William P. Hobby Airport

2003 Master Plan

Houston Airport System

City of Houston

Executive Summary

Ricondo & Associates, Inc.

In association with

Llewelyn-Davies Sahni, Inc.

Kimley-Horn and Associates, Inc.

SES Horizon Consulting Engineers, Inc.

Quadrant Consultants, Inc.

PTI, Incorporated

The Lentz Group

Hanscomb Faithful & Gould

Graphics Support Services, Inc.

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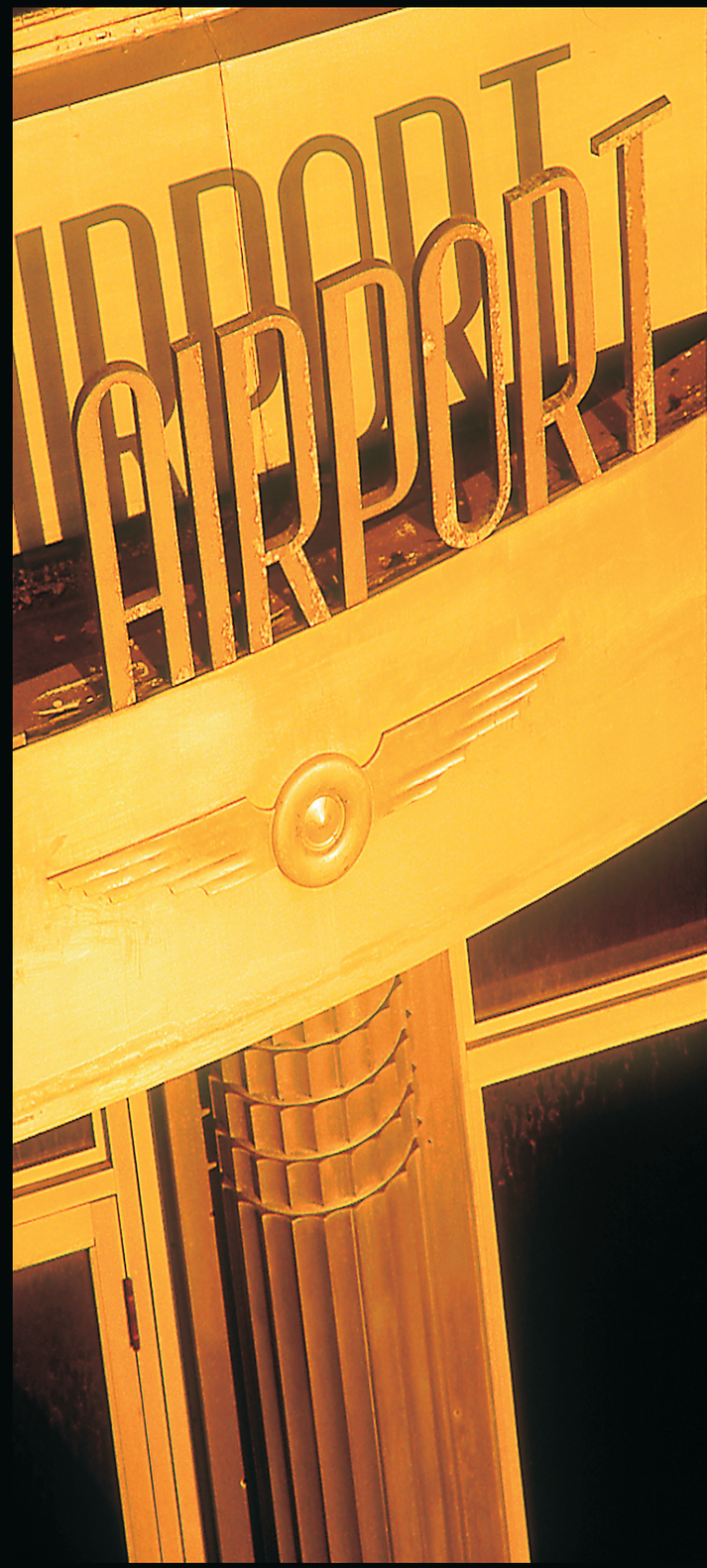

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May 2004

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1. Introduction

William P. Hobby Airport is one of three airports owned and operated by the Houston Airport System (HAS), an enterprise fund of the City of Houston. The other two airports in the system are George Bush Intercontinental Airport/Houston and Ellington Field. Each airport plays a unique role within the system, and they collectively provide the Houston region with a full range of aviation activity.

Hobby is located approximately seven miles southeast of downtown Houston on approximately 32 acres, as shown on **Exhibit 1-1**. Also shown are the other HAS airports and other non-HAS airports in the region. Hobby is the airport of choice for many business travelers because of its proximity to downtown Houston and the availability of low-cost flights to many United States destinations. It is a key airport in Southwest Airlines' route system, and accommodates a significant level of general aviation activity. In 2000, Hobby was the 41st busiest airport in the United States in terms of total passenger enplanements and the 45th busiest in terms of aircraft operations.

1.1 History of William P. Hobby Airport

In 1937, the City of Houston purchased 600 acres from the W.T. Carter Lumber Company to build what would later become William P. Hobby Airport. In 1955, the passenger terminal complex, which currently serves the Airport, opened. International flights from the Airport began in the 1950s.

In 1967, the Airport was renamed William P. Hobby Airport in honor of the former Texas governor and owner/editor of the Houston Post newspaper. But with the June 1969 completion of Houston Intercontinental Airport (recently named George Bush Intercontinental Airport/Houston), all scheduled airline operations were moved from Hobby to Intercontinental. This changed the role of the Airport from the primary commercial airport serving Houston to a general aviation airport.

In 1971, Southwest Airlines inaugurated service between Dallas Love Field, San Antonio International Airport, and William P. Hobby Airport. The presence of Southwest Airlines and other carriers led to a 34 percent increase in the number of aircraft operations at the Airport between 1963 and 1977. In 1978, as the airline industry was being deregulated, 12 airlines initiated service from the Airport. Although plans were in place for expanding the facilities at Intercontinental, insufficient facilities existed at the time to accommodate all airline traffic demand, which encouraged growth at Hobby. More specifically, from 1978 to 1984, passenger enplanements at the Airport increased an average of 35 percent per year, reaching a total of more than 3.5 million scheduled enplanements in 1984. From the mid-1980s to 2000, passenger traffic increased an average of about 1.5 percent per year. Today, the Airport plays a major role accommodating air traffic demand in the Houston area. Approximately one-third of all origin/destination passengers from the region fly in and out of Hobby.

1.2 Airport Vision and Master Plan Goals

The initial task completed for the Hobby Master Plan in conjunction with HAS management included establishment of the vision for the Airport to help define the goals of the Master Plan. Presentations and meetings were conducted, and the vision and goals that were to be used as the guidelines or benchmarks for the update are summarized as follows.

Vision for Hobby's Future

- The Airport should be able to accommodate any narrowbody aircraft (including the Boeing 757) domestic flight, and potentially short-haul international flights.
- Air cargo will not be emphasized, but will continue to be carried as belly cargo on passenger aircraft.
- Corporate and charter activity will remain a priority.
- Smaller, private aircraft operators may elect to relocate to Ellington Field as other activity at Hobby increases.
- Ultimately, the market will determine how Hobby develops.

Master Plan Goals

- Meet the anticipated demand for passenger, aircraft, and cargo growth.
- Improve the image of the Airport and its environs.
- Maintain and improve customer convenience.
- Retain flexibility to respond to aviation industry changes.
- Maintain a reasonable cost structure for users and tenants.
- Influence and affect land use change around the Airport.
- Identify other public and private initiatives, and encourage their development to complement the Master Plan.

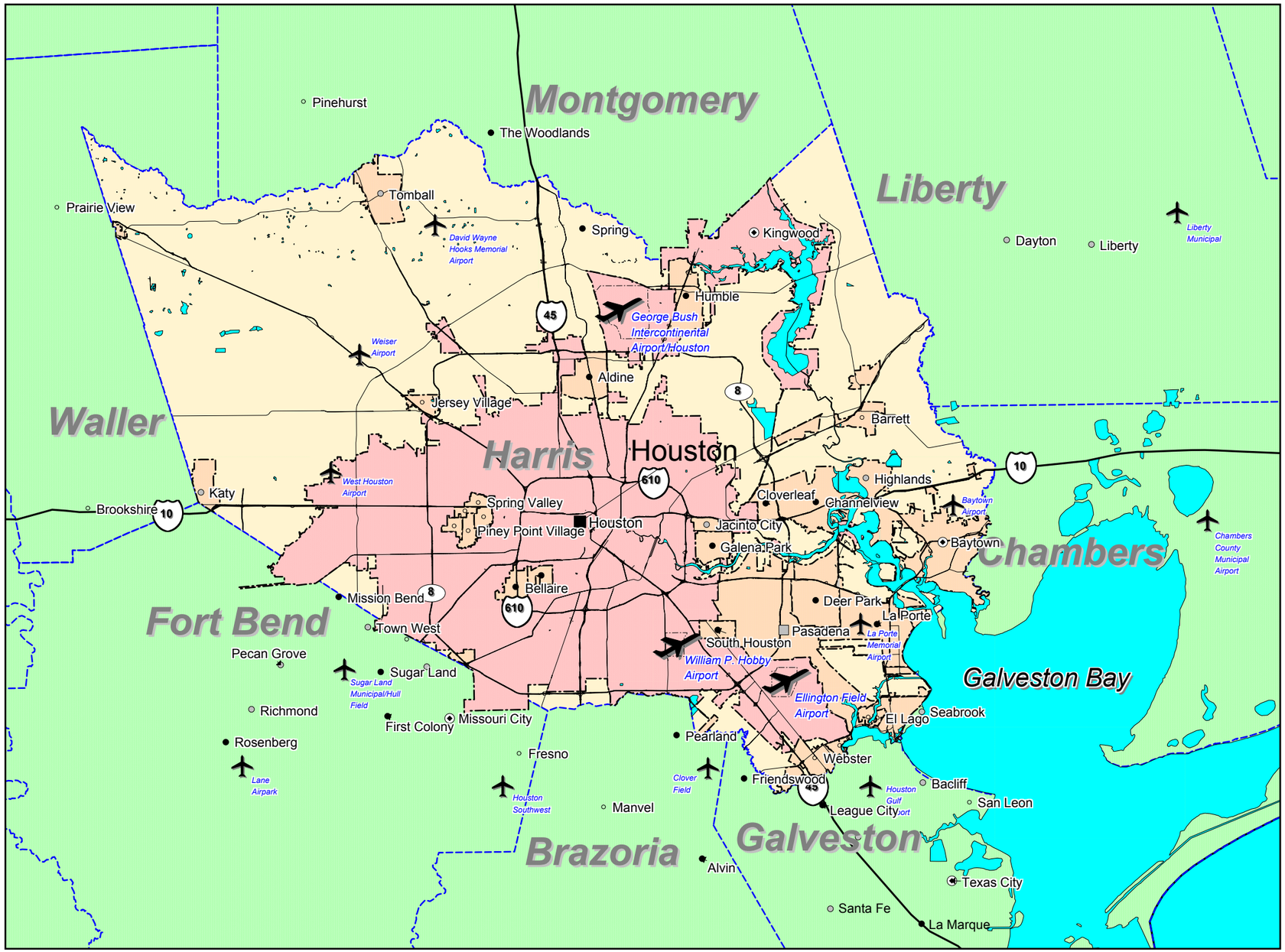
1.3 Summary of Master Plan

The Master Plan was initiated with the vision setting process in March of 2002. Public meetings were held in April and October 2002, to discuss the vision and preferred concept, respectively, with a final meeting presenting the Master Plan results in 2003. The technical analysis was concluded in 2003, with some refinement to the financial and environmental components being completed in 2004.

This Master Plan addressed potential activity and related improvements through 2022. Recommendations included short, intermediate and long-term development to accommodate the growth that could occur. Some elements of airport development, such as new runways, can take 10 to 15 years to put in place once the need is identified. However, it is prudent for an airport to update its master plan periodically to ensure that planning initiatives respond to contemporary market conditions.

This Master Plan was designed so that projects could be initiated when demand dictates the need for development. The forecasts identify one timeline in which development could occur, however, if activity does not materialize as quickly as forecast, the development envisioned by this master plan would be delayed accordingly. Conversely, if growth were to accelerate, projects could be initiated prior to the timeline associated with the master plan forecasts. The need for implementation of various projects is based on actual activity reaching specific Planning Activity Levels identified in the study. HAS would monitor aviation activity at Hobby annually to determine whether activity is tracking as projected and which projects from the master plan should be programmed into the Airport's five-year Capital Improvement Program (CIP) based on that activity.

The Hobby Airport Environs Image Plan, conducted as part of the Master Plan, was an integral part of the planning process. It resulted in concurrent recommendations of physical and functional needs. The main objective of the Image Plan was to create a cohesive identity for Hobby Airport and its surrounding areas in order to improve the passenger's travel experience and to celebrate Houston's rich history and cultural vitality.



LEGEND

- City Boundaries
- County Boundaries
- Roadway
- Water
- Houston Airport System Airport
- Airport

Source: Basemap - MapInfo, 2002.
Prepared by: Ricondo & Associates, Inc., May 2002.

Exhibit 1-1

north
0 7 Miles

C:\cad-symbols\maps\Houston\Airport Locations Exhibit 1-1.WOR

Airport Locations
Houston Airport System

2. Airport Inventory

An inventory of physical, operational, and functional characteristics of the Airport and its immediate environs is the initial step in the master planning *process* following establishment of the Airport vision and goals. The inventory information provides the basis for evaluating facilities and subsequently determining future facility needs. Data collection and inventory were completed for the following:

- Airfield Facilities
- Airspace Procedures
- Passenger Terminal Facilities
- Airport Tenant and Support Facilities
- Regional and Airport Ground Transportation
- Off-Airport Land Use Patterns
- Utility Infrastructure

2.1 Airfield Facilities

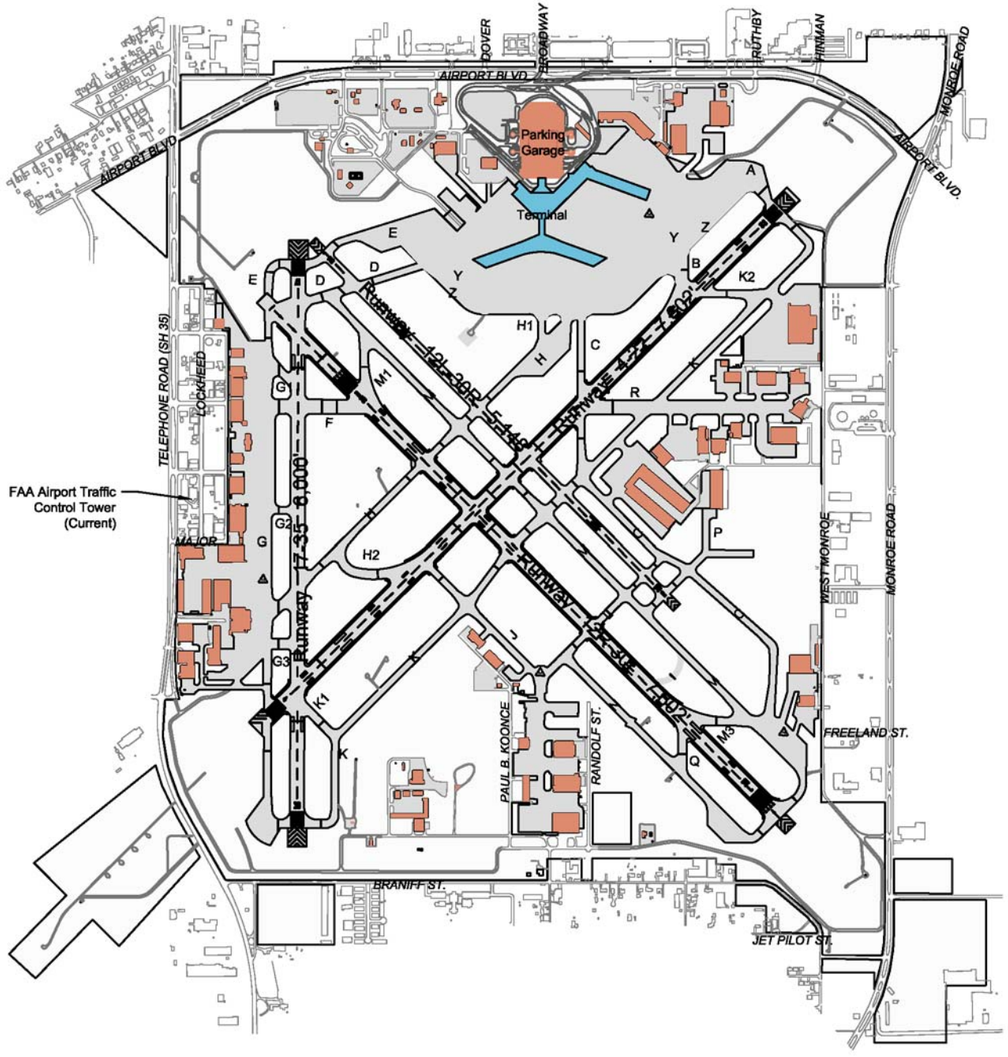
The Airport currently has four runways. Three of these (Runways 12R-30L, 4-22, and 17-35) are 150 feet wide and capable of accommodating the commercial aviation traffic that occurs at the Airport. The fourth, Runway 12L-30R, is 100 feet wide and is used primarily for general aviation activity. The airfield layout is illustrated on **Exhibit 2-1**, with the respective runway lengths shown.

Instrumentation on each runway end allows aircraft to land in varying weather conditions. Currently, Runways 12R-30L and 4-22 are the only runways equipped with a Category I (CAT I) instrument landing system (ILS), allowing landings in poor weather. However, weather conditions are sometimes so poor that aircraft must be diverted to other airports. HAS has been pursuing with the Federal Aviation Administration (FAA) the installation of a CAT II/III system for the Airport, proposed to be added to Runway 4.

2.2 Airspace Procedures

Three air traffic control (ATC) facilities provide services to aircraft arriving at or departing from the Airport, or overflying the immediate area, to assist in the safe, efficient, and expeditious movement of air traffic.

Exhibit 2-1
Airfield Layout



Sources: Jeppesen Airway Chart, November 2001; Airport/Facility Directory, April 2002, Airport Layout Plan; Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

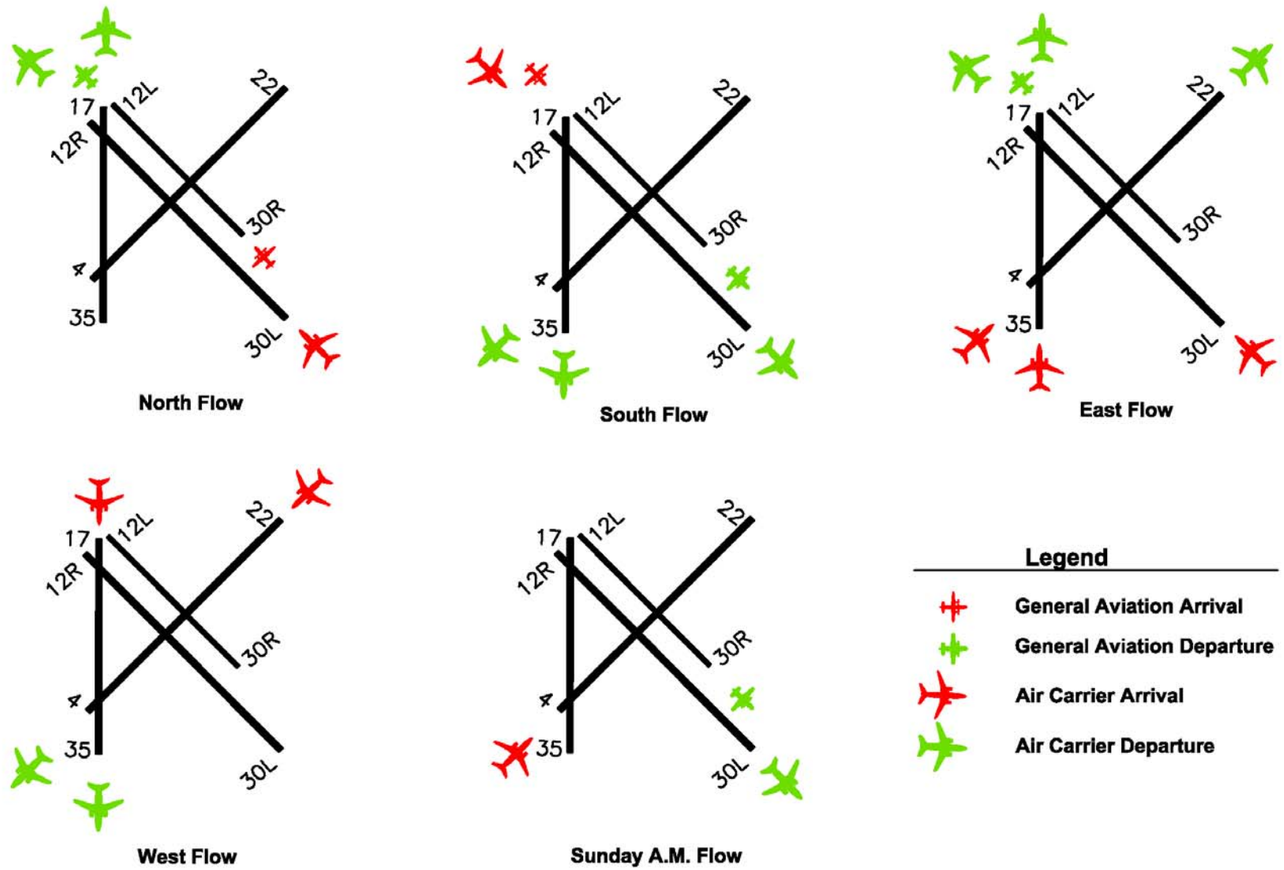
While all four runways are available for use by arrivals and departures, the weather conditions, runway characteristics (such as length, width, and location) and Airport noise policies define how the airfield is used. The runway operating configurations are designated North Flow, South Flow, East Flow, West Flow, and Sunday A.M. Flow. **Exhibit 2-2** illustrates the basic runway operating configurations at the Airport.

2.3 Passenger Terminal Facilities

HAS is currently reconstructing the terminal complex at the Airport. At the time this document was prepared, replacement of existing Concourse B and C with new Central Concourse was under way. Once it is completed, Concourse A will be replaced with a new East Concourse, and the existing terminal area will be remodeled. Although terminal complex reconstruction will not be completed until approximately 2008, the terminal complex that will exist after construction is considered an "existing" condition.

The passenger terminal complex consists of a Main Terminal, and two concourses designated as the Central Concourse and the East Concourse. Together, these facilities total 936,721 square feet and serve major and regional airlines. The terminal facilities are currently used by the following commercial airlines: AirTran Airways, American Airlines, American Eagle, Atlantic Southeast Airlines, Comair, Delta Air Lines, and Southwest Airlines.

Exhibit 2-2
Basic Runway Operating Configurations

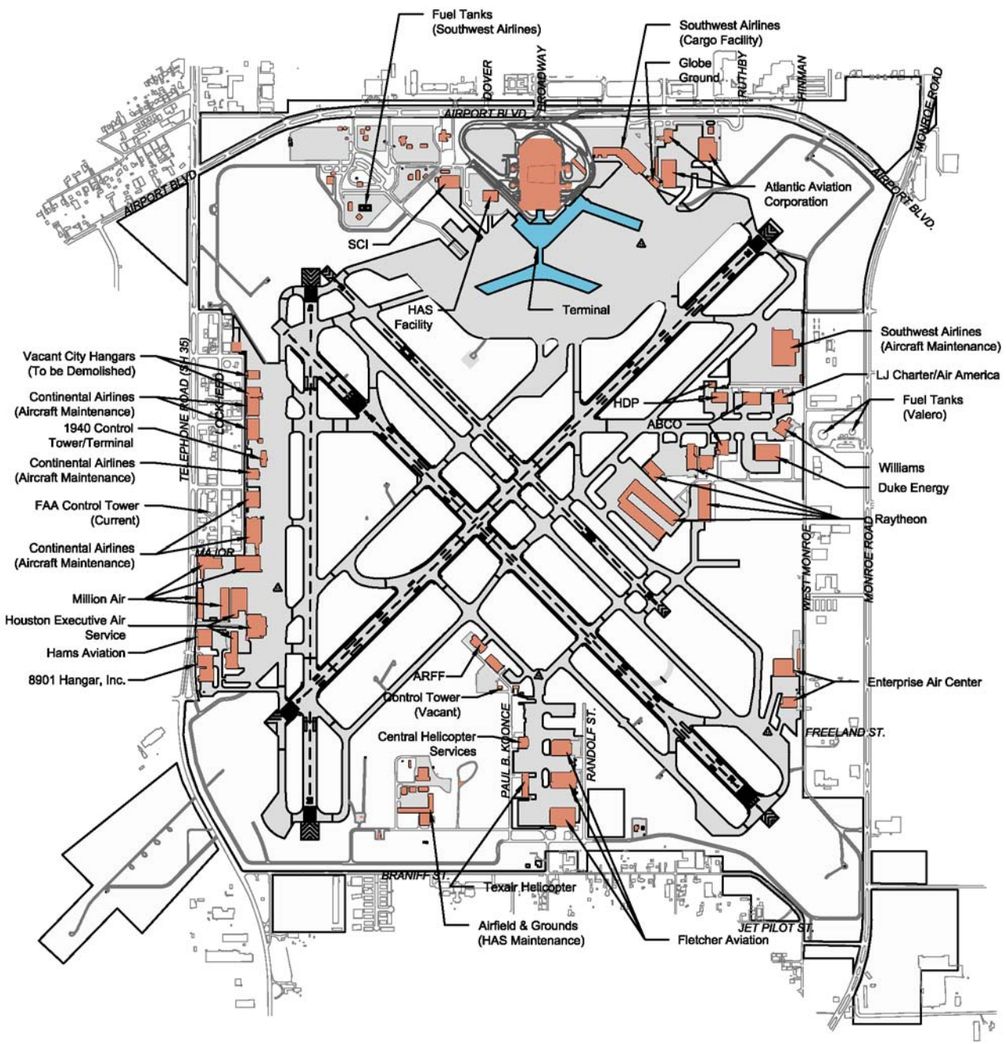


Source: HOU ATCT 7110.1G Houston Hobby TRACAB Air Traffic Control.
Prepared by: Ricondo & Associates, Inc., January 2002.

2.4 Airport Tenant and Support Facilities

Various Airport tenants located within the perimeter fence line can be grouped into the following categories: fixed base operators (FBOs), corporate aviation, aircraft maintenance, air cargo, and other, such as fueling, government, and helicopter operators. They are depicted on **Exhibit 2-3**. Presently, the Airport accommodates six FBOs, which provide passenger terminal facilities, fueling services, aircraft storage, and aircraft maintenance. Four corporate aviation tenants store a variety of aircraft and provide fuel for their own aircraft. The Houston Police Department bases its helicopter operations at Hobby, along with two other helicopter operators. The air cargo facility at the Airport is a multitenant facility designed to handle belly cargo operations for Southwest, and Delta. Other airfield tenants include Southwest Airlines Provisioning, Globe Ground North America, Choctaw Refueling Service, and 8901 Hangar, Inc.

Exhibit 2-3
Airport Tenant Facilities



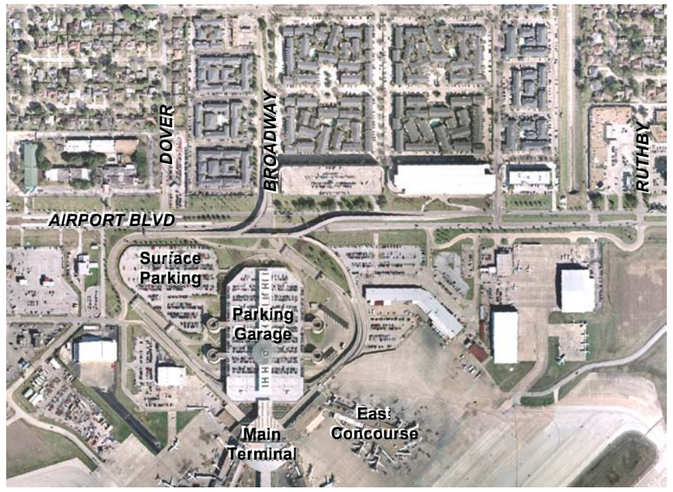
Sources: Ricondo & Associates, Houston Airport System
Prepared by: Ricondo & Associates, Inc.

2.5 Regional and Airport Ground Transportation

The Airport is generally bounded by Airport Boulevard on the north, Monroe Road on the east, Braniff Street on the south, and Telephone Road on the west. Broadway Street provides access into the terminal area. These roads are the ones most commonly used by the traveling public. Local roads, such as Braniff Street, Scranton Street, and Old Telephone Road, provide access to FBO, maintenance, cargo, and other Airport facilities. **Exhibit 2-4** provides an overview of the Airport access roadway system and the access and egress mode splits, as determined by a passenger survey conducted in April 2002.

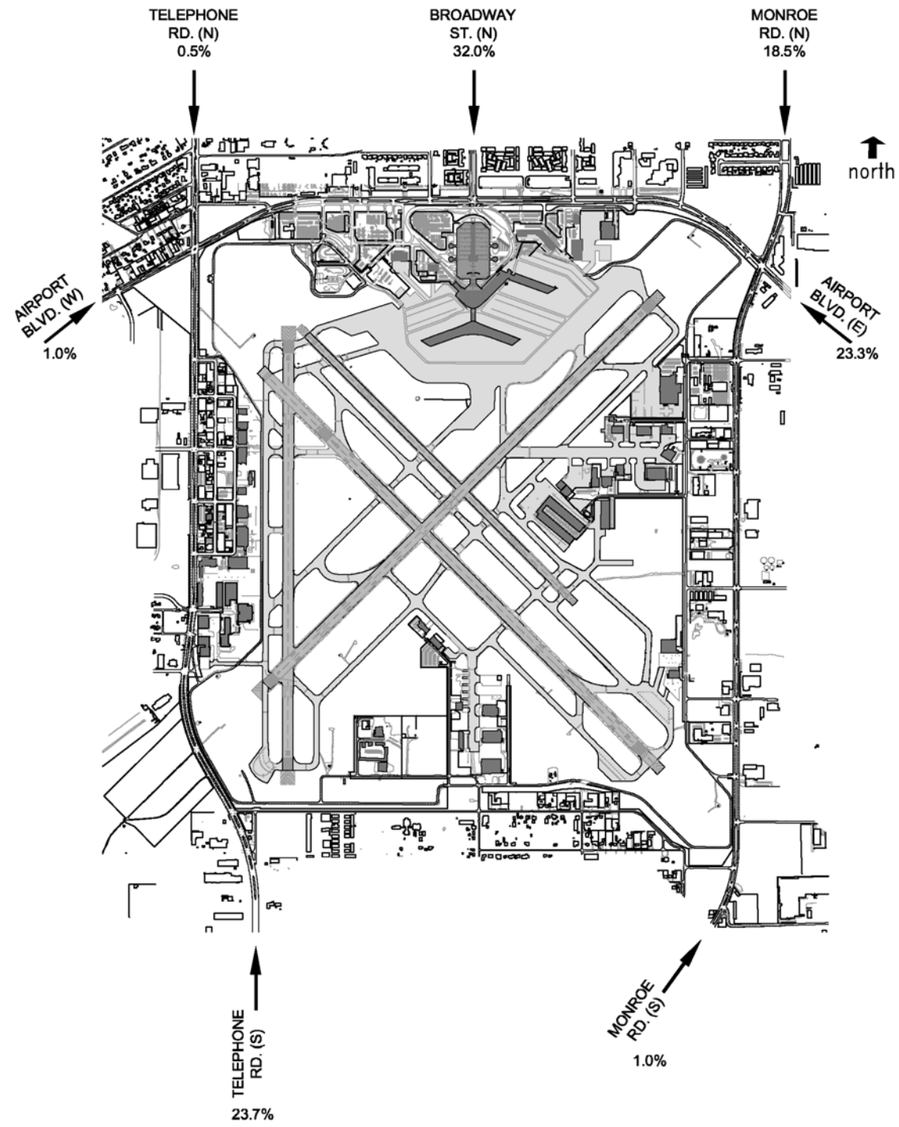
Currently, the Airport provides 3,494 public parking spaces in a garage, allocated as short-term and long-term spaces. In addition, the Airport provides 566 surface lot spaces in a designated Economy Lot, for a total of 4,060 on-Airport public parking spaces. It is estimated that privately operated off-Airport parking lots provide 5,500[1] parking spaces for public use. The layout of facilities is shown on **Exhibit 2-5**.

Exhibit 2-5
On-Airport Parking Areas



Source: Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

Exhibit 2-4
Interpreted Responses to Access Roadway Survey



Source: Kimley-Horn and Associates, Inc., Passenger Surveys
Prepared by: Kimley-Horn and Associates, Inc., April 2002

[1] Off-Airport parking companies provide an estimated supply of 6,963 total parking spaces. However, Airport (non Transportation Security Administration [TSA]) employees utilize 1,287 spaces and TSA employees utilize 179 spaces.

2.6 Off-Airport Land Use Patterns

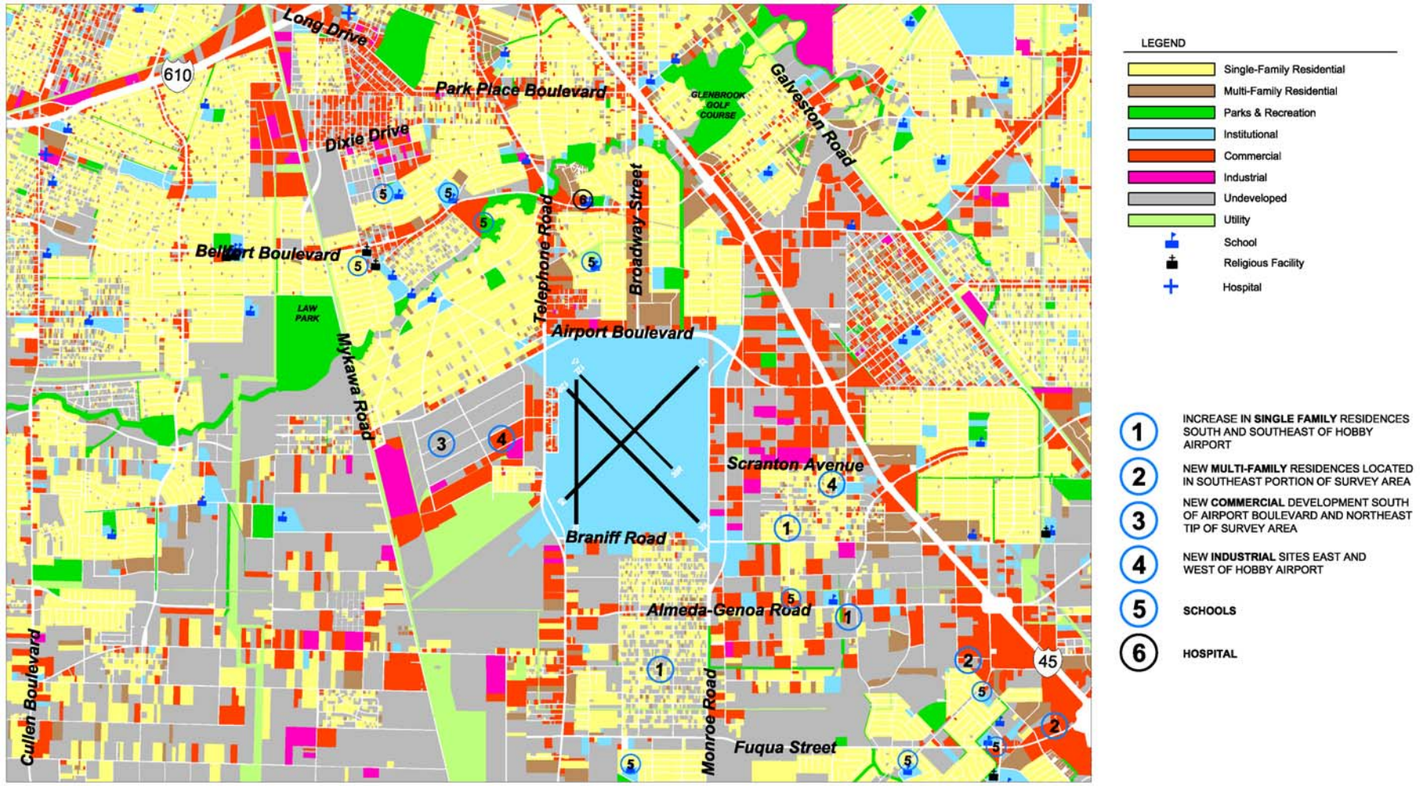
Existing land uses were documented by conducting a windshield survey of the area. The study defined an Airport Area of Influence (AOI), which is bounded by Loop 610 to the north, I-45 to the east, Beltway 8 to the south, and Mykawa Road to the west. The windshield survey was conducted using the 1999 land use drawing from the current Airport Layout Plan (ALP) as a basemap. **Exhibit 2-6** is a graphical representation of Off-Airport land use in 2002, and the significant changes that occurred between 1999 and 2002.

2.7 Utility Infrastructure

The utility infrastructure at the Airport consists of sanitary sewer collection, water, storm sewer, electrical power, communication lines and gas lines. Each system is linked to the utility infrastructure for the City of Houston. The detailed data collection process for each of these categories of utility infrastructure provided information such as responsible agency, current conditions, and whether there was flexibility for future expansion.

Exhibit 2-6

Off-Airport Land Use (2002)



Sources: Houston Airport System, Airport Layout Plan; Llewelyn-Davies Sahni, Inc. (windshield survey); USGS internet query.
Prepared by: Ricondo & Associates, Inc. June 2003.

3. Aviation Demand Forecasts

For the Master Plan aviation demand forecasts were developed for passenger enplanements, air cargo volume, air carrier and regional/commuter airline operations, general aviation, based aircraft and aircraft fleet mix through 2022. The forecasts provide the basis for determining facility requirements and for performing the environmental, financial, and other analyses necessary for preparation of the Airport Master Plan. The detailed analyses conducted in developing the forecasts are contained in the Technical Reports, Volume I, Chapter 3.

The aviation activity forecasts were based on assumptions about aviation activity in the Houston region and other factors that may affect future aviation demand at the Airport, including:

- National aviation industry trends, including changes following September 11, 2001
- Policy goals and objectives of the Houston Airport System
- Hobby's role in the Houston Airport System
- Historical activity levels and trends in air service at the Airport, including comparisons of historical U.S. market shares
- Local socioeconomic and demographic trends, compared with State and national trends

The forecasts represent estimates of future activity at the Airport. The actual activity levels may vary from those forecast due to unforeseen events within the aviation industry or the Houston Airport System. In addition to the baseline forecasts, several alternative forecast scenarios are presented to account for potential changes in air service patterns that could emerge during the planning period (through 2022).

3.1 Historical Activity Levels and Trends

The Airport is considered a medium hub airport by the FAA and in 2000 accommodated approximately 9.1 million passengers (enplaned and deplaned) and 254,000 aircraft operations. The Airport primarily serves origin-destination passenger traffic and accounts for 37 percent of the region's total domestic origin-destination passenger traffic. Airlines at the Airport primarily serve short- and medium-haul destinations with an average stage length of 700 miles. **Table 3-1** presents nonstop markets historically served from Hobby.

The total number of domestic enplaned passengers at the Airport grew 1.6 percent annually over the historical period and the number of connecting passengers accommodated at the Airport grew an average of

Table 3-1

Nonstop Passenger Markets, 1990-2002

	Year												
City	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Abilene, TX		●				●							
Albuquerque, NM	●	●	●			●	●	●	●	●	●	●	●
Atlanta, GA	●	●	●	●	●	●	●	●	●	●	●	●	●
Austin, TX	●	●	●	●	●	●	●	●	●	●	●	●	●
Baltimore, MD									●	●	●	●	●
Baton Rouge, LA		●	●										
Beaumont/Port Arthur, TX	●	●											
Birmingham, AL	●				●	●	●	●	●	●	●	●	●
Chicago, IL (Midway)										●	●	●	●
Chicago, IL (O'Hare)	●	●	●	●	●								
Cincinnati, OH	●	●	●	●	●	●	●	●	●	●	●	●	●
Cleveland, OH	●												
Corpus Christi, TX	●	●	●	●	●	●	●	●	●	●	●	●	●
Dallas, TX (Love Field)	●	●	●	●	●	●	●	●	●	●	●	●	●
Dallas-Ft. Worth, TX (DFW)	●	●	●	●	●	●	●	●	●	●	●	●	●
Denver, CO	●	●	●	●	●								
Detroit, MI	●	●	●	●	●	●	●	●	●	●	●		
El Paso, TX	●	●	●	●	●	●	●	●	●	●	●	●	●
Fort Worth, TX								●	●				
Gulfport, MS										●	●	●	
Harlingen, TX	●	●	●	●	●	●	●	●	●	●	●	●	●
Houston, TX (Bush)	●					●	●	●	●	●	●	●	
Jackson, MS								●	●	●	●	●	●
Kansas City, MS								●	●	●	●	●	●
Lafayette, LA		●	●										
Lake Charles, LA	●	●	●										
Laredo, TX	●												
Las Vegas, NV							●	●	●	●	●	●	●
Little Rock, AR	●					●	●	●	●	●	●	●	●
Longview, TX		●	●										
Los Angeles, CA	●	●									●	●	●
Lubbock, TX						●							
Memphis, TN	●	●	●	●	●	●	●	●	●	●	●	●	
Miami, FL		●	●	●	●								
Midland, TX	●	●	●	●	●	●	●	●	●	●	●	●	●
Minneapolis-St. Paul, MN	●	●	●	●	●	●	●	●	●	●	●		
Nacogdoches, TX		●	●										
Nashville, TN	●	●	●	●	●	●	●	●	●	●	●	●	●
New Orleans, LA	●	●	●	●	●	●	●	●	●	●	●	●	●
New York, NY (JFK)	●	●	●	●	●	●	●	●					
New York, NY (LaGuardia)	●	●							●	●	●	●	●
Newark, NJ	●	●										●	
Oakland, CA													●
Oklahoma City, OK	●	●	●	●	●	●	●	●	●	●	●	●	●
Orlando, FL									●			●	●
Phoenix, AZ	●	●	●	●	●	●	●	●	●	●	●	●	●
Providence, RI										●	●		
Reno, NV										●	●	●	
Salt Lake City, UT											●	●	
San Antonio, TX	●	●	●	●	●	●	●	●	●	●	●	●	●
Shreveport, LA		●											
St. Louis, MO	●	●	●	●	●	●	●	●	●	●	●	●	●
Tampa, FL												●	●
Tulsa, OK	●	●	●	●	●	●	●	●	●	●	●	●	●
Tyler, TX	●	●	●										
Washington, DC (Reagan)	●	●								●			

Source: Official Airline Guides, Inc., Official Airline Guide
Prepared by: Ricondo & Associates, Inc., April 2002

7.3 percent per year between 1991 and 2000. However, the number of originating passengers at the Airport decreased 0.3 percent annually over the same period. The share of connecting passengers at the Airport increased from approximately 13 percent in 1991 to 22 percent in 2000.

Aircraft operations for each category of activity (air carrier, regional/commuter, general aviation, all cargo, and military) remained relatively flat for most of the historical period. However, activity among regional/commuter carriers fluctuated greatly over the historical period.

3.2 Factors Affecting Aviation Activity

A number of factors affect aviation activity. Each segment of the industry is affected by the strength or weakness of the economy. The introduction of new aircraft, airline and aviation business practices, and federal aviation policy also affect aviation activity. Several local factors, such as the goals and policies of the Houston Airport System and socioeconomic and demographic trends, will affect demand for air travel in the region.

The recent nationwide economic recession and the aftermath of the September 11th terrorist attacks on the United States are expected to have a prolonged negative effect on the industry.[1] **Table 3-2** illustrates the decrease in enplanements at the Airport due to the September 11th terrorist attacks.

While the events of September 11th resulted in a significant decrease in passenger enplanements, it also seems to have spurred an increased interest in fractional and corporate aircraft ownership. The business/corporate segment of the general aviation industry has experienced increased growth in fractional ownership companies and corporate flying has continued to expand the market for jet aircraft. This change shows that Airport activity is sensitive to changes in local and national economic conditions. The strength of a local economy typically correlates to the level of aviation activity at an airport. An airport located in a region with a strong economy will typically experience positive growth in aviation activity.

Table 3-2

Passenger Enplanements Before and After September 11

	October - December Enplanements			Annual Enplanements		
Airline	2000	2001	Percent change	2000	2001	Percent change
Air Carrier						
AirTran	41,181	31,316	-24.0%	164,836	160,724	-2.5%
American	29,417	8,287	-71.8%	94,342	88,792	-5.9%
Delta	41,085	41,512	1.0%	158,002	170,211	7.7%
Southwest	949,205	848,494	-10.6%	3,816,716	3,687,250	-3.4%
Others [(a)]	602	3	-99.5%	39,505	1,623	-95.9%
Total Air Carrier	1,061,490	929,612	-12.4%	4,273,401	4,108,600	-3.9%
Regional/Commuter						
American Eagle	37,544	33,574	-10.6%	157,448	149,660	-4.9%
Atlantic Southeast	7,340	8,629	17.6%	43,681	31,702	-27.4%
Comair	8,923	6,735	-24.5%	37,721	15,708	-58.4%
Continental Express [(b)]	3,219	0	-100.0%	18,879	7,929	-58.0%
NW Airlink Express One [(c)]	5,332	0	-100.0%	21,346	4,610	-78.4%
Total Regional/Commuter	62,358	48,938	-21.5%	279,075	209,609	-24.9%
Total Enplanements	1,123,848	978,550	-12.9%	4,552,476	4,318,209	-5.1%

Notes: (a) Includes charter airlines.
(b) Continental Express stopped serving the Airport as of October 2001.
(c) NW Airlink Express One stopped serving the Airport as of April 2001.

Source: Houston Airport System
Prepared by: Ricondo & Associates, Inc., April 2002.

3.3 Alternative Demand Scenarios

Based on the analysis of historical trends, air passenger survey results, and discussions with airline representatives and other Airport users, three demand scenarios were developed to represent possible growth in aviation demand at the Airport. The demand scenarios cover a range of possible activity levels that could affect the scale and scope of facility requirements over the forecast period. These demand scenarios are discussed below.

Baseline Scenario: Represents a likely growth scenario based on historical trends. Reflects the assumption that the roles of the airports in the Houston Airport System would be maintained and that the Airport would continue to accommodate origin-destination passenger traffic and attract low-fare, high-frequency airline service.

Connecting Scenario: Reflects an assumption that connecting activity by Southwest Airlines will increase at a rate higher than has occurred in recent years. The scenario is based on the additional assumptions that (1) the Central Concourse will be built with a total of 24 gates[2], and (2) Southwest Airlines will increase connecting activity at the Airport, leading to growth rates comparable to those that have occurred at other focus airports in Southwest's network.

Accelerated Scenario: Reflects the assumption that, because of (1) economic expansion, (2) terminal improvements planned at the Airport, (3) the introduction of new generation aircraft that can serve longer haul markets from the Airport, and (4) the proximity of the Houston region to Mexico and other Latin

[1] *FAA Aerospace Forecasts, Fiscal Years 2002-2013*, FAA Office of Policy and Plans, March 2002.

[2] As mentioned in Section 2.3 of the Master Plan Technical Reports, the original design for the Central Concourse calls for 20 gates, all of which will be used by Southwest Airlines. At the time this document was prepared, there was an expressed interest by Southwest Airlines to have an additional four gates constructed on the east end of the Central Concourse, and an effort by HAS to receive a Categorical Exclusion from the FAA for construction of the additional four gates. The 4-gate expansion was approved by the FAA and the full 24-gate Central Concourse is being constructed. Therefore, for the connecting scenario, it was assumed that the additional four gates would be constructed and operational by 2005 or early 2006.

Table 3-3

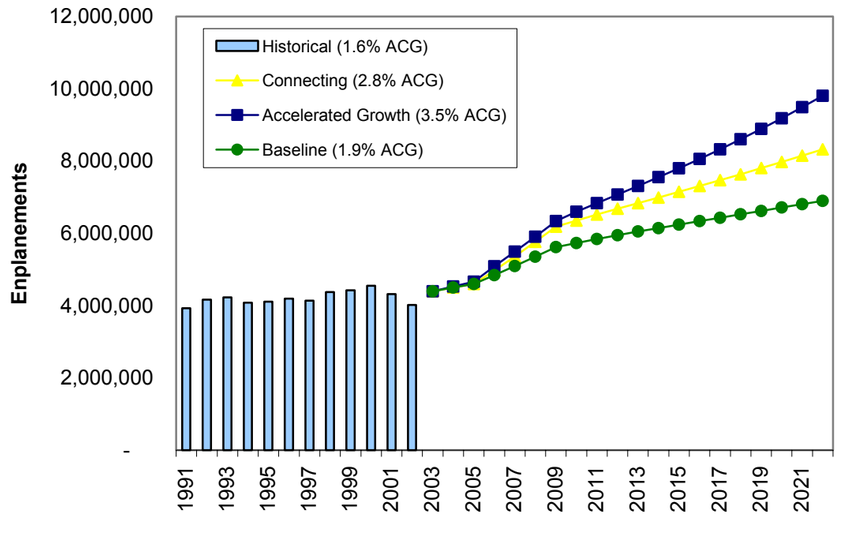
Historical and Forecast Total Passenger Enplanements – Baseline, Connecting, and Accelerated Growth Scenarios

Year	Baseline	Connecting	Accelerated Growth
Historical			
1991	3,930,586	3,930,586	3,930,586
1992	4,165,717	4,165,717	4,165,717
1993	4,229,561	4,229,561	4,229,561
1994	4,079,553	4,079,553	4,079,553
1995	4,107,245	4,107,245	4,107,245
1996	4,193,914	4,193,914	4,193,914
1997	4,138,971	4,138,971	4,138,971
1998	4,377,233	4,377,233	4,377,233
1999	4,422,032	4,422,032	4,422,032
2000	4,552,487	4,552,487	4,552,487
2001	4,318,209	4,318,209	4,318,209
2002	4,019,340	4,019,340	4,019,340
Forecast			
2007	5,097,700	5,363,100	5,490,400
2008	5,355,000	5,768,300	5,907,900
2009	5,616,400	6,187,700	6,338,100
2010	5,733,900	6,355,600	6,599,700
2011	5,845,400	6,519,500	6,835,900
2012	5,950,600	6,679,300	7,072,700
2013	6,049,900	6,835,100	7,310,100
2014	6,146,000	6,989,700	7,551,900
2015	6,241,900	7,147,000	7,801,800
2016	6,337,500	7,307,000	8,060,000
2017	6,432,800	7,469,800	8,327,000
2018	6,527,400	7,635,200	8,602,900
2019	6,621,500	7,803,400	8,888,200
2020	6,714,600	7,974,200	9,183,000
2021	6,806,800	8,147,700	9,487,800
2022	6,897,700	8,323,800	9,802,800
Annual Compounded Growth			
1991-2000	1.6%	1.6%	1.6%
2000-2007	1.6%	2.4%	2.7%
2007-2012	3.1%	4.5%	5.2%
2012-2017	1.6%	2.3%	3.3%
2017-2022	1.4%	2.2%	3.3%
2000-2022	1.9%	2.8%	3.5%

Sources: Houston Airport System (historical); Ricondo & Associates, Inc. (forecast)
Prepared by: Ricondo & Associates, Inc., April 2002

Exhibit 3-1

Historical and Forecast Total Passenger Enplanements – Baseline, Connecting, and Accelerated Growth Scenarios



Note: ACG = Annual Compounded Growth

Sources: Houston Airport System (historical); Ricondo & Associates, Inc. (projected)
Prepared by: Ricondo & Associates, Inc., April 2002

American destinations, the Airport would experience an expansion of service by existing carriers, the introduction of service by new carriers, and the introduction of new markets, including short-haul international markets in Mexico and Latin America. This scenario reflects the assumption that air passenger growth would parallel expected growth in the local economy and expansion of the economic interrelationships between Mexico and the United States (particularly Texas) over the foreseeable future.

After much analysis, it was determined that the Connecting Scenario would be used as the basis for developing the aviation demand forecasts for this Master Plan.

3.4 Passenger Enplanement Forecasts

Enplanement forecasts are presented by air carrier and regional/commuter airlines that provide service at the Airport. Separate forecasts were developed based on the operational differences between these types of carriers. Charter airline enplaned passengers are included in the air carrier enplanement projections. **Table 3-3** and **Exhibit 3-1** summarize historical and forecast total enplaned passengers at the Airport under each demand scenario.

3.5 Air Cargo Volume Forecasts

The volume of air cargo handled at the Airport is not anticipated to grow significantly over the forecast period. Passenger airlines carry the majority of air cargo volume at the Airport, and with the large investments by the Houston Airport System in cargo facilities at Bush Intercontinental Airport, it is not anticipated an all cargo facility will be developed at the Airport during the forecast period.[3]

[3] A 156,000-square-foot air cargo processing and distribution center, known as the Houston International Air Cargo Center, is under construction at Bush Intercontinental Airport. The facility will be capable of accommodating up to 12 B-747-400 freighters, and is designed to handle large volumes of domestic and international freight, express packages, and U.S. mail.

Table 3-4

Historical and Forecast Total Aircraft Operations – Baseline, Connecting, and Accelerated Growth Scenarios

Year	Baseline	Connecting	Accelerated Growth
Historical			
1991	258,376	258,376	258,376
1992	239,997	239,997	239,997
1993	235,756	235,756	235,756
1994	234,130	234,130	234,130
1995	247,946	247,946	247,946
1996	251,054	251,054	251,054
1997	261,214	261,214	261,214
1998	256,415	256,415	256,415
1999	259,454	259,454	259,454
2000	254,435	254,435	254,435
2001	249,304	249,304	249,304
Forecast			
2002	240,638	240,638	240,538
2003	248,398	248,398	248,998
2004	251,518	251,518	253,738
2005	254,100	254,100	258,030
2006	260,438	263,778	269,278
2007	266,598	273,038	279,678
2008	272,758	282,398	290,058
2009	278,758	291,758	300,518
2010	280,910	294,530	306,570
2011	283,598	298,038	313,218
2012	285,998	301,278	319,658
2013	288,198	304,338	325,958
2014	290,178	307,218	332,398
2015	292,030	309,970	338,950
2016	294,158	313,138	345,738
2017	296,038	316,078	352,638
2018	297,878	319,018	359,718
2019	299,658	321,938	366,998
2020	301,310	324,750	374,230
2021	302,991	327,811	381,901
2022	304,512	330,552	389,542
Annual Compounded Growth			
1991-2000	-0.2%	-0.2%	-0.2%
2000-2007	0.7%	1.0%	1.5%
2007-2012	1.0%	1.3%	2.1%
2012-2017	0.7%	1.0%	2.0%
2017-2022	0.6%	0.9%	2.0%
2000-2022	0.8%	1.2%	2.0%

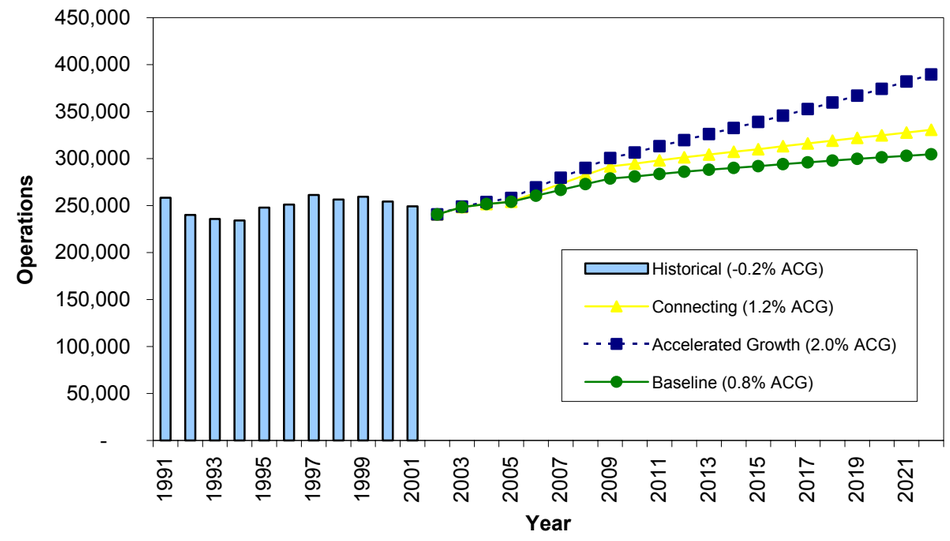
Sources: Houston Airport System (historical); Ricondo & Associates, Inc. (forecast)
Prepared by: Ricondo & Associates, Inc., April 2002

3.6 Aircraft Operations and Fleet Mix Projections

Based on the enplanement forecasts presented previously and assumptions regarding the average number of aircraft seats and passenger load factors, the same three demand scenarios for domestic air carrier operations and fleet mixes were developed. **Table 3-4** summarizes the historical and forecast aircraft operations under each demand scenario. **Exhibit 3-2** depicts the range of potential operational demand scenarios considered in the preparation of the Airport Master Plan.

Exhibit 3-2

Historical and Forecast Total Aircraft Operations – Baseline, Connecting, and Accelerated Growth Scenarios



Note: ACG = Annual Compounded Growth

Source: Houston Airport System (historical); Ricondo & Associates, Inc. (forecast)
Prepared by: Ricondo & Associates, Inc., April 2002

3.7 Design Hour Activity Forecasts

In addition to forecasting annual activity levels at the Airport, it was necessary to forecast design level activity, defined in this study as activity during the peak hour of the average day of the peak month (ADPM). These forecasts are important, as most airports are designed to accommodate peak-hour demand. Design level projections of operational fleet mix activity by commercial and noncommercial user groups were developed.

3.8 Forecast Comparisons

The previous sections of this chapter summarized the forecasts associated with three demand scenarios: baseline, connecting, and accelerated growth. Although many different factors can affect aviation activity at the Airport in the years to come, it is believed that the connecting scenario most accurately reflects the level of activity that can be expected at the Airport during the 20-year planning horizon. As a result, the forecasts associated with the connecting scenario are recommended for use in the Master Plan. This recommendation is based on numerous assessments, including but not limited to historical aviation activity at the Airport, the stated policy goals of HAS, industry trends, Southwest Airlines feedback, and other factors.

4. Demand/Capacity Analyses

The purpose of the demand/capacity analysis is to explore the relationship between demand and capacity in the context of various airport systems, such as airfield, terminal, ground access, and aviation support facilities, and to provide a general assessment of the ability of existing facilities to accommodate future demand.

The planning activity levels (PALs) that were assigned to a specific level of operation will be used throughout the demand/capacity analyses to tie the demand and subsequent facility requirements to activity levels and not to years. However, for discussion purposes, it is sometimes appropriate to associate the PAL with a year. For that purpose, PAL 1 is generally associated with the level of operations shown in the connecting scenario year 2007; PAL 2 is associated with 2012 and PAL 3 with 2022. For detailed analyses of the demand /capacity assessments, please refer to the Technical Reports, Volume 2, Chapter 4.

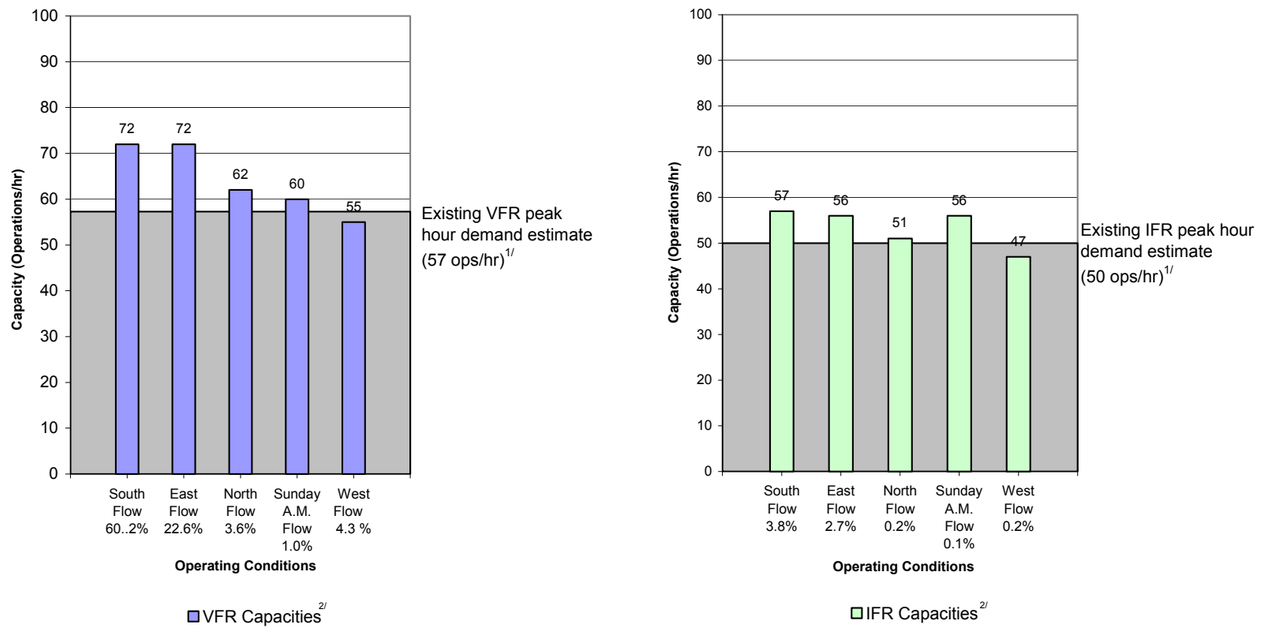
4.1 Airfield

The capability of the airfield facilities to accommodate the existing and forecast aircraft operations is determined by an airfield demand/capacity analysis. Airfield capacity is the maximum number of aircraft operations that an airfield can accommodate during a specific period of time without incurring an unacceptable level of delay. Factors that may affect airfield capacity include weather conditions, types of aircraft, airfield configuration, and ATCT procedures. The number and location of runways exits and the amount of touch-and-go activity may also affect the airfield's capacity. As aircraft demand nears or exceeds the airfield capacity for a specific operating condition, aircraft delays begin to increase exponentially. Detailed analyses of airfield demand/capacity and associated delay were completed. Capacity was estimated for current activity and future PALs for the five runway operating conditions in both visual flight rule (VFR) and instrument flight rule (IFR) conditions.

Exhibit 4-1 presents a comparison of hourly capacity with the peak hour demand estimated for the Airport in 2001. The exhibit provides a separate comparison for both VFR and IFR weather conditions, assuming an arrival mix of 50 percent.

Exhibit 4-1

Hourly Airfield Demand/Capacity Comparison – 2001



1/ Assuming that the peak hour is the peak hour for commercial operations (air carriers and commuters). During that period, it is assumed that general aviation operational demand would average 66 percent of its peak hour demand level during VFR conditions and IFR conditions.

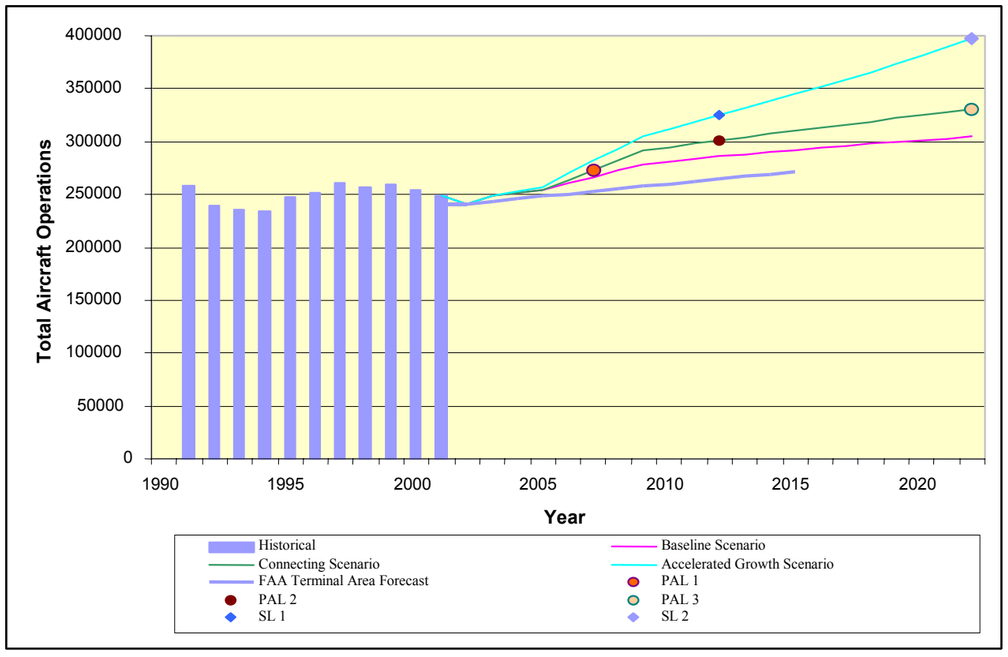
2/ Assuming 50 percent arrivals.

Source: Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

As shown on Exhibit 4-1, the VFR and IFR peak hour aircraft demand typically reached 57 and 50 operations, respectively, during 2001. This demand level typically exceeded the hourly airfield capacity while the airfield was operated in the West Flow configuration only. Although demand exceeded capacity during both VFR and IFR conditions, these weather conditions only occurred 4.5 percent of the time. However, as peak hour demand increases throughout PAL 3, the occurrence of operating conditions in which aircraft demand exceeds airfield capacity also increases. The peak hour IFR demand of 60 operations forecast for PAL 2 would exceed the hourly airfield capacity estimated for all five IFR operating configurations.

The demand/capacity analysis for the airfield determined that the existing runway configuration is adequate to serve the current (2001) operational demand experienced at the Airport. As demand increases throughout the planning period, airfield capacity will be exceeded during peak demand periods. Inevitably aircraft delay will increase, thereby increasing operational costs. Currently, the average delay is estimated to be less than one minute per aircraft operation. This value is expected to increase to nearly 8 minutes per operation by the end of PAL 3. At medium hub airports, an average delay of 4-6 minutes is typically the threshold of unacceptable delay to the airline industry. On that basis, exploration of airfield capacity enhancement opportunities that could be implemented prior to PAL 3 is warranted. **Exhibit 4-2** graphically depicts the association between the activity at each of the PALs and the range of years associated with each.

Exhibit 4-2
Forecast Aircraft Operations



Source: Ricondo and Associates, Inc.
Prepared by: Ricondo and Associates, Inc.

4.2 Terminal

Terminal demand/capacity analyses are focused on a terminal facility's ability to accommodate passenger demand as well as user/tenant needs. The overall terminal facility is evaluated, as well as individual functional components (i.e., aircraft gates, ticket-counters, departure lounges, bag claim areas) to determine their adequacy to serve existing and forecast demand.

From the demand/capacity analyses for the terminal, it was determined that the current terminal redevelopment project, which will be completed in 2008[1], will be adequate to serve current, PAL 1, and PAL 2 demand for terminal and gate facilities (**Table 4-1**), in accordance with recommended FAA planning factors. However, both the terminal area and the number of gates will become constrained at PAL 3. Some components of airline operational areas, concessions, public space, passenger security screening/TSA, and other areas, will not be adequate to meet passenger demand in PAL 1 and beyond. Administrative areas may be sufficient to operate through PAL 3. To meet these needs, the current terminal will need to be expanded during PAL 3.

[1] As of August 2003, the terminal completion schedule was revised. The new completion date for Southwest Airlines gates is 2005, while full completion of the terminal is now anticipated in 2008 rather than 2006.

Table 4-1

Demand/Capacity Analysis - Terminal and Concourses

	Existing (Upon Completion of New Terminal)	Target Planning Factor		Ratio of Functional Area to Demand Level or Related Component		
		Minimum	Recommended	PAL 1 Planning Factors	PAL 2 Planning Factors	PAL 3 Planning Factors
Airline Gate/Departure Lounges						
Number of Narrowbody Gates (Qty)	36					
Holdrooms (SF)	87,344	1,900 SF/NBGate	2,450 SF/NBGate	2,700 SF/NBGate	2,450 SF/NBGate	2,200 SF/NBGate
Total Holdrooms Space (SF)	**87,344**					
Airline Space						
Ticket Counter Length (LF)	411	0.25 LF/PHOP	0.30 LF/PHOP	0.33 LF/PHOP	0.28 LF/PHOP	0.26 LF/PHOP
Ticket Counter/Work Area (SF)	6,002	3.5 SF/PHOP	4.5 SF/PHOP	4.9 SF/PHOP	4.1 SF/PHOP	3.9 SF/PHOP
ATO Offices (SF)	11,704	7.0 SF/PHOP	9.0 SF/PHOP	9.52 SF/PHOP	8.0 SF/PHOP	7.5 SF/PHOP
Airline Clubs (SF)	N/A	1.55 SF/PHENP	2.0 SF/PHENP	- SF/PHENP	- SF/PHENP	- SF/PHENP
Operations/Support/Storage Area (SF)	44,236	5.0 SF/1000ANNENP	7.0 SF/1000ANNENP	8.2 SF/1000ANNENP	6.6 SF/1000ANNENP	5.3 SF/1000ANNENP
Baggage Claim Frontage (LF)	1,206	0.70 LF/PHTP	0.75 LF/PHTP	1.02 LF/PHTP	0.78 LF/PHTP	0.74 LF/PHTP
Baggage Claim Area (SF)	31,344	18 SF/PHTP	20 SF/PHTP	26.59 SF/PHTP	20.22 SF/PHTP	19.17 SF/PHTP
Outbound Baggage (SF)	72,983	25 SF/PHOP	40 SF/PHOP[1/]	59 SF/PHOP	50 SF/PHOP	47 SF/PHOP
Inbound Baggage (SF)						
Offload Areas (SF)	23,126	13 SF/PHTP	15 SF/PHTP	20 SF/PHTP	14.9 SF/PHTP	14 SF/PHTP
Tug Access/Circulation (SF)	41,698	20 SF/PHTP	22 SF/PHTP	35 SF/PHTP	27 SF/PHTP	26 SF/PHTP
Baggage Services (SF)	3,634	5% Share (%) of Bag. Claim Area	10% Share (%) of Bag. Claim Area	15% of Bag. Claim Area	12% of Bag. Claim Area	11% of Bag. Claim Area
Total Airline Space (SF)	**234,727**					
Concessions						
Car Rental						
Counter Length (LF)	147	0.09 LF/PHTP	0.12 LF/PHTP	0.125 LF/PHTP	0.095 LF/PHTP	0.0898 LF/PHTP
Counter Area (SF)	2,121	1.35 SF/PHTP	1.50 SF/PHTP	1.799 SF/PHTP	1.369 SF/PHTP	1.297 SF/PHTP
Food/Beverage (Secure and Non-secure) (SF)	30,116	4.5 SF/1000ANNENP	5.6 SF/1000ANNENP	5.615 SF/1000ANNENP	4.509 SF/1000ANNENP	3.618 SF/1000ANNENP
News/Gift/Other (SF)	15,026	2.5 SF/1000ANNENP	2.8 SF/1000ANNENP	2.802 SF/1000ANNENP	2.250 SF/1000ANNENP	1.805 SF/1000ANNENP
Other (Storage and Support Areas) (SF)	17,817	2.5 SF/1000ANNENP	3.3 SF/1000ANNENP	3.322 SF/1000ANNENP	2.667 SF/1000ANNENP	2.140 SF/1000ANNENP
Total Concessions Space (SF)	**65,080**					
Public Space						
Public Seating Area						
Seats (Qty)	68	0.15 Seat/PHTP	0.25 Seat/PHTP	0.06 Seat/PHTP	0.04 Seat/PHTP	0.04 Seat/PHTP
Seating Area (SF)	1,020	15 SF/Seat	15 SF/Seat	4 SF/Seat	3 SF/Seat	3 SF/Seat
Rental Car Queuing Area (SF)	1,500	0.89 SF/PHTP	1.00 SF/PHTP	1.27 SF/PHTP	0.97 SF/PHTP	0.92 SF/PHTP
Ticket Lobby/Ticket Queuing Area (SF)	16,440	10.0 SF/PHOP	12.5 SF/PHOP	13 SF/PHOP	11 SF/PHOP	11 SF/PHOP
Restrooms (SF)	24,790	4.6 SF/PHP	6.1 SF/PHP	7.92 SF/PHP	6.09 SF/PHP	5.06 SF/PHP
Secure Circulation (SF)	69,718	70% of Holdroom	80% of Holdroom	88% of Holdroom	78% of Holdroom	72% of Holdroom
Other Public Circulation (SF)	99,932	24.0 SF/PHP	30.0 SF/PHP	32 SF/PHP	25 SF/PHP	20 SF/PHP
Total Public Space (SF)	**213,400**					
Security Screening (TSA)						
Checkpoint (Qty)	6	1 Chkpt/200 PHOP	1 Chkpt/150 PHOP	1 Chkpt/200 PHOP	1 Chkpt/240 PHOP	1 Chkpt/260 PHOP
Security Checkpoint/Processing Area (SF)	3,856	650 SF/Chkpt	650 SF/Chkpt	550 SF/Chkpt	480 SF/Chkpt	480 SF/Chkpt
Passenger Queuing (SF)	3,981	900 SF/Chkpt	700 SF/Chkpt	570 SF/Chkpt	500 SF/Chkpt	500 SF/Chkpt
TSA Offices/Search Rooms (SF)	-	750 SF/Chkpt	750 SF/Chkpt	- SF/Chkpt	- SF/Chkpt	- SF/Chkpt
Total Security (TSA) (SF)	**7,837**					
Non-Public/Other Areas						
Airport Administration and Other (SF)[1/]	226,064	24.1% of Total Terminal SF	24.1% of Total Terminal SF	24.1% of Total Terminal SF[2/]	22.6% of Total Terminal SF[3/]	20.0% of Total Terminal SF[3/]
Mechanical/Electrical/Bldg. Sys. (SF)	66,722	7.0% of Total Terminal SF	7.0% of Total Terminal SF	7.1% of Total Terminal SF[2/]	6.7% of Total Terminal SF[3/]	5.9% of Total Terminal SF[3/]
Janitorial/Storage/Shops/Unenclosed Areas (SF)	35,546	3.8% of Total Terminal SF	3.8% of Total Terminal SF	3.8% of Total Terminal SF[2/]	3.6% of Total Terminal SF[3/]	3.1% of Total Terminal SF[3/]
Total Other Areas (SF)	**328,332**					
TOTAL TERMINAL SPACE (SF)	**936,721**					

Legend:

Ratio Indicates ratio does not satisfy the Recommended Planning Factor.

Ratio Indicates ratio satisfies neither the Minimum Planning Factor nor the Recommended Planning Factor.

LF = Linear Feet
SF = Square Feet
N/A = Not Applicable
NB = Narrowbody
ANNENP = Annual Enplaned Passengers
ATO = Airline Ticket Office
PHOP = Peak-Hour Originating Passenger
PHTP = Peak-Hour Terminating Passenger

Notes:

[1/] Includes restrooms, stairwells, and other non-public areas.

Sources: Hobby terminal design drawings provided by Lockwood, Andrew & Newnam, Inc., December 2001; Ricondo and Associates, Inc.
Prepared by: Ricondo and Associates, Inc

4.3 Airport Access and Parking

4.3.1 Ground Access Demand and Capacity

The Airport is located in close proximity to several regional highways. With many of the arterial systems that connect the Airport to these major highways, the capacity of the roadway network in the Airport area is controlled by the intersections. Traffic counts were conducted at the three major intersections in the study area in July of 2002 to ascertain current demand along the primary roadways serving the Airport. These intersections include Airport Boulevard at Telephone Road, Airport Boulevard at Broadway Street, and Airport Boulevard at Monroe Road, as shown in **Exhibit 4-3**. Level-of-service (LOS) analyses of the intersection operating conditions indicate that the afternoon peak hour typically has a LOS than the morning peak hour (see **Table 4-2**). Thus, the afternoon peak hour was selected as the critical analysis condition for the surface transportation network serving the Airport.

Table 4-2

Intersection Levels-of-Service (Existing PM Peak Hour Demand)

Intersection	EB Approach	WB Approach	NB Approach	SB Approach
Airport at Telephone Road – Existing Timing	B	F	B	F
Airport at Telephone Road – Optimized Timing [1/]	C	C	D	D
Airport at Broadway Street	B	C	D	D
Airport at Monroe Road	C	C	C	B

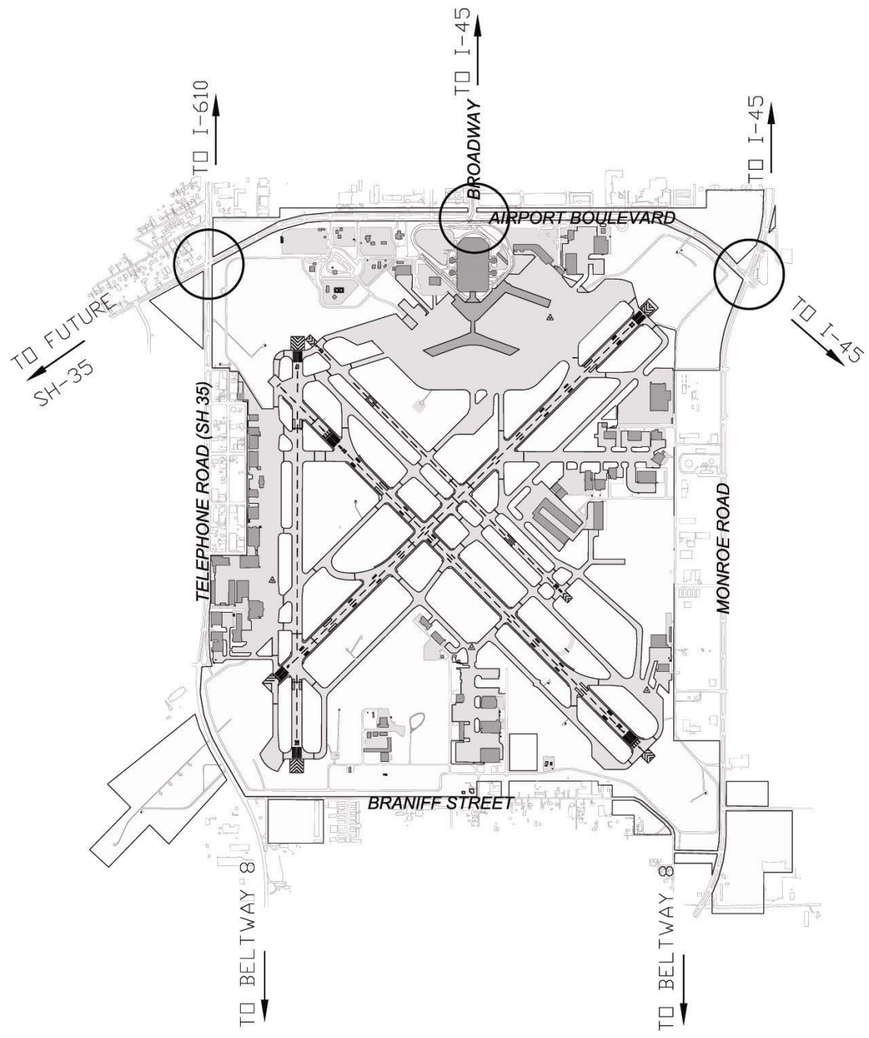
Note:
[1/] The Synchro 4 analysis technique was used to assess the intersection capacity if the timing were optimized

Source: Kimley-Horn and Associates, Inc.
Prepared by: Kimley-Horn and Associates, Inc.

After much assessment and simulation, it was determined that roadway capacity will be sufficient through PAL 3. However, the intersection demands at Airport Boulevard and Telephone Road, Airport Boulevard and Broadway Street, and Airport Boulevard and Monroe Road will yield LOS D or E using the existing geometries, even with improved signal timings. Major changes at each of the three intersections with Airport Boulevard are recommended in the Master Plan. With changes in traffic patterns over the next several years, it is anticipated that the distribution of regional access will also change, as shown in **Table 4-3**.

Exhibit 4-3

Roadways and Intersections



Source: Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

Table 4-3

Predicted Future Regional Access Distribution

Approach Direction	Existing	Future
Broadway Street	32.0%	10.0%
SB Monroe Road	18.5	29.5
NB Monroe Road	1.0	1.0
WB Airport Boulevard	23.3	23.3
EB Airport Boulevard	1.0	25.7
NB Telephone Road	23.7	10.0
SB Telephone Road	0.5	0.5

Source: Kimley-Horn and Associates, Inc.
Prepared by: Kimley-Horn and Associates, Inc.

4.3.2 Ground Access Demand/Capacity Conclusions

It was determined from the demand/capacity analyses for the roadways and intersections that the current expansion plans for Airport Boulevard, the creation of a new State Highway (SH-35), and the extension of Monroe Road to an intersection with Beltway-8 will improve traffic now and in the future. However, the levels of service at the intersections of Airport Boulevard with Telephone Road, Monroe Road and Broadway Street are currently low and can be expected to deteriorate further without substantial improvements. The demand for public and employee parking is expected to exceed capacity during PAL 1. As a result, additional public and employee parking facilities would be required. Rental car facilities would also require additional area to meet demand generated by passenger growth. The terminal curbside will also need additional frontage on the arrivals and departures levels to meet demand associated with PAL 1 and beyond. Development of public transportation and rail by the Harris County Metropolitan Transit Authority (METRO) will be incorporated into access planning alternatives.

4.4 Aviation Support Facilities

Ancillary facilities needed to support the operation of the Airport include: general aviation/fixed base operators, cargo, airline maintenance, aircraft rescue and firefighting and aircraft fueling facilities. Each support facility is evaluated separately in the Master Plan to determine its adequacy for serving the existing and future demand associated with PAL 1, PAL 2, and PAL 3.

It was determined in the demand/capacity analyses for the aviation support facilities that most areas will need increased capacity to meet demand. Currently, the fixed base operators (FBOs) require additional capacity for hangar space, aircraft parking apron, office space, and car parking. Corporate and helicopter facilities would not need additional capacity until PAL 2. If growth continues, airline belly cargo and airline maintenance facilities would need to be expanded to service expected PAL 2 operations. ARFF facilities will not need any capacity increase to service the Airport through PAL 3 and current fueling facilities would meet expected demand until PAL 3.

5. Airport Facility Development Strategies

The facility development strategies were based on the facility requirements associated with the forecast demand, specifically the Connecting Scenario. The facility requirements identify the quantity and size of the various facility components necessary to serve demand throughout the planning period. The facility requirements are used to identify the appropriate timing of future facility development and define the funding levels and sources required to support that development. Detailed analyses of the Airport facility development strategies are provided in the Master Plan Technical Reports, Volume 2, Chapter 5.

5.1 Airfield Facility Development Strategy

Alternative facility development strategies identified based on the requirements were subjected to a two-step screening and evaluation process. Each alternative was evaluated to determine its ability to satisfy PAL 3 facility requirements and the potential effects of the proposed development. During the screening process, alternatives were either eliminated from further consideration or recommended for further evaluation. The remaining alternatives were then evaluated and compared to complete the selection process.

5.1.1 Airfield Facility Requirements

Identification of future airfield facility requirements was focused on airfield capacity enhancements, runway length requirements, and compatibility with design standards prescribed by the Federal Aviation Administration (FAA). Airfield capacity enhancements typically include additional runway development, but may also include improvements to runway exits or instrument approach/departure procedures. Similarly, adding runway length and/or improving airfield geometry would allow the airport to better serve larger aircraft with higher performance characteristics.

5.1.1.1 Airfield Capacity Enhancements

The FAA has generally recommended planning for additional airfield capacity when demand exceeds 60 percent of the airfield's annual service volume (ASV). The airfield demand capacity analysis showed that Hobby's airfield is at 105% of its calculated ASV and is expected to be at 140% at PAL 3. Therefore, planning for additional airfield capacity is required. To achieve airfield capacity that would adequately serve the PAL 3 demand levels, additional runways would be required.

5.1.1.2 Airfield Design Standards

Selection of the appropriate design standards for development of airfield facilities was based primarily on the characteristics of the aircraft likely to use the Airport on a regular basis. The B-757 are projected to represent approximately 8 percent of the air carrier aircraft fleet at PAL 3. Therefore, the airfield should be capable of accommodating this aircraft type without operational restrictions.

The approach category and the Aircraft Design Group (ADG) for the B-757-200/300 aircraft is C and IV, respectively; the Airport Reference Code (ARC) for the Airport is C-IV. The ARC has a direct correlation with the width of the runways and taxiways, as well as the width of the pavement shoulders. Runway and taxiway safety areas, object free areas, and minimum separations between parallel taxiways, taxilanes, and runways are also dependent on the ARC. The ARC incorporates characteristics of the design aircraft and provides consideration for aircraft approach category and ADG. In some cases, it may be practical to impose less stringent design standards than prescribed for ADG IV aircraft, while ensuring an adequate margin of safety for B-757 aircraft operations. However, the use of B-757-specific design criteria would restrict future use of the airfield by larger ADG aircraft. Therefore, the use of B-757-specific design criteria should be limited and only considered if future compliance with full ADG IV requirements is not anticipated. **Table 5-1** provides a comparison of the airfield design standards for ADG IV and B-757 specific components.

Table 5-1

Recommended FAA Minimum Airfield Design Standards for ARCs C-IV

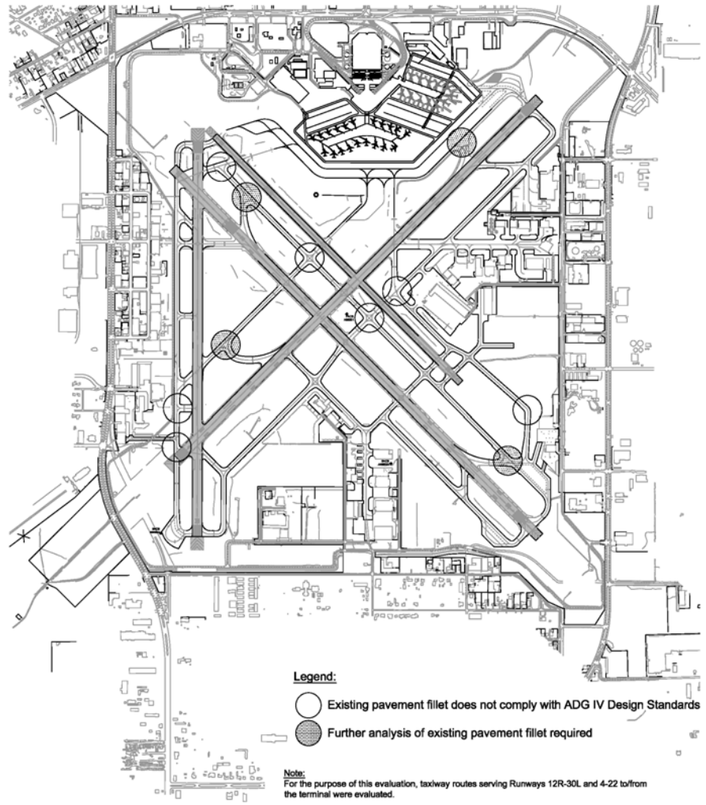
Design Element:	ARC C-IV (feet)	B-757 Specific (feet)
Runway Pavement Width	150.0	150.0
Runway Centerline to:		
Parallel Taxiway/Taxilane Centerline	400.0	312.5
Aircraft Parking Area	500.0	500.0
Runway Object Free Area (ROFA)		
Overall Width	800.0	800.0
Length Beyond Runway End	1,000.0	1,000.0
Taxiway Pavement Width	75.0	60.0
Taxiway Centerline Turning Radius	150.0	150.0
Taxiway Centerline to:		
Parallel Taxiway/Taxilane Centerline	215.0	160.0
Fixed or Movable Object	129.5	97.5
Taxiway OFA Width	259.0	196.0
Taxilane Centerline to:		
Parallel Taxilane Centerline	198.0	147.5
Fixed or Movable Object	112.5	85.0
Taxilane OFA Width	225.0	170.0

Source: FAA Advisory Circular 150/5300-13, Change 7, *Airport Design*.
Prepared by: Ricondo & Associates, Inc., November 2002.

In addition to the design criteria listed in Table 5-1, consideration should be given to the configuration of airfield pavements associated with taxiway/taxilane intersections, particularly the fillets associated with the taxiways. Many of the fillets for Taxiways A, B, C, D, E, H, and M do not meet the cockpit-over-centerline requirements necessary to serve ADG IV aircraft. **Exhibit 5-1** illustrates the taxiway intersections that do not meet these requirements. As shown, a total of seven intersections do not satisfy the pavement fillet requirements prescribed for ADG IV aircraft. In addition, four other angled taxiway exits are recommended for further analysis to determine if additional pavement fillet would be necessary. Due to their nonstandard centerline radii, these four angled taxiways require a detailed evaluation of the travel path of the aircraft's main landing gear as it travels through the intersection.

Exhibit 5-1

Taxiway Pavement Fillet Evaluation



Source: Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

5.1.1.3 Other Airfield Restrictions

In addition to the design criteria associated with the geometric configuration for runways, taxiways, and taxilanes, other restrictions need to be considered for airfield development. These include the establishment of building restriction lines, runway safety areas, and runway protection zones.

5.1.1.4 Runway Length / Obstruction Mitigation

To assess whether airlines serving the Airport could realize the full operational capabilities associated with new generation aircraft, an aircraft payload and range analysis was conducted. The goal of the analysis was to establish runway length requirements and/or develop obstruction mitigation plans, as necessary, to allow the new generation aircraft to serve all domestic markets within the continental United States. The takeoff performance characteristics and range capabilities of the B-737-700, B-757-200/300, and Canadair Regional Jet (CRJ-100ER) were considered for this analysis.

Although the existing runway length and/or obstructions limit the maximum takeoff weights for these three aircraft, departing Boeing 757-300 and Boeing 737-700 aircraft are able to reach all destinations within the continental United States when departing on either Runway 4-22 or 12R-30L. Departing CRJ-100ER aircraft can reach most of these destinations, except for a relatively small section of the northwest and northeast extremities of the continental United States. Therefore, it was determined that the existing 7,602-foot length of Runways 4-22 and 12R-30L are satisfactory to serve all destinations of the continental United States for all aircraft types expected to operate on a regular basis at the Airport.

5.1.2 Initial Airfield Development Alternatives

The primary objective of defining airfield development alternatives for the Airport was to achieve an airfield configuration that would adequately serve the aircraft operational demand forecast through the 20-year planning period, while minimizing the social, economic, community, and environmental impacts associated with its development and operation. A total of 13 initial airfield development alternatives were identified using an unconstrained approach. However, variations of many of the alternatives were also developed (such as varying the separation between runways), increasing the total number of alternatives to 43. Some of the alternatives were conservative, and would only require augmenting the existing airfield. Other alternatives were more aggressive, and would require the partial or total replacement of the existing airfield. These alternatives are described in their entirety in **Appendix D** of the Technical Reports.

An initial screening of the 43 potential airfield development alternatives was conducted to establish which alternatives should be further refined and evaluated in greater detail. A set of screening criteria was developed to provide a preliminary assessment of the overall merits of the alternatives in relation to each other. Screening criteria included: operational efficiency and effectiveness, constructibility and physical characteristics, relative development costs, and environmental and community impacts. Based on the initial screening, seven alternatives were selected for detailed refinement and further evaluation.

5.1.3 Evaluation of Short-Listed Airfield Alternatives

After further refinement of the short-listed alternatives, evaluations of the alternatives provided a secondary assessment of the future airfield and facility development patterns identified for the Airport. This evaluation process resulted in a quantitative assessment of the strengths and weaknesses of the short-listed alternatives, using measurable criteria.

None of the short-listed alternatives was determined to be adequate to serve the aircraft operational demand associated with PAL 3. Therefore, individual alternatives were combined into hybrid concepts that would increase capacity. Due to the resulting staggered thresholds associated with Runways 12R-30L and 12L-30R and the limited departure queuing capability for Runway 12R, however, three of the alternatives were not considered for the preferred hybrid alternative, and the no-build alternative was also not further evaluated. On that basis, hourly capacity and ASV estimates were developed for the possible hybrid concepts that would combine Alternatives 3C, 5A, and/or 7A-2. Refer to the Technical Reports, Volume 2, Chapter 5 for further details. **Table 5-2** summarizes these hourly capacity and ASV estimates.

Table 5-2 shows the combination of Alternative 5A with either Alternative 3C or 7A-2 would provide an ASV that is adequate to serve the annual demand levels associated with PAL 3. However, the development of Runway 4R-22L proposed under Alternative 5A would require relocation of the Raytheon and Southwest Airlines maintenance facilities, as well as all the existing east ramp tenant facilities. Therefore, it is least preferable to implement Alternative 5A in the near term. On that basis, the combination of Alternatives 3C and 7A-2 was selected as the preferred development alternative to be implemented in the near to mid-term (5-10 years). Although this hybrid alternative would improve the ASV of the airfield, the annual demand inherent in PAL 3 would still exceed the airfield's ASV. Therefore, construction of Runway 4R-22L as proposed under Alternative 5A, is recommended as the long-term (15-20 years) development alternative. This would not only ensure that the ASV exceeds annual demand beyond PAL 3, but it would delay the displacement of the existing Southwest Airlines maintenance hangar and east ramp tenant facilities.

5.1.4 Refinement of Selected Airfield Alternative

After the alternatives were combined and further refined, the preferred airfield development alternative was adjusted as follows:

- The proposed extension of Runway 17-35 to the south was reduced so that Almeda-Genoa Road could be preserved. Usable runway length would not be less than the current length of 6,000 feet, but is shown at approximately 6,500 feet. The decommissioning of the north end of the runway was also reduced to maximize the departure length available on Runway 17. However, to eliminate dependencies with Runway 12R-30L, the Runway 17 threshold would be displaced, requiring the use of declared distances on Runway 17-35.
- Redeveloped Runway 12L-30R would have an ultimate length of approximately 7,600 feet, consistent with that of existing Runway 12R-30L. It is anticipated that the new runway would primarily serve aircraft departures; therefore, no angled taxiway exits would be provided. A holding bay was added to serve as a staging area for aircraft queuing to depart on Runway 30R.
- To eliminate dependencies with Runway 17-35, the overall length proposed for future Runway 4R-22L was reduced to approximately 7,315 feet. Although it is anticipated that this runway would primarily serve aircraft arrivals during VFR conditions, the use of Runway 22L (west flow) would be limited. Therefore, angled runway exits are only proposed for landings on Runway 4R. The separation between the new runway and its parallel taxiways is not configured to allow for installation of a glide slope antenna. This configuration is acceptable, as existing Runway 4L-22R would remain the primary landing runway during IFR weather conditions because it is currently planned to be served by a Cat II/III instrument landing system (ILS).

Exhibit 5-2 illustrates the preferred airfield development alternative, a hybrid of Alternatives 3C, 5A, and 7A-2. It shows the proposed configuration of the new runway exit taxiways, as well as the reconfiguration of existing taxiways that would enhance airfield circulation. It also shows the existing airfield and tenant facilities that would be abandoned or demolished to accommodate the new airfield components. Other airfield improvements include reconfiguration of the entrance taxiways serving existing Runways 4L, 12R, and 12L to reduce the potential for runway incursions. Two additional crossfield taxiways would also be developed. One of the new taxiways would provide direct access to Runway 17 from the tenant facilities located on the south ramp. The other taxiway would reduce the taxiing distance to the terminal area from future Runway 4R.

Table 5-2

Comparative PAL 3 Runway Demand/Capacity Estimates – Combination of Preferred Airfield Development Concepts

	Current Utilization	Basis	Airfield Capacity: Existing	Alt 7A-2 + 3C	Alt 5A + 3C	Alt 5A + 7A-2	Alt 5A + 3A/C + 7A-2
VFR Hourly Capacity Estimates [1/]							
South Flow Configuration	60.2%	Ops/Hour	71	111	90	103	111
East Flow Configuration	22.6%	Ops/Hour	71	75	94	103	103
North Flow Configuration	3.6%	Ops/Hour	60	113	113	98	113
Sunday A.M. Flow Configuration	1.0%	Ops/Hour	60	66	69	69	69
VFR - West Flow Configuration	4.3%	Ops/Hour	53	53	88	88	88
VFR Peak Hour Demand Estimates [2/]							
Commercial (Air Carrier and Commuter/Regional)	N/A	Ops/Hour	49	49	49	49	49
General Aviation (Including Military)	N/A	Ops/Hour	26	26	26	26	26
Total VFR Peak Hour Demand Estimate	**N/A**	**Ops/Hour**	**75**	**75**	**75**	**75**	**75**
IFR Hourly Capacity Estimates [1/]							
South Flow Configuration	3.8%	Ops/Hour	56	58	57	57	58
East Flow Configuration	2.7%	Ops/Hour	57	57	58	58	58
North Flow Configuration	0.2%	Ops/Hour	49	58	58	49	58
Sunday A.M. Flow Configuration	0.1%	Ops/Hour	57	61	57	61	61
West Flow Configuration	0.2%	Ops/Hour	47	47	53	53	53
IFR Peak Hour Demand Estimates [2/]							
Commercial (Air Carrier and Commuter/Regional)	N/A	Ops/Hour	49	49	49	49	49
General Aviation (Including Military)	N/A	Ops/Hour	17	17	17	17	17
Total IFR Peak Hour Demand Estimate	**N/A**	**Ops/Hour**	**66**	**66**	**66**	**66**	**66**
Annual Service Volume (ASV) [1/]	**N/A**	**Annual Operations**	**235,449**	**310,488**	**329,914 [3/]**	**343,723**	**353,559**
Annual Demand at PAL 3	**N/A**	**Annual Operations**	**329,612**	**329,612**	**329,612**	**329,612**	**329,612**

Notes:

1/ Based on 50 percent arrivals (hourly capacity estimates for HOU are reduced approximately 10-15 percent during peak arrival conditions). Shading indicates hourly capacities and /or ASV levels that would be exceeded during peak demand periods.

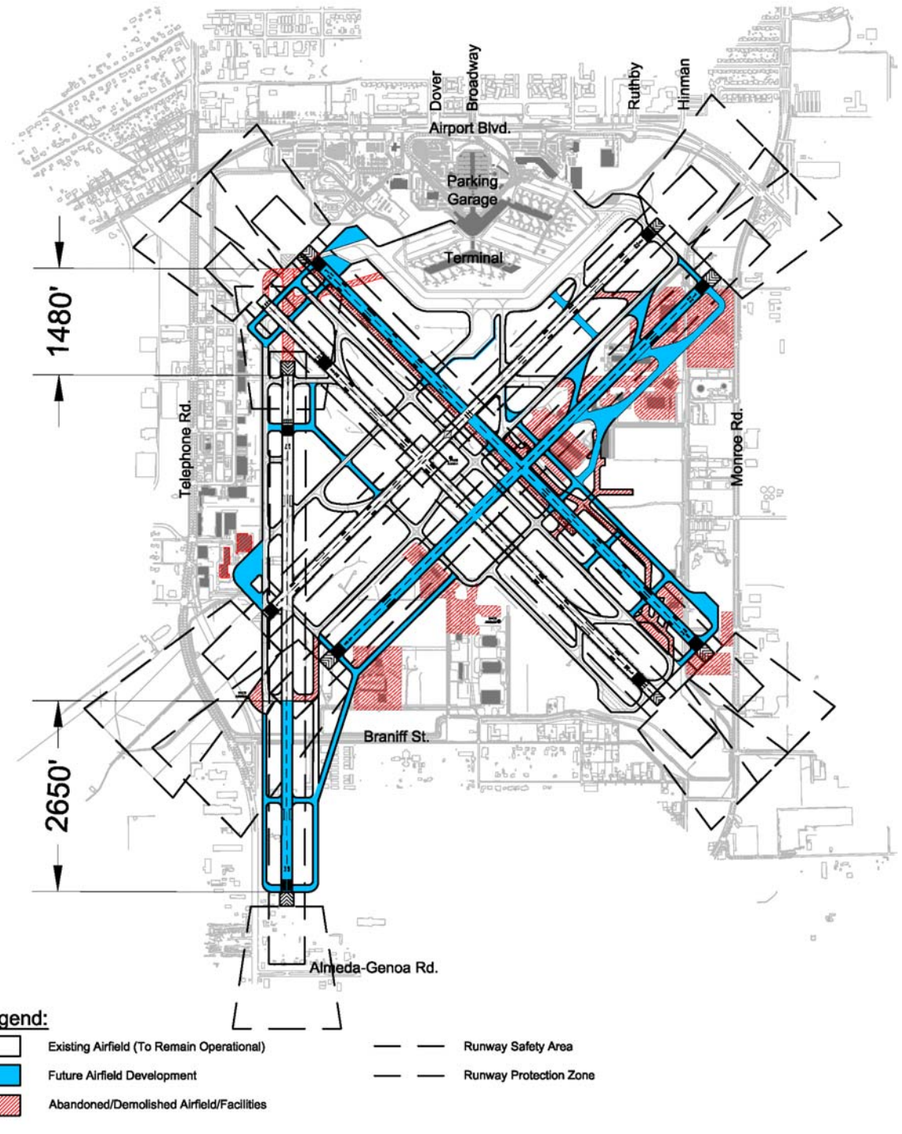
2/ Assuming that the peak hourly operations occur during the peak hour for commercial operations (air carriers and commuters). During that period, it was assumed that general aviation operational demand would average 66 percent and 44 percent of its peak hour demand during VFR and IFR conditions, respectively.

3/ In determining weighted capacity for Alternatives 5A + 3C, it was assumed that east flow configuration would be preferred during peak demand periods.

Source: Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

Exhibit 5-2

Preferred Airfield Development – Alternatives 3C, 5A, and 7A-2



Source: Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

5.2 Terminal Facility Development Strategy

The overall goal of the terminal facility development strategy is to provide for terminal expansion needs in the 20-year planning horizon with a strategy that is complementary to the current terminal reconstruction project, and that successfully synthesizes facility form and function.

5.2.1 Terminal Facility Requirements

The demand/capacity assessment determined that the existing terminal gates, in terms of quantity and type, are adequate to serve the peak-hour demand through PAL 2. However, at the end of PAL 3, the peak-hour gate demand associated with the Average Day Peak-Month (ADPM) is expected to exceed the number of existing gates.

A design schedule was developed based on actual flight schedule information from July 31, 2001. This date was selected to represent a typical day from the peak month prior to the events on September 11, 2001. From that schedule, design day schedules were developed for PAL 1, PAL 2, PAL 3, SL 1, and SL 2 by adding new flights throughout the design day consistent with the forecast increases in aircraft operational demand. **Table 5-3** summarizes the major airline and regional/commuter airline share of aircraft departures and gate occupancy times that were scheduled on July 31, 2001. The table also presents the flights that were added to develop the design day schedules for PAL, 1 PAL 2, PAL 3, SL 1, and SL 2. The resulting design day schedules are presented in **Appendix F** of the Master Plan Technical Reports.

The design day schedules were converted into a ramp chart using a gate-scheduling model. The model assigns each air carrier aircraft to a specific gate according to logic specified by the user.

The ramp chart analysis confirmed that the 36 gates associated with the new terminal would be adequate through PAL 2. At the end of PAL 3, however, three additional gates would be required, all of which would be for domestic operations. This would increase the total gate requirement to 39 gates.

Table 5-3

Average Day Peak Month (ADPM) Commercial Activity

	July 31, 2001 Scheduled Departures	Percent of Total Activity	Additional Flights Relative to July 31, 2001[1/] PAL 1 [a] Departures	PAL 2 [a] Departures	PAL 3 [a] Departures	SL 1 Departures	SL 2 Departures
Air Carrier[2/]							
AirTran Airways	7	4.1%	1	2	4	3	6
American Airlines	9	5.3%	2	4	5	4	7
Delta Air Lines	4	2.3%	1	2	3	2	3
Southwest Airlines	151	88.3%	31	60	90	64	105
International Carriers	-	-	0	0	0	6	8
New Entrant Carriers	-	-	0	0	0	2	8
Total	171	100.0%					
Incremental Flights			35	68	102	81	137
Commuter/Regionals[2/]							
American Eagle	13	50.0%	2	2	3	4	11
Continental Express/Others/New Entrants	4	15.4%	0	1	1	2	3
Delta Express/Atlantic Southeast Airlines	3	11.5%	0	0	1	1	3
Comair	6	23.1%	1	1	1	2	5
Total	26	100.0%					
Incremental Flights			3	4	6	9	22

Notes:

1/ PAL 1, 2, and 3 represent the activity associated with the Connecting Scenario at 2007, 2012, and 2022, respectively. SL 1 and 2 represent the activity associated with the Accelerated Growth Scenario at 2012 and 2022, respectively.

2/ Allocation of flights by carrier is based on the market shares shown for July 31, 2001.

Sources: Official Airline Guide; Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

5.2.2 Terminal Facility Alternatives

A total of 18 terminal area expansion concepts were considered, ranging from basic additions to complex reconfigurations. These initial concepts were created to explore a variety of design configurations on the site, and were not necessarily developed to meet PAL 3 requirements. Each concept was documented and evaluated to ensure a thorough assessment of all plausible opportunities before determining a recommended concept. The location of Airport parking was also explored, from splitting the parking garage into two equal sections to a total relocation of parking, which would involve bus or rail service to and from the terminal.

Each concept alternative was assessed based on a list of criteria extruded from the designated goals identified at the outset of the master planning process. **Exhibit 5-3** depicts the alternative concepts along with the evaluation criteria.

Based on this analysis, the terminal area concept recommended is Alternative F, which, by far, had the highest evaluation score. Reflecting the East Concourse across the terminal to create the West Concourse combines the rationality and functionality of the existing design. Under this concept, the building face of Level 2 would be moved out to align with the Level 1 building face, resulting in an enlarged area for the main ticket lobby, with more room for circulation, concessions, and security checkpoint expansion. Enlargement of the Level 2 lobby would also require relocating the enplaning curbfront further north, lengthening the curbside entrance of Level 2 and providing the frontage necessary to meet PAL 3 demands. The curbfront alternatives are discussed in greater detail in Section 5.3.3.

Another fundamental characteristic of this recommended alternative is alteration of the parking structure. Two symmetrical structures would replace the existing central garage. The two new parking structures would provide more than three times the number of on-Airport parking spaces as the old garage and would be located far enough from the terminal to comply with TSA's current "300 foot rule". The existing VOR would be preserved within the central courtyard, and could be used as a landmark for the Airport.

Implementation of this alternative would affect existing facilities at the Airport. Expansion of the terminal in the planned areas would require the relocation of several rental car companies (Alamo/National, Avis, and Budget), and the commercial vehicle staging area. The relocation of these services and facilities will need to be addressed in future development plans or in further studies for the terminal area and parking facilities.

The preferred alternative does not interfere with the existing Airport traffic control tower's line of sight, allowing tower personnel to observe all aircraft movement on runways, taxiways, and aprons.

Exhibit 5-3 (1 of 2)
Alternatives Matrix

Alternative Layouts		 A		 B		 C		 D		 E		 F		 G		 H		 I		 J	
Evaluation Criteria	**Weight**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**	**Value**	**Score**
Operating Efficiency	10	7	70	7	70	7	70	5	50	6	60	9	90	7	70	8	80	7	70	4	40
Constructibility and Phasing	8	8	64	7	56	7	56	6	48	7	56	8	64	7	56	7	56	7	56	9	72
Impact-Quality of Experience	7	4	28	6	42	7	49	4	28	6	42	7	49	7	49	8	56	8	56	4	28
Area of Influence Cost Benefit	3	7	21	8	24	6	18	7	21	6	18	9	27	8	24	7	21	7	21	3	9
Flexibility, Convertibility, Expandability	8	9	72	7	56	5	40	4	32	8	64	8	64	7	56	6	48	4	32	6	48
Efficient Passenger Processing	9	2	18	7	63	7	63	4	36	5	45	8	72	6	54	7	63	8	72	3	27
Image	7	3	21	4	28	5	35	4	28	4	28	8	56	5	35	1	7	8	56	5	35
Positive Effect on Hot Numbers	6	3	18	3	18	3	18	3	18	3	18	3	18	3	18	3	18	3	18	3	18
Accommodating SL2 Demand	7	2	14	2	14	6	42	8	56	8	56	8	56	7	49	8	56	8	56	8	56
Accommodating Demand Beyond SL2	5	0	0	0	0	0	0	7	35	3	15	2	10	2	10	7	35	8	40	3	15
Affordability	7	9	63	8	56	6	42	7	49	6	42	8	56	6	42	6	42	6	42	4	28
Total			**389**		**427**		**433**		**401**		**444**		**562**		**463**		**482**		**519**		**376**

Source: Llewelyn-Davies Sahni, Inc.
Prepared by: Llewelyn-Davies Sahni, Inc., August 2002

Exhibit 5-3 (2 of 2)
Alternatives Matrix

Alternative Layouts

Evaluation Criteria	Weight	K Value	K Score	L Value	L Score	M Value	M Score	N Value	N Score	O Value	O Score
Operating Efficiency	10	3	30	4	40	4	40	4	40	4	40
Constructibility and Phasing	8	9	72	3	24	8	64	8	64	8	64
Impact-Quality of Experience	7	5	35	5	35	3	21	3	21	3	21
Area of Influence Cost Benefit	3	2	6	3	9	3	9	4	12	4	12
Flexibility, Convertibility, Expandability	8	3	24	4	32	7	56	7	56	7	56
Efficient Passenger Processing	9	3	27	4	36	4	36	5	45	4	36
Image	7	5	35	7	49	3	21	4	28	5	35
Positive Effect on Hot Numbers	6	3	18	5	30	7	42	7	42	5	30
Accommodating SL2 Demand	7	8	56	8	56	8	56	8	56	8	56
Accommodating Demand Beyond SL2	5	8	40	8	40	6	30	4	20	6	30
Affordability	7	2	14	1	7	4	28	4	28	4	28
Total			**357**		**358**		**403**		**412**		**408**

Source: Llewelyn-Davies Sahni, Inc.
Prepared by: Llewelyn-Davies Sahni, Inc., August 2002

5.3 Airport Access and Parking Facility Development Strategy

This section responds to the demands and capacity requirements set forth in Section 4.3, identifying alternatives for the various access and parking facilities that meet or exceed capacity requirements. In addition, the following goals were determined for the Airport:

- Need to accommodate airfield and terminal facility changes
- Desire to improve the image of the Airport and its environs, as discussed in the *Airport Environs Image Plan*[1] (the Image Plan).
- Desire to improve signage to the Airport

Numerous alternatives were developed and critiqued for roadways and intersections, parking facilities, terminal curbs, rental car facilities, commercial vehicle staging areas, and public transportation. The alternatives for each were evaluated based on the same criteria and given an evaluation score. The alternative with the highest score was chosen as the preferred alternative for that functional segment, as set forth in the remainder of this section. Refer to the Technical Reports, Volume 2, Section 5.3 for further details on the Airport Access and Parking Facility Development Strategy.

5.3.1 Roadways and Intersections

The roadways serving the Airport have sufficient link capacity through PAL 3. However, intersection demands will exceed the capacity of the existing intersections. The intersection of Airport Boulevard and Telephone Road currently operates at level-of-service (LOS) D. Additional capacity will be required to sustain the anticipated growth. The future requirements for intersection and roadway facilities should be LOS C or above during the peak period.

5.3.1.1 Preferred Access Alternative

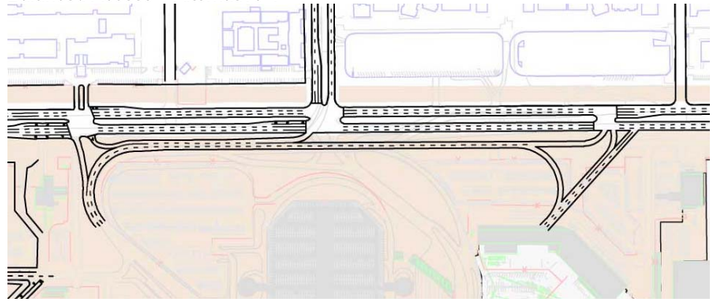
Evaluation criteria were established to determine which access alternative is most suitable for the Airport. The alternatives were evaluated based on their compatibility with the Image Plan, cost, access enhancement, wayfinding, traffic impacts, and flexibility, and Alternative 4 was selected as the preferred alternative.

Alternative 4 – Balanced Access

After Alternatives 1 through 3 were evaluated, a fourth alternative was developed that blended the best features from each. Alternative 4 (**Exhibit 5-4**) allows Broadway Street to function as a ceremonial entrance, while providing adequate connectivity to both the east and west on Airport Boulevard. Three intersections are used to provide capacity and distribute demand, while allowing direct entrance from each direction. The intersections at the corners of the terminal area provide access to enter and exit the Airport, while the intersection of Broadway Street and Airport Boulevard only allows entrance from Broadway and no exits.

Exhibit 5-4

Balanced Access – Alternative 4



Source: Kimley-Horn and Associates, Inc.
Prepared by: Kimley-Horn and Associates, Inc.

5.3.1.2 Telephone Road/Airport Boulevard Intersection

The current intersection of Telephone Road and Airport Boulevard will be unable to accommodate expected traffic growth. Two alternatives were evaluated to provide the required capacity. Alternative 2 was identified as the preferred alternative.

Alternative 2 – Reopening of Fauna Street

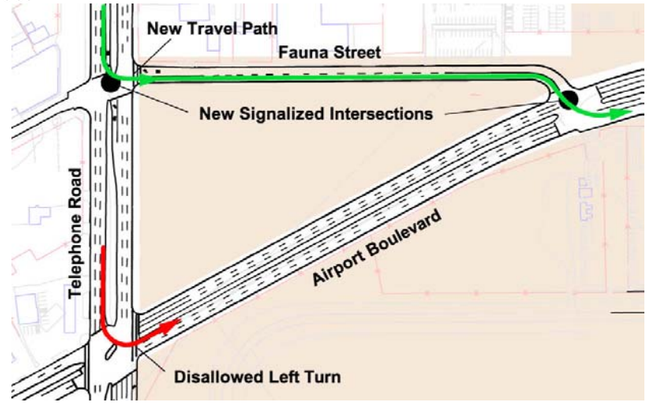
Fauna Street is a short east-west roadway that connects Airport Boulevard with Telephone Road, forming a triangle, as shown in **Exhibit 5-5.** Formerly, Fauna Street was bidirectional but now left turns from southbound Telephone Road to eastbound Fauna Street are prohibited. In effect, Fauna Street currently operates as a one-way road that provides a shortcut for traffic turning right from westbound Airport Boulevard to northbound Telephone Road. Fauna Street has the potential to provide increased operational efficiency at the Telephone Road/Airport Boulevard intersection.

Alternative 2 would prohibit southbound left turns from Telephone Road to eastbound Airport Boulevard. Instead, left turns would occur at Fauna Street and traffic would continue eastbound to Airport Boulevard. Fauna Street would still function bidirectionally, with traffic turning right from Airport Boulevard traveling to northbound Telephone Road. New traffic signals would be recommended at the intersections of Fauna Street with Telephone Road and also Airport Boulevard.

Removing southbound left turns at the intersection of Telephone Road and Airport Boulevard would allow the intersection to more efficiently accommodate other movements.

Exhibit 5-5

Telephone Road at Airport Boulevard, Alternative 2 – Reopening of Fauna Street



Source: Kimley-Horn and Associates, Inc.
Prepared by: Kimley-Horn and Associates, Inc.

5.3.2 Parking Facilities

Public and employee parking requirements and parking facility alternatives are discussed below.

5.3.2.1 Public Parking Facility Requirements

Estimated requirements for public parking are shown in **Table 5-4.** By PAL 3, it is estimated that a total of 6,110 spaces will be required to accommodate on-Airport parking demand. The total PAL 3 demand, including off-Airport parking, is estimated to be 12,820 spaces. Public parking requirements were calculated by increasing parking demands by an additional 10% to allow passengers to locate an available parking space during peak periods.

[1] The *Airport Environs Image Plan* is a separate companion volume to the Master Plan, written in conjunction with the Master Plan for the Houston Airport System.

Table 5-4

Public Parking Requirements (spaces)

Public Parking	Existing (2001)	PAL 1	PAL 2	PAL 3
On-Airport				
Garage	3,330	3,680	4,250	4,740
Economy lot	540	600	690	1,370
Subtotal	3,870	4,280	4,940	6,110
Off-Airport	5,240	5,660	6,540	6,710
Total	9,110	9,940	11,480	12,820

Source: Ricondo and Associates, Inc.
Prepared by: Ricondo and Associates, Inc.

5.3.2.2 Employee Parking Requirements

Estimated employee parking requirements are shown in **Table 5-5**. By PAL 3, it is estimated that approximately 3,280 parking spaces will be required to accommodate the employee demand and that all employee parking will be accommodated on-Airport. These requirements are based on the demands and growth rate assumptions discussed in Chapter 4. Evaluation of the alternatives was based on a set of criteria important to the Master Plan objectives. Criteria for evaluation were as follows: security, cost, and accessibility.

Table 5-5

Employee Parking Requirements (spaces)

Employee Parking	Existing (2001)	PAL 1	PAL 2	PAL 3
On-Airport	690	2,470	2,890	3,280
Off-Airport TSA	180	0	0	0
Off-Airport non-TSA	1,290	0	0	0
Total	2,160	2,470	2,890	3,280

Source: Ricondo and Associates, Inc.
Prepared by: Ricondo and Associates, Inc.

5.3.2.3 Parking Facility Alternatives

A number of alternatives for accommodating public and employee parking were considered and evaluated. Based on the public and employee parking requirements presented above, it was determined that all on-Airport parking could not be provided in the terminal area and that additional remote parking area(s) will be required. Therefore, alternatives for terminal area public parking, remote public parking, and employee parking were individually assessed. Selection of the preferred close-in premium parking facility was based on a comparative analysis similar to that used for the roadway alternatives. Evaluation criteria included compatibility with the Image Plan, cost, internal circulation, and pedestrian convenience.

Terminal Area Public Parking – Preferred Alternative

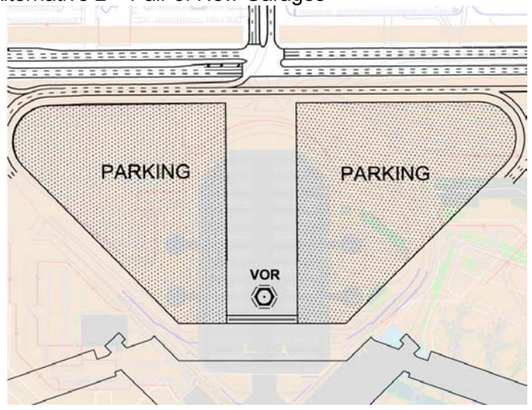
Alternative 2 was selected as the preferred alternative for public parking in the terminal area.

Alternative 2 – Pair of New Garages

The existing garage structure would be demolished, but the VOR would remain as a freestanding structure. An underlying assumption of the Master Plan was that retaining the existing VOR as a freestanding structure is feasible, but should be confirmed through separate structural analyses. Each garage is limited in height to approximately that of the existing garage due to clearance requirements of the VOR. Some increase in height, possibly up to 10 feet, would be necessary to eliminate vehicle height restrictions by increasing plate height. Preliminary design of new garage structures should include a reflection study for the VOR to verify that garage heights and configurations will not create VOR interference. This configuration is illustrated in **Exhibit 5-6**.

Exhibit 5-6

Parking Alternative 2 – Pair of New Garages



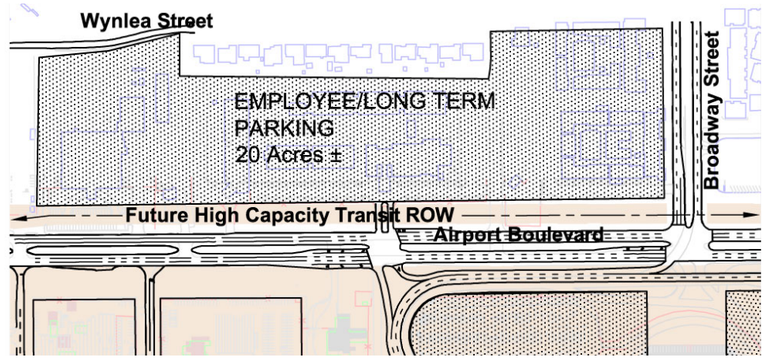
Source: Kimley-Horn and Associates, Inc.
Prepared by: Kimley-Horn and Associates, Inc.

Remote Public Parking - Preferred Alternative

Two locations were identified and analyzed for possible HAS supplied remote long-term parking. Alternative 1, shown in **Exhibit 5-7,** provides parking north of Airport Boulevard, directly across the street from the Airport terminal area. Alternative 2 provides parking off Monroe Road, on the expanded Airport property in a location compatible with the Aviation Support Facility Development Strategy. The selection of Alternative 1 as the preferred location for remote long-term parking was based on a similar comparative analysis as used for the premium close-in parking area. The evaluation criteria for the remote long-term parking were Image Plan compatibility, cost, and accessibility/wayfinding.

Exhibit 5-7

Alternative 1, Remote Parking North of Airport Boulevard



Source: Kimley-Horn and Associates, Inc.
Prepared by: Kimley-Horn and Associates, Inc.

Alternative 1—North of Airport Boulevard

The area north of Airport Boulevard is a desirable parking location because of its proximity to the terminal area. It is anticipated that wayfinding would be simple from all approach directions. In addition, the travel time from the parking area to the terminal would be minimal compared with other potential locations. Accessibility to public transportation is also a benefit to this site, especially if METRO's plan for increased service to this location is approved and implemented.

Employee Parking – Preferred Alternative

As discussed previously, it is desired to replace the existing on-Airport employee parking lots with a remotely located consolidated employee parking area that would accommodate security screening for employees. Furthermore, it is also desired to accommodate employees who currently park in privately operated lots within the consolidated employee parking and screening area. Alternative 4 was selected as the preferred alternative.

Alternative 4 – North of Airport Boulevard

This location is across Airport Boulevard from the terminal area, co-located with the proposed long-term parking area. This area is advantageous because of its proximity to the terminal area, where most

employees work. Employee shuttles could use public roadways. This location would require the shortest travel distance with only one signalized intersection.

5.3.3 Terminal Curbs

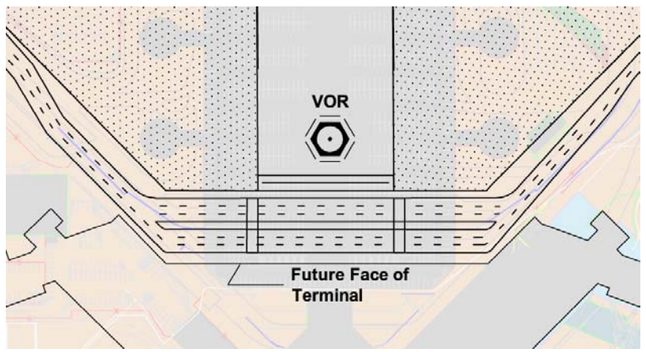
It was recommended in the terminal facility development strategy that the ticketing level be expanded to provide increased lobby space. To accommodate this expansion, the upper level face of the terminal would be expanded outward to be even with the lower level terminal face. The upper level curbfront would be relocated and expanded, requiring removal of a portion of the existing parking garage.

Removal of the parking garage would provide an opportunity to reconfigure the lower level curbfronts, since the structural support columns for the garage could be removed. The upper level curbfronts would be supported by a new structure that could be designed to accommodate the reconfigured lower level. The arrivals level requires more than twice the curb space of the departures level. If the arrivals level capacity requirement could be satisfied, there should be sufficient capacity on the departures level.

The curbfront configuration should be refined when and if the garage is removed or modified. **Exhibit 5-8** shows a concept that would provide sufficient curbside capacity at PAL 3. The concept demonstrates that sufficient capacity is available without affecting the VOR, which is an HAS requirement for the Master Plan. The upper level curbfront would have sufficient capacity with a similar layout.

Exhibit 5-8

Arrivals (Lower Level) Curbfront Concept



Source: Kimley-Horn and Associates, Inc.
Prepared by: Kimley-Horn and Associates, Inc.

5.3.4 Rental Car Facilities

Terminal area rental car terminal facilities consist of in-terminal customer counters and curb space for shuttle bus operations. The in-terminal customer counter requirements and alternatives are described in the terminal facility development strategy.

5.3.4.1 Rental Car Facility Requirements

In addition to the terminal area facilities, on-Airport rental car companies occupy approximately 11 acres on the west side of the Airport for vehicle ready/return spaces, quick turnaround (QTA), and vehicle storage, among other uses. Additional rental car companies are located off-Airport to the east in the Monroe Road area. However, by PAL 3 it is anticipated that terminal and airfield expansion will require the relocation of on-Airport and some off-Airport rental car companies.

5.3.4.2 Rental Car Facility Alternatives

Evaluation of the alternatives was based on a set of criteria important to the Master Plan objectives. These criteria include: Image Plan compatibility, cost, access enhancement, simple way finding, traffic operations, air quality, and flexibility. Alternative 3 was selected as the preferred alternative.

Alternative 3—Terminal Garage

This alternative consists of rental car ready and return spaces provided on one level (e.g., Level 2) of the east parking garage. QTA facilities would be provided on the ground level of the garage and on an adjacent surface area external to the garage.

Alternative 3 is recommended because it provides the highest level of convenience for the rental car customers, reduces curbside congestion due to the elimination of shuttle buses, and improves wayfinding. Furthermore, it is anticipated that the proposed phasing of the terminal area parking and rental car facility development could minimize the effect on close-in premium space requirements.

Further studies on how and when to implement Alternative 3 are warranted before a final recommendation is made. Alternative 2, locating facilities on Monroe Road made available for Airport-related purposes, is recommended as a lower cost, higher flexibility, interim solution.

5.3.5 Commercial Vehicle Staging Areas

Commercial vehicle staging area requirements analysis showed that this area should nearly double in size to approximately 1.3 acres at PAL 3. Staging areas should be sited close to the terminal curbfronts. The current commercial vehicle staging area is northwest of the terminal and south of the fire station, properly sited for convenient access to the terminal curbfronts. It could likely be expanded to accommodate up to PAL 2 requirements in its current location. However, when the ramp is expanded to accommodate airfield growth, the commercial vehicle staging area would be displaced.

The tenant space plan allocates sufficient space south of Airport Boulevard to accommodate commercial vehicle staging near the proposed cargo area. This area is next to the existing location for commercial vehicle staging. Depending on airfield configuration, a dedicated lane into the Airport could be possible. This location is preferred for operational reasons.

5.3.6 Public Transportation

The Master Plan was developed for the ground transportation system with specific attention on integrating passenger station interfaces for a future high-capacity mass transit access mode at the Airport. The alternatives studied have focused on accommodating the METRO Southeast-Universities-Hobby Planning Study (SUHPS), a corridor study developing conceptual alignments for advanced high-capacity transit to the Airport area. The SUHPS is part of the METRO MOBILITY 2025 initiative. At this time, the SUHPS has not determined the preferred alternative for the transit alignment into the Airport area or the transit technology. However, all SUHPS alternatives would run along the north side of Airport Boulevard, crossing the intersection of Broadway Street and Airport Boulevard to travel eastward toward I-45.

There is not currently a requirement for a METRO advanced high-capacity transit station to be located at the Airport, or in the terminal area. However, advanced high-capacity transit can provide a fast, efficient and economical way for passengers and employees to travel to the Airport. High-capacity transit can also help reduce car trips and thus help limit the degradation of air quality. Therefore, alternatives were assessed for terminal access by METRO passengers, should high-capacity mass transit be deemed viable for the corridor as part of the SUHPS.

5.3.6.1 Mass Transit Requirements

The mass transit demand and capacity assessment reached several conclusions. The following were recommended:

- Continued allocation of space on the curbfront to preserve existing METRO bus service
- Provision of space for the FTA-approved METRO transit center. This transit center should be co-located with the METRO advanced high-capacity transit station to provide maximum regional connectivity, but should not be on the terminal curbfront.

- Provision of space for a METRO station near the employee checkpoint. Many of the riders will be employees; therefore, having the station in close proximity to employee parking and the employee screening checkpoint will enhance service for employees.

Interpretation of these requirements and the assessment of alternatives is affected by the assumptions about the type of high-capacity transit technology to be used. For a general baseline, it was assumed that the technology will be light rail transit (LRT), which METRO is currently deploying on the Main Street Line.

5.3.6.2 Mass Transit Alternatives

While this Master Plan recommends that METRO bus service continue to be accommodated at the curbfront, locations for the planned bus transfer station and the future high-capacity transit station must also be considered. Transit station development would begin with the bus transfer station proposed by METRO to be in place by 2005. The future SUHPS station could be co-located with the bus transfer station.

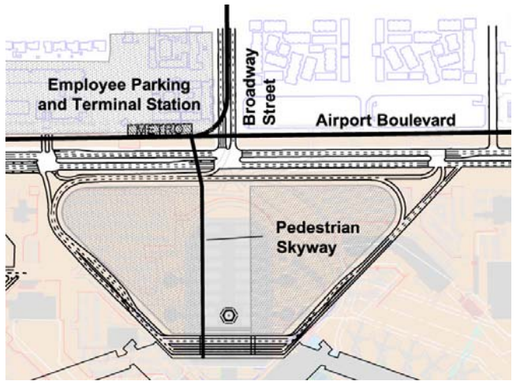
The evaluation of alternatives was based on a set of criteria important to the Master Plan's objectives. The evaluation criteria were: Image Plan compatibility, cost, complexity, level of service for employees, and traffic impacts. The results of this comparative analysis have led to the selection of Alternative 3, with a single Airport mass transit station located north of Airport Boulevard, as the preferred alternative.

Alternative 3 – Single Airport Station at Airport Boulevard and Broadway Street

Alternative 3 places the mass transit interface at a single station for both air passengers and Airport employees. **Exhibit 5-9** shows the station location north of Airport Boulevard in close proximity to the proposed employee/remote parking lot. The precise station location would depend on the SUHPS preferred alternative. As shown, the Broadway Street alignment would continue on Airport Boulevard after a pinched loop stop at the Airport station. An Airport Boulevard alignment would require a normal stop at the Airport station.

Exhibit 5-9

Mass Transit Alternative 3 – Conceptual Guideway Alignment



Source: Kimley-Horn and Associates, Inc.
Prepared by: Kimley-Horn and Associates, Inc.

Alternative 3 ranks first as the preferred alternative. However, it is recommended that both Alternative 3 and Alternative 2 be preserved as optional mass transit guideway alignment and station locations within the overall Airport ground transportation system.

Refer to the Technical Reports, Volume 2, Section 5.3 for further details on the Airport Access and Parking Facility Development Strategy.

5.4 Aviation Support Facility Development Strategy

A general land use planning approach was used to identify facility development strategies for the various aviation support facilities. In lieu of developing detailed site planning for these facilities, various tracts of Airport property were identified for each specific land use. This approach allows for identification of aviation support facility needs, and the ability of the Airport to accommodate these facilities given the airfield, terminal, and ground/regional access development strategies identified earlier. Actual development of aviation support facilities is typically based on the individual needs and operational requirements of the tenants.

The land use strategies presented herein are based on gross facility requirements for individual aviation support facility types, including: GA/FBO, cargo, airline maintenance, aircraft rescue and firefighting (ARFF), and aircraft fueling facilities. Using the gross facility requirements, three initial land use strategies were developed that would be capable of accommodating the demand associated with both PAL 3 and SL 2. These strategies would ensure that the Airport property envelope would be adequate to serve all demand associated with both the Connecting and Accelerated Growth scenarios. The three land use plans were evaluated and a preferred land use strategy was selected for inclusion in the subsequent development of the Airport Development Plan (ADP).

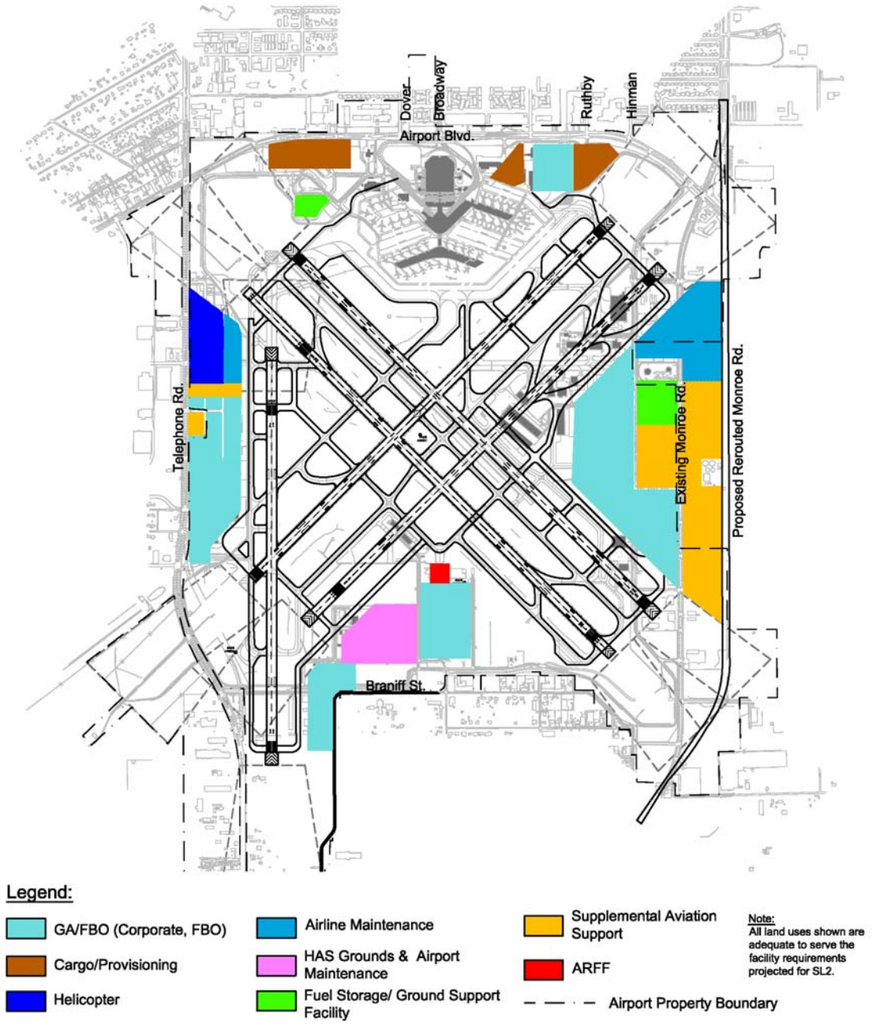
5.4.1 Aviation Support Facility Requirements

Although conceptual site plans are not being developed for aviation support facilities, detailed facility requirements were derived for the individual facility components that were evaluated during the demand/capacity assessment. Additional consideration was given for "other grounds" to account for landscaped areas associated with the aviation support facilities. Total requirements were assessed to determine whether adequate area would be available to accommodate tenant needs through PAL 3. To assess the ability of the facilities to accommodate demand in excess of the PALs, the facility requirements for SL 1 and SL 2 are also presented.

5.4.2 Preferred Land Use Plan

The preferred land use plan consists of a hybrid of the three land use strategies. (For a detailed description of each alternative, refer to Section 5.4 of the Technical Reports.) The selection of this plan was identified in consultation with HAS staff and subsequently approved by the Oversight Committee. **Exhibit 5-10** illustrates the preferred land use plan. The land uses shown coincide with the SL 2 facility requirements

Exhibit 5-10
Land Use Development Plan, Preferred Alternative



Source: Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

associated with the aviation support facilities. The remaining Airport property was maximized to support supplemental aviation support facilities. For the purposes of this discussion, the land uses in the preferred land use plan were separated according to their locations relative to the airfield. **Table 5-6** depicts existing land uses by category and the future requirements by activity level, as well as the acreage in the preferred land use alternative.

5.4.3 Aviation Support Facility Development Summary

The preferred land use is created through a general land use policy to guide HAS development, relocation, and redevelopment decisions at the Airport as the Master Plan is implemented over a period of years. According to the demand/capacity analysis, the GA/FBO facilities will need to be expanded before PAL 1, belly cargo will require expanded facilities to meet the PAL 3 forecast, and ARFF facilities can meet demand until PAL 3, but a 50% increase in facilities is suggested. Fuel facilities will need to be expanded prior to PAL 2, and maintenance facilities will need to be enlarged prior to PAL 2.

Table 5-6

Compatible Land Use Areas

	Development and Planning Phase (in acres)			
Land Use Category	Current	PAL 3	Preferred Alternative	SL 2
GA/FBO (Corporate, FBO)	61.9	98.6	140.3	127.7
Cargo/Provisioning	5.5	7.4	22.7	8.1
Helicopter	4.3	4.6	14.7	5.2
Airline Maintenance	17.2	23.6	34.8	55.0
HAS Grounds and Airport Maintenance	25.0	37.5	20.3	37.5
Fuel Storage/Ground Support Facilities	6.1	10.1	12.2	12.2
Supplemental Aviation Support	0.0	0.0	64.0	0.0
ARFF	1.3	1.3	2.1	1.3
Total	121.4	183.1	311.1	246.9

Source: Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

6. Airport Development Plan

The purposes this chapter are to refine the recommended facility development strategies, define individual projects necessary to meet future demand, and discuss general development initiatives and development plans that are outside the jurisdiction of the HAS to implement in the future, but that are nonetheless critical for ensuring that the Airport and its environs are positively affected by implementation of the Master Plan projects. The combination of the Airport Master Plan with these other plans will collectively be referred to as the Airport Development Plan, or ADP.

6.1 Primary Airport Development Plan Initiatives

The ADP is essentially a composite of the four recommended facility development strategies (airfield, terminal, ground access, and tenant/land use). However, in the process of consolidating the four facility development strategies into the Master Plan, many of the development projects were refined to ensure that each of the facility development strategies formed a compatible development plan, and maximized land-use efficiency, while preserving flexible expansion options.

6.2 Airport Development Plan Projects

The ADP provides a number of major Airport development initiatives. Each initiative includes a variety of specific projects that must be carefully coordinated and planned to ensure that operational effects are minimized throughout implementation. The development program for the Airport is divided into four categories; airfield, terminal area, ground access, and tenant/land use. The major initiatives are grouped into the corresponding category below, generally in chronological order. In addition, a land acquisition program would be needed to support all of the individual facility development strategies and is described in a section separate from of the four development categories.

6.2.1 Airfield

Airfield initiatives and improvements included in the ADP are as follows:

- Drainage Master Plan
- Taxiway H extension
- Category II/III ILS Installation
- Taxiway Improvements
- Runway 12R-30L Obstruction Clearing and Threshold Relocation
- Northwest Airfield Reconfiguration
- Runway 17-35 Relocation/Extension
- Taxiway J Construction
- Helipad Development
- Runway 12L-30R Upgrade
- Runway 12L-30R Obstruction Clearing and Threshold Relocation
- Future Runway 4R-22L Construction

Prior to the relocation/extension of Runway 17-35 and the upgrade of Runway 12L-30R, an Environmental Assessment (EA) should be conducted to assess the potential impacts of all near-term projects. Also, before initiating the construction of Runway 4R-22L, another environmental study, either an EA or an environmental impact statement (EIS), should be completed to determine the environmental implications the additional runway would have on the Airport and surrounding areas.

6.2.2 Terminal Area

The terminal area improvements are projects that will facilitate passenger wayfinding in and outside the terminal and enhance capacity at various facilities. Improvements and additions will be made to the curbfronts, the terminal building, utility infrastructure, and parking areas. The specific projects are listed below.

- Terminal Curbfront Improvements
- Terminal Ticketing Level Expansion
- East and West Parking Garage and Remote Parking Garage Construction
- New Central Plant
- West Concourse Construction

6.2.3 Ground Access

A variety of ground access improvements will be implemented to ease vehicular congestion, particularly along Airport Boulevard where significant congestion exists from mixing Airport-related traffic with local pass-through traffic. Intersection improvements and signal timing along Airport Boulevard to support terminal roadway improvements at Dover, Broadway, and Glencrest Streets will help to eliminate congestion on the roadways. The following list depicts the ground access improvements identified in the ADP.

- Monroe Road Right Turn Lane
- Terminal Roadway Improvements
- Fauna Street Re-opening to Bidirectional Traffic
- Braniff Street Relocation
- West Side Ceremonial Entrance
- Portions of West Monroe Road and Freeland Street Closure
- Monroe Road Relocation

6.2.4 Tenant/Land Use

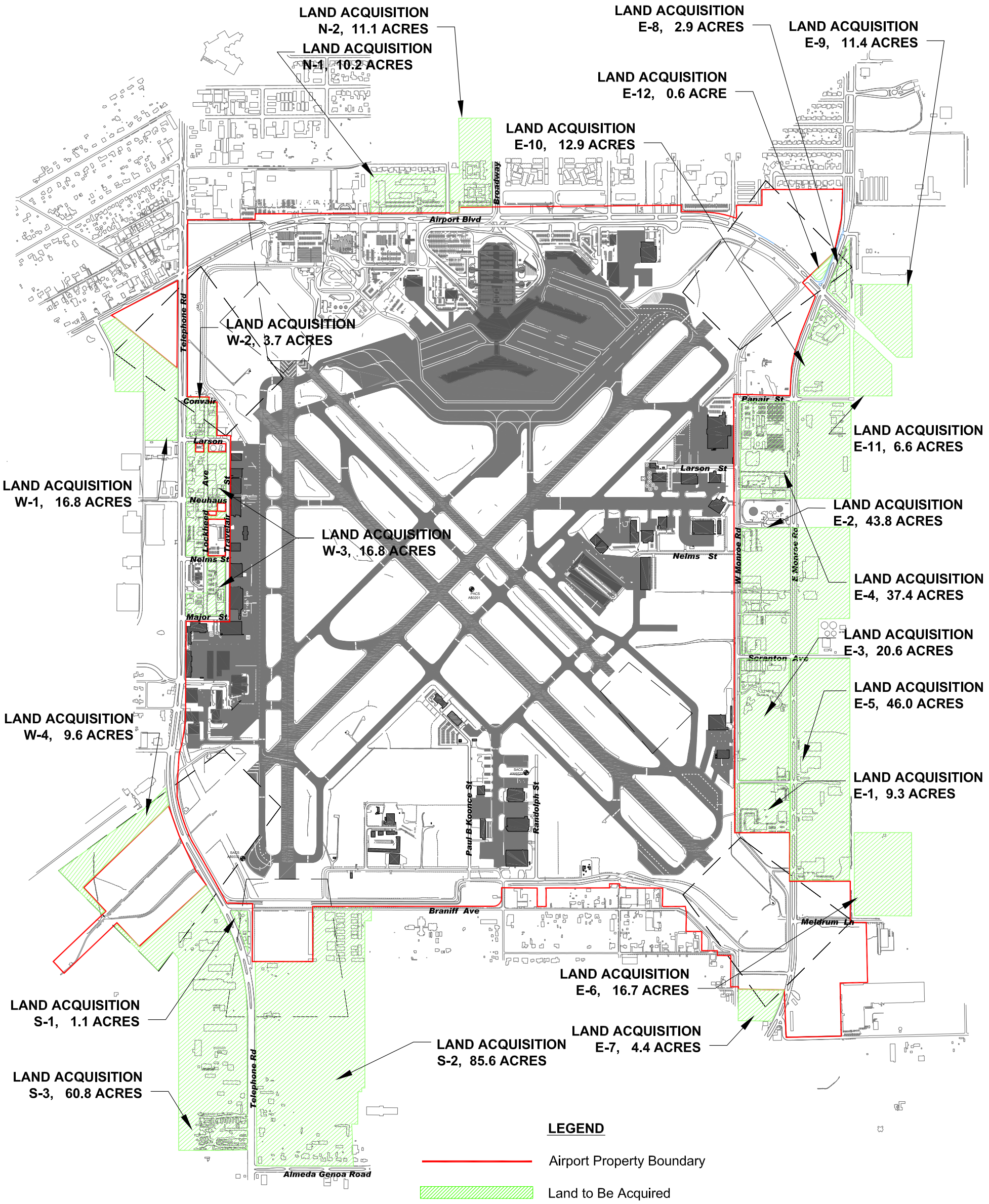
The projects proposed for tenant/land use development will help to enhance the Airport's image or benefit Airport users other than passengers, such as the airlines and other tenants. The projects identified under the tenant/land use development strategy range from new taxilane and apron construction to the development of new facilities, such as rental car storage and belly-freight facilities.

- New Taxilane for SCI (corporate aviation tenant) to Enhance Safety Around the Terminal Ramp
- Remain Over Night (RON) Aircraft Parking Ramp Construction
- Access Taxilane from Taxiway H to the Hams Aviation Ramp to Provide Direct Access to the Airfield
- West-Side Revitalization Plan
- New Belly-Freight Facility Construction
- Ground Transportation Center Development
- Co-Location of Rental Car Maintenance and Storage Facilities
- Tenant Relocation

6.2.5 Land Acquisition

The land acquisition planned throughout the planning period includes approximately 419 acres surrounding the Airport. In some instances, after the property is purchased, the existing structures will be demolished to clear obstructions or to make the land available for additional airfield or tenant development. Owners of the property with compatible land uses in place could be allowed to lease the facilities back from HAS and continue operating until the property is needed for Airport development. These operational continuance periods could vary from six months to a number of years, depending on the location of the property, the speed of acquisition, and the schedule for Airport expansion. **Exhibit 6-1** shows all property to be acquired throughout the ADP, labeled by parcel number.

Exhibit 6-2 provides a composite view of the Airport after completion of the projects included in the ADP.



Source: Ricondo & Associates, Inc., July 2003.
Prepared by: Ricondo & Associates, Inc., July 2003.

Exhibit 6-1

0 1200 ft.

north

Airport Development Plan
Land Acquisition

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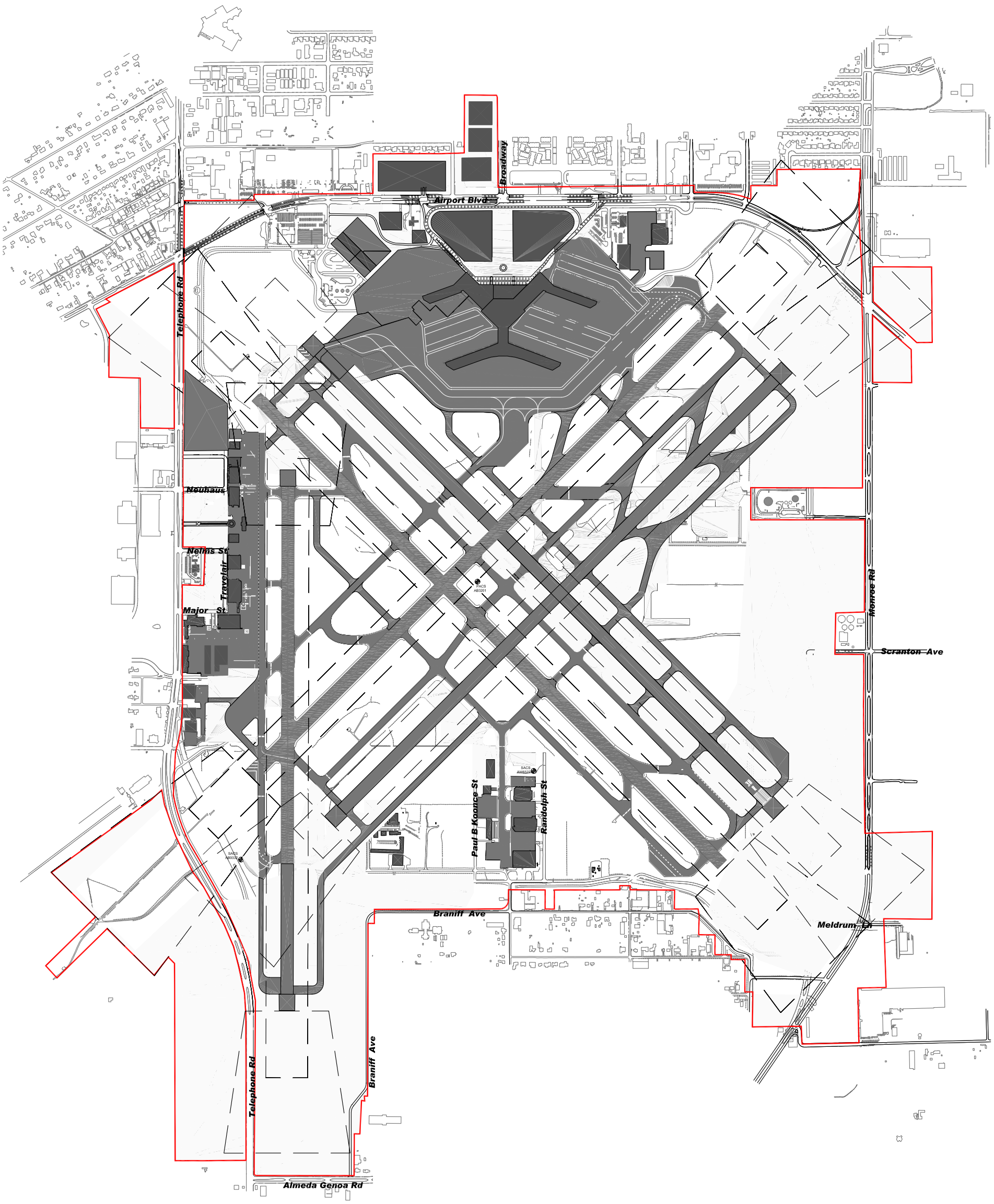

Source: Ricondo & Associates, Inc., May 2003.
Prepared by: Ricondo & Associates, Inc., May 2003.

Exhibit 6-2

0 1200 ft.

north

Airport Development Plan
Future Airfield Layout

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6.3 Additional Development Initiatives

In addition to the Master Plan, other development initiatives are expected to take place throughout the planning period that will positively affect the Airport. However, these projects are outside the jurisdiction of the HAS and would benefit a wider area and group of users than just Airport property and passengers, respectively. The following sections explain these projects and how their development will benefit or otherwise affect the Airport.

6.3.1 METRO Service

For planning and design purposes, the Houston metropolitan area to be served by METRO was split into three corridors: Southeast-Universities-Hobby, North-Hardy, and Uptown-West Loop. The Airport is located within the Southeast-Universities-Hobby corridor of Houston. This corridor is presently under consideration for Advanced High Capacity Transit (AHCT). At this time, the most advantageous mode of AHCT is light-rail. In the November 2003 elections, the METRO Transit Referendum passed to extend METRO AHCT service to the Southeast Hobby corridor.

The METRO has the potential to facilitate economic development in the area and to aid in the growth of the Airport. The preferred stop for METRO will be located across Airport Boulevard from the terminal and adjacent to the remote parking garage, which will house the employee security-screening checkpoint, with a covered walkway from the METRO station over Airport Boulevard to the terminal area. This location will add to the convenience of the Airport for employees and passengers by providing an efficient, low cost means of transportation. The cost to ride the METRO is estimated to be the same as a bus fare, which is currently one dollar.

6.3.2 The William P. Hobby Airport Environs Image Plan

The purpose of the Image Plan was to design an appealing and consistent identity for the Airport and the areas immediately surrounding the Airport. Proposed in the Image Plan are initiatives such as landscaping, architecture, lighting, and graphics to create attractive visible characteristics along the access roadways that are associated with the Airport and surrounding areas. Through implementation of the Image Plan, the passenger's travel experience to and from the Airport will be improved.

The Image Plan identifies opportunities and constraints offered by the conditions within the Hobby area of influence (AOI) for capital and image-related improvements. The related report provides an outline for future planning, urban design, agency cooperation, economic development, and implementation. The Image Plan also contains mandatory and discretionary guidelines that convey the intent of the Plan to public and private agencies responsible for capital improvements within and around the AOI. For a detailed synopsis of the Plan, refer to the Executive Summary for the Airport Environs Image Plan presented in **Appendix H** of the Technical Reports.

6.3.3 Utility Infrastructure Improvements

In conjunction with the Master Plan process, the utility infrastructure at the Airport was also analyzed. The analysis was used to determine the effect of projected Airport growth on the utility infrastructure serving the Airport. The utility infrastructure consists of six systems: sanitary collection, water system, storm drainage system, electrical power, communication lines, and gas lines. Each system was assessed in relation to existing demand and capacity as well as future demand and capacity. Each utility system was found to have the capacity to meet the anticipated growth of the Airport for the immediate future.

HAS would not be financially responsible for the upgrades and improvements to the utility infrastructure. However, these aspects must be taken into consideration and closely coordinated with the corresponding agency to ensure adequate infrastructure prior to the initiation of any Airport development. For a more detailed analysis of the utility infrastructure at the Airport, refer to the Utility Infrastructure Assessment in **Appendix I** of the Technical Reports.

7. Implementation Plan

The Implementation Plan outlines a possible development sequence and schedule based on the character and rates of growth anticipated under the Connecting Scenario through the planning horizon, year 2022. As part of this, development depicted on the Airport Layout Plan (ALP) and described in the previous chapters has been categorized into distinct projects with budgetary costs and durations. These make up the implementation plan.

The timing by which projects are implemented is based on demand. As such, the sequencing is based on the Planning Activity Levels (PALs). These PALs are tied to calendar years only through the Connecting Scenario. Since actual growth will probably vary from that which has been forecast, the Implementation Plan includes an overview of factors that are anticipated to prompt a development action.

7.1 Factors Affecting Implementation and Development Phasing

Implementation of the Airport Development Plan (ADP) should be phased so that development corresponds with the anticipated demand levels discussed in the forecast chapter. Preferably, projects should be implemented in sufficient time to serve growing demand, but not so early that facilities are underutilized. The ability to phase implementation correctly requires an understanding of the factors that prompt development, and ongoing data monitoring and analysis to identify when action should be taken. While it is anticipated that Airport development projects recommended as part of the Master Plan will be constructed as demand materializes, it must also be recognized that older facilities will continually need to be replaced or modernized.

7.1.1 Volume and Character of Growth

The volume and character of activity - factors that were addressed in detail in the forecasts of aviation activity - determine when development should occur throughout the planning period. Recognizing that growth may not occur as forecast, it is crucial to continuously monitor the overall activity and assess the individual characteristics of that activity. The type of demand placed on the Airport's individual components will indicate more about the utilization patterns and needs for a facility than an overall activity statistic.

Factors that could influence the volume and character of growth at the Airport are:

- Changes in the fleet mix
- Introduction of service by other low cost or regional carriers
- Use of the Airport as a mid-continent connecting point for Southwest Airlines
- Significant fluctuation in O&D traffic versus transfer traffic
- Introduction of international service
- Fluctuations in the type and amount of general aviation traffic

As the Airport and aviation services offered there continue to grow and expand, the ADP and Implementation Plan should be periodically reviewed to ensure that the actual trends are similar to those forecast.

7.1.2 General Criteria for Implementation

The primary criteria used to phase the ADP included:

- Initiating detailed project planning and design so that improvements can be in place when needed.
- Minimizing operational effects on the airfield, terminal and ground access routes.
- Maintaining a logical sequence of development, building with individual projects toward the ultimate Airport Development Plan.
- Meeting Houston Airport System goals and objectives.

7.1.3 Implementation Indicators

Two types of indicators or activity levels that will trigger development were identified as useful to activity monitoring and implementation: primary and secondary. Primary indicators are considered "triggers" for implementation when a specific level of activity is reached. Secondary indicators do not trigger implementation actions, but provide more insight into the type of demand that is occurring. They may provide another way to measure activity or guide some details of how the project is implemented once the trigger is reached. For example, the number of annual passenger enplanements is a primary indicator, or trigger, for the addition of terminal area and gates. A secondary indicator, such as whether the passengers are O&D or transfer passengers, would help determine the types of facilities needed to accommodate that growth. Indicators for each area of Airport development are presented below.

7.1.3.1 Airfield Indicators

It is stated in the Master Plan that planning for additional airfield capacity should begin as demand exceeds 60% of the ASV. By initiating planning at this point, additional capacity could be expected to come on-line as the demand begins to exceed 100% of the ASV. However, current demand at the Airport is approximately 105% of the ASV of the airfield. Therefore it is recommended in the Master Plan that airfield capacity enhancing projects should be implemented as soon as possible. Decoupling of Runway 17-35 from the Runway 12R complex in conjunction with the upgrade to Runway 12L-30R will increase airfield capacity.

7.1.3.2 Terminal/Gate Indicators

The timing of terminal/gate expansion or development is usually based on airline demand for additional facilities, the need to replace old or insufficient facilities, or to enhance passenger service. These needs may or may not be specifically linked to demand. Therefore, no primary indicators that trigger terminal gate development were identified. Phasing of development will be based on the facilities occupied, facilities required, the carrier needing the facilities, and the ability of Airport management to reallocate facilities to accommodate carrier needs. Secondary indicators were identified to assess those factors pertinent to phasing and to track passenger and aircraft gate utilization. As a general indicator, typical utilization at similar airports is 150,000 to 200,000 annual passengers per gate.

7.1.3.3 Access and Curbfront Indicators

Access and curbfront improvements identified include improvements to the terminal loop roadway and improvements to flow and through traffic lanes in front of the upper level curbfront. Peak hour curbfront operations should be observed to determine whether congestion is affecting operations. If so, operational modifications that could improve utilization should be reviewed prior to expanding the curbfront. No indicators were identified for the curbfront.

7.1.3.4 Parking Indicators

A primary indicator for public parking development is parking lot occupancy in the peak month. Planning should be initiated when average peak month occupancy reaches 85% to 88% of total capacity so that improvements can be in place when occupancy reaches approximately 90% to 95%. Secondary indicators include allocation of parking between hourly, daily, and remote lots and total parkers by month and type of lot.

7.1.3.5 General Aviation Indicators

Two principal types of general aviation tenants have facilities at the Airport: corporate tenants and FBOs. General aviation development typically occurs by tenant initiatives rather than by HAS. However, activity indicators may be assessed to provide insight into overall general aviation demand. With a multi-airport system, HAS has the flexibility to offer development options at another airport (e.g. Ellington Field). Based aircraft fleet and the annual number of GA operations indicate the health and overall demand for GA facilities and services at the Airport. Growth in the based aircraft fleet by tenants (corporate or FBO) can indicate a demand for hangar, terminal, or apron expansion.

7.2 Phased Implementation Plan

ADP phasing is based on specific demand levels trigger the need for implementation of individual projects and a logical progression of development that will allow critical projects to be in place to meet that demand. **Table 7-1** illustrates the relationship between the phases and PALs and total annual operations and enplanements.

Table 7-1

Correlation Between Phases, PALs and Activity

Phase	PAL	Operations	Enplanements
1	1	273,038	5,363,100
2	2	301,278	6,679,300
3	2.5	315,915[1/]	7,501,550[1/]
4	3	330,552	8,323,800

Notes:
[1/] Values determined by prorating activity midway between PAL 2 and PAL 3.

Source: Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

Although the demand levels will dictate when development should occur at the Airport rather than a particular date or timeframe, for purposes of the implementation and financial plans, the timeline associated with the Connecting Scenario was used.

Exhibit 7-1 presents a simple bar schedule for implementation of the projects in Phase 1 through Phase 4 of the implementation plan under the Connecting Scenario.

Because activity may not occur as anticipated, a second comparative implementation schedule was developed based on the Baseline Scenario, as shown on **Exhibit 7-2**. This schedule is based on the same project sequence as in Exhibit 7-1, however the timeline is much longer since activity growth at the Airport would be expected to occur at a slower rate under the Baseline Scenario. Therefore the timeframe associated with each phase or PAL is later than that under the Connecting Scenario. For example, under the Baseline Scenario, PAL 2 would be reached in 2019 compared to 2012 under the Connecting Scenario. These exhibits illustrate how implementation of the ADP would change with changes in demand.

Exhibits 7-3 through **7-6** graphically depict project implementation, by phase, as shown in the Implementation Schedule for the Connecting Scenario.

Exhibit 7-1

Illustrative Connecting Scenario Implementation Schedule - 2004-2022

Project	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Phase 1 (2004-2007)																			
SCI Taxilane																			
Taxiway Improvements																			
Taxiway H Extension																			
Drainage Master Plan																			
Category II/III ILS Installation																			
Terminal Roadway Improvements																			
Belly Freight Facility																			
Land Acquisition																			
Remote Parking Garage																			
Obstruction Removal (HAS Cost-O&M or Center Point)																			
Environmental Assessment																			
*Braniff Road Realignment																			
*Fauna Street																			
*Monroe Road Right Turn Lane																			
*Intersection Improvements																			
Phase 2 (2008-2012)																			
Perimeter Road and Fence																			
Runway 17-35 Relocation/Extension																			
Northwest Airfield Reconfiguration																			
Helipad Development																			
Land Acquisition																			
East Terminal Parking Garage[2/] and Economy Lot Expansion[1/]																			
Terminal and Curbfront Improvements																			
Taxiway J																			
Westside Roadway Redevelopment/Museum Entrance																			
Environmental Assessment																			
Phase 3 (2013-2017)																			
Transportation Center																			
West Parking Garage[2/]																			
Monroe Road Rental Car Areas																			
West Monroe Road and Freeland Street Closures																			
Runway 12L-30R Upgrade																			
Land Acquisition																			
Perimeter Road and Fence																			
Environmental Impact Statement																			
Phase 4 (2018-2022)																			
Relocation of the ARFF Station																			
Belly Freight Facility																			
Runway 4R-22L																			
Runway 30R Threshold Relocation																			
*Monroe Road Realignment																			
Perimeter Road and Fence																			
West Concourse Terminal Expansion																			

Legend

Design & bidding

Construction or project implementation

Note: (*) Denotes projects that are off Airport property and will not be funded by HAS.

[1/] The Economy Lot expansion is included in the costs for the East Garage and would be designed and constructed concurrently. The Economy Lot is expected to be operational in 2007.

[2/] The costs associated with the design of the rental car QTA/fueling facility will be included with the costs for the East Garage, and the construction costs will be included with the West Garage costs.

Source: Ricondo & Associates, Inc.

Prepared by: Ricondo & Associates, Inc.

Exhibit 7-2

Illustrative Baseline Scenario Implementation Schedule - 2004-2036

Project	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Phase 1 (2004-2008) 251,500 - 272,800 ops																																	
SCI Taxilane																																	
Taxiway Improvements																																	
Taxiway H Extension																																	
Drainage Master Plan																																	
Category II/III ILS Installation																																	
Terminal Roadway Improvements																																	
Belly Freight Facility																																	
Land Acquisition																																	
Remote Parking Garage																																	
Obstruction Removal (HAS Cost-O&M or Center Point)																																	
Environmental Assessment																																	
*Braniff Road Realignment																																	
*Fauna Street																																	
*Monroe Road Right Turn Lane																																	
*Intersection Improvements																																	
Phase 2 (2009-2019) 278,800 - 299,700 ops																																	
Perimeter Road and Fence																																	
Runway 17-35 Relocation/Extension																																	
Northwest Airfield Reconfiguration																																	
Helipad Development																																	
Land Acquisition																																	
East Terminal Parking Garage Reconstruction																																	
Terminal and Curbfront Improvements																																	
Taxiway J																																	
Westside Roadway Redevelopment/Museum Entrance																																	
Environmental Assessment																																	
Phase 3 (2020-2029) 301,300 - 316,800 ops																																	
Transportation Center																																	
West Parking Garage																																	
Monroe Road Rental Car Areas																																	
West Monroe Road and Freeland Street Closures																																	
Runway 12L-30R Upgrade																																	
Land Acquisition																																	
Perimeter Road and Fence																																	
Environmental Impact Statement																																	
Phase 4 (2030-2036) 318,600 - 329,600 ops																																	
Relocation of the ARFF Station																																	
Belly Freight Facility																																	
Runway 4R-22L																																	
Runway 30R Threshold Relocation																																	
*Monroe Road Realignment																																	
Perimeter Road and Fence																																	
West Concourse Terminal Expansion																																	

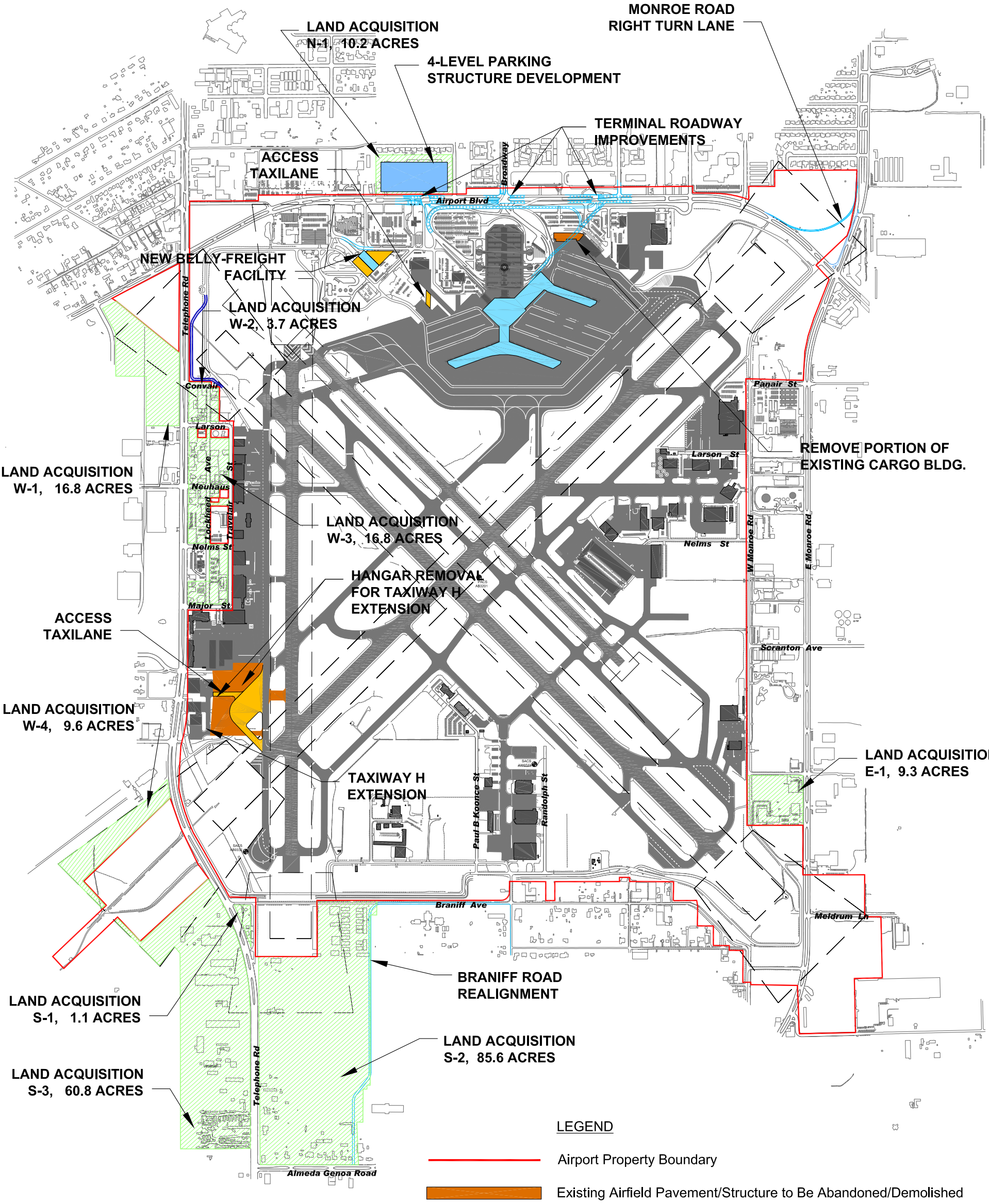
Legend

Design & bidding

Construction or project implementation

Note: (*) Denotes projects that are off Airport property and will not be funded by HAS.

Source: Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.



Source: Ricondo & Associates, Inc., May 2003.
Prepared by: Ricondo & Associates, Inc., May 2003.

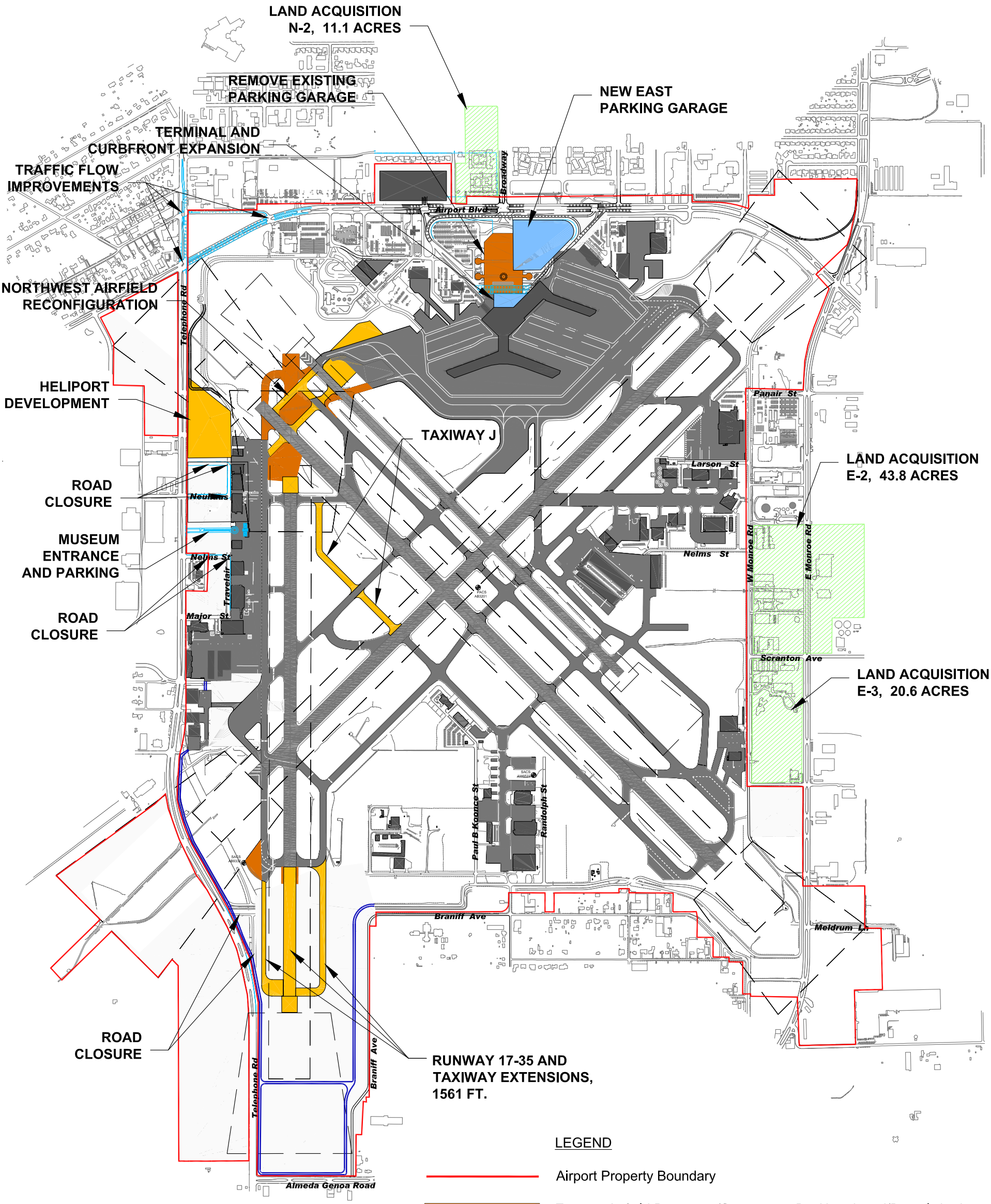
Exhibit 7-3

0 1200 ft.

north

Hobby - Airfield Composite-future-ph1e.dwg

ADP Project Implementation Phase 1



Source: Ricondo & Associates, Inc., May 2003.
Prepared by: Ricondo & Associates, Inc., May 2003.

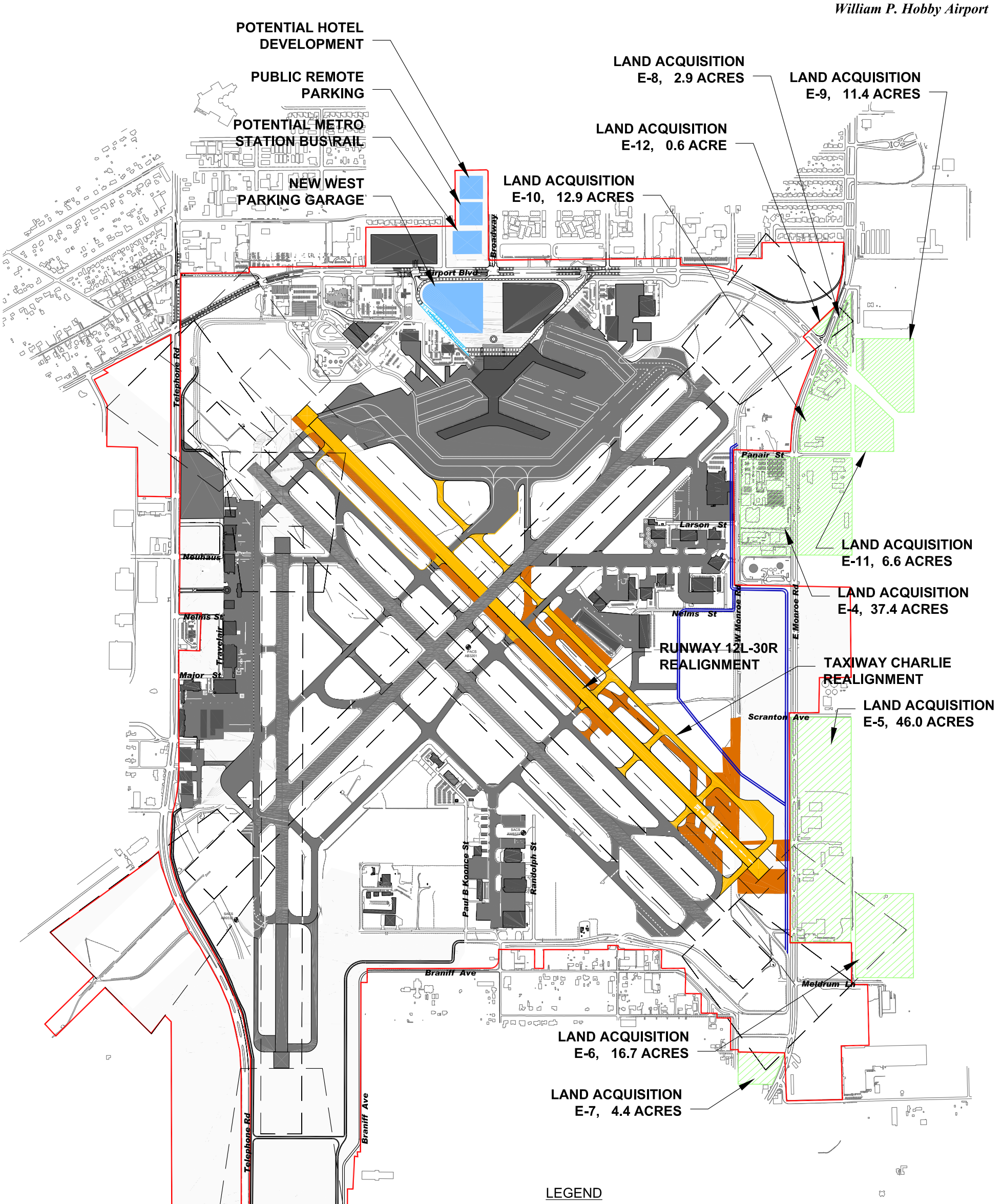
Exhibit 7-4

0 1200 ft.

north

P:\Houston\Drawings\Hobby\Future Layout\Hobby - Airfield Composite-future-ph2f.dwg

ADP Project Implementation Phase 2



Source: Ricondo & Associates, Inc., May 2003.
Prepared by: Ricondo & Associates, Inc., May 2003.

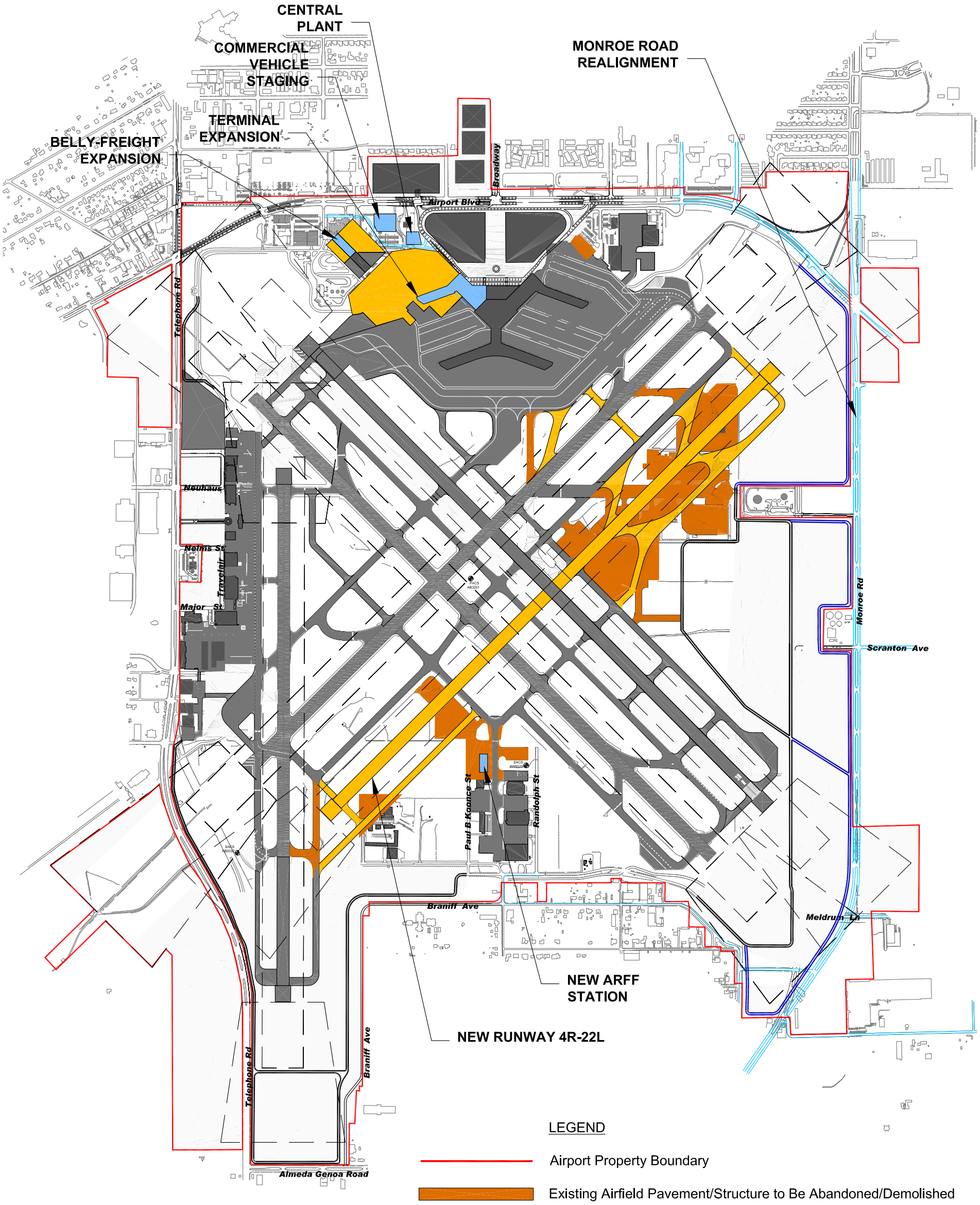
Exhibit 7-5

0 1200 ft.

north

P:\Houston\Drawings\Hobby\Future Layout\Hobby - Airfield Composite-future-ph3e.dwg

ADP Project Implementation Phase 3



Source: Ricondo & Associates, Inc., May 2003.
Prepared by: Ricondo & Associates, Inc., May 2003.

Exhibit 7-6

0 1200 ft.

north

Hobby - Airfield Composite-future-ph4e.dwg

ADP Project Implementation Phase 4

7.3 Annual Activity Monitoring

The HAS currently monitors passenger, aircraft operations and cargo data to assess growth. However, adding several key data items to the monitoring program can provide a more thorough understanding of the character of growth and guide the annual update of the HAS CIP. **Exhibit 7-7** illustrates the implementation statistics and provides a flow chart of the processes that should be followed throughout the year to monitor activity at the Airport. It graphically shows how the projects in the ADP would evolve from Master Plan projects into capital improvement line items.

As the information is collected and analyzed, it should be compared to the forecasts for its corresponding functional area of the Airport. This comparison will help HAS to determine what stage of planning is necessary given the present conditions. Analyzing data to assess utilization of facilities, and comparing that data to PALs or demand thresholds outlined in the Master Plan can provide early indications of the need for implementation. By reviewing the activity levels in conjunction with implementation triggers, HAS will be prepared to initiate implementation of the ADP projects as justified by demand.

HAS should begin monitoring activity levels and the progress of the Master Plan. Every year, in the summer months, HAS will review the operational statistics for the Airport. The actual activity will be compared to the forecast activity, to determine whether demand is exceeding the capacity of the Airport forecasts. For other areas of consideration, such as tenant growth, existing facilities should be reviewed to assess the need for improvements (i.e., additional hangars or ramp space for an FBO) since the previous year, to assess conditions at the Airport, and to determine if actual growth is similar to that forecast in Chapter 3 of the Master Plan. **Table 7-2** shows the planning factors from the various categories, which will provide HAS with the ability to decide whether projects need to be initiated or postponed. (All references to tables in the Activity Triggers column of Table 7-2 refer to the Technical Reports.)

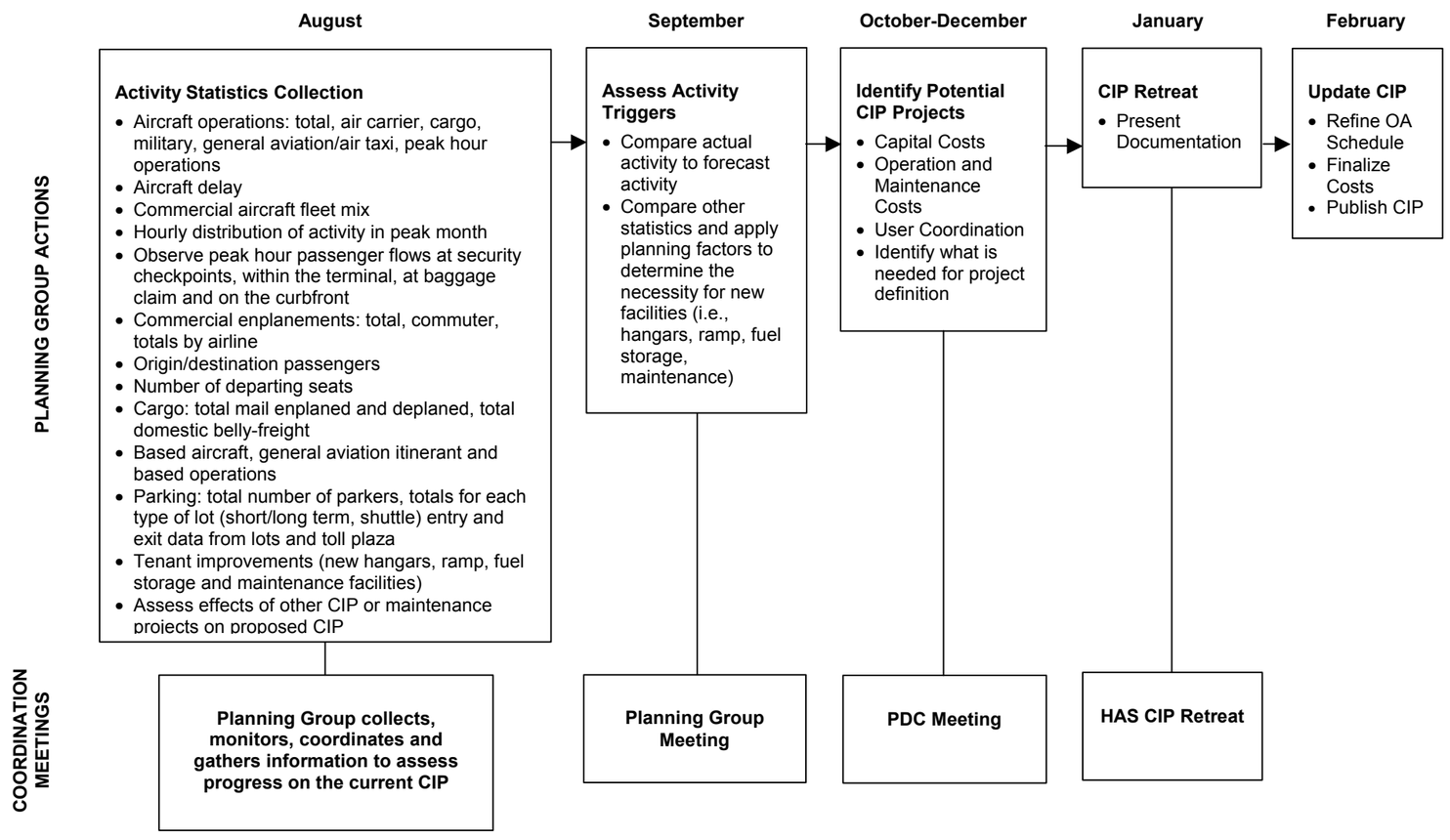
Should actual operations lag the forecasts, then the next phase of projects may not need to be implemented as presented, and should the triggers occur in advance of the forecasts, projects could be implemented more quickly. Furthermore, by reviewing the operations and growth in the summer, HAS allows ample opportunity for the inclusion of projects in the following year's CIP and funding cycles, which occur around the first of the year.

In addition to activity statistics at the Airport, other capital improvements and general maintenance projects separate from those identified in the Master Plan should be monitored as well. These projects could increase the costs or delay implementation of CIP projects.

7.3.1 Updating the Master Plan

HAS can evaluate the recommendations in the Master Plan on an annual basis, or upon initiation of significant changes in aviation activity. The purpose of this evaluation would be to compare activity forecasts with actual activity statistics and assess the effects of differing conditions in the ADP. In the event that actual activity varies significantly from that forecast in this Master Plan, the Master Plan should be revised to reflect the most current operational activity and the ADP should be adjusted accordingly. This plan was structured so that any of the four functional areas can be updated independently. Once requirements and alternatives are developed for the update, the preferred alternatives can be incorporated into the ADP.

Exhibit 7-7
Implementation Activity Statistics



Prepared by: Ricondo & Associates, Inc.
Source: Ricondo & Associates, Inc.

7.4 Additional Development Plan Initiatives

Additional development initiatives are expected to take place throughout the planning period that will positively affect the Airport, but are largely outside the control of the HAS. These initiatives would benefit the Airport environs, the residents and communities around the Airport as well as Airport users and employees. The following sections explain these projects and how their development will benefit or otherwise affect the Airport.

7.4.1 METRO Service to Airport

METRO service within Houston is currently under evaluation by the Metropolitan Transit Authority of Harris County and various entities within the City of Houston. During the November 2003 elections, the METRO Transit Referendum passed to extend METRO high-capacity transit service to the Southeast-Hobby corridor. Once complete, the system will provide service from downtown to other areas of the City, including Hobby Airport.

Several routes and technologies were under consideration. As the implementation of METRO's future initiatives are initiated, HAS should work with METRO to ensure that the Airport's needs and constraints are addressed.

Table 7-2

Planning Factors

Activity Statistics	Indicates	Activity Triggers	Action Required
Aircraft Operations: total, air carrier, cargo, military, general aviation/air taxi, peak hour operations	Traffic segments in which growth is occurring	Master Plan Aviation Demand Forecasts, Table 3-59	Monitor for long term trends and compare with operations forecasts of the Connecting Scenario.
Aircraft Delay	Airfield capacity	Demand is > 60% of ASV	Monitor for increase in delay as indication that additional airfield capacity may be required.
Commercial Aircraft Fleet Mix	Type of aircraft utilizing the airfield and terminal facilities	No trigger	Monitor to determine if fleet is increasing and the nature of increase.
Hourly Distribution of Activity in Average Day, Peak Month (ADPM)	Peaking factor, impacts annual service volume (ASV)	6 minutes average annual delay per aircraft	Monitor for long-term trends. Assess changes in seasonal distribution of activity.
Observe Peak Hour Passenger Flows at security checkpoints, within the terminal, at baggage claim and on the curbfront	Utilization of specific functional areas of the terminal	Master Plan Demand/Capacity Assessment, Table 4-16	Monitor the demand for each functional area. May indicate the need for additional area for the specific function.
Commercial Enplanements/Gate: overall, commuter, by airline, by terminal	Passenger demand at terminal gates	175,000 annual enplanements per gate	Monitor for indication of overall demand at gates. Figures in the higher range may indicate impending need for additional capacity.
Origin/Destination Passengers as a percentage of total passengers	Origin/Destination passengers vs. connecting passengers	Master Plan Aviation Demand Forecasts, Table 3-32	Monitor for long term trends.
Number of Departing Seats per Gate: overall, by terminal, and by carrier	Seating availability in departure lounge(s)	< 80% of passengers waiting to board flight are seated	Monitor for long term trends by terminal and carrier to develop understanding of typical utilization, assess changes in number of scheduled seats. May indicate the need for additional seating and/or larger departure lounges.
Cargo: Enplaned/Deplaned	Amount of enplaned and deplaned cargo	Master Plan Demand/Capacity Assessment, Table 4-34	Monitor for growth in cargo volume. An increase in cargo volume may indicate the need for additional facilities.
Based Aircraft: general aviation itinerant and based operations	General aviation activity levels	Master Plan Demand/Capacity Assessment, Table 4-31	Monitor to assess whether activity is increasing.
Parking: total parkers by month and type of lot, entry and exit data from lots and toll plaza	Utilization of individual lots	>85% occupancy for on-Airport parking	Monitor demand for each facility to determine averages and track shfits in demand of various lots. May be used to assess effectiveness of rate changes on lot utilization.
Tenant Improvements (new hangars, ramp, fuel storage and maintenance facilities)	Utilization of tenant facilities	No trigger	Monitor tenant activity/improvements with respect to Master Plan recommendations.
Other CIP and Maintenance	Additional considerations for CIP costs, scope, and timing	No trigger	Coordinate with PDC managers and HAS Program Managers to identify ongoing or planned activities in vicinity of proposed CIP projects.

Source: Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

7.4.2 Airport Environs Image Plan

The Hobby Airport Environs Image Plan is an important element to the Airport master planning process. The main objectives of the Image Plan were to create a cohesive identity for the Airport and its surrounding areas, to improve the passenger's travel experience, and to commemorate Houston's history and diversity. Through the use of landscape, architecture, lighting, and graphics, a common theme was created to influence land use development and potentially improve the overall quality of life in the area.

7.5 Implementation Conclusions

Implementation of the ADP is phased so that development corresponds with the demand levels presented in the forecast chapter. Detailed planning, design, and construction are important factors in the phasing process so as to minimize effects on the airfield, terminal, and ground access routes. The ability to effectively stage implementation requires an understanding of the factors that prompt development and the various characteristics of growth at the Airport. Implementation indicators are specific activity levels that trigger initiation of development. In the event that actual demand levels vary significantly from that forecast, the Master Plan should be updated to reflect the differences in the forecast and actual demand. These potential differences may also change the ADP and the implementation of projects listed in the ADP. Therefore, it is recommended that the ADP and Implementation Plan be reviewed annually through activity monitoring and comparative analysis, while referencing actual activity levels prior to initiation of development.

Additionally, HAS should continue to work collaboratively with METRO, City of Houston Public Works, Planning and Parks & Recreation Departments, Harris County Flood Control District, TxDOT, and other agencies to help influence and encourage appropriate development within the Airport area as defined in this Master Plan. Just as on-Airport elements of the implementation plan will be incorporated into HAS' CIP for Hobby, off-Airport projects should be incorporated into the development plans for other agencies. Through active coordination with these agencies, HAS can help ensure that critical off-Airport elements are implemented in a manner and timing consistent with the plans for the Airport. The specific means for this coordination should be determined by HAS and other agencies using either existing coordination channels or new methods.

8. Funding Plan

In its financial decision-making, the HAS considers the needs of the overall Airport System rather than isolating one facility. As such, it was not feasible to separate funding decisions regarding Hobby's Master Plan CIP without considering the effects on the other facilities in the HAS. As recommended by the HAS, this chapter only focused on the Master Plan CIP and its potential funding sources.

8.1 HAS Financial Structure

HAS manages and operates the Airport System Fund (Fund), an enterprise fund of the City. The Fund, used to account for services provided to the general public using the Airport System, has its costs recovered primarily through user charges (e.g., landing fees, rentals, parking, and concessions).

The HAS accounts for Airport System revenues and expenses using seven direct (revenue-producing) cost centers and seven indirect (allocated) cost centers:

Direct Cost Centers
- Airfield
- Terminal Apron
- Central Concourse Apron
- Terminal Building
- Central Concourse
- Parking & Ground Transportation
- Other

Indirect Cost Centers
- Roads
- Systems & Utilities
- Airport Management
- HAS Allocation
- Police Protection
- Fire Protection
- FAR Parts 107 & 139

The terminal, concourse, and apron rental rate calculations for Hobby are cost center compensatory. Cost center-specific operating expenses, allocated indirect operating expenses, allocated Renewal and Replacement Fund replenishment, and amortized capital improvements are combined to form the airline requirement. This requirement is divided by cost center-specific usable square footage to determine the average rental rate per square foot. The Airfield landing fee calculation for Hobby is also cost center compensatory, but with a reconciliation. Airfield-specific items listed above are combined, less credits for fuel flowage fees. This net requirement is divided by airline landed weight (passenger and all-cargo carriers) to determine the landing fee rate.

8.2 Capital Costs of the Master Plan CIP

Table 8-1 presents a summary of phased capital costs for the Master Plan CIP. For these analyses, estimated project costs in 2003 dollars were inflated at an annual compounded growth rate of 3.0 percent. As shown, the Master Plan CIP for Hobby is estimated to cost approximately $996.5 million in 2003 dollars ($1.4 billion in inflated dollars) over the four planning phases. For ease of presentation, the costs discussed in the remainder of this chapter are in inflated dollars. **Exhibit 8-1** presents individual project costs on an annual basis in conjunction with the implementation schedule presented in Chapter 7.

8.3 Funding Sources

Based on the recommended Master Plan CIP and its associated costs and available funding sources, a recommended funding plan was developed that attempts to maximize the use of external resources and minimize the amount of funding derived from local sources. This section discusses the sources of funds available to implement the Master Plan CIP at Hobby and the recommended funding sources.

8.3.1 FAA Airport Improvement Program (AIP)

Projects were reviewed to determine eligibility for AIP funding. As a general rule, only those projects that are related to non-revenue producing items, such as airfield construction and land acquisition, are eligible for federal funding. Federal grant eligibility is generally assumed to be 75 percent for airfield, ramp, and roadway projects. Federal funds are either in the form of AIP entitlement funds that are based on enplanement levels or discretionary funds that are distributed by the FAA on the basis of availability and priority of projects. In projecting the amount of funding from federal grants, it was assumed that the AIP would continue to be in effect throughout the planning period without any major changes.

Table 8-2 presents potential sources of funds for the Master Plan CIP, including federal funds, third party funds, and HAS (local) funds. As shown, the maximum federal share of eligible projects is 75 percent; however, the share for the West Concourse Terminal Expansion in Phase 4 was reduced to account for revenue-producing portions of the project that would not be eligible for AIP funding. Also as shown, eligible projects could receive maximum federal grants totaling approximately $475.1 million (34.4 percent of the total Master Plan CIP cost).

Table 8-1

Hobby Master Plan, CIP Project Costs

Project	Total Costs ($2003)	Maximum Total Costs (Inflated)
Phase 1 (2004 - 2007)		
SCI Taxilane	$164,000	$173,000
Taxiway Improvements 1	$549,000	$598,000
Taxiway Hotel Extension 1	$6,241,000	$6,602,000
Terminal Roadway Improvements	$10,416,000	$11,501,000
Belly Freight Facility	$5,649,000	$5,975,000
Land Acquisition 1	$42,928,000	$46,220,000
Remote Parking Garage	$108,370,000	$116,175,000
Obstruction Removal (HAS Cost-O&M or Center Point) 2	$0	$0
Environmental Assessment	$920,000	$947,000
Drainage Master Plan	$900,000	$927,000
Phase 1 Total	$176,137,000	$189,118,000
Phase 2 (2008 - 2012)		
Perimeter Road and Fence	$6,042,000	$6,984,000
Runway 17-35 Extension	$18,616,000	$21,808,000
Northwest Airfield Configuration	$12,593,000	$15,906,000
Heliport Development	$4,805,000	$5,997,000
Land Acquisition	$24,405,000	$30,015,000
East Terminal Parking Garage Reconstruction	$139,447,000	$165,551,000
Terminal and Curbfront Improvements	$41,188,000	$52,723,000
Taxiway Juliet	$2,600,000	$3,284,000
Westside Roadway Redevelopment/Museum Entrance	$3,480,000	$4,023,000
Environmental Assessment	$903,000	$1,127,000
Phase 2 Total	$254,079,000	$307,418,000
Phase 3 (2013 - 2017)		
Transportation Center	$13,896,000	$20,347,000
West Parking Garage and Plaza	$129,712,000	$183,876,000
Monroe Road Rental Car Area (Facility Demo.)	$1,117,000	$1,640,000
West Monroe Road and Freeland Street Closures	$1,029,000	$1,383,000
Runway 12L-30R Upgrade	$56,582,000	$79,144,000
Land Acquisition	$50,869,000	$72,527,000
Perimeter Road and Fence	$1,533,000	$2,312,000
Environmental Impact Study	$1,780,000	$2,653,000
Phase 3 Total	$256,518,000	$363,882,000
Phase 4 (2018 - 2022)		
Relocation of the ARFF Station	$8,381,000	$13,410,000
Belly Freight Facility	$7,943,000	$13,090,000
Runway 4R-22L	$73,227,000	$125,972,000
Runway 30R Threshold Relocation	$74,000	$126,000
Perimeter Road and Fence	$633,000	$1,106,000
West Concourse Terminal Expansion	$219,512,000	$366,108,000
Phase 4 Total	$309,770,000	$519,812,000
Total Master Plan CIP Costs	$996,504,000	$1,380,230,000

Notes:
1/ These projects or components of them are included in the overall current HAS CIP (see Table 8-4 of the Technical Reports, Volume 3, Chapter 8), as either an individual project or grouped with others into a larger program, and phased over time.
2/ The cost for this project will be absorbed into the Phase I land acquisition cost.

Source: Houston Airport System; Hanscomb Faithful & Gould; Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

Exhibit 8-1

Hobby Master Plan CIP Implementation Schedule and Project Costs

Project	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Phase 1 (2004-2007)																				
SCI Taxilane	$17,000	$156,000																		
Taxiway Improvements		$58,000	$540,000																	
Taxiway H	$643,000	$5,959,000																		
Drainage Master Plan	$927,000																			
Category II/III ILS Installation																				
Terminal Roadway Improvements		$1,105,000	$5,198,000	$5,198,000																
Belly Freight Facility	$582,000	$5,394,000																		
Land Acquisition	$11,555,000	$11,555,000	$11,555,000	$11,555,000																
Remote Parking Garage	$11,162,000	$52,506,000	$52,506,000																	
Obstruction Removal (HAS Cost-O&M or Center Point)																				
Environmental Assessment	$947,000																			
*Braniff Road Realignment																				
*Fauna Street																				
*Monroe Road Right Turn Lane																				
*Intersection Improvements																				
Phase 2 (2008-2012)																				
Perimeter Road and Fence			$660,000	$6,121,000																
Runway 17-35 Relocation/Extension				$2,095,000	$9,856,000	$9,856,000														
Northwest Airfield Reconfiguration							$1,549,000	$14,357,000												
Helipad Development							$2,998,000	$2,998,000												
Land Acquisition					$6,003,000	$6,003,000	$6,003,000	$6,003,000	$6,003,000											
East Terminal Parking Garage[2/] and Economy Lot Expansion[1/]		$14,794,000	$47,085,000	$47,085,000	$47,085,000															
Terminal and Curbfront Improvements							$5,066,000	$23,829,000	$23,829,000											
Taxiway J							$329,000	$2,964,000												
Westside Roadway Redevelopment/Museum Entrance				$392,000	$3,631,000															
Environmental Assessment							$564,000	$564,000												
Phase 3 (2013-2017)																				
Transportation Center													$1,981,000	$18,366,000						
West Parking Garage[2/]										$17,432,000	$17,432,000	$55,481,000	$55,481,000	$55,481,000						
Monroe Road Rental Car Areas														$1,640,000						
West Monroe Road and Freeland Street Closures										$1,383,000	$1,383,000									
Runway 12L-30R Upgrade										$7,604,000	$7,604,000	$35,770,000	$35,770,000							
Land Acquisition										$14,505,000	$14,505,000	$14,505,000	$14,505,000	$14,505,000	$14,505,000					
Perimeter Road and Fence														$225,000	$2,086,000					
Environmental Impact Study														$1,327,000	$1,327,000					
Phase 4 (2018-2022)																				
Relocation of the ARFF Station																$1,306,000	$12,104,000			
Belly Freight Facility																	$1,275,000	$11,816,000		
Runway 4R-22L																		$12,103,000	$56,934,000	$56,934,000
Runway 30R Threshold Relocation																			$126,000	
*Monroe Road Realignment																				
Perimeter Road and Fence																			$108,000	$998,000
West Concourse Terminal Expansion																$17,354,000	$17,354,000	$165,700,000	$165,700,000	
Total Annual Costs	$25,833,000	$91,527,000	$117,544,000	$72,446,000	$66,575,000	$15,859,000	$16,500,000	$50,715,000	$29,832,000	$40,924,000	$40,924,000	$105,756,000	$107,737,000	$91,544,000	$17,918,000	$18,660,000	$30,733,000	$189,619,000	$222,868,000	$57,932,000

Legend: Design & bidding; Construction or project implementation

Notes:

(*) Denotes projects that are off Airport property and will not be funded by HAS.

1/ The Economy Lot expansion is included in the costs for the East Garage and would be designed and constructed concurrently. The Economy Lot is expected to be operational in 2007.

2/ The costs associated with the design of the rental car QTA/fueling facility will be included with the East Garage costs, and the construction costs will be included with the West Garage costs.

Sources: Ricondo & Associates, Inc. and Hanscomb Faithful & Gould
Prepared by: Ricondo & Associates, Inc.

8.3.2 Passenger Facility Charges (PFCs)

In May 1991, the FAA issued 14 CFR Part 158 allowing public agencies controlling commercial service airports to charge a PFC. Since enactment of this regulation, the HAS has not submitted per eligible enplaned passenger an application to impose a PFC at either Hobby, George Bush Intercontinental Airport, or Ellington Field. For these analyses, it is not expected that the HAS will submit a PFC application during the planning period. However, 1) if a PFC were in place for the HAS between 2006 and 2022 and 2) PFC revenue generated at Hobby used solely for eligible Master Plan CIP projects during this period, then PFC revenues could provide approximately $222.1 million at a $3.00 PFC level and approximately $336.1 million at a $4.50 PFC level.

8.3.3 Third Party Funding

Private funding has been identified for certain projects included in the Master Plan CIP, including belly freight facilities (Phase 1 and Phase 4), a portion of the East Terminal Parking Garage Reconstruction (Phase 2), and the Transportation Center (Phase 3). Costs associated with these projects are estimated to be approximately $61.9 million, or 4.5 percent of the total cost of the Master Plan.

8.3.4 Local Funding

The remaining $1.2 billion (89.1 percent) of project costs would be funded through local funds from the HAS. As shown in Table 8-2, the majority of local funding would occur in Phase 4, with approximately $480.1 million required. Major projects requiring local funding include the Remote Parking Garage in Phase 1, the East Terminal Parking Garage Reconstruction in Phase 2, the West Parking Garage and Plaza in Phase 3, and the West Concourse Terminal Expansion in Phase 4. The local share for these four projects is estimated to be approximately $790.3 million, or 64.2 percent of the total local share. These projects are demand-driven and would not be constructed until demand warrants.

Project costs not funded by federal grants or private sources are expected to be financed through some combination of Airports Improvement Fund moneys and the sale of general airport revenue bonds. Project costs that are airfield or terminal/apron-related would be amortized over a 15, 20, or 25-year period and included in the airline rate base.[1] Airfield project costs would be recovered entirely through landing fees, while terminal/apron project costs would be recovered based on the airlines' share of the total square footage in that particular cost center.

8.4 Other Hobby Capital Improvement Projects

In addition to the Master Plan CIP, the HAS maintains an ongoing five-year CIP. This current CIP is different from the Master Plan CIP in that the phasing and implementation of projects are in finer detail than that required for the Master Plan CIP. Whereas projects in the Master Plan CIP are grouped into a broad package, in HAS' current CIP, these projects are phased over many years. Refer to Chapter 8 of the Technical Report for the current HAS CIP FY 2004 through FY 2008.

8.5 Summary

A broad, aggregate approach was used in developing the Master Plan CIP projects, as they will be refined before implementation. The financial analysis included in this chapter is different from the typical master plan financial analysis. Given the dynamics of the three airports included in the HAS, neither a financial feasibility nor a detailed financial analysis could be assessed without isolating Hobby from the other airports in the HAS. This isolation is inconsistent with the financial decision-making conducted by the HAS for the three facilities. As a result, the HAS recommended that this chapter be restricted to the Master Plan CIP and potential levels of funding from various sources to implement the Master Plan CIP.

[1] Equipment would be amortized over a 15-year period, renovations over a 20-year period, and new projects over a 25-year period.

Table 8-2

Potential Sources of Funds for Master Plan CIP

Project	Total Costs (Inflated $)	Maximum Eligible Federal Share	Maximum Eligible Federal Grants	HAS Priority	Expected Federal Grants	Third Party	HAS Share
Phase 1 (2004 - 2007)							
SCI Taxilane	$173,000	75.0%	$129,750	High	$129,750	$0	$43,250
Taxiway Improvements	$598,000	75.0%	$448,500	High	$448,500	$0	$149,500
Taxiway H Extension	$6,602,000	75.0%	$4,951,500	High	$4,951,500	$0	$1,650,500
Terminal Roadway Improvements	$11,501,000	75.0%	$8,625,750	Medium	$8,625,750	$0	$2,875,250
Belly Freight Facility	$5,975,000	0.0%	$0	-	$0	$5,975,000	$0
Land Acquisition	$46,220,000	75.0%	$34,665,000	Medium	$18,704,550	$0	$27,515,450
Remote Parking Garage	$116,175,000	0.0%	$0	-	$0	$0	$116,175,000
Obstruction Removal1/ (HAS Cost-O&M or Center Point)	$0	75.0%	$0	-	$0	$0	$0
Environmental Assessment	$947,000	0.0%	$0	-	$0	$0	$947,000
Drainage Master Plan	$927,000	75.0%	$695,250	High	$695,250	$0	$231,750
Phase 1 Total	$189,118,000	26.2%	$49,515,750		$33,555,300	$5,975,000	$149,587,700
Phase 2 (2008 - 2012)							
Perimeter Road and Fence	$6,781,000	75.0%	$5,085,750	Low	$5,085,750	$0	$1,695,250
Runway 17-35 Relocation/Extension	$21,808,000	75.0%	$16,356,000	High	$16,356,000	$0	$5,452,000
Northwest Airfield Configuration	$15,906,000	75.0%	$11,929,500	High	$11,929,500	$0	$3,976,500
Helipad Development	$5,997,000	0.0%	$0	-	$0	$0	$5,997,000
Land Acquisition	$30,015,000	75.0%	$22,511,250	Low	$12,689,950	$0	$17,325,050
East Terminal Parking Garage Reconstruction	$156,048,000	0.0%	$0	-	$0	$39,012,000	$117,036,000
Terminal and Curbfront Improvements	$52,723,000	75.0%	$39,542,250	Low	$0	$0	$52,723,000
Taxiway J	$3,284,000	75.0%	$2,463,000	High	$2,463,000	$0	$821,000
Westside Roadway Redevelopment/Museum Entrance	$4,023,000	0.0%	$0	-	$0	$0	$4,023,000
Environmental Assessment	$1,127,000	0.0%	$0	-	$0	$0	$1,127,000
Phase 2 Total	$297,712,000	32.9%	$97,887,750		$48,524,200	$39,012,000	$210,175,800
Phase 3 (2013 - 2017)							
Transportation Center	$20,347,000	75.0%	$13,123,815	Low	$0	$1,424,290	$18,922,710
West Parking Garage and Plaza	$183,876,000	0.0%	$0	-	$0	$0	$183,876,000
Monroe Road Rental Car Area (Facility Demo.)	$1,640,000	0.0%	$0	-	$0	$0	$1,640,000
West Monroe Road and Freeland Street Closures	$1,383,000	0.0%	$0	-	$0	$0	$1,383,000
Runway 12L-30R Upgrade	$79,144,000	75.0%	$59,358,000	High	$55,526,500	$0	$23,617,500
Land Acquisition	$72,527,000	75.0%	$54,395,250	Low	$0	$0	$72,527,000
Perimeter Road and Fence	$2,312,000	75.0%	$1,734,000	Low	$0	$0	$2,312,000
Environmental Impact Statement	$2,653,000	75.0%	$1,989,750	Low	$0	$0	$2,653,000
Phase 3 Total	$363,882,000	35.9%	$130,600,815		$55,526,500	$1,424,290	$306,931,210
Phase 4 (2018 - 2022)							
Relocation of the ARFF Station	$13,410,000	75.0%	$10,057,500	Low	$0	$0	$13,410,000
Belly Freight Facility	$13,090,000	0.0%	$0	-	$0	$13,090,000	$0
Runway 4R-22L	$125,972,000	75.0%	$94,479,000	High	$62,451,900	$0	$63,520,100
Runway 30R Threshold Relocation	$126,000	75.0%	$94,500	-	$0	$0	$126,000
Perimeter Road and Fence	$1,106,000	75.0%	$829,500	Low	$0	$0	$1,106,000
West Concourse Terminal Expansion	$366,108,000	25.0%	$91,527,000	-	$0	$0	$366,108,000
Phase 4 Total	$519,812,000	37.9%	$196,987,500		$62,451,900	$13,090,000	$444,270,100
Total ADP Costs	$1,370,524,000	34.7%	$474,991,815		$200,057,900	$59,501,290	$1,110,964,810

Sources: Houston Airport System; Hanscomb Faithful & Gould; Ricondo & Associates, Inc.
Prepared by: Ricondo & Associates, Inc.

9. Environmental Overview

Major Airport development projects are recommended for implementation throughout the 20-year planning period for this Master Plan, as described in previous chapters. In general, these projects consist of taxiway improvements, roadway improvements, land acquisition, new runways, runway extensions, parking garage construction, and environmental analyses. This chapter provides a general overview of potential environmental consequences related to the development.

9.1 Aircraft Noise

9.1.1 General Characteristics of Aircraft Noise

Aircraft noise originates from both the engines and the airframe of an aircraft, but the engines are by far the most significant source of aircraft noise. Although propeller-driven aircraft (mostly commuter and general aviation) noise can be annoying, jet aircraft are the primary source of disturbing noise from the Airport.

Generally, sounds that differ by 2 dBA (A-weighted decibles) or less are not perceived to be noticeably different by most listeners. A noise event produced by a jet aircraft flyover is usually characterized by a buildup to a peak noise level as the aircraft approaches, then a decrease in noise level through a series of lesser peaks or pulses after the aircraft passes and the noise recedes.

9.1.2 Aircraft Noise Analysis Methodology

The methodology used for this aircraft noise analysis involved the (1) use of noise descriptors developed for aircraft noise analyses, (2) application of a computer model that provides estimates of aircraft noise levels, and (3) development of basic data and assumptions as input to the computer model.

As a result of extensive research into the characteristics of aircraft noise and human response to that noise, a standard system of descriptors has been developed. The descriptors used in this aircraft noise analysis are as follows:

- ***A-Weighted Sound Pressure Level (dBA):*** dBA is a frequency-weighted sound level (expressed in decibels) that correlates with the way sound is heard by the human ear.
- ***Maximum Noise Level (L_{max}):*** Lmax is the maximum, or peak, sound level during a noise event.
- ***Sound Exposure Level (SEL)****:* SEL is a time-integrated measure, expressed in decibels, of the sound energy of a single noise event. The sound level is integrated over the period that the level exceeds a threshold (normally 65 dBA for aircraft noise events). Therefore, SEL accounts for the duration of the sound.
- ***A-weighted Day-Night Average Sound Level (DNL)****:* DNL is expressed in dBA and represents the average A-weighted sound level over a 24-hour period.

The Integrated Noise Model (INM) is an FAA computer model used to develop aircraft noise exposure maps and is the accepted *industry standard*, state-of-the-art tool for determining the total effect of aircraft noise at and around airports. INM uses the aircraft characteristics combined with conditions specific to an airport, such as runway geometry, runway use flight tracks, etc., to develop noise exposure contours. These noise exposure contours are based on the DNL noise descriptor.

Noise exposure values of DNL 75, 70, and 65 were used as the criterion levels for the aircraft noise analysis. Three specific ranges of noise exposure were estimated and analyzed: (1) DNL 75+, (2) DNL 70 to 75, and (3) DNL 65 to 70. Area within the DNL 75+ noise exposure contour is considered to experience "severe" aircraft noise conditions and area within the DNL 65 to 75 contour is considered to experience "significant" aircraft noise conditions.

9.1.3 Basic Data and Assumptions

The most critical data required to develop noise exposure contours using the FAA INM are:

- The existing and forecast numbers of aircraft operations by time of day, aircraft type, and stage length (nonstop departure distance from the airport); and
- Operational information, including use of the runways, the location and use of flight tracks (the paths that pilots fly to arrive at and depart from the airport), departure profiles, existing noise abatement procedures, etc.

In addition, the following conditions were assumed in developing the 2000 and 2022 noise exposure contours for the Airport:

- Based on historical weather data, the average (mean) temperature at the Airport in 2000 was 69.9º F.
- Noise, thrust, and altitude information for each specific aircraft type was not modified from that specified in the INM Version 6.1 aircraft database.

9.1.4 Results

The aforementioned assumptions were used to create the inputs to the INM Version 6.1 model developed specifically for the Airport. Version

The resulting noise exposure contours for the base case (2000) and the future case (2022) are depicted in **Exhibits 9-1** and **9-2**, respectively. **Table 9-1** lists the area contained within each noise exposure contour.

Table 9-1

Noise Impact Area (square miles)

Case (Year)	DNL 65-70	DNL 70-75	DNL 75 and Above	Total DNL 65 and Above
Base Case (2000)	7.13	3.04	2.64	12.81
Future Case (2022)	5.79	2.58	2.61	10.98

Source: Ricondo & Associates, Inc. INM Analysis, June 2003.
Prepared by: Ricondo & Associates, Inc.

9.2 Compatible Land Use

All land uses are generally considered compatible with yearly day-night average sound levels below DNL 65, although FAR Part 150 states that "acceptable" sound levels should be subject to local conditions and community decisions.

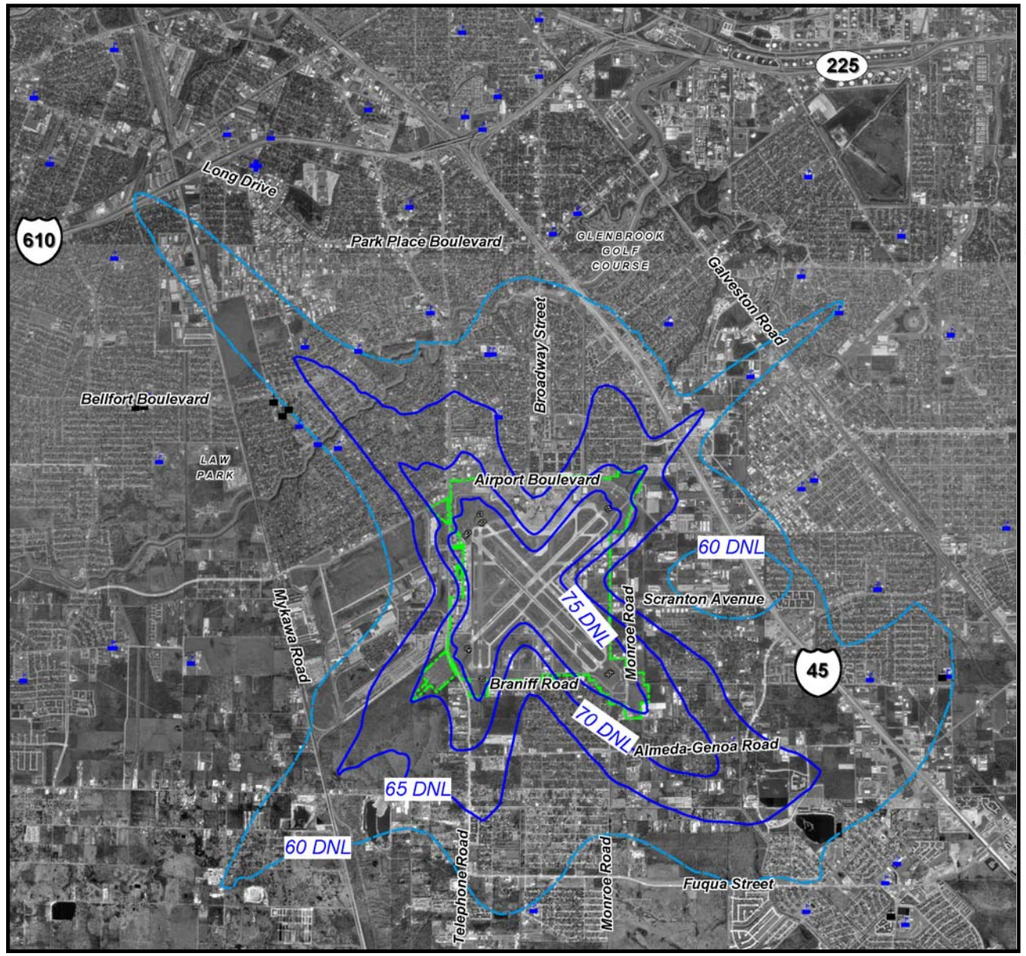
9.2.1 Existing Study Area Land Uses

Development in the Airport environs consists of a mixture of land uses that can be grouped into the following categories:

- Residential (Single-Family and Multi-Family)
- Commercial (Office/Business)
- Industrial
- Public Use (Parks and Recreation)
- Institutional (Schools, Religious Facilities, and Public Places of Assembly)
- Utility
- Undeveloped/Vacant Land

In general, the Airport environs are densely developed in the north, and have large tracts of undeveloped land in the south, interspersed with other land uses. Specifically, single-family residences are located throughout the Airport environs; however, the highest densities of residential development are in the northern section of the environs. Multi-family residences are similarly dispersed throughout the Airport environs, and are typically located along major arterial roadways, with a large cluster of multi-family residences immediately north of the Airport, along Broadway Street. Several parks and recreation areas are located north and west of the Airport, including Glenbrook Golf Course to the north and Law Park to the west.

Exhibits 9-1 and 9-2



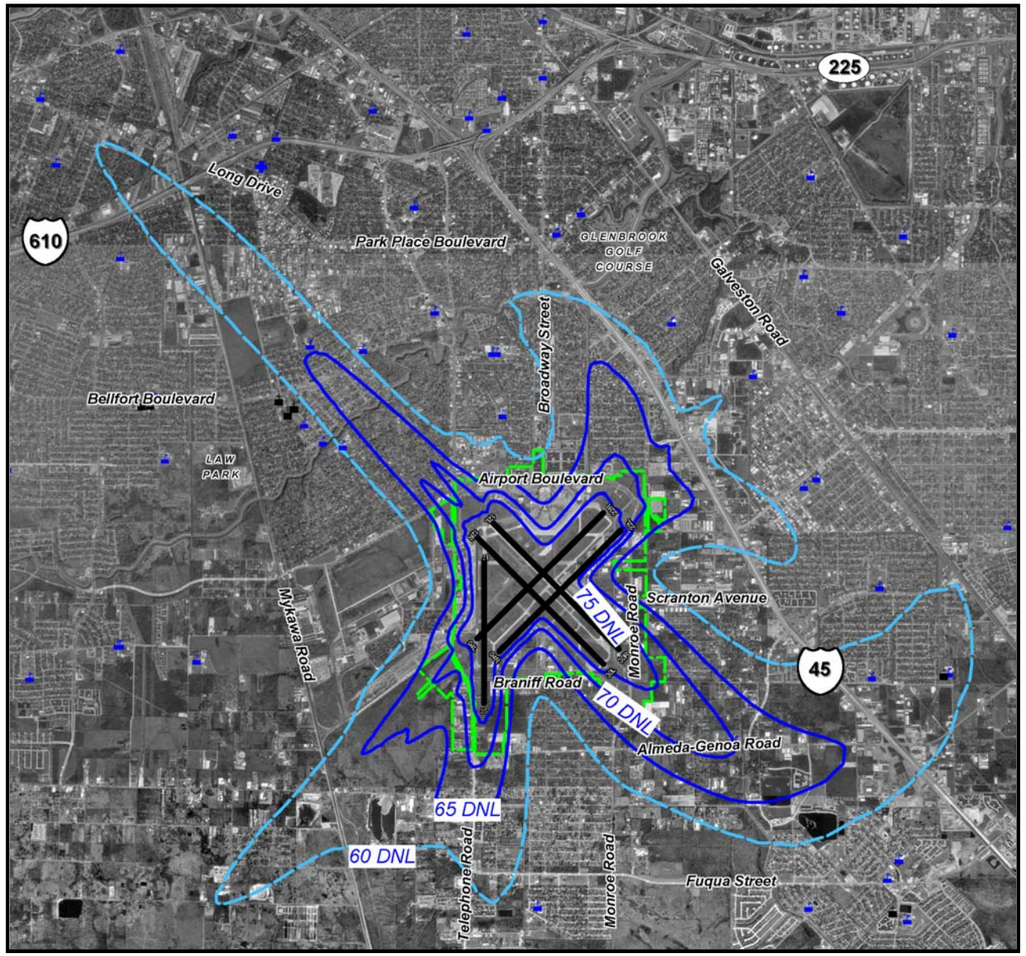
Source: Aerial, USGS Digital Orthophoto Quarter Quadrangle Imagery, 1996
Prepared by: Ricondo & Associates, Inc.

north
0 5,000 Feet

2000 Aircraft Noise Contours

LEGEND

- Airport Boundary
- Noise Contour
- School
- Religious Facility
- Hospital



Source: Aerial, USGS Digital Orthophoto Quarter Quadrangle Imagery, 1996
Prepared by: Ricondo & Associates, Inc.

north
0 5,000 Feet

2022 Aircraft Noise Contours – Future Airport Layout

9.2.2 Existing Noise Exposure (Base Case, 2000)

Exhibit 9-3 depicts the Base Case (Year 2000) noise contours overlaid on a map of existing land uses in the Airport environs. **Table 9-2** summarizes the effects of noise exposure in the Airport environs on population and noise-sensitive facilities.

Table 9-2

Effects of Noise Exposure in the Airport Environs – 2000

	Range of Noise Exposure (DNL)			
	65-70	70-75	75 +	Total 65 +
Population	9,544	885	19	10,448
Dwelling Units	3,325	335	10	3,670
Minority Population	2,375	148	10	2,533
Schools	1	-	-	1
Religious Facilities	-	-	-	-
Hospitals	-	-	-	-

Sources: Ricondo & Associates, Inc. and Llewelyn-Davies Sahni, Inc. based on U.S. Census Bureau, Census 2000.
Prepared by: Ricondo & Associates, Inc., July 2003.

9.2.3 Future Noise Exposure (Future Case, 2022)

Exhibit 9-4 depicts the Future Case (Year 2022) noise contours overlaid on a map of existing land uses in the Airport environs. **Table 9-3** summarizes the effects of noise exposure in the Airport environs on population and noise sensitive facilities, based on 2000 Census data.

Table 9-3

Effects of Noise Exposure in the Airport Environs – 2022

	Range of Noise Exposure (DNL)			
	65-70	70-75	75 +	Total 65 +
Population	6,582	701	2	7,285
Dwelling Units	2,582	233	1	2,816
Minority Population	1,818	251	1	2,070
Schools	1	-	-	1
Religious Facilities	-	-	-	-
Hospitals	-	-	-	-

Source: Ricondo & Associates, Inc. based on U.S. Census Bureau, Census 2000.
Prepared by: Ricondo & Associates, Inc., July 2003.

Comparing Tables 9-2 and 9-3 shows that noise exposure in terms of population and dwelling units exposed to DNL 65 or greater is expected to decrease from the existing condition to the future build condition. Federal regulations define a "significant impact" in terms of noise exposure as "exposure to aircraft noise that is likely to interfere with human activity in noise-sensitive areas, which may be specified by a cumulative noise description as a level of noise exposure, such as DNL 65". Therefore, full buildout of the ADP would not be expected to result in a significant impact in terms of noise or land use compatibility.

9.3 Social Impacts

Aviation development affects not only the natural environment but also the human environment. Therefore, consideration of social impacts is required to determine the potential effects of airport development on the human environment. Examples of types of social impacts that can generally result from airport development are discussed below.

9.3.1 Relocation of Residences and/or Businesses

Development projects at the Airport will occur in several phases, as discussed in Chapter 7. This development includes the acquisition of parcels of land adjacent to the Airport to accommodate specific expansion projects, such as taxiway improvements, roadway improvements, land acquisition, additional runways and runway extensions, and parking garage construction. **Exhibit 9-5** depicts the proposed land acquisition areas on the existing land use map. The proposed acquisition areas include commercial and residential land uses as well as some currently undeveloped parcels of land.

A total of 25 homes, 107 mobile homes, and 306 apartment units are proposed to be acquired, requiring relocation of the affected residents. In addition, a total of 36 commercial and 34 industrial businesses would need to be relocated with the proposed acquisition.

As depicted in Exhibit 9-5, many tracts of undeveloped land are located within the Airport environs, especially in areas west, south, and southeast of the Airport. These undeveloped areas could likely accommodate the relocation of commercial and industrial businesses that prefer to be near the Airport. Residents could be relocated to other single- and multi-family units within this part of the City.

Exhibit 9-6 depicts the existing population density in the Airport environs and the areas proposed for acquisition as the Airport expands. There is a large population concentration north of the Airport in the apartment complex at the corner of Airport Boulevard and Broadway Street, with a relatively equal distribution in all other neighborhood areas in the vicinity of the Airport.

Exhibit 9-7 depicts the areas of acquisition overlaid on a map of the population living in poverty. As shown, most of the areas of acquisition have the lowest share of population living in poverty, zero percent to 25 percent. The three apartment complexes in the north with 306 units fall into this category of poverty. Some areas of acquisition have a population living in poverty at a rate of 25 percent to 50 percent. The mobile home park south of the Airport on Telephone Road is located within this category. However, as shown by the population density in Exhibit 9-6, most of the areas of residential acquisition involve the lowest share, zero percent to 25 percent, of population living in poverty.

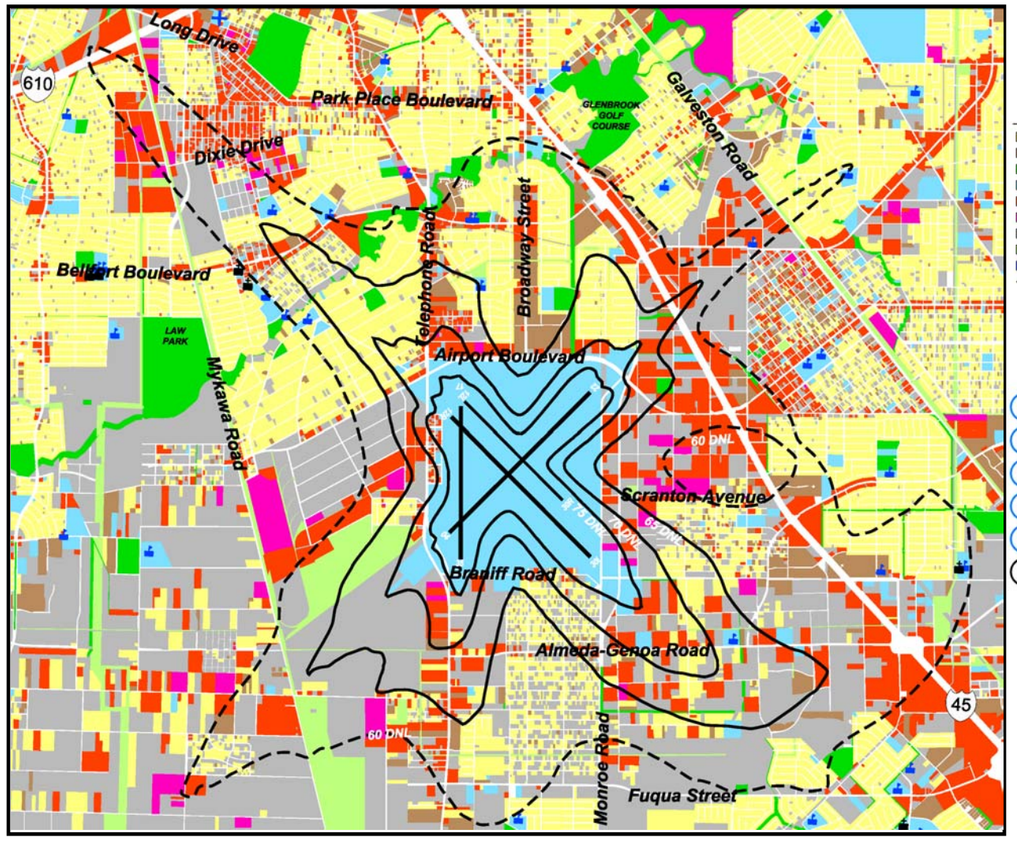
Exhibit 9-8 depicts the areas of acquisition overlaid on a map of the minority population in residential areas. An overall review of the Airport environs shows that the surrounding area predominately consists of minority populations. The three apartment buildings in the north are 75 percent to 100 percent minority population. The proposed residential acquisition area in the southeast portion of the Airport environs, where there is a high density of population as shown on Exhibit 9-6, falls within the 50 percent to 75 percent minority population range. The mobile home park southwest of the Airport has 25 percent 50 percent minority population.

9.3.2 Alteration of Surface Traffic Patterns

The following projects are recommended in the Master Plan to ensure that the roadways can accommodate Airport demand and serve Airport customers appropriately:

- Create a Monroe Road right turn lane to help lessen congestion at the Monroe Road and Airport Boulevard Intersection.
- Make Broadway Street the new ceremonial entrance to the Airport. Upgrade Telephone Road and Monroe Road to accommodate higher levels of traffic and thus become the major roadways to the Airport.
- The terminal roadway improvements include expansion of the on-Airport terminal loop roadway to the northeast and the addition of two new intersections with Airport Boulevard on the northeast and northwest to improve the flow of traffic into and out of the terminal area. Remove the ramps and overpasses in front of the terminal area to allow a clear view from Broadway Street, as recommended in the Image Plan.
- Reopen Fauna Street from Telephone Road to Airport Boulevard to bidirectional traffic. New traffic signals are proposed at the intersections of Fauna Street and Telephone Road, and Fauna Street and Airport Boulevard. These improvements would allow passengers traveling southbound on Telephone Road to make left-hand turns onto Fauna Street. The traffic would be able to continue on an eastbound path to Airport Boulevard. With Fauna Street operating in each direction, discontinue left turns from southbound Telephone Road at Airport Boulevard thus relieving congestion.

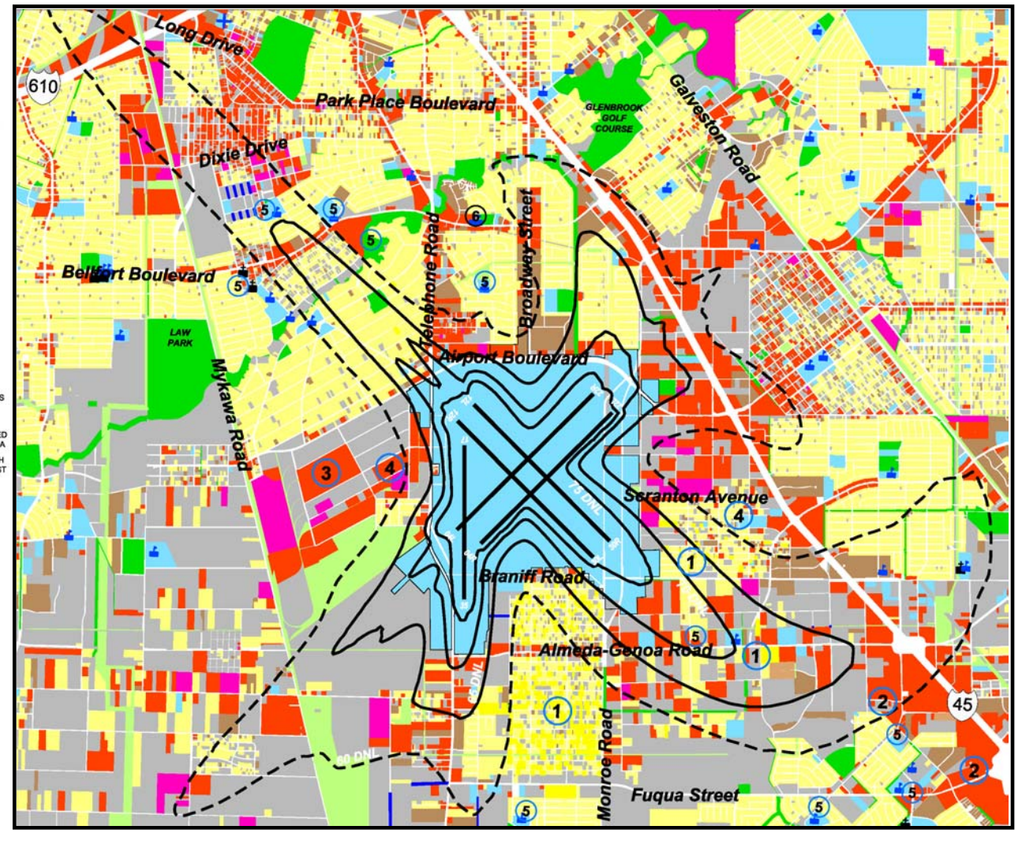
Exhibits 9-3 and 9-4



Sources: Houston Airport System, *Airport Layout Plan:* Llewelyn-Davies Sahni, Inc. (windshield survey); USGS internet query; Harris County Appraisal District.
Prepared by: Ricondo & Associates, June 2003.

2000 Aircraft Noise Contours

0 4,000 ft. north

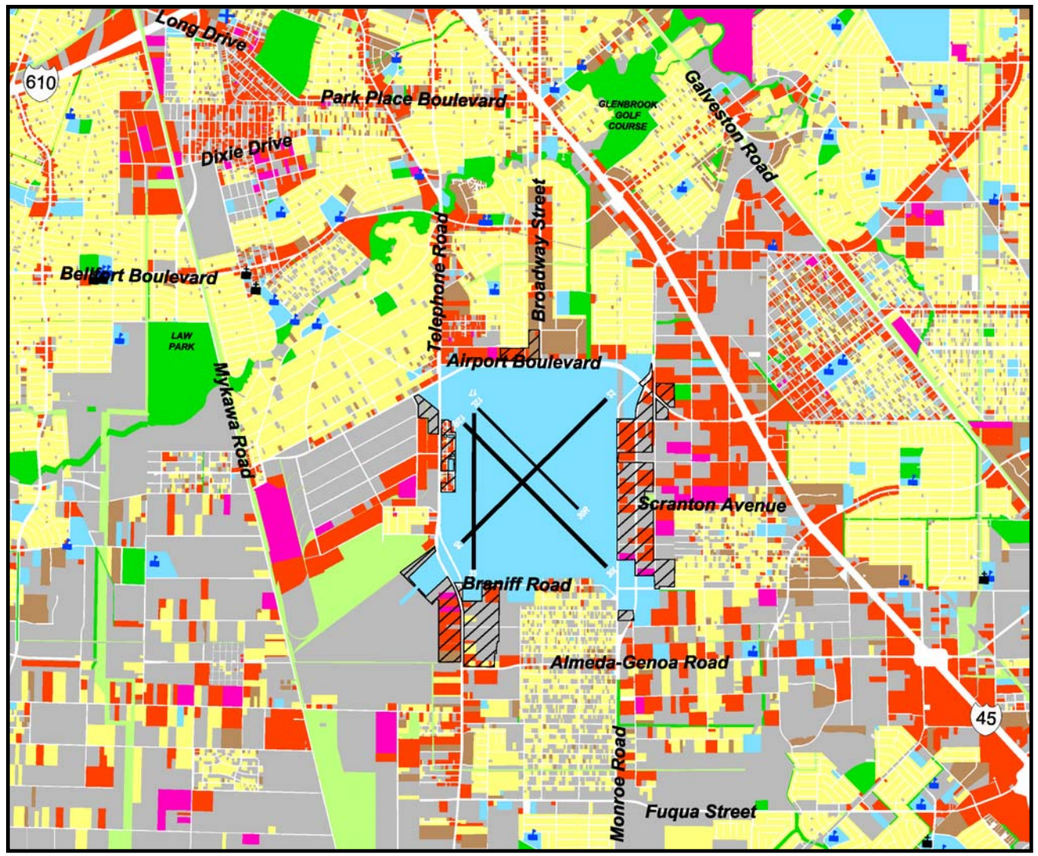


Sources: Houston Airport System, *Airport Layout Plan:* Llewelyn-Davies Sahni, Inc. (windshield survey); USGS internet query; Harris County Appraisal District.
Prepared by: Ricondo & Associates, June 2003.

2022 Aircraft Noise Contours - Future Airport Layout

0 4,000 ft. north

Exhibits 9-5 and 9-6



Sources: Houston Airport System, *Airport Layout Plan:* Llewelyn-Davies Sahni, Inc. (windshield survey); USGS internet query; Harris County Appraisal District.
Prepared by: Ricondo & Associates, June 2003.

0 4,000 ft. north

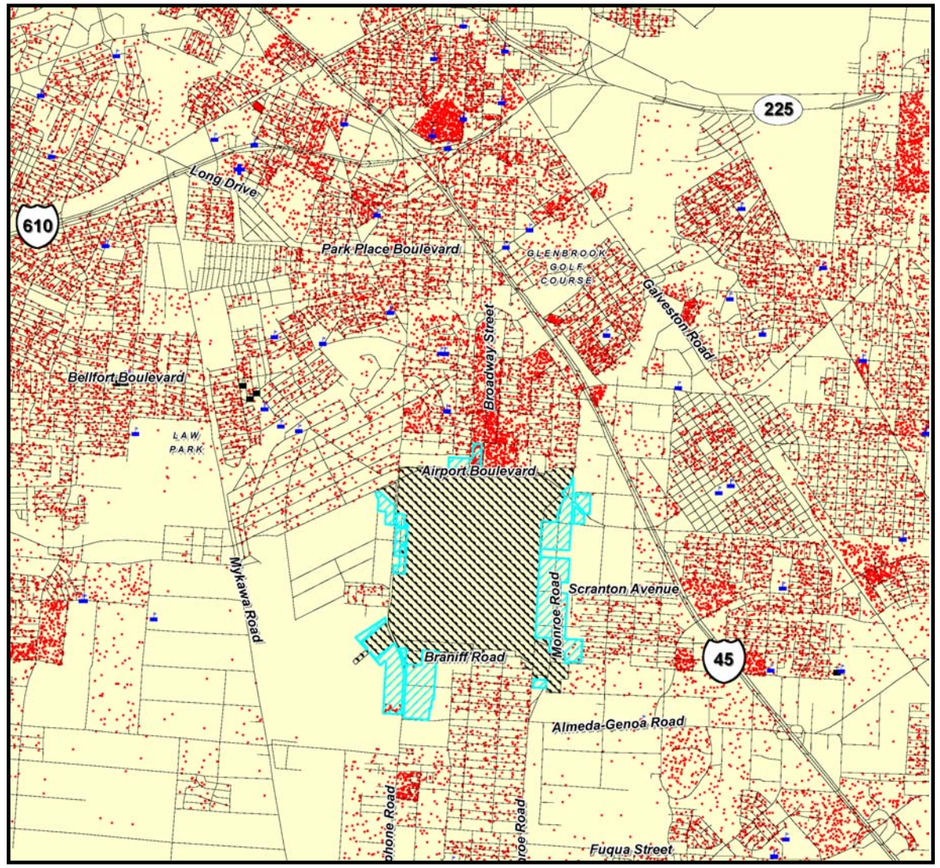
Proposed Land Acquisition

LEGEND

- Single-Family Residential
- Multi-Family Residential
- Parks & Recreation
- Institutional
- Commercial
- Industrial
- Undeveloped
- Utility
- Proposed Acquisition Areas
- School
- Religious Facility
- Hospital

LEGEND

- One dot equals ten people
- Airport Property
- Proposed Acquisition Areas
- School
- Religious Facility
- Hospital

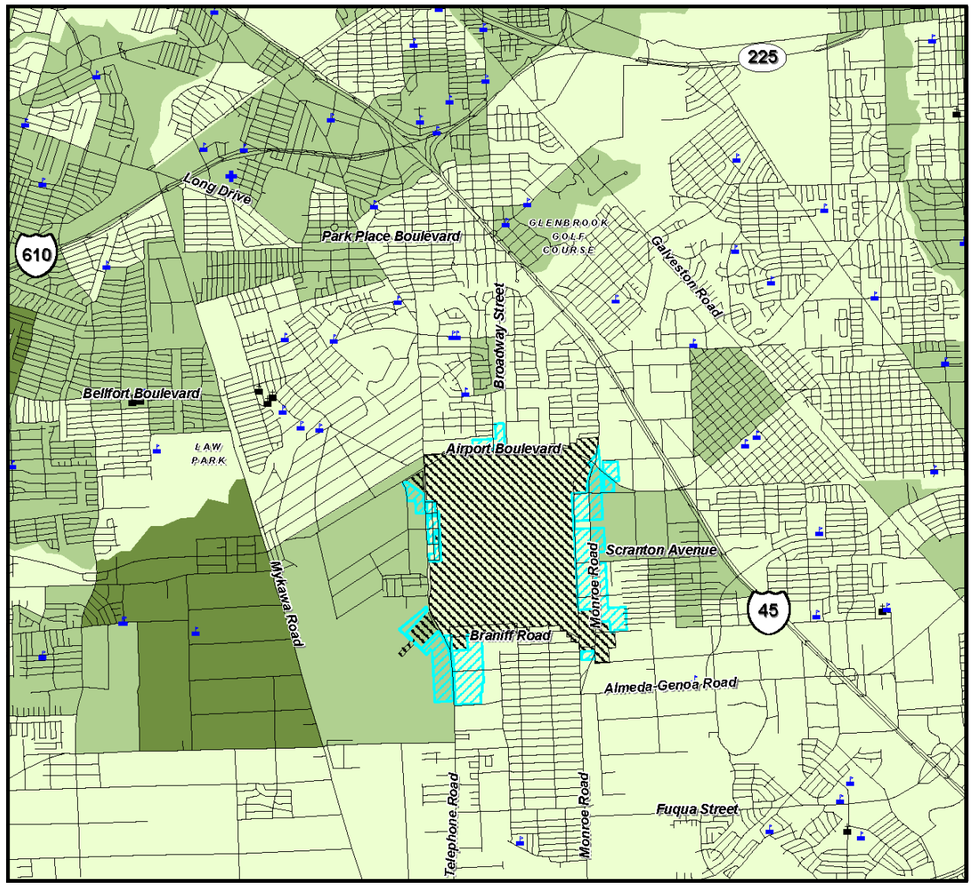


Source: Census TIGER/Line 2002 Data
Prepared by: Ricondo & Associates, Inc.

north
0 5,000 Feet

Population Density

Exhibits 9-7 and 9-8



Source: Census TIGER/Line 2002 Data
Prepared by: Ricondo & Associates, Inc.

0 north 5,000 Feet

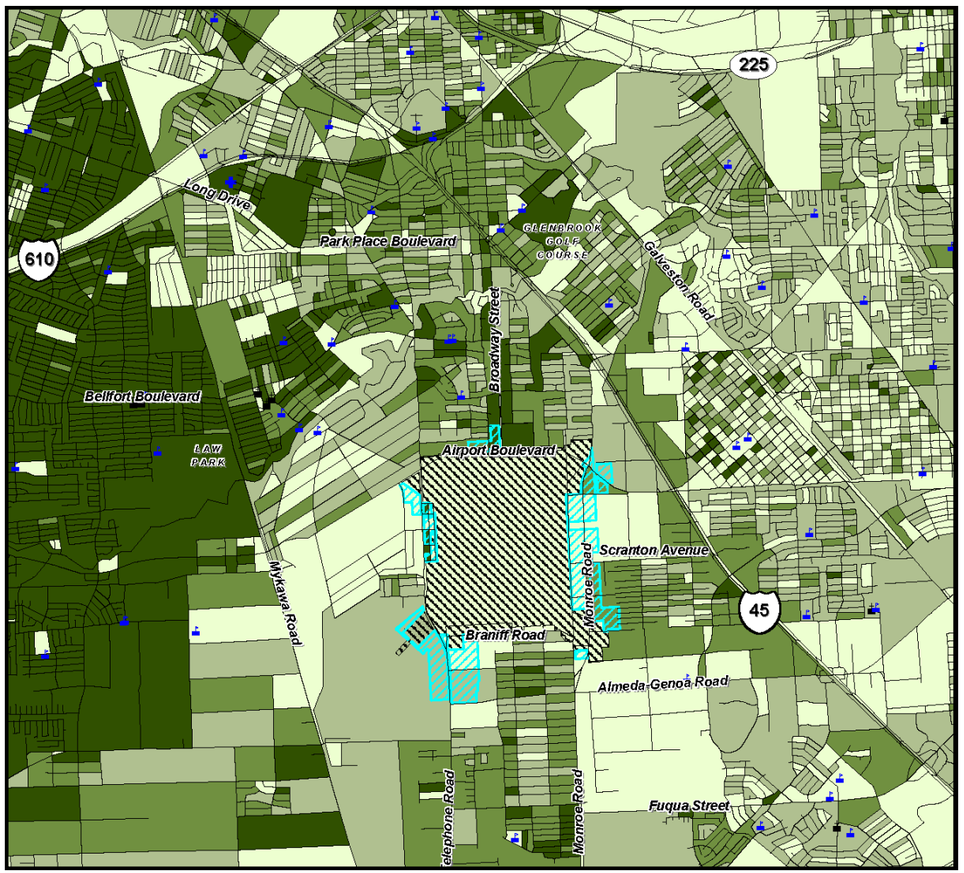
Population Living in Poverty

LEGEND

- 0%-25% Population Living in Poverty
- 25%-50% Population Living in Poverty
- 50%-75% Population Living in Poverty
- 75%-100% Population Living in Poverty
- Airport Property
- Proposed Acquisition Areas
- School
- Religious Facility
- Hospital

LEGEND

- 0%-25% Minority Population
- 25%-50% Minority Population
- 50%-75% Minority Population
- 75%-100% Minority Population
- Airport Property
- Proposed Acquisition Areas
- School
- Religious Facility
- Hospital



Source: Census TIGER/Line 2002 Data
Prepared by: Ricondo & Associates, Inc.

0 north 5,000 Feet

Minority Population

- Realign Braniff Street prior to the relocation/extension of Runway 17-35 to maintain access to Telephone Road. The new routing would begin just west of the HFD fire training facility and turn south to connect to Almeda-Genoa Road. Almeda-Genoa Road provides direct access to Telephone Road.
- Relocate Monroe Road further to the east approximately to the alignment of Berry Creek. Move the intersection of Monroe Road and Airport Boulevard to the east and reconfigure it during the roadway relocation to allow for additional capacity. This change would require that improvements to the Berry Creek channel be incorporated in the roadway design.

These roadway improvements would result in some alterations to current surface traffic patterns in the vicinity of the Airport. However, improvements on the north side are proposed to increase the operating efficiency of the roadways.

9.3.3 Disruption of Established Communities

Master Plan projects would not disrupt the larger, neighborhood developments around the Airport. It would however, displace the multi-family complex north of the Airport Boulevard, as well as the trailer park southwest of the Airport along Telephone Road. These are established residential areas. It is not anticipated that the displacement of these communities would have a detrimental effect on the overall larger neighborhoods, of which these two areas are a part.

9.4 Induced Socioeconomic Impacts

It is anticipated that the recommendations of the Master Plan will positively contribute to the business and overall economic climate of the area. The relocation of businesses and residences is expected to be accommodated in undeveloped parcels surrounding the Airport or within the Airport environs. Expansion of Airport facilities will increase Airport employment levels. The number of Airport employees is expected to increase from approximately 4,110 in 2001 to 7,755 at PAL 3. Tenant growth will create additional jobs. These factors combined will produce an increase in the number of jobs in the area, creating a benefit to the surrounding community.

9.5 Air Quality

Procedures to analyze and evaluate air quality at airports are described in the FAA report entitled *Air Quality Procedures for Civilian Airports and Air Force Bases*[1] and the U.S. Environmental Protection Agency's report *An Air Pollution Impact Methodology for Airports: Phase I*.[2]

[1] Federal Aviation Administration. *Air Quality Procedures for Civilian Airports and Air Force Bases*, Report No. FAA-AEE-97-03, Washington, D.C., April 1997.
[2] U.S. Environmental Protection Agency. *An Air Pollution Impact Methodology for Airports: Phase I*, EPA Report No. APTD-1470, National Technical Information Service, Springfield, VA, 1973.

Existing air quality conditions in the Airport environs and ADP projects requiring air quality assessments are discussed below.

9.5.1 Existing Conditions

The Airport is located in the Houston-Galveston-Brazoria Air Quality Control Region, which is currently designated a severe non-attainment area for ozone. As such, the applicable *de minimis* emission levels are 25 tons per year for Nitrogen Oxides (NO_x) and Volatile Organic Compounds (VOC). NO_x and VOC are "ozone precursors" and their emissions are regulated in order to control the creation of ozone.

9.5.2 Projects Requiring Air Quality Assessments

Table 9-4 presents a list of the ADP projects, by phase, and the type of air quality assessment that will most likely be required for the project to receive FAA approval. Most of these air quality assessments would be performed as part of future EAs or EISs, although some may be performed independently based on the actual timing of implementation for each project. As shown in Table 9-11, it is expected that four different types of air quality assessments may be required for the ADP projects, depending on the size and type of the project.

9.6 Water Quality

A comprehensive Storm Water Pollution Prevention Plan exists for Hobby. When a specific project is planned, an approved storm water plan to control pollution and erosion must be developed. Since the area directly surrounding the Airport is already developed, drainage systems are in place to accommodate storm water runoff. The Airport area is closely monitored for the collection and treatment of liquid and solid wastes. However, with flooding that occurs during heavy rain events, particularly on the east side of the Airport, HAS and the City of Houston are concerned about ensuring that adequate detention is provided in association with new development.

Expansion plans related to future development is not expected to affect current drainage systems. However, future construction to improve or move Monroe Road may require the development of drainage system connections to drainage basins and runoff areas east of Monroe Road.

9.7 Department of Transportation, Section 4(f)

Section 4(f) of the Department of Transportation Act of 1966 specifies that transportation projects cannot take land from public parks, historic sites, or wildlife refuges without first determining that there is no reasonable and prudent alternative. Takings can include physical acquisition of lands or significant environmental impacts to such lands due to noise, pollution, etc., which make the lands unsuitable for their desired use. No schools or parks are within the proposed acquisition areas southwest of the Airport along Telephone Road. These are established residential areas. It is not anticipated that the displacement of these communities would have a detrimental effect on the overall larger neighborhoods, of which these two areas are a part.

9.8 Historic, Architectural, Archaeological, and Cultural Resources

The original passenger terminal and U.S. Customs Building, as depicted in **Exhibit 9-9**, is the most recognized structure on the Airport with historic and architectural significance. This structure is on the registry of the Texas Historical Commission. This two story, open floor plan building was built in 1937 as the primary facility for processing departing and arriving passengers. The Houston Aeronautical Heritage Society has been renovating the facility, and the 1940 Air Terminal Museum was opened in early 2004. The Museum is being restored to its original conditions and will also eventually house a restaurant. The terminal building is not currently listed on the National Registry of Historic Places (NRHP). The building is located on Airport property and within the DNL 65 noise exposure contour. However, since the terminal building is not listed on the NRHP, it is considered a compatible land use with regard to noise. Future development of the building as a museum for public visitation may lead to further consideration of adding the museum to the NRHP, which could require actions under Section 4(f) of the Department of Transportation Act.

9.9 Biotic Communities

The Airport environs are dominated by urban development. Biotic communities are associated with these areas of previous urban development. Therefore, any acquisition and development of these previously developed parcels of land will not affect any biotic communities.

Based on a June 19, 2003, field reconnaissance of the areas subject to land acquisition and Airport property expansion, it was determined that the areas are primarily vacant grass lots of the prairie and woodlot types, and industrial buildings or properties. Therefore, it is not anticipated that the biotic communities in the undeveloped lots are rare or endangered, or that these areas are habitats for rare or endangered species.

Table 9-4

Airport Development Plan Projects – Air Quality Analysis Required

Project	Air Quality Analysis			
Phase 1 (2003-2007)	Emissions Inventory – Operational Emissions	Emissions Inventory – Construction Emissions	NAAQS Assessment – Hot Spot Analysis	NAAQS Assessment – General
SCI Taxilane		√		
Taxiway Improvements		√		
Taxiway H Extension		√		
Drainage Master Plan				√
Category II/III ILS Installation		√		
Terminal Roadway Improvements	√	√	√	
Belly Freight Facility		√	√	
Land Acquisition				
Remote Parking Garage		√		
Obstruction Removal (HAS Cost-O&M or Center Point)		√		
Braniff Road Realignment		√	√	
Fauna Street		√	√	
Monroe Road Right Turn Lane		√	√	
Intersection Improvements			√	
Phase 2 (2008-2012)				
Perimeter Road and Fence		√		
Runway 17-35 Relocation/Extension	√	√		
Northwest Airfield Reconfiguration	√	√		
Helipad Development	√	√	√	√
Land Acquisition				
East Terminal Parking Garage Reconstruction		√		
Terminal and Curbfront Improvements	√	√	√	
Taxiway J		√		
Ceremonial Museum Entrance		√		
Phase 3 (2013-2017)				
Transportation Center	√	√	√	
West Parking Garage		√		
Co-Location of Rental Car Facilities		√		
West Monroe Road and Freeland Street Closures	√	√	√	
Runway 12L-30R Upgrade	√	√		
Land Acquisition				
Perimeter Road and Fence		√		
Phase 4 (2018-2022)				
Relocation of the ARFF Station		√		
Belly Freight Facility		√		
Runway 4R-22L	√	√		√
Runway 30R Threshold Relocation		√		
Monroe Road Realignment	√	√	√	
Perimeter Road and Fence		√		
West Concourse Terminal Expansion	√	√	√	

Source: Ricondo & Associates, Inc., July 2003
Prepared by: Ricondo & Associates, Inc.

Exhibit 9-9

Original Terminal

Source: Site visit, Houston Cultural Society, Houston Executive Air Services, HOU MAP 1977
Prepared by: Quadrant Consultants Inc., May 2002

9.10 Endangered and Threatened Species of Flora and Fauna

The U.S. Fish and Wildlife Service (USFWS) is the primary agency responsible for determining which species are threatened or endangered with regard to extinction, and providing for their continued survival. The USFWS was contacted for a list of information on threatened and endangered species to determine if the proposed projects would affect the listed species. According to the USFWS, no threatened or endangered species would be affected by implementation of the proposed projects.

9.11 Wetlands

Wetlands were previously identified both within and outside the existing Airport boundary. Field reconnaissance failed to locate most of these wetlands. The remaining wetland that was observed during field reconnaissance is located outside Airport property on the west side of Telephone Road south of Airport Boulevard. It is about 30 feet in diameter, or about 0.02 acre.

Potential wetlands were identified within the proposed acquisition areas and the future Airport boundary by the use of color infrared aerial photographs. Wet signatures were illustrated on the east side of the study area. Approximately 0.34 acre of potential wetland area was identified in the future Airport property boundary. However, this estimate is based on the review of dated infrared aerial photographs

(1995) and therefore, does not consider recent developments. Field verification would be required to determine the impacts to wetlands.

9.12 Floodplains

Executive Order 11988, Floodplain Management, requires federal agencies to avoid or minimize activities that directly or indirectly result in developing floodplain areas. The City of Houston is a participant in the National Flood Insurance Program. Federal Emergency Management Agency (FEMA) maps, as depicted in **Exhibit 9-10**, were reviewed to determine if the Airport property is in a floodplain. According to the Flood Insurance Rate Map, Number 48201CO895J (revised November 6, 1996), part of the eastern half of the Airport along Monroe Road is in the 100-year floodplain of Berry Creek, which is east of and parallel to Monroe Road. Areas with a one percent chance of being flooded in any given year are defined as being within the 100-year floodplain. Approximately 194 acres of Airport property are currently located within the 100-year floodplain of Berry Creek, and an additional 220 acres of property are proposed to be acquired for the ADP. Therefore a total of 414 acres of Airport property is projected to be in the 100-year floodplain by the end of the planning period.

Prior to development commencing in a floodplain, a floodplain impact study must be completed for the area. In the event that the development would cause an increase in the 100-year flood elevation, a Letter of Map Revision (LOMR), based on the floodplain impact study, would be prepared showing the new floodplain lines. FEMA and the Harris County Flood Control District (HCFCD) must approve the LOMR before development would be allowed to continue.

9.13 Coastal Zone Management Program

The Texas Coastal Management Plan, administered by the Texas General Land Office, manages coastal resources along the Texas Gulf Coast. Projects for which State support is sought must be consistent with the Coastal Management Plan. The Airport is not within the area covered under the Coastal Management Plan and, therefore, Airport expansion will not affect the coastal zone management program.

9.14 Coastal Barriers

In Texas, coastal barriers are those narrow islands or margins along the Texas Gulf Coast with active dunes (or structures built to replace them). These barriers are managed to prevent beach erosion. The Airport is not on a coastal barrier. Therefore, the projects will not affect coastal barriers.

9.15 Wild and Scenic Rivers

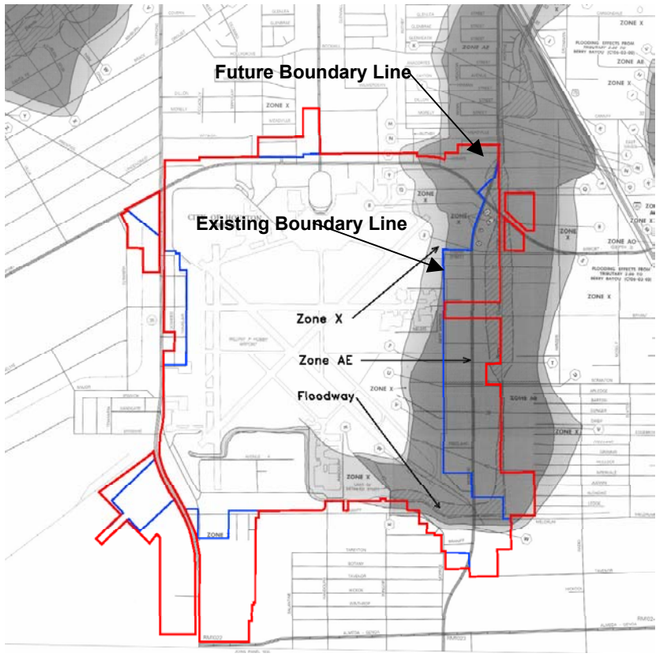
Wild and scenic rivers are designated by the U.S. Department of the Interior to protect the most beautiful and unspoiled rivers in the nation under the Wild and Scenic River Act. Such rivers are so designated because of their beauty, historic and natural sources, aquatic and wildlife habitats, and geological values. Only one river in Texas – the Rio Grande at Big Bend – is designated a wild and scenic river. The Airport is not located near this river. Therefore, expansion will not affect a designated wild and scenic river.

9.16 Farmland

Preservation of prime farmland is a priority goal for the U.S. Department of Agriculture, and projects with federal support must be assessed as to their affect on prime farmland. The Airport is primarily located in a commercial and industrial area of Houston. No farmland is on or adjacent to the Airport. Therefore, no impact to farmland will occur due to Airport expansion.

Exhibit 9-10

National Flood Insurance Program Map – Federal Emergency Management Agency



Notes : Zone AE – 100-Year Floodplain
Zone X – 500-Year Floodplain

Source: Federal Emergency Management Agency, 1996
Prepared By: Quadrant Consultants, Inc., May 2002

9.17 Energy Supply and Natural Resources

The Airport is not an energy-producing facility, nor does it produce mineral resources. The effects of Airport development on energy and natural resources are generally related to the amount of energy required for stationary facilities (i.e., terminal building cooling or heating equipment, electrical lighting for interior and airfield, and approach or radar control systems), and movement of aircraft and ground vehicles. The energy and natural resource providers for the Airport will be able to meet the future demand for energy at the Airport.

9.17.1 Electricity

Reliant Energy is the sole provider of electricity for the Airport. Reliant provides electrical power to the Houston Airport System and to all the on- and off-Airport customers. Reliant is capable of providing electrical power for the Airport and tenants for over the next 100 years without adding new power generation sources. As part of the recommended Master Plan CIP and the Terminal Expansion Project, the HAS has coordinated with Reliant regarding near and long term development plans.

9.17.2 Petroleum-based Fuels

The Airport is a major consumer of petroleum-based fuels for aircraft and ground-based equipment. The Airport fuel suppliers were contacted with reference to future fuel demands by airlines and FBOs at the Airport. The suppliers were asked if annual forecasts of Airport traffic and demand for more fuels would limit their abilities to provide adequate quantities of fuel to maintain a normal operation of aircraft and ground equipment. Each supplier, based upon current supply, reserves, and production, and current availability of fuel statistics, indicated that supplies would more than adequately meet future demand.

9.18 Light Emissions

The major sources of light emissions at the Airport are the terminal buildings, runway lights, and parking lots. Light emissions typically are caused by a project during two separate time periods, construction and operation. While some airfield construction operations may occur at night, lights will be localized and shielded to reduce interference with ongoing flight activity. Areas in which nighttime construction would occur are the northwest airfield and at runway intersections, the extension/relocation of Runway 17-35, the upgrade to Runway 12L-30R, and the construction of Runway 4R-22L. These areas are removed from residential areas, so light emissions should not affect those areas. Additional projects of concern are the Parking Garage north of Airport Boulevard and the METRO Stop. It is not anticipated that nighttime construction would occur for those projects; however, once the facilities are operational, they will be lit during nighttime hours. Operation of the proposed projects will be in accordance with all State and local ordinances regarding light emissions in the same manner as

currently occurs at the Airport. As such, light emissions are not expected to be a concern with implementation of the proposed projects at the Airport.

9.19 Solid Waste and Hazardous Materials

The Airport currently generates about 6,530 tons of solid waste per year. Solid waste concerns the Airport and the surrounding community in two ways. The first is disposal to secure and regulated disposal sites. The second is the effect of larger quantities of solid waste in the future due to Airport improvement projects on the disposal sites serving the Airport.

9.19.1 Municipal Solid Waste Landfill Sites

Municipal Solid Waste Landfills (MSWLF) attract a wide range of wildlife taking advantage of refuse as a food source. MSWLF sites near an airport pose a potential hazard to aircraft operations because they tend to attract birds that feed on rodents and other food sources found at these sites. Birds flying or migrating to and from the area can cross into the arrival and departure path of an aircraft and impede the overall safety of the flight.

The Airport's solid waste is disposed of by the BFI Corporation from four 30-yard compactors and three 30-yard open topped disposal units. The refuse is collected on either an on-call or scheduled service for one of the compactors. The refuse is taken to McCarty Landfill at 11013 Old Beaumont Highway, Houston, TX. This MSWLF is located over 14 miles away from the Airport. There are no other landfills within the vicinity of the Airport; aircraft traffic at Hobby is not affected by wildlife attracted by MSWLF.

9.19.2 Hazardous Materials

According to the HAS Environmental Department, there has been no documented incident of hazardous materials being dumped at the Airport. However, several out-of-service underground fuel tanks may have leaked fuel or oil over the years. The City of Houston is currently removing all these tanks and reporting any pertinent findings to the Texas Commission on Environmental Quality. The City contracted out the removal during 2002 and 2003 of two 20,000-gallon tanks and two 10,000-gallon tanks from Fletcher Aviation, located on the south side of the Airport. The City is also in the process of removing two other 20,000-gallon tanks from the Houston Aeronautical Fuel Farm. In the mid-1950s, one of the Airport's main underground fuel tanks, located on the ramp just south of Houston Executive Air Services, was abandoned and filled with sand.

Additionally, it is assumed that detailed records were not kept for some of the older areas of the Airport around the hangar areas on the east side of the Airport. Therefore, a detailed inventory and investigation following local, State, and federal environmental guidelines will likely be required during the land acquisition phases of the Master Plan CIP to ensure compliance with the disposition of hazardous materials.

9.20 Construction

Construction activities can create impacts at the construction site and in the surrounding area. These impacts are generally temporary in nature, and subside once construction is completed. Through prudent engineering and construction practices, construction impacts associated with the proposed project can be minimized. The affected environmental categories include air quality, noise, water quality, and solid and hazardous waste. The traffic can also affect the environment.

9.20.1 Air Quality

Construction activities can affect air quality in the Airport environs in two ways: (1) construction equipment emissions of relevant criteria pollutants and (2) fugitive dust from demolition, construction, and material and waste hauling. For each of the construction projects associated with the Master Plan CIP a general conformity analysis will be necessary. The effect on air quality from construction activity is temporary and air quality assessments will determine if there is an impact to the air quality of the region with implementation of the proposed projects.

9.20.2 Noise

Noise would be generated during construction by on-site equipment and heavy vehicles entering and leaving the construction site. All construction would remain on Airport property and would not be expected to affect any of the residential areas or other noise sensitive land uses in the Airport environs.

9.20.3 Water Quality

Construction activities can cause erosion or siltation mainly due to storm water runoff. A National Pollutant Discharge Elimination System (NPDES) construction permit application, which is required for all construction areas of five acres or more, must be filed with EPA Region 6 for all construction activities related to the proposed projects. As part of the NPDES permit application, a construction Storm Water Pollution Prevention Plan will also be prepared. This plan will document the erosion and siltation control measures, including the use of silt screens, hay bales, other sediment control measures, and other "best management practices" that would be taken to protect water quality during construction.

9.20.4 Solid and Hazardous Waste

Construction of the different phases of the proposed projects will result in the generation of a limited amount of solid waste from the excavation of materials. This material will be removed from Airport property and disposed of in the appropriate landfill. The proposed project construction is not expected to result in the excavation of any hazardous material.

9.20.5 Traffic

Construction of the roadways and intersections would involve a temporary inconvenience to users of the specified roadways. Construction activities would be timed and managed to have the least affect during heavy traffic periods and would be performed according to all Texas Department of Transportation standards to minimize the effects on the Airport environs.

Construction traffic would be expected to access the Airport via non-residential roads. Traffic should be routed along major thoroughfares wherever possible. Entrances and exits should be located along Telephone or Monroe Road to minimize disruption. Construction traffic should be minimized along the south side of the airfield to limit disturbance to the residential area south of Hobby.

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