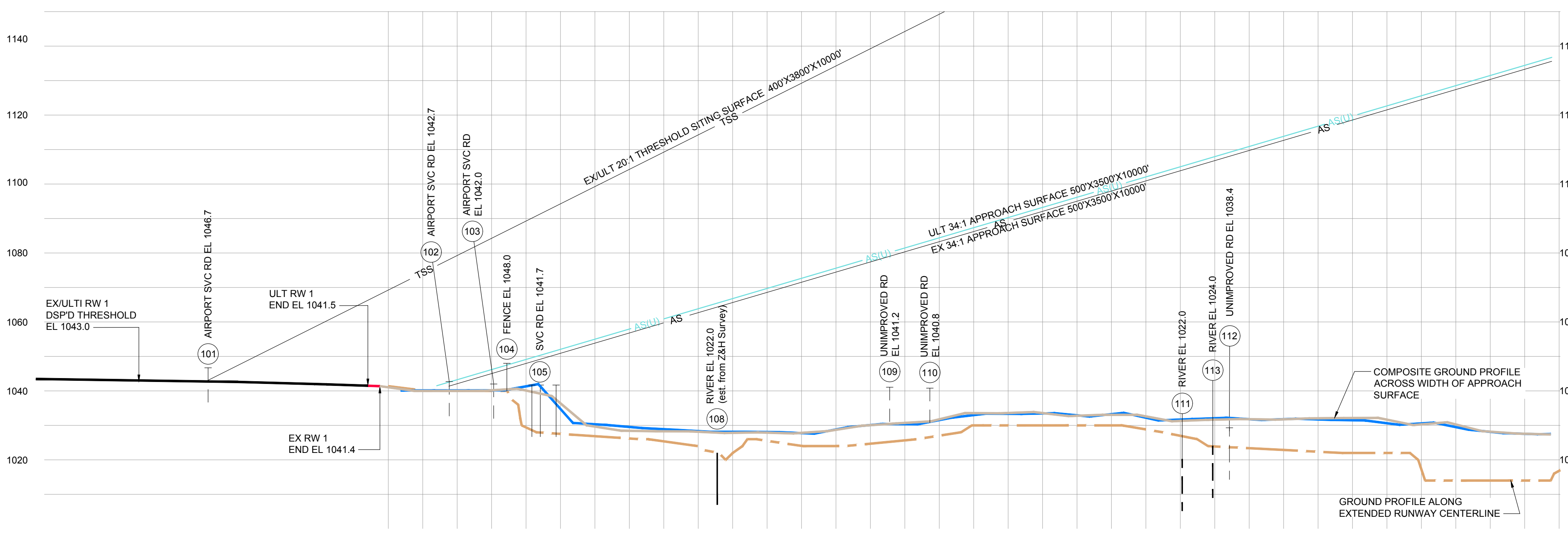
GENERAL NOTES

1. HORIZONTAL DATUM: NORTH AMERICAN DATUM 1983 - NAD83; VERTICAL DATUM: NORTH AMERICAN DATUM 1988 - NAVD88
2. OSTRUCTIONS IDENTIFIED BY COFFMAN ASSOCIATES FROM SURVEY BY Z&H ENGINEERING, SCOTTSDALE, ARIZONA, 2006; SUPPLEMENTED WITH DATA FROM THE FAA DIGITAL OBSTACLE FILE (DOF), RELEASE DATE JUNE 19, 2016.
3. WHEN APPLICABLE, ELEVATIONS ADJUSTED UPWARD 10' FOR PRIVATE ROAD, 15' FOR PUBLIC ROADWAY, 17' FOR INTERSTATE HIGHWAY, 23' FOR RAILROADS
4. ALL ELEVATIONS IN MSL FEET.
5. THRESHOLD SITING SURFACE DIMENSIONS FROM DRAFT AC 150/5300-13A CHANGE 2.

Magnetic Declination
10° 36' East (December 2015)
Annual Rate of Change
0° 05' West (December 2015)

HORIZONTAL SCALE IN FEET (0, 200, 400)

VERTICAL SCALE IN FEET (0, 20, 40)



RUNWAY 1 PROFILE

NO.	REVISIONS	DATE	BY	APP'D.

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GLENDALE MUNICIPAL AIRPORT

RUNWAY 1 INNER PORTION OF THE APPROACH SURFACE DRAWING

GLENDALE, ARIZONA

PLANNED BY: Matt R. Quick
DETAILED BY: Diana L. Przybycien
APPROVED BY: Stephen C. Wagner

APRIL 2018 SHEET 6 OF 12

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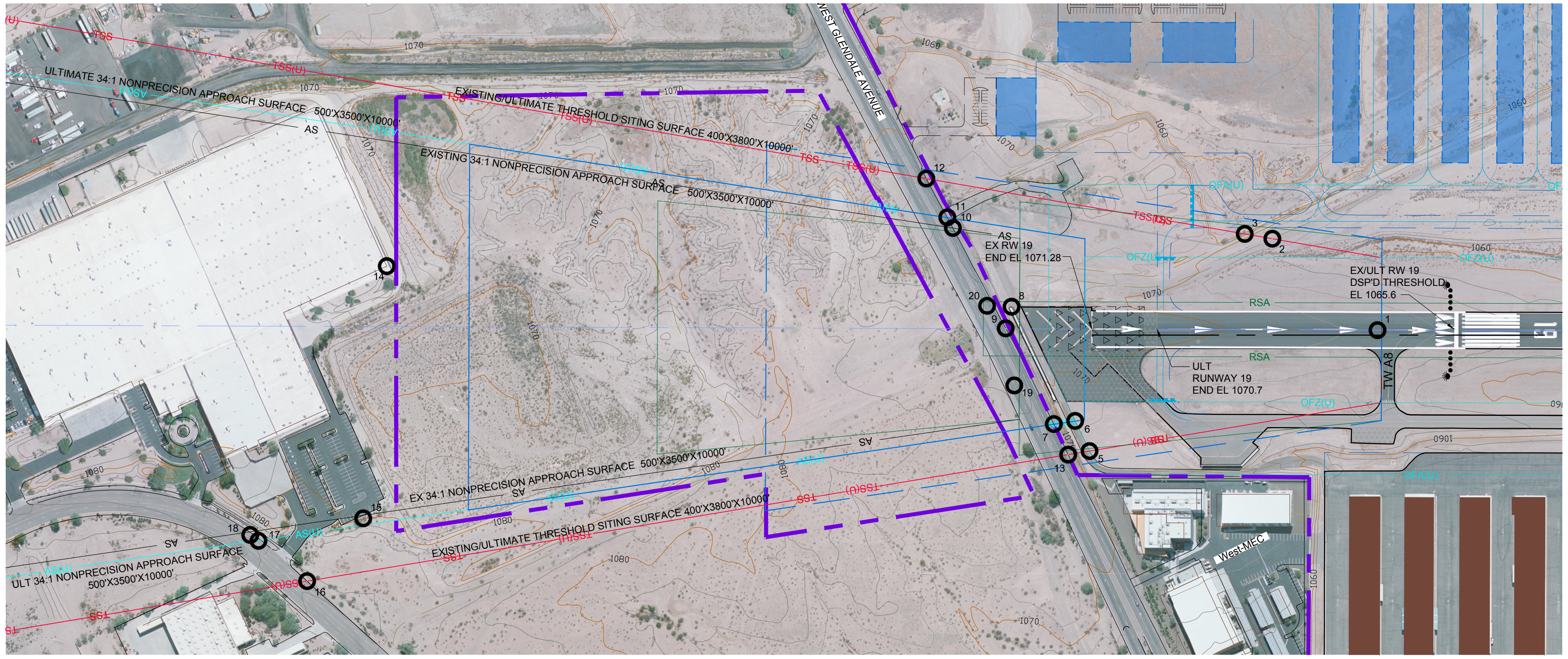

RUNWAY 19 PLAN

EXISTING RUNWAY 19 OBSTRUCTION TABLE						
No.	Description	Top Elevation	Surface Penetration	Triggering Event	Proposed Remediation	Source
1	RUNWAY	1067.2	1.3 - TSS	ALP UPDATE		Z & H SURVEY (2006)
2	AIRPORT SVC RD	1083.6	3.0 - TSS	ALP UPDATE	AIRPORT CONTROLLED ROAD NO ACTION REQUIRED	Z & H SURVEY (2006)
9	GLENDALE AVE	1092.0	19.6 - APPROACH	ALP UPDATE	CLEARS 20:1 TSS NO ACTION REQUIRED	Z & H SURVEY (2006)
10	GLENDALE AVE	1088.3	11.5 - APPROACH	ALP UPDATE	CLEARS 20:1 TSS NO ACTION REQUIRED	Z & H SURVEY (2006)

ULTIMATE RUNWAY 19 OBSTRUCTION TABLE						
No.	Description	Top Elevation	Surface Penetration	Triggering Event	Proposed Remediation	Source
1	RUNWAY	1067.2	1.3 - TSS	ALP UPDATE		Z & H SURVEY (2006)
6	SERVICE ROAD	1077.8	6.6 - APPROACH	ALPUPDATE/EMAS INSTALLATION	CLEARS 20:1 TSS NO ACTION REQUIRED	CITY OF GLENDALE AS-BUILTS
7	WEST GLENDALE AVENUE	1091.0	16.8 - APPROACH	ALPUPDATE/EMAS INSTALLATION	CLEARS 20:1 TSS NO ACTION REQUIRED	Z & H SURVEY (2006)
8	BLAST FENCE	1095.5	8.9 - APPROACH	RUNWAY SAFETY IMPROVEMENTS	TO REMAIN LIGHTED. CLEARS 20:1 TSS NO ACTION REQUIRED	CITY OF GLENDALE AS-BUILTS
9	WEST GLENDALE AVENUE	1092.0	14.9 - APPROACH	ALPUPDATE/EMAS INSTALLATION	CLEARS 20:1 TSS NO ACTION REQUIRED	Z & H SURVEY (2006)
11	WEST GLENDALE AVENUE	1087.2	5.3 - APPROACH	ALPUPDATE/EMAS INSTALLATION	CLEARS 20:1 TSS NO ACTION REQUIRED	Z & H SURVEY (2006)

GENERAL NOTES

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   VERTICAL DATUM: NORTH AMERICAN DATUM 1988 - NAVD88
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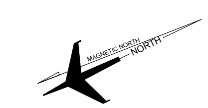
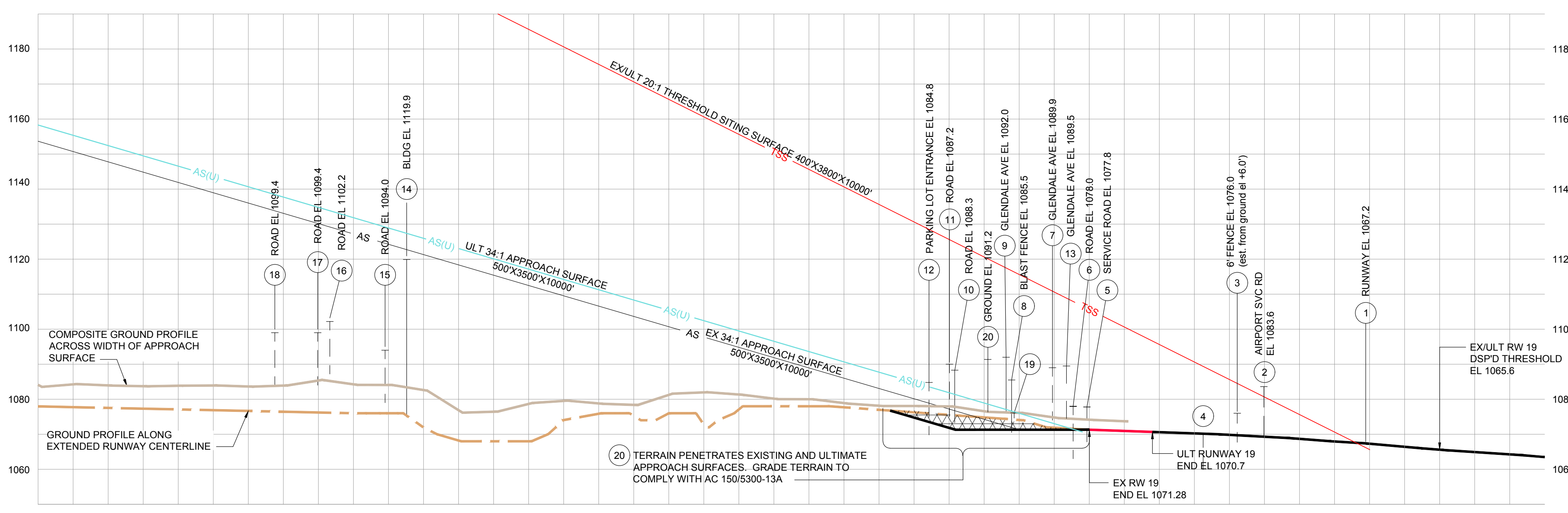
4. ALL ELEVATIONS IN MSL FEET.
5. THRESHOLD SITING SURFACE DIMENSIONS FROM DRAFT AC 150/5300-13A CHANGE 2.



Magnetic Declination
10° 36' East (December 2015)
Annual Rate of Change
0° 05' West (December 2015)

0 200 400
HORIZONTAL SCALE IN FEET

0 20 40
VERTICAL SCALE IN FEET



RUNWAY 19 PROFILE

NO.	REVISIONS	DATE	BY	APP'D.

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GLENDALE MUNICIPAL AIRPORT

RUNWAY 19 INNER PORTION OF THE APPROACH SURFACE DRAWING

GLENDALE, ARIZONA

PLANNED BY: Matt R. Quick
DETAILED BY: Diana L. Przybycien
APPROVED BY: Stephen C. Wagner

APRIL 2018 SHEET 7 OF 12

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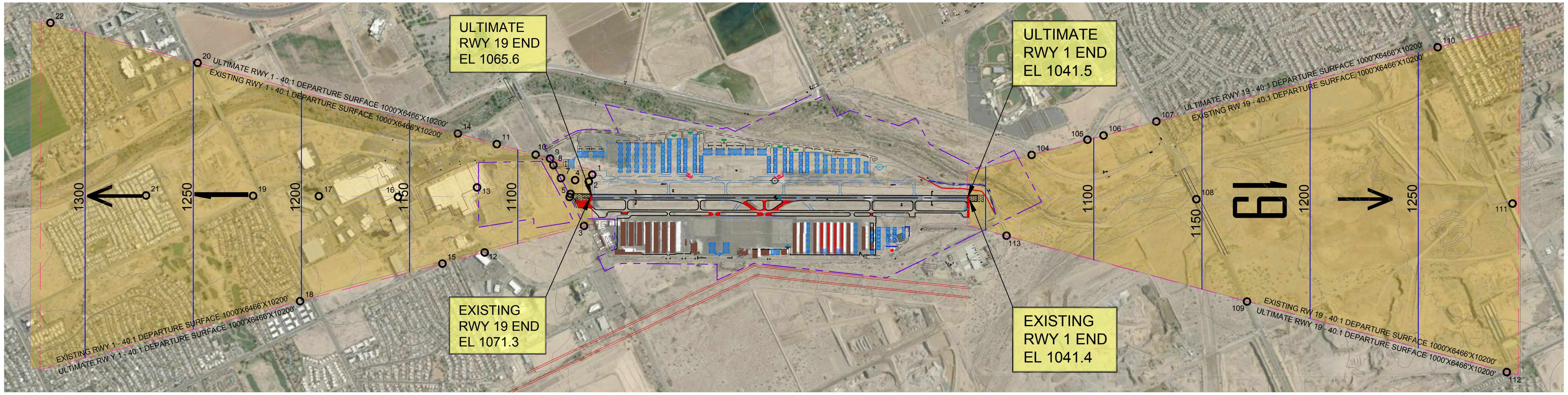
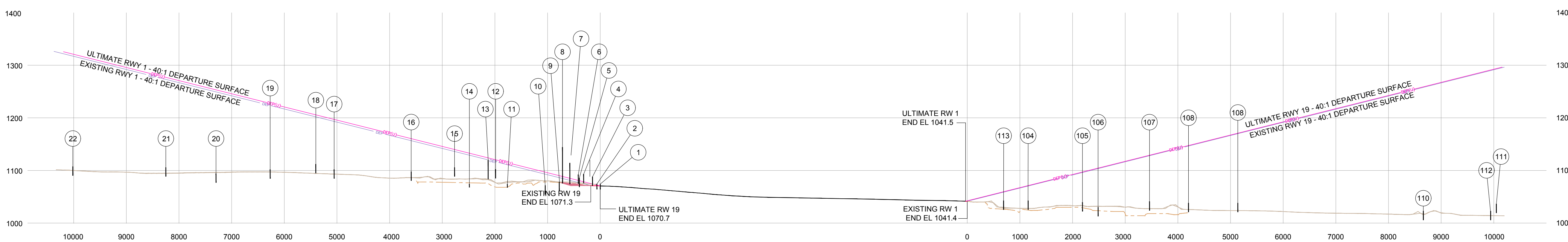


PLAN



PROFILE

RUNWAY 1 EXISTING DEPARTURE SURFACE TABLE				
No.	Description	Top Elevation	Penetration	Remediation
4	FENCE	1092.9	18.1	RELOCATE FENCE
5	BLAST FENCE	1085.0	9.2	TO REMAIN OBS LIGHTED
7	POLE	1114.0	32.7	SPECIAL DEPARTURE PROCEDURES APPLY
8	TRANSMISSION POLE	1144.0	55.8	SPECIAL DEPARTURE PROCEDURES APPLY

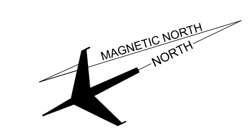
RUNWAY 19 EXISTING DEPARTURE SURFACE TABLE				
No.	Description	Top Elevation	Penetration	Remediation
	NONE			

RUNWAY 1 ULTIMATE DEPARTURE SURFACE TABLE				
No.	Description	Top Elevation	Penetration	Remediation
1	GROUND	1074.0	3.3	APPLY SPECIAL DEPARTURE PROCEDURES
2	GROUND	1074.3	2.0	APPLY SPECIAL DEPARTURE PROCEDURES
3	W. GLENDALE AVE	1087.9	13.7	APPLY SPECIAL DEPARTURE PROCEDURES
4	FENCE	1092.9	14.2	RELOCATE FENCE
5	OL ON BLAST FENCE	1085.5	5.3	APPLY SPECIAL DEPARTURE PROCEDURES
6	W. GLENDALE AVE	1092.0	10.8	APPLY SPECIAL DEPARTURE PROCEDURES
7	POLE	1114.0	28.8	APPLY SPECIAL DEPARTURE PROCEDURES
8	TRANSMISSION POLE	1144.0	55.4	APPLY SPECIAL DEPARTURE PROCEDURES

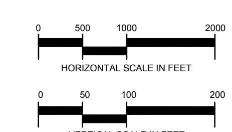
RUNWAY 19 ULTIMATE DEPARTURE SURFACE TABLE				
No.	Description	Top Elevation	Penetration	Remediation
	NONE			

GENERAL NOTES:

1. HORIZONTAL DATUM: NORTH AMERICAN DATUM 1983 - NAD83; VERTICAL DATUM: NORTH AMERICAN DATUM 1988 - NAVD88
2. OSTRUCTIONS IDENTIFIED BY COFFMAN ASSOCIATES FROM SURVEY BY Z&H ENGINEERING, SCOTTSDALE, ARIZONA, 2006; SUPPLEMENTED WITH DATA FROM THE FAA DIGITAL OBSTACLE FILE (DOF), RELEASE DATE JUNE 19, 2016.
3. GROUND CONTOURS SUPPLEMENTED WITH 5' CONTOUR DATA FROM USGS, 2013.
4. WHERE APPLICABLE, ELEVATIONS ADJUSTED UPWARD 10' FOR A PRIVATE ROAD, 15' FOR PUBLIC ROADWAY, 17' FOR INTERSTATE HIGHWAY, 23' FOR RAILROADS PER PART 77-OBJECTS AFFECTING NAVIGABLE AIRSPACE, SUBPART C, SECTION 77.23.
5. ALL ELEVATIONS IN FEET.
6. UTIMATE RUNWAY ELEVATIONS ARE ESTIMATES AND CONTINGENT UPON DEVELOPMENT, APPROVAL, IMPLEMENTATION AND CONSTRUCTION OF AN ENGINEERED DESIGN OF THE ULTIMATE PLAN AS PROPOSED BY THIS ALP.



Magnetic Declination
10° 36' East (December 2015)
Annual Rate of Change
0° 05' West (December 2015)



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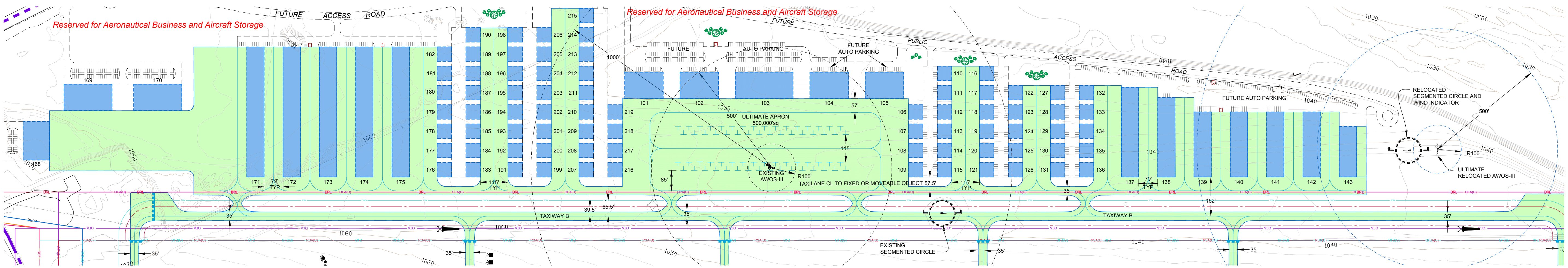
GLENDALE MUNICIPAL AIRPORT

DEPARTURE SURFACE DRAWING

GLENDALE, ARIZONA

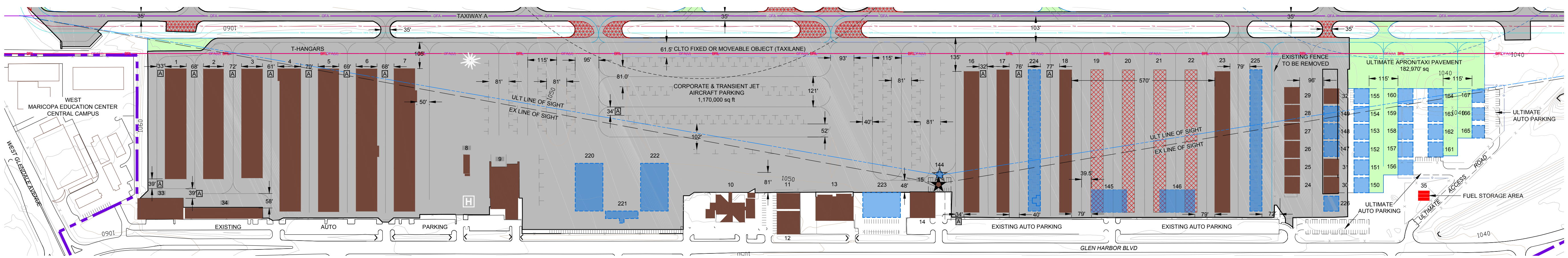
PLANNED BY: Matt R. Quick
DETAILED BY: Diana L. Przybycien
APPROVED BY: Stephen C. Wagner

APRIL 2018



EASTSIDE FACILITIES

Future landside development layouts on the east and west sides of the Airport are subject to change or modification



WESTSIDE FACILITIES

[A] SEE GENERAL NOTE 9.

EXISTING BUILDING/STRUCTURES

NO.	DESCRIPTION	MSL ELEV
1	LINEAR BOX HANGARS	1079.2'
2	LINEAR BOX HANGARS	UNKNOWN
3	LINEAR BOX HANGARS	1073.4'
4	LINEAR BOX HANGARS	1074..4'
5	LINEAR BOX HANGARS	1075.6'
6	LINEAR BOX HANGARS	1073.0'
7	LINEAR BOX HANGARS	1072.0'
8	SELF-SERVE FUEL/FUEL TRUCK PRKG	1067.9'
9	CORPORATE HANGAR	1081.8'
10	TERMINAL BUILDING/AIRPORT ADMIN	1086.5'
11	CONVENTIONAL HANGAR	UNKNOWN
12	FBO (AIR WEST)	UNKNOWN
13	CONVENTIONAL HANGAR	1080.6'
14	CONVENTIONAL HANGAR/MAINTENANCE MATERIALS/WASH RACK	1068.6'
15	ATCT/AIRPORT BEACON	1111.8'
16	T-HANGARS	1065.9'
17	T-HANGARS	1063.4'
18	T-HANGARS	1062.8'
19	SHADE HANGARS (TBR)	1061.9'
20	SHADE HANGARS (TBR)	1061.9'
21	SHADE HANGARS (TBR)	1061.9'
22	SHADE HANGARS (TBR)	1062.1'
23	T-HANGARS	1064.7'
24	BOX HANGAR	1071.6'
25	BOX HANGAR	1071.5'
26	BOX HANGAR	1071.8'
27	BOX HANGAR	1071.8'
28	BOX HANGAR	1071.8'
29	BOX HANGAR	1071.8'
30	BOX HANGAR	1071.9'
31	BOX HANGAR	1071.9'
32	BOX HANGAR	UNKNOWN
33	CONVENTIONAL HANGAR	UNKNOWN
34	T-HANGARS	1070.2'
35	FUEL FARM	UNKNOWN

PROPOSED BUILDING/STRUCTURES

NO.	DESCRIPTION	MSL ELEV
101	CONVENTIONAL HANGAR	1071.0'
102	CONVENTIONAL HANGAR	1070.0'
103	CONVENTIONAL HANGAR	1069.0'
104	CONVENTIONAL HANGAR	1068.0'
105	CONVENTIONAL HANGAR	1067.0'
106	CONVENTIONAL HANGAR	1066.0'
107	CONVENTIONAL HANGAR	1065.0'
108	CONVENTIONAL HANGAR	1064.0'
109	CONVENTIONAL HANGAR	1063.0'
110	CONVENTIONAL HANGAR	1064.0'
111	CONVENTIONAL HANGAR	1064.0'
112	CONVENTIONAL HANGAR	1064.0'
113	CONVENTIONAL HANGAR	1064.0'
114	CONVENTIONAL HANGAR	1064.0'
115	CONVENTIONAL HANGAR	1064.0'
116	CONVENTIONAL HANGAR	1063.0'
117	CONVENTIONAL HANGAR	1063.0'
118	CONVENTIONAL HANGAR	1063.0'
119	CONVENTIONAL HANGAR	1063.0'
120	CONVENTIONAL HANGAR	1063.0'
121	CONVENTIONAL HANGAR	1063.0'
122	CONVENTIONAL HANGAR	1062.0'
123	CONVENTIONAL HANGAR	1062.0'
124	CONVENTIONAL HANGAR	1062.0'
125	CONVENTIONAL HANGAR	1062.0'
126	CONVENTIONAL HANGAR	1062.0'
127	CONVENTIONAL HANGAR	1061.0'
128	CONVENTIONAL HANGAR	1061.0'
129	CONVENTIONAL HANGAR	1061.0'
130	CONVENTIONAL HANGAR	1061.0'
131	CONVENTIONAL HANGAR	1061.0'
132	CONVENTIONAL HANGAR	1061.0'
133	CONVENTIONAL HANGAR	1061.0'
134	CONVENTIONAL HANGAR	1061.0'
135	CONVENTIONAL HANGAR	1061.0'
136	CONVENTIONAL HANGAR	1061.0'

PROPOSED BUILDING/STRUCTURES

NO.	DESCRIPTION	MSL ELEV
137	T-HANGARS	1060.0'
138	T-HANGARS	1059.0'
139	T-HANGARS	1058.0'
140	T-HANGARS	1057.0'
141	T-HANGARS	1056.0'
142	T-HANGARS	1055.0'
143	T-HANGARS	1054.0'
144	ATCT/AIRPORT BEACON	1173.0'
145	CONVENTIONAL HANGAR	1082.4'
146	CONVENTIONAL HANGAR	1081.4'
147	BOX HANGAR	1071.0'
148	BOX HANGAR	1071.0'
149	BOX HANGAR	1071.0'
150	BOX HANGAR	1071.0'
151	BOX HANGAR	1071.0'
152	BOX HANGAR	1071.0'
153	BOX HANGAR	1071.0'
154	BOX HANGAR	1071.0'
155	BOX HANGAR	1071.0'
156	BOX HANGAR	1070.0'
157	BOX HANGAR	1070.0'
158	BOX HANGAR	1070.0'
159	BOX HANGAR	1070.0'
160	BOX HANGAR	1070.0'
161	BOX HANGAR	1070.0'
162	BOX HANGAR	1070.0'
163	BOX HANGAR	1070.0'
164	BOX HANGAR	1068.0'
165	BOX HANGAR	1068.0'
166	BOX HANGAR	1068.0'
167	BOX HANGAR	1068.0'
168	CONVENTIONAL HANGAR	1094.0'
169	CONVENTIONAL HANGAR	1094.0'
170	CONVENTIONAL HANGAR	1094.0'
171	T-HANGARS	1084.0'
172	T-HANGARS	1084.0'

PROPOSED BUILDING/STRUCTURES

NO.	DESCRIPTION	MSL ELEV
173	T-HANGARS	1083.0'
174	T-HANGARS	1082.0'
175	T-HANGARS	1081.0'
176	BOX HANGAR	1081.0'
177	BOX HANGAR	1081.0'
178	BOX HANGAR	1081.0'
179	BOX HANGAR	1080.0'
180	BOX HANGAR	1080.0'
181	BOX HANGAR	1079.0'
182	BOX HANGAR	1079.0'
183	BOX HANGAR	1080.0'
184	BOX HANGAR	1080.0'
185	BOX HANGAR	1079.0'
186	BOX HANGAR	1078.0'
187	BOX HANGAR	1077.0'
188	BOX HANGAR	1077.0'
189	BOX HANGAR	1077.0'
190	BOX HANGAR	1076.0'
191	BOX HANGAR	1078.0'
192	BOX HANGAR	1078.0'
193	BOX HANGAR	1078.0'
194	BOX HANGAR	1076.0'
195	BOX HANGAR	1076.0'
196	BOX HANGAR	1076.0'
197	BOX HANGAR	1075.0'
198	BOX HANGAR	1075.0'
199	BOX HANGAR	1077.0'
200	BOX HANGAR	1077.0'
201	BOX HANGAR	1077.0'
202	BOX HANGAR	1076.0'
203	BOX HANGAR	1076.0'
204	BOX HANGAR	1075.0'
205	BOX HANGAR	1075.0'
206	BOX HANGAR	1074.0'
207	BOX HANGAR	1076.0'
208	BOX HANGAR	1076.0'

GENERAL NOTES

1. PRIMARY AND SECONDARY AIRPORT CONTROL STATION DATA FROM NATIONAL GEODETIC SURVEY DATA SHEET, http:www.NGS.NOAA.GOV/CGI-BIN/DS_RADIUS.PRL.
2. HORIZONTAL DATUM: NAD 83; VERTICAL DATUM: NAVD 88
3. EXISTING END COORDINATES, DISPLACED THRESHOLD AND ASSOCIATED ELEVATION DATA DERIVED FROM FAA WEB DATASHEET, http://webdatasheet.faa.gov/
4. SEE INNER PORTION OF APPROACH SURFACE DRAWINGS FOR EXISTING AND ULTIMATE THRESHOLD SITING SURFACE PENETRATIONS
5. BRL COLOCATED WITH ROFA AT 400' FROM RUNWAY CENTERLINE, RESTRICTS BUILDINGS TO 21'.
6. SHOULD A NEW STRUCTURE BE PROPOSED BETWEEN THE LINE OF SIGHT AND THE MOVEMENT AREAS, THE PROPONENT WILL BE REQUIRED TO CONDUCT A STUDY TO CONFIRM THAT NO OBSTRUCTIONS TO THE LINE OF SIGHT WILL OCCUR. SHOULD A CONSTRUCTED HANGAR BLOCK THE ATCT LOS, IT WOULD BE REMEDIED AT THE PROPONENTS EXPENSE.
7. AIRPORT PERIMETER FENCING HEIGHT RANGES BETWEEN 6' TO 8' FEET.
8. ALL PROPOSED BUILDING ELEVATIONS ARE ESTIMATES SUBJECT TO CONSTRUCTION AND FINAL DRAINAGE AND GRADING.
9. WESTSIDE FACILITY DIMENSIONS REFERENCED WITH [A] DO NOT MEET MINIMUM FAA STANDARDS SET FORTH IN AC 150/5300-13A FOR ADG I.

PROPOSED BUILDING/STRUCTURES

NO.	DESCRIPTION	MSL ELEV
209	BOX HANGAR	1075.0'
210	BOX HANGAR	1075.0'
211	BOX HANGAR	1074.0'
212	BOX HANGAR	1074.0'
213	BOX HANGAR	1081.0'
214	BOX HANGAR	1081.0'
215	BOX HANGAR	1081.0'
216	BOX HANGAR	1075.0'
217	BOX HANGAR	1075.0'
218	BOX HANGAR	1075.0'
219	BOX HANGAR	1074.0'
220	CONVENTIONAL HANGAR	1074.0'
221	OFFICE BUILDING	1066.0'
222	CONVENTIONAL HANGAR	1074.0'
223	CONVENTIONAL HANGAR	1074.0'
224	T-HANGARS	1065.0'
225	T-HANGARS	1063.0'
226	BOX HANGAR	1071.0'

LEGEND

EXISTING	ULTIMATE	DESCRIPTION
		AIRPORT PROPERTY LINE
★	☆	AIRPORT BEACON
		AIRPORT PAVEMENT
		AIRPORT STRUCTURES
		OFF-AIRPORT STRUCTURES
N/A		ABANDON/REMOVE
BRL		BUILDING RESTRICTION LINE
		FENCE
		HOLD MARKING
	N/A	TIE-DOWNS
		LINE OF SIGHT
OFA	OFA(U)	OBJECT FREE AREA
RSA	RSA(U)	RUNWAY SAFETY AREA
OFZ	OFZ(U)	OBSTACLE FREE ZONE
TOFA	TOFA	TAXIWAY OBJECT FREE AREA
TSA	TSA	TAXIWAY SAFETY AREA
		PAPI-2
		LIGHTED WINDCONE/SEGMENTED CIRCLE
1030		INDEX CONTOUR
		VEGETATION

MAGNETIC NORTH
NORTH

Magnetic Declination
10° 36' East (December 2015)
Annual Rate of Change
0° 05' West (December 2015)

0 100 200 400
SCALE IN FEET

NO.	REVISIONS	DATE	BY	APP'D.

"THE PREPARATION OF THESE DOCUMENTS 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. THE CONTENTS DO NOT NECESSARILY REFLECT THE OFFICIAL VIEWS OR POLICY OF THE FAA. ACCEPTANCE OF THESE DOCUMENTS BY THE FAA DOES NOT IN ANY WAY CONSTITUTE A COMMITMENT ON THE PART OF THE UNITED STATES TO PARTICIPATE IN ANY DEVELOPMENT DEPICTED HEREIN NOR DOES IT INDICATE THAT THE PROPOSED DEVELOPMENT IS ENVIRONMENTALLY ACCEPTABLE IN ACCORDANCE WITH APPROPRIATE PUBLIC LAWS."

GLENDALE MUNICIPAL AIRPORT

TERMINAL AREA DRAWING

GLENDALE, ARIZONA

PLANNED BY: Matt R. Quick
DETAILED BY: Diana L. Przybycien
APPROVED BY: Stephen C. Wagner

APRIL 2018

SHEET 9 OF 12

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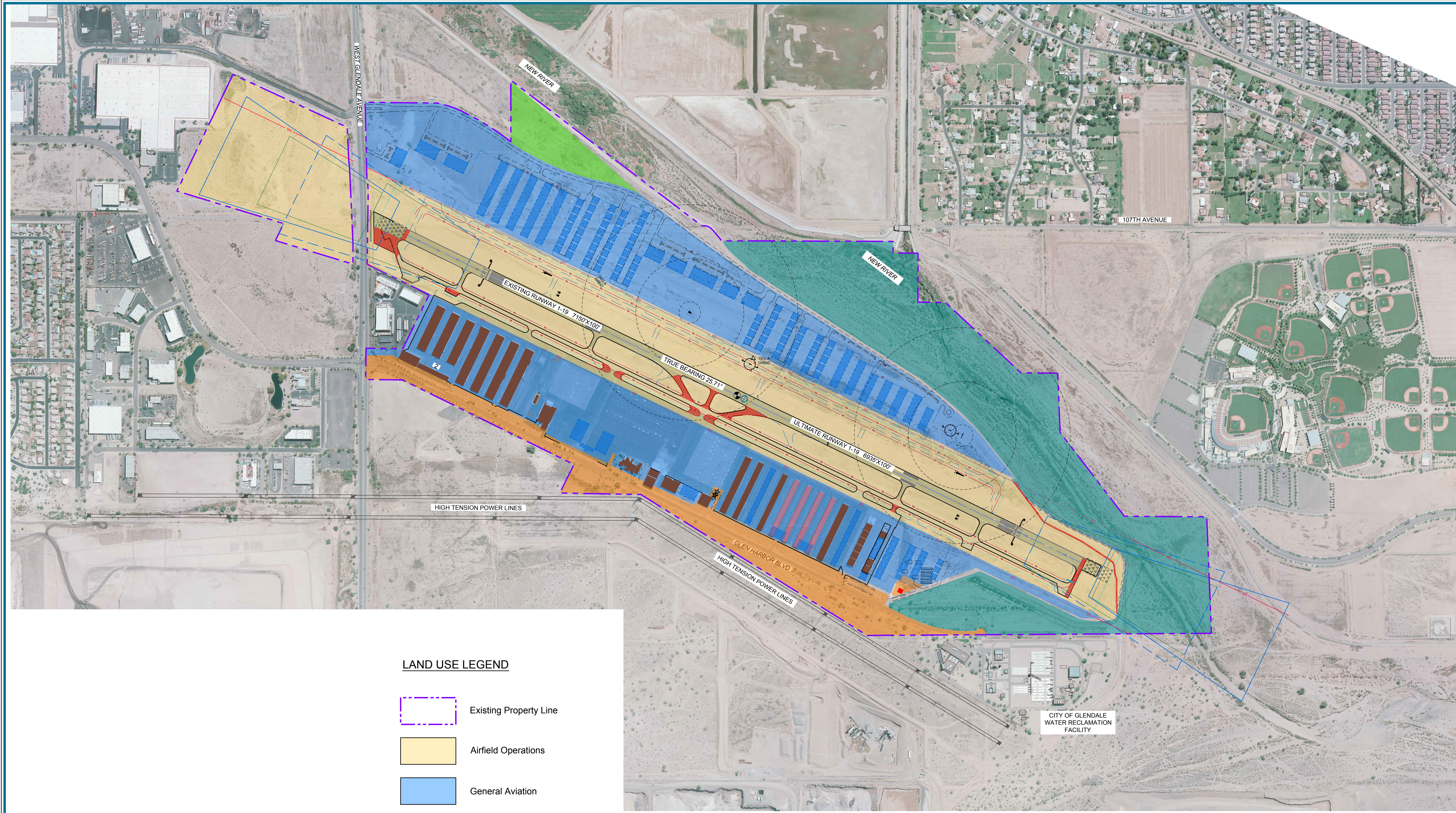

LAND USE LEGEND

- Existing Property Line
- Airfield Operations
- General Aviation
- Airport Support
- Revenue Support
- Drainage Control

Magnetic Declination
10° 36' East (December 2015)
Annual Rate of Change
0° 05' West (December 2015)

0 200 400 800
SCALE IN FEET

NO.	REVISIONS	DATE	BY	APP'D.

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GLENDALE MUNICIPAL AIRPORT

AIRPORT LAND USE DRAWING

GLENDALE, ARIZONA

PLANNED BY: Matt R. Quick
DETAILED BY: Diana L. Przybycien
APPROVED BY: Stephen C. Wagner

APRIL 2018 | SHEET 10 OF 12

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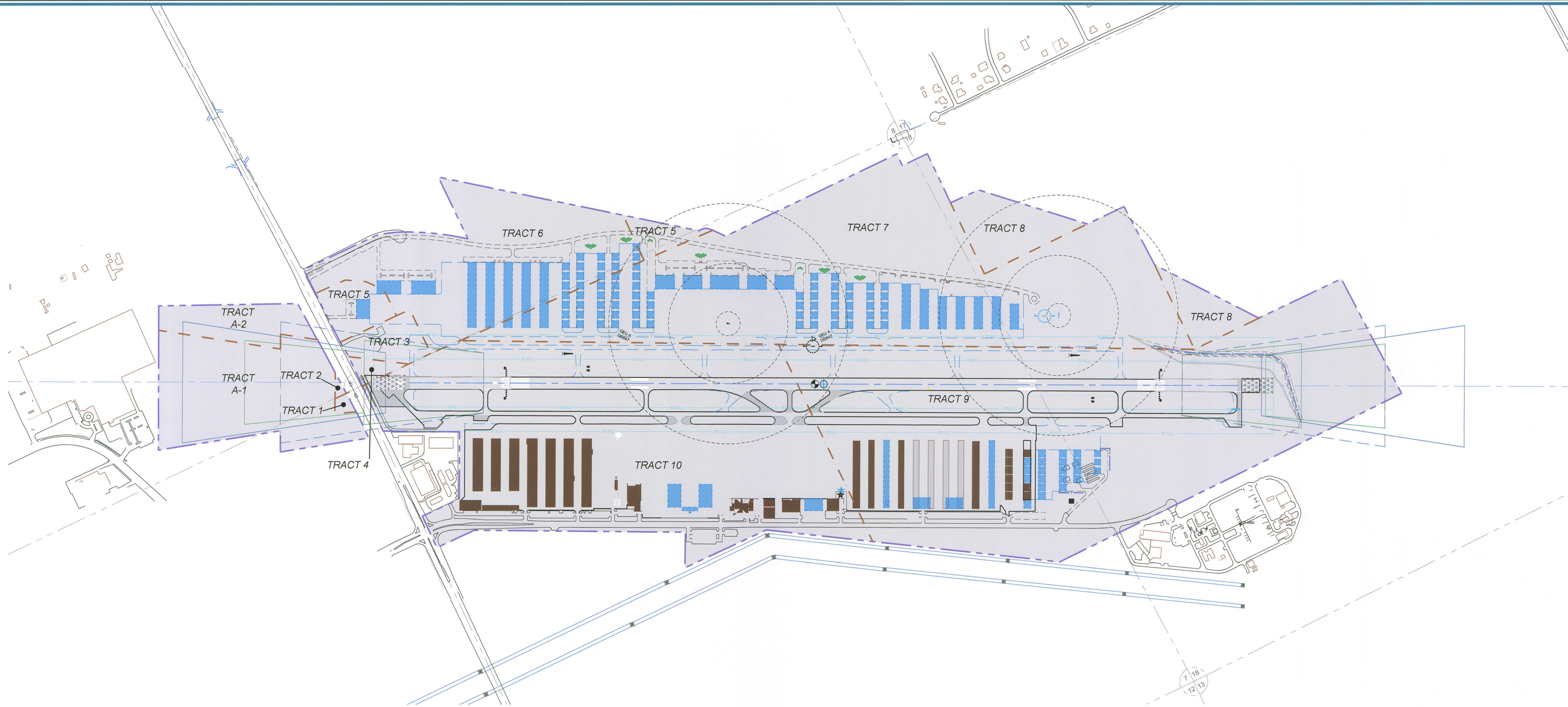

FOR APPROVAL BY
City of Glendale, Arizona

Joseph A. Husband
Airport General Manager

Date: 4-20-18

Magnetic Declination
10° 36' East (December 2015)
Annual Rate of Change
0° 05' West (December 2015)

0 200 400 800
SCALE IN FEET

EXISTING PROPERTY DATA									
TRACT	PARCEL NUMBER	ACREAGE	DATE RECORDED	TYPE OF INTEREST	DEED NUMBER	GRANTOR	FAA GRANT NUMBER	ADOT GRANT NUMBER	REMARKS
1	142-75-005-F	0.36±	10/15/1984	Donation	840448062	City of Glendale	N/A	N/A	Special Warranty Deed
2	142-58-003-G	0.27±	10/15/1984	Donation	840448063	City of Glendale	N/A	N/A	Special Warranty Deed
3	102-60-003-K,M,P&T	4.64±	04/26/2007	FEE	070507933	Rivera, et al	FAA #17	ADOT E6F64	Condemnation; FAA Grant
4	102-60-003-Q	1.20±	07/09/1984	FEE	840297785	Rivera, et al	FAA #5	N/A	Condemnation; FAA Grant
5	102-60-003-S 102-60-021 102-60-023	7.32±	07/22/1999	FEE	990691439	Rivera, et al	FAA #10	ADOT N830	Condemnation; FAA Grant
6	102-60-003-Q	41.62±	02/23/1999	FEE	030747223	Rivera, et al	FAA #10	ADOT N830	Condemnation; FAA Grant
7	102-59-001-V&U 102-59-008-P&F	155.20±	07/09/1984	Donation	840296588	John F. Long	N/A	N/A	Donated; Warrenty Deed
8	102-59-009-B 102-59-010-J&K	18.76±	04/15/1987	FEE	870120453	George E. Carter, et al	FAA #8	ADOT E0154	Condemnation; FAA Grant
9	102-59-008-N&Y	160.87±	12/29/1983	FEE	830522846	John F. Long	FAA #1	N/A	Warrenty Deed; FAA & ADOT Grant
10	102-59-001-W	124.24±	12/29/1983	Donation	830522847	John F. Long	N/A	N/A	Warrenty Deed
A-1	142-59-002-D	30.34±	05/29/2012	FEE	120461500	Conair Corporation, et al	N/A-Future	N/A-Future	
A-2	142-59-002-D	8.20±	05/29/2012	FEE	120461500	Conair Corporation, et al	N/A-Future	N/A-Future	
Total Acreage		553.02±							

Note: The total acreage shown in the table is the cumulative sum of the above described parcels, whose individual acreages were obtained from legal description and other legal documents by Maricopa County Arizona

PROPERTY LEGEND

- Existing Property Line
- Existing Airport Property
- Parcel Boundary
- Survey Monument
- Object Free Area (OFA)
- Runway Safety Area (RSA)

GENERAL NOTES

1. PRIMARY AIRPORT CONTROL STATION DATA FROM NATIONAL GEODETIC SURVEY DATA SHEET, http:www.NGS.NOAA.GOV/CGI-BIN/DS_RADIUS.PRL.
2. HORIZONTAL DATUM: NAD 83; VERTICAL DATUM: NAVD 88
3. CONSULTANT HAS MADE EVERY EFFORT TO RECONCILE PROPERTY DESCRIPTIONS AND INFORMATION. PREVIOUS EXHIBIT A AND THE MARICOPA COUNTY ASSESSORS & GIS SYSTEMS HAVE BEEN USED TO VERIFY RECORDS DEPICTED IN THE EXHIBIT. CONSULTANT RECOMMENDS A BOUNDARY SURVEY BE COMPLETED FOR THE MOST ACCURATE PARCEL DESCRIPTIONS.

NO.	REVISIONS	DATE	BY	APP'D.
4	ALP Update	07/2016	DH	SW
3	UPDATE BUILDINGS & PARKING BY Z & H ENGINEERING	06/01/2001	---	---
2	ALP REVALIDATED BY THE FAA	05/28/1996	---	---
1	ALP APPROVED & SIGNED BY THE FAA	02/03/1995	---	---

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GLENDALE MUNICIPAL AIRPORT
EXHIBIT "A"
AIRPORT PROPERTY MAP
GLENDALE, ARIZONA

PLANNED BY: Matt R. Quick
DETAILED BY: Maggie J. Beaver / Diana L. Przybycien
APPROVED BY: Stephen C. Wagner

APRIL 2018 | SHEET 11 OF 12

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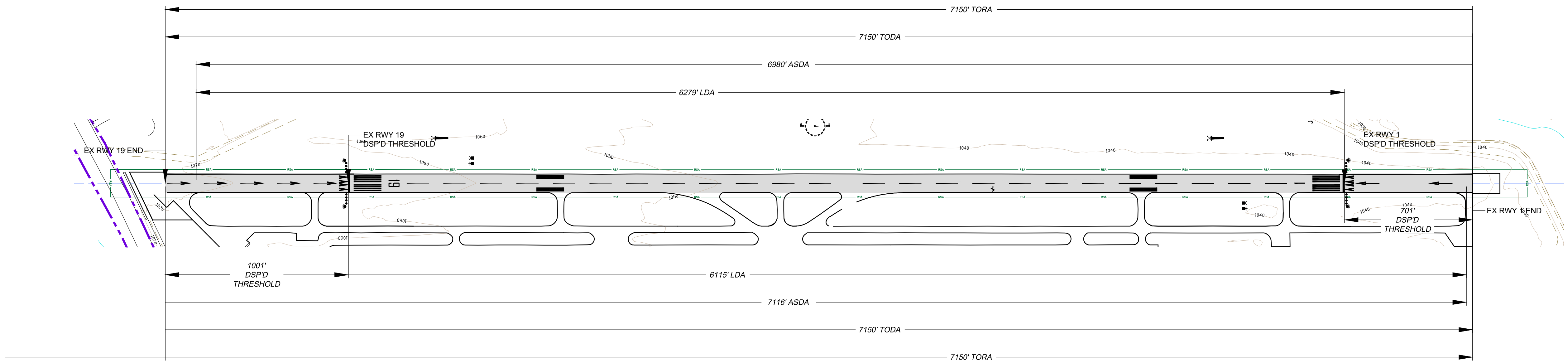
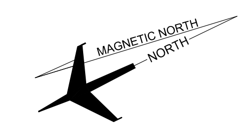
EXISTING RUNWAY 1 TAKE OFF/LANDING DIRECTION
1" = 300'



EXISTING RUNWAY 19 TAKE OFF/LANDING DIRECTION
1" = 300'

DECLARED DISTANCES	RUNWAY 1-19			
	EXISTING		ULTIMATE	
	1	19	1	19
TAKEOFF RUN AVAILABLE (TORA)	7150	7150	6935	6935
TAKEOFF DISTANCE AVAILABLE (TODA)	7150	7150	6935	6935
ACCELERATE STOP DISTANCE AVAILABLE (ASDA)	6980	7116	6935	6935
LANDING DISTANCE AVAILABLE (LDA)	6279	6115	6269	6115

[1] There currently are no published existing declared distances for Glendale Municipal Airport. Those identified in this table as existing are based on B-II RSA conditions.



Magnetic Declination
10° 36' East (December 2015)
Annual Rate of Change
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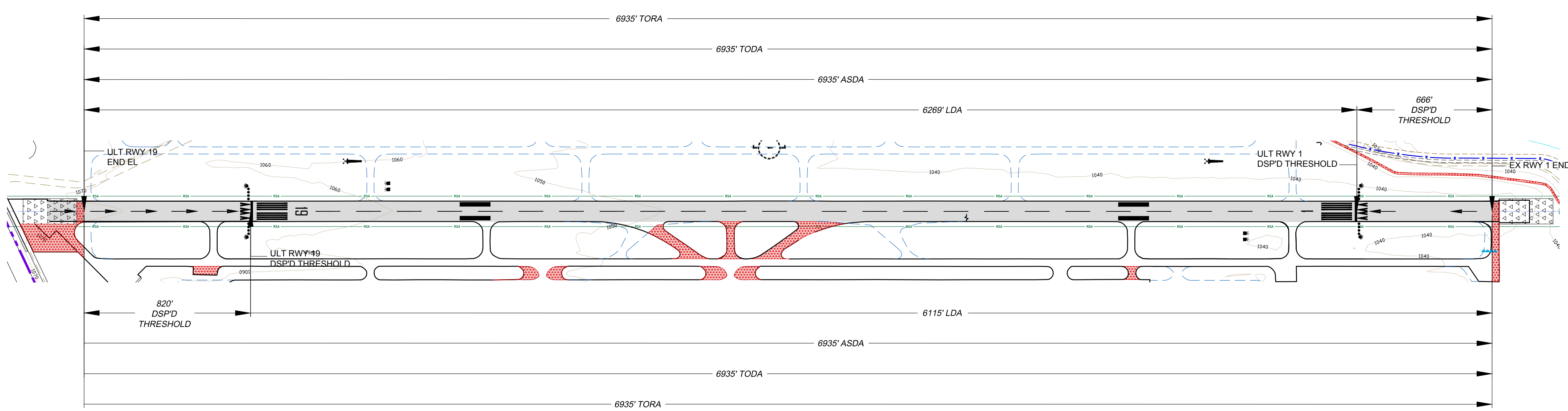
ULTIMATE RUNWAY 1 TAKE OFF/LANDING DIRECTION
1" = 300'



ULTIMATE RUNWAY 19 TAKE OFF/LANDING DIRECTION
1" = 300'

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GLENDALE MUNICIPAL AIRPORT

DECLARED DISTANCE DRAWING

GLENDALE, ARIZONA

PLANNED BY: Matt R. Quick
DETAILED BY: Diana L. Przybycien
APPROVED BY: Stephen C. Wagner

APRIL 2018

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KANSAS CITY
(816) 524-3500

237 N.W. Blue Parkway
Suite 100
Lee's Summit, MO 64063

PHOENIX
(602) 993-6999

4835 E. Cactus Road
Suite 235
Scottsdale, AZ 85254