MEMPHIS INTERNATIONAL AIRPORT

MASTER PLAN UPDATE TECHNICAL REPORT

PREPARED FOR: MEMPHIS-SHELBY COUNTY AIRPORT AUTHORITY

PRESENTED BY: JACOBSEN|DANIELS

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The Memphis-Shelby County Airport Authority (MSCAA) operates three airports in the greater Memphis Region including Memphis International (MEM) and two general aviation airports: General Dewitt Spain and Charles W. Baker. The MSCAA engaged the Jacobsen|Daniels Team to prepare master plans for all three airports to identify development needs throughout the 20-year planning period.

This document provides the analysis and support documentation for the Memphis International Airport Master Plan. The last update to the Airport Layout Plan (ALP) was completed in 2010, however much has changed in subsequent years. The airport has transitioned to operating as an origin and destination (O&D) airport and has added new airlines to serve Memphis in the post-hub era. In addition, MSCAA continues to ensure the airfield serves the needs of the FedEx World Hub and other tenants. In recent years, modernizing the terminal and landside has been the renewed focus.

The plan articulated herein will ensure that the MSCAA and MEM continue as an integral asset to the Region's economic prosperity and growth, serving the needs of the traveling public and businesses for decades to come.

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MASTER PLAN COMPONENTS

Existing Conditions

The existing conditions at each airport identifies current airfield, terminal, and landside facilities, as well as the condition of these facilities. The existing conditions provides a baseline from which to start planning for the future. In addition to existing facilities, the existing aviation activity is reviewed and serves as the baseline for projecting the nature and amount of future aviation activity.

Future Aviation Activity

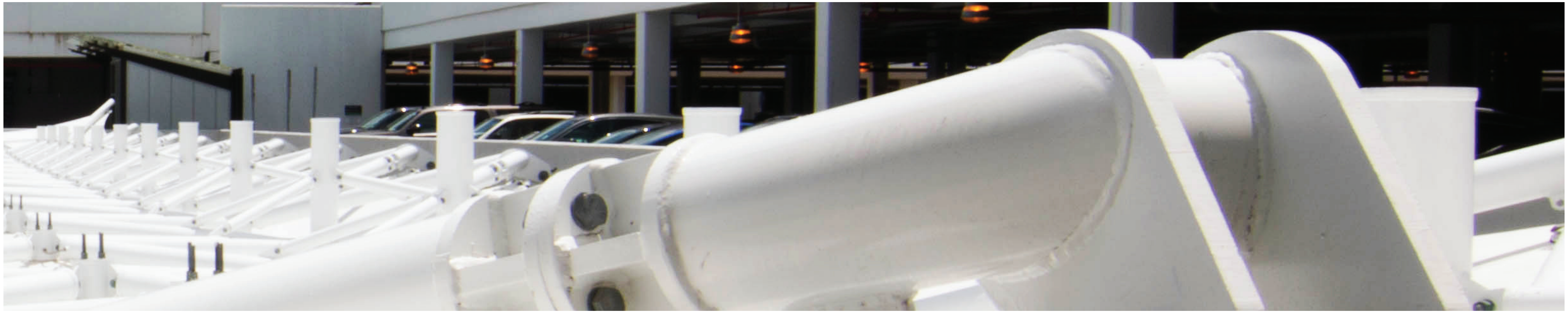
A forecast is prepared to identify future aviation activity. The forecasts are reviewed and approved by Federal Aviation Administration (FAA) as they often serve the basis for future development needs that are eligible for federal funds. The forecast is compared to the FAA Terminal Area Forecast to facilitate FAA's review and approval. The forecasts provided within have been approved by FAA.

Future Requirements

The anticipated future aviation activity drive future facility requirements. Based aircraft and fleet mix help to identify the need for based aircraft apron, and hangars, while operations drive the need for itinerant apron, terminal space, fuel and vehicle parking requirements. The critical aircraft or the most demanding aircraft that operates at the airport on a regular basis (500 or more annual operations) helps to determine the recommended runway length, width, and airfield design standards. The requirements are then compared to the existing conditions to identify any shortfalls that should be addressed to adequately accommodate the future demand.

Alternatives Analysis

Once the future requirements are identified alternatives are developed to meet these future needs. The alternatives are evaluated based on specific criteria including ability to meet requirements, cost, potential environmental issues, efficiency and phasing/constructability. The criteria help to identify the preferred alternative which will be further refined and serve as the Airport Layout Plan.



Preferred Development Plan and Airport Layout Drawings (ALP)

The preferred development plan is created from the best alternatives for each of the functional areas of the Airport (i.e.; terminal, ariside, landside). The plan considers phasing of when projects are needed/ desired and creates a Capital Improvement Plan (CIP). It also support the Airport's financial plans.

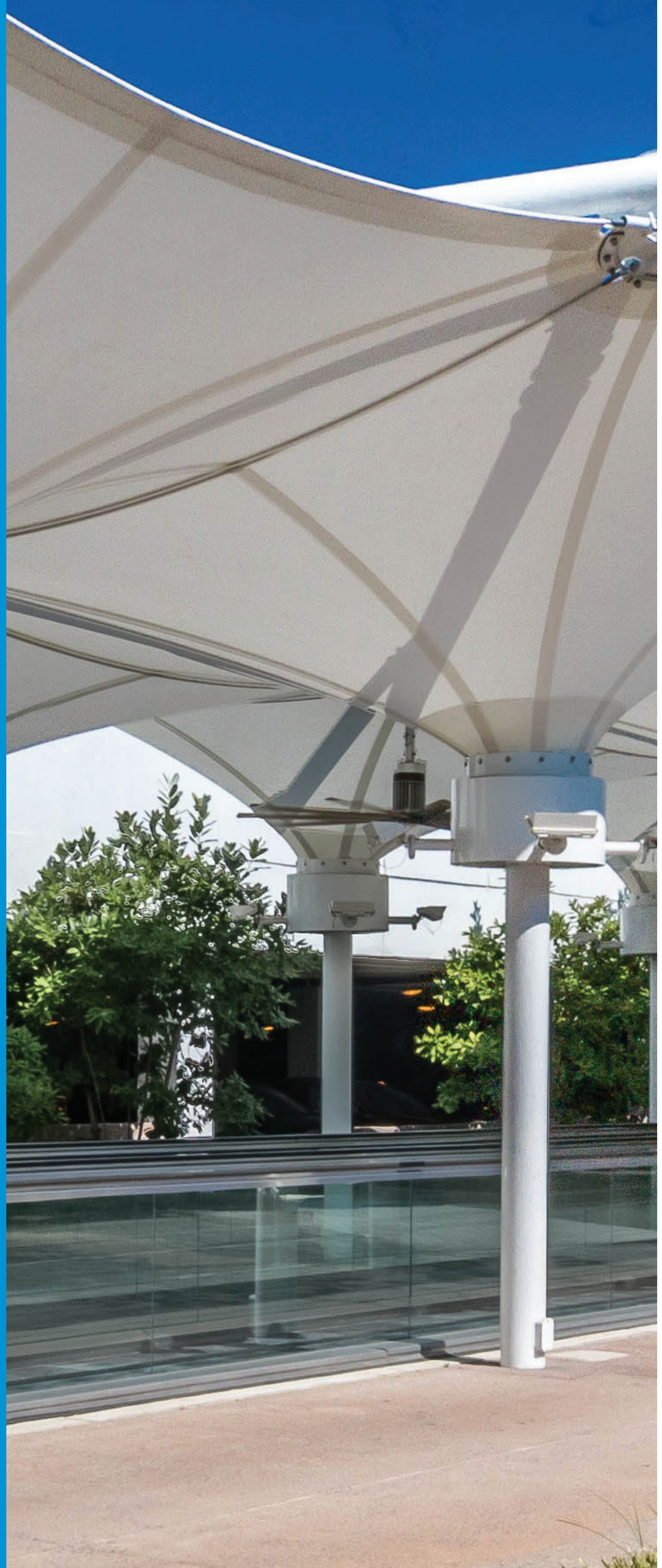
The Airport Layout Plan is a set of drawings that illustrate the existing and proposed airport layout. The ALP is approved by FAA and all development that occurs on the airport in the future must be illustrated on an approved ALP.

Environmental Overview

The environmental overview provides a summary of existing environmental conditions at the airport as well as any potential environmentally sensitive categories that may be impacted by the proposed future development. The overview helps to evaluate alternatives and identify the level of environmental analysis that will be needed prior to development. The ALP is typically approved based on the condition that all necessary environmental determinations will be made prior to development.

Public Engagement

The master plan process is a public process and stakeholder and public engagement are conducted through out the process to ensure that the plan is meeting the needs of the airport users and is compatible with the community.



INTRODUCTION

The Memphis-Shelby County Airport Authority (MSCAA, or the Authority) last updated the Memphis International Airport (MEM, or the Airport) Master Plan in 2010. Over the past 20 years, significant changes have occurred at MEM. The airport has transitioned to operating as an origin and destination (O&D) airport and has added new airlines to serve Memphis in the post-hub era. In addition, MSCAA continues to ensure the airfield serves the needs of the FedEx World Hub and other tenants. In recent years, modernizing the terminal and landside has been the renewed focus.

Significant investments have been made in the airfield and terminal over the past decade to position MEM for continued success. The largest of those investments include the Central Deicing Facility (CDF) and Concourse Modernization. The CDF is both an environmentally focused and efficiency-focused facility. It not only allows the FedEx World Hub operation to run smoothly, even when inclement weather forces aircraft to deice before take-off, it also allows the collection and retention of the fluid used for deicing. In doing so, much of the fluid is recycled as opposed to processed in a treatment plant – which is both green and economical. Opened in February 2022, the modernized concourse is the first step in providing Memphians a modern world class terminal and provides the airline partners, Federal Aviation Administration (FAA), Transportation Security Administration (TSA) and concessionaires a flexible and efficient facility out of which to operate.

A Master Plan provides a comprehensive, organized, and phased approach that will continue to guide current and future development of airport facilities over a planning horizon of 20 years. This document provides a comprehensive update to the previous Airport Master Plan and will consider all the major components of the Airport including landside, terminal, airside, and support facilities. With the airside facilities substantially improved under the previous Master Plan, the primary focus of this update is on improvements to the terminal and landside facilities.

Master Plan Goals and Objectives

As a kick-off to the Master Plan process, a visioning session was held with key members of the MSCAA to establish a vision for success of the Master Plan. Based on this session, the following overall vision statement was established for the Master Plan:

Master Plan Vision Statement

To develop an achievable, flexible, and fiscally responsible plan for ongoing development of Memphis International Airport that maintains safe, convenient, and efficient facilities and operations, while representing the diversity and economic strength of the Memphis-Shelby County and its surrounding communities..

To achieve this vision, the team established a series of goals and objectives based on the feedback received in the vision session and organized by overall airport, landside, terminal, and airside. These goals and objectives, along with the overall vision, established the criteria for measuring the success of the Master Plan. The following sections detail the established goals and objectives specific to the overall airport, landside, terminal and airside, cargo, and support facilities.

Overall Master Plan Goals and Objectives:

Goal:

Develop a feasible plan that reinforces the Airport as an economic engine and vital part of the community while enabling it to continue to operate safely.

Objectives to Consider:

- Identify the comprehensive 20-year projected requirements for Airport facilities.
- Provide a need-based development plan based on growth in activity at the Airport.
- Maintain customer convenience and improve the customer experience, particularly in the Terminals, to match the newly renovated Concourse.
- Provide a cost-effective, phased implementation plan.

Terminal Goals and Objectives

Goal:

Develop a cost effective, functionally efficient terminal facility that represents Memphis-Shelby County and provides capacity to meet the long-term demand of the region.

Objectives to Consider:

- Modernization of terminal core (ticketing & baggage claim).
  - » Modern technology
  - » Seismic resiliency
- Architectural features – Preserving the “Martini Glass” Overall Facility
- Centralize security screening functions.
- Optimize the use of terminal space and minimize the underutilized space found in the existing facilities.
- Open the curbside façade:
  - » Exterior/Interior connectivity
  - » Visibility/Line-of-site
  - » Welcoming / friendly
- Embrace shared-use facilities to improve utilization of existing facilities and to provide additional flexibility for the Airport and its tenants.
- Identify best practice sustainable initiatives and incorporate them into the recommended terminal alternatives.
  - » Accommodations for a new Federal Inspection Service (FIS) facility adjacent to the terminal.
- Optimize passenger amenities to maximize Airport revenues.
- Maintain short walking distances from parking, curb, and rental cars to the gates.
- Provide flexible terminal spaces that can adapt to changes in technology and passenger processing.
- Building Systems
  - » Implement outbound baggage screening and baggage makeup system improvements.
  - » Upgrade information technology systems to improve efficiency of operations for the Airport and its tenants.
  - » Upgrade existing building systems to improve efficiency and accommodate future expansion.
- Consider the ultimate buildout of the Concourse (beyond the planning horizon).

Landside Goals and Objectives

Goal:

Develop a landside improvement plan that maintains simple and walkable access to the Terminals, while minimizing the interaction of pedestrians and vehicles.

Objectives to Consider:

- Parking
  - » Provide additional parking within walking distance of the terminal.
  - » Develop a strategy to replace or revitalize the 3-Story garage.
- Curbfront
  - » Maintain curbfront and through-lane capacity for vehicles along the terminal roadway.
  - » Minimize pedestrian/vehicle conflicts.
- Rental Cars
  - » Identify a location for a purpose built consolidated rental car garage, with a Quick Turn Around (QTA) facility to accommodate the growth of rental cars and allow the first two levels of the Economy Garage to be converted to public parking.
- Identify a location for a future hotel development adjacent to the terminals.
- Enhance the cell phone lot function by developing a travel plaza with fuel and food/beverage amenities.

Airside, Cargo and Support Facilities Goals and Objectives

Goal:

Develop a plan for airside and support facility improvements that (1) continues to meet the needs of FedEx's hub operations, as well as other tenants operating at MEM, (2) meets projected demand, and (3) provides a safe operating environment and one that is current with FAA geometric standards.

Objectives to Consider:

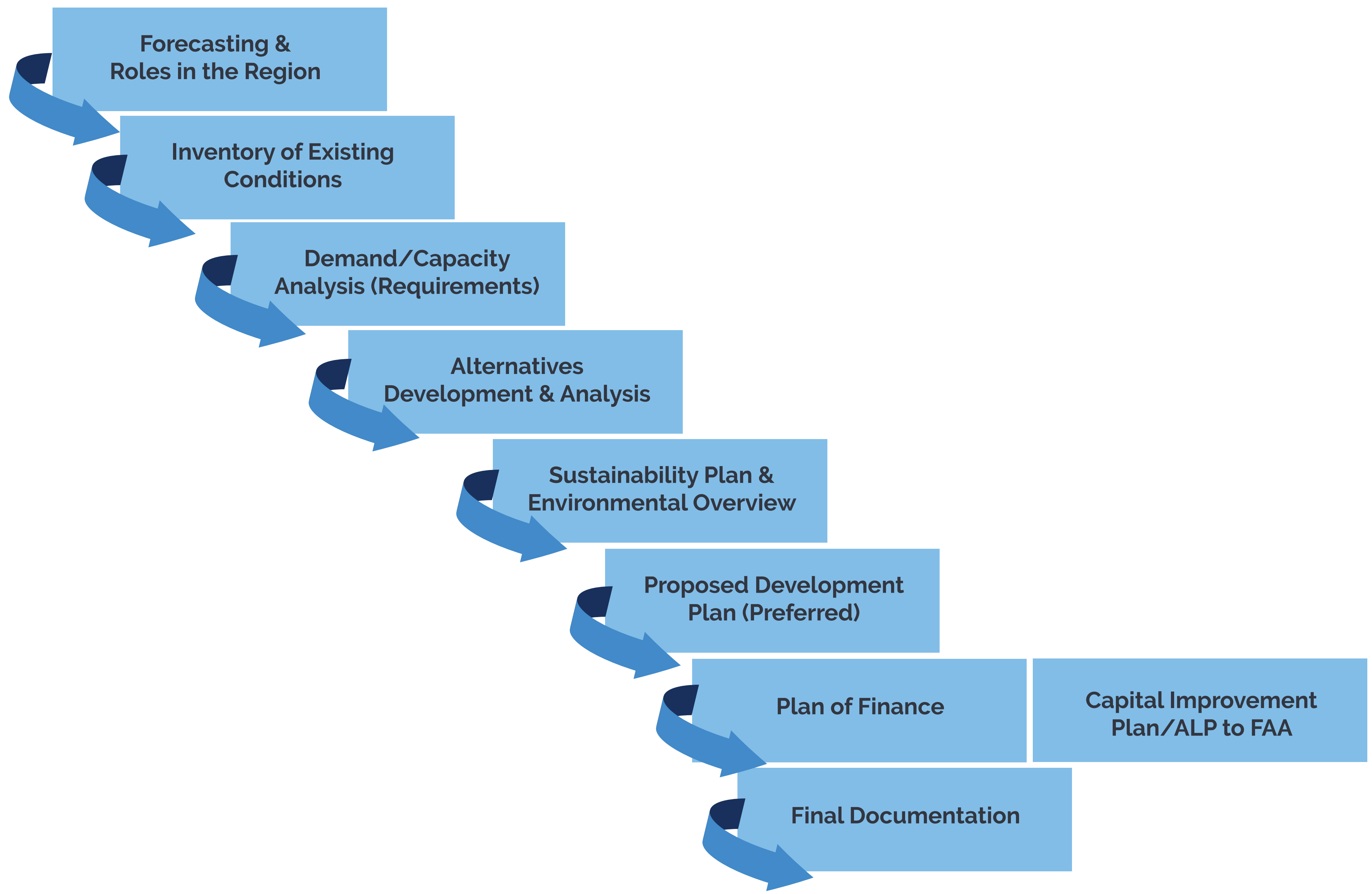
- Airfield
  - » Validate that the existing airfield capacity will meet long-term projected demand.
  - » Reduce number of aircraft crossing runways to reduce risk.
  - » Evaluate the need for increasing the length of the east or west runways to equal that of the center runway.
  - » Address Hot Spots 1 and 2.
  - » Meet new FAA geometric standards.
- Support Facilities
  - » Evaluate the need for and siting of a Ground Run-up Enclosure (GRE).
  - » Accommodate future growth in Maintenance Repair and Overhaul (MRO), cargo or other tenants.
  - » Preserve land for growth of Fixed Based Operators (FBO), and MSCAA Operations/ Maintenance functions.

Master Plan Methodology

In 2017, the MSCAA commissioned a team led by Jacobsen Daniels Associates, LLC (J|D), to prepare a comprehensive update to the MEM Master Plan. The Master Plan study followed guidance provided in Advisory Circular (AC) 150/5070-6B. The scope of work was developed in conjunction with the MSCAA and the FAA, which assisted in identifying the appropriate components requiring analysis along with defining the appropriate level of detail.

The Master Plan process depicted in **Figure 1.0** was utilized by the consultant team involved distinct phases, listed below, which are presented in greater detail in the following sections.

FIGURE 1.0: MASTER PLAN PROCESS



PHASE 1 - INVENTORY, FORECASTING AND OUTREACH PLAN

The first phase of the Master Plan process included developing a forecast of activity and defining existing conditions. Work performed in this phase included preparing a detailed inventory of all existing conditions, developing the forecast of aviation demand, and establishing the public involvement program.

These initial efforts also included defining the role that each of the three airports operated by the MSCAA play in the Region. Although this effort focused more on the roles of General Dewitt Spain (M01) and Charles Bakers (2M8) Airports, for which Master Plan Updates were also completed, it did inform the master plan process for MEM. The Roles in the Region Report is included as **Appendix A** for reference.

The inventory of existing conditions documented the current state of all facilities on the Airport. This provided a baseline from which to measure future requirements and alternatives. The forecast of aviation demand analyzed the market conditions of the Memphis-Shelby County region and projected the 5-year, 10-year, and 20-year demand for commercial airline passenger traffic, commercial airline operations, general aviation activity, and cargo activity.

The final component of the initial efforts was to establish an outreach strategy. Working with the MSCAA, a program was developed to engage tenants, other stakeholders and inform the public, including providing a venue for comment throughout the Master Plan process. In addition to establishing a Citizens Advisory Committee (CAC) and Technical Advisory Committee (TAC), the program established a schedule of Master Plan presentations to the Airport Authority board members at key milestones. All MSCAA board meetings are public meetings, therefore these meetings provided the general public an opportunity to hear updates about the Master Plan developments as well as make any statements regarding the plan. Finally, a public open house was conducted to allow those interested to understand and comment on the results of the master plan. The details of the Public Outreach strategy are described in greater detail in the following sections.

PHASE 2 -FACILITY REQUIREMENTS AND DEMAND/CAPACITY ANALYSIS

Phase 2 of the Master Plan process analyzed the capacity for each major functional component at the Airport, determined future demand, and then established the future requirements. The demand/capacity analysis reviewed the available capacity of all existing components at the Airport against the projected growth in passengers and aircraft operations. This analysis provided the basis for understanding whether a facility was adequate to meet the projected demand, or if there are anticipated deficiencies within the planning horizon.

Facility requirements were derived from the demand/capacity analysis. Future requirements for each component were examined and then incorporated as part of the overall future requirements to meet the Airport's future projected demands.

PHASE 3 – ALTERNATIVES ANALYSIS

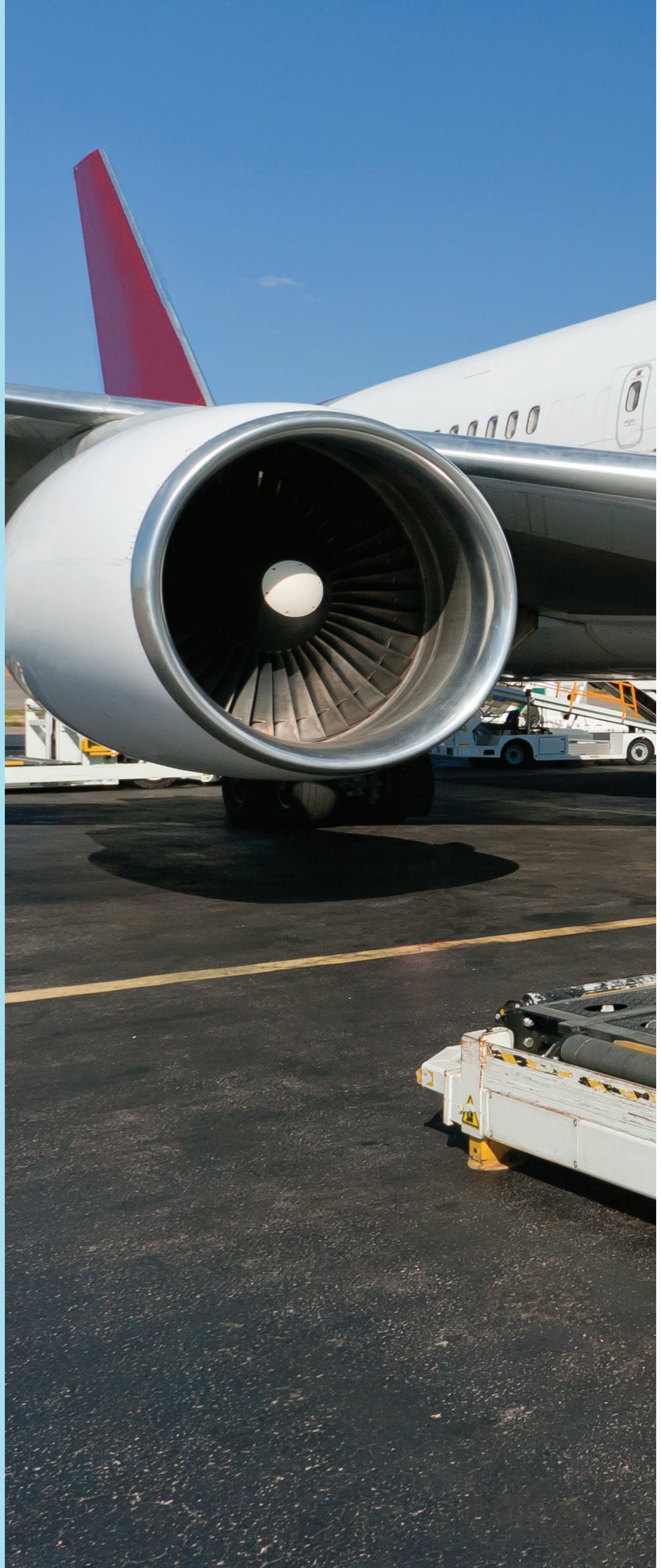
The alternatives analysis began by taking the deficiencies identified in the demand/capacity analysis and the future requirements for each component, and then creating a series of alternatives for each functional component that would fulfill the projected future requirements. The alternatives were rigorously evaluated by the project team working together with the MSCAA and the Technical Stakeholder Advisory Committee. Using a set of defined evaluation criteria based on the goals and objectives of the Master Plan, a preferred alternative was established to address the identified deficiencies for each component of the Master Plan.

PHASE 4 - ESTABLISH PROPOSED DEVELOPMENT PLAN

In Phase 4, the preferred alternatives were integrated into a proposed development plan. This development plan also analyzed the financial feasibility of implementing the proposed improvements, environmental considerations and developed a Sustainability Plan to guide the MSCAA in the future. Working through the available financial sources, the recommended improvements were inserted into the Capital Improvement Program (CIP) to outline a financially viable approach to implementing improvements over the course of the 20-year planning horizon.

PHASE 5 - FINAL DOCUMENTATION

Phase 5 of the Master Plan process took information prepared during the various phases of the Master Plan that was contained in several preliminary reports and compiled that information into a final Master Plan document that included the detailed Technical Report, the Airport Layout Plan (ALP) and the accompanying geographic information system (GIS) documentation.



INVENTORY

The purpose of this Master Plan Update is to provide a plan to guide future development of the Airport and to ensure appropriate facilities are available to accommodate the anticipated level of demand and to support future growth of the Airport over the 20-year planning period. Chapter 1 provides background data on the Airport and a comprehensive inventory of existing airport facilities and activity. The information contained in this Inventory will be used as a basis for assessing existing and future airport operating performance and to advise future facility requirements. Chapter 2 Inventory is organized into the following sections:

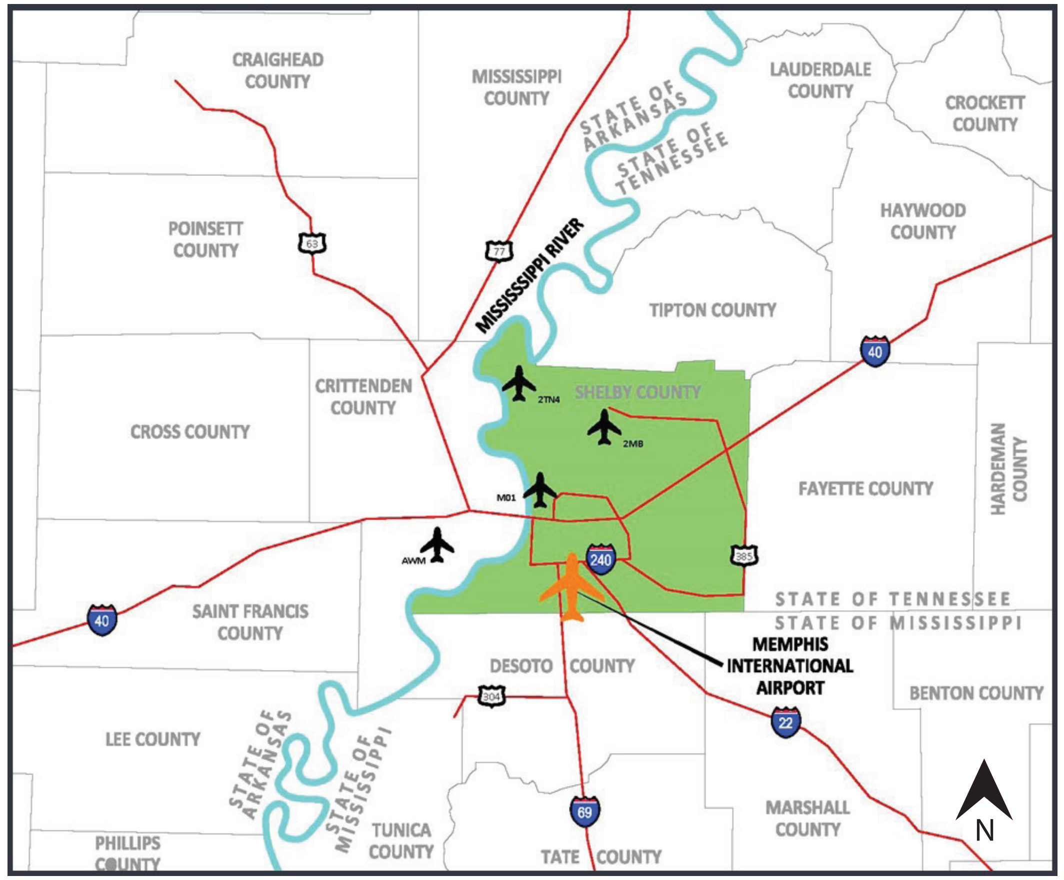
1) Airport Overview
2) Airfield and Airspace
3) Commercial Passenger Terminal
4) Terminal Passenger Processor
5) Access, Ground Transportation, Parking and Rental Car
6) Air Cargo
7) General Aviation and Military
8) Support Facilities
9) Utilities
10) Existing Environmental Conditions

AIRPORT OVERVIEW

Memphis International Airport is owned and operated by the Memphis-Shelby County Airport Authority. As shown on **Figure 2.0,** the Airport is in Shelby County, Tennessee, about seven (7) miles southeast of downtown Memphis and three-and-a-half (3.5) miles north of the Tennessee – Mississippi state line. According to the 2017 U.S. Department of Commerce, Bureau of the Census, Memphis is the 42nd largest metropolitan region in the United States with a population of approximately 1.35 million people. Shelby County lies along the Mississippi River and is the largest and most populous county in Tennessee.

The Airport is classified in the National Plan of Integrated Airport Systems (NPIAS) as a Commercial Service Primary Airport serving origin-destination (O&D) passengers (i.e., passengers beginning or ending their air journeys in Memphis). The Airport is also home to the FedEx "World Hub" which is the largest package sorting facility in the FedEx global network.

FIGURE 2.0: AIRPORT LOCATION



Source: Master Plan Team

AIRPORT SITE

The Airport occupies approximately 5,100-acres and is roughly bounded by Nonconnah Creek to the north; Tchulahoma and Swinnea Roads and the Oakhaven residential neighborhood to the east; East Shelby Drive to the south; and Airways and Plough Boulevards to the west. Primary access is provided from the northwest via Plough Boulevard and Jim McGehee Boulevard. Winchester Road, a primary east-west arterial, bisects the Airport site and tunnels under elements of the airfield infrastructure.

Figure 2.1 depicts the overall Airport site, which includes:

- **Airfield –** A system of four (4) runways including three (3) north-south parallel runways and one east-west runway, associated taxiways, aprons, hold pads, and surfaces.
- **Main Terminal –** Located between the runways, the Main Terminal consists of a passenger processing area that accommodates ticketing, baggage claim, and security screening functions, as well as ground transportation facilities. Three (3) concourses, the largest of which is currently undergoing an extensive modernization program, provide passenger access to aircraft.
- **FedEx SuperHub –** The FedEx SuperHub encompasses the majority of the area north of Runway 9-27 and features numerous facilities such as aircraft gates/hardstand parking positions, sort facilities, maintenance hangars, corporate offices, employee parking, support vehicle storage, and an independently-operated fuel farm.
- **Air Cargo –** In addition to FedEx facilities, additional air cargo aprons and hangars facilities serving UPS and other carriers are located on the east side of the airfield.
- **General Aviation (GA) –** Two (2) Fixed Base Operators (FBOs)—Signature Flight Support and Wilson Air Center—are located in separate areas of the Airport and provide a wide- range of services to general aviation.
- **Rental Car –** Rental car companies operate using a consolidated rental car facility (ConRAC) located adjacent to the Main Terminal on the first two floors of the Economy Parking Garage. Fuel and wash operations are conducted in a quick turnaround area onsite. Heavy maintenance and storage activities are currently conducted at a site west of Airways Boulevard and south of Winchester Road.
- **Military –** The southeast quadrant of the Airport is home to the 164th Tactical Airlift Wing of the Tennessee Air National Guard (TnANG), which is located on an approximately 118-acre site.
- **Support Facilities –** Primary support facilities include: airline maintenance facilities, a fuel farm located south of the Main Terminal, FAA air traffic control facilities, employee parking, Aircraft Rescue and Firefighting (ARFF), and airfield maintenance and support facilities located throughout the site.

Airport Access

Access to the Airport is provided predominately from Interstate 240 (I-240) via Plough Boulevard, a four-lane divided highway with ramps providing direct access to the terminal area. A secondary access route is provided via Tchulahoma Road and Winchester Road. Major arterial roadways including Democrat Road, Tchulahoma Road, Winchester Road, Swinnea Road, East Shelby Drive, and Airways Boulevard provide access to functional areas throughout the Airport site. Democrat Road, Tchulahoma Road, Winchester Road, Swinnea Road, East Shelby Drive, and Airways Boulevard provide access to functional areas throughout the Airport site.

Baseline Conditions

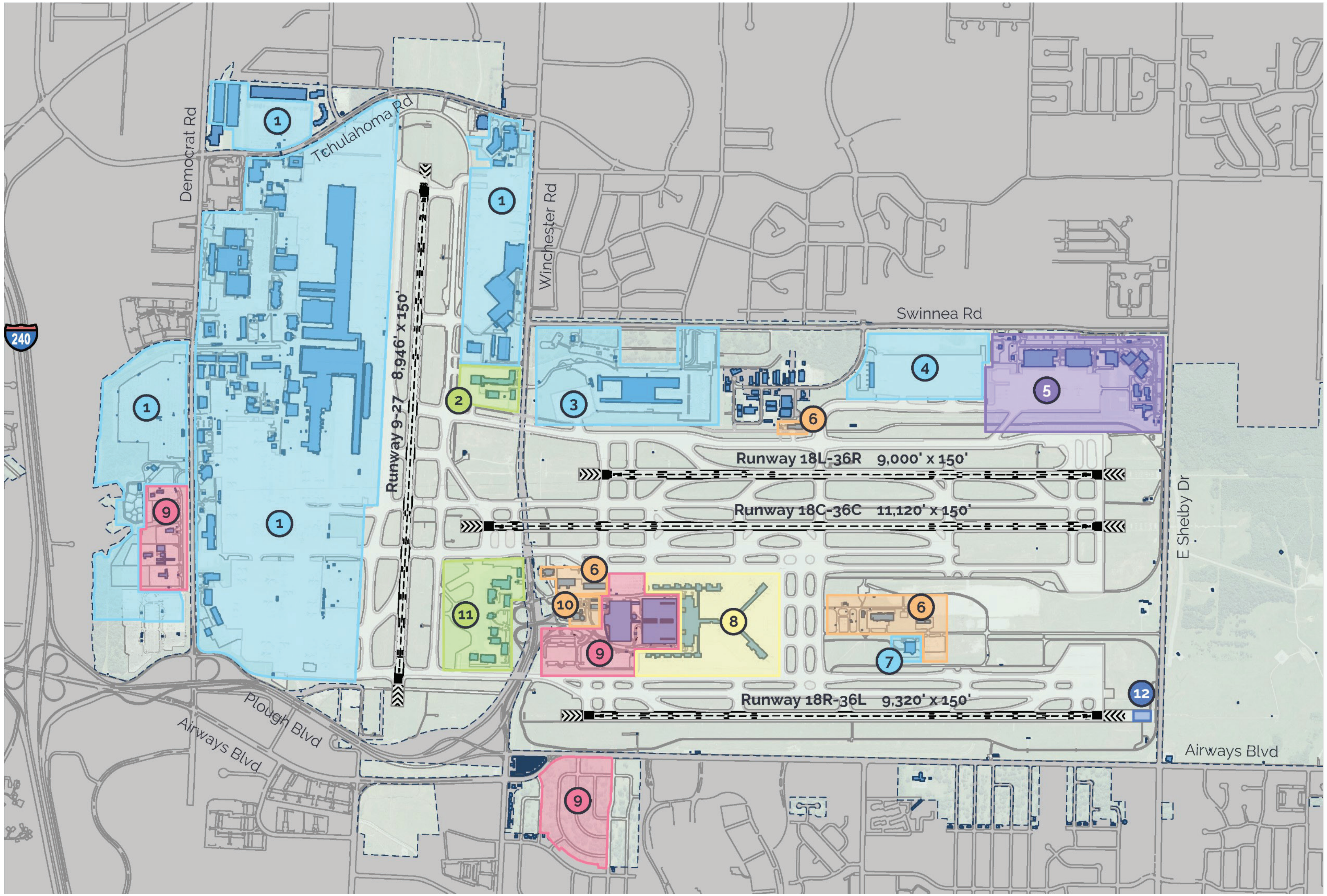
During the course of preparing this Master Plan, which was delayed due to the Global Pandemic, several Airport projects that were still under construction have been completed. When the Inventory was completed, these projects were not yet completed. Although some graphics depict them as in progress or in the future, they were considered part of the existing or "baseline" conditions at the Airport. These projects are listed in **Figure 2.2.**

FIGURE 2.2: AIRPORT PROJECTS UNDER CONSTRUCTION DURING THE PREPARATION OF THE INVENTORY

Project	Description
Concourse B Modernization	Opened February 15, 2022
Consolidated rental car (ConRAC) service sites	Opened April 2019
Centralized deicing facility and cross-field taxiways	Opened November 29, 2022
Mission Support Center	Opened in December 2020

Source: MSCAA Staff

FIGURE 2.1: AIRPORT SITE



Legend

- Airport property line
- Buildings
- Off-airport property

Airport Functional Areas

1. (Cargo) FedEx SuperHub™ facilities
2. (General aviation) Wilson Air Center
3. (Cargo) UPS distribution center
4. (Cargo) East cargo ramp
5. (Military) Tennessee Air National Guard
6. Airport support facilities
7. Vacant (previously USPS sorting facility)
8. Passenger terminal building
9. Landside facilities
10. (Airport support facilities) ATCT / TRACON
11. (General aviation) Signature Flight Support
12. EMAS

Sources: 2016 MSCAA AGIS Airport Layout Plan CADD line work
2010 MSCAA Master Plan CADD line work

0' 2,000'
GRAPHIC SCALE: 1"=2,000'

Source: Master Planning Team, March 2019

AIRFIELD AND AIRSPACE

This section provides an overview of existing airfield facilities at MEM as well as aids to navigation and airspace provisions.

Airfield

The MEM airfield consists of runways, taxiways, apron areas, service roads, and other facilities, as discussed below. . Airfield facilities meet Runway Design Code (RDC) D-V criteria, meaning the runways and taxiways can accommodate air carrier aircraft with approach speeds up to 165 knots and wingspans up to 214 feet. Aircraft Design Group (ADG) V aircraft include the Boeing 777 (B777) and Boeing 747-400 (B747-400). Approximately ten years ago, it was thought that the airfield may need to be upgraded to accommodate aircraft in ADG VI, as FedEx had ordered several Airbus A380 freighter (A380F) aircraft. Subsequently, some facilities are sized with that in mind. However, FedEx subsequently focused its large aircraft growth on the Boeing 777 freighter (B777F), negating the need for continued ADG VI improvements.

Runways

As illustrated on **Figures 2.3 and 2.4**, the Airport has four (4) runways: 9-27, 18C-36C, 18L-36R, and 18R-36L, all of which are used to accommodate air carrier aircraft. Runways 18C-36C, 18L-36R, and 18R-36L are parallel to one another and are located in the southern portion of the airfield. Runway 9-27 is perpendicular to and located north of the other runways. None of the four (4) runways intersect. Detailed characteristics of the Airport's runways, including dimensions, lighting and navigational aids, and pavement strength are summarized on **Figure 2.5**.

Taxiways

Figure 2.3 also shows the location of the taxiways that connect the runway system to aircraft parking areas. All taxiways are at least 75 feet wide, satisfying the width requirements for Taxiway Design Group (TDG) 6 aircraft. Taxiways Y, S, C, J, N, and M (listed from east to west) run in a north-south direction parallel to the Runway 18-36 system. Taxiways T, P, H, and R provide connections between the east and west portions of the southern airfield. Taxiways V and A run parallel to Runway 9-27.

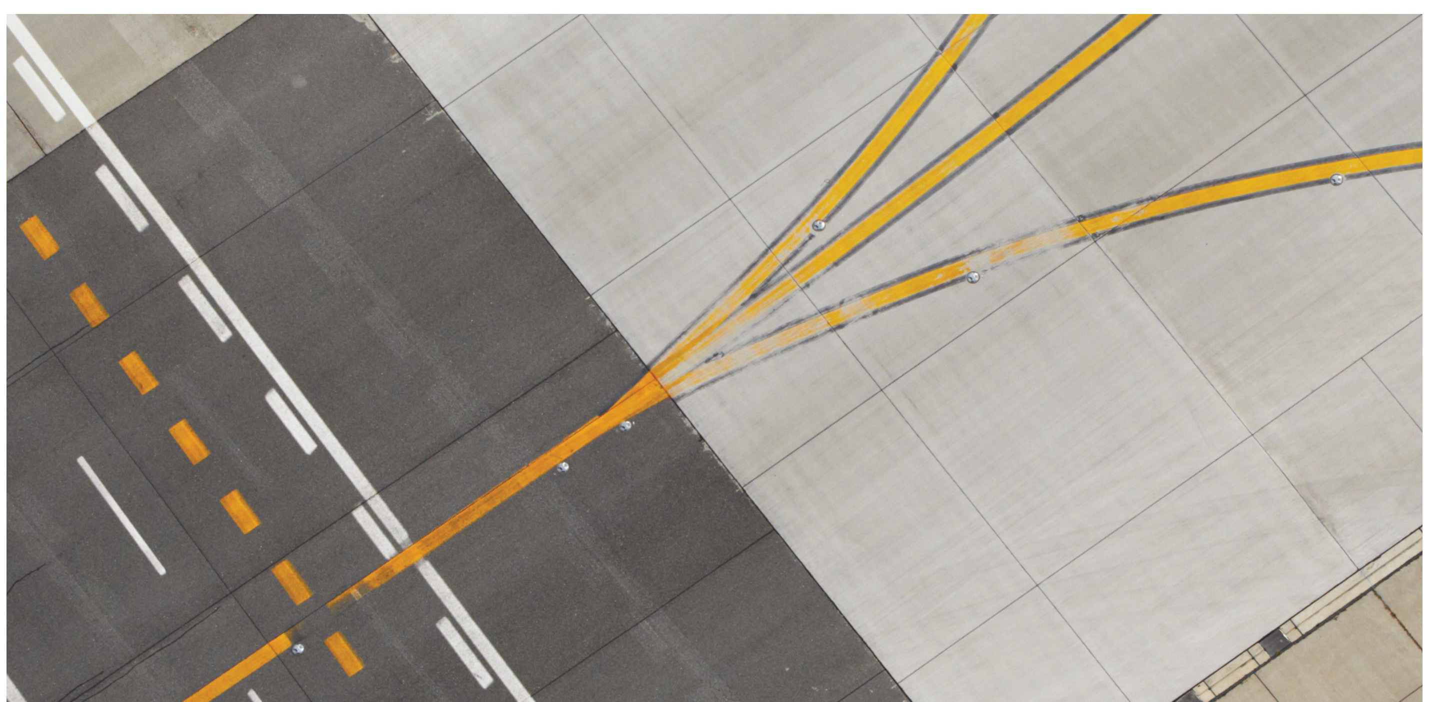


FIGURE 2.3 MEM AIRPORT DIAGRAM

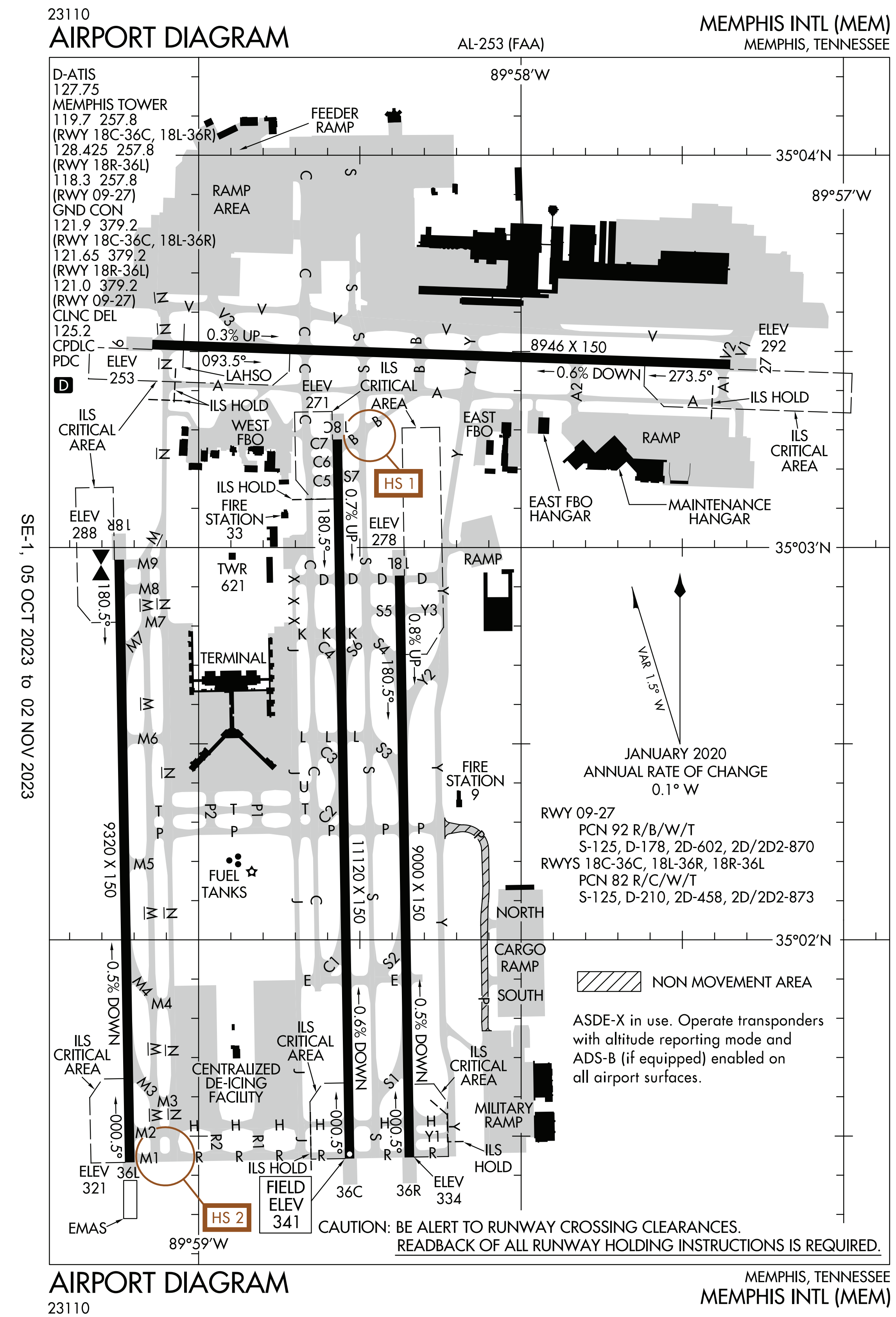
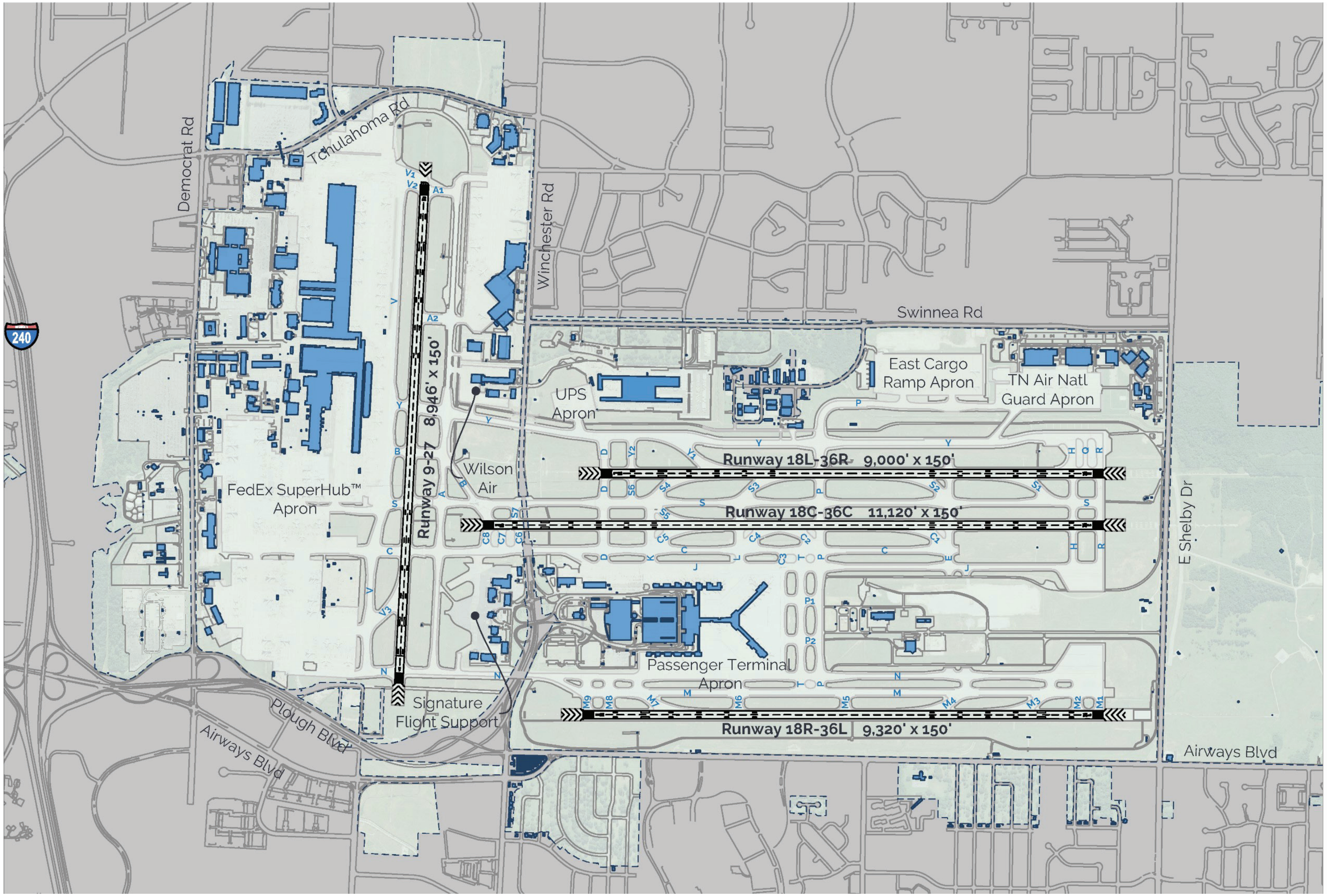


FIGURE 2.4: AIRFIELD FACILITIES



Legend

Airport property line	
Buildings	
Off-airport property	
ABC	Taxiway/Taxilane/Connector

Sources: 2016 MSCAA AGIS Airport Layout Plan CADD line work
2010 MSCAA Master Plan CADD line work
2018 Memphis International Airport FAA Airport Diagram

DECLARED DISTANCES

RUNWAY END	TORA	TODA	ASDA	LDA
9	8,946'	8,946'	8,946'	8,946'
27	8,946'	8,946'	8,946'	8,946'
18L	9,000'	9,000'	9,000'	9,000'
36R	9,000'	9,000'	9,000'	9,000'
18C	11,120'	11,120'	11,120'	11,120'
36C	11,120'	11,120'	10,715'	10,715'
18R	9,320'	9,320'	9,320'	9,320'
36L	9,320'	9,320'	9,320'	9,320'
18R FUT	11,120'	11,120'	11,120'	11,120'
36L FUT	11,120'	11,120'	11,120'	11,120'

0' 2,000'
GRAPHIC SCALE: 1"=2,000'

FIGURE 2.5 RUNWAY CHARACTERISTICS

Characteristic	Runway 9	Runway 27	Runway 18L	Runway 36R	Runway 18C	Runway 36C	Runway 18R	Runway 36L
Runway length (feet)	8,946	8,946	9,000	9,000	11,120	11,120	9,320	9,320
Runway width (feet)	150	150	150	150	150	150	150	150
Runway end elevation (feet AMSL)	253.2	292.0	277.5	334.7	270.6	340.9	288.4	320.8
Pavement type/friction	Concrete/grooved	Concrete/grooved	Concrete/grooved	Concrete/grooved	Concrete/grooved	Concrete/grooved	Concrete/grooved	Concrete/grooved
Pavement strength (psf)								
Single gear	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000
Dual gear	178,000	178,000	210,000	210,000	210,000	210,000	210,000	210,000
Dual tandem gear	602,000	602,000	458,000	458,000	458,000	458,000	458,000	458,000
Double dual tandem gear	870,000	870,000	873,000	873,000	873,000	873,000	873,000	873,000
Runway markings	Precision	Precision	Precision	Precision	Precision	Precision	Precision	Precision
Runway lighting	HIRL	HIRL	HIRL	HIRL	HIRL	HIRL	HIRL	HIRL
Centerline lights	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Approach lighting	MALSR	MALSR	MALSR	ALSF-2	MALSR	ALSF-2	MALSR	ALSF-2
Approach aids	LOC	PAPI (P4L)	PAPI (P4L)	PAPI (P4L)	LOC	LOC	LOC	PAPI (P4L)
	GS	LOC	LOC	LOC	GS	GS	GS	LOC
		GS	GS	GS				GS
Instrument Approach Procedures	ILS (CAT I)	ILS (CAT I)	ILS (CAT I)	ILS (CAT I, II, III)	ILS (CAT I)	ILS (CAT I, II, III)	ILS (CAT I)	ILS (CAT I, II, III)
	RNAV (GPS)	RNAV (GPS)	RNAV (GPS)	RNAV (GPS)	RNAV (GPS)	RNAV (GPS)	RNAV (GPS)	RNAV (GPS)
Minimum approach decision height (feet AMSL)	466	492	501	NA	655	NA	495	NA
Minimum approach visibility	2,400 RVR	2,400 RVR	1,800 RVR	300 RVR	3,500 RVR	300 RVR	1,800 RVR	300 RVR

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 lights with runway alignment indicator lights
NA = Not applicable
PAPI (P4L) = Precision approach path indicator (four identical light units placed on left side of runway)
REIL = Runway end indicator lights
RNAV = Area navigation
RVR = Runway visual range

Sources: Airport Master Record, October 2018. Federal Aviation Administration, Digital Terminal Procedures Publication, November 2018.

Apron Areas

Aircraft apron and parking areas located throughout the airfield include the following.

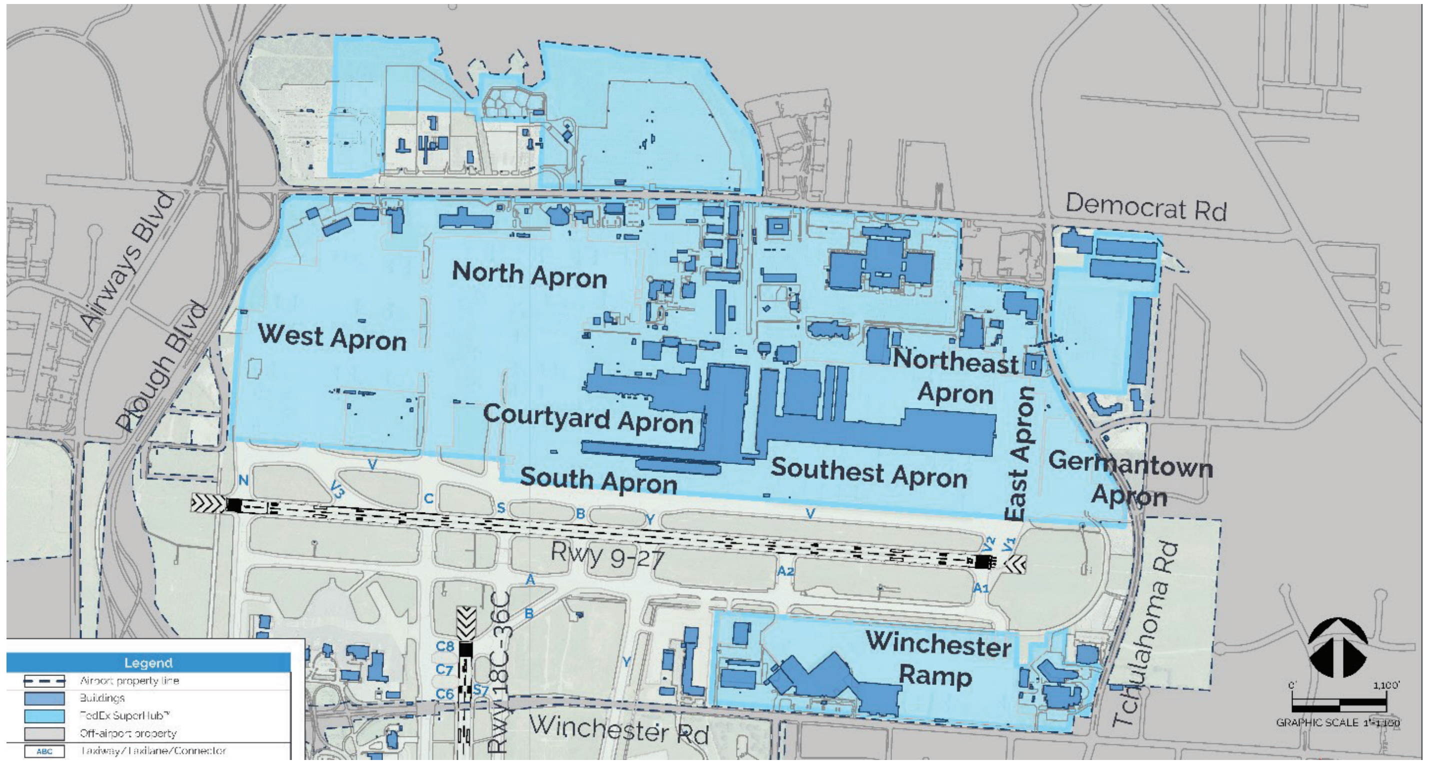
- **Passenger Terminal** – The Passenger Terminal Apron is approximately 2.8 million square feet and located between Runways 18R-36L and 18C-36C. Commercial passenger aircraft ranging in size from small commuter to large widebody park here to load and unload passengers and belly cargo. Airfield access is provided via Taxiways J, N, and T (via P1 and P2).
- **East Cargo** – The Airport has a 1.4 million square foot general-use cargo apron, named Cargo Central, and is located on the east side of the airfield. Airfield access is provided via Taxiway P.
- **United Parcel Service (UPS)** – A 390,000 square foot UPS Apron is located north of the UPS Oakhaven Distribution Center on the east side of the airfield, immediately south of Winchester Road. The UPS Apron is used for parking aircraft and active loading and unloading of cargo. Airfield access is provided via Taxiway Y.
- **FedEx Express (various)** – FedEx parks aircraft for active loading and unloading and maintenance on several aprons surrounding their major sorting facilities in the SuperHub.

These aprons encompass 16.3 million square feet, and include the following pavements, which are depicted on **Figure 2.6**:

- » West Apron, between Taxiways C, N, and V
- » North Apron, between Taxiways C, V, and the SuperHub
- » Courtyard Apron, between Taxiway S and two wings of the SuperHub;
- » South Apron, between Taxiways S, V, and Y
- » Southeast Apron, between Taxiways Y, V, and V1
- » East Apron, east of the SuperHub
- » Northeast Apron, located to the northeast of the SuperHub
- » Germantown Apron, located between the East Apron and Tchulahoma Road
- » Winchester Ramp/FedEx Maintenance Ramp, located south of Taxiway A

- **General Aviation** – Two (2) FBOs operate at the Airport: Signature Flight Support and Wilson Air Center. Both FBOs are on the northern portion of the Airport, south of Taxiway A, with Signature positioned between Taxiways N and C, and Wilson positioned east of Taxiway Y. The Signature aircraft parking apron is approximately one (1) million square feet. The Wilson Air aircraft parking apron is approximately 500,000 square feet. Both aprons are used for FBO operations and itinerant aircraft parking.
- **Tennessee Air National Guard** – The TnANG Apron is located in the southeast corner of the airfield and encompasses approximately 1.2 million square feet. The apron is accessed via an unnamed entrance from Taxiway Y, as well as Taxilane P.

FIGURE 2.6: FEDEX APRON AREAS



Source: Master Planning Team, March 2019

Centralized Deicing Facility

A Central Deicing Facility (CDF) is located south of the terminal building between Taxiways J and N and will accommodate 11 ADG V and one (1) ADG VI aircraft positions for centralized deicing operations. Six (6) of the 12 aircraft deicing positions will be located west of Louis Carruthers Drive and provide access to aircraft via Taxiway N. The remaining six (6) aircraft deicing positions will be located east of Louis Carruthers Drive and will be accessed via Taxiway J.

Deicing fluid will be stored at a central tank farm on site, then pumped to vehicle safety zones located adjacent to 12 aircraft deicing positions. Deicing equipment will then be able to withdraw deicing fluid and commence aircraft deicing operations. Deicing fluid from these operations will be collected entirely by surrounding trench drains and routed to an underground detention facility onsite. Spent deicing fluid will then be pumped and metered to the City of Memphis sanitary sewer system at predetermined rates and limits.

Service Roads

The Airport's main service road is Perimeter Access Road. It surrounds much of the south airfield and provides Authority and other airport personnel with a continuous secure access route clear of aircraft operations to over 80 percent of the airfield. Perimeter Access Road provides access from the FedEx maintenance ramp and facilities at the corner of Tchulahoma and Winchester Roads to Wilson Air Center, UPS Oakhaven facility, ARFF station, East Cargo Apron, TnANG base, and major aviation support facilities located in the south airfield between Runways 18C-36C and 18R-36L.

Airfield Structures

Winchester Road bisects the airfield north of the terminal, providing connectivity between areas east and west of the Airport. Four (4) bridge structures enable the airfield pavement infrastructure to cross over Winchester Road. These four structures include: (1) a narrow bridge supporting Perimeter Road; (2) a reinforced concrete bridge that supports Taxiway Y; (3) a 1,125-foot-long reinforced concrete bridge supporting Runway 18C-36C and Taxiways C and S; and (4) a bridge that supports Taxiway N

Most structures span between 150 and 200 feet, varying with the width of Winchester Road below. The CDF construction will include the development of two (2) new underpasses for the relocated Louis Carruthers Drive to pass under Taxiways R and H. These structures will extend beyond the taxiway shoulders and taxiway safety areas. Each will be approximately 240 feet in length. Additionally, there are several drainage culverts located beneath portions of the airfield. The largest is a concrete culvert that channels Hurricane Creek in a north-south orientation beneath Runway 9-27 and the FedEx SuperHub facilities. A separate concrete culvert for Hurricane Creek is located beneath the military ramp entrance from Taxiway Y at the southern end of the airfield. Lastly, storm water collected in the vicinity of the passenger terminal apron is transported through a culvert in an east-west orientation to a drainage area near Airways Boulevard.

Airfield Geometry

The following section provides an overview of the runways at MEM, airfield geometric features and standards, including separation standards and areas of potential geometric criteria deficiencies.

Runway to Runway Separation

Based on AC 150/5300-13A, *Airport Design*, Change 1, the minimum lateral separation between parallel runway centerlines for simultaneous Visual Flight Rules (VFR) operations is 700 feet. D-V and D-VI runways are recommended to be spaced 1,200 feet apart. For simultaneous precision instrument approaches, the minimum parallel runway centerline separation should be 4,300 feet. All runways meet these minimum requirements. Runway 18L-36R and Runway 18R-36L are spaced 4,300 feet apart, allowing simultaneous precision approaches, and Runway 18C-36C is spaced approximately 900 feet from Runway 18L-36R, meeting minimum separation requirements for VFR simultaneous operations.

Runway to Parallel Taxiway Separation

For runways designed to serve aircraft with a RDC of D-V, the minimum runway centerline to parallel taxiway centerline separation distance is 400 feet. For runways with instrument approach minimums of less than ½ mile, this distance increases to 500 feet. Runway 18R-36L, Runway 18L-36R, and Runway 18C-36C have CAT II / CAT III published instrument approaches with visibility minimums as low as 300 feet Runway Visual Range (RVR). Based on these minimums, the minimum parallel taxiway separation based on AC 150/5300-13A, Change 1 criteria should be 500 feet. During CAT II/III operations, the Air Traffic Control Tower (ATCT) currently enacts a procedure in which operations on one or more parallel taxiways are halted in order to meet the minimum 500' separation requirement.

- **Runway 18R-36L** Runway 18R-36L has two (2) full parallel taxiways on the east side of the Runway. The closest parallel taxiway, Taxiway M, has 400-feet spacing. The outboard parallel taxiway, Taxiway N, is spaced 700 feet from the runway centerline, which meets criteria during CAT II/III operations.
- **Runway 18C-36C** Runway 18C-36C has three (3) parallel taxiways, two (2) of which are full length and one is a partial parallel. Taxiway C, a partial parallel on the west side of the runway, is spaced at 450 feet from the runway centerline. Taxiway J is a full parallel taxiway on the west, spaced at 750 feet from runway centerline. Taxiway S is a full-length parallel taxiway serving both Runway 18C-36C and Runway 18L-36R and is spaced 400 feet east of the Runway 18C-36C centerline.
- **Runway 18L-36R** Runway 18L-36R has two (2) parallel taxiways, one on each side of the runway. Both taxiways have at least 500-foot lateral separation from the runway centerline to taxiway centerline, ranging from 527 feet to 675 feet.
- **Runway 9-27** Runway 9-27 has a CAT I approach with published visibility minimums of ½ mile, which requires parallel taxiway separation of 400 feet. The full-length parallel taxiways for Runway 9-27, Taxiway A and Taxiway V, meet or exceed the 400-foot separation standard.

Modifications of Standards Review

Figure 2.7 depicts the approved Modification of Standards (MOS) on file.

Runway Hold Line Separation

Runway hold lines or holding position markings are placed on taxiways or runways at points for aircraft to hold their position prior to entering a runway. Per AC 150/5300-13A, Change 1, the required lateral distance from runway centerline to the holding position marking is 280 feet for all runways with instrument approach visibility minimums that are less than ¾ mile. This distance increases by one foot for each 100 feet in elevation above sea level. This results in a required hold line separation distance of 283 feet for all runways, which is met by all runway hold line positions.

Greater Than Three-node Intersections

The three-node concept provides for simplification of taxiway intersections and keeps the number of possible maneuvers at an intersection at three (3) or fewer. Adherence to this principle keeps taxiway intersections simple by reducing the number of taxiways intersecting at a single location and allows for proper placement of airfield markings, signage and lighting. The airfield was reviewed for instances of these intersections and the following locations were noted. These locations are depicted in **Figure 2.8**.

- Taxiway S /Taxiway S4/S5/K
- Taxiway S / Taxiway E/S2
- Taxiway E/C/C1
- Taxiway C/P/C2
- Taxiway C/C4/L
- Taxiway C/C5/K

Direct Access from Apron to Runway

FAA AC 150/1500-13A, Airport Design, recommends that taxiways not be designed to lead directly from an apron to a runway without requiring a turn. Such configurations can lead to confusion when a pilot typically expects to encounter a parallel taxiway but instead accidently enters a runway. The airfield was reviewed for instances of direct apron access to a runway and several instances. These locations are depicted in **Figure 2.8**.

- Taxiway V2/V1 (FedEx Apron)
- Taxiway Y (FedEx Apron)
- Taxiway B (FedEx Apron)
- Taxiway S (FedEx Apron)
- Taxiway C (FedEx Apron)
- Taxiway N (FedEx Apron)
- Taxiway A2
- Taxiway K (Passenger Terminal Apron)
- Taxiway L (Passenger Terminal Apron)
- Taxiway M6 (Passenger Terminal Apron)

Shoulder Dimensions

For taxiway shoulders, the critical design aircraft is the most demanding aircraft regularly operating at an airport in the highest TDG. For MEM, the MD-11, which is classified as TDG 6 due to its gear configuration, is the most demanding. Under TDG 6, taxiway shoulder dimensions should be 30 feet wide. Based on a review of shoulder dimensions across the airfield, all paved shoulders are at least 30 feet wide.

Taxiway Fillet and Centerline Radius Dimensions

With the publication of AC 150/5300-13A Change 1 in 2012, taxiway fillet design criteria were revised to correspond with TDG in addition to ADG. Taxiway design principles in accordance with TDG aim for standard 90-degree taxiway intersections without the pilot's use of judgmental oversteering and include longer fillet dimensions and lead-in line lengths prior to standard degree taxiway intersections.

The airfield taxiway system is currently based on "legacy" geometric design standards, meaning that the taxiway fillets currently are in accordance with design standards in effect prior to the publication of AC 150/5300-13A Change 1. While not deficient, it should be noted that as rehabilitation projects for taxiway pavements occur, taxiways should be designed in accordance with criteria of 5300-13A which would include, where practicable, greater fillet sizes.

A review of existing taxiway intersection geometry determined that taxiway centerline radii at intersections meet or exceed the minimum radius requirements of 115 feet for a 90-degree intersection and 150 feet for a 135-degree intersection.

Hot Spots

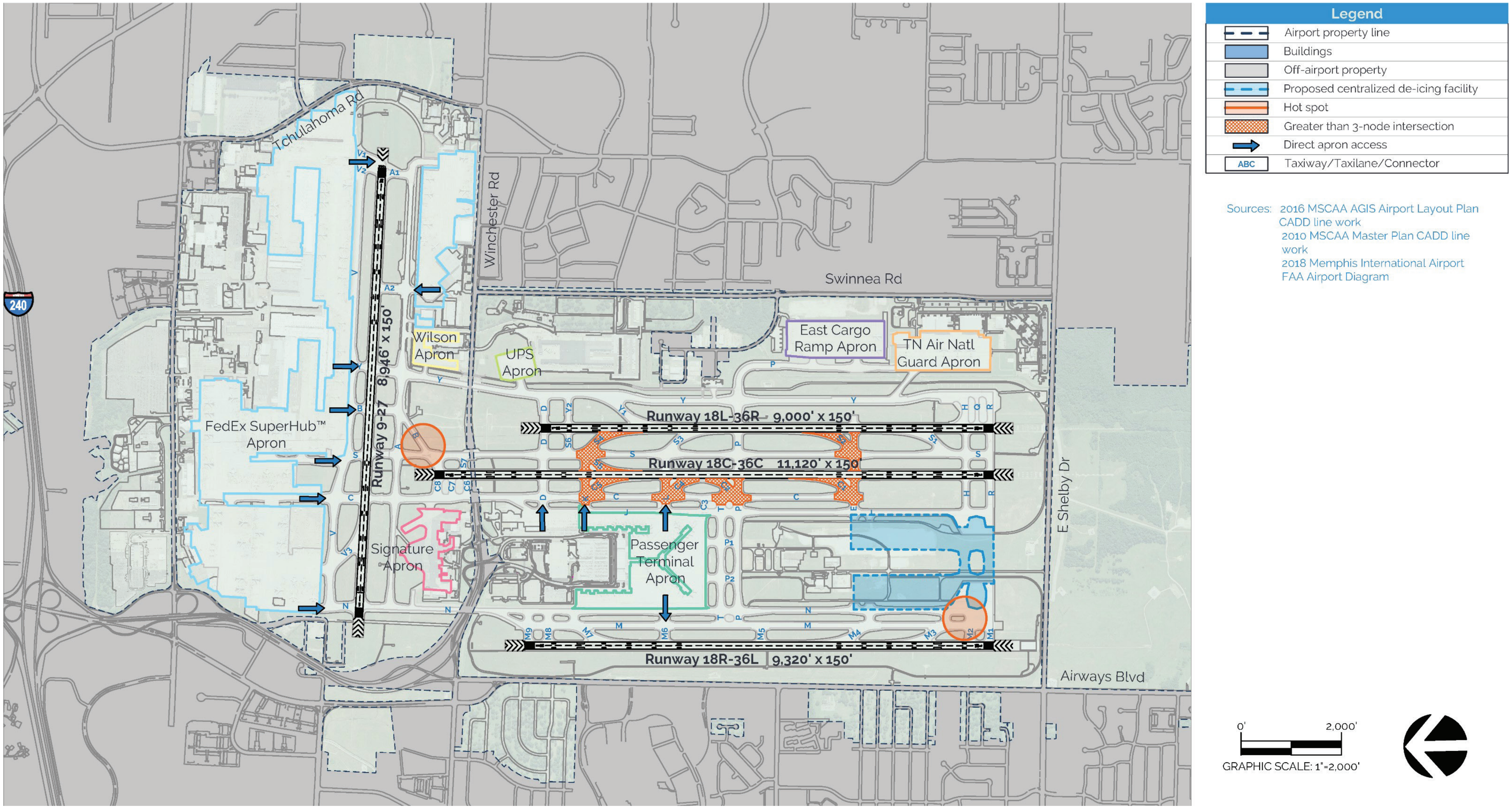
Hot spots are defined and designated by the Runway Safety Action Team as locations on an airport movement area with a history of potential risk of collision or runway incursion, and where heightened attention by pilots and drivers is necessary. The airfield has two (2) identified Hot Spots described below with locations depicted in **Figure 2.8**.

- **Hot Spot 1:** Located on Taxiway B in vicinity of Runway 18C, the hot spot designates two (2) holding position markings: one (1) for the 18C approach, one (1) for the 18C runway holding position west of Taxiway S.
- **Hot Spot 2:** Located in the Taxiway M/M1 intersection, near the holding apron for Runway 36L, the hot spot is designated to call attention to a taxiway departure risk by mistaking Taxiway M for Runway 36L.

FIGURE 2.7: APPROVED MODIFICATION OF DESIGN STANDARDS

MODIFICATION OF DESIGN STANDARDS					
NO.	STANDARD MODIFIED	FAA STANDARD	EXISTING CONDITION	PROPOSED ACTION	DATE APPROVED
1	FAA AC 150/5320-6E, Airport Pavement Design and Evaluation, 332.b.(2), With Stabilized Subbase	The AC recommends a maximum joint spacing of 20 feet for slabs equal to or thicker than 16 inches.	MSCAA requests to use 25-foot joint spacing with a 18-inch or greater concrete slab thickness	None	11/29/2016
2	FAA AC 150/5320-10G, Standards for Specifying Construction of Airports	AC 5320-6E recommends a stabilized subbase for pavements with aircraft weighing greater than 100,000 pounds. Acceptable materials are P-304, P-306, and P-401 and P-403. The minimum thickness of subbase is 4 inches	MSCAA proposes to use a 4" layer of "Porous Bituminous Base Course" (S-102) under the concrete.	None	12/1/2016
3	AC 150/5300-13A, Change 1, Airport Design, 418.b.(3)	Longitudinal Grades - AC states "A vertical curve is not necessary when the grade change is less than 0.40%..." for longitudinal grade changes of more than 0.40%, a vertical curve meeting requirements of 100 feet per 1.0% of change is required.	To salvage the existing concrete pavement & eliminate the need to replace it, the proposed design will include longitudinal grade changes on the Juliet Pad for TWYs R & H, which will exceed 0.40% at the existing trench drain.	None	4/4/2017
4	AC 150/5300-13A, Change 1, Airport Design, 418.b.(3)	Longitudinal Grades - AC states "A vertical curve is not necessary when the grade change is less than 0.40%..." for longitudinal grade changes of more than 0.40%, a vertical curve meeting requirements of 100 feet per 1.0% of change is required.	To salvage the existing concrete pavement & eliminate the need to replace it, the proposed design will include longitudinal grade changes on the November Pad for TWYs R & H, which will exceed 0.40% at two of the three existing trench drains.	None	2/15/2017
5	AC 150/5300-13A, Change 1, Airport Design	Airport Reference Code D-V	D-IV restriction for Taxiway V	None	9/9/2010
6	AC 150/5300-13A, Change 1, Airport Design	ADG VI required Taxiway Safety Edge Margin is 20 feet	Taxiway safety edge margin of 15 feet	None	Unknown
7	AC 150/5370-10 Specification P-401 Plant Mix Bituminous Pavements	Revising the requirement for asphalt to allow the use of polymer modified asphalt (section 401-3.2c.) and to allow the specification of performance graded asphalt (section 401-2.3).	Allow the use of polymer modified asphalt and allow the specification of performance graded asphalt	None	7/21/2003
8	AC 150/5300-13 Table 4.1 Taxiway Dimensional Standards	Table 4.1 - Taxiway Width of 100 ft. for Group VI operations	Taxiways A,C, and Y are 75 ft. Wide	Allow ADG VI aircraft (A380F) to operate on 75ft wide taxiway with operational restrictions and taxiway enhancements	3/25/2004
9	AC 150/5300-13 Table 4.1 Taxiway Dimensional Standards	Table 4.1 - Taxiway OFA of 167 ft. for Group VI operations	Taxiway A to North Service Road OFA is 163 ft.	Allow A38F0 to operate on Taxiway A under ADG V TOFA criteria with operational restrictions and taxiway enhancements	3/25/2004
10	AC 150/5300-13 Table 4.1 Taxiway Dimensional Standards	Table 4.1 - Pavement Edge Margin of 20 ft. for Group VI operations	Taxi exit routes only meet D-V (B747) standards	Closest 9 ft. of the full-strength shoulder be counted in achieving the edge margin	3/25/2004
11	AC 150/5300-13 Table 2-2	Table 2-2 - Group VI Runway to parallel Taxiway separation	Runway to Centerline separation of 527 ft. (Taxiway S), and 550 ft. (Taxiway Y).	Allow ADG VI aircraft (A380F) to operate on Runway with operational restrictions on parallel Taxiway	4/23/2004

FIGURE 2.8: NON - STANDARD AIRFIELD CONDITIONS AND HOT SPOTS



Source: Master Planning Team, March 2019

Instrument Approach Aids, Lighting, Visual Aids and Navigational Aids

A summary of instrument approaches, lighting systems, Visual Aids and Navigational Aids (NAVAIDS) that support aircraft operations is provided below.

Instrument Approaches

Airport runways include multiple precision instrument approach procedures to allow continuous aircraft operations during periods of low cloud ceilings and reduced 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 have RNAV approaches that utilize pre-determined waypoints and global positioning system (GPS) guidance to enable aircraft to fly point-to-point.
- **Category I ILS** – All runways are equipped with a Category I Instrument Landing Systems (ILS), which allows aircraft approaches to a decision height of 200 feet above ground level (AGL) in visibility minimums of ½ mile, varying slightly on each runway taking into account approach-specific parameters.
- **Category II/ III ILS** – Runways 36C, 36L, and 36R are equipped with either Category II or III 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.

Approach and Runway Lighting

All eight (8) runway ends are equipped with approach lighting systems that assist pilots in visually recognizing the orientation and touchdown point of the runway during descent. Runways 9, 27, 18C, 18L, and 18R are equipped with medium-intensity approach light systems with runway alignment indicator lights (MALSR) to support Category I ILS approaches. Runways 36C, 36L, and 36R 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 High-Intensity Runway Lights (HIRL) along their edges to depict the edge of runway pavement during nighttime and low visibility conditions. All runways also have centerline lights.

Visual and Navigational Aids

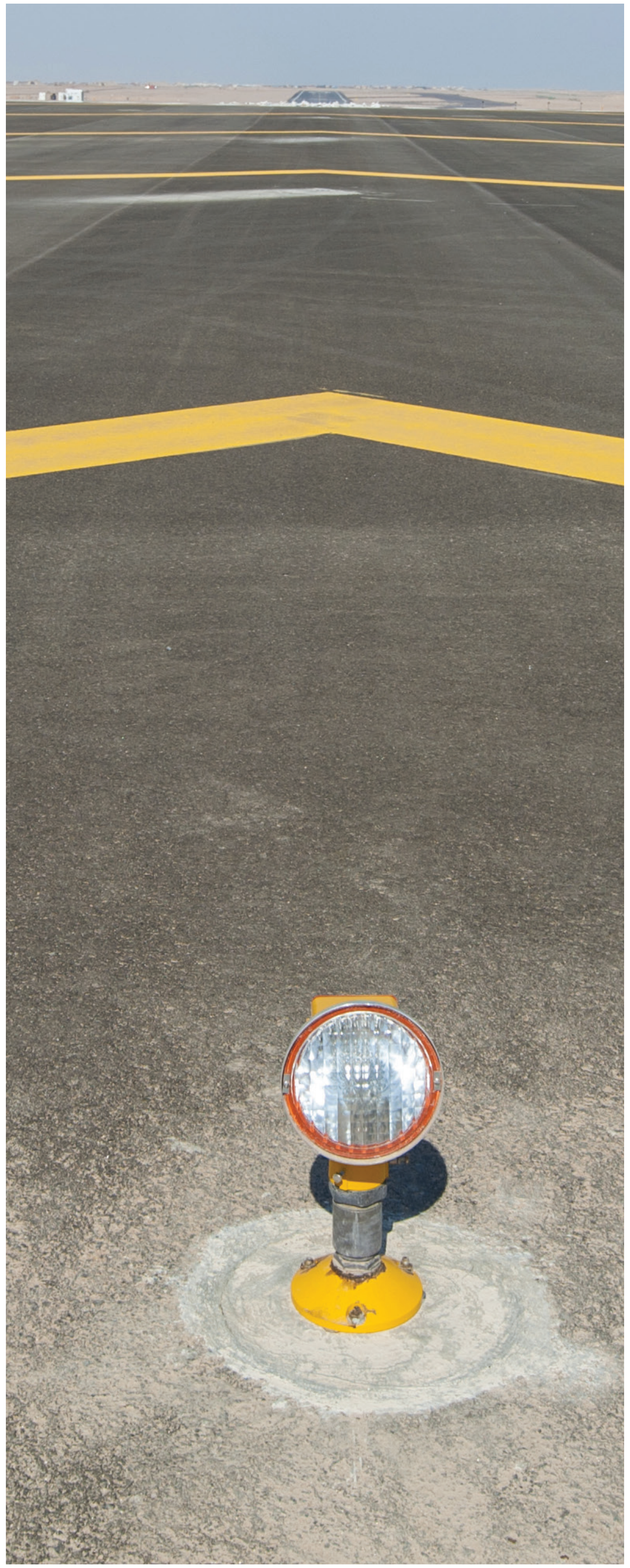
Additional visual and navigational aids include the following:

- **Precision Approach Path Indicator (PAPI)**—Additional visual and navigational aids include the following:
- **Tactical Air Navigation Facility (VORTAC)** – The VORTAC is located south of East Shelby Drive approximately 3,400 feet to the southeast of the Runway 36L threshold and is used for both enroute 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 north of East Shelby Drive on a platform that is approximately 2,030 and 1,670 feet from the Runway 36L and 36C thresholds, respectively
- **Rotating Beacon** – The Airport's rotating beacon is located adjacent to Taxiways J and P. The beacon flashes an alternating green and white light to help pilots locate the airfield at nighttime.

Surface Detection

The Airport utilizes an airport surface detection equipment (ASDE-X) system, which uses radar, multilateration and satellite technology to allow air traffic controllers to track aircraft and vehicles on the airfield. The ASDE-X system can also alert air traffic controllers of potential runway conflicts by providing detailed coverage of movement on runways and taxiways. The ASDE-X radar antenna is on top of the ATCT.

The Airport also has a Surface Movement Guidance Control Systems (SMGCS) plan 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.



Operating Procedures

The following sections summarizes airfield operating procedures.

Airfield Circulation Patterns

The Airport has three (3) north-south parallel runways that constitute the majority of airfield flows. For the airfield's largest user, FedEx, inbound and outbound taxi flows are predominantly centered on the Runway 18-36 system, although the FAA ATCT works to optimize capacity and get aircraft into the hub as efficiently as possible. Arrivals in north and south flows utilize various exit taxiways to access parallel Taxiways M, N, J, C, S and Y to taxi to various destinations including FedEx, FBOs, and the central terminal area. Departing (outbound) aircraft use the same parallel taxiways to access Runway 18C/18R or Runway 36C/36R for departure. For departures on Runway 36L, Taxiway N and Taxiway M are both used for aircraft queuing.

FedEx creates the largest activity peaks for the airfield. Its two (2) peaks occur in an overnight bank and a daytime bank. The overnight peak has a higher number of flights inbound and outbound during the same or shorter periods than the daytime peak. **Figure 2.9** shows the rolling hour arrivals and departures by our for the December 2017 FedEx schedule. This represents only FedEx activity and does not include other airlines, either passenger or cargo that occur throughout the day and night. Handoff between the FAA's ATCT and FedEx Ramp Control occurs at Taxiway V. FAA ATCT has control south of Taxiway V while FedEx has control north of the taxiway, however, responsibility for control of Taxiway V is swapped between FedEx Ramp Control and FAA ATCT at certain times as prescribed by an LOA.

Letters of Agreement

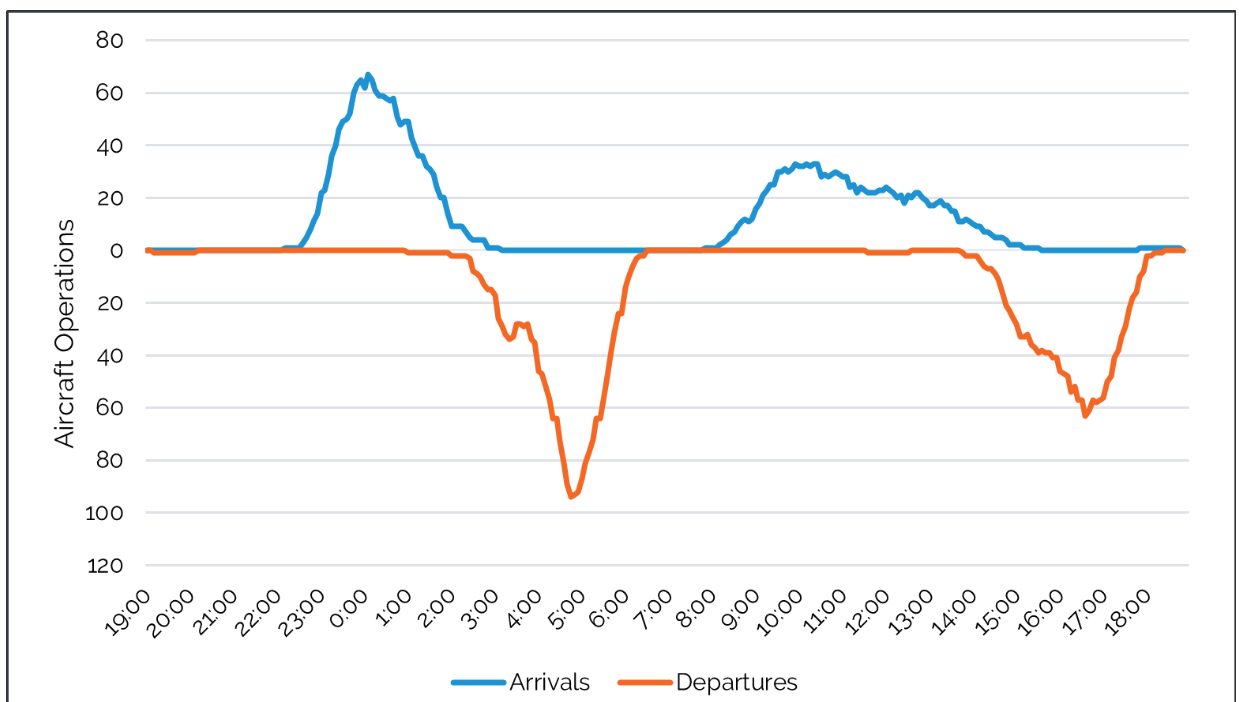
The MSCAA has Letters of Agreement (LOA) with other entities that detail responsibilities for parties in areas of movement responsibility, jurisdictional responsibilities, and various operational procedures. Review of the Airport's Part 139 Airport Certification Manual shows the LOAs summarized in **Figure 2.10.**

Noise Abatement Procedures

Based on a review of the Authority's FAR Part 150 Noise Compatibility Program completed in 2015, there are no formal noise abatement procedures in place. However, the following locally adopted procedures are utilized.

- Engine run-ups may only be conducted from 6:00am to 10:00pm in designated run-up areas except in emergency situations and after notification to the Authority. Only specific locations with prior may approval may be used and require prior approval.
- Turbojet aircraft are not authorized to turn or be assigned a heading which would result in an aircraft below 3,000 feet in altitude traversing residential areas north of Holmes Rd. and east and west of the extended centerline of Runway 18L/R
- Turbojet aircraft departing Runway 27 will not be authorized to turn south until leaving 3,000 feet or two (2) miles from departure end of the runway.

Figure 2.9: FedEx Rolling Hour Arrivals and Departures by Hour, December 2017



Source: Master Planning Team, March 2019

FIGURE 2.10: MSCAA ACTIVE LETTERS OF AGREEMENT

LOA Between MSCAA and	Subject	Effective Date
FAA ATCT	Movement Area Closing and Opening Procedures	11/25/2017
FAA ATCT	Jurisdictional Responsibilities	11/25/2017
FAA ATCT	Requirements for Operating in Runway Safety Areas	3/11/2016
FAA ATCT	Land and Hold Short Operations Procedures	4/29/2016
FAA ATCT	Runway Surface Condition Reporting	10/1/2016
FAA ATCT, and FedEx	FedEx Express Ramp/Taxi Procedures	11/25/2017
Memphis Fire Department	Emergency Procedures	2/26/2016

Source: MEM Part 139 Certification Manual, Kimley Horn, December 2018

Meteorological Conditions

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 and the general operating procedures put in place by FAA Air Traffic Control (ATC) and Authority personnel.

Wind Coverage

Wind speed and direction influence runway use. A runway is ideally oriented with the prevailing winds, as operations into the wind (both arrivals and departures), enhance aircraft performance. However, crosswinds, or winds that are perpendicular to a runway, have the potential to effectively close a runway for use, due to inadequate conditions required for aircraft operations. FAA planning standards, in AC 150/5300-13, Change 1, Airport Design, indicate that the primary runway should be capable of operating under allowable wind conditions at least 95 percent of the time, considering various factors that influence operations.

Larger aircraft have a higher tolerance for crosswind than smaller aircraft due to their size, weight, and operational speed. When crosswinds exceed the allowable tolerance for the aircraft categories using the airport, the availability of a crosswind runway is necessary to continue operating. Based on the guidance described above, **Figure 2.11** illustrates wind coverage for the Airport, that was analyzed using available wind data from 2008-2017.

FIGURE 2.11: WIND COVERAGE

Crosswind component	Runway 18-36	Effective Date	Combined
		All weather coverage (18.8% calm)	
10.5 knots	95.7%	87.0%	99.2%
13 knots	98.0%	92.5%	99.8%
16 knots	99.5%	98.0%	100.0%
20 knots	99.9%	99.6%	100.0%
		VMC weather coverage (19.3% calm) (1)	
10.5 knots	95.9%	87.0%	99.2%
13 knots	98.1%	92.5%	99.9%
16 knots	99.6%	97.9%	100.0%
20 knots	99.9%	99.6%	100.0%
		IMC weather coverage (14.6% calm) (2)	
10.5 knots	93.5%	86.9%	98.5%
13 knots	96.6%	92.5%	99.6%
16 knots	98.8%	98.0%	99.9%
20 knots	99.6%	99.4%	100.0%

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

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

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

Source: FAA Wind Rose Generator 2018, Memphis International Airport Annual Period Record 2008-2017, National Climate Data Center.

FIGURE 2.12: WEATHER COVERAGE

Weather condition	Cloud ceiling (feet AGL)	Visibility (miles)	Occurrence
VFR	1000	3	94.3%
IFR Category I	200	½	5.4%
IFR Category II	100	¼	0.2%
IFR Category III	0	0	0.0%
Total occurrence			100.0%

VFR = Visual flight rules

IFR Category I = IFR weather conditions in which a Category I ILS must be used.

IFR Category II = IFR weather conditions in which a Category II ILS must be used.

IFR Category III = IFR weather conditions in which a Category III ILS must be used.

Source: ASOS 5-Minute Data, January 1, 2008, through December 31, 2017, from the National Climatic Data Center.

Weather Coverage

In addition to wind coverage, weather data or meteorological conditions also affect operations at the Airport. All aircraft flights are governed by either Visual Flight Rules (VFR) or Instrument Flight Rules (IFR) which depend on the meteorological conditions at the time of operation.

VFR is the set of regulations, procedures, and conditions that permit a pilot to operate and navigate an aircraft based on visual reference to the surrounding environment with limited instrumentation. This requires favorable weather conditions with a ceiling of 1,000 feet AGL or greater and visibility of at least three (3) statute miles (also referred to visual meteorological conditions or visual meteorological conditions (VMC)). IFR conditions require a pilot to use aircraft instruments to navigate. When weather conditions are poor (e.g., when the cloud ceiling is less than 1,000 feet or the visibility is less than 3 miles), pilots are required to fly according to IFR in controlled airspace.

Figure 2.12 illustrates weather conditions based on weather data analyzed over a 10-year period from January 1st, 2008 to December 31st, 2017. As indicated, poor weather conditions in the Memphis area occurred less than six (6) percent of the time over a 10-year period and the Airport operates under VFR approximately 94.3 percent of the time. IFR Category III conditions seldom occur, approximately 0.04 percent of the time. As a matter of note, all air carrier aircraft and many military and high-performance GA aircraft generally operate under IFR flight plans irrespective of weather conditions.

Airspace and Airport Traffic Control

This section provides a general overview of airspace and procedures with respect to air traffic control that affect aircraft operations and includes descriptions of departure and arrival procedures and air traffic control jurisdictions.

Class B Airspace

MEM is surrounded by Class B airspace as classified under Federal aviation regulations. Class B airspace is generally airspace that begins at the ground level and extends vertically typically to 10,000 feet above mean sea level (AMSL). Class B Airspace is typically found at the nation's busiest airports by enplanement or operations, and ATC clearance is required for aircraft to operate within this classification of controlled airspace.

Standard Terminal Arrival and Departure Routes

Standard terminal arrival routes (STARs) and standard instrument departure procedures (SIDs) are established by the FAA as a means of making arrivals into busy airports more efficient for air traffic control. An arriving aircraft may be assigned a STAR and may be cleared to execute the STAR as coded or instructed, rather than having to continually communicate back and forth with ATC for individual altitude or heading instructions. Memphis currently has 19 SIDs and 11 STARs.

In the terminal airspace vicinity of the Airport, pilots operating under IFR are typically provided radar vectors or directional guidance instructions to their assigned routes as necessary by the Memphis terminal radar approach control (TRACON) or follow published instrument approach and departure procedures.

Air Traffic Control Jurisdictions

Controlled airspace in the Memphis area falls under the jurisdiction of the following entities: Memphis Air Route Traffic Control Center (ARTCC), Memphis TRACON, and Memphis ATCT.

- **ARTCC – Memphis Center—** The airspace over the continental United States is sub-divided into regions known as ARTCCs or "Centers." The primary purpose of an ARTCC is to provide ATC services to enroute aircraft that are typically flying at assigned cruising altitudes and are not within airport terminal airspace areas (i.e. within approximately 20 miles of an airport). The Memphis ARTCC facility, which has jurisdiction of enroute air traffic over western Tennessee, most of Arkansas and Mississippi, and small portions of Alabama, Kentucky, and Missouri, is located adjacent to Airport property near the intersection of Democrat and Tchulahoma Roads
- **TRACON – Memphis Departure/Approach—** The TRACON provides radar approach and departure control as well as other ATC separation services to aircraft flying in terminal area airspace or generally within 40 nautical miles of the airport. The TRACON works to sequence aircraft for arrivals into the Airport from enroute control and, conversely, for departures heading into enroute control after takeoff. Memphis Center has delegated control over certain airspace in the Memphis area to the Memphis TRACON, which is located at the Airport. In radio communications, pilots refer to the Memphis TRACON as either Memphis approach control or Memphis departure control, depending on the phase of flight.
- **FAA ATCT – Memphis Tower—** Completed in 2010, 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 on the ground and on final approach. Controllers are responsible for separating aircraft on the ground (ground control) as well as in the traffic pattern, giving landing and takeoff clearances to aircraft (commonly known as "local control"), and providing weather information to pilots. The ATCT also provides route clearances to aircraft prior to initiating flight (clearance delivery). The ATCT at Memphis is located along the Airport's primary entrance road to the north of the passenger terminal.

COMMERCIAL PASSENGER TERMINAL

This section provides an overview of existing MEM commercial passenger facility configurations, space measurements, and development history. The descriptions of passenger facilities incorporate departing and arriving passengers processing functions such as the ticketing, security screening checkpoints, passenger amenities, baggage claim, and support areas that serve Airport operations and functional uses.

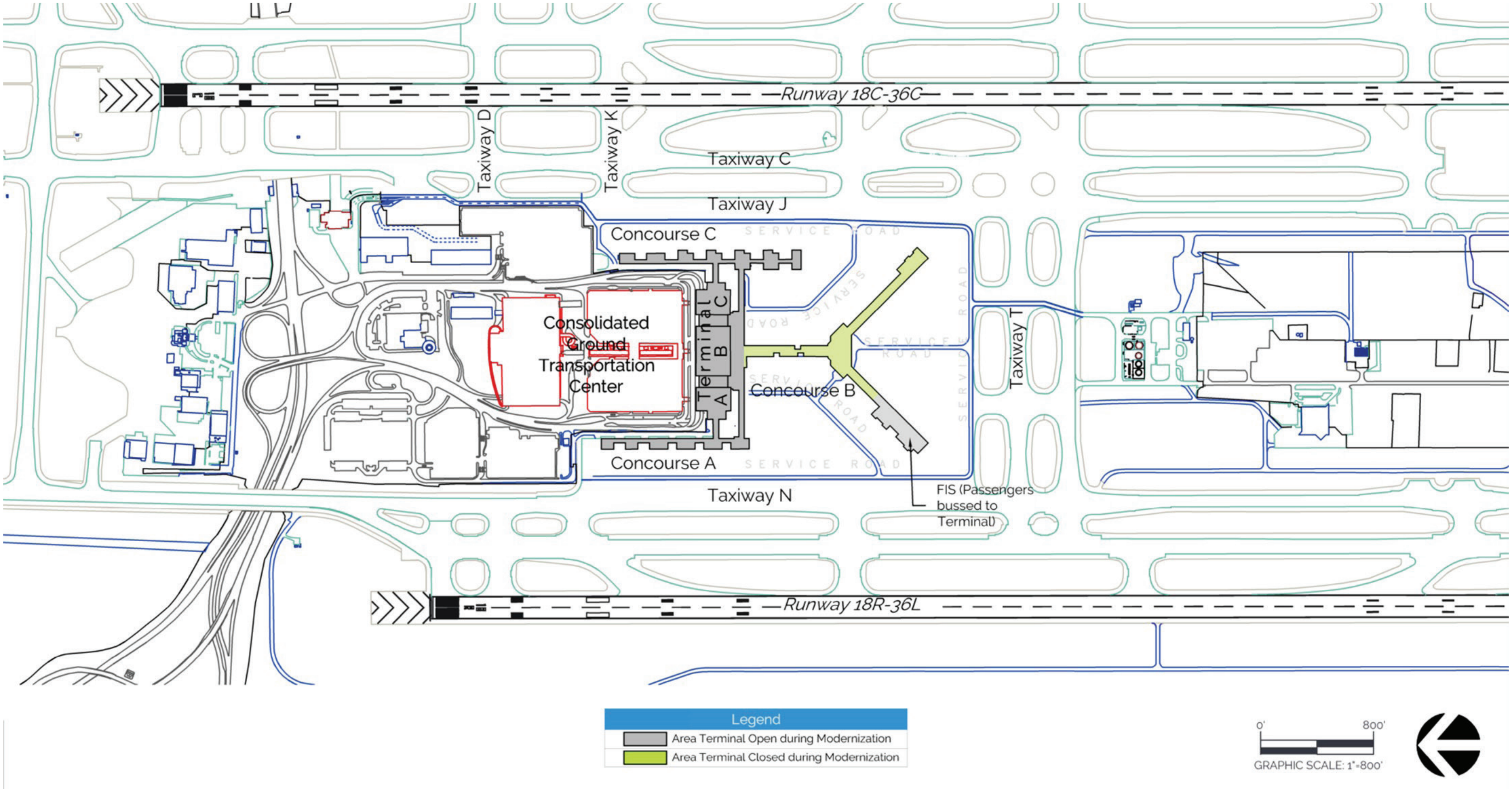
The Main Terminal site occupies approximately 160 acres between Runway 18C-36C and 18-36L and comprised of three (3) separate facilities identified as Terminal A, Terminal B, and Terminal C as shown in **Figure 2.13**. While passenger processing functions such as check-in and baggage claim are largely independent at each terminal, the facilities are connected to one another on several levels and locations, effectively functioning as a single large terminal building.

Terminal B and Concourse B opened in 1963 providing 22 aircraft gates at one central terminal building. By 1974, the addition of four (4) buildings, Terminal A and C and Concourses A and C, were constructed in a matching architectural style to unify the passenger experience between the original and new facilities.

In 2010 the four (4) level passenger terminal complex and its three (3) separate concourses provided over 1 million square feet of space and 79 aircraft gates. The Airport experienced a contraction of facility demand following the 2008 merger of Northwest and Delta Airlines. This created opportunity for other airlines to add new flights serving O&D passengers and new low-cost air carriers to enter the MEM market. Currently eight (8) airlines operate with 38 aircraft gates. The current airline tenants include Air Canada, Allegiant Air, American Airlines, Delta Air Lines, Frontier Airlines, Southwest Airlines, United Airlines, and Vacation Express.

A renovation of the facility was completed in 2022 through a project called the Concourse B Modernization. This section describes the terminal facilities as they are in the current state and documents the modernization program and proposed final state. The modernization program is anticipated to be substantially completed by 2021, after the Master Plan is completed.

FIGURE 2.13: TERMINAL AREA SITE PLAN



Source: Master Planning Team, March 2019.

Main Terminal Building

The main terminal building provides approximately 550,000 square feet of space on four (4) levels, including a Tunnel Level, Apron Level, Ticketing Level and Mezzanine Level. It is comprised of three (3) terminal building Terminal A, B and C. Each is described below and on **Figures 2.15 and 2.16.**

Tunnel Level

Building Engineering & Maintenance administration space and mechanical, electrical, and plumbing systems are housed at the terminal's tunnel level (or basement level). Utility tunnels leading out to each concourse connect the terminals to the concourses at this level and provide space for all utility lines and some of the power substations that support the facility operation.

Apron Level

The apron level (first level/ground level) contains both the passenger baggage claims and the baggage handling and sorting areas used by airline personnel for outbound baggage. Additionally, there are airline office spaces adjacent to the claim areas, Authority building maintenance office space, and storage and mechanical spaces.

Baggage claim facilities are located on the apron level of each of the three terminals. Airlines maintain baggage service offices in these areas as well. Airlines balance use of bag claim devices based on availability. **Figure 2.17** lists the locations, types, and lengths of baggage claim carousels.

Inbound and outbound baggage make-up facilities are also located on apron level. Baggage and parcels originating at the ticketing facilities above the apron level are transported downstairs via conveyor belts onto carousels or laterals in the baggage make-up areas and manually loaded by airline personnel into baggage carts. Inbound bags follow a similar procedure, arriving at inbound baggage stripping belts that feed the claim devices. The five (5) baggage makeup areas in Terminals A, B, and C are described in **Figure 2.18** lists the baggage make-up facilities in each terminal.

Concourse Level

The concourse level (second level) of the Main Terminal contains ticket counters, passenger self-service check-in kiosks, airline office space, two (2) TSA passenger security screening checkpoints, several concessions spaces in both secure and non-secure areas, and mechanical rooms. Other tenant administrative spaces are also on this level.

Ticketing lobbies are in each of the three (3) Main Terminal atrium areas on the concourse level that provides positions for airline agents and self-service kiosks to support additional passenger check-in. The location and number of positions occupied by each airline is summarized in **Figure 2.19.** Facilities are available for skycap service for passengers on the concourse level of the terminal's roadway, however none of the airlines are currently offering it.

Baggage screening equipment and TSA screening personnel are located behind airline ticket counter positions. Because the Airport has no consolidated baggage inspection screening system, individual Explosive Detection System (EDS) machines are positioned between the counters and the take-away belts to process bags from multiple counter positions. To accommodate the equipment installation and provide working space for TSA and airline staff, ticket counters were relocated farther away from the back wall, encroaching into the open circulation space in each ticketing lobby.

FIGURE 2.15: MAIN PASSENGER TERMINAL SPACE ALLOCATION AS OF 2019

Space category	Tunnel	Apron	Concourse	Mezzanine	Total Area
Airline space 1	--	29,520	70,350	--	99,870
Airport administration	--	52,310	25,780	41,320	119,410
Baggage claim	--	46,210	--	--	46,210
Baggage handling	--	88,220	--	--	88,220
Concessions 2	--	910	23,090	2,160	26,160
Customs and immigration 3	--	6,690	400	--	7,090
Open/vacant	--	9,150	20,700	--	29,840
Other 4	192,270	25,910	4,190	--	222,370
Public space/ circulation	6,400	38,220	256,170	18,380	319,170
Security screening 5	--		7,420	--	7,420
Total	**198,670**	**297,140**	**408,100**	**61,860**	**965,770**

Note: All quantities are in square feet. Calculations based on gross areas measured to the outside edge of exterior walls and the center of interior walls.

1) Includes ticket counters, operations space, departure lounges, and secure office space
2) Does not include vending machine areas
3) Includes all space allocated for the Federal Inspection Service
4) Includes building systems, utilities, and other non-leased spaces within the building
5) Includes TSA-leased space within the terminal building
Source: Master Planning Team, March 2019

FIGURE 2.16: PASSENGER TERMINAL GROSS AREA AS OF 2019

	Tunnel	Apron	Concourse	Mezzanine	Total Area
Terminal					
Terminal A	38,600	30,420	42,130	12,210	123,360
Terminal B	16,220	119,700	120,810	38,470	295,200
Terminal C	37,570	30,480	41,120	12,210	121,380
Total	92,930	180,600	204,060	62,890	539,940
Concourses					
Concourse A	27,500	45,420	45,930	--	118,850
Concourse B*	51,690	113,230	191,810	--	356,730
Concourse C*	19,970	54,950	70,920	--	145,840
Total	**99,160**	**213,600**	**308,660**	**--**	**621,420**
Total All	**349,200**	**329,830**	**512,720**	**62,890**	**1,161,360**

Note: All quantities are square feet. Calculations based on gross areas measured to the outside edge of exterior walls. Concourse B square footage reflects portion open during the Modernization Program, at the time this table was compiled.

**Post-modernization, Concourse B & C*

Source: Master Planning Team, March 2019

FIGURE 2.17: BAGGAGE CLAIM FACILITIES

Baggage Claim Location	Device Type	Presentation Length (ft)
Terminal A	Flat Plate	61
	Flat Plate	41
Terminal B	Slope Plate	86
	Slope Plate	86
	Slope Plate	86
	Flat Plate	74
Terminal C	Flat Plate	83
	Flat Plate	97
	Flat Plate	83

Source: MSCAA Lease Drawings, Master Planning Team, March 2019

Passenger security screening checkpoints are located in the middle of the terminal (Checkpoint B) and near Concourse C which provide screening of passengers and carry-on baggage before they enter the secure concourse areas. The checkpoint locations are summarized in **Figure 2.20.**

Mezzanine Level

The mezzanine level features open walkways around the perimeter of each terminal's atrium, which connect enclosed spaces at each end and between the terminal buildings. The enclosed spaces include MSCAA executive offices, the MSCAA development office, HMS Host's main office, and additional MSCAA administrative areas. **Figures 2.21, 2.22 and 2.23** depict the overall layout of the terminal buildings.

FIGURE 2.18 BAGGAGE MAKE-UP AREAS

Bag Make-Up Location	Area (SF)	Airlines	Carousel or Lateral, Lengths (FT)
Terminal A	5,610	Allegiant/Joint Use	Equipment Parking
Terminal B	31,680	AA/SWA/Delta/Allegiant	3 Carousels (638)
Terminal B	2,180	Joint Use	1 Lateral (45)
Terminal C	2,170	United	1 Lateral (42)
Terminal C	4,580	Frontier/Air Canada/Joint Use	1 Carousel (90)

Source: MSCAA Lease Drawings, November 2018 and Master Planning Team, March 2019

FIGURE 2.19: AIRLINE TICKETING POSITIONS AS OF 2019

Airline	Terminal	Ticket Counter Positions	Kiosk Positions 1	Curbside Positions	Total
Air Canada	C	2	-	-	2
Allegiant Air	A	2	-	-	2
American Airlines	B	4	12	1	17
Delta Airlines	B	6	8	1	15
Frontier Airlines	C	3	-	-	3
Southwest Airlines	B	6	6	-	12
United Airlines	C	3	3	-	6
Vacation Express	C	1	-	-	1

6) Includes kiosks located at both the ticket counter as well as remotely in lobby for passengers not checking baggage.

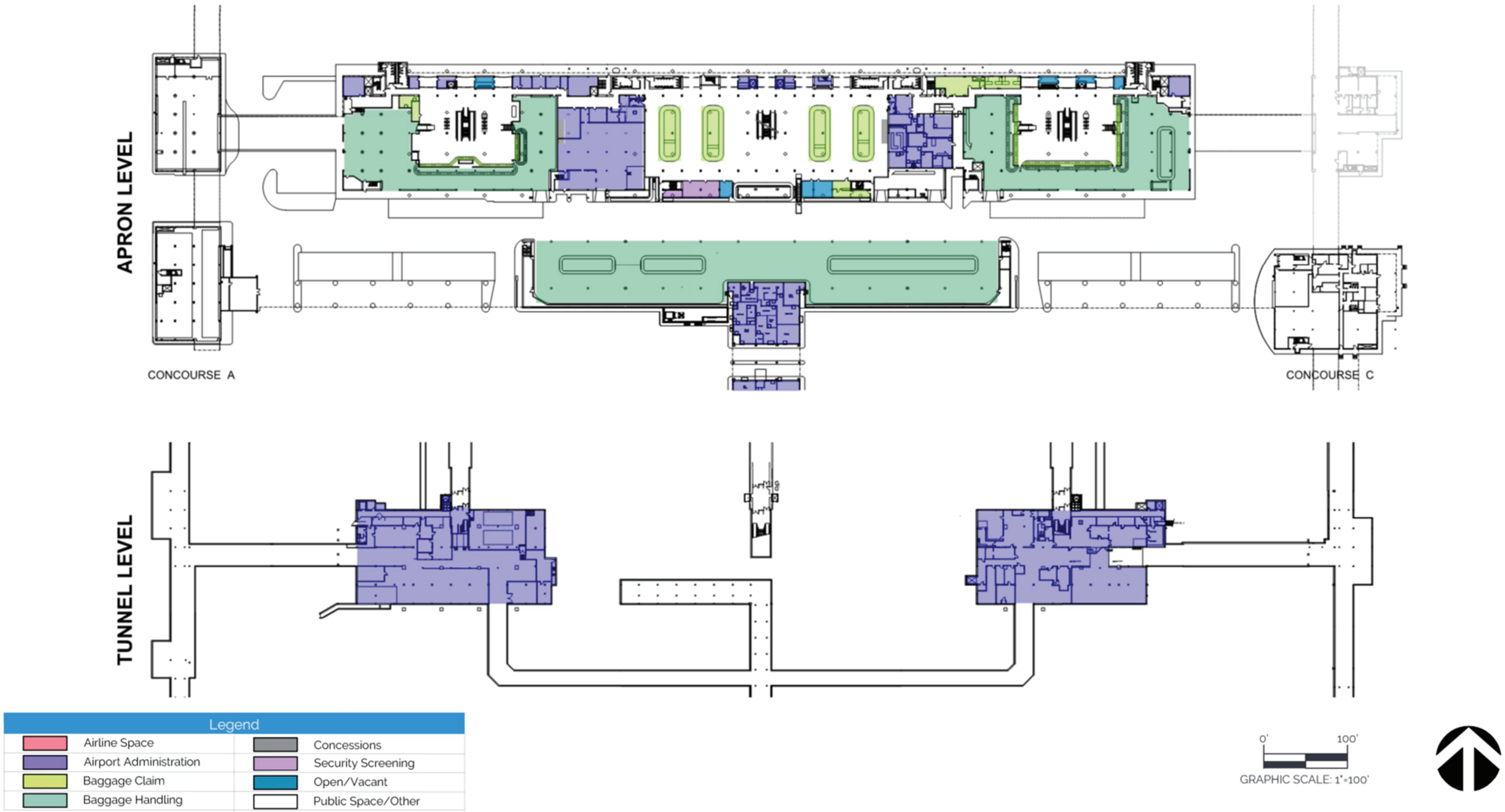
Source: Master Planning Teams, March 2019

FIGURE 2.20: SECURITY SCREENING CHECKPOINTS

Location	Number of Lanes and User Designations
Main Terminal B	6 lanes (7,900 sf checkpoint / 2,900 sf queue)
Terminal C	3 lanes (2,700 sf checkpoint / 800 sf queue)

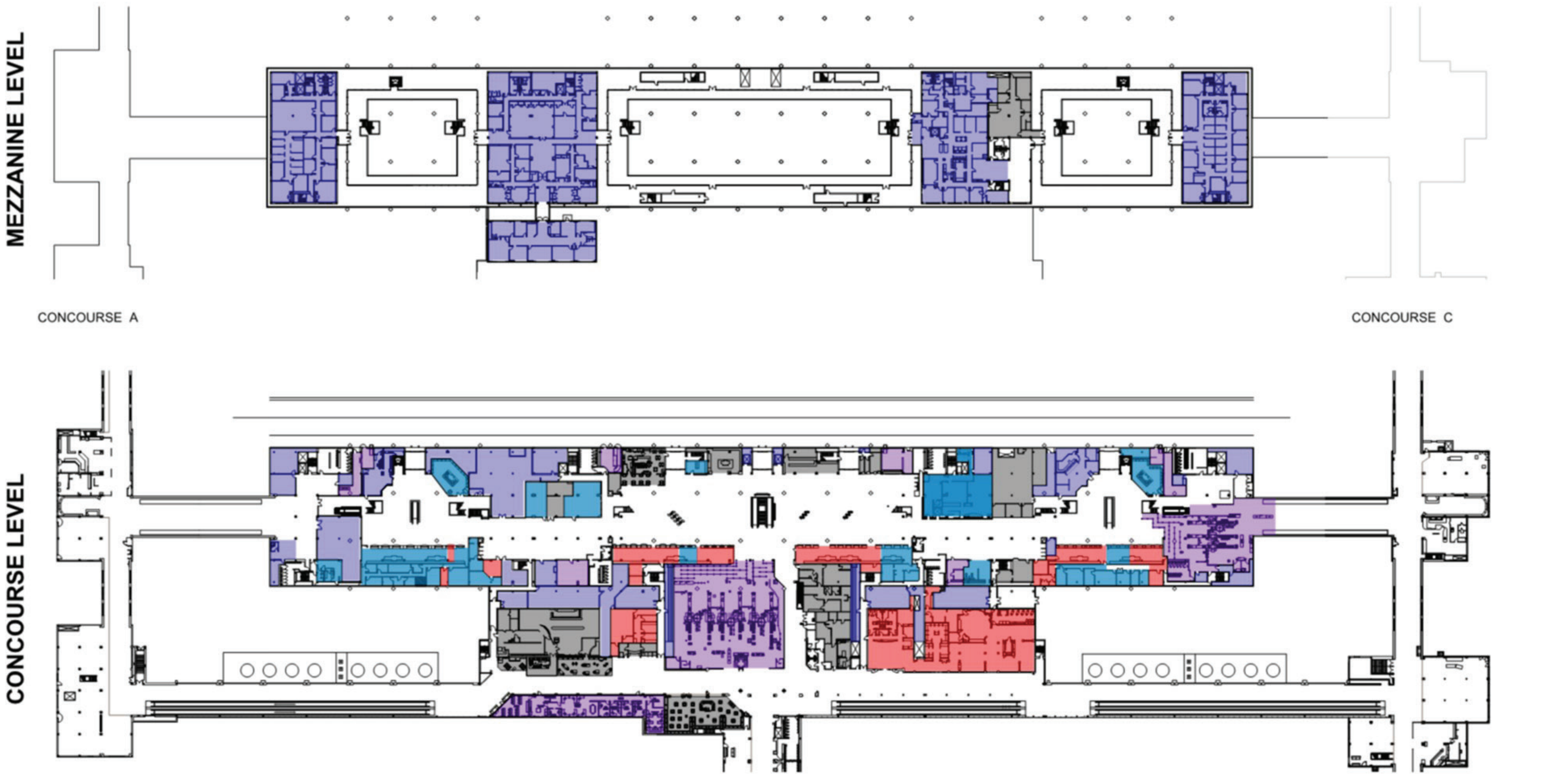
Source: Master Planning Team, March 2019.

FIGURE 2.21: MAIN PASSENGER TERMINAL BUILDING AT TUNNEL AND APRON LEVELS



Source: Master Planning Team, March 2019.

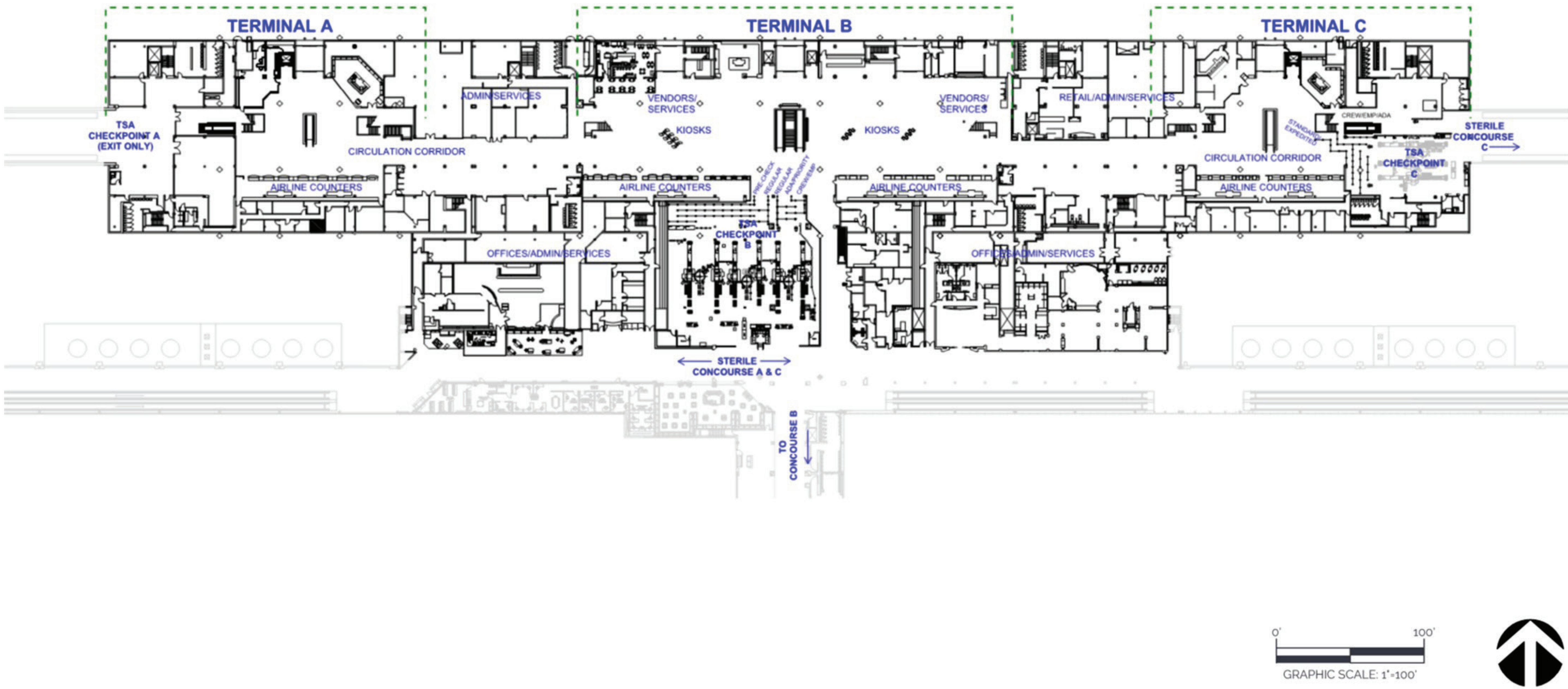
FIGURE 2.22: MAIN PASSENGER TERMINAL BUILDING AT CONCOURSE/MEZZANINE LEVELS



Legend	
Airline Space	Concessions
Airport Administration	Security Screening
Baggage Claim	Open/Vacant
Baggage Handling	Public Space/Other

Source: Master Planning Team, March 2019.

FIGURE 2.23: TERMINAL PROCESSOR BUILDING, CONCOURSE LEVEL FUNCTIONS



Source: Master Planning Team, March 2019.

Passenger Concourses

Concourses A and C

Currently and during the MEM Modernization Program, Concourses A and C provide a total of 25 aircraft contact gates with passenger boarding bridges for domestic flights. These concourses are linear in a north-south orientation and flank each side of the Main Terminal. Single corridors provide circulation to and from gates, concessions, and other services located along the concourses. The portions of Concourses A and C to the north of the Main Terminal are single-loaded (i.e., passenger gates equipped on only one side of the concourse), while the south end of Concourse C is double-loaded (i.e., passenger gates equipped on both sides of the concourse). Aircraft parking during the Modernization Program is shown in **Figure 2.26.**

In early 2015, a nine-gate addition to the southern portion of Concourse A and two (2) of the adjacent, original Concourse A departure lounges were demolished as part of the Modernization Program. Nine (9) aircraft gate positions and departure lounges were refurbished in Concourse A; six (6) for Delta and three (3) for Southwest. The southern end of Concourse C will also be demolished as part of the Modernization Program after Concourse B is renovated.

Concourses A and C have two operational levels: an apron level used by airline tenants and other support functions, and a passenger level containing passenger gates, departure lounges, concessions, and restrooms. These are depicted in **Figure 2.26** and **Figure 2.27** for Concourses A and C, respectively.

The space allocation for Concourse A is shown in **Figure 2.24** and for Concourse C in **Figure 2.25.** These reflect future space after completion of the Modernization Program.

FIGURE 2.24: CONCOURSE A SPACE ALLOCATION

Space Category	Tunnel	Apron	Concourse	Total Area
Airline space [1]		10,000	14,320	24,320
Airport administration		1,080	560	1,640
Baggage claim				
Baggage handling				
Concessions [2]			2,990	2,990
Customs and immigration [3]				
Open/vacant		1,360		1,360
Other [4]	27,500		22,270	49,770
Public space/ circulation				
Security screening [5]				
Total	**27,500**	**12,440**	**40,140**	**80,080**

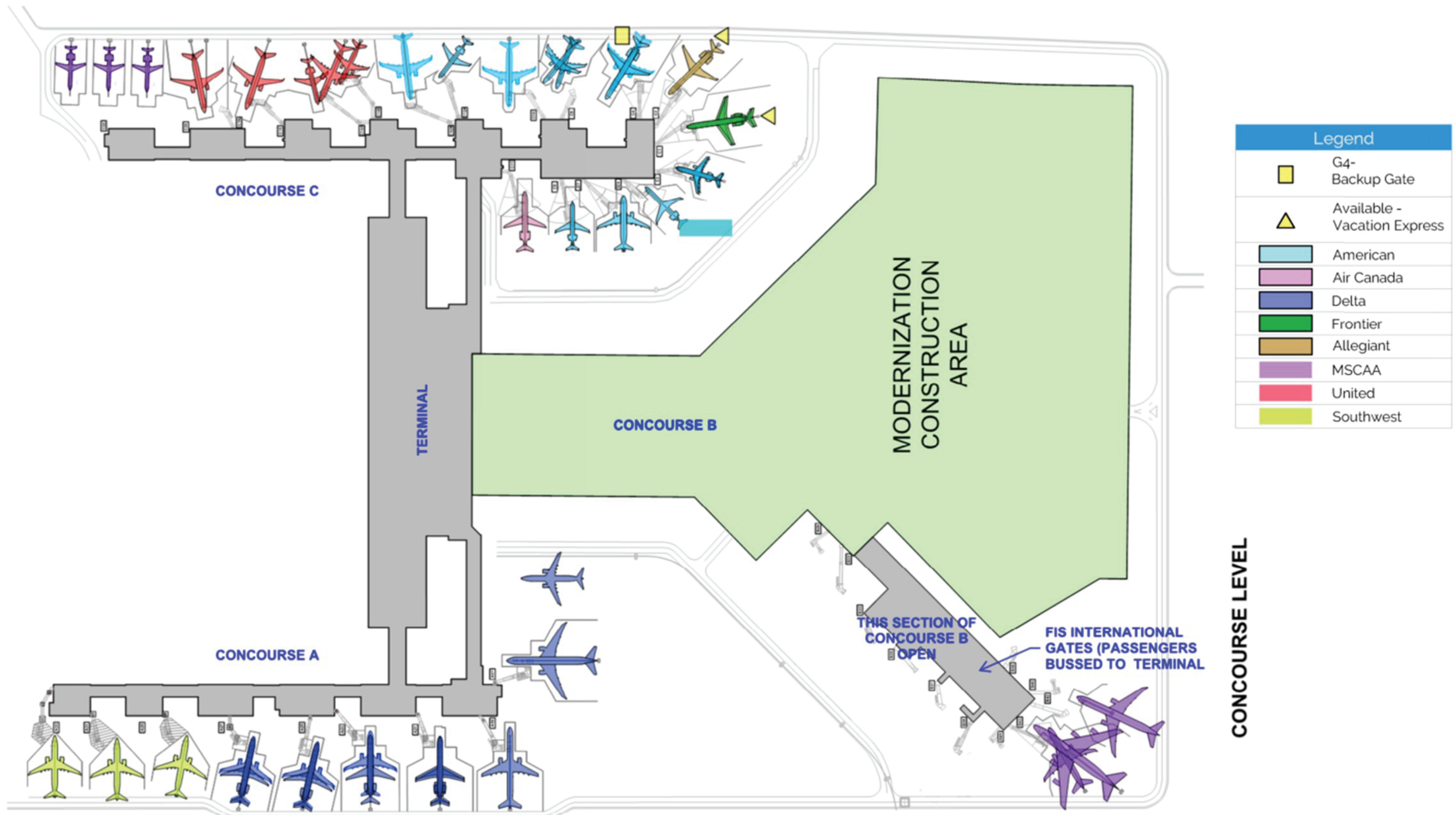
Note: All quantities are in square feet. Calculations based on construction and program documents.
1) Includes operations space, departure lounges, and secure office space
2) Does not include vending machine areas
3) Includes all space allocated for the Federal Inspection Service
4) Includes building systems, utilities, and other non-leased spaces within the building
5) Includes TSA-leased space
Source: Master Planning Team, March 2019

FIGURE 2.25: CONCOURSE C SPACE ALLOCATION

Space Category	Tunnel	Apron	Concourse	Total Area
Airline space [1]		14,560	11,720	26,280
Airport administration		12,780	10,820	23,600
Baggage claim				
Baggage handling				
Concessions [2]			3,490	3,490
Customs and immigration [3]				
Open/vacant		5,640		5,640
Other [4]	19,970		25,100	45,070
Public space/ circulation				
Security screening [5]				
Total	**19,970**	**32,980**	**51,130**	**104,080**

Note: All quantities are in square feet. Calculations based on construction and program documents.
1) Includes operations space, departure lounges, and secure office space
2) Does not include vending machine areas
3) Includes all space allocated for the Federal Inspection Service
4) Includes building systems, utilities, and other non-leased spaces within the building
5) Includes TSA-leased space
Source: Master Planning Team, March 2019

FIGURE 2.26: AIRCRAFT PARKING POSITIONS DURING MODERNIZATION AS OF 2019

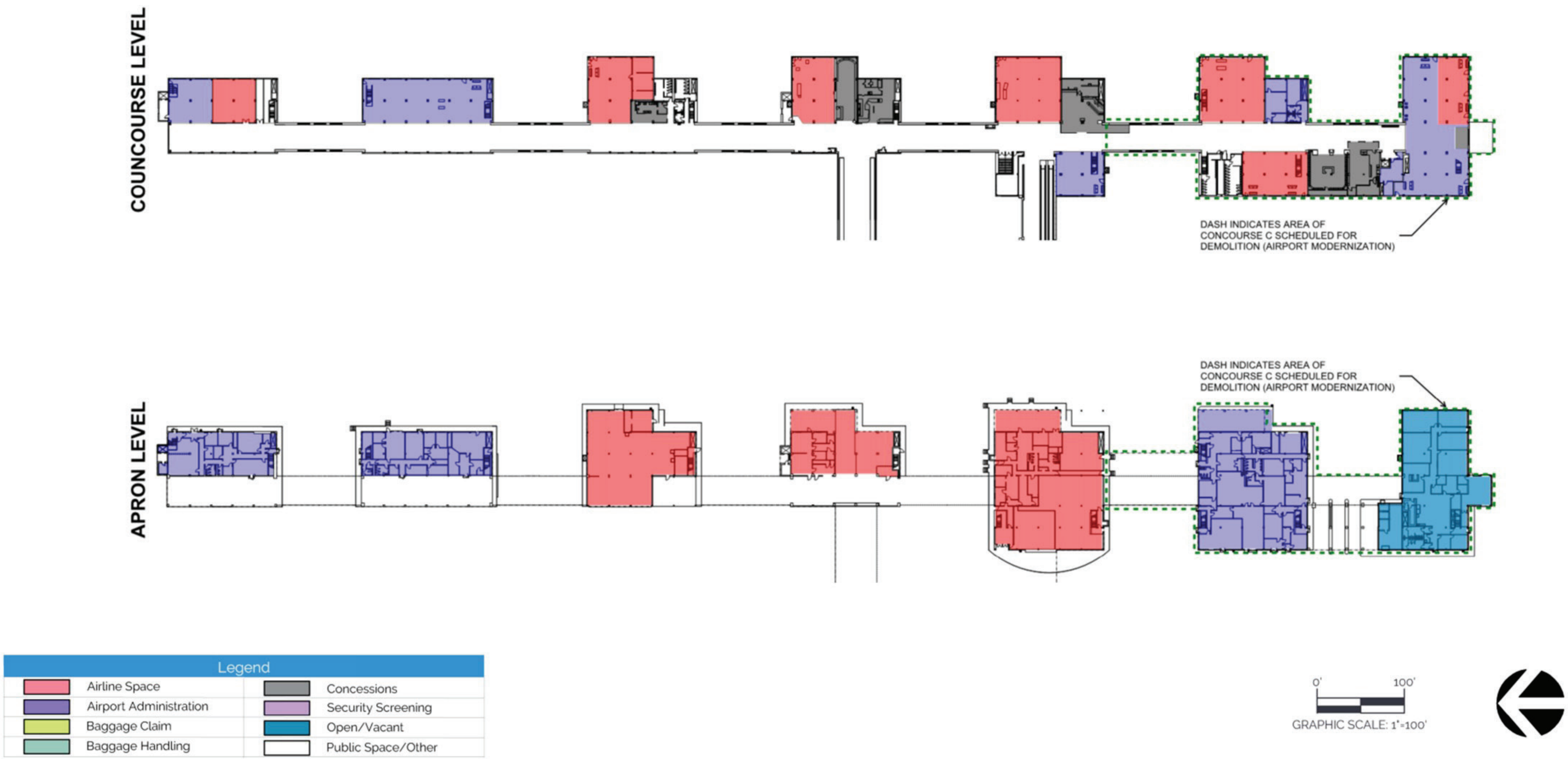


Source: Master Planning Team, March 2019.

FIGURE 2.27: CONCOURSE A PASSENGER AND APRON LEVELS AS OF 2019

Source: Master Planning Team, March 2019.

FIGURE 2.28: CONCOURSE C PASSENGER AND APRON LEVELS AS OF 2019



Source: Master Planning Team, March 2019.

Concourse B

In response to increased O&D airline passenger traffic beginning in 2014, as well as the need to modernize aging facilities, the MSCAA initiated the rehabilitation program to expand and modernize Concourse B. The program improved passenger experience, increased operational efficiency, and extended the life of older facilities. Improvements also upgrade the roof, foundations and structure in Concourse B to meet current building codes for high seismic areas. Seismic upgrades in other portions of the terminal and concourses were not included in the program and will be addressed in future projects.

The improved concourse has wider circulation areas, moving walkways, higher ceilings, and upgraded utility infrastructure. Airline gates, concessions and restrooms are located on the concourse level while the apron level will continue to serve airline, concessions support, and airport operations functions. The rotunda in the central portion of Concourse B is an open space with multiple food, beverage, and retail concessions as well as a stage for live music. The Modernization Program also provides ground power units and pre-conditioned air on each jet bridge.

After completion of the Modernization Program in February 2022 Concourse B has 25 gates operational with opportunity to grow to 29 gates as demand dictates. Two (2) international gates will be maintained on the southwest leg of the concourse, which is not modernized at this time. **Figure 2.31** presents the future space allocation for Concourse B correlating to the floor plans shown in **Figures 2.30 and 2.31**. **Figure 2.32** depicts the anticipated gate assignments post modernization.

FIGURE 2.29: CONCOURSE B FUTURE SPACE ALLOCATION

Space Category	Tunnel	Apron	Concourse	Total Area
Airline space 1			63,890	63,890
Airport administration				
Baggage claim				
Baggage handling				
Concessions 2		38,520	33,130	71,760
Federal Inspection Services 3		31,550		31,550
Open/vacant		63,130		63,130
Other 4	51,690	50,100		101,790
Public space/ circulation		2,980	94,800	97,780
Security screening 5		8,170		8,170
Total	**51,690**	**194,450**	**191,820**	**437,960**

Note: All quantities are in square feet. Calculations based on construction and program documents.
1) Includes operations space, departure lounges, and secure office space
2) Does not include vending machine areas
3) Includes all space allocated for the Federal Inspection Service
4) Includes building systems, utilities, and other non-leased spaces within the building
5) Includes TSA-leased space
Source: Master Planning Team, March 2019

Passenger Flow

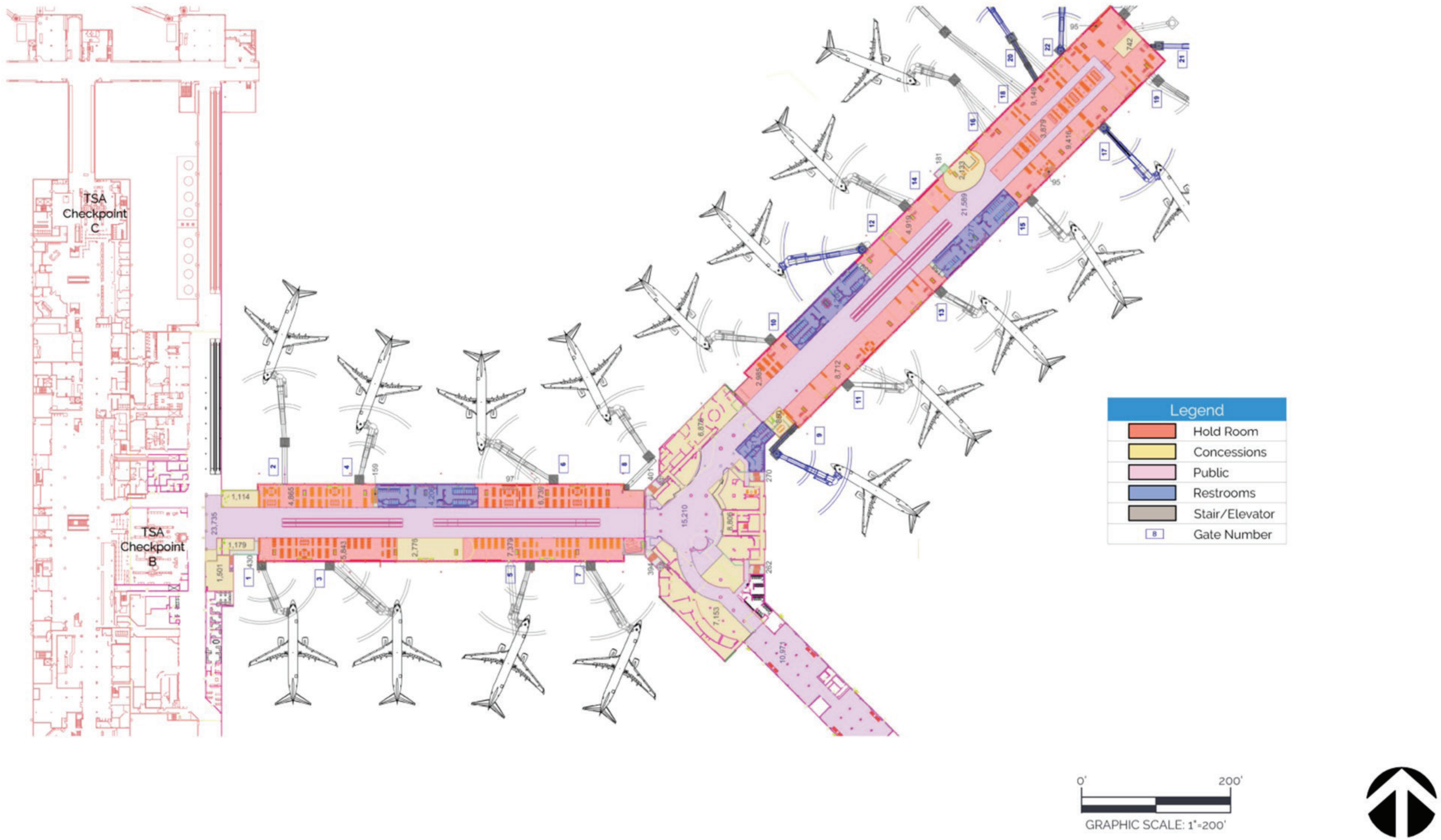
During Airport Modernization all airlines, concessionaires, and tenants operate out of Concourses A and C. Departing passenger continue ticketing and check-in at the Main Terminal, security screening is accommodated at TSA Checkpoints B and C. Arriving passengers exit Concourses A and C to baggage claim areas through Terminal B. The southwest leg of Concourse B remains operational for international flights during the construction closure of Concourse B. The U.S. Customs and Border Patrol (CBP) remains in operation in this area and international arriving passengers are bussed to baggage claim after clearing customs.

Delta Air Lines and Southwest Airlines, the carriers serving the greatest number of passengers at the Airport, operate in Concourse A. Allegiant, American, Air Canada, Frontier Airlines and United Airlines operate in Concourse C.

Federal Inspection Service Screening

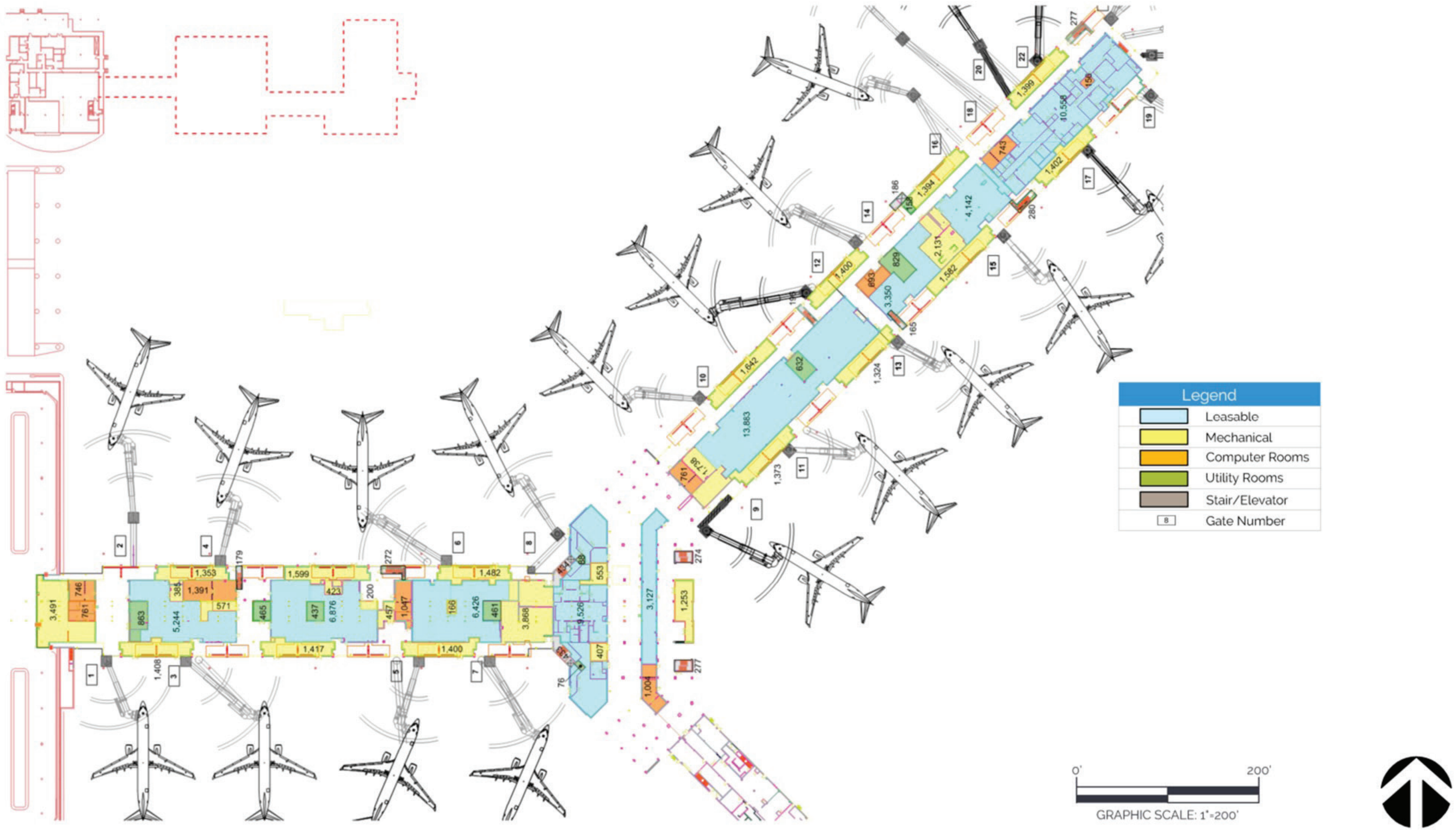
During modernization, two (2) FIS contact gates are being maintained on the southwest end of Concourse B. The FIS screening facility occupies approximately 6,600 square feet on the apron level. Passengers arriving from other countries that do not have U.S. pre-clearance enter the FIS through a sterile corridor and screened by US immigrations and CBP staff. The FIS area includes baggage claim devices, primary inspection counters, secondary baggage inspection areas and equipment, passenger queue and circulation, CBP offices, and the TSA security screening checkpoint. Cleared arriving and connecting passengers and baggage are bussed from the apron level to the terminal. Connecting passenger must exit to the terminal lobby for rechecking.

FIGURE 2.30: CONCOURSE B FUNCTIONAL AREAS – PASSENGER LEVEL AS OF 2023



Source: MSCAA Concourse B Construction Drawings, March 2019

FIGURE 2.31: CONCOURSE B FUNCTIONAL AREAS – APRON LEVEL AS OF 2023



Source: MSCAA Concourse B Construction Drawings, March 2019

FIGURE 2.32: CONCOURSE B AIRCRAFT PARKING POSITIONS AND PRELIMINARY GATE AS OF 2023

Source: MSCAA Concourse B Modernization files, May 2017

Aircraft Parking Apron

Approximately 70 acres of apron is available for aircraft maneuvering and parking at the concourses. The apron is currently configured to accommodate aircraft ranging from small turbo-prop aircraft (Saab 340) to large widebody aircraft (B747-800). During Concourse B Modernization there are 25 gates with passenger boarding bridges on Concourses A and C. Once modernization was completed, there 25 gates available on Concourse B and the gates in Concourses A and C will be closed. All gate assignments are based on preferential use. Gate information, both pre- and post-modernization, is identified in **Figure 2.33.**

A system of service roadways circumnavigates the concourses to allow for the safe and efficient movement of ground support equipment (GSE) and other vehicles on the aircraft apron. Additionally, there are several service road concourse cut through locations beneath all three concourses through which GSE can efficiently access the aircraft aprons

FIGURE 2.33: AIRCRAFT GATES AND AIRLINE GATE ASSIGNMENTS

Gate	Predominant User	Widest aircraft	Longest aircraft
Existing Conditions			
Concourse A			
A17	Delta Air Lines	B767-400	B767-400
A19	Delta Air Lines	B757-2W	B757-3W
A21	Delta Air Lines	B757-2W	B757-2W
A23	Delta Air Lines	A319S	MD90
A25	Delta Air Lines	A319S	MD90
A27	Delta Air Lines	A319S	MD90
A29	Southwest Airlines	B737-7W	B737-8W
A31	Southwest Airlines	B737-7W	B737-8W
A33	Southwest Airlines	B737-7W	B737-8W
Concourse B			
B39	Common Use (Int'l)	B747-800	B747-800B
B43	Common Use (Int'l)	B767-400ER	B767-400ER
Concourse C			
C1	Frontier Airlines	A319	A321
C2	Allegiant Air	B737-7	MD90
C3	American Airlines	EMB-170	CRJ-700
C4	American Airlines	B737-7	MD90
C5	American Airlines	CRJ-900	CRJ-900
C7	American Airlines	A319	A320
C81	American Airlines	EMB-190	EMB-190
C8A1	American Airlines	CRJ-900	CRJ-900
C9	American Airlines	EMB-190	EMB-190
C10	American Airlines	B737-7	A321
C11	Air Canada	DC9-3	DC9-4
C12A	American Airlines	CRJ-700	CRJ-700
C12B	American Airlines	B737-7	A321
C14	Common Use	B737-7W	B737-9W
C14A1	United Airlines	CRJ-700	CRJ-700
C14B1	United Airlines	EMB-175W	CRJ-700
C16	United Airlines	B737-7W	B737-9W
C18	United Airlines	EMB-175W	CRJ-900

Gate	Predominant User	Widest aircraft	Longest aircraft
Post-Modernization			
Concourse B2			
1	Not Yet Assigned	A319S	A321S
2	Not Yet Assigned	A319S	A321S
3	Not Yet Assigned	A319S	MD90
4	Not Yet Assigned	A319S	A321S
5	Not Yet Assigned	B737-7W	B737-8W
6	Not Yet Assigned	A319S	A321S
7	Not Yet Assigned	A319S	MD90
8	Not Yet Assigned	A319S	A321S
9	Not Yet Assigned	B757-2W	B757-3W
10	Not Yet Assigned	A319S	MD90
11	Not Yet Assigned	A319S	A321S
12	Not Yet Assigned	A319S	MD90
13	Not Yet Assigned	A319S	A321S
14	Not Yet Assigned	MD83	MD83
15	Not Yet Assigned	A319S	A321S
16	Not Yet Assigned	A319S	MD90
17	Not Yet Assigned	A319S	MD90
18	Not Yet Assigned	A319S	MD90
19	Not Yet Assigned	B767-300ERW	B767-300ERW
20	Not Yet Assigned	A319S	MD90
21	Not Yet Assigned	A319S	MD90
22	Not Yet Assigned	A319S	A321S
23	Not Yet Assigned	A319S	MD90
39	Not Yet Assigned	B747-800	B747-800
403	Not Yet Assigned	B767-400ER	B767-400ER

1) Denotes two parking positions at the same contact gate
2) Gates B1 – B23 are planned as medium narrowbody gates (B737). Maximum aircraft size will vary based on airline gate assignments and parking plans. Aircraft size noted is based on preliminary gate assignments.
3) Former Gate 43.
Source: Master Planning Team, March 2019

ACCESS, GROUND TRANSPORTATION, PARKING AND RENTAL CAR

Airport Access and Terminal Roadways

This section provides an overview of existing MEM ground access facility configurations and utilization for roadways, curbside access, on- and off-airport parking, and rental car facility operations.

The Airport is connected to the regional highway network, including Interstate 240 toward downtown by Airways Boulevard, Interstate-55 via Winchester Road, and East Shelby Drive, and U.S. Highway 78 / Interstate 22 via Democrat Road, Winchester Road, and American Way. Prominent signalized intersections adjacent to the Airport property exist at the intersections of Winchester Road at Airways Boulevard and Plough Boulevard, Winchester Road at Swinnea Road, Swinnea Road at East Shelby Drive, and Airways Boulevard at East Shelby Drive. The terminal area is accessed directly from Jim McGehee Parkway from Plough Boulevard or from a half cloverleaf interchange with Winchester Road. All entry paths to the terminal area require crossing underneath taxiway or runway elements of the airfield. **Figure 32** highlights the primary roadways accessing the terminal area.

The City of Memphis has plans for improvements to the intersection of Plough Boulevard, Winchester Road, and Airways Boulevard with new flyover ramps for the northbound and southbound movements. Additionally, the Tennessee Department of Transportation (TDOT) has conducted a study to construct new flyover ramps at the interchange of Interstate 240 and Airways Boulevard.

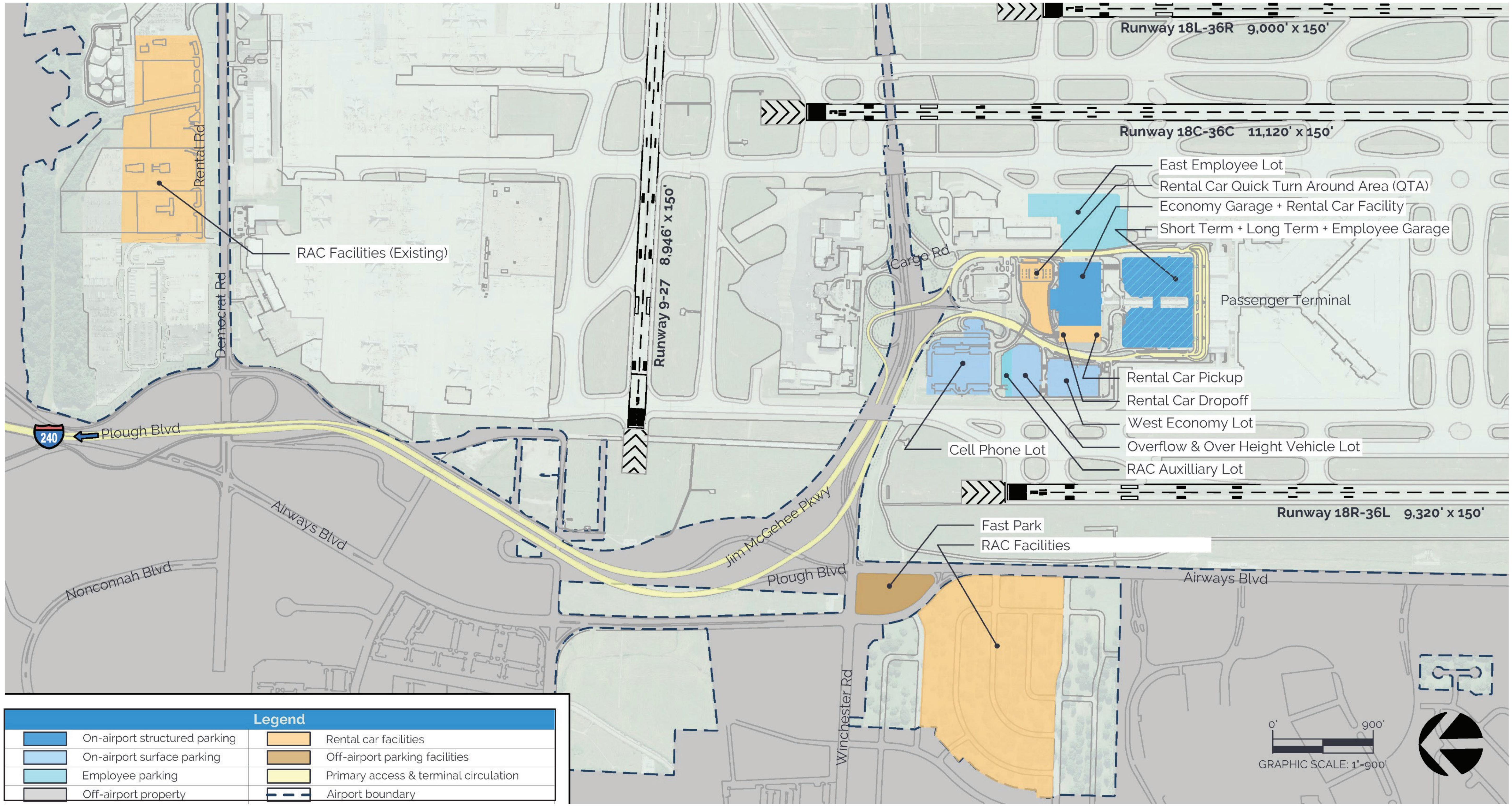
Terminal Area Roadway Traffic Counts

Once inside the terminal area, Jim McGehee Parkway provides one-way traffic circulation to and from the cell phone waiting lot, rental car ready/return facility, short-term, long-term, and economy public parking facilities, and the terminal building as shown in **Figure 2.34**.

Terminal Area Roadways and Curbsides

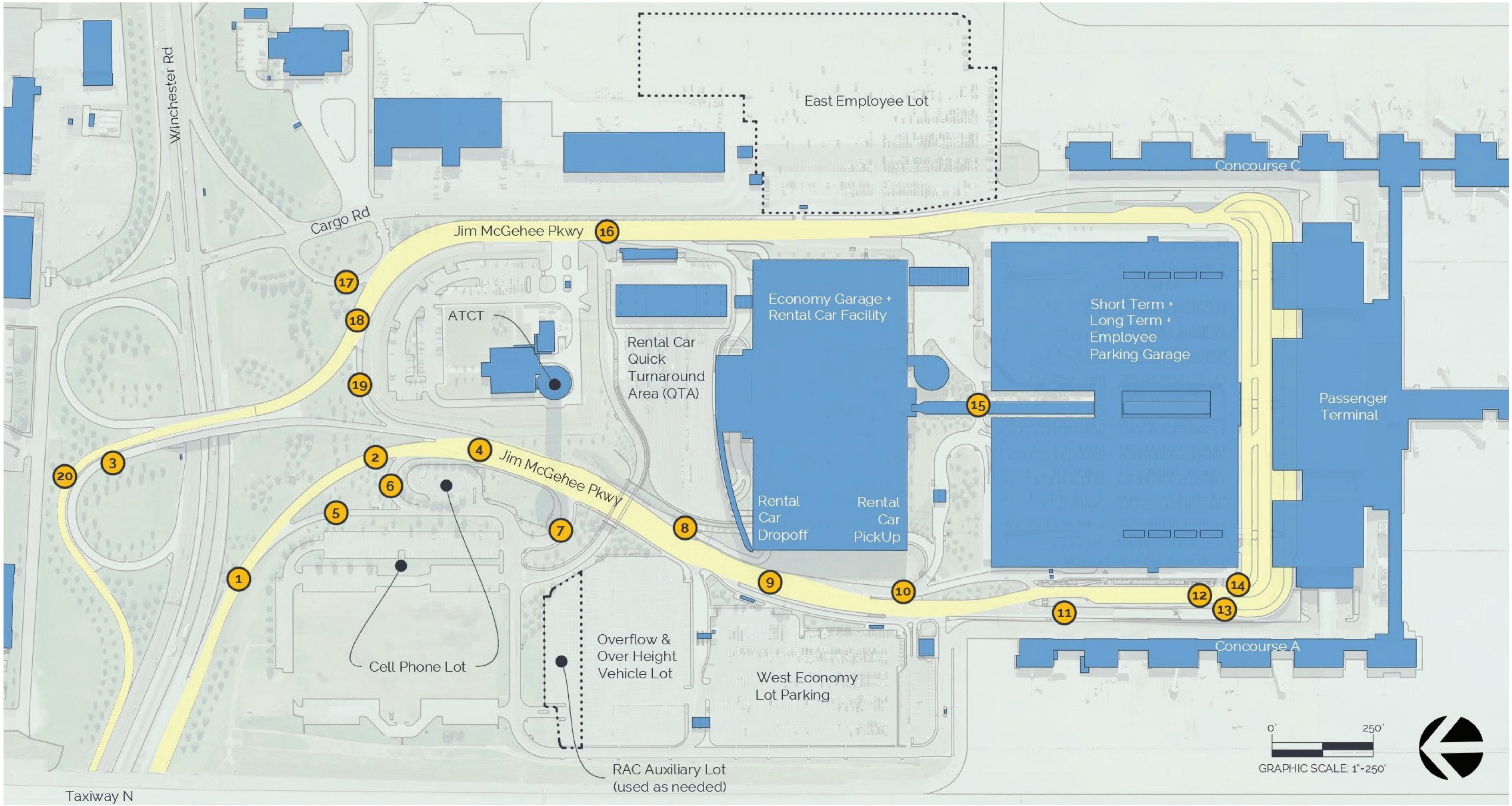
A traffic count program was conducted at 20 roadway locations within the terminal area, as shown in **Figure 2.35**. Counts were performed using seven-day automated traffic recorder (ATR) devices deployed between December 2 and December 9, 2018. **Figure 2.36** depicts the traffic volumes collected during the AM peak hour, PM peak hour, and average weekday total volume.

FIGURE 2.34 ROADWAY ACCESS AND GROUND TRANSPORTATION FACILITIES



Sources: 2016 AGIS Airport Layout Plan CADD line work provided by MSCAA, 2010 Master Plan CADD line work provided by MSCAA

FIGURE 2.35: TERMINAL AREA ROADWAY TRAFFIC COUNT LOCATIONS



Sources: 2016 AGIS Airport Layout Plan CADD line work provided by MSCAA, 2010 Master Plan CADD line work provided by MSCAA

FIGURE 2.36: TERMINAL AREA ROADWAY TRAFFIC COUNT SUMMARY

Location	Description	AM Peak Hour Volume	Concourse	Total Area
1	Eastbound Winchester to Jim McGehee	579	557	9,444
2	Jim McGehee past cell phone lot	544	508	8,649
3	Westbound Winchester to Jim McGehee	78	77	1,260
4	Jim McGehee mainline before RAC/Parking	614	611	9,985
5	Jim McGehee turnoff into cell phone lot	34	49	795
6	Cell phone lot exit to Jim McGehee	69	102	1,336
7	Jim McGehee turnoff to cell phone lot	42	45	650
8	Entry to rental car return lower-level	94	111	1,501
9	Jim McGehee approaching terminal	508	555	8,332
10	Entry to rental car return upper-level	63	71	985
11	Upper level curbside roadways	240	252	3,802
12	Lower level curbside roadways	110	186	2,313
13	Private vehicle access to lower-level curb	73	140	1,615
14	Commercial access to lower-level curb	70	103	1,361
15	Short-term / long-term parking connector	10	11	183
16	Jim McGehee terminal and parking exits	728	1,009	12,705
17	Jim McGehee Winchester eastbound	104	134	1,780
18	Jim McGehee terminal area exit	549	777	10,002
19	Jim McGehee return to terminal roadway	110	150	1,862
20	Jim McGehee to Winchester westbound	330	472	6,029

Source: Traffic counts conducted by the Master Planning Team on December 2, 2018 to December 9, 2018

FIGURE 2.37: CURBSIDE ROADWAY FACILITIES

Roadway	User Group(s) Permitted	Length (ft)	Lanes
Upper-Level, Inner Roadway	Private vehicle	825±	2
Upper-Level, Outer Roadway	All commercial vehicle drop-off TNC pick-up and drop off	825±	2
Lower-Level, Inner Roadway	Private vehicle pick-up	810±	1
Lower-Level, Center Roadway	Taxis; limos; hotel shuttle pick-up	840±	2
Lower-Level, Outer Roadway	Pick-up for shuttles serving off-airport parking; Airport employee; FedEx; MATA public transit	855±	2

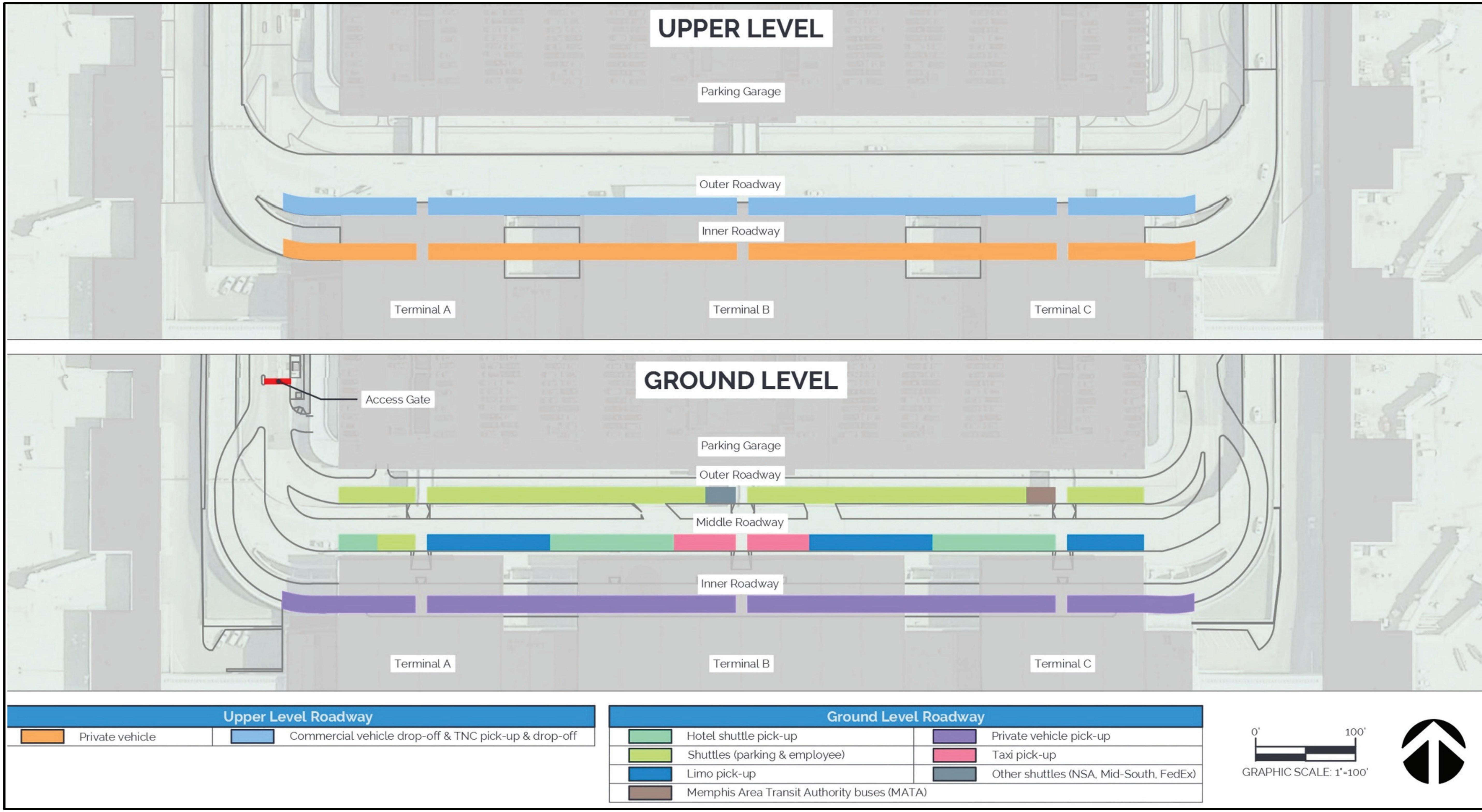
Sources: MSCAA ground transportation rules and regulations; Master Planning Team field verification

Passenger Terminal Curbside Roadways

As Jim McGehee Parkway approaches the passenger terminal building, the roadway divides into an upper-level roadway serving the ticketing level, and a lower-level roadway serving baggage claim on the ground level. The upper-level roadway consists of an inner roadway used by private vehicles, and an outer roadway used by commercial vehicles and Transportation Network Companies (TNCs), such as Uber and Lyft. Three (3) pedestrian crosswalks connect the terminal building to the outer roadway curbside and parking garage.

The lower-level roadway consists of three (3) separate curbside facilities. The inner roadway is used by private vehicles to pick up arriving passengers exiting the baggage claim area. The center and outer roadways are designated for commercial vehicle use and include operating areas for taxis, limos, Memphis Area Transit Authority (MATA) public bus transit, and shuttle buses service hotels, off-airport parking, and FedEx. Both the center and outer roadways are access-controlled requiring users to swipe a card to enter the curbside facility. Six (6) pedestrian crosswalks, three on each level, connect the terminal building to the center and outer roadways and parking garage. Physical characteristics of each of the upper-level and lower-level roadways are summarized in **Figure 2.37. Figure 2.38** depicts curbside space allocated to each user group.

FIGURE 2.38: CURBSIDE ROADWAY SPACE ALLOCATION



Sources: 2016 AGIS Airport Layout Plan CADD line work provided by MSCAA, 2010 Master Plan CADD line work provided by MSCAA, On-site survey performed on October 10, 2018, by Master Planning Team to estimate curbside

FIGURE 2.39: VEHICLE CLASSIFICATION SURVEY

	AM Peak Hour Vehicles		PM Peak Hour Vehicles	
Vehicle Type	**Drop-Offs**	**Pick-Ups**	**Drop-Offs**	**Pick-Ups**
Taxis	3%	3.3%	9%	22%
Limo's	2%	4%	3%	17%
TNC's	69%	37%	72%	17%
Hotel Shuttles	16%	13%	3%	19%
Other Shuttles	10%	13%	13%	25%

Sources: Field observations made October 10, 2018 by Master Planning Team

Commercial Vehicle Operations

Numerous commercial vehicles serve the Airport. **Figure 2.39** summarizes commercial vehicle operations observed during a survey on October 10, 2018.

Commercial vehicle staging is provided away from the terminal curbsides in three (3) locations along the Jim McGehee Parkway approach to the passenger terminal. A commercial vehicle staging lane dedicated for shuttle buses is provided adjacent to the Blue Lot which accommodates up to six (6) courtesy vans or three (3) buses. The taxi hold lot located south of the west economy parking lot can be accessed via Jim McGehee Parkway and can accommodate approximately 50 taxis before they are dispatched to the taxicab queue on the lower-level roadway. TNCs are permitted to stage in the cell phone parking lot.

Ground transportation operators pay commercial vehicle fees to MSCAA according to either an annual permit or per-trip fee structure, as shown in **Figure 2.40.**

FIGURE 2.40: COMMERCIAL VEHICLE FEES AS OF 2019

Fee Type	Fee	Basis
Access <25 feet	$2.00	Per access
Access ≥25 feet	$10.00	Per access
Privilege	10% gross revenue	Amount paid by Operators equal to 10% of gross revenue generated from parking of vehicles
Shuttle & Limo	$125.00	Monthly fee or 6% of Operator's monthly gross revenue, whichever is greater but not to exceed $500.00
Hotel Courtesy Shuttle	$3.00 times # rooms	Annual guarantee based on $3.00 times number of rooms assigned to Operator's property, due on or before first day of January each year thereafter
Coach Bus	$10.00	Monthly per access for entrance to Airport's Commercial Drive based on number of Tour Bus Commercial Drive Access Forms completed by Operator's driver
Occasional User <25 feet	$20.00	Per access
Occasional User ≥25 feet	$40.00	Per access
Taxicab Permit	$200.00	Annual per taxicab due on or before first day of January each year thereafter
Taxicab Access	$2.00	Per trip from each taxicab prior to entering the Commercial Drive to load passengers
TNC Permit	$2,000.00	Annually due on or before first day of January each year thereafter, then access fees

Sources: Memphis International Airport Commercial Ground Transportation Rules and Regulations

PUBLIC TRANSPORTATION

Public transportation to and from the Airport is provided by the MATA. There is one (1) route that serves the Airport, which also serves the FedEx facilities, Airways Transit Center, and American Way Transit Center.

PUBLIC AND EMPLOYEE PARKING

On-Airport Public Parking

Public parking options at the Airport include economy, long-term, short-term, oversized vehicles, and a cell phone parking lot. The long-term and short-term parking facilities are in a three-level structured parking garage immediately north of the Airport terminal. Users of the parking garage access the terminal via connecting walkways on the first second and second levels.

The economy parking garage is located to the north of the long-term and short-term facility and is co-located with the rental car facility in a seven-level parking structure. Covered walkways with movable sidewalks on the first level of the parking garage provide access to the terminal. The oversized vehicle/overflow parking is in a surface lot west of the economy and rental car garage. The cell phone lot is located off Jim McGehee Parkway, with entrance and exits on the south side. **Figure 2.34** (previously shown) illustrates the location of the public parking facilities. **Figure 2.42** provides the fees and number of spaces for the various public parking facilities.

Off-Airport Public Parking

Off-airport parking is provided by one (1) operator, located along Airways Boulevard west of the terminal area. **Figure 2.43** provides a summary of the number of spaces, parking rates, and typical monthly revenue for off-airport parking.

Employee Parking

Terminal area employee parking is provided in the East Lot and a portion of the Hourly Parking Garage. Approximately 150 spaces are reserved for MSCAA employee parking on the baggage level of the Hourly Parking Garage. Other terminal area employees park in the East Lot. Fedex and other lease holders provide parking for their respective employees.

Rental Car Facilities

Rental car services are provided by nine (9) rental car companies: Hertz, National, Alamo, Budget, Avis, Payless, Enterprise, Dollar, and Thrifty. Rental car customer activity is concentrated in the economy parking garage, located to on levels one (1) and two (2) of the seven-level Economy Parking Garage. Passengers are conveyed from the terminal building to the rental car center via a covered outdoor sidewalk equipped with moving walkways. A climate-controlled customer service building is incorporated into the ready/return facility, which is located on the lower level of the economy parking garage. A QTA with vehicle wash bays and fuel stations

FIGURE 2.42: ON-AIRPORT PUBLIC PARKING FACILITIES

Parking Facility	Capacity	First 30 Minutes	31-60 Minutes	31-90 Minutes	91 Minutes - 24 Hours	Each Additional 30 minutes	24 - Hour Interval/ Maximum
Economy	4,542	Free	–	$1	$6	–	$6
Short-Term	487	Free	$2	–	–	$1	$24
Long-Term	2,225	Free	$2	–	–	$1	$15
Oversize	180	–	–	–	–	–	$12

Sources: Memphis International Airport Parking webpage, December 2018

FIGURE 2.43: OFF-AIRPORT PARKING FACILITIES

Facility	Location	Approximate Capacity1	Daily Parking Rate
Fast Park	2201 Winchester Rd, Memphis, TN 38116	700 spaces	$7.41 per day + 10% fee + tax

Sources: Off-Airport parking provider websites, MSCAA revenue records is located immediately to the north of the ready/ return garage in a separate at-grade facility.

Maintenance service sites have historically been located further north along Rental Road, accessible from Democrat Road; however, construction is ongoing to relocate these rental car service sites to a new area accessible via Airways Boulevard with an opening anticipated in 2019.

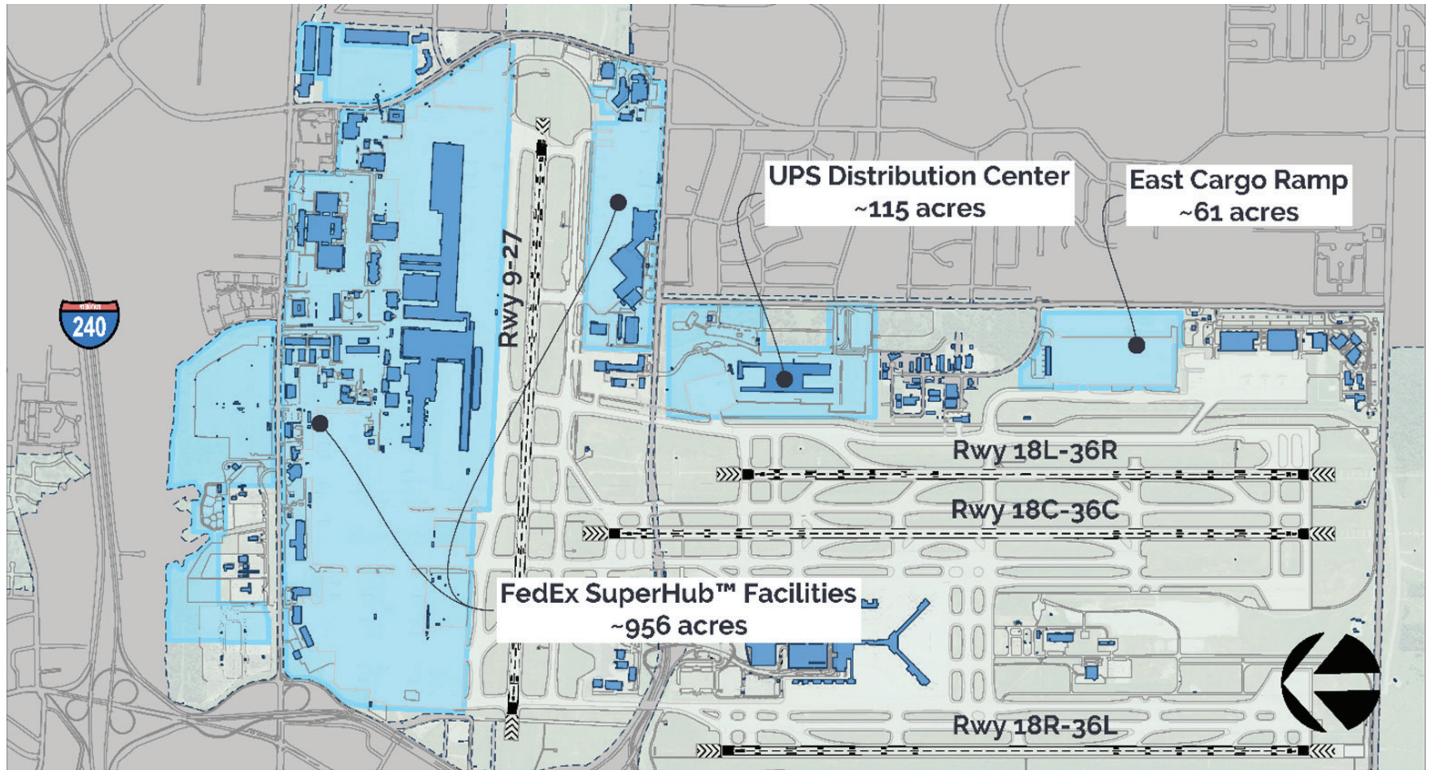
AIR CARGO

This section provides an overview of existing MEM air cargo site characteristics, facility sizes, and description of cargo activity.

Memphis International Airport is the busiest air cargo airport in North America, and second in the world behind Hong Kong. In 2016, 4.3 million metric tons of cargo passed through the facility which accounted for 15.2 percent of all air cargo tonnage in the U.S.

The Airport is home to two (2) cargo service providers. FedEx is the largest provider at MEM and utilizes approximately 945 acres on airport property for their SuperHub operation. UPS has a significant presence and utilizes approximately 115 acres on airport property to the east of Runway 18L-36R. The East Cargo Ramp that was developed by MSCAA in 2006 provides approximately 61 acres for cargo activities and supports users including Air Transport International, DHL, Check, Kalitta Air, and Bankair, Inc. **Figure 2.44** identifies the areas on airport property designated for air cargo activities.

FIGURE 2.44: AIR CARGO FACILITIES ACREAGE



Sources: Master Planning Team, March, 2019

GENERAL AVIATION AND MILITARY

General Aviation

This section provides an overview of existing MEM GA site characteristics and sizes, FBO operations, and military facilities. Signature Flight Support and Wilson Air Center are the two (2) FBOs that serve the GA community. The FBOs provide a wide range of services to users.

Signature Flight Support

Signature Flight Support (Signature) is a wholly-owned subsidiary of BBA Aviation, a worldwide provider of flight support services. This FBO site was previously operated by Memphis Aero Club from the 1940s until 1985 when it was purchased by AMR services. In 2000, Signature purchased the FBO and today provides a complete range of GA services including aircraft basing, airframe and engine repair and maintenance, flight instruction, ground handling, and aircraft charters.

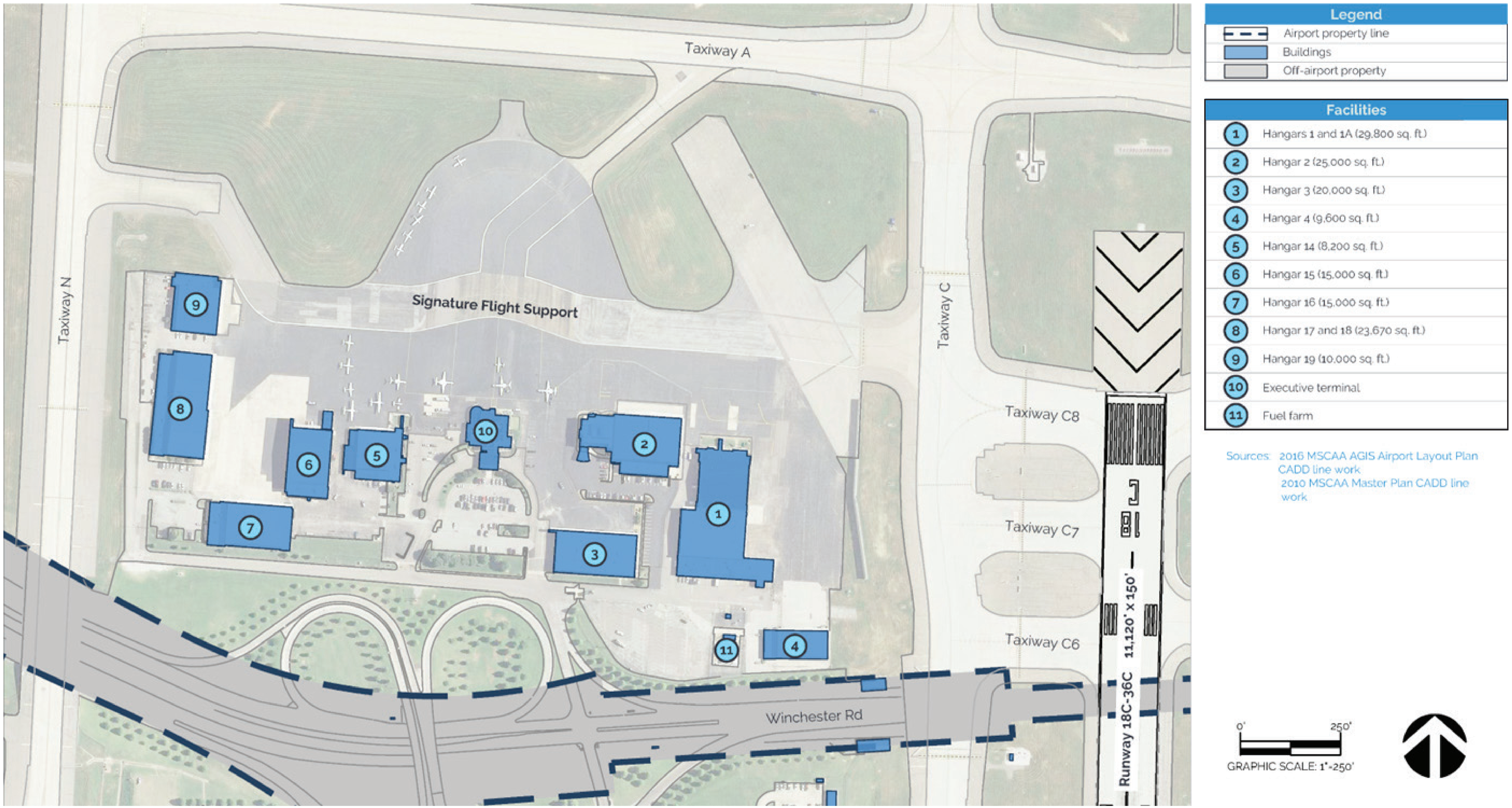
The Signature FBO facility, shown on **Figure 2.45,** leases approximately 11 acres from MSCAA and is located north of Winchester Road between Taxiways N and C and south of Taxiway A. Airfield access is provided via Taxiways A, C, and N. Vehicular access is from Access Road, via Winchester Road. Signature employs approximately 40 people at the Airport, or about 20 per shift (excluding sublease holders).

The following are key elements of Signature Flight Support's facilities:

- Approximately 156,270 square feet of indoor aircraft storage space is available with three (3) hangars totaling 58,670 square feet subleased to third parties. **Figure 2.46** summarizes the Signature hangars utilized for aircraft storage and maintenance.
- The Executive Terminal is a 5,500 square-foot building that accommodates the FBO's administrative offices, a pilots' lounge and restaurant, and other crew and passenger amenities. The Terminal, which dates back to 1938, once served as the Airport's original passenger terminal and administration building.
- An above ground fuel farm adjacent to Hangar 4 consists of two (2) 30,000-gallon jet-A fuel storage tanks, one (1) 30,000-gallon avgas fuel storage tank, and one (1) 12,000-gallon diesel fuel storage tank. Fuel is transported to the farm via tanker trucks.
- Parking spaces for approximately 300 vehicles are provided on site. The number of vehicle parking spaces is sufficient to accommodate demand, but the surface lot pavement requires rehabilitation in the near-term.

There are approximately 70 aircraft based with Signature, ranging in size from single engine piston aircraft to corporate jets as shown on **Figure 2.47.** The FBO is currently at 115% capacity for indoor based aircraft and has an active waiting list for new tenants. The Signature itinerant aircraft parking apron is approximately one (1) million square feet and includes tie-down parking positions for approximately 40 aircraft of a variety of sizes.

FIGURE 2.45: SIGNATURE FLIGHT SUPPORT COMPLEX



Source: Master Planning Team, March 2019

Wilson Air Center

Wilson Air Center (Wilson), shown on **Figure 2.48**, is located north of Winchester Road between Taxiway Y and Hurricane Creek and includes the large hangar east of Hurricane Creek (formerly the Pinnacle Hangar). Wilson leases approximately 20 acres from MSCAA and offers ground handling services to aircraft that operate from the facility. Airfield access is provided via Taxiways A and Y. Vehicular access is from Winchester Road at the signalized intersection opposite United Parcel Service's Oakhaven Hub truck entrance. Wilson employs approximately 35 people.

The following are key elements of the Wilson Air Center facilities:

- Wilson has approximately 101,600 square feet of indoor aircraft storage space. The FBO does not sublease any of its hangars to third parties. In 2016, MSCAA acquired a 31,250 square foot hangar from Pinnacle Airlines that is located east of the Wilson Air facilities and adjacent to the FedEx apron. This hangar is currently leased to Wilson Air and utilized for aircraft storage. **Figure 2.46** summarizes the aircraft storage and maintenance hangars at the Wilson site.
- Wilson's Main Terminal, constructed in 1996, is a 12,000 square foot facility that accommodates administrative offices, pilots' lounge, and other crew and passenger amenities. A 26,000 square foot canopy is located adjacent to the terminal and covers a significant portion of the itinerant aircraft parking apron adjacent to the building.
- An above-ground fuel farm is adjacent to Winchester Road and consists of two (2) 35,000-gallon jet-A fuel storage tanks, one (1) 15,000-gallon avgas fuel storage tank, and one (1) 2,500-gallon unleaded gasoline fuel storage tanks. Fuel is transported to the farm via tanker trucks.
- Parking is available for 210 vehicles.

There are approximately 35 aircraft based with Wilson, with the majority being corporate jets as shown in **Figure 2.47**. The FBO is currently at 100% capacity for indoor based aircraft storage but has sufficient apron capacity for outdoor based aircraft parking. The Wilson itinerant aircraft parking apron encompasses approximately 500,000 square feet. The FBO reports that there are no issues regarding operations or constraints on the airfield.

Military Facilities

The Airport is home to the 164th Tactical Airlift Wing of the Tennessee Air National Guard (TnANG), which currently operates C-17 Globemaster aircraft. The TnANG recruits, organizes, and trains personnel to provide airlift capability that can assist airborne forces in moving military troops, equipment, and supplies via air drops, air-land, or cargo extraction systems. The TnANG employs approximately 450 full-time and 1,200 part-time personnel, and it is located on a 118-acre site in the southeast corner of the airfield. The site is currently leased from the Authority.

FIGURE 2.46: FBO HANGAR SPACE

Designation	Tenant	Use	Size SF
Signature Flight Support			
Hangars 1 & 1A	Signature Flight Support	Aircraft storage and maintenance	29,800
Hangar 2	Leased to private tenant	Aircraft storage	25,000
Hangar 3	Signature Flight Support	Aircraft storage	20,000
Hangar 4	Signature Flight Support	Aircraft storage and maintenance	9,600
Hangar 14	Signature Flight Support	Aircraft storage	8,200
Hangar 15	Signature Flight Support	Aircraft storage	15,000
Hangar 16	Signature Flight Support	Aircraft storage	15,000
Hangar 17 & 18	Leased to private tenant	Aircraft storage and maintenance	23,670
Hangar 19	Leased to private tenant	Aircraft storage	10,000
Total Buildings			**156,270**
Wilson Air Center			
Canopy	Wilson Air Center	Itinerant aircraft parking	26,000
Hangars 1 & 2	Wilson Air Center	Aircraft storage	6,400
Hangar 3	Wilson Air Center	Aircraft storage	6,400
Hangar 4	Wilson Air Center	Aircraft storage	8,250
Hangar 5	Wilson Air Center	Aircraft storage	11,300
Hangar 6 & 7	Wilson Air Center	Aircraft storage	16,000
Hangar 8 & 9	Wilson Air Center	Aircraft storage	22,000
East Hangar	Wilson Air Center	Aircraft storage	31,250
Total Buildings[1]			**101,600**

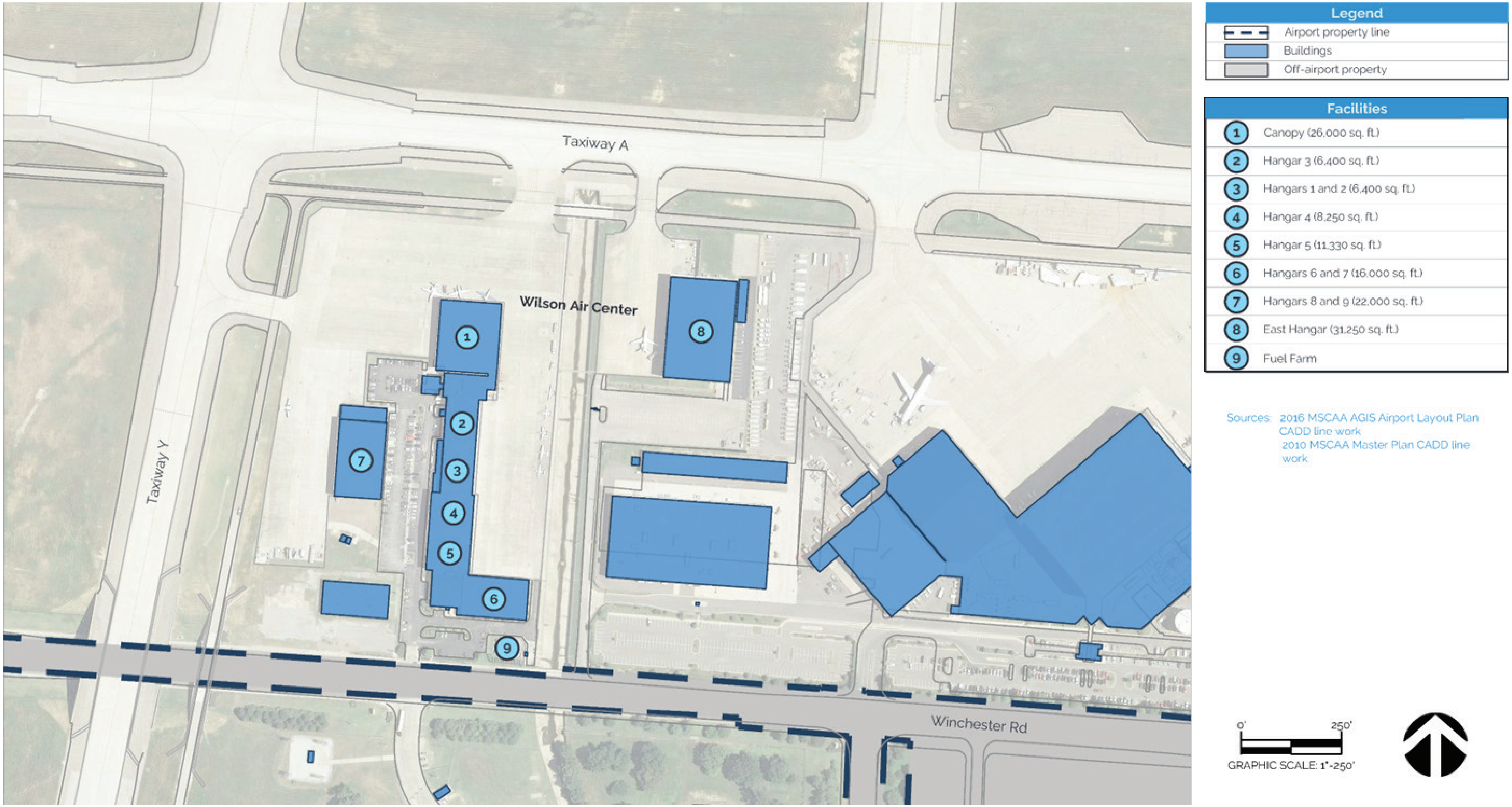
1) Excludes the Canopy located next to the FBO terminal building
Source: Master Planning Team, March 2019

FIGURE 2.47: BASED AIRCRAFT

FBO	Single Engine	Multi-engine	Jet	Helicopter	Total
Signature Flight Support	7	11	53	–	71
Hangar 2	5	2	28	–	35
Hangar 3	12	13	81	–	106

Source: Master Planning Team, based on tenant interviews conducted in 2018

FIGURE 2.48: WILSON AIR CENTER FACILITIES



Source: Master Planning Team, March 2019

SUPPORT FACILITIES

This section provides an overview of existing MEM airline and airport support facility sizing for maintenance, storage, emergency response, and operations support functions. Support facility locations are shown on **Figure 2.49.**

Ground Support Equipment (GSE) Storage and Maintenance

Passenger airline GSE is stored in the terminal baggage makeup area or on the passenger terminal apron. Historically Delta Air Lines GSE storage areas were in the air cargo buildings until 2008 when Delta constructed a GSE storage and maintenance facility encompassing approximately 30,000 square feet south of the Main Terminal. GSE vehicles ingress and egress the terminal area via Perimeter Road and Taxiway P1. The facility includes a 23,000 square foot parking apron, and approximately 20,000 square feet for vehicle parking. All GSE vehicles are fueled with gas or diesel. There are no known issues regarding GSE operations, maintenance, or storage.

Aircraft Maintenance

Outside of the GA maintenance conducted by Signature Flight Support, Wilson Air, and TnANG, only FedEx has hangars where aircraft maintenance is conducted at the Airport. Their facilities are located south of Runway 9-27 and Winchester Road, and east of Taxiway Y as well as in the northeast corner of the SuperHub site. FedEx performs various maintenance operations from three (3) hangars totaling approximately 360,000 square feet with a total of approximately 890,000 square feet of apron located adjacent to the maintenance hangars.

Airline Catering and Flight Kitchen

A 55,000 square-foot airline flight catering facility previously located in the area south of the Main Terminal along Louis Carruthers Drive was demolished in 2017 to allow for construction of a new airport Maintenance and Operations Support Facility and CDF. Gate Gourmet, who previously leased the flight catering facility, now operates from a facility off airport property.

Airport Traffic Control Tower

The Airport's ATCT was constructed in 2011 and is centrally located in the north side of the Main Terminal, south of Winchester Road. The ATCT is designed for Activity Level 12 (ATC12) and is at a height of 335 feet AGL (eye level 307 feet 2 inches AGL). The tower cab is approximately 3,500 square feet. The base building encompasses 24,500 square feet and accommodates the Memphis TRACON and administrative functions.

Aircraft Rescue and Fire Fighting Facility (ARFF)

The Airport's ARFF is accommodated in a 20,000 square-foot facility located on Airport property on the east side of the Airport along Rudder Road, north of Taxiway P. The state-of-the-art facility became operational in 2008. The department is part of the City of Memphis Division of Fire Services and employs 38 firefighters. Specialized equipment at the station complies with FAA guidance and regulations for ARFF Index C, and includes:

- **ARFF Apparatus A-1** – a quick response/command vehicle equipped with 300 gallons of pre-mixed aqueous film-forming foam (AFFF) in a Compressed Air Foam System (CAFS) and 480 pounds of potassium bicarbonate in a dry-chemical dispensing system.
- **ARFF Apparatus A-2** – equipped with a Rhino bumper turret, 3,000 gallons of water, 420 gallons of AFFF (ready for dilution at a 6% rate), and 480 pounds of potassium bicarbonate in a dry chemical dispensing system. The potassium bicarbonate powder can be dispensed in conjunction with the water through the bumper turret to lengthen the reach of the powder.
- **ARFF Apparatus A-3** – equipped with a Snozzle elevated turret, 3,000 gallons of water, 420 gallons of AFFF (ready for dilution at a 6% rate), and 480 pounds of Halotron I (vaporizing liquid extinguishing agent).

The building provides an 8,000 square foot parking bay for equipment storage and 10,000 square feet for administration and other functions. A 23,500 square foot vehicle parking lot is situated immediately east of the facility and provides approximately 40 parking spaces.

Memphis Fire Department Station #33, the Airport's second station, is 4,800 square feet and located in the Main Terminal, north of the Air Cargo Apron adjacent to Taxiway C. This facility provides structural fire suppression and backup ARFF assistance as needed and is equipped to handle both aircraft crash and rescue and services to the surrounding municipal area, if necessary. The building provides an 8,800 square foot parking bay for equipment storage and 7,300 square feet for administration and other functions. A 7,500 square foot vehicle parking lot is situated immediately north of the facility and provided approximately 20 parking spaces.

Fuel Farm

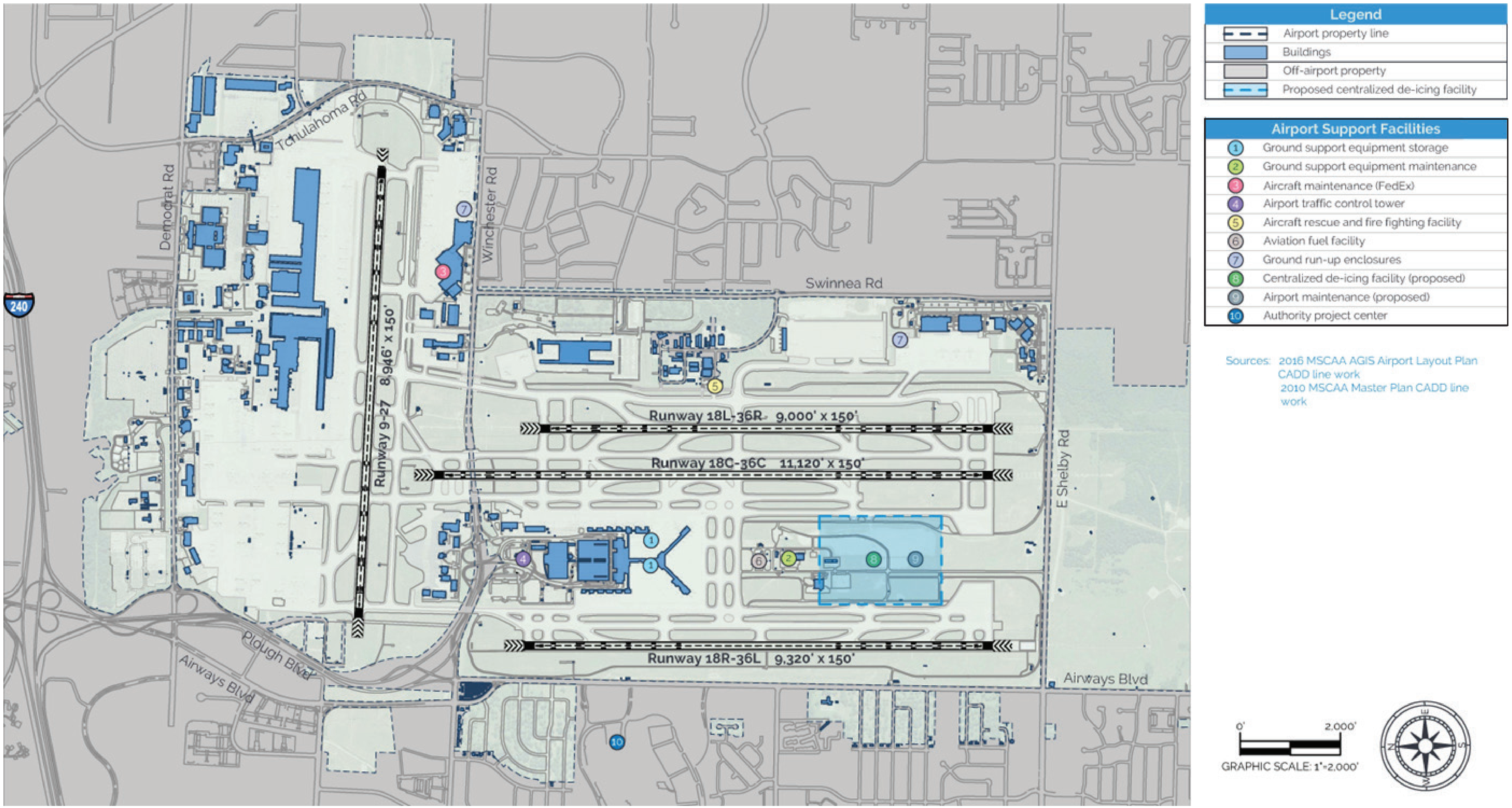
The Airport's primary fuel farm, which provides storage for fuel used by air carrier aircraft, is located between Runways 18C-36C and 18R-36L, immediately to the south of Taxiway P. There are two (2) 420,000-gallon and one (1) 210,000-gallon tank capable of storing 1.05 million gallons of fuel at any given time. The fuel farm is only used for short-term fuel storage, given that it is supplied directly from the Valero Refinery. In the event of a pipeline shutdown, the tanks can be supplied from standard tanker trunks.

A hydrant system, which transports jet fuel directly from the fuel farm to individual hydrant locations on the passenger terminal ramp adjacent to aircraft parking positions, serves most of the Airport's passenger terminal parking positions. All gates have direct access to the hydrant system except the Concourse A gates, and gates C4 through C22 on Concourse C, which are fueled by six (6) tenant-owned tanker trucks capable of holding between 3,000 and 5,000 gallons of fuel each.

During the Concourse B Modernization construction, all aircraft will utilize active Concourse A and Concourse C gates, where fuel hydrant access is limited. Upon construction completion, aircraft will utilize Concourse B gates and resume access to the fuel hydrant system.

The hydrant system consists of a looping network of pipes that range in size from six (6) to 18 inches in diameter and are fed from five (5) pumps at the fuel farm. The fuel hydrant system is owned and maintained by but the MSCAA and leases its use to a fuel consortium in which Swissport USA, Inc. operates the facility.

FIGURE 2.49: SUPPORT FACILITY LOCATIONS



Source: Master Planning Team, March 2019

In addition to the fuel farm supporting air carrier operations, there are other aviation fuel facilities located at Signature Flight Support, Wilson Air Center, TnANG, and the FedEx Super-hub. FedEx's fuel farm, which is located to the north of Democrat Road along the Airport's northern boundary, is operated by WesPac Pipelines, L.L.C, on leasehold from the Authority.

Ground Run-Up Enclosures (GRE)

Two (2) GREs are located on the airfield. One (1) GRE is located on the north side of the TnANG Apron and used exclusively by the TnANG. The second GRE is located on FedEx's Winchester Ramp near the maintenance facilities south of Runway 9-27, and east of Taxiway Y. The FedEx GRE is sized to accommodate B777 aircraft and used exclusively by the FedEx.

Deicing Fluid Containment

Each individual air carrier, or their designee, is responsible for acquiring, storing, and applying deicing fluids when conditions warrant. Currently, aircraft deicing operations take place at three (3) locations: around the Main Terminal, southern end of Taxiway Y, and hangar apron adjacent to Taxiway A. Currently, deicing fluid is stored at several locations:

- 20,000-gallon above-ground tanks adjacent to the fuel farm
- 300- to 500-gallon tanks located north of Concourse C and west of Taxiway C.
- Multiple small tote carts around the terminal building are used by commercial airlines.

Deicing fluids are applied by trucks with a retractable boom that are owned by the air carriers or their designees.

In November 2022 MSCAA opened a Central Deicing Facility (CDF). It contains 12 aircraft deicing positions, south of the Main Terminal, to allow for centralized deicing operations. Six (6) of the 12 aircraft parking positions are located west of Louis Carruthers Drive and provide access to aircraft via Taxiway N. The remaining six (6) aircraft parking positions are located east of Louis Carruthers Drive and provide access to aircraft via Taxiway J. Deicing fluid is stored at a central tank farm on site, then pumped to vehicle safety zones located adjacent to 12 aircraft parking positions. Deicing equipment withdraw deicing fluid and commence aircraft deicing operations.

Deicing fluid from these operations is captured entirely by surrounding trench drains and routed to an underground detention facility on site. Deicing fluid is then pumped and metered to the City of Memphis sanitary sewer system at predetermined rates and limits. Previously used deicing locations will cease large deicing operations, and equipment used at those sites will no longer be needed. Deicing fluid will continue to be used on the aircraft apron surrounding the terminal buildings for frost, cleaning operations, and other small deicing operations.

Airport Maintenance

Temporary airport maintenance facilities are in the industrial park on the east side of the Airfield, west of Swinnea Road. A new Mission Support Center (MSC) opened in December 2020. It is located south of the terminal building and north of the CDF and existing GSE facility along Louis Carruthers Drive. All equipment in use at the existing maintenance facility will be relocated to the new facility.

The new facility includes one (1) 120,000 square foot building for airport maintenance and operations and two (2) separate buildings for general equipment storage and bulk storage totaling 62,000 square feet. Airport communications will also be in the facility. Plans may include an additional building to house snow removal equipment at this facility.

This facility includes an 84,000 square foot employee surface parking lot to provide approximately 200 parking spaces. An additional 54 parking spaces will be provided for police and operations vehicle parking on site.

Miscellaneous Authority Facilities

The Airport Authority employs approximately 300 staff. Authority offices are located within approximately 46,214 square feet of the mezzanine level of the Passenger Terminal above the main lobby. Airport Police, other MCAA departments, and other support functions are located below the main lobby in the baggage claim level of the Terminal. Building maintenance occupies space in the Concourse A and C tunnels. Approximately 150 spaces are reserved for MSCAA employee parking on the baggage level of the parking garage.

Remaining MSCAA functions, including project/construction management support are accommodated in an approximately 18,000 square-foot facility named the "Project Center" located on the west side of the Airport, along Airways Boulevard.

UTILITIES

This section provides an overview of existing MEM utility systems related to electricity, natural gas, water, sanitary sewer, and aircraft fuel.

Electricity

Memphis Light, Gas, and Water (MLGW) provides electricity purchased from the Tennessee Valley Authority to the Airport through a grid of 12.47- and 23-kilovolt primary circuits energized from nearby substations. There are no major electrical generation or transmission facilities on Airport property. A substation on the southeast corner of Airways Boulevard and Winchester Road, owned and maintained by MLGW, contains two (2) switchgear that provide the primary electrical service to the passenger terminal via two (2) 15 kilovolt (kV) circuits. Beyond this point, the Authority has responsibility for the capacity and maintenance on the electricity distribution system, which will consist of nine (9) substations located in and near the Main Terminal after the Concourse B Modernization has been completed.

Additionally, the construction of a new parking garage immediately to the north of the existing parking garage required MLGW to install a new switchgear adjacent to the intersection of Winchester and Cargo Roads. This switchgear provided electrical service to both the new and existing parking structures via two (2) 10 megavolt (mV) circuits.

The Authority installed an emergency generator system in 2008 to provide backup electricity to the passenger terminal in the event of an unexpected power outage. The diesel-powered generator system is located along the east side of Airways Boulevard adjacent to the existing MLGW switchgear and provides continuous emergency power to all areas receiving electrical service from this switchgear.

Natural Gas

MLGW provides natural gas, purchased from Texas Gas Transmissions, L.L.C., to the Airport through a grid of four- to eight-inch (4" to 8") pipes located within public rights-of-way beneath the surrounding roadway network. MLGW owns the pipes and related infrastructure up to the point of consumption metering at various Airport facilities. The passenger terminal is served via a single six-inch (6") pipe fed from a line beneath Winchester Road connecting to the terminal to the west of Concourse A. There are no natural gas pumping or storage facilities on the Airport's property.

A 14-inch natural gas transmission pipeline in parallel with a 20-inch crude oil pipeline crosses a portion of the airfield between Runway 18R-36L and Airways Boulevard. The pipes, which are owned by MLGW but operated and maintained by Valero Energy Corporation, provide service to the company's Memphis refinery and do not provide service to the Airport.

Water

MLGW provides water service from three (3) pumping stations—Davis, Allan, and Lichterman—to the Airport through a grid of eight (8) to 24-inch pipes located within public rights-of-way beneath the surrounding roadway network. MLGW owns the pipes and related infrastructure up to the point of consumption metering at various Airport facilities. There are no specific water utility corridors, pumping stations, or storage facilities on the Airport's property.

Sanitary Sewer

A series of three (3) basins (i.e. pipe networks) collect and transport wastewater via a gravity flow system to the Nonconnah Interceptor, a 72-inch pipe that runs parallel to Nonconnah Creek on its south side flowing from east to west. Wastewater generated at the Airport is conveyed to the T.E. Maxson Wastewater Treatment Plan, located south of downtown Memphis adjacent to the Mississippi River. The plant is owned and operated by the City of Memphis, Division of Public Works, and can treat 160 million gallons of wastewater per day.

Other than the gravity-induced basins that collect wastewater, there are no major pumping, storage, or treatment facilities at the Airport.

Airport Drainage

The Airport's stormwater drainage is a gravity flow system that flows into Nonconnah Creek, located one-quarter (1/4) mile north of the Airport. Hurricane Creek flows north across a small southeastern portion of Airport property toward Nonconnah Creek. The Nonconnah Creek then flows west for approximately six (6) miles into McKellar Lake, which is part of the Mississippi River. The Airport's drainage system has no pumping stations; however, pumps are used to drain certain low areas such as the Winchester Tunnel and Louis Carruthers Drive. In addition, there are four (4) detention ponds located throughout the airfield. Recent development to the TnANG and UPS facilities have slightly increased impervious area and stormwater surface runoff to the Hurricane Creek watershed.

Upon its completion, the impervious area associated with the Central Deicing Facility will increase significantly from the current and existing conditions. In its final built-out condition the CDF will consist of approximately 370,000 square yards of new Portland Cement Concrete pavement with 30-foot-wide asphalt shoulders, future offices, various facility buildings and accompanying parking lots with connecting access roads. The stormwater management system for the CDF intends to use a dual-purposing vault for glycol storage to treat glycol impacted deice events as well as non-glycol impacted stormwater for detention purposes.

Type A Jet Fuel

Type A jet fuel is provided to the Airport via a six-inch (6") pipeline from the Valero Energy Corporation's Memphis refinery, located south of downtown Memphis, approximately seven (7) miles from the Airport. This pipeline, which is owned by MLGW but operated and maintained by Valero, enters the Airport beneath Airways Boulevard, turns south under Runway 9-27 and parallels Taxiways M and N before flowing east into the fuel farm.

EXISTING ENVIRONMENTAL CONDITIONS

Environmental considerations are important to review during the airport planning process to assist in analyzing development alternatives and identifying preferred alternatives. It is necessary to provide the information needed to understand existing environmentally sensitive features in the airport vicinity and disclose potential environmental impacts of future airport development projects that are proposed in the Master Plan. The following sections describe the existing environmental considerations at MEM.

The following environmental categories are addressed:

- Air Quality
- Noise
- Compatible Land Use
- Section 4(f)
- Historical, Architectural, Archaeological, and Cultural Resources
- Threatened and Endangered Species
- Water Quality
- Wetlands
- Floodplains

Air quality

As required by the Clean Air Act, the U.S. Environmental Protection Agency (EPA) has established National Ambient Air Quality Standards (NAAQS) for six (6) criteria pollutants considered harmful to public health and the environment:

- Carbon Monoxide (CO)
- Lead (Pb)
- Nitrogen Diozide (NO2)
- Ozone (O3)
- Particulate Pollution (PM; both 10 micron and 2.5 micron)
- Sulfure Dioxide (SO2)

An attainment area is one in which air pollutants do not exceed the NAAQS. Nonattainment areas are those in which a criteria pollutant has exceeded the NAAQS for a period of time. MEM is in Shelby County, which is currently designated as being in attainment for all criteria pollutants as classified by the EPA and the Tennessee Department of Environment and Conservation (TDEC), Air Pollution Control Division. The Memphis-Shelby County Health Department Air Pollution Control Branch has jurisdiction over Shelby County and enforces local ambient air quality standards to ensure compliance with the Clean Air Act.

Should Shelby County become designated as non-attainment for any criteria pollutants, future MEM projects may need to be accounted for in the State Implementation Plan (SIP) and/or be shown not to exceed the applicable de minimis levels as defined by General Conformity. Conformity requirements are addressed in Section 176I(1) of the Clean Air Act. These requirements are intended to ensure that the federal government does not take, approve, or support actions that are inconsistent with a state's plan to attain and/or maintain NAAQS.

Noise

Noise is defined by the FAA as unwanted sound that can disturb routine activities such as sleep, conversation, or student learning. Aviation related noise typically comes from the operation of aircraft during departures, arrivals, overflights, taxiing, and engine run-ups. The FAA measures noise in Day-Night Average Sound Level (DNL) that accounts for noise experienced during a 24-hour period.

On the DNL scale, noise occurring between the hours of 10:00 p.m. to 7:00 a.m. is penalized with an additional 10 decibel (dB). This penalty accounts for the higher sensitivity to noise during nighttime hours and the expected minimal background noise levels that typically occur at night. DNL is used to evaluate both the noise levels during existing conditions, as well as potential noise levels that could be expected to occur with proposed airport improvement projects. According to FAA Order 1050.1f, the 65 DNL noise contour defines the threshold level for significant aviation noise.

In 2015 the MSCAA conducted a CFR Part 150 Noise Exposure Map (NEM) Update to identify and quantify noise-sensitive land uses and populations located within the MEM 65 DNL noise contour. Since 2015, there have been no changes to fleet mix or activity levels that would result in expanded noise contours.

According to the Part 150 Noise Study, the 65 DNL contour encompasses approximately 13.63 square miles consisting of single family, multi-family, and transient residential; mobile homes; utility/ROW; industrial; civic; recreational; vacant; and commercial land uses. There are 14 noise-sensitive sites, including 10 churches and four (4) schools, located within 65-70 DNL noise contours and four (4) noise-sensitive sites, including one (1) hospital, one (1) cemetery/funeral home, and two (2) churches, located within the 70-75 DNL contour. There are no noise-sensitive sites within the 75 DNL which is primarily on Airport property. Both the 70 DNL and 65 DNL extend into DeSoto County, Mississippi.

In 1987, a Noise Compatibility/Property Acquisition Program was established by MSCAA to reduce noise exposure to affected properties. Much of the 75 DNL now lies within the Airport property boundary because 1,400 single-family residences located within the 75 DNL noise contour were acquired during this 10-year Property Acquisition Program.

Future Airport development projects that may require an in-depth noise analysis would include those which result in changes to air traffic procedures and those which would result in changes to fleet mix or an increase in activity that would subsequently increase the noise contours illustrated on the current FAA approved NEM. Projects that may result in non-aircraft related noise impacts may also require noise analysis. These types of projects could involve components such as engine run-ups, aircraft taxiing, construction noise, and noise from related roadway work or increased use of roads.

Compatible Land Use

Aviation-related land use planning is integral to safe, sustainable airport operations. The compatibility of existing and planned land uses near an airport is typically determined in relation to the level of aircraft-generated noise, but can also incorporate other considerations related to zoning, relocations, disruptions of communities, and induced socioeconomic impacts.

FAA grant assurances require airport operators to ensure that actions are taken to establish and maintain compatible land uses around airports. Ensuring compatibility requires an analysis of how an airport functions within the community and how the community can be impacted by an airport. An inventory of the existing zoning, land uses, and various land use planning and control mechanisms used to guide property development is an important element in the airport planning process. This section provides an overview of jurisdictions, zoning, and land use designations in the vicinity of MEM according to the Memphis/Shelby County Unified Development Code and Zoning Map.

Airport Environs

Jurisdictions within the MEM environs include portions of Shelby County, the City of Memphis, and the cities of Southaven and Horn Lake, Mississippi. Transportation planning assistance is provided by the Memphis Metropolitan Planning Organization (MPO), which plays a key role in determining transportation infrastructure in the vicinity of MEM.

Existing Zoning

Generalized zoning designations within the airport environs are illustrated in **Figure 2.50**. The MEM property is primarily zoned as Employment (EMP). According to Section 2.2.4 of the Memphis and Shelby County Unified Development Code, the EMP district intends to accommodate office, light manufacturing, research and development, and commercial issues to promote economic viability, encourage employment growth, and limit the encroachment of non-industrial development within industrial areas. The remainder of the MEM property is zoned as Conservation Agriculture (CA), generalized under Agriculture; Residential Urban (RU-2; RU-3), generalized under Residential; and Commercial Mixed Use (CMU-1), generalized under Commercial. Though segments of Airport property are zoned as residential, there are no residences on Airport property. Property immediately north, south, east, and west of the Airport comprises Residential, Residential Urban, Employment, Conservation Agriculture, Heavy Industrial, Commercial Mixed Use, and Manufactured Home Park zoning designations.

Airport Overlay District

The Memphis/Shelby County Unified Development Code states that specific Airport Overlay District boundaries depicted on maps maintained by the Authority shall take precedence over generalized boundaries referenced on the Zoning Map. Within the Airport Overlay District, the maximum permitted height of structures shall be as prescribed by the Authority. The purpose of the restricted structural heights is to protect health, safety and general welfare of the traveling public and the Memphis community by protecting airspace surrounding MEM from obstructions that could affect air navigation.

The Airport Overlay District and the height restrictions within are reflective of, and in compliance with, the imaginary surfaces and regulations outlined in FAR Part 77, Safe, Efficient Use, and Preservation of the Navigable Airspace. The MEM Airport Overlay District extends well beyond the Airport property boundary and is illustrated in **Figure 2.51.**

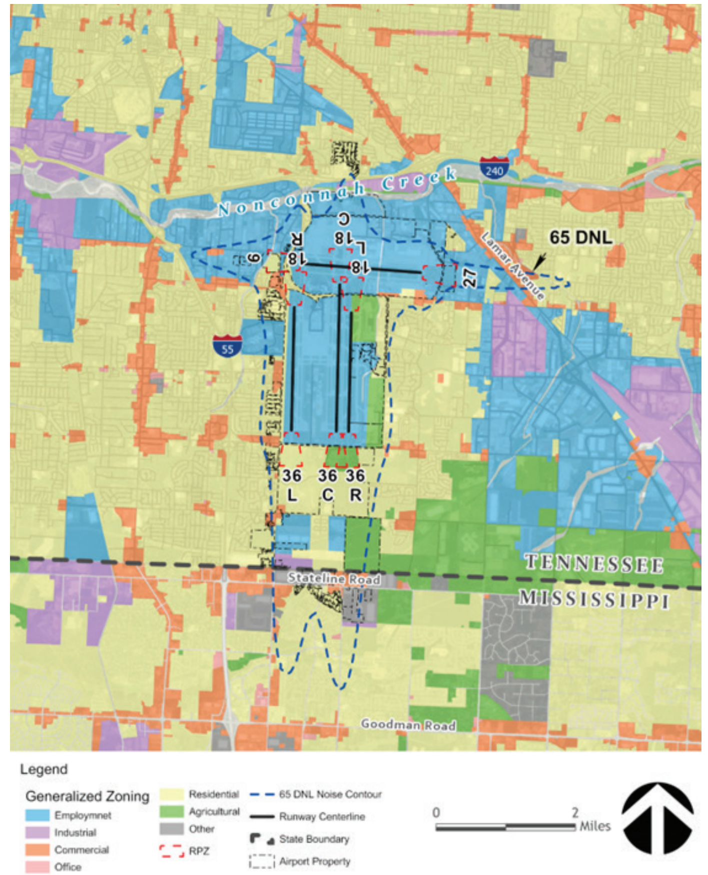
Land Use

Within the zoning districts are permissible land uses grouped and categorized as Residential, Civic, Commercial, Open, or Planned based on shared/similar functional, structural, or product characteristics. MEM and its facilities are considered permissible land uses within in the Civic and Industrial land use categories. Land uses surrounding the Airport are primarily a mix of vacant, commercial, industrial, and residential development, as illustrated in **Figure 2.52.**

The area north of the Airport (north of Interstate 240) consists primarily of residential uses, with some commercial land uses along U.S. Highway 78. Northwest of the residential land use is industrial land use consisting of the Memphis Depot Business Park. East of the Airport, between Interstate 240 and East Shelby Drive, are residential, commercial, industrial, and institutional land uses. Residential, commercial, and industrial land uses are also located along Getwell Road, US Highway 78, and Interstate 240. West of the Airport between Interstate 240 and East Shelby Drive land uses include residential, commercial, industrial, and institutional. There is residential land use between MEM and Interstate 55, and commercial land use adjacent to the Airport, north of East Raines Road, and along US Highway 51. Land to the south of the airport is largely owned by the MSCAA and vacant or industrial use.

Runway Protection Zones (RPZs) enhance the protection of people and property on the ground. Incompatible land uses within the RPZ are any land use that encourages the congregation of people. Airport ownership of the land within the RPZ is the most effective way to ensure land use compatibility. If land within an RPZ isn't owned by MSCAA, acquisition is recommended, however on a case-by-case basis, avigation easements may be acceptable.

FIGURE 2.50: MEM EXISTING GENERALIZED ZONING



Source: DeSoto County (Zoning), 2019; Jacobson|Daniels (Existing Property Boundary), 2019; Memphis Shelby County (Zoning), 2019; and URS (2020 65 dnl), 2015.

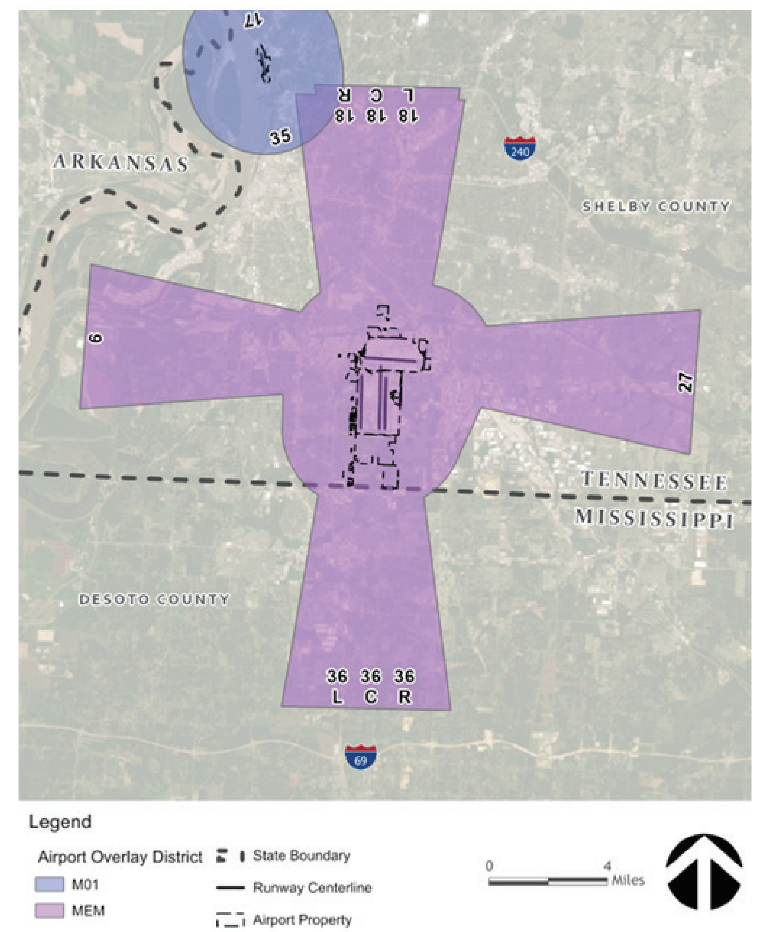
The RPZs of Runways 36L, 36C, 36R, and 9-27 extend off Airport property and contain public roads, which are considered transportation facilities, and therefore, are incompatible land uses. East Shelby Road traverses through the RPZs of Runways 36L, 36C, and 36R. East Brooks Road, Plough Blvd., Jim McGehee Parkway, and Airways Blvd are located within the RPZ of Runway 9. Additionally, a two-story entertainment facility is located within the furthest northwest corner of the RPZ for Runway 9.

Additional Land Use Considerations

Agricultural activities and wildlife attractants within the vicinity of the Airport are also important to consider in relation to land uses. MEM is located within a developed, urban area that includes airfield pavement, buildings, and Airport related uses. No agricultural activities take place on Airport property or in the immediate vicinity. Furthermore, the MEM property boundary is consolidated within the Memphis city limits (an urbanized area), so it is exempt from the Farmland Protection Policy Act.

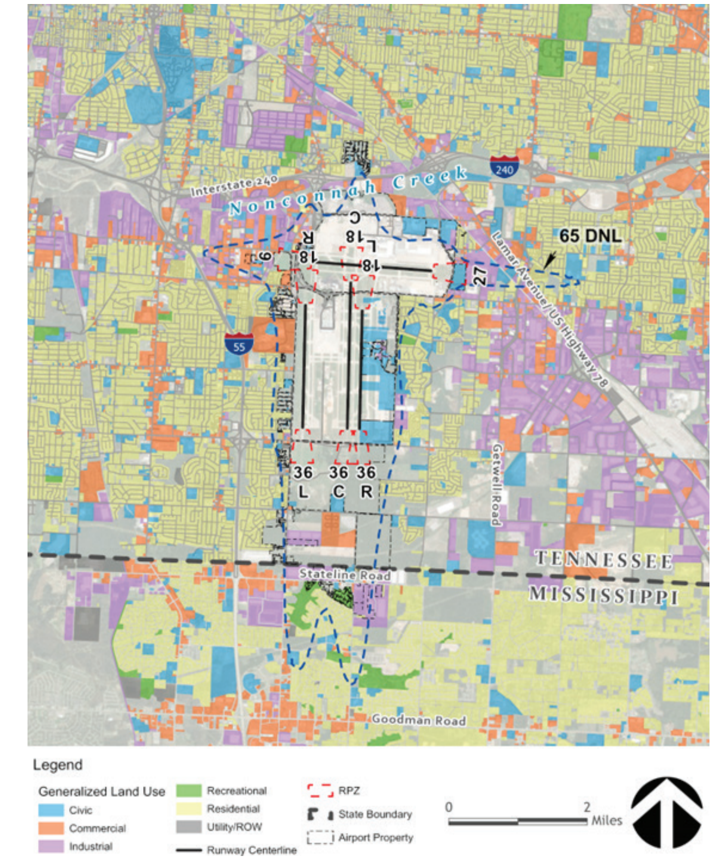
Wildlife attractants within the expanded critical zone, a five (5)-mile area along approach and departure corridors, could potentially result in safety impacts to aircraft operating at MEM. The Airport's Wildlife Hazard Management Plan (WHMP), approved by FAA in 2016,

FIGURE 2.51: MEM AIRPORT OVERLAY DISTRICT



Source: Jacobson|Daniels (Existing Property Boundary), 2019; and MSCAA (Airport Overlay), 2019.

FIGURE 2.52: MEM LAND USE



Source: Jacobson|Daniels (existing property boundary), 2019; Memphis Shelby County (Land Use), 2019; and URS (2020 65 dnl), 2015.

outlines measures to actively reduce on-Airport habitats that attract wildlife. MSCAA also works with adjacent property owners to discourage land-use practices that can attract wildlife. Hurricane Creek and an open water drainage system are the only open water sites on Airport property.

Department of Transportation Act, Section 4(f)

According to Section 4(f) of the Department of Transportation Act (re-codified as 49 USC, Subtitle I, Section 303), no publicly owned park; recreation area; wildlife or waterfowl refuge; or land of historic site that is of national, state, or local significance shall be used, acquired, or affected by programs or projects requiring federal assistance for implementation unless there is not a feasible or prudent alternative. There are no Section 4(f) properties located on Airport property; however, Oakhaven Park and Meadal of Honor Park are located approximately one-half (0.5) miles east, Charjean Park and Alcy Samuels Park are located approximately one-half (0.5) miles north, and Gardenview Park and Zodiac Park are located one-half (0.5) miles and three-quarters (0.75) miles, respectively, west of the Airport.

Historical, Architectural, Archaeological, and Cultural Resources

Section 106 of the National Historic Preservation Act (NHPA) requires federal agencies to consider the impacts of their undertakings on historic property, which includes archeological sites, buildings, structures, objects, and districts. The National Register of Historic Places (NRHP), maintained by the National Park Service (NPS), is a database of all historic sites that meet criteria set by the NPS. There are no NRHP listed sites currently on Airport property; however, according to the Memphis Heritage website, the Main Terminal and the Memphis Aero Building have been determined eligible for NRHP listing. The nearest NRHP listed sites are Graceland and the Normal Station Historic District, located three (3) miles west and five (5) miles northeast, respectively.

Each state has a State Historic Preservation Office (SHPO) that is granted the authority to nominate sites, districts, and/or objects for inclusion in the NRHP. Some SHPOs maintain a database of state-historic sites, districts, and objects that are significant to the history of the state but may not be included in the NRHP. The Tennessee Historical Commission (THC) is the state of Tennessee's SHPO. There are no state-listed historic sites on or in the vicinity of the Airport.

Though the NRHP does not report any listed sites on Airport property, in 1987 property directly west of Runway 36L, that included the Hilderbrand House, was acquired by the Airport as part of the 1987 Noise Compatibility/Property Acquisition Program. In 2001, a burial site containing 66-graves was discovered on MEM property during the extension of Taxiway C. The Authority coordinated with the THC and Weaver and Associates to catalog, excavate, and inter the remains in the Shelby County Cemetery.

In 2017, a Draft Environmental Assessment (EA) was prepared for the proposed development and modernization of Fed Ex facilities at MEM that included 24 structures. As part of this EA, an inventory of historical, architectural, archaeological, and cultural resources was conducted. The historic resources survey, site investigation, and archival research were completed for the 24 sites slated for modernization, demolition, and reconstruction. Of these 24 sites, Hangar 6, Hangar 7, the Boiler Room, and the Administrative Building were determined to be potentially eligible for NRHP listing. Hangar 6, Hangar 7, and the Boiler room are associated with World War Two (WWII) efforts and rapid development of the Army Air Corps and Army Air Forces, now the U.S. Air Force. The Administrative Building was constructed in connection to Hangars 6 and 7 by FedEx when the company relocated to the airfield. As an original FedEx facility, the Administrative building is the only representative of early FedEx operations in the nation. It is eligible for listing as a historic district (FedEx Historic District) under Criteria Consideration G due to the property (FedEx) achieving significance in the last 50 years, its connectivity to Hangars 6 and 7 used by FedEx, and FedEx's impact on local and international economies and communities. FedEx is seeking approval to mitigate the adverse effects to the potentially eligible structures caused by their demolition through the completion of Historic American Buildings Survey (HABS) Level II documentation of the eligible structures in accordance with the U.S. Army Corps of Engineers recommendations for military aircraft hangars and supporting structures.

Threatened and Endangered Species

The Endangered Species Act (ESA), as amended, requires federal agencies to ensure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of habitat of such species. Threatened species are species likely to become endangered. Endangered species are species in danger of extinction. The U.S. Fish and Wildlife Service (USFWS) is responsible for listing federal threatened and endangered species protected by the ESA.

The USFWS Information for Planning and Consultation (IPaC) identifies threatened and endangered species that are present in a specified area based on a species range and area of influence. The IPaC report identifies species protected by the ESA that could be located within the MEM vicinity (see **Figure 2.53**). Species that are not classified as threatened or endangered may be classified by USFWS as recovery to conserve the species' life and slow or stop the decline in population of the species. Though delisted under the ESA, recovery status has been declared for the bald eagle within Shelby County, as the bald and golden eagle are protected under the Bald and Golden Eagle Protection Act.

Twenty-seven (27) species (see **Figure 2.53**), including animals and plants, are identified as Species of Concern by the TDEC for Shelby County within the Biotics Database of the Tennessee Division of Natural Areas. Species of special concern are uncommon species or subspecies of plant in Tennessee, or those with unique or highly specific habitat requirements or scientific value, which therefore require careful monitoring of its status. Of the 27 species, several are designated as rare as noted in the figure, which are species of scarce population or rarity within a certain geographical area. Several of these species could be found within the MEM vicinity.

Aquatic plant and wildlife communities in Hurricane, Days, and Nonconnah Creeks are protected by measures required under the MSCAA Storm Water Pollution Prevention Plan (SWPPP). According to the SWPPP, MSCAA follows best management practices to prevent storm water discharges from adversely affecting listed or proposed threatened or endangered aquatic fauna.

The MEM Wildlife Hazard Management Team, with assistance from the contracted U.S. Department of Agriculture biologist, are responsible for implementing the Airport's Wildlife Hazard Management Plan (WHMP) approved by FAA in 2016. MEM wildlife control personnel are responsible for familiarizing themselves with listed threatened or endangered species and their potential occurrence at the Airport. The WHMP states that no threatened or endangered species nor critical habitats have been observed on Airport property. Ongoing monitoring and the MEM Wildlife Hazard Assessment conclude the following species pose the greatest potential safety hazards at MEM:

- Blackbirds
- Waterfowl
- Birds of Prey
- Pigeons
- Mourning doves

In compliance with Federal and State law, wildlife hazard management procedures are to be conducted in such a manner to ensure there is no negative effect to endangered or threatened species. If endangered or threatened species pose safety hazards at MEM, Federal and State agencies are to be consulted. All necessary permits must be obtained, and procedures will be pursued to allow MSCAA to maintain public safety.

Water Quality

Some airport activities can result in water quality impacts. Construction sediment-laden runoff, biological and chemical breakdown of deicing chemicals in airport runoff, and fueling activities or leaks, as well as certain operations or maintenance activities may affect water quality. Airport-related water quality impacts can occur from both point sources and non-point sources. Point sources are stormwater or other types of discharges from water collection devices that flow through a conveyance (pipe) and discharge to a waterway. Non-point sources include stormwater runoff from runways, taxiways, aprons, outdoor storage areas, or construction areas that do not flow through conveyance systems.

At MEM, the principal water quality concerns are related to the potential presence of pollutants in storm water associated with aviation and industrial activities including aircraft and vehicle maintenance, equipment cleaning, and deicing. Other sources that may affect water quality are associated with existing and former fueling and maintenance facilities.

FIGURE 2.53.: SPECIES AND CRITICAL HABITAT WITH FEDERAL ESA STATUS IN SHELBY COUNTY

Common Name	Scientific Name	Jurisdiction	ESA Status	Critical Habitat
Indiana Bat	Myotis sodalist	USFWS Endangered	None	Airport Property
Northern Long-eared Bat	Myotis septentrionalis	USFWS Threatened	None	None designated
Least Tern	Sterna antillarum	USFWS Endangered	None	None designated
Pallid Sturgeon	Scaphirhynchus albus	USFWS Endangered	None	None designated within Airport Property
Bald Eagle	Haliaeetus leucocephalus	USFWS Recovery	None	None designated on Airport Property

Source: United States Fish and Wildlife Service (USFWS), Information for Planning and Consultation (IPaC), June 2019

FIGURE 2.53: ENDAGERED, THREATENED, AND SPECIES OF SPECIAL CONCERN IN SHELBY (CONT.)

Common Name	Scientific Name	Federal Status	State Status
Animal Assemblage			
Heron Rookery	Rookery	–	Rare, Not State Listed
Invertebrate Animal			
Bronze Copper	Lycaena Hyllus	–	Rare, Not State Listed
Striped Whitelip	Webbhelix multilineata	–	Rare, Not State Listed
Southern Hickorynut	Obovaria jacksoniana	–	Rare, Not State Listed
Fatmucket	Lampsilis siliquoidea	–	Rare, Not State Listed
Vascular Plant			
Har'ey's Beakrush	Rhynchospora harveyi	–	Threatened
Cedar Elm	Ulmus crassifolia	–	Special Concern
Willow Aster	Symphyotrichum praealtum	–	Endangered
Sweetbay Magnolia	Magnolia virginiana	–	Threatened
American Ginseng	Panax quinquefolius	–	Special Concern, Commercially Exploited
Red Starvine	Schisandra glabra	–	Threatened
Ovate Catchfly	Silene ovata	–	Endangered
Multiflowered Mud-plantain	Heteranthera multiflora	–	Special Concern
Featherfoil	Hottonia inflata	–	Special Concern
Copper Iris	Iris fulva	–	Threatened
Vertebrate Animal			
Bald Eagle	Haliaeetus leucocephalus	Recovery	Deemed in Need of Management
Bew'ck's Wren	Thryomanes bewickii	–	Deemed in Need of Management
Piebald Madtom	Noturus gladiato	–	Deemed in Need of Management
Blue Sucker	Cycleptus elongatus	–	Threatened
Cerulean Warbler	Setophaga cerulea	–	Deemed in Need of Management
Southern Cricket Frog	Acris gryllus	–	Rare, Not State Listed
Naked Sand Darter	Ammocrypta beani	–	Deemed in Need of Management
Northern Pinesnake	Pituophis melanoleucus melanoleucus	–	Threatened
Eastern Woodrat	Neotoma floridana illinoensis	–	Deemed in Need of Management
B'll's Vireo	Vireo bellii	No Status	Rare, Not State Listed
Interior Least Tern	Sternula antillarum athalassos	Listed Endagered	Endagered
Swain'on's Warbler	Limnothlypis swainsonii	–	Deemed in Need of Management

Source: TDEC, Division of Natural Areas, Rare Species by County, June 2019.
Source: United States Fish and Wildlife Service (USFWS), Information for Planning and Consultation (IPaC), June 2019

Stormwater and Drainage

MEM is situated in a relatively low-lying area within the Nonconnah Watershed. The Memphis area is prone to significant rainfalls, which creates a large capacity of ground and rainwater. Therefore, stormwater management and water quality are key considerations in planning for future airport development projects.

MEM's stormwater drainage is a gravity flow system that flows into Nonconnah Creek, approximately one-quarter (1/4) mile north of the Airport. Nonconnah Creek then flows west for approximately six (6) miles into McKellar Lake, which eventually empties into the Mississippi River. The drainage system has no pumping stations; however, pumps that are maintained and operated by the City of Memphis are used to drain certain low-lying areas, such as the Winchester Tunnel. There are four (4) detention ponds located on the airfield. When the Passenger Terminal Apron Project was completed in 2015, the associated facilities for stormwater drainage and hydrant fueling were also replaced.

The National Pollutant Discharge Elimination System (NPDES) stormwater program requires permits for discharges from construction activities that disturb one or more acres, and discharges from smaller sites that are part of a larger common plan of development. Airport projects that involve excavating one (1) or more acres or often require the use of equipment, such as bulldozers, cranes, dump trucks, etc., disturbing or removing trees or ground cover, or filling or leveling land. Such activities typically result in sediment run off and temporary construction impacts that require a NPDES permit. Examples of airport projects that typically require a NPDES permit include new or expanded terminal and hangar facilities, runways and taxiway extensions or widening, installation of NAVAIDS, as well as new or relocated access roadways, remote parking facilities, and rental car lots.

Deicing Facilities and Activities

As part of MEM's Strategic Plan (2017-2021), the Airport has prioritized compliance with its 2014 state-issued storm water permit by installing in-stream monitoring stations that collect extensive data and baseline information during winter weather events. This data is being used to develop a model for measuring how de-icing activities impact the streams, create mitigation steps to reduce or eliminate negative impacts from winter weather operations, and assist in the design of a centralized de-icing pad to provide future options for collection and treatment of these discharges.

There were previously four (4) de-icing pads located around the airfield at MEM: three (3) pads at the south end of the airfield adjacent to Taxiways J, N, and Y, and a fourth located to the north and south side of Taxiway A, adjacent to the FedEx aircraft maintenance facility. A new central location was opened in 2022 at the southern end of the Airport, which has two (2) pads and a glycol collection system. The pads adjacent to Taxiways A and Y pads will remain available on an as-needed basis; the J and N pads will be incorporated into the new consolidated pad.

It is anticipated that the consolidated de-icing facilities will improve overall water quality in relation to deicing activities at MEM as aircraft glycol runoff into Hurricane Creek, the only onsite water body under the jurisdiction of TDEC, will be significantly reduced. The improved collection of de-icing fluids associated with the new deicing facility also diverts runoff from Days Creek, and ultimately Nonconnah Creek.

Environmental regulations require that used fluid from de-icing pads be collected and transported to a holding tank so that it does not mix with stormwater runoff. MSCAA developed and implemented a Deicing/Anti-icing Chemicals Management Plan (DACMP) as required by NPDES Permit TN0072940. The purpose of the DACMP is to provide for improved control of chemicals used for deicing/anti-icing activities at MEM. Fluids in the pavement drainage system surrounding the de-icing pads are collected and diverted from the sanitary sewer system to a pump that transfers the fluids into above-ground storage tanks. Liquid transport trucks empty used de-icing fluids from the storage tanks to similar tanks located east of Taxiway N and south of Taxiway P where the fluids are then discharged via meters through a manhole into the Airport's sanitary sewer system. MEM is currently in the process of obtaining a new Storm Water Permit and developing a plan to comply with new de-icing fluid collection requirements.

Fueling Facilities and Activities

The primary air carrier fuel farm is located between Runways 18C-36C and 18R-36L, south of Taxiway P. This facility was updated in 2014 with a new water treatment system equipped to handle large volumes of rainfall and extract residual fuel. The water is stored in an underground storage tank and is then pumped through an oil/water separator (OWS), which separates residual fuel from the water, disposes of the wasted fuel, and returns the clean water back through the storm drainage system. A hydrant system transports jet fuel directly from the fuel farm to individual hydrant locations on the passenger terminal ramp adjacent to aircraft parking positions and serves most of the Main Terminal parking positions. In addition to the fuel farm supporting the passenger terminal, Signature Flight Support, Wilson Air Center, TnANG, and the FedEx super-hub also have their own fuel facilities. FedEx's fuel farm, which is located to the north of Democrat Road along the Airport's northern boundary, receives its fuel from a separate off-airport facility fed by an 18-mile pipeline that runs from Airport property in Memphis, TN, across the Mississippi River to the Teppco pipeline system in West Memphis, Arkansas.

Wetlands

Section 404 of the Clean Water Act (CWA) prohibits the discharge of dredged or fill material into waters of the U.S., including wetlands, unless a permit has been obtained. Wetlands are defined as areas inundated by surface or groundwater, with a frequency sufficient to support vegetation or aquatic life requiring saturated or seasonally saturated soil conditions for growth and reproduction. The Division of Water Resources of the TDEC is responsible for protecting wetlands within the state and requires obtainment of an Aquatic Resource Alteration Permit (ARAP) if an organization's activities will impact a wetland.

According to the USFWS National Wetlands Inventory (NWI), there are several wetlands located throughout Airport property, as illustrated in **Figure 2.54**. Freshwater pond, imbedded freshwater/forested/shrub, freshwater forested/shrub, and riverine wetland types are identified on and surrounding Airport property. Areas declared as riverine wetlands according to the NWI map appear to be culverts that span throughout MEM property.

As part of various development projects and land acquisitions since 1993, wetland delineations have been conducted on MEM property. Based on these delineations and aerial images, it is possible that there may be additional wetlands within undeveloped areas and development of these sites may require mitigation of wetland impacts if impacts cannot be avoided. Potential development projects impacting wetlands will require permits from the U.S. Army Corps of Engineers and appropriate mitigation as required by Federal, State, and local regulations.

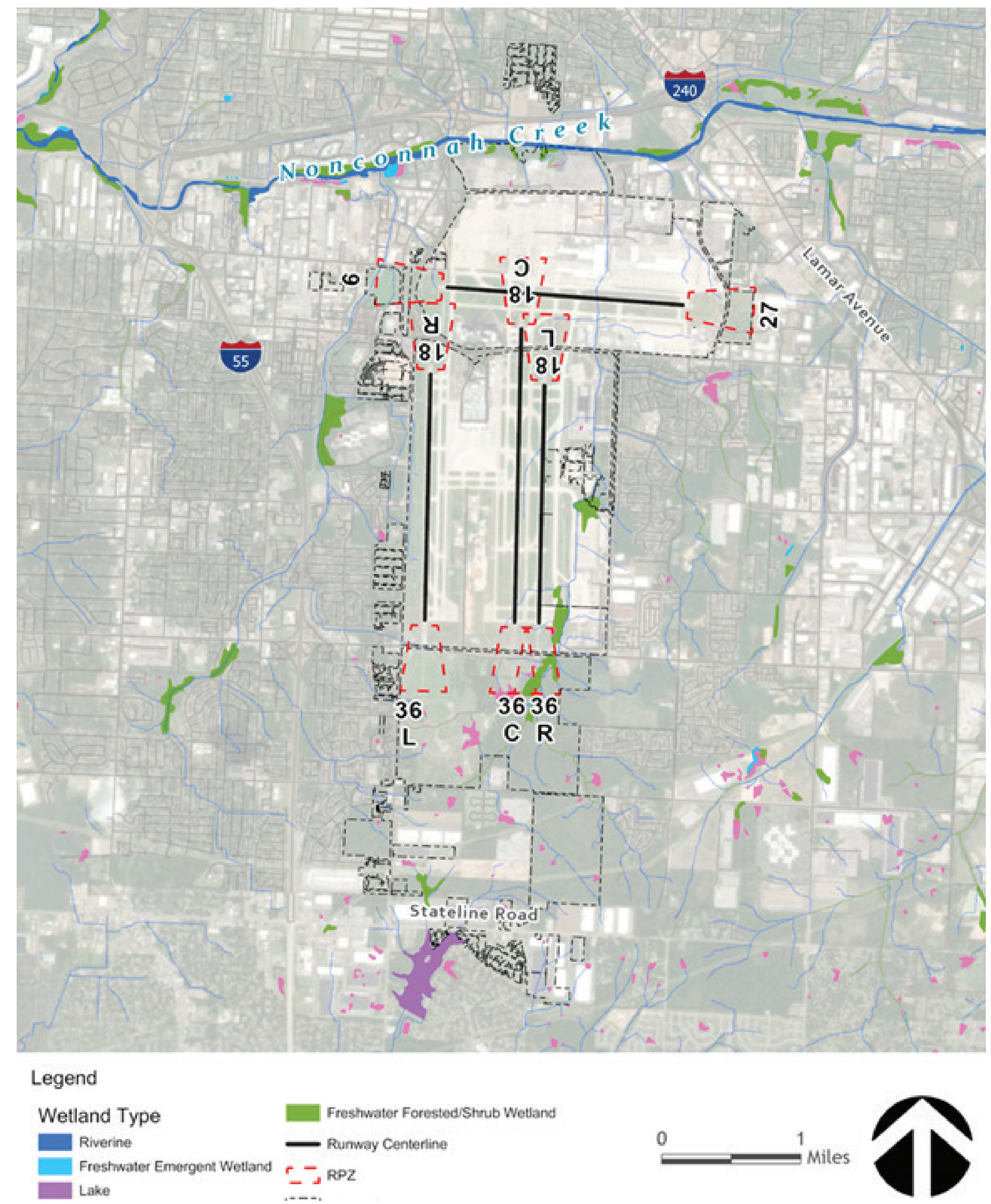
Floodplains

Executive Order 11988, Floodplain Management, requires federal agencies to avoid, to the extent possible, indirect, and direct short and long-term impacts to floodplains. As part of the National Flood Insurance Program, the Federal Emergency Management Agency (FEMA) produces Flood Insurance Rate Maps (FIRM), which depict Special Flood Hazard Areas (SFHA). FEMA distinguishes SFHAs as those that will be inundated by the base flood, or the flood event having a one-percent (1%) chance of being equaled to the Base Flood Elevation (BFE) or exceeded in any given year (i.e., the 100-year floodplain).

Much of MEM property is considered an area of minimal flood hazard and is outside the 0.2 percent annual chance flood; however, as illustrated in **Figure 2.55,** there are areas within the property boundary and just outside the property boundary that are identified as regulatory floodways. Hurricane Creek, that flows along the east side of Airport property; Days Creek, west of Runway 9 (off Airport property); and Nonconnah Creek, that is partly contained within the northern portion of the Airport property, are considered regulatory floodways. According to the FIRM, the floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the one-percent annual chance flood can be carried without substantial increase in flood heights. Hurricane Creek is located east of Runway 18L-36R in a north-south orientation where it is mostly aboveground. A portion of Hurricane Creek is located under FedEx facilities and later resurfaces near Nonconnah Creek.

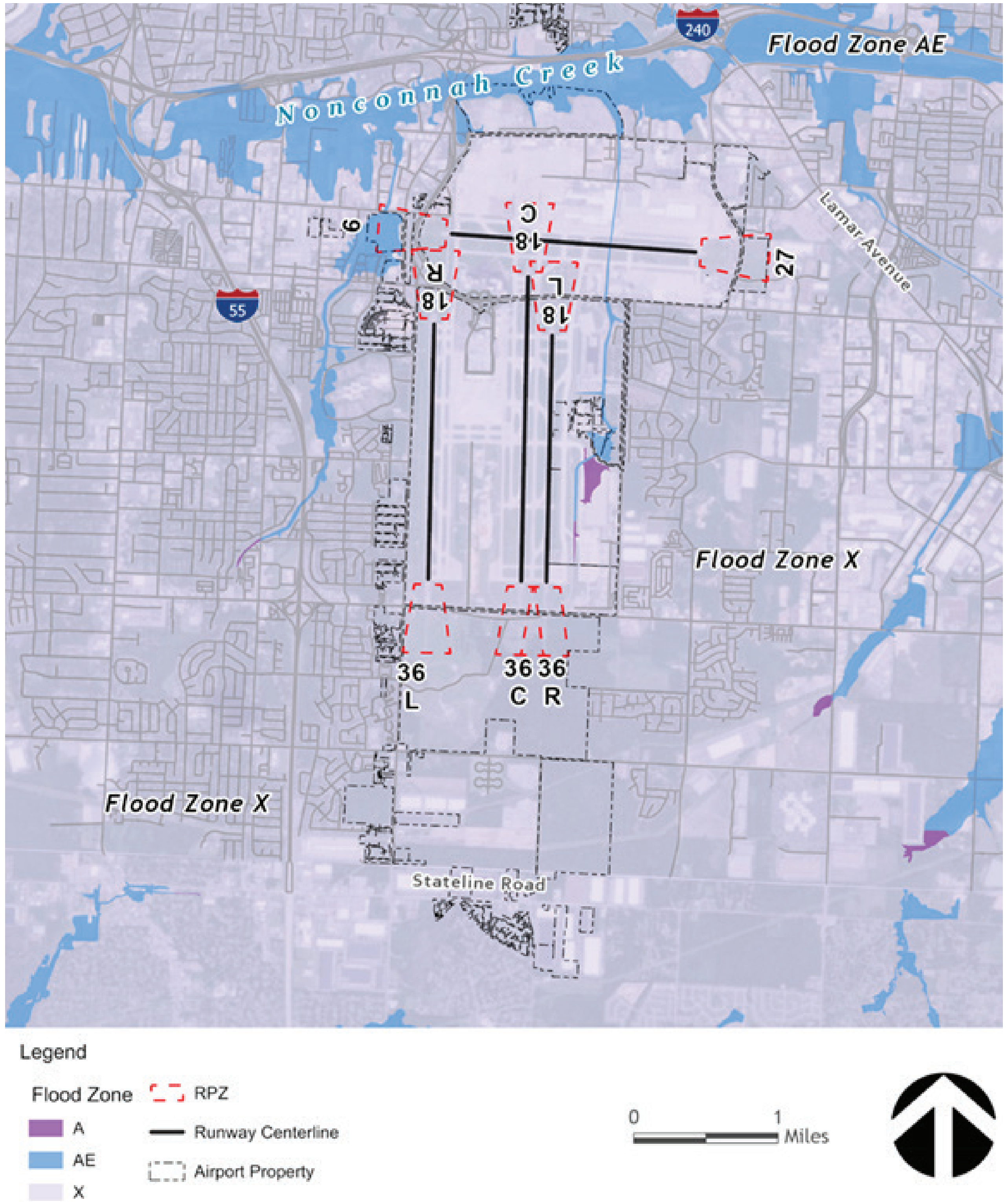
Sections of Hurricane Creek that were reconstructed during the construction of Runway 18L-36R between Runway Road and Shelby Drive were designed and engineered to accommodate a 100-year flood event. The section of Hurricane Creek between Democrat Road and Christine Road that flows through a concrete channel can also accommodate a 100-year flood event, but the remainder of the natural and unlined sections north of Democrat Road, between Christine and Runway Roads and south of Shelby Drive, are subject to 100-year flood events. Design and engineering of future facilities in these areas would require incorporating appropriate flood mitigation controls.

FIGURE 2.54: WETLANDS ON AND SURROUNDING MEM

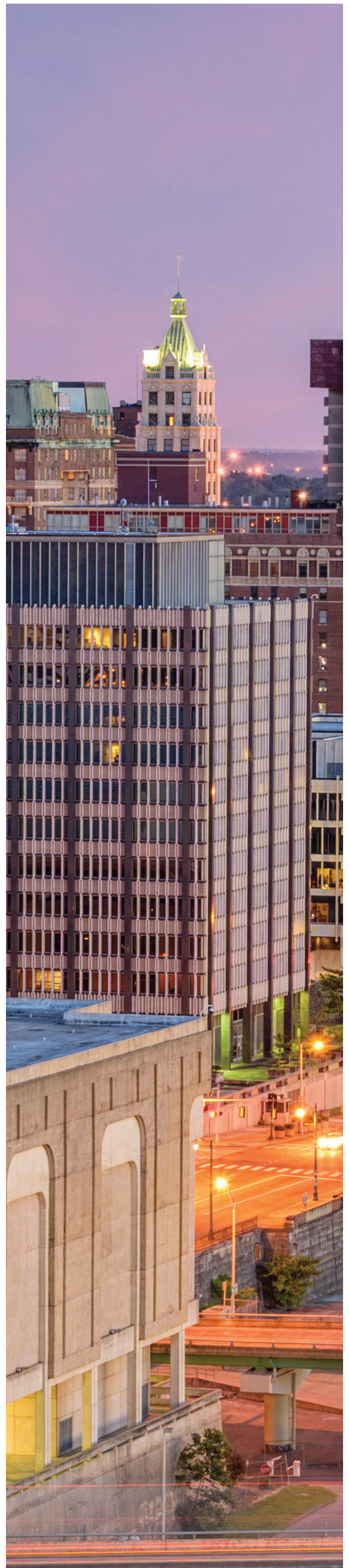


Source: Jacobson|Daniels (existing property boundary), 2019; and USFWS (National Wetlands Inventory), 2019.

FIGURE 2.55: MEM FLOODPLAIN AREAS



Source: Jacobson|Daniels (existing property boundary), 2019; FEMA (National Flood Hazard Layer), 2019.



FORECAST OF AVIATION ACTIVITY

Chapter 3 describes the forecasts of future aviation activity at Memphis International that were developed to guide the Master Planning process. Activity forecasts represent critical inputs to the Master Plan Update as they are used to determine the required level of airport facility development needed to accommodate expected levels of future demand. The forecasts for this Master Plan have been prepared using a base fiscal year of 2017 and cover a 20-year planning horizon. Key activities measured in the forecast include commercial airline passenger traffic, associated aircraft operations, cargo volume and all-cargo operations, and general aviation aircraft operations. The Military did not give direct input into this forecast, although the Memphis Shelby County Airport Authority (MSCAA) is not aware of any changes to the Tennessee Air National Guard's mission or operations. Historical activity presented is derived from MSCAA records. Military activity was forecasted according to the FAA TAF and is reflected as such in the operational totals.

Memphis International Airport is the primary commercial airport serving the Greater Memphis area and is located approximately seven (7) miles southeast of downtown Memphis, making it an attractive facility for area residents and visitors to the region. In the 2017 calendar year, Memphis International was ranked as the 62nd largest airport in the U.S. based on enplaned passengers. The National Plan of Integrated Airport Systems (NPIAS) classifies MEM as a small hub airport. Small hub airports are defined as those that account for at least 0.05%, but less than 0.25% of total U.S. passenger enplanements. In the 2017 calendar year, MEM's passenger volume activity represented 0.245% of the total U.S. activity, being the largest of all small hub U.S. airports.

The forecasts included herein were approved by the Federal Aviation Administration (FAA) on July 22, 2019. A copy of the final report and approval letter is provided in **Appendix B** and **Appendix C** respectively.

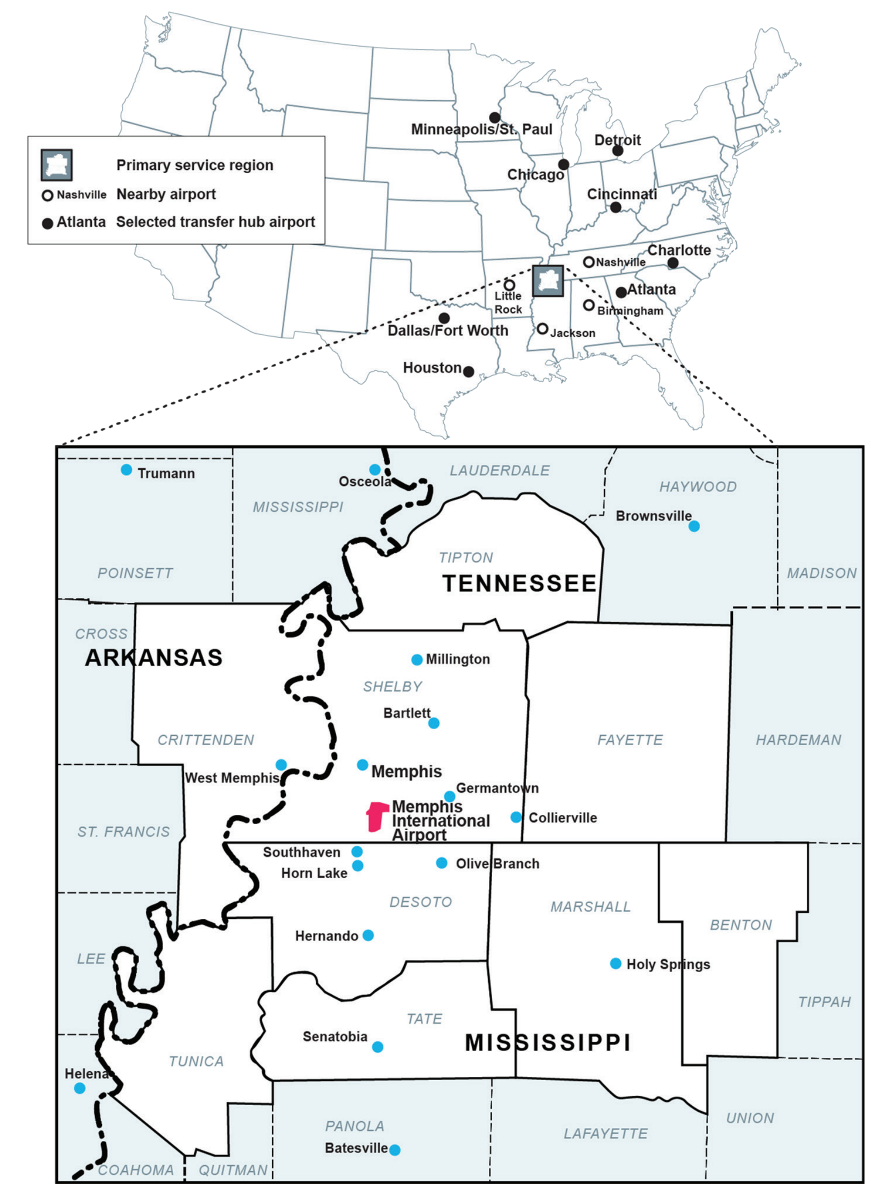
Socioeconomic Review of the Memphis Market Area

This section describes historical and forecast socioeconomic activity of the Memphis Airport service region. For the purposes of the forecast analysis, the Memphis, TN-MS-AR Metropolitan Statistical Area (MSA) is defined as the principal market and catchment area from which the Airport draws passengers and air cargo shipments. The primary market area includes nine (9) counties spanning the states of Tennessee, Arkansas, and Mississippi. Its nearest major metropolitan neighbors are Nashville, located approximately 205 miles northeast of Memphis, and Little Rock, Arkansas, located 153 miles west. Notably, the largest U.S. airport and Delta's hub airport, Atlanta Hartsfield-Jackson (ATL), is 383 miles southeast of MEM. Given the proximity to ATL (the world's busiest airport) and the capabilities of the airfield (multiple runways accommodating large aircraft), there is also the possibility that MEM could serve as a reliever airport for diversion activity in situations where ATL has inclement weather or some other type of emergency. **Figure 3.0** shows an outline of the counties captured in the Memphis MSA along with the Airport's location.

Gross Domestic Product Trends and Outlook

Air travel demand and airport passenger traffic are strongly linked to the economic characteristics of a region. The City of Memphis, which is located in the southwest region of Tennessee, borders the Mississippi River and neighboring states Arkansas and Mississippi. The Memphis MSA is comprised of nine (9) counties across the surrounding three states as shown in **Figure 3.0**.

FIGURE 3.0: MEMPHIS MSA



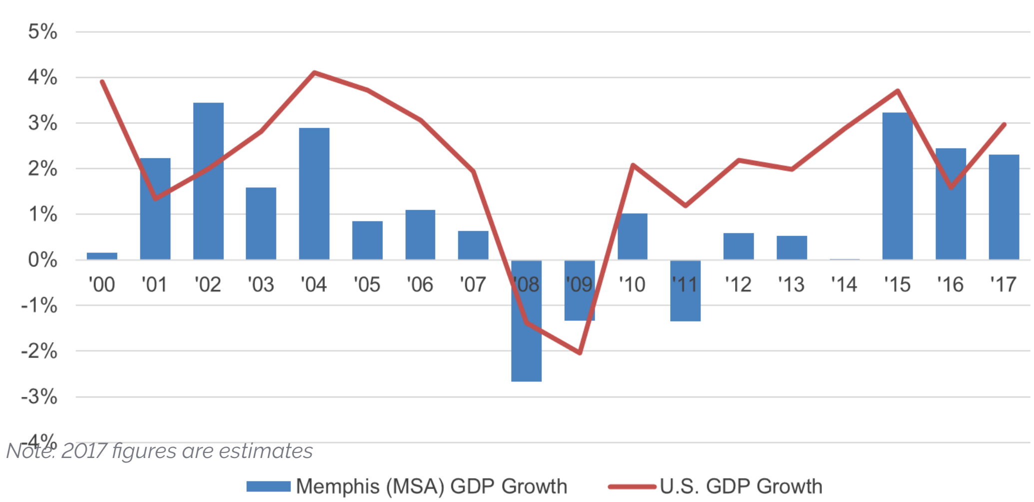
Source: Master Planning Team

Figure 3.1 shows historical year-over-year Gross Domestic Product (GDP) growth for the Memphis MSA and the U.S. between 2000 and 2017. GDP growth within Memphis has historically underperformed the nation over the past decade and a half, except in 2016, when Memphis GDP growth exceeded U.S. GDP growth by about 0.8 percentage points. Between 2000 and 2017, Memphis GDP grew at an average annual rate of 0.6%, compared to 0.9% for the nation. During the 2008-2009 Great Recession, Memphis GDP contracted, in-line with the overall national trend. From 2016 to 2017, national GDP growth outpaced Memphis MSA GDP growth. Over the next 10 and 20 years, Woods & Poole Economics projects that Memphis MSA GDP will continue to grow at rates below the national average. Memphis GDP is expected to grow by 1.5% between 2017 and 2027 and by 1.4% between 2027 and 2037 (see in **Figure 3.2**).

Population

The Memphis MSA has a population of approximately 1.35 million according to Woods & Poole estimates from 2017. Shelby County, which includes the City of Memphis, has a population of 938,219, representing 69% of the total MSA population. The top five (5) counties in the Memphis MSA by population – Shelby, DeSoto, Tipton, Crittenden, and Fayette counties – are all within less than an hour drive from the Airport and combine to account for 94% of the total MSA population (see in **Figure 3.3**).

FIGURE 3.1: HISTORIC ANNUAL GROWTH OF MEMPHIS REGION GDP AND NATIONAL GDP (CY)



Note: 2017 figures are estimates

Source: Woods & Poole, 2018 Complete Economic and Demographic Data Source (CEDDS)

FIGURE 3.2: HISTORICAL AND FORECAST MEMPHIS REGION AND NATIONAL GDP GROWTH (CY 2000-2017)

	Historical		Estimate	Forecast	
	1997	2007	2017	2027	2037
GDP (millions 2009 US$)					
Memphis	49,481.7	63,357.5	66,344.5	76,952.6	87,333.1
Tennessee	195,639.6	250,253.3	309,240.5	371,728.7	433,834.9
United States	10,768,753.4	14,820,650.5	17,204,393.0	20,671,067.3	24,206,856.8
Memphis (MSA) GDP Share					
% of Tennessee	25.3%	25.3%	21.5%	20.7%	20.1%
% of United States	0.5%	0.4%	0.4%	0.4%	0.4%
Average Annual Growth	**20 Years '97-'17**	**10 Years '07-'17**		**10 Years '17-'27**	**20 Years '17-'37**
Memphis	1.5%	0.5%		1.5%	1.4%
Tennessee	2.3%	2.1%		1.9%	1.7%
United States	2.4%	1.5%		1.9%	1.7%

Note: 2017 figures are estimates

Source: Woods & Poole, 2018 CEDDS

FIGURE 3.3: MEMPHIS MSA POPULATION BY COUNTY (2017)

Rank	County	State	Population	Percent of Total
1	Shelby	TN	938,219	69%
2	DeSoto	MS	180,652	13%
3	Tipton	TN	62,086	5%
4	Crittenden	AR	49,278	4%
5	Fayette	TN	40,337	3%
6	Marshall	MS	36,003	3%
7	Tate	MS	28,287	2%
8	Tunica	MS	10,255	1%
9	Benton	MS	8,283	1%
	Total		**1,353,400**	**100%**

Note: Sum may not add up to 100%, due to rounding

Source: Woods & Poole, 2018 CEDDS

The population of the Memphis MSA represents 15.5% of the Tennessee population , and 0.4% of the total U.S. population. The Memphis MSA is the 42nd largest metro area in the United States according to Woods & Poole's 2017 estimates. Between 2007 and 2017, the Memphis MSA population increased an average of 0.4% per year and has been growing behind the rate of the rest of Tennessee and the U.S., which both grew 0.8% per year during the same ten-year period.

Over the next ten years, population growth in Memphis is forecast by Woods & Poole to increase by about 0.9% annually, which matches the U.S. average growth rate. By 2037, Memphis' share of the total state population is expected to decrease slightly, from 20.2% today to 19.5% by 2037 (see **Figure 3.4**). On the state-level, Tennessee's population is forecast to growan average of 1.0% annually from 2017 to 2037.

FIGURE 3.4: HISTORICAL & FORECAST POPULATION GROWTH FOR MEMPHIS MSA & U.S. (CY 1997-2037)

	Historical		Estimate	Forecast	
	1997	2007	2017	2027	2037
Population (in 000s)					
Memphis MSA	1,172.5	1,302.3	1,353.4	1,473.8	1,591.2
Tennessee	5,499.2	6,175.7	6,714.6	7,430.5	8,144.7
United States	272,646.9	301,231.2	325,888.1	357,430.5	389,046.2
Memphis Population Share					
% of Tennessee	17.4%	16.5%	15.5%	14.8%	14.0%
% of United States	0.4%	0.4%	0.4%	0.4%	0.4%
Average Annual Growth	**20 Years '97-'17**	**10 Years '07-'17**		**10 Years '17-'27**	**20 Years '17-'37**
Memphis MSA	0.7%	0.4%		0.9%	0.8%
Tennessee	1.0%	0.8%		1.0%	1.0%
United States	0.9%	0.8%		0.9%	0.9%

Note: 2017 figures are estimates

Source: Woods & Poole, 2018 CEDDS

Employment Trends

In terms of non-farm employment, Tennessee ranks 5th among the states that comprise the U.S. South as defined by the Bureau of Labor Statistics (BLS), with a workforce of over 3.2 million employees as of June 2018. The BLS Establishment Payroll Data is estimated from a survey of about 400,000 business establishments that account for about one-third (1/3) of all jobs in the country (excluding agricultural sector jobs) which is frequently used to analyze labor market and economic conditions. Non-farm payroll employment is utilized because it provides accurate reported data, which gauges the economic health of the nation, and helps calculate unemployment rates.

Tennessee's total employment is up 1.6% since June 2017 (see **Figure 3.5**), making it the second fastest growing state in the South in terms of number of non-farm employees, behind Georgia. In addition, the Tennessee labor force grew faster than the U.S. average over the past 12 months. The Tennessee non-farm labor force represents about 2.0% of the total U.S. labor force as of June 2018.

FIGURE 3.5: NON-AGRICULTURE EMPLOYMENT FOR THE SOUTHERN STATES & U.S. (JUNE 2017 TO JUNE 2018)

Rank	State	Non-Farm Employees ('000s) June 2018	Non-Farm Employees ('000s) June 2017	Net Change	Pct Change	Rank by Pct Change
1	Florida	10,232.6	10,103.1	129.5	1.3%	4
2	Georgia	5,155.4	5,057.8	97.6	1.9%	1
3	North Carolina	4,997.5	4,938.0	59.5	1.2%	5
4	Virginia	4,348.9	4,310.8	38.1	0.9%	8
5	**Tennessee**	**3,245.9**	**3,193.6**	**52.3**	**1.6%**	**2**
6	Maryland	3,233.3	3,223.2	10.1	0.3%	9
7	South Carolina	2,313.1	2,310.5	2.6	0.1%	11
8	Alabama	2,187.7	2,167.8	19.9	0.9%	7
9	Kentucky	2,063.0	2,058.3	4.7	0.2%	10
10	Mississippi	1,281.6	1,280.9	0.7	0.1%	12
11	West Virginia	785.1	776.5	8.6	1.1%	6
12	Delaware	484.5	477.6	6.9	1.4%	3
	United States	162,140.0	160,214.0	1,926.0	1.2%	

Note: June 2018 are preliminary numbers; seasonally adjusted by BLS reporting.

Source: U.S. Department of Commerce, Bureau of Labor Statistics (BLS)

FIGURE 3.6: NON-AGRICULTURE EMPLOYMENT FOR THE SOUTHERN STATES & U.S. (JUNE 2017 TO JUNE 2018)

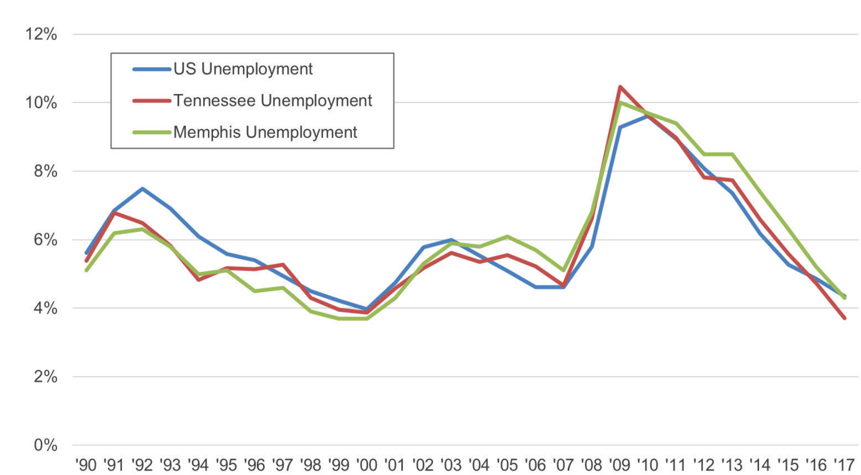
Industry Sector	Non-Farm Employees ('000s) 2007	2012	2017	Average Annual Percent Change '07-'12	'12-'17	'07-'17
Trade, Transportation, and Utilities	179.4	167.7	183.0	-1.3%	1.8%	0.2%
Professional and Business Services	87.5	91.6	97.0	0.9%	1.2%	1.0%
Education and Health Services	82.2	89.4	96.3	1.7%	1.5%	1.6%
Government	88.4	85.2	84.5	-0.7%	-0.2%	-0.5%
Leisure and Hospitality	71.7	62.6	68.9	-2.7%	1.9%	-0.4%
Manufacturing	51.1	44.5	45.2	-2.7%	0.3%	-1.2%
Financial Activities	33.2	27.4	29.1	-3.8%	1.2%	-1.3%
Other Services	24.0	24.0	25.3	0.0%	1.1%	0.5%
Mining, Logging, and Construction	26.2	20.5	22.7	-4.8%	2.1%	-1.4%
Information	7.4	6.0	5.6	-4.1%	-1.4%	-2.7%
Total	**651.1**	**618.9**	**657.6**	**-1.0%**	**1.2%**	**0.1%**
Percent of Total						
Trade, Transportation, and Utilities	27.6%	27.1%	27.8%			
Professional and Business Services	13.4%	14.8%	14.8%			
Education and Health Services	12.6%	14.4%	14.6%			
Government	13.6%	13.8%	12.8%			
Leisure and Hospitality	11.0%	10.1%	10.5%			
Manufacturing	7.8%	7.2%	6.9%			
Financial Activities	5.1%	4.4%	4.4%			
Other Services	3.7%	3.9%	3.8%			
Mining, Logging, and Construction	4.0%	3.3%	3.5%			
Information	1.1%	1.0%	0.9%			
Total	**100.0%**	**100.0%**	**100.0%**			

Note: Not seasonally adjusted. Memphis, TN-MS-AR Metropolitan Statistical Area

Source: U.S. Department of Commerce, Bureau of Labor Statistics (BLS).

In 2017, the leading industries for employment in Memphis were Trade, Transportation, and Utilities; Professional and Business Services; and Education and Health Services. As reflected in **Figure 3.6** for December 2017 show that Trade, Transportation, and Utilities account for 27.8% of Memphis' non-farm employees; Professional and Business Services account for 14.8%; and Education and Health Services represent 14.6% of non-farm employees in Memphis.

FIGURE 3.7: UNEMPLOYMENT RATES FOR MEMPHIS, TENNESSEE, AND THE U.S. (CY 1990 – 2017)2018)



Note: The unemployment rate for Memphis is not seasonally adjusted.

Source: U.S. Department of Commerce, Bureau of Labor Statistics (BLS)

Over the historical five-year period, the fastest growing industry sector was the Mining, Logging, and Construction industry (2.1%) followed by Leisure and Hospitality (1.9%). These two industry sectors make up 3.5% and 10.5%, respectively, of total Memphis non-farm employees and rely heavily on the air transport market for travel and trade. Memphis altogether has a diversified employment base, which is a strength of its economy. The top five (5) industry sectors make up more than 80% of Memphis' non-farm employee total; for the U.S. overall, those five (5) sectors make up 75% of the U.S. total employee count.

As seen in **Figure 3.7** Memphis' unemployment rate has tracked closely with the Tennessee and national averages over the past several decades. From 1990 to 2003, Memphis' unemployment rate was consistently below the national average, but since 2004, Memphis' unemployment rate has been slightly higher than the national average. By the end of 2017, however, Memphis' and Tennessee's unemployment rates fell below the U.S. national average of 4.4%, reaching 3.7% and 4.3%, respectively. Memphis's unemployment rate peaked in 2009 at 10.0%, primarily due to the effects of the financial crisis. The U.S. national unemployment rate increased from 4.6% in 2007 to over 9% from 2009-2011, peaking at 9.6% in 2010.

Major Employers in the Region

Some of the major employers in the Memphis area include FedEx Corporation (FedEx), the Shelby County Schools, AutoZone, International Paper, Service Master, and various healthcare employers.

FedEx, which employs more than 30,000 employees in the area, is an American multinational courier delivery service that is headquartered in Memphis. As described later in this report, FedEx operates its largest global hub at Memphis International and dominates the cargo freight operation at the airport. The Shelby County Schools (primary and secondary education) and U.S. Government (federal government) are two other large employers in the region, with approximately 16,000 and 14,800 local employees, respectively. AutoZone, the nation's leading retailer and distributor of automotive replacement parts and accessories, is headquartered in Memphis and has more than 2,000 employees in the Memphis metro area . International Paper Company is a pulp and paper company. It is one of the world's leading producers of fiber-based packaging, with nearly 3,000 employees in Memphis (52,000 in more than 24 countries globally) . Their global headquarters is located east of Memphis in Germantown.

The healthcare/hospital industry is the fastest growing employment sector in the Memphis area, as seen in **Figure 3.6**, registering 1.6% increases per year on average over the past 10 years. Methodist Le Bonheur Healthcare (13,000 local full-time employees), Baptist Memorial Healthcare Corp. (8,000+), and St. Jude Children's Research Hospital (3,500) are the three (3) major hospital groups by number of emergency visits and full-time employee equivalents in the metro area that drive the healthcare sector in Memphis . Le Bonheur is a hospital network system in Tennessee with multiple operating facilities throughout the state, including:

» Le Bonheur Children's in Downtown Memphis

» Le Bonheur Germantown with 309 beds

» Methodist North Hospital located in northeast Shelby County with an Outpatient Diagnostic and Mammography Center

» Methodist Olive Branch (the newest hospital in its system)

» Methodist University (Teaching) Hospital for the University of Tennessee Health Science Center

Baptist Memorial Healthcare is one of Tennessee's highest volume hospitals, with more than 50,000 emergency department visits each year and has 706 medical beds in its facility. St. Jude Children's Research Hospital has approximately 8,500 patients per year and 78 operational hospital beds to support its mission to find cures for children with cancer and other catastrophic diseases through research and treatment.

Tourism and Visitor Industry

Memphis is a major tourist destination, driven primarily by its vibrant music history, prominent role during the civil rights movement, and popular Memphis-style barbeque cuisine. In 2017, Memphis attracted 11.7 million visitors with an average length of stay of 2.7 days. The City of Memphis expects to see growth in visitors due to the upcoming bicentennial celebrations in 2019. The average nightly expenditure per visitor in Memphis was $372. Across the state of Tennessee, the length of stay for leisure visitors was 2.3 days, and the travel party size spent an average of $492 per visit .

The top U.S. origin markets for visitors to Memphis in 2017 were Dallas/Ft. Worth, Chicago, Houston, New Orleans, and Miami/Ft. Lauderdale. Outside the U.S., many visitors came from Canada, United Kingdom, Australia, Japan, Germany, France, and Brazil. Millions from around the world have visited the city's attractions such as Beale Street, Graceland, Sun Studio, the National Civil Rights Museum, and the Memphis Zoo .

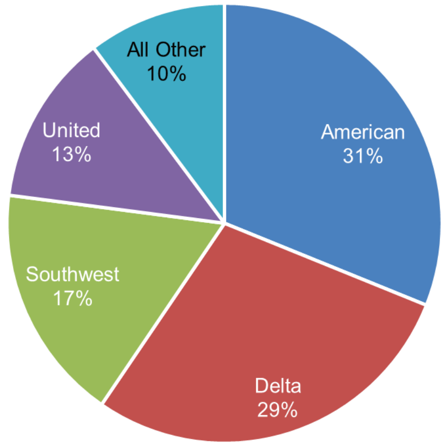
MEMPHIS INTERNATIONAL TRAFFIC AND SERVICE CHARACTERISTICS

Overview

The Memphis-Shelby County Airport Authority operates three (3) airports in the Memphis area, Memphis International Airport, which is the busiest commercial airport in Southwest Tennessee, and two (2) public reliever airports, Charles W. Baker and General Dewitt Spain airports that serve general aviation activity. Memphis International served 4.3 million passengers in CY 2017 and handled more than 4.8 million tons of cargo and is the primary airport for the Greater Memphis Metropolitan Area, with nonstop flights to more than 27 domestic destinations and two (2) international destinations (one seasonal), as of August 2018. Based on U.S. DOT T-100 data, Memphis International is the 62nd largest airport by enplanements in the U.S as of 2017.

A diverse mix of full-service, low-cost carriers, and ultra-low-cost carriers serves the Airport, with no single airline accounting for more than 31% of seat capacity. American and Delta are the two (2) largest carriers at MEM, with departing seat capacity shares of 31% and 29%, respectively, followed by Southwest and United Airlines (see **Figure 3.8**).

FIGURE 3.8: DEPARTING ANNUAL SEAT SHARE BY CARRIER (CY 2018)



Note: Figure 62 data is rounded; All Other includes Allegiant (4.6%), Frontier (4.3%), Air Canada (0.9%), Southern Airways Express (0.3%), and Volaris (0.1%)
Source: Innovata forward schedules for full calendar year 2018

Airport Service Area

An airport's service area refers to the local graphic region from which it draws passengers. The quality of service at an airport, as well as the proximity, accessibility and service offerings of other airports in the region, generally determines the airport's service area boundaries. The "core" or primary service area generates the majority of an airport's passengers. The secondary service area extends outward from the core and may overlap with the service areas of other airports.

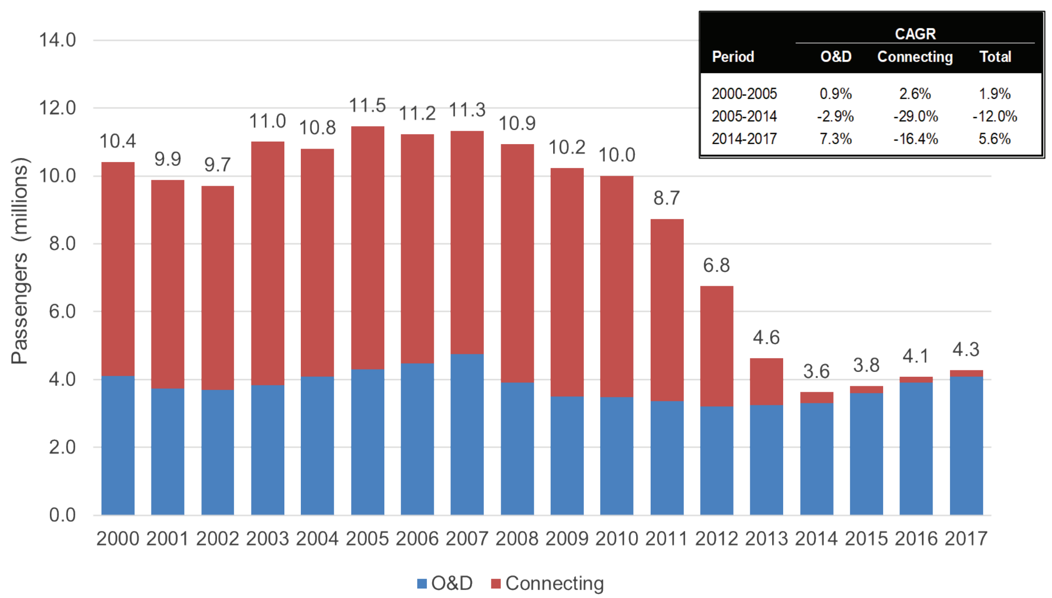
As shown in **Figure 3.1** from the previous section, the primary service area for Memphis International consists of Shelby, DeSoto, Tipton, Crittenden, Fayette, Marshall, Tate, Benton, and Tunica counties across the Tennessee, Mississippi, and Arkansas tristate region. Memphis is the principal commercial airport serving this region.

Airport Passenger Traffic

History of Enplaned Passenger Traffic

In CY 2017, Memphis International served 4.3 million total passengers (enplaned and deplaned), representing a 4.8% increase over CY 2016. **Figure 3.9** shows historical total passenger traffic volumes at the Airport since 2000 as well as the split of O&D and connecting traffic.

FIGURE 3.9: HISTORICAL O&D VS. CONNECTING PASSENGER TRAFFIC (CY 2000-2017)



Source: U.S. DOT, T-100 Databank, via Airline Data Inc., U.S. DOT O&D Survey, via Airline Data Inc.

Passenger traffic at the Airport declined between 2000 and 2002, in-line with the national trend, resulting from the terrorist events of September 11, 2001 and the subsequent economic recession.

Following a period of relatively flat passenger volumes between 2003 and 2007, the Airport then experienced a structural decline in traffic in 2009 as Delta (which merged with Northwest in 2008) began to dismantle its Memphis connecting hub operation. Between 2007 and 2012, enplaned passenger traffic declined on average 9.8% annually. Traffic fell 31.5% in 2013, its largest year-over-year drop, as Delta finalized its move to downsize operations at the Airport. Over this period, the role of Memphis International has transitioned from a connecting hub airport to an O&D airport.

Figure 3.10 shows historical enplaned passenger traffic volumes at Memphis International and the U.S. overall since 2000, split by domestic and international passengers. In 2017, Memphis had approximately 2.1 million enplanements, which made up about 0.245% of all enplanements in the U.S.

FIGURE 3.10: HISTORICAL ENPLANED PASSENGER TRAFFIC (CY 2000 – 2017)

	MEM Passengers (000s)			U.S. Passengers (000s)		
Year	Domestic	Intl.	Total	Domestic	Intl.	Total
2000	5,076	127	5,204	613,967	72,384	686,351
2001	4,814	127	4,941	571,987	66,133	638,120
2002	4,702	155	4,857	561,808	63,370	625,178
2003	5,300	195	5,496	594,754	64,472	659,226
2004	5,209	190	5,399	640,901	72,217	713,118
2005	5,534	196	5,730	666,215	76,816	743,031
2006	5,410	202	5,612	666,206	78,947	745,153
2007	5,451	211	5,661	687,507	82,291	769,797
2008	5,236	225	5,461	658,909	82,478	741,387
2009	4,922	188	5,110	625,438	77,789	703,228
2010	4,878	120	4,998	636,652	81,910	718,562
2011	4,299	64	4,363	647,005	85,136	732,141
2012	3,341	32	3,373	647,861	88,784	736,645
2013	2,308	3	2,312	650,412	92,769	743,181
2014	1,813	2	1,815	666,454	97,469	763,923
2015	1,901	3	1,904	697,723	103,833	801,556
2016	2,038	2	2,039	720,397	109,556	829,953
2017	2,126	12	2,138	742,869	114,858	857,727
Average Annual Growth						
2000-2007	1.0%	7.4%	1.2%	1.6%	1.8%	1.7%
2007-2012	-9.3%	-31.3%	-9.8%	-1.2%	1.5%	-0.9%
2012-2017	-8.6%	-18.3%	-8.7%	2.8%	5.3%	3.1%
Percent Change Over Prior Year						
2012	-22.3%	-49.4%	-22.7%	0.1%	4.3%	0.6%
2013	-30.9%	-89.8%	-31.5%	0.4%	4.5%	0.9%
2014	-21.4%	-38.3%	-21.5%	2.5%	5.1%	2.8%
2015	4.8%	52.6%	4.9%	4.7%	6.5%	4.9%
2016	7.2%	-48.5%	7.1%	3.2%	5.5%	3.5%
2017	4.3%	636.1%	4.8%	3.1%	4.8%	3.3%

Note: Total U.S. Enplanements, excludes general aviation passengers.
Source: U.S. DOT, T-100 Databank, via Airline Data Inc.

Transition from Connecting Hub to O&D Airport

For many years, Memphis served as an important connecting hub airport in the network of Northwest Airlines. Following Delta Air Lines' merger/acquisition of Northwest in 2008, the merged carrier began to draw down service at the airport as it consolidated the networks of the two airlines. Memphis saw a drop in its total passenger numbers from 11.3 million in 2007 to 3.6 million by end of 2014 . As shown in **Figure 3.11**, Delta/Northwest accounted for over 80% of total passenger traffic at the Airport during its hub years. As Delta pulled service at the airport, its share of total traffic declined steadily, to its current level at around 31% in 2017.

On June 4, 2013, Delta officially announced it would end its hub operation at Memphis International because of continued financial losses at the airport and the consolidation of the merged carrier's network. As shown in **FIgure 3.12** Delta/Northwest began drawing down service at the Airport before 2013. At the peak of service in 2009, Delta served nearly 90 markets and over 200 daily departures from the airport. Delta began reducing markets and frequencies in 2010 and by 2018 only served six (6) markets (ATL, DTW, LAX, LGA, MCO and MSP).

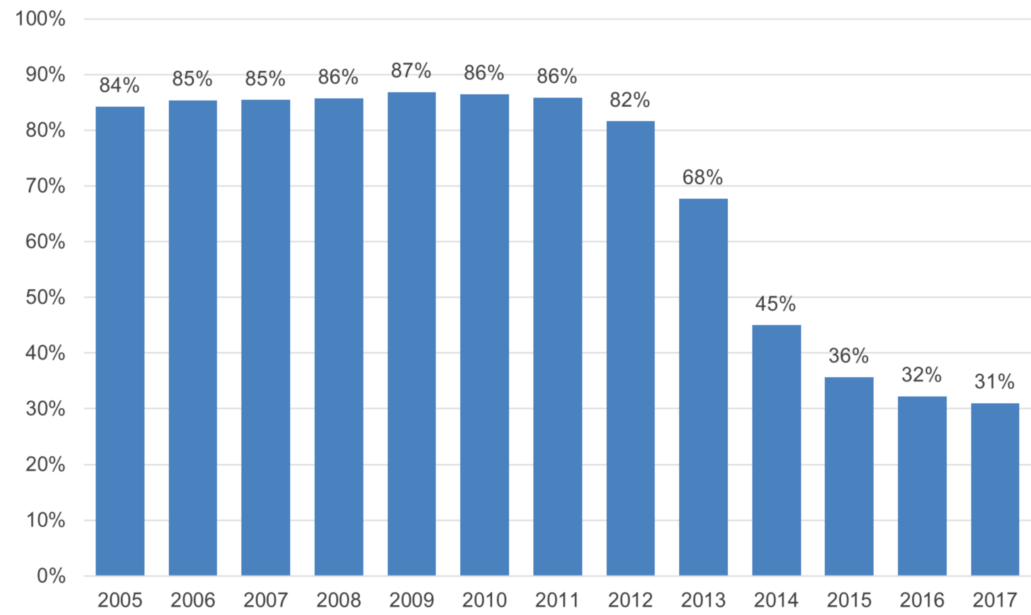
As shown in **Figure 3.13**, During the Northwest hub years, the majority of traffic at Memphis International was connecting. In FY 2009, 64.4% of passengers at MEM were connecting and 35.6% were origin-destination passengers. The connecting passenger share steadily declined as Delta dismantled its hub operation at the Airport, and by FY 2016, connecting passengers represented less than one percent of total.

Airline Market Share

During the 2007 calendar year, Delta Airlines still held the dominate share of traffic at Memphis International, accounting for 84.2%. As shown in **Figure 3.14** Delta's passenger share dropped to 31.2% by 2017. At the same time, American Airlines saw an increase in its share from 5.9% in 2007 to 30.5% in 2017, while Southwest Airlines grew its share of traffic from 2.9% in 2007 to 16.9% in 2017.

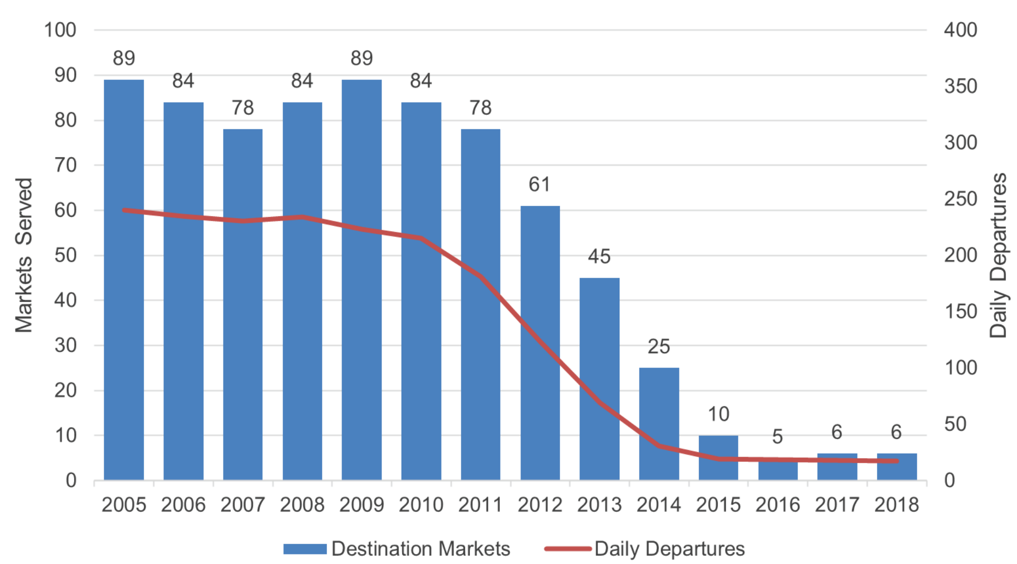
In 2017, the three (3) legacy carriers (American, Delta, and United) made up 74.8% of the total Airport

FIGURE 3.11: DELTA/NORTHWEST AIRLINES PASSENGER TRAFFIC SHARE (CY 2005 – 2017)



Source: U.S. DOT, T-100 Databank, via Airline Data Inc.

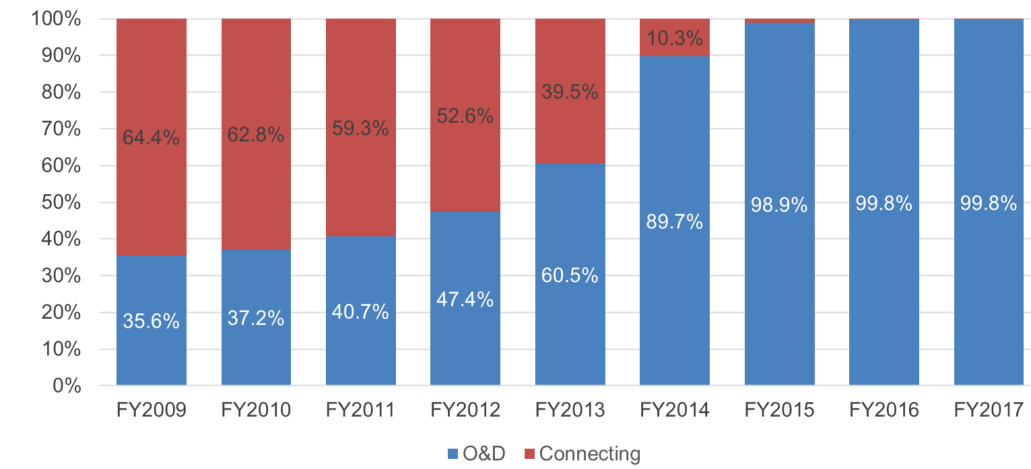
FIGURE 3.12: DELTA/NORTHWEST AIRLINES DESTINATIONS SERVED & DAILY DEPARTURES



Note: data labels on chart above are destination market numbers

Source: Innovata schedules

FIGURE 3.13: O&D VS. CONNECTING TRAFFIC BREAKDOWN (FY 2009 – 2017)



Source: Memphis-Shelby County Airport Finance Division

passenger share, while low-cost carriers Allegiant, Southwest, and Frontier accounted for 24.6%. Compared to 2012, all of the top five (5) airlines with the exception of Delta saw an increase in market share.

Recent Trends in Post-Hub Years

Since 2014, the Airport has seen steady traffic growth, most of which is domestic traffic. Memphis International domestic passenger traffic reached 2.1 million enplanements in CY 2017, representing average annual growth of 5.1% since 2014 (see **Figure 3.15**).

FIGURE 3.14: AIRLINE SHARE OF TOTAL PASSENGERS (CY 2007, 2012, 2017)

	CY 2007			CY 2012			CY 2017		
Airline	**Rank**	**Passengers**	**Share**	**Rank**	**Passengers**	**Share**	**Rank**	**Passengers**	**Share**
Delta	1	9,482,756	84.2%	1	5,496,646	81.4%	1	1,309,016	31.2%
American	2	662,637	5.9%	3	383,900	5.7%	2	1,278,298	30.5%
Southwest	4	329,213	2.9%	4	292,243	4.3%	3	707,690	16.9%
United	3	410,355	3.6%	2	554,594	8.2%	4	548,936	13.1%
Allegiant	5	0	0.0%	5	0	0.0%	5	181,226	4.3%
Subtotal		**10,884,961**	**96.7%**		**6,727,383**	**99.6%**		**4,025,166**	**95.9%**
All Other Carriers		373,721	3.3%		25,803	0.4%		171,093	4.1%
Total Airport		**11,258,682**			**6,753,186**			**4,196,259**	

Source: Memphis-Shelby County Airport Finance Division

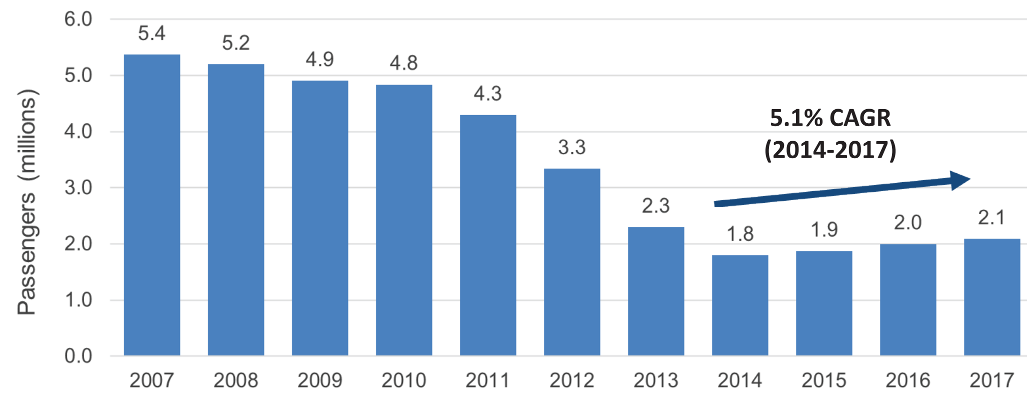
The reduction of service by Delta presented an opportunity for other carriers to step in and backfill lost capacity at the Airport and since 2013, Memphis International has seen the launch of service by ultra-low-cost carriers Frontier (re-launched in 2014) and Allegiant Air (2015). Frontier discontinued service to Denver, Fort Lauderdale, and Orlando in 2008, but re-launched service from Memphis in 2014 bringing back Denver, along with routes to Las Vegas and Orlando. Allegiant Air began service from Memphis in 2015 and serves nine (9) markets including Austin (seasonal), Destin-Ft. Walton (seasonal), Ft. Lauderdale, Las Vegas, Los Angeles, Oakland (seasonal), Orlando (Sanford), Phoenix (Mesa Gateway – seasonal), and St. Petersburg/Clearwater.

Prior to Frontier and Allegiant's launch of service, Southwest was the only Low-Cost Carrier (LCC)/ Ultra-Low Cost Carrier (ULCC) serving the airport. Since entering the market as AirTran Airways in April 1998 (Southwest acquired AirTran Airways in 2011), Southwest has grown to become Memphis

Note: Includes passengers on legacy carrier's regional affiliates; All other carriers include Frontier, Air Canada, and small regional airlines; Delta merged with Northwest in 2008, United merged with Continental in 2010, Southwest merged with AirTran in 2010, and American merged with U.S. Airways in 2013; Allegiant Air began service in May 2015.

Source: Memphis International Airport Annual Report, 2012 & 2017; U.S. DOT, T-100 Databank, via Airline Data Inc. for 2007 data.

FIGURE 3.15 HISTORICAL DOMESTIC ENPLANED PASSENGER TRAFFIC (CY 2007-2017)



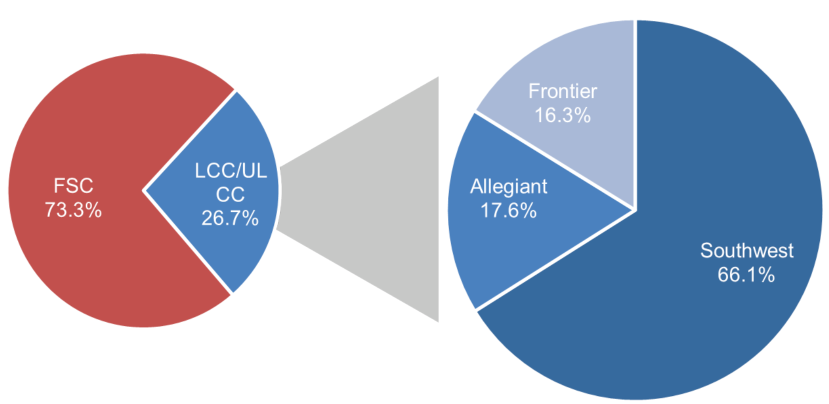
Source: Memphis International Airport Annual Report

International's largest LCC/ULCC carrier, making up 66.1% of the total. As of November 2018, Southwest provides service to seven (7) domestic markets: Chicago-Midway, Houston-Hobby, Baltimore-Washington, Dallas-Love Field, Denver (commenced October 2018), Orlando, and Tampa. Chicago, Houston, and Orlando make up about 52% of Southwest's departing seats from Memphis.

As shown in **Figure 3.16 ,** Full-Service Carriers (FSC) account for 73.3% of departing seat capacity at the Airport and LCCs/ULCCs make up 26.7% in 2018. Within the LCC/ULCCs category, Southwest is the largest carrier, accounting for 66.1% of LCC/ULCC capacity at MEM.

At Memphis International Airport, international enplanements have increased dramatically over the last four (4) years with an average growth rate of 86.1% per year (see **Figure 3.17**). In 2017, the Airport saw 12,139 international enplanements.

FIGURE 3.16 SPLIT OF ALL DEPARTING SEAT CAPACITY BY AIRLINE TYPE (CY 2018)



Source: Innovata schedules

Prior to Delta leaving Memphis, Delta/Northwest provided a majority of international service between 2007 and 2012 to destinations such as Amsterdam, Cancun, Cozumel (seasonal), Montego Bay, Puerto Vallarta, Toronto and Vancouver (seasonal), based on Innovata schedules data. In 2018, Air Canada was the only carrier providing international service to Toronto (Pearson) with twice-daily flights between May and August, and once daily the rest of the year. Cancun is the other (seasonal) international destination served by Volaris between May and August with one weekly flight.

Memphis' Top 50 Domestic Origin-Destination Markets

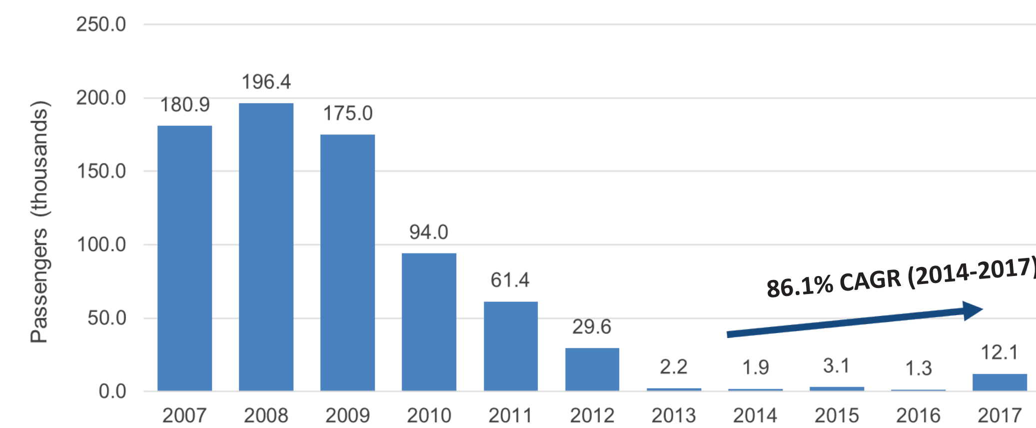
Memphis International served 3.7 million domestic O&D passengers for the 12-month period ended March 31, 2018. The top 50 domestic O&D markets, shown below in **Figure 3.18** accounted for more than 85% of MEM's total domestic O&D passengers. The Airport currently has nonstop service to 23 of the top 50 domestic O&D markets.

American Airlines, Delta airlines and Southwest Airlines all provide nonstop services to three of the top five (5) O&D markets: New York-LaGuardia (AA/DL), Chicago (O'Hare-AA) and (Midway-SW), Dallas/Ft. Worth (DFW-AA) and (DAL-SW), Orlando (DL/SW), and Atlanta (DL). Memphis International added new nonstop service to San Antonio (operated by Frontier Airlines) in August 2018, and added seasonal service to Oakland (operated by Allegiant Air) in May 2018.

Current Scheduled Nonstop Passenger Services

As of August 2018, eight (8) scheduled passenger airlines serve the Airport with 75 daily departures to 34 nonstop destinations. Air Canada, Allegiant, American, Delta, Frontier, Southern Airways Express, Southwest, and United serve the Airport (see **Figure 3.19**). All services operate with either narrowbody, regional jet, or turboprop aircraft. Based on forward schedules provided by Innovata, Cancun will not be served by any airline after August 2018. It was

FIGURE 3.17 HISTORICAL DOMESTIC ENPLANED PASSENGER TRAFFIC (CY 2007-2017)



Source: Memphis International Airport Annual Report

FIGURE 3.18 TOP 50 DOMESTIC O&D MARKETS (12 MONTHS ENDED MARCH 31, 2018)

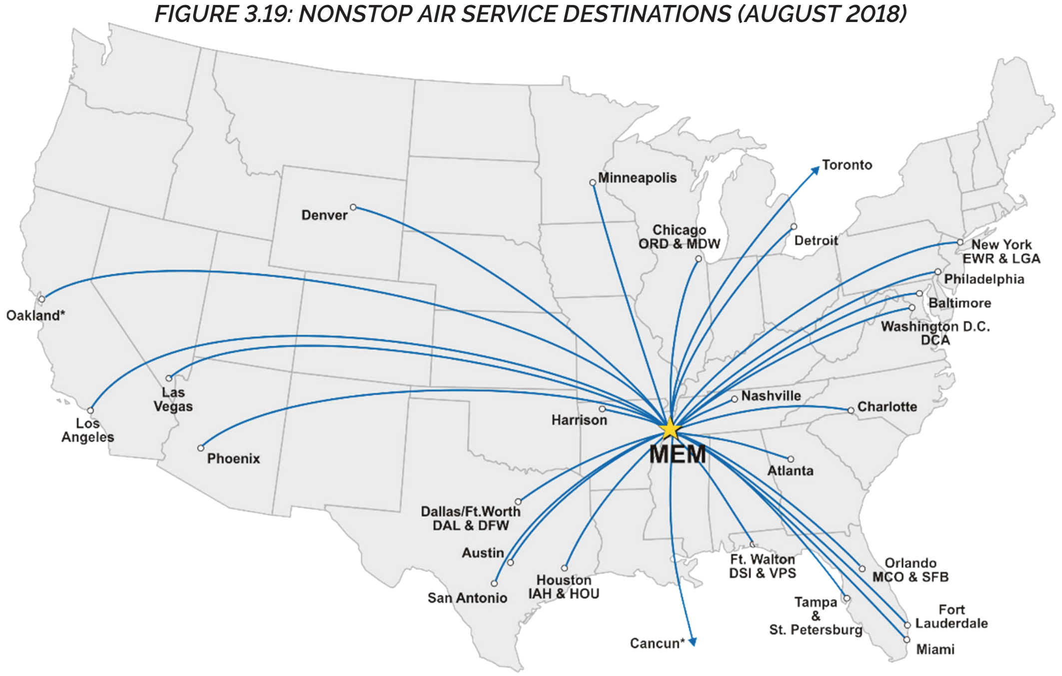
O&D Rank	City	Average Miles	O&D Psgrs	Pct of Total	Served Nonstop?
1	New York	956	228,023	6.1%	✓
2	Chicago	486	221,313	5.9%	✓
3	Dallas/Fort Worth	426	209,049	5.6%	✓
4	Orlando	683	176,704	4.7%	✓
5	Atlanta	331	151,972	4.1%	✓
6	Los Angeles	1,615	151,696	4.1%	✓
7	Las Vegas	1,412	150,790	4.0%	✓
8	Denver	870	141,682	3.8%	✓
9	Houston	476	140,749	3.8%	✓
10	Washington	751	125,266	3.4%	✓
11	Baltimore	786	93,966	2.5%	✓
12	Tampa	656	90,917	2.4%	✓
13	Charlotte	510	81,515	2.2%	✓
14	Fort Lauderdale	851	78,569	2.1%	✓
15	Philadelphia	872	74,007	2.0%	✓
16	Phoenix	1,261	70,670	1.9%	✓
17	Minneapolis	700	64,422	1.7%	✓
18	Detroit	610	63,763	1.7%	✓
19	Austin	556	62,462	1.7%	✓
20	San Francisco	1,802	61,613	1.7%	
21	Boston	1,137	59,407	1.6%	
22	San Diego	1,563	49,329	1.3%	
23	Seattle/Tacoma	1,866	48,304	1.3%	
24	Raleigh/Durham	632	42,580	1.1%	
25	Miami	860	41,771	1.1%	✓
26	Portland	1,526	35,754	1.0%	
27	Salt Lake City	1,258	35,677	1.0%	
28	San Antonio	625	33,557	0.9%	✓
29	Pittsburgh	650	30,847	0.8%	
30	Sanford	671	27,803	0.7%	✓
31	Jacksonville	637	27,446	0.7%	
32	St. Petersburg/Clearwater	653	26,363	0.7%	✓
33	Cincinnati	402	23,773	0.6%	
34	Orange County	1,588	22,598	0.6%	
35	Cleveland	622	20,753	0.6%	
36	Norfolk	780	20,159	0.5%	
37	Sacramento	1,756	19,881	0.5%	
38	Fort Myers	764	19,347	0.5%	
39	Richmond	724	19,121	0.5%	
40	Charleston	553	18,914	0.5%	
41	Hartford	1,046	18,863	0.5%	
42	Columbus	428	18,681	0.5%	
43	Indianapolis	381	17,341	0.5%	
44	West Palm Beach	822	16,070	0.4%	
45	San Jose	1,779	15,248	0.4%	
46	Milwaukee	557	14,594	0.4%	
47	Greensboro	569	14,394	0.4%	
48	Honolulu	4,166	13,580	0.4%	
49	Buffalo	812	13,540	0.4%	
50	Providence	1,102	13,178	0.4%	
	Subtotal Top 50		**3,218,021**	**86.3%**	
	All Other		509,906	13.7%	
	Total		**3,727,927**	**100.0%**	

Source: U.S. DOT, O&D Survey, via Airline Data Inc.; Innovata schedules, August 2018 previously served seasonally (summer 2018) by Volaris, however, the Authority will be working to reinstate this service each year.

American Airlines is the leading airline in terms of scheduled departing seats in 2018, with 870,490 offered. American has 22 average daily departures to Dallas/Ft. Worth (DFW), Charlotte (CLT), Chicago O'Hare (ORD), Washington Reagan (DCA), and Philadelphia (PHL). Other major carriers like Delta and United also link the Airport to their hubs across the country. Delta has 10 daily flights to Atlanta (ATL) plus three (3) daily to both Minneapolis (MSP) and Detroit (DTW), while United flies to Houston-Intercontinental (IAH) five (5) times daily, Chicago O'Hare (ORD) four (4) times daily, and Newark (EWR) three (3) times daily. Although American has the most scheduled departing seats from Memphis International, Delta still holds the largest passenger share with 31.5% of the share in CY 2017.

Changes in the Airport's scheduled domestic airline service by the full-service carriers and LCC/ULCCs over the past eight (8) years are shown in **Figure 3.20.** Domestic service has increased by about 2% in the past five (5) years since Delta fully dehubbed at Memphis. Allegiant Air, Southern Airways Express, and American Airlines account for the largest increase in frequencies over the four (4) past years, where Allegiant Air and Southern Airways Express added 16 and 19 nonstop weekly departures out of Memphis, and American introduced 45 weekly departures between August 2014 and 2018. However, Delta and Southwest reduced their weekly frequencies between 2017 and 2018, losing six (6) and eight (8) departures, respectively. Over the past eight (8) years, American has increased its weekly departures by about 61%, and Southwest doubled

FIGURE 3.19: NONSTOP AIR SERVICE DESTINATIONS (AUGUST 2018)



*Note: *Seasonal service. The Authority will be working to reinstate Cancun service each year*

Source: Innovata schedules, August 2018

FIGURE 3.20: SCHEDULED WEEKLY DOMESTIC AIRLINE DEPARTURES (AUGUST 2010 TO AUGUST 2018)

Domestic	Nonstop Weekly Departures									Change ('10-'18)		Change ('14-'18)	
Reporting Carrier	'10	'11	'12	'13	'14	'15	'16	'17	'18	Net Change	% Change	Net Change	% Change
Allegiant Air	0	0	0	0	0	6	11	12	16	16		16	
American	116	99	119	124	142	177	192	183	187	71	61%	45	31%
Delta	1,582	1,247	877	560	211	134	138	133	127	-1,455	-92%	-84	-40%
Frontier	0	0	0	0	7	10	9	9	12	12		5	71%
Southern Airways Express	0	0	0	0	0	10	6	19	19	19		19	
Southwest	28	27	30	49	43	63	63	64	56	28	102%	13	31%
United	96	100	96	83	99	117	98	92	96	0	0%	-3	-3%
Total	**1,822**	**1,472**	**1,122**	**816**	**503**	**516**	**516**	**512**	**513**	**-1,309**	**-72%**	**10**	**2%**

Source: Innovata schedules, August 2018

its frequencies. Delta frequencies decreased significantly by 92%, comparing August 2010 to 2018, and United's weekly departures remains unchanged.

As shown in **Figure 3.21,** in terms of international departures from Memphis, as of November 2018, Air Canada is the only airline providing international service with 14 weekly departures to Toronto (Pearson). Air Canada doubled its weekly frequency in 2018 compared to the previous year during the summer months (May through August) when it provided one daily flight. In the summer of 2018, Volaris began seasonal service to Cancun, which was previously flown by Delta on a daily basis. Delta ended service to Cancun in July 2017.

FIGURE 3.21: SCHEDULED WEEKLY INTERNATIONAL AIRLINE DEPARTURES (AUGUST 2010 TO AUGUST 2018)

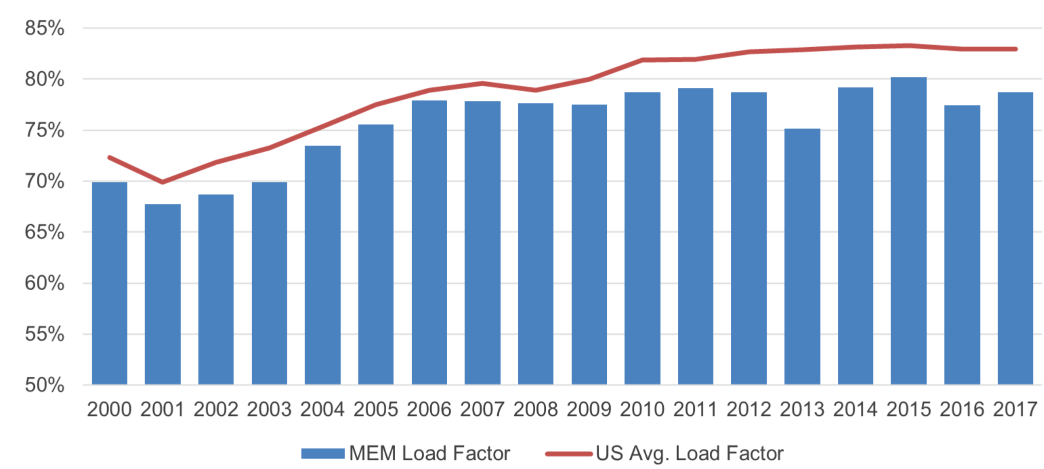
International	Nonstop Weekly Departures									Change ('10-'18)	
Reporting Carrier	'10	'11	'12	'13	'14	'15	'16	'17	'18	Net Change	% Change
Air Canada	11	7	7	0	0	0	0	7	14	3	27.3%
Bahamasair	0	0	0	0	2	0	0	0	0	0	
Delta	24	8	4	1	0	0	0	0	0	-24	-100.0%
Total	**35**	**15**	**11**	**1**	**2**	**0**	**0**	**7**	**14**	**-21**	**-60.0%**

Source: Innovata schedules

Load Factor Trends

Figure 3.22 illustrates the trend in average passenger load factors at Memphis International and for the U.S. overall since 2000. Average load factors at the Airport and across the nation grew steadily between 2001 and 2006. Since then, load factors have continued to rise, though at a slower pace, due to tight capacity discipline exercised by most U.S. carriers. This trend is seen both at Memphis International, and across the entire U.S. air transportation system.

FIGURE 3.22: PASSENGER AIRLINE LOAD FACTORS, MEM VS. U.S. AVERAGE (CY 2000 – 2017)



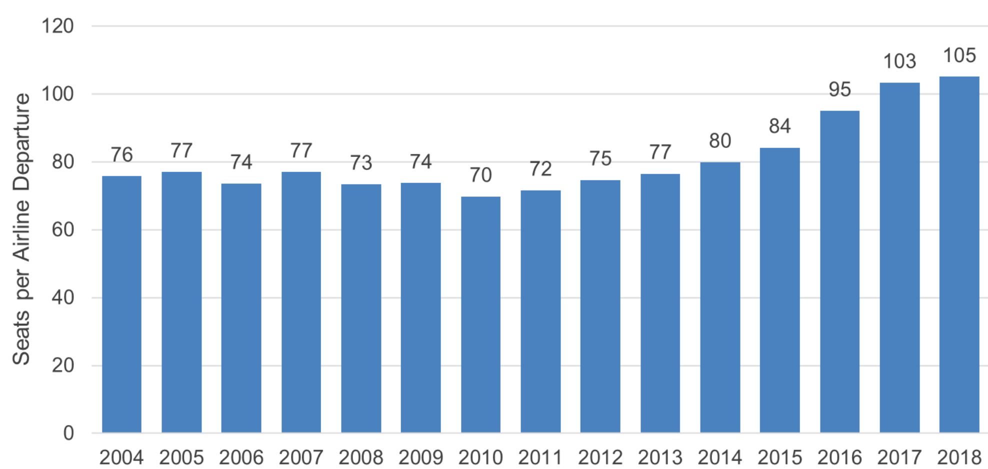
Source: U.S. DOT, T-100 Databank, via Airline Data Inc

Average Seats per Departure

The trend in average seats per aircraft departure at Memphis is depicted in **Figure 3.24**. Average aircraft size at the Airport was relatively flat between 2004 and 2009 at between 75 and 80 seats. However, since 2010, average seats per departure has been increasing at an average annual rate of 5.2%. This has been driven by the increased use of larger aircraft with seat capacity greater than 50 seats at the airport. Per Innovata schedule data, operations of narrowbody and regional jets with more than 50 seats have been growing at 3.4 and 0.6% each year since 2015, while turboprop and small regional jets have both been declining about 0.7 and 0.6% per year.

Average seats per departure reached a record high in 2018 with 105 seats per departure. **Figure 3.24** shows an increase in average seats per departure starting in 2010. The recent/ongoing pilot shortage, which has caused disruption to all sectors of aviation around the globe along with the rise in oil prices are both factors contributing to aircraft (type) up-gauging for some U.S. airlines.

FIGURE 3.24: AVERAGE SEATS PER AIRLINE DEPARTURE (AUGUST 2004 TO AUGUST 2018)



Source: Innovata schedules, August 2004 to August 2018

Commercial Airline Aircraft Operations

There were approximately 26,220 commercial airline operations (excluding general aviation) at Memphis International during 2017, up 10.5% from the previous year (see **Figure 3.25**). Since 2007, commercial airline operations have been declining at an average annual rate of 9.3%. As Delta withdrew its service through 2013, other airlines such as American and Southwest increased their average weekly departures between 2013 and 2014 by 12.5% and 9.3%, respectively .

FIGURE 3.25: HISTORICAL COMMERCIAL AIRLINE AIRCRAFT OPERATIONS (CY 2006 – 2017)

Calendar Year	Aircraft Takeoffs and Landings			Percent Change Over Prior Year		
	Domestic	International	Total	Domestic	International	Total
2006	66,458	2,080	68,538			
2007	67,271	2,293	69,564	1.2%	10.2%	1.5%
2008	54,132	2,534	56,666	-19.5%	10.5%	-18.5%
2009	42,308	2,258	44,566	-21.8%	-10.9%	-21.4%
2010	38,098	1,840	39,938	-10.0%	-18.5%	-10.4%
2011	32,980	1,458	34,438	-13.4%	-20.8%	-13.8%
2012	28,042	844	28,886	-15.0%	-42.1%	-16.1%
2013	23,642	46	23,688	-15.7%	-94.5%	-18.0%
2014	18,632	52	18,684	-21.2%	13.0%	-21.1%
2015	20,260	210	20,470	8.7%	303.8%	9.6%
2016	23,710	24	23,734	17.0%	-88.6%	15.9%
2017	25,708	516	26,224	8.4%	2050.0%	10.5%
Average Annual Growth						
2007-12	-16.1%	-18.1%	-16.1%			
2012-17	-1.7%	-9.4%	-1.9%			
2014-17	6.7%	58.2%	7.0%			
2007-17	-17.5%	-25.8%	-17.7%			

Source: Memphis International Airport Annual Report

Since 2014, Memphis International has experienced an average annual growth of 12.0% in total takeoffs and landings, while Airport passengers grew by 5.3%.

In particular, international movements have seen a dramatic increase primarily due to Air Canada resuming nonstop service to Toronto, which was previously served until 2012. Based on August 2018 schedules, Air Canada doubled its 2017 weekly frequency to Toronto, where it flew 14 weekly departures.

Passenger Airline Fleet Mix

Figure 3.26 depicts the Scheduled Weekly Passenger Airline Departures by Aircraft Category. Narrowbody jet aircraft account for an increasing share of total commercial passenger aircraft departures at MEM. In August 2005, narrowbody aircraft accounted for approximately 37.0% of weekly departures, and by August 2018, its share rose to about 50.9%. Prior to 2005, regional jets with less than 50 seats per departure had the greatest share of departures at MEM accounting for 43% of the total; however, the use of smaller regional jets declined to 11.2% in 2018. As small regional jets have become less prominent, large regional jets movements (i.e. over 50 seats), which include the CRJ-700/900 and E-170/175 aircraft, have increased and now account for about 34.8% of Memphis' weekly departures.

FIGURE 3.26: SCHEDULED WEEKLY PASSENGER AIRLINE DEPARTURES BY AIRCRAFT CATEGORY (AUGUST 2005, 2010, 2015, 2017, 2018)

Aircraft Category	August				
	2005	2010	2015	2017	2018
Weekly Departures					
Narrow Body Jet	757	377	187	247	267
Wide Body Jet	7	7	0	0	0
Reg Jet <=50 Seats	886	1,112	138	55	59
Reg Jet >50 Seats	178	310	181	198	183
Turboprop	219	116	51	19	16
Total	**2,047**	**1,923**	**556**	**519**	**525**
Percent of Departures					
Narrow Body Jet	37.0%	19.6%	33.6%	47.7%	50.9%
Wide Body Jet	0.3%	0.4%	0.0%	0.0%	0.0%
Reg Jet <=50 Seats	43.3%	57.8%	24.8%	10.6%	11.2%
Reg Jet >50 Seats	8.7%	16.1%	32.5%	38.1%	34.8%
Turboprop	10.7%	6.0%	9.1%	3.6%	3.1%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Source: Innovata schedules

Cargo Activity

Cargo Volumes

Memphis International is the largest U.S. airport in terms of total cargo volume, including freight and mail, as of calendar year 2017 (see **Figure 3.27**), representing a 13.7% share of the total U.S. cargo market. MEM handled nearly 4.8 million U.S. tons of cargo in 2017, ranking second in the world behind Hong Kong (HKG) which handled 5.6 million tons. Over the past five years, cargo volume at the Airport has grown an average rate of 1.5% per year.

Cargo Operations

Memphis International experienced 140,382 cargo operations in calendar year 2017. Over the past 10 years, total cargo movements at the Airport grew by 1.0% per year on average. During the most recent financial crisis, operations fell by 8.5% between 2007 and 2009, which was in-line with national trends. This resulted in a 3.7% drop in cargo volume from

FIGURE 3.27: TOP U.S. AIRPORTS RANKED BY CARGO VOLUME (CY 2017)

Rank CY 2017	Airport	Total Cargo (Tons)	5-Year CAGR	Pct. Of U.S. Market	Rank CY 2017	Airport	Total Cargo (Tons)	5-Year CAGR	Pct. Of U.S. Market
1	Memphis	4,780,445	1.5%	13.7%	16	Honolulu	570,292	4.6%	1.6%
2	Anchorage	2,990,821	1.9%	8.5%	17	Houston Intercontinental	496,968	0.6%	1.4%
3	Louisville	2,868,977	3.7%	8.2%	18	Seattle/Tacoma	469,425	8.5%	1.3%
4	Los Angeles	2,379,142	3.9%	6.8%	19	Philadelphia	462,733	1.5%	1.3%
5	Miami	2,283,680	1.4%	6.5%	20	Phoenix	374,589	4.4%	1.1%
6	Chicago O'Hare	1,897,965	6.5%	5.4%	21	Boston	354,279	5.3%	1.0%
7	New York J F Kennedy	1,488,779	1.0%	4.3%	22	Washington Dulles	330,092	2.3%	0.9%
8	Indianapolis	1,144,881	1.0%	3.3%	23	Denver	292,377	2.3%	0.8%
9	Cincinnati	1,041,677	11.9%	3.0%	24	Portland	261,051	3.5%	0.7%
10	Dallas/Fort Worth	892,793	6.1%	2.6%	25	Minneapolis	252,914	2.9%	0.7%
11	New York Newark	881,848	1.5%	2.5%	26	Orlando	242,536	4.9%	0.7%
12	Atlanta	755,455	1.2%	2.2%	27	Detroit	238,301	-0.2%	0.7%
13	Ontario	654,714	7.6%	1.9%	28	Rockford	215,618	9.0%	0.6%
14	Oakland	625,400	3.3%	1.8%	29	Charlotte	211,217	8.5%	0.6%
15	San Francisco	619,283	8.1%	1.8%	30	Salt Lake City	209,613	2.6%	0.6%

Source: Memphis International Airport Annual Report 2009

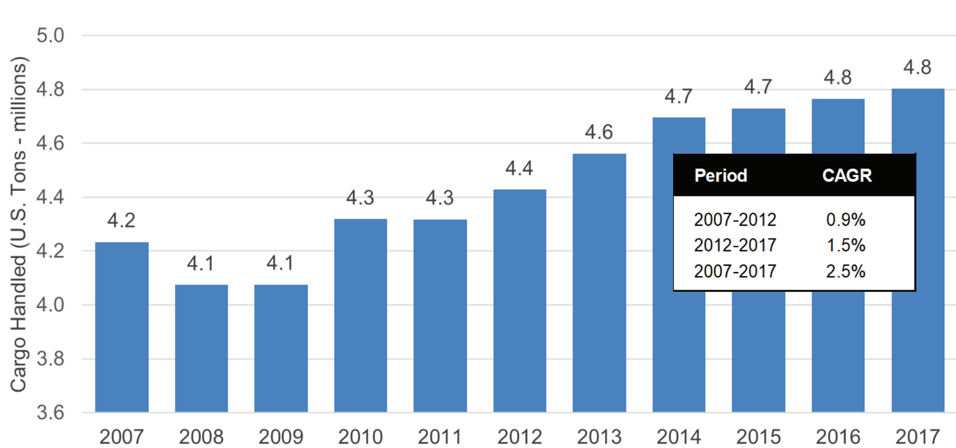
FIGURE 3.28: ALL OPERATING CARGO AIRLINES (CY 2017)

All Cargo Airlines	
ABX Air	Federal Express
Air Transport International	Kalitta Air
Atlas Air	Mountain Air
Baron Aviation	United Parcel Service

Note: ABX Air's main customer is DHL, and the majority of the freight carried is for that company. Atlas and Kalitta Air also operate additional freighters on behalf of DHL Aviation. Mountain Air is a major contract carrier for FedEx that operates their turboprop aircraft on a dry-lease basis.

Source: Memphis International Airport Annual Report

FIGURE 3.29: HISTORICAL CARGO VOLUMES (CY 2007 – 2017)



Source: Memphis International Airport Annual Report

4.23 million tons to 4.08 million. Based on U.S. DOT T-100 data, FedEx saw a slight change in fleet structure where cargo departures increased for larger aircraft type like the DC-10, MD-11, and B757, and decreased from their aging B727 and A310 aircraft. In 2007, FedEx acquired 90 secondhand B757-200s, which carry more cargo than their 727s . Eventually by 2009, they began to receive their B777 aircraft from Boeing. **Figure 3.30** and **Figure 3.31** show this activity in detail.

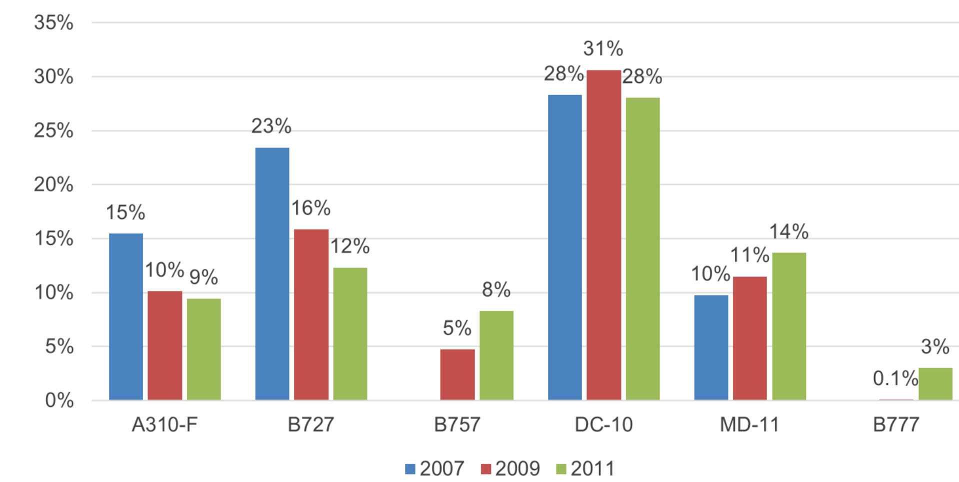
Over the next five years after the financial crisis from 2012 to 2017, total operation growth increased at an average annual rate of 2.3%. In 2017, international operations saw a significant increase of 9.2%, which is due in part to FedEx's recent acquisition of TNT Express, a Dutch delivery company, based in Europe.

FedEx Operations at MEM

Memphis International serves as the primary hub for FedEx, the largest cargo airline in the United States and in the world, ranked by freight tonnage. FedEx maintains regional hubs across the U.S. at Indianapolis, Anchorage, Oakland, Newark, Fort Worth, and Miami. FedEx's international hubs also include Paris (Charles de Gaulle), Guangzhou, and Toronto (Pearson).

FedEx's share of cargo handled at Memphis has consistently represented between 98 and 99% over the past decade. In FY 2017, FedEx moved about 4.8 million total tons of cargo, including both domestic and international cargo. Since 2009, following the financial crisis, FedEx's cargo volumes at the Airport have grown by 2.3% per year on average. **Figure 3.32** depicts historical FedEx cargo volumes.

FIGURE 3.30: PERCENTAGE OF DEPARTURES PERFORMED BY FEDEX FREIGHTERS FROM MEMPHIS INTERNATIONAL AIRPORT BY AIRCRAFT TYPE (CY 2007 VS 2009 VS 2011)



Source: U.S. DOT, T-100 Databank, via Airline Data Inc.

FIGURE 3.31: HISTORICAL CARGO/FREIGHTER AIRCRAFT OPERATIONS (CY 2006-2017)

Calendar Year	Aircraft Takeoffs and Landings			Percent Change Over Prior Year		
	Domestic	International	Total	Domestic	International	Total
2006	125,052	10,484	135,536			
2007	122,478	11,102	133,580	-2.1%	5.9%	-1.4%
2008	117,506	11,554	129,060	-4.1%	4.1%	-3.4%
2009	112,408	9,874	122,282	-4.3%	-14.5%	-5.3%
2010	112,896	11,234	124,130	0.4%	13.8%	1.5%
2011	113,420	12,002	125,422	0.5%	6.8%	1.0%
2012	113,132	11,920	125,052	-0.3%	-0.7%	-0.3%
2013	114,288	12,174	126,462	1.0%	2.1%	1.1%
2014	119,348	12,006	131,354	4.4%	-1.4%	3.9%
2015	120,708	11,376	132,084	1.1%	-5.2%	0.6%
2016	126,170	11,638	137,808	4.5%	2.3%	4.3%
2017	127,668	12,714	140,382	1.2%	9.2%	1.9%
Average Annual Growth						
2007-12	-1.6%	1.4%	-1.3%			
2012-17	2.4%	1.3%	2.3%			
2014-17	1.4%	1.2%	1.3%			
2007-17	0.8%	2.7%	1.0%			

Source: Memphis International Airport Annual Report

FedEx maintains the largest all-cargo aircraft fleet in the world. As shown in **Figure 3.33**, FedEx operates a range of dedicated cargo freighter aircraft at Memphis International. In terms of its fleet mix at the Airport, 22.9% of total FedEx operations are flown on A300s, 19.1% on B757s, and 18.7% on MD-11s.

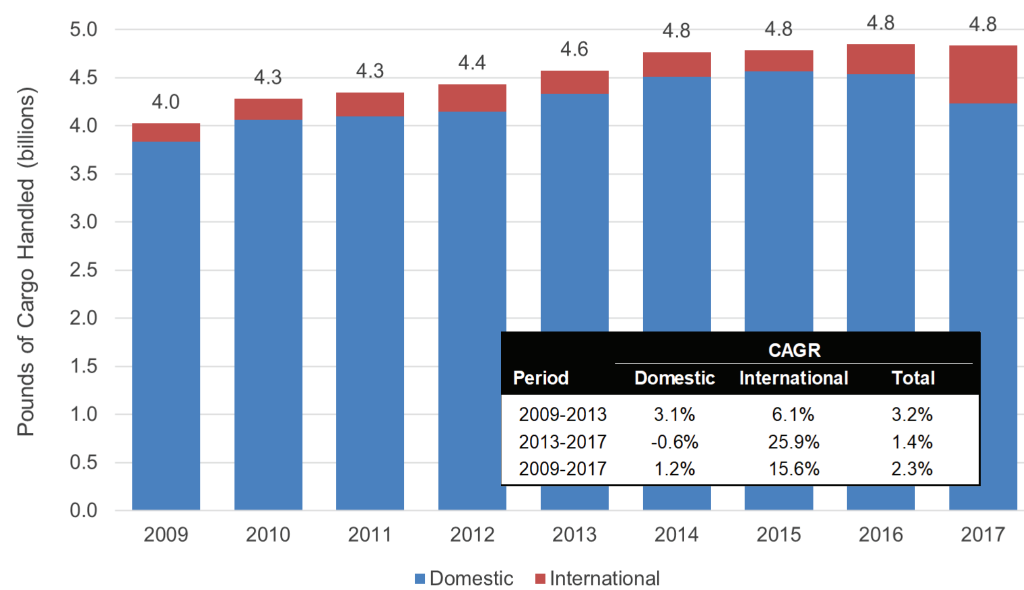
FedEx continues to innovate and modernize their aircraft fleet by replacing older aircraft with newer models, such as the Boeing 777F, and retiring aging airframes. Aircraft expected to be phased out over time include A300s, DC-10s and MD-11s. To support smaller community service, FedEx plans on ordering newly designed Cessna Sky Courier C-408 twin turboprops which will carry double the volume capacity than their current single-engine Cessna aircraft . It is also expected that the ATR-42s will be phased out, with the ATR-72 and C-208 continuing in service.

In addition to scheduled service utilizing their own fleet, FedEx regularly contracts with other carriers, particularly for seasonal holiday peaks. For example, during the month of December 2017 a variety of operations were conducted by non-FedEx aircraft including approximately six (6) B747 departures per day. FedEx will also operate new technology to feed the backbone of its customer solutions. FedEx recently joined the Blockchain in Transportation

Alliance (BiTA), which will allow them to explore blockchain technology and how it will improve and be used within the logistics sector. The integration of new technology into FedEx's virtual and physical networks will play a crucial role for its success within e-commerce trends and deliveries.

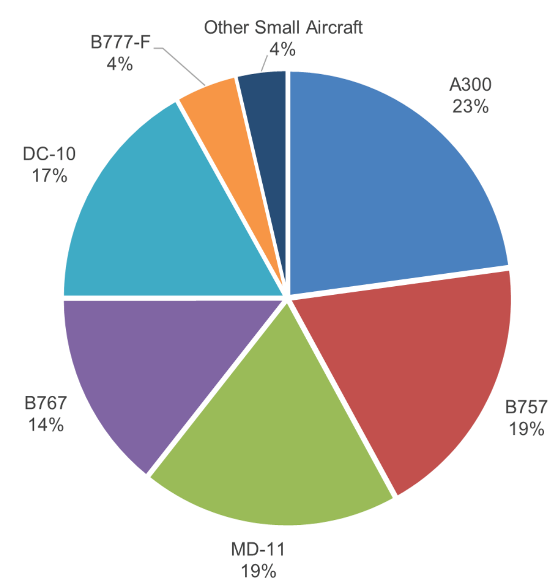
Aside from air cargo, FedEx Ground is making investments in hub expansion and technology investments, which will help the carrier focus on e-commerce growth, especially within North America. The company has over 130 automated facilities to better serve their customers given weather contingencies and unexpected situations by rerouting and sorting packages at any hub.

FIGURE 3.32: HISTORICAL FEDEX CARGO VOLUME (FY 2009-2017)



Source: Tennessee Department of Transportation (TDOT)

FIGURE 3.33: DISTRIBUTION OF FEDEX'S OPERATIONS BY AIRCRAFT TYPE (CY 2017)



Source: U.S. DOT, T-100 Databank, via Airline Data Inc.

General Aviation Activity

Annual General Aviation (GA) activity at Memphis International Airport is shown in **Figure 3.34.** In 2017, Memphis International accommodated more than 29,800 general aviation operations. General Aviation activity at the Airport consists primarily of business and corporate aviation jets. Nearby GA airports tend to attract more of the pilot training and recreation activities along with some corporate operations. At Memphis International, there are two (2) Fixed-Based Operators (FBOs), Wilson Air Center and Signature Flight Support. These FBOs blend the provision of hospitality management (i.e. concierge service, pilot's lounge, executive conference rooms, etc.) and aviation services. In the past seven (7) years, since reaching its lowest level of GA operations, 24,349 in 2010, the Airport has seen average annual growth of 2.9%. The decline prior to 2010, with an average decrease of 15% per year, was mainly attributed to the financial crisis, which negatively affected general aviation demand during the period. Based on data from the Airport Master Record (AirportIQ 5010) database, Memphis International currently has 77-based aircraft total at the airport. JetNet's database of based aircraft was utilized to determine the mix of aircraft, where 46 are jet aircraft and 31 are piston/turboprop aircraft.

FIGURE 3.34: GENERAL AVIATION ACTIVITY (CY 2006-2017)

Year	General Aviation Operations	Annual Percent Change
2006	46,566	-
2007	42,128	-9.5%
2008	33,459	-20.6%
2009	26,675	-20.3%
2010	24,349	-8.7%
2011	27,108	11.3%
2012	27,698	2.2%
2013	26,289	-5.1%
2014	30,305	15.3%
2015	30,400	0.3%
2016	31,387	3.2%
2017	29,818	-5.0%
Average Annual Growth		
2006-'10	-15.0%	
2010-'17	2.9%	

Source: Memphis International Airport Annual Report

FORECAST OF AVIATION DEMAND AT MEMPHIS INTERNATIONAL

This section of the report presents forecasts of future aviation activity at Memphis International Airport, which were developed to guide and support the Master Planning process. Aviation activity forecasts represent a critical input to the Master Plan Update as they are used in determining the size and scope of airport facility development needed to support future levels of aviation demand. These aviation forecasts use Fiscal Year 2017 as the base year, and project 5-, 10-, and 20-year planning horizons (or forecast FY 2022, FY 2027, and FY 2037). Key activities measured in the forecast include:

- Commercial airline passenger traffic
  - » Passenger enplanements (domestic – air carrier vs commuter and international)
  - » By airline type (full-service, low-cost)
  - » Commercial airline operations
  - » Cargo volume (in U.S. tons)
  - » Passenger airline belly cargo
  - » Integrator/Express carrier cargo
  - » Cargo operations
  - » General Aviation
  - » Aircraft operations
  - » Based aircraft
  - » Military operations
  - » Total aircraft operations
- Peak Period Activity

Passenger Forecast

Forecast Methodology

There are several commonly used methods for forecasting airport passenger demand. These include trend analysis, econometric analysis, and market share analysis. This analysis investigated each of these approaches and decided to use a hybrid approach to project future traffic at the Airport.

A regression analysis of Memphis MSA GDP and Memphis O&D passenger traffic was conducted and covered the last 20 years; however, due to Delta's decision to de-hub at MEM in 2013, and the resulting multi-year decline in traffic, the regression analysis did not show a statistically significant relationship between historical passenger growth and GDP growth. Although GDP has not been a strong predictor of historic traffic volumes at Memphis International in the recent past, this analysis assumes that over the long-term, as an O&D airport, passenger traffic will be driven by GDP, as it does at most other U.S. airports. As a result, the Memphis metro area GDP was used as the forecast driver of air traffic in the medium to long-term periods.

To forecast near-term (5 years) passenger traffic activity, the growth of traffic was studied at other dehubbed airports during the near-term years of traffic recovery and found an average elasticity of 2.8 (ratio of passenger traffic growth to local GDP growth). The peer group of dehubbed airports (and former Hub Airline) considered in the analysis along with their calculated average elasticity from the year they experienced dehubbing included:

- CLE – Cleveland Hopkins International Airport (Continental/United in 2014): 2.3
- CVG–Cincinnati/Northern Kentucky International Airport (Delta in 2014): 4.3
- PIT – Pittsburgh International Airport (US Airways in 2014): 3.1
- RDU – Raleigh-Durham International Airport (American in 1996): 1.3
- STL – St. Louis Lambert International Airport (TWA/American in 2015): 3.1

The FY 2018-2023 forecast is based on a bottom-up route level approach, where it models the impact of new air service from potential new entrants as well as existing carrier service at the airport that may increase/decrease seat capacity or frequencies for certain routes. The analysis views current airline strategy as well as the O&D market sizes, in order to substantiate the viability of service expected. The implied traffic growth/GDP growth elasticity over this short-term period is 2.3 – which is in-line with the average coefficient observed at other dehubbed airports as stated above. The forecast projects an average annual growth of 4.1% over this 5-year period.

After adding short-term stimulation with new routes, the long-term econometric traffic forecast section beginning FY2024 is driven by GDP growth based on underlying economic data provided by Woods & Poole. When determining onboard passengers based on O&D shares, the forecast assumes an annual decrease in domestic connecting shares for domestic onboard passengers, by 0.002 percent as Memphis finds itself becoming more of an O&D passenger marketed airport and by 2037 will be 99.8% O&D enplaned passengers, nearly matching the recent shares since FY2016.

From FY 2024 to FY 2037, the analysis assumes a traffic growth elasticity of 1.4 to Memphis MSA GDP growth, which results in a compound annual growth rate (CAGR) of 1.8%, reflecting the maturing of the Memphis market. Over the entire forecast period (FY 2017 – FY 2037), the projected average annual growth is 2.5%.

Forecast of Passenger Enplanements

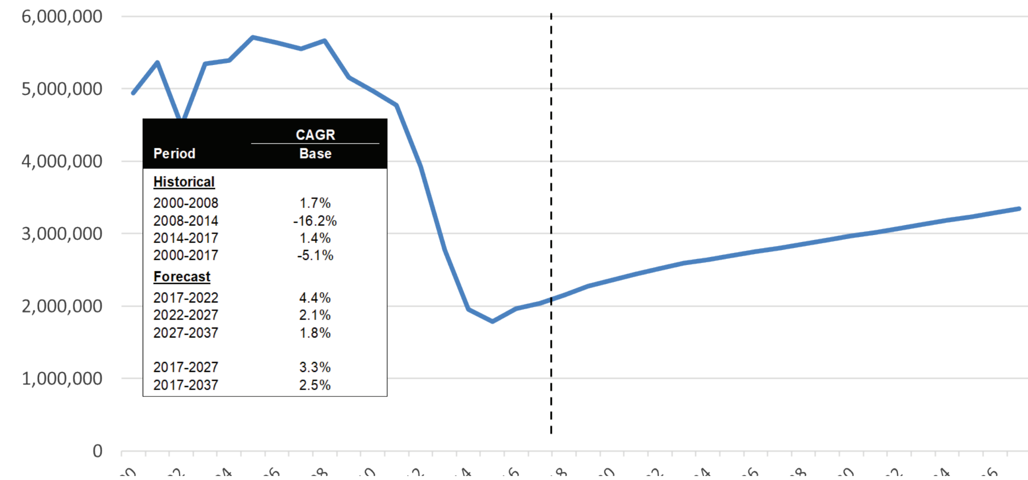
Total enplaned passengers at Memphis International are forecast to increase by an average of 2.5% per year from 2.0 million in Fiscal Year 2017 to 3.3 million in FY 2037. Growth is expected to average 3.3% in the near-term (FY 2017-FY 2027) as new service is introduced, and then moderate to 1.8% over the longer-term planning period (FY 2027- FY 2037) as the market matures (see **Figure 3.35** and **Figure 3.36**).

FY 2018 enplanements were estimated using Innovata schedules data and a trailing eleven-month growth rate based on published Airport data from the previous fiscal year ending in June.

Throughout the forecast, domestic passenger enplanements made up approximately 99% of all passengers each year at Memphis International. In FY 2018, international passengers increased about 290% from 2017, primarily due to Air Canada's increased frequencies for Memphis-Toronto service based on Innovata forward schedules into FY 2019. **Figure 3.37** shows forecasted annual growth of enplaned passengers by domestic and international segments.

In terms of passenger enplanements by airline type (full-service vs low-cost carrier), the share of MEM enplaned passengers departing on low cost carriers (Allegiant, Frontier, Southwest) is expected to grow faster than the segment flying on full service carriers like American and Delta. Throughout the 20-year forecast period, low-cost carrier traffic will grow on average 3.8 percent annually (see **Figure 3.38**).

FIGURE 3.35: FORECAST OF ENPLANED PASSENGERS (FY 2000 - 2037)



Source: MEM Forecast analysis, TDOT, U.S. DOT, T-100 Databank, via Airline Data Inc.

FIGURE 3.36: PASSENGER ENPLANEMENT FORECAST LEVELS AND AVERAGE GROWTH RATES

	Base Year 2017	2018	2022	2027	2037	Average Annual Compound Growth Rates 2018	2022	2027	2037
Passenger Enplanements									
Domestic									
Air Carrier	1,992,095	2,086,401	2,448,201	2,721,226	3,244,826	4.7%	4.2%	3.2%	2.5%
Commuter	39,444	48,074	54,388	58,883	70,212	21.9%	6.6%	4.1%	2.9%
Subtotal	*2,031,539*	*2,134,475*	*2,502,589*	*2,780,109*	*3,315,039*	5.1%	4.3%	3.2%	2.5%
International	3,874	15,102	20,550	22,848	27,862	289.8%	39.6%	19.4%	10.4%
TOTAL PASSENGER ENPLANEMENTS	***2,035,413***	***2,149,577***	***2,523,139***	***2,802,956***	***3,342,901***	***5.6%***	***4.4%***	***3.3%***	***2.5%***

Source: MEM Forecast analysis, TDOT, U.S. DOT, T-100 Databank, via Airline Data Inc.

FIGURE 3.37: ANNUAL GROWTH OF FORECAST ENPLANED PASSENGERS (FY 2018 – 2037)

Period	MEM Annual Enplanements (000s) Domestic	Intl.	Total	Period	MEM Annual Enplanements (000s) Domestic	Intl.	Total
Forecast							
2018	2,134.5	15.1	2,149.6	2028	2,833.5	23.3	2,856.8
2019	2,253.6	18.7	2,272.2	2029	2,887.1	23.8	2,910.9
2020	2,344.6	19.4	2,364.0	2030	2,941.0	24.3	2,965.3
2021	2,423.9	19.9	2,443.7	2031	2,994.9	24.8	3,019.7
2022	2,502.6	20.6	2,523.1	2032	3,048.6	25.3	3,073.9
2023	2,571.3	21.0	2,592.3	2033	3,102.1	25.8	3,127.9
2024	2,622.5	21.4	2,643.9	2034	3,155.5	26.3	3,181.8
2025	2,674.6	21.9	2,696.5	2035	3,208.8	26.8	3,235.7
2026	2,727.2	22.4	2,749.5	2036	3,262.0	27.4	3,289.3
2027	2,780.1	22.8	2,803.0	2037	3,315.0	27.9	3,342.9
	Domestic	**Intl.**	**Total**		**Domestic**	**Intl.**	**Total**
Annual Percent Change							
2018	5.1%	289.8%	5.6%	2028	1.9%	2.1%	1.9%
2019	5.6%	23.6%	5.7%	2029	1.9%	2.1%	1.9%
2020	4.0%	3.9%	4.0%	2030	1.9%	2.1%	1.9%
2021	3.4%	2.5%	3.4%	2031	1.8%	2.1%	1.8%
2022	3.2%	3.4%	3.2%	2032	1.8%	2.0%	1.8%
2023	2.7%	2.1%	2.7%	2033	1.8%	2.0%	1.8%
2024	2.0%	2.2%	2.0%	2034	1.7%	2.0%	1.7%
2025	2.0%	2.2%	2.0%	2035	1.7%	1.9%	1.7%
2026	2.0%	2.1%	2.0%	2036	1.7%	1.9%	1.7%
2027	1.9%	2.1%	1.9%	2037	1.6%	1.8%	1.6%

Note: FY 2018 estimated based on 11-months of activity (July 2017 through May 2018); Base year for forecast is FY 2017; International passenger increases by 289.8% due to increased scheduled frequency of existing international service to Toronto.

Source: MEM Forecast analysis, TDOT, U.S. DOT, T-100 Databank, via Airline Data Inc.

FIGURE 3.38: ANNUAL GROWTH OF FORECAST ENPLANED PASSENGERS (FY 2018 – 2037)

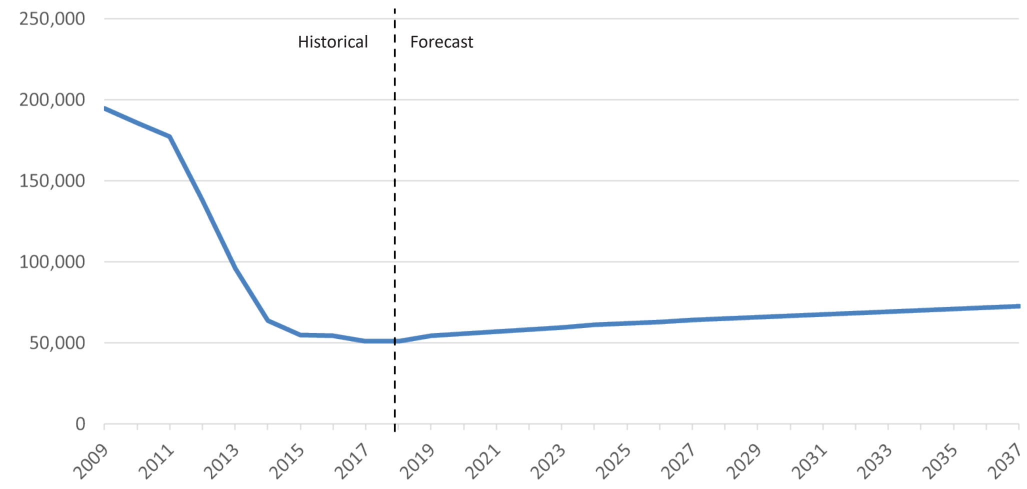
	Base Year 2017	2018	2022	2027	2037	Average Annual Compound Growth Rates 2018	2022	2027	2037
Passenger Enplanements by Airline Type									
Full Service Carrier	1,532,576	1,601,255	1,857,792	2,032,157	2,273,173	4.5%	3.9%	2.9%	2.0%
Low Cost Carrier	502,837	548,322	665,347	770,799	1,069,728	9.0%	5.8%	4.4%	3.8%
TOTAL PASSENGER ENPLANEMENTS	*2,035,413*	*2,149,577*	*2,523,139*	*2,802,956*	*3,342,901*	*5.6%*	*4.4%*	*3.3%*	*2.5%*
Percentage Share									
Full Service Carrier	75.3%	74.5%	73.6%	72.5%	68.0%				
Low Cost Carrier	24.7%	25.5%	26.4%	27.5%	32.0%				

Source: MEM Forecast analysis, TDOT, U.S. DOT, T-100 Databank, via Airline Data Inc.

Forecast of Commercial Passenger Aircraft Operations

The total movements by commercial passenger aircraft are forecast to increase by 1.8% per year from 51,102 operations in FY 2017 to 72,732 in FY 2037. In the near-term (FY 2017-FY2027), where the trend for airlines is to up-gauge aircraft due to rising operating costs, the Airport will see overall growth in average seats per departure between FY 2017 to FY 2022. An average of 103 domestic seats per departure in FY 2017 will rise to a forecasted level of 107 by FY 2022, resulting in an average annual growth rate of 2.3% in total passenger operations from 2017-2027 (see **Figure 3.39** and **Figure 3.40**).

FIGURE 3.39: FORECAST OF TOTAL COMMERCIAL PASSENGER AIRCRAFT OPERATIONS (FY



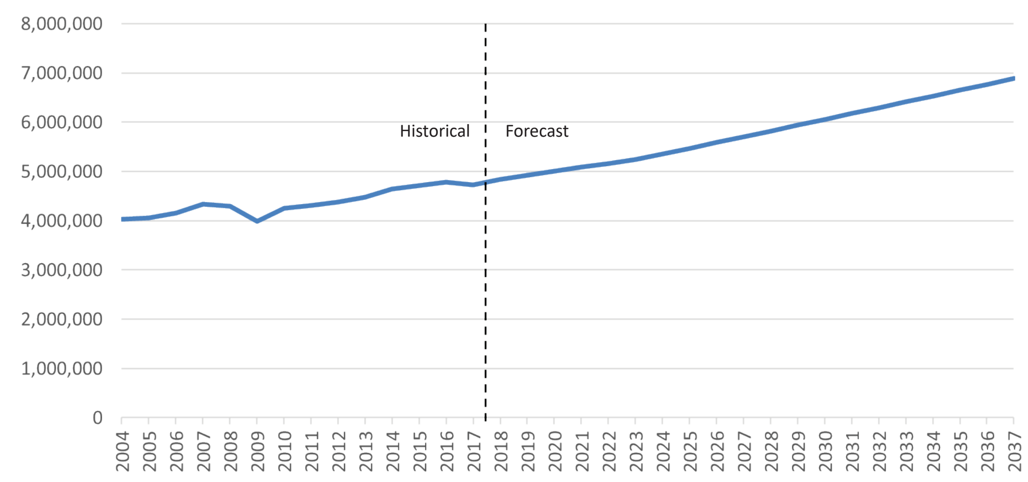
Source: MEM Forecast analysis, TDOT, U.S. DOT, T-100 Databank, via Airline Data Inc., Innovata schedules

FIGURE 3.40: FORECAST OF TOTAL PASSENGER AIRCRAFT OPERATIONS

	Base Year					Average Annual Compound Growth Rates			
	2017	2018	2022	2027	2037	2018	2022	2027	2037
Operations									
Passenger Commercial Operations									
Domestic	50,970	50,329	57,388	62,915	71,573	-1.3%	2.4%	2.1%	1.7%
International	132	795	988	1,037	1,159	502.2%	49.6%	22.9%	11.5%
TOTAL PASSENGER OPERATIONS	***51,102***	***51,124***	***58,376***	***63,952***	***72,732***	***0.0%***	***2.7%***	***2.3%***	***1.8%***

Source: MEM Forecast analysis, TDOT, U.S. DOT, T-100 Databank, via Airline Data Inc., Innovata schedules

FIGURE 3.41: FORECAST OF TOTAL CARGO TONNAGE (U.S. TONS) (FY2004-2037)



Source: MEM Forecast analysis, TDOT, U.S. DOT, T-100 Databank, via Airline Data Inc., Innovata schedules

Cargo Forecast

The total cargo tonnage (belly and freighter combined) at Memphis International is forecast to increase annually by an average of 1.9% from 4.7 million U.S tons in Fiscal Year 2017 to 6.9 million tons in 2037. Growth in both the near-term (FY 2017-2027) and longer-term planning periods (FY 2027-2037) will be maintained at 1.9% per year (see **Figure 3.41**).

The belly cargo tonnage in the forecast is driven by FY 2018 estimated belly cargo tonnage per passenger air traffic movement (ATM), which is held constant and calculated by taking the estimated belly cargo tonnage in FY 2018 using an 11-month YTD growth rate and dividing the tonnage by forward Innovata passenger airline schedule data. The freighter cargo tonnage is driven by running a regression analysis on historical growth in freighter tonnage at Memphis against U.S. GDP annual growth rates.

Throughout the forecast period, the share of cargo carried in the belly compartments of commercial passenger aircraft is forecast to remain fairly low at 0.035%. The FAA Aerospace Forecast estimated a CAGR for revenue-ton mile (metric measuring the volume of freight transported and the distance it is transported) across the nation to be about 1.9% between FY 2017-2038, which matches the resulting 20-year forecast for this analysis having a CAGR of 1.9% (see **Figure 3.42**).

In terms of cargo operations, the forecast is driven by estimates of future fleet mix for FY 2033, and the cargo tonnage forecast. The analysis distributes average historical cargo tonnage per operation, specified by aircraft type, across the total tonnage by aircraft type each annual period. From FY 2018-2033, tonnage allocated to aircraft types being phased out based on FedEx's future fleet mix was

FIGURE 3.42: AVERAGE GROWTH RATES OF FORECASTED TOTAL CARGO TONNAGE (U.S. TONS) (FY 2004-2037)

Fiscal	Base Case			Annual Pct Change		
Year	Belly	Freighter	Total	Belly	Freighter	Total
Actual						
2004	10,378	4,026,300	4,036,678			
2005	8,328	4,059,898	4,068,226	-19.8%	0.8%	0.8%
2006	7,094	4,153,476	4,160,570	-14.8%	2.3%	2.3%
2007	7,878	4,327,872	4,335,750	11.1%	4.2%	4.2%
2008	7,660	4,289,484	4,297,144	-2.8%	-0.9%	-0.9%
2009	7,408	3,975,435	3,982,843	-3.3%	-7.3%	-7.3%
2010	6,367	4,244,441	4,250,808	-14.0%	6.8%	6.7%
2011	5,490	4,308,412	4,313,902	-13.8%	1.5%	1.5%
2012	4,097	4,381,245	4,385,342	-25.4%	1.7%	1.7%
2013	2,447	4,480,253	4,482,699	-40.3%	2.3%	2.2%
2014	1,803	4,645,417	4,647,220	-26.3%	3.7%	3.7%
2015	2,152	4,707,533	4,709,685	19.4%	1.3%	1.3%
2016	2,252	4,777,068	4,779,320	4.6%	1.5%	1.5%
2017	2,394	4,731,639	4,734,033	6.3%	-1.0%	-0.9%
Forecast						
2018	2,227	4,831,965	4,834,193	-7.0%	2.1%	2.1%
2019	2,377	4,919,162	4,921,539	6.7%	1.8%	1.8%
2020	2,432	5,000,114	5,002,546	2.3%	1.6%	1.6%
2021	2,478	5,080,432	5,082,911	1.9%	1.6%	1.6%
2022	2,543	5,162,350	5,164,893	2.6%	1.6%	1.6%
2027	2,786	5,698,743	5,701,529			
2037	3,169	6,885,578	6,888,746			
Annual Growth Rate						
2007-2012	-12.3%	0.2%	0.2%			
2012-2017	-10.2%	1.6%	1.5%			
2017-2022	1.2%	1.8%	1.8%			
2017-2027	1.5%	1.9%	1.9%			
2017-2037	1.4%	1.9%	1.9%			

Source: MEM Forecast analysis, TDOT, U.S. DOT, T-100 Databank, via Airline Data Inc., Innovata schedules

done so via a straight-line method, where by 2033, those specified aircraft (below) are not operating anymore. Those cargo tonnages are re-allocated to existing aircraft type throughout the forecast period, which impact expected cargo operations. Below is a bulleted list of assumptions for the particular phased out aircraft types over the forecast period:

- Via a straight-line method between FY 2018-2033, the MD-11/DC-10 operations were replaced by B777F
- Cargo to be carried on A300 aircraft are replaced on B767 aircraft - The analysis assumed this given the 54 B767s on order (as of May 2019) from CAPA Fleet data

- B757-200 freighters that FedEx recently acquired would absorb cargo flown on the A310
- Smaller aircraft like the ATR-72 and Cessna Caravans (i.e., C-208 and C-408) were allocated 70% and 30%, respectively, of that total cargo tonnage
- By FY 2033, the share of operation movements will remain constant for the remained of the forecast period (FY 2037)

Figure 3.43 shows the forecast number of cargo operations from FY 2017-2037, resulting in a CAGR of 1.7%. As freight aircraft fleet mix changes over the forecast period due to old widebody aircraft like the A300 and MD-11s becoming obsolete, Memphis International and the FedEx hub are expected to see a total of 192,730 cargo movements by FY 2037. The majority of these operations will be operated on B757, B767, and B777 freighters by the end of the forecast period.

FIGURE 3.43: FORECAST OF TOTAL CARGO OPERATIONS AND AVERAGE CARGO TONNAGE PER OPERATION (FY 2017-2037)

	Base Year 2017	2018	2022	2027	2037	Average Annual Compound Growth Rates 2018	2022	2027	2037
Freighter Cargo Commercial Operations	138,170	139,729	149,135	162,881	192,734	1.1%	1.5%	1.7%	1.7%
Cargo/Mail (U.S. tons in '000s)	4,731.6	4,832.0	5,162.3	5,698.7	6,885.6	2.1%	1.8%	1.9%	1.9%
AVERAGE TONNAGE PER OPERATION	*34.2*	*34.6*	*34.6*	*35.0*	*35.7*	*1.0%*	*0.2%*	*0.2%*	*0.2%*

Source: MEM Forecast analysis, TDOT, U.S. DOT, T-100 Databank, via Airline Data Inc., Innovata schedules

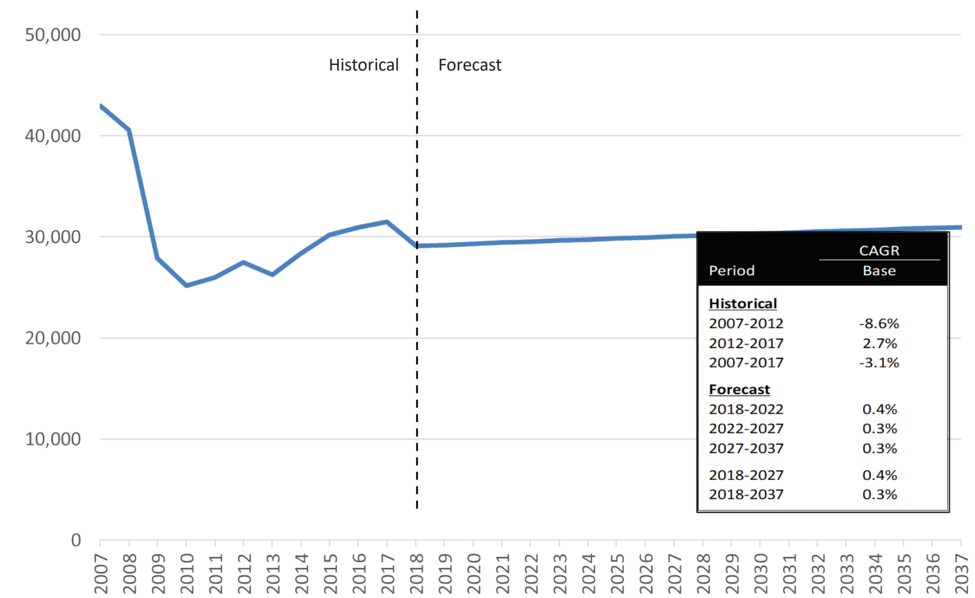
General Aviation Forecast

Forecast General Aviation Operations

This analysis expects very conservative growth in GA activity at Memphis International over the forecast period where GA operations are growing slower than the economic growth in the Memphis area. Our projected long-term forecast (FY 2018 – FY 2037) growth rates for GA activity at Memphis International are in-line with the published FAA Workload Forecast (FY 2018 – FY 2038) for GA activity (0.3% growth) across U.S. airports that have FAA Traffic Control and Contract Tower Service. The growth in GA activity is driven by GDP growth and is forecast to grow slower than the Memphis-Forrest City Combined Statistical Area's (CSA) GDP. **Figure 3.44** illustrates the base case general aviation outbound activity for Memphis International. Take note that the estimated FY 2018 GA movements had a sharp decline in activity of about 7.6%.

At Memphis International, the forecast shows a 0.3% average annual growth rate between FY 2018-2037, growing from an estimated 29,101 departures in 2018 to 30,973 by 2037. The Memphis MSA GDP is expected to grow about 1.4% during FY 2017-2037. The recently published 2017 TAF forecast for FY 2018-2037, grew general aviation operations at 0.3% for Memphis International.

FIGURE 3.44: HISTORICAL & FORECAST OF TOTAL GENERAL AVIATION OPERATIONS (FY 2007-2037)



Source: MEM Forecast analysis

FIGURE 3.47: FORECAST OF TOTAL CARGO OPERATIONS AND AVERAGE CARGO TONNAGE PER OPERATION (FY 2017-2037)

Fiscal Year	Aircraft Type by Engine: Single	Jet	Multi	Helo	Other	Total	Change in Aircraft
Historical							
2012	16	37	9	1	0	63	
2013	10	40	7	1	9	67	4
2014	16	45	14	9	9	93	26
2015	16	45	14	9	0	84	-9
2016	16	46	13	1	9	85	1
2017	14	46	17	0	0	77	-8
Forecast							
2022	14	48	18	0	0	80	3
2025	14	48	18	0	0	80	0
2027	14	48	18	0	0	80	0
2032	14	49	18	0	0	81	1
2034	14	49	18	0	0	81	0
2037	15	50	18	0	0	83	2

Note: Only forecast years that see net change in total based aircraft are shown
Source: MEM Forecast analysis and FAA Terminal Area Forecast 2018-2045, Feb 2019

Forecast of Based Aircraft

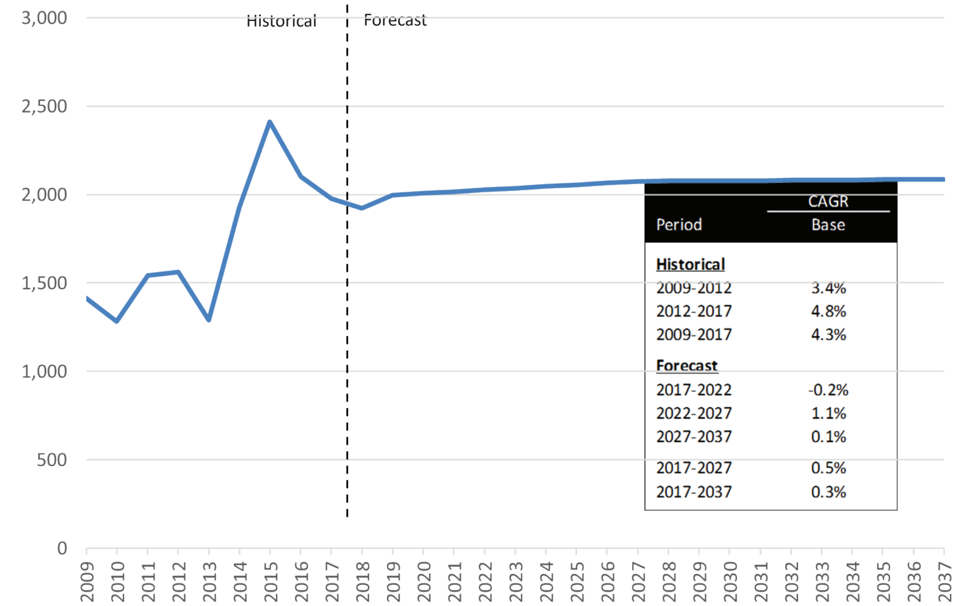
In the base case, the total number of based aircraft operating at Memphis is forecasted to reach 83 in FY 2037, growing from 77 based aircraft in FY 2017. This is a growth rate of 0.4% annually over the forecast period. The based aircraft forecast is segmented into five (5) aircraft types consistent with the segments included in the FAA TAF, which include single engine, jet engine, multi-engine, helicopter/rotorcraft, and other (i.e.; include sports/recreation). There is a correlation between historical general aviation activity growth at Memphis International and the growth rate of active civilian pilots in the states of Tennessee, Arkansas, and Mississippi. The pilot populations surveyed by respective historical years were categorized by the FAA as student, private, flight instructors, commercial (general aviation vs airline transport), and miscellaneous (recreation/sport). By determining a baseline of average operations performed per based aircraft (by type), in each respective year, the Master Planning team was able to forecast the growth in based aircraft at the Airport. The following **Figure 3.45** shows the growth of based aircraft by aircraft type. Single engine based aircraft are project to grow from 14 in 2017 to 15 by 2037, while jet and multi engine based aircraft types are estimated to grow from 46 and 17, respectively, to 50 and 18. Based helicopters will remain at the existing levels throughout the forecast period.

Military Forecast

Forecast Military Operations

The Master Planning team was unable to obtain information about future military operations at the airport. Therefore, this forecast relies on projections developed in the FAA TAF. In fiscal year 2017, the Airport saw 1,978 annual military movements. The FAA TAF projects an average annual growth rate of 0.5% for military operations for the 10-year forecast period, and 0.3% over the 20-year forecast period. By fiscal year 2037, military aircraft movements are expected to reach 2,087 (see **Figure 3.46**).

FIGURE 3.46: HISTORICAL & FORECAST OF ANNUAL MILITARY OPERATIONS (FY 2009-2037)



Source: MEM Forecast analysis and FAA Terminal Area Forecast 2017-2045, Apr 2018

Forecast of Total Aircraft Operations at Memphis International Airport

Figures 3.47 and 3.48 depict the forecast of aircraft operations. In fiscal year 2017, Memphis International accommodated approximately 222,736 aircraft movements. Total aircraft operations is expected to increase at a rate of 1.5% over the next 10-year forecast period, and will remain consistent in growth for the forward 20-year period at 1.5% again, reaching a total of 298,526 aircraft operations.

FIGURE 3.47: TOTAL AIRCRAFT OPERATIONS (FY 2017-2037)

	Base Year 2017	2018	2022	2027	2037	Average Annual Compound Growth Rates 2018	2022	2027	2037
Operations									
Passenger Commercial Operations									
Domestic	50,970	50,329	57,388	62,915	71,573	-1.3%	2.4%	2.1%	1.7%
International	132	795	988	1,037	1,159	502.2%	49.6%	22.9%	11.5%
Freighter Cargo Commercial Operations	138,170	139,729	149,135	162,881	192,734	1.1%	1.5%	1.7%	1.7%
TOTAL COMMERCIAL OPERATIONS	***189,272***	***190,853***	***207,511***	***226,832***	***265,466***	***0.8%***	***1.9%***	***1.8%***	***1.7%***
General Aviation									
Itinerant	31,386	29,008	29,432	29,940	30,874	-7.6%	-1.3%	-0.5%	-0.1%
Local	100	93	94	96	99	-7.6%	-1.3%	-0.5%	-0.1%
Military	1,978	1,923	1,960	2,075	2,087	-2.8%	-0.2%	0.5%	0.3%
TOTAL OPERATIONS	***222,736***	***221,877***	***238,997***	***258,943***	***298,526***	***-0.4%***	***1.4%***	***1.5%***	***1.5%***

Source: MEM Forecast analysis, FAA Terminal Area Forecast 2017-2045, Apr 2018 (for military)

FIGURE 3.48: FORECAST GROWTH RATES OF AIRCRAFT OPERATIONS (FY 2017-2037)

	Average Annual Growth Passenger Airline	Cargo	GA	Military	Total
2017-2022	2.7%	1.3%	0.4%	-0.2%	1.3%
2017-2027	2.3%	1.4%	0.4%	0.5%	1.4%
2017-2037	1.8%	1.4%	0.3%	0.3%	1.3%

Note: GA growth rates start at FY 2018, due to a steep decrease in

Source: MEM Forecast analysis, TDOT, FAA Terminal Area Forecast 2017-2045, Apr 2018 (for military)

Critical Aircraft

Pursuant to FAA guidance, the critical aircraft is the most demanding aircraft identified in the forecast that will use the airport. Federally funded projects require that the critical aircraft will make substantial use of the airport in the planning period. Substantial use means either 500 or more annual itinerant operations or scheduled service. In some cases, the critical aircraft may be a composite of the most demanding characteristics of several aircraft.

Many aspects of the forecast of operations influence the master plan. For example, the forecast of commercial passenger aircraft operations will influence terminal aircraft parking facility needs even though those aircraft are not the largest at the airport. For purposes of this forecast, in accordance with AC 150/5300-13A Airport Design and ARP-SOP-200-ALP-Review, the critical aircraft has be identified in terms of the Aircraft Approach Speed (AAC), Airplane Design Group (ADG) and Taxiway Design Group (TDG).

Based on analysis from Innovata schedules of current operations at Memphis International (for CY 2018), the existing critical aircraft is a Boeing 777F (B777F) with 7,062 operations recorded/scheduled in FY 2018. It should be noted that although FedEx contracts with various operators during peak holidays periods, with some aircraft as big as the B747, overall this aircraft is not considered the critical aircraft as these flights do not happen year around and are not scheduled. Based on the forecasted operations and future aircraft orders for FedEx, the B777F is expected to remain the critical design aircraft for Memphis International throughout the entire planning horizon with an estimated 23,567 operations forecasted for 2037, given that it will replace cargo shipped on the MD-11 and DC-10 aircraft that are being phased out through FY 2033. According to CAPA Fleet data as of May 2019, FedEx has 23 B777F aircraft expected to be delivered in the next 5 years, growing that variant type in the fleet by 60%. The summary of annual operations, both historical and forecasted (by aircraft type), is shown in **Figure 3.49**.

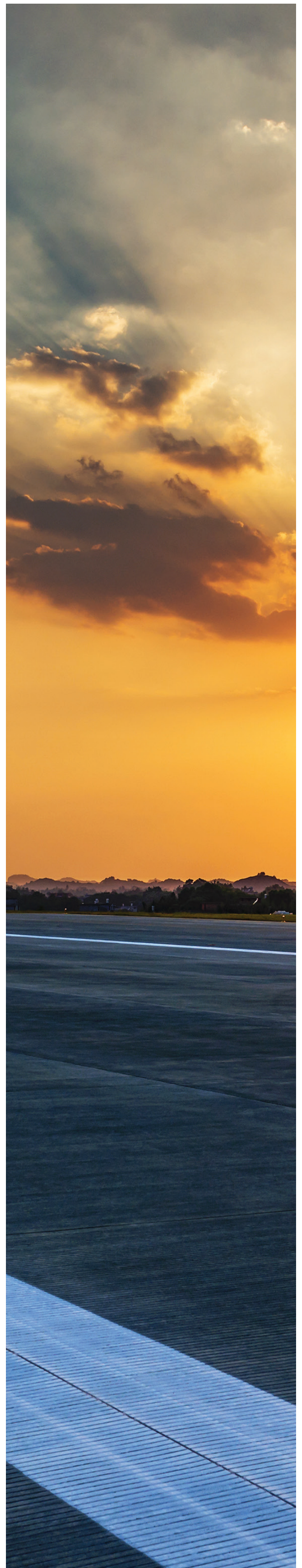


FIGURE 3.49: HISTORICAL AND FORECASTED AIRCRAFT OPERATIONS (CRITICAL AIRCRAFT)

	Historical/Scheduled			Forecast			
Aircraft Type	FY2016	FY2017	FY2018	FY2022	FY2027	FY2032	FY2037
A300-600	30,083	31,647	29,403	21,562	11,761	1,960	0
A310-2CF	3,042	2,071	1,924	1,411	770	128	0
A319	4,389	4,276	4,383	7,057	7,153	7,661	8,138
A320	1,245	1,340	1,633	5,263	7,368	7,891	8,382
A321	0	135	329	222	225	241	256
ATR-72	0	32	93	679	1,294	1,909	2,184
B717-200	1,751	1,524	1,095	674	683	732	777
B737-300	1,662	1,842	453	0	0	0	0
B737-500	16	2	0	0	0	0	0
B737-700 Passenger	4,865	4,795	5,841	6,508	7,953	8,517	9,047
B737-800 Passenger	514	1,656	2,310	4,175	5,587	5,984	6,356
B737-900 Passenger	0	133	241	1,176	1,192	1,276	1,356
B737-Max 8 Passenger	0	0	0	152	155	165	176
B757-200 Cargo	28,476	27,185	27,741	30,563	34,515	38,467	42,182
B757-200 Passenger	45	59	0	0	0	0	0
B767-3	13,786	19,681	25,516	49,178	79,004	108,830	123,344
B777F	6,360	6,124	7,062	11,022	15,982	20,942	23,567
BEECH 18	1,107	932	866	635	346	58	0
Beech BE400	381	0	0	0	0	0	0
CARAVAN (C208 / C408)	1,854	1,857	1,931	944	1,131	1,318	1,457
Cessna	4,213	1,971	1,675	1,372	1,391	1,489	1,582
CRJ	2,711	900	782	1,658	1,716	1,826	1,931
CRJ-200	1,130	1,211	447	7	7	8	8
CRJ-700	3,407	5,351	6,041	4,980	5,048	5,405	5,742
CRJ-900	8,230	5,886	6,372	5,865	5,945	6,367	6,763
DC-10	23,655	23,046	21,412	15,702	8,565	1,427	0
E-170	848	1,605	1,089	626	635	680	722
E-175	4,499	5,586	6,339	6,214	6,299	6,745	7,166
ERJ135/ ERJ140/ ERJ145	5,940	2,788	2,204	3,227	3,271	3,503	3,721
ERJ-140	117	0	210	1,332	1,350	1,446	1,536
ERJ-145	1,650	1,354	1,715	1,030	1,045	1,119	1,188
MD-11	27,665	25,595	23,780	17,439	9,512	1,585	0
MD-80	1,518	396	413	955	968	1,037	1,101
MD-82	377	1,811	525	62	63	68	72
MD-88	4,857	5,857	6,010	5,290	5,362	5,742	6,100
MD-90	0	623	1,015	529	536	574	610
Total (excludes Military and GA)	**190,392**	**189,272**	**190,853**	**207,511**	**226,832**	**245,102**	**265,466**

Note: Does not reflect FedEx seasonal contract operations.

Source: Innovata schedules, 2018, U.S. DOT, T-100 Databank, via Airline Data Inc., YE May 2018

Peak Period Demand Forecast

The forecast of enplaned passengers and aircraft operations are used in master plans to determine future facility requirements. In determining future facility requirements, planners consider both annual and peak period activity levels as the peak periods can often drive the need for facility growth more than annualized activity. Therefore, prior to applying annual forecast results, peak period design metrics are derived to supplement the annual estimates.

For this effort, three (3) categories of peak period activity are provided.

Peak hour enplanements (arrivals and departures) - Peak Hour passenger enplanements were based on Innovata published flight schedules during FY2017. The peak period analysis selected the representative busy hour given daily flight schedules for both departures and arrivals at Memphis.

Peak hour cargo operations - Peak period cargo operations are presented separately from passenger operations given that the majority of FedEx's cargo operations occur during two (2) distinct peak periods – the day sort and night sort, with the night sort representing the larger number of operations. For these cargo operations, the peak month was determined to be December, given high volume of FedEx shipments during the holiday season. Existing peak hour activity was formulated around a monthly FedEx schedule provided by the Airport, while the future peak hour operations were derived based on input from FedEx regarding their future peak period estimates and their anticipated fleet replacements.

It should be noted, that in the case of planning airfield facilities such as runway capacity, taxiway capacity/efficiency and deicing operations, the nature of FedEx's operations, particularly at night, requires considerations of the entire peak period. In FedEx's case this is a 1.5-2 hour window where all arrivals are experienced at the beginning of the push and then another 1.5-2 hour window when all departures push after the sort is completed. For planning purposes, the following information is provided for the night sort activity by the end of the planning horizon in 2037.

- Number of arrivals within a 1.5-2-hour window
  - » ADG II – 3
  - » ADG III – 6
  - » ADG IV – 133
  - » ADG V – 18
- Number of departures within a 1.5-2-hour window
  - » ADG II – 3
  - » ADG III – 6
  - » ADG IV – 133
  - » ADG V - 18

FedEx regularly contracts with other carriers, particularly for seasonal holiday peaks. During the month of December 2017, a variety of operations were conducted by larger (ADG IV or V) non-FedEx aircraft including approximately six (6) B747 departures per day.

Peak hour passenger operations - Peak Hour passenger operations were based on Innovata published flight schedules during FY2017. The peak period analysis selected the representative busy hour given daily flight schedules for both departures and arrivals at Memphis.

Peak hour projections for the forecast horizon years 2022, 2027, 2032, and 2037 were developed based on the 2017 baseline analysis, and the respective annual forecasts. **Figure 3.50** outlines the peaking characteristics for enplaned passengers at the Airport and aircraft operations separated by cargo and commercial passenger segments. The aircraft operations are categorized by FAA aircraft designation codes (ie. II, III, IV, etc.). A reference of aircraft types corresponding to the appropriate FAA designation codes can be found on **Figure 3.51**.

FIGURE 3.50: PEAK PERIOD ACTIVITY

Fiscal Year	Actual 2017	Forecast 2022	2027	2032	2037
Enplaned Passengers					
Annual	2,035,413	2,523,139	2,802,956	3,073,885	3,342,901
Domestic	2,031,539	2,502,589	2,780,109	3,048,558	3,315,039
International	3,874	20,550	22,848	25,327	27,862
Peak Hour					
Arrivals	991	1,159	1,259	1,356	1,451
Departures	1,312	1,511	1,615	1,712	1,803
Total	1,483	1,735	1,884	2,029	2,172
O&D vs Connecting Breakdown					
O&D (%)	*99.8%*	*99.8%*	*99.9%*	*99.9%*	*99.9%*
Connecting (%)	*0.2%*	*0.2%*	*0.1%*	*0.1%*	*0.1%*
Aircraft Operations					
Annual - Cargo (ATMs)	138,170	149,135	162,881	176,626	192,734
Peak Hour (by FAA Aircraft Designation Code)					
Total	*97*	*103*	*110*	*117*	*125*
IV	91	97	103	110	117
V	6	6	7	7	8
Arriving	*70*	*74*	*79*	*84*	*90*
III	1	1	1	1	1
IV	65	69	74	78	84
V	4	4	5	5	5
Departing	*96*	*101*	*108*	*114*	*121*
IV	92	97	103	109	116
V	4	4	4	5	5
Annual - Passenger (ATMs)	51,102	58,376	63,952	68,476	72,732
Domestic	50,970	57,388	62,915	67,377	71,573
International	132	988	1,037	1,099	1,159
Peak Hour (by FAA Aircraft Designation Code)					
Total	*20*	*22*	*24*	*25*	*26*
II	4	4	5	5	5
III	16	18	19	20	21
Arriving	*11*	*12*	*13*	*14*	*15*
II	3	3	4	4	4
III	8	9	9	10	11
Departing	*14*	*15*	*16*	*17*	*17*
II	1	1	1	1	1
III	13	14	15	15	16

Source: MEM Forecast Analysis, Innovata schedules, FY 2017, FedEx cargo schedule, Dec 2018

FIGURE 3.51: FAA AIRCRAFT DESIGNATION CODE REFERENCE BY AIRCRAFT TYPE

Cargo FAA Code	Aircraft Type	Passenger FAA Code	Aircraft Type	
II		II		
	C-208-B		CNC (Cessna)	
	FALCON		CR2 (CRJ-200)	
III			CRJ (CRJ)	
	ATR-42		ER4 (ERJ-145)	
	ATR-72		ERJ (ERJ135/ ERJ140/ ERJ145)	
IV		III		
	B757-200		319 (A319)	73H (B737-800 Winglets Pax/BBJ2)
	B767-EX		320 (A320)	73W (B737-700 Winglets Pax/BBJ1)
	A300-AAD		321 (A321)	CR7 (CRJ-700)
	A310-PW		32A (A320 Sharklets)	CR9 (CRJ-900)
	B767-300F		717 (B717-200)	E70 (E-170)
	MD10-10		733 (B737-300)	E75 (E-175)
	MD10-29		735 (B737-500)	E7W (E-175 Enhanced Winglets)
	MD10-30		738 (B737-800 Passenger)	M80 (MD-80)
	MD-11		739 (B737-900 Passenger)	M82 (MD-82)
	MD-11CR		73C (B737-300 Winglets Passenger)	M88 (MD-88)
			73G (B737-700 Passenger)	M90 (MD-90)
V		IV		
	B747-2FC		752 (B757-200 Passenger)	
	B747-4F		757 (B757 Passenger)	
	B777F			
	B747-200			

Source: FAA Database AC 150/5300-13 Appendix 1: Fixed-Wing Aircraft Characteristics, 2018

COMPARISON TO FAA TAF

From the perspective of forecast approvals in accordance with AC 150-5070-6B-Change-2, the general requirement for FAA approval of the master plan study's forecasts is that they are supported by an acceptable forecasting analysis and are consistent with the TAF. Master plan forecasts for operations, based aircraft, and enplanements are considered to be consistent with the TAF if they differ by less than 10 percent in the 5-year forecast and 15 percent in the 10-year period.

The FAA's most recent Terminal Area Forecast (TAF) for fiscal years 2018-2045 was published in February 2019 and is used for the following comparisons.

Figure 3.52, Figure 3.53 and **Figure 3.54** show the comparison of the TAF and Master Plan enplanements forecast. The TAF Memphis' airline passenger traffic is expected to increase at an average annual rate of 2.5% for the next 20 years and grow to about 3.37 million enplaned passengers in FY 2037. This forecast projects the average annual growth rate to be 2.5%, where MEM reaches 3.34 million enplanements in FY 2037.

In the 5-year base case period (FY 2017-2022), this forecast projects the average annual growth rate to be 4.4%, driven by new airline service mentioned previously and conservative increases in load factors on a route-level basis. Over the same period, the TAF forecasts the average annual growth rate to be 4.2%.

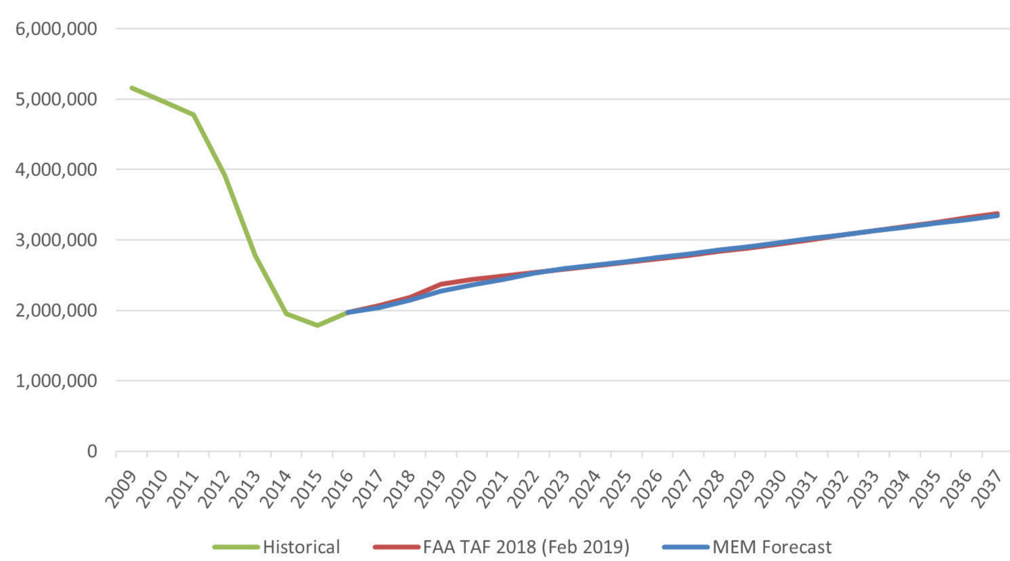
In comparing the enplanement forecast to the TAF, in 2022 (5-year) the MEM forecast is 0.7% lower than the TAF. In 2027 (10-year), the MEM forecast is 0.8% higher than the TAF. Each is within the respective 10% and 15% criteria.

FIGURE 3.52: MEM FORECAST VS FAA TAF (PASSENGER ENPLANEMENTS)

	Year	Airport Forecast	TAF	AF/TAF (% Difference)
Passenger Enplanements				
	2017	2,035,413	2,069,229	-1.6%
	2022	2,523,139	2,540,311	-0.7%
	2027	2,802,956	2,779,822	0.8%
	2037	3,342,901	3,375,423	-1.0%
Average Annual Growth				
	2017-2022	4.4%	4.2%	
	2022-2027	2.1%	1.8%	
	2017-2027	3.3%	3.0%	
	2027-2037	1.8%	2.0%	
	2017-2037	2.5%	2.5%	

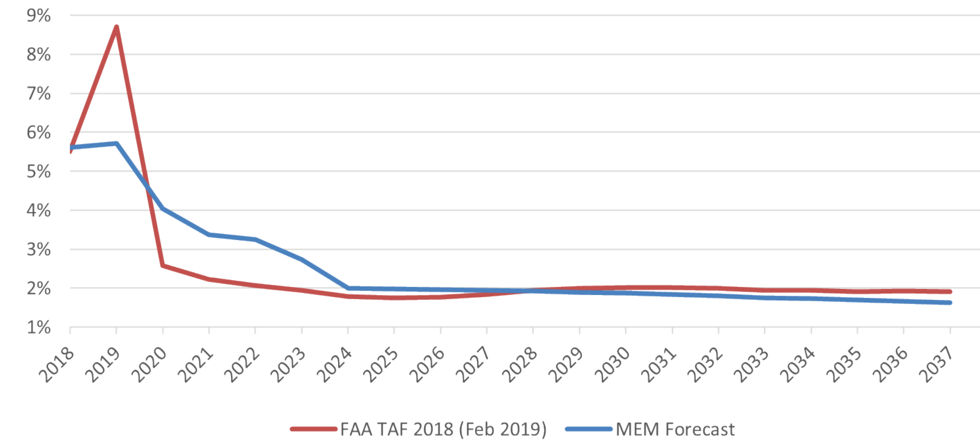
Note: TAF data is on a U.S. government fiscal year basis (October 1 through September 30).
Source: MEM Forecast analysis, FAA Terminal Area Forecast 2018-2045, Feb 2019

FIGURE 3.53: FORECAST VS FAA TAF (PASSENGER ENPLANEMENTS)



Note: FAA TAF forecast is for Federal fiscal years ended in September 30.
Source: MEM Forecast analysis, FAA Terminal Area Forecast 2018-2045, Feb 2019

FIGURE 3.54: FORECAST VS FAA TAF PASSENGER ENPLANEMENTS (ANNUAL PERCENTAGE CHANGE)



Note: FAA TAF forecast is for Federal fiscal years ended in September 30.

Source: MEM Forecast analysis, FAA Terminal Area Forecast 2018-2045, Feb 2019

FIGURE 3.55: MEM FORECAST VS FAA TAF AIRPORT OPERATIONS ACTIVITY

	Year	Airport Forecast	TAF	AF/TAF (% Difference)
Commercial Operations				
	2017	189,272	199,165	-5.0%
	2022	207,511	218,946	-5.2%
	2027	226,832	236,575	-4.1%
	2037	265,466	279,184	-4.9%
Total Operations				
	2017	222,736	222,271	0.2%
	2022	239,063	240,142	-0.4%
	2027	258,943	258,059	0.3%
	2037	298,526	301,259	-0.9%
Average Annual Growth - Total Operations				
	2017-2022	1.4%	1.6%	
	2022-2027	1.6%	1.4%	
	2017-2027	1.5%	1.5%	
	2027-2037	1.4%	1.6%	
	2017-2037	1.5%	1.5%	

Source: MEM Forecast analysis, FAA Terminal Area Forecast 2018-2045, Feb 2019

Operations

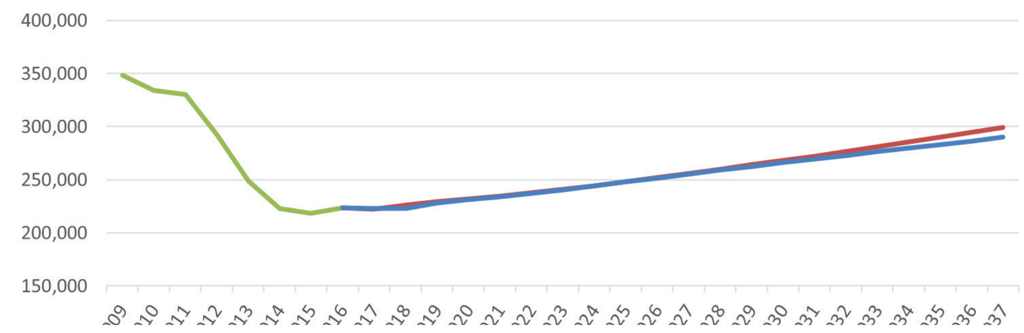
Figures 3.55, 3.56 and **3.57** show the comparison of the TAF and Master Plan operations forecast. In the short-term period (FY 2017-2022), for operation activity across all segments at Memphis International, this forecast projects the average annual growth rate to be 1.4%, which is closely in-line with the recent published FAA TAF forecast of 1.6%. The analysis showed an initial decline in annual movements overall between FY 2017 and FY 2018 due to historical decline in general aviation activity at MEM. For the full 20-year forecast (FY 2017-2037), airport annual operations is projected to grow an average of 1.5% annually, and the FAA TAF projects the same average growth rate of 1.5%.

In comparing the total operations forecast to the TAF, in 2022 (5-year) the MEM forecast is -0.4% lower than the TAF. In 2027 (10-year), the MEM forecast is 0.3% higher than the TAF. Each is within the respective 10% and 15% criteria.

Based Aircraft

In 2022 (5-year) the MEM forecast for based aircraft is 80, compared to the TAF at 77. In 2027 (10-year), the MEM forecast for based aircraft remains at 80 along with the TAF remaining at 77. Each is within the 10% and 15% criteria.

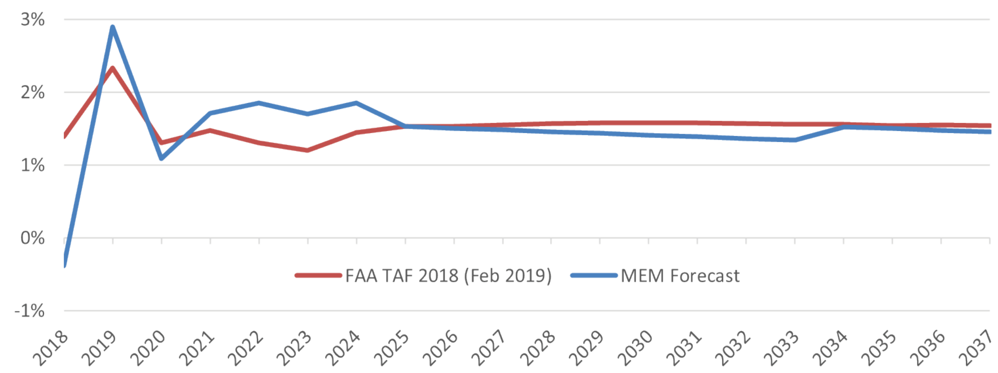
FIGURE 3.56: MEM FORECAST VS FAA TAF AIRPORT OPERATIONS ACTIVITY



Source: MEM Forecast analysis, FAA Terminal Area Forecast 2018-2045, Feb 2019

Note: FAA TAF forecast is for federal fiscal years ended in September 30; the TAF forecast begins in 2018.

FIGURE 3.57: FORECAST VS FAA TAF TOTAL AIRCRAFT OPERATIONS (ANNUAL PERCENTAGE CHANGE)



Note: FAA TAF forecast is for Federal fiscal years ended in September 30.
Source: MEM Forecast analysis, FAA Terminal Area Forecast 2018-2045, Feb 2019

Summary Comparison of Forecast to Terminal Area Forecast

Figure 3.58 provides a comparison of the Airport Planning Forecast and TAF using the recommended template.

FIGURE 3.58: SUMMARY COMPARISON OF FORECAST VS FAA TAF

	Year	Airport Forecast	TAF	AF/TAF (% Difference)
Passenger Enplanements				
Base yr.	2017	2,035,413	2,069,229	-1.6%
Base yr. + 5yrs.	2022	2,523,139	2,540,311	-0.7%
Base yr. + 10yrs.	2027	2,802,956	2,779,822	0.8%
Base yr. + 20yrs.	2037	3,342,901	3,375,423	-1.0%
Commercial Operations				
Base yr.	2017	189,272	199,165	-5.0%
Base yr. + 5yrs.	2022	207,511	218,946	-5.2%
Base yr. + 10yrs.	2027	226,832	236,575	-4.1%
Base yr. + 20yrs.	2037	265,466	279,184	-4.9%
Total Operations				
Base yr.	2017	222,736	222,271	0.2%
Base yr. + 5yrs.	2022	239,063	240,142	-0.4%
Base yr. + 10yrs.	2027	258,943	258,059	0.3%
Base yr. + 20yrs.	2037	298,526	301,259	-0.9%
Based Aircraft				
Base yr.	2017	77	77	0.0%
Base yr. + 5yrs.	2022	80	77	3.9%
Base yr. + 10yrs.	2027	80	77	3.9%
Base yr. + 20yrs.	2037	83	77	7.8%
Operations per Based Aircraft				
	2017	2,893	2,887	-0.2%
	2022	2,988	3,119	4.4%
	2027	3,237	3,351	3.5%
	2037	3,597	3,912	8.8%

Note: For passengers and operations, Airport Forecast base year (2017) actual data and FAA TAF 2017 actual data do not match as the TAF is for Federal fiscal years ended in September 30 and the Airport Forecast is based on the MSCAA's fiscal year which ends June 30.in 2018.

PASSENGER TERMINAL FACILITIES

Chapter 4 describes future development requirements of the terminal facilities completed as a part of the Master Plan, including facility demand/capacity analysis, alternatives, and recommendations. This Master Plan focuses on establishing the long-term plan for improvements of the terminal and landside facilities – to modernize them, to ensure seismic resiliency and to "right size" them for the post hub operation.

PASSENGER TERMINAL DEMAND/CAPACITY ANALYSIS

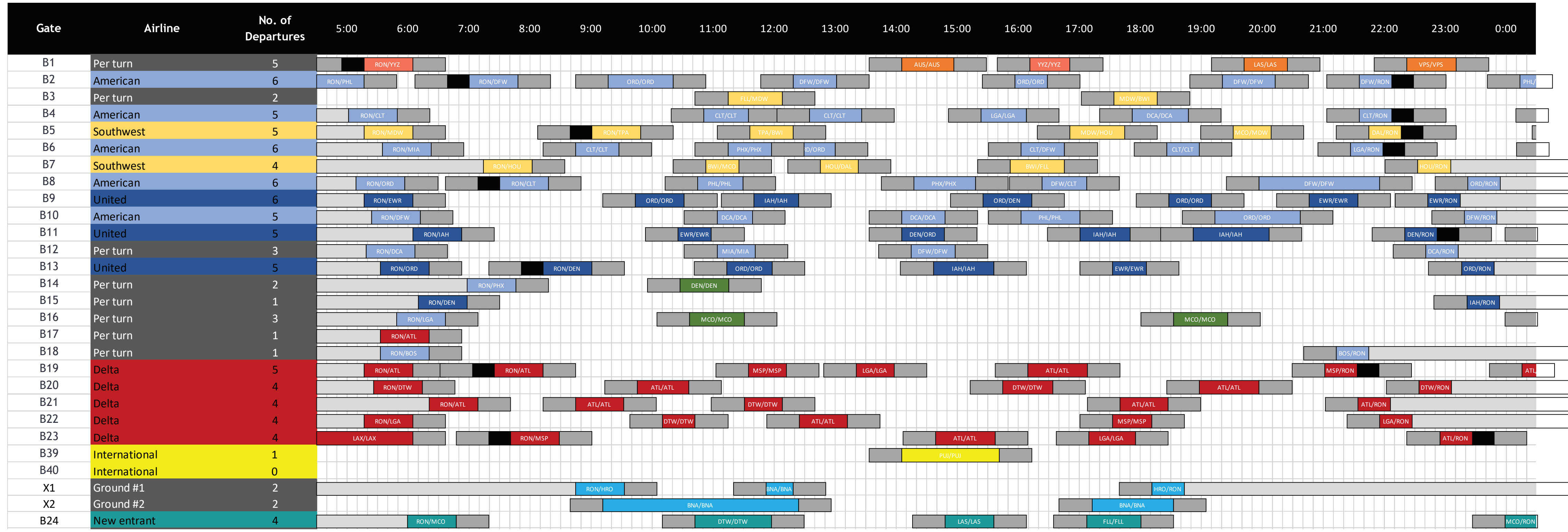
The following sections detail the facility demand/capacity analysis and the future facility requirements for each of the individual functions associated with the existing terminal building. The approach utilized established future terminal requirements and focused on establishing Design Day Flight Schedules (DDFS) for each future Planning Activity Level (PAL).

Design Day Flight Schedule Development

Design Day Flight Schedules were developed for each Planning Activity Level (PAL 2, 3 and 4) based on current airline schedules and the FAA-approved aviation forecast. The DDFS provided aircraft parking and passenger and baggage volumes that facilitate the creation of facility requirements for all other elements of the passenger terminal and concourses.

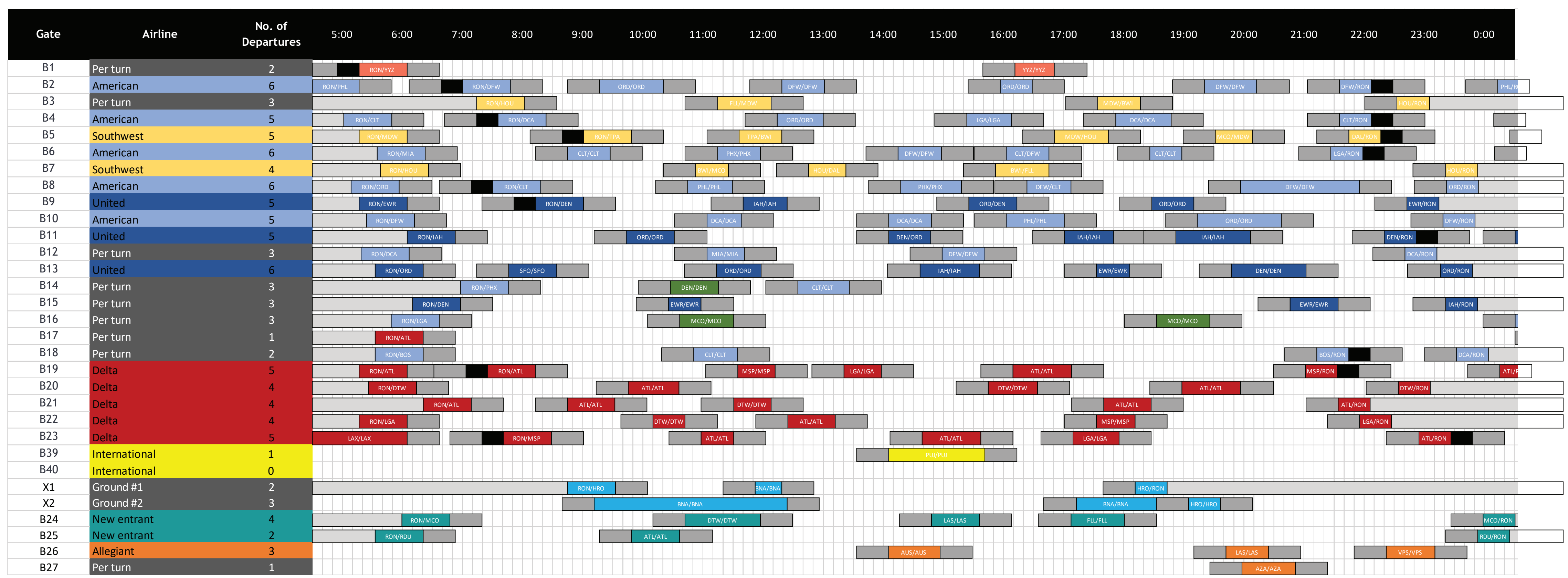
FIGURE 4.0 DDFS FOR EACH PLANNING ACTIVITY LEVEL

PLANNING ACTIVITY LEVEL 2



SOURCE: MASTER PLANNING TEAM, MARCH 2019

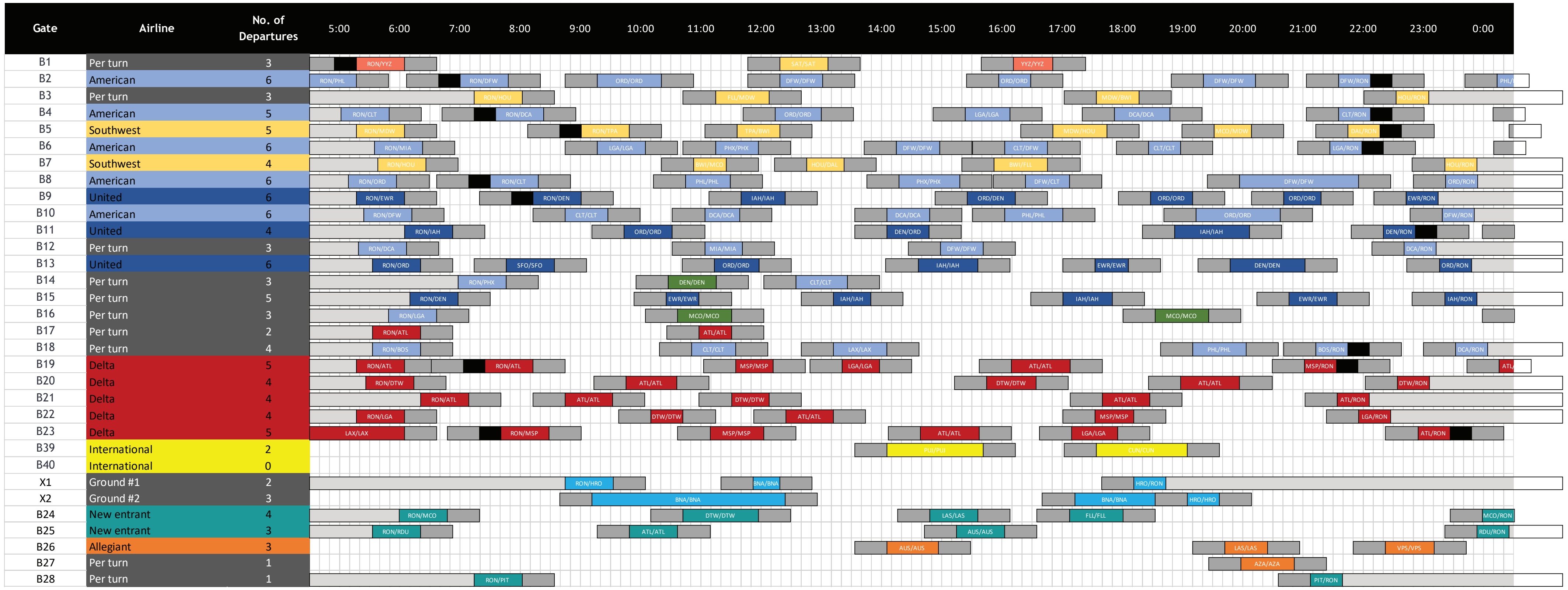
PLANNING ACTIVITY LEVEL 3



SOURCE: MASTER PLANNING TEAM, MARCH 2019

FIGURE 4.0 - DDFS FOR EACH PLANNING ACTIVITY LEVLE (CONT.)

PLANNING ACTIVITY LEVEL 4



SOURCE: MASTER PLANNING TEAM, MARCH 2019

Figure 4.0 shows the DDFS ramp charts created for PALs 2 through 4, including analysis assumptions associated with each activity level.

Aircraft Gates and Hardstand Positions

Aircraft Gates

Determining the mix and number of gates is an important planning consideration. Narrowbody jet aircrafts account for an increasing share of total commercial passenger aircraft departures at MEM. In August 2005, narrowbody aircrafts accounted for approximately 37.0% of weekly departures, and by August 2018, the share rose to about 50.9%. As small regional jets have become less prominent, large regional jet operations (i.e., over 50 seats), including the CRJ-700/900 and E-170/175 aircrafts, have increased to 34.8% of weekly departures.

Currently, commercial aircraft activity at the Airport is predominantly regional jets and narrow-body aircrafts. This mix is assumed to continue through the planning period, even though it is slowly trending away from smaller regional jets towards narrowbody aircrafts with a higher number of seats. The shift in the gauge of aircraft over the planning period and the individual airlines' mixed fleet of regional jets and narrowbody aircrafts were the two most significant factors in determining the recommended fleet mix for facility planning. With these two factors in mind, the approach to the gate allocation was to define a narrowbody design aircraft for the gates. This provides the Airport and airlines with better flexibility and the ability to accommodate any airline at any gate.

The specific design aircraft recommended for future growth is the Boeing 737-900w with consideration for the Boeing 757-200 for specific carriers, as needed. While most of the gate mix is recommended to accommodate the design aircraft, it is further recommended that several gates be configured to service larger aircraft. This will provide the flexibility to accommodate one-off flight activity, charters, diversions, or unanticipated changes in fleets where larger wide-body activity is brought into MEM on a regular basis. The complete future gate requirements are depicted in **Figure 4.1.**

FIGURE 4.1 - FUTURE GATE REQUIREMENTS

	Baseline	PAL 1	PAL 2	PAL 3	PAL 4
	2	2	2	2	2
Regional Jet (CRJ-900)	-	-	-	-	-
Narrowbody (B737-900)	23	23	24	27	28
Widebody (B767-300)	-	-	-	-	-
Jumbo (B777/B747) /2	2	2	2	2	2
Total:	25	27	28	31	32

/1 These commuter flights currently operate remotely, but are included here for consideration of integrating this operation at the main passenger terminal

/2 Two jumbo gates would be provided at the international arrival facility – the DDFS does not project flights of this size aircraft; however they provide operational flexibility for irregular operations such as diversions

SOURCE: MASTER PLANNING TEAM, MARCH 2019

FIGURE 4.2 - FUTURE DEPARTURE LOUNGE REQUIREMENTS

	Existing (Post-Modernization)	Baseline	PAL 1	PAL 2	PAL 3	PAL 4
Commuter (Cesna)	0 sf	1,200 sf	1,200 sf	1,200 sf	1,200 sf	1,200 sf
Regional Jet (CRJ-900)	-	-	-	-	-	-
Narrowbody (B737-900)	56,330 sf	59,800 sf	59,800 sf	62,400 sf	70,200 sf	72,800 sf
Widebody (B767-300)	-	-	-	-	-	-
Jumbo (B777/B747)	11,485 sf	9,500 sf	9,500 sf	9,500 sf	9,500 sf	9,500 sf
Total:	67,815 sf	70,500 sf	70,500 sf	73,100 sf	80,900 sf	83,500 sf

SOURCE: MASTER PLANNING TEAM, MARCH 2019

Hardstand Positions

Hardstands are critical to operations due to the high volume of remain-overnight (RON) aircraft. Currently, in the overnight hours, the number of aircraft on the ground exceeds the available gate capacity.

Although the DDFSs depict a scenario where all aircraft could remain on the gates, historical activity at MEM indicates that RON parking is essential to meeting airline needs. For purposes of determining facility requirements, it is assumed that eight (8) to ten (10) RON hardstand positions should be planned for in the out years. In the interim, parking on the unused portions of the concourses will be leveraged to accommodate off-gate RON needs.

Departure Lounges

Departure lounges adjacent to aircraft gates are provided to accommodate passengers waiting to board aircrafts. Typically, departure lounges are sized to accommodate 80% of the passengers on the maximum aircraft for that gate. Seating areas are provided based on 15 square feet per seated passenger (80%) and 10 square feet per standing passenger (20%). Additionally, space is provided for a gate podium and an egress corridor to/from the passenger boarding bridge door. For departure lounges that are shared by multiple gates, a 10% reduction is typically applied to account for the ability to cross-utilize the adjacent departure lounge.

The utilization of departure lounges in recent years has significantly transformed from the utilitarian space lined with uncomfortable seating and no amenities. Passengers have come to expect more comfortable seating, increased flight information, free Wi-Fi, and power outlets for their electronic devices (e.g., mobile phones, e-readers, iPods, computers, and so forth). This has led to a number of airports and airlines redefining the departure lounge, incorporating concessions into the seating area and more, while still providing for the amenities mentioned beforehand.

For purposes of this Master Plan update, a departure lounge size of 2,600 square feet per gate is recommended as an industry standard. The Concourse Modernization will provide an average departure lounge size of almost 2,500 square feet, which is in line with this standard. A summary of the departure lounge requirements based on the projected gate requirements is shown in **Figure 4.2.**

Check-in

The function of the check-in lobby has changed significantly over the years. Once the one-stop for all ticket purchases, check-in, baggage check, and passenger issues, check-in lobbies now play a smaller role in the passenger experience because of technological advancement and use of personal smart devices. Increasingly, the departure process is moving toward self-service, which reduces the demands on the check-in counter. This is only anticipated to increase with the recent TSA approval of passenger self-tagging of checked baggage. While this has been in place in other countries around the world for several years, it remains to be seen how U.S. airlines choose to configure the process. Regardless of how they choose to do so, it is anticipated to continue to drive a reduction in the space required in the check-in lobby.

Alongside ongoing changes in the check-in process, common-use passenger processing systems (CUPPS) are another consideration that could have a significant impact on the facility requirements. Providing a shared use check-in area, where passengers can use self-service kiosks to check-in and self-tag their baggage, could also reduce the space requirements for individual airlines. Implementation of these systems requires close coordination with the airlines to ensure the system fits their individual needs as well as understanding the cost implications of how the system is paid for and maintained. The uncertainty of how these processes will be implemented and the impacts they will have pose a challenge to developing future requirements. While the trend is clear that there will likely be less space required, the speed and severity of the space reduction is more uncertain.

In its existing configuration, MEM's terminals have:

- 76 counters (6 with built-in kiosks) and 23 freestanding kiosks in queue.
  - » 30 existing counters remain unleased.

FIGURE 4.3 - FUTURE CHECK-IN REQUIREMENTS

	Existing	Baseline	PAL 1	PAL 2	PAL 3	PAL 4
Check-in Positions:						
Counter Positions (standard positions, bag drops, and built in kiosks)	76 (46 leased)	47	55	64	68	70
Required Counter Length	412 lf (260 lf leased)	260 lf	300 lf	350 lf	370 lf	390 lf
Freestanding Kiosks (in queue or elsewhere)	23	23	25	26	26	26
Check-in Counter Area:	4,237 sf	2,600 sf	3,000 sf	3,500 sf	3,700 sf	3,900 sf
Check-in Queue Area:	9,260 sf	7,800 sf	9,000 sf	10,500 sf	11,100 sf	11,700 sf
Total Check-in Area:	13,497 sf	10,400 sf	12,000 sf	14,000 sf	14,800 sf	15,600 sf

SOURCE: MASTER PLANNING TEAM, MARCH 2019

FIGURE 4.4 - FUTURE BAGGAGE CLAIM REQUIREMENTS

	Existing	Baseline	PAL 1	PAL 2	PAL 3	PAL 4
Baggage Claim Devices:						
Presentation Length Required:		420 lf	465 lf	570 lf	600 lf	645 lf
Number of Claim Devices:	10	5	5	5	5	6
Presentation Length Provided:	1,050 lf	700 lf	700 lf	700 lf	840 lf	840 lf
Baggage Claim Area:	27,254 sf	21,000 sf	21,000 sf	21,000 sf	25,200 sf	25,200 sf

SOURCE: MASTER PLANNING TEAM, MARCH 2019

- 4 distinct check-in groupings provide 412 feet of counter length.
  - 150 feet unleased.
- 4,240 square feet of counter area with 10,380 square feet of passenger queue area (total leased/unleased)

While MEM's terminal has the footprint needed to accommodate check-in facilities overall, the arrangement of the spaces will need to be reconfigured. Queuing in front of the check-in counters is problematic, particularly the conflict with the queues of the Security Screening Checkpoint (SSCP) in Terminal B and the vertical circulation. In addition, the lack of a Checked Baggage Screening System (CBIS) requires standalone scanners to be placed behind the check-in counters, further complicating the check-in operations. **Figure 4.3** depicts the future check-in requirements.

Baggage Claim

Baggage claim provides space for the public to reclaim their checked baggage upon arriving at their destination. There are several key factors in calculating the baggage claim requirements. Requirements include the number of carousels, the length of each carousel, and the overall area provided for passengers to congregate while waiting for bags to be delivered. Accommodation must also be provided for oversize and odd-sized baggage claim.

The existing baggage claim carousels provide 1,050 Linear Feet of presentation length on 10 carousels.

- Terminal A – Two (2) Flat Plate Carousels
- Terminal B – Four (4) Sloped Bed Carousels and One Flat Plate
- Terminal C – Three (3) Flat Plate Carousels

Figure 4.4 depicts the future baggage claim requirements.

As alternatives are considered, the following recommendations should be evaluated.

- A single consolidated baggage claim area with all the carousels co-located would provide additional flexibility to accommodate peak passenger demand.
- Terminal B carousels alone meet current demand (consider consolidation of lobbies).
- Existing Terminal B carousels are oversized for the MEM fleet mix, which provides flexibility for multiple flights on each carousel.
- Installation of a fifth carousel in Terminal B bag claim likely needed to minimize sharing in the near term.
- A sixth carousel may be necessary with future new airline entrants.

Security Screening Checkpoint

The Transportation Security Administration (TSA) has a full set of guidelines for the layout of the screening space and the equipment required. These guidelines have continued to evolve since the formation of the TSA, as threats have changed, and technology has provided new methods for screening passengers. There are several different checkpoint configurations that vary in size depending on the type of equipment and lane configuration. For the purposes of the Master Plan, a generous size of 15'-0" by 90'-0" per lane was used to provide the flexibility to accommodate a wide variety of lane configurations and changing technology.

The number of checkpoint lanes is based on the peak hour departing passenger volumes and the anticipated throughput of each lane. Currently, the TSA has reported processing an average of 150 passengers per lane per hour at MEM. In addition to the screening area, an appropriate passenger queue area should be provided to accommodate a maximum 20-minute wait time. Typically, 30'-0" to 35'-0" of queue length prior to the checkpoint will meet this need.

For purposes of this Master Plan, a single combined checkpoint was assumed when articulating requirements because it provides optimal efficiency for processing passengers, but the lane requirements may increase if a two-checkpoint configuration is maintained in the future. **Figure 4.5** depicts the projected security checkpoint requirements.

FIGURE 4.5 - FUTURE SECURITY SCREENING CHECKPOINT REQUIREMENTS

	Existing	Baseline	PAL 1	PAL 2	PAL 3	PAL 4
Check-in Positions						
Number of Lanes (#)	9	6	7	8	9	10
Screening Area	11,595 sf	9,000 sf	10,500 sf	12,000 sf	13,500 sf	15,000 sf
Queue Area	2,161 sf	3,600 sf	4,200 sf	4,800 sf	5,400 sf	6,000 sf
Employee Checkpoint						
Number of Lanes (#)	0	2	2	2	2	2
Screening Area	0 sf	3,000 sf	3,000 sf	3,000 sf	3,000 sf	3,000 sf
Queue Area	0 sf	300 sf	300 sf	300 sf	300 sf	300 sf
Subtotal:	13,756 sf	15,900 sf	18,000 sf	20,100 sf	22,200 sf	24,300 sf

SOURCE: MASTER PLANNING TEAM, MARCH 2019

Concessions

Concessions are a critical component of any airport terminal, as they provide revenues and necessary services to the travelling public. The number, mix, and location of these concessions are important drivers to the success of the concessions program.

In total, there is 38,000 square feet of concession space in the existing terminal and planned for the Concourse Modernization, including all retail, food and beverage, other services, support, and office space. The primary revenue generating concessions are retail, food and beverage, and other services which comprise almost 29,000 square feet of space (over 25,000 square feet located post security). Assuming industry standards, this is estimated to be slightly below the baseline requirement today.

Figure 4.6 summarizes the overall concessions program recommendations from Baseline through PAL 4.

Circulation and Other Public Functions

Public circulation and other general public functions include circulation, public restrooms, and other public support space such as public seating, the greeter lobby, entertainment areas, and service animal relief areas (SARAs).

Public circulation includes areas of the terminal utilized by people for movement through the terminal building. Functions are broken down into three (3) distinct areas for the program: non-secure circulation, secure circulation, and connectors. Because these areas are significantly impacted by the overall terminal configuration and some building configurations are more efficient than others, any program comparisons need to reflect the appropriate terminal configuration.

FIGURE 4.6 - FUTURE CONCESSIONS REQUIREMENTS

	Existing	Baseline	PAL 1	PAL 2	PAL 3	PAL 4
Check-in Counter Area:	24,580 sf	25,900 sf	28,300 sf	31,500 sf	34,500 sf	37,600 sf
Non-Secure Concessions:	4,064 sf	2,800 sf	3,100 sf	3,500 sf	3,900 sf	4,200 sf
Concessions Support:	8,345 sf /[1]	10,090 sf	11,040 sf	12,260 sf	13,450 sf	14,620 sf
Total:	39,989 sf	38,790 sf	42,440 sf	47,260 sf	51,850 sf	56,420 sf

/1 Does not include any storage space on the lower level of Concourse B following modernization

SOURCE: MASTER PLANNING TEAM, MARCH 2019

Non-Secure Circulation

Non-secure circulation is the circulation in the terminal building prior to the security screening checkpoint. It includes circulation in the check-in lobby, baggage claim hall, as well as other general circulation connecting other terminal functions.

Currently, non-secure circulation is among the most inefficient aspects of the terminal configuration. The segmented terminal ticketing halls (with low ceiling connectors in between), lack depth of space between the curb and ticket counters and the location of vertical circulation cores have all contributed to circulation and queuing challenges in the terminal during peak times. The alternatives should look to strategies to reconfigure, open up the non-secure circulation space, and better reflect a modern airport operation.

Secure Circulation

Secure circulation is the circulation in the terminal and concourses after the security screening checkpoint. This circulation is primarily driven by the number and size of gates and the configuration of the concourses.

With the opening of the new concourse, adequate secure circulation will be provided and there will no longer be a need for connectors to other concourses. Consideration should be given to increasing and reconfiguring the areas immediately after the SSCP to provide a more spacious recompose and circulation space, as well as to reconfiguring the "way out" path towards the non-secure side.

Figure 4.7 depicts the requirements for circulation and other public functions.

Baggage Processing

The baggage processing systems include three (3) primary functions: outbound baggage makeup, baggage screening, and inbound baggage delivery. All three of these functions at MEM have significant deficiencies and are important functions to be considered for improvements. Currently, MEM does not have a Checked Baggage Screening System (CBIS). Screening of bags is accommodated via 7 EDS machines (located behind the ticket counters in the check-in lobby) which occupy approximately 3,250 square feet of space. The CBIS operation adds to the congestion in the ticketing lobby and is inefficient for TSA. Inbound baggage delivery is accommodated on 10 carousels, with five (5) baggage makeup carousels providing staging for 63 carts.

Figure 4.8 depicts the requirements for baggage processing through PAL 4.

FIGURE 4.7 - FUTURE CONCESSIONS REQUIREMENTS

	Existing	Baseline	PAL 1	PAL 2	PAL 3	PAL 4
Public Restrooms:						
Non-Secure	7,630 sf	6,000 sf	6,000 sf	6,000 sf	6,000 sf	6,000 sf
Secure	12, 710 sf	11,500 sf	11,500 sf	12,000 sf	13,500 sf	15,000 sf
Service Animal Relief Area	373 sf	450 sf	450 sf	450 sf	450 sf	450 sf
Concourse Seating (Civilized Waiting Lounge)	2,713 sf	3,000 sf	3,000 sf	3,000 sf	3,600 sf	3,600 sf
Children's Playing Area	639 sf	600 sf	600 sf	600 sf	600 sf	600 sf
Performance Stage	1,006 sf	1,000 sf	1,000 sf	1,000 sf	1,000 sf	1,000 sf
Public Seating	1,719 sf	2,220 sf	2,850 sf	3,000 sf	3,360 sf	3,600 sf
Meeter/Greeter Lobby/[1]	-	1,590 sf	18,000 sf	20,100 sf	22,200 sf	24,300 sf
Total:	26,790 sf	26,360 sf	26,950 sf	27,760 sf	31,320 sf	31,750 sf

/1 Existing facility does not have a clearly defined meeter/greeter lobby

SOURCE: MASTER PLANNING TEAM, MARCH 2019

FIGURE 4.8 - FUTURE BAGGAGE PROCESSING REQUIREMENTS

	Existing	Baseline	PAL 1	PAL 2	PAL 3	PAL 4
Outbound Baggage Makeup						
Number Carts Staged	63	6,000 sf	6,000 sf	6,000 sf	6,000 sf	6,000 sf
Outbound Makeup Area	31,404 sf	11,500 sf	11,500 sf	12,000 sf	13,500 sf	15,000 sf
Inbound Bag Delivery	23,392 sf	450 sf	450 sf	450 sf	450 sf	450 sf
Tug Circulation/Cart Storage	30,633 sf	3,000 sf	3,000 sf	3,000 sf	3,600 sf	3,600 sf
Baggage Screening						
Number of EDS Required	7	1,000 sf	1,000 sf	1,000 sf	1,000 sf	1,000 sf
Baggage Screening Area	3,253 sf	2,220 sf	2,850 sf	3,000 sf	3,360 sf	3,600 sf
Total:	88,682 sf	1,590 sf	18,000 sf	20,100 sf	22,200 sf	24,300 sf

SOURCE: MASTER PLANNING TEAM, MARCH 2019

Airline Support Space

Airline support space includes the spaces generally leased by the airlines to support their day-to-day operations. These spaces include airline ticket offices, airline operations, and baggage service offices.

Figure 4.9 depicts the requirements for airline support space through PAL 4.

FIGURE 4.9 - AIRLINE SUPPORT SPACE REQUIREMENTS

	Existing	Baseline	PAL 1	PAL 2	PAL 3	PAL 4
Airline Support Space:						
Airline Ticket Offices	7,630 sf	6,000 sf	6,000 sf	6,000 sf	6,000 sf	6,000 sf
Airline Operations/[1]	12, 710 sf	11,500 sf	11,500 sf	12,000 sf	13,500 sf	15,000 sf
Baggage Service Offices	373 sf	450 sf	450 sf	450 sf	450 sf	450 sf
Airline Club	2,713 sf	3,000 sf	3,000 sf	3,000 sf	3,600 sf	3,600 sf
Total:	26,790 sf	26,360 sf	26,950 sf	27,760 sf	31,320 sf	31,750 sf

/1 Not specifically designated in Concourse B Modernization drawings. Assume shell space will be built out to accommodate as needed by the airlines.

SOURCE: MASTER PLANNING TEAM, MARCH 2019

Airport Support Offices

Airport support facilities include the support spaces for day-to-day operations of the Airport. Functions primarily include support space for the Authority, Airport Badging and Airport Police. All other functions are housed elsewhere.

Airport administrative offices and support primarily include the airport administrative office suites located on the mezzanine level of the existing terminals. The existing administrative space is 46,214 square feet. Generally, the existing terminal building provides adequate space to support the existing Airport support functions, however, an increase in space will be required to meet future demand. The moderate increase in space over the planning horizon provides opportunities for various groups to increase their staffing levels to support activities at the Airport as passenger demand increases. **Figure 4.0** lists the future space requirements for the airport support functions in the terminal building.

Other Tenant Space

There are a number of miscellaneous tenants and users in the existing terminal building aside from the airlines and Airport support functions. The other users include the TSA, the FAA, the visitor information booth, and tenants. Requirements for each of these functions are discussed in the sections below along with an assessment of their existing conditions.

TSA Offices

The TSA does not lease the security screening checkpoint or the baggage screening areas, as is the case in all terminal facilities in the U.S., however, the TSA leases space for their staff in support of these functions. Currently the TSA leases 6,497 square feet of support space in the existing terminal. Future requirements for support space are projected to grow at half the rate of the increase of the requirements for the number of passenger security screening checkpoint lanes.

Other Tenants

There are various additional tenants at the Airport occupying 2,395 square feet of space in the existing terminal building. It was assumed that these tenants will maintain their current space through the planning period.

Figure 4.11 summarizes the future facility requirements for the other tenant functions in the terminal building.

FIGURE 4.10 - FUTURE AIRPORT SUPPORT SPACE REQUIREMENTS

	Existing	Baseline	PAL 1	PAL 2	PAL 3	PAL 4
Airline Support Space:						
Airline Administration	41,808 sf	42,300 sf	43,300 sf	44,500 sf	45,600 sf	46,600 sf
Badging and ID Office	3,838 sf	4,000 sf	4,200 sf	4,400 sf	4,600 sf	4,800 sf
Airport Police	568 sf	600 sf	700 sf	800 sf	900 sf	1,000 sf
Total:	46, 214 sf	46,900 sf	48,200 sf	49,700 sf	51,100 sf	52,400 sf

SOURCE: MASTER PLANNING TEAM, MARCH 2019

FIGURE 4.11 - FUTURE OTHER TENANT SPACE REQUIREMENTS

	Existing	Baseline	PAL 1	PAL 2	PAL 3	PAL 4
Other Tenant Space:						
TSA Support Space	6,497 sf	6,500 sf	7,000 sf	7,500 sf	8,000 sf	8,500 sf
Other Tenanats (KC Group/Blue Suede Volunteers)	2,395 sf	2,395 sf	2,395 sf	2,395 sf	2,395 sf	2,395 sf
Total:	8,892 sf	8,895 sf	9,395 sf	9,985 sf	10,395 sf	10,895 sf

SOURCE: MASTER PLANNING TEAM, MARCH 2019

Terminal Support Functions

Terminal support functions are primarily grossing factors applied to the programmed area to build up the overall gross area required for the terminal building. These functions are required to maintain an operational terminal building and relate directly to the overall size of the programmed net terminal space. Areas include non-public circulation, non-public restrooms, terminal support, the loading dock, building systems, and non-net space. **Figure 4.12** provides a summary of the terminal support facility requirements.

FIGURE 4.12 - FUTURE TERMINAL SUPPORT REQUIREMENTS

	Existing	Baseline	PAL 1	PAL 2	PAL 3	PAL 4
Public Circulation:						
Non-Secure Circulation	73,347 sf	17,640 sf	18,900 sf	20,490 sf	23,010 sf	23,640 sf
Secure Circulation	69,560 sf	69,340 sf	69,340 sf	72,900 sf	83,700 sf	87,260 sf
Connectors	56,155 sf	56,155 sf	56,155 sf	56,155 sf	56,155 sf	56,155 sf
Non-public Circulation	20,325 sf	34,400 sf	35,500 sf	37,300 sf	40,600 sf	41,900 sf
Bldg. Maint./Storage/ Shops	17,531 sf	7,400 sf	7,600 sf	8,000 sf	8,700 sf	9,000 sf
Loading Dock	877 sf	1,800 sf	1,800 sf	2,2500 sf	2,700 sf	2,700 sf
Building Systems (MEP)	64,509 sf	59,000 sf	60,900 sf	63,900 sf	69,500 sf	71,800 sf
Vacant Space (In Main Terminal)	13,403 sf	-	-	-	-	-
Shell Space (Under Concourse B)	56,776 sf	-	-	-	-	-
Non-Net Terminal Space	6,025 sf	22,000 sf	22,500 sf	23,300 sf	24,700 sf	25,300 sf
Total:	378,535 sf	124,600 sf	128,300 sf	134,750 sf	146,200 sf	150,700 sf

SOURCE: MASTER PLANNING TEAM, MARCH 2019

International Arrivals Functions

MEM currently manages arriving international flights at two (2) gates on Concourse B. Facilities include two (2) gates with departure lounges on the upper level, with processing on the lower level of the concourse in approximately a 32,000 square feet space. Passengers bus back to terminal once cleared. This operation will be maintained for the immediate future even though that portion of the concourse is not being modernized at this time. The Airport Authority would like to plan for a future facility in the terminal building. U.S. Customs and Border Protection (CBP) has a detailed document of the requirements for these types of facilities. There are five (5) primary functions that need to be considered for an international arrival facility, including primary processing, baggage claim, secondary processing, CBP administration, and public areas and support spaces.

It is assumed that a future international arrival facility would accommodate small narrow-body flights, such as Caribbean and Mexico markets serviced by B737's. To accommodate international arrivals of a single wide-body or overlapping narrow-body flights, the facility is sized to process 400 passenger per hour according to CBP requirements. **Figure 4.13** depicts the sizing requirements for an international arrival facility.

FIGURE 4.13 - FUTURE INTERNATIONAL ARRIVALS REQUIREMENTS

	Baseline	PAL 1	PAL 2	PAL 3	PAL 4
Primary Processing:					
Number Primary Booths	4	4	4	4	4
Primary Processing Area	6,000 sf	6,000 sf	6,000 sf	6,000 sf	6,000 sf
Baggage Claim:					
Claim Devices Required:	1	1	1	1	1
Presentation Length:	230 lf	230 lf	230 lf	230 lf	230 lf
Baggage Claim Area:					
Secondary Processing:					
Secondary Processing Area	3,290 sf	3,290 sf	3,290 sf	3,290 sf	3,290 sf
Secondary Operations/ Support	310 sf	310 sf	310 sf	310 sf	310 sf
CBP Administration					
CBP Office/Staff Areas	810 sf	810 sf	810 sf	810 sf	810 sf
CBP Support Space	730 sf	730 sf	730 sf	730 sf	730 sf
Public Areas/Support					
Sterile Corridor System	3,000 sf	3,000 sf	3,000 sf	3,000 sf	3,000 sf
Exit Podium	180 sf	180 sf	180 sf	180 sf	180 sf
Sterile Restrooms	420 sf	420 sf	420 sf	420 sf	420 sf
General Sterile Circulation	3,960 sf	3,960 sf	3,960 sf	3,960 sf	3,960 sf
International Greeter Lobby	290 sf	290 sf	290 sf	290 sf	290 sf
Total:	27,040 sf	27,040 sf	27,040 sf	27,040 sf	27,040 sf

SOURCE: MASTER PLANNING TEAM, MARCH 2019

Existing Building Architectural & Structural Conditions

In 1956 the Memphis Planning Commission recommended the construction of a new airport terminal, which began construction in 1959. The $5.5 million terminal dedicated in 1963 featured 22 aircraft gates and offered daily flights by seven (7) different carriers (see **Figure 4.14**). Architect Roy Harrover (1928-2016), of Mann & Harrover, designed the airport terminal building in the Contemporary New Formalism Style, shown in **Figure 4.15** Harrover won both the National Design Award from Progressive Architecture and the National Award of Merit from the American Institute of Architects in 1964 for his design of the terminal.

According to the exhibit panels inside the central lobby of the airport terminal, the lobby was designed as a big hall to handle large volumes of people (similar to a train station lobby). The structure features a flat roof with the large concrete pillars, designed to mimic martini-glasses and the second-floor showcases its design through glass stationary windows covering the front façade, where the martini-glass pillars can be seen from the lobby. The original terrazzo floor surface and original glazed brick are found in the terminal today. The exterior walls are a mixture of glazed brick and concrete. In 1975, eastern and western terminal wings were added, matching the architecture of the original central terminal.

This terminal building was one of the first U.S. airports to feature two (2) levels. Within 6 years of opening, the new terminal became a point of entry and origin for international passengers and cargo. Thus, the facility was renamed the Memphis International Airport in 1969. That same year, the Memphis-Shelby County Airport Authority was established. Over the next decade, the Authority oversaw the doubling of the terminal's capacity with the construction of two (2) adjacent terminals and concourses.

A significant focus of this master plan effort is the modernization of MEM's terminals. Although they served the community well in the decades that closed out the 20th century, they are not efficiently laid out for modern airport terminal operations. The history and significance of the architecture, less than ideal layout of the facilities, and the age of the building are a key consideration when contemplating how to ensure facilities continue to serve the needs of the traveling public, airlines, and tenants. Of specific focus was the seismic resiliency of the terminal structures. Memphis and the airport lie within the New Madrid Fault Zone and thus the structures could be exposed to significant earthquake events.

Therefore, in support of this Master Plan Update, a detailed seismic risk assessment was prepared. The update was specifically focused on four (4) MEM buildings: the Main Terminal Building, Concourses A & C, and the Baggage Handling Addition (BHA). Three (3) SRA reports have been prepared over the past 15 years (2008, 2010, and 2020). Each is included in the appendices **Appendix D, E**, and **F,** respectively.

A seismic risk assessment is an estimate of potential losses that an asset (often a building or structure) or collection of assets will experience due to earthquake hazard. More generally speaking, risk is a function of a particular hazard (or dangerous event), and one's level of exposure or vulnerability to it. For example, a building in California faces low hurricane risk but high earthquake risk, while the

FIGURE 4.14 – ORIGINAL 1963 TERMINAL

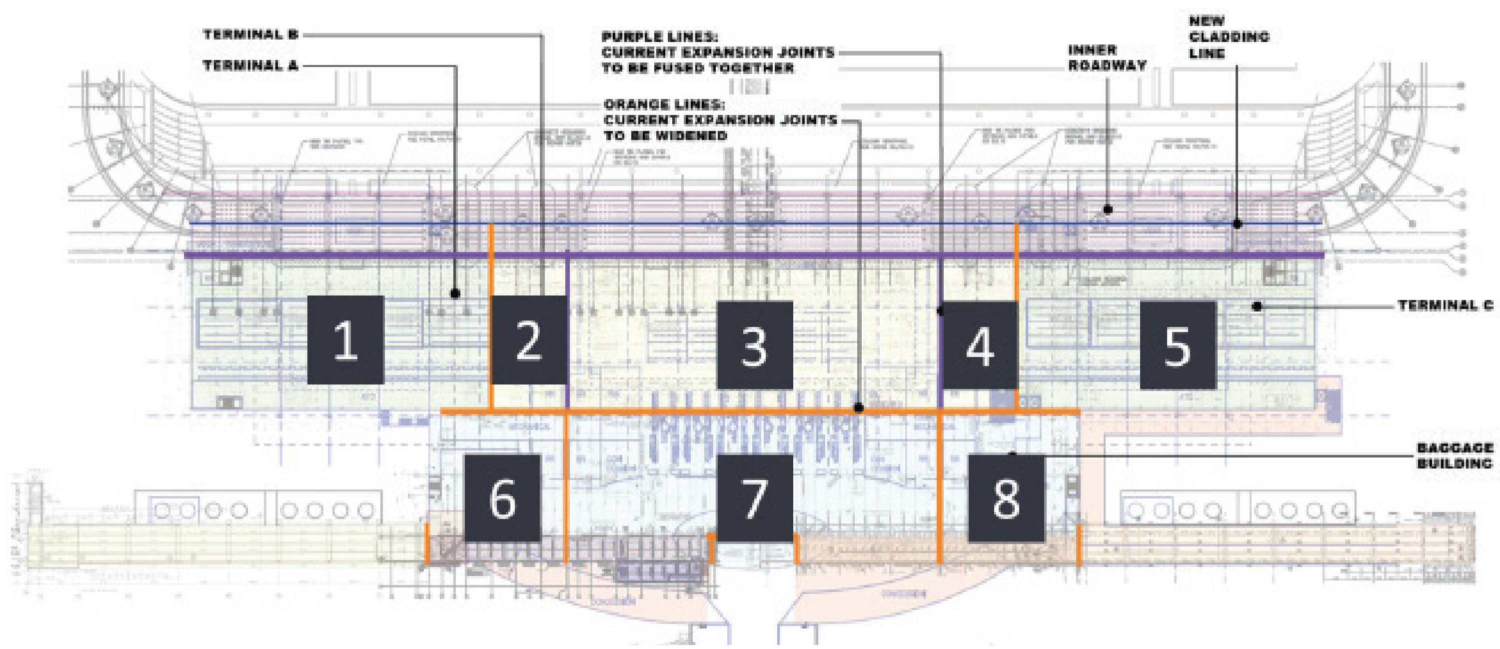
FIGURE 4.15 – ARCHITECT ROY HARROVER

owner of a 1900s brick apartment building in San Francisco faces a much higher earthquake risk than the newly constructed police station next door.

The information from these assessments, detailed inspections of the existing terminals' structures and direction from the MSCAA resulted in the following key findings and recommendations that guided the terminal alternatives.

- The architectural character (martini-glass look) should be preserved to the extent practical. Although it was recognized that many features of the building layout, such as the placement of the vertical circulation cores in the middle of the ticket lobby, will need to change to accommodate modern airport operations, it is desired to not replace the terminal itself with a new structure.
- Retrofitting the existing structure to improve its seismic resiliency is essential.
- The building is structurally complex and was developed/altered over time. Overall, the building is comprised of no fewer than eight (8) separate structures, as shown in **Figure 4.16**, that have structural ties to one another. This will influence the improvements that can be made and how those improvements are sequenced/phased.

FIGRURE 4.16: STRUCTURAL RELATIONSHIPS OF THE TERMINAL INFRASTRUCTURE



SOURCE: MASTER PLANNING TEAM, MARCH 2019

Demand/Capacity and Terminal Facility Requirements Summary

The existing terminal building as a whole is nearly right-sized for the level of activity at the Airport, however, available expansion space is often not near where it would be most beneficial. The duplication of facilities – check-in, baggage claim, and security – results in inefficiencies in processing, where a single location would optimize the facility use. Various functional areas are under- or over-sized for the current level of activity. For example, the placement of the escalators causes significant congestion in the Terminal B lobby and elevators are poorly placed from a wayfinding perspective. Other key deficiencies include the lack of visibility between the terminal lobbies, the lack of a checked baggage inspection system and dual security checkpoints.

Ultimately, repurposing existing space to offset the deficiencies in other functions can help avoid the need to expand unnecessarily; however, in many instances this is not possible, as the available expansion space is not where the need is. As passenger demand grows from the Baseline activity through PAL 4, the majority of the increase in terminal space will be a direct result of the increase in gate count. Repurposing existing spaces is unlikely to resolve this type of growth as it results in increased demand for space, such as pre-security circulation, security checkpoints and ticketing functions which are already deficient in size and configuration.

The most critical deficiencies identified by the terminal demand/capacity analysis include the following recommended actions:

- Seismically improve the building structures.
- Increase the circulation space within the terminal lobbies and relocate the vertical circulation cores to the edges of the building versus in the center.
- Open up" the ticket lobbies to improve line-of-site from east to west.
- Provide a single centralized security screening checkpoint that meets the current TSA standards.
- Provide a checked baggage inspection system (CBIS) and a consolidated/expanded baggage makeup solution.
- Expand the centralized concessions court, post-security.
- Provide for a new federal inspection facility (adjacent to the terminal building versus on the concourse).
- Provide space for a segregated employee screening checkpoint.

FIGURE 4.17 FUTURE TEMRINAL SPACE PROGRAM

	Existing	Baseline	PAL 1	PAL 2	PAL 3	PAL 4
Check-in	13,497 sf	10,400 sf	12,000 sf	14,000 sf	14,800 sf	15,600 sf
Baggage Claim	27,254 sf	21,000 sf	21,000 sf	21,000 sf	22,200 sf	24,300 sf
Security Screening Checkpoint	13,756 sf	15,900 sf	18,000 sf	20,100 sf	22,200 sf	24,300 sf
Departure Lounges	67,815 sf	70,500 sf	70,500 sf	73,100 sf	80,900 sf	83,500 sf
Concessions	34,602 sf	38,790 sf	42,440 sf	47,260 sf	51,850 sf	56,420 sf
Passenger Support Space	26,790 sf	26,360 sf	26,950 sf	27,760 sf	31,320 sf	31,750 sf
Baggage Processing	88,682 sf	72,260 sf	76,560 sf	79,860 sf	87,180 sf	89,280 sf
Airline Support Space	18,654 sf	20,050 sf	20,850 sf	22,090 sf	23,180 sf	23,810 sf
Airport Support Space	46,214 sf	46,900 sf	48,200 sf	49,700 sf	51,100 sf	52,400 sf
Other Tenant Space	8,892 sf	8,895 sf	9,395 sf	9,895 sf	10,395 sf	10,895 sf
Terminal Support Functions	378,535 sf	125,300 sf	129,200 sf	135,450 sf	146,900 sf	151,400 sf
International Arrivals Functions	32,259 sf	27,440 sf	27,440 sf	27,440 sf	27,440 sf	27,440 sf
Total:	756,951 sf	487,795 sf	502,535 sf	527,655 sf	572,465 sf	591,995 sf

SOURCE: MASTER PLANNING TEAM, MARCH 2019

Future terminal facilities need to comprehensively provide for these space requirements to balance the needs of the various terminal components and to achieve the most efficient terminal building design to meet current and future demand. **Figure 4.17** summarizes the overall terminal space program and **(Appendix G)** provides the full detail of the facility space program.

PASSENGER TERMINAL ALTERNATIVES ANALYSIS

The terminal demand/capacity analysis discussed previously details the future requirements of the terminal facilities from which the alternatives were based. Addressing the current terminal area capacity constraints and providing direction for the long-term terminal facilities at the Airport were two of the key issues to address in the alternatives phase of the Master Plan.

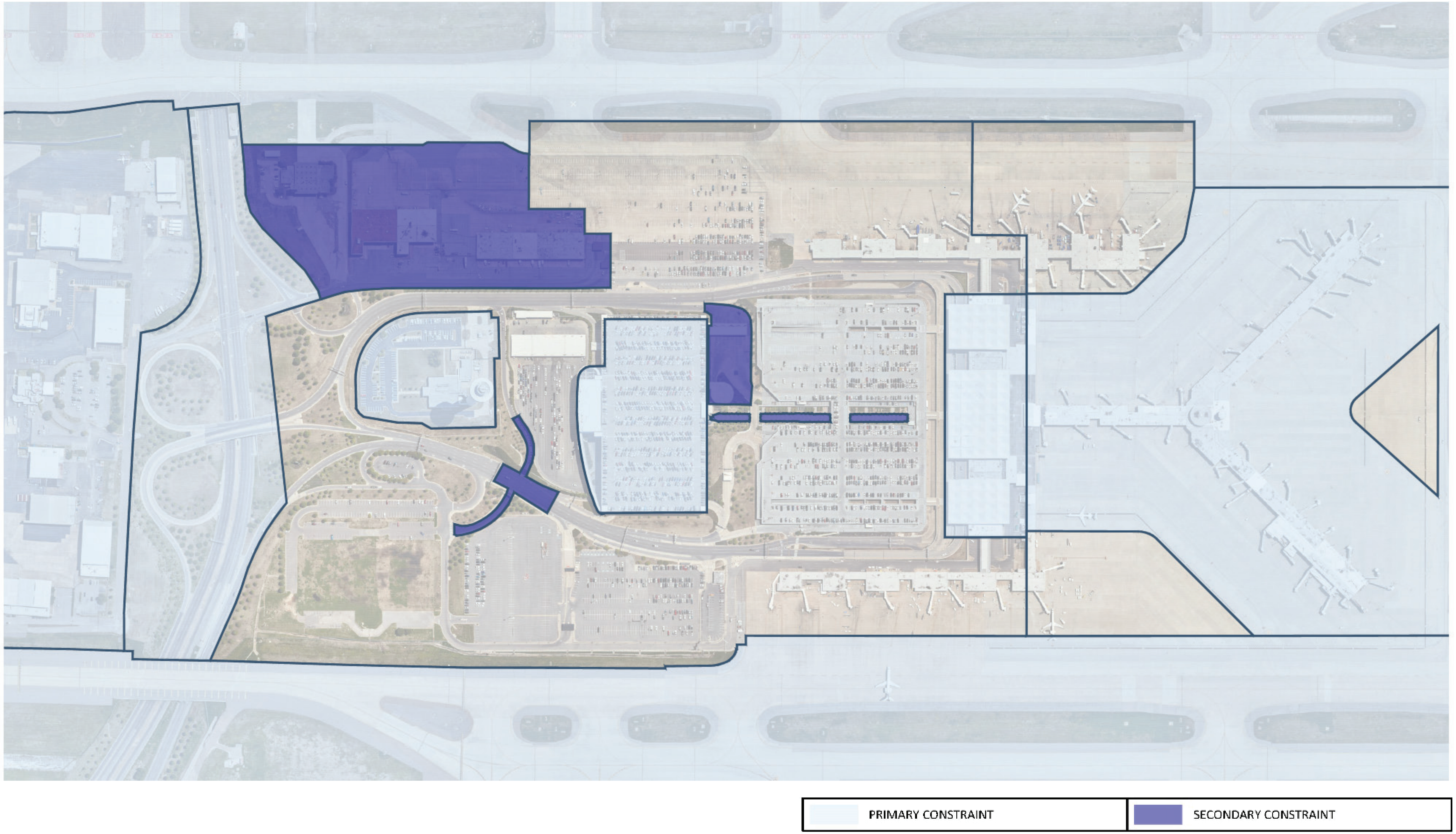
The process for exploring the terminal alternatives first included studying the opportunities and constraints of the site and determining whether to replace the existing terminal with a new building in the same general area, replace it within the existing area, or renovate the existing structures. Then the process assessed a series of high-level initial alternatives, refining a group of shortlisted alternatives, and finally developing the detail of a preferred terminal concept. **Appendix H – Terminal Alternatives** details the alternatives process evolution and formulation of the preferred alternative.

Opportunities and Constraints

While the demand/capacity analysis identified the programmatic requirements of the terminal facilities at the Airport, the alternatives analysis takes the next step in exploring the configuration of the physical facilities to meet these requirements. The first step of the alternatives process was to evaluate the existing site opportunities and constraints, to help better understand where the physical constraints of the site are and where opportunities may exist.

Figure 4.18 depicts the areas available for redevelopment of terminal facilities. Development to the south is limited by the newly renovated concourse and development to the east and west are constrained by the airfield. Expanding into the northern landside parking facilities is the only viable growth option aside from continuing to utilize the existing site.

FIGURE 4.18 – AREAS AVAILABLE FOR TERMINAL DEVELOPMENT



SOURCE: MASTER PLANNING TEAM, MARCH 2019

Preliminary Terminal Alternatives

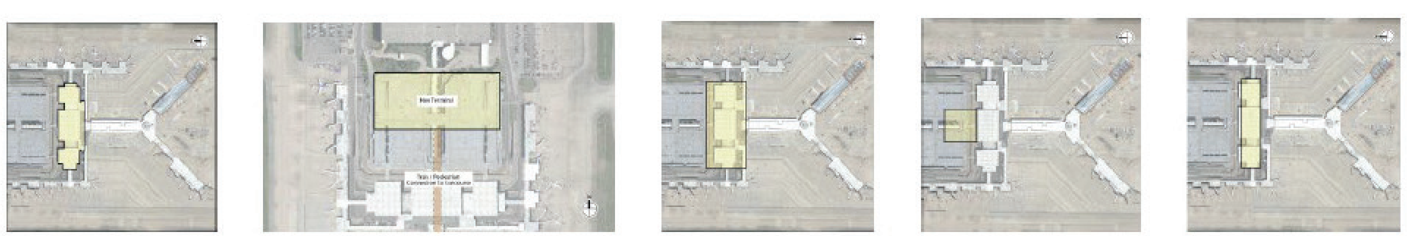
The preliminary terminal alternatives analysis explored a wide variety of long-term concepts to meet the projected passenger demand at the Airport. These options ranged from replacement of the terminal facilities to expansion and renovation of the existing terminal building. Five (5) alternatives were considered, as shown in **Figure 4.19,** to relocate, replace or renovate the existing terminal. The alternatives evaluation resulted in the following determinations:

- Moving the terminal to a new location did not make financial or operational sense. It would displace critical landside facilities and move the terminal processing functions away from the concourse.
- New construction would be equal or more costly than renovation and sacrifices the "martini-glass" architecture.
- Maintaining the terminal in the existing area and renovating/modernizing it best meets the goals of the MSCAA and was recommended.

The MSCAA is in the process of renovating Concourse B to serve as the primary concourse at MEM. The renovation will provide 23 gates, which is anticipated to meet their needs through PAL 1 (not including the needs for international widebody and commuter Cessna gates that were considered in the gate requirements). Furthermore, the common use operation of the facility will allow the MSCAA to maximize the use of the gates before new gates are needed. With that said, the PAL 4 requires 28 gates, plus two (2) Cessna gates and two (2) international gates.

The concourse renovation currently underway redevelops the main leg of the concourse as well as the southeast leg. This leaves approximately 12 additional gates that can be provided on the southwest leg, as part of a planned Phase 2 Concourse renovation. As shown in **Figure 4.20** this renovation coupled with common use technology and new FIS gates adjacent to the terminal will provide ample gate capacity beyond PAL 4. It should also be noted that expansion beyond the planning horizon and the approximately 35 gate capacity of the concourse could be achieved by expanding the ends of the southwest/southeast legs further to the south.

FIGURE 4.19 – INITIAL TERMINAL SITING ALTERNATIVES



Alt A - Renovation in Current Footprint

Alt B - New Terminal in New Location

Alt C - Demolition and Build on Current Site

Alt D - New Terminal Addition to North

Alt E - Renovation, with Facade Expansion, in Current Footprint

SOURCE: MASTER PLANNING TEAM, MARCH 2019

FIGURE 4.20 – PREFERRED GATE EXPANSION ALTERNATIVE

SOURCE: MASTER PLANNING TEAM, MARCH 2019

Guiding Principles and Conclusions

Through a series of focus studies and workshops, a number of key elements of the terminal were discussed to guide the alternatives development. Several principles and conclusions informed how functional areas would be placed or relocated in the building:

- Overall Circulation and Line-of-Sight: Open up terminal ticket and bag claim halls to the maximum extent possible to provide an open experience for travelers and mitigate the crowding in the ticketing hall adjacent to the SSCP.
- Vertical Circulation: Relocate vertical circulation to north building space to improve overall circulation and mitigate the crowding in the ticketing hall adjacent to the SSCP.

- Checked Bag Inspection System (CBIS): Locate the CBIS to the west of the terminal in the lower level of Terminal A or to the south of the building, where bag make-up resides today.
- Federal Inspection Services (FIS): Locate the FIS to the east of the terminal in the lower level of Terminal C. Provide two (2) international gates to the east, at the end of the existing secure connector corridor from the SSCP to the existing concourse C. Ensure the gate can accommodate both domestic and international operations.
- Security Screening Checkpoint (SSCP): Provide a single SSCP to achieve:
  - » Staffing efficiencies for TSA and other security personnel.
  - » Better flexibility to reassign lanes to different passenger categories as needs and security levels change.
  - » Reduced space (no duplication of functions such as screening rooms, and STSO podiums).
  - » Easier wayfinding for passengers.
- Security Exit: Provide for either manned or automated exit lane breach control, adjacent to the SSCP.
- Baggage Claim: Centralize area in Terminal B and integrate a strategy to use a new FIS claim unit as a flex unit (domestic and international).
- Employee Screening: Provide a location for a separate employee screening facility with access to the secured areas.

Shortlisted Terminal Area Alternatives

- Three (3) alternatives were shortlisted from the initial evaluation process:
- Renovation of the existing footprint.
- North expansion.
- Reclaim inner lanes for bag claim expansion to the north.

Each alternative is shown in **Figure 4.21.** The following sections describe the three (3) shortlisted concepts in detail.

Existing Footprint

particularly below the mezzanines. Mezzanines would remain. Bag claim is focused on Terminal B with some expansion into Terminal C to the east. Bag make-up remains in its existing footprint. Employee screening is accommodated adjacent to the CBIS in Terminal C. FIS is accommodated in the lower level of Terminal C. **Figure 4.22** shows the Existing Footprint floor plans for the arrival and departure levels.

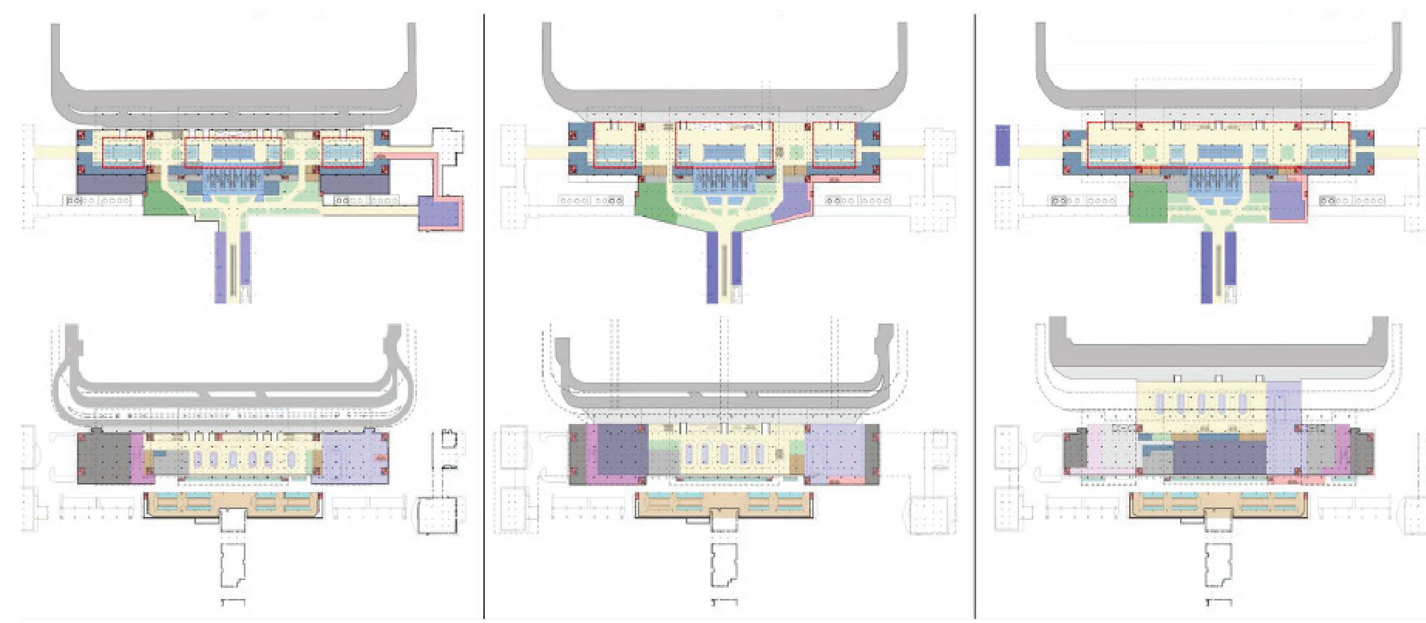
North Expansion

The North Expansion alternative pushes the existing structure to the north and closes/reclaims the inner roadways in front of the terminal on both the arrivals and departures levels to allow for the expansion. Vertical circulation is pushed to the north face of the building and a centralized security checkpoint is provided in Terminal B with two (2) exit points (one on either side of the SSCP). The ticket lobby areas would be cleared of existing offices and storage spaces, particularly below the mezzanines. Mezzanines would remain. Bag claim is focused in Terminal B with some expansion into Terminal A, to the west. Bag make-up shifts to the west, allowing for a CBIS to be constructed to the east of it. Employee screening is accommodated in the lower level of Terminal C. FIS is accommodated in the lower level of Terminal C. **Figure 4.23** shows the North Expansion floor plans for the arrival and departure levels.

Reclaim Inner Lanes, Baggage Expansion

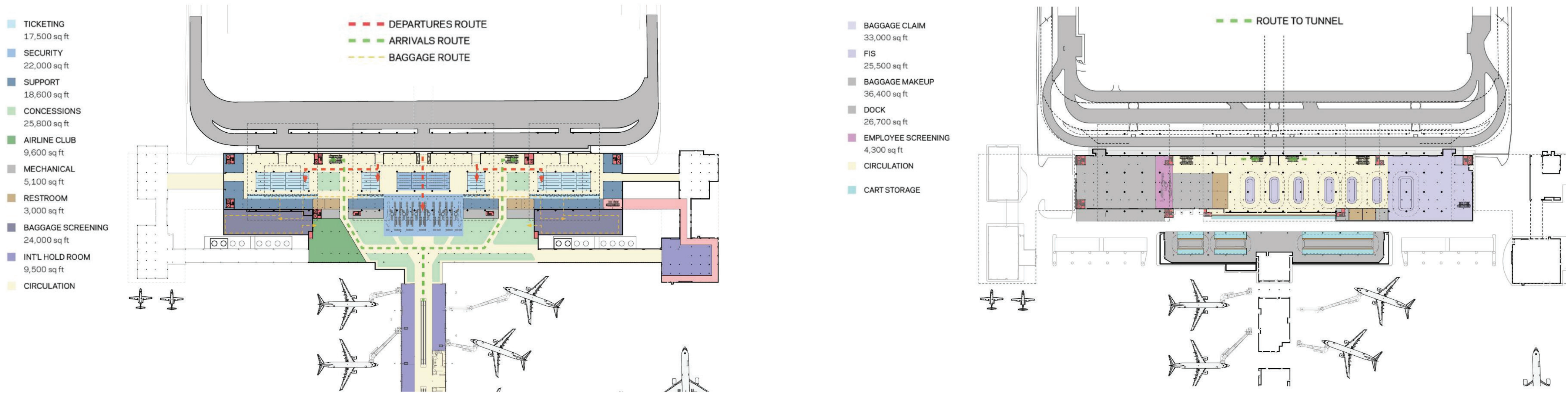
The Baggage Expansion alternative expands the existing structure (only in Terminal B) to the north and closes/reclaims the inner roadways in front of the terminal on both the arrivals and departures levels to allow for the expansion. On the departures level, the existing outer roadway would remain for curbing activities. On the arrivals level, bag claim is expanded into the short-term garage and a new arrival curb would be built within the garage. Vertical circulation is pushed to the north face of the building . A centralized security checkpoint is provided in Terminal B with one (1) exit point to the east of the SSCP. The ticket lobby areas would be cleared of existing offices and storage spaces, particularly below the mezzanines. Mezzanines would remain. A new CBIS would be constructed in the lower level of Terminal B. Bag make-up remains in its existing footprint. Employee screening is accommodated in the lower level of Terminal C. FIS is accommodated in the lower level of Terminal C. **Figure 4.24** shows the North Expansion floor plans for the arrival and departure levels.

FIGURE 4.21 – SHORT LIST TERMINAL ALTERNATIVES



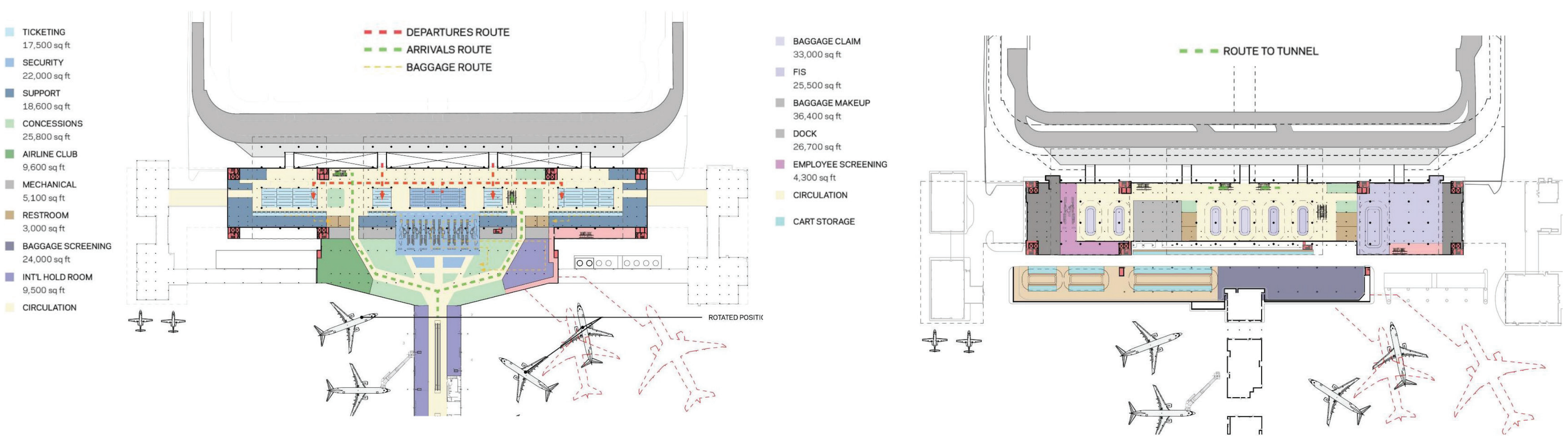
SOURCE: MASTER PLANNING TEAM, MARCH 2019

FIGURE 4.22 – EXISTING FOOTPRINT ALTERNATIVE



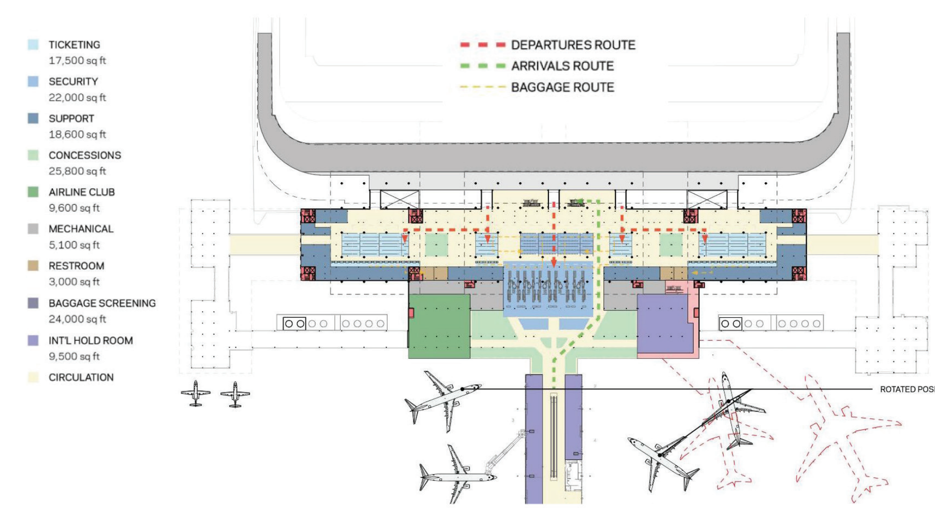
SOURCE: MASTER PLANNING TEAM, MARCH 2019

FIGURE 4.23 – NORTH EXPANSION ALTERNATIVE



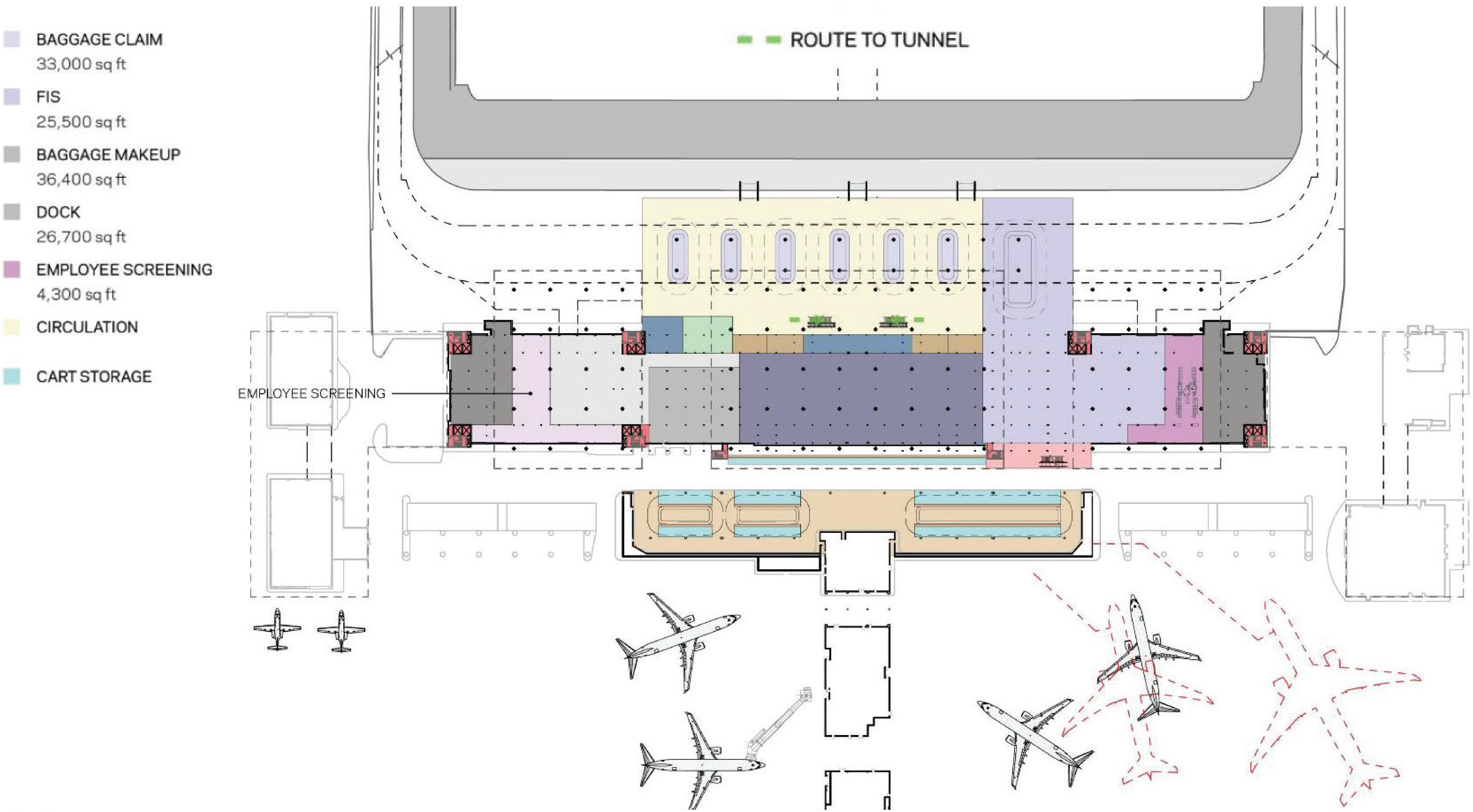
SOURCE: MASTER PLANNING TEAM, MARCH 2019

FIGURE 4.24 – RECLAIM INNER LANES, BAGGAGE CLAIM EXPANSION ALTERNATIVE



SOURCE: MASTER PLANNING TEAM, MARCH 2019

FIGURE 4.24 – RECLAIM INNER LANES, BAGGAGE CLAIM EXPANSION ALTERNATIVE

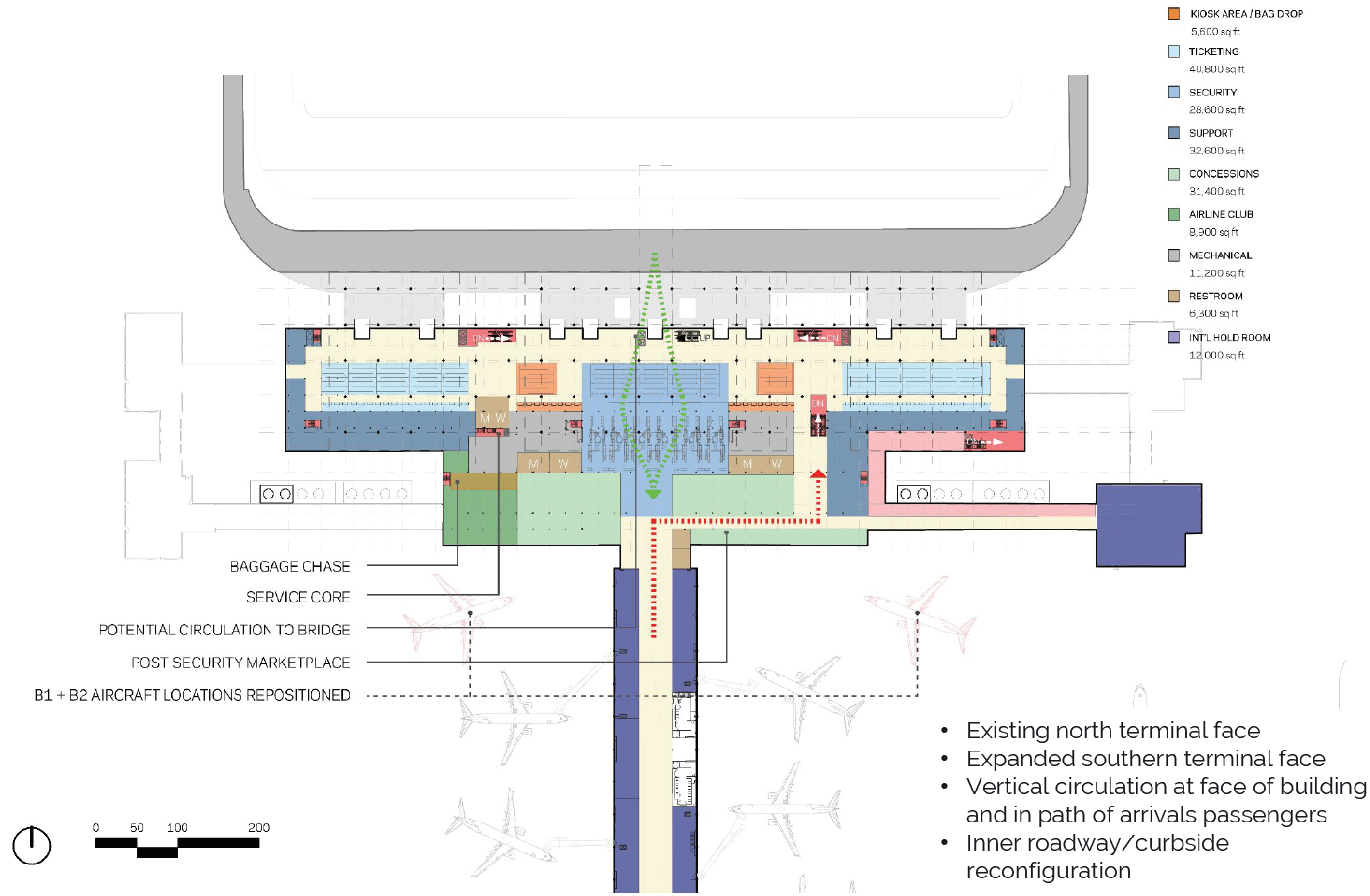


SOURCE: MASTER PLANNING TEAM, MARCH 2019

Terminal Alternatives Refinement

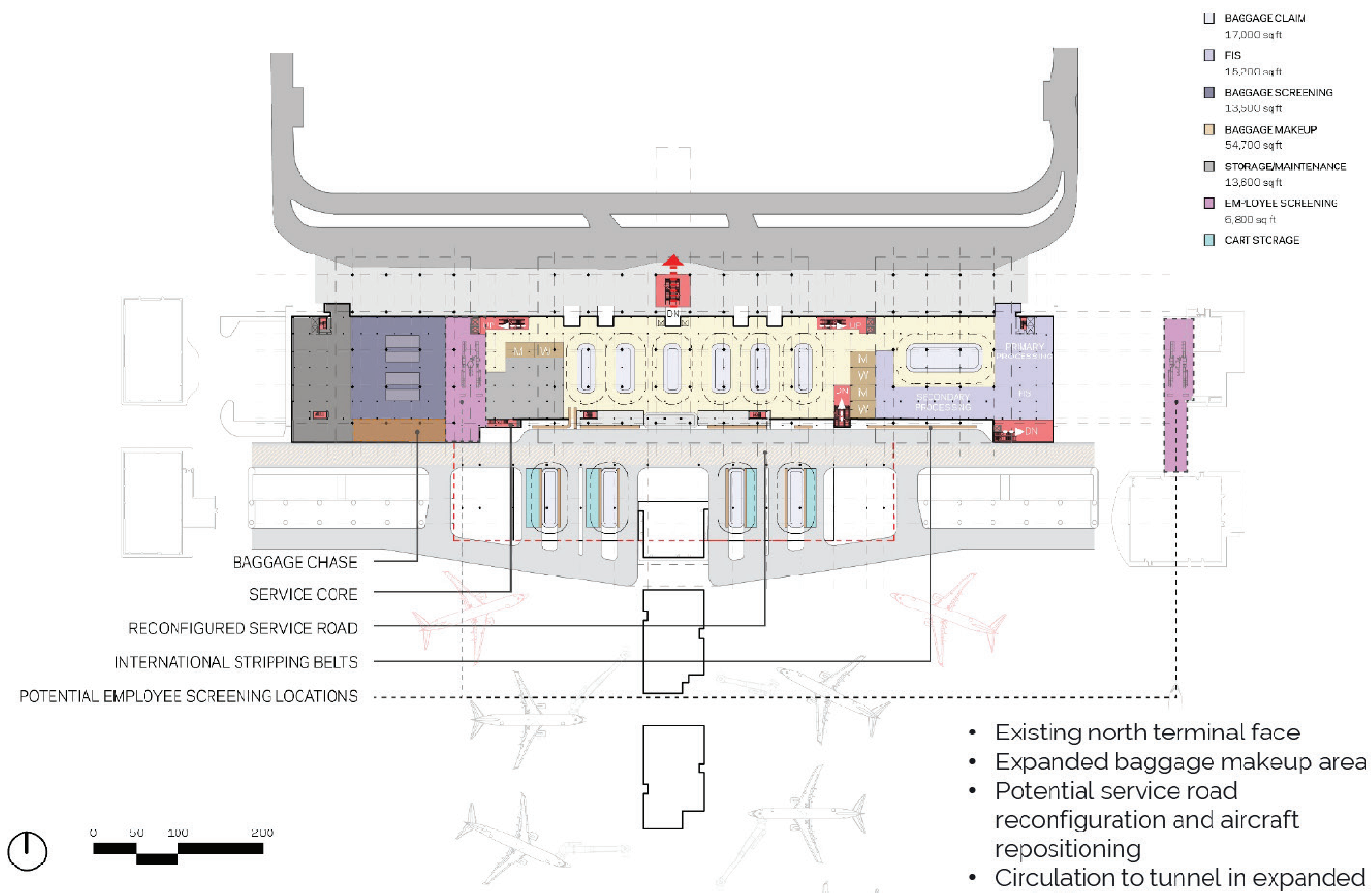
Initial concepts were advanced to two (2) Terminal alternatives, where the first maintains the existing face of the terminal building/footprint and the second expands the building footprint to the north, reclaiming the inner roadway. Each alternative is depicted in **Figures 4.25 and 4.26,** respectively.

FIGURE 4.25 – ALTERNATIVE 1 EXISTING FOOTPRINT REFINED - DEPARTURES LEVEL



SOURCE: MASTER PLANNING TEAM, MARCH 2019

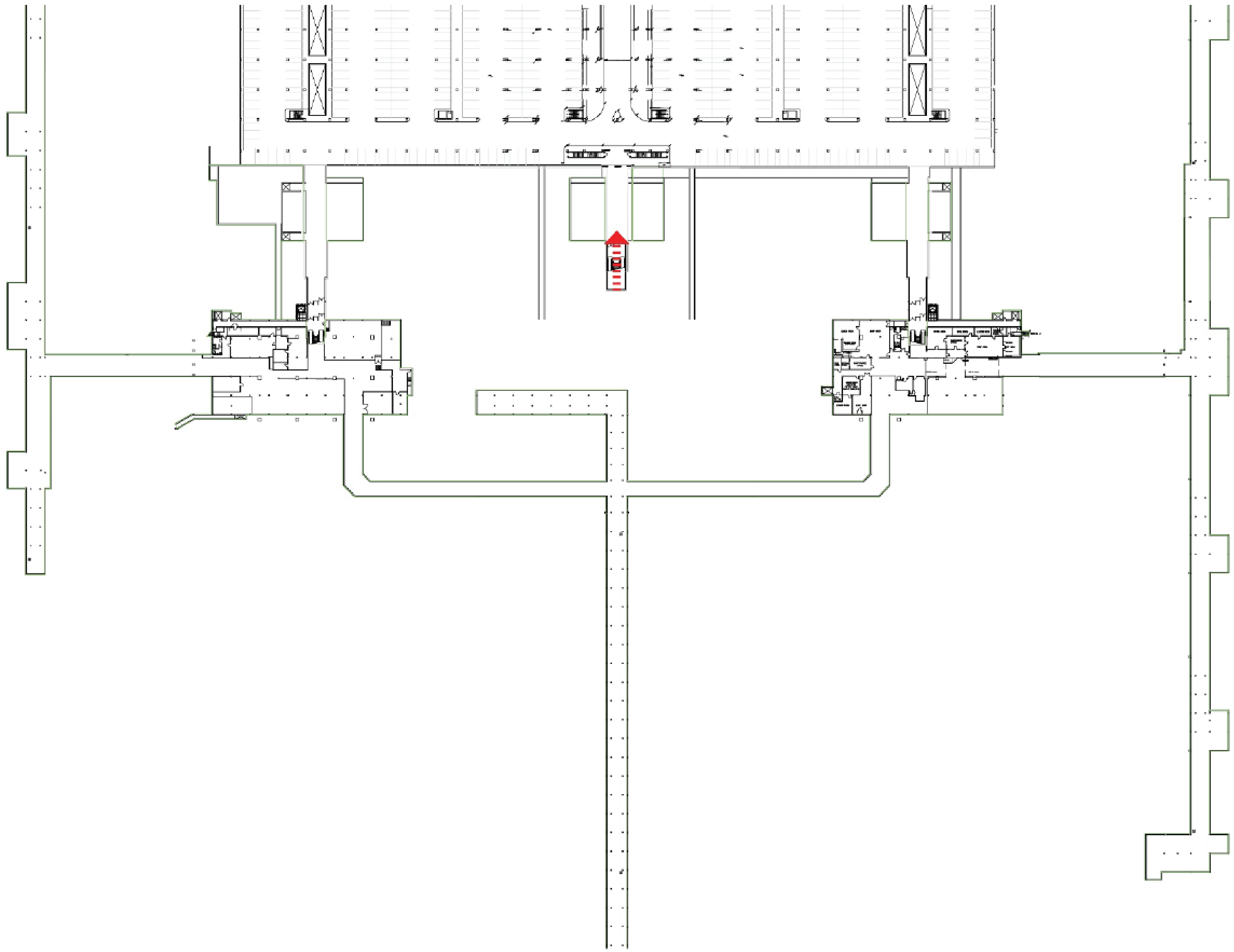
FIGURE 4.25 – ALTERNATIVE 1 EXISTING FOOTPRINT REFINED - ARRIVALS LEVEL



- Existing north terminal face
- Expanded baggage makeup area
- Potential service road reconfiguration and aircraft repositioning
- Circulation to tunnel in expanded curbside area

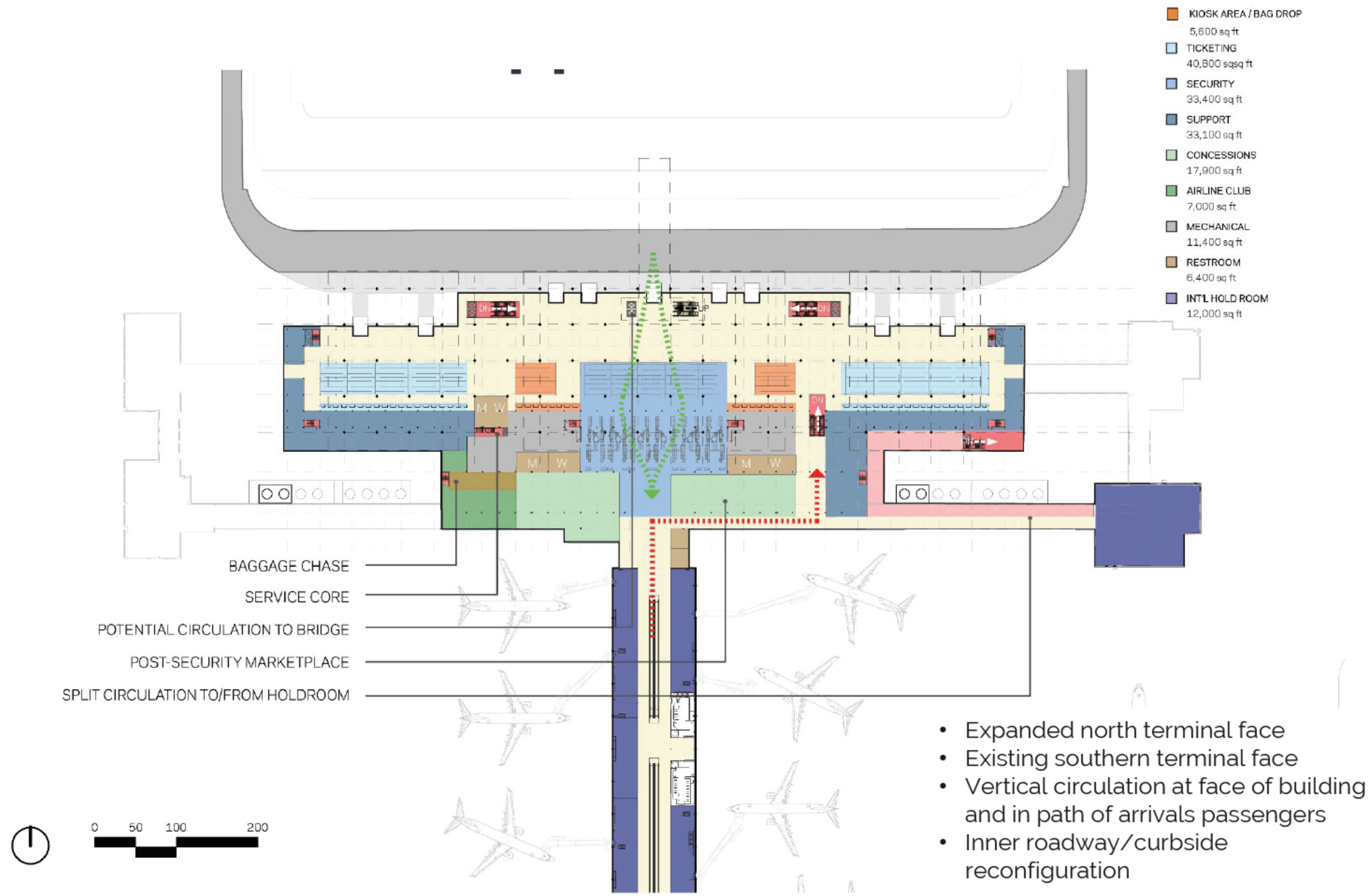
SOURCE: MASTER PLANNING TEAM, MARCH 2019

FIGURE 4.25 – ALTERNATIVE 1 EXISTING FOOTPRINT REFINED - TUNNEL LEVEL



SOURCE: MASTER PLANNING TEAM, MARCH 2019

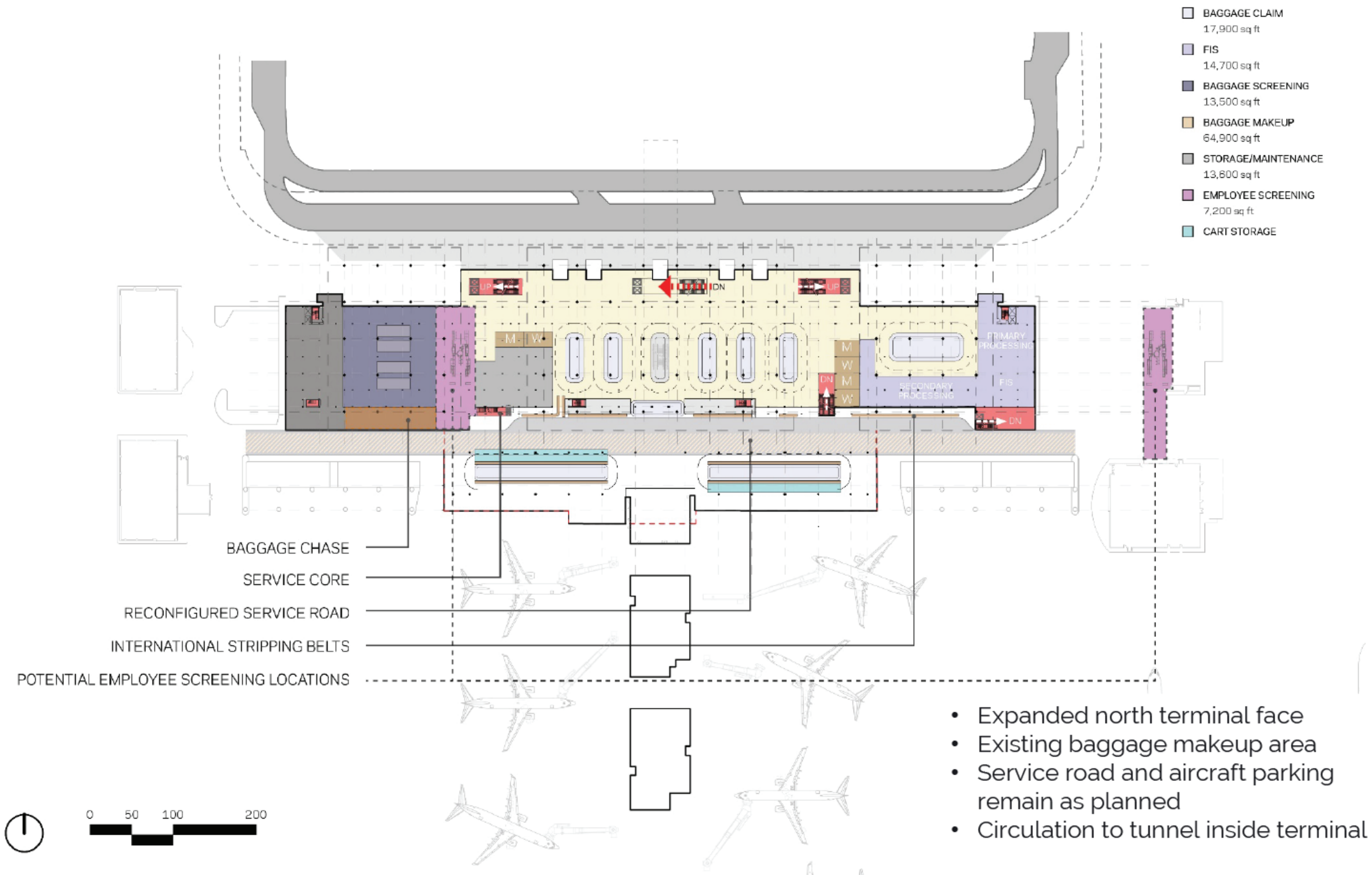
FIGURE 4.26 – ALTERNATIVE 2 EXPAND BUILDING NORTH REFINED - DEPARTURES LEVEL



- Expanded north terminal face
- Existing southern terminal face
- Vertical circulation at face of building and in path of arrivals passengers
- Inner roadway/curbside reconfiguration

SOURCE: MASTER PLANNING TEAM, MARCH 2019

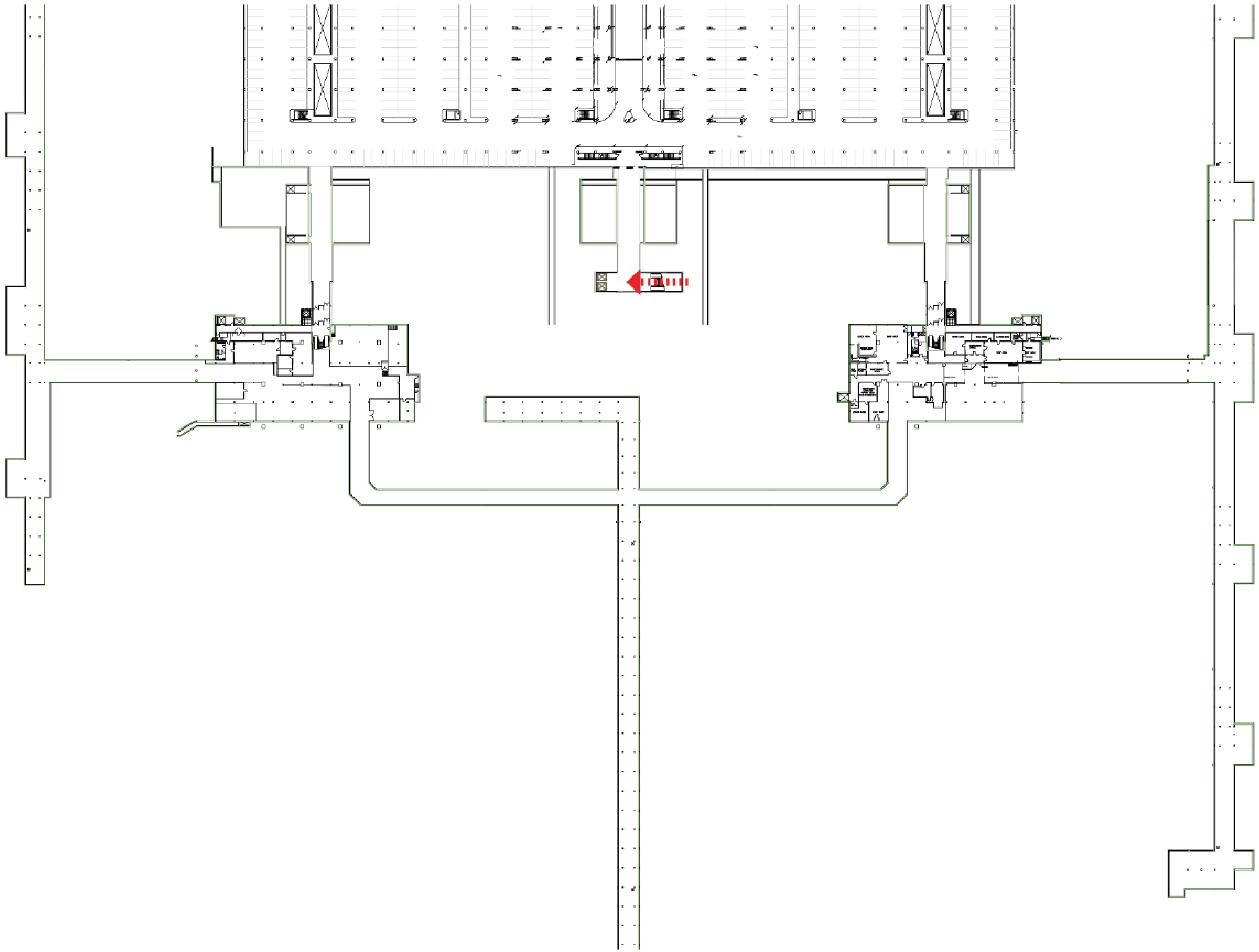
FIGURE 4.26 – ALTERNATIVE 2 EXPAND BUILDING NORTH REFINED - ARRIVALS LEVEL



- Expanded north terminal face
- Existing baggage makeup area
- Service road and aircraft parking remain as planned
- Circulation to tunnel inside terminal

SOURCE: MASTER PLANNING TEAM, MARCH 2019

FIGURE 4.26 – ALTERNATIVE 2 EXPAND BUILDING NORTH REFINED - TUNNEL LEVEL



SOURCE: MASTER PLANNING TEAM, MARCH 2019

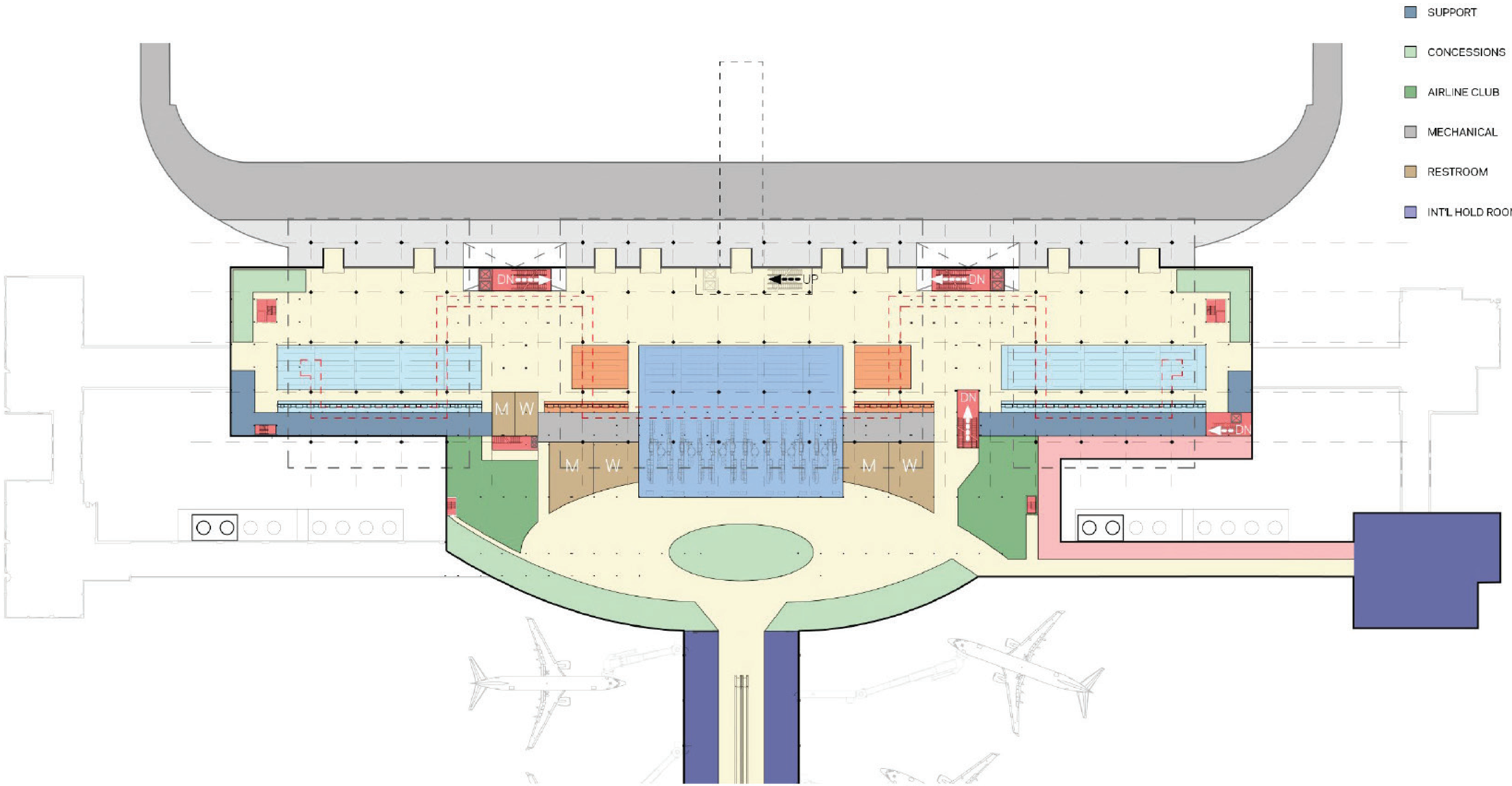
After comparing the two (2) refined concepts, Alternative 2 was selected for final refinement. Expanding the façade of the building north provides flex space into the roadway, resulting in additional space for the terminal. This additional space allows the vertical circulation to be moved to the face of building and provides ample circulation between the ticketing/security checkpoint and the face of building. Final refinements to Alternative 2 included:

- Expansion of face of building to north and consider carrying the expansion across all three (3) terminals verses just Terminal B.
- Shift vertical cores slightly to the north (considering the area between the inner and outer roadways) to optimize the structural and lighting benefits.
- Expanding the face of all three (3) terminals removes the need for CBIS expansion to the south (formerly impacting the tunnel hatch) in Terminal A and provides additional passenger space in Baggage Claim.
- Shifting the face of the expansion back from the original Alterative 2 facilitates larger lightwells located where the vertical circulation occurs.
- Maximize bag make-up capacity.
- Relocate drive lane to/from apron to far east and west of boilers – confirm that is viable with aircraft parking.
- Consider seismic strategies and construction phasing.

Preferred Passenger Terminal Alternative

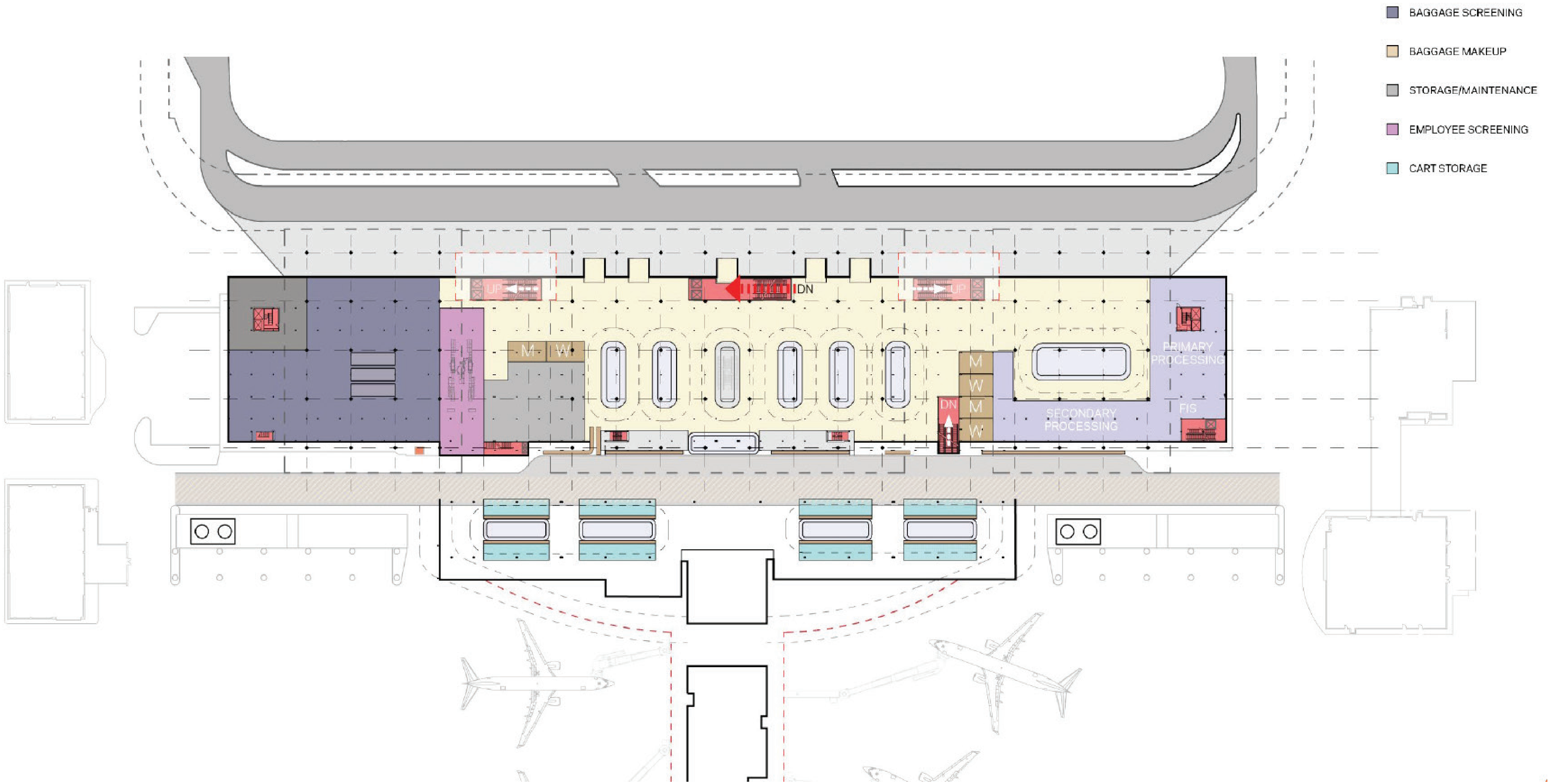
Minor modifications to the original shortlisted concept produced the final terminal layout. **Figures 4.27 - 4.30** depict the floor plans for the preferred terminal layout. **Figures 4.31 - 4.35** provide renderings of the preferred terminal layout. The entirety of the alternatives process is articulated in **Appendix H.**

FIGURE 4.27 – PREFERRED TERMINAL ALTERNATIVE DEPARTURES LEVEL



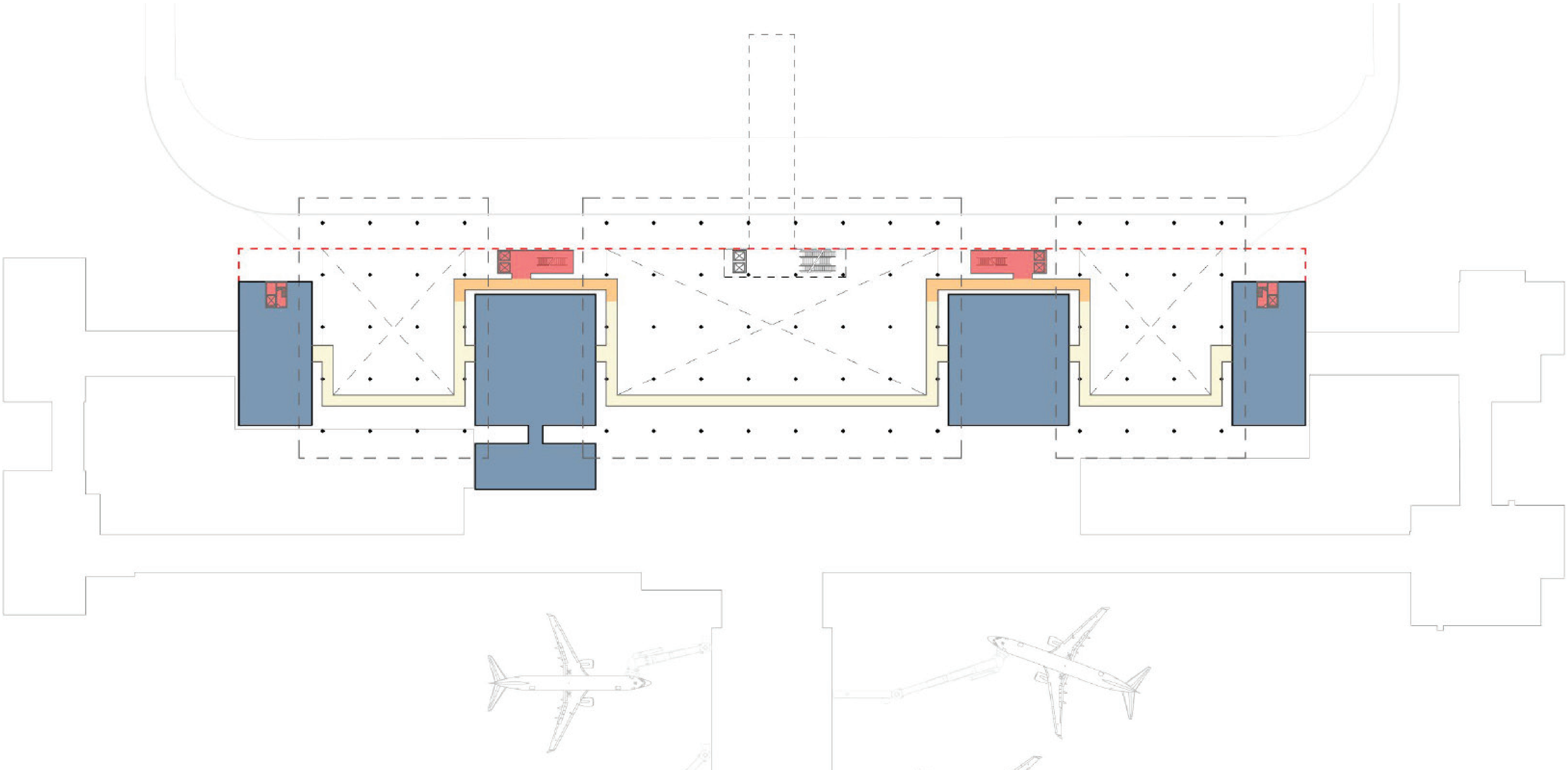
SOURCE: MASTER PLANNING TEAM, JUNE 2021

FIGURE 4.28 – PREFERRED TERMINAL ALTERNATIVE ARRIVALS LEVEL



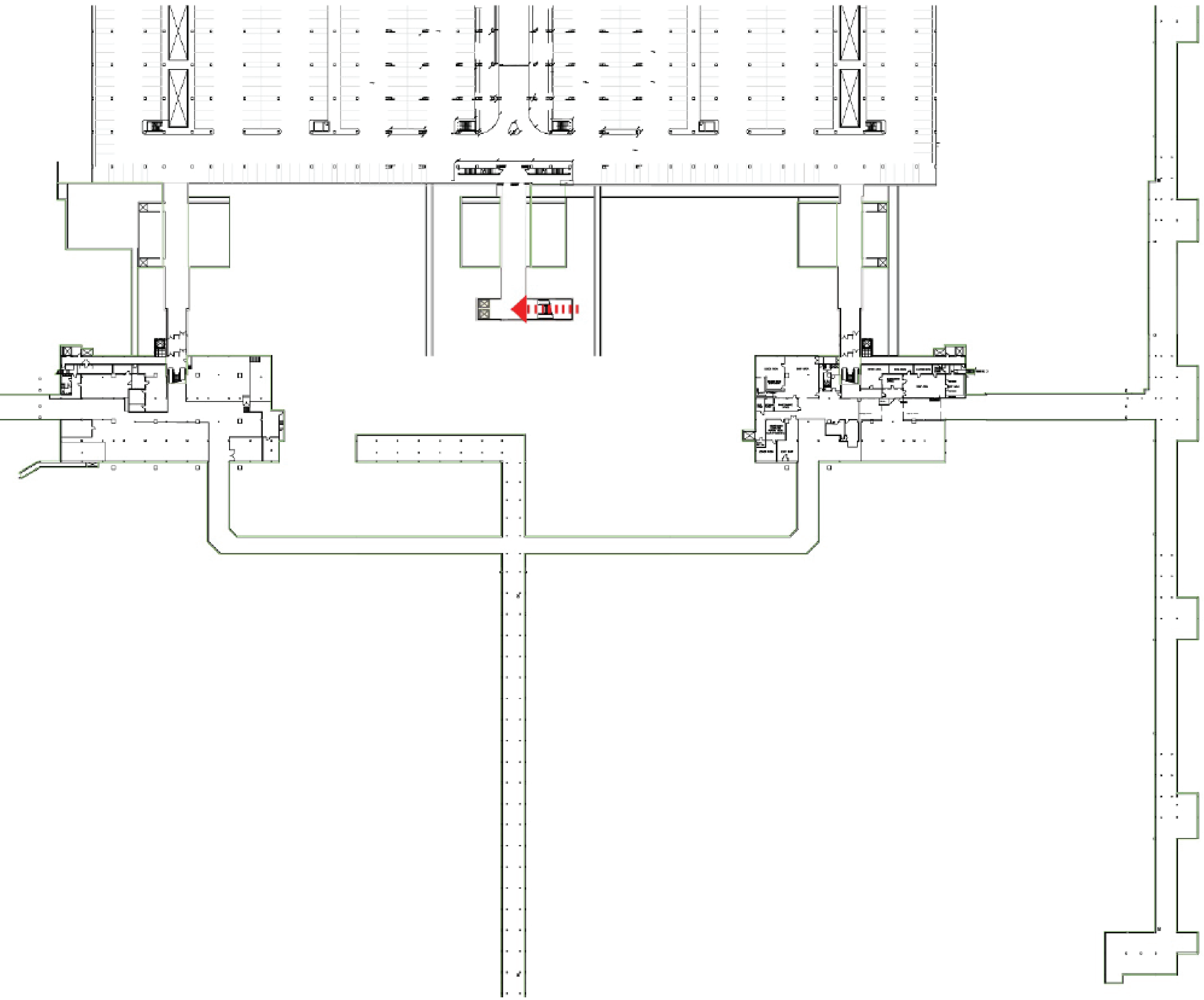
SOURCE: MASTER PLANNING TEAM, JUNE 2021

FIGURE 4.29 – PREFERRED TERMINAL ALTERNATIVE MEZZANINE LEVEL



SOURCE: MASTER PLANNING TEAM, JUNE 2021

FIGURE 4.30 – PREFERRED TERMINAL ALTERNATIVE TUNNEL LEVEL



SOURCE: MASTER PLANNING TEAM, JUNE 2021

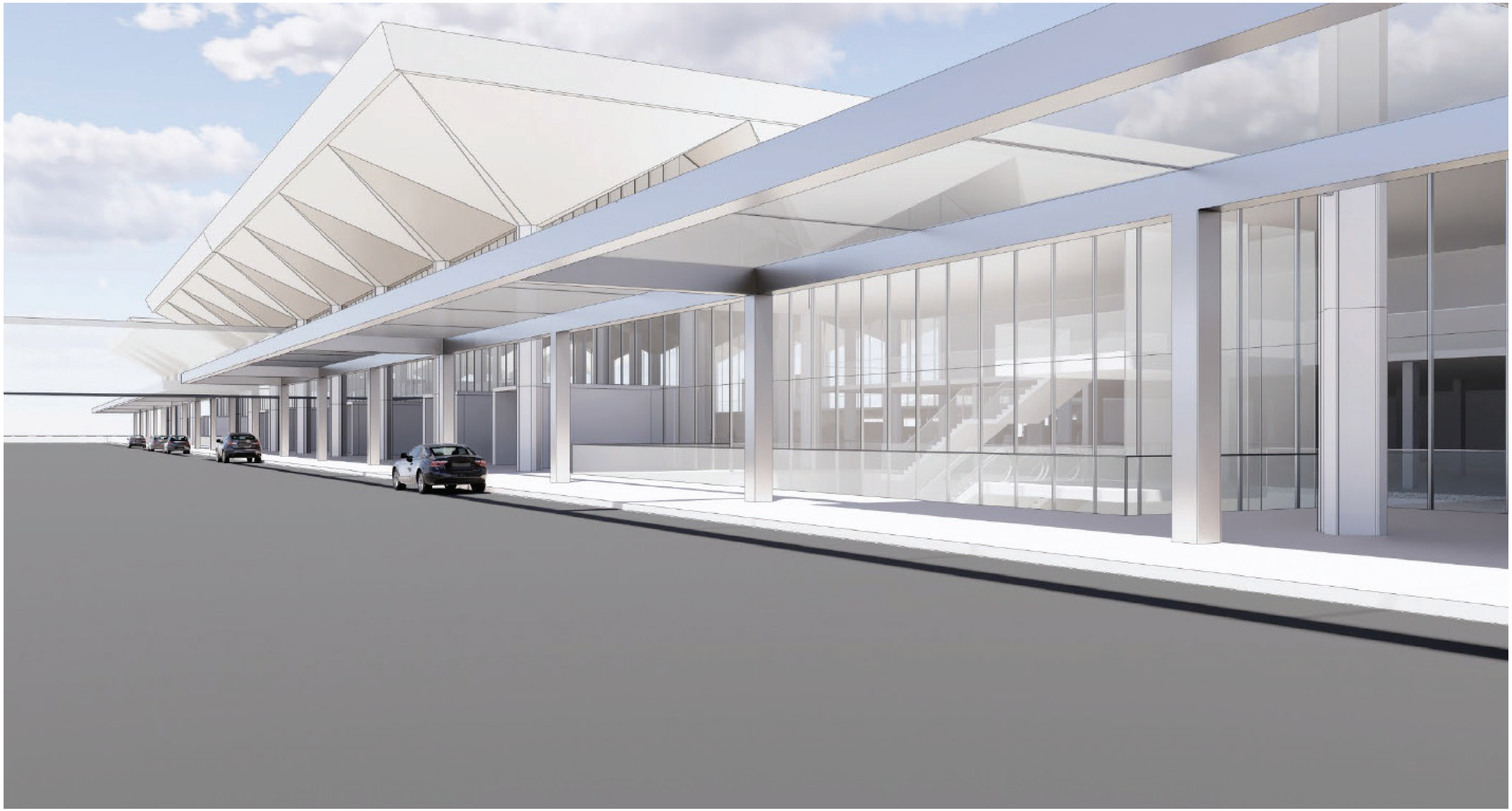
FIGURE 4.31 – PREFERRED TERMINAL PLAN - MEZZANINE

SOURCE: MASTER PLANNING TEAM, JUNE 2021

FIGURE 4.32 – PREFERRED TERMINAL PLAN - DEPARTURES HALL

SOURCE: MASTER PLANNING TEAM, JUNE 2021

FIGURE 4.33 – PREFERRED TERMINAL PLAN - FRONT PORCH



SOURCE: MASTER PLANNING TEAM, JUNE 2021

FIGURE 4.34 – PREFERRED TERMINAL PLAN - MARKETPLACE

SOURCE: MASTER PLANNING TEAM, JUNE 2021

FIGURE 4.35 – PREFERRED TERMINAL PLAN

SOURCE: MASTER PLANNING TEAM, JUNE 2021

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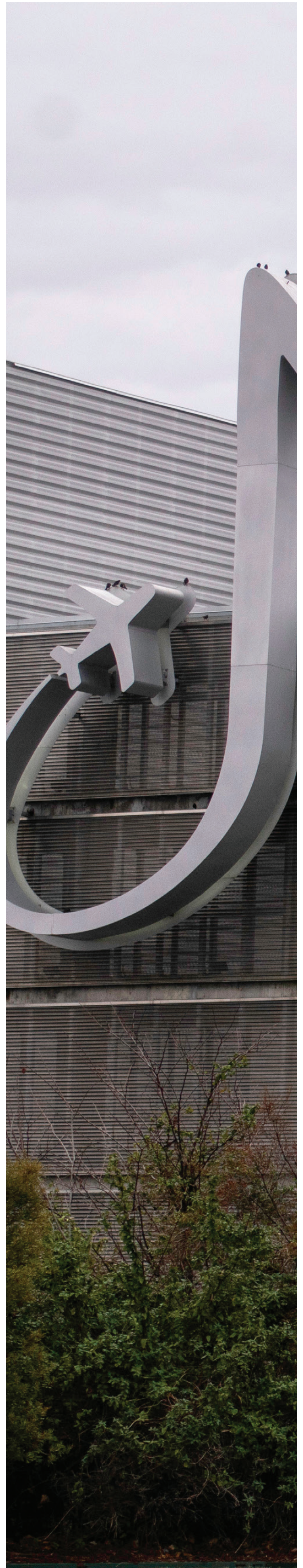


LANDSIDE FACILITIES

Chapter 5 describes the landside facilities at the Airport, which include the terminal area access roadways, curbfront and ground transportation, parking, and rental car facilities. The landside facilities are primarily dependent on the preferred terminal alternative, which is different from some of the other Airport facilities. The following sections describe the existing landside facilities, the landside demand/capacity analysis, the landside alternatives, and the final landside recommendations.

LANDSIDE DEMAND/ CAPACITY & FACILITY REQUIREMENTS ANALYSIS

The following sections summarize the demand/ capacity analysis and future facility requirements for each of the facilities constituting the landside – Airport Access Roadways, Curbfront, Public/ Employee Parking and Rental Car.

Airport Access Roadways

During the inventory phase of study, traffic counts were conducted at several locations including the entrance of the inbound Jim McGehee Parkway, the terminal curbfront, the parking facility entrances and outbound Jim McGehee Parkway. These volumes were used to evaluate the peak hour traffic volumes at the critical facility entrance and exit locations. Like the access roadways, these traffic counts were increased proportionally to the increase in passenger activity from the Baseline activity to PAL 4.

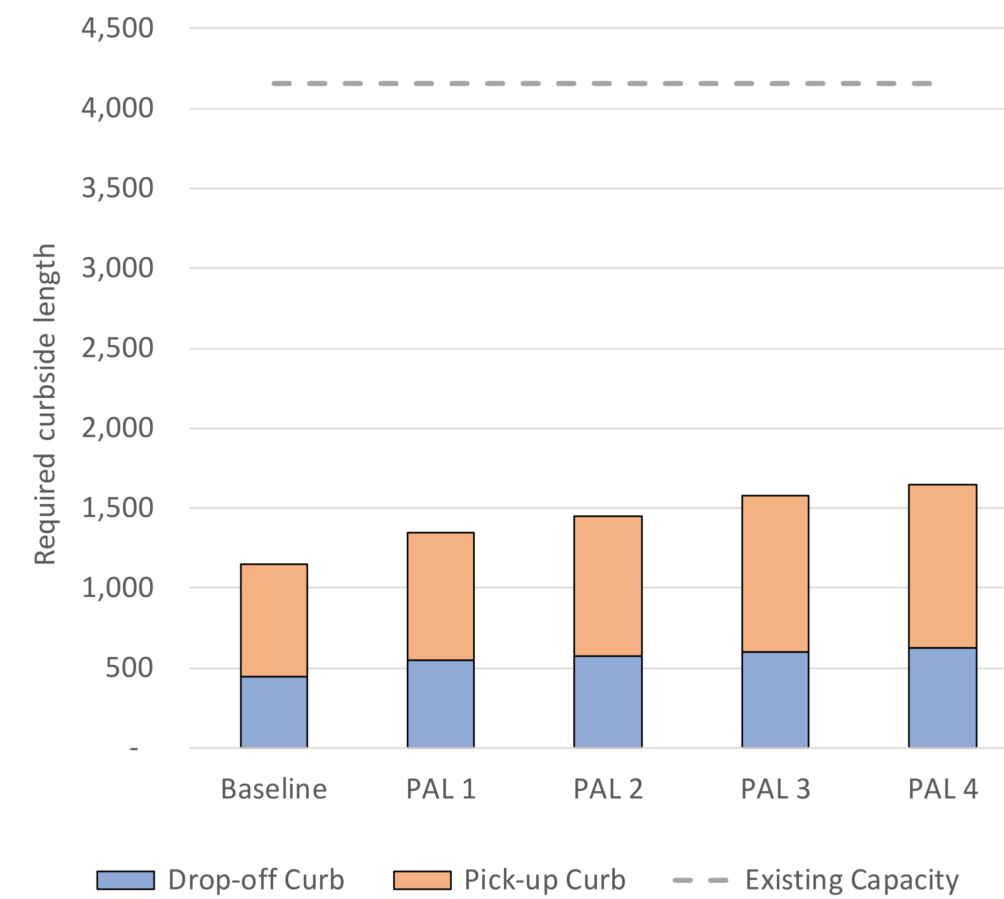
Upon review of the data, it was determined that the roadways themselves will continue to accommodate growth in traffic accessing the airport. Therefore, no additional roadway capacity improvements were identified. Although the Airport access roadways are anticipated to meet the long-term demand of the Airport and do not require any significant modifications, wayfinding on the approach roadway will likely need improvements as a part of the terminal development plan to sign the new facilities. Additionally, simplification of the signage at this time will also help to eliminate an overload of information provided to passengers as they approach the curbfront. Additionally, the access and delivery road modifications included as a part of the recommended terminal improvements should be implemented to eliminate airside deliveries and to provide segregates access of service and delivery vehicles to the terminal.

Curbfront

The following discusses the demand/capacity analysis and facility requirements for the curbfronts. The curbfronts include the inner curbfront generally utilized for private autos and the outer curbfronts generally utilized for ground transportation vehicles.

Figure 5.0 depicts the estimated facility requirements for each Planning Activity Level (PAL) as well as the existing overall capacity. As shown the curbfronts have excess capacity, however the preferred terminal concept will eliminate the inner roadway. This will likely trigger the need for additional capacity in the form of a Ground Transportation Center or addition curb for commercial vehicle functions. Alternatives for this condition should be evaluated during the advanced planning for the terminal developments.

FIGURE 5.0: CURBFRONT FACILITY REQUIREMENTS



Source: MASTER PLANNING TEAM, MARCH 2019

Public Parking

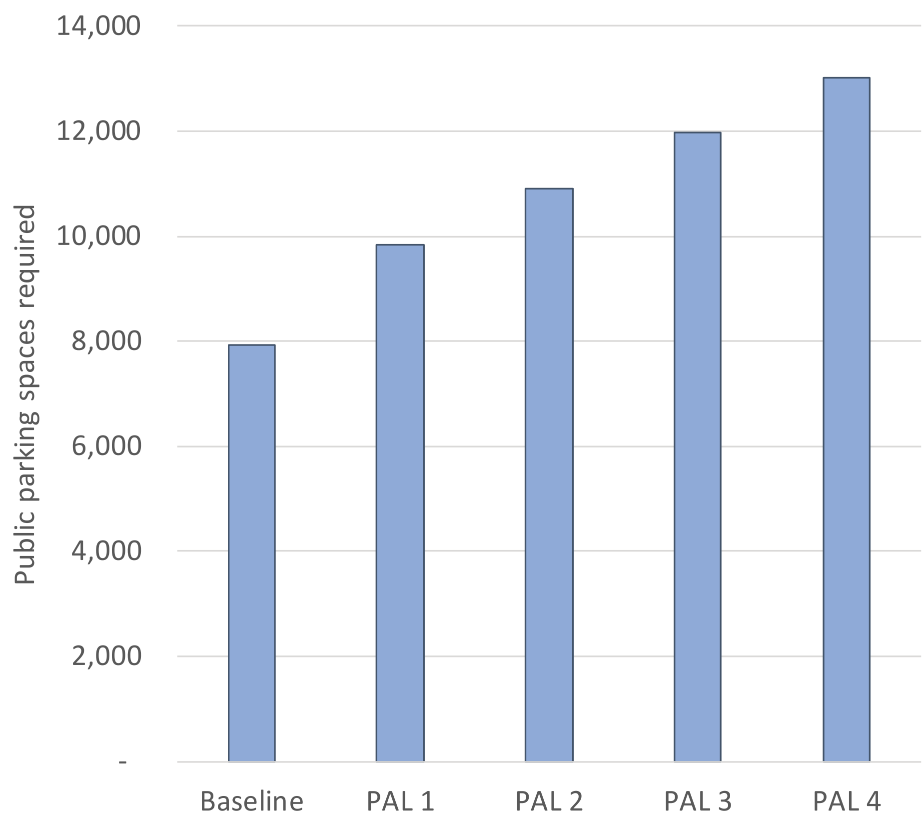
Public parking facilities at the Airport include the Stort-term Garage, Economy Garage, Blue, Lot and Yellow Lot. The parking analysis projected future demand based on the growth of passenger volumes as detailed in the forecast. The demand projections assumed a consistent utilization of the various parking products and did not account for any shifts in the types of products that may occur due to a change in price structure, new parking products offered, or unavailable capacity in a certain parking product.

To determine the facility requirement based on the demand, the utilization of the facility is considered. Utilization is the percentage of the total capacity of the facility that is occupied. A lot with a capacity of 100 vehicles that has 70 stalls occupied has a utilization of 70%. Peak utilization is the highest occupancy the facility experienced over a given period. A typical rule of thumb suggests that once a parking facility has reached 85% utilization (peak or otherwise), the facility should consider beginning to plan for future capacity enhancements. Additionally, once a parking facility has reached utilization in excess of 90%, the parking facility is generally considered "full". As the utilization of a parking facility exceeds 90%, wayfinding becomes a critical factor in the use of the facility. At this point, it is highly recommended that the owner initiate an adjustment to expand capacity.

The future parking facility requirements are calculated based on the peak future parking demand. The demand is more specifically the number of vehicles projected to require a parking space, and the peak demand is the maximum number of vehicles within a specific timeframe, specifically the peak. In order to provide an efficient facility that can appropriately accommodate that demand and not be 100% occupied on the facility's opening day, the demand is 80% of the recommended capacity. For example, if the future demand is for 80 vehicles, the recommended parking capacity is for 100 vehicles. This provides a facility that can efficiently circulate vehicles to available parking, while providing room to grow.

Figure 5.1 depicts a summary of the overall parking requirements for each PAL. All parking products considered, the Airport has 7,254 existing parking spaces, which is not adequate to meet today's demand. Considering the potential impacts of continued Transportation Network Companies (TNCs) adoption, and additional 5,773 spaces will be required to meet PAL 4 demand.

FIGURE 5.1: PUBLIC PARKING FACILITY REQUIREMENTS



Source: MASTER PLANNING TEAM, MARCH 2019

Employee Parking

Figure 5.2 reflects the current parking supply, current parking demand, and the projected parking demands for each PAL. Although the existing capacities are anticipated to meet long-term demand, the need for public parking will likely necessitate new or relocated employee parking capacity.

FIGURE 5.2: EMPLOYEE PARKING FACILITY REQUIREMENTS

	Existing Facility	Baseline (2024)	PAL 1 (2026)	PAL 2 (2032)	PAL 3 (2036)	PAL 4 (+2036)
Employee Parking (stalls):	1,000+ (remote) ~250 (close-in)	773	770	729	899	1,036

SOURCE: MASTER PLANNING TEAM, MARCH 2019

Rental Car

Rental car facilities at the Airport include the ready/return facilities in the Economy Garage (located at Levels 1 and 2), the adjacent Quick-turn-around (QTA) facility and the maintenance complex to the west of Airways Drive. The following describes the demand/capacity analysis and facility requirements for rental car facilities.

Currently, there are nine (9) rental car agencies (RACs) that operate at MEM. These agencies utilize several facilities at the Airport which have each been evaluated for their future requirements. These facilities are organized into five (5) functional elements including:

- Airport Terminal Counter/Customer Service Space: Dedicated brand-specific walk-up counter space located in the Economy Garage for the purposes of transacting business with respective customers. These areas typically include a transaction counter with sufficient support for the operator's personnel including offices and breakroom space.
- Garage Counters/Customer Service space: Additional customer service space typically dedicated to the distribution of keys to rental car customers in a ready/return lot or garage, additional RAC employee space, and storage of rental equipment (such as GPS devices or car seats).
- Ready/Return Parking – Vehicles that have been cleaned/serviced and are "ready" for rent by the operator's customers are parked in the ready area. Vehicles being returned to the rental car operator at the end of the rental contract are directed to the return lanes.
- Quick Turnaround Area (QTA) – Usually located near a ready/return facility. A QTA facility allows for quick prep and return of rental cars to a "ready" position within the parking facility and can be a valuable tool to reduce not only rental car operating inefficiencies, but also congestion and environmental emissions caused by transporting each car to an off-site location to be prepared (fueled and cleaned) for the next customer.
- Vehicle Service Sites – Space and facilities designed specifically for the maintenance, cleaning, and fueling of the cars. Sites typically include fuel islands, fuel island canopies, carwash equipment, storage for supplies, and offices and support facilities for the operator's employees located at the service site.

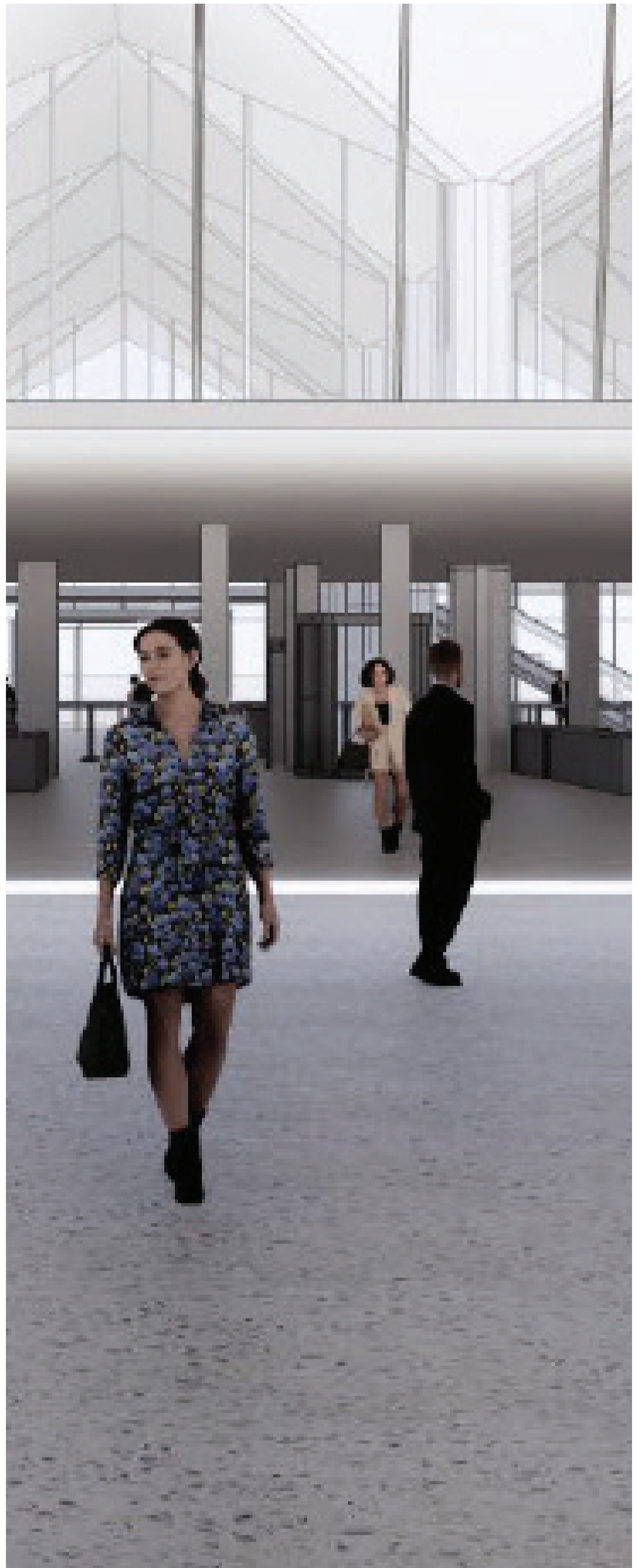
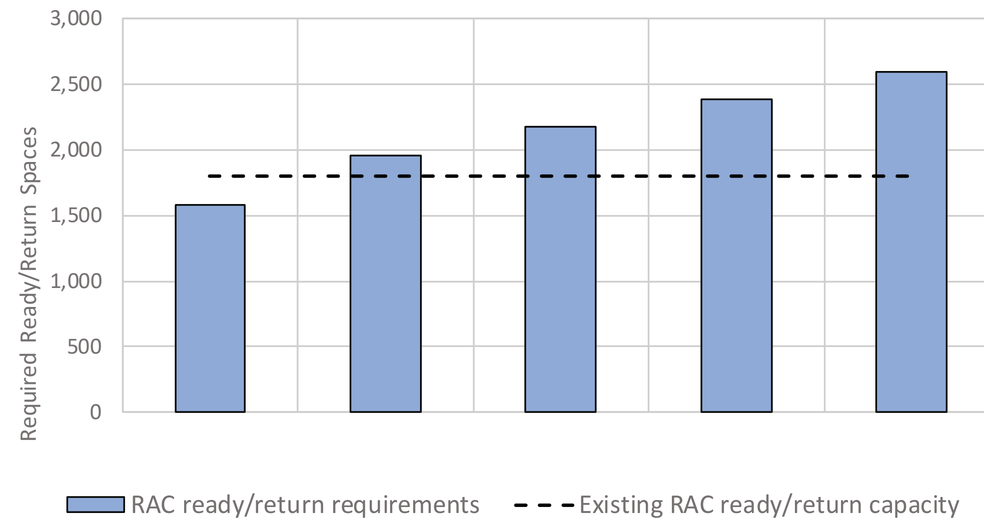


FIGURE 5.3: EMPLOYEE PARKING FACILITY REQUIREMENTS



Source: MASTER PLANNING TEAM, MARCH 2019

Figure 5.3 and Figure 5.4 depicts the existing, Baseline and estimated facility requirements for each functional element and through each PAL. Based on this analysis and conversations with the rental car agencies, the following was discovered:

- The existing Ready/Return capacity of 1,200 to 1,500 spaces (depending on configuration) is near or at capacity.
- The Airway Blvd. maintenance and storage facility will meet the rental car agency's needs throughout the planning horizon.
- Expansion of walk-up counter space is not required. These areas are being utilized less due to technology advancements.
- QTA and in-close storage of ready/return vehicles is required to meet future demand.

FIGURE 5.4 FACILITY REQUIREMENTS

	Existing Facility	Baseline (2024)	PAL 1 (2026)	PAL 2 (2032)	PAL 3 (2036)	PAL 4 (+2036)
Fuel/Vac Positions	24	13	15	18	20	21
Wash Bays	6	3	4	4	5	5
QTA Size (sq ft)	140k+	67k	80k	92k	106k	110k
Service & Storage	Off Site - assumed to provide adequate capacity through PAL4					

SOURCE: MASTER PLANNING TEAM, MARCH 2019

Landside Facility Requirements Summary

Figure 5.5 depicts a summary of the facility requirements for all landside facilities. **Appendix I** provides more detail and background related to the landside facility requirements.

FIGURE 5.5- FUTURE CHECK-IN REQUIREMENTS

	Existing Facility	Baseline (2024)	PAL 1 (2026)	PAL 2 (2032)	PAL 3 (2036)	PAL 4 (+2036)
Departures Curbside (LF)	1,700 (850 outer)	525	650	700	725	775
Arrivals Curbside (LF)	2,550 (1,700 outer)	800	925	1,075	1,150	1,175
Public Parking (stalls)\1	7,254	7,932	9,833	10,923	11,979	13,027
Employee Parking (stalls)\2	1,000+ (remote) ~250 (close-in)	773	770	729	899	1,036
Rental CAr Facility (stalls)	600 +300+300 1,200 to 1,500	906 +677 1,583	1,120 +839 1,959	1,245 +933 2,178	1,364 +1,023 2,387	1,483 +1,111 2,594

1. *Conservatively grown based on the Operations Forecast applied to the 15th busiest day at east and west lots plus 200 additional parkers in the ST Garage.*
2. *Existing RAC Ready/Return Capacity estimated by assuming floor surface utilized as 65% Ready Return (600/floor) with the remaining area used for vehicle storage, RAC operations, additional circulation and security. Existing operations also include approximate 30% of RR stalls serving as flex stalls depending on the time of day. Baseline and PAL projections do not assume flex space.*

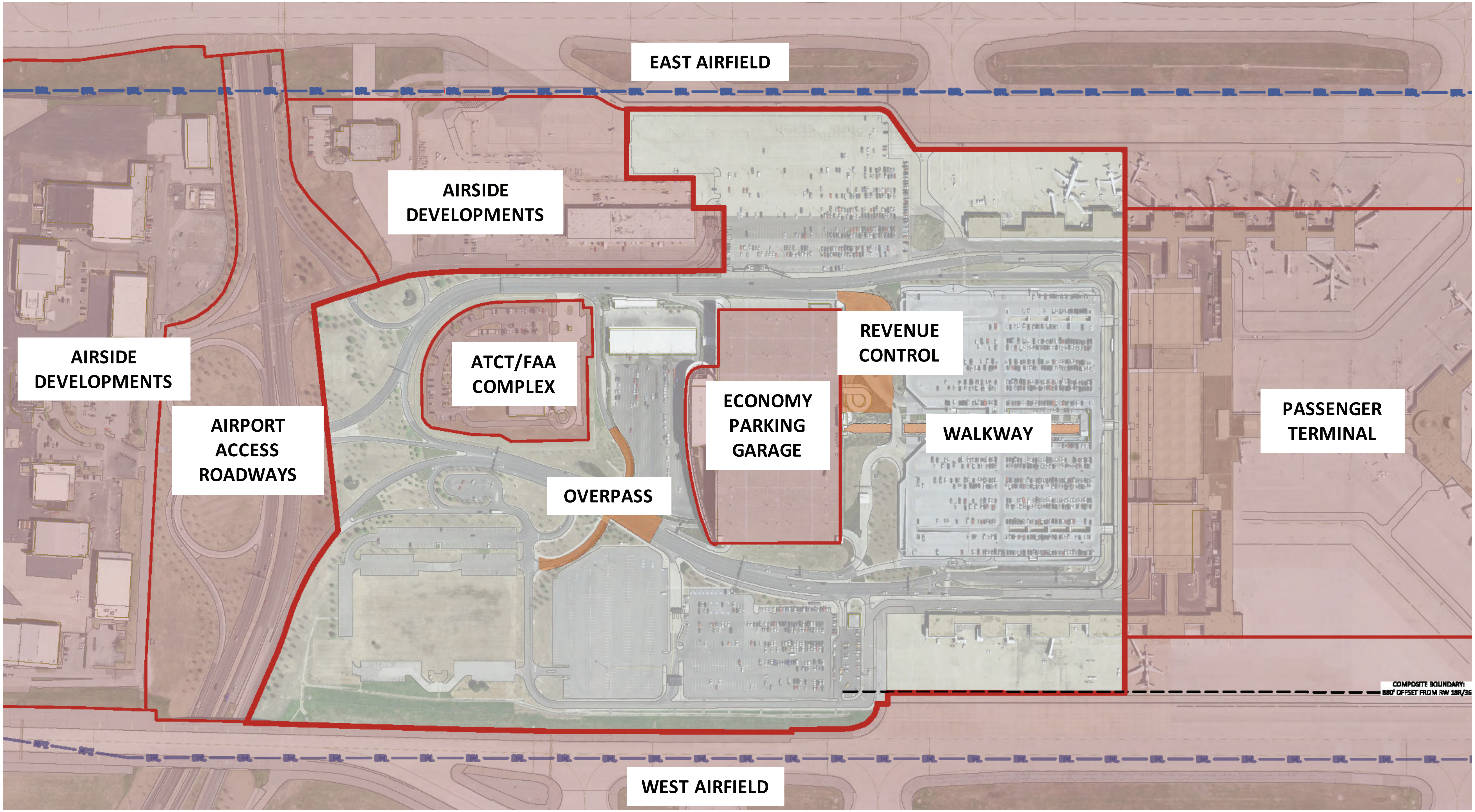
Source: MASTER PLANNING TEAM, MARCH 2019

Landside Alternatives Analysis

The process for exploring the landside alternatives first included studying the opportunities and constraints of the site and the MSCAA's goals and objectives. Then the process assessed a series of high-level initial alternatives, refining a group of shortlisted alternatives, and finally working through the detail of a preferred terminal concept. **Appendix I** contains a series of presentations outlining how the alternatives process evolved and concluded with the preferred alternative.

Figure 5.6 identifies the constraints in the terminal core and resulting areas for new landside development or redevelopment of existing landside facilities. In addition to land use constraints, the location of the adjacent runways and air traffic control tower pose restrictions of heights of landside facilities such as parking garages. **Figure 5.7** depicts height limitations associated with FAR Part 77 surfaces and air traffic control tower (ATCT) line-of-site to the airfield runways, taxiways and aprons.

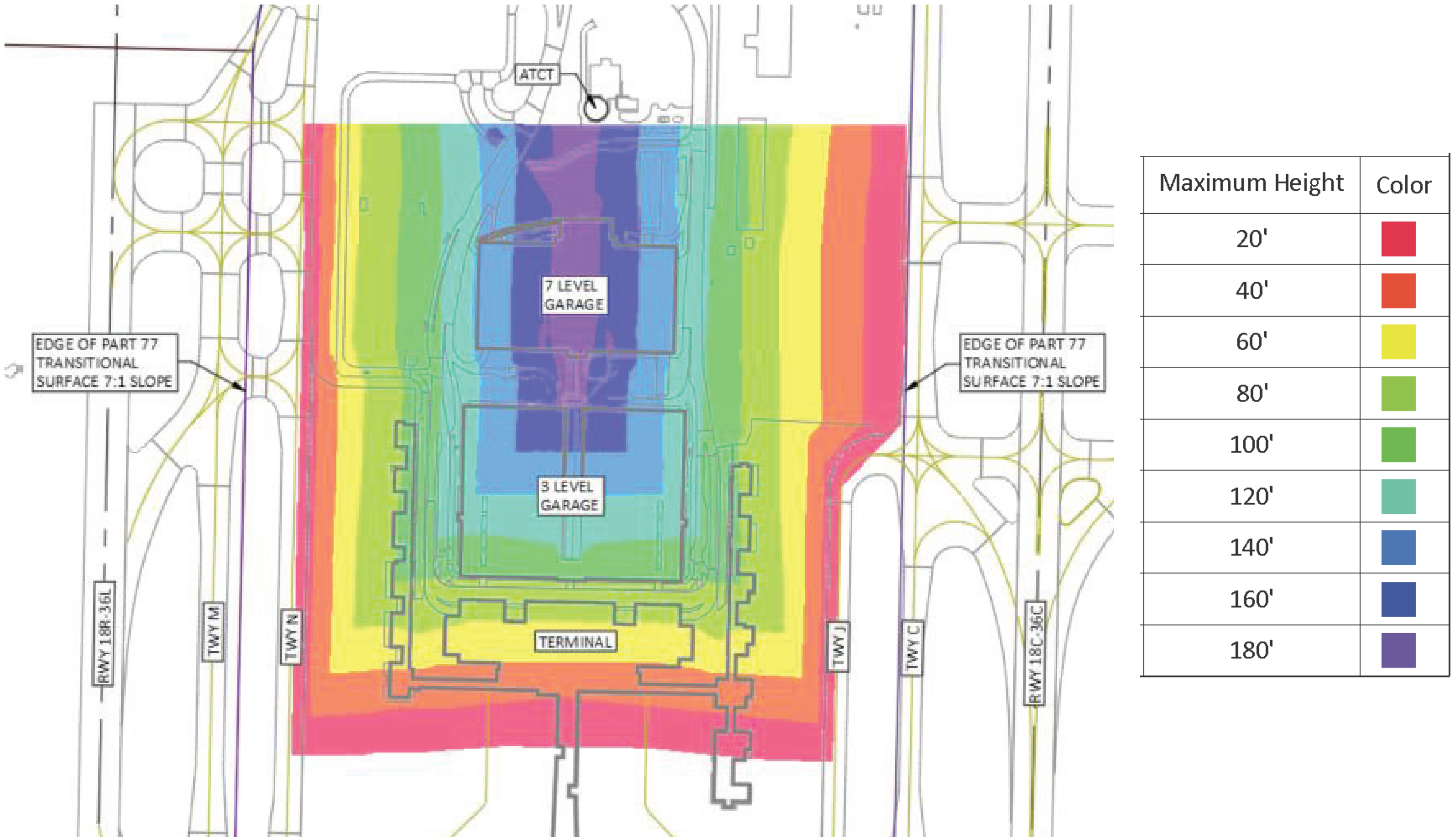
FIGURE 5.6: LANDSIDE SITE OPPORTUNITIES & CONSTRAINTS



Source: Master Planning Team, March 2019

PRIMARY CONSTRAINT
SECONDARY CONSTRAINT

FIGURE 5.7: LANDSIDE FACILITY HEIGHT CONSTRAINTS



SOURCE: MASTER PLANNING TEAM, MARCH 2019

With site opportunities and constraints identified, the goals and objectives of the MSCAA were discussed and documented, including:

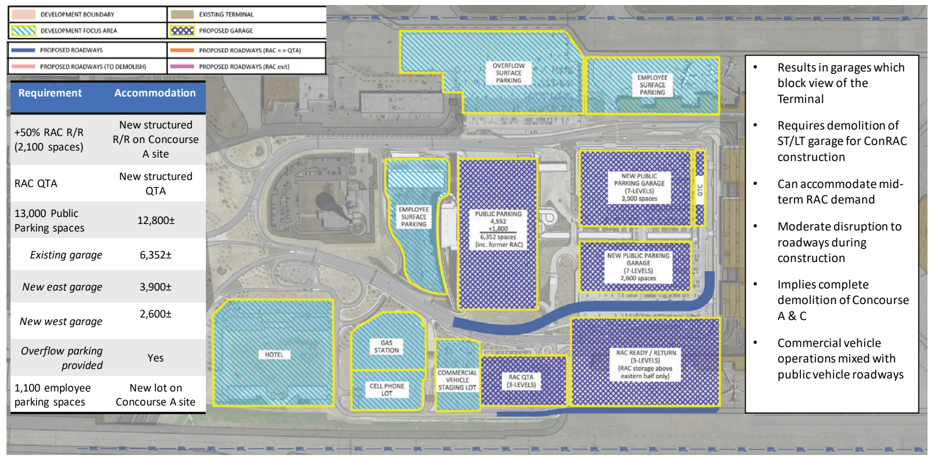
- ConRAC:
  - » Existing garage is purpose-built for two levels of RAC use, not more.
  - » New facility or southward expansion existing facility is preferred versus expanding vertically into garage to level 3.
  - » New ConRAC site belongs north or west of terminal, not on east side, due to returning customer wayfinding.
- Parking: Goal is for all parking to be walkable (employee and public).
- Hotel: Site adjacent to terminal with parking is preferred.
  - » East side site location is preferred for independent vehicle access via Cargo Rd.
  - » Hotel parking can be integrated into larger public parking program.
- Gas station/travel plaza/cell phone: Site is fixed at northwest side of terminal core.

Preliminary Landside Alternatives

The preliminary landside alternatives analysis explored a wide variety of long-term concepts to meet the projected demand at the Airport for public parking, employee parking, rental car operations and terminal curbs. **Figure 5.8** shows the initial eight (8) alternatives developed from visioning and brainstorming sessions conducted.

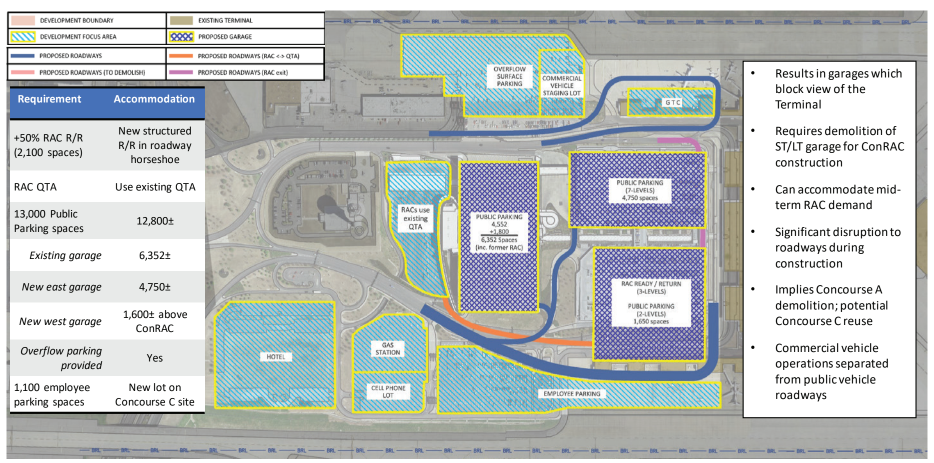
FIGURE 5.8: PRELIMINARY LANDSIDE ALTERNATIVES

LANDSIDE ALTERNATIVE A



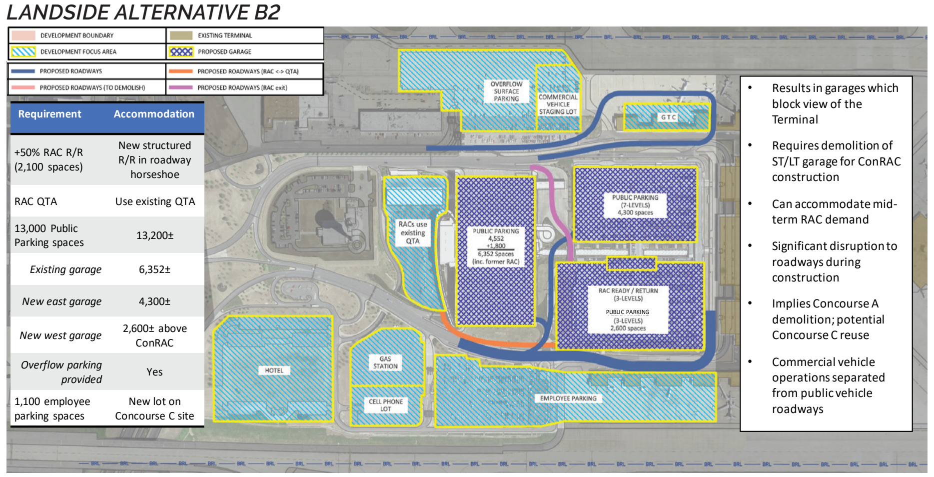
SOURCE: MASTER PLANNING TEAM, MARCH 2019

LANDSIDE ALTERNATIVE B1



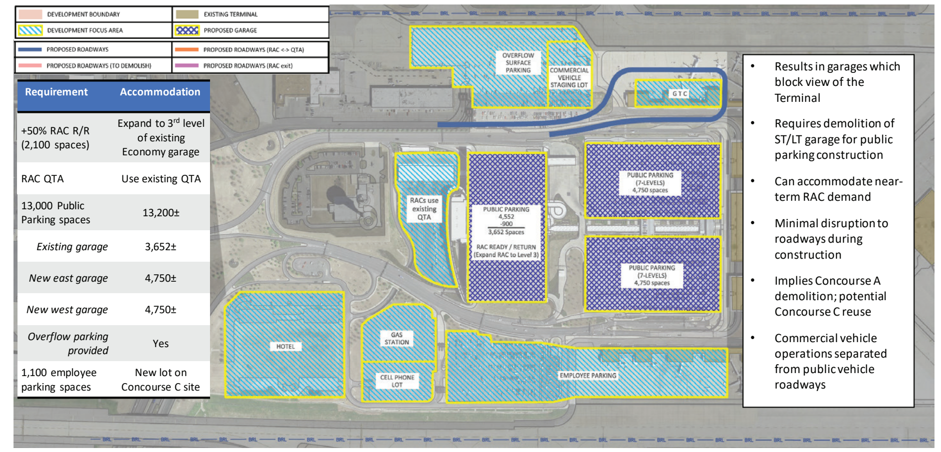
SOURCE: MASTER PLANNING TEAM, MARCH 2019

LANDSIDE ALTERNATIVE B2



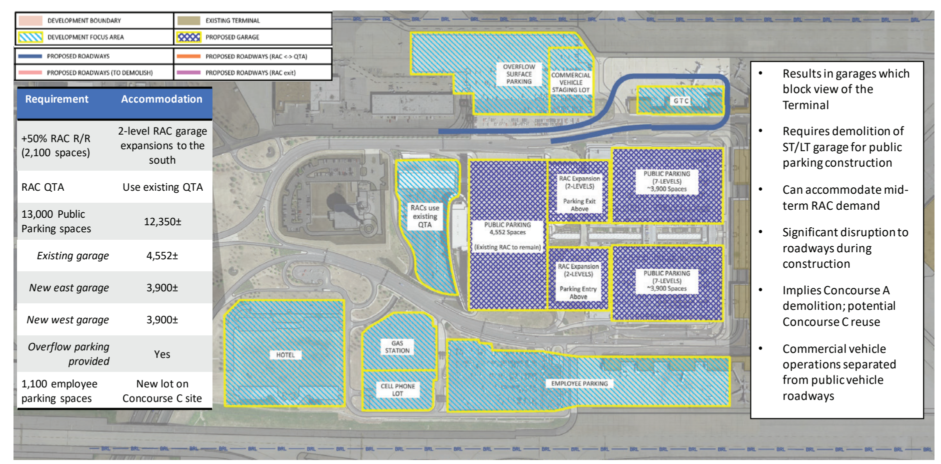
SOURCE: MASTER PLANNING TEAM, MARCH 2019

LANDSIDE ALTERNATIVE C



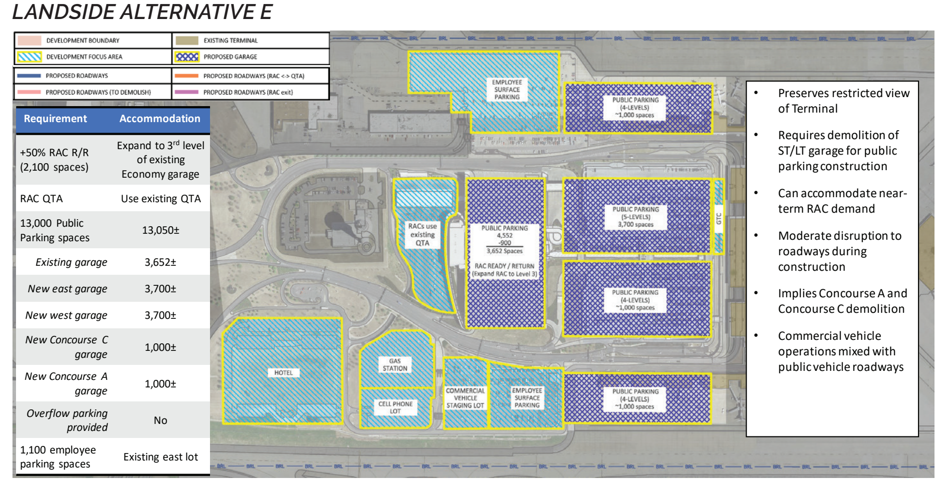
SOURCE: MASTER PLANNING TEAM, MARCH 2019

LANDSIDE ALTERNATIVE D



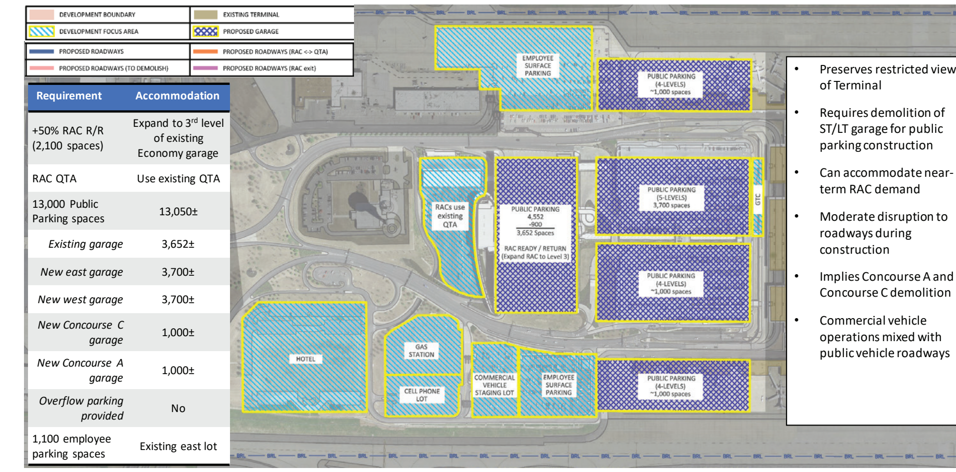
SOURCE: MASTER PLANNING TEAM, MARCH 2019

LANDSIDE ALTERNATIVE E



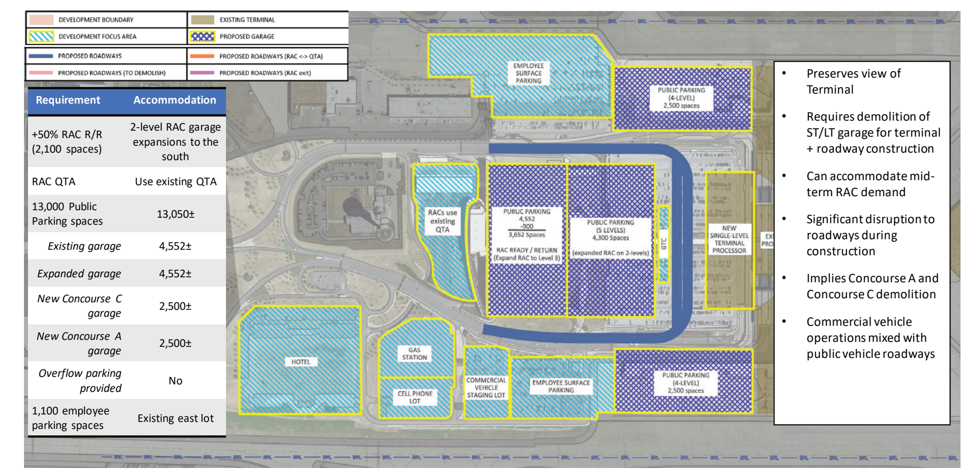
SOURCE: MASTER PLANNING TEAM, MARCH 2019

LANDSIDE ALTERNATIVE F



SOURCE: MASTER PLANNING TEAM, MARCH 2019

LANDSIDE ALTERNATIVE G



SOURCE: MASTER PLANNING TEAM, MARCH 2019

Shortlisted Landside Alternatives

Four (4) alternatives were shortlisted from the initial evaluation process. Each is shown in **Figure 5.9**. The following sections describe the four shortlisted concepts in further detail.

Alternative 1A

- ConRAC facility located on the Concourse A site/apron.
- Reconstruction of the short-term garage into two separate structures for purposes of construction phasing.
- New public parking garage on the Concourse C site/apron.
- Employee parking in the Yellow, Blue and QTA surface lots.
- Hotel development adjacent to Terminal C on the Concourse C site/apron.
- Travel plaza/cell phone lot to the northwest corner of terminal core.

Alternative 2

- Expansion of the Economy Garage south to accommodate expansion of the rental car floors 1 & 2 and expansion of public parking floors 3-7.
- QTA remains in the existing location.
- New Public parking garage located on the Concourse A site/apron.
- Reconstruction and reduction of the short-term garage into two separate structures for purposes of construction phasing.
- Employee parking in the Yellow and Blue surface lots.
- Hotel development w/parking adjacent to Terminal C on the Concourse C site/apron.
- Travel plaza/cell phone lot to the northwest corner of terminal core.

Alternative 3A

- Replacement of the Short-term Garage with separate public parking and Consolidated rental car (ConRAC) garages.
- QTA remains in the existing location.
- New Public parking garage located on the Concourse A site/apron.
- New public parking garage on the Concourse C site/apron.
- Employee parking in the Yellow and Blue surface lots.
- Hotel development adjacent to Terminal C on the Concourse C site/apron.
- Travel plaza/cell phone lot to the northwest corner of terminal core.

Alternative 3B

- Replacement of the Short-term Garage with a combined public parking and Consolidated rental car (ConRAC) garage.
  - » QTA remains in the existing location.
- New Public parking garage located on the Concourse A site/apron.
- New public parking garage on the Concourse C site/apron.
- Employee parking in the Yellow and Blue surface lots.
- Hotel development adjacent to Terminal C on the Concourse C site/apron.
- Travel plaza/cell phone lot to the northwest corner of terminal core.

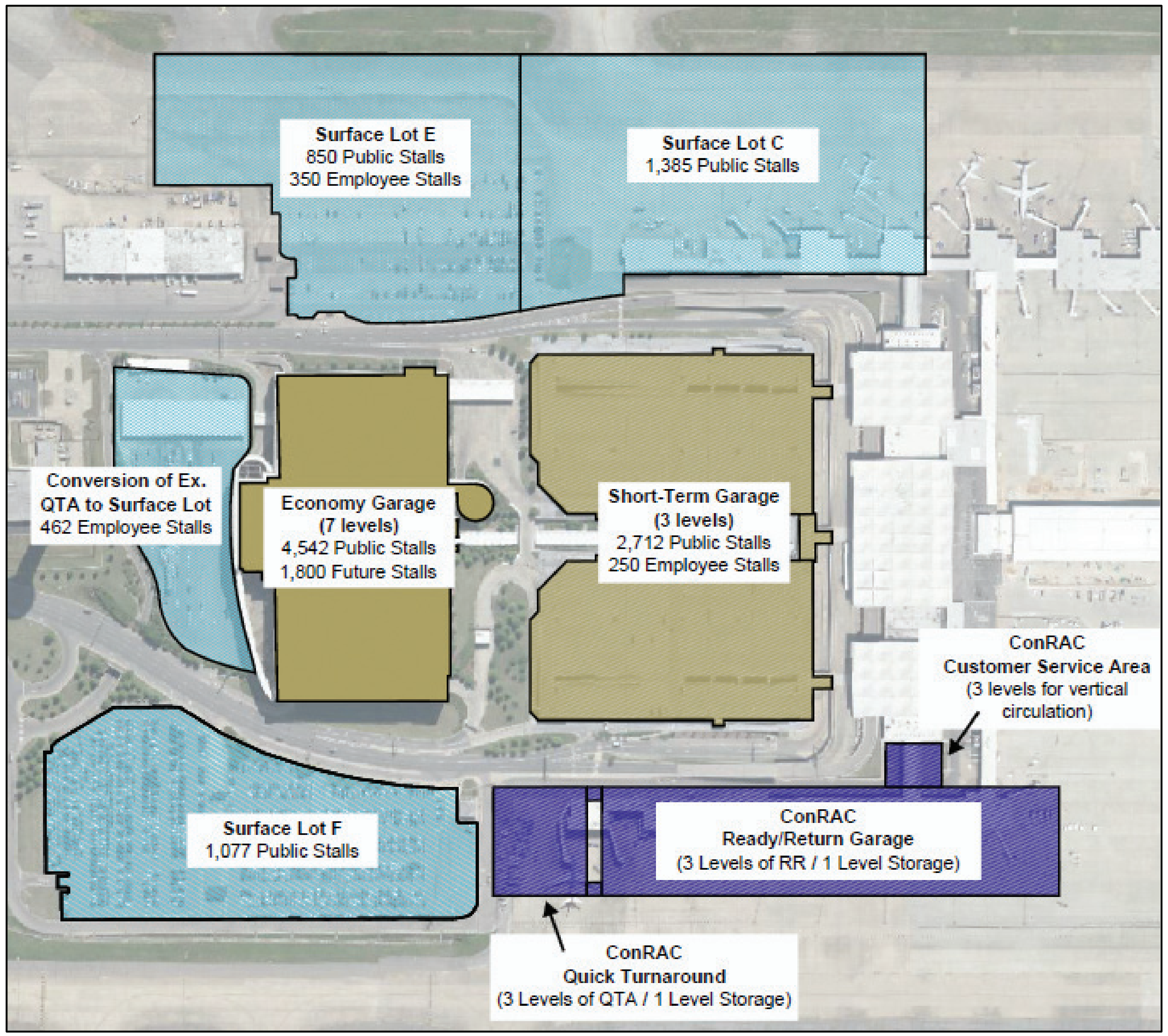
FIGURE 5.9: SHORTLIST LANDSIDE ALTERNATIVES

SOURCE: MASTER PLANNING TEAM, MARCH 2019

Preferred Landside Alternative

The preferred landside layout reflects shortlisted Alternative 1A. **Figures 5.10** and **5.11** depict the preferred landside option in a two-phase development approach. Phase 1 provides immediate capacity for both RAC and public parking operations by constructing the ConRAC on the Concourse A site, as well as expanded surface parking on the Concourse C site. Phase 2 then rebuilds the Short-term garage with more capacity compared to the existing garage and a new public parking garage/hotel on the Concourse C site.

FIGURE 5.10: PREFERRED LANDSIDE ALTERNATIVE PHASE 1

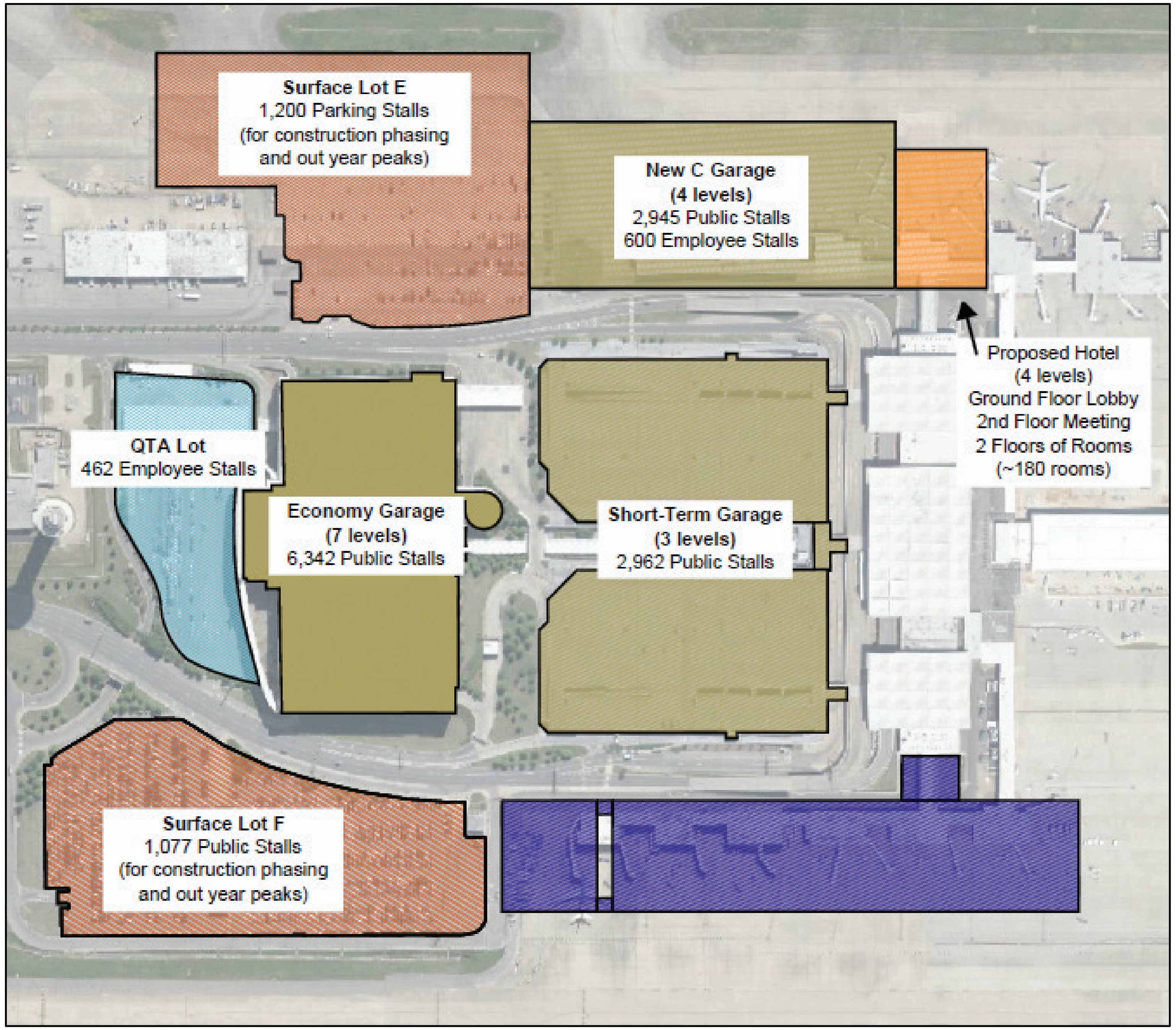


Landside Component	Spaces	Close-in Public	Remote Public	Employee
Economy Garage	6,342	6,342		
Surface Lot C	1,385	1,385		
Existing Short-Term Garage	2,712	2,712		250
Surface Lot E	1,200		850	350
Surface Lot F	1,077		1,077	
Existing QTA	462			462
Total	13,472	10,439	1,927	1,062
Public	12,366	10,439	1,927	
Employee	1,062			1,062
		Excess/Deficit		
PAL 1	9,833	2,533		
PAL 2	10,923	1,443		
PAL 3	11,979	387		(see note)
PAL 4	13,027	-661		

1. Construct Surface public parking lot at Concourse C by 2024 (Baseline).
2. Construct New ConRAC @ Concourse A by PAL 1 (2026).
3. Convert former QTA space to employee parking.
4. Convert former RAC Space in Economy Garage to public parking.

SOURCE: MASTER PLANNING TEAM, MARCH 2019

FIGURE 5.11: PREFERRED LANDSIDE ALTERNATIVE PHASE 2



Landside Component	Spaces	Close-in Public	Remote Public	Employee
Economy Garage	6,342	6,342		
New C Garage	3,545	2,945		600
Existing Short-Term Garage	2,962	2,962		
Existing QTA	462			462
Total	13,310	12,249	NA	1,062
Public	12,249	12,249	NA	
Employee	1,062			1,062
		Excess/Deficit		
PAL 1	9,833	2,416		
PAL 2	10,923	1,326		
PAL 3	11,979	270		
PAL 4	13,027	-778		(see note)

1. Maintain the existing Short-Term Garage and re-life the facility in phases (begin construction by PAL 2).
2. Activate Surface Lots at E and F locations by PAL 2 (2032) for construction phasing and close Surface lot C.
3. Construct Garage C and activate by PAL 3 (2036).
4. Lots E and F are still available for out year peak periods.

SOURCE: MASTER PLANNING TEAM, MARCH 2019

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AIRSIDE & SUPPORT FACILITIES

Chapter 6 describes future development requirements of the airside and support facilities at the Airport, which include the airspace, the airfield, general aviation, cargo, and various support facilities. The following sections describe the demand/capacity analysis, the alternatives, and the final recommendations for the airside and support facilities. **Appendix J** contains additional information related to the demand/capacity and future facility requirements for the Airside and Support Facilities.

AIRFIELD/AIRSPACE

The following sections describe Master Plan analysis for the airfield and airspace facilities at the Airport.

Airfield/Airspace Demand/ Capacity Analysis

Airfield and airspace components at the Airport include all the facilities that are related to the arrival, departure, and ground movement of aircraft. These facilities include the following:

- Runways
- Taxiways
- Airfield marking, lighting, and signage
- Navigational and approach aids

The analysis of these facilities included a review of previously completed runway capacity analysis, geometric design requirements, runway performance requirements, taxiway requirements, and all the future airfield and airspace future requirements.

Runways

The approach to evaluating the runway capacity at Memphis International Airport (MEM) focused on reviewing throughput analysis of the airfield completed in 2010 and comparing it to the new forecast demand levels to determine any existing or future deficiencies that are expected to materialize as aircraft activity increases over the planning period. This approach was preferred because the operations activity estimated in the 2010 MPU is higher than that forecast as part of this Master Plan Update – largely driven by de-hubbing. Specifically, this analysis achieved the following.

- Reviewed the current operations levels against the previously completed demand/capacity analysis, air traffic volumes, peaks, fleet mix, and airfield usage.
- Reviewed the previously completed Total Airspace and Airport Modeler (TAAM) results.
- Stakeholder interviews.
- **Appendix J** Airside Alternatives contains additional information related to the demand/capacity and future facility requirements for the Airside.

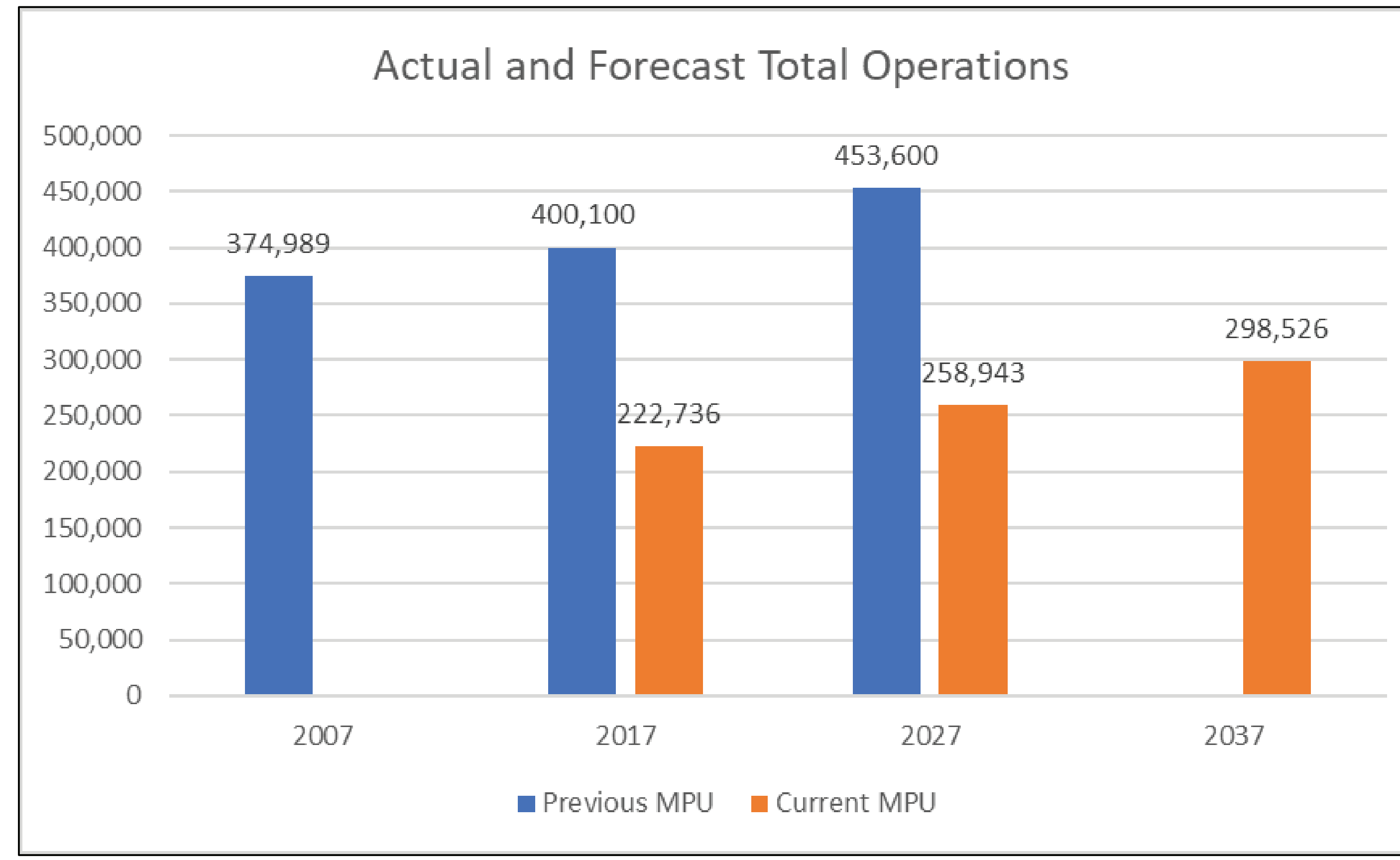
<u>Airfield Demand/Capacity</u>

The 2010 Master Plan concluded that:

"The results of the simulation analyses indicate that there will be sufficient airfield capacity to accommodate forecast aviation demand through at least PAL 3/2027. As stated above, design day delays at the Airport will remain very moderate, averaging four minutes per aircraft operation or less, though PAL 3 without additional or relocated runways."

Figure 6.0 compares the annual operations estimates prepared in 2010 to those created in 2019 for this Master Plan Update. As shown, the total operations forecasted for 2037 (298,526) is significantly less than the previous estimate for 2027 (453,600). Even though Air Cargo and Military operations are growing, Commercial Passenger operations and general aviation (GA) operations are significantly lower. This is due to de-hubbing and a general decline in GA activity, respectively.

FIGURE 6.0: COMPARISON OF 2010 OPERATIONS TO 2019 FORECAST



SOURCE: KIMLEY-HORN, OCTOBER 2019.

At MEM, annual operations are a logical demand measure to compare to the airfield's runway capacity. However, given the FedEx Hub operation, the peak period is a more accurate measure and indicator of the runway system's ability to meet future demand.

When considering peak period operations at MEM, cargo operations are the focus given that most FedEx's cargo operations occur during two distinct peak periods – the day sort and night sort, with the night sort representing the larger number of operations. Furthermore, the timing of these sorts is such that they do not significantly overlap with commercial passenger operations.

For these cargo operations, the peak month was determined to be December because of high shipment volumes during the holiday season. Existing peak hour activity was formulated around a monthly FedEx schedule provided by the Airport, while the future peak hour operations were derived based on input from FedEx regarding their future peak period estimates and their anticipated fleet replacements.

It should be noted that when planning airfield facilities such as runway capacity, taxiway capacity/efficiency, and deicing operations, the nature of FedEx's operations requires considerations of the entire peak period, particularly at night. In FedEx's case this is a 90 to 120 minute window where all arrivals are experienced at the beginning of the push and then another 90 to 120 minute window when all departures push after the sort is completed.

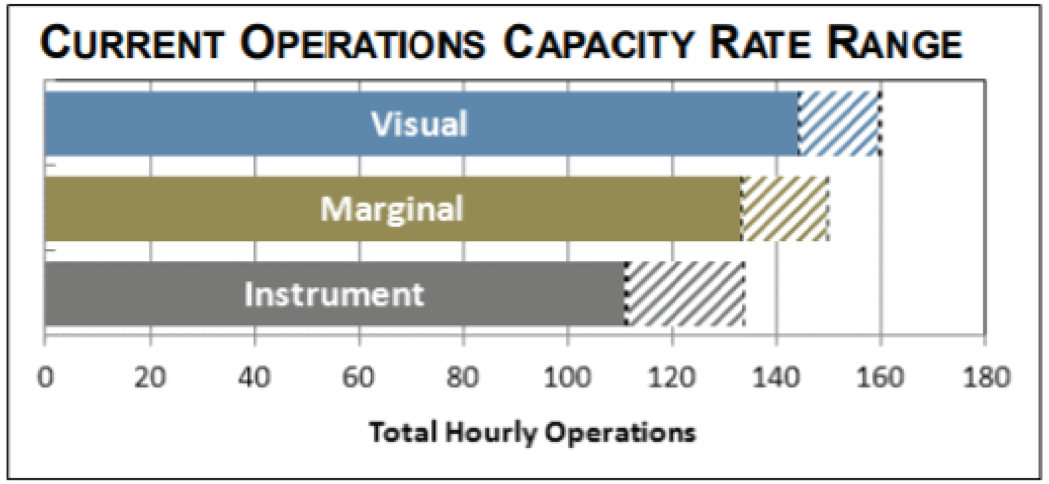
The following represents the estimate for the night sort activity by the end of the planning horizon in 2037. Using this information, FedEx's night sort is estimated to have 160 operations in the peak period (90 to 120 minutes long), with 125 of those operations occurring in a peak hour.

- Number of arrivals within a 90 to 120 minutes window
  - ADG II – 3
  - ADG III – 6
  - ADG IV – 133
  - ADG V – 18
- Number of departures within a 90 to 120 minutes window
  - ADG II – 3
  - ADG III – 6
  - ADG IV – 133
  - ADG V - 18

When considering the capacity of the airfield's runways, the FAA's Airport Capacity Model was utilized to create a capacity profile for MEM. This profile considered both the modeled capacity as well as the Air Traffic Control (ATC) reported capacity.

Figure 6.1 depicts the capacity profile. This shows the hourly throughput that MEM can sustain during periods of high demand, represented as the range between the model estimated capacity and the ATC facility reported rate. Each weather condition has a unique rate range. Using this approach, peak hour capacity of MEM's runways is 144 to 160 operations in visual flight rules (VFR) conditions and 111 to 134 operations in instrument flight rules (IFR) conditions.

FIGURE 6.1: MEM RUNWAY HOURLY CAPACITY PROFILE



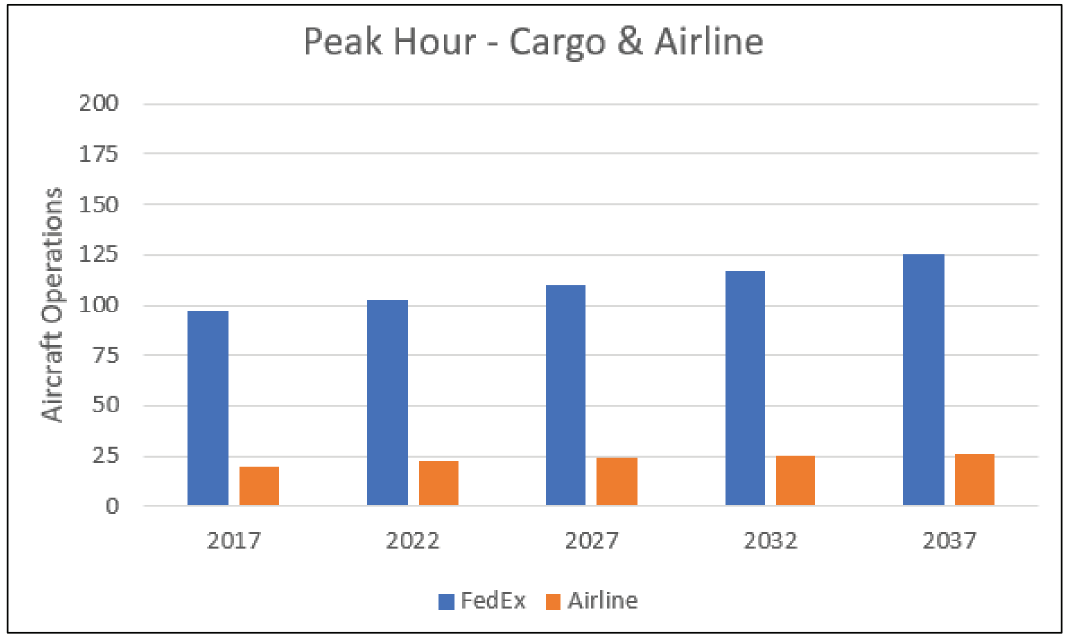
SOURCE: FAA AIRPORT CAPACITY MODEL, MEMPHIS INTERNATIONAL AIRPORT - 2014

Figure 6.2 compares the runways capacity with the forecasted demand, both air cargo and airline operations. Current runway capacity of airfield appears to be adequate to meet needs through 2037. Although runway capacity is adequate, various other improvements should be considered to improve taxi flow, reduce runway dependencies and remedy hot spots/non-standard conditions – all of which will enhance the overall airfield's ability to accommodate demand.

Runway Geometric Design Requirements

The planning and design of an airfield is typically based on the airport's role and the design aircraft. For geometric design purposes, it is necessary to establish applicable design standards for any future airfield development. These geometric design standards are detailed in FAA Advisory Circular 150/5300-13b. The following outlines the current and anticipated geometric requirements for MEM and how these may impact future facility requirements.

FIGURE 6.2: MEM RUNWAY HOURLY CAPACITY VS DEMAND



SOURCE: FAA AIRPORT CAPACITY MODEL, MEMPHIS INTERNATIONAL AIRPORT - 2014

<u>Existing and Future Geometric Requirements</u>

The geometric design standards detailed within the Advisory Circular vary for each runway design element based on the Airport reference code (ARC) or the aircraft design group (ADG) for a specific airfield element. As discussed in Chapter 3 Forecast of Aviation Activity, the Airport currently has an ARC of D-V with a Boeing 777F (B777F) as the aircraft.

Based on the forecasted operations and future aircraft orders for FedEx, the B777F is expected to remain the critical design aircraft for Memphis International throughout the entire planning horizon with an estimated 23,567 operations forecasted for 2037, given that it will replace cargo shipped on the MD-11 and DC-10 aircraft that are being phased out through 2033.

The geometry at MEM can accommodate ADG V and, in some cases ADG VI standards, with few exceptions. With the airfield currently meeting the geometry requirements it is reasonable to assume that the airfield geometry will meet the needs of the Airport through the planning period provided that the ARC or ADG does not increase.

Runway Performance Requirements

The adequacy of a runway to meet future needs is determined by several factors, including runway length, instrumentation, and lighting. The following discusses these factors in more detail.

Runway Length

To determine if existing runway lengths are sufficient to support the existing and future fleet mix, a runway length analysis is typically completed using aircraft manufacturer airport planning manuals. However, it is the air carriers that establish their own requirements for payload, performance and risk management purposes. Given FedEx operates the largest aircraft, they were consulted to determine if MEM's runways provide adequate runway length for future demand and operations.

As previously stated, the B777F is the critical aircraft at MEM, but operations are sometimes conducted for other heavy aircraft such as the B747F. FedEx estimates that the maximum runway length of 11,129-ft (Runway 18C-36C) at MEM will remain adequate through the planning horizon. However, extension of one other runway to a near or equivalent length would be beneficial and justified through operational efficiency/redundancy during construction, snow removal, etc.

Instrumentation and Lighting

Memphis International Airport has a variety of instrumentation and lighting at strategic locations across the airfield. The following sections discuss the airfield instrumentation and lighting currently in place and found to be adequate to service the airfield through the planning horizon.

Instrumentation

Instrumentation often refers to a ground or space based electronic navigational aids (NAVAIDs) that provide lateral and/or vertical guidance to a pilot. For the arrival and departure phases of flight, instrumentation is used for Standard Instrument Departure Procedures (SIDS), Standard Terminal Arrival Routes (STAR), and Instrument Approach Procedures (IAP).

Currently, all runway ends at MEM are serviced by a Category I ILS. Runways 36L, 36C and 36R also have a Category II/III ILS. All runway ends are serviced by an RNAV approach. With this capability, it is reasonable to assume the instrumentation will meet the Airport's needs through the planning period.

Lighting

Airfield runway lighting includes approach lighting systems, elevated lighting, and in-pavement lighting. Lighting helps define airfield components during inclement weather and times of low natural light. The type and configuration of runway and approach lighting plays an important role in determining IAP weather minimums.

The existing runway and approach lighting at MEM currently allow the Airport to meet the FAA's guidelines and provide adequate IAP. Since the existing lighting is able to meet all requirements, it is reasonable to assume it will also meet the Airport's needs through the planning horizon.

Runway Orientation – 9-27 shift

Currently all aircraft arriving and departing the FedEx hub facility on the north end of the airfield cross Runway 9-27. Although not a primary runway, Runway 9-27 is utilized during high levels of crosswinds and for operational efficiency during the fringes of the FedEx arrival and departure pushes. In addition to reducing taxi crossing of the runway during its use, there is value in exploring decoupling the runway from the 18-36 runways where feasible. While identifying capacity related facility requirements, workshops with FedEx and the Air Traffic Control Tower identified the idea of shifting runway 9-27 to the east to provide an end-around-taxiway (EAT) and potentially decouple the runway somewhat from Runway 18R-36L. This should be explored as part of the airfield alternatives analysis.

Taxiway Requirements

Key factors for determining adequacy of taxiways include, but are not limited to, width, separation, and connectivity. The following sections discuss such factors for the taxiways at MEM.

Runway Taxiway Separation

Except for Taxiway V and Runway 9-27, which from Taxiway S to Taxiway V1 which has a separation of 375 feet, all taxiways parallel to a runway have 400-foot separation or greater.

Taxiway Geometry Standards

Similar to runways, the planning and design of taxiways is typically based on an airport's role and the critical design aircraft. For geometric design purposes, it is necessary to establish applicable design standards, represented by the ADG and TDG, for any future airfield development. The design standards specific to taxiways include the taxiway width, shoulder width, safety area, and taxiway separation.

The B777F is a ADG V and TDG 6 aircraft. The standard taxiway dimensions include 75-foot-wide taxiways, 30-foot-wide shoulders, a 285-foot Object Free Area (OFA) and 214 feet separation between parallel taxiways. The current taxiway system at MEM aligns with these requirements. Any planned improvements will also align with these requirements unless otherwise justified.

Taxiway Orientation and Configuration

MEM is equipped with a network of taxiways to facilitate the movement of aircraft to and from the runways. The existing taxiway network is adequately equipped with full-length parallel taxiways for each of the runways and access to and from any air carrier, cargo carrier, or general aviation facility. The taxiways have been determined to provide sufficient access, connectivity, and circulation to accommodate efficient ground movements through the planning period.

Non-Standard Taxiway Conditions

FAA design guidelines and best practices have evolved in recent years and MEM, like many airports, now have taxiway layouts and geometry that are no longer considered to meet standards. MEM has several taxiways that need to be evaluated against standards and addressed when practical or as pavements need reconstruction, including:

- Runway Access from Apron - Taxiways leading from an apron to a runway to make at least one turn between 75- and 90-degrees prior to reaching the runway hold line.

- » Various locations from FedEx ramp to Runway 9-27 (Taxiways N, C, S and V1).
- » Taxiway L from Terminal apron to Runway 18C-36C.
- » Taxiway M6 from Terminal apron to Runway 18R-36L.

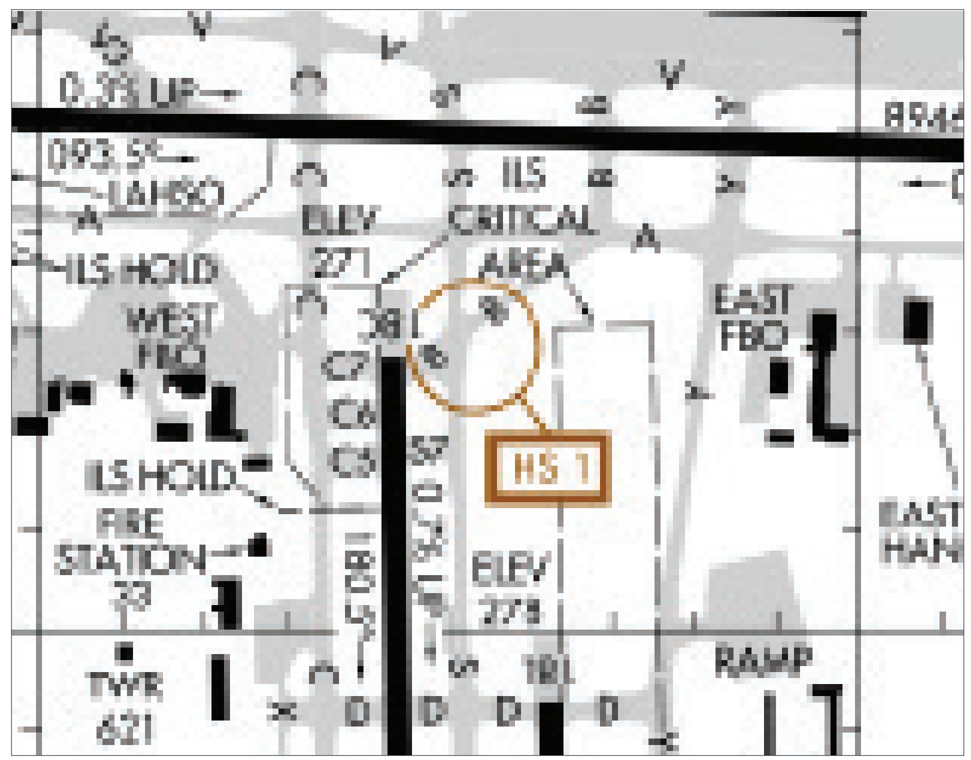
- Three-Path Concept - A pilot has no more than three choices at an intersection; left, right, and forward.
  - » Taxiways C, K, C4
  - » Taxiways C, L, C3
  - » Taxiways C, P, C2
  - » Taxiways S, E, S1
  - » Taxiways S, K, S4, S6
- Taxiway Fillet Geometry: Various locations do not reflect recent changes in standards. Although these locations will not be identified in alternatives or on the capital plan, as pavements are reconstructed, they will be improved as such to comply with design standards for fillet geometry.

Taxiway Hotspots

Although the access, connectivity, and circulation are adequate, the Airport has two "hotspots" or areas that are potentially confusing for pilots. **Figures 6.3 and 6.4** depict Hot Spots 1 and 2. Each should be evaluated during the alternatives analysis and remedied as necessary.

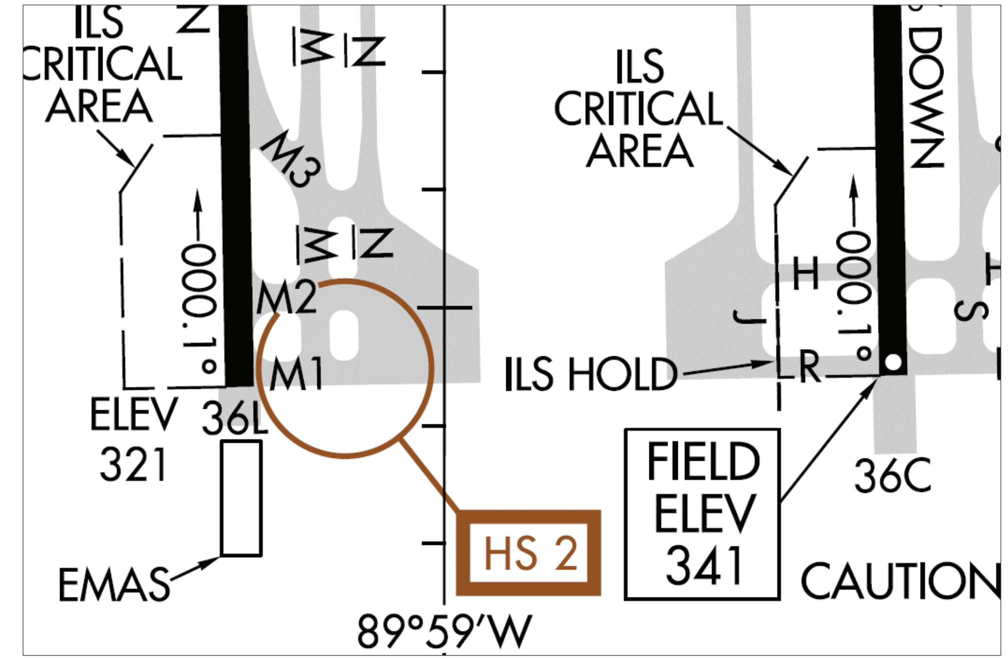
- Hot Spot 1: Hot Spot 1 constitutes the angled intersection of Taxiways B, S and Runway 18C. The angled southbound approach of Taxiway B to Runway 18C could contribute to pilot confusion in terms of discerning between Taxiway S and Runway 18C.
- Hot Spot 2: During reconstruction of Runway 18R-36L, Taxiway M was utilized as a temporary runway and widened to 100 feet. Although there have been no recent reports of confusion, it is believed that because of the wide pavement and the presence of the second parallel Taxiway N, pilots may be confused when taxing from southbound Taxiway N to Runway 36L for departure. This has resulted in instances where pilots have lined up on the taxiway thinking they were on the runway.

FIGURE 6.3 HOT SPOT LOCATION 1



SOURCE: MASTER PLANNING TEAM, 2019

FIGURE 6.4 HOT SPOT LOCATION 2



SOURCE: MASTER PLANNING TEAM, 2019

Future Airfield and Airspace Facility Requirements

The following summarize the future facility requirements for the airfield and airspace at MEM.

Runway Extension

Extension of Runway 18R-36L or 18L-36R to a near or equivalent length of Runway 18C-36C. Additional or reconfigured instrumentation and lighting facilities are not anticipated to be required within the planning horizon.

Runway 9-27 Shift

Shifting runway 9-27 to the east to provide an end-around-taxiway (EAT) and potentially partially decouple the runway from Runway 18R-36L operations.

Taxiways

Three future facility requirements have been identified for the taxiway system:

- Hot Spots 1 and 2.
- Addressing areas not standard with Three-Path Concept.
- Addressing non-standard areas where the runway can be directly accessed from an apron.

Airfield/Airspace Alternatives

Although the results of the demand/capacity analysis did not dictate the need for significant airside expansion, airfield alternatives that would optimize airfield operations, address non-standard conditions, and prepare for the future growth were explored.

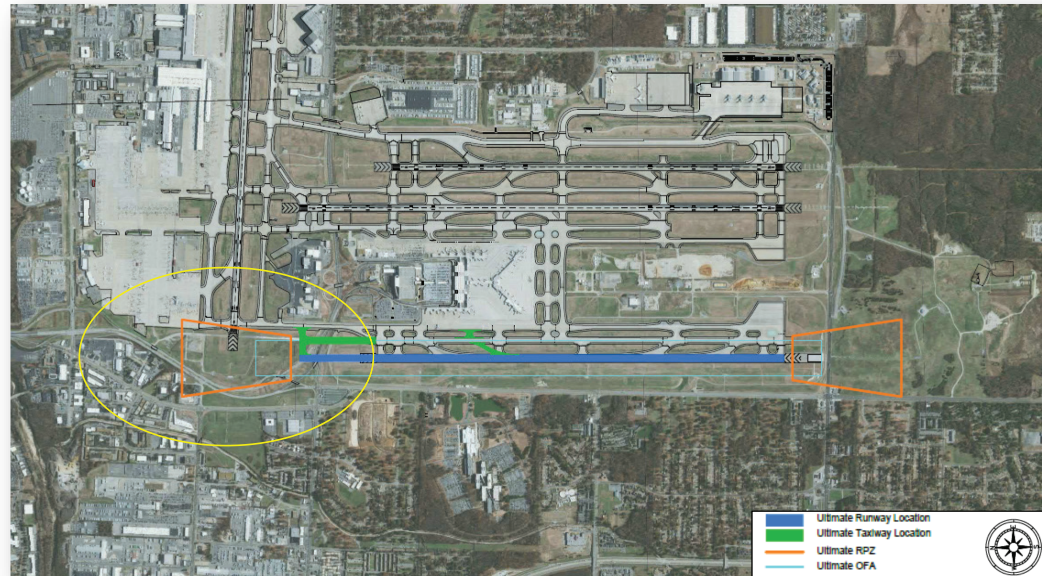
Runway Extension to Provide Redundant Runway Length

Five (5) alternatives were developed to provide other runway(s) at or near the length of Runway 18C-36C (11,120 feet). **Figures 6.6 - 6.10** depict the alternatives and their corresponding pros and cons.

- Alternative 1: Extend Runway 18R-36L north; extend Taxiway M; add high-speed taxiway at M6.
- Alternative 2: Extend Runway 18R-36L south; add high-speed taxiway at M6.
- Alternative 3: Extend Runway 18R-36L south; shift Runway 18C-36C south.
- Alternative 4: Extend Runway 18R-36L south; shift Runway 18C-36C south; extend Runway 18L-36R south.
- Alternative 5: Partially extend Runway 18L-36R north (645' extension).

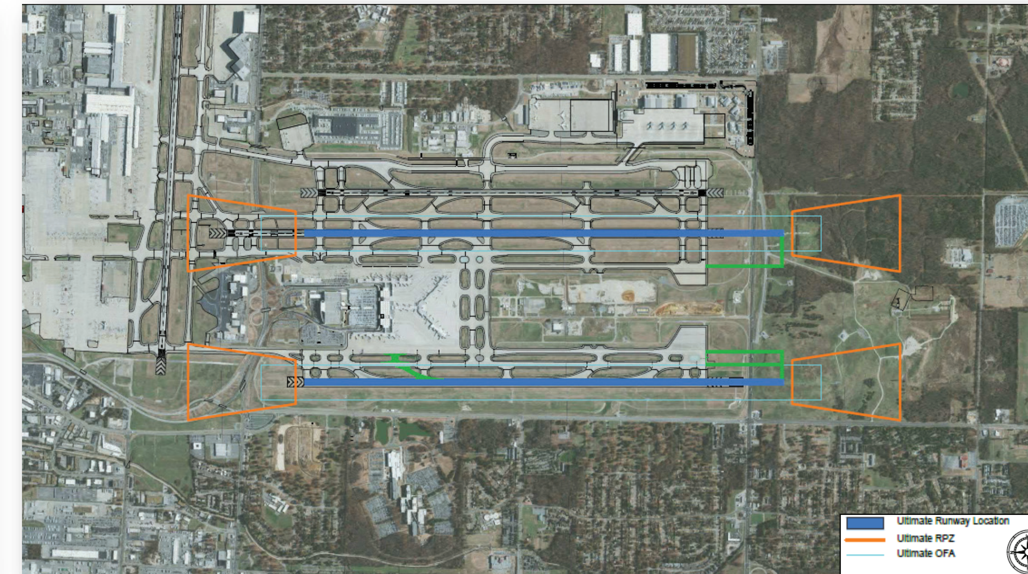
In consultation with FedEx and FAA Air Traffic Control, it was concluded that Alternative 2 provided the best balance of improving airfield efficiency, cost, and flexibility. Alternative 2 alleviates the cross over conflict (aircraft departing Runway 18C traveling westbound must cross the departure stream of Runway 18R), does not require the extension of Taxiway M over Winchester Boulevard as part of the project and allows for a future shift of Runway 9-27.

FIGURE 6.5 RUNWAY EXTENSION ALTERNATIVE 1



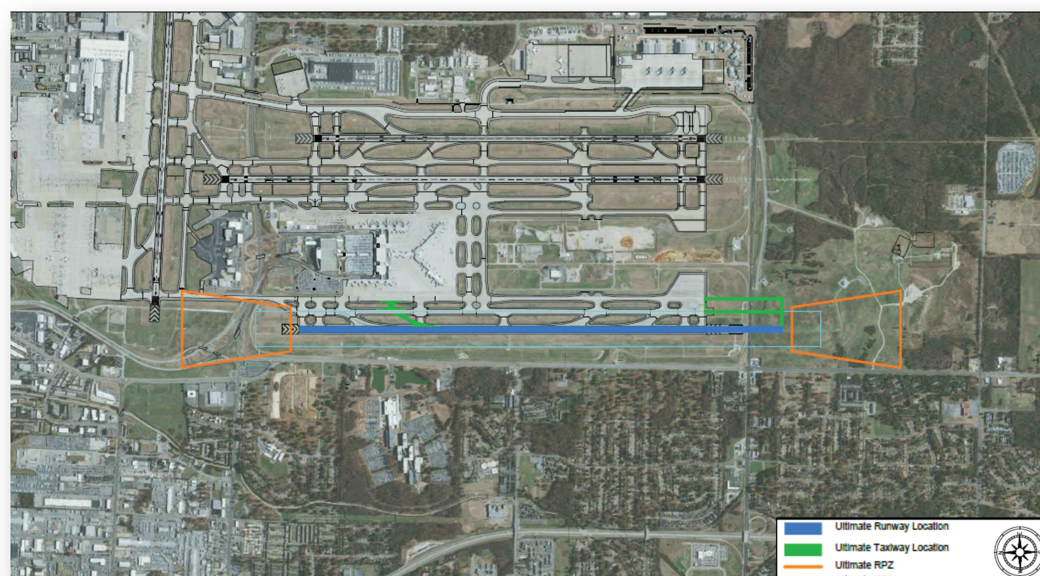
SOURCE: MASTER PLANNING TEAM, 2019

FIGURE 6.6 RUNWAY EXTENSION ALTERNATIVE 3



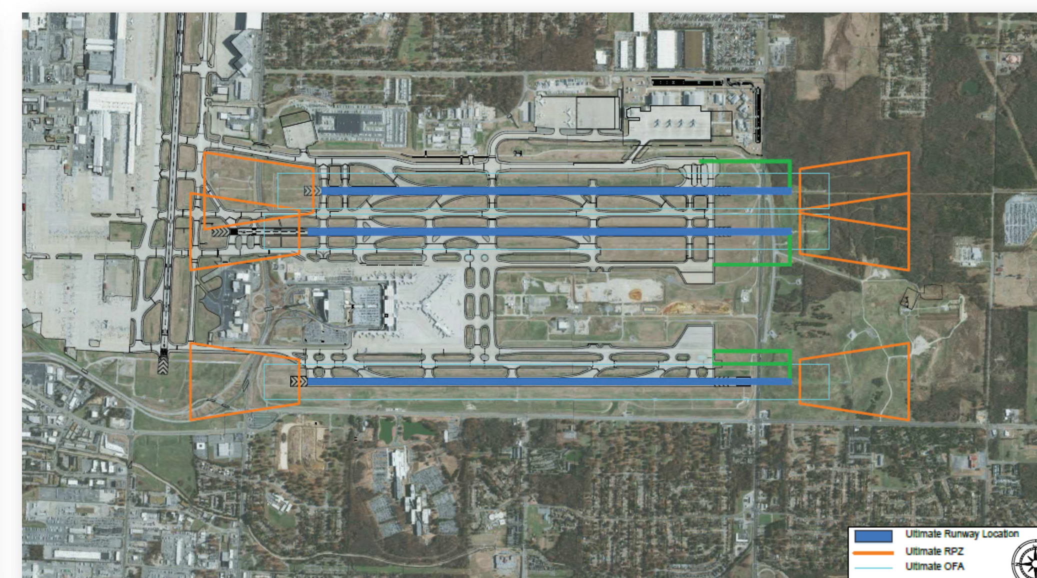
SOURCE: MASTER PLANNING TEAM, 2019

FIGURE 6.7 RUNWAY EXTENSION ALTERNATIVE 2



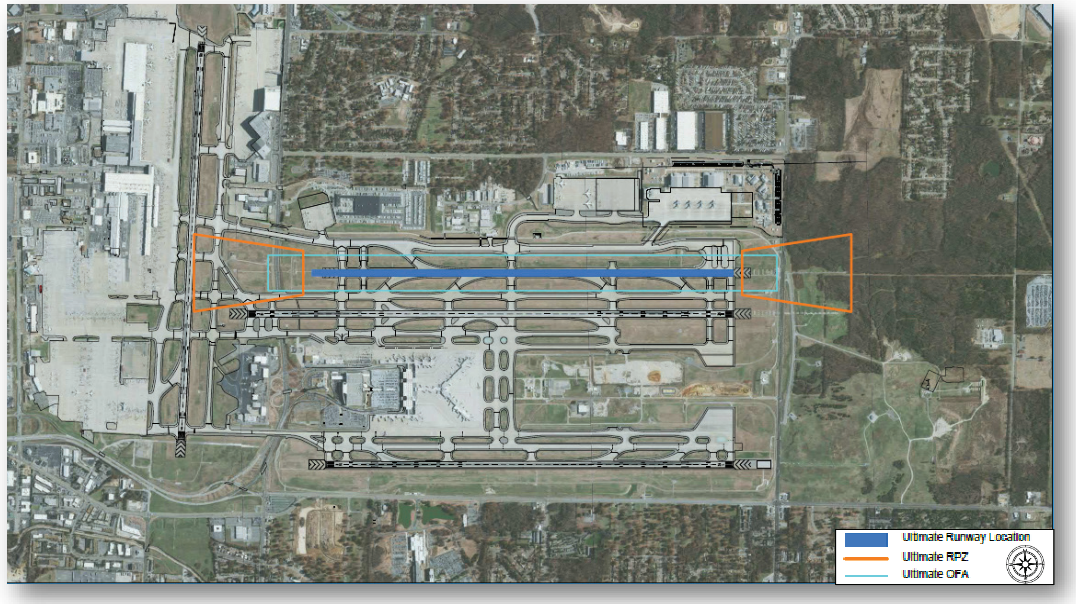
SOURCE: MASTER PLANNING TEAM, 2019

FIGURE 6.8 RUNWAY EXTENSION ALTERNATIVE 4



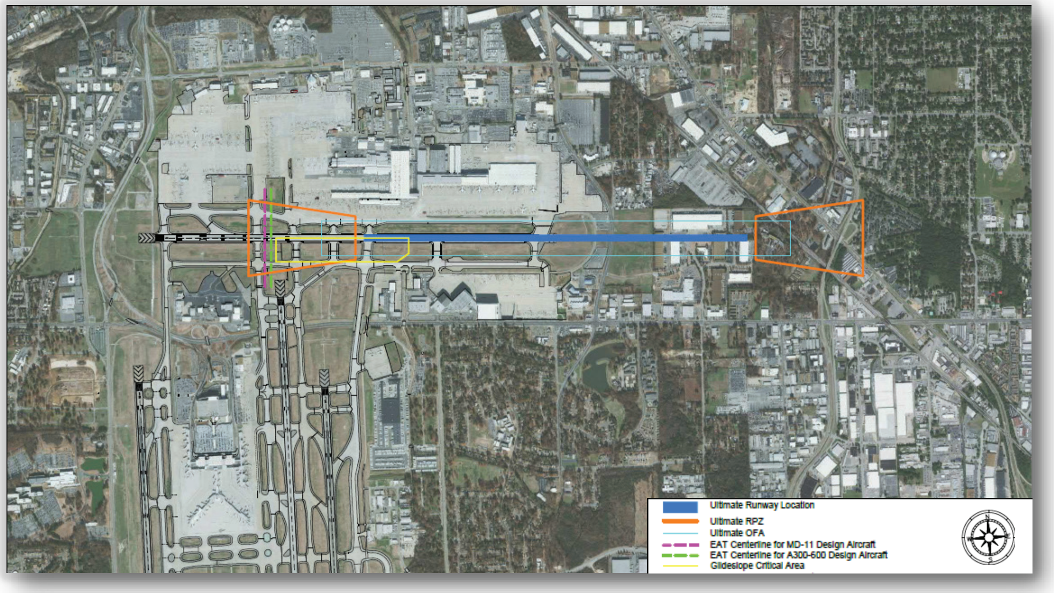
SOURCE: MASTER PLANNING TEAM, 2019

FIGURE 6.9 RUNWAY EXTENSION ALTERNATIVE 5



SOURCE: MASTER PLANNING TEAM, 2019

FIGURE 6.10 RUNWAY EXTENSION ALTERNATIVE 6



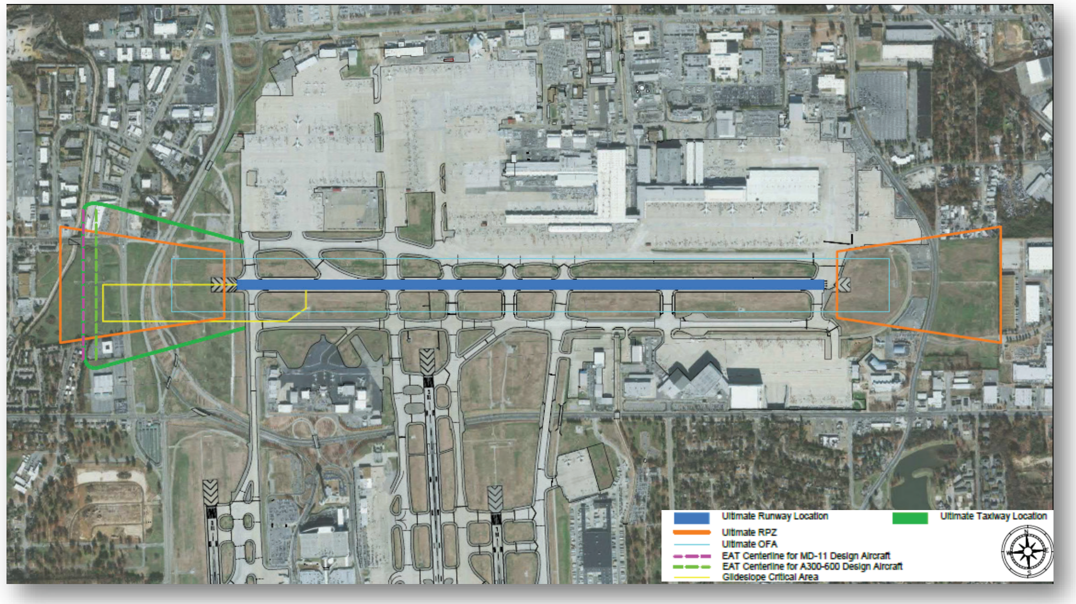
SOURCE: MASTER PLANNING TEAM, 2019

Runway 9-27 Shift

Three (3) alternatives were evaluated to shift Runway 9-27 to reduce runway crossings and potentially decouple it from one or more of the north/south parallel runways. **Figures 6.11 and 6.12** depict the alternatives and their corresponding pros and cons. Each alternative also includes extending Taxiway M north over Winchester Road.

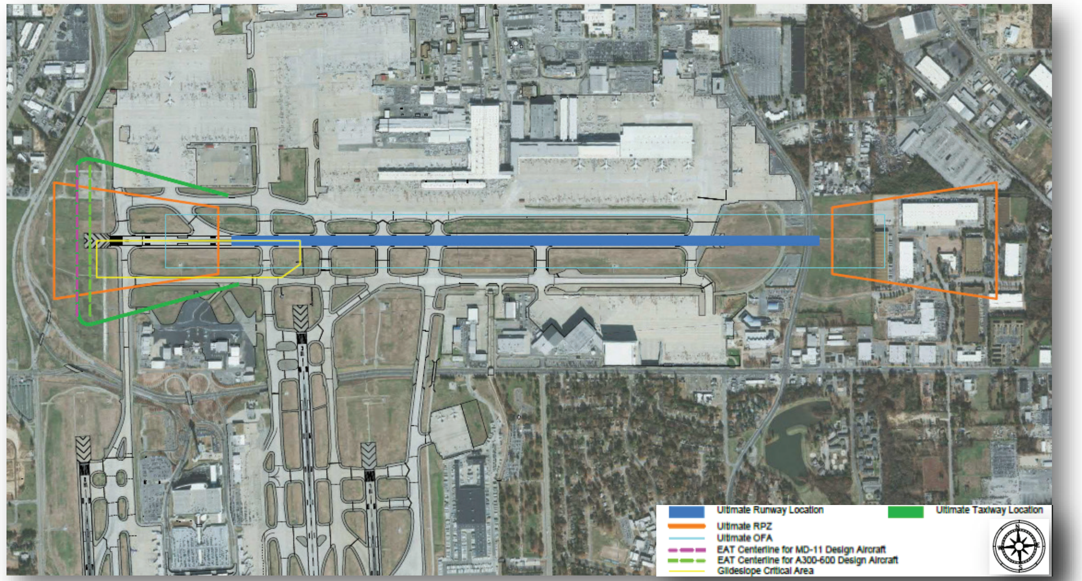
- Alternative 1: Shift Runway 9 departure end east to Taxiway Y.
- Alternative 2: EAT with existing runway location.
- Alternative 3: EAT with shifted runway location to avoid access road impacts.

FIGURE 6.11 RUNWAY 9-17 SHIFT ALTERNATIVE 1



SOURCE: MASTER PLANNING TEAM, 2019

FIGURE 6.12 RUNWAY 9-17 SHIFT ALTERNATIVE 2

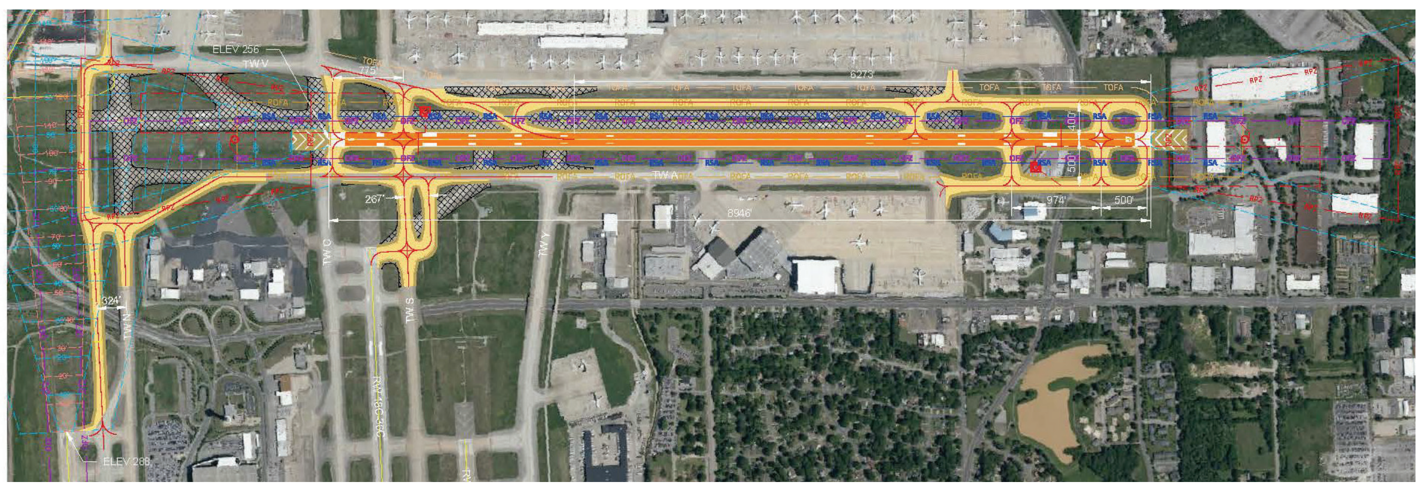


SOURCE: MASTER PLANNING TEAM, 2019

Two conclusions were drawn from the alternatives analysis. First, Alternative 3 was determined to be the most feasible in that it was the least impactful from an off-airport land use perspective and thus a cost perspective. Secondly, it was determined that the likely timing of the project would coincide with reconstruction of the runway.

With the project including full reconstruction of the runway, a shift to the south would also be feasible and provide more beneficial separation between the runway, Taxiway V and the FedEx ramp. Currently there is a restriction on Taxiway V due to the 375-foot separation to Runway 9-27 and the separation between the taxiway and the FedEx ramp. Shifting the runway and Taxiway V south 200 feet would provide the standard 400-foot separation between Runway 9-27 and both Taxiways A and V. **Figure 6.13** depicts the concept of shifting Runway 9-27 south and to the east.

FIGURE 6.13: RUNWAY 9-27 RECOMMENDED ALTERNATIVE



SOURCE: MASTER PLANNING TEAM, 2019

While Alternative 3, as described above, provides the best solution there are still several considerations and further analysis that would need to be conducted to fully vet its benefit and financial feasibility. Furthermore, the project would not likely be within the planning horizon.

For these reasons, the Memphis-Shelby County Airport Authority (MSCAA) determined that it would articulate the potential for the project in this document and on an Ultimate Airport Layout Plan Drawing. This would not be submitted officially to the FAA for airspace and other approvals but would be submitted for informational purposes and to ensure that the public and other stakeholders were aware of its potential in the future.

Taxiway Improvements

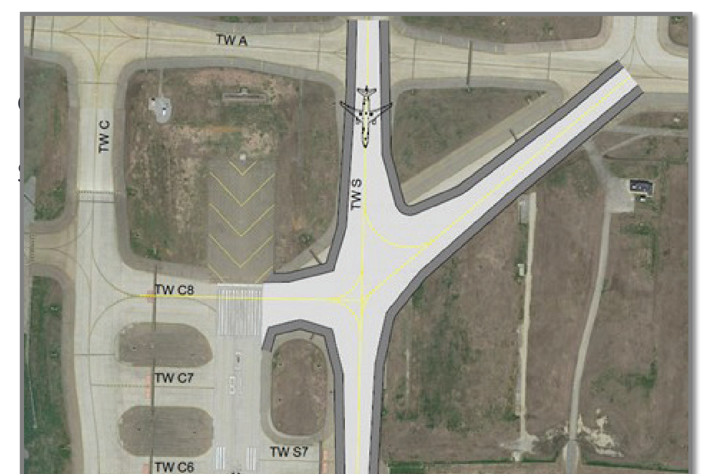
The following taxiway improvements were identified to address the hot spots and the new FAA requirements for the three-path concept and runway access from apron.

- Hot Spots 1 and 2.
- Addressing areas not standard with Three-Path Concept.
- Addressing non-standard areas where the runway can be directly accessed from an apron.

<u>Hot Spot 1</u>

Two (2) alternatives were evaluated to address Hot Spot 1. Alternative 2 was deemed to be the most effective in minimizing pilot confusion. **Figure 6.14** and **6.15** depict each alternative.

FIGURE 6.14: HOTSPOT 1 ALTERNATIVE 1



SOURCE: MASTER PLANNING TEAM, 2019

FIGURE 6.15: HOTSPOT 1 ALTERNATIVE 2

SOURCE: MASTER PLANNING TEAM, 2019

<u>Hot Spot 2</u>

The only and most effective alternative identified to address Hot Spot 2 is the narrowing of the taxiway from 100 feet to 75 feet. This narrower width will provide an additional visual queue to the pilot that they are located on a taxiway and not the runway. The improvement includes the narrowing of Taxiway M to 75 feet from the runway end to Taxiway M3.

<u>Taxiway V1/V2</u>

Though not a hot spot, the Taxiway V1 and V2 expanse of pavement has been identified as a potential point of pilot confusion. Runway Incursion Mitigation (RIM) location and the ultimate reconstruction and shifting of Runway 9-27 will address this condition, however an interim project was identified to be included in Future Airport Layout Plan and as part of this Master Plan Update.

FIGURE 6.17: TAXIWAY V1/V2 ALT 1

SOURCE: MASTER PLANNING TEAM, 2019

FIGURE 6.18: AXIWAY V1/V2 ALT 2

SOURCE: MASTER PLANNING TEAM, 2019

FIGURE 6.19: AXIWAY V1/V2 ALT 3

SOURCE: MASTER PLANNING TEAM, 2019

Multiple configurations of the taxiway connector improvements were evaluated and are depicted in **Figure 6.17-6.19**.

Through review and discussion with FAA Airport District Office and ATC, as well as FedEx, Alternative 1 was identified as the preferred concept. The exact placement of lead-in lines and islands will be further studied and determined during design phases.

Three-Path Concept

The areas identified with more than three decisions/paths for a pilot to take are all associated with Runway 18C-36C. Each of these intersections contain critical exit points and crossings. It was determined that the most appropriate approach is to evaluate those intersection and address the non-standard condition when the runway is reconstructed.

Runway Access from Apron

Apron access from the FedEx ramp to Runway 9-27 is a controlled environment where hand-off points from ramp control to the FAA ATC exist. Furthermore, those locations will be addressed as part of the Runway 9-27 shift. Access to the runways from the Terminal Aprons will be addressed by demolition of Taxiway L (between Taxiways C and J) and Taxiway M6 (between Runway 18R-36L and Taxiway M).

Other Taxiway Improvements

The following taxiway improvements were identified through the alternatives process to improve efficiency, flexibility and enhance safety.

- Extension of Taxiway C to the south to aid in sequencing aircraft in and out of Central Deicing Facility.
- Construct a new highspeed exit between Taxiway M5 and demolished Taxiway M6 (aligns with eliminating runway access from apron and Runway 18R extension).
- Demolish Taxiway M2 (aligns with Runway 18R extension).

GENERAL AVIATION AND MILITARY FACILITIES

Currently, two fixed base operators (FBOs) operate at the Airport, Signature Flight Support and Wilson Air Center. The FBOs provide a wide range of services to users, including apron and indoor aircraft parking/storage and FBO support services.

As outlined in the Inventory Chapter, there are several aircraft storage and handling facilities at each FBO location. To identify future needs, the MSCAA/Master Plan Team met with each FBO to discuss their current and future facility needs. In terms of new FBO entrants, at the time of this Master Plan, none are planned for or are known to desire entrant into MEM.

The following summarizes the input received related to demand/capacity and future facility needs for each of the FBO operations.

Signature Flight Support

Aircraft Parking (Apron)

- Adequate parking for current and forecast activity.
- Apron in good shape - Recent overlay project to replace existing apron pavement.
- Desire to shift western taxilane entrance to campus north to prevent incursions with aircraft utilizing Taxiway N.

Indoor Aircraft Storage

- Hangars are currently operating at 115% capacity with no apparent issues.
- Need to modify/replace existing hangars: replace Hangar 14, expand Hangars 1 and 1A (currently exploring four (4) options).
- Need for hangars to accommodate taller tail heights.
- Expect new hangar along "corporate row" to be funded by occupying tenant.

FBO Operations

- Adequate capacity for current and future traffic levels.
- Fuel trucked from fuel farm.
- Would be prudent to increase capacity in anticipation of larger jet traffic.
- Possibility to incorporate 3rd-party services (ex. de-icing) "in house" as operations grow.

Vehicle Parking

- The current landside parking infrastructure (main lot plus auxiliary lots) is sufficient to meet demand.

Wilson Air Center

Aircraft Parking (Apron)

- Adequate space for current and forecast activity.
- Apron re-surfacing is not required in near future.
- Expansion challenged by surrounding developments.
- Interest in expanding on the east side by bridging over Hurricane Creek.

Indoor Aircraft Storage

- Need a new hangar to accommodate future demand.
- No maintenance facilities (no need expressed).

FBO Operations

- Adequate capacity for current and future traffic levels.
- Terminal facility does not require modifications.
- Existing fuel tanks provide sufficient capacity.

Vehicle Parking

- Landside parking infrastructure sufficient to meet demand.
- Some concerns during the football season (peak demand).

Although the discussions with the FBOs did identify facility improvements needs, much of those needs can be accommodated on the existing sites. It is recognized that the expansion of Wilson Air Center hangars will be difficult to accommodate on-site. The Signature FBO site does have more opportunities to reconfigure the taxilanes and replace hangars to accommodate larger aircraft. This Master Plan will not identify new FBO specific sites to preserve for development, nor can either existing site be expanded significantly. New facilities related to General Aviation will be considered on a case-by-case basis and lands identified as "Future Aviation Related Development" on the Airport Layout Plan could be made available for such a purpose.

Cargo Facilities

Memphis International Airport is unique in that it is home to FedEx's World Hub. FedEx leased facilities and estimating their future needs were not included in this Master Plan Update. MSCAA and FedEx meet regularly to discuss airport land use and facility needs. Any known/requested needs will be contemplated and included within the Airport Layout Plan.

UPS and various other freight forwarders/cargo charters operate at MEM. Interviews with UPS determined that their existing facilities are adequate to meet future needs. All other carriers utilize the East Cargo Ramp and adjacent Cargo Central Warehouse and do not require additional building facilities. It is estimated that these facilities will also accommodate future needs through the planning horizon.

New cargo operators requiring exclusive apron and building facilities will be considered on a case-by-case basis and lands identified as "Future Aviation Related Development" on the Airport Layout Plan could be made available for such a purpose.

Aircraft Maintenance Facilities

No specific air carrier maintenance buildings are present on the airfield. New facilities related to aircraft maintenance will be considered on a case-by-case basis and lands identified as "Future Aviation Related Development" on the Airport Layout Plan could be made available for such a purpose.

Airport Maintenance Facilities

Facilities for the storage of airport maintenance equipment, such as fleet vehicles, lawn care, and snow removal equipment, are currently being constructed and opening in mid-2020. The new Airfield Maintenance and Warehouse Facility will be referred to as the Mission Support Center (MSC). The facility will house the Airport Authority's airfield maintenance area, Memphis Airport Police, Communications Dispatch, Operations staff, and Procurement staff along with a warehouse. The facility will also serve as a base for emergency and snow operations.

The MSC is expected to accommodate demand through the planning horizon. Additional snow equipment storage may be required in the future and can be accommodated on site to the south of the existing storage areas.

Airport Traffic Control Tower (ATCT)

MEM is served by a 24-hour ATCT located north of the Economy Garage. The facility designed for Activity Level 12 (ATC12) and has sufficient capacity to accommodate current and forecast activity. Additionally, there are no airfield facilities recommended that would create line of site issues.

Aircraft Rescue and Firefighting Facilities (ARFF)

The Airport's ARFF is accommodated in two facilities:

- A 20,000 square-foot facility located on Airport property on the east side of the Airport along Rudder Road, north of Taxiway P. The state-of-the-art facility became operational in 2008. Specialized equipment at the station complies with FAA guidance and regulations for ARFF Index C.
- Memphis Fire Department Station #33, the Airport's second station, is 4,800 square feet and located in the Main Terminal, north of the Air Cargo Apron adjacent to Taxiway C. This facility provides structural fire suppression and backup ARFF assistance as needed and is equipped to handle both aircraft crash and rescue and services to the surrounding municipal area, if necessary.

The facilities are anticipated to meet the needs of the airport throughout the planning horizon. Furthermore, no change in ARFF index is anticipated.

Deicing Facilities

In 2022, a Consolidated Deicing Facility (CDF) was opened that provides airlines with a centralized location to perform their de-icing operations during winter weather. The project included the relocation of Louis Carruthers Road, the construction of two taxiway bridges and one vehicle bridge, and the construction of deicing pads and associated infrastructure. The pad contains 12 deicing positions, each able to handle the largest aircraft in the FedEx fleet, as well as glycol storage and reclamation facilities.

The CDF is anticipated to meet the needs of the airport throughout the planning horizon.

Remain-Over-Night (RON) Hardstand

Hardstands for RON aircraft that are not able to park at the gates are currently accommodated on the southwest leg of the Concourse and adjacent to Concourse A and C. Availability for RON positions to remain at Concourses A and C in the future will be dictated by terminal and landside development. Upwards of 15 RON hardstands will be required based on discussions with the airlines and recent trends. The terminal/landside alternatives analysis should contemplate and accommodate this need.

Aircraft Ground Run-ups

Two (2) Ground Run-up Enclosures (GREs) are located on the airfield. One is located on the north side of the Tennessee Air National Guard (TnANG) facility, sized to accommodate C-5A aircraft and used exclusively by the TnANG. The second GRE is located on FedEx's Winchester Ramp near the maintenance facilities south of Runway 9-27, and east of Taxiway Y. The FedEx GRE is sized to accommodate B777 aircraft and used exclusively by FedEx. Ground run-ups are also conducted by the passenger airlines and FedEx at a variety of airfield surface locations around the airfield.

Due to the potential noise impacts of conducting aircraft run-ups at surface locations, the MSCAA desires to identify a location for a second GRE that would be available to all users of the airfield.

Airline Catering and Flight Kitchen

Currently Gate Gourmet, who previously leased space from MSCAA for an on-site flight catering facility, now operates from a facility off of airport property. It is anticipated that this practice will continue and thus the Master Plan does not require preserving space for on-airport flight catering facilities. Should one be desired, lands identified as "Future Aviation Related Development" on the Airport Layout Plan could be made available for such a purpose.

Aircraft Fuel Storage

The Airport's primary fuel farm provides storage for fuel used by air carrier aircraft and is located between Runways 18C-36C and 18R-36L, immediately to the south of Taxiway P. The 1.05 million gallon capacity is supplied directly from the Valero Refinery pipeline. A hydrant system, transports jet fuel directly from the fuel farm to individual hydrant locations on the passenger terminal ramp adjacent to aircraft.

In addition to the fuel farm supporting air carrier operations, there are other aviation fuel facilities located at Signature Flight Support, Wilson Air Center, TnANG, and the FedEx Super-hub. FedEx's fuel farm is located to the north of Democrat Road.

Each of these facilities is expected to accommodate future demand through the planning horizon. If there is a need for additional tank capacity, each location has the potential to add additional tank capacities on the existing footprint.

Utilities

The four major site utilities the Master Plan reviewed include storm sewer, sanitary sewer, electrical power, and communications. The following sections describe the existing configuration of each of these systems.

Storm Sewer

The scope of the Master Plan Update included creation of a storm water management model using the 1D Environmental Protection Agency (EPA) Storm Water Management Model (SWMM) Version 5.1. This model will be leveraged to evaluate developments identified through this Master Plan Update and through other means. No significant storm sewer improvements were identified to support existing infrastructure.

Sanitary Sewer

No significant storm sewer improvements were identified to support existing infrastructure.

Power

Power and specifically accommodating electrical vehicles (EV) is a major focus of the MSCAA. Memphis Light Power & Gas (MLGW) provides power to MEM. Although not part of this Master Plan Update, MSCAA has initiated studies to identify future needs campus wide and developing strategies to accommodate increased demand, including renewable energy, micro grids, and other facility developments.

Water

Water is provided by MLGW. At times water pressure has been compromised due to off-airport MLGW facility failures. This has impacted the airport. MSCAA is exploring strategies to install equipment (i.e. pumps to maintain water pressure) on-airport to mitigate interruptions to water availability.

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PREFERRED DEVELOPMENT PLAN

Chapter 7 describes the overall development plan for the Airport over the course of the planning period based on the recommendations of the alternatives analysis. The development plan identifies the specific projects to be included in the Capital Improvement Program (CIP), reviews the financial feasibility analysis of the CIP, and provides an environmental overview of the Master Plan recommendations.

Master Plan Capital Improvement Program

The CIP for the Memphis International Airport (MEM) summarizes the capital improvement projects anticipated through the course of the planning horizon based on the recommendations of the Master Plan alternatives analysis. It should be noted that the overall CIP for MEM may contain other projects, such as airfield pavement rehabilitation and operational enhancements, which are not articulated herein as those projects are more asset management in nature and not typically part of a master plan process. Each of the projects included in the Master Plan CIP is listed and illustrated in **Figure 7.1**.

The following sections describe the details of project cost-estimates, provide an overview of the timeframe of the CIP, and provide a summary of each anticipated project. Each project summary provides a description of the project, a graphic illustration of the scope of work, a summary for the need for the project, the anticipated cost, potential funding sources, and the approximate duration.

CIP Cost Estimates

The Master Plan included the development of a rough order of magnitude opinion of probable costs for each of the potential CIP projects. All costs are in current (2021 or 2022) U.S. Dollars and do not include escalation. While some projects include more detailed study than others, the estimates in general are intended only for the overall high-level financial planning conducted as a part of this Master Plan.

Construction cost estimates are based on the measurement and pricing of planning level quantities for each project prepared in this Master Plan and include Estimated Design Evolution (25%) and Owners Soft Costs (varies based on project). **Figure 7.2** lists each of the CIP projects and the associated cost estimate.

CIP Timeline

There are two aspects to the timing of the proposed CIP projects: passenger/operations activity and useful life/time. Most projects in the proposed CIP are projects driven by passenger activity. These projects are expanding the available capacity to meet future demand. Some projects, specifically those that relate more to the end of a facility's useful life, have more relation to time. Based on the demand/capacity analysis and the existing facility assessments, the CIP primarily balanced the needs of projects between the anticipated passenger activity from the forecast and the needs of facilities

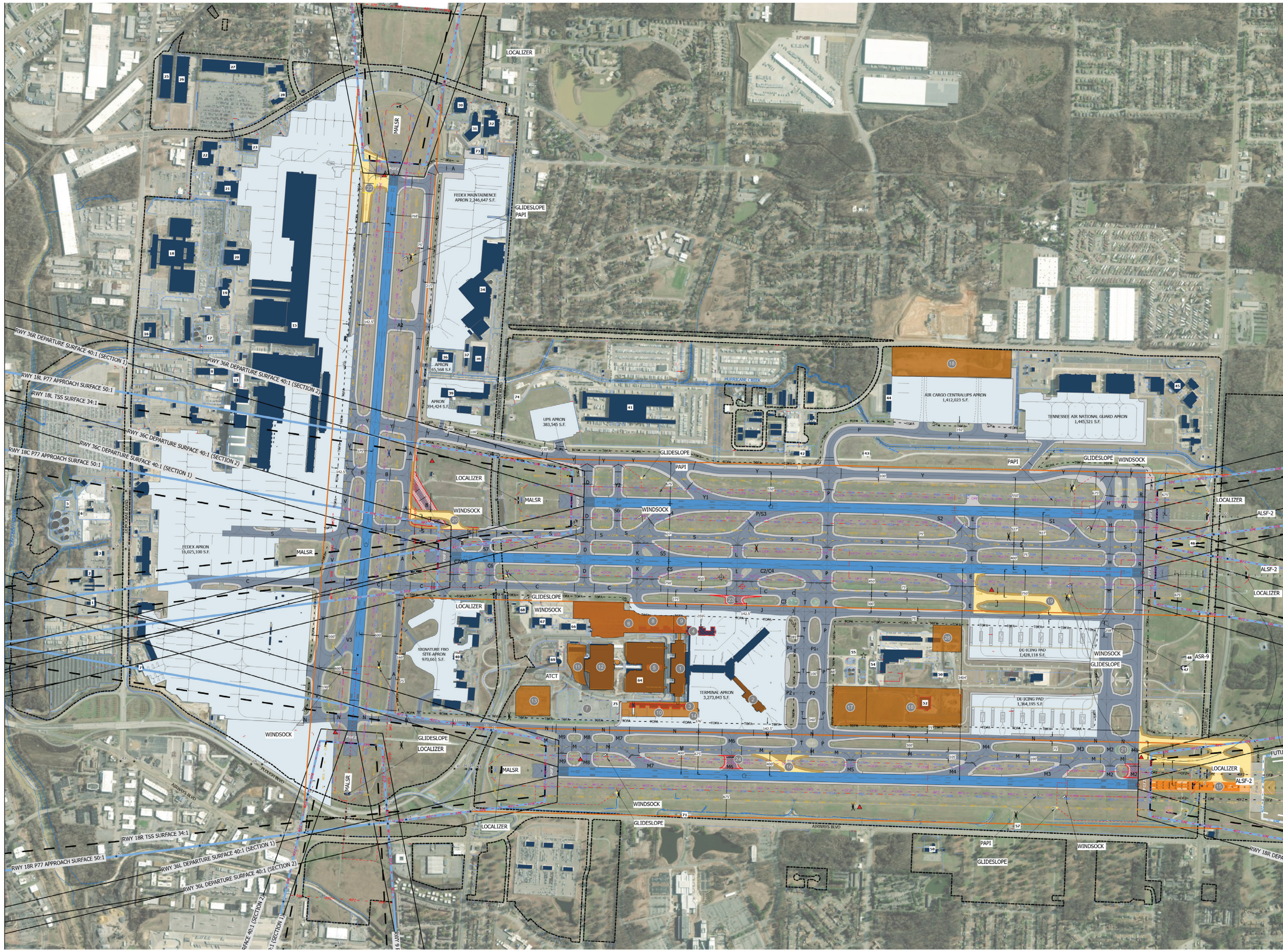
FIGURE 7.2: MASTER PLAN CIP

Projet Number /1	Project Name	Estmated Cost /2
Near Term – BASELINE TO PAL 2		$ 1,550,738,725
1	Terminal Modernization & Seismic Program (TMSP)	$ 1,200,000,000
3	Concourse A Demolition	$ 5,000,000
6	Surface Lot E (Yellow)/Employee Lot Expansion	$ 5,567,577
7	Surface Lot F (Blue)	$ 5,000,000
10	Rental Car Garage	$ 220,796,037
11	Employee Parking	$ 2,174,982
12	Economy Garage (Convert RAC to Public Parking)	$ 13,522,265
13	Travel Plaza	$ 13,877,764
14	Replacement Admin Building	$ 50,000,000
17	Ground Run-up Enclosure	$ 17,550,000
18	Future Aviation Related Development	TBD
20	Hot Spot 1 Reconfiguration	$ 9,250,000
21	Hot Spot 2 Reconfiguration	$ 8,000,000
26	Construct Snow Equipment Building	$ 15,000,000
Long Term – (PAL 2 to PAL 4)		$ 511,301,870
2	Concourse Modernization (SW Leg)	$ 120,000,000
4	Concourse C Demolition	$ 5,000,000
5	Re-life of Short-Term Garage	$ 76,146,291
8	Public Parking Garage C	$ 141,119,260
15	Runway 18R/36L Extension	$135,203,751
16	Runway Highspeed Taxiway M7	$ 11,100,000
19	Taxiway C Extension	$ 22,732,568
Other Potential Projects (As neededm on-going or PAL 4 and Beyond)		$ 960,520,764
9	Hotel Development (Site Prep)	$ 5,759,207
22	Taxiway V1/V2 Reconfiguration	$ 23,540,715
23	Taxiway L Demolition	$ 3,500,000
24	Taxiway M6 Demolition	$ 820,842
25	Solar Installation	TBD
Not shown	Runway 9-27 Shift South & East, Taxiway M Extension (Not on FALD)	$ 911,900,000

/1 Project number refers to the designation in Figure 7.1
/2 2021/22 US Dollars

SOURCE: MASTER PLANNING TEAM, 2019

FIGURE 7.1: PREFERRED DEVELOPMENT PLAN/MASTER PLAN CIP



FUTURE FEATURES	
ID	**Project Description**
1	Terminal Modernization & Seismic Program (TMSP)
2	Concourse Modernization (SW Leg)
3	Concourse A Demolition
4	Concourse C Demolition
5	Re-life of Short-Term Garage
6	Surface Lot E (Yellow/Employee Lot Expansion)
7	Surface Lot F (Blue)
8	Public Parking Garage C
9	Hotel Development
10	Rental Car Garage
11	Employee Parking
12	Economy Garage (Convert RAC to Public Parking)
13	Travel Plaza
14	Replacement Admin Building
15	Runway 18R/36L Extension
16	Runway High Speed Taxiway M7
17	Ground Run-up Enclosure (GRE)
18	Future Aviation Related Development
19	Taxiway C Extension
20	Hot Spot 1 Reconfiguration
21	Hot Spot 2 Reconfiguration
22	Taxiway Victor 1/Victor 2 Runway Incursion Mitigation - Design
23	Taxiway L Demolition
24	Taxiway M5 Demolition
25	Solar Installation
26	SRE Storage Expansion

SOURCE: MASTER PLANNING TEAM, 2019

CIP Project Descriptions

Terminal Modernization & Seismic Program (TMSP)

Project Description/Need:

Constructed in 1962 and located in the New Madrid Fault Zone, MEM's terminal facilities are aging and do not meet modern seismic or current building code standards. In addition to aging infrastructure, MEM has transitioned from a hub airport to an origin and destination airport with much different passenger and market demands. As such, the existing terminal facilities no longer meet the current or forecasted needs of the airport requiring expansion, renovation, and modernization efforts.

The TMSP is multi-year program that will modernize the 60-year-old terminal and its facilities. The modernization plan will ensure seismic resiliency, meet future demand, reduce environmental impacts through sustainability, improve the customer experience, improve Americans with Disabilities Act (ADA) access requirements, and ensure flexibility as operations continue to evolve. The overall program will expand the face of the building, reconfigure vertical circulation, reconfigure the ticket lobby, construct a Central Baggage Inspection System (CBIS), expand the Security Screening Checkpoint (SSCP), construct an employee screening checkpoint, expand bag claim, and prepare an area for a future new Federal Inspection Station (FIS).

Project Triggers

Needed immediately. Phase 1 of the modernization of the terminal complex was completed with the opening of the new concourse. Phase 2 will modernize the terminal building.

Potential Funding Sources:

Airport Improvement Program (AIP), Passenger Facility Charges (PFC), General Airport Revenue Bonds (GARBs), Transportation Security Administration (TSA), Bipartisan Infrastructure Law (BIL), and State funding.

Project Duration :

Five (5) to ten (10) years.

Concourse A Demolition

Project Description/Need:

The demolition of Concourse A is required to allow for the construction of the replacement Administration Building and Rental Car Garage. The concourse is not needed for terminal or other airside uses.

Project Triggers

Construction of replacement Administration Building.

Potential Funding Sources:

PFC, GARBs, Customer Facility Charges (CFC), BIL, and State funding.

Project Duration:

One (1) year.

Surface Lot E (Yellow)/Employee Lot Expansion

Project Description/Need:

Expansion of public and employee parking is needed to meet growing demand. This project will convert areas adjacent to Concourse C and the belly cargo buildings, previously used for aircraft parking, to public and employee parking. The project includes fencing, stripping, and lighting improvements. Concourse C and the adjacent ramps are not needed for terminal or other airside uses.

Project Triggers

Growth in parking demand.

Potential Funding Sources:

GARBs, BIL, and State funding.

Project Duration:

Less than one (1) year.

Surface Lot F (Blue)

Project Description/Need:

Expansion of public and employee parking is needed to meet growing demand. This project will expand the existing Blue Lot to accommodate growth in public and employee parking. The project includes fencing, stripping, and lighting improvements.

Project Triggers

Growth in parking demand.

Potential Funding Sources:

GARBs, CFC, and State funding.

Project Duration:

Less than one (1) year.

Rental Car Garage

Project Description/Need:

Expansion of rental car facilities is required to meet future demand. The existing facilities in the Economy Garage cannot be easily expanded without adverse impact on public parking. Further, the garage is not a purpose-built facility and is not optimally efficient for rental car operations. Therefore, a new facility will be developed in the area currently occupied by Concourse C.

Project Triggers

Growth in rental car and public parking demand. Initiation of the design process to begin immediately.

Potential Funding Sources:

CFC and State funding.

Project Duration:

Two (2) to three (3) years.

Employee Parking

Project Description/Need:

Conversion of the existing rental car quick-turn-around facility to employee parking.

Project Triggers

Completion of the rental car garage.

Potential Funding Sources:

CFC, GARBs, and State funding.

Project Duration:

One (1) year.

Economy Garage (Convert RAC to Public Parking)

Project Description/Need:

Conversion of the existing floors 1 and 2 of the Economy Garage to public parking. The project will include signage, stripping and modification of ramps.

Project Triggers

Completion of the rental car garage.

Potential Funding Sources:

CFC, GARBs, and State funding.

Project Duration:

One (1) year.

Travel Plaza

Project Description/Need:

Construction of a travel plaza facility at the entrance to the airport off Jim McGehee Parkway. The facility will include a gas station, food/beverage and reconfigure the cell phone lot to allow meter/greeters to utilize the facility.

Project Triggers

To be developed as needed and/or as third-party interest presents itself.

Potential Funding Sources:

GARBs and State funding.

Project Duration:

One (1) year.

Replacement Admin Building

Project Description/Need:

Construction of a new structure to house MSCAA staff, as well as the TMSP's CBIS. The focus of TMSP is to modernize the terminal facilities to improve passenger flow, efficiency, and operations. To achieve this, the terminal will be reconfigured and "opened up" to provide an improved customer experience. This requires the existing mezzanine offices to be removed. The replacement building will allow the completion of the TMSP and also position MSCAA for future growth in administrative staff and functions.

Project Triggers

Initiation of the Terminal Modernization & Seismic Program.

Potential Funding Sources:

GARBs, BIL, and State funding.

Project Duration:

One (1) year.

Ground Run-up Enclosure (GRE)

Project Description/Need:

Two (2) GREs are located on the airfield: one for the Tennessee Air National Guard (TnANG) is owned and operated by FedEx. Ground run-ups are also conducted by the passenger airlines and FedEx at several locations around the airfield. Due to the potential noise impacts of conducting aircraft run-ups at surface locations, a GRE is needed that would be available to all users of the airfield.

Project Triggers

As required and funding becomes available.

Potential Funding Sources:

AIP, GARBs, and State funding.

Project Duration:

Two (2) years.

Future Aviation Related Development

Project Description/Need:

Various areas on the airfield have been identified for future aviation related development. These areas are anticipated to be available for facilities such maintenance, repair, and overhaul (MRO), cargo, or general aviation uses.

Project Triggers

Demand and interest from tenants.

Potential Funding Sources:

AIP, GARBs, State funding, and private funding.

Project Duration:

To be determined case-by-case.

Hot Spot 1 Reconfiguration

Project Description/Need:

The angled southbound approach of Taxiway B to Runway 18C could contribute to pilot confusion in terms of discerning between Taxiway S and Runway 18C. Realignment of the angled intersection of Taxiways B, S, and Runway 18C geometry will alleviate confusion.

Project Triggers

Immediate implementation.

Potential Funding Sources:

AIP and State funding.

Project Duration:

Less than one (1) year.

Hot Spot 2 Reconfiguration

Project Description/Need:

Narrowing of Taxiway M from 100 feet to 75 feet from the runway end to Taxiway M3. The wide pavement and the presence of the second parallel Taxiway N, pilots may be confused when taxiing from southbound Taxiway N to Runway 36L for departure. This has resulted in instances where pilots have lined up on the taxiway thinking they were on the runway. The narrower taxiway width will provide additional queues for pilots to understand the aircraft's position on the airfield.

Project Triggers

Availability of funding.

Potential Funding Sources:

AIP and State funding.

Project Duration:

Less than one (1) year.

Concourse Modernization (SW Leg)

Project Description/Need:

Project includes the modernization of the southwest leg of the concourse similar to the recently modernized concourse. As demand for aircraft gates increases, the SW leg of the concourse will provide additional gates.

Project Triggers

Passenger demand.

Potential Funding Sources:

AIP, PFC, GARBs, and State funding.

Project Duration:

Three (3) to (4) years.

Concourse C Demolition

Project Description/Need:

The demolition of Concourse C is required to allow for the construction of a new parking garage and/or hotel development. Parking demand will increase over time and the area currently occupied by Concourse C will be needed for a new garage.

Project Triggers

Parking demand/passenger demand.

Potential Funding Sources:

PFC, GARBs, and State funding.

Project Duration :

Less than one (1) year.

Re-life of Short-Term Garage

Project Description/Need:

Parking demand will increase over time and the useful life of the short-term garage necessitates the need for the garage to be replaced and expanded. The new short-term garage is anticipated to also house remote bag check-in and ground transportation functions.

Project Triggers

Parking demand/passenger demand, facility condition of existing garage.

Potential Funding Sources:

PFC, GARBs, and State funding.

Project Duration:

Three (3) to five (5) years.

Public Parking Garage C

Project Description/Need:

Project includes the construction of a three (3) to five (5) level garage adjacent to Terminal C. Parking demand will increase over time and the area currently occupied by Concourse C will be needed for a new garage to accommodate that demand.

Project Triggers

Parking demand/passenger demand.

Potential Funding Sources:

PFC, GARBs, State funding.

Project Duration:

Three (3) to five (5) years.

Runway 18R/36L Extension

Project Description/Need:

The B777F is the critical aircraft at MEM, but operations are sometimes conducted for other heavy aircraft such as the B747F. This Master Plan estimates that the maximum runway length of 11,129-ft (Runway 18C-36C) will remain adequate through the planning horizon. However, extension of one other runway to a near or equivalent length would be beneficial and justified through operational efficiency/redundancy during construction, snow removal, etc.

This project includes extending Runway 18R-36L, Taxiway M and Taxiway N 1,800 feet to the south over the existing Shelby Drive. To accommodate the extended airfield components, Shelby Drive will be lowered to establish the necessary vertical clearance from the new runway and taxiways bridge.

Project Triggers

Operational efficiency of the runways and delays.

Potential Funding Sources:

AIP and State funding.

Project Duration:

Five (5) to seven (7) years.

Runway Highspeed Taxiway M7

Project Description/Need:

The extension of Runway 18R-36L, the removal of Taxiway M6 and the desire to reduce runway occupancy times (ROT) necessitate the need for a new high-speed exit for aircraft landing on Runway 36L. This exit will be placed between the existing Taxiway M6 and Taxiway M5.

Project Triggers

Operational efficiency of the runways .

Potential Funding Sources:

AIP and State funding.

Project Duration:

One (1) to two (2) years.

Taxiway C Extension

Project Description/Need:

Extension of Taxiway C to the south approximately 1,000 feet. This project will aid in sequencing aircraft in and out of Central Deicing Facility (CDF), providing air traffic control with more efficient flow of aircraft during deicing operations.

Project Triggers

Operational efficiency and funding availability.

Potential Funding Sources:

AIP and State funding.

Project Duration:

Two (2) to three (3) years.

Other Potential CIP Projects

Other potential projects are those projects that are not necessarily passenger-demand driven or may be currently presumed to be beyond the planning horizon. These projects may act as a placeholder to preserve land from encroachments of other potential development or that may arise from unanticipated needs of the Airport based on a changing operating environment. These projects include the following.

- Hotel Development (Site Prep)
- Taxiway V1/V2 Reconfiguration
- Taxiway L Demolition
- Taxiway M6 Demolition
- Solar Installation
- Runway 927 Shift South & East, Taxiway M Extension (Not on Future Airport Layout Drawing)
- Construct Snow Equipment Building

Financial Feasibility Analysis

The financial feasibility analysis reviewed the proposed CIP to verify that the plan put forward is financially feasible without undue financial burden on the Airport, the airlines, or other stakeholders. At the time of this Master Plan effort, the world was amid a global pandemic and the aviation industry was greatly impacted. For these reasons, the MSCAA chose not to conduct a detailed financial plan due to the uncertainty of aviation related forecasts. Since completion of the project, the MSCAA's finance team conducted an analysis of the master plan projects and all other CIP projects known at the time.

Based on the finances of the Airport, the various potential funding sources and overall financial structure, the Airport's Master Plan is financially feasible. The Airport should have the ability to obtain the necessary funding through GARBs and with the new income streams of PFCs, CFCs, BIL and State funding sources, the Airport will be able to build upon its strong financial base.

The Master Plan CIP has been prepared based on available information and assumptions set forth. Prior to any project implementation, the financial feasibility of such projects should be determined using updated specific project costs as well as funding sources available at the time. In addition, although every effort has been made to make reasonable assumptions from the information available, some of the assumptions used to develop the Master Plan CIP may not be realized, and other unanticipated circumstances may arise. Therefore, actual results may be materially different from those projected. As such, the Master Plan CIP is not intended to be used to support the sale of bonds or to obtain other forms of financing.

Environmental Review of Preferred Development Plan

This section reviews the potential environmental impacts of the preferred development plan. The potential impacts include air quality, biotic communities, existing and future land use, endangered and threatened species, hazardous materials, historic and archaeological resources, floodplains, Section 4(f) Resources/Parks/Wildlife Refuges, water quality, and waters of the U.S. including wetlands.

Air Quality

As required by the Clean Air Act, the U.S. Environmental Protection Agency (EPA) has established National Ambient Air Quality Standards (NAAQS) for six (6) criteria pollutants considered harmful to public health and the environment:

- Carbon Monoxide (CO)
- Lead (Pb)
- Nitrogen Diozide (NO2)
- Ozone (O3)
- Particulate Pollution (PM; both 10 micron and 2.5 micron)
- Sulfure Dioxide (SO2)

An attainment area is one in which air pollutants do not exceed the NAAQS. Nonattainment areas are those in which a criteria pollutant has exceeded the NAAQS for a period of time. MEM is in Shelby County, which is currently designated as being in attainment for all criteria pollutants as classified by the EPA and the Tennessee Department of Environment and Conservation (TDEC), Air Pollution Control Division. The Memphis-Shelby County Health Department Air Pollution Control Branch has jurisdiction over Shelby County and enforces local ambient air quality standards to ensure compliance with the Clean Air Act.

Most of the improvements are associated with landside construction and operations. Additional analysis and permits may be required for the proposed improvements. The need for additional analysis and permits should be assessed on a project-by-project basis. Construction emissions should also be considered. These impacts are temporary, but implementation of best management practices (BMP) can reduce construction impacts.

Should Shelby County become designated as non-attainment for any criteria pollutants, future MEM projects may need to be accounted for in the State Implementation Plan (SIP) and/or be shown not to exceed the applicable de minimis levels as defined by General Conformity.

Noise

Noise is defined by the FAA as unwanted sound that can disturb routine activities such as sleep, conversation, or student learning. Aviation related noise typically comes from the operation of aircraft during departures, arrivals, overflights, taxiing, and engine run-ups. The FAA measures noise in Day-Night Average Sound Level (DNL) that accounts for noise experienced during a 24-hour period.

In 2015 the MSCAA conducted a CFR Part 150 Noise Exposure Map (NEM) Update to identify and quantify noise-sensitive land uses and populations located within the MEM 65 DNL noise contour. Since 2015, there have been no changes to fleet mix or activity levels that would result in expanded noise contours.

According to the Part 150 Noise Study there are 14 noise-sensitive sites, including 10 churches and four (4) schools, located within 65-70 DNL noise contours and four (4) noise-sensitive sites, including one (1) hospital, one (1) cemetery/funeral home, and two (2) churches, located within the 70-75 DNL contour. There are no noise-sensitive sites within the 75 DNL which is primarily on Airport property. Both the 70 DNL and 65 DNL extend into DeSoto County, Mississippi.

CIP development projects that may require an in-depth noise analysis would include those which result in changes to air traffic procedures, including the Runway 18R-36L Extension. No other projects are expected to change the fleet mix at the airport and/or generate new operations demand.

Projects that may result in non-aircraft related noise impacts may also require noise analysis. These types of projects could involve components such as engine run-ups, aircraft taxiing, construction noise, and noise from related roadway work or increased use of roads.

Compatible Land Use

The proposed improvements consist primarily of landside improvements, runway and taxiway rehabilitation, and extension and upgrades to existing infrastructure. The landside improvements, runway and taxiway rehabilitation and existing infrastructure upgrades are generally compatible with existing and future land uses and should not result in adverse effects to the surrounding communities. Noise analyses were not conducted as part of this Master Plan but may be required for the Runway 18R-36L Extension.

Department of Transportation Act, Section 4(f)

According to Section 4(f) of the Department of Transportation Act (re-codified as 49 USC, Subtitle I, Section 303), no publicly owned park; recreation area; wildlife or waterfowl refuge; or land of historic site that is of national, state, or local significance shall be used, acquired, or affected by programs or projects requiring federal assistance for implementation unless there is not a feasible or prudent alternative.

There are no Section 4(f) properties located on Airport property; however, Oakhaven Park and Medal of Honor Park are located approximately one-half (0.5) miles east, Charjean Park and Alcy Samuels Park are located approximately one-half (0.5) miles north, and Gardenview Park and Zodiac Park are located one-half (0.5) miles and three-quarters (0.75) miles, respectively, west of the Airport. Impacts to these off-site parks are not anticipated as a result of the proposed Master Plan.

Historical, Architectural, Archaeological, and Cultural Resources

Section 106 of the National Historic Preservation Act (NHPA) requires federal agencies to consider the impacts of their undertakings on historic property, which includes archeological sites, buildings, structures, objects, and districts. There are no NRHP listed sites currently on Airport property; however, according to the Memphis Heritage website, the Main Terminal and the Memphis Aero Building have been determined eligible for NRHP listing.

Each state has a State Historic Preservation Office (SHPO) that is granted the authority to nominate sites, districts, and/or objects for inclusion in the NRHP. Some SHPOs maintain a database of state-historic sites, districts, and objects that are significant to the history of the state but may not be included in the NRHP. The Tennessee Historical Commission (THC) is the state of Tennessee's SHPO. There are no state-listed historic sites on or in the vicinity of the Airport.

In 2017, a Draft Environmental Assessment (EA) was prepared for the proposed development and modernization of Fed Ex facilities at MEM that included 24 structures. As part of this EA, Hangar 6, Hangar 7, the Boiler Room, and the Administrative Building were determined to be potentially eligible for NRHP listing. Since, FedEx obtained approval to mitigate the adverse effects to the potentially eligible structures caused by their demolition through the completion of Historic American Buildings Survey (HABS) Level II documentation of the eligible structures in accordance with the U.S. Army Corps of Engineers recommendations for military aircraft hangars and supporting structures.

Adverse impacts to Historical, Architectural, Archaeological, and Cultural Resources are not anticipated as a result of the proposed improvements.

Threatened and Endangered Species

Twenty-seven (27) species, including animals and plants, are identified as Species of Concern by the TDEC for Shelby County within the Biotics Database of the Tennessee Division of Natural Areas. Several of these species could be found within the MEM vicinity, however there are no known listed species on or in the vicinity of the airport. Native habitats are also limited and do not occur in the areas where the proposed improvements described in this Master Plan would occur.

Adverse impacts to endangered and threatened species are not anticipated because of the proposed Airport improvements, however, because species can be mobile or new species could be listed prior to implementation of all proposed improvements, updated evaluations may be needed especially for projects that will not occur in the short-term.

Water Quality

At MEM, the principal water quality concerns are related to the potential presence of pollutants in storm water associated with aviation and industrial activities including aircraft and vehicle maintenance, equipment cleaning, and deicing. Other sources that may affect water quality are associated with existing and former fueling and maintenance facilities.

Although it is limited, the implementation of the improvements described in the Master Plan will result in additional impervious area and increased stormwater runoff. There are improvements proposed that could result in positive impacts to the area's surface and groundwater such as upgrades in the storm sewer system.

The construction of the proposed improvements could also result in temporary impacts to water quality. Through BMPs and the implementation of a Stormwater Pollution Prevention Plan (SWPPP), the effects associated with construction can be minimized. This would be regulated through the NPDES program. With the implementation of BMPs, it is anticipated that the proposed improvements will not have a significant adverse effect on water quality.

Wetlands

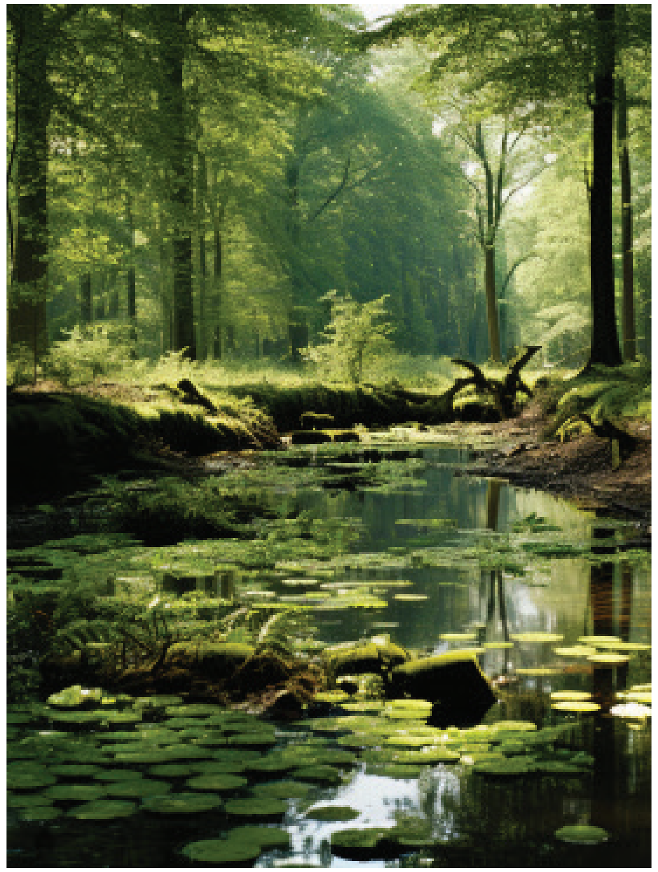
Section 404 of the Clean Water Act (CWA) prohibits the discharge of dredged or fill material into waters of the U.S., including wetlands, unless a permit has been obtained. According to the USFWS National Wetlands Inventory (NWI), there are several wetlands located throughout Airport property. Freshwater pond, imbedded freshwater/forested/shrub, freshwater forested/shrub, and riverine wetland types are identified on and surrounding Airport property. Areas declared as riverine wetlands according to the NWI map appear to be culverts that span throughout MEM property.

As part of various development projects and land acquisitions since 1993, wetland delineations have been conducted on MEM property. Based on these delineations and aerial images, it is possible that there may be additional wetlands within undeveloped areas and development of these sites may require mitigation of wetland impacts if impacts cannot be avoided. Although none have been identified as part of the Master Plan, potential development projects impacting wetlands will require permits from the U.S. Army Corps of Engineers and appropriate mitigation as required by Federal, State, and local regulations.

Floodplains

Executive Order 11988, Floodplain Management, requires federal agencies to avoid, to the extent possible, indirect and direct short and long-term impacts to floodplains. Much of MEM property is considered an area of minimal flood hazard and is outside the 0.2 percent annual chance flood; however, there are areas within the property boundary and just outside of the property boundary that are identified as regulatory floodways. Hurricane Creek, Days Creek and Nonconnah Creek are considered regulatory floodways.

The projects included in this Master Plan are not anticipated to impact floodplains, however, design and engineering of future facilities in these areas would require incorporating appropriate flood mitigation controls.



AIRPORT LAYOUT PLANS PACKAGE

Chapter 8 depicts the Airport Layout Plans (ALP) Package. An ALP package is a series of plans that reflect existing conditions as well as the preferred future development for a given airport. Through graphics such as plans, views, profiles and scales, a better understanding of the written content found in an airport master plan or airport master plan update is achieved.

The ALP package of drawings for MEM was created in accordance with the criteria set forth in the FAA Advisory Circular (AC) 150/5300-13b Airport Design and AC 150/5300-18 General Guidance and Specifications for Submission of Aeronautical Surveys to NGS: Field Data Collection and Geographic Information System (GIS) Standards. The content of individual sheets was determined using the guidelines found in AC 150/5070-6b Airport Master Plans Appendix F Airport Layout Plan Drawing Set and those requirements contained in the ARP SOP 2.00 Standard Procedure for FAA Review and Approval of Airport Layout Plans (ALPs).

The Future Airport Layout Drawing (ALD) is ultimately reviewed and approved by the FAA from a regulatory and safety perspective. Once approved, the Future ALD serves as the initial step in securing access to federal funding through the FAA for existing and future airport studies and construction projects.

The ALP package for MEM consists of the drawings listed below. The following narrative describes each drawing in more detail:

- Cover Sheet & Data Sheet
- Existing Airport Layout Drawing
- Future Airport Layout Drawing
- Terminal Drawing
- Airspace Drawing
- Runway 9 Existing Plan & Profile
- Runway 27 Existing Plan & Profile
- Runway 18R Existing Plan & Profile
- Runway 18C Existing Plan & Profile
- Runway 18L Existing Plan & Profile
- Runway 36L Existing Plan & Profile
- Runway 36L Future Plan & Profile
- Runway 36C Existing Plan & Profile
- Runway 36R Existing Plan & Profile
- Runway 9-27 Existing Runway Profile
- Runway 18R-36L Existing/Future Profile
- Runway 18C-36C Existing Profile
- Runway 18L-36R Existing/Future Profile
- Land Use Plans
- Property Maps & Data Tables
- Ultimate Airport Layout Drawing

Cover & Data Sheet

The cover sheet contains approval blocks, airport location maps and other pertinent information as required by local FAA Airport District Offices and State aviation agencies. The data sheet contains basic airport and runway data tables. The data sheet includes the information listed below:

- **Wind Rose Information –** Wind roses and corresponding wind data are provided for all weather conditions, Visual Flight Rules (VFR) conditions, and Instrument Flight Rules (IFR) conditions for each runway as well as for each of the runways.
- **Runway Protection Zone (RPZ) Data –** The FAA defines this zone as an area off the runway end to enhance the protection of people and property on the ground. The data table outlines RPZ dimensions for existing and future runways.
- **Airport Data Table –** Geographic, operational, meteorological, and classification data is shown in this table for both existing and future layouts.
- **Runway Data Table –** Physical, geometric and operational data for each runway is listed in this table. Data includes runway dimensions, runway classifications, wind coverage for each runway, maximum runway elevation, pavement types and loading strengths, runway gradients, approach and obstruction clearance slopes, runway approach categories, runway safety area dimensions, runway lighting and marking data, navigational aids data, approach visibility minima and declared distances information.

Existing Airport Layout Drawing

The existing airport layout drawing (ALD) serves to give the reader a general layout of the environment in and surrounding a given airport. It depicts existing airport facilities and nearby surroundings and is shown at a scale 1:600 ft. This drawing shows required facility identifications, labels, imaginary surfaces, RPZs, and Runway Safety Areas (RSA).

Elements of the existing ALD include airfield infrastructure such as existing runways and taxiways, aprons and holding areas. The existing ALD also includes any terminals, concourses and depicted access to these facilities. Existing General Aviation areas are also depicted on the ALD. Other aviation-related items such as navigational aids are shown.

The existing ALD also reveals any main cargo areas and cargo buildings, existing military sites and maintenance facilities. All other infrastructure such as buildings, roads, railroads, and fencing are shown. The existing airport property line is depicted on the ALD. The importance of the airport property line is to demarcate which aviation and non-aviation facilities are on or off airport property.

Future and Ultimate Airport Layout Drawings

During the planning process, the potential to shift Runway 9-27 to the east and south was explored. The alternative that was determined to be the most feasible is significantly impactful from an off-airport land use perspective and thus a cost perspective. Secondly, it was determined that the likely timing of the project would coincide with reconstruction of the runway.

Because of the uncertainty of the timing and significant cost of the project, it was determined that that making that important planning decision is premature. Therefore, MSCAA has decided to split the ALD into a Future ALD and an Ultimate ALD. The Ultimate ALD is provided for reference for the FAA, airport management and the surrounding communities as a potential development scenario in the future.

Terminal Area Plan

This plan represents a large-scale depiction of areas with significant terminal facility development. The drawing is an enlarged area of the passenger terminal areas of the future ALD. A legend identifies the prominent development in the terminal area and known building heights.

Airport Airspace Drawings

The airport airspace drawings provide the reader with an understanding of the relationship between objects and navigable airspace for a given airport. Components of the drawings focus on a different parts of navigable airspace with the intent of capturing and assessing all pertinent airspace surrounding an airport runway configuration to help evaluate and ultimately ensure safety from an airspace navigation standpoint. Any object which constituted a penetration to a navigable airspace surface is listed and described in one of the airspace drawings with a plan of action for the object.

Runway Plan & Profiles

These drawings contain the plan and profile view of the applicable approach and departure surfaces to the runway along with a tabular listing of all penetrations. Any object which constituted a penetration to a navigable airspace surface is listed and described in one of the airspace drawings with a plan of action for the object.

Land Use Plans

The Land Use Drawing depicts land uses within the Airport property boundary and land use zoning for the property surrounding the Airport. This drawing also depicts the Airport Noise Exposure Map contours for reference.

Airport Property Map

This drawing depicts the Airport property boundary, and various tracts of land that were acquired along with specific data related to their acquisition. The drawing sheets for the Airport Property Map include graphic depictions of the property and tables reflecting the acquisition data. Although these property maps depict the same information, a separate Exhibit A submittal was provided to FAA for purposes of official acceptance.

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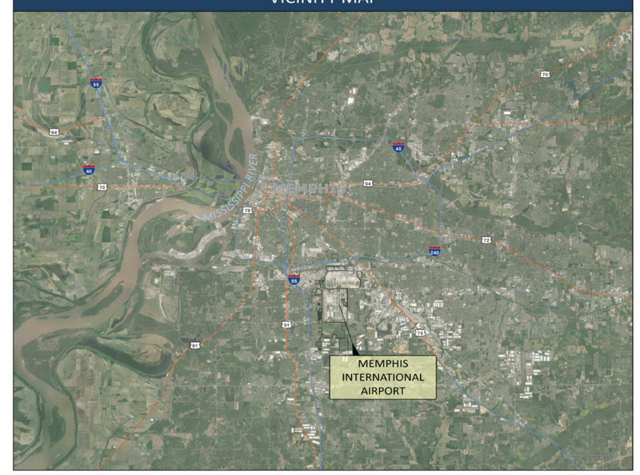
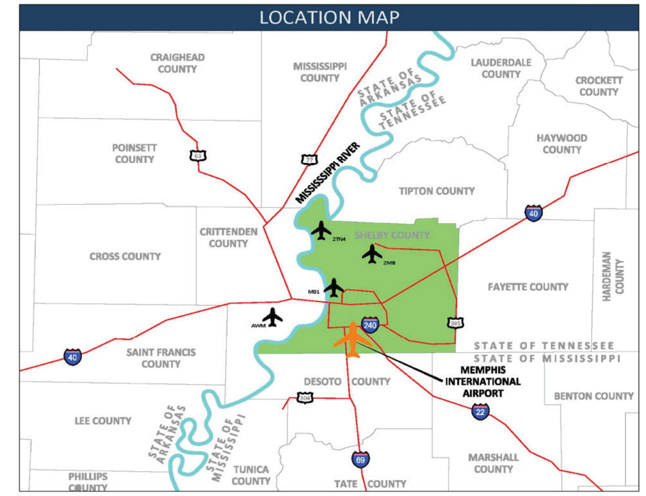
MEMPHIS INTERNATIONAL AIRPORT

AIRPORT LAYOUT PLAN

VICINITY MAP



LOCATION MAP



DRAWING INDEX

SHEET NUMBER	SHEET NAME
1	TITLE SHEET
2	AIRPORT DATA SHEET
3	EXISTING AIRPORT LAYOUT PLAN DRAWING
4	FUTURE AIRPORT LAYOUT PLAN DRAWING
5	TERMINAL AREA DRAWING
6	AIRPORT AIRSPACE DRAWING
7	RWY 09 INNER APPROACH & RWY 27 DEPARTURE - EXISTING PLAN & PROFILE
8	RWY 27 INNER APPROACH & RWY 09 DEPARTURE - EXISTING PLAN & PROFILE
9	RWY 18R INNER APPROACH & RWY 36L DEPARTURE - EXISTING PLAN & PROFILE
10	RWY 18C INNER APPROACH & 36C DEPARTURE - EXISTING PLAN & PROFILE
11	RWY 18L INNER APPROACH & 36R DEPARTURE - EXISTING PLAN & PROFILE
12	RWY 36L INNER APPROACH & 18R DEPARTURE - EXISTING PLAN & PROFILE
13	FUTURE RWY 36L INNER APPROACH & FUTURE 18R DEPARTURE - PLAN & PROFILE - 1
14	FUTURE RWY 36L INNER APPROACH & FUTURE 18R DEPARTURE - PLAN & PROFILE - 2
15	RWY 36C INNER APPROACH & 18C DEPARTURE - EXISTING PLAN & PROFILE
16	RWY 36R INNER APPROACH & 18L DEPARTURE - EXISTING PLAN & PROFILE - 1
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18	RWY 9-27 RUNWAY PLAN & PROFILE
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22	LAND USE DRAWING
23	PROPERTY MAP
24	PROPERTY MAP - INSETS
25	PROPERTY MAP - EASEMENTS
26	PROPERTY MAP - TABLES
27	ULTIMATE AIRPORT LAYOUT PLAN DRAWING

AIRPORT APPROVAL

MEMPHIS INTERNATIONAL AIRPORT
On behalf of Memphis-Shelby County Airport Authority, I hereby certify that the Memphis International Airport, Airport Layout Plan Package was prepared according to the current FAA ARP SOP 2.00 Checklist.

President/Chief Executive Officer   Date   Director of Development   Date

Governor of Tennessee   Date   TDOT Commissioner   Date

TDOT Aeronautics Director   Date   TAD Chief Engineer   Date

FAA DISCLAIMER

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CONSTRUCTION NOTICE

THESE ALP DRAWINGS ARE FOR PLANNING PURPOSES ONLY. THE DRAWING INFORMATION, INCLUDING LOCATION DETAILS AND ELEVATIONS SHOULD NOT BE USED FOR CONSTRUCTION. TO PROTECT THE AIRPORT'S OPERATIONAL SAFETY AND FUTURE DEVELOPMENT, ALL PROPOSED CONSTRUCTION ON THE AIRPORT MUST BE COORDINATED BY THE AIRPORT OWNER WITH FAA/STATE AERONAUTICS PRIOR TO CONSTRUCTION.

AN FAA FORM 7460 SHALL BE SUBMITTED TO EVALUATE THE EFFECT OF PROPOSED CONSTRUCTION ON THE AIRPORT OR ALTERATION ON AIR NAVIGATION EXCEEDING 14 CFR, PART 77. FILING THE FAA FORM 7460 DOES NOT RELIEVE THE SPONSOR FROM COMPLYING WITH OTHER FEDERAL, STATE OR LOCAL RULES AND REGULATIONS.

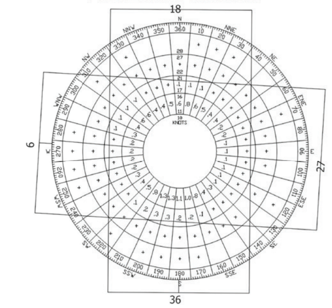
RUNWAY DATA TABLE

RUNWAY		9		27		18L		36R		18C		36C		18R		36L	
ITEM		EXISTING	FUTURE	EXISTING	FUTURE	EXISTING	FUTURE	EXISTING	FUTURE	EXISTING	FUTURE	EXISTING	FUTURE	EXISTING	FUTURE	EXISTING	FUTURE
RUNWAY DESIGN CODE (RDC)		D-V-2400	SAME	D-V-2400	SAME	D-V-1800	SAME	D-V-1200	SAME	D-V-3500	SAME	D-V-1200	SAME	D-V-1800	SAME	D-V-1200	SAME
AIRCRAFT APPROACH CATEGORY		D	SAME	D	SAME	D	SAME	D	SAME	D	SAME	D	SAME	D	SAME	D	SAME
APPROACH REFRENCE CODE (APRC)		B/III/2400	SAME	B/III/2400	SAME	D/VI/2400	SAME	D-V-1600	SAME	D/IV/2400	D/V/2400	D/IV/1600	SAME	D/IV/2400	D/V/2400	D-V-1600	SAME
DEPARTURE REFRENCE CODE (DPRC)		D/IV	D/V	D/IV	D/V	D/VI	SAME	D/VI	SAME	D/IV	D/V	D/IV	D/V	D/IV	D/V	D/IV	D/V
RUNWAY PAVEMENT STRENGTH (X 1,000 LBS)		SW 125	SAME	SW 125	SAME	SW 125	SAME	SW 125	SAME	SW 125	SAME	SW 125	SAME	SW 125	SAME	SW 125	SAME
		DW 178	SAME	DW 178	SAME	DW 210	SAME	DW 210	SAME	DW 210	SAME	DW 210	SAME	DW 210	SAME	DW 210	SAME
		DT 602	SAME	DT 602	SAME	DT 458	SAME	DT 458	SAME	DT 458	SAME	DT 458	SAME	DT 458	SAME	DT 458	SAME
		DDT 870	SAME	DDT 870	SAME	DDT 873	SAME	DDT 873	SAME	DDT 873	SAME	DDT 873	SAME	DDT 873	SAME	DDT 873	SAME
RUNWAY PAVEMENT STRENGTH (PCN)		92/R/B/W/T	SAME	92/R/B/W/T	SAME	82/R/C/W/T	SAME	82/R/C/W/T	SAME	82/R/C/W/T	SAME	82/R/C/W/T	SAME	82/R/C/W/T	SAME	82/R/C/W/T	SAME
SURFACE TREATMENT		CONCRETE GRVD	SAME	CONCRETE GRVD	SAME	CONCRETE GRVD	SAME	CONCRETE GRVD	SAME	CONCRETE GRVD	SAME	CONCRETE GRVD	SAME	CONCRETE GRVD	SAME	CONCRETE GRVD	SAME
MAXIMUM EFFECTIVE GRADIENT (%)		-0.1%	SAME	0.1%	SAME	0.0%	SAME	0.0%	SAME	0.0%	SAME	0.0%	SAME	0.0%	0.5%	0.0%	SAME
RUNWAY LENGTH		8,946'	SAME	8,946'	SAME	9,000'	SAME	9,000'	SAME	11,120'	SAME	11,120'	SAME	9,320'	11,120'	9,320'	11,120'
RUNWAY WIDTH		150'	SAME	150'	SAME	150'	SAME	150'	SAME	150'	SAME	150'	SAME	150'	SAME	150'	SAME
RUNWAY END ELEVATION (NAVD88 - MSL)		253.2'	SAME	292.0'	SAME	277.6'	SAME	334.3'	SAME	270.6'	SAME	340.9'	SAME	288.4'	SAME	320.8'	SAME
RUNWAY BEARING (TRUE)		92.0°	SAME	272.0°	SAME	179.0°	SAME	359.0°	SAME	179.0°	SAME	359.0°	SAME	179.0°	SAME	359.0°	SAME
DISPLACED THRESHOLD DISTANCE		N/A	SAME	N/A	SAME	N/A	SAME	N/A	SAME	N/A	SAME	N/A	SAME	N/A	SAME	N/A	SAME
DISPLACED THRESHOLD ELEVATION (MSL)		N/A	SAME	N/A	SAME	N/A	SAME	N/A	SAME	N/A	SAME	N/A	SAME	N/A	SAME	N/A	SAME
RUNWAY SAFETY AREA (RSA) LENGTH BEYOND RUNWAY END		1,000'	SAME	1,000'	SAME	1,000'	SAME	1,000'	SAME	1,000'	SAME	1,000'	SAME	1,000'	SAME	1,000'	SAME
RUNWAY SAFETY AREA (RSA) WIDTH		500'	SAME	500'	SAME	500'	SAME	500'	SAME	500'	SAME	500'	SAME	500'	SAME	500'	SAME
RUNWAY END COORDINATES (NAD83)	LATITUDE	N 35° 03' 31.0460"	SAME	N 35° 03' 28.0128"	SAME	N 35° 02' 55.7402"	SAME	N 35° 01' 26.7376"	SAME	N 35° 03' 16.5411"	SAME	N 35° 01' 26.5803"	SAME	N 35° 02' 58.1489"	SAME	N 35° 01' 25.9852"	N35 01' 08.19'
	LONGITUDE	W 89° 59' 8.6536"	SAME	W 89° 57' 21.0816"	SAME	W 89° 58' 22.6229"	SAME	W 89° 58' 20.7544"	SAME	W 89° 58' 34.2156"	SAME	W 89° 58' 31.8977"	SAME	W 89° 59' 14.7913"	SAME	W 89° 59' 12.8121"	W 89 59' 12.43'
DISPLACED THRESHOLD COORDIATES (NAD83)	LATITUDE	N/A	SAME	N/A	SAME	N/A	SAME	N/A	SAME	N/A	SAME	N/A	SAME	N/A	SAME	N/A	SAME
	LONGITUDE	N/A	SAME	N/A	SAME	N/A	SAME	N/A	SAME	N/A	SAME	N/A	SAME	N/A	SAME	N/A	SAME
RUNWAY LIGHTING		C/L | HIRL | MALSR | TDZL	SAME	C/L | HIRL | MALSR | TDZL	SAME	C/L | HIRL | MALSR | TDZL	SAME	C/L | HIRL | ALSF-2 | TDZL	SAME	C/L | HIRL | MALSR | TDZL	SAME	C/L | HIRL | ALSF-2 | TDZL	SAME	C/L | HIRL | MALSR | TDZL	SAME	C/L | HIRL | ALSF-2 | TDZL	SAME
APPROACH RUNWAY PROTECTION ZONE (RPZ)	LENGTH	2,500'	SAME	2,500'	SAME	2,500'	SAME	2,500'	SAME	1,700'	SAME	2,500'	SAME	2,500'	SAME	2,500'	SAME
	INNER WIDTH	1,000'	SAME	1,000'	SAME	1,000'	SAME	1,000'	SAME	1,000'	SAME	1,000'	SAME	1,000'	SAME	1,000'	SAME
	OUTER WIDTH	1,750'	SAME	1,750'	SAME	1,750'	SAME	1,750'	SAME	1,510'	SAME	1,750'	SAME	1,750'	SAME	1,750'	SAME
DEPARTURE RUNWAY PROTECTION ZONE (RPZ)	LENGTH	1,700'	SAME	1,700'	SAME	1,700'	SAME	1,700'	SAME	1,700'	SAME	1,700'	SAME	1,700'	SAME	1,700'	SAME
	INNER WIDTH	500'	SAME	500'	SAME	500'	SAME	500'	SAME	500'	SAME	500'	SAME	500'	SAME	500'	SAME
	OUTER WIDTH	1,010'	SAME	1,010'	SAME	1,010'	SAME	1,010'	SAME	1,010'	SAME	1,010'	SAME	1,010'	SAME	1,010'	SAME
RUNWAY MARKING		Precision	SAME	Precision	SAME	Precision	SAME	Precision	SAME	Precision	SAME	Precision	SAME	Precision	SAME	Precision	SAME
FAR PART 77 APPROACH CATEGORY		50:1/40:1	SAME	50:1/40:1	SAME	50:1/40:1	SAME	50:1/40:1	SAME	50:1/40:1	SAME	50:1/40:1	SAME	50:1/40:1	SAME	50:1/40:1	SAME
FAR PART 77 APPROACH TYPE		PIR	SAME	PIR	SAME	PIR	SAME	PIR	SAME	PIR	SAME	PIR	SAME	PIR	SAME	PIR	SAME
FAR PART 77 APPROACH SURFACE	WIDTH OF PRIMARY SURFACE	1,000'	SAME	1,000'	SAME	1,000'	SAME	1,000'	SAME	1,000'	SAME	1,000'	SAME	1,000'	SAME	1,000'	SAME
	AT OUTER END	16,000'	SAME	16,000'	SAME	16,000'	SAME	16,000'	SAME	16,000'	SAME	16,000'	SAME	16,000'	SAME	16,000'	SAME
	LENGTH	50,000'	SAME	50,000'	SAME	50,000'	SAME	50,000'	SAME	50,000'	SAME	50,000'	SAME	50,000'	SAME	50,000'	SAME
VISIBILITY MINIMUMS		1/2 Mile	SAME	1/2 Mile	SAME	1/2 Mile	SAME	>1/4 Mile	SAME	1/2 Mile	SAME	>1/4 Mile	SAME	1/2 Mile	SAME	>1/4 Mile	SAME
AERONAUTICAL SURVEY REQUIRED		VGS	SAME	VGS	SAME	VGS	SAME	VGS	SAME	VGS	SAME	VGS	SAME	VGS	SAME	VGS	SAME
TERPS DEPARTURE SURFACE/OCS		YES	SAME	YES	SAME	YES	SAME	YES	SAME	YES	SAME	YES	SAME	YES	SAME	YES	SAME
RUNWAY OBJECT FREE AREA (ROFA) LENGTH BEYOND RUNWAY END		1,000'	SAME	1,000'	SAME	1,000'	SAME	1,000'	SAME	1,000'	SAME	1,000'	SAME	1,000'	SAME	1,000'	SAME
RUNWAY OBJECT FREE AREA (ROFA) WIDTH		800'	SAME	800'	SAME	800'	SAME	800'	SAME	800'	SAME	800'	SAME	800'	SAME	800'	SAME
RUNWAY OBSTACLE FREE ZONE (ROFZ) LENGTH BEYOND RUNWAY END		200'	SAME	200'	SAME	200'	SAME	200'	SAME	200'	SAME	200'	SAME	200'	SAME	200'	SAME
RUNWAY OBSTACLE FREE ZONE (ROFZ) WIDTH		400'	SAME	400'	SAME	400'	SAME	400'	SAME	400'	SAME	400'	SAME	400'	SAME	400'	SAME
INNER APPROACH OFZ LENGTH BEYOND RUNWAY END		200'	SAME	200'	SAME	200'	SAME	200'	SAME	200'	SAME	200'	SAME	200'	SAME	200'	SAME
INNER APPROACH OFZ WIDTH		400'	SAME	400'	SAME	400'	SAME	400'	SAME	400'	SAME	400'	SAME	400'	SAME	400'	SAME
INNER TRANSITIONAL OFZ (H-VALUE)		6:1 (40.2')	SAME	6:1 (40.1')	SAME	6:1 (40.1')	SAME	5:1 (24.6')	SAME	N/A	SAME	5:1 (24.6')	SAME	6:1 (40.1')	SAME	5:1 (24.6')	SAME
PRECISION OBSTACLE FREE ZONE (POFZ) LENGTH		200'	SAME	200'	SAME	200'	SAME	200'	SAME	200'	SAME	200'	SAME	200'	SAME	200'	SAME
PRECISION OBSTACLE FREE ZONE (POFZ) WIDTH		800'	SAME	800'	SAME	800'	SAME	800'	SAME	800'	SAME	800'	SAME	800'	SAME	800'	SAME
THRESHOLD SITING SURFACE (TSS)		34:1 - TYPE 5	SAME	34:1 - TYPE 5	SAME	34:1 - TYPE 5	SAME	34:1 - TYPE 5	SAME	20:1 - TYPE 4	SAME	34:1 - TYPE 5	SAME	34:1 - TYPE 5	SAME	34:1 - TYPE 5	SAME
TSS OBJECT PENETRATION(S)		YES	SAME	YES	SAME	YES	SAME	YES	SAME	YES	SAME	YES	SAME	YES	SAME	YES	SAME
VISUAL APPROACH AIDS		N/A	SAME	PAPI-4L	SAME	PAPI-4L	SAME	PAPI-4R	SAME	N/A	SAME	PAPI-4L	SAME	N/A	SAME	PAPI-4L	SAME
INSTRUMENT APPROACH AIDS		ILS/GPS	SAME	ILS/GPS	SAME	ILS/GPS	SAME	ILS/GPS	SAME	ILS/GPS	SAME	ILS/GPS	SAME	ILS/GPS	SAME	ILS/GPS	SAME
TOUCHDOWN ZONE ELEVATION (MSL)		258.7'	SAME	292.0'	SAME	300.9'	SAME	334.7'	SAME	290.1'	SAME	340.9'	SAME	294.7'	SAME	320.8'	SAME
REPRESENTATIVE CRITICAL AIRCRAFT		B777-F	SAME	B777-F	SAME	B777-F	SAME	B777-F	SAME	B777-F	SAME	B777-F	SAME	B777-F	SAME	B777-F	SAME

ALL WEATHER COVERAGE

RUNWAY END	WIND COVERAGE 16 KNOTS	WIND COVERAGE 20 KNOTS
RUNWAY 9-27	97.95%	99.57%
RUNWAY SYSTEM 18-36	99.50%	99.89%

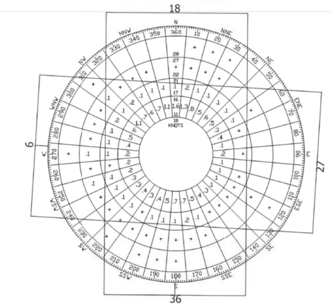
ALL WEATHER WINDROSE



IFR WEATHER COVERAGE

RUNWAY END	WIND COVERAGE 16 KNOTS	WIND COVERAGE 20 KNOTS
RUNWAY 9-27	98.02%	99.44%
RUNWAY SYSTEM 18-36	98.81%	99.59%

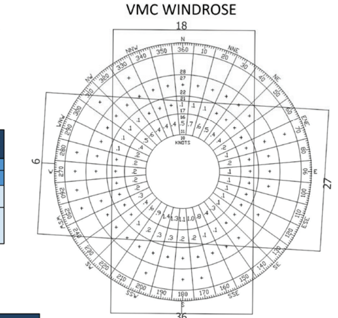
IMC WINDROSE



VFR WEATHER COVERAGE

RUNWAY END	WIND COVERAGE 16 KNOTS	WIND COVERAGE 20 KNOTS
RUNWAY 9-27	97.91%	99.57%
RUNWAY SYSTEM 18-36	99.55%	99.91%

VMC WINDROSE



WINDROSE;
NATIONAL CLIMATIC DATA CENTER
WEATHER STATION USAF 723340 WBAN 13893
MEMPHIS INTERNATIONAL AIRPORT
DATA PERIOD: 2008 THROUGH 2017
AIRPORT DESIGN TOOLS STANDARD WIND ANALYSIS

DECLARED DISTANCES

RUNWAY END	TORA	TODA	ASDA	LDA
9	8,946'	8,946'	8,946'	8,946'
27	8,946'	8,946'	8,946'	8,946'
18L	9,000'	9,000'	9,000'	9,000'
36R	9,000'	9,000'	9,000'	9,000'
18C	11,120'	11,120'	11,120'	11,120'
36C	11,120'	11,120'	10,715'	10,715'
18R	9,320'	9,320'	9,320'	9,320'
36L	9,320'	9,320'	9,320'	9,320'
18R FUT	11,120'	11,120'	11,120'	11,120'
36L FUT	11,120'	11,120'	11,120'	11,120'

MODIFICATION OF DESIGN STANDARDS

NO.	STANDARD MODIFIED	FAA STANDARD	EXISTING CONDITION	PROPOSED ACTION	DATE APPROVED
1	FAA AC 150/5320-6E, Airport Pavement Design and Evaluation, 332.b.(2), With Stabilized Subbase	The AC recommends a maximum joint spacing of 20 feet for slabs equal to or thicker than 16 inches.	MSCAA requests to use 25-foot joint spacing with a 18-inch or greater concrete slab thickness	None	11/29/2016
2	FAA AC 150/5320-10G, Standards for Specifying Construction of Airports	AC 5320-6E recommends a stabilized subbase for pavements with aircraft weighing greater than 100,000 pounds. Acceptable materials are P-304, P-306, and P-401 and P-403. The minimum thickness of subbase is 4 inches	MSCAA proposes to use a 4" layer of "Porous Bituminous Base Course" (S-102) under the concrete.	None	12/1/2016
3	AC 150/5300-13A, Change 1, Airport Design, 418.b.(3)	Longitudinal Grades - AC states "A vertical curve is not necessary when the grade change is less than 0.40%..." for longitudinal grade changes of more than 0.40%, a vertical curve meeting requirements of 100 feet per 1.0% of change is required.	To salvage the existing concrete pavement & eliminate the need to replace it, the proposed design will include longitudinal grade changes on the Juliet Pad for TWYs R & H, which will exceed 0.40% at the existing trench drain.	None	4/4/2017
4	AC 150/5300-13A, Change 1, Airport Design, 418.b.(3)	Longitudinal Grades - AC states "A vertical curve is not necessary when the grade change is less than 0.40%..." for longitudinal grade changes of more than 0.40%, a vertical curve meeting requirements of 100 feet per 1.0% of change is required.	To salvage the existing concrete pavement & eliminate the need to replace it, the proposed design will include longitudinal grade changes on the November Pad for TWYs R & H, which will exceed 0.40% at two of the three existing trench drains.	None	2/15/2017
5	AC 150/5300-13A, Change 1, Airport Design	Airport Reference Code D-V	D-IV restriction for Taxiway V	None	9/9/2010
6	AC 150/5300-13A, Change 1, Airport Design	ADG VI required Taxiway Safety Edge Margin is 20 feet	Taxiway safety edge margin of 15 feet	None	Unknown
7	AC 150/5370-10 Specification P-401 Plant Mix Bituminous Pavements	Revising the requirement for asphalt to allow the use of polymer modified asphalt (section 401-3.2c.) and to allow the specification of performance graded asphalt (section 401-2.3).	Allow the use of polymer modified asphalt and allow the specification of performance graded asphalt	None	7/21/2003
8	AC 150/5300-13 Table 4.1 Taxiway Dimensional Standards	Table 4.1 - Taxiway Width of 100 ft. for Group VI operations	Taxiways A,C, and Y are 75 ft. Wide	Allow ADG VI aircraft (A380F) to operate on 75ft wide taxiway with operational restrictions and taxiway enhancements	3/25/2004
9	AC 150/5300-13 Table 4.1 Taxiway Dimensional Standards	Table 4.1 - Taxiway OFA of 167 ft. for Group VI operations	Taxiway A to North Service Road OFA is 163 ft.	Allow A38F0 to operate on Taxiway A under ADG V TOFA criteria with operational restrictions and taxiway enhancements	3/25/2004
10	AC 150/5300-13 Table 4.1 Taxiway Dimensional Standards	Table 4.1 - Pavement Edge Margin of 20 ft. for Group VI operations	Taxi exit routes only meet D-V (B747) standards	Closest 9 ft. of the full-strength shoulder be counted in achieving the edge margin	3/25/2004
11	AC 150/5300-13 Table 2-2	Table 2-2 - Group VI Runway to parallel Taxiway separation	Runway to Centerline separation of 527 ft. (Taxiway S), and 550 ft. (Taxiway Y).	Allow ADG VI aircraft (A380F) to operate on Runway with operational restrictions on parallel Taxiway	4/23/2004

TAXIWAY DATA TABLE

NAME	DIMENSIONS				SEPARATION FROM TAXIWAY CL TO FIXED/MOVABLE OBJECT	LIGHTING
	WIDTH	SHOULDER	TSA	OFA		
A	75'	30'	214'	285'	142.5'	MITL
B	75'	30'	214'	285'	142.5'	MITL
C	75'	30'	214'	285'	142.5'	MITL
D	110'	30'	214'	285'	142.5'	MITL
E	90'	30'	214'	285'	142.5'	MITL
H	90'	30'	214'	285'	142.5'	MITL
J	75'	30'	214'	285'	142.5'	MITL
K	140'	30'	214'	285'	142.5'	MITL
L	140'	30'	214'	285'	142.5'	MITL
M	75'	30'	214'	285'	142.5'	MITL
N	75'	30'	214'	285'	142.5'	MITL
P	75'	30'	214'	285'	142.5'	MITL
Y1	75'	30'	214'	285'	142.5'	MITL
R	110'	30'	214'	285'	142.5'	MITL
S	75'	30'	214'	285'	142.5'	MITL
T	75'	30'	214'	285'	142.5'	MITL
U	75'	30'	214'	285'	142.5'	MITL
V	75'	30'	214'	285'	142.5'	MITL
Y	75'	30'	214'	285'	142.5'	MITL

AIRPORT DATA TABLE

ITEM		EXISTING	FUTURE
AIRPORT REFERENCE CODE (ARC)		D-V	SAME
MEAN MAX. TEMPERATURE (HOTTEST MONTH)		91° (JULY)	SAME
AIRPORT ELEVATION MSL (NAVD88)		340.9'	SAME
AIRPORT NAVIGATIONAL AIDS		ROTATING BEACON	SAME
AIRPORT REFERENCE POINT	LATITUDE (N)	35° 02' 32.4"	35° 02' 29.29"
	LONGITUDE (W)	89° 58' 36"	89° 58' 37.68"
	DATUMS	NAD83 | NAVD88	SAME
MISCELLANEOUS FACILITIES		AIRPORT BEACON/WINDSOCK/ VORTAC/ASR	SAME
AIRPORT CRITICAL / DESIGN AIRCRAFT TYPE		B777-F	SAME
AIRPORT MAGNETIC VARIATION	DECLINATION	1.32° W ± 0.22°	SAME
	ANNUAL RATE OF CHANGE	0.05° W	SAME
	DATE	9/2/2020	SAME
	SOURCE	NATIONAL GEOPHYSICAL DATA CENTER NOAA	SAME
FAA NPIAS SERVICE LEVEL		MEDIUM HUB - COMMERCIAL SERVICE	SAME
STATE SERVICE LEVEL		PRIMARY	SAME
AIRPORT OWNER		MEMPHIS SHELBY COUNTY AIRPORT AUTHORITY (MSCAA)	SAME
AIRPORT ACREAGE		3,900 ACRES	SAME
SOURCE: MAGNETIC VARIATION FROM NOAA, NATIONAL GEOPHYSICAL DATA CENTER (NGDC) (September, 2020)			
http://www.ngdc.noaa.gov/geomag-web/#declination			
MEAN MAX. TEMPERATURE FROM THE WEATHER CHANNEL, MONTHLY AVERAGE/RECORD TEMPERATURES (September, 2020)			
https://weather.com/weather/monthly/l/c1ca374775e9801046c101ac4bdca865df4f97eef592cf9ad6e5243591a3ce6c			

ALP Prepared By
JACOBSEN | DANIELS
Planning, Implementation, Operations & Management

Drawn: DS II
Approved: KS
Date: 04-14-2023
Project No.: 09-130-18-0

No.	Date	Revisions

FAA'S APPROVAL OF THIS AIRPORT LAYOUT PLAN (ALP) REPRESENTS ACCEPTANCE OF THE GENERAL LOCATION OF FUTURE FACILITIES DEPICTED (SHEET 17144C04). DURING THE PRELIMINARY DESIGN PHASE, THE AIRPORT OWNER IS REQUIRED TO RESUBMIT FOR APPROVAL THE FINAL LOCATIONS, HEIGHTS, AND EXTERIOR FINISH OF STRUCTURES. FAA'S CONCERN IS OBSTRUCTIONS, IMPACT ON ELECTRONIC AIDS, OR ADVERSE EFFECTS ON CONTROLLER VIEW OF AIRCRAFT APPROACHES AND GROUND MOVEMENT AREAS WHICH COULD ADVERSELY AFFECT THE SAFETY, EFFICIENCY, OR UTILITY OF THE AIRPORT.

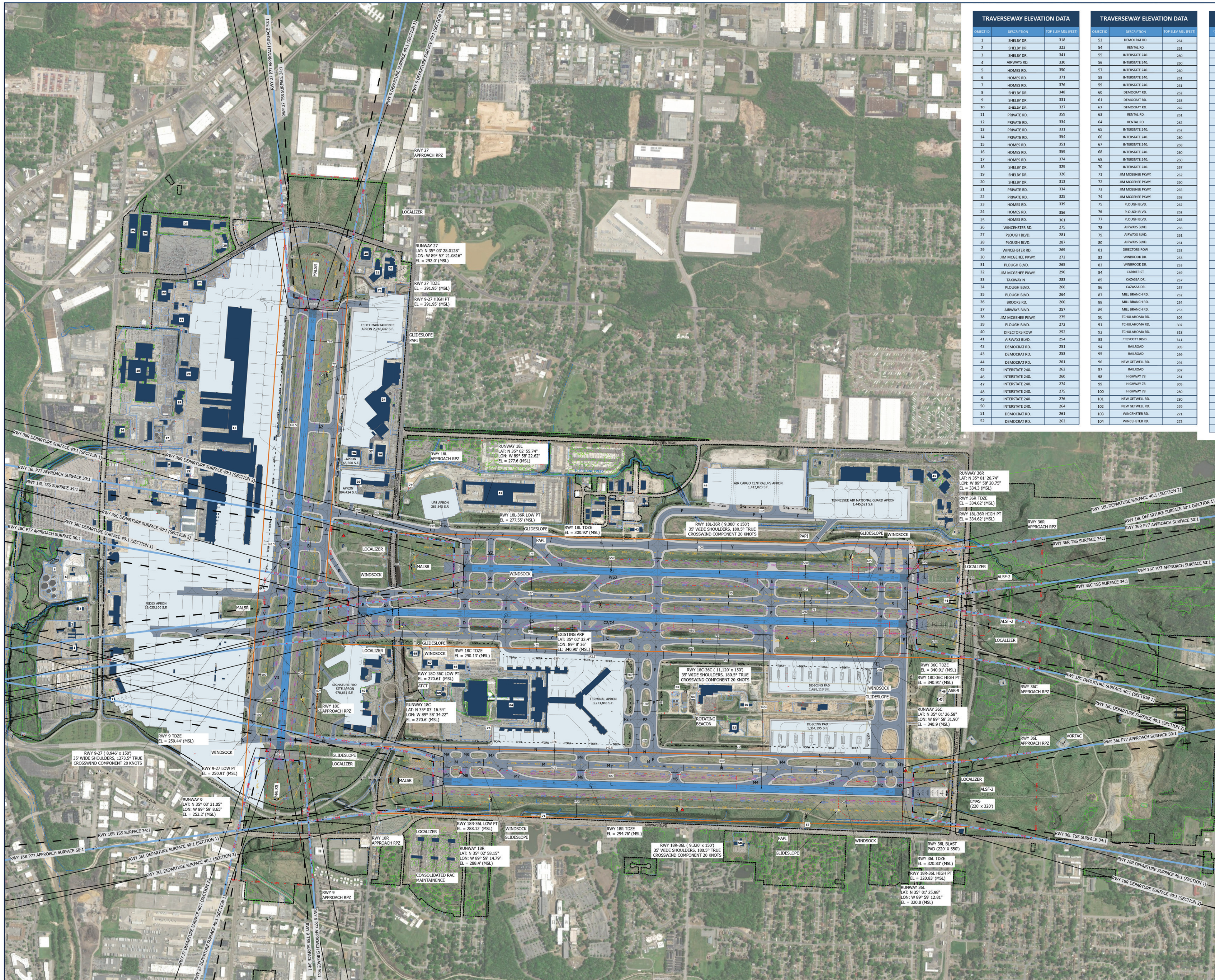
Notes

Sources

Memphis

AIRPORT DATA SHEET
Airport Layout Plan Drawing Set

Memphis International Airport



TRAVERSEWAY ELEVATION DATA

OBJECT ID	DESCRIPTION	TOP ELEV MSL (FEET)
1	SHELBY DR.	318
2	SHELBY DR.	323
3	SHELBY DR.	341
4	AIRWAYS RD.	330
5	HOMES RD.	350
6	HOMES RD.	371
7	HOMES RD.	376
8	SHELBY DR.	348
9	SHELBY DR.	331
10	SHELBY DR.	327
11	PRIVATE RD.	359
12	PRIVATE RD.	334
13	PRIVATE RD.	331
14	PRIVATE RD.	354
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25	HOMES RD.	361
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28	PLOUGH BLVD.	287
29	WINCEHSTER RD.	269
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39	PLOUGH BLVD.	272
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41	AIRWAYS BLVD.	254
42	DEMOCRAT RD.	251
43	DEMOCRAT RD.	253
44	DEMOCRAT RD.	261
45	INTERSTATE 240.	262
46	INTERSTATE 240.	260
47	INTERSTATE 240.	274
48	INTERSTATE 240.	275
49	INTERSTATE 240.	276
50	INTERSTATE 240.	264
51	DEMOCRAT RD.	261
52	DEMOCRAT RD.	263

TRAVERSEWAY ELEVATION DATA

OBJECT ID	DESCRIPTION	TOP ELEV MSL (FEET)
53	DEMOCRAT RD.	264
54	RENTAL RD.	261
55	INTERSTATE 240.	280
56	INTERSTATE 240.	260
57	INTERSTATE 240.	260
58	INTERSTATE 240.	261
59	INTERSTATE 240.	261
60	DEMOCRAT RD.	262
61	DEMOCRAT RD.	263
62	DEMOCRAT RD.	265
63	RENTAL RD.	261
64	RENTAL RD.	262
65	INTERSTATE 240.	262
66	INTERSTATE 240.	260
67	INTERSTATE 240.	268
68	INTERSTATE 240.	260
69	INTERSTATE 240.	260
70	INTERSTATE 240.	267
71	JIM MCGEHEE PKWY.	262
72	JIM MCGEHEE PKWY.	260
73	JIM MCGEHEE PKWY.	265
74	JIM MCGEHEE PKWY.	268
75	PLOUGH BLVD.	262
76	PLOUGH BLVD.	262
77	PLOUGH BLVD.	265
78	AIRWAYS BLVD.	256
79	AIRWAYS BLVD.	261
80	AIRWAYS BLVD.	261
81	DIRECTORS ROW	252
82	WINBROOK DR.	253
83	WINBROOK DR.	253
84	CARRIER ST.	249
85	CAZASSA DR.	257
86	CAZASSA DR.	257
87	MILL BRANCH RD.	252
88	MILL BRANCH RD.	254
89	MILL BRANCH RD.	253
90	TCHULAHOMA RD.	304
91	TCHULAHOMA RD.	307
92	TCHULAHOMA RD.	318
93	PRESCOTT BLVD.	311
94	RAILROAD	305
95	RAILROAD	299
96	NEW GETWELL RD.	294
97	RAILROAD	307
98	HIGHWAY 78	281
99	HIGHWAY 78	305
100	HIGHWAY 78	280
101	NEW GETWELL RD.	280
102	NEW GETWELL RD.	279
103	WINCEHSTER RD.	271
104	WINCEHSTER RD.	272

EXISTING BUILDINGS TABLE

OBJECT ID	BUILDING NAME / TENANT	TOP ELEV MSL (FEET)
1	FORMER RAC BUILDING	273.09
2	FORMER RAC BUILDING	267.50
3	FORMER RAC BUILDING	263.24
5	FORMER RAC BUILDING	268.48
6	FORMER RAC BUILDING	267.70
7	FEDEX CORPORATE HANGARS	261.95
9	FEDEX MAINTENANCE FACILTY	291.67
13	FEDEX GENERATOR BUILDING	280.04
15	FEDEX SUPER HUB	345.19
16	FEDEX OFFICE BUILDING	288.77
17	FUEL FARM	270.45
18	FEDEX OFFICE COMPLEX	276.16
19	FEDEX ARTC FLIGHT SIMULATOR	296.34
20	FEDEX SPECIALTY SORT	304.51
21	FEDEX DC10 HANGER	355.36
22	FEDEX AIRCRAFT PARTS WAREHOUSE	299.63
23	FEDEX TAB	324.66
25	FEDEX PUBLISHING FACILITY	295.37
26	FEDEX LOGISTICS AND NETWORK SERVICES	299.24
27	COMMERCIAL BUILDING	306.80
28	BELZ OFFICE COMPLEX	292.52
30	TENNESSEE COLLEGE OF APPLIED TECHNOLOGY	347.38
31	GSE ADMIN	338.39
32	GSE SHOP	339.63
34	FEDEX MAINENANCE HANGER	370.98
36	PINNACLE AIRLINES AIRCRAFT MAINTENANACE FACILITY	303.00
37	FEDEX DEICING EQUIPMENT STORAGE	284.72
38	FEDEX AC POWER PLANT	305.40
39	WILSON AIR CENTER	303.32
40	SIGNATURE TERMINAL	303.42
41	UNITED PARCEL SERVICE OAKHAVEN HUB	308.80
42	AIRCRAFT RESCUE AND FIREFIGHTING STATION #9	332.74
43	AIRFIELD ELECTRICAL VAULT #4	307.35
44	CARGO CENTRAL WAREHOUSE	324.22
45	TENNENSEE AIR NATIONAL GAURD	346.66
46	NAVAID ELECTRICAL VAULT	333.54
47	AIRPORT SURVEILLLANCE RADAR	367.50
48	NATIONAL WEATHER SERVICE EQUIPMENT SHED	372.42
50	DELTA GLOBAL SERVICES	331.51
52	UNITE STATES POSTAL SERVICE BUILDING	321.55
54	AIRPORT CHILLER UNIT	323.76
55	AIRFIELD ELECTRICAL VAULT #3	316.64
57	AIRFIELD ELECTRICAL VAULT #1	314.68
58	AIRPORT PROJECT CENTER AND NOISE OFFICE	319.75
64	PASSENGER TERMINAL PARKING GARAGE	307.81
66	GROUND SUPPORT STORAGE	308.32
67	TERMINAL SUPPORT BUILDING	307.41
68	FIRE STATION #33	325.26
69	FAA AIRPORT TRAFFIC CONTROL TOWER AND TRACON	608.10
71	MEMPHIS LIGHT GAS, AND WATER SWTICH GEAR	285.08
73	GES	327.92
74	GATE HOUSE	273.41
75	TAXI STAGING FACILITY	302.20

PACS/SACS DATA

TYPE	LABEL	LAT	LONG	EASTING	NORTHING	ELEVATION (MSL)
PACS	MEM F	N 35° 3' 33.67"	W 89° 59' 8.93"	775889.15	288570.71	248.6
SACS	MEM AP 1963 STA A2	N 35° 3' 29.49"	W 89° 57' 21.10"	784829.28	287784.86	288.6
SACS	MEM C	N 35° 1' 25.67"	W 89° 59' 7.41"	775488.66	275634.37	318.6
SACS	MEM D	N 35° 1' 50.53"	W 89° 58' 36.30"	778175.77	278040.16	330.3
SACS	MEM N	N 35° 2' 54.63"	W 89° 59' 12.24"	775453.02	284637.60	284.3
SACS	MEM P	N 35° 3 20.09"	W 89° 58' 15.84"	780243.74	287018.96	264.9
SACS	MEM Q	N 35° 2' 10.06"	W 89° 59' 19.23"	774689.07	775889.15	295.5

LEGEND

ITEM	DESCRIPTION
	GROUND CONTOUR
	AIRPORT PROPERTY LINE
	STRUCTURES ON AIRPORT PROPERTY
	RUNWAY PAVEMENT & MARKINGS
	TAXIWAY PAVEMENT
	AIRFIELD APRON PAVEMENT
	SHOULDER PAVEMENT
	STORAGE TANKS
	AIRPORT REFERENCE POINT
	FENCE
	CREEK / RIVER / PONDS
	FOREST / TREE CLUSTER
	ROTATING BEACON
	BUILDING RESTRICTION LINE (BRL)
TOFA	TAXIWAY OBJECT FREE AREA (TOFA)
OFA	OBJECT FREE AREA (OFA)
RSA	RUNWAY SAFETY AREA (RSA)
OFZ	OBJECT FREE ZONE (OFZ)
RPZ	RUNWAY PROTECTION ZONE (RPZ)
POFZ	PRECISION OBSTACLE FREE ZONE (POFZ)
123	FACILITY IDENTIFIER
	AUTOMATED WEATHER OBSERVING SYSTEM (AWOS)
	AWOS CRITICAL AREA
	GS CRITICAL AREA
	LOC CRITICAL AREA
	PRECISION APPROACH PATH INDICATOR (PAPI)
	WINDSOCK
	SURVEY MONUMENT
	GLIDESLOPE
615.1'	TRAVERSE WAY POINT & AMSL ELEVATION IN FEET
	TOUCHDOWN ZONE (TDZE)

JACOBSEN | DANIELS
Planning, Implementation, Operations & Management

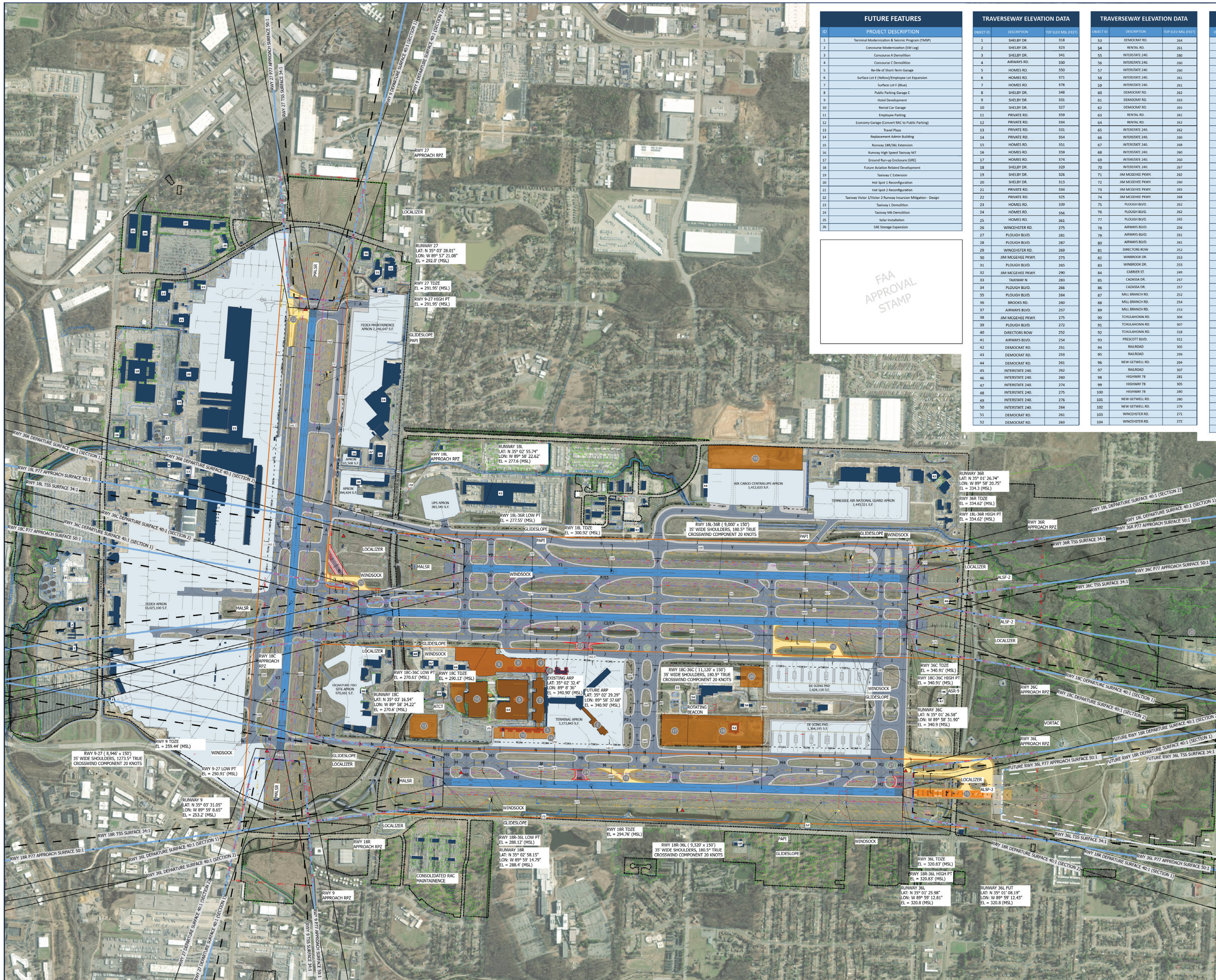
0 500 1,000 2,000
SCALE: 1" = 600'

MAGNETIC DECLINATION
0 30' WEST (2009)
DECLINATION CHANGING BY 0 6' WEST/YEAR

Memphis
INTERNATIONAL AIRPORT

EXISTING AIRPORT LAYOUT PLAN DRAWING

Airport Layout Plan Drawing Set



FUTURE FEATURES

ID	PROJECT DESCRIPTION
1	Terminal Modernization & Seismic Program (TMSP)
2	Concourse Modernization (SW Leg)
3	Concourse A Demolition
4	Concourse C Demolition
5	Re-life of Short-Term Garage
6	Surface Lot E (Yellow)/Employee Lot Expansion
7	Surface Lot F (Blue)
8	Public Parking Garage C
9	Hotel Development
10	Rental Car Garage
11	Employee Parking
12	Economy Garage (Convert RAC to Public Parking)
13	Travel Plaza
14	Replacement Admin Building
15	Runway 18R/36L Extension
16	Runway High Speed Taxiway M7
17	Ground Run-up Enclosure (GRE)
18	Future Aviation Related Development
19	Taxiway C Extension
20	Hot Spot 1 Reconfiguration
21	Hot Spot 2 Reconfiguration
22	Taxiway Victor 1/Victor 2 Runway Incursion Mitigation - Design
23	Taxiway L Demolition
24	Taxiway M6 Demolition
25	Solar Installation
26	SRE Storage Expansion

FAA APPROVAL STAMP

TRAVERSEWAY ELEVATION DATA

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69	INTERSTATE 240.	260
70	INTERSTATE 240.	267
71	JIM MCGEHEE PKWY.	262
72	JIM MCGEHEE PKWY.	260
73	JIM MCGEHEE PKWY.	265
74	JIM MCGEHEE PKWY.	268
75	PLOUGH BLVD.	262
76	PLOUGH BLVD.	262
77	PLOUGH BLVD.	265
78	AIRWAYS BLVD.	256
79	AIRWAYS BLVD.	261
80	AIRWAYS BLVD.	261
81	DIRECTORS ROW	252
82	WINBROOK DR.	253
83	WINBROOK DR.	253
84	CARRIER ST.	249
85	CAZASSA DR.	257
86	CAZASSA DR.	257
87	MILL BRANCH RD.	252
88	MILL BRANCH RD.	254
89	MILL BRANCH RD.	253
90	TCHULAHOMA RD.	304
91	TCHULAHOMA RD.	307
92	TCHULAHOMA RD.	318
93	PRESCOTT BLVD.	311
94	RAILROAD	305
95	RAILROAD	299
96	NEW GETWELL RD.	294
97	RAILROAD	307
98	HIGHWAY 78	281
99	HIGHWAY 78	305
100	HIGHWAY 78	280
101	NEW GETWELL RD.	280
102	NEW GETWELL RD.	279
103	WINCEHSTER RD.	271
104	WINCEHSTER RD.	272

EXISTING BUILDINGS TABLE

OBJECT ID	BUILDING NAME / TENANT	TOP ELEV MSL (FEET)
1	FORMER RAC BUILDING	273.09
2	FORMER RAC BUILDING	267.50
3	FORMER RAC BUILDING	263.24
5	FORMER RAC BUILDING	268.48
6	FORMER RAC BUILDING	267.70
7	FEDEX CORPORATE HANGARS	261.95
9	FEDEX MAINTENANCE FACILTY	291.67
13	FEDEX GENERATOR BUILDING	280.04
15	FEDEX SUPER HUB	345.19
16	FEDEX OFFICE BUILDING	288.77
17	FUEL FARM	270.45
18	FEDEX OFFICE COMPLEX	276.16
19	FEDEX ARTC FLIGHT SIMULATOR	296.34
20	FEDEX SPECIALTY SORT	304.51
21	FEDEX DC10 HANGER	355.36
22	FEDEX AIRCRAFT PARTS WAREHOUSE	299.63
23	FEDEX TAB	324.66
25	FEDEX PUBLISHING FACILITY	295.37
26	FEDEX LOGISTICS AND NETWORK SERVICES	299.24
27	COMMERCIAL BUILDING	306.80
28	BELZ OFFICE COMPLEX	292.52
30	TENNESSEE COLLEGE OF APPLIED TECHNOLOGY	347.38
31	GSE ADMIN	338.39
32	GSE SHOP	339.63
34	FEDEX MAINENANCE HANGER	370.98
36	PINNACLE AIRLINES AIRCRAFT MAINTENANACE FACILITY	303.00
37	FEDEX DEICING EQUIPMENT STORAGE	284.72
38	FEDEX AC POWER PLANT	305.40
39	WILSON AIR CENTER	303.32
40	SIGNATURE TERMINAL	303.42
41	UNITED PARCEL SERVICE OAKHAVEN HUB	308.80
42	AIRCRAFT RESCUE AND FIREFIGHTING STATION #9	332.74
43	AIRFIELD ELECTRICAL VAULT #4	307.35
44	CARGO CENTRAL WAREHOUSE	324.22
45	TENNENSEE AIR NATIONAL GAURD	346.66
46	NAVAID ELECTRICAL VAULT	333.54
47	AIRPORT SURVEILLLANCE RADAR	367.50
48	NATIONAL WEATHER SERVICE EQUIPMENT SHED	372.42
50	DELTA GLOBAL SERVICES	331.51
52	UNITE STATES POSTAL SERVICE BUILDING	321.55
54	AIRPORT CHILLER UNIT	323.76
55	AIRFIELD ELECTRICAL VAULT #3	316.64
57	AIRFIELD ELECTRICAL VAULT #1	314.68
58	AIRPORT PROJECT CENTER AND NOISE OFFICE	319.75
64	PASSENGER TERMINAL PARKING GARAGE	307.81
66	GROUND SUPPORT STORAGE	308.32
67	TERMINAL SUPPORT BUILDING	307.41
68	FIRE STATION #33	325.26
69	FAA AIRPORT TRAFFIC CONTROL TOWER AND TRACON	608.10
71	MEMPHIS LIGHT GAS, AND WATER SWTICH GEAR	285.08
73	GES	327.92
74	GATE HOUSE	273.41
75	TAXI STAGING FACILITY	302.20

PACS/SACS DATA

TYPE	LABEL	LAT	LONG	EASTING	NORTHING	ELEVATION (MSL)
PACS	MEM F	N 35° 3' 33.67"	W 89° 59' 8.93"	775889.15	288570.71	248.6
SACS	MEM AP 1963 STA A2	N 35° 3' 29.49"	W 89° 57' 21.10"	784829.28	287784.86	288.6
SACS	MEM C	N 35° 1' 25.67"	W 89° 59' 7.41"	775488.66	275634.37	318.6
SACS	MEM D	N 35° 1' 50.53"	W 89° 58' 36.30"	778175.77	278040.16	330.3
SACS	MEM N	N 35° 2' 54.63"	W 89° 59' 12.24"	775453.02	284637.60	284.3
SACS	MEM P	N 35° 3 20.09"	W 89° 58' 15.84"	780243.74	287018.96	264.9
SACS	MEM Q	N 35° 2' 10.06"	W 89° 59' 19.23"	774689.07	775889.15	295.5

LEGEND

FUTURE	ITEM	DESCRIPTION
		GROUND CONTOUR
		AIRPORT PROPERTY LINE
		STRUCTURES ON AIRPORT PROPERTY
		RUNWAY PAVEMENT & MARKINGS
		TAXIWAY PAVEMENT
		AIRFIELD APRON PAVEMENT
		SHOULDER PAVEMENT
		STORAGE TANKS
		DEMO PAVEMENT
		AIRPORT REFERENCE POINT
		FENCE
		CREEK / RIVER / PONDS
		FOREST / TREE CLUSTER
		ROTATING BEACON
		BUILDING RESTRICTION LINE (BRL)
	TOFA	TAXIWAY OBJECT FREE AREA (TOFA)
OFA	OFA	OBJECT FREE AREA (OFA)
RSA	RSA	RUNWAY SAFETY AREA (RSA)
OFZ	OFZ	OBJECT FREE ZONE (OFZ)
RPZ	RPZ	RUNWAY PROTECTION ZONE (RPZ)
POFZ	POFZ	PRECISION OBSTACLE FREE ZONE (POFZ)
	123	FACILITY IDENTIFIER
		AUTOMATED WEATHER OBSERVING SYSTEM (AWOS)
		AWOS CRITICAL AREA
		GS CRITICAL AREA
		LOC CRITICAL AREA
	P P	PRECISION APPROACH PATH INDICATOR (PAPI)
		WINDSOCK
		SURVEY MONUMENT
		GLIDESLOPE
		TRAVERSE WAY POINT & AMSL ELEVATION IN FEET
		TOUCHDOWN ZONE (TDZE)

Memphis International Airport

JACOBSEN | DANIELS
Planning, Implementation, Operations & Management

0 500 1,000 2,000
SCALE: 1" = 600'

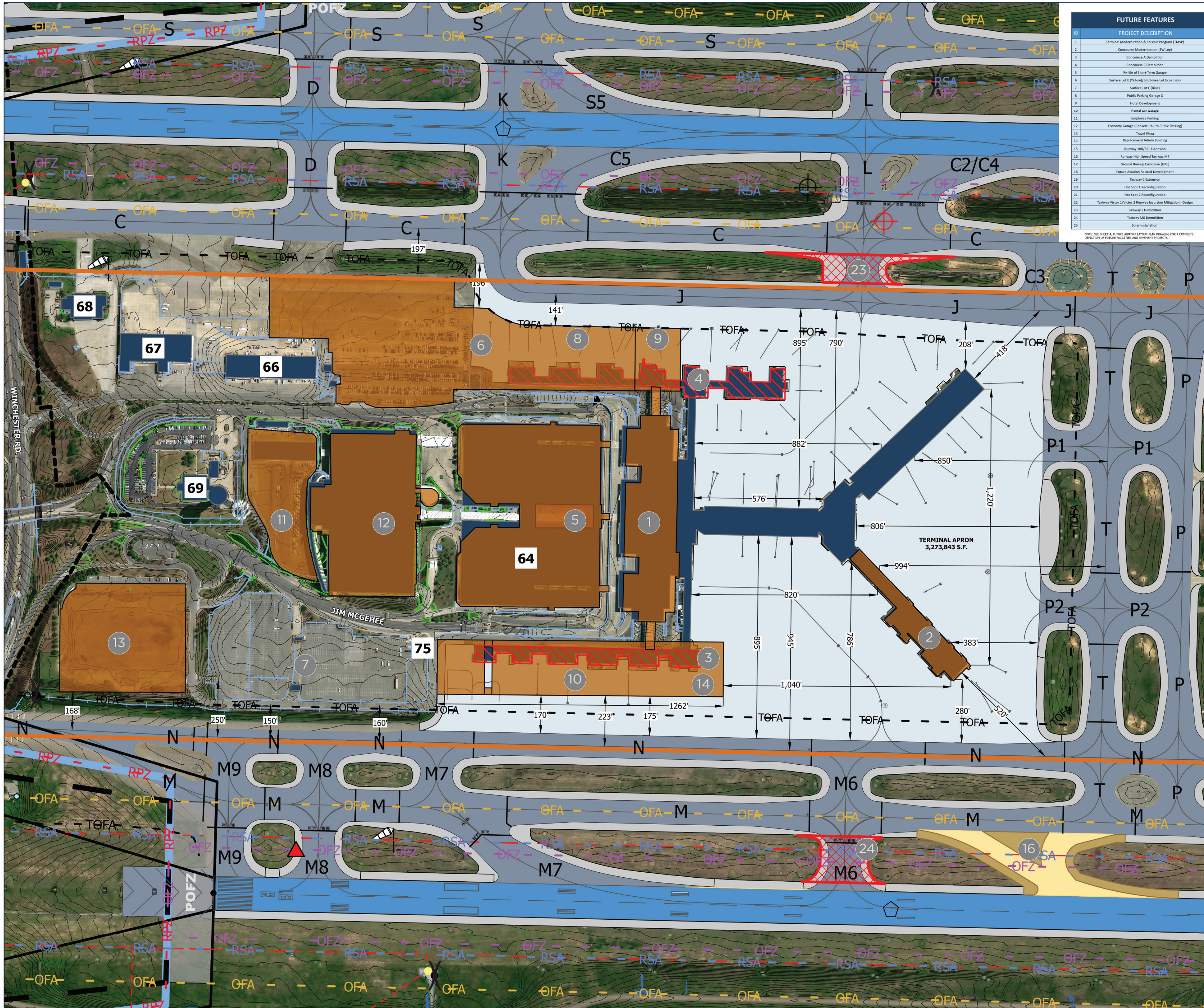
MAGNETIC DECLINATION
0 30' WEST (2009)
DECLINATION CHANGING BY 0 6' WEST/YEAR

Memphis INTERNATIONAL AIRPORT

FUTURE AIRPORT LAYOUT PLAN DRAWING

Airport Layout Plan Drawing Set

Memphis International Airport



FUTURE FEATURES	
ID	PROJECT DESCRIPTION
1	Terminal Modernization & Seismic Program (TMSP)
2	Concourse Modernization (SW Leg)
3	Concourse A Demolition
4	Concourse C Demolition
5	Re-life of Short-Term Garage
6	Surface Lot E (Yellow)/Employee Lot Expansion
7	Surface Lot F (Blue)
8	Public Parking Garage C
9	Hotel Development
10	Rental Car Garage
11	Employee Parking
12	Economy Garage (Convert RAC to Public Parking)
13	Travel Plaza
14	Replacement Admin Building
15	Runway 18R/36L Extension
16	Runway High Speed Taxiway M7
17	Ground Run-up Enclosure (GRE)
18	Future Aviation Related Development
19	Taxiway C Extension
20	Hot Spot 1 Reconfiguration
21	Hot Spot 2 Reconfiguration
22	Taxiway Victor 1/Victor 2 Runway Incursion Mitigation - Design
23	Taxiway L Demolition
24	Taxiway M6 Demolition
25	Solar Installation

NOTE: SEE SHEET 4, FUTURE AIRPORT LAYOUT PLAN DRAWING FOR A COMPLETE DEPICTION OF FUTURE FACILITIES AND PAVEMENT PROJECTS.

EXISTING BUILDINGS TABLE		
OBJECT ID	BUILDING NAME / TENANT	TOP ELEV MSL (FEET)
1	FORMER RAC BUILDING	273.09
2	FORMER RAC BUILDING	267.50
3	FORMER RAC BUILDING	263.24
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16	FEDEX OFFICE BUILDING	288.77
17	FUEL FARM	270.45
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26	FEDEX LOGISTICS AND NETWORK SERVICES	299.24
27	COMMERCIAL BUILDING	306.80
28	BELZ OFFICE COMPLEX	292.52
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31	GSE ADMIN	338.39
32	GSE SHOP	339.63
34	FEDEX MAINENANCE HANGER	370.98
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37	FEDEX DEICING EQUIPMENT STORAGE	284.72
38	FEDEX AC POWER PLANT	305.4
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46	NAVAID ELECTRICAL VAULT	333.54
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48	NATIONAL WEATHER SERVICE EQUIPMENT SHED	372.42
50	DELTA GLOBAL SERVICES	331.51
52	UNITE STATES POSTAL SERVICE BUILDING	321.55
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71	MEMPHIS LIGHT GAS, AND WATER SWTICH GEAR	285.08
73	GES	327.92
74	GATE HOUSE	273.41
75	TAXI STAGING FACILITY	302.20

NOTE: SEE SHEET 4, FUTURE AIRPORT LAYOUT PLAN DRAWING FOR A COMPLETE DEPICTION OF EXISTING BUILDINGS.

LEGEND		
FUTURE	ITEM	DESCRIPTION
		GROUND CONTOUR
		AIRPORT PROPERTY LINE
		STRUCTURES ON AIRPORT PROPERTY
		RUNWAY PAVEMENT & MARKINGS
		TAXIWAY PAVEMENT
		AIRFIELD APRON PAVEMENT
		SHOULDER PAVEMENT
		STORAGE TANKS
		DEMO PAVEMENT
		AIRPORT REFERENCE POINT
		FENCE
		CREEK / RIVER / PONDS
		FOREST / TREE CLUSTER
		ROTATING BEACON
		BUILDING RESTRICTION LINE (BRL)
	TOFA	TAXIWAY OBJECT FREE AREA (TOFA)
OFA	OFA	OBJECT FREE AREA (OFA)
RSA	RSA	RUNWAY SAFETY AREA (RSA)
OFZ	OFZ	OBJECT FREE ZONE (OFZ)
RPZ	RPZ	RUNWAY PROTECTION ZONE (RPZ)
POFZ	POFZ	PRECISION OBSTACLE FREE ZONE (POFZ)
	123	FACILITY IDENTIFIER
		AUTOMATED WEATHER OBSERVING SYSTEM (AWOS)
		AWOS CRITICAL AREA
		GS CRITICAL AREA
		LOC CRITICAL AREA
		PRECISION APPROACH PATH INDICATOR (PAPI)
		WINDSOCK
		SURVEY MONUMENT
		GLIDESLOPE
	615.1'	TRAVERSE WAY POINT & AMSL ELEVATION IN FEET
		TOUCHDOWN ZONE (TDZE)

ALP Prepared By

JACOBSEN | DANIELS

Revisions

FAA'S APPROVAL OF THIS AIRPORT LAYOUT PLAN (ALP) REPRESENTS ACCEPTANCE OF THE GENERAL LOCATION OF FUTURE FACILITIES DEPICTED (SHEET I7144C04). DURING THE PRELIMINARY DESIGN PHASE, THE AIRPORT OWNER IS REQUIRED TO RESUBMIT FOR APPROVAL THE FINAL LOCATIONS, HEIGHTS, AND EXTERIOR FINISH OF STRUCTURES. FAA'S CONCERN IS OBSTRUCTIONS, IMPACT ON ELECTRONIC AIDS, OR ADVERSE EFFECTS ON CONTROLLER VIEW OF AIRCRAFT APPROACHES AND GROUND MOVEMENT AREAS WHICH COULD ADVERSELY AFFECT THE SAFETY, EFFICIENCY, OR UTILITY OF THE AIRPORT.

Notes
1. ALL BLAST PADS ARE 220' x 400' UNLESS OTHERWISE NOTED.
2. REFER TO DATA SHEET FOR ALL TAXIWAY/TAXILANE INFORMATION.
3. TSA AND TESM LINES ARE NOT SHOW FOR CLARITY AND DIMENSIONS CAN BE FOUND ON THE DATA SHEET
4. ALL COORDINATES ARE HORIZONTAL: NORTH AMERICAN DATUM OF 1983/2011 (NAD 83(2011)), IN THE TN STATE PLANE COORDINATE SYSTEM, IN US SURVEY FEET. VERTICAL: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88)
5. THE OBJECT FREE ZONE (OFZ) H VALUE IS 48' AND THEN EXTENDS TO THE PART HORIZONTAL SURFACE AT A SLOPE OF 6:1. THE OFZ IS CLEAR OF OBSTRUCTIONS..
6. APPROXIMATE FENCE HEIGHTS VARY FROM 6' to 11'.

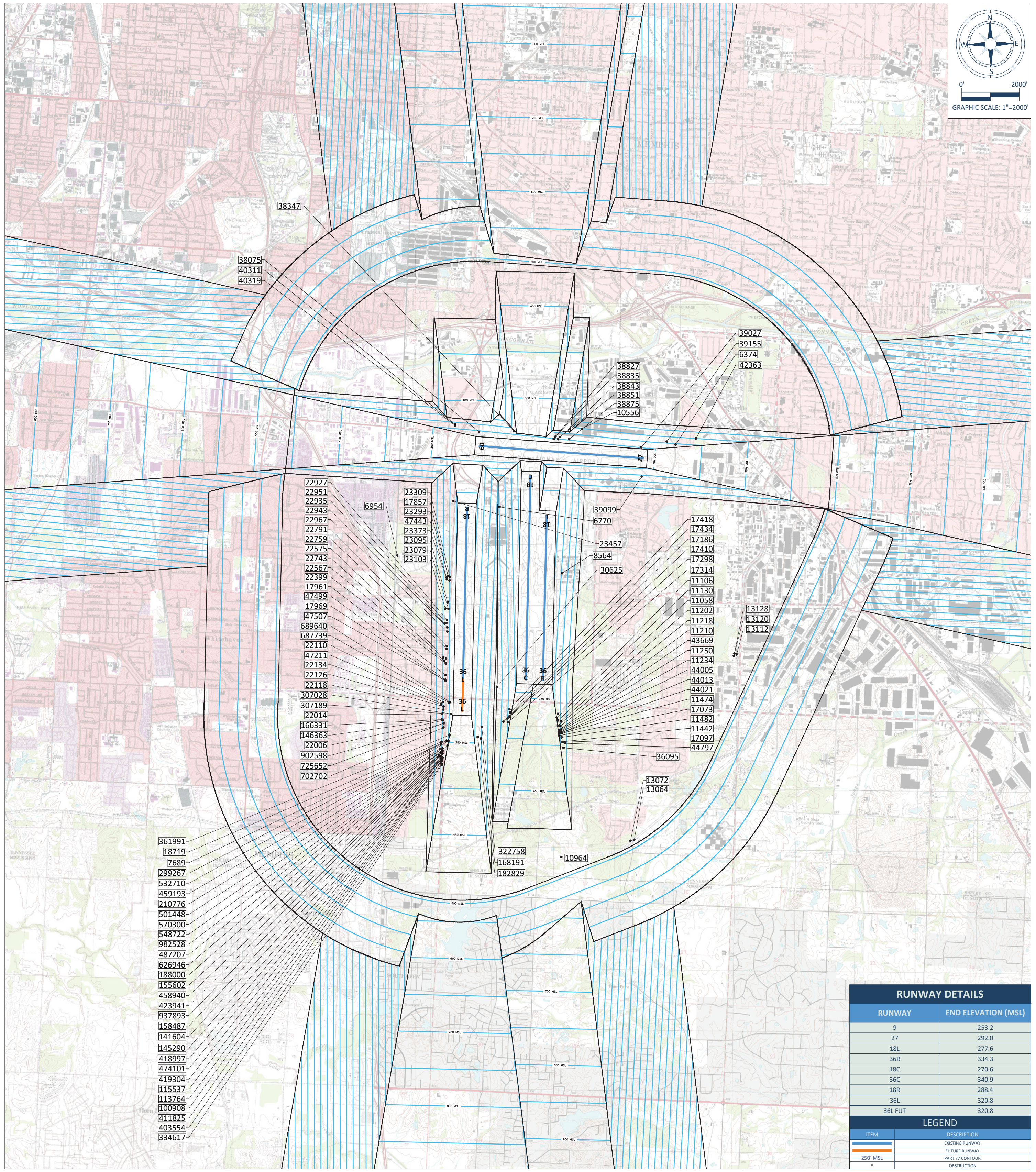
Sources
1. FEATURE GEOMETRY SHOWN ON THESE PLANS ARE FROM THE AGIS PROJECT NUMBER 220139 AND 2016 ALP UPDATE.
2. OBSTACLES, AND TRAVERSEWAY POINTS ON THESE PLANS ARE FROM SURVEY MAPPED BY QUANTUM SPATIAL DATED SEPTEMBER, 2016 AND TRAVERSEWAY POINTS FROM GOOGLE EARTH PRO.
3. FENCE HEIGHTS ARE FROM MSCAA PROJECT NUMBER 16-1400-02-01 DATED MARCH 2019

0 300 600 Feet

Memphis

TERMINAL AREA DRAWING

Airport Layout Plan Drawing Set



RUNWAY DETAILS

RUNWAY	END ELEVATION (MSL)
9	253.2
27	292.0
18L	277.6
36R	334.3
18C	270.6
36C	340.9
18R	288.4
36L	320.8
36L FUT	320.8

LEGEND

ITEM	DESCRIPTION
(blue line)	EXISTING RUNWAY
(orange line)	FUTURE RUNWAY
250' MSL	PART 77 CONTOUR
•	OBSTRUCTION

SURFACE OBSTRUCTION TABLE

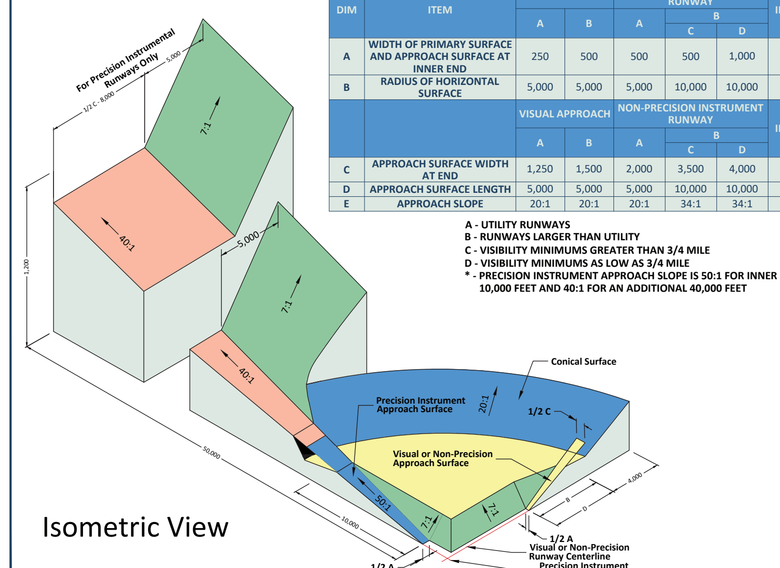
OBJECT ID	DESCRIPTION	SURFACE	TOP ELEV MSL	P77 PEN VALUE (FEET)	RESOLUTION
6374	TREE AREA	P77TS	345.30	1.87	TBR
6770	CONTROL TOWER	P77TS	618.07	172.64	FBF
8564	CELL TOWER	P77TS	392.19	36.83	LGTD
10556	TERMINAL BUILDING	P77TS	398.25	0.35	FBF
11058	TREE AREA	P77TS	402.37	21.06	TBR
11106	TREE AREA	P77TS	388.03	7.54	TBR
11130	TREE AREA	P77TS	388.77	16.71	TBR
11202	TREE AREA	P77TS	404.30	1.33	TBR
11210	TREE AREA	P77TS	408.08	8.15	TBR
11218	TREE AREA	P77TS	404.19	23.10	TBR
11234	TREE AREA	P77TS	434.20	47.47	TBR
11250	TREE AREA	P77TS	420.23	14.16	TBR
11442	TREE AREA	P77TS	425.90	14.84	TBR
11474	TREE AREA	P77TS	427.79	13.31	TBR
11482	TREE AREA	P77TS	419.48	8.75	TBR
17073	TREE AREA	P77TS	429.64	36.93	TBR
17097	TREE AREA	P77TS	434.45	2.39	TBR
17186	TREE AREA	P77TS	433.17	1.49	TBR
17298	TREE AREA	P77TS	405.49	3.32	TBR
17314	TREE AREA	P77TS	403.33	6.95	TBR
17410	TREE AREA	P77TS	391.52	3.04	TBR
17418	TREE AREA	P77TS	389.02	0.45	TBR
17434	TREE AREA	P77TS	388.55	5.66	TBR
36095	TREE AREA	P77TS	427.50	2.39	TBR
38075	POLE LIGHT	P77TS	292.04	0.16	LGTD
38347	POLE LIGHT	P77TS	334.90	9.47	LGTD
38827	POLE LIGHT	P77TS	338.04	40.98	LGTD
38835	POLE LIGHT	P77TS	338.18	21.76	LGTD
38843	POLE LIGHT	P77TS	339.32	41.32	LGTD
38851	POLE LIGHT	P77TS	338.89	21.70	LGTD
38875	POLE LIGHT	P77TS	341.11	33.96	LGTD
39027	POLE LIGHT	P77TS	367.03	64.73	LGTD
39099	POLE LIGHT	P77TS	392.92	31.07	LGTD
39155	POLE LIGHT	P77TS	364.37	3.26	LGTD
40311	TREE AREA	P77TS	332.73	0.65	TBR
40319	TREE AREA	P77TS	325.10	1.25	TBR
42363	TREE AREA	P77TS	401.58	0.47	TBR
43669	TREE AREA	P77TS	422.10	32.65	TBR
44005	TREE AREA	P77TS	425.37	18.06	TBR
44013	TREE AREA	P77TS	431.65	29.23	TBR
44021	TREE AREA	P77TS	426.55	39.16	TBR
44797	TREE AREA	P77TS	440.42	1.61	TBR
17857	TREE AREA	P77TS	383.63	20.96	TBR
17961	TREE AREA	P77TS	404.95	26.43	TBR
17969	TREE AREA	P77TS	399.89	16.99	TBR
22006	TREE AREA	P77TS	396.95	1.88	TBR
22014	TREE AREA	P77TS	405.56	2.53	TBR
22110	TREE AREA	P77TS	406.27	10.46	TBR
22118	TREE AREA	P77TS	403.63	8.53	TBR
22126	TREE AREA	P77TS	409.30	16.37	TBR
22134	TREE AREA	P77TS	420.71	7.82	TBR
22399	TREE AREA	P77TS	391.75	14.96	TBR
22567	TREE AREA	P77TS	411.63	20.51	TBR
22575	TREE AREA	P77TS	397.59	21.72	TBR
22743	TREE AREA	P77TS	397.69	0.61	TBR
22759	TREE AREA	P77TS	375.38	3.14	TBR
22791	TREE AREA	P77TS	380.31	9.31	TBR
22927	TREE AREA	P77TS	370.99	2.18	TBR
22935	TREE AREA	P77TS	403.39	14.81	TBR
22943	TREE AREA	P77TS	378.55	11.32	TBR
22951	TREE AREA	P77TS	384.00	9.69	TBR
22967	TREE AREA	P77TS	368.87	2.37	TBR
23079	TREE AREA	P77TS	370.69	12.43	TBR
23095	TREE AREA	P77TS	364.63	0.01	TBR
23103	TREE AREA	P77TS	390.33	7.61	TBR
23293	TREE AREA	P77TS	368.70	18.05	TBR
23309	TREE AREA	P77TS	368.19	20.61	TBR
23373	TREE AREA	P77TS	375.39	3.44	TBR
23457	TREE AREA	P77TS	332.32	7.13	TBR
30625	TREE AREA	P77TS	377.28	6.38	TBR
47211	TREE AREA	P77TS	417.28	5.62	TBR
47443	TREE AREA	P77TS	381.77	7.54	TBR
47499	TREE AREA	P77TS	392.74	11.56	TBR
47507	TREE AREA	P77TS	387.81	8.47	TBR
7689	TREE AREA	P77TS	411.02	5.53	TBR
18719	TREE AREA	P77TS	409.87	7.42	TBR
100908	TREE AREA	P77TS	409.03	4.58	TBR
113764	TREE AREA	P77TS	420.43	18.58	TBR
115537	TREE AREA	P77TS	411.47	17.96	TBR
141604	TREE AREA	P77TS	416.98	11.57	TBR
145290	TREE AREA	P77TS	406.80	15.72	TBR
146363	TREE AREA	P77TS	407.91	2.77	TBR
155602	TREE AREA	P77TS	426.50	7.69	TBR
158487	TREE AREA	P77TS	412.50	8.79	TBR
166331	TREE AREA	P77TS	409.44	4.44	TBR
168191	NAVAID	P77TS	407.57	10.31	FBF
182829	NAVAID	P77TS	389.00	17.41	FBF
188000	TREE AREA	P77TS	407.43	9.73	TBR
210776	TREE AREA	P77TS	423.76	10.78	TBR
299267	TREE AREA	P77TS	385.50	21.22	TBR
307028	BUILDING	P77TS	358.24	23.99	FBF
307189	BUILDING	P77TS	356.20	22.31	FBF
322758	TREE AREA	P77TS	403.91	1.35	TBR
334617	TREE AREA	P77TS	415.18	20.13	TBR
361991	TREE AREA	P77TS	382.40	39.92	TBR
403554	TREE AREA	P77TS	414.75	18.14	TBR
411825	TREE AREA	P77TS	418.26	24.20	TBR
418997	TREE AREA	P77TS	425.58	23.34	TBR
419304	TREE AREA	P77TS	421.73	22.33	TBR
423941	TREE AREA	P77TS	428.86	4.16	TBR
458940	TREE AREA	P77TS	407.98	11.27	TBR
459193	TREE AREA	P77TS	379.18	29.56	TBR
474101	TREE AREA	P77TS	404.37	13.48	TBR
487207	TREE AREA	P77TS	408.48	11.09	TBR
501448	TREE AREA	P77TS	398.56	3.31	TBR
532710	TREE AREA	P77TS	411.31	5.31	TBR
548722	TREE AREA	P77TS	396.43	3.70	TBR
570300	TREE AREA	P77TS	394.18	0.91	TBR
626946	TREE AREA	P77TS	379.19	24.54	TBR
687739	TREE AREA	P77TS	357.45	4.48	TBR
689640	TREE AREA	P77TS	350.37	8.43	TBR
702702	TREE AREA	P77TS	392.27	0.82	TBR
725652	TREE AREA	P77TS	396.13	5.85	TBR
902598	TREE AREA	P77TS	395.69	6.38	TBR
937893	TREE AREA	P77TS	400.71	8.61	TBR
982528	TREE AREA	P77TS	399.01	6.13	TBR
6954	ANTENNA	P77HS	499.64	8.74	LGTD
10964	POWER TRANSMISSION PYLON	P77HS	505.81	14.91	LGTD
13064	POWER TRANSMISSION PYLON	P77HS	512.73	21.83	LGTD
13072	CELL TOWER	P77HS	515.13	24.23	LGTD
13112	CELL TOWER	P77HS	596.77	105.87	LGTD
13120	CELL TOWER	P77HS	537.67	46.77	LGTD
13128	CELL TOWER	P77HS	505.54	14.64	LGTD

PROFILE VIEW

DIMENSIONAL STANDARDS (FEET)

DIM	ITEM	VISUAL RUNWAY		NON-PRECISION INSTRUMENT RUNWAY			PRECISION INSTRUMENT RUNWAY
		A	B	A	B		
					C	D	
A	WIDTH OF PRIMARY SURFACE AND APPROACH SURFACE AT INNER END	250	500	500	500	1,000	1,000
B	RADIUS OF HORIZONTAL SURFACE	5,000	5,000	5,000	10,000	10,000	10,000
		VISUAL APPROACH		NON-PRECISION INSTRUMENT RUNWAY			PRECISION INSTRUMENT APPROACH
		A	B	A	B		
					C	D	
C	APPROACH SURFACE WIDTH AT END	1,250	1,500	2,000	3,500	4,000	16,000
D	APPROACH SURFACE LENGTH	5,000	5,000	5,000	10,000	10,000	-
E	APPROACH SLOPE	20:1	20:1	20:1	34:1	34:1	-

A - UTILITY RUNWAYS
B - RUNWAYS LARGER THAN UTILITY
C - VISIBILITY MINIMUMS GREATER THAN 3/4 MILE
D - VISIBILITY MINIMUMS AS LOW AS 3/4 MILE
* - PRECISION INSTRUMENT APPROACH SLOPE IS 50:1 FOR INNER 10,000 FEET AND 40:1 FOR AN ADDITIONAL 40,000 FEET



Isometric View

ALP Prepared By

JACOBSEN | DANIELS
Planning, Implementation, Operations & Management

Drawn:
Approved: MJ
Date: 5-1-2023
Project No.:

No.	Date	Revisions

FAA'S APPROVAL OF THIS AIRPORT LAYOUT PLAN (ALP) REPRESENTS ACCEPTANCE OF THE GENERAL LOCATION OF FUTURE FACILITIES DEPICTED (SHEET I7144C04). DURING THE PRELIMINARY DESIGN PHASE, THE AIRPORT OWNER IS REQUIRED TO RESUBMIT FOR APPROVAL THE FINAL LOCATIONS, HEIGHTS, AND EXTERIOR FINISH OF STRUCTURES. FAA'S CONCERN IS OBSTRUCTIONS, IMPACT ON ELECTRONIC AIDS, OR ADVERSE EFFECTS ON CONTROLLER VIEW OF AIRCRAFT APPROACHES AND GROUND MOVEMENT AREAS WHICH COULD ADVERSELY AFFECT THE SAFETY, EFFICIENCY, OR UTILITY OF THE AIRPORT.

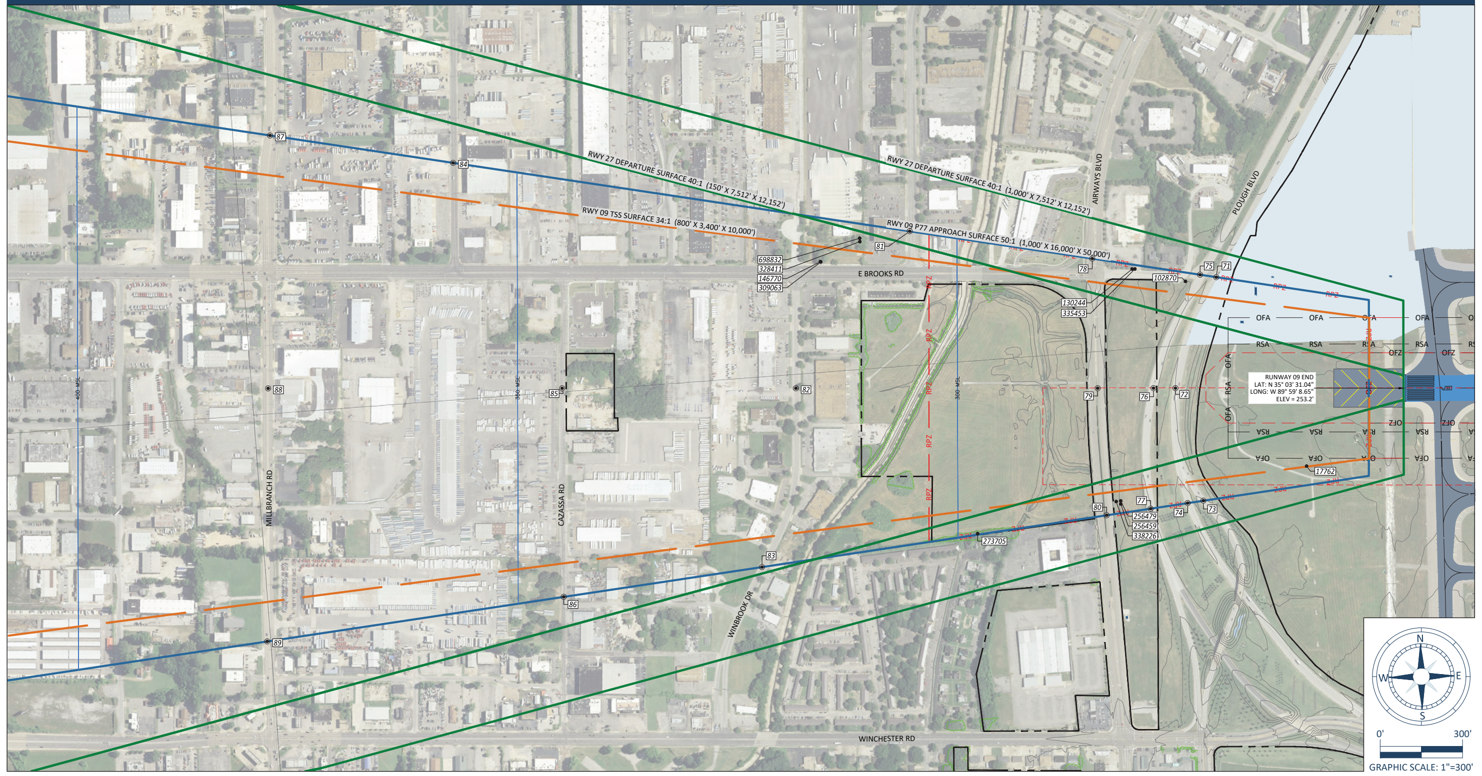
Notes
1. Shelby County Zoning includes an airport overlay district that includes height restrictions associated with FAR Part 77 imaginary surfaces.
2. No OFZ obstructions/violations in the existing/future conditions.
3. Trees penetrating the 40:1 departure surface are shown as grey colored dots.
4. No PAPI siting surface (3:1 slope) obstructions. Surface not shown on drawing for clarity.
5. TBR = To be removed.
6. FBF = Fixed by function.
7. LGTD = Lighted.

Sources
1. Obstruction survey data performed under CIVICX (GCR) GIS Data Package Summary, dated July 2020.
2. Extended runway composite profile obtained using contours from AGIS project #220139 (September 2015) and United States Geographic Survey outside of survey limits.
3. Data of individual obstructions specifically trees can be found in the CIVICX (GCR) GIS Data Package Summary.

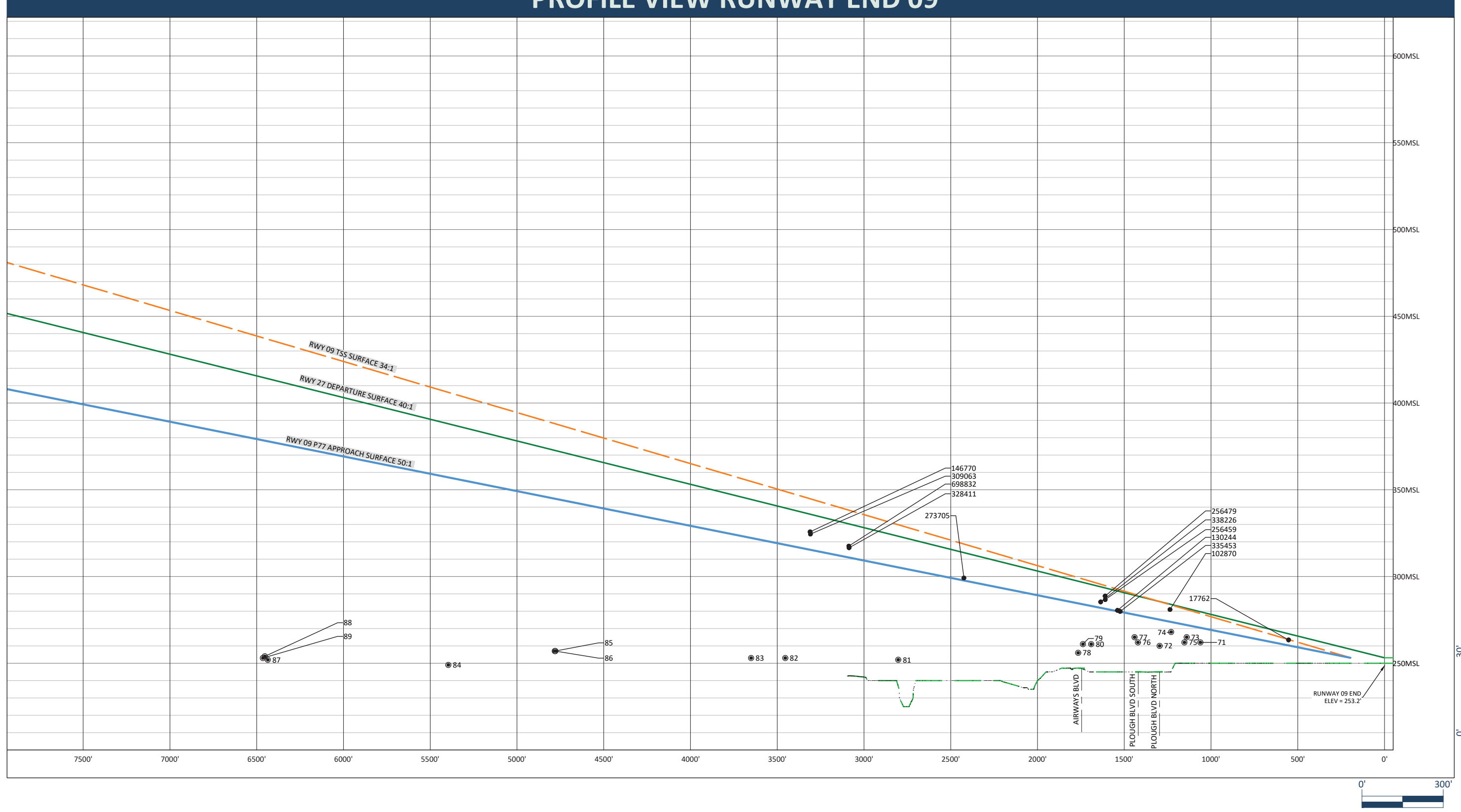
Memphis INTERNATIONAL AIRPORT

AIRSPACE DRAWING
AIRPORT LAYOUT PLAN

PLAN VIEW RUNWAY END 09



PROFILE VIEW RUNWAY END 09



SURFACE OBSTRUCTION TABLE

OBJECT ID	DESCRIPTION	TOP ELEV MSL	P77 PEN VALUE (FEET)	DEP PEN VALUE (FEET)	TSS PEN VALUE (FEET)	DISPOSTITION	TRIGGERING EVENT
17762	UNKNOWN	263.45	3.17	-	-	N/A	N/A
102870	POLE	280.95	6.92	-	-	LGTD	N/A
130244	POLE	280.51	0.42	-	-	LGTD	N/A
146770	TREE AREA	325.76	10.24	-	-	TBR	N/A
256459	POLE	286.68	5.30	-	-	LGTD	N/A
256479	POLE	288.76	7.36	-	-	LGTD	N/A
273705	TREE AREA	299.15	1.48	-	-	TBR	N/A
309063	TREE AREA	324.44	8.95	-	-	TBR	N/A
328411	TREE AREA	316.58	5.54	-	-	TBR	N/A
335453	POLE	279.88	0.10	-	-	LGTD	N/A
338226	POLE	285.37	3.46	-	-	LGTD	N/A
698832	TREE AREA	317.55	6.48	-	-	TBR	N/A

TRAVERSEWAY ELEVATION DATA

OBJECT ID	DESCRIPTION	TOP ELEV MSL	P77 PEN VALUE (FEET)	DISPOSTITION
71	JIM MCGEHEE PKWY.	262.00	-8.44	N/A
72	JIM MCGEHEE PKWY.	260.00	-15.12	N/A
73	JIM MCGEHEE PKWY.	265.00	-6.98	N/A
74	JIM MCGEHEE PKWY.	268.00	-5.77	N/A
75	PLOUGH BLVD.	262.00	-10.29	N/A
76	PLOUGH BLVD.	262.00	-15.62	N/A
77	PLOUGH BLVD.	265.00	-12.98	N/A
78	AIRWAYS BLVD.	256.00	-28.54	N/A
79	AIRWAYS BLVD.	261.00	-22.97	N/A
80	AIRWAYS BLVD.	261.00	-21.98	N/A
81	DIRECTORS ROW	252.00	-53.29	N/A
82	WINBROOK DR.	253.00	-65.27	N/A
83	WINBROOK DR.	253.00	-69.17	N/A
84	CARRIER ST.	249.00	-108.16	N/A
85	CAZASSA DR.	257.00	-87.84	N/A
86	CAZASSA DR.	257.00	-87.72	N/A
87	MILL BRANCH RD.	252.00	-125.97	N/A
88	MILL BRANCH RD.	254.00	-124.26	N/A
89	MILL BRANCH RD.	253.00	-125.43	N/A

NOTES:
1. TBR = TO BE REMOVED.
2. N/A = POINT CLEARS THE SURFACE OR IS OUTSIDE THE SURFACE AREA.
3. FBF = FIXED BY FUNCTION.
4. LGTD = LIGHTED.

- NO DEPARTURE SURFACE TREE PENETRATIONS.

LEGEND

ITEM	DESCRIPTION	ITEM	DESCRIPTION
250	EXISTING GROUND CONTOUR	ROFA	RUNWAY OBJECT FREE AREA (ROFA)
250 MSL	PART 77 SURFACE CONTOUR	RSA	RUNWAY SAFETY AREA (RSA)
	GS CRITICAL AREA	OFZ	OBJECT FREE ZONE (OFZ)
	RUNWAY PAVEMENT & MARKINGS	RPZ	RUNWAY PROTECTION ZONE (RPZ)
	TAXIWAY PAVEMENT		EXISTING AIRPORT PROPERTY LINE
	FOREST / TREE CLUSTER		PT77 APPROACH SURFACE
			TSS APPROACH SURFACE
	TRAVERSE WAY POINT		DEPARTURE SURFACE
	OBSTRUCTIONS		LOC CRITICAL AREA
	STRUCTURES ON AIRPORT PROPERTY		

ALP Prepared By

JACOBSEN | DANIELS
Planning, Implementation, Operations & Management

Drawn:
Approved: MJ
Date: 4-21-2023
Project No.:

No.	Date	Revisions

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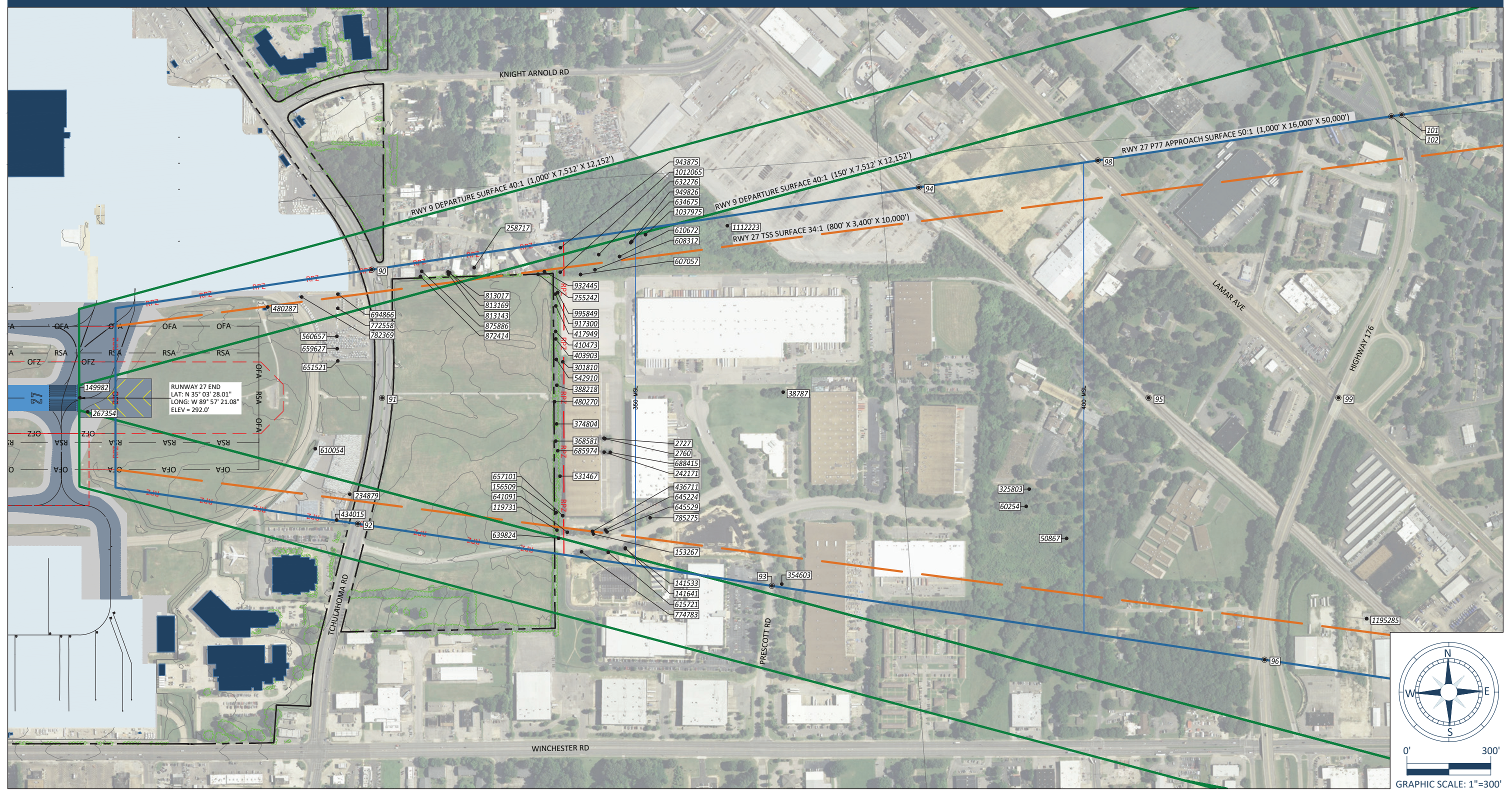
MAGNETIC DECLINATION
0 30' WEST (2009)
DECLINATION CHANGING BY 0 6' WEST/YEAR

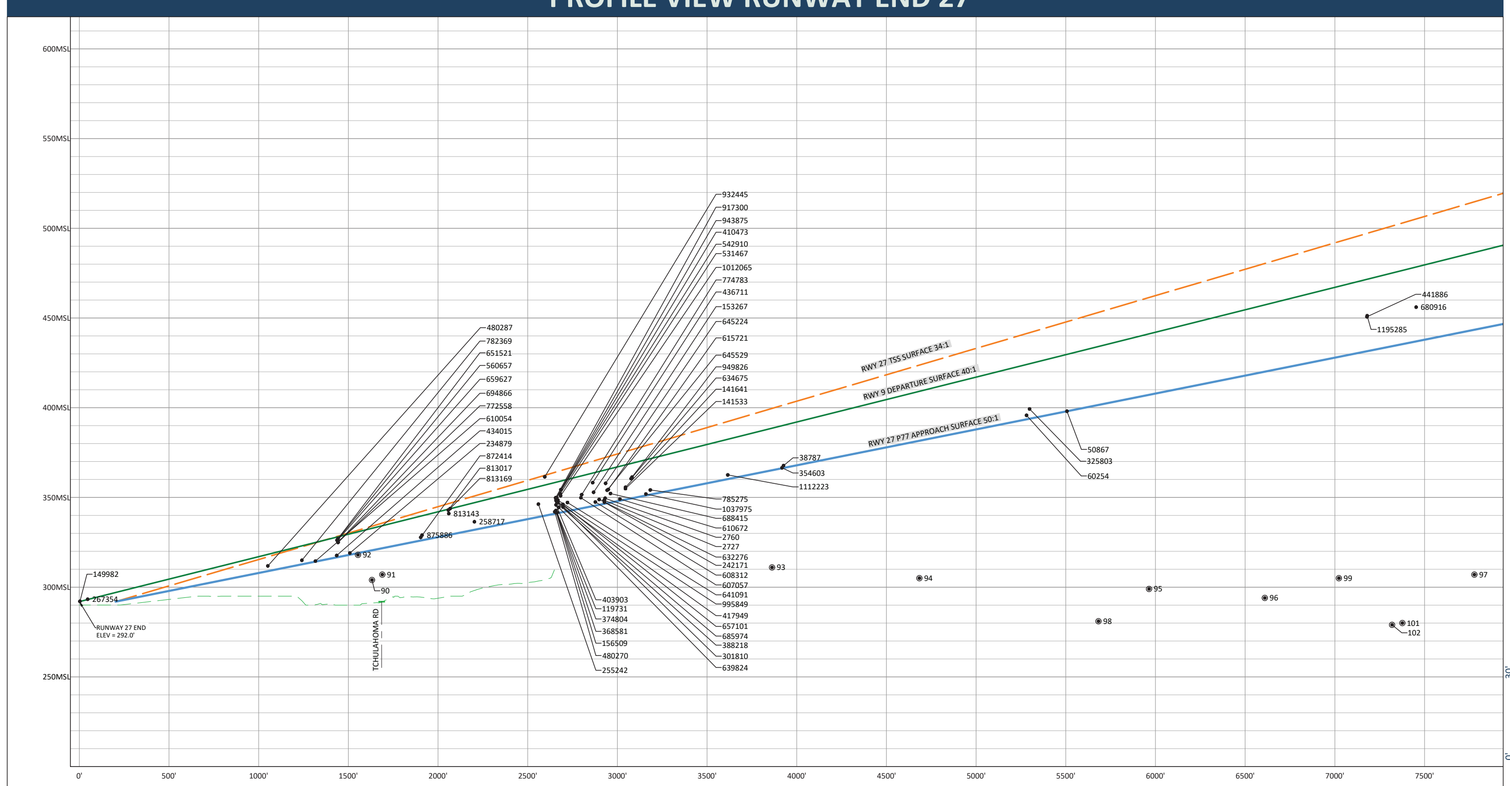
Memphis INTERNATIONAL AIRPORT

RWY 09 INNER APPROACH
RWY 27 DEPARTURE
EXISTING PLAN & PROFILE
Airport Layout Plan Drawing Set

PLAN VIEW RUNWAY END 27



PROFILE VIEW RUNWAY END 27



SURFACE OBSTRUCTION TABLE

OBJECT ID	DESCRIPTION	TOP ELEV MSL	P77 PEN VALUE (FEET)	DEP PEN VALUE (FEET)	TSS PEN VALUE (FEET)	DISPOSTITION	TRIGGERING EVENT
2727	TREE AREA	348.43	1.99	-	-	TBR	N/A
2760	TREE AREA	349.55	3.01	-	-	TBR	N/A
38787	TREE AREA	367.75	1.32	-	-	TBR	N/A
50867	TREE AREA	398.05	0.00	-	-	TBR	N/A
60254	TREE AREA	395.79	2.26	-	-	TBR	N/A
119731	TREE AREA	341.48	0.29	-	-	TBR	N/A
141533	TREE AREA	354.91	6.09	-	-	TBR	N/A
141641	TREE AREA	355.65	6.83	-	-	TBR	N/A
149982	GROUND	292.10	-	0.06	-	N/A	N/A
153267	TREE AREA	352.88	7.62	-	-	TBR	N/A
156509	TREE AREA	341.73	0.64	-	-	TBR	N/A
234879	LIGHT POLE	319.01	0.92	-	-	LGTD	N/A
242171	TREE AREA	347.33	0.88	-	-	TBR	N/A
255242	TREE AREA	346.27	7.18	-	-	TBR	N/A
258717	TREE AREA	336.45	4.49	-	-	TBR	N/A
267354	UNKNOWN	293.25	-	0.14	-	N/A	N/A
301810	TREE AREA	344.65	2.81	-	-	TBR	N/A
325803	TREE AREA	399.32	5.45	-	-	TBR	N/A
354603	TREE AREA	366.52	0.25	-	-	TBR	N/A
368581	TREE AREA	342.74	1.68	-	-	TBR	N/A
374804	TREE AREA	341.46	0.31	-	-	TBR	N/A
388218	TREE AREA	347.01	5.84	-	-	TBR	N/A
403903	TREE AREA	345.87	4.80	-	-	TBR	N/A
410473	TREE AREA	349.32	8.27	-	-	TBR	N/A
417949	TREE AREA	348.21	7.13	-	-	TBR	N/A
434015	LIGHT POLE	317.67	1.05	-	-	LGTD	N/A
436711	TREE AREA	358.23	13.07	-	-	TBR	N/A
441886	LIGHT POLE	450.70	19.19	-	-	LGTD	N/A
480270	TREE AREA	342.00	1.08	-	-	TBR	N/A
480287	POLE	311.84	2.91	-	-	LGTD	N/A
531467	TREE AREA	352.05	10.51	-	-	TBR	N/A
542910	TREE AREA	349.92	8.79	-	-	TBR	N/A
560657	LIGHT POLE	326.19	9.54	-	-	LGTD	N/A
607057	TREE AREA	349.85	6.02	-	-	TBR	N/A
608312	TREE AREA	347.46	2.02	-	-	TBR	N/A
610054	LIGHT POLE	314.53	0.29	-	-	LGTD	N/A
610672	TREE AREA	349.09	0.91	-	-	TBR	N/A
615721	TREE AREA	354.45	7.55	-	-	TBR	N/A
632276	TREE AREA	348.88	3.02	-	-	TBR	N/A
634675	TREE AREA	360.49	11.07	-	-	TBR	N/A
639824	POLE	344.46	3.09	-	-	LGTD	N/A
641091	TREE AREA	347.17	4.82	-	-	TBR	N/A
645224	TREE AREA	357.87	11.26	-	-	TBR	N/A
645529	TREE AREA	354.02	7.25	-	-	TBR	N/A
651521	LIGHT POLE	327.07	10.31	-	-	LGTD	N/A
657101	TREE AREA	346.10	4.27	-	-	TBR	N/A
659627	LIGHT POLE	326.03	9.35	-	-	LGTD	N/A
680916	LIGHT POLE	456.06	19.08	-	-	LGTD	N/A
685974	TREE AREA	347.20	5.92	-	-	TBR	N/A
688415	TREE AREA	352.20	5.06	-	-	TBR	N/A
694866	LIGHT POLE	325.02	8.26	-	-	LGTD	N/A
772558	LIGHT POLE	324.95	8.19	-	-	LGTD	N/A
774783	TREE AREA	351.52	7.59	-	-	TBR	N/A
782369	POLE	314.97	2.25	-	-	LGTD	N/A
785275	TREE AREA	354.18	2.60	-	-	TBR	N/A
813017	TREE AREA	342.98	13.94	-	-	TBR	N/A
813143	TREE AREA	341.01	11.91	-	-	TBR	N/A
813169	TREE AREA	343.77	14.52	-	-	TBR	N/A
872414	TREE AREA	327.77	1.80	-	-	TBR	N/A
875886	TREE AREA	328.99	2.86	-	-	TBR	N/A
917300	TREE AREA	349.82	8.80	-	-	TBR	N/A
932445	TREE AREA	361.50	21.70	4.60	-	TBR	N/A
943875	TREE AREA	354.32	12.73	-	-	TBR	N/A
949826	TREE AREA	361.37	11.83	-	-	TBR	N/A
995849	TREE AREA	348.47	7.20	-	-	TBR	N/A
1012065	TREE AREA	350.94	9.38	-	-	TBR	N/A
1037975	TREE AREA	351.91	0.84	-	-	TBR	N/A
1112223	TREE AREA	362.55	2.35	-	-	TBR	N/A
1195285	LIGHT POLE	451.24	19.72	-	-	LGTD	N/A

TRAVERSEWAY ELEVATION DATA

OBJECT ID	DESCRIPTION	TOP ELEV MSL	P77 PEN VALUE (FEET)	DISPOSTITION
90	TCHULAHOMA RD.	304.00	-16.66	N/A
91	TCHULAHOMA RD.	307.00	-14.79	N/A
92	TCHULAHOMA RD.	318.00	-1.06	N/A
93	PRESCOTT BLVD.	311.00	-54.22	N/A
94	RAILROAD	305.00	-76.71	N/A
95	RAILROAD	299.00	-108.28	N/A
96	NEW GETWELL RD.	294.00	-126.16	N/A
97	RAILROAD	307.00	-136.51	N/A
98	HIGHWAY 78	281.00	-120.68	N/A
99	HIGHWAY 78	305.00	-123.46	N/A
100	HIGHWAY 78	280.00	-184.95	N/A
101	NEW GETWELL RD.	280.00	-155.58	N/A
102	NEW GETWELL RD.	279.00	-155.43	N/A

NOTES:
1. TBR = TO BE REMOVED.
2. N/A = POINT CLEARS THE SURFACE OR IS OUTSIDE THE SURFACE AREA.
3. FBF = FIXED BY FUNCTION.
4. LGTD = LIGHTED.

SURFACE POINT #680916 AND TRAVERSEWAY POINTS #97 & #100 EXTEND BEYOND VIEWPORT RANGE

LEGEND

ITEM	DESCRIPTION	ITEM	DESCRIPTION
250	EXISTING GROUND CONTOUR	ROFA	RUNWAY OBJECT FREE AREA (ROFA)
250 MSL	PART 77 SURFACE CONTOUR	RSA	RUNWAY SAFETY AREA (RSA)
	GS CRITICAL AREA	OFZ	OBJECT FREE ZONE (OFZ)
	RUNWAY PAVEMENT & MARKINGS	RPZ	RUNWAY PROTECTION ZONE (RPZ)
	TAXIWAY PAVEMENT		EXISTING AIRPORT PROPERTY LINE
	FOREST / TREE CLUSTER		PT77 APPROACH SURFACE
			TSS APPROACH SURFACE
	TRAVERSE WAY POINT		DEPARTURE SURFACE
	OBSTRUCTIONS		LOC CRITICAL AREA
	STRUCTURES ON AIRPORT PROPERTY		

ALP Prepared By
JACOBSEN | DANIELS
Planning, Implementation, Operations & Management

Drawn:
Approved: MJ
Date: 4-21-2023
Project No.:

No.	Date	Revisions

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Notes
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2. No OFZ obstructions/violations in the existing/future conditions.
3. Trees penetrating the 40:1 departure surface are shown as grey colored dots.
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Sources
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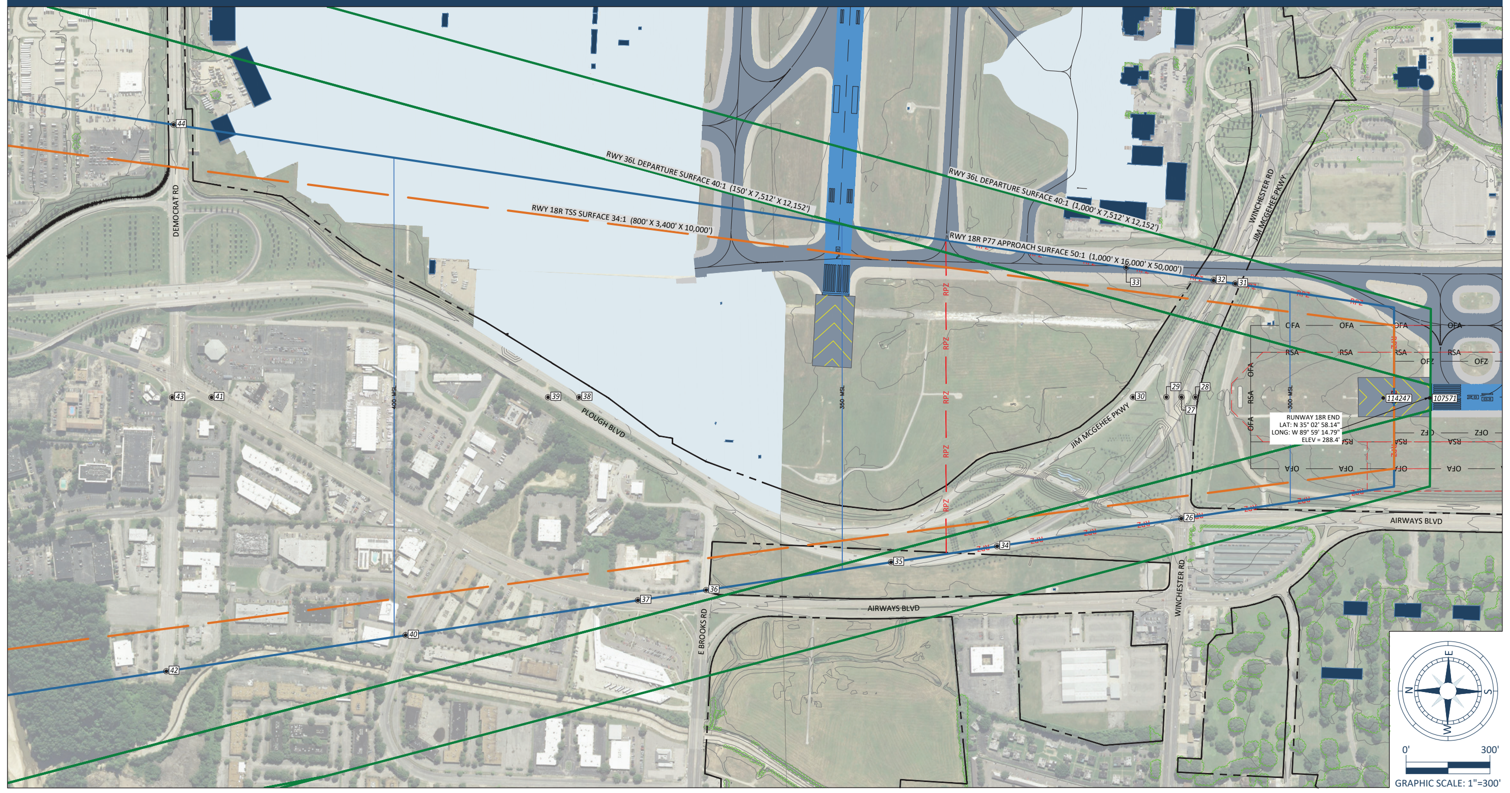
2. Extended runway composite profile obtained using contours from AGIS project #220139 (September 2015) and United States Geographic Survey outside of survey limits.
3. Data of individual obstructions specifically trees can be found in the CIVICX (GCR) GIS Data Package Summary.

N W E S
MAGNETIC DECLINATION
0 30' WEST (2009)
DECLINATION CHANGING BY 0 6' WEST/YEAR

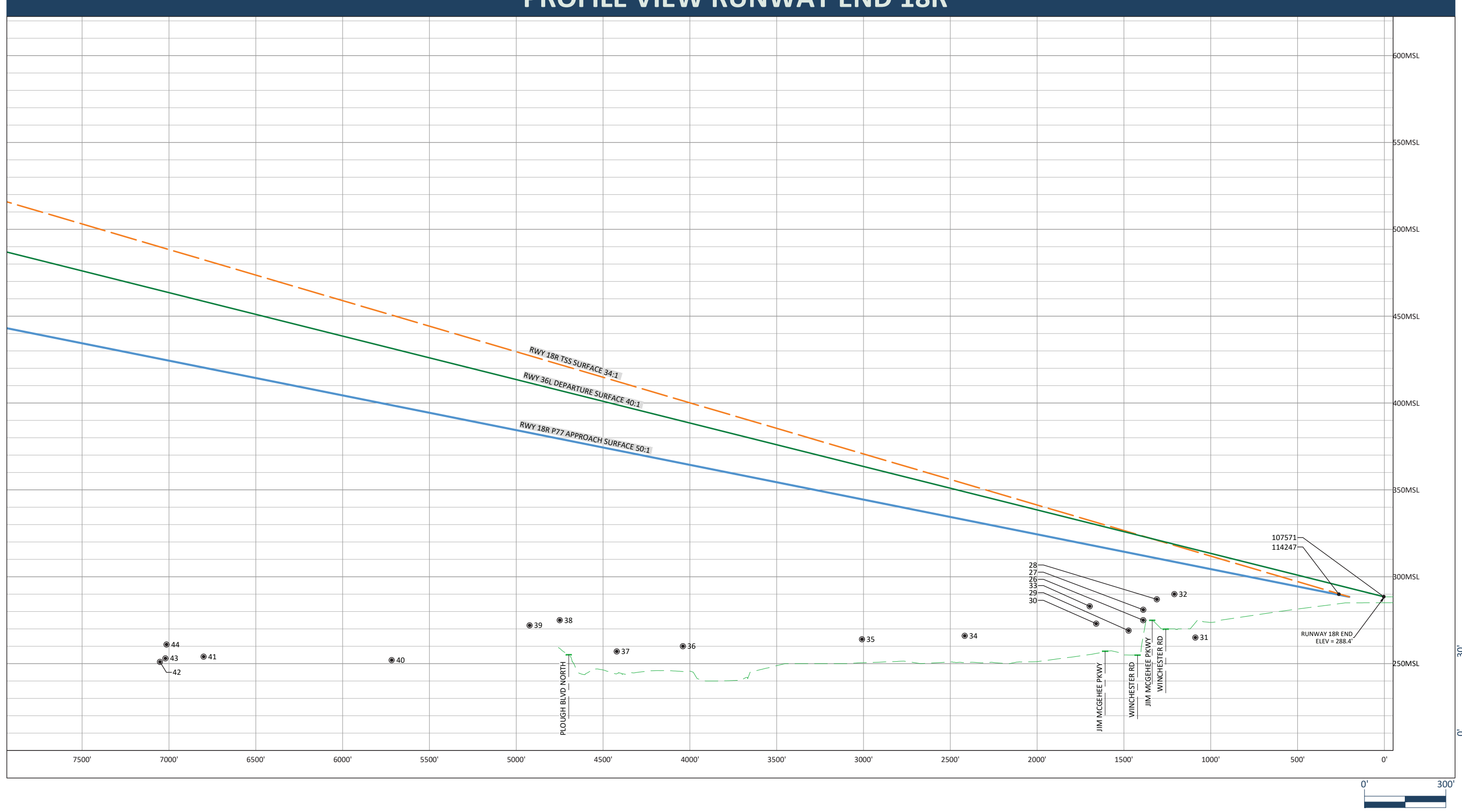
Memphis INTERNATIONAL AIRPORT

RWY 27 INNER APPROACH
RWY 09 DEPARTURE
EXISTING PLAN & PROFILE
Airport Layout Plan Drawing Set

PLAN VIEW RUNWAY END 18R



PROFILE VIEW RUNWAY END 18R



SURFACE OBSTRUCTION TABLE

OBJECT ID	DESCRIPTION	TOP ELEV MSL	P77 PEN VALUE (FEET)	DEP PEN VALUE (FEET)	TSS PEN VALUE (FEET)	DISPOSTITION	TRIGGERING EVENT
107571	NAVAID	288.53	-	0.01	-	FBF	N/A
114247	NAVAID	289.92	0.29	-	-	FBF	N/A

TRAVERSEWAY ELEVATION DATA

OBJECT ID	DESCRIPTION	TOP ELEV MSL	P77 PEN VALUE (FEET)	DISPOSTITION
26	WINCEHSTER RD.	275.00	-37.12	N/A
27	PLOUGH BLVD.	281.00	-31.18	N/A
28	PLOUGH BLVD.	287.00	-23.62	N/A
29	WINCEHSTER RD.	269.00	-44.86	N/A
30	JIM MCGEHEE PKWY.	273.00	-44.60	N/A
31	PLOUGH BLVD.	265.00	-41.24	N/A
32	JIM MCGEHEE PKWY.	290.00	-18.66	N/A
33	TAXIWAY N	283.00	-35.42	N/A
34	PLOUGH BLVD.	266.00	-66.66	N/A
35	PLOUGH BLVD.	264.00	-80.49	N/A
36	BROOKS RD.	260.00	-105.10	N/A
37	AIRWAYS BLVD.	257.00	-115.72	N/A
38	JIM MCGEHEE PKWY.	275.00	-104.39	N/A
39	PLOUGH BLVD.	272.00	-110.86	N/A
40	DIRECTORS ROW	252.00	-146.62	N/A
41	AIRWAYS BLVD.	254.00	-166.42	N/A
42	DEMOCRAT RD.	251.00	-174.29	N/A
43	DEMOCRAT RD.	253.00	-171.81	N/A
44	DEMOCRAT RD.	261.00	-163.83	N/A
45	INTERSTATE 240.	262.00	-213.35	N/A
46	INTERSTATE 240.	260.00	-217.38	N/A
47	INTERSTATE 240.	274.00	-205.77	N/A
48	INTERSTATE 240.	275.00	-209.25	N/A
49	INTERSTATE 240.	276.00	-200.75	N/A
50	INTERSTATE 240.	264.00	-218.37	N/A

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- TRAVERSEWAY POINTS #45 THROUGH #50 EXTEND BEYOND VIEWPORT RANGE.
- NO DEPARTURE SURFACE TREE PENETRATIONS.

LEGEND

ITEM	DESCRIPTION	ITEM	DESCRIPTION
250	EXISTING GROUND CONTOUR	ROFA	RUNWAY OBJECT FREE AREA (ROFA)
250 MSL	PART 77 SURFACE CONTOUR	RSA	RUNWAY SAFETY AREA (RSA)
	GS CRITICAL AREA	OFZ	OBJECT FREE ZONE (OFZ)
	RUNWAY PAVEMENT & MARKINGS	RPZ	RUNWAY PROTECTION ZONE (RPZ)
	TAXIWAY PAVEMENT		EXISTING AIRPORT PROPERTY LINE
	FOREST / TREE CLUSTER		PT77 APPROACH SURFACE
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	TRAVERSE WAY POINT		DEPARTURE SURFACE
	OBSTRUCTIONS		LOC CRITICAL AREA
	STRUCTURES ON AIRPORT PROPERTY		

ALP Prepared By

JACOBSEN | DANIELS
Planning, Implementation, Operations & Management

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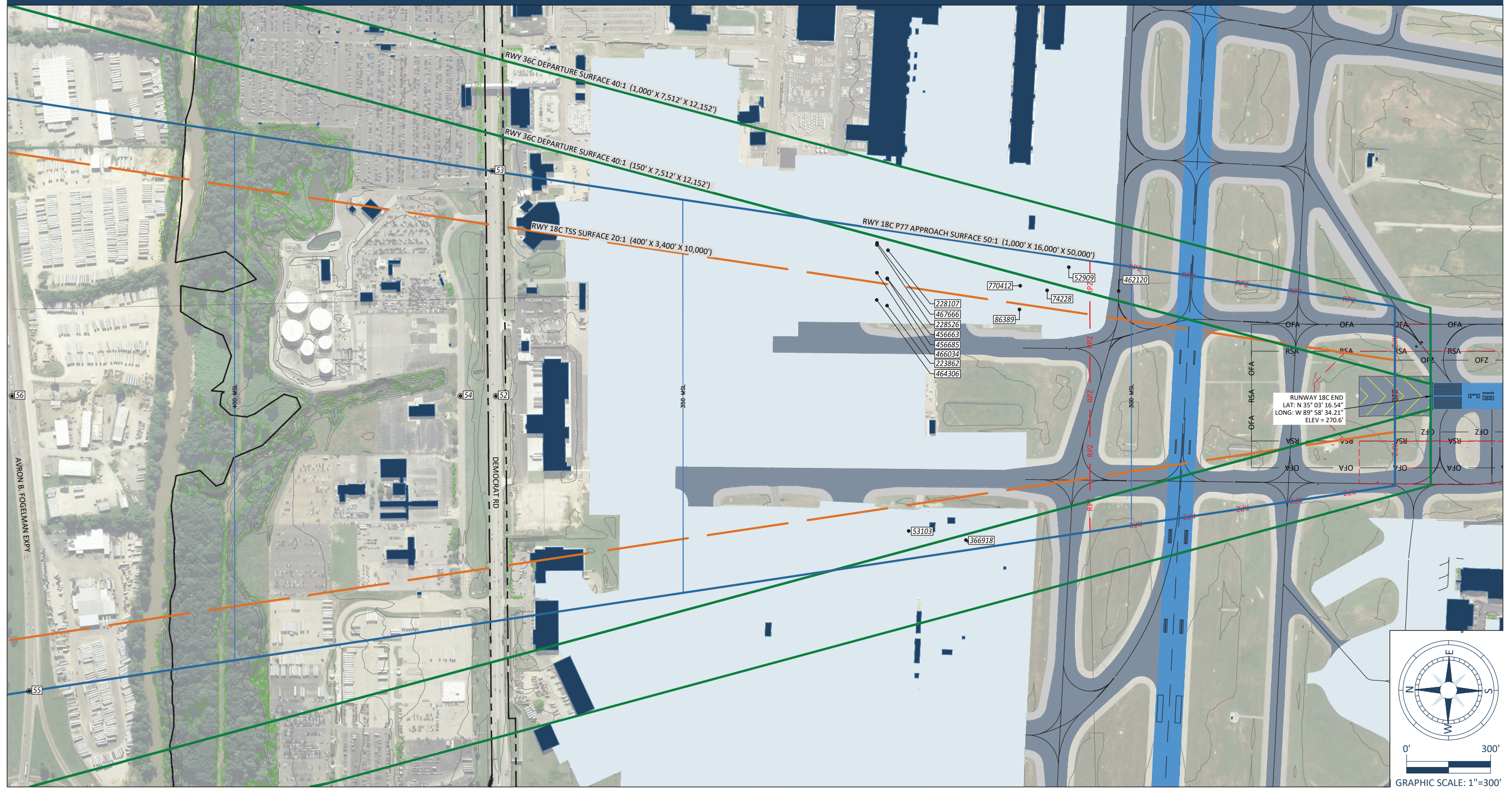
DECLINATION CHANGING BY 0 6' WEST/YEAR

Memphis INTERNATIONAL AIRPORT

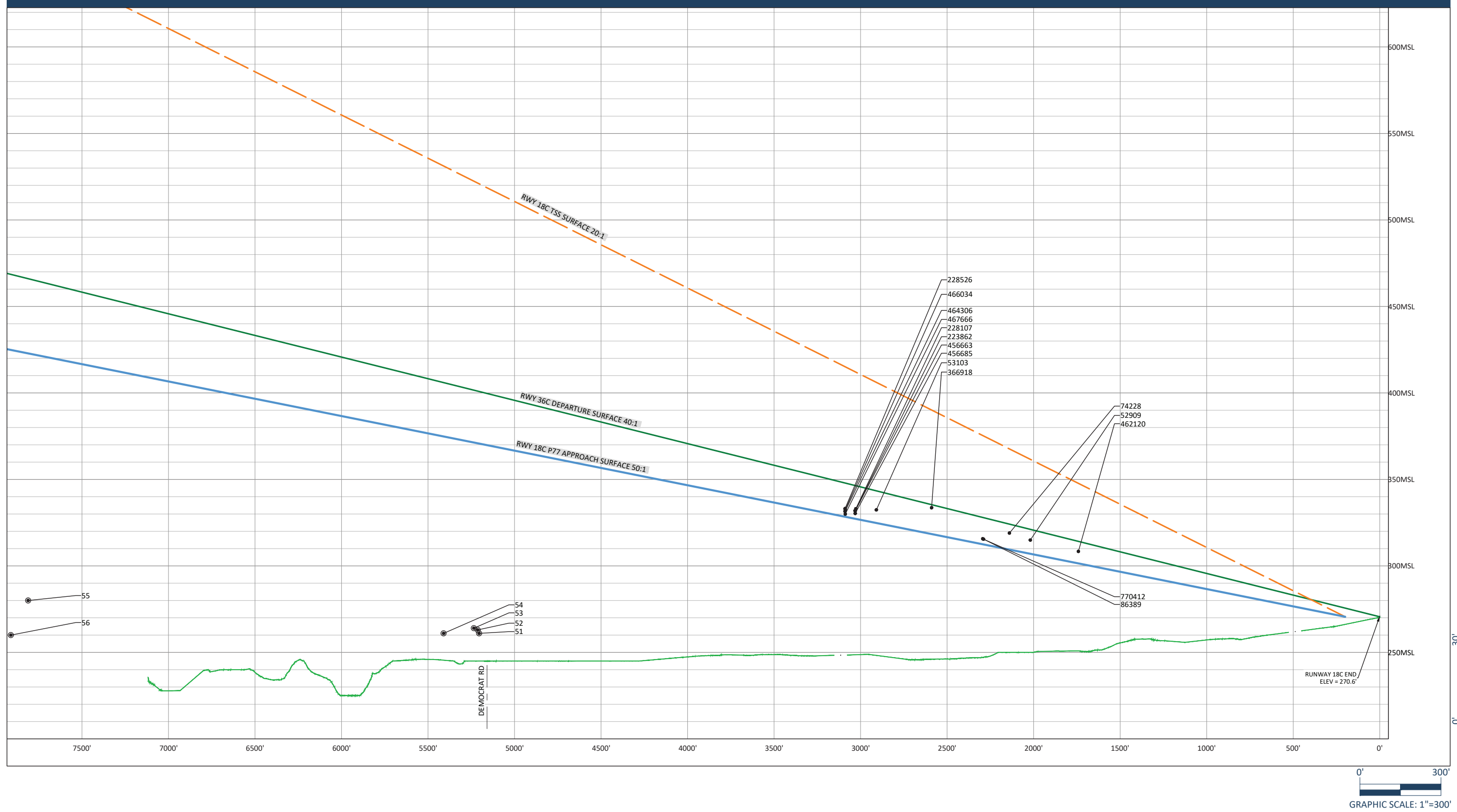
RWY 18R INNER APPROACH
RWY 36L DEPARTURE
EXISTING PLAN & PROFILE
Airport Layout Plan Drawing Set

Memphis International Airport

PLAN VIEW RUNWAY END 18C



PROFILE VIEW RUNWAY END 18C



SURFACE OBSTRUCTION TABLE

OBJECT ID	DESCRIPTION	TOP ELEV MSL	P77 PEN VALUE (FEET)	DEP PEN VALUE (FEET)	TSS PEN VALUE (FEET)	DISPOSTITION	TRIGGERING EVENT
52909	LIGHT POLE	314.96	7.98	-	-	LGTD	N/A
53103	LIGHT POLE	332.39	7.55	-	-	LGTD	N/A
74228	LIGHT POLE	318.99	9.58	-	-	LGTD	N/A
86389	LIGHT POLE	315.69	3.20	-	-	LGTD	N/A
223862	LIGHT POLE	331.98	4.73	-	-	LGTD	N/A
228107	LIGHT POLE	333.04	5.89	-	-	LGTD	N/A
228526	LIGHT POLE	333.14	4.75	-	-	LGTD	N/A
366918	LIGHT POLE	333.67	15.20	-	-	LGTD	N/A
456663	LIGHT POLE	331.74	4.52	-	-	LGTD	N/A
456685	LIGHT POLE	330.35	3.13	-	-	LGTD	N/A
462120	UNKNOWN	308.39	6.96	-	-	LGTD	N/A
464306	LIGHT POLE	331.52	3.12	-	-	LGTD	N/A
466034	LIGHT POLE	332.43	4.04	-	-	LGTD	N/A
467666	LIGHT POLE	329.97	1.61	-	-	LGTD	N/A
770412	LIGHT POLE	315.45	3.06	-	-	LGTD	N/A

TRAVERSEWAY ELEVATION DATA

OBJECT ID	DESCRIPTION	TOP ELEV MSL	P77 PEN VALUE (FEET)	DISPOSTITION
51	DEMOCRAT RD.	261.00	-109.71	N/A
52	DEMOCRAT RD.	263.00	-107.86	N/A
53	DEMOCRAT RD.	264.00	-107.28	N/A
54	RENTAL RD.	261.00	-113.80	N/A
55	INTERSTATE 240.	280.00	-142.85	N/A
56	INTERSTATE 240.	260.00	-164.81	N/A
57	INTERSTATE 240.	260.00	-166.62	N/A
58	INTERSTATE 240.	261.00	-167.32	N/A
59	INTERSTATE 240.	261.00	-168.98	N/A

NOTES:
1. TBR = TO BE REMOVED.
2. N/A = POINT CLEARS THE SURFACE OR IS OUTSIDE THE SURFACE AREA.
3. FBF = FIXED BY FUNCTION.
4. LGTD = LIGHTED.

- TRAVERSEWAY POINTS #57, #58, AND #59 EXTEND BEYOND VIEWPORT RANGE.
- NO DEPARTURE SURFACE PENETRATIONS.

LEGEND

ITEM	DESCRIPTION	ITEM	DESCRIPTION
250	EXISTING GROUND CONTOUR	ROFA	RUNWAY OBJECT FREE AREA (ROFA)
250 MSL	PART 77 SURFACE CONTOUR	RSA	RUNWAY SAFETY AREA (RSA)
	GS CRITICAL AREA	OFZ	OBJECT FREE ZONE (OFZ)
	RUNWAY PAVEMENT & MARKINGS	RPZ	RUNWAY PROTECTION ZONE (RPZ)
	TAXIWAY PAVEMENT		EXISTING AIRPORT PROPERTY LINE
	FOREST / TREE CLUSTER		PT77 APPROACH SURFACE
			TSS APPROACH SURFACE
	TRAVERSE WAY POINT		DEPARTURE SURFACE
	OBSTRUCTIONS		LOC CRITICAL AREA
	STRUCTURES ON AIRPORT PROPERTY		

ALP Prepared By

JACOBSEN | DANIELS
Planning, Implementation, Operations & Management

Drawn:
Approved: MJ
Date: 4-21-2023
Project No.:

No.	Date	Revisions

FAA'S APPROVAL OF THIS AIRPORT LAYOUT PLAN (ALP) REPRESENTS ACCEPTANCE OF THE GENERAL LOCATION OF FUTURE FACILITIES DEPICTED (SHEET I7144C04). DURING THE PRELIMINARY DESIGN PHASE, THE AIRPORT OWNER IS REQUIRED TO RESUBMIT FOR APPROVAL THE FINAL LOCATIONS, HEIGHTS, AND EXTERIOR FINISH OF STRUCTURES. FAA'S CONCERN IS OBSTRUCTIONS, IMPACT ON ELECTRONIC AIDS, OR ADVERSE EFFECTS ON CONTROLLER VIEW OF AIRCRAFT APPROACHES AND GROUND MOVEMENT AREAS WHICH COULD ADVERSELY AFFECT THE SAFETY, EFFICIENCY, OR UTILITY OF THE AIRPORT.

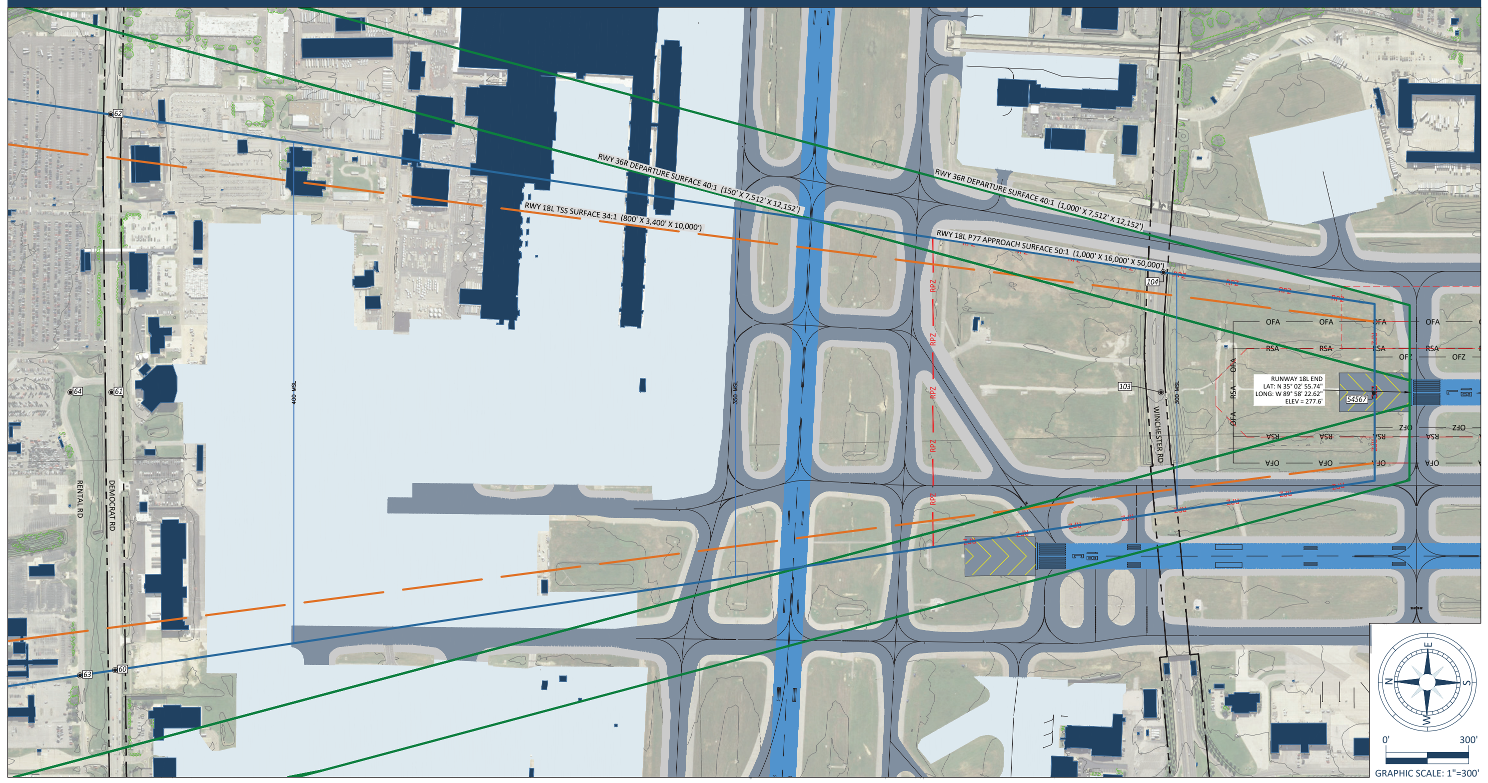
Notes
1. Shelby County Zoning includes an airport overlay district that includes height restrictions associated with FAR Part 77 imaginary surfaces.
2. No OFZ obstructions/violations in the existing/future conditions.
3. Trees penetrating the 40:1 departure surface are shown as grey colored dots.
4. No PAPI siting surface (3:1 slope) obstructions. Surface not shown on drawing for clarity.

Sources
1. Obstruction survey data performed under CIVICX (GCR) GIS Data Package Summary , dated July 2020.
2. Extended runway composite profile obtained using contours from AGIS project #220139 (September 2015) and United States Geographic Survey outside of survey limits.
3. Data of individual obstructions specifically trees can be found in the CIVICX (GCR) GIS Data Package Summary.

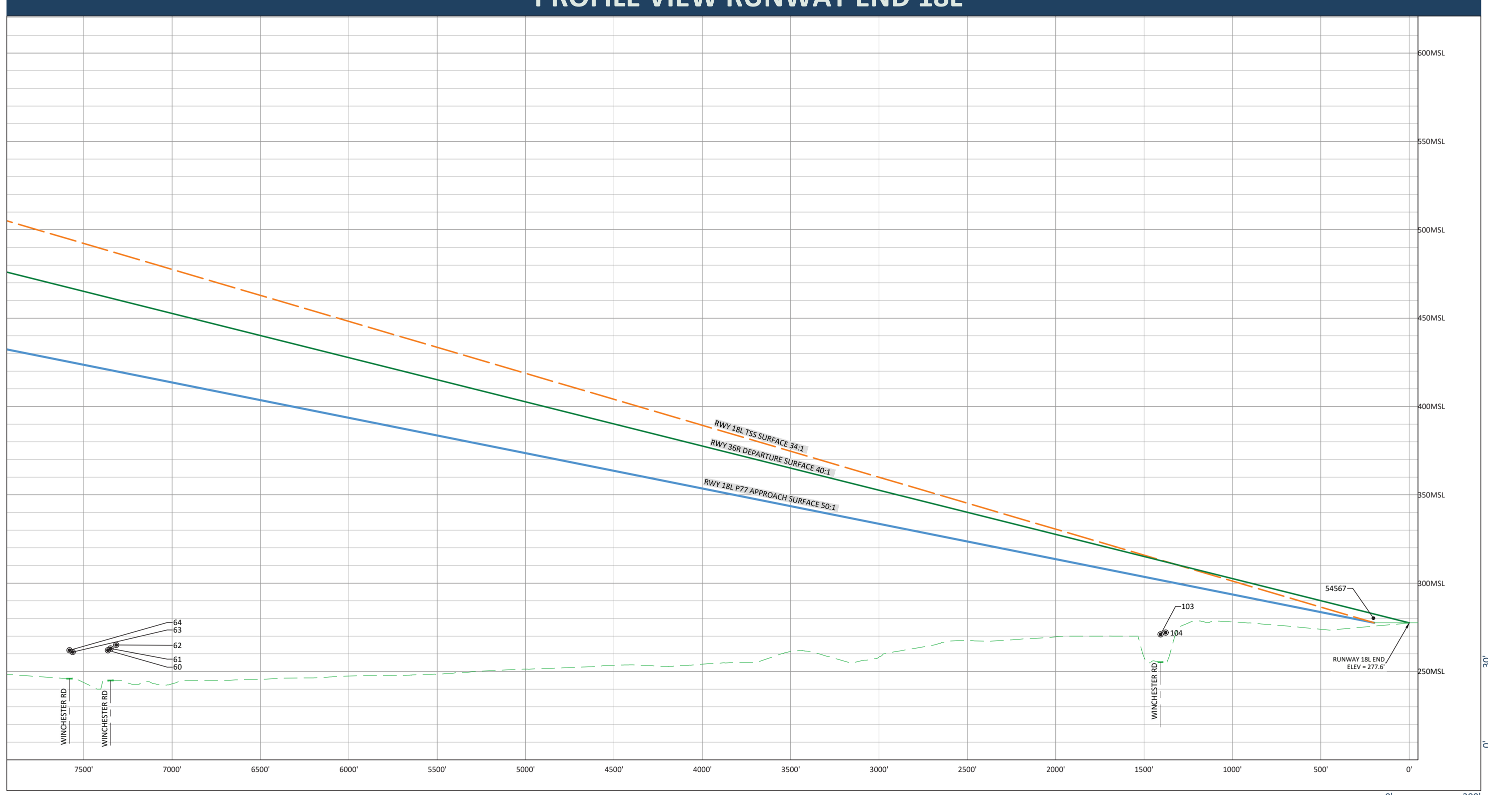
Memphis INTERNATIONAL AIRPORT

RWY 18C INNER APPROACH
RWY 36C DEPARTURE
EXISTING PLAN & PROFILE
Airport Layout Plan Drawing Set

PLAN VIEW RUNWAY END 18L



PROFILE VIEW RUNWAY END 18L



SURFACE OBSTRUCTION TABLE

OBJECT ID	DESCRIPTION	TOP ELEV MSL	P77 PEN VALUE (FEET)	DEP PEN VALUE (FEET)	TSS PEN VALUE (FEET)	DISPOSTITION	TRIGGERING EVENT
54567	NAVAID	280.20	2.54	-	2.50	FBF	N/A

TRAVERSEWAY ELEVATION DATA

OBJECT ID	DESCRIPTION	TOP ELEV MSL	P77 PEN VALUE (FEET)	DISPOSTITION
60	DEMOCRAT RD.	262.00	-158.14	N/A
61	DEMOCRAT RD.	263.00	-157.60	N/A
62	DEMOCRAT RD.	265.00	-155.72	N/A
63	RENTAL RD.	261.00	-163.12	N/A
64	RENTAL RD.	262.00	-163.24	N/A
65	INTERSTATE 240.	262.00	-210.27	N/A
66	INTERSTATE 240.	260.00	-216.11	N/A
67	INTERSTATE 240.	268.00	-212.26	N/A
68	INTERSTATE 240.	260.00	-216.82	N/A
69	INTERSTATE 240.	260.00	-217.85	N/A
70	INTERSTATE 240.	267.00	-214.99	N/A
103	WINCEHSTER RD.	271.00	-30.75	N/A
104	WINCEHSTER RD.	272.00	-29.49	N/A

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- TRAVERSEWAY POINTS #65 THROUGH #70 EXTEND BEYOND VIEWPORT RANGE.
- NO DEPARTURE SURFACE PENETRATIONS.

LEGEND

ITEM	DESCRIPTION	ITEM	DESCRIPTION
250	EXISTING GROUND CONTOUR	ROFA	RUNWAY OBJECT FREE AREA (ROFA)
250 MSL	PART 77 SURFACE CONTOUR	RSA	RUNWAY SAFETY AREA (RSA)
	GS CRITICAL AREA	OFZ	OBJECT FREE ZONE (OFZ)
	RUNWAY PAVEMENT & MARKINGS	RPZ	RUNWAY PROTECTION ZONE (RPZ)
	TAXIWAY PAVEMENT		EXISTING AIRPORT PROPERTY LINE
	FOREST / TREE CLUSTER		PT77 APPROACH SURFACE
			TSS APPROACH SURFACE
	TRAVERSE WAY POINT		DEPARTURE SURFACE
	OBSTRUCTIONS		LOC CRITICAL AREA
	STRUCTURES ON AIRPORT PROPERTY		

ALP Prepared By

JACOBSEN | DANIELS
Planning, Implementation, Operations & Management

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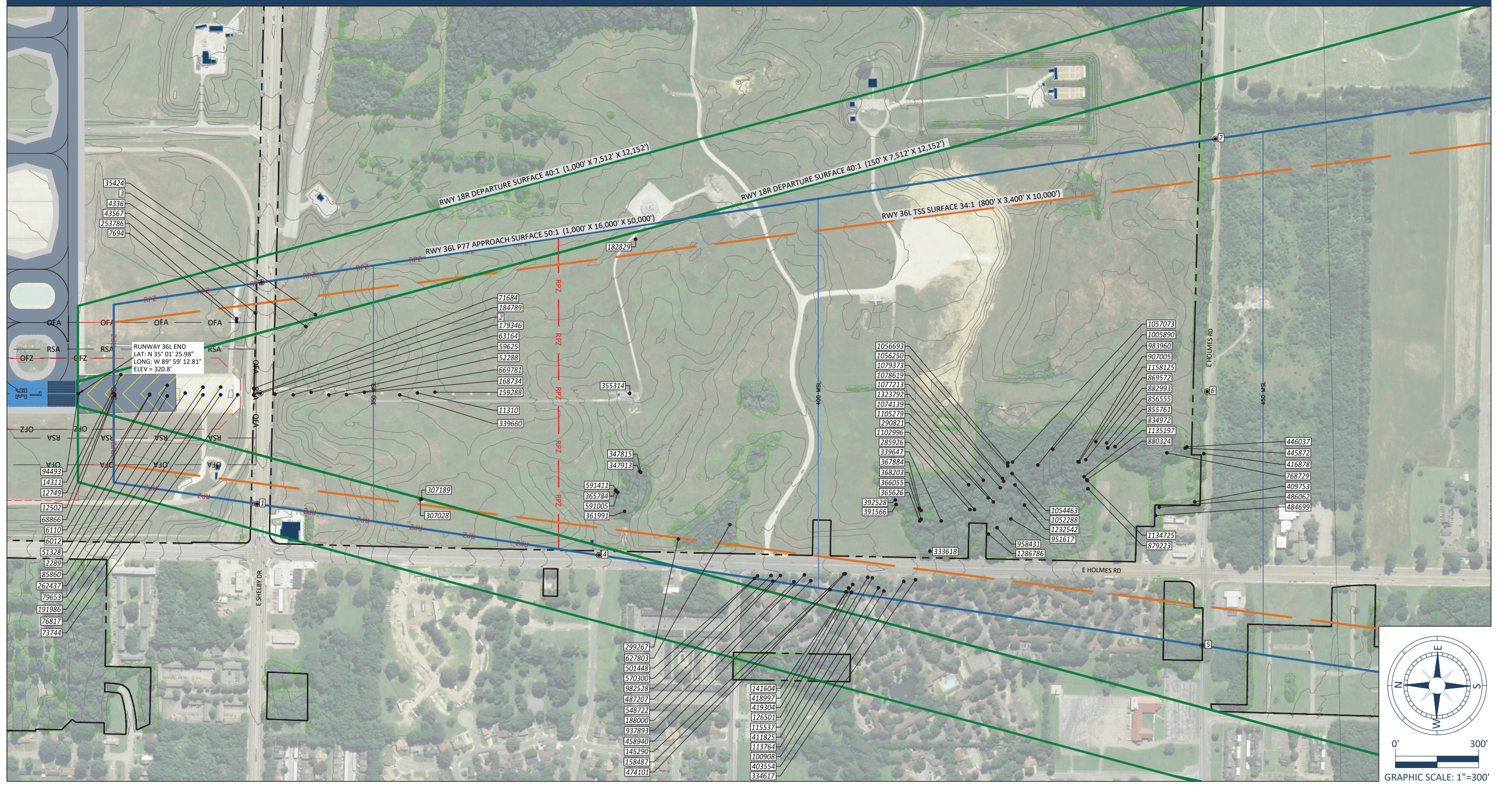
0 30' WEST (2009)
DECLINATION CHANGING BY 0 6' WEST/YEAR

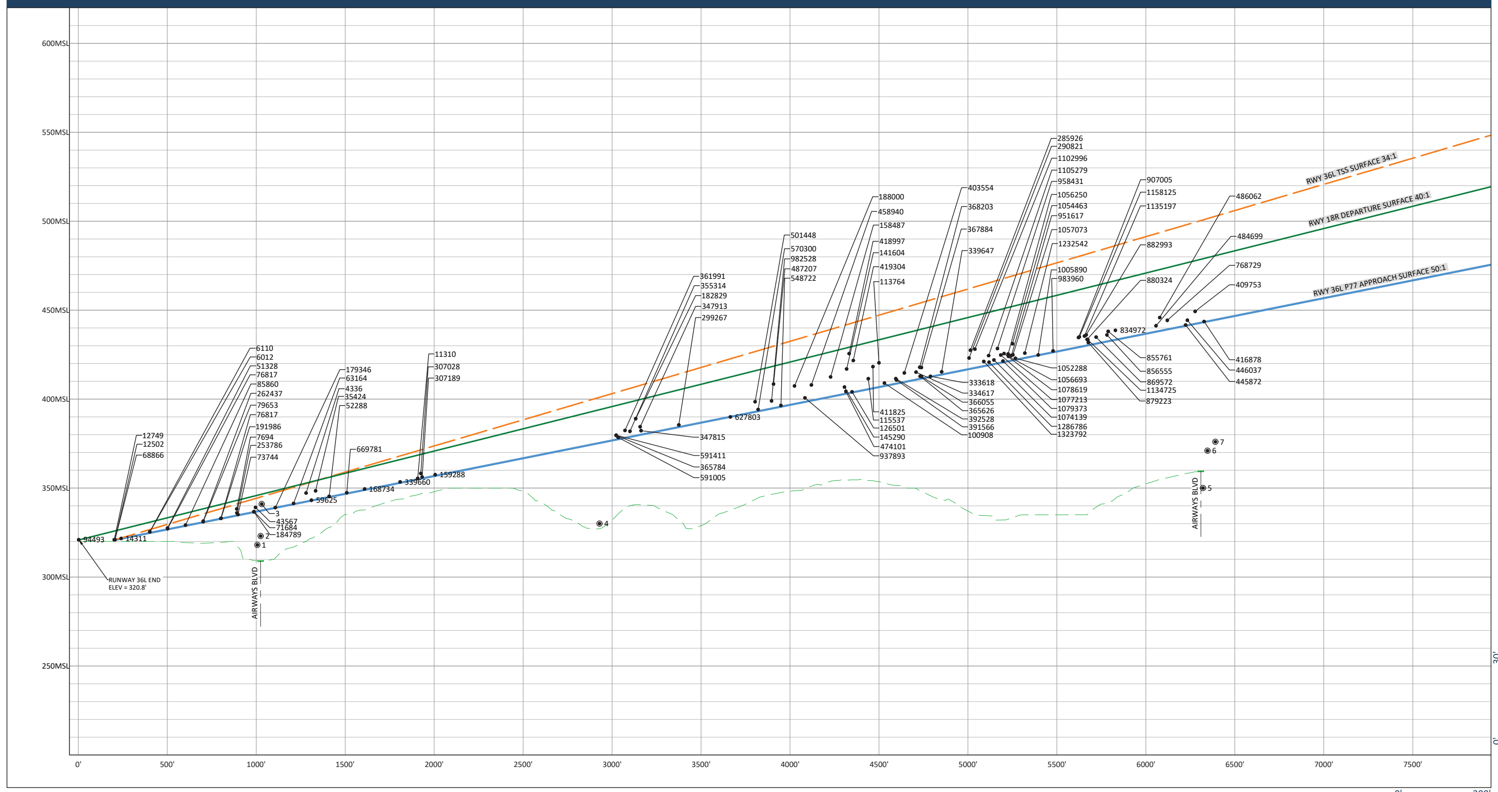
Memphis INTERNATIONAL AIRPORT

RWY 18L INNER APPROACH
RWY 36R DEPARTURE
EXISTING PLAN & PROFILE
Airport Layout Plan Drawing Set

PLAN VIEW RUNWAY END 36L



PROFILE VIEW RUNWAY END 36L



SURFACE OBSTRUCTION TABLE

OBJECT ID	DESCRIPTION	TOP ELEV MSL	P77 PEN VALUE (FEET)	DEP PEN VALUE (FEET)	TSS PEN VALUE (FEET)	DISPOSTITION	TRIGGERING EVENT
2289	NAVAID	327.18	0.39	-	-	FBF	N/A
4336	TREE AREA	347.22	4.86	-	-	TBR	N/A
6012	NAVAID	325.38	0.58	-	-	FBF	N/A
6110	NAVAID	325.49	0.69	-	-	FBF	N/A
7694	NAVAID	338.29	3.71	-	-	FBF	N/A
11310	NAVAID	355.44	0.54	-	-	FBF	N/A
12502	GROUND	320.97	0.11	-	0.0618	N/A	N/A
12749	GROUND	320.96	0.17	-	0.1611	N/A	N/A
14311	UNKNOWN	321.65	0.08	-	-	NA	N/A
35424	TREE AREA	348.47	5.03	-	-	TBR	N/A
43567	LIGHT POLE	339.16	2.48	-	-	LGTD	N/A
51328	NAVAID	327.51	0.73	-	-	FBF	N/A
52288	NAVAID	345.37	0.42	-	-	FBF	N/A
59625	NAVAID	343.19	0.23	-	-	FBF	N/A
63164	NAVAID	341.37	0.43	-	-	FBF	N/A
68866	GROUND	320.95	0.08	-	0.0255	N/A	N/A
71684	NAVAID	336.76	0.28	-	-	FBF	N/A
73744	NAVAID	335.10	0.41	-	-	FBF	N/A
76817	NAVAID	332.94	0.17	-	-	FBF	N/A
79653	NAVAID	331.11	0.32	-	-	FBF	N/A
85860	NAVAID	329.17	0.37	-	-	FBF	N/A
94493	GROUND	320.99	-	0.1704	-	N/A	N/A
100908	TREE AREA	409.03	1.71	-	-	TBR	N/A
113764	TREE AREA	420.43	13.72	-	-	TBR	N/A
115537	TREE AREA	411.47	5.97	-	-	TBR	N/A
126501	TREE AREA	404.09	0.41	-	-	TBR	N/A
141604	TREE AREA	416.98	13.91	-	-	TBR	N/A
145290	TREE AREA	406.80	3.97	-	-	TBR	N/A
158487	TREE AREA	412.50	11.23	-	-	TBR	N/A
159288	NAVAID	357.53	0.66	-	-	FBF	N/A
168734	NAVAID	349.49	0.56	-	-	FBF	N/A
179346	NAVAID	339.00	0.11	-	-	FBF	N/A
182829	NAVAID	389.00	9.57	-	-	FBF	N/A
184789	NAVAID	336.57	0.07	-	-	FBF	N/A
188000	TREE AREA	407.43	10.21	-	-	TBR	N/A
191986	NAVAID	333.03	0.24	-	-	FBF	N/A
253786	NAVAID	336.09	1.49	-	-	FBF	N/A
262437	NAVAID	331.41	0.62	-	-	FBF	N/A
285926	TREE AREA	427.50	10.50	-	-	TBR	N/A
290821	TREE AREA	423.09	6.24	-	-	TBR	N/A
299267	TREE AREA	385.50	1.28	-	-	TBR	N/A
307028	BUILDING	358.24	3.01	-	-	LGTD	N/A
307189	BUILDING	356.20	0.82	-	-	LGTD	N/A
333618	TREE AREA	412.83	0.33	-	-	TBR	N/A
334617	TREE AREA	415.18	4.29	-	-	TBR	N/A
339647	TREE AREA	415.36	1.59	-	-	TBR	N/A
339660	NAVAID	353.47	0.55	-	-	FBF	N/A
347815	TREE AREA	382.28	2.29	-	-	TBR	N/A
347913	TREE AREA	384.48	4.59	-	-	TBR	N/A
355314	NAVAID	381.91	3.15	-	-	FBF	N/A
361991	TREE AREA	382.40	4.23	-	-	TBR	N/A
365626	TREE AREA	412.85	1.49	-	-	TBR	N/A
365784	TREE AREA	379.65	2.47	-	-	TBR	N/A
366055	TREE AREA	412.60	1.09	-	-	TBR	N/A
367884	TREE AREA	417.76	6.26	-	-	TBR	N/A

OBJECT ID	DESCRIPTION	TOP ELEV MSL	P77 PEN VALUE (FEET)	DISPOSTITION	TRIGGERING EVENT
368203	TREE AREA	417.93	6.63	TBR	N/A
391566	TREE AREA	410.71	2.00	TBR	N/A
392528	TREE AREA	411.50	2.88	TBR	N/A
403554	TREE AREA	414.75	5.20	TBR	N/A
409753	TREE AREA	449.35	7.08	TBR	N/A
411825	TREE AREA	418.26	12.23	TBR	N/A
416878	TREE AREA	443.65	0.37	TBR	N/A
418997	TREE AREA	425.58	22.22	TBR	N/A
419304	TREE AREA	421.73	17.91	TBR	N/A
445872	TREE AREA	441.68	0.47	TBR	N/A
446037	TREE AREA	444.35	2.95	TBR	N/A
458940	TREE AREA	407.98	8.86	TBR	N/A
474101	TREE AREA	404.37	1.38	TBR	N/A
484699	TREE AREA	441.25	3.38	TBR	N/A
486062	TREE AREA	445.85	7.57	TBR	N/A
487207	TREE AREA	408.48	13.62	TBR	N/A
501448	TREE AREA	398.56	5.76	TBR	N/A
548722	TREE AREA	396.43	0.74	TBR	N/A
570300	TREE AREA	394.18	1.05	TBR	N/A
591005	TREE AREA	378.49	1.07	TBR	N/A
591411	TREE AREA	379.70	2.50	TBR	N/A
627803	TREE AREA	390.03	0.02	TBR	N/A
669781	NAVAID	347.38	0.45	FBF	N/A
768729	TREE AREA	444.31	5.17	TBR	N/A
834972	TREE AREA	438.68	5.36	TBR	N/A
855761	TREE AREA	438.10	5.60	TBR	N/A
856555	TREE AREA	436.10	3.73	TBR	N/A
869572	TREE AREA	434.86	3.72	TBR	N/A
879223	TREE AREA	431.85	1.59	TBR	N/A
880324	TREE AREA	433.60	3.48	TBR	N/A
882993	TREE AREA	436.10	6.08	TBR	N/A
907005	TREE AREA	434.64	5.47	TBR	N/A
937893	TREE AREA	400.71	2.32	TBR	N/A
951617	TREE AREA	424.55	2.95	TBR	N/A
958431	TREE AREA	428.44	8.40	TBR	N/A
982528	TREE AREA	399.01	4.36	TBR	N/A
983960	TREE AREA	427.12	0.82	TBR	N/A
1005890	TREE AREA	424.85	0.22	TBR	N/A
1052288	TREE AREA	422.95	0.88	TBR	N/A
1054463	TREE AREA	431.14	9.40	TBR	N/A
1056250	TREE AREA	425.41	4.16	TBR	N/A
1056693	TREE AREA	424.08	2.80	TBR	N/A
1057073	TREE AREA	424.91	3.12	TBR	N/A
1074139	TREE AREA	422.00	2.35	TBR	N/A
1077213	TREE AREA	424.79	4.37	TBR	N/A
1078619	TREE AREA	425.61	4.82	TBR	N/A
1079373	TREE AREA	421.40	0.73	TBR	N/A
1102996	TREE AREA	428.11	10.60	TBR	N/A
1105279	TREE AREA	424.44	5.38	TBR	N/A
1134725	TREE AREA	433.37	3.16	TBR	N/A
1135197	TREE AREA	435.47	5.64	TBR	N/A
1158125	TREE AREA	435.00	5.74	TBR	N/A
1232542	TREE AREA	425.85	2.73	TBR	N/A
1286786	TREE AREA	420.75	1.66	TBR	N/A
1323792	TREE AREA	421.19	2.68	TBR	N/A

TRAVERSEWAY ELEVATION DATA

OBJECT ID	DESCRIPTION	TOP ELEV MSL	P77 PEN VALUE (FEET)	DISPOSTITION
1	SHELBY DR.	318.00	-18.92	N/A
2	SHELBY DR.	323.00	-14.30	N/A
3	SHELBY DR.	341.00	3.56	N/A
4	AIRWAYS RD.	330.00	-45.36	N/A
5	HOMES RD.	350.00	-93.19	N/A
6	HOMES RD.	371.00	-72.72	N/A
7	HOMES RD.	376.00	-68.65	N/A

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LEGEND

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	FOREST / TREE CLUSTER		PT77 APPROACH SURFACE
			TSS APPROACH SURFACE
	TRAVERSE WAY POINT		DEPARTURE SURFACE
	OBSTRUCTIONS		LOC CRITICAL AREA
	STRUCTURES ON AIRPORT PROPERTY		

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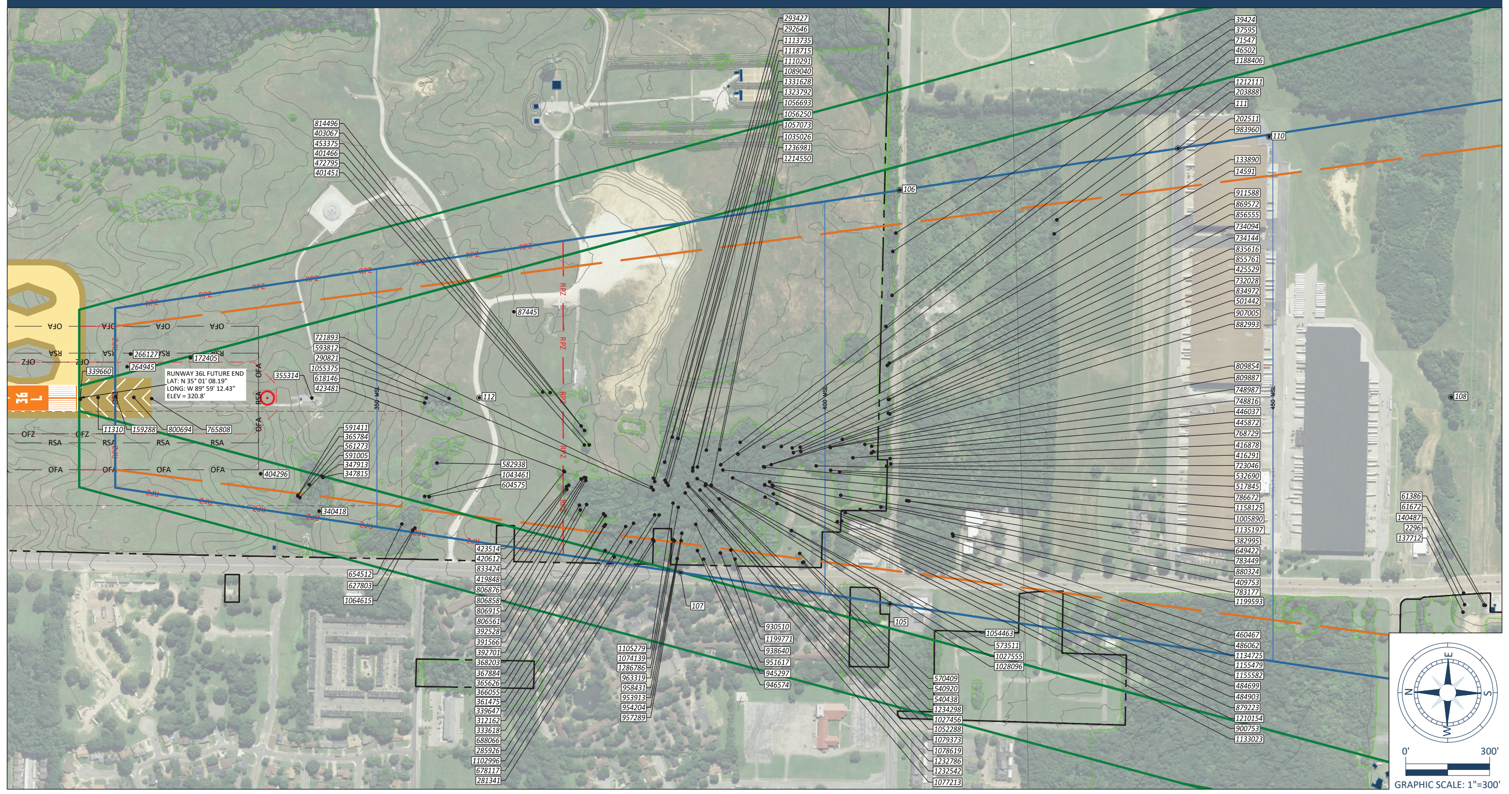
MAGNETIC DECLINATION
0 30' WEST (2009)
DECLINATION CHANGING BY 0 6' WEST/YEAR

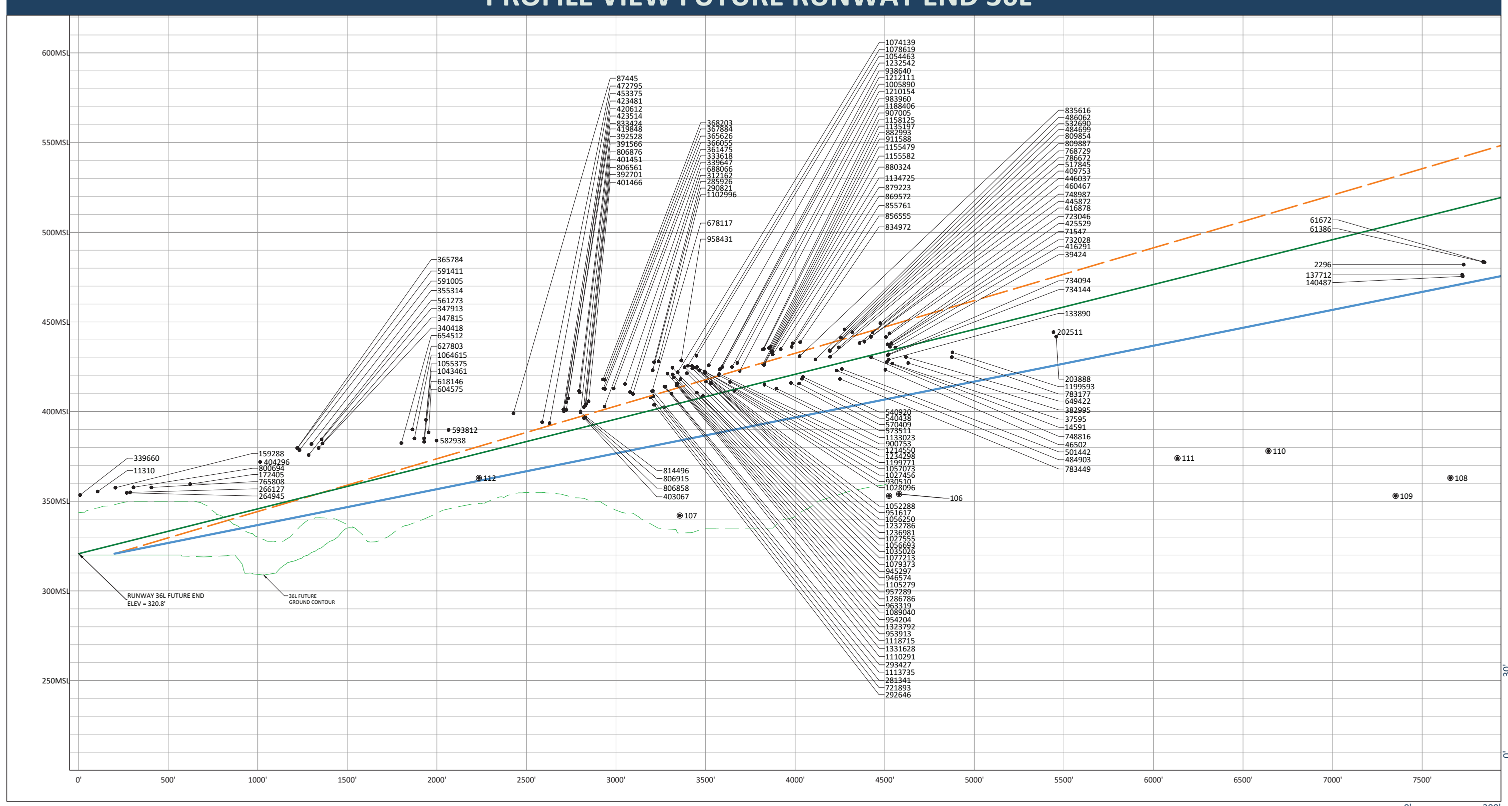
Memphis INTERNATIONAL AIRPORT

RWY 36L INNER APPROACH
RWY 18R DEPARTURE
EXISTING PLAN & PROFILE
Airport Layout Plan Drawing Set

PLAN VIEW FUTURE RUNWAY END 36L



PROFILE VIEW FUTURE RUNWAY END 36L



OBSTRUCTION AND TRAVERSEWAY TABLES SHOWN ON NEXT SHEET

LEGEND

ITEM	DESCRIPTION	ITEM	DESCRIPTION
250	EXISTING GROUND CONTOUR	ROFA	RUNWAY OBJECT FREE AREA (ROFA)
250 MSL	PART 77 SURFACE CONTOUR	RSA	RUNWAY SAFETY AREA (RSA)
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	OBSTRUCTIONS		LOC CRITICAL AREA
	STRUCTURES ON AIRPORT PROPERTY		FUTURE RUNWAY PAVEMENT
	FUTURE TAXIWAY SHOULDER PAVEMENT		FUTURE TAXIWAY PAVEMENT

ALP Prepared By

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Planning, Implementation, Operations & Management

Drawn:
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Date: 4-24-2023
Project No.:

No.	Date	Revisions

FAA'S APPROVAL OF THIS AIRPORT LAYOUT PLAN (ALP) REPRESENTS ACCEPTANCE OF THE GENERAL LOCATION OF FUTURE FACILITIES DEPICTED (SHEET I7144C04). DURING THE PRELIMINARY DESIGN PHASE, THE AIRPORT OWNER IS REQUIRED TO RESUBMIT FOR APPROVAL THE FINAL LOCATIONS, HEIGHTS, AND EXTERIOR FINISH OF STRUCTURES. FAA'S CONCERN IS OBSTRUCTIONS, IMPACT ON ELECTRONIC AIDS, OR ADVERSE EFFECTS ON CONTROLLER VIEW OF AIRCRAFT APPROACHES AND GROUND MOVEMENT AREAS WHICH COULD ADVERSELY AFFECT THE SAFETY, EFFICIENCY, OR UTILITY OF THE AIRPORT.

Notes
1. Shelby County Zoning includes an airport overlay district that includes height restrictions associated with FAR Part 77 imaginary surfaces.
2. No OFZ obstructions/violations in the existing/future conditions.
3. Trees penetrating the 40:1 departure surface are shown as grey colored dots.
4. No PAPI siting surface (3:1 slope) obstructions. Surface not shown on drawing for clarity.

Sources
1. Obstruction survey data performed under CIVICX (GCR) GIS Data Package Summary , dated July 2020.
2. Extended runway composite profile obtained using contours from AGIS project #220139 (September 2015) and United States Geographic Survey outside of survey limits.
3. Data of individual obstructions specifically trees can be found in the CIVICX (GCR) GIS Data Package Summary.

Memphis INTERNATIONAL AIRPORT

RWY 36L INNER APPROACH
RWY 18R DEPARTURE
PLAN & PROFILE
Airport Layout Plan Drawing Set

SURFACE OBSTRUCTION TABLE

OBJECT ID	DESCRIPTION	TOP ELEV MSL	P77 PEN VALUE (FEET)	DEP PEN VALUE (FEET)	TSS PEN VALUE (FEET)	DISPOSTITION	TRIGGERING EVENT
2296	TOWER	481.96	10.57	-	-	FBF	N/A
11310	NAVAID	355.44	31.99	31.99	-	FBF	N/A
14591	TREE AREA	427.66	20.68	-	-	TBR	N/A
37595	TREE AREA	426.80	19.20	-	-	TBR	N/A
39424	TREE AREA	435.67	27.73	0.85	-	TBR	N/A
46502	TREE AREA	423.28	16.45	-	-	TBR	N/A
61386	TOWER	483.27	9.56	-	-	FBF	N/A
61672	TOWER	483.53	9.97	-	-	FBF	N/A
71547	TREE AREA	438.20	30.69	3.91	-	TBR	N/A
87445	NAVAID	399.11	33.80	17.60	12.84	FBF	N/A
133890	TREE AREA	428.93	21.73	-	-	TBR	N/A
137712	TOWER	476.30	5.08	-	-	FBF	N/A
140487	TOWER	475.43	4.15	-	-	FBF	N/A
159288	NAVAID	357.53	36.66	31.61	36.61	FBF	N/A
172405	TREE AREA	359.56	30.34	23.20	26.37	TBR	N/A
202511	TREE AREA	444.34	18.74	-	-	TBR	N/A
203888	TREE AREA	441.76	15.86	-	-	TBR	N/A
264945	UNKNOWN	354.67	32.54	14.90	31.89	N/A	N/A
266127	UNKNOWN	354.95	32.42	-	31.60	N/A	N/A
281341	TREE AREA	408.60	27.67	7.56	-	TBR	N/A
285926	TREE AREA	427.50	46.50	26.36	18.15	TBR	N/A
290821	TREE AREA	423.09	42.24	22.13	13.96	TBR	N/A
292646	TREE AREA	403.84	22.83	2.69	-	TBR	N/A
293427	TREE AREA	411.55	30.69	10.58	2.40	TBR	N/A
312162	TREE AREA	409.77	31.12	11.57	3.88	TBR	N/A
333618	TREE AREA	412.83	36.33	12.66	-	TBR	N/A
339647	TREE AREA	415.36	37.59	18.27	10.77	TBR	N/A
339660	NAVAID	353.47	32.49	32.49	-	FBF	N/A
340418	TREE AREA	379.70	36.13	-	-	TBR	N/A
347815	TREE AREA	382.28	38.29	25.56	27.36	TBR	N/A
347913	TREE AREA	384.48	40.59	29.54	29.71	TBR	N/A
355314	NAVAID	381.91	39.15	28.61	28.80	FBF	N/A
361475	TREE AREA	402.81	27.33	8.58	-	TBR	N/A
365626	TREE AREA	412.85	37.49	18.77	11.81	TBR	N/A
365784	TREE AREA	379.65	38.47	-	-	TBR	N/A
366055	TREE AREA	412.60	37.09	18.33	11.32	TBR	N/A
367884	TREE AREA	417.76	42.26	23.50	16.50	TBR	N/A
368203	TREE AREA	417.93	42.63	23.92	16.96	TBR	N/A
382995	TREE AREA	427.11	17.73	-	-	TBR	N/A
391566	TREE AREA	410.71	38.00	19.95	13.56	TBR	N/A
392528	TREE AREA	411.50	38.88	20.85	14.48	TBR	N/A
392701	TREE AREA	404.07	30.66	12.43	5.89	TBR	N/A
401451	TREE AREA	402.54	29.38	11.21	4.72	TBR	N/A
401466	TREE AREA	405.77	32.06	13.76	7.15	TBR	N/A
403067	TREE AREA	396.28	23.09	4.91	-	TBR	N/A
404296	NAVAID	371.95	34.92	-	27.26	FBF	N/A
409753	TREE AREA	449.35	43.08	16.61	2.85	TBR	N/A
416291	TREE AREA	436.19	28.84	2.09	-	TBR	N/A
416878	TREE AREA	443.65	36.37	9.64	-	TBR	N/A
419848	TREE AREA	400.96	29.75	12.07	6.01	TBR	N/A
420612	TREE AREA	405.19	34.01	16.34	10.29	TBR	N/A
423481	TREE AREA	401.10	30.22	12.62	6.63	TBR	N/A
423514	TREE AREA	400.18	29.24	11.62	5.62	TBR	N/A
425529	TOWER	437.53	30.44	3.77	-	FBF	N/A
445872	TREE AREA	441.68	36.47	10.27	-	TBR	N/A
446037	TREE AREA	444.35	38.95	12.69	-	TBR	N/A
453375	TREE AREA	393.58	24.23	7.02	1.37	TBR	N/A
460467	TREE AREA	438.25	34.30	8.41	-	TBR	N/A
472795	TREE AREA	394.06	25.54	8.54	3.07	TBR	N/A
484699	TREE AREA	441.25	39.38	14.01	1.21	TBR	N/A
484903	TREE AREA	422.91	21.51	-	-	TBR	N/A
486062	TREE AREA	445.85	43.57	18.09	5.20	TBR	N/A
501442	TREE AREA	423.74	21.78	-	-	TBR	N/A
517845	TREE AREA	430.61	29.96	4.89	-	TBR	N/A
532690	TREE AREA	429.09	30.06	5.41	-	TBR	N/A
540438	TREE AREA	418.35	20.82	-	-	TBR	N/A
540920	TREE AREA	419.35	21.72	-	-	TBR	N/A
561273	TREE AREA	375.79	33.34	-	23.13	TBR	N/A
570409	TREE AREA	415.62	18.42	-	-	TBR	N/A
573511	TREE AREA	415.96	19.68	-	-	TBR	N/A
582938	TREE AREA	383.81	27.09	13.05	10.17	TBR	N/A
591005	TREE AREA	378.49	37.07	-	-	TBR	N/A
591411	TREE AREA	379.70	38.50	-	-	TBR	N/A
593812	TREE AREA	389.75	31.68	17.30	14.12	TBR	N/A
604575	TREE AREA	388.42	32.58	18.76	16.08	TBR	N/A
618146	TREE AREA	383.19	27.84	14.15	11.57	TBR	N/A
627803	TREE AREA	390.03	36.02	-	-	TBR	N/A
649422	TREE AREA	430.37	21.23	-	-	TBR	N/A
654512	TREE AREA	382.47	29.67	-	-	TBR	N/A
678117	TREE AREA	411.32	30.53	10.45	2.28	TBR	N/A
688066	TREE AREA	410.87	32.54	13.07	-	TBR	N/A
721893	TREE AREA	407.91	27.26	7.21	-	TBR	N/A
723046	TREE AREA	441.54	34.65	8.02	-	TBR	N/A

SURFACE OBSTRUCTION TABLE

OBJECT ID	DESCRIPTION	TOP ELEV MSL	P77 PEN VALUE (FEET)	DEP PEN VALUE (FEET)	TSS PEN VALUE (FEET)	DISPOSTITION	TRIGGERING EVENT
732028	TREE AREA	437.23	29.97	3.26	-	TBR	N/A
734094	TREE AREA	431.93	24.74	-	-	TBR	N/A
734144	TREE AREA	431.48	24.38	-	-	TBR	N/A
748816	TREE AREA	430.25	25.02	-	-	TBR	N/A
748987	TREE AREA	438.98	34.50	8.48	-	TBR	N/A
765808	NAVAID	357.67	32.79	26.73	30.85	FBF	N/A
768729	TREE AREA	444.31	41.17	15.49	2.41	TBR	N/A
783177	TREE AREA	430.35	16.11	-	-	TBR	N/A
783449	TREE AREA	418.26	16.49	-	-	TBR	N/A
786672	TREE AREA	435.84	34.20	8.88	-	TBR	N/A
800694	NAVAID	357.77	34.88	29.32	33.88	FBF	N/A
806561	TREE AREA	403.35	30.03	11.82	5.30	TBR	N/A
806858	TREE AREA	397.17	24.02	5.85	-	TBR	N/A
806876	TREE AREA	399.80	27.00	8.92	2.51	TBR	N/A
806915	TREE AREA	396.79	23.48	5.27	-	TBR	N/A
809854	TREE AREA	434.19	33.60	8.55	-	TBR	N/A
809887	TREE AREA	433.78	33.16	8.10	-	TBR	N/A
814496	TREE AREA	399.50	26.71	8.63	2.22	TBR	N/A
833424	TREE AREA	407.35	35.94	18.21	12.10	TBR	N/A
834972	TREE AREA	438.68	41.36	17.14	5.34	TBR	N/A
835616	TREE AREA	430.94	33.68	9.47	-	TBR	N/A
855761	TREE AREA	438.10	41.60	17.58	5.96	TBR	N/A
856555	TREE AREA	436.10	39.73	15.74	4.15	TBR	N/A
869572	TREE AREA	434.86	39.72	16.03	4.71	TBR	N/A
879223	TREE AREA	431.85	37.59	14.13	3.01	TBR	N/A
880324	TREE AREA	433.60	39.48	16.05	4.96	TBR	N/A
882993	TREE AREA	436.10	42.08	18.68	7.61	TBR	N/A
900753	TREE AREA	414.95	21.62	-	-	TBR	N/A
907005	TREE AREA	434.64	41.47	18.29	7.40	TBR	N/A
911588	TREE AREA	426.67	33.49	10.30	-	TBR	N/A
930510	TREE AREA	411.55	21.57	-	-	TBR	N/A
938640	TREE AREA	423.42	35.07	13.09	-	TBR	N/A
945297	TREE AREA	408.66	22.18	0.67	-	TBR	N/A
946574	TREE AREA	410.59	24.80	3.46	-	TBR	N/A
951617	TREE AREA	424.55	38.95	17.65	8.43	TBR	N/A
953913	TREE AREA	414.76	31.25	10.49	-	TBR	N/A
954204	TREE AREA	415.59	32.05	11.28	-	TBR	N/A
957289	TREE AREA	418.11	34.15	13.28	4.42	TBR	N/A
958431	TREE AREA	428.44	44.40	23.50	14.62	TBR	N/A
963319	TREE AREA	419.09	35.87	15.18	6.48	TBR	N/A
983960	TREE AREA	427.12	36.82	14.35	4.09	TBR	N/A
1005890	TREE AREA	424.85	36.22	14.17	4.28	TBR	N/A
1027456	TREE AREA	422.39	35.72	14.17	4.71	TBR	N/A
1027555	TREE AREA	415.96	28.64	6.92	-	TBR	N/A
1028096	TREE AREA	421.44	34.73	13.16	3.70	TBR	N/A
1035026	TREE AREA	416.93	30.15	8.57	-	TBR	N/A
1043461	TREE AREA	385.04	29.71	16.01	13.44	TBR	N/A
1052288	TREE AREA	422.96	36.88	15.47	6.15	TBR	N/A
1054463	TREE AREA	431.14	45.40	24.08	14.82	TBR	N/A
1055375	TREE AREA	395.41	39.88	26.13	23.51	TBR	N/A
1056250	TREE AREA	425.41	40.16	18.96	9.81	TBR	N/A
1056693	TREE AREA	424.08	38.80	17.60	8.44	TBR	N/A
1057073	TREE AREA	424.91	39.12	17.78	8.52	TBR	N/A
1064615	TREE AREA	385.01	30.76	-	-	TBR	N/A
1074139	TREE AREA	422.00	38.35	17.55	8.76	TBR	N/A
1077213	TREE AREA	424.79	40.37	19.38	10.41	TBR	N/A
1078619	TREE AREA	425.61	40.82	19.74	10.69	TBR	N/A
1079373	TREE AREA	421.40	36.73	15.67	6.66	TBR	N/A
1089040	TREE AREA	415.58	31.96	11.17	2.38	TBR	N/A
1102996	TREE AREA	428.11	46.60	26.34	18.01	TBR	N/A
1105279	TREE AREA	424.44	41.38	20.73	12.07	TBR	N/A
1110291	TREE AREA	413.91	31.74	11.32	2.85	TBR	N/A
1113735	TREE AREA	402.39	20.27	-	-	TBR	N/A
1118715	TREE AREA	410.08	27.12	6.49	-	TBR	N/A
1133023	TREE AREA	412.88	18.23	-	-	TBR	N/A
1134725	TREE AREA	433.37	39.16	15.71	4.60	TBR	N/A
1135197	TREE AREA	435.47	41.64	18.28	7.25	TBR	N/A
1155479	TREE AREA	426.85	33.54	10.32	-	TBR	N/A
1155582	TREE AREA	425.95	32.67	9.45	-	TBR	N/A
1158125	TREE AREA	435.00	41.74	18.53	7.62	TBR	N/A
1188406	TREE AREA	422.68	32.12	9.58	-	TBR	N/A
1199593	TREE AREA	433.05	18.74	-	-	TBR	N/A
1199771	TREE AREA	416.51	27.00	4.72	-	TBR	N/A
1210154	TREE AREA	424.79	35.08	12.76	2.64	TBR	N/A
1212111	TREE AREA	423.68	35.30	13.31	3.48	TBR	N/A
1214550	TREE AREA	420.93	32.64	10.68	0.86	TBR	N/A
1232542	TREE AREA	425.85	38.73	17.06	7.51	TBR	N/A
1232786	TREE AREA	415.92	28.52	6.77	-	TBR	N/A
1234298	TREE AREA	420.25	32.05	10.10	0.31	TBR	N/A
1236981	TREE AREA	416.10	28.78	7.05	-	TBR	N/A
1286786	TREE AREA	420.75	37.66	16.99	8.32	TBR	N/A
1323792	TREE AREA	421.19	38.68	18.16	9.62	TBR	N/A
1331628	TREE AREA	413.88	31.59	11.14	2.64	TBR	N/A

TRAVERSEWAY ELEVATION DATA

OBJECT ID	DESCRIPTION	TOP ELEV MSL	P77 PEN VALUE (FEET)	DISPOSTITION
105	HOLMES RD.	353.00	-54.24	N/A
106	HOLMES RD.	354.00	-54.37	N/A
107	AIRWAYS BLVD.	342.00	-33.67	N/A
108		363.00	-106.91	N/A
109	KILARNEY AVE.	353.00	-110.79	N/A
110		378.00	-71.59	N/A
111		374.00	-65.43	N/A
112	N. LAKE DR.	363.00	1.55	N/A

TRAVERSEWAY POINT #109 EXTEND BEYOND VIEWPORT RANGE

NOTES:
1. TBR = TO BE REMOVED.
2. N/A = POINT CLEARS THE SURFACE OR IS OUTSIDE THE SURFACE AREA.
3. FBF = FIXED BY FUNCTION.
4. LGTD = LIGHTED.

ALP Prepared By

JACOBSEN | DANIELS
Planning, Implementation, Operations & Management

Drawn:
Approved: MJ
Date: 4-21-2023
Project No.:

No.	Date	Revisions

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Sources
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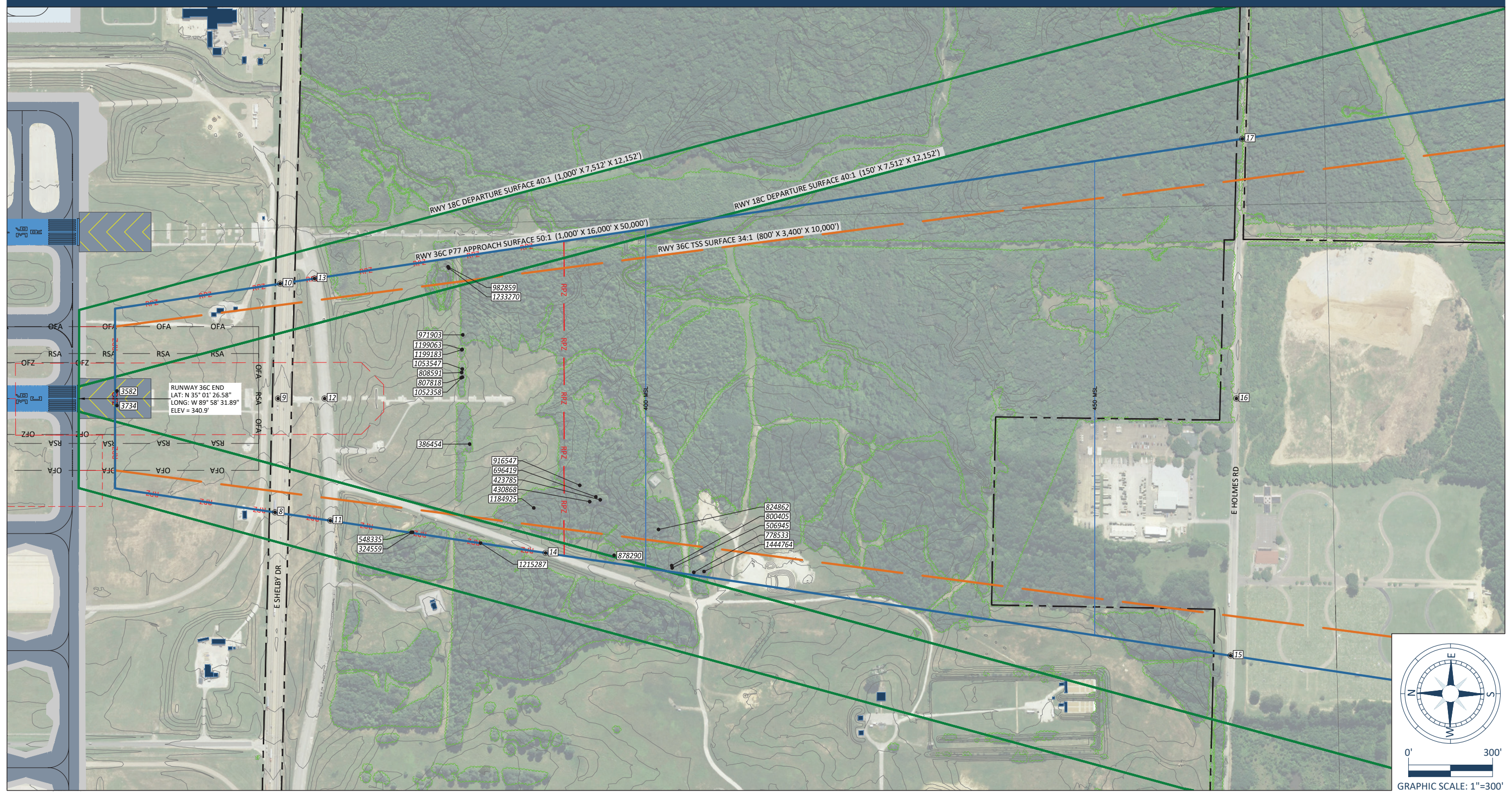
Memphis INTERNATIONAL AIRPORT

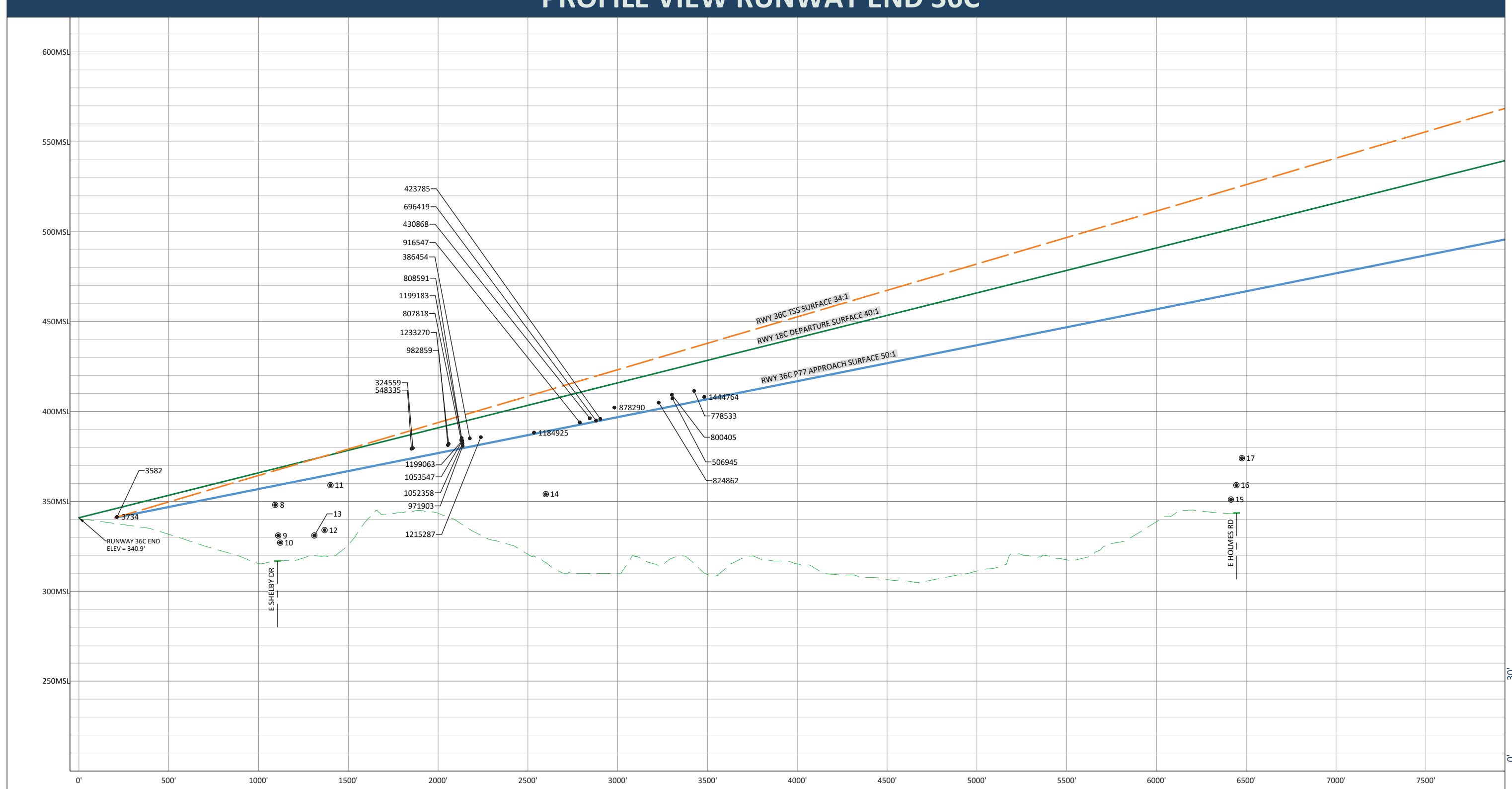
RWY 36L INNER APPROACH
RWY 18R DEPARTURE
PLAN & PROFILE
Airport Layout Plan Drawing Set

PLAN VIEW RUNWAY END 36C



GRAPHIC SCALE: 1"=300'

PROFILE VIEW RUNWAY END 36C



GRAPHIC SCALE: 1"=30'

GRAPHIC SCALE: 1"=300'

SURFACE OBSTRUCTION TABLE

OBJECT ID	DESCRIPTION	TOP ELEV MSL	P77 PEN VALUE (FEET)	DEP PEN VALUE (FEET)	TSS PEN VALUE (FEET)	DISPOSTITION	TRIGGERING EVENT
3582	NAVAID	341.26	0.17	0.06	-	FBF	N/A
3734	NAVAID	341.33	0.23	0.12	-	FBF	N/A
324559	TREE AREA	379.65	5.63	-	-	TBR	N/A
386454	TREE AREA	385.05	4.67	-	-	TBR	N/A
423785	TREE AREA	395.82	0.91	-	-	TBR	N/A
430868	TREE AREA	396.22	2.49	-	-	TBR	N/A
506945	TREE AREA	407.21	4.29	-	-	TBR	N/A
548335	TREE AREA	379.25	5.39	-	-	TBR	N/A
696419	TREE AREA	394.95	0.52	-	-	TBR	N/A
778533	TREE AREA	411.48	6.15	-	-	TBR	N/A
800405	TREE AREA	409.32	6.45	-	-	TBR	N/A
807818	TREE AREA	384.04	4.61	-	-	TBR	N/A
808591	TREE AREA	385.19	5.71	-	-	TBR	N/A
824862	TREE AREA	404.92	3.52	-	-	TBR	N/A
878290	TREE AREA	402.17	5.71	-	-	TBR	N/A
916547	TREE AREA	393.88	1.25	-	-	TBR	N/A
971903	TREE AREA	380.84	1.23	-	-	TBR	N/A
982859	TREE AREA	381.32	3.34	-	-	TBR	N/A
1052358	TREE AREA	382.18	2.61	-	-	TBR	N/A
1053547	TREE AREA	383.65	4.09	-	-	TBR	N/A
1184925	TREE AREA	388.25	0.74	-	-	TBR	N/A
1199063	TREE AREA	383.67	4.13	-	-	TBR	N/A
1199183	TREE AREA	384.77	5.28	-	-	TBR	N/A
1215287	TREE AREA	385.73	4.14	-	-	TBR	N/A
1233270	TREE AREA	382.03	3.98	-	-	TBR	N/A
1444764	TREE AREA	408.12	1.65	-	-	TBR	N/A

TRAVERSEWAY ELEVATION DATA

OBJECT ID	DESCRIPTION	TOP ELEV MSL	P77 PEN VALUE (FEET)	DISPOSTITION
8	SHELBY DR.	348.00	-10.79	N/A
9	SHELBY DR.	331.00	-28.09	N/A
10	SHELBY DR.	327.00	-32.29	N/A
11	PRIVATE RD.	359.00	-5.95	N/A
12	PRIVATE RD.	334.00	-30.27	N/A
13	PRIVATE RD.	331.00	-32.10	N/A
14	PRIVATE RD.	354.00	-34.93	N/A
15	HOMES RD.	351.00	-114.25	N/A
16	HOMES RD.	359.00	-106.80	N/A
17	HOMES RD.	374.00	-92.37	N/A

NOTES:
1. TBR = TO BE REMOVED.
2. N/A = POINT CLEARS THE SURFACE OR IS OUTSIDE THE SURFACE AREA.
3. FBF = FIXED BY FUNCTION.
4. LGTD = LIGHTED.

- NO DEPARTURE SURFACE TREE PENETRATIONS.

LEGEND

ITEM	DESCRIPTION	ITEM	DESCRIPTION
250	EXISTING GROUND CONTOUR	ROFA	RUNWAY OBJECT FREE AREA (ROFA)
250 MSL	PART 77 SURFACE CONTOUR	RSA	RUNWAY SAFETY AREA (RSA)
	GS CRITICAL AREA	OFZ	OBJECT FREE ZONE (OFZ)
	RUNWAY PAVEMENT & MARKINGS	RPZ	RUNWAY PROTECTION ZONE (RPZ)
	TAXIWAY PAVEMENT		EXISTING AIRPORT PROPERTY LINE
	FOREST / TREE CLUSTER		PT77 APPROACH SURFACE
			TSS APPROACH SURFACE
	TRAVERSE WAY POINT		DEPARTURE SURFACE
	OBSTRUCTIONS		LOC CRITICAL AREA
	STRUCTURES ON AIRPORT PROPERTY		

ALP Prepared By

JACOBSEN | DANIELS
Planning, Implementation, Operations & Management

Drawn:
Approved: MJ
Date: 4-21-2023
Project No.:

No.	Date	Revisions

FAA'S APPROVAL OF THIS AIRPORT LAYOUT PLAN (ALP) REPRESENTS ACCEPTANCE OF THE GENERAL LOCATION OF FUTURE FACILITIES DEPICTED (SHEET I7144C04). DURING THE PRELIMINARY DESIGN PHASE, THE AIRPORT OWNER IS REQUIRED TO RESUBMIT FOR APPROVAL THE FINAL LOCATIONS, HEIGHTS, AND EXTERIOR FINISH OF STRUCTURES. FAA'S CONCERN IS OBSTRUCTIONS, IMPACT ON ELECTRONIC AIDS, OR ADVERSE EFFECTS ON CONTROLLER VIEW OF AIRCRAFT APPROACHES AND GROUND MOVEMENT AREAS WHICH COULD ADVERSELY AFFECT THE SAFETY, EFFICIENCY, OR UTILITY OF THE AIRPORT.

Notes
1. Shelby County Zoning includes an airport overlay district that includes height restrictions associated with FAR Part 77 imaginary surfaces.
2. No OFZ obstructions/violations in the existing/future conditions.
3. Trees penetrating the 40:1 departure surface are shown as grey colored dots.
4. No PAPI siting surface (3:1 slope) obstructions. Surface not shown on drawing for clarity.

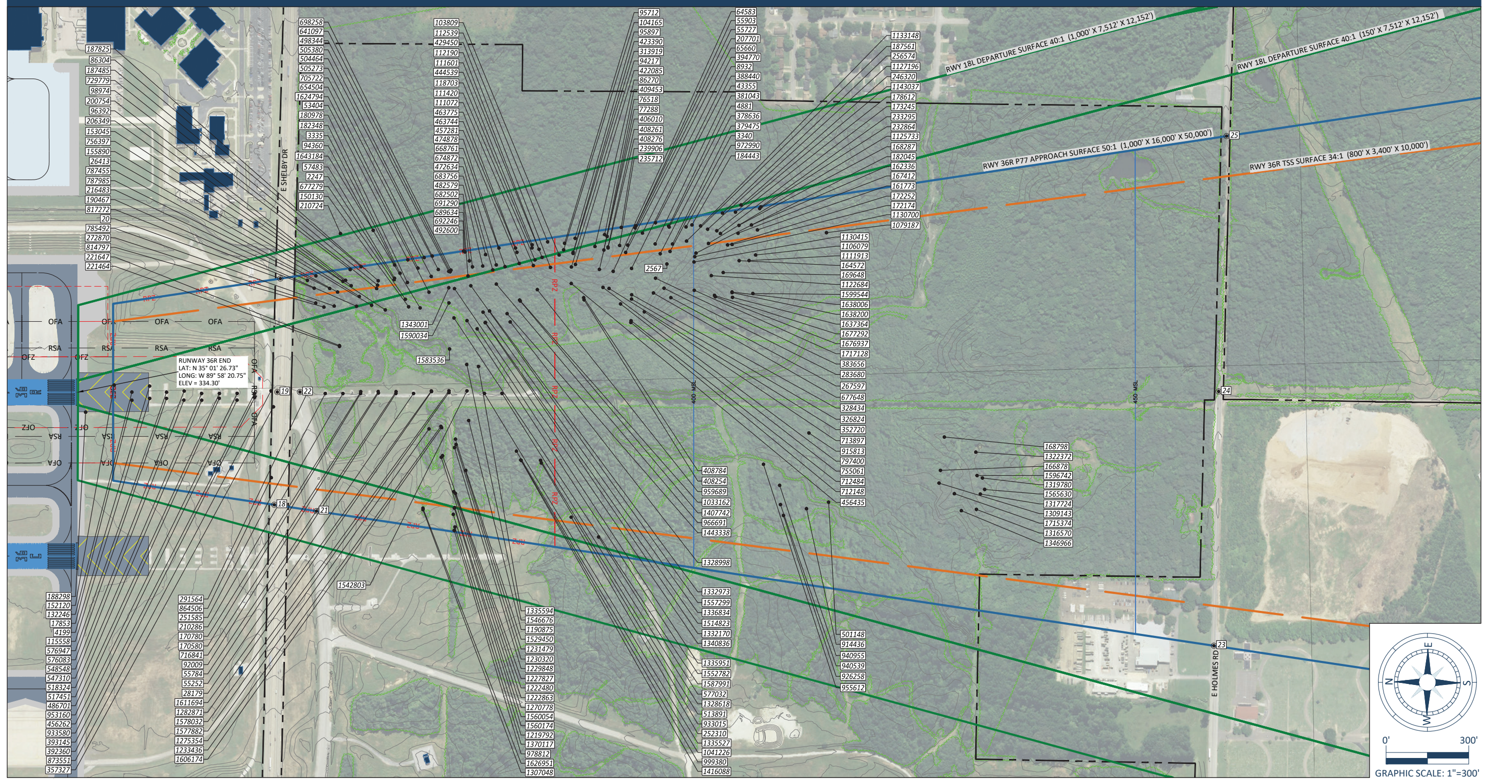
Sources
1. Obstruction survey data performed under CIVICX (GCR) GIS Data Package Summary , dated July 2020.
2. Extended runway composite profile obtained using contours from AGIS project #220139 (September 2015) and United States Geographic Survey outside of survey limits.
3. Data of individual obstructions specifically trees can be found in the CIVICX (GCR) GIS Data Package Summary.

MAGNETIC DECLINATION
0 30' WEST (2009)
DECLINATION CHANGING BY 0 6' WEST/YEAR

Memphis
INTERNATIONAL AIRPORT

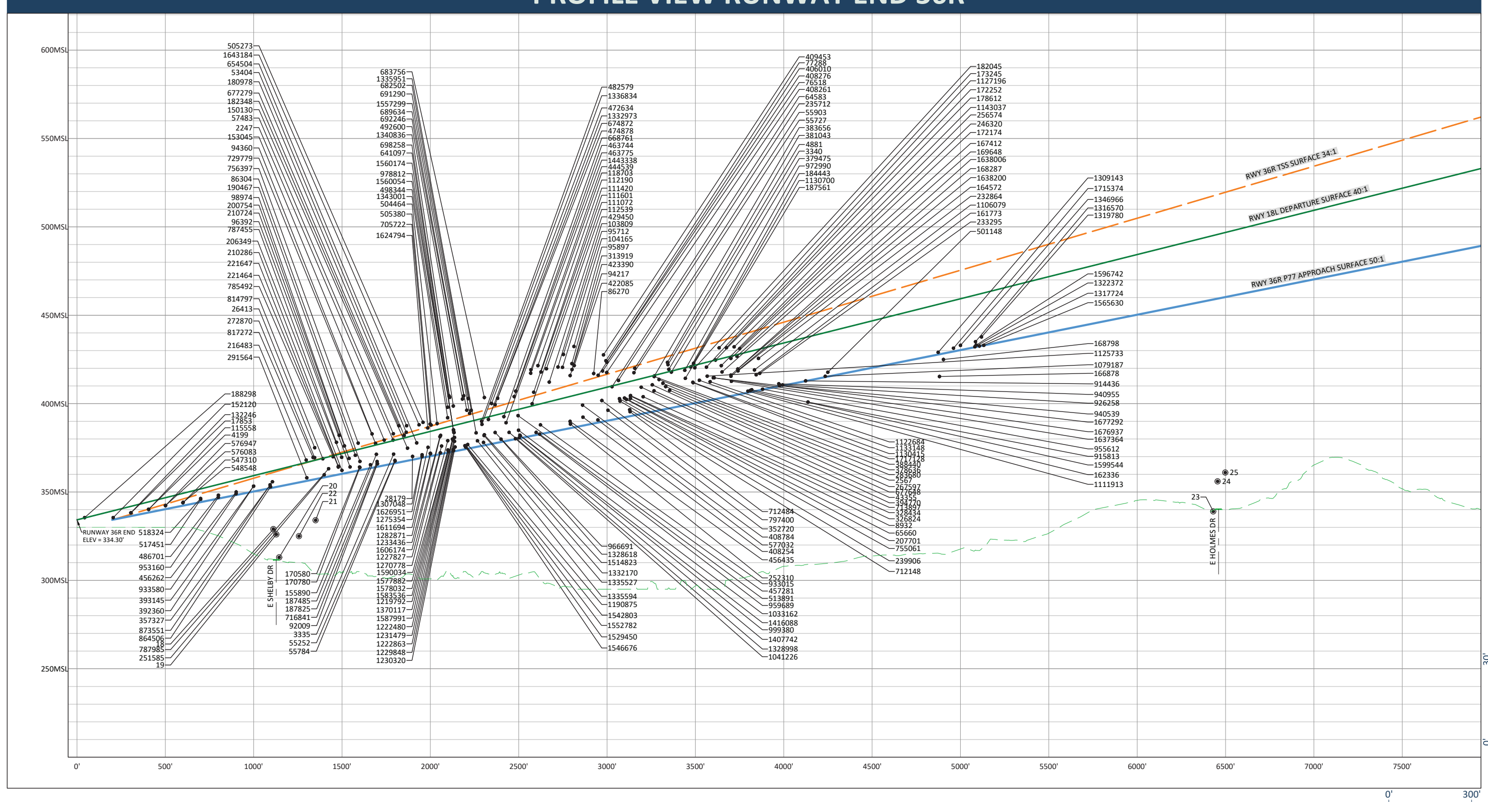
RWY 36C INNER APPROACH
RWY 18C DEPARTURE
EXISTING PLAN & PROFILE
Airport Layout Plan Drawing Set

PLAN VIEW RUNWAY END 36R



OBSTRUCTION AND TRAVERSEWAY TABLES SHOWN ON NEXT SHEET

PROFILE VIEW RUNWAY END 36R



LEGEND

ITEM	DESCRIPTION	ITEM	DESCRIPTION
250	EXISTING GROUND CONTOUR	ROFA	RUNWAY OBJECT FREE AREA (ROFA)
250 MSL	PART 77 SURFACE CONTOUR	RSA	RUNWAY SAFETY AREA (RSA)
	GS CRITICAL AREA	OFZ	OBJECT FREE ZONE (OFZ)
	RUNWAY PAVEMENT & MARKINGS	RPZ	RUNWAY PROTECTION ZONE (RPZ)
	TAXIWAY PAVEMENT		EXISTING AIRPORT PROPERTY LINE
	FOREST / TREE CLUSTER		PT77 APPROACH SURFACE
			TSS APPROACH SURFACE
	TRAVERSE WAY POINT		DEPARTURE SURFACE
	OBSTRUCTIONS		LOC CRITICAL AREA
	STRUCTURES ON AIRPORT PROPERTY		

ALP Prepared By

JACOBSEN | DANIELS
Planning, Implementation, Operations & Management

Drawn:
Approved: MJ
Date: 4-21-2023
Project No.:

No.	Date	Revisions

FAA'S APPROVAL OF THIS AIRPORT LAYOUT PLAN (ALP) REPRESENTS ACCEPTANCE OF THE GENERAL LOCATION OF FUTURE FACILITIES DEPICTED (SHEET 17144C04). DURING THE PRELIMINARY DESIGN PHASE, THE AIRPORT OWNER IS REQUIRED TO RESUBMIT FOR APPROVAL THE FINAL LOCATIONS, HEIGHTS, AND EXTERIOR FINISH OF STRUCTURES. FAA'S CONCERN IS OBSTRUCTIONS, IMPACT ON ELECTRONIC AIDS, OR ADVERSE EFFECTS ON CONTROLLER VIEW OF AIRCRAFT APPROACHES AND GROUND MOVEMENT AREAS WHICH COULD ADVERSELY AFFECT THE SAFETY, EFFICIENCY, OR UTILITY OF THE AIRPORT.

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4. No PAPI siting surface (3:1 slope) obstructions. Surface not shown on drawing for clarity.

Sources
1. Obstruction survey data performed under CIVICX (GCR) GIS Data Package Summary, dated July 2020.
2. Extended runway composite profile obtained using contours from AGIS project #220139 (September 2015) and United States Geographic Survey outside of survey limits.
3. Data of individual obstructions specifically trees can be found in the CIVICX (GCR) GIS Data Package Summary.

Memphis INTERNATIONAL AIRPORT

RWY 36R INNER APPROACH
RWY 18L DEPARTURE
EXISTING PLAN & PROFILE
Airport Layout Plan Drawing Set

SURFACE OBSTRUCTION TABLE

OBJECT ID	DESCRIPTION	TOP ELEV MSL	P77 PEN VALUE (FEET)	DEP PEN VALUE (FEET)	TSS PEN VALUE (FEET)	DISPOSTITION	TRIGGERING EVENT
2247	TREE AREA	379.41	13.33	-	-	TBR	N/A
2567	TREE AREA	409.66	12.72	-	-	TBR	N/A
3335	TREE AREA	371.41	13.61	-	-	TBR	N/A
3340	TREE AREA	419.41	22.12	-	-	TBR	N/A
4199	NAVAID	340.23	1.85	-	-	FBF	N/A
4881	TREE AREA	422.05	24.85	1.88	-	TBR	N/A
8932	TREE AREA	402.90	9.96	-	-	TBR	N/A
17853	NAVAID	338.17	1.78	-	0.78	FBF	N/A
26413	TREE AREA	375.06	17.85	-	-	TBR	N/A
28179	NAVAID	370.12	1.86	-	-	FBF	N/A
43355	TREE AREA	407.23	11.61	-	-	TBR	N/A
53404	TREE AREA	387.50	19.88	-	-	TBR	N/A
55252	NAVAID	367.86	5.62	-	-	FBF	N/A
55727	TREE AREA	417.53	24.18	-	-	TBR	N/A
55784	NAVAID	367.51	1.23	-	-	FBF	N/A
55903	TREE AREA	420.06	26.62	-	-	TBR	N/A
57483	TREE AREA	382.97	16.87	-	-	TBR	N/A
64583	TREE AREA	409.60	18.73	-	-	TBR	N/A
65660	TREE AREA	403.16	10.88	-	-	TBR	N/A
76518	TREE AREA	418.45	28.65	6.97	-	TBR	N/A
77288	TREE AREA	424.28	34.10	5.89	-	TBR	N/A
86270	TREE AREA	417.03	28.24	7.64	-	TBR	N/A
86304	TREE AREA	367.29	26.07	5.51	-	TBR	N/A
92009	NAVAID	365.90	1.62	-	-	FBF	N/A
94217	TREE AREA	415.88	29.76	7.98	5.35	TBR	N/A
94360	TREE AREA	382.87	26.97	5.44	2.42	TBR	N/A
95712	TREE AREA	427.80	42.44	6.67	-	TBR	N/A
95897	TREE AREA	432.33	45.77	5.21	-	TBR	N/A
96392	TREE AREA	364.17	2.97	-	-	TBR	N/A
98974	TREE AREA	368.99	7.89	-	-	TBR	N/A
103809	TREE AREA	420.70	35.96	16.62	-	TBR	N/A
104165	TREE AREA	420.52	35.27	12.29	-	TBR	N/A
111072	TREE AREA	399.88	18.06	-	-	TBR	N/A
111420	TREE AREA	406.45	24.45	6.06	-	TBR	N/A
111601	TREE AREA	417.91	35.10	16.38	-	TBR	N/A
112190	TREE AREA	421.52	39.04	2.52	-	TBR	N/A
112539	TREE AREA	419.74	36.30	-	-	TBR	N/A
115558	NAVAID	340.13	1.74	-	-	FBF	N/A
118703	TREE AREA	417.22	35.56	-	-	TBR	N/A
132246	NAVAID	338.25	1.87	-	0.87	FBF	N/A
150130	TREE AREA	374.81	7.10	-	-	TBR	N/A
152120	NAVAID	335.53	1.16	-	1.10	FBF	N/A
153045	TREE AREA	379.38	14.31	-	-	TBR	N/A
155890	TREE AREA	365.43	1.92	-	-	TBR	N/A
161773	TREE AREA	416.31	9.12	-	-	TBR	N/A
162336	TREE AREA	407.40	0.90	-	-	TBR	N/A
164572	TREE AREA	418.48	13.36	-	-	TBR	N/A
166878	TREE AREA	415.34	8.08	-	-	TBR	N/A
167412	TREE AREA	426.87	21.87	-	-	TBR	N/A
168287	TREE AREA	419.58	14.48	-	-	TBR	N/A
168798	TREE AREA	424.97	4.34	-	-	TBR	N/A
169648	TREE AREA	417.92	14.60	-	-	TBR	N/A
170580	NAVAID	364.11	1.84	-	-	FBF	N/A
170780	NAVAID	363.87	1.57	-	-	FBF	N/A
172174	TREE AREA	425.58	21.26	-	-	TBR	N/A
172252	TREE AREA	431.59	27.78	1.10	-	TBR	N/A
173245	TREE AREA	431.54	28.55	2.10	-	TBR	N/A
178612	TREE AREA	424.65	22.07	-	-	TBR	N/A
180978	TREE AREA	383.78	16.21	-	-	TBR	N/A
182045	TREE AREA	420.25	20.01	-	-	TBR	N/A
182348	TREE AREA	387.52	20.78	-	-	TBR	N/A
184443	TREE AREA	420.75	20.97	-	-	TBR	N/A
187485	TREE AREA	371.32	8.78	-	-	TBR	N/A
187561	TREE AREA	414.28	15.12	-	-	TBR	N/A
187825	TREE AREA	367.23	2.97	-	-	TBR	N/A
188298	NAVAID	335.51	7.58	-	-	FBF	N/A
190467	TREE AREA	370.75	8.95	-	-	TBR	N/A
200754	TREE AREA	376.07	15.51	-	-	TBR	N/A
206349	TREE AREA	369.64	9.38	-	-	TBR	N/A
207701	TREE AREA	402.35	9.85	-	-	TBR	N/A
210286	NAVAID	362.23	1.97	-	-	FBF	N/A
210724	TREE AREA	382.10	8.25	-	-	TBR	N/A
216483	TREE AREA	368.07	11.82	-	-	TBR	N/A
221464	TREE AREA	364.14	4.27	-	-	TBR	N/A
221647	TREE AREA	364.49	4.61	-	-	TBR	N/A
232864	TREE AREA	425.58	18.13	-	-	TBR	N/A
233295	TREE AREA	417.11	9.52	-	-	TBR	N/A
235712	TREE AREA	413.12	21.53	-	-	TBR	N/A
239906	TREE AREA	401.41	9.64	-	-	TBR	N/A
246320	TREE AREA	431.16	-	1.03		TBR	N/A
251585	NAVAID	359.75	1.47	-	-	FBF	N/A
252310	TREE AREA	388.44	2.34	-	-	TBR	N/A
256574	TREE AREA	421.50	18.26	-	-	TBR	N/A

SURFACE OBSTRUCTION TABLE

OBJECT ID	DESCRIPTION	TOP ELEV MSL	P77 PEN VALUE (FEET)	DEP PEN VALUE (FEET)	TSS PEN VALUE (FEET)	DISPOSTITION	TRIGGERING EVENT
267597	TREE AREA	407.49	10.11	-	-	TBR	N/A
272870	TREE AREA	369.44	12.25	-	1.45	TBR	N/A
283680	TREE AREA	411.50	14.88	-	-	TBR	N/A
291564	NAVAID	358.01	27.14	-	-	FBF	N/A
313919	TREE AREA	422.64	36.32	16.26	-	TBR	N/A
326824	TREE AREA	404.33	11.39	-	-	TBR	N/A
328434	TREE AREA	404.55	11.59	-	-	TBR	N/A
352720	TREE AREA	396.27	5.88	-	-	TBR	N/A
357327	LIGHT POLE	355.78	3.38	-	-	LGTD	N/A
378636	TREE AREA	413.63	17.44	-	-	TBR	N/A
379475	TREE AREA	417.86	20.28	-	-	TBR	N/A
381043	TREE AREA	423.32	26.18	3.39	-	TBR	N/A
383656	TREE AREA	415.66	20.00	-	-	TBR	N/A
388440	TREE AREA	415.33	19.69	-	-	TBR	N/A
392360	NAVAID	353.26	2.99	-	-	FBF	N/A
393145	NAVAID	353.32	3.05	-	-	FBF	N/A
394770	TREE AREA	409.29	15.12	-	-	TBR	N/A
406010	TREE AREA	416.06	26.76	3.91	0.86	TBR	N/A
408254	TREE AREA	392.35	9.64	-	-	TBR	N/A
408261	TREE AREA	417.63	27.36	5.81	-	TBR	N/A
408276	TREE AREA	423.45	33.17	11.51	-	TBR	N/A
408784	TREE AREA	399.17	27.58	6.76	-	TBR	N/A
409453	TREE AREA	427.56	37.67	4.58	-	TBR	N/A
422085	TREE AREA	421.54	34.96	13.25	10.33	TBR	N/A
423390	TREE AREA	419.25	32.92	12.99	-	TBR	N/A
429450	TREE AREA	412.20	28.44	8.01	5.15	TBR	N/A
444539	TREE AREA	419.17	37.49	-	-	TBR	N/A
456262	NAVAID	350.03	1.74	-	-	FBF	N/A
456435	TREE AREA	389.94	3.82	-	-	TBR	N/A
457281	TREE AREA	393.21	12.99	-	-	TBR	N/A
463744	TREE AREA	407.08	27.12	-	-	TBR	N/A
463775	TREE AREA	403.99	24.19	-	-	TBR	N/A
472634	TREE AREA	400.08	22.84	4.78	-	TBR	N/A
474878	TREE AREA	403.02	25.10	-	-	TBR	N/A
482579	TREE AREA	390.05	13.95	-	-	TBR	N/A
486701	NAVAID	348.19	1.91	-	-	FBF	N/A
492600	TREE AREA	402.60	28.67	-	-	TBR	N/A
498344	TREE AREA	397.94	25.69	-	-	TBR	N/A
501148	TREE AREA	417.78	2.54	-	-	TBR	N/A
504464	TREE AREA	388.73	17.66	-	-	TBR	N/A
505273	TREE AREA	389.41	19.94	-	-	TBR	N/A
505380	TREE AREA	387.92	17.54	-	-	TBR	N/A
513891	TREE AREA	382.78	0.14	-	-	TBR	N/A
517451	NAVAID	345.94	1.65	-	-	FBF	N/A
518324	NAVAID	346.31	2.04	-	-	FBF	N/A
547310	NAVAID	343.93	1.67	-	-	FBF	N/A
548548	NAVAID	344.14	1.85	-	-	FBF	N/A
576083	NAVAID	342.30	2.00	-	-	FBF	N/A
576947	NAVAID	342.38	2.08	-	-	FBF	N/A
577032	TREE AREA	390.76	1.55	-	-	TBR	N/A
641097	TREE AREA	404.39	31.98	-	-	TBR	N/A
654504	TREE AREA	377.76	9.00	-	-	TBR	N/A
668761	TREE AREA	392.66	14.04	-	-	TBR	N/A
674872	TREE AREA	399.40	21.77	-	-	TBR	N/A
677279	TREE AREA	382.01	14.67	-	-	TBR	N/A
677648	TREE AREA	410.62	15.21	-	-	TBR	N/A
682502	TREE AREA	396.19	21.27	-	-	TBR	N/A
683756	TREE AREA	403.46	27.05	-	-	TBR	N/A
689634	TREE AREA	396.27	21.85	3.61	2.94	TBR	N/A
691290	TREE AREA	402.89	28.30	-	-	TBR	N/A
692246	TREE AREA	404.42	30.34	-	-	TBR	N/A
698258	TREE AREA	403.51	31.02	-	-	TBR	N/A
705722	TREE AREA	388.45	18.18	-	-	TBR	N/A
712148	TREE AREA	396.57	3.72	-	-	TBR	N/A
712484	TREE AREA	395.47	2.59	-	-	TBR	N/A
713897	TREE AREA	403.88	9.50	-	-	TBR	N/A
716841	NAVAID	366.13	1.86	-	-	FBF	N/A
729779	TREE AREA	377.49	13.40	-	-	TBR	N/A
755061	TREE AREA	402.80	11.11	-	-	TBR	N/A
756397	TREE AREA	377.67	15.55	-	2.43	TBR	N/A
785492	TREE AREA	369.98	10.69	-	-	TBR	N/A
787455	TREE AREA	378.12	18.45	-	-	TBR	N/A
787985	TREE AREA	363.17	4.40	-	-	TBR	N/A
797400	TREE AREA	401.76	12.06	-	-	TBR	N/A
814797	TREE AREA	368.80	10.68	-	-	TBR	N/A
817272	TREE AREA	369.54	12.52	-	-	TBR	N/A
864506	LIGHT POLE	352.93	0.77	-	-	LGTD	N/A
873551	NAVAID	354.02	1.90	-	-	FBF	N/A
914436	TREE AREA	412.86	0.12	-	-	TBR	N/A
915813	TREE AREA	400.89	15.68	-	-	TBR	N/A
926258	TREE AREA	410.56	0.43	-	-	TBR	N/A
933015	TREE AREA	387.97	5.25	-	-	TBR	N/A
933580	NAVAID	348.98	0.70	-	-	FBF	N/A

SURFACE OBSTRUCTION TABLE

OBJECT ID	DESCRIPTION	TOP ELEV MSL	P77 PEN VALUE (FEET)	DEP PEN VALUE (FEET)	TSS PEN VALUE (FEET)	DISPOSTITION	TRIGGERING EVENT
940539	TREE AREA	410.21	0.42	-	-	TBR	N/A
940955	TREE AREA	411.23	1.53	-	-	TBR	N/A
953160	NAVAID	347.06	0.78	-	-	FBF	N/A
955612	TREE AREA	408.14	0.28	-	-	TBR	N/A
959689	TREE AREA	383.71	1.43	-	-	TBR	N/A
966691	TREE AREA	383.67	6.04	-	-	TBR	N/A
972990	TREE AREA	418.83	19.73	-	-	TBR	N/A
978812	TREE AREA	385.19	12.33	-	-	TBR	N/A
999380	TREE AREA	381.84	1.39	-	-	TBR	N/A
1033162	TREE AREA	384.97	4.70	-	-	TBR	N/A
1041226	TREE AREA	380.21	0.31	-	-	TBR	N/A
1079187	TREE AREA	415.46	0.46	-	-	TBR	N/A
1106079	TREE AREA	419.04	12.05	-	-	TBR	N/A
1111913	TREE AREA	407.07	0.83	-	-	TBR	N/A
1122684	TREE AREA	412.39	10.43	-	-	TBR	N/A
1125733	TREE AREA	415.56	13.92	-	-	TBR	N/A
1127196	TREE AREA	420.63	19.07	-	-	TBR	N/A
1130415	TREE AREA	412.06	12.05	-	-	TBR	N/A
1130700	TREE AREA	422.80	22.70	-	-	TBR	N/A
1133148	TREE AREA	413.21	12.46	-	-	TBR	N/A
1143037	TREE AREA	432.10	27.40	2.02	-	TBR	N/A
1190875	TREE AREA	376.86	2.35	-	-	TBR	N/A
1219792	TREE AREA	379.97	7.21	-	-	TBR	N/A
1222480	TREE AREA	380.84	7.85	-	-	TBR	N/A
1222863	TREE AREA	373.84	1.02	-	-	TBR	N/A
1227827	TREE AREA	376.00	4.46	-	-	TBR	N/A
1229848	TREE AREA	373.52	0.62	-	-	TBR	N/A
1230320	TREE AREA	375.46	2.39	-	-	TBR	N/A
1231479	TREE AREA	378.65	5.64	-	-	TBR	N/A
1233436	TREE AREA	381.32	9.96	-	-	TBR	N/A
1270778	TREE AREA	372.16	0.77	-	-	TBR	N/A
1275354	TREE AREA	375.27	5.26	-	-	TBR	N/A
1282871	NAVAID	371.59	1.30	-	-	FBF	N/A
1307048	TREE AREA	371.05	1.73	-	-	TBR	N/A
1309143	TREE AREA	429.01	1.27	-	-	TBR	N/A
1316570	TREE AREA	435.05	3.08	-	-	TBR	N/A
1317724	TREE AREA	432.58	0.17	-	-	TBR	N/A
1319780	TREE AREA	437.72	5.07	-	-	TBR	N/A
1322372	TREE AREA	432.17	0.27	-	-	TBR	N/A
1328618	NAVAID	379.93	1.66	-	-	FBF	N/A
1328998	TREE AREA	383.73	4.52	-	-	TBR	N/A
1332170	TREE AREA	381.97	5.59	-	-	TBR	N/A
1332973	TREE AREA	391.04	14.18	-	-	TBR	N/A
1335527	NAVAID	378.05	1.76	-	-	FBF	N/A
1335594	TREE AREA	378.94	3.33	-	-	TBR	N/A
1335951	TREE AREA	383.46	7.99	-	-	TBR	N/A
1336834	TREE AREA	388.27	12.14	-	-	TBR	N/A
1340836	TREE AREA	398.64	25.75	8.90	7.57	TBR	N/A
1343001	TREE AREA	392.02	19.77	3.41	1.88	TBR	N/A
1346966	TREE AREA	432.97	2.71	-	-	TBR	N/A
1370117	TREE AREA	383.65	10.71	-	-	TBR	N/A
1407742	TREE AREA	380.66	0.31	-	-	TBR	N/A
1416088	TREE AREA	382.16	1.77	-	-	TBR	N/A
1443338	TREE AREA	389.21	10.35	-	-	TBR	N/A
1514823	TREE AREA	382.37	5.96	-	-	TBR	N/A
1529450	TREE AREA	376.19	2.01	-	-	TBR	N/A
1542803	NAVAID	376.25	1.95	-	-	FBF	N/A
1546676	TREE AREA	375.32	1.04	-	-	TBR	N/A
1552782	TREE AREA	376.06	1.75	-	-	TBR	N/A
1557299	TREE AREA	394.51	19.77	2.20	0.71	TBR	N/A
1560054	TREE AREA	383.67	10.75	-	-	TBR	N/A
1560174	TREE AREA	384.77	11.90	-	-	TBR	N/A
1565630	TREE AREA	432.97	0.07	-	-	TBR	N/A
1577882	NAVAID	373.72	1.46	-	-	FBF	N/A
1578032	NAVAID	373.78	1.51	-	-	FBF	N/A
1583536	TREE AREA	373.17	0.83	-	-	TBR	N/A
1587991	TREE AREA	379.52	6.68	-	-	TBR	N/A
1590034	TREE AREA	379.04	6.77	-	-	TBR	N/A
1596742	TREE AREA	433.12	1.07	-	-	TBR	N/A
1599544	TREE AREA	407.86	1.20	-	-	TBR	N/A
1606174	TREE AREA	382.03	10.60	-	-	TBR	N/A
1611694	NAVAID	371.90	1.63	-	-	FBF	N/A
1624794	TREE AREA	386.24	16.23	0.61	-	TBR	N/A
1626951	TREE AREA	370.12	0.80	-	-	TBR	N/A
1637364	TREE AREA	412.64	8.27	-	-	TBR	N/A
1638006	TREE AREA	416.14	11.83	-	-	TBR	N/A
1638200	TREE AREA	415.50	11.18	-	-	TBR	N/A
1643184	TREE AREA	388.00	18.99	1.84	2.64	TBR	N/A
1676937	TREE AREA	414.58	12.17	-	-	TBR	N/A
1677292	TREE AREA	414.60	12.28	-	-	TBR	N/A
1715374	TREE AREA	431.37	1.90	-	-	TBR	N/A
1717128	TREE AREA	411.87	11.83	-	-	TBR	N/A

TRAVERSEWAY ELEVATION DATA

OBJECT ID	DESCRIPTION	TOP ELEV MSL	P77 PEN VALUE (FEET)	DISPOSTITION
18	SHELBY DR.	329.00	-23.56	N/A
19	SHELBY DR.	326.00	-26.87	N/A
20	SHELBY DR.	313.00	-40.17	N/A
21	PRIVATE RD.	334.00	-23.34	N/A
22	PRIVATE RD.	325.00	-30.43	N/A
23	HOMES RD.	339.00	-119.96	N/A
24	HOMES RD.	356.00	-103.41	N/A
25	HOMES RD.	361.00	-99.22	N/A

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ALP Prepared By

JACOBSEN | DANIELS
Planning, Implementation, Operations & Management

Drawn:
Approved: MJ
Date: 4-21-2023
Project No.:

No.	Date	Revisions

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Sources
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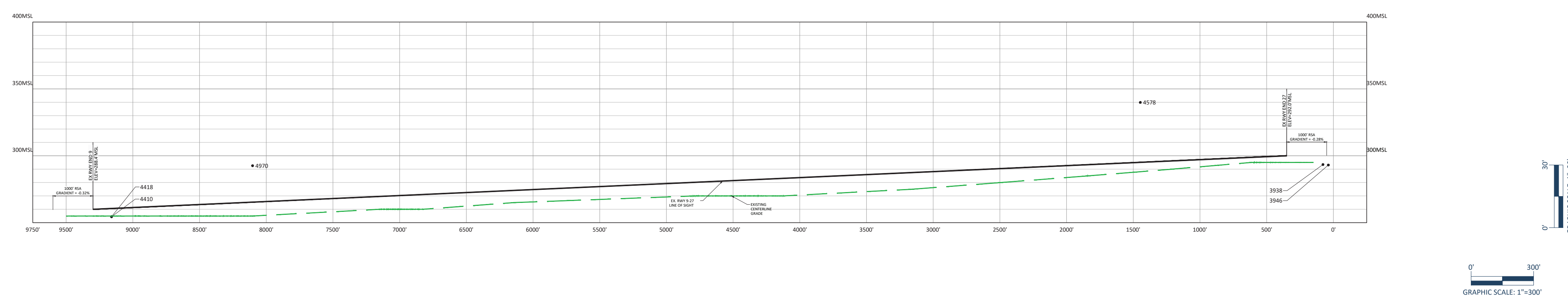
Memphis International Airport

RWY 36R INNER APPROACH
RWY 18L DEPARTURE
EXISTING PLAN & PROFILE
Airport Layout Plan Drawing Set

PLAN VIEW RUNWAY 9-27

PROFILE VIEW RUNWAY 9-27



SURFACE OBSTRUCTION TABLE

OBJECT ID	DESCRIPTION	TOP ELEV MSL	PRIMARY PEN VALUE (FEET)	DISPOSTITION	TRIGGERING EVENT
3938	RUNWAY LIGHT	293.46	1.78	FBF	N/A
3946	RUNWAY LIGHT	293.12	1.28	FBF	N/A
4410	RUNWAY LIGHT	254.41	0.42	FBF	N/A
4418	RUNWAY LIGHT	254.58	0.59	FBF	N/A
4578	ANTENNA	339.90	53.90	LGTD	N/A
4970	ANTENNA	292.60	34.22	LGTD	N/A

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LEGEND

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250 MSL	PART 77 SURFACE CONTOUR	RSA	RUNWAY SAFETY AREA (RSA)
	GS CRITICAL AREA	OFZ	OBJECT FREE ZONE (OFZ)
	RUNWAY PAVEMENT & MARKINGS	RPZ	RUNWAY PROTECTION ZONE (RPZ)
	TAXIWAY PAVEMENT		EXISTING AIRPORT PROPERTY LINE
	FOREST / TREE CLUSTER		PT77 APPROACH SURFACE
			TSS APPROACH SURFACE
	OBSTRUCTION		DEPARTURE SURFACE
	EXISTING STRUCTURES ON AIRPORT PROPERTY		LOC CRITICAL AREA
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	FUTURE RUNWAY PAVEMENT		FUTURE TAXIWAY PAVEMENT
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ALP Prepared By

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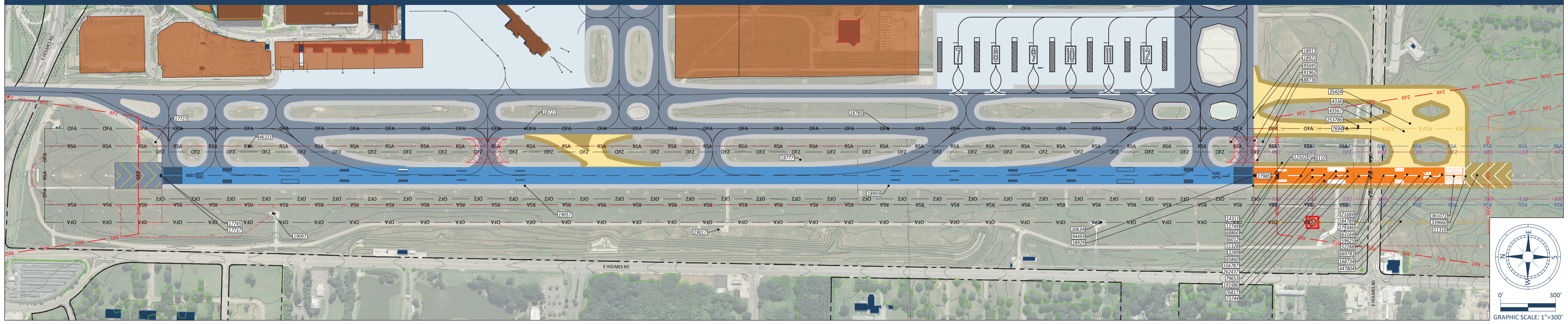
Memphis INTERNATIONAL AIRPORT

RWY 9-27 RUNWAY PLAN & PROFILE

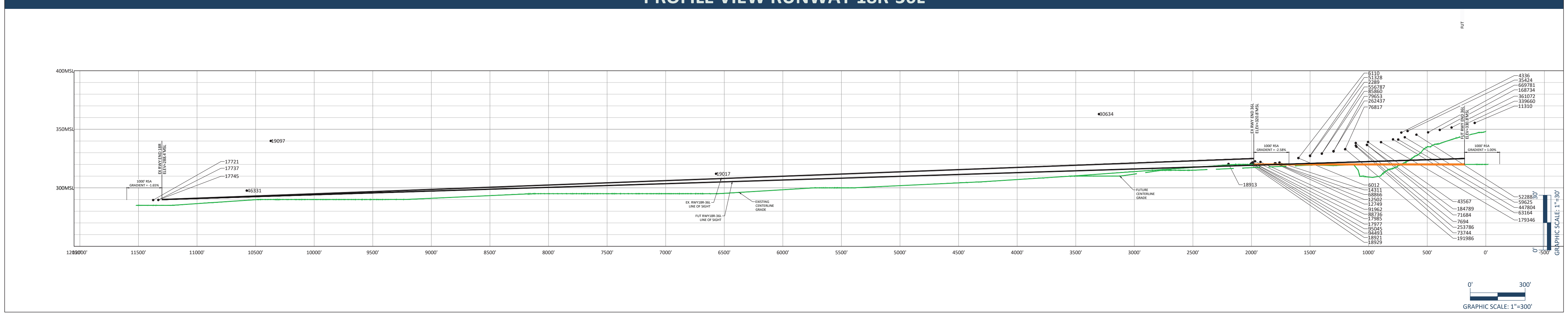
Airport Layout Plan Drawing Set

Memphis International Airport

PLAN VIEW RUNWAY 18R-36L



PROFILE VIEW RUNWAY 18R-36L



SURFACE OBSTRUCTION TABLE

OBJECT ID	DESCRIPTION	TOP ELEV MSL	PRIMARY PEN VALUE (FEET)	DISPOSTITION	TRIGGERING EVENT
17721	SIGN	289.56	0.75	FBF	N/A
17737	RUNWAY LIGHT	289.63	0.69	FBF	N/A
17745	RUNWAY LIGHT	289.63	0.69	FBF	N/A
17977	RUNWAY LIGHT	321.59	6.39	TBR	RWY EXT.
17985	RUNWAY LIGHT	321.69	6.49	TBR	RWY EXT.
18913	SIGN	320.44	5.82	FBF	N/A
18921	GROUND	320.58	5.41	N/A	RWY EXT.
18929	GROUND	319.83	4.68	N/A	RWY EXT.
19017	AWOS	312.04	9.72	FBF	N/A
19097	ANTENNA	340.05	48.42	LGTD	N/A
30634	ANTENNA	363.00	51.48	LGTD	N/A
46331	WINDSOCK	297.63	6.57	FBF	N/A
2289	NAVAID	327.18	10.60	TBR	RWY EXT.
6012	NAVAID	325.38	6.60	TBR	RWY EXT.
6110	NAVAID	325.49	9.19	TBR	RWY EXT.
12502	GROUND	320.97	4.67	N/A	RWY EXT.
12749	GROUND	320.96	3.29	N/A	RWY EXT.
14311	UNKNOWN	321.65	1.12	TBR	RWY EXT.
51328	NAVAID	327.51	11.76	TBR	RWY EXT.
68866	GROUND	320.95	5.21	N/A	RWY EXT.
88736	NAVAID	322.63	6.78	TBR	RWY EXT.
91962	NAVAID	322.07	3.14	TBR	RWY EXT.
94493	GROUND	320.99	3.02	N/A	RWY EXT.
95045	NAVAID	320.91	4.32	TBR	RWY EXT.

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SURFACE OBSTRUCTION TABLE

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4336	TREE AREA	347.22	28.09	TBR	RWY EXT.
7694	NAVAID	338.29	19.43	TBR	RWY EXT.
11310	NAVAID	355.44	36.87	TBR	RWY EXT.
52288	NAVAID	345.37	29.62	TBR	RWY EXT.
59625	NAVAID	343.19	25.24	TBR	RWY EXT.
63164	NAVAID	341.37	23.68	TBR	RWY EXT.
71684	NAVAID	336.76	19.34	TBR	RWY EXT.
73744	NAVAID	335.10	17.96	TBR	RWY EXT.
76817	NAVAID	332.94	16.08	TBR	RWY EXT.
79653	NAVAID	331.11	15.85	TBR	RWY EXT.
85860	NAVAID	329.17	13.78	TBR	RWY EXT.
168734	NAVAID	349.49	34.32	TBR	RWY EXT.
179346	NAVAID	339.00	23.81	TBR	RWY EXT.
184789	NAVAID	336.57	16.87	TBR	RWY EXT.
191986	NAVAID	333.03	14.75	TBR	RWY EXT.
262437	NAVAID	331.41	13.46	TBR	RWY EXT.
339660	NAVAID	353.47	36.04	TBR	RWY EXT.
361072	NAVAID	351.51	33.83	TBR	RWY EXT.
447804	TREE AREA	341.26	24.12	TBR	RWY EXT.
556787	NAVAID	329.29	9.03	TBR	RWY EXT.
669781	NAVAID	347.38	27.40	TBR	RWY EXT.
35424	TREE AREA	348.47	29.77	TBR	RWY EXT.
43567	LIGHT POLE	339.16	22.30	TBR	RWY EXT.
253786	NAVAID	336.09	16.67	TBR	RWY EXT.

LEGEND

ITEM	DESCRIPTION	ITEM	DESCRIPTION
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250 MSL	PART 77 SURFACE CONTOUR	RSA	RUNWAY SAFETY AREA (RSA)
	GS CRITICAL AREA	OFZ	OBJECT FREE ZONE (OFZ)
	RUNWAY PAVEMENT & MARKINGS	RPZ	RUNWAY PROTECTION ZONE (RPZ)
	TAXIWAY PAVEMENT		EXISTING AIRPORT PROPERTY LINE
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	DEMOLITION		FUTURE STRUCTURES ON AIRPORT PROPERTY
	FUTURE RUNWAY PAVEMENT		FUTURE TAXIWAY PAVEMENT
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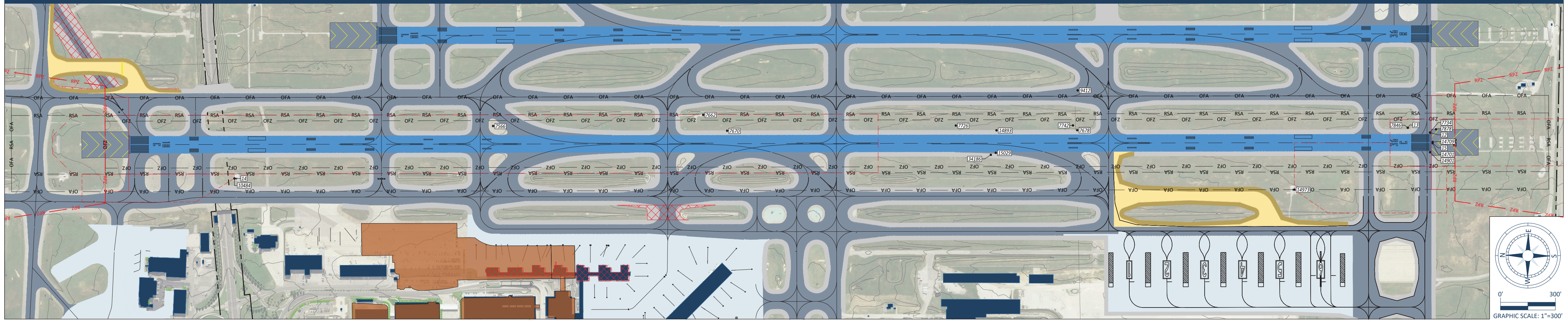
MAGNETIC DECLINATION
0 30' WEST (2009)
DECLINATION CHANGING BY 0 6' WEST/YEAR

Memphis INTERNATIONAL AIRPORT

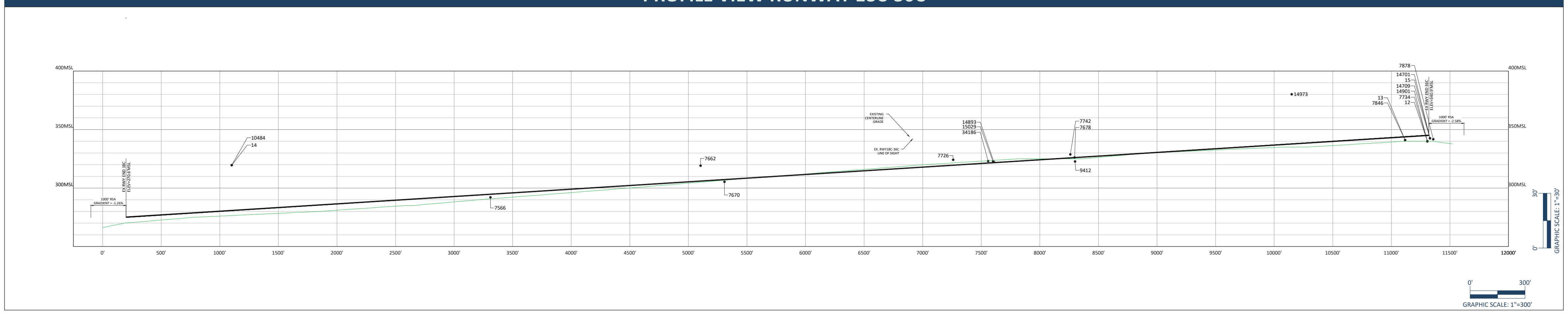
RWY 18R-36L RUNWAY PLAN & PROFILE

Airport Layout Plan Drawing Set

PLAN VIEW RUNWAY 18C-36C



PROFILE VIEW RUNWAY 18C-36C



SURFACE OBSTRUCTION TABLE

OBJECT ID	DESCRIPTION	TOP ELEV MSL	PRIMARY PEN VALUE (FEET)	DISPOSTITION	TRIGGERING EVENT
12	GROUND	340.03	0.42	N/A	N/A
13	SIGN	341.00	2.56	FBF	N/A
14	ANTENNA	319.54	42.21	LGTD	N/A
15	RUNWAY LIGHT	342.55	2.81	FBF	N/A
7566	SIGN	292.03	1.23	FBF	N/A
7662	AWOS	319.10	17.35	FBF	N/A
7670	GROUND	305.36	2.37	N/A	N/A
7678	GROUND	326.19	4.96	N/A	N/A
7726	SIGN	324.13	9.23	FBF	N/A
7734	GROUND	340.03	0.42	N/A	N/A
7742	SIGN	328.75	7.75	FBF	N/A
7846	SIGN	341.00	2.56	FBF	N/A
7878	NAVAID	341.71	1.80	FBF	N/A
9412	GROUND	322.74	1.49	N/A	N/A
10484	ANTENNA	319.54	42.21	LGTD	N/A
14701	RUNWAY LIGHT	342.55	2.81	FBF	N/A
14709	RUNWAY LIGHT	342.55	2.81	FBF	N/A
14893	GROUND	322.30	5.28	N/A	N/A
14901	GROUND	339.81	0.21	N/A	N/A
14973	ANTENNA	380.18	47.65	LGTD	N/A
15029	GROUND	322.70	5.72	N/A	N/A
34186	NAVAID	323.05	6.33	FBF	N/A

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LEGEND

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	TAXIWAY PAVEMENT		EXISTING AIRPORT PROPERTY LINE
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	OBSTRUCTION		DEPARTURE SURFACE
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	FUTURE RUNWAY PAVEMENT		FUTURE TAXIWAY PAVEMENT
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ALP Prepared By

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INTERNATIONAL AIRPORT

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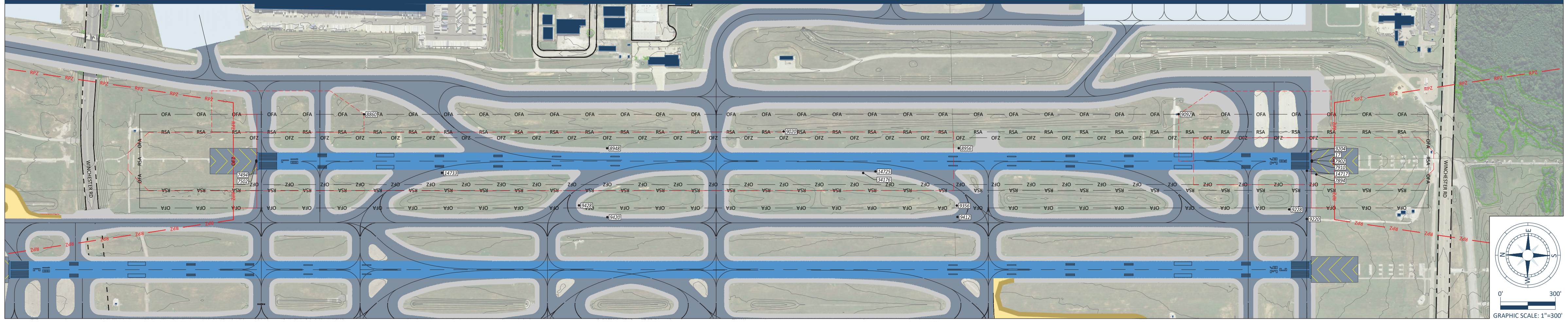
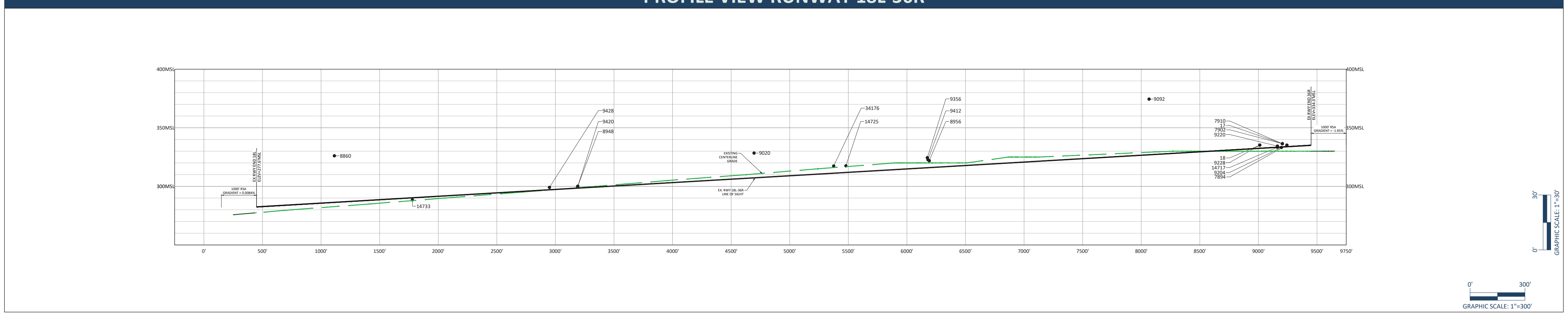
Memphis International Airport

PLAN VIEW RUNWAY 18L-36R



PROFILE VIEW RUNWAY 18L-36R



SURFACE OBSTRUCTION TABLE

OBJECT ID	DESCRIPTION	TOP ELEV MSL	PRIMARY PEN VALUE (FEET)	DISPOSTITION	TRIGGERING EVENT
17	RUNWAY LIGHT	336.41	3.29	FBF	N/A
18	SIGN	335.22	3.26	FBF	N/A
7894	NAVAID	335.20	1.84	FBF	N/A
7902	RUNWAY LIGHT	336.41	3.29	FBF	N/A
7910	RUNWAY LIGHT	336.38	3.26	FBF	N/A
8860	ANTENNA	326.08	41.76	LGTD	N/A
8948	GROUND	299.72	2.88	N/A	N/A
8956	GROUND	321.89	6.95	N/A	N/A
9020	AWOS	328.41	22.48	FBF	N/A
9092	ANTENNA	374.44	48.18	LGTD	N/A
9204	GROUND	333.20	0.12	N/A	N/A
9220	GROUND	334.38	1.51	N/A	N/A
9228	SIGN	335.22	3.26	FBF	N/A
9356	SIGN	324.46	9.61	FBF	N/A
9412	GROUND	322.74	7.86	N/A	N/A
9420	GROUND	300.16	3.31	N/A	N/A
9428	SIGN	299.11	3.72	FBF	N/A
14717	GROUND	333.37	0.50	N/A	N/A
14725	GROUND	317.54	6.88	N/A	N/A
14733	GROUND	288.48	0.14	N/A	N/A
34176	NAVAID	317.38	7.35	FBF	N/A

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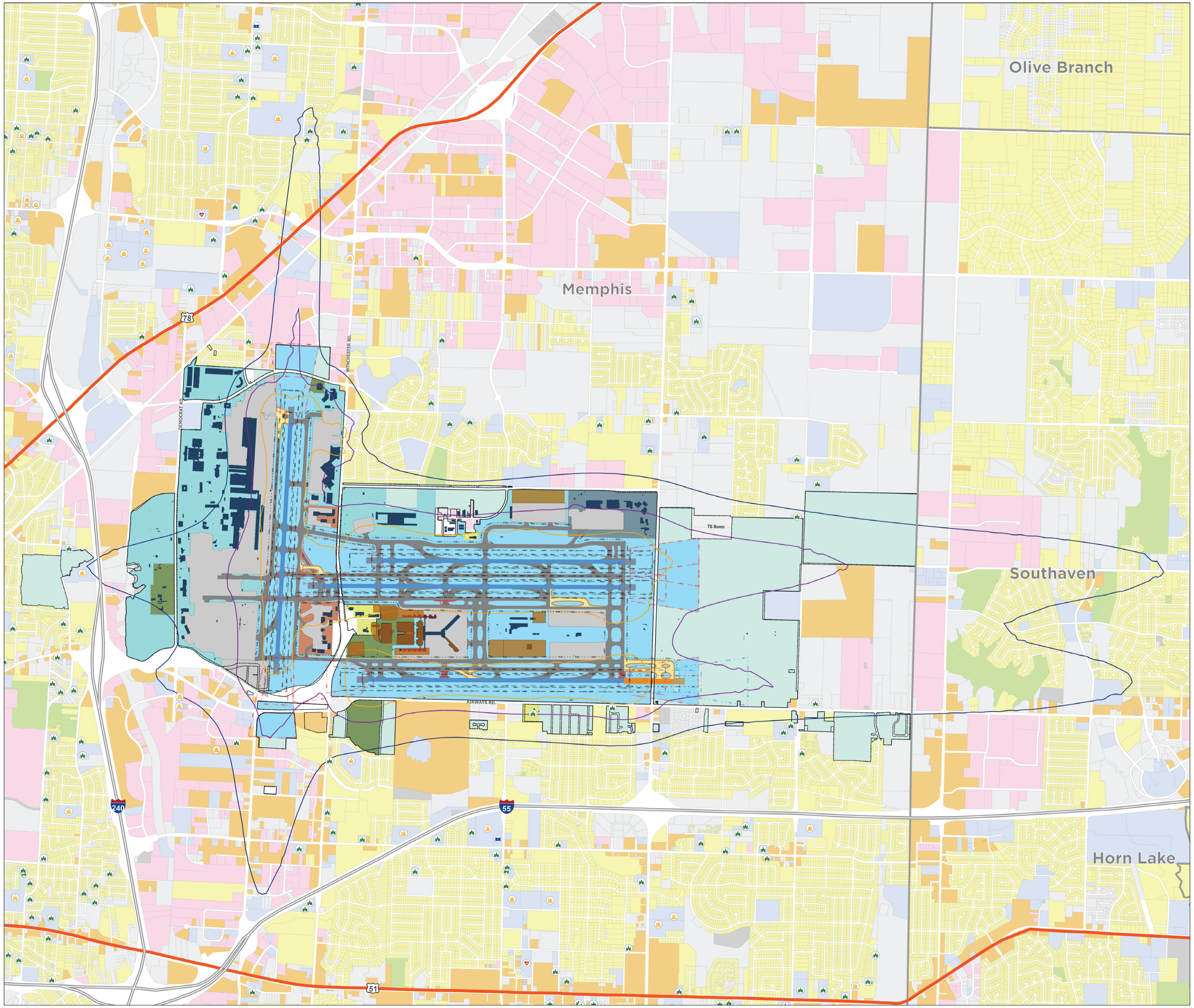
4. No PAPI siting surface (3:1 slope) obstructions. Surface not shown on drawing for clarity.

Sources
1. Obstruction survey data performed under CIVICX (GCR) GIS Data Package Summary , dated July 2020.
2. Extended runway composite profile obtained using contours from AGIS project #220139 (September 2015) and United States Geographic Survey outside of survey limits.
3. Data of individual obstructions specifically trees can be found in the CIVICX (GCR) GIS Data Package Summary.

Memphis INTERNATIONAL AIRPORT

RWY 18L-36R RUNWAY PLAN & PROFILE
Airport Layout Plan Drawing Set

Memphis International Airport



LEGEND

ITEM	DESCRIPTION
	65 NOISE CONTOUR
	70 NOISE CONTOUR
	75 NOISE CONTOUR
	RUNWAY PROTECTION ZONE (RPZ)
	RUNWAY OBJECT FREE AREA (ROFA)
	OBJECT FREE ZONE (OFZ)
	RUNWAY SAFETY AREA (RSA)
	TAXIWAY OBJECT FREE AREA (TOFA)
	FUTURE OBJECT FREE AREA (OFA)
	FUTURE RUNWAY PROTECTION ZONE (RPZ)
	FUTURE OBJECT FREE ZONE (OFZ)
	FUTURE RUNWAY SAFETY AREA (RSA)
	AIRPORT PROPERTY BOUNDARY

ON AIRPORT LAND USE

ITEM	DESCRIPTION
	AIRFIELD
	AIRPORT SUPPORT FACILITY
	CARGO
	GA FACILITY
	LANDSIDE FACILITY
	MILITARY
	TERMINAL
	UNDEVELOPED
	VACANT
	EXISTING RUNWAY
	EXISTING TAXIWAY
	FUTURE STRUCTURES
	AIRPORT APRON
	RUNWAY 36L EXTENSION
	FUTURE TAXIWAY PAVEMENT
	FUTURE SHOULDER PAVEMENT
	DEMOLITION

OFF AIRPORT LAND USE

ITEM	DESCRIPTION
	COMMERCIAL
	INDUSTRIAL
	INSTITUTIONAL
	PARKS, RECREATION & CEMETERY
	RESIDENTIAL
	UTILITY
	VACANT
	OTHER
	HOSPITAL
	LIBARARY
	SCHOOL
	RELIGOUS INSTITUTION

Plotted On: 5/9/2023 11:58 AM

ALP Prepared By

JACOBSEN | DANIELS
Planning, Implementation, Operations & Management

Drawn: DS II
Approved: KS
Date: 04-14-2023
Project No.: 09-130-18-0

No.	Date	Revisions

FAA'S APPROVAL OF THIS AIRPORT LAYOUT PLAN (ALP) REPRESENTS ACCEPTANCE OF THE GENERAL LOCATION OF FUTURE FACILITIES DEPICTED (SHEET I7144C04). DURING THE PRELIMINARY DESIGN PHASE, THE AIRPORT OWNER IS REQUIRED TO RESUBMIT FOR APPROVAL THE FINAL LOCATIONS, HEIGHTS, AND EXTERIOR FINISH OF STRUCTURES. FAA'S CONCERN IS OBSTRUCTIONS, IMPACT ON ELECTRONIC AIDS, OR ADVERSE EFFECTS ON CONTROLLER VIEW OF AIRCRAFT APPROACHES AND GROUND MOVEMENT AREAS WHICH COULD ADVERSELY AFFECT THE SAFETY, EFFICIENCY, OR UTILITY OF THE AIRPORT.

Notes

1. Noise Contours shown on Land Use Plan were developed by URS during Part 150 Study
2. Off Airport Land Use is based on parcel data provided by Memphis International Airport.

Sources

0 1,000 2,000 4,000
GRAPHIC SCALE: 1" = 1,100'

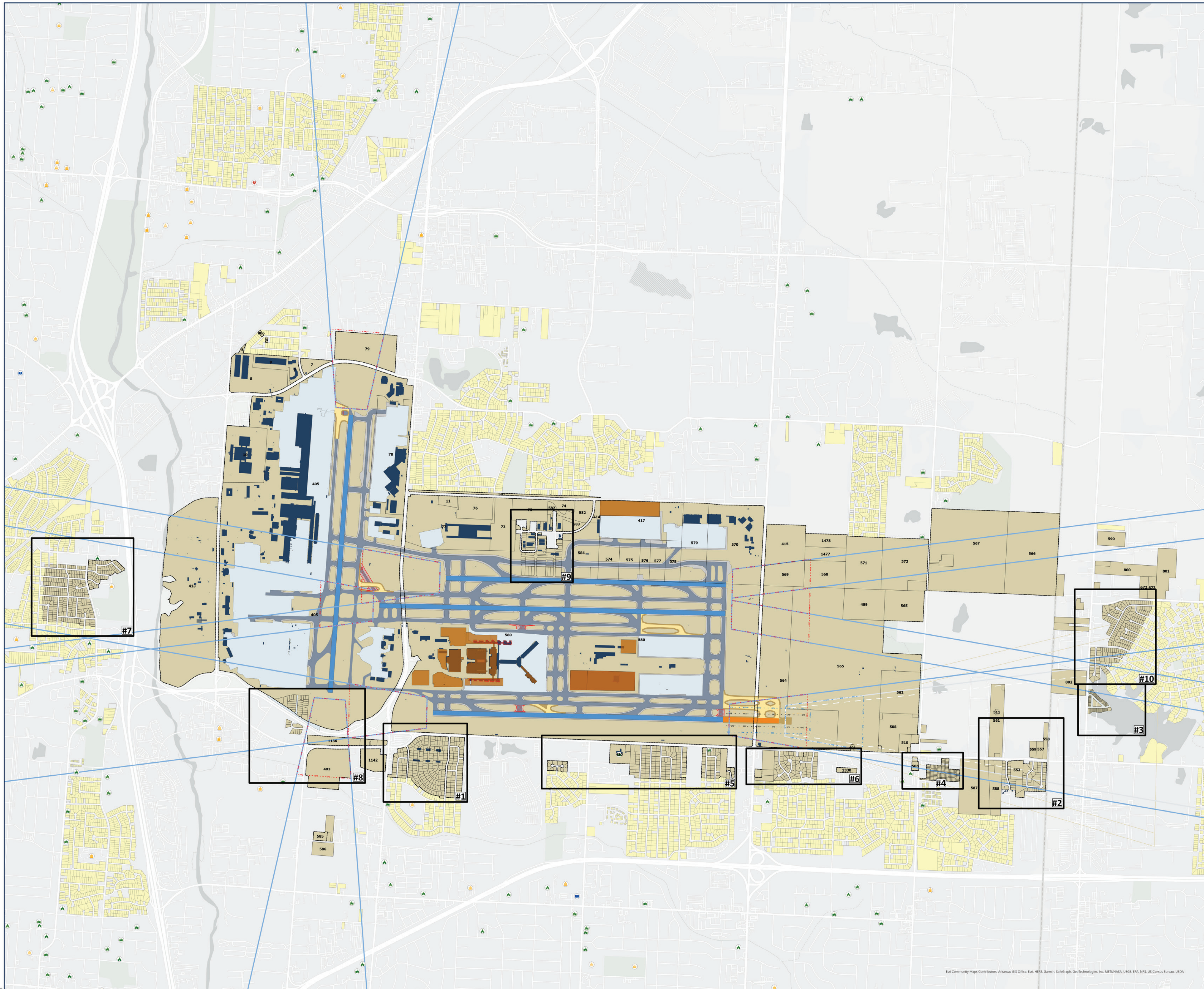
N E S W
MAGNETIC DECLINATION
0 30' WEST (2009)
DECLINATION CHANGING BY 0 6' WEST/YEAR

Memphis INTERNATIONAL AIRPORT

LAND USE DRAWING
Airport Layout Plan Drawing Set

22 of 27

Memphis International Airport



LEGEND

FUTURE	EXISTING	DESCRIPTION
		AIRPORT PROPERTY LINE
		STRUCTURES ON AIRPORT PROPERTY
		RUNWAY PAVEMENT & MARKINGS
		TAXIWAY PAVEMENT
		AIRFIELD APRON PAVEMENT
		SHOULDER PAVEMENT
RPZ	RPZ	RUNWAY PROTECTION ZONE (RPZ)
		PT 77 APPROACH SURFACE
		HOSPITAL
		LIBRARY
		SCHOOL
		RELIGOUS INSTITUTION
		AIRPORT EASEMENTS
		AIRPORT PARCELS
		DEMOLITION PAVEMENT
		SURVEY MONUMENTS

Plotted On: 5/9/2023 11:31 AM

ALP Prepared By

JACOBSEN | DANIELS
Planning, Implementation, Operations & Management

Drawn: DS II
Approved: KS
Date: 04-14-2023
Project No.: 09-130-18-00

No.	Date	Revisions

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Notes
1. ALL BLAST PADS ARE 220' x 400' UNLESS OTHERWISE NOTED.
2. REFER TO DATA SHEET FOR ALL TAXIWAY/TAXILANE INFORMATION.
3. TSA AND TESM LINES ARE NOT SHOW FOR CLARITY AND DIMENSIONS CAN BE FOUND ON THE DATA SHEET
4. ALL COORDINATES ARE HORIZONTAL: NORTH AMERICAN DATUM OF 1983/2011 (NAD 83(2011)), IN THE TN STATE PLANE COORDINATE SYSTEM, IN US SURVEY FEET. VERTICAL: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88)
5. THE OBJECT FREE ZONE (OFZ) H VALUE IS 48' AND THEN EXTENDS TO THE PART HORIZONTAL SURFACE AT A SLOPE OF 6:1. THE OFZ IS CLEAR OF OBSTRUCTIONS..
6. APPROXIMATE FENCE HEIGHTS VARY FROM 6' to 11'.

Sources
1. FEATURE GEOMETRY SHOWN ON THESE PLANS ARE FROM THE AGIS PROJECT NUMBER 220139 AND 2016 ALP UPDATE.
2. OBSTACLES, AND TRAVERSEWAY POINTS ON THESE PLANS ARE FROM SURVEY MAPPED BY QUANTUM SPATIAL DATED SEPTEMBER, 2016 AND TRAVERSEWAY POINTS FROM GOOGLE EARTH PRO.
3. FENCE HEIGHTS ARE FROM MSCAA PROJECT NUMBER 16-1400-02-01 DATED MARCH 2019

0 500 1,000 2,000 3,000 4,000 Feet

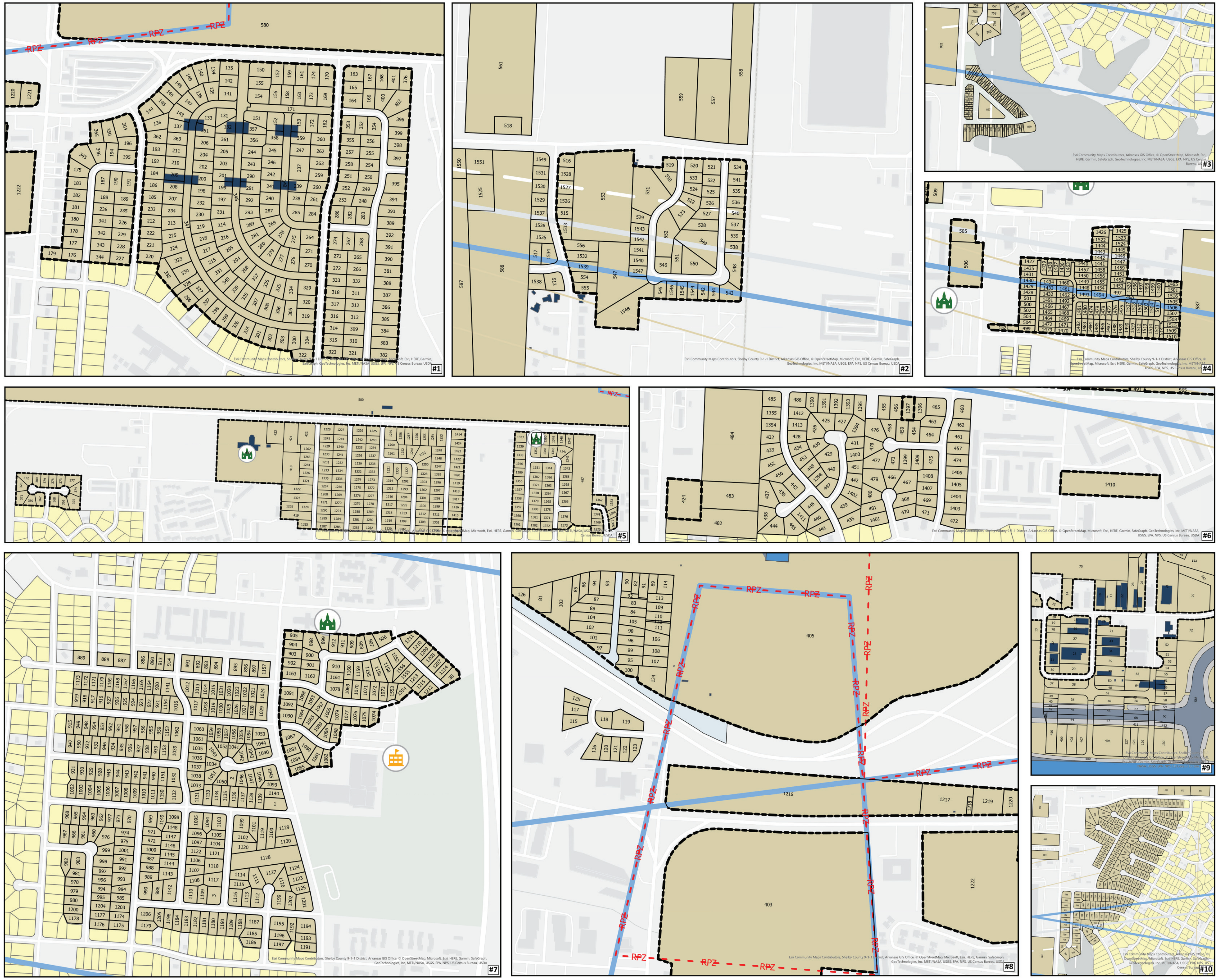
N E S W
MAGNETIC DECLINATION
0 30' WEST (2009)
DECLINATION CHANGING BY 0 6' WEST/YEAR

Memphis
INTERNATIONAL AIRPORT

PROPERTY MAP

Airport Layout Plan Drawing Set

Memphis International Airport



LEGEND

FUTURE	EXISTING	DESCRIPTION
		AIRPORT PROPERTY LINE
		STRUCTURES ON AIRPORT PROPERTY
		RUNWAY PAVEMENT & MARKINGS
		TAXIWAY PAVEMENT
		AIRFIELD APRON PAVEMENT
		SHOULDER PAVEMENT
RPZ	RPZ	RUNWAY PROTECTION ZONE (RPZ)
		PT 77 APPROACH SURFACE
		HOSPITAL
		LIBRARY
		SCHOOL
		RELIGOUS INSTITUTION
		AIRPORT EASEMENTS
		AIRPORT PARCELS
		DEMOLITION PAVEMENT

Plotted On: 5/9/2023 11:33 AM

ALP Prepared By

JACOBSEN | DANIELS
Planning, Implementation, Operations & Management

Drawn: DS II
Approved: KS
Date: 04-14-2023
Project No.: 09-130-18-00

No.	Date	Revisions

FAA'S APPROVAL OF THIS AIRPORT LAYOUT PLAN (ALP) REPRESENTS ACCEPTANCE OF THE GENERAL LOCATION OF FUTURE FACILITIES DEPICTED (SHEET I7144C04). DURING THE PRELIMINARY DESIGN PHASE, THE AIRPORT OWNER IS REQUIRED TO RESUBMIT FOR APPROVAL THE FINAL LOCATIONS, HEIGHTS, AND EXTERIOR FINISH OF STRUCTURES. FAA'S CONCERN IS OBSTRUCTIONS, IMPACT ON ELECTRONIC AIDS, OR ADVERSE EFFECTS ON CONTROLLER VIEW OF AIRCRAFT APPROACHES AND GROUND MOVEMENT AREAS WHICH COULD ADVERSELY AFFECT THE SAFETY, EFFICIENCY, OR UTILITY OF THE AIRPORT.

Notes
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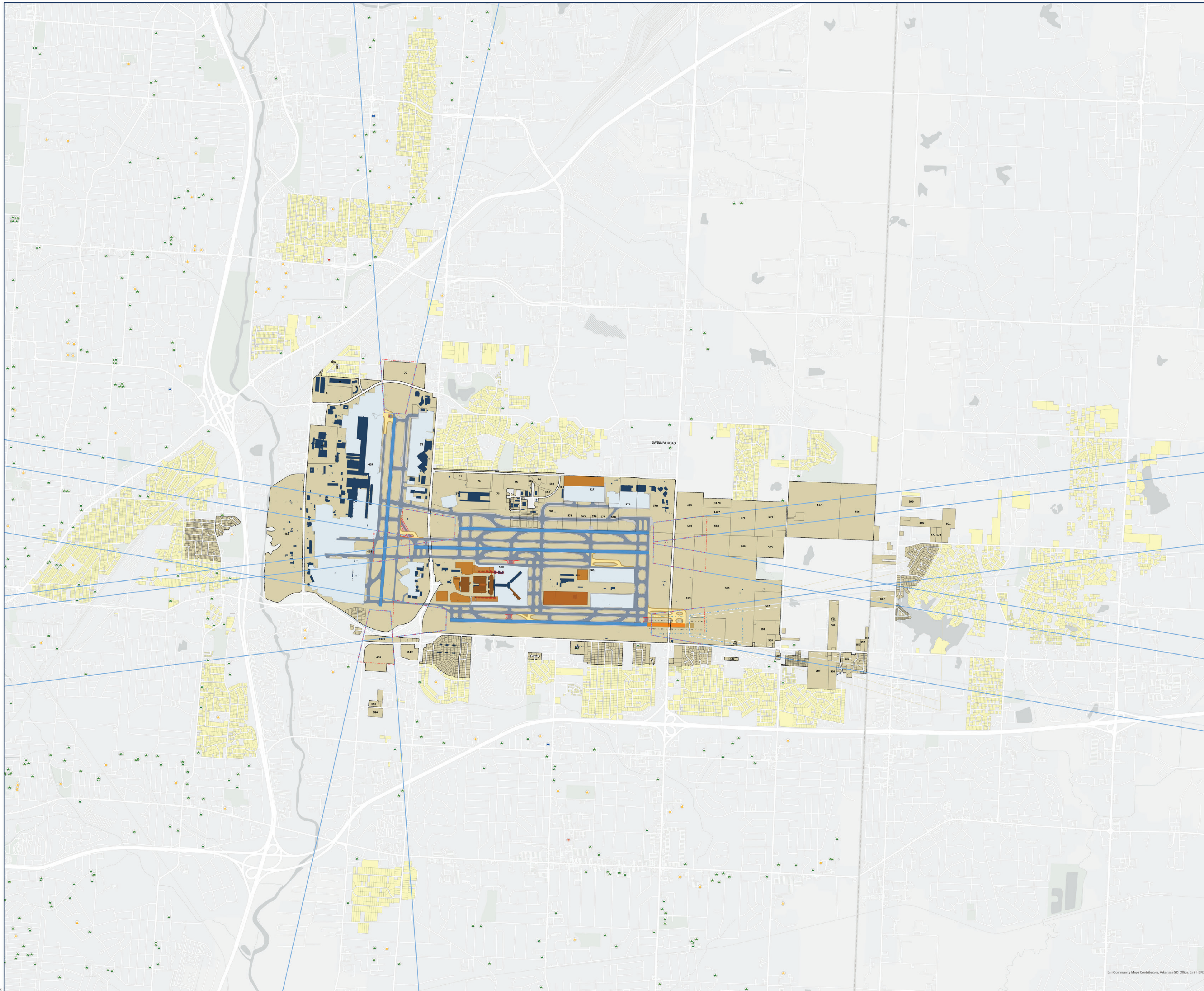
N W E S
MAGNETIC DECLINATION
0 30' WEST (2009)
DECLINATION CHANGING BY 0 6' WEST/YEAR

Memphis INTERNATIONAL AIRPORT

AIRPORT PROPERTY MAP INSETS

Airport Layout Plan Drawing Set

Memphis International Airport



LEGEND

FUTURE	EXISTING	DESCRIPTION
		AIRPORT PROPERTY LINE
		STRUCTURES ON AIRPORT PROPERTY
		RUNWAY PAVEMENT & MARKINGS
		TAXIWAY PAVEMENT
		AIRFIELD APRON PAVEMENT
		SHOULDER PAVEMENT
RPZ	RPZ	RUNWAY PROTECTION ZONE (RPZ)
		PT 77 APPROACH SURFACE
		HOSPITAL
		LIBRARY
		SCHOOL
		RELIGOUS INSTITUTION
		AIRPORT EASEMENTS
		AIRPORT PARCELS
		DEMOLITION PAVEMENT

Plotted On: 5/9/2023 11:35 AM

ALP Prepared By

JACOBSEN | DANIELS
Planning, Implementation, Operations & Management

Drawn: DS II
Approved: KS
Date: 04-14-2023
Project No.: 09-130-18-00

No.	Date	Revisions

FAA'S APPROVAL OF THIS AIRPORT LAYOUT PLAN (ALP) REPRESENTS ACCEPTANCE OF THE GENERAL LOCATION OF FUTURE FACILITIES DEPICTED (SHEET I7144C04). DURING THE PRELIMINARY DESIGN PHASE, THE AIRPORT OWNER IS REQUIRED TO RESUBMIT FOR APPROVAL THE FINAL LOCATIONS, HEIGHTS, AND EXTERIOR FINISH OF STRUCTURES. FAA'S CONCERN IS OBSTRUCTIONS, IMPACT ON ELECTRONIC AIDS, OR ADVERSE EFFECTS ON CONTROLLER VIEW OF AIRCRAFT APPROACHES AND GROUND MOVEMENT AREAS WHICH COULD ADVERSELY AFFECT THE SAFETY, EFFICIENCY, OR UTILITY OF THE AIRPORT.

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0 1,500 3,000 6,000 Feet

MAGNETIC DECLINATION
0 30' WEST (2009)
DECLINATION CHANGING BY 0 6' WEST/YEAR

Memphis INTERNATIONAL AIRPORT

PROPERTY MAP - EASEMENTS

Airport Layout Plan Drawing Set

PARCEL DATA

AREA ID	PARCEL ID	OBLIGATIONS	METHOD OF ACQUISITION	TYPE OF AQUISITION	ACREAGE
-	1	-	3-47-0049-16-1990	FEE SIMPLE	0.27
-	2	-	3-47-0049-36-1996	FEE SIMPLE	0.15
-	3	-	3-47-0049-16-1990	FEE SIMPLE	0.24
-	4	-	N/A	FEE SIMPLE	0.6
-	5	-	N/A	FEE SIMPLE	0.67
-	6	-	N/A	FEE SIMPLE	6.28
-	7	-	N/A	FEE SIMPLE	6.98
-	8	-	N/A	FEE SIMPLE	1,586.15
-	9	-	N/A	FEE SIMPLE	12.13
-	10	-	N/A	FEE SIMPLE	51.77
-	11	-	N/A	FEE SIMPLE	186.07
-	12	-	N/A	FEE SIMPLE	0.47
-	13	-	N/A	FEE SIMPLE	0.66
-	14	-	N/A	FEE SIMPLE	0.82
-	15	-	N/A	FEE SIMPLE	0.17
-	16	-	N/A	FEE SIMPLE	0.66
-	17	-	N/A	FEE SIMPLE	0.76
-	18	-	N/A	FEE SIMPLE	0.76
-	19	-	N/A	FEE SIMPLE	0.22
-	20	-	N/A	FEE SIMPLE	0.21
-	21	-	N/A	FEE SIMPLE	0.28
-	22	-	N/A	FEE SIMPLE	0.76
-	23	-	N/A	FEE SIMPLE	1.24
-	24	-	N/A	FEE SIMPLE	2.68
-	25	-	N/A	FEE SIMPLE	2.46
-	26	-	N/A	FEE SIMPLE	0.77
-	27	-	N/A	FEE SIMPLE	0.69
-	28	-	N/A	FEE SIMPLE	1.38
-	29	-	N/A	FEE SIMPLE	0.55
-	30	-	N/A	FEE SIMPLE	0.2
-	31	-	N/A	FEE SIMPLE	0.44
-	32	-	N/A	FEE SIMPLE	0.66
-	33	-	N/A	FEE SIMPLE	0.69
-	34	-	N/A	FEE SIMPLE	0.69
-	35	-	N/A	FEE SIMPLE	0.69
-	36	-	N/A	FEE SIMPLE	0.55
-	37	-	N/A	FEE SIMPLE	0.29
-	38	-	N/A	FEE SIMPLE	0.65
-	39	-	N/A	FEE SIMPLE	0.19
-	40	-	N/A	FEE SIMPLE	0.22
-	41	-	N/A	FEE SIMPLE	0.05
-	42	-	N/A	FEE SIMPLE	0.21
-	43	-	N/A	FEE SIMPLE	0.69
-	44	-	N/A	FEE SIMPLE	0.69
-	45	-	N/A	FEE SIMPLE	0.69
-	46	-	N/A	FEE SIMPLE	0.55
-	47	-	N/A	FEE SIMPLE	0.69
-	48	-	N/A	FEE SIMPLE	0.37
-	49	-	N/A	FEE SIMPLE	0.69
-	50	-	N/A	FEE SIMPLE	0.27
-	51	-	N/A	FEE SIMPLE	0.29
-	52	-	N/A	FEE SIMPLE	0.62
-	53	-	N/A	FEE SIMPLE	0.28
-	54	-	N/A	FEE SIMPLE	0.29
-	55	-	N/A	FEE SIMPLE	0.28
-	56	-	N/A	FEE SIMPLE	0.28
-	57	-	N/A	FEE SIMPLE	0.28
-	58	-	N/A	FEE SIMPLE	0.34
-	59	-	N/A	FEE SIMPLE	0.28
-	60	-	N/A	FEE SIMPLE	0.57
-	61	-	N/A	FEE SIMPLE	0.34
-	62	-		FEE SIMPLE	2.45
-	63	-	N/A	FEE SIMPLE	0.78
-	64	-	N/A	FEE SIMPLE	0.58
-	65	-	N/A	FEE SIMPLE	0.05
-	66	-	N/A	FEE SIMPLE	0.34
-	67	-	N/A	FEE SIMPLE	0.57
-	68	-	N/A	FEE SIMPLE	0.43
-	69	-	N/A	FEE SIMPLE	0.69
-	70	-	N/A	FEE SIMPLE	0.22
-	71	-	N/A	FEE SIMPLE	0.69

PARCEL DATA

AREA ID	PARCEL ID	OBLIGATIONS	METHOD OF ACQUISITION	TYPE OF AQUISITION	ACREAGE
-	72	-	N/A	FEE SIMPLE	1.21
-	73	-	N/A	FEE SIMPLE	1,086.34
-	74	-	N/A	FEE SIMPLE	5.35
-	75	-	N/A	FEE SIMPLE	18.73
-	76	-	N/A	FEE SIMPLE	730.32
-	77	-	N/A	FEE SIMPLE	82.99
-	78	-	N/A	FEE SIMPLE	90.53
-	79	-	N/A	FEE SIMPLE	44.52
-	80	-	3-47-0049-20-1991	FEE SIMPLE	0.2
-	81	-	N/A	FEE SIMPLE	0.51
-	82	-	N/A	FEE SIMPLE	0.16
-	83	-	N/A	FEE SIMPLE	0.24
-	84	-	N/A	FEE SIMPLE	0.24
-	85	-	N/A	FEE SIMPLE	0.25
-	86	-	N/A	FEE SIMPLE	0.84
-	87	-	N/A	FEE SIMPLE	0.31
-	88	-	N/A	FEE SIMPLE	0.11
-	89	-	N/A	FEE SIMPLE	0.18
-	90	-	N/A	FEE SIMPLE	0.19
-	91	-	N/A	FEE SIMPLE	0.23
-	92	-	N/A	FEE SIMPLE	0.11
-	93	-	N/A	FEE SIMPLE	0.84
-	94	-	N/A	FEE SIMPLE	0.84
-	95	-	N/A	FEE SIMPLE	0.28
-	96	-	N/A	FEE SIMPLE	0.26
-	97	-	N/A	FEE SIMPLE	0.18
-	98	-	N/A	FEE SIMPLE	0.24
-	99	-	N/A	FEE SIMPLE	0.26
-	100	-	N/A	FEE SIMPLE	0.24
-	101	-	N/A	FEE SIMPLE	0.35
-	102	-	N/A	FEE SIMPLE	0.47
-	103	-	N/A	FEE SIMPLE	0.99
-	104	-	N/A	FEE SIMPLE	0.12
-	105	-	N/A	FEE SIMPLE	0.28
-	106	-	N/A	FEE SIMPLE	0.34
-	107	-	N/A	FEE SIMPLE	0.27
-	108	-	N/A	FEE SIMPLE	0.27
-	109	-	N/A	FEE SIMPLE	0.23
-	110	-	N/A	FEE SIMPLE	0.23
-	111	-	N/A	FEE SIMPLE	0.26
-	112	-	N/A	FEE SIMPLE	0.04
-	113	-	N/A	FEE SIMPLE	0.23
-	114	-	N/A	FEE SIMPLE	0.32
-	115	-	3-47-0049-12-1988	FEE SIMPLE	0.33
-	116	-	Purchased with Proceeds from Sale of Noise Land	FEE SIMPLE	0.36
-	117	-	3-47-0049-12-1988	FEE SIMPLE	0.44
-	118	-	3-47-0049-12-1988	FEE SIMPLE	0.26
-	119	-	N/A	FEE SIMPLE	0.2
-	120	-	3-47-0049-12-1988	FEE SIMPLE	0.23
-	121	-	Purchased with Proceeds from Sale of Noise Land	FEE SIMPLE	0.23
-	122	-	Purchased with Proceeds from Sale of Noise Land	FEE SIMPLE	0.23
-	123	-	3-47-0049-12-1988	FEE SIMPLE	0.22
-	124	-	N/A	FEE SIMPLE	0.67
-	125	-	3-47-0049-11-1988	FEE SIMPLE	0.36
-	126	-	N/A	FEE SIMPLE	0.29
-	127	-	N/A	FEE SIMPLE	0.5
-	128	-	N/A	FEE SIMPLE	0.5
-	129	-	N/A	FEE SIMPLE	0.63
-	130	-	N/A	FEE SIMPLE	1.33
-	131	-	3-47-0049-10-1988	FEE SIMPLE	0.28
-	132	-	3-47-0049-14-1990	FEE SIMPLE	0.24
-	133	-	3-47-0049-14-1990	FEE SIMPLE	0.25
-	134	-	3-47-0049-10-1988	FEE SIMPLE	0.27
-	135	-	3-47-0049-24-1993	FEE SIMPLE	0.24
-	136	-	3-47-0049-10-1988	FEE SIMPLE	0.33
-	137	-	3-47-0049-20-1991	FEE SIMPLE	0.26
-	138	-	3-47-0049-10-1988	FEE SIMPLE	0.24
-	139	-	3-47-0049-10-1988	FEE SIMPLE	0.26
-	140	-	3-47-0049-10-1988	FEE SIMPLE	0.27
-	141	-	3-47-0049-10-1988	FEE SIMPLE	0.24
-	142	-	3-47-0049-10-1988	FEE SIMPLE	0.23

PARCEL DATA

AREA ID	PARCEL ID	OBLIGATIONS	METHOD OF ACQUISITION	TYPE OF AQUISITION	ACREAGE
-	143	-	3-47-0049-24-1993	FEE SIMPLE	0.28
-	144	-	3-47-0049-10-1988	FEE SIMPLE	0.31
-	145	-	3-47-0049-10-1988	FEE SIMPLE	0.28
-	146	-	3-47-0049-10-1988	FEE SIMPLE	0.27
-	147	-	3-47-0049-10-1988	FEE SIMPLE	0.26
-	148	-	3-47-0049-20-1991	FEE SIMPLE	0.27
-	149	-	3-47-0049-10-1988	FEE SIMPLE	0.27
-	150	-	3-47-0049-10-1988	FEE SIMPLE	0.33
-	151	-	3-47-0049-11-1988	FEE SIMPLE	0.28
-	152	-	3-47-0049-10-1988	FEE SIMPLE	0.3
-	153	-	3-47-0049-10-1988	FEE SIMPLE	0.3
-	154	-	3-47-0049-10-1988	FEE SIMPLE	0.32
-	155	-	3-47-0049-10-1988	FEE SIMPLE	0.27
-	156	-	3-47-0049-10-1988	FEE SIMPLE	0.25
-	157	-	3-47-0049-11-1988	FEE SIMPLE	0.27
-	158	-	3-47-0049-11-1988	FEE SIMPLE	0.25
-	159	-	3-47-0049-16-1990	FEE SIMPLE	0.27
-	160	-	3-47-0049-10-1988	FEE SIMPLE	0.25
-	161	-	3-47-0049-14-1990	FEE SIMPLE	0.27
-	162	-	3-47-0049-10-1988	FEE SIMPLE	0.25
-	163	-	TBD	FEE SIMPLE	0.3
-	164	-	3-47-0049-30-1994	FEE SIMPLE	0.3
-	165	-	3-47-0049-30-1994	FEE SIMPLE	0.25
-	166	-	3-47-0049-30-1994	FEE SIMPLE	0.25
-	167	-	3-47-0049-30-1994	FEE SIMPLE	0.27
-	168	-	3-47-0049-27-1994	FEE SIMPLE	0.27
-	169	-	3-47-0049-20-1991	FEE SIMPLE	0.33
-	170	-	Purchased with Proceeds from Sale of Noise Land	FEE SIMPLE	0.32
-	171	-		FEE SIMPLE	0.65
-	172	-	3-47-0049-10-1988	FEE SIMPLE	0.23
-	173	-	3-47-0049-10-1988	FEE SIMPLE	0.25
-	174	-	3-47-0049-16-1990	FEE SIMPLE	0.27
-	175	-	3-47-0049-10-1988	FEE SIMPLE	0.3
-	176	-	3-47-0049-20-1991	FEE SIMPLE	0.25
-	177	-	3-47-0049-12-1988	FEE SIMPLE	0.25
-	178	-	3-47-0049-12-1988	FEE SIMPLE	0.25
-	179	-	3-47-0049-16-1990	FEE SIMPLE	0.25
-	180	-	3-47-0049-12-1988	FEE SIMPLE	0.25
-	181	-	3-47-0049-21-1992	FEE SIMPLE	0.25
-	182	-	3-47-0049-24-1993	FEE SIMPLE	0.25
-	183	-	3-47-0049-24-1993	FEE SIMPLE	0.25
-	184	-	3-47-0049-20-1991	FEE SIMPLE	0.25
-	185	-	3-47-0049-16-1990	FEE SIMPLE	0.25
-	186	-	3-47-0049-20-1991	FEE SIMPLE	0.25
-	187	-	3-47-0049-14-1990	FEE SIMPLE	0.28
-	188	-	3-47-0049-10-1988	FEE SIMPLE	0.25
-	189	-	3-47-0049-24-1993	FEE SIMPLE	0.25
-	190	-	3-47-0049-14-1990	FEE SIMPLE	0.26
-	191	-	3-47-0049-10-1988	FEE SIMPLE	0.3
-	192	-	3-47-0049-36-1996	FEE SIMPLE	0.24
-	193	-	3-47-0049-24-1993	FEE SIMPLE	0.25
-	194	-	3-47-0049-14-1990	FEE SIMPLE	0.25
-	195	-	3-47-0049-12-1988	FEE SIMPLE	0.24
-	196	-	3-47-0049-20-1991	FEE SIMPLE	0.27
-	197	-	3-47-0049-24-1993	FEE SIMPLE	0.25
-	198	-	3-47-0049-15-1990	FEE SIMPLE	0.26
-	199	-	3-47-0049-10-1988	FEE SIMPLE	0.25
-	200	-	3-47-0049-12-1988	FEE SIMPLE	0.25
-	201	-	3-47-0049-20-1991	FEE SIMPLE	0.25
-	202	-	3-47-0049-11-1988	FEE SIMPLE	0.25
-	203	-	3-47-0049-10-1988	FEE SIMPLE	0.25
-	204	-	3-47-0049-20-1991	FEE SIMPLE	0.25
-	205	-	3-47-0049-10-1988	FEE SIMPLE	0.25
-	206	-	3-47-0049-16-1990	FEE SIMPLE	0.25
-	207	-	3-47-0049-24-1993	FEE SIMPLE	0.23
-	208	-	3-47-0049-24-1993	FEE SIMPLE	0.25
-	209	-	3-47-0049-24-1993	FEE SIMPLE	0.25
-	210	-	3-47-0049-27-1994	FEE SIMPLE	0.25
-	211	-	3-47-0049-15-1990	FEE SIMPLE	0.25
-	212	-	3-47-0049-20-1991	FEE SIMPLE	0.26
-	213	-	3-47-0049-20-1991	FEE SIMPLE	0.26

PARCEL DATA

AREA ID	PARCEL ID	OBLIGATIONS	METHOD OF ACQUISITION	TYPE OF AQUISITION	ACREAGE
-	214	-	3-47-0049-12-1988	FEE SIMPLE	0.26
-	215	-	3-47-0049-14-1990	FEE SIMPLE	0.25
-	216	-	3-47-0049-16-1990	FEE SIMPLE	0.27
-	217	-	3-47-0049-12-1988	FEE SIMPLE	0.26
-	218	-	3-47-0049-14-1990	FEE SIMPLE	0.27
-	219	-	3-47-0049-12-1988	FEE SIMPLE	0.27
-	220	-	3-47-0049-12-1988	FEE SIMPLE	0.28
-	221	-	3-47-0049-20-1991	FEE SIMPLE	0.29
-	222	-	3-47-0049-36-1996	FEE SIMPLE	0.27
-	223	-	3-47-0049-12-1988	FEE SIMPLE	0.32
-	224	-	3-47-0049-20-1991	FEE SIMPLE	0.34
-	225	-	3-47-0049-24-1993	FEE SIMPLE	0.27
-	226	-	3-47-0049-12-1988	FEE SIMPLE	0.25
-	227	-	3-47-0049-20-1991	FEE SIMPLE	0.25
-	228	-	3-47-0049-20-1991	FEE SIMPLE	0.25
-	229	-	3-47-0049-30-1994	FEE SIMPLE	0.25
-	230	-	3-47-0049-17-1991	FEE SIMPLE	0.26
-	231	-	3-47-0049-24-1993	FEE SIMPLE	0.28
-	232	-	3-47-0049-10-1988	FEE SIMPLE	0.26
-	233	-	3-47-0049-20-1991	FEE SIMPLE	0.25
-	234	-	3-47-0049-12-1988	FEE SIMPLE	0.26
-	235	-	3-47-0049-10-1988	FEE SIMPLE	0.25
-	236	-	3-47-0049-24-1993	FEE SIMPLE	0.25
-	237	-	3-47-0049-10-1988	FEE SIMPLE	0.49
-	238	-	3-47-0049-10-1988	FEE SIMPLE	0.23
-	239	-	3-47-0049-33-1995	FEE SIMPLE	0.23
-	240	-	3-47-0049-14-1990	FEE SIMPLE	0.25
-	241	-	3-47-0049-10-1988	FEE SIMPLE	0.25
-	242	-	3-47-0049-10-1988	FEE SIMPLE	0.25
-	243	-	3-47-0049-10-1988	FEE SIMPLE	0.25
-	244	-	3-47-0049-10-1988	FEE SIMPLE	0.25
-	245	-	3-47-0049-15-1990	FEE SIMPLE	0.24
-	246	-	3-47-0049-12-1988	FEE SIMPLE	0.25
-	247	-	3-47-0049-10-1988	FEE SIMPLE	0.25
-	248	-	3-47-0049-10-1988	FEE SIMPLE	0.25
-	249	-	3-47-0049-15-1990	FEE SIMPLE	0.24
-	250	-	3-47-0049-20-1991	FEE SIMPLE	0.25
-	251	-	3-47-0049-14-1990	FEE SIMPLE	0.25
-	252	-	3-47-0049-10-1988	FEE SIMPLE	0.24
-	253	-	3-47-0049-20-1991	FEE SIMPLE	0.25
-	254	-	3-47-0049-17-1991	FEE SIMPLE	0.25
-	255	-	3-47-0049-24-1993	FEE SIMPLE	0.25
-	256	-	3-47-0049-20-1991	FEE SIMPLE	0.25
-	257	-	3-47-0049-14-1990	FEE SIMPLE	0.25
-	258	-	3-47-0049-10-1988	FEE SIMPLE	0.25
-	259	-	3-47-0049-10-1988	FEE SIMPLE	0.25
-	260	-	3-47-0049-17-1991	FEE SIMPLE	0.23
-	261	-	3-47-0049-24-1993	FEE SIMPLE	0.23
-	262	-	3-47-0049-10-1988	FEE SIMPLE	0.25
-	263	-	3-47-0049-15-1990	FEE SIMPLE	0.25
-	264	-	3-47-0049-16-1990	FEE SIMPLE	0.28
-	265	-	3-47-0049-14-1990	FEE SIMPLE	0.25
-	266	-	3-47-0049-24-1993	FEE SIMPLE	0.25
-	267	-	3-47-0049-14-1990	FEE SIMPLE	0.23
-	268	-	3-47-0049-14-1990	FEE SIMPLE	0.27
-	269	-	3-47-0049-20-1991	FEE SIMPLE	0.28
-	270	-	Purchased with Proceeds from Sale of Noise Land	FEE SIMPLE	0.28
-	271	-	Purchased with Proceeds from Sale of Noise Land	FEE SIMPLE	0.24
-	272	-	3-47-0049-24-1993	FEE SIMPLE	0.25
-	273	-	3-47-0049-27-1994	FEE SIMPLE	0.25
-	274	-	3-47-0049-14-1990	FEE SIMPLE	0.27
-	275	-	3-47-0049-24-1993	FEE SIMPLE	0.28
-	276	-	3-47-0049-20-1991	FEE SIMPLE	0.29
-	277	-	3-47-0049-16-1990	FEE SIMPLE	0.28
-	278	-	3-47-0049-21-1992	FEE SIMPLE	0.28
-	279	-	3-47-0049-24-1993	FEE SIMPLE	0.28
-	280	-	3-47-0049-16-1990	FEE SIMPLE	0.28
-	281	-	3-47-0049-20-1991	FEE SIMPLE	0.25
-	282	-	3-47-0049-20-1991	FEE SIMPLE	0.23
-	283	-	3-47-0049-20-1991	FEE SIMPLE	0.24
-	284	-	3-47-0049-24-1993	FEE SIMPLE	0.25

PARCEL DATA

AREA ID	PARCEL ID	OBLIGATIONS	METHOD OF ACQUISITION	TYPE OF AQUISITION	ACREAGE
-	285	-	3-47-0049-24-1993	FEE SIMPLE	0.23
-	286	-	3-47-0049-33-1995	FEE SIMPLE	0.22
-	287	-	3-47-0049-10-1988	FEE SIMPLE	0.25
-	288	-	3-47-0049-15-1990	FEE SIMPLE	0.27
-	289	-	3-47-0049-20-1991	FEE SIMPLE	0.26
-	290	-	3-47-0049-10-1988	FEE SIMPLE	0.25
-	291	-	3-47-0049-20-1991	FEE SIMPLE	0.25
-	292	-	3-47-0049-24-1993	FEE SIMPLE	0.25
-	293	-	3-47-0049-10-1988	FEE SIMPLE	0.28
-	294	-	3-47-0049-12-1988	FEE SIMPLE	0.29
-	295	-	3-47-0049-14-1990	FEE SIMPLE	0.27
-	296	-	3-47-0049-20-1991	FEE SIMPLE	0.26
-	297	-	3-47-0049-16-1990	FEE SIMPLE	0.25
-	298	-	3-47-0049-14-1990	FEE SIMPLE	0.26
-	299	-	3-47-0049-20-1991	FEE SIMPLE	0.26
-	300	-	3-47-0049-12-1988	FEE SIMPLE	0.23
-	301	-	3-47-0049-16-1990	FEE SIMPLE	0.25
-	302	-	3-47-0049-20-1991	FEE SIMPLE	0.26
-	303	-	3-47-0049-24-1993	FEE SIMPLE	0.26
-	304	-	3-47-0049-16-1990	FEE SIMPLE	0.24
-	305	-	3-47-0049-20-1991	FEE SIMPLE	0.29
-	306	-	3-47-0049-20-1991	FEE SIMPLE	0.27
-	307	-	3-47-0049-16-1990	FEE SIMPLE	0.28
-	308	-	3-47-0049-27-1994	FEE SIMPLE	0.28
-	309	-	3-47-0049-20-1991	FEE SIMPLE	0.25
-	310	-	3-47-0049-36-1996	FEE SIMPLE	0.25
-	311	-	3-47-0049-14-1990	FEE SIMPLE	0.25
-	312	-	3-47-0049-20-1991	FEE SIMPLE	0.25
-	313	-	3-47-0049-16-1990	FEE SIMPLE	0.25
-	314	-	3-47-0049-36-1996	FEE SIMPLE	0.25
-	315	-	3-47-0049-20-1991	FEE SIMPLE	0.25
-	316	-	3-47-0049-30-1994	FEE SIMPLE	0.25
-	317	-	3-47-0049-27-1994	FEE SIMPLE	0.25
-	318	-	3-47-0049-16-1990	FEE SIMPLE	0.25
-	319	-	3-47-0049-27-1994	FEE SIMPLE	0.28
-	320	-	3-47-0049-27-1994	FEE SIMPLE	0.26
-	321	-	3-47-0049-30-1994	FEE SIMPLE	0.25
-	322	-	3-47-0049-16-1990	FEE SIMPLE	0.26
-	323	-	3-47-0049-16-1990	FEE SIMPLE	0.25
-	324	-	3-47-0049-20-1991	FEE SIMPLE	0.26
-	325	-	3-47-0049-10-1988	FEE SIMPLE	0.28
-	326	-	3-47-0049-24-1993	FEE SIMPLE	0.26
-	327	-	3-47-0049-36-1996	FEE SIMPLE	0.21
-	328	-		FEE SIMPLE	0.24
-	329	-	3-47-0049-24-1993	FEE SIMPLE	0.28
-	330	-	3-47-0049-20-1991	FEE SIMPLE	0.29
-	331	-	3-47-0049-30-1994	FEE SIMPLE	0.26
-	332	-	3-47-0049-27-1994	FEE SIMPLE	0.25
-	333	-	3-47-0049-20-1991	FEE SIMPLE	0.25
-	334	-	3-47-0049-20-1991	FEE SIMPLE	0.3
-	335	-	3-47-0049-24-1993	FEE SIMPLE	0.28
-	336	-	3-47-0049-20-1991	FEE SIMPLE	0.27
-	337	-	3-47-0049-17-1991	FEE SIMPLE	0.28
-	338	-	3-47-0049-14-1990	FEE SIMPLE	0.38
-	339	-	3-47-0049-20-1991	FEE SIMPLE	0.27
-	340	-	3-47-0049-33-1995	FEE SIMPLE	0.27
-	341	-	3-47-0049-14-1990	FEE SIMPLE	0.25
-	342	-	3-47-0049-21-1992	FEE SIMPLE	0.25
-	343	-	3-47-0049-14-1990	FEE SIMPLE	0.25
-	344	-	3-47-0049-21-1992	FEE SIMPLE	0.25
-	345	-	3-47-0049-14-1990	FEE SIMPLE	0.42
-	346	-	3-47-0049-15-1990	FEE SIMPLE	0.3
-	347	-		FEE SIMPLE	2.6
-	348	-		FEE SIMPLE	2.25
-	349	-		FEE SIMPLE	1.11
-	350	-	3-47-0049-30-1994	FEE SIMPLE	0.3
-	351	-	3-47-0049-11-1988	FEE SIMPLE	0.23
-	352	-	3-47-0049-14-1990	FEE SIMPLE	0.23
-	353	-	3-47-0049-10-1988	FEE SIMPLE	0.24
-	354	-	3-47-0049-11-1988	FEE SIMPLE	0.21
-	355	-	3-47-0049-10-1988	FEE SIMPLE	0.25

PARCEL DATA

AREA ID	PARCEL ID	OBLIGATIONS	METHOD OF ACQUISITION	TYPE OF AQUISITION	ACREAGE
-	356	-	3-47-0049-24-1993	FEE SIMPLE	0.28
-	357	-	3-47-0049-11-1988	FEE SIMPLE	0.32
-	358	-	3-47-0049-11-1988	FEE SIMPLE	0.23
-	359	-	3-47-0049-10-1988	FEE SIMPLE	0.25
-	360	-	3-47-0049-14-1990	FEE SIMPLE	0.25
-	361	-	3-47-0049-24-1993	FEE SIMPLE	0.25
-	362	-	3-47-0049-10-1988	FEE SIMPLE	0.28
-	363	-	3-47-0049-10-1988	FEE SIMPLE	0.25
-	364	-	3-47-0049-10-1988	FEE SIMPLE	0.45
-	365	-	Purchased with Proceeds from Sale of Noise Land	FEE SIMPLE	0.27
-	366	-	3-47-0049-20-1991	FEE SIMPLE	0.29
-	367	-	3-47-0049-16-1990	FEE SIMPLE	0.31
-	368	-	3-47-0049-30-1994	FEE SIMPLE	0.27
-	369	-	3-47-0049-11-1988	FEE SIMPLE	0.26
-	370	-	3-47-0049-14-1990	FEE SIMPLE	0.28
-	371	-	3-47-0049-20-1991	FEE SIMPLE	0.34
-	372	-	3-47-0049-11-1988	FEE SIMPLE	0.3
-	373	-	3-47-0049-24-1993	FEE SIMPLE	0.25
-	374	-	3-47-0049-16-1990	FEE SIMPLE	0.27
-	375	-	3-47-0049-16-1990	FEE SIMPLE	0.42
-	376	-	3-47-0049-30-1994	FEE SIMPLE	0.27
-	377	-	3-47-0049-20-1991	FEE SIMPLE	0.35
-	378	-	3-47-0049-20-1991	FEE SIMPLE	0.25
-	379	-	Purchased with Proceeds from Sale of Noise Land	FEE SIMPLE	0.25
-	380	-	3-47-0049-14-1990	FEE SIMPLE	0.25
-	381	-	3-47-0049-14-1990	FEE SIMPLE	0.33
-	382	-	3-47-0049-36-1996	FEE SIMPLE	0.33
-	383	-	3-47-0049-36-1996	FEE SIMPLE	0.33
-	384	-	3-47-0049-16-1990	FEE SIMPLE	0.33
-	385	-	3-47-0049-15-1990	FEE SIMPLE	0.33
-	386	-	3-47-0049-16-1990	FEE SIMPLE	0.33
-	387	-	3-47-0049-16-1990	FEE SIMPLE	0.33
-	388	-	3-47-0049-30-1994	FEE SIMPLE	0.33
-	389	-	3-47-0049-30-1994	FEE SIMPLE	0.33
-	390	-	3-47-0049-14-1990	FEE SIMPLE	0.33
-	391	-	3-47-0049-21-1992	FEE SIMPLE	0.33
-	392	-	3-47-0049-20-1991	FEE SIMPLE	0.33
-	393	-	3-47-0049-14-1990	FEE SIMPLE	0.32
-	394	-	3-47-0049-14-1990	FEE SIMPLE	0.29
-	395	-	3-47-0049-14-1990	FEE SIMPLE	0.4
-	396	-	3-47-0049-30-1994	FEE SIMPLE	0.32
-	397	-	3-47-0049-10-1988	FEE SIMPLE	0.3
-	398	-	3-47-0049-16-1990	FEE SIMPLE	0.25
-	399	-	3-47-0049-14-1990	FEE SIMPLE	0.25
-	400	-	3-47-0049-30-1994	FEE SIMPLE	0.33
-	401	-	3-47-0049-20-1991	FEE SIMPLE	0.27
-	402	-	3-47-0049-30-1994	FEE SIMPLE	0.52
-	403	-	N/A	FEE SIMPLE	34.26
-	404	-	N/A	FEE SIMPLE	2
-	405	-		FEE SIMPLE	2,847.8
-	406	-	N/A	FEE SIMPLE	0.06
-	407	-	N/A	FEE SIMPLE	0.68
-	408	-	N/A	FEE SIMPLE	0.68
-	409	-	N/A	FEE SIMPLE	0.68
-	410	-	N/A	FEE SIMPLE	1
-	411	-	N/A	FEE SIMPLE	0.34
-	412	-	N/A	FEE SIMPLE	0.74
-	413	-		FEE SIMPLE	2,847.8
-	414	-			151.1
-	415	-	N/A	FEE SIMPLE	35.76
-	416	-	3-47-0049-14-1990	FEE SIMPLE	4
-	417	-	N/A	FEE SIMPLE	74.64
-	418	-			50.43
-	419	-	3-47-0049-10-1988	FEE SIMPLE	0.62
-	420	-	3-47-0049-16-1990	FEE SIMPLE	85.1
-	421	-	3-47-0049-15-1990	FEE SIMPLE	0.99
-	422	-	3-47-0049-33-1995	FEE SIMPLE	0.82
-	423	-	3-47-0049-36-1996	FEE SIMPLE	0.85
-	424	-			55.86
-	425	-	3-47-0049-14-1990	FEE SIMPLE	0.29
-	426	-	3-47-0049-11-1988	FEE SIMPLE	0.34

PARCEL DATA

AREA ID	PARCEL ID	OBLIGATIONS	METHOD OF ACQUISITION	TYPE OF AQUISITION	ACREAGE
-	427	-	3-47-0049-16-1990	FEE SIMPLE	0.24
-	428	-	3-47-0049-11-1988	FEE SIMPLE	0.25
-	429	-	3-47-0049-12-1988	FEE SIMPLE	0.31
-	430	-	3-47-0049-14-1990	FEE SIMPLE	0.26
-	431	-	3-47-0049-15-1990	FEE SIMPLE	0.23
-	432	-	3-47-0049-11-1988	FEE SIMPLE	0.27
-	433	-	3-47-0049-12-1988	FEE SIMPLE	0.32
-	434	-	3-47-0049-15-1990	FEE SIMPLE	0.24
-	435	-	3-47-0049-20-1991	FEE SIMPLE	0.28
-	436	-	3-47-0049-11-1988	FEE SIMPLE	0.3
-	437	-	3-47-0049-14-1990	FEE SIMPLE	0.48
-	438	-	3-47-0049-17-1991	FEE SIMPLE	0.35
-	439	-	3-47-0049-20-1991	FEE SIMPLE	0.4
-	440	-	3-47-0049-14-1990	FEE SIMPLE	0.26
-	441	-	3-47-0049-12-1988	FEE SIMPLE	0.26
-	442	-	3-47-0049-15-1990	FEE SIMPLE	0.21
-	443	-	3-47-0049-14-1990	FEE SIMPLE	0.31
-	444	-	3-47-0049-14-1990	FEE SIMPLE	0.35
-	445	-	3-47-0049-16-1990	FEE SIMPLE	0.33
-	446	-	3-47-0049-12-1988	FEE SIMPLE	0.26
-	447	-	3-47-0049-24-1993	FEE SIMPLE	0.26
-	448	-	3-47-0049-15-1990	FEE SIMPLE	0.22
-	449	-	3-47-0049-20-1991	FEE SIMPLE	0.26
-	450	-	3-47-0049-16-1990	FEE SIMPLE	0.33
-	451	-	3-47-0049-20-1991	FEE SIMPLE	0.21
-	452	-	3-47-0049-21-1992	FEE SIMPLE	0.41
-	453	-	3-47-0049-16-1990	FEE SIMPLE	0.24
-	454	-	3-47-0049-14-1990	FEE SIMPLE	0.32
-	455	-	3-47-0049-11-1988	FEE SIMPLE	11.45
-	456	-	3-47-0049-14-1990	FEE SIMPLE	11.45
-	457	-	3-47-0049-12-1988	FEE SIMPLE	0.23
-	458	-	3-47-0049-12-1988	FEE SIMPLE	0.26
-	459	-	3-47-0049-16-1990	FEE SIMPLE	0.23
-	460	-	3-47-0049-14-1990	FEE SIMPLE	0.34
-	461	-	3-47-0049-12-1988	FEE SIMPLE	0.27
-	462	-	3-47-0049-15-1990	FEE SIMPLE	0.24
-	463	-	3-47-0049-14-1990	FEE SIMPLE	0.23
-	464	-	3-47-0049-30-1994	FEE SIMPLE	0.29
-	465	-	3-47-0049-12-1988	FEE SIMPLE	14.76
-	466	-	3-47-0049-24-1993	FEE SIMPLE	0.29
-	467	-	3-47-0049-20-1991	FEE SIMPLE	17.14
-	468	-	3-47-0049-21-1992	FEE SIMPLE	11.87
-	469	-	3-47-0049-14-1990	FEE SIMPLE	0.25
-	470	-	3-47-0049-14-1990	FEE SIMPLE	11.11
-	471	-	3-47-0049-14-1990	FEE SIMPLE	0.25
-	472	-	3-47-0049-16-1990	FEE SIMPLE	0.31
-	473	-	3-47-0049-12-1988	FEE SIMPLE	0.24
-	474	-	3-47-0049-12-1988	FEE SIMPLE	0.27
-	475	-	3-47-0049-14-1990	FEE SIMPLE	0.3
-	476	-	3-47-0049-16-1990	FEE SIMPLE	0.41
-	477	-	3-47-0049-24-1993	FEE SIMPLE	0.36
-	478	-	3-47-0049-16-1990	FEE SIMPLE	0.3
-	479	-	3-47-0049-14-1990	FEE SIMPLE	0.43
-	480	-	3-47-0049-14-1990	FEE SIMPLE	0.31
-	481	-	3-47-0049-24-1993	FEE SIMPLE	0.29
-	482	-	3-47-0049-12-1988	FEE SIMPLE	2.34
-	483	-	3-47-0049-11-1988	FEE SIMPLE	2.76
-	484	-	3-47-0049-16-1990	FEE SIMPLE	5.16
-	485	-	3-47-0049-24-1993	FEE SIMPLE	0.32
-	486	-	3-47-0049-12-1988	FEE SIMPLE	0.26
-	487	-	3-47-0049-33-1995	FEE SIMPLE	4.35
-	488	-	3-47-0049-16-1990	FEE SIMPLE	4.62
-	489	-	N/A	FEE SIMPLE	29.78
-	490	-	3-47-0049-15-1990	FEE SIMPLE	162.65
-	491	-	N/A	FEE SIMPLE	0.46
-	492	-	N/A	FEE SIMPLE	0.46
-	493	-	N/A	FEE SIMPLE	0.46
-	494	-	3-47-0049-16-1990	FEE SIMPLE	1.81
-	495	-	3-47-0049-11-1988	FEE SIMPLE	1
-	496	-	3-47-0049-11-1988	FEE SIMPLE	2.1
-	497	-	3-47-0049-20-1991	FEE SIMPLE	0.1

PARCEL DATA

AREA ID	PARCEL ID	OBLIGATIONS	METHOD OF ACQUISITION	TYPE OF AQUISITION	ACREAGE
-	498	-	N/A	FEE SIMPLE	0.54
-	499	-	N/A	FEE SIMPLE	4.51
-	500	-	N/A	FEE SIMPLE	4.09
-	501	-	N/A	FEE SIMPLE	0.1
-	502	-	N/A	FEE SIMPLE	4.08
-	503	-	N/A	FEE SIMPLE	4.1
-	504	-	N/A	FEE SIMPLE	4.09
-	505	-	Purchased with Proceeds from Sale of Noise Land	FEE SIMPLE	0.56
-	506	-	3-47-0049-14-1990	FEE SIMPLE	1.49
-	507	-	N/A	FEE SIMPLE	0.46
-	508	-	N/A	FEE SIMPLE	28.38
-	509	-	N/A	FEE SIMPLE	0.46
-	510	-	3-47-0049-20-1991	FEE SIMPLE	4.88
-	511	-	N/A	FEE SIMPLE	0.46
-	512	-	3-47-0049-16-1990	FEE SIMPLE	0.34
-	513	-	3-47-0049-36-1996	FEE SIMPLE	0.11
-	514	-	N/A	FEE SIMPLE	0.54
-	515	-	3-47-0049-17-1991	FEE SIMPLE	0.19
-	516	-	3-47-0049-24-1993	FEE SIMPLE	0.24
-	517	-	3-47-0049-20-1991	FEE SIMPLE	0.26
-	518	-	N/A	FEE SIMPLE	0.46
-	519	-	3-47-0049-16-1990	FEE SIMPLE	0.26
-	520	-	3-47-0049-12-1988	FEE SIMPLE	0.31
-	521	-	3-47-0049-20-1991	FEE SIMPLE	0.28
-	522	-	3-47-0049-12-1988	FEE SIMPLE	0.27
-	523	-	3-47-0049-12-1988	FEE SIMPLE	0.45
-	524	-	3-47-0049-14-1990	FEE SIMPLE	0.22
-	525	-	3-47-0049-15-1990	FEE SIMPLE	0.2
-	526	-	3-47-0049-11-1988	FEE SIMPLE	0.19
-	527	-	3-47-0049-17-1991	FEE SIMPLE	0.26
-	528	-	3-47-0049-12-1988	FEE SIMPLE	0.37
-	529	-	3-47-0049-16-1990	FEE SIMPLE	0.23
-	530	-	3-47-0049-16-1990	FEE SIMPLE	0.39
-	531	-	3-47-0049-16-1990	FEE SIMPLE	1.34
-	532	-	3-47-0049-16-1990	FEE SIMPLE	0.19
-	533	-	3-47-0049-12-1988	FEE SIMPLE	0.21
-	534	-	3-47-0049-16-1990	FEE SIMPLE	0.17
-	535	-	3-47-0049-12-1988	FEE SIMPLE	0.14
-	536	-	3-47-0049-24-1993	FEE SIMPLE	0.15
-	537	-	3-47-0049-24-1993	FEE SIMPLE	0.17
-	538	-	3-47-0049-12-1988	FEE SIMPLE	0.18
-	539	-	3-47-0049-14-1990	FEE SIMPLE	0.15
-	540	-	3-47-0049-14-1990	FEE SIMPLE	0.17
-	541	-	3-47-0049-21-1992	FEE SIMPLE	0.17
-	542	-	3-47-0049-20-1991	FEE SIMPLE	0.2
-	543	-	3-47-0049-16-1990	FEE SIMPLE	0.28
-	544	-	3-47-0049-15-1990	FEE SIMPLE	0.19
-	545	-	3-47-0049-16-1990	FEE SIMPLE	0.21
-	546	-	3-47-0049-15-1990	FEE SIMPLE	0.27
-	547	-	3-47-0049-24-1993	FEE SIMPLE	0.3
-	548	-	3-47-0049-14-1990	FEE SIMPLE	0.38
-	549	-	3-47-0049-14-1990	FEE SIMPLE	1.03
-	550	-	3-47-0049-12-1988	FEE SIMPLE	0.62
-	551	-	3-47-0049-24-1993	FEE SIMPLE	0.35
-	552	-	3-47-0049-20-1991	FEE SIMPLE	0.86
-	553	-	3-47-0049-36-1996	FEE SIMPLE	5.22
-	554	-	3-47-0049-30-1994	FEE SIMPLE	0.28
-	555	-	3-47-0049-30-1994	FEE SIMPLE	0.26
-	556	-	3-47-0049-30-1994	FEE SIMPLE	0.4
-	557	-	3-47-0049-11-1988	FEE SIMPLE	2.84
-	558	-	3-47-0049-11-1988	FEE SIMPLE	4.88
-	559	-	3-47-0049-33-1995	FEE SIMPLE	3.38
-	560	-	N/A	FEE SIMPLE	0.78
-	561	-	3-47-0049-11-1988	FEE SIMPLE	28.16
-	562	-	3-47-0049-33-1995	FEE SIMPLE	40
-	563	-	N/A	FEE SIMPLE	0.46
-	564	-	N/A	FEE SIMPLE	170.64
-	565	-	N/A	FEE SIMPLE	321.59
-	566	-	3-47-0049-36-1996	FEE SIMPLE	100
-	567	-	3-47-0049-17-1991	FEE SIMPLE	146
-	568	-	N/A	FEE SIMPLE	26.02

PARCEL DATA

AREA ID	PARCEL ID	OBLIGATIONS	METHOD OF ACQUISITION	TYPE OF AQUISITION	ACREAGE
-	569	-	N/A	FEE SIMPLE	21.78
-	570	-	N/A	FEE SIMPLE	102.81
-	571	-	N/A	FEE SIMPLE	44
-	572	-	Purchased with Proceeds from Sale of Noise Land	FEE SIMPLE	51.38
-	573	-	N/A	FEE SIMPLE	2.23
-	574	-	N/A	FEE SIMPLE	20
-	575	-	N/A	FEE SIMPLE	18.64
-	576	-	N/A	FEE SIMPLE	10
-	577	-	N/A	FEE SIMPLE	15
-	578	-	N/A	FEE SIMPLE	15
-	579	-	N/A	FEE SIMPLE	48.35
-	580	-		FEE SIMPLE	2,847.8
-	581	-		FEE SIMPLE	6.71
-	582	-	N/A	FEE SIMPLE	13.8
-	583	-	N/A	FEE SIMPLE	2.34
-	584	-	N/A	FEE SIMPLE	36.73
-	585	-	N/A	FEE SIMPLE	2.85
-	586	-		FEE SIMPLE	6.71
-	587	-	3-47-0049-33-1995	FEE SIMPLE	35.96
-	588	-	3-47-0049-12-1988	FEE SIMPLE	16.01
-	589	-	3-47-0049-33-1995	FEE SIMPLE	68.39
-	590	-	3-47-0049-16-1990	FEE SIMPLE	376.36
-	591	-	3-47-0049-33-1995	FEE SIMPLE	36.83
-	592	-	3-47-0049-12-1988	FEE SIMPLE	71.51
-	593	-	3-47-0049-15-1990	FEE SIMPLE	0.3
-	594	-	3-47-0049-12-1988	FEE SIMPLE	0.23
-	595	-	3-47-0049-14-1990	FEE SIMPLE	0.45
-	596	-	3-47-0049-14-1990	FEE SIMPLE	0.45
-	597	-	3-47-0049-14-1990	FEE SIMPLE	0.14
-	598	-	3-47-0049-20-1991	FEE SIMPLE	0.21
-	599	-	3-47-0049-16-1990	FEE SIMPLE	0.29
-	600	-	3-47-0049-14-1990	FEE SIMPLE	0.16
-	601	-	3-47-0049-12-1988	FEE SIMPLE	0.23
-	602	-	3-47-0049-12-1988	FEE SIMPLE	0.53
-	603	-	3-47-0049-12-1988	FEE SIMPLE	0.44
-	604	-	3-47-0049-14-1990	FEE SIMPLE	0.27
-	605	-	3-47-0049-14-1990	FEE SIMPLE	0.55
-	606	-	3-47-0049-12-1988	FEE SIMPLE	0.52
-	607	-	3-47-0049-24-1993	FEE SIMPLE	0.17
-	608	-	3-47-0049-16-1990	FEE SIMPLE	0.13
-	609	-	3-47-0049-11-1988	FEE SIMPLE	0.17
-	610	-	3-47-0049-12-1988	FEE SIMPLE	0.19
-	611	-	3-47-0049-16-1990	FEE SIMPLE	0.12
-	612	-	3-47-0049-15-1990	FEE SIMPLE	0.3
-	613	-	3-47-0049-11-1988	FEE SIMPLE	0.29
-	614	-	3-47-0049-24-1993	FEE SIMPLE	0.16
-	615	-	3-47-0049-12-1988	FEE SIMPLE	0.35
-	616	-	3-47-0049-12-1988	FEE SIMPLE	0.16
-	617	-	3-47-0049-14-1990	FEE SIMPLE	0.18
-	618	-	3-47-0049-16-1990	FEE SIMPLE	0.16
-	619	-	3-47-0049-12-1988	FEE SIMPLE	0.39
-	620	-			8.13
-	621	-	3-47-0049-14-1990	FEE SIMPLE	0.18
-	622	-	3-47-0049-12-1988	FEE SIMPLE	0.14
-	623	-	3-47-0049-14-1990	FEE SIMPLE	0.36
-	624	-	3-47-0049-16-1990	FEE SIMPLE	0.25
-	625	-	3-47-0049-12-1988	FEE SIMPLE	0.17
-	626	-	3-47-0049-14-1990	FEE SIMPLE	0.49
-	627	-	3-47-0049-12-1988	FEE SIMPLE	0.11
-	628	-	3-47-0049-14-1990	FEE SIMPLE	0.19
-	629	-	3-47-0049-16-1990	FEE SIMPLE	0.13
-	630	-	3-47-0049-27-1994	FEE SIMPLE	0.14
-	631	-	3-47-0049-12-1988	FEE SIMPLE	0.14
-	632	-	3-47-0049-14-1990	FEE SIMPLE	0.23
-	633	-	3-47-0049-12-1988	FEE SIMPLE	0.17
-	634	-	3-47-0049-14-1990	FEE SIMPLE	0.13
-	635	-	3-47-0049-14-1990	FEE SIMPLE	0.14
-	636	-	3-47-0049-16-1990	FEE SIMPLE	0.2
-	637	-	3-47-0049-16-1990	FEE SIMPLE	0.19
-	638	-	3-47-0049-17-1991	FEE SIMPLE	0.56
-	639	-	3-47-0049-14-1990	FEE SIMPLE	0.22

PARCEL DATA

AREA ID	PARCEL ID	OBLIGATIONS	METHOD OF ACQUISITION	TYPE OF AQUISITION	ACREAGE
-	640	-	3-47-0049-12-1988	FEE SIMPLE	0.49
-	641	-	3-47-0049-15-1990	FEE SIMPLE	0.26
-	642	-	3-47-0049-15-1990	FEE SIMPLE	0.31
-	643	-	3-47-0049-14-1990	FEE SIMPLE	0.19
-	644	-	3-47-0049-12-1988	FEE SIMPLE	0.2
-	645	-	3-47-0049-14-1990	FEE SIMPLE	0.18
-	646	-	3-47-0049-16-1990	FEE SIMPLE	0.19
-	647	-	3-47-0049-16-1990	FEE SIMPLE	0.17
-	648	-	3-47-0049-16-1990	FEE SIMPLE	0.19
-	649	-	3-47-0049-14-1990	FEE SIMPLE	0.19
-	650	-	3-47-0049-16-1990	FEE SIMPLE	0.17
-	651	-	3-47-0049-21-1992	FEE SIMPLE	0.17
-	652	-	3-47-0049-14-1990	FEE SIMPLE	0.18
-	653	-	3-47-0049-16-1990	FEE SIMPLE	0.21
-	654	-	3-47-0049-16-1990	FEE SIMPLE	0.25
-	655	-	3-47-0049-15-1990	FEE SIMPLE	0.2
-	656	-	3-47-0049-15-1990	FEE SIMPLE	0.19
-	657	-	3-47-0049-15-1990	FEE SIMPLE	0.3
-	658	-	3-47-0049-15-1990	FEE SIMPLE	0.18
-	659	-	3-47-0049-16-1990	FEE SIMPLE	0.19
-	660	-	3-47-0049-14-1990	FEE SIMPLE	0.21
-	661	-	3-47-0049-12-1988	FEE SIMPLE	0.29
-	662	-	3-47-0049-14-1990	FEE SIMPLE	0.16
-	663	-	3-47-0049-14-1990	FEE SIMPLE	0.2
-	664	-	3-47-0049-27-1994	FEE SIMPLE	0.18
-	665	-	3-47-0049-12-1988	FEE SIMPLE	0.18
-	666	-	3-47-0049-16-1990	FEE SIMPLE	0.18
-	667	-	3-47-0049-12-1988	FEE SIMPLE	0.29
-	668	-	Purchased with Proceeds from Sale of Noise Land	FEE SIMPLE	0.27
-	669	-	3-47-0049-16-1990	FEE SIMPLE	0.22
-	670	-	3-47-0049-21-1992	FEE SIMPLE	0.18
-	671	-	3-47-0049-24-1993	FEE SIMPLE	0.17
-	672	-	3-47-0049-33-1995	FEE SIMPLE	176.04
-	673	-	Purchased with Proceeds from Sale of Noise Land	FEE SIMPLE	167.14
-	674	-	3-47-0049-14-1990	FEE SIMPLE	0.18
-	675	-	3-47-0049-14-1990	FEE SIMPLE	0.17
-	676	-	3-47-0049-14-1990	FEE SIMPLE	0.43
-	677	-	3-47-0049-14-1990	FEE SIMPLE	0.32
-	678	-	3-47-0049-20-1991	FEE SIMPLE	0.2
-	679	-	3-47-0049-16-1990	FEE SIMPLE	0.16
-	680	-	3-47-0049-24-1993	FEE SIMPLE	0.17
-	681	-	3-47-0049-21-1992	FEE SIMPLE	0.23
-	682	-	Purchased with Proceeds from Sale of Noise Land	FEE SIMPLE	0.2
-	683	-	3-47-0049-15-1990	FEE SIMPLE	0.18
-	684	-	3-47-0049-12-1988	FEE SIMPLE	0.16
-	685	-	3-47-0049-16-1990	FEE SIMPLE	0.26
-	686	-	3-47-0049-14-1990	FEE SIMPLE	0.2
-	687	-	3-47-0049-12-1988	FEE SIMPLE	0.22
-	688	-	3-47-0049-20-1991	FEE SIMPLE	0.19
-	689	-	3-47-0049-15-1990	FEE SIMPLE	0.24
-	690	-	3-47-0049-14-1990	FEE SIMPLE	0.2
-	691	-	3-47-0049-12-1988	FEE SIMPLE	0.24
-	692	-	3-47-0049-16-1990	FEE SIMPLE	0.24
-	693	-	3-47-0049-14-1990	FEE SIMPLE	0.25
-	694	-	3-47-0049-12-1988	FEE SIMPLE	0.12
-	695	-	3-47-0049-12-1988	FEE SIMPLE	0.14
-	696	-	3-47-0049-20-1991	FEE SIMPLE	0.2
-	697	-	3-47-0049-12-1988	FEE SIMPLE	0.18
-	698	-	3-47-0049-14-1990	FEE SIMPLE	0.22
-	699	-	3-47-0049-24-1993	FEE SIMPLE	0.15
-	700	-	3-47-0049-24-1993	FEE SIMPLE	0.27
-	701	-	3-47-0049-24-1993	FEE SIMPLE	0.12
-	702	-	3-47-0049-14-1990	FEE SIMPLE	0.11
-	703	-	3-47-0049-12-1988	FEE SIMPLE	0.19
-	704	-	3-47-0049-14-1990	FEE SIMPLE	0.17
-	705	-	3-47-0049-12-1988	FEE SIMPLE	0.21
-	706	-	3-47-0049-12-1988	FEE SIMPLE	0.2
-	707	-	3-47-0049-12-1988	FEE SIMPLE	0.19
-	708	-	3-47-0049-12-1988	FEE SIMPLE	0.2
-	709	-	3-47-0049-16-1990	FEE SIMPLE	0.17
-	710	-	3-47-0049-16-1990	FEE SIMPLE	0.17

PARCEL DATA

AREA ID	PARCEL ID	OBLIGATIONS	METHOD OF ACQUISITION	TYPE OF AQUISITION	ACREAGE
-	711	-	3-47-0049-15-1990	FEE SIMPLE	0.2
-	712	-	3-47-0049-14-1990	FEE SIMPLE	0.21
-	713	-	3-47-0049-14-1990	FEE SIMPLE	0.21
-	714	-	3-47-0049-24-1993	FEE SIMPLE	0.57
-	715	-	3-47-0049-12-1988	FEE SIMPLE	0.12
-	716	-	3-47-0049-12-1988	FEE SIMPLE	0.55
-	717	-	3-47-0049-16-1990	FEE SIMPLE	0.47
-	718	-	3-47-0049-16-1990	FEE SIMPLE	0.28
-	719	-	3-47-0049-16-1990	FEE SIMPLE	0.22
-	720	-	3-47-0049-12-1988	FEE SIMPLE	0.26
-	721	-	3-47-0049-16-1990	FEE SIMPLE	0.22
-	722	-	3-47-0049-12-1988	FEE SIMPLE	0.22
-	723	-	3-47-0049-21-1992	FEE SIMPLE	0.2
-	724	-	3-47-0049-12-1988	FEE SIMPLE	0.18
-	725	-	3-47-0049-20-1991	FEE SIMPLE	0.22
-	726	-	3-47-0049-12-1988	FEE SIMPLE	0.21
-	727	-	3-47-0049-21-1992	FEE SIMPLE	0.23
-	728	-	3-47-0049-15-1990	FEE SIMPLE	0.21
-	729	-	3-47-0049-12-1988	FEE SIMPLE	0.28
-	730	-	3-47-0049-14-1990	FEE SIMPLE	0.17
-	731	-	3-47-0049-16-1990	FEE SIMPLE	0.18
-	732	-	3-47-0049-14-1990	FEE SIMPLE	0.23
-	733	-	3-47-0049-24-1993	FEE SIMPLE	0.2
-	734	-	3-47-0049-16-1990	FEE SIMPLE	0.23
-	735	-	3-47-0049-17-1991	FEE SIMPLE	0.2
-	736	-	3-47-0049-20-1991	FEE SIMPLE	0.29
-	737	-	3-47-0049-12-1988	FEE SIMPLE	0.2
-	738	-	3-47-0049-20-1991	FEE SIMPLE	0.2
-	739	-	3-47-0049-14-1990	FEE SIMPLE	0.21
-	740	-	3-47-0049-14-1990	FEE SIMPLE	0.24
-	741	-	3-47-0049-12-1988	FEE SIMPLE	0.2
-	742	-	3-47-0049-27-1994	FEE SIMPLE	0.22
-	743	-	3-47-0049-20-1991	FEE SIMPLE	0.25
-	744	-	3-47-0049-12-1988	FEE SIMPLE	0.18
-	745	-	3-47-0049-14-1990	FEE SIMPLE	0.19
-	746	-	3-47-0049-12-1988	FEE SIMPLE	0.23
-	747	-	3-47-0049-20-1991	FEE SIMPLE	0.25
-	748	-	3-47-0049-15-1990	FEE SIMPLE	0.26
-	749	-	3-47-0049-21-1992	FEE SIMPLE	0.18
-	750	-	3-47-0049-12-1988	FEE SIMPLE	0.21
-	751	-	3-47-0049-24-1993	FEE SIMPLE	0.22
-	752	-	3-47-0049-14-1990	FEE SIMPLE	0.21
-	753	-	3-47-0049-12-1988	FEE SIMPLE	0.3
-	754	-	3-47-0049-14-1990	FEE SIMPLE	0.22
-	755	-	3-47-0049-14-1990	FEE SIMPLE	0.22
-	756	-	3-47-0049-20-1991	FEE SIMPLE	0.24
-	757	-	3-47-0049-20-1991	FEE SIMPLE	0.25
-	758	-	3-47-0049-15-1990	FEE SIMPLE	0.27
-	759	-	3-47-0049-14-1990	FEE SIMPLE	0.29
-	760	-	3-47-0049-16-1990	FEE SIMPLE	0.27
-	761	-	3-47-0049-15-1990	FEE SIMPLE	0.25
-	762	-	3-47-0049-15-1990	FEE SIMPLE	0.23
-	763	-	3-47-0049-21-1992	FEE SIMPLE	0.8
-	764	-	3-47-0049-14-1990	FEE SIMPLE	0.63
-	765	-	3-47-0049-16-1990	FEE SIMPLE	0.44
-	766	-	3-47-0049-16-1990	FEE SIMPLE	0.62
-	767	-	3-47-0049-14-1990	FEE SIMPLE	0.32
-	768	-	3-47-0049-14-1990	FEE SIMPLE	0.44
-	769	-	3-47-0049-14-1990	FEE SIMPLE	0.36
-	770	-	3-47-0049-24-1993	FEE SIMPLE	0.32
-	771	-	3-47-0049-14-1990	FEE SIMPLE	0.36
-	772	-	3-47-0049-20-1991	FEE SIMPLE	0.48
-	773	-	3-47-0049-17-1991	FEE SIMPLE	0.22
-	774	-	3-47-0049-12-1988	FEE SIMPLE	0.2
-	775	-	3-47-0049-12-1988	FEE SIMPLE	0.23
-	776	-	3-47-0049-24-1993	FEE SIMPLE	0.27
-	777	-	3-47-0049-14-1990	FEE SIMPLE	0.25
-	778	-	3-47-0049-16-1990	FEE SIMPLE	0.21
-	779	-	3-47-0049-12-1988	FEE SIMPLE	0.23
-	780	-	3-47-0049-20-1991	FEE SIMPLE	0.22
-	781	-	3-47-0049-14-1990	FEE SIMPLE	0.18

PARCEL DATA

AREA ID	PARCEL ID	OBLIGATIONS	METHOD OF ACQUISITION	TYPE OF AQUISITION	ACREAGE
-	782	-	3-47-0049-14-1990	FEE SIMPLE	0.24
-	783	-	3-47-0049-20-1991	FEE SIMPLE	0.17
-	784	-	3-47-0049-12-1988	FEE SIMPLE	0.15
-	785	-	3-47-0049-20-1991	FEE SIMPLE	0.17
-	786	-	3-47-0049-14-1990	FEE SIMPLE	0.18
-	787	-	3-47-0049-21-1992	FEE SIMPLE	0.16
-	788	-	3-47-0049-14-1990	FEE SIMPLE	0.19
-	789	-	3-47-0049-14-1990	FEE SIMPLE	0.17
-	790	-	3-47-0049-12-1988	FEE SIMPLE	0.44
-	791	-	3-47-0049-16-1990	FEE SIMPLE	0.46
-	792	-	3-47-0049-14-1990	FEE SIMPLE	0.23
-	793	-	3-47-0049-21-1992	FEE SIMPLE	0.13
-	794	-	3-47-0049-21-1992	FEE SIMPLE	0.13
-	795	-	3-47-0049-14-1990	FEE SIMPLE	0.22
-	796	-	3-47-0049-12-1988	FEE SIMPLE	0.21
-	797	-	3-47-0049-16-1990	FEE SIMPLE	0.16
-	798	-	3-47-0049-16-1990	FEE SIMPLE	0.18
-	799	-	3-47-0049-21-1992	FEE SIMPLE	0.25
-	800	-	3-47-0049-30-1994	FEE SIMPLE	0.06
-	801	-	3-47-0049-27-1994	FEE SIMPLE	0.07
-	802	-	3-47-0049-27-1994	FEE SIMPLE	0.08
-	803	-	3-47-0049-30-1994	FEE SIMPLE	0.11
-	804	-	3-47-0049-27-1994	FEE SIMPLE	0.08
-	805	-	3-47-0049-27-1994	FEE SIMPLE	0.07
-	806	-	3-47-0049-27-1994	FEE SIMPLE	0.07
-	807	-	3-47-0049-27-1994	FEE SIMPLE	0.06
-	808	-	3-47-0049-27-1994	FEE SIMPLE	0.06
-	809	-	3-47-0049-27-1994	FEE SIMPLE	0.07
-	810	-	3-47-0049-27-1994	FEE SIMPLE	0.06
-	811	-	3-47-0049-27-1994	FEE SIMPLE	0.06
-	812	-	3-47-0049-27-1994	FEE SIMPLE	0.06
-	813	-	3-47-0049-27-1994	FEE SIMPLE	0.06
-	814	-	3-47-0049-27-1994	FEE SIMPLE	0.05
-	815	-	3-47-0049-27-1994	FEE SIMPLE	0.04
-	816	-	3-47-0049-27-1994	FEE SIMPLE	0.05
-	817	-	3-47-0049-27-1994	FEE SIMPLE	0.05
-	818	-	3-47-0049-27-1994	FEE SIMPLE	0.06
-	819	-	3-47-0049-27-1994	FEE SIMPLE	0.06
-	820	-	3-47-0049-30-1994	FEE SIMPLE	0.07
-	821	-	3-47-0049-30-1994	FEE SIMPLE	0.05
-	822	-	3-47-0049-30-1994	FEE SIMPLE	0.06
-	823	-	3-47-0049-30-1994	FEE SIMPLE	0.06
-	824	-	3-47-0049-30-1994	FEE SIMPLE	0.07
-	825	-	3-47-0049-30-1994	FEE SIMPLE	0.07
-	826	-	3-47-0049-27-1994	FEE SIMPLE	0.07
-	827	-	3-47-0049-27-1994	FEE SIMPLE	0.07
-	828	-	3-47-0049-27-1994	FEE SIMPLE	0.07
-	829	-	3-47-0049-27-1994	FEE SIMPLE	0.07
-	830	-	3-47-0049-27-1994	FEE SIMPLE	0.07
-	831	-	3-47-0049-27-1994	FEE SIMPLE	0.06
-	832	-	3-47-0049-30-1994	FEE SIMPLE	0.07
-	833	-	3-47-0049-27-1994	FEE SIMPLE	0.06
-	834	-	3-47-0049-27-1994	FEE SIMPLE	0.05
-	835	-	3-47-0049-30-1994	FEE SIMPLE	0.05
-	836	-	3-47-0049-27-1994	FEE SIMPLE	0.07
-	837	-	3-47-0049-30-1994	FEE SIMPLE	0.06
-	838	-	3-47-0049-30-1994	FEE SIMPLE	0.08
-	839	-	3-47-0049-27-1994	FEE SIMPLE	0.07
-	840	-	3-47-0049-30-1994	FEE SIMPLE	0.06
-	841	-	3-47-0049-30-1994	FEE SIMPLE	0.05
-	842	-	3-47-0049-30-1994	FEE SIMPLE	0.05
-	843	-	3-47-0049-30-1994	FEE SIMPLE	0.05
-	844	-	3-47-0049-30-1994	FEE SIMPLE	0.06
-	845	-	3-47-0049-30-1994	FEE SIMPLE	0.06
-	846	-	3-47-0049-30-1994	FEE SIMPLE	0.07
-	847	-	3-47-0049-30-1994	FEE SIMPLE	0.07
-	848	-	3-47-0049-30-1994	FEE SIMPLE	0.07
-	849	-	3-47-0049-30-1994	FEE SIMPLE	0.07
-	850	-	3-47-0049-30-1994	FEE SIMPLE	0.07
-	851	-	3-47-0049-30-1994	FEE SIMPLE	0.06
-	852	-	3-47-0049-30-1994	FEE SIMPLE	0.06

PARCEL DATA

AREA ID	PARCEL ID	OBLIGATIONS	METHOD OF ACQUISITION	TYPE OF AQUISITION	ACREAGE
-	1137	-	3-47-0049-12-1988	FEE SIMPLE	0.19
-	1138	-	3-47-0049-15-1990	FEE SIMPLE	0.19
-	1139	-	3-47-0049-12-1988	FEE SIMPLE	0.19
-	1140	-	3-47-0049-15-1990	FEE SIMPLE	0.17
-	1141	-	3-47-0049-20-1991	FEE SIMPLE	0.25
-	1142	-	3-47-0049-12-1988	FEE SIMPLE	0.29
-	1143	-	3-47-0049-14-1990	FEE SIMPLE	0.19
-	1144	-	3-47-0049-16-1990	FEE SIMPLE	0.17
-	1145	-	3-47-0049-27-1994	FEE SIMPLE	0.17
-	1146	-	3-47-0049-20-1991	FEE SIMPLE	0.17
-	1147	-	3-47-0049-14-1990	FEE SIMPLE	0.17
-	1148	-	3-47-0049-12-1988	FEE SIMPLE	0.15
-	1149	-	3-47-0049-16-1990	FEE SIMPLE	0.2
-	1150	-	3-47-0049-16-1990	FEE SIMPLE	0.16
-	1151	-	3-47-0049-12-1988	FEE SIMPLE	0.17
-	1152	-	3-47-0049-16-1990	FEE SIMPLE	0.17
-	1153	-	3-47-0049-20-1991	FEE SIMPLE	0.16
-	1154	-	3-47-0049-20-1991	FEE SIMPLE	0.15
-	1155	-	3-47-0049-12-1988	FEE SIMPLE	0.22
-	1156	-	3-47-0049-17-1991	FEE SIMPLE	0.27
-	1157	-	3-47-0049-16-1990	FEE SIMPLE	0.2
-	1158	-	3-47-0049-14-1990	FEE SIMPLE	0.28
-	1159	-	3-47-0049-12-1988	FEE SIMPLE	0.18
-	1160	-	3-47-0049-16-1990	FEE SIMPLE	0.17
-	1161	-	3-47-0049-12-1988	FEE SIMPLE	0.18
-	1162	-	3-47-0049-16-1990	FEE SIMPLE	0.24
-	1163	-	3-47-0049-17-1991	FEE SIMPLE	0.22
-	1164	-	3-47-0049-30-1994	FEE SIMPLE	0.14
-	1165	-	3-47-0049-15-1990	FEE SIMPLE	0.14
-	1166	-	3-47-0049-16-1990	FEE SIMPLE	0.23
-	1167	-	3-47-0049-15-1990	FEE SIMPLE	0.14
-	1168	-	3-47-0049-14-1990	FEE SIMPLE	0.14
-	1169	-	3-47-0049-14-1990	FEE SIMPLE	0.14
-	1170	-	3-47-0049-15-1990	FEE SIMPLE	0.14
-	1171	-	3-47-0049-30-1994	FEE SIMPLE	0.14
-	1172	-	3-47-0049-20-1991	FEE SIMPLE	0.14
-	1173	-	3-47-0049-12-1988	FEE SIMPLE	0.14
-	1174	-	3-47-0049-12-1988	FEE SIMPLE	0.18
-	1175	-	3-47-0049-36-1996	FEE SIMPLE	0.18
-	1176	-	3-47-0049-24-1993	FEE SIMPLE	0.18
-	1177	-	3-47-0049-16-1990	FEE SIMPLE	0.18
-	1178	-	3-47-0049-16-1990	FEE SIMPLE	0.17
-	1179	-	3-47-0049-20-1991	FEE SIMPLE	0.18
-	1180	-	3-47-0049-12-1988	FEE SIMPLE	0.21
-	1181	-	3-47-0049-12-1988	FEE SIMPLE	0.21
-	1182	-	3-47-0049-12-1988	FEE SIMPLE	0.21
-	1183	-	3-47-0049-15-1990	FEE SIMPLE	0.21
-	1184	-	3-47-0049-20-1991	FEE SIMPLE	0.2
-	1185	-	3-47-0049-12-1988	FEE SIMPLE	0.19
-	1186	-	3-47-0049-14-1990	FEE SIMPLE	0.19
-	1187	-	3-47-0049-20-1991	FEE SIMPLE	0.23
-	1188	-	3-47-0049-12-1988	FEE SIMPLE	0.19
-	1189	-	3-47-0049-14-1990	FEE SIMPLE	0.21
-	1190	-	3-47-0049-12-1988	FEE SIMPLE	0.21
-	1191	-	3-47-0049-15-1990	FEE SIMPLE	0.2
-	1192	-	3-47-0049-16-1990	FEE SIMPLE	0.18
-	1193	-	3-47-0049-16-1990	FEE SIMPLE	0.19
-	1194	-	3-47-0049-20-1991	FEE SIMPLE	0.29
-	1195	-	3-47-0049-14-1990	FEE SIMPLE	0.23
-	1196	-	3-47-0049-12-1988	FEE SIMPLE	0.2
-	1197	-	3-47-0049-20-1991	FEE SIMPLE	0.2
-	1198	-	3-47-0049-20-1991	FEE SIMPLE	0.19
-	1199	-	3-47-0049-16-1990	FEE SIMPLE	0.24
-	1200	-	3-47-0049-20-1991	FEE SIMPLE	0.18
-	1201	-	3-47-0049-12-1988	FEE SIMPLE	0.3
-	1202	-	3-47-0049-12-1988	FEE SIMPLE	0.19
-	1203	-	3-47-0049-33-1995	FEE SIMPLE	0.2
-	1204	-	3-47-0049-20-1991	FEE SIMPLE	0.19
-	1205	-	3-47-0049-15-1990	FEE SIMPLE	0.2
-	1206	-	3-47-0049-14-1990	FEE SIMPLE	0.22
-	1207	-	3-47-0049-14-1990	FEE SIMPLE	0.17

PARCEL DATA

AREA ID	PARCEL ID	OBLIGATIONS	METHOD OF ACQUISITION	TYPE OF AQUISITION	ACREAGE
-	1208	-	3-47-0049-16-1990	FEE SIMPLE	0.17
-	1209	-	3-47-0049-12-1988	FEE SIMPLE	0.17
-	1210	-	3-47-0049-16-1990	FEE SIMPLE	0.19
-	1211	-	3-47-0049-12-1988	FEE SIMPLE	0.21
-	1212	-	3-47-0049-12-1988	FEE SIMPLE	0.18
-	1213	-	3-47-0049-20-1991	FEE SIMPLE	0.18
-	1214	-	3-47-0049-11-1988	FEE SIMPLE	0.17
-	1215	-	3-47-0049-16-1990	FEE SIMPLE	0.17
-	1216	-	N/A	FEE SIMPLE	11.48
-	1217	-	N/A	FEE SIMPLE	1.57
-	1218	-	N/A	FEE SIMPLE	0.1
-	1219	-	N/A	FEE SIMPLE	1
-	1220	-	N/A	FEE SIMPLE	0.66
-	1221	-	N/A	FEE SIMPLE	0.43
-	1222	-	N/A	FEE SIMPLE	12.38
-	1223	-	N/A	FEE SIMPLE	3.71
-	1224	-	N/A	FEE SIMPLE	0.78
-	1225	-	3-47-0049-12-1988	FEE SIMPLE	0.3
-	1226	-	3-47-0049-14-1990	FEE SIMPLE	0.32
-	1227	-	3-47-0049-21-1992	FEE SIMPLE	0.33
-	1228	-	3-47-0049-12-1988	FEE SIMPLE	0.32
-	1229	-	3-47-0049-11-1988	FEE SIMPLE	0.26
-	1230	-	3-47-0049-11-1988	FEE SIMPLE	0.26
-	1231	-	3-47-0049-36-1996	FEE SIMPLE	0.26
-	1232	-	3-47-0049-14-1990	FEE SIMPLE	0.25
-	1233	-	3-47-0049-16-1990	FEE SIMPLE	0.26
-	1234	-	3-47-0049-24-1993	FEE SIMPLE	0.25
-	1235	-	3-47-0049-21-1992	FEE SIMPLE	0.25
-	1236	-	3-47-0049-14-1990	FEE SIMPLE	0.25
-	1237	-	3-47-0049-11-1988	FEE SIMPLE	0.25
-	1238	-	3-47-0049-14-1990	FEE SIMPLE	0.25
-	1239	-	3-47-0049-14-1990	FEE SIMPLE	0.25
-	1240	-	3-47-0049-16-1990	FEE SIMPLE	0.25
-	1241	-	3-47-0049-20-1991	FEE SIMPLE	0.25
-	1242	-	3-47-0049-12-1988	FEE SIMPLE	0.25
-	1243	-	3-47-0049-12-1988	FEE SIMPLE	0.25
-	1244	-	3-47-0049-14-1990	FEE SIMPLE	0.25
-	1245	-	3-47-0049-11-1988	FEE SIMPLE	0.26
-	1246	-	3-47-0049-12-1988	FEE SIMPLE	0.3
-	1247	-	3-47-0049-14-1990	FEE SIMPLE	0.26
-	1248	-	3-47-0049-10-1988	FEE SIMPLE	0.26
-	1249	-	3-47-0049-10-1988	FEE SIMPLE	0.26
-	1250	-	3-47-0049-15-1990	FEE SIMPLE	0.33
-	1251	-	3-47-0049-21-1992	FEE SIMPLE	0.49
-	1252	-	3-47-0049-14-1990	FEE SIMPLE	0.25
-	1253	-	3-47-0049-14-1990	FEE SIMPLE	0.36
-	1254	-	3-47-0049-12-1988	FEE SIMPLE	0.32
-	1255	-	3-47-0049-10-1988	FEE SIMPLE	0.33
-	1256	-	3-47-0049-10-1988	FEE SIMPLE	0.33
-	1257	-	3-47-0049-12-1988	FEE SIMPLE	0.33
-	1258	-	3-47-0049-10-1988	FEE SIMPLE	0.32
-	1259	-	Purchased with Proceeds from Sale of Noise Land	FEE SIMPLE	0.37
-	1260	-	3-47-0049-12-1988	FEE SIMPLE	0.29
-	1261	-	3-47-0049-17-1991	FEE SIMPLE	0.3
-	1262	-	3-47-0049-12-1988	FEE SIMPLE	0.26
-	1263	-	3-47-0049-14-1990	EASEMENT	0.26
-	1264	-	3-47-0049-11-1988	FEE SIMPLE	0.26
-	1265	-			14.12
-	1266	-	3-47-0049-24-1993	FEE SIMPLE	0.25
-	1267	-	3-47-0049-14-1990	FEE SIMPLE	0.26
-	1268	-	3-47-0049-12-1988	FEE SIMPLE	0.26
-	1269	-	3-47-0049-20-1991	FEE SIMPLE	0.25
-	1270	-	3-47-0049-16-1990	FEE SIMPLE	0.25
-	1271	-	3-47-0049-17-1991	FEE SIMPLE	0.26
-	1272	-	3-47-0049-16-1990	FEE SIMPLE	0.25
-	1273	-	3-47-0049-11-1988	FEE SIMPLE	0.25
-	1274	-	3-47-0049-20-1991	FEE SIMPLE	0.25
-	1275	-	3-47-0049-24-1993	FEE SIMPLE	0.25
-	1276	-	3-47-0049-14-1990	FEE SIMPLE	0.25
-	1277	-	3-47-0049-12-1988	FEE SIMPLE	0.25
-	1278	-	3-47-0049-16-1990	FEE SIMPLE	0.25

PARCEL DATA

AREA ID	PARCEL ID	OBLIGATIONS	METHOD OF ACQUISITION	TYPE OF AQUISITION	ACREAGE
-	1279	-	3-47-0049-24-1993	FEE SIMPLE	0.25
-	1280	-	3-47-0049-16-1990	FEE SIMPLE	0.25
-	1281	-	3-47-0049-16-1990	FEE SIMPLE	0.25
-	1282	-	3-47-0049-12-1988	FEE SIMPLE	0.25
-	1283	-	3-47-0049-15-1990	FEE SIMPLE	0.25
-	1284	-	3-47-0049-12-1988	FEE SIMPLE	0.25
-	1285	-	3-47-0049-20-1991	FEE SIMPLE	0.26
-	1286	-	3-47-0049-15-1990	FEE SIMPLE	0.25
-	1287	-	3-47-0049-20-1991	FEE SIMPLE	0.26
-	1288	-	3-47-0049-12-1988	FEE SIMPLE	0.25
-	1289	-	3-47-0049-20-1991	FEE SIMPLE	0.25
-	1290	-	3-47-0049-15-1990	FEE SIMPLE	0.26
-	1291	-	3-47-0049-24-1993	FEE SIMPLE	0.25
-	1292	-	3-47-0049-12-1988	FEE SIMPLE	0.25
-	1293	-	3-47-0049-14-1990	FEE SIMPLE	0.27
-	1294	-	3-47-0049-14-1990	FEE SIMPLE	0.27
-	1295	-	3-47-0049-20-1991	FEE SIMPLE	0.27
-	1296	-	3-47-0049-16-1990	FEE SIMPLE	0.26
-	1297	-	3-47-0049-10-1988	FEE SIMPLE	0.26
-	1298	-	3-47-0049-24-1993	FEE SIMPLE	0.26
-	1299	-	3-47-0049-12-1988	FEE SIMPLE	0.26
-	1300	-	3-47-0049-12-1988	FEE SIMPLE	0.25
-	1301	-	3-47-0049-21-1992	FEE SIMPLE	0.25
-	1302	-	3-47-0049-12-1988	FEE SIMPLE	0.25
-	1303	-	3-47-0049-21-1992	FEE SIMPLE	0.25
-	1304	-	3-47-0049-12-1988	FEE SIMPLE	0.26
-	1305	-	3-47-0049-21-1992	FEE SIMPLE	0.26
-	1306	-	3-47-0049-20-1991	FEE SIMPLE	0.26
-	1307	-	3-47-0049-20-1991	FEE SIMPLE	0.25
-	1308	-	3-47-0049-20-1991	FEE SIMPLE	0.25
-	1309	-	3-47-0049-11-1988	FEE SIMPLE	0.27
-	1310	-	3-47-0049-20-1991	FEE SIMPLE	0.27
-	1311	-	Purchased with Proceeds from Sale of Noise Land	FEE SIMPLE	0.26
-	1312	-	3-47-0049-14-1990	FEE SIMPLE	0.25
-	1313	-	3-47-0049-14-1990	FEE SIMPLE	0.27
-	1314	-	3-47-0049-16-1990	FEE SIMPLE	0.24
-	1315	-	3-47-0049-16-1990	FEE SIMPLE	0.27
-	1316	-	3-47-0049-16-1990	FEE SIMPLE	0.27
-	1317	-	3-47-0049-24-1993	FEE SIMPLE	0.27
-	1318	-	3-47-0049-20-1991	FEE SIMPLE	0.27
-	1319	-	3-47-0049-20-1991	FEE SIMPLE	0.27
-	1320	-	3-47-0049-30-1994	FEE SIMPLE	0.27
-	1321	-	3-47-0049-12-1988	FEE SIMPLE	0.26
-	1322	-	3-47-0049-12-1988	FEE SIMPLE	0.64
-	1323	-	3-47-0049-20-1991	FEE SIMPLE	0.62
-	1324	-	3-47-0049-12-1988	FEE SIMPLE	0.27
-	1325	-	3-47-0049-12-1988	FEE SIMPLE	0.27
-	1326	-	3-47-0049-16-1990	FEE SIMPLE	0.26
-	1327	-	3-47-0049-11-1988	FEE SIMPLE	0.31
-	1328	-	3-47-0049-11-1988	FEE SIMPLE	0.25
-	1329	-	3-47-0049-12-1988	FEE SIMPLE	0.26
-	1330	-	3-47-0049-12-1988	FEE SIMPLE	0.28
-	1331	-	3-47-0049-24-1993	FEE SIMPLE	0.3
-	1332	-	3-47-0049-14-1990	FEE SIMPLE	0.25
-	1333	-	3-47-0049-15-1990	FEE SIMPLE	0.25
-	1334	-	3-47-0049-15-1990	FEE SIMPLE	0.25
-	1335	-	3-47-0049-14-1990	FEE SIMPLE	0.26
-	1336	-	3-47-0049-12-1988	FEE SIMPLE	0.25
-	1337	-	Purchased with Proceeds from Sale of Noise Land	FEE SIMPLE	0.27
-	1338	-	3-47-0049-24-1993	FEE SIMPLE	0.23
-	1339	-	3-47-0049-12-1988	FEE SIMPLE	0.23
-	1340	-	3-47-0049-10-1988	FEE SIMPLE	0.23
-	1341	-	3-47-0049-10-1988	FEE SIMPLE	0.29
-	1342	-	3-47-0049-16-1990	FEE SIMPLE	0.28
-	1343	-	3-47-0049-14-1990	FEE SIMPLE	0.23
-	1344	-	3-47-0049-16-1990	FEE SIMPLE	0.29
-	1345	-	3-47-0049-10-1988	FEE SIMPLE	0.22
-	1346	-	3-47-0049-12-1988	FEE SIMPLE	0.23
-	1347	-	3-47-0049-24-1993	FEE SIMPLE	0.26
-	1348	-	3-47-0049-10-1988	FEE SIMPLE	0.23
-	1349	-	Purchased with Proceeds from Sale of Noise Land	FEE SIMPLE	0.23

PARCEL DATA

AREA ID	PARCEL ID	OBLIGATIONS	METHOD OF ACQUISITION	TYPE OF AQUISITION	ACREAGE
-	1350	-	3-47-0049-12-1988	FEE SIMPLE	0.23
-	1351	-	3-47-0049-10-1988	FEE SIMPLE	0.29
-	1352	-	3-47-0049-14-1990	FEE SIMPLE	0.28
-	1353	-	3-47-0049-10-1988	FEE SIMPLE	0.28
-	1354	-	3-47-0049-16-1990	FEE SIMPLE	0.25
-	1355	-	3-47-0049-12-1988	FEE SIMPLE	0.25
-	1356	-	3-47-0049-14-1990	FEE SIMPLE	0.23
-	1357	-	3-47-0049-10-1988	FEE SIMPLE	0.23
-	1358	-	3-47-0049-10-1988	FEE SIMPLE	0.23
-	1359	-	Purchased with Proceeds from Sale of Noise Land	FEE SIMPLE	0.23
-	1360	-	3-47-0049-24-1993	FEE SIMPLE	0.23
-	1361	-	3-47-0049-14-1990	FEE SIMPLE	0.23
-	1362	-	3-47-0049-30-1994	FEE SIMPLE	0.3
-	1363	-	3-47-0049-12-1988	FEE SIMPLE	0.23
-	1364	-	3-47-0049-10-1988	FEE SIMPLE	0.23
-	1365	-	3-47-0049-10-1988	FEE SIMPLE	0.23
-	1366	-	3-47-0049-12-1988	FEE SIMPLE	0.28
-	1367	-	3-47-0049-12-1988	FEE SIMPLE	0.23
-	1368	-	3-47-0049-10-1988	FEE SIMPLE	0.23
-	1369	-	3-47-0049-16-1990	FEE SIMPLE	0.19
-	1370	-	3-47-0049-17-1991	FEE SIMPLE	0.2
-	1371	-	3-47-0049-14-1990	FEE SIMPLE	0.23
-	1372	-	3-47-0049-20-1991	FEE SIMPLE	0.23
-	1373	-	3-47-0049-12-1988	FEE SIMPLE	0.23
-	1374	-	3-47-0049-30-1994	FEE SIMPLE	0.21
-	1375	-	3-47-0049-10-1988	FEE SIMPLE	0.23
-	1376	-	3-47-0049-12-1988	FEE SIMPLE	0.28
-	1377	-	3-47-0049-10-1988	FEE SIMPLE	0.23
-	1378	-	3-47-0049-14-1990	FEE SIMPLE	0.23
-	1379	-	3-47-0049-15-1990	FEE SIMPLE	0.23
-	1380	-	3-47-0049-24-1993	FEE SIMPLE	0.23
-	1381	-	3-47-0049-12-1988	FEE SIMPLE	0.23
-	1382	-	3-47-0049-16-1990	FEE SIMPLE	0.23
-	1383	-	3-47-0049-30-1994	FEE SIMPLE	0.36
-	1384	-	3-47-0049-30-1994	FEE SIMPLE	0.21
-	1385	-	3-47-0049-30-1994	FEE SIMPLE	0.23
-	1386	-	3-47-0049-10-1988	FEE SIMPLE	0.23
-	1387	-	3-47-0049-10-1988	FEE SIMPLE	0.23
-	1388	-	3-47-0049-10-1988	FEE SIMPLE	0.23
-	1389	-	3-47-0049-16-1990	FEE SIMPLE	0.23
-	1390	-	3-47-0049-14-1990	FEE SIMPLE	0.22
-	1391	-	3-47-0049-20-1991	FEE SIMPLE	0.24
-	1392	-	3-47-0049-20-1991	FEE SIMPLE	0.23
-	1393	-	3-47-0049-30-1994	FEE SIMPLE	0.24
-	1394	-	3-47-0049-20-1991	FEE SIMPLE	0.34
-	1395	-	3-47-0049-14-1990	FEE SIMPLE	0.27
-	1396	-	3-47-0049-11-1988	FEE SIMPLE	10.88
-	1397	-			11.45
-	1398	-	3-47-0049-24-1993	FEE SIMPLE	0.21
-	1399	-	3-47-0049-24-1993	FEE SIMPLE	0.27
-	1400	-	3-47-0049-16-1990	FEE SIMPLE	0.21
-	1401	-	3-47-0049-24-1993	FEE SIMPLE	0.31
-	1402	-	3-47-0049-14-1990	FEE SIMPLE	0.27
-	1403	-	3-47-0049-17-1991	FEE SIMPLE	0.28
-	1404	-	3-47-0049-14-1990	FEE SIMPLE	0.26
-	1405	-	3-47-0049-20-1991	FEE SIMPLE	0.27
-	1406	-	3-47-0049-16-1990	FEE SIMPLE	0.28
-	1407	-	3-47-0049-12-1988	FEE SIMPLE	0.25
-	1408	-	3-47-0049-12-1988	FEE SIMPLE	0.26
-	1409	-	3-47-0049-24-1993	FEE SIMPLE	0.26
-	1410	-	3-47-0049-20-1991	FEE SIMPLE	93.4
-	1411	-	3-47-0049-20-1991	FEE SIMPLE	0.23
-	1412	-	3-47-0049-12-1988	FEE SIMPLE	0.25
-	1413	-	3-47-0049-14-1990	FEE SIMPLE	0.23
-	1414	-	3-47-0049-10-1988	FEE SIMPLE	0.31
-	1415	-	3-47-0049-16-1990	FEE SIMPLE	0.26
-	1416	-	3-47-0049-14-1990	FEE SIMPLE	0.26
-	1417	-	3-47-0049-12-1988	FEE SIMPLE	0.26
-	1418	-	3-47-0049-10-1988	FEE SIMPLE	0.26
-	1419	-	3-47-0049-16-1990	FEE SIMPLE	0.26
-	1420	-	3-47-0049-10-1988	FEE SIMPLE	0.26

PARCEL DATA

AREA ID	PARCEL ID	OBLIGATIONS	METHOD OF ACQUISITION	TYPE OF AQUISITION	ACREAGE
-	1421	-	3-47-0049-10-1988	FEE SIMPLE	0.26
-	1422	-	3-47-0049-12-1988	FEE SIMPLE	0.26
-	1423	-	3-47-0049-27-1994	FEE SIMPLE	0.26
-	1424	-	3-47-0049-11-1988	FEE SIMPLE	0.26
-	1425	-	N/A	FEE SIMPLE	0.12
-	1426	-	3-47-0049-20-1991	FEE SIMPLE	0.16
-	1427	-	N/A	FEE SIMPLE	0.1
-	1428	-	N/A	FEE SIMPLE	0.19
-	1429	-	N/A	FEE SIMPLE	0.1
-	1430	-	N/A	FEE SIMPLE	0.1
-	1431	-	N/A	FEE SIMPLE	0.1
-	1432	-	N/A	FEE SIMPLE	4.09
-	1433	-	N/A	FEE SIMPLE	4.09
-	1434	-	N/A	FEE SIMPLE	4.1
-	1435	-	N/A	FEE SIMPLE	0.1
-	1436	-	3-47-0049-20-1991	FEE SIMPLE	0.1
-	1437	-	3-47-0049-20-1991	FEE SIMPLE	0.11
-	1438	-	3-47-0049-20-1991	FEE SIMPLE	0.13
-	1439	-	3-47-0049-20-1991	FEE SIMPLE	0.1
-	1440	-	3-47-0049-20-1991	FEE SIMPLE	0.1
-	1441	-	3-47-0049-20-1991	FEE SIMPLE	0.1
-	1442	-	N/A	FEE SIMPLE	0.1
-	1443	-	N/A	FEE SIMPLE	0.1
-	1444	-	N/A	FEE SIMPLE	0.1
-	1445	-	3-47-0049-20-1991	FEE SIMPLE	0.1
-	1446	-	3-47-0049-20-1991	FEE SIMPLE	0.1
-	1447	-	3-47-0049-20-1991	FEE SIMPLE	0.1
-	1448	-	3-47-0049-20-1991	FEE SIMPLE	0.11
-	1449	-	3-47-0049-20-1991	FEE SIMPLE	0.11
-	1450	-	3-47-0049-20-1991	FEE SIMPLE	0.11
-	1451	-	3-47-0049-20-1991	FEE SIMPLE	0.1
-	1452	-	3-47-0049-20-1991	FEE SIMPLE	0.1
-	1453	-	3-47-0049-16-1990	FEE SIMPLE	0.1
-	1454	-	3-47-0049-16-1990	FEE SIMPLE	0.09
-	1455	-	3-47-0049-24-1993	FEE SIMPLE	0.09
-	1456	-	3-47-0049-24-1993	FEE SIMPLE	0.09
-	1457	-	3-47-0049-20-1991	FEE SIMPLE	0.1
-	1458	-	3-47-0049-20-1991	FEE SIMPLE	0.09
-	1459	-	3-47-0049-16-1990	FEE SIMPLE	0.1
-	1460	-	N/A	FEE SIMPLE	3.91
-	1461	-	N/A	FEE SIMPLE	4.09
-	1462	-	N/A	FEE SIMPLE	4.09
-	1463	-	3-47-0049-20-1991	FEE SIMPLE	0.1
-	1464	-	N/A	FEE SIMPLE	4.09
-	1465	-	N/A	FEE SIMPLE	4.09
-	1466	-	N/A	FEE SIMPLE	4.09
-	1467	-	N/A	FEE SIMPLE	4.09
-	1468	-	N/A	FEE SIMPLE	4.09
-	1469	-	N/A	FEE SIMPLE	4.09
-	1470	-	N/A	FEE SIMPLE	4.1
-	1471	-	N/A	FEE SIMPLE	4.09
-	1472	-	N/A	FEE SIMPLE	4.09
-	1473	-	N/A	FEE SIMPLE	4.09
-	1474	-	3-47-0049-16-1990	FEE SIMPLE	0.1
-	1475	-	3-47-0049-30-1994	FEE SIMPLE	0.14
-	1476	-	3-47-0049-30-1994	FEE SIMPLE	0.12
-	1477	-	3-47-0049-20-1991	FEE SIMPLE	0.11
-	1478	-	3-47-0049-20-1991	FEE SIMPLE	0.11
-	1479	-	3-47-0049-20-1991	FEE SIMPLE	0.1
-	1480	-	3-47-0049-20-1991	FEE SIMPLE	0.09
-	1481	-	3-47-0049-27-1994	FEE SIMPLE	0.12
-	1482	-	N/A	FEE SIMPLE	1.1
-	1483	-	N/A	FEE SIMPLE	0.1
-	1484	-	N/A	FEE SIMPLE	0.1
-	1485	-	N/A	FEE SIMPLE	0.1
-	1486	-	N/A	FEE SIMPLE	0.1
-	1487	-	3-47-0049-27-1994	FEE SIMPLE	0.1
-	1488	-	N/A	FEE SIMPLE	0.1
-	1489	-	N/A	FEE SIMPLE	0.1
-	1490	-	N/A	FEE SIMPLE	0.1
-	1491	-	N/A	FEE SIMPLE	4.09

PARCEL DATA

AREA ID	PARCEL ID	OBLIGATIONS	METHOD OF ACQUISITION	TYPE OF AQUISITION	ACREAGE
-	1492	-	N/A	FEE SIMPLE	4.09
-	1493	-	3-47-0049-27-1994	FEE SIMPLE	0.1
-	1494	-	3-47-0049-16-1990	FEE SIMPLE	0.12
-	1495	-	3-47-0049-20-1991	FEE SIMPLE	0.1
-	1496	-	3-47-0049-20-1991	FEE SIMPLE	0.12
-	1497	-	3-47-0049-20-1991	FEE SIMPLE	0.1
-	1498	-	3-47-0049-21-1992	FEE SIMPLE	0.1
-	1499	-	3-47-0049-36-1996	FEE SIMPLE	0.1
-	1500	-	3-47-0049-36-1996	FEE SIMPLE	0.1
-	1501	-	3-47-0049-16-1990	FEE SIMPLE	0.1
-	1502	-	3-47-0049-20-1991	FEE SIMPLE	0.1
-	1503	-	3-47-0049-16-1990	FEE SIMPLE	0.1
-	1504	-	3-47-0049-20-1991	FEE SIMPLE	0.1
-	1505	-	3-47-0049-16-1990	FEE SIMPLE	0.1
-	1506	-	3-47-0049-20-1991	FEE SIMPLE	0.1
-	1507	-	3-47-0049-27-1994	FEE SIMPLE	3.86
-	1508	-	3-47-0049-27-1994	FEE SIMPLE	3.85
-	1509	-	3-47-0049-27-1994	FEE SIMPLE	3.86
-	1510	-	3-47-0049-27-1994	FEE SIMPLE	3.82
-	1511	-	N/A	FEE SIMPLE	0.12
-	1512	-	N/A	FEE SIMPLE	0.12
-	1513	-	N/A	FEE SIMPLE	0.12
-	1514	-	N/A	FEE SIMPLE	0.12
-	1515	-	3-47-0049-30-1994	FEE SIMPLE	3.81
-	1516	-	3-47-0049-16-1990	FEE SIMPLE	0.1
-	1517	-	3-47-0049-16-1990	FEE SIMPLE	0.1
-	1518	-	3-47-0049-20-1991	FEE SIMPLE	0.1
-	1519	-	N/A	FEE SIMPLE	0.1
-	1520	-	3-47-0049-20-1991	FEE SIMPLE	0.1
-	1521	-	N/A	FEE SIMPLE	0.19
-	1522	-	N/A	FEE SIMPLE	0.1
-	1523	-	N/A	FEE SIMPLE	0.12
-	1524	-	3-47-0049-20-1991	FEE SIMPLE	0.13
-	1525	-	N/A	FEE SIMPLE	1
-	1526	-	3-47-0049-15-1990	FEE SIMPLE	0.25
-	1527	-	3-47-0049-15-1990	FEE SIMPLE	0.26
-	1528	-	3-47-0049-24-1993	FEE SIMPLE	0.26
-	1529	-	3-47-0049-15-1990	FEE SIMPLE	0.22
-	1530	-	3-47-0049-15-1990	FEE SIMPLE	0.22
-	1531	-	3-47-0049-15-1990	FEE SIMPLE	0.22
-	1532	-	3-47-0049-20-1991	FEE SIMPLE	0.37
-	1533	-	3-47-0049-15-1990	FEE SIMPLE	0.3
-	1534	-	3-47-0049-20-1991	FEE SIMPLE	0.31
-	1535	-	3-47-0049-20-1991	FEE SIMPLE	0.28
-	1536	-	3-47-0049-20-1991	FEE SIMPLE	0.21
-	1537	-	3-47-0049-16-1990	FEE SIMPLE	0.22
-	1538	-	3-47-0049-20-1991	FEE SIMPLE	0.24
-	1539	-	3-47-0049-30-1994	FEE SIMPLE	0.32
-	1540	-	3-47-0049-15-1990	FEE SIMPLE	0.2
-	1541	-	3-47-0049-12-1988	FEE SIMPLE	0.2
-	1542	-	3-47-0049-36-1996	FEE SIMPLE	0.2
-	1543	-	3-47-0049-12-1988	FEE SIMPLE	0.22
-	1544	-	3-47-0049-24-1993	FEE SIMPLE	0.19
-	1545	-	3-47-0049-16-1990	FEE SIMPLE	0.18
-	1546	-	3-47-0049-14-1990	FEE SIMPLE	0.2
-	1547	-	3-47-0049-12-1988	FEE SIMPLE	0.21
-	1548	-	3-47-0049-20-1991	FEE SIMPLE	0.29
-	1549	-	3-47-0049-14-1990	FEE SIMPLE	0.2
-	1550	-	TBD	FEE SIMPLE	0.62
-	1551	-	3-47-0049-20-1991	FEE SIMPLE	0.69
-	1552	-	3-47-0049-20-1991	FEE SIMPLE	0.22
-	1553	-	3-47-0049-20-1991	FEE SIMPLE	0.16
-	1554	-	3-47-0049-16-1990	FEE SIMPLE	0.24
-	1555	-	3-47-0049-20-1991	FEE SIMPLE	0.2
-	1556	-	3-47-0049-12-1988	FEE SIMPLE	0.19
-	1557	-	N/A	FEE SIMPLE	13.27
-	1558	-	N/A	FEE SIMPLE	12.88

ALP Prepared By

JACOBSEN | DANIELS
Planning. Implementation. Operations & Management

Drawn: DS II
Approved: KS
Date: 04-14-2023
Project No.: 09-130-19-00

No.	Date	Revisions

FAA'S APPROVAL OF THIS AIRPORT LAYOUT PLAN (ALP) REPRESENTS ACCEPTANCE OF THE GENERAL LOCATION OF FUTURE FACILITIES DEPICTED (SHEET I7144C04). DURING THE PRELIMINARY DESIGN PHASE, THE AIRPORT OWNER IS REQUIRED TO RESUBMIT FOR APPROVAL THE FINAL LOCATIONS, HEIGHTS, AND EXTERIOR FINISH OF STRUCTURES. FAA'S CONCERN IS OBSTRUCTIONS, IMPACT ON ELECTRONIC AIDS, OR ADVERSE EFFECTS ON CONTROLLER VIEW OF AIRCRAFT APPROACHES AND GROUND MOVEMENT AREAS WHICH COULD ADVERSELY AFFECT THE SAFETY, EFFICIENCY, OR UTILITY OF THE AIRPORT.

Notes
1. ALL BLAST PADS ARE 220' x 400' UNLESS OTHERWISE NOTED.
2. REFER TO DATA SHEET FOR ALL TAXIWAY/TAXILANE INFORMATION.
3. TSA AND TESM LINES ARE NOT SHOW FOR CLARITY AND DIMENSIONS CAN BE FOUND ON THE DATA SHEET
4. ALL COORDINATES ARE HORIZONTAL: NORTH AMERICAN DATUM OF 1983/2011 (NAD 83(2011)), IN THE TN STATE PLANE COORDINATE SYSTEM, IN US SURVEY FEET. VERTICAL: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88)
5. THE OBJECT FREE ZONE (OFZ) H VALUE IS 48' AND THEN EXTENDS TO THE PART HORIZONTAL SURFACE AT A SLOPE OF 6:1. THE OFZ IS CLEAR OF OBSTRUCTIONS..
6. APPROXIMATE FENCE HEIGHTS VARY FROM 6' to 11'.

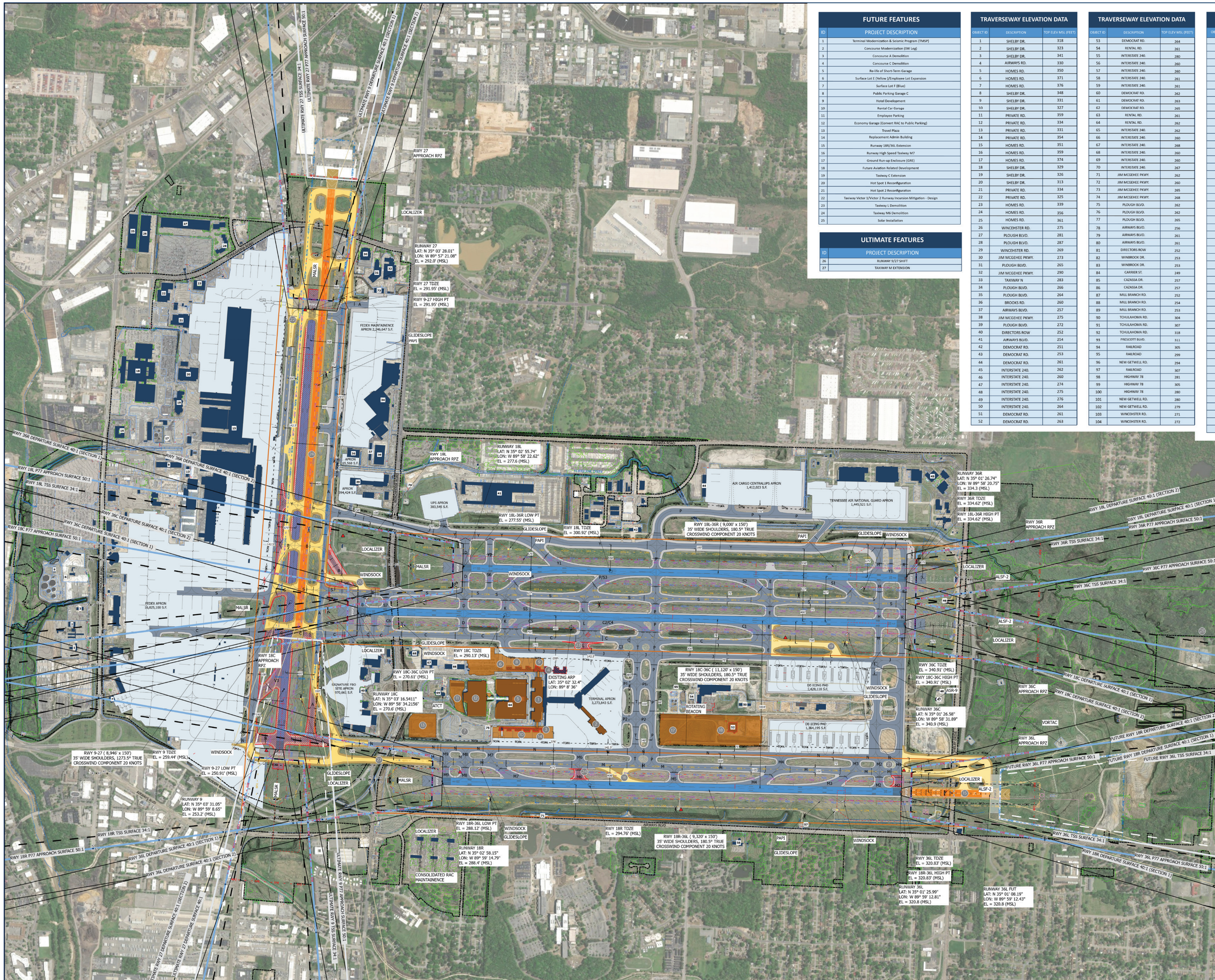
Sources
1. FEATURE GEOMETRY SHOWN ON THESE PLANS ARE FROM THE AGIS PROJECT NUMBER 220139 AND 2016 ALP UPDATE.
2. OBSTACLES, AND TRAVERSEWAY POINTS ON THESE PLANS ARE FROM SURVEY MAPPED BY QUANTUM SPATIAL DATED SEPTEMBER, 2016 AND TRAVERSEWAY POINTS FROM GOOGLE EARTH PRO.
3. FENCE HEIGHTS ARE FROM MSCAA PROJECT NUMBER 16-1400-02-01 DATED MARCH 2019

Memphis INTERNATIONAL AIRPORT

PROPERTY MAP - TABLES

Airport Layout Plan Drawing Set

Memphis International Airport



FUTURE FEATURES

ID	PROJECT DESCRIPTION
1	Terminal Modernization & Seismic Program (TMSP)
2	Concourse Modernization (SW Leg)
3	Concourse A Demolition
4	Concourse C Demolition
5	Re-life of Short-Term Garage
6	Surface Lot E (Yellow)/Employee Lot Expansion
7	Surface Lot F (Blue)
8	Public Parking Garage C
9	Hotel Development
10	Rental Car Garage
11	Employee Parking
12	Economy Garage (Convert RAC to Public Parking)
13	Travel Plaza
14	Replacement Admin Building
15	Runway 18R/36L Extension
16	Runway High Speed Taxiway M7
17	Ground Run-up Enclosure (GRE)
18	Future Aviation Related Development
19	Taxiway C Extension
20	Hot Spot 1 Reconfiguration
21	Hot Spot 2 Reconfiguration
22	Taxiway Victor 1/Victor 2 Runway Incursion Mitigation - Design
23	Taxiway L Demolition
24	Taxiway M6 Demolition
25	Solar Installation

ULTIMATE FEATURES

ID	PROJECT DESCRIPTION
26	RUNWAY 9/27 SHIFT
27	TAXIWAY M EXTENSION

TRAVERSEWAY ELEVATION DATA

OBJECT ID	DESCRIPTION	TOP ELEV MSL (FEET)
1	SHELBY DR.	318
2	SHELBY DR.	323
3	SHELBY DR.	341
4	AIRWAYS RD.	330
5	HOMES RD.	350
6	HOMES RD.	371
7	HOMES RD.	376
8	SHELBY DR.	348
9	SHELBY DR.	331
10	SHELBY DR.	327
11	PRIVATE RD.	359
12	PRIVATE RD.	334
13	PRIVATE RD.	331
14	PRIVATE RD.	354
15	HOMES RD.	351
16	HOMES RD.	359
17	HOMES RD.	374
18	SHELBY DR.	329
19	SHELBY DR.	326
20	SHELBY DR.	313
21	PRIVATE RD.	334
22	PRIVATE RD.	325
23	HOMES RD.	339
24	HOMES RD.	356
25	HOMES RD.	361
26	WINCEHSTER RD.	275
27	PLOUGH BLVD.	281
28	PLOUGH BLVD.	287
29	WINCEHSTER RD.	269
30	JIM MCGEHEE PKWY.	273
31	PLOUGH BLVD.	265
32	JIM MCGEHEE PKWY.	290
33	TAXIWAY N	283
34	PLOUGH BLVD.	266
35	PLOUGH BLVD.	264
36	BROOKS RD.	260
37	AIRWAYS BLVD.	257
38	JIM MCGEHEE PKWY.	275
39	PLOUGH BLVD.	272
40	DIRECTORS ROW	252
41	AIRWAYS BLVD.	254
42	DEMOCRAT RD.	251
43	DEMOCRAT RD.	253
44	DEMOCRAT RD.	261
45	INTERSTATE 240.	262
46	INTERSTATE 240.	260
47	INTERSTATE 240.	274
48	INTERSTATE 240.	275
49	INTERSTATE 240.	276
50	INTERSTATE 240.	264
51	DEMOCRAT RD.	261
52	DEMOCRAT RD.	263

TRAVERSEWAY ELEVATION DATA

OBJECT ID	DESCRIPTION	TOP ELEV MSL (FEET)
53	DEMOCRAT RD.	264
54	RENTAL RD.	261
55	INTERSTATE 240.	280
56	INTERSTATE 240.	260
57	INTERSTATE 240.	260
58	INTERSTATE 240.	261
59	INTERSTATE 240.	261
60	DEMOCRAT RD.	262
61	DEMOCRAT RD.	263
62	DEMOCRAT RD.	265
63	RENTAL RD.	261
64	RENTAL RD.	262
65	INTERSTATE 240.	262
66	INTERSTATE 240.	260
67	INTERSTATE 240.	268
68	INTERSTATE 240.	260
69	INTERSTATE 240.	260
70	INTERSTATE 240.	267
71	JIM MCGEHEE PKWY.	262
72	JIM MCGEHEE PKWY.	260
73	JIM MCGEHEE PKWY.	265
74	JIM MCGEHEE PKWY.	268
75	PLOUGH BLVD.	262
76	PLOUGH BLVD.	262
77	PLOUGH BLVD.	265
78	AIRWAYS BLVD.	256
79	AIRWAYS BLVD.	261
80	AIRWAYS BLVD.	261
81	DIRECTORS ROW	252
82	WINBROOK DR.	253
83	WINBROOK DR.	253
84	CARRIER ST.	249
85	CAZASSA DR.	257
86	CAZASSA DR.	257
87	MILL BRANCH RD.	252
88	MILL BRANCH RD.	254
89	MILL BRANCH RD.	253
90	TCHULAHOMA RD.	304
91	TCHULAHOMA RD.	307
92	TCHULAHOMA RD.	318
93	PRESCOTT BLVD.	311
94	RAILROAD	305
95	RAILROAD	299
96	NEW GETWELL RD.	294
97	RAILROAD	307
98	HIGHWAY 78	281
99	HIGHWAY 78	305
100	HIGHWAY 78	280
101	NEW GETWELL RD.	280
102	NEW GETWELL RD.	279
103	WINCEHSTER RD.	271
104	WINCEHSTER RD.	272

EXISTING BUILDINGS TABLE

OBJECT ID	BUILDING NAME / TENANT	TOP ELEV MSL (FEET)
1	FORMER RAC BUILDING	273.09
2	FORMER RAC BUILDING	267.50
3	FORMER RAC BUILDING	263.24
5	FORMER RAC BUILDING	268.48
6	FORMER RAC BUILDING	267.70
7	FEDEX CORPORATE HANGARS	261.95
9	FEDEX MAINTENANCE FACILTY	291.67
13	FEDEX GENERATOR BUILDING	280.04
15	FEDEX SUPER HUB	345.19
16	FEDEX OFFICE BUILDING	288.77
17	FUEL FARM	270.45
18	FEDEX OFFICE COMPLEX	276.16
19	FEDEX ARTC FLIGHT SIMULATOR	296.34
20	FEDEX SPECIALTY SORT	304.51
21	FEDEX DC10 HANGER	355.36
22	FEDEX AIRCRAFT PARTS WAREHOUSE	299.63
23	FEDEX TAB	324.66
25	FEDEX PUBLISHING FACILITY	295.37
26	FEDEX LOGISTICS AND NETWORK SERVICES	299.24
27	COMMERCIAL BUILDING	306.80
28	BELZ OFFICE COMPLEX	292.52
30	TENNESSEE COLLEGE OF APPLIED TECHNOLOGY	347.38
31	GSE ADMIN	338.39
32	GSE SHOP	339.63
34	FEDEX MAINENANCE HANGER	370.98
36	PINNACLE AIRLINES AIRCRAFT MAINTENANACE FACILITY	303.00
37	FEDEX DEICING EQUIPMENT STORAGE	284.72
38	FEDEX AC POWER PLANT	305.40
39	WILSON AIR CENTER	303.32
40	SIGNATURE TERMINAL	303.42
41	UNITED PARCEL SERVICE OAKHAVEN HUB	308.80
42	AIRCRAFT RESCUE AND FIREFIGHTING STATION #9	332.74
43	AIRFIELD ELECTRICAL VAULT #4	307.35
44	CARGO CENTRAL WAREHOUSE	324.22
45	TENNENSEE AIR NATIONAL GAURD	346.66
46	NAVAID ELECTRICAL VAULT	333.54
47	AIRPORT SURVEILLLANCE RADAR	367.50
48	NATIONAL WEATHER SERVICE EQUIPMENT SHED	372.42
50	DELTA GLOBAL SERVICES	331.51
52	UNITE STATES POSTAL SERVICE BUILDING	321.55
54	AIRPORT CHILLER UNIT	323.76
55	AIRFIELD ELECTRICAL VAULT #3	316.64
57	AIRFIELD ELECTRICAL VAULT #1	314.68
58	AIRPORT PROJECT CENTER AND NOISE OFFICE	319.75
64	PASSENGER TERMINAL PARKING GARAGE	307.81
66	GROUND SUPPORT STORAGE	308.32
67	TERMINAL SUPPORT BUILDING	307.41
68	FIRE STATION #33	325.26
69	FAA AIRPORT TRAFFIC CONTROL TOWER AND TRACON	608.10
71	MEMPHIS LIGHT GAS, AND WATER SWTICH GEAR	285.08
73	GES	327.92
74	GATE HOUSE	273.41
75	TAXI STAGING FACILITY	302.20

PACS/SACS DATA

TYPE	LABEL	LAT	LONG	EASTING	NORTHING	ELEVATION (MSL)
PACS	MEM F	N 35° 3' 33.67"	W 89° 59' 8.93"	775889.15	288570.71	248.6
SACS	MEM AP 1963 STA A2	N 35° 3' 29.49"	W 89° 57' 21.10"	784829.28	287784.86	288.6
SACS	MEM C	N 35° 1' 25.67"	W 89° 59' 7.41"	775488.66	275634.37	318.6
SACS	MEM D	N 35° 1' 50.53"	W 89° 58' 36.30"	778175.77	278040.16	330.3
SACS	MEM N	N 35° 2' 54.63"	W 89° 59' 12.24"	775453.02	284637.60	284.3
SACS	MEM P	N 35° 3 20.09"	W 89° 58' 15.84"	780243.74	287018.96	264.9
SACS	MEM Q	N 35° 2' 10.06"	W 89° 59' 19.23"	774689.07	775889.15	295.5

LEGEND

FUTURE	ITEM	DESCRIPTION
		GROUND CONTOUR
		AIRPORT PROPERTY LINE
		STRUCTURES ON AIRPORT PROPERTY
		RUNWAY PAVEMENT & MARKINGS
		TAXIWAY PAVEMENT
		AIRFIELD APRON PAVEMENT
		SHOULDER PAVEMENT
		STORAGE TANKS
		DEMO PAVEMENT
		AIRPORT REFERENCE POINT
		FENCE
		CREEK / RIVER / PONDS
		FOREST / TREE CLUSTER
		ROTATING BEACON
		BUILDING RESTRICTION LINE (BRL)
	TOFA	TAXIWAY OBJECT FREE AREA (TOFA)
OFA	OFA	OBJECT FREE AREA (OFA)
RSA	RSA	RUNWAY SAFETY AREA (RSA)
OFZ	OFZ	OBJECT FREE ZONE (OFZ)
RPZ	RPZ	RUNWAY PROTECTION ZONE (RPZ)
POFZ	POFZ	PRECISION OBSTACLE FREE ZONE (POFZ)
	123	FACILITY IDENTIFIER
		AUTOMATED WEATHER OBSERVING SYSTEM (AWOS)
		AWOS CRITICAL AREA
		GS CRITICAL AREA
		LOC CRITICAL AREA
		PRECISION APPROACH PATH INDICATOR (PAPI)
		WINDSOCK
		SURVEY MONUMENT
		GLIDESLOPE
		TRAVERSE WAY POINT & AMSL ELEVATION IN FEET
		TOUCHDOWN ZONE (TDZE)

Plotted On: 5/9/2023 12:00 PM

ALP Prepared By

JACOBSEN | DANIELS
Planning, Implementation, Operations & Management

Drawn: DS II
Approved: KS
Date: 4-14-2023
Project No.: 09-130-18-0

No.	Date	Revisions

FAA'S APPROVAL OF THIS AIRPORT LAYOUT PLAN (ALP) REPRESENTS ACCEPTANCE OF THE GENERAL LOCATION OF FUTURE FACILITIES DEPICTED (SHEET I7144C04). DURING THE PRELIMINARY DESIGN PHASE, THE AIRPORT OWNER IS REQUIRED TO RESUBMIT FOR APPROVAL THE FINAL LOCATIONS, HEIGHTS, AND EXTERIOR FINISH OF STRUCTURES. FAA'S CONCERN IS OBSTRUCTIONS, IMPACT ON ELECTRONIC AIDS, OR ADVERSE EFFECTS ON CONTROLLER VIEW OF AIRCRAFT APPROACHES AND GROUND MOVEMENT AREAS WHICH COULD ADVERSELY AFFECT THE SAFETY, EFFICIENCY, OR UTILITY OF THE AIRPORT.

Notes
1. ALL BLAST PADS ARE 220' x 400' UNLESS OTHERWISE NOTED.
2. REFER TO DATA SHEET FOR ALL TAXIWAY/TAXILANE INFORMATION.
3. TSA AND TESM LINES ARE NOT SHOW FOR CLARITY AND DIMENSIONS CAN BE FOUND ON THE DATA SHEET
4. ALL COORDINATES ARE HORIZONTAL: NORTH AMERICAN DATUM OF 1983/2011 (NAD 83(2011)), IN THE TN STATE PLANE COORDINATE SYSTEM, IN US SURVEY FEET. VERTICAL: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88)
5. THE OBJECT FREE ZONE (OFZ) H VALUE IS 48' AND THEN EXTENDS TO THE PART HORIZONTAL SURFACE AT A SLOPE OF 6:1. THE OFZ IS CLEAR OF OBSTRUCTIONS..
6. APPROXIMATE FENCE HEIGHTS VARY FROM 6' to 11'.

Sources
1. FEATURE GEOMETRY SHOWN ON THESE PLANS ARE FROM THE AGIS PROJECT NUMBER 220139 AND 2016 ALP UPDATE.
2. OBSTACLES, AND TRAVERSEWAY POINTS ON THESE PLANS ARE FROM SURVEY MAPPED BY QUANTUM SPATIAL DATED SEPTEMBER, 2016 AND TRAVERSEWAY POINTS FROM GOOGLE EARTH PRO.
3. FENCE HEIGHTS ARE FROM MSCAA PROJECT NUMBER 16-1400-02-01 DATED MARCH 2019

0 500 1,000 2,000
SCALE: 1" = 600'

MAGNETIC DECLINATION
0 30' WEST (2009)
DECLINATION CHANGING BY 0 6' WEST/YEAR

Memphis
INTERNATIONAL AIRPORT

ULTIMATE AIRPORT LAYOUT PLAN DRAWING

Airport Layout Plan Drawing Set

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STAKEHOLDER COORDINATION PROGRAM

Throughout the Master Plan process, the Stakeholder Coordination Program encouraged information-sharing and collaboration among the airport sponsor, users and tenants, resource agencies, elected and appointed public officials, residents, travelers, and the general public. Collectively, these various groups form the stakeholders who have an interest in the outcome of the Master Plan. A variety of forums were used to engage stakeholders, including a Citizen Advisory Committee (CAC), a Technical Advisory Committee (TAC), Airport staff working groups, and a public awareness campaign that included a project website, numerous individual meetings with stakeholders and a public open house. Although the Global Pandemic stalled out reach efforts and the master plan process as a whole, a significant amount of stakeholder coordination was realized, adding to the quality and thoughtfulness of the master plan effort.

MSCAA Staff Coordination

The Master Plan was coordinated extensively through the MSCAA Board and staff. The Board members were briefed collectively and individually throughout the process. MSCAA Executive Staff oversaw the planning effort and received numerous updates and provided valuable feedback during Senior Staff Meetings as well as through individual meetings throughout the effort. Finally, MSCAA staff participated in the planning process through a Staff Working Groups which met several times during the planning process.

Board Briefings

The MSCAA Board was briefed numerous times on the Master Plan. This included individual briefings with the Planning & Development Subcommittee as well as collective briefings of the entire Board as part of the regular Board meetings. These briefings allowed the Board members to discuss relevant issues and provide guidance and direction to staff regarding Master Plan issues. The Board was particularly helpful providing guidance related to various regional planning and marketing considerations and the overall vision for MEM. Members of the WCAA Board also participated in the Citizens Advisory Committee.

Staff Coordination

MSCAA Executive Staff directed the Master Plan and provided valuable input into the overall planning process and the key policy decisions. In addition, various Staff Working Group (SWG) meetings were conducted to assist in developing the Master Plan. The purpose of staff working meetings is to provide opportunities for detailed discussions about departmental or organizational issues and concerns as well as provide information regarding their respective areas of responsibility. These meetings allowed representatives responsible for the day to day management and operation of MEM to help shape how future facilities should be implemented and to maximize flexibility and efficiency if and when capital projects were developed.

Stakeholder Committees

Two stakeholder committees were used to solicit input on the Master Plan; the Citizen Advisory Committee (CAC) and the Technical Advisory Committee (TAC). These committee structures and responsibilities are referenced in FAA Advisory Circular 150/5070-6B Airport Master Plans dated May 1, 2007.

Citizen's Advisory Committee

The Citizens Advisory Committee (CAC) was intended for key stakeholders that include business leaders, community leaders, and/or other civic representatives. The purpose of the CAC meetings were to focus on the strategic issues of the Master Plan of key importance to the communities that surround and rely upon the Airports. Throughout the planning process, the CAC enabled MSCAA to include critical perspectives to the planning process and allow the CAC members to be an external voice for the Airport on matters related to the Airport today and in the future. Three CAC meetings were held as part of the master planning process.

Invited members of the CAC included the following, with participation varying from meeting to meeting.

- Mr. Douglas Scarboro (Federal Reserve)
- Mr. Phil Trenary (Chamber of Commerce)
- Mr. Jack Soden (Graceland/Elvis Presley Enterprises)
- Mr. Benjamin Orgel (Tower Ventures)
- Rep. Raumesh Akbari
- Councilwoman Patrice Robinson
- Senator Mark Norris
- Mr. Kevin Kane (CVB)
- Mr. Mauricio Calvo (Latino Memphis)
- Mrs. Teri Freeman (National Civil Rights Museum)
- Mr. Jason Little (Baptist Hospital)
- Mr. Mitch Graves (Methodist Hospital)
- Ms. Meri Amour (Lebonheur Hospital)
- Mrs. Leigh Shockey (Drexel Chemical)
- Mrs. Emily Greer (St. Jude)
- Mrs. Teresa Sloyan (Hyde Foundation)
- Mr. Rick Masson (Plough Foundation)
- Ms. Audrey Gregory (St. Francis Hospital)
- Ms. Lani Glancy (Autozone)
- Mr. Mark Sutton (International Paper)
- Mr. Steve Bares (Memphis Bio-works)
- Mr. Jim Slaba (Medtronic)
- Ms. Laura Whitsitt (Smith Nephew)
- Mr. David Williams (Leadership Memphis)
- Mr. Roby Williams (Black Business Association)

<u>CAC Meeting #1 Summary</u>

The first CAC Meeting was held on February 25, 2019. The purpose of the meeting was to introduce the CAC to the MEM master planning process, the planning team, and the roles of the committee and its members. The CAC meeting provided members with the progress of the master plan and outlined a schedule of the project moving forward.

<u>CAC Meeting #2 Summary</u>

The second CAC Meeting was held on March 9, 2020. The purpose of the meeting was to update the status of the airport master plan, review all completed components, and introduce the next steps in the process that would result in the plan to meet the Airport's needs over the next 20 years. Recommendations included improvements to the airfield, terminal, public parking, and other support facilities.

CAC Meeting #3 Summary

The third CAC meeting was held virtually on December 16, 2021. The purpose of the meeting was to recap previous discussions with the CAC, discuss the forecasts of aviation activity and the effects of the COVID-19 pandemic, and present the future facility requirements and preferred development plan for terminal, landside, and airfield.

Technical Advisory Committee

The Technical Advisory Committee (TAC) was intended for key stakeholders that are more technical in nature and focus on the technical issues of the Master Plan. The role of the TAC was to provide thoughts, visions, and input regarding the future of MEM and the needs of the representatives' organization(s). Throughout the planning process, the TAC enabled the MSCAA to include critical perspectives to the planning process, and allowed the TAC members to contribute their knowledge, expertise, and plans related to the airport today and in the future. The TAC provided technical input on existing facilities' ability to accommodate demand and areas of inefficiencies, as well as reviewed the master plan in various phases of the process. Three (3) TAC meetings were held as part of the master planning process.

Invited members of the TAC included the following, with participation varying from meeting to meeting.

- Bill Pettit (FedEx)
- Shane Seely (UPS)
- Scott Meader (Delta)
- Karen Dacosta (American)
- Anne Gao (United)
- Claudia Aguirre (Southwest)
- Kathy Lee Graves (Delta)
- Terry Merriweather (American
- Aquan White (Southwest)
- S. L. Patton (United)
- Starr Mosley (Allegiant /Frontier /Air Canada)
- Erly Alonso (Vacation Express /Casino Charters)
- Chris Byrd (FAA ATCT)
- Marty Hanna (FAA ATCT)
- Sean Rhone (FAA ATCT)
- Chad Collins (NATCA)
- Eric Alexander (FAA Tech Ops)
- Phillip Braden (FAA MEM ADO)
- Jamal Stovall (FAA MEM ADO)
- Bill Jones Jr. (FedEx)
- David Peacock (Wilson)
- Aaron Fowler (Signature)
- Chuck Bower (Swissport)
- Brandon McCormick (TNANG)
- Steve Wood (TSA)
- T. W. Billings (TSA)
- Kevin McCarthy (TSA)
- Scott Szczepanski (Paradies)
- Tim Clark (TSA)
- Lori Breakstone (USCBP)
- Chris Anderson (Enterprise)
- Wendy Duval (Enterprise)
- David E. Stark, Esq. (Avis)
- Howard Steinberg (Budget)
- Mark McBee (Hertz)
- Steven Whittaker (HMS Host)

TAC Meeting #1 Summary

The first TAC meeting was held on May 23, 2019. The purpose of the meeting was to introduce the TAC to the MEM master planning process, the planning team, and the role of the committee and its members. The TAC meeting provided members with the progress of the master plan to date and outlined a schedule of the project moving forward.

TAC Meeting #2 Summary

The second TAC meeting was held on March 10, 2020. The purpose of the meeting was to update the status of the airport master plan, review all completed components, and introduce the next steps in the process that would result in the plan to meet the Airport's needs over the next 20 years. Recommendations included improvements to the airfield, terminal, public parking, and other support facilities.

TAC Meeting #3 Summary

The third TAC meeting was held virtually on December 10, 2021. The purpose of the meeting was to recap previous discussions with the TAC, discuss the forecasts of aviation activity and the effects of the COVID-19 pandemic, and present the future facility requirements and preferred development plan for terminal, landside, and airfield.

Public Awareness Campaign

The purpose of public awareness was to allow the public to learn about the master planning process, current inventory of existing facilities, forecasts of future demand, facility needs, alternatives considered to accommodate the needs of the three airports, and which alternatives will best meet the goals and objectives of the MSCAA. The meetings were held town hall style with exhibits that summarized various aspects of the work completed to date. Attendees were able to review at their own pace with staff available to assist and answer questions. Two (2) offerings of the public informational meeting were held on October 25, 2022 and October 26, 2022. Both sessions contained the same information and attendees were invited to submit comments either at the event or afterwards through the MSCAA website.

Public Meeting Summary

Public Meeting Advertisements

Advertisements for the public meetings were posted on various outlets to announce the meetings and invite the public to participate. The advertisements were published on the following manner. **Appendix K** provides copies of the advertisements.

- Memphis International Airport Facebook page on October 3, 2022
- MSCAA press release on October 4, 2022
- Memphis International Airport Master Plan Update website
- Memphis International Airport Twitter on October 3, 2022
- Memphis-Shelby County Airport Authority LinkedIn page

Public Meeting Materials

Informational and educational materials were designed to educate a broad audience about all aspects of the Master Plan study. Appendix K also provides copies of the Boards utilized in the meetings, the sign in sheets, photos and a record of the comments received.

Project Website

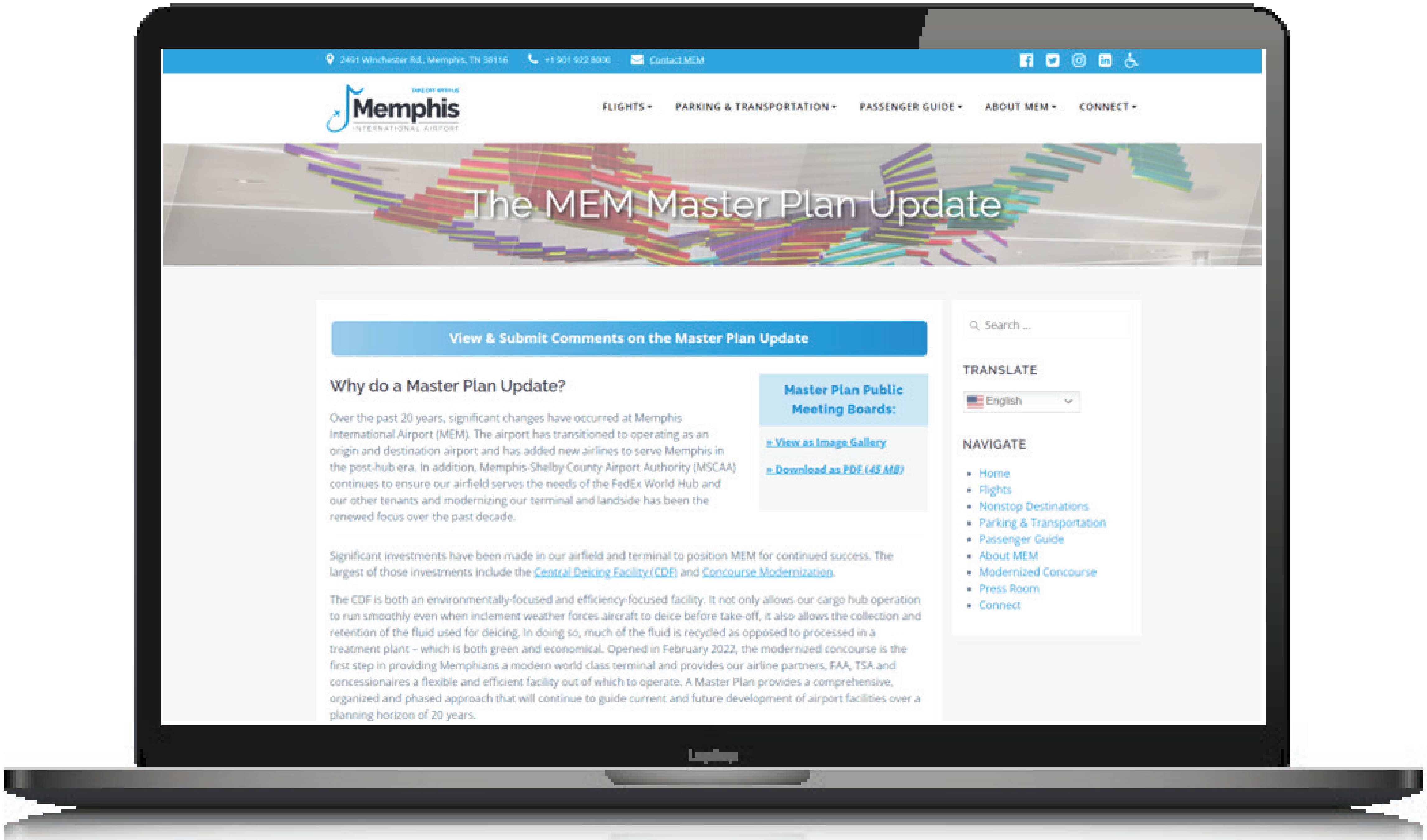
The planning team also created a webpage that was included in the Airport's website **(Figure 9.1)**, https://flymemphis.com/master-plan/. This webpage included a detailed description of the master plan process, master plan study documents, stakeholder presentations and a link for providing comments on the Master Plan.

Other Key Stakeholder Engagement

In addition to the organized efforts described previously, the project team also engaged with more intently with key stakeholders at the Airport including the Air Traffic Control Tower (ATCT) staff and FedEx.

An initial meeting was held with ATCT staff on October 1, 2019 to discuss various operational procedures and potential concerns, as well as airport facilities. Meetings to discuss demand/capacity and future facility requirements were held on October 31, 2019 with FedEx. Two additional meetings were held with FedEx on April 24 and May 4, 2020 to further discuss airfield alternatives.

A meeting was held with both FedEx and ATCT staff on December 10, 2020 to review the airfield alternatives and understand the operational benefits of each concept. On September 13, 2021, a final meeting was held with both FedEx and ATCT staff to discuss the final refinement of airfield alternatives.


2491 Winchester Rd., Memphis, TN 38116
Contact MEM
Memphis
INTERNATIONAL AIRPORT
FLIGHTS
PARKING & TRANSPORTATION
PASSENGER GUIDE
ABOUT MEM
CONNECT
The MEM Master Plan Update
View & Submit Comments on the Master Plan Update
Why do a Master Plan Update?
Over the past 20 years, significant changes have occurred at Memphis International Airport (MEM). The airport has transitioned to operating as an origin and destination airport and has added new airlines to serve Memphis in the post-hub era. In addition, Memphis-Shelby County Airport Authority (MSCAA) continues to ensure our airfield serves the needs of the FedEx World Hub and our other tenants and modernizing our terminal and landside has been the renewed focus over the past decade.
Master Plan Public Meeting Boards:
» View as Image Gallery
» Download as PDF (45 MB)
Significant investments have been made in our airfield and terminal to position MEM for continued success. The largest of those investments include the Central Deicing Facility (CDF) and Concourse Modernization.
The CDF is both an environmentally-focused and efficiency-focused facility. It not only allows our cargo hub operation to run smoothly even when inclement weather forces aircraft to deice before take-off, it also allows the collection and retention of the fluid used for deicing. In doing so, much of the fluid is recycled as opposed to processed in a treatment plant – which is both green and economical. Opened in February 2022, the modernized concourse is the first step in providing Memphians a modern world class terminal and provides our airline partners, FAA, TSA and concessionaires a flexible and efficient facility out of which to operate. A Master Plan provides a comprehensive, organized and phased approach that will continue to guide current and future development of airport facilities over a planning horizon of 20 years.
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Press Room
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