Riverside Airport

AIRPORT • MASTER • PLAN

AIRPORT MASTER PLAN

for

RIVERSIDE AIRPORT

Riverside, California

Prepared for the

CITY OF RIVERSIDE

by

Coffman Associates, Inc.

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Riverside, California

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INTRODUCTION

Introduction

This update of the Riverside Airport (RAL) Master Plan has been undertaken to evaluate the airport's capabilities and role, to review forecasts of 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 development, maintenance, 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 Riverside, as the airport sponsor, 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 demand. The intended result is a development concept which outlines the proposed uses for all areas of airport property.

The City of Riverside recognizes the importance of air transportation to the community, as well as the unique challenges that operating an airport presents. The investment in an airport yields many benefits to the community and the region. With a sound and realistic master plan, the Riverside Airport can maintain its important link to the national air transportation system for the community and maintain the existing public and private investments in its facilities.

MASTER PLAN GOALS AND OBJECTIVES

The primary objective of the master plan is to provide the community and its leadership with guidance for operating the airport in a safe and efficient manner while planning for future demand levels. Accomplishing this objective requires a comprehensive evaluation of the existing airport and a determination of what actions should be taken to maintain a safe and reliable airport facility while meeting the aviation needs of the region. This master plan will provide a vision for the airport covering the next 20 years and, in some cases, beyond. With this vision, the City of Riverside will have advance notice of potential future airport funding needs so that appropriate steps can be taken to ensure that adequate funds are budgeted and planned.

Specific objectives of the Riverside Airport Master Plan Update 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 designed to meet forecast aviation demand;
- To develop a plan that is responsive to air transportation demands;
- To develop an orderly plan for use of the airport;
- To meet Federal Aviation Administration (FAA) airport design standards;
- 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 2027;
- Analyzing socioeconomic factors likely to affect air transportation demand for the airport;
- Identifying potential existing and future land acquisition needs;
- Evaluating future airport facility development alternatives which will optimize airport capacity and aircraft safety;

- Developing a realistic, common-sense plan for the use and/or expansion of the airport;
- Present environmental consideration associated with the recommended development alternatives;
- Produce current and accurate airport base maps and Airport Layout Plans.

MASTER PLAN ELEMENTS AND PROCESS

The Riverside Airport Master Plan Update is being prepared in a systematic fashion following FAA and California Department of Transportation Division of Aeronautics (Caltrans) guidelines and industry-accepted principles and practices, as shown on **Exhibit IA**. The master plan 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 aviation demand at the airport. The 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 Riverside Airport through the year 2027. The results of this effort are used to determine the types and sizes of facilities which will be required to meet the projected aviation demand at 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 safely 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 Airport Layout Plan (ALP) and detailed technical drawings depicting related airspace, land use, and property data. These drawings are used by the FAA and Caltrans 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 Riverside Airport Master Plan Update is of interest to many within the local community. This includes local citizens, community organizations, airport users, airport tenants, areawide planning agencies, and aviation organizations.

As an important component of the regional, state, and national aviation systems, the Riverside Airport is of importance to both state and federal agencies responsible for overseeing air transportation.

To assist in the development of the master plan, the airport administration has 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) will review phase reports and provide comments throughout the study to help ensure that a realistic, viable plan is developed.

To assist in the review process, draft chapters will be prepared at the various milestones in the planning process. The production of draft chapters allows for timely input and review during each step within the master plan to ensure that all master plan issues are fully addressed as the recommended program develops.

BASELINE ASSUMPTIONS

A study such as this typically requires some baseline assumptions that will be used throughout the analysis. The baseline assumptions for the Riverside Airport Master Plan are listed below:

- Riverside Airport currently operates as a reliever airport in the greater Los Angeles metropolitan area, and in particular, to the Ontario International Airport.

- Riverside Airport will continue in its role as a reliever airport.

- Rialto Municipal Airport may close in the near term.

- The other publicly owned general aviation airports in the region will remain open for the foreseeable future.

- The airport will operate under the direction of the City of Riverside throughout the planning period.

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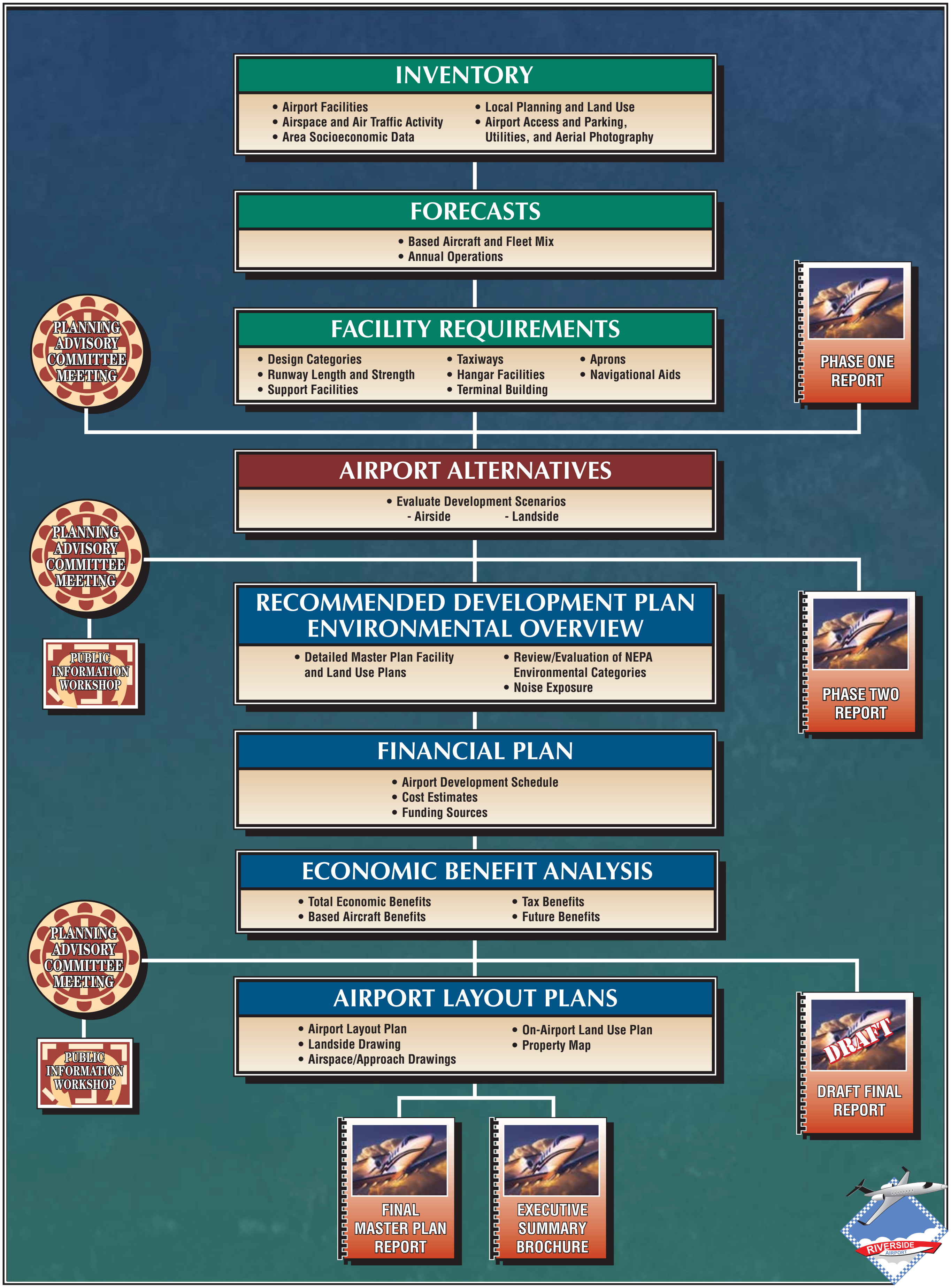

Exhibit IA
MASTER PLAN PROCESS

- Riverside Airport intends to seek general aviation and corporate business aviation based tenants and transient operations.

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

- Population and employment in the Riverside Airport service area will continue to grow as forecast by the Southern California Association of Governments (SCAG), the Western Riverside County Council of Governments (WRCOG), and the City of Riverside.

CONCLUSION

The master plan is evidence that the City of Riverside is committed to maintaining a first-class aviation facility providing general aviation services. The City recognizes the importance of Riverside Airport to the community and the region, as well as the associated challenges inherent in providing for aviation needs in a growing regional environment. Maintaining a sound, flexible master plan will facilitate continued growth of the airport as a major economic asset for the community.

Chapter One

INVENTORY

Inventory

The initial step in the preparation of the airport master plan update for Riverside Airport is the collection of information that will provide a basis for the analysis to be completed in subsequent chapters. For the master plan, information is gathered regarding not only the airport, but also the region it serves. This chapter will begin with an overview of the airport location, competing airports, and typical weather conditions. This will be followed by a discussion of demographic and socioeconomic factors relevant to the region. A comprehensive overview of the national aviation system for general aviation airports and the role of Riverside Airport in the national system are also presented. Finally, an inventory of the existing facilities at the airport will be discussed.

The information outlined in this chapter was obtained through on-site inspections of the airport, including interviews with airport management, airport tenants, and representatives of various government agencies. Information was also obtained from existing studies. Additional information and documents were provided by the Federal Aviation Administration (FAA), Riverside County Airport Land Use Commission, the City of Riverside - Planning and Development Departments, and the California Department of Transportation - Aeronautics Division (Caltrans). A complete list of document sources is provided at the end of this chapter.

AIRPORT SETTING AND ADMINISTRATION

As depicted on **Exhibit 1A**, Riverside Airport is located on approximately 441 acres of property in the northwest portion of the City of Riverside, California. The airport is approximately six miles to the west/southwest of the City of Riverside's government district. The City of Riverside is located in Riverside County in the greater Los Angeles basin and is approximately 50 miles from downtown Los Angeles.

The City of Riverside is located in a well-developed area and is adjacent to the cities of San Bernardino, Rancho Cucamonga, and Ontario to the north. To the west is the Cities of Moreno Valley and Chino and to the south is Corona.

The airport is bordered on the north by Central Avenue, to the south by the Arlington Avenue, and to the west by Van Buren Boulevard. Each of these is an arterial road traversing the City of Riverside. On the west, the airport is bordered by Hillside Avenue, a connector street.

Airport Drive, extending from Arlington Avenue, is the main entrance to the airport. Flight Road provides terminal building access and access to airport facilities located southwest of the primary runway. Gemende Drive provides access to general aviation services and the hangar storage building on the southeast side of the primary runway. An unnamed road leading to the new general aviation hangars is being constructed west of Runway 16-34 will extend east from Arlington Avenue. Access from Central Avenue to the north leads to the hangar facility located to the east of Runway 16.

GROUND TRANSPORTATION

The Riverside Transit Agency (RTA) serves the City of Riverside and the western third of Riverside County, as far east as the City of Banning, approximately 30 miles to the east of the City of Riverside. As of 2006, the RTA operates more than 230 vehicles, the majority of which are traditional busses on 39 fixed routes. Five commuter routes are provided and a Dial-A-Ride Service is available.

The City of Riverside is served by Greyhound and Amtrak, both of which provide terminal facilities in downtown Riverside. Metrolink trains provide commuter rail service from western Riverside County to Los Angeles and Orange counties. The Pedley Metrolink station is approximately three miles to the northwest and the La Sierra station is approximately five miles southwest of the airport. The Riverside downtown station serves both Amtrak and Metrolink. Local transportation service providers include several taxi companies and charter van and bus lines.

Union Pacific rail lines extend through the City of Riverside. One rail spur crosses Central Avenue, extending south to within approximately 475 feet of the Runway 9 end. This rail spur terminates near the intersection of Van Buren Boulevard and Arlington Avenue. This spur primarily serves a lumber yard accessible from Arlington Avenue.

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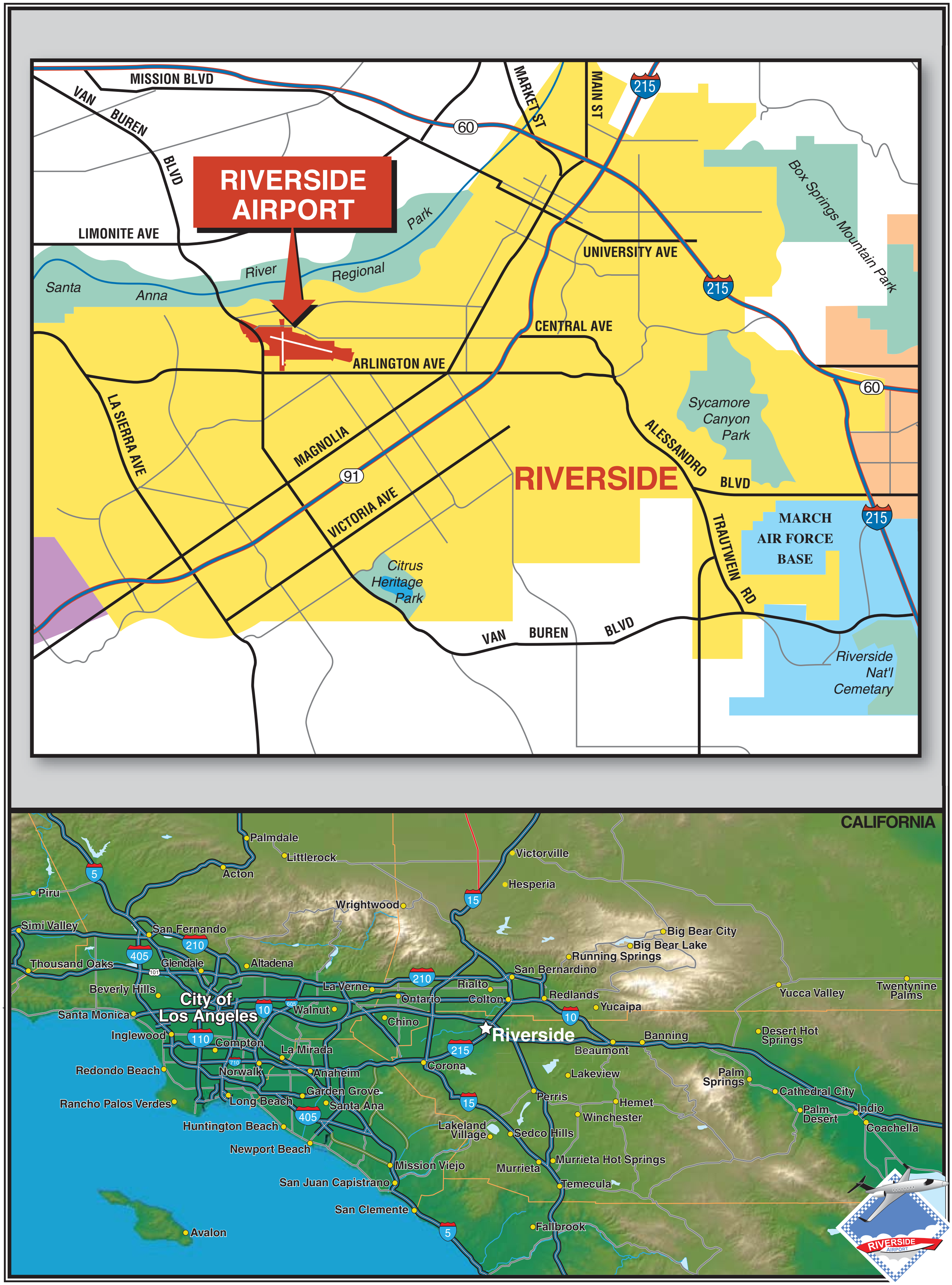

Exhibit 1A
LOCATION MAP

Traditional airport location signs with a white airplane outline and a green background are located along the major arterial streets in the vicinity of the airport.

AIRPORT ADMINISTRATION

Riverside Airport is owned and operated by the City of Riverside as an enterprise fund. The airport functions as an independent department within the City, reporting to the Deputy City Manager. The day-to-day administration and management of the airport is the responsibility of the Airport Director. Airport staff includes three maintenance/operations personnel and two administrative assistants.

Administrative and financial oversight of the airport is the responsibility of the Riverside City Council, with guidance provided by a nine-member Airport Commission, appointed by the City Council. The Airport Commission serves in an advisory capacity, reviewing policy and providing recommendations to the City Council. Airport Commission members can serve two consecutive four-year terms.

REGIONAL CLIMATE

Weather conditions must be considered in the planning and development of an airport, as daily operations are affected by local weather. Temperature is a significant factor in determining runway length needs, while local wind patterns (both direction and speed) dictate the optimal orientation of the runway.

The regional climate is typical of the desert southwest, warm and dry. The average daily low temperature ranges from 42 degrees Fahrenheit in December to 63 degrees in July. The average daily high temperature ranges from 68 degrees in January to 93 degrees in August. The region averages approximately 10 inches of precipitation annually. The City of Riverside experiences sunshine approximately 70 percent of the time. The monthly average wind speed is 6.25 mph, and the predominant wind direction is from west to east. A summary of climactic data is presented in **Table 1A**.

TABLE 1A
Climate Summary
Riverside, California

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
High Temp. Avg.	68	70	71	76	80	88	93	93	91	83	74	69
Low Temp. Avg.	43	44	46	49	54	59	63	64	61	54	46	42
Precip. Avg.(in.)	2.32	2.31	2.11	0.58	0.20	0.10	0.03	0.17	0.24	0.31	0.74	1.11
Wind Speed (mph)	5.5	6.0	6.5	7.4	7.1	7.0	6.8	6.7	6.3	5.5	5.2	5.0
Sunshine (%)	71	71	70	68	60	62	67	71	70	69	74	72

Source: The Weather Channel; www.city-data.com

AREA LAND USE

Land uses in the vicinity of the airport can have a significant impact on airport operations and growth. The following section identifies baseline information relating to both existing and future land uses in the vicinity of Riverside Airport. By understanding the land use issues surrounding the airport, more appropriate recommendations can be made for the future of the airport.

Land use in the vicinity of the airport is a mixture of residential, commercial, industrial, and open space. To the north of the airport is a mixture of industrial and open space land uses extending to the Santa Ana River valley. Land uses to the south, west, and east are primarily residential. A number of schools, churches, healthcare, and commercial facilities are distributed through these residential areas. **Exhibit 1B** presents existing land uses in the vicinity of the airport.

Exhibit 1C presents the current land use policy for properties in the vicinity of the airport. This land use policy is included in the *City of Riverside General Plan* as adopted in 2006.

Height restrictions are necessary to ensure that objects will not impair flight safety or decrease the operational capability of the airport. Title 14 of the Code of Federal Regulations (CFR) Part 77, *Objects Affecting Navigable Airspace*, defines a series of imaginary surfaces surrounding airports. The imaginary surfaces consist of the approach zone, conical zones, transitional zones, and horizontal zones. Objects such as trees, towers, buildings, or roads, which penetrate any of these surfaces, are considered by the FAA to be an obstruction to air navigation. Current City of Riverside ordinances adhere to and support the height restriction guidelines as set forth in 14 CFR Part 77. Height restrictions can be accomplished through height and hazard zoning, avigation easements, or fee simple acquisition.

RIVERSIDE COUNTY AIRPORT LAND USE COMPATIBILITY PLAN

Airport land use commissions (ALUCs) were first established under the *California State Aeronautics Act* in 1967. Although the law has been amended numerous times since then, the fundamental purpose of ALUCs to promote land use compatibility around airports has remained unchanged.

The statute gives ALUCs two principal powers by which to accomplish this objective. First, ALUCs must prepare and adopt an airport land use compatibility plan. Secondly, they must review the plans, regulations, and other actions of local agencies and airport operators for consistency with that plan.

The ALUCs are somewhat limited in their enforcement power. The statute specifically says that ALUCs have no authority over either existing land uses or the operation of airports. Local general plans are the primary mechanism for implementing the compatibility policies set forth in the ALUCs plan.

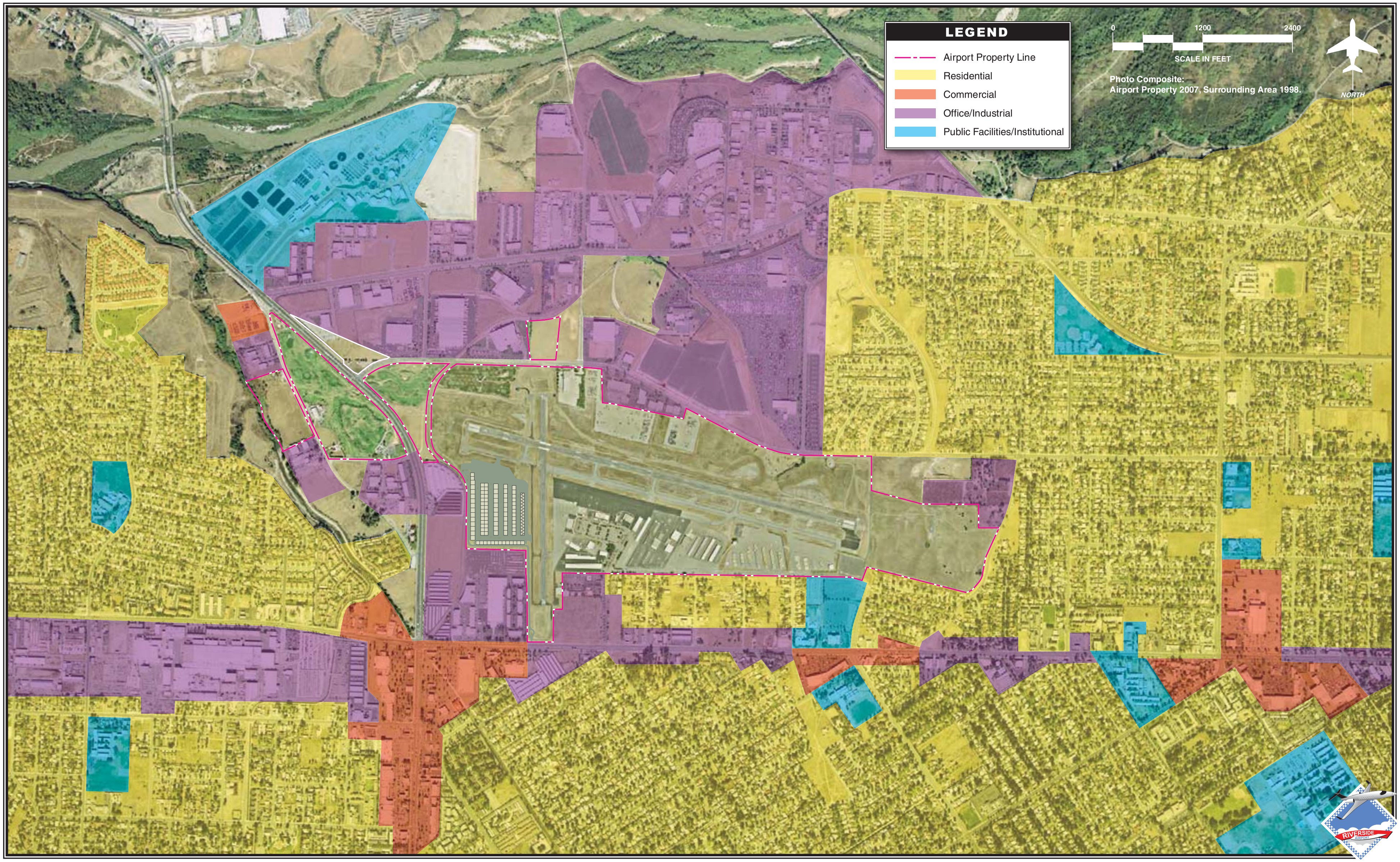

Exhibit 1B
EXISTING LAND USE

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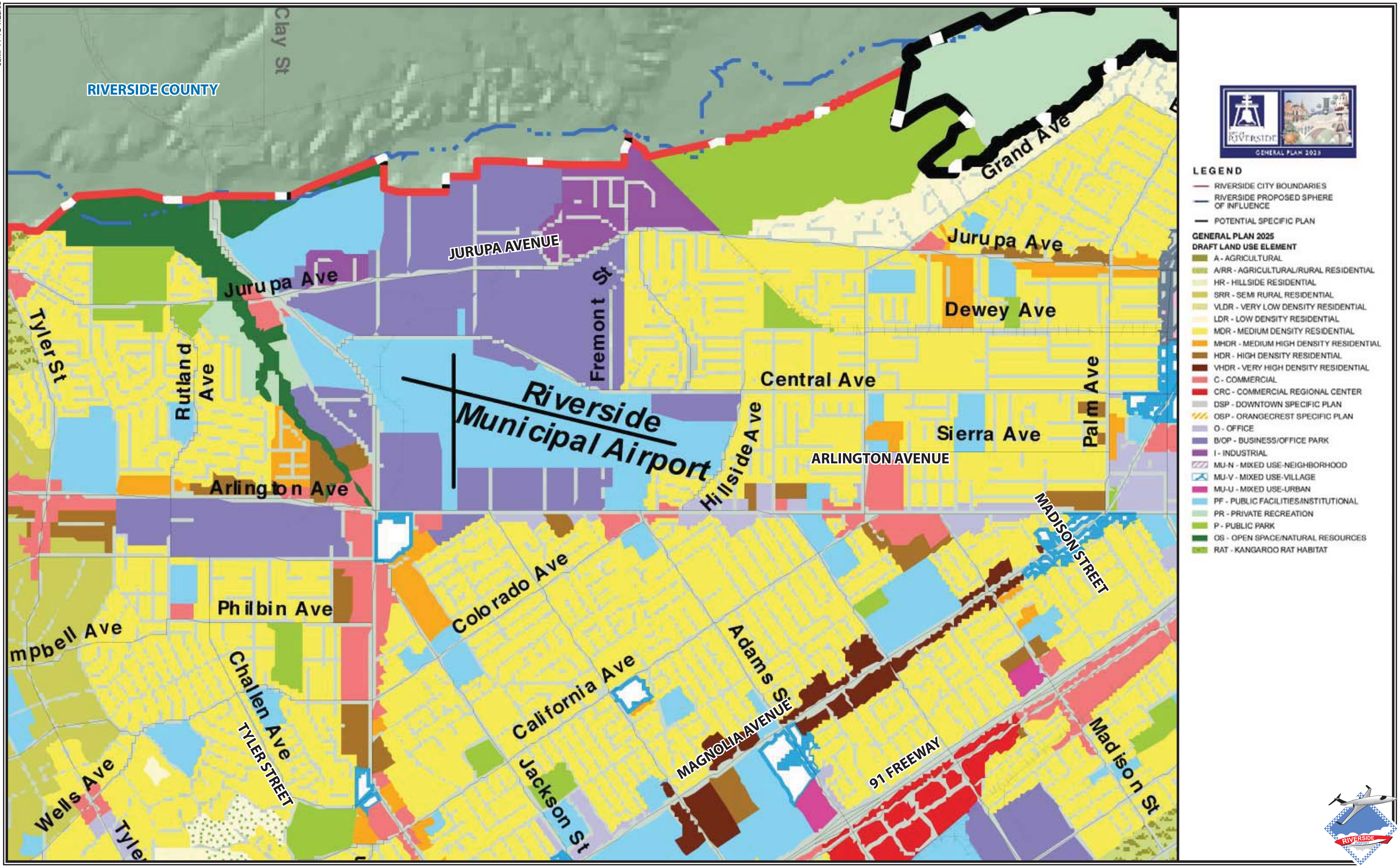


Exhibit 1C
RIVERSIDE LAND USE POLICY MAP

In 2005, the Riverside County Airport Land Use Commission adopted its official *Riverside County Airport Land Use Compatibility Plan*. **Exhibit 1D** presents the compatibility map associated with Riverside Airport. This map and the recommendations for land use compatibility have subsequently been included in the City of Riverside Zoning Code (Article VI, Chapter 19.170, *Airport Protection Overlay Zone [AP*]) as of March 2006.

The compatibility map defines several zones and provides recommended land uses. A summary of the recommended land uses by zones are as follows:

- Zone A – Runway Protection Zone and within Building Restriction Line: This zone should have no structures except those set by aeronautical function such as airfield lighting and navigational aids.
- Zone B1 – Inner Approach/Departure Zone: Parcels should average at least 20 acres in size with at least 30 percent open space. No schools, day care centers, libraries, hospitals, or other noise-sensitive uses. A density of no more than 50 persons per acre.
- Zone B2 – Adjacent to Runway: Parcels should average more than 10 acres in size. No more than 200 persons per acre. No noise-sensitive land uses like Zone B1.
- Zone C – Extended Approach/ Departure Zone: Parcels should average more than five acres in size with at least 20 percent open space. A density of no more than 150 persons per acre.
- Zone D – Primary Traffic Patterns and Runway Buffer Area: Parcels should average more than five acres in size with ten percent open space provided. No noise-sensitive land uses. No more than 300 persons per acre.
- Zone E – No limits on land uses except to prevent hazards to flight. Large assembly halls are discouraged under the traffic pattern.

This airport master plan is subject to review by the Riverside Airport Land Use Commission. A member of the commission sits on the Planning Advisory Committee. If any changes to airport operations are planned, an application to amend the Riverside County Airport Land Use Compatibility Plan will need to be made.

AIRPORT SYSTEM PLANNING ROLE

Airport planning exists on four primary levels: local, regional, state, and national. Each level has a different emphasis and purpose. An airport master plan is the primary local airport planning document. This master plan will provide a vision of both the airfield and landside facilities over the course of the next 20 years.

At the regional level, Riverside Airport is included in the Southern California Association of Government (SCAG) *General Aviation System Plan* (GASP). The GASP evaluates the region's capacity and ability to meet aviation demand. Riverside Airport is one of 44 general aviation airports included in the GASP, which SCAG considers important to meeting the region's demand for aviation services.

At the state level, the airport is included in the *California Aviation System Plan* (CASP). The purpose of the CASP is to ensure that the state has an adequate and efficient system of airports to serve its aviation needs. The CASP defines the specific role of each airport in the state's aviation system and establishes funding needs. The CASP is updated every five years with the most recent revision being completed in 2003. Riverside Airport is one of 244 general aviation and reliever airports within the state's aviation 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 3,431 airports which are significant to national air transportation. Of this total, 2,847 are general aviation or reliever airports. The NPIAS plan is used by the FAA in administering the Airport Improvement Program (AIP). The NPIAS supports the FAA's strategic goals for safety, system efficiency, and environmental compatibility by identifying specific airport improvements. An airport must be included in the NPIAS to be eligible for federal funding assistance through the AIP program.

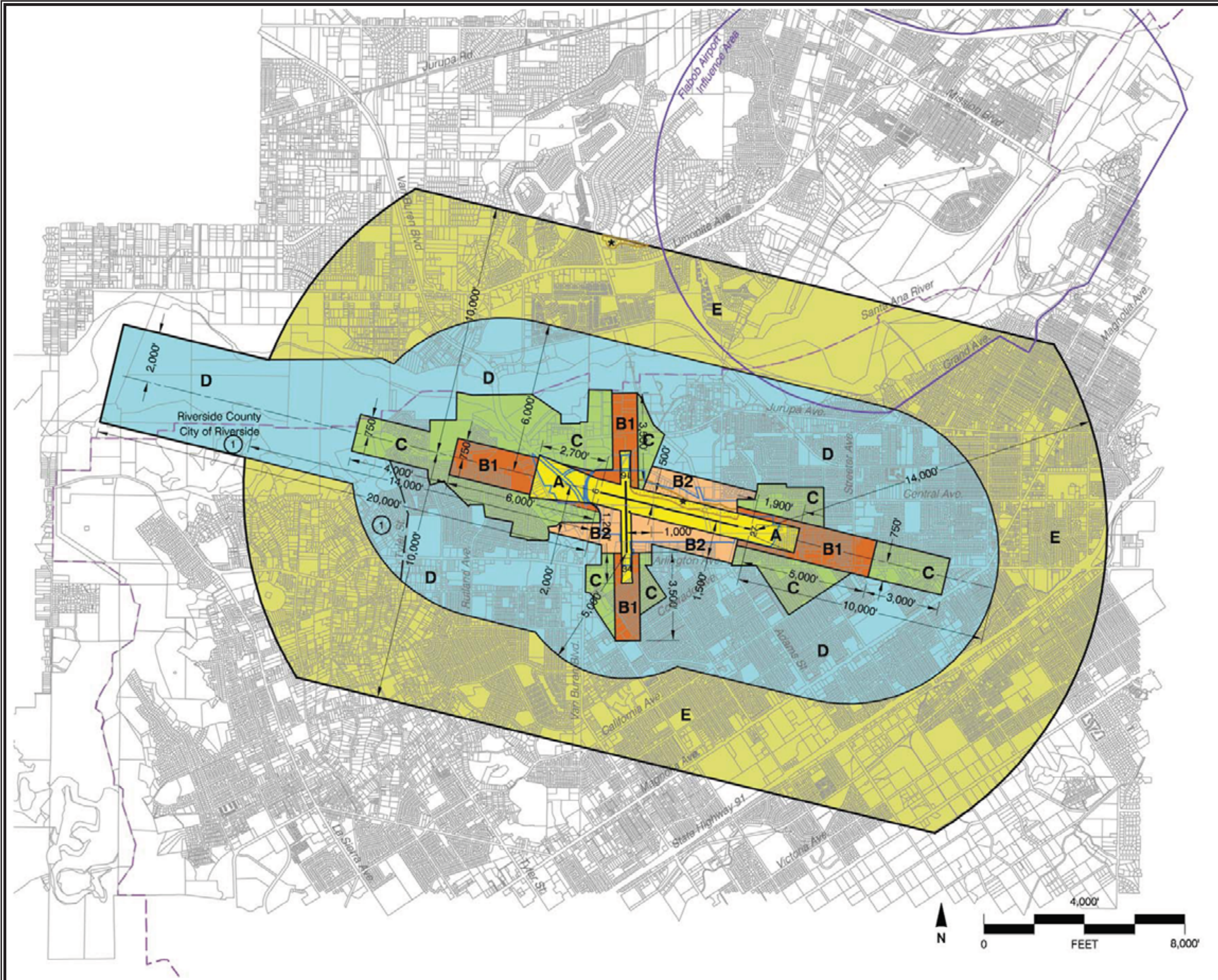
Riverside Airport is one of 191 general aviation airports in California included in the NPIAS. The NPIAS includes estimates on the total development needs of the nation's airports which are eligible for federal funding assistance. Riverside Airport has been designated by the NPIAS as a reliever airport for the region's commercial service airports. Reliever airports are high-capacity general aviation airports in major metropolitan areas. These specialized airports serve as attractive alternatives to using congested commercial service airports for general aviation aircraft.

Riverside Airport is one of seven designated reliever airports in the southern California area. According to the NPIAS, the 274 reliever airports across the country have an average of 232 based aircraft and account for 29 percent of the nation's general aviation fleet.

The following sub-sections present a description of the primary existing planning documents that incorporate Riverside Airport.

SOUTHERN CALIFORNIA ASSOCIATION OF GOVERNMENTS (SCAG) GENERAL AVIATION SYSTEM PLAN

In 2003, SCAG completed the *General Aviation System Plan (GASP)*. As the Metropolitan Planning Organization (MPO) for the region, the SCAG is charged with coordinating transportation planning among the constituent governments. As the regional aviation plan for commercial service airports is implemented, there will be a "ripple effect" through the aviation system, where rising costs and less available capacity will impact smaller general aviation airports.



Legend

Compatibility Zones

- Airport Influence Area Boundary
- Zone A
- Zone B1
- Zone B2
- Zone C
- Zone D
- Zone E
- Height Review Overlay Zone

Boundary Lines

- Airport Property Line
- City Limits

Note

Airport influence boundary measured from a point 200 feet beyond runway ends in accordance with FAA airspace protection criteria (FAR Part 77). All other dimensions measured from runway ends and centerlines.

See Chapter 2, Table 2A for compatibility criteria associated with this map. See Section RI.2 for special exceptions to the Table 2A criteria.

Riverside County
Airport Land Use Commission

Riverside County
Airport Land Use Compatibility Plan
Policy Document

(Adopted March 2005)

05MP11-1D-8/14/07

Exhibit 1D
AIRPORT LAND USE
COMPATIBILITY PLAN

The GASP is intended to provide aviation forecasts for each general aviation airport in the system. The study also provides a better understanding of corporate aviation in the region and identifies potential growth trends. The potential impacts of the *Regional Aviation Plan* implementation on corporate and smaller general aviation activity are also discussed.

The GASP recognizes that many general aviation airports are supporting an increasing level of corporate aviation activity, particularly cabin-class business jets. The emergence of "fractional ownership" aircraft, essentially a time-share agreement for a portion of an aircraft, has greatly impacted general aviation airports.

With increased security requirements and airline delay becoming more prevalent in the post-9/11 aviation environment, many corporate executives are looking to charters or fractional programs to reduce their travel times and, therefore, save money.

The SCAG-GASP will be considered throughout this master planning process. Review of the baseline aviation demand forecasts in comparison with more recent forecasts will be presented in the chapters to follow.

CALIFORNIA AVIATION SYSTEM PLAN (CASP)

The California Department of Transportation Division of Aeronautics (Caltrans) actively participated in aviation planning and capital improvement projects in the state. The CASP is composed of ten Elements and Working Papers and is updated every five years. The CASP is developed in consultation with regional transportation planning agencies and is adopted by the California Transportation Commission.

The CASP was updated in 2003 and includes minimum standards depending on the airport classification. The minimum standards are presented in **Table 1B**. Riverside Airport is classified as a regional general aviation airport and it meets the minimum standards for this classification. Riverside Airport also meets the minimum standards for a metropolitan general aviation airport. The minimum standards may need to be exceeded depending on local airport activity. Further analysis of the needs for Riverside Airport will be provided in subsequent chapters of this master plan.

PREVIOUS AIRPORT MASTER PLAN

The City of Riverside adopted the previous Airport Master Plan for Riverside Airport in November 1999. The adopted master plan concept recommended extending Runway 27, 753 feet to the east. This planned extension was intended to accommodate forecast growth in activity by larger business jets. Currently, on warmer days in the summer, some aircraft may be weight-restricted necessitating an intermediate stop to take on more fuel.

A north side parallel taxiway was planned to provide access to future aviation-related parcel development. Reserving the north side for development will lead to additional revenue generation for the airport, aiding in airport self-sufficiency.

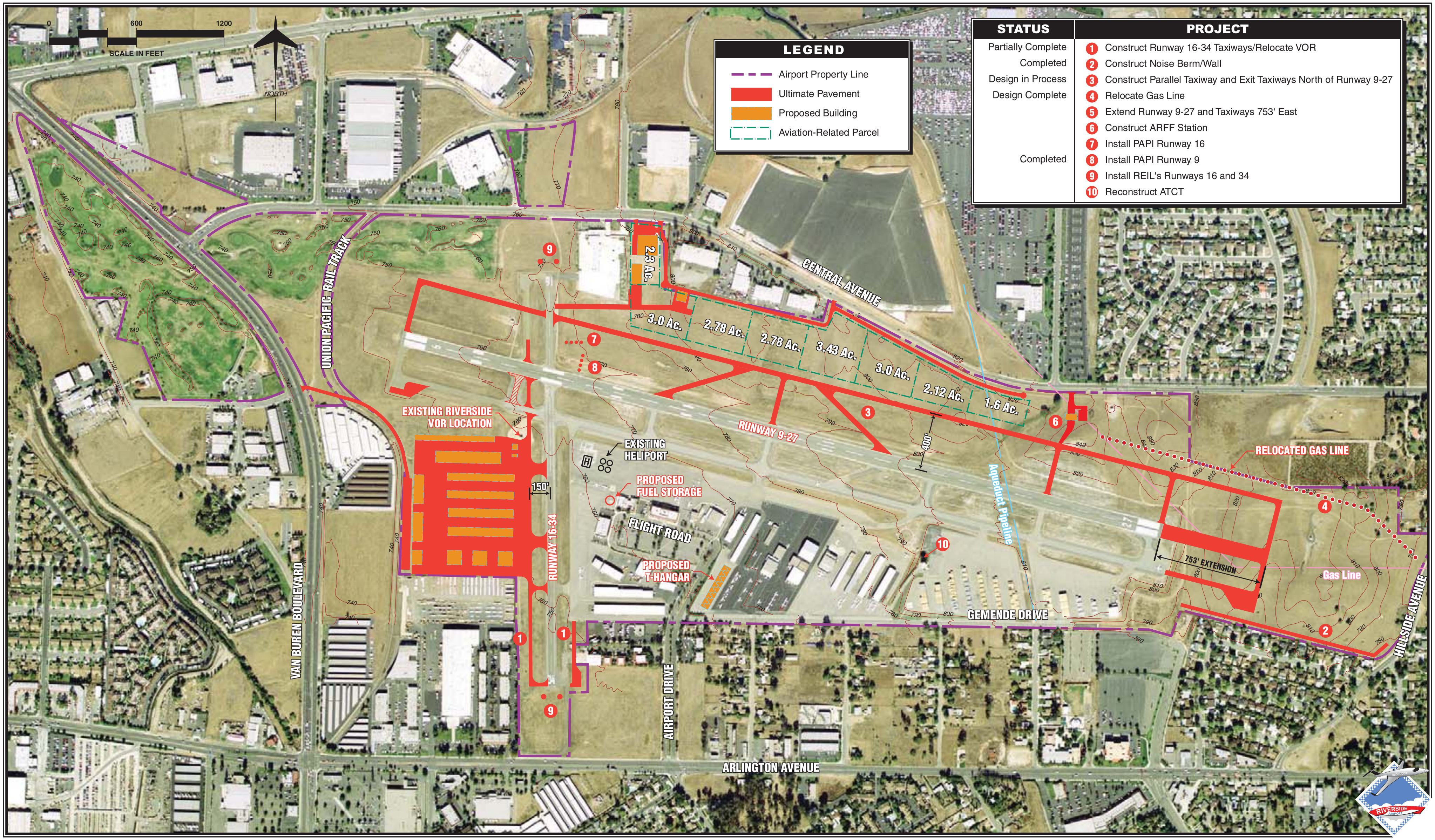
TABLE 1B
Caltrans Airport Classification Minimum Standards
Non-Primary Commercial Service Airports

Airport Element	Metropolitan GA	Regional GA	Community GA	Limited Use GA
Runway Length	5,000' below 3,000' MSL; 6,000' above 3,000' MSL; or as provided in AMP.	Sufficient to accommodate 100% of fleet at 60% useful load.*	Sufficient to accommodate 100% of small fleet with 10 or fewer seats.*	Sufficient to accommodate 75% of small fleet with 10 or fewer seats.*
Runway Width	100'	75'	75'	60'
Runway Strength Minimum	25,000 SWL	12,500 SWL	12,500 SWL	12,500 SWL
Runway Approach Lights	MALS to runway with precision approach.	None	None	None
Weather Aids	24-Hour ASOS/AWOS	24-Hour ASOS/AWOS	24-Hour ASOS/AWOS if IFR approach or Part 135 air ambulance operator on field.	None
Landing Aids	VASI/PAPI to lighted runway if no approach lights; REIL for IFR runway w/o approach lights.	VASI/PAPI to lighted runway if no approach lights; REIL for IFR runway w/o approach lights.	VASI/PAPI to lighted runway if no approach lights; REIL for IFR runway w/o approach lights.	None
Fuel	Jet A and AvGas	AvGas; Jet A unless runway less than 3,000'	AvGas	None

MSL: Mean Sea Level.
AMP: Airport Master Plan
SWL: Single Wheel Loading (Landing gear with a single wheel on each strut)
MALS: Medium intensity approach lighting system
IFR: Instrument Flight Rules
VASI: Visual approach slope indicator.
PAPI: Precision approach slope indicator.
ASOS: Automated surface observation system
AWOS: Automated weather observation system.
* As defined in FAA AC 150/5325-4A

Source: California Aviation System Plan

The southern 1,400 feet of Runway 34 is obstructed from view by the airport traffic control tower (ATCT). The previous master plan recommended a replacement tower be constructed in its present location to alleviate this situation. **Exhibit 1E** presents the master plan concept from the *1999 Riverside Airport Master Plan*.



05MP11-1E-9/27/07

Exhibit 1E
1998 MASTER PLAN CONCEPT

AIRSIDE FACILITIES

Airport facilities can be functionally classified into two broad categories: airside and landside. The airside category includes those facilities which are needed for the safe and efficient movement of aircraft, such as runways, taxiways, lighting, and navigational aids. The landside category includes those facilities necessary to provide a safe transition from surface-to-air transportation and support aircraft servicing, storage, maintenance, and operational safety on the ground.

Existing airside facilities are identified on **Exhibit 1F**. **Table 1C** summarizes airside facility data for Riverside Airport.

TABLE 1C
Airside Facility Data
Riverside Airport

	RUNWAY 9-27	RUNWAY 16-34
Runway Length (feet)	5,401	2,851
Runway Width (feet)	100	48
Runway Surface Material (Condition)	Asphalt (Excellent)	Asphalt (Excellent)
Runway Markings (Condition)	Nonprecision (27) (Good) Precision (9) (Good)	Basic (Good)
Runway Lighting	Medium Intensity (MIRL)	Medium Intensity (MIRL)
Runway Load Bearing Strength (pounds)		
Single Wheel Loading (SWL)	48,000	40,000
Dual Wheel Loading (DWL)	70,000	50,000
Dual Tandem Wheel Loading (DTWL)	110,000	80,000
Taxiway Lighting	Medium Intensity (MIRL)	
Taxiway, Taxilanes & Apron Lighting	Centerline marking, Tie-down area marking	
Traffic Pattern	Left (9-27)	Right (16); Left (34)
Approach Aids	1,400' MALSR (9) PAPI-4L (9-27) (Inoperable) REIL (27) (Inoperable)	PAPI-2L (34)
Instrument Approach Aids	ILS (CAT I) (9) RNAV (GPS) (27) VOR or GPS (9) VOR or GPS-A (Circling) VOR or GPS-B (Circling)	VOR or GPS-A (Circling) VOR or GPS-B (Circling)
Helipad 'H1' with lights measuring 60' x 60'		
Weather and Navigational Aids	Automated Surface Observation System (ASOS) Lighted Wind Cone Airport Beacon Airport Traffic Control Tower (ATCT) Automated Terminal Information System (ATIS) VOR (Inoperable) Remote Communications Outlet (RCO)	
PAPI - Precision Approach Path Indicator		
GPS - Global Positioning System		
VOR - Very high frequency Omni-directional Range		
REIL - Runway End Identification Lights		
MALSR - Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights		

Source: Airport/Facility Directory - Southwest U.S. (July 5, 2007); Airport records.

RUNWAYS

Riverside Airport is served by a two-runway system, both of which are constructed of asphalt. The primary runway is 5,401 feet long by 100 feet wide. The runway was recently reconstructed and is in excellent condition. The pavement has been strength-rated at 48,000 pounds single wheel loading (SWL), 70,000 pounds dual wheel loading (DWL), and 110,000 pounds dual tandem wheel loading (DTWL). These strength ratings refer to the configuration of the aircraft landing gear. For example, SWL indicates an aircraft with a single wheel on each landing gear.

Crosswind Runway 16-34 is 2,851 feet long and 48 feet wide. Runway 16-34 provides an alternate landing direction for small aircraft (12,500 pounds and less) when wind direction is not closely aligned with Runway 9-27. This runway was recently resurfaced and is in excellent condition.

TAXIWAYS

Taxiway A is the full-length parallel taxiway on the south side of Runway 9-27. The western 1,100 feet of Taxiway A has been relocated to a separation distance of 275 feet and has been widened to 50 feet. The eastern 4,300 feet of this taxiway is separated from the primary runway by 270 feet as measured centerline to centerline. This portion of Taxiway A, from the intersection with the crosswind runway to the Runway 27 threshold, is planned to be relocated to 275 feet and widened to 50 feet in 2008.

Taxiway J from the intersection with Taxiway A, extending south to the Runway 34 threshold, was constructed in 2006. This taxiway is 25 feet wide and located 150 feet from the runway centerline. This taxiway provides access to the new west side landside hangar development area. The portion of Taxiway J between the primary runway and Taxiway A is 100 feet wide and is not in line with the rest of Taxiway J. This portion of the taxiway has previously been planned for replacement with a section that will connect the north and south ends of Taxiway J.

Taxiway B extending to the Runway 34 threshold is also new since the previous master plan. This taxiway provides direct terminal area access to the Runway 34 threshold.

The entrance/exit taxiways serving Runway 9-27 are labeled from east to west as Taxiways C, D, E, F, G, and H. Taxiway L connects the aircraft apron area to the southern portion of Runway 34. All of these taxiways are between 40 and 75 feet in width. The apron taxiway has been designated as a non-movement area.

PAVEMENT MARKINGS

Pavement markings aid in the movement of aircraft along airport surfaces and identify closed or hazardous areas on the airport. The precision markings to Runway 9 identify the runway centerline, designation, touchdown point, threshold, aircraft hold positions, and pavement edges. The non-precision markings to Runway 27

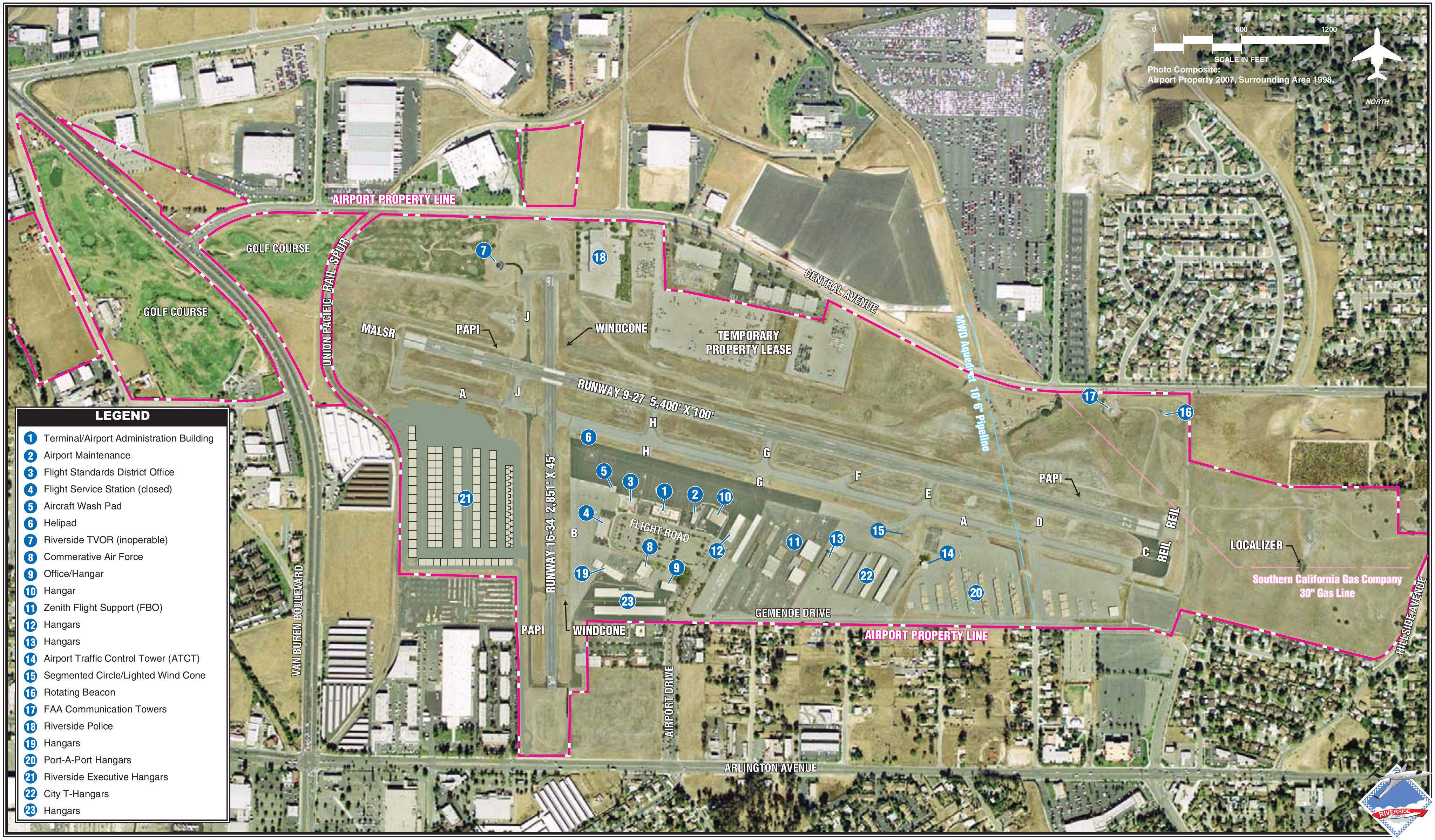


Exhibit 1F
EXISTING FACILITIES

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identify the runway centerline, threshold, designation, and hold positions. Runway 16-34 is equipped with basic markings which identify the runway centerline, designation, and aircraft hold positions. Taxiway and apron centerline markings assist pilots when moving on these surfaces. In addition, all aircraft tie-down areas are outlined with white striping.

The helipad is also marked with traditional white striping and an “H” designation.

AIRFIELD LIGHTING

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. These lighting systems, categorized by function, are summarized as follows:

Identification Lighting: The location of the airport at night is universally identified by a rotating beacon. The rotating beacon projects two beams of light, one white and one green, 180 degrees apart. The rotating beacon at Riverside Airport is situated on the top of a 50-foot tall steel scaffold tower located in the northeast corner of airport property.

Runway and Taxiway Lighting: Runway and taxiway 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.

Both runways are equipped with medium intensity runway lighting (MIRL). These are lights set atop a pole that is approximately one foot above the ground. The light poles are frangible, meaning if one is struck by an object, such as an aircraft wheel, they can easily break away, thus limiting the potential damage to an aircraft. Runway threshold lighting identifies each runway end. The helipad is also equipped with perimeter lighting.

Medium intensity taxiway lighting (MITL) is associated with the taxiways. These lights are mounted on the same type of structure as the runway lights.

Visual Approach Lighting: Since the last master plan was completed in 1999, the visual approach slope indicator (VASI) lights for Runway 27 have been replaced with precision approach path indicator (PAPI) lights. PAPIs have also been installed to serve approaches to the Runway 9 and Runway 34 ends. The VASI and PAPI are identical in their purpose of providing visual approach slope guidance, but vary in their configuration. Each lighting aid, however, consists of a system of lights located at various distances from the runway threshold, which when interpreted by the pilot, give him or her an indication of being above, below, or on the correct descent path to the runway. The PAPIs serving approaches to Runway 9-27 are currently inoperable.

Precision Approach Lighting: A medium intensity approach lighting system with runway alignment indicator lights (MALSR) is installed leading to the Runway 9 threshold. A MALSR consists of a configuration of light signals extending into the approach area from the runway threshold to aid pilots transitioning from instrument flight to visual flight and landing. The MALSR, in conjunction with the localizer and glideslope antennas, comprise the Instrument Landing System (ILS), which provides for approaches when visibility conditions are as low as one-half mile and cloud ceiling heights as low as 200 feet.

Runway End Identification Lighting: Set to either side of the Runway 27 threshold is runway end identification lighting (REIL). REILs provide a visual identification of the runway end for landing aircraft. The system consists of two flashing light assemblies located approximately 40 feet to either side of the runway landing threshold. These flashing lights can be seen day or night for up to 20 miles depending on visibility conditions. The REILs are currently inoperable.

Airfield Signs: Airfield identification signs assist pilots in identifying their location on the airfield and direct them to their desired location. The airfield signs, including the runways, taxiways, and distance-to-go markings, are lighted at Riverside Airport.

Pilot-Controlled Lighting: When the air traffic control tower (ATCT) is closed, the airfield lights are turned off. With the pilot-controlled lighting system (PCL), pilots can turn on the airfield lights from their aircraft, through a series of clicks of their radio transmitter. Runway, taxiway, MALSR, and the helipad lights are controllable through the system. Typically, the airfield lights will remain on for approximately 15 minutes.

WEATHER AND COMMUNICATION AIDS

Riverside Airport has three lighted wind cones, one inside the segmented circle, one northeast of the runway intersection, and one immediately south of Taxiway L. A supplemental wind sock is located near the Runway 27 end. The lighted wind cones provide information to pilots regarding wind conditions, such as direction and speed. The segmented circle provides traffic pattern information to pilots. Having four wind indicators spread out equally along the runway system is advantageous because wind conditions can be determined from anywhere along the flightline.

Riverside Airport is equipped with an Automated Surface Observing System (ASOS). An ASOS will automatically record weather conditions such as wind speed, wind gust, wind direction, temperature, dew point, altimeter setting, visibility, fog/haze condition, precipitation, and cloud height. This information is then transmitted at regular intervals (usually once per hour). Aircraft in the vicinity can receive this information if they have their radio tuned to the correct frequency (128.8 MHz). In addition, pilots and individuals can call a published telephone number and receive the information via an automated voice recording. Regional weather conditions can be obtained via ASOS broadcasts from airports in Ontario, Chino, San Bernardino, and Corona. The ASOS was taken out of service in 2007 to accommodate west side hangar development and is planned to be relocated.

Riverside Airport is also equipped with an automated terminal information service (ATIS), which is a recorded message updated hourly and broadcast on 128.8 MHz. ATIS broadcasts are used by airports to notify arriving and departing pilots of the current surface weather conditions, runway and taxiway conditions, communication frequencies, and other information of importance to arriving and departing aircraft. The ATIS broadcast includes the ASOS information and can be accessed on the same frequency.

Riverside Airport also utilizes a common traffic advisory frequency (CTAF). This radio frequency (121.0 MHz) is used by pilots in the vicinity of the airport to communicate with each other about approaches or takeoffs from the airport when the ATCT is closed. The same frequency will reach the ATCT if the tower is open. Ground control can be reached via 121.7 MHz during tower hours. In addition, a UNICOM frequency is also available (122.95 MHz) where a pilot can obtain fixed base operator (FBO) information. Southern California Approach and Departure clearance is available via frequency 135.4 MHz.

The airport is also equipped with a Remote Communications Outlet (RCO). The RCO provides the airport a direct link with Southern California Approach and Departure control. The RCO is an automated transceiver facility that is remotely controlled by air traffic personnel. The RCO was established to provide ground-to-ground communications between air traffic control specialists and pilots at satellite airports for delivering enroute clearances, departure clearances, and acknowledging instrument flight rule cancellation or departure/landing times. The RCO is available when the tower is closed.

NAVIGATIONAL AIDS

Navigational aids are electronic devices that transmit radio frequencies, which pilots of properly equipped aircraft can translate into point-to-point guidance and position information. The types of electronic navigational aids available for aircraft flying in the vicinity of Riverside Airport include non-directional beacons (NDBs), a very high frequency omni-directional range (VOR) facility, and the global positioning system (GPS).

The NDB transmits nondirectional radio signals whereby the pilot of an aircraft equipped with direction-finding equipment can determine their bearing to or from the NDB facility in order to track to the beacon station. The PETIS NDB is approximately 7.4 nautical miles (nm) to the northeast of the airport. This facility can be used by pilots to track to the region, then other aids would need to be utilized to track to the airport.

The very high omnidirectional range (VOR), in general, provides azimuth readings to pilots of properly equipped aircraft transmitting a radio signal at every degree to provide 360 individual navigational courses. Frequently, distance measuring equipment (DME) is combined with a VOR facility (VOR/DME) 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. The VORTAC provides distance and direction information to both civil and military pilots.

The Riverside VOR is located on the airfield but is currently inoperable. It has been relocated from southwest of the runway intersection to northwest of the runway intersection. The Paradise VORTAC is located 4.7 nautical miles (nm) to the southwest. The Homeland VOR is located 16.7 nm to the southeast. The Pomona VORTAC is located 18.6 nm to the northwest.

GPS is an additional navigational aid for pilots. GPS was initially developed by the United States Department of Defense for military navigation around the world. GPS differs from an NDB or VOR in that pilots are not required to navigate using a specific ground-based facility. GPS uses satellites placed in orbit around the earth that transmit electronic radio signals, which pilots of properly equipped aircraft use to determine altitude, speed, and other navigational information. With GPS, pilots can navigate directly to any airport in the country and are not required to navigate using a ground-based navigational facility.

Loran-C is another point-to-point navigation system available to pilots. Where GPS utilizes satellite-based transmitters, Loran-C uses a system of ground-based transmitters.

AREA AIRSPACE

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 environment for civil, commercial, and military aviation. The NAS is defined as the common network of U.S. airspace, including air navigational facilities; airports and landing areas; aeronautical charts; associated rules, regulations, and procedures; technical information; and personnel and material. System components shared jointly with the military are also included as part of this system.

To ensure a safe and efficient airspace environment for all aspects of aviation, the FAA has established an airspace structure that regulates and establishes procedures for aircraft using the National Airspace System. The U.S. airspace structure provides for categories of airspace, controlled and uncontrolled, and identifies them as Classes A, B, C, D, E, and G as described below. **Exhibit 1G** generally illustrates each airspace type in three-dimensional form.

- Class A airspace is controlled airspace and includes all airspace from 18,000 feet mean sea

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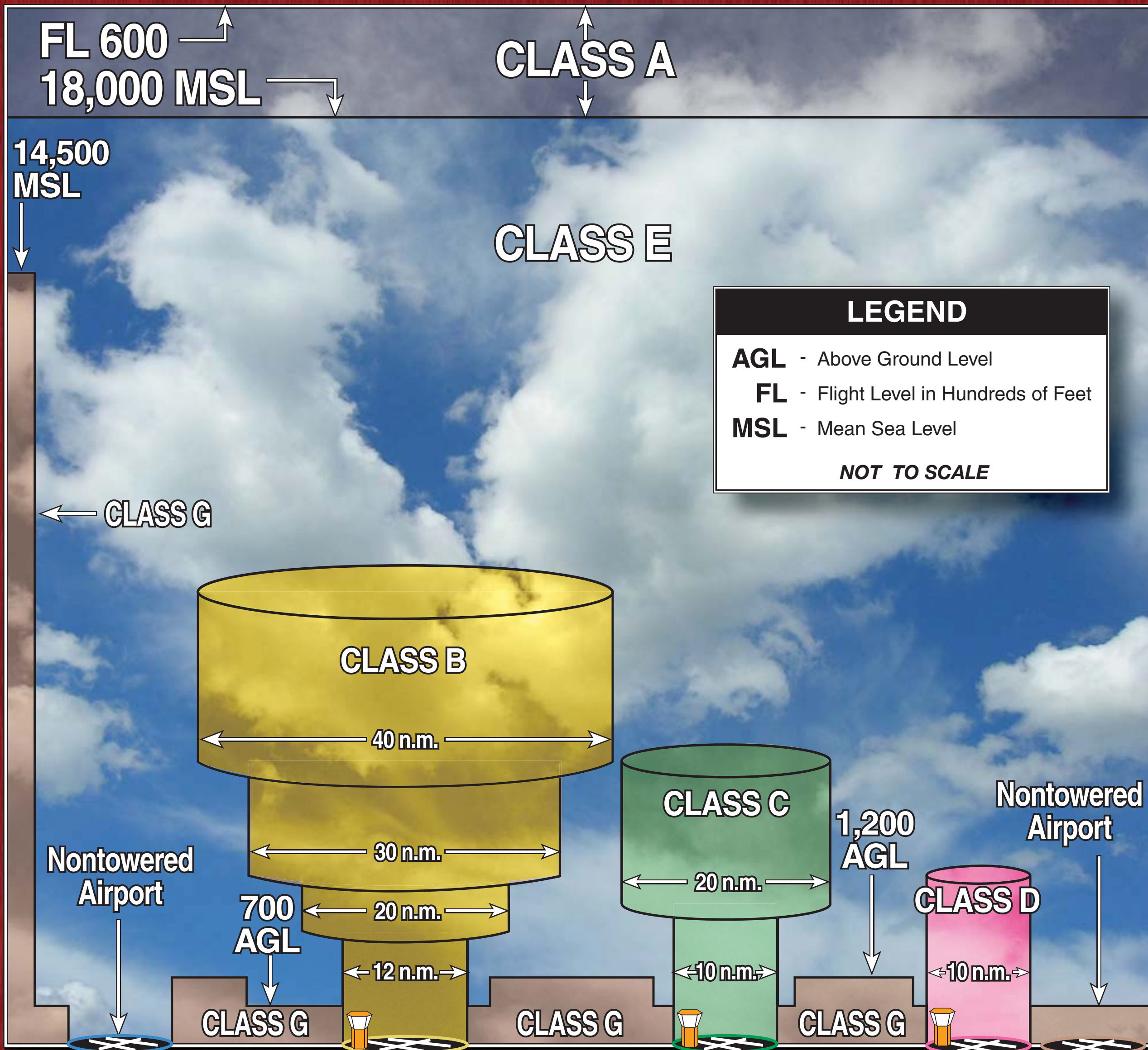

CLASSIFICATION	*DEFINITION*
CLASS A	Generally airspace above 18,000 feet MSL up to and including FL 600.
CLASS B	Generally multi-layered airspace from the surface up to 10,000 feet MSL surrounding the nation's busiest airports.
CLASS C	Generally airspace from the surface to 4,000 feet AGL surrounding 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.

Source: "Airspace Reclassification and Charting Changes for VFR Products," National Oceanic and Atmospheric Administration, National Ocean Service. Chart adapted by Coffman Associates from AOPA Pilot, January 1993.

Exhibit 1G
AIRSPACE CLASSIFICATION

level (MSL) to Flight Level 600 (approximately 60,000 feet MSL).

- Class B airspace is controlled airspace surrounding high-activity commercial service airports (i.e., Los Angeles International Airport).

- Class C airspace is controlled airspace surrounding lower-activity commercial service (i.e., Ontario, Orange County) and some military airports (March AFB).

- Class D airspace is controlled airspace surrounding low-activity commercial service and general aviation airports with an ATCT, such as Riverside Airport.

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

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

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

Airspace within the vicinity of Riverside Airport is depicted on **Exhibit 1H**. When the ATCT is open, the airport is located under Class D airspace. Class D airspace extends to a 3.5 nautical mile radius from the ATCT and to an elevation of 2,500 feet above ground level (AGL) or where Class C airspace begins. The Riverside Airport Class D airspace does not include Flabob Airport which is in Class E airspace.

When the tower is closed, the airport operates in Class E airspace with a floor of 700 feet AGL and extending to 18,000 feet MSL, or where Class C airspace begins. The Class E airspace surrounding the airport includes most of the southern California Area.

Victor Airways

Victor Airways are designated navigational routes extending between VOR facilities. Victor Airways have a floor of 1,200 feet above ground level and extend upward to an altitude of 18,000 feet MSL. Victor Airways are eight nautical miles wide. As previously discussed, there are a number of VOR facilities within the airport region. In the complicated Southern California airspace there are more than 30 designated Victor Airways, as seen on **Exhibit 1H**.

Military Operations Areas (MOAs)

A Military Operations Area (MOA) is an area of airspace designated for military training use. This is not restricted airspace as civil pilots can use the airspace. However, they should be on alert for the possibility of military traffic. A pilot may need to be aware that military aircraft can be found in high concentrations, conducting aerobatic maneuvers, and possibly operating at high speeds at lower elevations. The activity status of a MOA is advertised by a *Notice to Airmen* (NOTAM) and noted on Sectional Charts.

The closest MOA to Riverside Airport is the Buckhorn MOA located approximately 60 nautical miles to the north. To the northwest, the Bagdad 1 MOA typically has activity from 7,000 feet AGL to 18,000 feet above MSL. The Outlaw MOA to the southeast typically will have activity from 8,000 feet AGL to 18,000 feet MSL. It is published in use Monday-Friday 6:00 a.m. to 7:00 p.m. and is normally extended to 11:30 p.m. by NOTAM.

Military Training Routes

A Military Training Route, or MTR, is a specified training route for military pilot proficiency. Aircraft operate on the MTR at speeds in excess of 250 knots and up to 10,000 feet MSL. Several MTRs are to the north and west of Riverside Airport. General aviation pilots should be aware of the locations of the MTRs and exercise special caution if they need to cross them.

Restricted Areas

According to the FAA, "Restricted areas denote the existence of unusual, often invisible, hazards to aircraft such as artillery firing, aerial gunnery, or guided missiles. Penetration of restricted areas without authorization from the using or controlling agency may be extremely hazardous to the aircraft and its occupants." There are three designated restricted areas located approximately 40 nautical miles to the south. These restricted areas are primarily associated with the Marine base at Camp Pendleton.

INSTRUMENT APPROACH PROCEDURES

Instrument approach procedures are a series of predetermined maneuvers established by the FAA using electronic navigational aids to assist pilots in locating and landing at an airport during low visibility and cloud ceiling conditions. The capability of an instrument approach is defined by the visibility and cloud ceiling minimums associated with the approach. Visibility minimums define the horizontal distance that the pilot must be able to see to complete the approach. Cloud ceilings define the lowest level a cloud layer (defined in feet above the ground) can be situated for a pilot to complete the approach. If the observed visibility or cloud ceiling is below the minimums prescribed for the approach, the pilot cannot complete the instrument approach.

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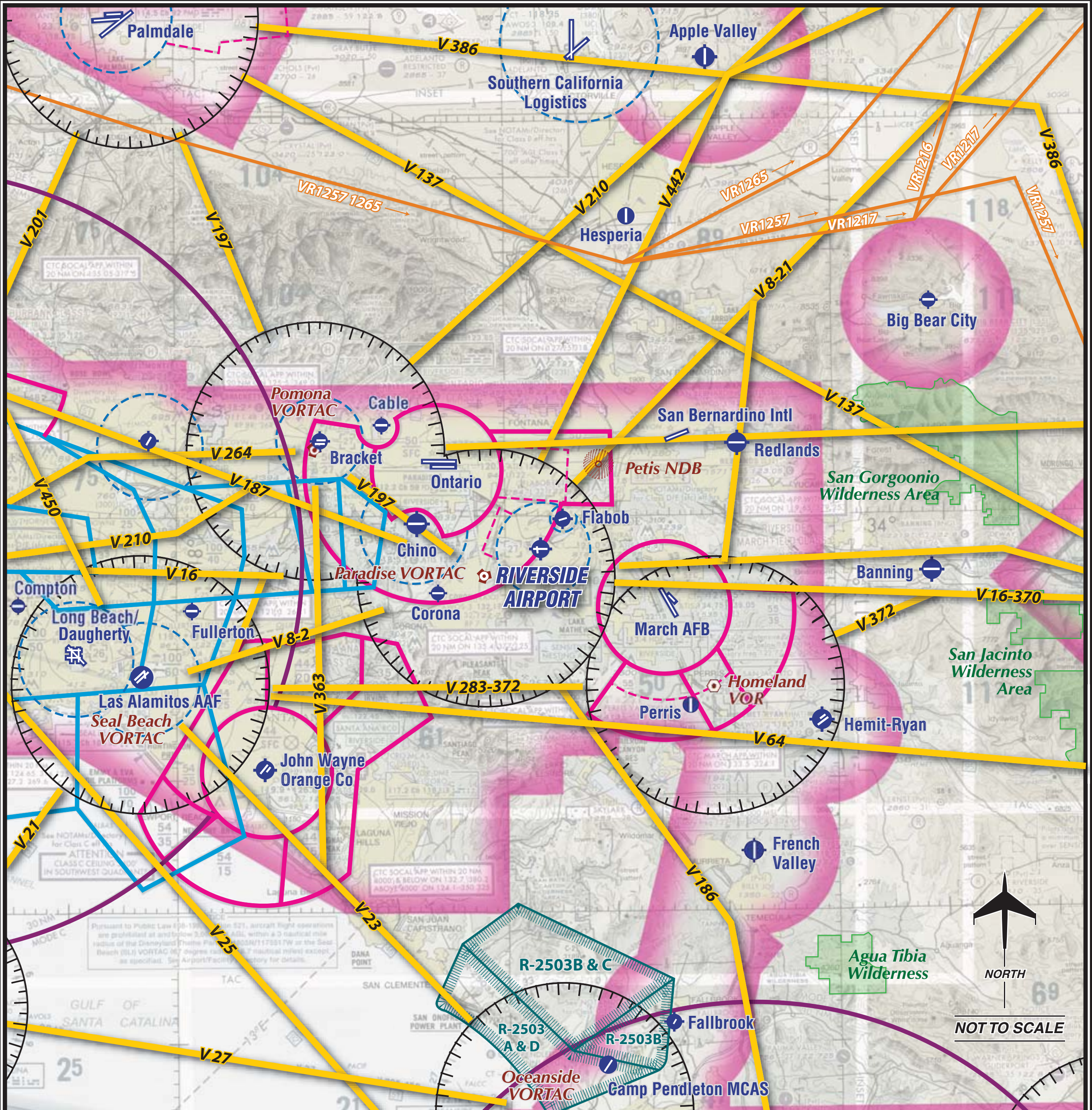


LEGEND

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

Source: Los Angeles Sectional Chart, US Department of Commerce, National Oceanic and Atmospheric Administration February 15, 2007

Exhibit 1H
VICINITY AIRSPACE MAP

Five instrument approaches has been approved for Riverside Airport. The detail for the instrument approaches is presented in **Table 1D**.

TABLE 1D
Instrument Approach Data
Riverside Airport

	WEATHER MINIMUMS BY AIRCRAFT TYPE					
	Categories A & B		Category C		Category D	
	CH	VIS	CH	VIS	CH	VIS
ILS RWY 9						
ILS Straight	200	0.50	200	0.50	200	0.75
LOC Straight	506	0.50	506	1.00	506	1.00
Circling	482-542	1.00	802	2.25	802	2.50
RNAV (GPS) RWY 27						
LPV	418	1.50	418	1.50	418	1.50
LNAV/VNAV	550	2.00	550	2.00	550	2.00
LNAV	1,282	1.25-1.50	1,282	3.00	1,282	3.00
Circling	1,282	2.00	1,282	3.00	1,282	3.00
VOR or GPS RWY 9						
Straight	469	0.50	469	0.75	469	1.00
Circling	442-542	1.00	802	2.25	802	2.50
VOR or GPS-A						
Circling	1,184	1.25-1.50	1,184	3.00	1,184	3.00
VOR or GPS-B						
Circling	1,524	1.25-1.50	NA	NA	NA	NA

Aircraft Categories are based on 1.3 times the stall speed in landing configuration as follows:
Category A: 0-90 knots (Cessna 172)
Category B: 91-120 knots (Beechcraft KingAir)
Category C: 121-140 knots (Canadair Challenger)
Category D: 141-166 (Gulfstream IV)

Abbreviations:
CH – Cloud Height (in feet above ground level)
VIS – Visibility Minimums (in miles)
LPV – Localizer performance with vertical guidance
LNAV – Lateral Navigation
VNAV – Vertical Navigation

Source: U.S. Terminal Procedures, Southwest (July 5, 2007)

The ILS approach to Runway 9 is a precision approach offering the lowest visibility minimums at the airport. Properly equipped aircraft are able to utilize this approach when visibility is no lower than one-half mile and cloud height ceilings are at least 200 feet above ground level. Large cabin-class business jets in approach category D, such as the Gulfstream IV and V models, have a slightly higher visibility minimum of three-quarters of a mile. There is a localizer only and circling approach associated with this ILS approach.

Runway 9 also provides a GPS only approach with visibility minimums not lower than one-half mile for smaller aircraft, three-quarters of a mile for medium sized business jets, and one mile for large business jets. This approach also has a VOR approach, which utilizes the Riverside VOR. Because this VOR facility is currently inoperable, the VOR only approach is not available.

The RNAV (GPS) approach to Runway 27 offers visibility minimums not lower than one and one-half miles. The LPV approach to Runway 27 provides both horizontal and vertical guidance. Several alternate GPS approaches, including lateral navigation/vertical navigation (LNAV/ VNAV), an LNAV only, and a circling approach, are also available with this approach.

The last two approaches are GPS-A and GPS-B. The GPS-A approach is a circling approach to Runway 9-27 while the GPS-B approach is a circling approach to Runway 16-34. The VOR approach associated with this procedure is also unavailable currently.

Arrival Procedures

Because of the possibility of congested airspace over the greater Southern California area, the FAA has established a series of Standard Terminal Arrival (STAR) and Departure Procedures. The STAR is a preplanned air traffic control arrival procedure designed to provide for the transition from the enroute phase of the flight to an outer fix or an instrument approach fix in the terminal area. The two published STARs are: SETER TWO and ZIGGY FOUR.

Local Conditions and Operating Procedures

Riverside Airport is situated at 818 feet MSL. The traffic pattern altitude for all light aircraft is 1,000 feet AGL. The traffic pattern for high-performance aircraft, including jet-powered aircraft, is at 1,500 feet AGL. The helicopter traffic pattern is designated at 500 feet AGL. The airport utilizes a non-standard right-hand traffic pattern for Runway 16 and standard left-hand traffic pattern for all other runways. This traffic pattern for Runway 16 is intended to avoid the high volume of approaches to Runway 27.

Runway use is dictated by prevailing wind conditions. Ideally it is desirable for aircraft to land directly into the wind. The prevailing wind condition during the day is from the west leading to greater usage of Runway 27. Easterly winds predominate at night, dictating the use of Runway 9. Wind flows from the north occur approximately two percent of the time, which requires use of Runway 34. Runway 16 is generally not used, and Runway 9 is the designated calm wind runway. Tower personnel estimate that Runway 27 is utilized nearly 90 percent of the time and Runway 16-34 will see some activity in the spring and fall.

The FAA Airport/Facility Directory identifies several conditions for pilots to be aware of in the vicinity of the airport. There is a 60-foot tall utility pole approximately 1,920 feet north of Runway 16 and 150 feet right of the extended runway centerline. A 28:1 slope is necessary to clear the pole. There is a 20-foot tall tree approximately 900 feet from the Runway 34 threshold. A 34:1 slope is necessary to clear the tree. There is a power plant 3,000 feet north of Runway 16 producing a thermal plume. There are numerous power lines at or below 80 feet AGL located between 1,780 feet and 2,887 feet from the Runway 16 threshold.

The City of Riverside has established a number of voluntary noise abatement operational procedures in an effort to reduce aircraft noise for helicopters and fixed-wing aircraft. **Exhibit 1J** depicts noise abatement and traffic patterns for aircraft operating in the vicinity of the airport.

AIRPORT TRAFFIC CONTROL TOWER

The ATCT is located approximately 1,500 feet from the Runway 27 threshold and approximately 600 feet south of the runway centerline. The tower is owned by the FAA and its operation is contracted to Serco Corporation under the FAA Contract Tower Program. The tower operates from 7:00 a.m. to 8:00 p.m., 365 days a year.

The ATCT located at the airport controls air traffic within the Class D airspace that surrounds Riverside Airport. The tower cab floor is 50 feet high. The southern 1,400 feet of Runway 34 is obstructed from view from the tower by buildings and trees. The tower is equipped with D-Brite airport surveillance radar.

HELIPAD

A helipad is located on the northwest edge of the tie-down apron. Helicopter operations are directed to the helipad when arriving or departing the airport. Three helicopter hardstands, or tie-down positions, are located approximately 200 feet to the south of the helipad. The helipad is outfitted with edge lighting.

LANDSIDE FACILITIES

Landside facilities are the ground-based facilities that support the aircraft and pilot/passenger handling functions. These facilities typically include the FBOs, aircraft storage hangars, aircraft maintenance hangars, aircraft parking aprons, and support facilities such as fuel storage, automobile parking, roadway access, and aircraft rescue and firefighting. Landside facilities are identified on **Exhibit 1F**.

AIRPORT BUSINESSES

Terminal Building

A two-story terminal building is located along Flight Road approximately at the midpoint of Runway 9-27. This 18,000 square-foot terminal building was constructed in 1967 to serve as an air carrier passenger terminal building. Presently, the first floor of the terminal includes office space, restrooms, a pilot's lounge, and restaurant. Airport Administration offices, restrooms, and additional office space are located on the second floor. The following businesses have offices in the terminal building:

City of Riverside - Airport Administration
Embry Riddle Aeronautical University – Higher education
D&D Airport Café - Restaurant
Dr. Malcolm Gilbert – Flight Surgeon
AvTech – FAA/FCC Testing Center
Frank Harringan – Attorney
Eternal Flight – Flight Training

General Aviation Services

A full range of aviation services are available at Riverside Airport. This includes aircraft rental, flight training, aircraft maintenance, aircraft charter, aircraft fueling, and many other services. The following provides a brief discussion of general aviation businesses at the airport:

Zenith Aviation (FBO) - Aircraft Rental, Flight Instruction, Fueling, Maintenance
Flying Kolors Aeropaint - Aircraft Painting
Airline Transport Professionals (ATP) – Advanced flight training
California Aviation Services, Inc. – Helicopter and fixed-wing flight school
Heli-Flite – Helicopter crane service
Prestige Upholstery – Aircraft interior remodeling
Maintenance One – Airframe and powerplant maintenance
Riverside Executive Aviation – Hangar sales and leasing

Other Airport Businesses

The following organizations are also located at Riverside Airport:

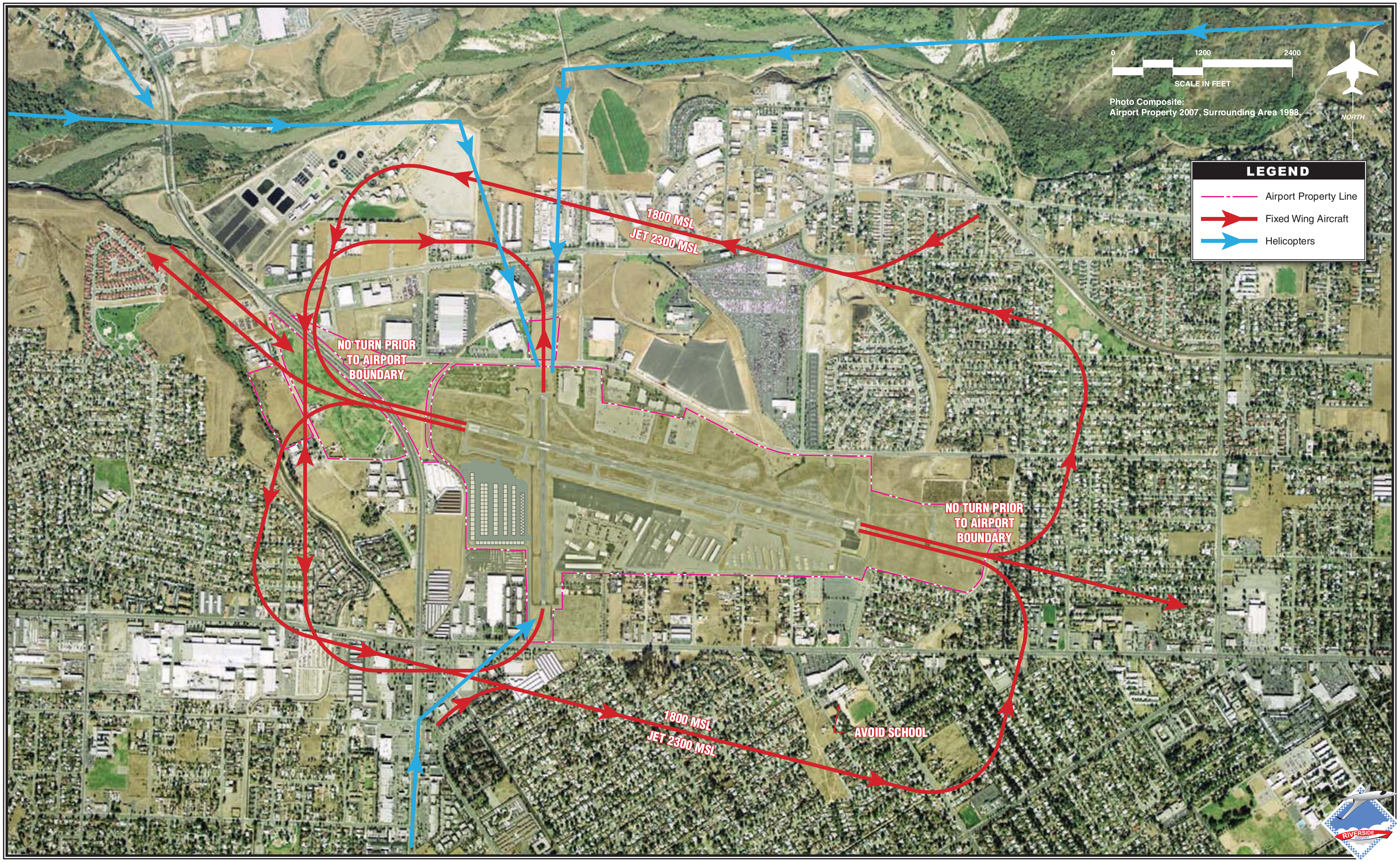
Aero Tech Surveys – Aerial mapping and photogrammetry
Riverside Aerial Labs – Aerial photography
Riverside Police – Based helicopters on the north side of the airport
FAA Flight Standards District Office – Located adjacent to the terminal building
Enterprise and Hertz – Car rental agencies
Commemorative Air Force – Not-for-profit historical aircraft society
Sky Links Airport Golf Course – Public golf course

AIRCRAFT PARKING APRON

The apron area at Riverside Airport is constructed of asphalt and encompasses approximately 53 acres providing space for aircraft tie-downs, apron taxilanes, and hangars. Approximately 300 aircraft tie-down positions are available on the apron. Approximately 40 of these are designated as transient tie-down positions. The remaining tie-down positions are reserved for based aircraft.

AIRCRAFT HANGAR FACILITIES

A wide variety of hangars are available at Riverside Airport for use in aircraft storage and repair. This includes individual enclosed T-hangars, individual Port-A-Port hangars, small



05MP11-1J-3/19/08

Exhibit 1J
NOISE ABATEMENT PROCEDURES
AND TRAFFIC PATTERNS

clear-span hangars, and larger clear-span (conventional hangars).

There are a total of 79 City-owned T-hangars units at Riverside Airport totaling approximately 130,000 square feet of storage space. There are approximately 58 individual Port-A-Port hangars located east of the control tower totaling approximately 46,400 square feet. A total of 13 smaller clear-span hangars are located on the airport for individual aircraft storage, totaling approximately 36,800 square feet. These hangars range in size from approximately 1,800 square feet to nearly 4,000 feet. A total of approximately 43,100 square feet of large conventional hangar space is available for aircraft storage and repair. A 12,200 square-foot shade hangar (a specific hangar design with no doors on each end) is also available for aircraft storage.

A new hangar development area is under construction as of September 2007. Riverside Executive Aviation is constructing these hangars on a parcel located west of Runway 16-34 and south of Runway 9-27. These hangars are available for purchase or lease. The development will be a mix of T-hangars and clear-span box hangars. There are 26 planned T-hangar units encompassing 30,000 square feet. A total of 91 box hangars are planned encompassing 259,000 square feet of storage space. In addition, two FBO hangars encompassing approximately 5,000 square feet are planned.

AUTOMOBILE PARKING

A total of approximately 600 parking spaces are available in various locations on the airport. The parking lot located south of the terminal building includes approximately 328 parking spaces for airport tenants, operators, and users. Approximately 18 spaces are available at the airport control tower. Approximately, 175 spaces are located along the north side of Gemende Drive. The remaining parking spaces are located adjacent to aircraft hangars, airport businesses, and the FAA buildings.

AIRCRAFT WASH FACILITY

There are two City-owned aircraft wash pads at the airport. One is located on the apron west of the terminal building. The second is located in the southwest corner of the Port-A-Port apron. The wash pads are designed to properly dispose of cleaning fluids used on aircraft and equipment.

AIRCRAFT RESCUE AND FIREFIGHTING (ARFF)

The City of Riverside Fire Department responds to all airport emergencies. Fire Station 5 is nearest and is located on Arlington Avenue approximately three minutes to the east of the airport. The airport has a 3/4 ton truck equipped with dry chemical and other firefighting equipment available for initial response. A second truck, a 2005 Ford Renegade Model TM-5150-0012 ARFF vehicle, is on order that will have capacities for 150 gallons of pre-mix water/foam, and 500 pounds of dry chemical. The trucks are operated by airport maintenance personnel.

AIRPORT MAINTENANCE

The airport maintenance facility is located east of the terminal building along Flight Road. The maintenance building totals approximately 3,000 square feet and is used for equipment storage and maintenance and repair activities.

UTILITIES

The utility system at Riverside Airport includes existing water, electric, sanitary sewer, telephone, and natural gas systems. Electricity, water, and sanitary sewer services are provided by the City of Riverside. Natural gas and telephone is provided by Southern California Gas Company and Pacific Bell, respectively.

Of special consideration are the two utility easements through Riverside Airport. A 10'6" underground pipeline operated by the Metropolitan Water District crosses the runway from the north to south. A 30-inch underground pipeline for the Southern California Gas Company crosses Riverside Airport from the north to the east. The approximate location of each pipeline is illustrated on **Exhibit 1F**.

FUEL FACILITIES

Zenith Flight Support owns and operates the fuel farm which is located underground beneath the main apron fronting the FBO hangars. There are two Jet A tanks with capacities of 10,000 gallons and 5,000 gallons. There is one AvGas tank with a capacity of 12,000 gallons. In addition, Zenith Flight Support owns and maintains a 15,000-gallon aboveground AvGas fuel tank, which provides for self-service fueling. This FBO maintains two refueling trucks. The Jet A truck has a 3,000-gallon capacity, and the AvGas truck has a capacity of 1,000 gallons.

The west side hangar development area is planned to include additional FBO facilities. This facility is planned to provide fuel in addition to other general aviation services. It is anticipated that at least 10,000 gallons of Jet A and 5,000 gallons of AvGas fuel storage will be available.

FENCING

The perimeter fence is six feet high chain-link topped with three strand barbed wire. There are a total of 40 gates, some of which are pedestrian gates and others are vehicle gates. The pedestrian gates can be locked and the vehicle gates require a key pass.

ADDITIONAL AIRPORT DOCUMENTATION

The airport maintains several procedural documents which provide guidance for airport management on airport issues. The following is a brief description of the major documents.

Spill Prevention

Riverside has procedures in place to direct airport staff in case of a chemical or fuel spill.

14 CFR Part 150 Noise Compatibility Study

In 1995 the airport completed a 14 CFR Part 150 Noise Compatibility Study. The results of the study provide the airport administration with guidance on how to mitigate the impacts of aircraft noise on airport neighbors. The procedures developed in this study have been advertised to the pilot community and air traffic control personnel. **Exhibit 1J** depicts the recommended traffic patterns to minimize noise impacts on neighboring noise-sensitive land uses.

Rules and Regulations

The airport maintains Minimum Operating Standards which provide rules and guidelines for commercial activity conducted on the airport by tenants. The Rules and Regulations for Riverside Airport apply to all airport tenants whether they are engaged in commercial activity or not.

REGIONAL AIRPORTS

There are a number of airports of various sizes, capacities, and functions within the vicinity of Riverside Airport, as indicated on **Exhibit 1H**. In an urban/suburban setting, airports within 20 nautical miles of each other will generally have some influence on the activity of the other airport. The airports described below are those within approximately 20 nautical miles of Riverside Airport or are important to the airspace and control environment of the area. Information pertaining to each airport was obtained from the Southern California Association of Governments *Regional Aviation System Plan* and the FAA's *5010-Airport Master Record* forms.

Flabob Airport (RIR) is a privately owned public-use airport located approximately three nautical miles northeast of Riverside Airport. A single runway (3,200 feet long) is available for use. There are approximately 200 based aircraft. A full range of general aviation services are available at Flabob Airport. Flabob airport is uncontrolled (no airport control tower) and has no published instrument approach procedures.

March Air Reserve Base (RIV) is a military installation with a 13,300-foot long concrete runway. The airport is primarily utilized by reserve units of the U.S. Air Force. There are 11 instrument approach procedures including ILS approaches to Runway 32. This facility is not open to the public without prior permission, but it does have a role in civil aviation. The air cargo company DHL/ABX Air utilizes the airport as its Southern California hub.

Corona Municipal Airport (AJO) is located approximately nine nautical miles west-southwest of Riverside Airport. The single runway is 3,200 feet long. An estimated 414 aircraft are based at the airport. Corona Municipal Airport is uncontrolled and has one published instrument approach procedure. A full range of general aviation services are available at Corona Municipal Airport.

Chino Airport (CNO) is located approximately 10 nautical miles west of Riverside Airport. Chino Airport has a parallel runway system with an intersecting crosswind runway. The longest runway is Runway 8R-26L at 7,000 feet in length. Crosswind Runway 3-21 is 6,023 feet in length. Chino Airport is equipped with an airport traffic control tower and three published instrument approaches, including an instrument landing system (ILS) approach to Runway 26R. An estimated 947 aircraft are based at Chino Airport including 40 jet aircraft. A full range of general aviation services is available at Chino Airport.

Ontario International Airport (ONT) is located approximately 10 nautical miles northwest of Riverside Airport. Although the airport's primary role is to provide commercial air service to the area, the airport also serves general aviation activity. Approximately 25 general aviation aircraft are based at the airport, including 17 jet aircraft. Ontario International Airport has a parallel runway system. The longest runway is 12,200 feet long. Ontario International Airport is equipped with an airport control tower and 11 published instrument approaches, including ILS approaches to Runways 8L, 26R, and 26L. A full range of general aviation services are available at Ontario International Airport.

Rialto Municipal Airport - Miro Field (L67) is located approximately 11 nautical miles north-northeast of Riverside Airport. The airport has an intersecting runway configuration. The longest runway is 4,500 feet long. Rialto Municipal Airport is uncontrolled and has one published instrument approach procedure. Approximately 251 aircraft are based at the airport, including 25 helicopters. A full range of general aviation services are available at Rialto Municipal Airport. It should be noted that by November 2008, after the completion of an environmental assessment and the relocation of airport tenants, the airport will be closed.

San Bernardino International Airport (SBD) is located approximately 14 nautical miles northeast of Riverside Airport. A single runway (10,001 feet long) is available for use. An estimated 30 aircraft are based at the airport, including two jet aircraft. The airport is uncontrolled and has three published instrument approach procedures, including an ILS approach to Runway 6. A full range of general aviation services are available at San Bernardino International Airport.

Cable Airport (CCB) is located approximately 15 nautical miles northwest of Riverside Airport. A single runway (3,864 feet long) is available for use. The airport is uncontrolled and has two published instrument approach procedures. Approximately 362 aircraft are based at Cable Airport. A full range of general aviation services are available at the airport.

Perris Valley Airport (L65) is a privately owned public-use airport located approximately 16 nautical miles southeast of Riverside Airport. A single 5,100 foot-long asphalt surfaced runway is available for use. The airport is uncontrolled and has no published instrument approach procedures. Approximately 141 aircraft are based at the airport, including 125 ultralight aircraft. No fuel services are available at Perris Valley Airport.

Redlands Municipal Airport (L12) is located approximately 17 nautical miles east-northeast of Riverside Airport. A 4,505-foot long runway is available for use. The airport is uncontrolled and has one published GPS approach procedure. Approximately 221 aircraft are based at the airport, including one jet. General aviation services are available at the airport, but jet fuel is not available.

Brackett Field (POC) is located approximately 19 nautical miles west-northwest of Riverside Airport in La Verne, California. Brackett Field provides a parallel runway system. The longest runway is 4,839 feet long. Brackett Field is equipped with an airport traffic control tower and two published instrument approaches, including an ILS approach to Runway 26L. A full range of general aviation services are available at the airport. Approximately 485 aircraft are based at Brackett Field.

AIRPORT CAPITAL IMPROVEMENT HISTORY

Table 1E presents an overview of capital improvements undertaken with federal and state grant funding at Riverside Airport since 2001. Several projects are of particular note, including the reconstruction of the primary runway which was completed in 2007. The construction of Taxiway J, parallel to Runway 16-34 has led directly to the west side hangar development currently being undertaken. The design of a north side parallel taxiway is currently in progress. It is anticipated that this will open the north side land for aviation-related development. Progress has been made on the relocation of a gas line that traverses the airfield through Federal grant funding. This must be completed prior to the planned extension of the runway.

TABLE 1E
Grants Offered to Riverside Airport
Riverside Airport

Fiscal Year	AIP Grant Number	Project Description	Total Grant Funds
2001	3-06-0200-16	Extend Taxiway "J" south and relocate VOR (Phase I); Extend Taxiway "B" to the south (Phase I); Acquire 0.03 acres for Taxiway "B" extension.	$1,380,000
2002	3-06-0200-17	Rehabilitate taxilanes and aprons	$150,000
2003	3-06-0200-18	Construction of noise berm	$375,000
2004	3-06-0200-19	Extend Taxiway "J" south and relocate VOR (Phase II); Extend Taxiway B to the south (Phase II).	$150,000
2004	3-06-0200-20	Extend Taxiway "J" south and relocate VOR (Phase III); Extend Taxiway B to the south (Phase III). Design north parallel taxiway and relocate gas line (Phase I).	$1,600,000
2005	3-06-0200-21	Design north parallel taxiway and relocate gas line (Phase II).	$1,043,600
2006	3-06-0200-22	Reconstruct Runway 9-27, Taxiway A, connecting taxiways, drainage improvements, lighting, signs, and REIL for Runway 27.	$4,110,538
2006	3-06-0200-23	Master Plan with Environmental Evaluation/Overview.	$350,000
Total Federal Grant Funds:			***$9,159,138***
Fiscal Year	**State Grant Number**	**Project Description**	**Total Grant Funds**
2003	Riv-7-04-3-Mat	State AIP match for project number 3-06-0200-18	$18,750
2004	Riv-7-04-1-Mat	State AIP match for project number 3-06-0200-19	$7,500
2005	Riv-7-04-2-Mat	State AIP match for project number 3-06-0200-20	$80,000
2005	Riv-7-05-1-Mat	State AIP match for project number 3-06-0200-21	$52,180
2006	Riv-7-06-1-Mat	State AIP match for project number 3-06-0200-23	$8,750
2006	Riv-7-06-2-Mat	State AIP match for project number 3-06-0200-22	$102,763
Subtotal State Grant Funds:			***$269,943***
TOTAL GRANT FUNDS			**$9,429,081**

AIP: Airport Improvement Program
Source: Airport Records

HISTORICAL AIRPORT ACTIVITY

At airports primarily serving general aviation activity, the number of based aircraft and the total annual operations (takeoffs and landings) are the primary indicators of aeronautical activity. These indicators will be used in subsequent analyses in this master plan update to project future aeronautical activity and determine future facility needs. A brief summary of historical airline service at Riverside Airport is also included within this section.

ANNUAL OPERATIONS

The ATCT located on the airport records data regarding aircraft operations (takeoffs and landings). **Table 1F** summarizes historical annual aircraft operations at the airport since 1990.

TABLE 1F
Historical Aircraft Operations
Riverside Airport

	Itinerant				Local			
Year	General Aviation	Air Taxi	Military	Total Itinerant	General Aviation	Military	Total Local	Total
1990	79,395	1,416	516	81,327	80,579	18	80,597	161,924
1991	87,800	1,512	590	89,902	113,147	0	113,147	203,049
1992	60,839	1,131	1,069	63,039	117,018	0	117,018	180,057
1993	56,330	927	518	57,775	87,306	0	87,306	145,081
1994	57,548	563	595	58,706	69,535	0	69,535	128,241
1995	42,542	97	296	42,935	38,422	7	38,429	81,364
1996	44,788	175	525	45,488	33,086	4	33,090	78,578
1997	43,022	27	32	43,081	30,256	6	30,262	73,343
1998	39,581	137	166	39,884	31,300	34	31,334	71,218
1999	39,602	376	171	40,149	36,642	44	36,686	76,835
2000	39,405	878	217	40,500	43,043	83	43,126	83,626
2001	43,464	803	65	44,332	53,226	34	53,260	97,592
2002	43,321	881	61	44,263	59,586	37	59,623	103,886
2003	44,296	260	163	44,719	55,593	103	55,696	100,415
2004	44,090	190	287	44,567	49,001	66	49,067	93,634
2005	46,466	415	57	46,938	49,126	38	49,164	96,102
2006	41,947	539	96	42,582	41,376	23	41,399	83,981
2007*	26,504	193	84	26,781	26,830	66	26,896	53,677

* Actual Through August 31, 2007
Source: FAA Air Traffic Activity System (ATADS) Tower Count.

Aircraft operations are classified as local or itinerant. Local operations consist mostly of aircraft training operations conducted within the airport traffic pattern and touch-and-go and stop-and-go operations. Itinerant operations are originating or departing aircraft which are not conducting operations within the airport traffic pattern. Operations have historically been fairly evenly split between local and itinerant. On average over the last 18 years, local operations have represented 48 percent of total operations.

Aircraft operations are further classified in three general categories: air taxi, general aviation, and military. Air taxi operations normally consist of the use of general aviation type aircraft for the "on demand" commercial transport of persons and property in accordance with 14 CFR Part 135 and Subchapter K of 14 CFR Part 91. General aviation operations include a wide range of aircraft use ranging from personal to business and corporate uses. General aviation operations comprise the majority of operations at Riverside Airport. Military use of the airport is limited.

Since 1990, overall operations have declined by approximately three percent annually. In the early 1990s, the airport experienced a high of over 200,000 operations. Since 2000, the airport has averaged approximately 94,000 annual operations. While general aviation was heavily impacted by the events surrounding September 11, it appears that Riverside Airport did not see an appreciable decline in activity.

BASED AIRCRAFT

Table 1G summarizes based aircraft at Riverside Airport from 1998 to 2006 as recorded and maintained by the Riverside Airport for reporting to the Riverside County Assessor. As shown in the table, based aircraft have shown slow growth since 1998. This slow growth trend is primarily attributable to the lack of hangar development at the airport over this time period. It should be noted that an estimate of 2007 based aircraft has been made by the airport resulting in a total of 215 based aircraft. While 2006 is the base year of this master plan, the trend in 2007 is for based aircraft growth.

TABLE 1G
Historic Based Aircraft Fleet Mix
Riverside Airport

Year	Single Engine Piston	Multi-Engine Piston	Turboprop	Jet	Helicopter	Other	Total
1998	158	14	1	1	10	2	186
2001	163	17	1	1	4	0	186
2002	165	18	1	1	4	0	189
2003	170	17	1	1	4	0	193
2004	168	19	3	1	5	0	196
2005	172	20	2	1	5	0	200
2006/2007	170	22	2	1	7	0	202

Source: Airport Records

AIR SERVICE

Between 1960 and 1986, Riverside Airport was served by scheduled air service through a combination of air carriers. The number of air passengers peaked in 1969 at 21,653 after increasing annually during the 1960s. Enplaned passengers declined annually afterward to a low of 56 in 1986. Riverside Airport was not served by scheduled air service in 1981. Western Express Air, utilizing eight passenger Cessna 208 Caravan aircraft, began scheduled charter service from Riverside to Laughlin/Bullhead City in April of 2005. This service continued until May 2007, when all future flights were cancelled. Presently, Ontario International Airport provides scheduled air service for the region with daily non-stop destinations across the continental United States.

ENVIRONMENTAL INVENTORY

The protection and preservation of the local environment are essential concerns for the master planning process. An inventory of potential environmental sensitivities 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 existing environmental conditions at Riverside 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.

Due to the close proximity of the Santa Ana River, approximately one mile north, wetlands could be present on airport property. According to the United States Geologic Survey (USGS) topographic map, a water feature passes through airport property from the north. During the 1999 Master Plan, coordination with the U.S. Army Corps of Engineers (USACE) indicated that a Section 404 permit would be required for future north side development due to the presence of jurisdictional areas.

In 2008 a jurisdictional determination was undertaken for this water feature on the airport's north side. Results of a field investigation determined that a potentially jurisdictional area is present on the airports north side. The area totals 1.8 acres. As of the printing of this Master Plan, the USACE had not been contacted to confirm the jurisdictional status of the area. No additional wetlands or potential waters of the U.S. were identified in the northern portions of airport property during the 2008 survey.

FLOODPLAINS

As defined in 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 ground water 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 FIRM maps, Riverside Airport is not contained within a 100-year floodplain.

WATER SUPPLY AND QUALITY

The City of Riverside is located within the Santa Ana Region (Region 8) of the California Regional Water Quality Control Board (RWQCB). The RWQCB issues Federal National Pollutant Discharge Elimination System (NPDES) permits for discharge to surface waters. The City of Riverside requires compliance with NPDES requirements and enforces compliance under the RWQCB NPDES permit number CAG998001 which includes Best Management Practices (BMPs) which are specific to the Santa Ana River watershed. This 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.

The City of Riverside Public Utilities Resource Division – Water Resource Group currently provides potable water and wastewater service to the airport. The airport operates in conformance with Section 402(p) of the *Clean Water Act*. Riverside Airport holds an NPDES Multi-Sector General Permit for stormwater discharges associated with industrial activity and maintains a *Stormwater Pollution Prevention Plan* (SWPPP) in accordance with Environmental Protection Agency (EPA) regulations.

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 1H depicts federally listed threatened and endangered species and species of special concern listed for Riverside County.

TABLE 1H
Threatened (T), Endangered (E), or Candidate (C) Species
Riverside County, California

COMMON NAME	SCIENTIFIC NAME	STATUS
Plants		
Munz's Onion	Allium munzii	E
San Diego ambrosia	Ambrosia pumila	E
Coachella Valley milk-vetch	Astragalus lentiginosus var. coachellae	E
Triple-ribbed milk-vetch	Astragalus tricarinatus	E
San Jacinto Valley crownscale	Atriplex coronata var. notarior	E
Nevin's barberry	Berberis nevinii	E
Thread-leaved brodiaea	Brodiaea filifolia	T
Vail Lake ceanothus	Ceanothus ophiochilus	T
Slender-horned spineflower	Dodecahema leptoceras (Cenrostegia l.)	E
Santa Ana River woolly-star	Eriastrum densifolium ssp. sanctorum	E
Parish's daisy	Erigeron parishii	T
San Diego button celery	Eryngium aristtulatum var. parishii	E
Spreading navarretia	Navarretia fossalis	T
California Orcutt grass	Orcuttia californica	E
Brand's phacelia	Phacelia stellaris	C
Hidden Lake bluecurls	Trichostema austromontanum compactum	T
Invertebrates		
Vernal pool fairy shrimp	Branchinecta lynchii	T
Quino checkerpoint butterfly	Euphydrayas editha quino	E
Delhi Sands flower-loving fly	Rhaphiomidas terminatus abdominalis	E
Riverside fairy shrimp	Streptocephalus woottoni	E
Fish		
Santa Ana sucker	Catostomus santaanae	T
Desert pupfish	Cyprinodon macularius	E
Bonytail chub	Gila elegans	E
Colorado squawfish	Ptychocheilus lucius	E
Razorback sucker	Xyrauchen texanus	E
Amphibians		
Desert slender salamander	Batrachoseps aridus	E
Arroyo toad	Bufo californicus	E
California red-legged frog	Rana aurora draytoni	T
Mountain yellow-legged frog	Rana muscosa	E
Reptiles		
Desert tortoise	Gopherus agassizii	T
Coachella Valley fringe-toed lizard	Uma inornata	T
Bird		
Bald eagle	Haliaeetus leucocephalus	T
Yellow-billed cuckoo	Coccyzus americanus	C
Brown pelican	Pelecanus occidentalis	E
Southwestern willow flycatcher	Empidonax traillii extimus	E
Coastal California gnatcatcher	Polioptila californica californica	T
Yuma clapper rail	Rallus longirostris yumanensis	E
California least tern	Sterna antillarum browni	E
Least Bell's vireo	Vireo bellii pusillus	E
Mammals		
San Bernardino kangaroo rat	Dipodomys merriami parvus	E
Stephens' kangaroo rat	Dipodomys stephensi	E
Peninsular bighorn sheep	Ovis Canadensis	E
Jaguar	Panthera onca	E
Palm Springs ground squirrel	Spermophilus tereticaudus chlorus	C

Source: US Fish and Wildlife Service, Riverside County Species List

According to the *Open Space and Conservation Element to the General Plan*, the airport consists of non-native grassland habitat and urbanized areas. The Santa Ana River Regional Park, located north of the airport, has been identified in the General Plan as an area with an abundance of wildlife habitat.

The airport environs is located within the Western Riverside County Multiple Species Habitat Conservation Plan (MSHCP), a comprehensive, multi-jurisdictional HCP focused on conserving species and their associated habitat within Western Riverside County. The MSHCP includes compensation requirements for the "take" of 146 special-status species and their habitat in accordance with the Endangered Species Act. According to the MSHCP, the airport is within the overlay for the burrowing owl, the San Diego ambrosia, Brand's phacelia, San Miguel savory, least Bell's vireo, southwestern willow flycatcher, western yellow-billed cuckoo, California linderiella, Riverside fairy shrimp, and vernal pool fairy shrimp.

In 2008 habitat assessments were performed for these species on the northern and eastern portions of airport property. During the field surveys a number of burrowing owls were sighted in eastern portions of airport property and suitable habitat for the San Diego ambrosia was identified near the previously discussed wetland. Finally, habitat for a number of birds classified as California species of special concern was identified in the northern portions of the airport. The birds include the California horned lark, the loggerhead shrike, white-tailed kite, and the northern harrier.

AIR QUALITY

The 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).

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.

Air contaminants increase the aggravation and the production of respiratory and cardiopulmonary diseases. 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 personal comfort and well-being.

According to the Environmental Protection Agency's "Green book," Riverside County is in nonattainment for ozone and particulate matter.

ENVIRONMENTAL JUSTICE

Environmental Justice Impacts occur when disproportionately high and adverse human health or environmental effects occur to minority and low-income populations

According to the EPA EnviroMapper tool, the neighborhoods directly east and west of airport property contain a relatively low percentage of individuals living below poverty levels (10 to 20 percent). Areas to the immediate southwest contain a moderate percentage of individuals living below the poverty rate (20 to 30 percent). The majority of the area surrounding the airport consists of a high percentage of minority population.

DEPARTMENT OF TRANSPORTATION ACT: SECTION 4(f)

These include publicly owned land from a public park, recreation area, or wildlife and waterfowl refuge of national, state, or local significance, or any land from a historic site of national, state, or local significance.

Potential Section 4(f) properties located in proximity to the airport include the Sky Links/Van Buren Golf Course, located on the western portion of airport property and the Santa Ana River Regional Park which is located approximately 0.5 mile north of the airport.

HISTORICAL AND CULTURAL RESOURCES

According to the City of Riverside's Community Development Department, one known historical area is located in the vicinity of Riverside Airport. Camp Anza is located immediately southwest of the airport and is roughly bordered by Arlington Avenue to the north, Van Buren Boulevard to the east, Crest/Babb Avenue to the west, and Philibin Avenue to the south. Camp Anza served as an embarkation point/staging center for more than 600,000 soldiers passing onto the Pacific, with more than 20,000 men housed at the camp at one time. Additionally, residential areas surrounding the airport contain many homes over 50 years old that may be of historic value to the area.

Previous studies conducted for the City of Riverside indicate that Sycamore Canyon, Mockingbird Canyon Reservoir, and the Spring Rancheria area are areas of the city having known or potential archaeological or paleontological resources. According to the General Plan 2025, areas surrounding the airport have a medium-to-high potential for archaeological resources.

In 2008 paleontological and archaeological surveys were conducted for the western, eastern, and northern portions of airport property. It was determined that the western and easternmost portions of airport property are underlain by geologic sediments determined to have a high paleontological sensitivity rating. Additionally, cultural resource investigations identified a number of archaeological sites in the easternmost portions of airport property.

SUMMARY

The information discussed in this inventory chapter 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.

DOCUMENT SOURCES

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

Airport/Facility Directory, Southwest, U.S. Department of Transportation, Federal Aviation Administration, National Aeronautical Charting Office, expires 30 August, 2007 Edition.

Los Angeles Sectional Aeronautical Chart, U.S. Department of Transportation, Federal Aviation Administration, National Aeronautical Charting Office, Expires 12/20/07.

National Plan of Integrated Airport Systems (NPIAS), U.S. Department of Transportation, Federal Aviation Administration, 2007-2011.

U.S. Terminal Procedures, Southwest, U.S. Department of Transportation, Federal Aviation Administration, National Aeronautical Charting Office, July 5, 2007.

California Aviation System Plan, 2003.
Riverside Airport Master Plan, 1999.

Southern California Association of Governments General Aviation Study, 2003.

Riverside General Plan 2025 (Recirculated). City of Riverside.

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

FAA 5010 Airport Master Record Data:
www.airnav.com

Southern California Association of Governments
www.scag.ca.gov

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

The City of Riverside, California
www.riversideca.gov

Riverside County, California
http://www.countyofriverside.us/portal/page?_pageid=133,1&_dad=portal&_schema=PORTAL

Riverside County Airport Land Use Commission
http://www.rcaluc.org/

California Department of Finance
http://www.dof.ca.gov/Research/Research.asp

California Department of Transportation (Caltrans)
http://www.dot.ca.gov/

Bureau of Economic Analysis, U.S. Department of Commerce
http://www.bea.gov/bea/regional/data.htm

Chapter Two

FORECASTS

Forecasts

An important factor in facility planning involves a definition of demand that may reasonably be expected to occur during the useful life of the facility's key components. In airport master planning, this involves projecting potential aviation activity for a 20-year timeframe. For a general aviation reliever airport such as Riverside Airport (RAL), forecasts of based aircraft and operations (takeoffs and landings) serve as the basis for facility planning.

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

As stated in FAA Order 5090.3C, *Field Formulation of the National Plan of Integrated Airport Systems* (NPIAS), dated December 4, 2004, forecasts should be:

- Realistic
- Based on the latest available data
- Reflect current conditions at the airport
- Supported by information in the study
- Provide adequate justification for airport planning and development

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

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

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

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

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

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

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

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

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

The following forecast analysis for Riverside Airport was produced following these basic guidelines. Existing forecasts, including the previous master plan, are examined and compared against current and historic activity. The historical aviation activity is then examined along with other factors and trends that can affect demand. The intent is to provide an updated set of aviation-demand projections for Riverside Airport that will permit the City of Riverside to make planning adjustments as necessary to maintain a viable, efficient, and cost-effective facility.

AVIATION TRENDS AND PROJECTIONS

Identifying trends in aviation activity on the national, regional, and local levels provides a basis for understanding activity at Riverside Airport. Aviation trends and forecasts are presented in the following sections.

NATIONAL TRENDS

Each year, the FAA updates and publishes a national aviation forecast. Included in this publication are forecasts for the large air carriers, regional/commuter air carriers, air cargo, 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. This discussion will focus on general aviation, which most closely relate to the type of activity at Riverside Airport.

The current edition when this chapter was prepared was FAA *Aerospace Forecasts-Fiscal Years 2007-2020*, published in March 2007. 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.

In the seven years prior to 2001, the U.S. civil aviation industry experienced unprecedented growth in demand and profits. The impacts to the economy and aviation industry from the events of 9/11 were immediate and significant. The economic climate and aviation industry, however, have been recovering. U.S. airline passengers (combined domestic and international) are expected to recover and exceed pre-9/11 levels. Continuing the turnaround that began in 2004, U.S. commercial airlines experienced an increase in passenger enplanements of 7.1 percent in 2005. This is expected to continue, albeit more slowly in 2006, and then grow at an average of 3.1 percent annually through 2017. Mainline air carriers will grow at 2.8 percent annually, while the regional/commuter airlines are expected to grow at a pace of 4.3 percent annually. Air cargo, measured as revenue ton miles (RTMs), is projected to grow at 5.5 percent annually. The number of active general aviation aircraft is expected to grow at 4.3 percent annually.

Growth in the general aviation sector is expected to continue to be strong, particularly with the introduction of Very Light Jets (VLJs) to the fleet. These relatively inexpensive microjets may redefine "on-demand" air taxi service. In 2008, over 350 VLJs are forecast to enter the fleet, with that figure growing to 400-500 per year through 2020. Overall, general aviation hours flown is projected to increase an average of 3.4 percent per year through 2020. The number of active general aviation aircraft is expected to grow at 1.4 percent annually.

GENERAL AVIATION

In the 13 years since the passage of the *General Aviation Revitalization Act of 1994* (federal legislation which limits the liability on general aviation aircraft to 18 years from the date of manufacture), it is clear that the Act has successfully infused new life into the general aviation industry. This legislation sparked an interest to renew the manufacturing of general aviation aircraft due to the reduction in product liability, as well as renewed optimism for the industry. After the passage of this legislation, annual shipments of new aircraft rose every year between 1994 and 2000. According to the General Aviation Manufacturers Association (GAMA), between

1994 and 2000, general aviation aircraft shipments increased at an average annual rate of more than 20 percent, increasing from 928 shipments in 1994, to 3,140 shipments in 2000. As shown in **Table 2A,** the growth in the general aviation industry slowed considerably after 2000, negatively impacted by the national economic recession and the events surrounding 9/11. In 2003, there were over 450 fewer aircraft shipments than in 2000, a decline of 14 percent.

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

Year	Total	SEP	MEP	TP	J	Net Billings ($ millions)
2000	3,140	1,862	103	415	760	13,497.00
2001	2,994	1,644	147	421	782	13,866.60
2002	2,687	1,601	130	280	676	11,823.10
2003	2,686	1,825	71	272	518	9,994.80
2004	2,963	1,999	52	321	591	11,903.80
2005	3,580	2,326	139	365	750	15,140.00
2006	4,042	2,508	242	407	885	18,793.00

SEP - Single Engine Piston; MEP - Multi-Engine Piston; TP - Turboprop; J - Turbofan/Turbojet
Source: GAMA

In 2004, general aviation production showed a significant increase, returning to near pre-9/11 levels for most indicators. With the exception of multi-engine piston aircraft deliveries, deliveries of new aircraft in all categories increased. In 2005, total aircraft deliveries increased 17 percent over the previous year. The largest increase was in single engine piston aircraft deliveries that increased 14 percent or by over 300 aircraft. Turbojet deliveries increased 21 percent, growing by more than 159 aircraft to 750 total aircraft. In 2006, these strong growth trends continued.

On July 21, 2004, the FAA published the final rule for sport aircraft: the *Certification of Aircraft and Airmen for the Operation of Light-Sport Aircraft* rules, which went into effect on September 1, 2004. This final rule established new light-sport aircraft categories and allows aircraft manufacturers to build and sell completed aircraft without obtaining type and production certificates. Instead, aircraft manufacturers will build to industry consensus standards. This reduces development costs and subsequent aircraft acquisition costs. This new category places specific conditions on the design of the aircraft to limit them to "slow (less than 120 knots maximum) and simple" performance aircraft. New pilot training times are reduced and offer more flexibility in the type of aircraft which the pilot would be allowed to operate.

Viewed by many within the general aviation industry as a revolutionary change in the regulation of recreational aircraft, this new rule is anticipated to significantly increase access to general aviation by reducing the time required to earn a pilot's license and the cost of owning and operating an aircraft. Since 2004, there have been over 30 new product offerings in the airplane category alone. These regulations are aimed primarily at the recreational aircraft owner/operator. By 2017, there is expected to be 14,000 of these aircraft in the national fleet.

While impacting aircraft production and delivery, the events of 9/11 and economic downturn have not had the same negative impact on the business/corporate side of general aviation. The increased security measures placed on commercial flights have increased interest in fractional and corporate aircraft ownership, as well as on-demand charter flights. According to GAMA, the total number of corporate operators has increased every year since 1992. Corporate operators are defined as those companies that have their own flight departments and utilize general aviation airplanes to enhance productivity. **Table 2B** summarizes the number of U.S. companies operating fixed-wing turbine aircraft since 1991.

TABLE 2B
U.S. Companies Operating Fixed-Wing Turbine Aircraft and Number of Aircraft, 1991-2005

Year	Number of Operators	Number of Aircraft
1991	6,584	9,504
1992	6,492	9,504
1993	6,747	9,594
1994	6,869	10,044
1995	7,126	10,321
1996	7,406	11,285
1997	7,805	11,774
1998	8,236	12,425
1999	8,778	13,148
2000	9,317	14,079
2001	9,709	14,837
2002	10,191	15,569
2003	10,661	15,870
2004	10,735	16,369
2005	10,809	16,867

Source: GAMA/NBAA (Note: 2006 figures not yet available)

The growth in corporate operators comes at a time when fractional aircraft programs are experiencing significant growth. Fractional ownership programs sell a share in an aircraft at a fixed cost. This cost, plus monthly maintenance fees, allows the shareholder a set number of hours of use per year and provides for the management and pilot services associated with the aircraft's operation. These programs guarantee the aircraft is available at any time, with short notice. Fractional ownership programs offer the shareholder a more efficient use of time (when compared with commercial air service) by providing faster point-to-point travel times and the ability to conduct business confidentially while flying. The lower initial startup costs (when compared with acquiring and establishing a flight department) and easier exiting options are also positive benefits.

Since beginning in 1986, fractional jet programs have flourished. **Table 2C** summarizes the growth in fractional shares since 1986. The number of aircraft in fractional jet programs has grown rapidly. In 2001, there were 696 aircraft in fractional jet programs. This grew to 776 aircraft in fractional jet programs at the end of 2002, and 826 in 2003. There were 949 aircraft at the end of 2005.

TABLE 2C
Fractional Shares and Number of Aircraft In Use

Year	Number of Shares	Number of Aircraft
1986	3	NA
1987	5	NA
1988	26	NA
1989	51	NA
1990	57	NA
1991	71	NA
1992	84	NA
1993	110	NA
1994	158	NA
1995	285	NA
1996	548	NA
1997	957	NA
1998	1,551	NA
1999	2,607	NA
2000	3,834	NA
2001	3,415	696
2002	4,098	776
2003	4,516	826
2004	4,765	865
2005	4,691	949

Source: GAMA (Note 2006 figures not yet available)

Very light jets entered the operational fleet in 2006. Also known as microjets, the VLJ is defined as a jet aircraft that weighs less than 10,000 pounds. There are several new aircraft under development, with the Eclipse 500, Cessna Mustang, and Adams 700 jets expected to enter service in 2007. These jets cost between one and two million dollars, can takeoff on runways of less than 3,000 feet, and cruise at 41,000 feet at speeds in excess of 300 knots. The VLJ is expected to redefine the business jet segment by expanding business jet flying and offering operational costs that can support on-demand air taxi point-to-point service. This category of aircraft is expected to expand at 400 to 500 aircraft per year, reaching nearly 6,300 aircraft by 2020.

The FAA forecast assumes that the regulatory environment affecting general aviation will not change dramatically. The FAA recognizes that a major risk to continued economic growth is upward pressure on commodity prices, including the price of oil. However, the FAA economic models predict a 15 percent increase in oil prices in 2006, followed by a decline of 0.6 percent to 2.5 percent annually between 2007 and 2012, then rising by just over 2.0 percent annually for the balance of the forecast period.

The FAA projects the active general aviation aircraft fleet to increase at an average annual rate of 1.4 percent through 2020, increasing from 224,352 in 2005, to 274,914 in 2020. This growth is depicted on **Exhibit 2A**. FAA forecasts identify two general aviation economies that follow different market patterns. The turbojet fleet is expected to increase at an average annual rate of 6.0 percent, increasing from 9,823 in 2005, to 22,797 in 2020. Factors leading to this substantial growth include expected strong U.S. and global economic growth, the continued success of fractional-ownership programs, the introduction of the VLJ/microjet, and a continuation of the shift from commercial air travel to corporate/business air travel by business travelers and corporations. Piston-powered aircraft (single and multi-engine) are projected to grow at 0.3 percent annually. Piston-powered helicopters are forecast to grow at 5.7 percent annually, while turbine helicopters are forecast to grow 2.1 percent annually.

Aircraft utilization rates are projected to increase through the year 2020. The number of general aviation hours flown is projected to increase at 3.4 percent annually. Similar to active aircraft projections, there is projected disparity between piston and turbine aircraft hours flown. Hours flown in turbine aircraft are expected to increase at 6.1 percent annually, compared with 1.3 percent for piston-powered aircraft. Jet aircraft are projected to increase at 9.4 percent annually, while fixed wing piston-powered aircraft are projected to grow 1.0 percent annually through 2020.

The total pilot population is projected to increase by 38,000 through 2020, from an estimated 467,745 in 2005, to 506,097, which represents an average annual growth rate of .08 percent. The student pilot population is forecast to increase at an annual rate of 1.2 percent over the forecast period, reaching a total of 100,181 in 2020. Growth rates for the other pilot categories over the forecast period are as follows: airline transport pilots, up 0.2 percent; recreational pilots declining 0.1 percent annually; rotorcraft only, up 3.1 percent annually; commercial pilots up 0.8 percent annually, private pilots show a zero growth rate, and glider only, up 0.4 percent. The decline in recreational and private pilots is the result of the expectation that most new general aviation pilots will choose to obtain the Sport Pilot license instead.

Over the past several years, the general aviation industry has launched a series of programs and initiatives whose main goals are to promote and assure future growth within the industry. "No Plane, No Gain" is an advocacy program created in 1992 by the General Aviation Manufacturers Association (GAMA) and the National

Business Aircraft Association (NBAA) to promote acceptance and increased use of general aviation as an essential, cost-effective tool for businesses. Other programs are intended to promote growth in new pilot starts and introduce people to general aviation. "Project Pilot," sponsored by the Aircraft Owners and Pilots Association (AOPA), promotes the training of new pilots in order to increase and maintain the size of the pilot population. The "Be a Pilot" program is jointly sponsored and supported by more than 100 industry organizations. The NBAA sponsors "AvKids," a program designed to educate elementary school students about the benefits of business aviation to the community and career opportunities available to them in business aviation. Over the years, programs such as these have played an important role in the success of general aviation and will continue to be vital to its growth in the future.

COMPARABLE FORECASTS

For Riverside Airport, the FAA provides forecasts within their *Terminal Area Forecast* (TAF) for operations and based aircraft. These are updated annually based upon current trends, or when new planning forecasts have been developed for master plans. The current TAF figures for Riverside Airport are reflected in **Table 2D**. While projections are available for each year through 2025, only the five-year incremental figures are included in the table.

TABLE 2D
Terminal Area Forecast (FAA)
Riverside Airport

	Actual	Forecast		
	2006	2012	2017	2025
Based Aircraft	241	285	325	399
Itinerant Operations	42,022	50,352	53,686	64,724
Local Operations	41,540	47,791	53,713	64,751
Annual Operations	83,562	98,143	107,399	129,475

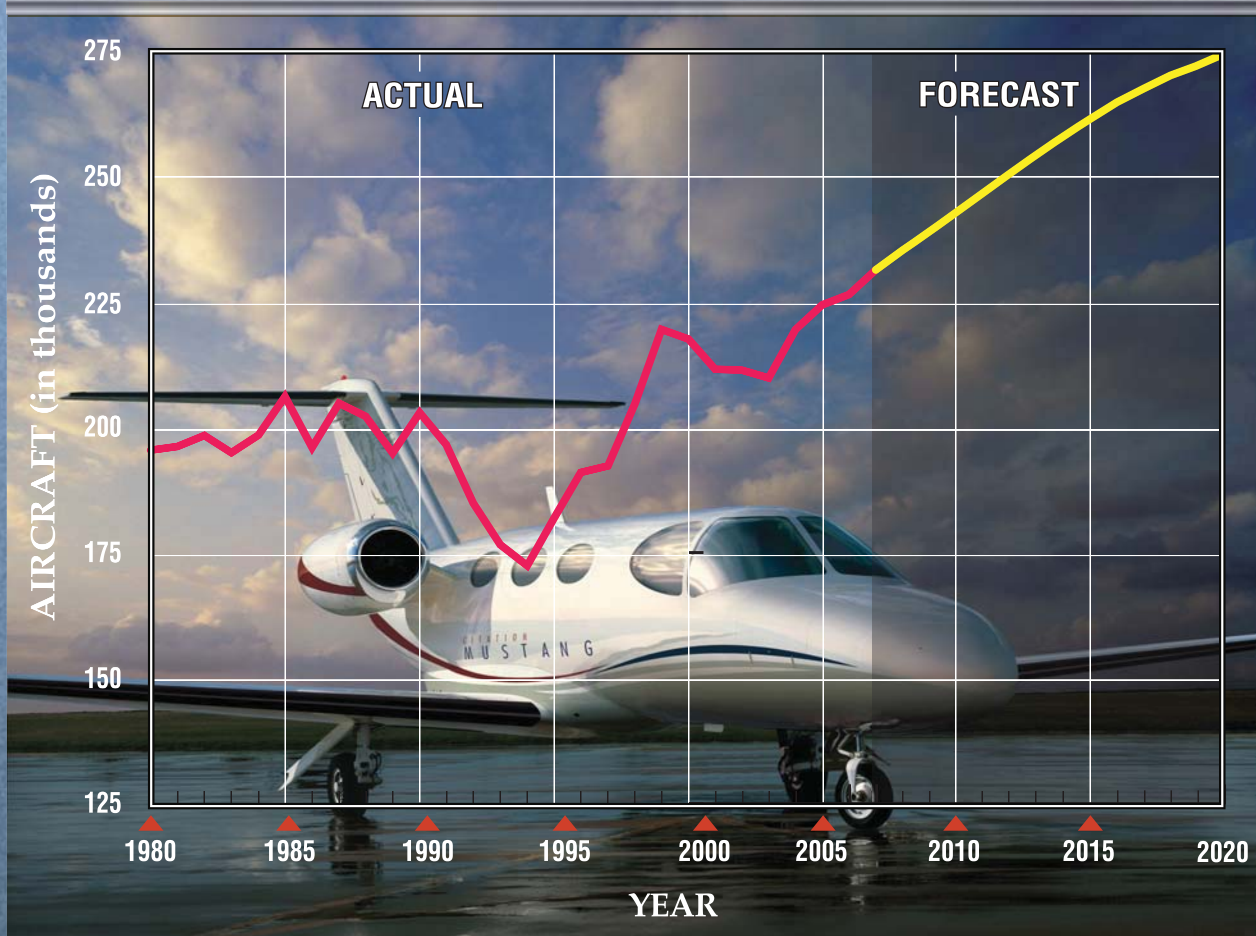
Source: FAA Terminal Area Forecast (TAF) 2007

REGIONAL AND LOCAL TRENDS AND PROJECTIONS

As previously discussed, the California Department of Transportation Division of Aeronautics (Caltrans) actively participates in aviation planning and capital improvement projects in the state. Caltrans produces the *California Aviation System Plan* (CASP) in which aviation forecasts for each of the state's airports is presented. Various elements of the CASP are produced and published at different times. The aviation demand forecasts have not been updated since 1996. Since there are more recent forecasts available from other sources, and since the CASP forecasts are more than 10 years old, they will not be considered further in this master plan.

04MP20-2A-9/27/07

U.S. ACTIVE GENERAL AVIATION AIRCRAFT



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

Year	FIXED WING				ROTORCRAFT		Experimental	Sport Aircraft	Other	Total
	PISTON		TURBINE							
	Single Engine	Multi-Engine	Turboprop	Turbojet	Piston	Turbine				
2006 (Est.)	148.2	19.4	8.0	10.0	3.4	5.9	24.5	0.4	6.6	226.4
2010	150.4	19.2	8.2	13.4	4.8	6.5	27.7	5.6	6.8	242.8
2015	154.0	19.0	8.5	18.0	6.3	7.2	31.1	10.5	6.7	261.4
2020	155.6	18.8	8.8	22.8	7.4	7.9	33.9	13.2	6.6	274.9

Source: FAA Aerospace Forecasts, Fiscal Years 2007-2020.

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

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

In 2003, the Southern California Association of Governments (SCAG) completed the *General Aviation System Plan (GASP)*. In the plan SCAG recognized the congested nature of the commercial service airports in the region. The SCAG-GASP indicates that the activity at commercial service airports has a direct effect on general aviation airports, particularly reliever airports such as Riverside. As capacity issues at commercial airport become more pronounced, general aviation activity tends to naturally transition to other smaller airports. This "ripple" effect can be seen in the trends shown in **Exhibit 2B**.

The SCAG-GASP utilized the FAA TAF and existing airport master plans to forecast aviation activity. Therefore, the TAF previously presented is the most recent forecast for the airport. Of note, from a regional perspective, is the forecast growth in activity in the SCAG counties. Ventura and Orange Counties show slower growth rates primarily due to limited capacity at the existing airport. Riverside, San Bernardino, and Los Angeles Counties are all showing positive forecast growth. As shown in **Table 2E**, Riverside County is forecast to grow 1.04 percent annually through 2030.

TABLE 2E
SCAG General Aviation Operations Forecast

County	2005	2010	2015	2020	2025	2030	AAGR ('05-'30)
Imperial	105,250	110,278	115,556	121,875	126,903	131,931	0.91%
Los Angeles	2,130,999	2,282,557	2,432,018	2,449,591	2,467,284	2,780,316	1.07%
Orange	340,088	356,189	372,255	388,306	404,456	420,965	0.86%
Riverside	600,526	624,249	661,967	699,169	737,656	777,326	1.04%
San Bernardino	766,859	811,508	858,893	906,961	956,308	1,008,278	1.10%
Ventura	371,500	377,392	383,129	396,827	398,214	402,937	0.33%
Riverside Airport	**113,213**	**127,688**	**142,164**	**156,640**	**170,918**	**184,763**	**1.98%**

Source: Southern California Association of Governments - General Aviation System Plan (2003)

The SCAG-GASP also forecasts operations for each airport in each county. As can be seen from the table, growth at Riverside Airport is forecast to nearly double the growth of the County.

The local airport planning document is the airport master plan. The previous master plan for the airport was completed in 1998 and approved in 1999. The base year for the master plan was 1998 and projected based aircraft and operations through 2020. In addition, an updated set of forecasts were developed for a potential airport tenant in 2002. While these updated forecasts were not presented to or approved by the FAA, they are presented here for comparison purposes. Both of these forecasts are presented in **Table 2F**.

The long range forecasts from the previous master plan have been exceeded in terms of based aircraft. The actual operations have been trending very closely to the 1999 forecast. The based aircraft forecast from the 2002 updated forecast has trended well with actual activity.

TABLE 2F **Previous Airport Forecasts** **Riverside Airport**						
Previous Airport Master Plan (1998)						
Demand Category	**Base Year (1998)**	**2005**	**2010**	**2015**	**2020**	
Based Aircraft	184	190	199	208	216	
Itinerant Operations	39,397	46,500	52,300	58,600	65,500	
Local Operations	30,357	35,800	40,200	45,000	50,300	
Annual Operations	69,754	82,300	92,500	103,600	115,800	
Updated Forecasts (2002)						
Demand Category	**Base Year (2002)**	**2005**	**2010**	**2015**	**2020**	**2025**
Based Aircraft	240	277	319	363	413	468
Itinerant Operations	44,975	49,390	53,090	57,130	61,510	66,070
Local Operations	59149	66,130	69,330	73,030	76,630	80,730
Annual Operations	104,124	115,520	122,420	130,160	138,140	146,800

Source: 1999 Airport Master Plan; 2002 Aviation Forecasts.

SERVICE AREA

Defining a service area for an airport can be useful in the forecasting process. Once a general service area is identified, various statistical comparisons can be made for projecting aviation demand. For example, in rural areas, where there may be one general aviation airport in each county, the service area could reasonably be defined as the entire county. This would facilitate comparisons to county population and employment for forecasting purposes.

In urban areas, where there are many general aviation airports, the definition of the service area is not as simple. Aircraft owners in urban areas have many more choices when it comes to basing their aircraft. The number one reason aircraft owners select an airport at which to base their aircraft is convenience to home or work. Other reasons may include the capability of the runway system, services available, availability of hangar space, etc. Therefore, the primary limiting factor to defining an airport service area is the proximity of other airports that provide a similar or greater level of service.

The defined service area is developed for the purposes of identifying a geographic area from which to further develop aviation demand projections. The service area will generally represent where most, but not all, based aircraft will come from. It is not unusual for some based aircraft to be registered outside the county or even outside the state. Particularly in urban areas, service areas will likely overlap to some extent as well.

The service area for Riverside Airport is primarily limited by the proximity of other airports. To the west, Chino Airport is a full service general aviation facility. The airport supports three runways, the longest of which is 7,000 feet. There are approximately 947 based aircraft, of which 40 are jet aircraft. Three FBOs provide a full

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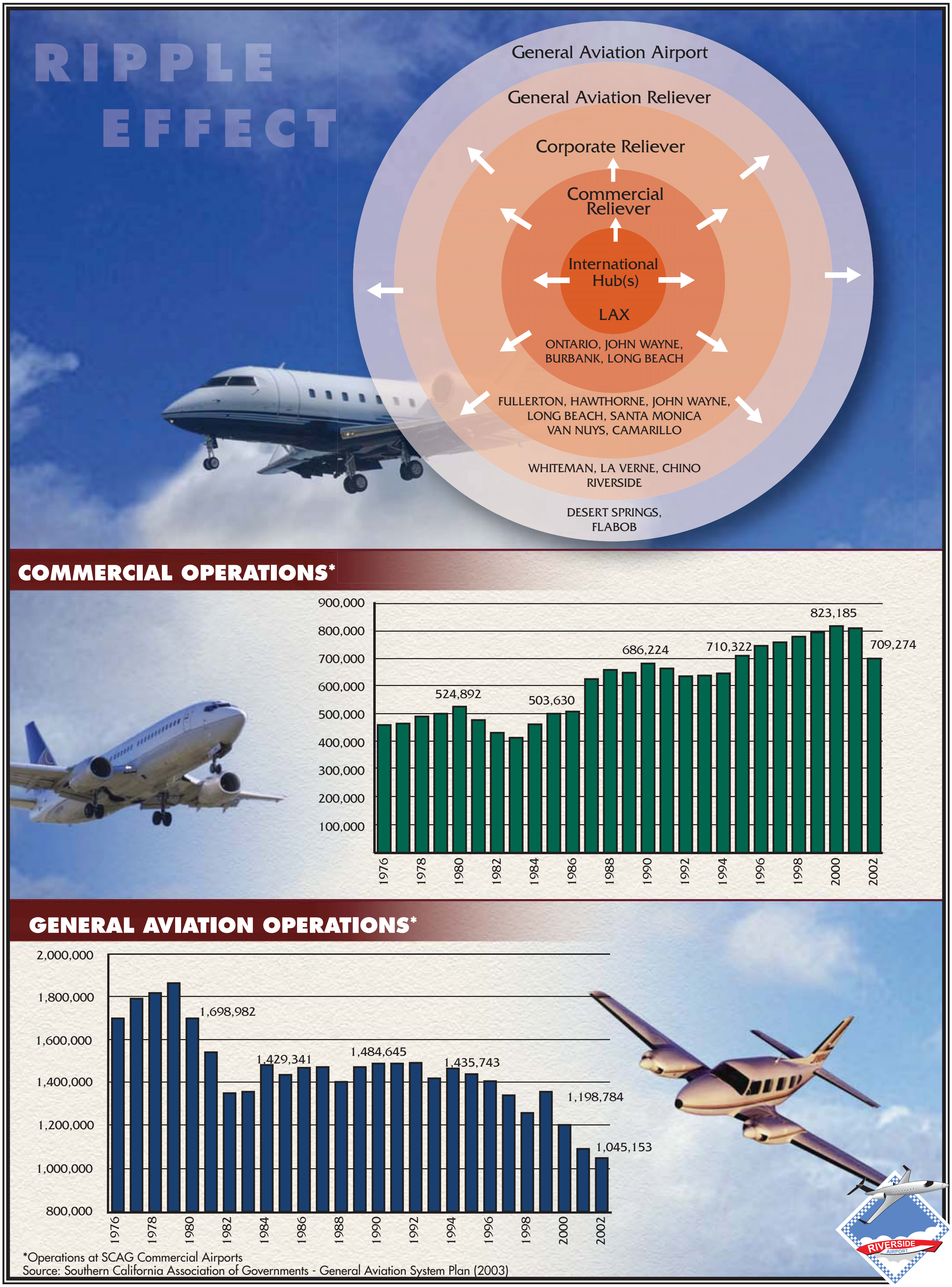

Exhibit 2B
SCAG AIRPORT "RIPPLE EFFECT"

array of general aviation services including fuel. The airport has a control tower as well.

Both Redlands and Banning Municipal Airports provide general aviation services to the east of Riverside Airport. Redlands has a 4,500-foot runway, 221 based aircraft (1 jet), and FBO services. Banning provides a 5,200-foot runway and has 74 based aircraft. Neither of these airports provides Jet A fuel.

To the southeast of Riverside are Hemit-Ryan and French Valley Airports. Hemit-Ryan has two runways, the longest of which is 4,300 feet. There are approximately 279 based aircraft (1 jet) and a full service FBO with AvGas and Jet fuel. French Valley has a single 6,000-foot long runway and approximately 311 based aircraft (7 jets).

To the north of Riverside Airport is Ontario International and San Bernardino Airports. Both have a runway longer than 8,100 feet and full FBO services. South of Riverside is mountainous areas which limits the service area.

The general service area for Riverside Airport, as presented on **Exhibit 2C**, would be the western half of Riverside County. A portion of the service area may cross over into northeast Orange County, but Chino is better located to serve this constituency. This defined service area is also one of the subareas defined by the SCAG for their demographic projections, which will allow for direct comparisons of aviation demand to socioeconomic trends.

SOCIOECONOMIC CHARACTERISTICS

The socioeconomic profile of the region provides a general look at the economic makeup of the community that utilizes Riverside Airport. It also provides an understanding of the dynamics for growth and the potential changes that may affect aviation demand. Aviation demand is often directly related to the population base, economic strength, and sustained economic condition of the airport service area. Current socioeconomic data was obtained from the recently completed *Riverside General Plan 2025*. This document utilized socioeconomic data provided by the SCAG. Other sources considered were the California Department of Finance, California Employment Development Department, U.S. Bureau of Labor Statistics, and the U.S. Bureau of Economic Analysis.

POPULATION

Population is a basic demographic element to consider when planning for future needs of the airport. **Table 2G** presents historical and forecast population for the airport service area, represented most closely by western Riverside County. For comparison purposes, the whole of Riverside County and the City of Riverside are included.

TABLE 2G
Population Trend and Projection

Year	City of Riverside	Average Annual % Change	Riverside County	Average Annual % Change	Western Riverside County	Average Annual % Change
Historic Trend						
2000	256,352	NA	1,559,482	NA	1,205,301	NA
2005	286,935	2.39%	1,850,231	3.73%	1,430,893	3.74%
Projection						
2010	307,847	1.46%	2,085,432	2.54%	1,614,605	2.57%
2015	323,384	1.01%	2,370,526	2.73%	1,830,421	2.67%
2020	338,712	0.95%	2,644,278	2.31%	2,037,129	2.26%
2025	353,397	0.87%	2,900,563	1.94%	2,230,185	1.90%
2030	367,489	0.80%	3,143,468	1.67%	2,413,467	1.64%

Sources: Riverside General Plan 2006.

The data indicates that the western Riverside County area is projected to add nearly one million to its population from 2005 to 2030. This is an overall average annual growth rate of 2.11 percent. As can be seen over time, the average growth rate is projected to slow from 3.74 percent between 2000 and 2005 to 1.64 percent from 2025 to 2030. The growth trend is similar for the City and County of Riverside.

In 2005, the overall U.S. population grew at 0.9 percent as a point of comparison. These positive growth trends have been attributed to the availability of affordable quality homes, excellent educational institutions, and enjoyable recreational amenities.

EMPLOYMENT

Analysis of a community's employment base can be valuable in determining the overall economic well-being of that community. In most cases, the community make-up and health are significantly impacted by the availability of jobs, the variety of employment opportunities, and the types of wages provided by local employers. **Table 2H** provides historical and forecast employment characteristics.

Total employment growth in the region has outpaced population growth. Western Riverside County added nearly 59,000 jobs from 2000 to 2005. By 2010, an additional 100,000 jobs are forecast to be added. By 2030, more than 918,000 jobs are forecast to be available for a population base of 2.4 million.

Like population, employment growth is forecast to slow slightly over time, but the overall average annual growth rate from 2005 to 2030 is estimated at 2.9 percent. Unemployment for Riverside County has averaged below five percent for the last 10 years.

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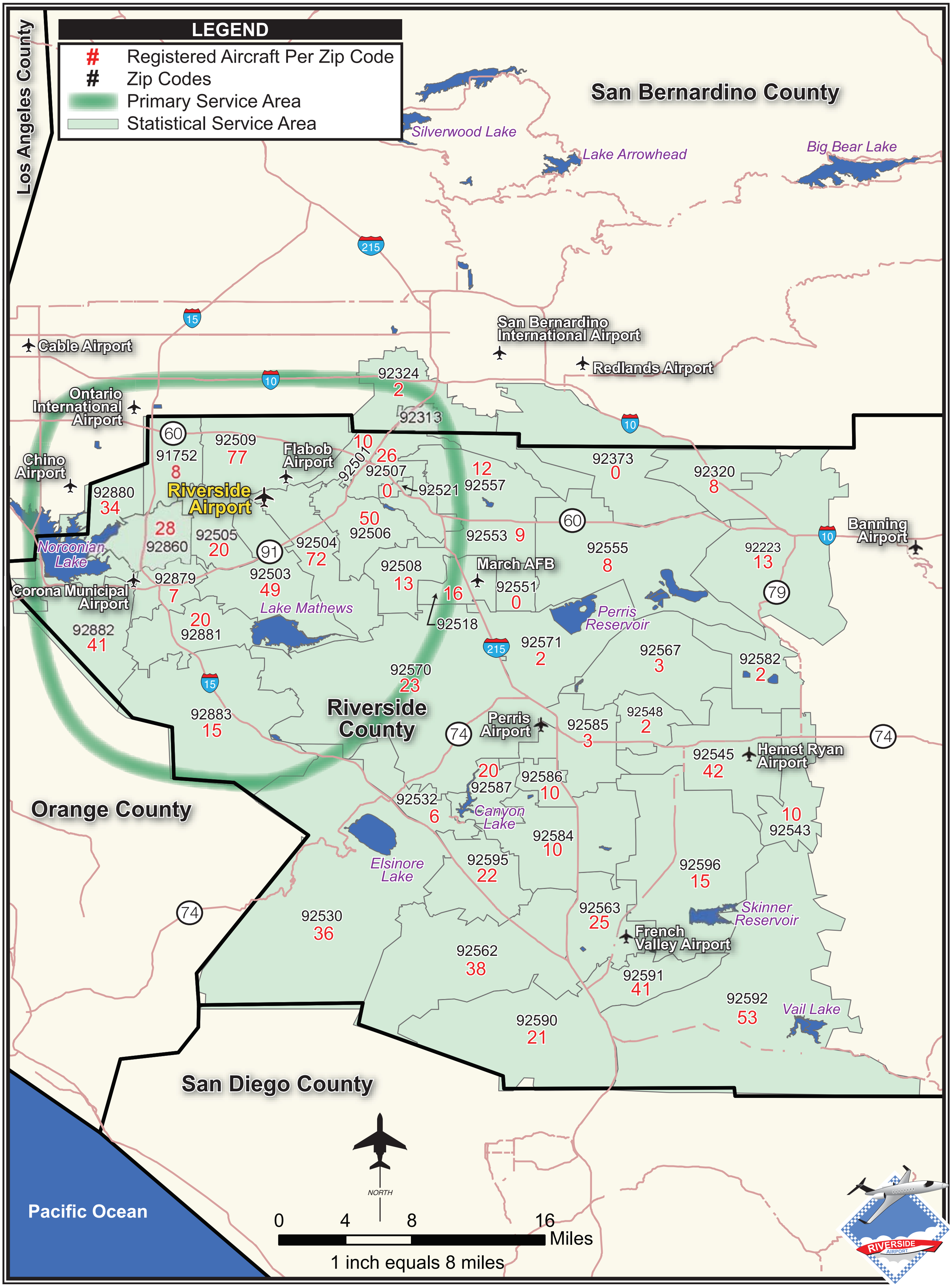

Exhibit 2C
PRIMARY AIRPORT
SERVICE AREA

TABLE 2H
Employment Trend and Projection

Year	City of Riverside	Average Annual % Change	Riverside County	Average Annual % Change	Western Riverside County	Average Annual % Change
Historic Trend						
2000	126,679	NA	526,541	NA	388,141	NA
2005	140,887	2.24%	603,610	2.93%	446,932	3.03%
Projection						
2010	163,771	3.25%	727,711	4.11%	541,587	4.24%
2015	181,120	2.12%	839,698	3.08%	633,161	3.38%
2020	199,078	1.98%	954,499	2.73%	727,005	2.96%
2025	217,369	1.84%	1,070,761	2.44%	822,031	2.61%
2030	236,081	1.72%	1,188,976	2.21%	918,640	2.35%

Sources: Riverside General Plan 2006.

INCOME

Table 2J compares historical per capita personal income (PCPI) for Riverside County, the Riverside MSA, the State of California, and the United States between 2000 and 2030. As indicated in the table, the PCPI for the selected areas is forecast to grow. A growing income base is often an indicator of a growing trend in aviation activity as more expendable capital is available.

TABLE 2J
Historic and Projected Per Capita Personal Income (1996 dollars)

	Riverside County	Riverside MSA	California	United States
History				
2000	$22,197	$21,336	$30,368	$27,919
2005	$22,183	$21,898	$30,389	$28,562
AAGR '00-'05	**-0.01%**	**0.52%**	**0.01%**	**0.46%**
Projected				
2010	$23,282	$22,931	$32,098	$30,133
2015	$24,513	$24,089	$33,980	$31,869
2020	$25,854	$25,348	$36,003	$33,736
2025	$27,301	$26,702	$38,166	$35,734
2030	$28,833	$28,129	$40,441	$37,837
AAGR '05-'30	**1.05%**	**1.01%**	**1.15%**	**1.13%**

MSA: Metropolitan Statistical Area (Includes Ontario and San Bernardino)
AAGR – Average Annual Growth Rate
Source: Woods & Poole Economics, CEDDS, 2006

FORECASTING APPROACH

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

The most reliable approach to estimating aviation demand is through the utilization of more than one analytical technique. Methodologies frequently considered include trend line projections, correlation/regression analysis, and market share analysis.

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

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

Regression analysis measures the statistical relationship between dependent and independent variables yielding a "correlation coefficient." The correlation coefficient (Pearson's "r") measures association between the changes in a dependent variable and independent variable(s). If the r-squared (r^2) value (coefficient determination) is greater than 0.95, it indicates good predictive reliability. A value below 0.95 may be used with the understanding that the predictive reliability is lower.

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

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

The need for airport facilities at Riverside Airport can best be determined by quantifying future aviation demand. Therefore, the remainder of this chapter presents the aviation demand forecasts and includes activity in three broad categories: general aviation, air taxi, and military.

GENERAL AVIATION FORECASTS

To determine the types and sizes of facilities that should be planned to accommodate general aviation activity, certain elements of this activity must be forecast. Indicators of general aviation demand include:

- Based Aircraft
- Based Aircraft Fleet Mix
- General Aviation Operations
- Peak Activity Levels
- Annual Instrument Approaches

REGISTERED AIRCRAFT FORECAST

The number of based aircraft is the most basic indicator of general aviation demand at an airport. By first developing a forecast of based aircraft, other demand segments can be projected based upon this trend.

One method of forecasting based aircraft is to first examine local aircraft ownership by reviewing aircraft registrations in the region. All civil aircraft in the U.S. must be registered with the FAA and that information is public record. The FAA aircraft registration database was filtered by zip code and the 46 zip codes most closely representing the airport service area (western Riverside County) were compiled.

The number of registered aircraft in western Riverside County has increased from 580 in 1998 to 924 in 2006. This represents an average annual growth rate of 5.3 percent, or the addition of 344 aircraft to the service area. This strong growth in aircraft registrations is a positive indication of the economic health of the region as aircraft ownership typically follows local and national economic trends. **Table 2K** presents the historic aircraft registrations in western Riverside County since 1993.

TABLE 2K
Registered Aircraft Fleet Mix in the Airport Service Area
Riverside Airport

Year	Single Engine Piston	Multi-Engine Piston	Turboprop	Jet	Helicopter	Other	Total
1993	396	45	8	1	15	23	488
1994	417	45	6	0	15	31	514
1995	421	45	7	1	19	42	535
1996	433	41	7	2	26	44	553
1997	498	50	5	1	28	67	649
1998	461	39	5	1	24	50	580
1999	476	41	7	2	28	61	615
2000	500	47	6	2	28	69	652
2001	558	54	9	3	29	74	727
2002	568	55	9	4	32	74	742
2003	648	68	13	3	37	76	845
2004	682	68	14	4	39	79	886
2005	711	66	14	4	35	76	906
2006	726	70	14	3	35	76	924

Source: FAA Aircraft Registry Database; FAA Census of U.S. Civil Aircraft

Several projections for registered aircraft in western Riverside County have been developed. Comparisons to national U.S. active general aviation aircraft were first considered. While the national general aviation fleet was declining in the years from 2000 through 2003, registered aircraft in western Riverside County were on the increase. As a result, market share projections of registered aircraft compared to the national fleet were low and not considered reliable considering the positive growth trend experienced over the last nine years in the service area.

Additional forecasts were developed that take into consideration local factors such as the local growth trends in registered aircraft, population, and employment. **Table 2L** presents these forecasts.

The first forecast considers the future number of registered aircraft in the airport service area representing a constant share of the population growth in the service area. This forecast results in 1,070 registered aircraft in 2012; 1,204 in 2012; and 1,451 in 2027. This forecast slows the historical trend of the service area where registered aircraft grew faster than the population and is, therefore, considered a low range forecast.

TABLE 2L
Registered Aircraft Projections for Western Riverside County
Riverside Airport

Year	Western Riverside County Registrations	U.S. Active Aircraft	Market Share of U.S. Active Aircraft	Western Riverside Co. Pop.	Employment Western Riverside County	Aircraft Per 1,000 Population
1998	580	204,711	0.283%	1,127,196	329,658	0.515
1999	615	219,464	0.280%	1,165,521	357,712	0.528
2000	652	217,533	0.300%	1,205,301	388,141	0.541
2001	727	211,535	0.344%	1,247,366	399,242	0.583
2002	742	211,345	0.351%	1,290,899	410,660	0.575
2003	845	209,788	0.403%	1,335,951	422,405	0.633
2004	886	219,426	0.404%	1,382,576	434,486	0.641
2005	906	224,352	0.404%	1,430,893	446,932	0.633
2006	924	226,422	0.408%	1,465,950	464,452	0.630
Constant Share of Registered Aircraft Per 1,000 Population						
2012	1,070	250,587	0.427%	1,697,669	576,468	0.630
2017	1,204	267,470	0.450%	1,910,349	669,114	0.630
2027	1,451	299,891	0.484%	2,301,669	859,439	0.630
Registered Aircraft v. Western Riverside County Pop. (94-06) R-Squared = 0.95						
2012	1,177	250,587	0.470%	1,697,669	576,468	0.693
2017	1,392	267,470	0.520%	1,910,349	669,114	0.729
2027	1,788	299,891	0.596%	2,301,669	859,439	0.777
Registered v. Year (93-06) Trend Line - R-Squared = 0.94						
2012	1,130	250,587	0.451%	1,697,669	576,468	0.666
2017	1,307	267,470	0.489%	1,910,349	669,114	0.684
2027	1,662	299,891	0.554%	2,301,669	859,439	0.722
SELECTED FORECAST						
2012	1,100	250,587	0.439%	1,697,669	576,468	0.648
2017	1,300	267,470	0.486%	1,910,349	669,114	0.681
2027	1,650	299,891	0.550%	2,301,669	859,439	0.717

As described previously, regression analysis measures the statistical relationship between dependent and independent variables. Utilizing this method, the statistical relationship between historic registered aircraft in western Riverside County to the population of western Riverside County, was determined. This regression showed a strong correlation and an r^2 value of 0.95. This regression produced a forecast of 1,177 registered aircraft in 2012; 1,392 in 2017; and 1,788 in 2027.

A third forecast was developed utilizing a statistical trend line by "fitting" a growth curve to the historical trend and extending that curve into the future. The trend line projection considered registered aircraft going back to 1993. This result is a good correlation and an r^2 value of 0.94. This projection shows 1,130 registered aircraft in 2012; 1,307 in 2017; and 1,662 in 2027.

It is unusual to realize such high coefficient determination (r^2 values) with several statistical methods. This shows that the growth trend in registered aircraft has been fairly consistent since 1993. It also shows a high correlation with population, which is not as common in the aviation industry because of the volatile nature of the business. As a result of the several forecasting methods being statistically reliable, the selected forecast is approximately an average of the three methods presented.

The average annual growth rate in registered aircraft for western Riverside County from 1993 to 2006 was 4.67 percent. The selected forecast represents an average annual growth rate of 2.80 percent from 2006 to 2027. **Exhibit 2D** presents the registered aircraft forecast for western Riverside County in graphic form. The selected forecast will be utilized as a variable when determining a reasonably based aircraft forecast in the following subsection.

BASED AIRCRAFT FORECASTS

Determining the number of based aircraft at an airport can be a challenging task because the number of based aircraft can change frequently. Many general aviation and reliever airports don't maintain historic records of based aircraft. Fortunately, airport staff has maintained records on based aircraft over the past several years. These records serve as the basis for the historic based aircraft numbers used in this analysis.

With a reasonable forecast of western Riverside County registered aircraft determined, a based aircraft forecast can now be made. As presented in **Table 2M**, based aircraft at Riverside Airport have fluctuated around 200 for the past 13 years. In 1994, there were 232 based aircraft and, in 2006, there were 202 based aircraft. In 1997, there were as few as 181 based aircraft. As a result of the number of based aircraft remaining relatively steady, the percentage of registered aircraft in western Riverside County actually basing at Riverside Airport has been on the decline. Since 2001, based aircraft as a percentage of registered aircraft has declined from 25.6 percent to 21.9 percent. This trend is most likely the direct result of a lack of hangar development at the airport. With a new general aviation hangar complex currently being constructed, based aircraft can be expected to grow.

Two market share forecasts for based aircraft were developed utilizing the forecast of registered aircraft in the western Riverside County region. The first assumes that Riverside Airport will account for a constant share of approximately 22 percent of registered aircraft, freezing a downward trend over the previous six years. This forecast results in 251, 295, and 383 based aircraft for the years 2012, 2017, and 2027, respectively. Considering the current construction of 117 new hangars, this forecast is considered a low end forecast.

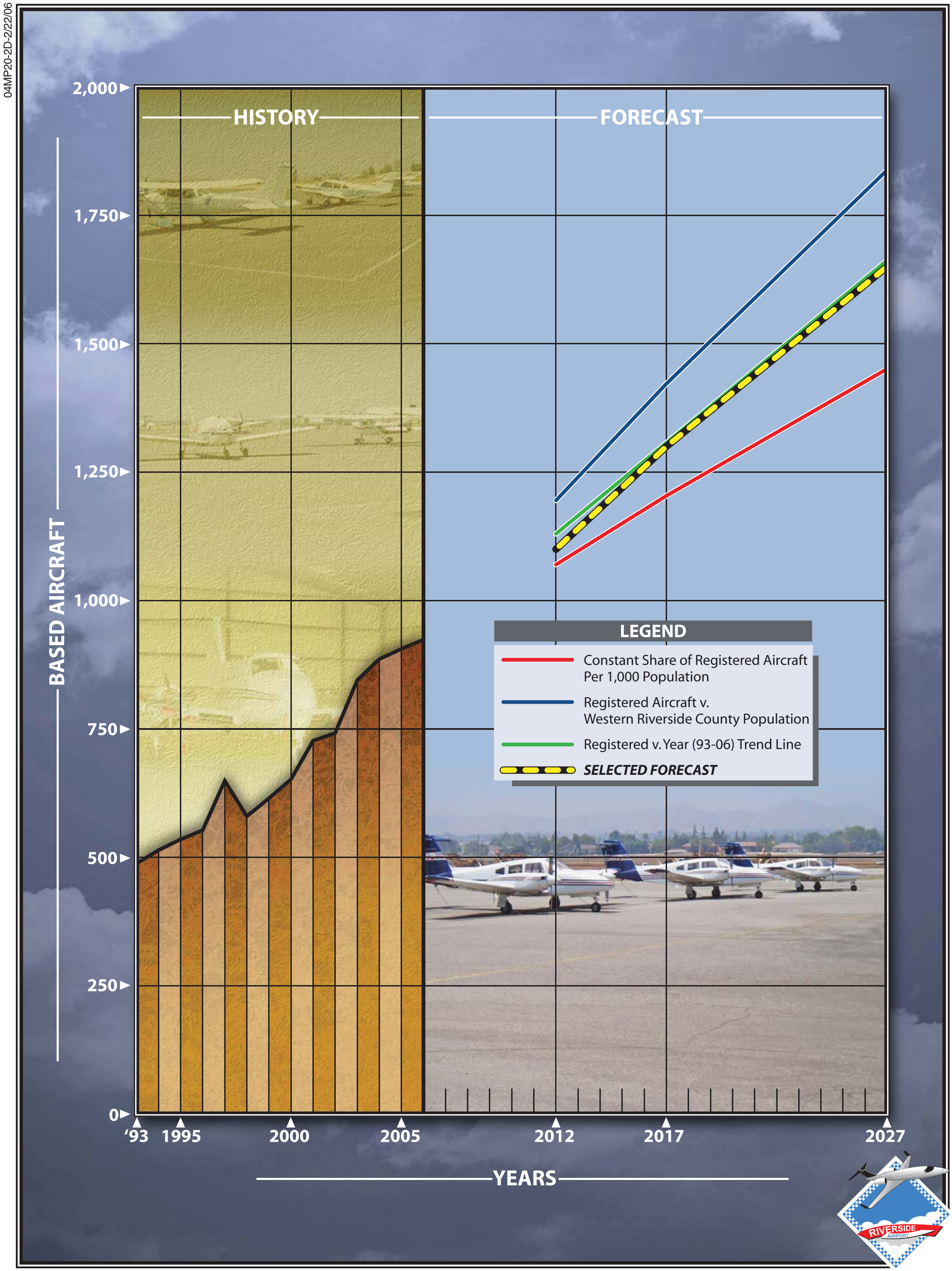

Exhibit 2D
WESTERN RIVERSIDE COUNTY
REGISTERED AIRCRAFT FORECAST

TABLE 2M
Based Aircraft v. Western Riverside County Registered Aircraft
Riverside Airport

Year	Western Riverside County Registered Aircraft	Based Aircraft	Percent of Registered Aircraft
1993	488	NA	NA
1994	514	232	45.1%
1995	535	230	43.0%
1996	553	195	35.3%
1997	649	181	27.9%
1998	580	184	31.7%
1999	615	NA	NA
2000	652	NA	NA
2001	727	186	25.6%
2002	742	189	25.5%
2003	845	193	22.8%
2004	886	196	22.1%
2005	906	200	22.1%
2006	924	202	21.9%
Constant Market Share Projection			
2012	1,150	251	21.9%
2017	1,350	295	21.9%
2027	1,750	383	21.9%
Increasing Market Share Projection			
2012	1,100	300	27.3%
2017	1,300	370	28.5%
2027	1,650	480	29.1%

Source: Airport Records; FAA Census of Civil Aircraft

The second forecast considers an increasing market share of registered aircraft in western Riverside County. This forecast projects that Riverside Airport will, over the next 20 years, increase from a 22 percent market share to slightly more than 29 percent, recapturing a portion of its share of western Riverside County registered aircraft. This projection appears reasonable considering that prior to 1998, the airport accounted for between 30 and 45 percent of the registered aircraft in the county. This forecast yields 300 based aircraft in 2012, 370 in 2017, and 480 in 2027.

Based Aircraft Conclusion

Table 2N presents the selected based aircraft forecast in comparison to the several forecasts previously completed for the airport. It is anticipated that Riverside Airport will experience a large jump in based aircraft in the near term (2012), based primarily on the current construction of 117 new hangars at the airport, and then level out through the longer term of the forecast (2027). **Exhibit 2E** depicts the trend lines for the forecast methods as well as the selected based aircraft forecast.

TABLE 2N Based Aircraft Summary Riverside Airport			
	2012	**2017**	**2027**
Market Share of Western Riverside County Registered Aircraft			
Constant Share	239	283	359
Increasing Share	300	370	480
Comparison Projections*			
FAA TAF	285	325	420
1998 Master Plan	203	211	228
2002 Forecast Update	336	382	492
SCAG-GASP 2003	328	384	529
SELECTED FORECAST	**300**	**370**	**480**

*Figures interpolated and extrapolated to plan years.

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 has been established that takes into consideration the reasonable range of based aircraft projections.

The milestones are founded on the potential of attracting additional based aircraft to the airport and, more importantly, supporting those aircraft with facilities. By providing a realistic based aircraft forecast for Riverside Airport, officials will be able to respond to unexpected changes in a timely manner. As a result, these milestones provide flexibility, while potentially extending this plan's useful life if aviation trends slow over the period.

The most important reason for utilizing milestones is that they allow the airport to develop facilities according to need generated by actual demand levels. The demand-based schedule provides flexibility in development, as development schedules can be slowed or expedited according to actual demand at any given time over the planning period. The resultant plan provides airport officials with a financially-responsible and need-based program. The planning horizons for based aircraft that will be utilized for the remainder of this master plan are as follows:

- Short Term 300
- Intermediate Term 370
- Long Term 480

BASED AIRCRAFT FLEET MIX

The based aircraft fleet mix at Riverside Airport is presented in **Table 2P**. The forecast fleet mix utilizes existing local trends as well as forecast U.S. general aviation trends as presented in FAA *Aerospace Forecasts Fiscal Years 2007-2020*. The FAA projects that business jets will be the fastest growing general aviation aircraft type in the future. The number of business

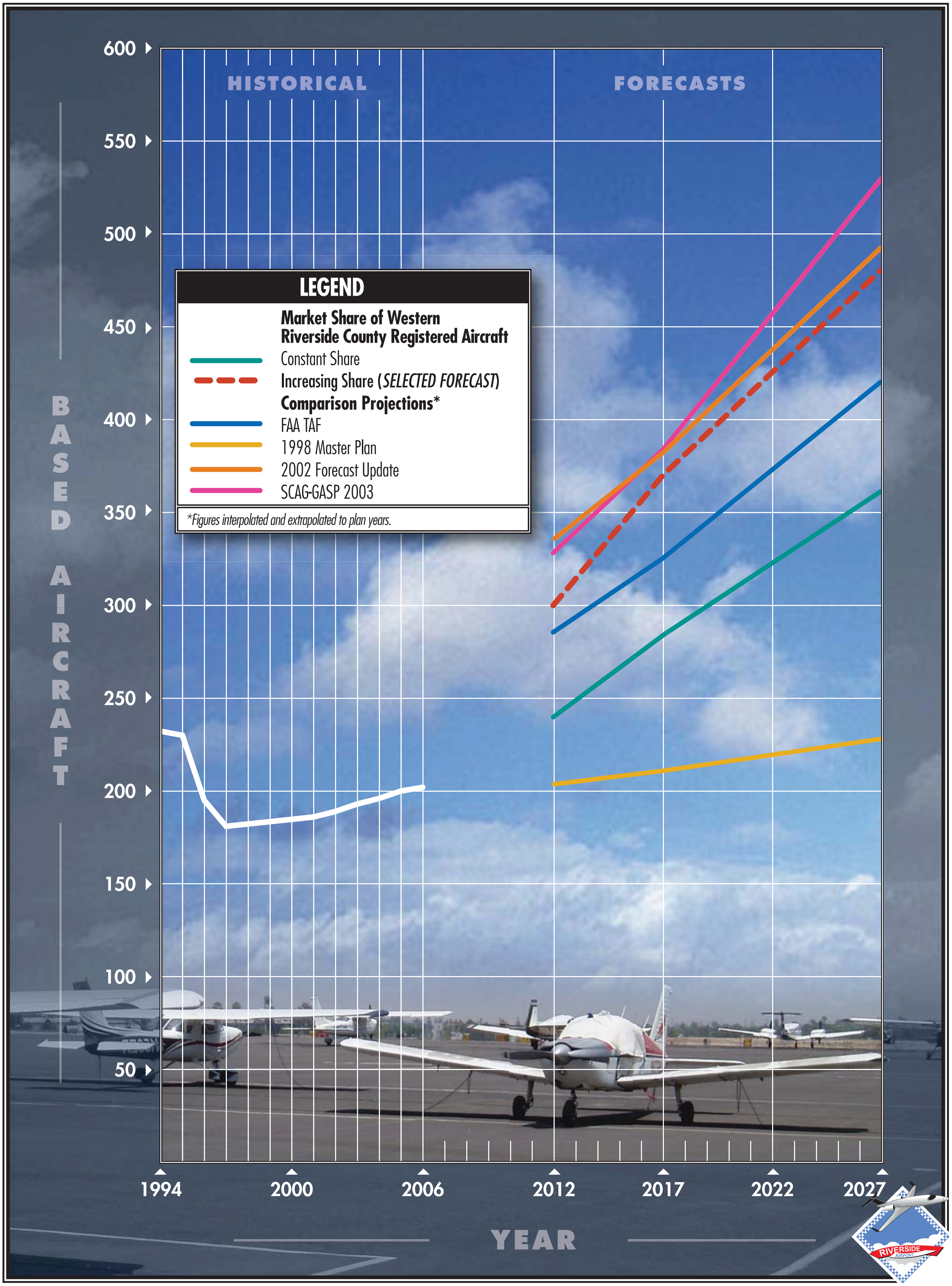

Exhibit 2E
BASED AIRCRAFT
FORECAST SUMMARY

jets in the U.S. fleet is expected to more than double in the next 12 years. This represents an annual growth rate of 6.0 percent. Turboprop aircraft are the next fastest growing segment at 4.3 percent annually. Piston-powered aircraft are also expected to grow but at only 0.3 percent for single engine and 0.1 percent for multi-engine annually.

TABLE 2P
Based Aircraft Fleet Mix
Riverside Airport

Aircraft Category	Current	%	2012	%	2017	%	2027	%
Single Engine Piston	170	84.2%	252	84.0%	307	83.0%	399	83.1%
Multi-Engine Piston	22	10.9%	27	9.0%	33	8.9%	39	8.1%
Turboprop	2	1.0%	5	1.7%	7	1.9%	10	2.1%
Jet	1	0.5%	4	1.3%	8	2.2%	12	2.5%
Helicopter/Other	7	3.5%	12	4.0%	15	4.1%	20	4.2%
Total	**202**	**100.0%**	**300**	**100.0%**	**370**	**100.0%**	**480**	**100.0%**

While single engine piston-powered aircraft are projected to continue to dominate the based aircraft fleet mix at Riverside Airport, business jets and turboprop aircraft are expected to experience growth. Currently, there is one business jet and two turboprop aircraft based at the airport. The fleet mix forecast indicates that as many as 10 turboprops and 12 jets could base at the airport by 2027.

While the airport will continue to primarily serve the needs of owners of smaller piston-powered aircraft, both turboprop and jet aircraft are expected to grow at the airport. Nationally, the introduction of business jets into the fleet is expected to out-pace turboprops. The introduction of VLJs will likely attract buyers who might otherwise purchase a turboprop due to the similarity of cost. Riverside Airport is also perfectly positioned to attract VLJ activity because of their excellent general aviation facilities, including the airport terminal building, adequate runway length, and the airport traffic control tower (ATCT). In addition, Riverside is growing substantially in terms of employment and population. These factors add to the optimism for business jet growth at the airport.

ANNUAL OPERATIONS

General aviation operations are classified by the ATCT as either local or itinerant. A local operation is a take-off or landing performed by an aircraft that operates within sight of the airport, or which executes simulated approaches or touch-and-go operations 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.

As previously discussed in both the Inventory chapter and earlier in this Forecasts chapter, several sets of operations forecasts have been developed by various airport stakeholders. **Table 2Q** presents the most recent operations forecasts completed dating back to the previous master plan in 1998. This forecast is included for comparison purposes but is likely too dated to provide a valid benchmark considering the changes to the aviation system since 1998.

TABLE 2Q
Previous General Aviation Operations Forecasts
Riverside Airport

	2005	2010	2015	2020	2025
Itinerant GA Operations					
FAA-TAF		46,799	53,786	58,556	63,750
1998 Master Plan	46,500	52,300	58,600	65,500	
2002 Updated Forecasts	49,390	53,090	57,130	61,510	66,070
Local GA Operations					
FAA-TAF		45,582	51,234	57,584	64,724
1998 Master Plan	35,800	40,200	45,000	50,300	
2002 Updated Forecasts	66,130	69,330	73,030	76,630	80,730
Total GA Operations					
GASP 2003		127,688	142,164	156,640	170,918
FAA-TAF		92,381	105,020	116,140	128,474
1998 Master Plan	82,300	92,500	103,600	115,800	
2002 Updated Forecasts	115,520	122,420	130,160	138,140	146,800

Sources: Southern California Association of Governments - General Aviation System Plan (GASP); Federal Aviation Administration - Terminal Area Forecast (FAA-TAF).

In 2002, a private developer with an interest in Riverside Airport contracted with Coffman Associates to produce updated forecasts that would take into consideration those major events affecting aviation, such as the events on September 11, 2001. Also included is the Southern California Association of Governments (SGAC) *General Aviation System Plan (GASP)*, published in 2003.

As can be seen in the table, the range of forecasts is wide with the most recent forecasts from SCAG being the most optimistic. The FAA TAF and the 1998 master plan are the most conservative. The following sections will present updated general aviation operations forecasts for this master planning effort.

ITINERANT OPERATIONS

Table 2R outlines the history of itinerant general aviation operations at Riverside Airport in relation to the total general aviation itinerant operations at towered airports in the United States. The Riverside Airport market share, as a percentage of general aviation itinerant operations at towered airports across the country, increased from a low of 0.1806 percent in 1998, to a high of 0.2430 in 2005. This increase in the percentage share is reflective of relative steady itinerant operations at Riverside Airport while total U.S. itinerant operations were on the decline. Total U.S. itinerant operations are forecast to increase over the planning period, achieving 1999 levels by 2013. So, during a period where national general aviation itinerant operations were on the decline, Riverside Airport was able to not only maintain its itinerant operational count but showed an increase from approximately 40,000 annual itinerant operations in 1998 to 47,000 in 2005.

TABLE 2R
General Aviation Itinerant Operations Forecast
Riverside Airport

Year	Riverside GA Itinerant Ops	U.S. GA Itinerant Ops	Market Share Itinerant Ops	Riverside Based Aircraft	Itinerant Ops Per Based Aircraft
1998	39,581	22,086,500	0.1792%	186	213
1999	39,602	23,019,400	0.1720%	186	213
2000	39,405	22,844,100	0.1725%	186	212
2001	43,464	21,433,300	0.2028%	186	234
2002	43,321	21,450,500	0.2020%	189	229
2003	44,296	20,231,300	0.2189%	193	230
2004	44,090	20,007,200	0.2204%	196	225
2005	46,466	19,315,100	0.2406%	200	232
2006	41,947	18,751,900	0.2237%	202	208
Constant Market Share of U.S. General Aviation Itinerant Operations					
2012	48,856	21,840,300	0.2237%	300	163
2017	54,030	24,153,600	0.2237%	370	146
2027	66,125	29,560,461	0.2237%	480	138
Increasing Market Share of U.S. General Aviation Itinerant Operations					
2012	50,233	21,840,300	0.2300%	300	167
2017	57,969	24,153,600	0.2400%	370	157
2027	76,857	29,560,461	0.2600%	480	160
Selected Forecast					
2012	50,000	21,840,300	0.2289%	300	167
2017	56,000	24,153,600	0.2318%	370	151
2027	72,000	29,560,461	0.2436%	480	150

Source: FAA Aerospace Forecasts 2007-2020; Operations from tower count.

Several methods for forecasting itinerant operations at Riverside Airport were considered. A trend line developed considering the historic itinerant operations at the airport from 1998 to 2006. This resulted in an "r^2" value of 0.54 and forecasts of 49,717 itinerant operations in 2012; 53,024 in 2017; and 59,637 in 2027. Because the "r^2" value is too low to consider the forecast statistically reliable, this forecast is not considered further. A regression analysis was developed comparing Riverside Airport itinerant operations with forecasts of national itinerant operations. This, too, resulted in a poor "r^2" value of 0.50 and, thus, this forecast was not considered either.

Two market share forecasts were developed for itinerant operations at Riverside Airport. The first considered the airport maintaining a constant share of national itinerant operations. This forecast results in a 2027 forecast of slightly more than 67,000 annual itinerant operations. This forecast likely represents a low range as the airport has consistently shown an increasing share. The second market share forecast is an increasing share.

The selected forecast is an approximate average of these two market share forecasts. The average was utilized because as U.S. itinerant operations reverse trend and begin to increase, it cannot be assumed that Riverside Airport will capture the same growth percentage. Therefore, the selected forecast for itinerant general aviation operations is tempered moderately, but still shows positive growth.

LOCAL OPERATIONS

Table 2S outlines the history of local operations in relation to the total general aviation local operations at towered airports in the U.S. The Riverside Airport market share, as a percentage of general aviation local operations at towered airports across the country, increased from a low of 0.1963 percent in 1998, to a high of 0.3687 in 2002. The local market share began to decline in 2003 and accounted for 0.2879 percent in 2006.

As with itinerant general aviation operations, both trend line and regression analysis was conducted, both with poor statistical reliability. Two market share forecasts were then developed. A constant share of total U.S. local operations resulted in 47,632 local operations in 2012; 50,978 in 2017; and 64,093 in 2027. A modest increasing share was also developed. The selected forecast is an approximate average of the two market share projections.

Exhibit 2F presents the local and itinerant operations forecast for the Riverside Airport.

AIR TAXI OPERATIONS

The air taxi category includes aircraft involved in on-demand passenger, small parcel transport, and air ambulance activity. The history of air taxi operations at Riverside Airport is presented in **Table 2T**. Since 1999, air taxi operations have averaged 543 per year. The FAA-TAF projects air taxi activity to remain level at 532 operations annually through 2025.

Many general aviation airports are experiencing increases in air taxi activity. This can be primarily attributed to the increased popularity of on-demand air travel for time savings and due to scheduled airline security procedures.

As mentioned earlier, an entire new category of VLJs are programmed to enter the general aviation fleet in 2007. A number of companies are proceeding with business plans to offer on-demand air taxi service utilizing these types of aircraft. The VLJs are relatively inexpensive compared to larger cabin class business jets, and they will have access to more airports as the required runway length is much less. Riverside Airport is well positioned to attract operations by VLJs with a terminal building, restaurant, and, most importantly, a substantial growth in business opportunities in the airport service area.

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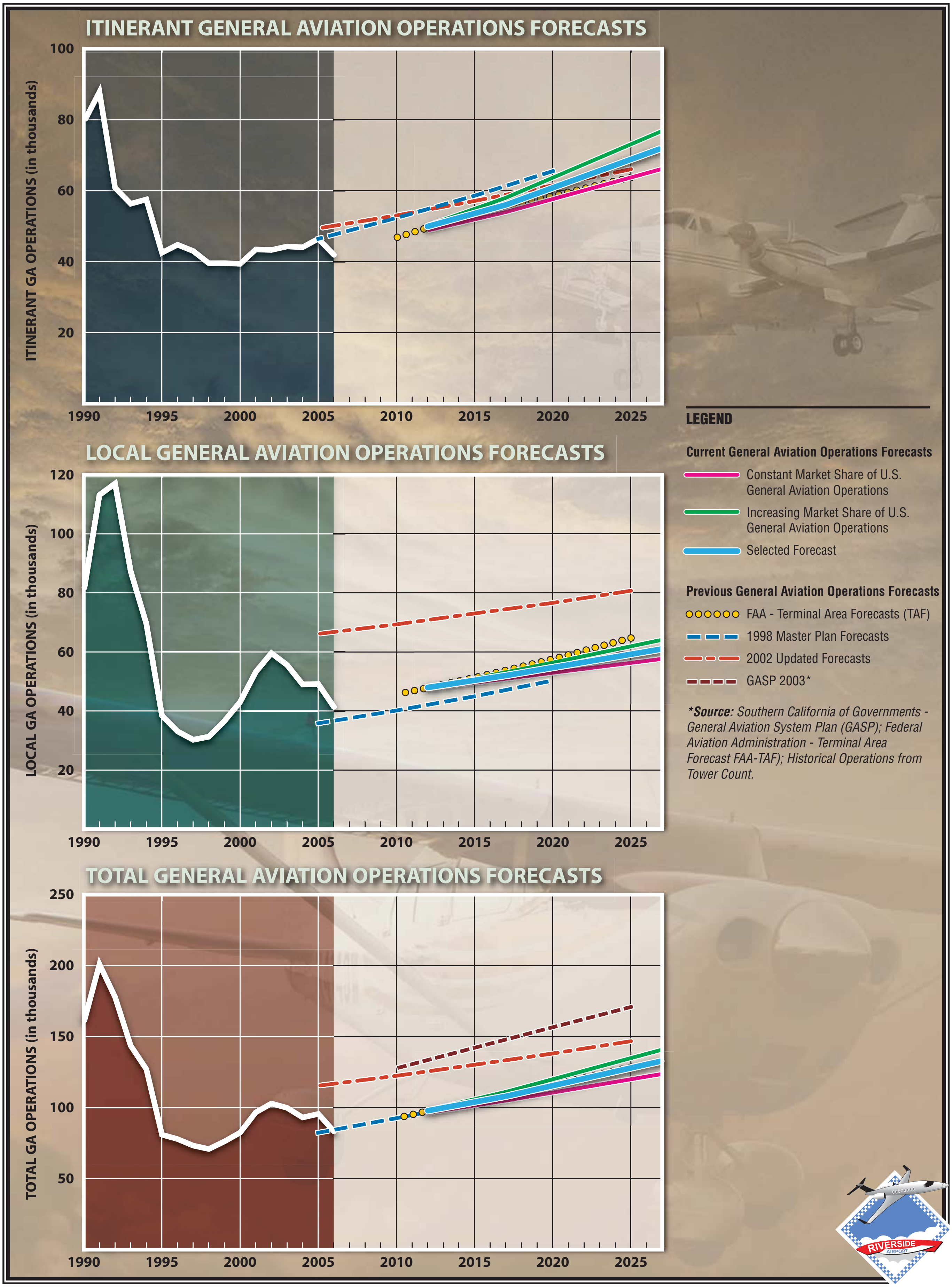

Exhibit 2F
GENERAL AVIATION
OPERATIONS FORECAST

TABLE 2S
General Aviation Local Operations Forecast
Riverside Airport

Year	Riverside GA Local Ops	U.S. GA Local Ops	Market Share Local Ops	Riverside Based Aircraft	Local Ops Per Based Aircraft
1998	31,300	15,960,000	0.1961%	186	168
1999	36,642	16,980,200	0.2158%	186	197
2000	43,043	17,034,400	0.2527%	186	231
2001	53,226	16,193,700	0.3287%	186	286
2002	59,586	16,172,800	0.3684%	189	315
2003	55,593	15,292,100	0.3635%	193	288
2004	49,001	14,960,400	0.3275%	196	250
2005	49,126	14,845,900	0.3309%	200	246
2006	41,376	14,378,900	0.2878%	202	205
Constant Market Share of U.S. General Aviation Local Operations					
2012	47,632	16,552,900	0.2878%	300	159
2017	50,978	17,715,800	0.2878%	370	138
2027	57,635	20,029,200	0.2878%	480	120
Increasing Market Share of U.S. General Aviation Local Operations					
2012	48,003	16,552,900	0.2900%	300	160
2017	53,147	17,715,800	0.3000%	370	144
2027	64,093	20,029,200	0.3200%	480	133
Selected Forecast					
2012	48,000	16,552,900	0.2900%	300	160
2017	52,000	17,715,800	0.2935%	370	141
2027	61,000	20,029,200	0.3046%	480	127

Source: FAA Aerospace Forecasts 2007-2020; Operations from tower count.

TABLE 2T
Other Air Taxi Forecasts
Riverside Airport

Year	Other Air Taxi	U.S. Air Taxi/Commuter Operations	Percent
1999	376	9,316,500	0.004%
2000	878	10,760,600	0.008%
2001	803	10,882,100	0.007%
2002	881	11,029,400	0.008%
2003	260	11,426,000	0.002%
2004	190	12,243,900	0.002%
2005	415	12,551,700	0.003%
2006	539	11,967,600	0.005%
FORECAST			
2012	900	12,455,700	0.007%
2017	1,100	13,244,000	0.008%
2027	1,400	14,974,599	0.009%

Source: ATADS

The historic up-and-down air taxi activity at Riverside Airport over the previous six years does not produce a statistical trend line that can be relied upon to predict future activity levels. Therefore, a market share forecast was developed. The market share forecast considers the airport regaining its market share of national air taxi operations by 2017 and showing a slight increase by 2027.

MILITARY

Military activity accounts for the smallest portion of the operational traffic at Riverside Airport. **Table 2U** presents the history of military operations since 1998. Forecasting for military activity is particularly challenging when there are no based aircraft.

TABLE 2U
Military Operations Forecasts
Riverside Airport

Year	Itinerant	Local	Total
1998	166	34	200
1999	171	44	215
2000	217	83	300
2001	65	34	99
2002	61	37	98
2003	163	103	266
2004	287	66	353
2005	57	38	95
2006	96	23	119
FORECAST			
2012	150	50	200
2017	150	50	200
2027	150	50	200

Source: Historical data from ATADS

In addition, the mission of the military can change rapidly, affecting the potential for military activity. Therefore, military activity is forecast as a constant for each planning period. That constant is approximately an average of the activity experienced over the previous nine years.

OPERATIONS ADJUSTMENT AND SUMMARY

Since the Riverside Airport traffic control tower (ATCT) is not a 24-hour tower, its air traffic counts are not all-inclusive of aircraft operations at the airport. Some aspects of the master plan analysis require that all airport activity be considered. For these evaluations, it is necessary to estimate and adjust for operations that occur when the tower is closed. The Riverside Airport tower currently operates from 7:00 a.m. to 8:00 p.m. each day of the year.

Typically, training and military operations will not occur when the tower is closed. Therefore, an adjustment to itinerant general aviation and air taxi operations will be made. Experience at other southern California reliever airports provides an estimate that three percent of these operations may occur when the tower is closed. For planning purposes, itinerant general aviation and air taxi operations will be increased by approximately three percent.

PEAKING CHARACTERISTICS

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

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

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

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

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

The peak month is an absolute peak within a given year. All other peak periods will be exceeded at various times during the year. However, they do represent reasonable planning standards that can be applied without overbuilding or being too restrictive. The peak periods forecast has been determined utilizing operations reported by the ATCT to the FAA. Hourly peaking characteristics are maintained by the ATCT and were provided for use in this analysis.

The peak month at Riverside Airport has historically alternated between the spring and fall months, but overall operations are spread fairly evenly throughout the year. In 2006, the peak month was March with 7,754 operations. This peak month average accounted for 9.2 percent of the annual operations.

The design day operations were calculated by dividing the peak month by the average number of days in a month (30). The busiest day of each week accounts for 19.8 percent of weekly operations. Thus, to determine the typical busy day, the design day is multiplied by 1.39, which represents 19.8 percent of the days in a week (7 x 0.198). Design hour operations were determined to be approximately 13 percent of the design day operations. The peaking operations characteristics are summarized in **Table 2V**.

TABLE 2V
Peaking Characteristics
Riverside Airport

	2006	2012	2017	2027
Annual	83,981	100,600	111,000	136,800
Peak Month	7,754	9,779	10,789	13,297
Busy Day	324	452	499	614
Design Day	234	326	360	443
Design Hour	30	42	47	58

ANNUAL INSTRUMENT APPROACHES

An instrument approach, as defined by the FAA, is "an approach to an airport with the intent to land by an aircraft in accordance with an Instrument Flight Rule (IFR) flight plan, when visibility is less than three miles and/or when the ceiling is at or below the minimum initial approach altitude." To qualify as an instrument approach at Riverside Airport, aircraft must land at the airport after following one of the published instrument approach procedures and then properly close their flight plan on the ground. The approach must be conducted in weather conditions which necessitate the use of the instrument approach. If the flight plan is closed prior to landing, then the AIA is not counted in the statistics. Forecasts of annual instrument approaches (AIAs) provide guidance in determining an airport's requirements for navigational aid facilities. It should be noted that practice or training approaches do not count as annual AIAs.

Typically, AIAs for airports with available instrument approaches utilized by advanced aircraft will average between one and two percent of itinerant operations. In the southern California area, weather conditions occasionally necessitate an instrument approach. The increased availability of low-cost navigational equipment could allow smaller and less sophisticated aircraft to utilize instrument approaches. National trends indicate an increasing percentage of approaches given the greater availability of approaches at airports with GPS and the availability of more cost-effective equipment.

Riverside Airport has experienced an average of 40-60 AIAs per month or between 480 and 720 per year. For planning purposes, AIAs are forecast as 1.5 percent of total operations. This forecast is presented in the forecast summary exhibit.

SUMMARY

Exhibit 2G provides a summary of the aviation activity forecasts for Riverside Airport. These forecasts will be utilized in establishing planning horizon milestones that will then be used to determine future facility needs and airfield development.

Based aircraft at Riverside Airport are projected to grow from 202 in 2006, to 480 in 2027. Business jets are anticipated to show the strongest rate of growth into the future, reflective of what is happening in the industry. Based jets are expected to increase from one in 2006 to 12 in 2027, or growing from 0.5 percent to 2.5 percent of the Riverside Airport based aircraft fleet.

Single engine piston-powered aircraft will continue to dominate the fleet mix at the airport. Single engine piston aircraft account for approximately 83 percent of the based aircraft. This figure is forecast to remain fairly steady into the future.

Annual operations are forecast to grow from approximately 85,000 in 2006, to 137,000 by 2027. Military operations will remain a minor part of activity at Riverside Airport, but air taxi operations are expected to increase moderately, particularly with growth in on-demand charters and the introduction of very light jets to the national general aviation fleet.

The next chapter will outline the airside (runway and taxiway system) and landside (hangars) facilities needed to meet forecast demand.

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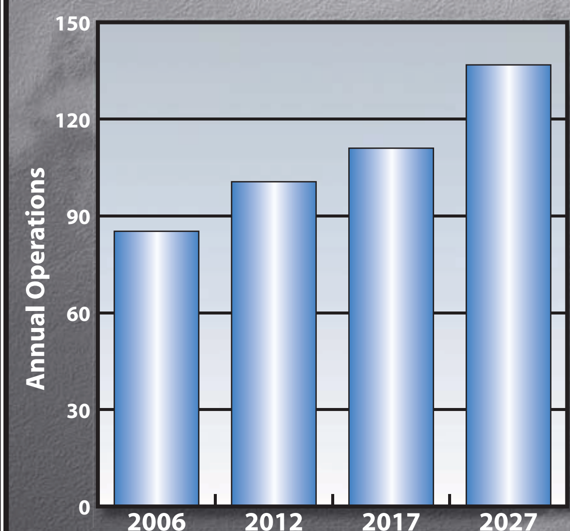
	Actual	Forecast		
ANNUAL OPERATIONS	**2006**	**2012**	**2017**	**2027**
General Aviation				
Itinerant	41,947	50,000	56,000	72,000
Local	41,376	48,000	52,000	61,000
Military				
Itinerant	96	150	150	150
Local	23	50	50	50
Air Taxi	539	900	1,100	1,400
Total Itinerant	**42,582**	**51,050**	**57,250**	**73,550**
Total Local	**41,399**	**48,050**	**52,050**	**61,050**
Subtotal Operations	83,981	99,100	109,300	134,600
3% Nighttime Adjustment to Itinerant GA and Air Taxi Operations	1,275	1,500	1,700	2,200
TOTAL OPERATIONS	***85,256***	***100,600***	***111,000***	***136,800***
BASED AIRCRAFT				
Single Engine	170	252	307	399
Multi-Engine	22	27	33	39
Turboprop	2	5	7	10
Business Jet	1	4	8	12
Helicoper / Other	7	12	15	20
TOTAL BASED AIRCRAFT	***202***	***300***	***370***	***480***
Instrument Approaches (AIA's)	1,279	1,509	1,665	2,052



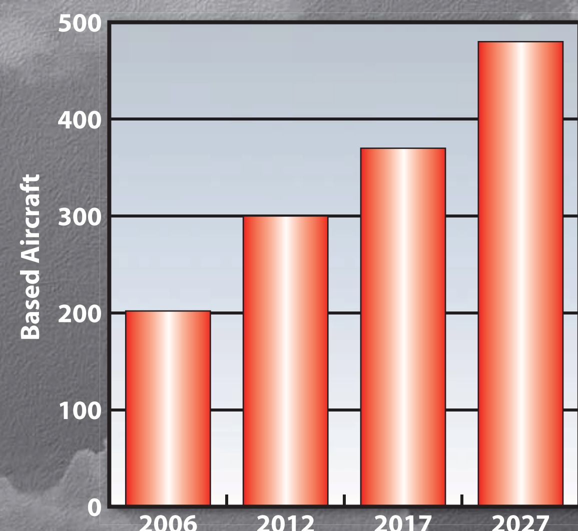


Exhibit 2G
FORECAST SUMMARY

Chapter Three

AIRPORT FACILITY REQUIREMENTS

Airport Facility Requirements

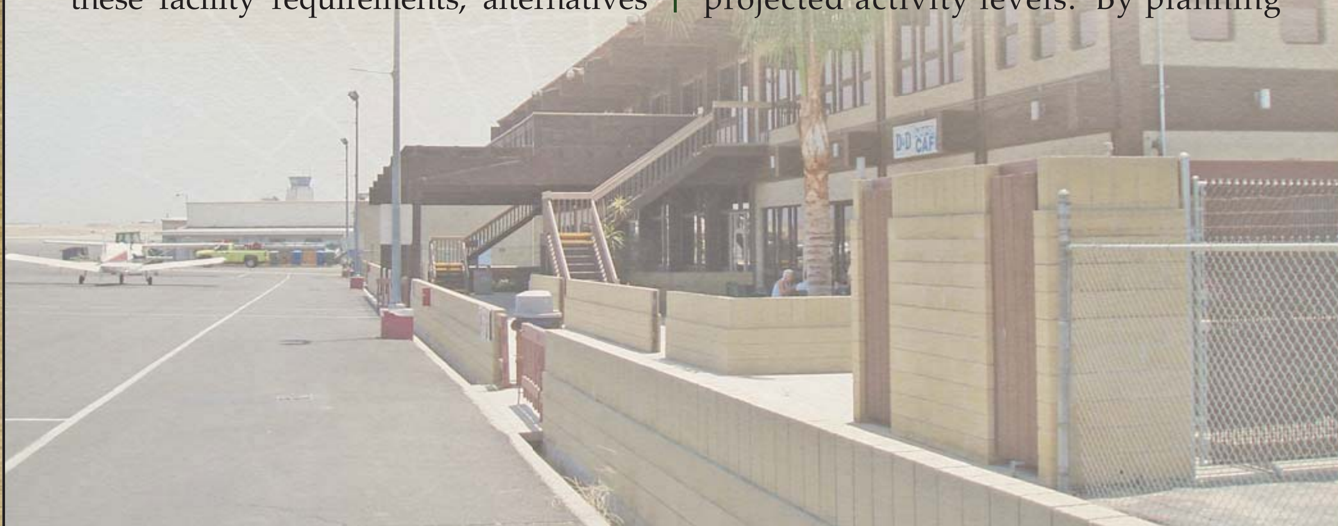
To properly plan for the future of Riverside Airport, it is necessary to translate forecast aviation demand into the specific types and quantities of facilities that can adequately serve this identified demand. This chapter uses the results of the forecasts presented in Chapter Two, as well as established planning criteria, to determine the airfield (i.e., runways, taxiways, navigational aids, marking and lighting) and landside (i.e., hangars, aircraft parking apron, and automobile parking) facility requirements.

The objective of this effort is to identify, in general terms, the adequacy of the existing airport facilities, outline what new facilities may be needed, and when these may be needed to accommodate forecast demands. Having established these facility requirements, alternatives for providing these 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. In order to develop a master plan that is demand-based rather than time-based, a series of planning horizon milestones has been established for Riverside Airport that take into consideration the reasonable range of aviation demand projections prepared in Chapter Two.

It is important to consider that the actual activity at any given time at the airport may be higher or lower than projected activity levels. By planning



according to activity milestones, the resulting plan can accommodate unexpected shifts or changes in the area's aviation demand. It is important that the plan accommodate these changes so that airport staff can respond to unexpected changes in a timely fashion. These milestones provide flexibility while potentially extending this plan's useful life if aviation trends slow over time.

The most important reason for utilizing milestones is that they allow the airport to develop facilities according to need generated by actual demand levels. The demand-based schedule provides flexibility in development, as development schedules can be slowed or expedited according to actual demand at any given time over the planning period. The resulting plan provides airport officials with a financially responsible and need-based program. **Table 3A** presents the planning horizon milestones for each aircraft activity category. The planning milestones of short, intermediate, and long term generally correlate to the five, ten, and twenty-year periods used in the previous chapter.

TABLE 3A
Planning Horizon Activity Summary
Riverside Airport

	BASE YEAR	FORECAST		
	2006	**2012**	**2017**	**2027**
Based Aircraft	202	300	370	480
Annual Operations				
General Aviation				
Itinerant	41,947	50,000	56,000	72,000
Local	41,376	48,000	52,000	61,000
Military				
Itinerant	96	150	150	150
Local	23	50	50	50
Air Taxi	539	900	1,100	1,400
Total Itinerant	42,582	51,050	57,250	73,550
Total Local	41,399	48,050	52,050	61,050
Subtotal Operations	83,981	99,100	109,300	134,600
3% Nighttime Adjustment to Itinerant GA and Air Taxi Operations	1,275	1,500	1,700	2,200
TOTAL OPERATIONS	**85,256**	**100,600**	**111,000**	**136,800**

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

AIRFIELD CAPACITY

An airport's airfield capacity is expressed in terms of its annual service volume. Annual service volume is a reasonable estimate of the maximum level of aircraft operations that can be accommodated in a year. Annual service volume accounts for annual differences in runway use, aircraft mix, and weather conditions. The airport's annual service volume was examined utilizing Federal Aviation Administration (FAA) Advisory Circular (AC) 150/5060-5, *Airport Capacity and Delay*.

FACTORS AFFECTING ANNUAL SERVICE VOLUME

Exhibit 3A graphically presents the various factors included in the calculation of an airport's annual service volume. These include the airfield characteristics, meteorological conditions, aircraft mix, and demand characteristics (aircraft operations). These factors are described below.

Airfield Characteristics

The layout of the runways and taxiways directly affects an airfield's capacity. This not only includes the location and orientation of the runways, but the percent of time that a particular runway or combination of runways is in use, and the length, width, weight-bearing capacity, and instrument approach capability of each runway at the airport. The length, width, weight-bearing capacity, and instrument approaches available to a runway determine which type of aircraft may operate on the runway and if operations can occur during poor weather conditions.

- RUNWAY CONFIGURATION

The existing runway configuration consists of two intersecting runways. Primary Runway 9-27 is 5,400 feet long. Crosswind Runway 16-34 is 2,851 feet long. The intersection of the runways is approximately 1,000 feet from the Runway 9 threshold and 700 feet from the Runway 16 threshold. Full length parallel taxiways serve the south side of Runway 9-27 and the east side of Runway 16-34.

The primary runway can accommodate all small general aviation aircraft and a majority of business jet aircraft. The crosswind runway is for the exclusive use of small aircraft. The intersecting runways prevent simultaneous operations in most cases. Runway 9-27 serves as the primary instrument runway. During low visibility conditions and cloud ceiling situations, this is the only runway available for use. Both of these conditions tend to reduce overall airfield capacity since only a single runway is available during most operating conditions.

- RUNWAY USE

Runway use is normally dictated by wind conditions. The direction of take-offs and landings are generally determined by the speed and direction of wind. It is generally safest for aircraft to takeoff and land into the wind, avoiding a crosswind (wind that is blowing perpendicular to the travel of the aircraft) or tailwind components during these operations. Prevailing winds during the day are from the west leading to greater usage of Runway 27. An easterly wind flow prevails at night leading to the use of Runway 9. While conditions favor Runway 9-27, Runway 34 is needed approximately two percent of the time, while Runway 16 is used sparingly.

- EXIT TAXIWAYS

Exit taxiways have a significant impact on airfield capacity since the number and location of exits directly determines the occupancy time of an aircraft on the runway. Eight entrance/exit taxiways are available along Runway 9-27. Runway 16-34 has four exits. The airfield capacity analysis gives credit to exits located within a prescribed range from a runway's threshold. This range is based upon the mix index of aircraft that use the runway. For Riverside Airport, those exit taxiways located between 2,000 and 4,000 feet of the landing threshold count in the capacity determination. The exits must be at least 750 feet apart to count as separate exits. Under these criteria, operations to Runway 9 and Runway 27 are credited with two exits. The presence of four or more exit taxiways within the prescribed distance and with proper separation will receive maximum credit for exit taxiways in the capacity and delay model.

Meteorological Conditions

Weather conditions can have a significant effect on airfield capacity. Airport capacity is usually highest in clear weather, when flight visibility is at its best. Airfield capacity is diminished as weather conditions deteriorate and cloud ceilings and visibility are reduced. As weather conditions deteriorate, the spacing of aircraft must increase to provide allowable margins of safety. The increased distance between aircraft reduces the number of aircraft which can operate at the airport during any given period. This, consequently, reduces overall airfield capacity.

There are three categories of meteorological conditions considered in this capacity analysis, each defined by the reported cloud ceiling and flight visibility. Visual Flight Rule (VFR) conditions exist whenever the cloud ceiling is greater than 1,000 feet above ground level, and visibility is greater than three statute miles. VFR flight conditions permit pilots to approach, land, or take off by visual reference and to see and avoid other aircraft.

Instrument Flight Rule (IFR) conditions exist when the reported ceiling is less than 1,000 feet above ground level and/or visibility is less than three statute miles. Under IFR conditions, pilots must rely on instruments for navigation and guidance to the runway. Other aircraft cannot be seen and safe separation between aircraft must be assured solely by following air traffic control rules and procedures. As mentioned, this leads to increased distances between aircraft, which diminishes airfield capacity.

Poor Visibility Condition (PVC) exists when the cloud ceiling and/or visibility are less than the minimums pre-

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Exhibit 3A
AIRFIELD CAPACITY FACTORS

scribed by the instrument approach procedures for the airport. At Riverside Airport, the Runway 9 ILS approach provides the lowest minimums with one-half mile visibility and a 200-foot cloud ceiling. When conditions are below these minimums, the airport is essentially closed to arrivals.

According to regional data, VFR conditions exist approximately 93.4 percent of the time. IFR conditions exist approximately 5 percent of the time, and the remaining 1.6 percent of the time PVC conditions are experienced.

Aircraft Mix

Aircraft mix refers to the speed, size, and flight characteristics of aircraft operating at the airport. As the mix of aircraft operating at an airport increases to include larger aircraft, airfield capacity begins to diminish. This is due to larger separation distances that must be maintained between aircraft of different speeds and sizes.

Aircraft mix for the capacity analysis is defined in terms of four aircraft classes. Classes A and B consist of single and multi-engine aircraft weighing less than 12,500 pounds. Aircraft within these classifications are primarily associated with piston-powered general aviation operations, but does include some business turboprop and business jet aircraft (e.g., the Cessna 500 Citation business jet and Beechcraft King Air). Class C consists of multi-engine aircraft weighing between 12,500 and 300,000 pounds. This broad classification includes business jets, turboprops, and large commercial airline aircraft. Most of the business jets in the national fleet are included within this category. Class D includes all aircraft over 300,000 pounds and includes wide bodies and jumbo jets. There are no Class D aircraft currently operating or forecast to operate from the airport.

For the capacity analysis, the percentage of Class C aircraft operating at the airport is critical in determining the annual service volume as this class includes the larger and faster aircraft in the operational mix. The existing and projected operational fleet mix for the airport is summarized in **Table 3B**. Consistent with projections prepared in the previous chapter, the operational fleet mix at the airport is expected to slightly increase its percentage of Class C aircraft as business and corporate use of general aviation aircraft increases at the airport.

TABLE 3B
Aircraft Operational Mix
Riverside Airport

	A & B	C
2006	96.8%	3.2%
Short Term	96.4%	3.6%
Intermediate Term	96.0%	4.0%
Long Term	95.4%	4.6%

A&B - 12,500 pounds or less
C - 12,500 to 300,000 pounds
D - Over 300,000 pounds

Demand Characteristics

Operations, not only the total number of annual operations, but the manner in which they are conducted, have an important effect on airfield capacity. Peak operational periods, touch-and-go operations, and the percent of arrivals impact the number of annual operations that can be conducted at the airport.

- PEAK PERIOD OPERATIONS

For the airfield capacity analysis, average daily operations and average peak hour operations during the peak month are calculated. These operational levels were calculated previously in Chapter Two for existing and forecast levels of operations. Typical operational activity is important in the calculation of an airport's annual service level as "peak demand" levels occur sporadically. The peak periods used in the capacity analysis are representative of normal operational activity and can be exceeded at various times through the year.

- TOUCH-AND-GO OPERATIONS

A touch-and-go operation involves an aircraft making a landing and an immediate take-off without coming to a full stop or exiting the runway. These operations are normally associated with general aviation training operations and are included in local operations data recorded by the air traffic control tower.

Touch-and-go activity is counted as two operations since there is an arrival and a departure involved. A high percentage of touch-and-go traffic normally results in a higher operational capacity because one landing and one takeoff occurs within a shorter time than individual operations. Touch-and-go operations currently account for approximately 39 percent of total operations.

- PERCENT ARRIVALS

The percentage of arrivals as they relate to the total operations in the design hour is important in determining airfield capacity. Under most circumstances, the lower the percentage of arrivals, the higher the hourly capacity. However, except in unique circumstances, the aircraft arrival-departure split is typically 50-50. At the airport, traffic information indicated no major deviation from this pattern, and arrivals were estimated to account for 50 percent of design period operations.

CALCULATION OF ANNUAL SERVICE VOLUME

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

Hourly Runway Capacity

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

As the mix of aircraft operating at an airport changes to include a greater utilization of Class C aircraft, the hourly capacity of the runway system is reduced. This is because larger aircraft require longer utilization of the runway for takeoffs and landings, and because the greater approach speeds of the aircraft require increased separation. This contributes to a slight decline in the hourly capacity of the runway system over the planning period.

Annual Service Volume

Once the hourly capacity is known, the annual service volume can be determined. Annual service volume is calculated by the following equation:

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

Following this formula, the current annual service volume for Riverside Airport has been estimated at 305,000 operations. The increasing percentage of larger Class C aircraft over the planning period will contribute to a decline in the annual service volume, lowering it to a level of 251,000 operations by the end of the planning period.

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 the airport traffic area. Departing aircraft delays result in aircraft holding at the runway end until released by the air traffic control tower.

Currently, total annual delay at the airport is estimated at 210 hours. If no capacity improvements are made, annual delay can be expected to reach 912 hours by the long range planning horizon. This calculates to an average delay of only 24 seconds per aircraft.

Conclusion

Table 3C summarizes annual service volume values. **Exhibit 3B** compares annual service volume to existing and forecast operational levels. The 2006 total of 85,256 operations represented 28 percent of the existing annual service volume. By the end of the long term planning period, total annual operations are expected to represent 55 percent of annual service volume.

TABLE 3C
Airfield Demand/Capacity Summary
Riverside Airport

	PLANNING HORIZON			
	Current	**Short Term**	**Intermediate Term**	**Long Term**
Operational Demand				
Annual	85,256	100,600	111,000	136,800
Design Hour	30	42	47	58
Capacity				
Annual Service Volume	305,000	261,000	255,000	251,000
Percent Capacity	27.95%	38.54%	43.53%	54.50%
Weighted Hourly Capacity	109	109	108	106
Delay				
Per Operation (Minutes)	0.15	0.20	0.25	0.40
Total Annual (Hours)	210	335	463	912

FAA Order 5090.3C, *Field Formulation of the National Plan of Integrated Airport Systems* (NPIAS), indicates that improvements for airfield capacity purposes should be considered when operations reach 60 to 75 percent of the annual service volume. Should operations occur as forecast, the airport is not expected to exceed this threshold. Therefore, an additional runway for capacity is not needed at the airport.

CRITICAL AIRCRAFT

The selection of appropriate Federal Aviation Administration (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 used to define the design parameters for 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 range potential needs of the airport.

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.

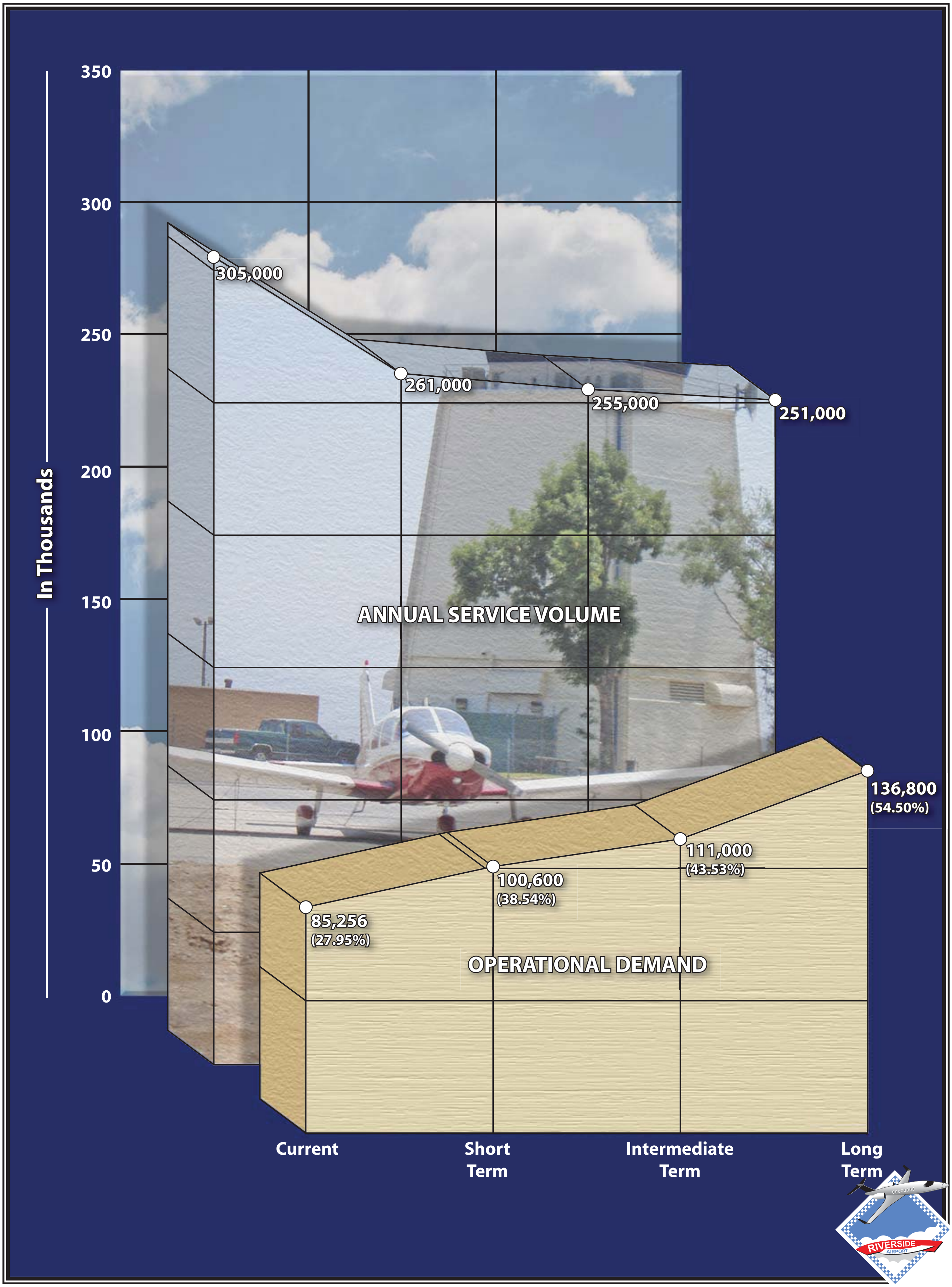


Exhibit 3B
AIRFIELD CAPACITY

According to FAA Advisory Circular (AC) 150/5300-13, *Airport Design*, Change 11, 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 either the aircraft's wingspan or tail height, whichever is greater. For example, an aircraft may fall in ADG II for wingspan but ADG III for tail height. This aircraft would be classified under ADG III. The six ADGs used in airport planning are as follows:

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

Source: 150/5300-13, Change 11

Exhibit 3C summarizes representative aircraft by ARC. As shown on the exhibit, the airport does not currently, nor is it expected to, regularly serve aircraft in ARCs C-III, D-III, C-IV, D-IV, or D-V. These large transport aircraft are commonly used by commercial air carriers and air cargo carriers, which do not currently use, nor are they expected to use, Riverside Airport through the planning period. Some of the largest business jets such as the Gulfstream V do fall in ARC D-III and are capable of operating at the airport.

In order to determine 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 aircraft currently using the airport and those expected to use the airport through the 20-year planning period.

CURRENT CRITICAL AIRCRAFT

The critical design aircraft is defined as the most demanding category of aircraft which conduct 500 or more operations at the airport each year. In some cases, more than one specific make and model of aircraft comprises the airport's critical design aircraft. One category of aircraft may be the most critical in terms of approach speed, while another is most critical in terms of wingspan and/or tail height, which affects runway/taxiway width and separation design standards.

General aviation aircraft using the airport include a variety of small single and multi-engine piston-powered aircraft, turboprops, and turbojet aircraft. While the airport is used by a number of helicopters, helicopters are not included in this determination as they are not assigned an ARC.

The majority of the based aircraft are single and multi-engine piston-powered aircraft which fall within approach categories A and B and ADG I. To determine if the current ARC for the airport is larger than A/B-I, an analysis of both based and transient activity by larger turboprops and business jets was undertaken.

There is currently one based business jet, a Cessna 560XL Citation Excel, which is operated several times each week. This aircraft falls in ARC B-II. There are two turboprop aircraft based at the airport, the largest of which is a King Air B200. This aircraft also falls in ARC B-II. The activity undertaken by these two aircraft would, at a minimum, identify the airport as a B-II airport.

A wide range of transient jet aircraft operate at the airport. In order to discern the number and type of business jet operations at Riverside Airport, an analysis of instrument flight plan data was conducted. Flight plan data was acquired for this study from the subscription database service, *AirportIQ*. The data available includes documentation of flight plans that are opened and closed on the ground at the airport. Flight plans that are opened or closed from the air are not credited to the airport. Therefore, it is likely that there are more business jet operations at the airport than are captured by this methodology but they are not included in these calculations. Additionally, some business jets and turboprops conduct operations within the traffic pattern at the airport. These local operations are also not captured on instrument flight plans. No activity conducted under visual flight conditions is captured.

Table 3D shows general aviation business jets completing instrument flight plans conducted 583 operations at Riverside Airport in the 12-month period (September 26, 2006 – September 25, 2007) used for this study. The largest number of operations is conducted within approach category B with 399 operations. Business jets within approach category D conducted an additional 54 operations.

TABLE 3D
Business Jet Operations
By Design Category
September 26, 2006 - September 25, 2007
Riverside Airport

Design Category	Operational Count*
Approach Category B	399
Approach Category C	130
Approach Category D	54
Total	583
Airplane Design Group I	130
Airplane Design Group II	449
Airplane Design Group III	4
Total	583

* Does not account for flight plans closed in air.
Source: Airport IQ; Coffman Associates analysis.

Transient activity by business jets in approach categories B, C, and D accounted for at least 583 annual operations at the airport over the previous year. The most common Airplane Design Group for transient business jets was ADG-II with 449 operations. The most common approach category was approach category B with 399 operations. **The combination of local based aircraft and transient operations by turboprops and business jets make the current airport code ARC B-II.**

04MP20-3C-2/22/06

A-I

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

C-I, D-I

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

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

C-II, D-II

- Cessna Citation III, VI, VIII, X
- **Gulfstream** II, III, **IV**
- Canadair 600
- ERJ-135, 140, 145
- CRJ-200, 700, 900
- Embraer Regional Jet
- Lockheed JetStar
- Super King Air 350

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

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

C-III, D-III

- ERJ-170, 190
- Boeing Business Jet
- B 727-200
- B 737-300 Series
- MD-80, DC-9
- Fokker 70, 100
- A319, A320
- **Gulfstream V**
- Global Express

B-I, B-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

C-IV, D-IV

- **B-757**
- B-767
- C-130
- DC-8-70
- DC-10
- MD-11
- L1011

A-III, B-III

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

D-V

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

Note: Aircraft pictured is identified in bold type.

Exhibit 3C
AIRPORT REFERENCE CODES

FUTURE CRITICAL AIRCRAFT

The aviation demand forecasts indicate the potential for continued growth in business jet activity at the airport. This includes the addition of 11 based business jets and 8 based turboprops through the long term planning horizon. Transient business jet activity is expected to continue to be strong, especially in fractional-ownership activity, charters, and business-owned aircraft. Therefore, it is expected that business jets will continue to define the critical design parameters for Riverside Airport through the planning period.

The type and size of the business jet activity in the future is difficult to precisely identify. Factors such as the significant population and employment growth in the airport service area, the proximity and level of service at other regional airports, and development at the airport can influence future activity.

Utilizing the flight plan information from *AirportIQ*, activity data was collected for the previous four years and is presented in **Table 3E**. As can be seen, with the exception of a spike in 2006, the level of activity has remained relatively consistent. There is a slight trend towards an increase in transient business jet activity at the airport.

When considering factors such as the very strong growth in population and employment in the region, it is reasonable to expect the number of transient business jet operations to increase over time. This expected increase, along with the activity generated by the forecast addition of 11 based business jets, will lead to a greater impact to the airport from business jets.

TABLE 3E
Yearly Flight Plans by Jets
Riverside Airport

	Jets
Sept 26, 2006 - Sept 25, 2007	
GA	415
Air Taxi	168
Total	583
Sept 26, 2005 - Sept 25, 2006	
GA	534
Air Taxi	212
Total	746
Sept 26, 2004 - Sept 25, 2005	
GA	455
Air Taxi	110
Total	565
Sept 26, 2003 - Sept 25, 2004	
GA	442
Air Taxi	94
Total	536

Source: GCR and Associates, Inc. AirportIQ Database.

Airports can realize a transition from one ARC design standard to another as the mix of activity changes. This transition is dictated by actual operations and may be generated by as few as one or two frequent operators of medium to large size business jets. Future planning will consider the possibility that the combination of transient and based business jet operations will exceed the substantial use threshold of 500 annual operations. Therefore, the alternatives analysis will consider the potential transition from ARC B-II to ARC C-II.

AIRFIELD REQUIREMENTS

Airfield requirements include the need for those facilities related to the arrival and departure of aircraft. The adequacy of existing airfield facilities at Riverside Airport has been analyzed from a number of perspectives, including:

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

DESIGN STANDARDS

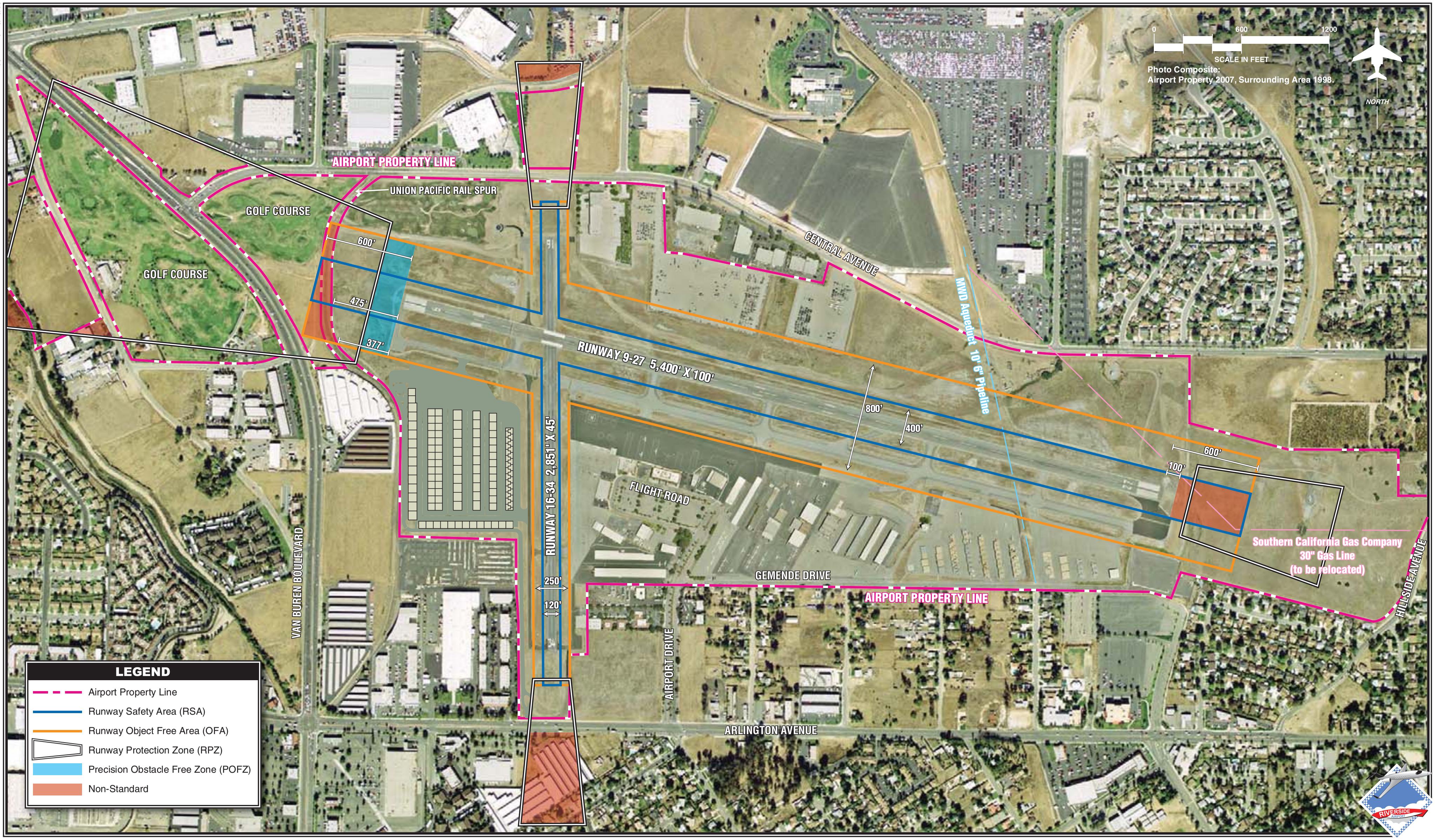
The FAA has established several imaginary surfaces to protect aircraft operational areas and keep them free from obstructions or incompatible land uses that could affect an aircraft's safe operation. These include the runway safety area (RSA), object free area (OFA), obstacle free zone (OFZ), and runway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

The entire RSA, OFA, and OFZ should be under the direct control of the airport sponsor to ensure these areas remain free of obstacles and can be readily accessed by maintenance and emergency personnel. It is not required that the RPZ be under airport ownership, but it is strongly recommended. An alternative to outright ownership of the RPZ is the purchase of avigation easements (acquiring control of designated airspace within the RPZ) or having sufficient land use control measures in places which ensures that the RPZ remains free of incompatible development. **Exhibit 3D** visually depicts the limits of the existing ARC B-II RSA, OFA, and RPZ at Riverside Airport.

Dimensional standards for the various safety areas associated with the runways are a function of the Airport Reference Code (ARC) as well as the approach visibility minimums. At Riverside Airport, Runway 9-27 should meet design standards for ARC B-II and one-half mile visibility minimums, which are presented in **Table 3F**. Standards are also presented for Runway 16-34 which is designed to serve small aircraft exclusively, now and into the future. Design standards for ARC C -II are also presented for comparison purposes.

Runway Safety Area (RSA)

The RSA is defined in FAA Advisory Circular (AC) 150/5300-13, *Airport Design*, Change 11, as a "surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway." The RSA is centered on the runway and dimensioned in accordance to the approach speed of the critical aircraft using the runway. The FAA requires the RSA to be cleared and graded, drained by grading or storm sewers, capable of accommodating the design aircraft and fire and rescue vehicles, and free of obstacles not fixed by navigational purpose.



05MP11-3D-3/19/08

Exhibit 3D
RUNWAY SAFETY AREAS

TABLE 3F Airfield Design Standards Riverside Airport			
Design Standard	**B-I***	**B-II**	**C -II**
Applicable Runway	**Runway 16-34**	**Runway 9-27**	**Runway 9-27**
Applicable Approach	**Visual**	**CAT I (1/2 mile vis)**	**CAT I (1/2 mile vis)**
RUNWAYS			
Runway Width	60	100	100
Runway Shoulder Width	10	10	10
Runway Safety Area			
Width	120	300	400
Length Beyond End	240	600	1,000
Length Prior to Landing	240	600	600
Runway Object Free Area			
Width	250	800	800
Length Beyond End	240	600	1,000
Runway Centerline to:			
Holding Position	125	250	250
Parallel Taxiway	150	240	400
Aircraft Parking Area	125	250	500
TAXIWAYS			
Taxiway Width	25	35	35
Taxiway Centerline to:			
Fixed or Movable Object	44.5	65.5	65.5
Parallel Taxilane	69	105	105
Taxilane Centerline to:			
Fixed or Movable Object	39.5	57.5	57.5
Parallel Taxilane	64	97	97

*Small aircraft exclusively; All measurements in feet.
Source: FAA AC 150/5300-13, Change 11, Airport Design

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

Ultimately, the RSA surrounding Runway 9-27 may be required to be 400 feet wide, as centered on the runway, and extend 1,000 feet beyond each runway end to meet ARC C-II standards. In addition, the RSA must be cleared, graded, and have no hazardous ruts or humps. It must allow drainage through grading or storm sewers to prevent water accumulation. Under dry conditions, the RSA must be able to support an aircraft or emergency vehicles. The existing area beyond each runway end currently would not meet these standards.

To the west of the Runway 9 threshold, approximately 475 feet of area is available to meet RSA standards. At this point, the RSA is obstructed by the airport perimeter road and a railroad spur. To the east of Runway 27, the RSA does not meet grading standards as it drops off precipitously approximately 100 feet east of the runway threshold. Alternatives analysis, to be presented in Chapter Four, will identify potential solutions to these RSA deviations from standard.

Runway 16-34 provides an RSA that extends at least 240 feet beyond the runway ends and is 150 feet wide. This meets FAA RSA standards for the runway.

Object Free Area (OFA)

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

For ARC B-II runways, the OFA must be 800 feet wide, centered on the runway, and extend 600 feet beyond the runway ends. The 600-foot standard is dictated by the existence of the one-half mile visibility ILS approach. If the airport transitions to ARC C-II, the OFA width remains the same but the length beyond the runway ends becomes 1,000 feet.

The OFA standard is met to the east of the Runway 27 end but the railroad spur and perimeter service road penetrate the OFA to the west of Runway 9.

The OFA surrounding Runway 16-34 is 250 feet wide and extends 240 feet beyond the runway ends. The OFA standard from Runway 16-34 is met.

Obstacle Free Zones (OFZ)

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

For all runways serving aircraft over 12,500 pounds (i.e., Runway 9-27), the OFZ is 400 feet wide, centered on the runway, and extends 200 feet beyond the runway ends. The OFZ at Riverside Airport is clear of obstruction.

A precision obstacle free zone (POFZ) is further defined for runway ends with an ILS approach. The POFZ is 800 feet wide as centered on the runway and extends 200 feet beyond the runway threshold. The POFZ is only in effect when the following conditions are met:

a) The runway supports a vertically guided approach

b) Reported ceiling is below 250 feet and/or visibility is less than three-quarter mile

c) An aircraft is on final approach within two miles of the runway threshold

The POFZ standard is met for the approach to Runway 9.

The OFZs serving Runway 16-34 extend 200 feet from the runway pavement end and are 250 feet wide. The OFZs are unobstructed and meet FAA standards.

Runway Protection Zones (RPZ)

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

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

In addition, the Western Region of the FAA has taken the RPZ restrictions to mean that roads are not allowed in the RPZ. If roads that traverse the RPZ are an existing condition, then they have been grandfathered and are allowable, but new roads or improvements to the airfield (such as a runway extension) that introduce a road (or other non-compatible land use) into the RPZ has not been supported. There is some indication that roads traversing the Controlled Activity Area may be allowable.

Table 3G presents the dimensions of the RPZ serving Riverside Airport. The table also presents the potential RPZ changes if the airport were to transition to an ARC C-II airport.

TABLE 3G
Runway Protection Zones
Riverside Airport

	Runway 9		Runway 27			Runway 16-34
Approach Visibility Minimum	1/2 Mile		1 Mile	1 Mile	3/4 Mile	1 Mile
Airport Reference Code	**B-II**	C-II	**B-II**	C-II	B/C-II	**B-I**
Inner Width	**1,000**	1,000	**500**	500	1,000	**250**
Outer Width	**1,750**	1,750	**700**	1,010	1,510	**450**
Length	**2,500**	2,500	**1,000**	1,700	1,700	**1,000**

BOLD: Existing RPZ dimensions
Source: FAA AC 150/5300-13, Airport Design, Change 11

RUNWAYS

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

Runway Orientation

The airport is served by two intersecting runways. Runway 9-27 is oriented in an east-to-west manner while Runway 16-34 is oriented in a north-south manner. For the operational safety and efficiency of an airport, it is desirable for the primary runway to be oriented as closely as possible to the direction of the prevailing wind. This reduces the impact of wind flowing perpendicular to the direction of travel of an aircraft that is landing or taking off (defined as a crosswind).

FAA Advisory Circular 150/5300-13, *Airport Design,* Change 11, recommends that a crosswind runway should be made available when the primary runway orientation provides for less than 95 percent wind coverage for specific crosswind components. The 95 percent wind coverage is computed on the basis of the crosswind component not exceeding 10.5 knots (12 mph) for ARCs A-I and B-I; 13 knots (15 mph) for ARCs A-II and B-II; and 16 knots (18 mph) for ARC C-I through D-II.

All-weather wind data specific to Riverside Airport was obtained from National Oceanic and Atmospheric Administration (NOAA) for the years from 1997 to 2006. The wind data is depicted on **Exhibit 3E**. Runway 9-27 provides 96.15 percent wind coverage for 10.5 knot crosswinds and 97.16 percent coverage at 13 knots. Runway 16-34 provides 94.45 percent wind coverage at 10.5 knots and 97.04 percent coverage at 13 knots.

The two-runway system at Riverside Airport provides 99.55 percent coverage for 10.5 knot crosswinds and nearly 100 percent coverage for other crosswind components. There is no need to consider additional runway orientations at Riverside Airport.

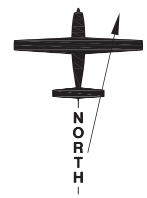
ALL WEATHER WIND COVERAGE

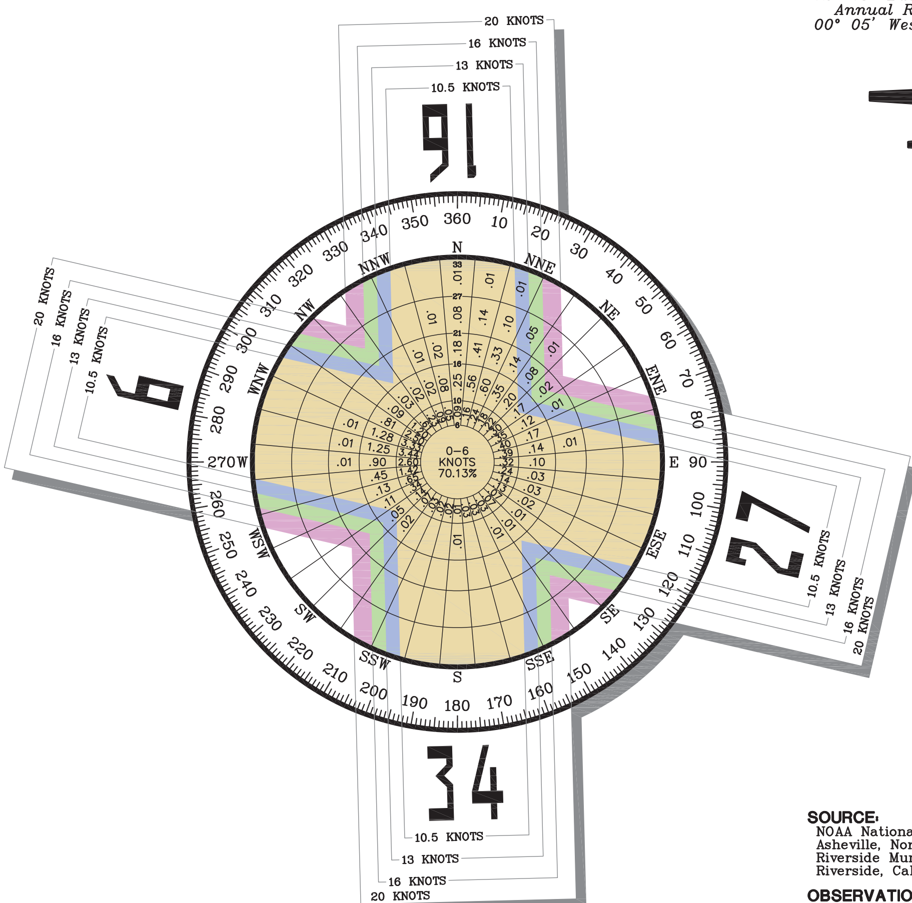
Runways	10.5 Knots	13 Knots	16 Knots	20 Knots
Runway 9-27	96.15%	97.16%	98.32%	99.29%
Runway 16-34	94.45%	97.04%	99.75%	99.99%
Combined	99.55%	99.90%	99.98%	100.00%

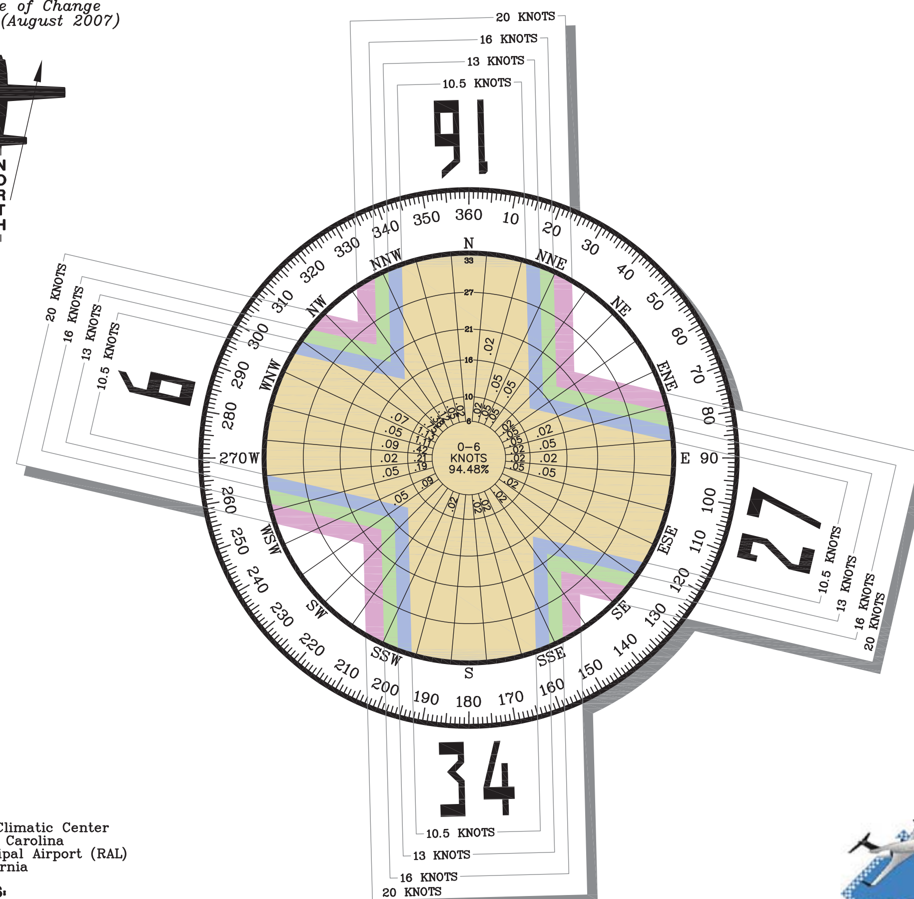
IFR CAT-I WIND COVERAGE

Runways	10.5 Knots	13 Knots	16 Knots	20 Knots
Runway 9-27	99.88%	99.92%	99.97%	99.99%
Runway 16-34	99.57%	99.76%	99.98%	100.00%
Combined	99.99%	100.00%	100.00%	100.00%

Magnetic Variance
12° 48' East (August 2007)
Annual Rate of Change
00° 05' West (August 2007)







SOURCE:
NOAA National Climatic Center
Asheville, North Carolina
Riverside Municipal Airport (RAL)
Riverside, California

OBSERVATIONS:
64,100 All Weather Observations
4,239 IFR CAT-I
1997-2006

Exhibit 3E
WINDROSE

Runway Length

Runway length requirements are based upon five primary elements: airport elevation, the mean maximum daily temperature of the hottest month, runway gradient, critical aircraft type expected to use the runway, and aircraft loading (weight). Aircraft performance declines as elevation, temperature, and runway gradient factors increase. Therefore, these factors increase runway length requirements. For calculating runway length requirements at Riverside Airport, the elevation is 818 feet above mean sea level (MSL) and the mean maximum daily temperature of the hottest month is 93 degrees Fahrenheit (July). The Runway 9 end is at an elevation of 760 feet MSL, while the Runway 27 end is at 818 feet MSL. This is a difference of 58 feet, or an effective runway gradient of 1.07 percent.

FAA Advisory Circular (AC) 150/5235-4B, *Runway Length Requirements for Airport Design*, provides guidelines to determine runway lengths for civil airports. It states, "For airport projects receiving Federal funding, the use of this AC is mandatory."

The first step in determining runway length is to identify the list of critical design aircraft that will make regular use of the runway. Regular use is defined in AC 150/5325-4B as at least 500 or more annual itinerant operations.

For Riverside Airport, Runway 9-27 is used by all categories of general aviation aircraft, each with different runway length requirements. Small single and multi-engine piston-powered aircraft are the only category of aircraft to currently conduct over 500 annual operations at the airport; therefore, they define the current runway length requirement. As shown in **Table 3H** 4,500 feet of runway length is needed for these aircraft to operate at the airport. At 5,400 feet, Runway 9-27 adequately provides for this mix of aircraft to operate at the airport. Therefore, no additional length is currently needed at the airport to serve these aircraft now or into the future.

The potential increased use of the airport by larger business jets must be considered in this analysis. Business jets have proven themselves to be an asset to corporations by meeting the needs of companies for flexibility in scheduling, time savings, and privacy. Runway length requirements for business jets are determined according to a "family grouping of airplanes" having similar performance characteristics and operating weights. For Riverside Airport, the majority of business jet operations are conducted by aircraft weighing less than 60,000 pounds. As shown in **Table 3J** aircraft over 60,000 pounds only conducted approximately 38 operations in the 12-month period from September 26, 2006 to September 25, 2007. Therefore, the runway length requirements for the family of general aviation business jets weighing less than 60,000 pounds are critical for determining future runway length requirements for Riverside Airport.

TABLE 3H General Aviation Runway Length Analysis Riverside Airport	
AIRPORT AND RUNWAY DATA	
Airport Elevation	818 feet
Mean daily maximum temperature	93º F
Maximum difference in runway centerline elevation	58 feet
Length of haul length for airplanes of more than 60,000 pounds	1,000 miles
Wet and slippery runways	
RUNWAY LENGTHS RECOMMENDED FOR AIRPORT DESIGN	
Small airplanes with less than 10 passenger seats	
75 percent of these small airplanes	2,800 feet
95 percent of these small airplanes	3,400 feet
100 percent of these small airplanes	4,000 feet
Small airplanes with 10 or more passenger seats	4,500 feet
Large airplanes of 60,000 pounds or less	
75 percent at 60 percent useful load	5,400 feet
100 percent at 60 percent useful load	6,400 feet
Airplanes of more than 60,000 pounds	approximately 6,300 feet
Reference: Chapter Two of AC 150/5325-4A, Runway Length Requirements for Airport Design	

The AC further segregates business jets into two categories: 1) aircraft that make up 75 percent of the national fleet; and 2) aircraft that make up 100 percent of the national fleet. As shown in **Table 3J** the majority of the business jet operations during the latest 12-month period were from business jets comprising "75 percent of the national fleet." As shown in **Table 3H** at 5,400 feet long, Runway 9-27 meets the runway length requirement for 75 percent of business jets at 60 percent useful load. Therefore, no additional runway length is needed to serve the current mix of business jets using the airport.

The FAA only accepts planning for runway length requirements at 60 percent useful load and does not provide for determining runway lengths based upon 100 percent useful load. This is due to the fact that many of the aircraft used in determining the curves are weight-restricted during the climb after takeoff. In other words, due to the need to maintain a certain positive climb rate after departure, the aircraft can never be fully loaded.

As shown in **Table 3H** at 5,400 feet long, Runway 9-27 meets the runway length requirement for 75 percent of business jets at 60 percent useful load. To accommodate 100 percent of business jets at 60 percent useful load, a runway length of 6,400 feet would need to be provided. The airport is able to accommodate the majority of business jets in the national fleet. For most of the year, when daily temperatures do not reach the upper 90s, the useful load of business jets is not greatly affected by operations at the airport. However, on warm summer days, aircraft operators may have to reduce useful load to be able to depart. This has the potential to increase operator costs as they must stop enroute to their final destination to take on the additional fuel needed.

TABLE 3J
12-Month Business Jet Aircraft Operations
Critical Design Family Grouping of Airplanes
Riverside Airport

Aircraft Make	Aircraft Model	12-Month Operational Count		
		Private Jets	Air Taxi	Totals
Airplanes That Make Up 75 Percent of the Fleet				
Aerospatiale	Sn-601 Corvette	0	0	0
BAe	125-700	2	2	4
Beech Jet	400A	8	8	16
Beech Jet	Premier I	6	0	6
Bombardier	Challenger 200	0	0	0
Cessna	500/501 Citation	10	0	10
Cessna	Citation I/II/III (525)	24	0	24
Cessna	525A II (CJ-2)	22	2	24
Cessna	550 Citation Bravo	22	0	22
Cessna	550 Citation II	0	14	14
Cessna	551 Citation II/Special	2	0	2
Cessna	552 Citation	0	0	0
Cessna	560 Citation Encore	68	44	112
Cessna	560/560 XL Citation Excel	47	20	67
Cessna	560 Citation V Ultra	76	0	76
Cessna	650 Citation VII	0	22	22
Cessna	680 Citation Sovereign	8	4	12
Dassault	Falcon 10	2	0	2
Dassault	Falcon 20	0	4	4
Dassault	Falcon 50/50 EX	6	2	8
Dassault	Falcon 900/900B	2	0	2
IAI	Jet Commander 1121	0	0	0
IAI	Westwind 1123/1124	0	0	0
Learjet	20 Series	8	4	12
Learjet	31/31A/31A ER	2	0	2
Learjet	35/35A/36/36A	20	2	22
Learjet	40/45	12	2	14
Mitsubishi	Mu-300 Diamond	0	0	0
Raytheon	390 Premier	0	0	0
Raytheon/Hawker	400/400XP	0	0	0
Raytheon/Hawker	600	0	0	0
Sabreliner	40/60	0	0	0
Sabreliner	75A	0	0	0
Sabreliner	80	0	0	0
Sabreliner	T-39	0	0	0
Subtotal Operations		**347**	**130**	**477**

Source: Airport IQ 9/26/06 - 9/25/07; FAA AC 150/5325-4B, Runway Length Requirements for Airport Design.

TABLE 3J *(Continued)* 12-Month Business Jet Aircraft Operations Critical Design Family Grouping of Airplanes Riverside Airport				
Aircraft Make	**Aircraft Model**	**12-Month Operational Count**		
		Private Jets	**Air Taxi**	**Totals**
Airplanes That Make Up 100 Percent of the Fleet				
BAe	Corporate 800/1000	0	0	0
Bombardier	Challenger 300/600	12	8	20
Bombardier	Challenger 604	0	0	0
Bombardier	BD-100 Continental	0	0	0
Cessna	S550 Citation S/II	0	0	0
Cessna	650 Citation III/IV	0	0	0
Cessna	750 Citation X	8	8	16
Dassault	Falcon 900C/900EX	0	0	0
Dassault	Falcon 2000/2000EX	2	2	4
IAI	Astra 1125	0	0	0
IAI	Galaxy 1126	0	2	2
Learjet	45XR	0	0	0
Learjet	55/55B/55C	0	0	0
Learjet	60	6	10	16
Raytheon/Hawker	Horizon	2	0	2
Raytheon/Hawker	800/800XP	8	0	8
Raytheon/Hawker	1000	0	0	0
Sabreliner	65/75	0	0	0
Subtotal Operations		**38**	**30**	**68**
Business Jets over 60,000 pounds				
Gulfstream	II	8	2	10
Gulfstream	III	0	2	2
Gulfstream	IV	20	2	22
Gulfstream	V	2	2	4
Subtotal Operations		**30**	**8**	**38**
Total ALL Operations		**415**	**168**	**583**
Source: Airport IQ 9/26/06 - 9/25/07; FAA AC 150/5325-4B, Runway Length Requirements for Airport Design				

To confirm the results of this analysis and the fact that a runway extension may not be needed to serve the mix of aircraft currently using the airport, actual runway length requirements for aircraft that use the airport were calculated. **Table 3K** presents these calculated runway length requirements. The runway length required is derived from the aircraft operating manuals for each aircraft type and factors airport temperature, elevation, and runway gradient. In contrast with the FAA runway length requirements, each aircraft is assumed to be fully loaded to the certified maximum takeoff weight.

TABLE 3K
Runway Length for Business Jets
Riverside Airport

Aircraft Type	ARC	MTOW (lb.)	Max Range - Seats Full (nm.)	Take-off Runway Length (ft.)
Lear 35	C-I	20,350	1,610	4,400
Lear 45	C-I	20,500	1,650	5,200
Cessna 550	B-II	14,100	1,220	4,000
Challenger 604	C-II	47,600	3,838	5,700
Beechjet 400A	C-I	15,780	1,140	5,400
IAI Westwind	C-I	23,500	2,150	5,800
IAI Astra	C-I	23,500	2,330	5,900
Gulfstream IV	D-II	73,200	3,800	5,300
Gulfstream V	D-III	90,500	6,250	5,500

Assumptions: 93 Degrees; 818-foot elevation; 58-foot runway gradient (1.07%)

As shown in the table, the Lear 35, Lear 45, Cessna 550, and Beechjet 400A which fall within the "airplanes that make up 75 percent of the national fleet" category do not need additional runway length to operate at the airport. The Gulfstream IV (400) is not restricted from operating at the airport. This is primarily due to the advanced technology of these newer aircraft that has reduced runway length requirements.

The remaining aircraft, such as the IAI Westwind, IAI Astra, and Challenger 604 may be modestly weight-restricted when operating at the airport, as these aircraft may require up to 500 feet of additional runway length to operate fully loaded from the airport. However, most of the year these aircraft would not be weight–restricted, as the weight restrictions would only occur during the warmest summer days. These aircraft also fall within the "airplanes that make up 100 percent of the national fleet" category. As shown in **Table 3H**, a runway length up to 6,400 feet would serve 100 percent of large aircraft at 60 percent useful load. As shown in **Table 3J**, aircraft within this category conducted less than 70 operations in the past 12 months at the airport. Therefore, additional runway length at Riverside Airport cannot be justified until 500 annual operations are conducted by aircraft which fall within the category "airplanes that make up 100 percent of the national fleet" category.

As shown above, the primary runway length at Riverside Airport is adequate to accommodate most business jets in the national fleet throughout the year. The current length of Runway 9-27 is able to meet the needs of 75 percent of the national business jet fleet. Based upon this analysis, a runway extension is not currently needed.

On the hottest summer days, some aircraft in the remaining 25 percent of the national fleet may be weight-restricted. However, the types of aircraft that comprise the remaining 25 percent of the national fleet do not conduct a sufficient number of operations at the airport to be considered for a runway extension.

There are two circumstances under which the runway length may not be adequate and a runway extension may be considered. The first is if business jets which fall in the category of 100 percent of the national fleet base at the airport and combine for at least 500 annual operations. Typical aircraft types include the Challenger 604, the Citation X, the Learjet 55 and 60, and the Hawker 800XP or 1000. These based operators would also have to provide documentation of the number of annual operations and runway length requirements to justify this need to the FAA and qualify for funding assistance.

The second circumstance would be if the number of annual operations by transient business jets in the 100 percent of the national fleet category were to exceed 500. This information is more difficult to determine and document. In the past, the FAA has accepted formal letters from transient operators expressing a need for greater runway length and outlining the economic impacts to their operation of utilizing a shorter runway than desired. Currently, there are no based business jets in the 100 percent of the national fleet category.

In conclusion, the primary runway length meets the current needs of both based and transient airport users. It would be recommended that airport management closely monitor itinerant activity by business jets within the 100 percent of the national fleet category and be aware of the introduction of any owners of business jets within this category wishing to base at Riverside Airport. The combination of activity by these two sources of large business jet operations could lead to a need for an extension of the primary runway. The need for a runway extension would have to be thoroughly documented and justified.

If the possibility of a runway extension were to be pursued, there are several factors that could limit the potential length of an extension. As shown in **Table 3H**, to accommodate 100 percent of the business jet fleet, an optimal runway length of up to 6,400 feet may be necessary. The location of the railroad spur, 475 feet to the west of the Runway 9 threshold, limits any extension to the Runway 27 end. Since the completion of the previous master plan in 1999, the FAA has taken a strict interpretation on meeting design standards, and not supporting airfield improvements that build into a non-standard situation.

For example, an extension to the east of Riverside Airport would position the RPZ serving Runway 27 over Hillside Avenue and over approximately 70 homes. The road and the homes would be incompatible with the design standards of the RPZ. Hillside Avenue would have to be closed and the homes would have to be purchased and removed.

While an extension of Runway 9-27 is not currently justified, in the future, operational need may warrant a reexamination. The alternatives chapter to follow will consider a potential extension of Runway 9-27.

The crosswind runway is 2,851 feet in length. This length is adequate to meet the needs of 75 percent of small aircraft. This length is adequate through the planning period for the aircraft that utilize this runway.

Runway Width

Runway 9-27 is 100 feet wide and constructed of asphalt. FAA design standards call for a runway width of 100 feet when visibility minimums to the runway are lower than three-quarters of a mile and the runway serves a critical aircraft in ARC B-II or higher. The existing width meets the current and future critical aircraft needs.

Runway 16-34 is currently 48 feet wide. The standard for this runway is 60 feet. The alternatives chapter will consider the possibility of widening this runway to 60 feet.

Runway Strength

The FAA pavement strength rating for Runway 9-27 is 48,000 pounds single wheel loading (SWL). As previously mentioned, SWL refers to the aircraft weight based upon the landing gear configuration with a single wheel on the landing strut. The strength rating for dual wheel configurations (DWL) is 70,000 pounds, and the strength rating for dual tandem wheel (DTWL) is 110,000 pounds.

The strength rating of Runway 16-34 is 40,000 SWL, 50,000 DWL, and 80,000 DTWL. While the strength rating of this runway can accommodate larger aircraft, the airport recommends this runway be utilized by small aircraft weighing 12,500 pounds or less.

The current strength rating of each runway is adequate to serve the critical aircraft now and into the future as well as occasional operations by larger aircraft.

Runway/Taxiway Separation

FAA AC 150/5300-13, *Airport Design*, Change 11, also discusses separation distances between a runway centerline and various areas on the airport. The separation distances are a function of the approaches approved for the airport and the critical design aircraft.

Runway 9-27, with a current critical aircraft in ARC B-II and with a one-half mile visibility minimum approach, should have a parallel taxiway located at least 300 feet from the runway centerline. The edge of aircraft parking areas should be at least 400 feet from the runway centerline.

The western 1,100 feet of Taxiway A has been relocated to a separation distance of 275 feet and is 35 feet wide. The eastern 4,300 feet of this taxiway is separated from the primary runway by 275 feet as measured centerline-to-centerline. This portion of Taxiway A, from the intersection with the crosswind runway to the Runway 27 threshold, is 50 feet wide.

The runway/taxiway separation standards for a critical aircraft in ARC C-II, and an instrument approach with lower than three-quarters-of-a-mile visibility is 400 feet.

Taxiway J is parallel to Runway 16-34. This taxiway is located 150 feet from the runway centerline. The FAA runway/taxiway separation standard for a runway supporting small aircraft exclusively is 150 feet. This separation distance should be maintained.

TAXIWAYS

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

Taxiways serving a runway designed to support operations by small aircraft exclusively should be 25 feet wide. This standard would apply to Taxiways J and L. Taxiways designed to support operations by aircraft in design group II should be 35 feet wide.

The taxiways serving Riverside Airport vary in width. **Table 3L** presents the taxiway widths at the airport. Taxiways serving Runway 16-34 meet or exceed the FAA design standard. Taxiways serving Runway 9-27 meet or exceed the 35-foot minimum for the current critical aircraft in design group II. As pavements are reconstructed over time, the airport should strive to achieve a uniform taxiway width.

TABLE 3L
Taxiway Dimensions
Riverside Airport

	Width (feet)
Taxiways Primarily Serving Runway 9-27	
Taxiway A	40/50/75
Taxiway C	100
Taxiway D	50
Taxiway E	75
Taxiway F	40
Taxiway G	75
Taxiway H	75
Taxiways Primarily Serving Runway 16-34	
Taxiway B	30
Taxiway J	25
Taxiway L	30/50

A taxiway object free area (TOFA) applies to taxiways and taxilanes. The width of the TOFA is dependent on the wingspan of critical aircraft. For ADG II aircraft, the TOFA is 131 feet wide, or 65.5 feet on either side of centerline. The taxiway shoulder width requirements are 10 feet for ADG II aircraft. The shoulders need to be traversable by vehicles and aircraft, should they veer off the taxiway.

A parallel taxiway has been planned north of Runway 9-27 to provide access to the landside development.

Hold aprons have been constructed at the Runway 9 and 27 thresholds. Holding aprons provide an area for aircraft to prepare for departure, away from the taxiway, which allows other aircraft that are ready for departure to pass. These areas should be maintained through the planning period and included on the northern Runway 9-27 parallel taxiway.

INSTRUMENT NAVIGATION AIDS

A number of electronic navigational aids are in place to assist pilots in locating and landing at Riverside Airport. The Riverside very high frequency omnidirectional range (VOR) (current inoperable), the Instrument Landing System (ILS) to Runway 9, and the GPS approaches to both ends of Runway 9-27 assist pilots landing at the airport when following instrument procedures established by the FAA.

A GPS modernization effort is underway by the FAA and focuses on augmenting the GPS signal to satisfy requirements for accuracy, coverage, availability, and integrity. For civil aviation use, this includes the continued development of the Wide Area Augmentation System (WAAS), which was initially launched in 2003. The WAAS uses a system of reference stations to correct signals from the GPS satellites for improved navigation and approach capabilities. Where the non-WAAS GPS signal provides for enroute navigation and limited instrument approach (lateral navigation) capabilities, WAAS provides for approaches with both course and vertical navigation. This capability was historically only provided by an instrument landing system (ILS), which requires extensive on-airport facilities. The WAAS upgrades are expected to allow for the development of approaches to most airports with cloud ceilings as low as 200 feet above the ground and visibilities restricted to one-half mile.

Nearly all new instrument approach procedures developed in the United States are being developed with GPS. GPS approaches are currently categorized as to whether they provide only lateral (course) guidance (LNAV/RNAV) or a combination of lateral and vertical (descent) guidance (LPV). An approach procedure with vertical guidance (LPV) provides both course and descent guidance. A lateral navigation approach (LNAV) only provides course guidance. The Runway 27 RNAV (GPS) approach is an LNAV approach. In the future, as approaches are upgraded using WAAS, precision approaches similar in capability to the existing ILS will become available.

The ILS to Runway 9 should be maintained. A future CAT I GPS approach would also be appropriate for this runway. An LPV approach to Runway 27 is available and provides descent guidance in addition to course guidance. Approach capability similar to that provided on Runway 9 is not expected on Runway 27 due to the proximity of March Air Force Base airspace in relation to Riverside Airport.

The existing circling approaches to Runway 16-34 should be adequate through the planning period, due to the low utilization of this runway during poor weather conditions.

VISUAL NAVIGATION AIDS

The airport beacon, located in the northeast corner of the airport, provides for rapid identification of the airport. The beacon should be maintained through the planning period.

Runway end identification lights (REILs) are strobe lights set to either side of the runway. These lights provide rapid identification of the runway threshold. REILs should be installed at runway ends not currently providing an approach lighting system but supporting instrument operations. REILs are located on the end of Runway 27 and should be maintained.

Precision approach path indicator (PAPI) lights provide pilots with visual descent information to the runway touchdown zone. Both ends of Runway 9-27 are equipped with PAPIs. A PAPI system is also located on the approach to Runway 34. The PAPIs should also be maintained through the planning period. A PAPI to Runway 16 should also be planned.

WEATHER REPORTING AIDS

Riverside Airport has a lighted wind cone and segmented circle as well as two lighted supplemental wind cones. The lighted wind cones provide information to pilots regarding wind conditions, such as direction and speed. The segmented circle consists of a system of visual indicators designed to provide traffic pattern information to pilots. A wind cone and segmented circle are required since the airport traffic control tower (ATCT) is not open 24 hours per day. These should be maintained through the planning period.

Riverside Airport is equipped with an Automated Surface Observation System (ASOS). The ASOS automatically records weather conditions such as wind speed, wind gust, wind direction, temperature, visibility, precipitation, and cloud height. This system was removed in order to allow for the development of the west side hangars. This system should be relocated and maintained through the planning period.

AIRFIELD LIGHTING AND MARKING

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

Runway and Taxiway Lighting

Runway identification lighting provides the pilot with a rapid and positive identification of the runway and its alignment. Both Runway 9-27 and Runway 16-34 are equipped with medium intensity runway lighting (MIRL). This lighting should be maintained. Medium intensity taxiway lighting (MITL) is provided on all taxiways and should be maintained.

Pavement Markings

Runway markings are designed according to the type of instrument approach available on the runway. FAA AC 150/5340-1F, *Marking of Paved Areas on Airports*, provides guidance necessary to design an airport's markings. Runway 9 provides precision instrument markings and Runway 27 provides nonprecision marking. Runway 16-34 provides visual markings. These markings should be properly maintained through the planning period.

Taxiway markings include a centerline stripe to aid pilots in ground movements and aircraft hold positions. Hold position markings are defined in AC 150/5340-18D, *Standards for Airport Sign Systems*. Hold position markings at Riverside Airport should be at least 250 feet from the Runway 9-27 centerline. The hold position marking for Runway 16-34 should be at least 125 feet from the runway centerline. The hold position markings at the airport meet these standards.

Distance-To-Go Markers

Riverside Airport has distance-to-go markers on the north side of the runway. These markers identify remaining runway length available to the pilot of a departing aircraft. The markers are positioned every 1,000 feet and are lighted at night. These markers should be maintained through the planning period.

Helipad

Riverside Airport has a designated helipad. The helipad is located on the northwest corner of the main apron. The helipad has edge lighting and measures 60 feet by 60 feet. The helipad and lighting is sufficient through the planning period.

AIRPORT TRAFFIC CONTROL TOWER

The airport traffic control tower (ATCT) is located south of Runway 9-27 and east of the terminal building. It is adjacent to the western side of the Port-a-port hangars. In its present position, air traffic personnel cannot visually monitor aircraft movements along the southern 1,400 feet of Runway 16-34 and the associated apron and taxiway areas due to line-of-sight limitations. A number of buildings and natural objects obstruct the view. The tower is owned by the FAA and operated under contract to Serco, Inc. The FAA would be responsible for any necessary corrective action such as raising the tower cab, or relocating the tower, to eliminate the line-of-sight limitations. The alternatives analysis will examine a potential location that should be reserved for a future relocated tower.

LANDSIDE REQUIREMENTS

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

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

HANGARS

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

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

While a majority of aircraft owners prefer enclosed aircraft storage, a number of based aircraft owners will still tie-down outside (due to the lack of hangar availability, hangar rental rates, and/or operational needs). Therefore, enclosed hangar facilities do not necessarily need to be planned for each based aircraft. At Riverside Airport, it is estimated that 85 percent of the based aircraft are stored in hangars. In the future, it is estimated that 95 percent of the based aircraft at the airport will be stored in a hangar.

T-hangars, shade hangars, and Port-a-ports are similar in size and will typically house a single engine piston powered aircraft. Some multi-engine aircraft owners may elect to utilize these facilities as well. There is a total of 154 individual storage units and 71,400 square feet of space in this category of aircraft storage. For determining future aircraft storage needs, a planning standard of 1,200 square feet per based aircraft is utilized for T-/Shade/Port-a-port hangars.

Riverside Airport has stand-alone box hangars and connected box hangars, both of which are open-space facilities with no roof supporting structure interference. Currently, there are 13 box hangar positions. In total, these hangars provide 36,800 square feet of hangar storage space. Since a larger aircraft or multiple aircraft can be stored in a box hangar, a planning standard of 2,500 square feet per based aircraft is utilized for future box hangar needs.

There are several conventional hangars on the airfield. It is estimated that these hangars provide five permanent aircraft parking positions and encompass approximately 23,100 square feet of aircraft parking area.

A portion of conventional hangars often are utilized for maintenance and/or office space. A planning standard of 175 square feet per based aircraft is considered for these purposes and is in addition to the aircraft storage needs. **Table 3M** provides a summary of the aircraft storage needs through the long term planning horizon.

Significant hangar development is planned at Riverside Airport. Riverside Executive Aviation is constructing hangar facilities west of Runway 16-34. This development will offer several hangar types for sale or lease. The complex plans 26 T-hangar positions, 91 box hangar positions, and two medium-sized conventional hangars (for use by a fixed base operator [FBO]), which it is estimated may house two aircraft. The T-hangars will encompass approximately 30,000 square feet of space. The box hangars and FBO hangars will encompass 264,000 square feet.

TABLE 3M
Aircraft Storage Hangar Requirements
Riverside Airport

		Future Requirements		
	Currently Available	**Short Term**	**Intermediate Term**	**Long Term**
Total Based	202	300	370	480
T-/Shade/Port-a-port Positions	154	219	272	366
Box Hangar Positions	13	34	43	57
Conventional Hangar Positions	5	18	25	34
Hangar Area Requirements (s.f.)				
T-/Shade/Port-a-port Hangar Area	71,400	262,300	326,700	438,600
Box Hangar Area	36,800	83,900	108,400	143,600
Conventional Hangar Area	23,100	45,300	62,100	83,800
Maintenance Area	20,000	35,350	52,500	64,750
Total Hangar Storage Area (s.f.)*	151,300	426,900	549,700	730,800

AIRCRAFT PARKING APRON

FAA Advisory Circular 150/5300-13, *Airport Design*, Change 11, suggests a methodology by which transient apron requirements can be determined from knowledge of busy-day operations. At Riverside Airport, the number of itinerant spaces required was determined to be approximately 13 percent of the busy-day itinerant operations. A planning criterion of 800 square yards per aircraft was applied to determine future transient apron requirements for single and multi-engine aircraft. For business jets (which can be much larger), a planning criterion of 1,600 square yards per aircraft position was used. For planning purposes, 60 percent of these spaces are assumed to be utilized by jet aircraft, which is in line with national trends at urban reliever airports. Locally based tie-downs typically will be utilized by smaller single engine aircraft; thus, a planning standard of 650 square yards per position is utilized.

A parking apron should provide space for the number of locally based aircraft that are not stored in hangars, transient aircraft, and for maintenance activity. For local tie-down needs, an additional five spaces are identified for maintenance activity. Maintenance activity would include the movement of aircraft into and out of hangar facilities and temporary storage of aircraft on the ramp.

Total apron parking requirements are presented in **Table 3N**. Space should be made available for up to 30 transient aircraft parking positions in the short term. Forecasts indicate this figure may rise to a need for 45 spaces through the long term planning period. There is currently transient parking on the main apron as well as apron provided by the FBO. These apron areas appear to be meeting the demand. Some spaces nearest the terminal building are leased to locally based aircraft owners as well. Overall, the apron area appears adequate through the planning period to accommodate both local tie-down needs and the needs of transient operators. Additional apron area should be planned as needed for individual hangar developments (i.e., north side private hangars).

TABLE 3N
Aircraft Parking Apron Requirements
Riverside Airport

	Available	Short Term	Intermediate Term	Long Term
Single, Multi-engine Transient Aircraft Positions		12	14	18
Apron Area (s.y.)		9,800	11,000	14,200
Transient Business Jet Positions		18	21	27
Apron Area (s.y.)		29,500	33,000	42,500
Locally-Based Aircraft Positions		35	35	29
Apron Area (s.y.)		22,800	22,500	18,900
Total Positions	±100	65	70	74
Total Apron Area (s.y.)	257,000	62,100	66,500	75,600

GENERAL AVIATION TERMINAL FACILITIES

General aviation terminal facilities have several functions. Space is required for a pilots' lounge, flight planning, concessions, management, storage, and various other needs. This space is not necessarily limited to a single, separate terminal building, but can include space offered by fixed base operators (FBOs) for these functions and services.

The methodology used in estimating general aviation terminal facility needs is based on the number of airport users expected to utilize general aviation facilities during the design hour. General aviation space requirements were then based upon providing 120 square feet per design hour itinerant passenger. Design hour itinerant passengers are determined by multiplying design hour itinerant operations by the number of passengers on the aircraft (multiplier). An increasing passenger count (from 1.8 to 2.2) is used to account for the likely increase in the number of passengers utilizing general aviation services. **Table 3P** outlines the general aviation terminal facility space requirements for Riverside Airport.

As presented in the table, the existing public spaces appear adequate through the long term planning period. The terminal building provides some of the necessary space and the FBO provides additional space. If additional FBOs establish operations at the airport, consideration should be given to providing general aviation services as necessary.

An additional consideration for terminal space is the anticipated emergence of a new class of aircraft. A number of aircraft manufacturers will be producing low cost microjets or very light jets (VLJs). The VLJs have a capacity of up to six passengers. A number of new companies are positioning themselves to utilize the VLJs for on-demand air taxi services. The air taxi businesses are banking on a desire by business travelers to avoid delays at major commercial service airports by taking advantage of the nationwide network of general aviation airports such as Riverside Airport. General aviation airports with appropriate terminal building services are better positioned to meet the needs of this new class of business traveler. The current terminal building serving Riverside Airport should be adequate to meet these needs.

TABLE 3P
General Aviation Terminal Area Facilities
Riverside Airport

	Available	Short Term	Intermediate Term	Long Term
Design Hour Operations	30	42	47	58
Design Hour Itinerant Operations	16	22	25	32
Multiplier	1.8	1.9	2	2.2
Total Design Hour Itinerant Passengers	28	42	50	70
General Aviation Building Spaces (s.f.)	±18,000	5,000	6,000	8,400

SUPPORT REQUIREMENTS

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

AUTOMOBILE PARKING

General aviation vehicular parking demands have been estimated for Riverside Airport. Space determinations were based on an evaluation of existing airport use, as well as industry standards. Terminal automobile parking spaces required to meet general aviation itinerant demands were calculated by taking the design hour itinerant passengers and using a multiplier of 1.8, 2.0, and 2.2 for each planning period. This multiplier represents the anticipated increase in corporate operations and, thus, passengers.

Currently, the terminal building has approximately 275 parking spaces. The FBO facility has approximately 50 spaces. Even though it appears there are plenty of spaces for transient airport users, the location may not be ideal. The FBO may need additional parking spaces, particularly since most of the business jet and turboprop transient activity utilize their services.

The parking requirements of based aircraft owners should also be considered. Although some owners prefer to park their vehicles in their hangars, safety can be compromised when automobile and aircraft movements are intermixed. For this reason, separate parking requirements which consider a parking space for one-half of the based aircraft at the airport were applied to general aviation automobile parking space requirements.

Parking for local airport users is spread throughout the airport, with some spaces available adjacent to hangars and other spaces available along Gemende Drive. In total, there are approximately 700 parking spaces at the airport. Parking requirements for the airport are summarized in **Table 3Q**.

TABLE 3Q
GA Vehicle Parking Requirements
Riverside Airport

		Future Requirements		
	Available	Short Term	Intermediate Term	Long Term
Design Hour Itinerant Passengers	30	42	47	58
GA Itinerant Spaces	400	76	84	104
GA Based Spaces	300	150	185	240
Total GA Parking Area (s.f.)	160,000	90,500	107,700	137,500
Total Parking Spaces	700	226	269	344

The number of existing parking spaces appears to be adequate, but the location of these lots may not be convenient or efficient. The FBO facility may benefit by additional parking and any new hangar development should consider additional parking or utilization of existing parking.

FUEL STORAGE

Zenith Flight Support owns and operates the fuel farm which is located underground, beneath the main apron fronting the FBO hangars. There are two Jet-A tanks with capacities of 10,000 gallons and 5,000 gallons.

There is one AvGas tank with a capacity of 12,000 gallons. In addition, Zenith Flight Support owns and maintains a 15,000-gallon aboveground AvGas fuel tank, which provides for self-service fueling. This FBO maintains two refueling trucks. The Jet-A truck has a 3,000-gallon capacity and the AvGas truck has a capacity of 1,000 gallons.

The west side hangar development area is planned to include additional FBO facilities. This facility is planned to provide fuel in addition to other general aviation services. It is anticipated that at least 10,000 gallons of Jet-A and 5,000 gallons of AvGas fuel storage will be available.

Any future fuel storage needs should be determined by the FBOs providing fueling services.

AIRCRAFT RESCUE AND FIREFIGHTING (ARFF)

The airport is not required to have aircraft rescue and firefighting equipment on the site since there are no scheduled airline flights and the airport does not operate under Title 14 of the Code of Federal Regulations (CFR), Part 139 standards.

Only airports that are certified under 14 CFR, Part 139, are required to have ARFF facilities on or adjacent the airport. The requirements of Index A, the lowest level of conformance for firefighting material under Part 139, are listed in section 139.317, *Aircraft Rescue and Firefighting: Equipment and Agents*. Index A requires at least one vehicle carrying at least 500 pounds of sodium-based dry chemical, halon 1211, or clean agent; or 450 pounds of potassium-based dry chemical and water with a commensurate quantity of Aqueous Film Forming Foam (AFFF) to total 100 gallons for simultaneous dry chemical and AFFF application.

Some corporate flight departments request ARFF services at the airports they utilize. Although not required for a general aviation airport such as Riverside Airport, some airport sponsors also promote ARFF certification for their firefighters.

The airport has a 3/4-ton truck equipped with dry chemical and other firefighting equipment available for initial response. A second truck, a 2005 Ford Renegade Model TM-5150-0012 ARFF vehicle, is on order that will have capacities for 150 gallons of pre-mix water/foam and 500 pounds of dry chemical. The trucks are operated by airport maintenance personnel.

The City of Riverside Fire Department responds to all airport emergencies. Fire Station Number 5 is nearest and is located on Arlington Avenue approximately three minutes to the east of the airport.

AIRPORT MAINTENANCE BUILDING

The airport maintenance facility is located east of the terminal building along Flight Road. The maintenance building totals approximately 3,000 square feet and is used for equipment storage and maintenance and repair activities. Some equipment is stored outside adjacent to the building. While this facility appears adequate for the current needs of the airport, should the City of Riverside consider a replacement facility, a location removed from the main apron would be optimal, thus allowing for more developable aviation-related businesses on the main apron.

UTILITIES

Access to appropriate utilities for future development is available to all undeveloped airport property.

Of special consideration are the two utility easements through Riverside Airport. A 10-foot, six-inch underground pipeline operated by the Metropolitan Water District crosses the runway from the north to south. A 30-inch underground pipeline for the Southern California Gas Company crosses Riverside Airport from the north to the east. The gas pipeline is intended to be relocated to allow for proper grading to the Runway 27 threshold. The approximate location of each pipeline was previously illustrated on Exhibit 1F.

VEHICLE ACCESS

Primary access to the airport is provided via Airport Drive to Flight Road as it extends from Arlington Avenue. Flight Road is an airport loop road that leads directly to the airport terminal building. Gemende Drive extends east from Airport Drive and provides access to facilities located to the east of the terminal building. Airport Drive provides an attractive entrance road to the airport and should be maintained.

Access to the Riverside Executive Aviation hangars, currently under construction, is located directly across from Arlington Avenue. Access to the north side of the airfield is available from Central Avenue. As north side airport property is developed, additional access points may be necessary.

SECURITY

In cooperation with representatives of the general aviation community, the Transportation Security Administration (TSA) published security guidelines for general aviation airports. These guidelines are contained in the publication entitled, *Security Guidelines for General Aviation Airports*, published in May 2004. Within this publication, the TSA recognized that general aviation is not a specific threat to national security. However, the TSA does believe that general aviation may be vulnerable to misuse by terrorists as security is enhanced in the commercial portions of aviation and at other transportation links.

To assist in defining which security methods are most appropriate for a general aviation airport, the TSA defined a series of airport characteristics that potentially affect an airport's security posture. These include:

1. Airport Location – An airport's proximity to areas with over

100,000 residents or sensitive sites that can affect its security posture. Greater security emphasis should be given to airports within 30 miles of mass population centers (areas with over 100,000 residents) or sensitive areas such as military installations, nuclear and chemical plants, centers of government, national monuments, and/or international ports.

2. Based Aircraft – A smaller number of based aircraft increases the likelihood that illegal activities will be identified more quickly. Airports with based aircraft over 12,500 pounds warrant greater security.

3. Runways – Airports with longer paved runways are able to serve larger aircraft. Shorter runways are less attractive as they cannot accommodate the larger aircraft which have more potential for damage.

4. Operations – The number and type of operations should be considered in the security assessment.

Table 3R summarizes the recommended airport characteristics and ranking criterion. The TSA suggests that an airport rank its security posture according to this scale to determine the types of security enhancements that may be appropriate. As shown in the table, the Riverside Airport ranking on this scale is 35. Points are assessed for the airport having more than 101 based aircraft, having a runway greater than 5,001 feet in length, having a paved runway surface, having 14 CFR, Part 135, charter operations, and for having flight training and rental aircraft activities at the airport. In addition, the airport's proximity to population centers, sensitive areas, Class B airspace and/or restricted airspace, enhance the need for adequate security.

As shown in **Table 3R**, a rating of 35 points places Riverside Airport on the third tier ranking of security measures by the TSA. This rating clearly illustrates the importance of meeting security needs at Riverside Airport as the activity at the airport grows. The airport is not projected to transition to the fourth tier during the planning period.

Based upon the results of the security assessment, the TSA recommends 13 potential security enhancements for Riverside Airport. These enhancements are outlined in **Table 3S**.

A review of each recommended security procedure is discussed below.

Access Controls: To delineate and adequately protect security areas from unauthorized access, it is important to consider boundary measures such as fencing, walls, or other physical barriers, electronic boundaries (e.g., sensor lines, alarms), and/or natural barriers. Physical barriers can be used to deter and delay the access of unauthorized persons onto sensitive areas of airports. Such structures are usually permanent and are designed to be a visual and psychological deterrent as well as a physical barrier. The airport provides perimeter fencing with access control gates for both vehicles and pedestrians.

TABLE 3R
General Aviation Airport Security Measurement Tool
Transportation Security Administration

	Assessment Scale	
Security Characteristic	**Public Use Airport**	**Riverside Airport**
Location		
Within 20nm of mass population areas[1]	5	5
Within 30nm of a sensitive site[2]	4	4
Falls within outer perimeter of Class B airspace	3	0
Falls within boundaries of restricted airspace	3	0
Based Aircraft		
Greater than 101 based aircraft	3	3
26-100 based aircraft	2	0
11-25 based aircraft	1	0
10 or fewer based aircraft	0	0
Based aircraft over 12,500 pounds	3	3
Runways		
Runway length greater than 5,001 feet	5	5
Runways less that 5,000 feet and greater than 2,001 feet	4	0
Runway length less than 2,000 feet	2	0
Asphalt or concrete runway	1	1
Operations		
Over 50,000 annual operations	4	4
Part 135 operations (Air taxi and fractionals)	3	3
Part 137 operations (Agricultural aircraft)	3	0
Part 125 operations (20 or more passenger seats)	3	0
Flight training	3	3
Flight training in aircraft over 12,500 pounds	4	0
Rental aircraft	4	4
Maintenance, repair, and overhaul facilities conducting long-term storage of aircraft over 12,500 pounds	4	0
Totals	**64**	**35**

[1] An area with a population over 100,000
[2] Sensitive sites include military installations, nuclear and chemical plants, centers of government, national monuments, and/or international ports
nm = nautical mile

Source: Security Guidelines for General Aviation Airports (TSA 2004)

Lighting System: Protective lighting provides a means of continuing a degree of protection from theft, vandalism, or other illegal activity at night. Security lighting systems should be connected to an emergency power source, if available.

Personal ID System: This refers to a method of identifying airport employees or authorized tenants and allowing access to various areas of the airport through badges or biometric controls.

Vehicle ID System: This refers to an identification system which can assist airport personnel and law enforcement in identifying authorized vehicles. Vehicles can be identified through the use of decals, stickers, or hang tags.

Challenge Procedures: This involves an airport watch program which is implemented in cooperation with airport users and tenants to be on guard for unauthorized and potentially illegal activities at the airport.

Law Enforcement Support: This involves establishing and maintaining a liaison with appropriate law enforcement including local, state, and federal agencies. These organizations can better serve the airport when they are familiar with airport operating procedures, facilities, and normal activities. Procedures may be developed to have local law enforcement personnel regularly or randomly patrol ramps and aircraft hangar areas, with increased patrols during periods of heightened security.

Security Committee: This committee should be composed of airport tenants and users drawn from all segments of the airport community. The main goal of this group is to involve airport stakeholders in developing effective and reasonable security measures and disseminating timely security information.

TABLE 3S
Recommended Security Enhancements
Riverside Airport

	Points Determined Through Airport Security Characteristics Assessment			
Security Enhancements	**> 45**	**25-44**	**15-24**	**0-14**
Fencing	■			
Hangars	■			
Closed-Circuit Television (CCTV)	■			
Intrusion Detection System	■			
Access Controls	■	■		
Lighting System	■	■		
Personal ID System	■	■		
Challenge Procedures	■	■		
Law Enforcement Support	■	■	■	
Security Committee	■	■	■	
Transient Pilot Sign-in/Sign-Out Procedures	■	■	■	
Signs	■	■	■	
Documented Security Procedures	■	■	■	■
Positive/Passenger/Cargo/Baggage ID	■	■	■	■
Aircraft Security	■	■	■	■
Community Watch Program	■	■	■	■
Contact List	■	■	■	■

Source: Security Guidelines for General Aviation Airports

Transient Pilot Sign-in/Sign-Out Procedures: This involves establishing procedures to identify non-based pilots and aircraft using their facilities, and implementing sign-in/sign-out procedures for all transient operators and associating them with their parked aircraft. Having assigned spots for transient parking areas can help to easily identify transient aircraft on an apron.

Signs: The use of signs provides a deterrent by warning of facility boundaries as well as notifying of the consequences for violation.

Documented Security Procedures: This refers to having a written security plan. This plan would include documenting the security initiatives already in place at Riverside Airport, as well as any new enhancements. This document should consist of airport and local law enforcement contact information, and include utilization of a program to increase airport user awareness of security precautions such as an airport watch program.

Positive/Passenger/Cargo/Baggage ID: A key point to remember regarding general aviation passengers is that the persons boarding these flights are generally better known to airport personnel and aircraft operators than the typical passenger on a commercial airliner. Recreational general aviation passengers are typically friends, family, or acquaintances of the pilot in command. Charter/sightseeing passengers typically will meet with the pilot or other flight department personnel well in advance of any flights. Suspicious activities such as use of cash for flights or probing or inappropriate questions are more likely to be quickly noted and authorities could be alerted. For corporate operations, typically all parties onboard the aircraft are known to the pilots. Airport operators should develop methods by which individuals visiting the airport can be escorted into and out of aircraft movement and parking areas.

Aircraft Security: The main goal of this security enhancement is to prevent the intentional misuse of general aviation aircraft for criminal purposes. Proper securing of aircraft is the most basic method of enhancing general aviation airport security. Pilots should employ multiple methods of securing their aircraft to make it as difficult as possible for an unauthorized person to gain access to it. Some basic methods of securing a general aviation aircraft include: ensuring that door locks are consistently used to prevent unauthorized access or tampering with the aircraft; using keyed ignitions where appropriate; storing the aircraft in a hangar, if available, and locking hangar doors, using an auxiliary lock to further protect aircraft from unauthorized use (i.e., propeller, throttle, and/or tie-down locks); and ensuring that aircraft ignition keys are not stored inside the aircraft.

Community Watch Program: The vigilance of airport users is one of the most prevalent methods of enhancing security at general aviation airports. Typically, the user population is familiar with those individuals who have a valid purpose for being on the airport property. Consequently, new faces are quickly noticed. A watch program should include elements similar to those listed below. These recommendations are not all-inclusive. Additional measures that are specific to each airport should be added as appropriate, including:

- Coordinate the program with all appropriate stakeholders, including airport officials, pilots, businesses and/or other airport users.
- Hold periodic meetings with the airport community.
- Develop and circulate reporting procedures to all who have a regular presence on the airport.
- Encourage proactive participation in aircraft and facility security and heightened awareness measures. This should include encouraging airport and line staff to "query" unknowns on ramps, near aircraft, etc.
- Post signs promoting the program, warning that the airport is watched. Include appropriate emergency phone numbers on the sign.
- Install a bulletin board for posting security information and meeting notices.
- Provide training to all involved for recognizing suspicious activity and appropriate response tactics.

Contact List: This involves the development of a comprehensive list of responsible personnel/agencies to be contacted in the event of an emergency procedure. The list should be distributed to all appropriate individuals. Additionally, in the event of a security incident, it is essential that first responders and airport management have the capability to communicate. Where possible, coordinate radio communication and establish common frequencies and procedures to establish a radio communications network with local law enforcement.

FRACTIONAL JET OPERATOR SECURITY REQUIREMENTS

The major fractional jet operators have established minimum standards for airports serving their aircraft. These minimum standard documents specify the following general security requirements:

Identification: The airport should issue unique identification badges for employees who have access to the aircraft operations areas. Unescorted passenger access to the ramp is prohibited.

Employees: The airport must conduct FAA-compliant background checks on each employee. The airport must have pre-employment drug screening.

Aircraft Security: Aircraft cannot be left unattended when the ground power unit or auxiliary power unit is operating. Aircraft must be locked when unattended. Aircraft must be parked in well-lit, highly visible areas with a minimum of six-foot chain link fencing. Security cameras are preferred. Sightseers or visitors are not allowed access aboard or near aircraft.

Facility Security: Visual surveillance of all aircraft operational areas belonging to the airport is required. The airport shall establish controlled access to the aircraft operational areas. The airport should maintain at least six feet between safety fence and parked ground equipment. Bushes and shrubs must be less than four feet in height.

SUMMARY

The intent of this chapter has been to outline the facilities required to meet potential aviation demands projected for Riverside Airport for the planning horizons. A summary of the airside and landside requirements is presented on **Exhibits 3F and 3G**.

Several primary recommendations are made in this chapter. The highest priority items for the airport and the FAA is to meet safety design standards. The RSA surrounding Runway 9-27 does not currently meet design standards. The RSA extends 600 feet beyond both runway ends and should be smooth and graded within standard slope tolerances. To the east of Runway 27, the RSA drops significantly approximately 100 feet from the runway threshold. To the west of the Runway 9 end, the railroad spur is approximately 475 feet from the runway threshold.

A review of the necessity of a runway extension was presented in this chapter. The extension of Runway 27 by 753 feet, as presented in the previous master plan, was intended to provide the maximum runway length in order to accommodate the needs of larger business jets anticipated to use the airport in the future. Aircraft requiring a longer runway are not using the airport at a sufficient level to justify this previously planned extension. The analysis above determined that the types of aircraft currently operating at the airport do not require a runway extension. Other aircraft, which use the airport in a limited capacity, may be moderately weight-restricted on only the hottest summer days. In addition, significant increases in operations will be needed by business jets to reach the threshold of 500 annual operations as set by the FAA to justify an extension. Any proposed runway extension would require documentation and justification by airport operators, both based and itinerant.

Following the facility requirements, the next step is to determine a direction of development which best meets these projected needs through a series of airport development alternatives. The remainder of the master plan will be devoted to outlining this direction, its schedule, and its cost.

05MP11-3F-3/13/09

RUNWAYS

	AVAILABLE	SHORT TERM	LONG TERM
RUNWAYS	**Runway 9-27** ARC B-II 5,401' x 100' 48,000# SWL/70,000# DWL 110,000# DTWL Non-standard safety areas **Runway 16-34** ARC B-I 2,851' x 48' 40,000# SWL/50,000# DWL Visual Approach (small aircraft exclusively)	**Runway 9-27** ARC B-II 5,401' x 100' 48,000# SWL/70,000# DWL 110,000# DTWL ***Standard safety areas*** **Runway 16-34** ARC B-I ***2,851' x 60'*** 40,000# SWL/50,000# DWL Visual Approach (small aircraft exclusively)	**Runway 9-27** ***ARC C-II*** 6,400' x 100' 48,000# SWL/70,000# DWL 110,000# DTWL Standard safety areas **Runway 16-34** ARC B-I 2,851' x 60' 40,000# SWL/50,000# DWL Visual Approach (small aircraft exclusively)

TAXIWAYS

	AVAILABLE	SHORT TERM	LONG TERM
TAXIWAYS	**Runway 9-27** Vary 35' to 75' wide South parallel Seven south side exits **Runway 16-34** 25' wide Dual parallel Four west exits Three east exits	**Runway 9-27** ***Uniform width*** ***Add north side parallel*** ***Add seven north side exits*** **Runway 16-34** 25' wide Dual parallel Four west exits ***Add one east exit***	**Runway 9-27** Uniform width North side parallel South side parallel Seven south side exits Seven north side exits **Runway 16-34** 25' wide Dual parallel Four west exits Four east exits

NAVIGATIONAL AIDS

	AVAILABLE	SHORT TERM	LONG TERM
NAVIGATIONAL AIDS	ATCT, VOR, ATIS, RCO, ASOS **Runway 9-27** LPV(27);ILS (9); GPS VOR or GPS circling **Runway 16-34** VOR or GPS circling	ATCT, VOR, ATIS, RCO, ASOS **Runway 9-27** LPV (27); ILS (9); GPS VOR or GPS circling **Runway 16-34** VOR or GPS circling	ATCT, VOR, ATIS, RCO, ASOS **Runway 9-27** LPV (27); ILS (9); GPS; ***CAT I GPS (9)*** VOR or GPS circling **Runway 16-34** VOR or GPS circling

LIGHTING AND MARKING

	AVAILABLE	SHORT TERM	LONG TERM
LIGHTING AND MARKING	Rotating Beacon Lighted Windcones (3) MIRL/MITL **Runway 9-27** MALSR (9) REIL (27) PAPI-4L Precision marking (9) Non-precision marking (27) **Runway 16-34** PAPI-2L (34) Visual marking	Rotating Beacon ***Add north side windcone*** MIRL/MITL **Runway 9-27** MALSR (9) REIL (27) PAPI-4L Precision marking (9) Non-precision marking (27) **Runway 16-34** PAPI-2L (34); ***PAPI-2L (16)*** Visual marking	Rotating Beacon Lighted Windcones (4) MIRL/MITL **Runway 9-27** MALSR (9) REIL (27) PAPI-4L Precision marking (9) Non-precision marking (27) **Runway 16-34** PAPI-2L (34); PAPI-2L (16) Visual marking

KEY

ATCT - Airport Traffic Control Tower
ASOS - Automated Surface Observing System
ATIS - Automatic Terminal Information Services
DTWL - Dual Tandem Wheel Loading
DWL - Dual Wheel Loading
GPS - Global Positioning System
MALSR - Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights
MIRL - Medium Intensity Runway Lighting
MITL - Medium Intensity Taxiway Lighting
PAPI - Precision Approach Path Indicator
RCO - Remote Communications Outlet
REILs - Runway End Identifier Lights
SWL - Single Wheel Loading
VOR - Very high frequency Omni-directional Range

Bold Red print indicates recommended / required changes

Exhibit 3F
AIRFIELD FACILITY REQUIREMENTS

05MP11-3G-10/10/07

AIRCRAFT STORAGE HANGARS

	Currently Available	Future Requirements: Short Term	Intermediate Term	Long Term
T/Shade/Port-a-port Hangar Positions	154	219	272	366
Box Hangar Positions	13	34	43	57
Conventional Hangar Positions	5	18	25	34
Total Hangar Positions	**172**	**271**	**340**	**456**
T/Shade/Port-a-port Hangar Area (s.f.)	71,400	262,300	326,700	438,600
Box Hangar Area (s.f)	36,800	83,900	108,400	143,600
Conventional Hangar Area (s.f.)	23,100	45,300	62,100	83,800
Maintenance Area (s.f.)	20,000	35,350	52,500	64,750
Total GA Hangar Area Need*	**151,300**	**426,900**	**549,700**	**730,800**
Total Need After Riverside Executive Aviation Hangar Construction*	**445,300**	**131,100**	**253,900**	**435,000**

AIRCRAFT PARKING APRON AREA

	Available	Short Term	Intermediate	Long Term
Transient Piston Positions	NA	12	14	18
Transient Busines Jet Positions	NA	18	21	27
Locally Based Positions	NA	35	35	29
Total GA Apron Positions	**±100**	**65**	**70**	**74**
Total GA Apron Area	**257,000**	**62,100**	**66,500**	**75,600**

GENERAL AVIATION TERMINAL SERVICES

	Available	Short Term	Intermediate	Long Term
Terminal Service Building	±18,000	5,000	6,000	8,400
Automobile Parking				
Total GA Parking Spaces	**700**	**226**	**269**	**344**
Total GA Parking Area	**160,000**	**90,500**	**107,700**	**137,500**

* Figures rounded to nearest 100

Red indicates demand needed

Exhibit 3G
LANDSIDE FACILITY REQUIREMENTS

Chapter Four

ALTERNATIVES

Alternatives

In the previous chapter, airside and landside facilities required to satisfy the demand through 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 20 years. However, no plan of action should be developed which may be inconsistent with the future goals and objectives of the City of Riverside and its citizens, who have a vested interest in the development and operation of the airport.

The development alternatives for Riverside 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 capabilities and facilities are required or desired. In addition, the utilization of 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 and then coordinated as a whole to ensure the final plan is functional, efficient, and cost-effective. The total impact of all these factors on the existing airport must be evaluated to determine if the investment in Riverside 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 the input and direction from local government agencies and airport users, a final airport concept can evolve into a realistic development plan.

AIRPORT DEVELOPMENT OBJECTIVES

Prior to identifying objectives specifically associated with development of Riverside Airport, non-development alternatives are briefly considered. Non-development alternatives include the "no-build" or "do-nothing" alternative, the transfer of services to another existing airport, or the development a new airport at a new location.

The Riverside Airport plays a critical role in the economic development of the City of Riverside and the surrounding region as well as an important role in the continuity of the national aviation network. There is significant public and private investment at the airport. Pursuit of a non-development alternative would slowly devalue these investments, lead to infrastructure deterioration, and potentially the loss of significant levels of federal funding for airport improvements. Ultimately, the safety of aircraft, pilots, and persons on the ground could be jeopardized. Therefore, the non-development alternatives are not further considered.

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 Riverside provides the overall guidance for the operation and development of the Riverside 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 the current and long term needs of all general aviation users.

- To be reflective and supportive of the City of Riverside General Plan – 2025.

- 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.

AIRSIDE PLANNING ISSUES

The aviation demand forecasts presented in Chapter Two and revised and submitted to the FAA for approval indicate that Riverside Airport may realize significant growth over the next 20 years. Of particular note is the potential growth and impact in the number of operations by business jets. The forecast shows the potential for up to 12 based business jets as well. If the FAA threshold of 500 annual operations by these types of aircraft is exceeded, more stringent design standards would apply to the airport. Therefore, the alternatives will address the application of FAA design standards for Riverside Airport as it evolves to include a greater level of activity by business jet operators.

Exhibit 4A presents both airside and landside considerations to be specifically addressed in this chapter. On the airside, consideration will be given to the safety area dimensions as applied to the current Airport Reference Code (ARC B-II), and to the potential future standards for ARC C-II (refer to Chapter Three for a full discussion of the ARC). In addition, analysis will be conducted on the potential for an extension of the runway as included in the previous master plan. A north side parallel taxiway has long been planned and is currently in the design phase with construction planned for 2008 or 2009. The alternatives will depict the designed configuration of this parallel taxiway.

Landside considerations will include three distinct study areas: the south and west terminal building areas, the south and east FBO areas, and the north side undeveloped area. Consideration will be given to parcel layouts, in-fill opportunities, and redevelopment opportunities. In addition, several locations for a replacement airport traffic control tower (ATCT) will be examined.

AIRSIDE DEVELOPMENT ALTERNATIVES

The alternatives to be presented next consider meeting airport design standards, particularly as they relate to the runway safety area (RSA), obstacle free zone (OFZ), object free area (OFA), and runway protection zone (RPZ). The current operational activity level indicates that Riverside Airport is an ARC B-II airport. Long term planning will consider the design improvements necessary to meet standards for ARC C-II. The possible alternatives are limitless, but the airside alternatives presented are believed to be the alternatives that best consider all factors specific to the airport, while being financially reasonable and within FAA standards. The recommended development plan, which will be presented in Chapter Five, will likely be a combination of critical elements from each of these alternatives.

INSTRUMENT APPROACH IMPACT

The approved instrument approach procedures at an airport, in conjunction with the critical aircraft, determine the applicable airport design standards. The approach with the lowest visibility and cloud ceiling minimums dictate what design standards to apply. The most sophisticated approach at Riverside Airport is the Instrument Landing System (ILS) with Category (CAT) I minimums to Runway 9. CAT I minimums are one-half mile visibility and 200-foot cloud ceilings.

Table 4A presents the current and potential future design standards that may be applied to Riverside Airport. The first column presents the current B-II design standards. The airport currently does not meet standards for RSA, OFA, and runway/taxiway separation. The middle column presents the B-II standards if the airport did not have a CAT I approach and instead had an approach with three-quarter mile visibility minimum. In this case, the airport would meet current design standards. The last column shows the design standards for the forecast future C-II condition. The airport also does not meet these more stringent standards for RSA, OFA, and runway/taxiway separation.

TABLE 4A
Runway 9-27 Design Standards
Riverside Airport

Airport Reference Code	B-II (Current Condition)	B-II (Current Standard)	B-II	C-II
Approach Visibility Minimums	**1/2 mile visibility**	**1/2 mile visibility**	**3/4 mile visibility**	**1/2 mile visibility**
Runway Width	100	100	75	100
Runway Shoulder Width	10	10	10	10
Runway Safety Area				
Width	300	300	150	**400**
Length Beyond End	**475 (27)/100 (9)**	**600**	300	**1,000**
Length Prior to Landing	**475 (9)/100 (27)**	**600**	300	**600**
Runway Object Free Area				
Width	800	800	500	800
Length Beyond End	**377 (27)**/1,000 (9)	**600**	300	**1,000 (27)**
Runway/Taxiway Separation	**275**	**300**	240	**400**
Obstacle Free Zone				
Length Beyond End	200	200	200	200
Width	400	400	400	400
Precision Obstacle Free Zone (Rwy 9)				
Length Beyond End	200	200	200	200
Width	800	800	800	800

All measurements in feet.
BOLD: Currently non-standard at the airport.

Source: FAA AC 150/5300-13, Change 11, Airport Design

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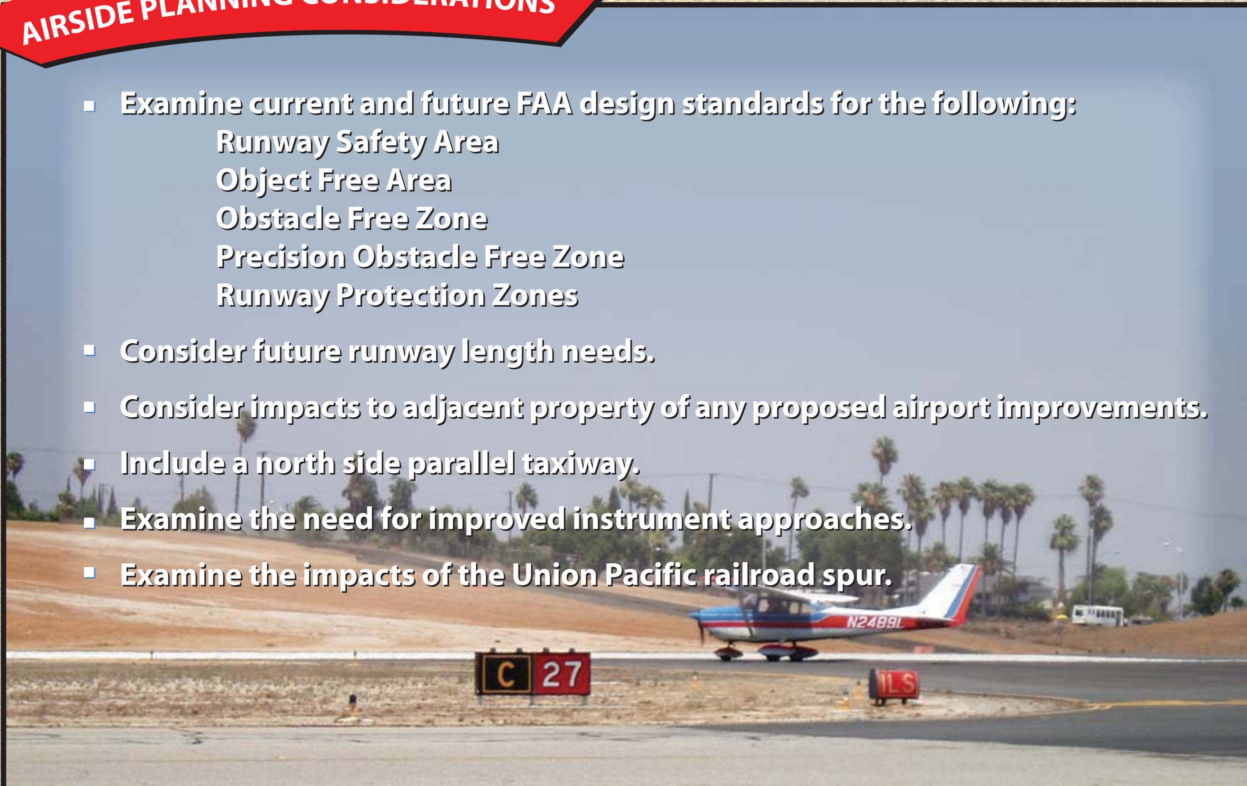
AIRSIDE PLANNING CONSIDERATIONS

- Examine current and future FAA design standards for the following:
  - Runway Safety Area
  - Object Free Area
  - Obstacle Free Zone
  - Precision Obstacle Free Zone
  - Runway Protection Zones
- Consider future runway length needs.
- Consider impacts to adjacent property of any proposed airport improvements.
- Include a north side parallel taxiway.
- Examine the need for improved instrument approaches.
- Examine the impacts of the Union Pacific railroad spur.



LANDSIDE PLANNING CONSIDERATIONS

- Maximize available property for facility development.
- Provide for appropriate separation of activity levels.
- Consider potential locations for replacement airport traffic control tower.
- Develop parcel plan for north side of airport property.

RIVERSIDE AIRPORT

Exhibit 4A
PLANNING ISSUES

As will become evident in the sections to follow, there are challenges to meeting design standards for the airport today as well as in the future. In an effort to consider all potential design options for the airport, initial consideration was given to voluntarily increasing the visibility minimums from one-half mile to three-quarter mile for ILS approaches to Runway 9. Doing this would bring the airport into compliance with applicable existing ARC B-II design standards. After consultation with city staff, the airport engineer, and various federal officials, it was determined that this solution is short-sighted and ignores the possibility of the airport transitioning to ARC C-II. Transitioning to ARC C-II would ultimately require that the airport meet even more stringent design standards. Therefore, the alternatives to follow will consider solutions to meeting ARC C-II standards and will present short term solutions to meeting current B-II standards with a CAT I approach where necessary.

RUNWAY/TAXIWAY SEPARATION ANALYSIS

There are two factors that primarily influence the FAA standard for runway/taxiway separation. The first is the type and frequency of aircraft operations as described by the applicable ARC and the second is the capability of the instrument approaches available at the airport.

As discussed, Runway 9-27 should meet ARC B-II design standards with a CAT I instrument approach. The separation between Runway 9-27 and Taxiway A (centerline to centerline) should be 300 feet. While the current separation of 275 feet does not meet this standard, several FAA grant-funded projects, including the 2006-2007 rebuilding of Taxiway A, have approved the location of Taxiway A at a distance of 275 feet.

Initial consideration is given to relocating Taxiway A to a separation distance from the runway of 300 feet. This course of action would have a severe negative operational impact to the new hangar and FBO development on the southwest corner of the airport. A portion of the aircraft ramp would become unusable and aircraft could not park outside the FBO hangars. In addition, a portion of the entire main apron would become unusable. Because of these physical impacts, the FAA permits consideration of alternatives based on providing a comparable level of safety.

The runway/taxiway separation standard is intended to prevent the possibility of an aircraft operating on the runway from coming into contact with the wing of an aircraft operating on the taxiway. Also, the separation standard should prevent the wing of a taxiing aircraft from penetrating the RSA or OFZ surrounding the runway. At Riverside Airport, the RSA and OFZ are both 400 feet wide, centered on the runway.

To codify the existing non-standard runway/taxiway separation, a note will be placed on the Airport Layout Drawing to be submitted to the FAA. In the future, when the runway/taxiway system is improved or the role of the airport transitions to ARC C-II, the airport should request from the FAA, a modification to standard which would then be documented on the Airport Layout Drawing for the airport. A modification to standard can be obtained if the airport is able to demonstrate that the non-standard situation is not detrimental to safety, which it is not in this case.

Two aircraft with a maximum wingspan of 79 feet (Airplane Design Group – ADG-II) can operate on the runway and parallel taxiway at the same time without any penetration to the RSA or OFZ. The minimum acceptable separation would be 239.5 feet (200 feet of RSA/OFZ and 39.5 feet for the maximum ADG-II wingspan). The existing runway/taxiway separation provides an additional 35.5 feet of distance between the wing of an ADG-II aircraft taxiing and the RSA/OFZ surfaces surrounding the runway.

A parallel taxiway is planned for the north side of Runway 9-27. This taxiway is being designed at a separation distance of 300 feet. As discussed above, this separation will provide an acceptable level of safety between the runway and the taxiway. In fact this distance will provide an addition margin of safety over the separation currently available between the runway and Taxiway A.

An additional consideration is the Inner-transitional OFZ, which applies only to airports with lower than three-quarters mile approach visibility minimums, such as Riverside Airport. The Inner-transitional OFZ begins at the edge of the OFZ (200 feet from the runway centerline), rises to an elevation of 51 feet, and then slopes up and away at a 6:1 ratio to an elevation of 150 feet. The tallest aircraft tail height in ADG-II is shorter than 51 feet; therefore, the Inner-transitional surface is not a factor in runway/taxiway separation determination at Riverside Airport.

In conclusion, the current separation between Runway 9-27 and Taxiway A does not meet FAA design standards. In the long term, consideration should be given to relocating this taxiway to a distance of at least 300 feet. This action should not be undertaken until the taxiway is in need of reconstruction in order to maximize its current useful life. In the meantime, a note will be made on the Airport Layout Drawing associated with this master plan indicating that the current runway/taxiway separation is a deviation of standard.

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 firefighting 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 dimension of the RSA surrounding the runway is a function of the critical aircraft. The current critical aircraft is in ARC B-II. Future planning will consider a critical aircraft in ARC C-II. The existing B-II RSA serving Runway 9-27 should be 300 feet wide (centered on the runway) and extend 600 feet beyond each end of the runway. The future ARC C-II RSA is 400 feet wide but requires 1,000 feet of RSA beyond the far ends of the runway and 600 feet prior to the landing thresholds. Since operations are performed to both runway ends, depending on wind conditions, the future RSA effectively needs to extend 1,000 feet beyond each runway end.

FAA Order 5300.1F, *Modification of Agency Airport Design, Construction, and Equipment Standards*, indicates in Paragraph 6.d the following:

". . . Runway safety areas at both certificated and non-certificated airports that do not meet dimensional standards are subject to FAA Order 5200.8, *Runway Safety Area Program*. Modification of Standards is not issued for nonstandard runway safety areas."

The FAA placed a greater emphasis on meeting RSA standards with the publication of FAA Order 5200.8, *Runway Safety Area Program,* in 1999, following congressional direction. The Order states in Paragraph 5, "The object of the Runway Safety Area Program is that all RSAs at federally obligated airports and all RSAs at airports certified under 14 Code of Federal Regulations (CFR) Part 139 shall conform to the standards contained in AC 150/5300-13, *Airport Design*, to the extent practicable."

The Order goes on to state in Paragraph 8.b:

"The Regional Airports Division Manager shall review all data collected for each RSA in Paragraph 7, along with the supporting documentation prepared by the region for that RSA, and make one of the following determinations:

(1) The existing RSA meets the current standards contained in AC 150/5300-13, *Airport Design*.

(2) The existing RSA does not meet the current standards, but it is practicable to improve the RSA so that it will meet current standards.

(3) The existing RSA can be improved to enhance safety, but the RSA will still not meet current standards.

(4) The existing RSA does not meet current RSA standards, and it is not practicable to improve the RSA."

The findings of this master plan will aid the Regional Airports Division Manager for the FAA's Western Pacific Region in making a determination on the existing condition of RSAs at Riverside Airport.

During the FAA's review of the airport layout plan generated from the previous master planning effort in 1999, the status of the RSA was addressed. The FAA indicated at that time that the existing RSA did not meet standard but was improved to the extent practicable. This essentially resulted in the FAA pursuing no improvements to the RSA as had been analyzed in the master plan. While the "no-action" alternative continues to be an option for the FAA, consideration of RSA improvement alternatives is still necessary.

Appendix 2 of FAA Order 5200.8 provides direction for an RSA determination. This includes the alternatives that must be evaluated. Paragraph 3 of Appendix 2 states:

"The first alternative that must be considered in every case is constructing the traditional graded runway safety area surrounding the runway. Where it is not practicable to obtain the entire safety area in this manner, as much as possible should be obtained. Then the following alternatives shall be addressed in the supporting documentation . . . :"

- 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).

The following subsections will discuss the application of the FAA-recommended alternatives for mitigating non-standard RSA. This RSA alternatives evaluation will address the future C-II condition for the airport. Therefore, this analysis will address the more restrictive C-II design standards, rather than the current B-II design standards. Following this discussion, solutions to meeting the immediate B-II condition will be presented.

RSA Alternative A:
Provide Full RSA

Providing full RSA to the west of the Runway 9 threshold would have significant impact. The first challenge is the location of the Union Pacific railroad spur that bisects airport property approximately 475 feet from the Runway 9 threshold. In consultation with the Union Pacific real estate department, it was determined that this spur could be closed or re-routed at city expense.

The railroad spur, identified as the Rohr Industrial Lead Track #23-700, provides critical delivery of building supplies to Boise Cascade, a construction supply business that is located near the corner of Van Buren Boulevard and Arlington Avenue. Rerouting the spur would involve constructing new track leading west across Van Buren Blvd., north through the golf course, and back east across Van Buren Blvd. again to connect with the Central Avenue access point for the railroad. This option is presented on **Exhibit 4B**.

Another option is to purchase the spur and close the track south of Central Avenue. It would then be the responsibility of the City of Riverside to relocate Boise Cascade and all its track capacity to allow the business to continue to operate at an acceptable alternate site that is also operationally satisfactory to Union Pacific.

In addition to relocating or closing the railroad spur, Van Buren Blvd. is also a penetration to the RSA. Van Buren could be re-routed through the golf course on the west side of the current alignment or Doolittle Avenue could be improved to carry Van Buren traffic. However, Van Buren/Doolittle Avenue would still be located within the RPZ. The current FAA Western-Pacific position stipulates that public roadways should not be located within an RPZ (existing roads in RPZs are not affected by this position). Therefore, this relocation may not fully comply with the FAA's position. Another consideration would be to tunnel Van Buren Blvd. under the RSA in order to maintain the existing alignment. This would meet the FAA position as the roadway would not actually be located in the RPZ. **Exhibit 4B** presents these options.

The RSA on the east end of the runway also needs to be improved. The profile of the terrain for the first 1,000 feet to the east of the Runway 27 threshold does not meet the RSA maximum grade standard of two percent. One method to mitigate this issue is to bring in fill dirt and bring the entire RSA up to grade. Current planning for a north side parallel taxiway involves removing excess material north of the runway, then placing along the RSA east of Runway 27 to bring the RSA up to grade.

When considering the effort necessary to meet RSA standards, all impacts must be addressed including the impact of the RPZ. As previously discussed, it is desirable to clear all objects from the RPZ. Prohibited land uses within the RPZ include residences and places of public assembly (churches, schools, hospitals, office buildings, and shopping centers).

The application of C-II design standards would necessitate a larger RPZ to serve the Runway 27 end. This would extend across Hillside Avenue and over portions of 10 private properties. To meet the current FAA Western-Pacific position, which stipulates that public roadways should not be located within an RPZ, Hillside Avenue should either be closed at those points where it crosses the RPZ or re-routed around the RPZ. **Exhibit 4B** shows the re-routing of Hillside Avenue. In addition, the properties that fall within the RPZ would have to be acquired and existing homeowners relocated.

Meeting ARC C-II RSA standards is not considered feasible. Several options including re-routing or tunneling Van Buren Boulevard and the railroad spur were considered. This option is likely cost-prohibitive and would additionally create significant traffic issues during construction.

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

As shown in Chapter Three - Facility Requirements, the runway is aligned in the ideal direction as determined by the wind analysis. Relocating or realigning the runway is impractical due to limited airport property available and the physical constraints of development on all sides of the runway system.

A shift of the runway would involve removing approximately 600 feet of the runway from the Runway 9 end in order to clear the railroad spur and adding 600 feet to the Runway 27 end to maintain existing runway length. A 600-foot shift would provide a 75-foot buffer between the railroad spur and the RSA. The runway shift alternative is presented on **Exhibit 4C**.

To accomplish the shift, the glide slope antenna, medium intensity approach lighting system with runway alignment indicator lights (MALSR), and precision approach slope indicator (PAPI) would have to be re-located at least 600 feet to the east and re-calibrated. The north side parallel taxiway is currently planned with a slight jog in order to allow for taxiing aircraft to clear the glide slope antenna in its current location. By relocating the glide slope to the east, this jog would lose its usefulness. New instrument approaches would then have to be developed. The new approaches may not have the same capability as the current approaches.

The addition of 600 feet of runway to the east end would move the RSA 600 feet further to the east, thus leading to a need for more fill material. In addition, the shift of the runway would bring a total of 56 properties under portions of the RPZ. To meet FAA standards, these parcels would need to be purchased and the structure removed. Hillside Avenue and several neighborhood streets would have to be re-routed or closed to meet the FAA Western-Pacific region position for public roadways in the RPZ.

Due to these impacts, a runway shift project intended to provide RSA beyond the runway ends is not considered feasible.

RSA Alternative C: Decrease Runway Length

As presented in Chapter Three - Facility Requirements, a preferred runway length to serve the current critical aircraft would be 5,400 feet. This length would accommodate 75 percent of large business jet aircraft (those under 60,000 pounds) at 60 percent useful load. The airport currently provides a 5,400-foot runway. A reduction in runway length would have negative

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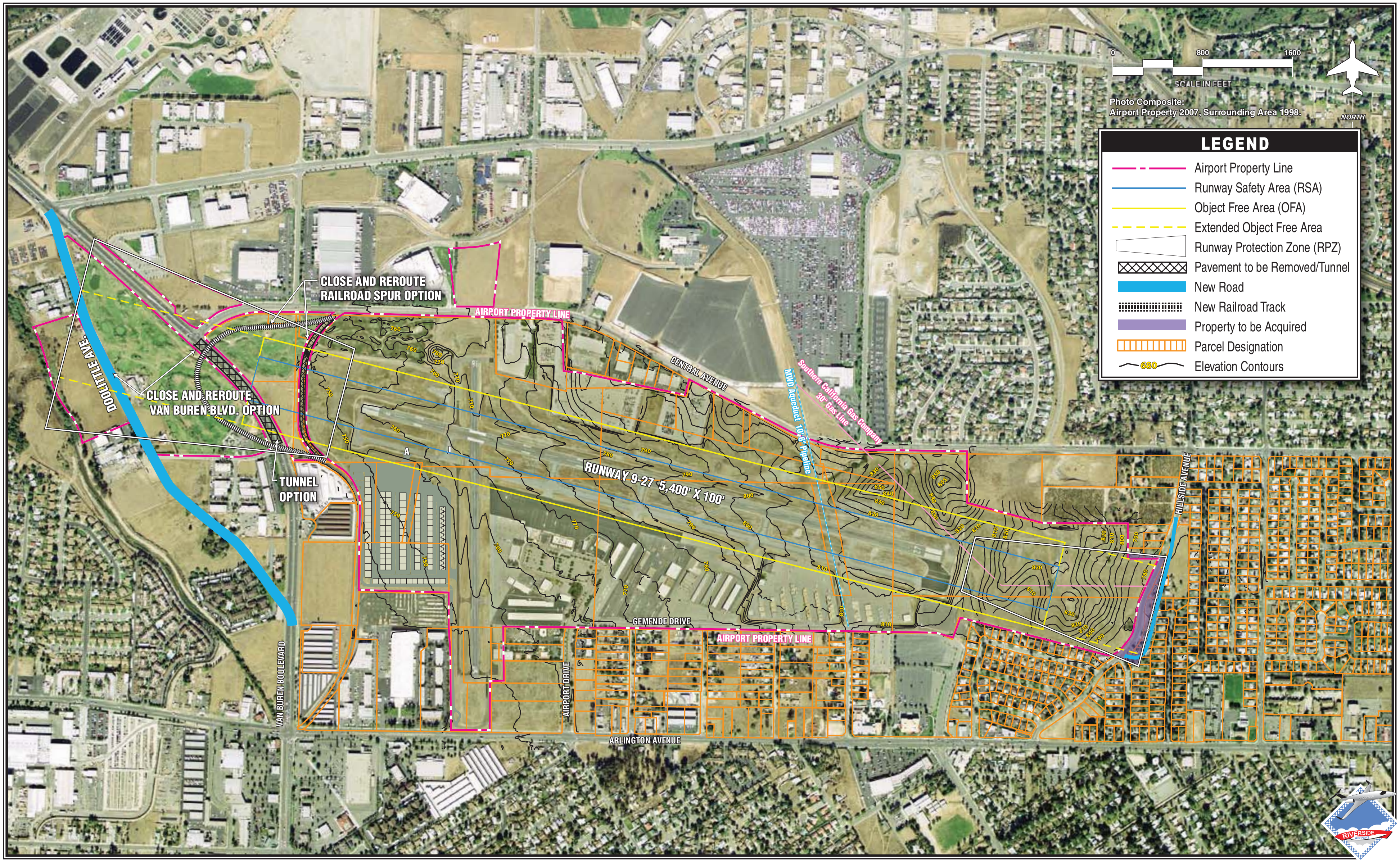

Exhibit 4B
RSA ALTERNATIVE A
PROVIDE FULL RSA

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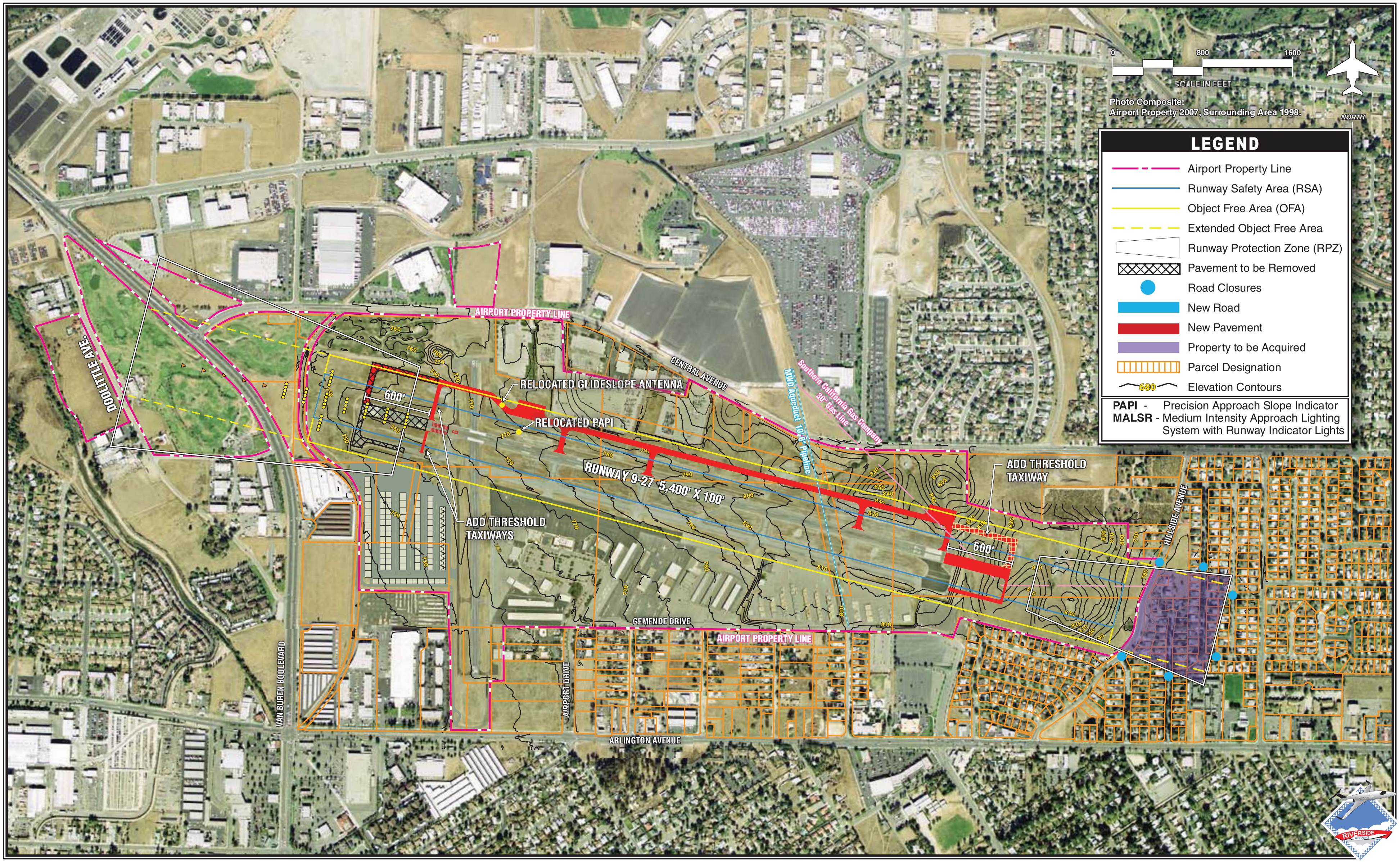

Exhibit 4C
RSA ALTERNATIVE B
RUNWAY SHIFT

impacts on the capability of the runway to serve these critical aircraft. Advisory Circular 150/5220-22A, *Engineered Materials Arresting Systems (EMAS) for Aircraft Overruns*, published in September 2005, 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." Therefore, no reduction in runway length can be considered to meet RSA standards.

RSA Alternative D:
Combination Method

The combination method provides for the flexibility to combine runway relocation, shifting, realignment, or reduction in order to provide the full RSA. As discussed above, relocation, realignment, runway shift, and runway length reduction are not practicable; therefore, a combination method is not feasible.

RSA Alternative E:
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 the threshold to complete the approach, touchdown, and decelerate to a stop, plus safety factors.

The TORA and TODA are equal to the actual runway length as a clearway is not provided at the airport. The ASDA and the LDA are the primary considerations in determining the runway length available for use by aircraft, as these calculations must consider providing the RSA to standard in operational calculations. The ASDA and LDA can be figured as the usable portions of the runway length less the distance required to maintain adequate RSA beyond the ends of the runway or prior to the landing threshold. By regulation, a full 1,000 feet of RSA must be available at the far end of a departure operation in the ASDA calculation. For LDA calculations, 600 feet of RSA is required prior to the landing threshold and 1,000 feet of RSA is required beyond the far end of the landing operation. Declared distances are not currently implemented at Riverside Airport.

Exhibit 4D presents the implementation of declared distances to meet RSA standards for a C-II runway at Riverside Airport. The Runway 9 landing threshold would be relocated 200 feet to the east. The Runway 27 departure threshold, as identified at night by red runway end lighting, would be located 600 feet from the pavement end. As shown on the exhibit, the ASDA for Runway 9 would be the full 5,400 feet as the full 1,000 feet of RSA can be provided beyond Runway 27, provided this area is graded to standard. The Runway 9 LDA would be reduced to 5,200 feet, the length necessary to provide the 600 feet of required RSA prior to the landing threshold. The ASDA and LDA for Runway 27 would be reduced to 4,800 feet. This ensures 1,000 feet of RSA is available at the far end of takeoff and landing operations on Runway 27.

Aircraft typically require greater runway length for take-off than for landing. According to ATCT personnel, Runway 27 is utilized nearly 90 percent of the time. Therefore, the implementation of declared distances as described would have a negative operational impact on airport operations. As described before, 5,400 feet of runway length is needed at the airport to support the critical aircraft. Negatively impacting operations in order to meet RSA standards is not required by the FAA. Therefore, implementing declared distances to meet RSA standards is not a viable alternative.

RSA Alternative F: Engineered Materials Arresting System (EMAS)

EMAS is an engineered compressible concrete material that is located beyond the runway end for the purpose of safely stopping an aircraft overrun. EMAS is not considered as a substitute for aircraft undershoots; thus, 600 feet of RSA is still necessary prior to the landing threshold.

EMAS functions similar to the sandy, high-speed exits provided on highways in mountainous terrain in order to safely stop a runaway tractor trailer. The FAA considers the installation of EMAS as an acceptable substitute to providing the full RSA. 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 evaluating an EMAS alternative and for determining the maximum financially feasible cost for RSA improvements is provided in FAA Order 5200.9, *Financial Feasibility and Equivalency of Runway Safety Area Improvements and Engineered Material Arresting Systems*.

A standard EMAS installation is capable of safely stopping a design aircraft that leaves the runway end traveling at 70 knots or less. The RSA where the EMAS is located should also provide for potential short landings to

RUNWAYS	DECLARED DISTANCES ASDA	LDA
Runway 9	5,400	5,200
Runway 27	4,800	4,800

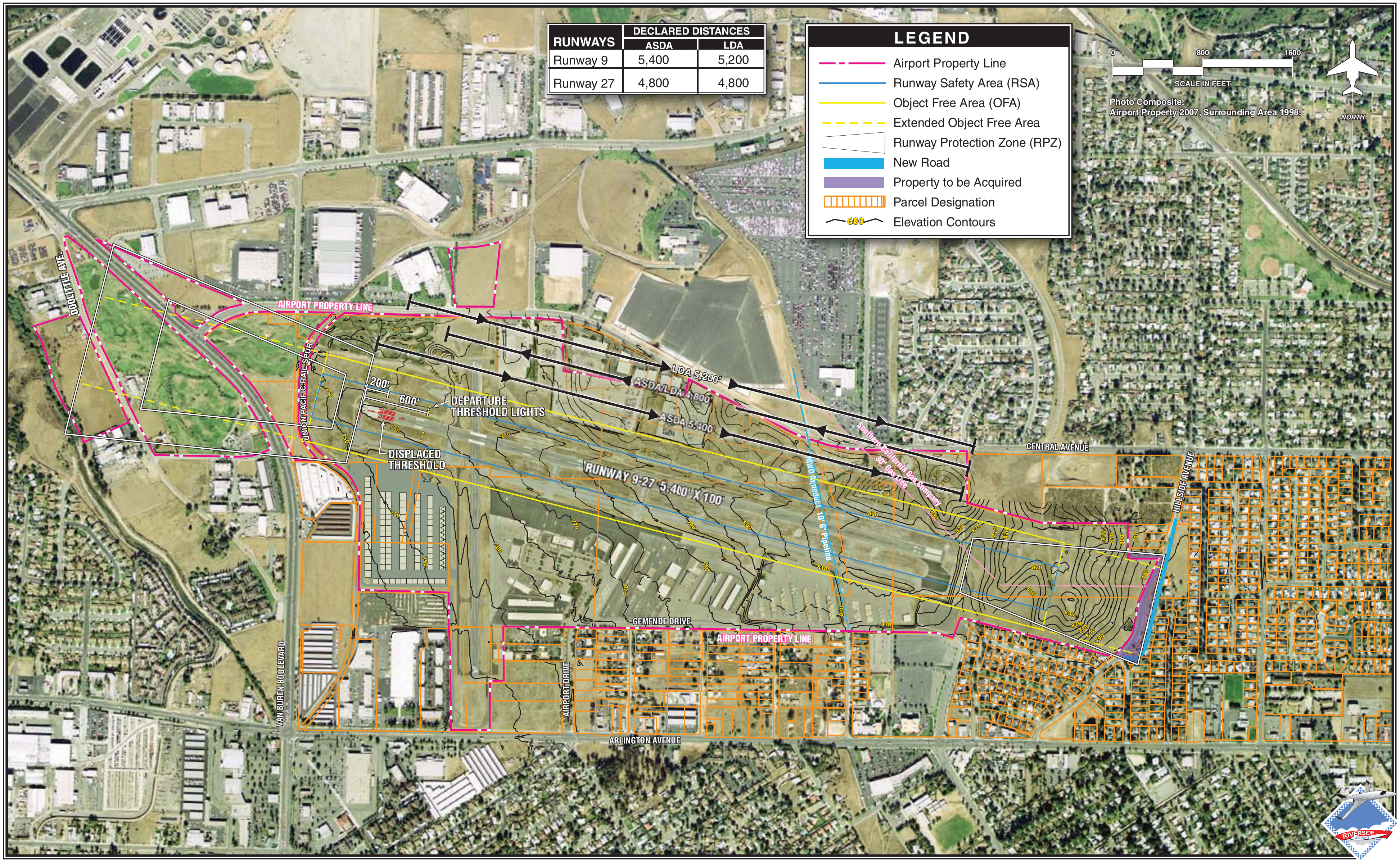

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Exhibit 4D
RSA ALTERNATIVE E
DECLARED DISTANCES

runway ends with vertical guidance. Vertical guidance to Runway 9 is available via the instrument landing system (ILS) or visually from the precision approach path indicator (PAPI) lights. Therefore, a standard EMAS bed would be a portion of the 600-foot RSA needed prior to landing.

The standard EMAS bed, as presented on **Exhibit 4E – Option 1**, would be 220 feet long with a 380-foot lead-in. The lead-in area is an essential factor in calculating the stopping ability of the EMAS bed. This EMAS bed at Riverside Airport would require the implementation of declared distances in order to provide the full 600-foot RSA prior to landing. The ASDA for Runway 9 would remain at 5,400 feet as the first 200 feet of the runway would still be available for take-off calculations to the east. The LDA for Runways 9 and 27 and the ASDA for Runway 27 would be limited to 5,200 feet.

As previously discussed, the FAA will not require an airport to reduce its runway length or declare its length to be less than the actual length to meet safety area standards if either action adversely affects operations by the design aircraft. The installation of a standard EMAS bed will cause the loss of 200 feet of runway length at the airport. This would adversely affect aircraft operations, as the full 5,400 feet of runway length would not be available.

A second alternative for installing a standard EMAS that does not adversely impact operations by the critical aircraft is to relocate the Union Pacific railroad spur. The railroad spur would have to be relocated approximately 125 feet to the west. Consultation with Union Pacific representatives indicates moving the spur, as shown on **Exhibit 4E – Option 2**, is acceptable as long as the city pays for the relocation. This cost would be included when determining the financial feasibility of installing an EMAS bed.

There are several additional benefits to consider when including a relocation of the railroad spur in order to provide adequate safety area. First, EMAS is a solution that has only been supported for runways with a critical aircraft in ARC C-II or larger. Riverside Airport is currently a B-II airport; therefore, a short term solution to providing the required 600 feet of RSA prior to Runway 9 is still necessary. Relocating the railroad tracks will allow the airport to meet the ARC B-II standards as well. Second, there would not be a need to shorten or shift the runway to accommodate safety area.

If relocating the railroad spur is not feasible, then another option is to provide a longer EMAS bed. At Riverside Airport, this EMAS bed would be 265 feet long with a 210-foot lead-in, as presented on **Exhibit 4E – Option 3**. This EMAS is capable of stopping the future C-II critical aircraft at 70 knots or less. This EMAS installation would allow the ASDA and LDA for Runway 27, the predominant operational direction, to remain at 5,400 feet. The ASDA for take-offs on Runway 9 would also be 5,400 feet. Only the LDA for Runway 9 would be shorter at 5,275 feet. This may be acceptable, as the LDA for Runway 9 is the least critical of declared distance measurements. This is because landings to Runway 9 are less frequent as compared to take-offs from either end or landings to the Runway 27 end.

It should be noted that the OFA in each of the three EMAS alternatives would still slightly clip the railroad spur. This may be acceptable to the FAA via a modification to standard or final engineering of the EMAS might be slightly altered to accommodate a cleared OFA.

RSA Alternative Summary

Each of the six RSA mitigation alternatives, as prescribed by the FAA, has been analyzed in their application to Riverside Airport. **Table 4B** presents a summary of the feasibility of the RSA alternatives.

TABLE 4B
Runway Safety Area Analysis Summary
Riverside Airport

Option #	Exhibit #	RSA Alternative	Feasible?	Comments
1	4B	Provide full RSA	No	Van Buren Avenue is fixed. High cost to re-locate.
2	4C	Relocate, shift, or realign runway	No	High cost of property acquisition.
3	NA	Reduce runway length	No	Negative impact to operations.
4	NA	Combination method of runway reduction, relocation, or shifting	No	Negative impact to operations.
5	4D	Declared distances	No	Negative impact to operations.
6	4E	**EMAS**		
		Option 1 - Declared Distances	No	Declared distances leads to a negative impact on operations.
		Option 2 – Relocate Rail Spur	Yes	Re-route railroad spur. No declared distances.
		Option 3 – Longer EMAS Bed	Yes	Declared distances but no negative impact to operations.

Source: Coffman Associates analysis of FAA Order 5200.8 Runway Safety Area Program

Only an EMAS alternative is considered feasible for providing full RSA compliance at Riverside Airport for ARC C-II standards. Three EMAS alternatives were considered. The first would require the implementation of declared distances that would in effect reduce the runway length. FAA policy does not require an airport to reduce runway length if it would have a negative operational impact on the airport. Reducing runway length, particularly the ASDA for Runway 27, would have a negative operational impact.

The second EMAS alternative considered relocating the railroad spur 125 feet to the west. This would allow space for the EMAS bed and the appropriate lead-in distance and would not require declared distances. By relocating the railroad spur this alterna-

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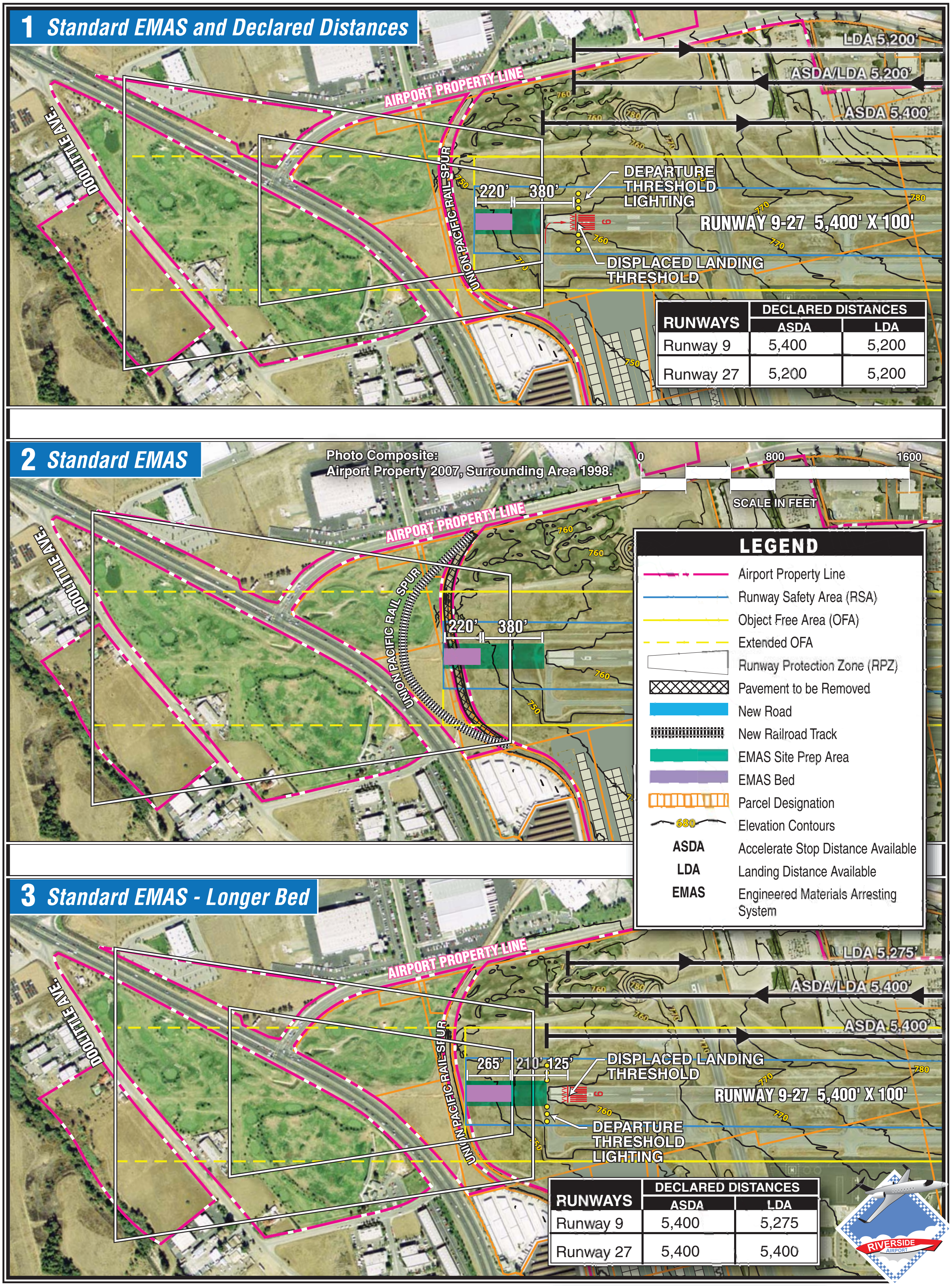


RUNWAYS	DECLARED DISTANCES	
	ASDA	LDA
Runway 9	5,400	5,200
Runway 27	5,200	5,200

RUNWAYS	DECLARED DISTANCES	
	ASDA	LDA
Runway 9	5,400	5,275
Runway 27	5,400	5,400

Exhibit 4E
RSA ALTERNATIVE F

tive would have the added benefit of allowing the airport to meet RSA standard (600') beyond the runway end for the current ARC B-II critical aircraft. Then in the future when the airport transitions to ARC C-II, an EMAS installation will provide the equivalent safety level for ARC C-II RSA.

The third option considered the installation of a longer EMAS bed. This installation would not require the relocation of the railroad spur, but it would probably not be supported by the FAA until the airport transitions to ARC C-II. Thus, the RSA would remain non-standard until that transition takes place sometime in the future. This alternative does require the implementation of declared distances but only landings to Runway 9 would be shortened. This is the operational direction with the least impact and this alternative is therefore still considered viable.

Financial consideration must be made prior to a final RSA recommendation. FAA Order 5200.9, *Financial Feasibility and Equivalency of RSA Improvements and EMAS*, provides guidance on the maximum feasible expenditure (cost) for improving the RSA with an EMAS component. The maximum cost is applied to the entire RSA, including both runway ends and the full width of the RSA. The maximum feasible cost is a function of the EMAS bed length. For EMAS Options 1 and 2, the maximum feasible cost is approximately $10.5 million. For Option 3, the maximum feasible cost is approximately $12 million.

The manufacturer of EMAS (ESCO-Zodiac) was contacted and provided with the RSA specifications for Riverside Airport. The manufacturer indicated the EMAS bed would need to be the width of the runway. The area prepared for the EMAS bed would include 25 feet to each side and the lead-in area. The manufacturer has indicated that the life cycle of EMAS is the same as concrete pavement, or approximately 20 years.

The manufacturer provided cost estimates for Riverside Airport that included materials and installation. The site preparation is not included. The EMAS solution provided in Options 1 and 2 is estimated to cost $2.4 million (2007 prices). The cost estimate for the EMAS solution in Option 3 is $2.9 million.

Option 2 includes the relocation of the railroad spur in order to provide space for a standard EMAS installation in the future. The Union Pacific Railroad was contacted and they indicated that the cost to relocate the spur to the west, adjacent to Van Buren Avenue, is approximately $300 a linear foot. As presented in Option 2, approximately 1,600 linear feet of new rail line would be necessary at a cost of $480,000. Therefore, the estimated cost of Option 2, including a relocation of the rail spur, is slightly less than the cost of Option 3, with a longer EMAS. The cost summary is presented in **Table 4C**.

TABLE 4C
EMAS Cost Summary
Riverside Airport

EMAS Option	EMAS Bed Length	Maximum Feasible Cost from the FAA[1]	Estimated Materials and Labor Cost[2]	Additional Costs[3]	Total Cost
1*	220'	$10.5 million	$2.4 million	NA	$2.4 million
2	220'	$10.5 million	$2.4 million	$480,000	$2.9 million
3	265'	$12 million	$2.9 million	NA	$2.9 million

* Not feasible due to need to declare runway shorter.
Source: FAA Order 5200.9[1]; Zodiac-ESCO[2]; Union Pacific Railroad[3].

In conclusion, EMAS Alternative – Option 2 is the most feasible solution to meeting RSA standards at Riverside Airport. This option has the added benefit of being able to be implemented in phases. The railroad spur can be programmed for relocation immediately, as this will provide for 600 feet of RSA needed to meet current ARC B-II standards. When the airport transitions to ARC C-II a standard EMAS bed can then be installed to provide an equivalent level of safety to the 1,000-foot design standard.

The suggested method to improving the RSA beyond the Runway 27 end is to utilize north side fill material to bring the RSA up to grade. This, too, can be accomplished in phases as only 600 feet is necessary to meet current B-II standards, but 1,000 feet will be needed ultimately.

Based on this analysis of the RSA mitigation alternatives which followed criteria outlined in FAA Order 5200.8, *Runway Safety Area Program,* it is recommended that the FAA Regional Airports Division Manager make the following determination:

- The existing RSA does not meet the current standards, but it is practicable to improve the RSA so that it will meet current standards.

ARC B-II SAFETY AREA

While the previous analysis indicates that the airport can meet future C-II RSA standards with the installation of an EMAS bed, it is still incumbent upon the airport to explore alternatives to meeting the current B-II standards. The RSA should currently extend 600 feet beyond each runway end. To the west of Runway 9, only 475 feet is available and to the east of Runway 27, only 100 feet is available due to a lack of proper grading.

The area to the east of Runway 27 is planned to be brought to grade with fill dirt from the north side of the airport. This project is planned when construction of the north side parallel taxiway begins.

Two immediate solutions to the non-standard RSA to the west of Runway 9 are available. The first is to re-route the railroad spur approximately 125 feet to the west. This was also the first step in providing space for a standard EMAS bed to accommodate the C-II RSA in the future, which was previously shown on **Exhibit 4E – Option 2**.

A second option would be to shift the runway at least 125 feet to the east. This would involve removing 125 feet of pavement from the Runway 9 end and adding 125 feet to the Runway 27 end. The taxiways leading to both runway ends would have to be relocated. The instrument approaches would have to be re-developed, and the approach lights and localizer would have to be relocated. The glide slope antenna may also need to be relocated.

Shifting the runway 125 feet to the east to meet ARC B-II standards would not introduce any new properties to the RPZ immediately but when the airport transitions to ARC C-II, a total of 20 properties would be impacted by the RPZ. Hillside Avenue would also traverse the RPZ and would need to be closed at this point or re-routed to meet the FAA Western-Pacific region position prohibiting public roadways in an RPZ.

RUNWAY LENGTH AND RUNWAY PROTECTION ZONES

In Chapter Three – Facility Requirements, the necessary runway length was discussed in detail. It was determined that the current runway can accommodate 75 percent of large business jets (under 60,000 pounds) at 60 percent useful load. A runway length of 6,400 feet would be necessary to accommodate 100 percent of large business jets at 60 percent useful load. Some aircraft models included in the 100 percent category are the Challenger 300/600/604, Cessna Citation models 650/750, Falcon 900EX/2000/2000EX, Lear 55/60, and Hawker 800XP/1000.

The activity of this grouping of aircraft does not currently exceed the FAA threshold of 500 annual operations needed to justify extending the runway. There is a possibility that this grouping of aircraft may exceed the FAA minimum operational threshold sometime during the 20-year scope of this master plan, thereby justifying a 1,000-foot runway extension.

The previous master plan included a 753-foot extension to the east. The length of this extension was limited to 753 feet to allow the RSA and OFA to remain on airport property and be clear of obstructions. The previous master plan fully recognized that the RPZ would extend over residential development which, according to FAA standards, should remain outside the RPZ. The previous ALP and master plan did not depict the acquisition of these parcels at the request of the City.

Since the completion of the previous master plan, the FAA Western-Pacific Region Airports Division is requiring airport sponsors to keep RPZs clear of public roadways. A special emphasis is placed on maintaining the Central Portion of the RPZ (the extended OFA line) clear, as recently defined in AC 150/5300-13, Change 11, *Airport De-*

sign. This allows a relocated road to cut through the outer corners of the RPZ.

While the FAA generally allows existing incompatibilities to remain, the introduction of new incompatibilities to the RPZ, either by design (e.g., runway extension) or by a change in the role of the runway (e.g., transition to ARC C-II), has not been supported. The FAA requires that airport sponsors make efforts to own and clear the RPZs of incompatible development.

Any extension of Runway 9-27 would have to be justified by the activity of ARC C-II aircraft, which fall within the 75 to 100 percent category of business jets as defined in Chapter Three. To meet the needs of these aircraft, a full 1,000-foot extension of Runway 9-27 would be needed. While the previous master plan only showed a 753-foot extension of Runway 9-27 in the final program, the facility requirements and alternatives analysis examined extending the Runway by 1,000 feet. In addition to the 753-foot extension to the west, the previous master plan considered a 247-foot extension to the west. Ultimately, the FAA required that the City remove the 247-foot extension to the west, from the ALP.

Therefore, analysis of a 1,000-foot extension will be considered in this master plan. Consideration of an extension of less than 1,000 feet would not fully accomplish the goal of a runway extension as it would not fully meet the needs of large C-II aircraft and would not meet the next incremental runway length step from 5,400 feet to 6,400 feet.

With a 1,000-foot extension, all or a portion of 86 parcels of residential development would be located within the RPZ. Hillside Avenue would continue to be located within the limits of the RPZ as would Phoenix Avenue. Phoenix Avenue is the next north/south road connecting Arlington and Central Avenue. Were these roads to be closed, Streeter Avenue would be the first "through" street until Van Buren Boulevard, a distance of approximately two miles. This distance may create traffic congestion issues as traffic that once used Hillside Avenue would be forced onto the more distant Streeter Avenue.

While the cost of acquiring these properties would likely be more than $34 million (86 x $400,000 est.), the environmental and social impacts may be of greater concern. Several roads and neighborhood streets would have to be closed, property owners would have to be relocated at the expense of the airport, and an existing community would be divided and disrupted. The impact to community continuity is also measured. In addition, community opposition to this level of acquisition could be a factor.

A runway extension and related property acquisition project of this magnitude would require more than $5 million discretionary dollars from the FAA. Therefore, a Benefit-Cost Analysis (BCA) would be required by the FAA. The BCA would weigh the benefit of the runway extension (extra fuel sales, time and cost savings from reducing intermediate fuel stops), against the cost of runway construction, property acquisition, and relocations. Today, with only a handful of operations by these types of aircraft annually, the benefit/cost would most likely not be met.

Exhibit 4F illustrates the residential properties located within the RPZ when runway length is added to the east end of Runway 27. Three separate scenarios are shown. The first illustrates the location of the current Runway 27 ARC B-II RPZ in yellow. The RPZ remains entirely on airport property. If the airport were to transition to ARC C-II design standards, then the longer yellow RPZ would apply. This RPZ would cross Hillside Avenue and include approximately 10 residential parcels.

The second scenario, illustrated in blue, shows a 600-foot runway extension and ARC B-II and C-II RPZs. This extension comprises the shift of Runway 9-27 to the east to meet RSA standards as previously shown on **Exhibit 4C**. A B-II RPZ remains on airport property except for small portions that crosses Hillside Avenue. The C-II RPZ extends well over Hillside Avenue and encompasses approximately 56 residential parcels.

The third scenario illustrates the full 1,000-foot runway extension. Since a 1,000-foot extension is only justified by a transition to a C-II critical aircraft, only a C-II RPZ is shown. As previously mentioned, this RPZ would encompass approximately 86 parcels. In addition, seven roads would cross the RPZ and would need to be closed or re-routed to meet the FAA Western-Pacific position prohibiting public roadways within an RPZ.

LANDSIDE PLANNING ISSUES

Landside planning issues, summarized on **Exhibit 4A**, will focus on facility locating strategies following a philosophy of separating activity levels. The number of structures and the storage capacity potentially available is not limitless. Therefore, it is important to plan for an appropriate mix of smaller T-hangars, box hangars, and larger conventional hangars.

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 valuable space along the flight line.

Activity in the terminal area should 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 a 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 used for 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 up 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.

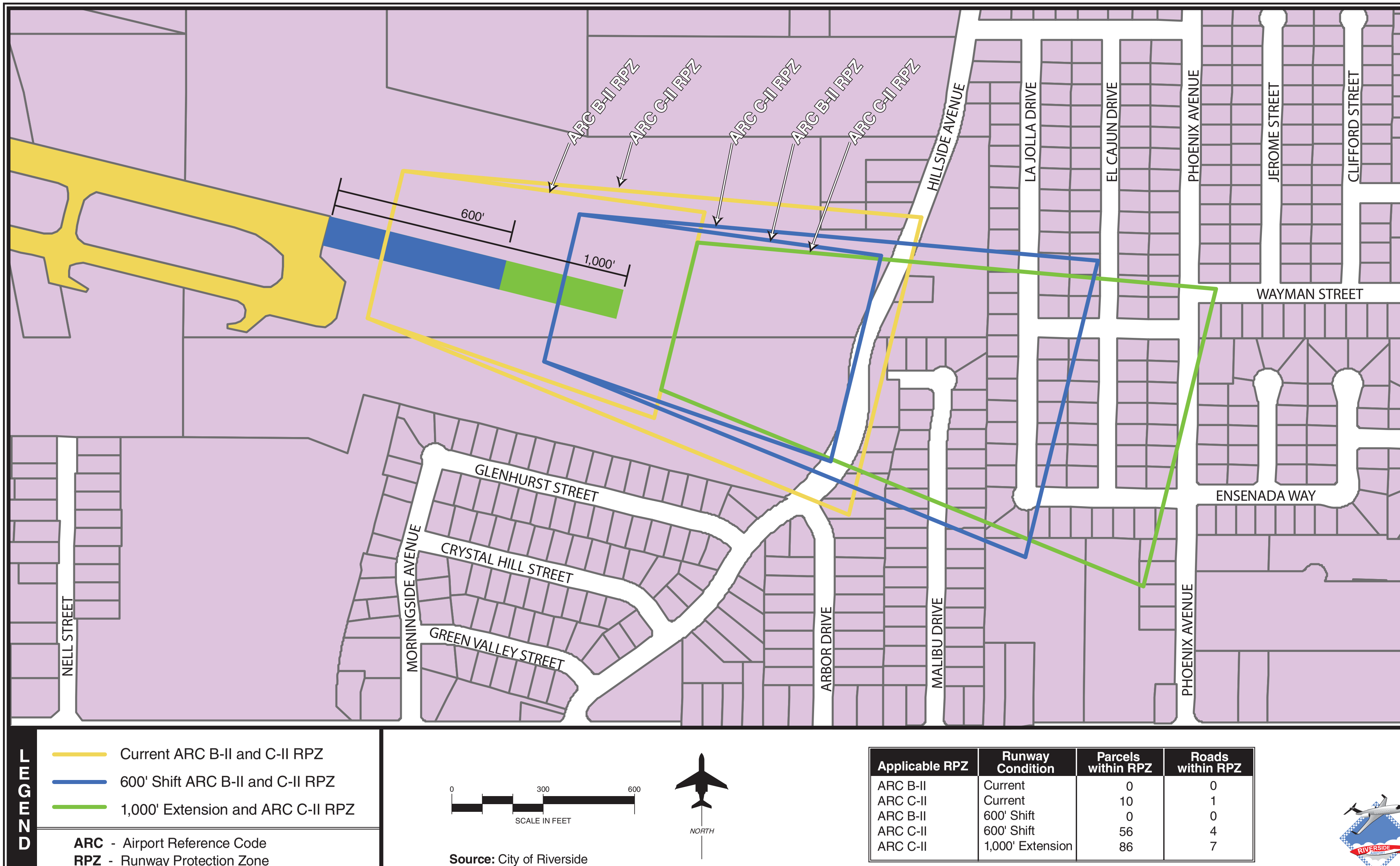
The low-activity use category defines the area for storage of smaller single and twin-engine aircraft. Low-activity users are personal or small business aircraft owners who prefer individual space in T-hangars or small executive hangars. Low-activity areas should be located in less-conspicuous areas, 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 Riverside Airport. Consideration to aesthetics should be given high priority in all public areas, as the airport can many times serve as the first impression a visitor may have of the community. Aesthetic standards compatible with the City General Plan should be applied to airport development.

The existing terminal area at Riverside Airport has, for the most part, followed the separation of activity levels philosophy. The terminal building faces a large central ramp area with hangar areas located to the sides. The current FBO area includes a mix of T-hangars, box, and conventional hangars.

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.

Potential locations for a replacement airport traffic control tower (ATCT) will be identified in conjunction with proposed landside alternatives. Care has been given in development of the landside alternatives to meet both mandatory and non-mandatory ATCT siting requirements as provided in FAA Order 6480.4, *Airport Traffic Control Tower Siting Criteria*. 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.



Source: City of Riverside

Applicable RPZ	Runway Condition	Parcels within RPZ	Roads within RPZ
ARC B-II	Current	0	0
ARC C-II	Current	10	1
ARC B-II	600' Shift	0	0
ARC C-II	600' Shift	56	4
ARC C-II	1,000' Extension	86	7

Exhibit 4F
RUNWAY EXTENSION/
SHIFT CONSIDERATIONS

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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 the growth in jet traffic utilizing Riverside Airport, there is an additional need for executive hangars or corporate parcels for development of hangars. Elements such as automobile parking, security, and aircraft apron areas are addressed in order to appropriately support new facility development.

VEHICULAR ACCESS AND PARKING

A planning consideration for any airport master plan is the segregation of vehicles and aircraft operational areas. This is both a safety and security consideration for the airport. Aircraft safety is reduced and accident potential increased when vehicles and aircraft share the same pavement surfaces. Vehicles contribute to the accumulation of debris on aircraft operational surfaces, which increases the potential for Foreign Object Damage (FOD), especially for turbine-powered aircraft. The potential for runway incursions is increased, as vehicles may inadvertently access active runway or taxiway areas if they become disoriented once on the aircraft operational area (AOA). Airfield security may be compromised as there is loss of control over the vehicles as they enter the secure AOA. The greatest concern is for public vehicles, such as delivery vehicles and visitors, which may not fully understand the operational characteristics of aircraft and the markings in place to control vehicle access. The best solution is to provide dedicated vehicle access roads to each landside facility that is separated from the aircraft operational areas with security fencing.

The segregation of vehicle and aircraft operational areas is supported by FAA guidance established in June 2002. FAA AC 150/5210-20, *Ground Vehicle Operations on Airports*, states, "The control of vehicular activity on the airside of an airport is of the highest importance." The AC further states, "An airport operator should limit vehicle operations on the movement areas of the airport to only those vehicles necessary to support the operational activity of the airport."

The landside alternatives for Riverside Airport have been developed to reduce the need for vehicles to cross an apron or taxiway area. Dedicated vehicle parking areas, which are outside the airport fence line, are considered for all potential hangars.

TERMINAL AREA DEVELOPMENT ALTERNATIVES

The Riverside Airport property is nearly fully developed with the exception of the north side of the runway. Engineering and design of a north side parallel taxiway is currently taking place, which will open up this area for development. With completion of the parallel taxiway to Runway 16-34, the planned west side development is well underway. This complex will provide 75 new hangar positions and two FBO hangars. The south side flight line is fully developed, but some opportunities for infill hangars or hangar redevelopment may exist.

Exhibit 4G presents three development alternatives for the south terminal area. **Option 1** considers redevelopment of a portion of the terminal building parking lot. This lot encompasses approximately 120,000 square feet of space which is much more than necessary to serve airport terminal area users. **Option 1** considers the potential of converting approximately 50 percent of the parking lot to aviation uses. As depicted, eight medium-sized box hangars could be placed in this area. Airfield access would then be available via a new taxilane extending to the west ramp area.

This option also considers meeting the FAA standard for the runway visibility zone. The runway visibility zone should be clear of visual obstructions so that a pilot on one runway can see clearly to the other runways. To meet this standard, two structures are depicted as being removed and replaced with aircraft parking ramp. The terminal building is also within the runway visibility zone. If the terminal building is ever considered for replacement, it should be relocated to outside of the runway visibility zone.

To the east of the terminal area, in the area currently occupied by the FBO, there is a mixture of conventional, box, and T-hangars. Some of these facilities have reached the end of their useful life and are in need of some significant repairs. These areas may provide opportunities for redevelopment. As depicted, three of the oldest T-hangar structures are shown as being redeveloped as box hangars. In addition, a 14-unit hangar structure is southwest of the FBO hangar, adjacent to the airport entrance road.

The east end of the airport is currently occupied by several rows of Port-a-Port hangars. These hangars are some of the oldest on the airport. Ultimately, the airport management may elect to redevelop this area with more permanent structures. Currently, these hangars provide an aircraft storage type and fee structure that meets demand in the region. These hangars are fully occupied and provide a steady revenue stream to the airport.

The second terminal area alternative depicted on **Exhibit 4G – Option 2,** considers a slightly different approach to development of a portion of the terminal building parking lot. In this alternative, a taxilane again provides access to the west terminal area ramp, but it then extends toward the terminal building. This alternative would utilize the western half of the parking lot and provide for four small box hangars.

The eastern terminal area reflects redevelopment of the oldest hangars and the addition of a T-hangar facility. A small T-hangar structure located near the FBO facility is considered for demolition. This would open up more space for transient aircraft parking near the FBO.

Interviews with the FBO operator indicated that a lack of ramp space has constrained their operations. Only one or two larger aircraft, business jets in particular, are able to park on the ramp at one time. The FBO oper-

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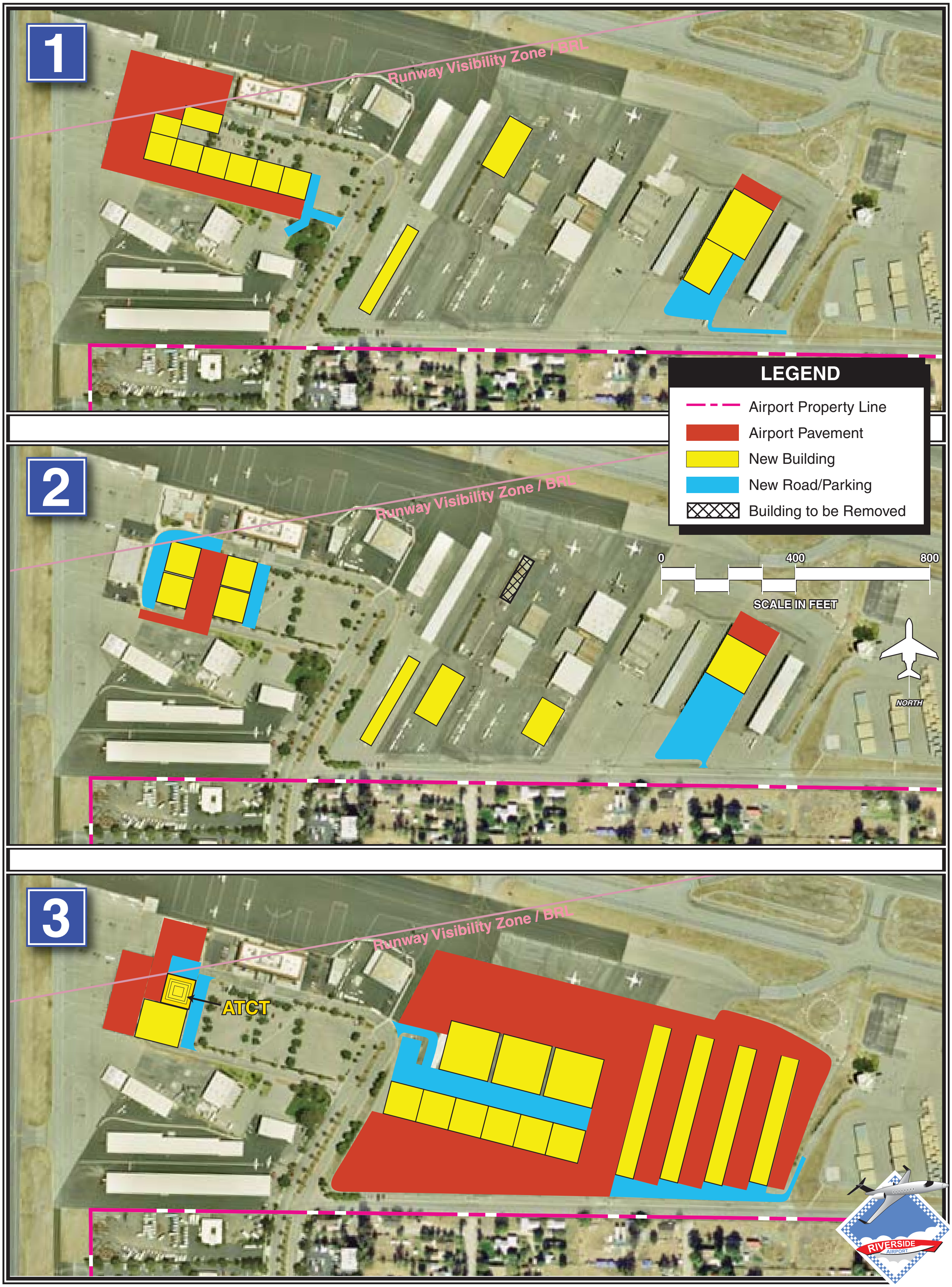


Exhibit 4G
TERMINAL AREA ALTERNATIVES

ator believes this has led business jet operators to utilize other, less convenient airports.

The third terminal area development alternative shown on **Exhibit 4G – Option 3**, considers removal of the two buildings in the runway visibility zone. Not only are these two buildings in the runway visibility zone but they also occupy valuable flight line space. Flight line space should be reserved for activity that requires airfield access. Typically, this would include aviation-related businesses, FBOs, or aircraft storage space.

As depicted, one large conventional hangar is located on the western portion of the terminal building parking lot. Adjacent to this hangar is a potential replacement ATCT.

To the east, in the current FBO complex, an entire redevelopment plan is considered. Redevelopment of this area should consider providing more ramp space a priority. Currently, the FBO can experience congestion on its limited ramp space. A main ramp providing approximately 25,000 square yards is depicted in this alternative. This ramp is fronted by three large conventional hangars. Set to the east side are four rows of T-hangars which may provide 75 units. Set to the back is a series of medium-sized box hangars. These hangars could house airport specialty operators (aircraft painting, upholstery, maintenance, avionics, etc.) or corporate aircraft storage.

Redevelopment of any existing facility must be considered carefully. The City or developer would need to weigh the cost of construction and temporary lost revenue verses the increased revenue generated by the new facilities, and presumably higher lease rates.

NORTH SIDE DEVELOPMENT ALTERNATIVES

The north side of the airport offers nearly 30 acres of developable land. With the construction of the west side hangar complex, the remaining aircraft storage need is for larger hangars intended to accommodate corporate aircraft, particularly larger turboprops and business jets.

As previously discussed, a north side parallel taxiway is currently planned at a separation distance of 300 feet from the runway. This separation is acceptable as it meets current ARC B-II standards. In the future, when the airport transitions to ARC C-II, a modification to standard will need to be obtained from the FAA for runway/taxiway separation. This request appears reasonable considering Taxiway A is separated from the runway by 275 feet. The FAA has approved projects for Taxiway A in this location, including the current reconstruction project. In addition, it was previously demonstrated that the safety margin provided at this separation distance is acceptable. If a modification to standard cannot be obtained for the north side parallel taxiway, then the taxiway may have to be moved to a separation distance of 400 feet.

The previous master plan provided a similar parcel layout to the layout depicted on the top half of **Exhibit 4H**. This layout considers individual parcels of approximately three acres in size. This size of parcel would allow for the development of ramp space, automobile parking, and a large conventional hangar. Two smaller box hangars could be developed instead of a large hangar.

The previous master plan provided a vehicle access point in the northwest corner near the Riverside Police facilities. The top half of **Exhibit 4H** considers a second entrance point, about midway between the east and west ends of the parcels. The bottom half considers a through road that would have entrances at the police facility and an eastern entrance at the intersection of Central Avenue and Fremont Street. This is a three-way signalized intersection that could be converted to a four-way if access to the airport is made available at this point.

The bottom half of **Exhibit 4H** depicts one potential hangar layout. As can be seen, several large conventional hangars or smaller box hangars can be accommodated along this flight line. Ramp is also available for parked aircraft or aircraft maneuvering.

Exhibit 4H also depicts two potential sites for a replacement ATCT. If a replacement tower is to be constructed, every effort should be made to relocate to an area that allows maximum visibility of the airfield. As previously discussed, the line-of-sight from the current tower to the southern portion of Runway 16-34 and the ramp are obstructed. The first potential site is on the north side of the airfield near the police facilities. This location would provide visibility to all runway ends and all ramp areas. A second location for consideration is to the west of the terminal building as previously depicted on **Exhibit 4G-Option 3**. This location would also provide full field visibility.

LANDSIDE SUMMARY

There is limited available developable space on the airport. The north side of the airfield provides the greatest opportunity. A parallel taxiway is currently in design. This taxiway will open this area for significant development just as the parallel taxiway to Runway 16-34 did the same for the west property.

While the potential layout alternatives for the north side are limitless, the airport should insure that an appropriate mix of aircraft storage types is made available. According to the forecasts presented in Chapter Two, the new west side hangar complex will provide adequate space for piston powered aircraft. A few of the hangars would also be capable of accommodating small business jets. There-fore, much of the north side space should be targeted to operators of medium and large business jets. If the forecast of 12 based jets over the course of the next 20 years materializes, then much of this property would likely be needed for large hangars.

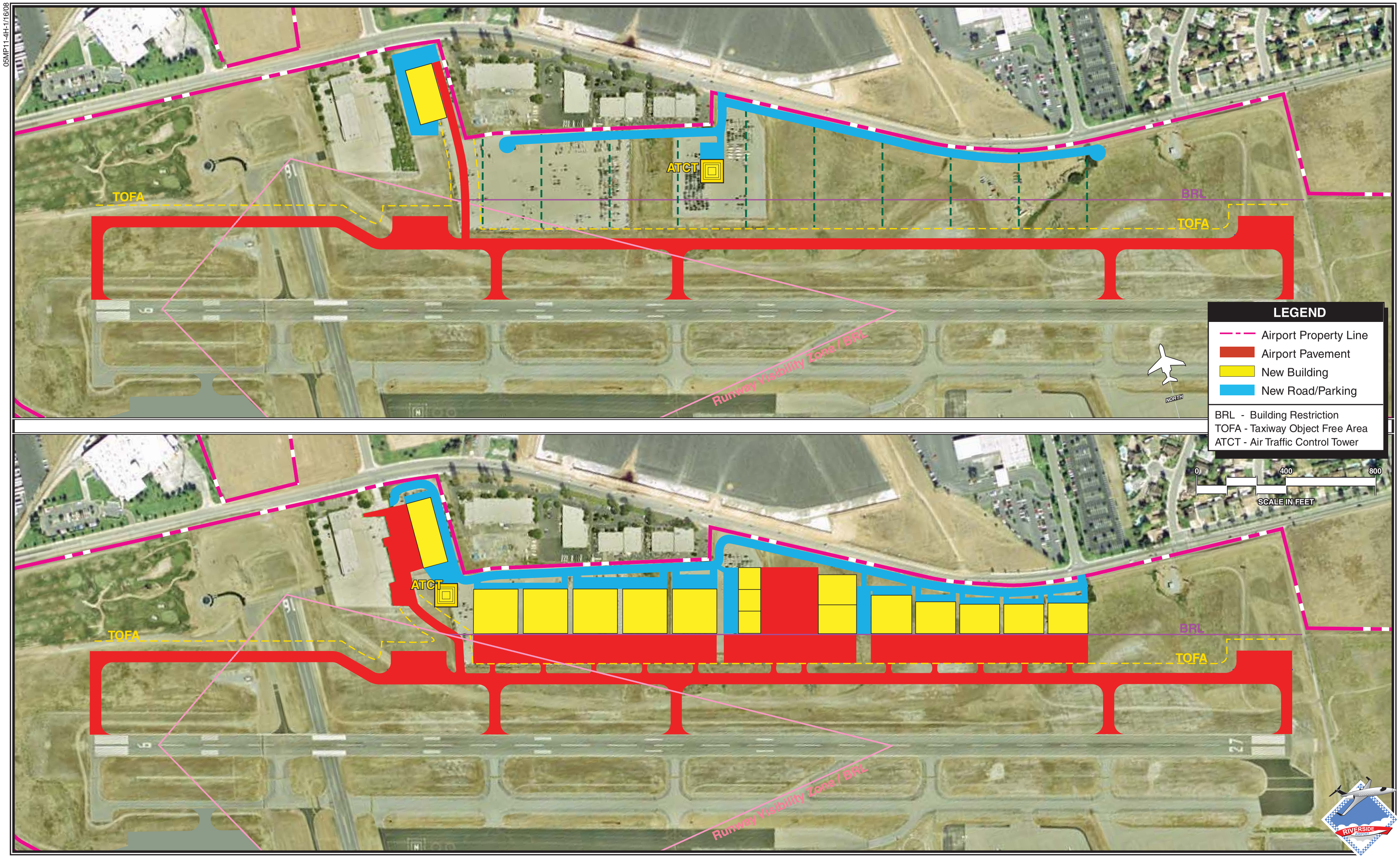


Exhibit 4H
NORTH SIDE
DEVELOPMENT ALTERNATIVES

ALTERNATIVES SUMMARY

The process utilized in assessing the airside and landside development alternatives involved a detailed analysis of short and long term requirements, as well as future growth potential. Current and future airport design standards were considered at every stage in the analysis. Safety issues, both air and ground, were given the highest priority in the analysis of alternatives.

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 resultant plan will represent an airside facility that fulfills safety design standards, and a landside complex that can be developed as demand dictates.

The following chapters will be dedicated to refining the basic concept into a final plan, with recommendations to ensure proper implementation and timing for a demand-based program.

Chapter Five

RECOMMENDED MASTER PLAN CONCEPT

Recommended Master Plan Concept

The airport master planning process for Riverside Airport (RAL) has evolved through the development of forecasts of future demand, an assessment of future facility needs, and an evaluation of airport development alternatives to meet those future facility needs. The planning process has included the development of two phase reports which were presented to the Planning Advisory Committee (PAC) and discussed at several coordination meetings and a public information workshop. The City of Riverside has participated in each of these meetings and has been actively involved in the master planning process.

The PAC is comprised of several constituencies with an investment or interest in Riverside Airport. Groups represented on the PAC include the Federal Aviation Administration (FAA), the California Department of Transportation - Division of Aeronautics (CALTRANS), the Riverside County Airport Land Use Commission, the City of Riverside (Planning, Economic Development, Public Works, and City Council), Southern California Association of Governments (SCAG), the airport commission, airport management, airport traffic control tower personnel, airport businesses, and local and national aviation associations. 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 Riverside Airport. The development alternatives have been refined into a single recommended

concept for the master plan. This chapter describes, in narrative and graphic form, the recommended direction for the future use and development of Riverside Airport.

RECOMMENDED MASTER PLAN CONCEPT

The recommended master plan concept incorporates elements from each of the airside and landside alternatives presented in the previous chapter. This concept provides the airport with the ability to meet the increasing demands on the airport by larger corporate aircraft, while also providing adequate space for smaller piston aircraft operators. The recommended master plan concept, as presented on **Exhibit 5A**, presents the ultimate configuration for the airport that preserves and enhances the role of the airport while meeting FAA defined design standards. A phased program to implement the recommended development configuration will be presented in Chapter Six - Capital Improvement Program. The following sub-sections will describe the recommended master plan concept in detail.

AIRSIDE CONCEPT

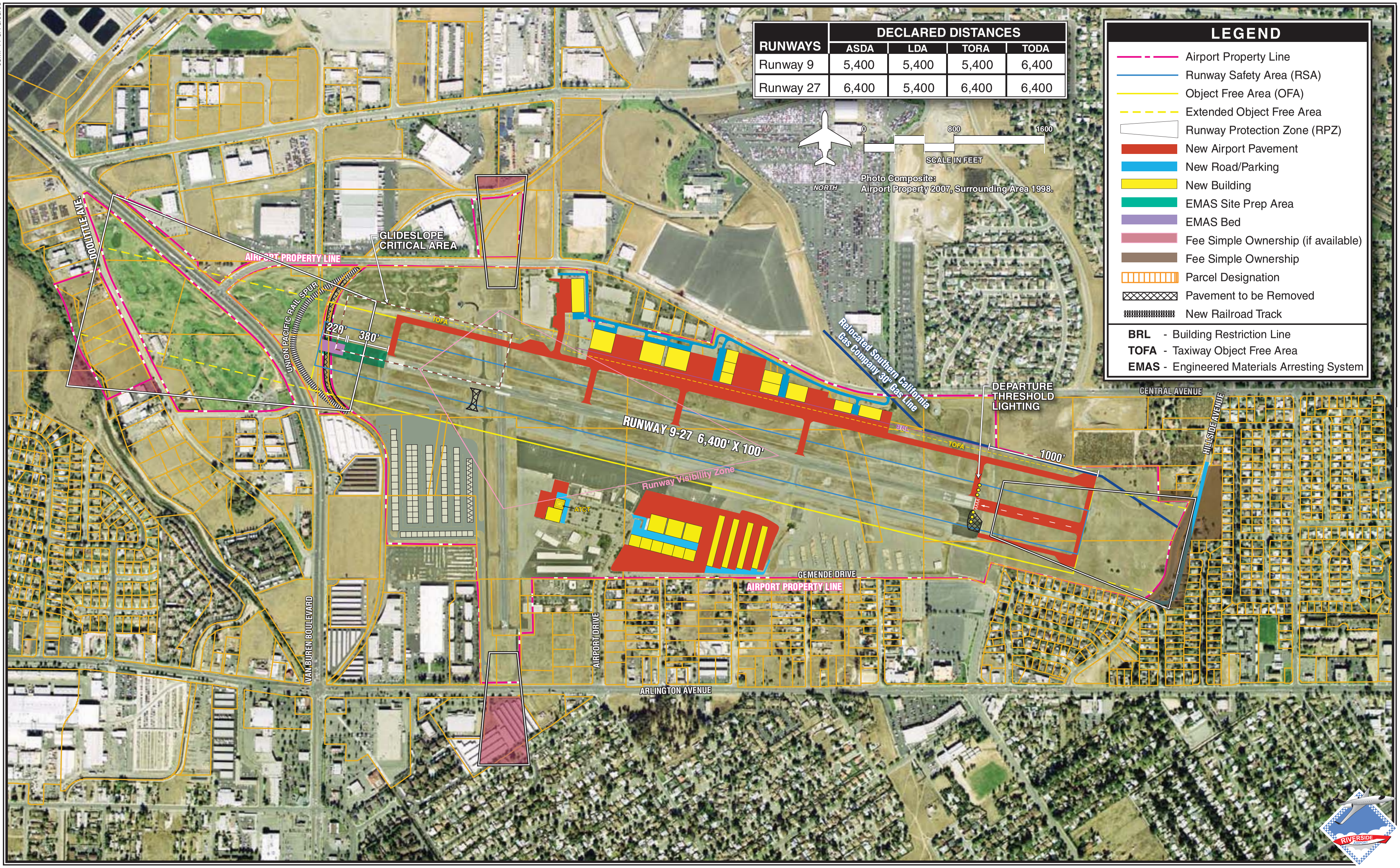
The FAA has established design criteria to define the physical dimensions of runways and taxiways, as well as the imaginary surfaces surrounding them which protect the safe operation of aircraft at the airport. These design standards also define the separation criteria for the placement of landside facilities.

As discussed previously, FAA design criteria primarily center around 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 and landings) per year at the airport. Factors included in airport design are an aircraft=s wingspan, approach speed, tail height 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 turboprops and small business jets in ARC B-II. There is a King Air turboprop and a Cessna Citation V - Model 560XL based at the airport. Both of these aircraft operate on a frequent basis. These aircraft in conjunction with itinerant activity represent the critical aircraft.

The master plan anticipates that business jet aircraft using the airport will increase in the future, consistent with local and national trends. Significant employment and population growth in the immediate Riverside area and the Inland Empire region will also contribute to strong growth in aviation activity at Riverside Airport. Therefore, a future critical aircraft in ARC C-II is considered.

While airfield elements must meet design standards associated with a critical aircraft in ARC C-II, landside elements can be designed to accommodate specific



RUNWAYS	DECLARED DISTANCES			
	ASDA	LDA	TORA	TODA
Runway 9	5,400	5,400	5,400	6,400
Runway 27	6,400	5,400	6,400	6,400

Exhibit 5A
RECOMMENDED
MASTER PLAN CONCEPT

05MP11-5A-6/05/08

categories of aircraft. For example, a taxilane into a T-hangar area only needs to meet the object free area width standard for smaller single and multiengine piston aircraft expected to utilize the taxilane, not those for the larger business jets representing the overall critical aircraft.

Table 5A presents the design standards to be applied to Runway 9-27 at Riverside Airport. It also highlights those areas where the runway does not currently meet FAA design standards. The following discussion will describe the recommended master plan concept in detail and the proposed solutions to meeting design standards.

Runway 16-34 is the crosswind runway and is designed to accommodate small aircraft exclusively. This runway currently meets all applicable design standards except for runway width. The design standard is 60 feet wide and the runway is currently 48 feet wide. This runway was recently reconstructed so it is in excellent condition. The next time it is reconstructed, probably 20 or more years, it should be widened.

Runway Protection Zone

The runway protection zone (RPZ) is a trapezoidal area generally beginning 200 feet from the runway end and extending out in accordance with the operational activity at the airport and the instrument approach visibility minimums. The function of the RPZ is to enhance the protection of people and property on the ground. The FAA recommends the airport have positive control of the RPZ through fee-simple ownership if possible.

As airports transition from one critical aircraft to a larger critical aircraft or as more sophisticated instrument approaches are approved, the size of the RPZ can change. At Riverside, the Category (CAT) I approach to Runway 9 necessitates the largest RPZ. This is planned to remain in place.

The RPZs serving the crosswind runway are for runways serving small aircraft only. The role of this runway is not planned to change and straight-in approaches are not planned; therefore, the RPZs will remain the same size.

The RPZ for Runway 27 is anticipated to change size due to a transition in the critical aircraft operating at the airport. The current critical aircraft falls in ARC B-II. The future critical aircraft is anticipated to fall in ARC C-II. The future RPZ is 700 feet longer than the existing RPZ. This places the Runway 27 future RPZ beyond airport property and over approximately ten properties along Hillside Avenue. The affected properties along Hillside Avenue are recommended for acquisition. **Table 5B** presents the RPZ sizes currently and into the future.

TABLE 5A
Airfield Planning Design Standards for Runway 9-27
Riverside Airport

	FAA ARC C-II Design Standard	Current Condition	Ultimate Condition
Runway 9-27			
Width	100	100	100
Shoulder Width	10	10	10
Runway Centerline to:			
Hold Position	200	200	200
Parallel Taxiway A Centerline	400	**275**	**275**[1]
Parallel Taxiway (North) Centerline	400	**NA**	400
Edge of Aircraft Parking Area	500	**400**	500
Runway 9			
Runway Safety Area			
Width	400	400	400
Length Beyond End	1,000	**100**	1,000
Length Prior to Landing	600	**475**	600
Object Free Area			
Width	800	800	800
Length Beyond End	1,000	1,000	1,000
Length Prior to Landing	600	**377**	600
Obstacle Free Zone			
Width	400	400	400
Length Beyond End	200	200	200
Runway 27			
Runway Safety Area			
Width	400	400	400
Length Beyond End	1,000	**475**	**600**[2]
Length Prior to Landing	600	**100**	600
Object Free Area			
Width	800	800	800
Length Beyond End	1,000	**377**	**600**[2]
Length Prior to Landing	600	600	600
Obstacle Free Zone			
Width	400	400	400
Length Beyond End	200	200	200
Taxiways			
Width	35	35-50	35-50
Shoulder Width	10	10	10
Safety Area Width	79	79	79
Object Free Area Width	131	131	131
Edge Safety Margin	7.5	7.5	7.5
Taxiway Centerline to:			
Fixed or Movable Object	65.5	65.5	65.5
Parallel Taxiway/Taxilane	105	105	105
Taxilanes			
Object Free Area Width	115	115	115
Taxilane Centerline to:			
Fixed or Movable Object	57.5	57.5	57.5
Parallel Taxiway/Taxilane	97	97	97

[1]Request Modification to Standard
[2]EMAS (Engineered Materials Arresting System) provides RSA equilavency.
Note: All measurements in feet. **BOLD =** Does not meet standard
Source: FAA AC 150/5300 - 13, Change 12, Airport Design

TABLE 5B Runway Protection Zone Standards Riverside Airport	Current & Future	Current	Future	Current & Future
	Runway 9	**Runway 27**	**Runway 27**	**Runway 16-34***
Visibility Minimum	0.5 Mile	1.5 Mile	1.5 Mile	Not lower that 1 mile
Inner Width	1,000	500	500	250
Outer Width	1,750	700	1,010	450
Length	2,500	1,000	1,700	1,000

*Small aircraft exclusively
Source: FAA AC 150/5300-13, Airport Design, Change 12

Runway Length Analysis

The appropriate runway length for Riverside Airport has been discussed previously in Chapters Three and Four. It was determined that at 5,400 feet, Riverside Airport is able to accommodate 75 percent of business jets at 60 percent useful load. In order to accommodate 100 percent of business jets at 60 percent useful load, a runway length of 6,400 feet is estimated. To accommodate aircraft of more than 60,000 pounds, a runway length of 6,300 feet is estimated.

The business jet operational statistics previously presented indicated that the majority of activity by business jet operators falls into the zero-to-75 percent category. Larger business jets in the 75 to 100 percent category do operate at the airport, although on a less frequent basis. These aircraft could ultimately represent the critical aircraft if one or several of these aircraft base at the airport or if transient operations increase significantly over the next 20 years.

Riverside Airport has a large undeveloped area to the north of the primary runway. A north side parallel taxiway is planned for construction in order to provide airfield access for potential hangar development. This area has been identified for corporate and conventional hangars, which could accommodate medium and large business jets. Given the space constraints at airports in the region, it is prudent for Riverside Airport to plan for a potential based critical aircraft in the 75 to 100 percent category. This may include Challengers, Citation models 650 and 750, Falcon 900EX and 2000, Lear 45XR, 55 and 60, Hawker 800, 1000, and Horizons. In addition, larger business jets such as the Gulfstream family could also base at the airport.

Exhibit 5A shows the possibility of a 1,000-foot runway extension at Riverside Airport. Analysis presented in previous chapters indicated that extending the runway to the west could be extremely difficult and cost-prohibitive. Van Buren Avenue would have to be tunneled or re-routed outside of the Runway Safety Area (RSA). The railroad spur would have to be closed or rerouted as well. An extension to the west would shift the Runway Protection Zone (RPZ), introducing new incompatible land uses to the RPZ, which is not acceptable to the FAA. A relocated Van Buren Avenue and railroad spur would have to extend outside the RPZ, if possible, a distance of approximately 2,700 feet.

An additional significant consideration is what would happen to the current CAT I instrument approach to Runway 9. An extension to the west would require the relocation of the glideslope antenna and the approach lights. It is likely that the FAA would not approve a new CAT-I approach to Runway 9 because of the non-standard runway/taxiway separation. Therefore, an extension to the west would likely reduce the capability of the instrument approach to one mile visibility minimums. Thus, extending to the west ultimately defeats the purpose of accommodating larger, more sophisticated aircraft (i.e., those aircraft that are more likely to use the CAT I approach and those aircraft operators that desire a CAT I approach at airports at which they operate). Extending the runway to the west was not considered further.

When considering a 1,000-foot runway extension to the east, several potential impacts were examined in the alternatives chapter. Exhibit 4F indicated that a 1,000-foot extension to the east would introduce 86 residential properties into the RPZ. Seven roads would also be introduced and would have to be closed or re-routed. Further analysis, along with comment and feedback from the Planning Advisory Committee, has led to a recommended runway extension that does not extend the RPZ over the homes and roads to the east.

The runway extension would provide for take-off operations to the west utilizing Runway 27. This is the predominant operational direction, accounting for approximately 90 percent of total annual operations. By making the extension usable for operations only to the west, the departure RPZ for Runway 9 would not extend any farther to the east than the RPZ for a natural transition to a critical aircraft in ARC C-II. Declared distances would then be implemented.

Table 5C presents the declared distances that would apply to this runway configuration. The departure RPZ begins 200 feet from the Take-off Run Available (TORA); therefore, if the TORA does not include the runway extension for Runway 9, then the RPZ will not extend over additional homes to the east.

TABLE 5C
Declared Distances
Riverside Airport

	Runway 9	Runway 27
Declared Distances - 1,000' Extension to the East		
ASDA: Accelerate-Stop Distance Available	5,400	6,400
LDA: Landing Distance Available	5,400	5,400
TORA: Take-Off Run Available	5,400	6,400
TODA: Take-Off Distance Available	6,400	6,400

Source: Coffman Associates Analysis

There are some challenges to the proposed one-way runway extension. Any extension of the runway must be justified. At Riverside Airport that means that the critical aircraft must be represented by large business jets in the 75 to 100 percent category. This would most likely occur when one or more business jets in this category base at the airport. Additional justification can be provided by itinerant operators that can document that more runway length at Riverside Airport will allow for greater operational capability. The FAA would also conduct a Benefit Cost Analysis (BCA) to determine if the benefit of the runway extension would outweight the cost.

The proposed one-way runway extension was presented to the FAA Western-Pacific Region for their comment and review. The FAA supports planning for the one-way use 1,000-foot extension for two primary reasons: 1) the extension would be able to accommodate over 90 percent of the operations at the airport, and 2) the FAA prefers to limit the RPZ impact to the properties to the east of the airport. They noted that any funding for a runway extension would come only after justification by operator need.

Runway/Taxiway Separation

There are two factors that primarily influence the FAA standard for runway/taxiway separation. The first is the type and frequency of aircraft operations as described by the applicable ARC, and the second is the capability of the instrument approaches available at the airport. While the current ARC is B-II, the future ARC is C-II and a CAT I instrument approach is currently available.

As discussed in Chapter Four – Alternatives, Taxiway A is located 275 feet from Runway 9-27, centerline to centerline. The ultimate ARC C-II standard with a CAT I approach is 400 feet. The FAA allows for a modification to standard if it can be shown that there is no negative impact to safety presented by the non-standard condition. The example that follows was previously presented in Chapter Four and demonstrates that safety is not compromised when two Airplane Design Group (ADG) II aircraft are on the runway and taxiway at the same time. In fact, safety is not compromised if two Gulfstream Vs (ADG III with wingspan of approximately 100 feet) were on the runway and taxiway at the same time.

Two aircraft with a maximum wingspan of 79 feet (ADG-II) can operate on the runway and parallel taxiway at the same time without any penetration to the RSA or object free zone (OFZ). The minimum acceptable separation would be 239.5 feet (200 feet of RSA/OFZ and 39.5 feet for the maximum ADG-II wingspan). The existing runway/taxiway separation provides an additional 35.5 feet of distance between the wing of an ADG-II aircraft taxiing and the RSA/OFZ surfaces surrounding the runway. The FAA has agreed that Taxiway A can remain at 275 feet.

A parallel taxiway is planned for the north side of Runway 9-27. This taxiway is being considered at a separation distance of 300 feet. As discussed above, this separation will provide an acceptable level of safety between the runway and the taxiway. In fact, this distance will provide an additional margin of safety over the separation currently available between the runway and Taxiway A. A modification to standard would need to be obtained from the FAA to accommodate a 300-foot separation as opposed to a 400-foot standard.

Discussions with the FAA Western-Pacific Region were conducted concerning the runway/taxiway separation issue for the planned north side parallel taxiway. The FAA suggested that a request for modification to standard be submitted prior to the design of the north side parallel taxiway. This request was submitted in May 2008. The FAA reviewed the proposal and concluded that this taxiway should be located at a separation of 400 feet in order to meet the future standard for a critical aircraft in ARC C-II.

In conclusion, the recommended master plan concept supports maintaining the current runway/taxiway separation of 275 feet on the south side and constructing the planned north side parallel at a separation of 400 feet.

Safety Area Analysis

The RSA analysis presented in Chapter Four – Alternatives, concluded that two options were available for mitigation of the non-standard RSA for an ARC C-II runway: 1) implementation of declared distances, or 2) installation of an Engineered Materials Arresting System (EMAS). The declared distances option would have a negative impact on airport operations, while the EMAS option would preserve and enhance the operational runway length in all directions. These two options were previously presented on Exhibit 4E – Options 2 & 3.

After consultation with the PAC, the FAA, and airport staff, Option 2 most closely represents the recommended concept for meeting RSA standards to the west of the Runway 9 threshold. The FAA has indicated that the RSA is currently improved to the greatest extent practicable and no further action needs to be taken to provide 600 feet of RSA to meet the current B-II standard. To meet the C-II standard, the FAA supports shifting the railroad spur to the west to provide 600 feet of RSA and then installing EMAS to provide RSA equivalency to the standard of 1,000 feet.

Based on conversations with Union Pacific railroad during research for this master plan, it appears they are amenable to relocating the railroad spur, provided there is limited disruption to service and the airport (FAA) pays the cost. The FAA recommended beginning these discussions immediately to move the relocation process forward. Therefore, the relocation of the spur could occur prior to the installation of EMAS or the construction of the runway extension. This would have the added benefit of meeting ARC B-II RSA standards in the near term.

Relocation of the railroad spur will also require close coordination with the City of Riverside Planning Department. The Circulation Element of the 2025 General Plan designates Van Buren Boulevard as a "Parkway" and "Scenic Boulevard." As a result, any railroad relocation should be fully evaluated for its potential aesthetic impacts to views from Van Buren Boulevard. Mitigation, including a landscaped set-back and berming, may be required for the project to be in compliance with the general plan.

The RSA to the east of the Runway 27 threshold is also non-standard as it does not meet grading standards. Several projects are currently planned to alleviate this situation. First the underground gas pipeline that traverses the RSA is planned to be relocated. Second, as part of the north side parallel taxiway project, several hills would be graded and this dirt will be used to bring the RSA up to grading standards.

Airside Conclusion

Design standards for Riverside Airport are determined by the frequency of activity by the critical aircraft and the sophistication of the instrument approaches. The current critical aircraft falls in ARC B-II. The future critical aircraft falls in ARC C-II. For runway length determination, the critical aircraft are divided into two groups. The current runway length meets the needs of zero to 75 percent of the national general aviation aircraft fleet. The future critical aircraft may be represented by larger business jets making up 75 to 100 percent of the national fleet. Providing the necessary runway length to meet the needs of these aircraft at 60 percent useful load is the planning standard applied to Riverside Airport.

There is currently at least 5,400 feet of runway length available for operations in all directions. This meets the need of the current critical aircraft family (ARC B-II). This also meets the needs of small and medium sized business jets in ARC C-II. In the future, large business jets in ARC C-II may represent the critical aircraft family, thus requiring up to 6,400 feet of runway length. A 1,000-foot runway extension is planned to meet the needs of these operators should they ultimately represent the critical aircraft for the airport.

The extension is planned to benefit take-off operations to the west only, which will reduce the impact to the residential neighborhood to the east. Approximately 90 percent of all operations are in this direction, so most operations would benefit.

To meet RSA standards for the future critical aircraft in ARC C-II, the recommended concept plans for shifting the Union Pacific railroad spur approximately 125 feet to the west. EMAS is then planned to be installed on the Runway 9 end, thereby providing a level of safety equivalent to the full 1,000 RSA standards. The FAA has recommended the airport begin the process of shifting the railroad spur as soon as possible.

LANDSIDE CONCEPT

The primary goal of landside facility planning is to provide adequate aircraft storage space to meet 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.

The recommended landside concept for the airport terminal area most closely resembles Exhibit 4G – Option 3, previously presented in Chapter Four. The recommended plan provides for ultimate redevelopment of the fixed base operator (FBO) and T-hangar areas to the east of the terminal building. It also plans for a replacement airport traffic control tower (ATCT) to the west of the terminal building along with a conventional hangar.

The area to the west of the terminal building would involve the removal of two buildings: the current FAA Flight Service Station and the unoccupied building on the west of the terminal loop road. Both of these buildings are located within the Runway Visibility Zone. The area within this zone should be free of visual obstructions so that a pilot on one runway can see any activity on the other runway and have time to react, if necessary. A portion of the airport terminal building is also in the Runway Visibility Zone. This building is critical to airport operations and is planned to remain, but when a replacement terminal building is considered, a new location should be sought.

Once the two buildings are removed, the planned redevelopment includes a replacement ATCT. As discussed previously, the current tower does not meet current FAA standards. Adjacent to the replacement tower is a large conventional hangar. This hangar could be used for a corporate lease or airport business operation. The redevelopment of this area of the airport would require utilizing a portion of the existing terminal area parking lot. As depicted, the terminal loop road is rerouted and preserved.

The recommended landside concept for the FBO and T-hangar area to the east of the terminal building involves a long term vision for redeveloping this area. Planned redevelopment was considered the most prudent course of action that would allow for enhanced services at the airport.

The current hangar layout is a hodgepodge of larger conventional hangars, medium sized box hangars, and smaller T-hangars. Ideally, each hangar type would be grouped in order to limit the interaction of large and small aircraft and to meet separation standards for buildings.

The recommended concept for this area provides for three large conventional hangars ideally suited for FBO activities. An expanded ramp area is also provided which will reduce the current congested environment, particularly for transient operators. To the south of the FBO hangars is a row of six medium sized box hangars. These hangars would be for medium activity uses such as specialty airport businesses or corporate flight departments. The layout presented would allow for pilots to access these hangars without the need for a tug. Finally, the east portion of the area is redeveloped with four rows of T-hangars.

Farther to the east is the current location of the port-a-port hangars. This type of hangar is intended for owners of small single engine aircraft. The master plan recommends maintaining this area for this use. These small hangars, with comparatively lower lease rates, serve a vital customer base in the region. It should be recognized that in the future, if additional aircraft storage space is needed, this location would allow for redevelopment opportunities. For the time being, the forecast increase in based aircraft can be accommodated with hangars being developed and planned on the west and north sides of the airport.

The north side of the airport provides for more than 30 acres of undeveloped space that can accommodate aviation activity. A north side parallel taxiway is planned for construction in the near term. This taxiway will open the whole of the north side for development possibilities. The layout depicted shows the potential for a mix of large conventional hangars with medium sized box hangars. Two entrance roads are considered. The first is the current entrance to the Riverside Police facility, and the second is at the intersection of Central Avenue with Freemont Street.

Table 5D shows that the total hangar area planned in the recommended landside concept is 376,550 square feet. This includes the north and south terminal area and accounts for hangar space that is planned to be redeveloped. When considering Riverside Executive Aviation hangars on the west, which are currently under construction, a total of 665,550 square feet of new hangar space is planned. This is slightly less than the 730,800 square feet of hangar area needed to meet aviation demand through the long term planning period. Ultimately, the airport may need to consider additional redevelopment areas, such as the port-a-port location, to accommodate long term need.

TABLE 5D
Total Hangar Area Planned
Riverside Airport

	South Terminal Area	North Terminal Area	Terminal Area Hangars Lost to Redevelopment	Total New North/South Hangar Space	Riverside Executive Aviation	Total New Hangar Space
Hangar Types						
Conventional Hangars	83,100	217,200	45,600	254,700	25,000	279,700
Box Hangars	65,500	45,750	14,600	96,650	234,000	330,650
T-hangar	100,400	0	75,200	25,200	30,000	55,200
Total	**249,000**	**262,950**	**135,400**	**376,550**	**289,000**	**665,550**

Note: All measurements in square feet.

Strategic Property Acquisition

In order for the Airport to meet various FAA design requirements, some strategic property acquisition is recommended. The FAA recommends fee-simple ownership of the land within the RPZs. Those areas within the current and future RPZs are recommended for acquisition. This can be important for protection of the instrument approaches to the airport and for the protection of pilots as well as people and property on the ground.

Reimbursement from the FAA for land acquisition can take several years. As such, the acquisition schedule is prioritized. The 10 residential properties to the east of Runway 27 should be acquired as soon as possible. The structures should then be razed and the property left clear of any objects. When this transition occurs, Hillside Avenue would traverse the extreme eastern portion of the RPZ, including the Central Portion of the RPZ, which should be clear of objects. Ultimately, the FAA may desire that Hillside Avenue be slightly re-routed to the east in order to avoid penetration of the Central Portion of the RPZ.

The remaining lands recommended for acquisition are lower priorities. The small portion of land in the Runway 16 RPZ is currently zoned for industrial/commercial uses and is surrounded by such uses. The likelihood of incompatible development is low. The property in the Runway 34 RPZ is fully developed with several storage buildings and a few residences within the extreme southeastern corner of the RPZ. While the cost to acquire these properties and structures may be high, the fact is this runway is used very infrequently. None the less, if the opportunity presents itself, the airport should acquire this area.

There are two small portions of property within the Runway 9 RPZ. The extreme southwestern corner of the RPZ, within the Controlled Activity Area of the RPZ, is privately owned but undeveloped. This property is within a drainage channel. Incompatible development is unlikely, but the property should be acquired if possible. The last portion of property is a commercially developed building also in the Runway 9 Controlled Activity Area of the RPZ. It should be acquired, but more realistically, an avigation easement could be sought which would restrict certain incompatible uses on the property.

Airport Land Use Compatibility

The recommended master plan concept requires a review by the Riverside County Airport Land Use Commission. If the planned future airport layout and forecast activity levels are significant, the Commission may elect to update the Riverside County Airport Land Use Compatibility Plan (RCALUCP) with regard to Riverside Airport.

The current RCALUCP was based on a planned 753-foot runway extension to the east. This extension was to be available for operations in all directions. The new master plan concept also considers an extension (1,000 feet), but it is only available for takeoffs from Runway 27. This one-way pavement would effectively remove the RPZ from numerous homes east of Hillside Avenue. The commission would need to determine if this change justified updating the RCALUCP.

The Runway 9 end would remain in the current location and the RPZ would remain the same size. The currently available CAT-I approach would also remain. Therefore, no changes to the RCALUCP would be anticipated on this end of the airport.

SUMMARY

The recommended master plan concept has been developed in conjunction with the Planning Advisory Committee, airport management, and numerous City officials, and is designed to assist in making decisions on future development and growth of Riverside Airport. This plan provides the necessary development to accommodate and satisfy the anticipated growth over the next 20 years and beyond.

It is incumbent upon the airport to meet FAA design standards for the various safety areas surrounding the runways. Runway 16-34 meets these standards, except for runway width, for its design aircraft now and into the future. Runway 9-27 does not currently meet these standards. To meet the current standard for RSA to the east of the runway, fill and grading is necessary. To the west, the FAA has indicated that the RSA has been improved to the maximum extent practicable for ARC B-II. To meet the standard for a future critical aircraft in ARC C-II, the FAA has indicated support for shifting the railroad spur and installing EMAS.

On the landside, development opportunities exist on the north and south sides of the airport. On the south side, the current FBO complex is planned for redevelopment. The hangar layout is currently not efficient and the limited ramp space creates congestion issues even when only a few aircraft are present.

To the west of the terminal building, two office buildings are in the restricted Runway Visibility Zone. These buildings are planned for removal when economically feasible. They are planned to be replaced by an aircraft hangar and a replacement airport traffic control tower.

On the north side, a planned parallel taxiway will open up approximately 30 acres of airport property for aviation-related development. Several large and medium sized hangars are planned.

The next chapter of this master plan will consider strategies for funding the recommended improvements and will provide a reasonable schedule for undertaking the projects based on demand over the course of the next 20 years.

Chapter Six

CAPITAL IMPROVEMENT PROGRAM

Capital Improvement 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 is applied to each development item so that the feasibility of each item contained in the plan can be assessed.

The presentation of the capital improvement program (CIP) has been organized into two sections. First, the airport development schedule and CIP cost estimate is presented in narrative and graphic form. Second, capital improvement funding sources on the federal, state, and local levels are identified and discussed.

AIRPORT DEVELOPMENT SCHEDULES AND COST SUMMARIES

Now that the recommended concept has been developed and specific needs and improvements for the airport have been established, the next step is to determine a realistic schedule (implementation timeline) and the associated costs for the plan. This section will examine the overall cost of each item in the development plan and present a development schedule. The recommended improvements are grouped by planning horizon: short term, intermediate term, and long term. The short term planning hori-

zon is further subdivided into yearly increments. **Table 6A** summarizes the key milestones for each of the three planning horizons.

TABLE 6A
Planning Horizon Milestone Summary
Riverside Airport

	2006	Short Term (2012)	Intermediate Term (2017)	Long Term (2027)
ANNUAL OPERATIONS				
Total Itinerant	42,582	51,050	57,250	73,550
Total Local	41,399	48,050	52,050	61,050
Subtotal Operations	83,981	99,100	109,300	134,600
3% Nighttime Increase to Itinerant GA and Air Taxi Operations	1,275	1,500	1,700	2,200
Total Operations	**85,256**	**100,600**	**111,000**	**136,800**
BASED AIRCRAFT				
Single Engine	170	252	307	399
Multi-Engine	22	27	33	39
Turboprop	2	5	7	10
Jet	1	4	8	12
Helicopter/Other	7	12	15	20
Total Based Aircraft	**202**	**300**	**370**	**480**
Instrument Approaches (AIAs)	1,279	1,509	1,665	2,052

Source: Coffman Associates Analysis

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. These items should be considered for development based on actual demand levels within the next five years. As short term horizon 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 includes construction of new hangar aprons and taxilanes. Based aircraft will be the indicator for additional hangar needs. If based aircraft growth occurs as projected, additional hangars should be constructed to meet the demand. Often this potential growth is tracked with a hangar waiting list.

If growth slows or does not occur as forecast, some projects may 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 meeting design standards for various safety areas. These items should be programmed in a timely manner regardless of the forecast growth in activity. Other items, such as pavement maintenance, should be addressed in a scheduled manner and is not dependant on reaching aviation demand milestones. These types of projects typically are more associated with day-to-day operations.

As a master plan is a conceptual document, implementation of the capital projects should only be undertaken after further refinement of their design and costs through architectural and engineering analyses. Moreover, some projects may require extensive infrastructure improvements (i.e., drainage improvements, extension of utilities, etc.).

Once the list of necessary projects was identified and refined, project specific cost estimates were developed. The cost estimates have been increased to allow for contingencies that may arise on the project. Capital costs presented here should be viewed only as estimates subject to further refinement during design. Nevertheless, these estimates are considered sufficient for planning purposes. Cost estimates for each of the development projects in the capital improvement plan are in current (2008) dollars. **Exhibit 6A** presents the proposed capital improvement program for Riverside Airport. **Exhibit 6B** presents the CIP overlaid onto the airport aerial photograph and broken out into planning horizons.

SHORT TERM IMPROVEMENTS

The short term capital program includes improvement projects from 2009 through 2013. Most of these projects relate to runway safety area (RSA) improvements and north side development as well as on-going pavement maintenance. Several of the short term projects will require environmental documentation. In June 2008, the airport began soliciting for a consultant to complete both NEPA (*National Environmental Policy Act*) and CEQA (*California Environmental Quality Act*) documentation as it relates to short term capital projects at the airport. The environmental documentation would cover planned north side development, pipeline relocation, and RSA improvements, as well as this master plan once complete.

The 2009 CIP considers the design phase of the north side parallel taxiway. This project has already begun and will stretch into 2009. The FAA determined that the north parallel taxiway should be located at a separation distance of 400 feet. This separation distance will meet the design standard for an airport with a critical aircraft represented by medium and large business jets (ARC C-II) and a Category I (CAT-I) approach.

In 2003, the City of Riverside purchased approximately 12 acres of property within the Runway 9 runway protection zone (RPZ). The airport is including a reimbursement grant request in the CIP for $3.5 million. Prior to the FAA approving the grant request, appropriate environmental documentation covering the property will need to be provided. Once the grant request is fulfilled, the originating source of the funds can be reimbursed while the property remains as part of the airport.

The City of Riverside provides an annual pavement maintenance budget of approximately $125,000. As the recipient of federal grants for airport development, it is the responsibility of the airport and the City to preserve and maintain the useful life of pavement areas, including the runways, taxiways, taxilanes, and ramps. This pavement maintenance figure is applied for each year of the 20-year CIP.

It is anticipated that the relocation of the gas pipeline may proceed in the 2010 timeframe provided environmental documentation is completed. The 2010 CIP continues the phased development of the north side area. Drainage, grading, and various site preparation is planned for the parallel taxiway area. Excess dirt excavated during this project is planned to be relocated to the Runway 27 RSA in order to bring it up to FAA design standards for grading. If possible, a full 1,000 feet of graded RSA should be provided.

The next project is infrastructure work that would support the construction of the north side parallel taxiway. This includes an electrical vault, lighting and signage. The design phase of the public apron on the north side is also considered in 2010. Typically, the design phase of a project will precede the construction by a year.

Relocation of the Union Pacific railroad (UPRR) spur is planned for 2010. Negotiations with UPRR should begin immediately in order to facilitate this relocation.

Projects considered in 2011 are related to phasing of the design and development of the north side. The parallel taxiway is planned for construction while the first phase of the north public apron enters the site preparation stage and phase two enters the design stage. In 2012, phase one is constructed and phase two enters site preparation. Phase two would be constructed in 2013. The new access road from Central Avenue would also be designed and constructed in 2012.

Other than completing construction of the north side public apron, the 2013 improvements also include plans to begin the process for extending the runway. The first step will be to undertake appropriate environmental documentation (NEPA and CEQA). These documents would provide the justification for the extension, if it exists.

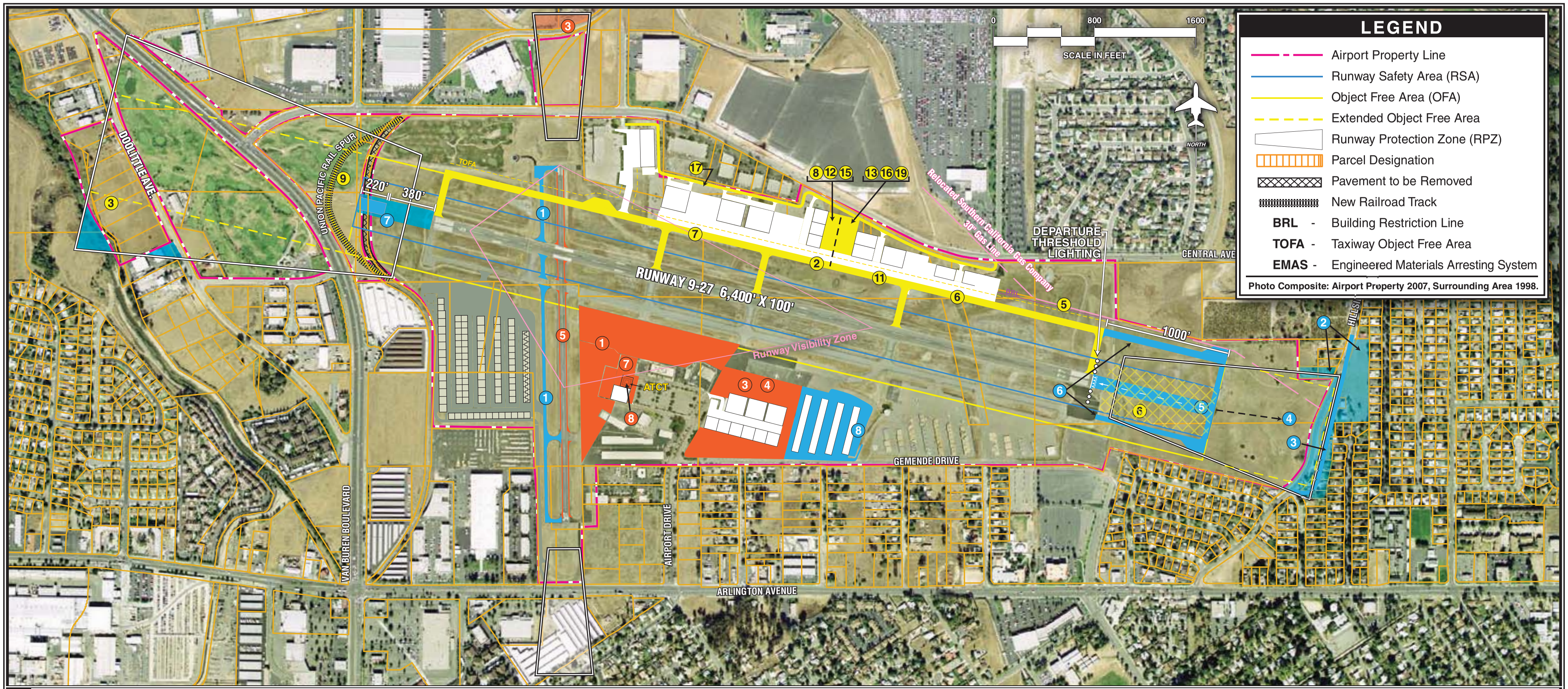
The short term CIP totals approximately $23.0 million. Of this total, approximately $21.3 is eligible for FAA grant funding and $560,000 for State funding. The airport sponsor would be responsible for the remaining $1.2 million.

05MP11-6A-7/6/09

	PROJECT DESCRIPTION	Category	Project Cost	Federally Eligible	State Eligible	Local Share
SHORT TERM PROGRAM (0-5 YEARS)						
2009						
1	Environmental Documentation for 5-Year CIP	Environmental	$750,000	$712,500	$17,813	$19,688
2	Design and Engineering Northside Taxiway	Capacity	$988,000	$938,600	$23,465	$25,935
3	Reimbursement for RPZ Land Purchase	Safety	$3,500,000	$3,325,000	$83,125	$91,875
4	Annual Pavement Preservation	Maintenance	$125,000	$0	$0	$125,000
2009	**TOTAL**		**$5,363,000**	**$4,976,100**	**$124,403**	**$262,498**
2010						
5	Gas Line Relocation	Safety	$700,000	$665,000	$16,625	$18,375
6	Drainage, Grading, Northside Taxiway and Rwy 27 RSA Improvement	Capacity	$4,363,000	$4,144,850	$103,621	$114,529
7	Electrical Vault, Lighting and Signage Northside Taxiway	Capacity	$1,358,000	$1,290,100	$32,253	$35,648
8	Northside Ramp Design - Phase 1	Landside Need	$126,000	$119,700	$2,993	$3,308
9	Relocate UP Railroad Spur - RSA Rwy 9 Improvement	Safety	$480,000	$456,000	$11,400	$12,600
10	Annual Pavement Preservation	Maintenance	$125,000	$0	$0	$125,000
2010	**TOTAL**		**$7,152,000**	**$6,675,650**	**$166,891**	**$309,459**
2011						
11	Taxiway Pavement Northside	Landside Need	$6,175,000	$5,866,250	$146,656	$162,094
12	Northside Ramp Grading, Drainage and Utilities - Phase 1	Landside Need	$225,000	$213,750	$5,344	$5,906
13	Northside Ramp Design - Phase 2	Landside Need	$126,000	$119,700	$2,993	$3,308
14	Annual Pavement Preservation	Maintenance	$125,000	$0	$0	$125,000
2011	**TOTAL**		**$6,651,000**	**$6,199,700**	**$154,993**	**$296,308**
2012						
15	Northside Ramp Pavement - Phase 1	Landside Need	$1,117,000	$1,061,150	$26,529	$29,321
16	Northside Ramp Grading, Drainage and Utilities - Phase 2	Landside Need	$225,000	$213,750	$5,344	$5,906
17	Northside Access Road Design and Construction	Access	$847,000	$804,650	$20,116	$22,234
18	Annual Pavement Preservation	Maintenance	$125,000	$0	$0	$125,000
2012	**TOTAL**		**$2,314,000**	**$2,079,550**	**$51,989**	**$182,461**
2013						
19	Northside Ramp Pavement - Phase 2	Landside Need	$1,117,000	$1,061,150	$26,529	$29,321
20	Environmental Documentation for Runway Extension	Environmental	$300,000	$285,000	$7,125	$7,875
21	Annual Pavement Preservation	Maintenance	$125,000	$0	$0	$125,000
2013	**TOTAL**		**$1,542,000**	**$1,346,150**	**$33,654**	**$162,196**
TOTAL SHORT TERM PROGRAM			**$23,022,000**	**$21,277,150**	**$531,929**	**$1,212,921**
INTERMEDIATE TERM PROGRAM (6-10 YEARS)						
1	Reconstruct Taxiway J and Connectors	Maintenance	$1,330,000	$1,263,500	$31,588	$34,913
2	Hillside Avenue RPZ Property Acquisition	Safety	$3,500,000	$3,325,000	$83,125	$91,875
3	Hillside Avenue Relocation	Safety	$627,000	$595,650	$14,891	$16,459
4	Relocate Localizer	Safety/Capacity	$750,000	$712,500	$17,813	$19,688
5	Runway Extension 1,000' to Runway 27 End	Capacity	$1,882,000	$1,787,900	$44,698	$49,403
6	Taxiway Extension to Runway 27 End.	Capacity	$2,329,000	$2,212,550	$55,314	$61,136
7	EMAS Installation Runway 9 End	Safety	$3,684,000	$3,499,800	$87,495	$96,705
8	Redevelopment Ramp (T-hangar Area) - Phase 1	Landside Need	$3,527,000	$3,350,650	$83,766	$92,584
9	Airport Master Plan Update	Planning	$400,000	$380,000	$9,500	$10,500
10	Annual Pavement Preservation	Maintenance	$625,000	$0	$0	$625,000
TOTAL INTERMEDIATE TERM PROGRAM			**$18,654,000**	**$17,127,550**	**$428,189**	**$1,098,261**
LONG TERM PROGRAM (11-20 YEARS)						
1	Terminal Area Apron Reconstruction	Maintenance	$4,138,000	$3,931,100	$98,278	$108,623
2	Update Part 150 Noise Compatibility Study	Environmental	$750,000	$712,500	$17,813	$19,688
3	Runway 16 RPZ Property Acquisition	Safety	$200,000	$190,000	$4,750	$5,250
4	Revedevelopment Ramp (FBO Area) - Phase 2	Landside Need	$13,076,000	$12,422,200	$310,555	$343,245
5	Widen Runway 16-34 to 60 feet	Safety	$883,000	$838,850	$20,971	$23,179
6	ATCT Tower Siting Study	Planning	$250,000	$237,500	$5,938	$6,563
7	Building Demolition and Ramp Construction for Replacement ATCT	Safety	$1,581,000	$1,501,950	$37,549	$41,501
8	Replacement Control Tower Design and Constructoin	Safety	$5,000,000	$4,750,000	$118,750	$131,250
9	Annual Pavement Preservation	Maintenance	$1,250,000	$0	$0	$1,250,000
TOTAL LONG TERM PROGRAM			**$27,128,000**	**$24,584,000**	**$615,000**	**$1,929,000**
TOTAL PROGRAM COSTS			**$68,804,000**	**$62,988,700**	**$1,575,118**	**$4,240,183**

Note: Totals may not equal due to rounding

Exhibit 6A
CAPITAL IMPROVEMENT PROGRAM



KEY

SHORT TERM PROGRAM (0-5 YEARS)

2009
1. Environmental Documentation for 5-Year CIP (NP)
2. Design and Engineering Northside Taxiway
3. Reimbursement for RPZ Land Purchase
4. Annual Pavement Preservation (NP)

2010
5. Gas Line Relocation
6. Drainage, Grading, Northside Taxiway and Rwy 27 RSA
7. Electrical Vault, Lighting and Signage Northside Taxiway (NP)
8. Northside Ramp Design - Phase 1
9. Relocate UP Railroad Spur - RSA Rwy 9 Improvement
10. Annual Pavement Preservation (NP)

2011
11. Taxiway Pavement Northside
12. Northside Ramp Grading, Drainage and Utilities - Phase 1
13. Northside Ramp Design - Phase 2
14. Annual Pavement Preservation (NP)

2012
15. Northside Ramp Pavement - Phase 1
16. Northside Ramp Grading, Drainage and Utilities - Phase 2
17. Northside Access Road Design and Construction
18. Annual Pavement Preservation (NP)

2013
19. Northside Ramp Pavement - Phase 2
20. Environmental Documentation for Runway Extension (NP)
21. Annual Pavement Preservation (NP)

INTERMEDIATE TERM PROGRAM (6-10 YEARS)

1. Reconstruct Taxiway J and Connectors
2. Hillside Avenue RPZ Property Acquisition
3. Hillside Avenue Relocation
4. Relocate Localizer
5. Runway Extension 1,000' to Runway 27 End
6. Taxiway Extension to Runway 27 End
7. EMAS Installation Runway 9 End
8. Redevelopment Ramp (T-hangar Area) - Phase 1
9. Airport Master Plan Update (NP)
10. Annual Pavement Preservation (NP)

LONG TERM PROGRAM (11-20 YEARS)

1. Terminal Area Apron Reconstruction
2. Update Part 150 Noise Compatibility Study (NP)
3. Runway 16 RPZ Property Acquisition
4. Redevelopment Ramp (FBO Area) - Phase 2
5. Widen Runway 16-34 to 60 Feet
6. ATCT Tower Siting Study (NP)
7. Terminal Area Building Demolition and Ramp Construction for Replacement ATCT
8. Replacement Control Tower Design and Construction
9. Annual Pavement Preservation (NP)

NP - Not Pictured

Exhibit 6B
AIRPORT DEVELOPMENT STAGING

It should be noted that budgetary constraints make receiving the total amount in the years specified unlikely, but typically once the FAA begins a phased project they will commit to completing that project. Other grants would be awarded based on priority, with safety-related projects having a high priority.

INTERMEDIATE TERM IMPROVEMENTS

Planning new projects beyond a five year timeframe can be challenging. Project need is heavily dependant upon local demand and the economic outlook of the aviation industry. Therefore, intermediate term projects are grouped together to represent years 6-10. The use of planning horizons to group potential airport projects provides the airport flexibility to accelerate those projects that are needed immediately and delay those projects that no longer have a high priority. The projects are prioritized based on the aviation forecasts, but these priorities may change.

The first project considered in the intermediate term is the reconstruction of Taxiway J. This asphalt surface will be approximately eight years old at this time and in need of major repair. The next project is the acquisition of 10 properties along Hillside Avenue to the east of the airport that would fall in the RPZ once the critical aircraft transitions to large business jets. Associated with this project is the relocation of Hillside Avenue approximately 150 feet to the east.

On the airfield, several projects are planned for each end of the runway. On the Runway 9 end, EMAS is installed in order to provide adequate safety area for a larger critical aircraft. On the Runway 27 end, the 1,000-foot extension is planned to meet the needs of a more demanding critical aircraft. To accommodate the runway extension, the existing localizer will need to be relocated to a distance of at least 200 feet from the planned future runway end. This will provide wingtip clearance and place it outside the object free zone and well outside the runway safety area.

On the land side, redevelopment of the south T-hangar area is planned. This project would involve removing the existing T-hangars, reconstruction of the apron and taxilanes and constructing new T-hangars. The airport may undertake the T-hangar construction or permit a developer to construct the T-hangars.

Finally in the intermediate term, the airport should continue to analyze the local and national aviation conditions by updating their master plan. Riverside Airport has been consistent in undertaking proper planning over the years.

The total cost of the intermediate term projects is $18.7 million. Of this total, $17.1 million is eligible for FAA grant funding. Approximately $451,000 is eligible for State grant matching funds, and the remaining $1.1 million would be the responsibility of the airport.

LONG TERM IMPROVEMENTS

The first project of the long term planning period is the rehabilitation of the main terminal area ramp. This is a large area that extends from the terminal building to the west and south along the frontage to the crosswind runway. Depending on funding availability, this project could be phased over several years.

The timing for updating the noise compatibility program for the airport will be at the discretion of the City. The previous FAR Part 150 study was completed in 1995. With the growth of business jet activity at the airport, there may be a need to update this plan prior to the long term planning period. From a master planning perspective, the airport should consider updating the FAR Part 150 study within a few years of the opening of the runway extension. The Part 150 update may be particularly important since the environmental evaluation (Appendix C) indicates that some homes to the southeast of the runway could be exposed to unacceptable noise levels in the future.

A portion of the Runway 16 RPZ is not currently under airport ownership. This property should be acquired by the airport if possible. While this acquisition is shown in the long term, it should be acquired when it becomes financially feasible for the city.

The redevelopment of the fixed base operator (FBO) area, as planned, may require a public/private partnership. The public areas of the redevelopment site are eligible for FAA grant funding. As presented, the ramp, taxilanes and any utility improvements are considered to be undertaken by the airport. All hangar development is considered to be privately funded with the airport receiving land lease revenue.

The next project identified is the widening of the crosswind runway. At 48 feet wide, it is short of the design standard by 12 feet. This project should be scheduled for when the runway is in need of reconstruction. Considering the usage level of this runway, reconstruction may be beyond the 20-year scope of this master plan.

The airport traffic control tower (ATCT) does not meet current design standards. The first step to determining alternatives for tower improvement is a tower siting study. With this study the airport can determine if the existing site is the optimal site on the airport or if the master plan recommended site, closer to the intersection of the two runways, is a beneficial improvement. If the existing site is preferred, then the study can analyze if a new tower is needed or if tower modifications, such as raising the cab height, can bring the tower to within standards.

Regardless of the results of the ATCT study, the two buildings inside the runway visibility zone should be removed. The master plan called for a replacement tower to be located in this area as well as a new conventional hangar that could support an airport business. A portion of the ramp is also planned for construction.

The long term projects total $27.1 million. The City would be responsible for $1.9 million of this, while federal and state grants would be eligible for the remaining $25.2 million.

CAPITAL IMPROVEMENT SUMMARY

The CIP for Riverside Airport covers the next 20 years of improvements projected to be needed at the airport. The airport is currently in the process of a phased development of the north side of the airfield. As part of this multi-year project, the RSA to the east of Runway 27 is planned to be improved to meet FAA standards.

Over the course of the next five years, a new north side parallel taxiway would open up more than 30 acres for development. A portion of this area is planned for public use and is eligible for federal grant assistance. The remaining portion is considered for private hangar development.

Intermediate term projects address a wide range of improvements. Property along Hillside Avenue is planned for acquisition in order to clear the RPZ. This would only be necessary when the airport transitions to a larger design aircraft. If the airport further transitions to a design aircraft represented by large business jets, then a runway extension is planned.

In order to meet current standards for the RSA to the west of Runway 9, the Union Pacific railroad spur is planned to be relocated approximately 125 feet to the west. This will provide 600 feet of RSA needed to meet current standard. When the airport transitions to a design aircraft represented by medium and large business jets, the RSA standard beyond the runway ends is 1,000 feet. The installation of an EMAS bed is planned on the Runway 9 end in order to provide an equivalent level of safety to the standard 1,000-foot RSA.

The terminal area is planned for several changes, including the removal of two office buildings located within the runway visibility zone. This area is then made available for the construction of a replacement ATCT and an aircraft hangar.

In the long term, the FBO area to the west of the terminal building is planned for redevelopment. This area is a hodge-podge of construction with limited separation between the buildings. There is not enough aircraft ramp and access to set-back hangars requires aircraft towing. The redevelopment provides for a larger aircraft ramp, wider taxilanes, and a more efficient hangar layout.

The 20-year investment total is approximately $68.8 million, with $4.2 million of that total being the responsibility of the City.

CAPITAL IMPROVEMENT FUNDING SOURCES

Financing capital improvements at the airport will not rely solely on the financial resources of the airport or the city. Capital improvements funding is available through various grant-in-aid programs on both the state and federal levels. Historically, Riverside Airport has received approximately $3 million annually in federal grants. While some years more could be available, the CIP was developed with project phasing in order to remain realistic and within the range of anticipated federal assistance. The following discussion outlines key sources of funding potentially available for capital improvements at Riverside 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 covered 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 bill provided the FAA the opportunity to plan for longer term projects versus one-year re-authorizations. As of summer 2008, a new bill has not been passed, but several continuing resolutions have maintained funding for priority airport projects.

Vision 100 expired at the end of fiscal year 2007. A series of continuing resolutions were passed in order to carry the program through June 2008 at 75 percent of authorized funding levels. In December 2007, AIP was included in the omnibus appropriation act and authorized $3.5 billion in 2008 for airport improvements. While this one-year bill provided AIP funding, it did not provide the legislative authority to continue the program. This issue was temporarily solved in February 2008 with a bill that provided AIP authority through March 2009. As of October 2008, a new multi-year AIP authorization and authority bill had not been passed.

The source for AIP funds and the subsequent continuing resolutions 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. The Trust Fund is also up for re-authorization.

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 levels. Congress appropriated the full amounts authorized by *Vision 100*, allowing eligible general aviation airports to 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). Riverside Airport qualified for full NPE funding as the NPIAS includes over $150,000 in yearly capital projects.

The remaining AIP funds were distributed by the FAA based on the priority of the project for which they have requested federal assistance through discretionary apportionments. A national priority ranking system is used to evaluate and rank each airport project. Those projects with the highest priority from airports across the country are given preference in funding.

Under the AIP program, examples of eligible development projects include the airfield, public aprons, and access roads. Additional buildings and structures may be eligible if the function of the structure is to serve airport operations in a non-revenue generating capacity such as maintenance facilities. Some revenue enhancing structures, such as T-hangars, may be eligible if all airfield improvements have been made.

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 AID TO AIRPORTS

All state grant programs for airports are funded from the Aeronautics Account in the California State Transportation Fund. Tax revenues, which are collected on general aviation fuel, are deposited in the Aeronautics Account. General aviation jet fuel is taxed at $.02 per gallon, and Avgas is taxed at $.18 per gallon. These taxes generate approximately $7 million per year. The Revenue and Taxation Code spells out the priority for expenditure of funds: 1) administration and collection of taxes; 2) operations of Division of Aeronautics; and 3) grants to airports. The Public Utilities Code further specifies the priority for allocation of Aeronautics Account funds to airports: 1) Annual Grants; 2) AIP Matching; and 3) Acquisition and Development (A&D) Grants.

Annual Grants

To receive an Annual Grant, the airport cannot be designated by the FAA as a reliever or commercial service airport. The Annual Grant can fund projects for Aairport and aviation purposes@ as defined in the *State Aeronautics Act*. It can also be used to fund fueling facilities, restrooms, showers, wash racks, and operations and maintenance. The annual funding level is $10,000; up to five years' worth of Annual Grants may be accrued at the sponsor=s discretion. No local match is required.

Riverside Airport is not eligible for Annual Grants as a reliever airport.

AIP Matching Grants

An FAA AIP grant can be matched with state funds; the current matching rate is 2.5 percent. Generally, state matching is limited to projects that primarily benefit general aviation. A project which is being funded by an AIP grant must be included in the Capital Improvement Program (CIP). The amount set aside for AIP matching is determined by the California Transportation Commission (CTC) each fiscal year. Unused set-aside funds are available for additional A&D Grants.

Acquisition and Development (A&D) Grants

This grant program is open to general aviation, reliever, and commercial service airports. Also, a city or county may receive grants on behalf of a privately owned, public-use airport. An airport land use commission (ALUC) can receive funding to either prepare or update a comprehensive land use plan (CLUP). An A&D grant can fund projects for Aairport and aviation purposes@ as defined in the *State Aeronautics Act*. An A&D grant cannot be used as a local match for an AIP grant. The minimum amount of an A&D grant is $10,000, while the maximum amount that can be allocated to an airport in a single fiscal year is $500,000 (single or multiple grants). The local match can vary from 10 to 50 percent of the project's cost and is set annually by the CTC. A 10 percent rate has been used the past 15 years. The Annual Grant may not be used for the local match to an A&D grant.

Local Airport Loan Program

Eligible airports, including Riverside Airport, can obtain low interest loans for airport development projects, the local matching portion of an AIP grant, and revenue-generating projects such as fuel farms and hangars. Land banking, airport access roads, parking lots and airline facilities are not eligible under the loan program. Currently, there is no limit on the size of the loans except the availability of funds.

LOCAL FUNDING

The balance of project costs, after consideration has been given to grants, must be funded through local resources. Riverside Airport is operated by the City of Riverside and could receive some assistance from the City. The goal of the airport is to generate ample revenues to cover all operating and capital expenditures. As with many general aviation airports, this is not always possible and other financial methods will be needed.

There are several alternatives for local financing options for future development at the airport, including airport revenues, direct funding from the City of Riverside, 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. The capital improvement program has assumed that some landside facility development would be privately developed.

There are several municipal bonding options available, including general obligation bonds, limited obligation bonds, and revenue bonds. General obligation bonds are a common form of municipal bond which is issued by voter approval and is secured by the full faith and credit of the City. City tax revenues are pledged to retire the debt. As instruments of credit and because the community secures the bonds, general obligation bonds reduce the available debt level of the community. Due to the community pledge to secure and pay general obligation bonds, they are the most secure type of municipal bond and are generally issued at lower interest rates and carry lower costs of issuance. The primary disadvantage of general obligation bonds is that they require voter approval and are subject to statutory debt limits. This requires that they be used for projects that have broad support among the voters, and that they are reserved for projects that have the highest public priorities.

In contrast to general obligation bonds, limited obligation bonds (sometimes referred to as self-liquidating bonds) are secured by revenues from a local source. While neither general fund revenues nor the taxing power of the local community is pledged to pay the debt service, these sources may be required to retire the debt if pledged revenues are insufficient to make interest and principal payments on the bonds. These bonds still carry the full faith and credit pledge of the local community and are considered, for the purpose of financial analysis, as part of the debt burden of the local community. The overall debt burden of the local community is a factor in determining interest rates on municipal bonds.

There are several types of revenue bonds, but in general they are a form of municipal bond which is payable solely from the revenue derived from the operation of a facility that was constructed or acquired with the proceeds of the bonds. For example, a lease revenue bond is secured with the income from a lease assigned to the repayment of the bonds. Revenue bonds have become a common form of financing airport improvements. Revenue bonds present the opportunity to provide those improvements without direct burden to the taxpayer. Revenue bonds normally carry a higher interest rate because they lack the guarantees of general and limited obligation bonds.

Leasehold financing refers to a developer or tenant financing improvements under a long term ground lease. The obvious advantage of such an arrangement is that it relieves the community of all responsibility for raising the capital funds for improvements. However, the private development of facilities on a ground lease, particularly on property owned by a government agency, produces a unique set of concerns.

In particular, it is more difficult to obtain private financing as only the improvements and the right to continue the lease can be claimed in the event of a default. Ground leases normally provide for the reversion of improvements to the lessor at the end of the lease term, which reduces their potential value to a lender taking possession. Also, companies that want to own their property as a matter of financial policy may not locate where land is only available for lease.

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 is based will remain valid for a number of years. The primary goal is for the airport to best serve the air transportation needs of the region, while continuing to be economically self-sufficient.

The actual need for facilities is most appropriately established by airport activity levels rather than a specified date. For example, projections have been made as to when additional hangars may be needed at the airport. In reality, however, the time frame 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 the airport management to consistently monitor the progress of the airport in terms of aircraft operations and based aircraft. Analysis of aircraft demand is critical to the timing and need for new airport facilities. The information obtained from continually monitoring airport activity will provide the data necessary to determine if the development schedule should be accelerated or 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.

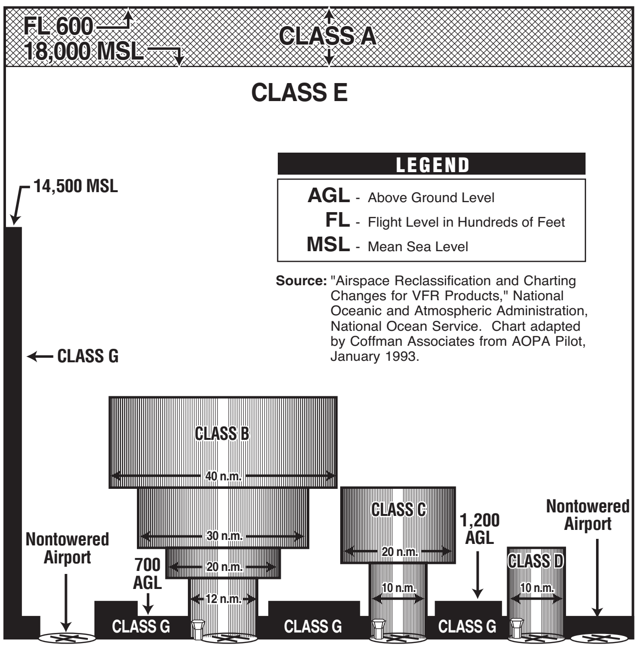
- *CLASS B:* Generally, the airspace from the surface to 10,000 feet MSL surrounding the nation's busiest airports. The configuration of Class B airspace is unique to each airport, but typically consists of two or more layers of air space and is designed to contain all published instrument approach procedures 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

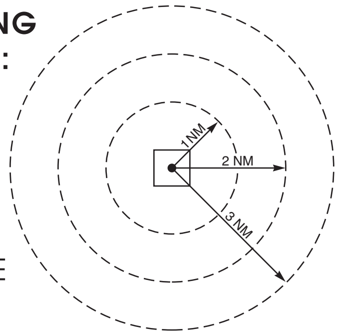
- *LANDING DISTANCE AVAILABLE (LDA):* The runway length declared available and suitable for landing.

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 ultrahigh frequency electronic air navigation system which provides suitably-equipped aircraft a continuous indication of bearing and distance to the TACAN station.

TAKEOFF RUNWAY AVAILABLE (TORA): See declared distances.

TAKEOFF DISTANCE AVAILABLE (TODA): See declared distances.

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

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

TAXIWAY 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.

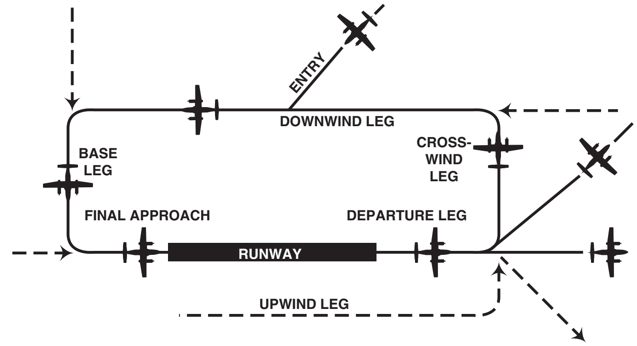
TOUCHDOWN: The point at which a landing aircraft makes contact with the runway surface.

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.

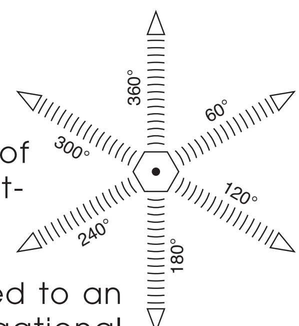


UNCONTROLLED AIRPORT: An airport without an air traffic control tower at which the control of Visual Flight Rules traffic is not exercised.

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

AIRPORT PLANS

Appendix B
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 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 typically 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 Riverside Airport, a draft of which is included in this appendix. The ALP drawing graphically presents the existing and ultimate airport layout plan. The ALP drawing will include such elements as the physical airport features, wind data tabulation, location of airfield facilities (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 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.

FAR PART 77 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 FAR Part 77 Airspace Drawing included in this master plan is a graphic depiction of this regulatory criterion. The FAR 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 FAR Part 77 Airspace Drawing can be a critical tool for the airport sponsor's use in reviewing proposed development in the vicinity of the airport.

The City of Riverside should do all in its power to ensure development stays below the FAR Part 77 surfaces to protect the role of the airport. The following discussion will describe those surfaces that make up the recommended FAR Part 77 surfaces at Riverside Airport.

The FAR Part 77 Airspace Drawing assigns three-dimensional imaginary surfaces associated with the airport. These imaginary surfaces emanate from the runway centerline(s) 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 FAR Part 77 imaginary surfaces include the primary surface, approach surface, transitional surface, horizontal surface, and conical surface. Each surface is described as follows.

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 FAR Part 77 regulations, the primary surface for Runway 9-27 is 1,000 feet wide. The primary surface for Runway 16-34 is 250 feet wide.

Approach Surface

An approach surface is also established for each runway. The approach surface begins at the same width as the primary surface, extends upward and outward from the primary surface end, and is centered along an extended runway centerline. The approach surface leading to each runway is based upon the type of approach available (instrument or visual) or planned. The inner edge of the approach surface is the same width as the primary surface and it expands uniformly.

The approach surface to Runway 9, as defined by the presence of the Instrument Landing System (ILS), is 10,000 feet long rising at a 50:1 slope with an additional 40,000 feet at a 40:1 slope. The width of this approach surface is 16,000 feet.

The approach surface to Runway 27 rises at a 34:1 slope to an ultimate width of 3,500 feet. This approach surface is defined by the presence of non-precision instrument approach procedures with not lower than ¾-mile visibility minimums.

As a visual approach runway, Runway 16-34 has an approach surface that extends to a width of 1,250 feet at a 20:1 ratio to a distance of 5,000 feet.

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 to 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 to 1. Therefore, at 4,000 feet from the horizontal surface, the elevation of the conical surface is 350 feet above the highest airport elevation.

RUNWAY 9 EXTENDED APPROACH SURFACE DRAWING

The approach surface for any precision instrument runway extends to a total length of 50,000 feet; therefore, a separate drawing depicting approximately the last 45,000 feet is necessary. The inner 5,000 feet is separately depicted on the inner-portion of the approach surface drawings.

APPROACH SURFACE PROFILE DRAWINGS

The runway profile drawing presents the entirety of the FAR Part 77 approach surface to the runway ends. It also depicts the runway centerline profile with elevations. This drawing provides profile detail that the Airspace Drawing does not. The profile drawings also depict the existing and future Threshold Siting Surface. There is a separate drawing for each runway.

INNER APPROACH SURFACE DRAWINGS

The Inner Portion of the Approach Surface Drawing contains the plan and profile view of the inner portion of the approach surface to the runway and a tabular listing of all surface violations. The drawing also contains other approach surfaces such as the threshold-siting surface. Detailed obstruction and facility data is provided to identify planned improvements and the disposition of obstructions. A drawing of each runway end is provided.

DEPARTURE SURFACE DRAWING

For runways supporting instrument operations, such as Runway 9-27, a separate drawing depicting the departure surface is required. The departure service, also called the one engine inoperable (OEI) obstacle identification surface (OIS) is a surface emanating from the departure end of the runway to a distance of 10,200 feet. The inner width is 1,000 feet and the outer width is 6,466 feet. On January 1, 2009, the FAA requires that the airport have this drawing completed. The departure surface information should be made available to any commercial operator at the airport.

There are three recommended methods to mitigate penetrations to this surface:

1. The object is removed or lowered.
2. The Takeoff Distance Available (TODA) is decreased (i.e., pilots are instructed to lift off prior to the runway end in order to avoid the obstruction.
3. Instrument departure minimums are raised.

Existing obstacles of 35 feet or less would not require mitigation; instead, new departure procedures may be introduced or existing departure procedures may be altered or no action may be taken.

TERMINAL AREA DRAWING

The terminal area 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*.

AIRPORT LAND USE DRAWING

The objective of the Airport Land Use Drawing is to coordinate uses of the airport property in a manner compatible with the functional design of the airport facility. Airport land use planning is important for orderly development and efficient use of available space. There are two primary considerations for airport land use planning. These are to secure those areas essential to the safe and efficient operation of the airport and to determine compatible land uses for the balance of the property which would be most advantageous to the airport and community.

In the development of an airport land use plan for Riverside Airport, the airport property was broken into several large general tracts. Each tract was analyzed for specific site characteristics, such as tract size and shape, land characteristics, and existing land uses. The availability of utilities and the accessibility to various transportation modes were also considered. Limitations and constraints to development such as height and noise restrictions, runway visibility zones, and contiguous land uses were analyzed next. Finally, the compatibility of various land uses in each tract was analyzed.

The depiction of on-airport land uses on this drawing becomes the official FAA acceptance of current and future land uses. For Riverside Airport, all airport property is planned for aviation purposes.

INNER APPROACH AND INNER TRANSITIONAL OFZ DRAWING

For those runways that have approach visibility minimums lower than ¾ miles, this drawing is required. This drawing depicts, in detail, the sloping inner transitional obstacle free zone (OFZ) surrounding the runway and approach slope.

AIRPORT PROPERTY MAP

The Property Map provides information on property under airport control and is therefore subject to FAA grant assurances. The various recorded deeds that make up the airport property are listed in tabular format. The primary purpose of the drawing is to provide information for analyzing the current and future aeronautical use of land acquired with federal funds.

DRAFT ALP DISCLAIMER

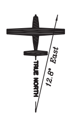
The ALP set has been developed in accordance with accepted FAA and California Department of Transportation – Division of Aeronautics (Caltrans) standards. The ALP set has not been approved by the FAA and is subject to FAA airspace review. Land use and other changes may result.

AIRPORT LAYOUT PLANS
FOR
RIVERSIDE MUNICIPAL AIRPORT
RIVERSIDE, CALIFORNIA

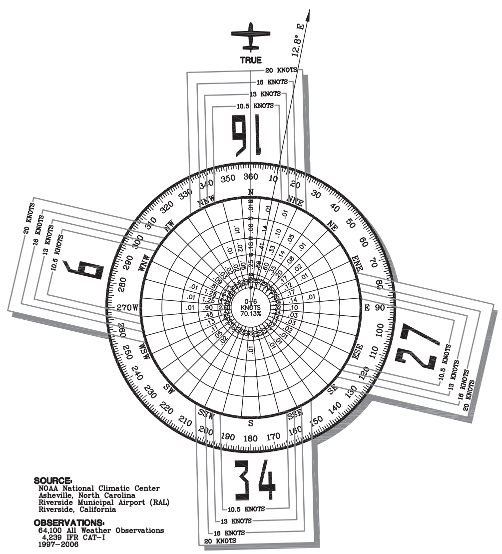
Prepared for

CITY OF RIVERSIDE

LOCATION MAP

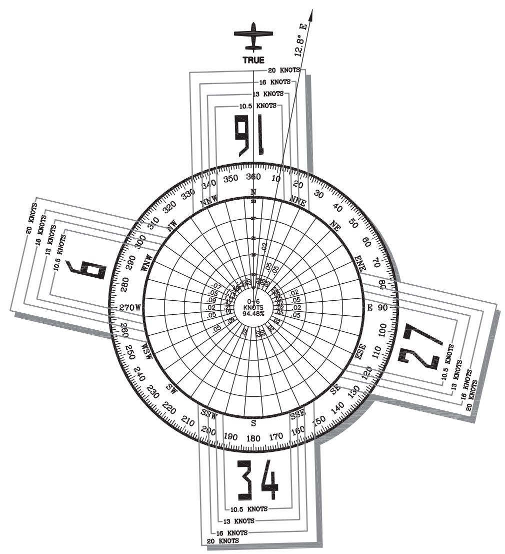


Magnetic Declination
12° 48' East (August 2007)
Annual Rate of Change
00° 05' West (August 2007)



SOURCE:
NOAA National Climatic Center
Asheville, North Carolina
Riverside Municipal Airport (RAL)
Riverside, California

OBSERVATIONS:
64,100 All Weather Observations
4,239 IFR CAT-I
1997-2006



ALL WEATHER WIND COVERAGE				
Runways	10.5 Knots 12 MPH	13 Knots 15 MPH	16 Knots 18 MPH	20 Knots 23 MPH
Runway 9-27	96.15%	97.16%	98.32%	99.29%
Runway 16-34	94.45%	97.04%	99.75%	99.99%
Combined	99.55%	99.90%	99.98%	100.00%

IFR CAT-I WIND COVERAGE				
Runways	10.5 Knots 12 MPH	13 Knots 15 MPH	16 Knots 18 MPH	20 Knots 23 MPH
Runway 9-27	99.88%	99.92%	99.97%	99.99%
Runway 16-34	99.57%	99.76%	99.98%	100.00%
Combined	99.99%	100.00%	100.00%	100.00%

VICINITY MAP

INDEX OF DRAWINGS

1. AIRPORT LAYOUT PLAN
2. AIRPORT AIRSPACE DRAWING CONICAL SURFACE
3. AIRPORT AIRSPACE DRAWING RUNWAY 9 APPROACH SURFACE
4. RUNWAY 9-27 APPROACH SURFACE PROFILES
5. RUNWAY 16-34 APPROACH SURFACE PROFILES
6. INNER PORTION OF RUNWAY 9 APPROACH SURFACE DRAWING
7. INNER PORTION OF RUNWAY 27 APPROACH SURFACE DRAWING
8. INNER PORTION OF RUNWAY 16 APPROACH SURFACE DRAWING
9. INNER PORTION OF RUNWAY 34 APPROACH SURFACE DRAWING
10. TERMINAL AREA DRAWING
11. AIRPORT LAND USE DRAWING
12. RUNWAY 9-27 OFZ DRAWING
13. RUNWAY 9-27 DEPARTURE SURFACE
14. AIRPORT PROPERTY MAP

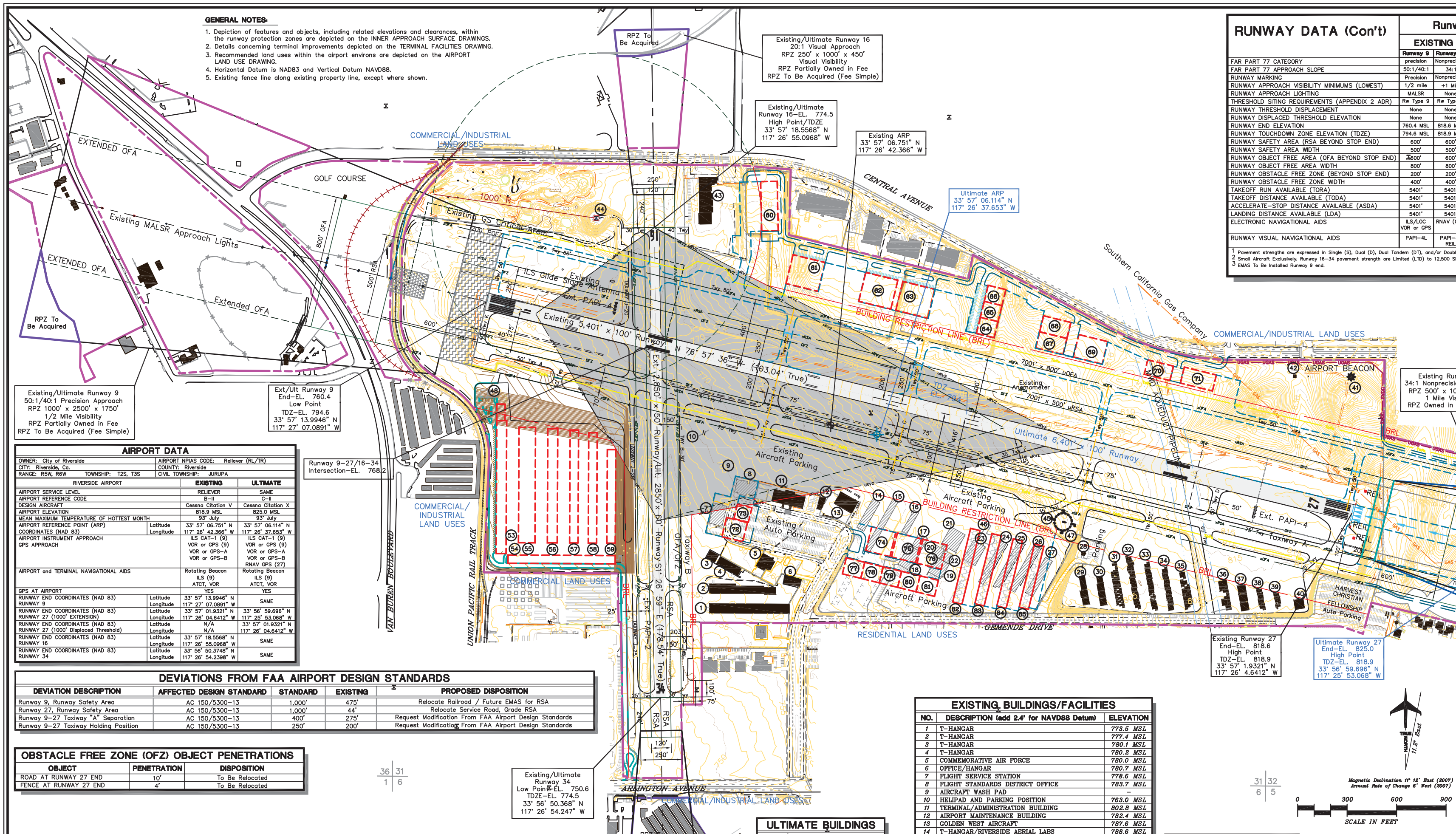
DRAFT

Coffman Associates
Airport Consultants
www.coffmanassociates.com

January 2010

GENERAL NOTES:

1. Depiction of features and objects, including related elevations and clearances, within the runway protection zones are depicted on the INNER APPROACH SURFACE DRAWINGS.
2. Details concerning terminal improvements depicted on the TERMINAL FACILITIES DRAWING.
3. Recommended land uses within the airport environs are depicted on the AIRPORT LAND USE DRAWING.
4. Horizontal Datum is NAD83 and Vertical Datum NAVD88.
5. Existing fence line along existing property line, except where shown.



RUNWAY DATA (Con't)

	Runway 9-27				Runway 16-34			
	EXISTING		ULTIMATE		EXISTING		ULTIMATE	
	Runway 9	Runway 27	Runway 9	Runway 27	Runway 16	Runway 34	Runway 16	Runway 34
FAR PART 77 CATEGORY	precision	Nonprecision	precision	Nonprecision	Visual (A)	Visual (A)	Visual (A)	Visual (A)
FAR PART 77 APPROACH SLOPE	50:1/40:1	34:1	50:1/40:1	34:1	20:1	20:1	20:1	20:1
RUNWAY MARKING	Precision	Nonprecision	Precision	Nonprecision	Visual	Visual	Visual	Visual
RUNWAY APPROACH VISIBILITY MINIMUMS (LOWEST)	1/2 mile	+1 Mile	1/2 mile	+1 Mile	Visual	Visual	Visual	Visual
RUNWAY APPROACH LIGHTING	MALSR	None	MALSR	None	None	None	None	None
THRESHOLD SITING REQUIREMENTS (APPENDIX 2 ADR)	Rw Type 9	Rw Type 6	Rw Type 9	Rw Type 6	Rw Type 2	Rw Type 2	Rw Type 2	Rw Type 2
RUNWAY THRESHOLD DISPLACEMENT	None	None	None	1000'	None	None	None	None
RUNWAY DISPLACED THRESHOLD ELEVATION	None	None	None	818.6 MSL	None	None	None	None
RUNWAY END ELEVATION	760.4 MSL	818.6 MSL	760.4 MSL	825.0 MSL	774.5 MSL	750.6 MSL	774.5 MSL	750.6 MSL
RUNWAY TOUCHDOWN ZONE ELEVATION (TDZE)	794.6 MSL	818.9 MSL	794.6 MSL	818.9 MSL	774.5 MSL	774.5 MSL	774.5 MSL	774.5 MSL
RUNWAY SAFETY AREA (RSA BEYOND STOP END)	600'	600'	1000' [3]	1000'	240'	240'	240'	240'
RUNWAY SAFETY AREA WIDTH	500'	500'	500'	500'	120'	120'	120'	120'
RUNWAY OBJECT FREE AREA (OFA BEYOND STOP END)	600'	600'	1000'	1000'	240'	240'	240'	240'
RUNWAY OBJECT FREE AREA WIDTH	800'	800'	800'	800'	250'	250'	250'	250'
RUNWAY OBSTACLE FREE ZONE (BEYOND STOP END)	200'	200'	200'	200'	200'	200'	200'	200'
RUNWAY OBSTACLE FREE ZONE WIDTH	400'	400'	400'	400'	250'	250'	250'	250'
TAKEOFF RUN AVAILABLE (TORA)	5401'	5401'	5401'	6401'	2850'	2850'	2850'	2850'
TAKEOFF DISTANCE AVAILABLE (TODA)	5401'	5401'	6401'	6401'	2850'	2850'	2850'	2850'
ACCELERATE–STOP DISTANCE AVAILABLE (ASDA)	5401'	5401'	5401'	6401'	2850'	2850'	2850'	2850'
LANDING DISTANCE AVAILABLE (LDA)	5401'	5401'	5401'	5401'	2850'	2850'	2850'	2850'
ELECTRONIC NAVIGATIONAL AIDS	ILS/LOC VOR or GPS	RNAV (GPS)	ILS/LOC VOR or GPS	RNAV (GPS)	None	None	None	None
RUNWAY VISUAL NAVIGATIONAL AIDS	PAPI–4L	PAPI–4L REIL	PAPI–4L	PAPI–4L REIL	PAPI–2L	PAPI–2L	PAPI–2L	PAPI–2L

1 Pavement strengths are expressed in Single (S), Dual (D), Dual Tandem (DT), and/or Double Dual Tandem (DDT) wheel loading capacities.
2 Small Aircraft Exclusively. Runway 16–34 pavement strength are Limited (LTD) to 12,500 Single (S) wheel loading capacities.
3 EMAS To Be Installed Runway 9 end.

AIRPORT DATA

OWNER: City of Riverside		AIRPORT NPIAS CODE: Reliever (RL/TR)	
CITY: Riverside, Ca.		COUNTY: Riverside	
RANGE: R5W, R6W TOWNSHIP: T2S, T3S		CIVIL TOWNSHIP: JURUPA	

RIVERSIDE AIRPORT		EXISTING	ULTIMATE
AIRPORT SERVICE LEVEL		RELIEVER	SAME
AIRPORT REFERENCE CODE		B–II	C–II
DESIGN AIRCRAFT		Cessna Citation V	Cessna Citation X
AIRPORT ELEVATION		818.9 MSL	825.0 MSL
MEAN MAXIMUM TEMPERATURE OF HOTTEST MONTH		93° July	93° July
AIRPORT REFERENCE POINT (ARP) COORDINATES (NAD 83)	Latitude Longitude	33° 57' 06.751" N 117° 26' 42.366" W	33° 57' 06.114" N 117° 26' 37.653" W
AIRPORT INSTRUMENT APPROACH GPS APPROACH		ILS CAT–1 (9) VOR or GPS (9) VOR or GPS–A VOR or GPS–B	ILS CAT–1 (9) VOR or GPS (9) VOR or GPS–A VOR or GPS–B RNAV GPS (27)
AIRPORT and TERMINAL NAVIGATIONAL AIDS		Rotating Beacon ILS (9) ATCT, VOR	Rotating Beacon ILS (9) ATCT, VOR
GPS AT AIRPORT		YES	YES
RUNWAY END COORDINATES (NAD 83) RUNWAY 9	Latitude Longitude	33° 57' 13.9946" N 117° 27' 07.0891" W	SAME
RUNWAY END COORDINATES (NAD 83) RUNWAY 27 (1000' EXTENSION)	Latitude Longitude	33° 57' 01.9321" N 117° 26' 04.6412" W	33° 56' 59.696" N 117° 25' 53.068" W
RUNWAY END COORDINATES (NAD 83) RUNWAY 27 (1000' Displaced Threshold)	Latitude Longitude	N/A N/A	33° 57' 01.9321" N 117° 26' 04.6412" W
RUNWAY END COORDINATES (NAD 83) RUNWAY 16	Latitude Longitude	33° 57' 18.5568" N 117° 26' 55.0968" W	SAME
RUNWAY END COORDINATES (NAD 83) RUNWAY 34	Latitude Longitude	33° 56' 50.3748" N 117° 26' 54.2398" W	SAME

DEVIATIONS FROM FAA AIRPORT DESIGN STANDARDS

DEVIATION DESCRIPTION	AFFECTED DESIGN STANDARD	STANDARD	EXISTING	PROPOSED DISPOSITION
Runway 9, Runway Safety Area	AC 150/5300–13	1,000'	475'	Relocate Railroad / Future EMAS for RSA
Runway 27, Runway Safety Area	AC 150/5300–13	1,000'	44'	Relocate Service Road, Grade RSA
Runway 9–27 Taxiway "A" Separation	AC 150/5300–13	400'	275'	Request Modification From FAA Airport Design Standards
Runway 9–27 Taxiway Holding Position	AC 150/5300–13	250'	200'	Request Modification From FAA Airport Design Standards

OBSTACLE FREE ZONE (OFZ) OBJECT PENETRATIONS

OBJECT	PENETRATION	DISPOSITION
ROAD AT RUNWAY 27 END	10'	To Be Relocated
FENCE AT RUNWAY 27 END	4'	To Be Relocated

RUNWAY DATA

	Runway 9-27		Runway 16-34	
	EXISTING	ULTIMATE	EXISTING	ULTIMATE
AIRCRAFT APPROACH CATEGORY–DESIGN GROUP	B–II	C–II	B–I [2]	B–I [2]
DESIGN CRITICAL AIRCRAFT	Cessna Citation V (560)	Cessna Citation X	Beech Baron 58	Beech Baron 58
WINGSPAN OF DESIGN AIRCRAFT	52.25'	63.92'	37.83'	37.83'
MAX. CERTIFIED TAKEOFF WEIGHT OF DESIGN A/C	16,300 lbs	36,100 lbs	5500 lbs	5500 lbs
UNDERCARRIAGE WIDTH OF DESIGN AIRCRAFT	12.6'	12.6'	7'	7'
DESIGN AIRCRAFT APPROACH SPEED IN KNOTS	115 knots	136 knots	96 knots	96 knots
RUNWAY CENTERLINE TO PARALLEL RUNWAY CENTERLINE	N/A	N/A	N/A	N/A
TAXIWAY CENTERLINE TO PARALLEL TAXIWAY CENTERLINE	N/A	N/A	N/A	N/A
TAXIWAY WINGTIP CLEARANCE	26'	26'	20'	20'
RUNWAY CENTERLINE TO PARALLEL TAXIWAY CENTERLINE	275'	275' / 400'	150'	150'
RUNWAY DIMENSIONS (L x W)	5401' x 100'	6401' x 100'	2850' x 50'	2850' x 60'
RUNWAY TRUE BEARING (NGS SURVEY 3/28/07)	N 76° 57' 36" W (103.04°)	N 76° 57' 36" W (103.04°)	N 1° 27' 36" W (178.54°)	N 1° 27' 36" W (178.54°)
RUNWAY WIND COVERAGE (KNOTS/MPH)	98.16% (16 knots/18 mph)	98.16% (16 knots/18 mph)	95.32% (10.5 knots/12 mph)	95.32% (10.5 knots/12 mph)
RUNWAY MAXIMUM ELEVATION/HIGH POINT OF RUNWAY	818.9 MSL	825.0 MSL	774.5 MSL	774.5 MSL
RUNWAY LOW POINT ELEVATION	760.4 MSL	760.4 MSL	750.6 MSL	750.6 MSL
RUNWAY LIGHTING	MIRL	MIRL	MIRL	MIRL
RUNWAY EFFECTIVE GRADIENT/MAXIMUM GRADIENT	1.08%	1.00%	0.84%	0.84%
RUNWAY PAVEMENT MATERIAL/SURFACE TREATMENT	Asphalt	Asphalt	Asphalt	Asphalt
RUNWAY PAVEMENT STRENGTH (IN THOUSAND LBS.) [1]	48 (S), 70 (DW), 110 (DTW)	48 (S), 70 (DW), 110 (DTW)	40 (S), 50 (DW), 80 (DTW)	40 (S), 50 (DW), 80 (DTW)
LINE OF SIGHT REQUIREMENT MET	NO	NO	YES	YES
TAXIWAY WIDTH	Varies 50'–100'	Varies 50'–100'	Varies 25'–30'	Varies 25'–30'
TAXIWAY LIGHTING	MITL	MITL	MITL	MITL
TAXIWAY MARKING	Centerline	Centerline	Centerline	Centerline
TAXIWAY SURFACE MATERIAL	Asphalt	Asphalt	Asphalt	Asphalt
TAXIWAY SAFETY AREA WIDTH	79'	79'	49'	49'
TAXIWAY OBJECT FREE AREA WIDTH	131'	131'	89'	89'
TAXIWAY HOLDING POSITION MARKING/HOLDSIGN	200'	200' / 250'	125'	125'

ULTIMATE BUILDINGS

NO.	DESCRIPTION
53	T–HANGAR
54	T–HANGAR
55	T–HANGAR
56	T–HANGAR
57	T–HANGAR
58	T–HANGAR
59	T–HANGAR
60	BUILDING 300' x 100'
61	BUILDING 200' x 180'
62	BUILDING 200' x 180'
63	BUILDING 200' x 180'
64	BUILDING 100' x 110'
65	BUILDING 100' x 110'
66	BUILDING 100' x 110'
67	BUILDING 100' x 170'
68	BUILDING 100' x 170'
69	BUILDING 140' x 180'
70	BUILDING 90' x 160'
71	BUILDING 100' x 200'
72	BUILDING 120' x 130'
73	BUILDING 90' x 90'
74	BUILDING 150' x 150'
75	BUILDING 150' x 150'
76	BUILDING 150' x 150'
77	BUILDING 115' x 100'
78	BUILDING 115' x 100'
79	BUILDING 115' x 100'
80	BUILDING 115' x 100'
81	BUILDING 115' x 100'
82	T–HANGAR (20 units)
83	T–HANGAR (19 units)
84	T–HANGAR (18 units)
85	T–HANGAR (17 units)

EXISTING BUILDINGS/FACILITIES

NO.	DESCRIPTION (add 2.4' for NAVD88 Datum)	ELEVATION
1	T–HANGAR	773.5 MSL
2	T–HANGAR	777.4 MSL
3	T–HANGAR	780.1 MSL
4	T–HANGAR	780.2 MSL
5	COMMEMORATIVE AIR FORCE	780.0 MSL
6	OFFICE/HANGAR	780.7 MSL
7	FLIGHT SERVICE STATION	778.6 MSL
8	FLIGHT STANDARDS DISTRICT OFFICE	783.7 MSL
9	AIRCRAFT WASH PAD	–
10	HELIPAD AND PARKING POSITION	763.0 MSL
11	TERMINAL/ADMINISTRATION BUILDING	802.8 MSL
12	AIRPORT MAINTENANCE BUILDING	782.4 MSL
13	GOLDEN WEST AIRCRAFT	787.6 MSL
14	T–HANGAR/RIVERSIDE AERIAL LABS	788.6 MSL
15	T–HANGAR	785.9 MSL
16	T–HANGAR	787.6 MSL
17	RIVERSIDE AIR SERVICE	791.6 MSL
18	RIVERSIDE AIR SERVICE	796.4 MSL
19	RIVERSIDE AIR SERVICE	801.2 MSL
20	RIVERSIDE AIR SERVICE	793.4 MSL
21	RIVERSIDE AIR SERVICE	810.9 MSL
22	RIVERSIDE AIR SERVICE	794.5 MSL
23	FLYING COLORS AEROPAINT	800.7 MSL
24	T–HANGAR	790.6 MSL
25	T–HANGAR	792.9 MSL
26	T–HANGAR	793.7 MSL
27	T–HANGAR	801.9 MSL
28	AIRPORT TRAFFIC CONTROL TOWER (ATCT)	867.6 MSL
29	PORT–A–PORT HANGARS	818.8 MSL
30	PORT–A–PORT HANGARS	821.8 MSL
31	PORT–A–PORT HANGARS	815.5 MSL
32	PORT–A–PORT HANGARS	817.7 MSL
33	PORT–A–PORT HANGARS	817.4 MSL
34	PORT–A–PORT HANGARS	817.1 MSL
35	PORT–A–PORT HANGARS	818.8 MSL
36	PORT–A–PORT HANGARS	823.9 MSL
37	PORT–A–PORT HANGARS	830.7 MSL
38	PORT–A–PORT HANGARS	823.5 MSL
39	PORT–A–PORT HANGARS	823.3 MSL
40	HANGARS	833.7 MSL
41	AIRPORT ROTATING BEACON	899.5 MSL
42	RTR TOWERS	910.2 MSL
43	RIVERSIDE POLICE	797.5 MSL
44	RIVERSIDE TVOR (To Be Relocated)	780.1 MSL
45	SEGMENTED CIRCLE/LIGHTED WIND CONE	818.0 MSL
46	FUEL STORAGE	N/A
47	ELECTRICAL VAULT	N/A
48	FUEL STORAGE	N/A

FOR APPROVAL BY:

City of Riverside DATE

FAA APPROVAL STAMP

LEGEND

EXISTING	ULTIMATE	DESCRIPTION
	SAME	ABANDONED PAVEMENT (To Be Removed)
		AIRPORT PROPERTY LINE/FENCE
		AIRPORT REFERENCE POINT (ARP)
		AIRPORT ROTATING BEACON
		AVIGATION EASEMENT
	SAME	BUILDING ABANDONMENT (To Be Removed)
		BUILDING CONSTRUCTION (Off / on Airport)
		DRAINAGE
		FACILITY CONSTRUCTION
		FENCING
VASI–4	PAPI–4	NAVIGATIONAL AID INSTALLATION (GVGI)
		RUNWAY THRESHOLD LIGHTS and REIL
34 35 / 3 2	SAME	SECTION CORNER
		SEGMENTED CIRCLE/WIND INDICATOR
1080	SAME	TOPOGRAPHY (2005)
		WIND INDICATOR (Lighted)
		HOLDING POSITION MARKING
BRL		BUILDING RESTRICTION LINE (BRL)
		UNIMPROVED ROAD
		PARCELS
		TREES
		CRITICAL AREA
GAS	UGAS	GAS LINES
OFZ		RUNWAY OBSTACLE FREE ZONE
RSA		RUNWAY SAFETY AREA
OFA		RUNWAY OBJECT FREE AREA
	SAME	SURVEY MONUMENT (PACS/SACS)
		LOCALIZER ANTENNA
		GLIDE SLOPE ANTENNA
		MALSR APPROACH LIGHT SYSTEM
		RUNWAY PROTECTION ZONE (RPZ)
		RUNWAY SHADE
		EMAS
		PRECISION OBSTACLE FREE ZONE (POFZ)

No.	REVISIONS	DATE	BY	APP'D.
5	Added Tw J as built, revised West Hangar Development, revised Property Line, revised Bldg No. 5 tenant.	6/5/06	LDJ	CH
4	Revalidation	7/20/05	LDJ	CH
3	Added ASOS, Revised TVOR and Ultimate Property Line	5/9/05	LDJ	CH
2	ALP REVISION	8/18/03	LDJ	CH
1	Revised 1999 Master Plan, added new planimetric details	7/1/00	LDJ	CH

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RIVERSIDE MUNICIPAL AIRPORT

AIRPORT LAYOUT PLAN

DRAFT

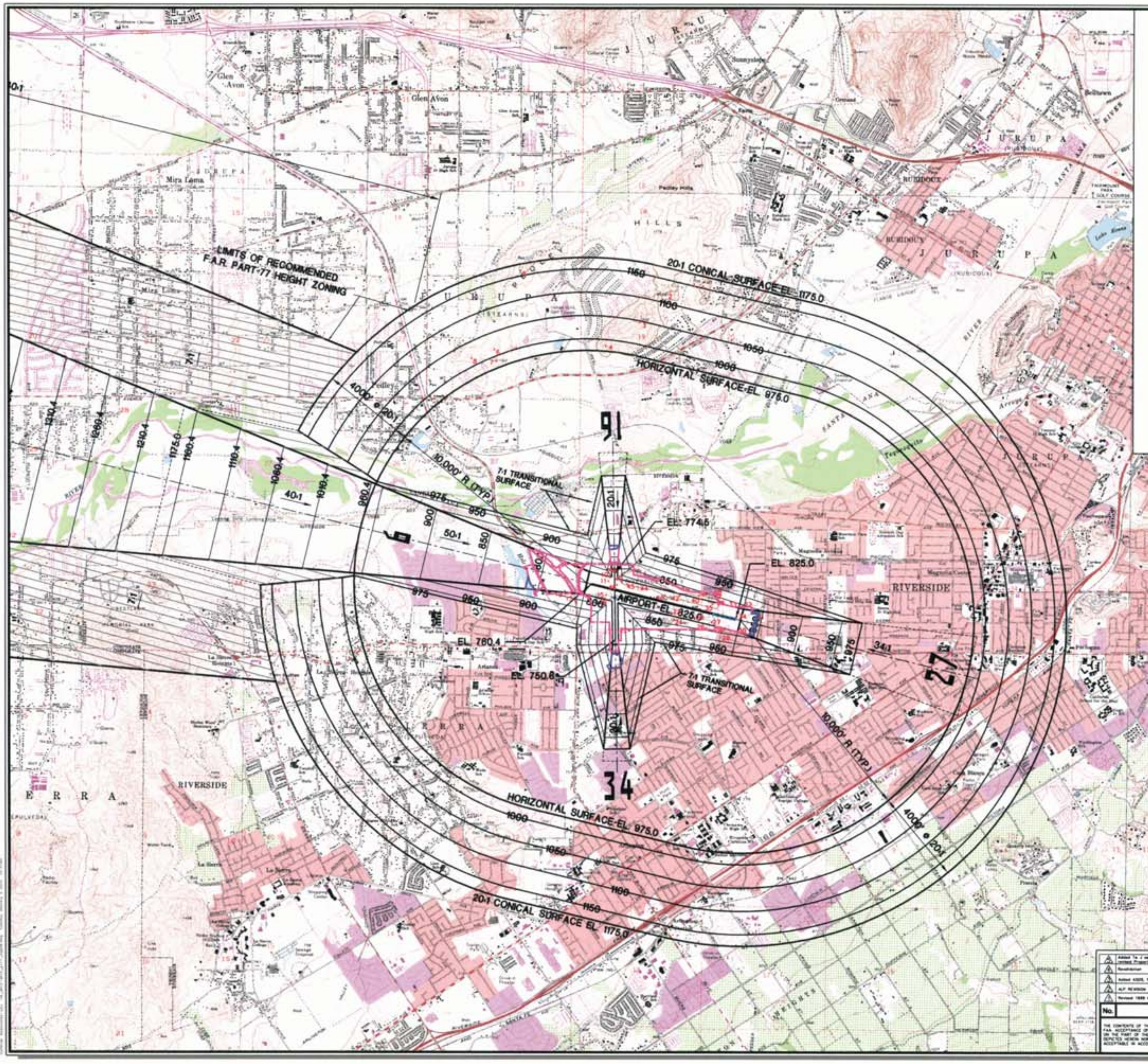
Riverside, California, USA

PLANNED BY: Patrick Taylor
DETAILED BY: Larry D. Johnson
APPROVED BY: James M. Harris, P.E.

January 5, 2010 SHEET 1 OF 14

Coffman Associates
Airport Consultants
www.coffmanassociates.com

Coffman Associates–LDJ RAL_ovr_alp_lup_ofz_prop.dwg Tuesday January 5 2010 8:54am



OBSTRUCTION TABLE

Object Description	Object Elevation	Obstructed Part 77 Surface	Surface Elevation	Object Penetration	Proposed Object Disposition
1. POLE	1228 MSL	20:1 CONICAL SURFACE	1143 MSL	85'	NO ACTION
2. GROUND	1231 MSL	20:1 CONICAL SURFACE	1112 MSL	119'	NO ACTION
3. GROUND	1339 MSL	20:1 CONICAL SURFACE	1038 MSL	1'	NO ACTION
4. TREE	1136 MSL	20:1 CONICAL SURFACE	978 MSL	60'	NO ACTION
5. GROUND	1171 MSL	20:1 CONICAL SURFACE	1146 MSL	25'	NO ACTION
6. TREE	1043 MSL	20:1 CONICAL SURFACE	999 MSL	44'	NO ACTION
7. GROUND	1023 MSL	20:1 CONICAL SURFACE	973 MSL	50'	NO ACTION
8. TREE	1043 MSL	20:1 CONICAL SURFACE	1000 MSL	43'	NO ACTION
9. POLE	791 MSL	7:1 TRANSITIONAL SURFACE	782 MSL	9'	NO ACTION
10. GROUND	767 MSL	PRIMARY SURFACE	762 MSL	5'	EXCAVATED
11. OL ON GLIDE SLOPE	787 MSL	PRIMARY SURFACE	762 MSL	25'	TO REMAIN LIGHTED
12. TREE	791 MSL	7:1 TRANSITIONAL SURFACE	775 MSL	16'	TO BE REMOVED
13. POLE	777 MSL	7:1 TRANSITIONAL SURFACE	775 MSL	2'	NO ACTION
14. RAILROAD	764 MSL	50:1 APPROACH SURFACE	758 MSL	6'	NO ACTION
15. WINDSOCK	767 MSL	PRIMARY SURFACE	762 MSL	5'	NO ACTION
16. OL ON VOR	780 MSL	PRIMARY SURFACE	765 MSL	15'	TO BE RELOCATED
17. WINDSOCK	756 MSL	PRIMARY SURFACE	750 MSL	6'	NO ACTION
18. TREE	783 MSL	7:1 TRANSITIONAL SURFACE	767 MSL	16'	TO BE REMOVED
19. TREE	792 MSL	7:1 TRANSITIONAL SURFACE	772 MSL	20'	TO BE REMOVED
20. TREE	805 MSL	20:1 APPROACH SURFACE	799 MSL	6'	NO ACTION
21. FENCE	754 MSL	PRIMARY SURFACE	748 MSL	6'	NO ACTION
22. FENCE	756 MSL	PRIMARY SURFACE	752 MSL	4'	NO ACTION
23. OL ON LIGHTED WINDSOCK	818 MSL	PRIMARY SURFACE	802 MSL	16'	TO REMAIN LIGHTED
24. ANTENNA ON OL ATCT	876 MSL	7:1 TRANSITIONAL SURFACE	811 MSL	65'	TO REMAIN LIGHTED
25. CEILOMETER	818 MSL	PRIMARY SURFACE	815 MSL	3'	NO ACTION
26. FLOODLIGHT	845 MSL	7:1 TRANSITIONAL SURFACE	829 MSL	16'	NO ACTION
27. WINDSOCK	821 MSL	PRIMARY SURFACE	816 MSL	5'	NO ACTION
28. TREE	842 MSL	7:1 TRANSITIONAL SURFACE	825 MSL	17'	NO ACTION
29. TREE	852 MSL	7:1 TRANSITIONAL SURFACE	842 MSL	10'	NO ACTION
30. TREE	855 MSL	7:1 TRANSITIONAL SURFACE	831 MSL	24'	NO ACTION
31. TREE	859 MSL	34:1 APPROACH SURFACE	841 MSL	18'	TO BE REMOVED
32. TREE	857 MSL	7:1 TRANSITIONAL SURFACE	834 MSL	23'	TO BE REMOVED
33. GROUND	841 MSL	7:1 TRANSITIONAL SURFACE	821 MSL	20'	EXCAVATE
34. ANTENNA ON BUILDING	840 MSL	34:1 APPROACH SURFACE	817 MSL	23'	NO ACTION
35. GROUND	838 MSL	PRIMARY SURFACE	816 MSL	22'	TO BE GRADED
36. GROUND	834 MSL	PRIMARY SURFACE	816 MSL	18'	TO BE GRADED
37. GROUND	856 MSL	7:1 TRANSITIONAL SURFACE	831 MSL	25'	EXCAVATE
38. OL ON AIRPORT BEACON	902 MSL	7:1 TRANSITIONAL SURFACE	849 MSL	53'	TO REMAIN LIGHTED
39. ROD ON OL RTR TOWER	904 MSL	7:1 TRANSITIONAL SURFACE	836 MSL	68'	TO REMAIN LIGHTED
40. GROUND	849 MSL	PRIMARY SURFACE	815 MSL	34'	TO BE GRADED
41. LIGHT STANDARD	861 MSL	7:1 TRANSITIONAL SURFACE	835 MSL	26'	NO ACTION
42. GROUND	821 MSL	PRIMARY SURFACE	804 MSL	17'	TO BE GRADED
43. OL ON ANEMOMETER	818 MSL	PRIMARY SURFACE	795 MSL	23'	TO REMAIN LIGHTED
44. GROUND	800 MSL	7:1 TRANSITIONAL SURFACE	782 MSL	18'	TO BE GRADED
45. GROUND	789 MSL	PRIMARY SURFACE	772 MSL	17'	TO BE GRADED
46. WINDSOCK	775 MSL	PRIMARY SURFACE	766 MSL	9'	NO ACTION
47. GROUND	774 MSL	PRIMARY SURFACE	769 MSL	5'	TO BE GRADED
48. FENCE	777 MSL	7:1 TRANSITIONAL SURFACE	775 MSL	3'	TO BE RELOCATED

GENERAL NOTES:

1. Obstructions, clearances, and locations are calculated from ultimate runway end elevations and ultimate approach surfaces, unless otherwise noted.
2. Depiction of features and objects within the primary, transitional, and horizontal Part 77 surfaces, is illustrated on the AIRPORT AIRSPACE DRAWING, sheet 2 and 3.
3. Depiction of features and objects within the outer portion of the approach surfaces, is illustrated on the APPROACH SURFACE PROFILES DRAWING sheet 4 and 5.
4. Depiction of features and objects within the inner portion of the approach surfaces, is illustrated on the INNER PORTION OF RUNWAY APPROACH SURFACE DRAWING, sheets 6, 7 and 8.
5. Existing and future height and hazard ordinances are to be amended and/or referenced upon approval of updated AIRPORT AIRSPACE DRAWING.
6. Additional obstruction data is illustrated on National Ocean Survey document OC 769, AIRPORT OBSTRUCTION CHART.

HORIZONTAL SCALE IN FEET: 0 – 2000 – 4000 – 6000

Magnetic Declination 11° 12' East (2007)
Annual Rate of Change 6' West (2007)

No.	REVISIONS	DATE	BY	APP'D.
5	Added ... as built, revised ... Hangar Development, ... Property Line, ...	6/5/08	LDJ	CH
4	[illegible]	7/20/05	LDJ	CH
3	[illegible]	5/9/05	LDJ	CH
2	[illegible]	8/18/03	LDJ	CH
1	[illegible]	7/1/00	LDJ	CH

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RIVERSIDE MUNICIPAL AIRPORT

AIRPORT AIRSPACE DRAWING CONICAL SURFACE

Riverside, California, USA

PLANNED BY: Patrick Taylor
DETAILED BY: Larry D. Johnson
APPROVED BY: James M. Harris, P.E.

January 5, 2010 — SHEET 2 OF 14

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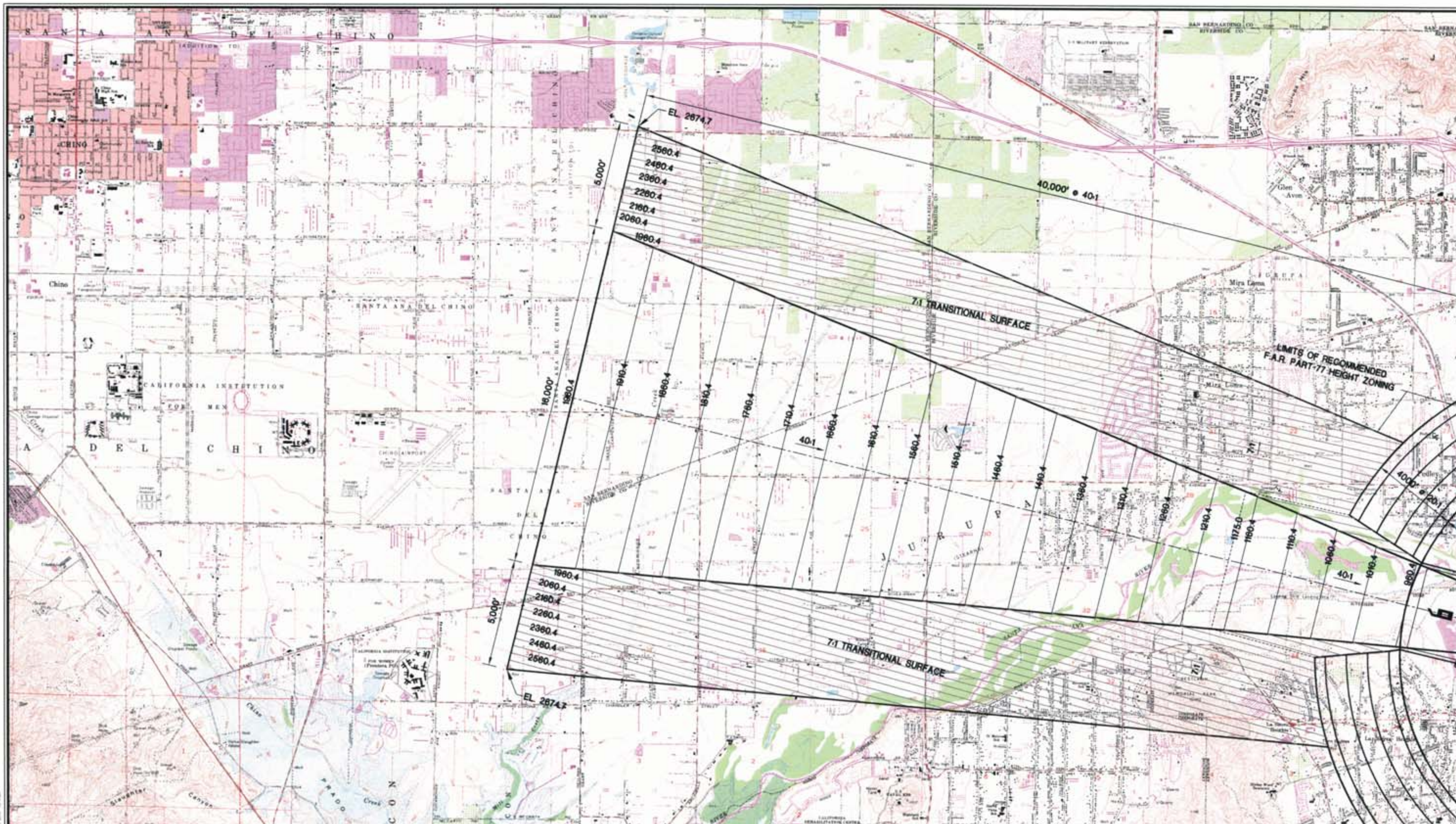

OBSTRUCTION TABLE							
RUNWAY 9	Part 77 Approach Surfaces				Threshold Siting		
Object Description/Elevation	50:1	40:1	34:1	20:1	34:1	20:1	Proposed Disposition
NONE. SEE NOTE 4							

GENERAL NOTES-

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0 2000 4000 6000
HORIZONTAL SCALE IN FEET

No.	REVISIONS	DATE	BY	APP'D.
	[illegible]	6/5/06	LDJ	CH
	[illegible]	7/20/05	LDJ	CH
	[illegible]	5/9/05	LDJ	CH
	ALP REVISION	8/18/03	LDJ	CH
	[illegible]	7/1/00	LDJ	CH

[illegible]

RIVERSIDE MUNICIPAL AIRPORT

AIRPORT AIRSPACE DRAWING
RUNWAY 9 APPROACH SURFACE

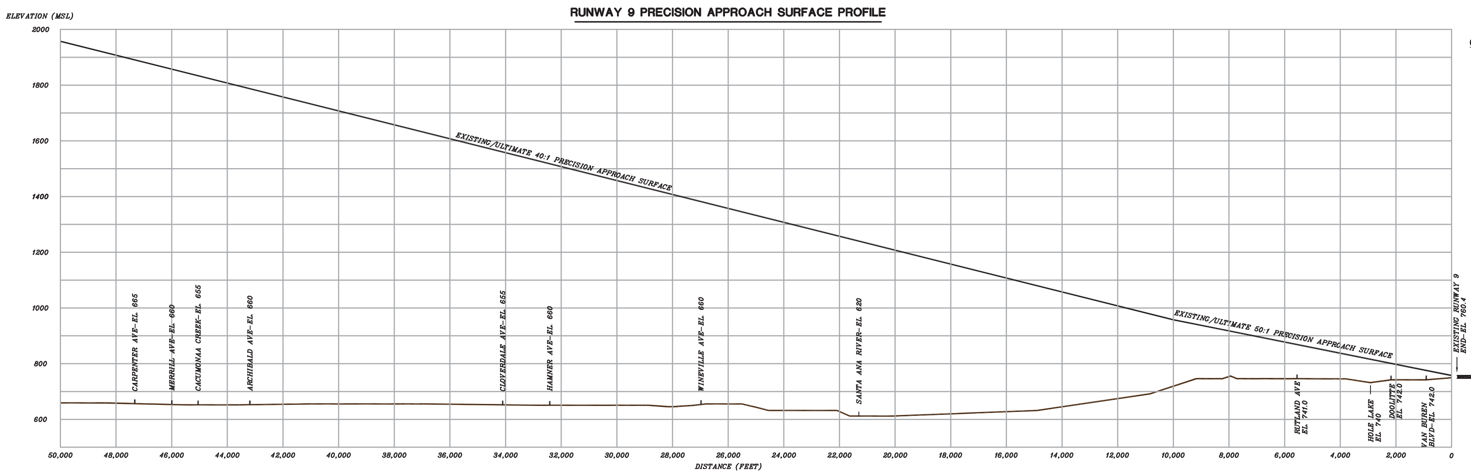
Riverside, California, USA

PLANNED BY: Patrick Taylor
DETAILED BY: Larry D. Johnson
APPROVED BY: James M. Harris, P.E.

January 5, 2010 | SHEET 3 OF 14

Coffman Associates
Airport Consultants

RUNWAY 9 PRECISION APPROACH SURFACE PROFILE



GENERAL NOTES:

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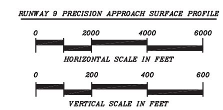
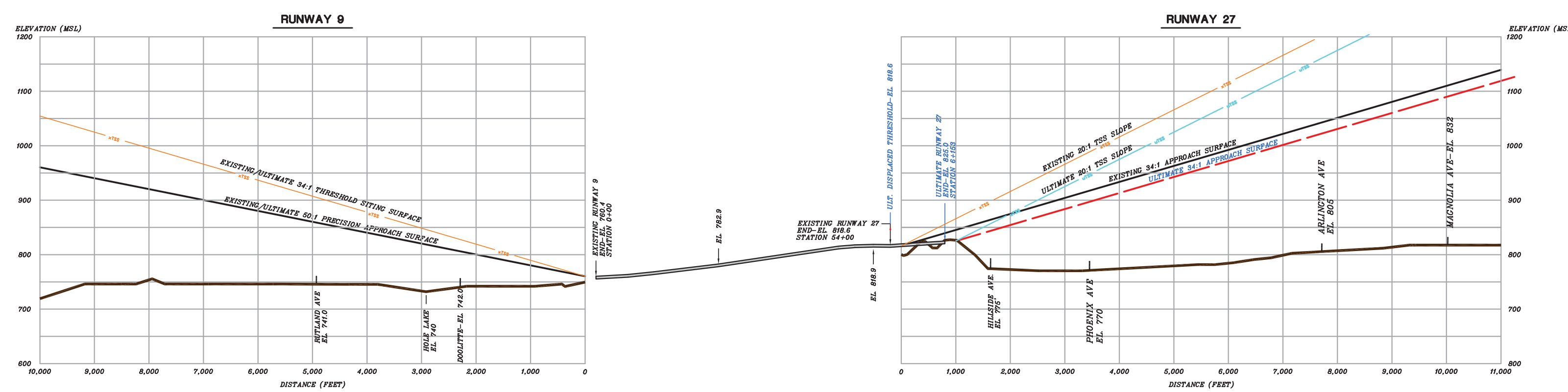
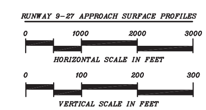
RUNWAY 9 PRECISION APPROACH SURFACE PROFILE





RUNWAY 9-27 APPROACH SURFACE PROFILES

RUNWAY 9-27 APPROACH SURFACE PROFILES



TRUE NORTH 11.2° East

Magnetic Declination 11° 12' East (2007)
Annual Rate of Change 6' West (2007)

RUNWAY 9 OBSTRUCTION TABLE

Object Description	Object Elevation	Obstructed Part 77 Surface	Surface Elevation	Object Penetration	Proposed Object Disposition
-- SEE NOTE 4.	--	--	--	--	--
-- --	--	--	--	--	--
-- --	--	--	--	--	--
-- --					

RUNWAY 27 OBSTRUCTION TABLE

Object Description	Object Elevation	Obstructed Part 77 Surface	Surface Elevation	Object Penetration	Proposed Object Disposition
-- SEE NOTE 4.	--	--	--	--	--
-- --	--	--	--	--	--
-- --	--	--	--	--	--
-- --	--	--	--	--	--
-- --	--	--	--	--	--
-- --	--	--	--	--	--

No.	REVISIONS	DATE	BY	APP'D.
5	Added Tw J as built, revised West Hangar Development, revised Property Line, revised Bldg No. 5 tenant.	6/5/06	LDJ	CH
4	Revalidation	7/20/05	LDJ	CH
3	Added ASOS, Revised TVOR and Ultimate Property Line	5/9/05	LDJ	CH
2	ALP REVISION	8/18/03	LDJ	CH
1	Revised 1999 Master Plan, added new planimetric details	7/1/00	LDJ	CH

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RIVERSIDE MUNICIPAL AIRPORT

RUNWAY 9-27 APPROACH SURFACE PROFILES

DRAFT

Riverside, California, USA

PLANNED BY: *Patrick Taylor*
DETAILED BY: *Larry D. Johnson*
APPROVED BY: *James M. Harris, P.E.*

January 5, 2010 SHEET 4 OF 14

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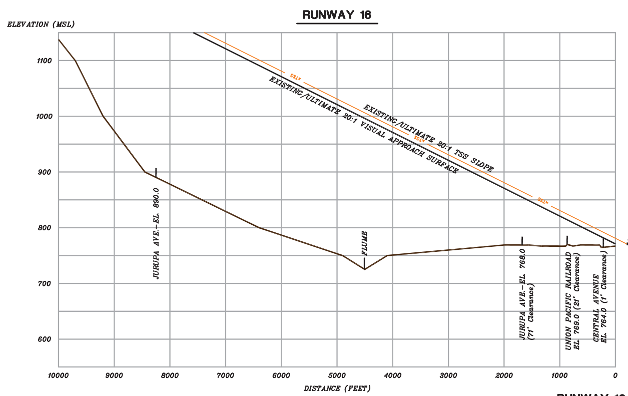
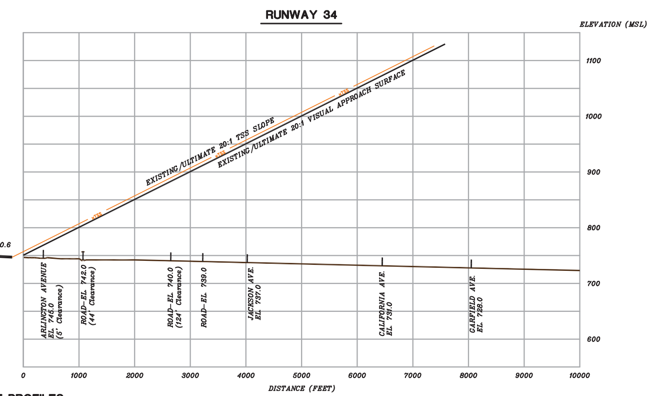
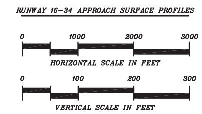
RUNWAY 16-34 APPROACH SURFACE PROFILES







RUNWAY 16-34 APPROACH SURFACE PROFILES

RUNWAY 16 OBSTRUCTION TABLE					
Object Description	Object Elevation	Obstructed Part 77 Surface	Surface Elevation	Object Penetration	Proposed Object Disposition
– SEE NOTE 4.	–	–	–	–	–

RUNWAY 34 OBSTRUCTION TABLE					
Object Description	Object Elevation	Obstructed Part 77 Surface	Surface Elevation	Object Penetration	Proposed Object Disposition
– SEE NOTE 4.	–	–	–	–	–

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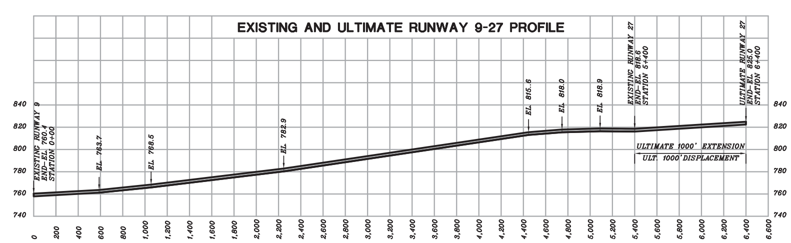

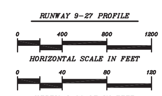

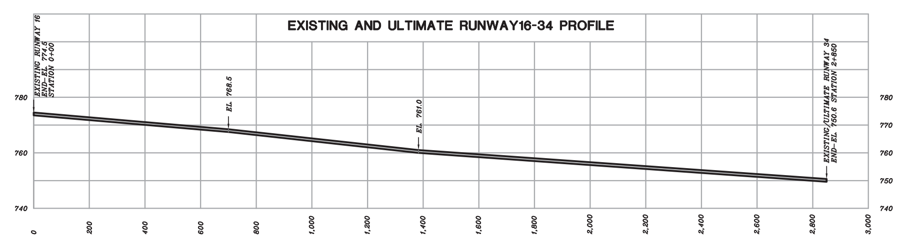

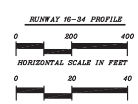

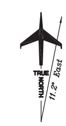

Magnetic Declination 11° 12' East (2007)
Annual Rate of Change 6' West (2007)

No.	REVISIONS	DA		
5	Added Tw J as built, revised West Hangar Development, revised Property Line, revised Bldg No. 5 tenant.	6/5/06	LDJ	CH
4	Revalidation	7/20/05	LDJ	CH
3	Added ASOS, Revised TVOR and Ultimate Property Line	5/9/05	LDJ	CH
2	ALP REVISION	8/18/03	LDJ	CH
1	Revised 1999 Master Plan, added new planimetric details	7/1/00	LDJ	CH

RIVERSIDE MUNICIPAL AIRPORT
RUNWAY 16-34
APPROACH SURFACE PROFILES
DRAFT
Riverside, California, USA

PLANNED BY:
DETAILED BY:
APPROVED BY: M. Harris, P.E.
January 5, 2010
5 14

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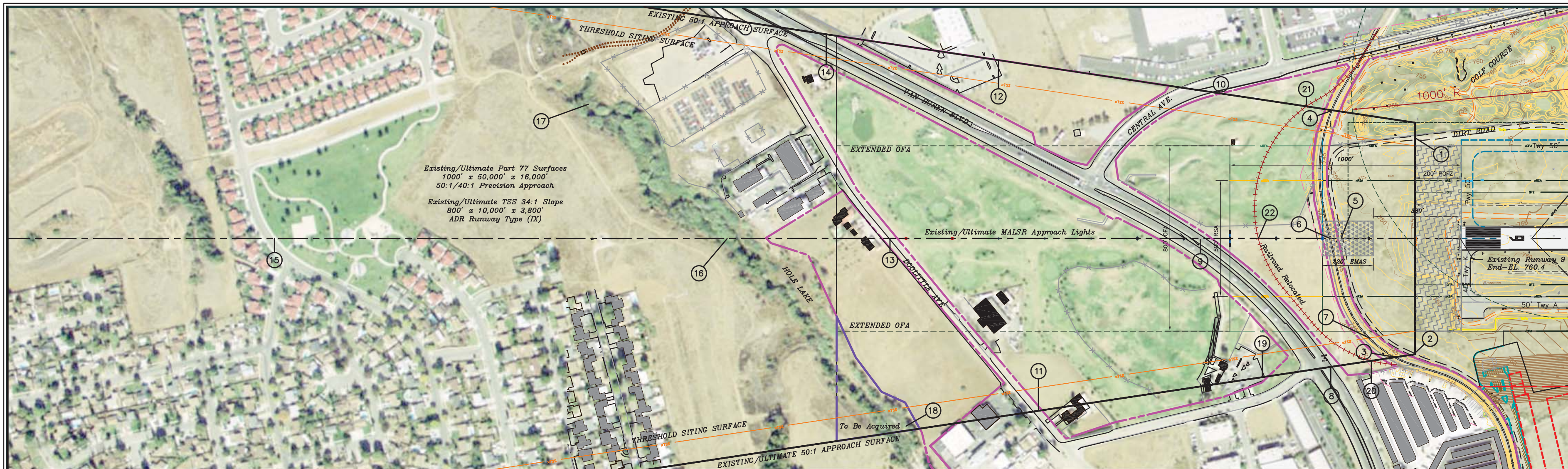

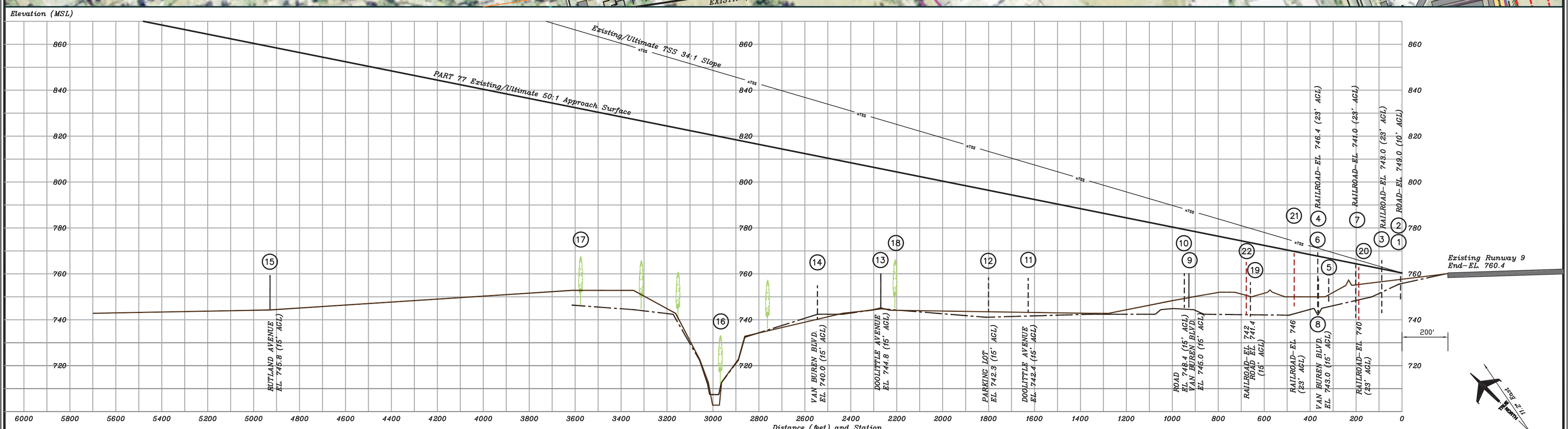

RUNWAY 9 OBSTRUCTION TABLE				
Objects Description/Elevation	Part 77 Approach Existing/Ultimate 50:1	AC 150/5300-13 Existing/Ultimate TSS 34:1 SLOPE		Proposed Disposition
3. RAILROAD-EL. 766	4'	CL		Relocate
– –	–	–		–
–	–	–		–
– –	–	–		–
– –	–	–		–

GENERAL NOTES:

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2. Depiction of features and objects within the primary, transitional, and horizontal Part 77 surfaces, is illustrated on the AIRPORT AIRSPACE DRAWING.

TRUE NORTH 11.2° East

Magnetic Declination
11° 12' East (2007)
Annual Rate of Change
6' West (2007)

VERTICAL SCALE IN FEET (0, 20, 40, 60)

HORIZONTAL SCALE IN FEET (0, 200, 400, 600)

No.	REVISIONS	DATE	BY	APP'D.
5	Added Tw J as built, revised West Hangar Development, revised Property Line, revised Bldg No. 5 tenant.	6/5/06	LDJ	CH
4	Revalidation	7/20/05	LDJ	CH
3	Added ASOS, Revised TVOR and Ultimate Property Line	5/9/05	LDJ	CH
2	ALP REVISION	8/18/03	LDJ	CH
1	Revised 1999 Master Plan, added new planimetric details	7/1/00	LDJ	CH

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RIVERSIDE MUNICIPAL AIRPORT

INNER PORTION OF RUNWAY 9 APPROACH SURFACE DRAWING

DRAFT

Riverside, California, USA

PLANNED BY: Patrick Taylor
DETAILED BY: Larry D. Johnson
APPROVED BY: James M. Harris, P.E.

January 5, 2010 | SHEET 6 OF 14

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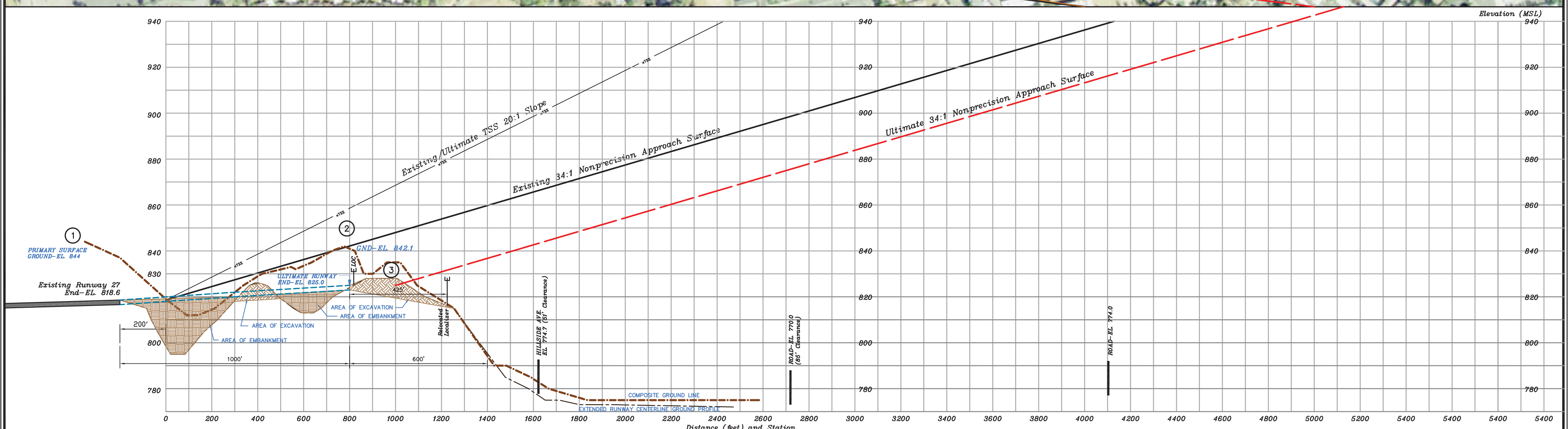

RUNWAY 27 OBSTRUCTION TABLE

Objects Description/Elevation	Part 77 Approach Ultimate	Part 77 Approach Existing	AC 150/5300-13 Appendix 2 Ultimate	AC 150/5300-13 Appendix 2 Existing	Proposed Disposition
	34:1	34:1	20:1	SAME	
1. TERRIAN-EL. 845.0	–	2'	CLEAR	SAME	EXCAVATE
2. TERRIAN-EL. 842.1	–	6'	5'	SAME	EXCAVATE
3. TERRIAN-EL. 835.2	10'	CLEAR	CLEAR	SAME	EXCAVATE
– –	–	–	–	–	–
– –	–	–	–	–	–

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Magnetic Declination 11° 12' East (2007) Annual Rate of Change 6' West (2007)

VERTICAL SCALE IN FEET (0, 20, 40, 60)

HORIZONTAL SCALE IN FEET (0, 200, 400, 600)

No.	REVISIONS	DATE	BY	APP'D.
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4	Revalidation	7/20/05	LDJ	CH
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RIVERSIDE MUNICIPAL AIRPORT

INNER PORTION OF RUNWAY 27 APPROACH SURFACE DRAWING

DRAFT

Riverside, California, USA

PLANNED BY: Patrick Taylor
DETAILED BY: Larry D. Johnson
APPROVED BY: James M. Harris, P.E.

January 5, 2010

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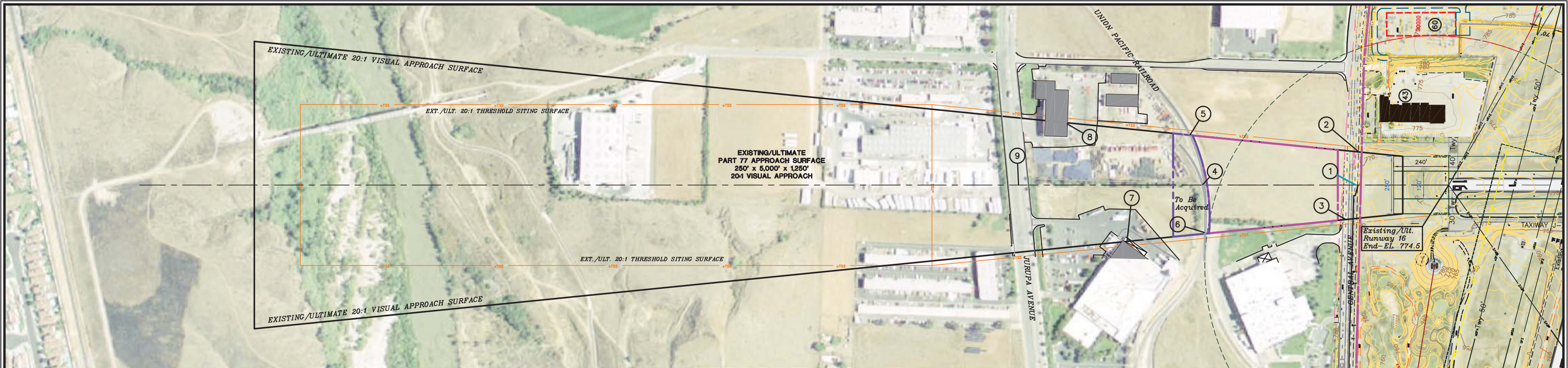
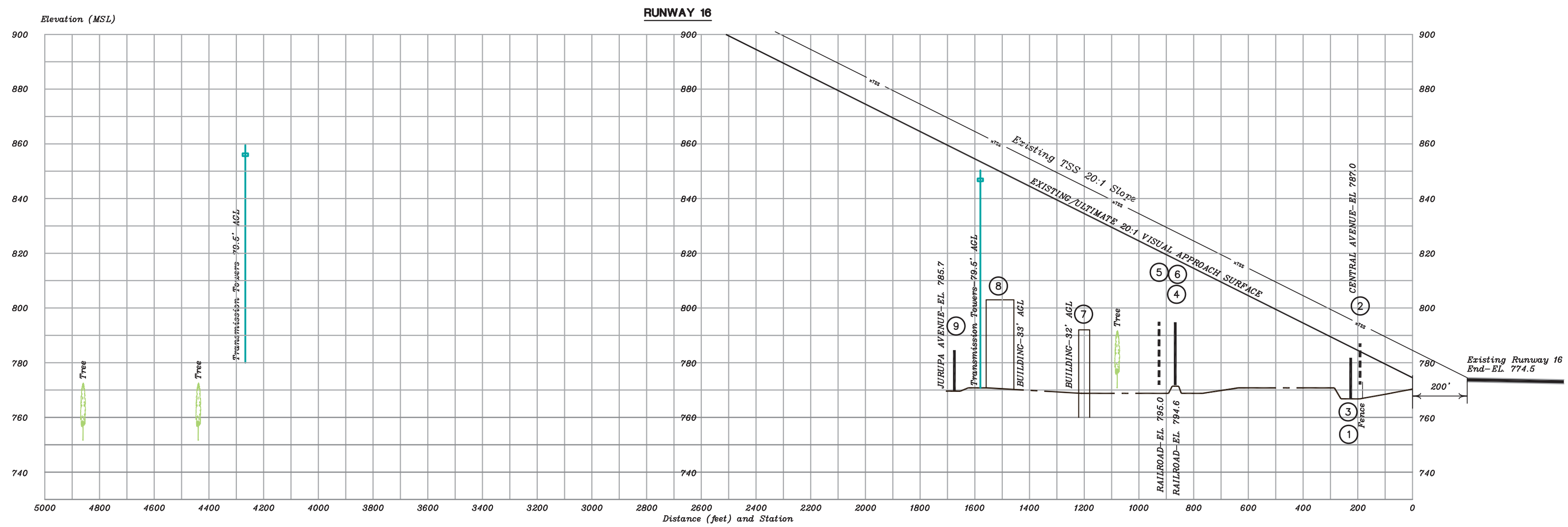


RUNWAY 16



RUNWAY 16 OBSTRUCTION TABLE					
Objects Description/Elevation	Part 77 Approach		AC 150/5300-13 Appendix 2		Proposed Disposition
	Ultimate	Existing	Ultimate	Existing	
	20:1	20:1	20:1	20:1	
2. Road-EL. 787	3'	SAME	CLEAR	SAME	NO ACTION
– –	–	–	–	–	–
– –	–	–	–	–	–
– –	–	–	–	–	–
– –	–	–	–	–	–

GENERAL NOTES:

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11.2' East
TRUE NORTH

Magnetic Declination
11° 12' East (2007)
Annual Rate of Change
6' West (2007)

0 20 40 60
VERTICAL SCALE IN FEET

0 200 400 600
HORIZONTAL SCALE IN FEET

No.	REVISIONS	DATE	BY	APP'D.
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4	Revalidation	7/20/05	LDJ	CH
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RIVERSIDE MUNICIPAL AIRPORT

INNER PORTION OF RUNWAY 16 APPROACH SURFACE DRAWING

DRAFT

Riverside, California, USA

PLANNED BY: Patrick Taylor
DETAILED BY: Larry D. Johnson
APPROVED BY: James M. Harris, P.E.

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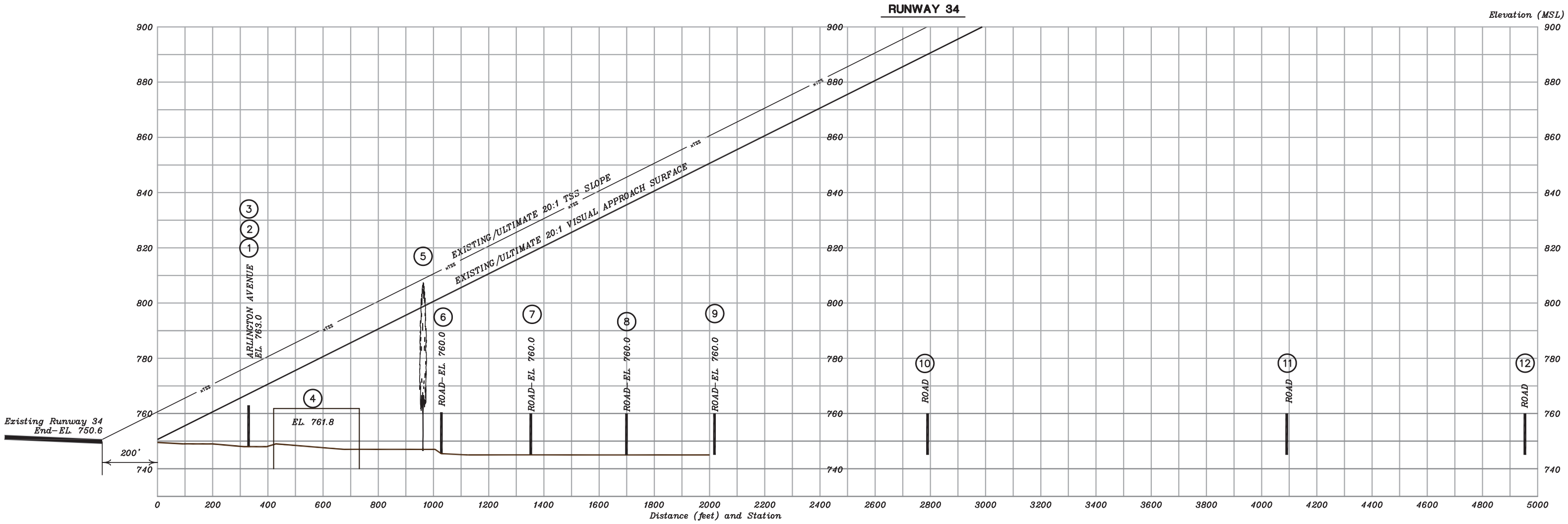
RUNWAY 34



RUNWAY 34 OBSTRUCTION TABLE

Objects Description/Elevation	Part 77 Approach Ultimate 20:1	Part 77 Approach Existing 20:1	AC 150/5300-13 Appendix 2 Ultimate 20:1	AC 150/5300-13 Appendix 2 Existing 20:1	Proposed Disposition
5. TREE-EL 808	6'	SAME	CLEAR	SAME	TRIM or REMOVE
– –	–	–	–	–	–
– –	–	–	–	–	–
– –	–	–	–	–	–
– –	–	–	–	–	–

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11.2° East
TRUE NORTH

Magnetic Declination
11° 12' East (2007)
Annual Rate of Change
6' West (2007)

VERTICAL SCALE IN FEET (0, 20, 40, 60)

HORIZONTAL SCALE IN FEET (0, 200, 400, 600)

No.	REVISIONS	DATE	BY	APP'D.
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RIVERSIDE MUNICIPAL AIRPORT

INNER PORTION OF RUNWAY 34 APPROACH SURFACE DRAWING

DRAFT

Riverside, California, USA

PLANNED BY: Patrick Taylor
DETAILED BY: Larry D. Johnson
APPROVED BY: James M. Harris, P.E.

January 5, 2010 SHEET 9 OF 14

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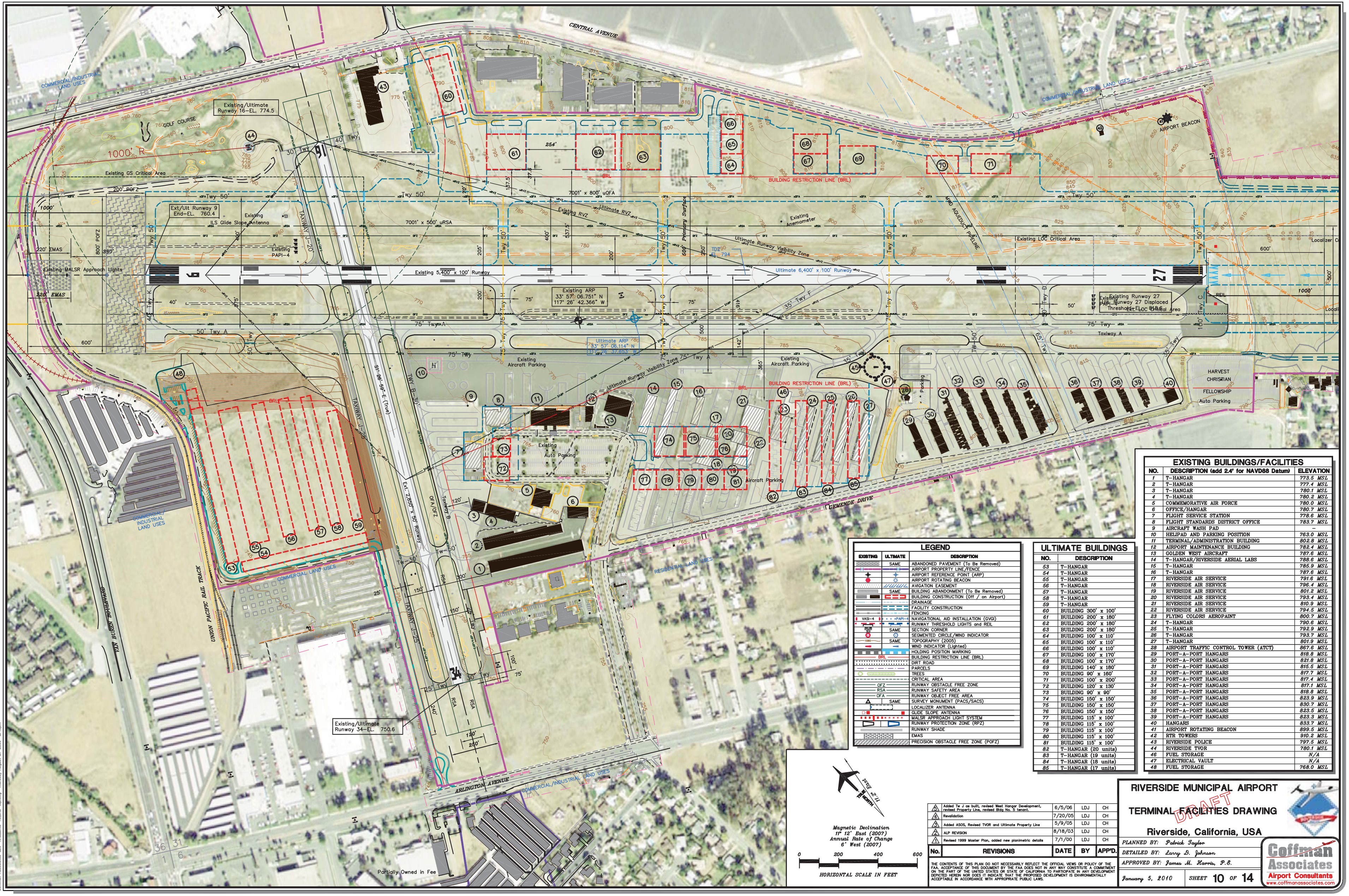

LEGEND

EXISTING	ULTIMATE	DESCRIPTION
	SAME	ABANDONED PAVEMENT (To Be Removed)
		AIRPORT PROPERTY LINE/FENCE
		AIRPORT REFERENCE POINT (ARP)
		AIRPORT ROTATING BEACON
		AVIGATION EASEMENT
	SAME	BUILDING ABANDONMENT (To Be Removed)
		BUILDING CONSTRUCTION (Off / on Airport)
		DRAINAGE
		FACILITY CONSTRUCTION
		FENCING
VASI-4	PAPI-4	NAVIGATIONAL AID INSTALLATION (GVGI)
		RUNWAY THRESHOLD LIGHTS and REIL
	SAME	SECTION CORNER
		SEGMENTED CIRCLE/WIND INDICATOR
	SAME	TOPOGRAPHY (2005)
		WIND INDICATOR (Lighted)
		HOLDING POSITION MARKING
BRL		BUILDING RESTRICTION LINE (BRL)
		DIRT ROAD
		PARCELS
		TREES
		CRITICAL AREA
OFZ		RUNWAY OBSTACLE FREE ZONE
RSA		RUNWAY SAFETY AREA
OFA		RUNWAY OBJECT FREE AREA
	SAME	SURVEY MONUMENT (PACS/SACS)
		LOCALIZER ANTENNA
		GLIDE SLOPE ANTENNA
		MALSR APPROACH LIGHT SYSTEM
		RUNWAY PROTECTION ZONE (RPZ)
		RUNWAY SHADE
		EMAS
		PRECISION OBSTACLE FREE ZONE (POFZ)

ULTIMATE BUILDINGS

NO.	DESCRIPTION
53	T-HANGAR
54	T-HANGAR
55	T-HANGAR
56	T-HANGAR
57	T-HANGAR
58	T-HANGAR
59	T-HANGAR
60	BUILDING 300' x 100'
61	BUILDING 200' x 180'
62	BUILDING 200' x 180'
63	BUILDING 200' x 180'
64	BUILDING 100' x 110'
65	BUILDING 100' x 110'
66	BUILDING 100' x 110'
67	BUILDING 100' x 170'
68	BUILDING 100' x 170'
69	BUILDING 140' x 180'
70	BUILDING 90' x 160'
71	BUILDING 100' x 200'
72	BUILDING 120' x 130'
73	BUILDING 90' x 90'
74	BUILDING 150' x 150'
75	BUILDING 150' x 150'
76	BUILDING 150' x 150'
77	BUILDING 115' x 100'
78	BUILDING 115' x 100'
79	BUILDING 115' x 100'
80	BUILDING 115' x 100'
81	BUILDING 115' x 100'
82	T-HANGAR (20 units)
83	T-HANGAR (19 units)
84	T-HANGAR (18 units)
85	T-HANGAR (17 units)

EXISTING BUILDINGS/FACILITIES

NO.	DESCRIPTION (add 2.4' for NAVD88 Datum)	ELEVATION
1	T-HANGAR	773.5 MSL
2	T-HANGAR	777.4 MSL
3	T-HANGAR	780.1 MSL
4	T-HANGAR	780.2 MSL
5	COMMEMORATIVE AIR FORCE	780.0 MSL
6	OFFICE/HANGAR	780.7 MSL
7	FLIGHT SERVICE STATION	778.6 MSL
8	FLIGHT STANDARDS DISTRICT OFFICE	783.7 MSL
9	AIRCRAFT WASH PAD	–
10	HELIPAD AND PARKING POSITION	763.0 MSL
11	TERMINAL/ADMINISTRATION BUILDING	802.8 MSL
12	AIRPORT MAINTENANCE BUILDING	782.4 MSL
13	GOLDEN WEST AIRCRAFT	787.6 MSL
14	T-HANGAR/RIVERSIDE AERIAL LABS	788.6 MSL
15	T-HANGAR	785.9 MSL
16	T-HANGAR	787.6 MSL
17	RIVERSIDE AIR SERVICE	791.6 MSL
18	RIVERSIDE AIR SERVICE	796.4 MSL
19	RIVERSIDE AIR SERVICE	801.2 MSL
20	RIVERSIDE AIR SERVICE	793.4 MSL
21	RIVERSIDE AIR SERVICE	810.9 MSL
22	RIVERSIDE AIR SERVICE	794.5 MSL
23	FLYING COLORS AEROPAINT	800.7 MSL
24	T-HANGAR	790.6 MSL
25	T-HANGAR	792.9 MSL
26	T-HANGAR	793.7 MSL
27	T-HANGAR	801.9 MSL
28	AIRPORT TRAFFIC CONTROL TOWER (ATCT)	867.6 MSL
29	PORT-A-PORT HANGARS	818.8 MSL
30	PORT-A-PORT HANGARS	821.8 MSL
31	PORT-A-PORT HANGARS	815.5 MSL
32	PORT-A-PORT HANGARS	817.7 MSL
33	PORT-A-PORT HANGARS	817.4 MSL
34	PORT-A-PORT HANGARS	817.1 MSL
35	PORT-A-PORT HANGARS	818.8 MSL
36	PORT-A-PORT HANGARS	823.9 MSL
37	PORT-A-PORT HANGARS	830.7 MSL
38	PORT-A-PORT HANGARS	823.5 MSL
39	PORT-A-PORT HANGARS	823.3 MSL
40	HANGARS	833.7 MSL
41	AIRPORT ROTATING BEACON	899.5 MSL
42	RTR TOWERS	910.2 MSL
43	RIVERSIDE POLICE	797.5 MSL
44	RIVERSIDE TVOR	780.1 MSL
46	FUEL STORAGE	N/A
47	ELECTRICAL VAULT	N/A
48	FUEL STORAGE	768.0 MSL

TRUE NORTH 11.2° East

Magnetic Declination 11° 12' East (2007) Annual Rate of Change 6' West (2007)

0 200 400 600

HORIZONTAL SCALE IN FEET

No.	REVISIONS	DATE	BY	APP'D.
	Added Tw J as built, revised West Hangar Development, revised Property Line, revised Bldg No. 5 tenant.	6/5/06	LDJ	CH
	Revalidation	7/20/05	LDJ	CH
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RIVERSIDE MUNICIPAL AIRPORT

TERMINAL FACILITIES DRAWING

DRAFT

Riverside, California, USA

PLANNED BY: Patrick Taylor

DETAILED BY: Larry D. Johnson

APPROVED BY: James M. Harris, P.E.

January 5, 2010

SHEET 10 OF 14

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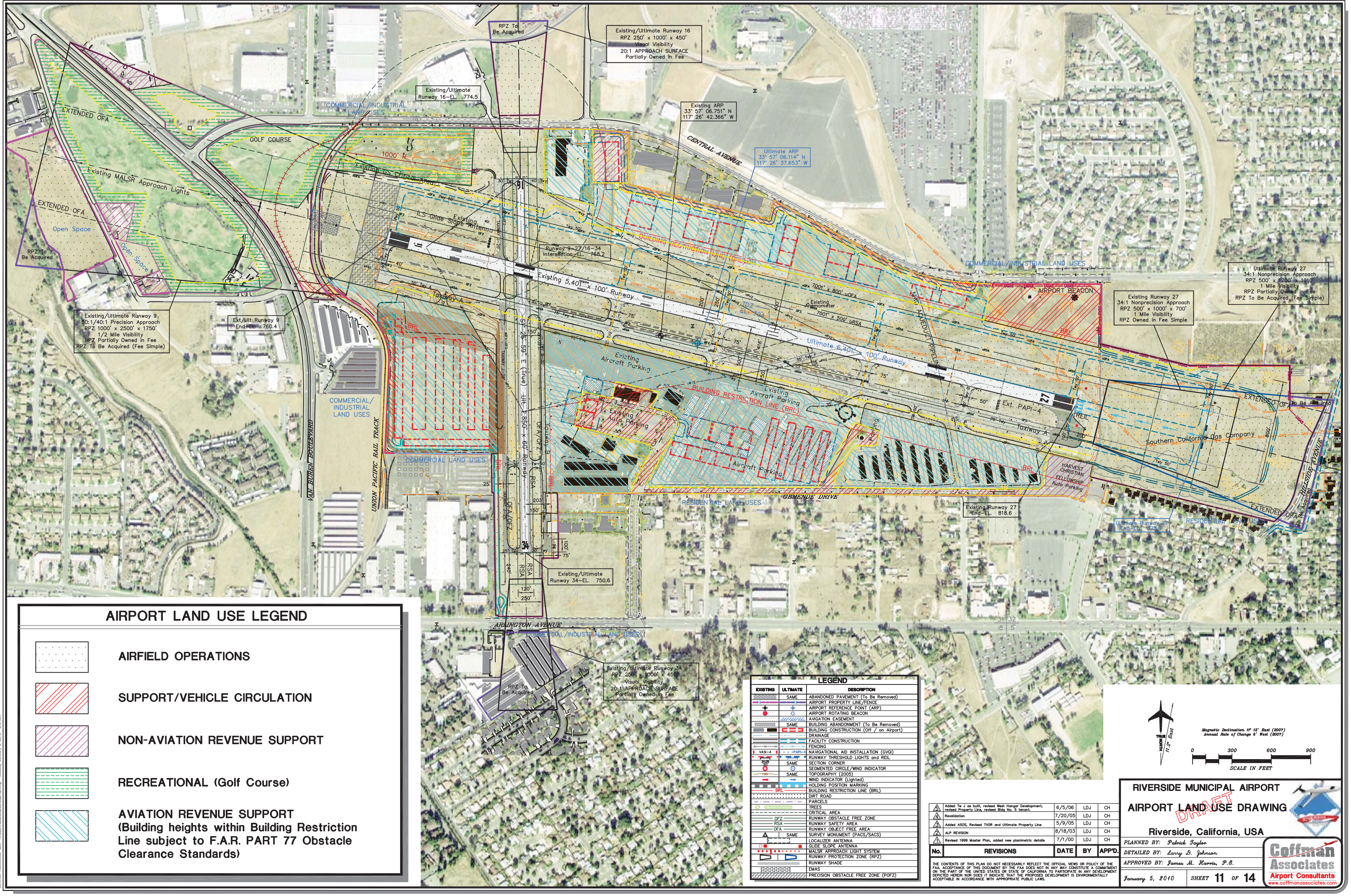
AIRPORT LAND USE LEGEND
AIRFIELD OPERATIONS
SUPPORT/VEHICLE CIRCULATION
NON-AVIATION REVENUE SUPPORT
RECREATIONAL (Golf Course)
AVIATION REVENUE SUPPORT (Building heights within Building Restriction Line subject to F.A.R. PART 77 Obstacle Clearance Standards)
RIVERSIDE MUNICIPAL AIRPORT
AIRPORT LAND USE DRAWING
DRAFT
Riverside, California, USA
PLANNED BY: Patrick Taylor
DETAILED BY: Larry D. Johnson
APPROVED BY: James M. Harris, P.E.
January 5, 2010
SHEET 11 OF 14
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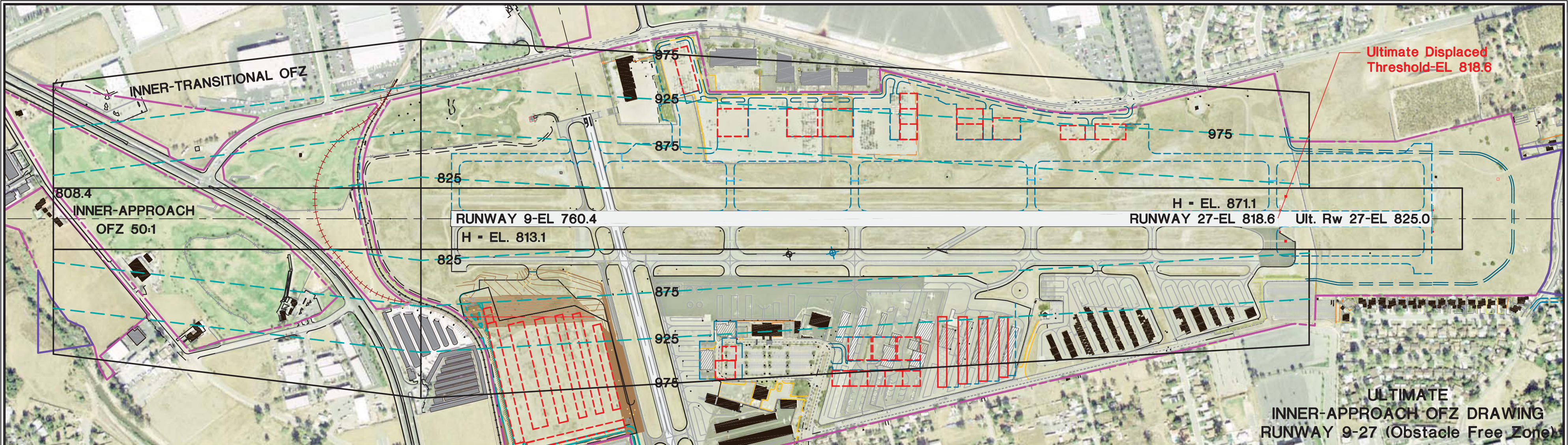
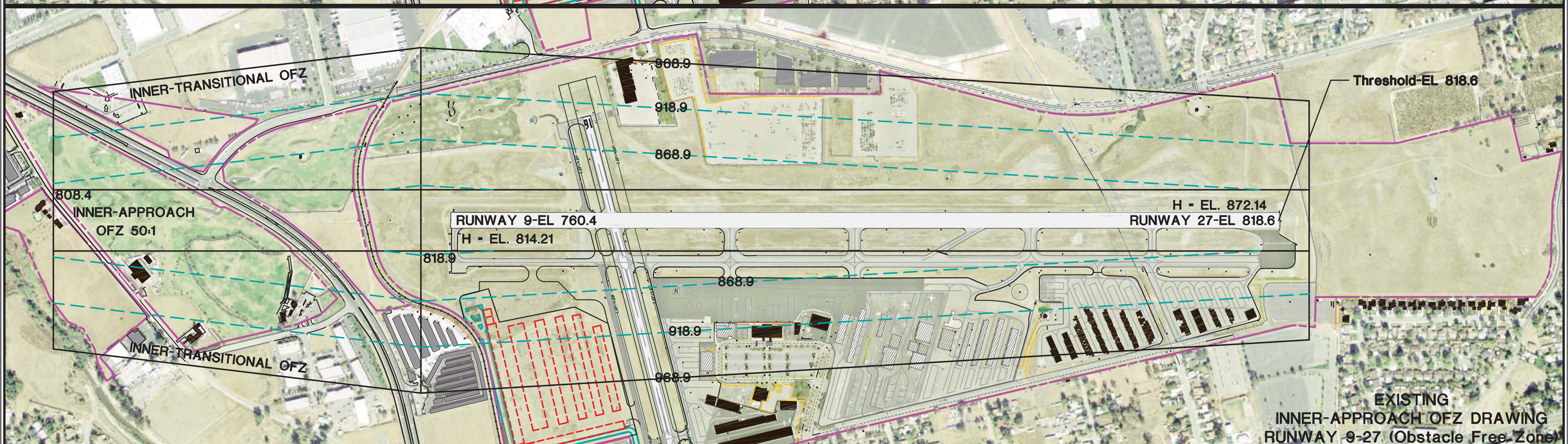
REVISIONS
Existing/Ultimate Runway 16 RPZ 250' x 1000' x 450' Visual Visibility 20:1 APPROACH SURFACE Partially Owned In Fee
Existing/Ultimate Runway 16-EL. 774.5
Existing ARP 33° 57' 06.751" N 117° 26' 42.366" W
Ultimate ARP 33° 57' 06.114" N 117° 26' 37.653" W
Existing/Ultimate Runway 9 50:1/40:1 Precision Approach RPZ 1000' x 2500' x 1750' 1/2 Mile Visibility RPZ Partially Owned In Fee RPZ To Be Acquired (Fee Simple)
Ext/Ult Runway 9 End-EL. 760.4
Existing Runway 27 34:1 Nonprecision Approach RPZ 500' x 1000' x 700' 1 Mile Visibility RPZ Owned In Fee Simple
Ultimate Runway 27 34:1 Nonprecision Approach RPZ 500' x 1700' x 1010' 1 Mile Visibility RPZ Partially Owned In Fee RPZ To Be Acquired (Fee Simple)
Existing Runway 27 End-EL. 818.6
Existing/Ultimate Runway 34-EL. 750.6
Existing/Ultimate Runway 34 RPZ 250' x 1000' x 450' Visual Visibility 20:1 APPROACH SURFACE Partially Owned In Fee
Runway 9-27/16-34 Intersection-EL. 768.2
Existing 5,401' x 100' Runway
Ultimate 5,401' x 100' Runway
Ult. 2,850' x 60' Runway
BUILDING RESTRICTION LINE (BRL)
AIRPORT BEACON
CENTRAL AVENUE
ARLINGTON AVENUE
GRAMERCY DRIVE
VAN BUREN BOULEVARD
UNION PACIFIC RAIL TRACK
HILLSIDE AVENUE
COMMERCIAL/INDUSTRIAL LAND USES
COMMERCIAL LAND USES
RESIDENTIAL LAND USES
GOLF COURSE
EXTENDED OFA
Open Space
RPZ To Be Acquired
Existing MALSR Approach Lights
Southern California Gas Company
HARVEST CHRISTIAN FELLOWSHIP Auto Parking
Existing Aircraft Parking
Aircraft Parking
Existing Auto Parking
Taxiway A
Ext. PAPI-4
REIL
OFA/OFZ
RSA

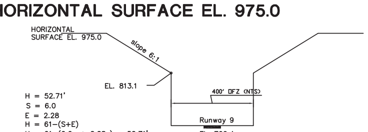


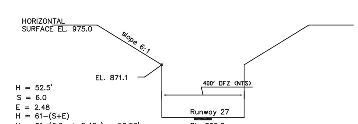


OBSTACLE FREE ZONE (OFZ) OBJECT PENETRATIONS

OBJECT	PENETRATION	DISPOSITION
None	– –	– –

HORIZONTAL SURFACE EL. 975.0





Magnetic Declination 11° 12' East (2007)
Annual Rate of Change 6' West (2007)

TRUE NORTH 11.2° East

0 300 600 900
SCALE IN FEET

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RIVERSIDE MUNICIPAL AIRPORT

RUNWAY 9-27 OFZ DRAWING

DRAFT

Riverside, California, USA

PLANNED BY: Patrick Taylor
DETAILED BY: Larry D. Johnson
APPROVED BY: James M. Harris, P.E.

January 5, 2010 SHEET 12 OF 14

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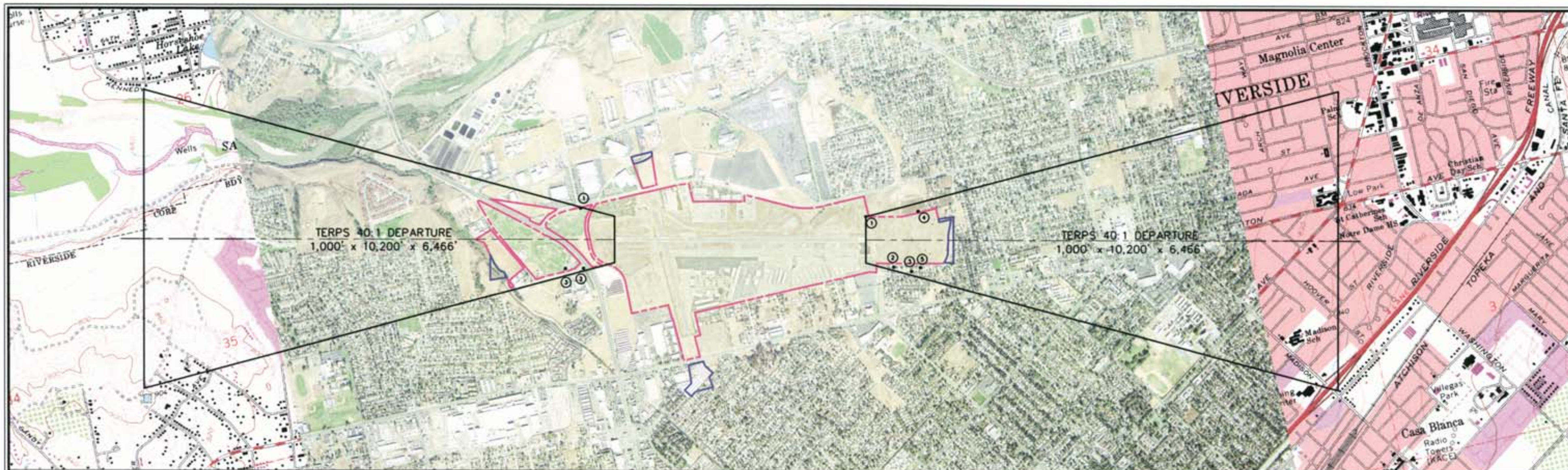

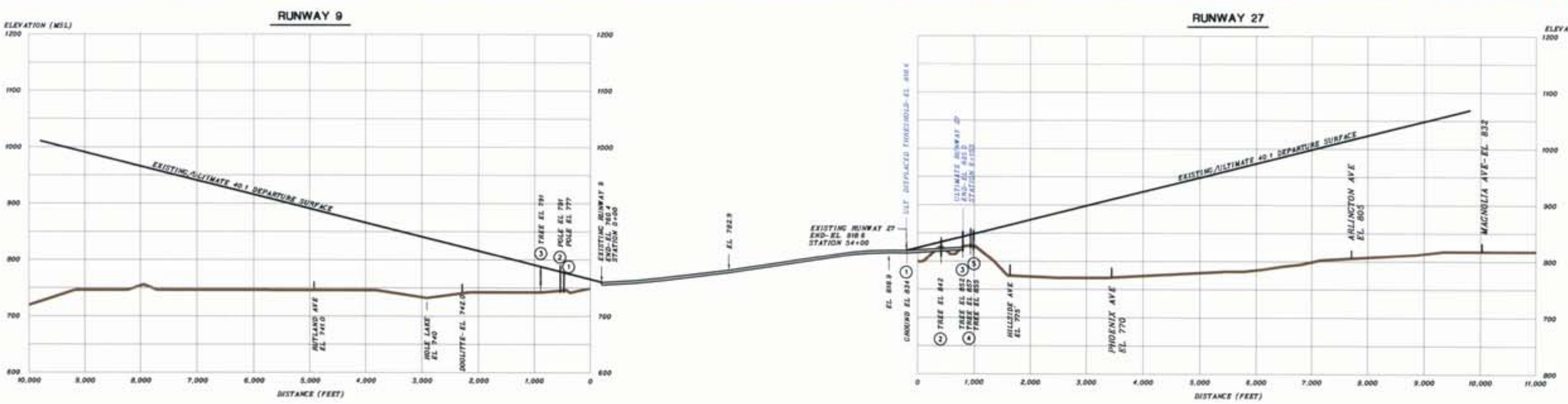

Magnetic Declination 11° 12' East (2007)
Annual Rate of Change 6' West (2007)

HORIZONTAL SCALE IN FEET (0, 1000, 2000, 3000)

VERTICAL SCALE IN FEET (0, 100, 200, 300)

RUNWAY 9 OBSTRUCTION TABLE

Object Description	Object Elevation	Obstructed Surface	Surface Elevation	Object Penetration	Proposed Object Disposition
1 POLE	777 MSL	40:1 DEPARTURE SURFACE	777 MSL	CLEAR	LOWER POLE
2 POLE	791 MSL	40:1 DEPARTURE SURFACE	779 MSL	12'	REMOVE POLE
3 TREE	791 MSL	40:1 DEPARTURE SURFACE	788 MSL	3'	REMOVE TREES
-- --	--	--	--	--	--

RUNWAY 27 OBSTRUCTION TABLE

Object Description	Object Elevation	Obstructed Surface	Surface Elevation	Object Penetration	Proposed Object Disposition
1 GROUND EL 834	834 MSL	40:1 DEPARTURE SURFACE	EL 818.6	15.4'	REQUEST TO BE GRADED
2 TREE EL 842	842 MSL	40:1 DEPARTURE SURFACE	EL 833.9	8.1'	REMOVE
3 TREE EL 852	852 MSL	40:1 DEPARTURE SURFACE	EL 843.4	8.6'	REMOVE
4 TREE EL 857	857 MSL	40:1 DEPARTURE SURFACE	EL 847.0	10'	REMOVE
5 TREE EL 855	855 MSL	40:1 DEPARTURE SURFACE	EL 848.2	6.8'	REMOVE
-- --	--	--	--	--	--
-- --	--	--	--	--	--

No.	REVISIONS	DATE	BY	APP'D.
[illegible]	[illegible]	6/5/08	LDJ	CH
[illegible]	Revalidation	7/20/05	LDJ	CH
[illegible]	[illegible]	5/9/05	LDJ	CH
[illegible]	ALP REVISION	8/18/03	LDJ	CH
[illegible]	[illegible]	7/1/00	LDJ	CH

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RIVERSIDE MUNICIPAL AIRPORT

RUNWAY 9-27
DEPARTURE SURFACE

Riverside, California, USA

PLANNED BY: Patrick Taylor
DETAILED BY: Larry D. Johnson
APPROVED BY: James M. Harris, P.E.

January 5, 2010 | SHEET 13 OF 14

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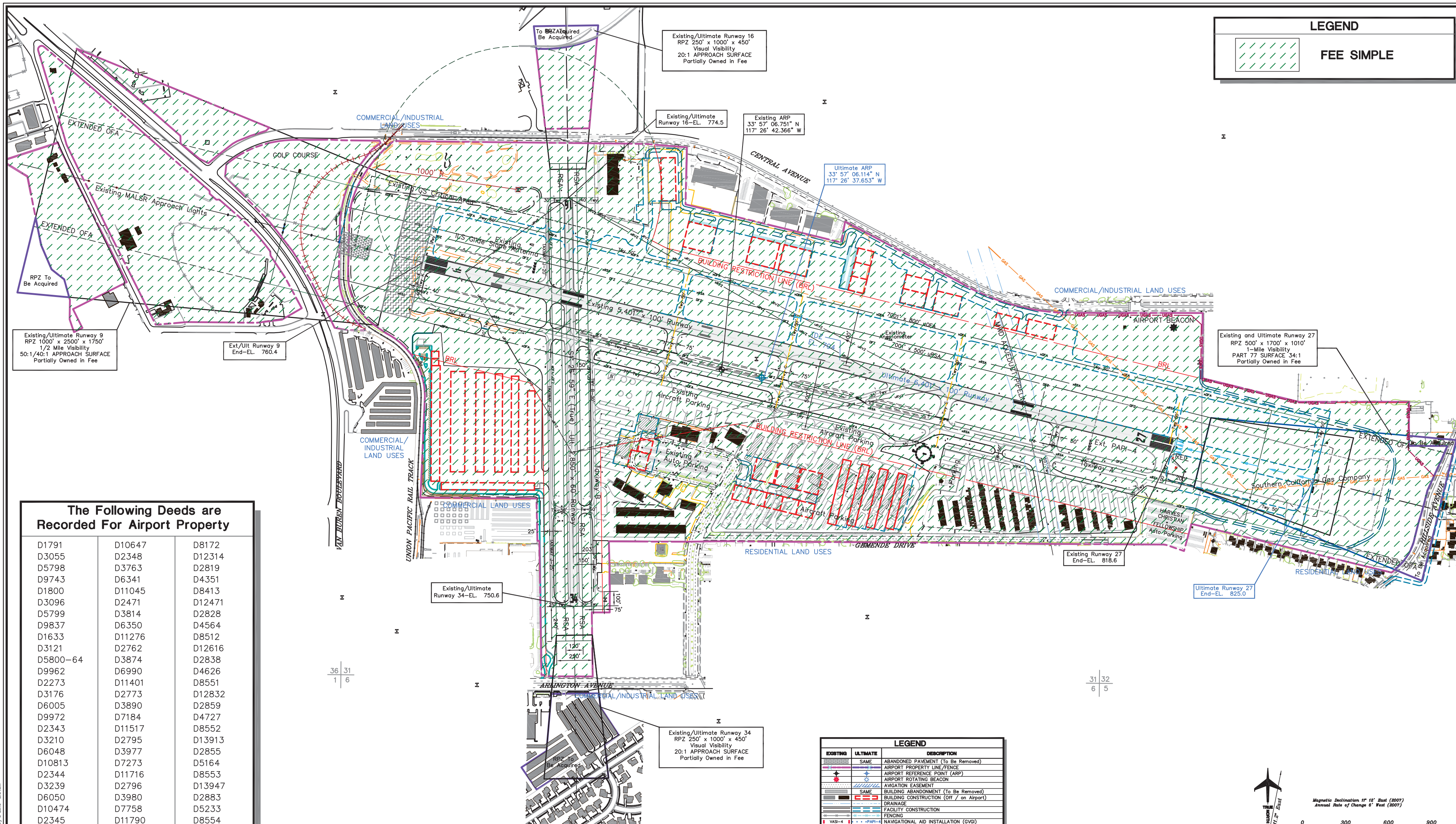

The Following Deeds are Recorded For Airport Property

D1791	D10647	D8172
D3055	D2348	D12314
D5798	D3763	D2819
D9743	D6341	D4351
D1800	D11045	D8413
D3096	D2471	D12471
D5799	D3814	D2828
D9837	D6350	D4564
D1633	D11276	D8512
D3121	D2762	D12616
D5800–64	D3874	D2838
D9962	D6990	D4626
D2273	D11401	D8551
D3176	D2773	D12832
D6005	D3890	D2859
D9972	D7184	D4727
D2343	D11517	D8552
D3210	D2795	D13913
D6048	D3977	D2855
D10813	D7273	D5164
D2344	D11716	D8553
D3239	D2796	D13947
D6050	D3980	D2883
D10474	D7758	D5233
D2345	D11790	D8554
D3288	D2797	D14071
D6065	D4060	D2884
D10475	D7898	D5234
D2346	D12020	D9593
D3510	D2798	D2914
D6069	D4144	D5354
D10520	D8051	D9624
D2347	D12274	D2920
D3676	D2807	D5519
D6074	D4269	D9649
D9660	D5796	D2998

LEGEND

EXISTING	ULTIMATE	DESCRIPTION
	SAME	ABANDONED PAVEMENT (To Be Removed)
		AIRPORT PROPERTY LINE/FENCE
		AIRPORT REFERENCE POINT (ARP)
		AIRPORT ROTATING BEACON
		AVIGATION EASEMENT
	SAME	BUILDING ABANDONMENT (To Be Removed)
		BUILDING CONSTRUCTION (Off / on Airport)
		DRAINAGE
		FACILITY CONSTRUCTION
		FENCING
VASI–4	PAPI–4	NAVIGATIONAL AID INSTALLATION (GVGI)
		RUNWAY THRESHOLD LIGHTS and REIL
	SAME	SECTION CORNER
		SEGMENTED CIRCLE/WIND INDICATOR
	SAME	TOPOGRAPHY (2005)
		WIND INDICATOR (Lighted)
		HOLDING POSITION MARKING
BRL		BUILDING RESTRICTION LINE (BRL)
		DIRT ROAD
		PARCELS
		TREES
		CRITICAL AREA
OFZ		RUNWAY OBSTACLE FREE ZONE
RSA		RUNWAY SAFETY AREA
OFA		RUNWAY OBJECT FREE AREA
	SAME	SURVEY MONUMENT (PACS/SACS)
		LOCALIZER ANTENNA
		GLIDE SLOPE ANTENNA
		MALSR APPROACH LIGHT SYSTEM
		RUNWAY PROTECTION ZONE (RPZ)
		RUNWAY SHADE
		EMAS
		PRECISION OBSTACLE FREE ZONE (POFZ)

No.	REVISIONS	DATE	BY	APP'D.
5	Added Tw J as built, revised West Hangar Development, revised Property Line, revised Bldg No. 5 tenant.	6/5/06	LDJ	CH
4	Revalidation	7/20/05	LDJ	CH
3	Added ASOS, Revised TVOR and Ultimate Property Line	5/9/05	LDJ	CH
2	ALP REVISION	8/18/03	LDJ	CH
1	Revised 1999 Master Plan, added new planimetric details	7/1/00	LDJ	CH

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RIVERSIDE MUNICIPAL AIRPORT

AIRPORT PROPERTY MAP

DRAFT

Riverside, California, USA

PLANNED BY: Patrick Taylor
DETAILED BY: Larry D. Johnson
APPROVED BY: James M. Harris, P.E.

January 5, 2010 — SHEET 14 OF 14

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Appendix C

ENVIRONMENTAL EVALUATION

Appendix C
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 Riverside 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 *Order1050.1E and Order 5050.4B, National Environmental Policy Act* (NEPA) *Implementation Instructions for Airport Actions.*

In addition, because the airport is located in California, compliance with the *California Environmental Quality Act* (CEQA) is also necessary. CEQA requires consideration of the environmental impacts of the entire improvement program prior to local adoption of the master plan.

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
- Farmland
- Floodplains
- Wild and Scenic Rivers

The following sections describe potential impacts to resources based on the proposed airport development plan. Many of the resources discussed below were described in detail within Chapter One.

Exhibit C1 depicts the general location of the environmental resources on the northern, eastern, and western portions of airport property. The resources were identified during field surveys conducted in the spring of 2008.

AIR QUALITY

The U.S. Environmental Protection Agency (EPA) has adopted air quality standards that specify the maximum permissible short-term and long-term concentrations of various air contaminants. The National Ambient Air Quality Standards (NAAQS) consist of primary and secondary standards for six criteria pollutants which include: Ozone (O_3), Carbon Monoxide (CO), Sulfur Dioxide (SO_2), Nitrogen Oxide (NO), Particulate matter (PM_{10} and $PM_{2.5}$), and Lead (Pb). Various levels of review apply within both NEPA and permitting requirements. Potentially significant air quality impacts, associated with an FAA project or action, would be demonstrated by the project or action exceeding one or more of the NAAQS for any of the time periods analyzed.

As described in Chapter One, the airport is located in Riverside County which is in nonattainment for Ozone (O_3) and Particulate Matter (PM_{10} and $PM_{2.5}$). Further air quality analysis is required to determine potential air quality impacts which could result from proposed airport development projects. Coordination with the regional air quality board will be necessary.

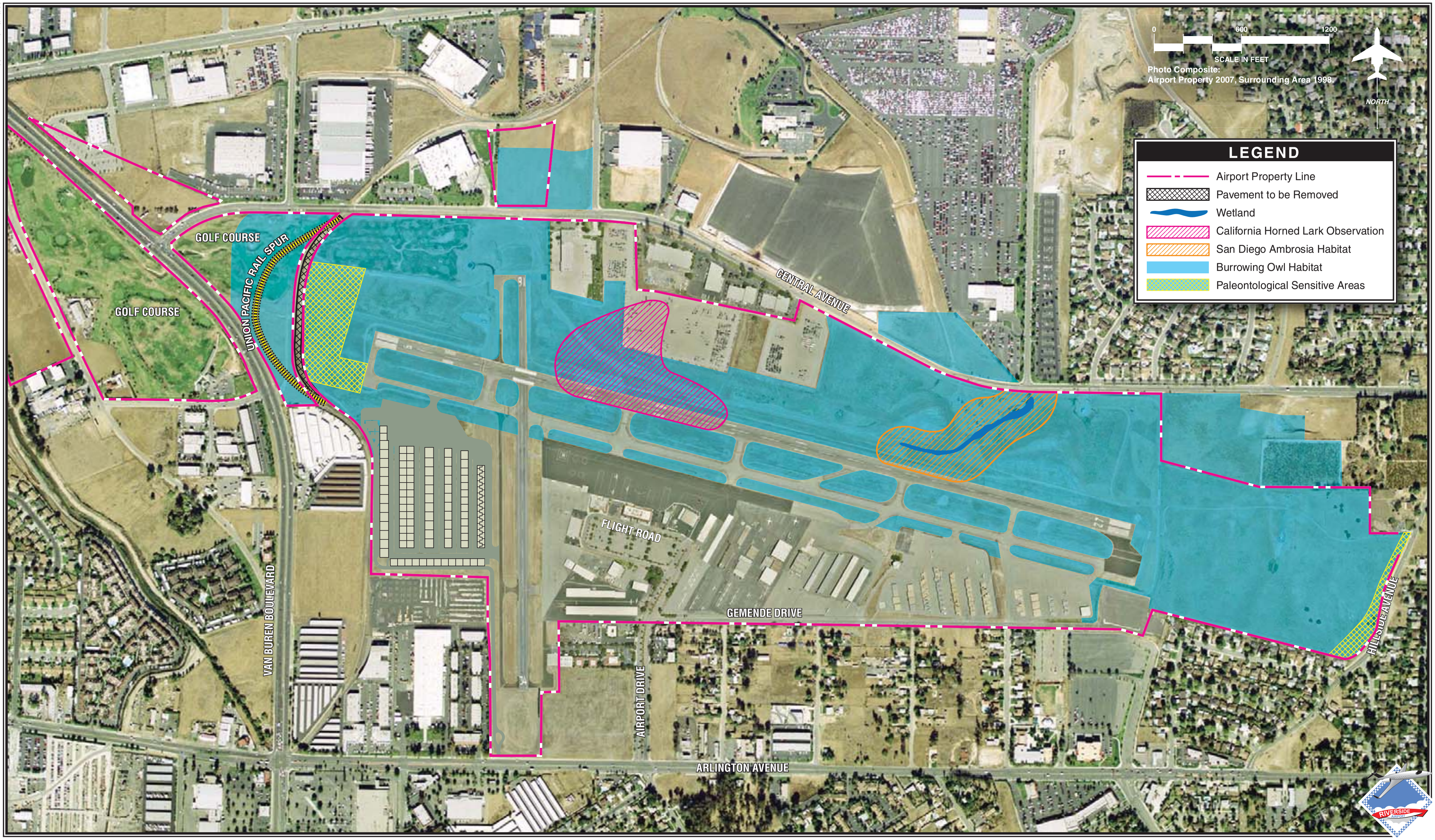


Exhibit C1
ENVIRONMENTAL RESOURCES

05MP11-C1-8/20/08

NOISE AND COMPATIBLE LAND USE

Aircraft sound emissions are often the most noticeable environmental impact an airport will produce on a 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 noise-related impacts that the proposed action could have on the environment surrounding the airport, noise exposure patterns based on projected future aviation activity were analyzed.
The standard methodology for analyzing noise conditions at airports involves the use of a computer simulation model. The FAA has approved the Integrated Noise Model (INM) for use in EAs.

The INM describes aircraft noise in the *Yearly Day-Night Average Sound Level* (DNL). DNL is the metric preferred by the FAA, Environmental Protection Agency (EPA), and Department of Housing and Urban Development (HUD), among others, as an appropriate measure of cumulative noise exposure. In California, the Community Noise Equivalent Level (CNEL) metric is used instead of the DNL metric. The two are actually very similar. DNL accumulates the total noise occurring during a 24-hour period, with a 10 decibel weight applied to noise occurring during the nighttime (10:00 p.m. to 7:00 a.m.). The CNEL metric is the same, except it also adds a 4.8 decibel weight for noise occurring between 7:00 p.m. and 10:00 p.m. CNEL is the metric currently accepted by the FAA, EPA, and HUD as an appropriate measure of cumulative average noise exposure in the State of California. These three federal agencies have each identified the 65 CNEL noise contour as the threshold of incompatibility.

The INM works by defining a network of grid points at ground level around the airport. It then selects the shortest distance from each grid point to each flight track and computes the noise exposure for each aircraft operation by aircraft type and engine thrust level along each flight track. Corrections are applied for air-to-ground acoustical attenuation, acoustical shielding of the aircraft engines by the aircraft itself, and aircraft speed variations. The noise exposure levels for each aircraft are summed at each grid location. The CNEL at all grid points is used to develop noise exposure contours for selected values (e.g., 65, 70, and 75 CNEL). Noise contours are then plotted on a base map of the airport environs using the CNEL metrics.

In addition to the mathematical procedures defined in the model, the INM has another very important element. This is a database containing tables correlating noise, thrust settings, and flight profiles for most of the civilian aircraft and many common military aircraft operating in the United States. This database, often referred to as the noise curve data, has been developed under FAA guidance based on rigorous noise monitoring in controlled settings. In fact, the INM database was developed through more than a decade of research, including extensive field measurements of more than 10,000 aircraft operations. The database also includes performance data for each aircraft to allow for the computation of airport-specific flight profiles (rates of climb and descent). The most recent version of the INM, Version 7.0, was used for modeling the noise condition for this master plan.

INM Input

A variety of user-supplied input data is required to use the INM. This includes the airport elevation, average annual temperature, airport area terrain, a mathematical definition of the airport runways, the mathematical description of ground tracks above which aircraft fly, and the assignment of specific take-off weights to individual flight tracks. In addition, aircraft not included in the model's database may be defined for modeling, subject to FAA approval.

- **Activity Data**

Airport activity is defined as the take-offs and landings by aircraft operating at the facility; this is also referred to as aircraft operations. Activity is further described as either *local*, indicating aircraft practicing take-offs and landings (i.e., performing touch-and-go's), or *itinerant*, referring to the initial departure from or final arrival at the airport.

Existing airport activity (i.e., take-offs and landings, or operations by aircraft) was estimated using data prepared during the development of this master plan. **Table C1** provides a breakdown of operations for the existing condition as well as the long range forecast.

- **Time-of-Day**

The time of day at which operations occur is important as input to the INM due to the 10 decibel nighttime (10:00 p.m. to 7:00 a.m.) and 4.8 decibel evening (7:00 p.m. to 10:00 p.m.) weighting of flights. In calculating airport noise exposure, one operation at night has the same noise emission value as 10 operations during the day by the same aircraft. While Riverside Municipal Airport does have an airport traffic control tower (ATCT), it is closed between 8:00 p.m. and 7:00 a.m. Counts for nighttime activity were derived from interviews with airport users and airport staff. Information obtained from these interviews was used to determine evening and nighttime aircraft operations for modeling the noise exposure contours. **Table C2** depicts the evening and nighttime percentages. These percentages of operations were applied to both the proposed action and no action scenarios.

TABLE C1
Operations Summary and Fleet Mix Data
Riverside Municipal Airport

Aircraft Type	INM Description	2006 Operations	2027 Operations
ITINERANT OPERATIONS			
Turbojet			
Business Jet	LEAR35	250	1,700
Business Jet	CNA500	200	800
Business Jet	MU3001	100	500
Business Jet	CNA55B	100	600
Business Jet	CL600	50	200
Business Jet	GIV	50	200
Business Jet	LEAR25	50	0
Subtotal		800	4,000
Piston/Turboprop/Helicopter			
Single Engine Variable	GASEPV	18,389	21,550
Single Engine Fixed	GASEPF	18,389	21,550
Multi-engine	BEC58P	2,000	6,000
Turboprop	DHC6	1,000	4,000
Helicopter	H500D	2,000	6,000
Subtotal		41,778	59,100
Military			
Helicopter	S70	86	130
Turboprop 1900D	C12	16	36
Subtotal		102	166
TOTAL ITINERANT		**42,680**	**63,266**
LOCAL OPERATIONS			
Piston/Turboprop/Helicopter			
Single Engine Fixed	GASEPV	16,779	26,750
Single Engine Variable	GASEPF	16,779	26,750
Multi-Engine Fixed	BEC58P	4,000	8,000
Helicopter	H500D	5,000	12,000
Subtotal		42,558	73,500
Military			
Helicopter	S70	18	34
Turboprop 1900D	C12	0	0
Subtotal		18	34
TOTAL LOCAL		**42,576**	**73,534**
TOTAL ACTIVITY		**85,256**	**136,800**

Source: Coffman Associates analysis utilizing Integrated Noise Model (INM) v7.0

TABLE C2
Day/Evening/Night Operational Percentages
Riverside Municipal Airport

Aircraft Type	Day	Evening	Night
Single-Engine Piston	80%	18%	2%
Twin Engine Piston	90%	9%	1%
Turboprop	90%	9%	1%
Business Jet	90%	9%	1%
Helicopter	90%	9%	1%

Source: Interviews with ATCT and airport staff and analysis of 10 years of wind data.

Runway Use

Runway usage data is another essential input to the INM. For modeling purposes, wind data analysis usually determines runway use percentages. Aircraft will normally land and take-off into the wind. However, wind analysis provides only the directional availability of a runway and does not consider pilot selection, primary runway operations, or local operating conventions.

The runway usage at the airport was established through discussions with the ATCT and airport staff. **Table C3** summarizes the runway use percentages for existing and forecast conditions.

TABLE C3
Existing and Future Runway Use
Riverside Municipal Airport

Runway	Business Jet	Turboprop	Piston	Local	Military
Existing Runway Use					
9	10%	10%	9%	9%	10%
27	90%	90%	88%	88%	90%
16	0%	0%	1%	1%	0%
34	0%	0%	2%	2%	0%
2027 Forecast Runway Use					
9	10%	10%	9%	9%	10%
27	90%	90%	88%	88%	90%
16	0%	0%	1%	1%	0%
34	0%	0%	2%	2%	0%

Source: Interviews with ATCT and airport staff and analysis of 10 years of wind data.

Aircraft Noise Impact Assessment

To standardize the assessment of airport land use compatibility and noise, the FAA has established guidelines, codified within 14 CFR Part 150, that identify suitable land uses for development near airport facilities. These guidelines, outlined in **Exhibit C2**, state that residential development, including standard construction (residential construction without acoustic treatment), mobile homes, and transient lodging are all incompatible with noise above 65 DNL (65 CNEL in California). Homes of standard construction and transient lodging may be considered compatible where local communities have determined these uses are permissible; however, sound insulation methods are recommended. Schools and other public use facilities are also generally considered to be incompatible with noise exposure above 65 CNEL.

The results of the noise analysis are depicted on **Exhibit C3**. As depicted on the exhibit, the 65 CNEL noise contour extends off airport property slightly to the northeast impacting a small portion of vacant property and to the southeast slightly impacting a parking lot. No noise-sensitive development is contained within the existing 65 CNEL noise contours.

LAND USE	Yearly Day-Night Average Sound Level (DNL) in Decibels					
	Below 65	65-70	70-75	75-80	80-85	Over 85
RESIDENTIAL						
Residential, other than mobile homes and transient lodgings	Y	N[1]	N[1]	N	N	N
Mobile home parks	Y	N	N	N	N	N
Transient lodgings	Y	N[1]	N[1]	N[1]	N	N
PUBLIC USE						
Schools	Y	N[1]	N[1]	N	N	N
Hospitals and nursing homes	Y	25	30	N	N	N
Churches, auditoriums, and concert halls	Y	25	30	N	N	N
Government services	Y	Y	25	30	N	N
Transportation	Y	Y	Y[2]	Y[3]	Y[4]	Y[4]
Parking	Y	Y	Y[2]	Y[3]	Y[4]	N
COMMERCIAL USE						
Offices, business and professional	Y	Y	25	30	N	N
Wholesale and retail-building materials, hardware and farm equipment	Y	Y	Y[2]	Y[3]	Y[4]	N
Retail trade-general	Y	Y	25	30	N	N
Utilities	Y	Y	Y[2]	Y[3]	Y[4]	N
Communication	Y	Y	25	30	N	N
MANUFACTURING AND PRODUCTION						
Manufacturing, general	Y	Y	Y[2]	Y[3]	Y[4]	N
Photographic and optical	Y	Y	25	30	N	N
Agriculture (except livestock) and forestry	Y	Y[6]	Y[7]	Y[8]	Y[8]	Y[8]
Livestock farming and breeding	Y	Y[6]	Y[7]	N	N	N
Mining and fishing, resource production and extraction	Y	Y	Y	Y	Y	Y
RECREATIONAL						
Outdoor sports arenas and spectator sports	Y	Y[5]	Y[5]	N	N	N
Outdoor music shells, amphitheaters	Y	N	N	N	N	N
Nature exhibits and zoos	Y	Y	N	N	N	N
Amusements, parks, resorts, and camps	Y	Y	Y	N	N	N
Golf courses, riding stables, and water recreation	Y	Y	25	30	N	N

The designations contained in this table do not constitute a federal determination that any use of land covered by the program is acceptable under federal, state, or local law. The responsibility for determining the acceptable and permissible land uses and the relationship between specific properties and specific noise contours rests with the local authorities. FAA determinations under Part 150 are not intended to substitute federally-determined land uses for those determined to be appropriate by local authorities in response to locally-determined needs and values in achieving noise compatible land uses.

See other side for notes and key to table.

Exhibit C2
LAND USE COMPATIBILITY GUIDELINES

KEY

Y (Yes) Land Use and related structures compatible without restrictions.

N (No) Land Use and related structures are not compatible and should be prohibited.

NLR Noise Level Reduction (outdoor-to-indoor) to be achieved through incorporation of noise attenuation into the design and construction of the structure.

25, 30, 35 Land Use and related structures generally compatible; measures to achieve NLR of 25, 30, or 35 dB must be incorporated into design and construction of structure.

NOTES

1 Where the community determines that residential or school uses must be allowed, measures to achieve outdoor-to-indoor Noise Level Reduction (NLR) of at least 25 dB and 30 dB, respectively, should be incorporated into building codes and be considered in individual approvals. Normal residential construction can be expected to provide a NLR of 20 dB; thus, the reduction requirements are often stated as 5, 10, or 15 dB over standard construction and normally assume mechanical ventilation and closed windows year round. However, the use of NLR criteria will not eliminate outdoor noise problems.

2 Measures to achieve NLR of 25 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise-sensitive areas, or where the normal noise level is low.

3 Measures to achieve NLR of 30 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise-sensitive areas, or where the normal noise level is low.

4 Measures to achieve NLR of 35 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise-sensitive areas, or where the normal noise level is low.

5 Land use compatible provided special sound reinforcement systems are installed.

6 Residential buildings require a NLR of 25.

7 Residential buildings require a NLR of 30.

8 Residential buildings not permitted.

Source: ***14 CFR Part 150***, Appendix A, Table 1.

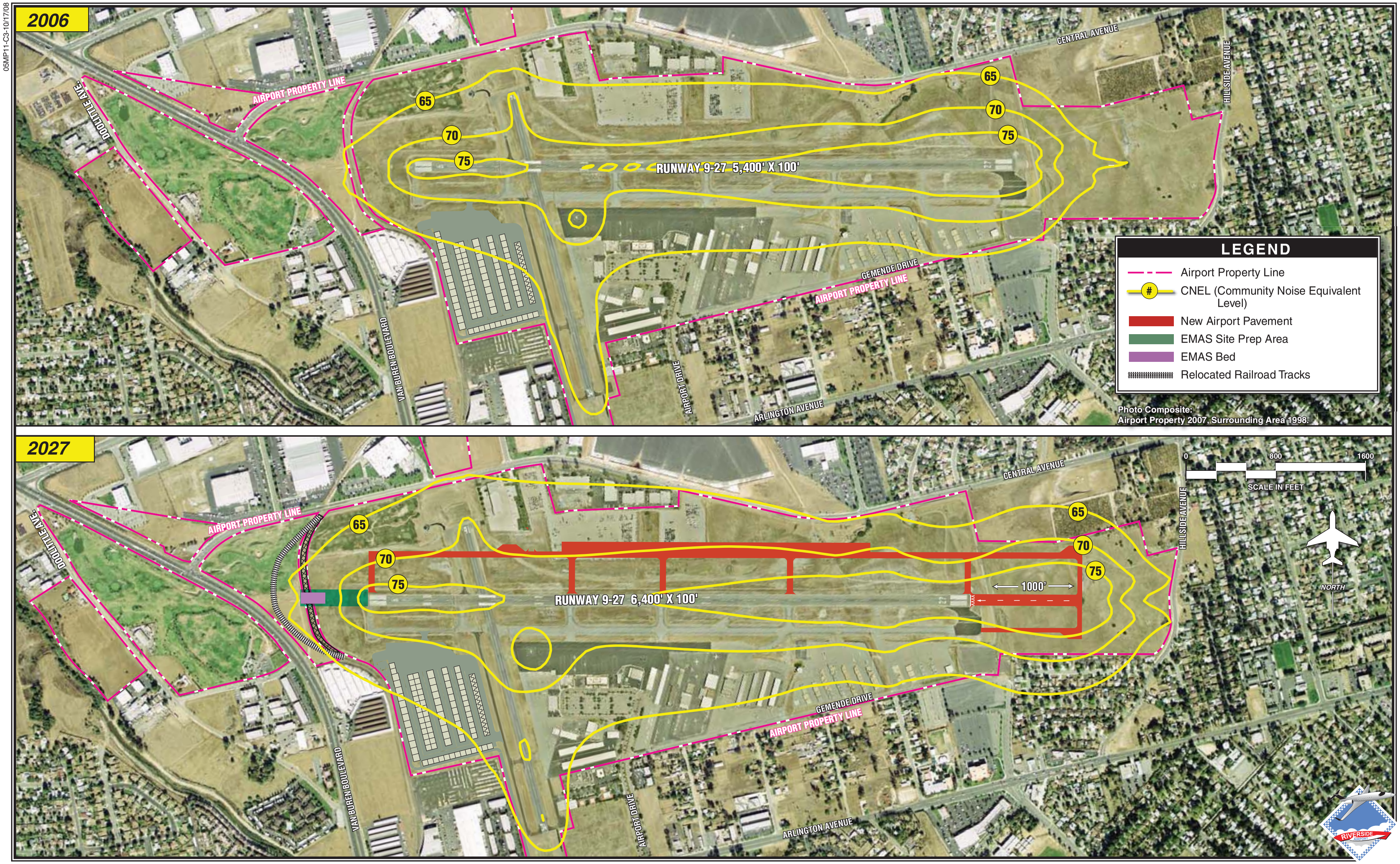


Exhibit C3
EXISTING AND FUTURE
NOISE EXPOSURE CONTOURS

The 2027 forecast noise contours are depicted on the lower half of **Exhibit C3**. The 65 CNEL extends beyond airport property in several locations including very slightly to the north of Runway 16 and to the southwest of Runway 9. These areas are currently roads or existing industrial development and are therefore compatible with the 65 CNEL.

To the northeast of the planned runway extension the 65 CNEL extends beyond airport property over some vacant property and over a portion of a landscaping nursery business. These uses are compatible with the 65 CNEL. The 70 CNEL extends to the northeast property line and may extend a few feet onto the same private property.

To the southeast of the planned runway extension both the 65 and 70 CNEL extend beyond airport property. Approximately eight residential dwelling units are impacted by the 70 CNEL. Approximately 30 residential dwelling units are impacted by the 65 CNEL in this area.

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 National Pollutant Discharge Elimination System (NPDES) permit. Use of these measures typically alleviates potential resource impacts.

Short-term construction-related noise impacts could occur with implementation of the proposed project as there are scattered residences in the vicinity. However, these impacts typically do not arise unless construction is being undertaken during early morning, evening, or nighttime hours. Furthermore, the proposed projects will be undertaken on a demand basis and will not be constructed simultaneously.

Construction-related air quality impacts can be expected. Air emissions related to construction activities will be short-term in nature and will be included in the air emissions inventory, if one is requested.

DEPARTMENT OF TRANSPORTATION: SECTION 4(f)

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

A significant impact would occur when a proposed action involves more than a minimal physical use of a Section 4(f) property, or is deemed a "constructive use" substantially impairing the Section 4(f) property where mitigation measures do not reduce or eliminate the impacts. Substantial impairment would occur when impacts to Section 4(f) lands are sufficiently serious that the value of the site in terms of its prior significance and enjoyment are substantially reduced or lost.

As discussed in Chapter One, two potential Section 4(f) properties are located in proximity to the airport. These include the Sky Links/Van Buren Golf Course, located on the western portion of airport property and the Santa Ana River Regional Park which is located approximately 0.5 mile north of the airport.

The proposed development plan will directly impact the Sky Links/Van Buren Golf Course. The proposed safety area improvements require the relocation of the Union Pacific Rail Spur, thereby necessitating the removal of a number of golf holes. Further coordination is needed with the City of Riverside to determine if this golf course would be considered a Section 4(f) property and whether or not mitigation measures would be required prior to project implementation.

FISH, WILDLIFE, AND PLANTS

As summarized within the following paragraphs, a number of acts have been passed to protect sensitive species from development activities.

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

The *Sikes Act* and various amendments authorize states to prepare statewide wildlife conservation plans, and the Department of Defense (DOD) to prepare similar plans, for resources under their jurisdiction. Airport improvement projects should be checked for consistency with the State or DOD Wildlife Conservation Plans where such plans exist.

The *Fish and Wildlife Coordination Act* requires that agencies consult with the state wildlife agencies and the Department of the Interior concerning the conservation of wildlife resources where the water of any stream or other water body is proposed to be controlled or modified by a federal agency or any public or private agency operating under a federal permit.

The *Migratory Bird Treaty Act* (MBTA) prohibits private parties and federal agencies in certain judicial circuits from intentionally taking a migratory bird, their eggs, or nests. The MBTA prohibits activities which would harm migratory birds, their eggs, or nests unless the Secretary of the Interior authorizes such activities under a special permit.

The airport environs is located within the Western Riverside County Multiple Species Habitat Conservation Plan (MSHCP), a comprehensive, multi-jurisdictional conservation plan focused on conserving species and their associated habitat within Western Riverside County. The MSHCP was prepared in accordance with the *Endangered Species* and *Sikes Acts* and includes compensation requirements for the "take" of 146 special-status species and their habitat in accordance with the Endangered Species Act. According to the MSHCP, the airport is within the overlay for the burrowing owl, the San Diego ambrosia, Brand's phacelia, San Miguel savory, least Bell's vireo, southwestern willow flycatcher, western yellow-billed cuckoo, California linderiella, Riverside fairy shrimp, and vernal pool fairy shrimp.

In 2008, habitat assessments were performed for these species on the northern and eastern portions of airport property. During the field surveys a number of burrowing owls were sighted in eastern portions of airport property and suitable habitat for the San Diego ambrosia was identified near the previously discussed wetland. Finally, habitat for a number of birds classified as California species of special concern was identified in the northern portions of the airport. The birds include the California horned lark, the loggerhead shrike, white-tailed kite, and the northern harrier. The general location of the survey results is depicted on **Exhibit C1**.

Development activities which could impact the aforementioned resources include the construction projects planned for the north-side of the airport including the access road, parallel taxiway, apron, hangar, and support facilities. Proposed runway improvements, including the safety area projects, have the potential to impact burrowing owls. Prior to development in these areas, additional field surveys and coordination will need to be undertaken in accordance with the MSHCP.

HAZARDOUS MATERIALS, POLLUTION PREVENTION, AND SOLID WASTE

The airport must comply with applicable pollution control statutes and requirements. Impacts may occur when changes to the quantity or type of solid waste generated, or type of disposal, differ greatly from existing conditions. No impaired waters or regulated hazardous material sites are located on or in the vicinity of the airport.

The airport will need to comply with the NPDES operations permit requirements. With regard to construction activities, the airport and all applicable contractors will need to comply with the requirements and procedures of the construction-related NPDES General Permit, including the preparation of a *Notice of Intent* and a *Stormwater Pollution Prevention Plan* prior to the initiation of project construction activities.

As a result of increased operations at the airport, solid waste may slightly increase; however, these increases are not anticipated to be significant.

HISTORICAL, ARCHITECTURAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

Determination of a project's environmental impact to historic and cultural resources is made under guidance in the *National Historic Preservation Act (NHPA) of 1966*, as amended, the *Archaeological and Historic Preservation Act (AHPA) of 1974*, the *Archaeological Resources Protection Act (ARPA)*, and the *Native American Graves Protection and Repatriation Act (NAGPRA) of 1990*. In addition, the *Antiquities Act of 1906*, the *Historic Sites Act of 1935*, and the *American Indian Religious Freedom Act of 1978* also protect historical, architectural, archaeological, and cultural resources.

Section 106 of the NHPA of 1966, as amended, requires federal agencies to take into account the effects of their undertakings on historic properties and determine if any properties in, or eligible for inclusion in, the National Register of Historic Places are present in the area. In addition, it affords the Advisory Council on Historic Preservation a reasonable opportunity to comment. The historic preservation review process mandated by Section 106 is outlined in regulations issued by the council.

The ARPA is triggered by the presence of archaeological resources on federal or Indian lands. The AHPA describes the process when consultation with resource agencies indicates that there may be an impact on significant scientific, prehistoric, historic, archaeological, or paleontological resources. The process provides for the preparation of a professional resource survey of the area. Should the survey identify significant resources, the National Register process described above will be followed. Should the survey be inconclusive, a determination is made whether it is appropriate to provide a commitment to halt construction if resources are recovered, in order for a qualified professional to evaluate their importance and provide for data recovery, as necessary.

The NAGPRA is triggered by the possession of human remains or cultural items by a federally funded repository or by the discovery of human remains or cultural items on federal or tribal lands and provides for the inventory, protection, and return of cultural items to affiliated Native American Groups. The Act includes provisions that, upon inadvertent discovery of remains, the action will cease in the area where the remains were discovered and the appropriate agency will be notified.

The *Antiquities Act of 1906* was the first general law providing protection for archaeological resources. It protects all historic and prehistoric sites on federal lands and prohibits excavation or destruction of such antiquities without the permission of the Secretary of the department having jurisdiction.

The *Historic Sites Act of 1935* declares as national policy the preservation for public use of historic sites, buildings, objects, and properties of national significance. It gives the Secretary of the Interior authority to make historic surveys, to secure and preserve data on historic sites, and to acquire and preserve archaeological and historic sites. This Act also establishes the National Historic Landmarks program for designating properties having exceptional value in commemorating or illustrating the history of the United States.

As described in Chapter One, one known historical area is located in the vicinity of Riverside Airport. Camp Anza is located immediately southwest of the airport and is roughly bordered by Arlington Avenue to the north, Van Buren Boulevard to the east, Crest/Babb Avenue to the west, and Philibin Avenue to the south. No direct impacts on this resource will occur with implementation of the projects contained within this master plan. Additionally, it is not anticipated that any indirect impacts will occur.

In 2008, paleontological and archaeological surveys were conducted for the western, eastern, and northern portions of airport property. It was determined that the western and easternmost portions of airport property are underlain by geologic sediments determined to have a high paleontological sensitivity rating. Additionally, cultural resource investigations identified a number of archaeological sites in the easternmost portions of airport property.

Projects which are planned in these areas include the relocation of the Union Pacific Rail Spur and the runway safety area improvements. Prior to the construction of these improvements, additional field surveys will be warranted and coordination will need to be undertaken with the State Historic Preservation Officer.

LIGHT EMISSIONS AND VISUAL IMPACTS

Landside development at the airport will create several new hangar complexes as well as privately leased aviation development parcels. These new facilities are not anticipated to create an annoyance among people or interfere with normal activities as the areas planned for development are surrounded by agricultural uses, open space, and light industrial land uses.

Airport lighting is characterized as either airfield lighting (i.e., runway, taxiway, approach and landing lights) or landside lighting (i.e., security lights, building interior lighting, parking lights, and signage). Generally, airport lighting does not result in significant impacts unless a high intensity strobe light, such as a Runway End Identifier Light (REIL), would produce glare on any adjoining site, particularly residential uses.

Visual impacts relate to the extent that the proposed development contrasts with the existing environment and whether a jurisdictional agency considers this contrast objectionable. The visual sight of aircraft, aircraft contrails, or aircraft lights at night, particularly at a distance that is not normally intrusive, should not be assumed to constitute an adverse impact.

Proposed development at the airport includes the development of facilities on the northern portions of airport property in areas which are currently vacant. It is not anticipated this development will result in visual or lighting impacts as, for the most part, the land located north of the airport is either undeveloped or utilized for industrial purposes. One neighborhood is located northeast of the airport; however, due to the distance from the proposed improvements, impacts are not anticipated to be significant.

SECONDARY (INDUCED) IMPACTS

These impacts address those secondary impacts to surrounding communities resulting from the proposed development, including shifts in patterns of population growth, public service demands, and changes in business and economic activity to the extent influenced by airport development.

Significant shifts in patterns of population movement or growth or public service demands are not anticipated as a result of the proposed development. It could be expected, however, that the proposed development would potentially induce positive socioeconomic impacts for the community over a period of years. The airport, with expanded facilities and services, would be expected to attract additional users. It is also expected to encourage tourism, industry, and trade, and to enhance the future growth and expansion of the community's economic base. Future socioeconomic impacts resulting from the proposed development are anticipated to be primarily positive in nature.

SOCIOECONOMIC IMPACTS, ENVIRONMENTAL JUSTICE, AND CHILDREN'S ENVIRONMENTAL HEALTH AND SAFETY RISKS

Socioeconomic impacts known to result from airport improvements are often associated with relocation activities or other community disruptions, including alterations to surface transportation patterns, division or disruption of existing communities, interferences with orderly planned development, or an appreciable change in employment related to the project. Social impacts are generally evaluated based on areas of acquisition and/or areas of significant project impact, such as areas encompassed by noise levels in excess of 65 DNL.

Executive Order 12898, *Federal Action to Address Environmental Justice in Minority Populations and Low-Income Populations,* and the accompanying Presidential Memorandum, and Order DOT 5610.2, *Environmental Justice*, require FAA to provide for meaningful public involvement by minority and low-income populations as well as analysis that identifies and addresses potential impacts on these populations that may be disproportionately high and adverse.

Pursuant to Executive Order 13045, *Protection of Children from Environmental Health Risks and Safety Risks,* federal agencies are directed to identify and assess environmental health and safety risks that may disproportionately affect children. These risks include those that are attributable to products or substances that a child is likely to come in contact with or ingest, such as air, food, drinking water, recreational waters, soil, or products they may be exposed to.

The acquisition of the residences and farmland is required to conform with the *Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970* (URARPAPA). These regulations mandate that certain relocation assistance services be made available to homeowners/tenants of the properties. This assistance includes help finding comparable and decent substitute housing for the same cost, moving expenses, and in some cases, loss of income.

The development concept includes the acquisition of a number of residences east of the airport as well as the relocation of Hillside Avenue. This entire area is considered an environmental justice area as it consists of a predominantly minority, low income population. During the NEPA documentation for the land acquisition, analysis will need to be undertaken to assess socioeconomic and environmental justice impacts.

WATER QUALITY

Water quality concerns associated with airport expansion most often relate to domestic sewage disposal, increased surface runoff and soil erosion, and the storage and handling of fuel, petroleum, solvents, etc.

Construction of the proposed improvements will result in an increase in impermeable surfaces and a resulting increase in stormwater runoff. During the construction phase, the proposed development may result in short-term impacts on water quality. Temporary measures to control water pollution, soil erosion, and siltation through the use of BMPs should be used. The airport will need to continue to comply with its current NPDES operations permit requirements.

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 NPDES General Permit, 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 Storm Water Pollution Prevention Plan (SWPPP) will need to be modified to reflect the additional impervious surfaces and any stormwater retention facilities. The addition and removal of impervious surfaces may require modifications to this plan should drainage patterns be modified.

WETLANDS

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 areas, 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.

The U.S. Army Corps of Engineers (USACE) 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*.

In 2008, a jurisdictional determination was undertaken for this water feature on the airport's north side. Results of a field investigation determined that a potentially jurisdictional area is present on the airport's north side. The area totals 1.8 acres and its general location is depicted on **Exhibit C1**. As of the printing of this Master Plan, the USACE had not been contacted to confirm the jurisdictional status of the area. No additional wetlands or potential waters of the U.S. were identified in the northern portions of airport property during the 2008 survey. Development proposed in the area of this potential wetland includes the north airport access road, the north-side parallel taxiway, apron areas, and aircraft storage hangars.

Appendix D

ECONOMIC BENEFIT STUDY

HIGHLIGHTS

This report presents an analysis of the economic benefits of Riverside Airport for the economy of the airport service area, which includes the City of Riverside as well as nearby communities in western Riverside County.

Riverside Airport serves as a gateway that welcomes commerce and visitors into the region and provides access for citizens and businesses to travel outward via general aviation. Economic benefits (revenues, employment and earnings) are created when economic activity takes place both on and off the airport. The highlights of the economic benefit analysis are set out below.

HIGHLIGHTS

Economic Benefit Analysis
Riverside Airport

- **The primary economic benefits (not including multiplier effects) of on-airport activity and off-airport visitor spending summed to $23.0 million in fiscal year 2008.**
- **The total economic benefits (including all multiplier effects of secondary benefits) of Riverside Airport summed to $44.8 million in fiscal year 2008.**
- **On-airport employers produced $17.9 million of economic output, with earnings to workers and proprietors on the airport of $7.5 million (not including capital projects).**
- **Economic activity resulting from the presence of the airport created $7.1 million of annual tax revenues, including $2.7 million revenues for state and local government**
- **General aviation travelers using Riverside Airport accounted for 25,972 visitor days in the airport service area, and visitor expenditures were $2.1 million for the year.**
- **Seventy-eight percent of based aircraft owners responded that the airport is important to the success of their businesses.**
- **Based aircraft at the airport flew 18,300 hours in fiscal year 2008; this travel had an estimated charter equivalent value of $8.4 million.**
- **Each day of the year, Riverside Airport generates more than $122,000 of revenue within the service area which supports sales, jobs and earnings in the general economy.**

MEASURING BENEFITS

The presence of an airport creates benefits for a community in many ways. Airports bring essential services, including enhanced medical care (such as air ambulance service), support for law enforcement and fire control, and courier delivery of mail and high value parcels. These services raise the quality of life for residents and maintain a competitive environment for economic development.

General aviation allows business travelers to reach destinations without the delays and uncertainty of today's airline flights and provides access to more than 5,300 airports in the nation, compared to approximately 565 served by scheduled airlines.

Although qualitative advantages created by the presence of an airport are important, they are also difficult to measure. In studying airport benefits, regional analysts have emphasized indicators of economic activity for airports that can be quantified, such as dollar value of output, number of jobs created, and earnings of workers and proprietors of businesses.

Economic benefit studies differ from cost-benefit analyses, which are often called for to support decision-making, typically for public sector capital projects.

Study of economic benefit is synonymous with measurement of economic contribution. The methodology was standardized in the publication by the Federal Aviation Administration, *Estimating the Regional Economic Significance of Airports*, Washington DC, 1992.

Following the FAA methodology, this study measures the contribution of Riverside Airport as a source of economic output (the production of aviation services) that creates revenues for firms, and employment and earnings for workers on and off the airport.

Aviation spending on the airport injects revenues into the community when firms buy products from suppliers and again when employees of the airport spend for household goods and services. In addition, spending by air visitors produces revenues for firms in the hospitality sector as well as employment and earnings for workers.

Benefit Measures

The quantitative measures of economic benefits of the Riverside Airport are each described below.

Revenue is the value in dollars of the output of goods and services produced by businesses. For government units, the budget is used as the value of output.

Output is equivalent to revenue or spending or sales. From the perspective of the business that is the supplier of goods and services, the dollar value of output is equal to the revenues received by that producer. From the viewpoint of the consumer, the dollar value of the output is equal to the amount that the consumer spent to purchase those goods and services from the business.

Earnings are a second benefit measure, made up of employee compensation (the dollar value of payments received by workers as wages and benefits) and proprietor's income of business owners.

Employment is the third benefit measure, the number of jobs supported by the revenues created by the airport.

To measure the economic benefits of the airport, information on revenues, employment and earnings was obtained directly from suppliers and users of aviation services through on-site interviews and mailed survey forms.

Those contacted included private sector firms on the airport, government agencies, general aviation air travelers, and based aircraft owners. Riverside Airport staff provided valuable assistance with data collection.

TABLE D1
Summary of Economic Benefits: 2008
Riverside Airport

	BENEFIT MEASURES		
Source	**Revenues**	**Earnings**	**Employment**
On-Airport Economic Benefits	**$20,834,000**	**$9,159,000**	**197**
Air Visitor Benefits	**2,148,000**	**839,000**	**31**
Primary Benefits: Sum of On-Airport & Air Visitor Benefits	**22,982,000**	**9,998,000**	**228**
Secondary Benefits (Multiplier Effects)	***21,834,000***	***9,597,000***	***239***
TOTAL BENEFITS	**$44,816,000**	**$19,595,000**	**467**

ECONOMIC BENEFIT SUMMARY

The economic benefits of Riverside Airport for fiscal year 2008 are shown in Table D1.

For 2008, the total benefits of the airport, including on-airport, air visitor, and secondary benefits (which result as dollars recirculate in the regional economy), were calculated to be:

- **$44.8 Million Revenues**
- **$19.6 Million Earnings**
- **467 Total Employment**

On-Airport Benefits

At the time of the inventory for preparation of the Master Plan, there were 202 based aircraft on the airport, including 170 single engine planes, 22 multi engine piston planes, 2 turboprop, 1 jet, and 7 helicopters or other craft.

Operations on Riverside Airport supported a total of 24 private and public employers including FBO services, pilot training, avionics, aircraft repair and maintenance, airport administration and other government agencies. Contractors working on capital projects also created jobs, earnings and revenues on the airport.

All combined on-site economic units were responsible for on-airport benefits of:

- **$20.8 Million Revenues**
- **$9.2 Million Earnings**
- **197 On-Airport Jobs**

Air Visitor Benefits

An important source of aviation-related spending comes from the more than 18,000 air visitors that arrive at the airport each year on general aviation aircraft.

Visitors traveling for business or personal reasons spend for lodging, food and drink, entertainment, retail goods and services, and ground transportation including auto rental and taxis, creating annual airport service area output, employment and earnings of:

- **$2.1 Million Revenues**
- **$0.839 Million Earnings**
- **31 Off-Airport Visitor Jobs**

Primary Benefits

The primary benefits represent the sum of on-airport and air visitor revenues, earnings and employment due to the presence of the airport. Primary benefits are the "first round" impacts and do not include any multiplier effects of secondary spending. The primary benefits of on-airport and air visitor economic activity related to Riverside Airport were:

- **$23.0 Million Revenues**
- **$10.0 Million Earnings**
- **228 Jobs**

Combined revenue flows for businesses and employers on and off the airport sum to a value of $23.0 million. The airport presence created benefits to workers by providing incomes of $10.0 million. There were 228 jobs supported directly by the suppliers and users of aviation services.

Secondary Benefits

Secondary benefits or multiplier effects are created when the initial spending by airport employers or visitors circulates and recycles through the economy. In contrast to initial or primary benefits, the secondary benefits measure the magnitude of successive rounds of re-spending as those who work for or sell products to airport employers or the hospitality sector spend dollars.

For example, when an aircraft mechanic's wages are spent to purchase food, housing, clothing, and medical services, these dollars create more jobs and income in the general economy of the region through multiplier effects of re-spending.

Input-output analysis shows the initial revenue stream of $23.0 million created by the presence of the airport stimulated secondary benefits from multiplier effects within the service area of:

- **$21.8 Million Revenues**
- **$9.6 Million Earnings**
- **239 Jobs**

Value of Based Aircraft Travel

Owners of general aviation aircraft based at the airport reported 18,300 business and personal hours flown in 2008. The Charter Equivalent Value of this travel was computed as $8.4 million, or more than $43,000 of equivalent value per aircraft per year.

ON-AIRPORT BENEFITS

Table D2 illustrates the annualized employment, earnings and value of output (revenues) produced by Riverside Airport tenants in 2008. Values shown for revenues, employment and earnings are the primary benefits and do not include multiplier effects of secondary benefits.

Surveys were distributed to airport employers to collect data on employment and economic activity. In addition, interviews were conducted and telephone follow-up contact was made to supplement the surveys in some cases. Respondents were informed that the survey results were confidential and only aggregate totals would appear in the written report.

On-Airport Output

In recent years, analysts and planners have become increasingly aware of the importance of airports as drivers of economic growth within a region.

On-airport economic activity created annual output of $20.8 million. Private sector revenues (not including capital projects) were $12.6 million, or 60 percent of the total. Construction projects pro-rated for 2008 had value of $3.0 million and governmental budgets were $5.3 million.

Riverside Airport offers a range of FBO services available for the aviation community including general aviation aircraft maintenance, painting and upholstery refurbishing, inspections, and fueling for various categories of aircraft including piston, turboprop, helicopters and jet. City-owned and private hangar space is available in several structures on the airport.

Aviation activities on the airport include flight training from introductory to advanced instruction, aircraft charter and rental, as well as pilot supplies, and food service.

A unique feature of the airport is the Van Buren Golf Center located at the western edge of the airport. The par 57 municipal course is privately managed and a popular alternative for area golfers.

The Golf Center is an example of modern perspectives on community economic development that view airports as potential sites for both aviation and non-aviation economic activity. Because of their available space and specialized zoning, a number of commercial activities are well suited to using airport land, including light manufacturing facilities, or industrial parks featuring warehousing and office space.

Similarly, office space in the terminal building is available for both aviation and non-aviation business activity.

Administrative and government agencies on the airport include the Riverside Airport staff from the City of Riverside, the Riverside police helicopter facility and the airport tower. In addition, the FAA Flight Standards Office is located on site.

Capital Projects

Capital projects are vital for airports to maintain safety and provide for growth. Capital spending for airport improvements also creates jobs and injects dollars into the local economy.

Riverside Airport has seen a number of capital improvement programs and private development projects in recent years. Improvements include extension and reconstruction of runways and taxiways, drainage, lighting, and additions to hangar space.

In order to account for varying annual magnitude of improvements authorized or started, as well as capital projects that extend over consecutive years, an average annual capital spending estimate was computed based on several years of activity. Private and public spending for construction projects on-going or authorized in 2008 was set at $3.0 million to represent a typical year.

Employment and Earnings

There were 20 private employers on the airport in 2008 and 4 administrative or government units. In addition, private contractors had employees on the airport to complete capital projects during the year.
Surveys and interviews with on-airport employers provided a tally of 197 jobs on the airport (including 27 workers for capital projects). Including construction workers, the ratio of private sector jobs to overall jobs was 152/197 or 77 percent of the total. On airport employees brought home annual earnings of $9.2 million to spend in their own neighborhoods and the general economy.

On-Airport Summary

Economic activity on the airport by private employers and government agencies summed to $20.8 million of revenues and 197 jobs created. Payroll and proprietor's income (earnings) was $9.2 million.

TABLE D2
On-Airport Benefits: Revenues, Earnings and Employment
Riverside Airport

	BENEFIT MEASURES		
Sources of On-Airport Benefits	Revenues	Earnings	Employment
On-Airport Employers Auto Rental Food Service FBO Services, Charter, Rental Fueling, Supplies Avionics, Maintenance, Repairs Aviation Education & Training Aircraft Storage Golf Course & Other Business Government & Administration	$12,605,000	$4,090,000	125
Capital Projects Private & Public Projects Upgrades, Improvements, Maintenance	$2,973,000	$1,615,000	27
Government Agencies/Services Airport Administration Police FAA Offices Air Traffic Control Tower	$5,256,000	$3,453,000	45
ON-AIRPORT BENEFITS	$20,834,000	$9,158,0000	197

Source: Survey of Employers, Riverside Airport, 2008

AIR VISITOR BENEFITS

Riverside Airport attracts general aviation visitors from throughout the region and the nation who come to the area for business, recreational and personal travel, including visiting relatives, medical consultation, or retail and investment spending.

This section provides detail on economic benefits from general aviation air travelers who use the airport. Values shown for spending (revenues), employment and earnings are benefits of initial visitor outlays and do not include secondary benefits of multiplier effects.

General Aviation Visitors

In order to analyze general aviation traffic patterns at the airport, a database of 2,600 general aviation flight plans involving Riverside Airport as either the destination or origin for travel was obtained from the FAA.

In this sample, the most frequent source of itinerant flights arriving at Riverside Airport was Long Beach. Second in importance was Orange County, followed by Gateway Airport in the Phoenix, Arizona metropolitan area. Van Nuys and Carlsbad rounded out the top five originating cities.

Overall, general aviation aircraft arriving at Riverside during the study period originated at more than 250 airports around the Western region and the nation.

Past years have typically seen more than 40,000 itinerant general aviation operations annually at Riverside Airport. Operations involve both arrivals and departures.

TABLE D3
GA Aircraft Itinerant Origination
Riverside Airport

Rank and Origin	State
1. Long Beach	CA
2. Orange County	CA
3. Phoenix-Mesa Gateway	AZ
4. Van Nuys	CA
5. Carlsbad	CA
6. Sacramento	CA
7. North Las Vegas	NV
8. Camarillo	CA
9. Montgomery Field, San Diego	CA
10. Fullerton	CA
11. Torrance	CA
12. Santa Monica	CA
13. San Luis Obispo	CA
14. El Cajon	CA
15. Santa Barbara	CA

Source: FAA Flight Plan Data Base and Riverside Airport Records

It is useful to differentiate between itinerant operations by based and transient aircraft. An itinerant operation involves an origination or destination airport other than Riverside Airport. However, both based and non-based aircraft contribute to itinerant activity in any given day.

When a Riverside based aircraft returns to Riverside Airport from a flight to Sacramento, for example, that is an itinerant operation. When an aircraft based at an airport other than Riverside arrives at Riverside Airport, that aircraft is classified as a transient itinerant.

Transient aircraft bring benefits to the airport service area when they spend for fuel or maintenance while at the airport, or when visitors spend for food, lodging, and other expenses such as auto rental in the Riverside area. Overnight transient visitors typically have much larger expenditures than transient visitors who stay only for a portion of a day.

According to analysis of flight records, there were 19,412 itinerant aircraft arrivals at Riverside Airport in fiscal year 2008. Of these, 7,765 were transients, aircraft based at another airport. 1,941 brought overnight visitors and 5,824 were one-day visitors (Table D4).

TABLE D4
General Aviation Transient Aircraft
Riverside Airport

Item	Annual Value
Itinerant AC Arrivals	19,412
Transient AC Arrivals	7,765
Overnight Transient AC	1,941
One Day Transient AC	5,824

Source: Derived from FAA Data and Riverside Airport Records

Separate analyses were conducted for those GA visitors with an overnight stay and those whose visit was one day or less in duration.

Overnight GA Visitors

Information on visiting general aviation aircraft was derived from a mail survey of visiting aircraft owners and pilots. Visitors were asked about the purpose of their trip, the size of the travel party, length of stay, type of lodging, and outlays by category.

The travel patterns underlying the calculation of overnight GA visitor economic benefits are shown in Table D5, for the 1,941 transient overnight aircraft arrivals during the year.

TABLE D5
General Aviation Overnight Visitors
Riverside Airport

Item	Annual Value
Transient AC Arrivals	7,765
Overnight Transient AC	1,941
Avg. Party Size	2.4
Number of Visitors	4,569
Average Stay (Days)	2.7
Visitor Days	12,579
Spending per Aircraft	$1, 062
Total Expenditures	$2,061,000

Source: Derived from FAA Data, Riverside Airport Records and GA Visitor Survey

The average party size was 2.4 persons and the average overnight travel party stayed in the area for 2.7 days. There were 4,569 overnight visitors for the year, with a combined total of 12,579 visitor days. Spending per travel party per overnight aircraft averaged $1,062. Total spending by all GA overnight visitors summed to $2.0 million for the year.

(Note: Spending by GA visitors is also included in on-airport rental car revenues shown in Tables D1 and D2.)

Table D6 shows the percentage distribution of outlays by overnight travel parties at Riverside Airport. Lodging accounts for 36 percent of visitor spending, averaging $380 per aircraft travel party.

Food and drink was the second largest category, at $272 per aircraft, accounting for 26 percent of the visitor spending dollar. Retail spending and entertainment were $145 and $151 per aircraft travel party. Ground transportation was the smallest expenditure category, at $114 for the average visiting overnight general aviation travel party.

TABLE D6
Spending Per Overnight GA Aircraft
Riverside Airport

Category	Spending	Percent
Lodging	**$380**	**36**
Food/Drink	**272**	**26**
Retail	**145**	**13**
Entertainment	**151**	**14**
Transportation	**114**	**11**
TOTAL	**$1,062**	**100**

Source: GA Visitor Survey

Day GA Visitors

According to flight operations records, 30 percent of itinerant general aviation aircraft arriving at Riverside Airport were transients that stayed on the airport for one day or less.

During the year, there were 5,824 transient aircraft that stopped at the airport for one day. Some were only on the ground for a few minutes while others were parked several hours when the travel party had their aircraft serviced, pursued a personal activity or conducted business.

The 5,824 day trip aircraft brought 13,393 visitors to the Riverside area during the year. The average spending per one-day aircraft was reported as $70 and total expenditures summed to $407,000 (Table D7).

TABLE D7
General Aviation Day Visitors
Riverside Airport

Item	Annual Value
Transient AC Arrivals	**7,765**
One Day Transient AC	**5,824**
Avg. Party Size	**2.3**
Number of GA Visitors	**13,393**
Spending per Aircraft	**$70**
Total Expenditures	**$407,000**

Source: Derived from FAA Data, Riverside Airport Records and GA Visitor Survey

The economic benefits from arriving transient aircraft travel parties are of two types. Those pilots or aircraft owners that buy fuel or have their aircraft serviced on the airport are making purchases which contribute to the revenue stream received by aviation businesses on the airport. That type of spending creates output, employment, and earning on the airport. Those economic benefits are shown in Table D2 as on-airport benefits.

However, if the aircraft travel party leaves the airport to visit a corporate site, conduct a business meeting, or attend a sporting or cultural event, these activities generate off-airport spending that create jobs and earnings in the local community.

TABLE D8 Spending Per Day Visitor Aircraft Riverside Airport		
Category	**Spending**	**Percent**
Food/Drink	**39**	**56**
Retail	**9**	**13**
Entertainment	**5**	**7**
Transportation	**17**	**24**
TOTAL	**$70**	**100**
Source: GA Visitor Survey		

The largest expenditure category for one-day visiting travel parties was purchase of food and beverages, which averaged $39 per aircraft travel party for the day and accounted for 56 percent of outlays (Table D8).

Spending for ground transportation (such as taxi or auto rental) was the second largest category, at $17 per aircraft.

Combined GA Visitor Spending

Table D9 shows the economic benefits resulting from spending in the region by combined overnight and day general aviation visitors arriving at Riverside Airport.

To recap, there were 7,765 transient general aviation aircraft that brought visitors to the airport during the year. Of these, 1,941 were overnight general aviation aircraft and 5,824 were one day visiting aircraft.

Each overnight travel party spent an average of $1,062 during their trip to the airport service area and travelers on each day visitor aircraft reported spending $70 per trip.

Multiplying the expenditures for each category of spending by the number of aircraft yields the total outlays for lodging, food and drink, entertainment, retail spending and ground transportation due to GA visitors during the year. This spending summed to $2.5 million in annual revenues.

There were 25,972 visitor days attributable to general aviation travelers during the year. Forty eight percent of visitor days (12,579) were due to overnight GA travelers and fifty two percent (13,393) were from one-day visitors.

On an average day, there were 70 visitors in the service area that had arrived by general aviation aircraft. Average daily spending by all GA air travelers was $6,761 within the airport service area. The average economic impact of any arriving GA transient aircraft (combined overnight and day visitor) was $317.

The largest single spending category by combined overnight and day visitors was for food and drink. The outlay of $755,000 accounted for 30 percent of the $2.5 million spent by GA visitors. Spending by general aviation visitors for food and drink was $738,000. Taken together, these two categories accounted for 60 percent of spending by visitors in the Riverside Airport service area. The third largest category was retail sales, at $330,000.

Of total spending of $2.5 million created by GA visitors, an average of 37 cents of each dollar circulated within the service area as earnings generated by the presence of the airport. (Earnings include wages and salaries paid to workers as well as income received by proprietors of businesses.) The earnings taken home by tourism/visitor sector workers and proprietors for spending in their own community summed to $913,000 during the year.

Expenditures by GA visitors created 33 jobs in the tourist sector in the Riverside Airport service area. Food and drink spending created the greatest number of jobs and the largest dollar value of earnings received by workers and proprietors ($59,000).

Since most general aviation visitors arrange for rental cars or other ground transportation pick ups on the airport, spending on ground transportation was treated as an "on-airport" activity in the summary tables D1 and D2. Below, Table D9 has been adjusted to remove ground transportation from visitor spending, so that visitor spending as reported in the summary tables is strictly off-airport. With this adjustment, off-airport visitor spending was $2.1 million, with 31 jobs created and earnings by workers of $839,000.

TABLE D9
Economic Benefits from GA Visitors - Revenues, Earnings and Employment
Riverside Airport

Category	Overnight AC Expenditures	One Day AC Expenditures	Total Visitor Expenditures	Earnings	Employment
Lodging	**$738,000**		**$738,000**	**$259,000**	**7**
Food/Drink	**528,000**	**$227,000**	**755,000**	**269,000**	**13**
Retail Sales	**281,000**	**52,000**	**333,000**	**153,000**	**6**
Entertainment	**293,000**	**29,000**	**322,000**	**158,000**	**5**
Ground Trans.	**221,000**	**99,000**	**320,000**	**74,000**	**2**
TOTAL	**$2,061,000**	**$407,000**	**$2,468,000**	**$913,000**	**33**
ADJUSTED TOTAL	**$1,840,000**	**$309,000**	**$2,148,000**	**$839,000**	**31**

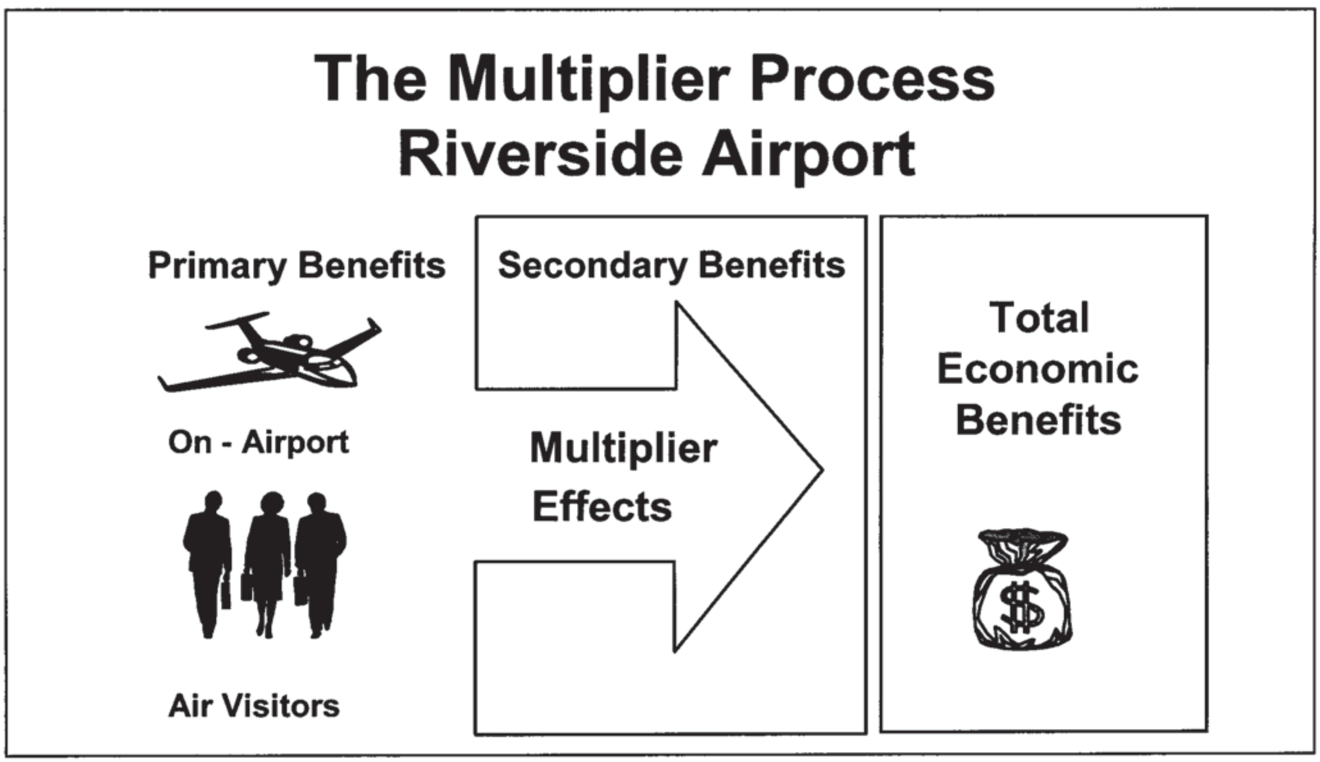
Note: Earnings and employment figures were derived from the IMPLAN input-output model based on data for Riverside County from the California Employment Development and the United States Bureau of Economic Analysis. Employment includes full and some part time workers, figures rounded to head counts. Ground Transportation figures have been subtracted from the Total to calculate an Adjusted Total and do not include auto rental spending, which has been accounted for in on-airport operations (Table D2).

SECONDARY BENEFITS: MULTIPLIER EFFECTS

The output, employment, and earnings from on-airport activity and off-airport visitor spending represent the computed primary benefits from the presence of Riverside Airport. For the service area, these primary benefits summed to $23.0 million of output (measured as revenues to firms and budgets of administrative units), 228 jobs, and earnings to workers and proprietors of $10.0 million. These figures for initial economic activity created by the presence of the airport do not include the "multiplier effects" that result from additional spending induced in the economy to produce the initial goods and services.

Production of aviation output requires inputs in the form of supplies and labor. Purchase of inputs by aviation firms has the effect of creating secondary or multiplier revenues and employment that should be included in total benefits of the airport. Airport benefit studies rely on multiplier factors from input-output models to estimate the impact of secondary spending on output, earnings and employment to determine benefits, as illustrated in the figure below.

The multipliers used for this study were from the IMPLAN input-output model based on data for Riverside County from the California Employment Development Department and the U. S. Bureau of Economic Analysis. To demonstrate the methodology, average Riverside Airport multipliers are shown in Table D10.



The multipliers represent weighted averages for combined industries in each category. For example, the visitor benefits multipliers shown combine lodging, food services, retailing, and entertainment multipliers used in the analysis.

The multipliers in this table illustrate the process for calculating the secondary and total impacts on all industries of the regional economy resulting from the initial impact of each aviation related industry. The multipliers for output show the average dollar change in revenues for all firms in the service area due to a one-dollar increase in revenues either on the airport or through visitor spending.

For example, each dollar of new output (revenue) created by on-airport employers circulates through the economy until it has stimulated *total* output in all industries in the service area of $1.9312 or, put differently, the revenue multiplier of 1.9312 for on-airport activity shows that for each dollar spent on the airport there is *additional* spending created as $0.9312 of secondary or multiplier spending.

Primary revenues from all sources associated with the presence of Riverside Airport were $22,982,000 for the year. After accounting for the multiplier effect, total revenues created within the service area were $44,816,000. Secondary revenues were $21,834,000, the difference between total and initial revenues.

The multiplier for earnings shows the dollar change in earnings for the economy due to a one-dollar increase in earnings either on the airport or in the visitor sector. The earnings multipliers determine how wages paid to workers on or off the airport stay within the economy and create additional spending and earnings for workers in other industries. For example, each dollar of wages paid for workers on the airport stimulates an additional $0.9443 of earnings in the total economy.

The initial wages of $9,159,000 for aviation workers and proprietors on the airport were spent for consumer goods and services that in turn created additional or secondary earnings of $8,648,000 for workers in the general economy.

The total earnings benefit of the on-airport activity was $17,807,000 consisting of the $9,159,000 initial benefits and the $8,648,000 secondary benefits. The economic interpretation is that the presence of the airport provided earnings for workers, who then re-spent these dollars in the service area, impacting the general economy.

The multipliers for employment show the total change in jobs for the service area due to an increase of one job on or off the airport. Each job on the airport is associated with 2.1103 total jobs in the rest of the airport service area. Similarly, each job in the hospitality industry supported by air visitor spending is associated with 1.6707 total jobs (primary + secondary) in the general economy.

The overall result is that the 228 initial jobs created by the presence of the airport supported an additional 239 jobs in the service area as secondary employment. The sum of the initial aviation related jobs and secondary jobs created in the general economy is the total employment of 467 workers that can be attributed to the presence of the airport.

The information above is intended for illustration only. In the full analysis, appropriate separate multipliers were used for the various categories on-airport aviation employers (FBO, food service, flight training, etc.) and visitor spending categories (lodging, food service, retail and entertainment).

TABLE D10
Average Multipliers and Secondary Benefits Within the Airport Service Area
Riverside Airport

Revenue Source	Primary Revenues	Average Output Multipliers	Secondary Revenues	Total Revenues
On-Airport Benefits	**$20,834,000**	**1.9312**	**$19,402,000**	**$40,236,000**
Visitor Benefits	**2,148,000**	**2.1322**	**2,432,000**	**4,580,000**
Revenues	***$22,982,000***		***$21,834,000***	***$44,816,000***
Earnings Source	Primary Earnings	Average Earnings Multipliers	Secondary Earnings	Total Earnings
On-Airport Benefits	**$9,159,000**	**1.9443**	**$8,648,000**	**$17,807,000**
Visitor Benefits	**839,000**	**2.1311**	**949,000**	**1,788,000**
Earnings	***$9,998,000***		***$9,597,000***	***$19,595,000***
Employment Source	Primary Employment	Average Employment Multipliers	Secondary Employment	Total Employment
On-Airport Benefits	**197**	**2.1103**	**218**	**415**
Visitor Benefits	**31**	**1.6707**	**21**	**52**
Employment	**228**		**239**	**467**

Notes: Multipliers above are weighted averages intended to illustrate how secondary and total benefits were calculated for Riverside Airport. In the full analysis, separate multipliers were used for on-airport employers (FBO and other airport businesses), and visitor spending (lodging, eating places, retailing, entertainment). Multipliers were for Riverside County as produced by the IMPLAN input-output model based on data from the California Employment Development Department and U. S. Bureau of Economic Analysis.

BASED AIRCRAFT BENEFITS

A survey of owners of aircraft based at Riverside Airport was conducted to compile information on private aircraft usage patterns, including number of trips per year, purpose of travel, average party size, and hours flown per trip. Questions were also posed concerning the importance of the airport for residential location and businesses of flyers.

TABLE D11
Based Aircraft Profile
Riverside Airport

Type	Number
Total Based Aircraft	**202**
Single Engine Piston	**170**
Multi-Engine Piston	**22**
Turboprop	**2**
Jet	**1**
Helicopter/Other	**7**

Source: Riverside Airport

Mailing addresses were obtained through the assistance of the City of Riverside who provided access to public records on aircraft ownership.

There were 202 based-aircraft at Riverside Airport (Table D11). Of these, 170 were single engine, 22 were multi-engine, 2 were turboprop, there was 1 jet, and 7 helicopters or other craft, including gliders and ultralights.

Characteristics of based aircraft at Riverside

Airport are shown in Table D12. The table sets out survey data, showing the average reported value for an individual aircraft was $108,000 and annual outlays were $9,300 for maintenance, upkeep, storage, and other expenses such as insurance.

Multiplying the average expenditures per aircraft of $9,300 times 202 aircraft gives total outlays by aircraft owners of more than $1.9 million injected into the economy, much of it going to the immediate airport service area.

The aircraft based at Riverside Airport represent assets to their owners with estimated total value exceeding $20 million. Many based aircraft are viewed as investments by their owners that provide returns through enhanced revenues and time savings when compared to scheduled airline travel. Entries in Table D12 also illustrate the relation between private aircraft ownership and business activity in the Riverside County area served by the airport.

Aircraft owners contribute to the economy when they use their aircraft for business purposes. Faster travel and more responsive businesses make the entire region more competitive. According to the aircraft owner survey, Riverside based aircraft were used for business for 5,600 flying hours in fiscal year 2008..

The presence of the airport as a factor affecting the personal quality of life and business success of aircraft owners was measured by survey questions asking respondents to rate the airport as "very important, important, slightly important, or not important" to their residential location decision and their business.

The survey results show that Riverside Airport is a significant factor in influencing the success of business and professional activity of aircraft owners.

- **Nearly 80 percent of all responding based aircraft owners (78%) said that the airport is "very important" or "important" to the success of their business.**

- **Similarly, 72 percent of based aircraft owners stated that the airport is "very important" or "important" to their residential location decision.**

Those who reported the airport as important to their business were also asked for information about their business.

- **Firms represented by users of based aircraft for business purposes accounted for 1,648 employees in the county and surrounding area, with employee earnings of $75.8 million**

Drawing from these results, it is evident that Riverside Airport plays a key role in the overall quality of life and level of economic activity in the Riverside County area, and particularly supports the business community.

TABLE D12
Based Aircraft Characteristics and Business Activity
Riverside Airport

Category	All Based AC
Average Aircraft Value	$107,600
Maintenance & Upkeep per Year	$9,300
Business Hours Flown per Year	5,600
Business Hours as Percent of All Hours	31%
Airport "Very Important" /"Important" to Business	78%
Employees of Owners of Based Aircraft	1,648
Employee Earnings at Firms Related to Based AC	$75,887,000

Notes: Figures are derived from Based Aircraft Owner Survey, 2008

Based aircraft owners at Riverside Airport reported flying 18,300 non-training hours per year (Table D13). Of these, 5,600 or 31 percent were for business and 12,700 or 69 percent were for personal travel. Of all owners, 42 percent reported some business use for their aircraft.

TABLE D13
Based Aircraft Use Patterns
Riverside Airport

Usage Measure	Annual Hours
Total Number of Hours	18,300
Business Hours	5,600
Personal Hours	12,700
Percent Business Hours	30.6%
Percent Personal Hours	69.4%
Source: Based Aircraft Owner Survey	

The typical business trip for a general aviation aircraft had 2.1 persons in the travel party (Table D14), according to survey responses completed by aircraft owners. The average aircraft was flown 28 hours on business during the year. Riverside Airport based aircraft flew 11,760 passenger hours during the year for business purposes.

The average aircraft based at Riverside Airport was flown 63 hours on personal trips per year. The typical round trip for pleasure, recreation or other personal reasons had 2.0 persons in the travel party (Table D15). There were 25,400 passenger hours flown for personal reasons that originated at Riverside Airport during the year.

(Note: Passenger hours flown on business or personal use were computed from multiplying average party size by hours flown, to obtain total passenger hours.)

TABLE D14
Based Aircraft - Business Use
Riverside Airport

Item	Annual Value
Business Hours	5,600
Avg. Hours per AC	28
Avg. Party Size	2.1
Passenger Hours	11,760
Source: Based Aircraft Owner Survey	

TABLE D15
Based Aircraft - Personal Use
Riverside Airport

Usage Measure	Annual Value
Personal Hours	12,700
Avg. Hours per AC	63
Avg. Party Size	2.0
Passenger Hours	25,400
Source: Based Aircraft Owner Survey	

An estimate of the value of travel on based aircraft may be obtained by computing the cost of making these same trips on a chartered flight. This approach is approved by the Internal Revenue Service for valuation of aircraft travel use by corporate executives.

The cost of charter flights varies by time, distance and type of aircraft. Table D16 shows charter rates for air travel in Southern California at mid-year 2008. A weighted average charter cost was determined for single, multi engine, turbo and jet aircraft by assigning a cost equivalent weighted by the number of each aircraft type based at the airport. For example, since 87% of the aircraft are single engine, the cost of a single engine charter had a weight of 0.87 in the charter cost for single and multi engine flights, to produce a weighted charter cost of $460 per hour for charters (helicopters were excluded from this analysis). The 195 fixed wing aircraft based at the airport flew 18,300 hours for the year. Assigning an average charter value of $460 per hour, the "charter equivalent value" of general aviation travel originating at Riverside Airport for the year totaled $8.4 million.

The computation is a conservative estimate of the value of general aviation travel. The estimate does not include all costs associated with charter service, such as standby fees, fuel surcharges, landing fees, or the standard two hour minimum requirement. Also, this value of travel estimate does not accurately measure all the associated economic gains and benefits that result from business trips. A single air trip can result in additional profits, fees, or revenues to a firm. Further, the flexibility compared to scheduled airline travel and the time saved by general aviation travel compared to automobile use is not calculated here, but has economic significance.

TABLE D16
Charter Equivalent Value of General Aviation Travel
Riverside Airport

Aircraft Type	Number	Weights	Hourly Charter Cost	Weighted Charter Cost
Single Engine	**170**	**0.87**	**$430**	**$376**
Twin Engine	**22**	**0.11**	**575**	**65**
Turboprop	**2**	**0.01**	**1,050**	**11**
Jet	**1**	**0.01**	**1,550**	**8**
TOTAL	**195**			**$460**

<u>Charter Equivalent Value Based On Weighted Cost Per Hour</u>

Hours	Hourly Cost	Total Value
18,300	**$460**	**$8,400,000**

Note: Charter costs by aircraft type based on average of rates as posted by various firms serving Southern California. Does not include standby time, landing fees, other charges including standard 2 hour minimum charge for charter travel.

SUMMARY & FUTURE BENEFITS

Airports are available to serve the flying public and support the regional economy every day of the year. On a typical day at Riverside Airport, there are more than 200 operations by aircraft involved in local or itinerant activity including flight instruction, touch and go operations, corporate travel, or transient aircraft bringing passengers visiting the area for personal travel or on business.

During each day of the year, Riverside Airport generates $122,800 of revenues within its service area (see box). Revenues and production support jobs, not only for the suppliers and users of aviation services, but throughout the economy.

Each day Riverside Airport provides 197 jobs on the airport and in total supports 467 area workers bringing home daily earnings of $53,000 for spending in their home communities.

On an average day during the year, there are 70 visitors in the area who arrived at Riverside Airport. Some will stay in the Riverside area for only a few hours while they conduct their business, and others will stay overnight. The average spending by these visitors on a typical day injects $6,700 into the local economy.

Table D17 shows a summary of current economic benefits associated with the airport. Primary benefits to the service area, without multiplier effects, include revenues of $23.0 million, 228 jobs and earnings to workers and proprietors of $10.0 million.

Riverside Airport Daily Economic Benefits

- **$122,800 Revenue Created**
- **467 Local Jobs Supported**
- **$6,700 Visitor Spending**
- **70 Air Visitors**

TABLE D17
Summary of Economic Benefits: 2008
Riverside Airport

	Revenues	Earnings	Employment
On-Airport Activity	**$20,834,000**	**$9,159,000**	**197**
Air Visitors	**2,148,000**	**839,000**	**31**
Primary Benefits	**22,982,000**	**9,998,000**	**228**
Secondary Benefits	**21,834,000**	**9,597,000**	**239**
Total Benefits	**$44,816,000**	**$19,595,000**	**467**

Note: Revenues, earnings and employment benefits reflect activity associated with 83,000 operations.

Including secondary or multiplier effects, total benefits to the service area are $44.8 million in revenues, 467 jobs and earnings of $19.6 million.

Riverside Airport is the origin of thousands of general aviation trips per year. Corporate and other private aircraft are used to visit other parts of the nation, and to bring visitors, customers and employees to the Riverside area. The estimated cost of chartering aircraft to serve the business needs of these travelers was found to be $8.4 million. In addition, the presence of the Riverside Airport provides unmeasured benefits in the form of flexibility in travel not found through reliance on scheduled air carriers.

It is important for citizens and policy makers to be aware that there are significant qualitative benefits from aviation that represent social and economic value created by airports for the regions which they serve. In addition to exerting a positive influence on economic development in general, aviation often reduces costs and increases efficiency in individual firms. Annual studies by the National Business Aviation Association show that those firms with business aircraft have sales 4 to 5 times larger than those that do not operate aircraft.

In 2007, the net income of aircraft operating companies was 6 times larger than non-operators (see National Business Aviation Association, *Fact Book*, 2007).

Future Benefits

The service area of Riverside Airport is located one of the stronger growth areas of California. Tables D18 through D20 illustrate the future benefits of Riverside Airport based on short term, intermediate term, and long term operations forecasts. As operations on the airport increase to 100,600, benefits rise from the current level to $60.9 million in the short term. The long term operations level of 136,800 is associated with economic benefits of $82.8 million in revenues, 863 jobs supported in the service area, and earnings of workers of $36.0 million.

TABLE D18
Aviation Related Economic Benefits: Short Term Demand Planning Horizon
Riverside Airport

	Revenues	Earnings	Employment
On-Airport Benefits	$24,136,000	$10,193,000	230
Visitor Benefits	3,081,000	1,188,000	43
Primary Benefits	27,217,000	11,381,000	273
Secondary Benefits	33,708,000	15,236,000	362
Total Benefits	$60,925,000	$26,617,000	635

Note: Revenues, earnings and employment benefits exclude capital projects. Values shown are constant 2008 dollars, and represent airport activity growth to 100,600 operations.

TABLE D19
Aviation Related Economic Benefits: Intermediate Term Demand Planning Horizon
Riverside Airport

	Revenues	Earnings	Employment
On-Airport Benefits	$26,631,000	$11,247,000	253
Visitor Benefits	3,400,000	1,311,000	48
Primary Benefits	30,031,000	12,558,000	301
Secondary Benefits	37,192,000	16,811,000	399
Total Benefits	$67,223,000	$29,369,000	701

Note: Revenues, earnings and employment benefits exclude capital projects. Values shown are constant 2008 dollars, and represent airport activity growth to 110,000 operations.

TABLE D20
Aviation Related Economic Benefits: Long Term Demand Planning Horizon
Riverside Airport

	Revenues	Earnings	Employment
On-Airport Benefits	**$32,821,000**	**$13,861,000**	**312**
Visitor Benefits	**4,190,000**	**1,542,000**	**59**
Primary Benefits	**37,011,000**	**15,403,000**	**371**
Secondary Benefits	**45,837,000**	**20,604,000**	**492**
Total Benefits	**$82,848,000**	**$36,007,000**	**863**

Note: Revenues, earnings and employment benefits exclude capital projects. Values shown are constant 2008 dollars, and represent airport activity growth to 136,800 operations.

Tax Impacts

Because of the spending, jobs, and earnings created by the presence of Riverside Airport, the facility is an important source of public revenues. As airport activity expands, tax revenues will continue to grow.

Estimated tax potential is set out in Table D21. The table shows the revenues for each tax category based on current average tax rates relative to output and personal income (earnings) for Riverside County and California. Federal taxes are applied using current federal rates.

The first column in Table D21 shows tax revenues associated with the current level of airport activity and total economic benefits of $44.8 million. The 467 workers in the service area have taxable earnings of $19.6 million.

Federal social security taxes are estimated at $2.1 million, the largest component of federal taxes. The second largest federal tax category is the personal income tax of $1.5 million.

Overall, federal tax revenues currently collected due to economic activity associated with Riverside Airport are estimated to be $4.4 million. State and local tax revenues are shown in the lower portion of the table. Tax revenues sum to $2.7 million for the current level of operations. The largest single component is sales taxes of $774,000. Combined federal, state, and local taxes are $7.1 million at the current level of operations.

Projected taxes for future demand based activity levels are linked to growth rates in airport operations. From $9.6 million for short term activity, total taxes rise to $10.6 million as demand and airport activity rise to higher operations in the intermediate term. In the long term planning period, total economic benefits related to aviation reaches $82.8 million, including all multiplier effects and taxes are $13.0 million.

TABLE D21
Tax Impacts from On Airport and Visitor Economic Activity
Riverside Airport

Federal Taxes				
Revenue Category	**Current**	**Short Term**	**Intermediate Term**	**Long Term**
Corporate Profits Tax	$472,000	$638,000	$704,000	$867,000
Personal Income Tax	1,536,000	2,075,000	2,290,000	2,822,000
Social Security Taxes	2,153,000	2,910,000	3,211,000	3,957,000
All Other Federal Taxes	210,000	283,000	313,000	385,000
Total Federal Taxes	**$4,371,000**	**$5,906,000**	**$6,517,000**	**$8,031,000**
State and Local Taxes				
Revenue Category	**Current**	**Short Term**	**Intermediate Term**	**Long Term**
Corporate Profits Tax	$117,000	$159,000	$175,000	$216,000
Motor Vehicle Taxes	33,000	45,000	49,000	61,000
Property Taxes	604,000	816,000	901,000	1,110,000
Sales Taxes	774,000	1,046,000	1,154,000	1,422,000
Personal Income Tax	558,000	754,000	832,000	1,026,000
All Other S & L	663,000	896,000	989,000	1,219,000
Total S & L	**$2,750,000**	**$3,716,000**	**$4,100,000**	**$5,053,000**
Total Taxes	**$7,121,000**	**$9,622,000**	**$10,617,000**	**$13,084,000**

Note: All figures are in 2008 dollars. Derived from average tax rates in Riverside, CA and Federal sources. Current impact estimate based on economic activity associated with 83,000 operations; short term operations of 100,600; intermediate operations of 110,000 and long term operations of 136,800.

Real Growth: 2008 vs. 1998

Table D22 compares current economic benefits associated with the airport with results from the 1998 benefit study. The table excludes multiplier effects, showing only primary benefits of on-airport economic activity and visitor spending. All dollar values are adjusted to 2008 levels in order to calculate "real growth."

On-airport revenues are 12 percent greater, and on-airport real earnings are up by 14 percent. Visitor spending is up by 14 percent, but earnings are up by 88 percent, due to minimum wage effects and less part-time employment. Overall real growth of primary economic benefits was 12 percent during the decade.

TABLE D22
Inflation Adjusted Real Growth of Economic Benefits
(Ratio of Economic Benefits: FY 2008 vs. FY 1998 in 2008 Dollars)
Riverside Airport

2008	Revenues	Earnings	Employment
On-Airport Benefits	**$20,834,000**	**$9,159,000**	**197**
Air Visitor Benefits	**2,148,000**	**839,000**	**31**
Primary Benefits	***22,982,000***	***9,998,000***	***228***
1998 (2008 Dollars)	**Revenues**	**Earnings**	**Employment**
On-Airport Benefits	**18,580,000**	**8,014,000**	**177**
Air Visitor Benefits	**1,886,000**	**445,000**	**27**
Primary Benefits	**20,466,000**	**8,459,000**	**204**
Ratio 2008/1998	**Revenues**	**Earnings**	**Employment**
On-Airport Benefits	**1.12**	**1.14**	**1.11**
Air Visitor Benefits	**1.14**	**1.88**	**1.15**
Primary Benefits	**1.12**	**1.18**	**1.12**

Note: Dollar figures expressed in 2008 dollars, adjusted by U.S. Consumer Price Index; operations increased 10 percent from 1998 (71,218) to 2008 (78,498) based on FAA Air Traffic Activity System reports

Appendix E

FAA FORECAST APPROVAL LETTER

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

Western-Pacific Region
Los Angeles Airports District Office

P.O. Box 92007
Los Angeles, CA 90009

November 26, 2008

Mark Ripley
Airport Manager
Riverside Municipal Airport
6951 Flight Road
Riverside, CA 92504

Dear Mr. Ripley:

Riverside Municipal Airport, Riverside, California
Aviation Activity Forecast

The Federal Aviation Administration (FAA) has reviewed the *Draft Chapter Two Forecasts* for the Riverside Airport (RAL) Master Plan. The forecast is consistent with the FAA Terminal Area Forecast (TAF) and is approved.

We originally reviewed the forecast in December 2007, but had not yet issued a formal approval. We have since re-checked the forecast, as currently posted on the Coffman Associates website. The forecast remains consistent with the latest version of the TAF.

If you have any questions about this forecast approval, please call Dick Dykas at (310) 725-3613.

Sincerely,

Ruben C. Cabalbag
Assistance Manager, Los Angeles Airports District Office

cc: Coffman Associates, Inc (James M. Harris)

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