Chapter 2
Assessment of Existing Conditions

Chapter 2
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2.1 INTRODUCTION

This chapter includes a broad range of information on existing facilities and operations at George Bush Intercontinental Airport/Houston (hereinafter referred to as the Airport, or IAH), that provides useful data for the planning effort. This information will be used in subsequent master planning elements, including the analysis of facility requirements based on forecast aviation demand.

2.2 AIRFIELD AND AIRSPACE

This section provides an overview of existing airfield facilities at the Airport as well as an overview of the airspace structure and air traffic control procedures.

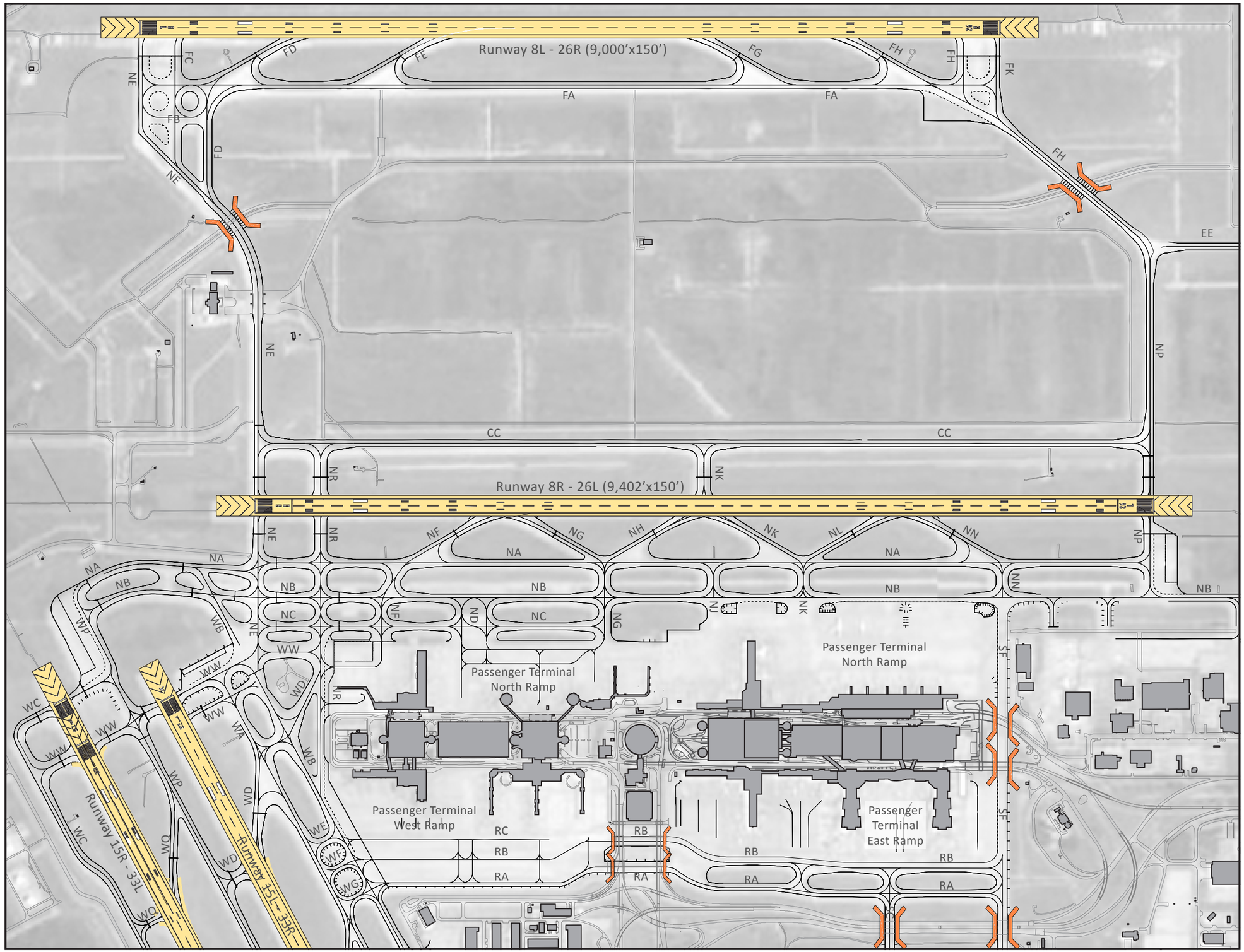
2.2.1 Airfield

The airfield is depicted on Figures 2-1, 2-2, and 2-3, and it consists of runways, taxiways, apron areas, and other facilities, as discussed below. Airfield facilities meet Airport Reference Code (ARC) D-V criteria—meaning the runways and taxiways can accommodate air carrier aircraft with approach speeds up to 165 knots and wingspans of up to 214 feet—with limited exceptions. Airplane Design Group (ADG) V aircraft include the Boeing 777-200/300 and Boeing 747-400, among others.

Currently, not all airfield facilities meet design requirements for ADG VI, which includes the Airbus A380 and the Boeing 747-8. The FAA has recently completed studies that define the conditions under which ADG VI aircraft can be safely operated on runways and taxiways designed to ADG V standards until improvements can be made to upgrade runway and taxiway pavements to ADG VI standards. The Airport has prepared an Operations Plan for A380 aircraft operations at IAH, which outlines operational procedures for ADG VI aircraft operations to meet FAA guidelines to accommodate A380 traffic.

2.2.1.1 Runways

The airfield consists of five runways and associated taxiways. Runway data, including key airfield dimensions and navigational aids, are summarized in Table 2-1.



LEGEND

- Airfield bridges
- Buildings
- Runway pavement
- Taxiway pavement

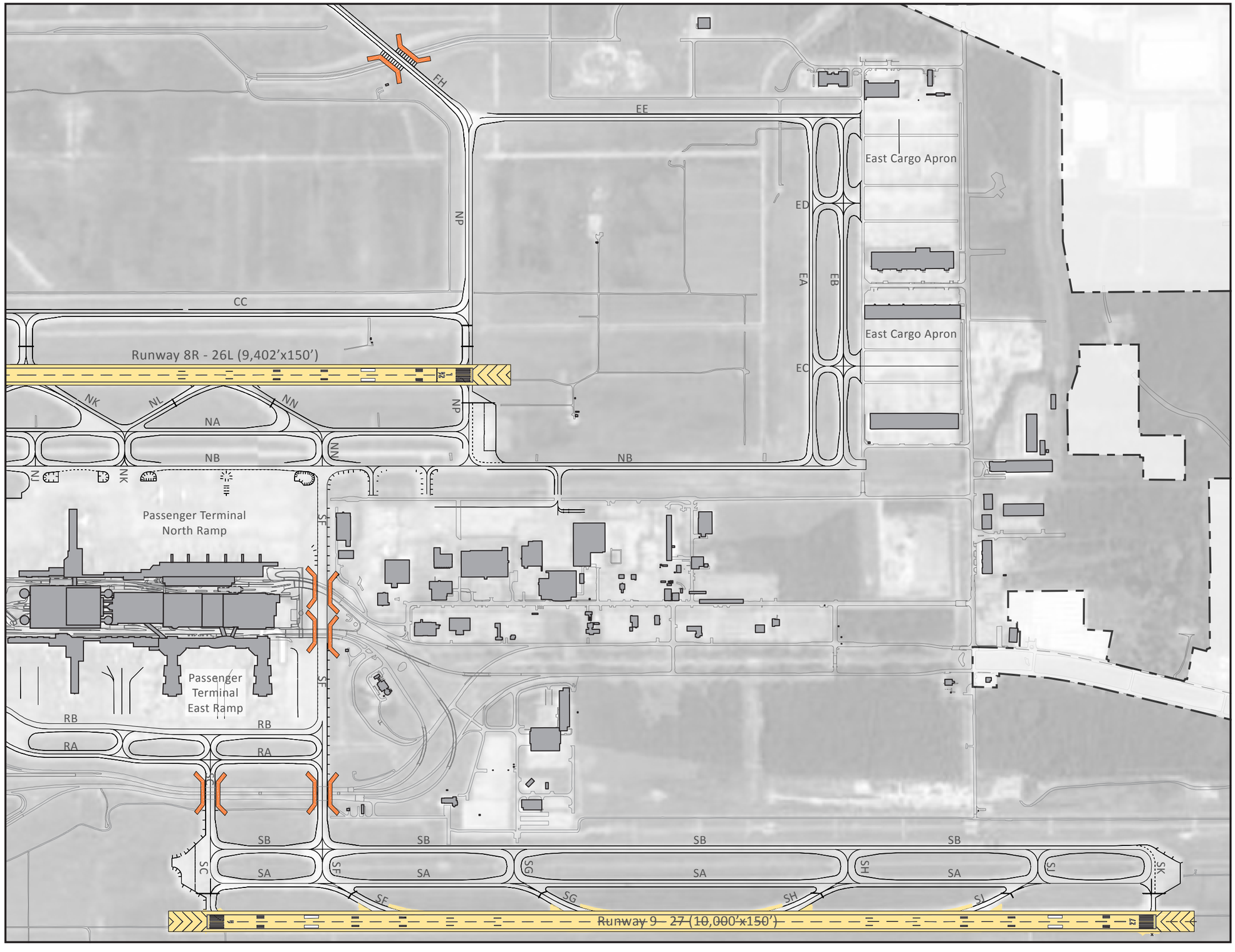
Leigh|Fisher

0 500′ 1000′

N

Source: Source: HAS Records &
IAH Airport Layout Plan, August 2006
Prepared by: Leigh|Fisher
December 21, 2012

Figure 2-1
Airfield Facilities
North Airfield



LEGEND

- Airfield bridges
- Buildings
- Runway pavement
- Taxiway pavement

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Source: Source: HAS Records &
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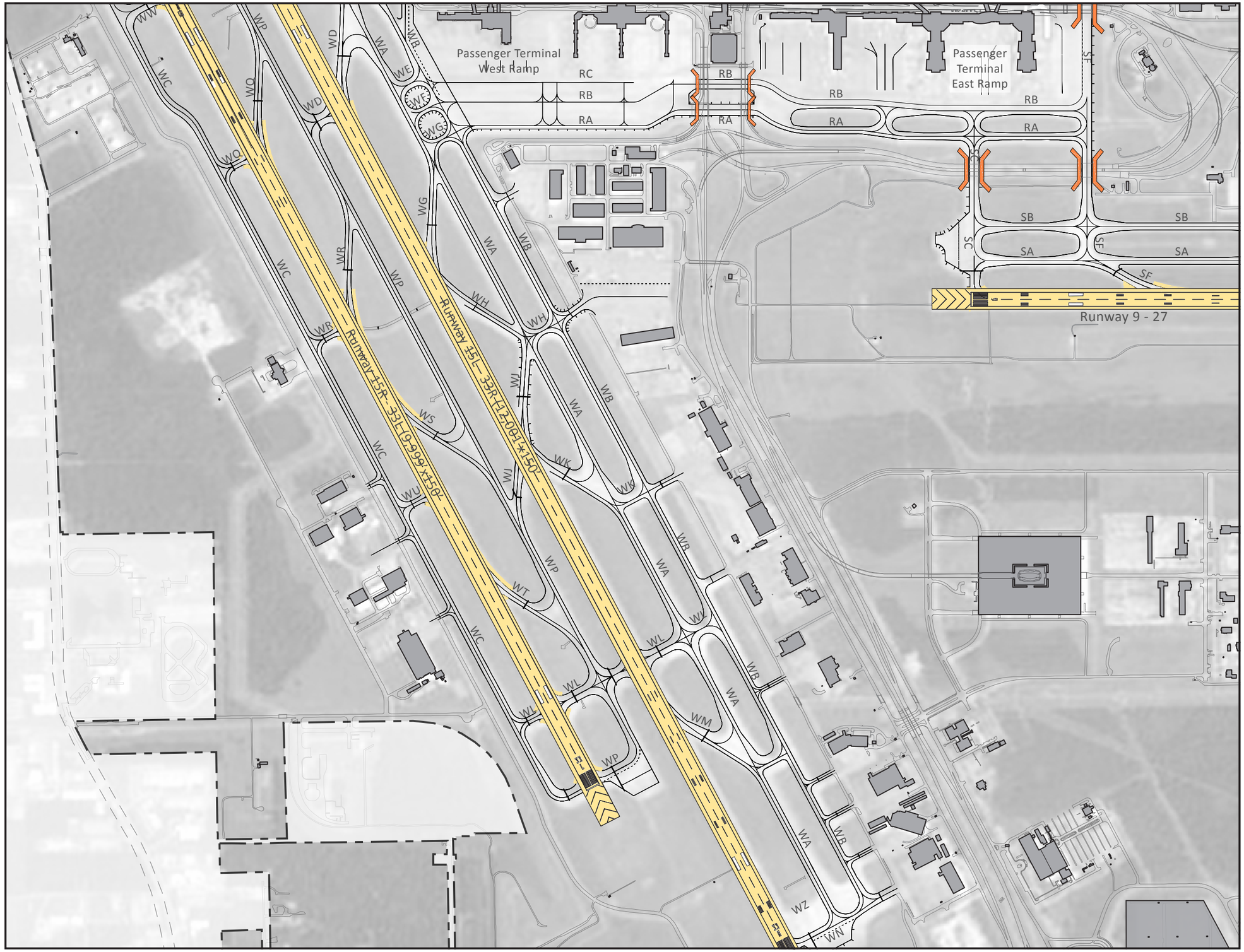
Figure 2-2
Airfield Facilities
South Airfield



LEGEND

- Airfield bridges
- Buildings
- Runway pavement
- Taxiway pavement

Leigh|Fisher

0 500′ 1000′

N

Source: Source: HAS Records &
IAH Airport Layout Plan, August 2006
Prepared by: Leigh|Fisher
December 21, 2012

Figure 2-3

Airfield Facilities
West Airfield

Table 2-1
RUNWAY DATA

	Runway									
	8L	26R	8R	26L	9	27	15R	33L	15L	33R
Runway length (feet)	9,000	9,000	9,402	9,402	10,000	10,000	9,999	9,999	12,001	12,001
Runway width (feet)	150	150	150	150	150	150	150	150	150	150
Runway end elevation (feet above MSL)	92	95	97	94	92	86	97	88	96	86
Pavement type/friction	PCC/grooved	PCC/grooved	PCC/grooved	PCC/grooved	PCC/grooved	PCC/grooved	PCC/grooved	PCC/grooved	PCC/grooved	PCC/grooved
Pavement strength (000 pounds)										
Single gear	75(S)	75(S)	75(S)	75(S)	75(S)	75(S)	75(S)	75(S)	100(S)	100(S)
Dual gear	210(D)	210(D)	210(D)	210(D)	210(D)	210(D)	200(D)	200(D)	200(D)	200(D)
Dual tandem gear	409(2D)	409(2D)	498(2D)	498(2D)	560(2D)	560(2D)	400(2D)	400(2D)	400(2D)	400(2D)
Double dual tandem gear	873(2D/2D2)	873(2D/2D2)	873(2D/2D2)	873(2D/2D2)	850(2D/2D2)	850(2D/2D2)	873(2D/2D2)	873(2D/2D2)	800(2D/2D2)	800(2D/2D2)
Runway markings	Precision	Precision	Precision	Precision	Precision	Precision	Precision	Non-precision	Non-precision	Precision
Runway lighting	HIRL	HIRL	HIRL	HIRL	HIRL	HIRL	HIRL	HIRL	HIRL	HIRL
Centerline lights	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Approach lighting	ALSF-2	ALSF-2	MALSR	ALSF-2	MALSR	ALSF-2	MALSR	-	-	MALSR
Approach aids	LOC GS	LOC GS	PAPI LOC	PAPI LOC	PAPI LOC	PAPI LOC	PAPI LOC	PAPI	PAPI LOC	LOC GS
Instrument runway status	Instrument	Instrument	Instrument	Instrument	Instrument	Precision	Precision	Visual	Visual	Precision
Instrument approach procedures	ILS CAT. IIIb RNAV(GPS)	ILS CAT. IIIb RNAV(GPS)	ILS CAT. I RNAV(GPS)	ILS CAT. IIIb RNAV(GPS)	ILS CAT. I RNAV(GPS)	ILS CAT. IIIb RNAV(GPS)	ILS CAT. I RNAV(GPS)	- -	- -	ILS CAT. I RNAV(GPS)
Minimum approach decision height (feet above MSL)	92	95	297	94	292	86	297	-	-	289
Minimum approach visibility	600 RVR	600 RVR	1,800 RVR	600 RVR	2,400 RVR	600 RVR	1,800 RVR	Visual	Visual	2,400 RVR

PCC = Portland cement concrete
ALSF-2 = High-intensity approach light system with centerline sequenced flashers
CAT = Category
GPS = Global positioning system
GS = Glide slope
HIRL = High-intensity runway lights
ILS = Instrument landing system
LOC = Localizer
MALSR = Medium-intensity approach light system with runway alignment indicator lights
PAPI = Precision approach path indicator
RNAV = Area navigation
RVR = Runway visual range

Sources: Airport Layout Plan, George Bush Intercontinental Airport, 2006.
FAA Airport Master Record, November 15, 2012.
Federal Aviation Administration, Digital Terminal Procedures Publication (Version 1212), December 2012.

Runway 8L-26R, located on the north end of the airfield, is 9,000 feet long by 150 feet wide. The runway has a concrete surface and is used primarily for arrivals in both east and west flows. There is a full-length parallel taxiway, Taxiway FA, located 600 feet south of Runway 8L-26R.

Runway 8R-26L, north of the passenger terminal complex, is 9,402 feet long by 150 feet wide. The runway has a concrete surface and is primarily used for arrivals in both directions. There are three parallel, full-length taxiways serving Runway 8R-26L, Taxiway CC to the north and Taxiways NA and NB to the south side of the runway. Runway 8R-26L is parallel to and separated by 5,000 feet centerline-to-centerline from Runway 8L-26R.

Runway 9-27, south of the passenger terminal complex, is 10,000 feet long by 150 feet wide. The runway has a concrete surface and is used primarily for arrivals in both east and west flows. There are dual, parallel, full-length taxiways, Taxiways SA and SB, on the north side of the runway. Runway 9-27 is parallel to and separated by 5,760 feet centerline-to-centerline from Runway 8R-26L.

Runway 15L-33R, on the western portion of the airfield, is 12,001 feet long by 150 feet wide. The runway has a concrete surface and is primarily used for departures. There are dual, parallel, full-length taxiways, Taxiways WA and WB, on the east side of Runway 15L/33R.

Runway 15R-33L is 9,999 feet long by 150 feet wide. It is located on the western portion of the airfield, and is parallel to and separated by 1,000 feet centerline-to-centerline from Runway 15L-33R. The thresholds of Runways 15R and 15L are staggered by 499 feet, while the thresholds of Runways 33L and 33R are staggered by 2,500 feet. An enlarged holding pad has been constructed north of Runway end 15R to accommodate separate departures to the south. Taxiway WC is the single parallel full-length taxiway on the west side of the runway. Runway 15R-33L is primarily used for departures.

All runways have 35-foot shoulders per FAA design guidelines for ADG V runways, with the exception of Runway 15L-33R, whose shoulders were increased to 50 feet in 2011 to accommodate ADG VI.

2.2.1.2 Taxiways

Figures 2-1, 2-2, and 2-3 show the location of the taxiways that connect the runway system to the aircraft parking areas. FAA criteria for taxiway width and taxiway shoulder width are defined in terms of the Taxiway Design Group (TDG) of an aircraft, which is a function of undercarriage dimensions. Examples of TDG 6 aircraft include the Airbus A330-200/300, Airbus A340-200/300/500/600, Boeing 777-200/300, Boeing 747-400/8, Boeing 767-400ER, and MD-11, and an example of a TDG 7 aircraft is the Airbus A380.

All taxiways at the Airport are at least 75 feet wide, which is the standard for TDG 6 and 7 aircraft. Taxiway shoulders range from 15 to 25 feet, which is substandard per FAA criteria, which require 35-foot wide shoulders and 40 foot shoulders for TDG 6 and 7 aircraft, respectively. The shoulders of Taxiway WA were widened in 2011 to meet standards for TDG 7 aircraft.

Several taxiways are designated as non-movement areas, including:

- Taxiways RA and RB, and Taxiway SC north of Taxiway SB. These taxiways are under the control of the United Airlines Ramp Tower to better manage the flow of their aircraft.
- Taxiway SF between Taxiways NB and RB due to line-of-sight issues from the Airport Traffic Control Tower (ATCT). However, it is operated much like a part of the movement area as ATCT staff must meter the flow of taxiing aircraft to avoid head-to-head conflicts since it currently provides the only unrestricted crossfield taxiing capability.

2.2.1.3 Non-Conforming Airfield Conditions

The following is a list of operational agreements with the ATCT likely because of physical limitations on the airfield.

- Taxiway NR between Taxiway WD and Taxiway WB is restricted to Boeing 757 without winglets (wingspan of 125 feet) or smaller aircraft.
- Taxiway WC west of Runway 15R-33L is restricted to Boeing 737 (wingspan of 118 feet) or smaller aircraft.
- Taxiway NA between Taxiway NE and Taxiway WP is restricted to Boeing 757 or smaller aircraft when Runway 26L is being used for departures.

Other restrictions in place are listed below.

- Taxilane RC is restricted to aircraft with wingspans smaller than 135 feet.
- Interim operation of ADG VI aircraft on runways and taxiways not currently meeting ADG VI pavement sections and/or lateral separations:
  - ADG VI can operate on Runways 8L-26R, 8R-26L, despite the substandard shoulder width of 35 feet;
  - ADG VI aircraft are not authorized to land or depart on Runway 9-27;
  - Taxiway restrictions due to lateral clearance: Taxiway NB between Taxiways SF and NJ; Taxiway NB west of Taxiway NE (i.e., Taxiway NA closed when ADG VI present); Taxiway WB between Taxiways WD and WH; and Taxiway SF between Taxiway NB and Gate D12;
  - Hold pad closures occur at the ends of Runways 15L and 15R when ADG VI aircraft are present.

2.2.1.4 Apron Areas

As presented on Figures 2-1, 2-2 and 2-3 there are several aircraft apron and parking areas located throughout the airfield.

- **Passenger Terminal North Ramp**—The Passenger Terminal North Ramp is located on the north side of the passenger terminal complex and serves the northern airside buildings of Terminals A, B and C, as well as Terminal D. It is approximately 5,797,000 square feet (644,000 square yards), which includes the taxilanes necessary for aircraft circulation. Aircraft ranging in size from small commuter to large widebody aircraft park on the north ramp to load and unload passengers and belly cargo. Airfield access is provided via Taxiways NA through NN.
- **Passenger Terminal East Ramp**—The Passenger Terminal East Ramp is located on the south side of the passenger terminal complex and provides aircraft parking positions for the southern airside building of Terminal C as well as Terminal E. It is approximately 2,668,000 square feet (296,000 square yards). Airfield access is provided via Taxiways RA, RB, and SF as well as at intersections SC and R2.
- **Passenger Terminal West Ramp**—The Passenger Terminal West Ramp is located on the south side of the passenger terminal complex and serves the southern airside buildings for Terminals A

and B. It is approximately 3,335,000 square feet (370,000 square yards). Airfield access is provided via Taxiways RA, RB, and RC as well as at intersections WD, WE, WF and WG.

- **East Cargo Apron**—The cargo apron is located on the east side of the airport campus and is accessible via Taxiways EE and NB. The apron provides 2,561,000 square feet of aircraft parking space (285,000 square yards).

- **Central Cargo Apron**—The apron is located east of Runway 15L-33R, accessible via Taxiway WH. The apron provides 740,000 square feet of aircraft parking space (82,000 square yards).

- **General Aviation Apron**—The Landmark Aviation fixed base operator (FBO) aircraft parking apron is 219,000 square feet (24,300 square yards) and located west of Runway 15R-33L, accessible via Taxiway WC. The Atlantic Aviation FBO aircraft parking apron is 642,000 square feet (71,300 square yards)) and located east of Runway 15L-33R. The Atlantic Aviation FBO apron and facilities can be accessed by Taxiway WK. Both aprons are used for general aviation operations and itinerant and based aircraft parking.

2.2.1.5 Airfield Structures

Eight taxiway bridges connect the north and south sides of the airfield:

- Taxiway FH: the taxiway provides access to the eastern end of Runway 8L-26R. The bridge spans an airfield service road between Taxiways EE and FA. It can support aircraft weighing up to 1.6 million pounds.

- Taxiway NE: the taxiway provides access to the western end of Runway 8L-26R. The bridge spans an airfield service road between Taxiways FA and CC. It can support aircraft weighing up to 1.6 million pounds.

- Taxilane RB: the taxiway is an east-west connector located south of the passenger terminal complex. The bridge is located immediately south of the Marriott hotel and spans John F. Kennedy Boulevard. It can support aircraft weighing up to 875,000 million pounds.

- Taxiway RA: the taxiway is located parallel to and 267 feet south of Taxiway RB. The bridge can support aircraft weighing up to 1.4 million pounds.

- Taxiway SF North and South bridges: Taxiway SF provides a connection between the north and south airfield and is located immediately to the east of Terminals D and E. Two north bridges span the North and South Terminal Roads while the south bridge spans the Will Clayton Parkway. Each of the Taxiway SF bridges can support aircraft weighing up to 875,000 pounds.

- Taxiway SC: the taxiway provides access to the western end of Runway 9-27. The bridge spans the Will Clayton Parkway and can support aircraft weighing up to 875,000 pounds.

2.2.2 Navigational Aids

Navigational aids enable the Airport to accommodate air traffic, especially during periods of low cloud cover and reduced visibility. The navigational aids installed at the Airport enable aircraft to operate under most weather conditions. In addition to these navigational aids, an FAA ATCT is located east of the passenger terminal complex between Runways 8R-26L and 9-27. A summary of navigational aids and lighting systems that support aircraft operations is provided in Table 2-1, and summarized below.

2.2.2.1 Precision Instrument Approaches

Airport runways allow for precision instrument approach procedures to allow continuous aircraft operations during periods of low visibility. A precision approach utilizes ground- or satellite-based navigational aids to provide pilots with definitive guidance on the horizontal and vertical position of the aircraft. Approaches in place at the Airport include:

- **Area Navigation (RNAV)**—All runway ends except for Runways 33L and 15L have RNAV approaches that utilize pre-determined waypoints and global positioning system (GPS) guidance to enable aircraft to fly point-to-point until reaching the runway. RNAV approaches at the Airport allow pilots to descend to a minimum of 400 feet above threshold elevation before visual contact with the runway must be established in conditions down to 0.75 miles of visibility (varies by runway end).

- **Category I Instrument Landing System (ILS)**—All runways except for Runways 33L and 15L are equipped with a minimum Category I ILS, which allows aircraft approaches to a decision height of 200 feet above ground level (AGL) in visibility minimums of 0.5 mile, varying slightly on each runway taking into account approach-specific parameters.

- **Category II and III ILS**—Runways 8L, 26R, 26L, and 27 are equipped with Category II, IIIa, and IIIb ILS approaches to allow aircraft to land in even the most challenging of visibility conditions. Execution of these approaches requires aircraft to be equipped with specific avionics and pilots to receive additional training. Pilots flying the Category IIIb approach are able to land with a zero-foot cloud ceiling with visibility as low as 600 feet.

2.2.2.2 Approach and Runway Lighting

All runway ends except Runways 33L and 15L are equipped with approach lighting systems that assist pilots in visually recognizing the orientation and touchdown point of the runway during descent. As presented in Table 2-1, Runways 8R, 9, 15R and 33R are equipped with medium-intensity approach light systems with runway alignment indicator lights (MALSR) to support Category I ILS approaches. Runways 8L, 26R, 26L, and 27 are equipped with more-sophisticated high-intensity approach light systems with centerline sequenced flashers (ALSF-2) to allow Category II and III ILS approaches during extremely poor weather and visibility conditions.

in addition, all runways are equipped with centerline lights and high-intensity runway lights along their edges to depict the edge of runway pavement during nighttime and low visibility conditions.

2.2.2.3 Approach Aids

Additional visual and instrument approach aids include the following:

- **Precision Approach Path Indicator (PAPI)**—Runways 8R, 26L, 9, 27, 15R, 33L and 15L are equipped with a PAPI located beside the runway end that provides visual guidance during descent using red and white lights.

- **Very-high Frequency Omnidirectional Range/Tactical Air Navigation Facility (VORTAC)**—The HUMBLE VORTAC is located north of Hardy Toll Road approximately 2,400 feet to the south of the Runway 33L threshold and is used for both en-route navigation and non-precision instrument approaches.

- **Airport Surveillance Radar (ASR)**—The ASR-9 system, which is used to detect and display an aircraft's position within the surrounding airspace, displays range and azimuth information and can provide coverage within a 60-mile radius of the Airport. The Airport's ASR-9 antenna is located west of Taxiway NE between Runways 8L-26R and 8R-26L.

- **Rotating Beacon**—The Airport's rotating beacon is located to the west of Runway 15R-33L. The beacon flashes an alternating green and white light to help pilots locate the airfield at nighttime.

2.2.2.4 Surface Detection

The Airport utilizes airport surface detection equipment (ASDE-X) system, which uses surface radar and multi-lateration sensors to detect aircraft and surface vehicles on the airfield and display position and identification information to air traffic controllers to assist with ground movements. There are two ASDE radar antennas, one located atop the ATCT and the other located on the fuel farm site, to the west of the end of Runway 15R.

The Airport also operates an advanced Surface Movement Guidance Control Systems (SMGCS) that provides for the safe and efficient movement of aircraft on the ground during low visibility operations. The SMGCS is activated at the discretion of air traffic control when visibility falls below 1,200 feet runway visual range. When active, specific airfield lighting on runways and taxiways as well as specific taxi routes are utilized to ensure that aircraft are able to taxi around the airfield.

2.2.3 Airfield Operations

The operational configuration of the Airport's runway and taxiway system is primarily dictated by the prevailing wind and weather conditions. The following paragraphs describe typical wind and weather patterns in the region, as well as the general operating procedures put in place by ATCT and HAS personnel.

2.2.3.1 Weather Coverage

An analysis of Airways Hourly Surface Observations (TD-3505) data from the National Climatic Data Center was conducted to assess the percent occurrence of the various weather conditions for the 10-year period ending December 31, 2011. Weather conditions—namely cloud ceiling and visibility—determine the ATC procedures that can be used at an airport, which in turn affect runway capacity and aircraft delay. Cloud ceiling and visibility levels that govern changes in ATC procedures at the Airport were based on FAA rules, and verified with representatives from the ATCT and HAS staff.

For purposes of the wind and weather analysis, visual meteorological conditions (VMC), marginal visual meteorological conditions (MVMC), and instrument meteorological conditions (IMC) are defined in accordance with FAA guidance and Airport operating procedures, as follows:

- VMC weather is defined as cloud ceilings at least 5,000 feet above ground level (AGL) *and* visibility at least 5 miles. Under these conditions flights are governed by visual flight rules (VFR) meaning pilots use visual references to navigate.

- MVMC weather is defined as cloud ceilings at least 1,000 feet AGL *and* visibility at least 3 miles. Under these conditions flights are governed by VFR; however, the pilots of most high performance aircraft will rely on instrument flight procedures for landing rather than visual approaches.

- IMC weather is defined as cloud ceilings below 1,000 feet AGL *or* visibility less than 3 miles. Under these conditions flights are governed by instrument flight rules (IFR) meaning pilots use instruments to navigate.

in addition, varying levels of IMC were analyzed: Category I, Category II, and Category III conditions, defined as follows:

- Category I is defined as cloud ceilings at least 200 feet but less than 1,000 feet AGL *or* visibility at least 1/2 mile but less than 3 miles.
- Category II is defined as cloud ceilings at least 100 feet but less than 200 feet AGL *or* visibility at least 1/4 mile but less than 1/2 mile.
- Category III is defined as cloud ceilings of less than 100 feet AGL *or* visibility less than 1/4 mile.

As presented in Table 2-2, poor weather conditions (i.e., IMC) in the Houston area occur 6.3 percent annually and the Airport operates under VMC/MVMC approximately 93.7 percent of the time. However, regardless of weather conditions, all air carrier aircraft and many military and high-performance general aviation aircraft generally operate under IFR flight plans.

Table 2-2
WEATHER CONDITIONS

Weather condition	Minima		Occurrence
	Cloud ceiling (feet)	Visibility (miles)	
VMC	5,000	5	75.8%
MVMC	1,000	3	17.9
IMC	<1000	<3	6.3
Category I	200	½	5.4
Category II	100	¼	0.5
Category III	0	0	0.4

VMC = Visual meteorological conditions
MVMC = Marginal visual meteorological conditions
IMC = Instrument meteorological conditions
Category I = IMC weather conditions in which a Category I ILS must be used
Category II = IMC weather conditions in which a Category II ILS must be used
Category III = IMC weather conditions in which a Category III ILS must be used

Source: LeighFisher analysis of Integrated Surface Hourly Data (TD-3505), January 1, 2002 through December 31, 2011, from the National Climatic Data Center.

2.2.3.2 Runway Wind Coverage

Runway wind coverage refers to the percent of time that the crosswinds associated with a particular runway orientation are within an acceptable level. Airport wind coverage is determined by considering all runways simultaneously. Crosswinds—which are the components of wind that flow in a direction perpendicular to a runway's orientation—can effectively close a runway for use if they are outside an acceptable level. The maximum allowable crosswind components for a particular aircraft are determined largely by aircraft size, aircraft weight, and pilot capabilities. In general, larger, heavier air carrier aircraft can land and take off in higher crosswinds than smaller, lighter general aviation aircraft.

The FAA provides guidance regarding wind coverage in their Advisory Circular 150/5300-13A, *Airport Design*, which states the desirable wind coverage for an airport is 95 percent, taking into account various factors influencing operations and the economics of providing the coverage. The 95 percent wind coverage is computed on the basis of the crosswind not exceeding a specific magnitude, which varies by Airport Reference Code. The allowable crosswind for ARC A-IV through D-VI is 20 knots.

Based on this guidance, wind coverage for the east-west runway system (Runway 8-26 and 9-27 direction), and the Runway 15-33 direction, and each of the runways combined was estimated using the following maximum allowable crosswind component conditions:

- 10.5-knot crosswind component represents the crosswind component at which pilots of light general aviation aircraft are unable to use the runways
- 13-knot crosswind component represents the crosswind component at which pilots of twin-engine propeller aircraft are unable to use the runways
- 16-knot crosswind component represents the crosswind component at which pilots of larger, commuter, propeller aircraft and smaller business jets are unable to use the runway
- 20-knot crosswind component represents the crosswind component at which pilots of air carrier jets are be unable to use the runway

Table 2-3 summarizes the wind coverage of the Airport's runways at these crosswind component speeds. These results indicate that the Airport's airfield provides wind coverage in excess of the FAA's 95 percent coverage criteria for all four crosswind components evaluated. In addition, the results of the combined wind analysis indicate the airfield provides beyond 98 percent wind coverage given any of the four crosswind components.

Table 2-3
RUNWAY WIND COVERAGE

Crosswind component	Runway 8-26 and 9-27 System	Runway 15-33 System	Combined
	All weather coverage (28.5% calm)		
10.5 knots	85.0%	96.3%	98.7%
13 knots	91.7	98.5	99.7
16 knots	96.9	99.6	99.9
20 knots	99.4	99.9	100.0
	VMC weather coverage (29.1% calm) *(a)*		
10.5 knots	84.9	96.4	98.8
13 knots	91.7	98.6	99.7
16 knots	96.8	99.7	99.9
20 knots	99.4	100.0	100.0
	IMC weather coverage (19.0% calm) *(b)*		
10.5 knots	86.7	94.5	98.2
13 knots	93.1	97.7	99.5
16 knots	97.5	99.2	99.8
20 knots	99.4	99.7	100.0

Notes: Calm includes all winds below 5 knots; tailwind component is assumed as 5 knots.

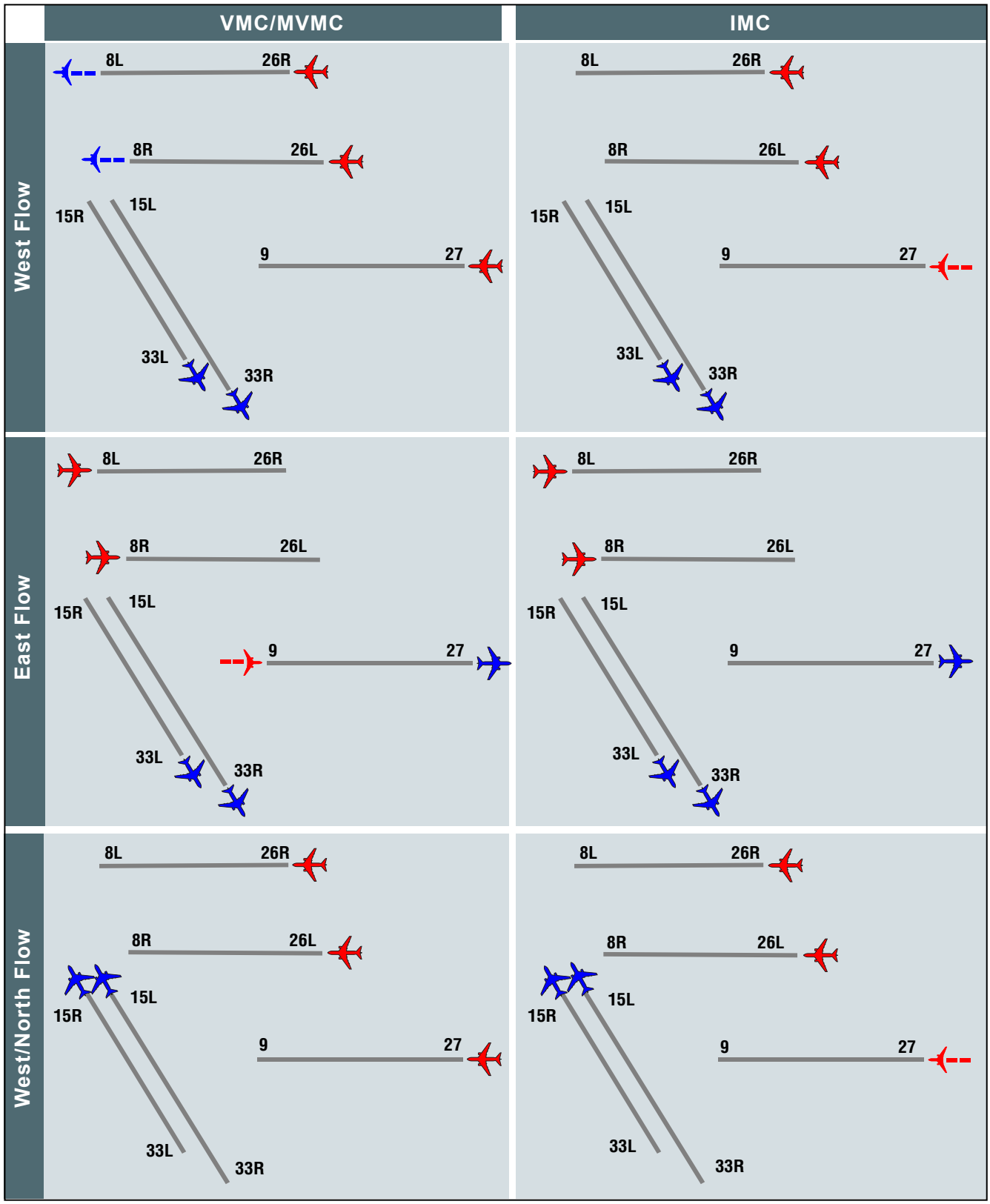
(a) VMC (Visual Meteorological Conditions) defined as a cloud ceiling of at least 1,000 feet and visibility of at least 3 miles.

(b) IMC (Instrument Meteorological Conditions) defined as a cloud ceiling less than 1,000 feet or visibility less than 3 miles.

Source: LeighFisher analysis of Integrated Surface Hourly Data (TD-3505), January 1, 2002 through December 31, 2011, from the National Climatic Data Center.

2.2.3.3 Runway Use Patterns

Direction of air traffic flow is largely dictated by prevailing wind and weather conditions, as well as capacity considerations. The two primary runway operational configurations are west flow and east flow, shown on Figure 2-4. West flow is the preferred configuration during periods of calm winds because it provides a higher capacity than east flow. The active runway configuration is typically switched when the tailwind component exceeds 5 knots. In general, the runways are used either for departures or arrivals at any given time, and mixed operations are not conducted.



Source: Leigh|Fisher, based on discussions with IAH Airport Traffic Control Tower, December 2012

Leigh|Fisher

Notes: Runway 9 arrivals dependent on Runways 15L and 15R departures in all wheather conditions. Runway 27 arrivals dependent on Runway 15L-33R and Runway 15R-33L departures in IMC

LEGEND
- Primary departure
- Secondary departure
- Primary arrival
- Secondary arrival

Figure 2-4
Runway Use Configurations

West flow is the preferred configuration during periods of calm winds because it provides a higher capacity as compared with east flow. In west flow, Runways 26R, 26L and 27 are the primary arrival runways while Runways 15R and 15L are the primary departure runways. Runways 26R and 26L can also be used for departures during peak periods as an offload when Runways 15R and 15L are operating at or near their capacity. During IMC, there is a dependency between arrivals on Runway 27 and departures on Runways 15L and 15R to protect for a possible missed approach.

In east flow, Runways 8L and 8R are the primary arrival runways while Runways 15R, 15L, and 9 are the primary departure runways. Runway 9 can also be used for arrivals during peak arrival periods; however additional separation and coordination is needed between these operations and departures from Runways 15R and 15L in all weather conditions. Arrival spacing is typically 10 nautical miles in trail and no heavy aircraft are placed in the Runway 9 arrival stream.

Although west and east flow are the primary runway configurations, wind and weather conditions can sometimes necessitate the use of other configurations. The most common alternate configuration is west/north flow where arrivals use Runways 26R, 26L, and 27 and departures use Runways 33L and 33R.

The FAA Aviation System Performance Metrics (ASPM) database keeps historical records on the occurrence of runway use configurations. The years 2007 through 2011 were selected for analysis. During this time period, 157 distinct configurations were recorded, so configurations accounting for 95% of the time were included in the analysis as representative of the most frequently occurring configurations in this period. Each distinct configuration was categorized into a more general category of west flow, east flow, and west/north flow. The different configurations and occurrences are described in Table 2-4.

Table 2-4
RUNWAY USE CONFIGURATION OCCURRENCE

		Occurrence
Primary configurations		
West flow	Arrivals on 26L, 26R and 27 Departures on 15R and 15L	69.5%
East flow	Arrivals on 8R, 8L and 9 Departures on 15R and 15L	23.2
Alternate configurations		
West/north flow	Arrivals on 26L, 26R and 27 Departures on 33L and 33R	7.3

Notes: Occurrence represents the most frequently occurring configurations so that 95% of the hours between 2007 and 2011 are included.

Source: LeighFisher analysis of FAA Aviation System Performance Metrics database for 2007 through 2011.

2.2.4 Airspace and Air Traffic Control

This section describes airspace and air traffic control provisions that affect aircraft operations and includes descriptions of terminal routes and air traffic control jurisdictions.

2.2.4.1 Air Traffic Control Jurisdictions

Airspace in the Houston area falls under the jurisdiction of two entities: (1) the Houston Air Route Traffic Control Center (ARTCC, or Houston Center) and (2) the Houston Terminal Radar Approach Control (TRACON).

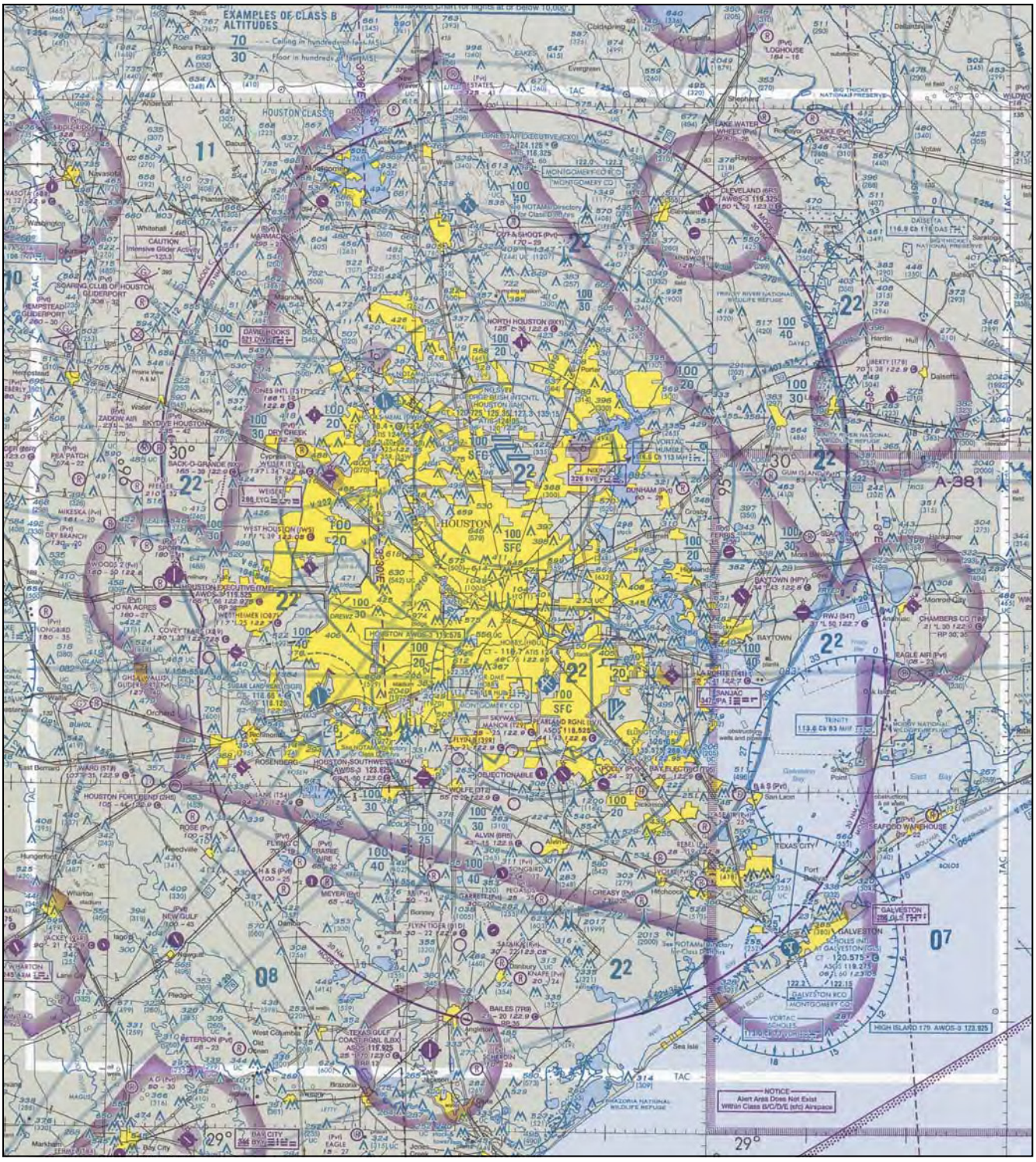
The airspace over the continental United States is divided into 20 geographically defined ATC jurisdictions based on ARTCCs. The primary purpose of an ARTCC is to provide radar service and other ATC services to en route aircraft (i.e., those aircraft that are not landing or taking off). The Houston ARTCC (ZHU), which has jurisdiction over the Airport, is located on Airport property approximately 2,500 feet east of the end of Runway 33R.

The TRACON provides radar approach and departure control as well as other air traffic control services to aircraft flying in the terminal area airspace. The Houston Center has delegated control over certain airspace in the Houston area to the Houston TRACON, located on Airport property directly to the west of Terminal A. A new TRACON was completed and put into operation in 2014. The new TRACON is located off of Greens Road, east of John F. Kennedy Boulevard. In radio communications, pilots refer to the Houston TRACON as either Houston approach control or Houston departure control, depending on the phase of flight. The boundary of the Houston TRACON is depicted as a thick magenta line on Figure 2-5 surrounding the Airport.

2.2.4.2 Controlled Airspace

Controlled airspace is airspace that has defined dimensions within which ATC service is provided to aircraft in accordance with the airspace classifications established by the FAA. As illustrated on Figure 2-6, there are five classes of controlled airspace in the United States: Class A, Class B, Class C, Class D, and Class E.

Class B airspace surrounds the Airport. Class B airspace is generally that airspace surrounding the nation's busiest airports from the ground to 10,000 feet above mean sea level. With the exception of the airspace within approximately 3 to 6 nautical miles of a towered airport, control responsibilities within Class B airspace are typically assumed by a TRACON. The configuration of Class B airspace is individually tailored and designed to contain all published instrument procedures once an aircraft enters the airspace. ATC provides radar vectoring and sequencing on a full-time basis for all aircraft operating in Class B airspace.



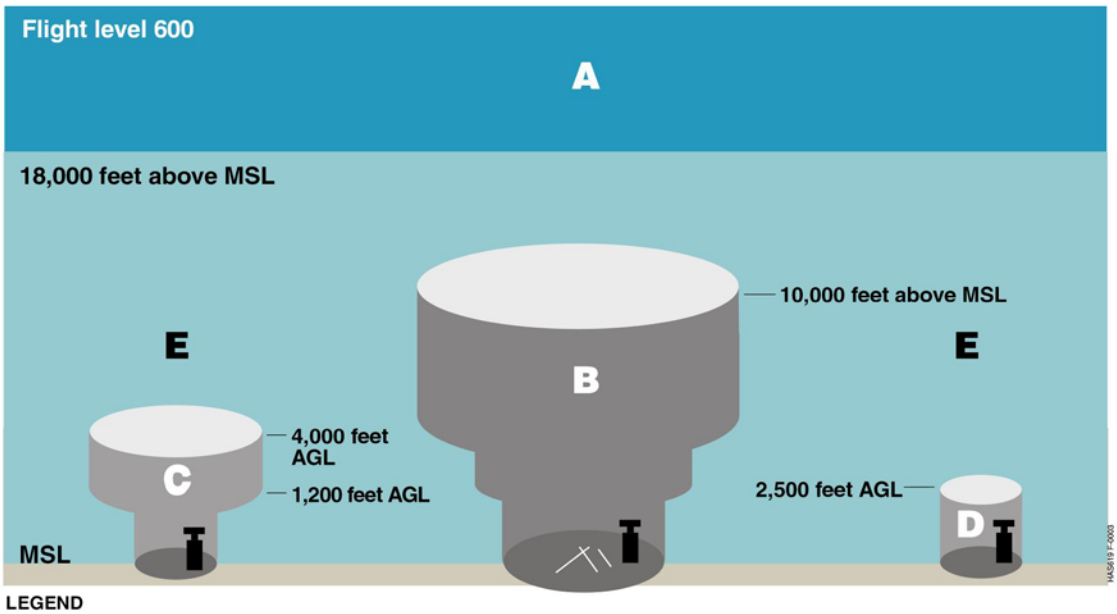
Source: Federal Aviation Administration
Prepared by: Leigh|Fisher, December 2012

Leigh|Fisher

Figure 2-5
Houston Terminal Area Airspace

The Houston Class B airspace boundary is shown as a circular blue line surrounding the Airport on Figure 2-5, and resembles an upside-down, three-tiered wedding cake, as shown on Figure 2-6. The outer portion of the Class B airspace is centered on the Airport and radiates outward for approximately 30 nautical miles. The outer portion of the Class B airspace circle is irregular to the south of the Airport because of the proximity of Houston Hobby, approximately 20 nautical miles south of IAH. Discussions with Houston Intercontinental ATCT staff revealed that Houston Hobby airport currently has minimal impact on operations at IAH, and development of arrival and departure procedures have been coordinated so that operations at both airports do not conflict.

Figure 2-6
CONTROLLED AIRSPACE CLASSIFICATIONS



2.2.4.3 Airport Traffic Control Tower

The ATCT provides air traffic control services to aircraft at and in the immediate vicinity of an airport, ensuring the safe, orderly, and expeditious flow of traffic. Controllers are responsible for separating aircraft on the ground and in the traffic pattern, giving arrival and departure clearance to aircraft, and providing weather information to pilots. The ATCT at the Airport is located east of the passenger terminal complex, and immediately north of Runway 9-27. The tower is 424 feet AGL.

United Airlines operates two ramp towers which control the movement of aircraft on the passenger apron areas. One is located in Terminal C North, and the other in Terminal C South.

2.3 PASSENGER TERMINAL COMPLEX

This section includes descriptions, drawings and tabular data related to the passenger terminal complex. It includes the five passenger terminal buildings, the Central Federal Inspection Services (FIS) Building, a Marriott hotel and the Terminal Link elevated people mover and its associated maintenance area.

The information presented in this section was based on review of existing plans and GIS information provided by Airport staff and consultants, field inspection of the accessible spaces and discussions with terminal tenants and HAS staff during the conduct of those inspections. The inspections occurred in the months of November and December of 2012, a period in which the construction of the South Concourse of Terminal B was underway. Because of this ongoing construction the information related to the Terminal B expansion was limited and the information presented herein represents the best available information at the time of this report. Similarly the consultant team, due to security restrictions was unable to access the "sterile" areas of Terminals D and E and the FIS building; accordingly, the reporting of those areas is based solely on the information provided by HAS.

2.3.1 Overview

The Airport presently maintains a single passenger terminal area, bounded by Taxiways SF on the east, Taxiways RB and RC on the south, Taxiway NR on the west, and Taxiways NB and NC on the north. The terminals and surrounding taxiways are located east of Runway 15L-33R and somewhat centered between Runways 8R-26L and 9-27. Aircraft access to Runway 9-27 is only available from the eastern end of the terminal complex by way of the north-south Taxiways SF and SC both of which cross Will Clayton Parkway with bridge structures.

The terminal area encompasses approximately 380 acres and is divided into two areas; Airside, consisting of the outer area containing the aircraft operations area (AOA) and the passenger boarding areas of the terminal buildings; and Landside, the inner area generally containing the public passenger-processing structures including ticketing, security screening, baggage claim, retail, news, food, and beverage services, and the public parking facilities. Within this inner area is the Marriott Hotel. The terminal complex also includes the maintenance facilities to the elevated, secure-side, automated people mover known as the Terminal Link; and the Inter-Terminal Train (ITT) which connects passengers outside the secure areas via an underground tunnel.

Separating the Airside from Landside terminal functions is the public roadway system consisting of North and South Terminal Roads, on which traffic circulates in a counter clockwise direction around the terminal complex. As described in greater detail in Section D, access to North Terminal Road and egress from South Terminal Road from the south is via John F. Kennedy Boulevard and from the east is via Will Clayton Parkway. To access the passenger terminal complex both of these approaching roadways pass under taxiway bridge structures along the terminal are perimeter.

The terminal buildings themselves are arranged along the longer east-west axis of the terminal area with the hotel located slightly west of the center of the terminal area. John F. Kennedy Boulevard approaches the terminal area from the south on axis with the hotel providing direct access to Terminals A and B which lie to the west of the hotel. Will Clayton Parkway approaches the terminal area from the east along on axis which is centered about the terminal complex. Vehicles proceeding to Terminals C, D and E, which are east of the hotel, are directed to approach from the east requiring north-bound traffic on John F. Kennedy Boulevard approaching those terminals to travel around the southern edge of the terminal complex and surrounding taxiways to connect to North Terminal Road just east of Taxiway SF.

Terminals A, B, C and E are arranged such that their landside areas are contained within the boundaries of the North and South Terminal Roads and their airside areas lay north and south of the roadway system, connected to the landside areas by bridge structures spanning the roadways.

Terminal D, breaking from this design concept, lies north of North Terminal Road and provides for both landside and airside functions within one contiguous building. Terminal E has a ticketing function adjacent the FIS building, with the airside functions located south of South Terminal Road.

Connecting the terminals are two automated people mover (APM) systems. The ITT, shown on Figures 2-28 and 2-29, is located on the non-secure side of the terminal facilities, connects Terminals A, B, and C, as well as the terminal complex hotel. Terminals D and E has a tunnel connection to the ITT. The second APM, known as the Terminal Link is an elevated, secure people mover with stations at Terminal A, B, C, and D/E. The Terminal Link system is located parallel to and above North Terminal Road with its maintenance facility located immediately west of the hotel.

2.3.2 Passenger Terminal Characteristics

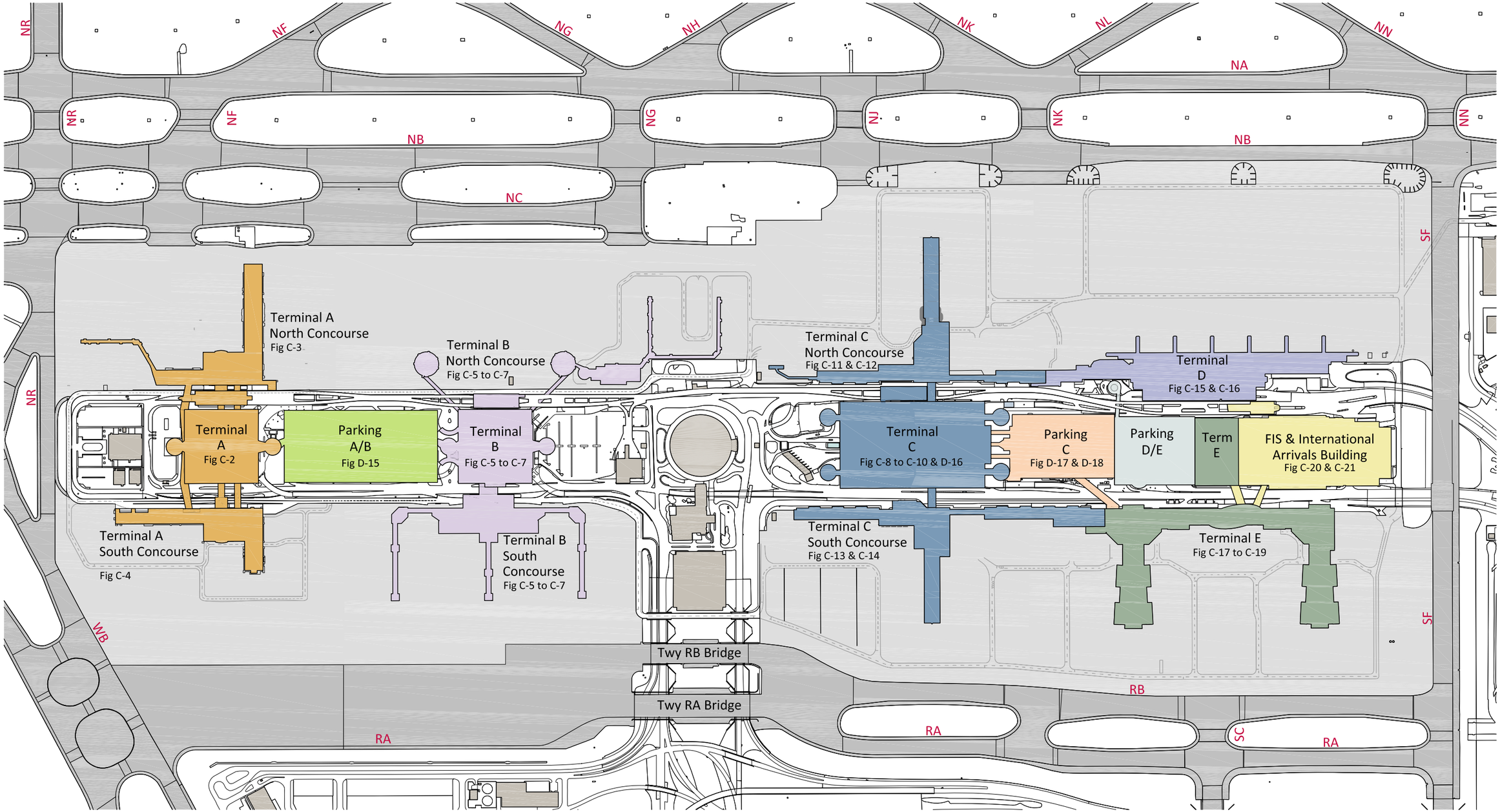
The key components and arrangement of the terminal area complex and its associated terminals are illustrated in Figure 2-7. Following is a brief overview of the terminal facilities which is then presented in greater detail in the pages which follow.

Terminals A and B are the only terminals original to the airport design. Opening in 1969, these two terminals shared essentially identical plans originally consisting of four circular concourses (referred to as flight stations by HAS) arranged off the four corners of a central terminal building housing ticketing and baggage handling functions. The top two levels of these terminal building structures were dedicated to public parking; however with the security restrictions imposed since September 11, 2001 these parking areas are now restricted to airport employees only.

Because of changes within the airline industry the original flight station arrangement of Terminal A was replaced with a more traditional "L" shaped concourse arrangement. These changes were made to convert the terminal from a 20-gate facility to serve as many as 30 gates.

As of the date of this report, the south concourses of Terminal B are in the process of being redeveloped into a facility designed to exclusively serve United Airline's regional jets (e.g. Embraer 145s). An expansion of Terminal B on the north side of North Terminal Road has also been proposed to serve United Airlines mainline aircraft. The proposal includes the addition of three piers, two of which would serve both domestic and international activity, as well as a second FIS. The Terminal B central building would also be expanded to provide additional ticketing lobby, baggage claim, and auto parking.

Terminal C was designed during the late 1970's and opened for service in 1981. While maintaining the north/south concourse and central terminal design concept, it was constructed with "T" shaped concourses from the onset. With Texas Air Corporation's (parent company of Texas International) acquisition of Continental Airlines in 1982 and subsequent relocation of the company's base of operations to Houston, Terminal C had served as the hub of Continental's operations at IAH. As such, it has undergone several renovations and additions over the years as Continental's operations grew. Most notable of these additions was the eastern garage, which additionally housed baggage screening and sorting facilities serving both Terminals C and E.



Source: HAS Records and IAH Airport Layout Plan, August 2006
Prepared by: RdlR Architects, Inc., December 21, 2012

Leigh | Fisher

Note:
Taxiway designations shown in red text.

0 250' 500'

N

Figure 2-7
Passenger Terminal Complex

in 1990, Terminal D was opened providing the Airport with a dedicated facility to accommodate international arrivals and departures. All international arriving flights to Houston were required to operate at Terminal D, prior to the construction of the Central FIS and Terminal E. Physically linked to the Terminal C North Concourse, Terminal D provided additional gates for Continental Airlines which could be used for domestic or international flights as well as gates dedicated for foreign flag carriers. At the time of construction Terminal D also housed all customs and immigration functions within the building. The Terminal D FIS had the capacity to serve approximately 1,800 passengers per hour. Following the events of September 11, 2001, domestic carriers began a rapid expansion in international markets. Continental Airlines (now United Airlines) began to substantially increase international service, soon exceeding the capacity of the Terminal D FIS. The expansion of international service fostered the planning, design and construction of Terminal E and the Central FIS which has the capacity to serve approximately 4,000 passengers per hour. The construction of Terminal E and the Central FIS was completed and placed into operation in 2003 and 2005 respectively. The former Terminal D FIS facility has been abandoned and much of the space remains unused.

In the course of the building plan reviews and field inspections of the terminal facilities, certain observations were made that merit recording and are presented below:

- Continual and ongoing changes in security screening requirements for both passengers and baggage are placing physical demands on spaces which were never designed to accommodate those functions and in which those security functions are perceived as an inappropriate insertion into public lobby spaces and corridors.
- Consolidation of air carriers in the industry has resulted in Terminal A being underutilized with some of the airline operations support space on the apron level of the concourses now vacant.
- The configuration of Terminal A necessitates the duplication of security screening at both the northern and southern concourses, while a centralized passenger security screening area could likely be operated more efficiently.
- There presently exists a large number of gates dedicated to regional jets in Terminal A (Gates A3A - A3G) and Terminal B (Gates B84A -B84Q) which are not served by facilities of similar quality standards as the other terminal facilities.
- The presence of the currently unused Terminal Link maintenance facility under the Terminal B Terminal Link station makes a direct northward connection to a new concourses challenging.
- Security requirements necessitate limited dwell time durations at the passenger pick-up areas causing vehicles to continually circle the terminal roads until their arriving passengers exit bag claim. This increases the traffic load on the terminal roads which were not designed to accommodate this circulating traffic load.

2.3.3 Terminal A

Terminal A is one of two original terminals at the Airport. Since its opening in 1969, Terminal A has been remodeled and updated several times as a result of changes in airline occupancies or other influences, such as the Terminal Link station. The original four corner satellite structures have been replaced with larger north and south concourse structures better suited to the current requirements of airline and aircraft operations. In addition, some remodeling was done to accommodate changes mandated by the TSA.

Terminal A accommodates the facilities and operations of the following domestic airlines: Alaska Airlines, American Airlines, Delta Air Lines, Frontier Airlines, Spirit Airlines, United Airlines, US Airways, and various charter airlines. Air Canada/Jazz also operates from Terminal A.

2.3.3.1 Terminal A Central Building

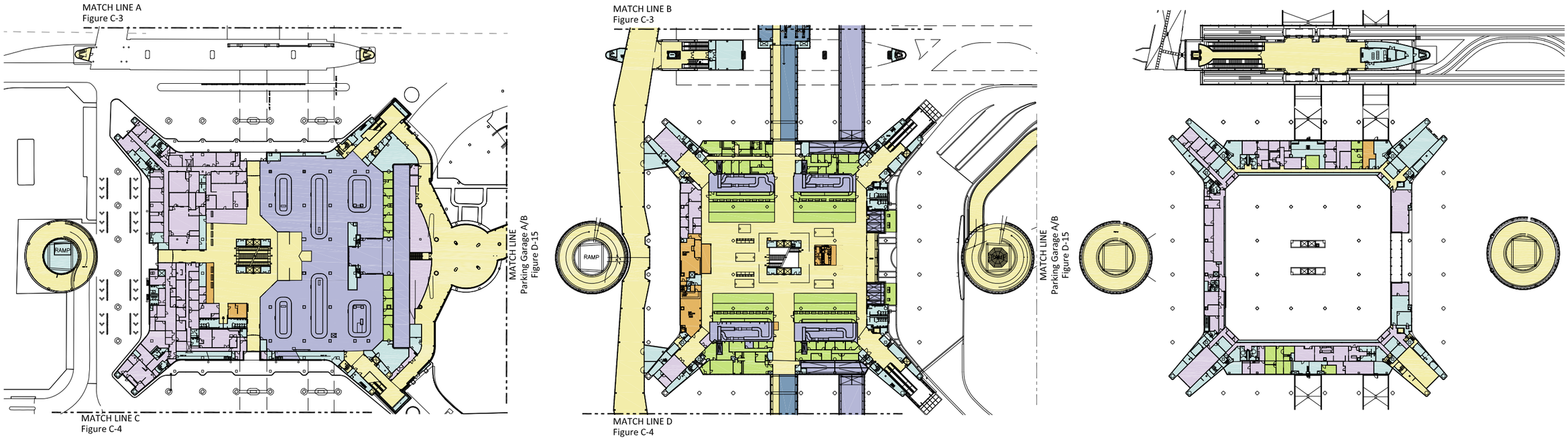
The Terminal A Central Building, depicted in Figure 2-8, is a six-level structure accommodating all terminal access and passenger-processing functions as well as two levels of parking. Functionally, the main building vertically segregates access, deplaning, enplaning, and parking functions, as follows:

- Level LL1 is below grade and provides space for building mechanical spaces and the right-of-way and boarding platform of the ITT station. Maintenance facilities for the ITT vehicles are also provided on this level.
- Level 1 (Figure 2-8) provides baggage claim areas, airline baggage offices, public services, deplaning curbside, parking access, and HAS operational offices for security and ground transportation.
- Level 2 (Figure 2-8) provides airline ticketing/ flight check-in counters and offices, public waiting areas, public services, enplaning curbside, parking access, limited concession space, and certain HAS and various airline operational offices.
- Level 3 (Figure 2-8) provides mezzanine offices for the HAS and terminal tenants.
- Levels 4 and 5 previously provided about 350 convenient parking spaces originally intended for use by the traveling public. However, security concerns have led to their conversion to employee use only.

Except for Level LL1, all levels of the Central Building are approximately square in plan, with the upper two levels being larger than the three levels beneath, thus providing cover for the road and curbside activities below.

The departure/ticketing level provides four quadrants of ticket counters. Each is linked by conveyor belt to an outbound baggage make-up unit. Each quadrant was developed to accommodate five gates. Two additional five gate ticket counter sections were planned to be located at the west end of the ticket level. The existing north and south baggage chases as well as the pedestrian baggage bridges were constructed to accommodate the additional baggage belts. Space for a third baggage make-up unit is available in the North and South Concourses.

There are six carousel style baggage claim units in Terminal A. Three serve the North Concourse and three serve the South Concourse. One of the three serving each side of the terminal building is a large carousel sufficient for a widebody aircraft such as the Boeing 767-200.

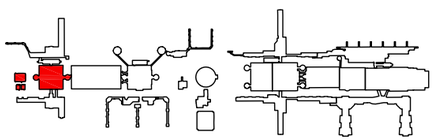


Arrivals / Baggage Claim (Level 1)

Departures Ticketing (Level 2)

Mezzanine (Level 3)

KEY MAP



Source: HAS Records and IAH Airport Layout Plan, August 2006
Prepared by: RdlR Architects, Inc., December 21, 2012

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N

LEGEND

- Airline
- Concessions
- Baggage handling
- Security
- Customs & border protection
- HAS
- Public space
- Building services & support

Figure 2-8
Terminal A Central Building

2.3.3.2 North and South Concourse Buildings

The original Flight Station buildings that were connected to the corners of the Central Building have been replaced with new concourse buildings connected to the central building at its north and south midpoints. These buildings, depicted in Figures 2-9 and 2-10, have been designed to better suit the current requirements of airline and aircraft operations. Each of the concourse buildings is connected to the Central Building by pedestrian/baggage conveyor bridges spanning the North and South Terminal Roads. Passenger security screening checkpoints are now located in the bridges at the concourse building entries. Parallel to and east of the pedestrian bridges are separate bridge structures carrying baggage conveyors between the concourse buildings and the central terminal building.

Each concourse building is a two-level, "L-shaped" structure with passenger-related facilities at the upper level and airline/aircraft operations areas and related facilities and baggage handling facilities at the lower, apron level. Functions in the "legs" of the L-shaped buildings are primarily aircraft boarding at the upper level and airline offices / operations at the apron level. Concession facilities, including a central food court/retail area, are available at the upper level of the intersection of the legs.

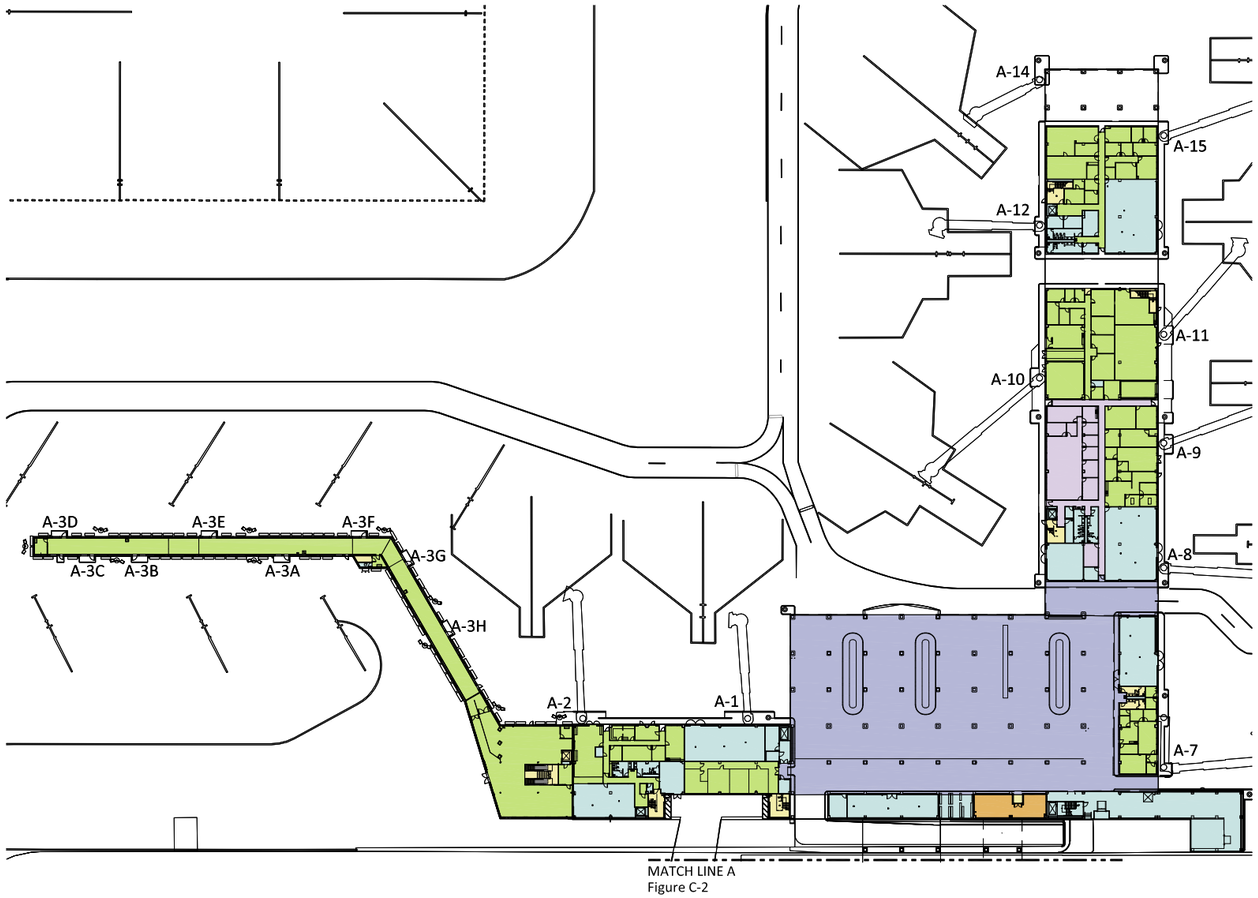
Terminal A was developed to serve approximately 20 aircraft gates and expand to approximately 30 gates. There are a total of 18 active gates in gates in the North Concourse and 10 gates in the South Concourse. The west leg of the North Concourse is expandable to add four aircraft gates and the South Concourse is expandable to add as many as five additional aircraft gates. At the western end of the North Concourse, United Airlines recently added an at grade temporary concourse with eight gates serving regional jets operated by its commuter affiliates. This turboprop facility is essentially a utilitarian metal building and is not of same quality standard of the other terminal facilities.

2.3.3.3 Terminal Link Station A

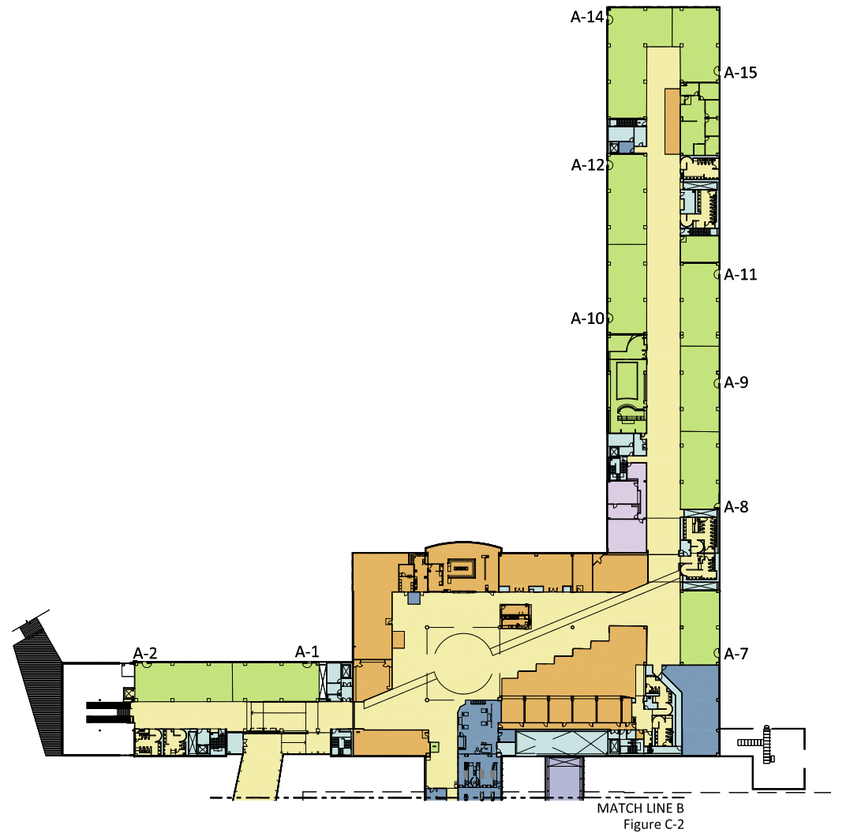
Passengers on Terminal A can connect to stations at Terminals B, C, D, and E via the Terminal Link station located between the Terminal A Central Building and the North Concourse building. Secure connections to the South Concourse from the Terminal A APM station are available via a dedicated corridor that was constructed when the Terminal A APM stations was constructed. The corridor is located along the western face of the Central Terminal Building. The station itself is located above North Terminal Road and above the passenger/baggage connector to the North Concourse. An elevator, escalators, and stairs connect the station to the secure corridor.

2.3.3.4 Passenger Circulation

Enplaning passengers entering the terminal from Level LL1 (if using the ITT system for access from other terminals, the hotel, or parking garages) proceed to the central elevator escalator core for transfer to the ticketing lobby on Level 2. Passengers utilizing the Terminal A/B Garage enter the facility through the Level 1 corridor system which connects to the eastern corners of the Central Building where escalators carry them to the Level 2 ticketing lobby. Passengers arriving from the roadway system access Level 2 directly from an elevated departure curb front area accessed via a ramp off North Terminal Road (see Section D for further detail). Completing check-in procedures at Level 2, passengers proceed to either the north or south bridge for security screening and on to their departure gate.

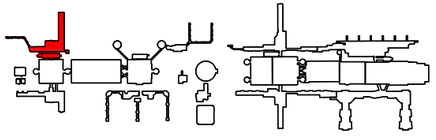


Apron Level (Level 1)



Passenger Level (Level 2)

KEY MAP



Source: HAS Records and IAH Airport Layout Plan, August 2006
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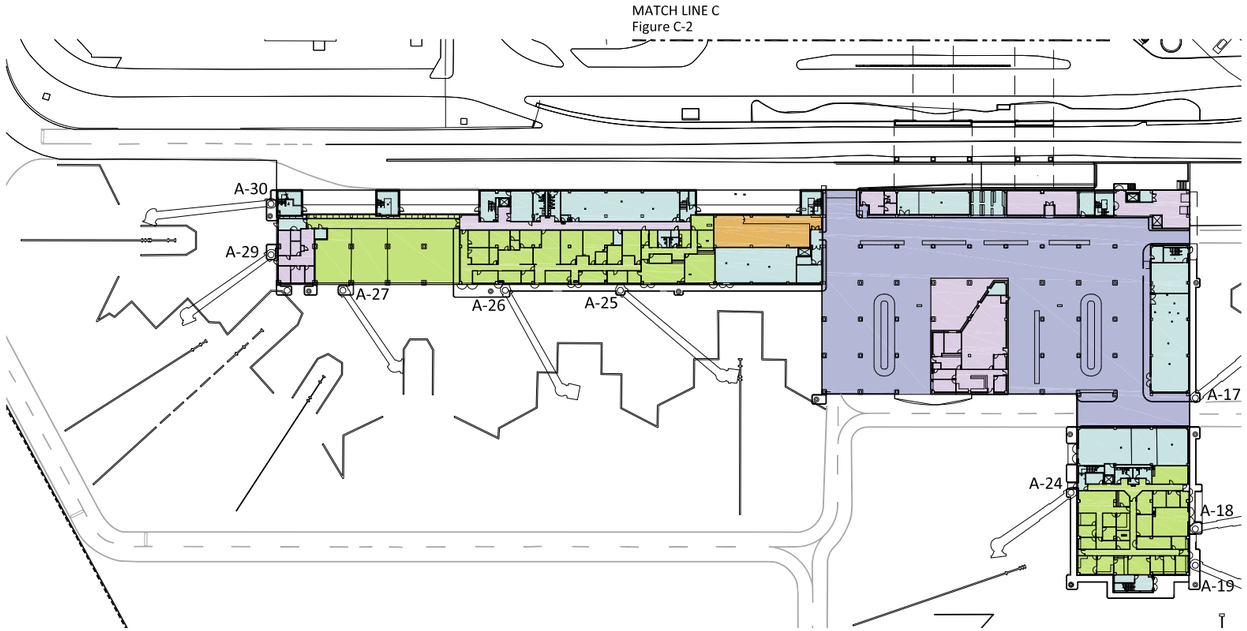
0 62.5' 125'

N

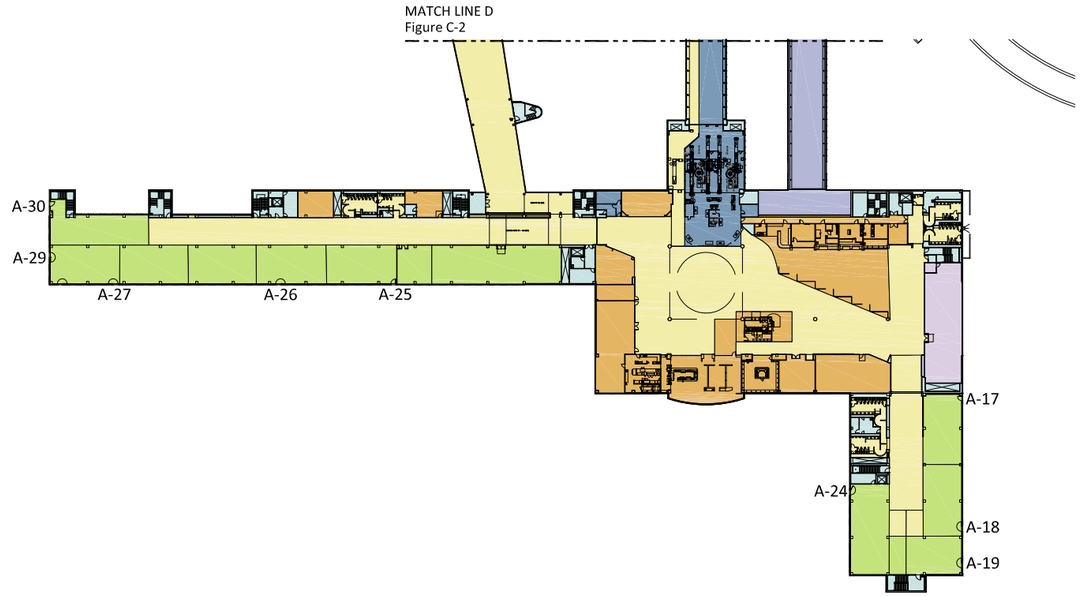
LEGEND

- Airline
- Concessions
- Baggage handling
- Security
- Customs & border protection
- HAS
- Public space
- Building services & support

Figure 2-9
Terminal A North Concourse

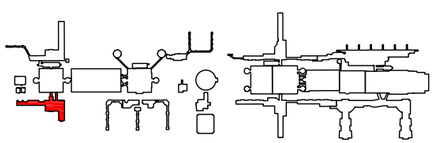


Apron Level (Level 1)



Passenger Level (Level 2)

KEY MAP



Source: HAS Records and IAH Airport Layout Plan, August 2006
Prepared by: RdlR Architects, Inc., December 21, 2012

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0 62.5' 125'

N

LEGEND

- Airline
- Concessions
- Baggage handling
- Security
- Customs & border protection
- HAS
- Public space
- Building services & support

Figure 2-10
Terminal A South Concourse

Deplaning passengers can either change terminals via the Terminal Link system, or proceed from the concourse buildings to the central building via the same bridges used by enplaning passengers. Once in Level 2 of the Central Building and outside the secure area, deplaning passengers descend to Level 1 using the central elevator/escalator core to access baggage claim. Having claimed their baggage, deplaning passengers may exit the central building in one of three ways: (1) proceed directly to the deplaning roadway curbside areas, (2) proceed to the northeast or southeast corners of the building for access to pedestrian paths leading to the Terminal A/B garage, or (3) descend to Level LL1 for access to the ITT system.

2.3.3.5 Baggage Circulation

All enplaning and deplaning baggage is handled in the baggage-handling areas at apron level of the concourse buildings. Enplaning baggage is transferred to this area from the ticketing/ check-in counters by a series of conveyor belts which first pass through the TSA baggage screening facilities housed within the departure lobby level of the central building, directly behind the airline's baggage check-in areas. The conveyors pass between the main and concourse buildings in bridges paralleling the pedestrian bridges. Once sorted, the outbound baggage is transferred to aircraft by baggage tugs. Inbound baggage is brought to the baggage-handling areas by baggage tugs and deposited on feed belts that are discretely assigned to each baggage claim device in the main building. Conveyors transfer baggage from these feed belts to the claim devices via the baggage bridges used for enplaning baggage transfers.

2.3.4 Terminal B

Terminal B opened in 1969 as the second of the two original terminal buildings at the Airport. The original Terminal A and B were virtually identical when built with respect to plan and functional layout of facilities. At the time, it was envisioned that future terminal additions would follow the same plans. Terminal B initially accommodated 20 jet gates, five on each of the four flight stations. In 1998, Continental Airlines expressed interest to expand its operations into Terminal B. After much discussion on how to integrate their expansion into Terminal B, it was decided that the separation of “product” was most efficient from a roadway orientation perspective. In this concept, the commuter operation (regional jets) was separated from the mainline aircraft operation that was maintained in Terminals C and D. Following this concept, Terminal B was developed to accommodate the facilities and operations of Continental Express airlines. The mainline aircraft gates were converted to serve regional jets, and each flight station was redeveloped to accommodate a total of 10 to 11 regional jet gates.

As in Terminal A, Terminal B consists of a six-level main building at landside, accommodating all terminal-access and passenger processing functions. Pedestrian bridges at each of the main building corners originally connected to four “Flight Station” buildings at the adjacent north and south airside areas for aircraft boarding. The northeast flight station building (number 5) has been expanded first to support busing operations associated with remote gate operations and more recently with an apron-level concourse wing to serve a greater number of regional jets.

The southwest and southeast flight station buildings are being replaced by a new larger South Concourse building. The southwest flight station has already been demolished and the southeast flight station is still in use but will soon be demolished as the new construction progresses. For the purpose of this report, both southern Flight Station concourses are considered replaced by the new South Concourse building. The concept for the New South Concourses will provide a central holdroom for all gates, concessions and airline operations facility with three gate access corridors. Passengers will wait in the central holdroom and be “called down” to departing flights.

The Terminal B Central Building has had two major alterations that changed the flow and character of the original terminal as originally envisioned in 1969 to accommodate the secure connecting operations between commuter and mainline operations in Terminal C. A "U" shaped secure corridor was developed to connect the four Flight Stations along with a significantly expanded concessions space within a newly defined secure area. A new central passenger security screening area was also developed to support the originating passenger base. A two level, 40 foot wide, bay was added to the west end of the central building to accommodate: needed office space on Level 1; a central concessions space on Level 2; and the central security screening area.

2.3.4.1 Terminal B Central Building

The Terminal B Central Building, depicted in Figures 2-11, 2-12 and 2-13, is a six-level structure accommodating all terminal access and passenger processing functions. Functionally, the main building vertically segregates access, deplaning, enplaning, and parking functions, as follows:

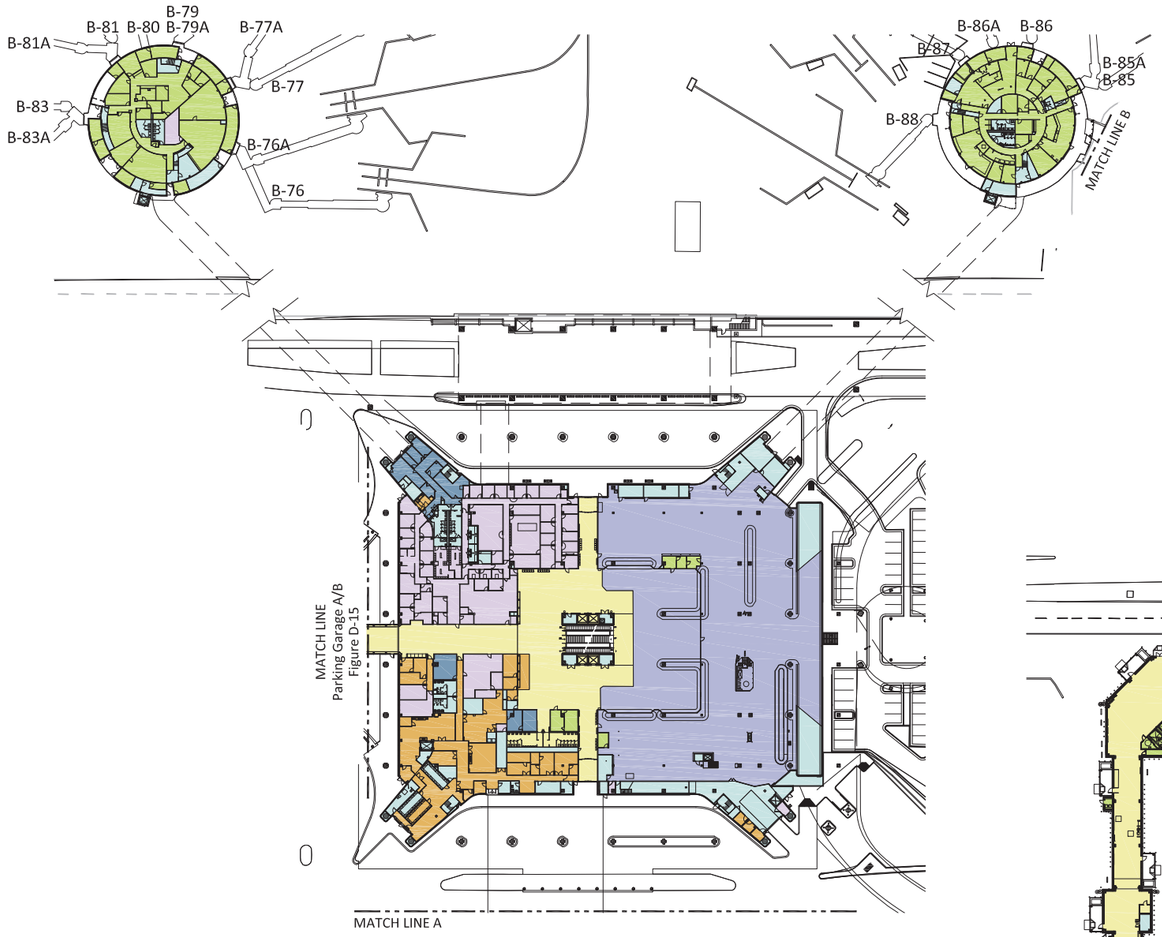
- Level LL1 (Figure 2-28) is below grade and provides space for building mechanical spaces and the right-of-way and boarding platform of the ITT system.
- Level 1 (Figure 2-11) provides baggage claim and outbound baggage handling areas, airline baggage offices, public services, deplaning curbside, parking access, security offices, and HAS operational offices.
- Level 2 (Figure 2-12) provides airline ticketing/flight check-in counters and offices, a central security-screening checkpoint, public waiting areas, public services, enplaning curbside, parking access, concession space, and certain Homeland Security offices.
- Level 3 (Figure 2-13) provides mezzanine offices for the HAS and terminal tenants on three sides. The southern mezzanine is dedicated to Continental (United) Club Lounge.
- Levels 4 and 5 previously provided about 350 convenient parking spaces originally intended for use by the traveling public. However, recent events and security concerns have led to their conversion to employee use.

Except for Level LL1, all levels of the main building are approximately square in plan, with the upper two levels being larger than the three levels beneath, thus providing cover for the road and curbside activities below.

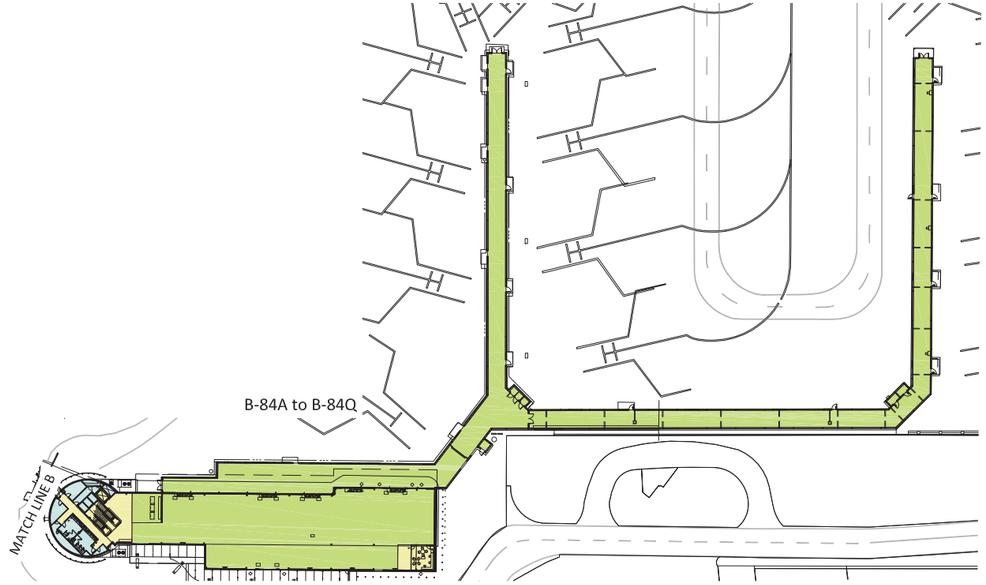
Because baggage handling areas are in the main building, baggage tug tunnels pass under the terminal roads from the northern and southern apron level to rise again and connect to the baggage handling areas of level 1.

2.3.4.2 North Flight Stations

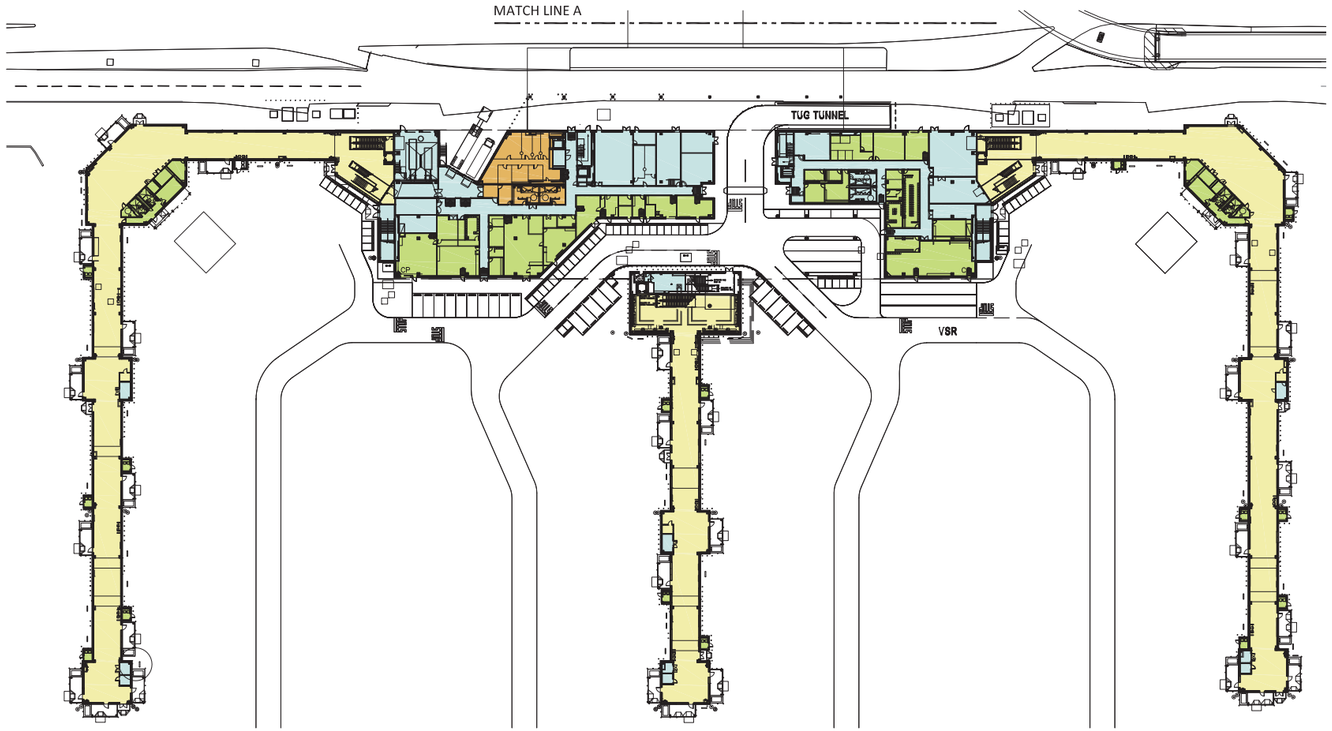
Two circular flight station buildings provide aircraft boarding facilities on the north airside, as shown in Figures 2-11 and 2-12. Pedestrian bridges extending from the corners of Level 2 in the Central Building provide access to the flight station buildings; Flight Station 5 to the northwest and Flight Station 6 to the northeast. Because the security screening checkpoint is centralized in the Central Building, security-screened passengers may freely circulate among all flight station buildings and patronize concessions available in both the flight stations and the Central Building. Both of the flight station buildings are minimally sized, commensurate with aircraft sizes at the time of construction. Apron-level structures of minimal quality have been added to the northeast flight station building to permit apron-level boarding of small regional jets.



Apron Level



Apron Level



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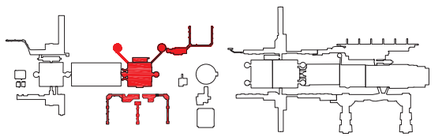

Source: HAS Records and IAH Airport Layout Plan, August 2006
Prepared by: RdlR Architects, Inc., December 21, 2012

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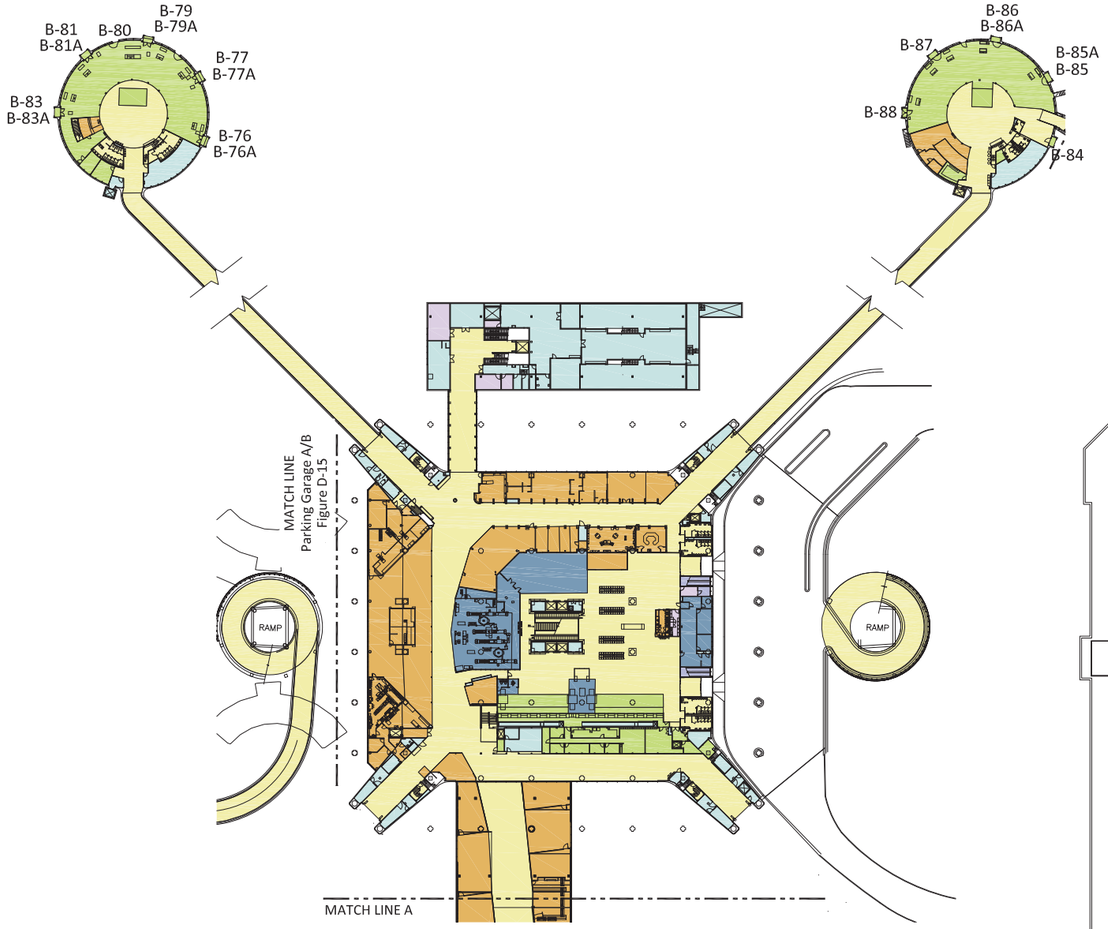
LEGEND

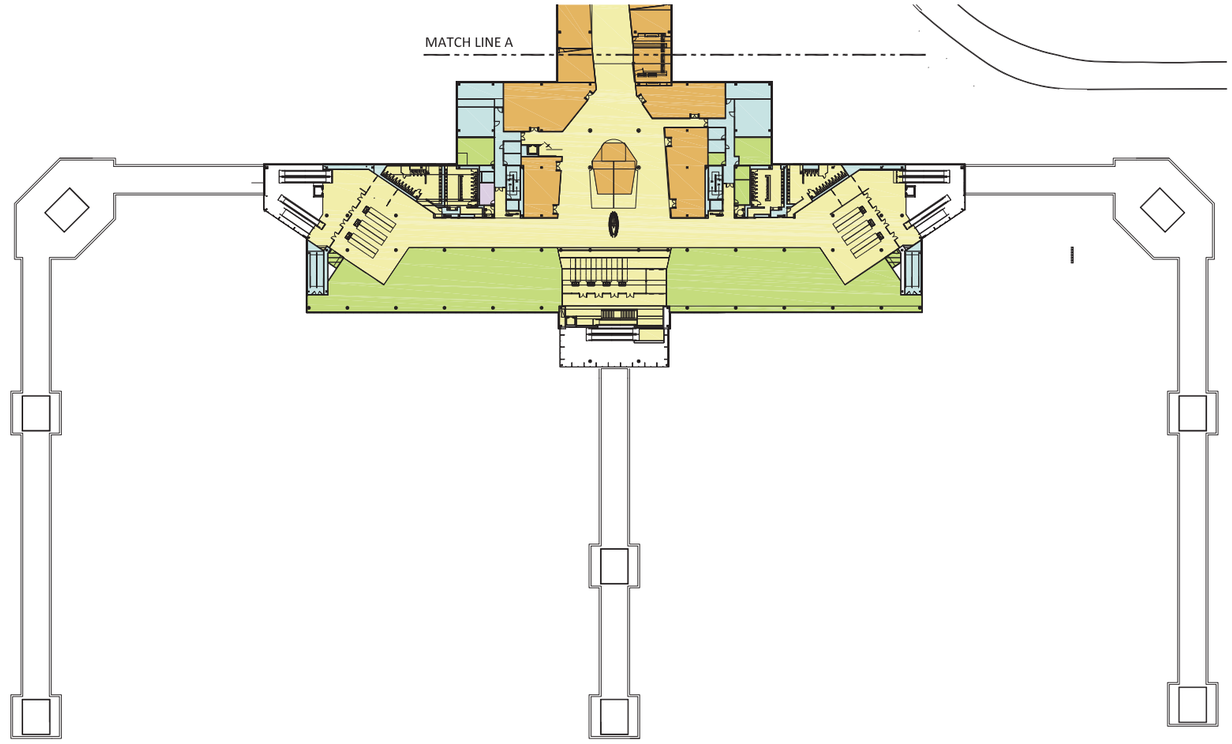
- Airline
- Concessions
- Baggage handling
- Security
- Customs & border protection
- HAS
- Public space
- Building services & support

Figure 2-11

Terminal B - Level 1

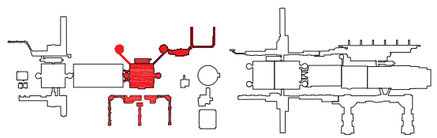


Passenger Level



Passenger Level

KEY MAP



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LEGEND

- Airline
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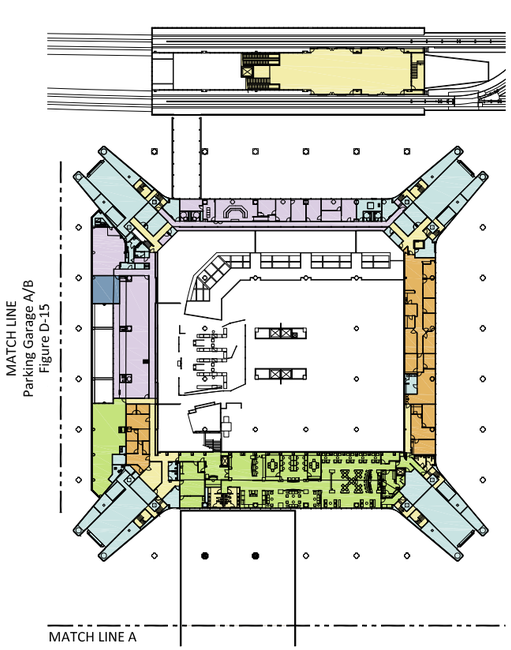
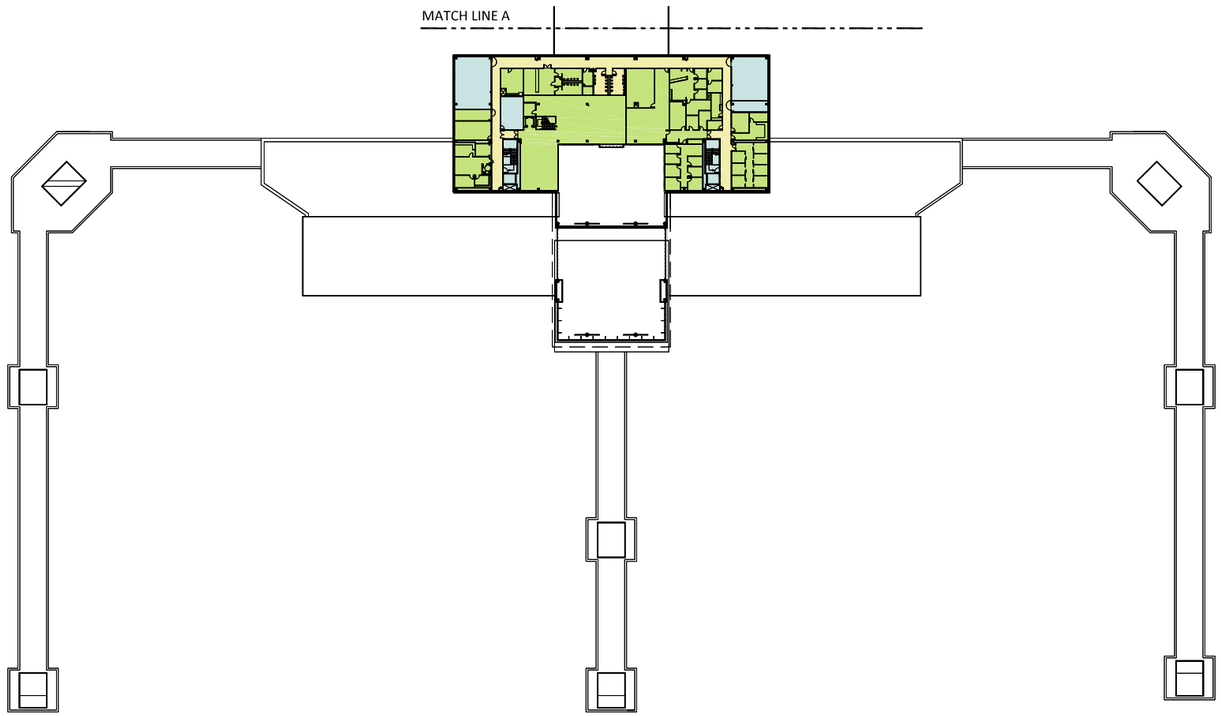
Figure 2-12
Terminal B - Level 2

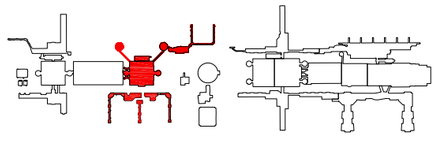


Mezzanine Level



Mezzanine Level

KEY MAP



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LEGEND

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Figure 2-13
Terminal B - Level 3

Each flight station building is a two-level structure with primary passenger-related facilities at the upper level and airline/aircraft operational facilities at the lower, apron level.

The northern flight station buildings have a total of 33 currently active gates. The Northwest Flight Station building has 11 however only nine are active with one gate position decommissioned and the jetway removed, and a second gate those jetway is blocked to preclude its use. The Northeast Flight Station has seven gates on the upper level plus 17 on the apron-level. All gates serve United Express Airlines.

2.3.4.3 South Flight Station

The original Southern Flight Station buildings were replaced by a new South Concourse building, depicted in Figures 2-11, 2-12 and 2-13. The new three level facility will be accessed from the Central Building via a 95-foot wide bridge leading to ticketing and concessions central area offering views of the apron-level boarding. Escalators will take passengers down to three apron-level concourse piers accommodating a total of 30 gates. A Mezzanine level has offices and a United Club Lounge.

2.3.4.4 Terminal Link Station B

Passengers in Terminal B can connect to stations at Terminals A, C, and D (with its connecting corridor to Terminal E) via the Airport's Terminal Link station located between the Central Building and the North Concourse Building. The station is accessed through a dedicated corridor that connects to the secure corridor within the Central Building through the north face of the building adjacent to the northwest corridor servicing Flight Station 5. The station itself spans North Terminal Road and is sufficiently elevated to allow the Flight Station bridges to pass under the elevated guideway structure. An elevator, escalators, and stairs connect the station to the secure corridor.

When the Terminal Link was first constructed the station at Terminal B also accommodated the maintenance facility for the system under the station platform. The presence of this now largely unused space under the station makes direct bridge connections to a new North Concourse through the center of the Central Building problematic.

2.3.4.5 Passenger Circulation

Enplaning passengers entering the terminal from Level LL1 (if using the ITT system for access from other terminals, the hotel, or parking structures) proceed to the central elevator/escalator core for transfer to Level 2. Passengers utilizing the A/B Garage enter the facility through the Level 1 corridor system which connects to Level 1 of the Central Building where the central circulation core carries them to the Level 2 ticketing lobby. Those passengers arriving from the enplaning road system enter Level 2 directly. Completing check-in procedures at the airline ticket counters, passengers proceed through the security-screening checkpoint to a secure corridor encircling the airline counters and office at the north, south, and west sides for access to the bridges extending to each concourse building. Concessions and public services are available within the secure circulation zones. Once in the concourse buildings, passengers may await their flight boarding in the holdrooms along the outer perimeter of the flight stations or, they may descend to the apron-level holdrooms for boarding of the regional jets the terminal serves. Limited concession facilities are available in the northern flight stations, however the new south concourse facility will provide ample concession amenities.

Deplaning passengers proceed from the concourse buildings to the Central Building using the same bridges and secure corridors used by enplaning passengers. Once in Level 2 of the Central Building, deplaning passengers descend to Level 1 using the central elevator / escalator core to the baggage claim area. Having claimed their baggage, deplaning passengers may exit the Central Building in one of three ways: (1) proceed

directly to the deplaning roadways with private car pick-up on the north and taxi and rental car pickup to the south, (2) proceed to the center of the west side of the building for access to an enclosed pedestrian connector leading to the adjacent garage structure, or (3) descend to Level LL1 for access to the Inter-Terminal people-mover system.

In addition to the above enplaning and deplaning circulation patterns, passengers may also change terminals via the Terminal Link system. Terminal Link Station B, see Figures 2-12 and 2-13, can be accessed from the north secure corridor in Level 2 of the Central Building.

2.3.4.6 Baggage Circulation

All enplaning and deplaning baggage is handled in the baggage-handling areas in level 1 of the Central Building. Enplaning baggage is first checked in at the ticketing/check-in counters where it is tagged and then moved to the TSA Screening equipment located within the level 2 lobby. From there it is transferred to the conveyor belts system that descends to the Level 1 bag sorting area where they are deposited on a sorting carrousel. Once sorted, baggage is transferred to aircraft on the north and south airsides by baggage carts towed by tugs through the tunnels at the northeast and southeast ends of the main building. Deplaning baggage is brought to the same baggage-handling area used for enplaning baggage by baggage tugs through the same tunnels and deposited on feed belts that are directly connected to the respective baggage claim devices.

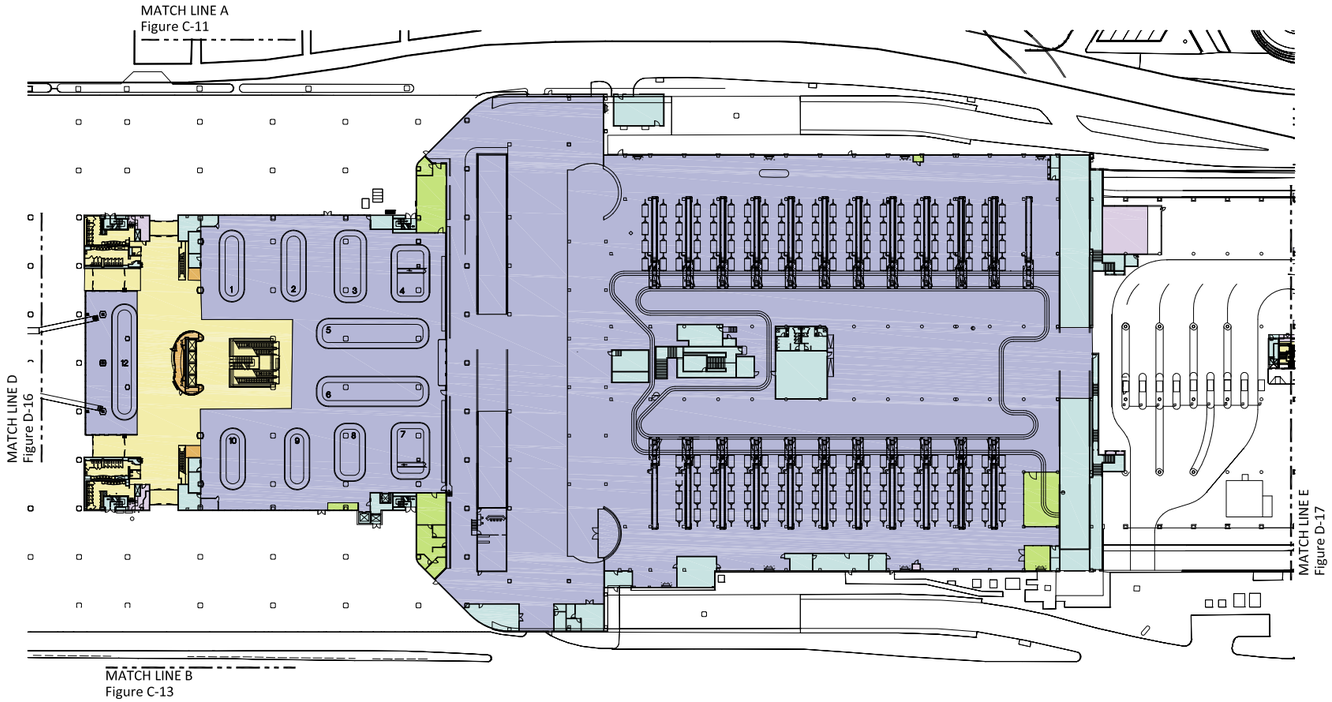
2.3.5 Terminal C

Terminal C opened in 1981; and remains the largest terminal at IAH accommodating the facilities and operations of United Airlines exclusively. Terminal C consists of three separate buildings: an eight-level central building at landside and two, two-level concourse buildings at airside. The Central Building accommodates all terminal-access and passenger processing functions. Pedestrian bridges at the north and south sides of the main building connect to the concourse buildings at the adjacent north and south airside areas for aircraft boarding. Other pedestrian bridges and walkways on the east and west sides connect to adjacent parking garages.

2.3.5.1 Terminal C Central Building

Like Terminals A and B, the Terminal C Central Building, shown in Figures 2-14, 2-15, and 2-16 accommodates all terminal access and passenger-processing functions. Functionally, the Central Building vertically segregates access, deplaning, enplaning, and parking functions, as follows:

- Level LL1 (Figure 2-28) is below grade and provides space for building mechanical spaces and the right-of-way and boarding platform of the ITT system.
- Level 1 (Figure 2-14) provides baggage claim and outbound baggage handling areas, airline baggage offices, support spaces, public services, and parking access to Garage D/E to the east.
- Level 2 (Figure 2-15) provides airline ticketing/ flight check-in counters and offices, two security-screening checkpoints, limited public waiting areas, public services, enplaning curbside, parking access, and a small concession space within the non-secure area of the ticketing lobby. In addition to the check-in counters in the lobby, there is a smaller check-in area located with the east garage at this level that is utilized by patrons using the remote parking shuttles which drop passengers there. Immediately east of the drop off location is a bay of accessible parking.



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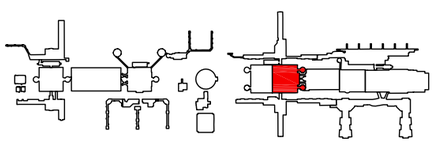

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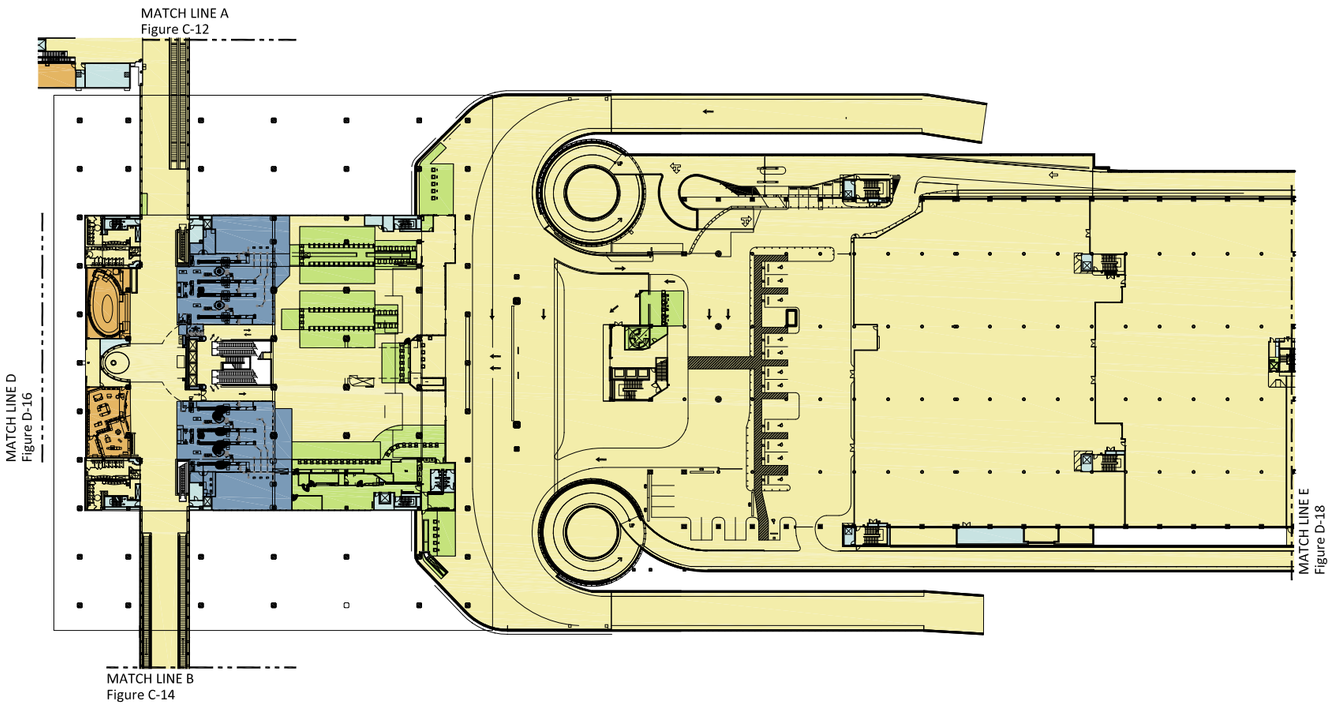
LEGEND

- Airline
- Concessions
- Baggage handling
- Security
- Customs & border protection
- HAS
- Public space
- Building services & support

Figure 2-14
Terminal C - Level 1



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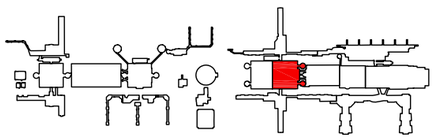

Source: HAS Records and IAH Airport Layout Plan, August 2006
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LEGEND

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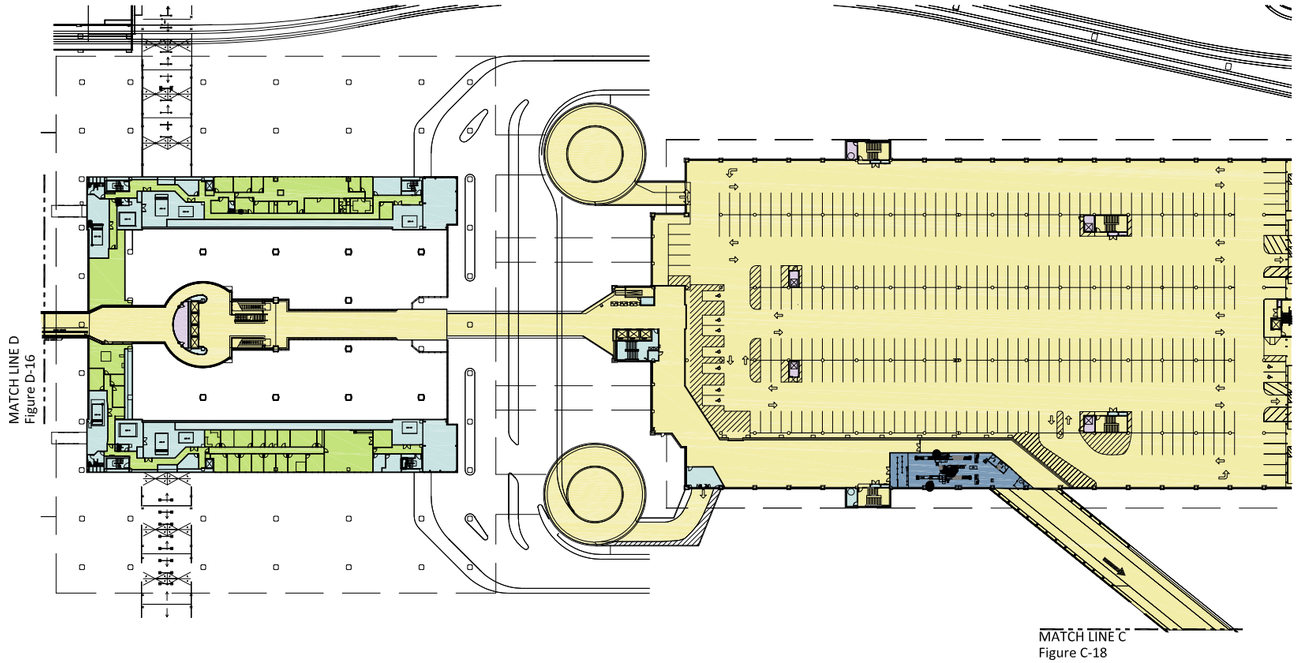
- HAS
- Public space
- Building services & support

Figure 2-15
Terminal C - Level 2



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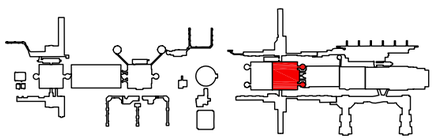

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Figure 2-16
Terminal C - Level 3

- Level 3 (Figure 2-16) provides elevated access above the ticketing lobby and secure corridor below, connecting the adjacent parking structures to the east and west through the center of the Terminal. Along the north and south building face, airline offices are located on the mezzanine level. Due to security requirements, access to these office mezzanines is independent from the garage connector. The Level 3 Mezzanine also provides a connection to Terminal E via a corridor connection along the south face of the Terminal C East Garage.

- Level 4 (Figure 2-47) and levels 5, 6 and 7 provide convenient parking spaces for the traveling public and are linked to the east and west garages by bridge structures which allow connectivity between all three parking structures at certain levels.

The upper parking levels of the Central Building connect with the upper levels of the adjacent east and west parking garages creating large contiguous parking floor plate while providing cover for the curbside drop-off and pick-up activities below.

While the baggage claim facilities are in the Central Building, the baggage sorting, handling and screening areas are done in the adjacent east parking structure baggage handling facility. Baggage is transported to and from the north and south airside concourse buildings via tug tunnels, with inbound baggage carried via conveyors to the bag claim carrousels located on Level 1.

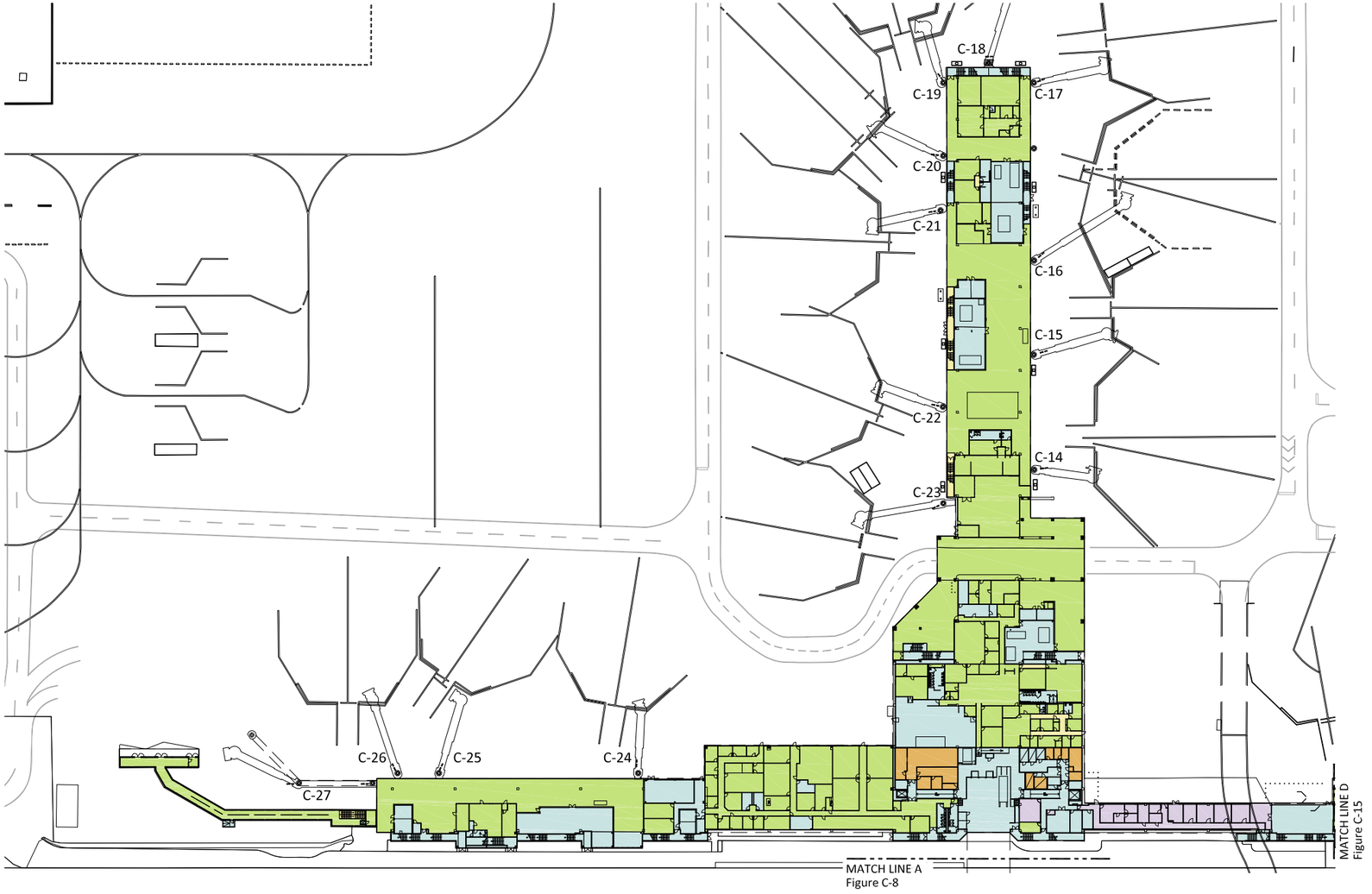
2.3.5.2 North and South Concourse Buildings

Two "T-shaped" concourse buildings provide airside aircraft boarding facilities. The North Concourse is shown in Figures 2-17 and 2-18; the South Concourse is shown in Figures 2-19 and 2-20. Pedestrian bridges extending from the north and south sides of Level 2 in the Central Building provide access to the concourse buildings. Because the security-screening checkpoints are in the Central Building, security-screened passengers may freely circulate between the concourse buildings. Furthermore, passengers may also transfer to all other terminals using the aerial Terminal Link system. They may also walk to Terminal D from the North Concourse building, or to Terminal E from the South Concourse.

Each concourse building is a two-level structure with passenger-related facilities at the upper level and airline/aircraft related facilities at the lower, apron level. There are a total of 12 active gates at the North Concourse Building, with two additional gate positions unused; one gate having been decommissioned and removed (C27) and the second (C15) blocked from use by the adjacent gates handling of larger widebody aircraft. There are a total of 16 active gates at the South Concourse Building, with one gate (C38) unassigned. All gates serve United Airlines aircraft.

2.3.5.3 Terminal Link Station C

Passengers in Terminal C can connect to stations at Terminals A, B, and D (with its connecting corridor to Terminal E) via the Airport's Terminal Link station located between the Central Building and the North Concourse Building. The station is accessed via the secure corridor bridge that links the North Concourse to the Central Building. The station itself spans North Terminal Road and is sufficiently elevated to allow the concourse bridges to pass under the elevated guideway structure. An elevator, escalators, and stairs connect the station to the secure corridor.



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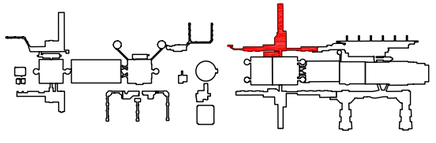

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LEGEND

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- Concessions
- Baggage handling
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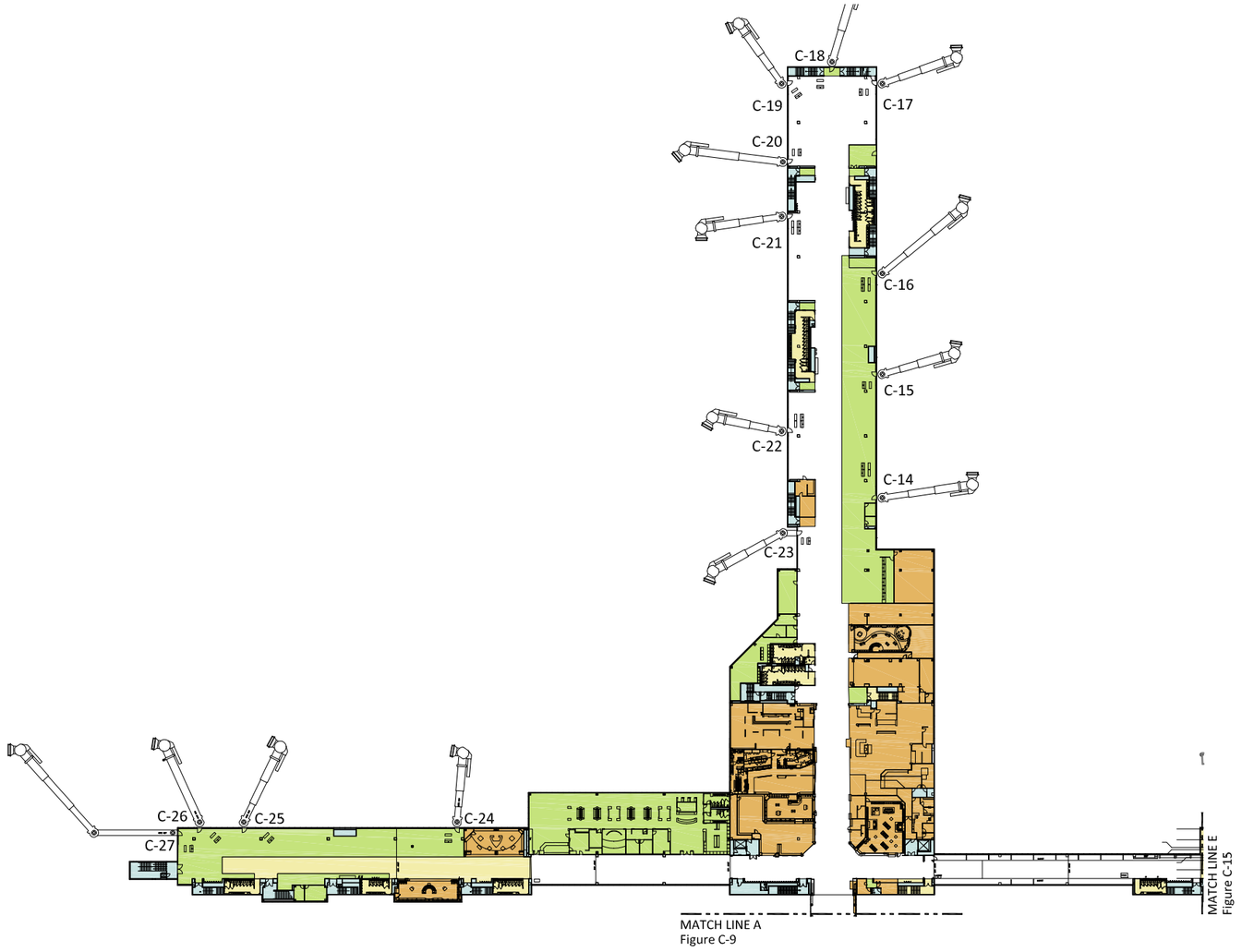
- Public space
- Building services & support

Figure 2-17
Terminal C North Concourse - Level 1



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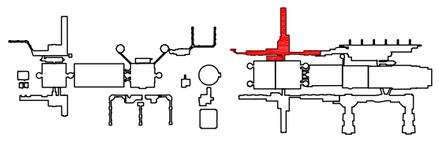

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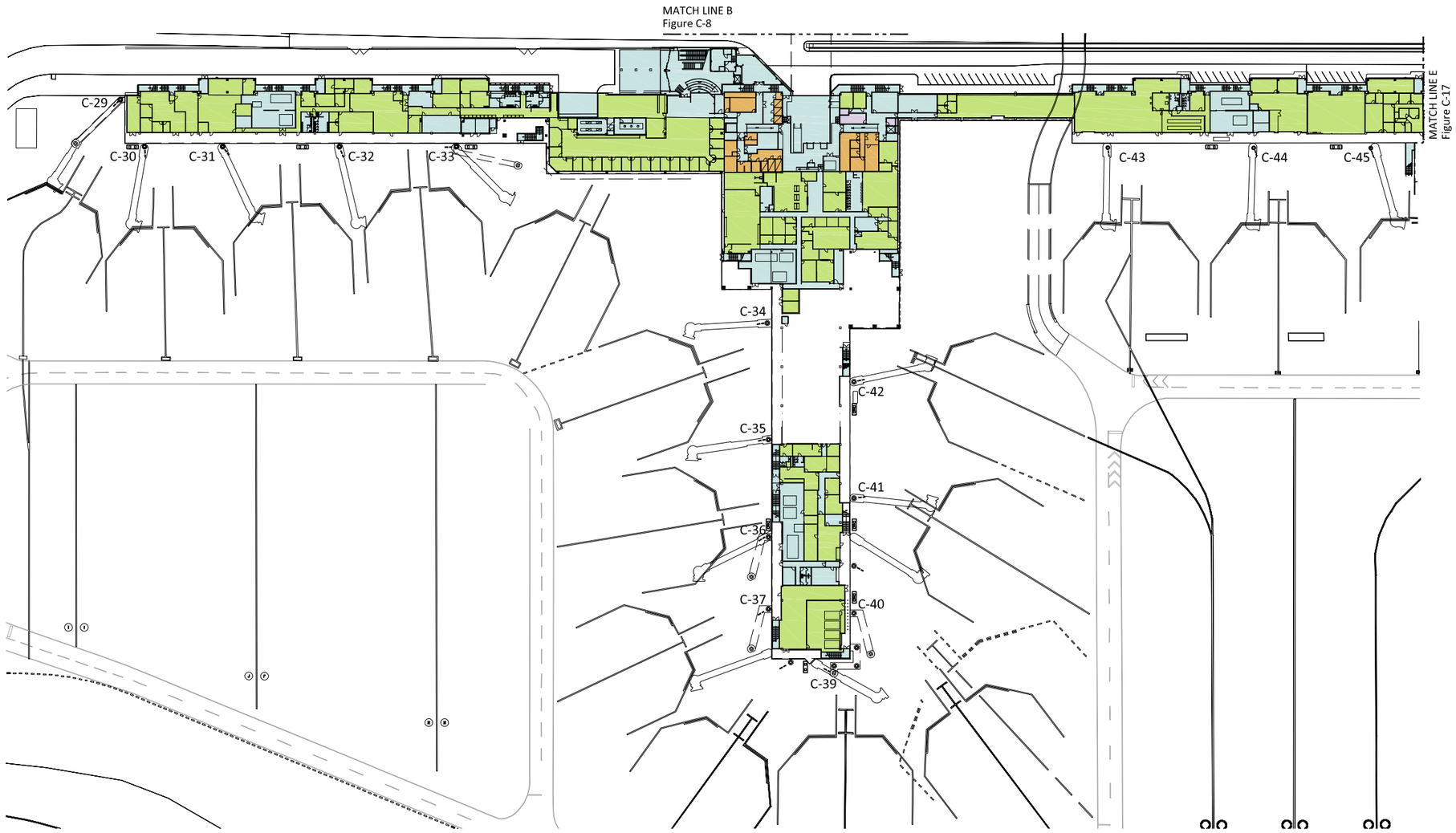
Figure 2-18
Terminal C North Concourse - Level 2



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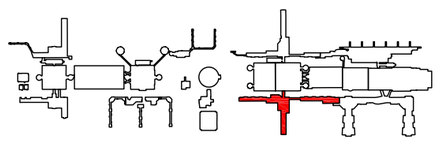

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LEGEND

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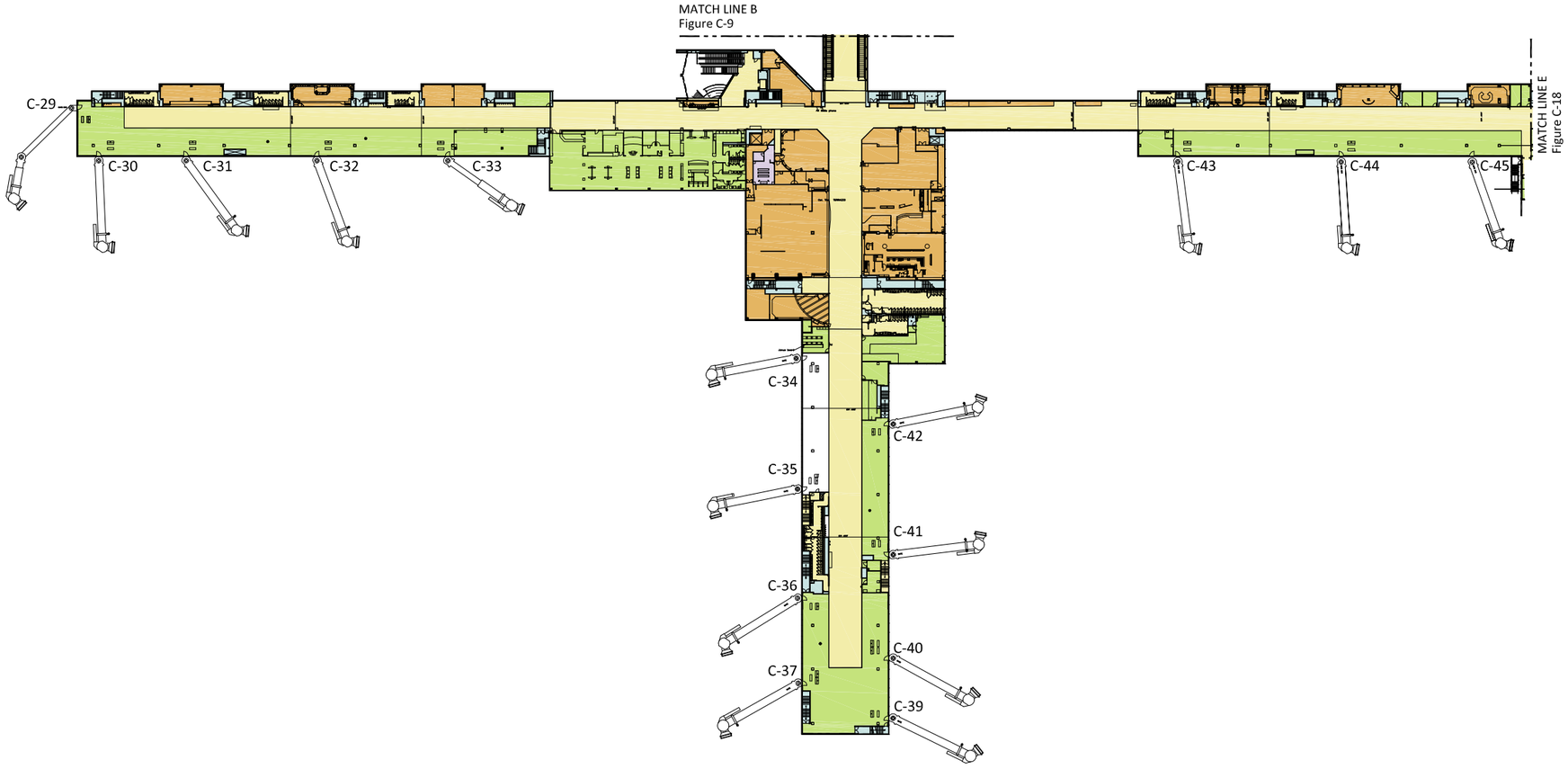
Figure 2-19
Terminal C South Concourse - Level 1



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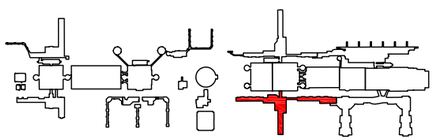

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LEGEND

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- Baggage handling
- Security
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- HAS
- Public space
- Building services & support

Figure 2-20
Terminal C South Concourse - Level 2

2.3.5.4 Passenger Circulation

Enplaning passengers entering the terminal from the below grade level (if using the ITT system for access from other terminals or the hotel) proceeding up the central elevator/escalator core to the Ticketing Lobby at Level 2. Those arriving from the enplaning road system enter the Level 2 Ticketing Lobby directly. Passengers driving and parking in the adjacent west garage enter at grade through Level 1 and up the centrally located elevator/escalator to Level 2. Alternately, they may enter via bridge links to the Mezzanine (Level 3), and go down via stairs or elevators to ticketing on Level 2. Completing check-in procedures at the airline ticket counters, passengers proceed through one of two security-screening checkpoints to a secure corridor extending to the bridges connecting to the concourse buildings.

At the north bridge, elevator and escalators provide access to the Terminal Link system for passengers connecting with flights in other Terminals.

Once in the concourse buildings, passengers may patronize food and merchandise facilities available near the concourse entries or proceed directly to their holdroom in one of the three concourse legs of each concourse. In the North Concourse Building, passengers may also connect with Terminal D, at its connection with the eastern concourse leg. Similarly, passengers may proceed to the eastern leg of the South Concourse Building to connect with the domestic and international operations of United Airlines in Terminal E.

Deplaning passengers proceed from the concourse buildings to the Central Building using the same bridges and secure corridor systems used by enplaning passengers. Once in Level 2 of the Central Building, passengers may transfer to other terminals via the Terminal Link accessed of the north secure corridor bridge.

Passengers terminating in Houston enter the Central Building and descend on dedicated escalators connecting directly to the Level 1 baggage claim area below. Alternately, they may exit the secure corridor into the ticketing lobby and circulate down to the baggage claim area using the central elevator/escalator core. Passengers may also utilize a bridge connection linking the western end of Terminal E to the Terminal C East Garage at Level 3 and from there connect via the non-secure mezzanine bridge to the Central Building of Terminal C.

Having claimed their baggage, deplaning passengers may exit the Central Building in one of four ways: (1) proceed directly to the deplaning roadways with private car pick-up on the north and taxi and rental car pickup to the south, (2) proceed to the center of the west side of the building for access to the adjacent garage structure at grade level, or (3) ascend the central elevator core of the building accessing the mezzanine-level bridge connections to adjacent parking structures or to the rooftop parking levels, (4) descend to Level LL1 for access to the Inter-Terminal people-mover system.

Terminal C also accommodates large United Airlines Club Lounges (in both the North and South Concourses) and ancillary customer facilities for young travelers, a Chapel, and a Nursery in the South Concourse.

2.3.5.5 Baggage Circulation

All enplaning and deplaning baggage is carried by conveyor systems to the baggage handling areas in Level 1 of the adjacent and contiguous parking garage east of the Central Building. Enplaning baggage is first checked in at the ticketing/check-in counters on Level 2 of the Central building where it is tagged and then moved via conveyors under the level 2 enplaning roadway to rise again into the TSA Screening located on Level 2 of the adjacent parking structure. After screening baggage is transferred by conveyor to United's

bag sorting area on Level 1 of the parking structure. Once sorted, baggage is transferred to aircraft on the north and south concourse airsides by baggage carts towed by tugs through the tunnels at the northeast and southeast ends of the central building. Deplaning baggage is brought to the same baggage handling area by baggage tugs through the same tunnels into the bag sorting area. Once sorted baggage is either transferred to connecting flights or deposited on conveyors that are directly connected to the respective baggage claim devices located on level 1 of the Main Building.

2.3.6 Terminal D

Terminal D which opened in 1990 was the fourth terminal constructed at IAH, and it was specifically designed to serve international arrivals and departures, replacing Flight Station 6 as the international arrival facility at the Airport. The terminal, which is named the Mickey Leland International Airlines Building, differs in design and function from the other terminals in that all passenger and airline arrival and departure functions were housed in a single structure. Terminal D provides six widebody gates (Boeing 747-400 and smaller aircraft) and six narrowbody gates. The building originally housed an FIS facility; however, with the subsequent completion of the Central FIS those functions have been relocated to that structure.

When originally constructed, Terminal D had connections from both the ticketing level and the passenger boarding levels with Terminal C's North Concourse which allowed some of the Terminal D gates to also support Continental Airline's domestic operations. At the time of development, Continental Airlines used six of the 12 gates primarily for domestic flights and the foreign flag carriers used the remaining six gates. Continental Airlines supported their gates (ticketing and baggage) from Terminal C, while the foreign flag carriers used newly developed facilities in Terminal D. As such, the outbound capability of Terminal D (ticketing, outbound baggage, security and airline offices) was limited to serving the six foreign flag carrier gates. The FIS included in the building had the capacity to accommodate approximately 1,800 passengers per hour and included sterile corridors, an immigrations area, a baggage claim area with five baggage claim units and customs inspection area, as well as USDA facilities. With the subsequent expansion of international flights by Continental Airlines in 2002, the level of service provided by the Terminal D FIS deteriorated to unacceptable levels. The construction of Terminal E and the Central FIS addressed the need for additional capacity to serve passengers arriving from international markets, most notably via Continental Airlines.

Today the terminal handles the operations of the following international air carriers: AeroMexico, Air France, Atlas Airlines, British Airways, Emirates Airline, KLM Royal Dutch Airlines, Lufthansa Airlines, Qatar Airways, Singapore Airlines, TACA, Turkish Airlines, and VivaAerobus. The building is operated on a common use basis, and all facilities are allocated by HAS.

The ticketing/check-in counters, hold rooms, gates and the baggage claim units in the Central FIS are operated on a common use basis. The allocation and use of the common use facilities is governed by HAS' International Facilities Policy (IFP).

The common use gates are developed to accommodate different classes of aircraft in order to provide flexibility. The current gates are either capable of accommodating ADG V aircraft and smaller or ADG III aircraft and smaller. The introduction of jumbo jets, namely the Airbus A380, into the IAH fleet mix has presented challenges for the existing building's capability. The A380 is a unique aircraft with a significantly larger wingspan and passenger capacity than the Boeing 747-400 and other ADG V aircraft, for which the building was designed. Lufthansa recently replaced their Boeing 747-400 service with service on an Airbus A380. In response, HAS made modifications to the building to accommodate the unique boarding

requirements and larger parking area required for the A380 at Gates D11 and D12. The A380 gate is referred to as Gate D12A which uses both existing Gates D11 and D12.

The demand for new international services continues to grow, and the HAS is currently evaluating the potential to expand the capability of Terminal D, which is now 22 years old. Any plans for Terminal D in the near-term will become part of the baseline conditions for the purposes of the master plan.

With the relocation of the FIS functions from Terminal D into the Central FIS, large areas of the present terminal building are vacant and underutilized. Studies are currently underway to determine how the terminal might be reconfigured to better utilize the available space and accommodate the growing number of international carriers and the larger aircraft expected to operate at the Airport in the future.

2.3.6.1 Building Composition

Terminal D depicted in Figures 2-21 and 2-22 is a long rectangular structure on five levels. Unlike the Central building at Terminals A, B, and C, Terminal D is located north of North Terminal Road rather than being between North and South Terminal Roads. This configuration reduces the walking distances to the gates even though the single loaded corridor configuration at the passenger holding areas by its nature tends to spread gates out. Terminal D is also unique in that there were more levels dedicated to the processing of inbound international passengers sandwiched between the ticketing and a departure levels. Because these additional levels do not generally align with the other airport levels, original and continuing practice has been to refer to the levels by their elevation above sea level. In keeping with this practice the levels of Terminal D are as follows:

- The ITT/utility Level (Figures 2-21 and 2-29) is a below grade level, substantially smaller than the floor level above. It provides a tunnel connection under North Terminal Road to the ITT and additionally provides non-secure access to the international arrivals building. This level also houses building mechanical spaces, baggage tunnels, and space for airline and HAS operations.

- Level 1 (elevation 88, Figure 2-21) includes the departure functions of Terminal D and adjoins the curbside areas along North Terminal Road. Level 1 accommodates the enplaning passenger facilities consisting of the ticketing lobby and airline ticketing and check-in counters, as well as the passenger security screening area and the baggage screening areas. Airline offices occupy space at the extreme eastern and western ends of the terminal. The terminal services areas (truck dock and trash compactors) are also accommodated at the east end of Level 1.

  The ticketing lobby is a high volume space containing a vertical circulation core that provides escalators and elevator systems to the departure level on Level 4 above. The circulation core is partitioned off from the rest of the lobby and accessed only from the passenger screening areas. Originally the areas north of the ticketing lobby accommodated the baggage claim and US Customs inspection facilities of the former FIS.

  Following the relocation of Continental Airlines international and domestic operations to Terminal E and the construction of the Central FIS, the former FIS space and much of the building became underutilized. New flight services emerged that soon created a need to expand the outbound processing capabilities of Terminal D for foreign flag carriers from six gates to 12 gates. Additional ticket counters were installed at the west end of the building along with additional airline ticket offices and outbound baggage capabilities, including a supplemental TSA baggage screening area. The expansions of internal functions began to consume portions of the former FIS space. Passenger security screening was relocated from the lobby and expanded as well into

some of the former FIS space. In addition, an in-line baggage screening area was subsequently added to Level 1 that also consumed portions of the former FIS space.

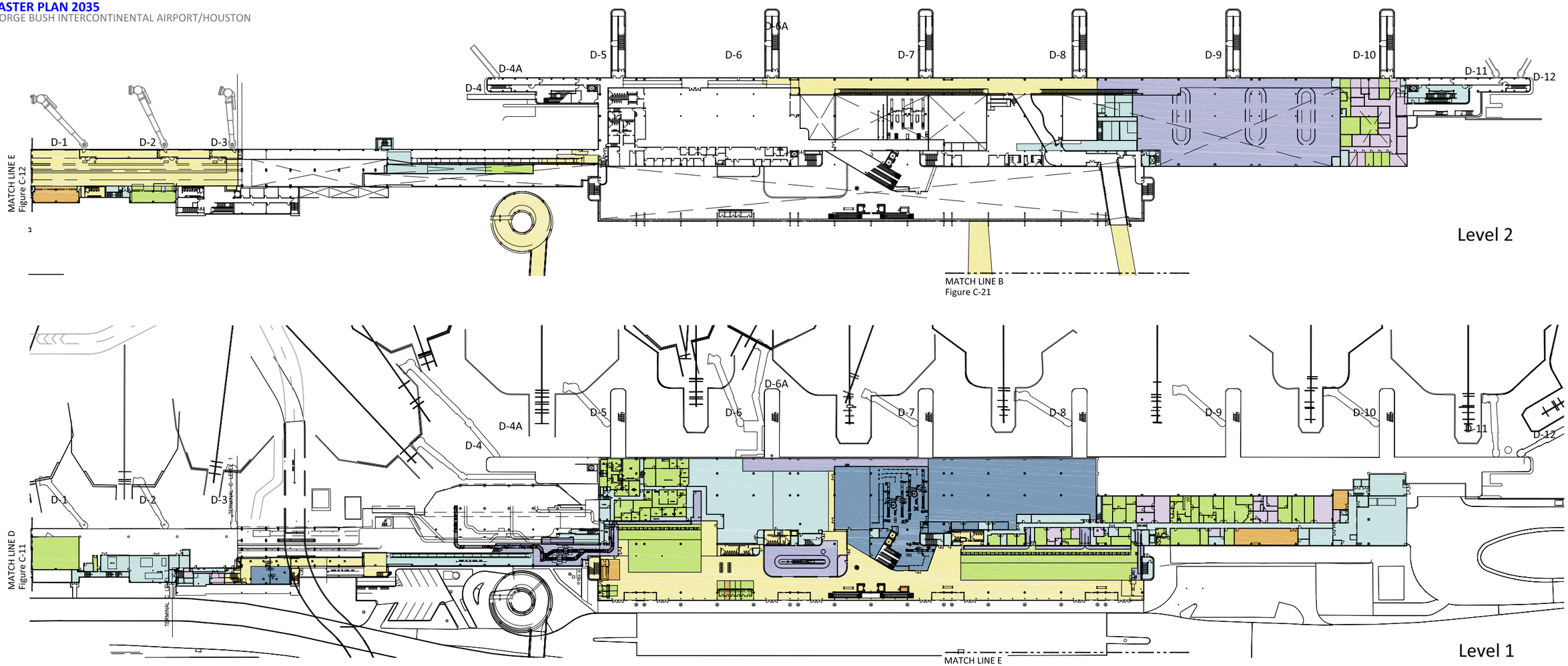
One baggage claim carrousel remains on Level 1 to serve the now rare domestic arrival as well as pre-cleared international arrivals or return to gate international flights. This lone carrousel effectively divides the ticketing lobby into two distinct ticketing zones at the eastern and western ends of the building.

- Level 2 (elevation 100, Figure 2-21) is the apron level of Terminal D. It accommodates the outbound baggage make-up facilities as well as the airline maintenance offices and storage facilities. Baggage conveyors belts are arranged along the north edge of the level, and an enplaning baggage handling and sorting areas occupy the east and west ends of the building.

- Level 3 (elevation 106/111, Figure 2-22) is generally at the same elevation as the departures level (Level 2) of all the other airport terminals. However, at Terminal D this level provides sterile circulation corridors from the international gates and originally accommodated much of the former FIS functionality. This level also previously accommodated an in-transit lounge for connecting international passengers. The sterile corridors remain in use today but portions of the former FIS located on this level remain vacant. With the construction of the Central FIS building, the sterile corridor was reconfigured with the addition of a diagonal corridor bisecting the former in-transit lounge and a trussed bridge structure connecting the original sterile corridor, across and over the ticketing lobby and North Terminal Road to the Central FIS.

- Level 4 (elevation 121, Figure 2-22) is the departure level that provides passenger hold rooms, concessions, airline clubs, and related departing passenger amenities. Access to the boarding jetways is provided by a ramp system at each gate. Much of Level 4 is open space abutting the northern face of the building with concessions, airline clubs and other support spaces along its southern edge. This large hall is further broken up by freestanding, partial height enclosures which contain additional concessions and airline club facilities. Near the eastern and western ends of this level there are exit balconies which overlook the ticketing lobby while providing access to the adjacent fire stairs. A portion of the level adjacent to the escalators overlooks the ticketing lobby on Level 1 below. To the east of the escalators a trussed bridge structure provides the secure corridor connection over the ticketing lobby below and across North Terminal Road to Terminal E. Access to the Terminal Link Station is also gained through this bridged corridor.

  Extending to the west from Level 4 is a secure connection to Terminal D Gates D1, D2 and D3 as well as the North Concourse of Terminal C. This connection is referred to as the C-link. Because of elevation differences in the Terminal D Level 4 and the departure level of Terminal C, this corridor slopes downward from east to west. Moving walkways are provided in this corridor to assist passenger transitions.



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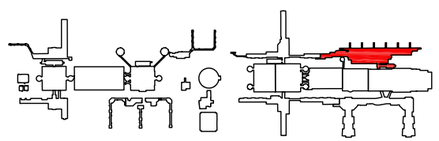

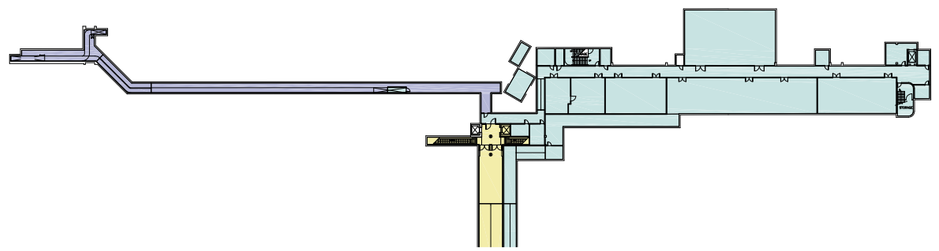

Source: HAS Records and IAH Airport Layout Plan, August 2006
Prepared by: RdlR Architects, Inc., December 21, 2012

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N

LEGEND

- Airline
- Concessions
- Baggage handling
- Security
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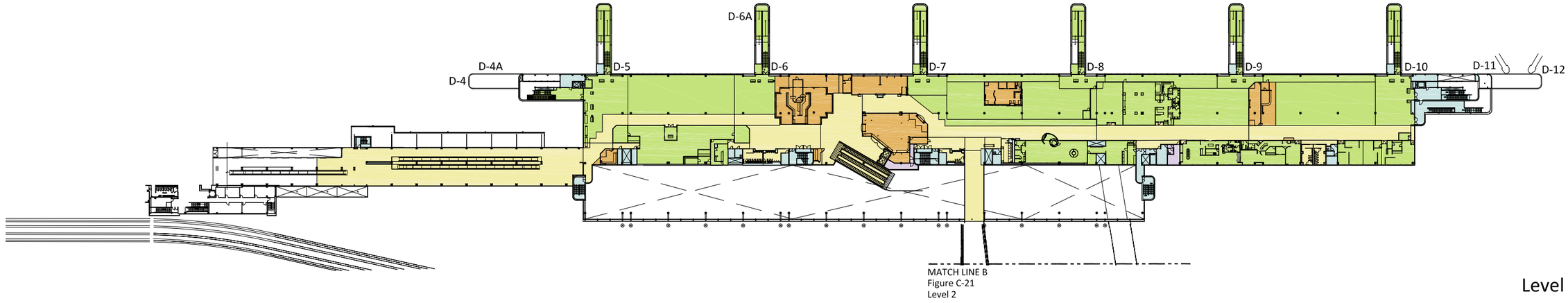
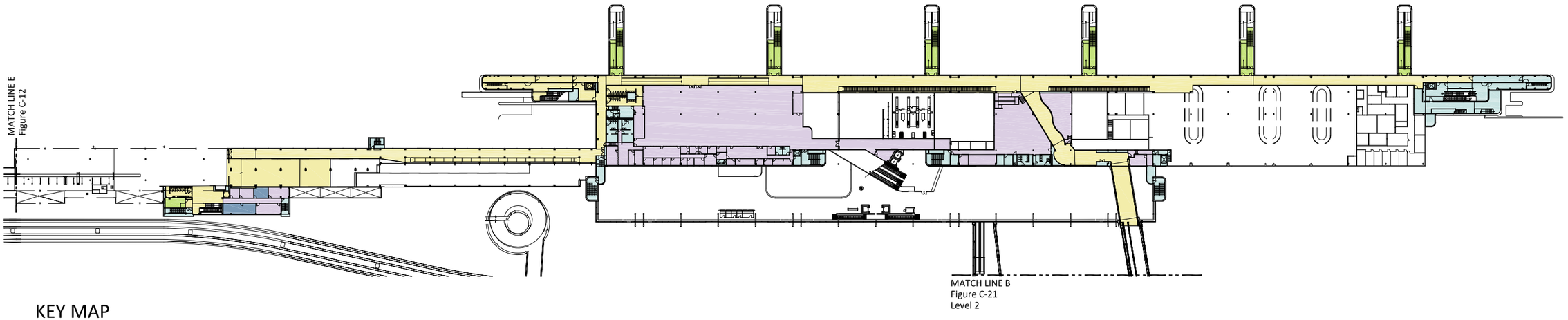
- Public space
- Building services & support

Figure 2-21
Terminal D - Levels LL, 1, & 2



Level 4



Level 3

KEY MAP

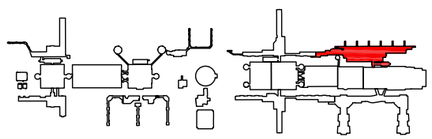


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Figure 2-22
Terminal D - Levels 3 & 4

2.3.6.2 Terminal Link Station D/E

Passengers in Terminal D can connect to stations at Terminals A, B, and C via the Airport's Terminal Link station located south of Terminal D and centered over North Terminal Road. The station is accessed off the secure corridor bridge that links Terminal D to the Central FIS building and Terminal E. An elevator, escalators, and stairs connect the station to the secure corridor.

2.3.6.3 Passenger Circulation

Non-security-screened persons may enter Terminal D in several ways, directly from the curbside along North Terminal Road, or through an underground tunnel connection and escalators/elevators from the ITT system to the ticketing lobby. Alternately, passengers may park in the garage structure between Terminal C and the Central FIS/Terminal E and gain access to Terminal D via the ITT.

Once arriving at the Level 1 ticketing lobby passengers proceed to the east or west ends of the lobby for airline check-in and bag check. Passengers then proceed to the center of the building where they pass through security screening leading to the vertical circulation core which provides access to the passenger boarding and hold rooms on Level 4.

Arriving passengers from connecting domestic flights gain access to the Level 4 boarding areas via connections from the Terminal C North Concourse or the secure bridge connection to the Central FIS building and Terminal E. The secure bridge connection also allows access to the Terminal Link connecting Terminals A, B and C. Enplaning passengers pass through the boarding gates, down a ramp system to access the jetways for aircraft boarding.

Arriving international passengers exit the jetways and descend a ramp to the sterile corridor on Level 3 which connects to the Central FIS building via the sterile bridge crossing North Terminal Road. Passing through the Central FIS building, passengers will ultimately either enter the secure corridor system in the Central FIS building and connect to other domestic flights, or exit into the meeter/greeter lobby in the Central FIS building.

2.3.6.4 Baggage Circulation

After check-in all outbound international baggage is transferred to TSA baggage screening facilities on the east or west ends of the building. After screening, baggage moves via conveyors to the baggage sorting areas airside at Level 2. Once there, baggage is transferred to the awaiting aircraft by baggage tugs. Inbound international baggage is loaded on to baggage tugs which transport it to the lower level of the Central FIS building via a bridge spanning North Terminal Road. Once there, it is placed on conveyors which then deposit the luggage onto the baggage claim carrousels located on Level 1 of the FIS building.

2.3.7 Terminal E

Terminal E is the newest terminal building at the Airport. Opened in 2003, it was built to accommodate the operations of Continental Airlines (now United Airlines). The Terminal E concourse is a three-level building, as depicted on Figures 2-23, 2-24, and 2-25, that serves as a domestic and international passenger enplaning and deplaning facility. It is completely an airside terminal having no direct connections to landside facilities. Landside functions are provided by facilities housed in the Central FIS building and Terminal C. Terminal E ticketing and passenger security screening is located on Level 2 of the Central FIS Building. The Terminal E ticketing and concourse buildings are linked to the Central FIS via a sterile bridge. Ticketing and passenger processing in Terminal E is dedicated to international passengers while domestic passenger ticketing and passenger processing is located on Level 2 of Terminal C Central Building. Access to the Terminal Link station is provided via a connecting corridor passing through the Central FIS building.

2.3.7.1 Building Composition

Terminal E is connected to Terminal C's South Concourse and to the Central FIS at the center of the facility. The Terminal E concourses have three levels, Level 1, shown on Figure 2-23, is at the apron level and serves airline operations offices. Level 2, shown on Figure 2-24, is the primary level of the terminal building with East and West Concourse wings that provide concessions and hold rooms and boarding facilities for a total of 23 aircraft gates. The gates are arranged in clusters and have the flexibility to serve either domestic or international flights. The domestic passengers are routed through the concourse level (Level 2). The international passengers deplane at the same level but are immediately transitioned via vertical circulation to a sterile corridor at a mezzanine level (Level 3), shown on Figure 2-25, ultimately connecting to the Central FIS via the sterile bridge for customs processing and inspections. Also in this third level, separated from the sterile corridors, are mezzanine restaurant concessions, one in each wing, and a United Airline's Club located at the center of the building.

2.3.7.2 Passenger Circulation

Enplaning passengers enter the Terminal E concourse after completing check-in procedures and security screening either at the Terminal E ticketing lobby or Terminal C. Passengers then proceed to the concourse through secure connectors on Level 2. Once in the concourse building of Terminal E, passengers may await their flight at the concessions areas located throughout the facility, or proceed to their designated departure hold rooms in either East or West Concourse wings.

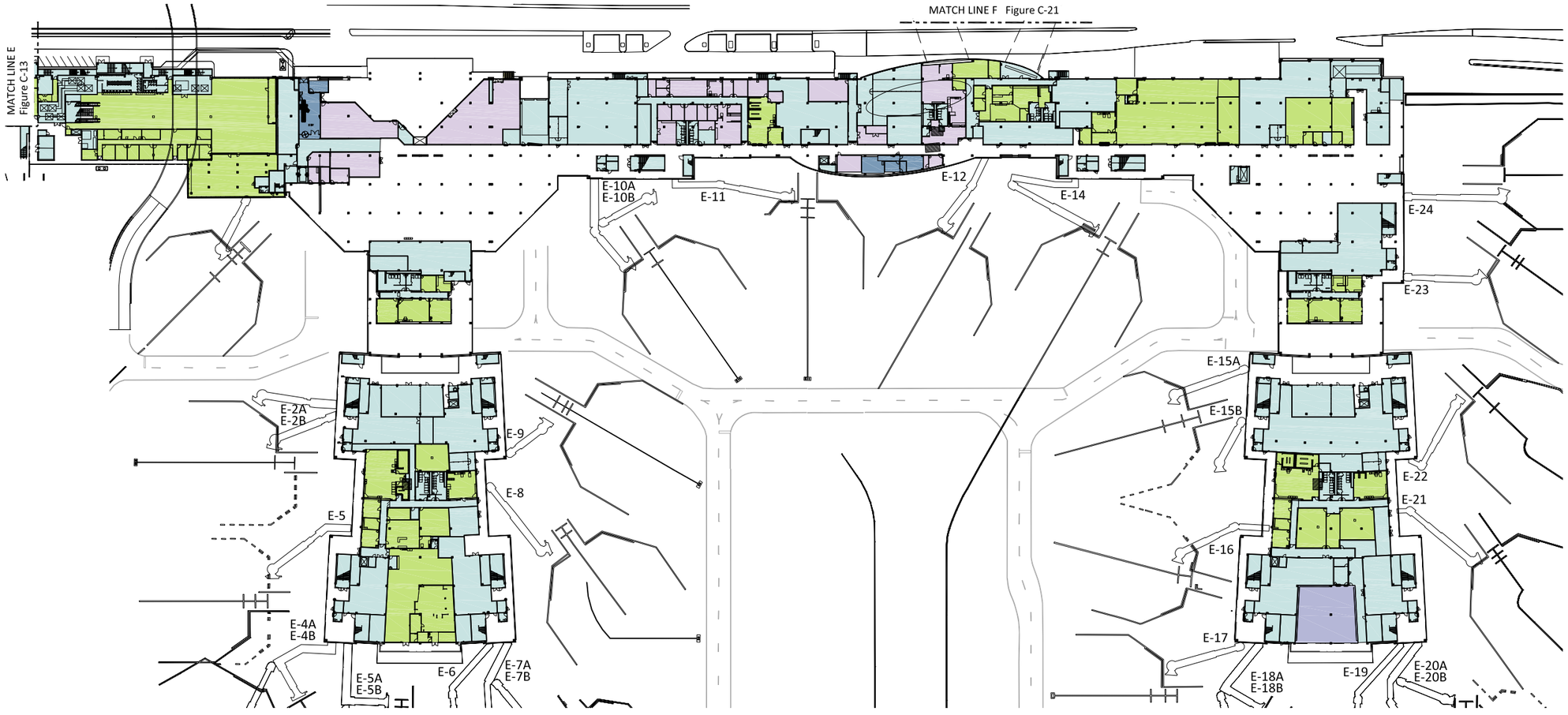
Domestic deplaning passengers utilize the same secure corridor systems to proceed to Terminal C baggage claim, or transfer to other terminals via the Terminal Link system at the station shared with the FIS and Terminal D. Having claimed their baggage, deplaning passengers exit the same way as other Terminal C passengers. International deplaning passengers proceed, via the mezzanine sterile corridors, across at sterile bridge spanning South Terminal Road to the Central FIS building for immigration processing and customs inspections. Once processed, the passengers either proceed to baggage re-check and a passenger security screening area prior to connecting to domestic flights through secure corridors leading to other terminals, or exit into the Central FIS meeter/greeter lobby and arrival curbside.

2.3.7.3 Baggage Circulation

All outbound international baggage in Terminal E is handled by United Airline's baggage facilities located below the Terminal C East Garage. After check-in at either Terminal E or Terminal C all baggage is screened and transported via conveyor to the central baggage facility where it is processed as described in the Terminal C narrative and then transported via baggage tugs to the Terminal E gates.

Domestic inbound baggage is likewise handled as described in the Terminal C narrative ultimately being deposited onto the Terminal C baggage carrousels.

Inbound international baggage is loaded on to baggage tugs and transported to the lower level of the Central FIS building via a bridge spanning South Terminal Road. Once there, it is placed on conveyors which then deposit the luggage onto the baggage claim carrousels located on Level 1 of the Central FIS building.



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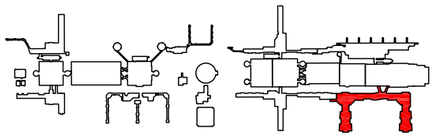

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LEGEND

- Airline
- Concessions
- Baggage handling
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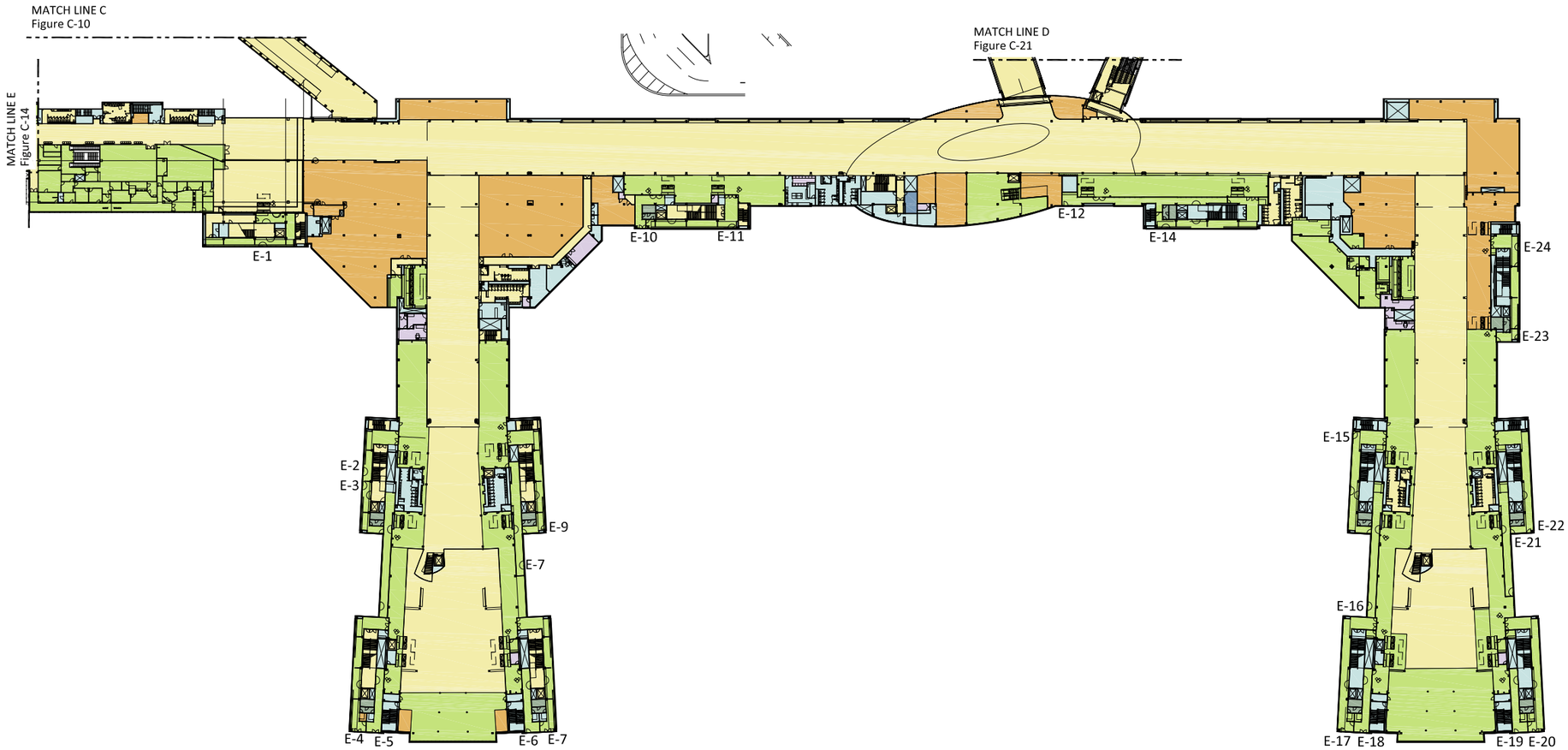
- Public space
- Building services & support

Figure 2-23
Terminal E - Level 1



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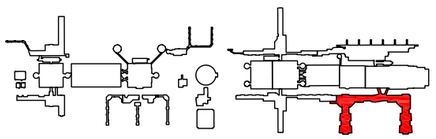

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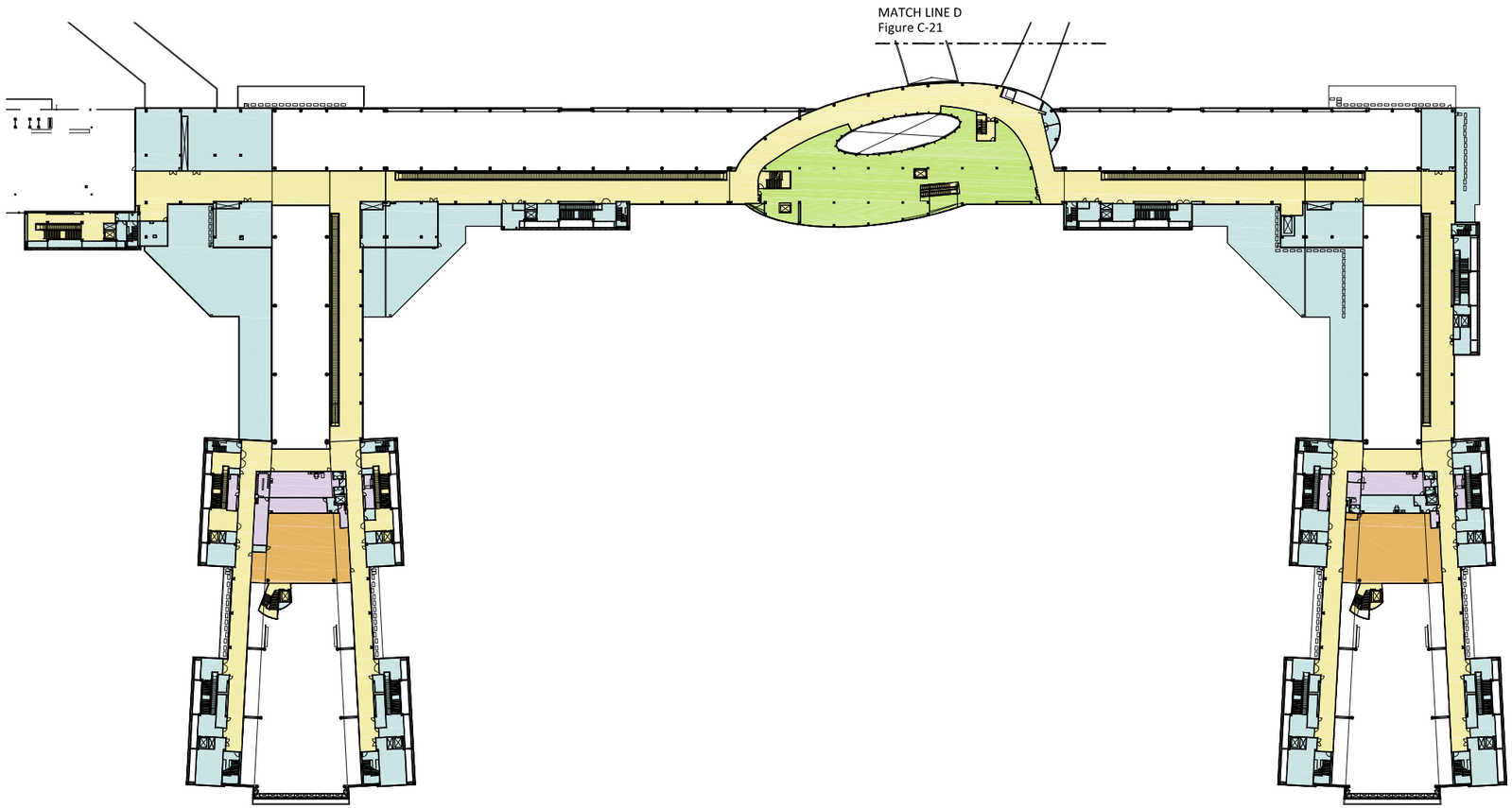
Figure 2-24
Terminal E - Level 2



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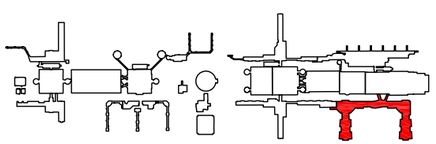

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Figure 2-25
Terminal E - Level 3

2.3.8 Federal Inspection Services Building

The International Arrivals and Federal Inspection Services building opened for operations in 2005. With its opening, all FIS functions previously provided in Terminal D were relocated to the Central FIS building located between Terminals D and E. The Central FIS was designed to accommodate the increased international traffic passing from Terminal D and Continental Airline's Terminal E.

The Central FIS building also functions as Terminal E's landside support, providing ticketing lobby, baggage check and security screening for those enplaning local passengers. United Airlines directs international departing passengers to Terminal E and domestic departing passengers to Terminal C. The Central FIS building only serves deplaning international traffic which must be processed through the FIS; domestic passengers arriving at Terminal E gates are directed to Terminal C for bag claim.

2.3.8.1 Building Composition

The levels of the FIS building segregate in-bound international baggage processing and inspections and deplaning flows of passengers through the various inspection processes of the Federal Inspection Services, as follows:

- Level LL (Figure 2-26) is below grade and provides space for international inbound baggage handling and conveyors and the right-of-way and boarding platform of the ITT system. The ITT Station (Figure 2-29) is actually at a lower level at this location and is accessed via escalators, elevators and stairs from this level. Baggage tugs utilize bridges spanning the terminal roads to access the ramps leading to the baggage handling facility from the eastern end of the building, adjacent to Taxiway SF.

- Level 1 (Figure 2-27) provides: baggage claim; customs and agricultural inspections; bag screening and recheck for continuing passengers; public services; Federal agency offices; a meeter/greeter lobby; deplaning curbside; and parking access to the garage located west of the facility.

- The western third of Level 2 (Figure 2-27) provides: airline ticketing and flight check-in counters; offices for United Airlines; security screening checkpoints; limited public waiting areas; public services; enplaning curbside; and access to the parking garage to the west. Just past the security check points a secure corridor traverses the building north to south providing connections to Terminal D and E and the D/E Terminal Link Station. Continuing west the balance of the level is dedicated to FIS functions including Customs and Border Patrol offices, sterile corridor connections from Terminals D and E, in-transit lounge, and immigration checkpoints. At the far eastern end of this level, escalators, stairs and elevators provide access to the baggage claim areas located on the floor below.

2.3.8.2 Passenger Circulation

International deplaned passengers enter the Central FIS building via sterile bridges spanning the terminal roads from Terminals D and E ending at the western end of the immigration hall. Circulating through the hall they pass through immigration checkpoints to the sky-lit central spine of the building. Traveling eastward down this spine, passengers take escalators or elevators at the eastern end of the building to the baggage claim hall below. Collecting their baggage they proceed to the western end of the hall and are directed through customs inspection stations. Once clearing customs they exit the hall and are presented two circulation paths. Connecting passengers recheck their luggage and proceed up an escalator to the passenger rescreening area on level 2. Once rescreened, passengers enter the secure corridor connecting Terminals D and E and the Terminal Link Station for transit to connecting flights. Terminating passengers

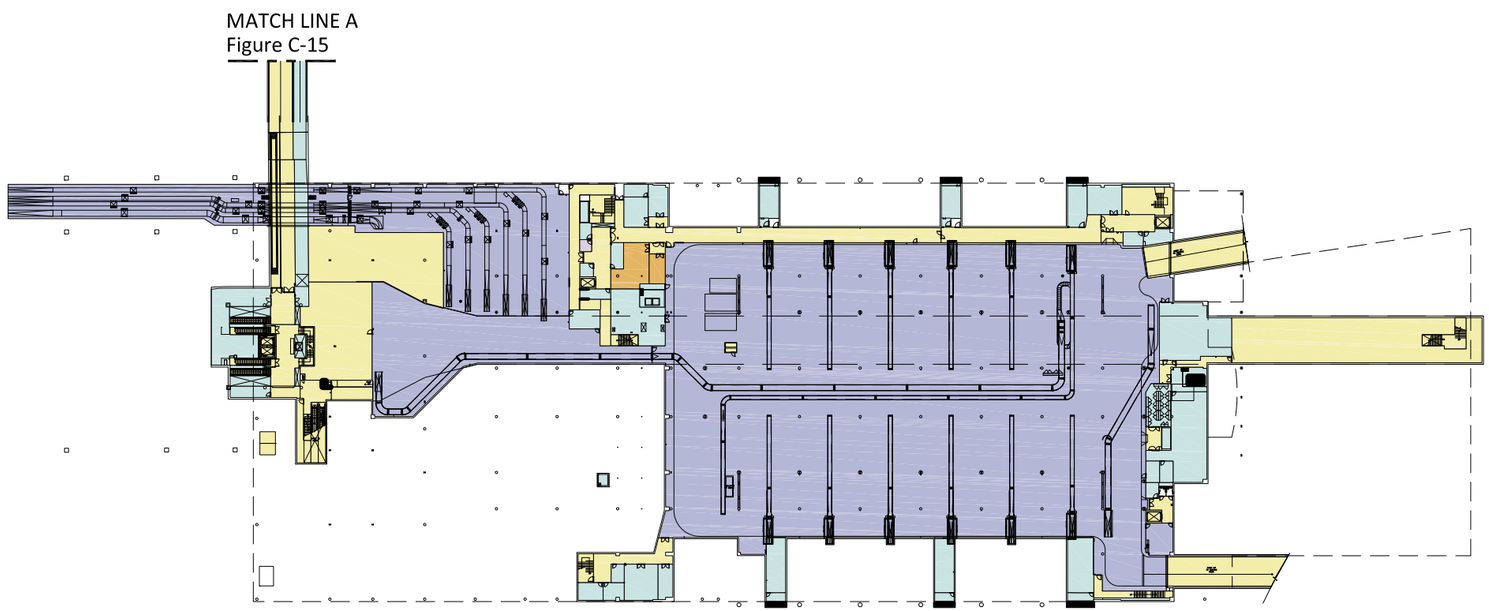
bypass the baggage recheck and exit into the meter/greeter lobby from which they may exit to curbside and the parking garage.

2.3.8.3 Baggage Circulation

All international inbound baggage is carried by baggage tug transport from Terminals D and E to the baggage facility located on the lower level of the FIS through a roadway and bridge system at the eastern ends of the terminals. Once in the FIS baggage processing on Level LL1 the baggage is placed on conveyors dedicated to each of the twelve baggage carrousels located in the baggage claim hall on Level 1 above. Passengers collect their bags and pass through the customs hall as described above. Baggage destined to continuing domestic flights is rechecked and carried via a conveyor down to the lower level where it is screened and then transported via conveyor to United Airline's baggage sorting facility located under the Terminal C, East Garage. Passengers continuing on flights on other international carriers must exit with their baggage into the meeter/greeter lobby and circulate down into the non-secure tunnel connection to Terminal D, where they recheck their baggage at the check-in counters there.

2.3.9 Building Spatial Allocation

Tables 2-5 through 2-10 provide a summary of the functional space allocation and usage in each terminal building and the Central FIS. As shown, there are a total of 28 aircraft gates in Terminal A, 67 in Terminal B, 28 in Terminal C, 12 in Terminal D, and 23 in Terminal E, for a grand total of 158.



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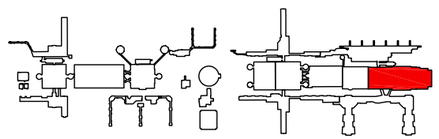

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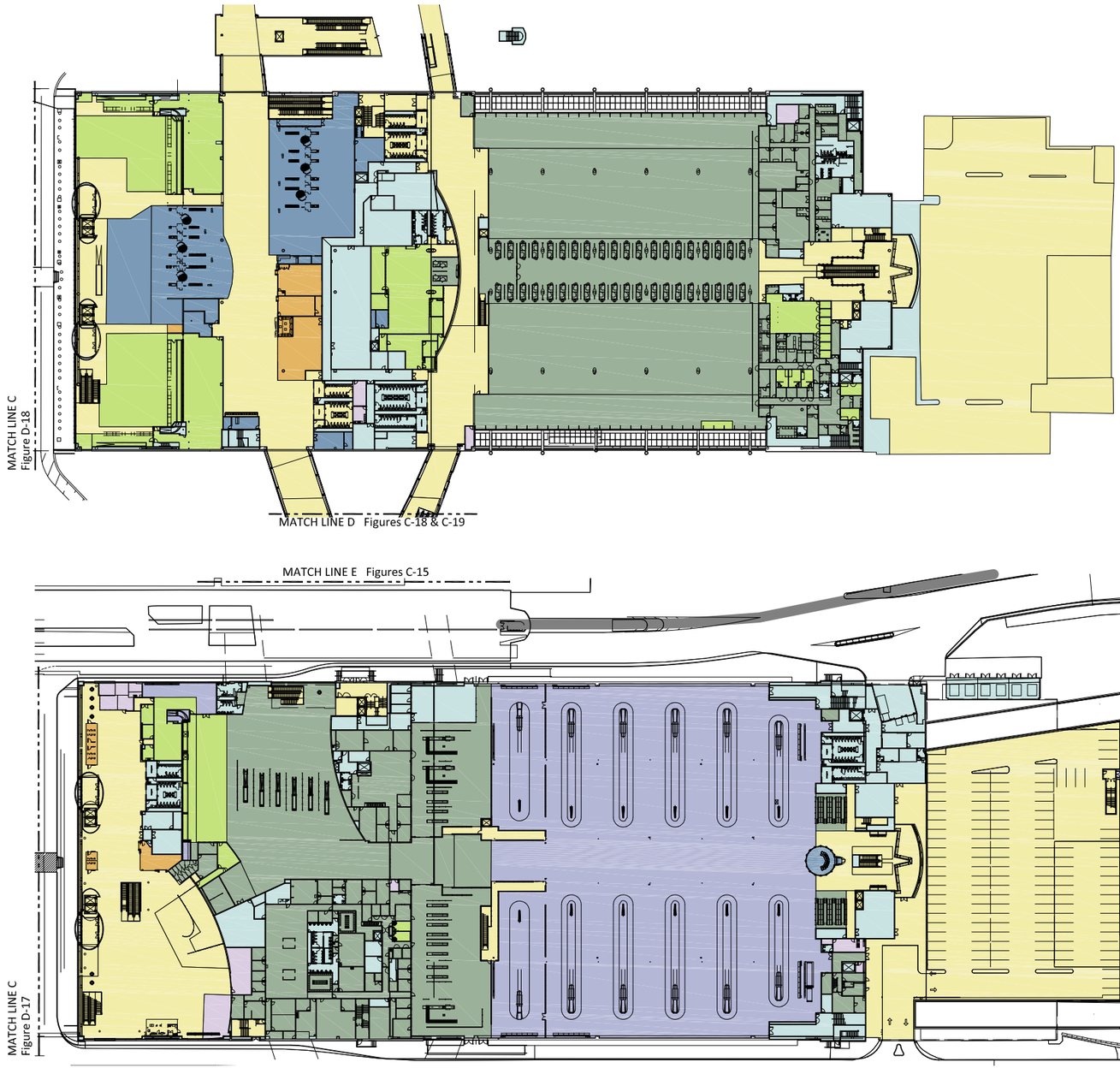
Figure 2-26
FIS & International Arrivals - Level LL1



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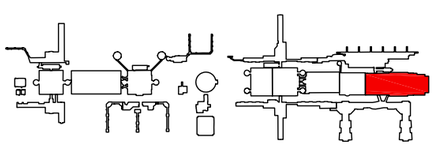

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Level 2

Figure 2-27
FIS & International Arrivals - Levels 1&2

Table 2-5

TERMINAL A SPACE ALLOCATION AND USAGE

SPACE FUNCTION AREA (SF)	CENTRAL BUILDING LEVELS						NORTH CONCOURSE LEVELS			SOUTH CONCOURSE LEVELS			
	LL	1	2	3	4	Total (SF)	1	2	Total (SF)	1	2	Total (SF)	Total Area (SF)
AIRLINE		1,969	21,335	2,071		25,375	35,202	29,529	64,731	22,996	23,819	46,814	136,920
Check-in Counters (ea)			66										66 ea
Check-in Kiosks (ea)			27										27 ea
Gates (ea)								18			10		28 ea
Ticket Counter Area			4,829			4,829							4,829
Check-in			3,883			3,883							3,883
Check-in Queue			3,797			3,797							3,797
Passenger Holdrooms & Gates							10,599	24,180	34,779		19,455	19,455	54,234
Clubs							283	2,624	2,907		4,364	4,364	7,271
Offices		1,969	6,652	2,071		10,692	3,141	2,666	5,808	7,727		7,727	24,227
Operations			2,175			2,175	21,178	59	21,237	15,269		15,269	38,680
BAGGAGE HANDLING		49,520	21,781			71,302	43,432		43,432	37,534	1,576	39,110	153,843
Bag Claim Conveyors (ea)		6											6 ea
Outbound Bag Handling			21,781			21,781	40,557		40,557	37,534	1,576	39,110	101,448
Bag Claim		29,873				29,873							29,873
Inbound Bag Handling		19,648				19,648	2,875		2,875				22,522
BUILDING SERVICES & SUPPORT *(a)*	17,760	13,954	8,822	17,340	356	58,233	22,554	11,318	33,872	19,614	8,898	28,512	120,617
CONCESSIONS	61	1,315	4,316	421		6,114	1,077	20,764	21,842	2,218	21,578	23,795	51,751
Food & Beverage	61		3,809			3,870		9,129	9,129		7,081	7,081	20,080
Food & Beverage (Secure)								3,400	3,400		4,874	4,874	8,274
Merchandise/Retail		900	507			1,407	1,077		1,077				2,485
Merchandise/Retail (Secure)								4,327	4,327		7,625	7,625	11,952
Offices		415		421		837		3,909	3,909	2,218	1,997	4,215	8,960
CUSTOMS & BORDER PROTECTION													
FIS Process													
FIS Queue													
CBP Offices													
HAS ADMINISTRATION *(b)*	4,252	25,967	3,337	15,850	5,867	55,272	5,155	2,155	7,309	11,968	3,085	15,053	77,634
PUBLIC SPACES	16,974	33,687	69,239	20,003	149,218	289,121	4,626	39,633	44,259		35,293	35,293	368,673
Circulation	16,906	27,226	31,165	1,623	5,542	82,461	2,526		2,526		1,236	1,236	86,223
Circulation (Secure)	68		25,153	5,960		31,181	1,782	35,383	37,166		31,129	31,129	99,475
Ticket Lobby (Non-Airline)			944			944							944
Meeter/Greeter Lobby		1,936		59		1,995							1,995
Restrooms							317	4,250	4,567		2,928	2,928	7,495
Parking		4,525	11,977	12,362	143,676	172,539							172,539
SECURITY			4,992			4,992		6,652	6,652		5,088	5,088	16,732
X-Rays Checkpoints (ea)			7										7 ea
AIT checkpoints (ea)			3										3 ea
TSA Screening								3,379	3,379		4,530	4,530	7,909
TSA Queue			4,992			4,992							4,992
TSA Offices								3,273	3,273		558	558	3,831
TSA Bag Screening													
TOTAL	39,047	126,413	133,822	55,686	155,441	510,409	112,045	110,051	222,096	94,329	99,336	193,665	926,170

(a) Includes Mechanical, Electrical, Fire Stairs, Service Elevators, Non-Public Restrooms, Chases (Voids), Loading Docks.
(b) Includes Offices and Security.

Table 2-6

TERMINAL B SPACE ALLOCATION AND USAGE

SPACE FUNCTION AREA (SF)	CENTRAL BUILDING LEVELS					NORTH CONCOURSE LEVELS			SOUTH CONCOURSE LEVELS				
	LL	1	2	3	Total (SF)	1	2	Total (SF)	1	2	3	Total (SF)	Total Area (SF)
AIRLINE		841	5,728	9,776	16,345	51,073	12,558	63,631	21,591	20,990	16,760	59,340	139,317
Check-in Counters (ea)			21										21 ea
Check-in Kiosks (ea)													--
Gates (ea)							33	33					33 ea
Ticket Counter Area			1,079		1,079								1,079
Check-in			582		582								582
Check-in Queue			1,224		1,224		583	583					1,807
Passenger Holdrooms & Gates						33,874	11,318	45,192	1,598	18,705		20,303	65,495
Clubs				9,776	9,776						5,990	5,990	15,776
Offices		409	2,487		2,896	13,597	658	14,254					17,150
Operations		432	356		788	3,602		3,602	19,993	2,285	10,770	33,047	37,437
BAGGAGE HANDLING	2,127	38,661	508		41,295								41,295
Bag Claim Conveyors (ea)		5											5 ea
Outbound Bag Handling			508		508								508
Bag Claim		7,689			7,689								7,689
Inbound Bag Handling	2,127	30,971			33,098								33,098
BUILDING SERVICES & SUPPORT *(a)*	1,035	12,788	18,252	12,860	44,934	5,060	1,995	7,055	25,504	9,322	4,740	38,566	90,556
CONCESSIONS		9,250	20,536	4,865	34,650		1,555	1,555	3,396	17,184		20,580	56,786
Food & Beverage		124	6,579		6,702		807	807		634		634	8,143
Food & Beverage (Secure)			7,574		7,574		748	748		9,368		9,368	17,690
Merchandise/Retail		286	464		751								751
Merchandise/Retail (Secure)			5,046		5,046					7,183		7,183	12,229
Offices		8,840	873	4,865	14,578				3,396			3,396	17,974
CUSTOMS & BORDER PROTECTION													
FIS Process													
FIS Queue													
CBP Offices													
HAS ADMINISTRATION *(b)*		14,333	1,366	9,156	24,855	322		322		228		228	25,406
PUBLIC SPACES		20,905	51,295	17,452	89,653	2,344	18,872	21,216	50,423	37,496	4,543	92,461	203,329
Circulation		19,504	13,132	551	33,187				10,894		3,969	14,863	48,050
Circulation (Secure)			25,589	8,077	33,666	1,728	17,744	19,472	39,528	32,675		72,203	125,341
Ticket Lobby (Non-Airline)													
Meeter/Greeter Lobby		689			689								689
Restrooms		712	1,303	577	2,592	616	1,128	1,744		4,821	574	5,395	9,731
Parking			11,271	8,248	19,519								19,519
SECURITY		2,678	8,250	521	11,449								11,449
X-Rays Checkpoints (ea)			4										4 ea
AIT checkpoints (ea)			2										2 ea
TSA Screening			3,321		3,321								3,321
TSA Queue			2,990		2,990								2,990
TSA Offices		2,678	1,939	521	5,138								5,138
TSA Bag Screening													
TOTAL	3,162	99,454	105,935	54,631	263,182	58,799	34,981	93,780	99,913	85,220	26,042	211,175	568,137

(a) Includes Mechanical, Electrical, Fire Stairs, Service Elevators, Non-Public Restrooms, Chases (Voids), Loading Docks.
(b) Includes Offices and Security.

Table 2-7

TERMINAL C SPACE ALLOCATION AND USAGE

SPACE FUNCTION AREA (SF)	CENTRAL BUILDING LEVELS							NORTH CONCOURSE LEVELS			SOUTH CONCOURSE LEVELS				Total Area (SF)
	LL	1	2	3	4	5	Total (SF)	1	2	Total (SF)	1	2	3	Total (SF)	
AIRLINE	5,663	5,009	21,263	15,269			47,204	82,432	32,023	114,455	83,484	57,054	588	141,126	302,785
Check-in Counters (ea)			88												88 ea
Check-in Kiosks (ea)			45												45 ea
Gates (ea)										12				16	28 ea
Ticket Counter Area			5,105				5,105								
Check-in			3,547				3,547								3,547
Check-in Queue			6,718				6,718								6,718
Passenger Holdrooms & Gates			1,346				1,346	2,710	19,235	21,945		31,178		31,178	54,469
Clubs									9,818	9,818		9,814		9,814	19,632
Offices	5,663	157	3,886	15,269			24,975	26,319	1,823	28,142	31,347	4,703		36,050	89,166
Operations		4,852	661				5,513	53,404	1,147	54,551	52,137	11,360	588	64,084	124,149
BAGGAGE HANDLING		222,949					222,949								222,949
Bag Claim Conveyors (ea) Outbound Bag Handling		10													10 ea
Bag Claim		46,753					46,753								46,753
Inbound Bag Handling		176,197					176,197								176,197
BUILDING SERVICES & SUPPORT *(a)*	32,665	14,882	11,747	15,304	3,243	687	78,528	37,080	8,943	46,023	52,312	9,690	3,673	65,675	190,226
CONCESSIONS	276	827	5,926				7,030	3,161	30,734	33,895	4,070	30,772		34,842	75,767
Food & Beverage		595					595		1,798	1,798		3,809		3,809	6,202
Food & Beverage (Secure)									11,963	11,963		17,060		17,060	29,023
Merchandise/Retail	276	233	1,664				2,172		8,086	8,086		1,101		1,101	11,359
Merchandise/Retail (Secure)			4,066				4,066		8,887	8,887		8,802		8,802	21,756
Offices			197				197	3,161		3,161	4,070			4,070	7,428
CUSTOMS & BORDER PROTECTION															
FIS Process															
FIS Queue															
CBP Offices															
HAS ADMINISTRATION *(b)*	3,820	507	59	378			4,764	4,632		4,632	464	628		1,092	10,488
PUBLIC SPACES	75,798	19,683	538,713	9,389	487,326	348,595	1,479,505	1,634	10,577	12,210		65,155		65,155	1,556,869
Circulation	75,798	16,974	38,790	9.389	9,631	5,572	156,154	1,634	362	1,996					158,150
Circulation (Secure)			20,814				20,814		5,143	5,143		58,018		58,018	83,975
Ticket Lobby (Non-Airline)															
Meeter/Greeter Lobby															
Restrooms		2709.4	3,071				5,780		5,072	5,072		7,137		7,137	17,989
Parking			476,037		477,695	343,023	1,296,755								1,296,755
SECURITY			15,293				15,293								15,293
X-Rays Checkpoints (ea)			10												10 ea
AIT checkpoints (ea)			5												5 ea
TSA Screening			9,212				9,212								9,212
TSA Queue			5,019				5,019								5,019
TSA Offices			1,062				1,062								1,062
TSA Bag Screening															
TOTAL	118,222	263,857	593,002	40,340	490,569	349,283	1,855,272	128,939	82,277	211,215	140,330	163,300	4,260	307,890	2,374,377

(a) Includes Mechanical, Electrical, Fire Stairs, Service Elevators, Non-Public Restrooms, Chases (Voids), Loading Docks.
(b) Includes Offices and Security.

Table 2-8

TERMINAL D SPACE ALLOCATION AND USAGE

SPACE FUNCTION AREA (SF)	LL	1	2	3	4	Total Area (SF)
AIRLINE		33,874	4,396	4,954	68,717	111,941
Check-in Counters (ea)			61			61 ea
Check-in Kiosks (ea)						-
Gates (ea)			12			12 ea
Ticket Counter Area		3,527	654			4,182
Check-in		3,504				3,504
Check-in Queue		8,160			4,185	12,344
Passenger Holdrooms & Gates			1,113	4,954	42,142	48,209
Clubs					18,371	18,371
Offices		14,054	1,886		4,019	19,959
Operations		4,629	743			5,372
BAGGAGE HANDLING	3,603	11,945	27,793			43,342
Bag Claim Conveyors (ea)		1				1 ea
Outbound Bag Handling	3,603	7,992				11,596
Bag Claim		3,599	27,793			31,392
Inbound Bag Handling		354				354
BUILDING SERVICES & SUPPORT *(a)*	22,375	39,470	9,792	12,116	9,648	93,400
CONCESSIONS		2,885	1,142		12,720	16,747
Food & Beverage		2,437				2,437
Food & Beverage (Secure)					5,065	5,065
Merchandise/Retail			1,142			1,142
Merchandise/Retail (Secure)					6,145	6,145
Offices		448			1,510	1,958
CUSTOMS & BORDER PROTECTION						
FIS Process						
FIS Queue						
CBP Offices						
HAS ADMINISTRATION *(b)*	39	4,842	5,884	31,236	826	42,827
PUBLIC SPACES	3,632	29,261	32,322	37,436	44,861	147,512
Circulation	3,632	27,409	2,105	2,048	15,799	50,992
Circulation (Secure)		157	29,802	33,933	26,897	90,789
Ticket Lobby (Non-Airline)						
Meeter/Greeter Lobby						
Restrooms		1,695	415	1455	2,165	5,731
Parking						
SECURITY		29,679		777		30,457
X-Rays Checkpoints (ea)			5			5 ea
AIT checkpoints (ea)			3			3 ea
TSA Screening		22,997				22,997
TSA Queue		4,121				4,121
TSA Offices		2,562		777		3,339
TSA Bag Screening						
TOTAL	29,650	151,957	81,328	86,518	136,772	486,225

Table 2-9

TERMINAL E SPACE ALLOCATION AND USAGE

SPACE FUNCTION AREA (SF)	CENTRAL BUILDING LEVELS LL	1	2	3	4	Total Area (SF)
AIRLINE		44,603	80,455	14,798	17,490	157,346
Check-in Counters (ea)			52			52 (ea)
Check-in Kiosks (ea)						
Gates (ea)			23			23 (ea)
Ticket Counter Area			960			960
Check-in						
Check-in Queue						
Passenger Holdrooms & Gates			70,942			70,942
Clubs			2,683	14,798	17,490	34,970
Offices		41,156	5,412			46,567
Operations		3,448	459			3,906
BAGGAGE HANDLING		3,787				3,787
Bag Claim Conveyors (ea)		12				12 (ea)
Outbound Bag Handling		3,787				3,787
Bag Claim						
Inbound Bag Handling						
BUILDING SERVICES & SUPPORT *(a)*	19,526	110,178	28,184	72,352	4,586	234,826
CONCESSIONS			41,667	9,731		51,397
Food & Beverage			13,463	63		13,525
Food & Beverage (Secure)			8,214	5,007		13,221
Merchandise/Retail			17,655			17,655
Merchandise/Retail (Secure)			1,921	4,661		6,582
Offices			414			414
CUSTOMS & BORDER PROTECTION			2,079			2,079
FIS Process						
FIS Queue						
CBP Offices			2,079			2,079
HAS ADMINISTRATION *(b)*		19,073	2,495	5,546		27,113
PUBLIC SPACES	125	81	138,709	71,866	3,890	214,672
Circulation	64	81	41,816		3,890	45,852
Circulation (Secure)	61		92,635	71,866		164,562
Ticket Lobby (Non-Airline)						
Meeter/Greeter Lobby						
Restrooms			4258			4,258
Parking						
SECURITY		2,618	250			2,868
X-Rays Checkpoints (ea)			6			6 (ea)
AIT checkpoints (ea)			3			3 (ea)
TSA Screening		1,509				1,509
TSA Queue						
TSA Offices		1,109	250			1,359
TSA Bag Screening						
TOTAL	19,651	180,341	293,837	174,292	25,966	694,087

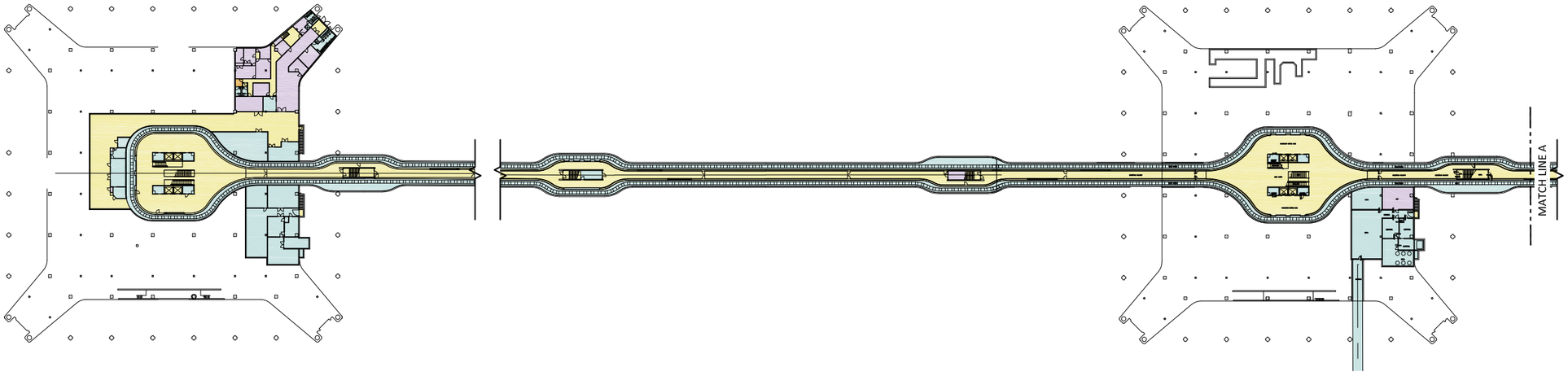
(a) Includes Mechanical, Electrical, Fire Stairs, Service Elevators, Non-Public Restrooms, Chases (Voids), Loading Docks.
(b) Includes Offices and Security.

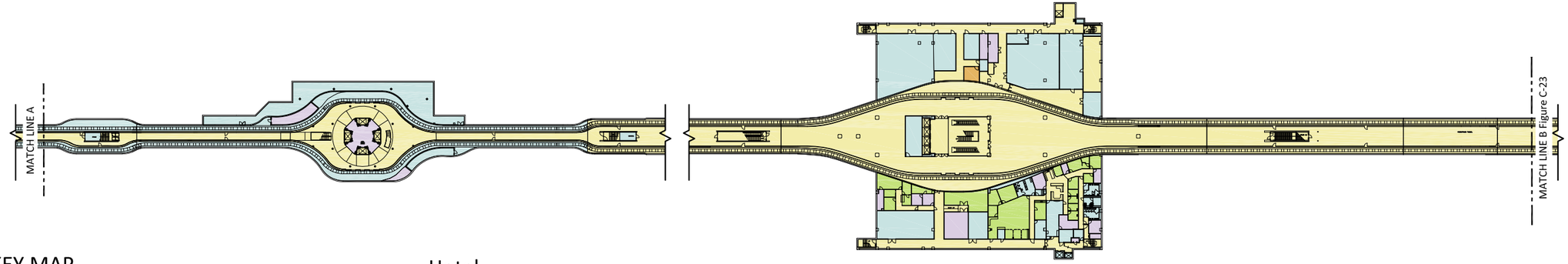
Table 2-10

FIS SPACE ALLOCATION AND USAGE

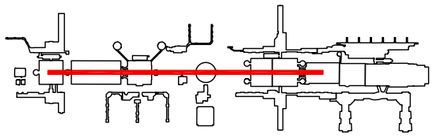
SPACE FUNCTION AREA (SF)	CENTRAL BUILDING LEVELS LL	1	2	3	Total Area (SF)
AIRLINE		8,453	33,455		41,908
Check-in Counters (ea)					
Check-in Kiosks (ea)					
Gates (ea)					
Ticket Counter Area		1,664			1,664
Check-in			4,130		4,130
Check-in Queue		3,635	10,324		13,959
Passenger Holdrooms & Gates		338	3,331		3,669
Clubs		593	4,454		5,048
Offices		2,223	11,216		13,439
Operations					
BAGGAGE HANDLING	133,750	106,542			240,293
Bag Claim Conveyors (ea)		12			12 ea
Outbound Bag Handling		409			409
Bag Claim		1,289			1,289
Inbound Bag Handling	133,750	104,845			238,595
BUILDING SERVICES & SUPPORT *(a)*	25,209	33,403	35,666	13,866	108,144
CONCESSIONS	1,273	1,662	4,798		7,733
Food & Beverage		328			328
Food & Beverage (Secure)			2,209		2,209
Merchandise/Retail		1,333	127		1,461
Merchandise/Retail (Secure)			2,292		2,292
Offices	1,273		169		1,442
CUSTOMS & BORDER PROTECTION		77,204	98,710		175,914
Immigration (ea)			80		80 ea
Customs (ea)			20		20 ea
FIS Process		44,727	36,296		81,022
FIS Queue		1,751	45,509		47,260
CBP Offices		29,806	17,826		47,632
HAS ADMINISTRATION *(b)*	396	3,749	1,137		5,282
PUBLIC SPACES	82,477	97,672	123,105	37,996	341,250
Circulation	82,477	5,618	10,934	37,996	137,025
Circulation (Secure)		8,469	54,582		63,051
Ticket Lobby (Non-Airline)					
Meeter/Greeter Lobby		26,860			26,860
Restrooms			3,051		3,051
Parking		56,726	54,538		111,264
SECURITY		671	26,560		27,231
X-Rays Checkpoints (ea)			6		6 ea
AIT checkpoints (ea)			3		3 ea
TSA Screening			19,149		19,149
TSA Queue			4,473		4,473
TSA Offices		671	2,939		3,609
TSA Bag Screening					
TOTAL	243,106	329,356	323,432	51,861	947,755

(a) Includes Mechanical, Electrical, Fire Stairs, Service Elevators, Non-Public Restrooms, Chases (Voids), Loading Docks.
(b) Includes Offices and Security.





KEY MAP



Source: HAS Records and IAH Airport Layout Plan, August 2006
Prepared by: RdlR Architects, Inc., December 21, 2012

Leigh|Fisher

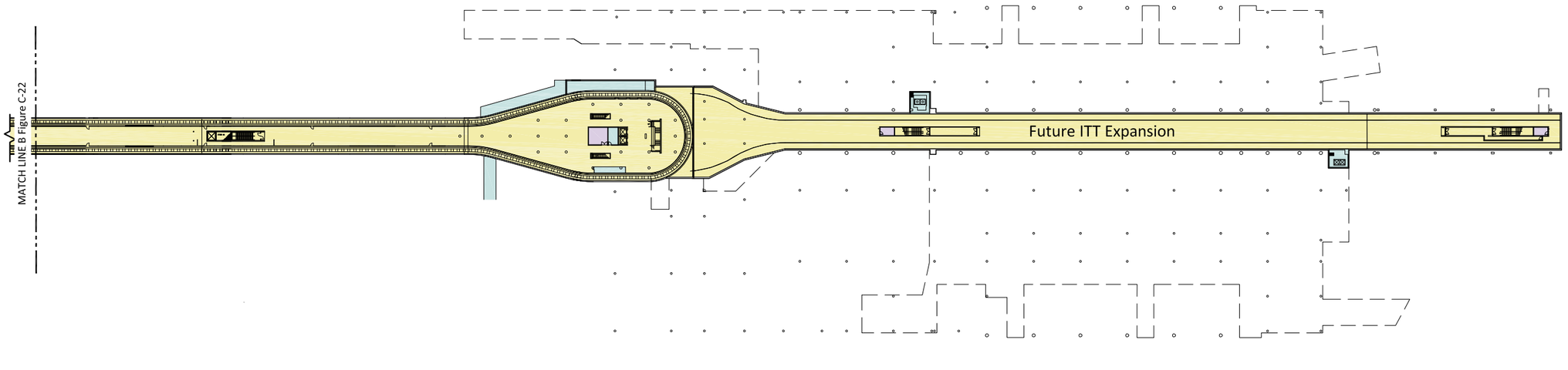
0 62.5' 125'

N

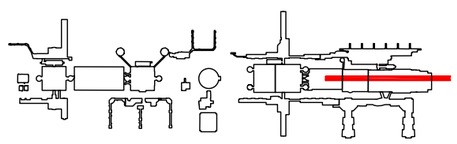
LEGEND

- Airline
- Concessions
- Baggage handling
- Security
- Customs & border protection
- HAS
- Public space
- Building services & support

Figure 2-28
Inter-Terminal Train - Level LL1



KEY MAP



Source: HAS Records and IAH Airport Layout Plan, August 2006
Prepared by: RdlR Architects, Inc., December 21, 2012

Leigh|Fisher

0 62.5' 125'

N

LEGEND

- Airline
- Concessions
- Baggage handling
- Security
- Customs & border protection
- HAS
- Public space
- Building services & support

Figure 2-29
Inter-Terminal Train - Level LL2

2.4 GROUND TRANSPORTATION AND PARKING

This section provides an overview of ground transportation and parking facilities at the Airport as well as an overview of the airport access roadways and regional transportation services and improvements that may affect access to the Airport. The data presented is based on field observations, data collection, interviews of local transportation and planning agencies, as well as past studies of the Airport's ground transportation facilities.

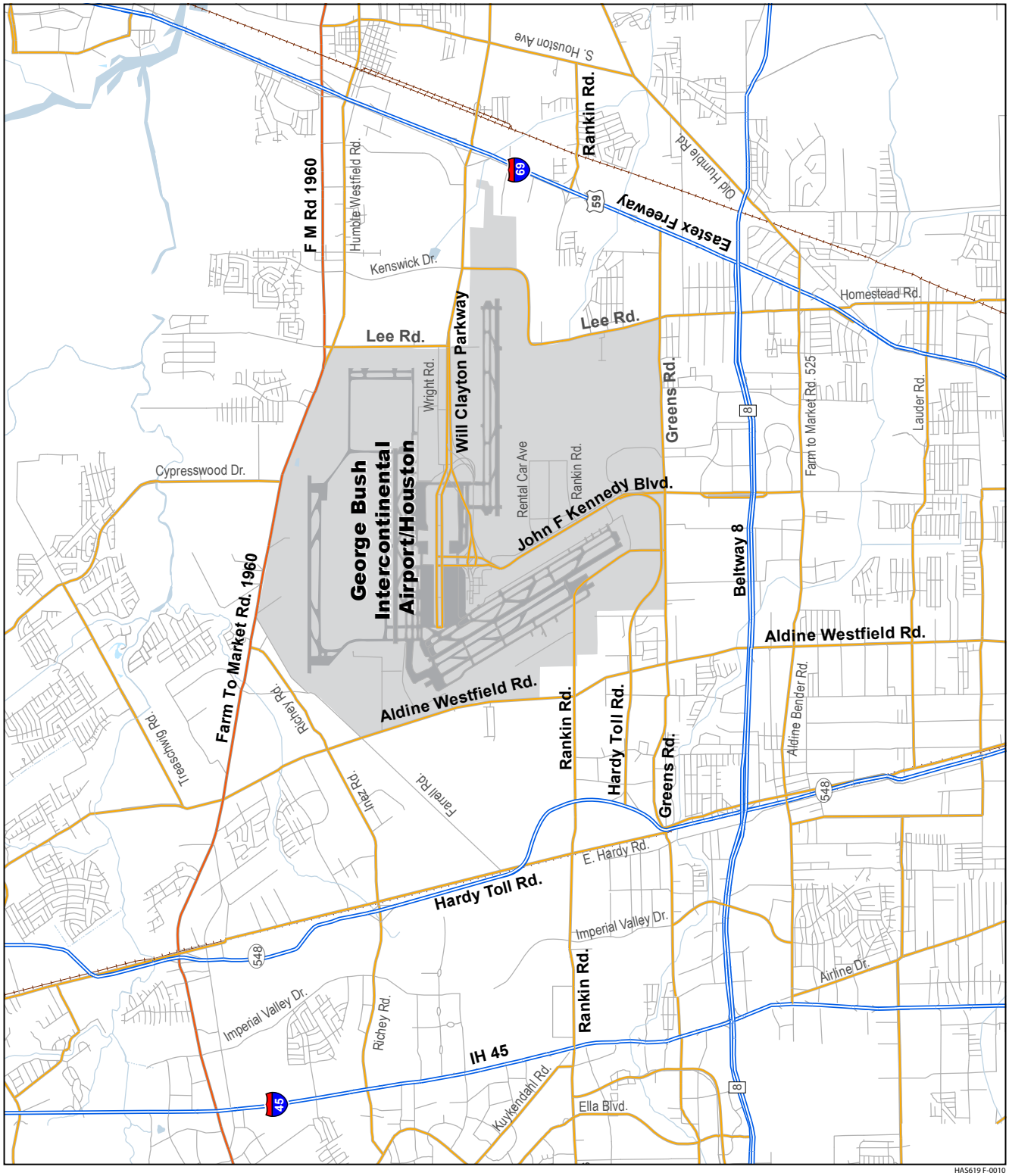
2.4.1 Airport Access

Regional surface access to the Airport is provided by the following roadways:

- Interstate 45 to the west,
- Hardy Toll Road to the west,
- Interstate 69/US 59/Eastex Freeway to the east,
- FM 1960 on the north, and
- Sam Houston Parkway (Beltway 8) on the south.

Direct access to the Airport is provided from John F. Kennedy Boulevard from the south and Will Clayton Parkway from the east. John F. Kennedy Boulevard is a north-south roadway with a speed limit of 45 mile per hour in the vicinity of the airport. It is a six-lane arterial roadway divided by raised medians with signalized intersections. It connects directly with Beltway 8, which in turn connects with Interstate 45, Hardy Toll Road, and Interstate 69/US 59. Will Clayton Parkway is an east-west four- to six-lane arterial roadway with a speed limit of 50 mile per hour in the vicinity of the Airport. Will Clayton Parkway connects directly with US 59 on the east. It is estimated, based upon traffic surveys described in subsequent paragraphs that approximately 63% of the traffic entering the airport uses John F. Kennedy Boulevard and the remaining traffic uses Will Clayton Parkway. This percentage is consistent with prior analyses which suggested that as much as 70% of all entering traffic uses John F. Kennedy to access the Airport.

Lee Road, Rankin Road, and Greens Road are other roadways which provide local access to the Airport. The primary roadways are shown in Figure 2-30 and the characteristics of those roadways are presented in Table 2-11.



Source: Leigh|Fisher, December 2012
Prepared by: Leigh|Fisher, December 2012

Leigh|Fisher

Figure 2-30
Primary Regional Roadways

Table 2-11
PRIMARY ACCESS ROADWAYS

Regional Access Roadway	Facility Type	Existing Lanes	Speed (mph)	General Direction
John F. Kennedy Boulevard	Divided arterial w/ signalized intersections	6	45	n-s
Will Clayton Parkway	Divided arterial w/ signalized intersections	4-6	45	e-w
I 69/US 59/Eastex Freeway	Limited access, divided freeway, w/ frontage roads	8 *(a)*	70	n-s
F.M. 1960	Undivided arterial w/ signalized intersections	4-6	55	e-w
Greens Road	Undivided arterial w/ signalized intersections	2-6	35-45	e-w
Hardy Toll Road	Limited access, divided toll road	4 *(a)*	70	n-s
Lee Road	Undivided connector, w/ signalized intersections	2-4	45	n-s
Sam Houston Parkway (Beltway 8)	Limited access, divided freeway, w/ frontage roads	6-8 *(a)*	70	e-w
I 45 (Hardy Toll Road)	Limited access, divided freeway, w/ frontage roads	10 *(a)*	60	n-s
Rankin Road	Undivided arterial w/ signalized intersections	4	45	e-w

(a) Freeway lanes only, does not include feeder road lanes.

Sources: Gunda Corporation based on data and information presented in the following reports: Roadway Access Study, HNTB, February 3, 2000 and Roadway Traffic Simulation Study, TransSolutions, January, 2001.

2.4.2 Passenger Terminal Circulation Roadways

Vehicular traffic volumes were collected or estimated at the key locations on the Airport roadways. This information can be utilized to evaluate the Level of Service (LOS) of the roadways. It also provides a basis for projecting future landside traffic demand.

2.4.2.1 Roadway Segment Traffic Volumes

To determine roadway segment traffic volumes, continuous 24-hour counts were collected for two consecutive days (Wednesday, October 24, 2012 and Thursday, October 25, 2012) at 14 key locations on the Airport roadways. Concurrently, morning, midday, and afternoon peak period turning movement volumes were gathered at the following intersections:

- John F. Kennedy Boulevard at Greens Road
- Will Clayton Parkway at Lee Road

The morning peak hour turning movement volumes were recorded between 6:00 and 9:00 AM, midday volumes were recorded between 12:00 and 3:00 PM, and afternoon volumes were recorded between 4:00 and 6:00 PM.

Automated traffic recorders were used to collect 24-hour traffic volumes. Peak period turning movement volumes were measured using video recordings. These surveys were compiled to produce typical peak hour volumes as well as 24-hour or daily traffic volumes at key locations. The locations where the 24-hour traffic surveys were conducted are illustrated in Figure 2-31 and the resulting 24-hour traffic volumes for Day 1 and Day 2 are summarized in Table 2-12.

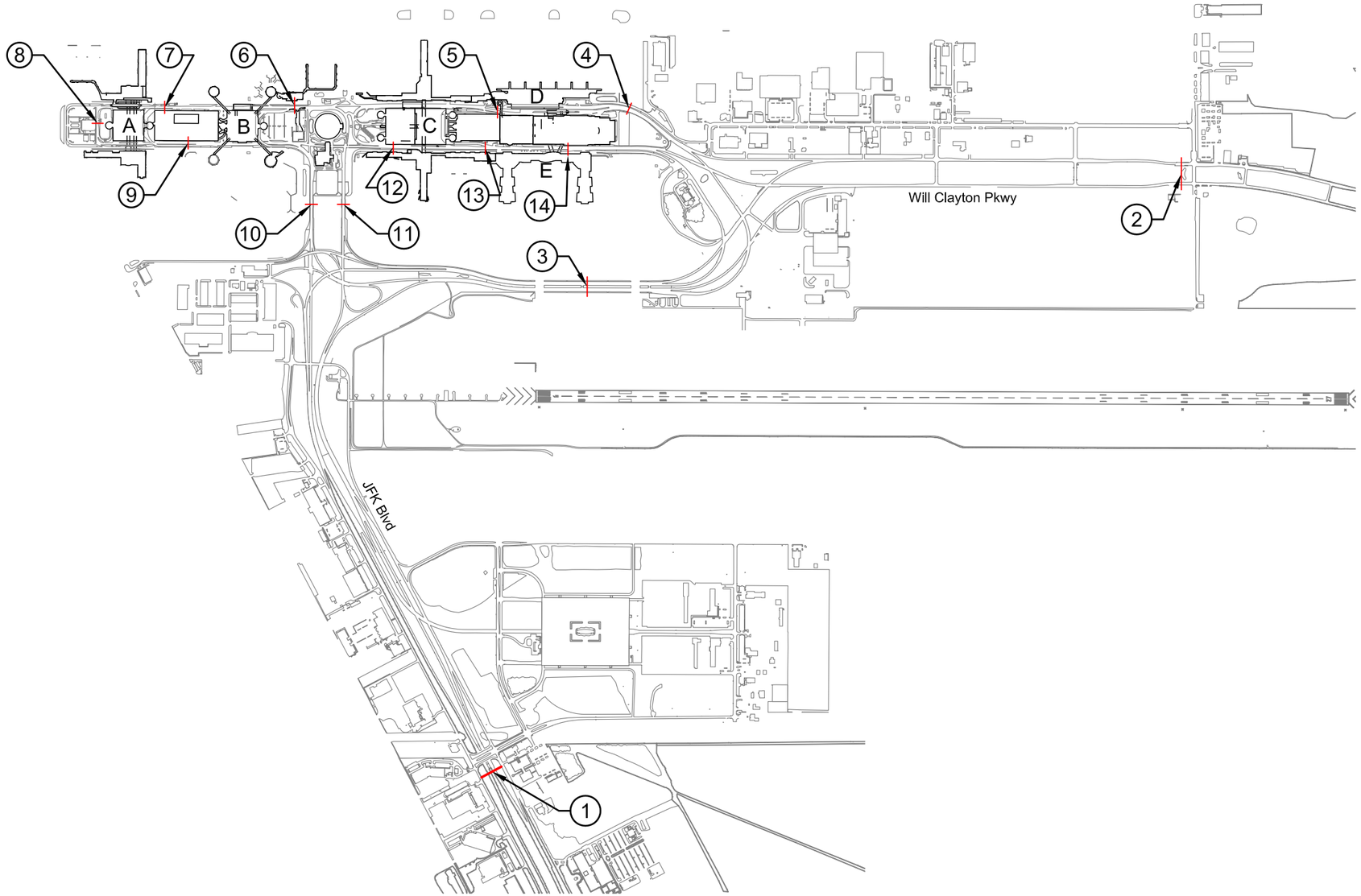
Estimated daily traffic volumes on major airport roadways are summarized below (the location numbers correspond to those shown on Figure 2-31 and listed in Table 2-12).

- 28,684 vehicles entered the airport via John F. Kennedy Boulevard mainline (Location 1)
- 17,059 vehicles entered the airport via Will Clayton Parkway (Location 2)
- 23,552 vehicles exited the airport via John F. Kennedy Boulevard mainline (Location 1)
- 15,600 vehicles exited the airport via Will Clayton Parkway (Location 2)
- 14,816 vehicles entered Terminal A/B area (Location 6)
- 15,825 vehicles exited Terminal A/B area (Location 9)
- 23,843 vehicles entered Terminal C/D/E area (Location 4)
- 21,269 vehicles exited Terminal C/D/E area (Location 14)

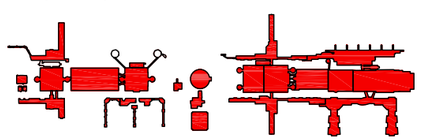
Different airport roadway segments experienced peak hours at different times; however, in the morning, the busiest segments (Locations 6 and 2 WB) experienced peak volumes during a two-hour window between 5:00 AM and 7:00 AM. Similarly, during the afternoon, the busiest segments experienced peak volumes during a two-hour window between 1:00 PM and 3:00 PM. During the evening, the busiest segments experienced peak volumes during a two-hour window between 7:00 PM and 9:00 PM.

2.4.2.2 North and South Terminal Roads

The lane configuration of North and South Terminal Roads is shown on Figures 2-32 through 2-34. These figures illustrate the complexity of the existing roadway configuration and how the lack of right-of-way restricts the ability to widen the roadways in order to increase roadway capacities.



Key Map



Source: Jacobs, December 2012
Prepared by: Gunda Corporation, December 2012

Leigh|Fisher

LEGEND

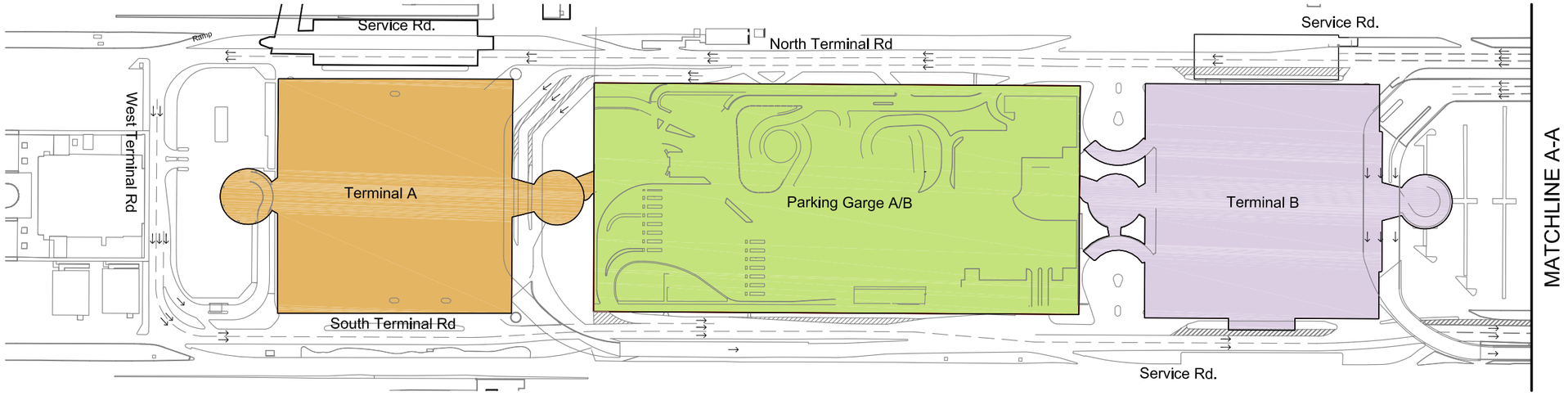
(X) Survey Locations

0 750' 1500'

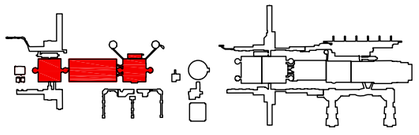
N

Figure 2-31

Passenger Terminal Complex
Automatic Traffic Recorder Survey Locations



Key Map



Source: Jacobs, December 2012
Prepared by: Gunda Corporation, December 2012

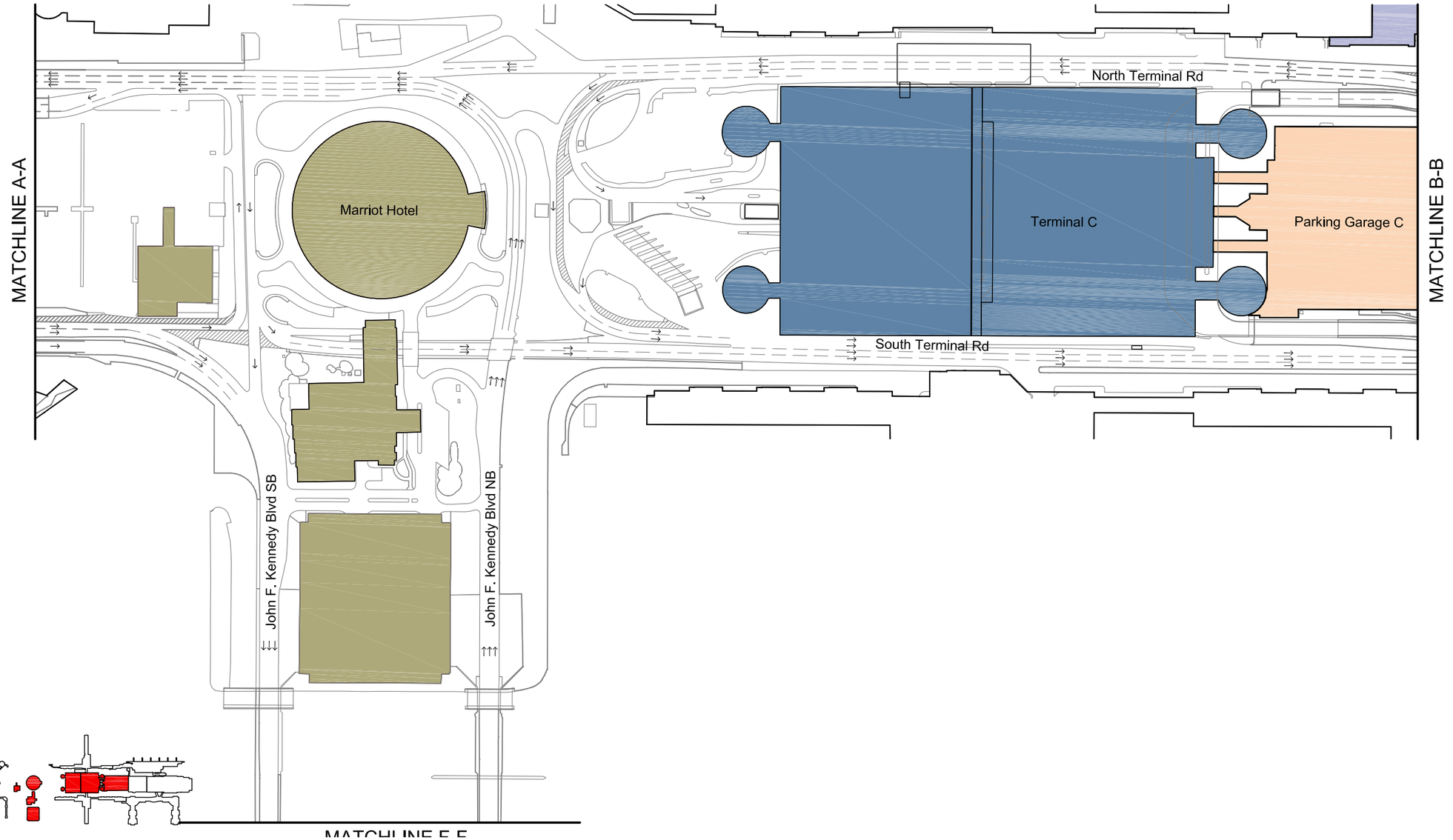
Leigh|Fisher

LEGEND
- Terminal A
- Terminal B
- Terminal A/B parking garage

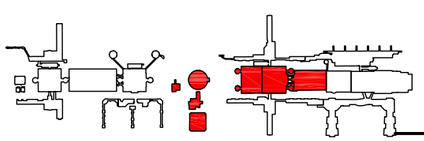
0 100' 200'

N

Figure 2-32
Curbside Roadways: Terminals A & B



Key Map



Source: Jacobs, December 2012
Prepared by: Gunda Corporation, December 2012

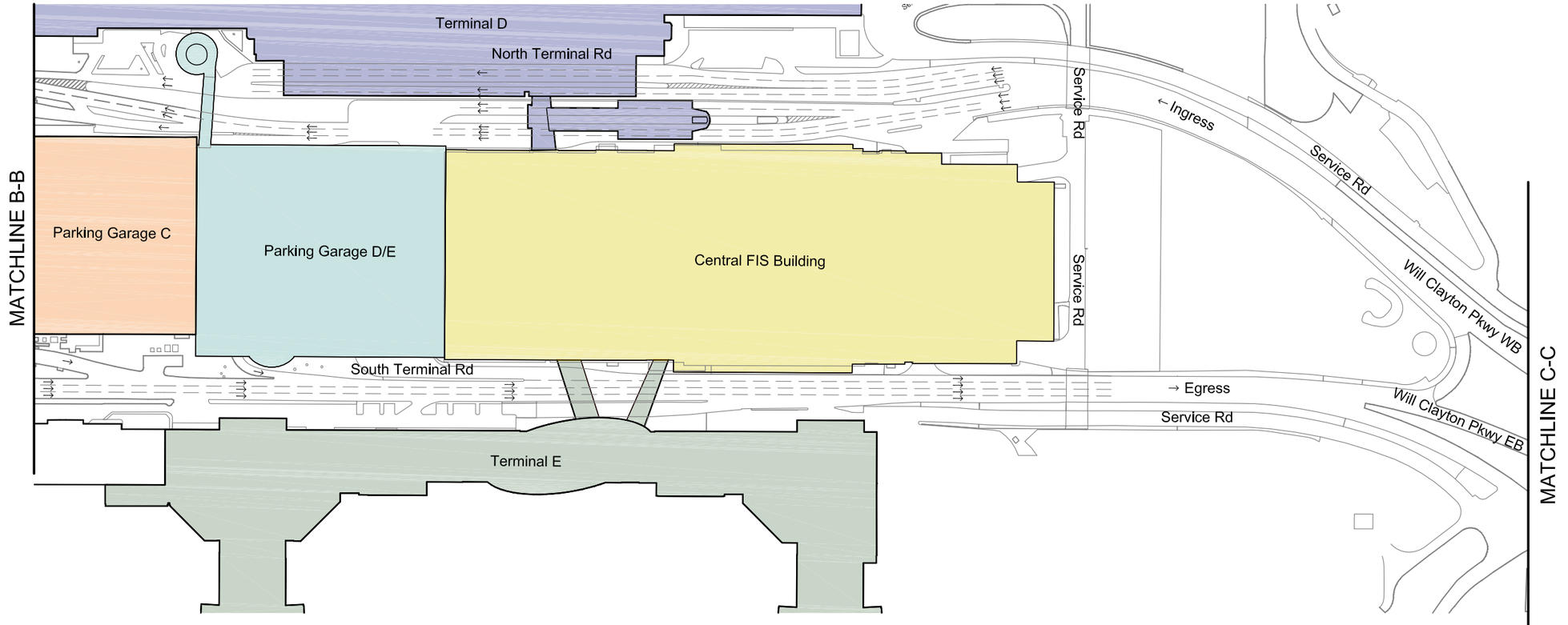
Leigh | Fisher

0 100' 200'

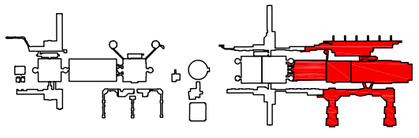
N

LEGEND
- Terminal C
- Terminal C parking garage
- Marriot Hotel & parking

Figure 2-33
Curbside Roadways: Terminal C



Key Map



Source: Jacobs, April 2015
Prepared by: Gunda Corporation, April 2015

Leigh|Fisher

LEGEND

- Terminal D
- Terminal E
- FIS & International Arrivals
- Terminal D/E parking garage
- Terminal C parking garage

0 100' 200'

N

Figure 2-34

Curbside Roadways: Terminals D & E

Table 2-12
24-HOUR TRAFFIC COUNT VOLUMES, PEAK HOUR, AND PEAK HOUR VOLUME

	Wednesday, October 24, 2012			Thursday, October 25, 2012			
Location	Total 24 hour volume	Peak hour	Peak hour volume	Total 24 hour volume	Peak hour	Peak hour volume	Airport-wide peak hour volume *(a)*
Loc 1 NB JFK Mainline S of Rankin Rd	25,729	13:00	1,872	28,684	16:00	2,038	1,683
Loc 1 SB JFK Mainline S of Rankin Rd	21,209	14:00	1,648	23,552	14:00	1,717	1,648
Loc 2 EB Will Clayton between Wright and Lee	13,754	17:00	1,239	15,600	7:00	1,356	1,083
Loc 2 WB Will Clayton between Wright and Lee	15,600	7:00	1,356	17,059	13:00	1,389	947
Loc 3 EB Will Clayton between taxiway bridges	23,156	13:00	1,772	22,852	16:00	1,763	1,768
Loc 3 WB Will Clayton between taxiway bridges	20,456	14:00	1,679	20,508	14:00	1,501	1,679
Loc 4 N. Terminal Rd Entrance at Arrivals	18,248	14:00	1,479	20,722	14:00	1,645	1,479
Loc 4 N. Terminal Rd Entrance at Departures	2,782	14:00	329	3,121	13:00	369	329
Loc 5- WB N Terminal Rd at Terminal C Departures Diverge	6,174	20:00	514	7,118	20:00	646	384
Loc 6- WB N Terminal Rd at Terminal B Departures Diverge	13,563	13:00	939	14,816	13:00	957	862
Loc 6B- Terminal B Departures at WB N Terminal Rd Diverge	3,018	5:00	265	2,996	5:00	296	187
Loc 7- WB N Terminal Rd at Terminal A Departures Diverge	3,606	5:00	288	3,890	5:00	310	284
Loc 7- WB N Terminal Rd at Terminal A Departures Diverge	7,405	13:00	520	8,549	20:00	545	447
Loc 8 WB N Terminal Rd W of Terminal A	8,595	13:00	568	9,678	20:00	635	515
Loc 9- EB S Terminal Rd W of Terminal B	10,531	17:00	785	11,936	18:00	919	782
Loc 9- EB S Terminal Rd W of Terminal B (upper Drive)	3,608	5:00	296	3,889	5:00	313	289
SB JFK Blvd at Taxiway Bridge	14,431	14:00	1,118	17,533	15:00	1,257	1,118
Loc 11 NB JFK Blvd at taxiway bridge	12,813	13:00	916	14,446	13:00	955	757
Loc 12 EB S Term. Rd at merge before Term. C Parking Garage	7,262	17:00	758	9,026	20:00	1,026	567
Loc 12 Term. C and parking garage before merge at EB S Terminal Rd	1,272	19:00	93	1,369	16:00	97	71
Loc 13 EB S Term. Rd at merge under parking lot C/D/E walkway to Term. E	6,818	20:00	720	8,408	20:00	974	526
Loc 13 Term. C Departures before merge with EB S Term. Rd	3,830	11:00	352	4,730	16:00	387	270
Loc 14 EB S Terminal Rd at upper and lower drive merge by Terminal E	15,038	14:00	1,353	17,975	14:00	1,494	1,353
Loc 14 Upper drive before merge with EB S Terminal Dr	2,973	14:00	266	3,294	16:00	247	266

(a) The airport-wide peak hour for vehicular traffic was observed to be 14:00 to 15:00.
Source: Gunda Corporation, October 2012.

2.4.3 Terminal Curbside Facilities

The following sections provide an overview of the curbside facilities for each passenger terminal building.

2.4.3.1 Terminal A Curbside Areas

Terminal A is one of the original two terminals at the Airport as described in the prior section (which also lists the airlines currently operating from Terminal A). The existing Terminal A curbside layout is presented in Figure 2-35. As shown, four separate curbside areas are available, each on one on side of the Central Terminal building.

Departures level curbside. The departures level curbside, or upper level curbside, of Terminal A is located on the east side of the terminal building (also referred to as the "U" ramp). This curbside, located adjacent to the ticketing level, primarily serves vehicles dropping off enplaning passengers. There are a total of five lanes at the departures level curbside area. The two lanes closest to the building are primarily used by private vehicles, taxis, and limousines. Parking shuttles and other courtesy vehicles were observed to use the remaining three outer lanes; however, there are no signs designating lanes specifically for any class of vehicles. Houston Police Department vehicles park on the outer lane of the departures level curbside.

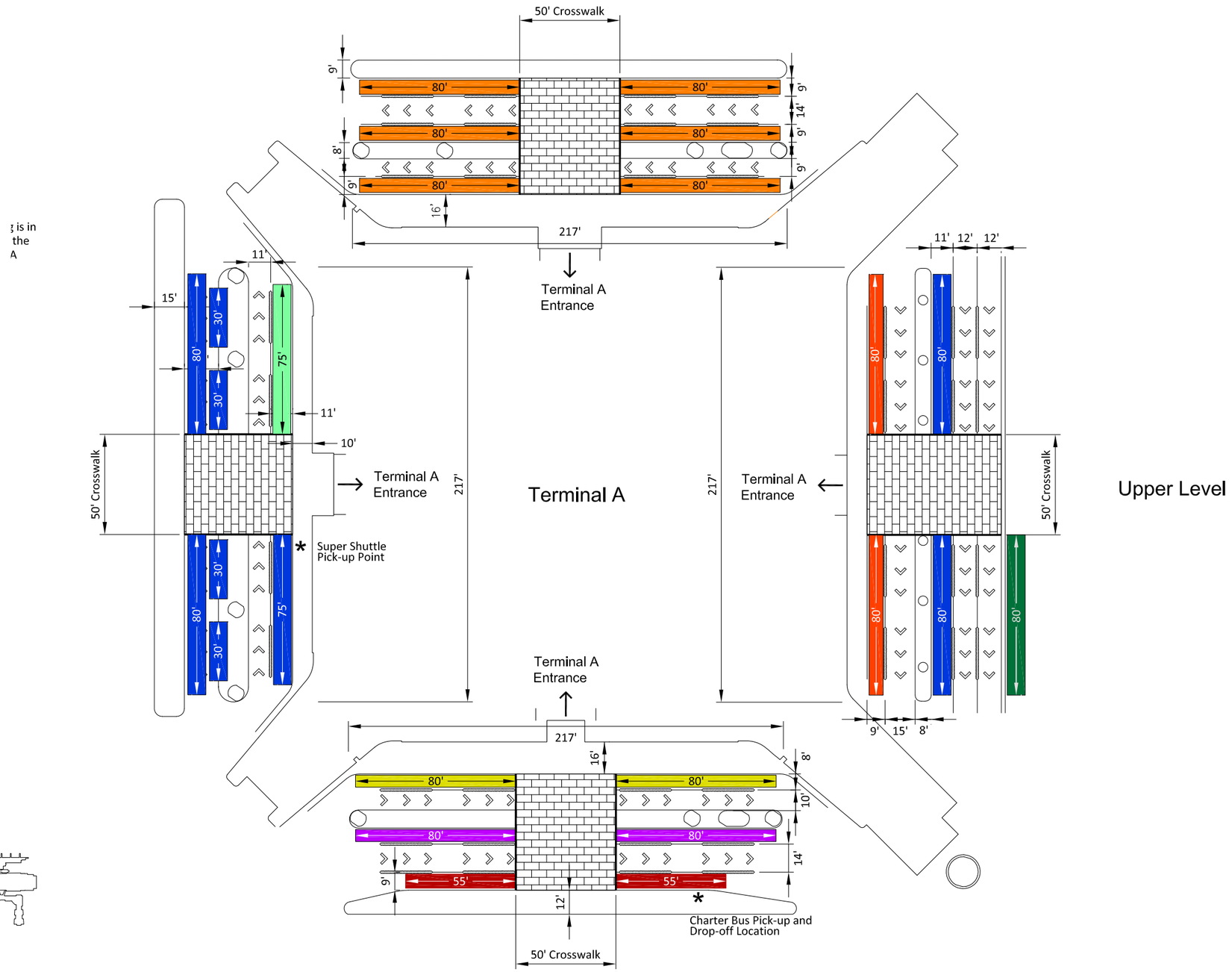
Arrivals level curbside. Three independent curbside areas are provided on the north, west, and south sides of the terminal building. These curbsides are located adjacent to the baggage claim areas of the building. The passenger arrivals curbside on the north side has five lanes and is designated for private vehicles only. The two inner lanes are separated from the three outer lanes by an island.

The arrivals level curbside area on the south side of the terminal has five lanes and is designated for taxis and rental car shuttles. The two inner lanes are separated from the three outer lanes by an intermittent island. The lane closest to the terminal building is designated for taxis, and the lane furthest from the terminal building is designated for rental car shuttles.

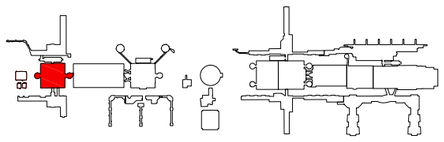
The arrivals level curbside area on the west side of the terminal is designated for EcoPark, off-airport parking shuttles, and hotel/motel courtesy shuttles. There are three lanes on this side of the terminal; the two inner lanes separated from the outer lane by a center island.

The passenger pick-up areas on the arrivals level and departures level have a frontage length of 217 feet on all four sides, which include a 50-foot pedestrian crosswalk. The total effective length of the departures level curbside accounting for each lane and the crosswalk is approximately 330 feet; the total effective length of the arrivals curbside accounting for each lane and the crosswalk is approximately 1,000 feet. The existing space allocation including the length of each curbside zone, the number and width of travel and parking lanes, and the locations of pedestrian crosswalks and pedestrian islands are illustrated in Figure 2-35.

is in
the
A



Key Map



Source: Gunda Corporation, March 2013
Prepared by: Gunda Corporation, March 2013

Leigh|Fisher

0 30' 60'

LEGEND

- Taxis
- Private vehicles
- Rental car pick-up shuttle
- HPD vehicles
- Courtesy vehicles
- EcoPark shuttle
- Private cars, taxis, and limousines
- Service/delivery vehicles

Figure 2-35
Terminal A
Existing Curbside Layout

2.4.3.2 Terminal B Curbside Areas

Terminal B is the second of the two original terminals at the Airport. Terminal B is virtually identical to Terminal A with respect to the plan and functional layout. Terminal B accommodates the facilities and operations of United Airlines.

Departures level curbside. Similar to Terminal A, the departure level curbside, or upper level of Terminal B is located on the east side of the terminal. There are a total of five lanes at the departure curbside area, with the three inner lanes separated from the two outer lanes by a pedestrian island. The two curbside lanes closest to the terminal building are primarily utilized by private vehicles, taxis, and limousines. Parking shuttles and other courtesy vehicles were observed to use the remaining three curbside lanes. At the entrance of the curbside area, a sign designates the lanes to be used by commercial vehicles and private vehicles.

Arrivals level curbside. Passenger arrival curbside areas are located on the lower level on the north, south, and west sides of Terminal B. The curbside area on the north side, designated for private vehicles only, has four lanes, with the two inner lanes separated from the outer lanes by a pedestrian island. Houston Police Department vehicles park on North Terminal Road on the north side of Terminal B.

The south side of the terminal has four lanes, with. the two inner lanes separated from the two outer lanes by a center island. The innermost lane is designated for taxis and hotel/motel courtesy shuttles. The outer lane is used by the rental car shuttle to both pick up and drop off passengers. A truck dock is present at the southwest corner of the lower level of curbside and is used for concession deliveries. Additionally, commercial trucks occasionally park at the southeast corner of the terminal.

The west side of the terminal has two roundabouts separated by an enclosed passenger walkway connecting Terminal B to the Terminal A/B garage. The roundabout on the southwest corner is designated for limousines, and the roundabout on the northwest corner is designated for parking shuttles and shared-ride vans. There are no lane markings on either roundabout. The distance from the terminal side curb to the center of the roundabout is 49 feet, providing a curb length of approximately 200 feet for each roundabout.

The arrivals curbside areas on the lower level and the departures curbside on the upper level each have a length of 217 feet on the north, south, and east sides, which includes a 50-foot pedestrian crosswalk. The total effective length of the departures level curbside accounting for each lane and the crosswalk is approximately 200 feet; the total effective length of the arrivals curbside accounting for each lane, the two roundabouts, and the crosswalk is approximately 950 feet. The existing space allocation, including the length of each curbside zone, the number and width of the travel and parking lanes, and the locations of pedestrian crosswalks and pedestrian islands are illustrated in Figure 2-36.

2.4.3.3 Terminal C Curbside Areas

Terminal C opened in 1981 and is the largest terminal at the Airport. This terminal accommodates United Airlines exclusively. The existing curbside layout for Terminal C is presented in Figure 2-37. As shown, it is similar to Terminals A and B with curbsides on each side of the terminal building.

Departures level curbside. The departures level curbside area, or upper level, of Terminal C is located on the east side of the terminal. There are a total of six lanes at the departures curbside area, with the three inner lanes separate by the three outer lanes by a central pedestrian island. The three inner lanes closest to the terminal buildings are primarily utilized by private vehicles, taxis, limousines, and shared-ride vehicles. The three outer lanes are used by emergency and public safety vehicles. The United Premier

Access drop-off area to the east of the six curbside lanes has an additional four lanes designated for the use of parking shuttles and hotel/motel courtesy vehicles. At the entrance of the passenger drop-off curbside area, a sign designates lanes specifically for commercial vehicles and private vehicles.

Arrivals level curbside. Like Terminals A and B, the passenger arrivals level curbside areas are located on the lower level on the north, south, and west sides of Terminal C. The arrivals level curbside area on the north side has seven lanes with intermittent pedestrian islands separating the two inner and outer lanes from the three lanes in the center. The north side curbside area is designated for private vehicles only. Emergency and public safety vehicles park in the innermost curbside lane. During peak periods, this side of the terminal has a high number of private vehicles stacked in front of the terminal building waiting to pick up the deplaning passengers.

The south side curbside of the terminal has eight lanes with intermittent pedestrian islands separating the two inner and three outer lanes from the three lanes in the center. The south side curbside area is designated for parking shuttles and hotel/motel courtesy shuttles. Also, there are signs designating the lane furthest from the terminal building for the metro bus and charter buses.

The west side curbside area of the terminal is designated for taxis, and rental car shuttles. There are six lanes on the west side of the terminal with the inner and outer lanes separated by a central pedestrian island. The lanes furthest from the terminal building are designated for taxis, and rental car shuttles were observed to use the lane closest to the terminal building. Limousines park in the C-West parking garage to access Terminal C.

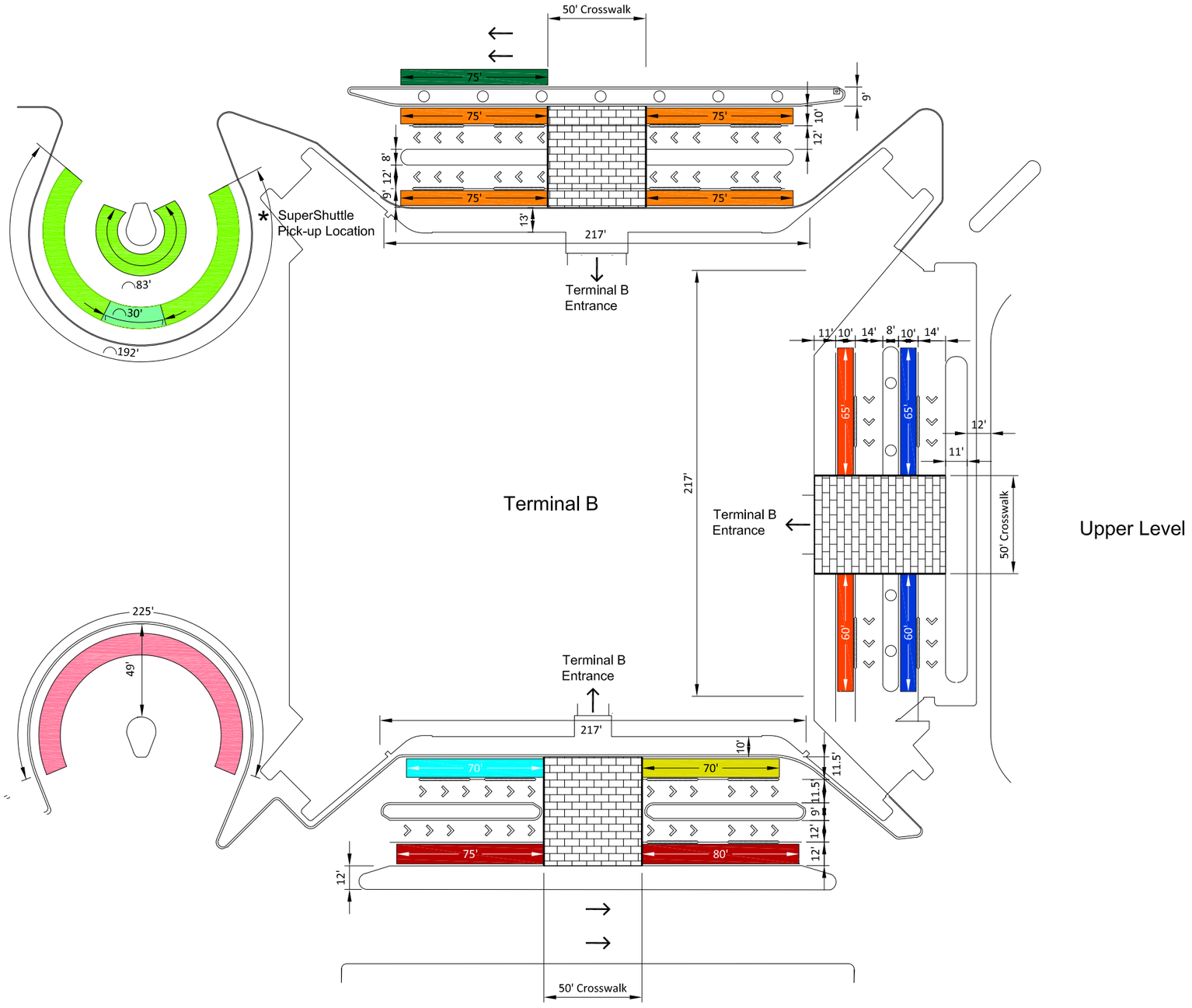
The total effective length of the departures level curbside accounting for each lane and the crosswalk is approximately 500 feet; the total effective length of the arrivals curbside accounting for each lane and the crosswalk is approximately 2,400 feet. The existing space allocation including the length of each curbside zone, the number and width of travel and parking lanes, and the locations of pedestrian crosswalks and pedestrian islands are illustrated on Figure 2-37.

2.4.3.4 Terminal D Curbside Area

Terminal D, known as the Mickey Leland International Airlines Building, opened in 1990 and differs substantially, both physically and functionally, from the other terminals. Terminal D serves departing passengers only. The passenger drop-off curbside area is located on the south side of the terminal building and extends the length of the terminal building. There are a total of five lanes at the Terminal D curbside area. Three inner lanes, which serve primarily private vehicles, taxis, and limousines, are configured with curbside drop-off lanes on either side of the center through lane. The outer curbside lanes, which primarily serve courtesy vehicles and the rental car shuttle, include one through and one drop-off lane adjacent to a raised sidewalk island. The lane configuration is illustrated on Figure 2-38.

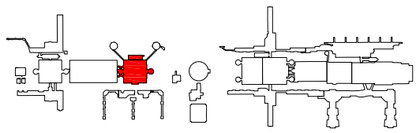
There is no pick-up or arrivals curbside at Terminal D. All airline passengers arriving at Terminal D proceed to the Terminal E arrivals curbside to board either private or commercial vehicles.

The passenger arrivals curbside has a total length of approximately 577 feet; the total effective length of the arrivals curbside accounting for each lane and the crosswalks is approximately 1,500 feet. The existing space allocation including the length of each curbside zone, the number and width of the travel and parking lanes, and the locations of pedestrian crosswalks and pedestrian refuge areas/islands are illustrated in Figure 2-38.



Upper Level

Key Map



Source: Gunda Corporation, March 2013
Prepared by: Gunda Corporation, March 2013

Leigh|Fisher

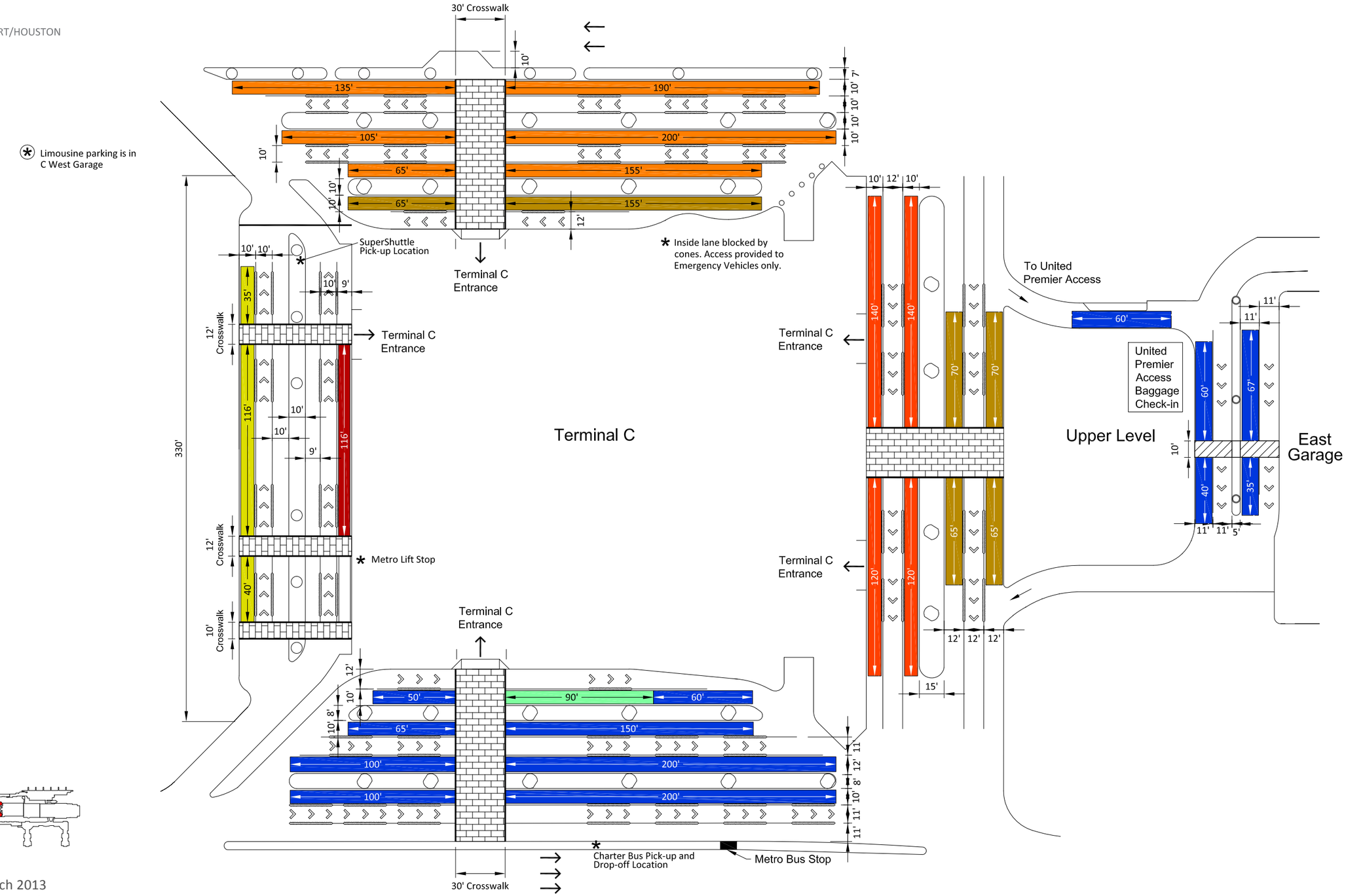
0 30' 60'

N

LEGEND

- Taxis
- Private vehicles
- Rental car pick-up shuttle
- Parking shuttle
- Hotel/motel shuttle
- Courtesy vehicles
- Private cars, taxis, and limousines
- Super Shuttle
- HPD vehicles
- Limousines
- EcoPark shuttle

Figure 2-36
Terminal B
Existing Curbside Layout



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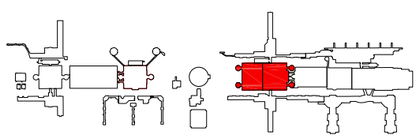


Source: Gunda Corporation, March 2013
Prepared by: Gunda Corporation, March 2013

Leigh|Fisher

0 30' 60'

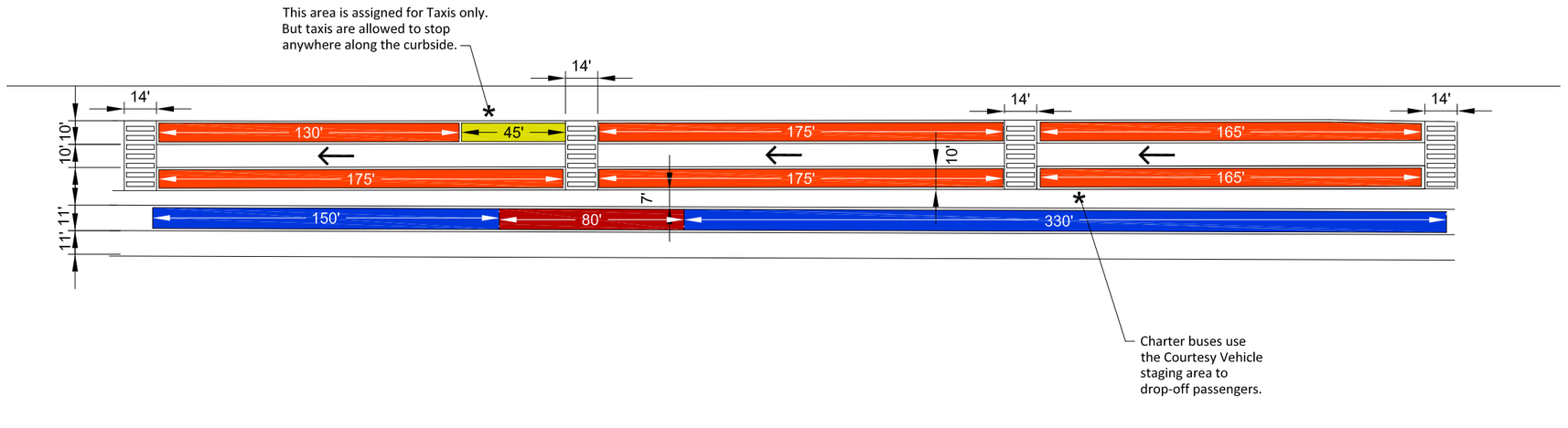
LEGEND

- Taxis
- Private vehicles
- Rental car pick-up shuttle
- Courtesy vehicle
- Private cars, taxis, and limousines
- Super shuttle
- Limousine
- Emergency/public safety vehicles
- EcoPark

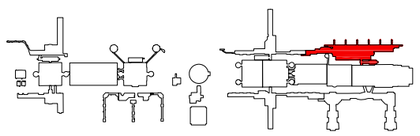
Figure 2-37
Terminal C
Existing Curbside Layout

(*) Limousines park in the parking lot to the east of Terminal D

Terminal D



Key Map



Source: Gunda Corporation, March 2013
Prepared by: Gunda Corporation, March 2013

Leigh|Fisher

0 30' 60'

N

LEGEND
- Taxis
- Private vehicles
- Rental car pick-up shuttle
- Courtesy vehicle

Figure 2-38
Terminal D
Existing Curbside Layout

2.4.3.5 Terminal E Curbside Areas

Terminal E opened in 2003 and differs substantially, both physically and functionally, from the other terminals. Terminal E serves United Airlines ticketing and accommodates all international arrivals from Terminals D and E. The enplaning and deplaning curbsides are located on the west side of the building. United's departing passengers use the upper curbside, arriving passengers use the lower curbside.

Departures level curbside. There are a total of eight lanes on the departures level, separated by a central pedestrian island. The inner four lanes are reserved for private vehicles, taxis, and limousines, and the outer lanes are designated for courtesy vehicles. United also operates employee shuttles which drop off employees on the outer lane of the Terminal E departures curbside. The Houston Police Department and City service vehicles park in spaces between the inner and outer curbside lanes. The existing curbside layout for Terminal E is presented in Figure 2-39.

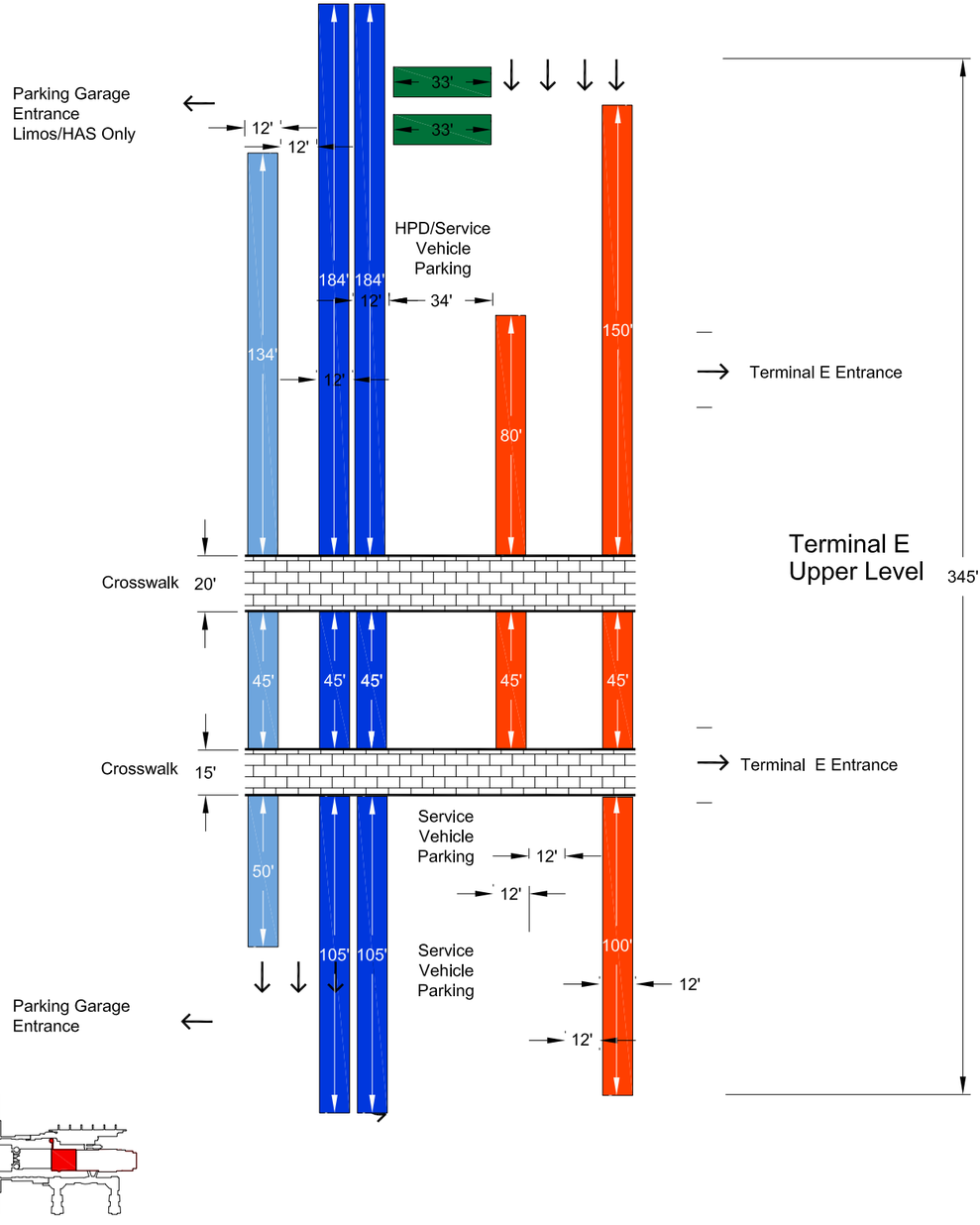
Arrivals level curbside. There are a total of eight lanes on the arrivals level, separated by a central pedestrian island. The innermost lane serves taxis, hotel/motel courtesy shuttles, and SuperShuttle. The fourth lane from the terminal serves rental car and parking shuttles. The southern half of the central pedestrian island provides angled, pull-through spaces for pre-arranged limousines. The four outer lanes are reserved for private vehicles.

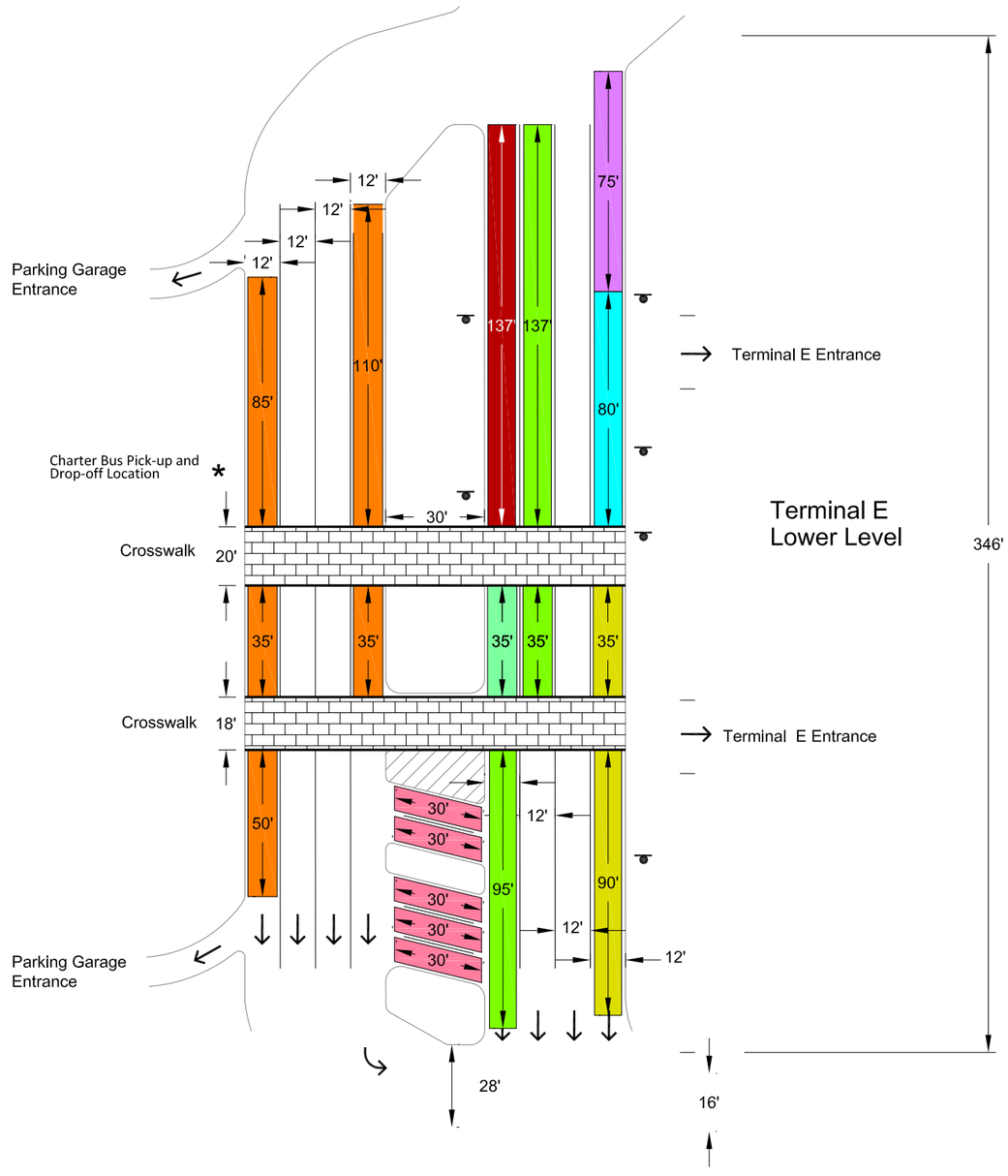
The total effective length of the departures level curbside accounting for each lane and the crosswalks is approximately 500 feet; the total effective length of the arrivals curbside length accounting for each lane and the crosswalks is approximately 830 feet. The existing space allocation including the length of each curbside zone, the number and width of the travel and loading/unloading lanes, and the locations of pedestrian crosswalks and pedestrian islands are illustrated in Figure 2-39.

2.4.3.6 Terminal Curb Vehicle Traffic Counts and Classification

Vehicular traffic volumes and classification counts were collected at all terminal curbsides of the airport. This information can be utilized for evaluating traffic operations at the curbs and also for forecasting traffic demand at the curbs in the future. Figure 2-40 illustrates the airport access points for the different terminal areas and Figure 2-41 illustrates the curb locations for the vehicular data gathered in the passenger terminal complex.

A combination of video recordings and surveyor observations was used to collect traffic volumes and vehicle classification counts for all 16 curbside areas in the terminal complex. Parking activity records were also obtained for the parking garages A/B, CW (C-West), and D/E located in the terminal area to derive the entry and exit volumes at these locations. The peak hours for individual curbs were identified using the traffic volumes. Instead of distinct morning and afternoon peak hours, the combined peak hour was identified for each peak curb volume. This is due to the fact that most of the curbs did not have peaks in the morning, and the busiest two peak periods occurred in the afternoon.





Source: Gunda Corporation, March 2013
Prepared by: Gunda Corporation, March 2013

Leigh|Fisher

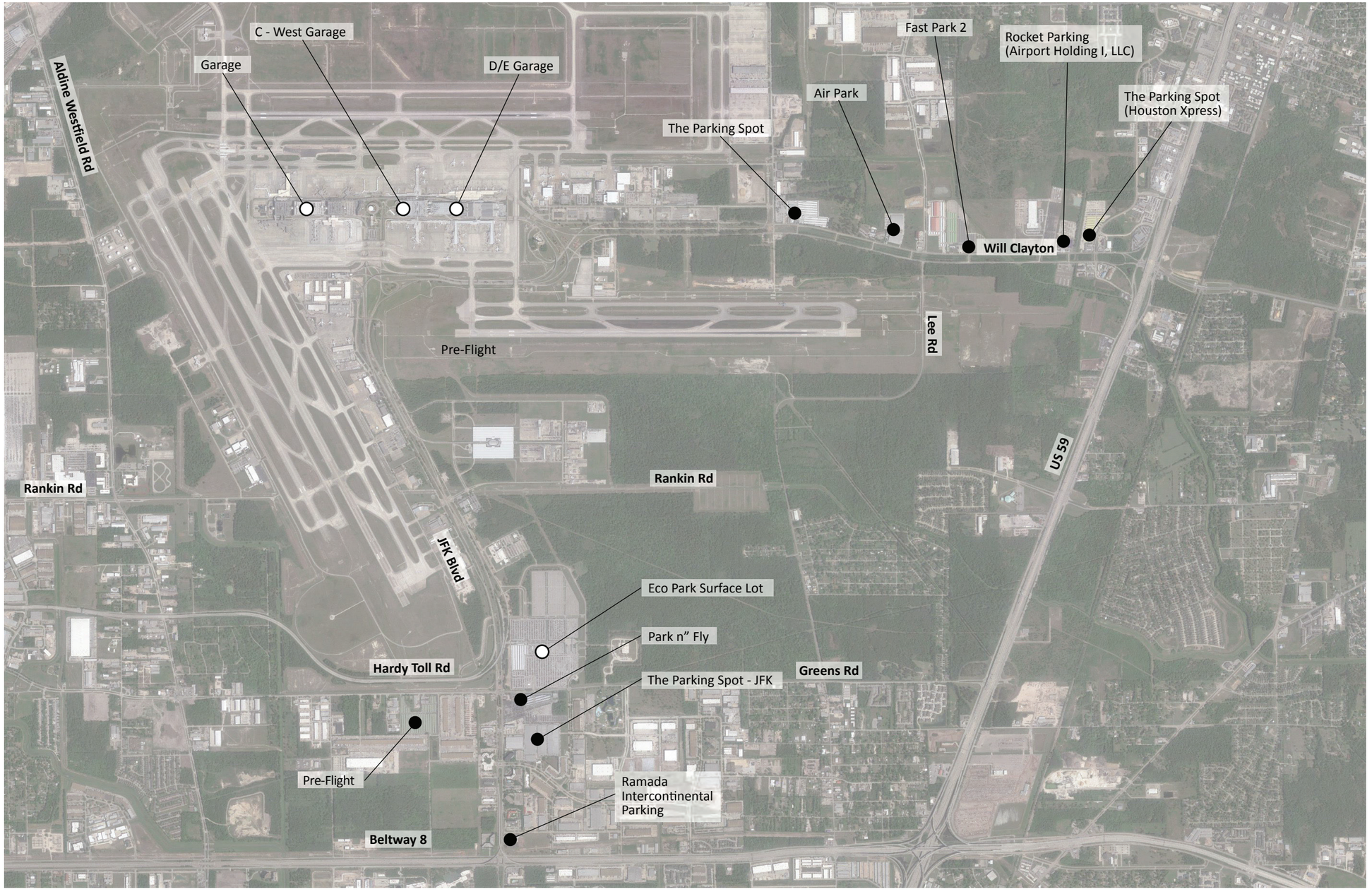
0 30' 60'

N

LEGEND

- Taxis
- Private vehicles
- Rental car pick-up shuttle
- Parking shuttle
- Hotel/motel shuttle
- Super shuttle
- Limousine
- Courtesy vehicle
- HPD vehicles
- Private cars, taxis, and limousines
- EcoPark shuttle
- United employee shuttle

Figure 2-39
Terminal E
Existing Curbside Layout



Source: Leigh|Fisher, December 2012
Prepared by: Leigh|Fisher, December 2012

Leigh|Fisher

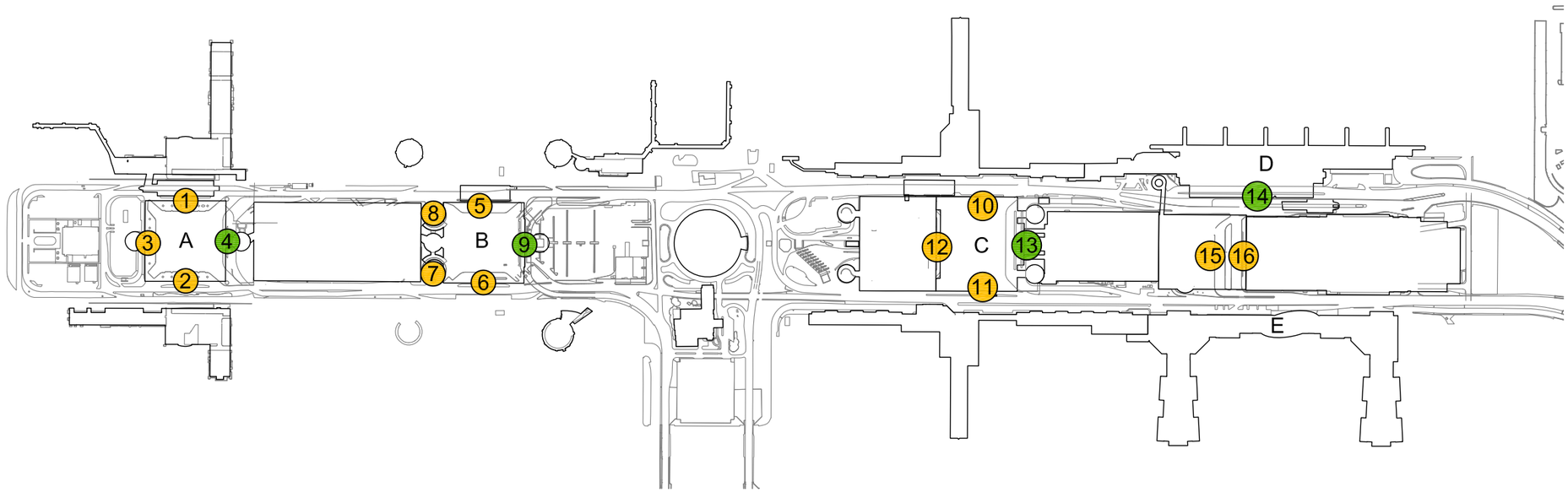
LEGEND

- On-airport parking
- Off-airport parking

0 2000' 4000'

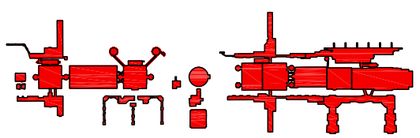
N

Figure 2-40
Primary Access Roadways and On/Off Airport Parking



Terminal		Curb	Curb Use by Vehcile Type
A	Arrivals	1	Private Cars
		2	Rental Car Shuttles
		3	Parking Shuttles
	Departures	4	All Vehicle Types
B	Arrivals	5	Private Cars
		6	Hotel/Motel Shuttles
		7	Rental Car Shuttles
		8	Shuttles (Parking Shuttles Only)
	Departures	9	All Vehicle Types
C	Arrivals	10	Private Cars
		11	Parking Shuttles
		12	Taxi, Limousine, Rental Car Shuttles
	Departures	13	All Vehicle Types
D	Departures	14	All Vehicle Types
E	Arrivals	15	Private Cars
		16	Commercial Vehicles

Key Map



Source: Jacobs, December 2012
Prepared by: Gunda Corporation, December 2012

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0 300' 600'

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Figure 2-41
Passenger Terminal Complex Data Collection

Vehicles were classified into the following six categories, similar to the airport roadway vehicle classification categories:

- Privately owned vehicles, including cars, pick-ups, mini-vans, and SUVs
- Taxis
- Limousines
- Shuttle vans, including courtesy vehicles serving hotels, off-airport parking lots, and SuperShuttle
- Shuttle Buses, including the rental car courtesy buses
- Service Vehicles

The terminal curbside vehicle dwell times and vehicle classification counts for each of the terminals are presented in Tables 2-13 and 2-14, respectively.

Table 2-13
SUMMARY – VEHICLE DWELL TIMES AT TERMINAL CURBS (MM:SS) DURING AM-PM PEAK HOUR

Location		AM		PM	
Terminal	Curb	Average	Std. Dev.	Average	Std. Dev.
A	1	00:50	00:36	--	--
	2	02:37	02:05	02:24	03:32
	3 *(a)*	n/a	n/a	n/a	n/a
	4	01:31	01:06	01:20	01:14
B	5	03:52	05:57	01:49	03:27
	6	00:50	00:27	02:06	02:21
	7	13:57	14:57	12:42	08:15
	8	03:13	03:38	02:49	02:10
	9	01:24	01:34	01:32	01:24
C	10	04:07	04:39	04:57	05:49
	11	02:56	01:39	02:36	01:42
	12	05:31	04:08	03:43	03:45
	13	01:36	01:16	01:06	01:11
D	14	--	--	02:28	02:40
E	15	06:23	07:00	01:41	01:25
	16	01:53	01:29	01:57	01:24

(a) Curb 3 (Terminal A, lower level) was closed due to construction during the study period.

Source: HNTB Peak Week Surveys, 2010.

Table 2-14
PEAK HOUR CURBSIDE VOLUME BY VEHICLE CLASSIFICATION *(a)*

Terminal	Curb	POV *(b)*	Taxi	Limousine	Shuttle van	Shuttle bus	Service vehicles	Total volume
A	1	0	0	0	0	57	0	57
	2	192	19	0	1	14	0	226
	3*(c)*	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	4	129	0	0	0	4	0	133
B	5	133	0	0	0	0	0	133
	6	12	5	0	11	17	4	49
	7	0	0	8	0	0	0	8
	8	0	0	0	0	38	0	38
	9	173	19	0	27	59	0	278
C	10	252	0	0	1	0	0	253
	11	1	0	0	65	14	0	80
	12	22	14	0	9	7	0	52
	13	262	4	0	38	0	0	304
D	14	332	12	0	56	11	0	411
E	15	324	13	58	8	0	0	403
	16	211	15	0	81	25	0	332
Total		2043	101	66	297	246	4	2757

(a) Curbside Volume by curb number includes inner, middle, and/or outer curb volumes.
(b) POV: Privately Owned Vehicle.
(c) Curb 3 (Terminal A, lower level) was closed due to construction during the study period.

Source: HNTB Peak Week Surveys, 2010.

2.4.4 Parking Facilities

2.4.4.1 Public Parking

Public parking facilities at the Airport include the three garages located adjacent to the terminal buildings (i.e., the A/B garage, the C-West garage, and the D/E garage) and the surface economy lot, referred to as EcoPark, located on the Airport near John F. Kennedy Boulevard and Greens Road intersection. Detailed illustrations of the three public parking garages in the passenger terminal complex are presented in Figures 2-44, 2-45, 2-46 and 2-47.

The midday occupancy counts (i.e., the number of parked vehicles during the busiest hours of the day) and the volume of traffic entering and exiting the airport-controlled parking facilities were provided by HAS for Wednesday, October 24, 2010 and Thursday, October 25, 2010, which were selected to represent typical busy days during a busy month. Additionally, to help analyze seasonal fluctuations in parking demand, the monthly parking revenue and transactions (i.e., the number of vehicles entering and exiting each parking facility) were obtained from HAS. The monthly parking revenues and monthly transactions are illustrated in Figures 2-42 and 2-43, respectively. As shown the largest volumes occur during June and July, reflecting the

peak travel periods for non-business travelers, and during March and October which are typically the peak travel periods for business travelers.

The peak entry hour for the A/B garage, the C-West garage, and EcoPark occurred during the morning, while the peak entry hour for the D/E garage entrance occurred during the early afternoon. Parking garages A/B and C-West both had exit peak hours in the afternoon, however, the EcoPark peak exit hour was in the evening.

Figure 2-42
MONTHLY PARKING REVENUES FY 2012

Source: HAS records for July 2011 through June 2012.

Figure 2-43
MONTHLY PARKING TRANSACTIONS FY 2012

Source: HAS records for July 2011 through June 2012.

The A/B garage peak inbound hour occurred between 6:00 and 7:00 AM when 215 vehicles entered, and the peak outbound hour occurred between 5:00 and 6:00PM when 210 vehicles exited. The C-West garage had a peak inbound hour between 7:00 and 8:00AM when 35 vehicles per hour entered, and the peak outbound hour occurred between 5:00 and 6:00 PM when 195 vehicles exited. The D/E garage had a peak inbound hour between 1:00 and 2:00 PM when 265 vehicles entered, and the peak outbound hour occurred between 2:00 and 3:00 PM when 215 vehicles exited. The EcoPark lot had a peak inbound hour between 6:00 and 7:00 AM when 65 vehicles entered, and the peak outbound hour occurred between 8:00 and 9:00 PM when 95 vehicles exited.

Table 2-15 presents parking capacity and peak period parking demand of the on-airport public parking facilities. Occupancy rates reported in Table 2-15 were collected at 08:00 AM and 02:00 PM on both Wednesday, October 24, 2012 and Thursday, October 25, 2012.

Table 2-15
ON-AIRPORT PUBLIC PARKING FACILITIES

Facility	Approximate parking capacity	Wednesday, October 24, 2012 AM Peak hour percent of occupied spaces *(a)*	Wednesday, October 24, 2012 PM Peak hour percent of occupied spaces *(b)*	Thursday, October 25, 2012 AM Peak hour percent of occupied spaces *(a)*	Thursday, October 25, 2012 PM Peak hour percent of occupied spaces *(b)*
Parking Garage					
Garage A/B	4,259	69%	74%	65%	70%
Garage C-West	4,620	78%	83%	78%	80%
Garage D/E	4,307	75%	84%	74%	78%
Economy Parking					
EcoPark	8,553	-	-	-	-
Covered	926	80%	85%	69%	76%
Uncovered	7,627	28%	28%	28%	28%
Employee and Administrative Parking					
Terminal A	700	100%	100%	100%	100%
Terminal B	700	100%	100%	100%	100%
East of Terminal B	500	100%	100%	100%	100%
Garage South of Hotel	500	100%	100%	100%	100%
Terminal C West	200	100%	100%	100%	100%
United EcoPark	3,500	100%	100%	100%	100%

(a) AM peak hour was 08:00.
(b) PM peak hour was 14:00.

Source: Gunda Corporation field survey, November 2012.

2.4.4.2 Off-Airport Public Parking

There are nine privately operated off-airport parking lots that provide courtesy vehicle service for airport passengers and employees. These lots are located along John F. Kennedy Boulevard, Greens Road, and Will Clayton Parkway as shown on Figure 2-37. In addition, the Hotel Ramada Intercontinental South, located near the intersection of Beltway 8 and John F. Kennedy Boulevard, also offers paid parking for airport customers that are not hotel guests.

A survey of the nine off-airport parking lots and the parking facility of Hotel Ramada Intercontinental South was conducted on Wednesday, November 14, 2012 between 12 noon and 4:00 p.m. The results of the survey are summarized in Table 2-16.

Table 2-16
OFF-AIRPORT PARKING FACILITY OCCUPANCY RATES

Parking lot	Approximate parking capacity	Percent of occupied spaces *(a)*
Fast Park	2,591	67.7%
Park N Fly	2,939	61.6%
The Parking Spot – JFK	3,312	83.7%
The Parking Spot – Houston Express	1,662	63.4%
Rocket Parking	1,170	21.4%
Fast Park 2	2,315	67.6%
Pre Flight	1,411	32.3%
Air Park	1,134	21.9%
The Parking Spot - Will Clayton	1,779	78.6%
Ramada Intercontinental	123	36.6%
Total	18,436	59.6%

(a) Based on observations conducted by Gunda on Wednesday, November 14, 2012.

Source: Gunda Corporation field survey, November 2012.

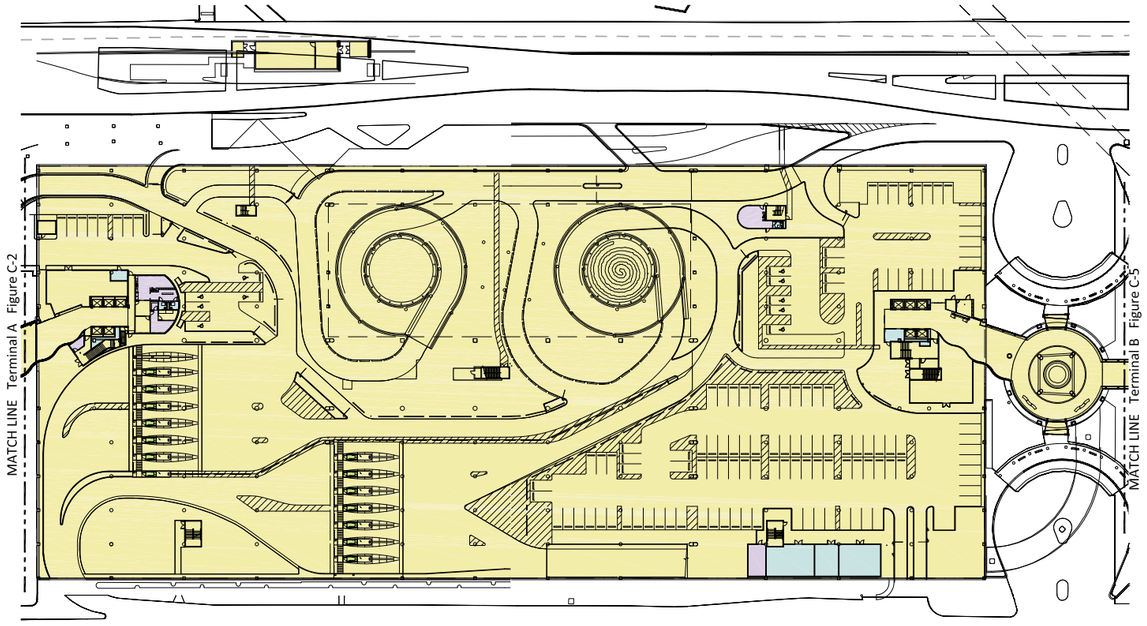
2.4.4.3 Employee Parking

Employee parking is located at Terminals A, B, and C. Additional employee parking is provided in surface lots near terminal buildings, such as Surface Parking Lot 6, Customs, and Border Protection parking structure. In addition, the employees of United Airlines are allocated approximately 3,500 spaces in the EcoPark lot. Further, some employers provide parking for their employees at off-airport parking lots and other parking areas. Table 2-15 summarizes the parking lot locations allotted for employee parking and the approximate number of spaces at each location.

2.4.5 Car Rental Facilities

The 1.6 million square foot Consolidated Rental Car Facility (CRCF) for the Airport is located at the intersection of John F. Kennedy Boulevard and Rankin Road, immediately north of HAS administrative offices, as shown in Figure 1-2. The CRCF provides approximately 5,400 ready-and-return spaces. The CRCF is served by a consolidated bus system which transports rental car customers between the CRCF and the airport terminals.

A questionnaire was developed to solicit information and comments from rental car companies regarding existing and future facilities and operations at the Airport. The questionnaire focused on gathering information on the existing activity levels, ready-and-return car processing, and traffic design criteria. It was distributed to the rental car companies operating at CRCF as of November 8, 2012.



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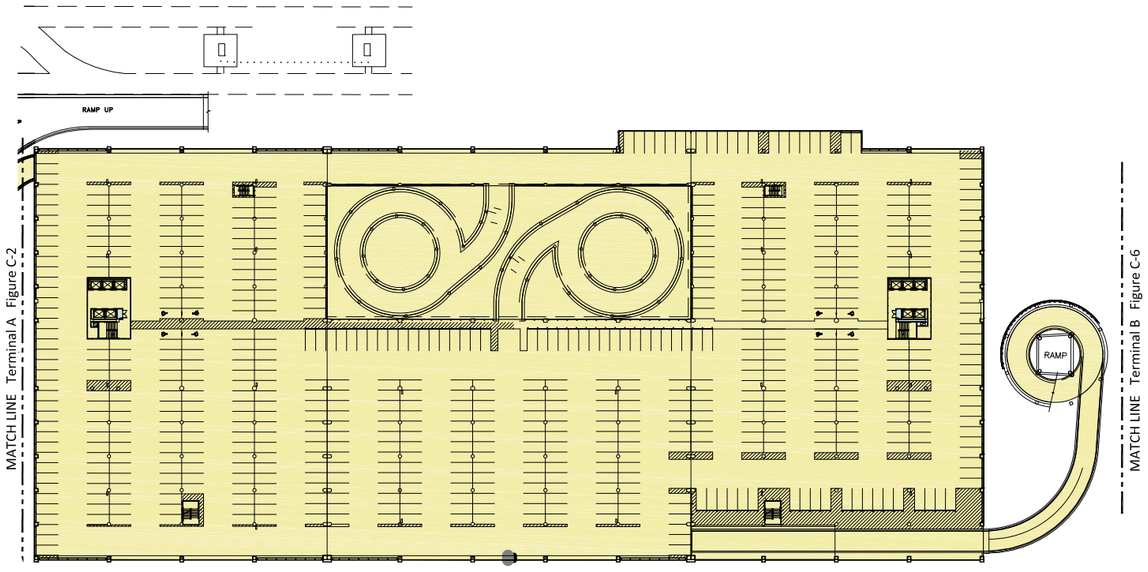
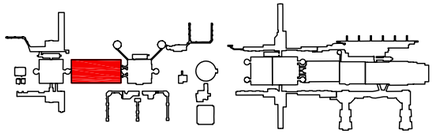


Level 2

KEY MAP



Source: HAS Records and IAH Airport Layout Plan, August 2006
Prepared by: RdlR Architects, Inc., December 21, 2012

Leigh | Fisher

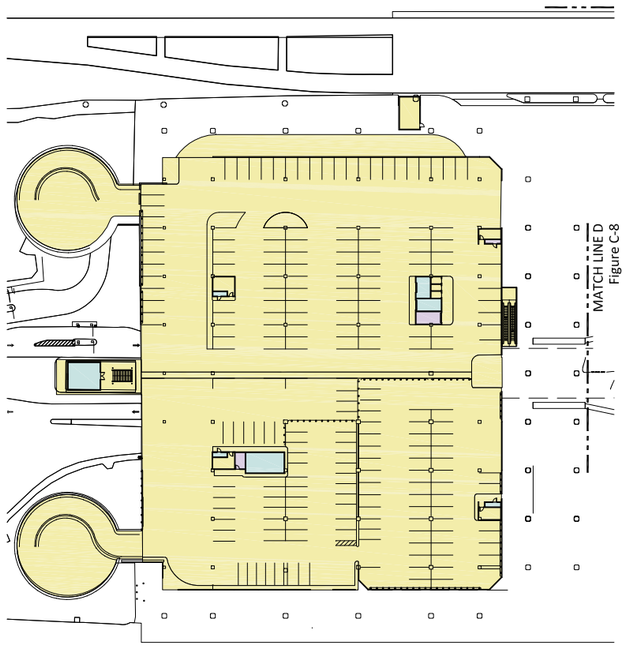
0 62.5' 125'

N

LEGEND

- Airline
- Concessions
- Baggage handling
- Security
- Customs & border protection
- HAS
- Public space
- Building services & support

Figure 2-44
Parking Garage A/B Levels 1 & 2



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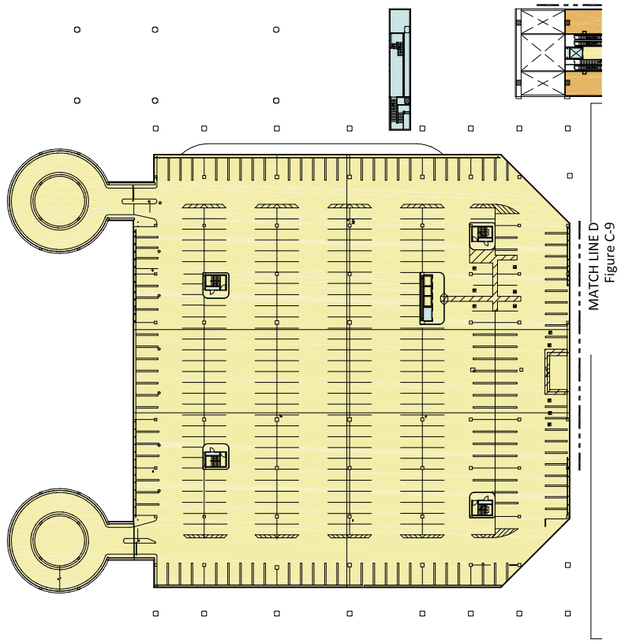
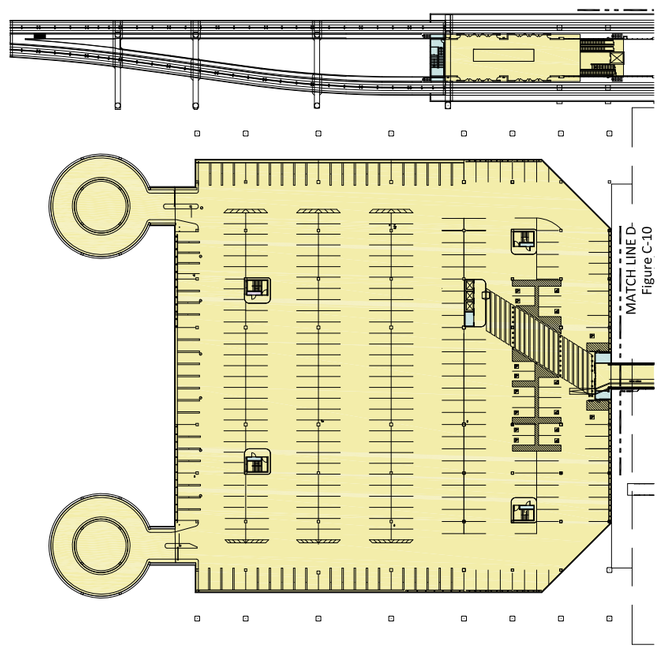
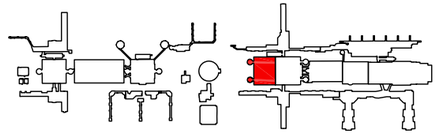


Level 2



Level 3

KEY MAP



Source: HAS Records and IAH Airport Layout Plan, August 2006
Prepared by: RdlR Architects, Inc., December 21, 2012

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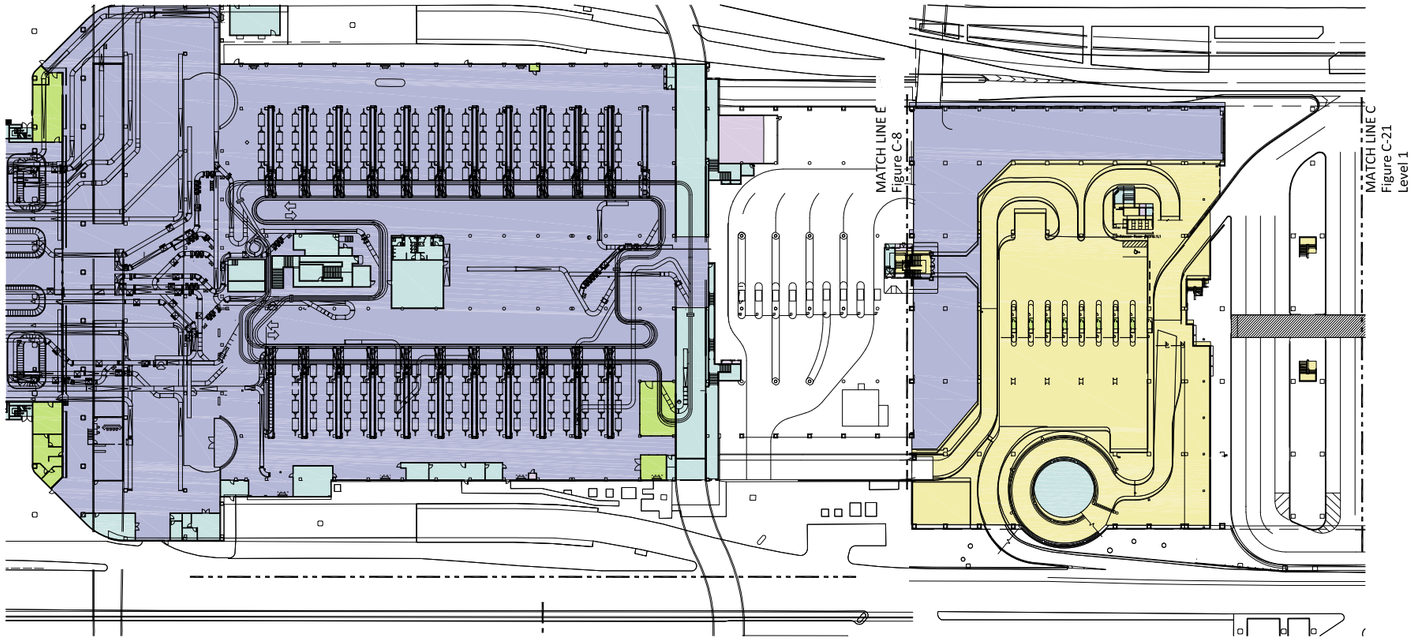
0 62.5' 125'

N

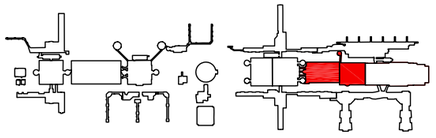
LEGEND

- Airline
- Concessions
- Baggage handling
- Security
- Customs & border protection
- HAS
- Public space
- Building services & support

Figure 2-45
Parking Garage C West



KEY MAP



Source: HAS Records and IAH Airport Layout Plan, August 2006
Prepared by: RdlR Architects, Inc., December 21, 2012

Leigh | Fisher

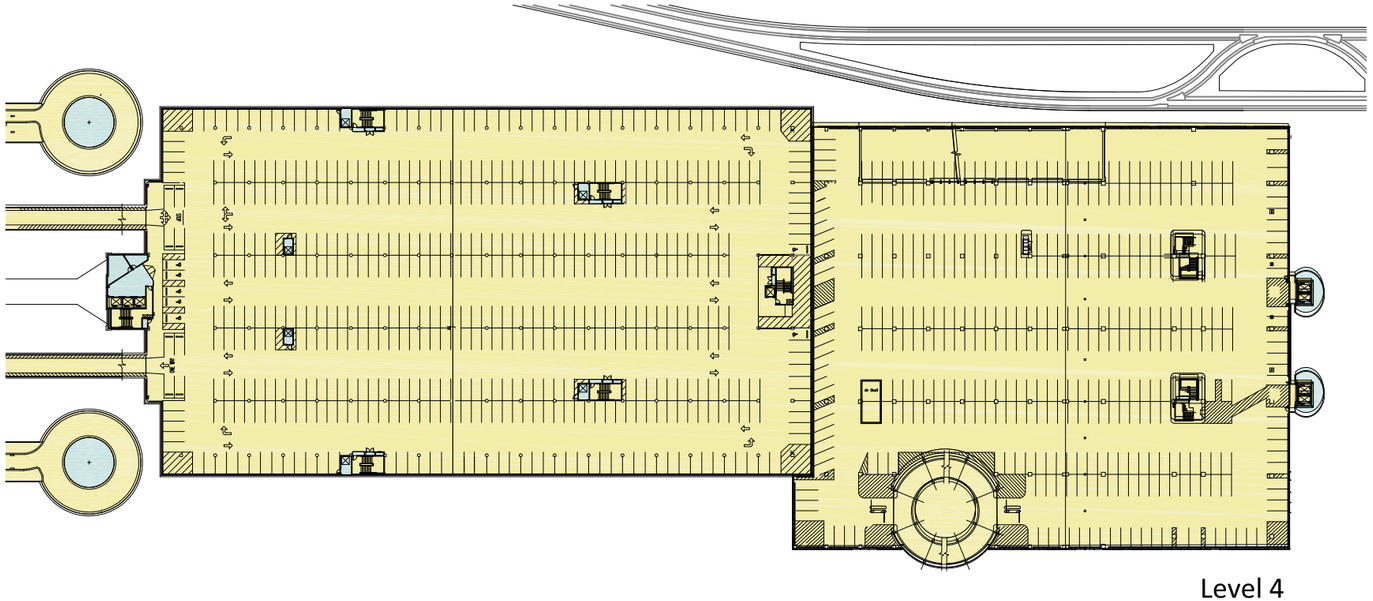
0 62.5' 125'

N

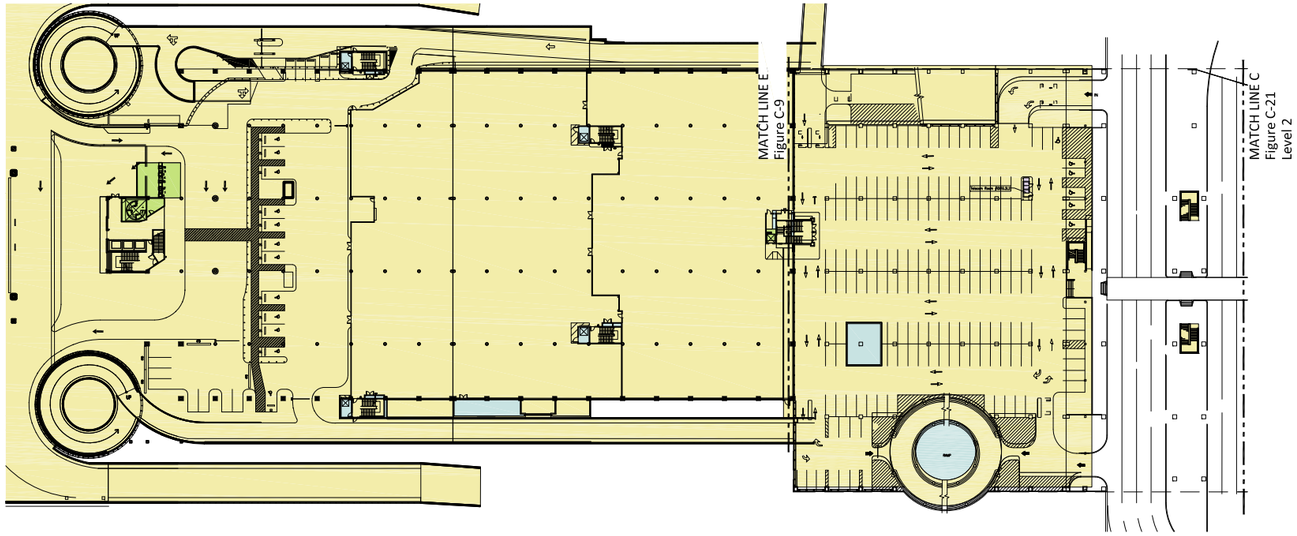
LEGEND

- Airline
- Concessions
- Baggage handling
- Security
- Customs & border protection
- HAS
- Public space
- Building services & support

Figure 2-46
Parking Garage C/D & E - Level 1

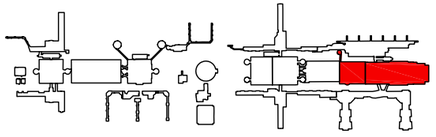


Level 4



Level 2

KEY MAP



Source: HAS Records and IAH Airport Layout Plan, August 2006
Prepared by: RdlR Architects, Inc., December 21, 2012

Leigh|Fisher

0 62.5’ 125’

N

LEGEND

- Airline
- Concessions
- Baggage handling
- Security
- Customs & border protection
- HAS
- Public space
- Building services & support

Figure 2-47
Parking Garage C/D & E - Levels 2 & 4

2.4.6 Commercial Vehicle Facilities and Operations

The following is a list of primary commercial vehicles operating at the Airport:

- Taxis
- Limousines
- Super Shuttles
- Courtesy Vehicles
- Charter Buses

2.4.6.1 Taxis

Taxicab staging for the airport is located north of Will Clayton Parkway at the intersection of Colonel Fisher Boulevard and Wright Road. Currently, there are 380 spaces in the staging area. All licensed taxi drivers must receive an airport badge. There are approximately 1,800 taxis in the airport database. Taxis are assigned to a queue dedicated to each terminal based on the demand. In situations where there is high demand for taxis and all licensed taxis are already engaged, any registered taxi may pick up passengers from the airport.

2.4.6.2 Limousines

Staging areas are provided for pre-arranged limousines at each terminal building. The limousine staging area for Terminal A is located on the west side at the HAS parking lot. At Terminal B, the roundabout on the southwest corner operates as the limousine staging area. For Terminal C, the limousine staging area is located on the west side. The limousine staging area at Terminal D is located in the parking lot for the international services personnel located on the east side of the terminal building. At Terminal E, five stretch limousine parking spots are located in between the private and commercial vehicle lanes. Currently, limousines operate on-call. Limousine drivers are not allowed to dwell at terminal building curbside areas for more than 30 minutes.

2.4.6.3 SuperShuttle

SuperShuttle, Inc., has an exclusive contract with the City of Houston to provide on-demand, door-to-door transportation service. Kiosks, staffed by SuperShuttle employees, are located at the baggage claim areas of each of the terminal buildings. There are 1 to 2 curbside spaces reserved for SuperShuttle at passenger deplaning curbside areas at Terminals A, B, C, and E.

2.4.6.4 Courtesy Vehicles

The courtesy vehicles are operated by the Airport (EcoPark), privately owned off-airport parking lots, and the hotels in the vicinity of the Airport. There are passenger pick-up and drop-off curbside areas designated exclusively for the courtesy vehicles at the terminals. The drivers of the courtesy shuttles are required to have a badge. The Airport issues permits for the operation of courtesy vehicles for a fee.

2.4.6.5 Charter Buses

Chartered buses, operated by private enterprises (e.g., Carnival Cruise Lines), need to obtain permits to operate at the Airport. Usually, the representatives of the chartered buses will coordinate with ground transportation representatives at each terminal to stage the vehicles at the terminals. The charter bus staging area for Terminals A and C are located on the south side, and at Terminal B the charter buses are staged at the roundabout on the southwest corner of the terminal building. Terminals D and E do not have assigned staging areas for charter buses.

2.4.7 Non-Terminal Area Roadways

The 24-hour traffic counts for the roadways near the Airport perimeter are summarized in Table 2-17. The turning movement counts for the perimeter intersections of John F. Kennedy Boulevard/Greens Road and Will Clayton Parkway/Lee Road for the morning, midday, and afternoon peak hours are summarized in Table 2-18.

Table 2-17
NON-TERMINAL AREA PEAK TRAFFIC VOLUMES

Location	Total 24 Hour Volume *(a)*		Peak Hour		Peak Hour Volume	
	Day 1	Day 2	Day 1	Day 2	Day 1	Day 2
Loc 1 NB JFK Mainline south of Rankin Rd	25,729	28,684	13:00	16:00	1,872	2,038
Loc 1 SB JFK Mainline south of Rankin Rd	21,209	23,552	14:00	14:00	1,648	1,717
Loc 2 EB Will Clayton between Wright and Lee	13,754	15,600	17:00	7:00	1,239	1,356
Loc 2 WB Will Clayton between Wright and Lee	15,600	17,059	7:00	13:00	1,356	1,389
Loc 3 EB Will Clayton between taxiway bridges	23,156	22,852	13:00	16:00	1,772	1,763
Loc 3 WB Will Clayton between taxiway bridges	20,456	20,508	14:00	14:00	1,679	1,501

(a) Based on traffic counts conducted Wednesday, October 24 and Thursday, October 25, 2012.

Source: Gunda Corporation, October 2012.

Table 2-18
PEAK HOUR TURNING MOVEMENT COUNTS – AIRPORT PERIMETER INTERSECTIONS

		Turning movement direction															
Location	Peak Hour	EBL	EBT	EBR	EBU	WBL	WBT	WBR	WBU	NBL	NBT	NBR	NBU	SBL	SBT	SBR	SBU
J.F.K Boulevard at West Greens Rd	7:15	132	214	209	0	44	394	63	0	296	1,007	87	0	82	820	301	29
	13:15	154	162	150	0	140	170	121	1	100	1,414	103	3	94	1,266	176	51
	16:15	212	364	325	0	81	325	96	0	197	1,131	92	6	70	1,142	214	43
Lee Rd at EB Will Clayton Pkwy	7:00	140	480	3	0	0	0	0	0	0	4	4	0	445	6	0	0
	14:00	274	924	0	0	0	0	0	0	0	1	4	0	274	1	0	0
	16:45	256	1,197	0	0	0	0	0	0	0	2	2	0	353	4	0	0
Lee Rd at West bound Will Clayton Pkwy	7:00	0	0	0	0	3	1,060	203	0	5	136	0	0	0	445	328	0
	13:00	0	0	0	0	11	1,039	184	0	0	202	0	0	0	235	252	0
	16:30	0	0	0	0	8	671	176	0	1	263	0	0	0	336	153	0

Source: Traffic counts conducted Wednesday, October 24 and Thursday, October 25, 2012.

2.4.8 Public Transit

Currently, the Metropolitan Transit Authority of Harris County (Houston METRO) operates a nonstop bus service (Route #102) from downtown Houston to the Greenspoint area and then continues on to the airport.

2.4.9 Regional Transportation Plans

Houston-Galveston Area Council, the metropolitan planning organization for the Houston metropolitan area, is currently developing the Year 2040 Regional Transportation Plan. The other public agencies such as City of Houston, Texas Department of Transportation, Harris County Toll Road Authority, and METRO are undertaking roadway infrastructure and other transportation improvement projects in the vicinity of the airport. The projects that involve improvement of roadways, which provide regional or direct access to the airport, are summarized in Table 2-19.

Table 2-19
REGIONAL TRANSPORTATION IMPROVEMENTS IN VICINITY OF AIRPORT

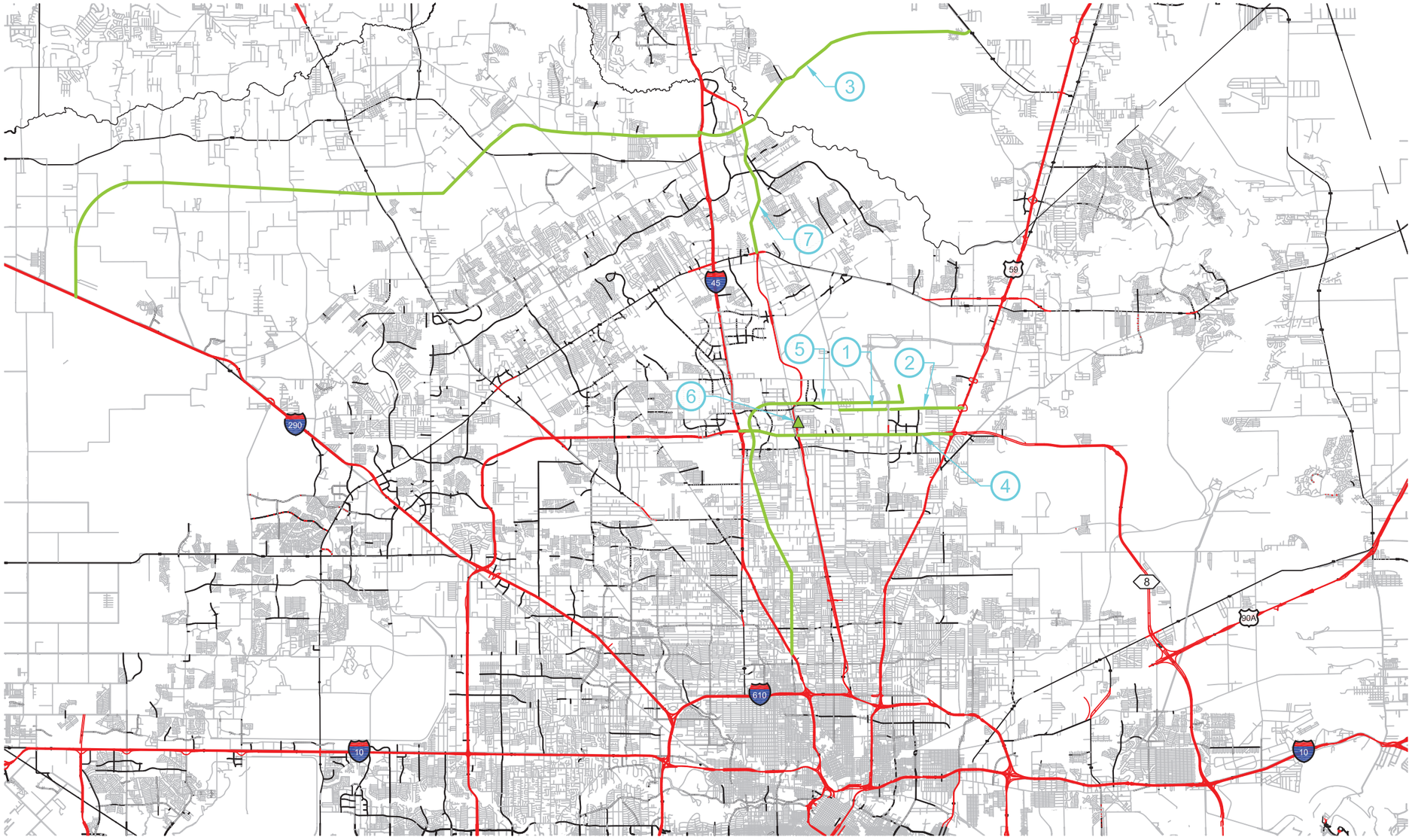
	Agency	Roadway	Project Limits	Project Type	Estimated Date of Completion
1	COH	Greens Road	Aldine-Westfield to JFK Blvd	Roadway Widening	2015
2	COH	Greens Road	JFK Blvd. to US 59	Roadway Widening	2016
3	TxDOT	SH 99/Grand Parkway	US 290 to US 59	Freeway Construction	2017
4	TXDOT	Beltway 8	IH 45 to US 59	Roadway and Bridge Widening	2021
5	METRO	Light Rail Corridor	From Northline Mall to IAH	Light Rail Corridor Construction	2035
6	HCTRA	Hardy Toll Road	At Beltway 8 Interchange	Add Direct Connectors	2020
7	HCTRA	Hardy Toll Road	FM 1960 to Grand Parkway	Roadway Widening	2017

TxDOT = Texas Department of Transportation
COH = City of Houston
HCTRA = Harris County Toll Road Authority

Source: Gunda Corporation, November 2012.

Texas Department of Transportation – Houston District is undertaking the SH 99/Grand Parkway project. It is anticipated that a 4-lane freeway section of Grand Parkway from US 290 to US 59 will be completed by about 2017. SH 99/Grand Parkway, when complete, will provide an alternative route for the residents traveling from the western part of the greater Houston area to the Airport. In addition to the projects listed in Table 2-19, Gulf Coast Rail District is planning on partnering with TxDOT on the high speed rail corridor between Houston and Dallas-Fort Worth, which would pass adjacent to the Airport. The high-speed rail project is neither funded nor scheduled. Houston METRO has proposed extending light rail service to the Airport in the vicinity of the existing rental car center. However, this rail extension is neither funded nor scheduled and was assigned a low priority, signifying that when funding becomes available other rail extension would receive higher priority. None of the projects described above appear to significantly modify the existing traffic patterns entering or exiting the Airport.

ExxonMobil Corporation is planning on establishing their world headquarters in the Greater Houston area. The proposed location of the development is in South Montgomery County/North Harris County at the proposed SH 99 (Grand Parkway) and Interstate 45 interchange. The complex which is anticipated to be completed by about 2015 would house approximately 10,000 employees and attract housing serving as many as 40,000 residents. To support the development, various master planned communities are being developed adjacent to the proposed office campus. The locations of the roadway improvement projects undertaken by various agencies, in the vicinity of the Airport, are illustrated in Figure 2-48.



	Agency	Roadway	Project Limits	Project Type	Est. Date of Completion
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2	COH	Greens Road	JFK Blvd. to US 59	Roadway Widening	2016
3	TxDOT	SH 99/Grand Parkway	US 290 to US 59	Freeway Construction	2017
4	TXDOT	Beltway 8	IH 45 to US 59	Roadway and Bridge Widening	2021
5	METRO	Light Rail Corridor	From Northline Mall to IAH	Light Rail Corridor Construction	2035
6	HCTRA	Hardy Toll Road	At Beltway 8 Interchange	Add Direct Connectors	2020
7	HCTRA	Hardy Toll Road	FM 1960 to Grand Parkway	Roadway Widening	2017

Source: Jacobs, December 2012
Prepared by: Gunda Corporation, December 2012

Leigh|Fisher

0 1000′ 2000′

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Figure 2-48
Planned Roadway Improvements

2.5 AIR CARGO

The Airport serves as one of the largest international cargo hubs in the United States. It includes two distinct air cargo facility areas, IAH Central Cargo and IAH East Cargo. Together, the two cargo areas comprise approximately 295 acres, including cargo support buildings. A layout of both cargo facilities is provided in Figure 2-49.

2.5.1 IAH Central Cargo

IAH Central Cargo is adjacent to and east of Runway 15L-33R and southwest of the terminal complex. IAH Central Cargo spans approximately 67 acres, and FedEx is the largest tenant. FedEx leases a portion of the apron accommodating four Airbus A300 parking positions adjacent to their building, as well as an additional parking position in the northwest corner of the apron. This parking position accommodates an MD-11. FedEx has been using one of the parking positions adjacent to their building for GSE storage, but recently leased additional space for this purpose located south of their main building.

The other parking positions on the IAH Central Cargo apron are common use positions managed by HAS. This area of the apron accommodates 3-4 aircraft parking positions depending on fleet mix, and it is currently used primarily by Atlas Air. A larger group of airlines lease smaller buildings at IAH Central Cargo for sorting and processing belly cargo. These airlines include American Airlines, Delta Air Lines, Air France, United Airlines, LAN, US Airways, Air Jamaica, Korean Air, and Servisair, among others. The IAH Central Cargo facility is accessible via the John F. Kennedy Boulevard.

Table 2-20 presents data on IAH Central Cargo, including building size, parking apron sizing and capacity, and operators.

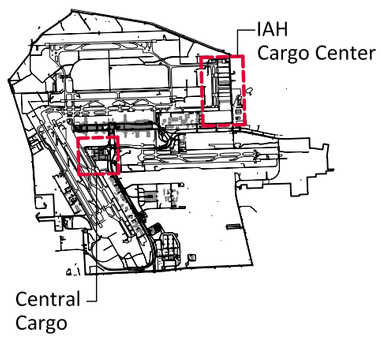
Table 2-20
IAH CENTRAL CARGO

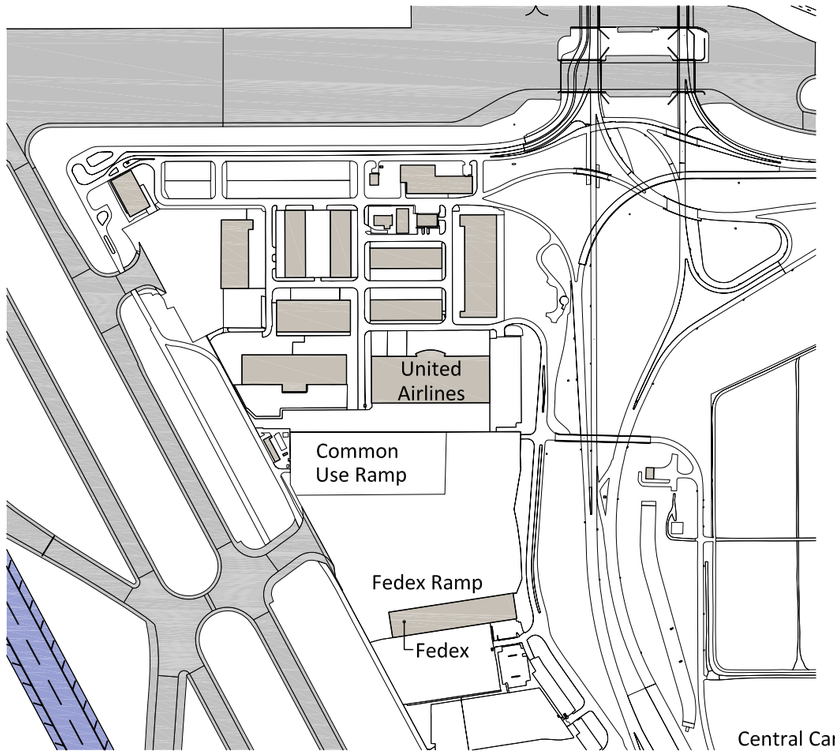
Tenant	Type of Freight Operator	Building (SF)	Apron Area (SF)	Parking Positions	Largest Aircraft Served
FedEx	Integrated Carrier	62,900 *(a)*	396,300 (*a)*	5 (*b*)	A300/D10 – 4 positions adjacent to the building MD11 – 1 position in the northwest corner of the apron
Gateway Logistic	Integrated Carrier	63,500	345,200 (*c*)	3-4 (*c*)	Depends on fleet mix
United Airlines	Belly Cargo	157,200 (*c*)	345,200 (*c*)	3-4 (*c*)	Depends on fleet mix

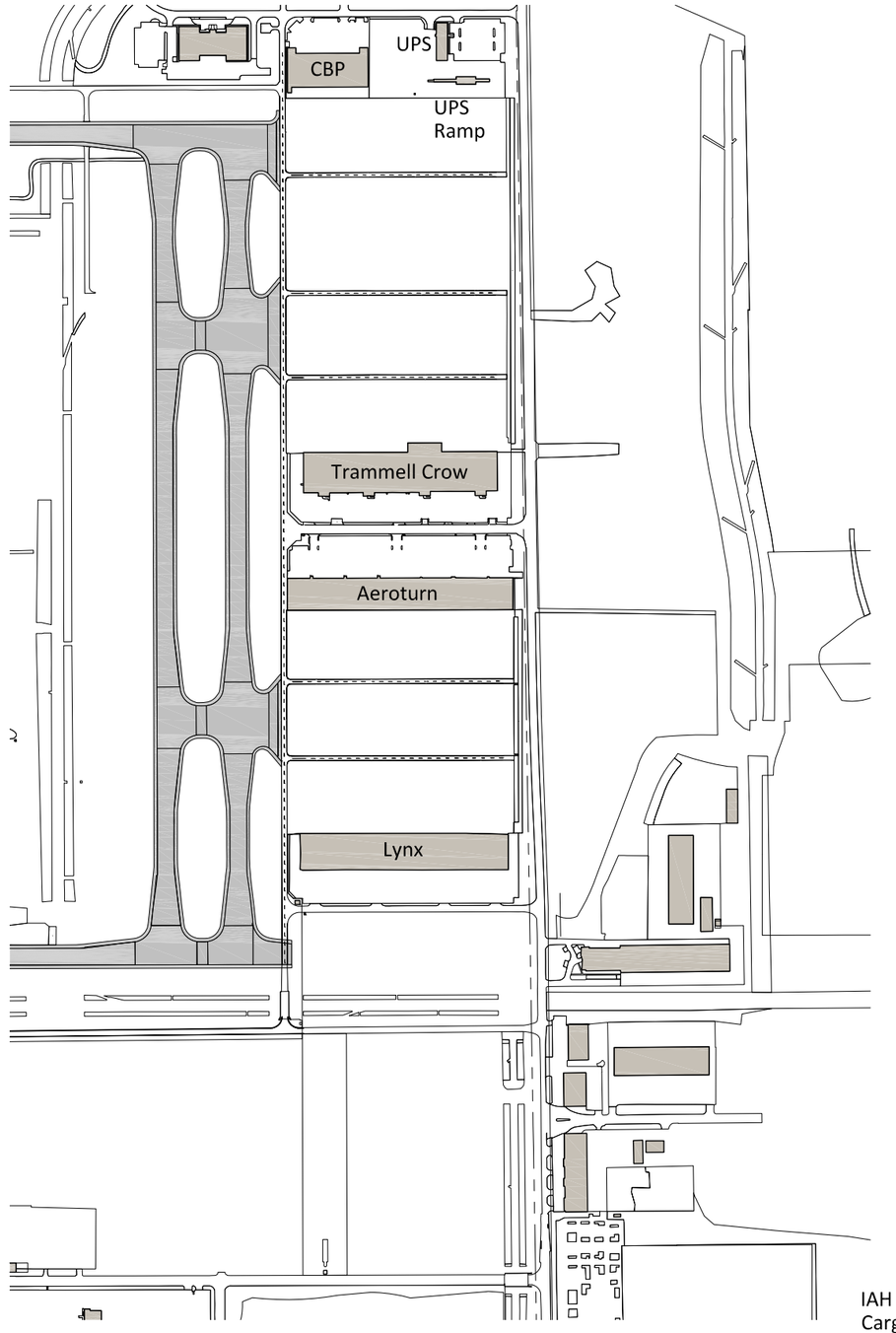
(a) The apron area for FedEx includes the parking position that is not adjacent to their building.
(b) Note that the westernmost parking position adjacent to the FedEx building has been used for GSE storage. FedEx also leases an additional parking position that is not adjacent to their building, bringing the total parking positions to 5.
(c) The parking positions and apron area adjacent to the Gateway Logistic and United Airlines buildings are common use. The total apron area and parking positions available for each of these tenants are displayed in this chart.

Source: Airport Layout Plan and LeighFisher Team field verifications.

KEY MAP







Source: Airport Layout Plan, August 2006
Prepared by: Leigh|Fisher, December 21, 2012

Leigh|Fisher

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Figure 2-49
Air Cargo Facilities

2.5.2 IAH East Cargo

IAH East Cargo is east of Runway 8R-26L and northeast of the passenger terminal complex. IAH Cargo Center spans 228 acres, including cargo support buildings. The facility opened in January 2003 and is a state of the art facility. The cargo buildings were designed, built, and funded by third party developers. All aircraft parking areas on the East Cargo site are common use managed by HAS. Nearby land has also been marked for future cargo expansion plans. The IAH East Cargo site is accessible via Lee Road. Cargo airlines using IAH East Cargo include Air France (AFR), Ameriflight (AMF), Air Transport International (ATN), China Airlines (CAL), Cargolux (CLX), Cathay Pacific (CPA), Lufthansa (DLH), EVA Airways (EVA), AeroLogic/ Lufthansa (GEC), British Airways (GSS), Martinaire (MRA), Air Cargo Carriers (SNC), Saudi Arabian Airlines (SVA), and United Parcel Service (UPS).

Several major freight forwarders operate off-Airport cargo buildings. Most are located east of Lee Road and west of SH 59. Cargo from these operations is destined for the East Cargo area.

Three of the four primary buildings, which are operated by Lynx, AeroTerm, and Trammell Crow, each have four aircraft parking positions. The remaining building, which is used by UPS, has four aircraft parking positions located in an area exclusively leased to UPS. Five additional common use aircraft parking positions are located on the northern side of the apron near the UPS exclusive use area. These common use parking positions are used most frequently by Antonov aircraft, with Atlas Air and United Airlines among the operators using these positions frequently. The IAH Cargo Center also includes a plant fumigation facility, a U.S. Customs and Border Protection/U.S. Department of Agriculture facility, and 12 smaller supporting buildings, located east of Lee Road.

Table 2-21 presents data on IAH Central Cargo, including building size, parking apron sizing and capacity, and operators.

2.5.3 Cargo Airlines Serving the Airport

Cargo airlines serving the Airport include scheduled cargo airline service and charter air cargo airlines. The scheduled cargo airlines include: Air France Cargo, British Airways World Cargo, Cargolux, Cathay Pacific Cargo, China Airlines, DHL, Eva Air, FedEx, Lufthansa Cargo, Qatar Airways Cargo, Saudi Arabian Airlines, and UPS. Charter air cargo airlines include American Airlines Cargo, Aeromexpress, Air Canada, Delta Air Lines, Emirates Sky Cargo, Frontier Airlines, KLM Cargo, Polar Cargo Airlines, Singapore Airlines Cargo, TACA, US Airways Cargo, United Cargo, and Volga Dneper.

Table 2-21
IAH EAST CARGO

Operator	Type of Freight Operator	Building (SF)	Apron Area (SF)	Parking Positions	Largest Aircraft Served
UPS	Integrated Carrier	8,900	152,210	4	2 positions – B757 (no winglets), 1 position –B763 1position –Swearingen Metro.
Trammell Crow (*a*)	Belly Cargo	164,900	782,950	4 (*b)*	B748 – 2 positions, B744 – 2 positions
AeroTerm	Integrated Carrier	144,100	490,700	4	B748 – 2 positions, B744 – 2 positions
Lynx	All Cargo Carrier	143,400	490,700	4	B748 – 2 positions, B744 – 2 positions
None	None	None	630,740 *(c)*	5	B747– 4 positions, B744 – 1 position

(a) Adjacent aircraft apron is common use and managed by HAS.
(b) One of these parking positions (C3) is used for GSE storage. It would accommodate a B748 aircraft.
(c) This apron area is common use.

Source: Airport Layout Plan and LeighFisher Team field verifications.

2.6 GENERAL AVIATION

The Airport is home to two fixed base operators (FBOs) — Landmark Aviation and Atlantic Aviation — serving the general aviation community. The Airport's FBOs are located on the western side of the Airport as shown on Figure 2-50 and provide a wide range of services to the general aviation users at the Airport.

2.6.1 Landmark Aviation

Landmark Aviation (Landmark) is located on the western side of Runway 15R-33L, along Taxiway WC between Taxiways WU and WL. This FBO site was previously operated by Garrett Aviation until 2004, when it was rebranded as Landmark. The FBO provides a broad range of general aviation services including aircraft basing, ground handling, fueling, tiedowns, and maintenance services. Airfield access is provided via Taxiway WC. Vehicular access is from Chanute Road, via Rankin Road.

There are no aircraft based at the Landmark Aviation facilities. In total, the Landmark site encompasses approximately 20 acres and the facilities include:

- **Apron**—The apron is approximately 208,000 square feet, and includes tie-down parking positions for aircraft. Currently, Landmark does not have any aircraft based at the Airport
- **Executive Terminal**—The Executive Terminal is a 5,500 square-foot building that accommodates the FBO's administrative offices, a pilots' lounge, and other crew and passenger amenities. Adjacent to the terminal is a 109,000 square foot parking lot providing a total of approximately 295 automobile parking spaces. Note that Landmark subleases approximately 1,500 square feet of office space within their executive terminal facility.
- **Hangar**—The 120,000 square foot hangar, collocated with the executive terminal, is utilized for aircraft storage and maintenance.
- **Fuel Farm**—Landmark's above ground fuel farm is located immediately north of the executive terminal building, across from the parking lot. It consists of four tanks: two 20,000 gallon jet-A tanks, one 6,000 gallon unleaded tank, and one 10,000 AVGAS tank. Fuel is transported to the farm via tanker trucks.

2.6.2 Atlantic Aviation

Atlantic Aviation is located east of Runway 15L-33R along Taxiway WB. Atlantic Aviation offers a wide-range of general aviation services including ground handling and fueling, indoor aircraft storage, and tie-downs. Airfield access is provided via Taxiway WK. Vehicular access is provided by John F. Kennedy Boulevard.

There are approximately 16 aircraft based at Atlantic, ranging in size from single engine piston aircraft to corporate jets. In total, the Atlantic site encompasses approximately 20 acres, and the facilities include:

- **Apron**—The apron is approximately 320,000 square feet and includes tie-down parking positions for aircraft.
- **Executive Terminal**—The Executive Terminal is a 17,000 square-foot building that accommodates the FBO's administrative offices, a pilots' lounge, and other crew and passenger amenities. Adjacent to the terminal is a 38,000 square foot parking lot providing a total of approximately 95 automobile parking spaces.

- **Hangar**—The 45,000 square foot hangar, located south of the executive terminal and Exxon Mobile corporate hangar, is utilized for aircraft storage.

- **Fuel Farm**—Atlantic Aviation's above ground fuel farm is located west of the hangar, across from the transient apron. It consists of six tanks: three 20,000 gallon jet-A tanks, one 10,000 gallon unleaded tank, one 10,000 gallon diesel tank, and one 10,000 AVGAS tank. Fuel is transported to the farm via tanker trucks.

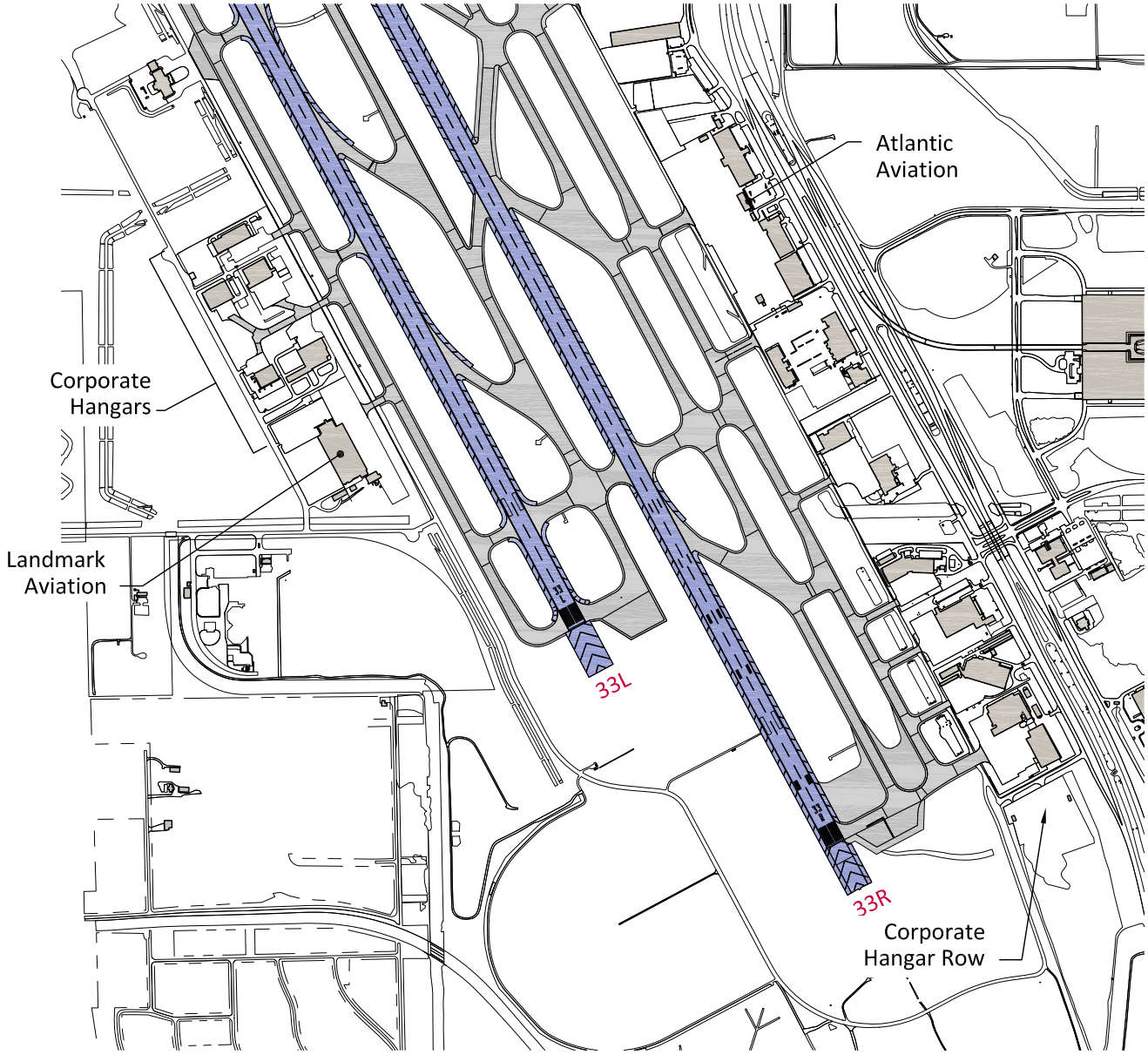
2.6.3 Corporate Aviation

The Airport has several corporate aviation tenants. Currently several corporate hangar facilities are located primarily on the southwest of the airfield, along Taxiways WB and WC. The corporate aviation facilities are summarized in Table 2-22.

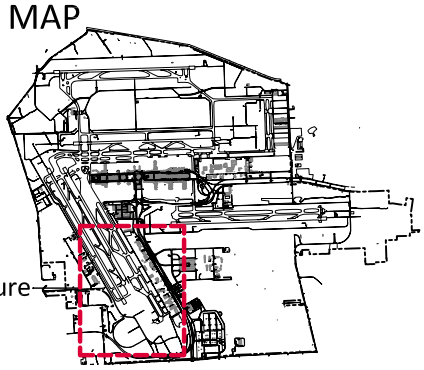
Table 2-22
CORPORATE AVIATION FACILITIES

Operator/user	Location	Building space (square feet)
Aramco (warehouse)	East of Runway 15L-33R	41,600
Aramco (hangar)	East of Runway 15L-33R	48,300
ConocoPhillips	East of Runway 15L-33R	71,200
Tenneco/El Paso Energy	East of Runway 15L-33R	51,200
Pennzoil/Compaq	East of Runway 15L-33R	75,000
Shell Oil Company	East of Runway 15L-33R	40,300
Marathon Oil Company	East of Runway 15L-33R	40,200
Waste Management	West of Runway 15R-33L	21,400
Anadarko Petroleum Corporation	West of Runway 15R-33L	47,100
Apache Corporation	West of Runway 15R-33L	31,300
Phillips 66	West of Runway 15R-33L	32,700
Vacant Hangar	West of Runway 15R-33L	33,800

Source: Airport Layout Plan and Houston Airport System Properties Department, November 2012.



KEY MAP



Source: Airport Layout Plan, August 2006
Prepared by: Leigh|Fisher, December 21, 2012

Leigh|Fisher

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Figure 2-50
General Aviation Facilities

2.7 AIRPORT AND AIRLINE SUPPORT

This section provides an overview of the major airport and airline support facilities located on the campus of the Airport.

2.7.1 Airport Support

Airport support facilities include aircraft rescue and firefighting facilities (ARFF), airport and airfield maintenance, HAS administration offices, and the FAA Airport Traffic Control Tower. Airport support facilities are described below and shown on Figure 2-51.

2.7.1.1 Aircraft Rescue and Firefighting Facilities

Personnel at the IAH ARFF facilities are responsible for all airport firefighting and emergency services. Two elements determine the level of ARFF capability at an airport—the size of the aircraft operating at the Airport and the number of daily departures. The Airport has an ARFF Index E designation. Index E indicates that the longest aircraft using the Airport on a regular basis is 200 feet. The index drives the type and quantity of equipment required to meet FAA Part 139 requirements.

Three ARFF stations are required to meet regulations on ARFF vehicle response times as delineated in the Federal airport certification regulation (Title 14, Code of Federal Regulations Part 139). They include:

- **North ARFF station**—ARFF Station 54 is located at 19006 Aldine Westfield between Runways 8L-26R and 8R-26L, immediately to the west of Taxiway NE. It became operational in 2003 to support the expansion of the airfield to the north with the construction of Runway 8L-26R. The three building facility has a total of approximately 32,500 square feet of space.

- **South ARFF station**—ARFF Station 92 is located at 4301 Will Clayton Parkway to the north of Runway 9-27 and east of Taxiway SF. The two buildings cover approximately 10,600 square feet, and the facility became operational in 1984.

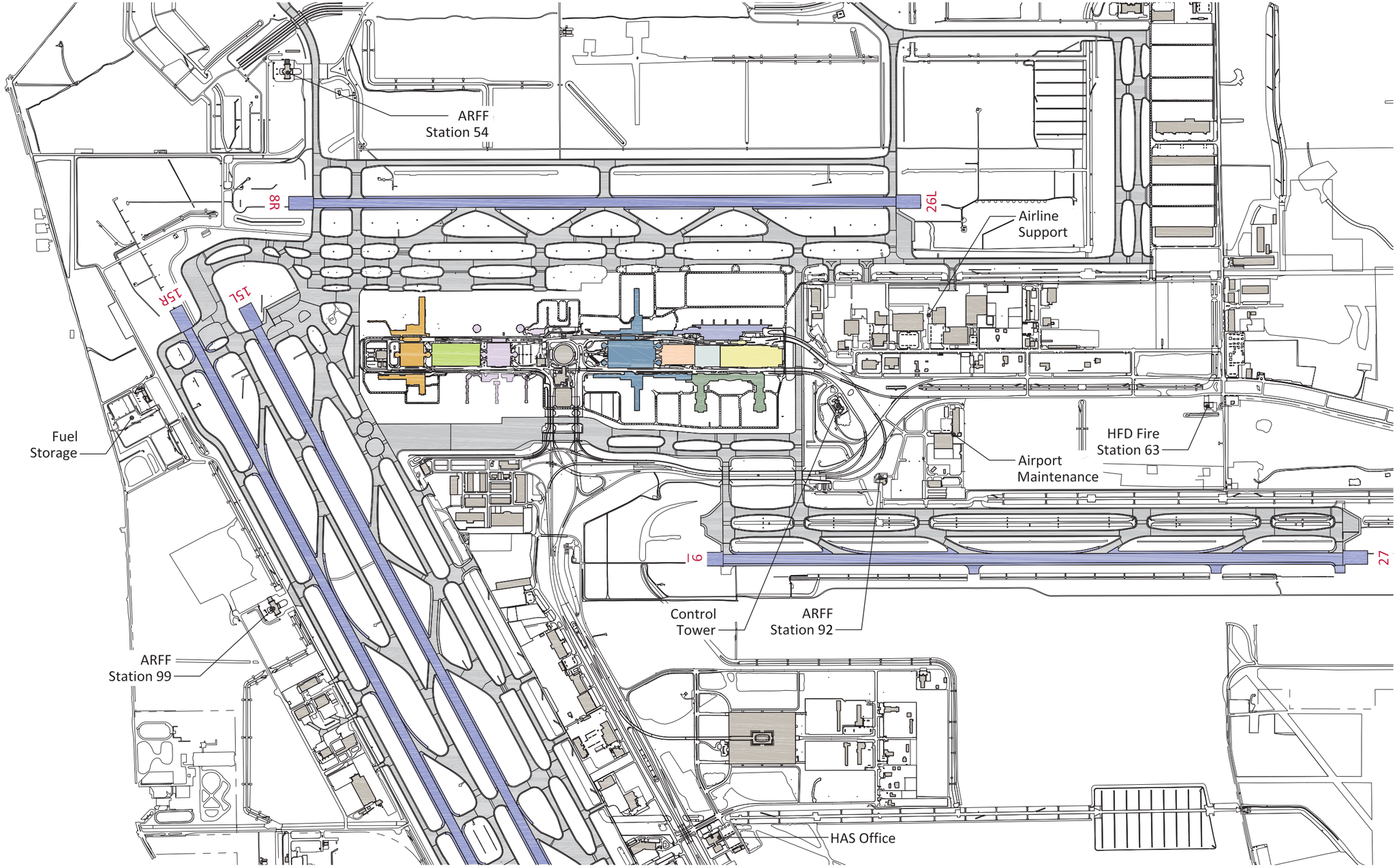
- **West ARFF Station**—ARFF Station 99 is located at 18580 Chanute Rd to the west of Runway 15R-33L, at the intersection of Taxiways WC and WR. The approximately 26,300-square foot facility opened in 2003.

2.7.1.2 Airport and Airfield Maintenance

The Airport's maintenance facilities are located east of the passenger terminal complex and ATCT, immediately north of Runway 9-27. The complex comprises five main buildings. The facilities include an approximate 80,000 square foot building used for the storage and maintenance of airfield and airport maintenance equipment.

2.7.1.3 Authority Administrative Facilities

The primary HAS office location is at the intersection of John F. Kennedy Boulevard and Rankin Road. HAS also occupies office space in Terminals A, B, C, D, and the Central FIS facility. Additional office space on-Airport includes a 7,100 square foot administrative service building near the primary office location at the corner of John F. Kennedy and Rankin. Employee parking is provided in Terminal A, Terminal B, Terminal C, Surface Parking Lot 6, and the Customs and Border Protection Parking garage. Further detail on employee parking can be found in Section 2.4.4.3.



Source: Airport Layout Plan, August 2006
Prepared by: Leigh|Fisher, December 21, 2012

Leigh|Fisher

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N

Figure 2-51
Airport and Airline Support Facilities

2.7.2 Airline Support

Airline support facilities are dedicated to supporting passenger and cargo airline operations. These facilities include aircraft maintenance facilities, airline catering, ground service equipment (GSE) storage and maintenance, and fuel storage and dispensing systems. The general location of these facilities is shown on Figure 2-51.

2.7.2.1 United Airlines Training and Administration

United Airlines maintains several on-site facilities including: a flight attendant training center, a reservations center, and a flight simulator/pilot training center. These buildings are located east of Runway 15L-33R near the corporate aviation facilities, and the area of these buildings totals approximately 160,000 square feet. The flight attendant training center is located north of Will Clayton Parkway east of Terminal D. United Airlines also maintains a facilities office at Wright Road and Colonel Fisher Boulevard.

2.7.2.2 Aircraft Maintenance

Aircraft maintenance facilities are primarily located to the east of the passenger terminal complex, between Runway 9-27 and 8R-26L and north of Will Clayton Parkway. Ground support equipment storage and maintenance is located within airlines' hangars along with the airlines' overall maintenance facilities. United Airlines operates several hangars each with associated apron areas. Aircraft maintenance facilities at the Airport total approximately 140,000 square feet.

2.7.2.3 Airline Catering and Flight Kitchen

Three flight kitchens offer airline catering services to the passenger airlines serving the Airport:

- **Gate Gourmet Catering Services** leases a 3-acre site, housing a 32,000-square-foot facility in the area east of the passenger terminal complex. Catering vehicles access the facility via Wright Road, and ingress and egress the terminal area via a vehicle service road that crosses Taxiway SF at the Terminal D apron.

- **Chelsea Flight Kitchen**, formerly Continental Airlines' flight catering unit, operates two facilities at the Airport. The main flight kitchen comprises a 130,000 square foot facility on a 10-acre site. Catering vehicles access the facility via Wright Road, and ingress and egress the terminal area via airfield roads. Chelsea Flight Kitchen also operates a dry good warehouse located immediately south of their main facility, across Wright Road. The facility encompasses approximately 60,000 square feet of space.

- **LSG SKY Chefs** leases 2-acre site and operates a 34,000 square foot flight kitchen. Catering vehicles access the facility via Colonel Fisher Boulevard, and ingress and egress the terminal area via a vehicle service road that crosses Taxiway SF at the Terminal D apron.

2.7.2.4 Fuel Storage and Dispensing System

The Airport's primary air carrier fuel farm is located approximately 1,000 feet southwest of the end of Runway 15R. Jet-A fuel is delivered to the fuel farm via three pipelines. The active fuel providers include Exxon, Teppco, and Shell. In addition to these pipeline companies, Parl Petroleum has an inactive pipeline into the fuel farm. All inbound fuel flows through a filtration system and is routed to ten individual storage tanks. There are six 1,838,000-gallon tanks and four 525,000-gallon tanks, with a total capacity of approximately 13 million gallons. The fuel farm is only used for short-term fuel storage, given that it is supplied directly from a local refinery. In the event of a pipeline shutdown, the tanks can be supplied from

standard tanker trunks. The net reserve at the fuel farm typically ranges from 5 to 8 days, with the existing reserve estimated to be 6.6 days.

A hydrant system, which transports jet fuel directly from the fuel farm to individual gate hydrant locations on the passenger terminal ramp serves a majority of the Airport's passenger terminal parking positions. This system includes 16 hydrant pumps rated at 100 gallons per minute and 4 hydrant pumps rated at 600 gallons per minute.

in addition to the fuel farm supporting the passenger terminal, there are other aviation fuel facilities located at Landmark Aviation, Atlantic Aviation, and the United Airlines maintenance facilities.

2.8 ENVIRONMENTAL OVERVIEW

In considering future improvements to the Airport, it is important to understand the environment in which it is located. Existing environmental conditions are presented in this section to facilitate comparisons with future projections.

2.8.1 Water Resources

This section describes the surface waters and groundwater in and around the Airport. Water quality data are assessed to identify potential sources of pollution, severity of pollution, and limits on resource use.

2.8.1.1 Groundwater

The Airport is in the Coastal Lowlands Aquifer system, which extends along the Gulf of Mexico from Florida to Mexico and provides water to 51 counties in Texas. The two main aquifers in the Houston-Galveston area are the Chicot and the Evangeline aquifers, which are deep formations that provide very high quality water for municipal and industrial use. In 2011, 14 percent of Houston's drinking water came from very deep wells (greater than 750 feet) in these two aquifers. Drinking water for the Airport area is provided from two surface water sources: the San Jacinto and Trinity Rivers.

2.8.1.2 Surface Waters

The Airport is in the San Jacinto River basin. There is no perennial stream, river, or surface water protection area near the Airport, but Lake Houston, 10 miles to the east, is a water supply reservoir for Houston. The Airport has an extensive drainage system of open excavated channels and underground drainage pipes. Runoff from this drainage system flows into Cypress Creek, Garners Bayou, and Greens Bayou. Cypress Creek is north of the airport and flows eastward into Spring Creek, which flows into the San Jacinto River at Lake Houston. Garners Bayou is in the southeast part of the Airport property and flows into Greens Bayou, which flows southeast into Buffalo Bayou.

2.8.1.3 Water Quality

Segments of Cypress Creek, Spring Creek, Lake Houston, Greens Bayou, and Garners Bayou are listed in a report prepared by the Texas Commission on Environmental Quality (TCEQ) under Section 303(d) of the Clean Water Act of 1972 as impaired streams. The airport is within five miles upstream of Segment 1002 of Lake Houston, Segment 1008 of Spring Creek, Segment 1009 of Cypress Creek, Segment 1016 of Greens Bayou above tidal, Segment 1016A of Garners Bayou, and Segment 1016D of an unnamed tributary of Greens Bayou, which are all listed as impaired by excessive counts of fecal coliform bacteria. High bacterial counts signify contamination with animal waste or untreated sewage and indicate the potential presence of waterborne disease pathogens.

Total maximum daily loads have been calculated by the TCEQ and discharge plans have been approved for Segments 1008, 1009, 1016, 1016A, and 1016D by the U.S. Environmental Protection Agency (EPA). Segment 1002 (Lake Houston) does not have an approved discharge plan.

Figure 2-52 shows the locations of stations near the Airport where the TCEQ has monitored water quality. Stations 11371, 16589, 11213, and 16676 are all within five miles downstream of the Airport. Water quality data for these stations during 2012 is shown in Table 2-23. The water quality parameters that were monitored at these stations include:

- Dissolved oxygen—fish and most aquatic fauna depend on sufficient oxygen dissolved in the water column to survive. Dissolved oxygen levels above 5 milligrams per liter (mg/l) are optimal, but many Houston stream species can survive at 2 mg/l. Dissolved oxygen levels are lowered by high water temperature and the decomposition of suspended organic matter; oxygen levels are raised by plants such as algae and diatoms.

- pH—is a measure of acidity or alkalinity. A pH of 7 is neutral (neither acidic nor alkaline). The pH affects the viability of aquatic life, and most aquatic organisms require an environment in which the pH is between 6.5 and 8.5 to survive.

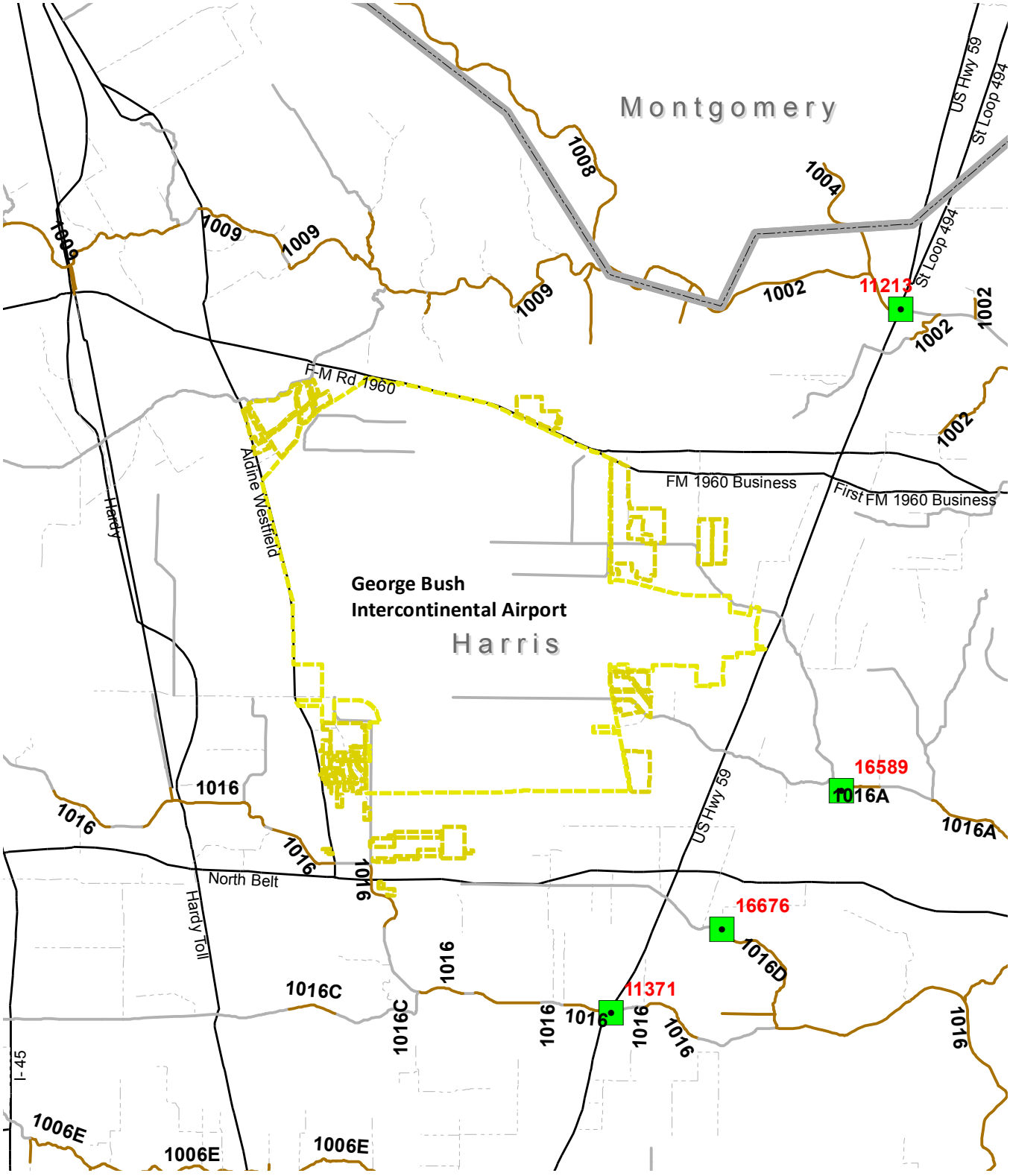
- Water temperature—the range of water temperature is critical for the survival of fish and other aquatic fauna. Houston has warm-water streams with species that have adapted to relatively warm temperatures, but temperatures exceeding 32 degrees centigrade are lethal to many species.

- Nitrogen (as nitrate and as ammonia)—nitrogen is a plant nutrient that encourages aquatic plant growth. High levels of nitrate or ammonia in the water stimulate algae blooms that are nuisances in streams and lakes. Although algae blooms increase dissolved oxygen while the plants are alive, when they die they fall to the bottom and decompose, causing dissolved oxygen levels to drop.

- Phosphorus—phosphorus is a plant nutrient that encourages plant growth and causes algae blooms.

- Fecal coliform bacteria—this bacteria normally lives in the intestines of mammals. High counts of these bacteria signify contamination with animal waste or untreated sewage. If coliform bacteria are present, then waterborne disease pathogens such as cholera and salmonella may also be present.

As shown in Table 2-23, the average dissolved oxygen at Stations 11371, 16589, and 11213 are at or above the optimal level of 5 mg/l, while the average level at Station 16676 is less than optimal but acceptable to many species. The pH readings and water temperature ranges are all within normal limits for aquatic life. Nitrate nitrogen is relatively high at Station 11371 and low at the other two stations with data; ammonia nitrogen is low at all stations. Phosphorus is relatively high at Stations 11371 and 16589 and low at Station 16676. Overall, the TCEQ rates the water quality of Greens Bayou, Garners Bayou and Lake Houston as “of concern,” while the unnamed tributary of Greens Bayou has “poor” water quality.



Source: Texas Commission on Environmental Quality, November 18, 2010
Prepared by: Quadrant Consultants Inc, December 06, 2012

Leigh|Fisher

LEGEND
- Impaired stream
- Stream
- Ditch
- Clean rivers monitoring site
- Road
- IAH boundary
- County boundary

0 4000′ 8000′

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Figure 2-52
Impaired Streams and Water Quality Monitoring Sites

Table 2-23
WATER QUALITY DATA FOR STREAMS NEAR IAH (2012)

Parameter		Station 11371	Station 16676	Station 16589	Station 11213
Water body		Greens Bayou	Unnamed tributary of Greens Bayou	Garners Bayou	Lake Houston
Segment ID		1016	1016D	1016A	1002
Dissolved O_2 (mg/l)	Average	7.1	3.6	6.25	7.7
	Range	6.9-7.3	3.5-3.7	5.6-6.9	3.6-8.7
pH	Average	7.9	7.6	7.7	7.5
	Range	7.8-7.9	7.5-7.6	7.6-7.8	7.2-7.7
Water temperature (°C)	Average	22	20	21	22
	Range	20-24	17-22	19-23	16-31
Total nitrate nitrogen (mg/l)	Average	8.8	0.3	5.2	N/A
	Range	7.1-10.4	0.2-0.4	2.0-8.4	N/A
Total ammonia nitrogen (mg/l)	Average	0.2	0.1	0.1	0.1
	Range	0.1-0.2	0.1-0.1	0.1-0.1	N/A
Total phosphorus (mg/l)	Average	1.8	0.5	2.3	0.4
	Range	1.3-2.2	0.4-0.6	1.9-2.7	N/A
Fecal coliform bacteria (count)	Geometric mean	1,700	520	1,100	10
TCEQ overall assessment		Of concern	Poor	Of concern	Of concern

Prepared by: Quadrant Consultants, December 2012.

Source: Texas Commission on Environmental Quality, 2012.

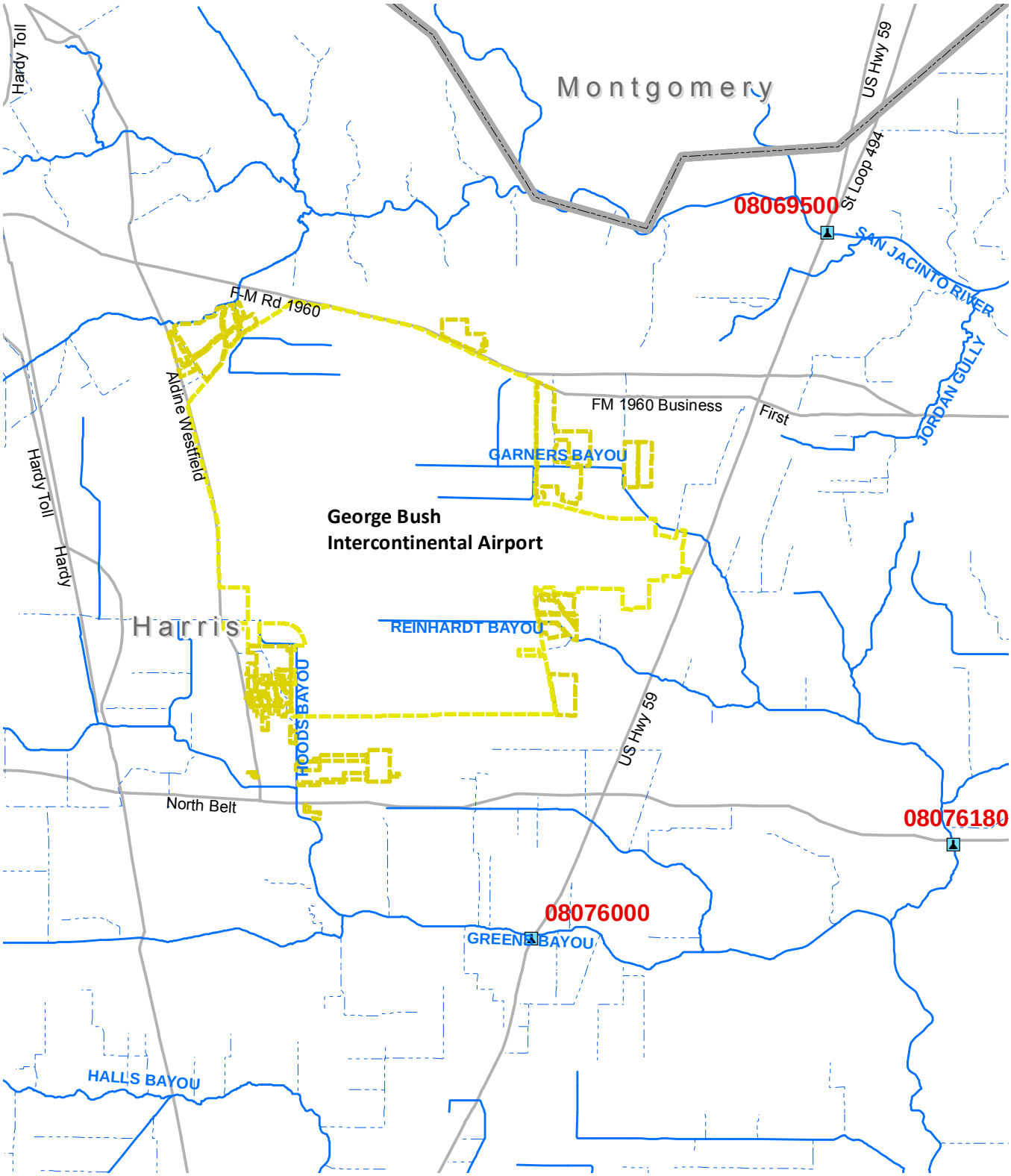
2.8.2 Floodplains

The following sections provide an overview of the watershed characteristics, peak stream flow, and floodplain resources in the vicinity of the Airport.

2.8.2.1 Watershed Characteristics

Most of Houston is in the San Jacinto Watershed. The watershed is about 80 miles long and 60 miles wide, oriented roughly north to south and encompasses about 5,600 square miles. The San Jacinto River, unlike most rivers in east Texas, has a comparatively narrow main channel in its upper reaches, flat slopes, and low-angled elevation gradients from headwaters to mouth. The river normally follows a meandering course and has a forested floodplain. In wet years, floods overflow the floodplains for long periods. The floodwaters rise and fall slowly and have relatively low velocity. There are numerous water-filled oxbow lakes, levee sloughs, and natural depressions in low-lying areas. The confluence of the East and West Forks of the San Jacinto River is at the north end of Lake Houston.

The IAH airport area, according to the Harris County Flood Control District, is in the Greens Bayou and Cypress/Spring Creek watersheds (Figure 2-53). Garners Bayou, Reinhardt Bayou, Hood Bayou, and Turkey Creek are on the airport property. The northwest corner of the airport drains to the north to Turkey Creek, which flows into Cypress Creek, a tributary of the West Fork of the San Jacinto River. Most of the airport property drains to the southeast via Garners Bayou and Reinhardt Bayou, which flow into Greens Bayou.



Source: United States Geological Survey, December 29, 2011
Prepared by: Quadrant Consultants Inc, December 06, 2012

Leigh|Fisher

LEGEND
- USGS Guage Site
- Stream
- Ditch
- Road
- IAH boundary
- County boundary

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N

Figure 2-53
Stream Network and USGS Gauge Sites

Greens Bayou eventually flows into Buffalo Bayou, which in turn flows into the San Jacinto River and Galveston Bay.

2.8.2.2 Peak Stream Flow

Peak floods in the San Jacinto River generally occur in spring or fall, after the heavy rainfall and hurricanes. The main source of flood flow information is stream flow data collected at United States Geological Survey stream gauges downstream of the airport. Gauge No. 08069500 is at the West Fork of the San Jacinto River near Humble; Gauge No. 08076180 is at Garners Bayou near Humble, and Gauge No. 08076000 is at Greens Bayou near Houston (Figure 2-53).

Table 2-24 shows peak stream flow data at these gauge stations from 1992 to 2011, including the peak day and flow rate. The time range of peak stream flow data for 08069500 is from May 31, 1929 to July 30, 1954; therefore, this information is not included in Table 2-24.

Table 2-24
PEAK STREAM FLOW GAUGE RECORDS

	Gauge 08076180 (cfs)		Gauge 08076000 (cfs)	
Year	Peak Day	Flow	Peak Day	Flow
1992	March 4	9,980	March 4	9,560
1993	June 21	3,900	March 1	5,620
1994	November 16	2,370	May 16	3,150
1995	October 18	3,940	October 18	7,150
1996	September 27	1,610	December 18	4,420
1997	May 24	5,970	May 24	13,100
1998	September 11	2,810	September 11	11,800
1999	November 13	2,310	October 18	4,420
2000	May 20	4,250	May 20	6,610
2001	June 9	12,400	June 9	26,500
2002	December 12	3,110	April 8	5,990
2003	October 29	7,670	October 29	14,300
2004	November 18	4,570	November 17	12,100
2005	May 30	3,170	November 22	7,580
2006	December 14	1,940	June 19	10,200
2007	October 16	5,050	October 16	9,500
2008	September 14	5,660	September 13	10,500
2009	October 15	5,550	April 18	7,390
2010	July 2	4,330	July 2	9,460
2011	December 29	1,200	December 29	2,800

Source: Texas Commission on Environmental Quality, 2012.

Peak stream flow is related to the 100-year floodplain level. The 100-year floodplain is the area inundated by the largest flood with one percent chance of occurring in any year. In this area, peak stream flow of 15,000 cubic feet per second (cfs) has a 100-year recurrence interval and therefore defines the 100-year flood. As shown in Table 2-24, both sites had their highest peak stream flow in 2001, during Tropical Storm

Allison in June (highlighted in Table 2-24). Gauge 08076000 reached 26,500 cfs, which exceeds the 100-year recurrence interval, and Gauge 08076180 reached 12, 400 cfs, which is approaching the 100-year recurrence interval.

2.8.2.3 Floodplains

The Federal Emergency Management Agency (FEMA) publishes Flood Insurance Rate Maps in participating cities and counties of the United States showing the extent of the 100-year floodplain, as well as the floodway, which is the channel of a stream. Floodplains and floodways should be kept free of encroachment so that the 100-year flood can be carried without substantial increase in flood height.

There are three zones in the 100-year floodplain:

- Floodway—the bed and banks of stream channels
- Zone A—the 100-year flood zone, no base flood elevations determined
- Zone AE—the 100-year flood zone, base flood elevations determined

Floodplain maps were consulted to determine the extent of the floodplain in and around the Airport. According to the FEMA maps, the Airport includes parts of the 100-year floodplain of four streams. There are 556 acres of 100-year floodplain within the airport boundary, six percent of the total airport area. Figure 2-54 shows the extent of the 100-year floodplain area and flood-level water surface elevations on airport property.

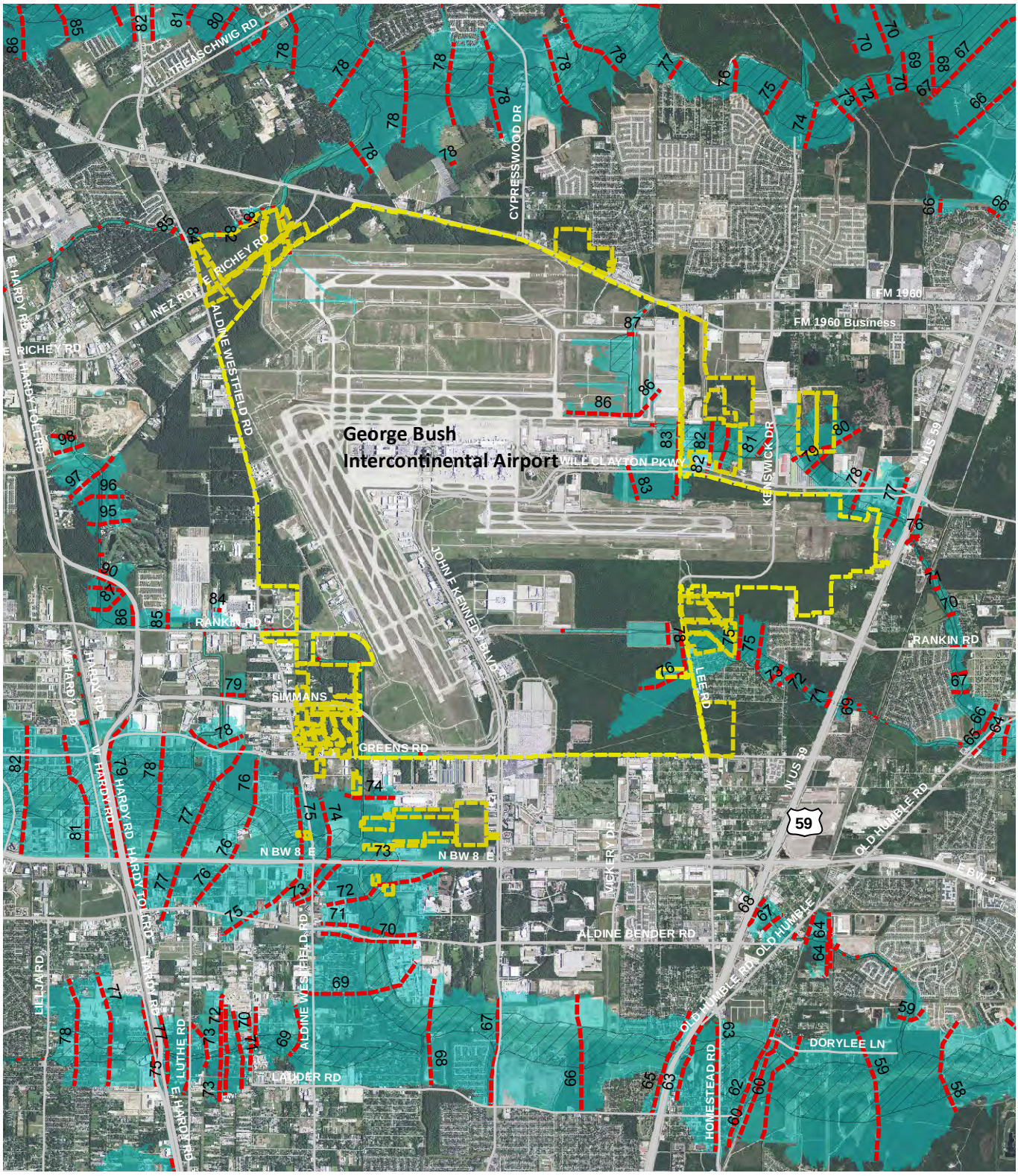
A drainage ditch in the southwest part of the Airport is a tributary of Greens Bayou and is a floodway. The floodway is limited to the ditch channel. The southeast part of the Airport property includes part of floodway and the 100-year floodplain of the headwaters of Reinhardt Bayou. Most of the floodway of Reinhardt Bayou on airport property is in the channel. The northeast corner of the Airport property includes the floodway and the 100-year floodplain of Garners Bayou.

2.8.3 Wetlands

Wetlands are defined as lowlands that are often inundated or saturated with water, typically grow plant species adapted to growth in standing water or on saturated soil, and have soils with characteristics of long saturation. Wetlands are often excellent wildlife habitats and provide nesting and wintering areas for many migratory bird species. Some wetlands can also filter sediments, nutrients and chemical pollutants and thus improve water quality. Some wetlands can also provide natural flood control by detaining or slowing flood waters, which reduces flood peaks and decreases the destructiveness of floods.

Wetlands were identified and delineated in 2010 in the northeast and southeast Airport property. Figure 2-55 shows the identified wetlands on airport property. In all, 32 wetlands totaling 87 acres were identified and delineated. Herbaceous wetlands account for 70 acres and forested wetlands comprise 17 acres. These wetlands appear to be isolated from waters of the United States, and therefore do not appear to be under federal jurisdiction under Section 404 of the Clean Water Act of 1972.

Figure 2-55 also indicates locations of possible wetlands on the remainder of the Airport property. Potential wetlands were identified on aerial photographs based on their spectral features, also taking into consideration the National Wetland Inventory maps prepared by the U.S. Fish & Wildlife Service in 1984 (which are also based on analysis of aerial photographs) and Natural Resources Conservation Service soil survey maps prepared in 1976. Potential wetlands in Figure2-55 have not been verified by field investigation and should not be considered wetlands until such verification can take place.



Source: Federal Emergency Management Agency, 2007
Prepared by: Quadrant Consultants Inc, December 06, 2012

Leigh | Fisher

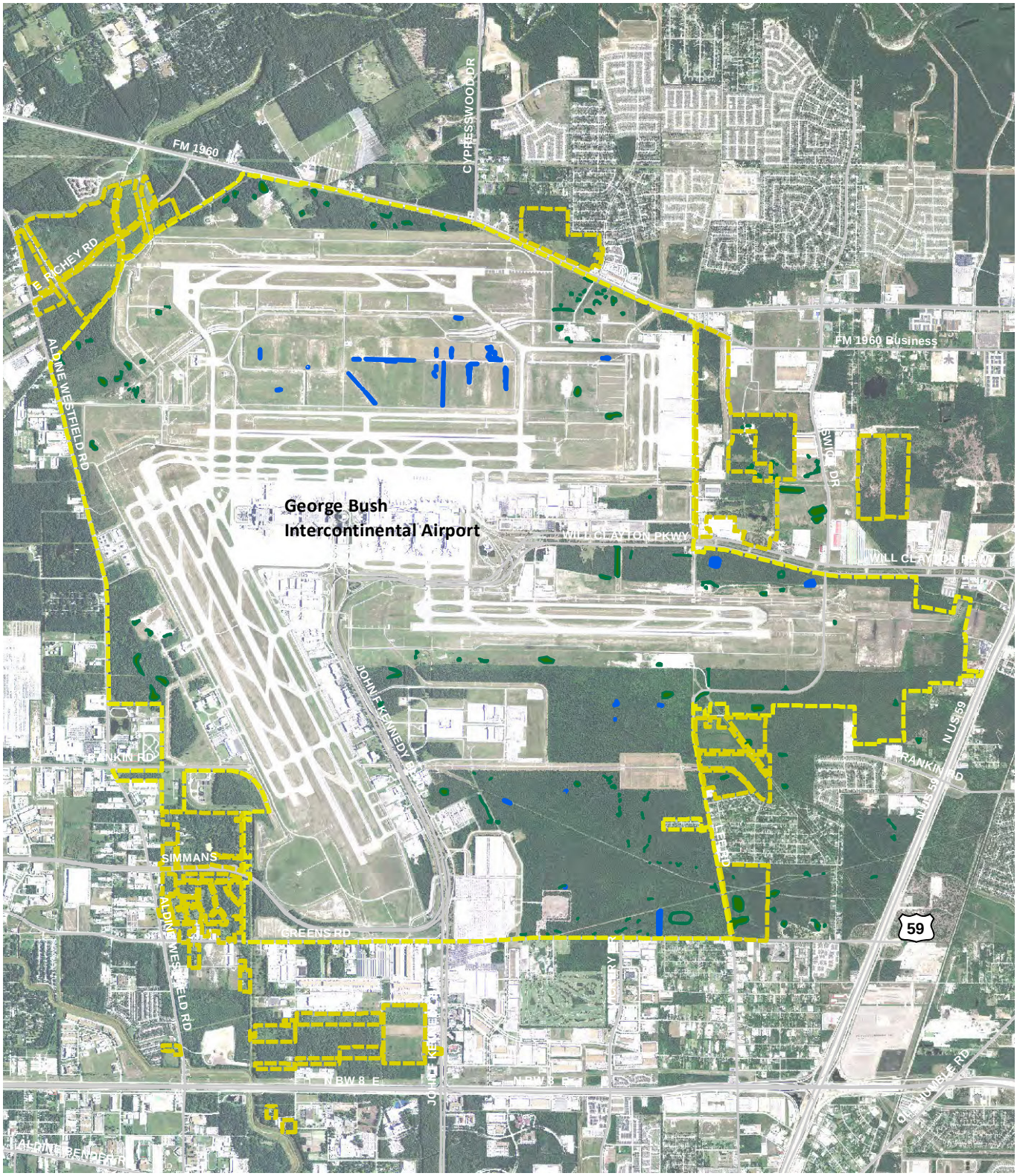
LEGEND

- 100-year flood zone
- Floodway
- Base flood elevation
- Road
- IAH boundary

0 3000′ 6000′

N

Figure 2-54
Floodplains



Source: Quadrant Consultants Inc, 2010, and U.S. Fish & Wildlife Service, 1984
Prepared by: Quadrant Consultants Inc, December 06, 2012

Leigh | Fisher

LEGEND
- Delineated wetland
- Potential wetland
- Road
- IAH boundary

0 2000′ 4000′

N

Figure 2-55
Wetlands

2.8.4 Air Quality

Many aspects of airport operations generate air pollution emissions. Air quality issues include airport-related emissions, pollutant loads, and regulations governing air quality.

The EPA sets criteria for pollution concentrations for six pollutants:

- Carbon monoxide (CO)—formed by incomplete oxidation of carbon-based fuels;
- Ozone (O_3)—a reactive form of oxygen; it is created in the atmosphere through chemical reactions of volatile organic compounds (VOCs), nitrogen oxides (NO_x) and sunlight;
- Nitrogen oxides (NO_x)—generally emitted from combustion;
- Sulfur oxides (SO_x)—formed by burning sulfur-containing materials;
- Particulate matter (PM)—the ash and incomplete combustion of solid or liquid fuels. PM is regulated in two categories; PM_{10} is particulate matter measuring at least 10 micrometers across, while $PM_{2.5}$ is particulate matter measuring at least 2.5 micrometers across; and
- Lead (Pb)—emitted from use of leaded fuels that are still used by general aviation aircraft but not commercial aircraft or other vehicles on the Airport.

Airport emissions are categorized by source:

- Aircraft operations—emissions from aircraft arrivals, departures, and training operations;
- Gate services—emissions generated by auxiliary power units at the gate for parked aircraft;
- Ground support equipment—emissions from equipment that support aircraft on the ground;
- Parking facility and terminal curbsides—emissions from motor vehicles in airport parking facilities and curbside areas;
- On-airport roadway traffic—emissions from motor vehicles on the airport property, including commercial vehicles, passenger cars, and taxicabs (excluding emissions while in parking facilities or curbsides);
- Off-airport roadway traffic—emissions outside the airport property from motor vehicles that have been to the Airport, including commercial vehicles, passenger cars, and taxicabs;
- Stationary sources—emissions from on-airport stationary equipment, such as incinerators, boilers, heating and cooling facilities, generators, training fires, and fuel storage facilities; and
- Construction—emissions from construction equipment operating at the Airport.

The Airport is in Harris County, which has been designated severe non-attainment for ozone. New Airport development that could increase emissions must conform to the State Implementation Plan (SIP) for VOCs and NO_x, the main precursors of ozone generation in the Houston region. The EPA requires that any industrial facility (including airports) that produces more than 25 tons of VOC and NO_x emissions per year and wants to increase its emissions must find compensatory reductions to offset the increases. Therefore, any future development that would result in the increase of VOC or NO_x emissions is subject to a conformity review to ensure that sufficient offsets have been applied.

The City of Houston has conducted periodic emissions inventories as part of its conformity reviews, to determine the quantities of pollutants that are emitted, and to ensure that planned reductions and offsets are sufficient to maintain conformity with the SIP. Emissions are estimated from the emissions rates of current airport ground equipment and the current number of annual aircraft operations. Future emissions are projected from changes in Airport ground equipment and the expected growth of aircraft operations. Table 2-25 shows the Airport emissions for 2005 and 2011, and projected emissions for 2018. As shown in Table 2-25, the Airport emissions of VOCs and NO_x, respectively, were 1,134 and 4,856 tons in 2005 and 1,190 and 4,937 tons in 2011. In 2018, the Airport emissions of VOCs and NO_x are projected to be 1,176 and 5,051 tons, respectively. Therefore, emissions offsets or reductions will likely be necessary at the Airport for future conformity to the SIP.

2.8.5 Land Use

This section describes land use around the airport property. It highlights compatible and incompatible land uses as well as the land use controls around the airport.

2.8.5.1 Existing Land Use

The Airport is bordered by FM 1960 to the north, Aldine-Westfield Road to the west, Greens Road to the south and Lee Road to the east. The current land use map (Figure 2-56), prepared by Houston-Galveston Area Council, shows that the land uses around the Airport include:

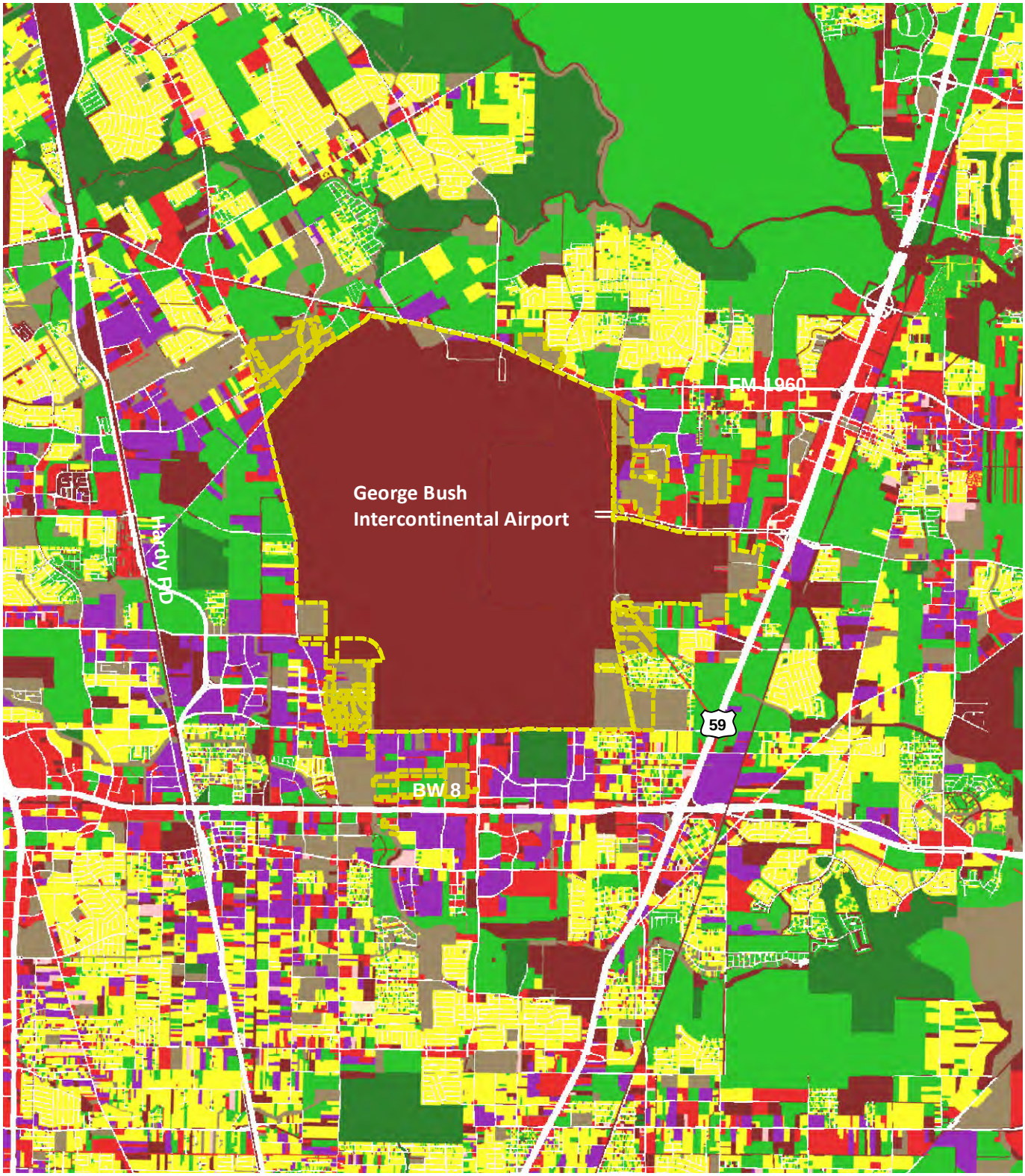
- Residential (single-family and multi-family);
- Commercial (retail, office space);
- Institutional (government/medical/ education);
- Industrial;
- Transportation and utilities;
- Parks and open space; and
- Vacant.

As shown in Figure 2-56, most of the residential area is outside an area enclosed by FM 1960, the Hardy Toll Road, the Sam Houston Parkway, and US 59. Inside this area are commercial, industrial, institutional, and vacant land uses. Parks and open spaces are along Cypress Creek north of FM 1960.

Table 2-26 tabulates the total area and proportion in each land use category within five miles of the Airport. The table shows that vacant land covers most of the total area. The most common developed land use is residential, and the remaining land uses include commercial, industrial, institutional, airport, park, and others.

2.8.5.2 Incompatible Land Uses

Federal guidelines require that land near airports receiving federal funding should have compatible land uses. The sensitivity of people to aircraft noise is the primary determinant of compatibility (tall structures are another category). The airport noise contour for 65 DNL (the day-night integrated sound level, in A-weighted decibels) is used to determine compatibility zones. Figure 2-57 shows the incompatible and compatible land use surrounding the Airport.



Source: Houston-Galveston Area Council, 2010
Prepared by: Quadrant Consultants Inc, December 06, 2012

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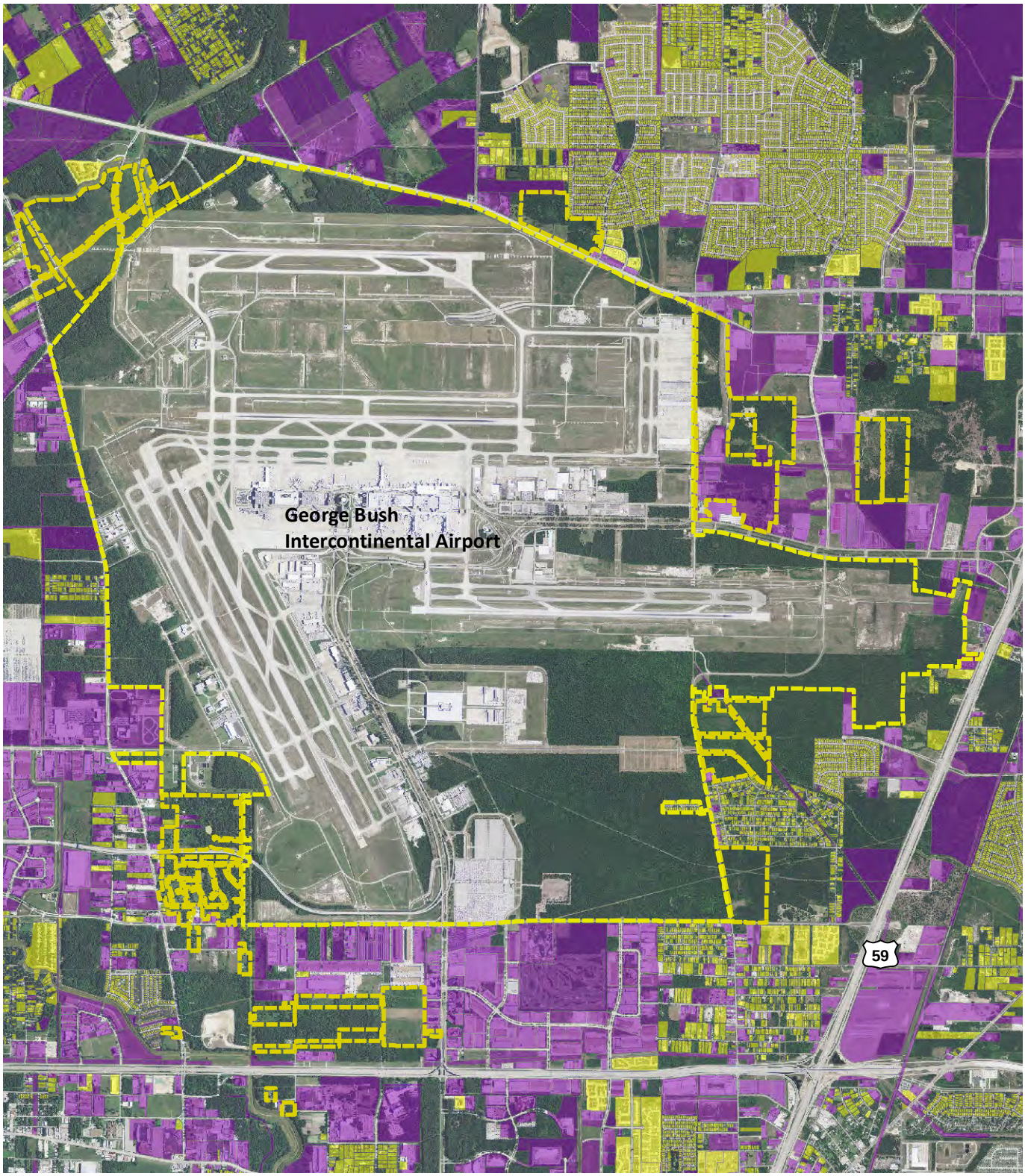
LEGEND

- Commercial
- Industrial
- Residential
- Gov./medical/edu.
- Other
- Parks/open spaces
- Vacant development
- Water
- Underdevelopment
- Unknown
- IAH boundary

0 2000′ 4000′

N

Figure 2-56
Land Use



Source: City of Houston, 2010
Prepared by: Quadrant Consultants Inc, December 06, 2012

Leigh | Fisher

LEGEND

- Incompatible land use
- Compatible land use
- Open space
- IAH boundary

0 2100′ 4200′

N

Figure 2-57

Compatible and Incompatible Land Use

Table 2-25
AIRPORT EMISSIONS INVENTORY AND PROJECTION (TONS/YEAR)

Emission Source	CO	VOC	NO_x	SO_x	PM_{10}	$PM_{2.5}$
2005						
Aircraft operations	5,326	376	2,088	244	33	33
Ground support equipment	1,091	43	166	16	7	7
Auxiliary power units	31	2	20	3	3	3
On-Airport parking	276	41	48	1	1	1
On-Airport roadway	1,320	104	390	11	11	8
Off-Airport roadway	7,315	551	2,102	57	57	42
Stationary sources	21	13	12	1	6	6
Training fires	<1	<1	<1	<1	<1	<1
Construction	11	3	30	4	21	21
Total emissions	12,673	1,134	4,856	337	139	120
2011						
Aircraft operations	3,366	553	2,892	314	43	43
Ground support equipment	720	28	113	2	5	5
Auxiliary power units	80	7	68	11	10	10
On-Airport parking	240	30	34	0	1	0
On-Airport roadway	1,133	85	263	2	8	5
Off-Airport roadway	6,296	455	1,441	9	42	25
Stationary sources	23	15	13	1	7	7
Training fires	<1	<1	<1	<1	<1	<1
Construction	118	16	114	0	12	5
Total emissions	11,976	1,190	4,937	340	128	101
2018						
Aircraft operations	3,134	576	3,751	256	48	48
Ground support Equipment	283	13	46	2	3	3
Auxiliary power units	115	11	137	20	18	18
On-Airport parking	275	28	21	0	1	0
On-Airport roadway	1,063	69	155	2	8	4
Off-Airport roadway	6,955	430	851	13	45	22
Stationary sources	28	18	15	1	8	8
Training fires	<1	<1	<1	<1	<1	<1
Construction	178	32	75	1	14	7
Total emissions	12,031	1,176	5,051	396	144	110

Note: Ground support equipment emissions exclude United Airlines equipment.

Source: Draft Report Houston Airport System Emission Study, LeighFisher (formerly Jacobs Consultancy), January 2009.

Table 2-26
OFF-AIRPORT LAND USES WITHIN FIVE MILES OF IAH

Existing Land Use	Area (acres)	Percent of Total
Residential	18,200	6%
Commercial	13,200	5%
Public and institutional	33,100	12%
Industrial	1,000	<1%
Transportation	9,400	3%
Parks and open space	9,900	3%
Vacant	191,200	67%
Other	11,300	4%
Total	287,300	100%

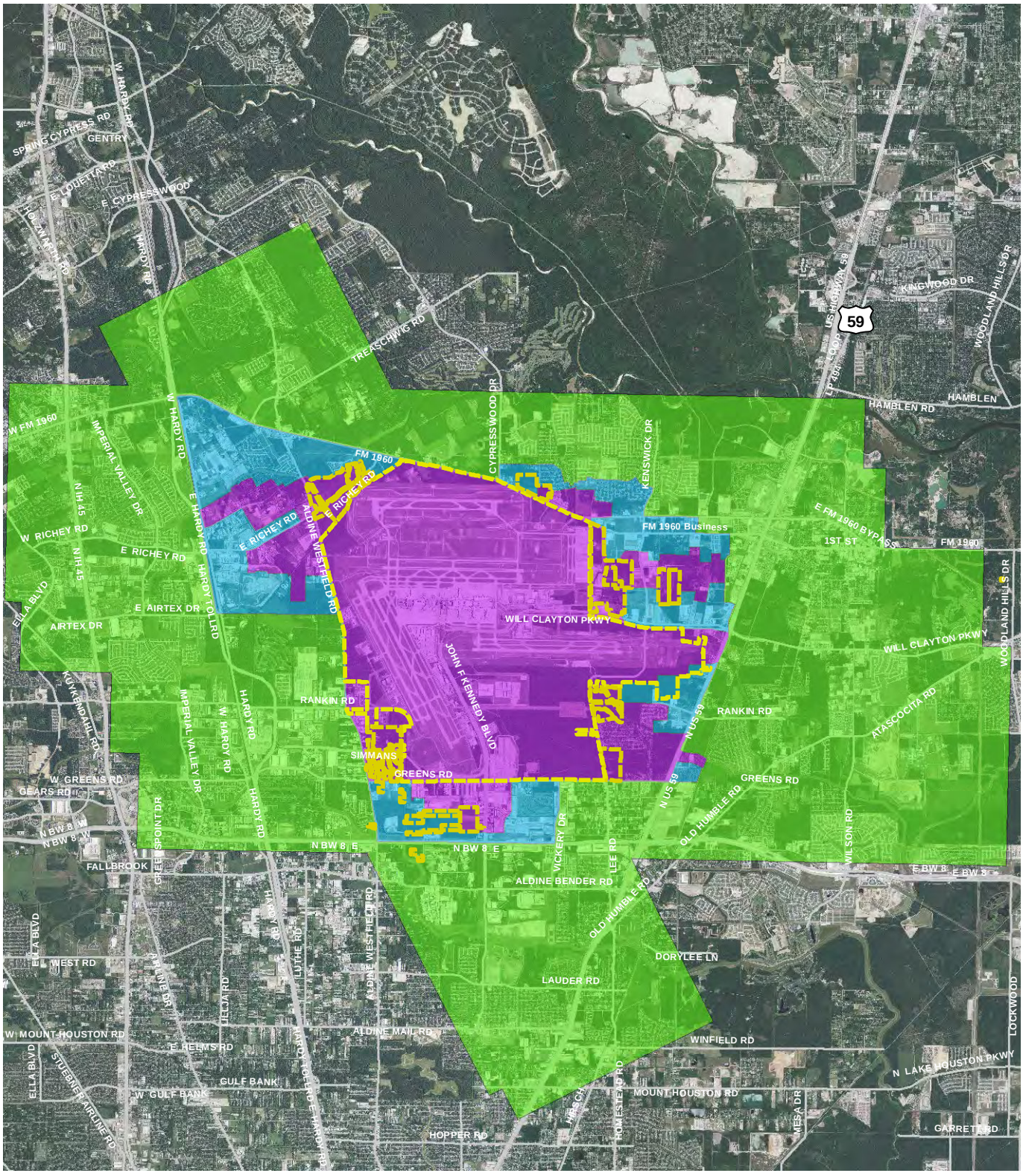
Source: Harris County Appraisal District, 2012.

As residential development occurs near the Airport, it could jeopardize future plans for improvements. New residential areas that are outside the 65 DNL could become inside the 65 DNL associated with new or extended runways. Furthermore, land adjacent to the Airport that could be acquired for terminals, roadways, parking, cargo operations, or other support functions could be converted to residential use before acquisition.

2.8.5.3 Land Use Controls

Both the City of Houston and the City of Humble, which have jurisdiction in the area within five miles of the Airport, have land use controls to prevent incompatible land uses near the Airport. The City of Humble has a zoning ordinance and a comprehensive plan that expressly prohibits incompatible land uses within the 65 DNL contour of the Airport. The City of Houston has issued an ordinance that establishes land use controls in three tiers around the Airport, as shown in Figure 2-58. The restrictions in each tier are as follows:

- Tier One—Critical Airport Noise Zone: Land outside of the airport but within the critical 65 DNL noise contour. New residential subdivisions are not permitted, and new infill residences may be built only if they include noise abatement measures. Existing residences may be renovated or enlarged only if they include noise abatement measures.
- Tier Two—Critical Airport Management Zone: Land outside Tier One and outside the 65 DNL noise contour but within the 60 DNL noise contour. New residential subdivisions are permitted, but only if homes include noise abatement measures. Existing homes may expand without noise abatement measure, but new or rebuilt homes must include noise abatement measures.
- Tier Three—Airport Influence Area: Lands outside Tier Two and the Tier Three boundary. New residential subdivisions are allowed upon City of Houston approval.



Source: City of Houston, 2011
Prepared by: Quadrant Consultants Inc, December 06, 2012

Leigh | Fisher

LEGEND
- Tier 1
- Tier 2
- Tier 3
- Road
- IAH boundary

0 5000′ 10000′

N

Figure 2-58
City of Houston Land Use Controls

2.8.6 Endangered Species

Endangered species are plants and animal species that are in imminent danger of extinction. Threatened species are likely to become endangered, and candidate species are not yet listed but are recommended to be listed. The U.S. Fish & Wildlife Service and the Texas Parks & Wildlife Department maintain lists of endangered and threatened species, and species and habitats of concern. Table 2-27 is a list of endangered species for which there are recorded observations in Harris County. Notably, no endangered, threatened or candidate species is known to be present in the Airport property or within one mile of the Airport.

The Natural Diversity Database has historical records of endangered and threatened species of plants and species of concern. The database indicates that Texas prairie dawn (*Hymenoxys texana*), an endangered plant on the federal list, was found about 30 miles south of airport property in Harris County in 1999 (EOID Nos. 26 and 3565). Texas prairie dawn is found only in poorly drained depressions or in nearly barren areas on slightly saline soils. The U.S. Fish & Wildlife Service has indicated that Texas prairie dawn is not likely to occur on airport property.

Table 2-27
ENDANGERED SPECIES IN HARRIS COUNTY

Common Name	Scientific Name	State Status	Federal Status	Habitat Description	Habitat Present?
Amphibians					
Houston toad	*Bufo houstonensis*	E	E†	Sandy soil, breeds in ephemeral pools	No
Birds					
American peregrine falcon	*Falco peregrinus anatum*	T	DM†	Potential migrant, nests in west Texas	No
Arctic peregrine falcon	*Falco peregrinus tundrius*	SOC	DM†	Potential migrant	No
Bald eagle	*Haliaeetus leucocephalus*	T	DM†	Near water areas, in tall trees	No
Brown pelican	*Pelecanus occidentalis*	T	DM†	Island near coastal areas	No
Black rail	*Laterallus jamaicensis*	SOC		Freshwater marshes and grassy swamps	No
Henslow's sparrow	*Ammodramus henslowii*	SOC		Weedy fields or cut-over areas	No
Mountain plover	*Charadrius montanus*	SOC		High plains or shortgrass prairie	No
Peregrine falcon	*Falco peregrinus*	T	DM†	Potential migrant	No
Red-cockaded woodpecker	*Picoides borealis*	E	E	Nest in 60+ year pine, forages in 30+ pine	No
Snowy plover	Charadrius alexandrinus	SOC		Potential migrant	No
Southeastern snowy plover	*Charadrius alexandrinus tenuirostris*	SOC		Texas Gulf Coast beaches and bayside mud or salt flats	No
White-faced ibis	*Plegadis chihi*	T	*	Freshwater marshes, but some brackish or salt marshes	No
White-tailed hawk	*Buteo albicaudatus*	T	*	Coastal prairies	No
Whooping crane	*Grus americana*	E	E†	Winters in Aransas NWR	No
Wood stork	*Mycteria americana*	T	*	Prairie ponds and flooded pastures	No
Fishes					
American eel	*Anguilla rostrata*	SOC		Coastal waterways below reservoirs to Gulf	No
Creek chubsucker	*Erimyzon oblongus*	T	*	Variety of small rivers and creeks, prefers headwaters	No
Smalltooth sawfish	*Pristis pectinata*	E	E†	Various water depths	No
Mammals					
Louisiana black bear	*Ursus americanus luteolus*	T	T†	Bottomland hardwoods; large, undisturbed forest areas	No
Plains spotted skunk	*Spilogale putorius interrupta*	SOC	†	Wooded, brushy areas and tallgrass prairie	No
Rafinesque's big-eared bat	*Corynorhinus rafinesquii*	T	†	Cavity trees in hardwood forest, concrete culverts, abandoned buildings	Yes
Red wolf		E	E†	Extirpated, brushy, forested areas, coastal prairies	No
Southeastern myotis bat	*Myotis austroriparius*	SOC		Roots in cavity trees	No

Table 2-27
ENDANGERED SPECIES IN HARRIS COUNTY *(continued)*

Reptiles					
Alligator snapping turtle	*Macrochelys temminckii*	T	*	Deep water of rivers and canals	No
Green sea turtle	*Chelonia mydas*	T	T†	Gulf and bay system	No
Gulf salt marsh snake	*Nerodia clarkii*	SOC		Saline flats, coastal bays, and brackish river mouths	No
Kemp's Ridley sea turtle	*Lepidochelys kempii*	E	E†	Gulf and bay system	No
Leatherback sea turtle	*Dermochelys coriacea*	E	E†	Gulf and bay system	No
Loggerhead sea turtle	*Caretta caretta*	T	T†	Gulf and bay system	No
Smooth green snake	*Liochlorophis vernalis*	T	*	Gulf coastal prairies, prefers dense vegetation	No
Texas horned lizard	*Phrynosoma cornutum*	T	†	Open, semi-arid regions, with bunch grass	No
Timber or canebrake rattlesnake	*Crotalus horridus*	T	*	Swamps and floodplains of hardwood and upland pine	No
Mollusks					
Little spectaclecase	*Villosa lienosa*	SOC		Creeks, rivers, and reservoirs, sandy substrates	No
Louisiana pigtoe	*Pleurobema riddellii*	T		Streams and moderate-size rivers	No
Pistolgrip	*Tritogonia verrucosa*	SOC		Substrate, rock, hard mud, silt, and soft bottoms, often buried deeply	No
Rock pocketbook	*Arcidens confragosus*	SOC		Mud, sand, and gravel substrates of medium to large rivers	No
Sandbank pocketbook	*Lampsilis satura*	T		Small to large rivers with moderate flows	No
Texas pigtoe	*Fusconaia askewi*	T		Rivers with mixed mud, sand, and fine gravel	No
Wabash pigtoe	*Fusconaia flava*	SOC		Creeks to large rivers on mud, sand, and gravel	No
Plants					
Coastal gay-feather	*Liatris bracteata*	SOC		Coastal prairie grasslands	No
Giant sharpstem umbrella-sedge	*Cyperus cephalanthus*	SOC		Deep prairie depressions	No
Houston daisy	*Rayjacksonia aurea*	SOC		Sandy to sandy loam soils on coastal prairies	No
Texas meadow-rue	*Thalictrum texanum*	SOC		Woodland margins on soils with a surface layer of sandy loam	No
Texas prairie dawn	*Hymenoxys texana*	E	E	Poorly drained areas in open grasslands; pimple mounds	No
Texas windmill-grass	*Chloris texensis*	SOC		Sandy to sandy loam soils in in coastal prairie grassland remnants	No
Threeflower broomweed	*Thurovia triflora*	SOC		Light colored silt or fine sand over saline clay on salty prairies and tidal flats	No

Notes: E = endangered; T = threatened; DM = delisted, monitoring; SOC = species of concern, † =listed by the U.S. Fish & Wildlife Service but not known to occur in Harris County; * = listed by the Texas Parks & Wildlife Department but not by the U.S. Fish & Wildlife Service

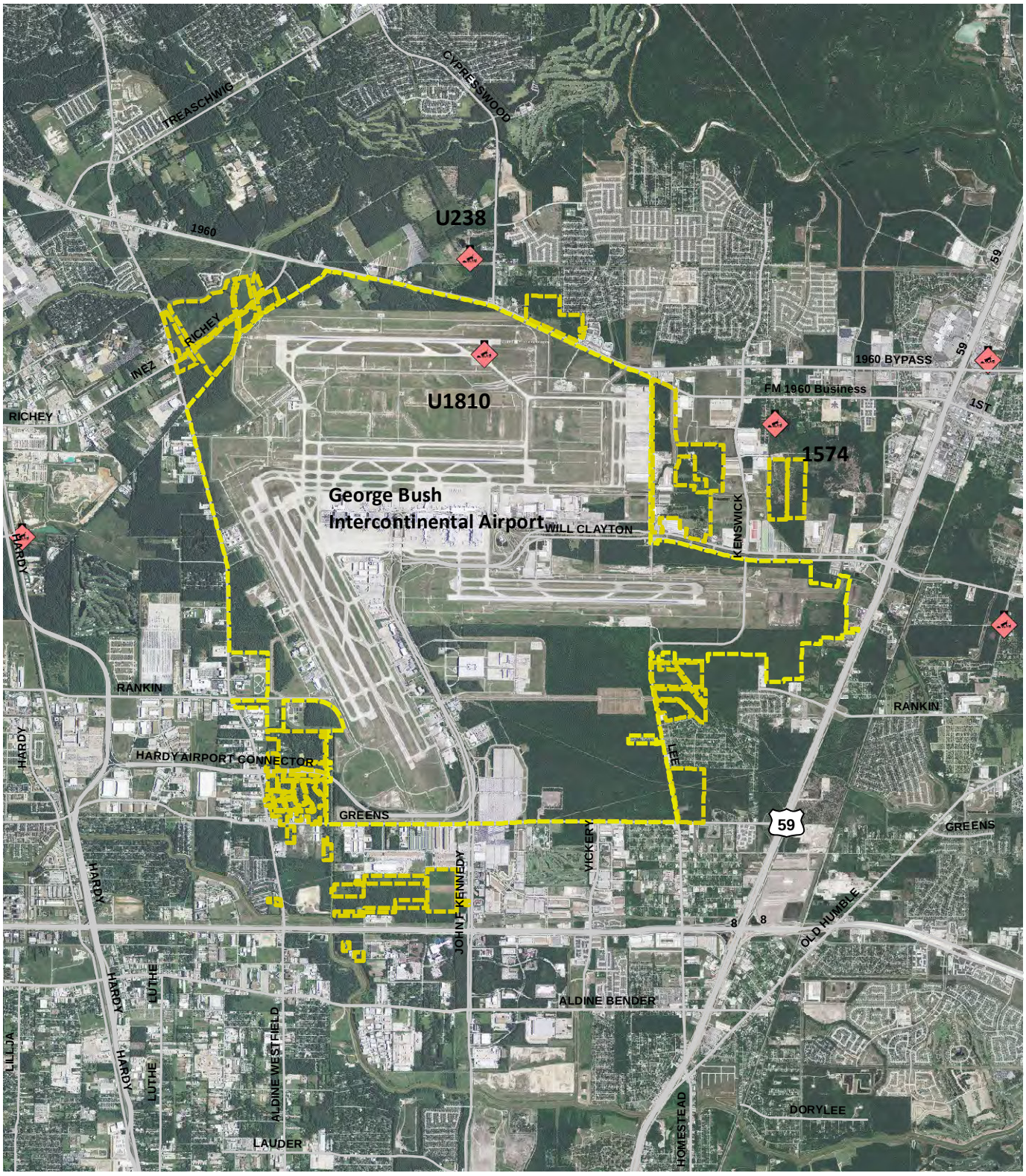
Source: Texas Parks & Wildlife Department, 2011.

2.8.7 Hazardous Materials

Potentially hazardous materials on or near the airport property were identified in searches of environmental databases, government records, and current and previous land use records. Databases maintained by regulatory agencies show no hazardous waste site on the EPA National Priority List or State Priority List, no radioactive waste site, and no corrective action site within one mile of the Airport. Three closed landfill sites are within one mile of the Airport property, according to records maintained by the

Houston-Galveston Area Council were examined. Figure 2-59 shows the locations for these landfills sites. A summary of these three landfill sites follows:

- Harris County Municipal Landfill Number No. 2 (Site ID: U238)—at the corner of FM 1960 and Cypresswood Drive, about one-half mile north of the Airport property. This site was closed in 1974 and is currently vacant land.
- T.S. Roberts Survey (Site ID: U1810)—about one-half mile south of FM 1960. This site closed in 1974 and was completely excavated by HAS in preparation for the construction of Runway 8L-26R. It is on airport property.
- Jack R. Wade, 19318 Banks Road (Site ID: 1574)—about one-half mile east of airport property. This site was closed in 1984. It is currently a residential area.



Source: Houston-Galveston Area Council, 2012
Prepared by: Quadrant Consultants Inc, December 06, 2012

Leigh | Fisher

LEGEND
- Closed landfill site
- Road
- IAH boundary

0 3000′ 6000′

N

Figure 2-59
Closed Landfill Sites