PHOENIX

GOODYEAR AIRPORT

AIRPORT MASTER PLAN

AIRPORT MASTER PLAN

for

PHOENIX GOODYEAR AIRPORT
Goodyear, Arizona

Prepared for the

CITY OF PHOENIX

by

Coffman Associates, Inc.

(Final Printing November 2007)

Approved by the Phoenix City Council June 6, 2007
Recommendation to approve from the Goodyear City Council May 29, 2007

ACKNOWLEDGEMENTS

The City of Phoenix Aviation Department would like to acknowledge the time and effort put forth by the members of the Planning Advisory Committee. This group of individuals represented a broad array of airport stakeholders and their input into the planning process is greatly appreciated.

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ACKNOWLEDGEMENTS

The City of Phoenix Aviation Department would like to acknowledge the efforts of the City of Goodyear City Council, the City of Phoenix City Council, and the Phoenix Aviation Advisory Board. Several members of each of these groups were active participants in the master planning process and each of these groups gave thoughtful consideration to the airport master plan.

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INTRODUCTION

Introduction

The Phoenix Goodyear Airport (GYR) Master Plan Study has been undertaken to evaluate the airport's capabilities and role, to forecast future aviation demand, and to plan for the timely development of new or expanded facilities that may be required to meet that demand. The ultimate goal of the master plan is to provide systematic guidelines for the airport's overall maintenance, development, and operation.

The master plan is intended to be a proactive document which identifies and then plans for future facility needs well in advance of the actual need for the facilities. This is done to ensure that the City of Phoenix Aviation Department can coordinate project approvals, design, financing, and construction to avoid experiencing detrimental effects due to inadequate facilities.

An important result of the master plan is reserving sufficient areas for future facility needs. This protects development areas and ensures they will be readily available when required to meet future needs. The intended result is a detailed land use concept which outlines specific uses for all areas of airport property.

The preparation of this master plan is evidence that the City of Phoenix recognizes the importance of air transportation to the community and the associated challenges inherent in providing for its unique operating and improvement needs. The cost of maintaining an airport is an investment which yields impressive benefits to the

community and the region. With a sound and realistic master plan, Phoenix Goodyear Airport can maintain its role as an important link to the national air transportation system for the community and maintain the existing public and private investments in its facilities.

MASTER PLAN OBJECTIVES

The primary objective of the master plan is to provide the community and public officials with guidance for future development in a manner that will satisfy aviation demands and be wholly compatible with the environment. The accomplishment of this objective requires the evaluation of the existing airport and determination of what actions should be taken to maintain an adequate, safe, and reliable airport facility to meet the general aviation needs of the area. This master plan will provide an outline of necessary development and give those responsible advance notice of future airport funding needs so that appropriate steps can be taken to ensure that adequate funds are budgeted and planned.

Specific objectives of the Phoenix Goodyear Airport Master Plan are:

& To preserve and protect public and private investments in existing airport facilities;

& To enhance the safety of aircraft operations;

& To be reflective of community and regional goals, needs, and plans;

& To ensure that future development is environmentally compatible;

& To establish a schedule of development priorities and a program to meet the needs of the proposed improvements in the master plan;

& To develop a plan that is responsive to air transportation demands;

& To develop an orderly plan for use of the airport;

& To coordinate this master plan with local, regional, state, and federal agencies, and;

& To develop active and productive public involvement throughout the planning process.

The master plan will accomplish these objectives by carrying out the following:

& Determining projected needs of airport users through the year 2025;

& Identifying existing and future facility needs;

& Evaluating future airport facility development alternatives which will optimize airport capacity and aircraft safety; and

% Developing a realistic, common-sense plan for the use and/or expansion of the airport.

MASTER PLAN ELEMENTS AND PROCESS

The Phoenix Goodyear Airport Master Plan is being prepared in a systematic fashion following FAA guidelines and industry-accepted principles and practices. The master plan for Phoenix Goodyear Airport has six chapters that are intended to assist in the discovery of future facility needs and provide the supporting rationale for their implementation.

Chapter One - Inventory summarizes the inventory efforts. The inventory efforts are focused on collecting and assembling relevant data pertaining to the airport and the area it serves. Information is collected on existing airport facilities and operations. Local economic and demographic data is collected to define the local growth trends. Planning studies which may have relevance to the master plan are also collected.

Chapter Two - Forecasts examines the potential demand for aviation activity at the airport. This analysis utilizes local socioeconomic information, as well as national air transportation trends to quantify the levels of aviation activity which can reasonably be expected to occur at Phoenix Goodyear Airport through the year 2025. The results of this effort are used to determine the types and sizes of facilities which will be required to meet the projected aviation demands on the airport through the planning period.

Chapter Three - Facility Requirements comprises the demand capacity and facility requirements analyses. The intent of this analysis is to compare the existing facility capacities to forecast aviation demand and determine where deficiencies in capacities (as well as excess capacities) may exist. Where deficiencies are identified, the size and type of new facilities to accommodate the demand are identified. The airfield analysis focuses on improvements needed to serve the type of aircraft expected to operate at the airport in the future, as well as navigational aids to increase the safety and efficiency of operations. This element also examines the general aviation terminal, hangar, apron, and support needs.

Chapter Four - Alternatives considers a variety of solutions to accommodate the projected facility needs. This element proposes various facility and site plan configurations which can meet the projected facility needs. An analysis is completed to identify the strengths and weaknesses of each proposed development alternative, with the intention of determining a single direction for development.

Chapter Five - Airport Plans provides both a graphic and narrative description of the recommended plan for the use, development, and operation of the airport. An environmental overview is also provided. The master plan also includes the official Airport Layout Plan (ALP) and detailed technical drawings depicting related air-

space, land use, and property data. These drawings are used by the Federal Aviation Administration (FAA) in determining grant eligibility and funding.

Chapter Six - Financial Plan focuses on the capital needs program which defines the schedules, costs, and funding sources for the recommended development projects.

COORDINATION

The Phoenix Goodyear Airport Master Plan is of interest to many within the local community. This includes local citizens, community organizations, airport users, airport tenants, area-wide planning agencies, and aviation organizations. As an important component of the regional, state, and national aviation systems, the Phoenix Goodyear Airport Master Plan is of importance to both state and federal agencies responsible for overseeing air transportation.

To assist in the development of the master plan, the City of Phoenix identified a group of community members and aviation interest groups to act in an advisory role in the development of the master plan. Members of the Planning Advisory Committee (PAC) reviewed phase reports and provided comments throughout the study to help ensure that a realistic, viable plan was developed. The list of committee members is included at the beginning of this volume.

To assist in the review process, draft working papers were prepared at various milestones in the planning process. The working paper process allowed for timely input and review during each step within the master plan to ensure that all master plan issues were fully addressed as the recommended program developed.

A series of public information workshops were held as part of the plan coordination. The public information workshops were designed to allow any and all interested persons to become informed and provide input concerning the master plan. Notices of meeting times and locations were advertised through the media as well as local neighborhood associations. The draft working papers were also made available to the public online at www.goodyearairport.com.

Chapter One

INVENTORY

Inventory

The initial step in the preparation of an updated master plan for Phoenix Goodyear Airport (GYR) is the assembly of information pertaining to existing conditions at the airport and the local area. This information will provide a foundation for subsequent analysis throughout the study. Therefore, it is essential that a complete inventory is conducted since the findings and assumptions made later in this study are dependent on information that is initially collected.

The inventory includes an examination of the existing airport facilities, air traffic activity, area airspace, and air traffic control. In addition, general information regarding the Goodyear region is presented. This includes information regarding the airport's role in the regional and national aviation system, local climatology, and socioeconomic profile.

The information in this chapter was obtained from several sources, including on-site inspections, interviews with City staff and airport tenants, airport records, related studies, the Federal Aviation Administration (FAA), and a number of internet sites. A complete listing of the data sources is provided at the end of this chapter.

AIRPORT SETTING

Phoenix Goodyear Airport is located in the west valley of the Phoenix metropolitan area within the corporate limits of the City of Goodyear, Arizona. As shown on **Exhibit 1A**, the City of

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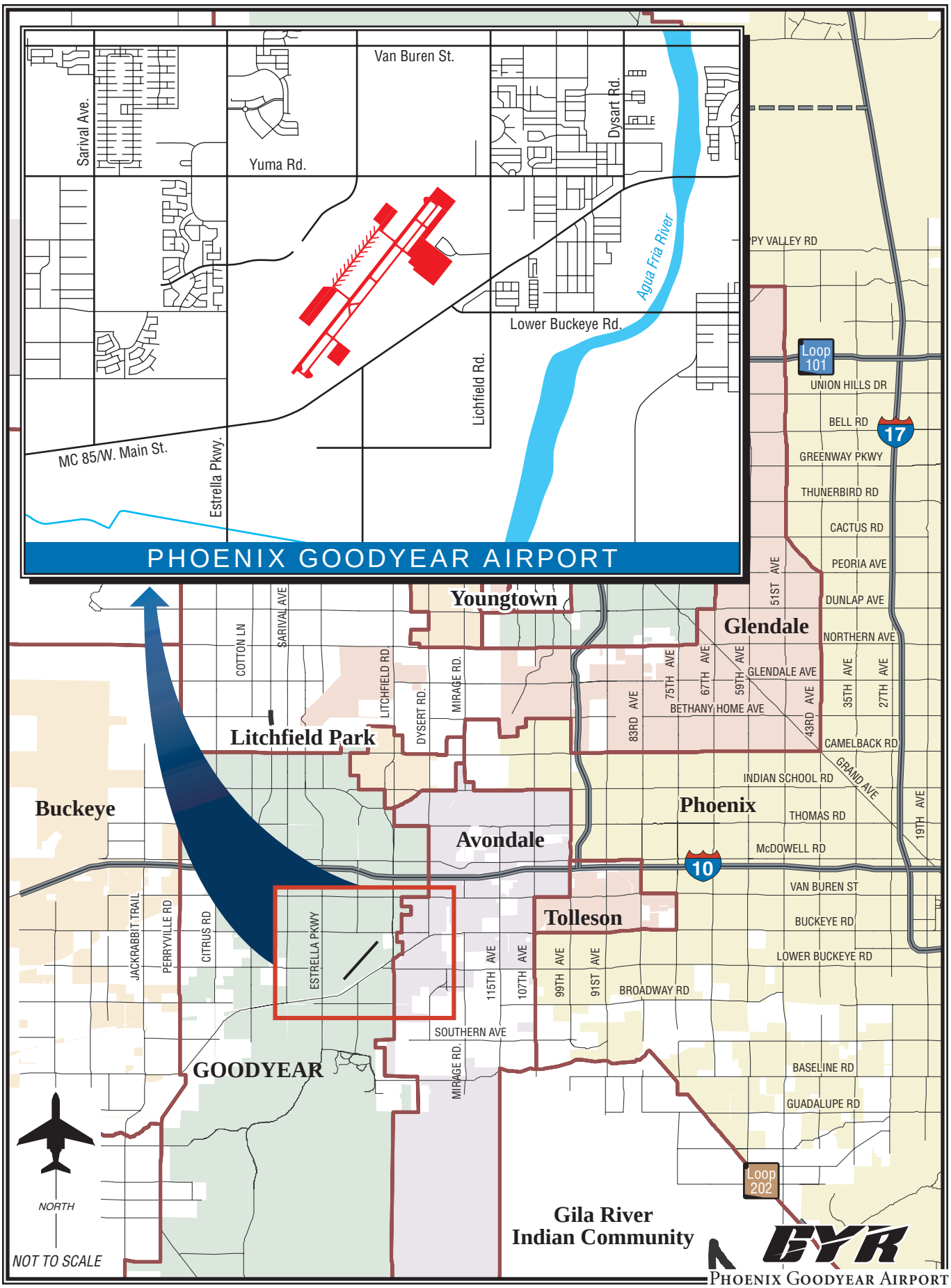

PHOENIX GOODYEAR AIRPORT

Exhibit 1A

VICINITY MAP

Goodyear is located in Maricopa County, west of Phoenix and Avondale, and south of Glendale and Litchfield Park. Maricopa County has a total area of 9,223 square miles, and contains 24 incorporated cities and towns. Maricopa County is largely located in the Sonoran Desert, with elevations ranging from 500 to 2,500 feet above mean sea level (MSL). Approximately 60 percent of the population of Arizona resides in Maricopa County.

The Phoenix Goodyear Airport site encompasses 789 acres, at 968 feet MSL. The airport is located south of Interstate 10 and just north of Maricopa County Route (MC) 85 (West Main Street).

AIRPORT HISTORY

The Phoenix Goodyear Airport was founded as a U.S. Naval Air Facility in 1942. Goodyear Aerospace operated at the airport, constructing portions of aircraft and also performing maintenance on aircraft for the Naval Air Facility. In 1946, the Naval Air Facility changed its focus from building and maintaining, to the preservation and storage of military aircraft. The U.S. Navy operated the airport through the Korean Conflict in the 1950s. Following the Korean Conflict, the airport was decommissioned but remained Department of Defense property until 1968, when ownership was transferred to the City of Phoenix for use as a reliever airport for Phoenix Sky Harbor International Airport.

RECENT CAPITAL IMPROVEMENTS

The Federal Aviation Administration (FAA) has provided funding assistance for capital improvements at Phoenix Goodyear Airport through the Airport Improvement Program (AIP). The AIP is funded through the Aviation Trust Fund. The fund was established in 1970 to provide finances for aviation capital investment programs (aviation development, facilities and equipment, and research and development).

The FAA has provided $7.4 million over the past 16 years for capital improvements at Phoenix Goodyear Airport. **Table 1A** summarizes FAA AIP grants for Fiscal Year (FY) 1988 through FY 2004.

Between 1989 and 2003, the Arizona Department of Transportation, Aeronautics Division invested $3.0 million in improvements at Phoenix Goodyear Airport. **Table 1B** summarizes these projects and expenditures over this fourteen year period.

HISTORICAL ACTIVITY

The number of aircraft operations and based aircraft are used to define the type and level of activity at general aviation airports such as Phoenix Goodyear Airport. **Table 1C** summarizes the historical aircraft operations recorded by the FAA at Phoenix Goodyear Airport since 1976.

TABLE 1A
AIP Grants Offered to Phoenix Goodyear Airport

Fiscal Year	AIP Grant Number	Project Description	Total Grant Funds
1988	3-04-0018-03	Runway Protection Zone Land Acquisition (12.6 Acres) for Runway 3-21	$563,742
1991	3-04-0018-04	Extend and Mark Taxiway "A"	$1,000,000
1994	3-04-0018-05	Master Plan Update	$1,000,000
1995	3-04-0018-06	Taxiway "A" Overlay, Runway Lighting and Signs	$7,000
1996	3-04-0018-07	Runway 3-21 Overlay	$1,000,000
1998	3-04-0018-08	Construct Apron, Taxiway Connectors, Install Precision Approach Path Indicators (PAPIs) for Runway 3-21	$750,000
2001	3-04-0018-09	Resurface Taxiway "A" and Adjacent Apron Area	$885,349
2002	3-04-0018-10	Rehabilitate Apron Phase II	$150,000
2003	3-04-0018-11	Construct Taxiway "A"	$1,133,905
2004	3-04-0018-12	Replace Electrical Vault	$910,600
Total AIP Grant Funds			$7,400,596

Source: Phoenix Department of Aviation

TABLE 1B
State Grants Offered to Phoenix Goodyear Airport

Fiscal Year	ADOT Grant Number	Project Description	Total Grant Funds
1989	N910	Land Acquisition for Runway Protection Zone: North Approach End of Runway 3	$265,000
1991	N011	Grade, drain, and resurface apron	$47,021
1992	N111	Surface apron and Taxiways G, D, and S	$323,000
1992	N211	Grade, drain and surface runway, taxiway extension, run-up pad	$475,000
1993	N311	Taxiway construction, surface preservation of apron	$500,000
1994	N510	Surface runway, taxiway, Medium Intensity Runway Lighting (MIRL), signage, sound protection	$90,614
1995	N610	Resurface runway	$500,000
1996	N712	Drainage/erosion control; master plan update	$30,000
1998	E9076	Drainage/erosion control; master plan update, taxiway lines	$33,580
1998	E9025	Design terminal	$135,000
2000	E0117	Perimeter road	$270,000
2001	E2F38	Rehabilitate apron - Phase 1, Construct taxiway "A"	$43,460
2003	E2S13	Install security fence upgrade of access card system	$270,000
Total State Grant Funds			$2,982,675

Source: Phoenix Department of Aviation

TABLE 1C
Historical Aircraft Operations
Phoenix Goodyear Airport

	Itinerant					Local				
Year	**Air Carrier**	**Air Taxi**	**General Aviation**	**Military**	**Total Itinerant**	**General Aviation**	**Military**	**Total Local**	**Total Operations**	**% Increase/ Decrease**
1976	2	1	42,942	449	43,394	87,179	1,341	88,520	**131,914**	N/A
1977	--	34	57,000	1,319	58,353	98,898	1,470	100,368	**158,721**	20.30%
1978	--	90	55,326	550	55,966	100,968	931	101,899	**157,865**	-0.50%
1979	--	126	54,702	488	55,316	90,163	865	91,028	**146,344**	-7.30%
1980	--	48	68,565	730	69,343	120,142	288	120,430	**189,773**	29.70%
1981	--	37	66,887	662	67,586	116,061	347	116,408	**183,994**	-3.00%
1982	--	7	52,060	136	52,203	78,053	2	78,055	**130,258**	-29.20%
1983	9	47	42,214	196	42,466	64,129	313	64,442	**106,908**	-17.90%
1984	--	41	43,383	525	43,949	107,835	1,673	109,508	**153,457**	43.50%
1985	--	30	37,858	489	38,377	92,861	1,154	94,015	**132,392**	-13.70%
1986	--	123	47,156	621	47,900	115,650	1,056	116,706	**164,606**	24.30%
1987	--	151	51,578	1,168	52,897	129,921	450	130,371	**183,268**	11.30%
1988	26	46	54,051	344	54,467	114,284	614	114,898	**169,365**	-7.60%
1989	244	154	59,741	385	60,524	120,895	264	121,159	**181,683**	7.30%
1990	146	113	82,010	731	83,000	119,456	100	119,556	**202,556**	11.49%
1991	139	110	86,075	520	86,844	93,465	44	93,509	**180,353**	-10.96%
1992	29	371	83,003	153	83,556	82,452	58	82,510	**166,066**	-7.92%
1993	3	122	74,276	145	74,546	64,350	8	64,358	**138,904**	-16.36%
1994	56	70	46,420	157	46,703	39,673	16	39,689	**86,392**	-37.80%
1995	0	2	33,542	171	33,715	28,385	6	28,391	**62,106**	-28.11%
1996	5	29	46,418	33	46,485	45,756	164	45,920	**92,405**	48.79%
1997	34	57	65,191	84	65,366	50,781	40	50,821	**116,187**	25.74%
1998	78	37	50,071	97	50,283	53,467	45	53,512	**103,795**	-10.67%
1999	169	27	60,605	65	60,866	75,355	53	75,408	**136,274**	31.29%
2000	200	60	62,575	183	63,018	79,334	106	79,440	**142,458**	4.54%
2001	268	40	59,920	110	60,338	74,236	36	74,272	**134,610**	-5.51%
2002	262	540	64,877	828	66,507	71,757	310	72,067	**138,574**	2.94%
2003	289	3,418	62,204	3,304	69,215	62,531	935	63,466	**132,681**	-4.25%
2004	416	3,440	57,706	2,616	64,178	40,389	904	41,293	**105,471**	-20.5%

Source: 1976-1989: FAA TAF; 1990-2004: FAA ATADS

An operation is defined as either a takeoff or landing. Aircraft operations are classified as either local or itinerant and designated as air carrier, air taxi, general aviation, and military.

Local operations are performed by aircraft which:

(a) Operate in the local traffic pattern or within sight of the airport;

(b) Are known to be departing for or arriving from flight in local practice areas located within a 20-mile radius of the airport;

(c) Execute simulated instrument approaches or low passes at the airport.

Itinerant operations are all other operations. They essentially represent aircraft either arriving from, or departing to, other airfields.

As shown in **Table 1C**, aircraft operations have varied annually at the airport since 1976. The lowest recorded level of operations was 62,106 operations in 1995. The highest level of operations was 202,556 recorded in 1990. Twelve of the past 27 years have recorded operations in excess of 150,000 annually; 1990 was the only year that operations exceeded 200,000.

For traffic count purposes, the air carrier category is defined as an aircraft capable of carrying more than 60 passengers or a maximum payload of more than 18,000 pounds. While the title of this category may imply that scheduled airline operations were conducted at the airport, it should not be viewed in that manner. The operations in this category are primarily representative of the aircraft serviced by various companies on the airport.

The air taxi category comprises aircraft designed to have a maximum seating capacity of 60 seats or less, or a maximum payload capacity of 18,000 pounds or less, carrying passengers or cargo for hire or compensation. This category includes a wide range of civilian aircraft conducting charter operations.

General aviation comprises the takeoffs and landings of all remaining civil aircraft. All operations within the air taxi category are recorded as transient, while military and general aviation activity is divided into local and itinerant categories.

Since 1976, local operations have averaged 59 percent of all operations, with itinerant operations comprising the remaining 41 percent. Since 1976, general aviation aircraft have conducted 99.5 percent of local operations and accounted for 98.4 percent of itinerant operations, while air taxi, air carrier and military aircraft have accounted for 1.6 percent of itinerant operations. The majority of local operations at Phoenix Goodyear Airport are representative of the flight training operations that have historically been based at the airport.

Table 1D summarizes total based aircraft at Phoenix Goodyear Airport for selected years since 1983. As shown in the table, based aircraft levels have fluctuated over the past 21 years from a low of 140 to a high of 209.

TABLE 1D
Historical Based Aircraft
Phoenix Goodyear Airport

Year	Based Aircraft
1983	184
1985	176
1990	140
1995	143
2000	198
2004	209

Source: 1983, 1985, 1990, and 1995, Maricopa Association of Governments (MAG) Regional Aviation System Plan, 2000 and 2004, Phoenix Dept. of Aviation

Based aircraft are also classified according to type. **Table 1E** summarizes the mix of aircraft based at Phoenix Goodyear Airport in 2004. Aircraft type categories include single-engine piston, multi-engine piston, turboprop, turbojet, rotorcraft, and other which includes aircraft such as gliders.

The single-engine piston includes all fixed wing aircraft that have a single piston-powered engine. This category represented 89 percent of based aircraft at Phoenix Goodyear Airport in 2004.

The multi-engine piston category includes all piston-powered aircraft with two or more engines. This category of aircraft represented seven percent of based aircraft in 2004.

The turboprop category includes all turbine-powered fixed wing aircraft with propellers. There are currently no turboprop aircraft based at Phoenix Goodyear Airport.

The jet category comprised one percent of 2004 based aircraft and includes the remainder of fixed wing turbine-powered aircraft. This includes business and corporate jet aircraft, as well as a number of older military jet aircraft that have become part of the civilian aircraft fleet.

The rotorcraft category includes all types of helicopters. Rotorcraft aircraft represented two percent of total based aircraft in 2004.

Finally, the other category, comprised of two gliders, represented one percent of based aircraft. The aircraft stored as part of the AeroTurbine operation are not included in the based aircraft mix.

TABLE 1E
2004 Based Aircraft Fleet Mix

Total Based Aircraft	Single-Engine Piston	Multi-Engine Piston	Turboprop	Jet	Rotorcraft	Other
209	185	15	0	3	4	2

Source: Phoenix Department of Aviation, 2004

OWNERSHIP AND MANAGEMENT

Phoenix Goodyear Airport is owned by the City of Phoenix and operated by the Phoenix Aviation Department. The City of Phoenix also owns and operates two other airports, Phoenix Sky Harbor International Airport, and Phoenix Deer Valley Airport. The Aviation Department currently employs approximately 737 people, and is composed of 9 divisions. The Aviation Department Administration includes the Director and three Assistant Directors. The Phoenix Goodyear Airport Manager oversees daily operations at the airport and reports directly to an Assistant Director.

THE AIRPORT'S SYSTEM ROLE

Airport planning exists on many levels: local, regional, state, and national. Each level has a different emphasis and purpose. This master plan is the primary local airport planning document.

Regionally, Phoenix Goodyear Airport is included in the Maricopa Association of Governments (MAG) Regional Aviation System Plan (RASP). The RASP is in place to provide an overview for airport planning in the region, to set the overall plan for airports in the region, and to assess proposed project costs and the proper phasing of projects. Phoenix Goodyear Airport is one of 16 public-use airports in the MAG region.

At the state level, Phoenix Goodyear Airport is included in the *Arizona State Aviation System Plan* (SASP). The purpose of the SASP is to ensure that the state has an adequate and efficient system of airports to serve its aviation needs. The SASP defines the specific role of each of the 112 airports in the state's aviation system and establishes funding needs. Through the state's continuous aviation system planning process, the SASP is updated every five years. The most recent update to the SASP was in 2000 when the State Aviation Needs Study (SANS) was prepared. The SANS provides policy guidelines to promote and maintain a safe aviation system in the state; assesses the state's airports' capital improvement needs; and identifies resources and strategies to implement the state system plan.

At the national level, the airport is included in the National Plan of Integrated Airport Systems (NPIAS). The NPIAS includes a total of 3,489 airports (both existing and proposed) which are important to national air transportation. Phoenix Goodyear Airport is one of 59 airports in Arizona that is included in the NPIAS and one of 43 airports in Arizona classified as a Reliever General Aviation Airport. An airport must be included in the NPIAS to be eligible for federal funding.

AIRPORT FACILITIES

Airport facilities can be functionally classified into two broad categories: airside and landside. The airside

category includes those facilities directly associated with aircraft operations. The landside category includes those facilities that provide a terminal interface between surface and air transportation, as well as support services such as aircraft storage and maintenance.

AIRSIDE FACILITIES

Airside facilities include runways, taxiways, lighting, and navigational aids. Airside facilities are depicted on **Exhibit 1B. Table 1F** summarizes airside facility data.

TABLE 1F
Airside Facility Data

	Runway 3-21	
Length (ft.) Width (ft.) Surface Material	8,500 150 Asphalt	
Load Bearing Strength Single Wheel Loading Double Wheel Loading Dual Tandem Wheel Loading	 75,000 lbs 200,000 lbs 270,000 lbs	
Instrument Approach Procedures	None	
Approach Aids	**Rwy 3** PAPI REIL	**Rwy 21** PAPI REIL
Pavement Edge Lighting	Medium Intensity Runway Lighting	
Pavement Markings	Precision	
Elevation – feet above mean sea level (MSL)	968	
Fixed Wing Aircraft Traffic Pattern	Left	Right

Source: Airport/Facility Directory, Southwest U.S., August 5, 2004
PAPI - Precision Approach Path Indicators
REILs - Runway End Identifier Lights

Runways

The Phoenix Goodyear Airport has one runway, as depicted on **Exhibit 1B**. Runway 3-21 is 8,500 feet long by 150 feet wide. There is a 2,100 foot displaced landing threshold at the northeast end of the runway. Runway 3-21 was originally built in 1942. The runway was resurfaced and overlaid in 1996. The condition of the pavement will be discussed later in this chapter.

The load bearing strengths for the runway are shown in **Table 1F**. Single wheel loading (SWL) refers to the design of certain aircraft landing gear which has a single wheel on each main landing gear strut. Dual wheel landing (DWL) refers to the design of certain aircraft landing gear which has two wheels on each main landing gear strut. Dual tandem wheel loading (DTWL) refers to the aircraft landing gear strut with a tandem set of dual

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PHOENIX GOODYEAR AIRPORT

Exhibit 1B

EXISTING FACILITIES

wheels (four wheels) on each main landing gear strut.

The runway gradient describes the average slope of a runway. The gradient is determined by dividing the difference in the runway's high and low points by its length. Runway 3-21 has an effective gradient of 0.32 percent sloping down towards the southwest end of the runway.

Taxiways

There is a full-length parallel taxiway, Taxiway A, located southeast of Runway 3-21. Taxiway A is 75 feet wide and located 400 feet from the runway centerline. Taxiway A has eight connecting taxiways to Runway 3-21. The widths of these connecting taxiways from Taxiway A are as follows; A1, A2, and A3 are 75 feet wide, A4 and A7 are 30 feet wide, A5 and A6 are 35 feet wide, and A8 is 70 feet wide. Taxiway B3 and B6 extend to the AeroTurbine aircraft storage area located northwest of the runway. Taxiway B3 is 80 feet wide, and Taxiway B6 is 66 feet wide.

Airfield Lighting and Signage

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

Identification Lighting: The location of the airport at night is universally identified by a rotating beacon. A rotating beacon projects two beams of light, one white and one green, 180 degrees apart. The airport beacon is located on top of the airport traffic control tower (ATCT). When low-visibility conditions occur during the daytime, the airport beacon will also be illuminated to improve airport visibility.

Pavement Edge Lighting: Pavement edge lighting utilizes light fixtures placed near the edge of the pavement to define the lateral limits of the pavement. This lighting is essential for safe operations during night and/or times of low visibility, in order to maintain safe and efficient access to and from the runway and aircraft parking areas. Runway 3-21 is equipped with medium intensity runway lighting (MIRL) systems. Taxiway A is equipped with centerline lights. Major intersections and Taxiways A1, A2, A3, A5, A6, and A8 are equipped with medium intensity taxiway lights (MITL).

Obstruction Lighting: Objects which obstruct the Federal Aviation Regulation (FAR) Part 77 imaginary surfaces are marked with red lights. Obstructions marked at Phoenix Goodyear Airport include: all wind cones, the airport traffic control tower (ATCT), all navigational aids, and apron light poles.

Airfield Signs: Airfield identification signs assist pilots in identifying their

location on the airfield and directing them to their desired location. Lighted signs are installed at all taxiway and runway intersections. Signs also identify the aircraft holding position. All of these signs are lit at night and during low-visibility periods.

Visual Approach Lighting: Precision approach path indicators (PAPI-2) are available on each end of the runway. PAPIs consist of a system of lights which provide the pilot a visual indication of the designed descent path to the runway.

Runway Threshold Lighting: Runway threshold lights identify the runway end. Runway threshold lights have specially designed lights that are green on one side and red on the other. The green side is oriented towards the landing aircraft. Runway 3-21 is equipped with runway threshold lights.

Runway End Identification Lighting: Runway end identifier lights (REILs) provide rapid and positive identification of the approach end of a runway. REILs are typically used on runways with no other approach lighting systems. The REIL system consists of two synchronized flashing lights, located laterally on each side of the runway threshold facing the approaching aircraft. REILs are installed at the ends of the runway. According to the Southwest U.S. Airport Facility Directory, the REILs are only active while the ATCT is in operation.

Lighting Controls: The airport lighting and signage system are powered through the airfield lighting vault building located southwest of the ATCT. The ATCT operators have control over the use and intensity settings of the lighting system.

Airport Markings

Pavement markings aid in the movement of aircraft along airport surfaces and identify closed or hazardous areas on the airport. Runway 3-21 is equipped with precision runway markings. Precision runway markings identify the runway centerline, threshold designation, touchdown point, and pavement edge.

Taxiway and apron taxilane centerline markings are provided to assist aircraft using these airport surfaces. Centerline markings assist pilots in maintaining proper clearance from pavement edges and objects near the taxilane/taxiway edges. Aircraft hold positions are also marked on all taxiway surfaces. Pavement markings identify aircraft parking positions.

A segmented circle and lighted wind cone are located at the center of the airport to the east of Runway 3-21 and Taxiway A. The segmented circle identifies the traffic pattern to pilots, and the wind cone indicates wind direction and approximate speed.

Pavement Condition

The Federal Aviation Administration has mandated that any airport sponsor receiving and/or requesting federal funds for pavement improvement pro-

jects must have implemented a pavement maintenance management program. To ensure that its airport system complies with Federal mandate, the City of Phoenix elected to implement a pavement management system for its three airports.

Part of the pavement maintenance management program is to develop a Pavement Condition Index (PCI) rating. The rating is based on the guidelines contained in FAA Advisory Circular 150/5380-6, *Guidelines and Procedures for Maintenance of Airport Pavements*.

The PCI procedure was developed to collect data that would provide engineers and managers with a numerical value indicating overall pavement conditions, and that would reflect both pavement structural integrity and operational surface condition. A PCI survey is performed by measuring the amount and severity of certain distresses (defects) observed within a pavement sample unit.

Exhibit 1C identifies the 2004 PCI ratings, Good, Fair, etc., of the pavement at Phoenix Goodyear Airport. This information, along with the City's management information, will be used later in this master plan to identify pavement maintenance strategies and cost.

Weather Reporting

Phoenix Goodyear Airport has a Limited Aviation Weather Reporting Station (LAWRS). There is no automated weather observing equipment at the airport. Trained observers collect information on cloud heights, obstructions to vision, temperature, dew point, surface wind, altimeter settings and pertinent remarks.

AREA AIRSPACE AND AIR TRAFFIC CONTROL

The *Federal Aviation Administration (FAA) Act of 1958* established the FAA as the responsible agency for the control and use of navigable airspace within the United States. The FAA has established the National Airspace System (NAS) to protect persons and property on the ground and to establish a safe and efficient airspace environment for civil, commercial, and military aviation. The NAS covers the common network of U.S. airspace, including: air navigation facilities; airports and landing areas; aeronautical charts; associated rules, regulations, and procedures; technical information; and personnel and material. The system also includes components shared jointly with the military.

Airspace Structure

Airspace within the United States is broadly classified as either "controlled" or "uncontrolled". The difference between controlled and uncontrolled airspace relates primarily to requirements for pilot qualifications, ground-to-air communications, navigation and air traffic services, and weather conditions. Six classes of airspace have been designated in the United States as shown on **Exhibit 1D**. Airspace

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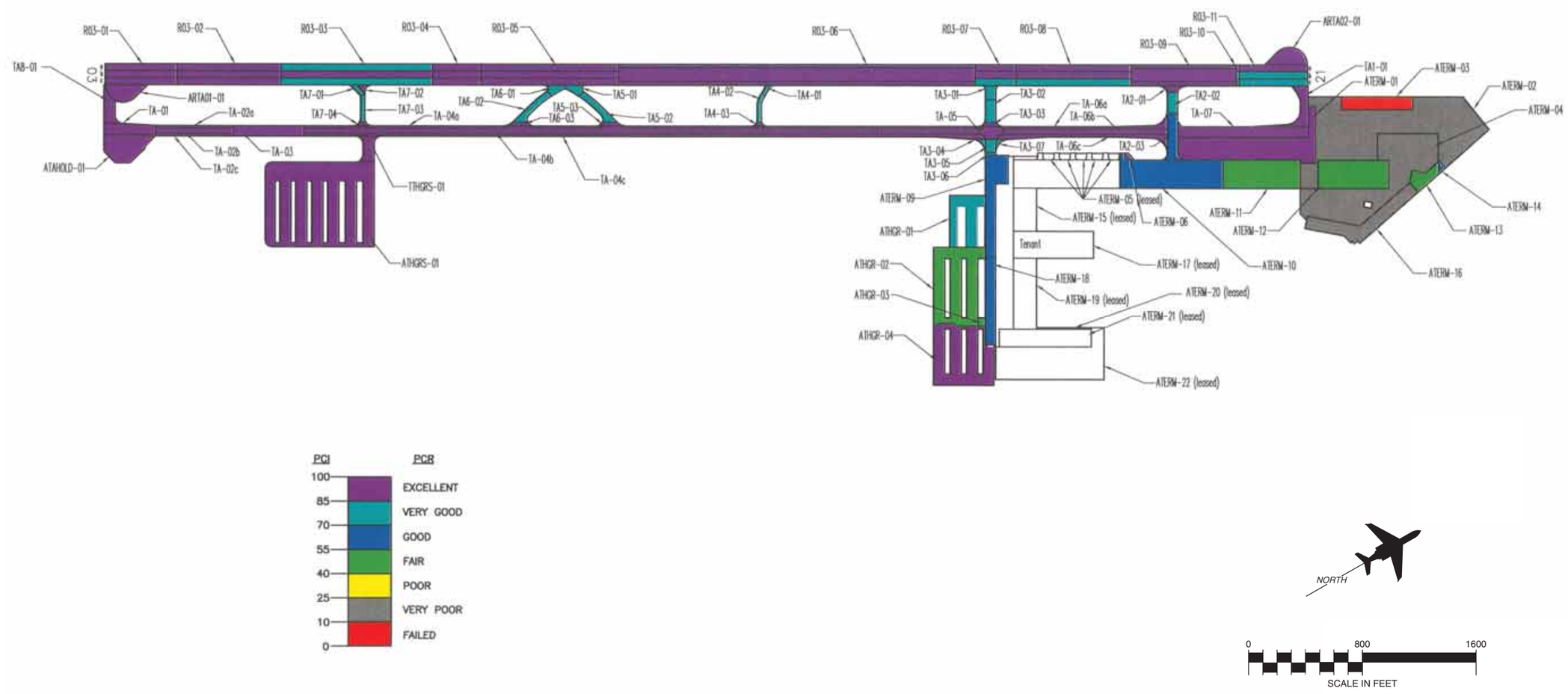

Source: 2004 Pavement Management Program Update
Phoenix Goodyear Airport
Pavement Consultants, Inc.

GYR

PHOENIX GOODYEAR AIRPORT

Exhibit 1C

CURRENT PAVEMENT CONDITIONS

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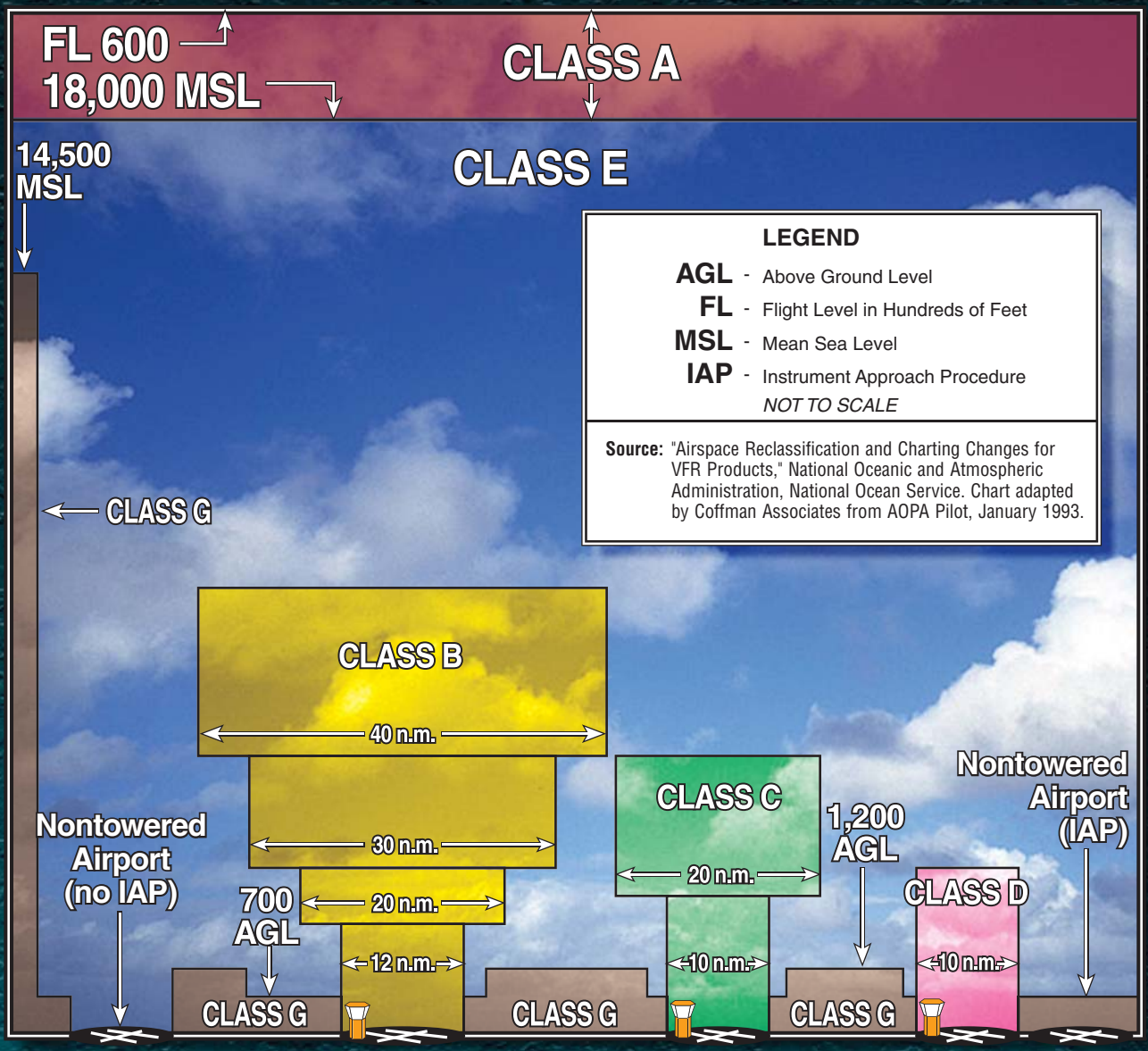

CLASSIFICATION	DEFINITION
CLASS A	Generally airspace above 18,000 feet MSL up to and including FL 600 .
CLASS B	Generally multi-layered airspace from the surface up to 10,000 feet MSL surrounding the nation's busiest airports.
CLASS C	Generally airspace from the surface to 4,000 feet AGL surrounding towered airports with service by radar approach control.
CLASS D	Generally airspace from the surface to 2,500 feet AGL surrounding towered airports.
CLASS E	Generally controlled airspace that is not Class A, Class B, Class C, or Class D.
CLASS G	Generally uncontrolled airspace that is not Class A, Class B, Class C, Class D, or Class E.

GYR

PHOENIX GOODYEAR AIRPORT

Exhibit 1D

AIRSPACE CLASSIFICATION

designated as Class A, B, C, D, or E is considered controlled airspace. Aircraft operating within controlled airspace are subject to varying requirements for positive air traffic control. Airspace in the vicinity of Phoenix Goodyear Airport is depicted on **Exhibit 1E**.

Class A Airspace: Class A airspace includes all airspace from 18,000 feet mean sea level (MSL) to flight level (FL) 600 (approximately 60,000 feet MSL). This airspace is designated in Federal Aviation Regulation (F.A.R.) Part 71.193, for positive control of aircraft. The Positive Control Area (PCA) allows flights governed only under IFR operations. The aircraft must have special radio and navigation equipment, and the pilot must obtain clearance from an air traffic control (ATC) facility to enter Class A airspace. In addition, the pilot must possess an instrument rating.

Class B Airspace: Class B airspace has been designated around some of the country's major airports, such as Phoenix Sky Harbor International Airport, to separate arriving and departing aircraft. Class B airspace is designed to regulate the flow of uncontrolled traffic, above, around, and below the arrival and departure airspace required for high performance, passenger-carrying aircraft at major airports.

In order to fly within Class B airspace, an aircraft must be equipped with special radio and navigation equipment and must obtain clearance from air traffic control. To operate within the Class B airspace of Phoenix Sky Harbor International Airport, a pilot must have at least a private pilot's certificate or be a student pilot who has met the requirements of F.A.R. Part 61.95, which requires special ground and flight training for the Class B airspace. Aircraft are also required to utilize a Mode C transponder within a 30 nautical mile (NM) range of the center of the Class B airspace. A Mode C transponder allows the ATCT to track the location and altitude of the aircraft.

Helicopters do not need special navigation equipment or a transponder if they operate at or below 1,000 feet and have made prior arrangements in the form of a Letter of Agreement with the FAA controlling agency.

The Class B airspace associated with the Phoenix area is depicted on **Exhibit 1E**. This airspace is essentially centered on the Phoenix very high frequency omnidirectional range (VORTAC) facility immediately east of Phoenix Sky Harbor International Airport. Phoenix has the only Class B airspace within the State of Arizona. The Phoenix Terminal Radar Approach Control Facility (TRACON) controls all aircraft operating within the Phoenix Class B airspace. The TRACON operates 24 hours per day.

The Phoenix Class B airspace consists of concentric rings at specific distances from the Phoenix VORTAC facility. Each of these rings contains airspace sectors defined by the upper and lower boundaries of the Class B airspace in that section. The upper boundaries

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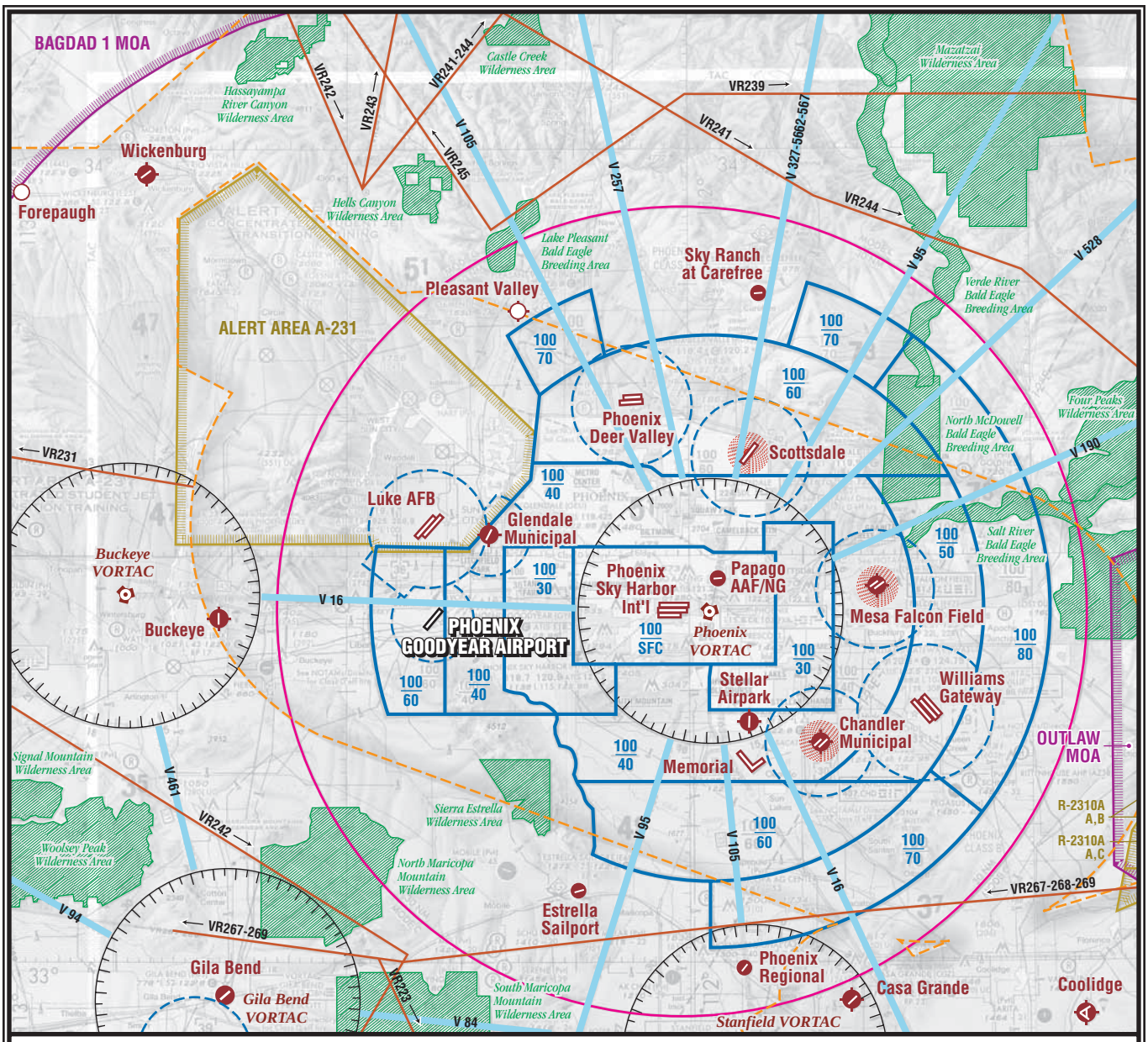

LEGEND

- 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 Airspace with floor 700' above surface

NORTH

NOT TO SCALE

Source: Phoenix Sectional Chart, US Department of Commerce, National Oceanic and Atmospheric Administration, May 13, 2004

PHOENIX GOODYEAR AIRPORT

Exhibit 1E

AREA AIRSPACE

are typically at 10,000 MSL, with the lower boundaries varying from the surface around Phoenix Sky Harbor International Airport, to 8,000 feet MSL in the outer areas of the Class B airspace.

Phoenix Goodyear Airport is located under a sector of the Phoenix Class B airspace. The sector which contains the airport has a floor of 6,000 feet MSL and a ceiling of 10,000 feet MSL. Immediately to the east of the airport is another section of Class B airspace in which the floor is 4,000 feet MSL and the ceiling is 10,000 feet MSL. Effective October 25, 2007, the Class B airspace ceiling will be lowered to 9,000 feet.

Class C Airspace: The FAA has established Class C airspace at 120 airports around the country, as a means of regulating air traffic in these areas. Class C airspace is designed to regulate the flow of uncontrolled traffic above, around, and below the arrival and departure airspace required for high-performance, passenger-carrying aircraft at major airports.

To operate inside Class C airspace, the aircraft must be equipped with a two-way radio, an encoding transponder, and the pilot must have established communication with ATC. Aircraft may fly below the floor of the Class C airspace, or above the Class C airspace ceiling without establishing communication with ATC. There is no Class C airspace in the vicinity of Phoenix Goodyear Airport.

Class D Airspace: Class D airspace is controlled airspace surrounding airports with an operating ATCT. The Class D airspace typically constitutes a cylinder with a horizontal radius of four or five nautical miles (NM) from the airport, extending from the surface up to a designated vertical limit, typically set at approximately 2,500 feet above the airport elevation. If an airport has an instrument approach or departure, the Class D airspace sometimes extends along the approach or departure path.

The Class D airspace for Goodyear extends approximately three nautical miles around the airport, from the surface to 2,999 feet MSL. Due to the proximity of Phoenix Goodyear Airport to Luke Air Force Base (AFB) to the north, Phoenix Goodyear's airspace is overlapped by Luke AFB's Class D airspace. The result of this is that when aircraft depart Phoenix Goodyear to the north, they must remain clear of Luke AFB's airspace. Once aircraft have reached an altitude of 3,600 feet MSL, they are clear to fly over Luke AFB. It should be noted that the Luke AFB simulated flame-out pattern overlies Luke Class D airspace up to 10,000 feet MSL. Thus, it is strongly recommended that VFR aircraft intending to transition this area contact Luke AFB Radar Approach Control (RAPCON) for traffic advisories.

Class D airspace exists only during the time the ATCT is operational, which is from 6:00 a.m. to 9:00 p.m. daily at GYR. At all other times, the airport is in Class E airspace. Luke Approach Control can provide traffic advisories for flights near Phoenix Goodyear Airport.

Class E Airspace: Class E airspace consists of controlled airspace designed to contain instrument flight rules (IFR) operations near an airport, and while aircraft are transitioning between the airport and enroute environments. Unless other-wise specified, Class E airspace terminates at the base of the overlying airspace. Only aircraft operating under IFR are required to be in contact with air traffic control when operating in Class E airspace. While aircraft conducting visual flights in Class E airspace are not required to be in radio communications with air traffic control facilities, they can only be conducted in visual flight rules (VFR) conditions.

A Class E airspace transition area surrounds Phoenix Goodyear Airport and the entire Phoenix metropolitan area. This area of controlled airspace has a floor of 700 feet above the surface and extends to Class A airspace, except for the areas of Class D airspace. This transition area is intended to provide protection for aircraft transitioning from enroute flights to the airport for landing.

Class G Airspace: Airspace not designated as Class A, B, C, D, or E is considered uncontrolled, or Class G, airspace. Air Traffic Control does not have the authority or responsibility to exercise control over air traffic within this airspace. Class G airspace lies between the surface and the overlaying Class E airspace (700 to 1,200 feet above ground level [AGL]). Class G airspace extends below the floor of the Class E airspace transition area in the Phoenix metropolitan area. While aircraft may technically operate within this Class G airspace without any contact with ATC, it is unlikely that many aircraft will operate this low to the ground. Furthermore, federal regulations specify minimum altitudes for flight. F.A.R. Part 91.119, *Minimum Safe Altitudes* generally states that except when necessary for takeoff or landing, pilots must not operate an aircraft over any congested area of a city, town, or settlement, or over any open air assembly of persons, at an altitude of 1,000 feet above the highest obstacle within a horizontal radius of 2,000 feet of the aircraft. Over less congested areas, pilots must maintain an altitude of 500 feet above the surface, except over open water or sparsely populated areas. In those cases, the aircraft may not be operated closer than 500 feet to any person, vessel, vehicle, or structure. Finally, this section states that helicopters may be operated at less than the minimums prescribed above if the operation is conducted without hazard to persons or property on the surface. In addition, each person operating a helicopter shall comply with any routes or altitudes specifically prescribed for helicopters by the FAA.

Special Use Airspace

Special use airspace is defined as airspace where activities must be confined because of their nature or where limitations are imposed on aircraft not taking part in those activities. These areas are depicted on **Exhibit 1E** by yellow and purple-hatched lines, as well as with the use of green shading.

Military Operating Areas: Military Operations Areas (MOAs) are depicted in **Exhibit 1E** with purple-hatched lines. The two MOAs near the Phoenix metropolitan area include the Bagdad MOA to the northwest, and the Outlaw MOA to the southeast. These MOAs are relatively distant from the Phoenix Goodyear Airport and have little effect on air traffic in the Goodyear area.

Military Training Routes: Military training routes near the Phoenix metropolitan area are identified with the letters VR (visual route) or with IR (instrument route). The arrows on the route show the direction of travel. Military aircraft travel on these routes below 10,000 feet MSL and at speeds in excess of 250 knots.

Wilderness Areas: As depicted on **Exhibit 1E**, there are a number of wilderness areas and bald eagle breeding areas in the Phoenix metropolitan area. Aircraft are requested to maintain a minimum altitude of 2,000 feet above the surface of designated National Park areas, which includes wilderness areas and designated breeding grounds. FAA *Advisory Circular 91-36C* defines the "surface" as the highest terrain within 2,000 feet laterally of the route of flight or the uppermost rim of a canyon or valley.

Victor Airways: For aircraft arriving or departing the regional area, a system of Federal Airways, referred to as Victor Airways, has been established. Victor Airways are corridors of airspace eight nautical miles wide that extend upward from 1,200 feet AGL to 18,000 feet MSL and extend between VOR navigational facilities. Victor Airways are shown with solid blue lines on **Exhibit 1E**. V16 crosses the airport, extending to the Phoenix VORTAC.

Alert Area: As depicted on **Exhibit 1E**, the airport borders a large alert area associated with Luke AFB. Within the boundaries of Alert Area A-231, there is a large concentration of military jet aircraft training. While general aviation flights are not restricted within this area, pilots are strongly cautioned to be alert for high-speed military jet training aircraft. Luke Approach Control can provide traffic advisories for the Alert Area. As of October 2007, this Alert Area was being reviewed by the Phoenix Airspace Users Work Group and may be reconfigured.

Airspace Control

The FAA is responsible for the control of aircraft within the Class A, Class C, Class D, and Class E airspace described above. The Albuquerque Air Route Traffic Control Center (ARTCC) controls aircraft operating in Class A airspace over the Phoenix metropolitan area. The Albuquerque ARTCC located in Albuquerque, New Mexico, controls IFR aircraft entering or leaving the Phoenix area. The area of jurisdiction for the Albuquerque center includes most of the states of New Mexico and Arizona, and portions of Texas, Colorado, and Oklahoma.

The Phoenix Terminal Radar Approach Control (TRACON) facility, based at Phoenix Sky Harbor International Airport, controls aircraft operating within the Class B airspace surrounding Phoenix Sky Harbor International Airport. The TRACON uses direct radio communications and the Automated Radar Terminal tracking system (ARTS) to control air traffic within its jurisdiction. Air traffic control services provided by Phoenix TRACON include radar vectoring, sequencing and separation of IFR aircraft, and traffic advisories.

The Goodyear ATCT, located southeast of Runway 3-21, controls aircraft operating in the Phoenix Goodyear Airport Class D airspace. The ATCT at Goodyear Airport is a contract tower and operates daily from 6:00 a.m. to 9:00 p.m. The Luke AFB Approach Control can provide traffic advisories for VFR flights in the western metropolitan area surrounding Luke AFB.

Luke RAPCON is the servicing approach control for Phoenix Goodyear Airport Monday through Friday. RAPCON provides air traffic services for aircraft arriving from the west. The RAPCON uses direct radio communications and the Standard Terminal Automation Replacement System (STARS) tracking system to control aircraft within its jurisdiction.

Navigational Aids

Navigational aids are electronic devices that transmit radio frequencies, which pilots of properly equipped aircraft translate into point-to-point guidance and position information. The types of electronic navigational aids available for aircraft flying to or from Phoenix Goodyear Airport include: the very high frequency omnidirectional range (VOR) facility, global positioning system (GPS), and Loran-C.

The VOR provides azimuth readings to pilots with properly equipped aircraft by transmitting a radio signal at every degree to provide 360 individual navigational courses. Frequently, distance measuring equipment (DME) is combined with a VOR facility to provide distance as well as direction information to the pilot. Military tactical air navigation aids (TACANs) and civil VORs are commonly combined to form a VORTAC. A VORTAC provides distance and direction information to civil and military pilots.

The Buckeye VORTAC and Phoenix VORTAC serve the western portions of the Phoenix metropolitan area including the Phoenix Goodyear Airport. The Buckeye VORTAC is located approximately 22 nautical miles west of Phoenix Goodyear Airport. The Phoenix VORTAC is located approximately 20 nautical miles east of Phoenix Goodyear Airport. These facilities are identified on **Exhibit 1E**.

GPS was initially developed by the United States Department of Defense for military navigation around the world. However, GPS is now used extensively for a wide variety of civilian uses, including the civil aircraft navigation.

GPS uses satellites placed in orbit around the globe to transmit electronic signals, which pilots of properly equipped aircraft use to determine altitude, speed, and navigational information. This provides more freedom in flight planning and allows for more direct routing to the final destination.

A GPS modernization effort, underway by the FAA, focuses on augmenting the GPS signal to satisfy requirements for accuracy, coverage, availability, and integrity. For civil aviation use, this includes the development of the Wide Area Augmentation System (WAAS), which was launched on July 10, 2003. The WAAS uses a system of reference stations to correct signals from the GPS satellites for improved navigation and approach capabilities. The present GPS provides for enroute navigation and instrument approaches with both course and vertical navigation. The WAAS upgrades are expected to allow for the development of approaches to most airports with cloud ceilings as low as 250 feet above the ground and visibilities restricted to three-quarters mile, when completed in 2015.

Loran-C is a ground-based enroute navigational aid which utilizes a system of transmitters located in various locations across the continental United States. Loran-C allows pilots to navigate without using a specific facility. With a properly equipped aircraft, pilots can navigate to any airport in the United States using Loran-C.

Visual Flight Procedures

Most flights at Phoenix Goodyear Airport are conducted under VFR. Under VFR flight, the pilot is responsible for maintaining aircraft separation. ATC sequences arriving IFR and VFR traffic into the traffic pattern and provides traffic information and radar vectors to departing VFR traffic. Typically, the pilot will contact the tower when approximately 15 miles from the airport, for sequencing into the traffic pattern for landing. While VFR aircraft arriving and departing Phoenix Goodyear Airport are not required to contact the Phoenix TRACON or Luke AFB RAPCON, they may do so to expedite their progress through the area. Phoenix Goodyear Airport is located under Class B airspace; therefore, aircraft approaching or departing the airport, must remain clear of the Class B airspace or obtain an ATC clearance before entering.

In most situations, under VFR and basic radar services, the pilot is responsible for navigation and choosing the arrival and departure flight paths to and from the airport. However, depending on the needs of the ATCT for sequencing, the pilot may be given directions by the ATCT to fly specified headings to position their aircraft behind a preceding aircraft in the approach sequence. Tower controllers sequence arriving and departing aircraft based on observed traffic, pilot reports, and anticipated aircraft maneuvers. **The results of individual**

pilot navigation for sequencing and collision avoidance, and ATCT instructions for sequencing and safety, are that aircraft do not fly a precise flight path to and from the airport. Therefore, aircraft can be found flying over a wide area around the airport for sequencing and safety reasons.

While aircraft can be expected to operate over most areas of the airport, the density of aircraft operations is higher near the airport. This is the result of aircraft following the established traffic patterns for the airport and common sequencing techniques used by the ATCT.

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

a. Upwind Leg - A flight path parallel to the landing runway in the direction of landing.

b. Crosswind Leg - A flight path at right angles to the landing runway off its departure end.

c. 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.

d. 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.

e. 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.

Essentially, the traffic pattern defines which side of the runway aircraft will operate. For example, at Phoenix Goodyear Airport, Runway 21 has an established right-hand traffic pattern. For this runway, aircraft make a right turn from base leg to final for landing. Therefore, aircraft approaching Runway 21 remain west of the runway. When landing on Runway 3 aircraft make left-hand turns. This also allows these aircraft to remain to the west.

While the traffic pattern defines the direction of turns that an aircraft will follow on landing or departure, it does not define how far from the runway an aircraft will operate. The distance laterally from the runway centerline an aircraft operates or the distance from the end of the runway is at the discretion of the pilot, based on the operating characteristics of the aircraft, number of aircraft in the traffic pattern, and metrological conditions. The actual ground location of each leg of the traffic pattern varies from aircraft operation to aircraft operation for reasons of safety, navigation and the sequencing described above. The distance that the downwind leg is located

laterally from the runway will vary based mostly on the speed of the aircraft. Slower aircraft can operate closer to the runway as their turn radius is smaller.

The FAA has established that piston-powered aircraft operating in the traffic pattern, fly at 1,000 feet above the ground (or 1,968 feet MSL) when on the downwind leg at GYR. Turbine-powered aircraft fly the downwind leg at 2,468 feet MSL (1,500 feet AGL). Helicopters have a pattern altitude of 1,468 feet MSL (500 feet AGL). The traffic pattern altitude is established so that aircraft have a predictable descent profile on base leg to final for landing.

The Phoenix Goodyear Airport does not have a formal F.A.R. Part 150 noise abatement program. An informal "voluntary" fly-friendly program stipulates that aircraft departing Runway 3 will be assigned a right crosswind climb to Litchfield Road or 1,032 feet AGL before turning right. Pilots are requested to limit operations within one to three nautical miles north, northeast of the airport.

Regional Airports

A review of public-use airports within the vicinity of Phoenix Goodyear Airport has been made to identify and distinguish the type of air service provided in the area surrounding the airport. Information pertaining to each airport was obtained from FAA records.

Glendale Municipal Airport is located approximately seven miles northeast of Phoenix Goodyear Airport. Glendale Municipal Airport is owned and operated by the City of Glendale. A single runway is available for use. Runway 1-19 is 7,150 feet long and 100 feet wide. The ATCT at Glendale Municipal Airport is operated from 6:00 a.m. to 8:30 p.m., Monday through Friday, and 7:00 a.m. to 7:00 p.m. on the weekends. There is one published GPS instrument approach into Glendale Municipal Airport. There are approximately 269 based aircraft at Glendale. A full range of general aviation services are available at the airport.

Luke Air Force Base is located approximately seven miles north of Phoenix Goodyear Airport. Luke AFB is a military base with two runways. The largest runway has a length of 10,012 feet and a width of 150 feet. There is an operating ATCT at the air base. Luke AFB serves as the primary F-16 training base for the U.S. Air Force.

Phoenix Deer Valley Airport is located approximately 22 miles northeast of Phoenix Goodyear Airport. Phoenix Deer Valley Airport is owned and operated by the City of Phoenix. Phoenix Deer Valley Airport has parallel runways, the longest runway of which is 8,208 feet long and 100 feet wide. The Phoenix Deer Valley Airport ATCT is operated from 6:00 a.m. to 9:00 p.m. daily. There are approximately 1,252 based aircraft at Phoenix Deer Valley Airport. The full range of general aviation services are provided at Phoenix Deer Valley Airport.

Phoenix Sky Harbor International Airport is located approximately 18 miles east of Phoenix Goodyear Airport, and is also owned and operated by the City of Phoenix. Phoenix Sky Harbor International Airport has three parallel runways, and a total of 14 published instrument approach procedures. The longest runway is 11,489 feet long and 150 feet wide. The Phoenix Sky Harbor International Airport ATCT operates 24 hours each day. There are also 237 based aircraft. Two FBOs located on the airport provide a full range of general aviation services.

Buckeye Municipal Airport is located 16 miles northwest of Phoenix Goodyear Airport. Runway 17-35 is 5,500 feet long and 75 feet wide. There are approximately 75 based aircraft and 40,000 annual operations. General aviation services provided at Buckeye include: aircraft maintenance, fuel, and transient aircraft parking.

LANDSIDE FACILITIES

Landside facilities support the aircraft and pilot/passenger handling functions. These facilities typically include a terminal building, aircraft storage/maintenance hangars, aircraft parking aprons, and support facilities such as fuel storage, automobile parking, roadway access, and aircraft rescue and firefighting. The landside facilities at Phoenix Goodyear Airport are identified on **Exhibit 1F**.

Terminal Building

The existing terminal building is located in the airport's northeast building area. The 5,500 s.f. terminal building provides a public lobby area, a conference room, a pilot briefing room, restrooms, and office space for City of Phoenix Aviation Department employees.

Aprons and Aircraft Parking

There are three aircraft apron areas at Phoenix Goodyear Airport. These apron areas are referred to as the terminal apron, the AeroTurbine apron, and the Airline Training Center of Arizona (ATCA) apron.

The terminal apron, located adjacent to the terminal building, includes approximately 43,000 square yards for aircraft parking and circulation taxilanes. There are a total of 45 open tiedown spaces.

The AeroTurbine apron is located adjacent to the AeroTurbine hangar facilities, and includes approximately 71,200 square yards. AeroTurbine uses its ramp area mainly for maintenance purposes.

The northwest aircraft storage apron has a total area of approximately 83,950 square yards. This apron is used by AeroTurbine to store aircraft that are being upgraded or being used for parts.

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③ TERMINAL BUILDING

④ ATCA MAINTENANCE HANGARS

⑤ ATCA DORMITORIES

⑥ GERMAN AIR FORCE OFFICES/DORMITORIES

① AIRPORT TRAFFIC CONTROL TOWER (ATCT)

② AEROTURBINE HANGARS

⑦ ATCA FLIGHT OPERATIONS AND CAFETERIA

GYR

PHOENIX GOODYEAR AIRPORT
Exhibit 1F
EXISTING LANDSIDE FACILITIES

The ATCA apron area is located adjacent to the ATCA facilities. This apron area encompasses approximately 99,500 square yards. ATCA uses its ramp area for fixed-wing aircraft parking for the flight school operations.

Aircraft Hangars

There are 25 hangar structures enclosing approximately 676,300 square feet at the airport. Hangar space is comprised of T-hangars, shade hangars, and large clearspan conventional hangars. T-hangars provide for separate, single aircraft storage areas. Shade hangar structures are somewhat similar to T-hangar structures. The shade hangar structure provides individual aircraft locations within a single structure; however, the shade hangar only provides a roof to protect the aircraft from excess sunshine and other weather elements. Conventional hangars provide a large enclosed space, typically accommodating more than one aircraft. Square footage for each type of hangar facility is shown in **Table 1G**.

There are 12 T-hangar buildings located on the airport, enclosing approximately 187,100 square feet. Six of these hangars are located adjacent to the AeroTurbine facility, while the remaining six are located near the south end of the runway. There are a total of 147 individual T-hangar units.

Shade hangar space totals approximately 115,200 square feet in nine separate hangars, with a total of 59 individual shade hangar parking positions. Seven of these shade hangar structures are located north of the ATCA facilities, and are used by ATCA, while the remaining two are located adjacent to the AeroTurbine facilities and are owned by the City. The ATCA shade hangar structures have a total of 37 aircraft positions, while the two owned by the City have a total of 22 aircraft positions.

Conventional hangar space at the airport totals approximately 374,000 square feet in four hangar buildings. Two of these hangars are leased by AeroTurbine and the other two are owned by ATCA.

TABLE 1G
Hangar Description

	T-Hangars	Shade Hangars	Conventional Hangars	Total
Buildings	12	9	4	25
Number of Units	147	59	NA	NA
Square Footage	187,100	115,200	374,000	676,300

Source: Phoenix Department of Aviation

General Aviation Services

Fueling and line services at Phoenix Goodyear Airport are provided by the City of Phoenix. The services are operated from the main terminal building. The following is a list of services provided at Phoenix Goodyear Airport.

- Aviation Fuel
- Aircraft Parking (ramp or tie-down)
- Passenger Terminal and Lounge
- Hangars

Tenants

AeroTurbine specializes in commercial jet maintenance, repair, modification, overhaul and storage. The AeroTurbine facility at Goodyear is an FAA-approved, Class Four unlimited repair station. Its capabilities include heavy airframe maintenance, complete aircraft stripping and painting, all manner of avionics, interior and structural modifications; and back-shop component overhaul and repair capabilities. Currently, AeroTurbine stores approximately 130 aircraft at Phoenix Goodyear Airport.

ATCA provides flight training services for the German-based Lufthansa Airlines and the German Air Force. New classes start approximately every six weeks. On average, 120 students go through flight training at Phoenix Goodyear Airport each year. The German Air Force trains its own pilots. Students for both Lufthansa and the German Air Force, train in single and multi-engine aircraft.

The students stay in dorms located east of the terminal building. The total area of the dorm building is approximately 26,071 square feet. Some of the amenities the students have while living on the airport include tennis courts, a basketball court, and a bathhouse with two swimming pools and a grill area. All the ATCA buildings are original World War II construction by the Navy. Two ATCA/OTCA dormitories have been refurbished and are presently being used. The total combined area of these three buildings is 21,044 square feet.

The main ATCA building, which houses the cafeteria, classrooms, and the administration offices, is located to the north end of the ATCA complex. The total area of this building is 45,861 square feet. There is an additional simulator training building toward the south end of the complex, just west of the German Air Force student dormitories. The total area of this building is 18,862 square feet.

Airport Management/Operations, Maintenance, and Airport Rescue and Firefighting

The airport management and operations offices are located in the main terminal building built in 2000. The airport maintenance building, also constructed in 2000, is located adjacent to the terminal building, to the east. The building has a total area of 2,542 square feet and houses offices and equipment used for the ongoing

maintenance of the airport and its facilities.

There are no airport rescue and fire fighting (ARFF) facilities located on the airport. When there is an emergency where rescue vehicles or fire fighting services are required, a local fire station is called. Goodyear Station 181 is the nearest fire station, and is located just to the north of the airport on Yuma Road. Mutual aid agreements are in place if there is an incident requiring multiple responding agencies.

Fueling Facilities

The City of Phoenix and ATCA maintain separate fuel facilities at Phoenix Goodyear Airport. Both facilities are located at the east of the airport property, along the perimeter road. The ATCA facility consists of four 20,000-gallon tanks, each holding 100LL Avgas. The fueling facility, owned and operated by the City of Phoenix, consists of three 20,000-gallon tanks: two for Jet A fuel and one for 100LL Avgas. All fuel is dispensed through mobile fuel trucks.

In addition, the airport provides the general aviation tenants with three waste collection areas. These are depositories for oil, hydraulic fluid, antifreeze, chemical wastes, tires, and airplane batteries to ensure the appropriate disposal and recycling of the waste streams.

Utilities

Water and sewer utilities serving the airport are provided by the City of Goodyear Water Department. Arizona Public Service Co. (APS) provides electrical service to the airport. Phone service at Phoenix Goodyear Airport is provided by Qwest.

Security Fencing and Gates

The entire airport is surrounded by security fencing. The fence is FAA standard six-foot chain-link with three strands of barbwire.

There are two security access points to the airport operations area (AOA). These access points are airside access-controlled gates, which can be opened only with a proximity card. There is also an emergency entrance from Yuma Road, accessible for emergency vehicles.

ACCESS & CIRCULATION

The airport can be accessed by Interstate 10 to the north and County Route 85 to the south. I-10 vehicles exit south onto Litchfield Road. From County Route 85, turn north onto Litchfield Road and turn left into the airport entrance.

Litchfield Road is a busy four-lane arterial, with stoplights, sidewalks, and curbs in the vicinity of the airport. The airport entrance road is a two-lane road which serves as the only public access road to the airport.

A Union Pacific rail line runs on the north side and parallel to County Road 85. This is a busy track that crosses Litchfield Road. Therefore, access to the airport from County Road 85 can be delayed when there is train activity. Union Pacific has indicated in the State Route 801 (I-10 Reliever) study that ultimately this rail line may be upgraded to a double track. No timeframe for this project was provided.

INTERNAL CIRCULATION

Internal circulation is via a perimeter road, parking lots, taxilanes and aprons. Access to the perimeter road is given to airport employees, employees of ATCA and AeroTurbine, and other tenants. Beginning at the East Building Area, authorized vehicles travel across the apron to the perimeter road at the north end of the airport, or to the east end of the T-hangars located to the south of the AeroTurbine hangars. The perimeter road extends around the entire airport property and also serves as an access road to the south T-hangars. AeroTurbine uses the perimeter road to access the stored aircraft on the west side of the runway.

PARKING

Terminal Parking Lot: The main parking area located east of the airport terminal has a total area of 29,366 square feet and 32 parking spaces, including 3 handicapped spaces. There are an additional 18 parking spaces south of the terminal. There is additional parking for the ATCA facilities and private parking for the AeroTurbine employees.

Rental Cars: There are no rental car facilities located at the airport. Avis, National, and Enterprise offer rental car services from other locations in the City of Goodyear.

SOCIOECONOMIC PROFILE

The socioeconomic profile provides a general overview of the socioeconomic make-up of the community surrounding Phoenix Goodyear Airport. It also provides an understanding of the dynamics for growth and the potential changes that may affect aviation demand. Aviation demand forecasts are often directly 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. Current demographic and economic information was collected from Maricopa Association of Governments (MAG), the City of Goodyear, and the 1990 and 2000 census reports.

POPULATION

Population is an important demographic element to consider when planning for future needs of the airport. The State of Arizona has been one of the fastest growing states in the country. **Table 1H** shows the total population growth since 1990 for the State of Arizona, Maricopa County,

and the City of Goodyear. The State of Arizona's population grew at an average annual rate of 3.3 percent between 1990 and 2003. Since 1990, the state has grown by 1.9 million people. The population of Goodyear grew at a rapid rate from 1990 to 2003, with an annual growth rate of 13.6 percent. In this time, Goodyear grew by 25,589 people, while Maricopa County grew by approximately 1.27 million people.

The City of Goodyear population has grown at a faster rate than Maricopa County or the State of Arizona. Between 1990 and 2003, the Goodyear population grew by 406.2 percent; whereas, the state population grew by 52 percent and the county population grew by 60 percent in the same time frame. The City of Goodyear has seen a much higher annual growth rate of 13.6 percent compared to 3.6 percent for Maricopa County, and 3.3 percent for the State of Arizona.

TABLE 1H
Total Population
State of Arizona, Maricopa County, Goodyear

Year	Arizona Population	Percent Change	Maricopa County Population	Percent Change	Goodyear Population	Percent Change
1990	3,665,339	N/A	2,122,101	N/A	6,300	7.0%
1991	3,788,576	3.4%	2,198,219	3.6%	6,470	2.7%
1992	3,915,740	3.4%	2,272,582	3.4%	6,760	4.5%
1993	4,065,440	3.8%	2,359,883	3.8%	7,110	5.2%
1994	4,245,089	4.4%	2,475,159	4.9%	8,315	17.0%
1995	4,432,499	4.4%	2,598,183	5.0%	8,930	7.4%
1996	4,586,940	3.5%	2,703,078	6.6%	10,215	14.4%
1997	4,736,990	3.3%	2,805,009	3.8%	12,205	19.5%
1998	4,883,342	3.1%	2,909,040	3.7%	14,305	17.2%
1999	5,023,823	2.9%	3,004,985	3.3%	17,085	19.4%
2000	5,130,632	2.1%	3,072,149	2.2%	18,911	10.7%
2001	5,297,684	3.3%	3,196,439	4.0%	22,820	20.7%
2002	5,441,125	2.7%	3,294,911	3.1%	27,030	18.5%
2003	5,580,811	2.6%	3,389,260	2.9%	31,889	18.0%
State of Arizona Average Annual Growth Rate						
1990-1997	3.7%		**Arizona Annual Population Growth Rate 1990-2003 – 3.3%**			
1998-2003	2.8%					
Maricopa County Average Annual Growth Rate						
1990-1997	4.0%		**Maricopa County Annual Population Growth Rate 1990-2003 – 3.6%**			
1998-2003	3.2%					
Goodyear Average Annual Growth Rate						
1990-1997	9.7%		**Goodyear Annual Population Growth Rate 1990-2003 – 13.6%**			
1998-2003	17.4%					

Source: Maricopa Association of Governments (MAG), 2004

EMPLOYMENT

Employment opportunities affect migration to the metropolitan area and population growth. The City of Goodyear's unemployment rate is consistent with the overall United States average, as shown in **Table 1J**. The City of Phoenix is consistently below state and national unemployment levels.

TABLE 1J
Unemployment Rates
Goodyear, Phoenix, State of Arizona, and the United States

Year	Goodyear	Phoenix	Arizona	United States
1990	6.4%	7.0%	7.2%	6.4%
1996	--	3.6%	5.5%	5.4%
1997	--	3.0%	4.6%	4.9%
1998	--	2.7%	4.1%	4.5%
1999	--	2.9%	4.4%	4.2%
2000	4.1%	2.7%	4.0%	4.0%
2001	--	3.9%	4.7%	4.7%
2002	--	4.2%	6.2%	5.8%
2003	6.1%	4.9%	5.6%	6.0%

Source: Greater Phoenix Economic Council, 2004; Census 1990 & 2000

Table 1K summarizes total employment for the City of Goodyear from 1990 and 2000, and for Maricopa County and the State of Arizona up to 2003. As shown in the table, the City of Goodyear's total employment quadrupled in this time frame. During that 10-year period, total employment grew by 5,781 or 309.1 percent. This was still lower than the 406 percent population growth over that period. Due to large number of retirees moving to Arizona and the Goodyear area, the population is rising much faster than total employment. **Table 1L** lists the largest employers in the City of Goodyear.

TABLE 1K
Total Employment
Goodyear, Maricopa County and the State of Arizona

	EMPLOYMENT					
Year	Goodyear Employment	Percent Change	Maricopa Employment	Percent Change	Arizona Employment	Percent Change
1990	1,870	N/A	1,005,925	N/A	1,603,896	N/A
2000	7,651	309.1%	1,504,252	49.5%	2,387,139	48.8%
2003	N/A	N/A	1,621,200	7.8%	2,511,762	5.2%

Source: 1990 & 2000 data: Census Bureau, 2004
2003 Arizona data: Arizona Workforce Informer
2003 Maricopa data: Bureau of Labor and Statistics

TABLE 1L
Largest Employers
City of Goodyear (2004)

Employer	Employees
Lockheed Martin	620
AeroTurbine	573
McLane Distributing	503
Cavco	400
Rubbermaid	335
City of Goodyear	280

Source: City of Goodyear Economic Development Department, February 2004

CLIMATE

Weather plays an important role in the operational capabilities of an airport. Temperature is an important factor in determining runway length. The percentage of time that visibility is impaired due to cloud coverage or inclement weather is a major factor in determining the use of instrument approach aids. The region experiences very little precipitation annually, with the greatest amounts occurring in the months of July and August. August is the warmest month, while January is the coolest. **Table 1M** summarizes typical temperature and precipitation data for the region. As shown in **Table 1N**, on average, rain falls on 33 days each year. Visibility is restricted on 68 days each year.

TABLE 1M
Temperature and Precipitation Data
Litchfield Park, Arizona

	Temperature (Fahrenheit)		
	Mean Maximum	Mean Minimum	Precipitation (inches)
January	66.9	36.0	0.89
February	71.8	39.7	0.96
March	77.4	43.7	0.84
April	86.2	49.7	0.33
May	95.2	57.7	0.13
June	104.2	66.3	0.08
July	106.9	75.4	0.73
August	104.7	74.0	1.21
September	100.4	66.7	0.87
October	89.7	53.7	0.48
November	76.6	42.0	0.64
December	67.9	36.7	1.06
Annual Average	87.3	53.5	8.21

Source: Western Regional Climate Center

TABLE 1N
Mean Number of Days by Month with Precipitation or Obstructions to Vision

	Precipitation (Days)	Obstruction to Vision (Days)
January	4	10
February	4	9
March	3	8
April	2	6
May	1	3
June	1	2
July	3	4
August	4	4
September	3	3
October	2	4
November	2	6
December	4	9
Annual Total	33	68

Source: Western Regional Climate Center

FUTURE LAND USE

Exhibit 1G depicts the planned land uses around the Phoenix Goodyear Airport. The majority of the land surrounding the airport is categorized as mixed use. To the south of the airport, the most common land use is mixed use and open space. To the west, the most common land use is single-family residential and commercial. Also west of the airport, at the corner of Yuma Road and Estrella Parkway, the City of Goodyear has planned a new "City Center" municipal complex to break ground in Spring 2005. To the north of the airport, the land use is mostly mixed with some commercial, single-family residential, open space, multi-family residential, and areas of other employment. To the east of the airport, the most common land use is single-family residential, with some open space, other employment, and multi-family residential.

HEIGHT AND HAZARD ZONING

Height and hazard zoning establishes height limits for new construction near an airport and within the runway approaches. Height and hazard zoning ordinances are typically based on Federal Aviation Regulation (FAR) Part 77, which defines imaginary surfaces surrounding the airport which are to remain free of obstructions for the purpose of safe air navigation. Currently, the City of Goodyear has no height and hazard zoning restrictions specific to new construction near the airport or within the runway approaches.

PUBLIC AIRPORT DISCLOSURE MAP

Arizona Revised Statues (ARS) 28-8486, *Public Airport Disclosure*, requires public airport owners to publish

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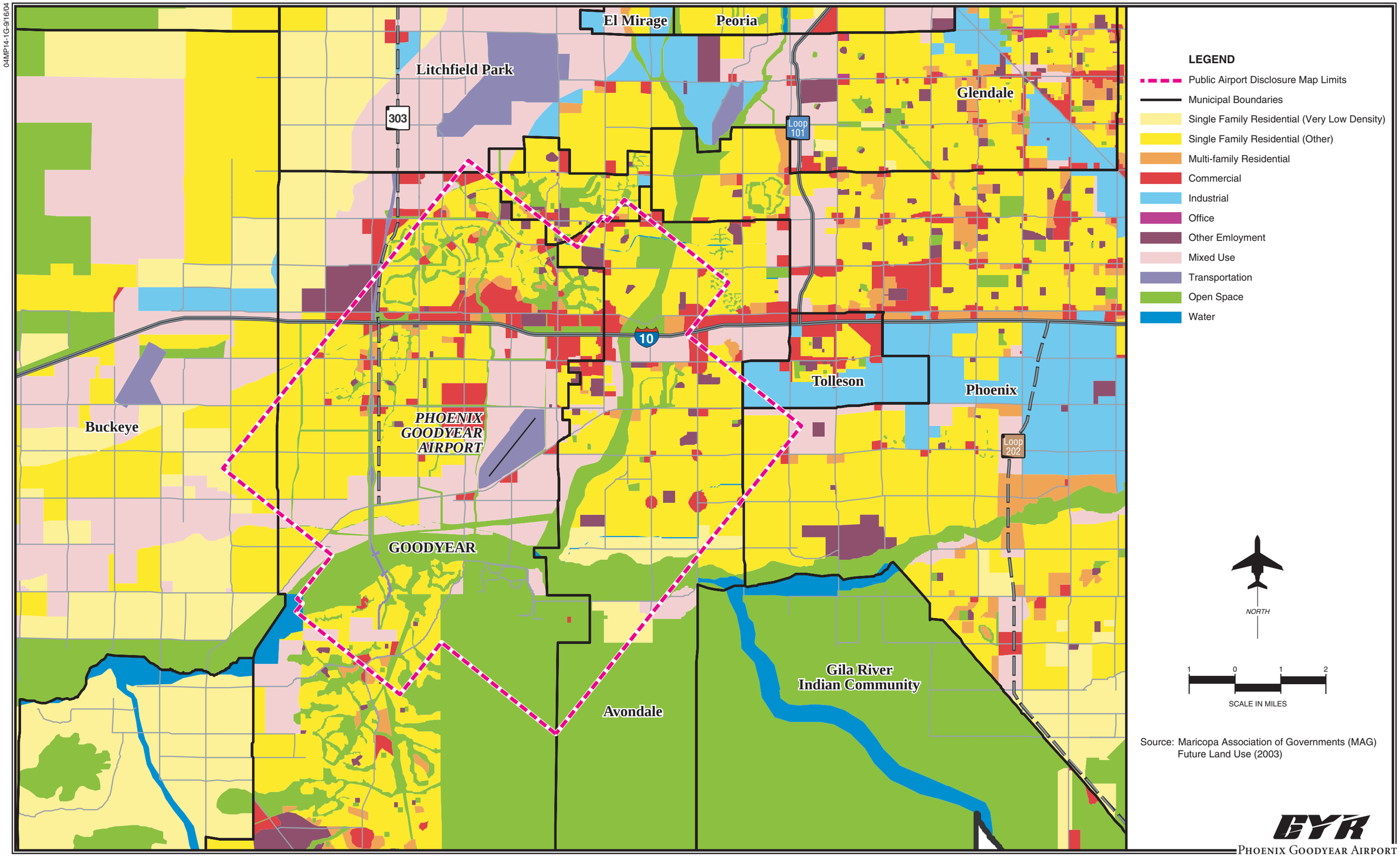

Source: Maricopa Association of Governments (MAG) Future Land Use (2003)

GYR

PHOENIX GOODYEAR AIRPORT

Exhibit 1G

FUTURE LAND USE

a map depicting the "territory in the vicinity of the airport." This is defined as the traffic pattern airspace and the property that experiences 60 day-night noise level (DNL) or higher in counties with a population of more than 500,000, and 65 DNL or higher in counties with less than 500,000 residents. The DNL is calculated for a 20-year forecast condition. ARS 28-8486 requires the state Real Estate Office to prepare a disclosure map in conjunction with the airport owner that is recorded with the county. The Phoenix Goodyear Airport disclosure map limits are depicted on **Exhibit 1G.**

ENVIRONMENTAL INVENTORY

The protection and preservation of the local environment are essential concerns for the Master Planning process. An inventory of potential environmental issues that might affect future improvements at the Airport has been completed to ensure proper consideration of the environment through the planning process. Available information about the existing environmental conditions at Phoenix Goodyear Airport has been derived from a variety of internet resources, agency maps, and existing literature.

WETLANDS

The U.S. Army Corps of Engineers (ACOE) regulates the discharge of dredge and/or fill material into waters of the United States, including adjacent wetlands, under Section 404 of the *Clean Water Act*.

Wetlands are defined by *Executive Order 11990, Protection of Wetlands,* as "those areas that are inundated by surface or groundwater with a frequency sufficient to support and under normal circumstances does or would support a prevalence of vegetation or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction." Categories of wetlands includes swamps, marshes, bogs, sloughs, potholes, wet meadows, river overflows, mud flats, natural ponds, estuarine area, tidal overflows, and shallow lakes and ponds with emergent vegetation. Wetlands exhibit three characteristics: hydrology, hydrophytes (plants able to tolerate various degrees of flooding or frequent saturation), and poorly drained soils.

Several years ago, the ACOE determined there were no wetlands on the airport site. Since this determination is over five years old, updated surveys may be required prior to construction.

FLOODPLAINS

As defined in the FAA Order 1050.1E, floodplains consist of "lowland and relatively flat areas adjoining inland and coastal water including flood prone areas of offshore islands, including at a minimum, that area subject to one percent or greater chance of flooding in any given year." Federal agencies are directed to take action to reduce the risk of flood loss, minimize

the impact of floods on human safety, health and welfare, and restore and preserve the natural and beneficial values served by floodplains. Floodplains have natural and beneficial values, such as providing groundwater recharge, water quality maintenance, fish, wildlife, plants, open space, natural beauty, outdoor recreation, agriculture and forestry. FAA Order 1050.1E (12) *(*c) indicates that "if the proposed action and reasonable alternatives are not within the limits of a base floodplain (100-year flood area)," that it may be assumed that there are no floodplain impacts. The limits of base floodplains are determined by Flood Insurance Rate Maps (FIRM) prepared by the Federal emergency Management Agency (FEMA).

According to the FIRM map, Bullard Wash, located northeast of the airport, is considered to be a 100-year floodplain. A containment channel controls and diverts the wash before it reaches airport property. Much of the area surrounding the airport is designated as Zone X, which is a 500-year floodplain which is protected from a 100-year flood by a channel. A small area just east of the south end of the Runway 3-21 is classified as a Zone A floodplain. A Zone A floodplain is a 100-year flood area where no base flood elevations have been determined. East of the airport's landside facility area is Zoned AH. An AH Zone indicates a 100-year flood hazard area with depths of 1 to 3 feet. These areas are characterized by ponding during a 100-year flood event. **Exhibit 1H** depicts the floodplain boundaries surrounding the airport.

FARMLANDS

Under the *Farmland Protection Policy Act* (FPPA), federal agencies are directed to identify and take into account the adverse effects of federal programs on the preservation of farmland, to consider appropriate alternative actions which could lessen adverse effects, and to assure that such federal programs are, to the extent practicable, compatible with state or local government programs and policies to protect farmland. The FPPA guidelines apply to farmland classified as prime or unique, or of state or local importance as determined by the appropriate government agency, with concurrence by the Secretary of Agriculture.

The majority of the open space surrounding the airport is classified as being "prime farmland if irrigated." South of the airport on the opposite side of County Route 85, the land is classified as "prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season." The areas proposed for development under this Master Plan concept have been identified by the Maricopa Association of Governments as a transportation land use and is dedicated to urban development; therefore, the FPPA does not apply.

WATER SUPPLY AND QUALITY

The City of Goodyear Water Management Department provides potable water and wastewater service to the

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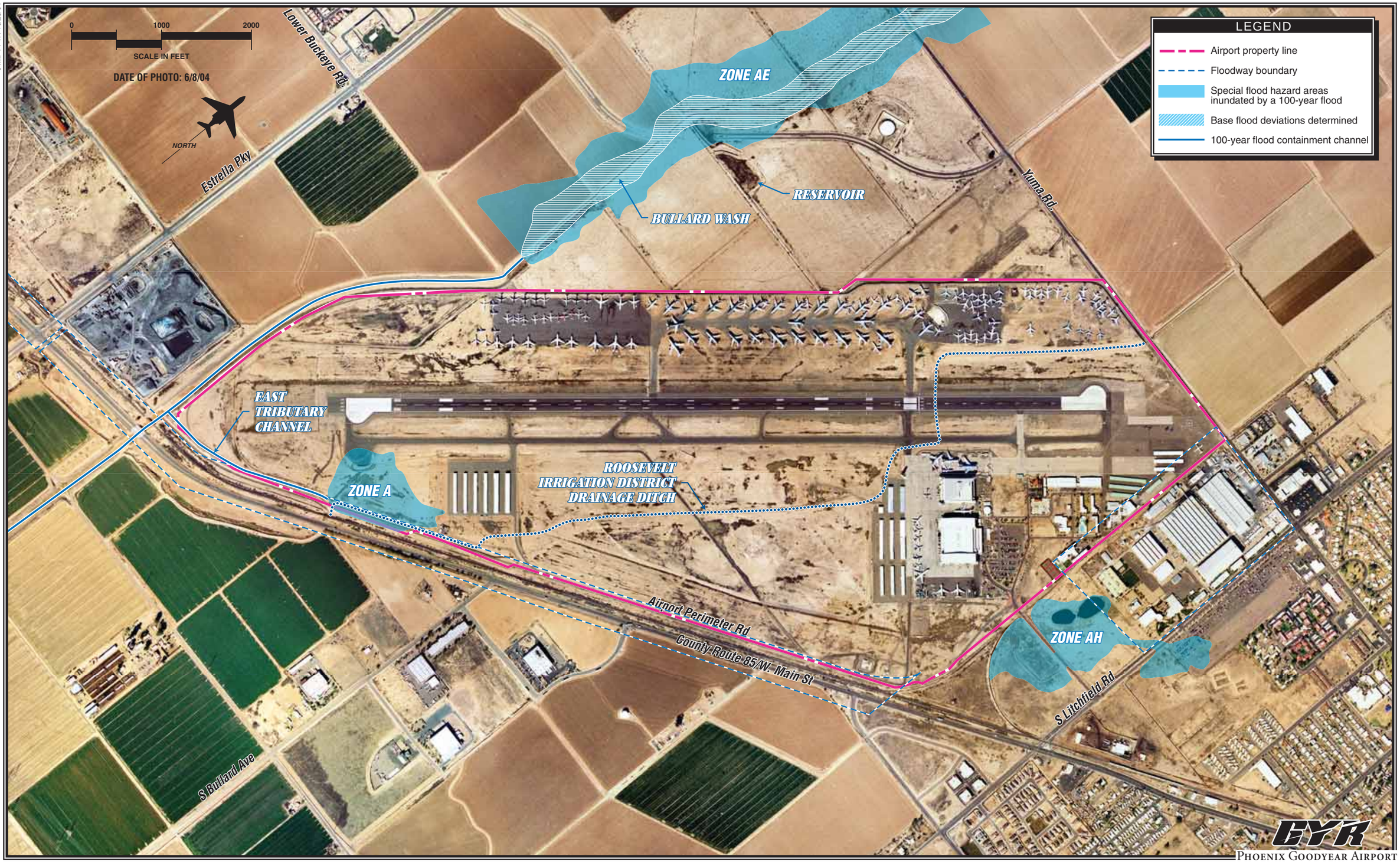

PHOENIX GOODYEAR AIRPORT
Exhibit 1H
FLOODPLAINS

City. The Goodyear Water Reclamation Facility (GWRF) provides service to all areas south of Interstate 10, including the airport. This facility is designed to treat 3 million gallons per day (MGD), with a peak-hourly flow capacity of 7.4 MGD.

The City's Water Production system consists of 18 facilities. Facilities include production wells, booster stations and storage tanks. The City's Water Production capacity is 7.7 MGD and the total storage capacity is 9.2 million gallons. Average water demand for the City's service area is 4.5 to 5.0 MGD during the winter months and increases to 6.0 to 7.0 MGD during the summer months.

Precipitation events causing surface water runoff is handled by sheet flow or, in paved areas, by a storm drain system. This drains via the Roosevelt Irrigation District canal that transects the airport. As an industrial facility, the airport is required to ensure activities that could cause pollutants to be washed into the surface water be controlled. Therefore, the City of Phoenix is currently regulated under the Environmental Protection Agency (EPA) Multi-Sector General Permit 2000 (MSGP 2000).

The State of Arizona has recently been given primary authority to run the National Pollution Discharge Elimination System (NPDES) permitting program and is developing its own version of the MSGP permit. The stormwater permitting process provides a mechanism to require the implementation of controls designed to prevent harmful pollutants from being washed by stormwater runoff into local water bodies.

BIOTIC RESOURCES

Biotic resources refer to those flora and fauna (i.e., vegetation and wildlife) habitats which are present in an area. Impacts to biotic communities are determined based on whether a proposal would cause a minor permanent alteration of existing habitat or whether it would involve the removal of a sizable amount of habitat, habitat which supports a rare species, or a small, sensitive tract.

Table 1P depicts federally-threatened and endangered species and species of special concern listed for Maricopa County.

A biological evaluation has not been conducted on airport property. However, in 1995 the City of Phoenix contacted the U.S. Fish and Wildlife Service in compliance with their MSGP 2000 for stormwater discharge. Coordination was required to determine the likelihood of federal-special status species occurring in the vicinity of the airport. It was documented that the Yuma clapper rail (currently endangered) may occur in the vicinity of the airport. Further coordination indicated that the Yuma clapper rail had only been identified at the confluence of the Gila and Aqua Fria Rivers, approximately 1 1/2 miles southeast of the airport.

TABLE 1P
Threatened, Endangered, or Sensitive Species

COMMON NAME	SCIENTIFIC NAME	Status
Arizona agave	Agave arizonica	Endangered
Arizona cliffrose	Purshia subintegra	Endangered
Bald eagle	Haliaeetus leucocephalus	Threatened
Cactus ferruginous pygmy-owl	Glauciduim brasilianum cactorum	Endangered
California Brown pelican	Pelecanus occidentalis californicus	Endangered
Desert pupfish	Cyprinodon macularius	Endangered
Gila topminnow	Poeciliopsis occidentalis occidentalis	Endangered
Lessor long-nosed bat	Leptonycteris curasoae yerbabuenae	Endangered
Mexican spotted owl	Strix occidentalis lucida	Threatened
Razorback sucker	Xyrauchen texanus	Endangered
Sonoran pronghorn	Antilocapra Americana sonoriensis	Endangered
Southwestern willow flycatcher	Empidonax traillii extimus	Endangered
Yuma clapper rail	Rallus longirostris yumanensis	Endangered
Gila chub	Gila intermedia	Proposed Endangered
Yellow-billed cuckoo	Coccyzus americanus	Candidate

Source: US Fish and Wildlife Service, Maricopa County Species List 2004

According to the Environmental Protection Agency report number AZD980695902, there are no unique habitats or threatened or endangered species at the airport, as native vegetation is sparse.

AIR QUALITY

The Environmental Protection Agency (EPA) has adopted air quality standards that specify the maximum permissible short-term and long-term concentrations of various air contaminants. The National Ambient Air Quality Standards (NAAQS) consist of primary and secondary standards for six criteria pollutants which include: Ozone (O_3), Carbon Monoxide (CO), Sulfur Dioxide (SO_x), Nitrogen Oxide (NO_x), Particulate Matter (PM_{10}), and Lead (Pb).

Air contaminants increase the aggravation and the production of respiratory and cardiopulmonary diseases. Primary air quality standards are established at levels to protect the public health and welfare from any known or anticipated adverse effects of a pollutant. All areas of the country are required to demonstrate attainment with NAAQS.

The standards also establish the level of air quality which is necessary to protect the public health and welfare, including among other things, effects on crops, vegetation, wildlife, visibility, and climate, as well as effects on materials, economic values, and on personnel comfort and well-being.

According to the Environmental Protection Agency's "Green Book," Maricopa County is in nonattainment for 8-hour ozone and PM_{10}.

HAZARDOUS MATERIALS AND SOLID WASTE

Phoenix Goodyear Airport is located on the former Litchfield Park Naval Air Field. From 1946-1968, the airport's primary purpose was the preservation and activation of military aircraft. The preservation of aircraft involved treating the engines to repel dust, rust, and moisture and then spraying the aircraft with a protective latex coating that contained a ketone solvent. Stripping off the protective coating required the removal of the latex with a (currently unknown) solvent and returning the parts to working order. This process was repeated every six months and the effluent (waste material discharged into the environment) from the process entered drains which discharged directly into the main airport drainage ditch. Up to as many as 2,000 aircraft per year were preserved at the Litchfield NAF. In addition to preserving and stripping chemicals, it is assumed that other liquid substances generated as a part of routine aircraft maintenance were also discharged, including chromium-based compounds.

In 1981, Arizona Department of Health Services (ADHS) discovered that the groundwater in the Phoenix Goodyear Airport area was contaminated with solvents and metals, resulting in the United States Environmental Protection Agency (EPA) adding the site to the National Priorities List (NPL). A remedial investigation by the EPA began in 1984.

In 1989, the EPA completed a Remedial Investigation/Feasibility Study (RI/FS) at the Phoenix Goodyear Airport South Superfund Site. The hazardous materials of concern associated with the Superfund Site are predominantly trichloroethene (TCE) and chromium.

According to the EPA report number AXD980695902, a former chromium sludge drying bed has been cleaned up by using on-site solidification technology. Construction of the remedy was completed in early 1993. Solidifying the sludge bed has prevented further migration of chromium into the groundwater and chromium dust particles into the air. In addition, remedial action included extraction and treatment of contaminated groundwater and airsparging of soils to remove Volatile Organic Compounds (VOCs). As of this time, the Goodyear Tire and Rubber Company, the working responsible party for the remediation, has completed all soil clean-up and has substantially completed restoration of the groundwater, per EPA.

Several fueling facilities also created environmental contamination at the airport. The Aviation Department has responded and completed work in those areas except for remediation that continues in the north infield area, where Navy-spec fuels and 100LL avgas are being cleaned up with EPA oversight.

Information on fuel facilities can be found in the earlier sub-section with that title (page 1-23). AeroTurbine and ATCA store regulated substances on their leaseholds for their maintenance activities. Small amounts of regulated materials are stored on the

airport at the city's maintenance yard for its own equipment.

Solid waste disposal facilities can cause a hazard to aircraft by attracting wildlife and, most importantly, birds. A bird hazard exists if the landfill is located within approximately 5,000 feet of runways used by piston aircraft and 10,000 feet of runways used by turbojet aircraft. The nearest active solid-waste facility is the City of Glendale's Municipal Solid Waste Landfill Facility. This facility is approximately eight miles (42,240) feet from the airport.

HISTORICAL AND CULTURAL RESOURCES

As various airport development projects have been undertaken, cultural and historical surveys have been completed. The airport is formally a U.S. Naval Air Facility, with a construction date of 1941. Structures remaining from that period may be eligible for listing on the National Register of Historic Places. However, many of these buildings have been heavily modified from their original structure, which may reduce their historical value.

The area has a rich prehistory, and cultural surveys will need to be conducted before construction. In addition, if any undocumented buried cultural resource should be encountered during construction, all ground-disturbing activities should stop immediately and the remains should be evaluated.

SUMMARY

The information discussed on the previous pages provides a foundation upon which the remaining elements of the planning process will be constructed. Information on current airport facilities and utilization will serve as a basis, with additional analysis and data collection, for the development of forecasts of aviation activity and facility requirement determinations. The inventory of existing conditions is the first step in the process of determining those factors which will be needed to meet projected aviation demand in the community and the region.

DOCUMENT SOURCES

A variety of sources were used during the inventory process. The following listing reflects a partial compilation of these sources. In addition, considerable information was provided directly to the consultant by the City of Phoenix Aviation Department.

AirNAV Airport information, website: www.airnav.com

Flight Plan Airport & FBO Information, website: www.fltplan.com

U.S. Terminal Procedures, Southwest Volume 4 of 4, June 10, 2004 Edition

Airport/Facility Directory Southwest U.S., August 5, 2004, Edition

Maricopa Association of Governments' Regional Aviation System Plan, Implementation Study, December 1996.

City-Data, website: www.city-data.com

City of Goodyear General Plan, 2002.

Greater Phoenix Economic Council, 2004, website: www.gpec.org/index.asp

United States Census Bureau, website: www.census.gov

Western Regional Climate Center, website: www.wrcc.dri.edu/index.html

Goodyear Department of Community Development website: http://az-goodyear

Federal Emergency Management Agency, website: www.fema.gov/fhm/

U.S. Fish and Wildlife Service; Arizona Ecological Services Field Office, website: http://arizonaes.fws.gov/

Environmental Protection Agency; Green Book, website: www.epa.gov/oar/oaqps/greenbk/

Environmental Protection Agency; Superfund, website: www.epa.gov/superfund/

Arizona Department of Environment Quality, website: www.azdeq.gov/environ/waste/index.html

Agency for Toxic Substances and Disease Registry, website: www.atsdr.cdc.gov/

Chapter Two

FORECASTS

Forecasts

Facility planning must begin with a definition of the demand that may reasonably be expected to occur at the airport facility over a specific period of time. For Phoenix Goodyear Airport, this involves forecasts of aviation activity indicators through the year 2025. In this master plan, forecasts of aircraft operations and based aircraft will serve as the basis for airport facility planning.

FAA Advisory Circular 150/5070-6A outlines six standard steps involved in the forecast process, including:

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

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

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

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

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

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

It is virtually impossible to predict with certainty year-to-year fluctuations of activity when looking twenty years into the future. Because aviation activity can be affected by many influences at the local, regional, and national level, 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.

The following forecast analysis examines recent developments, historical information, and current aviation trends to provide an updated set of aviation-demand projections for GYR. The intent is to permit the Phoenix Aviation Department to make planning adjustments as necessary to ensure that the facility meets projected demands in an efficient and cost-effective manner.

NATIONAL AVIATION TRENDS

Each year, the Federal Aviation Administration (FAA) updates and publishes a national aviation forecast. Included in this publication are forecasts for air carriers, regionals/commuters, 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 2004-2015*, published in March 2004. The forecasts use 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.

Following more than a decade of decline, the general aviation industry was revitalized with the passage of the *General Aviation Revitalization Act* in 1994, which limits the liability on general aviation aircraft to 18 years from the date of manufacture. This legislation sparked an interest to renew the manufacturing of general aviation aircraft due to the reduction in product liability, as well as renewed optimism for the industry. The high cost of product liability insurance had been a major factor in the decision by many American aircraft manufacturers to slow or discontinue the production of general aviation aircraft.

The sustained growth in the general aviation industry slowed considerably in 2001, negatively impacted by the events of September 11. Thousands of general aviation aircraft were grounded for weeks due to no-fly zone restrictions imposed on operations of aircraft in security-sensitive areas. Some U.S. airports in and around Washington, D.C. and New York City remain closed to visual flight rules (VFR) traffic. This, in addition to the economic recession that began in early 2001, has had a negative impact on the general aviation industry.

While the recession ended a seven-year period of growth in the aviation industry, it was early in 2002 before the severity of the recession was realized. The domestic economy declined

for three consecutive quarters in 2001. In 2002, the recovery was underway, although weak, but has picked up in the last two years. The FAA expects the U.S. economy to continue to recover strongly through 2005, and grow moderately thereafter. This will positively influence the aviation industry, leading to passenger, air cargo, and general aviation growth throughout the forecast period (assuming that there will not be any new successful terrorist incidents against either U.S. or world aviation).

According to the General Aviation Manufacturers Association (GAMA), aircraft shipments in the first three quarters of 2004 were up 7.7 percent from 2003. This followed a static level of growth between 2002 and 2003. The number of general aviation hours flown also remained static in 2003.

After a recent slowdown in business jet shipments (down 31.9 percent in 2003), the business/corporate segment of general aviation began to grow again in 2004 and offers the most growth potential. For the first three quarters of 2004, business jet shipments were up 10.4 percent. The FAA expects this segment will continue to expand at a faster rate than personal/sport flying. Safety concerns combined with increased processing time at commercial terminals make business/corporate flying an attractive alternative. In addition, the bonus depreciation provision of the President's economic stimulation package should help business jet sales even more, late in 2004.

In 2003, there were an estimated 211,190 active general aviation aircraft, representing an increase of 150 aircraft (0.07 percent). **Exhibit 2A** depicts the FAA forecast for active general aviation aircraft in the United States. The FAA forecasts general aviation aircraft to increase at an average annual rate of 1.3 percent over the 12-year forecast period, to 246,415. Piston-powered aircraft are expected to grow at an average annual rate of 0.2 percent. This is due, in part, to declining numbers of multi-engine piston aircraft, while single-engine and rotorcraft increase at rates of 0.3 and 1.0 percent, respectively.

Turbine-powered aircraft (turboprop and jet) are expected to grow at an average annual rate of 3.1 percent over the forecast period. Even more significantly, the jet portion of this fleet is expected to grow at an average annual growth rate of 5.1 percent. This growth rate for jet aircraft can be attributed to growth in the fractional ownership industry, new product offerings (which include new entry-level aircraft and long-range global jets), and the shift away from commercial travel by many travelers and corporations.

In summary, business aviation, by nature of its ownership and use, will experience cyclical movements in activity relating to economic conditions. Over the long term, however, it is anticipated to continue to be the strongest growth market in general aviation.

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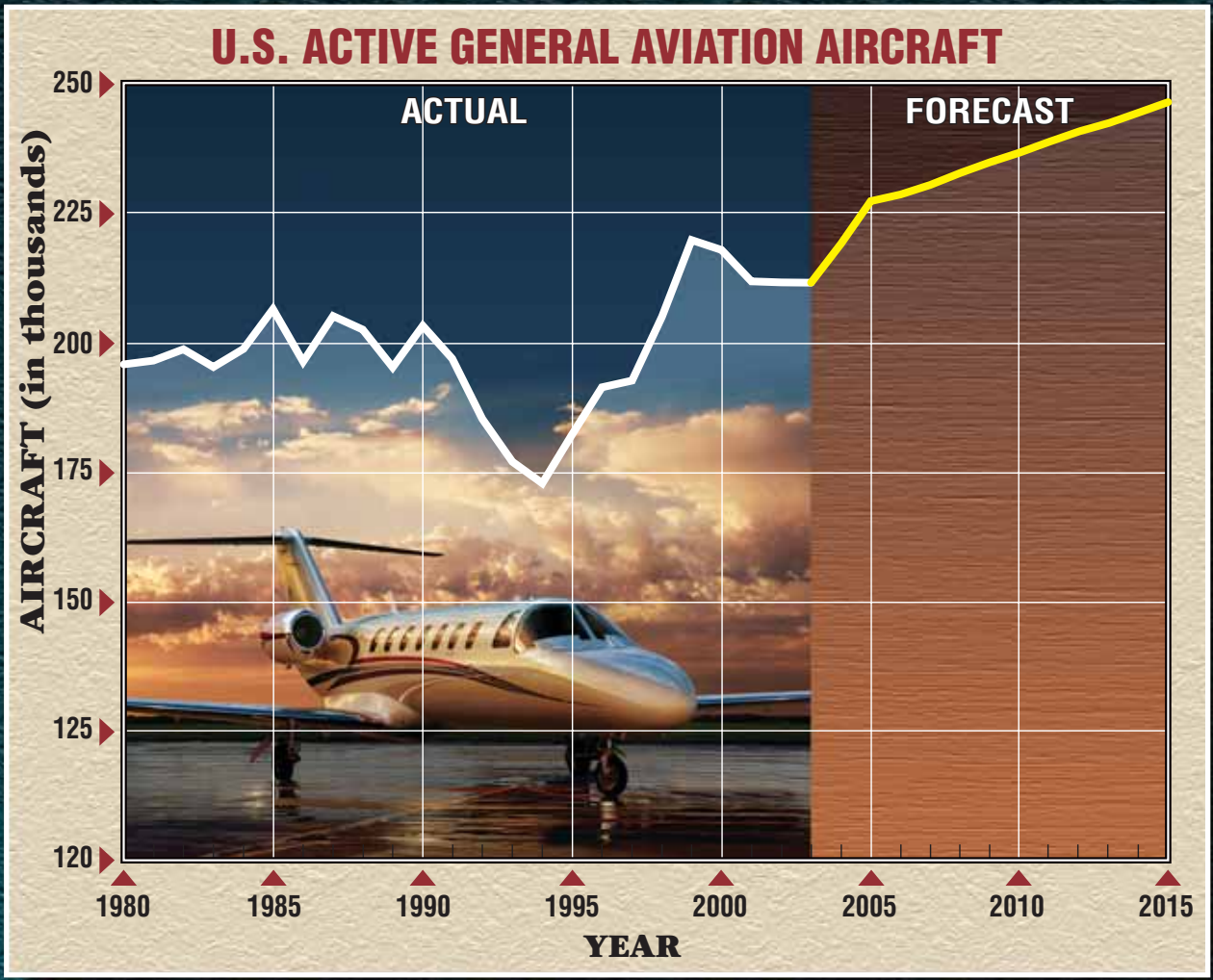

U.S. ACTIVE GENERAL AVIATION AIRCRAFT (in thousands)

Year	FIXED WING									
	PISTON		TURBINE		ROTORCRAFT					
	Single Engine	Multi-Engine	Turboprop	Turbojet	Piston	Turbine	Experimental	Sport Aircraft	Other	Total
2003 (Est.)	143.4	17.5	6.9	8.5	2.4	4.3	22.0	N/A	6.4	211.2
2005	143.5	17.3	7.0	9.0	2.4	4.3	22.1	15.5	6.4	227.6
2010	146.2	16.9	7.6	12.0	2.6	4.4	22.7	18.1	6.5	236.9
2015	148.5	16.5	8.1	15.5	2.7	4.5	23.1	20.9	6.6	246.4

Source: FAA Aerospace Forecasts, Fiscal Years 2004-2015.

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

PHOENIX GOODYEAR AIRPORT

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

STATE AND REGIONAL TRENDS

The Arizona Department of Transportation (ADOT) Aeronautics Division assists airports in the state in identifying infrastructure needs, with a state aviation needs study and other special aviation studies. The most recent study on a statewide basis is the *State Aviation Needs Study* (SANS) - *2000*. The SANS 2000 includes forecasts of aviation activity in the state. The Maricopa Association of Governments (MAG) is charged with preparing and updating a *Regional Airport System Plan* (RASP) for the Phoenix metropolitan area. The most recent aviation forecasts for the MAG-RASP were prepared in late 2001, after the events of September 11. They were adopted by MAG in 2003.

Table 2A depicts the based aircraft forecasts prepared from the SANS 2000 for the State and Maricopa County. The base year for these forecasts was 1998. The SANS 2000 forecast that based aircraft in the state would grow at an annual average rate of 1.3 percent through 2020. This is well above the 0.7 percent that the FAA projects for active aircraft nationwide.

TABLE 2A
Maricopa County Based Aircraft Forecasts

	Base Year*	2005	2010	2015	2020	2025
SANS 2000						
Arizona	6,700	7,156	7,674	8,247	8,896	NA
Maricopa County	3,857	4,065	4,303	4,568	4,877	NA
MAG-RASP						
Maricopa County	4,317	4,820	5,517	6,215	6,913	7,612

Sources: *State Aviation Needs Study – 2000*; ADOT, 1999.
Regional Airport System Plan; Maricopa Council of Governments, 2001.

* Base Year: SANS – 1998; MAG-RASP – 2000.

The percentage of Arizona-based aircraft in Maricopa County was actually forecast to decline over the years, from 57.6 percent in 1998 to 54.8 percent in 2020. Thus, the average growth rate for based aircraft in Maricopa County was projected to be slightly lower, at 1.2 percent.

Table 2A also presents the more recent forecast of Maricopa County based aircraft prepared for the MAG-RASP. The base year for this forecast was 2000. As evident from the table, based aircraft in Maricopa County increased by 12 percent between 1998 and 2000. In fact, the actual based aircraft in 2000 were more than the SANS 2000 forecast for 2010.

As could be expected, the MAG-RASP forecast of based aircraft is higher. This forecast projects total based aircraft in the region to reach 7,612 by 2025. This would be an annual average increase of 2.1 percent, significantly stronger than the national or

statewide growth rates projected by FAA and ADOT, respectively.

Keeping in line, the MAG-RASP projects fixed-wing turbine aircraft based in the county to grow from 170 in 2000, to 427 by 2025. This would be an increase of 151 percent (3.75 percent annually). Turbine aircraft would also grow as a percentage of all based aircraft, from 3.9 percent in 2000, to 9.3 percent in 2025.

SERVICE AREA

The generalized service area of an airport is defined by its proximity to other airports providing similar service. Phoenix Goodyear Airport is one of several airports serving the general aviation needs of the Phoenix metropolitan area.

Exhibit 2B depicts GYR in relationship to other airports that serve the West Valley. The airports with comparable capabilities are Phoenix Sky Harbor Airport (PHX) to the east, Buckeye Municipal (BXK) to the west, and Glendale Municipal Airport (GEU) to the north. **Table 2B** compares the runway lengths and based aircraft of these airports to Phoenix Goodyear Airport.

TABLE 2B
Public Airports
West Valley

Name	Longest Runway (ft.)	Approach Minimums (feet-miles)	Based Aircraft	2004 Annual Operations*
Phoenix Goodyear	8,500	NA	209	105,471
Phoenix Sky Harbor	11,490	200 – ½	237	599,105
Glendale Municipal	7,150	500 – 1 ¼	269	118,140
Buckeye Municipal	5,500	NA	58	35,027

* Tower counts, except for Buckeye, which is an estimate taken from FAA Form 5010.
Note: Phoenix Sky Harbor general aviation operations totaled 100,818 in 2004.

These four airports base a total of 773 aircraft. Glendale Municipal Airport has the most with 269 based aircraft, but GYR and PHX also have more than 200 based aircraft each. Phoenix Sky Harbor International Airport (PHX) had the most annual operations in 2004 with 599,105. As the commercial service airport for the Phoenix metropolitan area, however, PHX had just 100,818 general aviation operations in 2004. GYR and GEU are similar in traffic volume with over 100,000 annual operations each. Buckeye Municipal Airport is currently on the western fringe of the metropolitan area, and has not experienced the same activity levels as the other three airports.

The MAG-RASP has considered alternatives for developing new airports in the south valley. There are no specific sites, but the MAG-RASP includes a potential new general aviation airport located in Pinal County, and likely to

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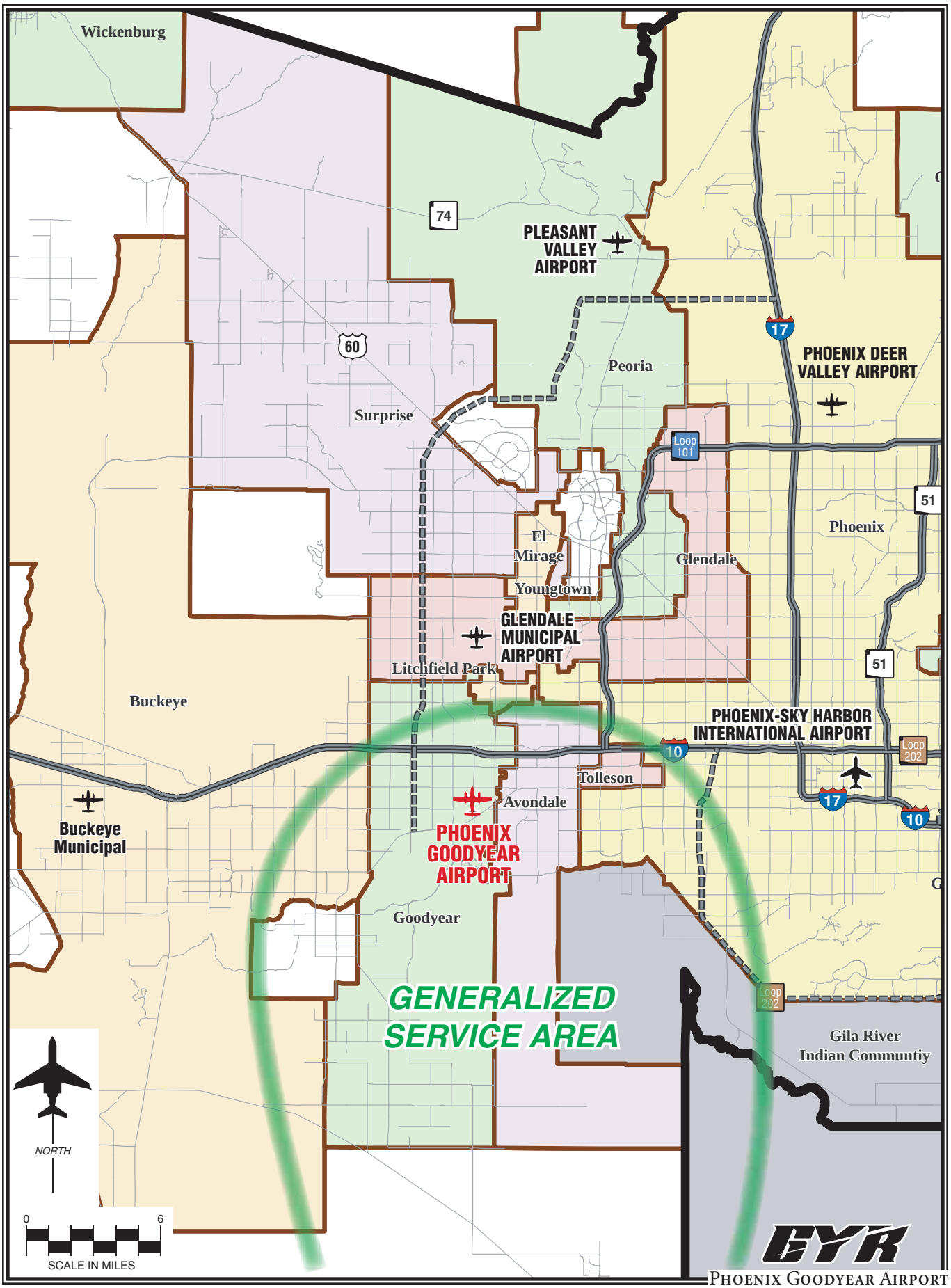

PHOENIX GOODYEAR AIRPORT

Exhibit 2B

GENERALIZED SERVICE AREA

be contained within the Gila River Indian Community. A location west of Interstate 10 is viewed as having the least potential impact on military airspace in the area.

Based upon the proximities of the other three public airports listed above, the primary general aviation service area for Phoenix Goodyear Airport is generally comprised of Goodyear, Avondale, Tolleson, as well as portions of east Buckeye, southwest Phoenix, and unincorporated Maricopa County. As shown on **Table 2C**, the population of this area totaled 85,596 in 2000. This represented 2.8 percent of the population of Maricopa County. **Table 2D** indicates that employment in the GYR primary service area was 44,205 in 2000, or 2.8 percent of the total employment in Maricopa County.

TABLE 2C
Population Forecasts
Primary Service Area
Phoenix Goodyear Airport

	Actual	Forecast		
	2000	2010	2020	2025
Goodyear	21,200	61,300	161,100	247,400
Avondale	37,800	82,100	122,500	141,600
East Buckeye	4,706	21,172	59,357	109,137
Litchfield Park	3,800	7,000	13,700	13,700
Southwest Phoenix	10,714	68,982	101,730	121,973
Tolleson	5,000	6,100	6,200	6,200
Unincorporated County	2,376	2,651	8,248	11,125
Total	85,596	249,305	472,835	651,135
Avg. Annual % Change	NA	11.3%	6.6%	6.6%
Maricopa County	3,072,149	4,134,388	5,164,142	5,663,999
Area % of County	2.8%	6.0%	9.2%	11.5%

Source: Interim Projections of Population, Housing, and Employment, Maricopa Association of Governments, July 2003.

In July of 2003, the MAG Regional Council adopted a new set of population, housing, and employment forecasts for the county. This included not only the county total, but a breakdown of sub-areas as well. **Tables 2C** and **2D** also present the population and employment forecasts for the various areas included in the Phoenix Goodyear Airport service area, as well as the Maricopa County total.

The population in the service area is projected to grow by 660 percent in the first quarter of the century, from 85,596 to 651,135. Incrementally, the population is projected to increase through 2010 at average annual rates of 11.3 percent. The growth rate declines, but remains strong between 2010 and 2020, at 6.6 percent annually. This same average is also projected to be maintained between 2020 and 2025.

This very strong growth rate also reflects in the percentage of the county population in the GYR service area over the planning period. At the time

of the last census in 2000, the service area comprised 2.8 percent of the County population. By the next census, the service area is expected to contain 6.0 percent of the County population. By 2025, 11.5 percent of the county population is forecast to reside within the GYR general aviation service area. Thus, population in the area is expected to grow at a much stronger rate than that of the County as a whole.

TABLE 2D
Employment Forecasts
Phoenix Goodyear Airport Service Area

	2000	2010	2020	2025
Goodyear	13,900	30,900	66,800	84,200
Avondale	9,000	21,900	50,800	53,800
East Buckeye	1,506	7,981	25,896	45,089
Litchfield Park	1,200	3,600	4,600	4,400
Southwest Phoenix	5,123	23,358	48,989	61,749
Tolleson	12,800	16,000	20,300	25,100
Unincorporated County	676	877	1,637	2,907
Total	44,205	104,616	219,022	277,245
Avg. Annual % Change	NA	9.0%	7.7%	4.8%
Maricopa County	1,564,836	2,112,000	2,705,000	3,002,000
Area % of County	2.8%	5.0%	8.1%	9.2%

Source: Interim Projections of Population, Housing, and Employment, Maricopa Association of Governments, July 2003.

Employment within the GYR service area is projected to grow by 527 percent in the first quarter of the century, from 44,205 to 277,245. This relates to an annual average rate increase of 9.0 percent through 2010. The average rate goes down to 7.7 percent between 2010 and 2020, and to 4.8 percent between 2020 and 2025. Like population, the percentage of county employment in the GYR service area is anticipated to grow throughout the planning period, from 2.8 percent in 2000, to 9.2 percent by 2025. This suggests that over the next two decades, the GYR service area will be a strong growth area within one of the fastest growing metropolitan areas in the country.

BASED AIRCRAFT

The number of based aircraft is one of the most basic indicators of general aviation demand. By first developing a forecast of based aircraft, the growth of other general aviation activities and demands can be projected.

Table 2E presents a history of based aircraft at GYR, dating back to 1983. As graphically depicted on **Exhibit 2C**, the based aircraft totals at GYR have fluctuated over the past two decades, with a net growth of 25 aircraft between 1983 and 2004.

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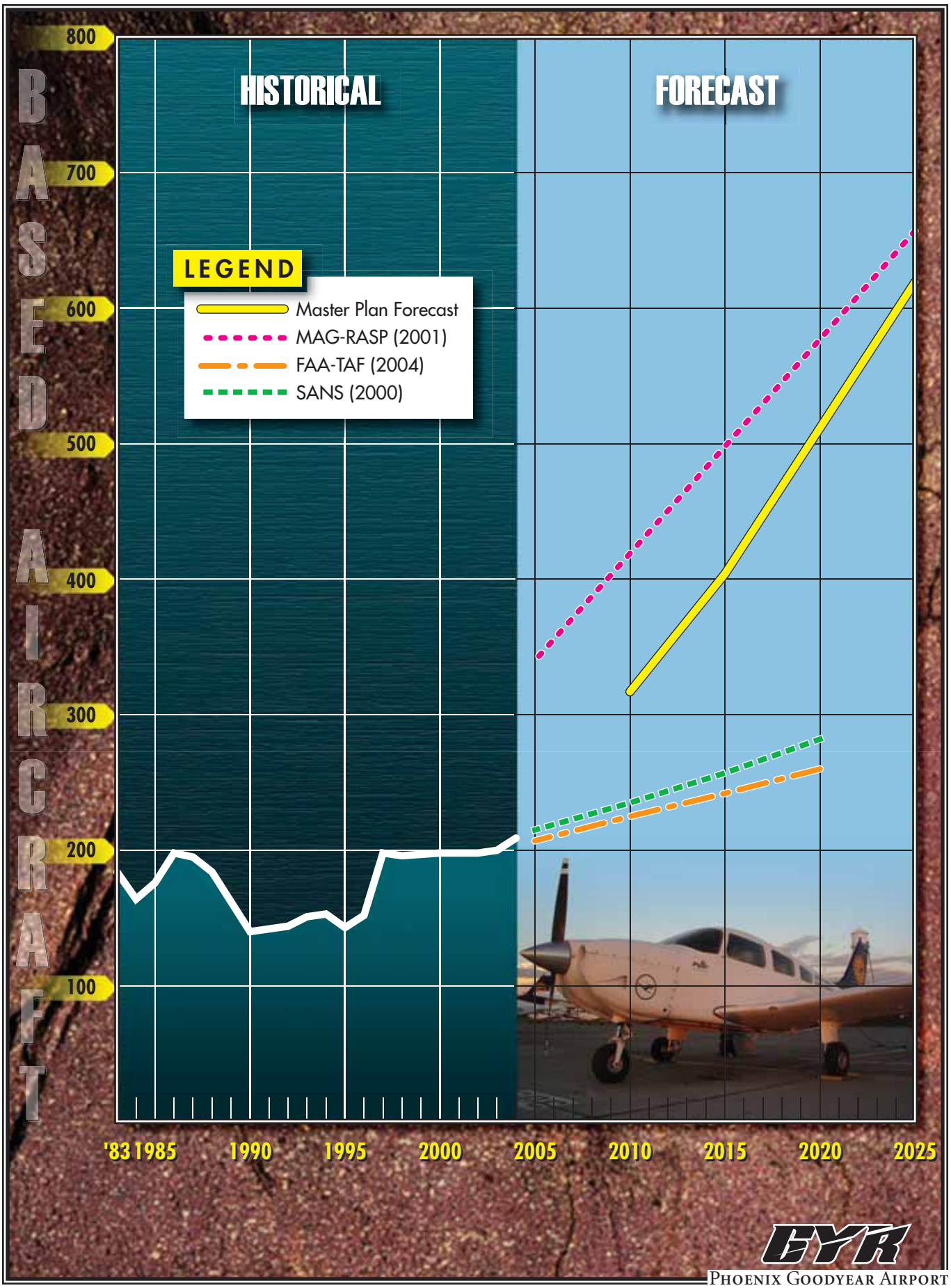

GYR

PHOENIX GOODYEAR AIRPORT

Exhibit 2C

BASED AIRCRAFT

TABLE 2E
Based Aircraft History
Phoenix Goodyear Airport

Year	Total Aircraft
1983	184
1984	164
1985	176
1986	198
1987	195
1988	184
1989	162
1990	140
1991	142
1992	144
1993	151
1994	153
1995	143
1996	152
1997	198
1998	196
1999	197
2000	198
2001	198
2002	198
2003	200
2004	209

Sources: Phoenix Aviation Department; Maricopa Association of Governments (MAG)

Table 2F compares the based aircraft at each of the airports (public and private) serving the West Valley over the last ten years. The total number of based aircraft at these airports has increased by 24 percent since 1994. Phoenix Sky Harbor International Airport has experienced minimal change in based aircraft because it is the air carrier airport for the region. Buckeye Municipal Airport has experienced a net loss in based aircraft over the last ten years. Effectively, the growth in aircraft in the West Valley has been at Glendale Municipal and Phoenix Goodyear Airports.

The MAG-RASP expects PHX to experience a continued decline in based aircraft over the next twenty years; the other three airports were forecast for strong growth, particularly at Phoenix Goodyear Airport.

Table 2F also presents the MAG-RASP forecasts for each of the airports. As can be seen from the table, the 2005 forecast has already been exceeded for PHX and GEU. The MAG-RASP forecast first projected the total aircraft based at public airports in Maricopa County, then distributed these aircraft to the airports within the county. A strong correlation was found between Maricopa County based aircraft and the County's population. Thus, the county-wide based aircraft forecasts were derived from a linear regression, using the county population as the independent variable.

The population forecasts used by the MAG-RASP were prepared in 1997. Those population forecasts for Maricopa County are lower than the recent population forecasts approved by the MAG Council in July of 2003. By comparison, the population forecasts used by the MAG-RASP projected 4.95 million residents in the county by 2025. The updated population forecast expects 5.66 million residents, or 14.4 percent higher than previously forecast.

TABLE 2F
Based Aircraft Forecasts
West Valley Airports
Maricopa Association of Governments (September 2001)

Year	Total	Phoenix Goodyear	Phoenix Sky Harbor	Glendale	Buckeye
ACTUAL					
1994	625	153	224	178	70
1997	693	198	265	184	46
2000	698	198	237	208	55
2004	773	209	237	269	58
% change 1994-2004	24%	37%	6%	51%	-17%
FORECAST					
2005	878	340	231	237	70
2015	1,082	498	183	300	101
2025	1,288	657	135	364	132

Source: MAG-RASP, Working Paper No. 2, September 2001

Since the MAG-RASP found such a high correlation (r^2 = 0.97) between population and based aircraft, the regression was updated with additional based aircraft and population data that has become available since 2000. The correlation coefficient of the expanded historic data remained at 0.97. A new projection utilizing the updated county population forecast was then developed. This resulted in an updated projection of 7,641 based aircraft at the public airports in the county by 2025. This figure is 4.8 percent higher than the MAG-RASP projection. The two projections are compared in **Table 2G.**

Exhibit 2C and **Table 2G** outline previous forecasts of based aircraft prepared for Phoenix Goodyear Airport. The oldest forecast shown is from the SANS 2000 which was prepared in 1998. The MAG-RASP forecast was prepared in 2001. The most current forecast, however, is the FAA *Terminal Area Forecast* (TAF) which was prepared in 2004 and published in January of 2005.

The MAG-RASP forecast more than doubles the based aircraft of the other two forecasts by 2020. While the growth rate of the MAG-RASP forecast is higher throughout, it also starts from a higher base year of 280 aircraft. While it is not clear why the MAG-RASP count was high for that period, it does affect the based aircraft upward.

TABLE 2G
Based Aircraft Forecasts
Phoenix Goodyear Airport

	2000	2004	2005	2010	2015	2020	2025
Maricopa County Based Aircraft Forecasts							
MAG-RASP (2001)	4,133		4,615	5,282	5,950	6,618	7,288
Updated (2004) *	4,133		4,737	5,474	6,211	6,937	7,641
Previous GYR Based Aircraft Forecasts							
Actual	198	209					
SANS-2000 (1998)			215	235	257	282	
MAG-RASP (2001)	280		340	419	498	577	657
FAA-TAF (2004)	198		207	225	242	260	
Updated GYR Forecast							
Master Plan				317	404	506	619
Percent of Updated County Forecast				5.8%	6.5%	7.3%	8.1%

* Update prepared by Coffman Associates to account for additional history and new county population forecasts.

The MAG-RASP projected that Phoenix Goodyear Airport's market share of based aircraft would grow from 6.8 percent in 2000, to 7.4 percent by 2005. The percentage was forecast to continue to grow to 9.0 percent by 2025. This growth in the percentage of the county's based aircraft would seem reasonable, as the population and employment growth in the West Valley is forecast to grow faster than Maricopa County as a whole.

Thus, two adjustments are necessary to update the MAG-RASP forecast of based aircraft for GYR. First the market share must be adjusted downward to reflect an actual based aircraft figure that was lower than used in the MAG-RASP. Second, the forecast based aircraft must then be adjusted to reflect the updated forecast demand for Maricopa County. The 2000 market share percentage for GYR was 4.8 percent rather than 6.8 percent, a 2.0 percent difference. The forecast percentage was adjusted downward to account for this difference. The resulting based aircraft forecast is presented on **Table 2G** and **Exhibit 2C** for comparison. The new forecast results in 38 less based aircraft at GYR than the MAG-RASP projected.

The based aircraft fleet mix at Phoenix Goodyear Airport (**Table 2H**) was compared to the existing and forecast U.S. general aviation fleet mix trends as presented in FAA *Aerospace Forecasts Fiscal Years 2004-2015*. The FAA expects that business jets will be the fastest growing general aviation aircraft type in the future. The number of business jets in the U.S. fleet is expected to nearly double in 10 years and almost triple in 20 years. While single engine piston aircraft will con-

tinue to dominate the mix at GYR, as it does across the country, based business jets are projected to increase eleven-fold at the airport over the planning period.

TABLE 2H
Based Aircraft Forecast
Phoenix Goodyear Airport

GYR Based	Current	%	2010	%	2015	%	2025	%
Single Engine Piston	185	88.5%	277	87.4%	348	89.1%	525	84.8%
Multi-Engine Piston	15	7.2%	19	6.3%	23	5.7%	30	4.8%
Turboprop	0	0.0%	4	1.3%	8	2.0%	16	2.6%
Jet	3	1.4%	7	2.2%	14	3.5%	33	5.3%
Helicopter	4	1.9%	6	1.9%	7	1.7%	10	1.6%
Other	2	1.0%	3	0.9%	4	0.7%	5	0.8%
Totals	209	100.0%	317	100.0%	404	100.0%	619	100.0%
U.S. Active Aircraft (FAA Aerospace Forecasts 2004)								
Single Engine Piston	173,050	79.0%	186,915	78.9%	192,465	78.1%	204,200	76.5%
Multi-Engine Piston	17,420	8.0%	16,910	7.1%	16,490	6.7%	15,800	5.9%
Turboprop	6,900	3.1%	7,580	3.2%	8,120	3.3%	9,700	3.6%
Jet	8,650	3.9%	11,990	5.1%	15,510	6.3%	22,800	8.5%
Helicopter	6,680	3.0%	7,000	3.0%	7,210	2.9%	7,600	2.8%
Other	6,400	2.9%	6,520	2.8%	6,620	2.7%	6,800	2.5%
Totals	219,100	100.0%	236,915	100.0%	246,415	100.0%	266,900	100.0%

Note: Experimental and sport aircraft totals are included under Single Engine Piston.

GENERAL AVIATION OPERATIONS

General aviation operations are classified by the airport traffic control tower (ATCT) as either local or itinerant. A local operation is a take-off or landing performed by an aircraft that operates within sight of the airport, or which executes simulated approaches or touch-and-go operations 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. Typically, itinerant operations increase with business and commercial use.

ITINERANT OPERATIONS

Table 2J depicts the history of general aviation (GA) itinerant operations, as counted by the ATCT at GYR since 1990. Itinerant operations decreased from 86,075 in 1991, to 33,542 in 1995. Since 1996, itinerant GA operations have generally been around 60,000 annually.

TABLE 2J
General Aviation Operations
Phoenix Goodyear Airport

Year	Itinerant	Local	Total
1990	82,010	119,456	201,466
1991	86,075	93,465	179,540
1992	83,003	82,452	165,455
1993	74,276	64,350	138,626
1994	46,420	39,673	86,093
1995	33,542	28,385	61,927
1996	46,418	45,756	92,174
1997	65,191	50,781	115,972
1998	50,071	53,467	103,538
1999	60,605	75,355	135,960
2000	62,575	79,334	141,909
2001	59,920	74,236	134,156
2002	64,877	71,757	136,634
2003	62,204	62,531	124,735
2004	57,706	40,389	98,095

Source: FAA – Air Traffic Activity Data System (ATADS)

Exhibit 2D and **Table 2K** compare the previous forecasts of general aviation itinerant operations. The MAG-RASP forecasts a strong growth for itinerant operations through 2025. The itinerant operations were directly related to based aircraft growth. Each future year was projected at 225 operations per based aircraft. This results in a projection of 147,700 annual itinerant operations by 2025.

The FAA-TAF has the advantage of being the more recent forecast and thus has a better consideration for the effects of the post-September 11 period. The FAA-TAF projects general aviation itinerant operations to grow at a slightly slower rate than based aircraft, as the ratio of operations per based aircraft declines slightly over the planning period. This, combined with a lower forecast for based aircraft in the TAF, results in a projection of just 76,592 operations by 2020.

Table 2L outlines the history of itinerant operations in relation to the total general aviation itinerant operations at towered airports in the U.S. As with the operations themselves, the GYR market share, as a percentage of general aviation itinerant operations at towered airports across the country, decreased from a high of 0.388 percent in 1991, to a low of 0.160 percent in 1995. The market share grew back to 0.308 percent by 2003, but operations were down over seven percent in 2004. With the fluctuations in market share over the years, the average percentage has been 0.288. In 2003, the market share was down slightly to 0.757.

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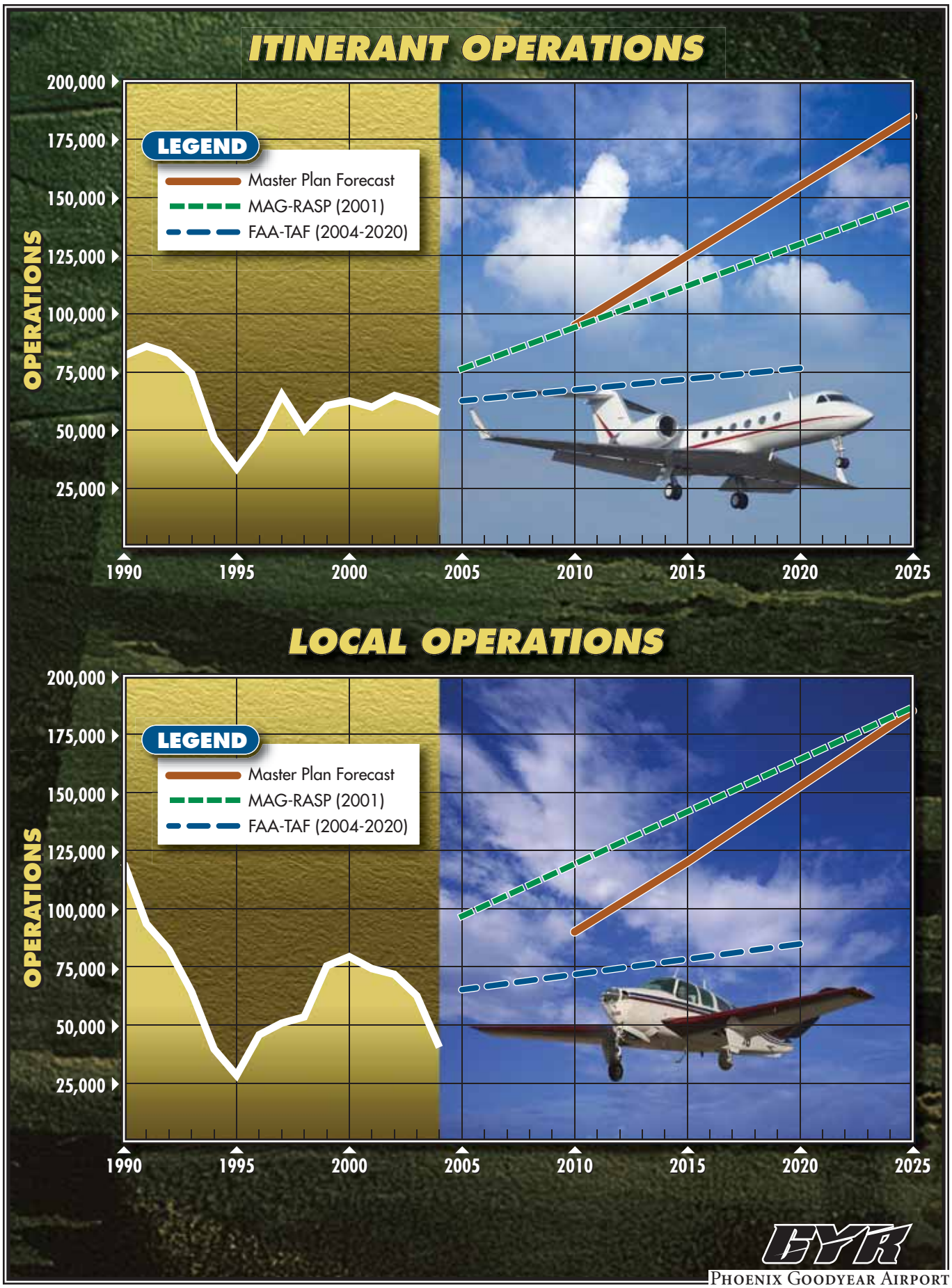

PHOENIX GOODYEAR AIRPORT

Exhibit 2D

GENERAL AVIATION OPERATIONS FORECASTS

TABLE 2K
Previous General Aviation Operations Forecast
Phoenix Goodyear Airport

	2000	2005	2010	2015	2020	2025
Itinerant GA Operations						
MAG-RASP (2001)	62,575	76,500		112,100		147,700
FAA-TAF (2004)	62,385	62,626	67,282	71,937	76,592	
Local GA Operations						
MAG-RASP (2001)	79,334	96,600		141,500		186,500
FAA-TAF (2004)	60,363	65,154	71,710	78,266	84,823	
Total GA Operations						
MAG-RASP (2001)	141,909	173,100		253,600		334,200
FAA-TAF (2004)	122,748	127,780	138,992	150,203	161,415	
SANS-2000		152,640	166,421	181,447	197,829	

This table also depicts the itinerant operations per based aircraft ratio. Over the past 15 years, this ratio declined from a high of 606 itinerant operations per based aircraft in 1991, to a low of 235 in 1995. Since then, the ratio has remained relatively steady, with the average being 303 operations per based aircraft.

Table 2L presents a pair of projections based upon maintaining a "constant" or average market share of the U.S. towered traffic and the average ratio of operations per based aircraft. The constant market share projection would result in a significant decline in operations per based aircraft. Considering that the operations per based aircraft ratio has been relatively constant since 1996, the constant market share projection would produce a low range forecast.

Maintaining the annual itinerant operations per based aircraft ratio at an average of 303 results in a growing share of the U.S. towered airport operations at GYR. Itinerant GA operations would total over 187,000 by 2025.

For comparison, the FAA-TAF projections are also presented in the table. The FAA-TAF operations would grow at a rate in line with the national average, and the operations per based aircraft would gradually decrease. Subsequently, this forecast is similar to the constant market share forecast, but significantly lower than the operations per based aircraft projection.

For the purposes of the Master Plan, there is little reason to believe that the ratio of itinerant operations per based aircraft will change significantly over the planning period. With based aircraft projected to grow strongly along with the socioeconomic indicators in the West Valley, itinerant operations can be expected to do likewise. As can be seen on **Table 2L**, the selected forecast most closely resembles the constant operations per based aircraft projection. The forecast, as presented in the table and on **Exhibit**

2D, would result in 185,000 annual itinerant general aviation operations by 2025, more than triple the current activity level.

TABLE 2L
General Aviation Itinerant Operations Forecast
Phoenix Goodyear Airport

Year	GYR GA Itinerant	U.S. ATCT GA Itinerant (millions)	GYR Market Share (%)	GYR Based AC	Itinerant Ops Per AC
1990	82,010	23.1	0.355%	140	586
1991	86,075	22.2	0.388%	142	606
1992	83,003	22.1	0.376%	144	576
1993	74,276	21.1	0.352%	151	492
1994	46,420	21.1	0.220%	153	303
1995	33,542	20.9	0.160%	143	235
1996	46,418	20.8	0.223%	152	305
1997	65,191	21.7	0.300%	198	329
1998	50,071	22.1	0.227%	196	255
1999	60,605	23.0	0.264%	197	308
2000	62,575	22.9	0.273%	198	316
2001	59,920	21.4	0.280%	198	303
2002	64,877	21.4	0.303%	198	328
2003	62,204	20.2	0.308%	200	311
2004	57,706	NA	NA	209	276
Constant Market Share Projection					
2010	66,528	23.1	0.288%	317	210
2015	70,848	24.6	0.288%	404	175
2025	80,352	27.9	0.288%	619	130
Operations Per Based Aircraft Projection					
2010	96,051	23.1	0.416%	317	303
2015	122,412	24.6	0.498%	404	303
2025	187,557	27.9	0.672%	619	303
FAA-TAF Projections					
2010	67,282	23.1	0.291%	225	299
2015	71,937	24.6	0.292%	242	297
2025	81,247	27.9	0.291%	278	292
Selected Forecast					
2010	95,000	23.1	0.411%	317	300
2015	125,000	24.6	0.508%	404	309
2025	185,000	27.9	0.663%	619	299

LOCAL OPERATIONS

Table 2M depicts the history of local GA operations at Phoenix Goodyear Airport and examines its historic market share of local operations at towered airports in the United States. Local operations have varied over the past 15 years, being affected by the level of activity generated by the flight training schools operating from the airport. Local traffic entered the 1990s with a high of 119,456 operations, but declined to just 28,385 in 1995. Local operations recovered over the rest of the decade, reaching 79,334 in 2000. Since that year, local opera-

tions have been on the decline. In 2003, local GA operations totaled 62,531. In 2004, local traffic dropped by over 35 percent to 40,389.

The decline in local operations since 2000, relates, at least in part, to the nature of local operations at GYR. GYR tenant, ATCA, trains new pilots for the German airline Lufthansa, as well as the German Air Force. With airline traffic worldwide affected by the events of 9-11, the demand for airline pilots has been down. Thus, Lufthansa's flight training demands appear to be reflective of the industry.

Exhibit 2D and **Table 2K** compare the previous forecasts of general aviation local operations. Like its itinerant operations projection, the MAG-RASP expects local operations to grow proportionally with based aircraft. This would result in over 186,500 annual local operations by 2025.

The FAA-TAF again has the advantage of being the more current forecast, and thus has a better consideration for the effects of the post September 11 period. The FAA-TAF projects general aviation local operations to grow at a rate slightly faster than both based aircraft and the national rate. Local operations would reach 85,000 by 2020. Extrapolated to 2025, local operations would be over 91,000.

The FAA *Aerospace Forecasts* project a 1.5 percent per year increase in local operations nationwide. The GYR share of the U.S. market of local general aviation operations at towered airports has averaged 0.417 percent over the past 15 years. **Table 2M** presents a market share projection that carries this average percentage forward through the planning period.

The second projection on the table considers the local operations per based aircraft since 1996. During that time, the ratio has averaged 317, with a high of 401 in 2000 and a low of 193 in 2004. **Table 2M** presents a projection based upon maintaining the average ratio throughout the planning period.

For comparison, the FAA-TAF projections are also presented in the table. As indicated earlier, the FAA-TAF local operations are projected to grow at a slightly faster rate than the national average, with local operations per based aircraft increasing slowly as well.

The level of local activity will continue to be dependent upon the success of the flight schools, as well as aircraft basing. It is anticipated that the operations per based aircraft will rebound from the current downturn, and grow to be a near-equal split with itinerant operations. The resulting projection of local operations is presented at the bottom of **Table 2M,** as well as on **Exhibit 2D.** It is similar to MAG-RASP forecast, and projects 185,000 local operations by 2025.

TABLE 2M
General Aviation Local Operations Forecast
Phoenix Goodyear Airport

Year	GYR GA Local	U.S. ATCT GA Local (millions)	GYR Market Share (%)	GYR Based AC	Local Ops Per AC
1990	119,456	17.1	0.699%	140	853
1991	93,465	16.6	0.563%	142	658
1992	82,452	16.3	0.506%	144	573
1993	64,350	15.5	0.415%	151	426
1994	39,673	15.2	0.261%	153	259
1995	28,385	15.1	0.188%	143	198
1996	45,756	14.5	0.316%	152	301
1997	50,781	15.2	0.334%	198	256
1998	53,467	16.0	0.334%	196	273
1999	75,355	17.0	0.443%	197	383
2000	79,334	17.0	0.467%	198	401
2001	74,236	16.2	0.458%	198	375
2002	71,757	16.2	0.443%	198	362
2003	62,531	15.3	0.409%	200	313
2004	40,389	NA	NA	209	193
Constant Market Share Projection					
2010	73,392	17.6	0.517%	317	232
2015	78,396	18.8	0.517%	404	194
2025	89,238	21.4	0.517%	619	144
Operations Per Based Aircraft Projection					
2010	100,489	17.6	0.571%	317	317
2015	128,068	18.8	0.681%	404	317
2025	196,223	21.4	0.917%	619	317
FAA-TAF Projections					
2010	71,710	17.6	0.407%	225	319
2015	78,266	18.8	0.416%	241	323
2025	91,380	21.4	0.427%	278	329
Selected Forecast					
2010	90,000	17.6	0.511%	317	284
2015	120,000	18.8	0.638%	404	297
2025	185,000	21.4	0.864%	619	299

AIR TAXI

The air taxi category includes aircraft involved in on-demand passenger or small parcel transport. The control tower counts air taxi in the same category as scheduled commuter airlines. At Phoenix Goodyear Airport, there is no scheduled commercial service, although the airport does experience flights by commercial service aircraft. They come to the airport either for maintenance/modification work or for temporary storage.

Table 2N presents the history of air taxi and air carrier operations at GYR since 1990. These operations never totaled over 800 until the last three years when there were 802 in 2002,

3,707 in 2003 and 3,856 in 2004. The FAA-TAF projects air taxi activity at GYR to remain level at 4,237 operations annually.

TABLE 2N
Air Taxi and Air Carrier Operations
1990-2004
Phoenix Goodyear Airport

Year	Air Taxi
1990	259
1991	249
1992	400
1993	125
1994	126
1995	2
1996	34
1997	91
1998	115
1999	196
2000	260
2001	308
2002	802
2003	3,707
2004	3,856

Source: FAA – ATADS

Many general aviation airports are experiencing increases in air taxi operations. This growth can be primarily attributed to the increased popularity of fractional ownership in aircraft, in particular, turbine aircraft. Fractional ownership allows companies to essentially time-share in an aircraft. A corporation or individual can purchase a fractional share in a type of corporate aircraft. This share will provide the owner a certain amount of flight time each year. This makes flying more feasible for a broader number of firms or individuals. Many operations by fractional aircraft are counted as air taxi operations, as are many charter aircraft. As security measures placed on commercial flights increased, interest in fractional and corporate aircraft ownership, as well as on-demand charter flights also increased.

Overall, the seven towered reliever airports in the Phoenix metropolitan area have experienced a 29 percent increase in air taxi activity from pre-September 11 levels. Deer Valley, Glendale Municipal, and Chandler Municipal Airports have not experienced any significant increase in air taxi activity. Phoenix Goodyear, Scottsdale, and Williams Gateway Airports, as well as Falcon Field in Mesa have each experienced increases of 35 percent of more.

The recent jump in air taxi activity at GYR in the last two years negates any potential statistical trend line that could be considered in predicting future activity levels. A low range forecast, however, would be in line with the FAA-TAF air taxi forecast of level activity through the planning period.

Another scenario considers air taxi operations growing at a rate similar to general aviation itinerant operations. Air taxi operations at GYR as a percentage of GA itinerant operations were 6.0 percent in 2003 and 6.7 percent in 2004. This is slightly above the 2004 average of 5.9 percent for the seven reliever airports combined.

Since a large amount of air taxi traffic is flown by business jets, the growth in business jet activity will affect air taxi growth. The FAA forecasts the number of business jets in the general aviation fleet to increase by an annual average of 5.1 percent. The typical corporate-owned jet is utilized 300

hours per year, while the fractional jet is used nearly three times as much. As a result, the FAA projects that total business jet hours flown will increase from 2.75 million hours in 2003, to 5.9 million hours in 2015, for an annual average increase of 6.5 percent.

At GYR, this growth rate would not keep pace with that of general aviation operations. For planning purposes, the GYR air taxi operations were projected to grow, to then maintain a level equal to 7.0 percent of GA itinerant operations. **Table 2P** presents this growth scenario that would result in 13,000 air taxi operations by 2025. This projection was selected as the preferred forecast for air taxi operations.

TABLE 2P
Air Taxi Operations Forecast
Phoenix Goodyear Airport

	2010	2015	2025
FAA/TAF 2004	4,237	4,237	4,237
Master Plan	6,300	8,800	13,000

MILITARY

Military activity accounts for the smallest portion of the operational traffic at GYR. **Table 2Q** presents the history of military operations since 1990. Between 1992 and 2001, military operations averaged just 173 annually. In late 2002, this annual figure began to be exceeded every month. In 2003, the total military operations reached a high of 4,239. In 2004, the total was down to 3,520, but with little indication that operations were declining to the early averages. Although military traffic at GYR has risen to a new level, growth beyond this level is not anticipated. For planning purposes, military operations are projected to fluctuate around 4,000 annually throughout the planning period.

ATCT COUNT ADJUSTMENT

The Phoenix Goodyear Airport traffic control tower is not a 24-hour tower but the airport is still open for activity after tower hours. There are several forecasting elements that are enhanced by having an accurate baseline count of all operations, particularly airfield capacity calculations and aircraft noise estimates. The tower is open from 6:00 a.m. to 9:00 p.m.

To provide a reasonable estimate of overnight operations, an overnight count was performed for a seven-day period. It was determined that the physical count was not indicative of average overnight operations; therefore, a review of overnight operations counts from other area general aviation airports was considered.

Overnight operations are estimated at approximately three percent of total operations. These operations are typically conducted by itinerant general aviation and air taxi aircraft. **Exhibit 2E** includes this adjusted tower count.

SUMMARY

Exhibit 2E provides a summary of the aviation activity forecasts for Phoenix Goodyear Airport. These forecasts will be utilized in establishing planning horizon milestones that

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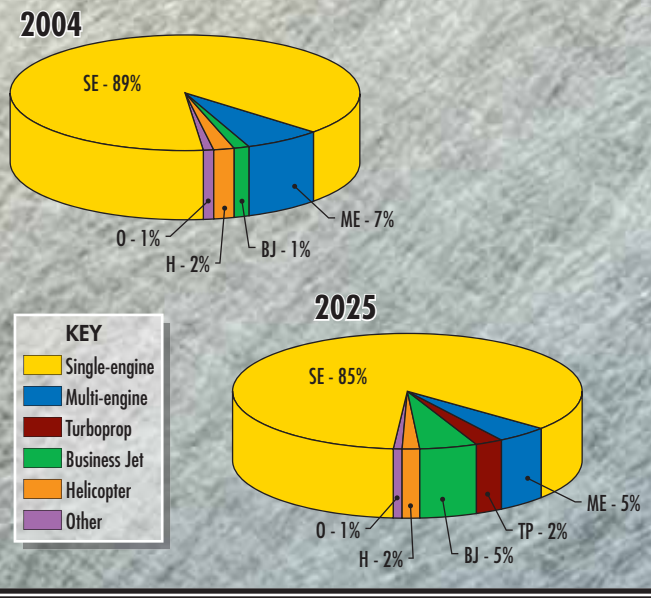
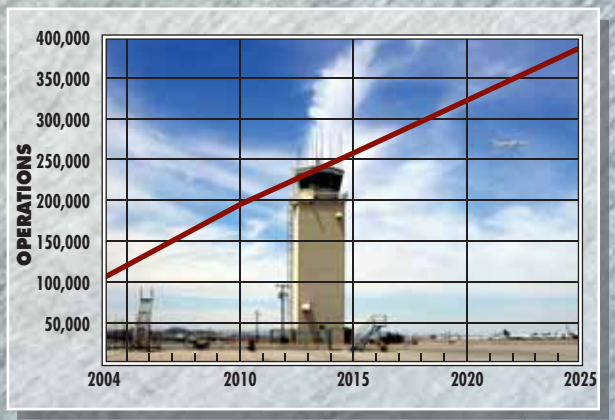
	2004	2010	2015	2025
BASED AIRCRAFT				
Single-Engine Piston	185	277	348	525
Multi-Engine Piston	15	20	23	30
Turboprop	0	4	8	16
Business Jet	3	7	14	33
Helicopter	4	6	7	10
Other	2	3	4	5
Total Based Aircraft	**209**	**317**	**404**	**619**
ATCT OPERATIONS COUNT				
General Aviation				
Local	40,389	90,000	120,000	185,000
Itinerant	57,706	95,000	125,000	185,000
Total General Aviation	*98,095*	*185,000*	*245,000*	*370,000*
Air Taxi	3,856	6,000	9,000	13,000
Military	3,520	4,000	4,000	4,000
Total ATCT Operations	**105,471**	**195,000**	**258,000**	**387,000**
ESTIMATED NIGHTTIME OPERATIONS *				
Air Taxi	116	200	300	400
Itinerant General Aviation	1,731	2,800	3,800	5,500
Local General Aviation	1,212	2,700	3,600	5,500
Total Adjusted Operations	**108,530**	**200,700**	**265,700**	**398,400**

*** accounts for time ATCT is closed from 9:00p.m. - 6:00a.m.**

BASED AIRCRAFT



ATCT OPERATIONS



GYR

PHOENIX GOODYEAR AIRPORT

Exhibit 2E

FORECAST SUMMARY

will then be used to determine future facility needs and potential solutions.

Based aircraft at GYR are projected to grow from 209 in the last year, to 619 over the long term by 2025. This represents a 6.2 percent annual average growth through 2015, and 4.3 percent annually beyond that. This strong growth is reflective of the growth expected for population and employment in the primary service area for GYR. Population is forecast to grow at 8.5 percent annually, while employment is forecast to grow at over 7.6 percent per year.

TABLE 2Q
Military Operations
Phoenix Goodyear Airport

	Annual Operations		
Year	**Itinerant**	**Local**	**Total**
1990	731	100	831
1991	520	44	564
1992	153	58	211
1993	145	8	153
1994	157	16	173
1995	171	6	177
1996	33	164	197
1997	84	40	124
1998	97	45	142
1999	65	53	118
2000	183	106	289
2001	110	36	146
2002	828	310	1,138
2003	3,304	935	4,239
2004	2,616	904	3,520
FORECAST			
2010	3,000	1,000	4000
2015	3,000	1,000	4000
2025	3,000	1,000	4000

Business jets are anticipated to show the strongest rate of growth into the future, reflective of what is happening on a nationwide basis. Based jets are expected to grow from 6 to 33 over the long term, growing from 1.4 percent to 5.3 percent of the GYR based aircraft fleet.

Annual operations are forecast to grow from 105,471 in 2004, to 387,000 by 2025. Air taxi operations will more than triple, particularly with growth in fractional ownership of aircraft. Military operations are expected to average 4,000 annually over the planning period.

Flight training will remain an important part of the activity at GYR into the future. Local operations were down in 2004, but are projected to recover to maintain approximately half

of the airports general aviation operations into the future. The next chapter will examine the operational capabilities of the airport in relation to both existing and projected aviation activity.

These aviation demand forecasts were submitted to the FAA for their review. A copy of the FAA's letter approving these forecasts for planning purposes is presented in **Appendix D**.

Chapter Three

"UNCONSTRAINED" FACILITY REQUIREMENTS

"Unconstrained" Facility Requirements

To properly plan for the future of the Phoenix Goodyear Airport, it is necessary to translate forecast aviation demand into the specific types and quantities of facilities that can adequately serve projected "unconstrained" demand levels. This chapter uses the results of the forecasts conducted in Chapter Two, as well as established planning criteria, to determine the airfield (i.e., runways, taxiways, navigational aids, marking and lighting) and landside (i.e., hangars, general aviation terminal building, aircraft parking apron, fueling, automobile parking and access) facility requirements.

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

PLANNING HORIZONS

Cost-effective, safe, efficient, and orderly development of an airport should rely more upon actual demand at an airport than a time-based forecast figure. Thus, in order to develop a master plan that is demand-based rather than time-based, a series of planning horizon milestones have been established that take into consideration the reasonable range of aviation demand projections.

It is important to consider that over time, the actual activity at the airport may be higher or lower than what the annualized forecast portrays. By planning according to activity milestones, the resultant plan can accommodate unexpected shifts or changes in the aviation demand. It is important to plan for these milestones so that airport officials can respond to unexpected changes in a timely fashion. As a result, these milestones provide flexibility while potentially extending this plan's useful life should aviation trends slow over the period.

The most important reason for utilizing milestones is to allow the airport to develop facilities according to need generated by actual demand levels. The demand-based schedule provides flexibility in development, as the schedule can be slowed or expedited according to actual demand at any given time over the planning period. The resultant plan provides airport officials with a financially-responsible and needs-based program. **Table 3A** presents the planning horizon milestones for each activity demand category.

TABLE 3A
Aviation Demand Planning Horizons
Phoenix Goodyear Airport

	2004	Short Term (± 5)	Intermediate Term (± 10)	Long Term (± 20)
ANNUAL OPERATIONS				
Air Taxi	3,856	6,000	9,000	13,000
Military	3,520	4,000	4,000	4,000
General Aviation				
Itinerant	57,706	95,000	125,000	185,000
Local	40,389	90,000	120,000	185,000
TOTAL OPERATIONS	105,471	195,000	258,000	387,000
Based Aircraft	209	317	404	619
ADJUSTED ANNUAL OPERATIONS				
Air Taxi	3,972	6,200	9,300	13,400
Military	49	4,000	4,000	4,000
General Aviation				
Itinerant	59,437	97,800	128,800	190,500
Local	41,601	92,700	123,600	190,500
TOTAL OPERATIONS	108,530	200,700	265,700	398,400

Note: Aircraft operations have been adjusted to account for those that occur overnight when the ATCT is not open.

The Phoenix Goodyear air traffic control tower (ATCT) is not a 24-hour tower, so the count is not all-inclusive of operations at the airport. Certain elements of the planning analyses, however, require that all the airport activity be considered. For these evaluations, it is necessary to estimate and adjust for operations that occur when the tower is closed.

The Phoenix Goodyear ATCT hours are from 6:00 a.m. to 9:00 p.m. The operations were adjusted based upon an overnight survey count and are included in the table.

PEAKING CHARACTERISTICS

Airport capacity and facility needs analyses typically relate to the levels

of activity during a peak or design period. The periods used in developing the capacity analyses and facility requirements in this study are as follows:

- **Peak Month** - The calendar month when peak passenger volumes of aircraft operations occur.

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

- **Busy Day** - The busy day of a typical week in the peak month. This descriptor is used primarily to determine general aviation transient ramp space requirements.

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

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

Itinerant Operations Peak Periods

Over the past fifteen years, the peak month for civilian itinerant operations has occurred during the winter months of October through March. March was the peak month seven times over that period. Over that same fifteen-year period, the peak month averaged 10.5 percent of the annual itinerant civilian operations.

Daily operational counts from the ATCT were utilized to determine a busy day peaking factor for itinerant civilian activity. During the peak month, the peak day of each week has averaged 19.4 percent of the week. This equates to a busy day 39 percent higher than the average design day.

The design hour for itinerant operations was calculated as 15.0 percent of the design day operations, but can be expected to decline slightly as activity increases over the long term. **Table 3B** summarizes the civilian itinerant peak activity projections for each planning horizon.

Total Operations Peak Periods

The peaking characteristics of the overall operations are utilized in examining the operational capacity of the airfield. The peak month for total operations has averaged 10.7 percent over the last 15 years. Over that time, the peak month occurred during the winter months of October through March. March and October were each the peak month four times over that period.

Design hour operations were calculated as 16.0 percent of the design day. This can be expected to decline as activity increases. **Table 3B** also summarizes the peak activity projections for the total operations planning horizons.

TABLE 3B
Peaking Characteristics
Phoenix Goodyear Airport

	2004	Short Term (± 5)	Intermediate Term (± 10)	Long Term (± 20)
OPERATIONS				
Civilian Itinerant				
Annual (Adjusted)	63,409	104,000	138,100	203,900
Peak Month	6,241	11,000	14,600	21,600
Design Day	216	355	471	697
Busy Day	300	461	593	860
Design Hour	32	46	55	77
Total Airport				
Annual (Adjusted)	108,530	200,700	265,700	398,400
Peak Month	11,600	21,500	28,400	42,600
Design Day	374	694	916	1,374
Design Hour	60	94	110	151

AIRFIELD CAPACITY

Airfield capacity is measured in a variety of different ways. The **hourly capacity** of a runway measures the maximum number of aircraft operations that can take place in an hour. The **annual service volume (ASV)** is an annual level of service that may be used to define airfield capacity needs. **Aircraft delay** is the total delay incurred by aircraft using the airfield during a given timeframe. FAA Advisory Circular 150/5060-5 **Airport Capacity and Delay** provides a methodology for examining the operational capacity of an airfield for planning purposes. This analysis takes into account specific factors about the airfield. These various factors are depicted in **Exhibit 3A**. The following describes the input factors as they relate to Phoenix Goodyear Airport:

- **Runway Configuration** - A single runway configuration with a full-length parallel taxiway and no instrument approach.

- **Runway Use** – Winds dictate Runway 3 approximately 40 percent of the time and Runway 21 approximately 42 percent. Calm winds of 0 to 3 miles per hour occur approximately 18 percent of the time.

- **Exit Taxiways** - Based upon mix, only taxiways between 2,000 feet and 4,000 feet count in the exit rating. There is just one exit available within this range for each runway. Therefore, the exit rating is one for both Runway 3 and 21.

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AIRFIELD LAYOUT

Runway Configuration

Runway Use

Number of Exits

WEATHER CONDITIONS

VFR

IFR

PVC

AIRCRAFT MIX

A&B

Single Piston

Small Turboprop

Twin Piston

C

Business Jet

Commuter

Regional Jet

Commercial Jet

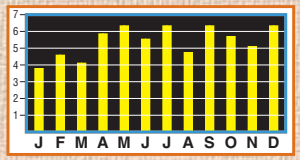
Wide Body Jet

D

OPERATIONS

Arrivals and Departures

Total Annual Operations



Touch-and-Go Operations

GYR

PHOENIX GOODYEAR AIRPORT

Exhibit 3A

AIRFIELD CAPACITY FACTORS

- **Weather Conditions** - The airport operates under visual meteorological conditions (VMC) over 99.5 percent of the time. Instrument meteorological conditions (IMC) occur when cloud ceilings are between 500 and 1,000 feet. Poor visibility conditions (PVC) apply for minimums below 500 feet and one mile. Because IMC and PVC occur less than one percent combined, they are considered negligible for this analysis.

- **Aircraft Mix** - Description of the classifications and the percentage mix for each planning horizon is presented on **Table 3C**.

- **Percent Arrivals** - Generally follows the typical 50-50 percent split.

- **Touch-and-Go Activity** - Percentages of touch-and-go activity are presented in **Table 3C**.

- **Operational Levels -** Operational planning horizons were outlined in the previous section of this chapter. The peak month averages 10.7 percent of the year. The peak hour currently averages 16 percent of the operations in a day, and will decline to 11 percent as operations increase in the long term planning horizon.

TABLE 3C
Aircraft Operational Mix - Capacity Analysis
Phoenix Goodyear Airport

Aircraft Classification	Current	Short Term (± 5)	Intermediate Term (± 10)	Long Term (± 20)
VFR				
Classes A & B	97.6%	96.8%	94.7%	92.8%
Class C	2.0%	2.8%	4.9%	7.5%
Class D	0.4%	0.4%	0.4%	0.3%
Touch-and-Go's	31%	37%	38%	39%

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

HOURLY RUNWAY CAPACITY

Based upon the input factors, current and future hourly capacities for the various operational scenarios at Phoenix Goodyear Airport were determined. As the mix of aircraft operating at an airport changes to include a higher percentage of large aircraft (weighing over 12,500 pounds), the hourly capacity of the system declines slightly. As indicated on **Table 3D**, the percentages of Class C aircraft will increase with the planning horizon activity milestones. At the same time a growing percentage of touch-and-go

traffic will serve to increase the hourly capacity.

The current and future hourly capacities are depicted in **Table 3D**. At Phoenix Goodyear Airport, the current hourly capacity is 114 operations. This is expected to fluctuate between 117 and 112 operations in the long term. This will be exceeded by the intermediate planning horizon milestone. The long term design hour operations of 151 will exceed the hourly capacity by nearly 50 percent.

TABLE 3D
Airfield Demand/Capacity Summary
Phoenix Goodyear Airport

	PLANNING HORIZON			
	Base Year (2004)	Short Term (± 5)	Intermediate Term (± 10)	Long Term (± 20)
Operational Demand				
Annual (Adjusted)	108,530	200,700	265,700	398,400
Design Hour	60	94	110	151
Capacity				
Annual Service Volume	206,000	250,000	275,000	296,000
Weighted Hourly Capacity	114	117	114	112
Delay				
Per Operation (Minutes)	0.40	0.97	2.19	12.0
Total Annual (Hours)	720	2,100	9,700	80,000

ANNUAL SERVICE VOLUME

The weighted hourly capacity is utilized to determine the annual service volume in the following equation:

$$ASV = C \times D \times H$$

C = weighted hourly capacity;
D = ratio of annual demand to the average daily demand during the peak month; and
H = ratio of average daily demand to the design hour demand during the peak month.

The ratio of annual demand to average daily demand (D) was determined to be 290 for Phoenix Goodyear Airport. This is expected to remain relatively constant over the long term planning period. The ratio of average daily demand to average peak hour demand (H) was determined to be 6.23. This ratio was also projected to increase to 9.10 by the long term planning horizon.

The current ASV was determined to be 206,000 operations. With the increasing ratio H, the annual service volume will increase to 296,000 as operations increase over the long term. With adjusted operations in 2004 totaling 108,530, the airport is currently at 53 percent of its annual service volume. The airport will reach its ASV just beyond the intermediate planning

horizon. Long term adjusted annual operations are forecast to reach nearly 398,400, which would be 135 percent of the airport's ASV. **Table 3D** summarizes the airport's ASV over the long term planning horizon.

AIRCRAFT DELAY

As the number of annual aircraft operations approaches the airfield's capacity, increasing amounts of delay to aircraft operations begin to occur. Delays occur to arriving and departing aircraft in all weather conditions. Arriving aircraft delays result in aircraft holding outside of the airport traffic area. Departing aircraft delays result in aircraft holding at the runway end until released by air traffic control.

Table 3D also summarizes the aircraft delay analysis conducted for Phoenix Goodyear Airport. Current annual delay is estimated at 720 hours. As an airport's operations increase toward the annual service volume, delay increases exponentially. Analysis of delay factors for the long range planning horizon indicate that annual delay can be expected to reach 80,000 hours. This is a significant level of delay.

CAPACITY ANALYSIS CONCLUSIONS

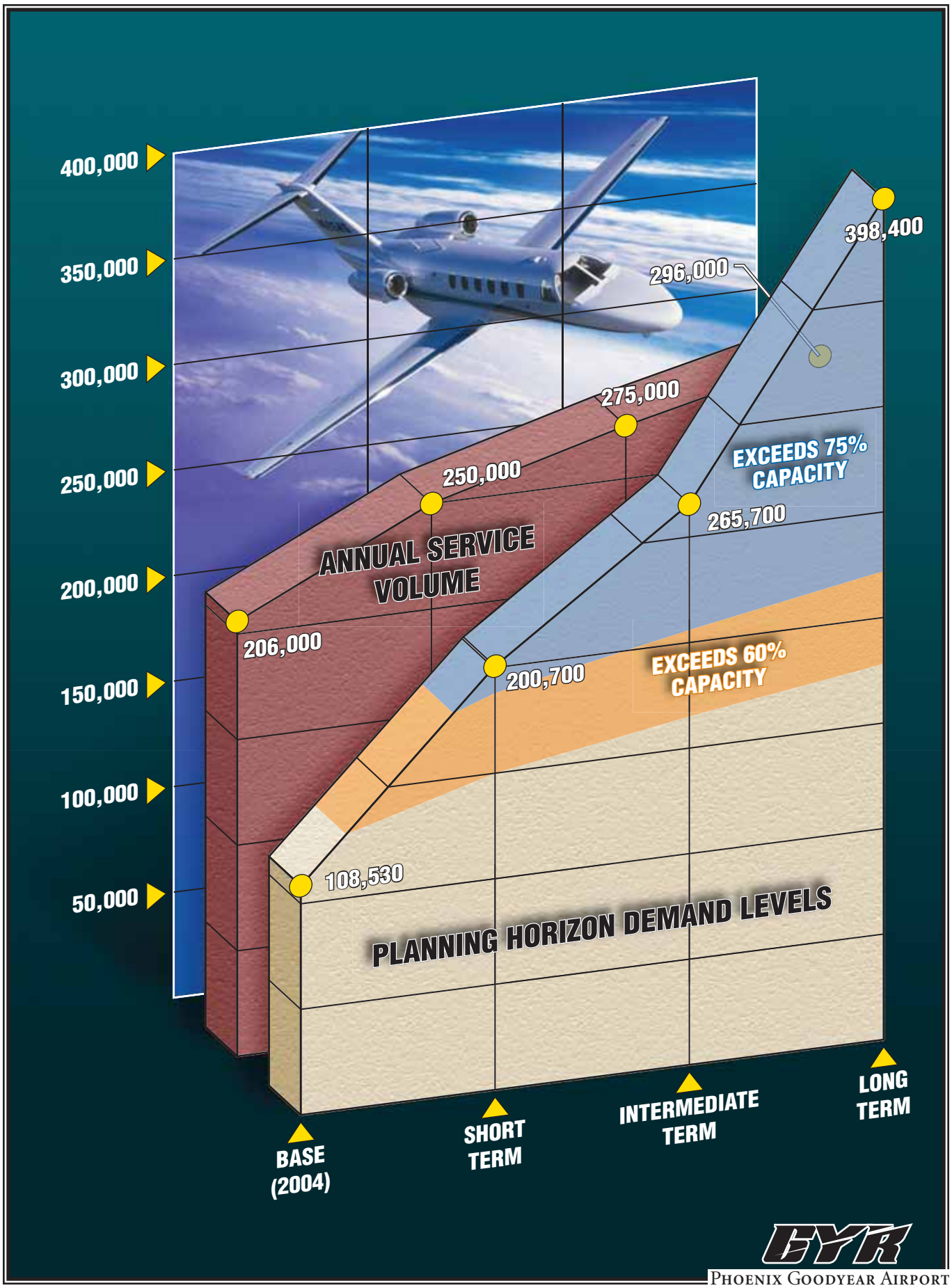
Exhibit 3B compares annual service volume to existing and forecast operational levels at Phoenix Goodyear Airport. The current operations level represents 58 percent of the airfield's annual service volume. By the end of the planning period total annual operations are expected to represent 140 percent of annual service volume.

FAA Order 5090.3C, *Field Formulation of the National Plan of Integrated Airport Systems* (*NPIAS*), indicates that improvements for airfield capacity purposes should begin to be considered once operations reach 60 to 75 percent of the annual service volume. Phoenix Goodyear Airport will enter this range in the short term, exceed its annual service volume near the intermediate planning horizon, and will begin to experience significant delays if capacity improvements are not undertaken. For this airport to accommodate the projected levels of activity, a parallel runway will be needed. This and other capacity enhancement alternatives will be considered and evaluated in the next chapter.

CRITICAL 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 the airport. The critical design aircraft is defined as the most demanding category of aircraft, or family of aircraft, which conducts at least 500 operations per year at the airport. Planning for future aircraft use is of particular importance since 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 long term potential needs of the airport.

04MP14-1A-8/15/05



PHOENIX GOODYEAR AIRPORT

Exhibit 3B

AIRFIELD DEMAND VS. CAPACITY

The FAA has established a coding system to relate airport design criteria to the operational and physical characteristics of aircraft expected to use the airport. This airport reference code (ARC) has two components: the first component, depicted by a letter, is the aircraft approach category and relates to aircraft approach speed (operational characteristic); the second component, depicted by a Roman numeral, is the airplane design group and relates to aircraft wingspan (physical characteristic). Generally, aircraft approach speed applies to runways and runway-related facilities, while airplane wingspan primarily relates to separation criteria involving taxiways, taxilanes, and landside facilities.

According to FAA Advisory Circular (AC) 150/5300-13, *Airport Design*, an aircraft's approach category is based upon 1.3 times its stall speed in landing configuration at that aircraft's maximum certificated weight. The five approach categories used in airport planning 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.

The airplane design group (ADG) is based upon the aircraft's wingspan. The six ADGs used in airport planning 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.

Exhibit 3C summarizes representative aircraft by ARC. According to the Goodyear Airport Layout Plan, the existing and future Goodyear ARC is D-IV.

In order to determine several airfield design requirements, the critical aircraft and critical ARC should first be determined, then appropriate airport design criteria can be applied. This begins with a review of the type of aircraft using and expected to use Phoenix Goodyear Airport. **Table 3E** provides a projected breakdown of planning horizon operations by airport reference code.

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A-I

- Beech Baron 55
- **Beech Bonanza**
- Cessna 150
- Cessna 172
- Piper Archer
- Piper Seneca

B-I less than 12,500 lbs.

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

B-II less than 12,500 lbs.

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

B-I, II over 12,500 lbs.

- Super King Air 300
- Beech 1900
- Jetstream 31
- Falcon 10, 20, 50
- Falcon 200, 900
- **Citation** II, **III**, IV, V
- Saab 340
- Embraer 120

A-III, B-III

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

C-I, D-I

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

C-II, D-II

- Cessna Citation X
- **Gulfstream** II, III, **IV**
- Canadair 600
- Canadair Regional Jet
- Lockheed JetStar
- Super King Air 350

C-III, D-III

- Boeing Business Jet
- B 727-200
- **B 737-300 Series**
- MD-80, DC-9
- Fokker 70, 100
- A319, A320
- Gulfstream V
- Global Express

C-IV, D-IV

- **B-757**
- B-767
- DC-8-70
- DC-10
- MD-11
- L1011

D-V

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

Note: Aircraft pictured is identified in bold type.

PHOENIX GOODYEAR AIRPORT

Exhibit 3C
AIRPORT REFERENCE CODES

TABLE 3E
Airport Reference Code (ARC) Mix
Phoenix Goodyear Airport

		ANNUAL OPERATIONS		
Reference Code	**2004**	**Short Term (± 5)**	**Intermediate Term ± 10)**	**Long Term (± 20)**
A, B-I	103,503	192,600	257,200	345,000
A, B-II	3,811	5,700	3,800	43,900
A, B-III	18	50	200	400
C-I	268	600	1,200	3,000
C-II	182	400	1,200	2,800
C-III	454	600	800	1,000
C-IV	84	100	150	200
D-I	4	50	100	200
D-II	20	250	500	1,000
D-III	10	50	200	400
D-IV	130	200	200	300
D-V	46	100	150	200
Total	108,530	200,700	265,700	398,400

Note: Operations based upon adjusted ATCT count.

From the table, it is evident that the airport is utilized by a wide range of aircraft. The largest aircraft to use the airport include the MD-11 and DC-10 (D-IV) and the Boeing 747 and 777 (D-V). Based upon the data, aircraft in C-IV and D-IV or larger accounted for 260 annual operations in 2004. This does not meet the 500 annual operations threshold to qualify as the current critical design aircraft. Aircraft in C-III and D-III totaled 464; but combined with the larger aircraft, totaled 748 aircraft in ARC C-III or above to qualify as the current critical aircraft family. The forecast expects Category D operations to reach 500 annually during the short term planning horizon. Design Group IV operations or larger will exceed 500 annual operations by the intermediate term. ARC D-V aircraft are not expected to reach the 500 annual operations threshold within the long term planning horizon, but will continue to be an active part of the operations at GYR. While these aircraft will not statistically qualify as the design aircraft, they are expected to remain an important part of the aircraft modification business located on the airport. **Therefore, it is recommended that Phoenix Goodyear Airport be planned to accommodate ARC D-IV, with special consideration for D-V aircraft serviced by a major employer on the airport.**

AIRFIELD REQUIREMENTS

The analyses of the operational capacity and the critical design aircraft are used to determine airfield needs. This includes runway configuration, dimensional standards, pavement strength, as well as navigational aids and lighting.

RUNWAY CONFIGURATION

Key considerations in the runway configuration of an airport involve the orientation for wind coverage and the operational capacity of the runway system. The airfield capacity analysis indicated that additional airfield capacity will need to be considered by the end of the short term planning horizon. As a result, the Master Plan should consider capacity improvements before activity approaches the operational capacity of the airfield. This will be a factor considered during the formulation and evaluation of alternatives. For the level of activity expected, however, the need for a parallel runway is a strong probability.

FAA Advisory Circular 150/5300-13, Change 1, *Airport Design,* recommends that a crosswind runway should be made available when the primary runway orientation provides less than 95 percent wind coverage for any aircraft forecast to use the airport on a regular basis. The 95 percent wind coverage is computed on the basis of the crosswind component not exceeding 10.5 knots (12 mph) for ARC A-I and B-I; 13 knots (15 mph) for ARC A-II and B-II; and 16 knots (18 mph) for ARC A-III, B-III, and C-I through D-II; and 20 knots (23 mph) for ARC C-III through D-IV.

The most recent 10 years of wind data specific to the Phoenix Goodyear Airport at the time of this analysis was 1994-2003. This data is graphically depicted on the wind rose in **Exhibit 3D**. The orientation of Runway 3-21 provides 96.95 percent coverage for 10.5 knot crosswinds. Thus, the single runway orientation has adequate wind coverage for all sizes and speeds of aircraft. For this reason, an additional runway strictly for crosswind purposes should not be necessary.

RUNWAY DIMENSIONAL REQUIREMENTS

Runway dimensional standards include the length and width of the runway, as well as the dimensions associated with runway safety areas and other clearances. These requirements are based upon the design aircraft, or group of aircraft. The runway length must consider the performance characteristics of individual aircraft types, while the other dimensional standards are generally based upon the most critical airport reference code expected to use the runway. The dimensional standards are outlined for the planning period for the primary runway, as well as for a potential parallel runway to meet future capacity demand.

Runway Length

The aircraft performance capability is a key factor in determining the runway length needed for takeoff and

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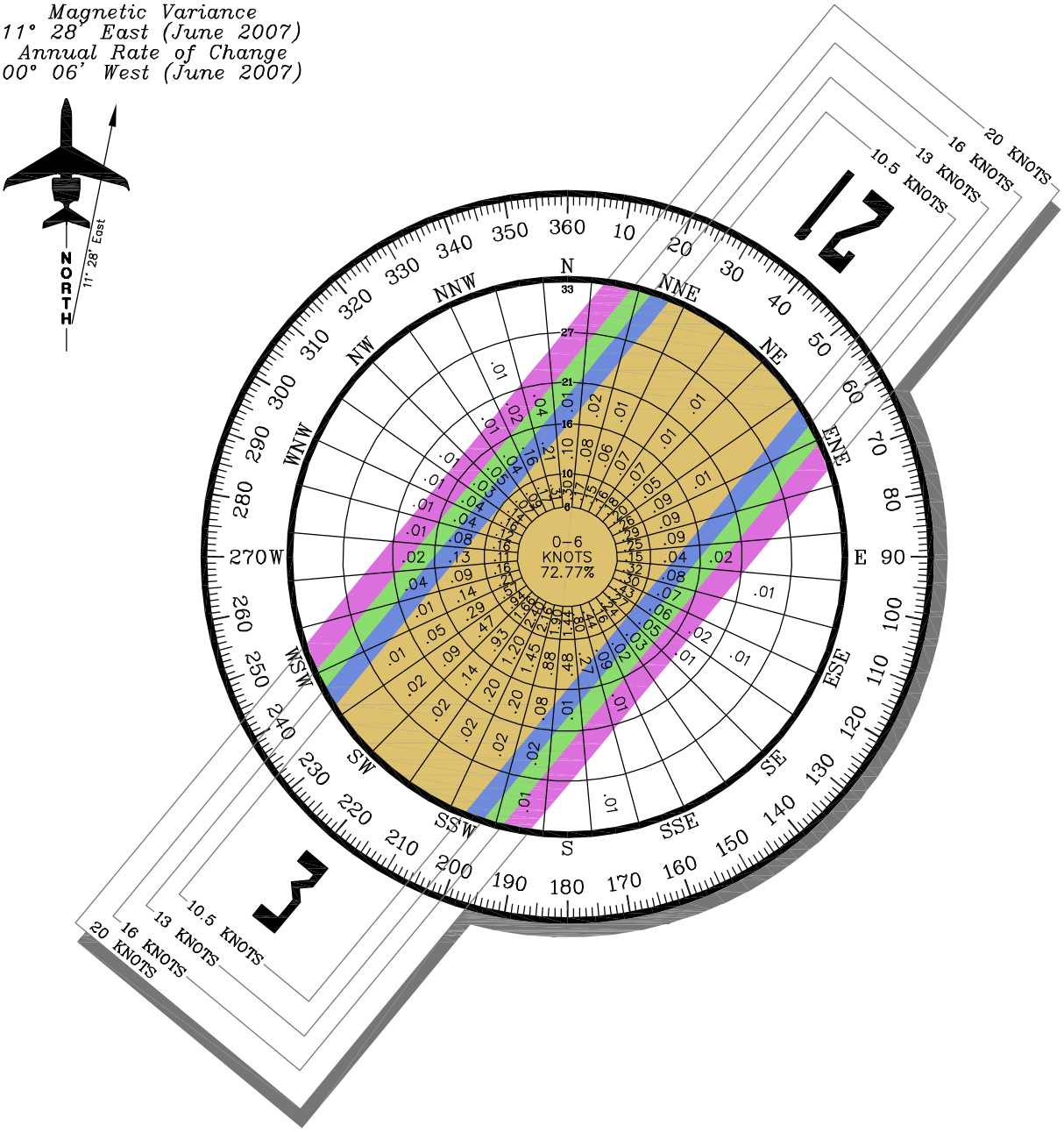
ALL WEATHER WIND COVERAGE

Runway	10.5 Knots	13 Knots	16 Knots	20 Knots
Runway 3-21	*98.51%*	*99.34%*	*99.80%*	*99.93%*

Magnetic Variance
11° 28' East (June 2007)
Annual Rate of Change
00° 06' West (June 2007)



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

OBSERVATIONS:
24,417 All Weather Observations
1999-2006

GYR

PHOENIX GOODYEAR AIRPORT
Exhibit 3D
WINDROSE

landing. The performance capability and, subsequently, the runway length requirement of a given aircraft type can be affected by the elevation of the airport, the air temperature, the gradient of the runway, and the operating weight of the aircraft.

The airport elevation at Phoenix Goodyear Airport is 968 feet above mean sea level (MSL). The mean maximum daily temperature during the hottest month is 106.9 degrees Fahrenheit. The gradient for Runway 3-21 is 0.32 percent.

While larger commercial jet aircraft are expected to be the design aircraft for the airport in the future, these aircraft are at the airport for service, modification, or storage. Thus, the operations have minimum payload and can generally operate from the existing runway.

Table 3F outlines the runway length requirements for various classifications of general aviation aircraft at Goodyear Airport. These were derived utilizing the FAA Airport Design Computer Program for *Runway Lengths Recommended for Airport Design*. These runway lengths are based upon groupings or "families" of aircraft. As discussed earlier, the runway design required should be based upon the most critical family with at least 500 annual operations.

Small aircraft are defined as aircraft weighing 12,500 pounds or less. Small airplanes make up the vast majority of general aviation activity at Phoenix Goodyear Airport and most other general aviation airports. In particular, piston-powered aircraft make up the majority of the small airplane operations. The runway length requirement for these aircraft is 4,300 feet.

Larger airplanes of 60,000 pounds or less are primarily comprised of business jets. The classifications listed on the table include 75 and 100 percent of the fleet. As indicated in the previous section, the airport hosts a wide range of business jets. **Table 3G** categorizes individual models of business jets under the appropriate family.

A runway length of 7,200 feet would accommodate the 100 percent fleet at 60 percent of their useful load category. The useful load is the maximum certificated takeoff weight minus the operating empty weight. Sixty (60) percent loading will not generally permit aircraft in this category to fly nonstop to the east coast.

A useful load of 90 percent will generally accommodate cross-country flights by these aircraft, provided they have sufficient range. A runway length of 8,500 feet will accommodate the 75 percent classification at 90 percent useful load. The table indicates a length of 11,400 feet would be required for the 100 percent category. This length however, is dictated by older, inefficient models no longer in production. A review of the individual runway length requirements indicate that many aircraft in the 100 percent category can operate on 8,500 feet or less at 90 percent useful load. Therefore, the existing runway length at Phoenix Goodyear Airport of 8,500 feet should be adequate for the planning period.

TABLE 3F
General Aviation Runway Length Requirements
Phoenix Goodyear Airport

AIRPORT AND RUNWAY DATA	
Airport elevation	968 feet
Mean daily maximum temperature of the hottest month	106.9 F
Maximum difference in runway centerline elevation	27 feet
Length of haul for airplanes of more than 60,000 pounds	2,000 miles
Wet runway	
RUNWAY LENGTHS RECOMMENDED FOR AIRPORT DESIGN	
Small airplanes with approach speeds of less than 30 knots	330 feet
Small airplanes with approach speeds of less than 50 knots	880 feet
Small airplanes with less than 10 passenger seats	
75 percent of these small airplanes	3,100 feet
95 percent of these small airplanes	3,600 feet
100 percent of these small airplanes	**4,300 feet**
Small airplanes with 10 or more passenger seats	4,800 feet
Large airplanes of 60,000 pounds or less	
75 percent of these large airplanes at 60 percent useful load	5,500 feet
75 percent of these large airplanes at 90 percent useful load	8,500 feet
100 percent of these large airplanes at 60 percent useful load	**7,200 feet**
100 percent of these large airplanes at 90 percent useful load	11,300 feet
Airplanes of more than 60,000 pounds	Approximately 8,100 feet

REFERENCE: Chapter 2 of AC 150/5325-4A, *Runway Length Requirements for Airport Design*, no Changes included.

A parallel runway is the most probable means to meet the future capacity needs of the airfield. If the runway is needed for capacity purposes, the runway can be planned to a length equal to the primary runway. Over 90 percent of the aircraft using the airport will continue to be small aircraft, however, so a lesser parallel runway can provide most of the capacity benefits. The parallel runway can also be planned as a back-up runway for keeping the airport open when the primary runway is temporarily closed for maintenance, emergencies, etc. If adequate length is not available during these periods, business jets would need to divert to an airport with sufficient length.

For the primary purpose of relieving capacity constraints, a runway length of 4,300 feet should be planned. This would be designed for small airplanes. In the future, the ability to accommodate some business jet operations can further enhance the operational efficiency of the airfield. A length of 5,500 feet would provide minimum service for business jets, while a length of 7,200 would be optimal for the long term. The development potential of each of these possibilities will be evaluated in the next chapter.

TABLE 3G
Business Jet Planning Statistics
Phoenix Goodyear Airport

Business Jet	ARC	MTOW #
12,500# and Under		
Cessna 500 Citation I	B-I	11,850
Cessna 501 Citation I/SP	B-I	10,600
Cessna 525 Citation Jet (CJ-1)	B-I	10,400
Raytheon 390 Premier	B-I	12,500
Cessna 525A Citation Jet (CJ-2)	B-II	12,500
Cessna 551 Citation II/SP	B-II	12,500
Lear 23	C-I	12,500
100% of Fleet Under 60,000#		
Dassault Falcon 2000	B-II	35,800
Dassault Falcon 900	B-II	45,500
Raytheon/Hawker 125-800	B-II	28,000
Lear 55	C-I	21,500
Sabreliner 75	C-I	23,300
Bombardier CL-600 Challenger	C-II	41,250
Bombardier CL-601 Challenger	C-II	41,250
Bombardier CL-604 Challenger	C-II	47,600
Cessna 650 Citation III/V	C-II	21,000
Cessna 750 Citation X	C-II	36,100
Dassault Falcon 900EX	C-II	48,300
Raytheon/Hawker 125-1000 Horizon	C-II	36,000
IAI Astra 1125	C-II	23,500
IAI Galaxy 1126	C-II	34,850
Sabreliner 65	C-II	24,000
Lear 60	D-I	23,500
Over 60,000#		
Gulfstream III	C-II	68,700
Bombardier CL-700 Global Express	C-III	96,000
Gulfstream II	D-II	65,300
Gulfstream IV	D-II	71,780
Gulfstream V	D-III	89,000

Business Jet	ARC	MTOW #
75% of Fleet Under 60,000#		
Aerospatiale SN-601 Corvette	B-I	14,550
Dassault Falcon 10	B-I	18,740
Lear 28/29	B-I	15,000
Mitsubishi MU-300 Diamond	B-I	14,630
Sabreliner 40	B-I	18,650
Cessna 550 Citation II	B-II	13,300
Cessna 550 Bravo	B-II	14,800
Cessna 552/T-47A	B-II	16,300
Cessna S550 Citation S/II	B-II	15,900
Cessna 560 Citation V Ultra	B-II	16,300
Cessna 560 Citation Encore	B-II	16,830
Cessna 560 Citation Excel	B-II	20,000
Dassault Falcon 20	B-II	28,660
Dassault Falcon 50	B-II	37,480
Beechjet 400A	C-I	16,100
IAI Jet Commander 1121	C-I	23,500
IAI Westwind 1123/1124	C-I	23,500
Lear 24	C-I	13,000
Lear 25	C-I	15,000
Lear 31	C-I	16,500
Lear 35/36	C-I	18,300
Lear 45	C-I	20,200
Sabreliner 60	C-I	20,200
BAe 125-700	C-II	24,200
Cessna 650 Citation VII	C-II	23,000
Hawker-Siddeley 125-400	C-II	23,300
Hawker-Siddeley 125-600	C-II	25,000
Sabreliner 75a/80	C-II	23,300

ARC – Airport Reference Code
MTOW # - Maximum Certificated Takeoff Weight (pounds)

Pavement Strength

An important feature of airfield pavement is the ability to withstand repeated use by aircraft of significant weight. Runway 3-21 is strength-rated at 75,000 pounds single wheel loading (SWL), 200,000 pounds dual wheel loading (DWL) and 270,000 pounds dual tandem loading (DTL).

This is adequate for the largest dual tandem aircraft, the Boeing 727-200 which can weigh up to 200,000 pounds. It will also accommodate the full range of business jets, including the Boeing Business Jet (BBJ) which can weigh up to 174,000 pounds.

The aircraft within the design ARC D-IV have maximum weights up to 605,000 pounds on dual tandem wheel gear. The operating empty weights, however, are typically 285,000 pounds or less. The Boeing 747 and 777 can weigh more than this, but also spread the loading over more wheels in a double-dual tandem gear configuration. Given the operational levels now and expected in the future, the current pavement strength should be adequate to continue to accommodate the large aircraft utilizing the airport for service, modification, or storage.

The parallel runway will need to be designed to a pavement strength of 12,500 pounds SWL to serve small airplanes. If ultimately developed, a runway that can serve business jets with a strength of up to 72,000 pounds should be planned.

Dimensional Design Standards

Runway dimensional design standards define the widths and clearances required to optimize safe operations in the landing and takeoff area. These dimensional standards vary depending upon the ARC for the runway. **Table 3H** outlines key dimensional standards for the airport reference codes most applicable to Phoenix Goodyear Airport now and in the future.

The primary runway should be planned to the standards of the critical ARC, which is D-IV. To continue to serve and develop the employment centers on the airport that service large commercial aircraft, taxiway clearances should be designed to accommodate D-V standards. A potential parallel runway should be designed to meet at least B-II standards, but should also consider the potential for C-II.

TABLE 3H
Airfield Design Standard
Phoenix Goodyear Airport

	Runway 3-21			Potential Parallel	
Airport Reference Code (ARC)	**Existing (ft.)**	**D-IV (ft.)**	**D-V (ft.)**	**B-II (ft.)**	**C-II (ft.)**
Runway Width	150	150	150	75	100
Runway Safety Area					
Width	500	500	500	150	500
Length Beyond End	1,000/**700**	1,000	1,000	300	1,000
Runway Object Free Area					
Width	800	800	500	500	800
Length Beyond End	1,000/**700**	1,000	1,000	300	1,000
Runway Blast Pad					
Width	240	200	220	80	120
Length	200	200	400	60	150
Runway Centerline to:					
Holding Position	**200**	250	260	200	250
Parallel Taxiway	400	400	410	240	300
Parallel Runway	NA	700	2,100	700	700
Taxiway Width	75	75	75	35	35
Taxiway Centerline to:					
Fixed or Moveable Object	**125**	129.5	160	65.5	65.5
Parallel Taxilane	250	215	267	105	105
Taxilane Centerline to:					
Fixed or Moveable Object	**112**	112.5	138	57.5	57.5
Parallel Taxilane	NA	198	245	97	97
Runway Protection Zones - One mile or greater visibility					
Inner Length	500	500	500	500	500
Length	1,700	1,700	1,700	1,000	1,700
Outer Width	1,010	1,010	1,010	700	1,010

* Boldface indicates standards not met.

The following considers those areas where standards will need to be met on the existing Runway 3-21:

Runway Width – The current width of Runway 3-21 (150 feet) is adequate for both D-IV and D-V design. A parallel runway will need to be 75 feet wide for B-II aircraft and is adequate for its current use, but would need to be widened to 100 feet if upgraded to C-II.

Runway Safety Area - The runway safety area (RSA) is defined in FAA Advisory Circular 150/5300-13 Change 8, *Airport Design*, as a surface surrounding the runway, prepared or suitable for reducing the risk of damage to airplanes in the event of an overshoot, undershoot, or excursion from the runway. The RSA is centered on the runway and extends beyond either end. The FAA requires the RSA to be cleared and graded, drained by grading or storm sewers, capable of accommodating fire and rescue vehicles, and free of obstacles not fixed by navigational purpose.

The RSA standard for all Category C and D aircraft is 500 feet wide and extends 1,000 feet beyond each runway end. The existing runway has at least 500 feet of safety area width; however, the existing RSA beyond the north end of Runway 21 does not extend for the full 1,000 feet. The perimeter fence, as well as Yuma Road, encroaches upon the RSA off the north end.

Runway Object Free Area - The object free area (OFA) is an area centered on the runway to enhance the safety of aircraft operations by having an area free of objects, except for objects that need to be located in the OFA for air navigation or ground maneuvering purposes. The OFA must provide clearance of all ground-based objects protruding above the runway safety area (RSA) edge elevation.

The OFA is the same for Category C and D aircraft. Like the RSA, the OFA extends for 1,000 feet beyond the runway end, but it is 800 feet wide. Runway 3-21 meets the OFA width standard, but the perimeter fence and Yuma Road encroach upon the extended OFA off the north end.

Runway Blast Pad - The blast pad is a surface adjacent to the ends of the runways provided to reduce the erosive effect of jet blast and propeller wash. Primary Runway 3-21 is equipped with 200-foot by 240-foot blasts pads off each end. This is adequate for the D-IV design aircraft.

Parallel Runway Separation - The parallel runway at GYR should be planned to have at least a centerline separation of 700 feet. This meets the minimum standard for the existing and future critical aircraft under visual flight rules (VFR).

Holding Position Separation – The current hold positions on the primary runway are marked 200 feet from the runway centerline. The standard for all Category C and D aircraft in Design Groups I through IV aircraft is 250 feet. These hold positions should be moved back in the short term.

Runway Protection Zones – The runway protection zone (RPZ) is an area off the runway end to enhance the protection of people and property on the ground. This is best achieved through airport owner control over the RPZs. Such control includes maintaining RPZ areas clear of incompatible objects and activities.

The RPZ is trapezoidal in shape and is centered on the extended runway centerline. The dimensions of the RPZ are a function of the critical aircraft and the approach visibility minimum associated with the runway. **Table 3H** depicts the requirements for runways with visibilities of one mile or more and for runways with Category I visibility (less than ¾ mile). The RPZs off primary Runway 3-21 both extend beyond the current airport property boundaries.

TAXIWAY REQUIREMENTS

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

As detailed in Chapter One, Runway 3-21 is served by a full-length parallel taxiway. Runway 3-21 has a total of eight exit taxiways. **Table 3H** outlines the runway to taxiway centerline separation standards. Parallel Taxiway A has adequate separation for D-V standards. Any parallel taxiways along the potential parallel runway should be planned to at least 300 feet to allow for ultimate C-II design.

Exit taxiways provide a means to enter and exit the runways at various points on the airfield. The type and number of exit taxiways can have a direct impact on the capacity and efficiency of the airport as a whole. Runway 3-21 has a total of eight exit taxiways on the southeast side of the runway.

Exit taxiways are most effective when planned at least 800 feet apart. Therefore, the eight exits from Runway 3-21 are essentially equivalent to seven. Right-angled exits require an aircraft to be nearly stopped before it can safely exit the runway. Angled exits allow aircraft to use a higher safe exit speed while exiting the runway. There are presently two angled exits on Runway 3-21 (one serving in each direction). Potential locations for new exit taxiways that may improve capacity or efficiency will be examined in Chapter Four – Alternatives.

Dimensional standards for the taxiways are depicted on **Table 3G**. The airfield taxiways are all 75 feet wide, meeting the Design Group V standard. The associated taxiways for a potential parallel runway should be planned at 35 feet, provided they are not located where they will need to serve larger aircraft.

Holding aprons and bypass taxiways can also improve the efficiency of the taxiway system. Currently, both runway ends have holding aprons. Holding aprons should also be considered for any potential parallel runway.

NAVIGATIONAL APPROACH AIDS

Navigational aids provide two primary services to airport operations, precision guidance to specific runway and/or non-precision guidance to a runway or the airport itself. The basic difference between a precision and non-precision navigational aid is that the former provides electronic descent, alignment (course), and position guidance, while the non-precision navigational aid provides only alignment and position location information. The necessity for such equipment is usually determined by design standards predicated on safety considerations and operational needs. The type, purpose and volume of aviation activity expected at the airport are factors in the determination of the airport's eligibility for navigational aids.

The advancement of technology has been one of the most important factors in the growth of the aviation industry in the twentieth century. Many of the civil aviation improvements have been derived and enhanced from initial development for military purposes. The use of orbiting satellites to confirm an aircraft's location is one of the latest military developments to be made available to the civil aviation community.

Global positioning systems (GPS) use two or more satellites to derive an aircraft's location by a triangulation method. The accuracy of these systems has been remarkable, with initial degrees of error of only a few meters. As the technology improves, it is anticipated that GPS may be able to provide accurate-enough position information to allow Category II and III precision instrument approaches, independent of any existing ground-based navigational facilities. In addition to the navigational benefits, it has been estimated that GPS equipment will be much less-costly than existing precision instrument landing systems.

Currently, Phoenix Goodyear Airport does not have any instrument approach. While Phoenix Goodyear Airport enjoys an unusually high percentage of VFR weather (over 99 percent), the addition of a straight-in instrument approach would be to serve corporate aircraft users, as well as flight training. The airport should be planned for a straight-in instrument approach as long as it does not conflict with Luke Air Force Base operations.

Visual glide slope indicators provide visual descent guidance information during approach. There are two forms of these aids that have been regularly installed by the FAA at airports. They include precision approach path indicators (PAPI) and visual approach path indicators (VASI). Phoenix Goodyear Airport is currently equipped with PAPI-2 for both approaches. PAPI-4 should be planned for the existing runway and any future parallel runway.

Two types of automated weather observing systems are currently deployed at airports around the country. ASOS (Automated Surface Observing System) and AWOS (Automated Weather Observing System) both measure and process surface weather observations 24 hours a day, with reporting varying from one minute to hourly. The systems provide near

real-time measurements of atmospheric conditions.

ASOS is typically commissioned by the National Weather Service or the Department of Defense. AWOS is often commissioned by the Federal Aviation Administration for airports that meet criteria of either 8,250 annual itinerant operations or 75,500 annual local operations. Phoenix Goodyear Airport currently has a Limited Aviation Weather Reporting Station (LAWRS). It should be a short-term planning goal to install an AWOS at Phoenix Goodyear Airport, to improve weather reporting and to advance safety for pilots operating at Goodyear.

Phoenix Goodyear Airport is presently served by an airport traffic control tower (ATCT) operated under an FAA contract, from 6 a.m. to 9 p.m. Hours of operation may increase in the long term as operations increase.

AIRFIELD LIGHTING, MARKING AND SIGNAGE

Runway identification lighting provides the pilot with a rapid and positive identification of the runway end. The most basic system involves runway end identifier lights (REILs). Both runway ends currently have REILs installed. REILs should be planned for any future parallel runway.

The medium intensity runway edge lighting (MIRL) currently available along Runway 3-21 will be adequate for the planning period. Similar lighting should be planned for any future parallel runway. The taxiway system is lighted with medium intensity taxiway lighting (MITL) which will be adequate for the planning period. MITL should be planned for all future taxiways as well.

Lighted airfield signage on the primary runway currently meets FAR Part 139 standards. This will need to be extended to any new airfield pavements as well.

Precision runway marking should be maintained on Runway 3-21. A future parallel runway should be planned for non-precision markings. Basic taxiway marking will continue to be adequate and should be applied to all new taxiways as well.

The airport also has a lighted wind cone and segmented circle which provide pilots with information about wind conditions and the airport traffic pattern. In addition, an airport beacon assists in identifying the airport from the air at night. Each of these facilities should be maintained in the future.

GENERAL AVIATION FACILITIES

General aviation facilities are those necessary for handling general aviation aircraft, passengers, and cargo while on the ground. This section is devoted to identifying future GA facility needs during the planning period for the following types of facilities normally associated with general aviation terminal areas:

- Hangars
- Aircraft Parking Apron
- General Aviation Terminal Services

HANGARS

The demand for hangar facilities typically depends on the number and type of aircraft expected to be based at the airport. Hangar facilities are generally classified as shade hangars or T-hangars, and conventional hangars. Conventional hangars can include individual hangars or multi-aircraft hangars. These different types of hangars offer varying levels of privacy, security, and protection from the elements.

Demand for hangars varies with the number of aircraft based at the airport. Another important factor is the type of based aircraft. Smaller single-engine aircraft usually prefer shade or T-hangars, while larger business jets will prefer conventional hangars. Rental costs will also be a factor in the choice.

The airport has 12 T-hangar storage facilities, providing 147 storage units. T-hangar space available at the airport totals approximately 187,100 square feet for aircraft storage. The airport also has 59 shade hangar storage positions, encompassing 115,200 square feet of storage space. Presently, the only hangars not fully occupied are the ATCA shade hangars. Analysis of future T-hangar and shade hangar requirements, as depicted on **Table 3J**, indicates that additional T-hangar and/or shade hangar positions may be needed within the long term planning horizon.

There is currently no conventional general aviation hangar storage space at the airport. Typical users of these facilities include medium and large aircraft. Conventional hangar space will need to be planned to accommodate the business jets forecast to base at GYR.

Requirements for maintenance and shop (FBO) hangar area were estimated at 10 percent of the total T-hangar and conventional hangar area. It should be noted that FBO hangars are cross-utilized for storage and aircraft maintenance. They are also sometimes used to store transient aircraft overnight. AeroTurbine's service hangar facilities were not included because they are not used for general aviation purposes.

Table 3J compares the existing hangar space to the future hangar requirements. It is evident from the table that there is a need for additional enclosed hangar storage space through the planning period. The analysis also indicates a potential need for additional service hangar space through the planning period.

TABLE 3J Hangar Storage Requirements Phoenix Goodyear Airport	Existing	Short Term (± 5)	Intermediate Term (± 10)	Long Term (± 20)
Hangar Positions				
Shade/T-Hangars	206	276	344	514
Conventional	0	26	41	77
Total Aircraft to be Hangared	197	302	385	591
Hangar Area Requirements				
T-Hangars (s.f.)	302,300	387,000	472,000	684,000
Conventional (s.f.)	0	68,000	107,000	200,000
Service Hangar Area (s.f.)	57,300	46,000	58,000	88,000
Total Hangar Area (s.f.)	359,600	501,000	637,000	972,000

AIRCRAFT PARKING APRON

Parking apron should be provided for at least the number of locally-based aircraft that are not stored in hangars, as well as transient aircraft. The airport provides approximately 38,000 square yards of total apron parking adjacent the airport terminal and the ATCA facilities. The apron areas adjacent the AeroTurbine facilities are privately used by AeroTurbine; therefore, they were not included. The number of local tie-downs and ramp space for the planning period is presented in **Table 3K.**

FAA Advisory Circular 150/5300-13 suggests a methodology by which transient apron requirements can be determined from knowledge of busy-day operations. At Phoenix Goodyear Airport, the number of transient spaces required was determined to be approximately 20 percent of busy-day itinerant operations.

A planning criterion of 700 square yards per aircraft was applied to the number of transient spaces to determine future transient apron requirements for single- and multi-engine aircraft. A planning criterion of 360 square yards per based aircraft was applied to the number of local positions.

Local ramp and transient parking spaces will need to be expanded to accommodate the projected demand.

GENERAL AVIATION TERMINAL SERVICES

The general aviation facilities are often the first impression of the community that corporate officials or vacationers will encounter. General aviation terminal facilities at an airport provide space for passenger waiting, pilots' lounge and flight planning, concessions, management, storage, and various other needs. This can be accommodated in a single facility or spread throughout several fixed base operators.

TABLE 3K
Aircraft Parking Apron Requirements
Phoenix Goodyear Airport

	Existing	Short Term (± 5)	Intermediate Term (± 10)	Long Term (± 20)
Non-hangared Based Aircraft	9	15	19	28
Busy Day Itinerant Operations	260	461	593	860
Local Ramp Positions	N/A	15	19	28
Transient Ramp Positions	N/A	92	119	172
Total Ramp Positions	54	107	138	200
Apron Area (s.y.)	38,000	70,000	90,000	130,000

The methodology used in estimating general aviation terminal facility needs was based upon the number of airport users expected to utilize general aviation facilities during the design hour, as well as FAA guidelines.

Space requirements for terminal facilities were based on providing 90 square feet per design hour itinerant passenger. Space within the offices of each fixed base operator is used for general aviation terminal facilities. **Table 3L** outlines the general space requirements for general aviation terminal services at Phoenix Goodyear Airport through the long term planning horizon. As shown in the table, the present general aviation terminal facilities almost meet the existing demand of the airport; however, more square footage will need to be added throughout the planning periods.

TABLE 3L
GA Terminal Services Requirements
Phoenix Goodyear Airport

	Available	Current Need	Short Term (± 5)	Intermediate Term (± 10)	Long Term (± 20)
Itinerant Operations					
Annual		63,407	104,000	138,100	203,400
Design Hour		32	46	55	77
Pax/OP		1.9	1.9	1.9	1.9
Des. HR Pax		61	87	105	146
Terminal Space (s.f.)	5,500	5,500	7,800	9,400	13,100

AIRPORT ACCESS

The airport has a single public access point located on the east side. The entrance road intersects with Litchfield Road. Using trip generation models from the *Institute of Transportation Engineers (ITE) Trip Generation Report*, GYR is estimated to currently generate 900 daily vehicle trips based upon peak month operations and based aircraft. This will grow to 2,900 daily vehicle trips by the long term planning horizon. In addition, traffic from the AeroTurbine facility on the airport is estimated to generate 2,100 daily vehicle trips based upon the number of employees and the size of its facilities. This equates to an aver-

age of 3,000 average daily vehicle trips during the peak month. This would grow to 5,000 daily trips by the long term planning horizon, assuming no significant change in the AeroTurbine operation.

The City of Goodyear has a one-mile grid system common in the west Valley. South Litchfield Road is classified as a major arterial and runs north-south by the airport. Immediately north of the airport is Yuma Road, which has been classified as a scenic arterial. The intersection of Litchfield and Yuma handles average daily traffic (ADT) of 24,663. To the south, Litchfield Road intersects with County Route (MC) 85 (West Main Street), which is also as a major arterial. The Maricopa Association of Governments (MAG) classifies MC-85 as a Road of Regional Significance (RRS) in its Regional Transportation Plan (RTP).

The City's comprehensive plan indicates that while traffic is increasing, all three roads are still at an acceptable Level of Service (LOS). All three roads are planned to be part of the roadway system serving the new City Center. Both Litchfield Road and MC-85 are classified as proposed City Center arterials in the future, continuing to be designed to carry traffic associated with the area as a business and employment center.

The area to the immediate north of the airport is identified in the City of Goodyear General Plan and the Bullard Business Corridor Plan as one of the primary short term employment centers in the City. A northern airport entrance is recommended in both plans. The planned construction of the I-10 and Bullard Avenue interchange will likely generate significant vehicular traffic to and beyond the northern airport area. The planned City Center retail/residential development could also create a tie-in with a new northern airport entrance. Thus a second entrance to the airport from the north is considered critical for future development of the airport if appropriate landside facilities are located in this area. Finally, a second airport entrance will serve to relieve congestion at the only current airport entrance off Litchfield Road.

GENERAL AVIATION PARKING

Vehicle parking requirements for general aviation were also examined. Space determinations were based on an evaluation of the existing airport use, as well as industry standards. General aviation spaces were calculated by multiplying design hour itinerant passengers by the industry standard of 1.8. Auto parking requirements are summarized in **Table 3M**.

TABLE 3M
Automobile Parking Requirements
Phoenix Goodyear Airport

		Future Requirements		
	2004	Short Term (± 5)	Intermediate Term (± 10)	Long Term (± 20)
Design Hour Passengers		99	127	181
Total Vehicle Spaces	32	178	229	326

The airport currently has 32 parking spaces in its public parking lot. The analysis indicates that the available parking is vastly undersized. This may not be as apparent because most based aircraft users park their vehicles in their T-hangars. The projected parking spaces are based upon no vehicles parked in hangars.

SUPPORT FACILITIES

Various facilities that do not logically fall within classifications of airfield, terminal building, or general aviation requirements, have been identified for these remaining facilities:

AIRPORT RESCUE AND FIREFIGHTING

The requirements for Aircraft Rescue and Firefighting (ARFF) equipment at an airport are determined by whether it is certified as an FAR Part 139 airport. Phoenix Goodyear is not a Part 139 airport; therefore, there is no requirement for ARFF facilities. The operations by large commercial aircraft, however, suggest that an on-site facility may need to be considered in the future.

FUEL STORAGE

The City of Phoenix and ATCA own and operate fuel facilities. The City of Phoenix facility is equipped with two 20,000-gallon tanks: one holds 100LL Avgas; the other holds Jet A fuel. An additional 20,000-gallon Jet A tank will be added in October 2005. The ATCA fuel facility consists of four 10,000-gallon tanks, each holding 100LL Avgas.

Fuel storage is typically based upon maintaining a one month supply of fuel during an average month; however, more frequent deliveries can reduce the fuel storage capacity requirement. Over the past year, Avgas fuel sales have averaged 4.0 gallons per operation. This ratio was utilized to project future Avgas sales. **Table 3N** presents future Avgas storage requirements for the airport based upon a two-week supply during the peak month.

Jet A fuel consumption at GYR currently averages 280 gallons per operation. This high ratio is generated by the large commercial aircraft serviced and stored at the airport. As business jet operations increase, this ratio can be expected to decline. Turbine operations currently comprise two percent of total operations. Turbine operations will reach 20,800 operations annually in the long term. **Table 3N** presents the Jet A fuel storage requirements.

The available Jet A fuel storage will drop below the two-week demand in the short term planning horizon. Avgas storage should be adequate until at least the long term planning horizon.

SUMMARY

The intent of this chapter has been to outline the facilities required to meet "unconstrained" aviation demands projected for Phoenix Goodyear Airport through the long term planning

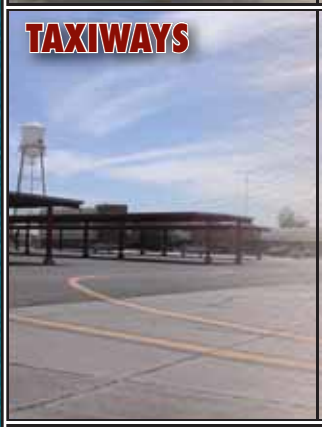
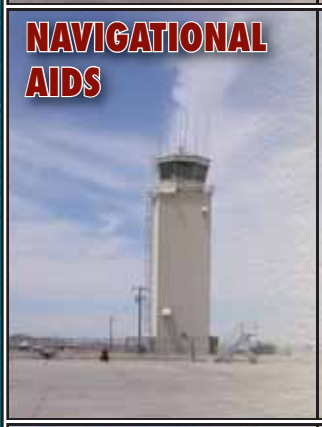
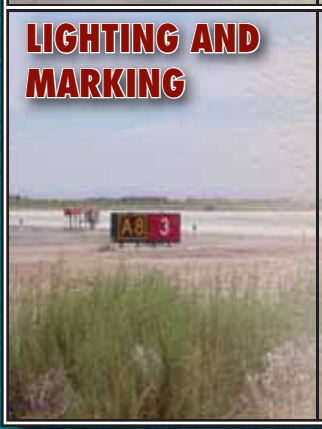
horizon. A summary of the airfield, airline terminal, and general aviation facility requirements are presented on **Exhibits 3E** and **3F**.

Following the "unconstrained" facility requirements determination, the next step is to develop a direction for development to best meet these projected needs. The remainder of the Master Plan will be devoted to outlining this direction, its schedule, and its costs.

TABLE 3N
Fuel Storage Requirements
Phoenix Goodyear Airport

	Available	Current Need	Short Term (± 5)	Intermediate Term (± 10)	Long Term (± 20)
Design Day Operations		423	674	890	1,335
Two-week Operations		5,922	9,436	12,460	18,690
Two-week Fuel Storage Requirements					
Avgas (gal.)	60,000	24,000	38,000	50,000	75,000
Jet A (gal.)	40,000	28,000	58,000	107,000	197,000

04MP14-3E-8/15/05

	EXISTING FACILITY	SHORT TERM NEED	LONG TERM NEED
RUNWAYS	**Runway 3-21** 8,500' x 150' 200,000# DWL 270,000# DTL ARC D-IV	**Runway 3-21** Improve and Extend RSA / OFA North End Correct RPZ North End **Potential Parallel Runway** 4,300' x 75' 12,500 # SWL ARC B-II	**Runway 3-21** Same **Potential Parallel Runway** 7,200' x 100' 60,000 # DWL ARC C-II
TAXIWAYS 	**Runway 3-21** Full Length Parallel 8 Exits 75' Wide 270,000# DTL Holding Aprons	**Runway 3-21** Same **Potential Parallel Runway** Full Length Parallel 5 Exits 35' Wide 12,500# SWL Holding Aprons	**Runway 3-21** Add: High Speed Exits **Potential Parallel Runway** Full Length Parallel 7 Exits 35' Wide 60,000# DWL Holding Aprons
NAVIGATIONAL AIDS 	ATCT (6 a.m. - 9 p.m.) LAWRS **Runway 3-21** PAPI-2	ATCT (6 a.m. - 9 p.m.) AWOS-III GPS **Runway 3-21** PAPI-4 GPS **Potential Parallel Runway** PAPI-4	ATCT (5 a.m. - 12 p.m.) AWOS-III GPS **Runway 3-21** Same **Potential Parallel Runway** PAPI-4 GPS
LIGHTING AND MARKING 	Airport Beacon Segmented Circle MITL Basic Taxiway Marking **Runway 3-21** MIRL • REILs Precision Marking	Same **Runway 3-21** MIRL • REILs Precision Marking **Potential Parallel Runway** MIRL • REILs Nonprecision Marking	Same **Runway 3-21** Same **Potential Parallel Runway** Same

GYR

PHOENIX GOODYEAR AIRPORT

Exhibit 3E

"UNCONSTRAINED" AIRFIELD REQUIREMENTS

04MP14-3F-9/13/06

AIRCRAFT STORAGE HANGAR REQUIREMENTS

	EXISTING	SHORT TERM NEED	INTERMEDIATE NEED	LONG TERM NEED
Aircraft to be Hangared	197	302	385	591
T-Hangars / Shade Hangars	206	276	344	514
Conventional Hangar Positions	0	26	41	77

HANGAR AREA REQUIREMENTS

	EXISTING	SHORT TERM NEED	INTERMEDIATE NEED	LONG TERM NEED
T-Hangar Area (s.f.)	302,300	387,000	472,000	684,000
Conventional Hangar Storage Area	0	68,000	107,000	200,000
Service Hangar Area	57,300	46,000	58,000	88,000
Subtotal Conventional Hangar Area	***359,600***	***501,000***	***637,000***	***972,000***

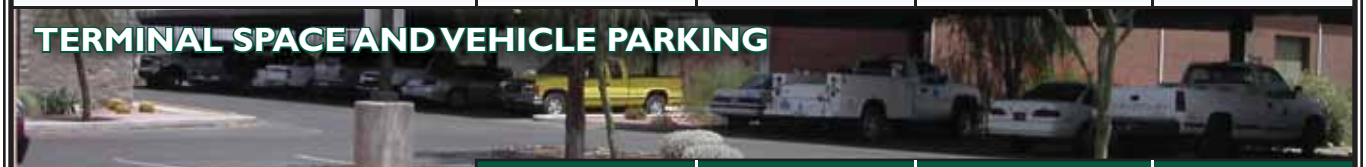
AIRCRAFT PARKING APRON REQUIREMENTS

	EXISTING	SHORT TERM NEED	INTERMEDIATE NEED	LONG TERM NEED
Transient Ramp Positions	NA	92	119	172
Local Ramp Positions	NA	15	19	28
Total Ramp Positions	***54***	***107***	***138***	***200***
Total Apron Area (s.y.)	***38,000***	***70,000***	***90,000***	***130,000***

FUEL STORAGE

	EXISTING	SHORT TERM NEED	INTERMEDIATE NEED	LONG TERM NEED
Av Gas (gallons)	60,000	30,000	50,000	75,000
Jet A (gallons)	40,000	58,000	107,000	197,000

TERMINAL SPACE AND VEHICLE PARKING



	EXISTING	SHORT TERM NEED	INTERMEDIATE NEED	LONG TERM NEED
General Aviation Parking (spaces)	32	178	229	326
Terminal Space (s.f.)	5,500	7,800	9,400	13,100

Exhibit 3F
"UNCONSTRAINED" GENERAL AVIATION
AND SUPPORT FACILITY REQUIREMENTS

Chapter Four

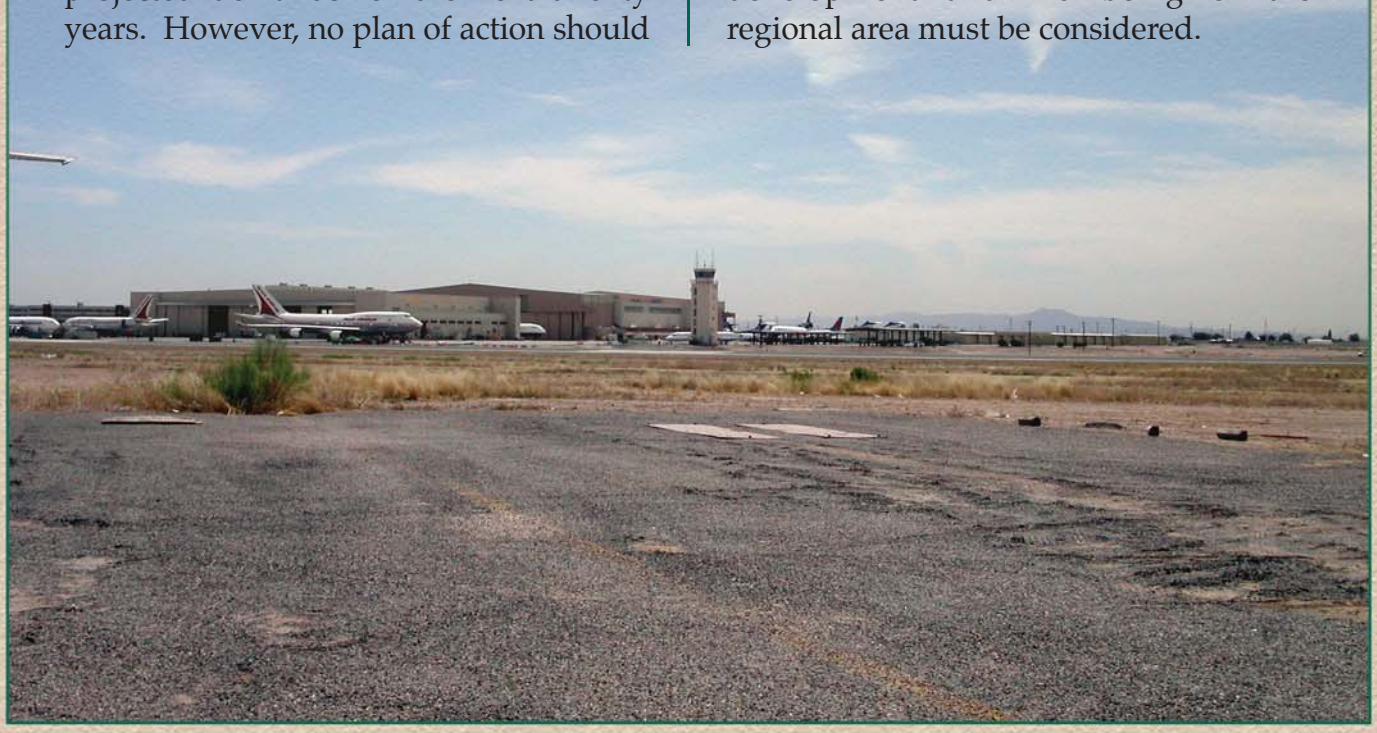
AIRPORT ALTERNATIVES

Airport Alternatives

In the previous chapter, airside and landside facilities required to satisfy the demand for the long range planning period were identified. The next step in the planning process is to evaluate reasonable ways these facilities can be provided. There can be countless combinations of design alternatives, but the alternatives presented here are those with the greatest potential for implementation.

Any development proposed for a master plan is evolved from an analysis of projected needs for a set period of time. Though the needs were determined by the best methodology available, it cannot be assumed that future events will not change these needs. The master planning process attempts to develop a viable concept for meeting the needs caused by projected demands for the next twenty years. However, no plan of action should be developed which may be inconsistent with the future goals and objectives of the City of Phoenix and its citizens, who have a vested interest in the development and operation of the airport. Since the airport is located in the City of Goodyear, the plan should also be consistent with the future goals and objectives of the City of Goodyear.

The development alternatives for Phoenix Goodyear Airport can be categorized into two functional areas: the **airside** (runways, navigational aids, taxiways, etc.) and **landside** (general aviation hangars, apron, and terminal area). Within each of these areas, specific facilities are required or desired. In addition, the utilization of the airport property to provide revenue support for the airport and to benefit the economic development and well-being of the regional area must be considered.



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

The alternatives considered are compared using environmental, economic, and aviation factors to determine which of the alternatives will best fulfill the local aviation needs. With this information, as well as input and direction from local government agencies and airport users, a final airport concept can evolve into a realistic development plan. The following airport development objectives have been defined by the City of Phoenix Aviation Department.

AIRPORT DEVELOPMENT OBJECTIVES

It is the goal of this effort to produce a balanced airside and an appropriate landside aircraft storage mix to best serve forecast aviation demands. However, before defining and evaluating specific alternatives, airport development objectives should be considered. As owner and operator, the City of Phoenix provides the overall guidance for the operation and development of the Phoenix Goodyear Airport. It is of primary concern that the airport is marketed, developed, and operated for the betterment of the community and its users. With this in mind, the following development objectives have been defined for this planning effort:

- To preserve and protect public and private investments in existing airport facilities.
- To develop a safe, attractive, and efficient aviation facility in accordance with applicable federal, state, and local regulations.
- To develop a balanced facility that is responsive to current and long term needs of all general aviation.
- To be reflective and supportive of both the City of Goodyear's and the City of Phoenix's goals, needs, and plans.
- To ensure that future development will not negatively impact Luke Air Force Base's mission.
- To develop a facility with a focus on self-sufficiency in both operational and developmental cost recovery.
- To ensure that future development is environmentally compatible.

NON-DEVELOPMENT ALTERNATIVES

When analyzing alternatives for development, consideration must first be given to non-development alternatives. These alternatives include the "no-action" or "do-nothing" alternative, transferring service to an existing airport, or developing an airport at a new location. These alternatives need to be examined first to determine whether future development of Phoenix Goodyear Airport is in the best interest of the City of Phoenix and the region as a whole.

“NO-ACTION” ALTERNATIVE

The "no-action" alternative essentially considers keeping the airport in its present condition and not providing for any improvement to the existing facilities. The primary result of this alternative would be the inability of the airport to satisfy the projected aviation demands of the airport service area. This result would be contradictory to the activity that has occurred and is expected to continue at the airport. Because of this activity, some improvements will continue to be needed.

The City of Phoenix has experienced strong growth in all socioeconomic categories over the past several decades. Forecasts indicate this trend will likely continue throughout and beyond the long term planning horizon. The City of Phoenix has a vested interest in maintaining and improving airport facilities for both recreational and business users. Without a commitment to ongoing maintenance and improvement of the airport, regular users of the airport and potential future users of the airport will be constrained from taking full advantage of the airport's air transportation capabilities.

The unavoidable consequence of the “no-action” alternative would involve the airport’s inability to accommodate potential airport users. Corporate aviation plays a major role in the transportation of business leaders and key employees. Thus, an airport’s facilities are often the first impression many corporate officials will have of the community. If the airport does not have the capability to meet hangar, apron, or airfield needs of potential users, the area’s capability to attract the major-sector businesses that rely on air transportation could be diminished.

The long term consequences of the "no-action" alternative would be to reduce the quality of the existing airport facilities over time, producing undesirable results. This scenario would result in overcrowded conditions and unnecessary delays and an overall unpleasant experience for regular users and visitors.

Phoenix Goodyear Airport is part of a system of airports in the Phoenix metropolitan area. Each airport provides a certain level of service and economic stimuli. To pursue a “no-action” alternative would place a burden on other airports in the region. Over time, many users of the airport may relocate to other airports and airport businesses would experience negative economic impacts.

To pursue a policy of “no-action” for Phoenix Goodyear Airport could have significant negative impacts on not only the users of the airport, but also the community as a whole. The “no-action” alternative is also inconsistent with the development objectives outlined previously. Therefore, the “no-action” alternative is not considered to be prudent or feasible.

TRANSFER AVIATION SERVICES

The alternative of shifting aviation services to another existing airport was found to be an undesirable alternative, due to existing capacity constraints at other airports and the importance that

the existing airport has on the economic well-being of the community. The closest public general aviation airport is Glendale Municipal Airport, located seven nautical miles (nm) to the north. This airport provides a single-runway system with limited facility expansion capability. Thus, Glendale Municipal Airport could only support the transfer of a few based aircraft from Goodyear.

The next closest general aviation airport is Phoenix Deer Valley Airport, which is 22 nm to the northeast. Phoenix Deer Valley Airport maintains a two-runway airfield system. This configuration is able to support a significant number of operations, but there are currently more than 1,200 based aircraft, and the airport is expected to experience capacity constraints of its own within the planning period. Phoenix Deer Valley Airport has the undeveloped land available to accommodate facility development, but the airport simply can't operate efficiently if too many more aircraft base there. As a result, the transfer of aircraft to Phoenix Deer Valley Airport is considered impracticable at this time.

Buckeye Airport is approximately 16 nm to the west of Goodyear. Buckeye offers a single 5,500-foot-long by 75-foot-wide runway. Runway 17-35 is strength rated at 12,500 pounds for a single wheel landing gear configuration. This airport could absorb many of the smaller aircraft based at Goodyear if facility development is provided in a timely manner. Since Buckeye is further from the metropolitan Phoenix region, only a portion of aircraft owners would choose to base their aircraft there.

Phoenix Goodyear Airport is a general aviation airport of significance in the Phoenix region. To attempt to transfer aviation services to other regional airports would create a void in the distribution of aircraft and cause an undue burden on other airports. If a shift of aviation services to any of the regional airports was pursued, current users of Phoenix Goodyear Airport would be forced to travel to a more distant and less convenient airport. Furthermore, the continuing growth expected in the area demonstrates the need for a highly functional and convenient airport.

In addition, the City of Phoenix, Arizona Department of Transportation (ADOT), and the FAA have contributed to significant improvements at the airport in recent years. To abandon these investments and transfer aviation services to another airport would result in an investment with little or no return. Closing Phoenix Goodyear Airport would mean the loss of a substantial investment in a sizable transportation facility. In a situation where public funds are limited, the replacement of a functional and expandable airport facility would represent an unjustifiable loss of significant public investment.

General aviation airports play a major role in the way companies conduct their businesses. These airports are becoming increasingly important in the post-9/11 aviation environment. Corporate aircraft use is becoming more affordable, not only for businesses, but also for individuals. Phoenix Goodyear Airport is expected to accommodate business aircraft traffic for companies located or conducting business in and around the Cities of Phoenix and Good-

year, as well as other surrounding communities. This role is not easily replaced by shifting demand to another airport in the system without tremendous expense.

Finally, transferring aviation services away from Phoenix Goodyear Airport would cause significant negative economic impacts. The airport supports numerous businesses and creates employment opportunities. The transfer of aviation services and businesses to other airports can be extremely difficult, costly, and in some cases, impossible. The financial impact to the City of Phoenix to pursue such an alternative is difficult to justify. In addition, the transfer of aviation services is inconsistent with the airport development alternatives previously identified.

CONSTRUCTION OF A NEW AIRPORT SITE

This alternative generally considers closing the primary airport and transferring aviation activity to a new airport, which presumably can accommodate a greater volume of activity. This possibility is contrary to the recommendations of the Regional Aviation System Plan (RASP). The RASP is currently being updated, but some recommendations and conclusions have been made.

The Maricopa Association of Governments (MAG) is the entity responsible for development of the RASP. The RASP identifies capacity constraint issues for the regional aviation system as a significant concern. Extensive study of four development alternatives to improve the regional aviation system was conducted. The four alternative elements are maintaining the status quo (i.e., preserving existing facilities), improving technology (i.e., instrument approaches), maximizing capacity (i.e., adding new and/or extending existing runways), and constructing new airports.

Initial consideration was given to the construction of up to four new general aviation airports in the region to address the growing concern of capacity constraint. In conjunction with improvements to the regional airports, the final plan calls for the addition of at least one new general aviation airport. According to the RASP, development of a new general aviation airport will enhance the regional operational capacity, provide for a more efficient and safe aviation environment, and maximize the capabilities of existing airports in the regional system.

The development of a new airport as a replacement for Phoenix Goodyear Airport is contrary to the RASP recommendations. According to the RASP, rather than replace the airport, significant improvements should be made to the airport, including consideration of a parallel runway. In addition, at least one new general aviation airport should be considered in order to accommodate some of the capacity issues affecting the entire regional aviation system.

SUMMARY

Overall, transferring services to an existing airport in the region or to an entirely new facility are unreasonable alternatives that should not be pursued at

this time. Phoenix Goodyear Airport is capable of accommodating the long term aviation demands of the area and should be developed in response to those demands. The airport has the potential to continue to develop as a quality general aviation airport that could greatly enhance the economic development of the region.

This chapter will present a number of development alternatives designed to accommodate projected aviation demand. Ultimately, however, long term capacity constraints may justify expansion of other regional airports or the construction of an additional airport to serve the region.

The following sections of this chapter will examine a number of development alternatives designed to maximize the ability of the airport to meet future demand. Ultimately, however, an additional general aviation airport may be justified for the Phoenix Region according to the RASP. The previous chapter identified facilities necessary to meet the forecast demand throughout the planning period. The purpose of the remainder of this chapter is to evaluate alternatives that meet the needs of the airport. The necessary facilities and applicable design standards are examined in the paragraphs to follow.

AIRSIDE PLANNING ISSUES

Developing the existing airport site to meet the long term aviation demand will consider the airside planning issues presented on **Exhibit 4A**. The overall capacity of the airport is of primary importance. Analysis in the previous chapter indicated that during the term of this master plan (20 years), the ability of the current runway/taxiway system to support growth may be severely limited. A number of capacity enhancements will be considered including the addition of a parallel runway and taxiway improvements.

The Regional Aviation System Plan (RASP-2001) as developed by the Maricopa Association of Governments recommended the development of a parallel runway for Phoenix Goodyear Airport. Development of a parallel runway would have the greatest positive impact on overall capacity at the airport by adding, in theory, as many as 250,000 annual operations to the overall annual service volume (ASV). Alternatives to follow will present a number of options for a parallel runway.

Adherence to airport design standards, as prescribed by the FAA, is also of critical importance. Currently, the runway safety area (RSA) and the object free area (OFA) beyond Runway 3 do not meet FAA standards. With the publication of FAA Order 5200.8, *Runway Safety Area Program*, the FAA indicated that all airports must meet safety area standards *to the extent practicable* and a modification to standard will not be issued. The publicity of recent aircraft accidents at airports with inadequate safety areas has placed even greater emphasis on airports meeting safety area standards. Detailed analysis will be presented to address RSA deficiencies at Phoenix Goodyear Airport.

The airport development alternatives will individually address additional airside issues such as the possibility of im-

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AIRSIDE PLANNING ISSUES

- Provide capacity enhancement with a parallel runway and other airside improvements such as additional high-speed exit taxiways and bypass taxiways.
- Meet FAA design standards for the Runway Safety Area (RSA), the Object Free Area (OFA), the Obstacle Free Zone (OFZ), and the Runway Protection Zone (RPZ).
- Maintain current primary runway length.
- Strengthen taxiways to support large aircraft.
- Examine the possibility of improved instrument approaches including a CAT I approach.

LANDSIDE PLANNING ISSUES

- Separate airport landside functions into low, medium and high activity areas.
- Develop T-hangars, conventional, and executive hangars to meet forecast demand levels.
- Provide for future FBO development areas.
- Provide for future private hangar and business development to meet the growing needs of corporate aviation.
- Provide appropriate support facilities as demand grows such as additional fuel storage capacity and an aircraft wash rack.
- Examine development possibilities on both sides of the airfield.
- Identify strategic property acquisition needs to aid in the long term viability of the airport.
- Provide adequate surface transportation access for landside improvements.
- Provide generalized on-airport land use plans based on airfield configuration.

PHOENIX GOODYEAR AIRPORT

Exhibit 4A

DEVELOPMENT ISSUES

proved instrument approaches, relocating landing thresholds to the pavement ends, and further capacity enhancements through taxiway improvements, as well as pavement strength needs. The RASP also recommends some technological improvements to the airport. Of particular concern is the development of a precision instrument approach. The airport alternatives will consider the development of approaches with at least one-mile visibility minimums, as well as a CAT I approach which affords visibility minimums as low as ½ mile.

RUNWAY SAFETY AREA (RSA) CONSIDERATIONS

The runway safety area (RSA) is a designated area surrounding the runways. According to the FAA, the RSA is to be:

(1) cleared and graded and have no potentially hazardous ruts, humps, depressions, or other surface variations;

(2) drained by grading or storm sewers to prevent water accumulation;

(3) capable, under dry conditions, of supporting snow-removal equipment, aircraft rescue and fire-fighting equipment, and the occasional passage of aircraft without causing structural damage to the aircraft, and;

(4) free of objects, except for objects that need to be located in the RSA because of their function in aiding air navigation.

The dimensions of the RSA surrounding the runway are a function of the critical aircraft. The RSA serving Runway 3-21 should be 500 feet wide and 1,000 feet beyond the far end of the runway and 600 feet prior to landing. Since operations are performed to both runway ends, depending on wind conditions, the RSA effectively needs to be 1,000 feet beyond both runway ends.

The current critical aircraft utilizing Phoenix Goodyear Airport falls in Airport Reference Code (ARC) C-III. The future critical aircraft is projected to fall into ARC D-IV, with planning consideration given to the possibility of operations by aircraft in ARC D-V. The RSA standards are the same for each of these ARCs.

The RSA beyond the departure end of Runway 3, is penetrated by the airport perimeter fence and Yuma Road. The RSA and OFA extend beyond airport property by approximately 200 feet and 300 feet respectively. The Runway Safety Area Program addresses deficiencies in RSA exclusively, but planning will consider applying RSA mitigation to OFA deficiencies as well. Thus, if action is going to be taken to fix RSA problems, then, where possible, the action should apply to the OFA. All future solutions to RSA deficiencies will attempt to solve OFA deficiencies as well.

The FAA has placed significant emphasis on airports meeting RSA standards. Under Order 5200.8, the FAA established the *Runway Safety Area Program*. The Order states, "The goal of the Runway Safety Area Program is that all RSAs at federally-obligated air-

ports . . . shall conform to the standards contained in AC 150/5300-13, *Airport Design*, to the extent practicable." Under the Order, each of the Regional Airports Divisions of the FAA is obligated to collect and maintain data on the RSA for each runway at federally-obligated airports.

The Order provides a list of design alternatives to be considered when RSA standards are not currently met. The list is as follows:

- Construct the traditional graded runway safety area surrounding the runway.
- Relocation, shifting, or realignment of the runway.
- Reduction in runway length where the existing runway length exceeds that which is required for the existing or projected design aircraft.
- A combination of runway relocation, shifting, grading, realignment, or reduction.
- Implementation of declared distances.
- Installation of Engineered Materials Arresting Systems (EMAS).

It is the desire of the FAA, where practicable, to have full RSA provided. Environmental and physical impacts as well as costs are potential obstacles to implementing some of the mitigation alternatives. A discussion of the practicality and feasibility of the FAA-prescribed RSA alternatives as they are applied to the deficiencies beyond the departure end of Runway 3 follows.

RSA Alternative 1: Clear and Grade RSA

In order to construct the full RSA beyond the departure end of Runway 3, the perimeter fence and a portion of Yuma Road will need to be rerouted. The airport would need to acquire approximately six acres of private property to accommodate this solution. This property is currently undeveloped but is being cultivated. Approximately 1,800 feet of Yuma Road would be rerouted.

This RSA alternative, as presented on **Exhibit 4B**, would preserve the full runway length of 8,500 feet. Meeting RSA standard is required, thus this alternative will be considered further.

RSA Alternative 2: Relocate, Shift, or Realign the Runway

Due to the limitations of the airport property boundary, relocation of the runway is impracticable. Any relocation of the runway would place a portion of the runway and the safety areas off airport property, necessitating property acquisition. Relocation of the runway would also hinder the future potential for airport growth on both the airside and landside. Relocation of the runway is not considered further.

Realignment of the runway involves changing the orientation of the runway. This course of action would only be considered if the runway is additionally deficient in wind coverage. As presented in Chapter Three – "Facility Requirements," the FAA recommends that an airport's runway system provide wind

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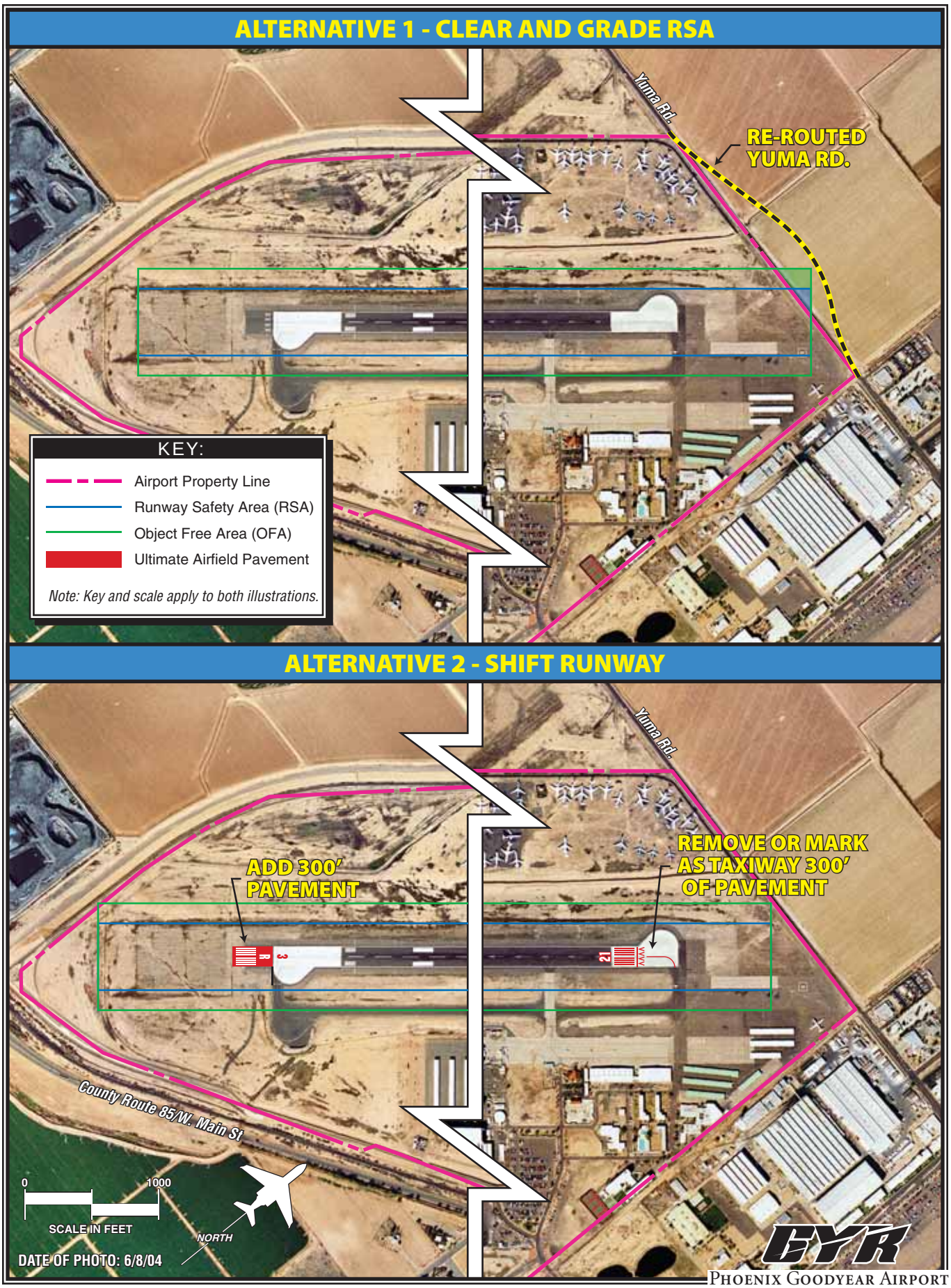

PHOENIX GOODYEAR AIRPORT

Exhibit 4B

RSA ALTERNATIVES 1 & 2

coverage for all aircraft at least 95 percent of the time. Phoenix Goodyear Airport provides 96.95 percent wind coverage for even the smallest aircraft. The runway is in the ideal orientation. Thus, a runway realignment is not considered further.

Shifting the runway involves removing runway length on one end and adding pavement on the opposite end. It appears that a shift of the runway approximately 300 feet to the southwest by adding 300 feet to Runway 3 and removing 300 feet from Runway 21, would meet RSA standards. As depicted on **Exhibit 4B**, a very small portion of the OFA serving Runway 3 may cross the airport property line. The airport could petition the FAA for a modification of standard, or purchase that land in order to fully comply with OFA standards. Shifting the runway is viable and will be considered further.

RSA Alternative 3: Decrease Runway Length

As presented in Chapter Three – "Facility Requirements," a preferred runway length to serve the current and future critical aircraft would be 8,500 feet. This length would accommodate 75 percent of large business jet aircraft (those under 60,000 pounds) at 90 percent useful load. Since the runway is currently 8,500 feet long, a significant reduction in runway length may have negative impacts on the capability of the runway to serve the critical aircraft, particularly on very hot days, and on long-haul trips.

Exhibit 4C does depict the reduction of the runway length by 200 feet on the Runway 21 end. Under this scenario, the RSA requirements for length beyond the runway end are satisfied, but the OFA still extends beyond airport property. The FAA would need to issue a modification of standard for this to be acceptable. An additional 100 feet of pavement could be removed, thus accommodating the full RSA and OFA dimensions, but this further reduction would limit capacity, useful load and haul lengths of some cabin-class aircraft. In essence, every measurable length of pavement that is removed will affect the operational capability of some aircraft that are in the critical aircraft family.

FAA Order 5200.8, *Runway Safety Area Program* indicates that a reduction of runway length is allowable "where the existing runway length exceeds that which is required for the existing or projected design aircraft." There is no excess runway length at Phoenix Goodyear Airport. In addition, FAA Advisory Circular 150/5220-22A, *Engineered Materials Arresting Systems (EMAS) for Aircraft Overruns*, states, "The FAA does not require an airport sponsor to reduce the length of a runway or declare its length to be less than the actual pavement length to meet runway safety area standards if there is an operational impact to the airport." Because there is no excess runway length, and a reduction in runway length would have an operational impact, a reduction in runway length at Phoenix Goodyear Airport is not considered further.

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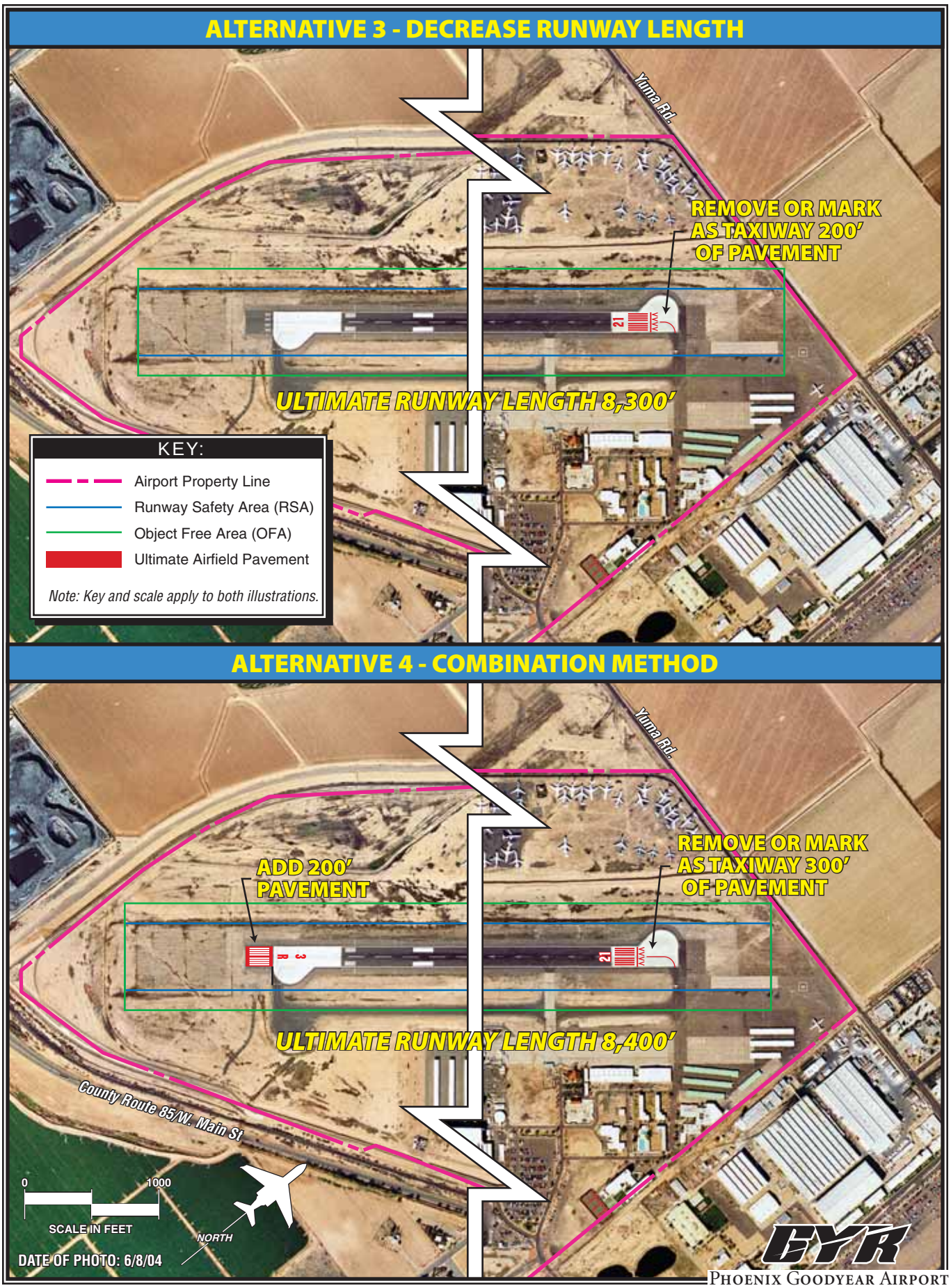

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Exhibit 4C

RSA ALTERNATIVES 3 & 4

RSA Alternative 4: Combination Method

The combination method provides the flexibility to combine runway relocation, shifting, realignment, or reduction in order to provide full RSA. The example presented on **Exhibit 4C** shows reducing Runway 21 by 300 feet and adding 200 feet to Runway 3. This possibility allows both the RSA and OFA to remain within the existing airport property.

It should be noted that this RSA alternative does consider an overall reduction in runway length from 8,500 feet to 8,400 feet. As previously discussed, the entire existing runway length is necessary to serve 75 percent of the critical aircraft at 90 percent useful load. A reduction of the overall runway length by 100 feet will have an impact on operations on occasion. Such occasions would include hot days when maximum runway length is needed for take-off, and/or times when the operator is planning a fully-loaded, long-haul trip. Due to the overall reduction in runway length, this alternative is not considered further.

RSA Alternative 5: Implement Declared Distances

Declared distances are the effective runway distances that the airport operator declares available for take-off run, take-off distance, accelerate stop distance, and landing distance requirements. These are defined by the FAA as:

Take-off run available (TORA) - The length of the runway declared available and suitable to accelerate from break release to lift-off, plus safety factors.

Take-off distance available (TODA) - The TODA plus the length of any remaining runway or clearway beyond the far end of the TORA available to accelerate from break release past lift-off to start of take-off climb, plus safety factors.

Accelerate-stop distance available (ASDA) - The length of the runway plus stopway declared available and suitable to accelerate from break release to take-off decision speed, and then decelerate to a stop, plus safety factors.

Landing distance available (LDA) - The distance from threshold to complete the approach, touchdown, and decelerate to a stop, plus safety factors.

The ASDA and the LDA are the primary considerations in determining the runway length available for use by aircraft, as safety areas must be considered. The ASDA and LDA can be figured as the usable portions of the runway minus the area required to maintain adequate RSA and OFA beyond the ends of the runway. In other words, for take-off, or ASDA calculations, only the RSA and OFA limitations at the far end of the runway need to be considered; whereas for landing operations (LDA), 600 feet prior to the landing threshold and 1,000 feet beyond the far end of the runway need to be considered.

Under the existing configuration, the ASDA for Runway 3 would be 8,200 feet. This would mean the runway would be declared 300 feet short for

take-off to the east in order to provide the full 1,000-foot RSA on the far end of the runway. The LDA for Runway 3 would also be 8,200 feet, as the full 1,000 feet of RSA is necessary at the far end of the runway.

The ASDA for Runway 21 would be the full 8,500 feet, as the stop end of the runway currently has adequate safety area. The LDA available is also 8,500 feet since only 600 feet of RSA is necessary and available prior to landing. The declared distances as applied at Phoenix Goodyear Airport are presented on **Exhibit 4D**.

While providing the full safety area beyond the runway is preferred, when practicable, the use of declared distances is an acceptable alternative. Implementing declared distances is typically the least expensive method since no pavement is being removed and the existing runway markings can often remain. The primary expense associated with implementing declared distances would be preparation of the runway for nighttime operations, as landing and departure threshold lights would need to be relocated to reflect the declared changes.

An additional consideration for the implementation of declared distances is the potential impact on existing operations at the airport. According to the FAA, a runway should not be physically shortened or declared shorter if it will significantly impact operational capability. As presented, the declared distances would have the effect of limiting the take-off run on Runway 3 by 300 feet. This may impact some longer haul lengths on hot days. Since adequate safety area is provided on the far end of Runway 21, there would be no limitation for take-off on that runway. This RSA alternative will be considered further with the understanding that some operations could be effected.

RSA Alternative 6: Engineered Materials Arresting System (EMAS)

EMAS is designed of compressible concrete and is similar in function to the sandy, high-speed exits provided on highways in mountainous terrain in order to safely stop a runaway tractor trailer. EMAS is designed to stop an aircraft overrun by exerting predictable deceleration forces on the landing gear as the EMAS material crushes. It is designed to minimize the potential for structural damage to the aircraft, since such damage could result in injuries to passengers and/or affect the predictability of deceleration forces.

Guidance for designing the size of an EMAS bed and comparing RSA alternatives with EMAS is provided in FAA Order 5200.9, *Financial Feasibility and Equivalency of Runway Safety Area Improvements and Engineered Material Arresting Systems*. The total length of an EMAS bed necessary at Phoenix Goodyear Airport is estimated to be 480 feet and is presented on **Exhibit 4D**. Paved overruns leading into the EMAS bed should be approximately 170 feet long. It should be noted that exact EMAS dimensions would be prepared during further engineering study.

The installation of EMAS can be expensive compared to other solutions. Recent engineering and installation cost

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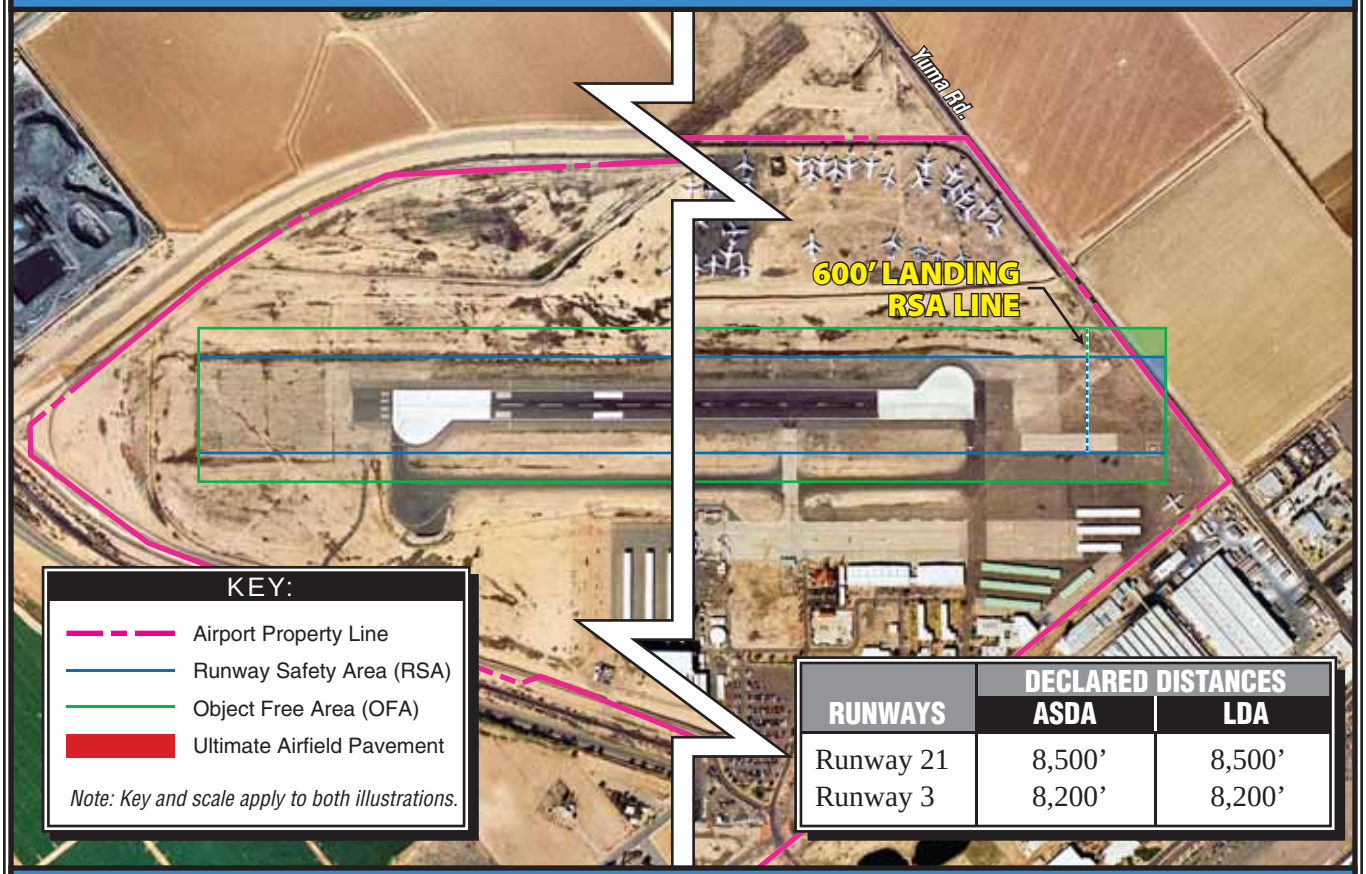
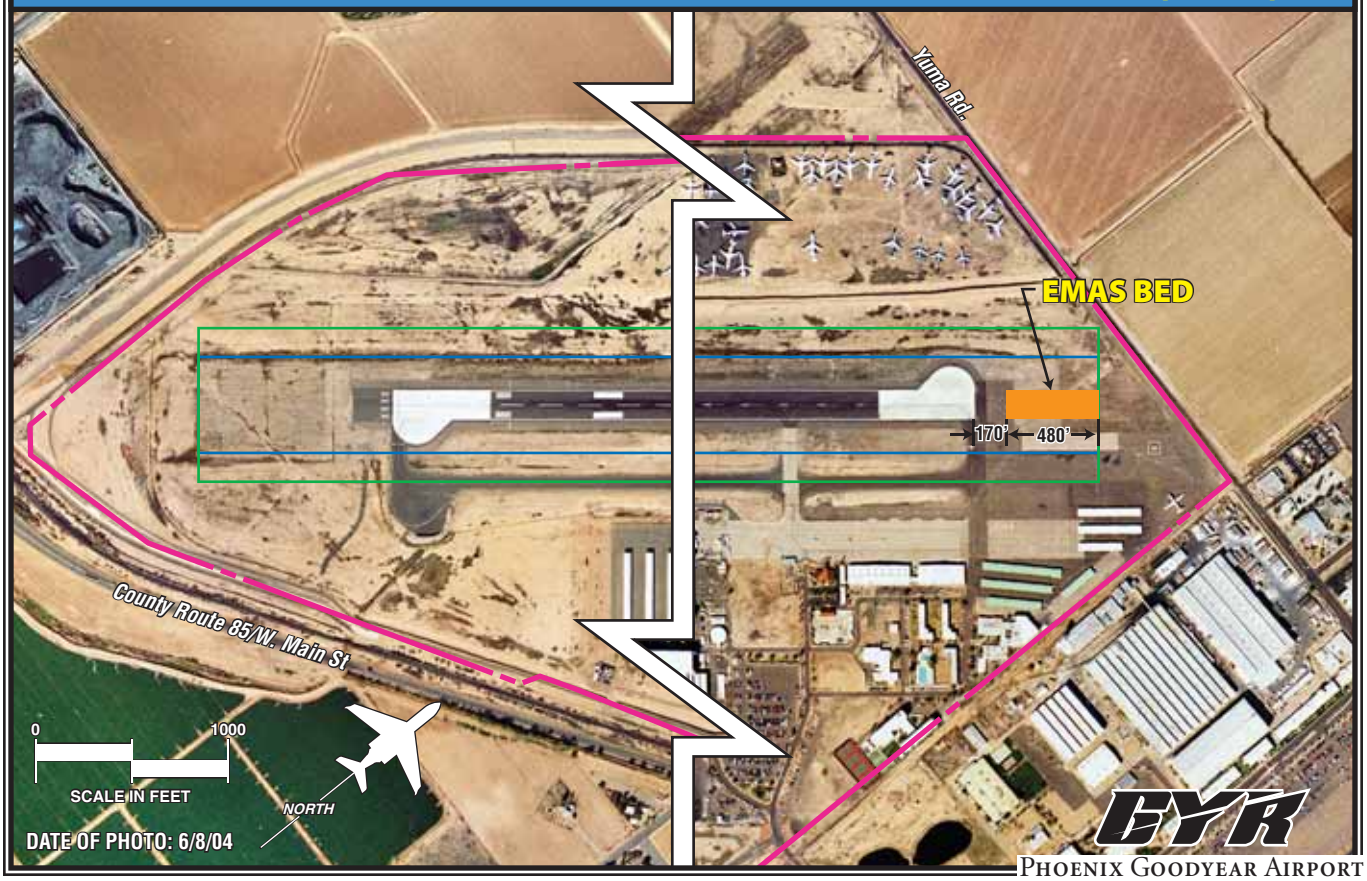
ALTERNATIVE 5 - IMPLEMENT DECLARED DISTANCES



RUNWAYS	DECLARED DISTANCES	
	ASDA	LDA
Runway 21	8,500'	8,500'
Runway 3	8,200'	8,200'

ALTERNATIVE 6 - ENGINEERED MATERIALS ARRESTING SYSTEM (EMAS)



PHOENIX GOODYEAR AIRPORT

Exhibit 4D

RSA ALTERNATIVES 5 & 6

estimates average approximately $90 per square foot. The cost to install EMAS at Phoenix Goodyear Airport is estimated at $6.4 million. Although this cost does not exceed the FAA's financial feasibility cost estimates, other solutions can be implemented at far less expense. As a result, EMAS will not be considered further.

RSA Alternative Conclusion

This analysis of the RSA deficiency mitigation methods available has shown that some potential solutions can be eliminated. The use of EMAS was found to be too expensive to justify. A reduction in runway length was determined to have both a potential negative operational effect on the critical aircraft family and would result in less length than is necessary to accommodate the critical aircraft. The use of declared distances is acceptable, but should be considered only if a physical solution cannot be justified either by cost or feasibility. **Table 4A** shows the results of the RSA alternatives beyond Runway 21. RSA beyond Runway 3 currently meets FAA standards.

TABLE 4A
Runway Safety Area Feasibility
Phoenix Goodyear Airport

	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6
	Provide Full RSA	Relocate, Shift, or Realign Runway	Reduce Runway Length	Combination Method	Declared Distances	EMAS
Runway 21	Yes	Yes – Shift Only	No	No	Yes*	No

* Reduces Runway 3 operational length by 300 feet.
Source: Coffman Associates analysis and FAA Order 5200.8, Runway Safety Area Program.

The physical solutions that are feasible would be a shift of the runway or providing full RSA through clearing and grading, once Yuma Road is relocated. The implementation of declared distances is also still a viable solution provided it is understood that reducing Runway 3 ASDA and LDA may have a negative impact on operations by the critical aircraft. Each of these three RSA alternatives will be presented in the airport development alternatives to follow.

CAPACITY CONSTRAINTS

Airport capacity and delay are currently an issue and may increasingly become problematic. Although some measure of delay is currently experienced by aircraft operators, as more aircraft base and operate at the airport, delay can reach a critical threshold where every operation experiences significant delay. According to FAA Order 5090.3c, *Field Formulation of the National Plan of Integrated Airport Systems*, significant delay is experienced when the average delay per aircraft exceeds four minutes.

Aircraft delay analysis involves evaluation of arrival/departure relationships, runway occupancy times, area airspace, and runway entrance and exit availability. An analytical computer model was developed to supplement previous capacity and delay discussions. This model was used to evaluate both the current average delay experienced at the airport and forecast future delay for each planning horizon based on the three airport development alternatives. The results of the computer delay model are presented in each airport development alternative section.

The computer model analyzes operations to both runway ends. As applied to Phoenix Goodyear Airport, there is an east and a west configuration. The east configuration means that the analysis was conducted on operations to the east, or specifically, those operations utilizing Runway 3. Once the raw outputs are gathered for both east and west configurations, they are weighted based on the predominant operational direction. At Phoenix Goodyear Airport, approximately 65 percent of the operations are on a west configuration.

Under the baseline condition, the model indicated that every aircraft operation, as averaged over a 24-hour period, currently experiences 0.25 minutes of delay. Operations during peak periods will experience much more than that, while operations during off hours may not experience any delay. With no airfield improvements, delay increases as more operations are forecast and more aircraft base at the airport. In the short term (within five years), delay is measured as 0.64 minutes per aircraft on average over a 24-hour period. By the end of the intermediate term (six to 10 years), delay becomes more pronounced at 1.65 minutes on average. By the long term of the planning period (20 years), the airport would come to a virtual standstill because the average delay is forecast at 39.81 minutes per aircraft.

Many factors will affect overall capacity and the total number of based aircraft that the airport can reasonably support. Even slight improvements to the taxiway system can have significant capacity benefits because the efficiency of aircraft movements is improved. The inclusion of hold aprons at the ends of taxiways provides a capacity benefit as well. Longer runways and improved instrument approaches will also improve overall capacity. Each airport development alternative to follow will identify the capacity improvements to be realized.

LANDSIDE PLANNING ISSUES

Landside planning issues of primary concern at Phoenix Goodyear Airport are presented on **Exhibit 4A**. Landside planning would include the number, type, and location of structures needed to meet forecast demand over the scope of the master plan.

The orderly development of the airport terminal area (those areas parallel to the runway and along the flight line) can be the most critical, and probably the most difficult development to control on the airport. A development approach of "taking the path of least resistance" can have a significant effect on

the long-term viability of an airport. Allowing development without regard to a functional plan can result in a haphazard array of buildings and small ramp areas, which will eventually preclude the most efficient use of the valuable space along the flight line.

Activity in the terminal area can be divided into three categories at an airport. The high-activity area should be planned and developed as the area providing aviation services on the airport. An example of the high-activity area is the aircraft parking apron, which provides outside storage and circulation of aircraft. In addition, large conventional hangars housing FBOs, other airport businesses, or for bulk aircraft storage would be considered high-activity uses. A conventional hangar structure in the high-activity area should be a minimum of 6,400 square feet (80 feet by 80 feet). If space is available, it is more common to plan these hangars for 150 feet by 150 feet, to 200 feet by 200 feet. The best location for high-activity areas is along the flight line near midfield, for ease of access to all areas of the airfield.

The medium-activity category defines the next level of airport use and primarily includes corporate aircraft operators that may desire their own executive or conventional hangar storage on the airport. A hangar in the medium-activity use area should be at least 50 feet by 50 feet, or a minimum of 2,500 square feet. The best location for medium-activity use is off the immediate flight line, but still with ready access to the runway/taxiway system. Typically these areas will be adjacent to the high-activity areas. Parking and utilities such as water and sewer should also be provided in this area.

The low-activity use category defines the area for storage of smaller single and twin-engine aircraft. Low-activity users are personal or small business aircraft owners who prefer individual space in T-hangars or small executive hangars. Low-activity areas should be located in less-conspicuous areas, or to the ends of the flight line. This use category will require electricity, but may not require water or sewer utilities.

In addition to the functional compatibility of the terminal area, the proposed development concept should provide a first-class appearance for Phoenix Goodyear Airport. Consideration to aesthetics should be given high priority in all public areas, as the airport will serve as the first impression a visitor may have of the community.

The existing terminal area at Phoenix Goodyear Airport is located in the extreme southeast corner of the airport. As a former military facility, several areas of the airport have been and continue to undergo environmental cleanup and monitoring. Development in these areas has been avoided to date, but much of the area is now capable of being safely developed. As a result, this master plan will examine alternatives to shift landside facility into a more central location.

Ideally, terminal area facilities at general aviation airports should follow a linear configuration parallel to the primary runway. The linear configuration

allows for maximizing available space, while providing ease of access to terminal facilities from the airfield. Each landside alternative will address development issues, such as the separation of activity levels and efficiency of layout.

When identifying potential development locations, consideration will be given to creating facility layout mix that accommodates all airport users. Layout mix considers the intended use of a potential facility, thus expounding upon the "separation of activity levels" philosophy. Consideration is given to recreational users, small-business aircraft owners, corporate aviation needs, and airport business operators. An appropriate facility layout will not sacrifice one group of users to accommodate another, but it will potentially limit one type of aviation user from becoming dominant.

Chapter Three – "Facility Requirements," indicated that additional fuel storage capacity may be needed in the short term. Construction of future fuel storage capacity is assumed to be the responsibility of those FBOs desiring to sell aviation fuel, with a fuel flowage fee going to the airport sponsor. As a result, specific locations for new fuel farms are not presented, but are instead assumed to be developed in conjunction with new airport service hangars. A self-serve fueling capability would also be the responsibility of the FBOs.

General aviation airports that have excess available lands that are not on the flight line often encourage non-aviation-related businesses to locate on airport property. Phoenix Goodyear Airport does not have surplus land and all property should be dedicated to aviation-related uses on airport property. Following this philosophy, all landside development alternatives will provide for aviation-related facilities only.

A helipad is a designated place at the airport where helicopters arrive and depart. Helicopters can utilize either the existing helipad or other available ramp space, with clearance from the tower, for operations. The helipad should be in close proximity to terminal services, which is typically the destination of transient helicopters. The helipad design should follow guidance provided in AC 150/5390-2A, *Heliport Design*. The existing helipad is located near the existing terminal building. It is anticipated that this area will generally remain available for helicopter traffic.

Each of the landside alternatives will address the forecast needs from the previous chapter of this plan. This will include long term needs for more aircraft storage facilities. With growth expected in corporate traffic utilizing Phoenix Goodyear Airport, there is an additional need for executive hangars or corporate parcels for development of corporate flight facilities. Elements such as automobile parking, security, airport access, and aircraft apron areas are addressed in order to appropriately support new facility development.

The possibilities for landside development alternatives are endless. The following development alternatives analysis utilizes accepted airport planning methodologies in conjunction with FAA AC 5300/13, *Airport Design*, Change 9. The three alternatives presented are based upon meeting safety standards

and the goals of the City of Phoenix, while maximizing airport property.

CURRENT AIRPORT LAND USES

Prior to beginning a comprehensive discussion of the development alternatives, it is important to provide a common foundation from which to begin. **Exhibit 4E** presents the current land uses on airport property. By identifying the existing land uses, the development alternatives can strive for an appropriate mix of facilities. Facility mix means that proposed land uses are grouped together in such a way that the quantity of each facility type meets the aviation demand without one facility type becoming too dominant or overburdened.

There are large areas to the south of the runway that are currently undeveloped, as well as the entire north side. The north side area is currently being used for temporary large-aircraft storage. Ultimately this area is available for either airside or landside development. The existing terminal area is at the southeast corner of the airport. There are a number of T-hangars and shade hangars to the southwest as well. Immediately to the west of the terminal area is a large aviation-related employment center. To the west of the employment center are the airport traffic control tower and additional T-hangars. To the southwest of the Runway 3 end is a complex of six T-hangar structures.

AIRPORT DEVELOPMENT ALTERNATIVES

Each airport development alternative will address the potential future configuration of the airport. Of primary consideration is the need to increase the overall capacity of the airport. Each alternative will consider a parallel runway for this purpose. The location of a parallel runway, as well as the design of that runway, will dictate the potential for landside development. As a result, each airport development alternative will include an airside alternative followed by a complementary landside alternative.

EVALUATION CATEGORIES AND CRITERIA

The evaluation of development alternatives includes both quantitative and subjective criteria. Quantitative criteria include (but are not limited to) the type and size of facility development, costs, and regulatory requirements. Subjective criteria could include preferences for facility layout and efficiency. The weight given to each criteria can be as subjective as the criteria itself. Therefore, the best manner in which to evaluate each alternative is to define evaluation categories and criteria which aid the evaluator in understanding the advantages and/or disadvantages of the proposed alternative.

Table 4B lists four evaluation categories and evaluation criterions which can

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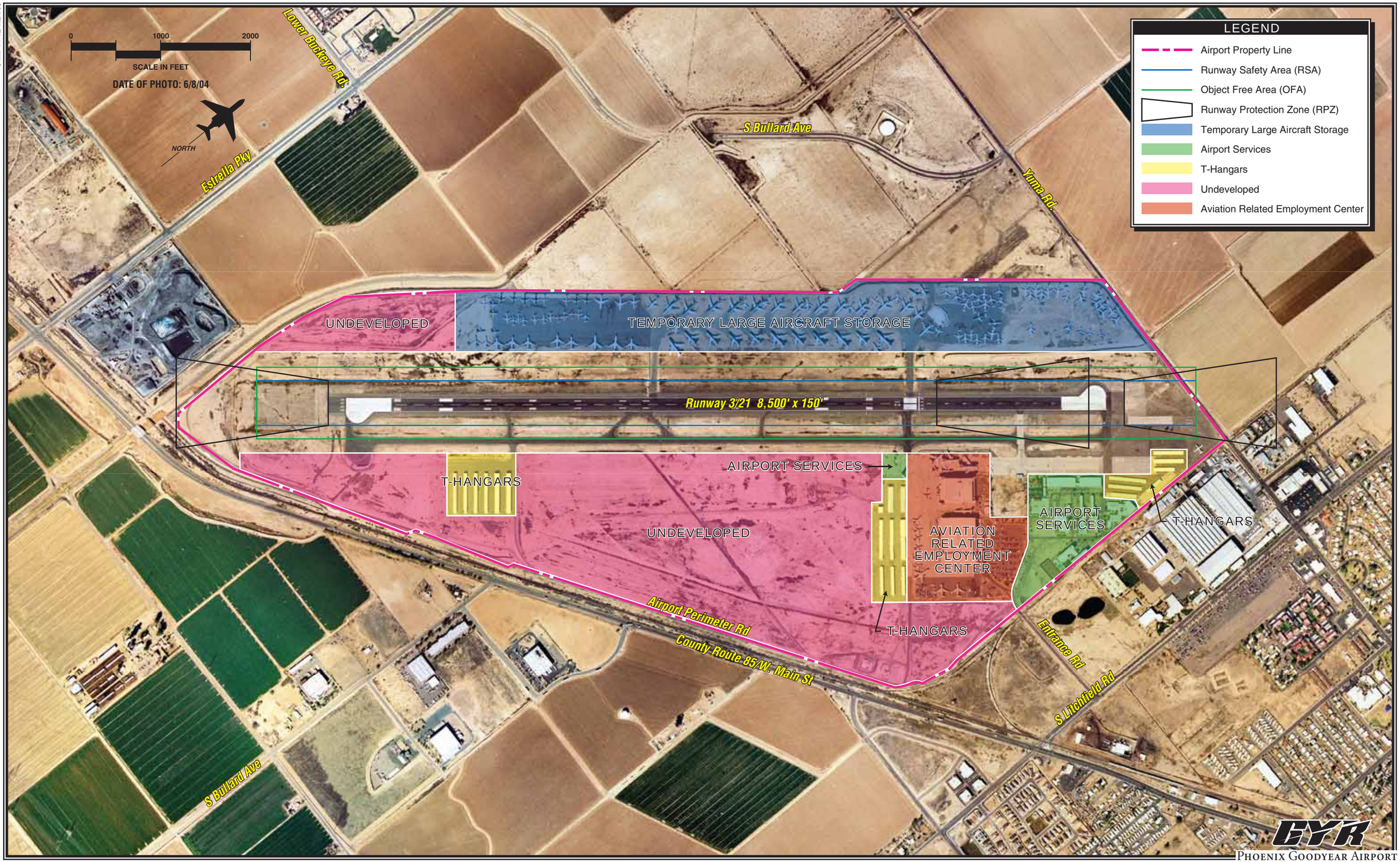

Phoenix Goodyear Airport
Exhibit 4E
EXISTING AIRPORT LAND USES

be used to evaluate each of the proposed alternatives. This list is not necessarily all-inclusive, and other criteria can be used as appropriate. Additionally, these categories are not intended to develop a ranking for the proposed alternatives. The intent of these criteria is to allow the evaluator to develop a full understanding of the alternative by applying similar criteria to each alternative. This provides the evaluator with a sound basis for the acceptance or rejection of a particular alternative. Following a description of each alternative in this chapter, an evaluation will be made to assist in the determination of the preferred development direction for the airport.

TABLE 4B
Phoenix Goodyear Airport
Evaluation Categories and Criteria

CATEGORY	DESCRIPTION/EVALUATION CRITERIA
1. Ability to Meet Program Requirements	1. Does the proposed alternative fully meet the requirements identified by the Facility Requirements chapter? If not, what are the constraints?
2. Development Strategy	2. What are the impacts on existing facilities? Are existing facilities displaced by the proposal? Can the proposed alternative be developed in phases? Are there expansion capabilities beyond the proposed alternative?
3. Financial Considerations	3. Does the proposed alternative provide a revenue enhancement for the airport? Does the proposed alternative increase the operational costs to the airport? Are the development costs of the proposed alternative more or less than other proposed alternatives?
4. Regulatory Requirements	4. Is the proposed alternative required to meet a federal, state, or local regulatory requirement? Are there regulatory or environmental requirements which could constrain the proposed alternative?

AIRPORT DEVELOPMENT ALTERNATIVE 1

The development theme of Airport Development Alternative 1 is to locate a parallel runway to the north. This runway would be primarily intended to accommodate training activity. The south side of the airport is then reserved for landside development.

Airside Alternative 1

As presented on **Exhibit 4F**, a parallel runway measuring 4,500 feet long by 75 feet wide is considered. The parallel runway is separated from the primary runway by 700 feet. This distance meets FAA standards for runway separation when simultaneous visual operations are permitted. A parallel taxiway

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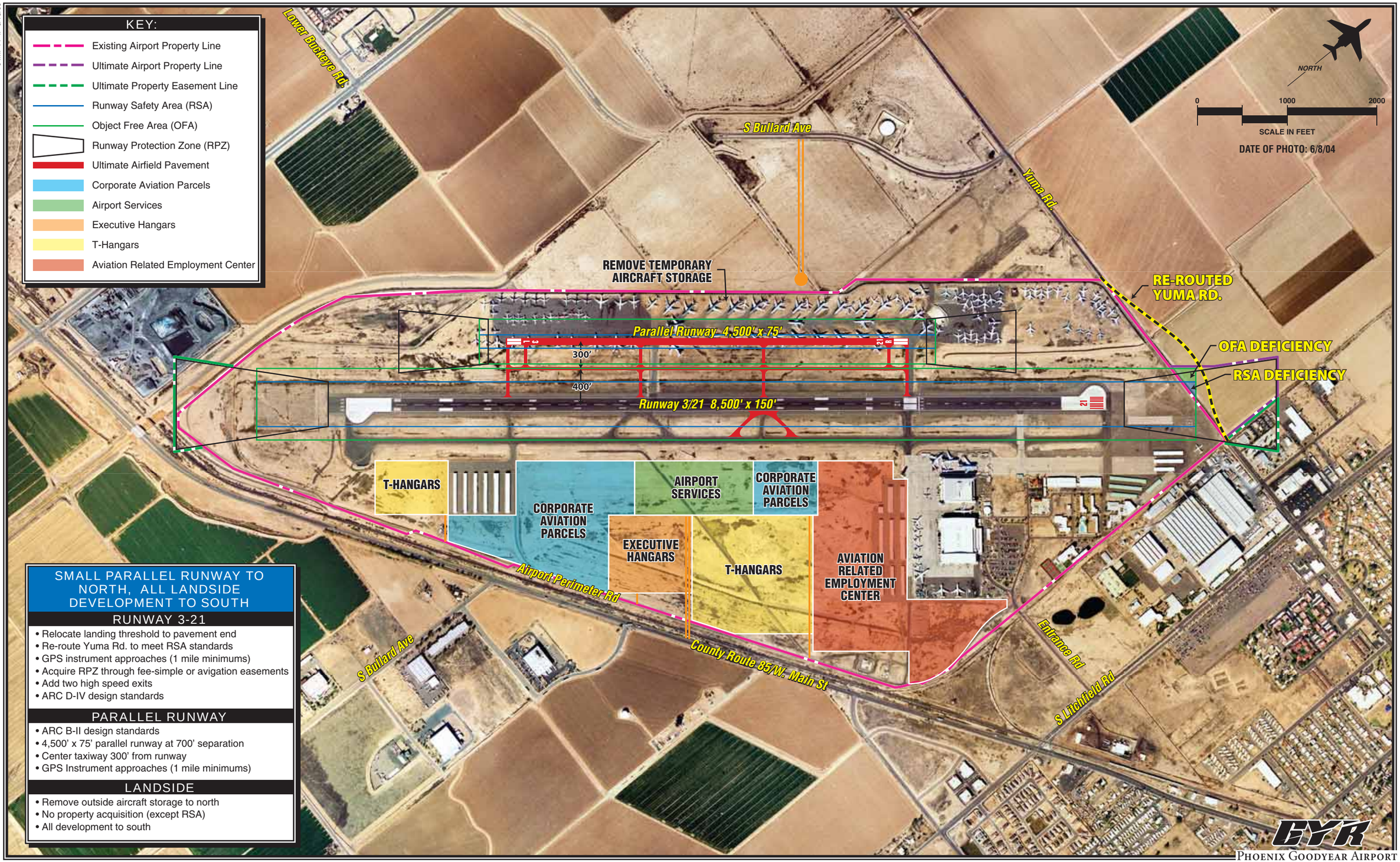

Phoenix Goodyear Airport
Exhibit 4F
AIRSIDE ALTERNATIVE 1

is situated 400 feet from the primary runway and 300 feet from the parallel runway. This separation will meet the standards for the current and future critical aircraft.

The parallel runway is designed to accommodate small aircraft (less than 12,500 pounds). A runway of this nature needs to be at least 4,300 feet in length. This runway is situated in such a manner to take advantage of the location of existing taxiways for runway end access. Thus, the runway is considered to be 4,500 feet in length. This length will have the additional ability to serve as a backup to the primary runway for the majority of users at the airport, but it is not designed to serve as a backup for the critical aircraft. Some operations may be lost if the primary runway closes, but most would still be accommodated.

The parallel runway is designed to ARC B-II standards and is outfitted with GPS instrument approaches with one-mile visibility minimums. The associated RSA, OFA and RPZ all remain on existing airport property, as depicted on the exhibit.

The primary runway is proposed for some moderate improvements including the addition of two high-speed taxiway exits. High-speed taxiway exists typically help improve overall airport capacity. The displaced landing threshold serving Runway 21 is considered for relocation to the pavement end. The landing threshold was not displaced for obstacle clearance and if relocated to the pavement end, there would be no obstructions, even with the most stringent 40:1 departure surface.

Relocating the landing threshold would serve two primary purposes. First, the longer landing length would be a slight capacity improvement. Second, the displaced landing thresholds could be eliminated. Both runway ends are then further considered for GPS instrument approaches with one-mile visibility minimums. The RPZs on the exhibit reflect these approaches. Some portions of the RPZs extend beyond airport property. Where possible, these areas are recommended for fee simple acquisition. Where that is not possible, acquisition of avigation easements is considered.

This alternative considers relocating Yuma Road in order to provide for full RSA and OFA compliance. Approximately six acres of private property would need to be acquired at an estimated cost of $300,000. The cost to move the road, perimeter fence, and grade the RSA is estimated at $400,000. This solution to the RSA deficiency should be strongly considered as it is always preferable to have full safety area serving the existing runway.

As applied to this alternative, the capacity and delay computer model indicates delay that exceeds the baseline condition in both the short and intermediate terms. In the short term, average delay approaches nearly two minutes as compared to 0.64 minutes in the baseline condition. By the end of the intermediate term, delay averages 3.73 minutes as compared to 1.66 minutes in the baseline.

Only by the long term planning period is significant capacity relief supplied by this alternative. While the baseline condition shows an unmanageable 40

minutes of delay per aircraft, this alternative reduces that to 5.43 minutes. This figure still exceeds the maximum FAA delay level of four minutes per aircraft.

The reason this alternative is somewhat ineffective in supplying capacity relief in the short and intermediate terms is due to a lack of airport services on the north side. This airport configuration creates excessive delay due to numerous runway crossings. Relief is ultimately provided in the long term as more operations are relocated to the parallel runway.

Surface transportation access to the airport is also addressed in this alternative. To the north, a cul-de-sac extends from South Bullard Avenue to the airport property boundary. In the long term, access may be considered for this side of the airfield, but this alternative does not present a development pattern for the north, other than the proposed parallel runway.

On the south side, a boulevard is proposed to serve as a second entrance point, leading from County Route 85 to additional airport service development. This entrance road considers a direct link to County Route 85, crossing the railroad tracks. If engineering and design determines that a direct link to County Route 85 is not possible, then this road can connect with the airport perimeter road. Two other south-side access points leading to proposed T-Hangars and corporate parcel locations would be intended to connect to the airport perimeter road.

Airside Alternative 1 also depicts a generalized landside development pattern. Areas on the south side are designated for specific types of uses. The green shade area representing high-activity Airport Services, such as FBO facilities or bulk aircraft storage, are located central to the flight line. Corporate aviation parcels are developed to either side. These are considered a medium to high-activity area. Low-activity T-hangars and executive hangars are set further back from the runway system. Note that aircraft storage needs are grouped by hangar type, activity level, and proximity to the runway.

Landside Alternative 1

Landside Alternative 1, as presented on **Exhibit 4G**, restricts all future landside development to the south side of the airfield. High, medium and low-activity level aircraft are then further grouped in order to limit the interaction of large and small aircraft. The alternative does provide adequate storage capability to accommodate all forecast growth at the airport.

Adjacent the existing airport traffic control tower (ATCT) is a series of T-hangars. This alternative proposes relocating these hangars and allowing for the expansion or development of a large aviation-related employment center. The relocation of the T-hangars would be recommended, as small single engine aircraft do not mix well with large commercial and passenger aircraft, which currently utilize the adjacent maintenance facility.

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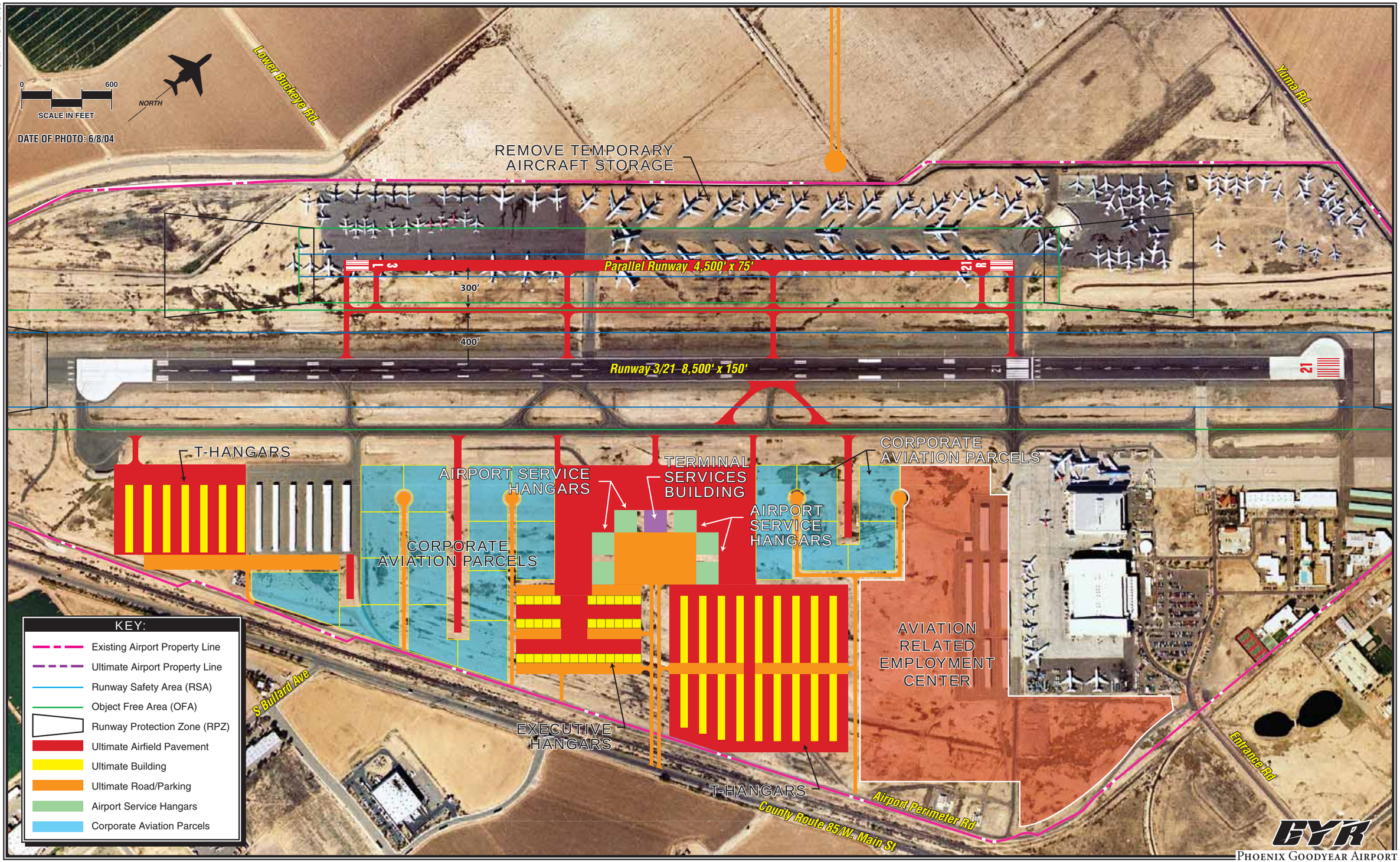

PHOENIX GOODYEAR AIRPORT
Exhibit 4G
LANDSIDE ALTERNATIVE 1

A new, centrally-located, high-activity airport services area is proposed. A large 200-foot by 200-foot terminal building would be the anchor of this area. Since only a portion of the terminal building would be necessary for terminal needs, significant space in the building could be leased, thus generating direct airport revenue. The City of Phoenix would likely have to pay for the construction costs of a new terminal above those areas necessary for terminal services such as line services, pilots' lounge, and pilot planning stations.

Surrounding the proposed new terminal building is a complex of large conventional hangars. These hangars should be reserved for an airport business directly related to providing aviation services. This would include FBOs, aircraft maintenance, specialty operators, and bulk aircraft storage operators. A large transient aircraft apron fronts the terminal building. Some aircraft tiedown positions would also be available.

Set back from the flight line and behind the high-activity conventional hangars is a large T-hangar complex. Providing for adequate T-hangar storage is of critical importance to the airport. It is the individual small aircraft owners who would typically lease a T-hangar that account for the largest number of based aircraft. Additional T-hangars are proposed for the far southwest side of the airport.

Additional individual aircraft storage capabilities set back from the airport services hangars include a number of small, executive hangars. The hangars depicted measure 50 feet by 50 feet and are designed to satisfy a growing demand by owners of cabin-class aircraft. These potential lessees are willing to pay a higher lease rate for an executive-type hangar, but cannot justify developing a corporate aviation parcel. This would be a source of increased revenue for the airport.

Set to either side of the terminal services ramp are designated corporate aviation parcels. The target lessee for these parcels would be an operator wishing to design and construct their own hangar in which to locate their aviation-related business or flight department. These parcels are located on the flight line, with ready access to the runway. Shorter taxiing times are appealing to corporate operators, as is the ability to reduce the interaction between smaller aircraft and larger corporate aircraft.

Corporate aviation parcel leases will generate land lease revenue for the airport. Corporate parcel operators will typically have a larger aircraft conducting more operations, thus increasing fuel and maintenance revenues. Attracting more corporate aviation operators will not only provide an increased revenue stream for the airport, but is typically seen as an overall economic benefit to the region.

Evaluation Summary for Alternative 1

The following summary analyzes Airport Development Alternative 1 utilizing the evaluation criteria described at the beginning of this chapter.

1. Ability to Meet Program Requirements - All program requirements are met including additional airfield capacity and adequate aircraft storage to accommodate all forecast demand.

2. Development Strategy - Six T-hangar structures would need to be relocated to accommodate expansion of or the introduction of a large aviation-related employer. The landside facilities can and should be phased based on demand. Some additional facility expansion could take place on the north side in the future.

3. Financial Considerations - Most airside improvements would be eligible for 95 percent grant-in-aid funding from the FAA, including RSA mitigation. Relocation of the T-hangars would not be funded, unless relocated for reasons of airfield safety. This airport development alternative would likely be the least expensive of the three, due to a shorter parallel runway and no north-side facility development.

4. Regulatory Requirements - The relocation of Yuma Road is necessary to met FAA regulations for RSA. Years of environmental cleanup on airport property have made much of the airport available for development.

Advantages: This alternative is likely the least expensive alternative. All airport development is segregated by activity level and is located on existing airport property. Each aircraft storage type is provided for, along with a significant area for a large aviation-related employment center.

Disadvantages: Locating all services on the south side of an airfield can lead to a "cluttered" facility layout. There are no support services available on the flight line of the proposed parallel runway. This means training activity would have to taxi across the primary runway to take-off. Approximately six acres of land would need to be acquired north of Yuma Road and approximately 1,800 feet of Yuma Road would need to be rerouted.

AIRPORT DEVELOPMENT ALTERNATIVE 2

The theme of Airport Development Alternative 2 is to provide for a parallel runway that is capable of accommodating the critical aircraft. This alternative also separates activity levels by designating the north side of the airport for corporate aviation developers and high-activity, airport service providers. No existing facilities are affected by this alternative.

Airside Alternative 2

To accommodate 100 percent of the large business jets at 60 percent useful load, which represents the current critical aircraft, a parallel runway with dimensions of 7,200 feet long by 100 feet wide is recommended, as presented on **Exhibit 4H**. The parallel runway is separated from the primary runway by 700 feet, the FAA minimum required for simultaneous VFR operations. The

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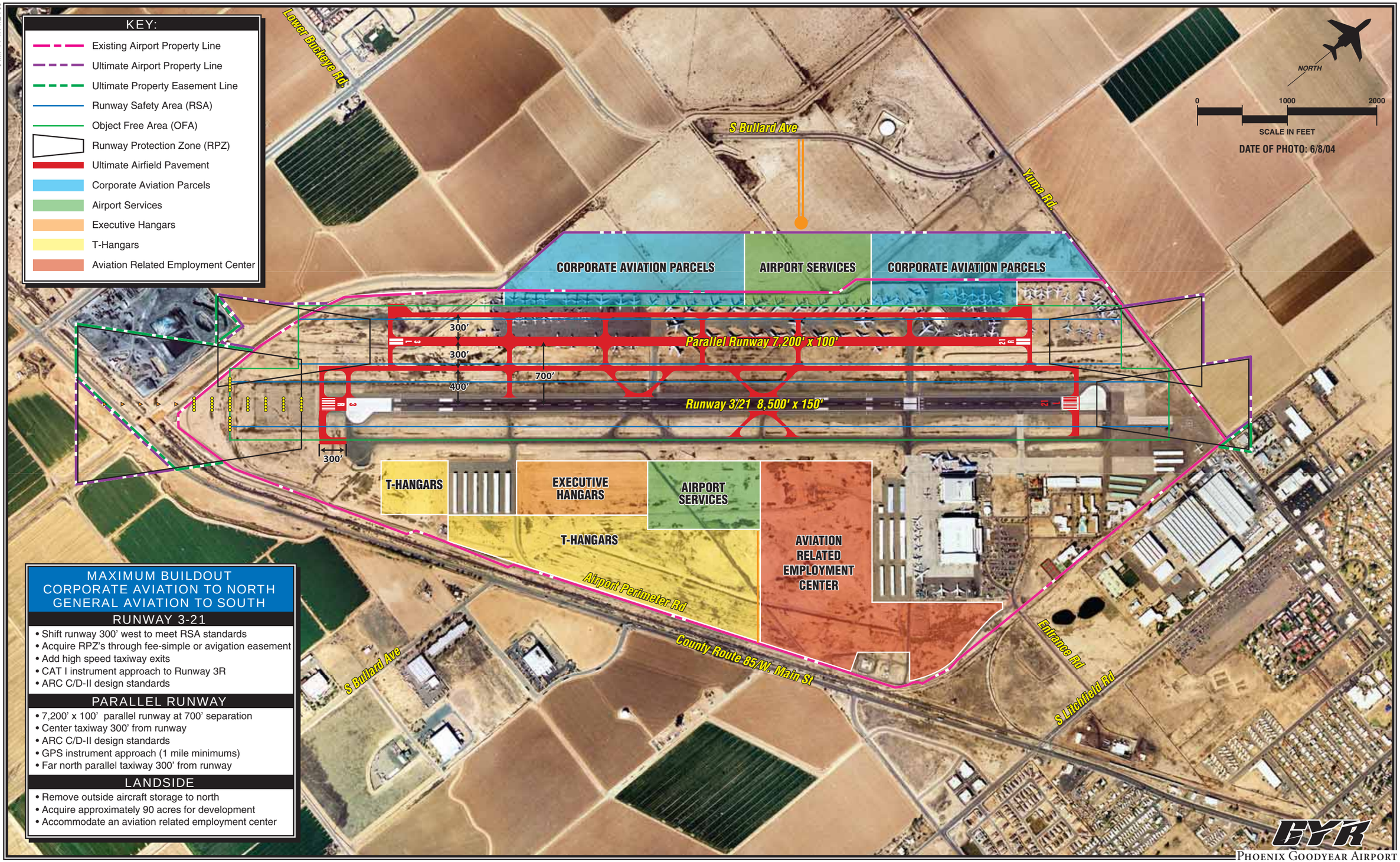

Phoenix Goodyear Airport
Exhibit 4H
AIRSIDE ALTERNATIVE 2

parallel runway is served by two parallel taxiways. The taxiway between the runways is 400 feet from the primary runway. The parallel taxiway serving the north side is 300 feet from the parallel runway.

The parallel runway is situated within airport property as much as possible. The RSA serving the runway is contained wholly on airport property. The OFA on the west end extends beyond airport property. The airport should consider fee-simple acquisition of the area. If that is not practicable, the airport should petition the FAA for a modification of standard. Another option would be to reduce the runway length to 7,000 feet so that the OFA remains completely on existing airport property.

Both ends of the proposed parallel runway are considered for GPS instrument approaches with one-mile visibility minimums. The RPZs extend beyond airport property and would be recommended for fee-simple acquisition.

The primary runway is shifted 300 feet to the west. This shift will pull the RSA and OFA beyond Runway 21, onto airport property. The RSA serving Runway 3 will also remain on airport property. The OFA serving Runway 3 may cross over the airport property line by just a few feet. Actual engineering surveys will be needed to determine if a shift of the full 300 feet is possible without the OFA extending beyond airport property.

The shifting of the runway provides the additional benefit of pulling the RPZ serving Runway 21 away from some commercial buildings to the east and closer to the airport. Only one commercial building would remain under the RPZ. Any improvement in RPZ land use compatibility is encouraged by the FAA.

Runway 3 is considered for a Category I approach. This is a precision instrument approach which can allow visibility minimums as low as ½ mile with cloud height ceilings as low as 200 feet. Currently, such an approach requires a localizer antenna, a glide slope antenna, and a sophisticated medium intensity approach lighting system with runway alignment indicator lights (MALSR). The FAA is currently deploying the Wide Area Augmentation System (WAAS), which may allow for stand-alone CAT I GPS approaches, probably with approach lighting systems. The airport should follow the status of the WAAS deployment prior to purchasing and installing the equipment for a CAT I approach.

Two high-speed taxiways from the primary runway to Taxiway A are added in this alternative. Four high-speed taxiways connecting to the proposed north parallel taxiway are also proposed. These taxiways will help improve the overall capacity of the airport.

This alternative offers the most attractive potential for airport efficiency and capacity improvements. Services are available on both sides of the airport. Taxiways on both sides of the parallel runway permit minimal disruption of taxi flows to either runway from most positions on the airport. The length and width of the parallel runway lends itself to accommodating more traffic with a wider variety of purposes. In this alter-

native, average delay does not exceed four minutes within the 20-year planning period.

New surface access to the airport is provided on both sides of the airport. On the north side, access is provided via a boulevard-type entrance from South Bullard Avenue. This entrance point should be designed to connect to the proposed airport services area on this side of the airfield. It is this entrance that will create a first impression on visitors to the airport, so attention should be given to the aesthetic presentation of the entrance. Consideration should also be given to creating a tie-in to the new Town Center development taking place approximately one mile to the north. On the south side, a new road connecting the airport perimeter road to the proposed airport services area is proposed.

The generalized landside development pattern presented on the exhibit attempts to segregate airport activity levels to the greatest extent possible. All development to the north is intended for medium to high uses. Central to the parallel runway flight-line is an area designed to accommodate airport services such as FBO and specialty operators who are catering to corporate or business aviation. Areas adjacent the airport services facilities are identified as corporate-aviation parcels. By locating corporate aviation to the north, the interaction of large and small aircraft can be limited. Approximately 90 acres of land is identified for acquisition.

Development of the south side of the airport includes new airport services hangars surrounded by executive and T-hangar facilities. Because of the proposed expansion to the north side of the airfield, a large parcel on the south is reserved for an additional large aviation-related employment center.

Landside Alternative 2

Potential development is available on both sides of the airfield with Landside Alternative 2, presented on **Exhibit 4J**. Beginning on the southeast side of the airfield, a large aviation-related employment center parcel is identified. This parcel could be utilized for expansion by existing airport operators or for the introduction of a new aviation employer.

Immediately west of the aviation employment center is a development designed to serve individual aircraft owners, training operators, recreational and small business flyers. A large ramp area is developed for both locally-based tie-down as well as transient operators. Six large conventional hangars are proposed to front this public apron. These hangars would be ideally suited for FBO operations, flight schools, or other aviation-related businesses.

Behind the airport services area (south) are lower-activity T-hangar complexes. Adjacent to the airport services facilities is a series of executive hangars. There is a growing trend for aircraft owners to desire the executive-type hangar over the traditional T-hangar. Development of these types of hangars could fill an aircraft storage option desired and increase revenue to the airport.

The north side of the airport is ideally suited, under this airfield configuration, to serve the needs of corporate aviation.

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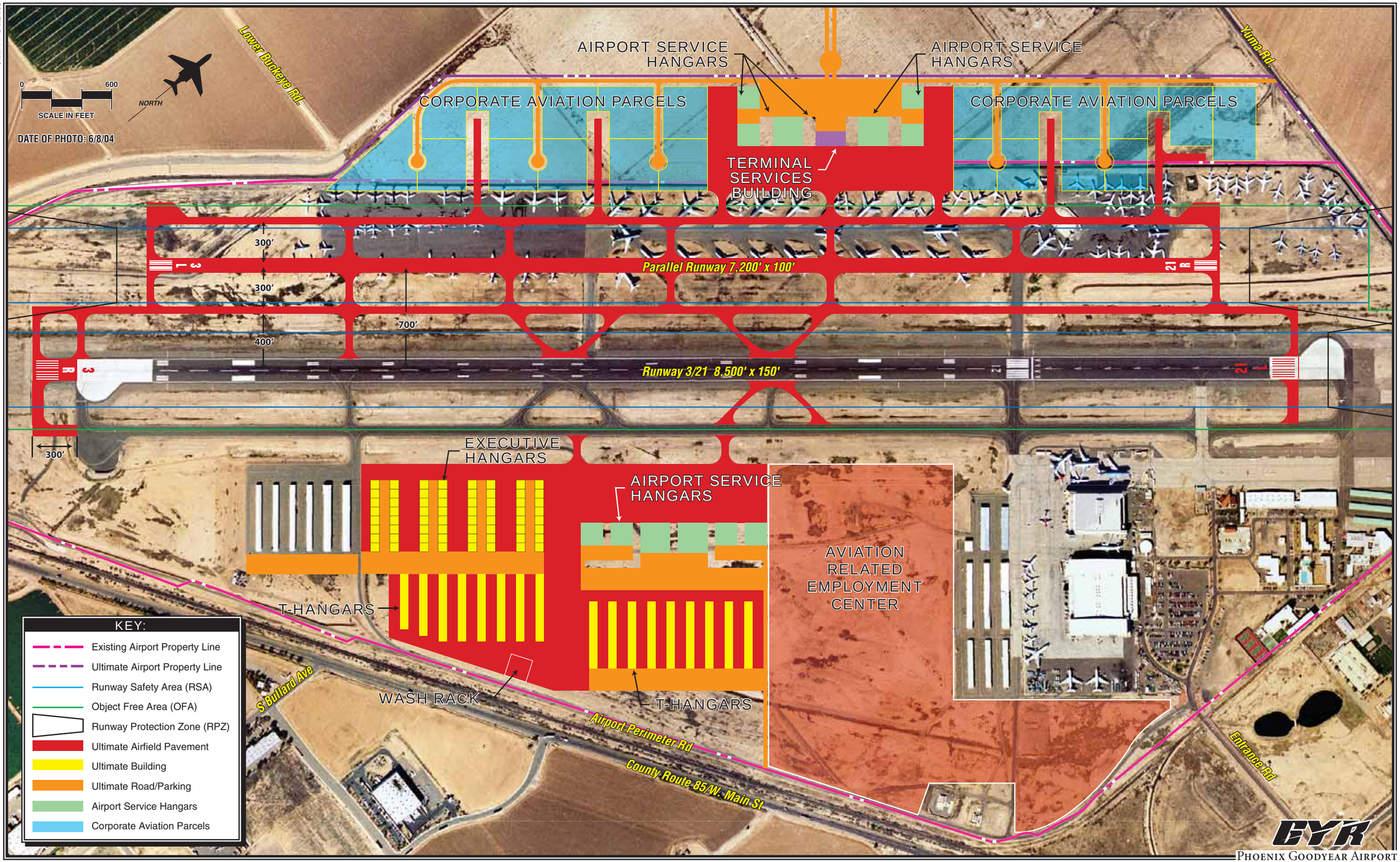

PHOENIX GOODYEAR AIRPORT
Exhibit 4J
LANDSIDE ALTERNATIVE 2

As proposed, approximately 90 acres of privately-owned land would need to be acquired. This acquisition would allow the full development of this side of the airport. A large aircraft apron is proposed, which would front a total of six conventional hangars of varying sizes. The largest and highest traffic hangars should be located immediately adjacent to the proposed terminal building. These should house an FBO-type business.

To either side of the centrally-located airport services area is extensive development of corporate-aviation parcels. The taxiways into the corporate-aviation parcels can accommodate nearly all Group III aircraft including the Gulfstream V and Global Express. Should an operator need even greater separation for their aircraft, the front-facing parcels can accommodate this need.

This landside alternative provides adequate aircraft storage to accommodate all forecast demand.

Evaluation Summary for Airport Development Alternative 2

The following summary analyzes Airport Development Alternative 2, utilizing the evaluation criteria described at the beginning of this chapter.

1. Ability to Meet Program Requirements - All program requirements are met including additional airfield capacity and adequate aircraft storage to accommodate all forecast demand.

2. Development Strategy - No existing structures are impacted by this development alternative. The landside facilities can and should be phased based on demand.

3. Financial Considerations - All airside improvements would be eligible for 95 percent grant-in-aid funding from the FAA, including RSA mitigation. Property acquisition not directly related to airside improvements is not eligible. This airport development alternative would likely be most expensive of the three.

4. Regulatory Requirements - By shifting the Runway 300 feet to the west, RSA requirements are met. Years of environmental cleanup on airport property have made most of the airport available for development.

Advantages: This alternative provides greater separation of activity levels than the first alternative, but not as much as the third alternative. The north-side corporate aviation development most directly ties in with the Town Center development. The parallel runway can serve as a backup to the primary if necessary. Each aircraft storage type is provided for, along with a significant area for a large aviation-related employment center. Re-routing of Yuma Road is not necessary as a 300-foot runway shift to the west would meet RSA requirements.

Disadvantages: This alternative likely would be the most expensive of the three presented. Ninety acres of prop-

erty would need to be acquired by the City of Phoenix. Additional property may need to be acquired to accommodate the parallel runway OFA.

AIRPORT DEVELOPMENT ALTERNATIVE 3

The development theme of Airport Development Alternative 3 is to locate a parallel runway to the south of the primary runway and reserve that airport property on the north for aviation-related development. A parallel runway measuring 4,300 feet long by 75 feet wide will accommodate all small aircraft. As such, this parallel runway would be intended primarily for training and touch-and-go operations.

Airside Alternative 3

The parallel runway is separated from the primary runway by 700 feet, meeting the FAA standard for simultaneous operation under visual meteorological conditions. The runway is designed to ARC B-II standards and is outfitted with GPS instrument approaches with one-mile visibility minimums. The associated RSA and OFA remain on airport property. The approach RPZ for the Runway 3R end would extend off airport property slightly, and over the railroad and County Route 85. If possible, an avigation easement should be acquired. Airside Alternative 3 is presented on **Exhibit 4K**.

The parallel runway is positioned so that the current airport traffic control tower (ATCT) would not penetrate the 20:1 approach slope. Since the ATCT would be a tall structure directly off the end of the runway, it should be relocated. Controllers would have a better view of the airfield layout from the north side.

A full-length parallel taxiway serving the proposed parallel runway is designed at a distance of 300 feet from the runway. This distance exceeds the minimum of 240 feet as recommended by the FAA, but it would provide the greatest flexibility for future runway improvements. This taxiway would provide full access to new south-side development areas. There are bypass taxiways serving both ends of the runway in order to increase capacity and efficiency.

Moderate improvements to the primary runway are considered. The displaced landing threshold serving Runway 21 is considered for relocation to the end of the pavement. By relocating the landing threshold to the pavement end, more pavement is available for landing. The RPZ associated with this threshold would extend beyond airport property and should be considered for fee-simple acquisition or avigation easements. It should be noted that Yuma Road would not be an obstruction to any approach surface serving Runway 21, as long as the approach minimums are one mile or greater, as presented on the exhibit.

A portion of the RSA and OFA still extend beyond airport property, necessitating the implementation of declared distances, in this alternative. For aircraft approaching Runway 21, the LDA would be the full 8,500 feet, since only 600 feet prior to landing is necessary. The ASDA available for aircraft taking

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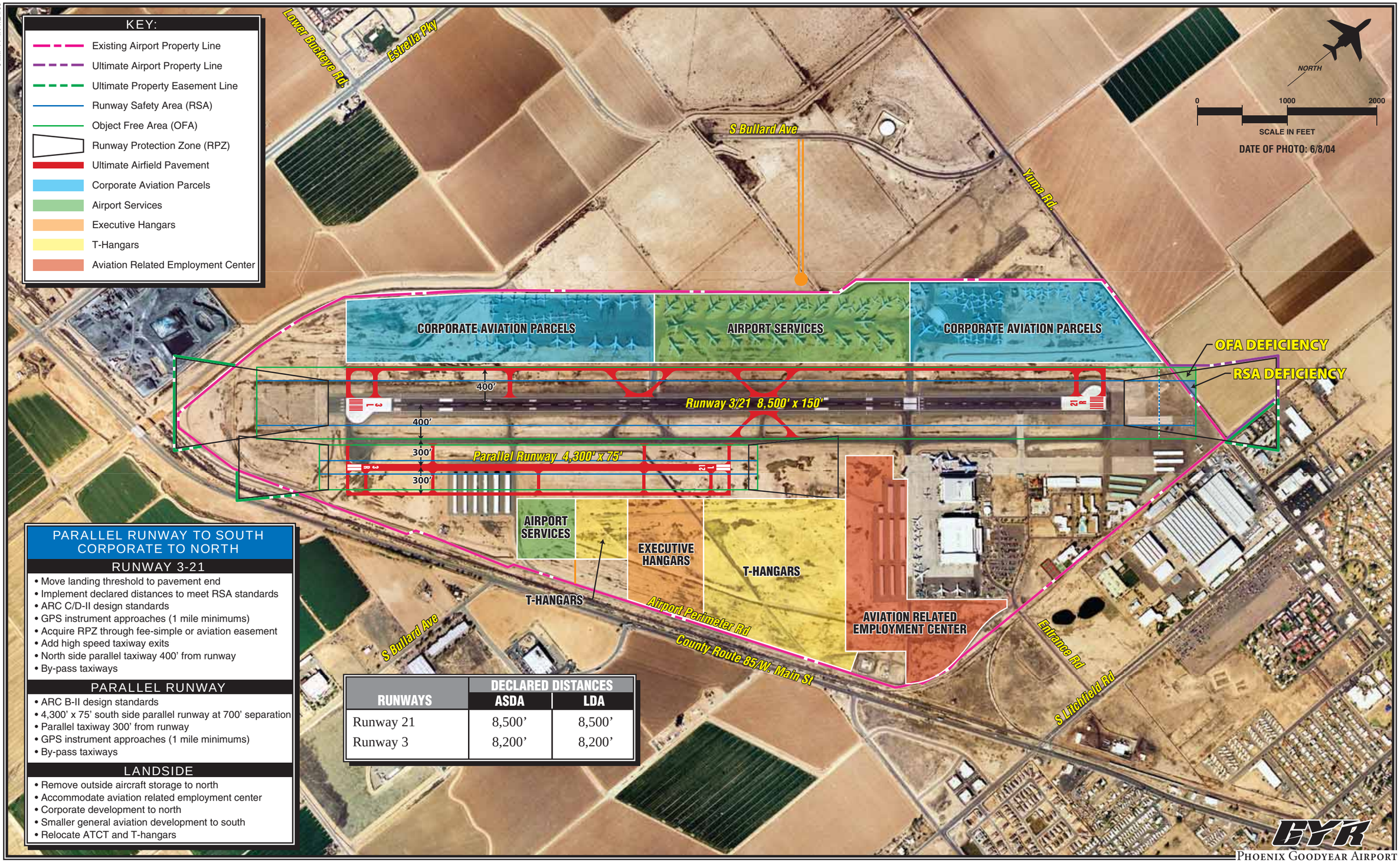

RUNWAYS	DECLARED DISTANCES	
	ASDA	LDA
Runway 21	8,500'	8,500'
Runway 3	8,200'	8,200'

PHOENIX GOODYEAR AIRPORT
Exhibit 4K
AIRSIDE ALTERNATIVE 3

off on Runway 21 would also be 8,500 feet, as the full 1,000-foot RSA and OFA beyond the runway end is available. The LDA for Runway 3 would be 8,200 feet, as the runway would need to be declared 300 feet shorter in order to provide full safety area beyond the runway end. The ASDA would also be 8,200 feet for the same reasons.

A full-length north-side parallel taxiway serving the primary runway is proposed. This taxiway would have bypass taxiways on both ends, as well as four high-speed exit taxiways. This parallel taxiway would support extensive landside development on the north side. The parallel taxiway is proposed at 75 feet wide. This is the width necessary for serving Group IV future critical aircraft with wingspans between 171 and 214 feet. Initial construction of the taxiway may be 50 feet wide to serve the current critical aircraft.

Airside Alternative 3 provides the greatest short and intermediate term improvements to delay, but the least desirable long term prospects. The average delay in the short term is 1.75 minutes, while it is 2.40 in the intermediate term. By the long term, average delay reaches nearly six minutes.

A new road from South Bullard Avenue to future north-side landside development is considered. Access on the south side is considered to be from the airport perimeter road. Primary south-side airport access would continue to be from South Litchfield Road.

Airside Alternative 3 also depicts a generalized landside development pattern. Areas on the south side are designated for specific types of uses. The green-shaded areas, representing high-activity Airport Services such as FBO facilities or bulk aircraft storage, are located central to the flight line. To the sides are possible corporate-aviation parcels. These are considered medium to high-activity areas. Low-activity T-hangars and executive hangars are set further back from the runway system. Note that aircraft storage needs are grouped by hangar type, activity level, and proximity to the runway.

Landside Alternative 3

Due to location of the parallel runway in this alternative, relocating the airport traffic control tower (ATCT) to the opposite side of the runway would be preferred. A north-side ATCT location, such as that depicted on **Exhibit 4L**, would provide for adequate visibility for tower personnel. Guidance on the siting of ATCTs is provided in FAA Order 6480.4, *Airport Traffic Control Tower Siting Criteria,* and has been applied to this potential site. As new structures are planned, exterior noise should be maintained at a minimum; thus, all proposed development locations are set some distance from the ATCT location. All proposed structure locations assume that line-of-sight from the ATCT will not be impeded by the height of facilities.

Areas immediately adjacent the relocated ATCT are identified for aircraft tie-downs as well as transient aircraft parking. This alternative presents the possibility of two airport services complexes, with a new airport terminal building included. The conventional

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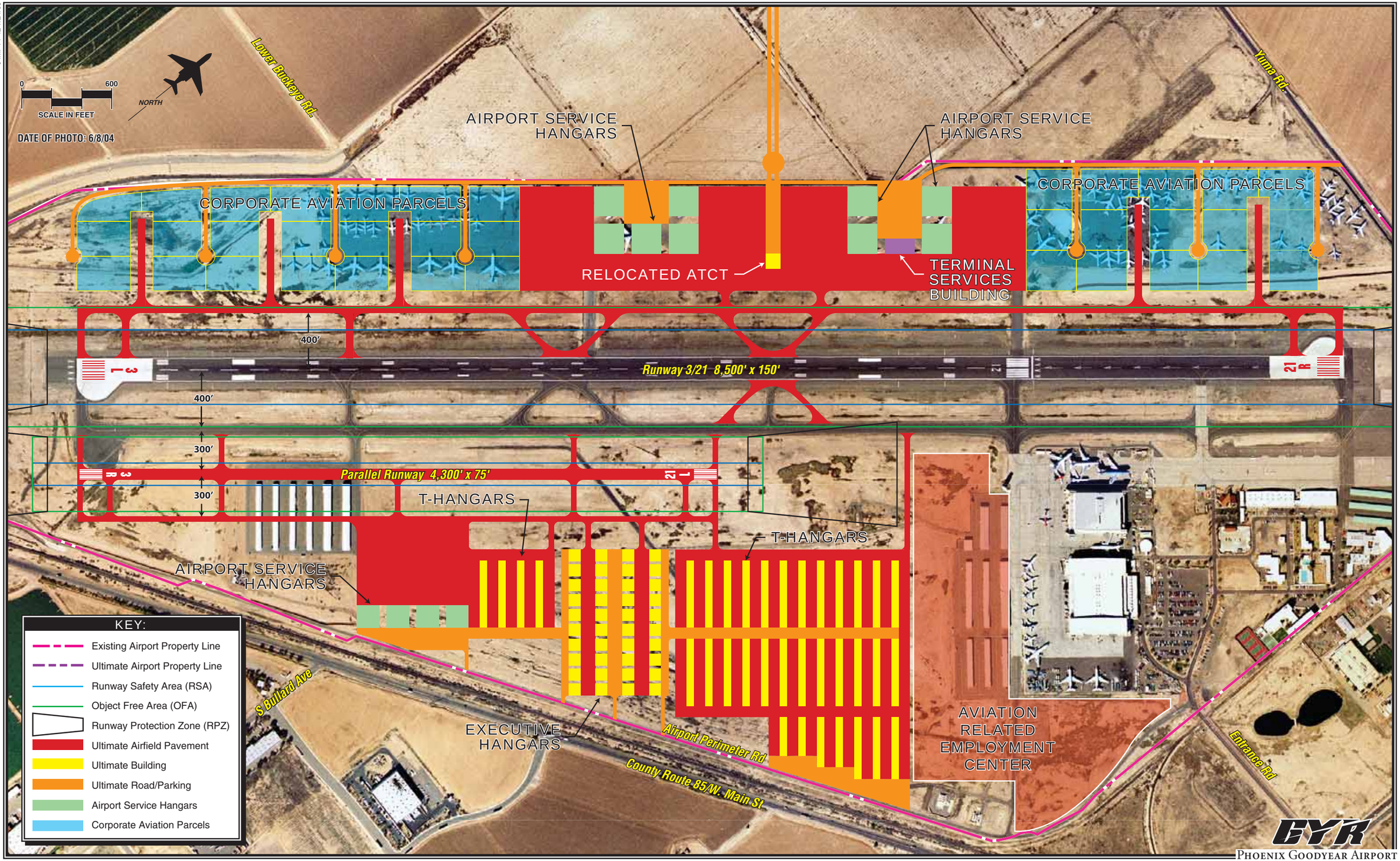

PHOENIX GOODYEAR AIRPORT
Exhibit 4L
LANDSIDE ALTERNATIVE 3

hangars depicted should be reserved for use by FBO-type activity and other high-activity airport businesses.

Filling in the remaining north-side property is corporate-aviation parcels. A total of 36 parcels, each approximately two acres, are located to either side of the airport service hangars. Locating all the corporate aviation parcels, which traditionally attract owners of larger cabin-class aircraft, to the north of the primary runway allows for a complete separation of large jet and turboprop traffic from piston-powered aircraft.

The south-side facility development is centered around the type of activity the proposed parallel runway would attract. At 4,300 feet in length, this runway is intended for smaller aircraft, those under 12,500 pounds. This runway would also serve to accommodate flight school activity. Central to the runway is a large apron area which would accommodate aircraft tie-down positions and transient aircraft parking. Fronting the apron is four large, conventional hangars. These hangars should be reserved for FBO-type businesses or other aviation-related business catering to non-business-jet activity.

New T-hangar facilities are located away from the high-activity airport service hangars. The large T-hangar complex is designed to accommodate the relocation of the T-hangars near the existing ATCT, as well as those currently to the southwest of the airport. Additional T-hangar structures are proposed to accommodate forecast growth. The relocation of the T-hangars near the ATCT is necessitated by the identification of that area for an aviation-related employment center.

A series of executive hangars is also presented. This type of hangar provides an upgrade from a T-hangar. The executive hangars presented are depicted at 70 feet by 70 feet.

Evaluation Summary for Airport Development Alternative 3

The following summary analyzes Airport Development Alternative 3, utilizing the evaluation criteria described at the beginning of this chapter.

1. Ability to Meet Program Requirements - All program requirements are met including additional airfield capacity and adequate aircraft storage to accommodate all forecast demand.

2. Development Strategy - The southwestern-most T-hangars are relocated to accommodate the parallel runway. The T-hangar complex nearest the ATCT is relocated to accommodate an aviation-related employment center. All landside development remains on existing airport property.

3. Financial Considerations - Most airfield improvements would be eligible for 95 percent grant-in-aid funding from the FAA, including RSA mitigation. Landside development would provide revenue in the form of land/building leases. This air-

port development alternative would likely be at the mid-level expense of the three.

4. Regulatory Requirements - RSA requirements are met by implementing declared distances. Years of environmental cleanup on airport property have made the entirety of the airport available for development.

Advantages: This alternative provides the greatest level of segregation between activity levels. The north-side corporate-aviation development provides a gateway to the Town Center development in the City of Goodyear. Each aircraft storage type is provided for, along with a significant area for a large aviation-related employment center. All development remains within the existing airport property boundary. This alternative would likely be slightly less expensive than Airport Development Alternative 2.

Disadvantages: The ATCT is recommended to be relocated. Some T-hangar facilities are relocated. Implementation of declared distances to solve RSA deficiencies is not preferred by the FAA.

AIRPORT DEVELOPMENT ALTERNATIVES SUMMARY

Each airside alternative addresses potential improvements to runways, taxiways, instrument approaches and safety areas. All of the improvements presented are designed to increase airport efficiency and/or capacity. Each alternative also mitigates existing safety area deficiencies.

The first element examined was the safety area deficiencies, specifically the RSA and OFA deficiencies on the Runway 21 end. Utilizing FAA-prescribed guidance, various alternative solutions were examined. The method most preferred by the FAA is to provide the full safety area where possible. This solution would require the relocating of approximately 1,800 feet of Yuma Road and the acquisition of six acres of land. Other RSA alternatives include shifting the runway 300 feet to the west or implementing declared distances.

It should be noted that the use of Engineered Materials Arresting Systems (EMAS) was considered when examining solutions to the RSA deficiencies. It is estimated that installing an EMAS bed to serve Runway 3 would cost as much as $6.4 million. The FAA indicates that the use of EMAS to provide for RSA should be the last option considered. Since there are less expensive options available to meet RSA requirements, EMAS was not considered further.

The necessity of the displaced landing threshold serving Runway 21 was also examined. Research indicated that the displacement is not necessary for obstruction clearance. As a result, alternatives consider relocating the landing threshold to the pavement end and reclaiming 2,100 feet of runway length for landing operations. This relocation places the approach RPZ serving Runway 21 in the same location as the departure RPZ serving Runway 3, so no new incompatibilities are created.

An instrument landing system (ILS) approach was considered for the ap-

proach to Runway 3, the predominant landing runway end. An ILS would provide for visibility minimums as low as ½ mile and cloud ceilings as low as 200 feet, i.e. a CAT I approach. A localizer antenna, glide slope antenna and MALSR approach lights would be required. The FAA is currently approving GPS approaches with the same minimums. Prior to the airport acquiring the equipment necessary for an ILS approach, consultation should take place with the FAA to determine if a CAT I GPS approach could be obtained. GPS approaches provide the airport with sophisticated approaches without equipment expenses. Airport Development Alternative 2 considers the ILS approach to Runway 3.

Three distinctly different parallel runway alternatives are considered. The first considers a 4,500-foot by 75-foot parallel runway to the north. This runway would be designed to accommodate small aircraft and training operations. The second parallel runway option is in the same location as the first, but it is 7,200 feet long by 100 feet wide. This runway could accommodate large aircraft as a backup to the primary runway. The third parallel runway alternative considers a south location for a runway measuring 4,300 feet by 75 feet. This runway also would serve small aircraft and training operations exclusively.

The application of an analytical computer model provides a point of comparison for each alternative as it relates the capacity and delay. **Table 4C** provides the data outputs from the computer model as weighted based on predominant runway usage. The model was run on both an east flow and a west flow airport operational configuration.

The airfield configuration associated with Airside Alternative 2 provides the greatest efficiency benefit through the long term planning horizon. Airside Alternative 1 provides the least benefit in the short term as well as the long term primarily because of a lack of north-side facilities.

TABLE 4C
Capacity and Delay Computer Model Analysis
Phoenix Goodyear Airport

	Average Delay per Aircraft (min.)			
Planning Horizon	**Baseline**	**Alternative 1**	**Alternative 2**	**Alternative 3**
Current	0.25			
Short Term	0.64	1.97	1.37	1.75
Intermediate Term	1.65	3.73	2.44	2.39
Long Term	39.81	5.43	3.30	5.88

Source: Crown Consulting computer model; Coffman Associates analysis.

Table 4D presents the facility requirements and quantifies how each landside alternative addresses that need. Chapter Three – "Facility Requirements," indicated a need for a total of 591 aircraft storage positions through the long term planning period. In addition to the number of positions needed, the aircraft storage mix is also considered based on local and national trends. In an area

like metropolitan Phoenix, where all general aviation activity is supported, storage facilities for large and small aircraft needs are considered.

Recent trends indicate that many aircraft owners are interested in slightly larger, open-spaced hangars, rather than T-hangars. This group of owners is willing to pay a premium for such space, but they are either unwilling or unable to construct their own hangar. In an effort to address this demand, the facility-planning strategies include the addition of small, executive hangars intended to compliment the total number of individual storage units provided by shade and T-hangars.

TABLE 4D
Facility Forecast Comparison
Phoenix Goodyear Airport

AIRCRAFT STORAGE POSITIONS					
	Available Today	**Forecast Need**	**Landside 1**	**Landside 2**	**Landside 3**
Individual Hangar Positions					
T-Hangars	147	360	359	342	396
Shade Hangars	59	113	97	80	97
Executive/Box Hangars	NA	41	36	74	40
Total Individual Hangar Positions	206	514	492	496	533
Multi-Aircraft Hangar Positions					
Conventional Hangars	0	39	51	124	168
Corporate Parcel Hangars	NA	38	63	66	108
Total Multi-Aircraft Hangar Positions	0	77	114	190	276
Total Positions	206	591	606	686	809

T-Hangar = 13 positions per structure
Shade Hangars = 20 positions per structure
Executive/Box Hangars = 1 position per hangar
Conventional Hangars = 2,500 s.f. per position
Corporate Parcels = 3 positions per parcel
Service/Maintenance Hangar area is taken from conventional hangars exclusively

There are currently no executive/box type hangars at the airport. Although a specific number of executive/box hangars is difficult to quantify, experience at general aviation airports similar to Phoenix Goodyear Airport indicates that between six and ten percent of individual hangar lessees may prefer the more-expensive executive/box hangars. Each alternative considers the addition of these types of hangars in order to fulfill a portion of the total number of individual hangar positions needed.

The desire for storage of larger cabin-class aircraft is also realizing a transition away from storage in large conventional hangars operated by FBOs. Many aircraft owners are desiring to build their own hangar to store these aircraft. Experience at similar general aviation airports indicated this figure

could be as much as 50 percent of owners of these type of aircraft. Thus, the development of corporate parcels, where a hangar can be built-to-suit, represents future storage of approximately half of multi-aircraft storage space.

Landside Alternative 1 provides for a total of 606 aircraft storage spaces. This figure includes the relocation or reconstruction of the T-hangar complex nearest the ATCT. Landside Alternative 2 provides for a total of 686 storage units. Landside Alternative 3 provides a total of 809 storage positions.

Actual demand levels will dictate facility development. For example, if the airport needed to house a large number of small aircraft, the decision to build (or allow private developers to build) T-hangars may be considered. However, if corporate aircraft are more demanding, executive or conventional hangar development would be necessary.

The ultimate plan will provide the City of Phoenix with the means to meet the future demands in an efficient manner. Each alternative does give the City a future vision of what the airport could become. This vision is important as it shifts the focus from build-as-you-go development to a long term, focused development process. As a result, the City will be capable of maintaining a first-class airport which maximizes airport property.

The process utilized in assessing the airside and landside development alternatives involved a detailed analysis of short and long term requirements, as well as future growth potential. Current airport design standards were considered at every stage in the analysis. Safety, both air and ground, were given the highest priority in the analysis of alternatives. **Exhibit 4M** presents a summary of the evaluation criteria as applied to each airport development alternative.

After review and input from the Planning Advisory Committee (PAC), City officials, and the public, a recommended concept will be developed by the consultant. The resulting plan will provide all airport stakeholders with a vision for the airport over the next 20 years. The following chapters will be dedicated to refining the basic concept into a final plan, with recommendations to ensure proper implementation and timing for a demand-based program.

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	AIRPORT DEVELOPMENT ALTERNATIVES		
	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
ABILITY TO MEET PROGRAM REQUIREMENTS			
Does the proposed alternative fully meet the requirements identified by the Facility Requirements chapter? If not, what are the constraints?	YES - Program requirements are met; facility development meets forecast need; capacity increased	YES - Program requirements are met; facility development meets forecast need; capacity increased	YES - Program requirements are met; facility development meets forecast need; capacity increased
DEVELOPMENT STRATEGY			
What are the impacts on existing facilities?	Relocate 8 T-hangar structures	None	Relocate 14 T-hangar structures
Can the proposed alternative be developed in phases?	YES - As demand dictates	YES - As demand dictates	YES - As demand dictates
Are there expansion capabilities beyond the proposed alternative?	NO - Alternative represents full build out	NO - Alternative represents full build out	NO - Alternative represents full build out
FINANCIAL CONSIDERATIONS			
Does the proposed alternative provide a revenue enhancements for the airport?	YES - More land and hangars available for lease	YES - More land and hangars available for lease	YES - More land and hangars available for lease
Does the proposed alternative increase the operational costs to the airport?	YES - More developed facilities to manage	YES - More developed facilities to manage	YES - More developed facilities to manage
Are the development costs of the proposed alternatives more or less than other proposed alternatives?	Least expensive	Most expensive	Intermediate level of expense
REGULATORY REQUIREMENTS			
Is the proposed alternative required to meet a federal, state, or local regulatory requirement?	YES - Reroute Yuma Rd. to meet RSA requirements	YES - Shift runway 300 feet to west to meet RSA requirements	YES - Implement declared distances to meet RSA requirements
Are there regulatory or environmental requirements which could constrain the proposed alternatives?	YES - Property acquisition requires environmental review	YES - Property acquisition requires environmental review	NO - All development remains on airport property
ADVANTAGES			
	• Least expensive • Landside development remains on existing property • Storage needs are met • RSA requirements are met	• Parallel runway can serve as a back-up for large aircraft • No relocation of existing facilities • Storage needs are met • North side development can tie to other community development (i.e., Town Center) • Adequate separation of activity levels • RSA requirements are met	• Intermediate level of expense • Landside development remains on existing property • Storage needs are met • Greatest separation of activity levels • North side development can tie to other community development (i.e., Town Center) • RSA requirements are met
DISADVANTAGES			
	• "Cluttered" facility layout • No airport services on parallel runway flightline • Least separation of activity levels • Relocation of some hangars • Reroute Yuma Rd. and acquire 6 acres to meet RSA requirements	• Most expensive • 90 acres to be acquired • Physical runway shift to meet RSA requirements • Potential OFA penetration for parallel runway	• ATCT relocation recommended • Implements declared distances to meet RSA requirements • Relocation of some hangars

GYR

PHOENIX GOODYEAR AIRPORT
Exhibit 4M
EVALUATION SUMMARY

Chapter Five

RECOMMENDED MASTER PLAN CONCEPT

Recommended Master Plan Concept

The airport master planning process for Phoenix Goodyear Airport (GYR) has evolved through the development of forecasts of future demand, an assessment of future facility needs, and the evaluation of airport development alternatives to meet those future facility needs. The planning process has included the development of three sets of working papers which were presented to the Planning Advisory Committee (PAC) and discussed at several coordination meetings and public information workshops. The City of Phoenix has participated in each of these meetings and has been actively involved in the master planning process.

The PAC was comprised of several constituencies with a stake in the Phoenix Goodyear Airport. Groups represented on the PAC included the Federal Aviation Administration (FAA), the Arizona Department of Transportation – Aeronautics Division, the City of Phoenix Department of Aviation, the City of Goodyear, Luke Air Force Base, airport management, airport traffic control tower personnel, airport fixed base operators (FBOs), pilot associations, and residents of the City of Goodyear. This diverse group has provided extremely valuable input into this recommended plan.

In the previous chapter, several development alternatives were analyzed to explore options for the future growth and development of Phoenix Goodyear Airport. The development alternatives were refined into a single recommended concept for the master plan. This chap-

ter describes, in narrative and graphic form, the recommended direction for the future use and development of Phoenix Goodyear Airport.

RECOMMENDED MASTER PLAN CONCEPT

The recommended master plan concept primarily incorporates Airside Alternative 3 and Landside Alternative 3 as presented in the previous chapter. This concept provides the airport with the ability to meet the demands generated by the large aircraft maintenance facilities on the airport, as well as providing adequate space for small, general aviation aircraft operators and increased use by operators of cabin class corporate aircraft.

The recommended master plan concept, as presented on **Exhibit 5A**, presents an ultimate configuration for the airport that meets FAA design standards, increases overall airport capacity, and provides a variety of aircraft storage options. A phased program to implement the recommended development configuration will be presented in Chapter Six - Capital Program.

The following sub-sections will describe the recommended master plan concept in detail.

AIRFIELD DESIGN STANDARDS

The FAA has established design criteria to define the physical dimensions of runways and taxiways, as well as the imaginary surfaces surrounding them, which protect the safe operation of aircraft at the airport. These design standards also define the separation criteria for the placement of landside facilities.

As discussed previously, FAA design criteria primarily center on the airport's critical design aircraft. The critical aircraft is the most demanding aircraft or family of aircraft which currently, or are projected to, conduct 500 or more operations (take-offs or landings) per year at the airport. Factors included in airport design are an aircraft's wingspan, approach speed, and, in some cases, the instrument approach visibility minimums for each runway. The FAA has established the Airport Reference Code (ARC) to relate these critical aircraft factors to airfield design standards.

Analysis conducted in Chapter Three – "Facility Requirements," concluded that the current critical aircraft is defined by large commercial service type aircraft that fall into ARC C-III (approach speeds less than 141 knots, wingspans less than 119 feet) and larger. This category of aircraft includes the B-737, MD-80, and Airbus A320. Larger aircraft such as the B-757, B-767, and DC-10 (ARC D-IV) also contribute to the critical aircraft determination. These large commercial service type aircraft will continue to account for the critical aircraft at the airport, provided there is a large aircraft maintenance facility at the airport.

It is not necessary to design all airfield and landside elements to the same design standards. Varying design standards can be applied to other runways and taxiways based upon the role of the

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PHOENIX GOODYEAR AIRPORT
Exhibit 5A
RECOMMENDED MASTER PLAN CONCEPT

runway and the aircraft that frequently use that runway or taxiway.

The proposed parallel runway, for example, would be designed to serve only small aircraft; therefore, this runway can be designed to a lesser design standard. For the proposed parallel runway, this is ARC B-II (approach speeds less than 90 knots, wingspans up to 79 feet). **Table 5A** summarizes the airport design standards to be applied to the ultimate design of Phoenix Goodyear Airport.

AIRSIDE RECOMMENDATIONS

The recommended master plan concept is a combination of elements from each of the alternatives presented in the previous chapter. The airside recommendations primarily focus on meeting the safety area standards for the runway and taxiway system. This includes recommendations for the acquisition of adjacent airport property to insure compatible land uses surrounding the airport. Of primary consideration is meeting FAA design standards for the runway safety area (RSA), object free area (OFA), obstacle free zone (OFZ), and runway protection zone (RPZ).

The RSA behind Runway 21R is penetrated by the perimeter fencing and Yuma Road. To meet RSA and OFA standards, the master plan concept recommends shifting Runway 3L-21R approximately 300 feet to the west. To accomplish this, 300 feet of pavement is removed from the Runway 21R end and 300 feet of runway is added to the Runway 3L end. The FAA recommends that when undertaking a runway shift, pavement no longer being used should be removed rather than marked as taxiway. The shift of the runway has an additional benefit in that the RPZ serving Runway 21R would be pulled back off of some of the office buildings across Yuma Road.

When undertaking the runway shift, RSA standards will be met. The OFA, which is 300 feet wider than the RSA, will extend slightly beyond airport property. The northeast corner behind Runway 21R would extend beyond airport property by 11 feet. The northwest corner would extend beyond airport property behind Runway 3L by 23 feet. A modification of standard for the OFA should be requested at the time of the runway shift project.

A full-length parallel taxiway is planned to support landside development north of the runway. This taxiway would be planned to be 50 feet wide to support business jets in airplane design group (ADG) III, such as the Boeing Business Jet and Gulfstream V.

High-speed exit taxiways are planned between the north-side parallel taxiway and the primary runway. These taxiways will allow aircraft to rapidly exit the runway to improve efficiency and airport capacity. In addition, bypass taxiways are planned for each end of the primary runway, also to improve airport efficiency. Additional taxiway improvements include widening the existing parallel taxiway and its exits to 75 feet to support large commercial airliners.

TABLE 5A
Airfield Planning Design Standards (Ultimate)
Phoenix Goodyear Airport

	Runway 3L-21R	Future Parallel Runway 3R-21L
	Ultimate	Ultimate
DESIGN STANDARDS		
Airport Reference Code (ARC)	D-IV	B-II
Lowest Visibility Minimum	Rwy 3: 1/2 Mile (GPS) RWY 21:1 Mile (GPS)	1 Mile (GPS)
Runways Length (ft.) Width (ft.)	 8,500 150	 4,300 75
Pavement Strength (lbs.) Single Wheel Loading (SWL) Dual Wheel Loading Dual Tandem Wheel Loading (DTWL)	 75,000 200,000 270,000	 12,500 NA NA
Shoulder Width (ft.)	20	10
Runway Safety Area Width (ft.) Length Beyond Runway End (ft.) Length Prior to Landing (ft.)	 500 1,000 600	 150 300 300
Object Free Area Width (ft.) Length Beyond Runway End (ft.)	 800 1,000	 500 300
Precision Object Free Area (ft.) Width (ft.) Length beyond runway end (ft.)	 Rwy 3: 800 Rwy 3: 200	 NA NA
Obstacle Free Zone Width (ft.) Length Beyond Runway End (ft.)	 400 200	 250 200
Taxiways Width (ft.) OFA (ft.) Centerline to Fixed or Movable Object (ft.)	 50/75 259 129.5	 35 131 66
Runway Centerline to: Parallel Taxiway Centerline (ft.) Aircraft Parking Area (ft.)	 400 500	 240 250
Building Restriction Line (ft.) 20 ft. Height Clearance 35 ft. Height Clearance	 640 745	 390 495
Runway Protection Zone: Inner Width (ft.) Outer Width (ft.) Length (ft.)	Rwy 3/Rwy 21 1,000/500 1,750/1,010 2,500/1,700	Parallel Rwy 3-21 500 700 1,000
Approach Obstacle Clearance	34:1	20:1
Departure Surface	40:1	NA

Source: FAA Advisory Circular 150/5300-13, Airport Design, Change 10

Runway 3L is planned for a precision approach that would allow for operations when visibility minimums are down to one-half mile and cloud ceiling heights are as low as 200 feet. This instrument approach procedure is planned as a GPS approach and may require a medium intensity approach lighting system with runway alignment indicator lights (MALSR), as depicted on the exhibit. The Runway 21R end is considered for a global positioning system (GPS) approach with one-mile visibility minimums. The Runway 21R landing threshold is also planned to be relocated to the pavement end.

The RPZs associated with both ends of primary Runway 3L-21R extend off airport property. The FAA recommends that the airport have ownership of the RPZ where possible in order to prevent incompatible land uses in the RPZ such as residential development. In lieu of outright ownership of the RPZ, avigation easements (airspace ownership) should be pursued in order to prevent additional structural development under the close-in approach. **Table 5B** presents the land area recommended for acquisition to protect the RPZs. Fee-simple acquisition is recommended for undeveloped land while easements are recommended for property with active land uses.

TABLE 5B
Proposed Property Acquisition
Phoenix Goodyear Airport

	Runway 21R RPZ	Runway 3L RPZ	Future Parallel Runway 21L RPZ	Future Parallel Runway 3R RPZ	Total
Fee-simple Acquisition	10.98 acres	16.75 acres	NA	NA	27.73
Avigation Easement	1.38 acres	34.40 acres	NA	2.05 acres	37.83

NA = Not applicable since RPZ is entirely on existing airport property.

The recommended concept includes a capacity-relieving parallel runway located 700 feet to the south of the primary runway. At this distance simultaneous operations can be conducted in visual conditions. This parallel runway is estimated to increase the annual service volume from 274,000 to 369,000 annual operations. This is not the absolute capacity, rather it is the operational level at which an average delay of four minutes per operation can be expected. Additional capacity is gained from the strategic location of high-speed taxiway exits.

The parallel runway would require the relocation of the T-hangar complex currently located to the southwest of the runway. The runway is outfitted with bypass taxiways and a run-up area.

The RPZs serving the parallel runway reflect the possibility of instrument approaches with not lower than one-mile visibility minimums. The location of the RPZs would not require any property acquisition. The RPZ serving parallel Runway 21L would be entirely on airport property, and the RPZ serving parallel Runway 3R would have a small corner crossing the railroad tracks. An avigation easement could be pursued in this location.

LANDSIDE PLANNING RECOMMENDATIONS

The primary goal of landside facility planning is to provide adequate aircraft storage space to meet the forecast need while also maximizing operational efficiencies and land uses. Achieving this goal yields a development scheme which segregates aircraft activity levels while maximizing the airport's revenue potential. **Exhibit 5A** depicts the recommended landside development plan for the airport.

In Chapter Two - Aviation Demand Forecasts, based aircraft were forecast to increase from 209 to 619 through the 20-year planning scope. To accommodate this growth, additional storage facilities will be necessary. An objective of the master plan is to be responsive to air transportation demands. This would include providing space for the development of aircraft storage facilities to accommodate the full breadth of general aviation aircraft.

The recommended landside plan includes the development of corporate aircraft facilities on the north side of the airport and a centrally located replacement ATCT. A new access road is planned from Bullard Avenue. To each side of the ATCT are airport services areas, each depicted with large conventional hangars. These areas would be intended for FBOs, bulk aircraft storage, or other high-activity uses. The north side plans include the provision for a north side airport terminal services building. To either side of the airport service area are individual corporate aviation parcels. This is a new feature for the airport and is intended to address a demand in the market for space where an individual or corporate flight department can construct a custom hangar.

The south side facility layout aims to provide owners of smaller aircraft direct access to the parallel runway. This runway is specifically designed to accommodate the majority of piston-powered aircraft. The facilities available on the south side include a large T-hangar and shade hangar complex. Also available is an area for executive hangar development. A large public apron for based aircraft tie-down as well as transient aircraft parking, is centrally located to the parallel runway. Four conventional hangars intended to house airport service businesses such as FBOs are facing the apron. An extension of the apron to the southwest is designated for aircraft run-up operations prior to take-off.

The existing airport entrance from Litchfield Road would continue in that capacity. A new airport entrance over the railroad tracks connecting from County Road 85 was considered, but is not included as part of this master plan. Should circumstances change in the future, nothing in the airport master plan precludes the development of an airport entrance from County Road 85.

Phoenix Goodyear Airport currently has a large aircraft maintenance tenant. The master plan designates space for expansion of this facility or introduction of another aviation-related employment center.

The facilities provided in the recommended concept exceed the forecast need and, as such, represents a full build-out scenario. **Table 5C** presents a summary of the existing aircraft storage capacity and the total capacity created by the recommended concept.

TABLE 5C
Facility Summary
Phoenix Goodyear Airport

	Available 2004	Forecast Total Need	Total Positions Provided
Individual Hangar Positions			
T-Hangars	147	360	375
Shade Hangars	59	113	97
Executive/Box Hangars	NA	41	40
Total Individual Hangar Positions	206	514	512
Multi-Aircraft Hangar Positions			
Conventional Hangars	0	39	168
Corporate Parcel Hangars	NA	38	72
Total Multi-Aircraft Hangar Positions	0	77	240
Total Positions	**206**	**591**	**752**

SUMMARY

The recommended master plan concept has been developed in conjunction with the Planning Advisory Committee, airport management, and officials from the cities of Goodyear and Phoenix, and is designed to assist in making decisions on future development and growth of Phoenix Goodyear Airport. This plan provides the necessary development to accommodate and satisfy the anticipated growth over the next 20 years and beyond.

Flexibility will be very important to future development at the airport. Activity projected over the next 20 years may not occur as predicted. The plan has attempted to consider demands that may be placed on the airport even beyond the 20-year planning horizon to ensure that the facility will be capable of handling a wide range of circumstances. The recommended plan provides the airport stakeholders with a general guide that, if followed, can maintain the airport's long term viability and allow the airport to continue to provide air transportation service to the region.

Chapter Six

CAPITAL PROGRAM

Capital Program

The analyses completed in previous chapters evaluated development needs at the airport over the next 20 years and beyond, based on forecast activity and operational efficiency. Next, basic economic, financial, and management rationale are applied to each development item so the feasibility of each item contained in the plan can be assessed.

The capital program has been organized into five sections. The first section is the 20-year capital needs program (CNP). This section identifies capital projects anticipated to be needed within each planning horizon. The second section is a discussion of various local, state, federal, and private sources of funding for airport improvements. The third section is a five-year capital improvement program (CIP). The CIP will identify priority projects, by year, from 2008 to 2012. **The CIP estimates are based upon probable levels of FAA, state, and local funding. The resulting five-year CIP will thus consist of those projects with the highest priority and the highest probability of receiving funding.** The fourth section will provide an estimate of hangar development costs. The last section will discuss the economic benefits of the airport.

AIRPORT CAPITAL NEEDS PROGRAM

Now that the recommended master plan concept has been established, the next step is to determine a realistic schedule and the associated costs for implementing the plan. This section will examine the overall cost of each item in the development plan and present a develop-

ment schedule. The recommended improvements are grouped by planning horizon: short term, intermediate term, and long term. **Table 6A** summarizes the key milestones for each of the three planning horizons.

TABLE 6A
Planning Horizon Milestone Summary
Phoenix Goodyear Airport

	Base Year 2004	Short Term	Intermediate Term	Long Term
ANNUAL OPERATIONS				
Total Itinerant	66,049	107,000	141,100	206,900
Total Local	42,481	93,700	124,600	191,500
Total Operations	108,530	200,700	265,700	398,400
BASED AIRCRAFT				
Single Engine	185	277	348	525
Multi-Engine	15	20	23	30
Turboprop	0	4	8	16
Jet	3	7	14	33
Helicopters/Others	6	9	11	15
Total Based Aircraft	209	317	404	619

A key aspect of this planning document is the use of demand-based planning milestones. The short term planning horizon contains items of highest priority, such as those identified as already submitted to the FAA and those relating to meeting safety design standards. As short term activity levels are reached, it will then be time to program for the intermediate term based upon the next activity milestones. Similarly, when the intermediate term milestones are reached, it will be time to program for the long term activity milestones.

Many development items included in the recommended concept will need to follow demand indicators. For example, the plan anticipates construction of new hangars and taxilanes. Based aircraft will be the indicator for additional hangar needs. If based aircraft growth occurs as projected, additional hangars will need to be constructed to meet the demand.

If growth slows or does not occur as projected, hangar-related construction projects can be delayed. As a result, capital expenditures will be undertaken as needed, which leads to a responsible use of capital assets. Some development items do not depend on demand, such as pavement maintenance and projects intended to meet FAA design standards. These types of projects typically are associated with day-to-day operations and should be monitored and identified by airport management.

As a master plan is a conceptual document, implementation of these capital projects should only be undertaken after further refinement of their design and costs through architectural and engineering analyses. Moreover, some projects may require further environmental study, such as property acquisition, and potentially the RSA improvement project.

The cost estimates presented in this chapter have been increased by 15 percent to allow for contingencies that may arise on the project. The cost estimates also include 12 percent for design and engineering, and an additional 13 percent for construction, inspection, and project management. Capital costs presented here should be viewed only as estimates subject to further refinement during design. Nevertheless, these estimates are considered reasonable for planning purposes. Cost estimates for each of the development projects listed in the capital program are in 2006 dollars. **Exhibit 6A** presents the proposed capital needs program (CNP) for the Phoenix Goodyear Airport (GYR).

SHORT TERM IMPROVEMENTS

The proposed capital needs program (CNP) has been divided into three planning horizons: short, intermediate, and long term. By grouping the projects, airport administration can accelerate projects that become critical or delay projects that are not priorities. The development staging is presented on **Exhibit 6B**.

All federally funded airport projects are subject to environmental review. Some projects may be covered by a Categorical Exclusion, while others will require an Environmental Assessment (EA). The conclusions of an EA are generally valid for three years after completion of the study. Any projects considered after this timeframe would require updated environmental documentation. The first project presented in each planning horizon is the appropriate environmental documentation, and a placeholder of $500,000 has been utilized. Depending on the projects undertaken, this amount may be more or less.

The EA should specifically address the disposition of the Superfund site cleanup wells located on airport property. It is estimated that the total cost to relocate the Superfund wells is slightly more than one million dollars. This cost has been divided into three phases corresponding to short, intermediate, and long term proposed construction.

The next project is the reconstruction of the existing 80,000 square yards of the terminal area ramp and hangar taxilanes. According to the 2004 Pavement Management Program, most of this ramp is failing. The deterioration of pavement surfaces can lead to the development of foreign object debris (FOD). The presence of FOD can damage the integrity of aircraft and can lead directly to aircraft accidents. It is imperative that the airport continue to maintain active pavement surfaces through maintenance or reconstruction when necessary. In the short term, $3.0 million has been earmarked for rehabilitation of the most critical apron areas.

Mitigation of nonstandard safety areas is of the highest priority for both the City of Phoenix and the FAA. The recommended solution to meeting RSA standards is to shift the runway 300 feet to the southeast. To accomplish this, 300 feet of pavement is removed from the Runway 21 end and added to the Runway 3 end. This project is estimated at $1.6 million. At the time of this project, the landing thresholds can be relocated to the pavement ends.

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	Project Description	Category	Project Cost	FAA Eligible	ADOT Eligible	Local Share
SHORT TERM PROGRAM (0-5 YEARS)						
1	Environmental Documentation for Short Term Projects	Environmental	$500,000	$475,000	$12,500	$12,500
2	Rehabilitate Portions of the North Aircraft Apron	Maintenance	$3,000,000	$2,850,000	$75,000	$75,000
3	Runway 3-21 RSA Mitigation. Add 300 Feet of Pavement to Southwest End and Remove 300 Feet of Pavement from Northeast End. Re-mark Thresholds at New Ends.	Safety - RSAT	$1,600,000	$1,520,000	$40,000	$40,000
4	Replace FAA Weather Equipment With AWOS-3	Maintenance	$100,000	$95,000	$2,500	$2,500
5	Master Utility Plan Study	Landside Demand	$500,000	$475,000	$12,500	$12,500
6	Pave Employee Parking Lot	Maintenance	$47,000	$0	$0	$47,000
7	Relocate Superfund Cleanup Wells	Landside Demand	$350,000	$332,500	$8,750	$8,750
8	Rehabilitate Asphalt Portion of Runway 3-21	Maintenance	$4,480,000	$4,256,000	$112,000	$112,000
9	Emergency Generator For ATCT	Maintenance	$100,000	$95,000	$2,500	$2,500
10	Widen and Strengthen Taxiways A-4, A-5, A-6, A-7 to 75 feet	Safety, Capacity	$2,000,000	$1,900,000	$50,000	$50,000
11	Strengthen Taxiways A	Safety	$2,500,000	$2,375,000	$62,500	$62,500
12	East High Speed Exits	Capacity	$885,000	$840,750	$22,125	$22,125
13	West Side On-Airport Accesss Road and Utility Extension - Phase 1	Landside Demand	$551,000	$440,800	$55,100	$55,100
14	Runway 21 RPZ Land Acquisition - Fee-Simple (11 Acres)	Safety	$4,400,000	$4,180,000	$110,000	$110,000
15	Runway 3 RPZ Land Acquisition - Fee-Simple (17 Acres)	Safety	$6,800,000	$6,460,000	$170,000	$170,000
16	Runway 21 RPZ Land Acquisition - Easement (1 Acre)	Safety	$50,000	$47,500	$1,250	$1,250
17	Runway 3 RPZ Land Acquisition - Easement (34 Acres)	Safety	$1,700,000	$1,615,000	$42,500	$42,500
18	West Public Ramp - Phase 1	Landside Demand	$3,866,000	$3,672,700	$96,650	$96,650
19	West Parallel Taxiway and Exits	Capacity	$5,329,000	$5,062,550	$133,225	$133,225
20	MALSR Serving Approaches to Runway 3	Safety	$1,400,000	$1,330,000	$35,000	$35,000
21	Reconstruct Public Access Road	Landside Demand	$4,000,000	$3,800,000	$100,000	$100,000
TOTAL SHORT TERM PROGRAM			**$44,158,000**	**$41,822,800**	**$1,144,100**	**$1,191,100**

	Project Description	Category	Project Cost	FAA Eligible	ADOT Eligible	Local Share
INTERMEDIATE TERM PROGRAM (6-10 YEARS)						
1	Environmental Documentation for Intermediate Term Projects	Environmental	$500,000	$475,000	$12,500	$12,500
2	West Side On-Airport Accesss Road and Utility Extension - Phase 2	Landside Demand	$2,051,000	$1,640,800	$205,100	$205,100
3	ATCT Site Selection Study	Safety	$75,000	$71,250	$1,875	$1,875
4	Replacement ATCT Construction	Safety	$4,200,000	$3,990,000	$105,000	$105,000
5	West Public Ramp - Phase 2	Landside Demand	$5,798,000	$5,508,100	$144,950	$144,950
6	North Terminal Building	Landside Demand	$2,100,000	$0	$1,050,000	$1,050,000
7	Large Aircraft Run-up Area and Blast Fence	Efficiency	$2,021,000	$1,919,950	$50,525	$50,525
8	Parallel Runway and Taxiway Construction	Capacity	$7,733,000	$7,346,350	$193,325	$193,325
9	Southside Taxiway Access - Phase 1	Landside Demand	$821,000	$779,950	$20,525	$20,525
10	South Public Ramp - Phase 1	Landside Demand	$4,639,000	$4,407,050	$115,975	$115,975
11	South Run-Up Areas	Capacity	$2,230,000	$2,118,500	$55,750	$55,750
12	Relocate Superfund Cleanup Wells	Landside Demand	$350,000	$332,500	$8,750	$8,750
13	Pavement Maintenance	Maintenance	$500,000	$475,000	$12,500	$12,500
TOTAL INTERMEDIATE TERM PROGRAM			**$33,18,000**	**$29,064,450**	**$1,976,775**	**$1,976,775**
LONG TERM PROGRAM (11-20 YEARS)						
1	Environmental Documentation for Long Term Projects	Environmental	$500,000	$475,000	$12,500	$12,500
2	Access Road from ATCT to End	Landside Demand	$4,375,000	$3,500,000	$437,500	$437,500
3	West Public Ramp - Phase 3	Landside Demand	$9,664,000	$9,180,800	$241,600	$241,600
4	Mill & Overlay Perimeter Road	Maintenance	$1,633,000	$1,551,350	$40,825	$40,825
5	Relocate Superfund Cleanup Wells	Landside Demand	$350,000	$332,500	$8,750	$8,750
6	Rehabilitate Portions of Aircraft Apron Area	Safety	$3,500,000	$3,325,000	$87,500	$87,500
7	Pavement Maintenance	Maintenance	$1,000,000	$950,000	$25,000	$25,000
TOTAL LONG TERM PROGRAM			**$21,022,000**	**$19,314,650**	**$853,675**	**$853,675**
TOTAL PROGRAM COSTS			**$98,198,000**	**$90,201,900**	**$3,974,550**	**$4,021,550**

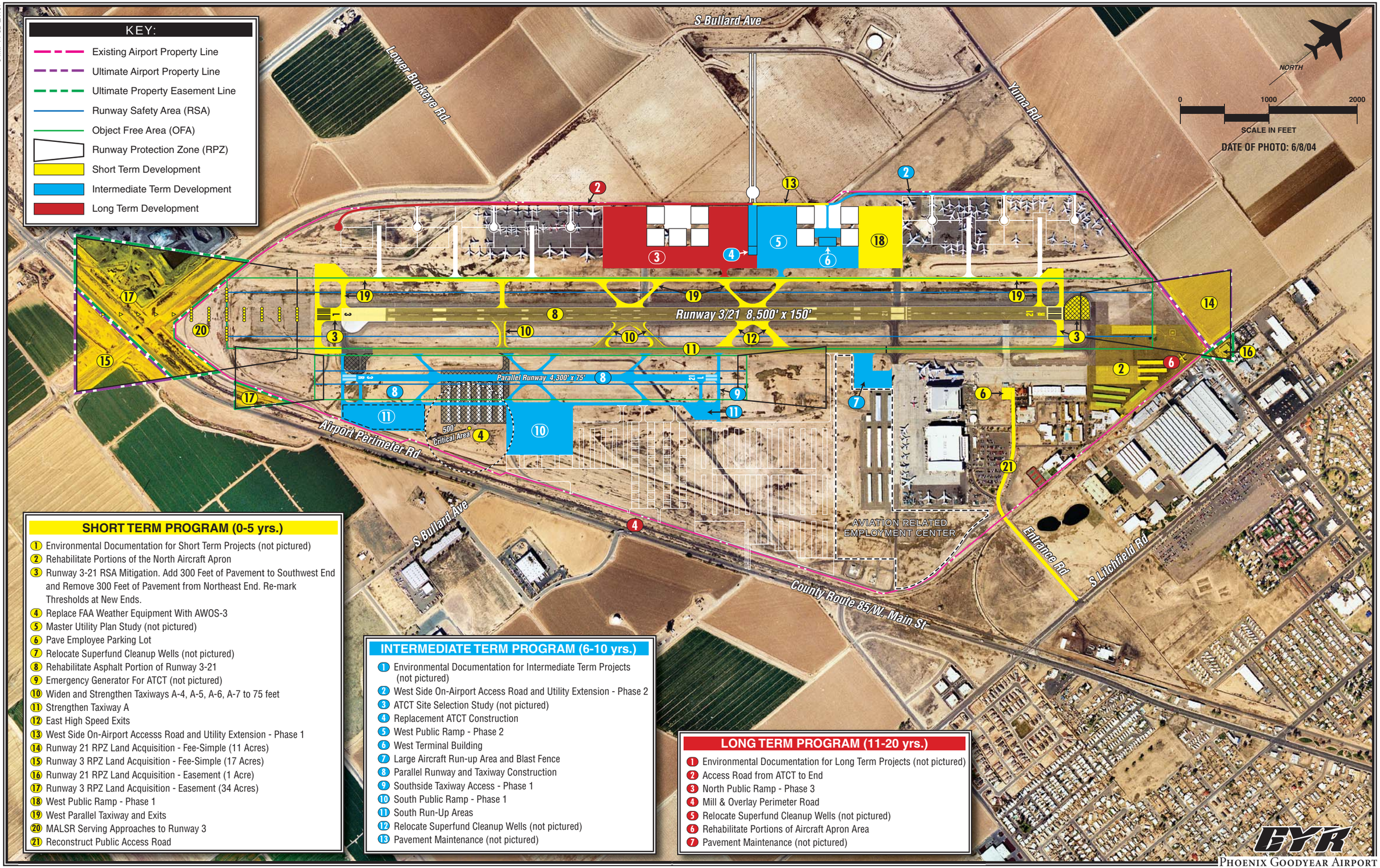
RPZ - Runway Protection Zone
RSA - Runway Safety Area
MALSR - Medium Intensity Approach Lights with Runway Alignment Indicator Lights
RSAT - Runway Safety Action Team

Source: Airport Records; Coffman Associates Analysis.

Note: Costs associated with hangar development are not included

PHOENIX GOODYEAR AIRPORT
Exhibit 6A
CAPITAL NEEDS PROGRAM

04MP14-6B-2/7/07



SHORT TERM PROGRAM (0-5 yrs.)

1. Environmental Documentation for Short Term Projects (not pictured)
2. Rehabilitate Portions of the North Aircraft Apron
3. Runway 3-21 RSA Mitigation. Add 300 Feet of Pavement to Southwest End and Remove 300 Feet of Pavement from Northeast End. Re-mark Thresholds at New Ends.
4. Replace FAA Weather Equipment With AWOS-3
5. Master Utility Plan Study (not pictured)
6. Pave Employee Parking Lot
7. Relocate Superfund Cleanup Wells (not pictured)
8. Rehabilitate Asphalt Portion of Runway 3-21
9. Emergency Generator For ATCT (not pictured)
10. Widen and Strengthen Taxiways A-4, A-5, A-6, A-7 to 75 feet
11. Strengthen Taxiway A
12. East High Speed Exits
13. West Side On-Airport Accesss Road and Utility Extension - Phase 1
14. Runway 21 RPZ Land Acquisition - Fee-Simple (11 Acres)
15. Runway 3 RPZ Land Acquisition - Fee-Simple (17 Acres)
16. Runway 21 RPZ Land Acquisition - Easement (1 Acre)
17. Runway 3 RPZ Land Acquisition - Easement (34 Acres)
18. West Public Ramp - Phase 1
19. West Parallel Taxiway and Exits
20. MALSR Serving Approaches to Runway 3
21. Reconstruct Public Access Road

INTERMEDIATE TERM PROGRAM (6-10 yrs.)

1. Environmental Documentation for Intermediate Term Projects (not pictured)
2. West Side On-Airport Access Road and Utility Extension - Phase 2
3. ATCT Site Selection Study (not pictured)
4. Replacement ATCT Construction
5. West Public Ramp - Phase 2
6. West Terminal Building
7. Large Aircraft Run-up Area and Blast Fence
8. Parallel Runway and Taxiway Construction
9. Southside Taxiway Access - Phase 1
10. South Public Ramp - Phase 1
11. South Run-Up Areas
12. Relocate Superfund Cleanup Wells (not pictured)
13. Pavement Maintenance (not pictured)

LONG TERM PROGRAM (11-20 yrs.)

1. Environmental Documentation for Long Term Projects (not pictured)
2. Access Road from ATCT to End
3. North Public Ramp - Phase 3
4. Mill & Overlay Perimeter Road
5. Relocate Superfund Cleanup Wells (not pictured)
6. Rehabilitate Portions of Aircraft Apron Area
7. Pavement Maintenance (not pictured)

GYR

PHOENIX GOODYEAR AIRPORT

Exhibit 6B

DEVELOPMENT STAGING

The Western Pacific Region of the FAA desires to see all reliever airports outfitted with an on-airfield weather reporting system. The capital needs program includes an automated weather observation system (AWOS). This system will provide minute by minute updates of climate data such as temperature, wind speed and direction, visibility, precipitation, and cloud height. In addition, the airport traffic control tower (ATCT) is in need of a back-up generator in order to insure continued communication with aircraft in the region in case of a power outage.

There are several projects identified that relate to preserving and improving the runway and taxiway system. The City of Phoenix Aviation Department's CIP identified $4.48 million for rehabilitation of the asphalt portion of Runway 3-21. This project should be undertaken in conjunction with the runway shift project as specified in this master plan to solve the nonstandard RSA condition. By shifting the runway 300 feet to the southwest, the full RSA can be provided on both runway ends. Access taxiways to the new runway ends are also provided. This project is of the highest priority as the RSA behind Runway 21 is 300 feet short of meeting FAA standards.

The airport has included a master utility plan study in the short term planning period. This study would provide airport management with a better understanding of the adequacy of the existing utility infrastructure to support the forecast growth at the airport. This study would also indicate the utility needs and costs to support this growth.

The airport is planning to pave the employee parking lot to the west of the terminal building. This parking lot is currently unpaved. The ATCT is in need of a replacement back-up generator. The airport is planning to acquire this equipment in the short term planning period.

The airport administration is planning to begin the development of the northwest side of the airport in the short term planning period. To accomplish this, it is forecast that some of the superfund cleanup wells will need to be relocated. Approximately $350,000 is reserved for the first phase of well relocations.

The next project is the strengthening of Taxiway A to a strength rating of 270,000 pounds dual tandem wheel (DTL). Taxiway A from the southwest hold apron to Taxiway A-3, a distance of approximately 6,000 feet, is only capable of handling a Boeing-727 or smaller. As a result, larger aircraft landing on Runway 21 have to make a 180 degree turn on the runway and back taxiway to the terminal area. This typically will close the runway for 5-10 minutes at a time. In addition, aircraft being towed from the southeast maintenance hangar or from the temporary storage area on the north side of the runway to the southwest run-up area also have to taxi on the runway. This can result in closing the runway for up to 30 minutes each time.

Some of the taxiways leading from the runway are in need of both strengthening and widening. Taxiways A-4, A-5,

A-6, and A-7 are strength rated to 12,500 pounds single wheel loading (SWL) and are no more than 35 feet wide. The FAA design standard for taxiways leading to the runway at Goodyear is 75 feet.

The addition of high speed taxiway exits extending from the runway to Taxiway A are planned. These exits will increase capacity of the runway system by allowing aircraft to exit the runway system in a more timely manner.

Acquisition of the property encompassing the runway protection zones (RPZs) is considered an essential short term project to insure the airport has compatible surrounding land uses. The property acquisition is split between those areas recommended for fee simple purchase and those areas where an avigation easement is more likely. Basically, undeveloped land is recommended for fee simple acquisition, and fully developed property is recommended for avigation easements as the purchase and relocation of existing businesses can be very expensive and difficult.

The RPZ serving Runway 21 has approximately 12 acres that extend beyond airport property. Eleven acres of this area is currently undeveloped and should be acquired by the airport if possible. A small one-acre portion of the RPZ traverses an office building. This is recommended for an avigation easement to protect the airport.

The RPZ serving Runway 3 includes approximately 51 acres which extend beyond airport property. Approximately 17 acres of this total is recommended for fee simple acquisition. This area crosses County Road 85 onto undeveloped agricultural land. The remaining 34 acres traverse the Bullard Wash, the County Road 85 easement, and an industrial operation. Unless the land use changes significantly, avigation easements should be sufficient.

Although the purchase of land adjacent to the airport is officially eligible for FAA funding, the funding process should be noted. Typically, the FAA will require the airport sponsor to make the initial land purchase. The FAA would then reimburse the airport sponsor over several years in restitution as the local match for future airport projects.

Once necessary safety and maintenance projects have been completed, short term projects associated with new landside development is considered. As depicted on **Exhibit 6B**, a new airport access point from Bullard Avenue would open development possibilities on the north side. The capital needs program considers the airport developing the portion of this access road from the airport property line to the location of the proposed north side terminal building. This would also include the extension of utilities to this area. Most of this project is FAA eligible, with the exception of sanitary sewer. As a result, approximately 80 percent of the project is eligible for FAA funding. The CNP considers the remaining 20 percent to be split between the state and local sponsor.

The first phase of a north side public apron would encompass approximately 40,000 square yards of pavement. This ramp would provide aircraft tie-down positions, circulation, and frontage for

fixed base operator (FBO) type services operating from large conventional hangars facing the apron.

The short term CNP also considers the development of a new north side parallel taxiway. This taxiway will open the north side to aviation development and improve overall airport capacity and efficiency. This parallel taxiway would be necessary when north side landside development extends beyond the initial apron development already considered. It should be noted that forecast growth for the airport in the short term would indicate a need for hangar development.

One additional project considered in the short term is the construction of additional terminal building vehicle parking space. Currently, overflow and employee parking needs are met with the use of an unpaved parking lot to the south of the terminal building. Approximately $47,000 is necessary for this project.

Near the end of the short term planning horizon is the planned installation of a medium intensity approach lighting system with runway alignment indicator lights (MALSR) leading to Runway 3. This sophisticated lighting system is currently a required component for the airport to support a Category (CAT) I approach. In the future, with advancements in global positioning system (GPS) technology, other required navigational aids, such as a localizer and glide slope antennae, may not be necessary for a CAT I approach. Thus, this additional equipment is not included in cost estimates.

The last project considered in the short term planning period is reconstruction of the existing public access road. This road extends from Litchfield Road to the terminal building complex. It should be noted that a portion of this road is in the City of Goodyear and not on airport property. Coordination should be undertaken to coordinate this road improvement with the City of Goodyear.

The total investment necessary for the short term capital needs program is approximately $44.16 million. Of this total, $41.82 million is eligible for FAA grant funding, and $1.14 million is likely eligible for ADOT funding. The remaining $1.20 million would be the responsibility of the City of Phoenix Aviation Department.

INTERMEDIATE TERM IMPROVEMENTS

Analyzing the impact to the environment is necessary for any airport improvement projects at federally obligated airports. Therefore, the first project in the intermediate term is the commission of appropriate environmental documentation. As previously discussed, a placeholder of $500,000 has been established for necessary environmental documentation for intermediate term projects.

The first few projects of the intermediate term CNP are related to the relocation of the airport traffic control tower (ATCT) to the north side of the airfield. A formal airport traffic control tower

site selection study will need to be undertaken. This study should follow criteria set forth in FAA Order 7031.2C, *Airway Planning Standard Number One - Terminal Air Navigation Facilities and Air Traffic Control Services.* This study will develop justification for a replacement ATCT and present a benefit-cost analysis.

Once justification for a replacement ATCT is established, operational and spatial requirements are planned for following FAA Order 6480.4, *Airport Traffic Control Tower Siting Criteria*. Factors such as visibility, size, height, signal strength, and FAR Part 77 compliance will be considered.

The next project identified is the construction of the replacement ATCT. The cost associated with tower construction can vary widely. For planning purposes, a tower cost of $4.2 million is considered. This is a mid-range cost that might typically be associated with a busy general aviation airport. The capital needs program assumes that the tower will be eligible for a 95 percent federal grant, and the remaining five percent would be divided evenly between state and local resources.

The next project is the extension of utilities from the north side terminal building to the east. Once again, 80 percent of the total project cost is considered eligible for FAA funding as some elements, such as sanitary sewer, would not be eligible.

Expansion of the public apron to the east of the replacement ATCT is considered next. This apron would encompass approximately 60,000 square yards of pavement. This apron expansion makes more property available for landside development. The proposed north side terminal building would also front this apron. Terminal buildings are typically non-eligible for FAA grant funding. This CNP considers the construction of the terminal building to be a jointly funded project with ADOT and the airport sponsor.

The aircraft run-up area and blast fence currently located at the western end of Taxiway A has to be relocated prior to the parallel runway being constructed. A midfield location for a replacement run-up area and blast deflection fence has been identified. This location is immediately west of the existing ATCT. Because constant noise activity is not recommended adjacent to an ATCT, this site will only be acceptable if the tower is relocated.

Once the tower and run-up area are relocated, the plan calls for the design and construction of the parallel runway 700 feet to the south of the existing runway. This runway would measure 4,300 feet by 75 feet wide. The primary purpose of the parallel runway is to accommodate forecast growth in local operations driven by more based aircraft. This runway would be designed to ARC B-II standards and have the ability to accommodate all small aircraft under 12,500 pounds. To further enhance capacity, the parallel runway is outfitted with several high-speed exits.

Several other intermediate projects are considered in conjunction with the parallel runway construction. These include the relocation of any monitoring or extraction wells associated with the

Superfund clean up project. A large aircraft run-up apron and hold aprons are considered for both ends of the parallel taxiway to serve the new parallel runway.

Finally, the intermediate term planning horizon includes a place holder for major pavement maintenance that may need to be undertaken during this timeframe. It is the airport's responsibility to preserve the useful life of airport pavements. To this end, some surfaces may need significant repair or replacement during the intermediate planning horizon.

The total investment for the intermediate term capital needs program is approximately $33.02 million. Of this total, $29.06 million is eligible for FAA grant funding, and $1.98 million is likely eligible for ADOT funding. The remaining $1.98 million would be the responsibility of the City of Phoenix Aviation Department.

LONG TERM IMPROVEMENTS

Long term capital needs are difficult to predict due to the fluid nature of aviation. Several long term projects would likely require environmental documentation, and a placeholder of $500,000 is reserved for this purpose.

An extension of the north side road and utilities is planned in the long term. The third phase of the north side public apron construction is also considered. This apron would mirror that proposed for east of the ATCT.

Other long term improvements, also presented on **Exhibit 6B**, further consider the need for relocation of the Superfund cleanup wells as necessary to accommodate landside development. By this time frame, it is anticipated that the perimeter service road will be in need of milling and overlay. A placeholder for major pavement maintenance projects has also been included.

The last project considered for the long term planning period is further reconstruction of the aircraft apron and taxilanes in the vicinity of the existing terminal area. In the short term, $1.0 million was established for rehabilitation of portions of this area. By the long term, it is anticipated that much more of this area will be in need of reconstruction at a cost of approximately $3.5 million.

The total investment for the long term capital needs program is approximately $21.02 million. Of this total, $19.31 million is eligible for FAA grant funding, and $855,000 is likely eligible for ADOT funding. The remaining $855,000 would be the responsibility of the City of Phoenix Aviation Department.

CAPITAL NEEDS PROGRAM SUMMARY

The 20-year capital needs program for Phoenix Goodyear Airport focuses heavily on meeting FAA design standards for safety, improving overall airfield capacity, and providing developable space for landside facilities to accommodate forecasted growth in based aircraft.

The most significant airside project in the first five years is the shifting of Runway 3-21 approximately 300 feet to the southwest. The runway shift involves removing 300 feet of pavement from the Runway 21 end and adding 300 feet to the Runway 3 end. The runway shift will allow the airport to meet FAA requirements for the runway safety area behind Runway 21. Also included in the short term airside capital needs program is the strengthening and widening of the taxiways in order to prevent lengthy delay caused by large aircraft needing to taxi on the runway.

In the intermediate term of the master plan, the ATCT is relocated to the north side. The tower then becomes the focus of potential significant landside development on this side of the airfield. A parallel runway is proposed on the south side. This runway would provide anticipated capacity relief.

The 20-year investment total is approximately $98.20 million. Projects eligible for FAA grant assistance total $90.20 million. ADOT – Aeronautics Department eligible capital improvement projects total $3.97 million. The local responsibility totals $4.03 million.

CAPITAL IMPROVEMENT FUNDING SOURCES

Financing capital improvements at the airport will not rely solely on the financial resources of the airport. Capital improvement funding is available through various grant-in-aid programs on both the state and federal levels. The following discussion outlines key sources of funding potentially available for capital improvements at Phoenix Goodyear Airport.

FEDERAL GRANTS

Through federal legislation over the years, various grant-in-aid programs have been established to develop and maintain a system of public airports across the United States. The purpose of this system and its federally based funding is to maintain national defense and to promote interstate commerce. The most recent legislation affecting federal funding was enacted in late 2003 and is titled *Century of Aviation Re-authorization Act,* or *Vision 100*.

The four-year bill covers FAA fiscal years 2004, 2005, 2006, and 2007. This bill presented similar funding levels to the previous bill - *Air 21*. Airport Improvement Program (AIP) funding was authorized at $3.4 billion in 2004, $3.5 billion in 2005, $3.6 billion in 2006, and $3.7 billion in 2007. This new bill provides the FAA the opportunity to plan for longer term projects versus one-year re-authorizations.

The source for *Vision 100* funds is the Aviation Trust Fund. The Aviation Trust Fund was established in 1970 to provide funding for aviation capital investment programs (aviation development, facilities and equipment, and research and development). The Aviation Trust Fund also finances the operation of the FAA. It is funded by user fees, including taxes on airline tickets, aviation fuel, and various aircraft parts.

Funds are distributed each year by the FAA from appropriations by Congress. A portion of the annual distribution is to primary commercial service airports based upon enplanement (passenger boarding) levels. If Congress appropriates the full amounts authorized by *Vision 100*, eligible general aviation airports could receive up to $150,000 of funding each year in Non-Primary Entitlement (NPE) funds (*National Plan of Integrated Airport Systems* [NPIAS] inclusion is required for general aviation entitlement funding). Phoenix Goodyear Airport qualifies for full NPE funding as the NPIAS includes over $150,000 in yearly capital projects.

The remaining AIP funds are distributed by the FAA based upon the priority of the project for which they have requested federal assistance through discretionary apportionments. A national priority ranking system is used to evaluate and rank each airport project. Those projects with the highest priority are given preference in funding.

Under the AIP program, examples of eligible development projects include the airfield, public aprons, and access roads. Additional buildings and structures may be eligible if the function of the structure is to serve airport operations in a non-revenue generating capacity, such as maintenance facilities.

Whereas entitlement monies are guaranteed on an annual basis, discretionary funds are not assured. If the combination of entitlement, discretionary, and airport sponsor match does not provide enough capital for planned development, projects may be delayed. Other supplemental funding sources are described in the following subsections.

STATE FUNDING PROGRAM

In support of the state aviation system, the State of Arizona also participates in airport improvement projects. The source for state airport improvement funds is the Arizona Aviation Fund. Taxes levied by the state on aviation fuel, flight property, aircraft registration tax, and registration fees (as well as interest on these funds) are deposited in the Arizona Aviation Fund.

Under the State of Arizona's grant program, an airport can receive funding for one-half (currently 2.5 percent) of the local share of projects receiving federal AIP funding. The state also provides 90 percent funding for projects which are typically not eligible for federal AIP funding or have not received federal funding.

State Airport Loan Program

The Arizona Department of Transportation (ADOT) -Aeronautics Division's Airport Loan Program was established to enhance the utilization of state funds and provide a flexible funding mechanism to assist airports in funding improvement projects. Eligible projects include runway, taxiway, and apron improvements; land acquisition; planning studies; and the preparation of plans and specifications for airport construction projects. Unlike the Federal AIP funding mechanism, revenue-generating improvements, such as hangars

and fuel storage facilities, are eligible under the State Airport Loan Program. Projects which are not currently eligible for the State Airport Loan Program are considered if the project would enhance the airport's ability to be financially self-sufficient.

There are three ways in which the loan funds can be used: Grant Advance, Matching Funds, or Revenue-Generating Projects. The Grant Advance loan funds are provided when the airport can demonstrate the ability to accelerate the development and construction of a multi-phase project. The project(s) must be compatible with the airport master plan and be included in the ADOT Five-Year Airport Development Program. The Matching Funds are provided to meet the local matching fund requirement for securing federal airport improvement grants or other federal or state grants. The Revenue-Generating funds are provided for airport-related construction projects that are not eligible for funding under another program.

Pavement Maintenance Program

The airport system in Arizona is a multi-million dollar investment of public and private funds that must be protected and preserved. State aviation fund dollars are limited, and the State Transportation Board recognizes the need to protect and extend the maximum useful life of the airport system's pavement. The Arizona Pavement Preservation Program (APPP) has been established to assist in the preservation of the Arizona airport system infrastructure. Phoenix Deer Valley Airport participates in this program.

Public Law 103-305 requires that airports requesting Federal AIP funding for pavement rehabilitation or reconstruction have an effective pavement maintenance management system. To this end, ADOT-Aeronautics maintains an Airport Pavement Management System (APMS). This system requires monthly airport inspections, which are conducted by airport management and supplied to ADOT.

The Arizona Airport Pavement Management System uses the Army Corps of Engineers' "Micropaver" program as a basis for generating a Five-Year Airport Pavement Preservation Program (APPP). The APMS consists of visual inspections of all airport pavements. Evaluations are made of the types and severities observed and entered into a computer program database. Pavement Condition Index (PCI) values are determined through the visual assessment of pavement conditions in accordance with the most recent FAA Advisory Circular 150/5380-7, *Pavement Management System*, and range from 0 (failed) to 100 (excellent). Every three years, a complete database update with new visual observations is conducted. Individual airport reports from the update are shared with all participating system airports. The Aeronautics Division ensures that the APMS database is kept current, in compliance with FAA requirements.

Every year, the Aeronautics Division, utilizing the APMS, will identify airport pavement maintenance projects eligible

for funding for the upcoming five years. These projects will appear in the State's Five-Year Airport Development Program. Once a project has been identified and approved for funding by the State Transportation Board, the airport sponsor may elect to accept a state grant for the project and not participate in the Airport Pavement Preservation Program (APPP), or the airport sponsor may sign an Inter-Government Agreement (IGA) with the Aeronautics Division to participate in the APPP.

LOCAL FUNDING

The balance of project costs, after consideration has been given to grants, must be funded through local resources. The Phoenix Goodyear Airport is operated by the City of Phoenix through the Phoenix Aviation Department. The goal for the operation of the airport is to generate ample revenues to cover all operating and maintenance costs, as well as the local matching share of capital expenditures.

There are several alternatives for local financing options for future development at the airport, including airport revenues, direct funding from the City, issuing bonds, and leasehold financing. These strategies could be used to fund the local matching share or complete the project if grant funding cannot be arranged.

Local funding options may also include the solicitation of private developers to construct and manage hangar facilities. The capital needs and improvement programs have not made any assumption as to who would finance the construction of hangar facilities. Private hangar development should only be allowed within the definition of the airport master plan and within the rules and regulations of the airport in order to maintain an efficient airport facility layout.

CAPITAL IMPROVEMENT PROGRAM

The previously presented capital needs program considers all those projects necessary to make the 20-year master plan vision for the airport a reality. In today's economic environment, the FAA is unable to fund all eligible projects needed at all airports. As a result, it is reasonable to develop a short term (0-5 years) list of recommended projects that Phoenix Goodyear Airport should consider priorities. With this list or capital improvement program (CIP), the airport can better direct funding requests to the FAA and ADOT for priority projects. The CIP presented on **Exhibit 6C** combines master plan recommendations and other five-year priority projects identified by the City of Phoenix Aviation Department.

From year-to-year, it is difficult to know what level of grant funding will be available from the FAA and ADOT. This is even more difficult as the entire funding mechanism for the FAA and airport improvements, the Airport Improvement Program, is up for reauthorization by the U.S. Congress in 2007. In order to facilitate this CIP discussion, it is necessary to estimate what Phoenix Goodyear Airport could reasonably expect in grant funding from the FAA and ADOT. For purposes of

04MP14-6C-2/20/07

Project Description	Category	Project Cost	FAA/ADOT Funding	Local Funding
2008				
Environmental Documentation For Short Term Projects	Environmental	$500,000	$468,500	$31,500
Rehabilitation of Portions of North Aircraft Apron	Safety	$3,000,000	$2,811,000	$189,000
Runway 3-21 RSA Mitigation. Add 300 Feet of Pavement to Southwest End and Remove 300 Feet of Pavement from Northeast End. Re-mark Thresholds at New Ends.	Safety	$1,600,000	$1,499,200	$100,800
Subtotal		**$5,100,000**	**$4,778,700**	**$321,300**
2009				
Replace FAA Weather Equipment With AWOS-3	Safety	$100,000	$93,700	$6,300
Master Utility Plan Study	Landside Demand	$500,000	$468,500	$31,500
Pave Employee Parking Lot	Maintenance	$47,000	$44,039	$2,961
Relocate Superfund Wells	Landside Demand	$350,000	$327,950	$22,050
Subtotal		**$997,000**	**$606,239**	**$40,761**
2010				
Rehabilitate Asphalt Portion of Runway 3-21	Safety	$4,480,000	$4,197,760	$282,240
Emergency Generator for ATCT	Safety	$100,000	$93,700	$6,300
Subtotal		**$4,580,000**	**$4,291,460**	**$288,540**
2011				
Widen Taxiways A-4, A-5, A-6, and A-7 to 75 feet	Safety	$2,000,000	$1,874,000	$126,000
Strengthen Taxiways A, A-4, A-5, A-6	Safety, Capacity	$2,500,000	$2,342,500	$157,500
East High-Speed Exits	Capacity	$885,000	$829,245	$55,755
West Public Ramp - Phase 1	Landside Demand	$3,866,000	$3,622,442	$243,558
Subtotal		**$9,251,000**	**$8,668,187**	**$582,813**
2012				
Install MALSR for Precision Approach Capability to Runway 3	Capacity	$1,400,000	$1,311,800	$88,200
West Side On-Airport Access Road and Utility Extension - Phase 1	Landside Demand	$551,000	$440,800	$110,200
RPZ Easement Acquisition (Combined 35 Acres)	Safety	$1,750,000	$1,639,750	$110,250
RPZ Fee Simple Acquisition (Combined 28 Acres)	Safety	$11,200,000	$10,494,400	$705,600
Subtotal		**$14,901,000**	**$13,886,750**	**$1,014,250**
Five Year Total		**$34,829,000**	**$32,231,336**	**$2,247,664**

Note: Costs associated with hangar development are not included

PHOENIX GOODYEAR AIRPORT

Exhibit 6C

FIVE YEAR CAPITAL IMPROVEMENT PROGRAM

this discussion, a federal funding level of $25 million and a state funding level of $7.5 million over the next five years are assumed. This makes available a total of $32.5 million for priority projects in the first five years. In addition, it is understood that ADOT policies allow them to provide a maximum of $1.2 million for a single project in a given year, and up to $2.5 million annually.

The first year CIP considers those projects identified for completion in 2008. The first project is any necessary environmental documentation. This may be in the form of a Categorical Exclusion or an Environmental Assessment.

The next CIP item considers the reconstruction of large portions of the existing terminal area ramp and hangar taxilanes. According to the 2004 Pavement Management Program, most of this ramp is failing. It is imperative that the airport continue to maintain active pavement surfaces through maintenance or reconstruction when necessary. It is estimated that approximately 80,000 square yards of ramp and taxilane area would need to be reconstructed. As this area is the focus of existing general aviation and transient activity, this would be a high priority.

The total cost to reconstruct the entire terminal area ramp and taxilanes is estimated at $4.77 million. Approximately $3.0 million has been identified for repair of those pavement areas in critical need.

The runway shift and RSA mitigation project is considered in the first year CIP. This project shifts the runway approximately 300 feet to the southwest and brings the current nonstandard RSA into compliance. Currently, the runway safety area (RSA) behind Runway 21 only extends 700 feet when design standards call for a 1,000-foot RSA. This project would remove 300 feet of pavement on the Runway 21 end and add 300 feet to the Runway 3 end. This action will bring the entire RSA onto airport property. In addition, this runway shift will pull the RPZ, located to the east of the Runway 21 end, off most of the office building to the east of the airport.

The second year of the CIP plans for the acquisition of an automated weather observation system. This system will allow pilots to receive airport specific metrological conditions. It is a priority established by the FAA Western Pacific Region that all reliever airports should have this capability.

The airport has identified the need for a master utility plan study to determine the adequacy of the existing infrastructure to accommodate planned growth. Paving of the employee parking lot is also planned in the second year CIP. Prior to future development of the northwest side of the airport, some of the superfund wells will likely need to be relocated.

The third year of the CIP considers rehabilitation of Runway 3-21. As previously discussed, this project should be considered in conjunction with the runway shift project if financially feasible. Also in the third year is the acquisition of an emergency generator for the tower.

The fourth year of the CIP considers projects that provide capacity improvement. Taxiways A-4, A-5, A-6, and A-7 are planned for widening to 75 feet in order to meet FAA design standards for the critical aircraft in D-IV. Taxiways A-4, A-5, and A-6 are also planned for strengthening in order to accommodate frequent movement by the critical aircraft.

Also included in the fourth year CIP is the construction of high speed exits leading from the primary runway to Taxiway A for capacity relief. Also included in this timeframe is the beginning of construction of the northwest side apron.

The fifth year CIP includes the installation of a medium intensity approach lighting system with runway alignment indicator lights (MALSR) on the approach to Runway 3. Currently, the MALSR is a required component for an Instrument Landing System (ILS). In conjunction with advancements in Global Positioning System (GPS), the airport may be able to add a CAT I approach to the airport without the need to acquire a localizer or glideslope antenna.

The next project in the fifth year CIP is the construction of a new north side access road, extending from the proposed north side entrance to the location of the north side terminal services building. This road would include extension of utilities. This project is eligible for FAA grant-in-aid funding except for the wastewater utilities; thus, the entire project is considered 80 percent eligible for grant funding.

Acquisition of property that falls within the future RPZs at the airport is also planned for the short term CIP. Approximately 35 acres are planned for fee simple acquisition and 28 acres are planned for avigation easements. While it is optimal for the airport to own all RPZs outright, it is more realistic to consider land that is already developed for avigation easements only.

The following section will discuss the various funding sources typically available for airport improvements. Some combination of these funding mechanisms will likely be necessary to undertake the recommended airport improvements.

HANGAR DEVELOPMENT NEEDS

Construction of hangars on airport property may be undertaken by the City of Phoenix, private enterprise, or a combination of both. **Table 6B** presents an estimate of the cost to build the hangars as depicted on Exhibit 5A. All hangars to be constructed on Corporate Aviation Parcels are assumed to be undertaken by the leasing entity and are not included in this summary.

The estimated cost to build hangars includes site preparation. Site preparation costs include an estimate of earthworks, utility extension, road construction, and parking lot construction. Taxilane construction includes estimates of earthworks, pavement, marking, and signage. Although revenue producing facilities, such as hangars, are generally

not eligible for FAA grant funding, the public taxilanes are eligible but are a low priority. Since the FAA will only issue grants to the airport sponsor, if a private developer were to undertake the taxilane construction they would be responsible for the full cost.

TABLE 6B
Estimated Hangar Development Costs

	Project Cost	FAA/ADOT Eligible	Local Invest-ment
SHORT TERM			
1 Corporate Aviation Parcels NE (10)	$3,067,000	$463,815	$2,603,185
2 Airport Services Area NE (4 200x200 Hangars)	$13,487,000	$0	$13,487,000
3 T-Hangars - Phase 1 (130 Units)	$14,023,000	$2,186,021	$11,836,979
4 Box Hangars – Phase 1 (10 Units)	$3,273,000	$306,399	$2,966,601
5 Airport Services Area S (4 150x150 Hangars)	$7,996,000	$0	$7,996,000
SHORT TERM TOTAL	**$41,846,000**	**$2,956,235**	**$38,889,765**
INTERMEDIATE TERM			
1 T-Hangars - Phase 2 (169 Units)	$16,958,000	$2,558,010	$14,399,990
2 Box Hangars – Phase 2 (10 Units)	$2,932,000	$306,399	$2,625,601
3 Airport Services Area NW (4 200x200 Hangars)	$13,487,000	$0	$13,487,000
4 Site Prep and Expansion Parking Lot	$723,000	$677,451	$45,549
5 Corporate Aviation Parcels NNW (6)	$1,931,000	$232,376	$1,698,624
INTERMEDIATE TERM TOTAL	**$36,031,000**	**$3,774,236**	**$32,256,764**
LONG TERM			
1 T-Hangars - Phase 3 (142 Units)	$14,193,000	$1,519,814	$12,673,186
2 Box Hangars – Phase 3 (20 Units)	$3,635,000	$611,861	$3,023,139
3 Corporate Aviation Parcels NW (8)	$2,245,000	$398,225	$1,846,775
LONG TERM TOTAL	**$20,073,000**	**$2,529,900**	**$17,543,100**
TOTAL	**$97,950,000**	**$9,260,371**	**$88,689,629**

The short term hangar estimates would provide 130 T-hangar spaces and 10 individual box hangar spaces. Construction of the conventional hangars are also included but could be shifted to the intermediate or long term planning horizons as demand dictates. The intermediate planning horizon provides for 169 T-hangar spaces and ten more individual box hangars. The long term planning horizon adds 142 T-hangar positions and 20 individual box hangar positions. The overall cost of the hangar construction is estimated at nearly $98 million in 2006 dollars.

AIRPORT FINANCING

The City of Phoenix Aviation Department is responsible for the operation and maintenance of three airports in its system. The largest airport in the system is Phoenix Sky Harbor International Airport, which is one of the busiest primary commercial service airports in the country. The other two airports are general aviation reliever airports. The Phoenix Goodyear Airport is experiencing increasing aviation activity, and the area surrounding the airport is rapidly developing. The other general

aviation airport in the system, Phoenix Deer Valley Airport, was the busiest general aviation airport in the country in 2006 and has a long history of supporting industrial/commercial development in the area.

One of the goals of the City of Phoenix Aviation Department is for each of the three airports in its system to be self-sufficient. This goal is also advanced by the FAA. General aviation airports across the country typically do not meet this goal and require direct financial support from the airport sponsor.

All revenue generated on airport property is pledged exclusively to on-airport operations and improvements. It is illegal to take any revenue generated on airport property and transfer it to any other governmental department; however, it is acceptable to transfer airport-generated revenue between the airports as necessary.

OPERATING REVENUE AND EXPENSES

Operating revenue sources for the Phoenix Goodyear Airport include hangar rental, fuel sales, building and facility leases, and tie-down and outside storage fees. Operating expenses fall into several categories, including personnel services, contractual services, commodities, and other internal expenses. As shown in **Table 6C**, the operating revenues generated by the airport have exceeded the operating expenses over each of the previous four years, although total positive income has decreased by 37 percent over the same period.

TABLE 6C
Historical and Current Operating Revenues and Expenses
Phoenix Goodyear Airport

	2003	2004	2005	2006
Revenue Center		**OPERATING REVENUE**		
Hangars	$793,500	$860,000	$886,500	$896,700
Tie-Downs & Outside Storage	$130,500	$177,700	$237,300	$128,600
Net Fuel Sales	$543,800	$377,700	$328,300	$340,600
Land Leases	$24,700	$15,100	$24,800	$25,100
Building & Facility Rental	$299,200	$299,200	$299,200	$299,200
Fuel Flowage Fees	$10,300	$26,100	$29,700	$28,100
Miscellaneous Receipts	$11,200	$17,500	$14,000	$7,000
TOTAL REVENUE	**$1,813,200**	**$1,773,300**	**$1,819,800**	**$1,725,300**
Expense Center		**OPERATING EXPENSES**		
Personnel Services	$532,200	$652,100	$729,800	$704,000
Contractual Services	$173,300	$195,800	$204,200	$274,300
Commodities	$26,700	$27,600	$59,300	$32,300
Internal	$109,400	$55,600	$90,400	$102,200
Other Expenses	$0	$0	$0	$0
Capital Equipment Outlay	$0	-$100	$0	$7,100
TOTAL EXPENSES	**$841,600**	**$931,000**	**$1,083,700**	**$1,119,900**
OPERATING INCOME/(LOSS)	**$971,600**	**$842,300**	**$736,100**	**$605,400**

Source: Airport records

The largest revenue source for the airport is the income generated from hangar leases, which represents nearly 50 percent of total revenue. Other aircraft storage fees, such as tie-downs, outside aircraft storage space, and building and facility leases represent another 26 percent of revenue. Net fuel sales represent 22 percent of airport revenues.

The largest expense category for the airport is personnel services in the form of salaries and benefits. Employee costs represent 66 percent of total expenses. Contractual services, which include ongoing services such as trash collection and cleaning services, is the next largest expenses category, representing 21 percent.

On an infrequent basis, the airport may need to make capital equipment purchases such as maintenance vehicles. This expense is reflected in the capital equipment outlay category. This category is not to be confused with capital improvement projects such as airfield maintenance or improvements or monies used in federal grant matching programs. Airfield improvement capital projects or matching of federal grants would be funded primarily through positive operating balances, if available.

Based on budget accounting, the airport is self-sufficient from an operating standpoint, as annual operating revenues exceed annual operating expenses. That is, if the airport did not take on significant additional contractual debt or other large expenses, it would continue to show a positive operating balance. Of course, any positive operating balance generated by the airport can only be spent on airport improvements as defined by federal grant assurances. Typically, at Phoenix Goodyear Airport, any positive operating balance is utilized to offset capital expenditures and ongoing maintenance of airport facilities.

Table 6D presents the total capital improvement outlay provided by the City of Phoenix Aviation Department for capital improvements for each of the previous four years. These capital improvement outlays were for projects such as infrastructure improvements, taxiway reconstruction, and other associated planning projects. In 2003, due to capital needs, timing, and funding availability, the Phoenix Goodyear Airport had a net positive balance of $316,400 after capital expenditures. Therefore, in 2003 GYR was able to cover the cost of capital improvements from the operating revenue fund balance and not require any funding supplements or assistance from Phoenix Sky Harbor. From 2004 through 2006, however, GYR had net negative balances of $4,715,600, $1,538,300, and $2,620,400, respectively; therefore, the positive revenue balance was not sufficient to cover the cost of the needed capital improvement projects. **Since 2004, GYR has a combined net negative balance of $8,557,900. Because of the imbalance between the operating revenues and cost of capital improvements for the last three years, GYR has needed to obtain an infusion of funds from Phoenix Sky Harbor.**

TABLE 6D Capital Improvement Outlay Phoenix Goodyear Airport	2003	2004	2005	2006
Capital Improvement Outlay	$655,200	$5,557,900	$2,274,400	$3,225,800
Operating Income/(Loss)	$971,600	$842,300	$736,100	$605,400
NET INCOME/(LOSS)	**$316,400**	**($4,715,600)**	**($1,538,300)**	**($2,620,400)**

Source: Airport records

On-going financial support for capital expenditures at Phoenix Goodyear Airport cannot be guaranteed. Various factors, such as the capital needs at the other two airports in the system, may limit the capital funds available to GYR. As a result, strategies such as those presented in this master plan should be pursued in order to increase overall revenue generated by the airport in order to cover the costs associated with capital expenditures in addition to operating costs.

ECONOMIC BENEFIT OF AVIATION

Phoenix Goodyear Airport is a vital contributor to the dynamic economy of the City of Phoenix, the City of Goodyear, and the surrounding communities. The airport serves as a gateway that welcomes a wide variety of aviation activity from smaller general aviation operators to larger corporate operators, to the largest commercial airplanes in the national fleet. In addition to providing transportation services to people and businesses, the airport itself is a center of employment for more than 1,000 workers who spend their payroll checks within the local economy.

The airport service area includes a population base of over one million people, encompassing the southwestern Phoenix Metropolitan area. Without question, Phoenix Goodyear Airport has been a catalyst, both spurring and maintaining economic growth in the region.

In 2003, the Arizona Department of Transportation – Aeronautics Division, in cooperation with Arizona State University, completed a study entitled *The Economic Impacts of Aviation in Arizona*. This study indicated that in 2002, aviation activity in the State of Arizona generated $38.5 billion in total economic activity. More than 470,000 Arizona jobs are related directly or indirectly to aviation. These jobs created almost $15 billion in wages and benefits for Arizona residents.

General aviation activity and support services in Arizona generated $842 million in economic activity in 2002. More than 9,800 Arizonians are employed directly in the general aviation industry and receive wages and benefits of $362 million. Over 60 percent of the economic contribution of general aviation comes from aircraft sales and services. This includes the sale of private aircraft

and aircraft parts, as well as aircraft rentals, fuel, maintenance, support services and storage. The spending of persons directly employed by general aviation supports an additional 15,000 jobs in other sectors of the Arizona economy. General aviation's total contribution to the Arizona economy is $1.8 billion. **Table 6E** shows the economic impact of general aviation on the Arizona economy.

By 2025, general aviation is forecast to account for a total of 40,501 jobs and nearly $3 billion in economic impact.

TABLE 6E
Economic Impacts of General Aviation
State of Arizona (2002)

	Non-scheduled Carriers	Aircraft Sales and Service	Aerial Services	Gov't Services	Airport Admin.	Airport Construction	Total
PRIMARY ECONOMIC IMPACT							
Economic Activity ($ million)	$64	$528	$195	$13	$18	$24	$842
Payroll ($ million)	$27	$223	$82	$11	$9	$11	$363
Employment	635	5,920	2,456	260	297	53	9,621
TOTAL ECONOMIC IMPACT							
Economic Activity ($ million)	$137	$1,119	$421	$29	$40	$54	$1,800
Payroll ($ million)	$57	$472	$174	$17	$20	$23	$763
Employment	1,611	15,015	6,229	480	753	647	24,735
Category Includes:	Commuter, Unscheduled Carriers	Sales, Rentals, Parts, FBO Services, Storage	Agricultural, Photography, Aerial Mapping, Air Sightseeing, Air Ambulance	Air Traffic Control, Other FAA, Customs, Postal Service, Weather Services, Airport Security	Management, Custodial, Marketing	Maintenance, Capital Improvements	

Source: The Economic Impact of Aviation in Arizona (ADOT 2002)

PHOENIX GOODYEAR AIRPORT ECONOMIC BENEFITS

As part of the study, an analysis was conducted of the economic benefits of the Phoenix Goodyear Airport specifically. The presence of the airport creates both tangible and intangible benefits. The intangible effects are represented by the trickle-down effect of spending on the local economy. **Table 6F** presents the primary (direct) and total (including multiplier) effect that the airport has of the local economy.

TABLE 6F
Economic Benefits
Phoenix Goodyear Airport

	On-Airport Direct	Visitor Spending	Total Primary Impacts	Total Impacts including Multiplier Effects
Employment	1,097	NA	1,097	2,493
Payroll (mil)	$52	NA	$52	$108.50
Sales (mil)	$188.60	NA	$188.60	$393.01

Source: The Economic Impact of Aviation in Arizona, (ADOT-2002)

As can be seen, the airport employed more than 1,000 people in 2002. Much of this figure is represented by the presence of the large aircraft maintenance business on the airfield. These on-airport jobs generated $52 million in annual payroll and sales of $188 million. Including multiplier effects, the airport generated approximately $108 million in payroll and $393 million in sales.

The future looks very bright for the Phoenix Goodyear Airport. The western Phoenix metropolitan area is growing faster than Maricopa County as a whole, and the county is one of the fastest growing counties in the county. The airport is forecast to increase from a current operational level of 108,000 to nearly 400,000 by 2025. Based aircraft are forecast to increase from 209 to 619 by 2025. Currently, there are three based jet aircraft. By 2025, this figure is forecast to increase to 33. Jet aircraft are more sophisticated than piston powered aircraft and are more expensive to maintain. The economic benefit of the Phoenix Goodyear Airport is significant.

SUMMARY

The best means to begin implementation of the recommendations in this master plan is to first recognize that planning is a continuous process that does not end with completion and approval of this document. Rather, the ability to continuously monitor the existing and forecast status of airport activity must be provided and maintained. The issues upon which this master plan are based will remain valid for a number of years. The primary goal is for the airport to best serve the air transportation needs of the region, while continuing to be economically self-sufficient.

The actual need for facilities is most appropriately established by airport activity levels rather than a specified date. For example, projections have been made as to when additional hangars may be needed at the airport. In reality, however, the timeframe in which the development is needed may be substantially different. Actual demand may be slower to develop than expected. On the other hand, high levels of demand may establish the need to accelerate the development. Although every effort has been made in this master planning process to conservatively estimate when facility development may be needed, aviation demand will dictate when facility improvements need to be delayed or accelerated.

The real value of a usable master plan is in keeping the issues and objectives in the minds of the managers and decision-makers so that they are better able to recognize change and its effect. In addition to adjustments in aviation demand, decisions made as to when to undertake the improvements recommended in this master plan will impact the period that the plan remains valid. The format used in this plan is intended to reduce the need for formal and costly updates by simply adjusting the timing. Updating can be done by the manager, thereby improving the plan's effectiveness.

In summary, the planning process requires that airport management consistently monitor the progress of the airport in terms of aircraft operations and

based aircraft. Analysis of aircraft demand is critical to the timing and need for new airport facilities. The information obtained from continually monitoring airport activity will provide the data necessary to determine if the development schedule should be accelerated or decelerated.

Appendix A

GLOSSARY OF TERMS

Glossary of Terms

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 non-regulatory 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: An alphabetic classification of aircraft based upon 1.3 times the stall speed in a landing configuration at their maximum certified landing weight.

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

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

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 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 enroute 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 enroute phase of flight.

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.

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

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.

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

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

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

CATEGORY II: An ILS that provides acceptable guidance information to an aircraft from the coverage limits of the ILS to the point at which the localizer course line intersects the glide path at a decision height of 50 feet above the horizontal plane containing the runway threshold.

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

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

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

CLASS A AIRSPACE: See Controlled Airspace.

CLASS B AIRSPACE: See Controlled Airspace.

CLASS C AIRSPACE: See Controlled Airspace.

CLASS D AIRSPACE: See Controlled Airspace.

CLASS E AIRSPACE: See Controlled Airspace.

CLASS G AIRSPACE: See Controlled Airspace.

CLEAR ZONE: See Runway Protection Zone.

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

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

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

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

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

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

- *CLASS A:* Generally, the airspace from 18,000 feet mean sea level (MSL) up to but not including flight level FL600. All persons must operate their aircraft under IFR.

- *CLASS B:* Generally, the airspace from the surface to 10,000 feet MSL surrounding the nation's busiest airports. The configuration of Class B airspace is unique to each airport, but typically consists of two or more layers of air space and is designed to contain all published instrument approach procedures to the airport. An air traffic control clearance is required for all aircraft to operate in the area.

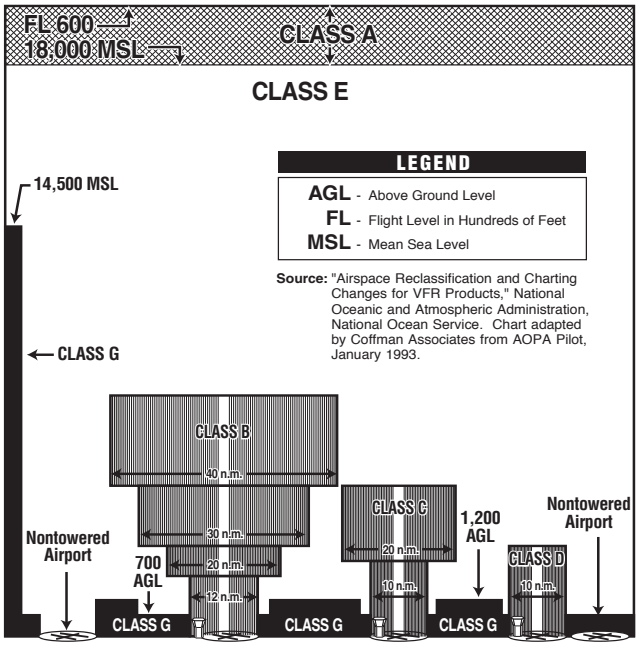
- *CLASS C:* Generally, the airspace from the surface to 4,000 feet above the airport elevation (charted as MSL) surrounding those airports that have an operational control tower and radar approach control and are served by a qualifying number of IFR operations or passenger enplanements. Although individually tailored for each airport, Class C airspace typically consists of a surface area with a five nautical mile (nm) radius and an outer area with a 10 nautical mile radius that extends from 1,200 feet to 4,000 feet above the airport elevation. Two-way radio communication is required for all aircraft.

- *CLASS D:* Generally, that airspace from the surface to 2,500 feet above the air port elevation (charted as MSL) surrounding those airports that have an operational control tower. Class D airspace is individually tailored and configured to encompass published instrument approach proce dures. 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."

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

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

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

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

- *TAKEOFF DISTANCE AVAILABLE (TODA):* The TORA plus the length of any remaining runway and/or clear way beyond the far end of the TORA;

- *ACCELERATE-STOP DISTANCE AVAILABLE (ASDA):* The runway plus stopway length declared available for the acceleration and deceleration of an aircraft aborting a takeoff; and

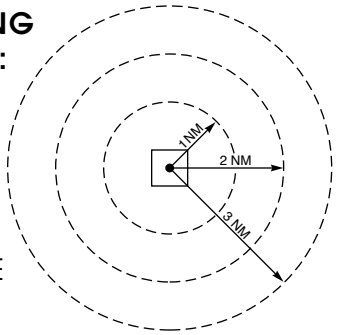
- *LANDING DISTANCE AVAILABLE (LDA):* The runway length declared available and suitable for landing.

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 A-weighted 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."

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 non-scheduled 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 ar 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.

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.

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."

FINDING OF NO SIGNIFICANT IMPACT (FONSI): A public document prepared by a Federal agency that presents the rationale why a proposed action will not have a

significant effect on the environment and for which an environmental impact statement will not be prepared.

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

FLIGHT LEVEL: A designation for altitude within controlled airspace.

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

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

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.

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

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

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

GLOBAL POSITIONING SYSTEM (GPS): A system of 24 satellites used as reference points to enable navigators equipped with GPS receivers to determine their latitude, longitude, and altitude.

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

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.

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.

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

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 enroute 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.

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.

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.)

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.

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.

OPERATION: A take-off or a landing.

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.

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 Sevice Volume. PVC conditions exist when the cloud ceiling is less than 500 feet and visibility is less than one mile.

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 enroute 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 enroute 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 END IDENTIFIER LIGHTS (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 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.

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

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

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

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

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

SPECIAL-USE AIRSPACE: Airspace of defined

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

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

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

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

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

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

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

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

STANDARD TERMINAL ARRIVAL (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.

TACTICAL AIR NAVIGATION (TACAN): An ultra-high 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 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.

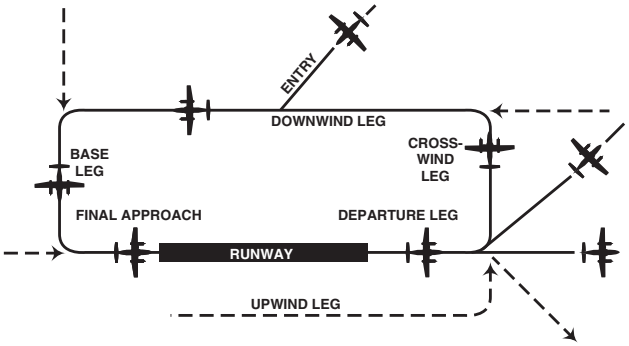
TOUCHDOWN: The point at which a landing aircraft makes contact with the runway surface.

TOUCHDOWN 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.

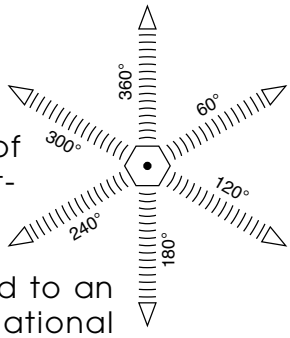
TRAFFIC PATTERN: The traffic flow that is prescribed for aircraft landing at or taking off from an airport. The components of a typical traffic pattern are the upwind leg, crosswind leg, downwind leg, base leg, and final approach.



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."

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

VERY HIGH FREQUENCY/ OMNIDIRECTIONAL RANGE STATION (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 STATION/ 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."

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)

APV: instrument approach procedure with vertical guidance

ARC: airport reference code

ARFF: aircraft rescue and firefighting

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: automated weather observation station

BRL: building restriction line

CFR: Code of Federal Regulations

CIP: capital improvement program

DME: distance measuring equipment

DNL: day-night noise level

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

DTWL: runway weight bearing capacity fo 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

LOC: ILS localizer

LOM: compass locator at ILS outer marker

LORAN: long range navigation

MALS: medium intensity approach lighting system

MALSR: medium intensity approach lighting system with runway alignment 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 rulemaking

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

REIL: runway end identifier 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 sequenced flashers

SSALR: 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 type landing gear

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

TACAN: tactical air navigational aid

TDZ: touchdown zone

TDZE: touchdown zone elevation

TAF: Federal Aviation Administration (FAA) Terminal Area Forecast

TODA: takeoff distance available

TORA: takeoff runway available

TRACON: terminal radar approach control

VASI: visual approach slope indicator

VFR: visual flight rules (FAR Part 91)

VHF: very high frequency

VOR: very high frequency omni-directional range

VORTAC: VOR and TACAN collocated

Appendix B

ENVIRONMENTAL EVALUATION

Appendix B
ENVIRONMENTAL EVALUATION

A review of the potential environmental impacts associated with proposed airport projects is an essential consideration in the airport master plan process. The primary purpose of this Appendix is to review the proposed improvement program for Phoenix Goodyear Airport to determine whether the proposed actions could, individually or collectively, have the potential to significantly affect the quality of the environment. The information contained in this appendix represents the compilation of several environmental resources and analysis by the consultant. This evaluation considers all environmental categories outlined in FAA Order1050.1E - *Environmental Impacts: Policies and Procedures,* and Order 5050.4A - *Airport Environmental Handbook.*

PROPOSED DEVELOPMENT

The Phoenix Goodyear Airport is forecast to grow significantly in both based aircraft and operations over the 20-year planning horizon considered in this master plan. The Recommended Master Plan Concept, as presented on Exhibit 5A, presents a plan for the City of Phoenix to help guide the decision-making process with regard to airport development. The following is a discussion of planned major projects.

AIRSIDE DEVELOPMENT

Airside development is typically defined as those items related to the runway and taxiway system. The most significant airside development project is the shifting of Runway 3-21 approximately 300 feet to the west. This shift will allow the airport to correct an existing non-standard runway safety area (RSA). Currently, the RSA extends approximately 300 beyond airport property to the east of the runway.

The runway protection zone (RPZ) is a trapezoidal area extending off each runway end. The RPZs should only have land uses present that are compatible with airport activity. The RPZ lands should not be developed in such a manner that encourages the congregation of people. The master plan concept recommends acquisition of those RPZ lands that extend beyond airport property.

Due to forecast capacity constraints, a parallel runway designed to accommodate smaller general aviation aircraft is proposed. The parallel runway would measure 4,300 feet long by 75 feet wide and it would be located 700 feet to the south of the existing runway. The parallel runway would be intended primarily for local operations or operations by small aircraft.

LANDSIDE DEVELOPMENT

The airport encompasses approximately 793 acres of land. Most of the developed landside property is located to the southeast of Runway 21. There are six T-hangar structures located to the southwest of the runway as well. There are over 348 acres of undeveloped property at the airport. The recommended master plan concept considers the full build-out potential of the undeveloped landside property. It should be noted that the full build-out would represent an overall vision for the airport that extends beyond the 20-year scope of the master plan as the hangars depicted exceed those needs established in the forecasts.

The north side of the runway is currently used for temporary storage of large aircraft. This entire area is considered for redevelopment as airport businesses and aircraft storage for larger general aviation aircraft. Several north side areas are planned for corporate aviation development. Also considered are large apron areas that would front conventional hangars intended for use by airport businesses. The replacement airport traffic control tower (ATCT) would also be located to the north of the runway as well.

The south side of the existing runway is considered for development to accommodate smaller general aviation aircraft. Large areas for T-hangars and individual box hangars are proposed. In addition, a large public ramp fronted by several airport businesses occupying conventional hangars is also considered.

The landside development plan allows the airport to accommodate all sizes of general aviation aircraft, while providing an adequate level of separation between the large and small aircraft.

ENVIRONMENTAL EVALUATION

A review of the potential environmental impacts associated with proposed airport projects is an essential consideration in the airport master plan process. The primary purpose of this section is to review the proposed improvement program at Phoenix Goodyear Airport to determine whether the proposed actions could, individually or collectively, have the potential to significantly affect the quality of the environment. The information contained in this section was obtained from previous studies, various internet websites, and analysis by the consultant.

Construction of the improvements depicted on the Airport Layout Plan will require compliance with the *National Environmental Policy Act (NEPA) of 1969*, as amended, to receive federal financial assistance. For projects not "categorically excluded" under FAA Order 1050.1E, *Environmental Impacts: Policies and Procedures*, compliance with NEPA is generally satisfied through the preparation of an Environmental Assessment (EA). In instances in which significant environmental impacts are expected, an Environmental Impact Statement (EIS) may be required. While this portion of the Master Plan is not designed to satisfy the NEPA requirements for a categorical exclusion, EA, or EIS, it is intended to supply a preliminary review of environmental issues that would need to be analyzed in more detail within the NEPA process. This evaluation considers all environmental categories required for the NEPA process as outlined in FAA Order 1050.1E and Order 5050.4B, *National Environmental Policy Act (NEPA) Implementation Instructions for Airport Actions.*

ENVIRONMENTAL ANALYSIS

FAA Orders 1050.1E and 5050.4B contain a list of the environmental categories to be evaluated for airport projects. Of the 20 plus environmental categories, the following resources are not found within the airport environs:

- Coastal Resources
- Department of Transportation Act Section 4(f) Properties
- Environmental Justice Areas and Children's Environmental Health Risks
- Wetlands and Waters of the U.S.
- Wild and Scenic Rivers

The following sections describe potential impacts to resources present within the airport environs. These resources were described in detail within Chapter One of this study.

WETLANDS

As discussed within Chapter One, the U.S. Army Corps of Engineers (USACE) has previously determined that no wetlands are located on airport property. Further coordination with the U.S. Army Corps of Engineers and local agencies may be required prior to construction of the proposed projects as this determination is over five years old. A *Clean Water Act*, Section 404, Initial Assessment Form shall be completed and submitted to the City's Section 404 Coordinator.

FLOODPLAINS

Chapter One described a number of floodplains present at and adjacent to airport property. As depicted on **Exhibit B1**, construction of the run-up area east of the Runway 3 end and the construction of the east end of parallel Runway 3R-21L will occur in a 100-year floodplain and designated floodway. A drainage study will be needed to determine whether the proposed projects will diminish the capacity of the floodplain and floodway, thereby resulting in potential impacts to life or property.

WATER QUALITY

The airport will need to continue to comply with an AZPDES Stormwater Multi-sector General Operations Permit. With regard to construction activities, the airport and all applicable contractors will need to obtain and comply with the requirements and procedures of the construction-related AZPDES General Permit number AZG2003-001, including the preparation of a *Notice of Intent* and a *Stormwater Pollution Prevention Plan*, prior to the initiation of product construction activities.

As development occurs at the airport, the AZPDES Stormwater Multi-sector General Permit will need to be modified to reflect the additional industrial activities, impervious surfaces, and any stormwater retention facilities. The addition and removal of impervious surfaces may require modifications to this permit should drainage patterns be modified.

Precipitation events causing surface water runoff drains into the Roosevelt Irrigation District (RID) drainage canal that bisects the airport. As an industrial facility, the airport is required to ensure that activities that could cause pollutants to be washed into the surface water collection systems be controlled. The City of Phoenix is currently regulated under the EPA Multi-Sector General Permit 2000 (MSGP 2000).

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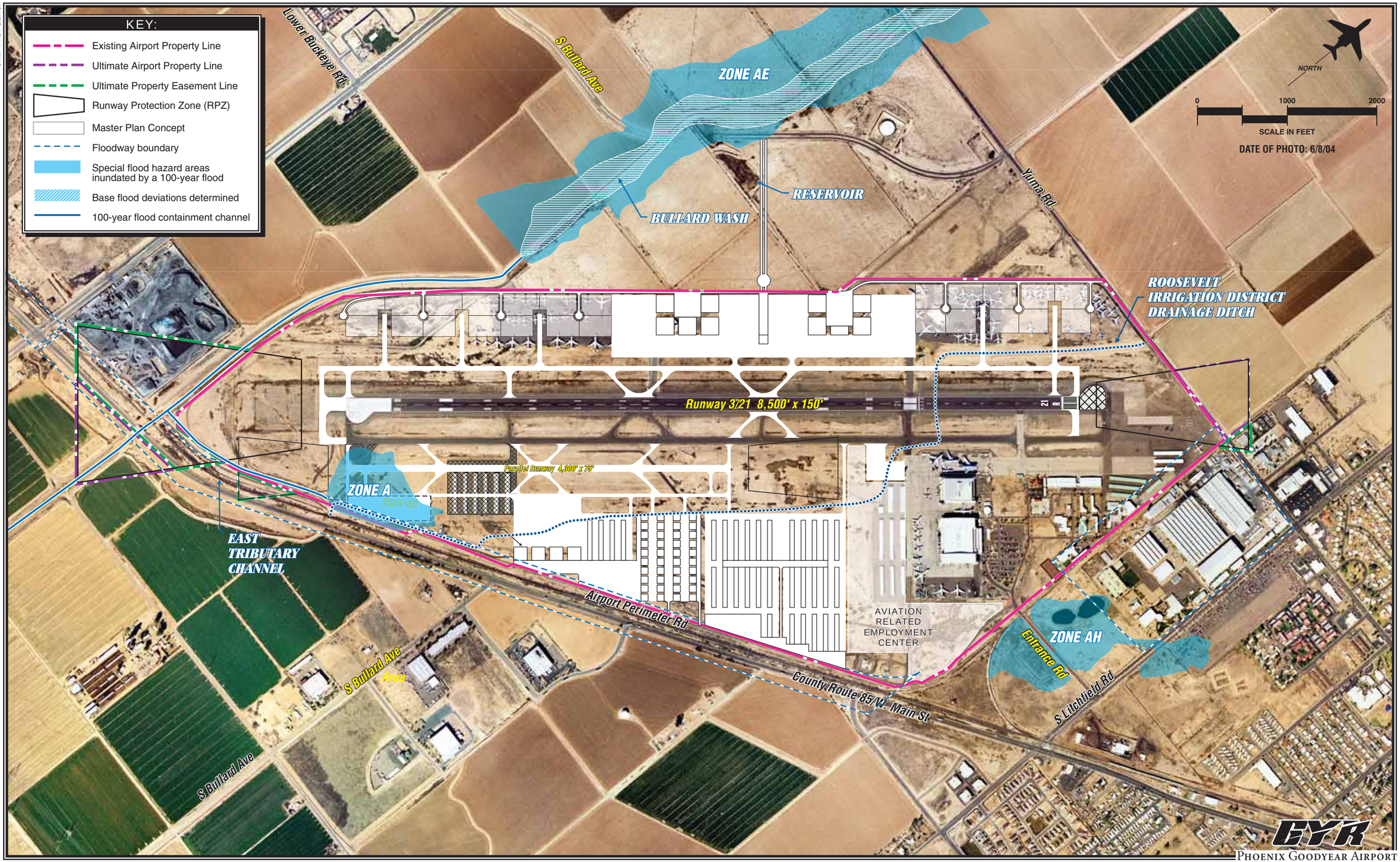

PHOENIX GOODYEAR AIRPORT
Exhibit B1
FLOOD PLAINS

The RID drainage canal is underground where it traverses under the runway. Portions of the canal to the northwest and southeast of the runway are not covered. Prior to facility construction, portions of the drainage canal may need to be routed through culverts.

BIOTIC RESOURCES

Biotic resources were discussed in detail in Chapter One. Since the completion of Chapter One, the federally listed species which may occur in Maricopa County has changed slightly. **Table B1** lists the threatened, endangered, and candidate species with the potential to occur in Maricopa County as of July 2006.

TABLE B1
Threatened, Endangered, and Candidate Species
Maricopa County

COMMON NAME	SCIENTIFIC NAME	STATUS
Arizona cliffrose	Purshia subintegra	Endangered
Bald eagle	Haliaeetus leucocephalus	Threatened
California brown pelican	Pelecanus occidentalis californicus	Endangered
Desert pupfish	Cyprinodon macularius	Endangered
Gila chub	Gila intermedia	Endangered
Gila topminnow	Poeciliopsis occidentalis occidentalis	Endangered
Lesser long-nosed bat	Leptonycteris curasoae yerbabuenae	Endangered
Mexican spotted owl	Strix occidentalis lucida	Threatened
Razorback sucker	Xyrauchen texanus	Endangered
Sonoran pronghorn	Antilocapra Americana sonoriensis	Endangered
Southwestern willow flycatcher	Empidonax traillii extimus	Endangered
Yuma clapper rail	Rallus longirostris yumanensis	Endangered
Yellow-billed cuckoo	Coccyzus americanus	Candidate

Source: U.S. Fish and Wildlife Service, Maricopa County Species List. July 2006

It is unlikely that any of these species are present in the areas proposed for development, as the habitat which supports most of them consists of treed areas or locations near rivers, streams, or marshes; however, field surveys would be needed to verify this determination.

According to the Arizona Game and Fish Department's On-Line Environmental Review Tool, two species listed as endangered (Southwestern willow flycatcher and Yuma clapper rail) have been documented to occur within three miles of Phoenix Goodyear Airport. The Department recommends biological surveys to be conducted prior to construction. Further coordination with the U.S. Fish and Wildlife Service and the Arizona Fish and Game Department is required.

AIR QUALITY

According to the most recent update (December 5, 2006) contained on the Environmental Protection Agency's (EPA) Greenbook website, Maricopa County is currently in non-attainment for 8-hour Ozone and PM_{10}. To determine the significance of potential air quality impacts, an emissions inventory is needed to determine if the project meets General Conformity outlined within the State Implementation Plan (SIP).

HAZARDOUS MATERIALS, POLLUTION PREVENTION, AND SOLID WASTE

In September 2005, the EPA released a fact sheet announcing the completion of the five-year review for the Phoenix Goodyear Airport (South) Superfund Site. The review was completed between March and September of 2005. The results indicated that the contaminant concentrations in groundwater at the Airport's Superfund Site has been reduced, and treated groundwater from the treatment systems has met cleanup goals throughout the period of operation. However, groundwater still contains levels above specified cleanup goals. Results of EPA's five-year review also indicate that vapor intrusion may be an issue in enclosed spaces. As such, assessment of the potential and mitigation of vapor intrusion may be warranted with airport development. **Exhibit B2** depicts the existing groundwater plumes, the level of contamination, and the location of the groundwater treatment system and well vaults.

The size of the Upper Aquifer (Subunit A) was nominally 400 acres and had a peak concentration of 2600 ug/L (micrograms per liter). The cleanup has successfully removed the TCE down to a current peak concentration of 80 ug/L, removing approximately 83 percent of the estimated mass. Current remedial system operations for Subunit A groundwater includes pumping from 12 extraction wells to a vertical air stripping column. Treated groundwater is then re-injected from 16 injection wells into the aquifer.

The Lower Aquifer (Subunit C) provides the drinking water for the area. The aquifer contains TCE in two plumes (northern and southern). The original footprint of the two plumes is 60 acres each. The cleanup of the southern plume has reduced the TCE from a peak concentration of 150 ug/L to 15 ug/L, removing approximately 75 percent of the estimated mass to date. The cleanup of the southern plume is projected to reach drinking water standards within the next 5 years. The northern plume is projected to continue cleanup for a projected additional 12-14 years.

As depicted on **Exhibit B2**, numerous extraction, injection, and monitoring wells are located throughout the project area. The extraction and injection wells should be avoided during construction if possible. By removing, altering, or interrupting these facilities, the City of Phoenix risks becoming a responsible party for the

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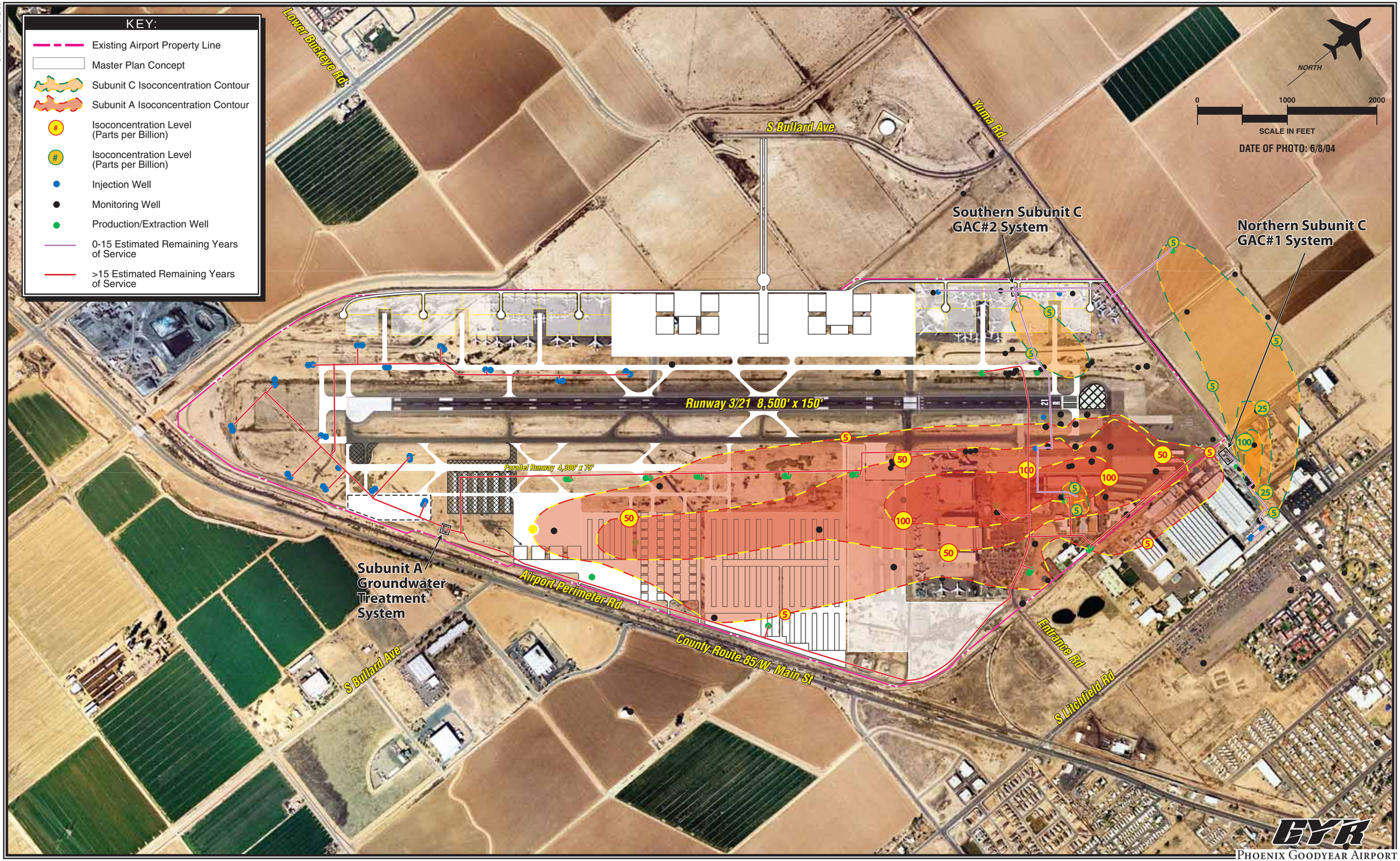


PHOENIX GOODYEAR AIRPORT
Exhibit B2
GROUNDWATER CLEANUP INFRASTRUCTURE

cleanup of the Phoenix Goodyear Airport (South) Superfund Site. In addition to the extraction and injection wells, there are pipelines located four feet below the ground surface that connect the wells to the groundwater treatment systems. These pipelines should also be avoided during construction for the City to avoid becoming a responsible party for the cleanup process. The monitoring wells could be abandoned and re-drilled in a similar area at a cost of approximately $25,000 each.

The potential relocation of injection and extraction wells is more complicated. The locations, extraction rates, and configuration of each well have been negotiated with the EPA under a Superfund Consent Order. These locations are based on groundwater modeling to determine optimum locations for these wells. To abandon and re-drill an extraction or injection well would require approval from the EPA. The cost to abandon an existing well, drill a new well, set a new well vault, and extend a new pipeline and electricity is estimated at approximately $100,000.

Immediate construction of proposed projects on the southeast and northwest portions of airport property would result in impacts to numerous extraction, injection, and monitor wells which are located throughout the area. Careful planning must be executed in order to prevent disturbance of extraction and injection wells until concentration levels reach acceptable levels and the site remediation is completed. Coordination among the EPA, the Arizona Department of Environmental Quality, and the airport sponsor, will be required prior to construction to ensure that the proposed projects will not disturb the continual efforts to eliminate groundwater contaminates.

The airport is aware of the presence of asbestos and lead-based paint in Hangar 18. This hangar is the large maintenance hangar closest to the runway, approximately 3,000 feet to the southwest from the airport terminal building. If the existing building is to be removed, relocated, or rehabilitated, then procedures that are in compliance with EPA regulations will need to be undertaken.

HISTORICAL, ARCHITECTURAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

The proposed project includes the removal of T-hangars on the east side of the airport. The first group of T-hangers is located southeast of the existing runway and will be removed to allow for the construction of a parallel runway. The second group of T-hangars is located east of the Runway 21 displaced threshold. The relocation of these T-hangars will allow for the construction of the aviation-related employment center. It is not anticipated that these T-hangars would be eligible for listing on the National Register of Historic Places as they are less than 50 years old.

Numerous T-hangars and corporate aviation parcels are proposed in areas which have not been previously disturbed. It is anticipated that these areas would need to be surveyed for cultural resources prior to construction. Coordination with the

State Historic Preservation Office is required prior to project implementation. An Archaeology Assessment request will also need to be submitted to the City Archaeologist for any projects involving subsurface excavation.

Several studies have been completed at the airport in the past. **Table B2** summarizes these reports.

TABLE B2
Previous Cultural, Architectural, and Archaeological Studies
Phoenix Goodyear Airport

Quad	Township, Range and Section	Report Reference	Project Type	Results	PGM Number
Perryville, Tolleson	T1N R1W Sections 17 and 20	Hiser, Donald H., 1978, Archaeological Survey at Phoenix-Litchfield Municipal Airport, Letter Report, Ms. on file, City of Phoenix Archeology Office.	Survey	Nothing encountered	NA
Tolleson, Perryville	T1N R1W Sections 16, 17, 20, and 21	Cable, John, 1985, Archaeological Survey of the Phoenix-Litchfield Municipal Airport, Goodyear, Arizona, Letter report, Ms. on file, City of Phoenix Archaeology Office.	Survey	Diffuse Artifact scatter	1985-09
Tolleson, Perryville	T1N R1W Sections 16, 20, and 21	Laine, Serelle E., 2006, *Archaeological Monitoring of Pipeline Repairs Within a Portion of the Phoenix Goodyear Airport, Goodyear, Maricopa County, Arizona*, Carter Burgess Project Report No. 2005-026	Monitoring	Nothing encountered	2005-33

Source: City of Phoenix Aviation Department

CONSTRUCTION IMPACTS

Construction impacts typically relate to the effects on specific impact categories, such as air quality or noise, during construction. The use of best management practices (BMPs) during construction is typically a requirement of construction-related permits such as a AZPDES General Permit Number (AZG2003-001) and fugitive dust control (Maricopa County Rule 310) permit. Use of these measures typically alleviates potential resource impacts.

Construction-related noise impacts are not anticipated as residential development does not border the airport. Residential areas to the east are buffered by open space, light industrial uses, two roads (County Route 85 and S. Litchfield Road), and the Union Pacific Railroad. Residential areas to the west and northwest are buffered by agricultural fields. Furthermore, these impacts typically do not arise unless construction is being undertaken during early morning, evening, or nighttime hours.

Construction-related air quality impacts can be estimated. Air emissions related to construction activities will be short-term in nature and can be minimized through established BMPs and will be included in the air emission inventory.

SOCIOECONOMIC IMPACTS

The proposed project includes the acquisition of approximately 28 acres located within the runway protection zones (RPZs) for Runway 3-21. This acquisition is recommended so the airport will have ownership of the RPZ to prevent incompatible land uses within the RPZ. The acquisition will not include the relocation of residents or businesses. In addition, avigation easements totaling 36 acres are recommended so the airport can obtain airspace ownership and prevent obstructions in the approach surface from developing.

LIGHT EMISSIONS AND VISUAL IMPACTS

Airside development will include a 300-foot shift of Runway 3L-21R to the west, the introduction of a new full-length parallel taxiway, various connector taxiways, installation of medium intensity approach lighting system with runway alignment indicator lights (MALSR), and a parallel runway 700 feet south of the existing runway.

Landside development at the airport will create a large number of new hangar space, as well as corporate aviation parcels and an aviation-related employment center.

These new facilities are not anticipated to create an annoyance among people or interfere with normal activities as the airport is surrounded by open space and light industrial land uses. The proposed projects are not anticipated to be considered objectionable when considered with the existing surrounding environment.

NOISE EXPOSURE ANALYSIS

Aircraft sound emissions are often the most noticeable environmental effect an airport will produce on the surrounding community. If the sound is sufficiently loud or frequent in occurrence, it may interfere with various activities or otherwise be considered objectionable.

To determine the noise-related impacts that the proposed development could have on the environment surrounding Phoenix Goodyear Airport, noise exposure patterns were analyzed for both existing airport activity conditions and projected long term activity conditions.

The basic methodology employed to define aircraft noise levels involves the use of a mathematical model for aircraft noise predication. The Yearly Day Night Average Sound Level (DNL) is used in this study to assess aircraft noise. DNL is the metric currently accepted by the FAA, the EPA, and the Department of Housing and Urban Development (HUD) as an appropriate measure of cumulative noise exposure. These three federal agencies have each identified the 65 DNL noise contour as the threshold of incompatibility, meaning that noise levels below 65 DNL are considered compatible with underlying land uses.

DNL is defined as the average A-weighted sound level as measured in decibels (dB) during a 24-hour period. A 10-dB penalty applies to noise events occurring at night (10:00 p.m. to 7:00 a.m.). DNL is a summation metric which allows objective analysis and can describe noise exposure comprehensively over a large area. Most federally funded airport noise studies use DNL as the primary metric for evaluating noise.

Since noise decreases at a constant rate in all directions from a source, points of equal DNL noise levels are routinely indicated by means of a contour line. The various contour lines are then superimposed on a map of the airport and its environs. It is important to recognize that a line drawn on a map does not imply that a particular noise condition exists on one side of the line and not on the other. DNL calculations do not precisely define noise impacts. Nevertheless, DNL contours can be used to: (1) highlight existing or potential incompatibilities between an airport and any surrounding development; (2) assess relative exposure levels; (3) assist in the preparation of airport environs land use plans; and (4) provide guidance in the development of land use control devices, such as zoning ordinances, subdivision regulations, and building codes.

The noise contours for Phoenix Goodyear Airport have been developed from the Integrated Noise Model (INM), Version 6.2a. The INM was developed by the Transportation Systems Center of the U.S. Department of Transportation at Cambridge, Massachusetts, and has been specified by the FAA as one of the two models acceptable for federally funded noise analysis.

The INM is a computer model which accounts for each aircraft along flight tracks during an average 24-hour period. These flight tracks are coupled with separate tables contained in the database of the INM, which relate to noise, distances, and engine thrust for each make and model of aircraft type selected.

Computer input files for the noise analysis contain operational data, runway utilization, aircraft flight tracks, and fleet mix as projected in the plan. The operational data and aircraft fleet mix are summarized in **Table B3**. These estimates were derived after review of instrument flight plans maintained by the FAA and existing airport records.

The runway use percentages are summarized in **Table B4**.

TABLE B3
Noise Model Input: Aircraft Operations
Phoenix Goodyear Airport

Aircraft Type	INM Descriptor	Base Year 2004	Short Term (5 Years)	Long Term (20 Years)
ITINERANT OPERATIONS				
Turbojet				
Business Jet	CL600	150	780	2,800
Business Jet	GV	14	104	400
Business Jet	GIV	21	153	1,000
Business Jet	LEAR35	150	780	3,000
Business Jet	CNA55B	228	1,560	6,300
Business Jet	BAE300	18	73	400
Business Jet	LEAR 25	154	140	200
Business Jet	FAL50	100	118	200
Commercial Jet	MD81	150	138	200
Commercial Jet	727EM2	150	100	100
Commercial Jet	737300	150	274	700
Commercial Jet	DC1030	213	279	500
Commercial Jet	747400	46	82	200
Subtotal		**1,544**	**4,581**	**16,000**
Piston				
Single Engine Variable	GASEPV	27,733	44,718	85,450
Single Engine Fixed	GASEPF	27,733	44,717	85,450
Multi-engine	BEC58P	4,500	6,240	9,000
Subtotal		**59,966**	**95,675**	**179,900**
Turboprop/Helicopter				
Turboprop	DHC6	600	1,924	4,800
Helicopter	H500D	1,300	1,820	3,200
Subtotal		**1,900**	**3,744**	**8,000**
Military				
Helicopter	S70	1,500	1,500	1,500
Turboprop	1900D	1,140	1,500	1,500
Subtotal		**2,640**	**3,000**	**3,000**
TOTAL ITINERANT		66,050	107,000	206,900
LOCAL OPERATIONS				
Multi-engine Fixed	GASEPV	19,801	44,728	93,050
Single Engine Fixed	GASEPF	19,801	44,727	93,050
Single Engine Variable	BEC58P	1,200	1,715	2,400
Helicopter	H500D	800	1,530	2,000
Subtotal		**41,602**	**92,700**	**190,500**
Military				
Helicopter	S70	500	500	500
Turboprop	1900D	380	500	500
Subtotal		**880**	**1,000**	**1,000**
TOTAL LOCAL		**42,482**	**93,700**	**191,500**
TOTAL ACTIVITY		**108,532**	**200,700**	**398,400**

Source: Coffman Associates analysis utilizing Integrated Noise Model (INM) v.6.2a

TABLE B4
Noise Model Input: Runway Use Percentages
Phoenix Goodyear Airport

RUNWAY	EXISTING RUNWAY USE				
	Itinerant Turbojet	Itinerant Turboprop	Itinerant Piston	Local GA	Military
Runway 3	65%	65%	65%	65%	65%
Runway 21	35%	35%	35%	35%	35%
RUNWAY	**LONG TERM RUNWAY USE**				
Runway 3L	65%	65%	65%	15%	65%
Runway 21R	35%	35%	35%	10%	35%
Runway 3R	0%	0%	0%	45%	0%
Runway 21L	0%	0%	0%	30%	0%

Note: Assumes 10 percent of flights occurred from 9:00 p.m. to 6:00 a.m. when the tower is closed

The aircraft noise contours generated using the aforementioned data for Phoenix Goodyear Airport are depicted on **Exhibit B3**. In the current condition, all noise contours of environmental significance remain on airport property. The current 65 DNL encompasses 292 acres of land.

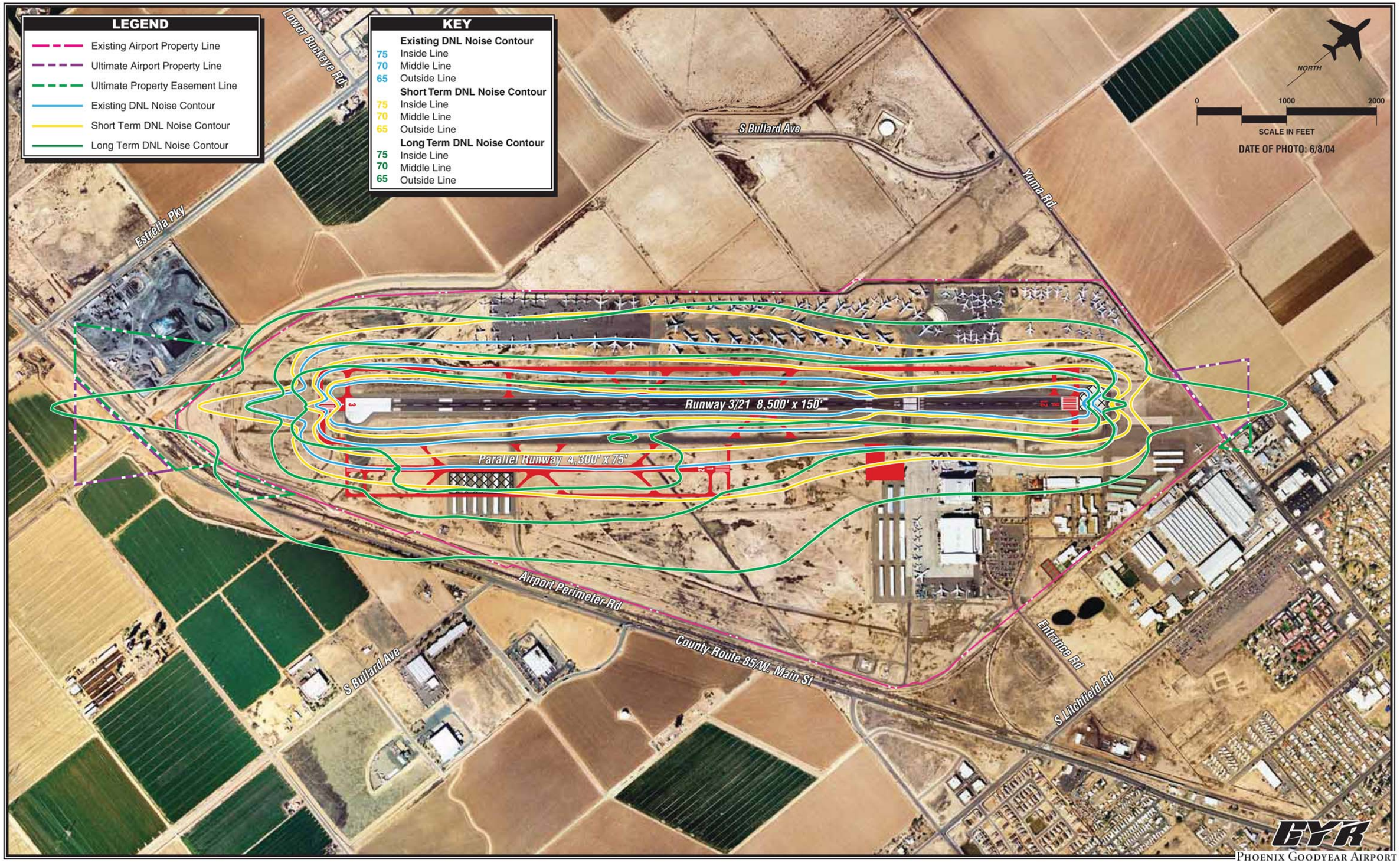
The long term forecast results in an increase of the area of impact by the 65 DNL contour to 597 acres. This is primarily attributable to increased use of the airport by jets of all sizes, as well as the use of the new parallel runway by significant touch-and-go training activity.

East and west of the primary runway, portions of the future 65 DNL cross the airport property line. Much of the area encompassed in the 65 DNL off both runway ends is incorporated in the RPZs which are already recommended for either fee simple acquisition or avigation easements. The small area beyond the west RPZ is 0.19 acres and is of such insignificance that no recommendation is made. The portion to the east of the Runway 21 RPZ is approximately 0.63 acres. Ideally, this should be acquired, but its location across the street from industrial/commercial type uses will likely protect this area already.

Approximately three acres over the Bullard Wash culvert to the immediate northwest of the airport is encompassed by the 65 DNL. This land cannot be developed thus no further consideration is needed for compatibility. The 65 DNL encompasses approximately 20.18 acres to the immediate southwest of the airport. This area is predominately railroad and roadway easement. Only a very small portion of this area may be available for development, but the development of incompatible land uses in this area is unlikely because compatible commercial/industrial development is already taking place to the immediate south.

In conclusion, it is recognized that some portions of the future 65 DNL extend beyond airport property. These areas have been examined in terms of their current

04MP14-B3-1/2/06



PHOENIX GOODYEAR AIRPORT
Exhibit B3
EXISTING AND FUTURE
AIRCRAFT NOISE EXPOSURE

and potential future land use. Development of incompatible land uses is not foreseen. As a result, it is not a high priority to purchase these areas beyond the future airport property line.

COMPATIBLE LAND USE

Title 14 of the Code of Federal Regulations (14 CFR), Part 150 recommends guidelines for planning land use compatibility within various levels of aircraft noise. As the name indicates, these are guidelines only; Part 150 explicitly states that determinations of noise compatibility and regulation of land use are purely local responsibilities.

Based upon the results of the noise modeling efforts, the current 65 DNL noise contour is entirely on airport property. This is the ideal circumstance as the airport can positively control what is developed on the airport. In the future condition, the 65 DNL extends beyond airport property into areas that are currently undeveloped but zoned for mixed use. Many land uses such as parking lots, roadways, commercial, manufacturing, and industrial development are permissible in the 65 DNL. A residential land use would be non-compatible and strongly discouraged within the 65 DNL. Often, mixed land uses can include some residential development. This circumstance should be avoided either through zoning or airport acquisition.

The primary goal of compatible land use planning is to achieve and maintain compatibility between the airport and its surrounding community. Inherent in this goal is the assurance that the airport can maintain or expand its size and level of operations to satisfy existing and future aviation demand. The protection of the investment in a facility such as an airport is of great importance. At the same time, a person who lives, works, or owns property near an airport should be able to enjoy the location without infringement by noise or other adverse impacts of the airport.

NOISE AND LAND USE SUMMARY

As the airport grows in the overall number of operations and as the fleet mix changes to include more operations by larger general aviation aircraft, such as turboprops and business jets, the extent of noise impacts can be expected to grow accordingly. Advancements in aircraft engine technology are also advancing and the noise generated by today's sophisticated jet aircraft is far less than that generated just ten years ago. Further noise reduction technology can be expected to be applied in the future to aircraft.

The existing 65 DNL, that noise contour deemed to be potentially hazardous by various governmental agencies, does not currently extend beyond airport property. By the long term, the 65 DNL is projected to extend approximately 1,100 feet beyond Yuma Road to the northeast and 600 feet beyond County Road 85 (W. Main

St.) southwest. The long term projections reflect ongoing engine technology improvements, relocating the landing threshold to the pavement ends, and the development of the parallel runway.

The visual impact of aircraft in the air would likely increase through the planning period although the air traffic pattern, as managed by the ATCT, would not expand significantly. In the future, the number of aircraft in the pattern may increase due to the increase in operations, but the extent of the pattern is not expected to change.

ENVIRONMENTAL SUMMARY

The environmental evaluation presented here is not designed to meet EPA and FAA standards for a formal Environmental Assessment (EA) or Environmental Impact Statement (EIS). Instead, the environmental evaluation is intended to alert the airport to any potential issues that may need to be further addressed prior to undertaking airport improvements.

One issue that will need to be addressed with further environmental documentation is the recommended acquisition of property encompassing the RPZs. Anytime an airport intends to purchase (either fee simple or easement) more than three acres of land, an Environmental Assessment is required. In addition, the City of Phoenix requires an Environmental Site Assessment.

The Phoenix Goodyear Airport is the site of a federal groundwater Superfund clean-up project. The infrastructure associated with the Superfund site would require particular attention during an EA or during the design of any projects. The research presented in this master plan indicated that the wells associated with the Superfund clean-up site can be relocated to allow for airport development but this process should be undertaken only with close consultation with the EPA and FAA.

Several other environmental documents will need to be completed prior to implementing the plan elements. The City of Phoenix will require compliance with the *Clean Water Act*, acquisition of water quality permits, and a *Storm Water Pollution Prevention Plan*. Airport projects will also require field surveys to make a final determination of the existence of any protected species on airport property. All projects will need to conform to the *State Implementation Plan* for air quality. Additional environmental permits will be needed from the Arizona Department of Environmental Quality.

Finally, the noise generated by an airport is often the most prominent environmental hazard to be considered. Utilizing the Integrated Noise Model (INM) approved by the FAA, EPA, and HUD, for use in measuring aggregate noise levels, noise contours have been developed. The 65 day-night noise level (DNL) contour represents the threshold of a noise hazard. The 65 DNL contour for Phoenix Goodyear Airport currently remains entirely on airport property. By the long term plan-

ning period, the 65 DNL contour will extend beyond airport property, particularly off the runway ends within the RPZs. Airport ownership of the RPZs would further help the airport in managing the environmental impacts of noise to the surrounding community.

Appendix C

AIRPORT PLANS

As part of this master plan, the Federal Aviation Administration (FAA) requires the development of several computer drawings detailing specific parts of the airport and its environs. These drawings were created on a computer-aided drafting system (CAD) and serve as the official depiction of the current and planned condition of the airport. These drawings will be delivered to the FAA for their review and inspection. The FAA will then critique the drawings from a technical perspective to be sure all applicable federal regulations are met. The FAA will use the CAD drawings as the basis and justification for funding decisions.

It should be noted that the FAA requires that any changes to the airfield (i.e., runway and taxiway system, etc.) be represented on the drawings. The landside configuration, developed during this master planning process, is also depicted on the drawings, but the FAA recognized that landside development is much more fluid and dependent upon developer needs. Thus, an updated drawing set is not necessary for future landside alterations.

The following is a description of the CAD drawings included with this master plan.

AIRPORT LAYOUT PLAN

An official Airport Layout Plan (ALP) drawing has been developed for Phoenix Goodyear Airport and can be found in this appendix. The ALP drawing graphically presents the existing and ultimate airport layout plan, and will include such elements as the physical airport features, wind data tabulation, location of airfield fa-

cilities (i.e., runways, taxiways, navigational aids), and existing general aviation development (and commercial development for air carrier airports). Also presented on the ALP are the runway safety areas, airport property boundary, and revenue support areas. The ALP is used by the FAA to determine funding eligibility for future capital projects.

The computerized plan provides detailed information on existing and future facility layouts on multiple layers that permit the user to focus on any section of the airport at a desired scale. The plan can be used as base information for design and can be easily updated in the future to reflect new development and more detail concerning existing conditions as made available through design surveys.

LANDSIDE FACILITY DRAWING

The landside facility drawing is a larger scale plan view drawing of existing and planned aprons, buildings, hangars, parking lots, and other landside facilities. It is prepared in accordance with FAA AC 150/5300-13, *Airport Design*.

AIRSPACE DRAWING

Federal Aviation Regulation (F.A.R.) Part 77, *Objects Affecting Navigable Airspace*, was established for use by local authorities to control the height of objects near airports. The Part 77 Airspace Drawing included in this master plan is a graphic depiction of this regulatory criterion. The Part 77 Airspace Drawing is a tool to aid local authorities in determining if proposed development could present a hazard to aircraft using the airport. The Airspace Drawing can be a critical tool for the airport sponsor's use in planning against future development limitations.

The City of Phoenix should do all in its power to ensure development stays below the Part 77 surfaces to protect the future role of the airport. The following discussion will describe those approach surfaces that make up the recommended F.A.R. Part 77 operations at Phoenix Goodyear Airport.

The Part 77 Airspace Drawing assigns three-dimensional imaginary areas to each runway. These imaginary surfaces emanate from the runway centerline and are dimensioned according to the visibility minimums associated with the approach to the runway end and size of aircraft to operate on the runway. The Part 77 imaginary surfaces include the primary surface, approach surface, transitional surface, horizontal surface, and conical surface. Part 77 imaginary surfaces are described in the following sections.

Primary Surface

The primary surface is an imaginary surface longitudinally centered on the runway. The primary surface extends 200 feet beyond each runway end. The elevation of any point on the primary surface is the same as the elevation along the nearest associated point on the runway centerline. Under Part 77 regulations, the width of the primary surface to primary Runway 3-21 is 1,000 feet and centered on the runway. The primary surface width associated with the future parallel runway would be 500 feet and centered on the runway.

Approach Surface

An approach surface is also established for each runway. The approach surface is the same width as the primary surface and begins at the primary surface end. The approach surface will extend upward and outward from the primary surface end and is centered along an extended runway centerline. The future approach surface to Runway 3 will extend to a distance of 10,000 feet and a width of 16,000 feet, at a slope of 50:1 with an additional 40,000 feet at a slope of 40:1. The approach surface to Runway 21 will extend to a distance of 10,000 feet, a width of 4,000 feet, at a slope of 34:1. The approach slope for both parallel runway ends will extend to a distance of 5,000 feet, a width of 2,000 feet, at a slope of 20:1.

Transitional Surface

Each runway has a transitional surface that begins at the outside edge of the primary surface at the same elevation as the runway. The transitional surface also connects with the approach surfaces of each runway. The surface rises at a slope of 7:1, up to a height 150 feet above the highest runway elevation. At that point, the transitional surface is replaced by the horizontal surface.

Horizontal Surface

The horizontal surface is established at 150 feet above the highest elevation of the runway surface. Having no slope, the horizontal surface connects the transitional and approach surfaces to the conical surface at a distance of 10,000 feet from the end of the primary surfaces of each runway.

Conical Surface

The conical surface begins at the outer edge of the horizontal surface. The conical surface then continues for an additional 4,000 feet horizontally at a slope of 20:1. Therefore, at 4,000 feet from the horizontal surface, the elevation of the conical surface is 350 feet above the highest airport elevation.

INNER APPROACH SURFACE DRAWINGS

The Inner Portion of the Approach Surface Plan is a scaled drawing of the runway protection zone (RPZ), the runway safety area (RSA), the obstacle free zone (OFZ), and the object free area (OFA) for each runway end. A plan and profile view of each RPZ is provided to facilitate identification of obstructions that lie within these safety areas. Detailed obstruction and facility data is provided to identify planned improvements and the disposition of obstructions. A drawing of each runway end is provided.

AIRPORT PROPERTY/BOUNDARY MAP

The Property Map provides information on the acquisition and identification of all land tracts under control of the airport. Easement interests in areas outside the fee property line are also included. The primary purpose of the drawing is to provide information for analyzing the current and future aeronautical use of land acquired with federal funds.

UTILITY LOCATION MAP

Utilities will be superimposed on the planimetric aerial obtained from the aerial mapping project. Utilities will include those on airport and those immediately adjacent to the airport property. Utilities depicted will include:

a.) Dry utilities – power, communication, and natural gas.
b.) Water distribution mainlines and services on the airport with delivery mainlines adjacent to and serving the airport.
c.) Sanitary sewer mainlines and services on the airport with service mainline adjacent to and servicing the airport
d.) Storm sewer manholes, mainlines, and catch basins on the airport and mainlines that service the airport.

LEASE PROPERTIES MAP

This drawing will calculate and superimpose lease properties as provided by the City of Phoenix on the planimetric detail obtained from the aerial mapping project.

ON-AIRPORT LAND USE DRAWING

The Airport Land Use Drawing will be prepared in accordance with FAA standards. The on-airport land uses will be depicted by general use categories.

UPDATE THE PUBLIC AIRPORT DISCLOSURE MAP

The existing Public Airport Disclosure Map for the Phoenix Goodyear Airport will be updated to reflect new operational forecasts, noise contours, airfield facility changes, and changes to the airport traffic pattern airspace.

AIRPORT PLANS GIS CONVERSION

The airport plan drawings will be converted to a GIS format for use with the Aviation Department's GIS system.

DRAFT ALP DISCLAIMER

The Airport Layout Drawing (ALP) set has been developed in accordance with accepted Federal Aviation Administration (FAA) and Arizona Department of Transportation – Aeronautics Division (ADOT) standards. The ALP and the Airport Master Plan have been approved and adopted by the City of Phoenix – Aviation Department. This ALP is still subject to FAA airspace review. Land use and other changes may result.

AIRPORT LAYOUT PLANS
FOR
PHOENIX GOODYEAR AIRPORT

Prepared for

The City of Phoenix
Aviation Department

INDEX OF DRAWINGS

1. AIRPORT LAYOUT DRAWING
2. PART 77 AIRSPACE DRAWING
3. APPROACH ZONE PROFILES/ RUNWAY PROFILE RUNWAY 3(L)-21(R)
4. APPROACH ZONE PROFILES/ RUNWAY PROFILE RUNWAY 3R-21L
5. INNER PORTION OF RUNWAY 3(L) APPROACH SURFACE DRAWING
6. INNER PORTION OF RUNWAY 21(R) APPROACH SURFACE DRAWING
7. INNER PORTION OF RUNWAYS 3R-21L APPROACH SURFACE DRAWING
8. TERMINAL AREA/NORTHEAST GENERAL AVIATION AREA DRAWING
9. SOUTHWEST GENERAL GENERAL AVIATION AREA DRAWING
10. AIRPORT LAND USE DRAWING
11. EXHIBIT "A" AIRPORT PROPERTY MAP

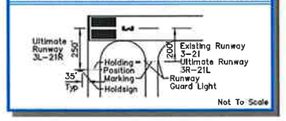
DRAFT

Coffman Associates
Airport Consultants

LEGEND

EXISTING	ULTIMATE	DESCRIPTION
		AIRPORT PROPERTY LINE
		AIRPORT PARCEL LINE
		AIRPORT REFERENCE POINT (ARP)
		AIRPORT ROTATING BEACON
		AVIGATION EASEMENT (if applicable)
		BUILDING REMOVAL
		BUILDING CONSTRUCTION (On/Off Airport)
BRL	BRL	BUILDING RESTRICTION LINE (BRL)
		FACILITY (PAVEMENT) CONSTRUCTION
		FENCING
		HELIPORT
		LOCALIZER ANTENNA
		MEDIUM-INTENSITY APPROACH LIGHTING SYSTEM WITH RUNWAY ALIGNMENT INDICATOR (MALSR)
Critical Area	Critical Area	NAVAID CRITICAL AREA (Localizer/Glide Slope)
VASI-4	VASI-4	NAVIGATIONAL AID INSTALLATION
PAPI-4	PAPI-4	PRECISION APPROACH PATH INDICATOR
		PRECISION OBJECT FREE ZONE
		PRIMARY/SECONDARY AIRPORT CONTROL STATION
OFA	OFA	RUNWAY OBJECT FREE AREA
OFZ	OFZ	RUNWAY OBSTACLE FREE ZONE
RPZ	RPZ	RUNWAY PROTECTION ZONE (RPZ)
RSA	RSA	RUNWAY SAFETY AREA
		RUNWAY END IDENTIFICATION LIGHTS (REIL)
		RUNWAY THRESHOLD LIGHTS
VTZ	VTZ	RUNWAY VISIBILITY ZONE
		SECTION CORNER
		SEGMENTED CIRCLE/WIND INDICATOR
		TAXIWAY DESIGNATION
		TAXIWAY HOLD LINE
		TOPOGRAPHY
		WIND INDICATOR (Lighted)

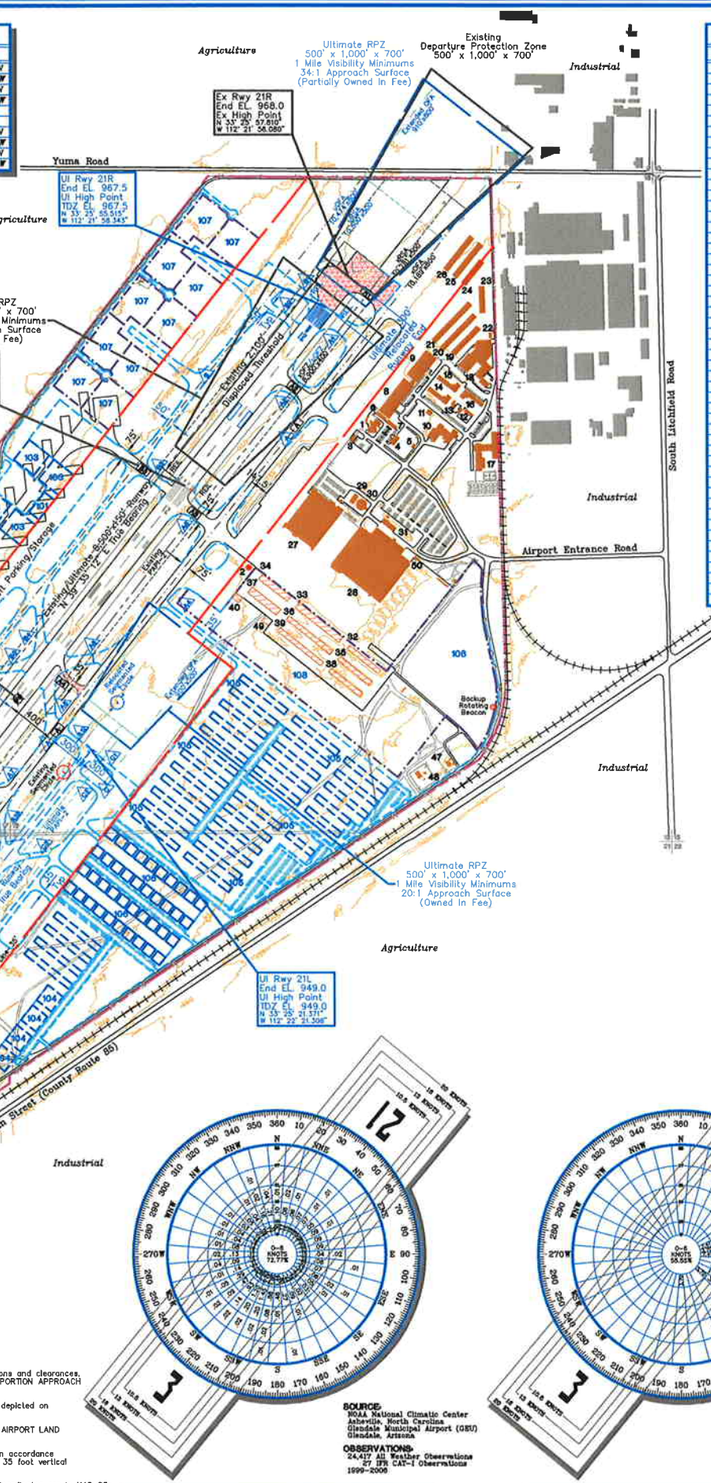
HOLDING POSITION MARKINGS/SIGN



LOCATION MAP

RUNWAY END COORDINATES (NAD 83)

RUNWAY		EXISTING	ULTIMATE
Runway 3(R)	Latitude	33° 24' 53.000" N	33° 24' 50.713" N
	Longitude	112° 23' 00.000" W	112° 23' 02.255" W
Runway 21(L)	Latitude	33° 25' 57.810" N	33° 25' 55.515" N
	Longitude	112° 21' 56.080" W	112° 21' 58.343" W
Runway 21(L) Displaced Threshold	Latitude	33° 25' 41.800" N	N/A
	Longitude	112° 22' 11.880" W	N/A
Runway 3L	Latitude	N/A	33° 24' 48.587" N
	Longitude	N/A	112° 23' 53.636" W
Runway 21R	Latitude	N/A	33° 25' 21.371" N
	Longitude	N/A	112° 22' 21.306" W



EXISTING BUILDINGS/FACILITIES

NO.	DESCRIPTION	ELEV.
1	TERMINAL BUILDING	971
2	AIR TRAFFIC CONTROL TOWER (*ATCT)/ROTATING BEACON	1106
3	–	969
4	MAINTENANCE BUILDING (City of Phoenix)	971
5	–	967
6	–	969
7	–	969
8	MAINTENANCE HANGAR (*ATCA)	980
9	MAINTENANCE HANGAR (*ATCA)	980
10	OFFICE BUILDING (*ATCA)	976
11	MAINTENANCE BUILDING (City of Phoenix)	978
12	–	975
13	–	970
14	DORMITORY (*ATCA)	988
15	DORMITORY (*ATCA)	988
16	DORMITORY (*ATCA)	988
17	OFFICE/DORMITORY (German Air Force)	1014
18	OFFICE (*ATCA)	975
19	SHADE HANGAR	976
20	SHADE HANGAR	976
21	SHADE HANGAR	976
22	OIL/CHEMICAL STORAGE (*ATCA)	972
23	SHADE HANGAR	976
24	SHADE HANGAR	979
25	SHADE HANGAR	981
26	SHADE HANGAR	981
27	HANGAR (City of Phoenix)	1016
28	CONVENTIONAL HANGAR (Aero Turbine)	1025
29	PUMP HOUSE	972
30	FIRE PROTECTION TANK (Timco)	978
31	MAINTENANCE HANGAR (Aero Turbine)	971
32	T-HANGAR	974
33	T-HANGAR	976
34	T-HANGAR	973
35	T-HANGAR	974
36	T-HANGAR	976
37	T-HANGAR	977
38	T-HANGAR	974
39	T-HANGAR	974
40	ELECTRICAL VAULT	976
41	T-HANGAR	964
42	T-HANGAR	964
43	T-HANGAR	958
44	T-HANGAR	957
45	T-HANGAR	957
46	T-HANGAR	956
47	FUEL FARM (City of Phoenix)	N/A
48	FUEL FARM (*ATCA)	N/A
49	WASHRACK	N/A
50	GUARD SHACK	–
51	FILTRATION SYSTEM	N/A

*Airline Training Center of Arizona

RUNWAY DATA

	RUNWAY 3(L)-21(R)				RUNWAY 3R-21L	
	EXISTING		ULTIMATE		ULTIMATE	
	3	21	3L	21R	3R	21L
AIRCRAFT APPROACH CATEGORY-DESIGN GROUP	C-III		D-IV		B-II	
CRITICAL AIRCRAFT	BOEING 737-300		BOEING DC10-40		BEECHCRAFT KING AIR 200	
CRITICAL AIRCRAFT WINGSPAN	94.8'		165.3'		54.5'	
CRITICAL AIRCRAFT UNDERCARRIAGE WIDTH	17.2'		35.0'		17.2'	
CRITICAL AIRCRAFT APPROACH SPEED (KNOTS)	178.1		188.5		117	
CRITICAL AIRCRAFT MAXIMUM CETIFIED TAKEOFF WEIGHT (1,000 LBS.)	138.5		555		12.5	
APPROACH VISIBILITY MINIMUMS (LOWEST)	1 MILE	VISUAL	1/2 MILE	1 MILE	1 MILE	1 MILE
F.A.R. PART 77 CATEGORY	C	C	PIR	C	ANP	ANP
PERCENTAGE OF WIND COVERAGE (ALL WEATHER IN MPH)	94.44%-13/98.22%-16/98.66%-20/99.93%-20/99.93%-20		94.44%-13/98.22%-13/98.66%-16/98.93%-20/99.93%-20		94.44%-13/98.22%-13/98.66%-16/98.93%-20/99.93%-20	
LINE OF SIGHT REQUIREMENT MET	YES		YES		YES	
MAXIMUM ELEVATION (ABOVE MSL)	968.0		967.5		949.0	
LOWEST ELEVATION (ABOVE MSL)	941.0		940.0		937.0	
RUNWAY DIMENSIONS	8,500' x 150'		8,500' x 150'		4,300' x 75'	
RUNWAY BEARING (TRUE BEARING – DECIMAL DEGREES)	39.5866	219.5964	39.5866	219.5964	39.5859	219.5908
RUNWAY APPROACH SURFACES (F.A.R. PART 77)	34:1	20:1	50:1	34:1	20:1	20:1
RUNWAY END ELEVATION (NAVD 88)	941.0	968.0	940.0	967.5	937.0	949.0
RUNWAY THRESHOLD DISPLACEMENT	0'	2,100'	0'	0'	0'	0'
RUNWAY THRESHOLD SITING REQUIREMENTS (APPENDIX 2, CATEGORY)	6	6	9	6	2	2
RUNWAY STOPWAY	0'	0'	0'	0'	0'	0'
RUNWAY SAFETY AREA WIDTH (RSA)	500'		500'		150'	
RUNWAY SAFETY AREA (RSA) BEYOND RUNWAY STOP END	1,000'	781'	1,000'	1,000'	300'	300'
RUNWAY OBSTACLE FREE ZONE WIDTH (OFZ)	400'		400'		250'	
RUNWAY OBSTACLE FREE ZONE (OFZ) BEYOND RUNWAY STOP END	200'	200'	200'	200'	200'	200'
RUNWAY OBJECT FREE AREA WIDTH (OFA)	800'		800'		500'	
RUNWAY OBJECT FREE AREA (OFA) BEYOND RUNWAY STOP END	1,000'	689'	974'	1,000'	300'	300'
RUNWAY PAVEMENT SURFACE MATERIAL	ASPHALT/CONCRETE		ASPHALT/CONCRETE		ASPHALT/CONCRETE	
RUNWAY PAVEMENT STRENGTH (IN THOUSAND LBS.)†	75(S)/200(D)/270(DT)		75(S)/200(D)/270(DT)		12.5(S)	
RUNWAY EFFECTIVE GRADIENT	0.32%		0.32%		0.28%	
RUNWAY MAXIMUM GRADIENT	0.32%		0.32%		0.28%	
RUNWAY TOUCHDOWN ZONE ELEVATION (ABOVE MSL)	953.0	968.0	950.5	967.5	945.4	949.0
RUNWAY MARKING	PRECISION	PRECISION	PRECISION	NONPRECISION	BASIC	BASIC
RUNWAY LIGHTING	MIRL		MIRL		MIRL	
RUNWAY APPROACH LIGHTING	NONE	NONE	MALSR	NONE	NONE	NONE
RUNWAY TO TAXIWAY SEPARATION (FROM CENTERLINE TO CENTERLINE)	400'		400'		300'	
RUNWAY HOLD LINE POSITION (FROM RUNWAY CENTERLINE)	200'		250'		200'	
TAXIWAY TO TAXILANE SEPARATION (FROM CENTERLINE TO CENTERLINE)	152'		215'		105'	
TAXIWAY CENTERLINE TO FIX OR MOVEABLE OBJECT	93'		129.5'		65.5'	
TAXIWAY LIGHTING	MITL		MITL		MITL	
TAXIWAY MARKING	CENTERLINE/SIGNACE		CENTERLINE/SIGNACE		CENTERLINE/SIGNACE	
TAXIWAY SURFACE MATERIAL	ASPHALT/CONCRETE		ASPHALT/CONCRETE		ASPHALT/CONCRETE	
TAXIWAY WINGTIP CLEARANCE	34'		44'		26'	
TAXIWAY WIDTH	30' TO 80'		75'		50'	
TAXIWAY SAFETY AREA WIDTH	118'		171'		79'	
TAXIWAY OBJECT FREE AREA WIDTH	186'		259'		131'	
RUNWAY VISUAL NAVIGATIONAL AIDS	PAPI-2 R REIL	PAPI-2 L REIL	PAPI-4 L	PAPI-4 L REIL	PAPI-2 L REIL	PAPI-2 L REIL
RUNWAY ELECTRONIC NAVIGATIONAL AIDS	GPS	GPS	CAT-I GPS	GPS	GPS	GPS

†Pavement strengths are expressed in Single(S), Dual(D), Dual Tandem(DT) and Double Dual Tandem(DDT) wheel loading capacities.

DECLARED DISTANCES DATA

	EXISTING RUNWAY 3-21		ULTIMATE RUNWAY 3L-21R		ULTIMATE RUNWAY 3R-21L	
	3	21	3L	21R	3R	21L
TORA – TAKEOFF RUN AVAILABLE	8,500'	8,500'	8,500'	8,500'	4,300'	4,300'
TODA – TAKEOFF DISTANCE AVAILABLE	8,500'	8,500'	8,500'	8,500'	4,300'	4,300'
ASDA – ACCELERATE-STOP DISTANCE AVAILABLE	8,500'	8,500'	8,500'	8,500'	4,300'	4,300'
LDA – LANDING DISTANCE AVAILABLE	8,500'	6,400'	8,500'	8,500'	4,300'	4,300'

DEVIATIONS FROM FAA AIRPORT DESIGN STANDARDS

DEVIATION DESCRIPTION	EFFECTED DESIGN STANDARD	STANDARD	EXISTING	PROPOSED DISPOSITION
RUNWAY 21 RUNWAY SAFETY AREA	RUNWAY SAFETY AREA LENGTH BEYOND RUNWAY END	1,000'	781'	RELOCATE RUNWAY END 300'
RUNWAY 21 OBJECT FREE AREA	RUNWAY SAFETY AREA LENGTH BEYOND RUNWAY END	1,000'	689'	RELOCATE RUNWAY END 300'
RUNWAY 3L OBJECT FREE AREA	RUNWAY SAFETY AREA LENGTH BEYOND RUNWAY END	974'	1,000'	REQUEST WAIVER

VICINITY MAP

AIRPORT DATA

PHOENIX GOODYEAR AIRPORT (GYR)			
CITY: GOODYEAR, ARIZONA	COUNTY: MARICOPA, ARIZONA	RANGE: 1W	TOWNSHIP: 1N
		EXISTING	ULTIMATE
AIRPORT SERVICE LEVEL		GENERAL AVIATION RELIEVER	GENERAL AVIATION RELIEVER
AIRPORT REFERENCE CODE		C-III	D-IV
DESIGN AIRCRAFT		BOEING 737-300	BOEING DC10-40
AIRPORT ELEVATION		968.4 MSL	967.5 MSL
MEAN MAXIMUM TEMPERATURE OF HOTTEST MONTH		106.9° F (JULY)	106.9° F (JULY)
AIRPORT REFERENCE POINT (ARP)	LATITUDE	33° 25' 23.410" N	33° 25' 17.025" N
COORDINATES (NAD 83)	LONGITUDE	112° 22' 28.040" W	112° 22' 32.709" W
AIRPORT AND TERMINAL NAVIGATIONAL AIDS		ATCT ROTATING BEACON LIGHTED WINDCONE	ATCT ROTATING BEACON LIGHTED WINDCONE
GPS APPROACH		3	3L/3R/21L/21R

ULTIMATE BUILDINGS/FACILITIES

NO.	DESCRIPTION
101	TERMINAL SERVICES BUILDING
102	AIR TRAFFIC CONTROL TOWER (ATCT)
103	AIRPORT SERVICES HANGAR (200'x200')
104	AIRPORT SERVICES HANGAR (150'x150')
105	T-HANGAR
106	BOX HANGAR (80'x80')
107	AVIATION RELATED PARCEL
108	AVIATION RELATED EMPLOYMENT CENTER

FAA APPROVAL STAMP

FOR APPROVAL BY:
Phoenix Aviation Department
APPROVED BY: ON THE DATE OF:
Mr. Danny Murphy
Director

NORTH
11° 27' East

Magnetic Variance
11° 27' East (August 2007)
Annual Rate of Change
00° 06' West (August 2007)

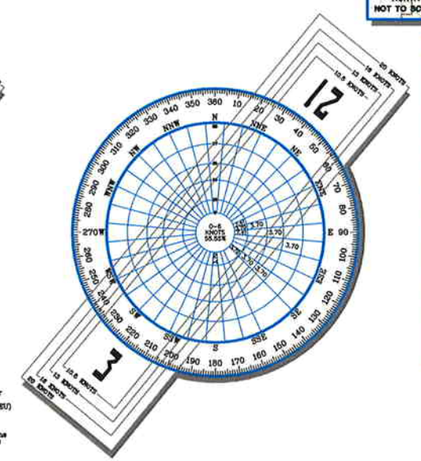
0 600 1,200
SCALE IN FEET

ALL WEATHER WIND COVERAGE

Runway	10.5 Knots	13 Knots	16 Knots	20 Knots
Runway 3-21	98.51%	99.34%	99.80%	99.93%

IFR CAT-I WIND COVERAGE

Runway	10.5 Knots	13 Knots	16 Knots	20 Knots
Runway 3-21	84.80%	86.90%	91.59%	95.98%



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

OBSERVATIONS:
24,417 All Weather Observations
27 IFR CAT-I Observations
1999-2006

GENERAL NOTES:

1. Features and objects, including related elevations and clearances, within the runway are depicted on the INNER PORTION APPROACH SURFACE DRAWINGS.
2. Details concerning terminal improvements are depicted on the TERMINAL AREA DRAWING.
3. Recommended land uses are depicted on the AIRPORT LAND USE DRAWING.
4. Building Restriction Line (BRL) is established in accordance with F.A.R. Part 77 criteria. Location utilizes 35 foot vertical object height.
5. All Elevations are in NAVD 88, all Horizontal Coordinates are in NAD 83.
6. No Threshold Siting Surface Object Penetrations.
7. No Obstacle Free Zone (OFZ) Object Penetrations.
8. There are no Primary or Secondary Airport Control Stations located near the airport.

No.	REVISIONS	DATE	BY	APP'D.

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PHOENIX GOODYEAR AIRPORT

AIRPORT LAYOUT DRAWING

DRAFT

GOODYEAR, ARIZONA

PLANNED BY: Patrick S. Taylor
DETAILED BY: Richard A. Lally
APPROVED BY: James M. Harris

August 20, 2007 SHEET 1 OF 11

Coffman Associates
Airport Consultants

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OBSTRUCTION TABLE

Object Description	Obstructed Part 77 Surface	Object Elevation	Surface Elevation	Object Penetration	Proposed Object Disposition
1. AIR TRAFFIC CONTROL TOWER/ROTATING BEACON	20:1 APPROACH SURFACE	1106	1034	72'	TO BE RELOCATED

OBSTRUCTION LEGEND

- OBSTRUCTION
- GROUP or MULTIPLE OBSTRUCTIONS
- TOPOGRAPHIC OBSTRUCTION

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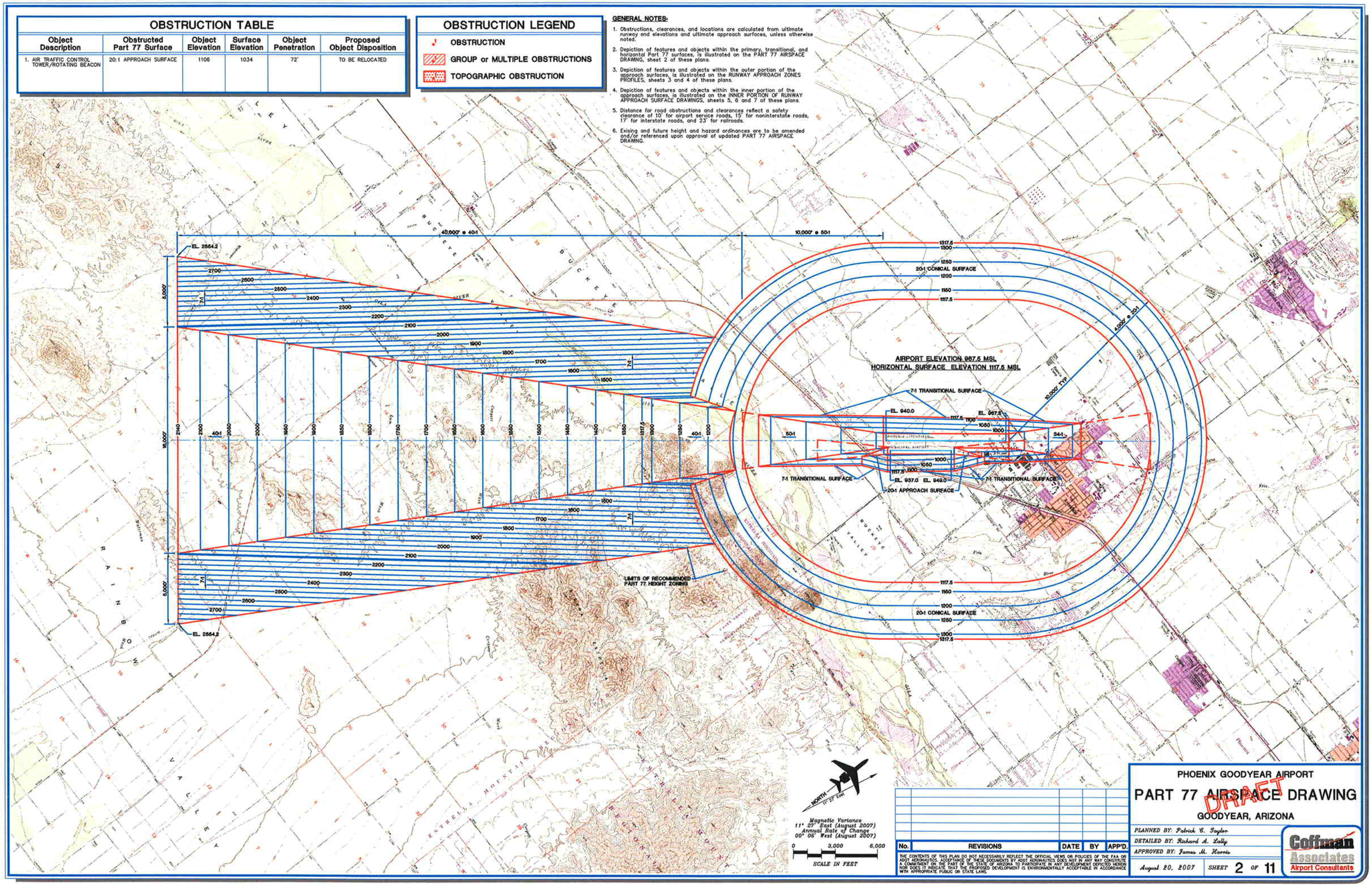
6. Exising and future height and hazard ordinances are to be amended and/or referenced upon approval of updated PART 77 AIRSPACE DRAWING.



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PHOENIX GOODYEAR AIRPORT

PART 77 AIRSPACE DRAWING

DRAFT

GOODYEAR, ARIZONA

PLANNED BY: Patrick G. Taylor
DETAILED BY: Richard A. Lally
APPROVED BY: James M. Harris

August 20, 2007 — SHEET 2 OF 11

Coffman Associates
Airport Consultants

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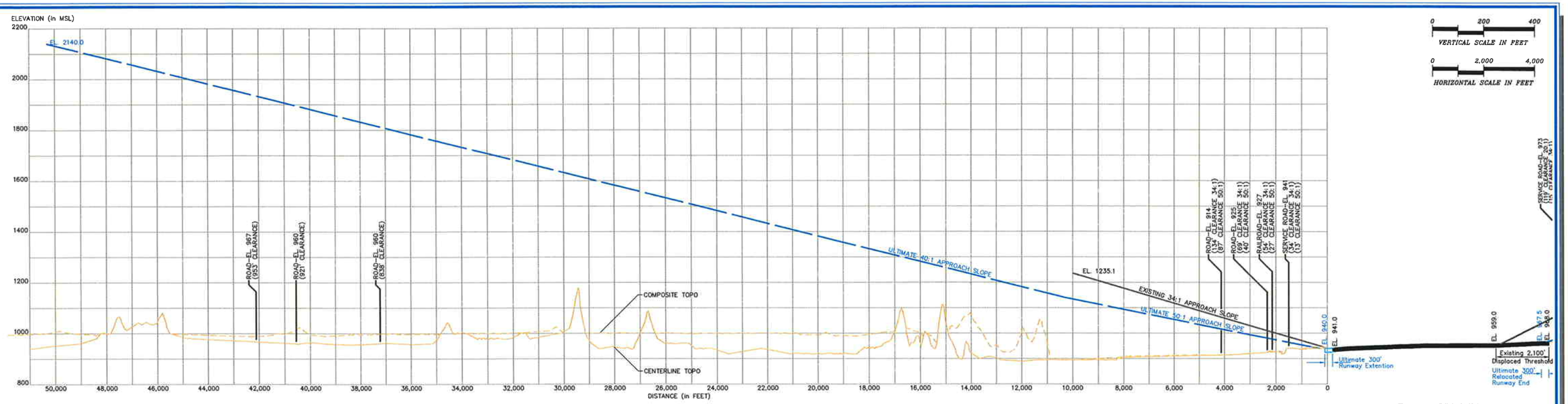
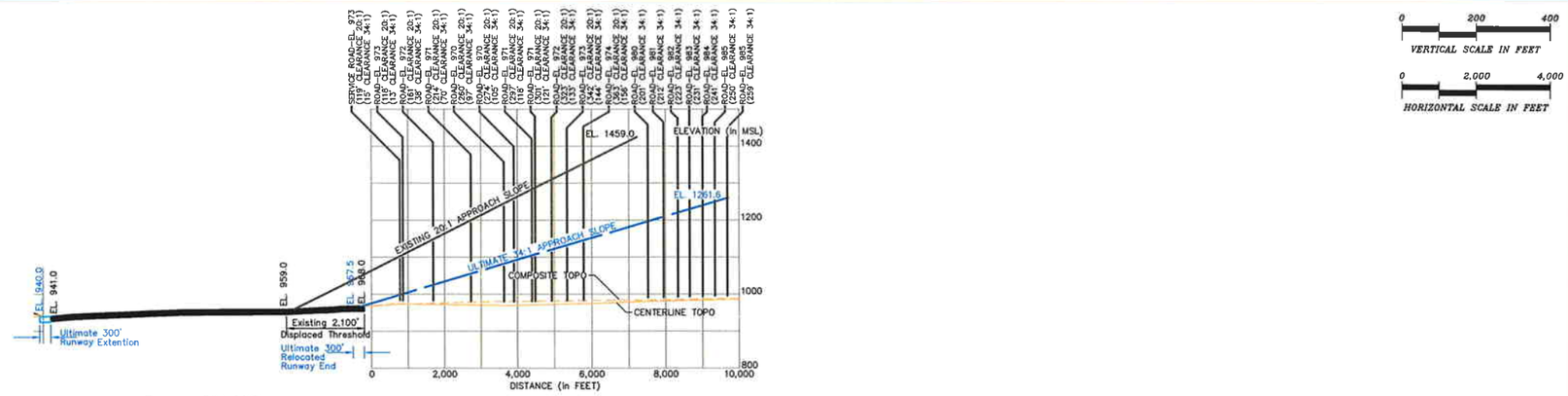
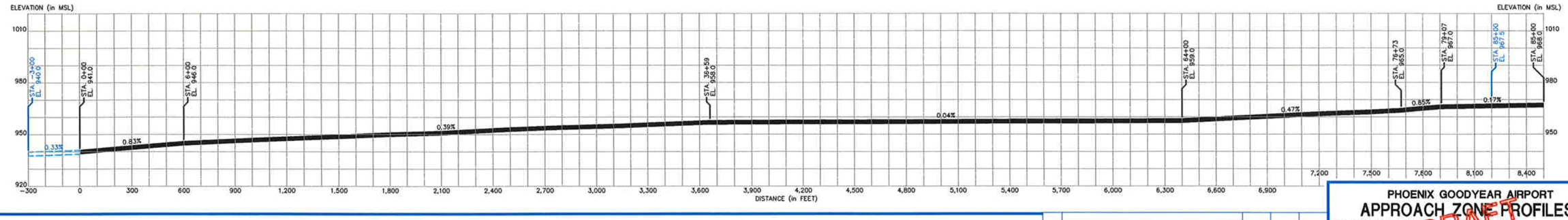


Runway 3(L)-21(R)



Runway 3(L)-21(R)



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0 30 60
VERTICAL SCALE IN FEET

0 300 600
HORIZONTAL SCALE IN FEET

No.	REVISIONS	DATE	BY	APP'D.

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PHOENIX GOODYEAR AIRPORT

APPROACH ZONE PROFILES/ RUNWAY PROFILE RUNWAY 3(L)-21(R)

GOODYEAR, ARIZONA

DRAFT

PLANNED BY: Patrick G. Taylor
DETAILED BY: Richard A. Lally
APPROVED BY: James M. Harris

August 20, 2007 SHEET 3 OF 11

Coffman Associates Airport Consultants

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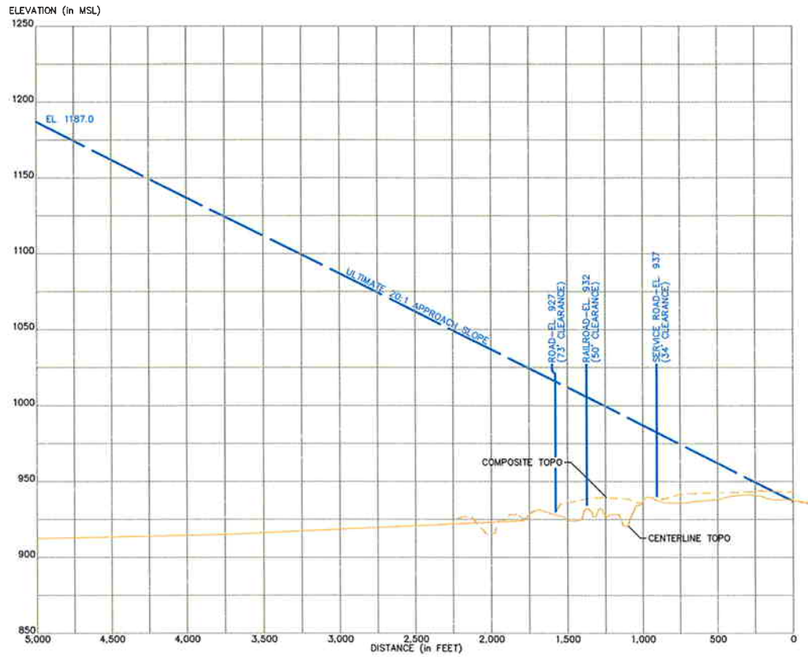

OBSTRUCTION TABLE

Object Description	Obstructed Part 77 Surface	Object Elevation	Surface Elevation	Object Penetration	Proposed Object Disposition
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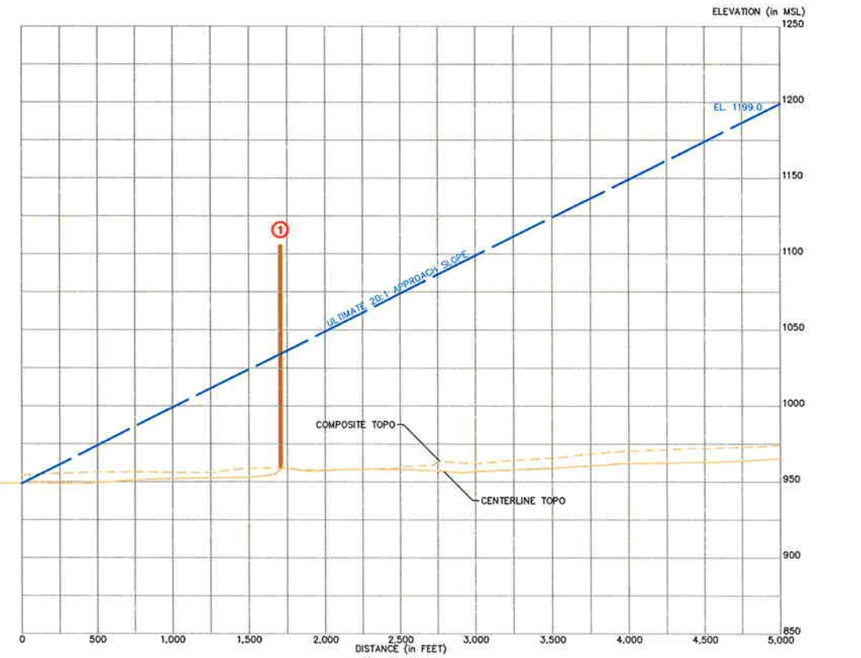
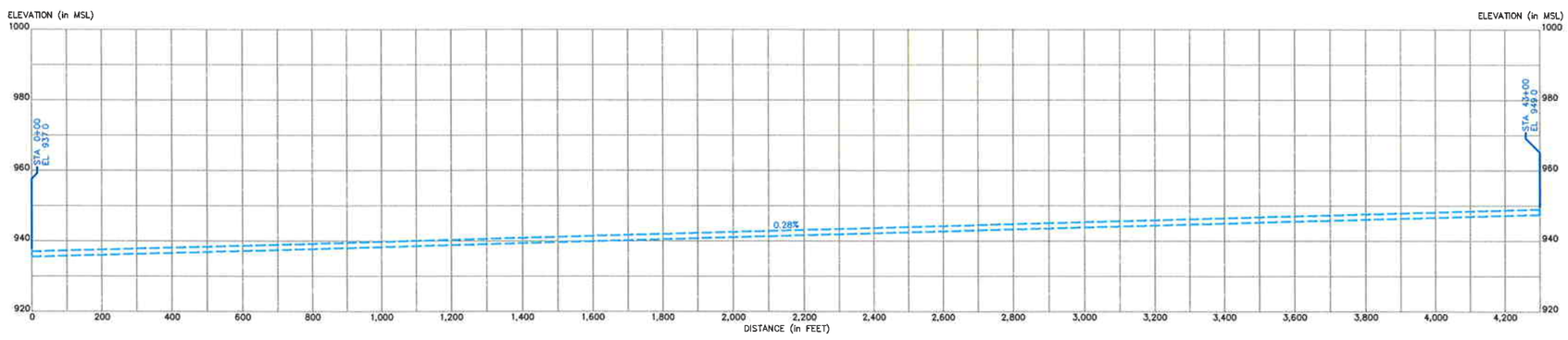


Runway 3R-21L

0 500 1,000 HORIZONTAL SCALE IN FEET

0 50 100 VERTICAL SCALE IN FEET



0 20 40 VERTICAL SCALE IN FEET

0 200 400 HORIZONTAL SCALE IN FEET

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PHOENIX GOODYEAR AIRPORT

APPROACH ZONE PROFILES/ RUNWAY PROFILE RUNWAY 3R-21L

GOODYEAR, ARIZONA

DRAFT

PLANNED BY: Patrick E. Taylor
DETAILED BY: Richard A. Lally
APPROVED BY: James M. Harris

August 20, 2007 SHEET 4 OF 11

Coffman Associates Airport Consultants

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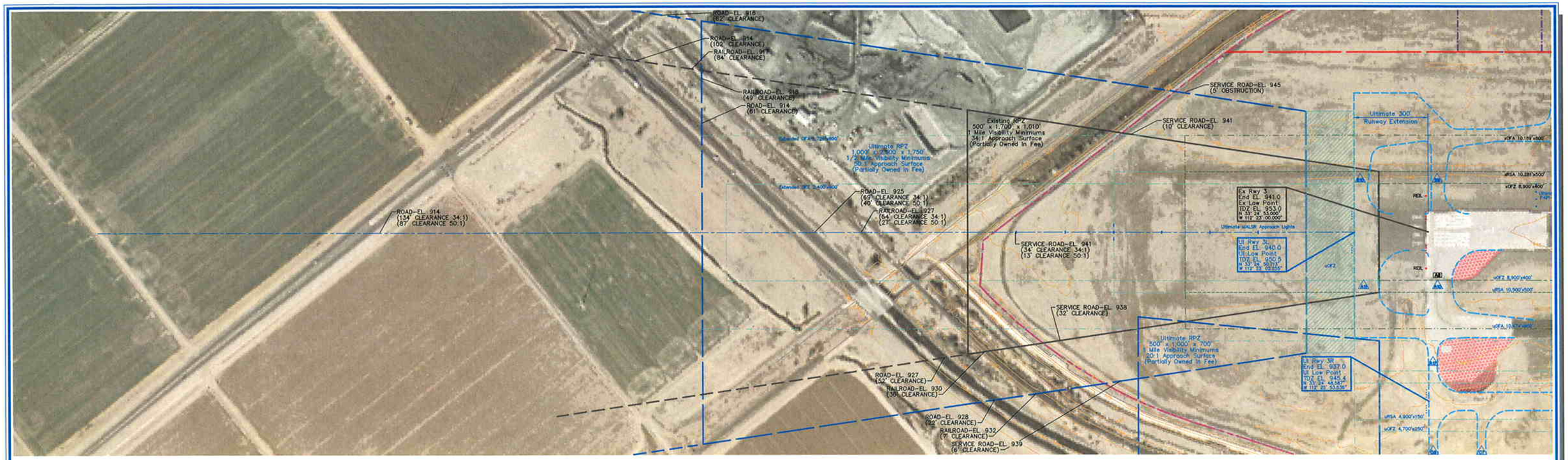

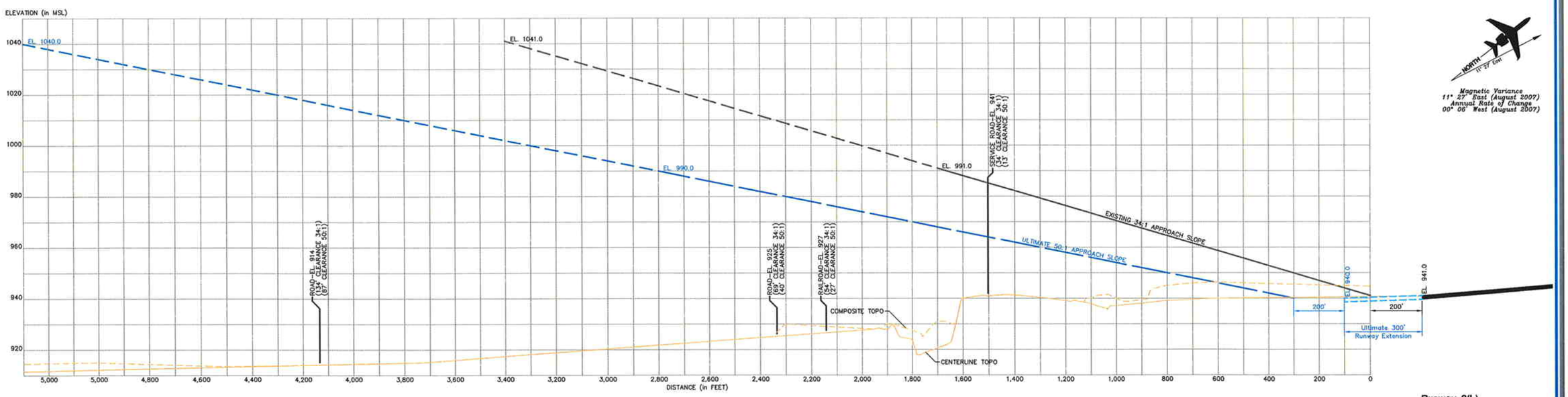

Magnetic Variance
11° 27' East (August 2007)
Annual Rate of Change
00° 06' West (August 2007)

Runway 3(L)

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OBSTRUCTION TABLE

Object Description	Obstructed Part 77 Surface	Object Elevation	Surface Elevation	Object Penetration	Proposed Object Disposition
NONE					

0 20 40
VERTICAL SCALE IN FEET

0 200 400
HORIZONTAL SCALE IN FEET

No.	REVISIONS	DATE	BY	APP'D.

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PHOENIX GOODYEAR AIRPORT

INNER PORTION OF RUNWAY 3(L) APPROACH SURFACE DRAWING

DRAFT

GOODYEAR, ARIZONA

PLANNED BY: Patrick G. Taylor
DETAILED BY: Richard A. Lally
APPROVED BY: James M. Harris

August 20, 2007 SHEET 5 OF 11

Coffman Associates
Airport Consultants

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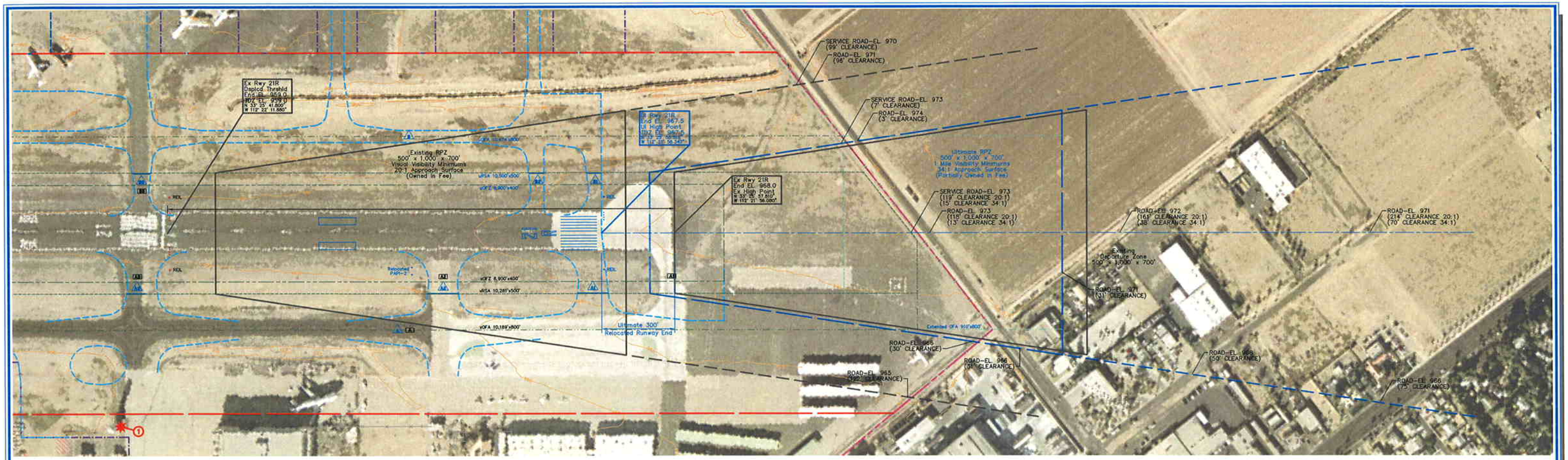
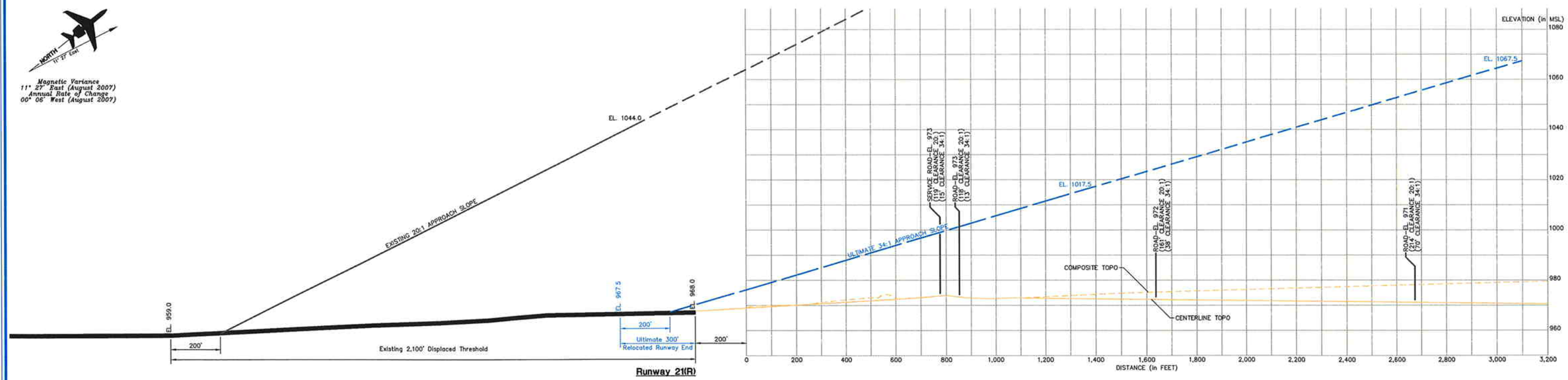


Magnetic Variance
11° 27' East (August 2007)
Annual Rate of Change
00° 06' West (August 2007)



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OBSTRUCTION TABLE

Object Description	Obstructed Part 77 Surface	Object Elevation	Surface Elevation	Object Penetration	Proposed Object Disposition
NONE					

0 30 60
VERTICAL SCALE IN FEET

0 300 600
HORIZONTAL SCALE IN FEET

No.	REVISIONS	DATE	BY	APP'D.

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PHOENIX GOODYEAR AIRPORT

INNER PORTION OF RUNWAY 21(R) APPROACH SURFACE DRAWING

GOODYEAR, ARIZONA

DRAFT

PLANNED BY: Patrick G. Taylor
DETAILED BY: Richard A. Lally
APPROVED BY: James M. Harris

August 20, 2007 SHEET 6 OF 11

Coffman Associates Airport Consultants

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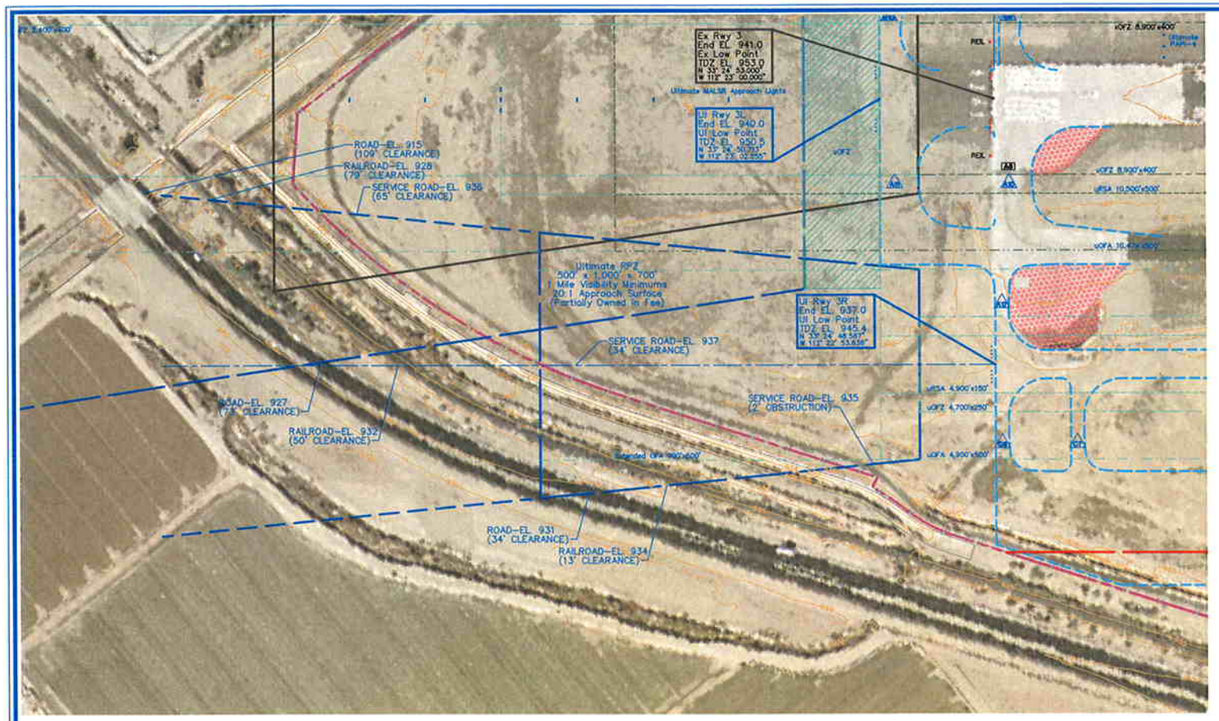
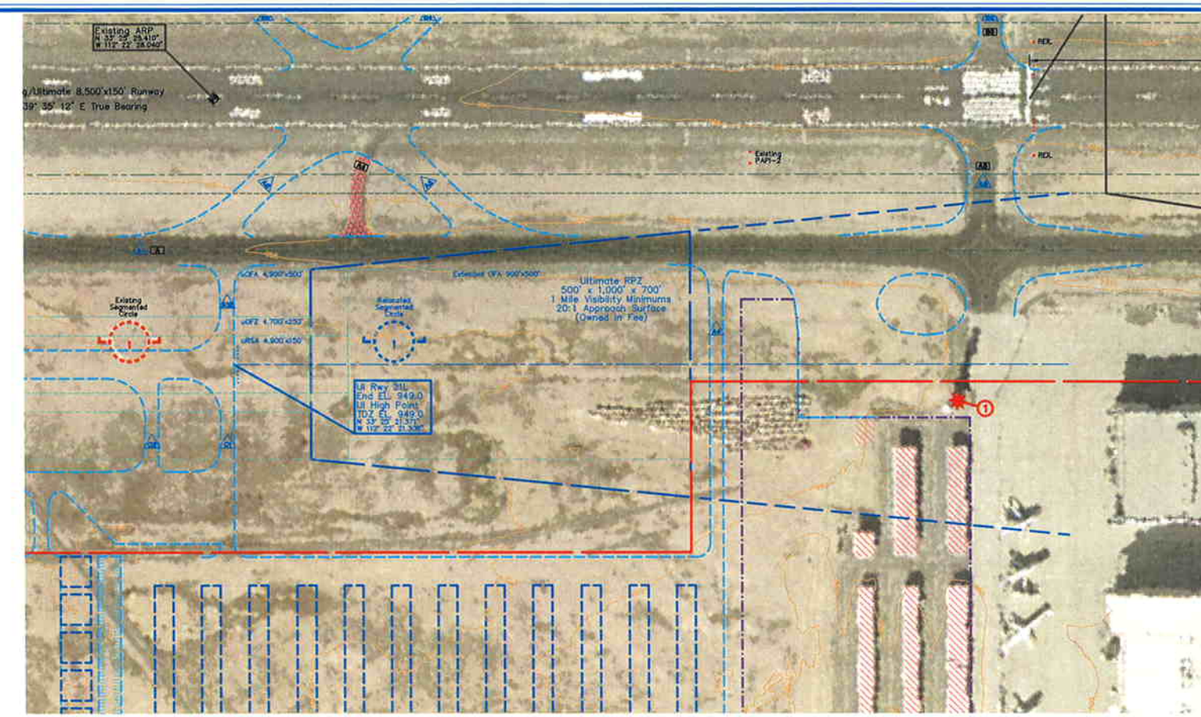
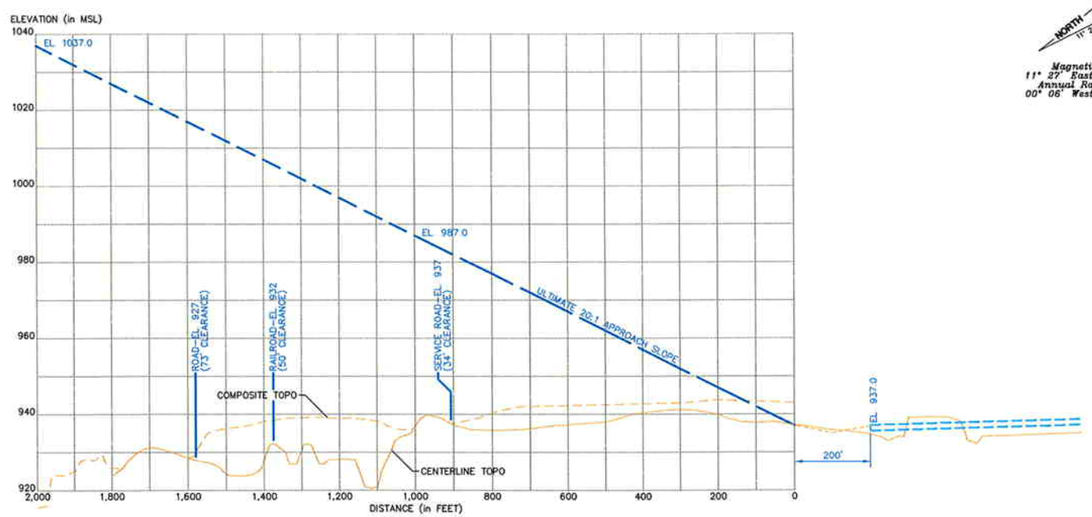
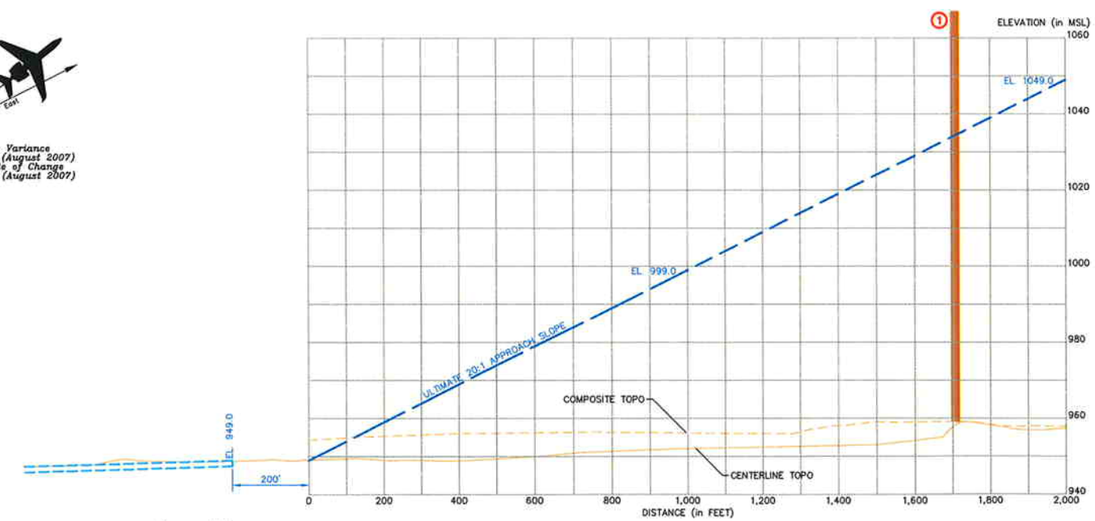






Runway 3R



Runway 21L

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OBSTRUCTION TABLE

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1. AIR TRAFFIC CONTROL TOWER/ROTATING BEACON	20:1 APPROACH SURFACE	1106	1034	72'	TO BE RELOCATED

0 20 40
VERTICAL SCALE IN FEET

0 200 400
HORIZONTAL SCALE IN FEET

No.	REVISIONS	DATE	BY	APP'D.

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PHOENIX GOODYEAR AIRPORT
INNER PORTION OF RUNWAYS 3R-21L APPROACH SURFACE DRAWING
GOODYEAR, ARIZONA

DRAFT

PLANNED BY: Patrick E. Taylor
DETAILED BY: Richard A. Lally
APPROVED BY: James M. Harris

August 20, 2007 SHEET 7 OF 11

Coffman Associates
Airport Consultants

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LEGEND

EXISTING	ULTIMATE	DESCRIPTION
		AIRPORT PROPERTY LINE
		AIRPORT PARCEL LINE
		AIRPORT REFERENCE POINT (ARP)
		AIRPORT ROTATING BEACON
		AVIGATION EASEMENT (if applicable)
		BUILDING REMOVAL
		BUILDING CONSTRUCTION (On/Off Airport)
BRL	BRL	BUILDING RESTRICTION LINE (BRL)
		FACILITY (PAVEMENT) CONSTRUCTION
		FENCING
H	H	HELIPORT
		LOCALIZER ANTENNA
		MEDIUM-INTENSITY APPROACH LIGHTING SYSTEM WITH RUNWAY ALIGNMENT INDICATOR (MALSR)
Critical Area	Critical Area	NAVAID CRITICAL AREA (Localizer/Glide Slope)
VASI-4	VASI-4	NAVIGATIONAL AID INSTALLATION
PAPI-4	PAPI-4	PRECISION APPROACH PATH INDICATOR
		PRECISION OBJECT FREE ZONE
		PRIMARY/SECONDARY AIRPORT CONTROL STATION
OFA	OFA	RUNWAY OBJECT FREE AREA
OFZ	OFZ	RUNWAY OBSTACLE FREE ZONE
RPZ	RPZ	RUNWAY PROTECTION ZONE (RPZ)
RSA	RSA	RUNWAY SAFETY AREA
		RUNWAY END IDENTIFICATION LIGHTS (REIL)
		RUNWAY THRESHOLD LIGHTS
RVZ	RVZ	RUNWAY VISIBILITY ZONE
		SECTION CORNER
		SEGMENTED CIRCLE/WIND INDICATOR
		TAXIWAY DESIGNATION
		TAXIWAY HOLD LINE
		TOPOGRAPHY
		WIND INDICATOR (Lighted)

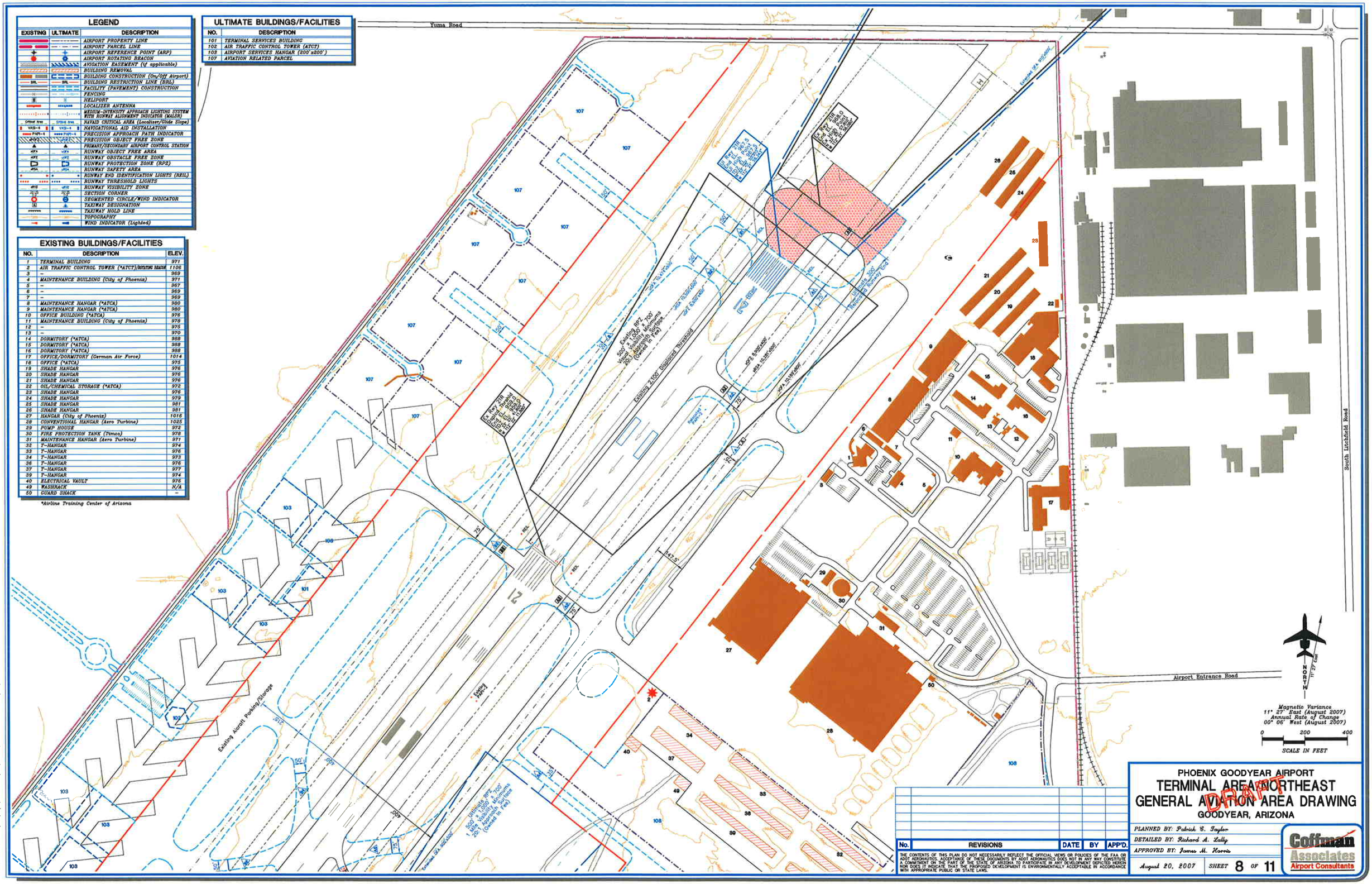
ULTIMATE BUILDINGS/FACILITIES

NO.	DESCRIPTION
101	TERMINAL SERVICES BUILDING
102	AIR TRAFFIC CONTROL TOWER (ATCT)
103	AIRPORT SERVICES HANGAR (200'x200')
107	AVIATION RELATED PARCEL

EXISTING BUILDINGS/FACILITIES

NO.	DESCRIPTION	ELEV.
1	TERMINAL BUILDING	971
2	AIR TRAFFIC CONTROL TOWER (*ATCT)/ROTATING BEACON	1106
3	–	969
4	MAINTENANCE BUILDING (City of Phoenix)	971
5	–	967
6	–	969
7	–	969
8	MAINTENANCE HANGAR (*ATCA)	980
9	MAINTENANCE HANGAR (*ATCA)	980
10	OFFICE BUILDING (*ATCA)	976
11	MAINTENANCE BUILDING (City of Phoenix)	978
12	–	975
13	–	970
14	DORMITORY (*ATCA)	989
15	DORMITORY (*ATCA)	988
16	DORMITORY (*ATCA)	988
17	OFFICE/DORMITORY (German Air Force)	1014
18	OFFICE (*ATCA)	975
19	SHADE HANGAR	976
20	SHADE HANGAR	976
21	SHADE HANGAR	976
22	OIL/CHEMICAL STORAGE (*ATCA)	972
23	SHADE HANGAR	976
24	SHADE HANGAR	979
25	SHADE HANGAR	981
26	SHADE HANGAR	981
27	HANGAR (City of Phoenix)	1016
28	CONVENTIONAL HANGAR (Aero Turbine)	1025
29	PUMP HOUSE	972
30	FIRE PROTECTION TANK (Tymco)	978
31	MAINTENANCE HANGAR (Aero Turbine)	971
32	T-HANGAR	974
33	T-HANGAR	976
34	T-HANGAR	973
36	T-HANGAR	976
37	T-HANGAR	977
39	T-HANGAR	974
40	ELECTRICAL VAULT	976
49	WASHRACK	N/A
50	GUARD SHACK	–

*Airline Training Center of Arizona



No.	REVISIONS	DATE	BY	APP'D.

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PHOENIX GOODYEAR AIRPORT

TERMINAL AREA/NORTHEAST GENERAL AVIATION AREA DRAWING

DRAFT

GOODYEAR, ARIZONA

PLANNED BY: Patrick E. Taylor

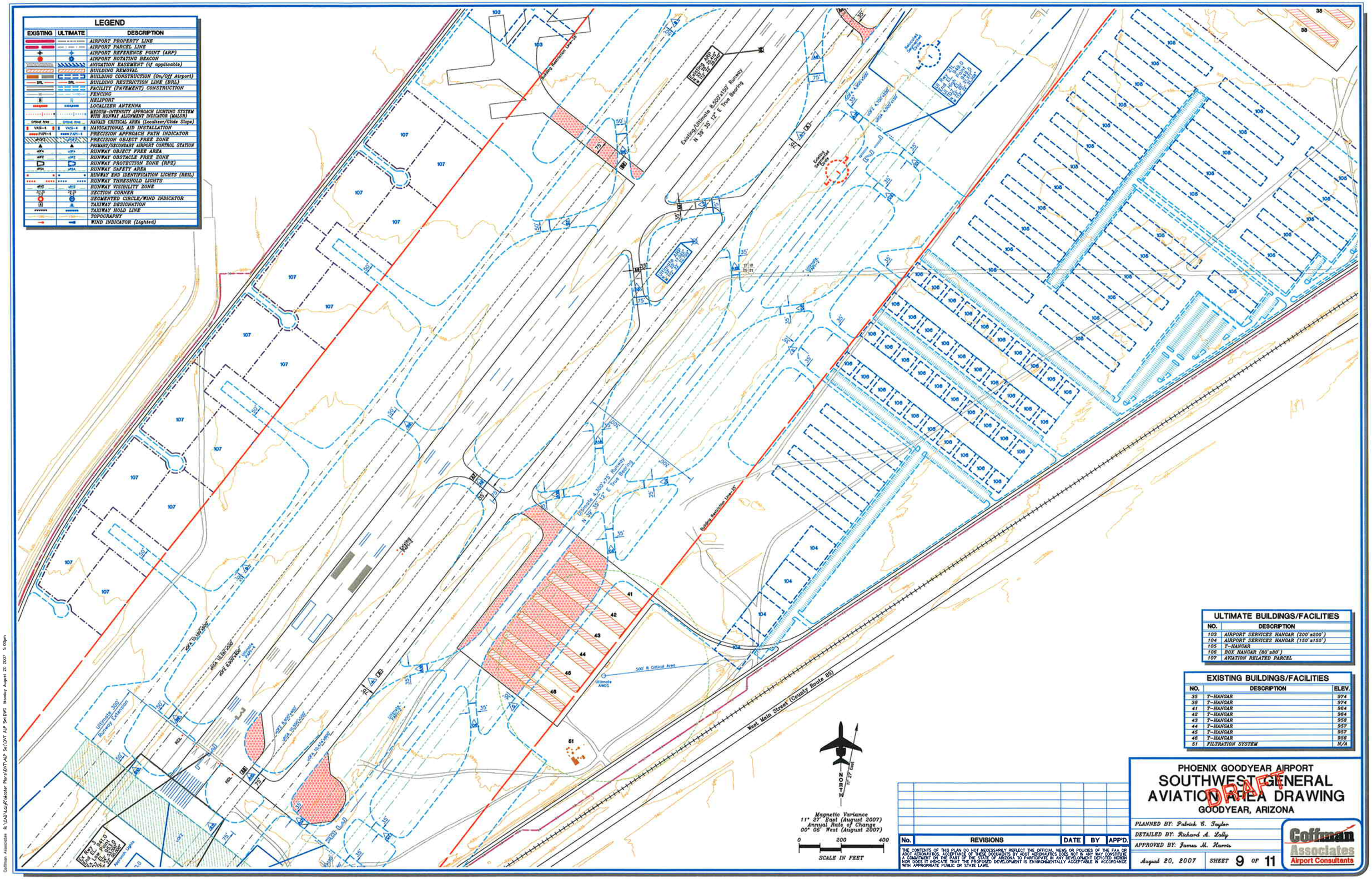
DETAILED BY: Richard A. Lally

APPROVED BY: James M. Harris

August 20, 2007 SHEET 8 OF 11

Coffman Associates Airport Consultants

Coffman Associates R:\CAD\Lally\Goodyear Phase3\DVT\ALP Set\DVT ALP Set.DWG Monday August 20 2007 5:00pm



ULTIMATE BUILDINGS/FACILITIES	
NO.	DESCRIPTION
103	AIRPORT SERVICES HANGAR (200'±200')
104	AIRPORT SERVICES HANGAR (150'±150')
105	T-HANGAR
106	BOX HANGAR (80'±80')
107	AVIATION RELATED PARCEL

EXISTING BUILDINGS/FACILITIES		
NO.	DESCRIPTION	ELEV.
35	T-HANGAR	974
38	T-HANGAR	974
41	T-HANGAR	964
42	T-HANGAR	964
43	T-HANGAR	958
44	T-HANGAR	957
45	T-HANGAR	957
46	T-HANGAR	956
51	FILTRATION SYSTEM	N/A

No.	REVISIONS	DATE	BY	APP'D.

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PHOENIX GOODYEAR AIRPORT

SOUTHWEST GENERAL AVIATION AREA DRAWING

DRAFT

GOODYEAR, ARIZONA

PLANNED BY: Patrick E. Taylor

DETAILED BY: Richard A. Lally

APPROVED BY: James M. Harris

August 20, 2007

SHEET 9 OF 11

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LEGEND

EXISTING	ULTIMATE	DESCRIPTION
		AIRPORT PROPERTY LINE
		AIRPORT PARCEL LINE
		AIRPORT REFERENCE POINT (ARP)
		AIRPORT ROTATING BEACON
		AVIGATION EASEMENT (if applicable)
		BUILDING REMOVAL
		BUILDING CONSTRUCTION (On/Off Airport)
BRL	BRL	BUILDING RESTRICTION LINE (BRL)
		FACILITY (PAVEMENT) CONSTRUCTION
		FENCING
		HELIPORT
		LOCALIZER ANTENNA
		MEDIUM-INTENSITY APPROACH LIGHTING SYSTEM WITH RUNWAY ALIGNMENT INDICATOR (MALSR)
Critical Area	Critical Area	NAVAID CRITICAL AREA (Localizer/Glide Slope)
VASI-4	VASI-4	NAVIGATIONAL AID INSTALLATION
PAPI-4	PAPI-4	PRECISION APPROACH PATH INDICATOR
POFZ	POFZ	PRECISION OBJECT FREE ZONE
		PRIMARY/SECONDARY AIRPORT CONTROL STATION
OFA	OFA	RUNWAY OBJECT FREE AREA
OFZ	OFZ	RUNWAY OBSTACLE FREE ZONE
		RUNWAY PROTECTION ZONE (RPZ)
RSA	RSA	RUNWAY SAFETY AREA
		RUNWAY END IDENTIFICATION LIGHTS (REIL)
		RUNWAY THRESHOLD LIGHTS
RVZ	RVZ	RUNWAY VISIBILITY ZONE
		SECTION CORNER
		SEGMENTED CIRCLE/WIND INDICATOR
		TAXIWAY DESIGNATION
		TAXIWAY HOLD LINE
		TOPOGRAPHY
		WIND INDICATOR (Lighted)

AIRPORT LAND USE LEGEND

AF	Airfield Operations Area
AS	Airport Support
PT	Public Terminal
	General Aviation
RS	Revenue Support
AA	Airport Access

No.	REVISIONS	DATE	BY	APP'D.

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PHOENIX GOODYEAR AIRPORT

AIRPORT LAND USE DRAWING

DRAFT

GOODYEAR, ARIZONA

PLANNED BY: Patrick C. Taylor
DETAILED BY: Richard A. Lolly
APPROVED BY: James M. Harris

August 20, 2007 | SHEET 10 OF 11

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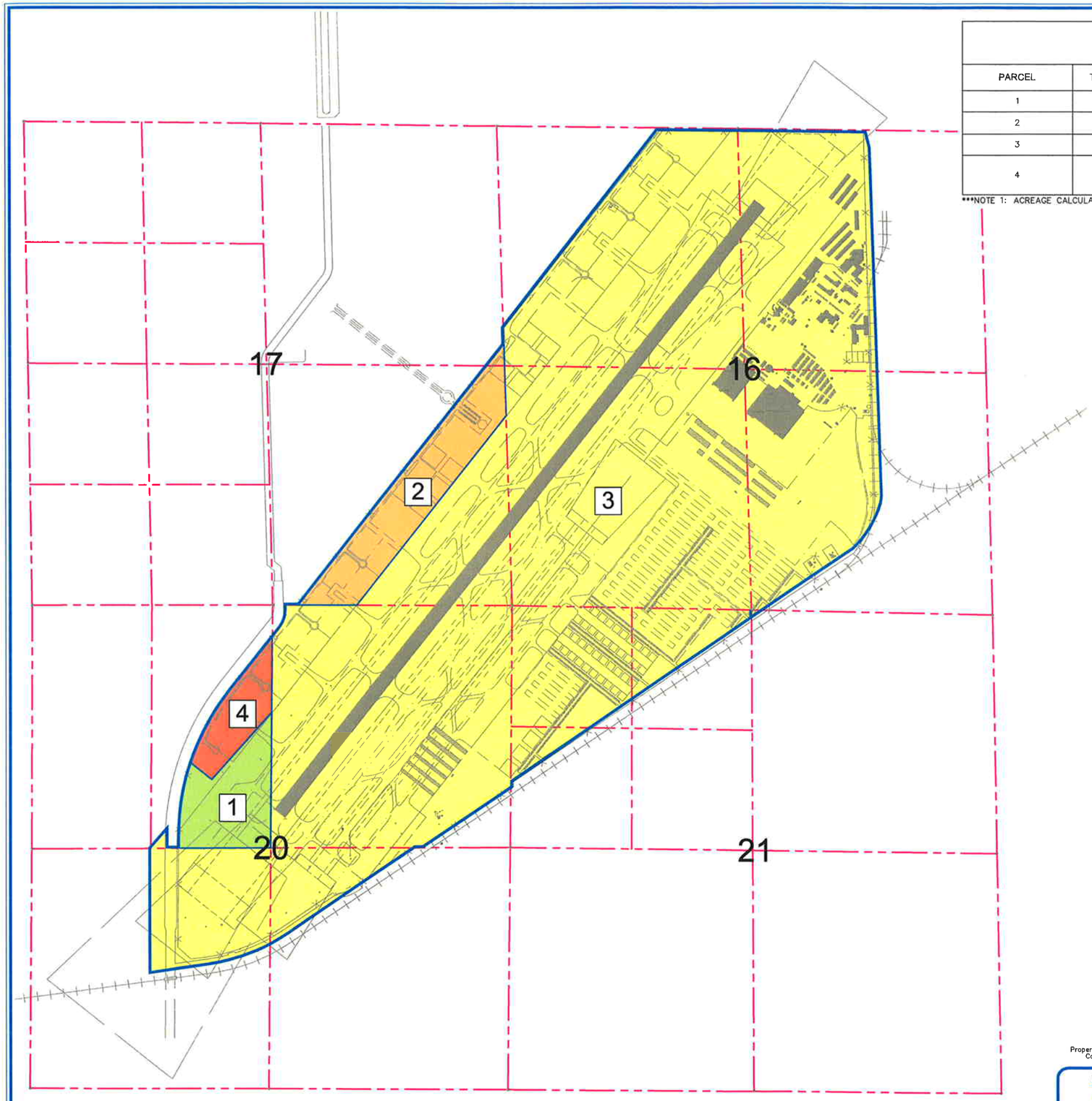

DEED REFERENCE - GOODYEAR AIRPORT

PARCEL	TAX PARCEL NO.	RECORDING NO.	RECORDING DATE	ACREAGE (SEE NOTE 1)	DESCRIPTION
1	500-07-031J	99-0985788	1-7-1999	22.7 AC±	WARRANTY DEED: FLOOD CONTROL DISTRICT, TO CITY OF PHOENIX
2	500-07-009B	88-360358	7-22-1988	36.0 AC±	WARRANTY DEED: RANCHO ESTRELLA REAL ESTATE CORP., TO CITY OF PHOENIX
3	500-07-006M	DKT.7166, PG.66	7-5-1968	754.8 AC ±	INDENTURE: U.S.A., TO CITY OF PHOENIX
4	500-07-031M	90-566515	12-21-1990	13.2 AC ±	WARRANTY DEED: WOOD FAMILY ENTERPRISES, L.P., TO CITY OF PHOENIX

***NOTE 1: ACREAGE CALCULATIONS BASED ON LEGAL DESCRIPTION IN TITLE REPORT ISSUED BY SECURITY TITLE AGENCY, ORDER NO. 400717621.

NORTH
11° 28' East

Magnetic Variance
11° 28' East (June 2007)
Annual Rate of Change
00° 06' West (June 2007)

0 600 1,200
SCALE IN FEET

Property Map Research Conducted By:

Wilcox
Wilcox Associates, Inc.

No.	REVISIONS	DATE	BY	APP'D.

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PHOENIX GOODYEAR AIRPORT

EXHIBIT "A"

AIRPORT PROPERTY MAP

GOODYEAR, ARIZONA

DRAFT

PLANNED BY: Patrick S. Taylor
DETAILED BY: Richard A. Lally
APPROVED BY: James M. Harris

July 12, 2007 SHEET 11 OF 11

Coffman Associates
Airport Consultants

Appendix D

FORECAST APPROVAL LETTER

U.S Department
of Transportation

**Federal Aviation
Administration**

Western-Pacific Region
Airports Division

P.O. Box 92007
Los Angeles, CA 90009

RECEIVED
JUN 22 2006

June 20, 2006

Barney Helmick
Airport Manager
Phoenix Goodyear Airport
1658 S. Litchfield Road
Goodyear, AZ 85338

Dear Mr. Helmick:

Phoenix Goodyear Airport, Goodyear, Arizona
Aviation Activity Forecast

The Federal Aviation Administration (FAA) has reviewed the *Draft Chapter Two Aviation Demand Forecasts* for the Phoenix Goodyear Airport (GYR) master plan. We approve the forecast for long-term airport planning purposes, including Airport Layout Plan (ALP) development.

The master plan forecast is much higher than the FAA Terminal Area Forecast (TAF). However, the difference between the forecasts does not point to a change in the role of the airport as identified in the FAA National Plan of Integrated Airport Systems (NPIAS). The NPIAS designation for GYR is a general aviation reliever and is not expected to change within the 20-year planning period.

The main reason the master plan forecast is higher than the TAF is because the Maricopa Association of Governments (MAG) projects high population growth within the airport service area over the next 25 years. The master plan points out that previous MAG study found strong historical correlation between based aircraft and population within Maricopa County. The master plan assumes this trend will continue and result in strong growth in both based aircraft and operations at GYR.

We also reviewed the *Chapter three "Unconstrained" Facility Requirements*. It does not appear the difference between master plan and TAF forecasts drives any major changes to the existing and proposed runway system as depicted on the current FAA approved ALP. However, the timing and need for potential projects such as construction of a second runway or significant expansion of aircraft basing facilities will depend on if and how fast forecast demand materializes. FAA will base future decisions about these types of projects on the activity levels reached and justifications provided at the time the projects are proposed for implementation.

06/22/2006 16:18 6029937196 COFFMAN ASSOCIATES PAGE 02/03

If you have any questions about this forecast approval, please call me at (310) 725-3613.

Sincerely,

Original Signed by

Richard P. Dykas
Supervisor, Capacity Section

cc: Coffman Associates, Inc (James M. Harris)

06/22/2006 16:18 6029937196 COFFMAN ASSOCIATES PAGE 03/03

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