

Chapter 6 Implementation Plan

Chapter 6 IMPLEMENTATION PLAN

This Chapter summarizes the implementation plan formulated to incrementally meet the requirements associated with the forecast aviation demand at the Airport, while taking into consideration current Capital Improvement Projects and baseline projects to be constructed within the next five years.

6.1 INTRODUCTION AND APPROACH

Included herein is a summary of (1) projects included in the RDP, including project sequence and cost estimates, (2) the future on-airport land use plan; (3) the recommended Capital Improvement Program, with a particular focus on projects recommended for near-term implementation.

6.2 RECOMMENDED PROJECTS AND PHASING PLAN

This section describes the RDP for the Airport through 2035. Recognizing uncertainties associated with long-range aviation demand forecasting, three planning activity levels (PALs) were identified to represent future levels of activity at which key improvements would be necessary. Because activity levels could deviate from calendar-based forecasts for any number of reasons, the use of PAL “triggers” allows planning recommendations to be tied to realized demand as it occurs, rather than arbitrary calendar years. For this Master Plan Update, PAL25, PAL33, and PAL40 correspond to the aviation activity forecasts for 2019, 2028, and 2034, respectively.

A summary of the activity levels associated with each PAL is shown in Table 6-1.

The specific improvements included in the RDP will enable the Airport to continue to fulfill and enhance its role as an important passenger connecting hub in the National Airspace System. The plan incorporates the recommended airfield and passenger terminal development alternatives identified in Chapter 5. Ground transportation and aviation support projects were also identified to accommodate projected demand, changing land uses, or relocation or replacement of facilities.

Table 6-1
SUMMARY OF PLANNING ACTIVITY LEVELS

	2012	PAL25	PAL33	PAL40
ANNUAL				
Enplaned passengers (millions)	20.3	25.3	33.3	39.9
Total aircraft operations	524,552	632,658	751,980	826,940
AVERAGE DAY PEAK MONTH (ADPM)				
Enplaned passengers	64,442	80,484	105,884	127,041
Total aircraft operations	1,506	1,840	2,188	2,410

Source: LeighFisher, October 2013.

6.2.1 PAL25 Projects

At PAL25, the primary recommendations are a new international terminal and a new crossfield taxiway linking the north and south portions of the airfield. Projects included in the RDP for PAL25 are shown on Figures 6-1 and 6-2 and discussed in the following sections. The numbering of projects described in the text corresponds to the project numbers listed on Figures 6-1 and 6-2.

1. Taxiway NR extension

Currently, Taxiway NR dead-ends into Taxiway WB in the vicinity of the Terminal A South apron. This project would extend Taxiway NR through to Taxiway RA as an Airplane Design Group (ADG) V and Taxiway Design Group (TDG) 6 taxiway, providing:

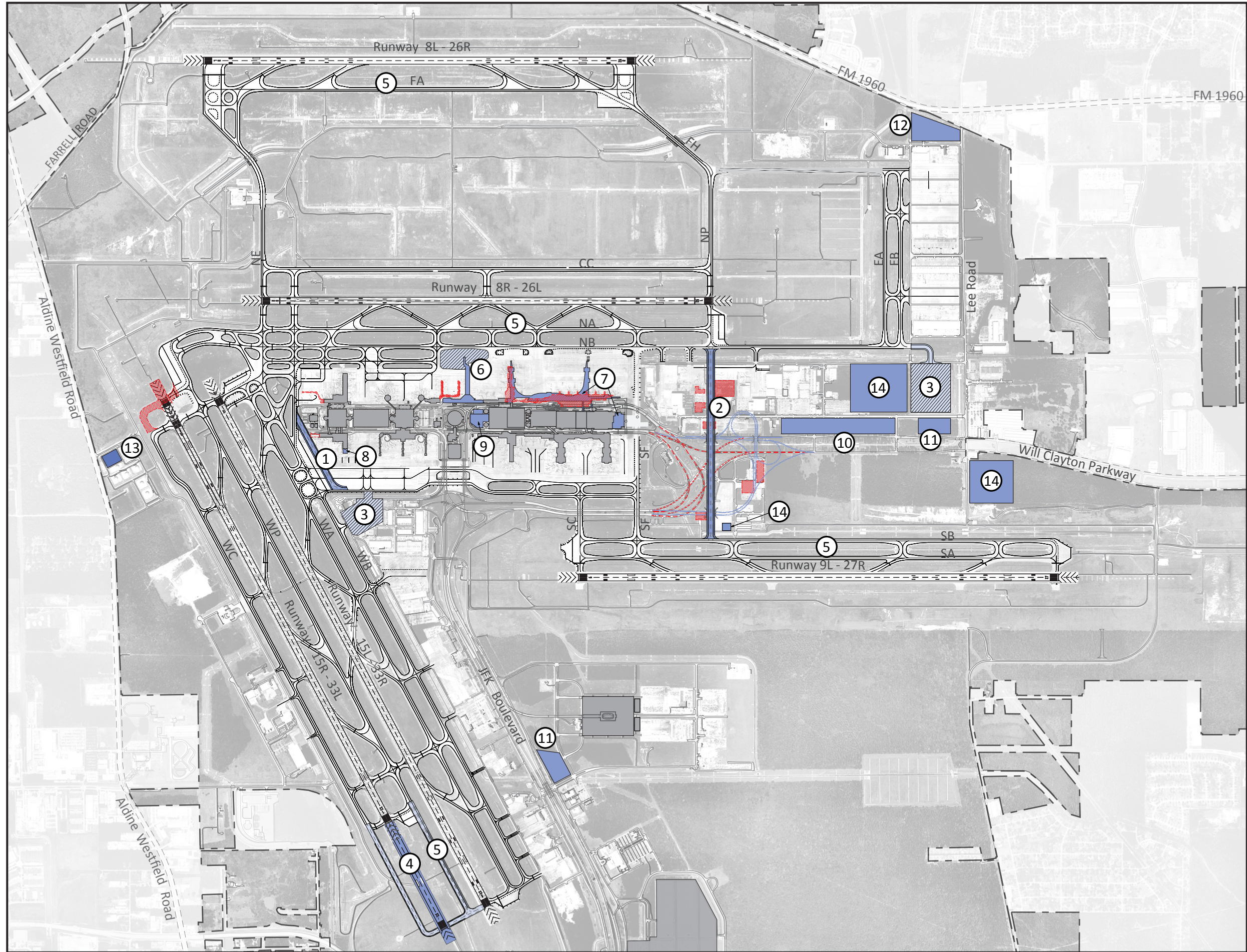
- 324 feet centerline-to-centerline separation from ADG VI Taxiway WB
- 160 feet from centerline to fixed object (Terminal A South gates)
- 75-foot width with shoulders of 35 feet shoulders

The utility of the west side of the airfield to serve crossfield taxiing operations is limited given both Taxiways WA and WB are used in a northbound direction for departures to Runways 15L and 15R, and any aircraft using Taxiway NR to travel southbound would create a head-to-head conflict with traffic on Taxiway WB. The extension of Taxiway NR would provide redundancy in crossfield taxiing capability to Taxiway SF. Additionally, the provision of Taxiway NR would reduce taxiing times for those aircraft using it, as well as reduce overall taxiing times due to reduced occurrence of head-to-head taxiing on Taxiway SF.

This taxiway extension would be used primarily in a southbound direction, providing a taxi route around the west end of the terminal complex for arriving aircraft from Runways 8R-26L and 8L-26R to Terminals A South and B South via Taxiway NE, rather than the existing circuitous taxi route around the east end of the terminal complex via Taxiway FH to Taxiways NP and SF. ADG V is the recommended capability for this taxiway given only ADG V and smaller aircraft are forecast to park on the south apron. The Taxiway NR extension is programmed for PAL25 because it could be used immediately to provide crossfield taxiing capability on the west side of the airfield, relieving congestion on Taxiway SF.

The extension of Taxiway NR would require removal of three aircraft gates on the south concourse of Terminal A. Replacement gates would be provided on the south concourse, as part of project 9. The taxiway extension would also eliminate one remote aircraft parking position, but additional apron for aircraft parking will be provided as part of project 9. The currently unused portion of the north concourse of Terminal A (Gates A3A through A3F) and the former site of the FAA ATCT/TRACON would need to be removed to provide ADG V wingtip clearances on the existing portion of Taxiway NR south of Taxiway NC.

Taxiway NR should be implemented as soon as possible. It may be prudent to complete the expansion of Terminal A concurrently with Taxiway NR, such that the three gates displaced are replaced. For the purposes of the Master Plan Update, this project is scheduled for completion in 2020.



LEGEND

- Airport property line
- Facilities removed/relocated pavement to be removed
- Near-term terminal improvements
- Aircraft apron improvements

PAL25 Recommended Projects

1. Taxiway NR extension
2. Taxiway SL
3. Aircraft parking aprons
4. Runway 15R-33L extension
5. Taxiway design group standard upgrades
6. Terminal C north concourse replacement
7. Mickey Leland International Terminal and Central FIS expansion
8. Terminal A concourse expansion
9. Expansion of Terminal C west parking garage.
10. Ecopark 2
11. Cell phone lots and commercial development.
12. Cargo lay down area
13. Fuel farm tank replacement
14. Support facilities reserve

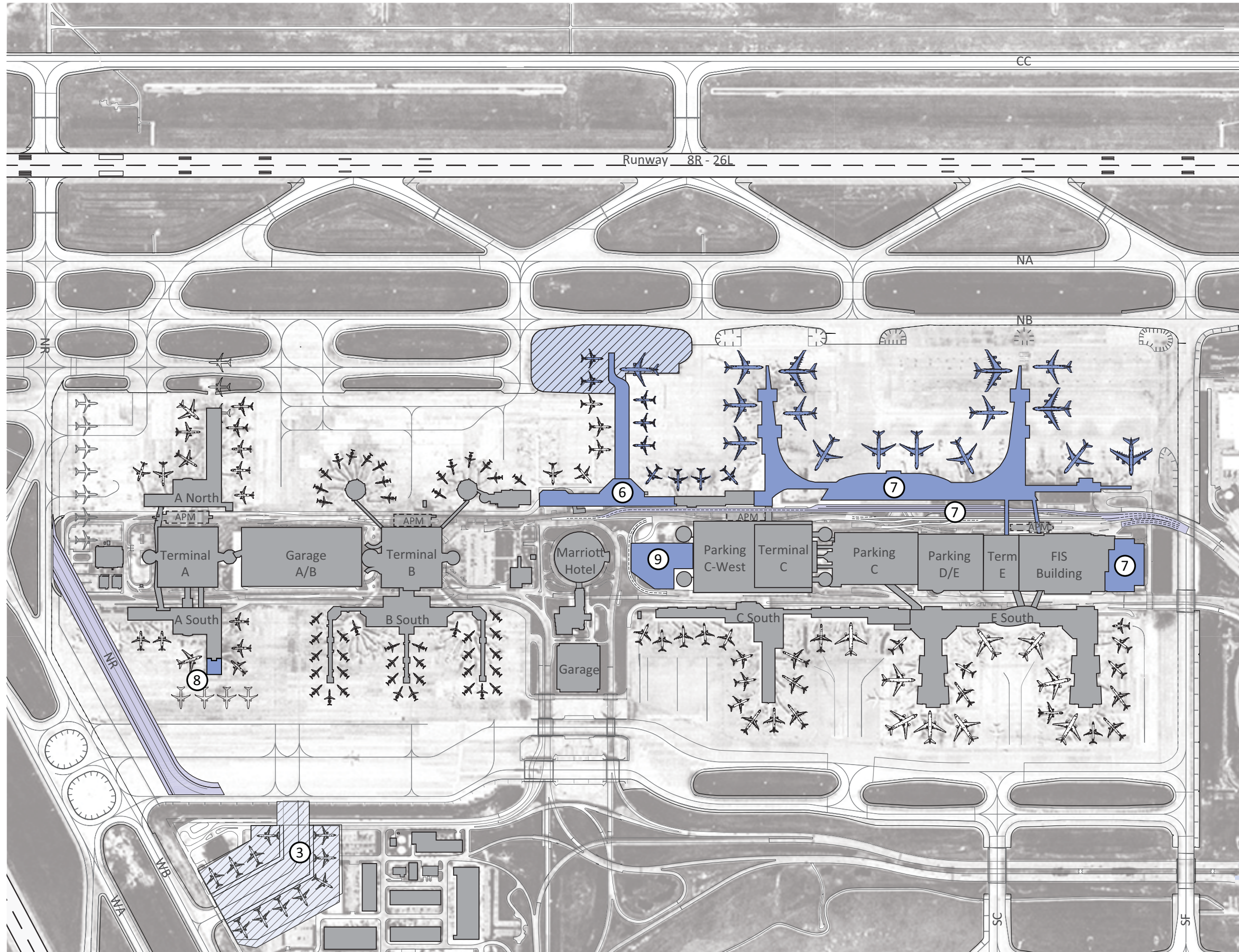
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Source: Source: HAS Records

Prepared by: Leigh | Fisher
 January, 2015

Figure 6-1
**Recommended Development
 Plan - PAL25**



LEGEND

- Airport property line
- Facilities removed/relocated pavement to be removed
- Near-term terminal improvements
- Aircraft apron improvements

PAL25 Recommended Projects

3. Aircraft parking aprons
6. Terminal C North concourse replacement
7. Mickey Leland International Terminal and Central FIS expansion
8. Terminal A concourse expansion
9. Expansion of Terminal C West parking garage.

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Source: Source: HAS Records

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 January, 2015

Figure 6-2
**Recommended Development
 Plan Terminal Complex - PAL25**

2. Taxiway SL

This project provides an additional crossfield taxiway to the east of existing crossfield Taxiway SF at centerline spacing of approximately 1,525 feet. The taxiway is in line with the end of Runway 26L, and connects Taxiways NB and SB. Taxiway SL would be constructed in accordance with design standards for ADG VI and TDG 7 aircraft. This taxiway should be operational when the airfield reaches approximately 633,000 annual operations.

Taxiway SF currently provides the single connection between the north and south airfield. Taxiway SF is used in a northbound and southbound direction in both flow directions, causing aircraft taxiing delays. During peak arrival periods, northbound and southbound aircraft need to wait to be “platooned” through the taxiway to avoid head-to-head taxiing situations. In the event Taxiway SF were to be unavailable (e.g., disabled aircraft, pavement maintenance, or bridge structure failure), aircraft would likely need to be assigned an arrival runway based on their assigned gate or parking position. This manner of assigning aircraft to runways based on their gate would lead to severely reduced operational efficiency of the airfield, major delays, and likely flight cancellations. Additionally, Taxiway SF has two bridges over North and South Terminal Roads which do not have the necessary shoulder width or structural strength to accommodate the fleet mix at the Airport. At a design width of 100 feet, the bridges do not meet taxiway safety area standards for ADG IV or larger aircraft. Taxiway SF being the single crossfield connection also limits the use of Runway 9 in east flow, since departures cannot queue on Taxiway SF while it is occupied by northbound taxiing operations by arrivals to Runway 9.

Taxiway SL is programmed for PAL25 as it is needed to eliminate the risk associated with Taxiway SF being out of service and to reduce aircraft taxiing time and delay. The following enabling projects are required to construct Taxiway SL:

- Relocate the interchange between John F. Kennedy Boulevard and Will Clayton Parkway
- Relocate Chelsea flight kitchen buildings #2 and #3
- Relocate ARFF station 92
- Relocate United Airlines in-flight training facility
- Relocate the ground service equipment (GSE) maintenance building

Taxiway SL should be operational as the annual number of aircraft operations reaches 633,000. According to the slow growth master plan forecast (discussed in Appendix A to this report), this level of operations is expected to occur around 2028.

3. Aircraft parking aprons

With construction of the Mickey Leland International Terminal (MLIT), the hardstand apron north of Terminal D will be displaced by the two pier concourses and associated taxilanes. The existing apron can accommodate up to six widebody aircraft, and is used primarily by United Airlines and foreign flag airlines on a daily basis for remote aircraft parking. A proposed apron for remote aircraft parking must be constructed as an enabling project for the MLIT.

The recommended remote parking apron at Wright Road is located approximately 200 feet west of the extended centerline of Taxiway EA. This site was selected because (1) it is proximate to the terminal area, (2) aircraft under tow would not need to cross runways, and (3) it can be constructed immediately. The proposed apron can accommodate up to eight widebody aircraft. The apron should be operational as soon

as possible, prior to the beginning of construction of the MLIT, project 6. For the purposes of the Master Plan Update, this project is scheduled for completion in 2016.

The remote aircraft parking apron at Central Cargo converts warehouse space in Central Cargo to remote aircraft parking apron. The apron shown is capable of providing parking for up to 11 ADG III aircraft. Additional aircraft parking is warranted for those airlines that have aircraft remaining overnight, especially airlines operating out of Terminal A. This project is scheduled for completion in 2025, after the lease for the warehouses that would be displaced have expired.

4. Runway 15R-33L extension

Currently, the longest runway at the Airport is Runway 15L-33R at 12,001 feet. A runway extension to another runway would provide a redundant long-haul departure runway in the case that Runway 15L-33R must be taken out of service (e.g., for maintenance or rehabilitation).

Runway 15R-33L was selected as the optimal runway for an extension because it is a primary departure runway and does not require extensive environmental mitigation or relocation of existing facilities. Also, an extension to Runway 15R-33L provides the opportunity to align the ends of Runway 15L-33R and 15R-33L, simplifying taxi flows, allowing for flexible assignment of departure runways, and reducing wake turbulence dependencies between departures from both runways.

Runway 15R-33L would be extended to the south by approximately 2,500 feet and shortened on the north end by approximately 500 feet, resulting in a final length of 12,001 feet. The extension would require relocation or decommissioning of the HUMBLE VHF omnidirectional range beacon and tactical air navigation system beacon (VORTAC).

The runway extension should be constructed concurrently with the rehabilitation of Runway 15R-33L, scheduled for 2024 and prior to rehabilitation of Runway 15L-33R, scheduled for 2025.

5. Taxiway design group standard upgrades

FAA criteria for taxiway width and taxiway shoulder width are defined in terms of TDG, which is based on the dimensions of the undercarriage of the aircraft. All taxiways at the Airport are at least 75 feet wide, which is the standard for TDG 6 aircraft but insufficient for TDG 7 aircraft. Taxiway shoulders on the Airport range from a width of 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. Accordingly, this section recommends a phased approach to upgrading the taxiway shoulders to meet TDG 6 and 7 standards as appropriate.

The taxiway dimensional requirements for TDG 6 and 7, and representative aircraft are listed in Table 6-2.

Table 6-2
TAXIWAY DESIGN STANDARDS

Taxiway Design Group (TDG)	Taxiway width (ft.)	Taxiway shoulder width (ft.)	Example aircraft
6	75	35	Airbus A330-200/300, Airbus A340-200/300/500/600, Airbus A350-900, Boeing 747-400/8, Boeing 767-400ER, Boeing 777-200/300, MD-11
7	82	40	Airbus A380

Source: FAA Advisory Circular 150/5300-13A, Airport Design.

Per FAA Engineering Brief 78, *Linear Equations for Evaluating the Separation of Airplane Design Groups on Parallel Taxiways and Taxiways to Fixed/Moveable Objects*, “new taxiway construction or reconstruction that receives Federal funding under the Airport Improvement Program (AIP) or is approved for the use of Passenger Facility Charges (PFC) must be built in accordance with AC 150/5300-13A.”

Guidance in FAA Engineering Brief 63b, *Taxiways for Airbus A380 Taxiing Operations*, and FAA Engineering Brief 73, *Use of Non-Standard 75-Foot Wide Straight Taxiway Sections for Boeing 747-8 Taxiing Operations*, allows a modification of standards for the use of existing 75-foot wide taxiways with 35-foot shoulders to be used for the Airbus A380 and Boeing 747-8.

Given this guidance, the approach to upgrading taxiway pavements should be as follows:

1. Any new taxiway infrastructure should be built to TDG 6 standards at a minimum, and to TDG 7 standards if it is expected to be used by TDG 7 aircraft.
2. When a taxiway is programmed for reconstruction, it should be rebuilt to TDG 6 standards at a minimum, and to TDG 7 standards if it is expected to be used by TDG 7 aircraft.
3. Taxiway shoulders on primary taxi routes for TDG 6 and 7 aircraft should be upgraded to 35 feet as soon as practical, in a phased manner.

Upgrades to existing taxiway shoulder pavements should be prioritized based on the most frequent taxi routes for TDG 6 and 7 aircraft. The highest priority taxiways for upgrades are as follows:

- To the primary departure runway, Runway 15L, from the terminal complex and East Cargo apron
 - Taxiway WB (already completed)
 - Taxiway NB (under construction)
 - Taxiway RA
- From the primary arrival runway, Runway 8R-26L, to the terminal complex and East Cargo apron
 - Taxiway NA (programmed)

- From Runway 9-27 to/from the terminal complex and East Cargo apron
 - Taxiway SB
 - Taxiway SC

- From Runway 8L-26R to the terminal complex and East Cargo apron
 - Taxiway FA
 - Taxiway FH
 - Taxiway NP
 - Taxiway EB

These taxiway shoulders should be upgraded as soon as practical, taking into account the overall schedule for pavement reconstruction. These projects are included in the list of PAL25 projects because they are required independent of future demand.

6. Terminal C north concourse replacement

Formerly referred to as Terminal B Phase 2, the proposed Terminal C north concourse is scheduled for construction in the first quarter of 2015 enabling the demolition of the existing north concourse of Terminal C which will be demolished and reconstructed as part of the proposed MLIT, project 7. This proposed concourse would be located on the north apron to the west of the existing C-north concourse and to the east of the B-north concourses. The proposed concourse would be capable of accommodating 13 narrowbody aircraft parking positions. The proposed Terminal C north concourse is scheduled for completion in 2017, prior to construction beginning for the MLIT.

7. Mickey Leland International Terminal and Central FIS Expansion

The MLIT is a proposed international terminal which would provide additional international aircraft gates, requiring the demolition of both the existing north concourse of Terminal C and Terminal D in phases. The MLIT provides aircraft parking positions for 15 widebody or 27 narrowbody aircraft, in a flexible apron parking configuration. In addition to the terminal and concourses, the Central FIS would be expanded to accommodate additional international passenger demand. The FIS expansion would accommodate a nine-level parking garage with approximately 1,000 public parking spaces.

The MLIT façade would be set back from the existing terminal roadways to allow for the widening of North Terminal Road to create a four lane curbside at the MLIT, a bypass roadway around Terminal C, and reconfigure the roadways to separate traffic destined for Terminals A, B, C, or the MLIT from traffic destined for Terminal E or parking. This project would simplify motorist wayfinding, allow traffic destined for Terminal C to bypass congestion at Terminal E, allow motorists destined for Terminals A or B to bypass congestion at Terminal C, and prevent congestion at Terminal C from impacting motorists destined for Terminal E or parking.

The MLIT is scheduled for completion in 2021.

8. Terminal A concourse expansion

This project would add three aircraft contact gates to the southern concourse of Terminal A. These gates would replace those displaced as a result of the construction of the Taxiway NR extension. This project should be the subject of a program definition study to be completed in 2016. This project would ideally be completed prior the construction of Taxiway NR, or as soon as possible following further study. For the purposes of the Master Plan, this project is scheduled for completion in 2018.

9. Expansion of Terminal C west parking garage

This project would expand the Terminal C West parking garage to the west to provide additional close-in public parking. The expansion would be seven levels and create approximately 2,000 additional public parking spaces. The existing exit plaza would be replaced with a more compact exit plaza to create space for this garage expansion. Along with the new parking garage built as part of the MLIT and Central FIS expansion, these additional spaces enable the Airport to meet the PAL25 requirement for close-in public parking. The proposed parking garage expansion is scheduled for completion in 2022.

10. Ecopark 2

This project would provide a second remote public parking lot, located to the north of Will Clayton Parkway, south of Wright Road and the existing commercial vehicle hold lot. Approximately 2,200 parking spaces would be created in Ecopark 2. This project is scheduled for construction and completion in 2015.

11. Cell phone lots and commercial development

This project involves construction of two new cell phone lots: one on Will Clayton Parkway immediately east of Ecopark 2, the other located north of Rankin Road and east of JFK Boulevard. Both cell phone lots would provide approximately 120 covered parking spaces, restroom facilities, and an option for future commercial development such as a gas station, convenience store, and/or quick service restaurant. The commercial development option for the JFK Cell Phone Lot will likely precede the commercial development at the Will Clayton Parkway Cell Phone Lot. Both cell phone lots are scheduled for construction and completion in 2017.

12. Cargo lay down area

This project involves clearing and grading space for air cargo airlines to store cargo containers adjacent to the east cargo apron. Currently, the airlines store their containers on the apron, obstructing aircraft parking positions. This project should be implemented as soon as practical. For the purposes of the Master Plan, this project is scheduled for completion in 2016.

13. Fuel farm tank replacement

The four small fuel tanks on the northwest corner of the fuel farm are scheduled for replacement due to their condition and age. The four tanks together provide approximately 2.1 million gallons of storage and this project would replace the four tanks with two larger tanks, each with a capacity of approximately 1.8 million gallons. The net gain in fuel storage would be approximately 1.5 million gallons. For the purposes of the Master Plan, this project is scheduled for completion in 2022.

14. Support facilities

To enable the construction of Taxiway SL, the Chelsea Flight Kitchen and GSE maintenance facilities must be relocated. These facilities could be located immediately east of project 3, the remote parking apron. In addition, IAH maintenance buildings, including vehicle maintenance would need to be relocated to accommodate Taxiway SL. These facilities would be relocated to the southeast corner of Lee Road and Will Clayton Parkway. Finally, ARFF Station 92 would need to be relocated to the west end of Runway 9-27, immediately west of Taxiway SC. Each of these projects should be completed in advance of construction beginning on Taxiway SL. For the purposes of the Master Plan, the Chelsea Flight Kitchen and GSE maintenance facilities are scheduled for relocation in 2020, while the IAH maintenance and ARFF Station 92 facilities are scheduled for completion in 2017 and 2018, respectively.

The IAH maintenance facilities are scheduled to be completed in 2017, given replacement vehicle maintenance facilities are required in the near-term. ARFF Station 92 is scheduled for completion in 2018 because the existing facilities would require investment to provide rapid foam refill capability and address additional facility needs.

6.2.2 PAL33 Projects

At PAL33, the primary recommendations are proposed Runway 8C-26C and phased replacement of Terminals A and B on the west side of the terminal complex. Projects included in the RDP for PAL33 are shown on Figures 6-3, 6-4, and 6-5. The numbering of projects described in the text corresponds to the project numbers shown on Figures 6-3, 6-4 and 6-5.

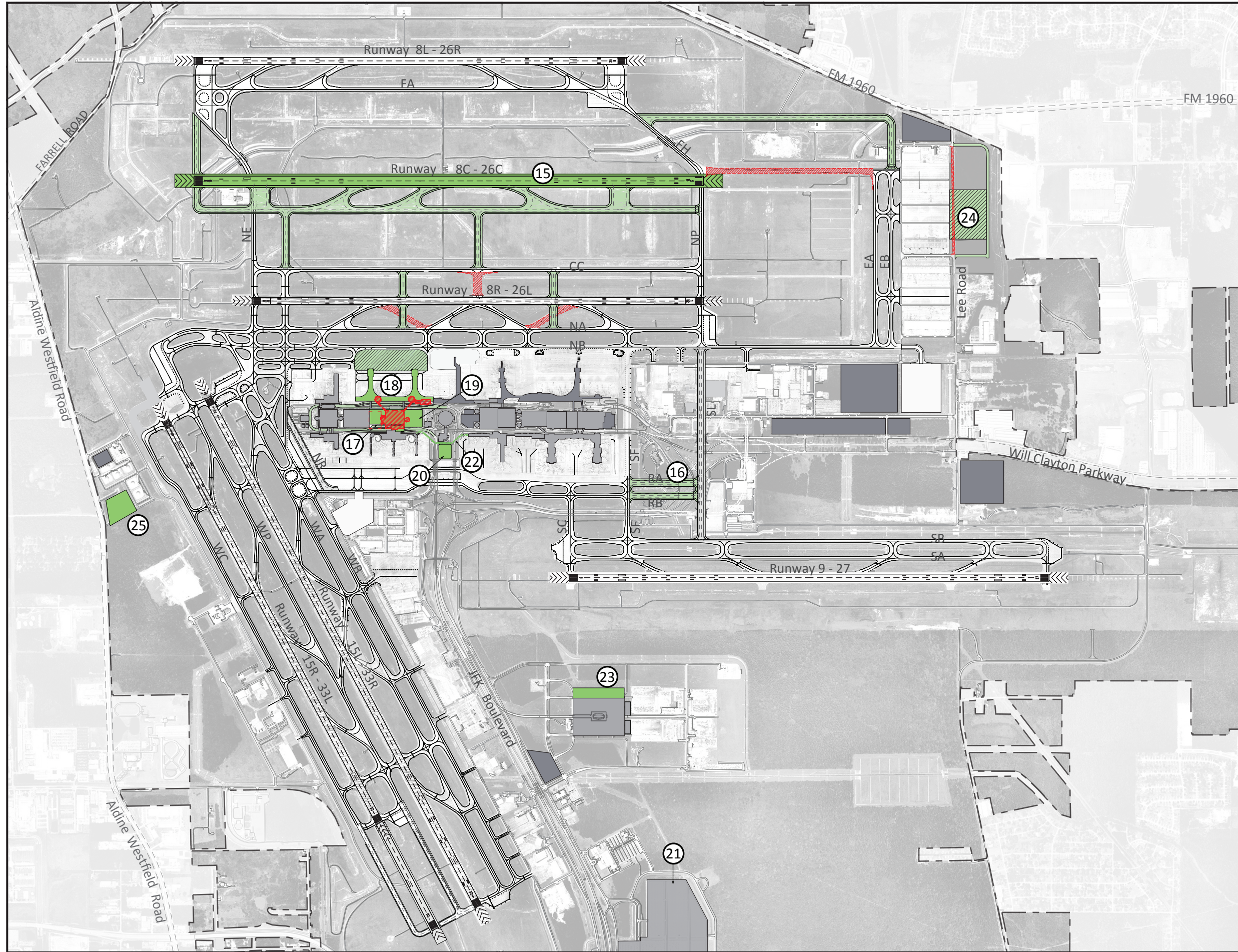
15. Runway 8C-26C and supporting taxiways

Project 15 includes a proposed Runway 8C-26C with the centerline spaced 2,500 feet from both the centerlines of Runways 8L-26R and 8R-26L. The eastern end of the runway would be aligned with the existing end of Runway 26L, and the western end would be aligned with the end of Runway 8L, making the length of the proposed runway 10,610 feet. The runway would be built to ADG VI design standards, making it 200 feet wide with 40 foot wide shoulders.

Runway 8C-26C would be used primarily for departures, although dependent on controller preference and workload, it could also be used for arrivals in visual conditions to minimize aircraft taxiing distances and runway crossings. Under instrument conditions, departures from Runway 8C-26C would use an intersection departure to mitigate an adverse threshold stagger; otherwise the departure would be dependent on arrivals to Runway 26R in west flow or Runway 8R in east flow.

Taxiways required to support the use of this runway are included as part of this project. These taxiway projects include:

- Full length parallel taxiway: a parallel taxiway meeting design criteria for ADG VI/TDG 7 standards would be provided the entire length of the runway, with centerline spacing of 600 feet from runway centerline.
- Runway entrance taxiways: runway entrance taxiways are provided for intersection departures in both directions. In west flow, the departure point is in line with the existing end of Runway 26R, allowing a takeoff run of 9,000 feet. In east flow, the departure point would be in line with Runway 8R, allowing a takeoff run of 9,402 feet. Dual ADG V taxiways are provided to enter the runway for departure staging and sequencing purposes. It is assumed that any aircraft larger than ADG V would require the full length of the runway to depart, and would not use an intersection departure procedure.
- Runway exit taxiways: although Runway 8C-26C is expected to be used primarily for departures, runway exit taxiways are provided in the event that it is used for arrivals. Two high speed exits would be provided in the west flow direction at a distance approximately 5,000 and 6,500 feet from the threshold of Runway 26C. A single high speed exit is provided in the east flow direction, approximately 6,000 feet from the threshold of Runway 8C.



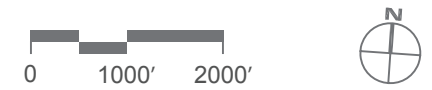
LEGEND

- Airport property line
- Facilities removed/relocated pavement to be removed
- Mid-term terminal improvements
- Aircraft apron improvements

PAL33 Recommended Projects

15. Runway 8C-26C and supporting taxiways
16. Taxiway RA and RB extension
17. Consolidated A/B terminal processor
18. Terminal B concourses
19. Terminal B parking garage
20. Marriott south parking garage
21. Ecopark parking garage (not shown)
22. Terminal B-C pedestrian connector
23. CONRAC facility expansion, phase 1
24. East cargo expansion, phase 1
25. Fuel farm expansion

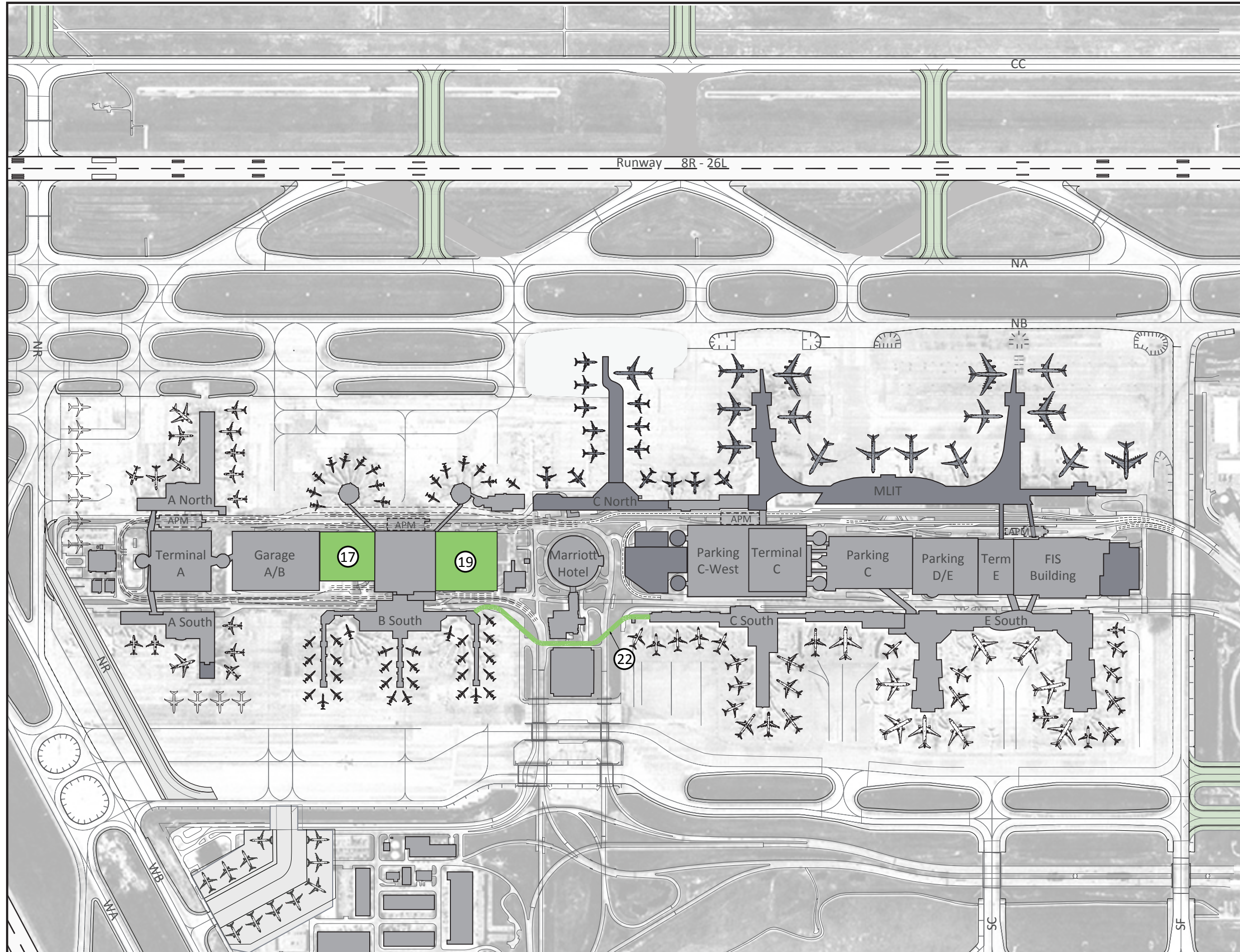
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 January, 2015

Figure 6-3
**Recommended Development
 Plan - PAL33**



LEGEND

-  Airport property line
-  Mid-term terminal improvements
-  Aircraft apron improvements

PAL33A Recommended Projects

- 17. Consolidated A/B terminal processor, phase 1
- 19. Terminal B parking garage
- 22. Terminal B-C pedestrian connector

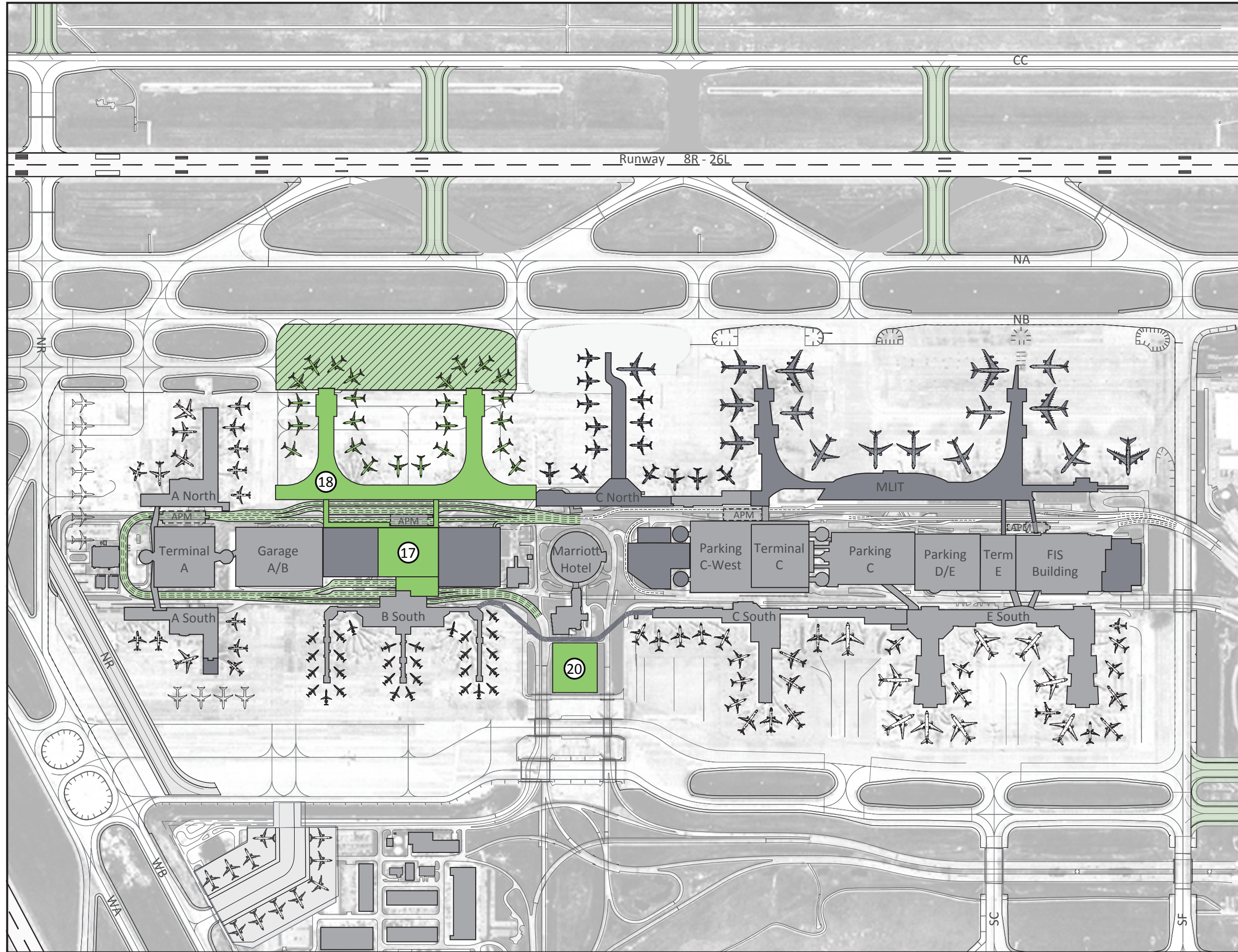
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Figure 6-4
**Recommended Development
 Plan Terminal Complex - PAL33A**



LEGEND

-  Airport property line
-  Mid-term terminal improvements
-  Aircraft apron improvements

PAL33B Recommended Projects

- 17. Consolidated A/B terminal processor, phase 2
- 18. Terminal B concourses
- 20. Marriott south parking garage

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Figure 6-5
**Recommended Development
 Plan Terminal Complex - PAL33B**

- Runway crossing taxiways: Runway 8C-26C will increase the frequency of runway crossings, and therefore require additional crossing points. To provide these crossing points, it is recommended that exit Taxiways NG and NL be removed and replaced with perpendicular taxiways between Taxiways NA and CC. Angled Taxiways NG and NL are currently too close to the runway threshold to be effectively used as high speed exits for arrivals and should be removed to provide perpendicular runway crossing points. The proposed runway crossings would be located approximately 3,100 feet from either end of Runway 8R-26L, following FAA guidance that runway crossings should take place in the first third or final third of the runway to avoid “high energy” intersections.*
- Relocated Taxiway EE: existing Taxiway EE must be relocated to the north with the construction of Runway 8C-26C so that the RPZ and departure surface for the runway remain clear of taxiing aircraft.

Runway 8C-26C and its supporting taxiways are programmed for PAL33 to meet future demand requirements. However, the timing of the runway should be adjusted in line with the actual growth of aircraft operations. Specifically, the runway should be in place at the time when annual aircraft operations reach 750,000. Additionally, the timing of Runway 8C-26C should be revisited, pending results of FAA review of converging runway operations at IAH. New guidance regarding converging/non-intersecting runways greatly increases controller workload when in north flow (i.e., departing Runways 33L and 33R while arriving Runways 26R, 26L and 27) because of the need to monitor and coordinate the Arrival/Departure Windows on the multiple arrival runways.** The new rules might make an all east-west configuration preferable when winds favor north flow, making Runway 8C-26C a more immediate need to provide adequate capacity in all flow directions.

16. Taxiway RA and RB extensions

Existing Taxiways RA and RB would be extended to the east to connect with the proposed Taxiway SL, providing flexibility in the use of Taxiway SL in either a northbound or southbound direction. In the near term, Taxiways SA or SB could be used to facilitate movement to or from Taxiway SL, at the expense of additional aircraft taxi time. As traffic levels increase, Taxiway SL will need to be used more flexibly, especially following construction of Runway 8C-26C, when aircraft departing Runway 8C-26C would be expected to taxi from the south apron to the runway.

The extensions to Taxiways RA and RB are programmed for PAL33, prior to construction of Runway 8C-26C. However, the taxiway extensions may be constructed coincidentally with Taxiway SL to provide full functionality of that taxiway.

17. Consolidated A/B terminal Processor

This project proposes phased removal of the passenger processing components of Terminals A and B between North and South Terminal roads. A proposed single terminal processor, centered on the site west of the Marriott would serve the existing and proposed concourses on the Terminal A and B aprons. The project has two primary phases, as shown in Figures 6-4 and 6-5.

As shown in Figure 6-4, the eastern third of the existing A/B garage would be demolished and the west portion of the new consolidated terminal processor would be constructed in its place. In addition, a public

*FAA Advisory Circular 150/5300-13A, Airport Design, Paragraph 401.b.5.d.

**FAA Order 7110.65V, Air Traffic Control, Paragraph 3-9-9.

parking garage would be constructed immediately east of the existing Terminal B and immediately west of the automated people mover (APM) maintenance facility (project 19).

In the second primary phase, existing Terminal B would be demolished and replaced by the eastern half of the proposed consolidated terminal processor, as shown in Figure 6-5. The APM stations at Terminals A and B would remain functional throughout the phases to enable passengers to be ticketed in either terminal as the construction schedule warrants. Additionally, Terminal B-South would be expanded on the secure side to connect to the new processor and provide additional area for concessions. The proposed consolidated processor is shown narrower as compared to existing Terminals A and B to allow for single-level dual curbsides on the north and south sides of the building. The north curbside would serve departing passengers being dropped off at the Airport and the south curbside would serve arriving passengers being picked up. Private motorists would use the inner curbsides and commercial vehicles would use the outer curbsides.

18. Terminal B concourses

This project would add two additional pier concourses to the north apron of Terminal B, replacing the two rotunda “flight station” concourses. This project is needed to replace the aging flight station concourses, as well as provide additional aircraft gates. These concourses would accommodate approximately 24 narrowbody aircraft gates, with two ADG-III taxilanes between the concourses. The project provides a net gain of approximately nine narrowbody aircraft gates, through more efficient use of the aircraft apron. Once in place, Taxiway NC between Taxiways ND and NG would be converted to aircraft apron.

19. Terminal B parking garage

During the first phase of the construction of the proposed Terminal A/B processor, the employee parking to the east of existing Terminal B would be displaced by an eight-level garage for public parking, providing approximately 3,200 spaces.

20. Marriott south parking garage

In addition to the Terminal B Parking Garage, a proposed garage would replace the existing two-level garage to the south of the Marriott, north of Taxiway RB. The proposed garage would be eight levels and accommodate approximately 1,800 spaces for public parking. Passengers parking in this garage would need to walk to the Marriott to gain access to the Inter-Terminal Train. Accordingly, this parking facility would likely have a lower price point than other terminal complex garages.

21. EcoPark parking garage

The constrained terminal area results in insufficient space to accommodate all close-in parking demand by PAL33. Therefore, a new parking product in the form of a remote parking garage would replace a portion of the existing EcoPark surface lot. The proposed garage would be eight levels and accommodate approximately 10,300 public parking spaces. With these additional spaces, the public and employee on-airport parking demand for PAL33 is met, with flexibility to allocate space in the various parking facilities among employees and the public as desired by HAS management. The exact site of this parking garage should be determined after further study.

22. Terminal B-C pedestrian connector

This project would provide a secure pedestrian connection between the south concourses of Terminals B and C. The connector would connect Gate B1 with Gate C29, passing between the Marriott and proposed Marriott south parking garage. Providing this option for connecting passengers to walk between terminals

would reduce demand on the TerminalLink APM. The most heavily used segment of the APM is between Terminals B and C.

23. Consolidated Rental Car (CONRAC) facility expansion, Phase 1

Phase 1 of the CONRAC expansion would consist of three components: (1) Level 1 of the customer service Building would be expanded by approximately 4,700 square feet, (2) the 2-level ready/return garage would be expanded to the north by 388,000 square feet (1,080 feet x 180 feet), and (3) the rental car companies would expand their service sites by a combined total of 12 acres in areas currently designated for service site expansion.

24. East Cargo expansion, Phase 1

As cargo demand warrants, the East Cargo apron may be expanded to the east, enabling construction of two additional cargo buildings and parking for up to six additional widebody aircraft. This expansion would require the realignment of Lee Road to the east, as shown in Figure 6-3.

25. Fuel farm expansion

The existing fuel farm would be expanded to the southeast to provide for as many as four additional large storage tanks. Four additional storage tanks would provide approximately 7.2 million gallons of additional storage capacity to keep pace with growth in aircraft operations.

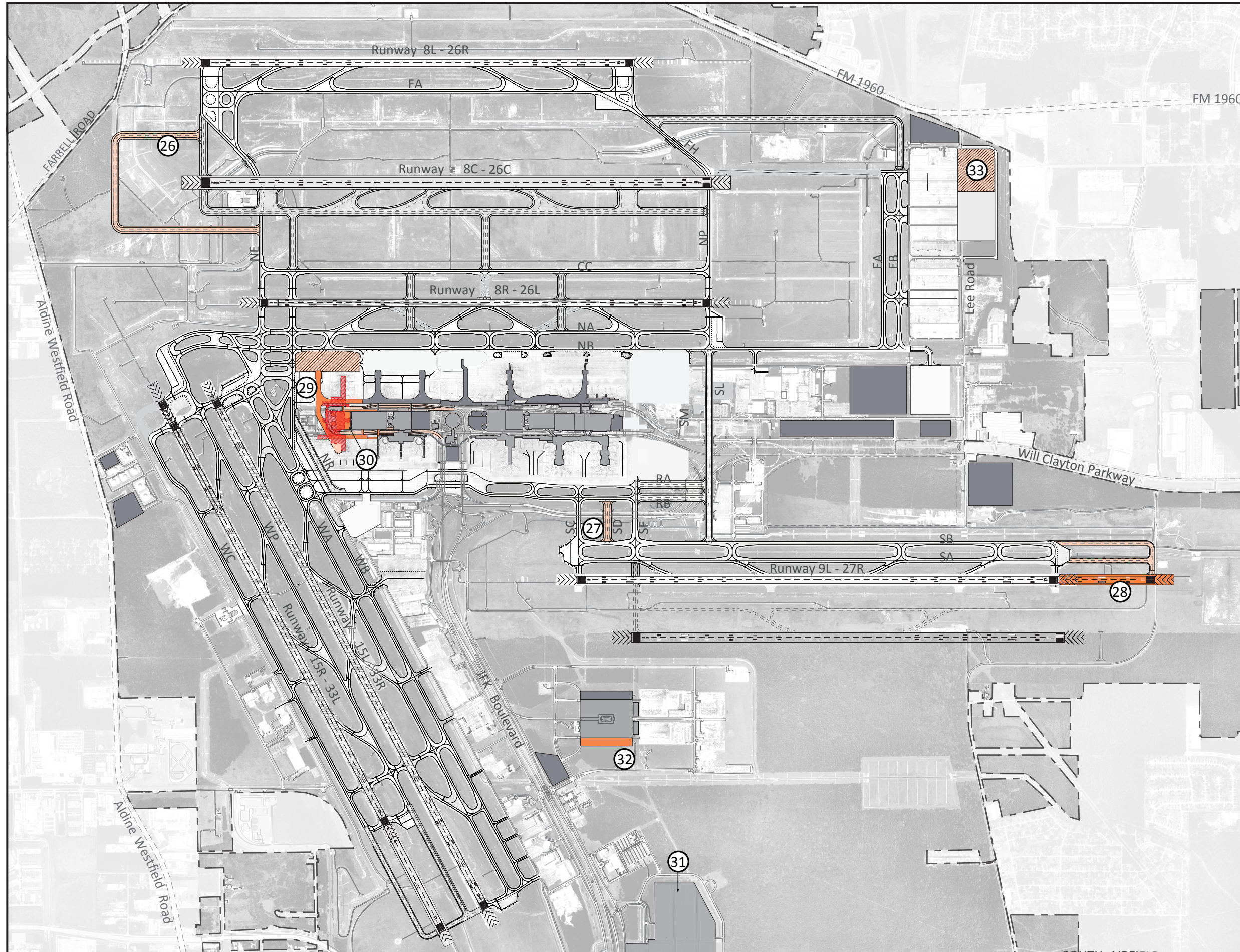
6.2.3 PAL40 Projects

At PAL40, the primary recommendations are an end-around taxiway and replacement of the Terminal A concourses. Projects included in the RDP for PAL40 are shown on Figures 6-6 and 6-7 and discussed in the following sections. The numbering of projects described in the text corresponds to the project depicted on Figures 6-6 and 6-7.

26. End-around taxiway

An end-around taxiway to the west of new Runway 8C-26C should be provided when airfield demand reaches 820,000 annual operations. This taxiway would serve arrivals to Runway 8L-26R taxiing to the terminal complex, so that they do not have to cross Runway 8C-26C. As seen on Figure 6-, the taxiway is 1,800 feet from the end of Runway 8C, meeting standards for ADG III and smaller aircraft, meaning the maximum allowable tail height on the taxiway to avoid penetrations to the 40:1 departure surface of Runway 26C is 45 feet. ADG III was deemed an acceptable size aircraft to design the taxiway for since ADG III and smaller aircraft make up approximately 95% of the passenger aircraft forecast future fleet mixes.

Although the end-around taxiway is planned for PAL40, prior to the construction of Runway 8C-26C, its timing should be revisited depending on apron layout at that time and congestion in the area of Taxiways NE, NA, NB, and NR. If apron and taxiway congestion in the vicinity of these taxiways restricts the use of the westerly taxiing route, the end-around taxiway may be warranted at the same time as the new runway.



LEGEND

- Airport property line
- Facilities removed/relocated pavement to be removed
- Long-term terminal improvements
- Aircraft apron improvements

PAL40 Recommended Projects

- 26. End-around taxiway
- 27. Taxiway SD
- 28. Runway 9-27 extension
- 29. Terminal A concourse
- 30. Terminal A parking garage
- 31. Ecopark parking garage expansion (not shown)
- 32. CONRAC facility expansion, phase 2
- 33. East cargo expansion, phase 2

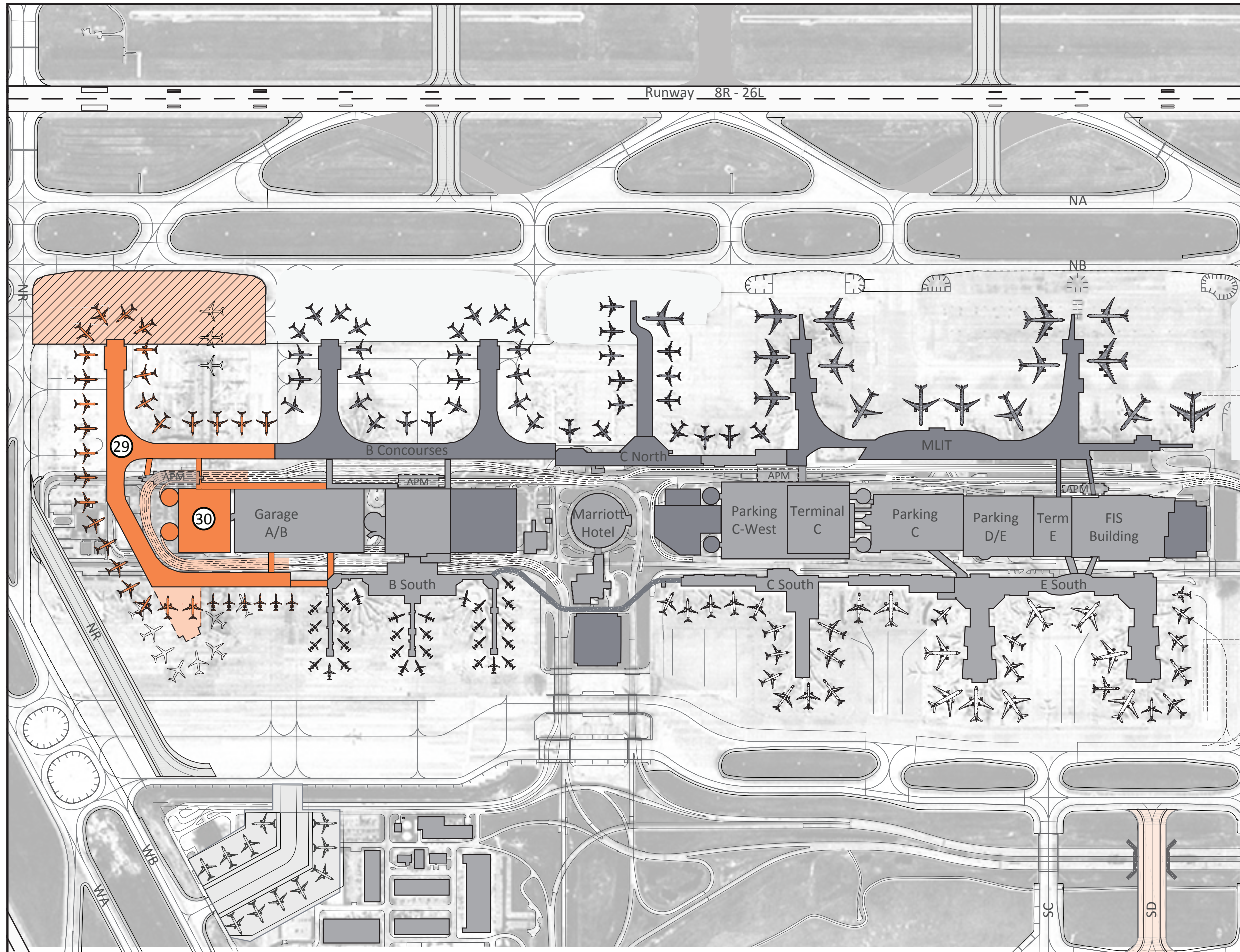
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 January, 2015

Figure 6-6
 Recommended Development
 Plan - PAL40



LEGEND

-  Airport property line
-  Long-term terminal improvements
-  Aircraft apron improvements

PAL40 Recommended Projects

- 29. Terminal A concourse
- 30. Terminal A parking garage

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Source: Source: HAS Records

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Figure 6-7
 Recommended Development
 Plan Terminal Complex - PAL40

27. Taxiway SD

This project connects Taxiways RA and SB between Taxiways SC and Taxiway SF. This taxiway would be constructed to ADG VI design standards and be used primarily for queuing departures to Runway 9. Currently, Taxiway SC is the primary area for the queuing of departures using Runway 9. However, area on this taxiway is limited since it backs onto the south apron and Taxiways RA and RB, which must remain clear for circulation. Also, departure queues cannot build on Taxiway SF since it must remain clear for circulation purposes. Taxiway SD would offer additional queue space for Runway 9 departures and allow the opportunity for sequencing departures to the runway. The use of Runway 9 for mixed-mode operations (arrivals and departures) could also be enhanced with this taxiway to allow bi-directional flows on Taxiways SC and SD, without using Taxiway SF. The taxiway could also be used as additional pavement to hold arrivals from Runway 27 waiting for a gate.

Proposed Taxiway SD would require a bridge spanning John F. Kennedy Boulevard, similar to Taxiways SC and SF. Taxiway SD is recommended in the PAL40 timeframe to improve departure staging options and reduce taxiway congestion.

28. Runway 9-27 extension

This project would involve an extension of Runway 9-27 to the east by 2,000 feet, for a total length of 12,000 feet. This extension would provide a runway in the east-west direction equivalent in length to Runways 15L-33R and 15R-33L. With a length of 12,000 feet, this runway would be capable of supplementing the Runway 15-33 complex for departures, especially in east flow. Additionally, at the PAL40 demand level, demand for long-haul departures by heavy aircraft may warrant a long east-west departure runway so that when winds favor north flow, the airfield could be operated in an all east-west configuration without the disruption of long-haul departures, which otherwise would need to depart Runways 33R or 33L.

29. Terminal A concourse

In this phase, the Terminal A concourses would be replaced by a concourse that wraps around the west end of the terminal complex. This concourse would accommodate up to 31 narrowbody gates. The concourse would be connected to north and south concourse of Terminal B. The terminal roadways on the west end of the terminal complex would need to be realigned to accommodate the proposed concourse.

30. Terminal A parking garage

To the west of the existing Terminal A/B Garage, a new seven level garage could be constructed to provide approximately 4,900 additional public parking spaces. The exact height and configuration of this garage should be subject to further study as it pertains to the line-of-sight between the FAA Airport Traffic Control Tower and the end of Runways 15L and 15R.

31. EcoPark parking garage expansion

Due to the constrained area, other than the facilities built as part of the Terminal A parking garage, no new terminal area parking would be built. To accommodate the additional demand for public parking, the eight level EcoPark garage planned for PAL33 would be expanded to accommodate an additional 10,000 parking spaces. This increase in parking would accommodate both the public and employee on-airport parking demand through PAL40. The structure and surface spaces could be divided among employees and the public as desired by airport management.

A summary of all parking projects to be implemented throughout the master plan period is included in Appendix E, *Parking Overview*.

32. Consolidated Rental Car (CONRAC) facility expansion, phase 2

Phase 2 of the CONRAC Expansion would consist of three components: (1) level 1 of the customer service building would be expanded by 4,000 square feet, (2) the 2-level ready/return garage would be expanded to the south by 260,000 square feet (1,080 feet x 120 feet), and (3) the rental car companies would expand their service sites by a combined total of 16 acres in areas currently designated for service expansion.

The rental car bus maintenance facility would also need to be expanded, doubling in size from four to eight bus maintenance bays. An additional paved area of approximately 44,000 square feet would be needed to the south of the existing facility to accommodate the maintenance bay expansion and increased bus storage area.

33. East cargo expansion, Phase 2

The East Cargo apron would be expanded to the east to accommodate an additional six parking positions and up to two corresponding cargo buildings. This project could be combined with the east cargo expansion phase 1 (project 24) depending on growth of air cargo demand.

6.2.4 Concepts Beyond the Planning Horizon

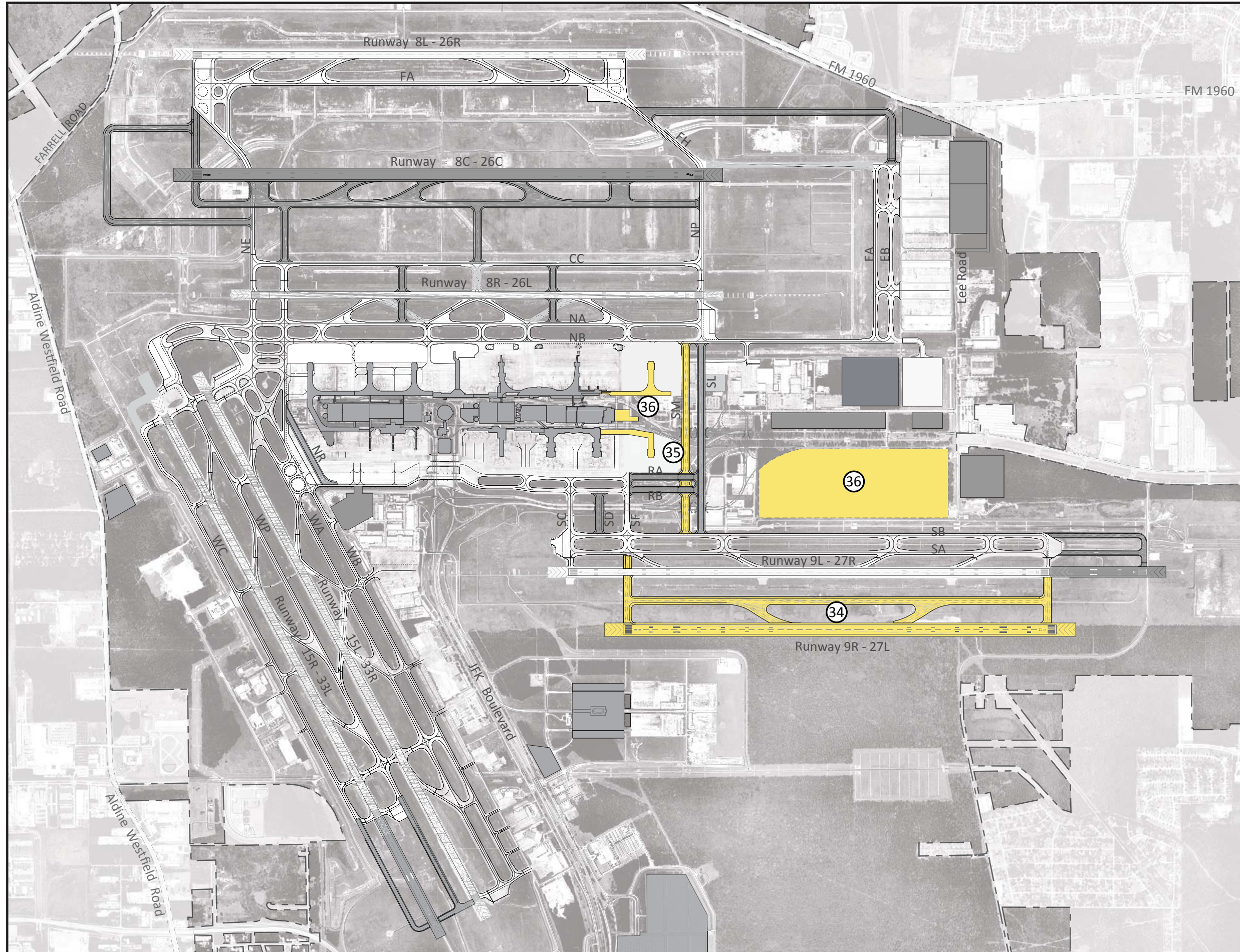
The previously defined recommendations are expected to meet forecast demand through the master planning horizon. The need for additional facilities is not likely to materialize until after the planning period. However, prudent planning dictates that major improvements beyond the planning period, such as future runways and terminal expansion, be identified to inform near and mid-term planning decisions and to reserve space. A list of potential projects beyond the planning horizon are described below and shown in Figure 6-8.

34. Runway 9R-27L



Land should be reserved for a fifth east-west parallel runway south of existing Runway 9-27, to be designated Runway 9R-27L. At such time, the airfield would likely be operated primarily in the east-west direction, and the use of the Runway 15-33 complex would be minimal. Proposed Runway 9R-27L would increase airfield capacity since there would no longer be dependencies with operations on Runways 15R and 15L. Runway 9R-27L would be used primarily for arrivals, and is shown in Figure 6-8 at a length of 9,000 feet and centerline spacing of 1,200 feet from existing Runway 9-27. The annual service volume of a five runway all east-west airfield with proposed Runway 8C-26C and Runway 9R-27L was estimated at 950,000 annual operations, providing capacity well beyond the demand forecast in the Master Plan.

35. Taxiway SM

To enable the contiguous expansion of the MLIT and Terminal E, Taxiway SF could be removed and replaced as a future Taxiway SM. Taxiway SM would be constructed to the west of Taxiway SL at a centerline spacing of 324 feet, the standard for ADG VI aircraft. Taxiway SM would be 82 feet wide with 40-foot shoulders, the standard for TDG 7 aircraft. The removal of Taxiway SF would also enable the extension of the secure automated people mover, when warranted.



LEGEND

-  Airport property line
-  Concepts beyond planning horizon projects

Concepts Beyond Planning Horizon

- 34. Runway 9R-27L
- 35. Taxiway SM
- 36. Long-term terminal expansion options

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 January, 2015

Figure 6-8
Concepts Beyond Planning Horizon

36. Long-Term Terminal Expansion Options

Multiple options for long-term terminal expansion are preserved beyond the master planning horizon. With removal of Taxiway SF, the terminal complex may be expanded to the east. On the north, an additional double-loaded concourse can be attached to the MLIT, and on the south, Terminal E could accommodate an additional double-loaded concourse. Various facility would be need be relocated to enable these concourse expansions, most notably the FAA Airport Traffic Control Tower for an expansion of Terminal E. Alternately, terminal expansion could be provided by a linear terminal located on the greenfield site to the north of Runway 9-27, east of proposed Taxiway SL, and south of Will Clayton Parkway.

Figure 6-10 illustrates the combined phasing projects for PAL25, PAL33, PAL40, and concepts beyond the planning horizon.

6.2.5 Regional Roadway Improvements

Additional projects to improve the regional roadways impacting the Airport, whether owned by an outside agency or owned by HAS but maintained by an outside agency, are described in Appendix D, *Roadway Technical Analysis*. The improvements address 16 intersections along Will Clayton Parkway and John F. Kennedy Boulevard.

6.3 FUTURE LAND USE PLAN

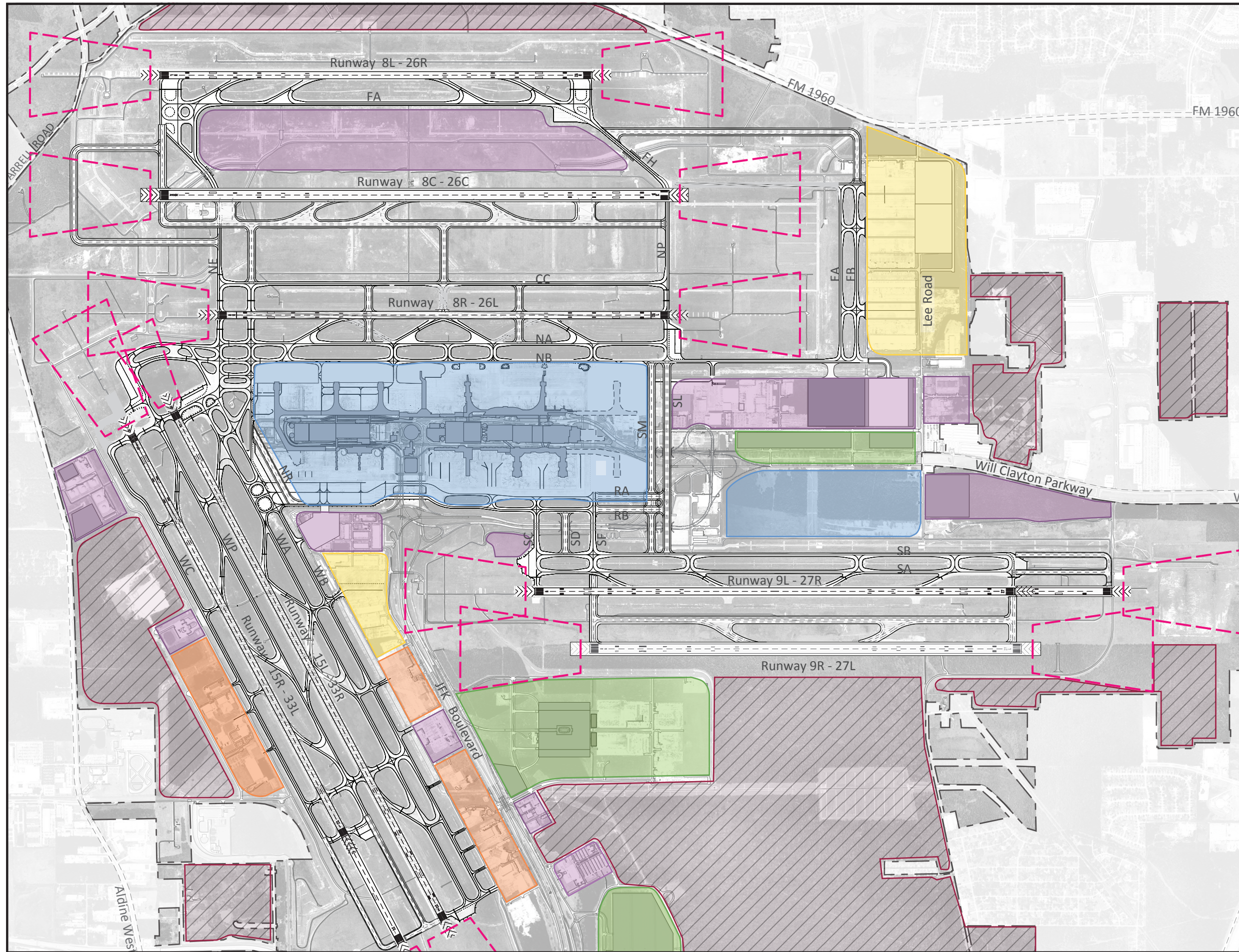
This section describes the preferred future on-Airport land use plan. The land use plan identifies land use “envelopes” that should be reserved to accommodate major Airport functions for the long-term. The purpose of the recommended on-Airport land use plan is to identify the highest and best use of Airport property given other Master Plan recommendations, surrounding off-Airport uses, existing and future infrastructure, and strategic considerations.

The recommended future land use plan was developed with primary consideration given to existing land uses, leases, and constructability/implementation factors. Priority was given to assigning land uses requiring airfield access to airfield-fronting parcels. Secondary focus was given to optimizing the use of on-Airport, non-airfield fronting land envelopes. The recommended land use plan for the Airport is shown on Figure 6-9.

6.4 CAPITAL IMPROVEMENT PROGRAM

The Airport has an ongoing capital improvement program (CIP) which assigns projects to a given year, currently looking out 10 years to 2024. While the majority of the implementation of the RDP is anticipated to be beyond the next five years, the Airport is planning to undertake a number of projects to enable the implementation of the master plan recommendations, beginning in 2016.

Projects identified within this chapter of the master plan are shown in Table 6-3, including a rough order of magnitude cost estimate, where available. PAL25 projects total approximately \$1.86 billion in 2015 dollars; PAL33 projects total approximately \$1.97 billion; and PAL40 total approximately \$1.09 billion. The total cost of all master plan recommendations is approximately \$4.9 billion. Notably, the cost estimates will be refined as further work is completed to define them including program definition documentation and design. Projects for PAL33 and PAL40 will change in scope as time passes and the level of demand associated with the project is approached. Nonetheless, these cost estimates may be used in long-term financial planning to inform the overall funding strategy. Details regarding the cost estimates prepared for the projects listed in Table 6-3 may be found in Appendix F, *Cost Estimates*.



- LEGEND**
- Airport property line
 - Airfield
 - Air cargo
 - General aviation
 - Reserve
 - Ground transportation and parking
 - Passenger terminal
 - Airport/airline support
 - Runway protection zone

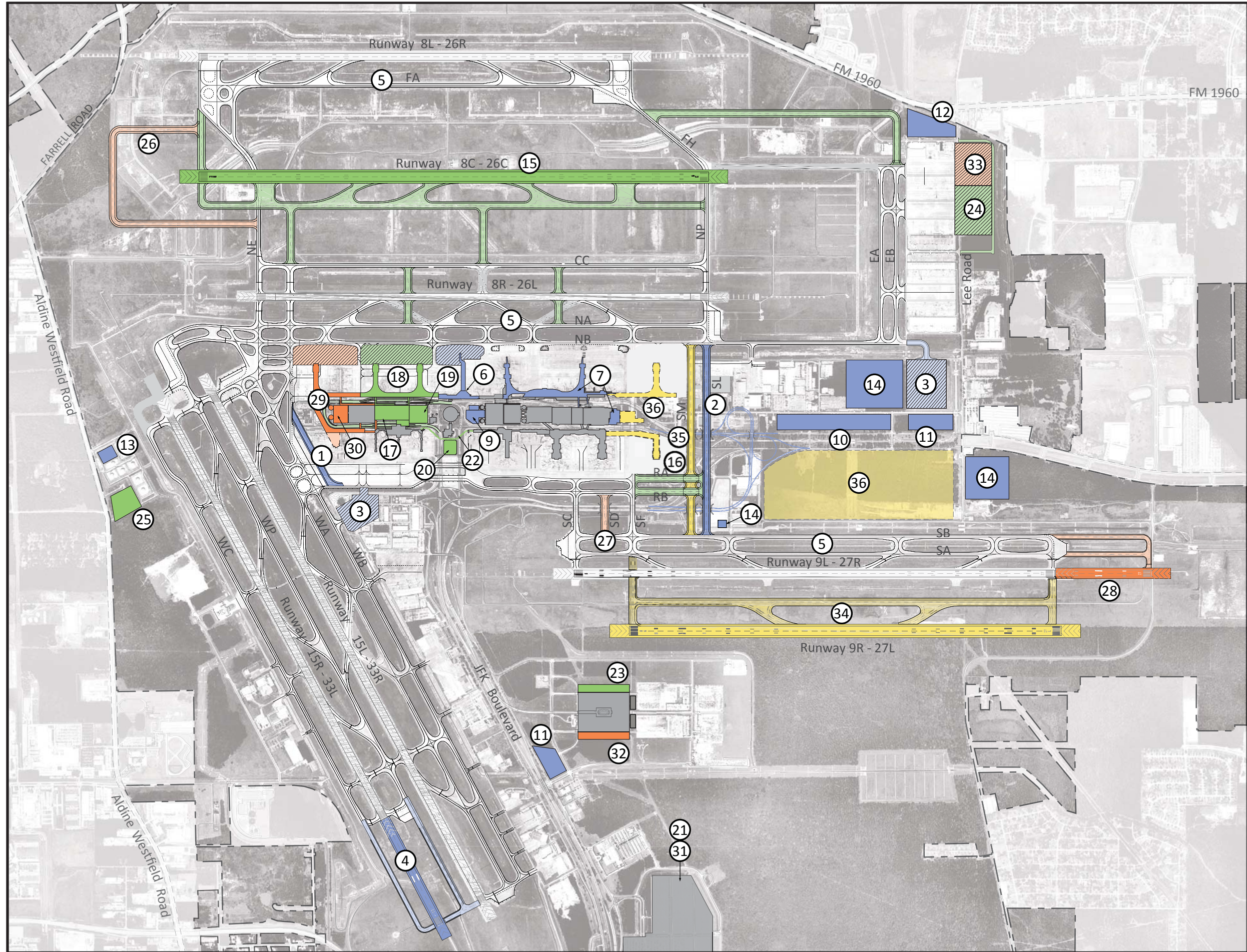
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 January, 2015

Figure 6-9
Airport Land Use



LEGEND

- Airport property line
- Near-term master plan
- Mid-term master plan
- Long-term master plan
- Concepts beyond plann. horizon

- PAL25 Projects**
1. Taxiway NR extension
 2. Taxiway SL
 3. Aircraft parking aprons
 4. Runway 15R-33L extension
 5. Taxiway design group standard upgrades
 6. Terminal C north concourse replacement
 7. Mickey Leland International Terminal
 8. Terminal A concourse expansion (not shown)
 9. Expansion of Terminal C west parking garage.
 10. Ecopark 2
 11. Cell phone lots and commercial development.
 12. Cargo lay down area
 13. Fuel farm tank replacement
 14. Support facilities

- PAL33 Projects**
15. Runway 8C-26C and supporting taxiways
 16. Taxiway RA and RB extension
 17. Consolidated A/B terminal processor
 18. Terminal B concourses
 19. Terminal B parking garage
 20. Marriott south parking garage
 21. Ecopark parking garage (not shown)
 22. Terminal B-C pedestrian connector
 23. CONRAC facility expansion, phase 1
 24. East cargo expansion, phase 1
 25. Fuel farm expansion

- PAL40 Projects**
26. End-around taxiway
 27. Taxiway SD
 28. Runway 9-27 extension
 29. Terminal A concourse
 30. Terminal A parking garage
 31. Ecopark parking garage expansion (not shown)
 32. CONRAC facility expansion, phase 2
 33. East cargo expansion, phase 2

- Concepts Beyond Planning Horizon**
34. Runway 9R-27L
 35. Taxiway SM
 36. Long-term terminal expansion options.

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Source: Source: HAS Records

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 January, 2015

Figure 6-10
**Phasing
 Diagram**

Table 6-3

RECOMMENDED DEVELOPMENT PLAN COST ESTIMATES		
Project (a)	Recommended project	Cost (b)
PAL 25		
1	Taxiway NR extension	\$16.0
2	Taxiway SL	133.8
3	Aircraft parking aprons (Wright Road and Central Cargo) (a)	82.7
4	Runway 15R-33L extension	52.3
5	Taxiway design group standard upgrades (b)	n.a.
6	Terminal C north concourse replacement (c)	268.2
7	Mickey Leland International Terminal and Central FIS Expansion (c)	1,189.2
8	Terminal A concourse expansion	28.4
9	Terminal C west parking garage expansion	63.2
10	Ecopark 2 (c)	14.5
11	Cell phone lots and commercial development	10.0
12	Cargo laydown area (c)	0.5
13	Fuel farm tank replacement (b)	n.a.
14	Support facilities reserve (b)	n.a.
	<i>Subtotal</i>	<u>\$1,858.8</u>
PAL33		
15	Runway 8C-26C and supporting taxiways	\$306.5
16	Taxiway RA and RB extension	18.6
17	Consolidated A/B terminal processor	617.8
18	Terminal B concourses	646.2
19	Terminal B parking garage	99.6
20	Marriott south parking garage	56.6
21	Ecopark parking garage, phase 1 (b)	n.a.
22	Terminal B-C pedestrian connector	29.8
23	CONRAC facility expansion, phase 1 (b)	72.1
24	East cargo expansion, phase 1	121.3
25	Fuel farm expansion	n.a.
	<i>Subtotal</i>	<u>\$1,968.5</u>
PAL40		
26	End-around taxiway	\$35.5
27	Taxiway SD	19.3
28	Runway 9-27 extension	52.9
29	Terminal A concourse	674.2
30	Terminal A parking garage	151.8
31	Ecopark parking garage, phase 2	n.a.
32	CONRAC expansion, phase 2 (b)	45.6
33	East cargo expansion, Phase 2	106.0
	<i>Subtotal</i>	<u>\$1,085.3</u>
	Recommended Development Plan Total	\$4,912.6

(a) There are two aircraft parking aprons: Wright Road parking apron estimated to cost \$40.5M and the Central Cargo aircraft parking apron estimated at \$42.4M.

(b) Cost estimates for these projects will be prepared after program definition work is completed.

(c) Cost estimates for these projects were prepared by others.

Source: Sunland Group; HAS records, 2015.