CORGAN

CITY OF SAN ANTONIO
AVIATION DEPARTMENT

SAN ANTONIO INTERNATIONAL AIRPORT

Program Definition Manual: Advance Terminal Planning Program

Volume 4: Appendices

June 09, 2023

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CITY OF SAN ANTONIO AVIATION DEPARTMENT

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Associate Architect

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Faith Group

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Sunland GROUP

Fueling

Argus FUEL FORWARD

Concessions

PMG Paslay Management Group

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VTC

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MEP Engineering

CNG ENGINEERING

Structural Engineering

AG/E

AACS – Automated Access Control System

AC. – Acres

ACM – Asbestos-Containing Materials

ACS – Access Control System

ADAP – Airport Development Aid Program

ADG – Airplane Design Group

AGL – Above Ground Level

AIP – Airport Improvement Program

ALP – Airport Layout Plan

ALS – Approach Lighting System

ALS – Assistive Listening System

ALSF-II – High Intensity Approach Lighting System with Sequenced Flashing Lights in ILS CAT-II

AOA – Airfield Operations Area

AOC – Airport Operations Center

APC – Automated Passport Control

APM – Automated People Mover

APRC – Approach Reference Code

ARC – Airport Reference Code

ARFF – Aircraft Rescue and Fire Fighting

ASDA – Accelerate-Stop Distance Available

ASOS – Automated Surface Observing System

ATCT – Air Traffic Control Tower

ATO – Airport Ticket Office

ATPP – Advanced Terminal Planning Program

AVDGS – Advanced Visual Docking Guidance System

AVE. – Avenue

BAP – Blast Analysis Plan

BAS – Building Automation System

BHS – Baggage Handling System

BIDS – Baggage Information Display Systems

BRL – Building Restriction Line

CAT – Category

CATEX – Categorical Exclusion

CBIS – Checked Baggage Inspection System (TSA)

CBP – Customs & Border Protection (U.S.)

CBRA – Checked Baggage Resolution Area (TSA)

CCTV – Closed Circuit Television (System)

CGID – Connecting Gate Information Display

CHRP – Central Heating and Refrigeration Plant

CIP – Commercially Important Passenger

CIP – Capital Improvement Program

CL – Centerline Lights

CMAR – Construction Manager at Risk

COSA – City of San Antonio

COV – Commercially Operated Vehicles

CUP – Central Utility Plant

CUPPS – Common-Use Passenger Processing Systems

CUSS – Common-Use Self Service

CUTE – Common-Use Terminal Equipment

DCP – Data Collection Package

DCV – Destination Coded Vehicle

DHS – Department of Homeland Security (U.S.)

DME – Distance Measuring Equipment

DOA – Department of Aviation

DOT – Department of Transportation

DPC – Data Control

DPRC – Departure Reference Code

D-RPZ – Departure Runway Protection Zone

DVR – Digital Video Recorder

EDS – Explosives Detection System

EFSO – Emergency Fuel Shut Off

ELEV. – Elevation

EMAS – Engineered Materials Arresting System

EOC –Emergency Operations Center

EPA – Environmental Protection Agency

EST. – Estimate

ETD – Explosives Trace Detection (or Detector)

EVIDS – Electronic Visual Information Display Systems

FAA – Federal Aviation Administration

FAM – Federal Air Marshall (TSA)

FAR – Federal Aviation Regulations

FBO – Fixed Base Operator

FEDEX – Federal Express

FIDS – Flight Information Display Systems

FIS – Federal Inspection Services (U.S.)

FOD – Foreign Object Damage

FSD – Federal Security Director (TSA)

FT. – Feet

GA – General Aviation

GIDS – Gate Information Display Systems

GLF – Ground Loading Facility

GPS – Global Positioning System

GRE – Ground Run-Up Enclosure

GS – Glidescope

GSE – Ground Services Equipment

GTC – Ground Transportation Center

HDRC – Historic and Design Review Commission

HIRL – High Intensity Runway Lights

IATA – International Air Transport Association

ICAO – International Civil Aviation Organization

IDS – Intrusion Detection System

IDF – Independent Distribution Frame

IECC– International Energy Conservation Code

ILS – Instrument Landing System

IM – Inner Marker

IMC – Instrument Meteorological Conditions

ITS – Information Technology Services

KTS – Knots

LAN – Local Area Network

LAT. – Latitude

LBP – Lead Based Paint

LBS – Pounds

LDA – Landing Distance Available

LEO – Law Enforcement Officer

LOC – Localizer

LOI – Letter of Intent

LONG. – Longitude

LOS – Level of Service

MALS – Medium Intensity Approach Lighting System

MARS – Multiple Aircraft Ramp System

MALSR – Medium Approach Lighting System with

Runway Alignment Indicator Lights

MDF– Main Distribution Frame

MER – Main Equipment Room – formally MDF

MII – Majority in Interest

MIRL – Medium Intensity Runway Lights

MITL – Medium Intensity Taxiway Lights

MOU – Memorandum of Understanding

MPH – Miles Per Hour

MRO – Maintenance, Repair, and Overhaul

MSL – Mean Sea Level

MX – Maintenance

MUFIDS – Multi-User Flight Information Display System

N/A – Not Applicable

NAD83 – North American Datum of 1983

NAVD88 – North American Vertical Datum of 1988

NB – Narrow Body (aircraft)

NO – Number

NOAA – National Oceanic and Atmospheric Administration

NPIAS – National Plan of Integrated Airport Systems

NVGS – Non-Vertically Guided Survey

O&D – Origin & Destination

OCS – Obstacle Clearance Surface

OEI/OIS – One-Engine Inoperative Obstacle Identification Surface

OFA – Object Free Area

OFR – Obstacle/Object Free Area

OFZ – Obstacle Free Zone

OL – Obstruction Light

OOG – Out-Of Gauge (checked baggage)

OSR – On-Screen Resolution

PAPI – Precision Approach Path Indicators

PARCS – Parking Access and Revenue Control

PAX - Passengers

PBB – Passenger Boarding Bridge

PDD– Project Definition Document

PCN – Pavement Classification Number

PFC – Passenger Facility Charge

PKWY – Parkway

POV – Privately Operated Vehicles

POFZ – Precision Obstacle Free Zone

PPP – Public Private Partnership

PRCS – Parking Revenue Control Software

RD. – Road

RDC – Runway Design Code

REIL – Runway End Identifier Lights

RF – Radio Frequency

RFID – Radio Frequency Identification

RIDS – Ramp Information Display Systems

RJ – Regional Jet (aircraft)

RNAV – Area Navigation

ROFA – Runway Object Free Area

RON – Remain Over Night

ROW – Right-of-Way

RPZ – Runway Protection Zone

RSA – Runway Safety Area

RTR – Remote Transmitter Receiver

RVR – Runway Visual Range

RVZ – Runway Visibility Zone

RWY – Runway

SAAPD – San Antonio Airport Police Department

SARA – Service Animal Relief Area

SAAS – San Antonio Airport System

SAASSAM – San Antonio Airport System Sustainable Airport Manual

SAIA– San Antonio International Airport

SAT – San Antonio International Airport

SAWS – San Antonio Water System

SM –Statute Mile

SIDA – Security Identification Display Area

SSCP – Security Screening Checkpoint (TSA)

SSD – Self Service Device

SSI – Sensitive Security Information

STSO – Supervisory Transportation Security Officer

SWS – Surface Weather System

TASP – Texas Airport System Plan

TBD – To Be Determined

TCEQ – Texas Commission on Environmental Quality

TCU – Threat Containment Unit

TDP – Terminal Development Program

TDZ – Touchdown Zone

TERPS – Terminal Instrument Procedures

TESM – Taxiway Edge Safety Margin

TLN –Taxilane

TNC – Transportation Network Companies

TODA – Take-Off Distance Available

TOFA – Taxiway Object Free Area

TORA – Take-Off Run Available

TR – Telecommunications Room – formerly IDF

TSA – Transportation Security Administration

TSS – Threshold Siting Surface

TWY – Taxiway

UDC – Unified Development Code

ULD – Unit Load Device

UPS – Uninterruptible/Uninterrupted Power Supply

UPS – United Parcel Service

USAA – United Services Automobile Association

VASI – Visual Approach Slope Indicators

VGS – Vertically Guided Survey

VMC – Visual Meteorological Conditions

VOR – Very-High-Frequency (VHF) Omni-Directional Range

VSR – Vehicle Service Road

WAN – Wide-Area Network

WB – Wide Body (aircraft)

WLAN – Wireless Local Area Network

WTMD – Walk-Through Metal Detector

YOE – Year of Expenditure

Airside – The secure area at an airport. This can be inside or outside the building.

Apron – Area where aircraft movement occurs. This includes gate areas, hard stand areas, taxiways, taxilanes, runways, etc.

Arrivals – Refers to the areas where passengers arriving at an airport via an aircraft enter the building or circulate through it. This could be a floor level, a roadway, or a curb where passengers are picked up.

Baggage Breakdown – Facilities in the secure area of the airport where checked baggage from arriving flights is unloaded from baggage containers or baggage carts and placed on conveyor belts for distribution to the baggage claim device(s).

Bag Drop – A staffed or non-staffed position where passengers use a self-service device to acquire tags for their checked baggage and the baggage is input into the BHS.

Baggage Make-Up – Facilities in the secure area of the airport where checked baggage for departing flights is sorted and loaded into containers or onto baggage carts.

CIP Lounge – A special airline lounge to accommodate commercially important passengers e.g. Business and First Class passengers. The term VIP lounge or Premiere Lounge/Club are also used.

Concessions – Refers to the areas where passengers can shop (retail) or eat (food & beverage) in an airport.

Concourse – Usually Level 2, directly above the Ramp Level where passengers load and unload from an aircraft. Can also refer to the area where public circulation occurs at the Airside of the airport.

Departures – Refers to the areas where passengers departing at an airport via an aircraft exit the building or circulate through it. This could be a floor level, a roadway, or a curb where passengers are dropped off.

HUB –

FAA definition of a Hub:

The notion of hub is used by the Federal Aviation Administration (FAA) to classify commercial service airports. The FAA defines Commercial service airports as publicly owned airports that have at least 2,500 enplanements each calendar year and receive scheduled passenger service. There are 5 types of hubs, each defined by the percentage of the annual number of enplanements among all U.S Commercial service airports.

- Large Hub: if the number of enplanements at the airport represents at least 1 percent of the total annual number of enplanements among all U.S Commercial service airports.
- Medium: if the number of enplanements at the airport represents at least 0.25 percent of the total annual number of enplanements among all U.S Commercial service airports.
- Small: if the number of enplanements at the airport represents at least 0.05 percent of the total annual number of enplanements among all U.S Commercial service airports.
- Nonhub: if the airport has at least 2,500 enplanements each year.

Airlines definition of a Hub:

A Hub or a "transfer hub" is an airport that an airline uses to transfer large number of passengers between flights. Thus for most passengers of the airline, the hub is not their final destination. The hub is a central element of most large airlines. Although a hub airport has to have more infrastructure and manpower in order to transfer passengers and bags, it permits the airlines to provide more frequent and less expensive service to a wider network of destinations.

Landside – The non-secure area at an airport. This can be inside or outside the building.

Meeters & Greeters – The area where a greeter meeting waits on an arriving passenger. Sometimes referred to as an Arrivals Lounge there is usually a designated space or area for them to wait just outside of Customs or just outside of the secure line.

Ramp – Usually Level 1 or Ground Level where aircraft operations occur.

Secure Line – An invisible line that demarks the difference between Airside and Landside. A physical barrier is located along this line.

Wayfinding – The ability of a passenger to easily find their way around an airport due to signage, landmarks, landscaping, lighting, interior design, visual cues, maps, and publications.

Appendix A – Introduction

A Introduction

EARLY WORKS

Conceptual development to support ROM

- Employee Parking Relocation
- Demo Hangar 4 & Public Safety
- Demo Badging Office
- RON Parking Relocation
- Relocate Public Safety

CORE PROJECTS

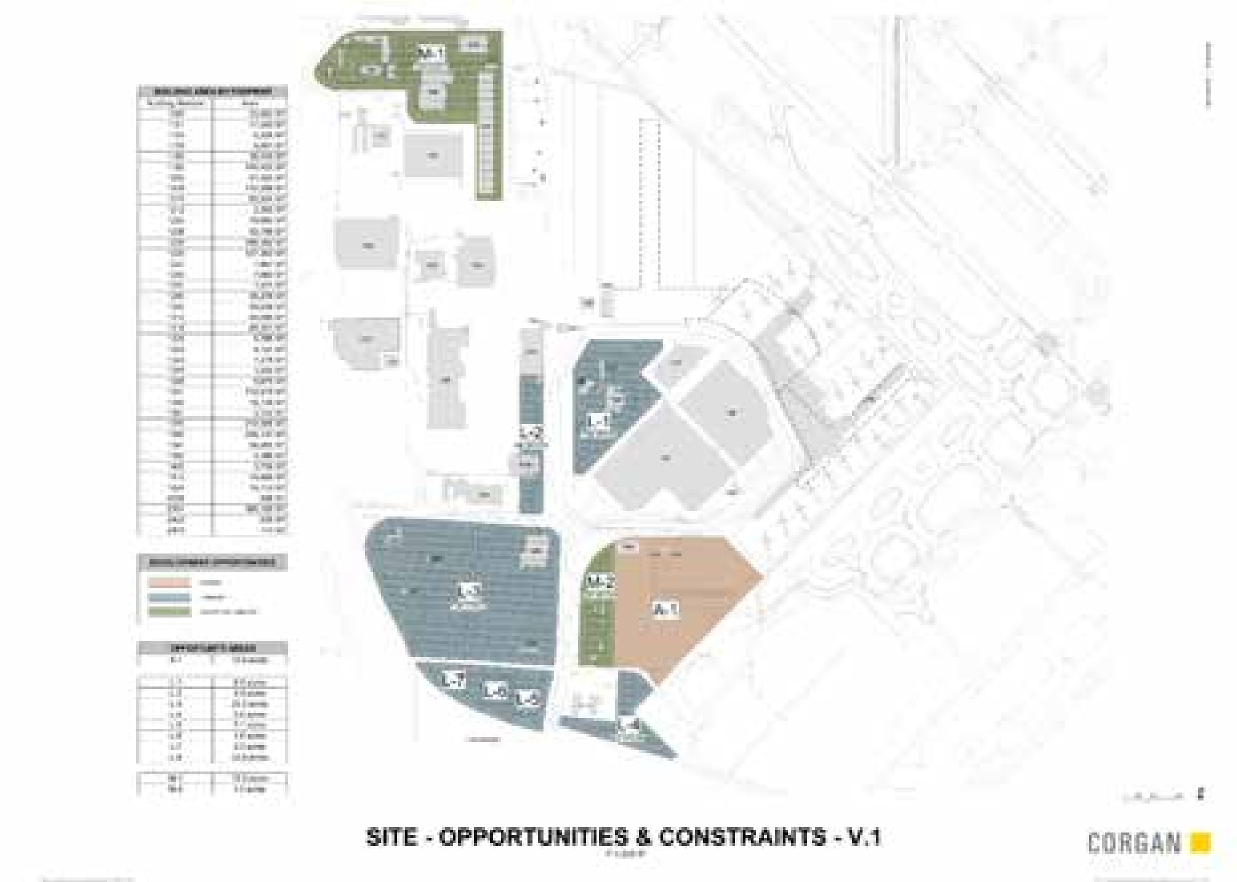
Advance Planning & Cost Estimates

- New Terminal with 17 Gates
- Central Processor and FIS
- A + B Connector
- Commercial Apron
- Fueling Storage & New Terminal Hydrant System
- Utility Corridor Relocation
- CUP Upgrades and Electrical Upgrades
- New Triturate for New Terminal
- New Parking Structure / GTC
- Terminal Curbside Roadway Improvement
- Airport Access Road
- Central Receiving Distribution Center (CRDC)
- Term A Reconfiguration
- Term B Reconfiguration

Appendix B – Employee Parking Relocation

B Employee Parking Relocation

Figure 1: Site Opportunities and Constraints Mapping



Source: Corgan

Figure 2 Employee Parking Relocation Travel Distance

Source: Corgan

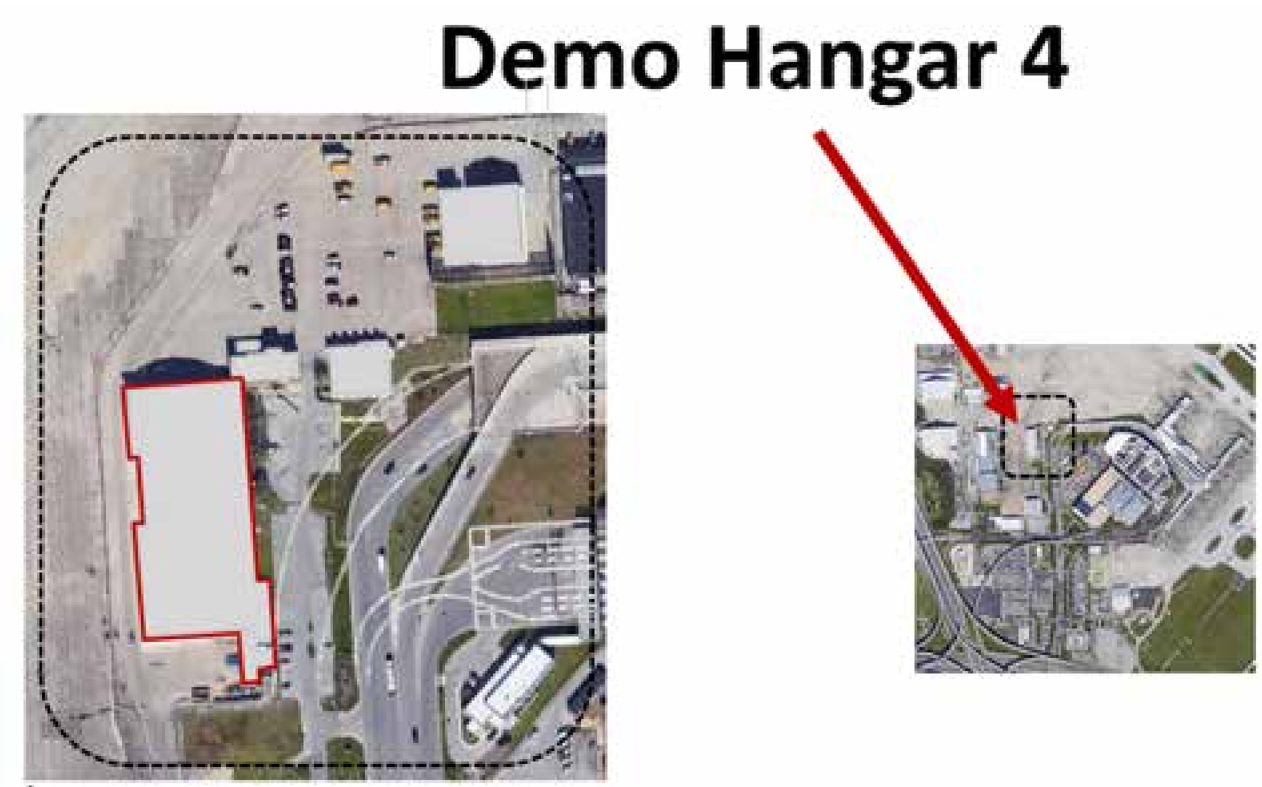
Figure 3 Existing Employee Parking Travel Distance

Source: Corgan

Appendix C – Demo Hangar 4 & Public Safety

C Demo Hangar 4 & Public Safety

Figure 4 Demo Hangar 4 Location

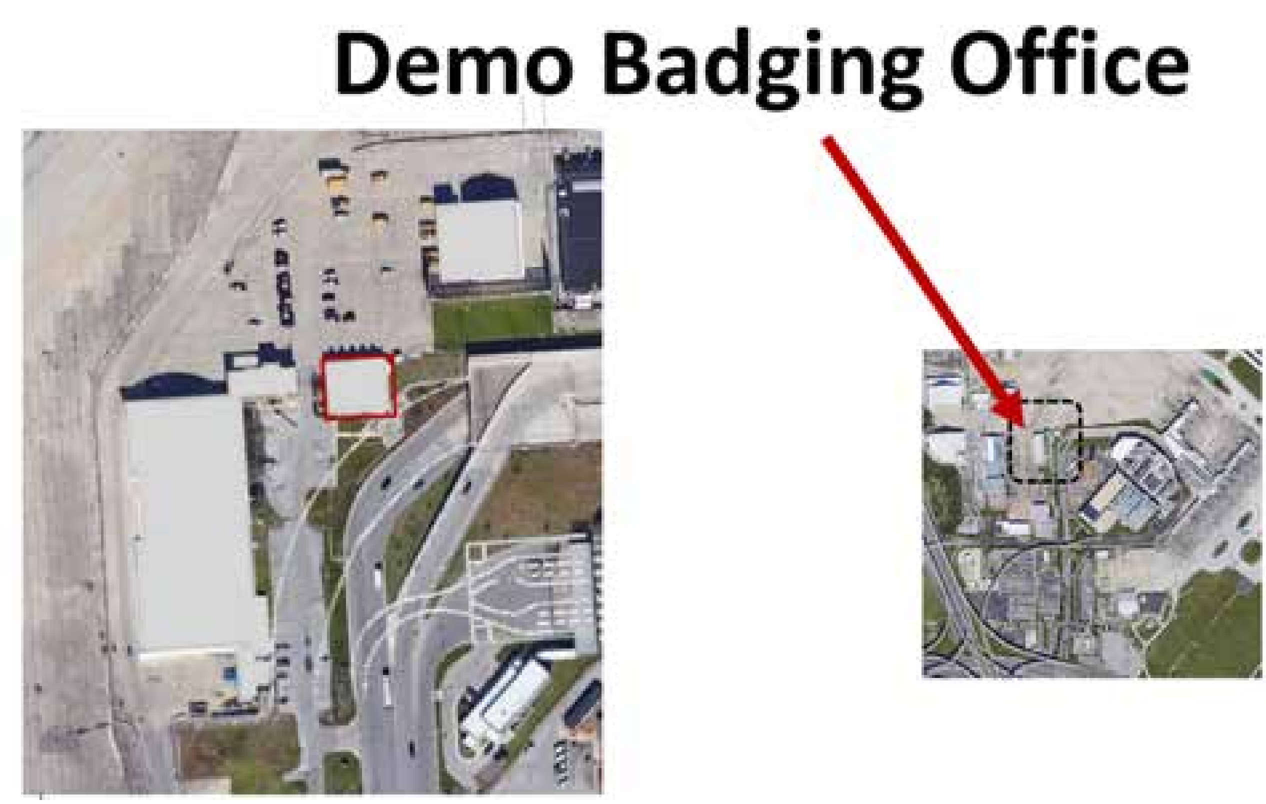


Source: Corgan

Appendix D – Demo Badging Office

D Demo Badging Office

Figure 5 Badging Office Location



Source: Corgan

Appendix E – RON Pads

E RON Pads

The existing apron on which the New Terminal will be constructed consists of approximately 19 narrowbody RON positions, as shown in Figure 6. This flexes to accommodate widebody aircraft at some positions. The team was tasked with identifying an adequate number of RON positions – in appropriate locations - to support all commercial gates, including those associated with the New Terminal. The evolution can be summarized in three iterations.

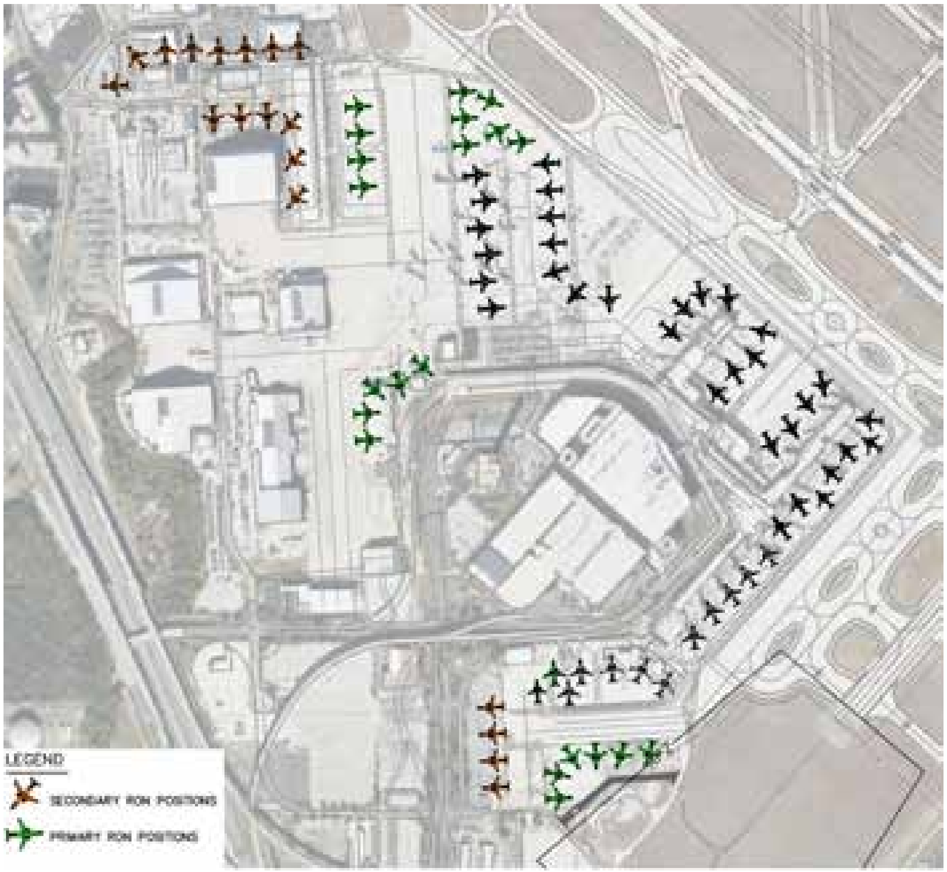
Figure 6 Existing RON Parking Layout with New Terminal Overlay

Source: Kimley-Horn

Iteration 1A: Maximize RON Availability

The first iteration identified all potential North and South RON locations that were not significantly far from the terminal buildings (see Figure 7). At the North RON site, this included the west cargo building pads that are used for Airline Tech Ops (i.e., RON's for another purpose). The team was also encouraged to explore specific areas west of the west cargo building, as it was understood tenants could potentially be relocated. Iteration 1A assumed a partial construction of the New Terminal to PAL 1, which included 6 RON positions that would be available for some time but then would be relocated for PAL 2 terminal expansion. A total of 40 total potential positions were identified in Iteration 1A.

Figure 7 Iteration 1A RON Parking Layout



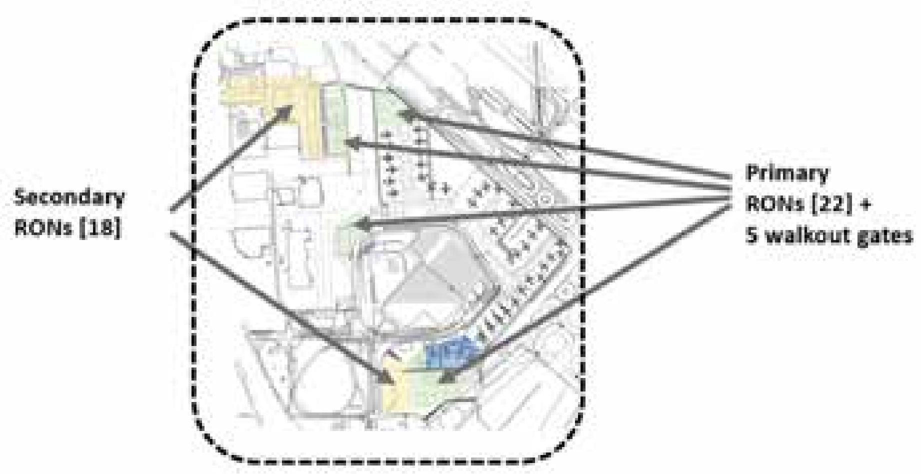
Source: Kimley-Horn

Iteration 1B: Classify and Evaluation

Iteration 1B sought to find those positions that were the most economical and most convenient for access to the terminals. The positions that would continue to Iteration 2 were classified as primary, while those that would be deferred were classified as secondary (see Figure 8). Balance between RON positions on the north and south was important as both Terminal A, Terminal B, and the New Terminal will require RON positions.

This iteration recognized the cost and implementation challenges of the 14 westernmost North RON positions, which were classified as secondary. The South RON positions were evaluated in conjunction with the functionality of the proposed Ground Load Facility being constructed in Terminal A. The adjacency and convenient availability factored into primary RON positions on either side of the Terminal taxilane. The 4 RON positions where the current taxi/TNC lot is located were classified as secondary and could be converted to RON positions if required in the future.

Figure 8 Iteration 1B: Classify and Evaluation



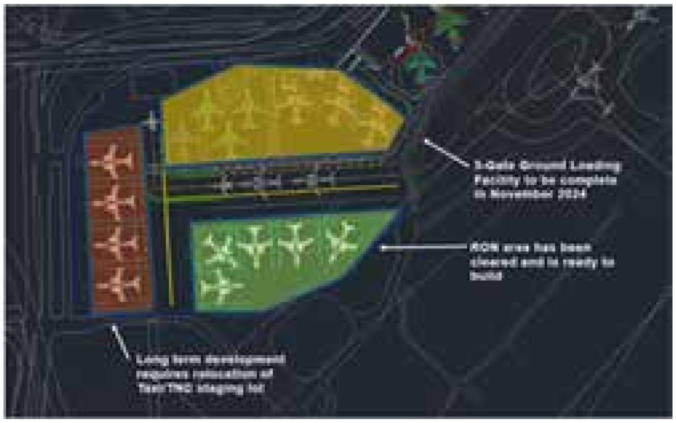
Source: Kimley-Horn

During Iteration 1B, the team developed more detailed technical drawings that outlined the development phasing and implementation plan for the North and South RON positions (see Figure 9 and Figure 10).

Figure 9 Iteration 1B North RON Implementation Plan

Source: Kimley-Horn

Figure 10 Iteration 1B South RON Implementation Plan



Source: Kimley-Horn

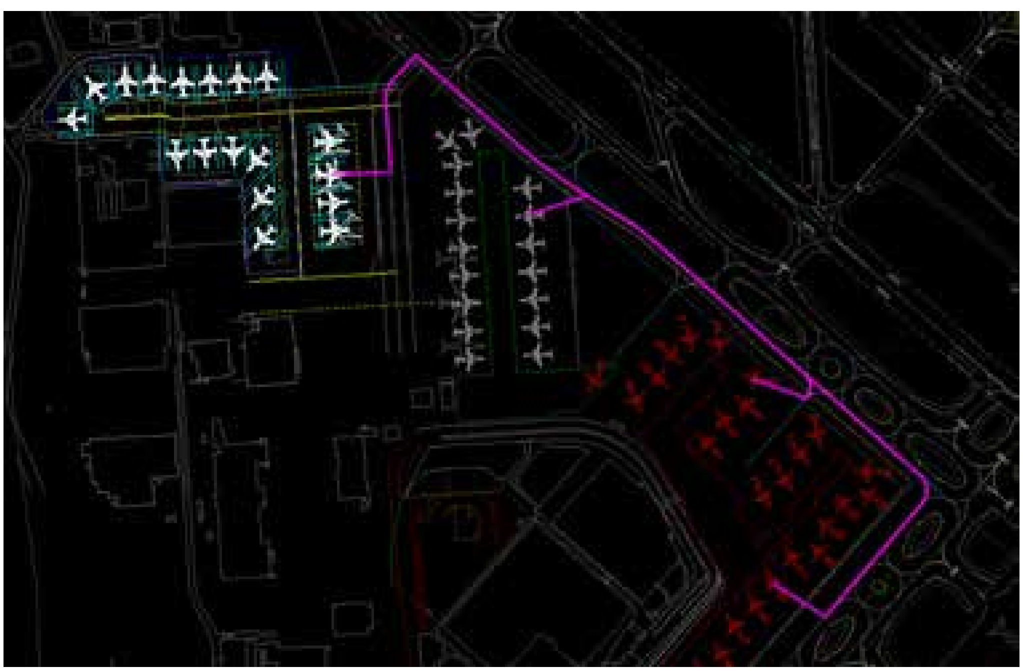
The average towing distances from the North and South RON areas were measured to test operational realities of the RONs in Iteration 1B and are summarized in RON Parking Towing Distance.

Figure 11 RON Parking Towing Distance

	Terminal A	Terminal B	Terminal C
North RON	5,440’	3,775’	2,170’
South RON	2,000’	3,770’	5,400’

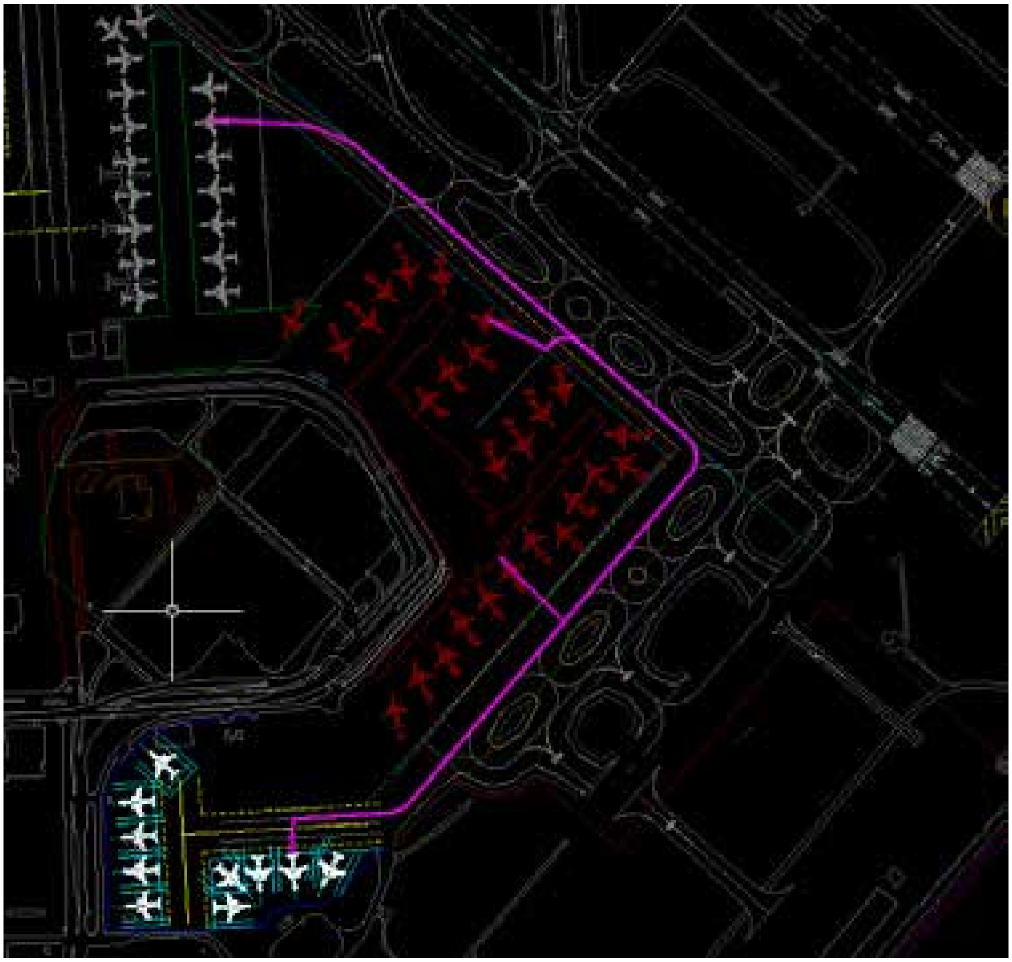
Source: Kimley-Horn

Figure 12 Iteration 1B North RON Towing Plan



Source: Kimley-Horn

Figure 13 Iteration 1B South RON Towing Plan

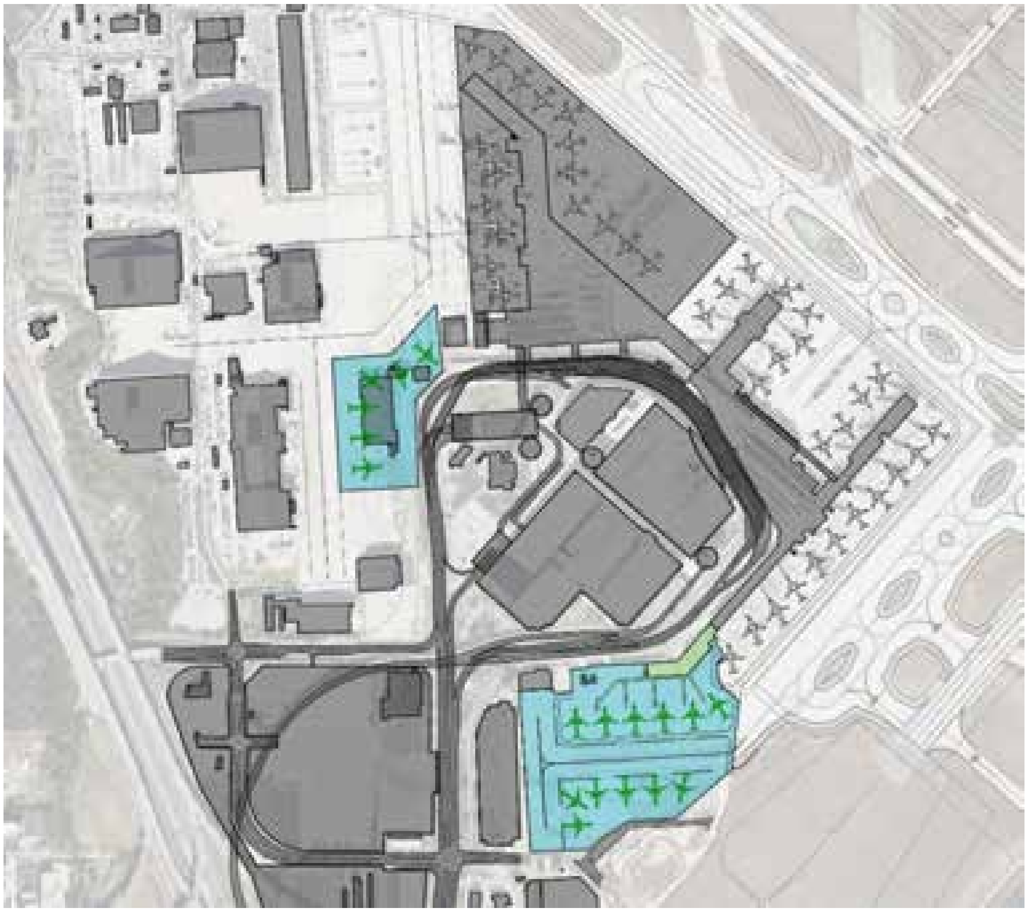


Source: Kimley-Horn

Iteration 2: Terminal PAL 2

Iteration 2 assumed the full 17-gate New Terminal (PAL 2) would be built immediately rather than in two phases. In this scenario, the 6 RON positions north of the PAL 1 New Terminal were relocated south. The design day forecast confirmed a total of 13 RON positions at PAL 2, divided into 6 North and 7 South RON positions. This is inclusive of the Ground Loading Facility but excludes the 4 TechOps RON positions west of the New Terminal which would remain available throughout the development of the New Terminal and RON positions.

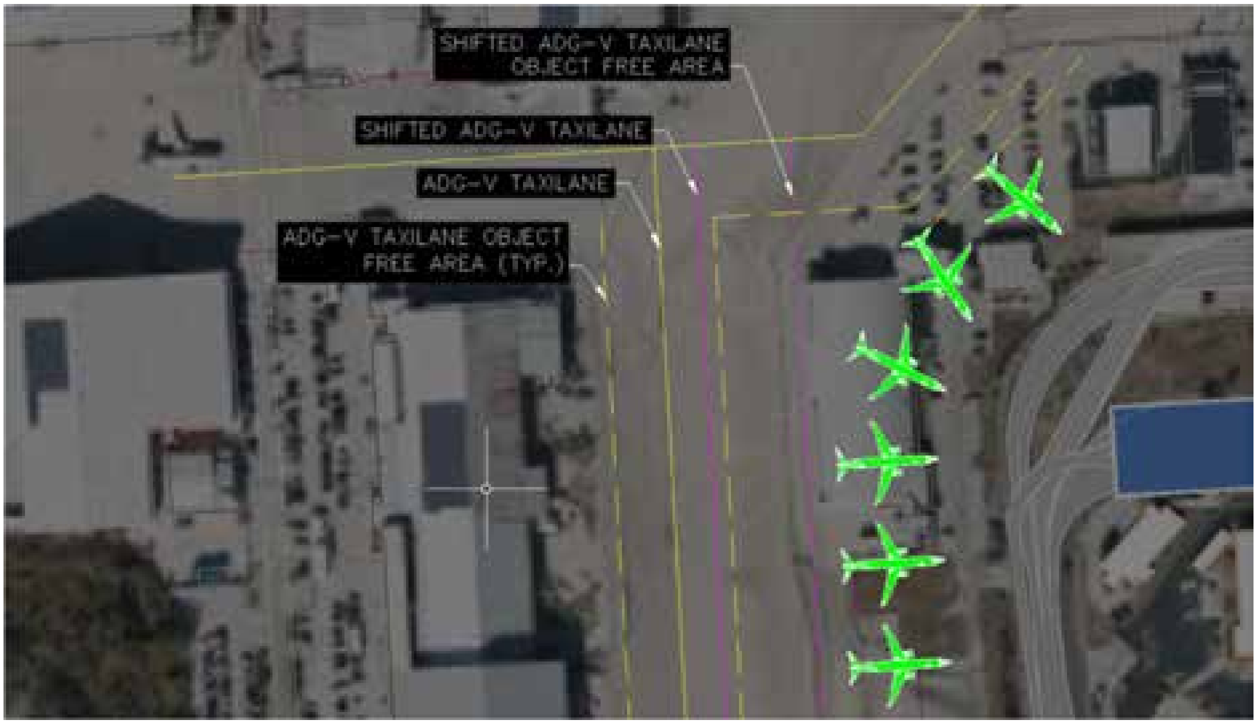
Figure 14 Iteration 2 RON Parking Layout



Source: Kimley-Horn

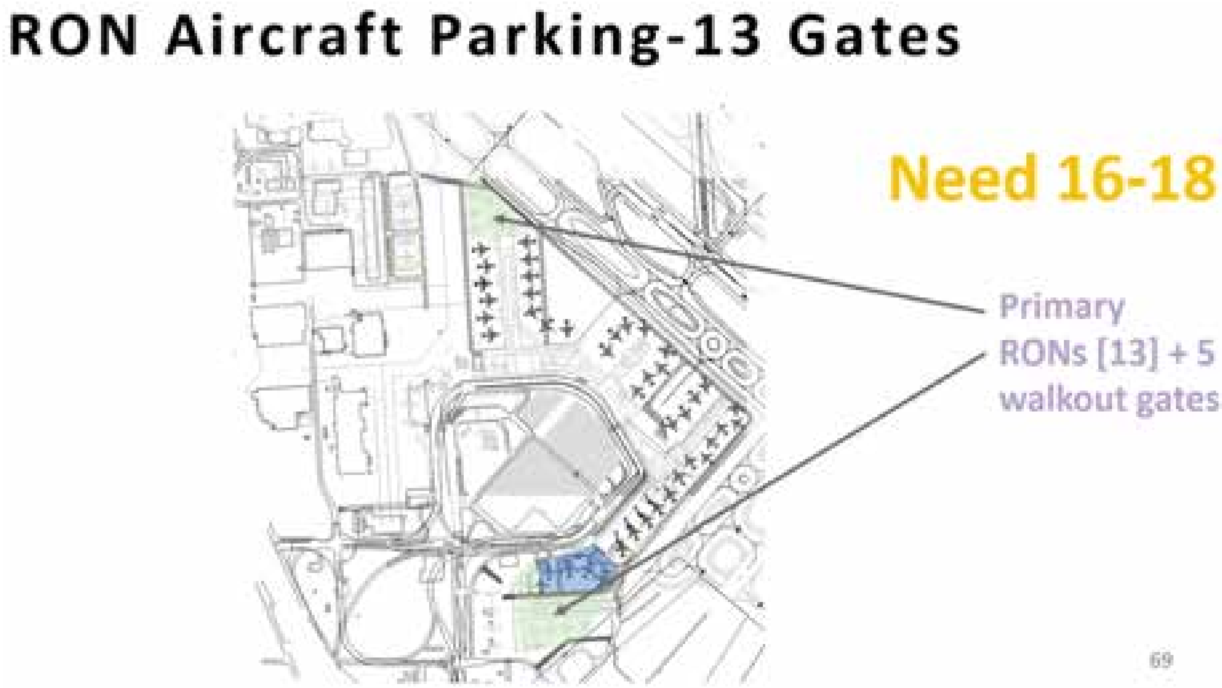
The North RON positions were further evaluated to accommodate ADG-V taxi operations for airport tenants south of the RON. Originally, the North RON positions were set back from the landside as a future road realignment was planned to expand slightly west. As the landside program evolved, the future roadway alignment was updated to follow the current alignment. This allowed the RON positions to shift east for a single ADG-V taxilane west of the RON positions while also preserving adequate landside right-of-way. North RON Shift for ADG-V Taxilane, shows the initial layout plan with a solid taxilane centerline and dashed object free area in yellow as well as the shifted alignment in magenta.

Figure 15 North RON Shift for ADG-V Taxilane



Source: Kimley-Horn

Figure 16 RON 13 Gate Option



Source: Corgan

Figure 17 RON 17 Gate Option

Source: Corgan

Figure 18 RON Parking ADGV MRO Taxilane

Source: Corgan

Appendix F – Relocate Public Safety

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CITY OF SAN ANTONIO
AVIATION DEPARTMENT

F Relocate Public Safety

Figure 19 Sandau Existing Building Program Overlay

Source: Lake Flato

Figure 20: New Public Safety Building Option 2

Source: Lake Flato

OPTION 2: New 30,000 SF Public Safety Building
2 LEVELS:

120 PARKING SPACES
(4:PER 1000SF)

Figure 21 New Public Safety Building Option A Level 1

Source: Lake Flato

Figure 22 New Public Safety Building Option A Level 2

Source: Lake Flato

Figure 23 New Public Safety Building Option A Program Summary

Program Summary — 1/12/2021

		space/function	units	SF per unit	Budgeted Program	staff	cars	notes
BY PROGRAM		**BY PROGRAM**						
	1.00	Airport Integrated Control Center (AICC)			10,441		[illegible]	
	2.00	Airside Operations			4,650		[illegible]	
	3.00	Airport Rescue and Fire Fighting (ARFF)			2,100		4	
	4.00	Airport Police Department			7,170		[illegible]	
	4.50	K-9 Kennel Facility			380			
	5.00	Badge, ID & Security			3,040		[illegible]	
	6.00	General Shared spaces			0			
	7.00	General parking						
	7.50	Secured parking						
		TOTALS Net program areas			**27,760**			
		TOTALS Building Gross			**39,715**		105	

Source: Lake Flato

OPTION A:

New 40,000 SF Public Safety Building

Two 20,000 SF levels

Level 1:

Security, Badge & ID

Airport Police Department

Airport Rescue & Fire Fighting (ARFF)

K-9 Kennel (Airport and TSA)

Level 2:

Airport Integrated Control Center (AICC)

Airport Emergency Control (AEC)

Airside Operations

Parking:

10 VISITOR SPACES

64 SECURE SPACES

72 GENERAL USE SPACES

Total on-site available parking

146 Parking Spaces

Development code requires

(4:PER 1000SF of office area)

Figure 24 New Public Safety Building Option B Level 1

Source: Lake Flato

Figure 25 New Public Safety Building Option B Level 2

Source: Lake Flato

Figure 26 New Public Safety Building Option B Program Summary

Program Summary [illegible]

		space/function	units	SF per unit	Budgeted Program	[illegible]	[illegible]	notes
		BY PROGRAM						
BY PROGRAM	1.00	Airport Integrated Control Center (AICC)			7,908		[illegible]	
	2.00	Airside Operations			2,640		[illegible]	
	3.00	Airport Rescue and Fire Fighting (ARFF)			2,500		4	
	4.00	Airport Police Department			4,970		[illegible]	
	4.50	K-9 Kennel Facility			360			
	5.00	Badge, ID & Security			2,020		[illegible]	
	6.00	General Shared spaces			4,130			
	7.00	General parking						
	7.50	Secured parking						
		TOTALS Net program areas			**24,128**			
		TOTALS Building Gross			**34,464**		[illegible]	

Source: Lake Flato

Option B:
- New 30,000 SF AICC Building
- Repurpose Existing Sandau Bld. for Airport Police

Level 1 (existing Sandau Building)
- Airport Police
- K-9 Kennel facility

Level 1 (New Building)
- Security Badge & ID
- Airside Operations
- Airport Rescue & Fire Fighting (ARFF)

Level 2 (New Building)
- Airport integrated control center (AICC)
- Airport Emergency control center (AEC)

Parking:
- 10 Visitor parking Spaces
- 30 Secure Parking Spaces
- 75 General Use/Employee Spaces

Parking Total:
- 115 Parking Spaces

Figure 27: New Public Safety Building Option C

Source: Lake Flato

OPTION C: *(Reduced Program Square footage)*

New 30,000 SF Public Safety Building

Two 15,000 SF levels

Level 1:

- Security, Badge & ID
- Airport Police Department
- Airport Rescue & Fire Fighting (ARFF)
- K-9 Kennel (Airport and TSA)

Level 2:

- Airport Integrated Control Center (AICC)
- Airport Emergency Control (AEC)
- Airside Operations

Parking:

- 10 VISITOR SPACES
- 64 SECURE SPACES
- 72 GENERAL USE SPACES

Total on-site available parking

- 146 Parking Spaces

Figure 28 New Public Safety Building Option D

Source: Lake Flato

OPTION D: (*Renovate M-7 1845 building)*

Renovated 50,000 SF Public Safety Building

Two 25,000 SF levels

Level 1:

Security, Badge & ID

Airport Police Department

K-9 Kennel (Airport and TSA)

7,000SF additional space available

Level 2:

Airport Integrated Control Center (AICC)

Airport Emergency Control (AEC)

Airside Operations

Parking:

10 VISITOR SPACES

120 SECURE SPACES

70 GENERAL USE SPACES

Total on-site available parking

250 +/- Parking Spaces

Development code requires

(4:PER 1000SF of office area)

Appendix G – New Terminal (17 Gate Expansion)

G New Terminal (17 Gate Expansion)

Figure 29 Arrivals Proposed New Terminal

Source: Corgan

Figure 30: Departure Proposed New Terminal

Source: Corgan

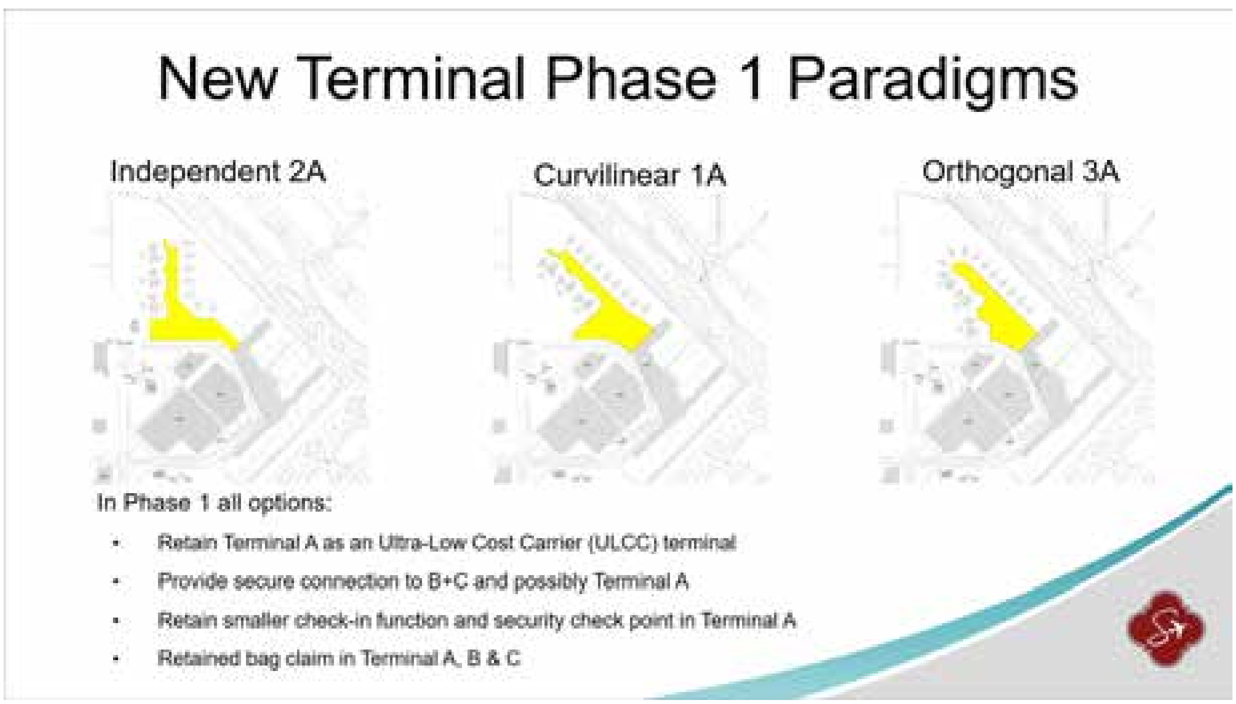
Figure 31 Mezzanine Proposed New Terminal

Source: Corgan

Figure 32 New Terminal Phase 1 Early Paradigm Studies

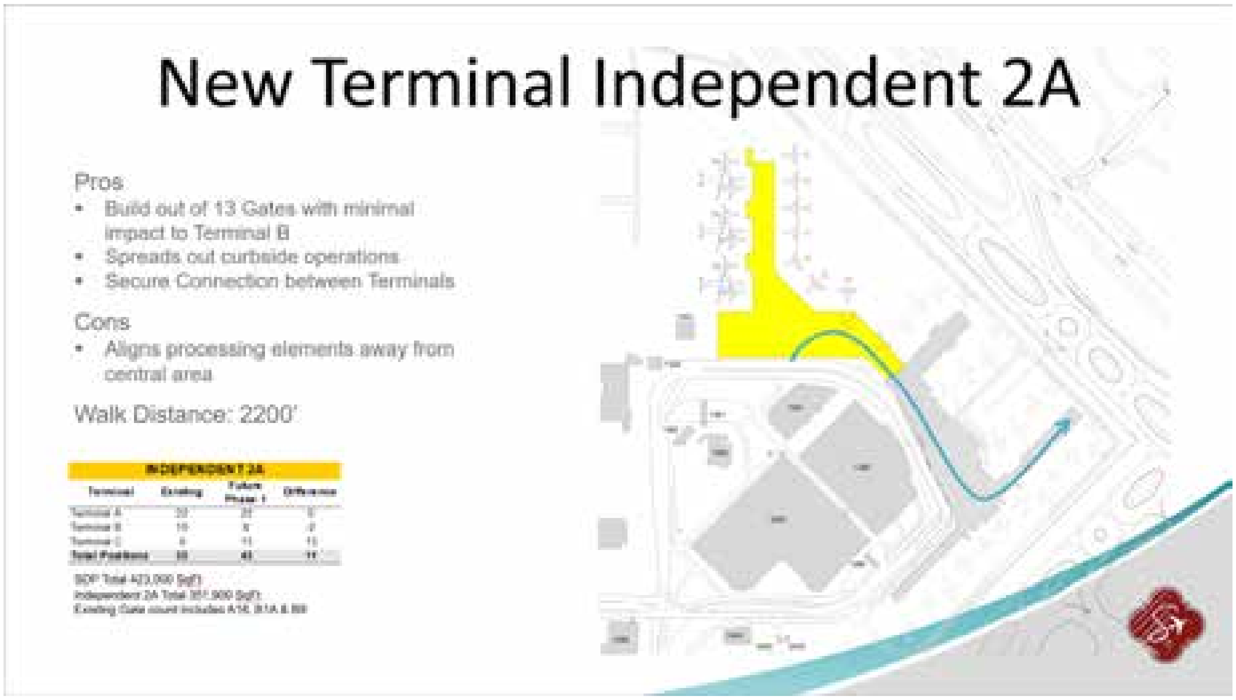
Source: Corgan

Figure 33 New Terminal - 3 Paradigm Families



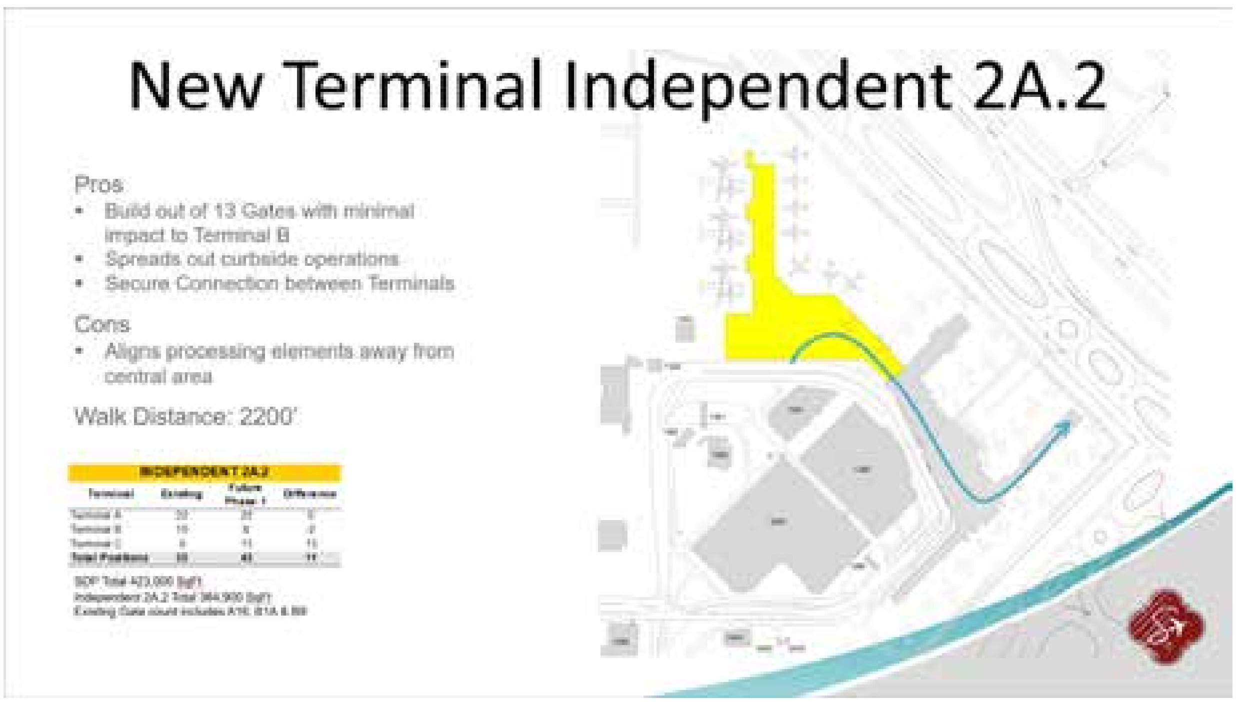
Source: Corgan

Figure 34 New Terminal Independent 2A Option



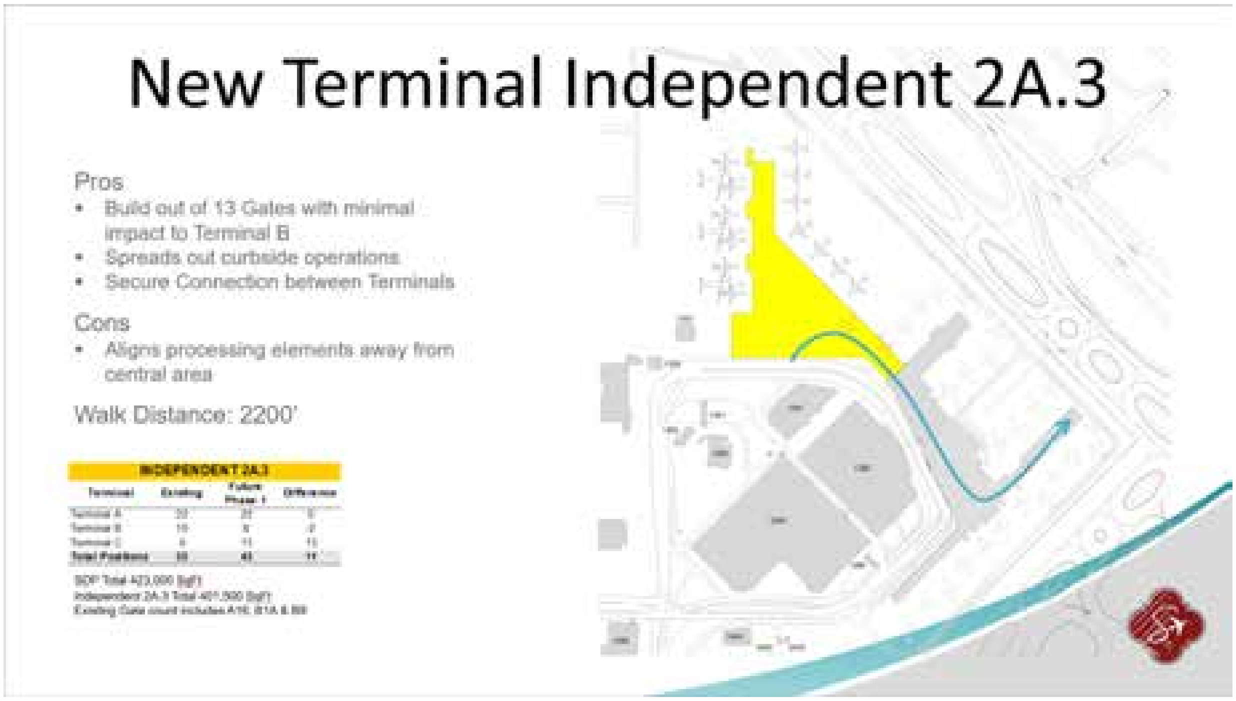
Source: Corgan

Figure 35 New Terminal Independent 2A.2 Option



Source: Corgan

Figure 36 New Terminal Independent 2A.3 Option

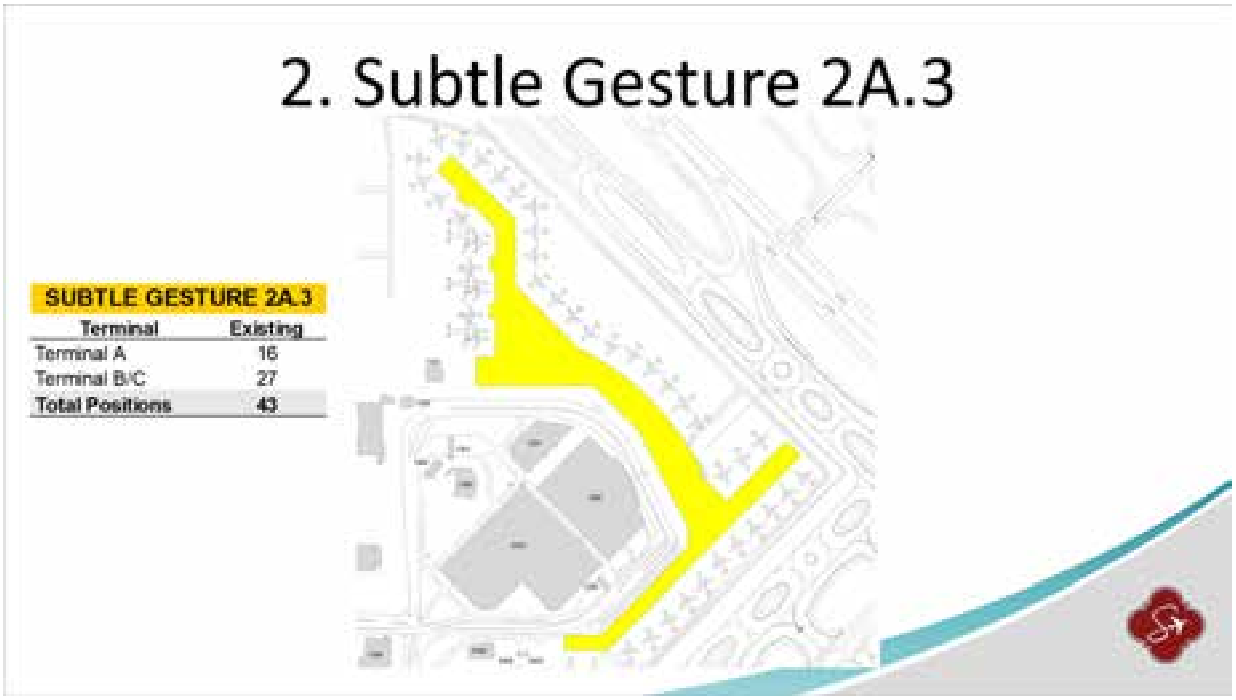


Source: Corgan

Figure 37 Full Buildout Scheme - Grand Gesture

Source: Corgan

Figure 38 Full Buildout Scheme - Subtle Gesture



Source: Corgan

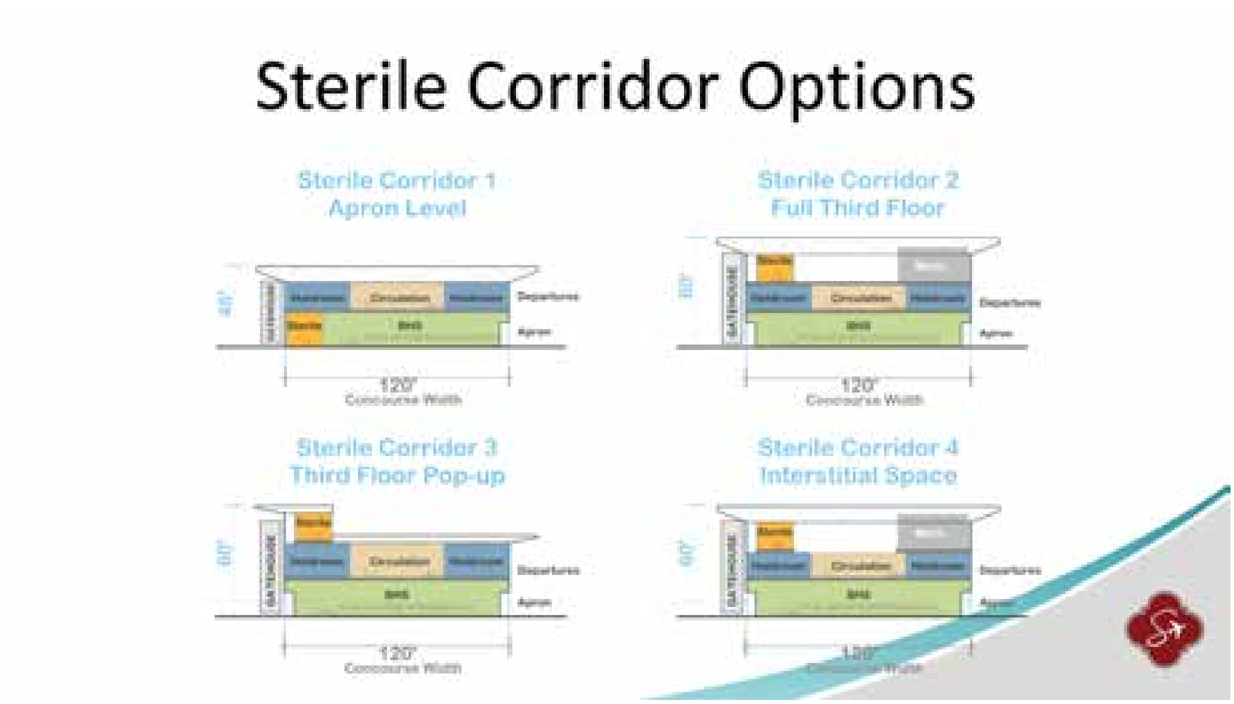
Figure 39 Full Buildout Scheme - Chamfer

Source: Corgan

Figure 40 Full Buildout Scheme - Retain Terminal B

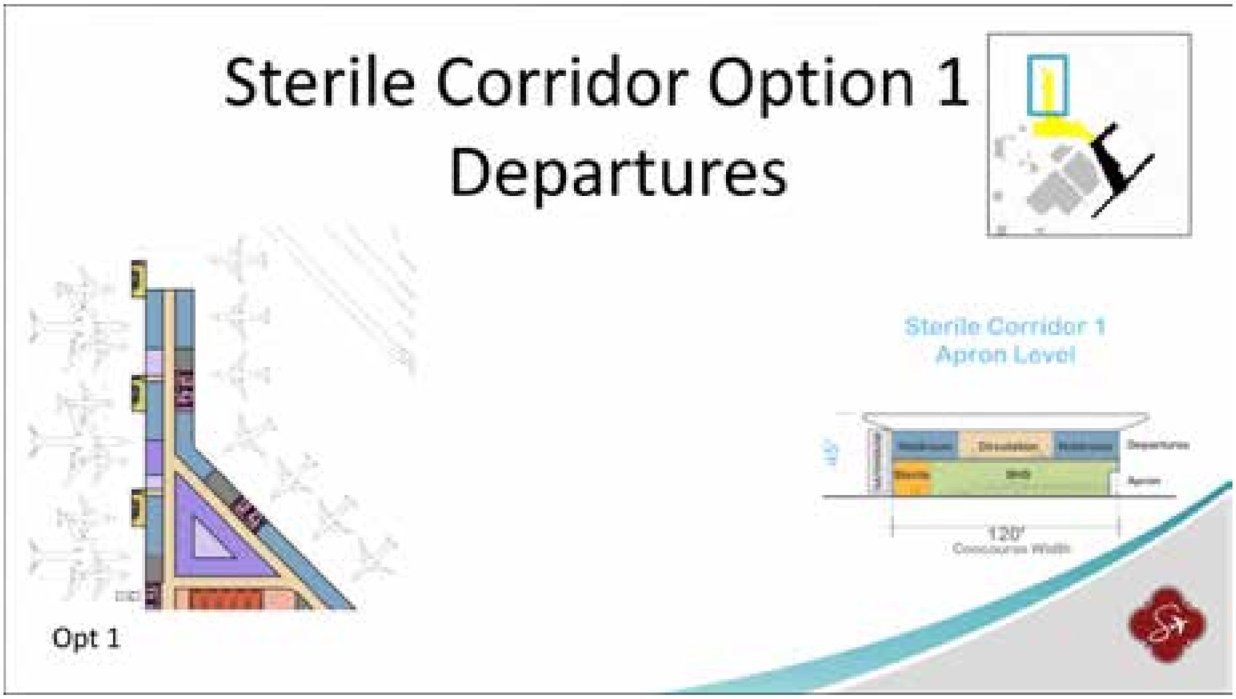
Source: Corgan

Figure 41 Sterile Corridor Option Studies



Source: Corgan

Figure 42 Sterile Corridor Option Studies

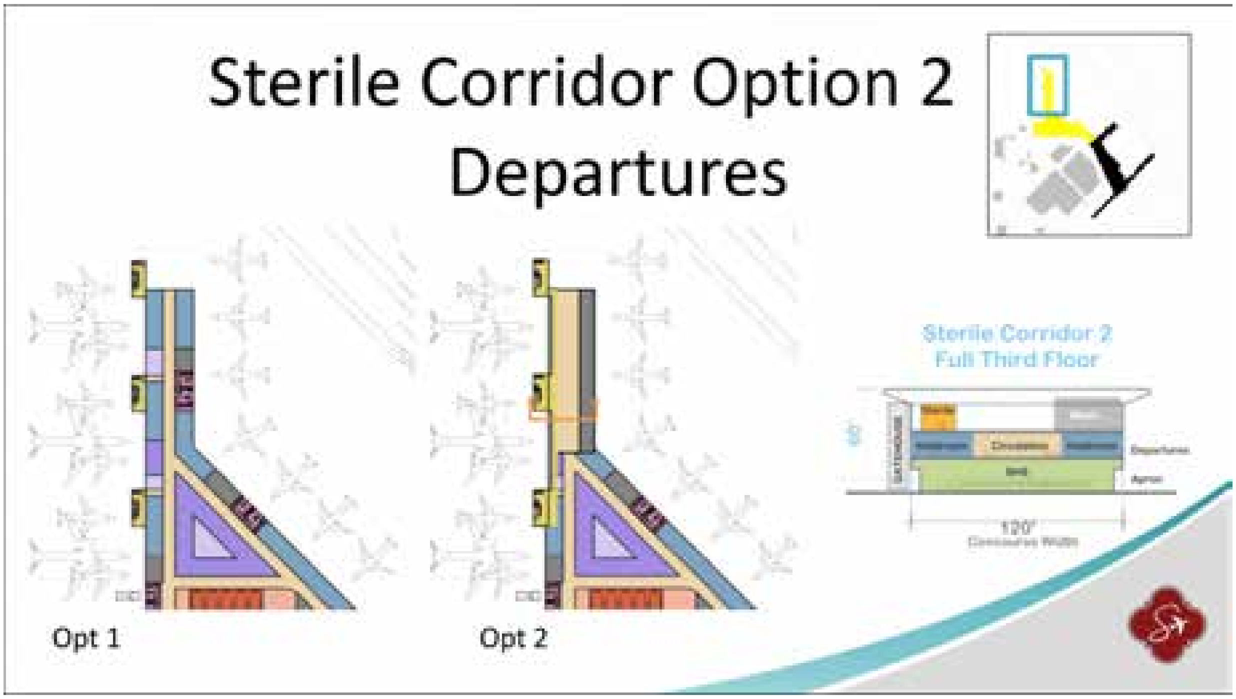


Source: Corgan

Figure 43 Sterile Corridor Option Studies

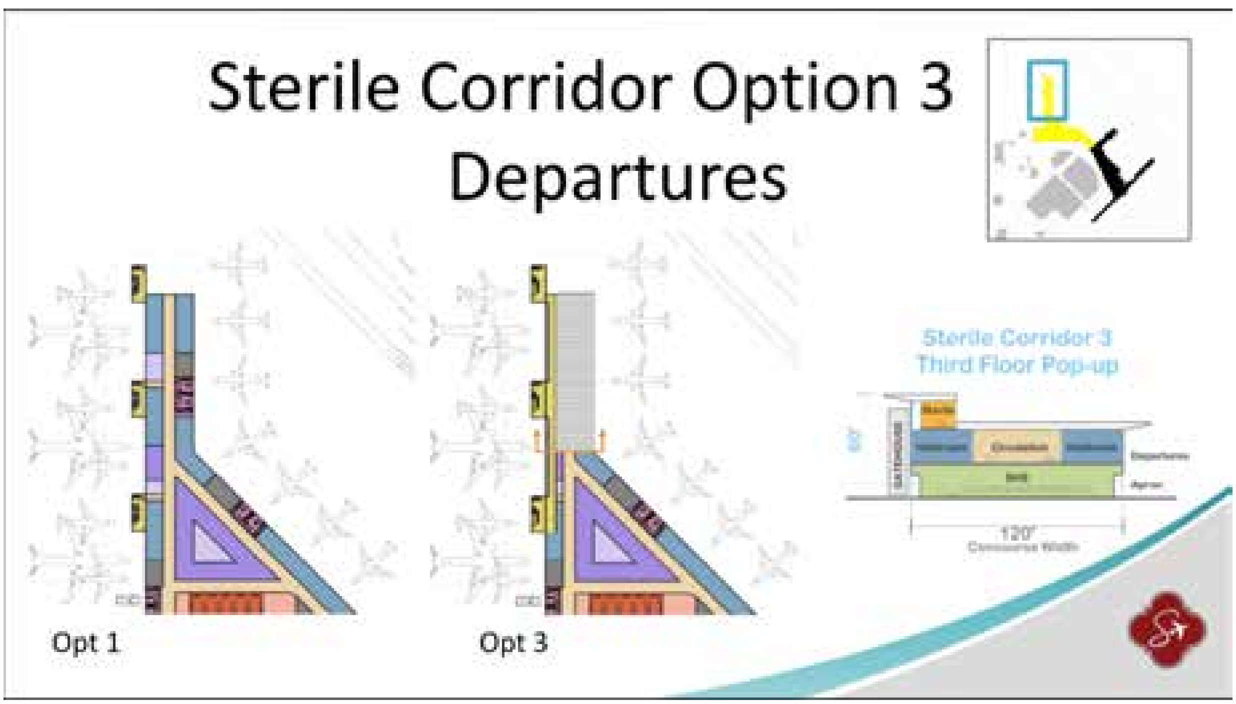
Source: Corgan

Figure 44 Sterile Corridor Option Studies



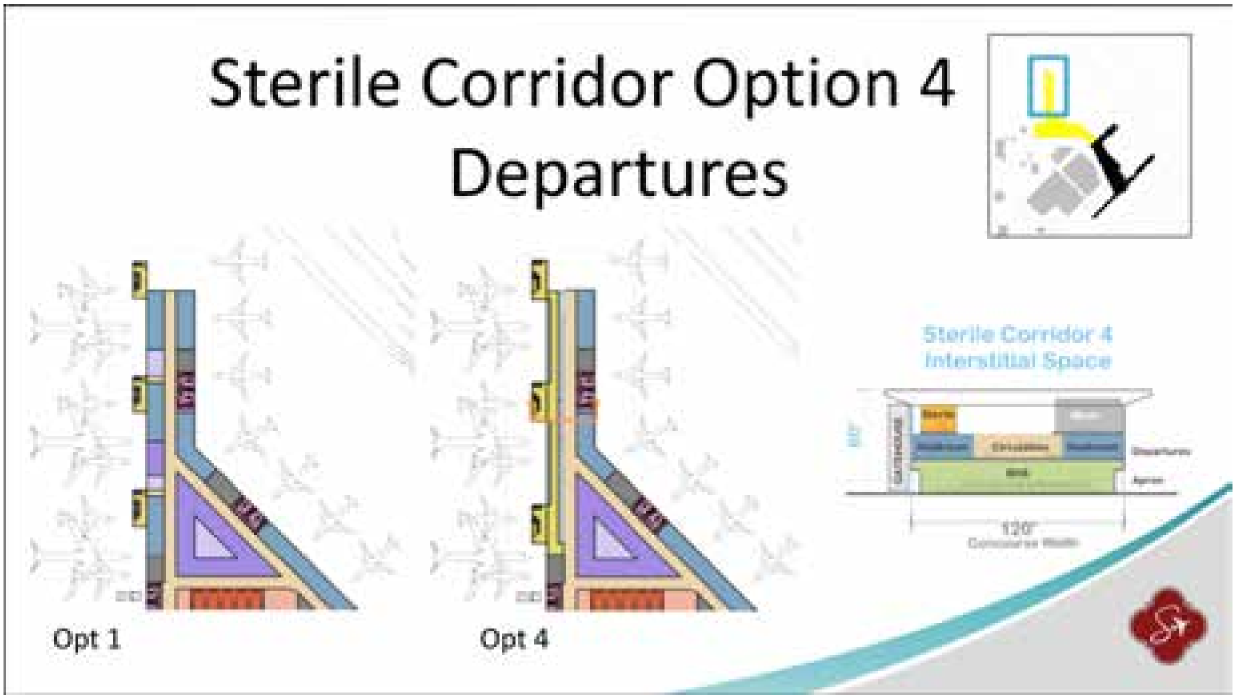
Source: Corgan

Figure 45 Sterile Corridor Option Studies



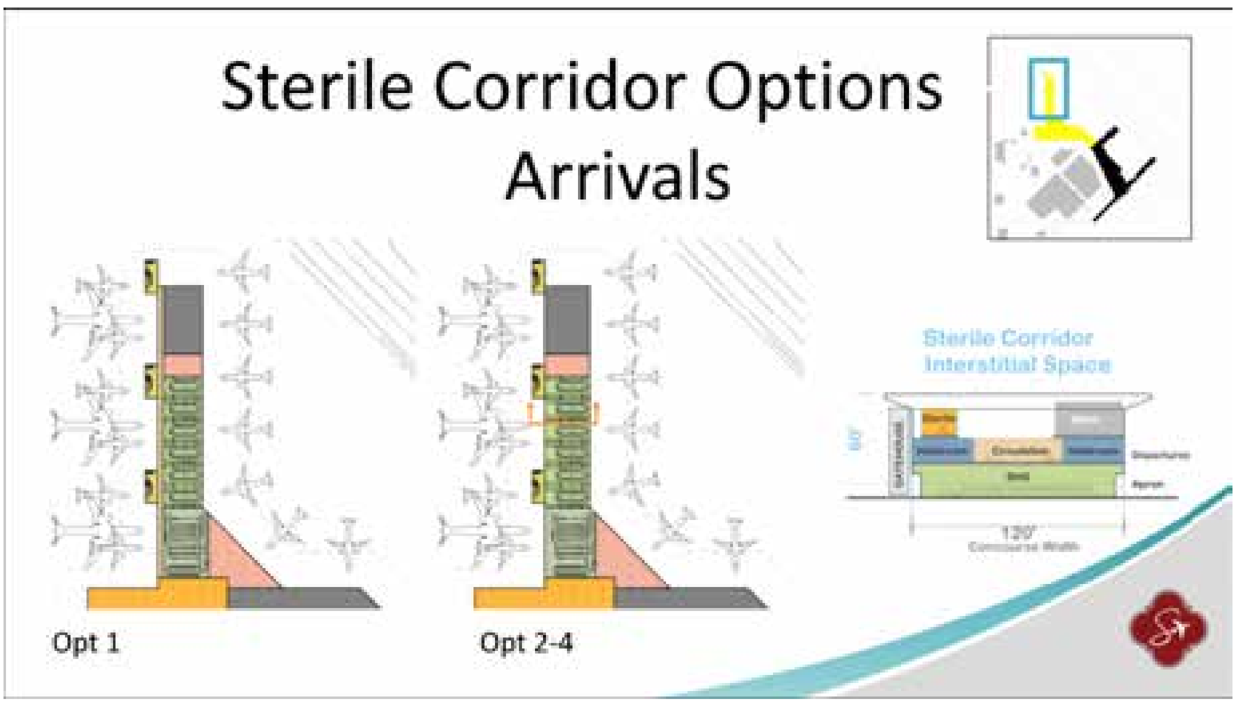
Source: Corgan

Figure 46 Sterile Corridor Option Studies



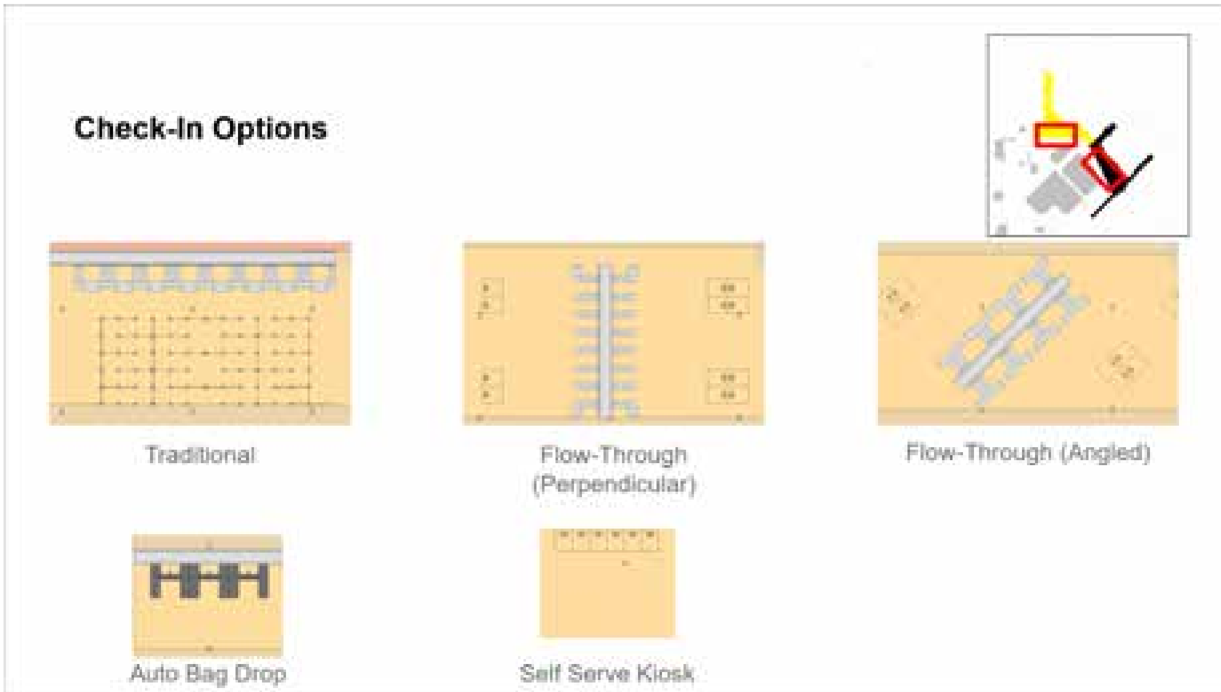
Source: Corgan

Figure 47 Sterile Corridor Option Studies



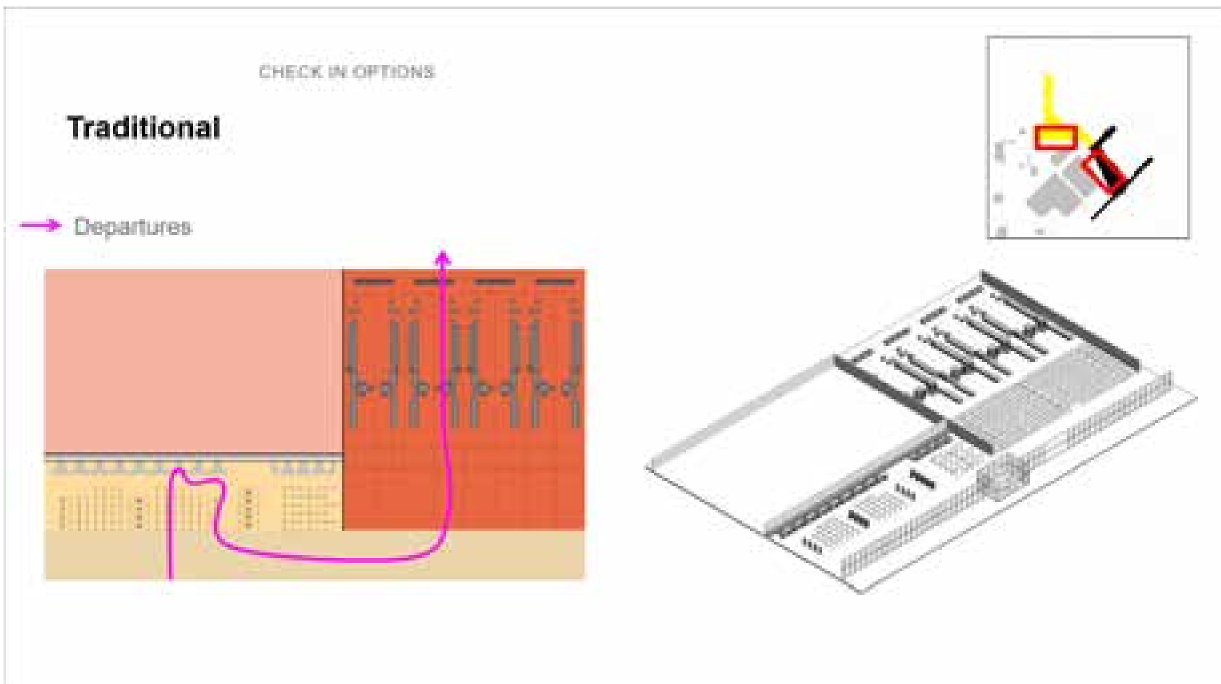
Source: Corgan

Figure 48 Check-in Options



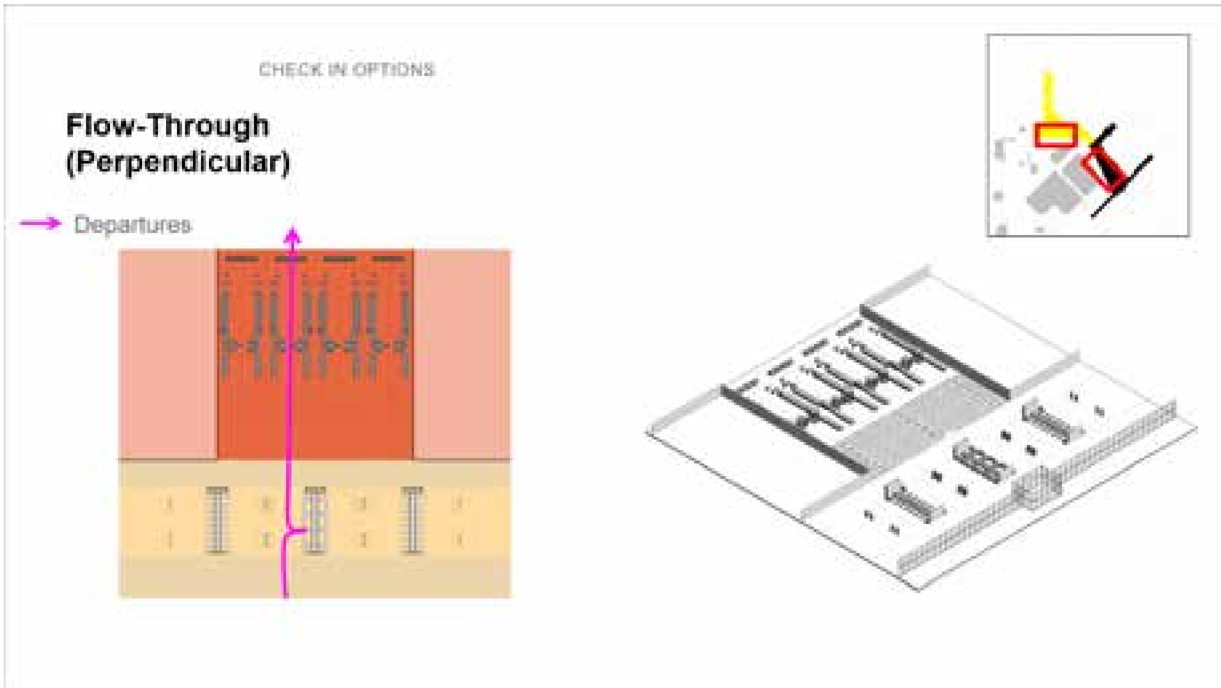
Source: Corgan

Figure 49 Check-in Options



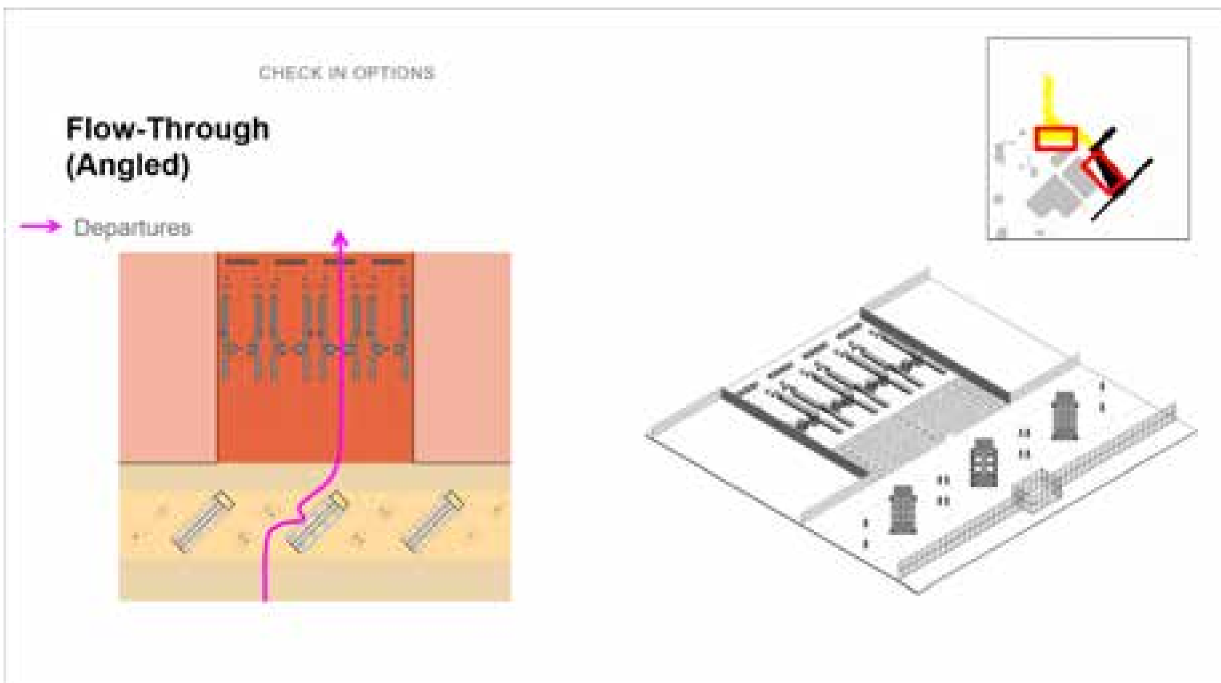
Source: Corgan

Figure 50 Check-in Options



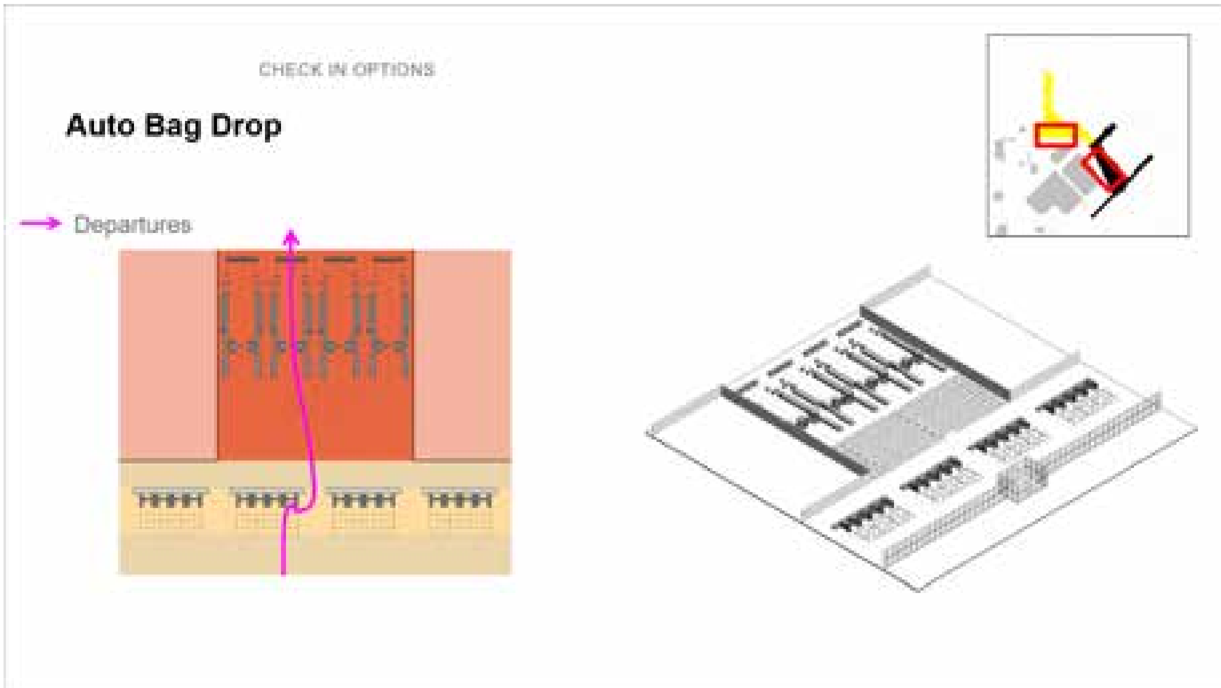
Source: Corgan

Figure 51 Check-in Options



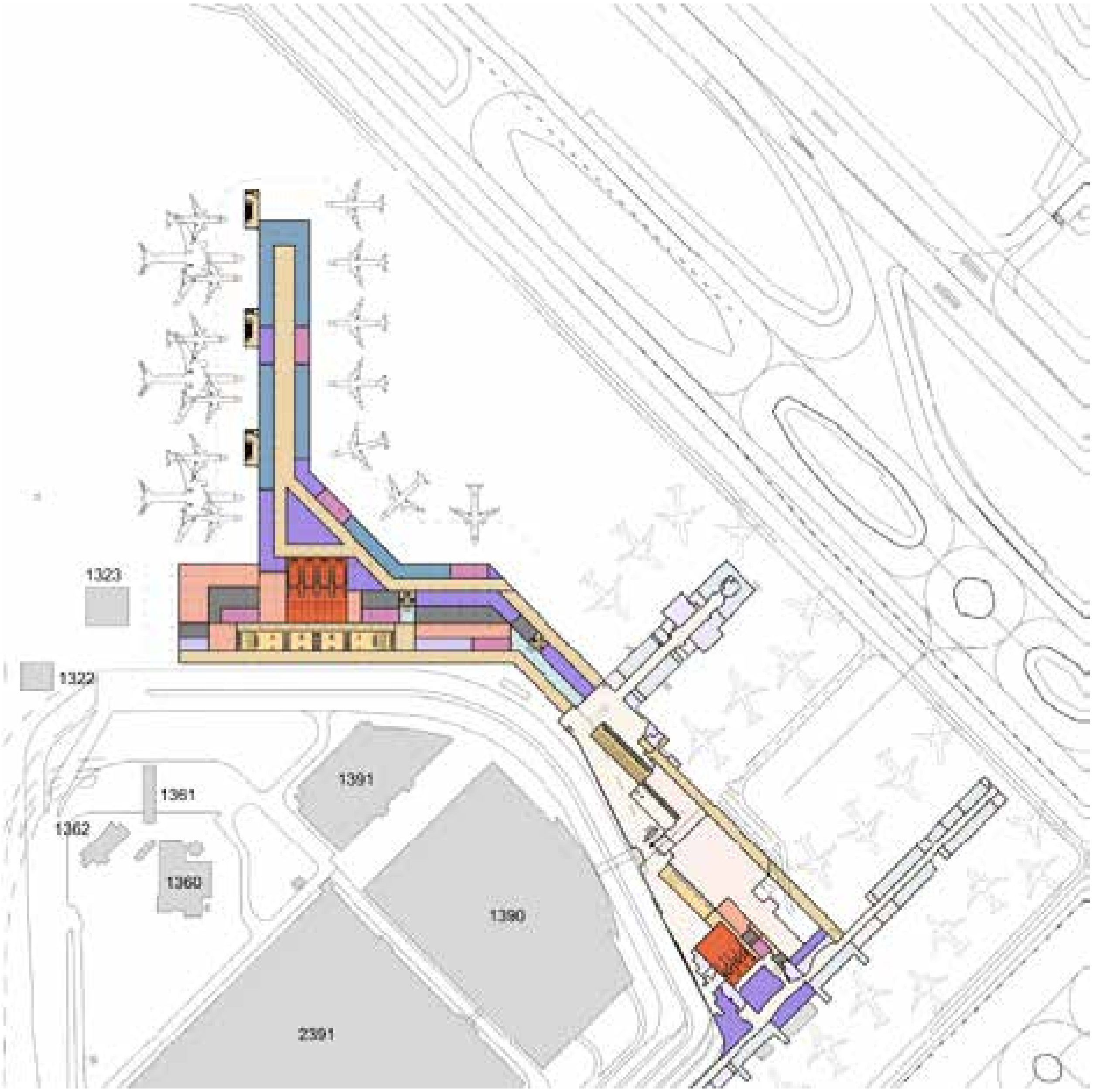
Source: Corgan

Figure 52 Check-in Options



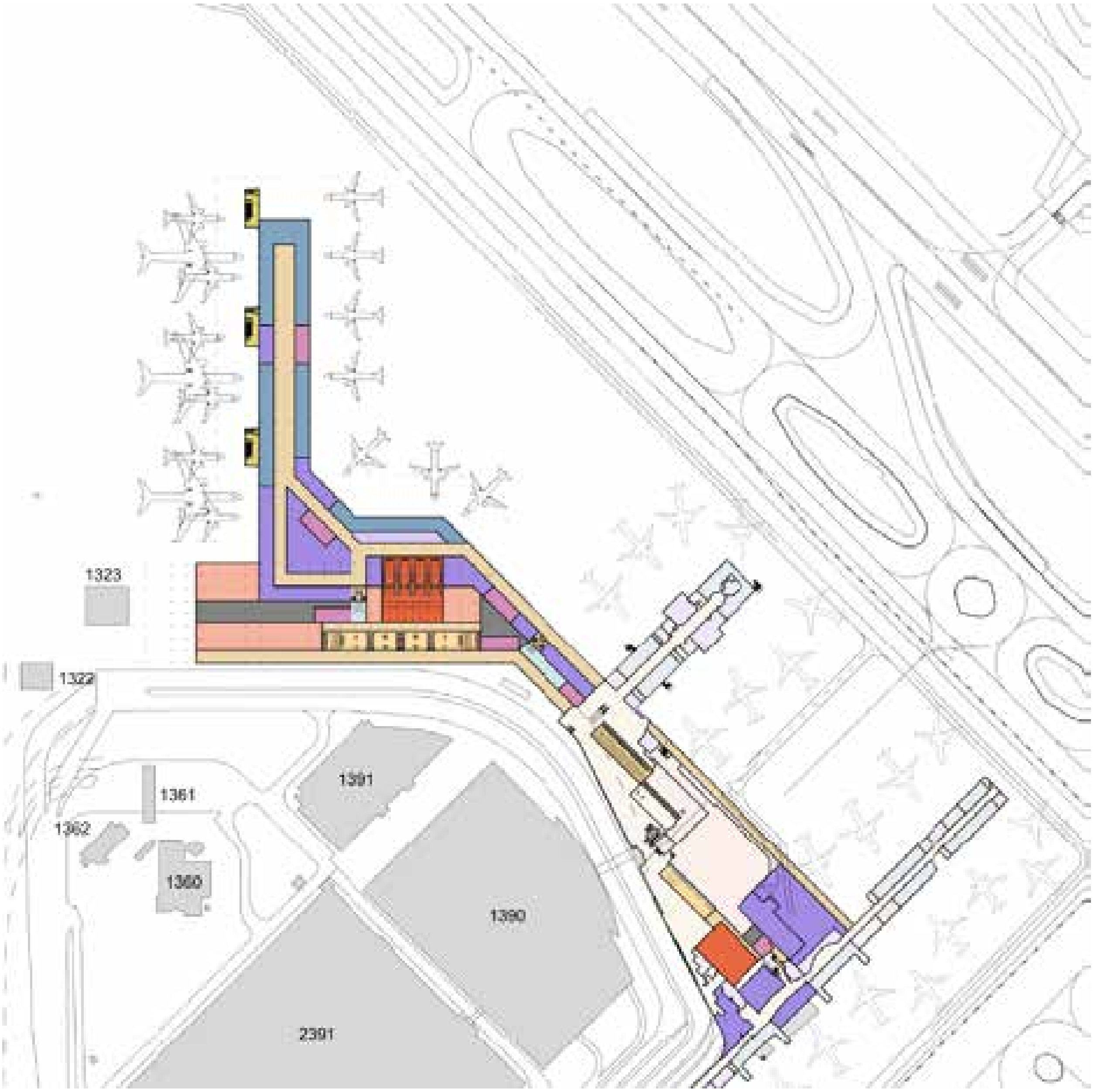
Source: Corgan

Figure 53: Check-in Layout Studies



Source: Corgan

Figure 54: Check-in Layout Studies



Source: Corgan

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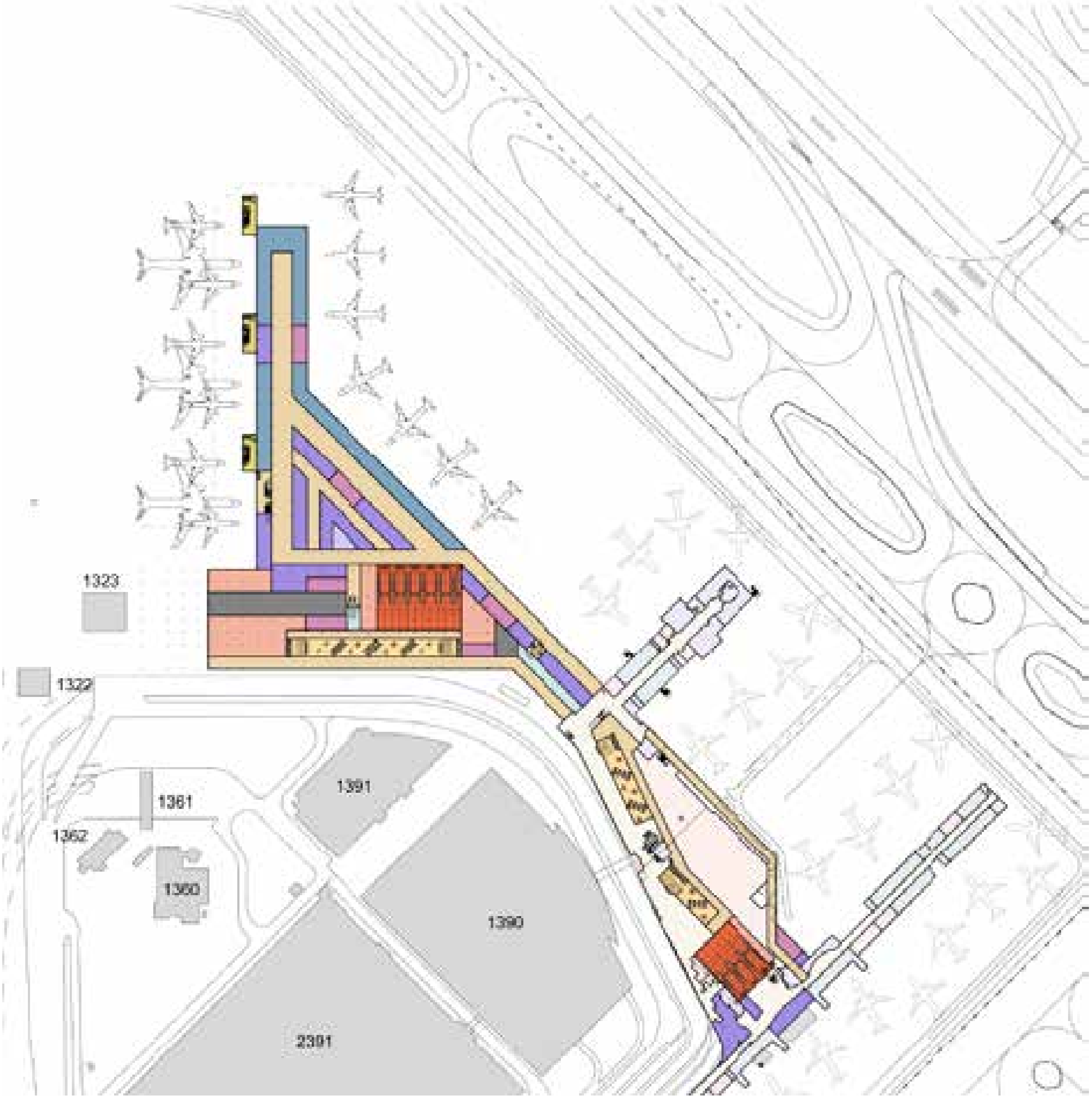
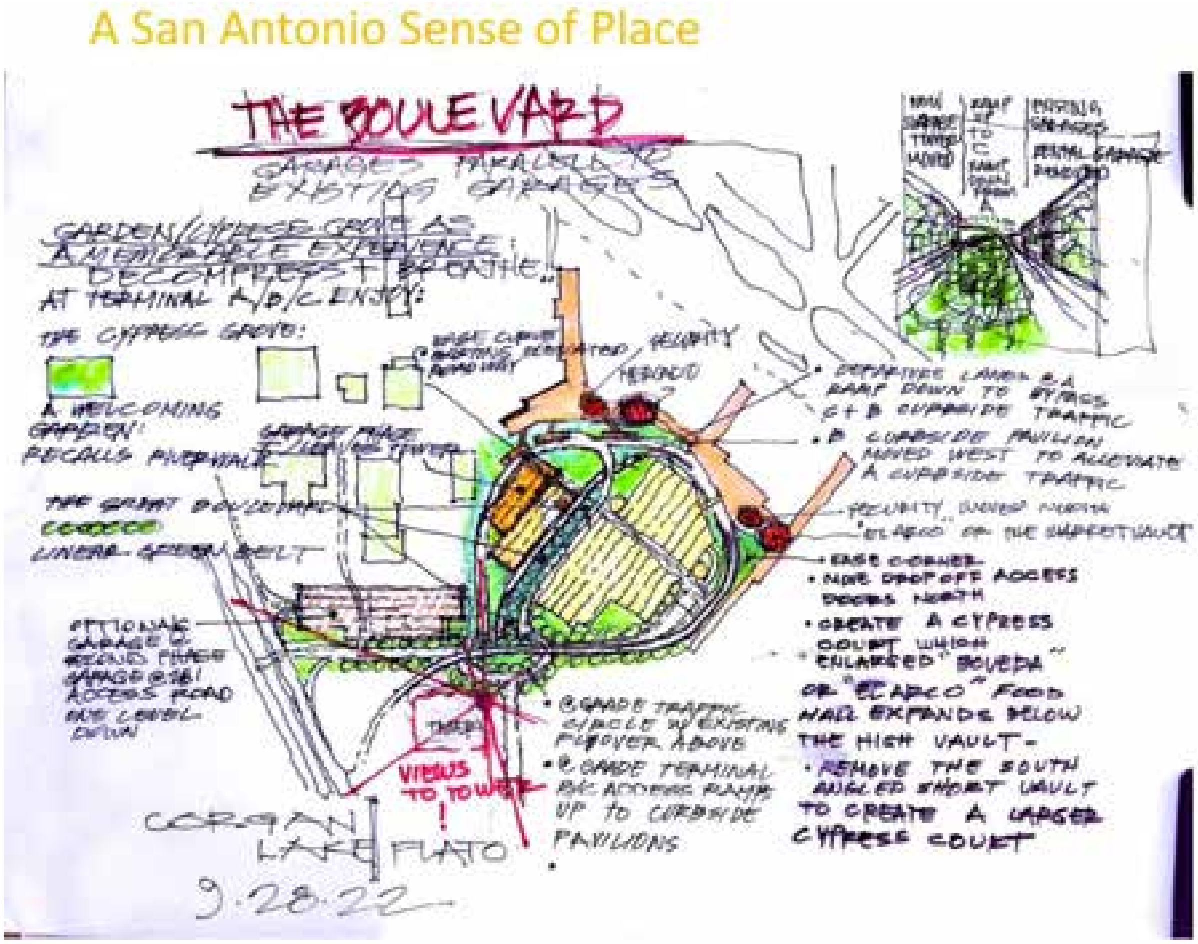
Figure 55: Check-in Layout Studies



Source: Corgan

Figure 56 New Terminal Concept Design 1



Source: Lake Flato

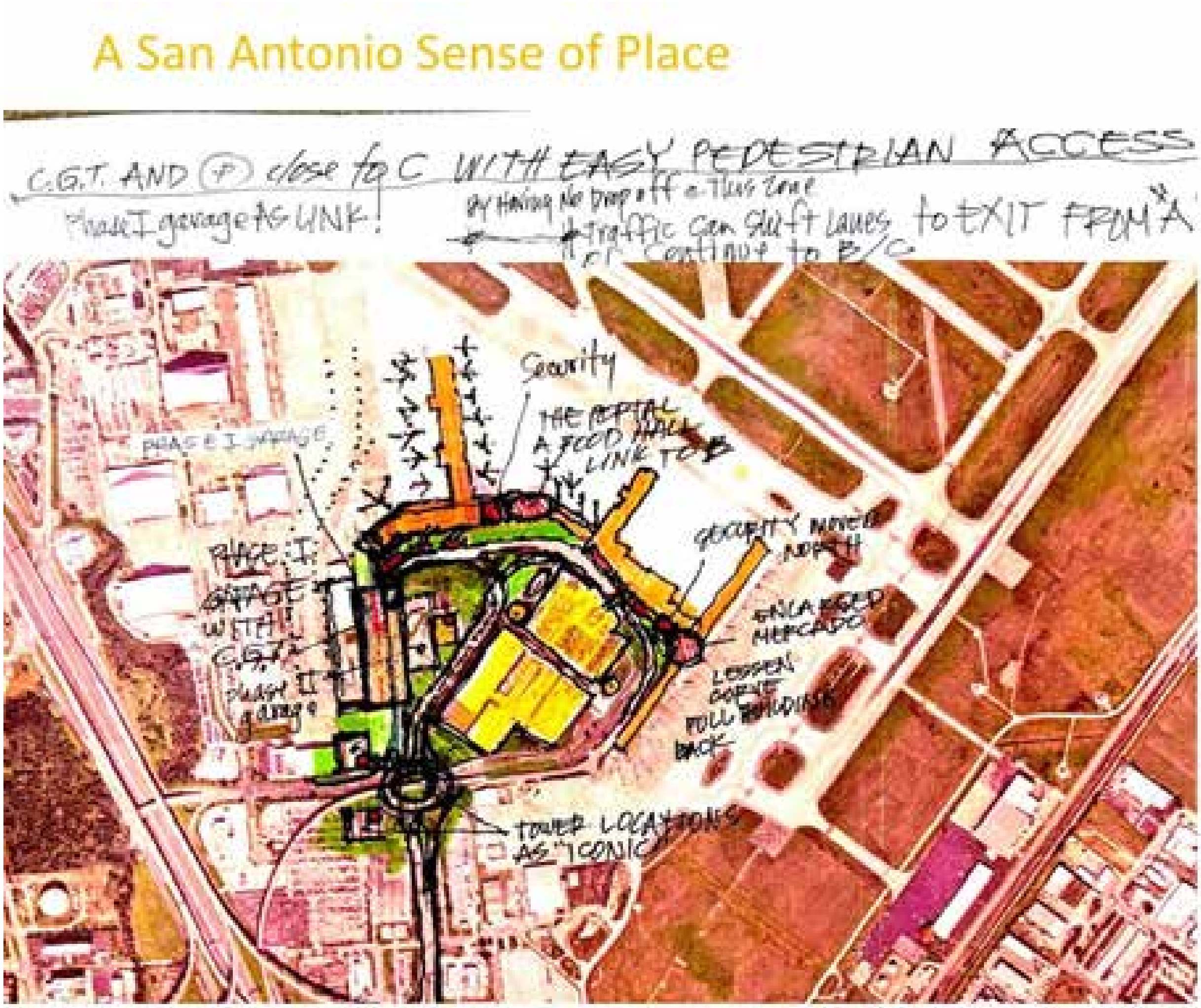
Figure 57 New Terminal Concept Design 2

Source: Lake Flato

Figure 58 New Terminal Concept Design 3

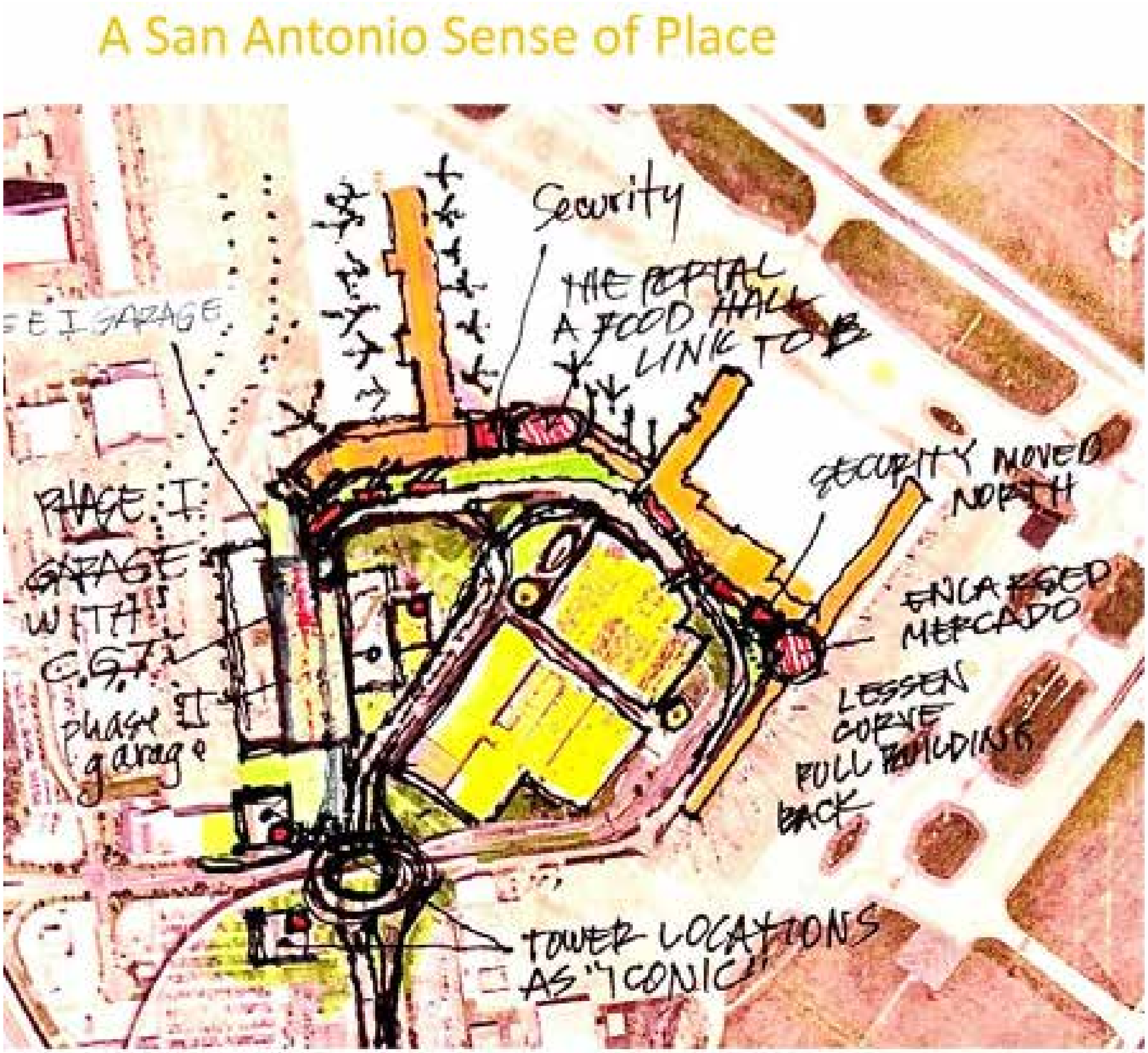
Source: Lake Flato

Figure 59 New Terminal Concept Design 4



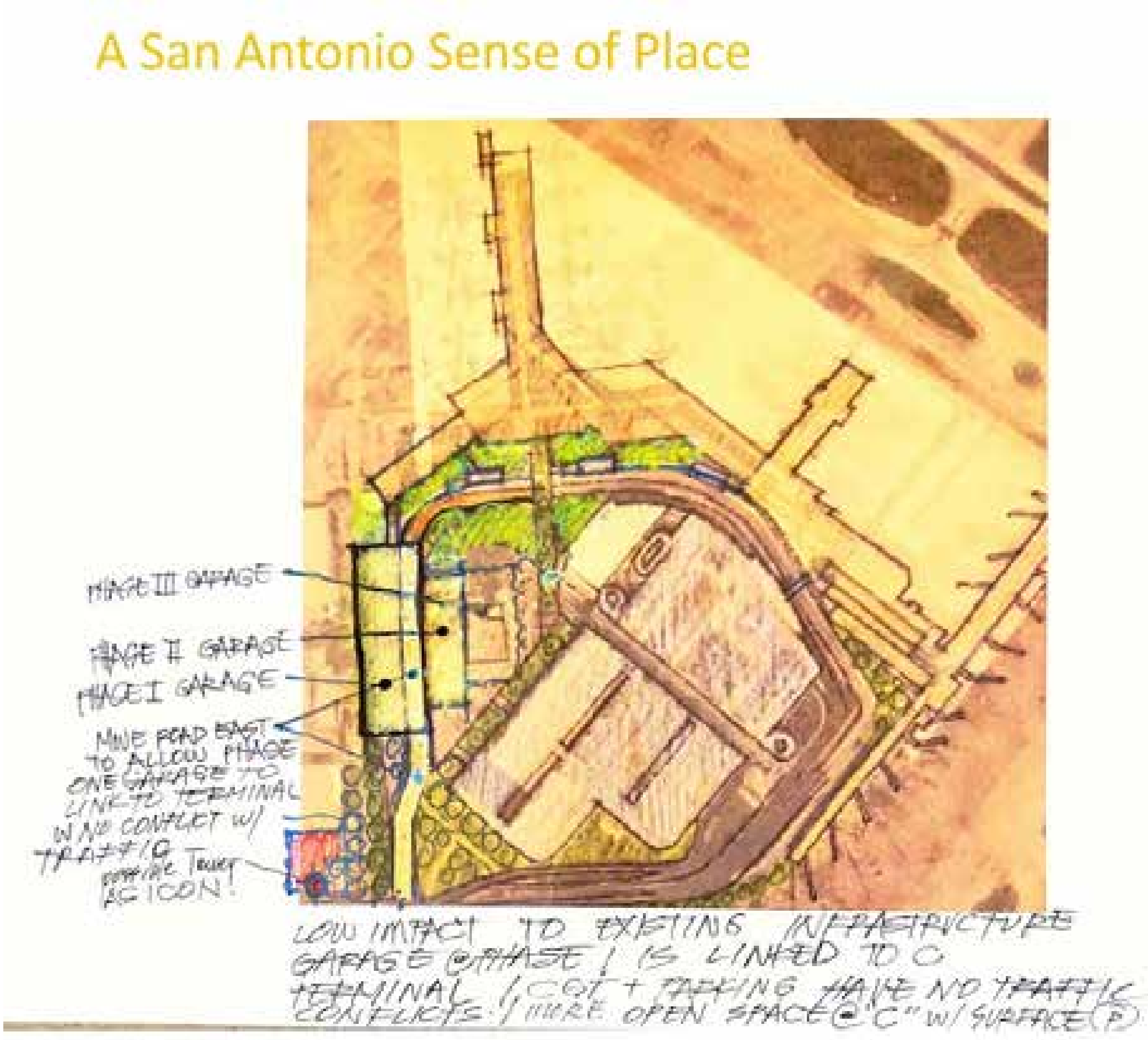
Source: Lake Flato

Figure 60 New Terminal Concept Design 5



Source: Lake Flato

Figure 61 New Terminal Concept Design 6



Source: Lake Flato

Figure 62 New Terminal Concept Design 7

Source: Lake Flato

Figure 63 New Terminal Concept Design 8

Source: Lake Flato

Figure 64 Approach to Terminal A

Source: Lake Flato

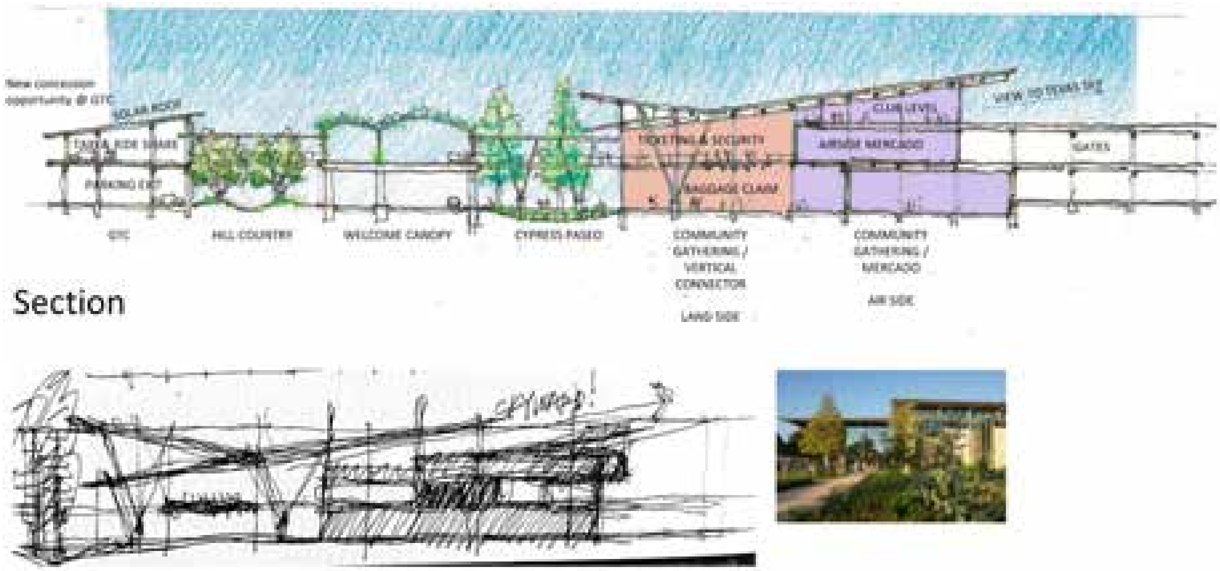
Figure 65 Culture Art bridge & New Bypass Lane

Source: Lake Flato

Figure 66 Arrival Portal / Welcome Canopy

Source: Lake Flato

Figure 67 New Terminal Cross Section



Source: Lake Flato

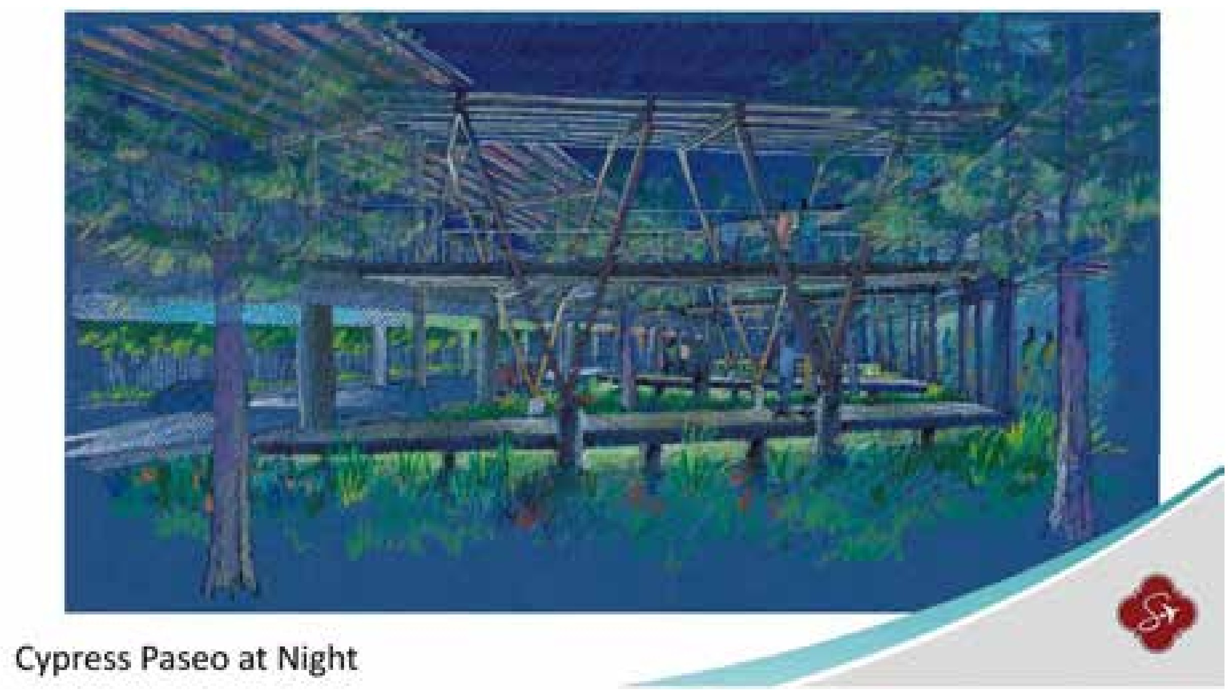
Figure 68 Cypress Paseo

Source: Lake Flato

Figure 69 Vertical Connector (T Community Neighborhood)

Source: Lake Flato

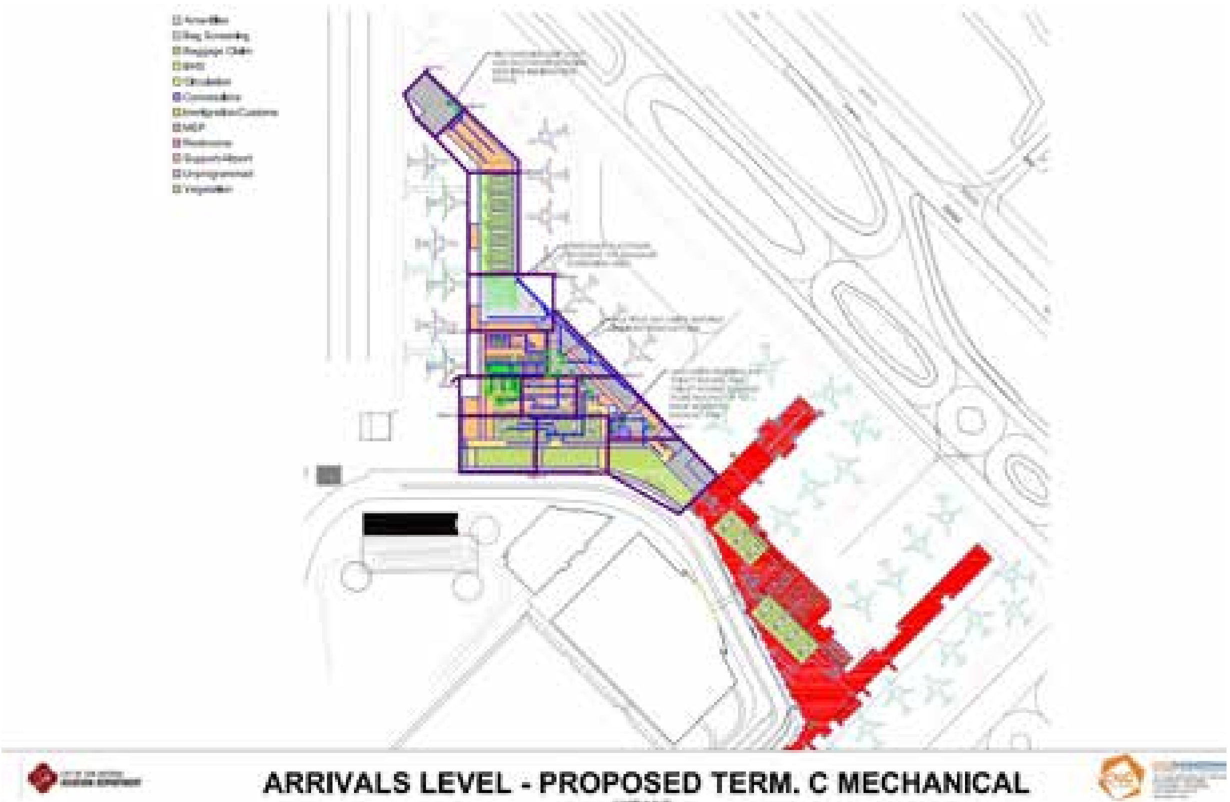
Figure 70 Cypress Paseo at Night



Source: Lake Flato

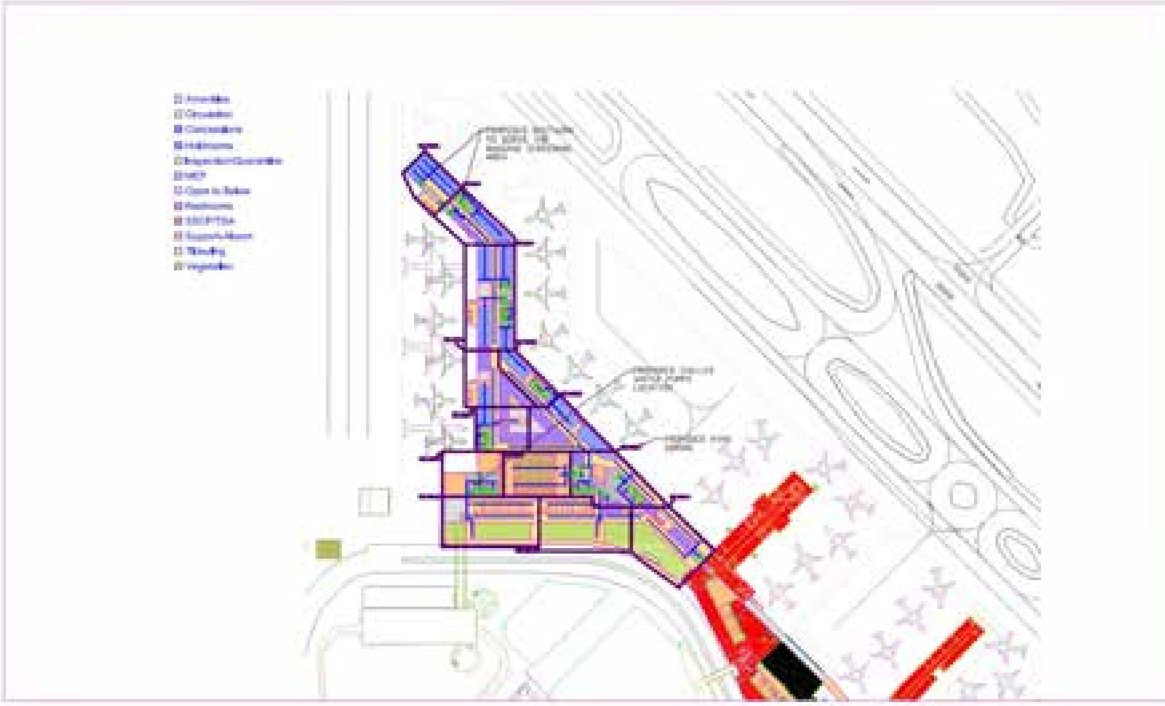
HVAC: The following reference drawings are provided to improve clarities for the figures included in the PDDS.

Figure 71 Arrivals level proposed HVAC units in mechanical rooms and duct routing



Source: CNG

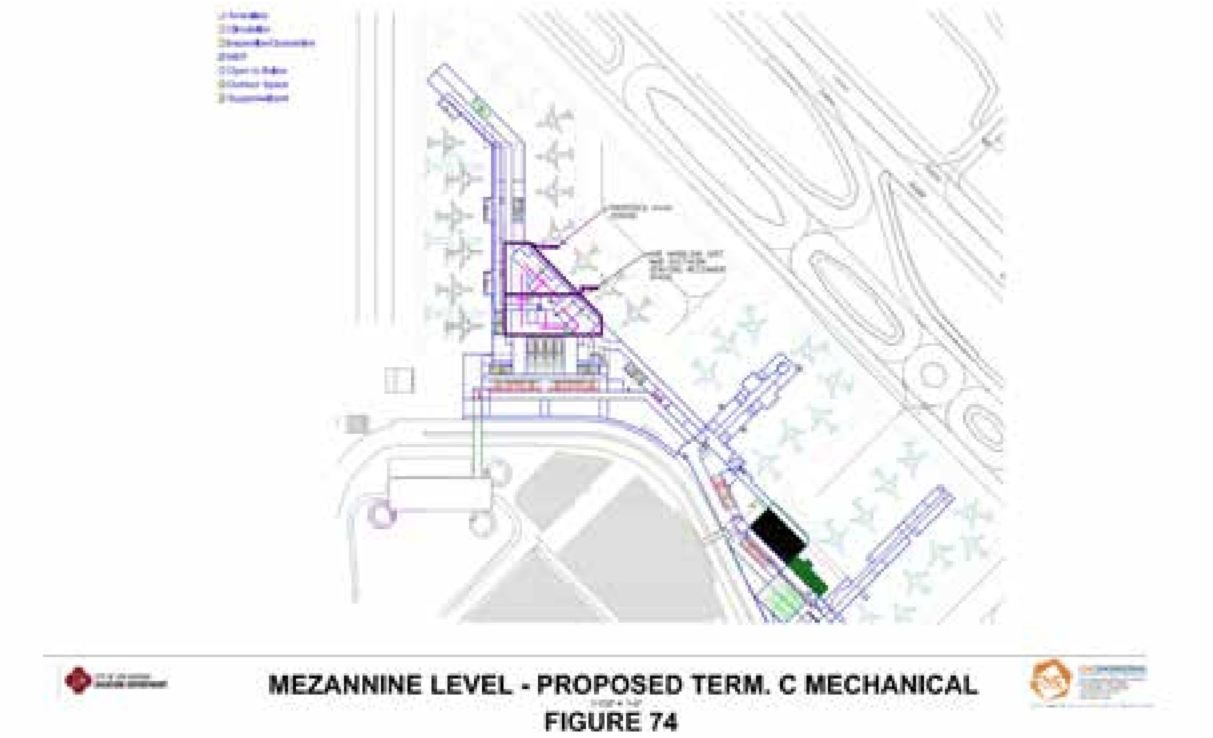
Figure 72 Departures level proposed HVAC units



DEPARTURES LEVEL - PROPOSED TERM. C MECHANICAL
FIGURE 73

Source: CNG

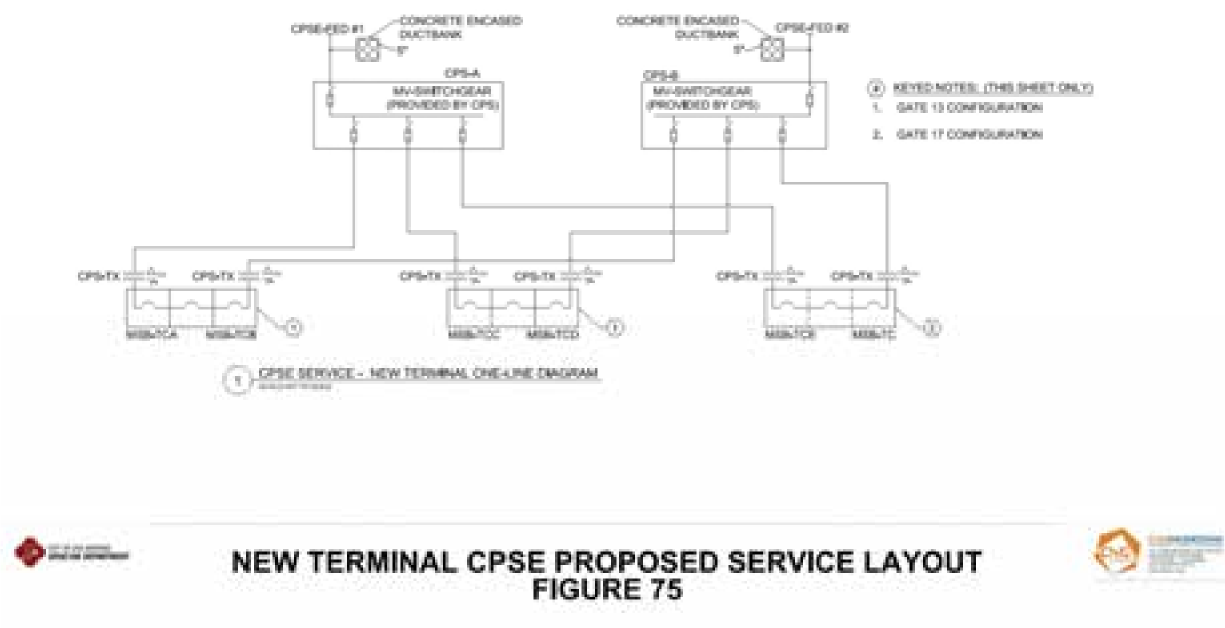
Figure 73 Mezzanine level proposed HVAC unit locations



Source: CNG

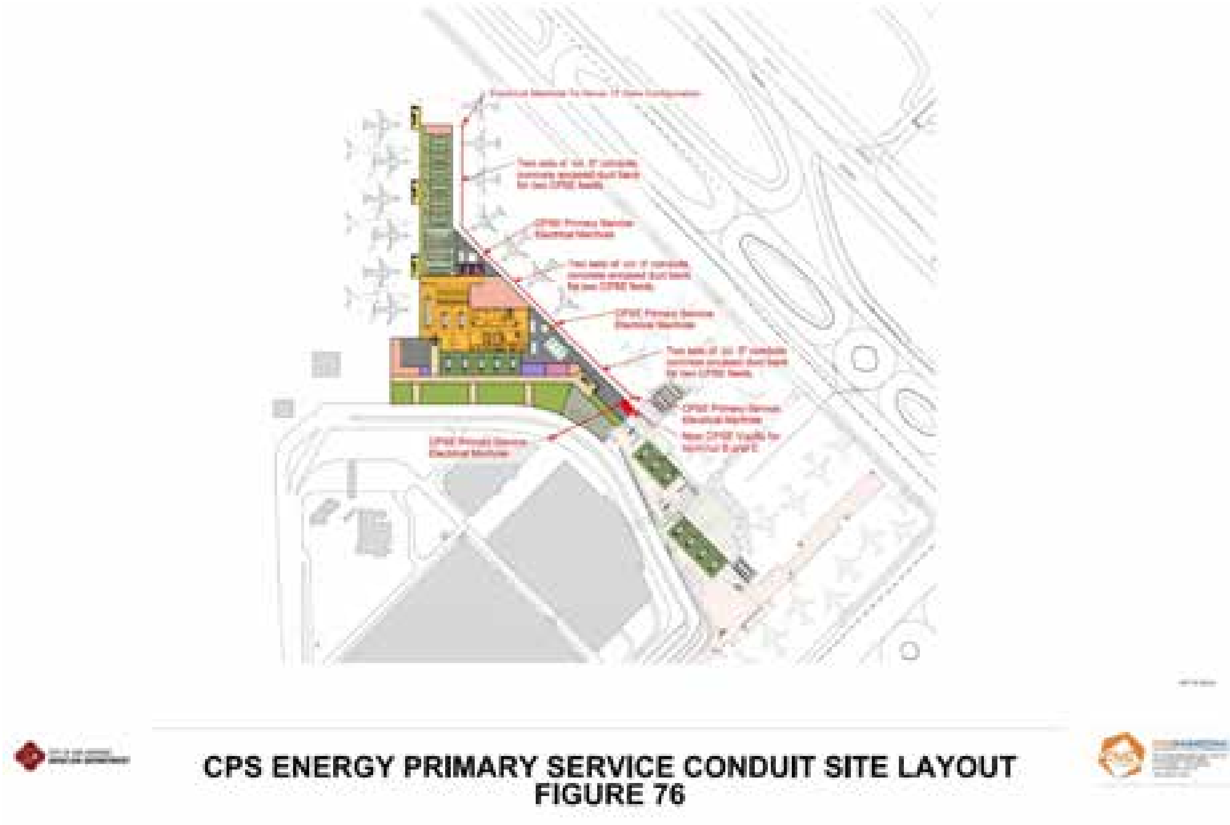
Electrical: The following reference drawings are provided to improve clarity for the figures included in the PDDS.

Figure 74 New Terminal CPSE Service One line diagram



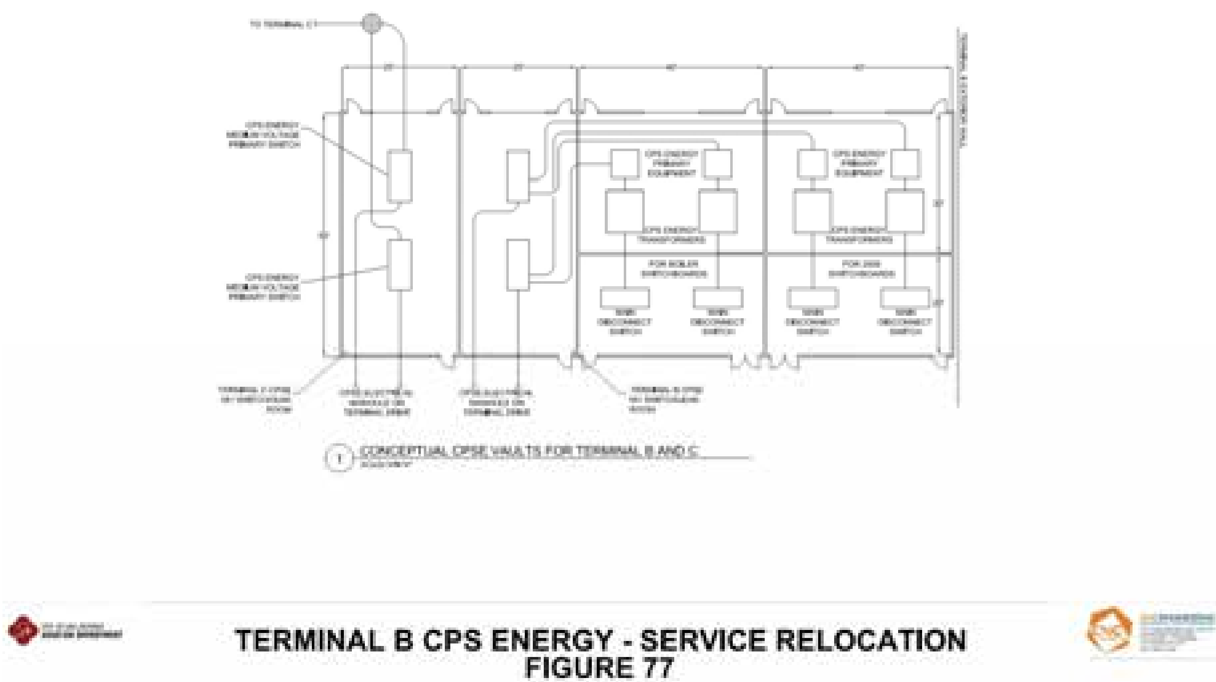
Source: CNG

Figure 75 Conceptual CPSE service site utilities layout



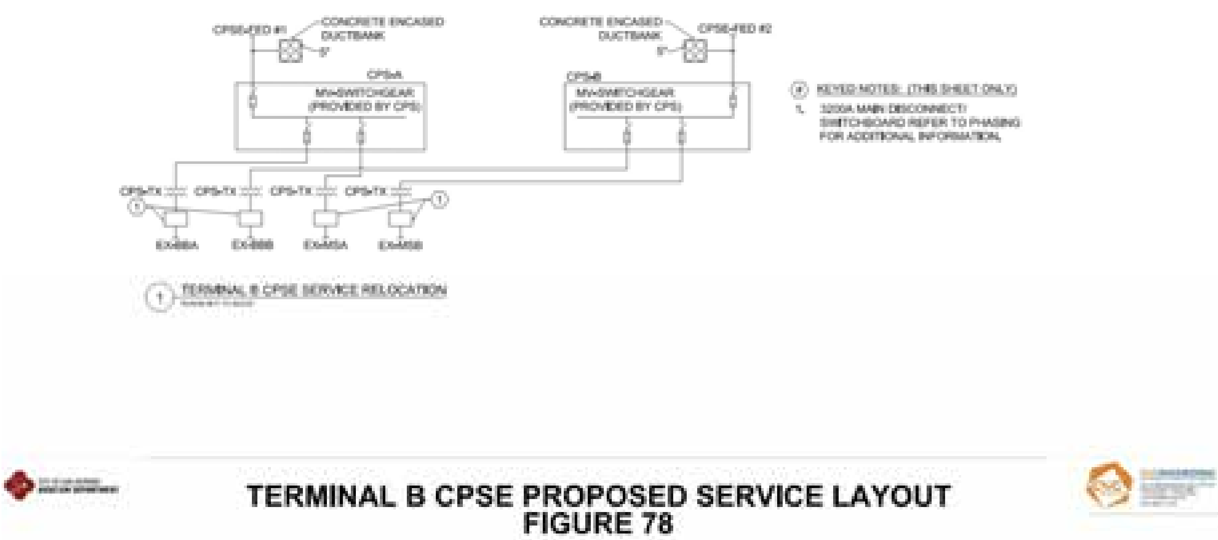
Source: CNG

Figure 76 Conceptual CPSE vaults for Terminal B and the New Terminal



Source: CNG

Figure 77 Terminal B CPSE service location

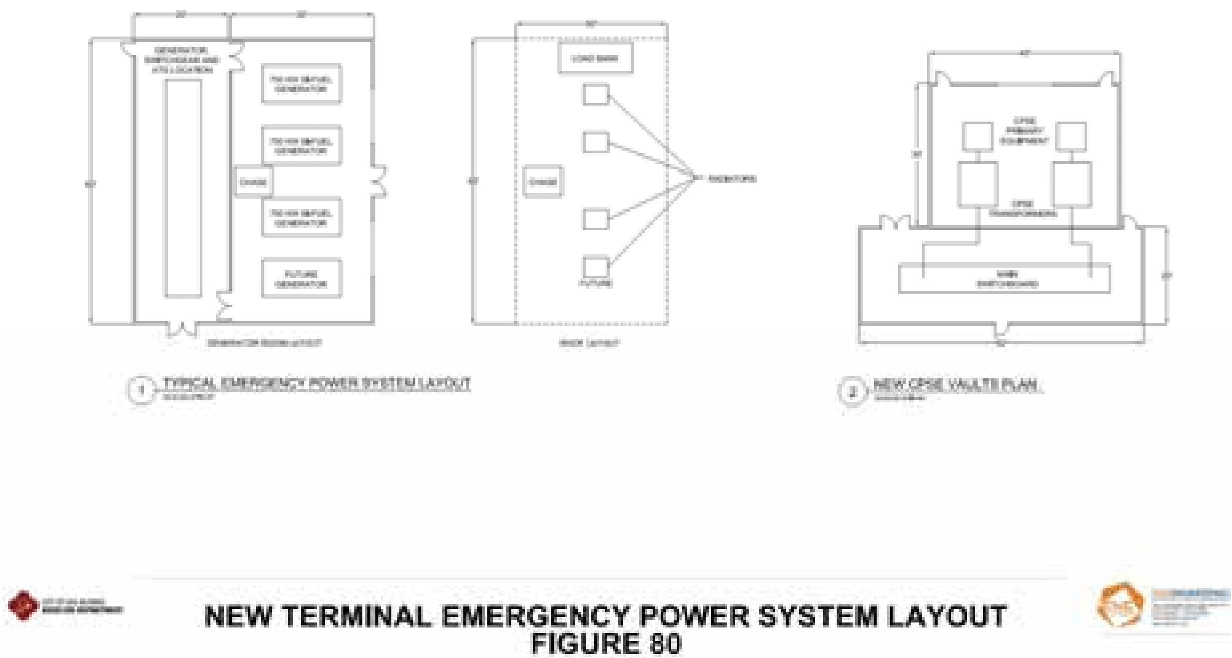


Source: CNG

Figure 78 Typical New Terminal CPS vault and secondary 480V/277

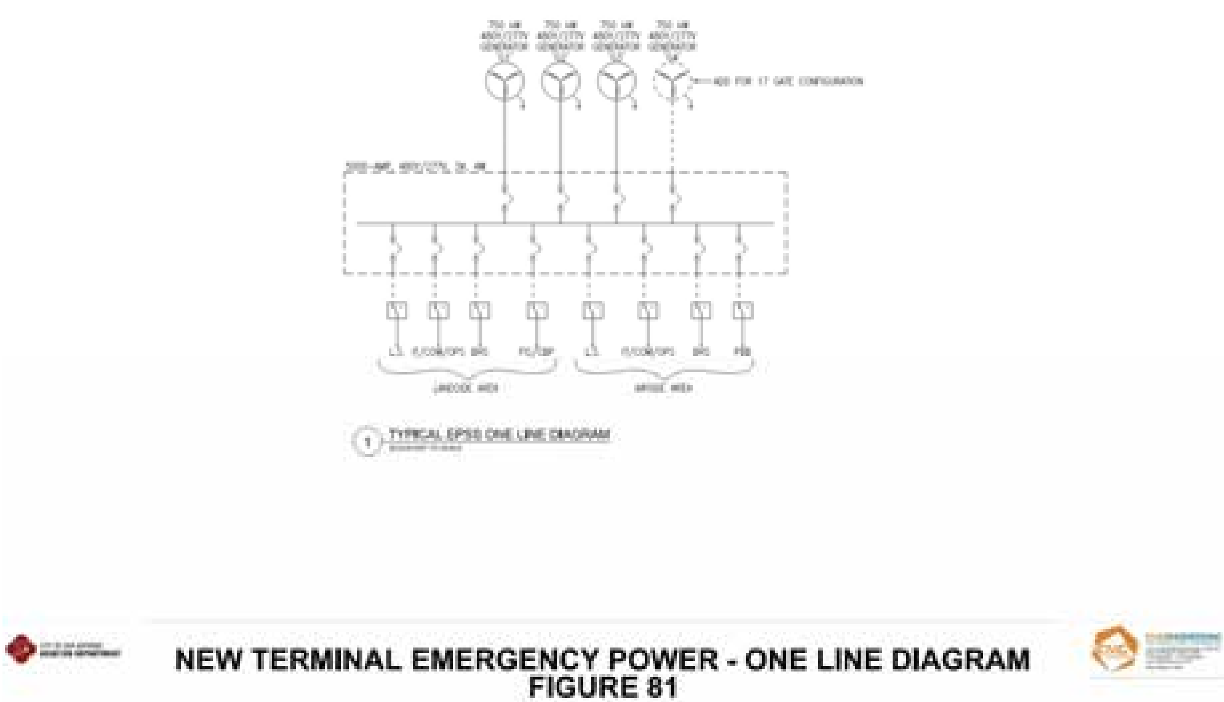
Source: CNG

Figure 79 Typical emergency power system layout



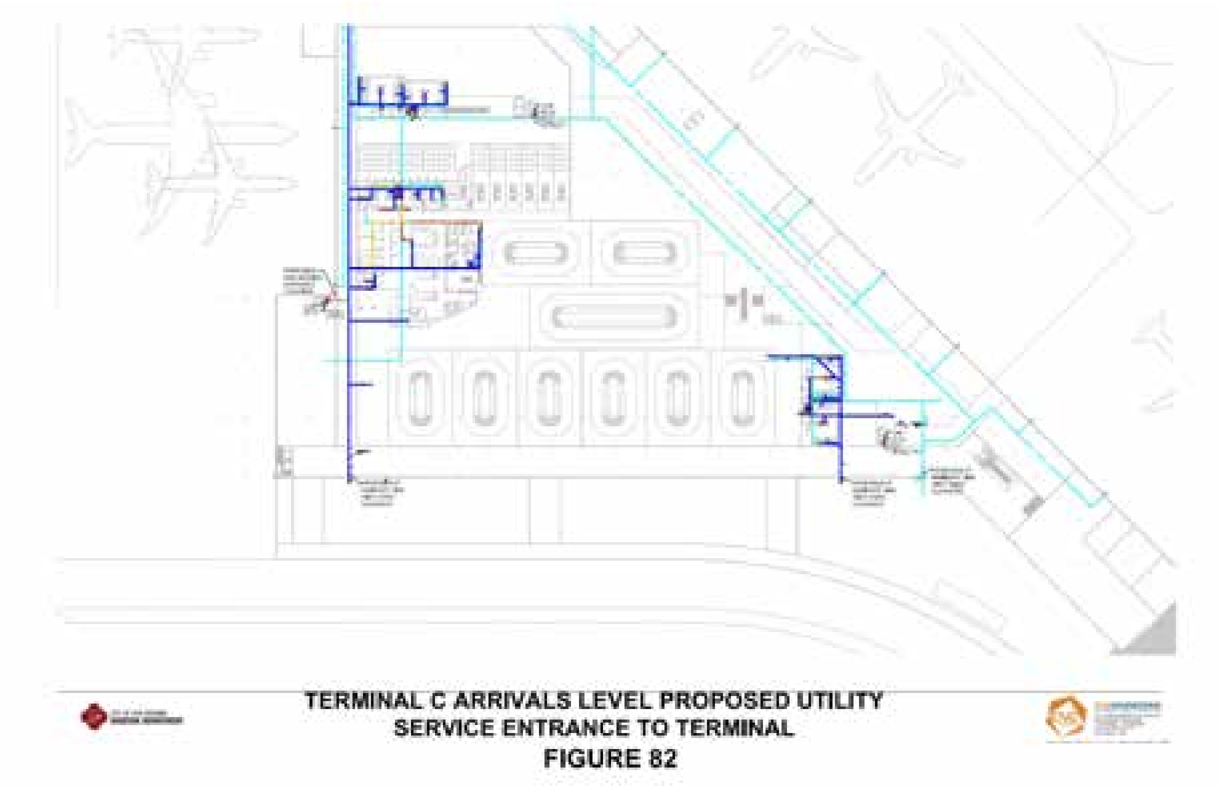
Source: CNG

Figure 80 Typical EPS one line diagram



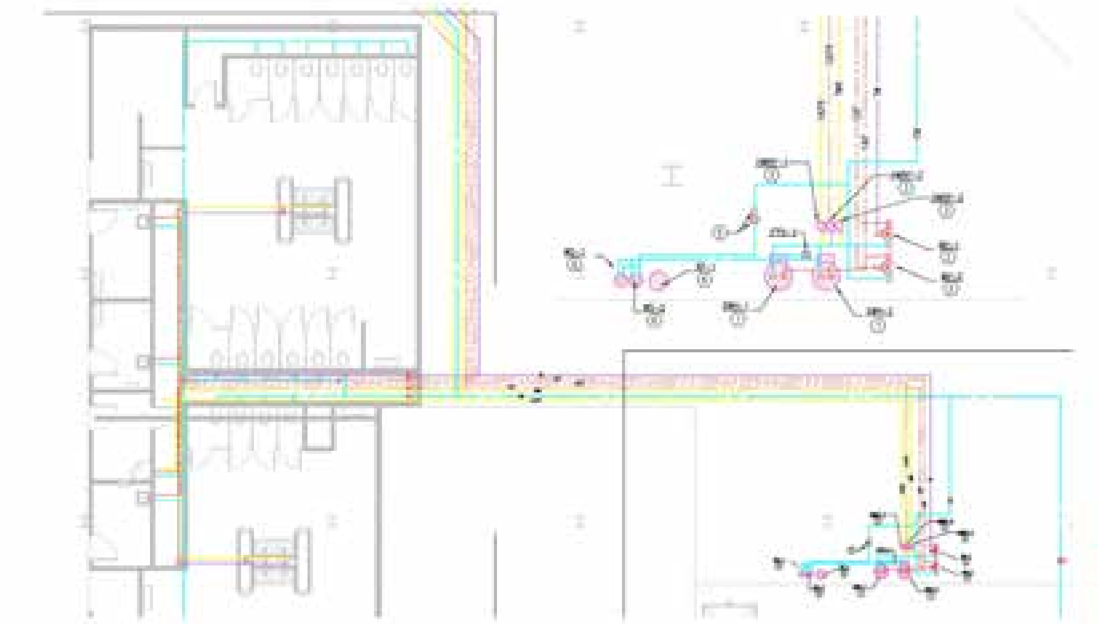
Source: CNG

Figure 81 Arrivals level proposed utility service entrance to terminal



Source: CNG

Figure 82 Proposed layout, Water Heaters, and Water Softener System



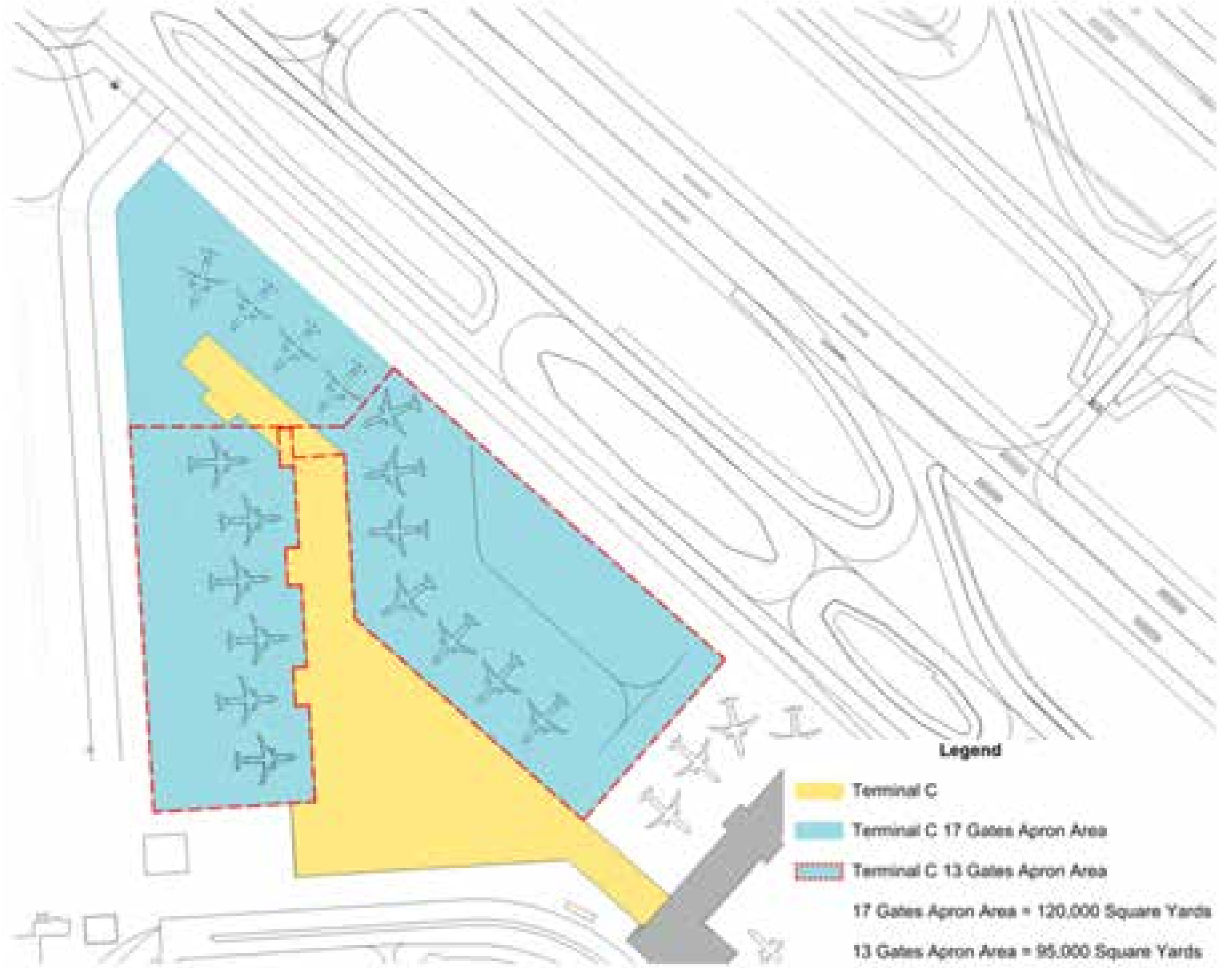
TERMINAL C ARRIVALS - RESTROOMS AND PROPOSED WATER HEATERS AND SOFTENER SYSTEMS - FIGURE 83

Source: CNG

Appendix H –Commercial Apron

H Commercial Apron

Figure 83 Commercial Apron Phasing

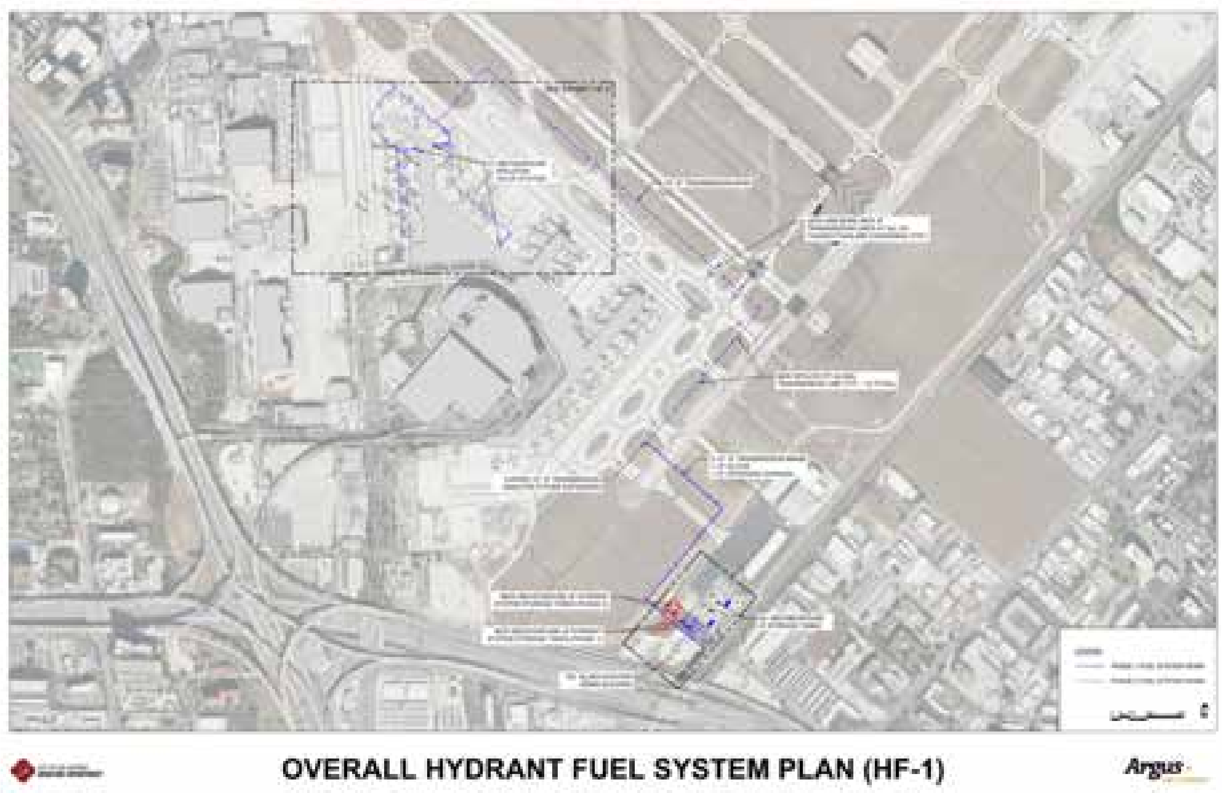


Source: Corgan

Appendix I – Fueling Storage & New Terminal Hydrant System

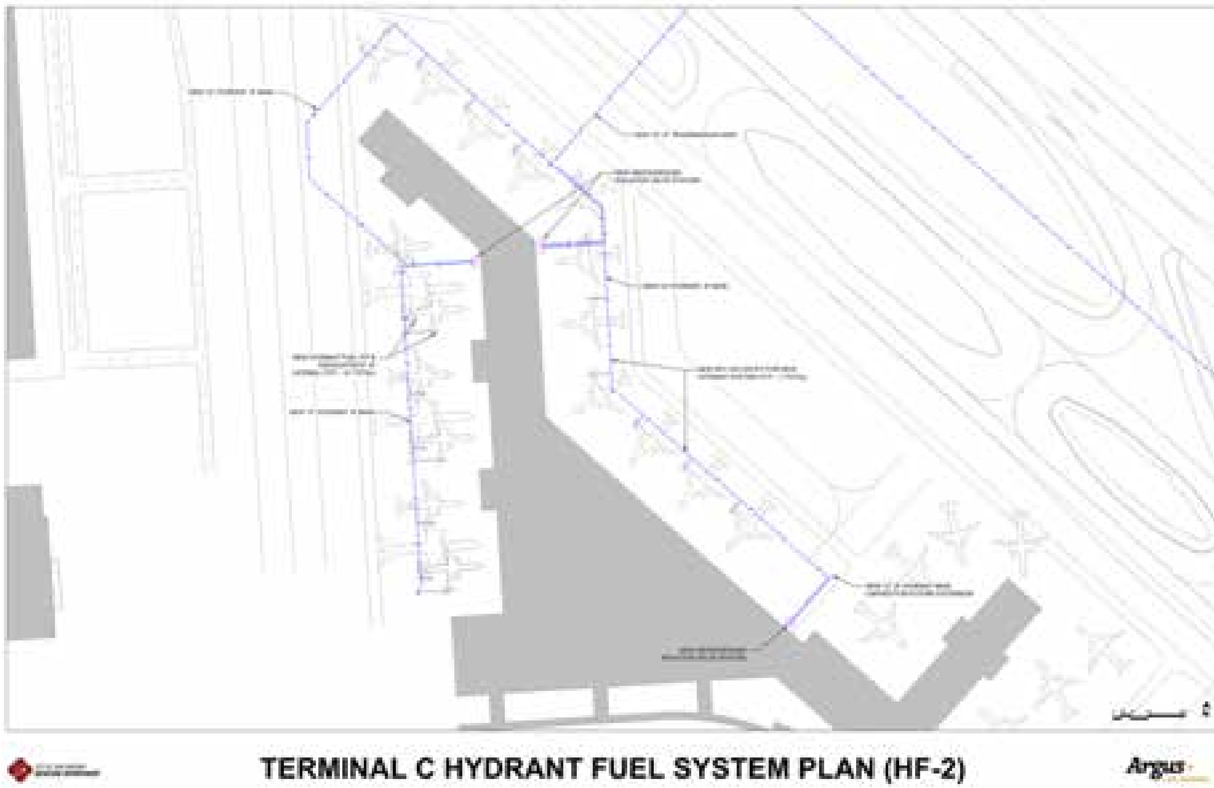
I Fueling Storage & New Terminal Hydrant System

Figure 84 Overall Hydrant Fuel System Plan



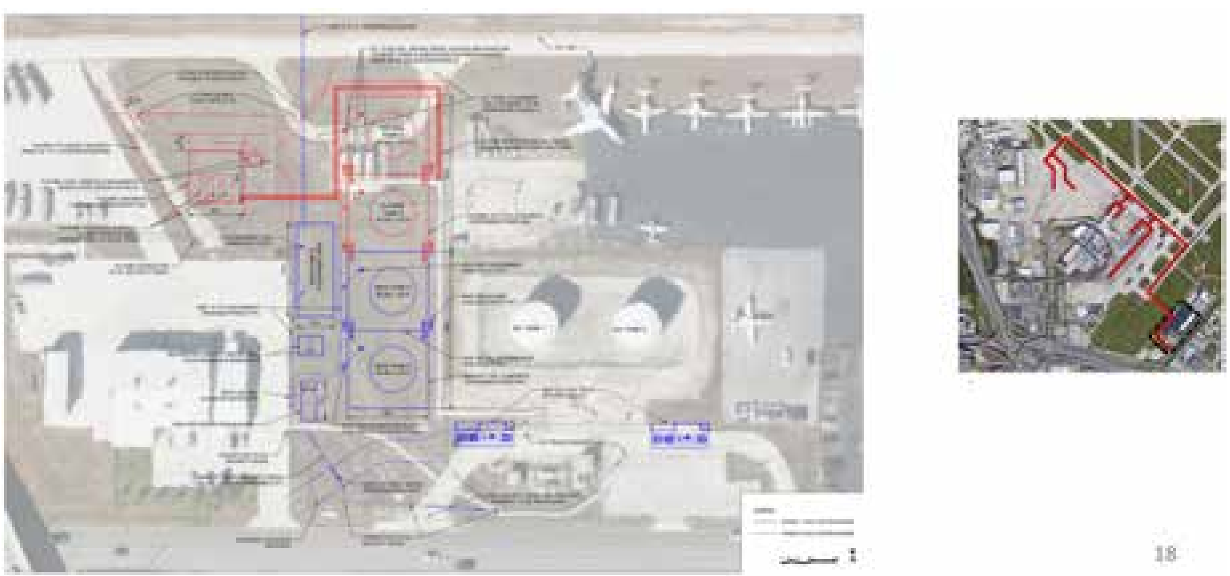
Source: Argus

Figure 85 Terminal Hydrant Fuel System Plan



Source: Argus

Figure 86 Fuel Storage Option



Source: Argus

Appendix J – Utility Corridor Relocation

J Utility Corridor Relocation

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Appendix K – CUP Upgrades and Electrical Upgrades

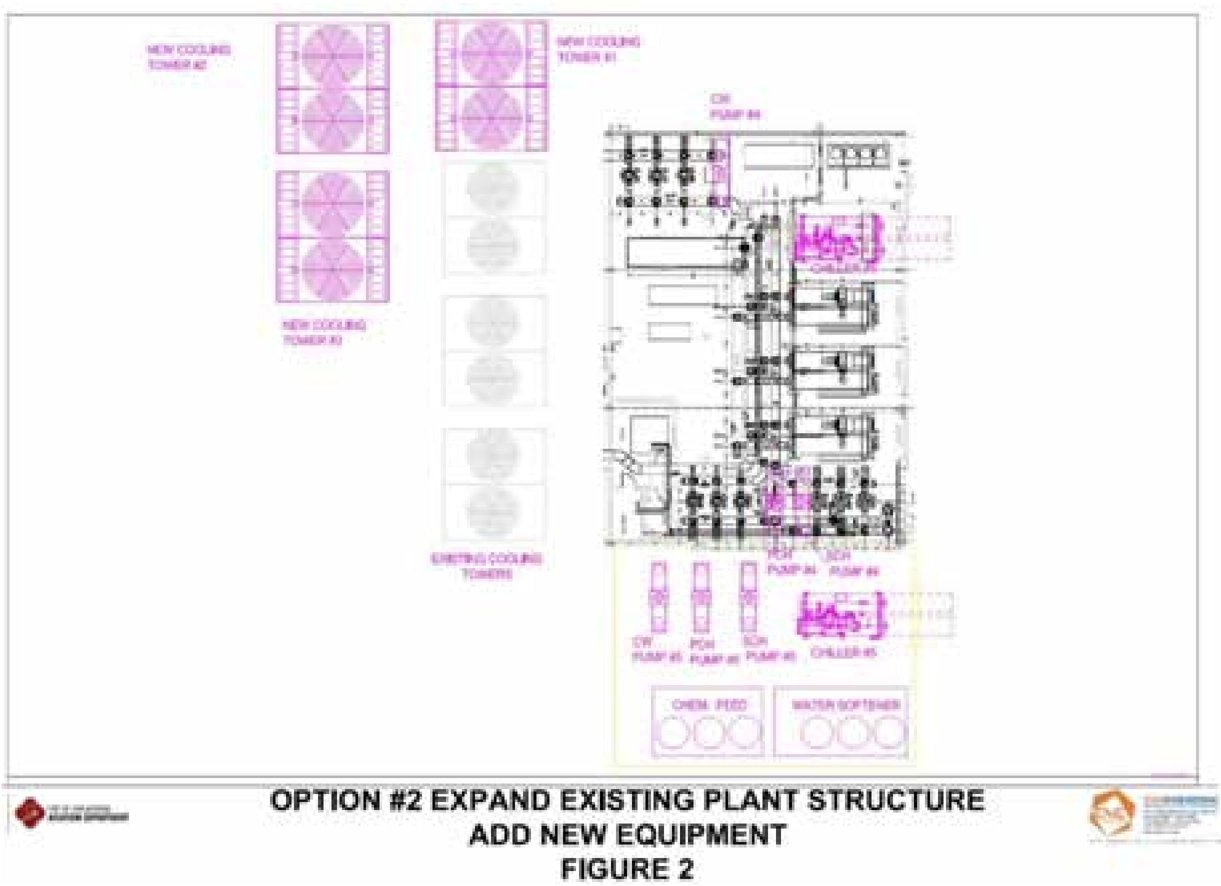
K CUP Upgrades and Electrical Upgrades

Figure 87 CUP Location

Source: Corgan

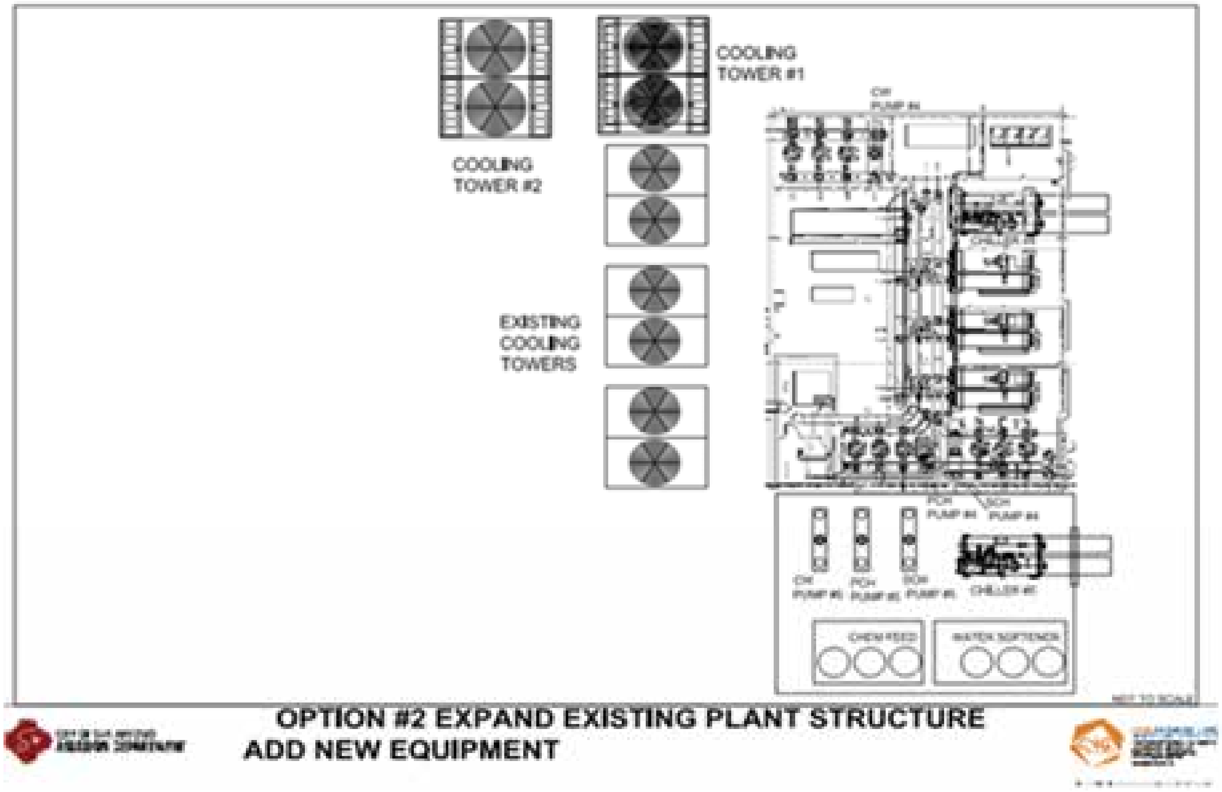
HVAC: The following reference drawings are provided to improve clarities for the figures included in the PDDS.

Figure 88: Option 2 Expand Existing Plant Structure and add New Equipment



Source: CNG

Figure 89 Option 2 Expand Existing Plant Structure and add New Equipment



Source: CNG

Appendix L – New Parking Structure / GTC

L New Parking Structure / GTC

Parking

When initially evaluating parking requirements, all reasonable potential areas for future parking development were looked at. During a stakeholder workshop, two areas were deemed to have access issues and/or preferred to an alternate use, as noted in the following graphic.

Figure 90 Potential Parking Development Areas

Source: Kimley-Horn

Various alternatives were created and sorted into families that could meet PAL 2 requirements. Family 1 focused on a new parking structure west of the existing terminal complex; Family 2 focused on a new structure in the Economy Lot; and Family 3 proposed a new parking structure in the terminal area.

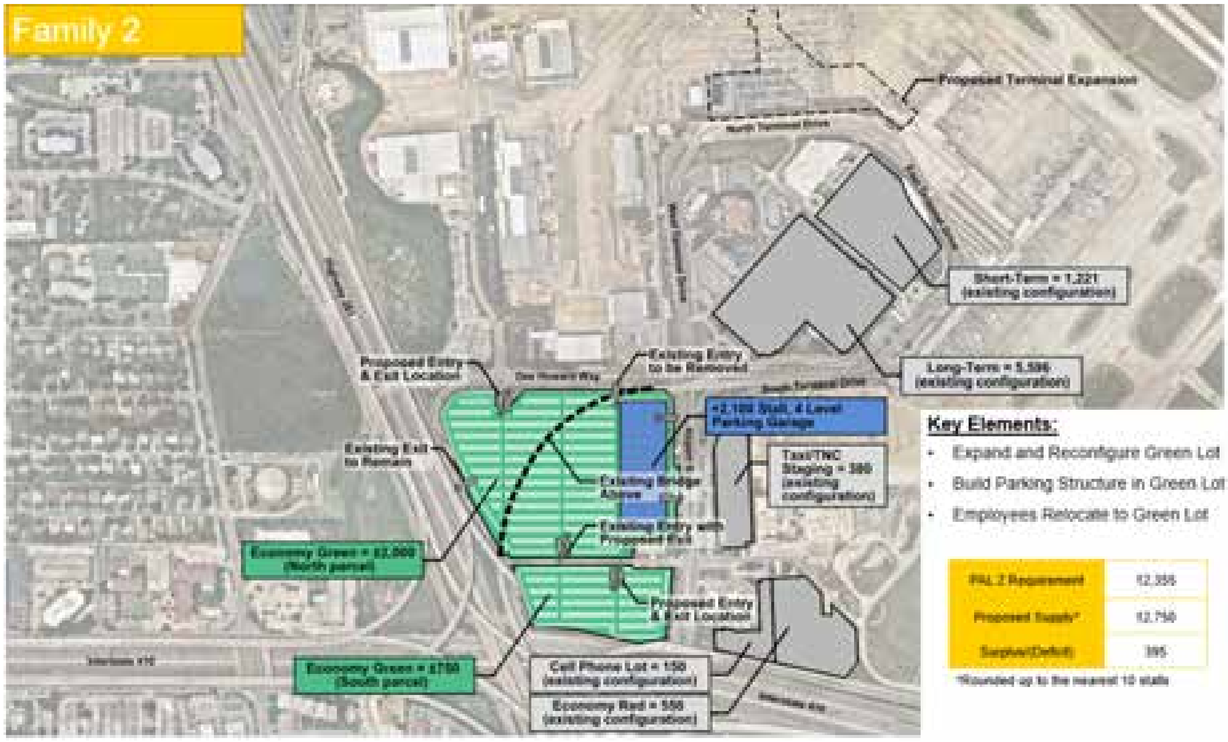
Figure 91 PAL 2, Family 1 Concept

PAL 2 Requirement	12,355
Proposed Supply*	12,370
Surplus/(Deficit)	15

*Rounded up to the nearest 10 stalls

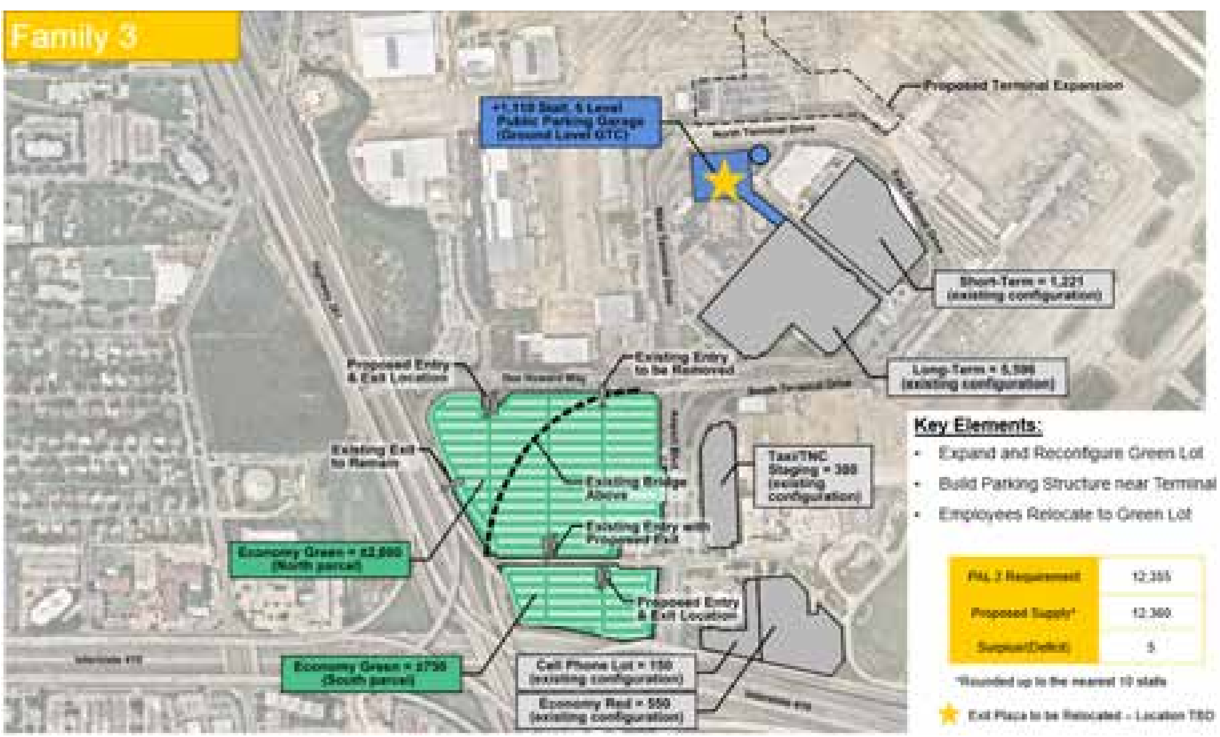
Source: Kimley-Horn

Figure 92 PAL 2, Family 2 Concept



Source: Kimley-Horn

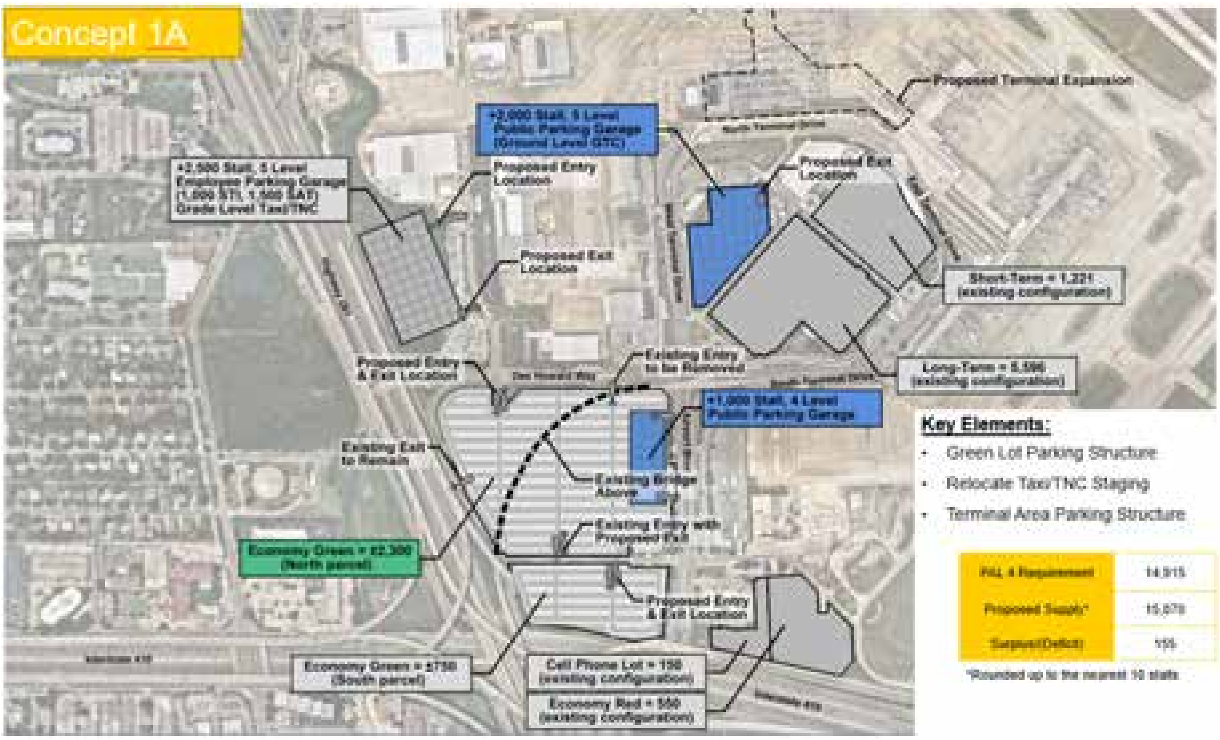
Figure 93 PAL 2, Family 3 Concept



Source: Kimley-Horn

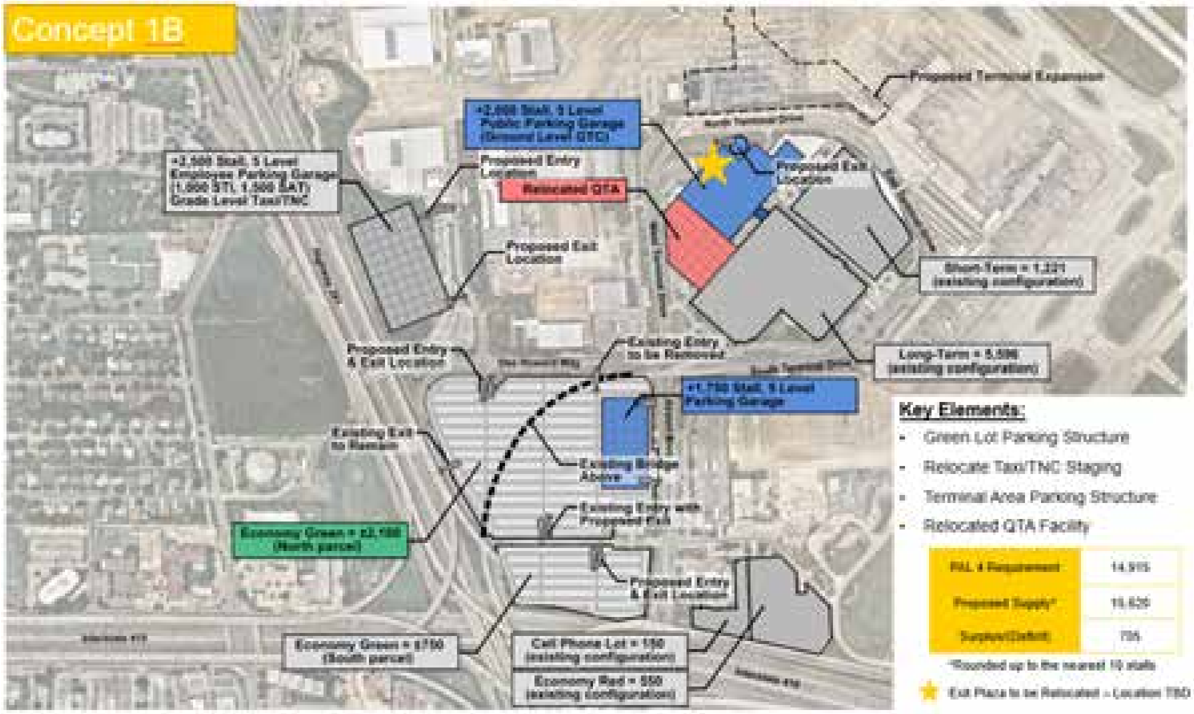
The families were further refined into alternatives to meet PAL 4 parking demands. Alternatives A maintained the existing ConRAC facility; Alternatives B relocated the QTA; and Alternatives C proposed a new ConRAC facility. Each concept was named based on the PAL 2 family they belonged to and the PAL 4 alternative (e.g. Concept 1A belongs to PAL 2 Family 1 and PAL 4 Alternative A). Each of these families and alternatives were rated based on a set of evaluation criteria.

Figure 94 PAL 4, Concept 1A



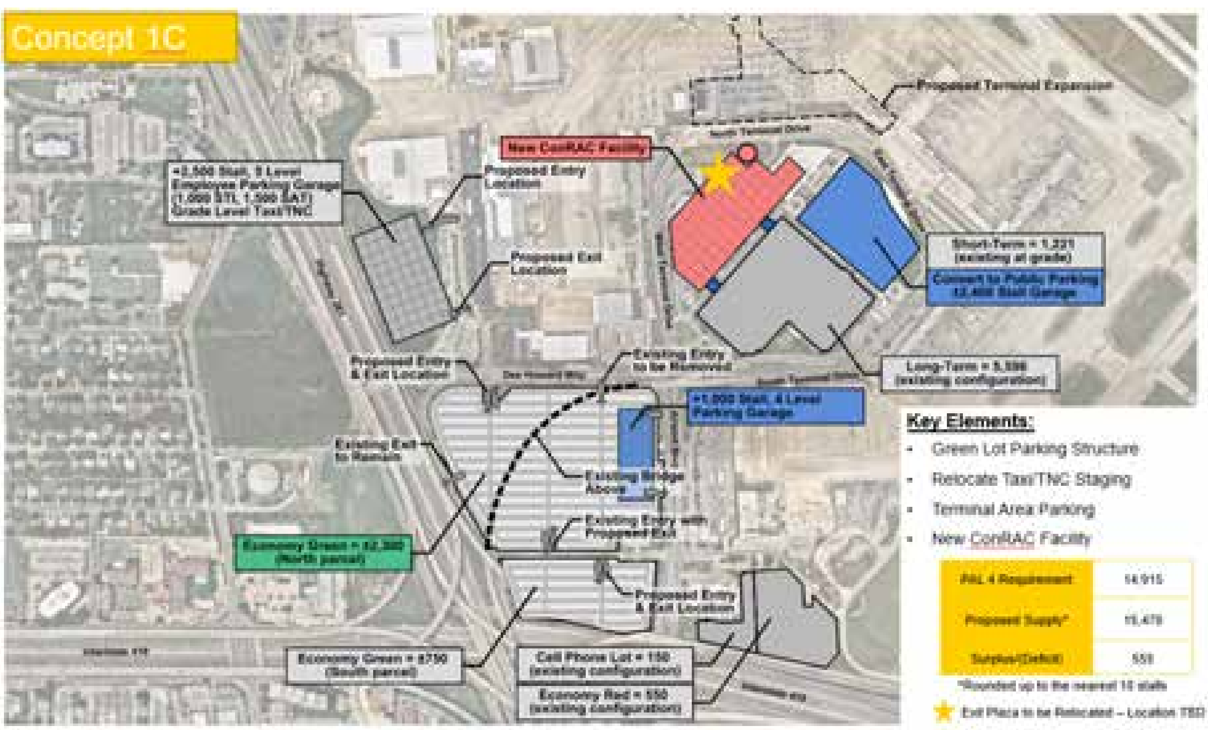
Source: Kimley-Horn

Figure 95 PAL 4, Concept 1B



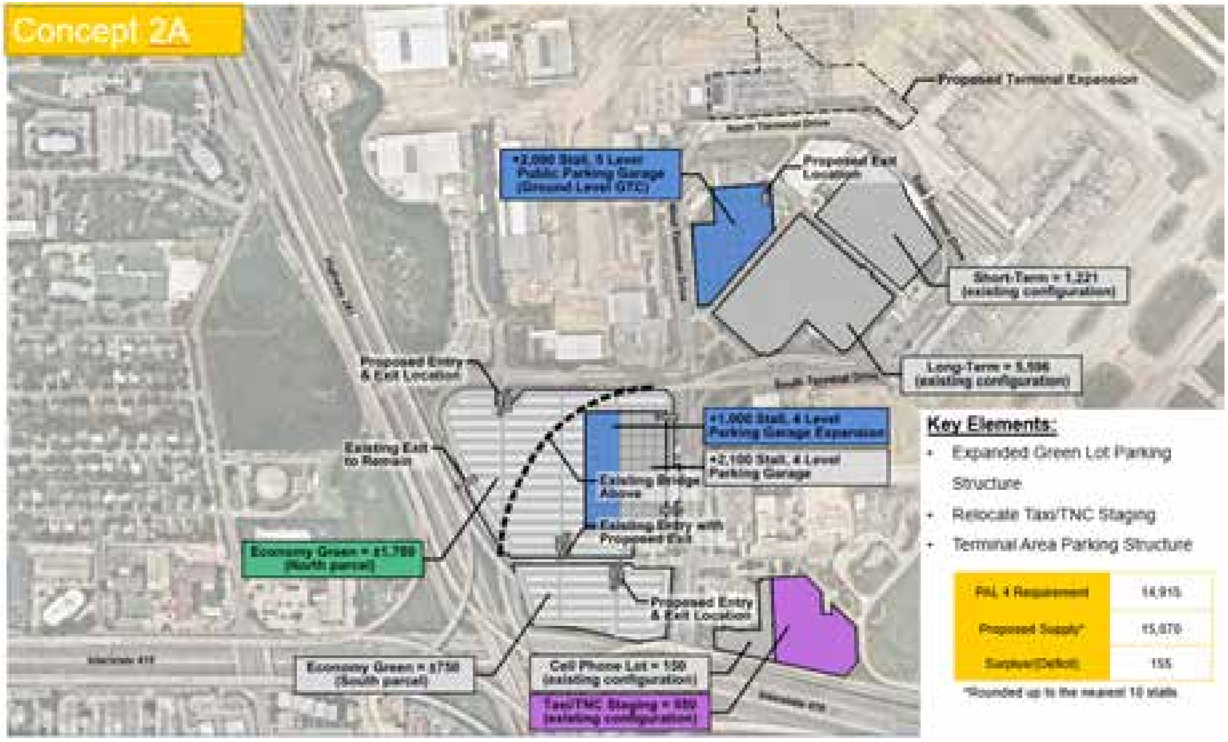
Source: Kimley-Horn

Figure 96 PAL 4, Concept 1C



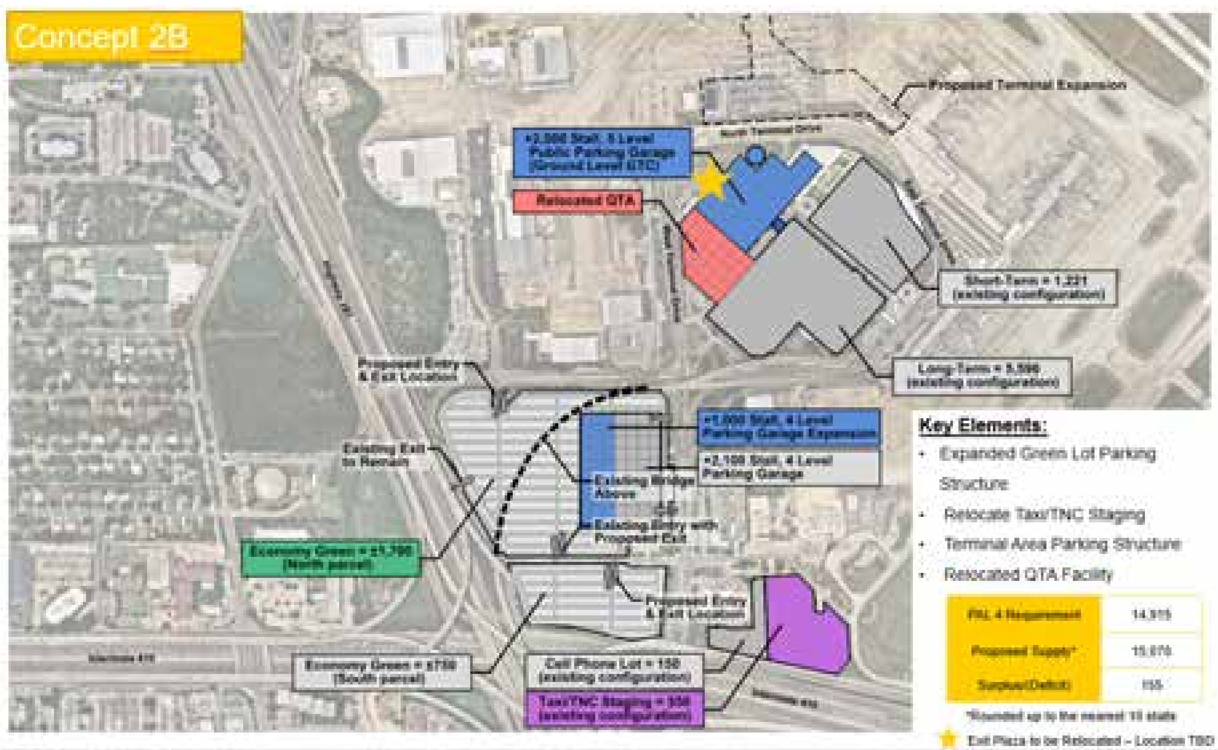
Source: Kimley-Horn

Figure 97 PAL 4, Concept 2A



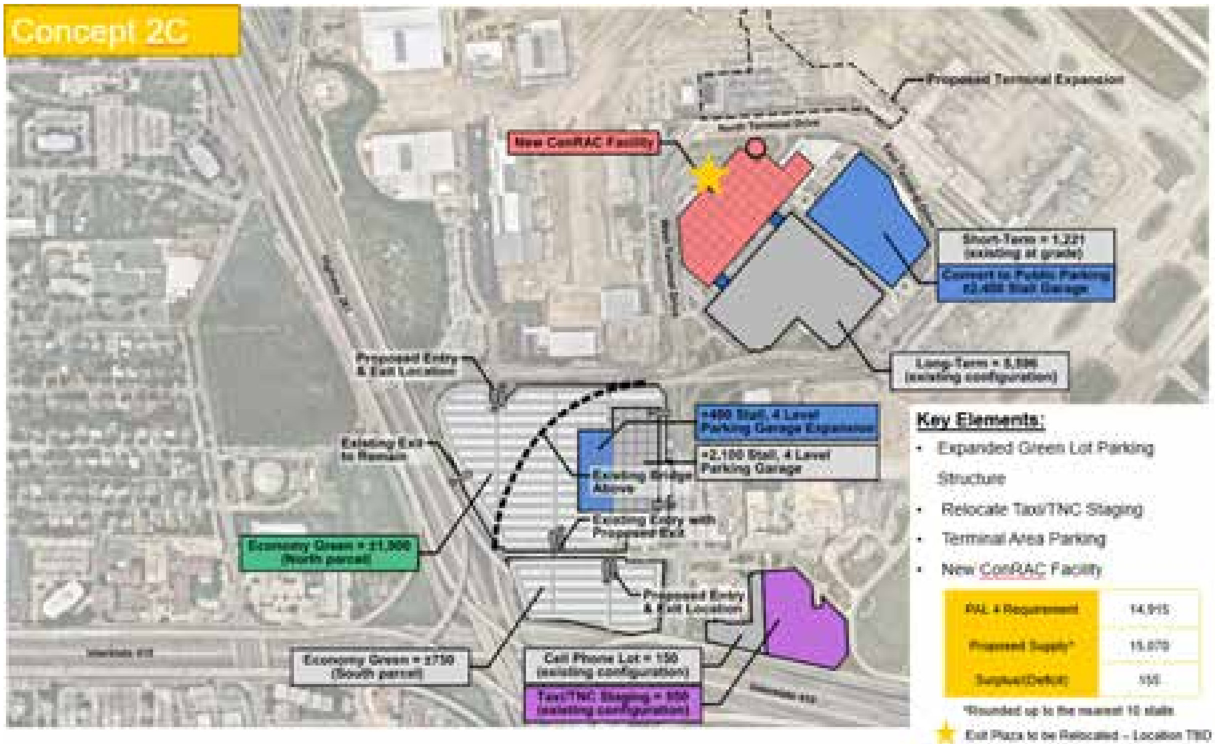
Source: Kimley-Horn

Figure 98 PAL 4, Concept 2B



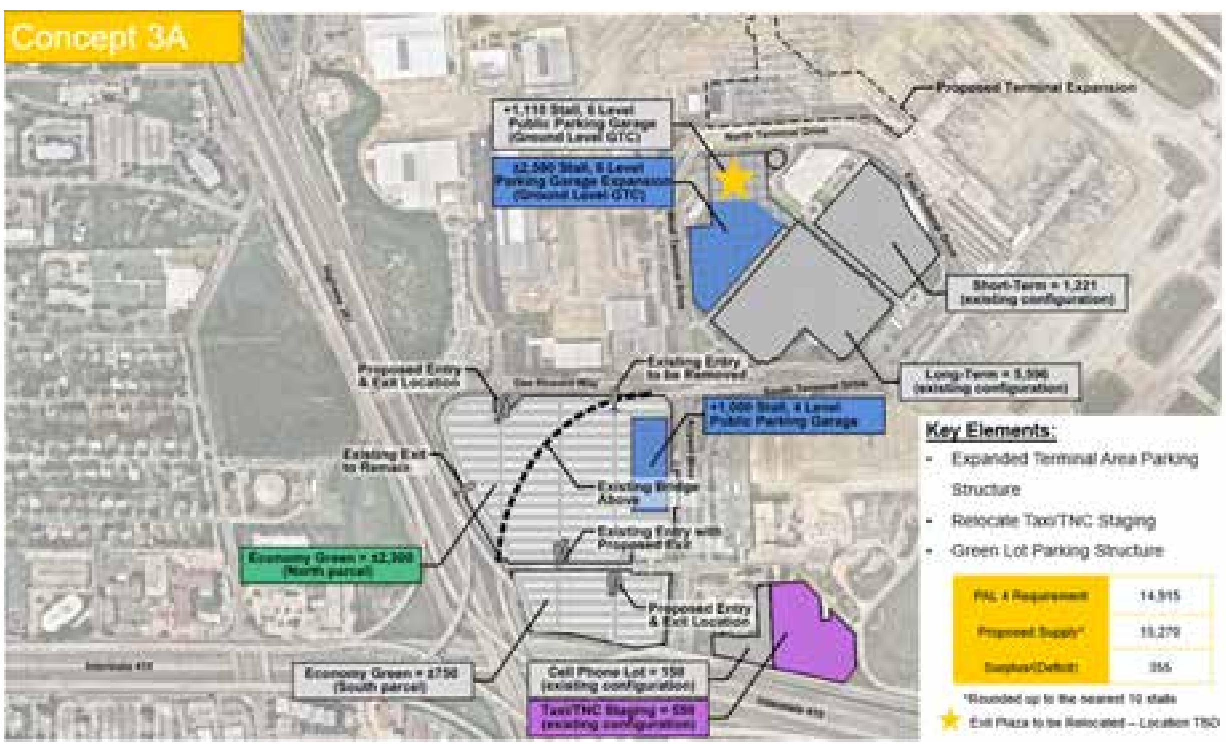
Source: Kimley-Horn

Figure 99 PAL 4, Concept 2C



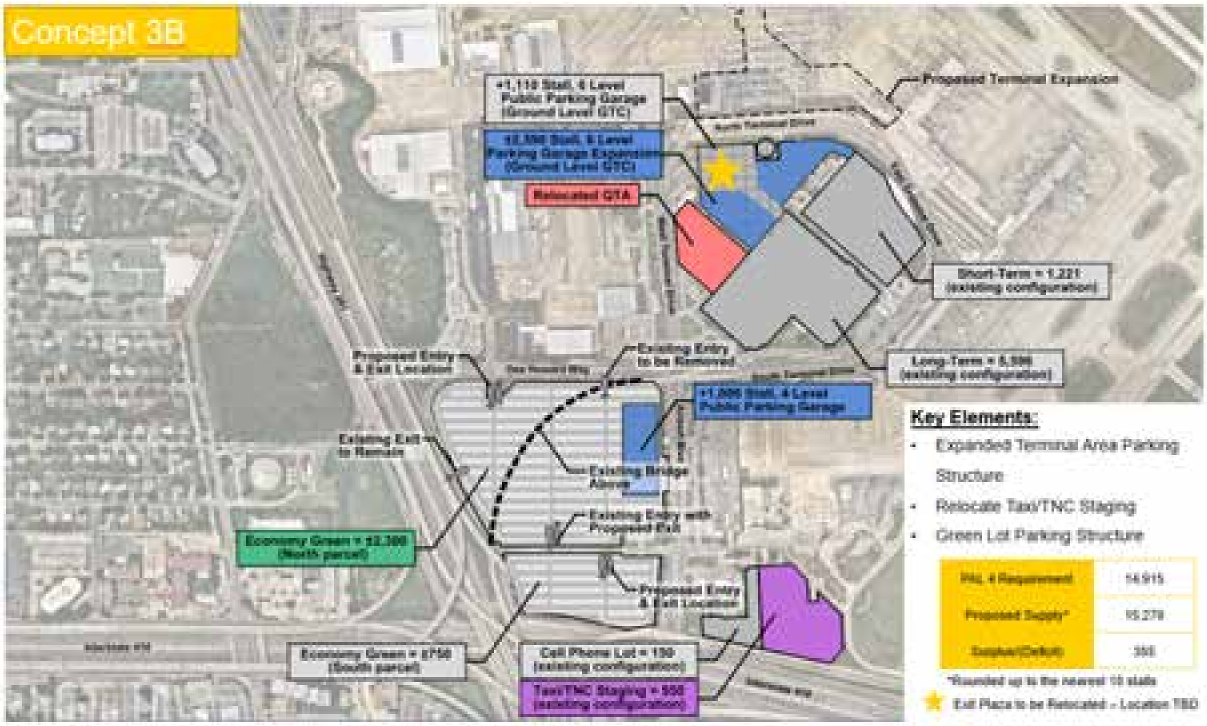
Source: Kimley-Horn

Figure 100 PAL 4, Concept 3A



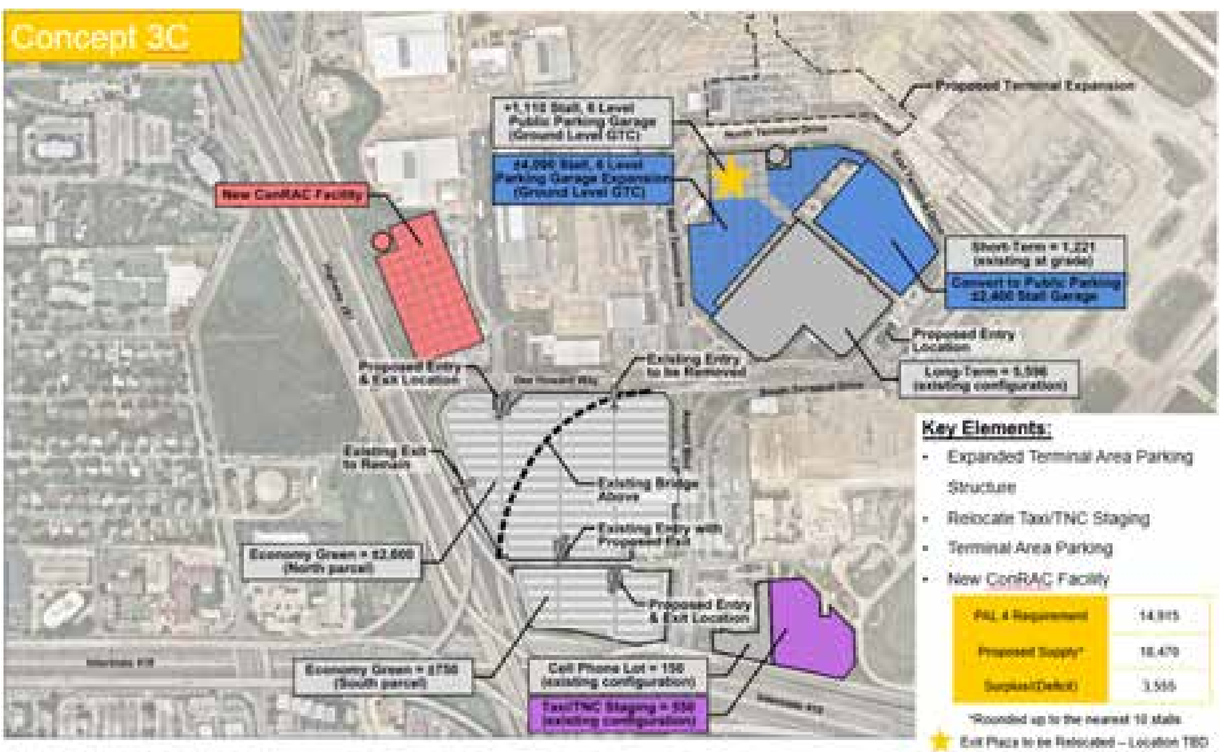
Source: Kimley-Horn

Figure 101 PAL 4, Concept 3B



Source: Kimley-Horn

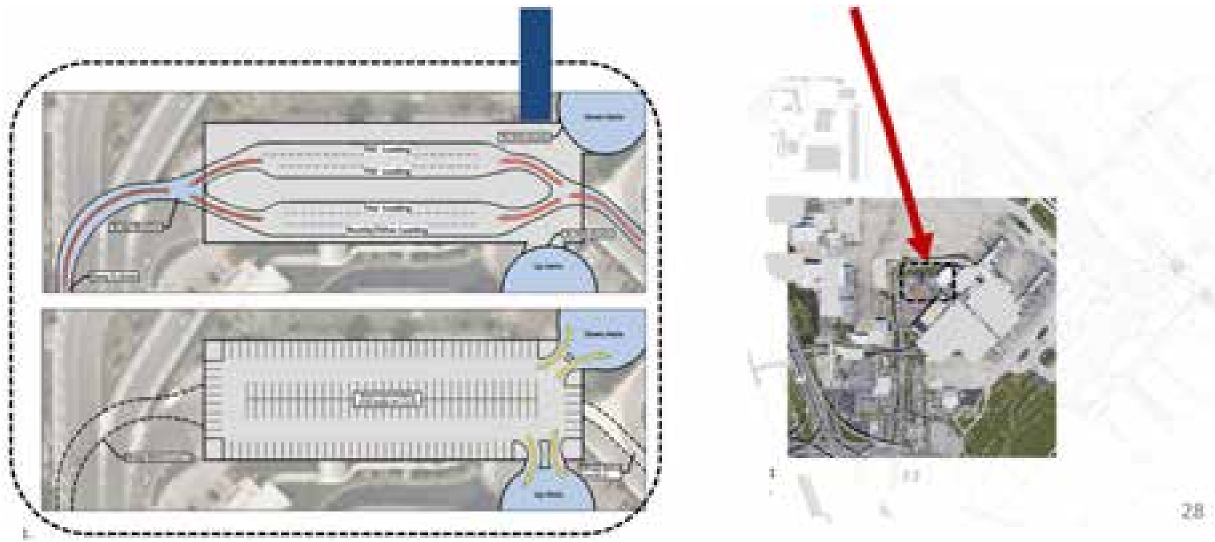
Figure 102 PAL 4, Concept 3C



Source: Kimley-Horn

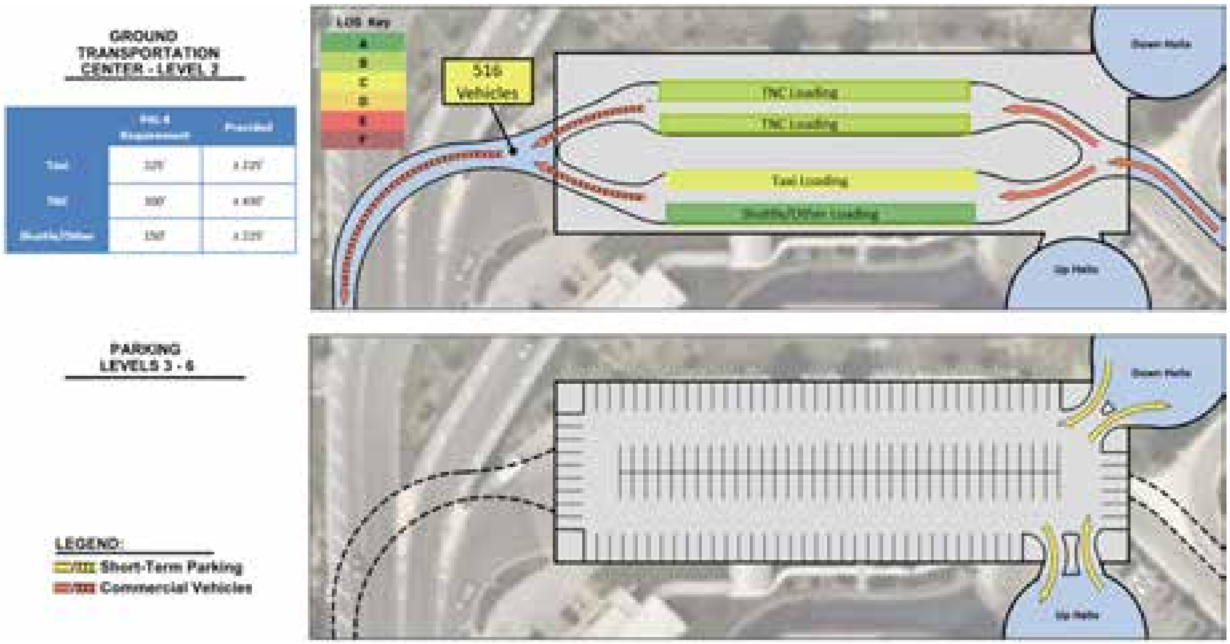
Through stakeholder workshops, it was determined that the preferred concept was to develop a structure in the terminal area for PAL 2. This structure could later be expanded at PAL 4 and avoid impacts to the existing ConRAC. Coordination with other elements of the program also altered the parking lots to respond to the access roadway needs and limited the PAL 2 structural footprint to maintain the existing FAA Airport Traffic Control Tower (ATCT). The resulting PAL 2 concept was deemed the preferred concept. The PAL 4 or "ultimate" preferred parking expanded the PAL 2 structure, assuming the ATCT is relocated, and proposes a new structure in the Economy Lot to help meet the projected parking requirements.

Figure 103 GTC Location



Source: Corgan

Figure 104 GTC Circulation



Source: Corgan

Figure 105 GTC Existing and Proposed

Source: Corgan

Ground Transportation Center

The discussions about the potential location for a ground transportation center were ongoing during the development of parking alternatives. Based on the user type and operation of a GTC, it was noted that the GTC would need to be located within walking distance of the terminals. Once the preferred parking concept indicated a new structured parking garage within the terminal area, it was determined that the structure could be modified to include the GTC as well. The preferred concept for the GTC was a result of the geometric site constraints and the separation between revenue-controlled parking products and the commercial vehicle operations.

Appendix M – Terminal Curbside Roadway Improvement

M Terminal Curbside Roadway Improvement

Figure 106 Curbside Location

Source: Corgan

Terminal curbside Concept 1 provides a dedicated roadway for traffic destined for the New Terminal, reducing weaving maneuvers and congestion. This concept was explored to provide complete separation of traffic for Terminals A/B and Terminal C. Concept 1 was not advanced due to feasibility and constructability concerns, as well as roadway geometric design constraints.

Figure 107 Curbside Concept 1

Source: Kimley-Horn

Concept 2 envisioned a bypass roadway to allow curbing vehicles destined to one of the terminals to bypass congestion in front of the other terminals. This concept was advanced from circulation arrows to a preliminary concept layout with Concept 3.

Figure 108 Curbside Concept 2

Source: Kimley-Horn

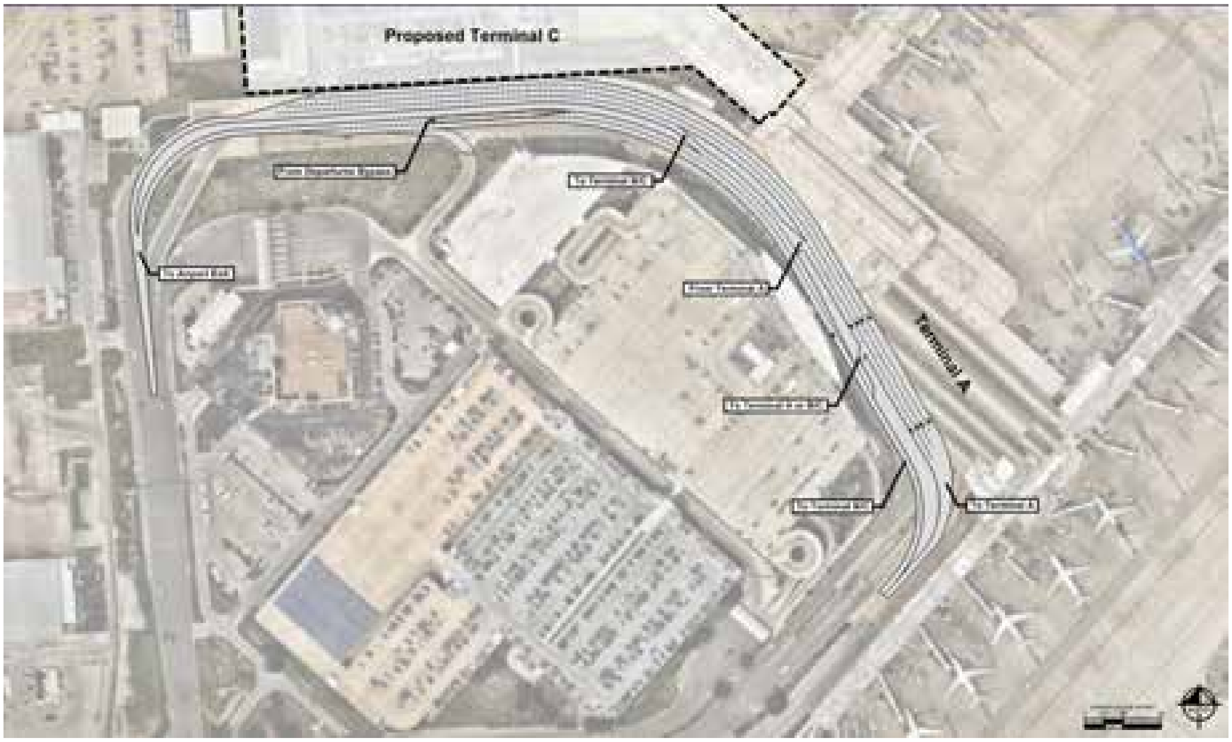
Concept 3 expanded on Concept 2 by providing details on the functionality of the bypass roadway and locations of where access/egress points would be along the bypass roadway. As the location and required lengths of each of the terminal curbfronts was refined, Concept 3 evolved into Concept 4.

Figure 109 Curbside Concept 3

Source: Kimley-Horn

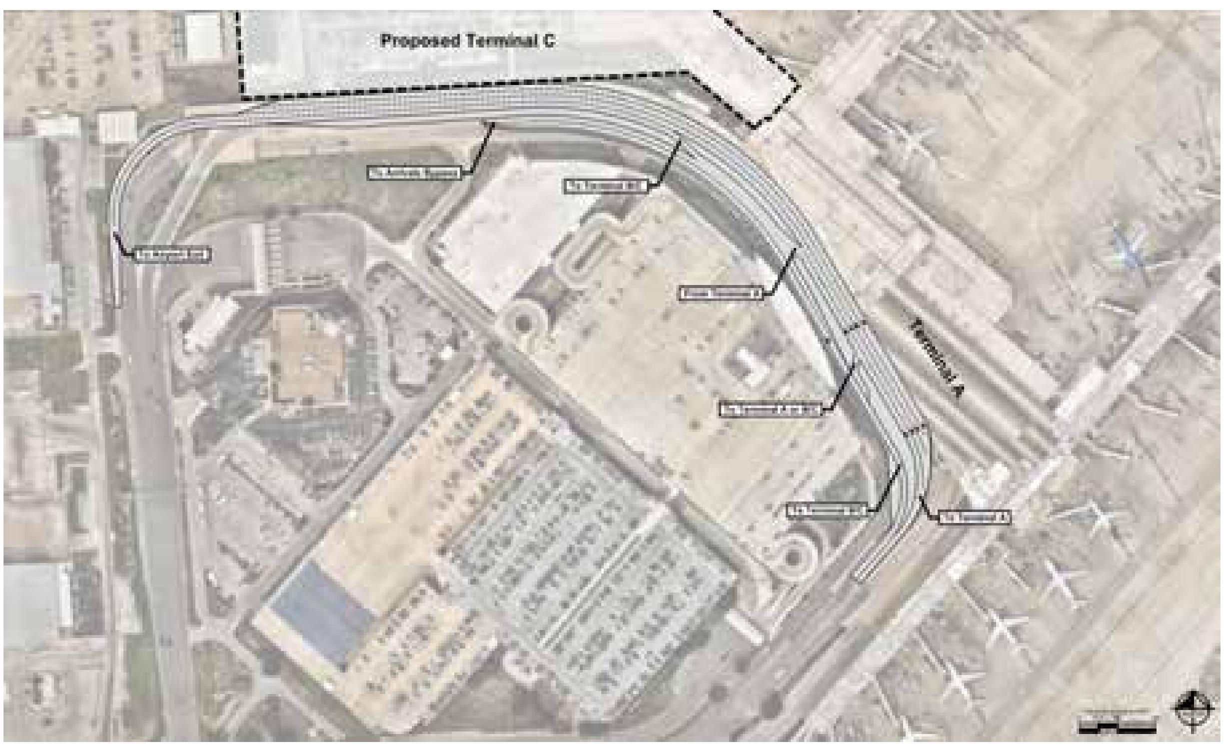
Further refinement created a specific conceptual layout for each roadway level (Departures and Arrivals). Concept 4 reduced and relocated the access/egress points along the bypass roadway to align with the locations of the Terminal curbfronts. Concept 4 incorporated the addition of the rental car exit feeding into the arrivals bypass roadway in front of Terminal C. Concept 4 also realigned the arrivals exit roadway. This change was ultimately not included in the preferred concept. Concept 4 added a ramp down from the upper-level bypass roadway to the lower-level bypass roadway which reduced the upper-level roadway expansion. Concept 4 also realigned the departures exit ramp, which was ultimately not include in the preferred concept.

Figure 110 Curbside Concept 4 - Arrivals



Source: Kimley-Horn

Figure 111 Curbside Concept 4 – Departures

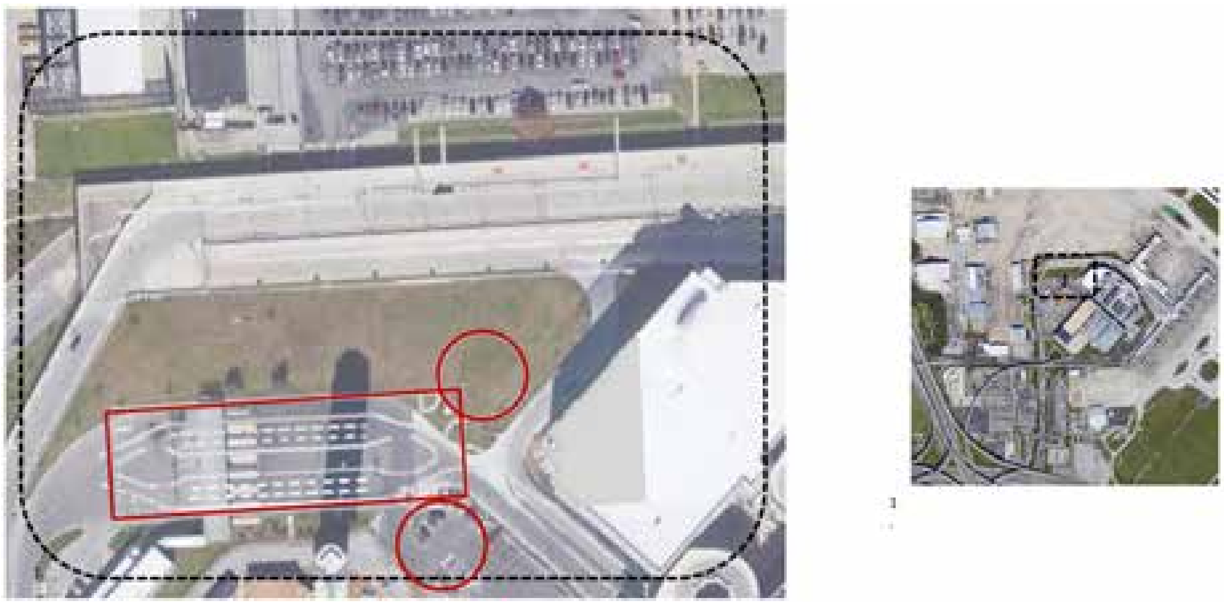


Source: Kimley-Horn

Appendix N – Administration Building

N Administration Building

Figure 112 Admin Building Proposed Location



Source: Corgan

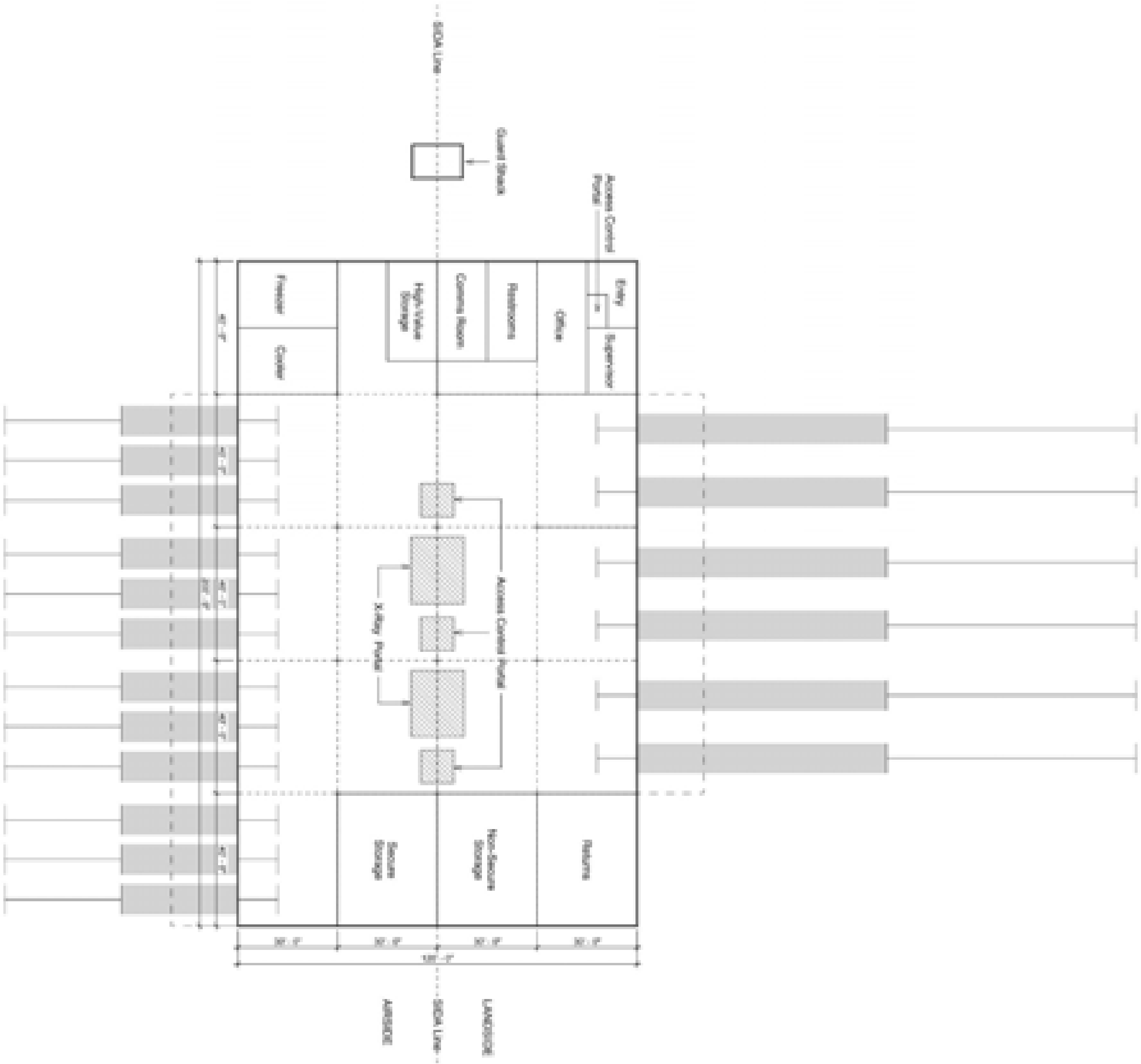
Appendix O – Central Receiving Distribution Center (CRDC)

O Central Receiving Distribution Center (CRDC)

Figure 113 CRDC Proposed Locations

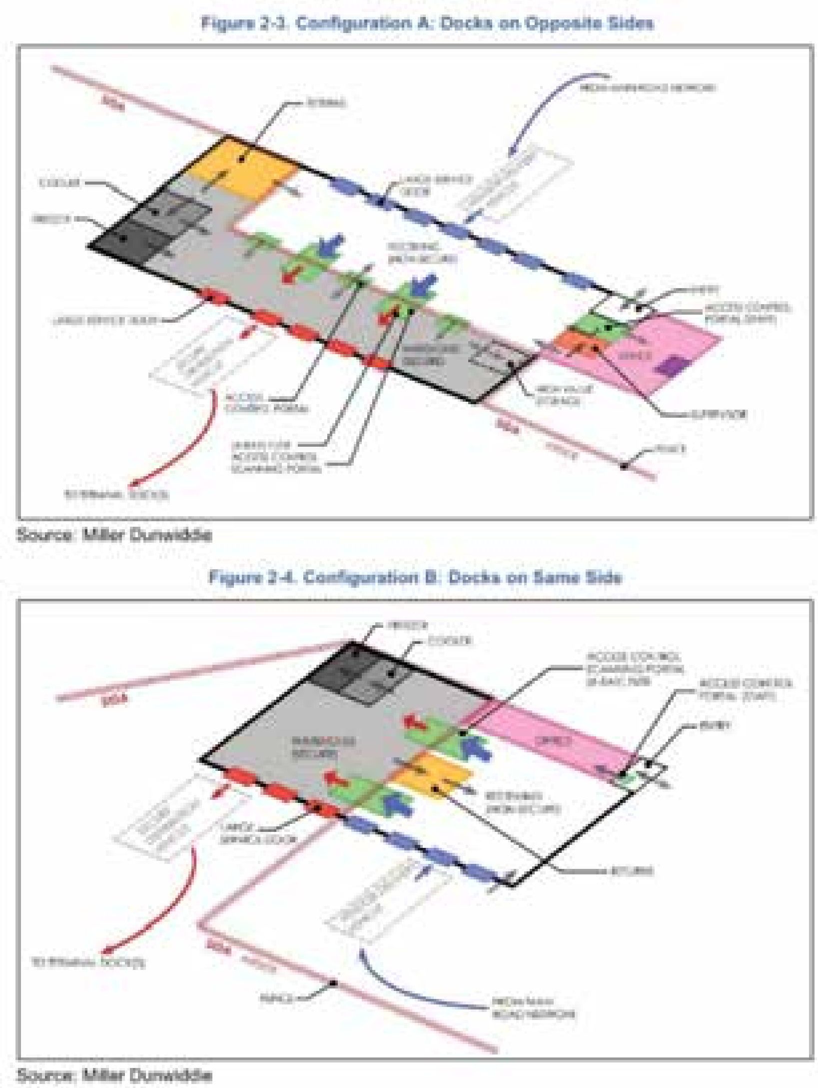
Source: Corgan

Figure 114 SAT - CRDC Schematic Layout



Source: Corgan

Figure 115 CRDC Design Guidelines

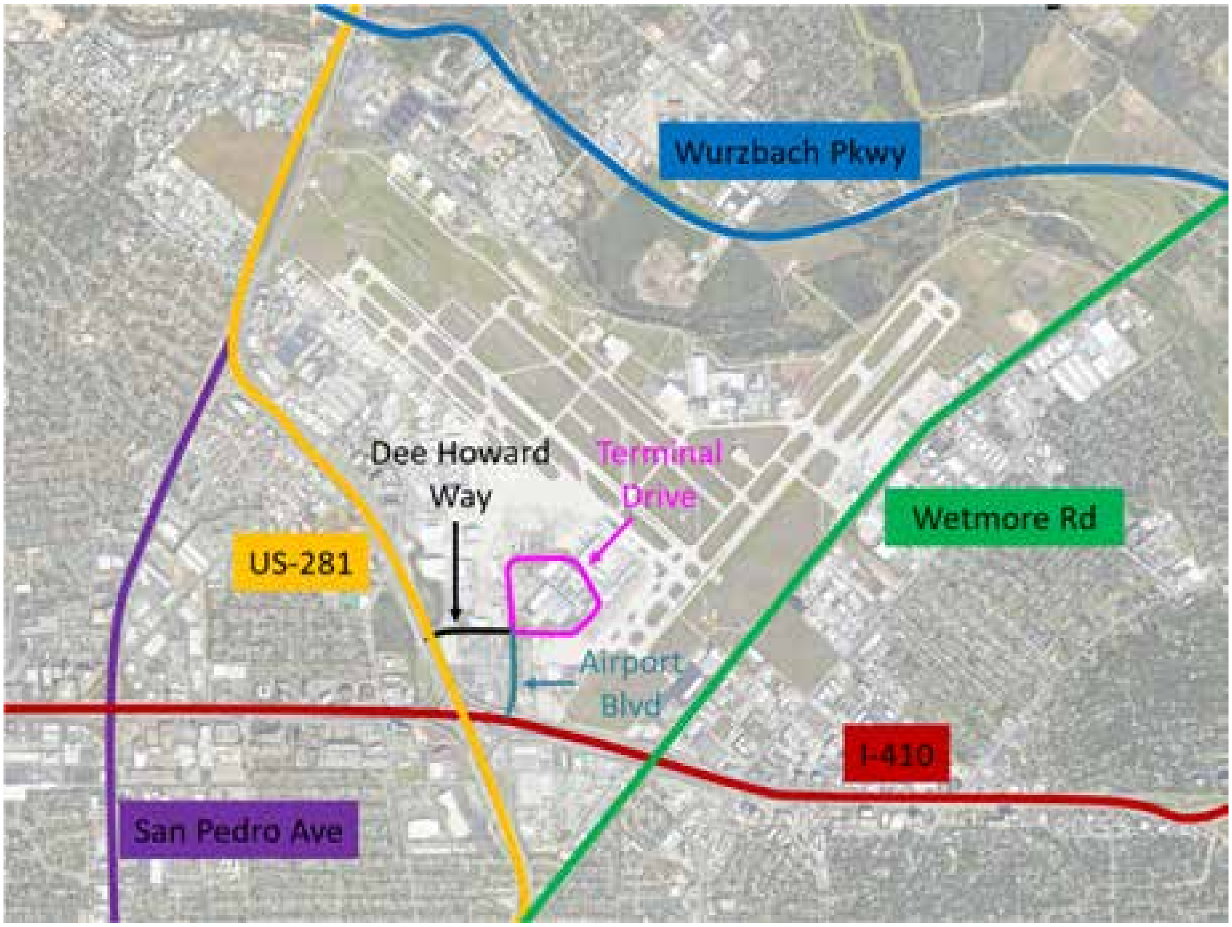


Source: Miller Dunwiddie

Appendix P – Airport Access Road

P Airport Access Road

Figure 116 Site Context Roadways



Source: Corgan

Figure 117 Airport Access Roadway

Source: Corgan

Figure 118 Airport Access Roadway Re-Alignment

Source: Corgan

Figure 119 SDP Recommended Roadway Configuration

Source: WSP

Figure 120 Operational Analysis Summary - Existing Roadway Geometry and Traffic Volumes

Source: Corgan

* LOS and Delay shown from Oct 2022 count data grown by 10% for a summertime seasonal adjustment

Figure 121 Operational Analysis Summary - Existing Roadway Geometry at PAL 4 Traffic Volumes

Source: Kimley-Horn

*Delay and LOS shown for October 2022 counts with 10% seasonal Adjustment and additional 40% for PAL 4 Projections

Alternatives Analysis: Concept 1 Highlights

- Components
  - Use 281 Northbound Frontage Road to direct people onto Dee Howard Way and then Eastbound onto Terminal Loop
  - Close Airport Boulevard Northbound at Northern Boulevard intersection and utilizing that roadway for parking and local access only to address weaving concerns. The connection of Northern Boulevard to US 281 Northbound Frontage Road poses weaving challenges as traffic competed between Loop 410 Westbound Frontage Road traffic and traffic utilizing the US 281 Southbound Frontage Road Turnaround to get to parking and eventually to Dee Howard Way.
- Analysis Outcomes
  - Weaving concerns from Eastbound Loop 410 and working group discussion of “sense of place” considerations associated with the primary entrance for over half of inbound traffic

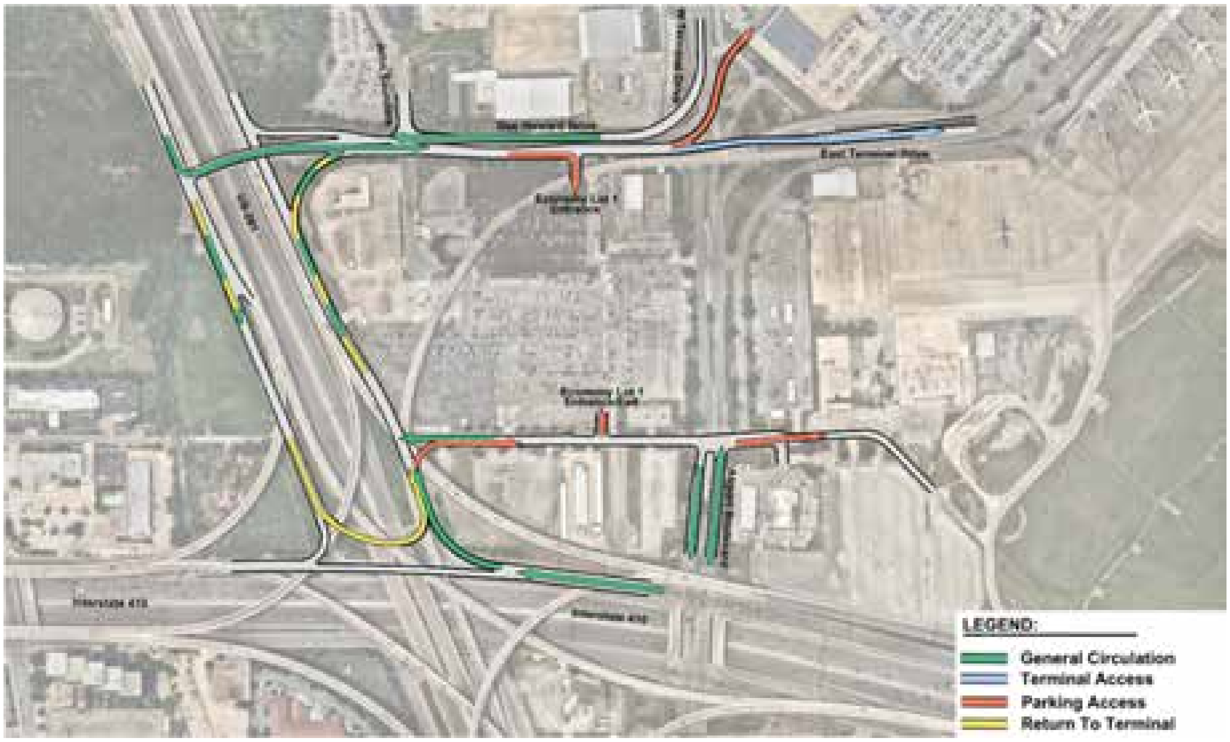
coming under multiple levels of the Loop 410 / US 281 interchange made this concept unfavorable on several of the key goals of the process.

- o Limiting access into and out of the airport via Dee Howard Way creates operational challenges for the traffic signal on Dee Howard Way at US 281 Frontage Road bridge over Loop 410 and which causes two problems. Connectivity to Loop 410 Eastbound for departures is poor

Figure 122 Roadway Concept 1

Source: Kimley-Horn

Figure 123 Roadway Concept 1 Circulation Paths



Source: Kimley-Horn

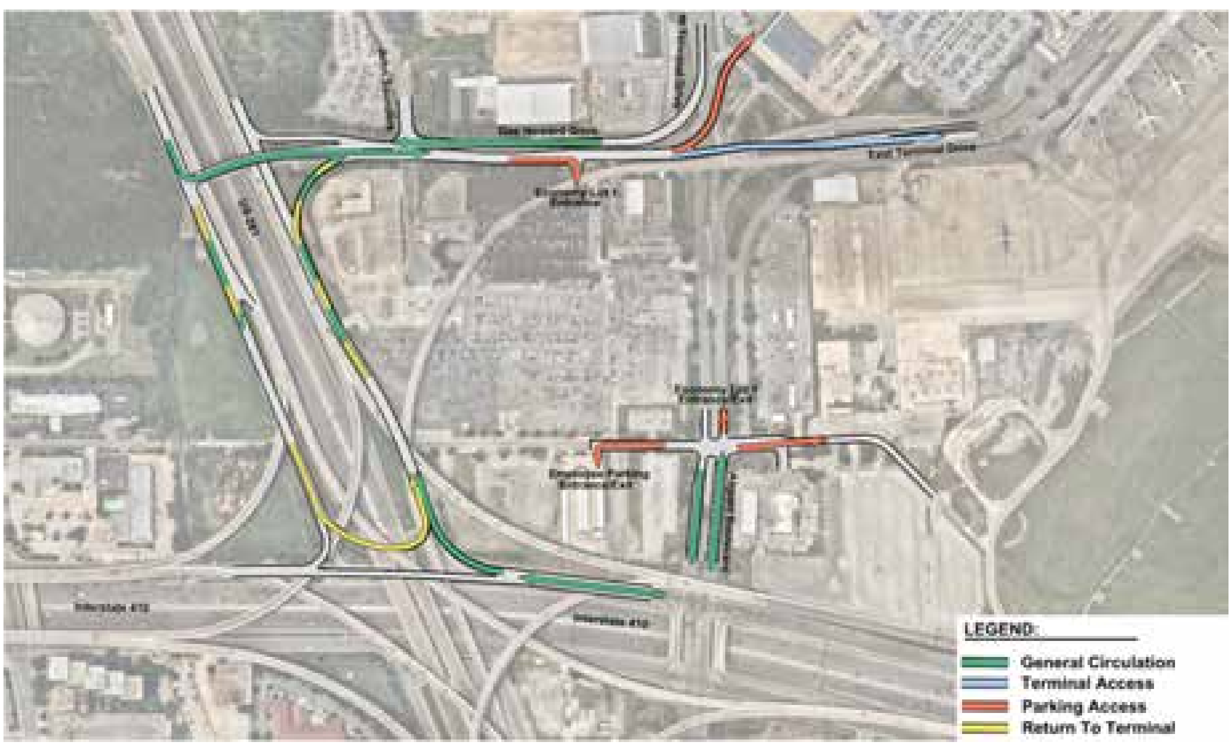
Alternatives Analysis: Concept 2 Highlights

- Components
  - o Remove Airport Boulevard connection to US 281 Northbound Frontage Road via Northern Boulevard. This would displace all cut through traffic but make return to terminal movements more difficult, displacing traffic to Loop 410 & Jones Maltsberger.
- Analysis Outcomes
  - o Similar to Concept 1, limiting access into and out of the airport to Dee Howard Way creates operational challenges for the traffic signal on Dee Howard Way at US 281 Frontage Road bridge over Loop 410 and connectivity to Loop 410 Eastbound for departures is poor.

Figure 124 Roadway Concept 2

Source: Kimley-Horn

Figure 125 Roadway Concept 2 Circulation Paths



Source: Kimley-Horn

Other Considerations

Considered tunneling Airport Boulevard under Dee Howard Way / Terminal Loop as an alternate way to remove the weave.

- Would require extensive drainage considerations (pumping system would be required to deal with rain events) and the team considered emergency ingress / egress in inclement weather or during a power outage as deterrents to this design concept
- A similar intersection exists in San Antonio at Fredericksburg Rd & Medical Dr. Based on transition distances at that location, the horizontal distance to ramp down and then back up to grade exceeds the available space to accommodate the structure and provide weaving room for ground transportation and curbside activities.
- A tunnel would limit future flexibility in a similar manner that additional bridge structures would

Final Schematic Concept Highlights

- No traffic signal at Airport Boulevard & Dee Howard Way / Terminal Loop which pulls controlled movements farther from curbside
- Parking access from northbound Airport Boulevard removes traffic from the curbside approach and reduces weaving maneuvers
- “Slip Road” to enter economy lot from Dee Howard Way Westbound allows those making the drop off of family / friends / luggage to park directly after exciting the Terminal Loop
- Layout is likely to encourage use of the cell phone waiting lot during critical drop off and pick up times by making the return to terminal path slightly longer.
- Provides flexibility for future continued expansion.

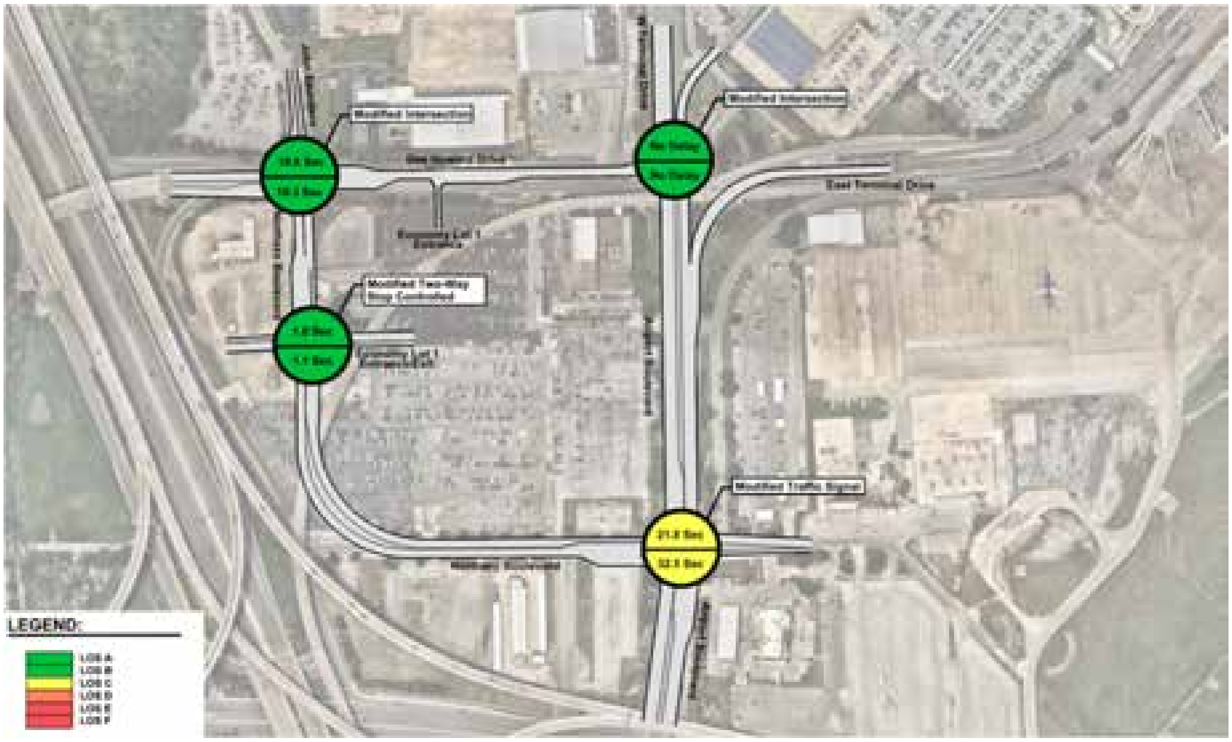
Figure 126 Recommended Airport Access Roadway Network

Source: Kimley-Horn

Figure 127 Concept for Future Potential Expansion

Source: Kimley-Horn

Figure 128 Recommended Network - Projected Roadway Level of Service and Delay



Source: Kimley-Horn

Figure 129 Recommended Network - Circulation Paths

Source: Kimley-Horn

Figure 130 Trip Length Comparison Across all Concepts

Trip Length Comparison

INBOUND

Trip Origin	Existing Geometry	Concept 1 / Concept 2		Concept 3	
		Trip Length	Difference	Length	Difference
From 281 NB	0.54 Mi	0.54 Mi	-	0.87 Mi	+ 0.33 Mi
From 281 SB	0.76 Mi	0.76 Mi	-	0.76 Mi	-
From 410 EB	0.81 Mi	1.22 Mi	+ 0.41 Mi	0.81 Mi	-
From 410 WB	1.33 Mi	1.70 Mi	+ 0.37 Mi	1.33 Mi	-

OUTBOUND

Trip Destination	Existing Geometry	Concept 1 / Concept 2		Concept 3	
		Trip Length	Difference	Length	Difference
To 281 NB	0.69 Mi	0.69 Mi	-	0.69 Mi	-
To 281 SB	0.43 Mi	0.43 Mi	-	0.43 Mi	-
To 410 EB	0.91 Mi	1.65 Mi	+ 0.74 Mi	0.91 Mi	-
To 410 WB	0.60 Mi	0.60 Mi	-	0.60 Mi	-

Source: Kimley-Horn

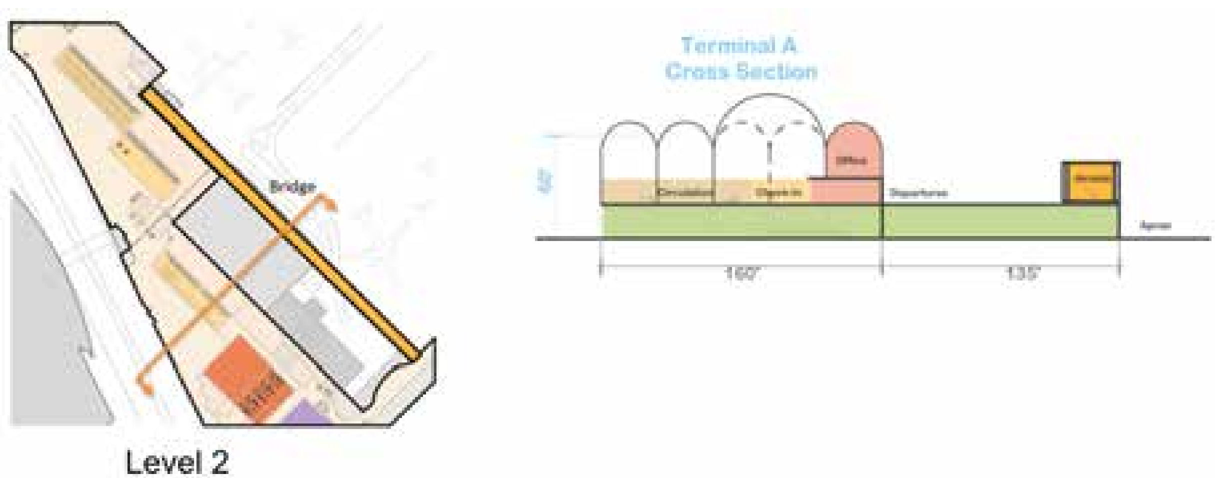
Appendix Q – A+B Connector

Q A + B Connector

Figure 131 Connector Option 1 Bridge

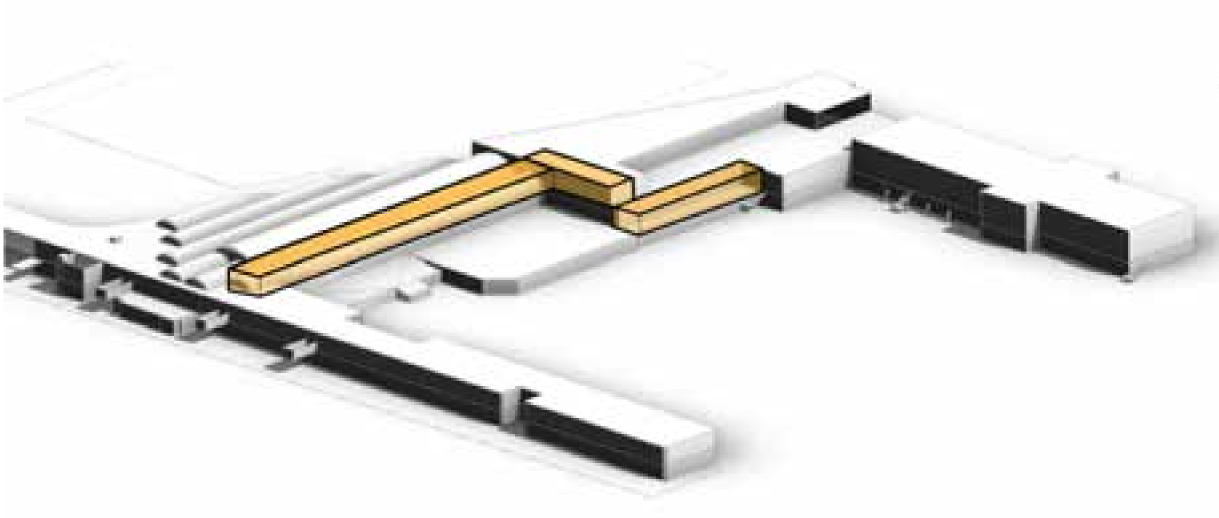
Source: Corgan

Figure 132 Connector Option 1 Bridge Plan Section



Source: Corgan

Figure 133 Connector Option 2 Mezzanine

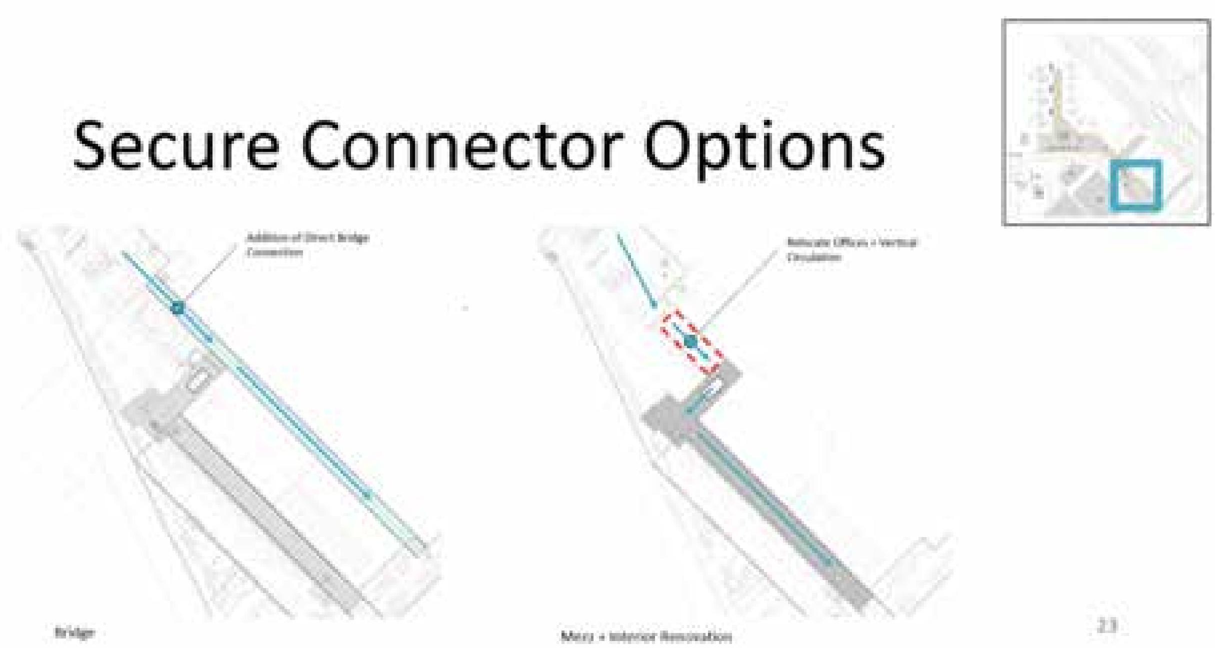


Source: Corgan

Figure 134 Connector Option 2 Mezzanine Plan Section

Source: Corgan

Figure 135 Secure Connector Options



Source: Corgan

Appendix R – Term A Configuration

R Term A Reconfiguration

Appendix S – Term B Configuration

CORGAN

CITY OF SAN ANTONIO
AVIATION DEPARTMENT

S Term B Reconfiguration

Appendix T – MAPS

CORGAN

SAN ANTONIO INTERNATIONAL AIRPORT

Airport Terminal Planning Program

Appendix T

CORGAN

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1 Introduction

1.1 Background & Objective

The City of San Antonio (City), Aviation Department has retained Corgan to provide airport planning services to develop an Advanced Terminal Planning Program (ATPP) for a new Terminal C at San Antonio International Airport (SAT), as well as areas related to or impacted by the terminal complex, such as an airfield, support facilities, landside, ground access, and environmental. The result of this project will create a Program Definition Manual (PDM) which defines the Terminal C expansion project, associated enabling projects, and related infrastructure necessary to support the development, with key projects developed to a 15% Level of Design.

TransSolutions will assist Corgan to derive processor requirements for Check-in, Security Screening Checkpoint, Federal Inspection Services (FIS), and baggage claim devices using discrete event simulation. TransSolutions' combined expertise in airport operations and simulation modeling of passenger flows will provide the project team with the processor requirements.

1.2 Purpose

This document summarizes all modeling assumptions, flight schedules, and input for the simulation analyses based on the following sources:

- Forecasted Design Day Flight Schedules developed by TransSolutions
- Passenger data collected onsite at SAT by TransSolutions, September 12-13, 2022
- Processing times data collected onsite at SAT by TransSolutions, September 12-14, 2022
- TransSolutions' knowledge and experience with airport and airlines operations

These modeling assumptions are presented to the project team to reach consensus on assumptions and to ensure that they reflect expected operations and passenger behavior/characteristics in the design year.

1.3 Approach

To accomplish the project objectives, TransSolutions will develop demand for departing and arriving passengers from the flight schedules based on the passenger characteristics and behavior data summarized in this document. TransSolutions will develop macro-simulation models to derive processor requirements. This technique will allow the rapid development of customized models to provide a comprehensive view of all processor requirements for various demand years.

2 Flight Schedule & Demand Summary

2.1 Flight Schedule Summary

Table 2-1 and Table 2-2 summarize the departures and arrivals flight schedule showing daily operations and seats for the design day flight schedules. There are four design day flight schedules (DDFS) created for 3-15 years from the date of beneficial use (DBU).

Table 2-1: Departure Flight Schedule Summary

AIRLINES	MARKET	PAL 1		PAL 2		PAL 3		PAL 4	
		Flights	Seats	Flights	Seats	Flights	Seats	Flights	Seats
AeroMexico	International	2	198	2	198	2	198	2	198
Alaska	Domestic	1	178	2	356	2	356	2	356
Allegiant	Domestic	1	186	1	186	1	186	2	372
American	International	7	1,015	7	1,194	7	1,194	7	1,194
	Domestic	20	3,008	22	3,370	25	3,860	27	4,169
Breeze	Domestic	1	108	1	108	5	540	5	540
Delta	International	2	301	2	301	2	382	2	382
	Domestic	13	1,980	15	2,396	16	2,814	17	3,005
Frontier	Domestic	3	567	4	797	4	797	4	797
JetBlue	Domestic	2	302	3	464	3	464	3	464
New Carrier	International	6	1,116	6	1,116	6	1,116	6	1,116
Southwest	International	4	668	4	668	4	668	4	668
	Domestic	54	8,074	54	8,074	54	8,074	57	8,855
Sun Country	Domestic	1	138	1	138	2	324	2	324
United	International	2	345	2	345	2	345	2	345
	Domestic	21	2,326	24	2,863	26	3,274	28	3,862
Viva	International	3	558	3	558	4	744	4	744
Volaris	International	3	537	3	537	3	537	4	716
Total	**International**	**29**	**4,738**	**29**	**4,917**	**30**	**5,184**	**31**	**5,363**
	Domestic	**117**	**16,867**	**127**	**18,752**	**138**	**20,689**	**147**	**22,744**

Source: TransSolutions' Design Day Flight Schedules

Table 2-2: Arrival Flight Schedule Summary

AIRLINES	MARKET	PAL 1	PAL 2	PAL 3	PAL 4

		Flights	Seats	Flights	Seats	Flights	Seats	Flights	Seats
AeroMexico	International	2	198	2	198	2	198	2	198
Alaska	Domestic	1	178	1	178	1	178	1	178
Allegiant	Domestic	1	186	1	186	1	186	1	186
American	Domestic	27	3,008	27	3,061	27	3,061	27	3,061
Breeze	Domestic	1	108	1	108	1	108	1	108
Delta	Domestic	15	1,980	15	2,014	15	2,241	15	2,241
Frontier	Domestic	3	567	3	567	3	567	3	567
JetBlue	Domestic	2	302	2	302	2	302	2	302
New Carrier	International	6	558	6	558	6	558	6	558
Southwest	Domestic	58	8,217	58	8,217	1	8,217	1	8,217
Sun Country	Domestic	1	138	1	138	1	138	1	138
United	Domestic	23	2,326	23	2,326	23	2,379	23	2,609
Viva	International	3	558	3	558	3	558	3	558
Volaris	International	3	537	3	537	3	537	3	537
Total	**International**	**14**	**1,851**	**14**	**1,851**	**14**	**1,851**	**14**	**1,851**
	Domestic	**132**	**17,010**	**132**	**17,097**	**132**	**17,377**	**132**	**17,863**

Source: TransSolutions' Design Day Flight Schedules

2.2 Load Factors and Originating Percentages

According to the Bureau of Transportation Statistics, the average load factor for domestic flights in 2019 (pre-pandemic) was 82.9%. The peak load factor was observed to be 92.2% in June 2019. The load factor has increased following the recovery from the pandemic. In June 2022, a historically high load factor of 92.8% was observed for domestic flights.

Similarly, the average load factor for international flights in 2019 was 82.5%. The peak load factor was observed in June 2019 at 91.2%. The international load factor data is unavailable for June 2022. The data is listed only until March 2022 and the load factor observed was 89.4%.

For purposes of this study, a load factor of 93% will be applied to all flights.

For purposes of this study, all passengers are assumed to be originating or terminating.

2.3 Departures Peak Hour

Table 2-3, Table 2-4, Table 2-5, and Table 2-6 summarize the peak hour departing flights and seat counts by airline associated with the four planning day flight schedules.

Table 2-3: Flight Schedule Summary PAL 1

AIRLINES	MARKET	PEAK HOUR	# OF FLIGHTS	PEAK HOUR	# OF SEATS
AeroMexico	International	12:30 - 13:30	1	12:30 - 13:30	99
Alaska	Domestic	17:50 - 18:50	1	17:50 - 18:50	178
Allegiant	Domestic	10:30 - 11:30	1	10:30 - 11:30	186
American	International	6:25 - 7:25	3	6:25 - 7:25	407
	Domestic	12:30 - 13:30	3	12:30 - 13:30	385
Breeze	Domestic	11:30 - 12:30	1	11:30 - 12:30	108
Delta	International	6:15 - 7:15	2	6:15 - 7:15	301
	Domestic	5:18 - 6:18	4	5:18 - 6:18	503
Frontier	Domestic	12:50 - 13:50	1	12:50 - 13:50	189
JetBlue	Domestic	12:50 - 13:50	1	12:50 - 13:50	162
New Carrier	International	5:30 - 6:30	2	5:30 - 6:30	372
Southwest	International	6:30 - 7:30	2	6:30 - 7:30	350
	Domestic	17:55 - 18:55	7	17:55 - 18:55	1,065
Sun Country	Domestic	16:10 - 17:10	1	16:10 - 17:10	138
United	International	6:30 - 7:30	2	6:30 - 7:30	345
	Domestic	5:30 - 6:30	4	11:15 - 12:15	507
Viva	International	7:55 - 8:55	1	7:55 - 8:55	186
Volaris	International	9:51 - 10:51	1	9:51 - 10:51	179
Overall		**5:34 - 6:34**	**20**	**5:34 - 6:34**	**2,766**

Source: TransSolutions' Design Day Flight Schedules

Table 2-4: Flight Schedule Summary PAL 2

AIRLINES	MARKET	PEAK HOUR	# OF FLIGHTS	PEAK HOUR	# OF SEATS
AeroMexico	International	12:30 - 13:30	1	12:30 - 13:30	99
Alaska	Domestic	9:00 - 10:00	1	9:00 - 10:00	178
Allegiant	Domestic	10:30 - 11:30	1	10:30 - 11:30	186
American	International	6:25 - 7:25	3	6:25 - 7:25	512
	Domestic	12:30 - 13:30	3	12:30 - 13:30	385
Breeze	Domestic	11:30 - 12:30	1	11:30 - 12:30	108
Delta	International	6:15 - 7:15	2	6:15 - 7:15	301
	Domestic	5:18 - 6:18	4	5:18 - 6:18	537
Frontier	Domestic	12:50 - 13:50	1	14:20 - 15:20	230
JetBlue	Domestic	12:50 - 13:50	1	12:50 - 13:50	162
New Carrier	International	5:30 - 6:30	2	5:30 - 6:30	372
Southwest	International	6:30 - 7:30	2	6:30 - 7:30	350
	Domestic	17:55 - 18:55	7	17:55 - 18:55	1,065
Sun Country	Domestic	16:10 - 17:10	1	16:10 - 17:10	138
United	International	6:30 - 7:30	2	6:30 - 7:30	345
	Domestic	5:30 - 6:30	4	17:50 - 18:50	508
Viva	International	7:55 - 8:55	1	7:55 - 8:55	186
Volaris	International	9:51 - 10:51	1	9:51 - 10:51	179
Overall		**5:34 - 6:34**	**20**	**5:34 - 6:34**	**2,927**

Source: TransSolutions' Design Day Flight Schedules

Table 2-5: Flight Schedule Summary PAL 3

AIRLINES	MARKET	PEAK HOUR	# OF FLIGHTS	PEAK HOUR	# OF SEATS
AeroMexico	International	12:30 - 13:30	1	12:30 - 13:30	99
Alaska	Domestic	9:00 - 10:00	1	9:00 - 10:00	178
Allegiant	Domestic	10:30 - 11:30	1	10:30 - 11:30	186
American	International	6:25 - 7:25	3	6:25 - 7:25	512
	Domestic	9:50 - 10:50	3	9:50 - 10:50	522
Breeze	Domestic	7:05 - 8:05	1	7:05 - 8:05	108
Delta	International	6:15 - 7:15	2	6:15 - 7:15	382
	Domestic	5:18 - 6:18	4	5:18 - 6:18	764
Frontier	Domestic	12:50 - 13:50	1	14:20 - 15:20	230
JetBlue	Domestic	12:50 - 13:50	1	12:50 - 13:50	162
New Carrier	International	5:30 - 6:30	2	5:30 - 6:30	372
Southwest	International	6:30 - 7:30	2	6:30 - 7:30	350
	Domestic	17:55 - 18:55	7	17:55 - 18:55	1,065
Sun Country	Domestic	16:10 - 17:10	1	19:00 - 20:00	186
United	International	6:30 - 7:30	2	6:30 - 7:30	345
	Domestic	5:30 - 6:30	4	17:50 - 18:50	508
Viva	International	7:55 - 8:55	1	7:55 - 8:55	186
Volaris	International	9:51 - 10:51	1	9:51 - 10:51	179
Overall		**5:34 - 6:34**	**20**	**5:34 - 6:34**	**3,207**

Source: TransSolutions' Design Day Flight Schedules

Table 2-6: Flight Schedule Summary PAL 4

AIRLINES	MARKET	PEAK HOUR	# OF FLIGHTS	PEAK HOUR	# OF SEATS
AeroMexico	International	12:30 - 13:30	1	12:30 - 13:30	99
Alaska	Domestic	9:00 - 10:00	1	9:00 - 10:00	178
Allegiant	Domestic	10:30 - 11:30	1	10:30 - 11:30	186
American	International	6:25 - 7:25	3	6:25 - 7:25	512
	Domestic	8:45 - 9:45	4	8:45 - 9:45	671
Breeze	Domestic	7:05 - 8:05	1	7:05 - 8:05	108
Delta	International	6:15 - 7:15	2	6:15 - 7:15	382
	Domestic	5:18 - 6:18	4	5:18 - 6:18	764
Frontier	Domestic	12:50 - 13:50	1	14:20 - 15:20	230
JetBlue	Domestic	12:50 - 13:50	1	12:50 - 13:50	162
New Carrier	International	5:30 - 6:30	2	5:30 - 6:30	372
Southwest	International	6:30 - 7:30	2	6:30 - 7:30	350
	Domestic	17:55 - 18:55	7	17:55 - 18:55	1,065
Sun Country	Domestic	16:10 - 17:10	1	19:00 - 20:00	186
United	International	6:30 - 7:30	2	6:30 - 7:30	345
	Domestic	5:30 - 6:30	4	5:30 - 6:30	613
Viva	International	7:55 - 8:55	1	7:55 - 8:55	186
Volaris	International	9:51 - 10:51	1	9:51 - 10:51	179
Overall		**5:34 - 6:34**	**20**	**5:34 - 6:34**	**3,491**

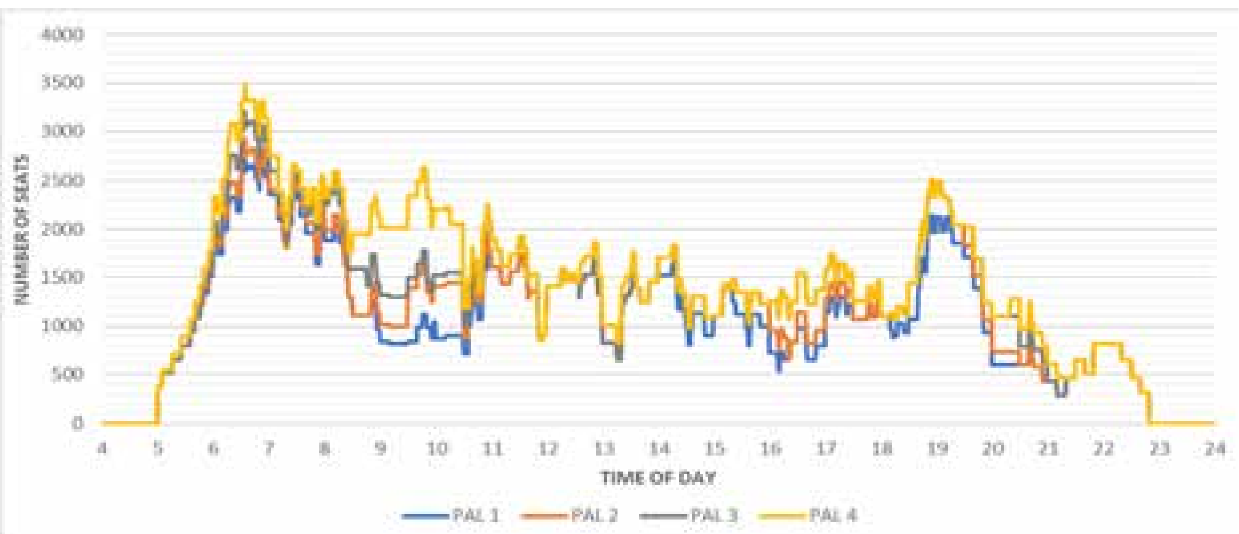
Source: TransSolutions' Design Day Flight Schedules

Figure 2-1 and Figure 2-2 show the combined rolling-hour departing flights and seats for each PAL activity level.

Figure 2-1: Rolling-Hour Departing Flights

Source: TransSolutions' Design Day Flight Schedules

Figure 2-2: Rolling-Hour Departing Seats



Source: TransSolutions' Design Day Flight Schedules

2.4 Arrivals Peak Hour

Table 2-7, Table 2-8 and Table 2-9 summarize the peak hour arriving flights and seat counts by airline associated with the four planning day flight schedules.

Table 2-7: Flight Schedule Summary PAL 1

AIRLINES	MARKET	PEAK HOUR	# OF FLIGHTS	PEAK HOUR	# OF SEATS
AeroMexico	International	11:15 - 12:15	1	11:15 - 12:15	99
Alaska	Domestic	16:45 - 17:45	1	16:45 - 17:45	178
Allegiant	Domestic	9:45 - 10:45	1	9:45 - 10:45	186
American	Domestic	21:19 - 22:19	4	22:57 - 23:57	469
Breeze	Domestic	10:55 - 11:55	1	10:55 - 11:55	108
Delta	Domestic	21:32 - 22:32	3	21:32 - 22:32	458
Frontier	Domestic	12:04 - 13:04	1	12:04 - 13:04	189
JetBlue	Domestic	12:00 - 13:00	1	12:00 - 13:00	162
New Carrier	International	20:45 - 21:45	2	6:45 - 7:45	186
Southwest	Domestic	17:20 - 18:20	7	17:20 - 18:20	1,065
Sun Country	Domestic	15:20 - 16:20	1	15:20 - 16:20	138
United	Domestic	10:15 - 11:15	4	10:15 - 11:15	507
Viva	International	6:45 - 7:45	1	6:45 - 7:45	186
Volaris	International	8:36 - 9:36	1	8:36 - 9:36	179
Overall	**International**	**6:45 - 7:45**	**2**	**6:45 - 7:45**	**372**
	Domestic	**12:13 - 13:13**	**12**	**17:07 - 18:07**	**1,886**

Source: TransSolutions' Design Day Flight Schedules

Table 2-8: Flight Schedule Summary PAL 2

AIRLINES	MARKET	PEAK HOUR	# OF FLIGHTS	PEAK HOUR	# OF SEATS
AeroMexico	International	11:15 - 12:15	1	11:15 - 12:15	99
Alaska	Domestic	8:00 - 9:00	1	8:00 - 9:00	178
Allegiant	Domestic	9:45 - 10:45	1	9:45 - 10:45	186
American	Domestic	21:19 - 22:19	4	22:57 - 23:57	522
Breeze	Domestic	10:55 - 11:55	1	10:55 - 11:55	108
Delta	Domestic	21:32 - 22:32	3	21:32 - 22:32	458
Frontier	Domestic	12:04 - 13:04	1	13:30 - 14:30	230
JetBlue	Domestic	12:00 - 13:00	1	12:00 - 13:00	162
New Carrier	International	20:45 - 21:45	2	6:45 - 7:45	186
Southwest	Domestic	17:20 - 18:20	7	17:20 - 18:20	1,065
Sun Country	Domestic	15:20 - 16:20	1	15:20 - 16:20	138
United	Domestic	10:15 - 11:15	4	16:38 - 17:38	508
Viva	International	6:45 - 7:45	1	6:45 - 7:45	186
Volaris	International	8:36 - 9:36	1	8:36 - 9:36	179
Overall	**International**	**6:45 - 7:45**	**2**	**6:45 - 7:45**	**372**
	Domestic	**12:13 - 13:13**	**13**	**17:15 - 18:15**	**2,014**

Source: TransSolutions' Design Day Flight Schedules

Table 2-9: Flight Schedule Summary PAL 3

AIRLINES	MARKET	PEAK HOUR	# OF FLIGHTS	PEAK HOUR	# OF SEATS
AeroMexico	International	11:15 - 12:15	1	11:15 - 12:15	99
Alaska	Domestic	8:00 - 9:00	1	8:00 - 9:00	178
Allegiant	Domestic	9:45 - 10:45	1	9:45 - 10:45	186
American	Domestic	17:20 - 18:20	4	17:20 - 18:20	565
Breeze	Domestic	6:30 - 7:30	1	6:30 - 7:30	108
Delta	Domestic	21:32 - 22:32	3	21:32 - 22:32	539
Frontier	Domestic	12:04 - 13:04	1	13:30 - 14:30	230
JetBlue	Domestic	12:00 - 13:00	1	12:00 - 13:00	162
New Carrier	International	20:45 - 21:45	2	6:45 - 7:45	186
Southwest	Domestic	17:20 - 18:20	7	17:20 - 18:20	1,065
Sun Country	Domestic	15:20 - 16:20	1	18:20 - 19:20	186
United	Domestic	10:15 - 11:15	4	16:38 - 17:38	508
Viva	International	6:45 - 7:45	1	6:45 - 7:45	186
Volaris	International	8:36 - 9:36	1	8:36 - 9:36	179
Overall	**International**	**6:45 - 7:45**	**2**	**6:45 - 7:45**	**372**
	Domestic	**17:20 - 18:20**	**14**	**17:20 - 18:20**	**2,147**

Source: TransSolutions' Design Day Flight Schedules

Table 2-10: Flight Schedule Summary PAL 4

AIRLINES	MARKET	PEAK HOUR	# OF FLIGHTS	PEAK HOUR	# OF SEATS
AeroMexico	International	11:15 - 12:15	1	11:15 - 12:15	99
Alaska	Domestic	8:00 - 9:00	1	8:00 - 9:00	178
Allegiant	Domestic	9:45 - 10:45	1	9:45 - 10:45	186
American	Domestic	8:27 - 9:27	4	8:27 - 9:27	671
Breeze	Domestic	6:30 - 7:30	1	6:30 - 7:30	108
Delta	Domestic	7:00 - 8:00	3	7:00 - 8:00	573
Frontier	Domestic	12:04 - 13:04	1	13:30 - 14:30	230
JetBlue	Domestic	12:00 - 13:00	1	12:00 - 13:00	162
New Carrier	International	20:45 - 21:45	2	6:45 - 7:45	186
Southwest	Domestic	17:20 - 18:20	7	17:20 - 18:20	1,065
Sun Country	Domestic	15:20 - 16:20	1	18:20 - 19:20	186
United	Domestic	7:32 - 8:32	4	7:32 - 8:32	613
Viva	International	6:45 - 7:45	1	6:45 - 7:45	186
Volaris	International	8:36 - 9:36	1	8:36 - 9:36	179
Overall	**International**	**6:45 - 7:45**	**2**	**6:45 - 7:45**	**372**
	Domestic	**7:39 - 8:39**	**15**	**7:39 - 8:39**	**2,372**

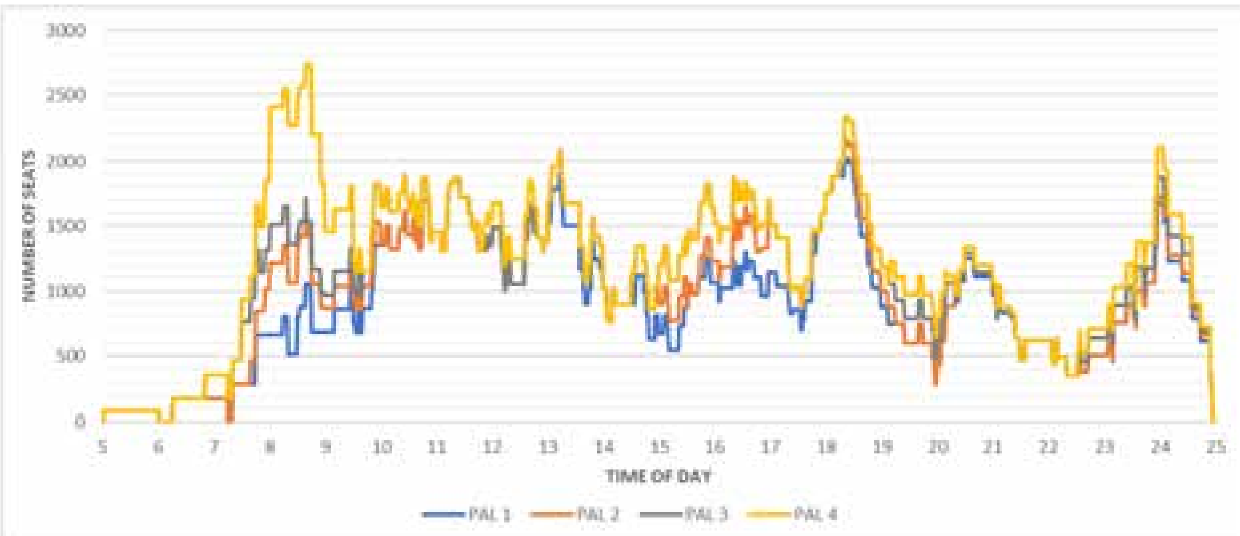
Source: TransSolutions' Design Day Flight Schedules

Figure 2-3 and Figure 2-4 show the combined rolling-hour departing flights and seats respectively for each PAL activity level.

Figure 2-3: Rolling-Hour Arriving Flights

Source: TransSolutions' Design Day Flight Schedules

Figure 2-4: Rolling-Hour Arriving Seats



Source: TransSolutions' Design Day Flight Schedules

2.5 Employee and Crew Demand

An additional 5% of the passenger demand will be added to represent employees and crew at the security screening checkpoint. A Known Crew Member (KCM) lane will not be modeled.

2.6 Well Wishers

Originating passengers may be escorted into the terminal by family, friends, or colleagues. These are referred to as well-wishers. Well-wishers will accompany their passengers during the check-in process but do not enter the queue for the SSCP when their passenger group enters the queue. The percentage of passengers with well-wishers is summarized in Table 2-11 and will be used for this study.

Table 2-11: Percentage of Well-wishers per Group

WELL-WISHERS GROUP SIZE	PERCENTAGE OF WELL-WISHERS	
	DOMESTIC	INTERNATIONAL
0	94.71%	85.43%
1	3.27%	6.40%
2	1.05%	4.79%
3	0.24%	2.38%
4	0.74%	0.72%
5	0.00%	0.28%

Source: TransSolutions' previous simulation studies

2.7 Meeters-Greeters

Meeters-greeters are visitors that arrive at the airport to pick up passengers. For purposes of this study, meeters-greeters are assumed to wait and meet the terminating passengers at the meeter-greeter area. For international terminating passenger groups with meeters-greeters, the group size distribution of the meeters-greeters is shown in Table 2-12.

Table 2-12: Number of Meeters-Greeters per Group

MEETERS-GREETERS GROUP SIZE	PERCENTAGE OF MEETERS-GREETERS	
	DOMESTIC	INTERNATIONAL
0	84.31%	74.58%
1	11.04%	19.00%
2	2.72%	3.82%
3	0.28%	1.36%
4	0.66%	0.88%
5	0.99%	0.37%

Source: TransSolutions' previous simulation studies

2.8 Meeters-Greeters Arrival Curve

Both international and pre-cleared/domestic passengers' meeters-greeters are expected to wait in the meeter-greeter hall. Pre-cleared/domestic meeters-greeters are expected to arrive as early as 15 minutes before the flight arrival or as late as 15 minutes after flight arrival. International passengers' meeters-greeters are assumed to arrive between 15 to 45 minutes after flight arrival. Passengers also dwell between 1-3 minutes in the meeters-greeters hall once they meet with their party.

3 Passenger Characteristics

3.1 Passenger Arrival Curves

Passengers arrive to the airport for their departing flight allowing time for check-in, security screening, concessions, and flight boarding. Passenger arrival curves vary by time of day. TransSolutions performed an on-site data collection to gather passenger arrival curves to the Security Screening Checkpoint. TransSolutions will assume passengers arrive at the check-in hall 10-20 minutes before their intercept time at the SSCP. Table 3-1 shows the passenger arrival curves for pre 8 AM domestic flights, post 8 AM domestic flights, and international flights.

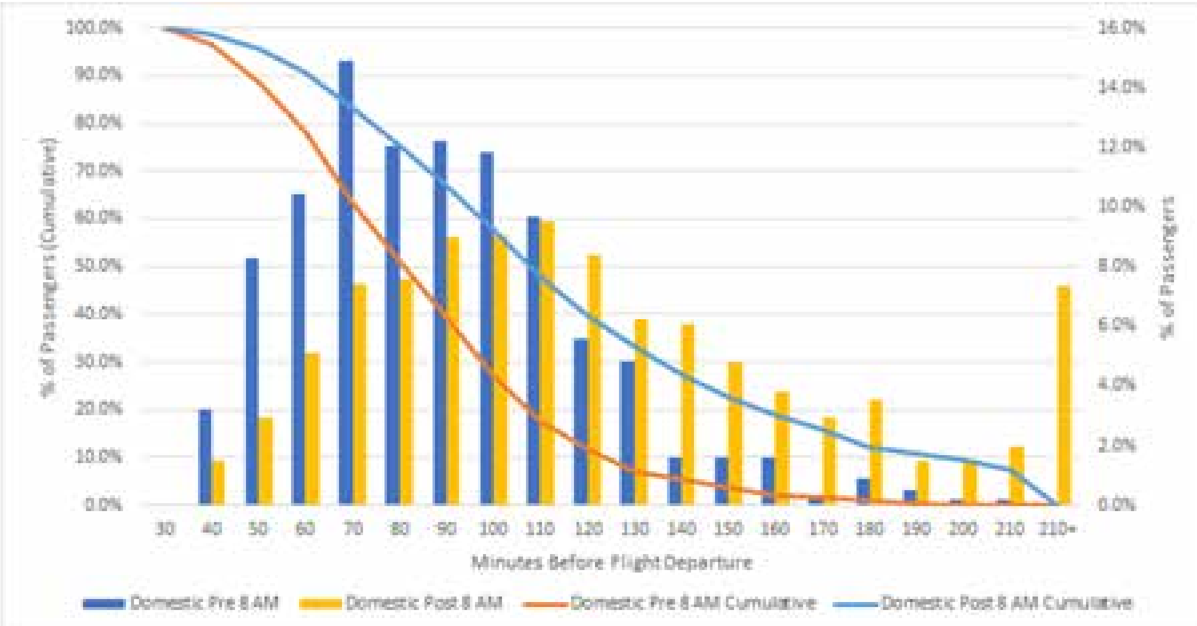
Table 3-1: Passenger Arrival Curve at Security Screening Checkpoint

TIME BEFORE SCHEDULED FLIGHT DEPARTURE	PERCENTAGE OF DOMESTIC PASSENGERS		% OF INTERNATIONAL PASSENGERS
	PRE 8:00 AM	POST 8:00 AM	
30	0.0%	0.0%	0.0%
40	3.2%	1.5%	0.0%
50	8.3%	2.9%	1.1%
60	10.4%	5.1%	1.1%
70	14.9%	7.4%	3.8%
80	12.0%	7.6%	8.2%
90	12.2%	9.0%	9.2%
100	11.8%	9.0%	8.7%
110	9.7%	9.5%	12.5%
120	5.6%	8.4%	9.8%
130	4.8%	6.2%	8.7%
140	1.6%	6.1%	9.2%
150	1.6%	4.8%	5.4%
160	1.6%	3.8%	6.0%
170	0.4%	2.9%	2.2%
180	0.9%	3.5%	6.0%
190	0.5%	1.5%	1.6%
200	0.2%	1.5%	1.6%
210	0.2%	2.0%	0.0%
210+	0.0%	7.4%	4.9%
Average	**85 min**	**120 min**	**123 min**

Source: TransSolutions Data Collection (9/12-9/13, 2022)

Figure 3-1 shows passenger arrival curves for domestic flights.

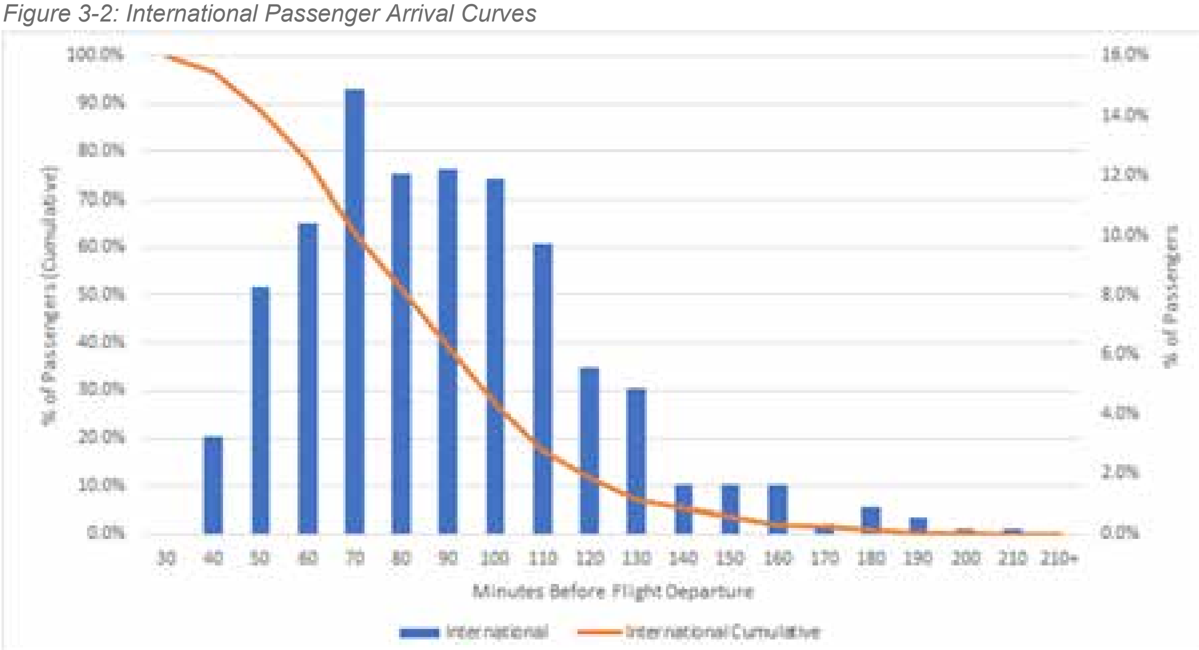
Figure 3-1: Domestic Passenger Arrival Curves



Source: TransSolutions Data Collection (9/12-9/13, 2022)
** 7.5% of post 8 AM passengers arrive between 210-360 minutes before their flight departure*

Figure 3-2 shows passenger arrival curves for international flights.

Figure 3-2: International Passenger Arrival Curves



Source: TransSolutions Data Collection (9/12-9/13, 2022)

3.2 Passenger Group Sizes

Passengers transit in the terminal as individual passengers or in groups. Typically, passengers maintain their group size for their entire journey through the terminal and do not separate from their group except at SSCP where passengers are screened individually. Table 3-2 shows the average passenger group size.

Table 3-2: Passenger Group Size

AIRLINE	AVERAGE GROUP SIZE	
	DOMESTIC	INTERNATIONAL
AeroMexico*	-	1.6
Alaska *	1.3	-
Allegiant *	1.3	-
American	1.3	1.3
Breeze*	1.3	-
Delta	1.3	1.6
Frontier	1.4	-
JetBlue	1.5	-
New Carrier*	1.3	-
Southwest	1.3	-
Sun Country	-	1.6
United	1.4	1.4
Viva	-	1.7
Volaris	-	1.8
Average	**1.3**	**1.6**

Source: TransSolutions Data Collection (9/12-9/13, 2022)
** Insufficient data. Overall domestic or international group size distribution will be applied*

3.3 Check-in Location

Table 3-3 shows the passenger check-in location.

Table 3-3: Passenger Check-in Location

AIRLINES	AGENT	KIOSK	ONLINE/MOBILE	CURBSIDE
AeroMexico*	40.2%	33.1%	26.7%	-
Alaska*	14.8%	45.8%	39.4%	-
Allegiant*	14.8%	45.8%	39.4%	-
American	21.5%	40.4%	38.1%	-
Breeze*	14.8%	45.8%	39.4%	-
Delta	16.3%	44.8%	38.9%	-
Frontier*	14.8%	45.8%	39.4%	-
JetBlue	36.6%	17.1%	46.3%	-
New Carrier*	14.8%	45.8%	39.4%	-
Southwest	15.9%	48.3%	35.8%	-
Sun Country*	40.2%	33.1%	26.7%	-
United	5.7%	54.8%	39.5%	-
Viva	72.0%	12.0%	16.0%	-
Volaris	35.9%	17.9%	46.2%	-

Source: TransSolutions Data Collection (9/12-9/13, 2022)
** Insufficient data. Overall domestic or international group size distribution will be applied*

Please note that passengers intercepted during the data collection did not provide curbside as a response to where they obtained their boarding pass. However, a small percentage of passengers do check-in at curbside. For purposes of this study 1% of American, Delta, Southwest, and United passengers are assumed to check-in at curbside. The check-in channel distribution will be adjusted in the simulation model to reflect 1% of passengers check-in at curbside.

3.4 Check-in Processing Time

Table 3-4 shows the check-in processing times.

Table 3-4: Average Check-In Processing Time (minutes) per Passenger Group

AIRLINE	AGENT	AGENT-PREMIUM	BAG DROP	CURBSIDE	KIOSK	KIOSK & SELF-BAG TAGGING	COMMON USE KIOSK
AeroMexico*	4.3	2.3	2.2	-	2.5	-	-
Alaska	4.4	2.6	0.8	-	-	2.2	-
Allegiant*	3.6	-	1.5	-	2.5	-	-
American	5.2	2.0	1.0	5.9	-	3.8	1.8
Breeze*	3.6	2.6	1.5	-	2.5	-	-
Delta	4.3	2.3	2.2	1.8	2.5	-	-
Frontier	2.8	-	1.7	-	-	-	-
JetBlue	3.5	-	3.4	-	-	1.9	2.4
New Carrier*	3.6	2.6	1.5	-	2.5	-	-
Southwest	2.5	2.1	0.9	2.2	-	2.2	-
Sun Country**	3.8	-	-	-	-	-	-
United	3.8	3.1	2.4	-	2.4	-	-
Viva	3.4	-	-	-	-	-	-
Volaris	3.8	-	-	-	-	-	2.3
Average	**3.6**	**2.6**	**1.5**	**3.4**	**2.5**	**2.9**	**2.2**

Source: TransSolutions Data Collection (9/12-9/14, 2022)
** Insufficient data. Overall domestic or international group size distribution will be applied*

3.5 Passengers with Checked Bags

The number of checked bags per passenger group is summarized in Table 3-5.

Table 3-5: Checked Bags Distribution

AIRLINE	% OF PASSENGERS WITH CHECKED-BAGS
AeroMexico	67%
Alaska*	64%
Allegiant*	64%
American	53%
Breeze*	64%
Delta	75%
Frontier	65%
JetBlue	86%
New Carrier*	64%
Southwest	74%
Sun Country*	65%
United	52%
Viva	65%
Volaris	53%
Average	**60%**

Source: TransSolutions Data Collection (9/12-9/13, 2022)
** Insufficient data. Overall domestic or international checked-bags distribution will be applied*

3.6 Priority Passengers

Table 3-6 shows the percentage of priority passengers.

Table 3-6: Percentage of Priority Passengers

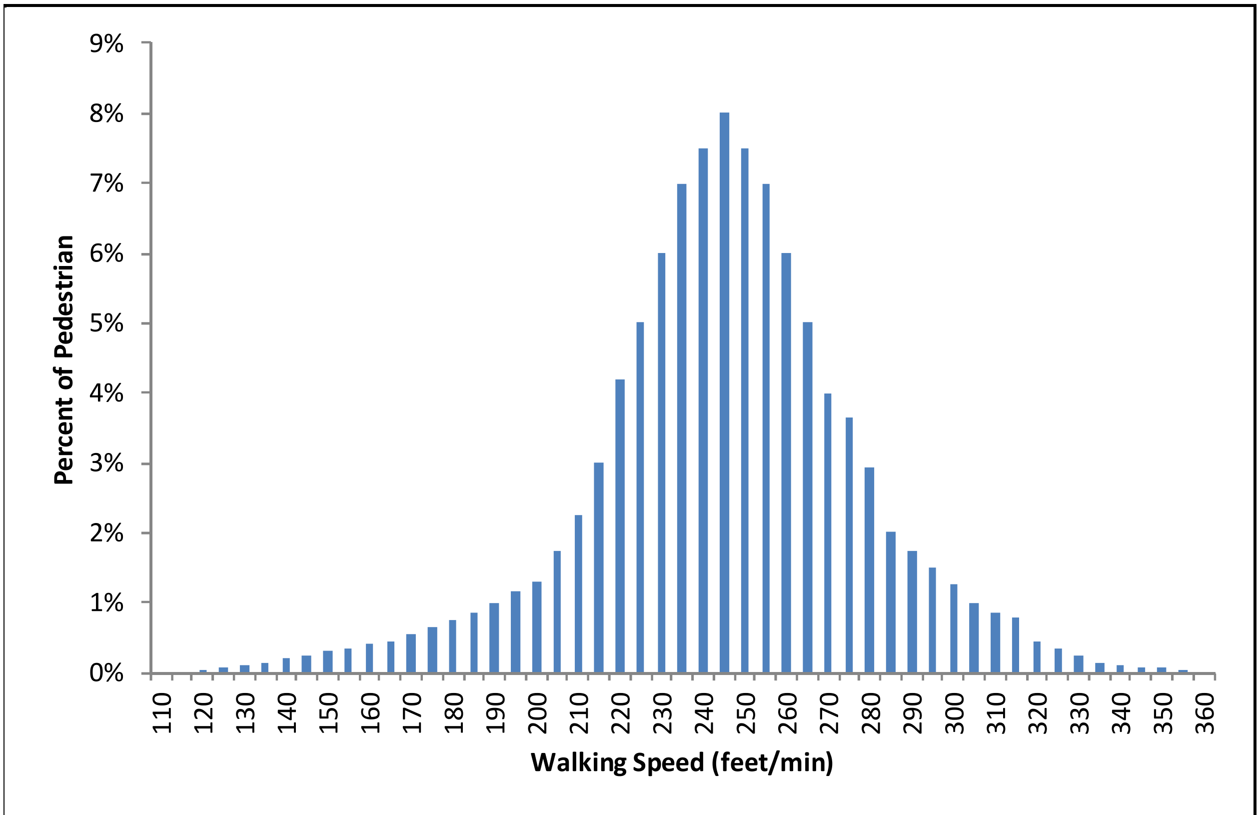
AIRLINE	% OF PRIORITY PASSENGERS
AeroMexico	67%
Alaska*	64%
Allegiant*	64%
American	53%
Breeze*	64%
Delta	75%
Frontier	65%
JetBlue	86%
New Carrier*	64%
Southwest	74%
Sun Country*	65%
United	52%
Viva	65%
Volaris	53%
Average	**60%**

Source: TransSolutions' previous studies
** Business Select®, Anytime, A-List, and A-List Preferred Members*

3.7 Passenger & Visitor Walking Speeds

Passengers and visitors walk through the airport at speeds that vary between 120 feet/minute (fpm) and 360 fpm, with an average of 257 fpm. The cumulative distribution of walking speeds that will be used in the simulation study is shown in Figure 3-3.

Figure 3-3: Passenger Walking Speed



Source: "Pedestrian Planning and Design," Fruin, 1987

4 Originating Passenger Process

4.1 Check-in

Upon arrival to the lobby, originating passengers either proceed to the check-in lobby to receive their boarding pass and/or to check baggage, or they proceed directly to the SSCP if they have checked in online and have no bags to check. The following table shows the different queues that were available for each airline. After completing check-in, passengers proceed to the SSCP to enter the secure side of the terminal.

Table 4-1: Current Check-in Queue Allocation

AIRLINE	QUEUE TYPE
AeroMexico	Premium Full Service Bag Drop Kiosk Curbside
Alaska	Premium Full Service Bag Drop Self-Tag Kiosk
American	Premium Full Service Bag Drop Self-Tag Kiosk Curbside
Delta	Premium Full Service Bag Drop Kiosk Curbside
Frontier	Full Service Bag Drop
JetBlue	Full Service

	Bag Drop
	Premium
	Full Service
Southwest	Bag Drop
	Self-Tag Kiosk
	Curbside
Sun Country	Full Service
	Bag Drop
	Premium
	Full Service
United	Boarding Pass Online Kiosk
	Self-Tag Kiosk
	Curbside
Viva	Express Check-in
	General Check-in
Volaris	Full Service
	Bag Drop

Source: TransSolutions Data Collection (9/12-9/13, 2022)

4.2 Security Screening Checkpoint

The following queueing areas are provided at SSCP:

- Pre✓® Queue – for TSA Pre✓® participants using established Pre✓® screening protocols
- CLEAR – for travelers participating in the program, assumed to be 6.8% based on TransSolutions' previous studies
- Employee/Crew Queue: for crew and employees
- General Queue – for the remaining main cabin passengers

Table 4-2 shows the passenger splits at the SSCP.

Table 4-2: Passenger Splits at SSCP

LANE TYPE	DEMAND
Pre✓®	20%
Regular	80%

Source: TransSolutions' Previous Studies

Table 4-3 shows the Travel Document Check (TDC) and SSCP Throughput.

Table 4-3: TDC and SSCP Throughput

LANE TYPE	PAX TYPE	THROUGHPUT (PAX/HOUR/LANE)
TDC	Domestic	240
	International	240
SSCP	Pre✓®	210
	Regular	160

Source: TransSolutions' Previous Studies

After clearing the SSCP, the departing passenger will proceed towards their respective gates and wait until their boarding call.

5 Terminating Passenger Flow

5.1 Aircraft Deboarding

Once an aircraft arrives and parks at a gate, three to five minutes are required to chock and block the aircraft, position the jet bridge, and open the door before the first passenger exits the aircraft. Table 5-1 shows passenger deboarding rates.

Table 5-1: Passenger Deboarding Rate

AIRCRAFT TYPE	PAX DEBOARDING RATE (PAX/MINUTE)
Widebody (two-aisle) – 1 Jet Bridge	25
Narrow body	18
Commuter	18

Source: TransSolutions' Assumptions

5.2 Domestic Passenger Flow

Arriving domestic passengers claiming bags proceed to the baggage claim area to claim their bags. As passengers arrive at the bag claim area, they queue around their specific claim device while waiting for their bags to arrive. Passenger groups remain at the claim device until all bags for the group have been claimed. Upon claiming their bags, passengers exit the terminal to their respective modes of transportation.

5.3 International Passenger Flow

All International arriving passengers who arrive at the Terminal will disembark and proceed through the sterile corridors to the Federal Inspection Services (FIS). Passengers upon arriving at the immigration hall will be processed by immigration officer, automated passport control (APC) kiosks, Mobil Passport Control (MPC)or Global Entry (GE) Kiosks. Passengers will then proceed to collect their baggage before going to customs exit control. CBP has told industry groups that 100 PAX/Hour/Lane is a good planning throughput to represent future technology since CBP's guidance for the current process is 60 PAX/Hour/Lane.

5.4 CBP Primary Process

Passengers who are eligible to use the kiosks - such as US citizens (USC), lawful permanent residents (LPR), and foreign nationals with visa waivers - Electronic System for Travel Authorization (ESTA) - are assumed to proceed to the APC kiosks to be processed while waiting for their bags. These kiosks could use technologies such as facial recognition/biometrics or other forms of verification. The passenger split assumption to be used in this study is summarized in Table 5-2.

Table 5-2: CBP/FIS Passenger Splits

PASSPORT TYPES	LATIN AMERICA
USC/LPR	60%
VW/B1/B2/NVW	40%

Source: TransSolutions' Previous Studies

Table 5-3 summarizes the percentage of U.S Citizens, Canadians, and Legal Permanent Residents that use the Automated passport controls.

Table 5-3: Automated Passport Control (U.S. Citizens/Canadians/LPR)

TYPE	% OF PAX
Global Entry	9.3%
Mobile Passport Control	10.0%
LPR (Legal Permanent Residents)	5.0%
US Citizens / Canadians	75.7%

Source: TransSolutions' Previous Studies

Table 5-4 summarizes the percentages for Visitors (includes Visa waiver and non-Visa waiver).

Table 5-4: Visitors (Visa waiver and non-Visa waiver)

TYPE	% OF PAX
Global Entry	9.3%
US Citizens / Canadians	75.7%

Source: TransSolutions' Previous Studies

Table 5-5 summarizes the usage of CBP Primary areas and the average processing times by U.S Citizens, Canadians, and Legal Permanent Residents.

Table 5-5: CBP Primary Processing Usage (U.S Citizens/Canadians/ LPR)

TYPE	% OF PAX	PROCESSING TIME (SECONDS)
GE Verification		5
U.S. Citizens /Canadians (Verification)	81.5%	20
U.S. Citizens /Canadians (Triage[1])	18.5	60
Legal Permanent Residents (Verification)	50%	20
Legal Permanent Residents (Triage[1])	50%	150

Source: TransSolutions' Previous Studies
[1] *Percentage at Triage includes kiosk error reads, passengers refusing to use kiosk, and declarations*

Table 5-6 summarizes the usage of CBP Primary areas and average CBP Primary processing times for Visitors (Visa- waiver and non-visa waiver).

Table 5-6: CBP Primary Processing Usage (Visitors)

TYPE	% OF PAX	PROCESSING TIME (SECONDS)
B1/B2/C1-D/ESTA (Verification)	50%	120
B1/B2/C1-D/ESTA (Triages)	50%	150

Source: TransSolutions' Previous Studies

For purposes of this study, pre-cleared passengers are treated as domestic passengers and the secondary inspection processing are not modeled.

6 Performance Specifications

6.1 Level of Service

Terminal Level of Service (LOS) metrics are taken from the IATA Airport Development Reference Manual (ADRM), 11th Edition. In this edition, the LOS framework includes four service level categories: Over-design, Optimum, Sub-optimum, and Under-provided. LOS is achieved via a combination of space and waiting time performance. The approach is as follows:

- Identify the space performance for a facility (**Error! Reference source not found.**)
- Identify the time performance for that same facility (**Error! Reference source not found.**)
- Combine space and time performances to identify overall LOS for the facility (**Error! Reference source not found.**)

An Optimum LOS will be the goal for all the facilities being analyzed.

- Optimum LOS is effectively equivalent to LOS C performance as identified by the previous IATA ADRM editions.

The following guidelines have been presented by the IATA ADRM in Exhibit 3.4.5.3. Project performance target for these studies is highlighted in green and shown in Table 6-1.

*Table 6-1: LOS Guidelines for Terminal Facilities**

<table>
<tr><th colspan="2" rowspan="2">LOS Guidelines</th><th colspan="3">Space Guidelines (ft^2 / pax)</th><th colspan="3">Max. Waiting Time Guidelines – Economy Class (minutes)</th><th colspan="3">Max. Waiting Time Guidelines – First / Business / Fast-Track (minutes)</th></tr>
<tr><th>Over-Design</th><th>Optimum</th><th>Sub-Optimum</th><th>Over-Design</th><th>Optimum</th><th>Sub-Optimum</th><th>Over-Design</th><th>Optimum</th><th>Sub-Optimum</th></tr>
<tr><td rowspan="6">Check-in</td><td>Kiosk</td><td>>19.4</td><td>14.0-19.4</td><td><14.0</td><td><1</td><td>1-2</td><td>>2</td><td><1</td><td>1-2</td><td>>2</td></tr>
<tr><td>Bag Drop</td><td>>19.4</td><td>14.0-19.4</td><td><14.0</td><td><1</td><td>1-5</td><td>>5</td><td><1</td><td>1-3</td><td>>3</td></tr>
<tr><td rowspan="4">Check-in Desk</td><td rowspan="4">>19.4</td><td rowspan="4">14.0-19.4</td><td rowspan="4"><14.0</td><td rowspan="4"><10</td><td rowspan="4">10-20</td><td rowspan="4">>20</td><td colspan="3">Business Class</td></tr>
<tr><td><3</td><td><3</td><td><3</td></tr>
<tr><td colspan="3">First Class</td></tr>
<tr><td><1</td><td><1</td><td><1</td></tr>
<tr><td colspan="2">Security Control</td><td>>12.9</td><td>10.8-12.9</td><td><10.8</td><td><5</td><td>5-10</td><td>>10</td><td><1</td><td>1-3</td><td>>3</td></tr>
<tr><td colspan="2">Holdrooms-Standing</td><td>>12.9</td><td>10.8-12.9</td><td><10.8</td><td colspan="6">n/a</td></tr>
</table>

Holdrooms-Seated*	>18.3	16.1-18.3	<16.1			n/a			
Baggage Claim	>18.3	16.1-18.3	<16.1	<0	0-15	>15	<0	0-15	>15

*Source: *Taken from Exhibit 3.4.5.3 from 11th Edition IATA ADRM; m² translated to ft²*

Table 6-2 shows the LOS Space – Time Diagram taken from the IATA ADRM Exhibit 3.4.5.2. This describes how the overall LOS is determined combining the space and time performance levels. Per IATA, the interpretation of the overall LOS guidelines is:

- If both space and time are in the Optimum range, or one is in the Optimum range and the other in the Over-Design range, the LOS is considered Optimum.
- If one parameter is in the Optimum range and the other is in the Sub-Optimum range, the LOS is considered Sub-Optimum, and improvements should be considered.
- If both parameters are in the Sub-Optimum range, the LOS is considered Under-Provided identifying the need for major improvements.
- If both parameters are in the Over-Design range, the LOS is considered Over-Design indicating over-sized / unused facilities or room for future growth.

Table 6-2: Level of Service Space – Time Diagram

LOS PARAMETERS		SPACE		
		OVER-DESIGN[1]	OPTIMUM[2]	SUB-OPTIMUM[3]
Maximum Waiting Time	Over-Design[1]	Over-Design	Optimum	Sub-Optimum *(consider improvements)*
	Optimum[2]	Optimum	Optimum	Sub-Optimum *(consider improvements)*
	Sub-Optimum[3]	Sub-Optimum *(consider improvements)*	Sub-Optimum *(consider improvements)*	Under-Provided *(reconfigure)*

Source: IATA ADRM Exhibit 3.4.5.2
[1] Excessive space; overprovision of resources
[2] Sufficient space for comfortable environment; acceptable waiting and processing times
[3] Crowded and uncomfortable; unacceptable waiting and processing times

Please note that the IATA LOS metrics are guidelines for international airports and can/should be adjusted as necessary to reflect specific characteristics, requirements, etc. of each facility.

Simulation modeling, rather than a formula-based analysis, is used for this study thus the findings are more precise. Therefore the 95% passenger wait time is used instead of the maximum wait time for check-in and SSCP; in simulation modeling the maximum is an extreme measure.

Appendix U – Facility Requirements

CORGAN

SAN ANTONIO INTERNATIONAL AIRPORT

Airport Terminal Planning Program

Chapter #: Chapter Title

CORGAN

Contents

Figures

Tables

CORGAN

1 Executive Summary

1.1 Background & Objective

The City of San Antonio (City), Aviation Department has retained Corgan to provide airport planning services to develop an Advanced Terminal Planning Program (ATPP) for a new Terminal C at San Antonio International Airport (SAT), as well as areas related to or impacted by the terminal complex, such as an airfield, support facilities, landside, and ground access, and environmental. The result of this project will create a Program Definition Manual (PDM) which defines the Terminal C expansion project, associated enabling projects, and related infrastructure necessary to support the development, with key projects developed to a 15% Level of Design.

TransSolutions will assist Corgan to derive processor requirements for Check-in, Security Screening Checkpoint, Federal Inspection Services (FIS), and baggage claim devices using discrete event simulation.

1.2 Requirements Summary

Figure 1-1 through Figure 1-4 show the processor requirements for the check-in hall for PAL 1, PAL 2, PAL 3 and PAL 4 scenarios.

Figure 1-1: Check-in Hall Processor Requirements for Scenario 1 – Combined Kiosks

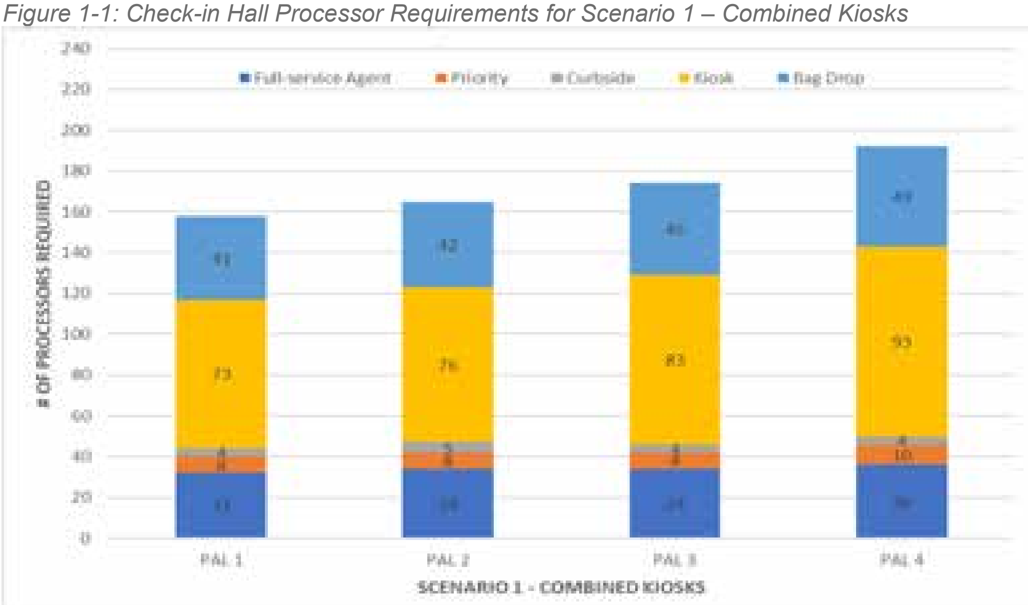


Figure 1-2: Check-in Hall Processor Requirements for Scenario 2 – Split Kiosks

Figure 1-3: Check-in Hall Processor Requirements for Scenario 3 – 1-step SSBDs

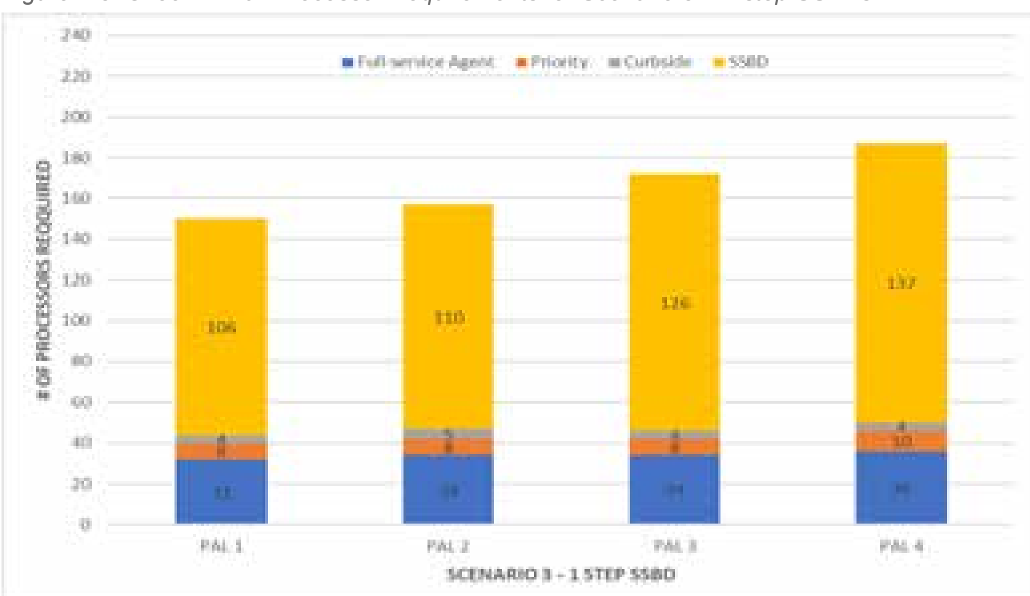


Figure 1-4: Check-in Hall Processor Requirements for Scenario 4 – 2-step SSBDs

Figure 1-14 through Figure 1-28 show the queueing area requirements for the check-in hall for PAL 1, PAL 2, PAL 3 and PAL 4 scenarios. For purposes of these figures queues for all types of kiosks and bag drops are combined.

Figure 1-5: Check-in Hall Queueing Area Requirements

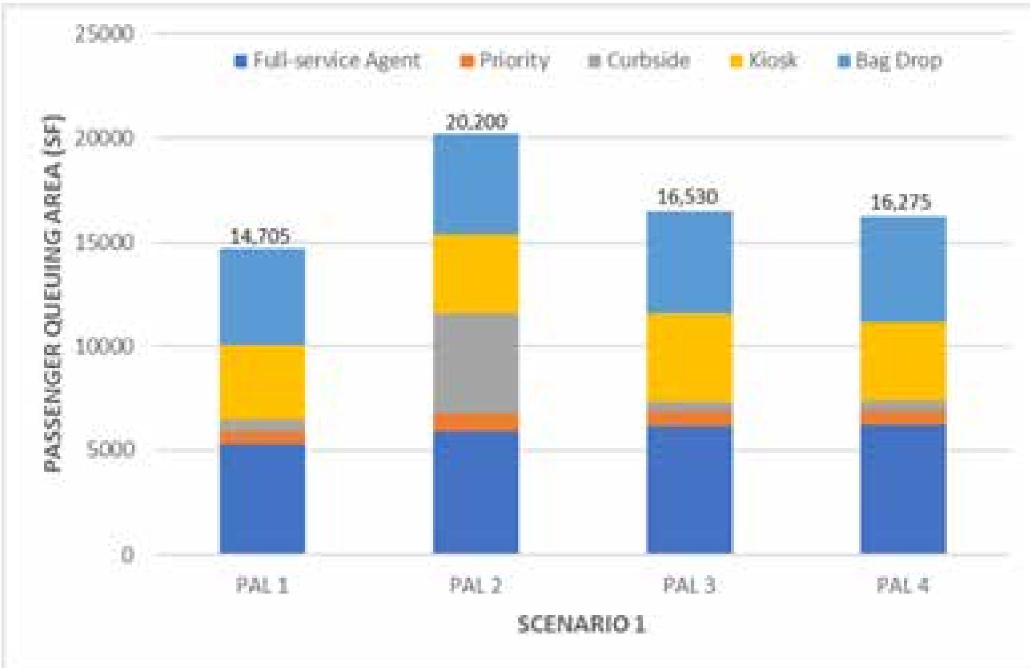


Figure 1-6: Check-in Hall Queueing Area Requirements

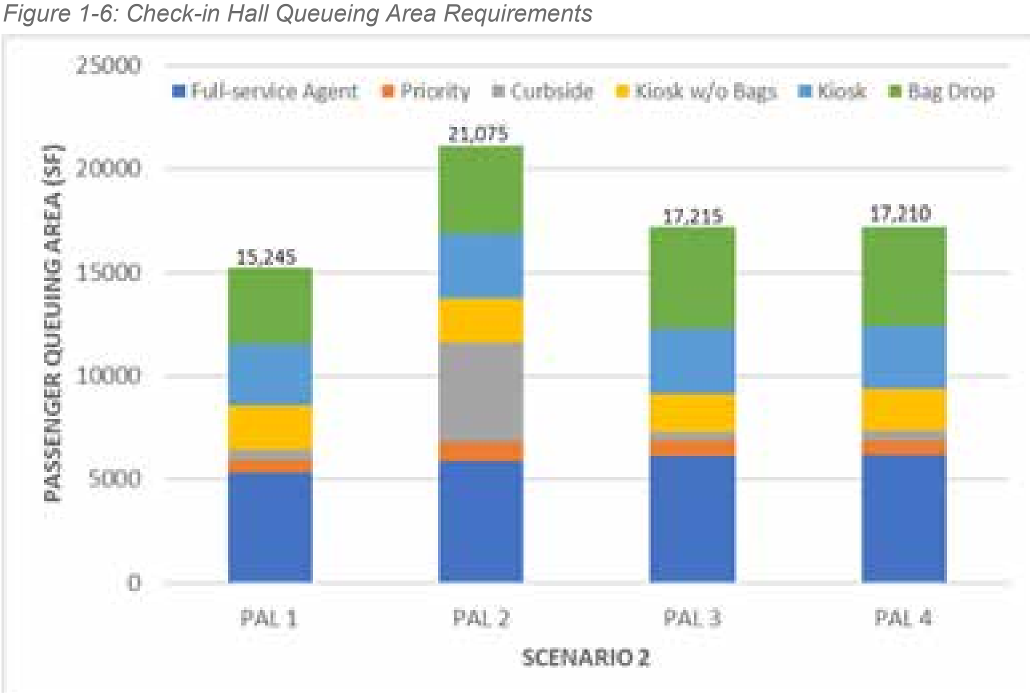


Figure 1-7: Check-in Hall Queueing Area Requirements

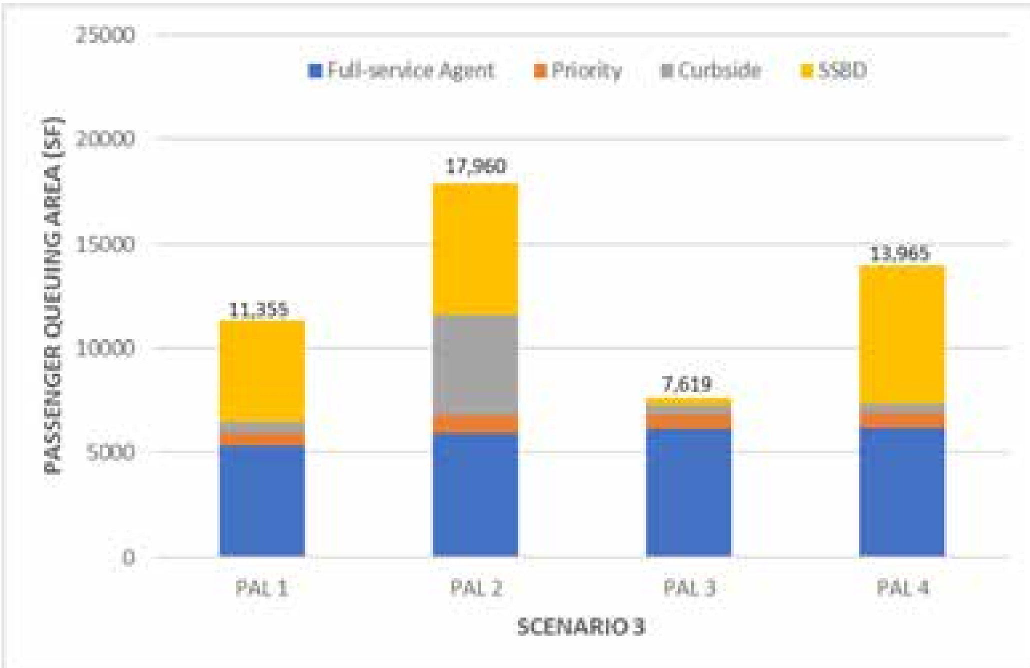
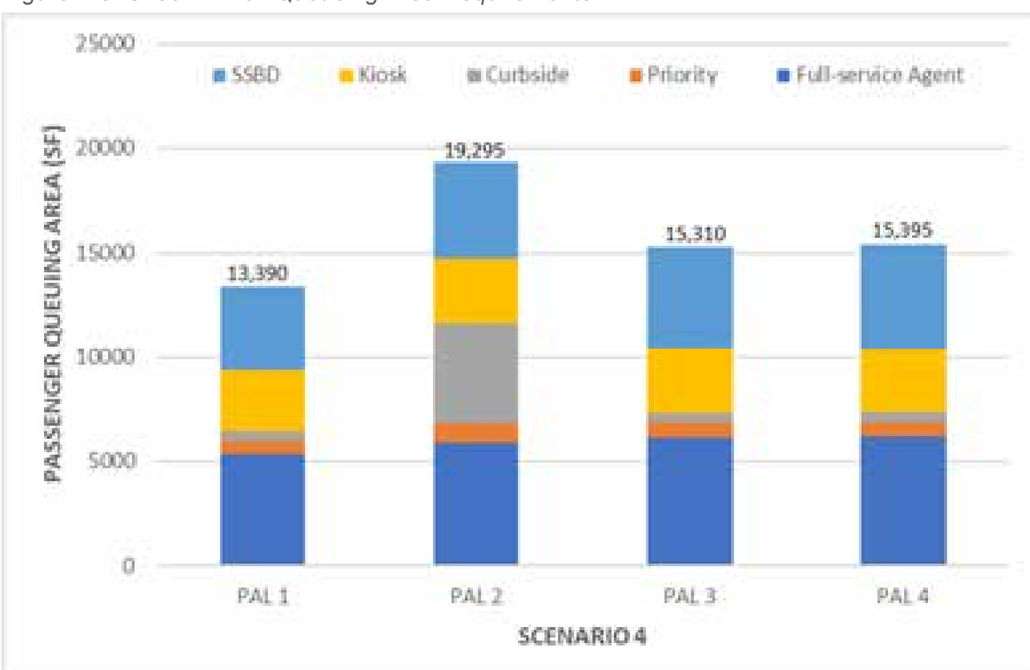


Figure 1-8: Check-in Hall Queueing Area Requirements



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2 Key Assumptions, Passenger Demand & Performance Cirteria

2.1 Key Assumptions

Table 2-1: Key Assumptions

PARAMETER	VALUE
Demand-related Parameters	
# of Airlines	14
Planning Day Flight Schedule	PAL 1, PAL 2, PAL 3, PAL 4
Daily Departures (PAL 1, PAL 2, PAL 3, PAL 4)	146, 156, 168, 178
Daily Arrivals (PAL 1, PAL 2, PAL 3, PAL 4)	146, 156, 168, 178
Peak Hour Departures (PAL 1, PAL 2, PAL 3, PAL 4)	20, 20, 20, 20
Peak Hour Departing Seats (PAL 1, PAL 2, PAL 3, PAL 4)	2,766, 2,927, 3,207, 3,497
Peak Hour Arrivals (PAL 1, PAL 2, PAL 3, PAL 4)	14, 15, 15, 17
Peak Hour Arriving Seats (PAL 1, PAL 2, PAL 3, PAL 4)	2,072, 2,200, 2,333, 2,744
Load Factor	93%
Average Origination/Destination (All Airlines)	100%
Passenger Characteristics	
Domestic Passenger Arrival Curve – Pre 8:00 AM	85 minutes average
Domestic Passenger Arrival Curve – Post 8:00 AM	120 minutes average
International Passenger Arrival Curve	123 minutes average
Domestic Average Group Size	1.3 Passengers/Group
International Average Group Size	1.6 Passengers/Group
Premium Passengers	15%-20%
Average Checked-Bags/Passenger Group	1 Bag/Group
SSCP-related Parameters	
% of Pre✓® Passengers	20%
% of General Passengers	80%
Pre✓® Passenger Throughput*	210 Passengers/Hour/Lane
Economy Passenger Throughput*	160 Passengers/Hour/Lane
Travel Document Check (TDC) Processing Time	240 Passengers/Hour/Agent

Source: SAT ATPP Simulation MAPS 20230323.pdf

2.2 Peak Hour Passenger Demand

Table 2-2 shows the combined (all airline and international and domestic) peak hour check-in and SSCP passenger demand for each of the four demand years.

Table 2-2: Peak Hour Departing Passenger Demand

YEAR	CHECK-IN HALL		SSCP	
	PEAK HOUR	PASSENGER DEMAND	PEAK HOUR	PASSENGER DEMAND
PAL 1	4:27 - 5:26	2,237	4:24 - 5:23	2,319
PAL 2	4:35 - 5:34	2,357	4:38 - 5:36	2,440
PAL 3	4:38 - 5:37	2,642	4:47 - 5:46	2,233
PAL 4	4:30 - 5:29	2,945	4:39 - 5:40	2,437

*Figure 2-1, **Error! Reference source not found.**, Figure 2-3 and*
Figure 2-4 show the rolling hour demand at the check-in hall for PAL, PAL 2, PAL 3 and PAL 4 scenarios.

Figure 2-5 shows the rolling hour demand at the security checkpoint for all the four demand years.

Figure 2-1: Rolling Hour Passenger Demand at Check-in Hall – PAL 1

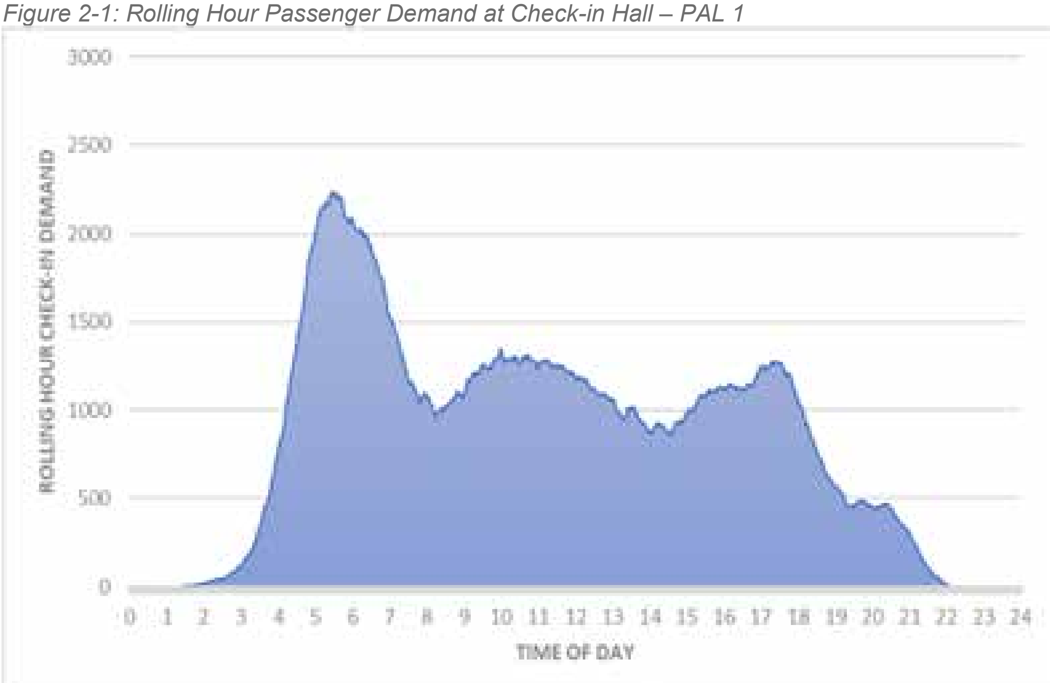


Figure 2-2: Rolling Hour Passenger Demand at Check-in Hall – PAL 2

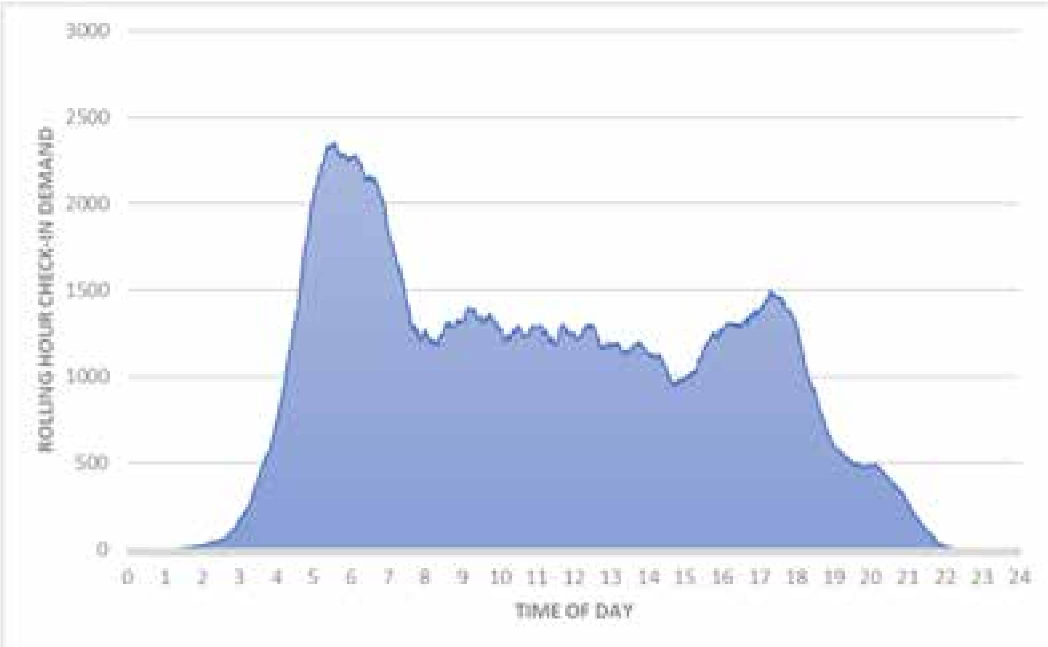


Figure 2-3: Rolling Hour Passenger Demand at Check-in Hall – PAL 3

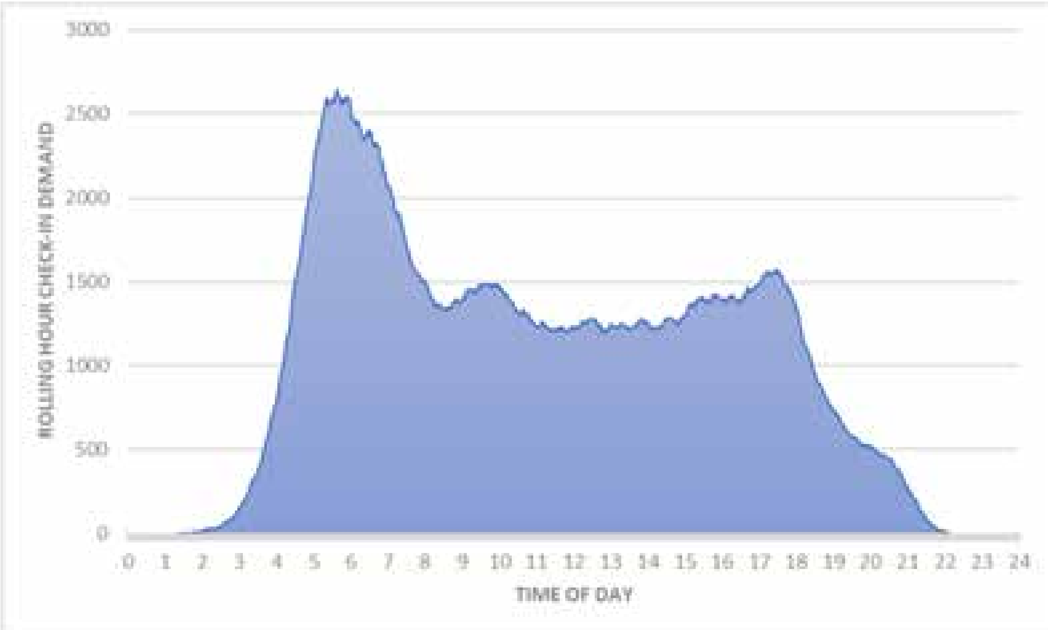


Figure 2-4: Rolling Hour Passenger Demand at Check-in Hall – PAL 4

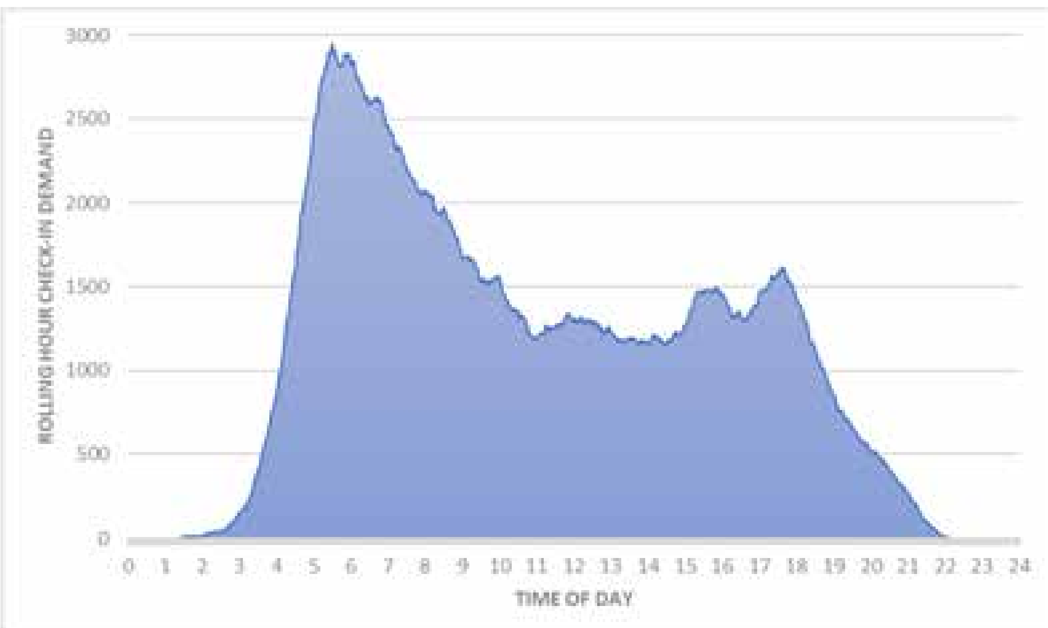


Figure 2-5: Rolling Hour Passenger Demand at SSCP

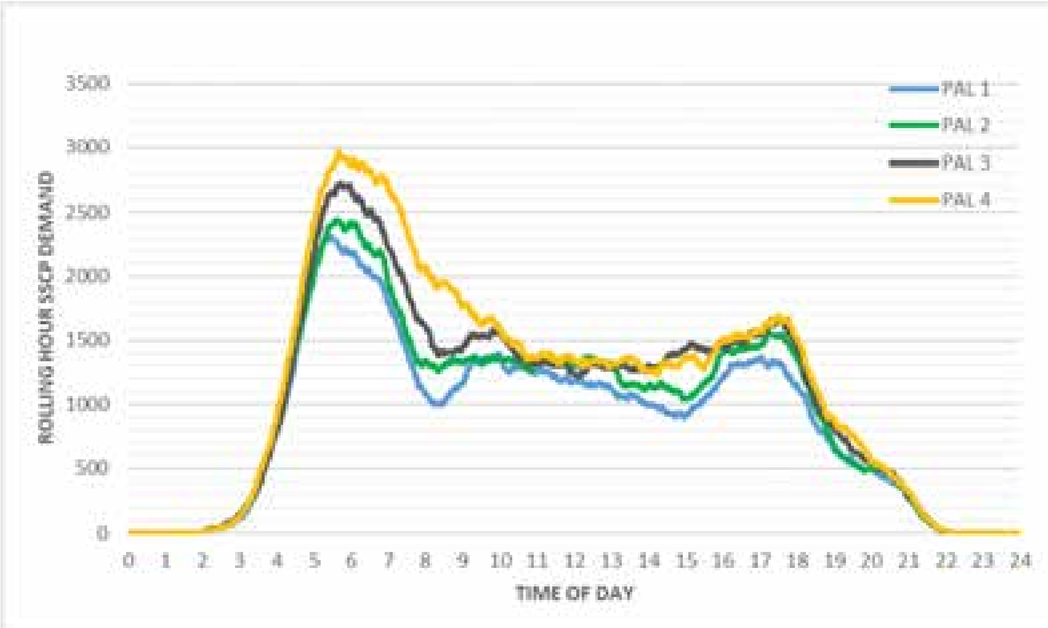
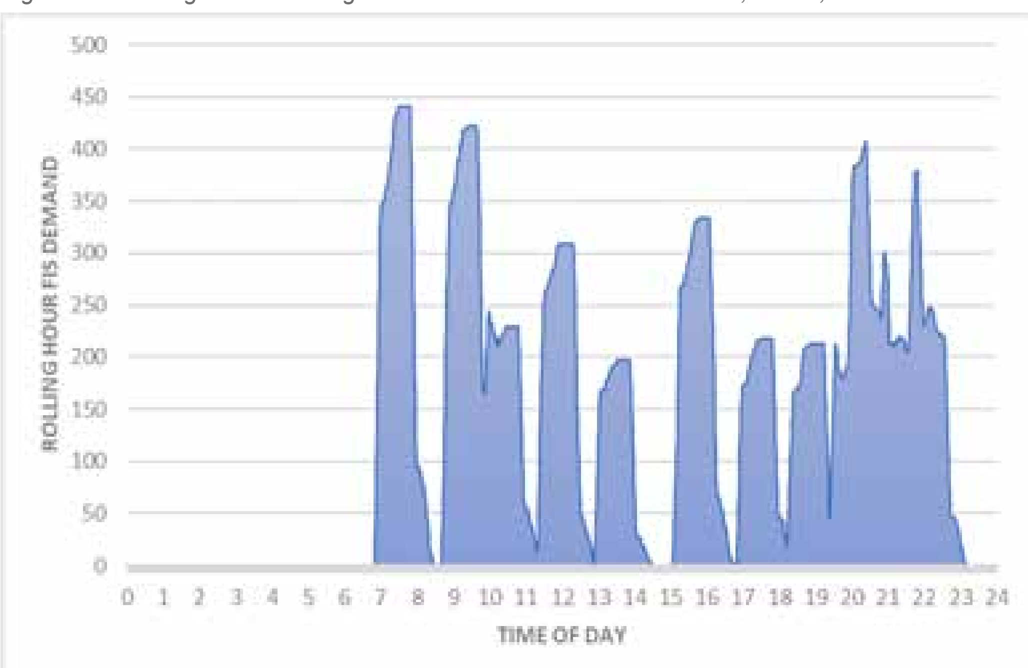


Figure 2-6 shows the rolling hour demand at the FIS hall for PAL, PAL 2, PAL 3 and PAL 4 scenarios. The peak hour demand remains unchanged across the four demand years.

Figure 2-6: Rolling Hour Passenger Demand at the FIS Hall for PAL 1, PAL 2, PAL 3 & PAL 4



2.3 Performance Specifications

Terminal Level of Service (LOS) metrics are taken from the IATA Airport Development Reference Manual (ADRM), 10th Edition, 4th Release, dated October 2016. In this edition, the LOS framework includes four service level categories: Over-design, Optimum, Sub-optimum, and Under-provided. LOS is achieved via a combination of space and waiting time performance. The approach is as follows:

- Identify the space performance for a facility (Table 2-3)
- Identify the time performance for that same facility (Table 2-3)
- Combine space and time performances to identify overall LOS for the facility (Table 2-4)

An Optimum LOS will be the goal for all Check-in and SSCP facilities being analyzed.

- Optimum LOS is effectively equivalent to LOS C performance as identified by the previous IATA ADRM editions.

The following guidelines have been presented by the IATA ADRM in Exhibit 3.4.5.3. Project performance targets for these studies are highlighted in green and shown in Table 2-3.

Table 2-3: LOS Guidelines for Terminal Facilities

LOS Guidelines		Space Guidelines (ft^2 / pax)			Max. Waiting Time Guidelines – Economy Class (minutes)			Max. Waiting Time Guidelines – First / Business / Fast-Track (minutes)		
		Over-Design	Optimum	Sub-Optimum	Over-Design	Optimum	Sub-Optimum	Over-Design	Optimum	Sub-Optimum
Check-in	Kiosk	>19.4	14.0-19.4	<14.0	<1	1-2	>2	<1	1-2	>2
	Bag Drop	>19.4	14.0-19.4	<14.0	<1	1-5	>5	<1	1-3	>3
	Check-in Desk	>19.4	14.0-19.4	<14.0	<10	10-20	>20	Business Class		
								<3	<3	<3
								First Class		
								<1	<1	<1
Security Control		>12.9	10.8-12.9	<10.8	<5	5-10	>10	<1	1-3	>3
Holdrooms-Standing		>12.9	10.8-12.9	<10.8	n/a					
Holdrooms-Seated*		>18.3	16.1-18.3	<16.1	n/a					
Baggage Claim		>18.3	16.1-18.3	<16.1	<0	0-15	>15	<0	0-15	>15

Source: Taken from Exhibit 3.4.5.3 from 10th Edition IATA ADRM; m2 translated to ft2

Table 2-4 shows the LOS Space – Time Diagram taken from the IATA ADRM Exhibit 3.4.5.2. This describes how the overall LOS is determined combining the space and time performance levels. Per IATA, the interpretation of the overall LOS guidelines is:

- If both space and time are in the Optimum range, or one is in the Optimum range and the other in the Over-Design range, the LOS is considered Optimum.
- If one parameter is in the Optimum range and the other is in the Sub-Optimum range, the LOS is considered Sub-Optimum and improvements should be considered.
- If both parameters are in the Sub-Optimum range, the LOS is considered Under-Provided identifying the need for major improvements.
- If both parameters are in the Over-Design range, the LOS is considered Over-Design indicating over-sized / unused facilities or room for future growth.

Table 2-4: Level of Service Space – Time Diagram

LOS PARAMETERS		SPACE		
		OVER-DESIGN[1]	OPTIMUM[2]	SUB-OPTIMUM[3]
Maximum Waiting Time	Over-Design[1]	Over-Design	Optimum	Sub-Optimum *(consider improvements)*
	Optimum[2]	Optimum	Optimum	Sub-Optimum *(consider improvements)*
	Sub-Optimum[3]	Sub-Optimum *(consider improvements)*	Sub-Optimum *(consider improvements)*	Under-Provided *(reconfigure)*

Source: IATA ADRM Exhibit 3.4.5.2
[1] Excessive space; overprovision of resources
[2] Sufficient space for comfortable environment; acceptable waiting and processing times
[3] Crowded and uncomfortable; unacceptable waiting and processing times

Please note that the IATA LOS metrics are guidelines for international airports and can/should be adjusted as necessary to reflect specific characteristics, requirements, etc. of each facility.

Simulation modeling, rather than a formula-based analysis, is used for this study and findings are more precise; therefore, the 95% passenger wait time is used instead of the maximum wait time for check-in and SSCP. When using simulation modeling to evaluate performance, the maximum is an extreme measure.

3 Facility Requirements Findings

3.1 Check-in Lobby Requirements

Airline check-in counters typically open three hours prior to the scheduled flight departure time. Originating passengers who show up at the check-in lobby earlier than the counter open time are considered as early passengers and need to wait in the terminal until the check-in counters open. Four scenarios have been considered for the check-in lobby primarily.

- Combined Kiosks – Kiosks serve passengers with and without checked bags
- Split Kiosks – Separate kiosks for passengers with and without checked bags
    - Increases inefficiency due to dedicated kiosks
- 1-step SSBD – Passengers use a self-service bag drop (SSBD) unit to check-in and drop their bags
    - Average Processing time for kiosk passengers with checked-bags - 3.9 min
    - Average Processing time for online passengers with checked-bags - 2.5 min
    - Kiosk Passengers without checked bags are assumed to check-in online and proceed directly to SSCP
- 2-step SSBD – Passengers use a kiosk to check-in and drop their bags at an SSBD unit
    - Kiosk Passengers: Average Processing Time at SSBD – 57 seconds
    - Online Passengers: Average Processing Time at SSBD – 98 seconds
    - Kiosk Passengers without checked bags are assumed to check-in online and proceed directly to SSCP

Table 3-1 shows the full-service, priority and curbside counter check-in requirements for the PAL 1 year. To process the originating passenger demand the check-in hall requires: 32 full-service counters, 8 priority counters and 4 curbside check-in counters. Full-service counters, priority counters, and curbside requirements do not vary by simulation scenarios because only passengers using kiosks and SSBDs vary by simulation scenarios. To achieve optimum level of service, passengers require a total queueing area of 6,450 ft^2. Note that the queueing area requirements do not include space required for the processors, circulation space, and the active space between the queues and the processors.

Table 3-1: Check-in Lobby Requirements: Full-service Agents, Priority Agents and Curbside – PAL

AIRLINE	LOCATION	# OF PROCESSORS	TIME GOAL (MIN)	95th % PASSENGER WAIT TIME IN QUEUE (MIN)	MAX NUMBER IN QUEUE	QUEUING SPACE REQUIRED (SF)
Aero Mexico	Economy Agent	2	20	4	9	175
	Priority Agent	1	5	1.9	6	115
Alaska	Economy Agent	1	20	17.7	11	215
	Priority Agent	1	5	0.3	1	20
Allegiant	Economy Agent	1	20	19.3	6	115
American	Economy Agent	7	20	12.7	33	640
	Priority Agent	2	5	1.9	8	155
	Curbside	1	20	5.7	4	80
Breeze	Economy Agent	1	20	19.2	6	115
Delta	Economy Agent	3	20	19.1	33	640
	Priority Agent	1	5	2.7	5	95
	Curbside	1	20	0.6	6	115
Frontier	Economy Agent	2	20	6.3	7	135
Jet Blue	Economy Agent	2	20	15.8	23	445
New Carrier	Economy Agent	2	20	9.3	13	250
Southwest	Economy Agent	3	20	17.2	49	950
	Priority Agent	2	5	0.9	7	135
	Curbside	1	20	6.7	8	155
Sun Country	Economy Agent	2	20	3.2	8	155
United	Economy Agent	1	20	18.1	17	330
	Priority Agent	1	5	0.4	5	95
	Curbside	1	20	5.7	9	175
Viva Aerobus	Economy Agent	3	20	13.8	36	700
Volaris	Economy Agent	2	20	16	23	445

Table 3-2 shows the check-in requirements for the PAL 1 scenario with combined kiosks which serve passengers with and without checked bags. To process the originating passenger demand the check-in hall requires: 73 kiosks and 41 bag drop counters. To achieve optimum level of service, passengers require a total queueing area of 8,255 ft^2. Note that the queueing area requirements do not include space required for the processors, circulation space, and the active space between the queues and the processors.

Table 3-2: Check-in Lobby Requirements: Combined Kiosks (Scenario 1) – PAL 1

AIRLINE	LOCATION	# OF PROCESSORS	TIME GOAL (MIN)	95th % PASSENGER WAIT TIME IN QUEUE (MIN)	MAX NUMBER IN QUEUE	QUEUING SPACE REQUIRED (SF)
Aero Mexico	Kiosks	2	2	0.1	7	135
	Bag Drop	2	5	2.9	9	175
Alaska	Kiosks	3	2	0.1	16	310
	Bag Drop	1	5	2.5	14	270
Allegiant	Kiosks	3	2	0.9	9	175
	Bag Drop	2	5	0.9	11	215
American	Kiosks	16	2	1.6	27	525
	Bag Drop	3	5	3.4	38	735
Breeze	Kiosks	3	2	0.1	14	270
	Bag Drop	2	5	0.4	7	135
Delta	Kiosks	8	2	1.6	13	250
	Bag Drop	8	5	1.6	24	465
Frontier	Kiosks	4	2	1.4	22	425
	Bag Drop	2	5	2.4	20	390
Jet Blue	Kiosks	2	2	1.5	8	155
	Bag Drop	4	5	3.6	18	350
New Carrier	Kiosks	6	2	1.4	14	270
	Bag Drop	3	5	2.8	16	310
Southwest	Kiosks	13	2	1.1	20	390
	Bag Drop	5	5	2.9	37	720
Sun Country	Kiosks	2	2	0.8	9	175
	Bag Drop	1	5	2.8	10	195
United	Kiosks	7	2	1.9	14	270
	Bag Drop	5	5	1.6	17	330
Viva Aerobus	Kiosks	2	2	0.1	7	135
	Bag Drop	1	5	1.9	9	175
Volaris	Kiosks	2	2	0.1	7	135
	Bag Drop	2	5	1.8	13	170

Table 3-3 shows the check-in requirements for the PAL 1 scenario with split kiosks which serve passengers with and without checked bags, separately. To process the originating passenger demand the check-in hall requires: 38 “no-bag” kiosks, 51 kiosks and 41 bag drop counters. To achieve optimum level of service, passengers require a total queueing area of 8,795 ft^2. Note that th queueing area requirements do not include space required for the processors, circulation space, and the active space between the queues and the processors.

Table 3-3: Check-in Lobby Requirements: Split Kiosks (Scenario 2) – PAL 1

AIRLINE	LOCATION	# OF PROCESSORS	TIME GOAL (MIN)	95th % PASSENGER WAIT TIME IN QUEUE (MIN)	MAX NUMBER IN QUEUE	QUEUING SPACE REQUIRED (SF)
Aero Mexico	Kiosk without bags	1	2	0.1	7	135
	Kiosk with bags	2	2	0.1	5	95
	Bag Drop	2	5	0.8	6	115
Alaska	Kiosk without bags	2	2	0.6	7	135
	Kiosk with bags	2	2	1.4	9	175
	Bag Drop	1	5	3.6	11	215
Allegiant	Kiosk without bags	2	2	0.4	4	80
	Kiosk with bags	2	2	1.6	8	155
	Bag Drop	2	5	1.2	11	215
American	Kiosk without bags	8	2	1.9	15	290
	Kiosk with bags	9	2	1.9	20	390
	Bag Drop	3	5	2.7	21	405
Breeze	Kiosk without bags	2	2	0.2	9	175
	Kiosk with bags	2	2	0.7	5	95
	Bag Drop	2	5	0.1	7	135
Delta	Kiosk without bags	3	2	1.7	8	155
	Kiosk with bags	6	2	1.9	12	235
	Bag Drop	8	5	2.0	23	445
Frontier	Kiosk without bags	3	2	0.1	5	95
	Kiosk with bags	3	2	1.7	18	350
	Bag Drop	2	5	2.5	15	290
Jet Blue	Kiosk without bags	1	2	0.1	4	80
	Kiosk with bags	2	2	1.4	8	155
	Bag Drop	4	5	4.0	16	310
New Carrier	Kiosk without bags	3	2	0.8	11	215
	Kiosk with bags	4	2	1.7	12	235
	Bag Drop	3	5	2.3	12	235
Southwest	Kiosk without bags	4	2	1.6	12	235
	Kiosk with bags	10	2	1.5	20	390
	Bag Drop	5	5	2.0	27	525

Sun Country	Kiosk without bags	2	2	0.2	3	60
	Kiosk with bags	1	2	1.4	8	155
	Bag Drop	1	5	3.0	10	195
United	Kiosk without bags	4	2	2.0	11	215
	Kiosk with bags	5	2	1.4	14	270
	Bag Drop	5	5	1.6	12	235
Viva Aerobus	Kiosk without bags	1	2	0.7	7	135
	Kiosk with bags	1	2	1.5	7	135
	Bag Drop	1	5	2.4	8	155
Volaris	Kiosk without bags	2	2	0.1	7	135
	Kiosk with bags	2	2	0.1	5	95
	Bag Drop	2	5	1.1	13	250

Table 3-4 shows the check-in requirements for the PAL 1 scenario with 1-step SSBD units. To process the originating passenger demand the check-in hall requires: 106 self-service bag drop units. To achieve optimum level of service, passengers require a total queueing area of 4,905 ft^2. Note that the queueing area requirements do not include space required for the processors, circulation space, and the active space between the queues and the processors.

Table 3-4: Check-in Lobby Requirements: 1-step SSBD (Scenario 3) – PAL 1

AIRLINE	LOCATION	# OF PROCESSORS	TIME GOAL (MIN)	95th % PASSENGER WAIT TIME IN QUEUE (MIN)	MAX NUMBER IN QUEUE	QUEUING SPACE REQUIRED (SF)
Aero Mexico	SSBD	3	5	1.3	7	135
Alaska	SSBD	3	5	3.4	19	370
Allegiant	SSBD	4	5	1.7	14	270
American	SSBD	16	5	1.7	26	505
Breeze	SSBD	3	5	4.2	9	175
Delta	SSBD	17	5	4.0	30	580
Frontier	SSBD	6	5	2.4	20	390
Jet Blue	SSBD	7	5	2.8	17	330
New Carrier	SSBD	7	5	3.6	19	370
Southwest	SSBD	22	5	2.1	47	910
Sun Country	SSBD	2	5	2.2	11	215
United	SSBD	11	5	1.7	13	250
Viva Aerobus	SSBD	2	5	3.1	8	155
Volaris	SSBD	3	5	2.7	13	250

Table 3-5 shows the check-in requirements for the PAL 1 scenario with 2-step SSBD units. To process the originating passenger demand the check-in hall requires: 51 kiosks and 37 self-service bag drop units. To achieve optimum level of service, passengers require a total queueing area of 6,940 ft^2. Note that the queueing area requirements do not include space required for the processors, circulation space, and the active space between the queues and the processors.

Table 3-5: Check-in Lobby Requirements: 2-step SSBD (Scenario 4) – PAL 1

AIRLINE	LOCATION	# OF PROCESSORS	TIME GOAL (MIN)	95th % PASSENGER WAIT TIME IN QUEUE (MIN)	MAX NUMBER IN QUEUE	QUEUING SPACE REQUIRED (SF)
Aero Mexico	Kiosk with bags	2	2	0.1	5	95
	Bag Drop	1	5	1.5	6	115
Alaska	Kiosk with bags	2	2	1.4	9	175
	Bag Drop	2	5	1.1	10	195
Allegiant	Kiosk with bags	2	2	1.6	8	155
	Bag Drop	2	5	2.5	14	270
American	Kiosk with bags	9	2	1.9	20	390
	Bag Drop	5	5	1.5	14	270
Breeze	Kiosk with bags	2	2	0.7	5	95
	Bag Drop	1	5	2.4	8	155
Delta	Kiosk with bags	6	2	1.9	12	235
	Bag Drop	5	5	2.8	27	525
Frontier	Kiosk with bags	3	2	1.7	18	350
	Bag Drop	2	5	1.8	11	215
Jet Blue	Kiosk with bags	2	2	1.4	8	155
	Bag Drop	2	5	4.2	17	330
New Carrier	Kiosk with bags	4	2	1.7	12	235
	Bag Drop	3	5	1.9	14	270
Southwest	Kiosk with bags	10	2	1.5	20	390
	Bag Drop	7	5	1.7	41	795
Sun Country	Kiosk with bags	1	2	1.4	8	155
	Bag Drop	1	5	1.8	5	95
United	Kiosk with bags	5	2	1.4	14	270
	Bag Drop	3	5	2.3	17	330
Viva Aerobus	Kiosk with bags	1	2	1.5	7	135
	Bag Drop	2	5	0.8	7	135
Volaris	Kiosk with bags	2	2	0.1	5	95
	Bag Drop	1	5	4.7	16	310

Table 3-6 shows the full-service, priority and curbside counter check-in requirements for the PAL 2 year. To process the originating passenger demand the check-in hall requires: 34 full-service counters, 8 priority counters and 5 curbside check-in counters. As with PAL 1, full-service counters, priority counters, and curbside requirements do not vary by simulation scenarios. To achieve optimum level of service, passengers require a total queueing area of 9,180 ft^2. Note that the queueing area requirements do not include space required for the processors, circulation space, and the active space between the queues and the processors.

Table 3-6: Check-in Lobby Requirements: Full-service Agents, Priority Agents and Curbside – PAL 2

AIRLINE	LOCATION	# OF PROCESSORS	TIME GOAL (MIN)	95th % PASSENGER WAIT TIME IN QUEUE (MIN)	MAX NUMBER IN QUEUE	QUEUING SPACE REQUIRED (SF)
Aero Mexico	Economy Agent	1	20	16.5	20	390
	Priority Agent	1	5	0.1	7	135
Alaska	Economy Agent	1	20	9.5	11	215
	Priority Agent	1	5	1.5	4	80
Allegiant	Economy Agent	1	20	15.9	12	235
American	Economy Agent	8	20	19.7	55	1065
	Priority Agent	2	5	3	13	250
	Curbside	2	20	2.2	24	465
Breeze	Economy Agent	1	20	6.9	5	95
Delta	Economy Agent	3	20	18.2	33	640
	Priority Agent	1	5	3.9	6	115
	Curbside	1	20	0.4	40	775
Frontier	Economy Agent	2	20	9.6	11	215
Jet Blue	Economy Agent	2	20	10.3	18	350
New Carrier	Economy Agent	3	20	2.4	12	235
Southwest	Economy Agent	3	20	14.7	50	970
	Priority Agent	2	5	1.2	8	155
	Curbside	1	20	2.6	43	835
Sun Country	Economy Agent	2	20	4.2	9	175
United	Economy Agent	2	20	1.6	8	155
	Priority Agent	1	5	2.2	7	135
	Curbside	1	20	4.2	17	330
Viva Aerobus	Economy Agent	3	20	10.4	35	680
Volaris	Economy Agent	2	20	10.2	25	485

Table 3-7 shows the check-in requirements for the PAL 2 scenario with combined kiosks which serve passengers with and without checked bags. To process the originating passenger demand the check-in hall requires: 76 kiosks and 42 bag drop counters. To achieve optimum level of service, passengers require a total queueing area of 8,255 ft^2. Please note that the queueing area requirements do not include space required for the processors, circulation space, and the active space between the queues and the processors.

Table 3-7: Check-in Lobby Requirements: Combined Kiosks – PAL 2

AIRLINE	LOCATION	# OF PROCESSORS	TIME GOAL (MIN)	95th % PASSENGER WAIT TIME IN QUEUE (MIN)	MAX NUMBER IN QUEUE	QUEUING SPACE REQUIRED (SF)
Aero Mexico	Kiosks	2	2	0.1	7	135
	Bag Drop	2	5	2.9	9	175
Alaska	Kiosks	3	2	0.1	16	310
	Bag Drop	1	5	2.5	14	270
Allegiant	Kiosks	3	2	0.9	9	175
	Bag Drop	2	5	0.9	11	215
American	Kiosks	16	2	1.6	27	525
	Bag Drop	3	5	3.4	38	735
Breeze	Kiosks	3	2	0.1	14	270
	Bag Drop	2	5	0.4	7	135
Delta	Kiosks	8	2	1.6	13	250
	Bag Drop	8	5	1.6	24	465
Frontier	Kiosks	4	2	1.4	22	425
	Bag Drop	2	5	2.4	20	390
Jet Blue	Kiosks	2	2	1.5	8	155
	Bag Drop	4	5	3.6	18	350
New Carrier	Kiosks	6	2	1.4	14	270
	Bag Drop	3	5	2.8	16	310
Southwest	Kiosks	13	2	1.1	20	390
	Bag Drop	5	5	2.9	37	720
Sun Country	Kiosks	2	2	0.8	9	175
	Bag Drop	1	5	2.8	10	195
United	Kiosks	7	2	1.9	14	270
	Bag Drop	5	5	1.6	17	330
Viva Aerobus	Kiosks	2	2	0.1	7	135
	Bag Drop	1	5	1.9	9	175
Volaris	Kiosks	2	2	0.1	7	135
	Bag Drop	2	5	1.8	13	170

Table 3-8 shows the check-in requirements for the PAL 2 scenario with split kiosks which serve passengers with and without checked bags, separately. To process the originating passenger demand the check-in hall requires: 40 “no-bag kiosks”, 57 kiosks and 40 bag drop counters. To achieve optimum level of service, passengers require a total queueing area of 9,470 ft^2. Note that the queueing area requirements do not include space required for the processors, circulation space, and the active space between the queues and the processors.

Table 3-8: Check-in Lobby Requirements: Split Kiosks – PAL 2

AIRLINE	LOCATION	# OF PROCESSORS	TIME GOAL (MIN)	95th % PASSENGER WAIT TIME IN QUEUE (MIN)	MAX NUMBER IN QUEUE	QUEUING SPACE REQUIRED (SF)
Aero Mexico	Kiosk without bags	1	2	1.1	6	115
	Kiosk with bags	2	2	0.1	5	95
	Bag Drop	1	5	4.6	8	155
Alaska	Kiosk without bags	2	2	0.2	7	135
	Kiosk with bags	2	2	1.5	10	195
	Bag Drop	1	5	5.0	15	290
Allegiant	Kiosk without bags	2	2	0.4	6	115
	Kiosk with bags	3	2	0.1	6	115
	Bag Drop	2	5	0.7	16	310
American	Kiosk without bags	10	2	1.5	16	310
	Kiosk with bags	11	2	1.1	15	290
	Bag Drop	4	5	1.8	17	330
Breeze	Kiosk without bags	2	2	0.1	3	60
	Kiosk with bags	2	2	0.8	10	195
	Bag Drop	2	5	0.5	5	95
Delta	Kiosk without bags	3	2	1.5	8	155
	Kiosk with bags	7	2	1.3	12	235
	Bag Drop	7	5	4.0	37	720
Frontier	Kiosk without bags	2	2	0.9	11	215
	Kiosk with bags	3	2	0.9	14	270
	Bag Drop	2	5	2.8	14	270
Jet Blue	Kiosk without bags	1	2	0.8	5	95
	Kiosk with bags	2	2	1.7	8	155
	Bag Drop	4	5	2.9	12	235
New Carrier	Kiosk without bags	3	2	0.8	7	135
	Kiosk with bags	4	2	0.8	13	250
	Bag Drop	3	5	3.2	22	425
Southwest	Kiosk without bags	5	2	0.9	11	215
	Kiosk with bags	10	2	1.7	21	405
	Bag Drop	5	5	2.7	29	565
Sun Country	Kiosk without bags	1	2	0.2	6	115
	Kiosk with bags	2	2	0.2	8	155
	Bag Drop	1	5	3.1	7	135
United	Kiosk without bags	5	2	1.8	14	270
	Kiosk with bags	5	2	1.1	28	545
	Bag Drop	5	5	2.1	17	330
Viva Aerobus	Kiosk without bags	1	2	1.5	7	135
	Kiosk with bags	2	2	0.1	6	115
	Bag Drop	1	5	2.9	7	135
Volaris	Kiosk without bags	2	2	0.1	5	95
	Kiosk with bags	2	2	0.1	5	95
	Bag Drop	2	5	0.9	10	195

Table 3-9 shows the check-in requirements for the PAL 2 scenario with 1-step SSBD units. To process the originating passenger demand the check-in hall requires: 110 self-service bag drop units. To achieve optimum level of service, passengers require a total queueing area of 6,355 ft². Note that the queueing area requirements do not include space required for the processors, circulation space, and the active space between the queues and the processors.

Table 3-9: Check-in Lobby Requirements: 1-step SSBD – PAL 2

AIRLINE	LOCATION	# OF PROCESSORS	TIME GOAL (MIN)	95th % PASSENGER WAIT TIME IN QUEUE (MIN)	MAX NUMBER IN QUEUE	QUEUING SPACE REQUIRED (SF)
Aero Mexico	SSBD	2	5	2.5	6	115
Alaska	SSBD	4	5	1.2	15	290
Allegiant	SSBD	5	5	1.2	13	250
American	SSBD	18	5	2.9	30	580
Breeze	SSBD	3	5	2.2	15	290
Delta	SSBD	19	5	4.0	36	700
Frontier	SSBD	5	5	3.9	25	485
Jet Blue	SSBD	7	5	2.3	16	310
New Carrier	SSBD	8	5	2.5	17	330
Southwest	SSBD	20	5	2.7	91	1765
Sun Country	SSBD	2	5	4.1	8	155
United	SSBD	12	5	3.1	32	620
Viva Aerobus	SSBD	2	5	1.2	7	135
Volaris	SSBD	3	5	3.6	17	330

Table 3-10 shows the check-in requirements for the PAL 2 scenario with 2-step SSBD units. To process the originating passenger demand the check-in hall requires: 57 kiosks and 38 self-service bag drop units. To achieve optimum level of service, passengers require a total queueing area of 7,690 ft². Note that the queueing area requirements do not include space required for the processors, circulation space, and the active space between the queues and the processors.

Table 3-10: Check-in Lobby Requirements: 2-step SSBD – PAL 2

AIRLINE	LOCATION	# OF PROCESSORS	TIME GOAL (MIN)	95th % PASSENGER WAIT TIME IN QUEUE (MIN)	MAX NUMBER IN QUEUE	QUEUING SPACE REQUIRED (SF)
Aero Mexico	Kiosk with bags	2	2	0.1	5	95
	Bag Drop	1	5	2.1	8	155
Alaska	Kiosk with bags	2	2	1.5	10	195
	Bag Drop	2	5	1.8	11	215
Allegiant	Kiosk with bags	3	2	0.1	6	115
	Bag Drop	2	5	1.3	14	270
American	Kiosk with bags	11	2	1.1	15	290
	Bag Drop	6	5	1.4	20	390
Breeze	Kiosk with bags	2	2	0.8	10	195
	Bag Drop	1	5	2.7	13	250
Delta	Kiosk with bags	7	2	1.3	12	235
	Bag Drop	5	5	2.7	23	445
Frontier	Kiosk with bags	3	2	0.9	14	270
	Bag Drop	2	5	1.4	14	270
Jet Blue	Kiosk with bags	2	2	1.7	8	155
	Bag Drop	2	5	2.1	18	350
New Carrier	Kiosk with bags	4	2	0.8	13	250
	Bag Drop	3	5	1.1	12	235
Southwest	Kiosk with bags	10	2	1.7	21	405
	Bag Drop	7	5	2.8	56	1085
Sun Country	Kiosk with bags	2	2	0.2	8	155
	Bag Drop	1	5	3.4	8	155
United	Kiosk with bags	5	2	1.1	28	545
	Bag Drop	3	5	2.3	15	290
Viva Aerobus	Kiosk with bags	2	2	0.1	6	115
	Bag Drop	1	5	3.2	9	175
Volaris	Kiosk with bags	2	2	0.1	5	95
	Bag Drop	2	5	0.9	15	290

Table 3-11 shows the full-service, priority and curbside check-in requirements for the PAL 3 year. To process the originating passenger demand the check-in hall requires: 38 full-service counters, 8 priority counters and 4 curbside check-in counters. Full-service counters, priority counters, and curbside requirements do not vary by simulation scenarios. To achieve optimum level of service, passengers require a total queueing area of 7,280 ft^2. Please note that the queueing area requirements do not include space required for the processors, circulation space, and the active space between the queues and the processors.

Table 3-11: Check-in Lobby Requirements: Full-service Agents, Priority Agents and Curbside – PAL 3

AIRLINE	LOCATION	# OF PROCESSORS	TIME GOAL (MIN)	95th % PASSENGER WAIT TIME IN QUEUE (MIN)	MAX NUMBER IN QUEUE	QUEUING SPACE REQUIRED (SF)
Aero Mexico	Economy Agent	1	20	17.7	14	270
	Priority Agent	1	5	0.1	4	80
Alaska	Economy Agent	1	20	19.1	10	195
	Priority Agent	1	5	1.2	7	135
Allegiant	Economy Agent	1	20	19	11	215
American	Economy Agent	8	20	11.5	39	755
	Priority Agent	2	5	1.5	7	135
	Curbside	1	20	7.9	5	95
Breeze	Economy Agent	2	20	3.9	8	155
Delta	Economy Agent	4	20	18.9	36	700
	Priority Agent	1	5	3.6	6	115
	Curbside	1	20	16.1	6	115
Frontier	Economy Agent	2	20	4.5	13	250
Jet Blue	Economy Agent	2	20	11.3	20	390
New Carrier	Economy Agent	2	20	17.3	21	405
Southwest	Economy Agent	3	20	14.6	51	990
	Priority Agent	2	5	1.3	8	155
	Curbside	1	20	4.2	6	115
Sun Country	Economy Agent	2	20	5.4	22	425
United	Economy Agent	1	20	15.6	14	270
	Priority Agent	1	5	4.9	6	115
	Curbside	1	20	1.9	5	95
Viva Aerobus	Economy Agent	3	20	11.6	36	700
Volaris	Economy Agent	2	20	6.4	21	405

Table 3-12 shows the check-in requirements for the scenario with combined kiosks which serve passengers with and without checked bags. To process the originating passenger demand the check-in hall requires: 83 kiosks and 45 bag drop counters. To achieve optimum level of service, passengers require a total queueing area of 9,250 ft^2. Note that the queueing area requirements do not include space required for the processors, circulation space, and the active space between the queues and the processors.

Table 3-12: Check-in Lobby Requirements: Combined Kiosks (Scenario 1) – PAL 3

AIRLINE	LOCATION	# OF PROCESSORS	TIME GOAL (MIN)	95th % PASSENGER WAIT TIME IN QUEUE (MIN)	MAX NUMBER IN QUEUE	QUEUING SPACE REQUIRED (SF)
Aero Mexico	Kiosks	2	2	1.0	7	135
	Bag Drop	1	5	2.3	11	215
Alaska	Kiosks	3	2	0.4	15	290
	Bag Drop	1	5	2.1	17	330
Allegiant	Kiosks	3	2	1.2	21	405
	Bag Drop	2	5	1.4	7	135
American	Kiosks	17	2	1.8	22	425
	Bag Drop	4	5	1.7	22	425
Breeze	Kiosks	4	2	0.5	8	155
	Bag Drop	2	5	2.9	12	235
Delta	Kiosks	12	2	1.4	29	565
	Bag Drop	10	5	2.5	37	720
Frontier	Kiosks	4	2	1.0	21	405
	Bag Drop	2	5	2.5	23	445
Jet Blue	Kiosks	3	2	1.5	9	175
	Bag Drop	4	5	4.4	14	270
New Carrier	Kiosks	6	2	1.2	11	215
	Bag Drop	3	5	1.6	16	310
Southwest	Kiosks	13	2	1.4	32	620
	Bag Drop	6	5	1.2	27	525
Sun Country	Kiosks	3	2	0.3	13	250
	Bag Drop	1	5	2.4	18	350
United	Kiosks	9	2	1.6	18	350
	Bag Drop	6	5	2.0	19	370
Viva Aerobus	Kiosks	2	2	0.1	7	135
	Bag Drop	2	5	0.4	7	135
Volaris	Kiosks	2	2	0.5	10	195
	Bag Drop	1	5	4.2	24	465

Table 3-13 shows the check-in requirements for the PAL 3 scenario with split kiosks which serve passengers with and without checked bags, separately. To process the originating passenger demand the check-in hall requires: 43 no-bag kiosks, 60 kiosks and 45 bag drop counters. To achieve optimum level of service, passengers require a total queueing area of 9,935 ft^2. Note that the queueing area requirements do not include space required for the processors, circulation space, and the active space between the queues and the processors.

Table 3-13: Check-in Lobby Requirements: Split Kiosks (Scenario 2) – PAL 3

AIRLINE	LOCATION	# OF PROCESSORS	TIME GOAL (MIN)	95th % PASSENGER WAIT TIME IN QUEUE (MIN)	MAX NUMBER IN QUEUE	QUEUING SPACE REQUIRED (SF)
Aero Mexico	Kiosk without bags	1	2	0.5	5	95
	Kiosk with bags	2	2	0.3	6	115
	Bag Drop	1	5	3.7	7	135
Alaska	Kiosk without bags	2	2	0.1	6	115
	Kiosk with bags	2	2	2.0	12	235
	Bag Drop	1	5	2.4	12	235
Allegiant	Kiosk without bags	2	2	1.4	6	115
	Kiosk with bags	2	2	1.3	11	215
	Bag Drop	2	5	1.3	6	115
American	Kiosk without bags	10	2	1.0	10	195
	Kiosk with bags	10	2	1.7	15	290
	Bag Drop	4	5	2.6	26	505
Breeze	Kiosk without bags	2	2	1.0	5	95
	Kiosk with bags	3	2	0.6	7	135
	Bag Drop	2	5	3.1	12	235
Delta	Kiosk without bags	4	2	1.3	7	135
	Kiosk with bags	9	2	1.8	21	405
	Bag Drop	10	5	2.7	40	775
Frontier	Kiosk without bags	3	2	0.6	7	135
	Kiosk with bags	3	2	1.1	17	330
	Bag Drop	2	5	2.2	18	350
Jet Blue	Kiosk without bags	1	2	1.3	6	115
	Kiosk with bags	3	2	0.2	6	115
	Bag Drop	4	5	3.6	10	195
New Carrier	Kiosk without bags	3	2	0.5	7	135
	Kiosk with bags	4	2	1.7	8	155
	Bag Drop	3	5	1.7	13	250
Southwest	Kiosk without bags	5	2	1.0	10	195
	Kiosk with bags	10	2	1.3	24	465
	Bag Drop	6	5	1.2	34	660
Sun Country	Kiosk without bags	2	2	0.2	5	95
	Kiosk with bags	2	2	0.3	11	215
	Bag Drop	1	5	3.7	18	350
United	Kiosk without bags	5	2	1.9	12	235
	Kiosk with bags	6	2	1.4	13	250
	Bag Drop	6	5	2.3	28	545
Viva Aerobus	Kiosk without bags	1	2	0.1	6	115
	Kiosk with bags	2	2	0.1	6	115
	Bag Drop	2	5	0.2	6	115
Volaris	Kiosk without bags	2	2	0.1	5	95
	Kiosk with bags	2	2	0.1	5	95
	Bag Drop	1	5	3.8	24	465

Table 3-14 shows the check-in requirements for the PAL 3 scenario with 1-step SSBD units. To process the originating passenger demand the check-in hall requires: 126 self-service bag drop units. To achieve optimum level of service, passengers require a total queueing area of 8,255 ft^2. Note that the queueing area requirements do not include space required for the processors, circulation space, and the active space between the queues and the processors.

Table 3-14: Check-in Lobby Requirements: 1-step SSBD (Scenario 3) – PAL 3

AIRLINE	LOCATION	# OF PROCESSORS	TIME GOAL (MIN)	95th % PASSENGER WAIT TIME IN QUEUE (MIN)	MAX NUMBER IN QUEUE	QUEUING SPACE REQUIRED (SF)
Aero Mexico	SSBD	3	5	1.0	9	175
Alaska	SSBD	3	5	2.8	22	425
Allegiant	SSBD	4	5	3.8	15	290
American	SSBD	19	5	2.5	24	465
Breeze	SSBD	5	5	3.4	16	310
Delta	SSBD	27	5	3.5	49	950
Frontier	SSBD	6	5	1.9	24	465
Jet Blue	SSBD	7	5	4.7	17	330
New Carrier	SSBD	7	5	3.5	25	485
Southwest	SSBD	21	5	3.1	68	1320
Sun Country	SSBD	3	5	1.2	19	370
United	SSBD	15	5	2.1	23	445
Viva Aerobus	SSBD	3	5	1.6	9	175
Volaris	SSBD	3	5	2.3	19	370

Table 3-15 shows the check-in requirements for the PAL 3 scenario with 2-step SSBD units. To process the originating passenger demand the check-in hall requires: 60 kiosks and 41 self-service bag drop units. To achieve optimum level of service, passengers require a total queueing area of 8,030 ft^2. Note that the queueing area requirements do not include space required for the processors, circulation space, and the active space between the queues and the processors.

Table 3-15: Check-in Lobby Requirements: 2-step SSBD (Scenario 4) – PAL 3

AIRLINE	LOCATION	# OF PROCESSORS	TIME GOAL (MIN)	95th % PASSENGER WAIT TIME IN QUEUE (MIN)	MAX NUMBER IN QUEUE	QUEUING SPACE REQUIRED (SF)
Aero Mexico	Kiosk with bags	2	2	0.3	6	115
	Bag Drop	1	5	2.7	13	250
Alaska	Kiosk with bags	2	2	2.0	12	235
	Bag Drop	2	5	0.8	12	235
Allegiant	Kiosk with bags	2	2	1.3	11	215
	Bag Drop	2	5	1.8	7	135
American	Kiosk with bags	10	2	1.7	15	290
	Bag Drop	5	5	3.3	29	565
Breeze	Kiosk with bags	3	2	0.6	7	135
	Bag Drop	2	5	1.8	11	215
Delta	Kiosk with bags	9	2	1.8	21	405
	Bag Drop	8	5	1.0	26	505
Frontier	Kiosk with bags	3	2	1.1	17	330
	Bag Drop	2	5	1.5	15	290
Jet Blue	Kiosk with bags	3	2	0.2	6	115
	Bag Drop	2	5	3.2	16	310
New Carrier	Kiosk with bags	4	2	1.7	8	155
	Bag Drop	3	5	1.4	11	215
Southwest	Kiosk with bags	10	2	1.3	24	465
	Bag Drop	7	5	2.0	48	930
Sun Country	Kiosk with bags	2	2	0.3	11	215
	Bag Drop	1	5	2.8	16	310
United	Kiosk with bags	6	2	1.4	13	250
	Bag Drop	4	5	1.2	16	310
Viva Aerobus	Kiosk with bags	2	2	0.1	6	115
	Bag Drop	1	5	2.5	12	235
Volaris	Kiosk with bags	2	2	0.1	5	95
	Bag Drop	1	5	3.6	20	390

Table 3-16 shows the full-service, priority and curbside counter check-in requirements for the PAL 4. To process the originating passenger demand the check-in hall requires: 36 full-service counters, 10 priority counters and 4 curbside check-in counters. To achieve optimum level of service, passengers require a total queueing area of 7,350 ft^2. Note that the queueing area requirements do not include space required for the processors, circulation space, and the active space between the queues and the processors.

Table 3-16: Check-in Lobby Requirements: Full-service Agents, Priority Agents and Curbside – PAL 4

AIRLINE	LOCATION	# OF PROCESSORS	TIME GOAL (MIN)	95th % PASSENGER WAIT TIME IN QUEUE (MIN)	MAX NUMBER IN QUEUE	QUEUING SPACE REQUIRED (SF)
Aero Mexico	Economy Agent	1	20	15.4	23	445
	Priority Agent	1	5	0.6	5	95
Alaska	Economy Agent	1	20	17.8	7	135
	Priority Agent	1	5	0.1	2	40
Allegiant	Economy Agent	2	20	10.2	13	250
American	Economy Agent	8	20	19.9	57	1105
	Priority Agent	2	5	2.8	10	195
	Curbside	1	20	15	5	95
Breeze	Economy Agent	1	20	15.6	13	250
Delta	Economy Agent	5	20	10.4	27	525
	Priority Agent	2	5	0.6	5	95
	Curbside	1	20	8.7	6	115
Frontier	Economy Agent	1	20	16.1	27	525
Jet Blue	Economy Agent	2	20	10.5	21	405
New Carrier	Economy Agent	2	20	8	13	250
Southwest	Economy Agent	4	20	8.2	34	660
	Priority Agent	2	5	1.5	7	135
	Curbside	1	20	3.5	7	135
Sun Country	Economy Agent	2	20	15.5	14	270
United	Economy Agent	2	20	12	16	310
	Priority Agent	2	5	0.4	7	135
	Curbside	1	20	6.9	7	135
Viva Aerobus	Economy Agent	3	20	10.3	33	640
Volaris	Economy Agent	2	20	12	21	405

Table 3-17 shows the check-in requirements for the PAL 4 scenario with combined kiosks which serve passengers with and without checked bags. To process the originating passenger demand the check-in hall requires: 93 kiosks and 49 bag drop counters. To achieve optimum level of service, passengers require a total queueing area of 8,255 ft^2. Note that the queueing area requirements do not include space required for the processors, circulation space, and the active space between the queues and the processors.

Table 3-17: Check-in Lobby Requirements: Combined Kiosks (Scenario 1) – PAL 4

AIRLINE	LOCATION	# OF PROCESSORS	TIME GOAL (MIN)	95th % PASSENGER WAIT TIME IN QUEUE (MIN)	MAX NUMBER IN QUEUE	QUEUING SPACE REQUIRED (SF)
Aero Mexico	Kiosks	2	2	1.2	6	115
	Bag Drop	2	5	0.1	6	115
Alaska	Kiosks	3	2	1.4	12	235
	Bag Drop	1	5	4.6	14	270
Allegiant	Kiosks	5	2	1.7	18	350
	Bag Drop	2	5	4.2	16	310
American	Kiosks	20	2	0.8	17	330
	Bag Drop	4	5	2.4	26	505
Breeze	Kiosks	4	2	0.8	8	155
	Bag Drop	2	5	3.6	21	405
Delta	Kiosks	11	2	1.4	17	330
	Bag Drop	10	5	3.8	35	680
Frontier	Kiosks	5	2	0.8	20	390
	Bag Drop	3	5	1.8	16	310
Jet Blue	Kiosks	3	2	0.1	7	135
	Bag Drop	4	5	2.2	12	235
New Carrier	Kiosks	5	2	1.2	13	250
	Bag Drop	3	5	2.4	16	310
Southwest	Kiosks	15	2	1.6	32	620
	Bag Drop	6	5	2.0	36	700
Sun Country	Kiosks	2	2	1.3	14	270
	Bag Drop	2	5	1.1	6	115
United	Kiosks	14	2	0.7	15	290
	Bag Drop	8	5	1.0	20	390
Viva Aerobus	Kiosks	2	2	0.1	8	155
	Bag Drop	1	5	1.3	9	175
Volaris	Kiosks	2	2	1.4	11	215
	Bag Drop	1	5	4.7	29	565

Table 3-18 shows the check-in requirements for the PAL 4 scenario with split kiosks which serve passengers with and without checked bags, separately. To process the originating passenger demand the check-in hall requires: 48 no-bag kiosks, 64 kiosks and 50 bag drop counters. To achieve optimum level of service, passengers require a total queueing area of 9,860 ft^2. Note that the queueing area requirements do not include space required for the processors, circulation space, and the active space between the queues and the processors.

Table 3-18: Check-in Lobby Requirements: Split Kiosks (Scenario 2) – PAL 4

AIRLINE	LOCATION	# OF PROCESSORS	TIME GOAL (MIN)	95th % PASSENGER WAIT TIME IN QUEUE (MIN)	MAX NUMBER IN QUEUE	QUEUING SPACE REQUIRED (SF)
Aero Mexico	Kiosk without bags	1	2	1.4	5	95
	Kiosk with bags	2	2	0.9	5	95
	Bag Drop	2	5	0.1	7	135
Alaska	Kiosk without bags	2	2	0.5	4	80
	Kiosk with bags	3	2	0.2	6	115
	Bag Drop	1	5	3.9	15	290
Allegiant	Kiosk without bags	3	2	1.2	7	135
	Kiosk with bags	4	2	0.5	9	175
	Bag Drop	3	5	1.0	14	270
American	Kiosk without bags	10	2	1.2	12	235
	Kiosk with bags	11	2	1.4	18	350
	Bag Drop	4	5	2.0	23	445
Breeze	Kiosk without bags	3	2	0.1	6	115
	Kiosk with bags	3	2	1.2	5	95
	Bag Drop	2	5	3.0	11	215
Delta	Kiosk without bags	4	2	1.1	8	155
	Kiosk with bags	9	2	1.5	15	290
	Bag Drop	11	5	2.5	26	505
Frontier	Kiosk without bags	2	2	1.8	8	155
	Kiosk with bags	3	2	1.9	17	330
	Bag Drop	3	5	1.1	18	350
Jet Blue	Kiosk without bags	1	2	2.0	5	95
	Kiosk with bags	2	2	1.6	11	215
	Bag Drop	4	5	3.3	12	235
New Carrier	Kiosk without bags	3	2	0.5	7	135
	Kiosk with bags	4	2	0.8	7	135
	Bag Drop	3	5	2.4	13	250
Southwest	Kiosk without bags	6	2	0.9	10	195
	Kiosk with bags	11	2	1.8	26	505
	Bag Drop	6	5	3.7	53	1030
Sun Country	Kiosk without bags	2	2	0.1	7	135
	Kiosk with bags	2	2	0.4	9	175
	Bag Drop	2	5	1.1	6	115
United	Kiosk without bags	7	2	1.9	15	290
	Kiosk with bags	7	2	1.7	13	250
	Bag Drop	7	5	1.5	17	330
Viva Aerobus	Kiosk without bags	1	2	1.2	5	95
	Kiosk with bags	1	2	2.0	8	155
	Bag Drop	1	5	1.2	9	175
Volaris	Kiosk without bags	3	2	0.1	7	135
	Kiosk with bags	2	2	0.9	7	135
	Bag Drop	1	5	5.0	23	445

Table 3-19 shows the check-in requirements for the PAL 4 scenario with 1-step SSBD units. To process the originating passenger demand the check-in hall requires: 137 self-service bag drop units. To achieve optimum level of service, passengers require a total queueing area of 6,615 ft^2. Note that the queueing area requirements do not include space required for the processors, circulation space, and the active space between the queues and the processors.

Table 3-19: Check-in Lobby Requirements: 1-step SSBD (Scenario 3) – PAL 4

AIRLINE	LOCATION	# OF PROCESSORS	TIME GOAL (MIN)	95th % PASSENGER WAIT TIME IN QUEUE (MIN)	MAX NUMBER IN QUEUE	QUEUING SPACE REQUIRED (SF)
Aero Mexico	SSBD	3	5	2.2	7	135
Alaska	SSBD	4	5	1.5	15	290
Allegiant	SSBD	6	5	5.0	22	425
American	SSBD	18	5	3.3	41	795
Breeze	SSBD	6	5	2.3	11	215
Delta	SSBD	25	5	4.9	67	1300
Frontier	SSBD	6	5	4.0	24	465
Jet Blue	SSBD	8	5	1.3	11	215
New Carrier	SSBD	7	5	2.6	21	405
Southwest	SSBD	25	5	3.2	62	1205
Sun Country	SSBD	4	5	1.6	8	155
United	SSBD	19	5	1.7	26	505
Viva Aerobus	SSBD	2	5	1.4	9	175
Volaris	SSBD	4	5	1.8	17	330

Table 3-20 shows the check-in requirements for the PAL 4 scenario with 2-step SSBD units. To process the originating passenger demand the check-in hall requires: 64 kiosks and 47 self-service bag drop units. To achieve optimum level of service, passengers require a total queueing area of 8,045 ft^2. Note that the queueing area requirements do not include space required for the processors, circulation space, and the active space between the queues and the processors.

Table 3-20: Check-in Lobby Requirements: 2-step SSBD (Scenario 4) – PAL 4

AIRLINE	LOCATION	# OF PROCESSORS	TIME GOAL (MIN)	95th % PASSENGER WAIT TIME IN QUEUE (MIN)	MAX NUMBER IN QUEUE	QUEUING SPACE REQUIRED (SF)
Aero Mexico	Kiosk with bags	2	2	0.9	5	95
	Bag Drop	1	5	2.8	20	390
Alaska	Kiosk with bags	3	2	0.2	6	115
	Bag Drop	2	5	1.0	11	215
Allegiant	Kiosk with bags	4	2	0.5	9	175
	Bag Drop	3	5	0.8	15	290
American	Kiosk with bags	11	2	1.4	18	350
	Bag Drop	6	5	1.3	22	425
Breeze	Kiosk with bags	3	2	1.2	5	95
	Bag Drop	2	5	1.4	9	175
Delta	Kiosk with bags	9	2	1.5	15	290
	Bag Drop	6	5	3.4	42	815
Frontier	Kiosk with bags	3	2	1.9	17	330
	Bag Drop	2	5	2.4	21	405
Jet Blue	Kiosk with bags	2	2	1.6	11	215
	Bag Drop	2	5	2.5	18	350
New Carrier	Kiosk with bags	4	2	0.8	7	135
	Bag Drop	3	5	1.5	14	270
Southwest	Kiosk with bags	11	2	1.8	26	505
	Bag Drop	10	5	1.7	35	680
Sun Country	Kiosk with bags	2	2	0.4	9	175
	Bag Drop	2	5	0.1	6	115
United	Kiosk with bags	7	2	1.7	13	250
	Bag Drop	5	5	1.3	20	390
Viva Aerobus	Kiosk with bags	1	2	2.0	8	155
	Bag Drop	1	5	2.1	11	215
Volaris	Kiosk with bags	2	2	0.9	7	135
	Bag Drop	2	5	1.7	15	290

3.2 SSCP Requirements

Analyses were performed assuming 20% of passenger demand is Pre✓®. Clear passengers have a separate queue to wait in, after which they are processed through either a General or Pre✓® lane based on their enrollment status. Passenger demand to the SSCP varies based on upstream processors. In the SSBD scenarios, kiosk passengers without checked-bags are assumed to check-in online and proceed directly to SSCP. Three scenarios were considered for each demand year:

- Scenario 1 – SY, UA, VB, and Y4 passengers constitute approximately 55% - 58% of the originating demand are processed through checkpoint A, while the rest are processed through checkpoint B.
- Scenario 2 – AA and UA passengers constitute approximately 31% – 34% of the originating demand are processed through checkpoint A, while the rest are processed through checkpoint B.
- Scenario 3 – DL and UA passengers constitute approximately 23% - 27% of the originating demand are processed through checkpoint A, while the rest are processed through checkpoint B.

Table 3-21 shows the SSCP requirements for the PAL design year. To process the originating passenger demand, it is estimated that 16 - 17 X-Ray lanes and a queuing area of 3,630 ft^2 – 5,105 ft^2 will be required. The queuing area requirements do not include space required for the processors, circulation space or space required for divest/revest.

Table 3-21: SSCP Requirements by Scenario – PAL 1

SCENARIO	CHECKPOINT	LANE TYPE	# OF LANES	TIME GOAL (MIN)	95th % PASSENGER WAIT TIME IN QUEUE (MIN)	MAX NUMBER IN QUEUE	QUEUING SPACE REQUIRED (SF)
1	A	General	6	10	2.1	81	1,535
		Clear	-	-	2.3	18	
		Pre✓®	2	3	1.4	20	
	B	General	6	10	2.3	62	1,215
		Clear	-	-	2.4	11	
		Pre✓®	2	3	1.6	21	
2	A	General	5	10	3.4	60	1,110
		Clear	-	-	1.9	11	
		Pre✓®	2	3	1.3	15	
	B	General	7	10	5.4	152	2,285
		Clear	-	-	1.1	10	
		Pre✓®	3	3	1.0	15	
3	A	General	4	10	2.4	50	980
		Clear	-	-	0.9	12	
		Pre✓®	2	3	0.9	14	
	B	General	8	10	1.9	81	1,430
		Clear	-	-	1.1	10	
		Pre✓®	3	3	0.8	20	

Table 3-22 shows the SSCP requirements for the PAL 2 design year. To process the originating passenger demand, it is estimated that 16 - 19 X-Ray lanes and a queuing area of 5,490 ft^2 – 7,235 ft^2 will be required. The queuing area requirements do not include space required for the processors, circulation space or space required for divest/revest.

Table 3-22: SSCP Requirements by Scenario – PAL 2

SCENARIO	CHECKPOINT	LANE TYPE	# OF LANES	TIME GOAL (MIN)	95th % PASSENGER WAIT TIME IN QUEUE (MIN)	MAX NUMBER IN QUEUE	QUEUING SPACE REQUIRED (SF)
1	A	General	6	10	8.2	172	3,030
		Clear	-	-	7.6	31	
		Pre✓®	2	3	2.9	32	
	B	General	6	10	1.7	73	1,495
		Clear	-	-	1.2	19	
		Pre✓®	2	3	1.3	24	
2	A	General	5	10	9.8	132	2,220
		Clear	-	-	7.7	21	
		Pre✓®	2	3	2.5	19	
	B	General	7	10	4.7	172	2,595
		Clear	-	-	1.1	12	
		Pre✓®	3	3	1.0	17	
3	A	General	4	10	2.5	910	865
		Clear	-	-	0.9	155	
		Pre✓®	4	3	0.9	235	
	B	General	8	10	5.0	179	2,785
		Clear	-	-	1.6	15	
		Pre✓®	3	3	1.1	22	

Table 3-23 shows the SSCP requirements for the PAL 3 design year. To process the originating passenger demand, it is estimated that 17 - 18 X-Ray lanes and a queuing area of 5,490 ft^2 – 7,235 ft^2 will be required. The queuing area requirements do not include space required for the processors, circulation space or space required for divest/revest.

Table 3-23: SSCP Requirements by Scenario – PAL 3

SCENARIO	CHECKPOINT	LANE TYPE	# OF LANES	TIME GOAL (MIN)	95th % PASSENGER WAIT TIME IN QUEUE (MIN)	MAX NUMBER IN QUEUE	QUEUING SPACE REQUIRED (SF)
1	A	General	7	10	8.2	199	2,930
		Clear	-	-	1.3	13	
		Pre✓®	3	3	0.9	15	
	B	General	6	10	1.7	73	1,495
		Clear	-	-	1.2	19	
		Pre✓®	2	3	1.3	24	
2	A	General	5	10	9.8	131	2,245
		Clear	-	-	7.7	16	
		Pre✓®	2	3	2.5	27	
	B	General	7	10	4.7	172	2,595
		Clear	-	-	1.1	12	
		Pre✓®	3	3	1.0	17	
3	A	General	4	10	2.5	47	865
		Clear	-	-	0.9	8	

		Pre✓®	2	3	0.9	12	
	B	General	8	10	5.0	179	2,785
		Clear	-	-	1.6	15	
		Pre✓®	3	3	1.1	22	

Table 3-24 shows the SSCP requirements for the PAL 4 design year. To process the originating passenger demand, it is estimated that 20 - 22 X-Ray lanes and a queuing area of 4,180 ft^2 – 5,998 ft^2 will be required. The queuing area requirements do not include space required for the processors, circulation space or space required for divest/revest.

Table 3-24: SSCP Requirements by Scenario – PAL 4

SCENARIO	CHECKPOINT	LANE TYPE	# OF LANES	TIME GOAL (MIN)	95th % PASSENGER WAIT TIME IN QUEUE (MIN)	MAX NUMBER IN QUEUE	QUEUING SPACE REQUIRED (SF)
1	A	General	8	10	2.3	85	1,510
		Clear	-	-	0.9	15	
		Pre✓®	3	3	0.8	17	
	B	General	8	10	2.3	93	1,495
		Clear	-	-	1.0	11	
		Pre✓®	3	3	0.9	12	
2	A	General	8	10	1.4	49	1060
		Clear	-	-	2.5	12	
		Pre✓®	2	3	2.7	21	
	B	General	9	10	4.7	191	3,120
		Clear	-	-	4.7	24	
		Pre✓®	3	3	1.9	27	
3	A	General	6	10	4.8	113	2,025
		Clear	-	-	6.8	26	
		Pre✓®	2	3	1.6	18	
	B	General	9	10	6.9	260	3,975
		Clear	-	-	6.2	25	
		Pre✓®	3	3	1.5	23	

3.3 FIS Requirements

SAT is assumed to implement a bag first policy, where passengers collect their checked bags before moving through the next areas of the arrivals flow. International terminating passengers proceed to the FIS hall where they interact with a U.S.CBP officer and get their documentation verified. Separate queues should be available so that passengers can be separated based on their eligibility to enter the country.

Table 3-25 shows the FIS requirements for PAL 1, PAL 2, PAL 3, and PAL 4. The resource requirements largely remain unchanged over the four demand years and hence were summarized as one.

Table 3-25: FIS Requirements – PAL 1, PAL 2, PAL 3, and PAL 4

DEMAND YEAR	FIS RESOURCE	# OF RESOURCES	TIME GOAL (MIN)	95th % PASSENGER WAIT TIME IN QUEUE (MIN)	MAX NUMBER IN QUEUE	QUEUING SPACE REQUIRED (SF)
PAL 1, 2, 3, and 4	MPC/Global Entry	1	1	0.1	4 – 5	52 – 65
	Global Entry Kiosk	1	1	0.1	5 – 8	65 – 103
	US Citizen	6	5	3.8	53 – 63	684 – 813
	Visitors	8	10	7.8	60 – 66	774 – 851

3.4 Baggage Claim Requirements

Table 3-26 shows the baggage claim requirements for the various PAL demand scenarios.

Table 3-26: Baggage Claim Requirements

DDFS	MARKET	PEAK 20-MIN PAX	CLAIM FRONTAGE REQUIRED (FT)	# OF DEVICES REQUIRED
PAL 1	International	346	292	2
	Domestic	831	701	5
PAL 2	International	346	292	2
	Domestic	981	828	5
PAL 3	International	346	292	2
	Domestic	968	817	6
PAL 4	International	346	292	2
	Domestic	1059	894	6

The required number of claim devices are calculated based on the peak 20-minute terminating passenger demand at the baggage claim hall and aiming to maintain an optimum Level of Service or better. Please note that this is a static analysis, and a micro-simulation model will better predict the level of service. It is recommended to have additional capacity instead of an optimized capacity at the requirements planning phase to accommodate any surges due to flight earliness and lateness.

- PAL 1 and PAL 2 scenarios require seven baggage claim units and
- PAL 3 and PAL 4 scenarios require eight baggage claim units

Figure 3-1 and Figure 3-2 show the passenger occupancy around the two international baggage claims for PAL 1, PAL 2, PAL 3, and PAL 4.

Figure 3-1: International Baggage Claim-1 Occupancy for PAL 1, PAL 2, PAL 3, and PAL 4

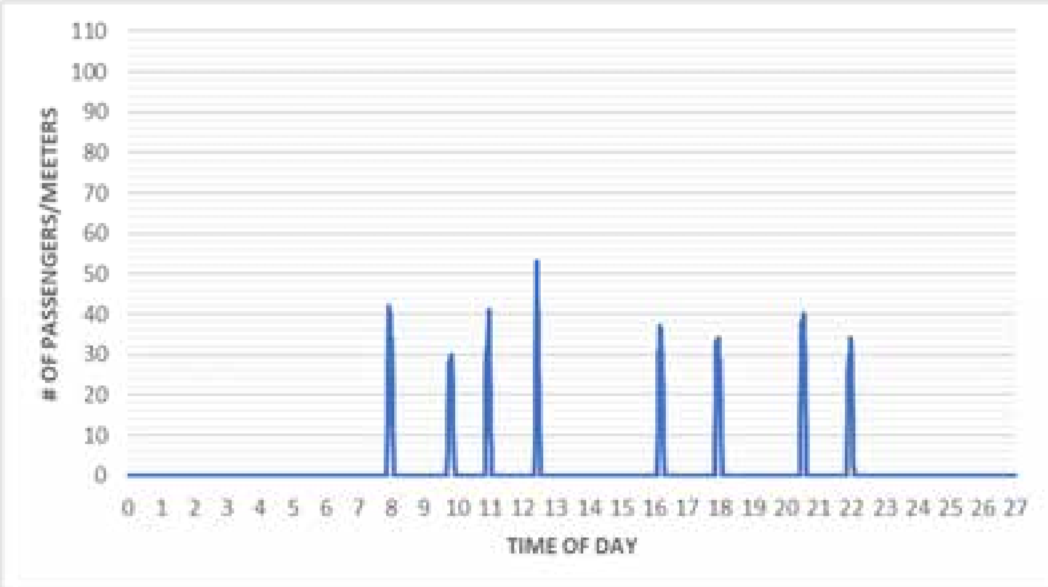


Figure 3-2: International Baggage Claim-2 Occupancy for PAL 1, PAL 2, PAL 3, and PAL 4

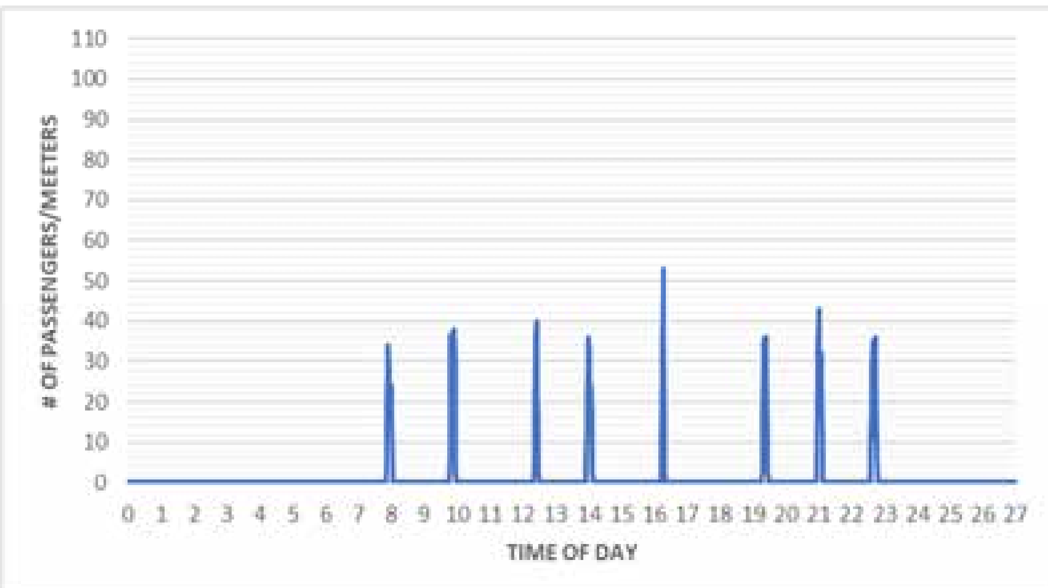


Figure 3-3: Domestic Baggage Claim-1 Occupancy for PAL 1

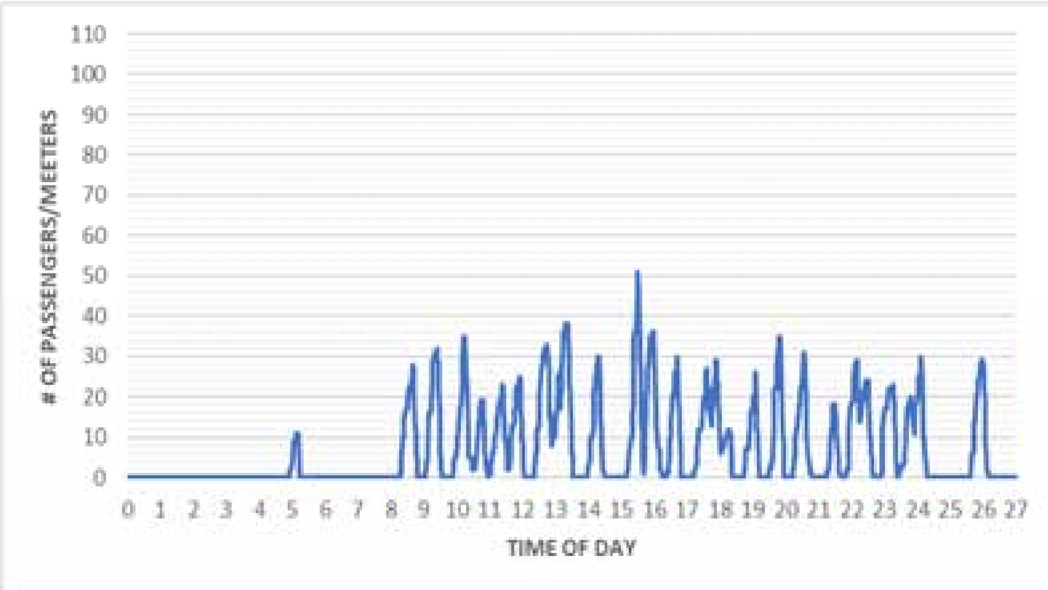


Figure 3-4: Domestic Baggage Claim-2 Occupancy for PAL 1

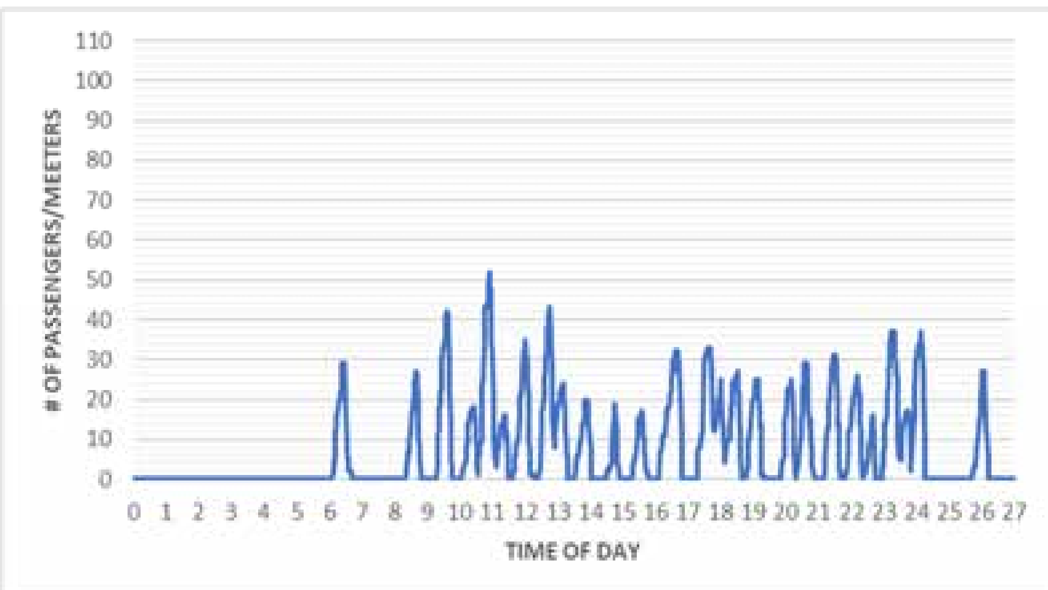


Figure 3-5: Domestic Baggage Claim-3 Occupancy for PAL 1

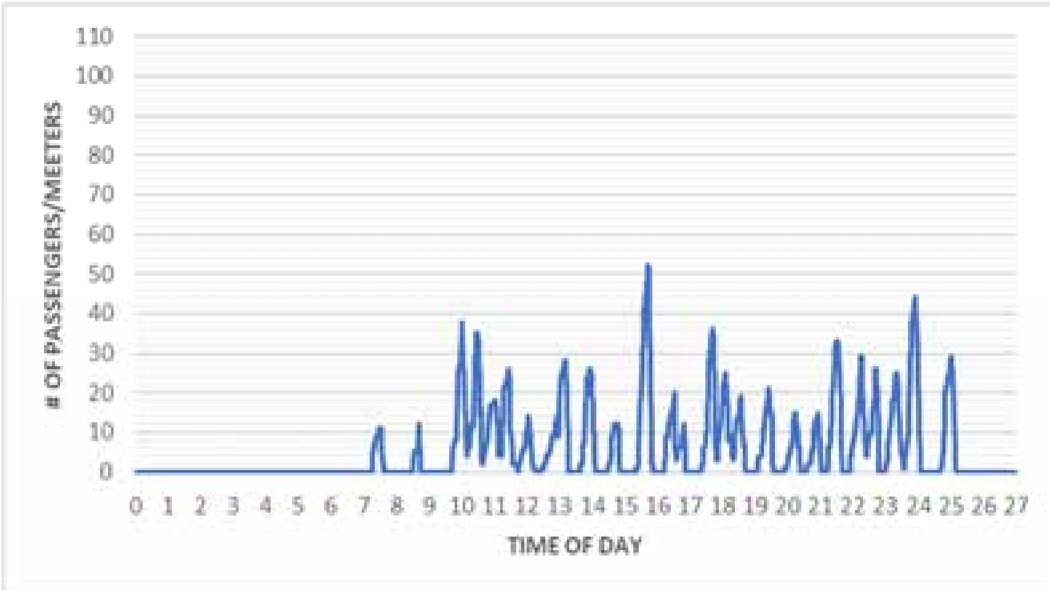


Figure 3-6: Domestic Baggage Claim-4 Occupancy for PAL 1

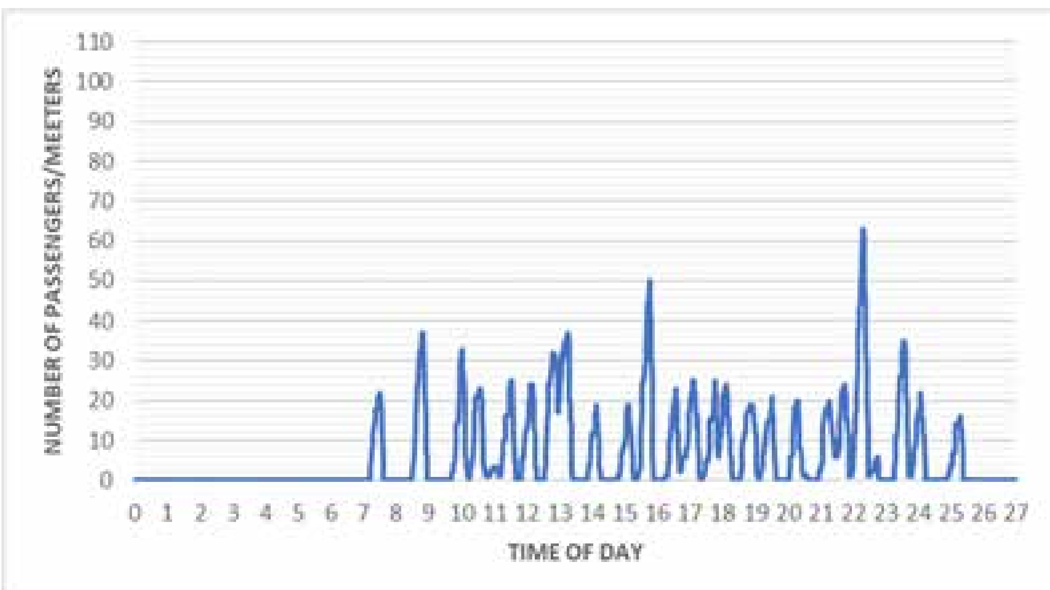


Figure 3-7: Domestic Baggage Claim-5 Occupancy for PAL 1

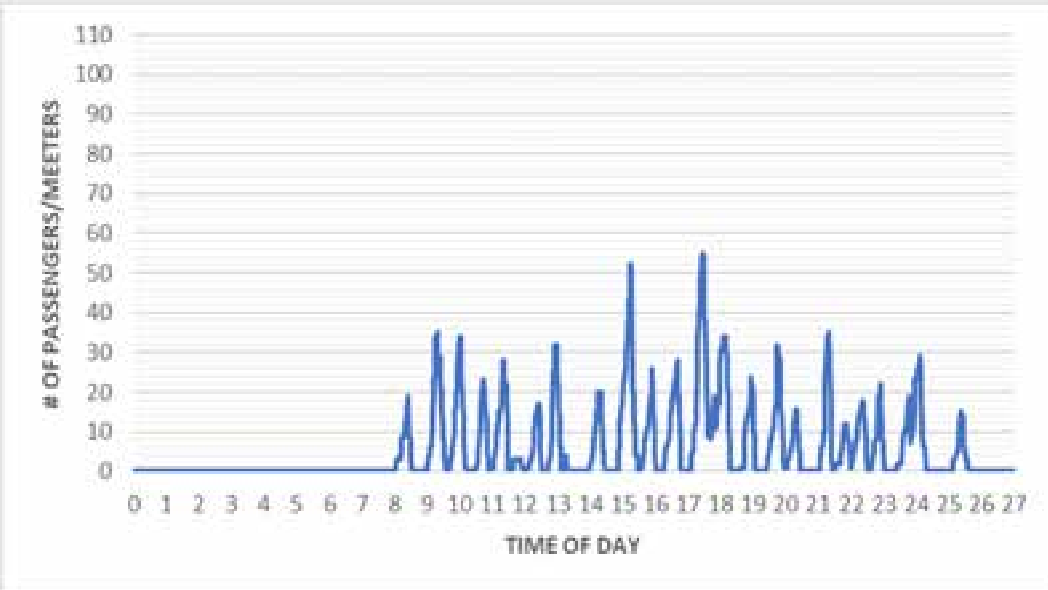


Figure 3-8: Domestic Baggage Claim-1 Occupancy for PAL 2

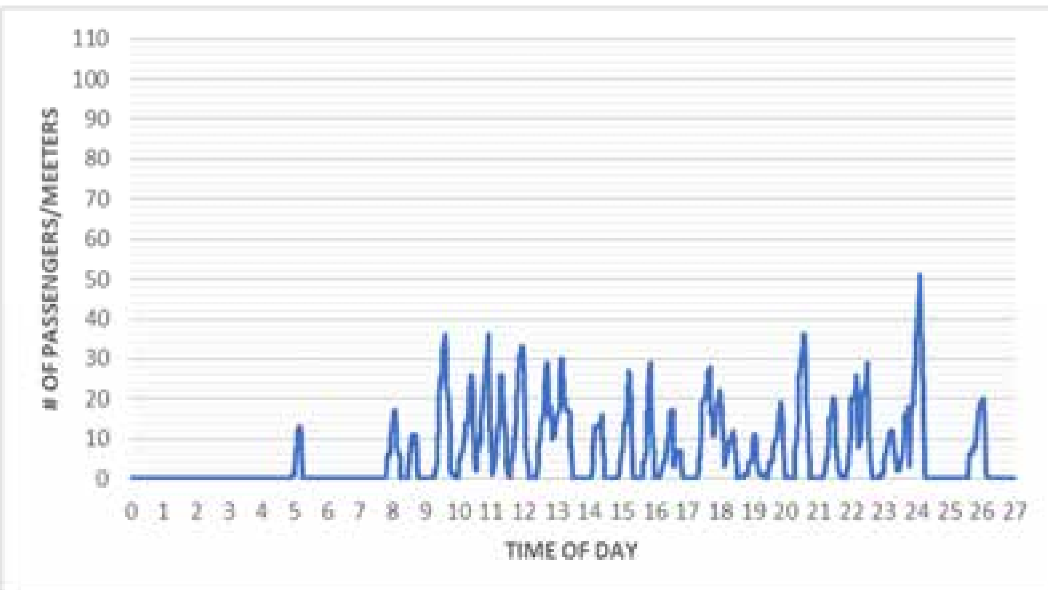


Figure 3-9: Domestic Baggage Claim-2 Occupancy for PAL 2

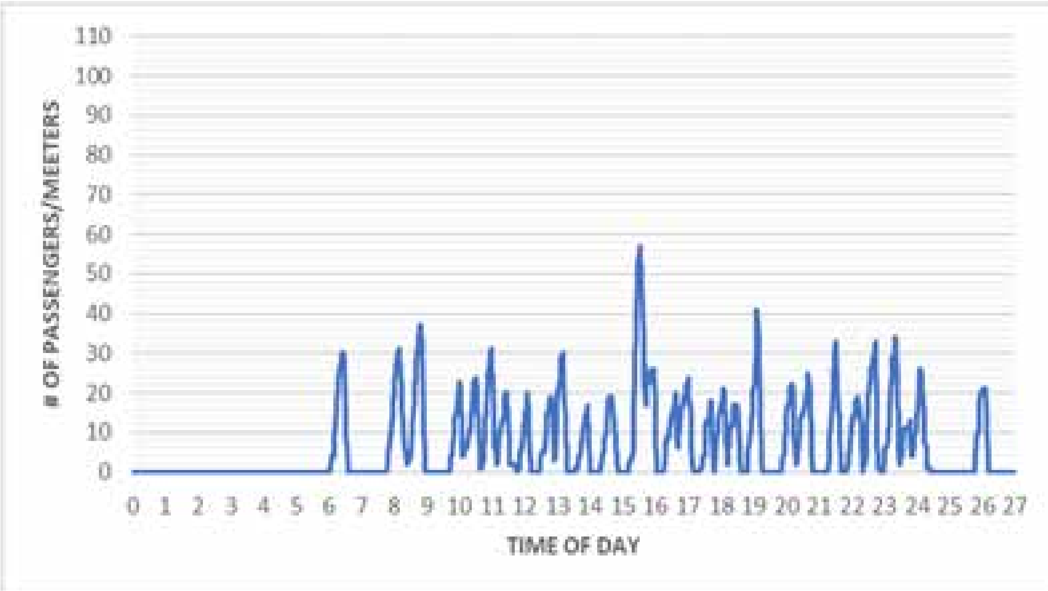


Figure 3-10: Domestic Baggage Claim-3 Occupancy for PAL 2

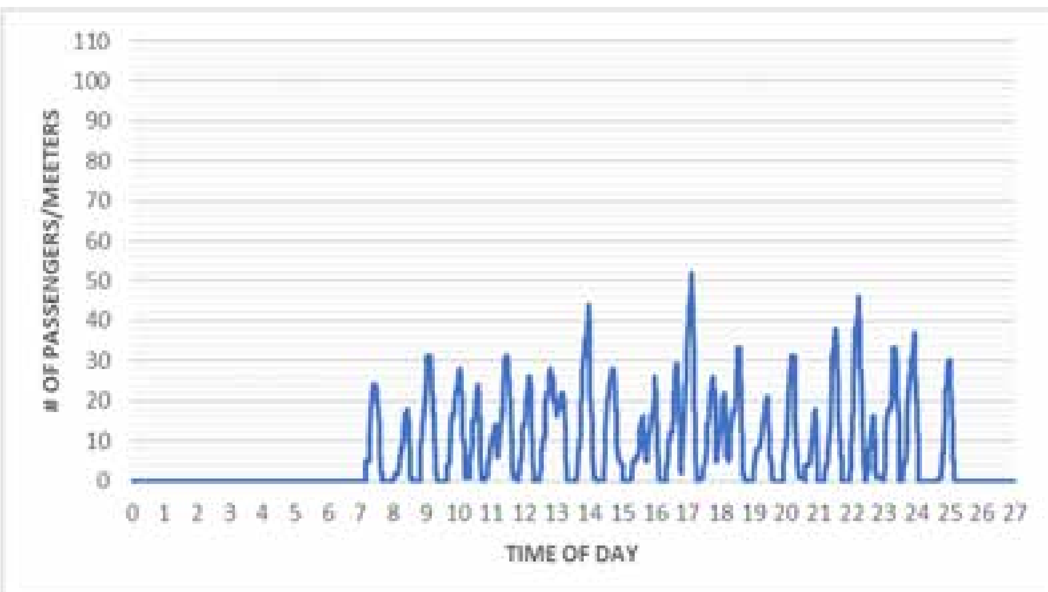


Figure 3-11: Domestic Baggage Claim-4 Occupancy for PAL 2

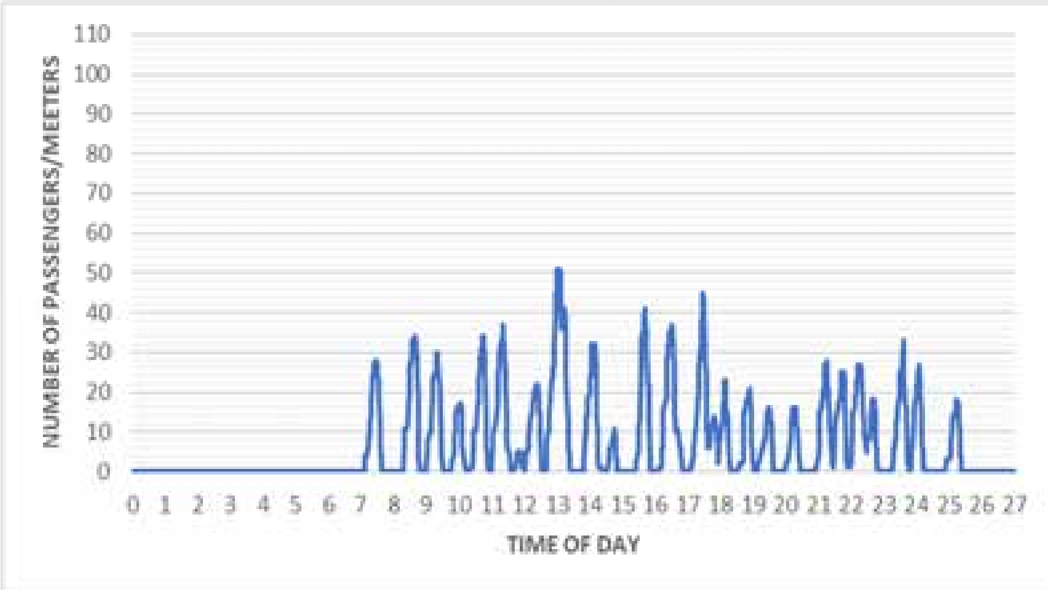


Figure 3-12: Domestic Baggage Claim-5 Occupancy for PAL 2

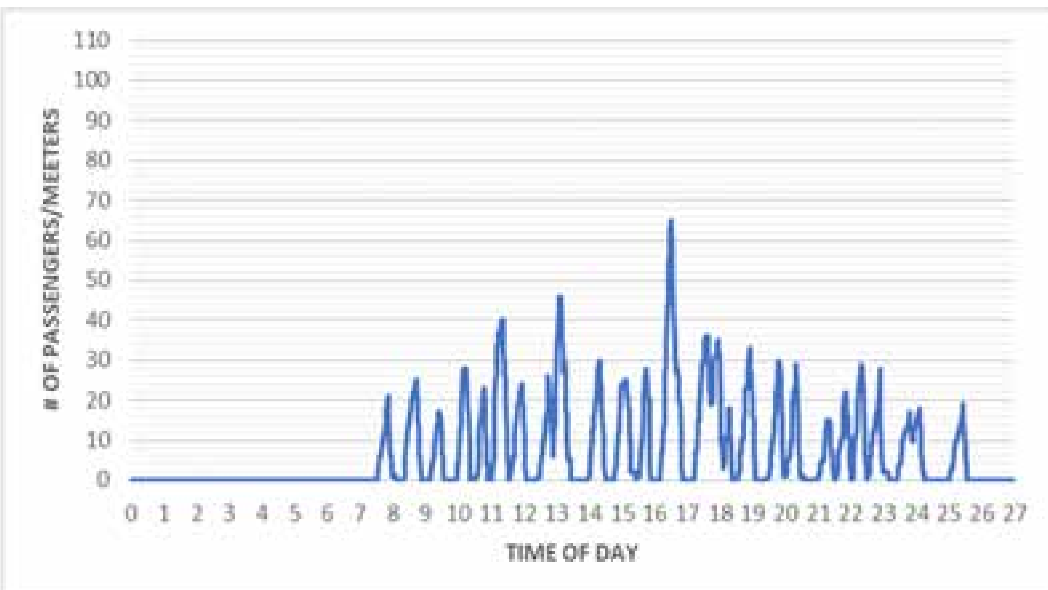


Figure 3-13: Domestic Baggage Claim-1 Occupancy for PAL 3

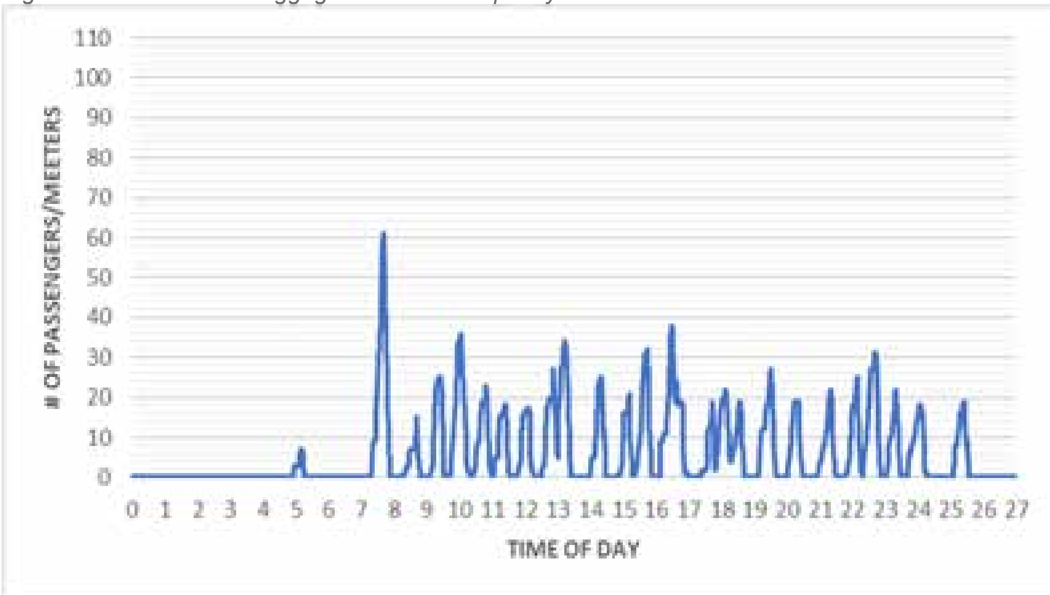


Figure 3-14: Domestic Baggage Claim-2 Occupancy for PAL 3

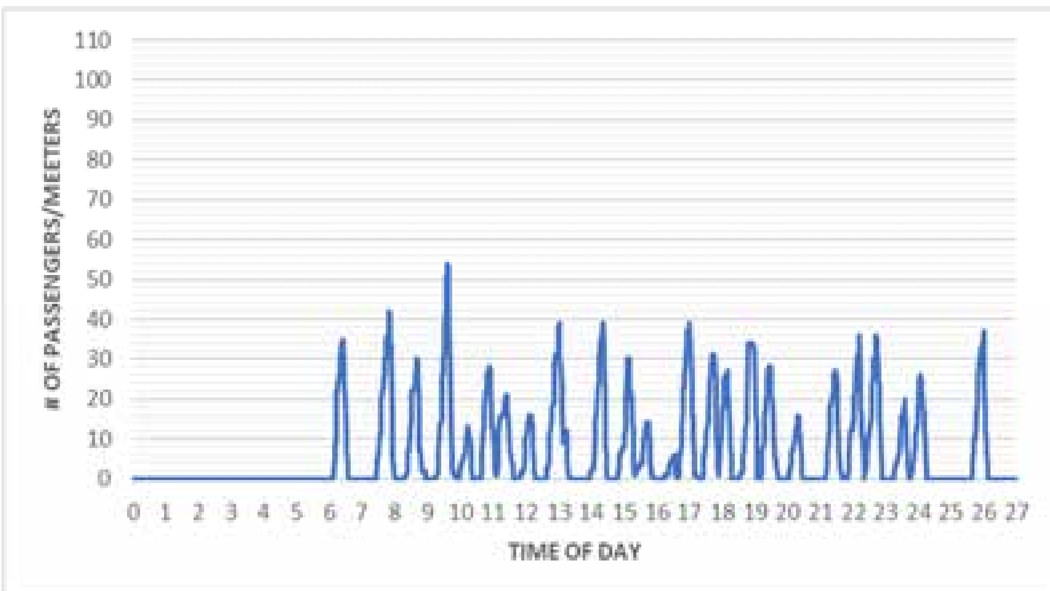


Figure 3-15: Domestic Baggage Claim-3 Occupancy for PAL 3

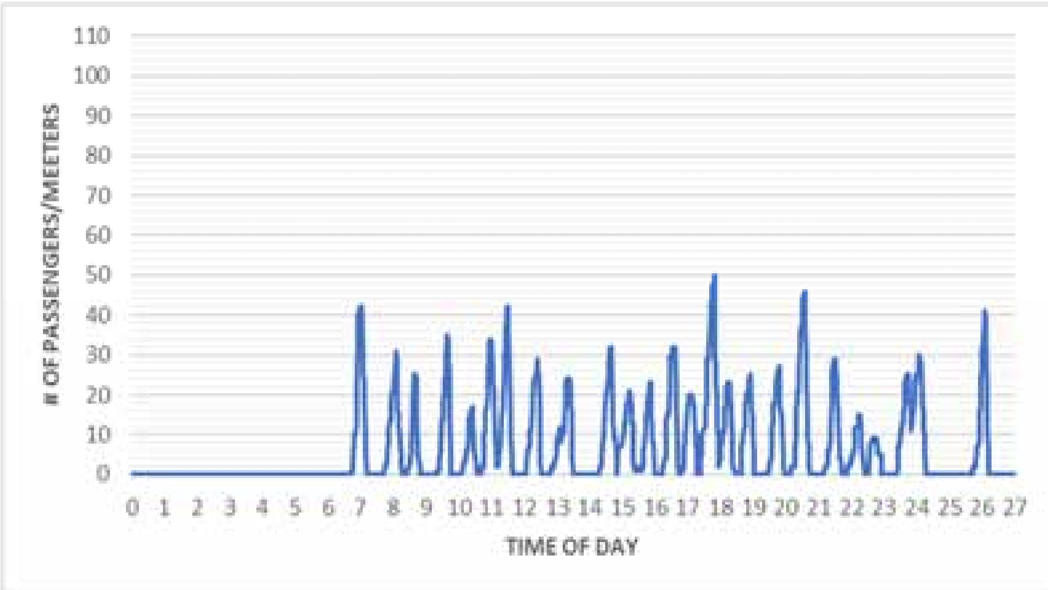


Figure 3-16: Domestic Baggage Claim-4 Occupancy for PAL 3

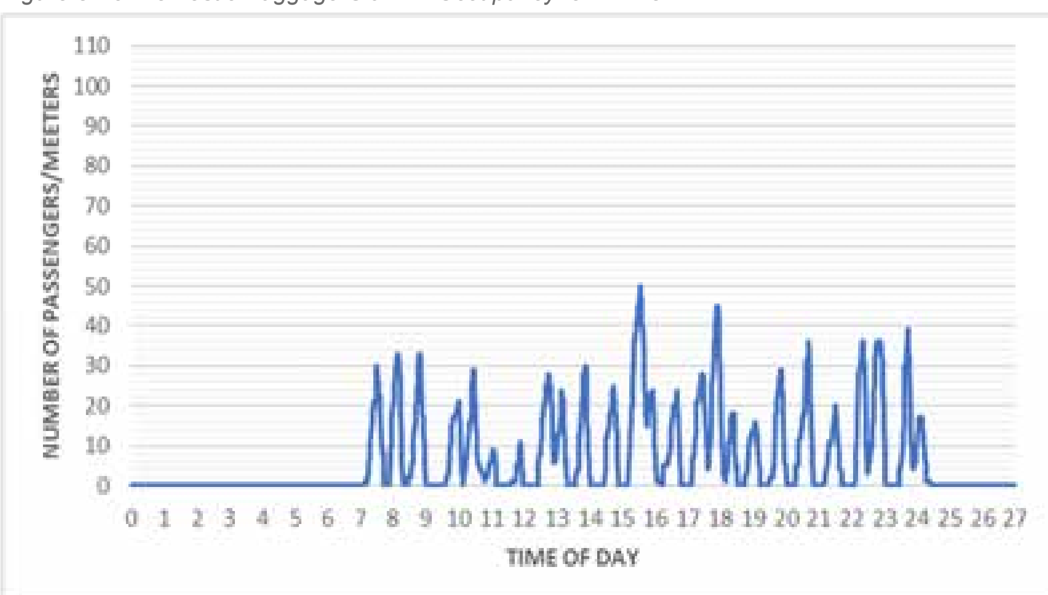


Figure 3-17: Domestic Baggage Claim-5 Occupancy for PAL 3

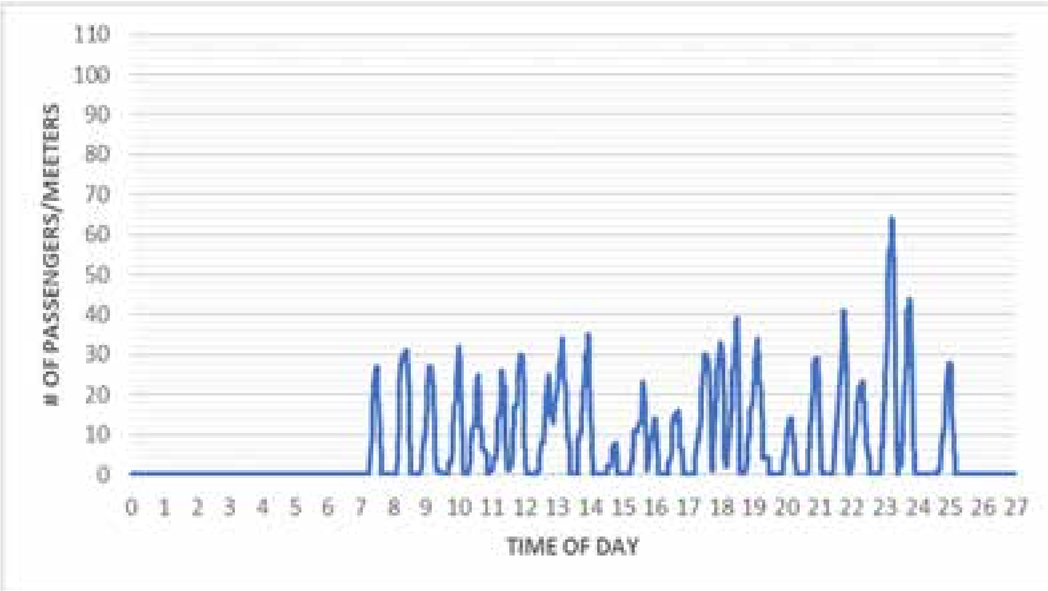


Figure 3-18: Domestic Baggage Claim-6 Occupancy for PAL 3

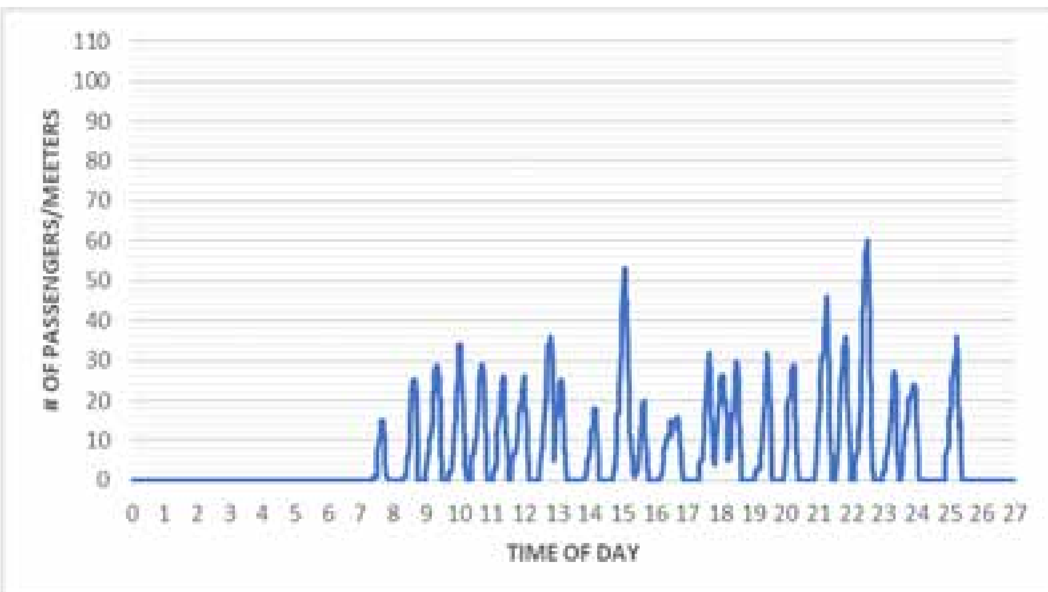


Figure 3-19: Domestic Baggage Claim-1 Occupancy for PAL 4

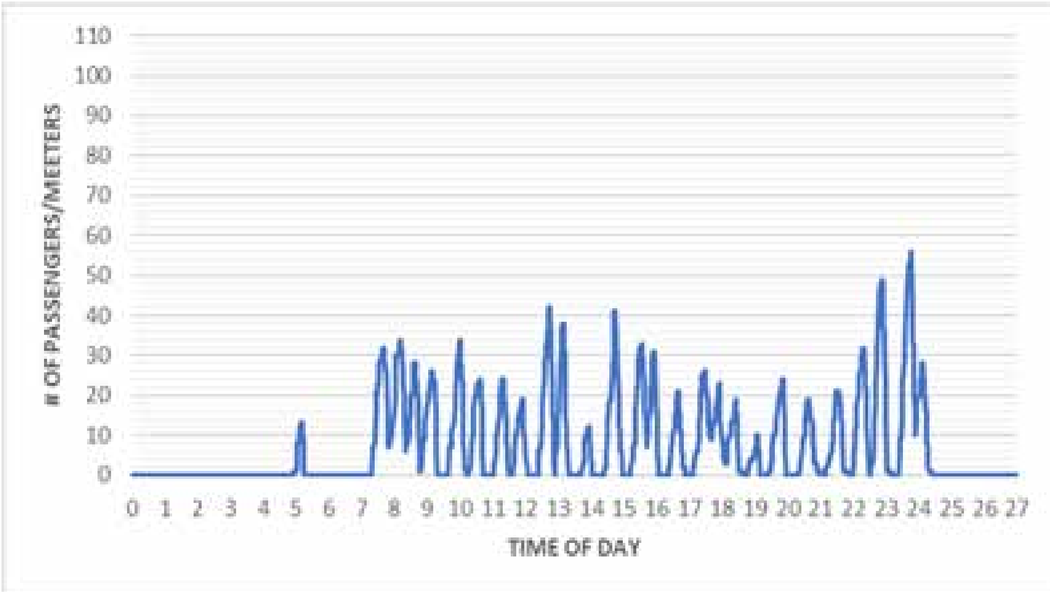


Figure 3-20: Domestic Baggage Claim-2 Occupancy for PAL 4

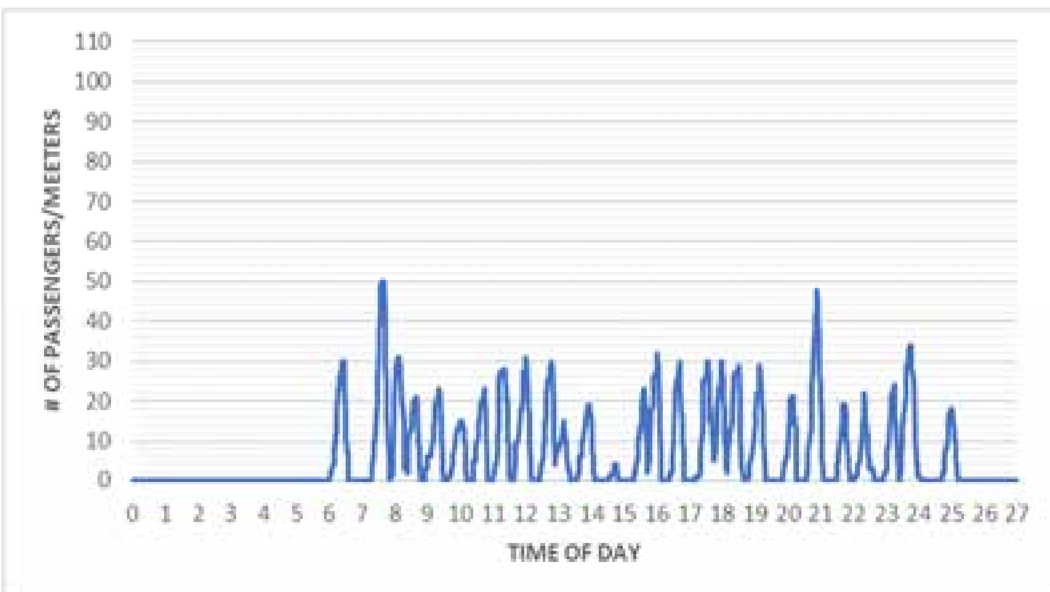


Figure 3-21: Domestic Baggage Claim-3 Occupancy for PAL 4

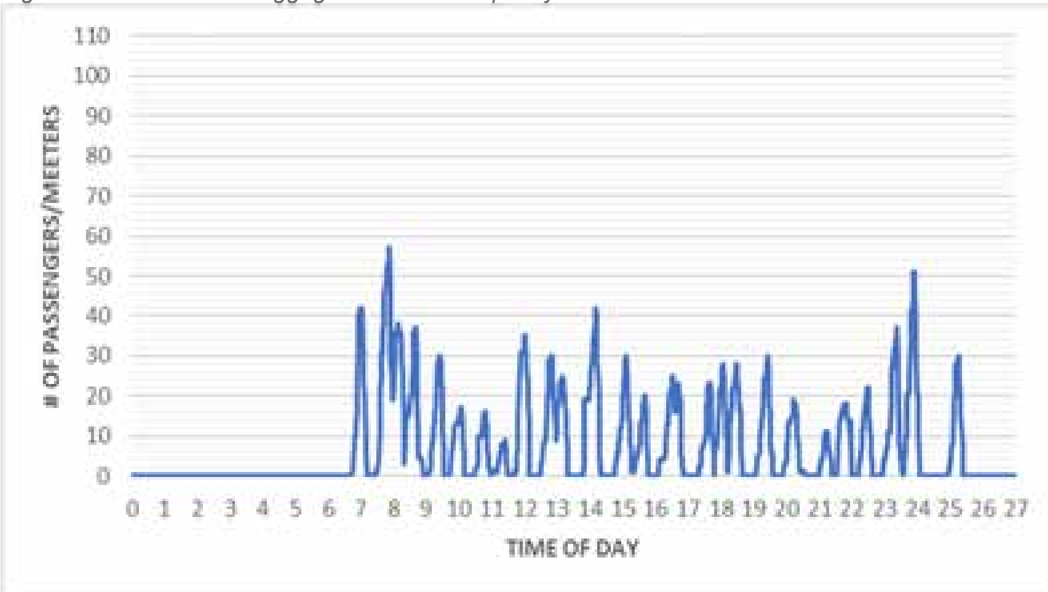


Figure 3-22: Domestic Baggage Claim-4 Occupancy for PAL 4

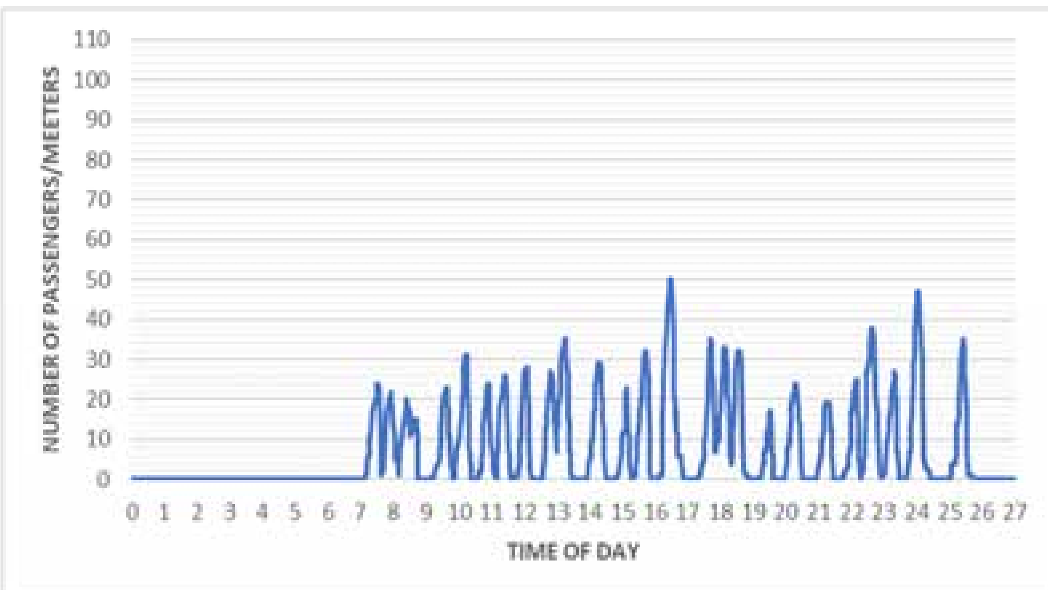


Figure 3-23: Domestic Baggage Claim-5 Occupancy for PAL 4

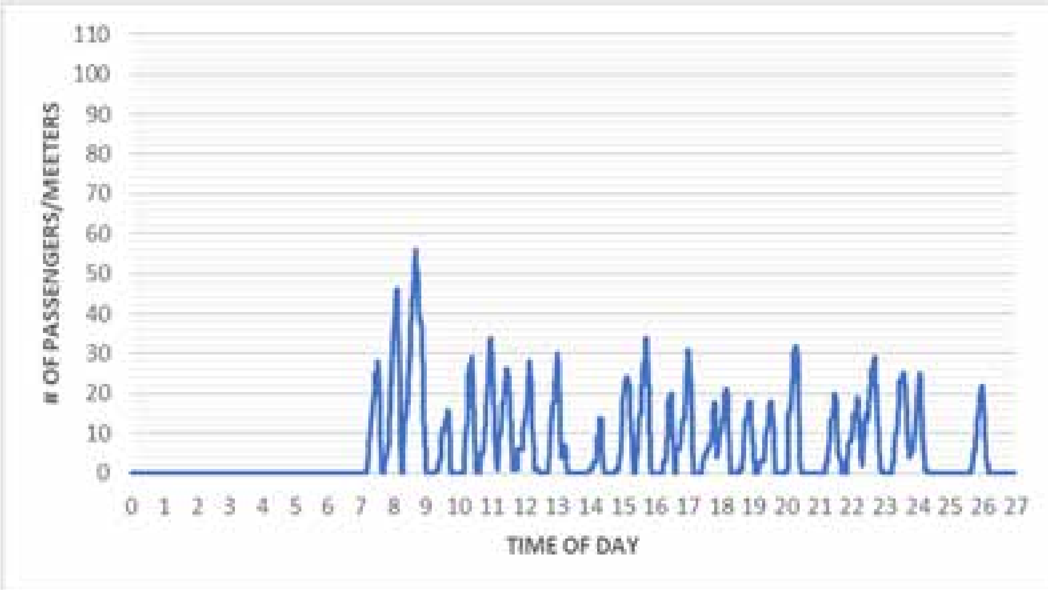


Figure 3-24: Domestic Baggage Claim-6 Occupancy for PAL 4

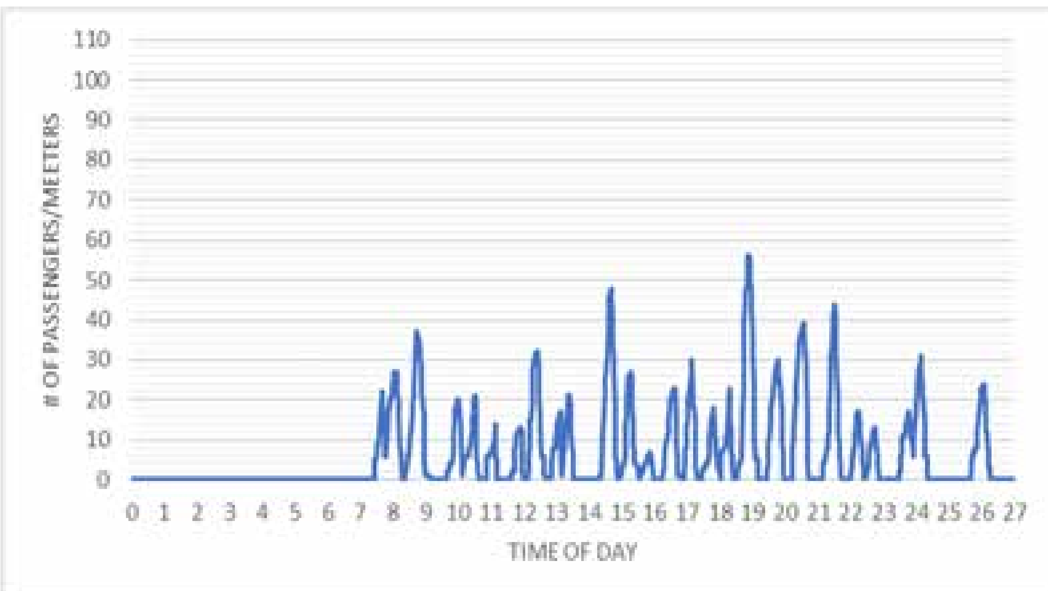
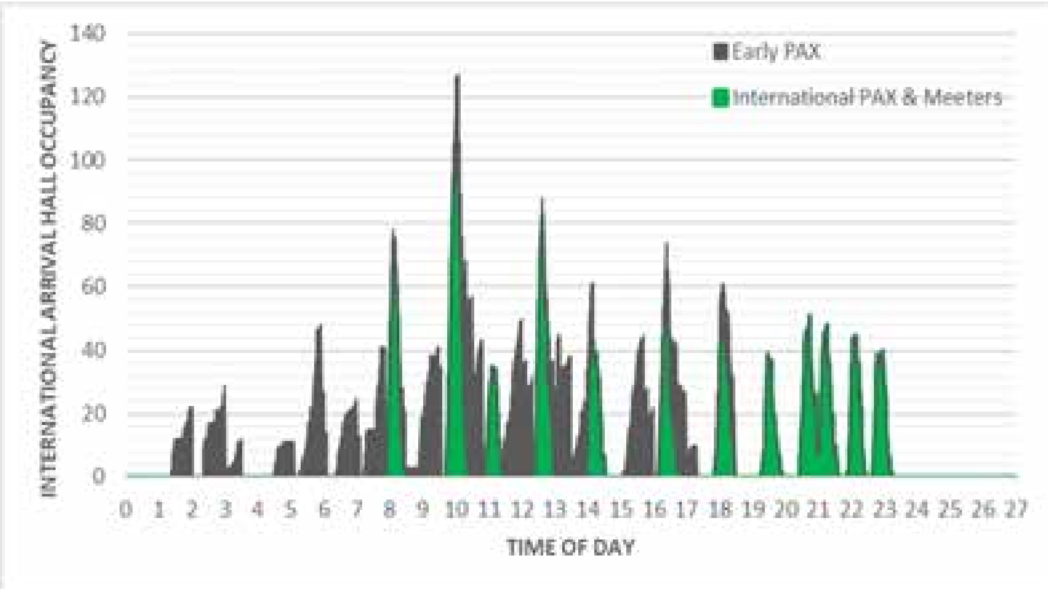


Figure 3-25 shows the occupancy for the international meeters hall for PAL 1, PAL 2, PAL 3, and PAL 4. It is assumed that the early passengers from the originating flow wait in the meters hall until the airline check-in counters open.

Figure 3-25: International Meeters Hall Occupancy for PAL 1, PAL 2, PAL 3, and PAL 4



Appendix V – Sustainability

SAN ANTONIO AIRPORT SYSTEM

SUSTAINABLE AIRPORT MANUAL

VOL. 1 BUILDING DESIGN AND CONSTRUCTION

SEPTEMBER 2021

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INTRODUCTION

INTEGRATED DESIGN

AIR AND EMISSIONS

ENERGY AND WATER MANAGEMENT

MATERIALS MANGEMENT

HEALTH, SAFETY AND SECURITY

INTRODUCTION

The San Antonio Airport System Sustainable Airport Manual (SAASSAM or "the Manual") is a green building manual. It is the guiding document for the San Antonio Airport System's (SAAS) ongoing efforts to implement more environmentally sustainable buildings. The purpose of this Manual is to integrate airport-specific sustainable design practices early in the design process with minimal impact to schedule or budget.

Sustainable design practices can potentially reduce the environmental impact of the built environment, while at the same time creating financial and operation benefits for the project and social benefits for the community at large. The optimization of these three aspects of sustainability is commonly referred to as the "triple bottom line".

The SAASSAM provides designers and contractors with the guidance needed to implement sustainable design practices to optimize environmental, social, and economic performance of new construction and major renovations at SAAS. The SAASSAM has been drawn in large part utilizing the Chicago Department of Aviation's Sustainable Airport Manual (CDA SAM) as a model, as well as other industry best practices for sustainable design, including:

- U.S. Green Building Council (USGBC) Leadership in Energy and Environmental Design (LEED) Versions 4 and 4.1 Rating System
- USGBC Performance in Energy and Electricity Renewal (PEER) Rating System
- Institute for Sustainable Infrastructure (ISI) Envision Framework
- Guiding Principles for High Performance and Sustainable Buildings

Utilization of the SAASSAM will produce high performance buildings for the SAAS. Third-party certification (e.g., LEED, Envision) is not required by this manual; however, the contents of the SAASSAM support certification should it be desired by SAAS. Project teams are encouraged to seek third-party certification where practical.

The SAASSAM is intended to communicate SAAS's expectations for sustainable design and construction, including documentation of compliance with requirements. It is not intended to supersede existing guidance; in all cases, design guidance and code requirements promulgated by the State of Texas, Bexar County, the City of San Antonio or other appropriate agency should be met first and foremost, with the manual providing supplemental green building guidance.

APPLICABILITY

This manual is applicable to all new construction and major renovation of occupied and unoccupied buildings greater than 1,000 square feet (SF). These applicable projects are provided in **Table 1**.

Table 1: SAASSAM Project Applicability

Type of Project	Description	Examples
New Construction – Occupied Building	Project consisting of facilities that once complete will be occupied by employees and passengers.	Terminals, Concourses, Guard Posts, Air Rescue and Firefighting Facilities, Cargo Facilities, Air Traffic Control Towers
New Construction – Unoccupied Buildings	Project consisting of facilities that do not have regular occupants (without permanent staff).	Pump Stations, Lighting Vaults, and Fuel Stations
Major Renovations	Projects that include renovated areas of at least 4,000 sq ft or with a construction cost greater than $3M or include the replacement of HVAC, electrical, plumbing, significant envelope modifications, and/or major interior renovations.	Terminal Gut-Rehab, Office Building Upgrades, Bathroom Remodels

Compliance with the criteria in this manual is mandatory for all projects that meet the applicability criteria in Table 1.

While sustainability measures are also applicable to operations and planning, this manual prioritizes the design and construction process with the anticipation that design and construction accomplishments will ultimately lead to a more sustainable and resilient airport.

Additionally, sustainable design elements can and should be implemented in infrastructure projects (e.g., runways, taxiways, parking facilities, etc.); however, this manual is focused on new construction and major renovation of buildings only. Future iterations of this manual may encompass planning and operations as well as infrastructure projects.

UNOCCUPIED BUILDING EXEMPTIONS

Some criteria in the Manual relating to occupant health, well-being and safety may not be applicable or achievable for unoccupied buildings. Project teams may exclude these criteria from their project submittals. Table 2 provides a summary of criteria that may be excluded from unoccupied building submittals.

Table 2: Unoccupied Buildings SAASSAM Criteria Exemptions

Category	Criteria Exempt from Unoccupied Buildings
Air and Emissions	Indoor Air Quality Performance
	Environmental Tobacco Smoke Control
Energy and Water Management	Daylighting
Materials Management	Storage and Collection Recyclables
Health, Safety, and Security	Thermal Comfort
	Noise and Acoustical Quality
	Exterior Views
	Occupant Well-Being Amenities

LIFE CYCLE COST EFFECTIVENESS EXEMPTIONS

This Sustainable Airport Manual aims to optimize the environmental, social and economic performance of newly constructed buildings and major building renovations within the San Antonio Airport System. To that end, project teams are not required to implement criterion that are not demonstrably cost-effective over the project life cycle. Project teams are encouraged to apply Life Cycle Cost Analysis (LCCA) to criterion where life cycle cost effectiveness (LCCE) is in doubt. Table 3 provides a summary of criteria that may be excluded from project requirements if shown to be not LCCE.

Table 3: Life Cycle Cost Effectiveness Exemptions

Category	Exempt Criteria for LCCE
Energy and Water Management	EWM-1: Improved Energy Performance
	EWM-3: Daylighting
	EWM-4: Alternative and Renewable Energy
	EWM-8: Water Use Reduction

- The LCCA must be prepared in accordance with 10 CFR Part 436, Subpart A and NIST Handbook 135 Life-Cycle Costing Manual for the Federal Energy Management Program, or an equivalent methodology.
- The LCCA must be prepared using the Building Life-Cycle Costing (BLCC) program, available from the National Institute of Standards and Technology, or equivalent software.
- If not otherwise supplied by SAAS, the implied long term inflation rate and discount rates identified in the Annual supplement to NIST Handbook 135 must be used.
- Any building-level LCCA must be calculated using a 40-year expectant life. Individual components or systems life expectancies must be reflected by inclusion of appropriate replacement and salvage values in the appropriate year of this analysis.
- Submit a narrative with the design documents that lists the sustainability feature(s) considered for the design; the results of the LCCA, including whether the feature(s) is LCCE; supporting LCCA calculations and assumptions; and how sustainable features were incorporated into the design to the maximum extent feasible.

OTHER EXEMPTIONS

Projects where the use of specific criteria are not feasible due to conflicts with airport operations may be exempt from meeting the associated requirements. Design teams must submit justification to the SAAS Environmental Stewardship Team identifying the conflict, its effect on sustainable design, and how sustainable features will be incorporated to the maximum extent feasible. The SAAS Environmental Stewardship Team will evaluate the justification on a per criteria basis and issue a final determination.

HOW TO USE THIS DOCUMENT

The SAASSAM provides streamlined, user-friendly design and construction standards that promote transparency and accountability while minimizing administrative costs to SAAS. The requirements in the manual establish technical standards for new construction and renovation of building projects in the following categories:

- Integrated Design
- Air and Emissions
- Energy and Water Management
- Health, Safety, and Security
- Materials Management

Within each category, there are several technical standards, called "Design Criteria". These design criteria provide direction and guidelines for incorporating sustainable elements into a project and clearly lays out requirements for designers and contractors. Each sustainable design criterion has seven subcategories: Purpose, Benefits, Phase, Responsible Discipline, Performance Targets, Documentation, Exemptions and Sustainable Design Strategies, as described below:

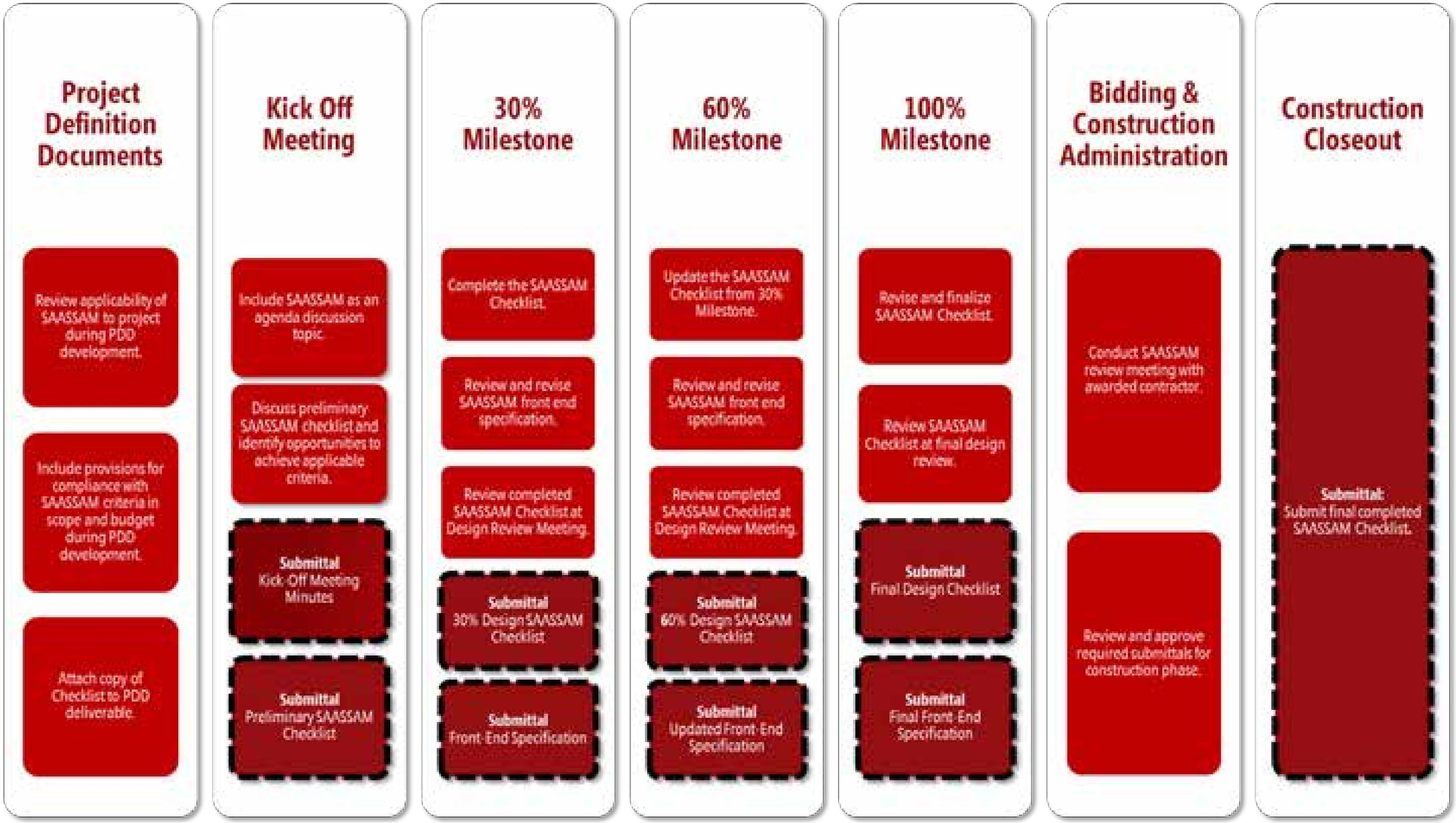
- **Responsible Discipline:** This subcategory identifies a discipline on the design team for which each criterion most commonly pertains to. Each criterion will identify a primary discipline and secondary discipline, if applicable, who may be responsible for demonstrating the requirements of each criterion. These identified disciplines are not intended to silo the design process; it is intended to provide disciplines with clear expectations from the start of the design process.
- **Purpose:** This subcategory establishes the primary motivation for each sustainable practice.
- **Phase:** This subcategory identifies the phase for incorporation and submittal of the criteria. Each criterion is assigned a "D" corresponding to the design phase or a "C" corresponding to the construction phase. If a criterion applies to both design and construction, it will be notated with a "D, C".
- **Benefits:** This subcategory provides a description of the benefits associated with implementation of the design criteria.
- **Performance Target(s):** This subcategory sets the minimum goal that must be achieved for each design criteria.
- **Documentation:** This subcategory describes documentation and/or information required to demonstrate that the criterion and associated performance target(s) have been met. This documentation may include calculations, data, short narratives, policies, documents or references to specification sections or design drawings indicating how the requirements are being met.
- **Exemptions**: This subcategory describes situations where the criteria may not be applicable and therefore exempt from the requirements in the manual. Only criteria that have the option for exemption will have this subcategory.
- **Sustainable Design Strategies:** This subcategory provides design ideas for and examples of candidate design measures. These strategies are not exhaustive. Project design teams are encouraged to identify, evaluate and document strategies beyond those identified for each criterion.

While not all sustainable design criteria will be applicable to every project category, design and construction teams are encouraged to think creatively and consider the intent of each throughout the project.

PROCESS

The SAASSAM and its supporting documentation are administered by SAAS. SAAS staff will be responsible for reviewing submittals with respect to sustainability and will provide technical support to each project in relation appropriate to the sustainable design strategies. As part of the standard design review process, the SAASSAM and supporting documentation will be reviewed at each milestone (typically 30%, 60%, and 100% design submittals) against the goals set forth in the Manual. Review comments on the checklist are submitted along with design-related review comments. **Figure 1** provides the anticipated SAASSAM review process.

Figure 1: Anticipated SAASSAM Review Process



ALIGNMENT TO CITY ACTIONS

The SAASSAM is intended to serve as an airport-specific guiding document for the improving the sustainable performance of buildings at the SAAS. In a Carbon Policy statement, dated August 31st, 2021, the SAAS stated the following:

The Aviation Department will work to ensure new construction meets rigorous energy efficiency standards, including the use of energy efficient construction equipment by developing a Sustainable Airport Manual (SAASSAM). The SAASSAM will serve as a key tool to reduce resource consumption during the planning, development, and construction of airport facilities in line with the City's sustainability and climate resiliency goals.

Where applicable, the criteria in the SAASSAM draw upon applicable guidance from relevant City of San Antonio sustainability, resilience and design standards. Guidance from the following documents were provided:

- San Antonio Tomorrow Sustainability Plan
- COSA Facility Design Guidelines & Standards for City Building and Parks
- San Antonio Climate Ready
- Draft Administrative Directive on Municipal Energy Policy

Design teams are encouraged to review these COSA guiding documents.

Criteria	Phase	Applicability	Responsible Discipline	Supporting Discipline
Integrated Design				
ID-1: INTEGRATED DESIGN	Design & Construction	All	Planning and Development	-
ID-2: GREEN MEETINGS	Design & Construction	All	Planning and Development	-
Air and Emissions				
AE-1: INDOOR AIR QUALITY PERFORMANCE	Design	Occupied Buildings Only	Mechanical	-
AE-2: ENVIRONMENTAL TOBACCO SMOKE CONTROL	Design	Occupied Buildings Only	Architectural	Mechanical
AE-3: CONSTRUCTION INDOOR AIR QUALITY MANAGEMENT	Construction	All	Construction Contractor	Architectural
AE-4: OZONE DEPLETING CHEMICALS AND REFRIGERANT MANAGEMENT	Design	All	Mechanical	-
AE-5: CLEAN FUEL AND LOW EMISSION CONSTRUCTION VEHICLES	Construction	All	Construction Contractor	-
AE-6: GREENHOUSE GAS EMISSIONS	Design	All	Architectural	Mechanical
Energy and Water Management				
EWM-1: IMPROVED ENERGY PERFORMANCE	Design	All	Mechanical	Electrical
EWM-2: MINIMIZE SOLAR HEAT GAIN	Design	All	Architectural	Landscape Architectural
EWM-3: DAYLIGHTING	Design	Occupied Buildings Only	Electrical	Architectural
EWM-4: ALTERNATIVE AND RENEWABLE ENERGY	Design	All	Electrical	-
EWM-5: ELECTRIC VEHICLE CHARGING INFRASTRUCTURE	Design	All	Electrical	-
EWM-6: METERING AND VERIFICATION	Design	All	Mechanical	Electrical
EWM-7: SYSTEMS COMMISSIONING	Design & Construction	All	Commissioning Authority	-
EWM-8: WATER USE REDUCTION	Design & Construction	All	Mechanical	-
EWM-9: STORMWATER MANAGEMENT	Design & Construction	All	Civil	-
Materials Management				
MM-1: SOURCING OF RAW MATERIALS AND FURNITURE	Design & Construction	All	Architectural	Interior Design
MM-2: LOW-EMITTING MATERIALS	Design & Construction	All	Architectural	Interior Design
MM-3: STORAGE AND COLLECTION OF RECYCLABLES	Design	Occupied Buildings Only	Architectural	-
MM-4: CONSTRUCTION WASTE MANAGEMENT	Construction	All	Construction Contractor	-
Health, Safety and Security				
HSS-1: THERMAL COMFORT	Design	Occupied Buildings Only	Mechanical	-
HSS-2: NOISE AND ACOUSTICAL QUALITY	Design	Occupied Buildings Only	Mechanical	Architectural
HSS-3: LIGHT POLLUTION REDUCTION	Design	All	Electrical	-
HSS-4: EXTERIOR VIEWS	Design	Occupied Buildings Only	Architectural	-
HSS-5: OCCUPANT WELLBEING AMENITIES	Design	Occupied Buildings Only	Architectural	Mechanical
HSS-6: DESIGN FOR ENHANCED RESILIENCE	Design	Occupied Buildings Only	Architectural	Mechanical, Electrical

ID-1: INTEGRATED DESIGN

Responsible Discipline	Purpose	Phase
Planning and Development	Enhance project design by planning for and identifying sustainable elements across multiple disciplines and stakeholders.	D , C

BENEFITS

- Sustainability commitments are established early in project.
- All members of the project team are aware of sustainability commitments.
- Sustainability performance is enhanced for each project.

PERFORMANCE TARGET(S)

- **During PDD Development:**
  - Form an Integrated Design Team that includes the Planning and Development, Environmental Stewardship, Facilities Maintenance departments of SAAS, as well as design and construction professionals and a sustainability expert.
  - Incorporate a design charette into the project Kick Off Meeting with the Integrated Design Team to review SAASSAM criteria and establish sustainability goals for the project with the intent of optimizing the performance of sustainable project elements.
  - Develop project-specific sustainability goals that are aligned with SAAS and/or City of San Antonio sustainability goals.
- Review sustainability elements of the project at each major milestone of the project design, including 30%, 60%, 90%, as well as during bidding, construction administration and project close out.
- Thoroughly document meeting minutes for meetings where sustainability or the SAASSAM is discussed. Keep detailed records of decisions made regarding sustainability.

DOCUMENTATION

- Develop a descriptive narrative of project team members and roles, the project-specific sustainability goals.
- Prepare meeting minutes for the Kickoff Meeting and subsequent meetings related to SAASSAM criteria.
- Complete versions of the SAASSAM checklist at the project Kick Off Meeting, at each of the 30%, 60% and 90% design submittals (or equivalent), and at construction close out.

SUSTAINABLE DESIGN STRATEGIES

Develop project sustainability goals that are quantifiable and/or verifiable.

ID-2: GREEN MEETINGS

Responsible Discipline	Purpose	Phase
Planning and Development	Guide meeting hosts, planners, and attendees toward more sustainable meetings.	**D , C**

BENEFITS

- Conserve resources and reduce environmental impact of meetings.
- Support SAAS's commitment to environmental stewardship.

PERFORMANCE TARGET(S)

Follow green meeting practices outlined in Section VI. Sustainable Design Strategies below.

DOCUMENTATION

At the Kickoff Meeting submit a plan for green meetings that will be followed for the duration of the project, including relevant Sustainable Design Strategies outlined below

SUSTAINABLE DESIGN STRATEGIES

- **Meeting Planning**
  - Reduce the number of copies produced by:
    - Sharing meeting materials
    - Digitizing materials and distributing presentations via email prior to meetings
    - Placing materials on the wall (one large print or presented with projector equipment)
  - If handouts are needed at the meeting, produce handouts locally and utilize both sides of paper. Use high post-consumer recycled content paper.
  - For exhibits and presentation materials:
    - Reuse display boards and utilize front and back sides
    - Use low-emitting materials for exhibit displays
    - Recycle cardboard and other packaging materials
- **For participants not located in the building:**
  - Provide an option for attendees to participate via phone or video conference.
- **If travel cannot be avoided**:
  - Encourage carpool or car share
  - Provide attendees with mass transit options including directions for use.
  - If overnight stays are necessary, suggest hotels nearest to the meeting venue. Consider moving the meeting to a hotel if multiple participants are staying at the same hotel.
  - If flights are necessary, encourage participation in a carbon offsetting program such as the Good Traveler Program.
- **For meetings that require catering services:**
  - Serve drinks from pitchers, utilize reusable utensils and dishes, and request local produce to cut down on waste.
  - Utilize condiments from bulk dispensers.
  - Plan for the pick-up and compost or donation of leftover food to reduce waste.

AE-1: INDOOR AIR QUALITY PERFORMANCE

Responsible Discipline	Purpose	Phase
Mechanical	Enhance indoor air quality in buildings and minimize occupant exposure to potentially hazardous particulates and chemical pollutants.	**D**

BENEFITS

- Enhance the health and comfort of the Airport community.
- Avoid over-ventilation of occupied spaces and associated energy use.
- Filter air to remove allergens, pathogens, and other irritants.
- Avoid unnecessary exposure to airborne chemicals and particles.

PERFORMANCE TARGET(S)

- Meet the minimum requirements of Sections 4 through 7 of ASHRAE 62.1-2016, Ventilation for Acceptable Indoor Air Quality (or most current version). Design mechanical ventilation systems using the Ventilation Rate Procedure or the applicable local code, whichever is more stringent. Naturally ventilated buildings should comply with ASHRAE 62.1-2016, paragraph 5.1 (or most current version).
- All building entrances must have permanent entryway systems (e.g., grills, grates or carpet) at least 10 feet long in the primary direction of travel.
- For 100% of spaces where hazardous gases or chemicals may be present or used (including garages and copying/printing rooms):
    - Provide exhaust systems sufficient to create negative pressure with respect to adjacent spaces with the doors to the room closed. The exhaust rate should be at least 0.50 cfm/sq.ft., with no air recirculation
    - Provide self-closing doors and deck to deck partitions or a hard lid ceiling.
- Each ventilation system that supplies outdoor air to occupied spaces must have particle filters or air-cleaning devices that meet minimum efficiency reporting value (MERV) of 13 or higher, in accordance with ASHRAE Standard 52.2-2007.

DOCUMENTATION

- Provide HVAC specifications and calculations showing HVAC systems meet performance targets.
- Provide annotated design drawings showing the locations of entryway systems, exhaust systems, and containment drains.

EXEMPTIONS

This criterion is not applicable to unoccupied buildings.

SUSTAINABLE DESIGN STRATEGIES

- Design HVAC systems to meet ventilation requirements of the standards referenced
- Right-size HVAC systems to avoid wasted energy
- Specify permanent outdoor air monitors for air handling units (AHUs) and integrate them into building automation system (BAS) controls
- Locate air intakes in secure areas for protection from potential attacks.
- Provide operable windows, where appropriate.
- Design airside buildings to be positively pressurized at all times to prevent jet exhaust and other fumes from the airfield from entering the buildings.
- Identify potential IAQ conflicts on the site and locate air intakes away from air contaminant source, which might include loading areas, exhaust fans, and cooling towers.
- Evaluate carbon or electrostatic filters for use in passenger terminal buildings and other occupied spaces.

- Evaluate the potential use of technologies and system settings that can reduce transmission of COVID-19 and other viral pathogens, such as HEPA filtration, ultraviolet germicidal irradiation (UVGI) and increased ventilation rates and outdoor air intake
- Specify permanent entryway systems (e.g., grills, grates or carpet) at least 10 feet long in the primary direction of travel to capture dirt and particulates from entering the building at all high-volume entryways.
- Where chemical use occurs (e.g., housekeeping areas, garages, shops, and copying/printing rooms), design segregated areas with deck-to-deck partitions, self-closing doors, or hard ceiling, and maintain separate outside exhaust at a rate of at least 0.50 cubic feet per minute per square foot, with no air re-circulation and a negative pressure maintained.
- Provide containment drains plumbed for appropriate disposal of liquid waste in spaces where water/liquid and chemical concentrate mixing occurs.
- Design central locations in terminal and office buildings for storage of concentrated cleaning chemicals and other pollutant sources. Locate these areas away from high volume occupant and tenant work areas.
- Design HVAC systems with carbon dioxide monitoring sensors in all densely occupied spaces and integrate these sensors with the building automation system (BAS). CO2 monitors should be installed at a height of between 3 and 6 feet above the floor. CO2 monitors should have an audible or visual indicator or alert the building automation system if the sensed CO2 concentration exceeds setpoints by more than 10%. Calculate appropriate CO2 setpoints using methods in ASHRAE 62.1–2010, Appendix C.
- Carbon dioxide sensors and BAS operation should be tested during building commissioning process prior to occupancy.
- Design to incorporate Demand Control Ventilation strategies, where possible, to vary the amount of ventilation air based on carbon dioxide levels in the spaces being served by the Air Handling Units (AHUs).
- Establish minimum ventilation rates for airside buildings so buildings are positively pressurized at all times to prevent fumes from entering buildings from airfield.
- Provide real-time control of terminal unit (VAV box) flow rates and total outdoor air flow rates based on carbon dioxide levels.

AE-2: ENVIRONMENTAL TOBACCO SMOKE CONTROL

Responsible Discipline	Purpose	Phase
Architectural	Prevent exposure of building occupants and users to environmental tobacco smoke (ETS).	**D**

BENEFITS

- Protect the health of SAAS employees and the travelling public.
- Avoid energy consumption associated with exhaust and ventilation of indoor smoking lounges.

PERFORMANCE TARGET(S)

- Prepare an environmental tobacco smoke (ETS) control plan as part of design. The plan must:
    - Prohibit smoking inside 100% of indoor spaces
    - Locate outdoor smoking areas at least 25 feet from all building entries, outdoor air intakes and operable windows
    - Provide for signage indicating the no smoking policy to be posted within 10 feet of all building entrances

DOCUMENTATION

- Submit an ETS Control Plan.
- Provide design drawings showing locations of outdoor smoking areas and signage.

EXEMPTIONS

This criterion is not applicable to unoccupied buildings.

SUSTAINABLE DESIGN STRATEGIES

- Prevent exposure of building occupants and systems to environmental tobacco smoke (ETS) by banning indoor smoking areas.
- Provide sheltered and naturally ventilated exterior smoking areas for employees and travelers. Exterior smoking areas must be located 25 feet away from all building entries, outdoor air intakes and operable windows, unless this requirement is superseded by local codes.
- Post appropriate signage that clearly communicates smoking area location(s).
- Post signage indicating no smoking areas within 10 feet of all building entrances

AE-3: CONSTRUCTION INDOOR AIR QUALITY MANAGEMENT

Responsible Discipline	Purpose	Phase
Construction Contractor	Reduce indoor air quality (IAQ) problems resulting from construction or renovation activities to promote the health, comfort, and well-being of construction workers and building occupants.	C

BENEFITS

- Enhance the health and comfort of the SAAS community.
- Improve indoor air quality (by reducing airborne contaminants) for workers during construction and for employees, passengers, and tenants during occupancy.
- Protect and extend the lifetime of the ventilation system.

PERFORMANCE TARGET(S)

Develop and implement a Construction IAQ Management Plan. The Plan must include, at a minimum:

- Specify activities to limit VOCs, dust and other IAQ impacts during construction, as well as building flush-out, IAQ testing and/or other strategies to ensure optimal IAQ prior to occupancy.
- Include provisions to prevent indoor smoking during construction.

DOCUMENTATION

- Provide Construction IAQ Management Plan.
- Provide results of any IAQ testing performed prior to occupancy.

SUSTAINABLE DESIGN STRATEGIES

- Specify the recommended control measures found in the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guideline for Occupied Buildings under Construction, 2nd Edition 2007, Chapter 3. The SMACNA guidelines recommend control measures s including HVAC protection, source control, pathway interruption, housekeeping, and scheduling. Examples of control measures include:
  - Specify the protection of stored on-site and installed absorptive materials from moisture damage.
  - Specify the partitioning of construction areas from occupied non-construction portions of a building to prevent the circulation of airborne contaminants
  - Specify the sequencing of installation of materials to avoid contamination of absorptive materials such as insulation, carpeting, ceiling tile, and gypsum wallboard.
  - Limit smoking during construction to outside of any buildings and at least 25 feet from building entrances.
  - If possible, avoid using permanently installed air handlers for temporary heating/cooling during construction.
  - Specify that if air handlers are used during construction, filtration media with a Minimum Efficiency Reporting Value (MERV) of 8 must be installed at each return air grill, as determined by ASHRAE 52.2-1999.
  - Specify replacement of all filtration media immediately prior to occupancy. Filtration media should have a Minimum Efficiency Reporting Value (MERV) of 13, as determined by ASHRAE 52.2-1999 for media installed at the end of construction.
  - If practical after construction is complete and prior to occupancy, specify conduct of a two-week building flush out with 100% outside air or complete IAQ testing to ensure proper IAQ

AE-4: OZONE DEPLETING CHEMICALS AND REFRIGERANT MANAGEMENT

Responsible Discipline	Purpose	Phase
Mechanical	Reduce stratospheric ozone depletion and greenhouse gas emissions.	D

BENEFITS

- Phase-out of Chlorofluorocarbons (CFCs) and other refrigerants avoids depletion of the stratospheric ozone layer. The thinning of this ozone layer is linked to many human health problems, such as skin cancer and to ecological effects, such as reduced crop yields, and to damage to the marine food chain.
- Refrigerants released into the atmosphere contribute to climate change, having a disproportionately large effect compared with other greenhouse gases, such as carbon dioxide. Careful consideration of the refrigerant requirements of energy and fire protection systems can avoid these effects while improving performance and reducing operating costs.

PERFORMANCE TARGET(S)

- Do not use chlorofluorocarbon (CFC) based refrigerants in new HVAC&R systems. When reusing existing HVAC&R equipment, complete a comprehensive CFC phase-out conversion before project completion.
- Do not use high global warming potential (GWP) chemicals (i.e., GWP greater than 50) where EPAs Significant New Alternatives Policy (SNAP) Program has identified acceptable substitutes or where other environmentally preferable products are available for use in construction, repair or end-of-life replacements.

DOCUMENTATION

- Demonstrate that no refrigerants are used, or document use of refrigerants (naturally occurring or synthetic) that have an ozone depletion potential (ODP) of zero and a global warming potential (GWP) of less than 50.
- For projects that use refrigerants with ODP > 0 or GWP > 50, demonstrate compliance with the following formula:

$$LCGWP + LCODP \times 10^5 \leq 100$$

Where:

- Lifecycle Ozone Depletion Potential (LCODP) = [ODPr × (Lr × Life + Mr) × Rc] / life
- Life Cycle Global Warming Potential (LCGWP) = [GWPr × (Lr × Life + Mr) × Rc] / life
- Ozone Depletion Potential of Refrigerant (ODPr) = value provided by manufacturer in pounds
- Global Warming Potential of Refrigerant (GWPr) = value provided by manufacturer in pounds
- Refrigerant Leakage Rate (Lr) = 2%
- End-of-life Refrigerant Loss (Mr) = 10%
- Refrigerant Charge (Rc) = value provided by manufacturer in pounds
- Life = 10 years, unless otherwise demonstrated

EXEMPTIONS

Existing small HVAC&R units (defined as containing less than 0.5 pound of refrigerant) and other equipment, such as standard refrigerators, small water coolers, and any other equipment that contains less than 0.5 pound of refrigerant, are exempt.

SUSTAINABLE DESIGN STRATEGIES

- Use alternative refrigerants that minimize ozone depletion potential (ODP) and GWP compared to hydrofluorocarbons (HCFCs) and hydrofluorocarbons (HFCs) include natural refrigerants such as carbon dioxide, ammonia, 2020 DC - 78 and propane. These compounds have an ODP of zero and GWPs which are three orders of magnitude less than most HCFCs and HFCs

- Specify new base building HVAC equipment that uses no CFC or hydrochlorofluorocarbon (HCFC) refrigerants.
- Specify HVAC equipment that uses refrigerants with low Global Warming Potential.
- Prohibit the specification of insulation materials that use ozone-depleting chemicals.
- Prohibit the specification of halons in fire suppression.
- Prohibit the specification of ozone-depleting substances in adhesives, coatings, and inks.

AE-5: CLEAN FUEL AND LOW EMISSION CONSTRUCTION VEHICLES

Responsible Discipline	Purpose	Phase
Construction Contractor	Minimize outdoor air quality impacts and reduce greenhouse gas emissions associated with construction.	C

BENEFITS

- Improve air quality
- Avoid greenhouse gas emissions
- Enhance health and safety of construction workers
- Reduce cost of transportation fuels

PERFORMANCE TARGET(S)

- Specify that the contractor must include strategies for minimizing emissions from construction equipment as part of the Construction Management Plan.
- Specify that 50% of all off-road vehicles over 50 hp on the project site for more than 14 consecutive days should be EPA Tier 4 compliant or better.

DOCUMENTATION

- Provide Construction Management Plan showing strategies for minimizing emissions from construction equipment.
- Provide documentation showing 50% or more of all off-road vehicles over 50 hp on the project site for more than 14 consecutive days during construction are EPA Tier 4 compliant or better.
- Specify the monthly reporting of fuel usage quantities by contractors during construction.

SUSTAINABLE DESIGN STRATEGIES

- Require the use of fuel efficient and low-emitting construction and contractor vehicles during construction.
- Specify the use of alternative fuels in heavy equipment such as biodiesel.
- Specify the use of hybrid or fully electric project vehicles.
- Specify the use of electric equipment vs. gas or diesel engines
- Encourage employee commuting programs with incentives.
- Reduce overall fuel consumption though improved planning and logistics, such as:
    - Reduced number of deliveries
    - Reduced idle times
    - On-site soil reuse to decrease truck traffic
    - Schedule acceleration without additional resource consumption
    - On-site plants in lieu of trucking materials to the site (e.g., concrete, asphalt plants)
    - Prefabrication of design elements

AE-6: GREENHOUSE GAS EMISSIONS

Responsible Discipline	Purpose	Phase
Architectural	Reduce the greenhouse gas emissions related to project energy use and optimize the embodied carbon of products and materials.	**D**

BENEFITS

- Reducing greenhouse gas emissions and optimizing embodied carbon minimizes the project contribution to climate change.
- By designing projects to use less material, use material efficiently, or specifying materials with lower embodied carbon project teams can reduce the overall environmental impact of the project.

PERFORMANCE TARGET(S)

- Establish baseline greenhouse gas emissions for the project's energy use.
- Establish baseline net embodied carbon for the project.

DOCUMENTATION

- Estimate the lifecycle greenhouse gas emissions from the project's energy use in tons of Carbon Dioxide equivalents (CO_2e). For the purposes of assessment, the service life of the building must be at least 60 years to fully account for maintenance and replacement. A building energy model can be used as the basis of this estimate.
- Conduct a life-cycle assessment (LCA) of the project's structure and enclosure global warming potential (greenhouse gases), in CO_2e. For the purposes of assessment, the service life of the building must be at least 60 years to fully account for maintenance and replacement.
    - The LCA must cover the complete building envelope and structural elements, including parking structures, as well as the material components of footings and foundations, structural wall assembly (from cladding to interior finishes), structural floors and ceilings (not including finishes), and roof assemblies.
    - Exclude electrical and mechanical equipment and controls, plumbing fixtures, fire detection and alarm system fixtures, elevators, and conveying systems. Exclude excavation and other site development (e.g., parking lots). Exclude additional building elements, such as interior nonstructural walls or finishes.
    - Use the ATHENA® Impact Estimator, http://www.athenasmi.org/our-software-data/impact-estimator/ for the LCA. This tool can import a bill of materials from a CAD system.

SUSTAINABLE DESIGN STRATEGIES

- While this criterion establishes baseline performance for the project's energy use, design teams may use the analysis to:
    - Optimize the energy efficiency of systems
    - Evaluate the environmental benefits of on-site renewable energy
- Consider the value of project carbon offsets
- While this criterion establishes baseline performance for embodied carbon, design teams may use the LCA model to:
    - Evaluate the environmental consequences of different materials, e.g., concrete versus steel.
    - Compare the environmental consequences of building footprint and shape
    - Evaluate different structural system types, such as load-bearing walls versus columns
    - Define the selection of building products and assemblies
    - Optimize structural system design (e.g., column spacing, slab depth)

EWM-1: IMPROVED ENERGY PERFORMANCE

Responsible Discipline	Purpose	Phase
Mechanical	Design energy efficient facilities that optimize energy use via industry best practices and systems to reduce environmental impacts.	**D**

BENEFITS

- Reduce costs associated with energy consumption.
- Reduce the greenhouse gas emissions of SAAS facilities.

PERFORMANCE TARGET(S)

- Design the project to achieve at least 30% energy consumption reduction from the ASHRAE 90.1 baseline.
- If a 30% reduction is not life cycle cost effective, modify the design to achieve the highest level of energy efficiency that is life cycle cost effective, which shall be no less than 5% energy consumption reduction from the ASHRAE 90.1 baseline.

DOCUMENTATION

- Determine energy consumption levels for both the ASHRAE Baseline Building and proposed building alternatives by using the Performance Rating Method found in Appendix G of ASHRAE 90.1.
- Include all energy consumption and costs within and associated with the building project.
- Submit energy modeling inputs and outputs as part of design deliverables.

SUSTAINABLE DESIGN STRATEGIES

- Utilize ENERGY STAR® Target Finder, if applicable, to establish an energy performance goal.
- Achieve ENERGY STAR® certification for the project if applicable. Target certification within the 80th percentile.
- Design buildings and site systems to comply with ASHRAE/IESNA 90.1-2013, Energy Standard for Buildings Except Low-Rise Residential Buildings. Utilize concepts in the ASHRAE Advanced Energy Design Guide where feasible to improve building performance.
- **Overall Building Envelope:**
    - Prioritize energy conservation measures over renewable energy strategies (until such point that payback favors renewables) to achieve long-term energy use reduction in the most cost-effective manner.
    - Design the building envelope and systems to maximize energy performance.
    - Design buildings and site systems to comply with the latest version of ASHRAE/IESNA 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings. Utilize concepts in the ASHRAE Advanced Energy Design Guide where feasible to improve building performance.
    - Incorporate comprehensive energy specifications and design guidance into specifications and Requests for Proposals (RFPs).
    - Use a computer simulation model to assess design energy performance and identify cost effective energy use optimization strategies.
    - Provide opportunities for natural ventilation with building/structure orientation and operable windows in facilities that are not noise sensitive, such as cargo buildings.
    - Incorporate renewable energy technologies (solar, wind) in design to offset all or a portion of the remaining energy usage after energy conservation measures have been implemented.
    - Design a building automation system (BAS).
    - Minimize air infiltration through all exterior openings including loading docks.
- **Energy Conservation/Performance:**
    - Design for energy peak shaving units to offset higher demand periods and costs.
    - Design fuel cell, cogeneration, trigeneration, or geothermal systems to meet facility energy needs.

- Incorporate an on-airport power generation system in the project design.
- Incorporate an anaerobic digester in the project design.
- Design project facilities to meet the requirements of ASHRAE/IESNA 189.1, Standard for the Design of High-Performance, Green Buildings or the International Green Construction Code to further improve project energy performance.
- Design facilities to comply with the Advanced Buildings Core Performance Guide, where applicable.
- Integrate high-performance chillers with thermal ice storage to reduce electrical demand use and costs during the cooling season.
- Perform payback analyses during the design phase which demonstrate that energy conservation measures have reasonable payback periods associated with them and allow for increased project capital costs with the knowledge that both energy and operating costs will be saved long term.

❖ **HVAC/Mechanical Systems**:

- Specify energy efficiency requirements for equipment in contract agreements.
- Specify premium efficiency motors for all air and water moving machines.
- Exceed ASHRAE 90.1 efficiency requirements for major HVAC equipment including refrigeration equipment.
- Design HVAC systems to provide ventilation air directly to spaces, reducing the overall quantity of ventilation air required for a given system.
- Include advanced HVAC equipment and control strategies on both air- and water-cooled systems to reduce energy consumption. Strategies include economizers, energy recovery systems, room temperature setpoint setbacks, Variable Refrigerant Systems, and water and air supply temperature reset schedules.
- In large projects with central cooling plants, provide for optimization routines that examine the energy usage of all associated components in real time and adjust accordingly.
- Specify integrated occupancy sensors with HVAC operation.
- Specify an indirect evaporative and/or evaporative condensing direct expansion (DX) HVAC system instead of chilled water plant system.
- Specify direct-drive equipment instead of belt- or gear-driven HVAC equipment.
- Provide building automation systems (BAS) for all projects to facilitate the monitoring of energy related processes.

❖ **Lighting/Electrical:**

- Incorporate energy efficient lighting systems, including LED and fluorescent lighting. Require individual control devices including occupancy sensors or timers to reduce lighting energy consumption.
- Specify lighting controls that dim or shut off lights in areas where daylighting is prevalent to maximize the use of daylighting. In single story buildings or at the roof level, incorporate skylights and/or light tubes to increase natural light and reduce artificial light.
- Incorporate large electrical cables (larger than required by the National Electric Code) into design to decrease the cable resistance and reduce energy loss during transmission.
- Specify solar-powered signage or equipment, where feasible.
- Specify occupancy sensors where practical to turn off lighting during unoccupied periods. Provide lighting control system that links lighting to flight schedules and occupancy. Provide occupancy sensors, either infrared (heat detection), ultrasonic (movement detection), or a combination of both, to control lighting in areas that are intermittently occupied (e.g., rest rooms, storage areas, stairwells).
- Specify energy efficient temporary lighting during construction.
- Provide task lighting in office areas and design overhead lighting to reduced levels.
- Specify use of Variable Frequency Drive (VFD) motors to control the rotational speed of an alternating current (AC) electric motor

EWM-2: MINIMIZE SOLAR HEAT GAIN

Responsible Discipline	Purpose	Phase
Architectural	Reduce heat islands (thermal gradient differences between developed and undeveloped areas) to minimize impact on microclimate and human and wildlife habitat	**D**

BENEFITS

Reduce energy use required to condition interior spaces.

PERFORMANCE TARGET(S)

Meet the following criterion, referring to the High Reflectance Roof and Nonroof Measures detailed in *Sustainable Design Strategies* below:

(Area of Nonroof Measures / 0.5) + (Area of High Reflectance Roof / 0.75) + Area of Vegetated Roof / 0.75) ≥ Total Site Paving Area + Total Roof Area

DOCUMENTATION

Document incorporation of High Reflectance Roof and Non-Roof Sustainable Design Strategies to achieve the performance target.

SUSTAINABLE DESIGN STRATEGIES

- **High Reflectance Roof**
  - Provide shade with architectural devices or structures. If the device or structure is a roof, it shall have an aged SR value of at least 0.28 as measured in accordance with ANSI/CRRC S100.
  - Evaluate and utilize an ENERGY STAR compliant roofing system, such as aluminum coating and light-colored coatings. Thermoplastic and white PVC roofing systems meet these standards.
- **Non-Roof Measures:**
  - Maximize light colored/high albedo pavement, such as portland cement concrete, for roadways, parking lots, sidewalks and plaza areas. Reflectance must be a minimum of 0.3. ['White' portland cement – 0.7 to 0.8, typical portland cement – 0.35 to 0.5, typical asphalt pavement – 0.05 (new) to 0.15 (over 5 years)].
  - Use the existing plant material or install plants that provide shade over paving areas on the site within 10 years of planting. Install vegetated planters. Plants must be in place at the time of occupancy permit and cannot include artificial turf.
  - Provide shade with structures covered by energy generation systems, such as solar thermal collectors, photovoltaics, and wind turbines.
  - Provide shade with architectural devices or structures. If the device or structure is not a roof, or if aged solar reflectance information is not available, it shall have at installation an initial SR of at least 0.33, as measured in accordance with ANSI/CRRC S100.
  - Provide open grid pavement for surface lots and site pavement (at least 50% unbound).

EWM-3: DAYLIGHTING

Responsible Discipline	Purpose	Phase
Electrical	Reduce energy use through the introduction of daylight into regularly occupied areas.	**D**

BENEFITS

- ❖ Utilize natural light over artificial light sources to increase occupant comfort and reinforce circadian rhythms.
- ❖ Reduce costs associated with energy consumption.
- ❖ Reduce the greenhouse gas emissions of SAAS facilities.

PERFORMANCE TARGET(S)

- ❖ Provide automatic (with manual override) glare-control devices for all regularly occupied spaces.
- ❖ Provide 25 foot-candles of daylight in 75% of spaces.
- ❖ If 25 foot-candles of daylight in 75% of spaces is not life cycle cost effective, or incompatible with airport operations requirements, achieve the highest level of daylighting that is feasible.

DOCUMENTATION

- ❖ Demonstrate that the design achieves the performance target through one of the following methods:
  - o Use a calculation. Achieve a minimum glazing factor of 2% in a minimum of 75% of all regularly occupied areas.

Glazing Factor = Window Area (SF) / Floor Area (SF) × Window Geometry Factor × Actual Visual Transmittance / Minimum Visual Transmittance × Window Height Factor

- ❖ Use computer simulation. Demonstrate 25 horizontal foot-candles under clear sky conditions, at noon, on the equinox, at 30 inches above the floor.
- ❖ Use records of indoor light measurements. Measurements must be taken on a 10-foot grid for all occupied spaces and must be recorded on building floor plans. Measurements must be taken under clear sky conditions, at 30" above the floor, on or about solar noon on the equinox.

EXEMPTIONS

This criterion is not applicable to unoccupied buildings.

SUSTAINABLE DESIGN STRATEGIES

- ❖ Optimize architectural features for daylighting and glare control. Consider light shelves, ceiling design, window placement, and window treatments.
- ❖ Design the building to maximize interior daylighting. Strategies to consider include building orientation, shallow floor plates, increased building perimeter, and exterior and interior permanent shading devices.
- ❖ In single story buildings or at the roof level, incorporate skylights and/or light tubes to
- ❖ increase natural light and reduce artificial light.
- ❖ Specify daylight dimming controls to reduce daytime lighting requirements.
- ❖ Integrate daylight harvesting strategy with the Building Automation System (BAS) and lighting control system.
- ❖ Specify spectrally selective glazing to maximize daylight while minimizing heat gain.
- ❖ Specify glazing films and/or coatings to minimize solar heat gain and air conditioning loss, maximize visible light transmittance and penetration, reduce glare, increase privacy, protect installed materials from the sun's ultraviolet rays, and prevent injury and damage from broken glass.

EWM-4: ALTERNATIVE AND RENEWABLE ENERGY

Responsible Discipline	Purpose	Phase
Electrical	Increase the supply of on-site alternative and renewable energy technologies to reduce energy costs, dependency on fossil fuels, and the environmental impacts associated with fossil fuel energy use	**D**

BENEFITS

- Design and construct more environmentally responsible and energy efficient facilities using industry best practices and systems.
- Pursue strategies to reduce petroleum fuel use.
- Promote the use of renewable energy sources over traditional energy sources.
- Reduce the life cycle cost of power supply.
- Increase power system resilience.

PERFORMANCE TARGET(S)

- Provide on-site alternative or renewable energy for all projects.
- Meet at least 30% of the annual domestic hot water requirement through the installation of solar domestic hot water heating (SDHW) where LCCE and considering compatibility with airport operations.

DOCUMENTATION

- Design the project to meet the International Green Construction Code (IgCC) 701.4.1.1 (7.4.1.1) where life cycle cost effective (LCCE) and considering compatibility with airport operations.
- Centralized alternative or renewable energy development may be utilized in lieu of a project specific application if the project can demonstrate that the centralized system provides an annual energy production equivalent to that required by the performance target(s), the development is owned by SAAS, or SAAS has at least a 10-year contract with the energy provider and SAAS retains all environmental benefits from the alternative or renewable energy.
- FAA requires early planning coordination for structures and assessment of glare from solar panels. For structure assessment, complete FAA Form 7460. Glare assessments are covered under FAA interim policy, FAA Review of Solar Energy System Projects on Federally Obligated Airports. This interim policy requires use of the Solar Glare Hazard Analysis Tool (SGHAT). As applicable, provide both FAA Form 7460 and SGHAT report.

EXEMPTIONS

- The alternative or renewable energy Performance Target may be exempt if not life cycle cost effective or incompatible with airport operations with supporting documentation.
- The SDHW Performance Target may be exempt if not life cycle cost effective or incompatible with airport operations with supporting documentation.

SUSTAINABLE DESIGN STRATEGIES

- Assess projects for renewable energy feasibility and life cycle cost to determine the optimal size, type, location, and the cost of installing and operating a renewable energy system.
    - Incorporate solar photovoltaic (PV) panels and/or solar-thermal powered water heaters into design (buildings and/or ground level).
    - Incorporate solar PV panels into facility design. Consider roof structural system/support, hurricane tolerance, wildlife attractant potential, and FAA guidance for solar installations at airports.
    - Solar thermal storage systems (e.g., solar Trombe walls) in facility design to provide passive solar heating.

  - Solar trash compactors along curb fronts and in remote areas.
  - Solar-powered roadway signage and parking lot lighting.
  - Solar-powered obstruction and barricade lighting.
  - Solar-powered water heating.
  - Geothermal heating and cooling systems.
  - Wind turbine power generation as a component of facility design.
  - Sewer heat recovery systems.
  - The use of fuel cells, biofuels, cogeneration, and geothermal energy technologies to reduce on-site fossil fuel consumption.
- In instances where renewable energy systems are not feasible, determine the energy needs of the building and investigate opportunities to engage in a contract for Renewable Energy Credits (RECs) and or Carbon Offsets.
  - RECs must be Green-e Energy certified or the equivalent. Direct or local green power may be available through CPS Energy; contact CPS to understand their offerings.
  - Green power and RECs can be used only toward the electric energy use portion of the project's annual energy use. They cannot be applied toward nonelectric energy uses.
  - Carbon offsets must be Green-e climate certified or the equivalent. Unlike RECs and purchased green power, carbon offsets can be used toward both electric and nonelectric energy use.
- Explore opportunities to enter a public-private partnership to construct and operate a renewable energy system.
- Investigate energy tax credits, rebates, and grants by local utilities or federal, state, or local agencies.

EWM-5: ELECTRIC VEHICLE CHARGING INFRASTRUCTURE

Responsible Discipline	Purpose	Phase
Electrical	Reduce pollution by promoting alternatives to conventionally fueled automobiles.	D

BENEFITS

- Reduce greenhouse gas emissions and air pollutant emissions.
- Pursue strategies to reduce petroleum fuel use.
- Reduce the cost of future electric vehicle charging infrastructure.

PERFORMANCE TARGET(S)

- Install electrical vehicle supply equipment (EVSE) in 2% of all parking spaces created by the project, OR
- Make 6% of parking spaces or at least 6 spaces, whichever is greater, EV Ready.
    - EV Ready means installation of listed raceway capable of accommodating a 208/240-volt dedicated branch circuit. The raceway shall not be less than trade size 1 (nominal 1-inch inside diameter). The raceway shall originate at the main service or subpanel and shall terminate into a listed cabinet, box or enclosure near the proposed location of the EV space. The service panel and/or subpanel shall provide capacity to install a 40-ampere minimum dedicated branch circuit and space(s) reserved to permit installation of a branch circuit overcurrent protective device.

DOCUMENTATION

- Clearly identify and reserve spaces for the sole use by plug-in electric vehicles. EVSE parking spaces must be provided in addition to preferred parking spaces for green vehicles.
- Provide a Level 2 charging capacity (208 – 240 volts) or greater.
- Comply with the relevant regional or local standard for electrical connectors, such as SAE Surface Vehicle Recommended Practice J1772 and SAE Electric Vehicle Conductive Charge Coupler.

EXEMPTIONS

This criterion is not applicable to projects without parking within the associated grounds.

SUSTAINABLE DESIGN STRATEGIES

- Consider selecting EVSE that is networked or internet addressable and be capable of participating in a demand-response program or time-of-use pricing to encourage off-peak charging.
- Consider legal, technical, and safety issues associated with EVSE.
- Learn about the safety and maintenance issues associated with alternative fuels. Building personnel need to be trained to operate and maintain the fueling stations.
- Review local codes and standards for fueling facilities to determine whether other requirements must be met.

EWM-6: METERING AND VERIFICATION

Responsible Discipline	Purpose	Phase
Mechanical Electrical	Ensure accountability for and optimization of energy and water consumption.	**D**

BENEFITS

- ❖ Ensure that building systems operate as intended in terms of energy and water use performance.
- ❖ Reduce costs associated with energy and water consumption.
- ❖ Assist maintenance personnel in the diagnosis and correction of energy and water system inefficiencies.
- ❖ Promote the involvement of facilities personnel in the overall goal of reducing water consumption.

PERFORMANCE TARGET(S)

- ❖ Install a permanent energy meter or meters that measure total energy use for the building and associated grounds.
  - o Install permanent energy meters for major systems, including but not limited to: HVAC equipment, lighting systems, data centers, and other building-related process energy systems and equipment (including cooking), as applicable.
- ❖ Install a permanent water meter or meters that measure the total potable water use for the building and associated grounds.
  - o Meter public water supply, on-site well supply and/or on-site potable water treatment systems.
- ❖ Meter data must be able to be compiled into monthly and annual summaries

DOCUMENTATION

- ❖ Document all end uses of energy in the project building and on the grounds, including consumption from plug loads, lighting systems and controls, constant and variable motor loads, HVAC equipment, building-related process energy systems and equipment (including cooking), and domestic hot water equipment.
- ❖ Document all end uses of potable water in the project building and on the grounds, including consumption from plumbing fixtures, cooling towers, evaporative condensers, laundering, dishwashing, indoor and outdoor water features, irrigation, et cetera.
- ❖ Where meters are provided by a utility, identify the location where the meter will be located and document how the meter can be accessed and how it will be read.

SUSTAINABLE DESIGN STRATEGIES

- ❖ Develop Energy Measurement & Verification (M&V) Plan incorporating all energy and water end uses.
- ❖ Include data collection requirements in M&V Plan to facilitate the collection and trending analysis of operational data to evaluate systems/equipment that are not operating at peak efficiency.
- ❖ Specify a meter with automatic data logging or install an automatic data logging submeter on utility-supplied meters with communications capabilities to facilitate collection and trending analysis.
- ❖ Install permanent water meters for major water subsystems, as applicable to the project, including, but not limited to plumbing fixtures, domestic hot water, boilers, irrigation, reclaimed water, and process water, such as cooling towers, evaporative condensers, laundering, dishwashing.

EWM-7: SYSTEMS COMMISSIONING

Responsible Discipline	Purpose	Phase
Commissioning Authority (CxA)	Verify that fundamental building elements and systems are designed, installed, and calibrated to operate as intended and according to owner requirements.	D , C

BENEFITS

- Design and construct more environmentally responsible and energy efficient facilities using industry best practices and systems.
- Ensure that building systems operate as intended from the date of completion.
- Reduce costs associated with energy consumption and maintenance.
- Improve equipment life by ensuring systems operate as designed.

PERFORMANCE TARGET(S)

Complete the commissioning process activities specified in Documentation below for mechanical, electrical, plumbing, building envelope and renewable energy systems and assemblies, as applicable in accordance with ASHRAE Guidance 0-2005 and ASHRAE Guideline 1.1-2007 for HVAC&R systems, as they relate to energy, water, indoor environmental quality and durability.

DOCUMENTATION

- The CxA must complete the following as part of a documented project commissioning plan:
  - Review OPR, BOD, and project design.
  - Complete a commissioning plan for all major mechanical, electrical, and plumbing systems, as well as building envelope, lighting, and other project-specific minor systems.
  - Confirm incorporation of commissioning requirements into construction documents.
  - Develop construction checklists.
  - Develop system test procedures.
  - Verify system test execution.
  - Maintain an issues and benefits log throughout the commissioning process.
  - Prepare a final commissioning report.
  - Document all findings and recommendations and report directly to the owner throughout the process.
  - Review contractor submittals.
  - Verify inclusion of systems manual requirements in construction documents.
  - Verify inclusion of operator and occupant training requirements in construction documents.
  - Verify systems manual updates and delivery.
  - Verify operator and occupant training delivery and effectiveness.
  - Verify seasonal testing.
  - Review building operations 10 months after substantial completion.
  - Develop an ongoing commissioning plan.

SUSTAINABLE DESIGN STRATEGIES

- Develop process for future documentation of conformance with commissioning plan as part of project close-out, including submittal of a commissioning report.
- Specify successful commissioning prior to facility occupancy.
- Specify manufacturer documentation/guarantee of installations, projected results, and in-situ performance criteria to compare to standard performance results as part of systems Commissioning.
- Develop project-specific operations and maintenance (O&M) checklists.
- Specify provision of project-specific building systems training to the Facilities Maintenance Department.

- Specify delivery of a single manual that contains the information required for future re-commissioning systems to the Facilities Maintenance Department.
- Specify delivery of a comprehensive operation manual for all commissioned systems to the Facilities Maintenance Department to allow optimal facility operation and adjustment.

EWM-8: WATER USE REDUCTION

Responsible Discipline	Purpose	Phase
Mechanical	Maximize water efficiency of buildings and their exteriors.	D , C

BENEFITS

- Conserve water for ecosystem functions
- Reduce costs associated with energy consumption.

PERFORMANCE TARGET(S)

- **For Indoor Water:**
  - Reduce potable water use by at least 30% or more compared to a baseline case.
  - If a 30% reduction is not life cycle cost effective, modify the design to achieve the highest level of water efficiency that is life cycle cost effective, which shall be no less than 20% water use reduction compared to a baseline case.
  - All newly installed toilets, urinals, private lavatory faucets, and showerheads that are eligible for labeling must be WaterSense labeled.
- **For Outdoor Water:**
  - Design landscaping with native and drought tolerant species that require no potable or groundwater usage.
  - If an irrigation system is required by airport operations, reduce potable water consumption by 50% from a calculated mid-summer base case. Reductions can be attributed to drought-tolerant plant species, irrigation efficiency, use of captured rainwater, or recycled wastewater.

DOCUMENTATION

- **Indoor Water**:
  - Provide drawings/specifications showing use of high efficiency flush and flow fixtures and other water-saving technologies
  - Provide calculations showing projected water use compared to baseline. Base calculations on the volumes and flow rates in the table below.

Fixture or fitting	Baseline (IP units)
Toilet	1.6 gpf
Urinal	1.0 gpf
Public restroom faucet	0.5 gpm at 60 psi
Private restroom faucet	2.2 gpm at 60 psi
Kitchen faucet	2.2 gpm at 60 psi
Showerhead	2.5 gpm at 80 psi

- Document installation of appliances, equipment, and processes within the project scope that meet the requirements listed in the tables below.

Appliance / Process	Requirement
Residential Clothes washers	ENERGY STAR performance or equivalent
Commercial clothes washers	CEE Tier 3A
Residential dishwashers	ENERGY STAR performance or equivalent
Prerinse spray valves	≤ 1.3 gpm
Ice machines	ENERGY STAR or performance equivalent and use either air-cooled or closed-loop cooling, such as chilled or condenser water system
Heat rejection and cooling	No once-through cooling with potable water for any equipment or appliances that reject heat
Cooling towers and evaporative condensers	Equip with makeup water meters, conductivity controllers and overflow alarms, and efficient drift eliminators that reduce drift to maximum of 0.002% of recirculated water volume for counterflow towers and 0.005% of recirculated water flow for crossflow towers

- **Outdoor Water**
  - Provide landscape plan showing use of drought tolerant species.
  - If irrigation is required, complete the Environmental Protection Agency (EPA) WaterSense Water Budget Tool to demonstrate a 50% reduction in potable water use.

SUSTAINABLE DESIGN STRATEGIES

- Specify high-efficiency fixtures and valves.
- Specify motion sensors and water-conserving aerators on faucets.
- Specify waterless or water-efficient urinals, dual-flush toilets, and/or pressure-assisted toilets.
- Design a non-potable water system (e.g., graywater) for toilet/urinal flushing in new construction, recognizing storage limitations.
- Design a non-potable water (e.g., reclaimed, rainwater) for cooling tower makeup; and/or capture condensate for use in cooling tower; and/or use pulsed-power electromagnetic water treatment, ultraviolet treatment, or ozone treatment for the cooling tower water.
- Evaluate the use of non-potable water (e.g., reclaimed, graywater, or rainwater harvesting) to meet construction water needs.
- Specify non-potable water for all vehicle and equipment washing.
- Specify drought-tolerant, vegetation in landscape design. If plants require irrigation during initial establishment period, temporary irrigation systems should be removed once plants are established.
- If reclaimed water is used for irrigation, consider sourcing from building systems, such as greywater.
- For projects in locations of low visibility, require the establishment and maintenance of landscaping without the use of supplemental irrigation.
- Design buildings to collect and reuse stormwater for landscape irrigation through the integration of green infrastructure (GI) solutions such as: rainwater harvesting, cisterns, rain gardens, etc.
- If irrigation systems are used, incorporate soil moisture monitoring and/or weather monitoring and smart controls.

EWM-9: STORMWATER MANAGEMENT

Responsible Discipline	Purpose	Phase
Civil	Minimize the impact on stormwater runoff quantity, rate, and quality while controlling soil erosion and waterway sedimentation.	D , C

BENEFITS

- ❖ Reduce stormwater flow.
- ❖ Reduce waterway sedimentation and impact to stormwater infrastructure.
- ❖ Improve stormwater runoff quality.

PERFORMANCE TARGET(S)

- ❖ Develop an Erosion and Sediment Control Plan/SWP3 in accordance with the CGP and/or local erosion and sedimentation control standards, whichever is more stringent. The Erosion and Sediment Control Plan/SWP3 should include a plan for dust and particulate matter, strategies for reduction of the construction footprint, soil erosion waterway sedimentation, and requirements.
- ❖ In a manner best replicating natural site hydrology processes, manage on-site runoff from the developed site for the 95th percentile of regional or local rainfall events utilizing low-impact development (LID) and/or green infrastructure.

DOCUMENTATION

- ❖ Use daily rainfall data and the methodology in the U.S. Environmental Protection Agency (EPA) Technical Guidance on Implementing the Stormwater Runoff Requirements for Federal Projects under Section 438 of the Energy Independence and Security Act to determine the 95th percentile amount.
- ❖ Submit a Construction General Permit (CGP) Notice of Intent (NOI) and Stormwater Pollution Prevention Plan (SWP3) to the Texas Commission on Environmental Quality (TCEQ) in accordance with TXR150000.
- ❖ Submit copies of both the CGP and the SWP3 to the SAAS Environmental Stewardship Department (ESD).
  - o Include BMPs outlined in the SAT SWP3 into the project specific CGP.

SUSTAINABLE DESIGN STRATEGIES

- ❖ Implement strategies to replicate the natural hydrology and water balance of the site, based on historical conditions.
- ❖ Design landscaping, rain gardens, and bio-retention areas to reduce runoff.
- ❖ Evaluate the potential use of curb breaks, drainage ditches, and/or bioswales to encourage ground infiltration of stormwater runoff.
- ❖ Incorporate non-wildlife attracting vegetated green roof systems to intercept and treat rainwater.
- ❖ Design buildings and facilities to collect and reuse stormwater (e.g., building-integrated rainwater harvesting, rainwater cisterns, collection of water used during airport rescue and firefighting training exercises) and reuse stormwater for non-potable uses (e.g., toilet and urinal flushing, machine/vehicle washing, custodial uses, and landscape irrigation in areas not served by reclaimed water) to the extent allowed by the Safe Drinking Water Act of 1974.
- ❖ Design for harvesting of stormwater for irrigation and use in buildings.
- ❖ Incorporate bio-filtration into stormwater detention for stormwater quality treatment.
- ❖ Design onsite detention basins, ditches, ditch checks and other BMPs to accommodate first flush treatment.
- ❖ Specify the use of pervious and/or porous pavement and permeable pavers (e.g., pedestrian areas, roadways, shoulders, non-traffic pavements, maintenance roads, utility yards, and surface parking).
- ❖ Develop an inventory of topsoil for potential re-use.
- ❖ Prepare a construction dust control plan covering construction activities, site, and material transport (minimize fugitive dust through tarping, spraying, roadway sweeping, or other measures). Consider environmental factors such as seasonal weather patterns (dry vs. wet season) in developing plan.
- ❖ Employ temporary and permanent soil stabilization techniques, such as hydroseeding, biodegradable rolled mats, lime, soil binders, and mulching.

- Specify the use of non-potable water (e.g., stormwater, reclaimed, or graywater) to provide dust control.
- Incorporate temporary or permanent structural practices that may include earth dikes, drainage swales, temporary stream crossings, pipe slope drains, silt fences, storm drain inlet protection, sediment traps, sediment basins, outlet protection, energy dissipation assemblies, and check dams.
- Specify that vegetation, were possible, is composted for re-use.
- Minimize the size and duration of disturbed construction areas at any one time.
- Control/minimize wind driven movement of sediments and dust using barriers such as fences, hay bales, and crate walls.
- Specify rock or other stabilizing materials on designated haul routes and restrict vehicle and equipment movements to the use of the designated routes.

MM-1: SOURCING OF RAW MATERIALS AND FURNITURE

Responsible Discipline	Purpose	Phase
Architectural	Encourage the use of products and materials that have been extracted or sourced in an environmentally, economically, and socially responsible manner.	**D , C**

BENEFITS

- Reduced environmental footprint of projects.
- Reduced material life cycle impacts.
- Reduced raw material usage.

PERFORMANCE TARGET(S)

- Use products that meet at least one of the responsible extraction criteria below for at least 25%, by cost, of the total value of permanently installed building products on the project.
  - **Extended producer responsibility:** Products purchased from a manufacturer that participates in an extended producer responsibility program or is directly responsible for extended producer responsibility.
  - **Bio-based materials:** Products meet the Sustainable Agriculture Network's Sustainable Agriculture Standard. Bio-based raw materials must be tested using ASTM Test Method D6866 and be legally harvested, as defined by the exporting and receiving country. Exclude hide products (e.g., leather and other animal skins material).
  - **Wood products:** Products must be certified by the Forest Stewardship Council.
  - **Materials reuse:** Reuse includes salvaged, refurbished, or reused products.
  - **Recycled content:** Recycled content is the sum of postconsumer recycled content plus one-half the preconsumer content, based on cost.
  - **Local / Regional Materials:** Products that are sourced within 500 miles of the project site.
- **For furniture:**
  - 40% of the total purchases of furniture by cost meet one of the following criteria:
  - At least 10% post-consumer or 20% pre-consumer material
  - At least 70% material salvaged from off-site sources or outside the airport boundary
  - At least 70% material salvaged from on-site sources, such as an equipment reuse program or internal reorganization
  - At least 50% rapidly renewable material
  - At least 50% FSC-certified wood
  - At least 50% material harvested and processed or extracted and processed within 500 miles of the project

DOCUMENTATION

- Submit calculations of products used that meet the criteria in the performance target.
- Submit documentation of product claims that meet criteria in the performance target.

SUSTAINABLE DESIGN STRATEGIES

- Purchase products that are certified by the Forest Stewardship Council (FSC) or Sustainable Forestry Initiative (SFI). Building components include, at a minimum, framing, flooring, sub-flooring, wood doors, and finishes.
- Identify material suppliers early in the project to demonstrate ability to achieve the project goal, or document barriers to the achievement of the goal.
- Specify the use of rapidly renewable (a mature growing cycle of seven years of less) building materials and products made from plants that are typically harvested within a ten-year or shorter cycle, including cork, bamboo, natural rubber, wheat, cotton, straw, or linseed.

- Document consideration of rapidly renewable materials such as straw board or "agriboard," bamboo, cork, wool carpets and fabrics, cotton-batt insulation, linoleum flooring, sunflower seed board, wheat grass or straw board cabinetry.
- Identify material suppliers early in the project to demonstrate ability to achieve the project goal, or document barriers to the achievement of the goal.
- Specify the use of recycled content building materials and products (e.g., aggregate in cast in place concrete, fly-ash in cast in place concrete, aggregate in pre-cast concrete including site work and infrastructure piping, fly-ash in pre-cast concrete including site work and infrastructure piping, bituminous concrete pavement, unit pavers, steel reinforcement, structural steel, miscellaneous steel, steel fencing and furnishings, unit masonry, ductile iron pipe, aluminum products, steel doors and frames, aluminum doors and windows, plaster, terrazzo, acoustical ceilings, drywall, finish flooring including carpet, tiles, resilient flooring and terrazzo, toilet compartments, and special finishes).
- Re-use, repair, and/or refurbish existing furniture.
- Specify furniture materials and products that are recycled, rapidly renewable, local/regional, low-emitting (i.e., contain no/low volatile organic compounds), contain wood materials that are certified (e.g., Forest Stewardship Council [FSC]) or low-emitting (e.g., no added urea-formaldehyde) and/or are salvaged.
- Specify furniture systems that are GreenGuard certified.
- Specify furniture that contains specific minimum (e.g., 10%) post-consumer recycled content or locally sourced materials.
- Specify furniture that contains specific minimum certified wood materials (e.g., 50% FSC-certified wood) or rapidly renewable materials (e.g., 25%).

MM-2: LOW-EMITTING MATERIALS

Responsible Discipline	Purpose	Phase
Architectural	Reduce the quantity of indoor air contaminants that are odorous, potentially irritating, and/or harmful to the health, comfort and wellbeing of contractors and occupants.	**D , C**

BENEFITS

- Promote sustainable procurement.
- Enhance health and safety.
- Reduce the amount of harmful chemicals released indoors during manufacturing, installation and use of the product.

PERFORMANCE TARGET(S)

Specify materials and products with low or no pollutant emissions, including composite wood products, adhesives, sealants, interior paints and finishes, carpet systems, and furnishings.

DOCUMENTATION

Submit documentation of product claims that meet criteria in IgCC 801.4.2 (8.4.2) Materials.

SUSTAINABLE DESIGN STRATEGIES

- Clearly specify requirements for product testing and/or certification in the construction documents. Select products that are either certified under the Green Label Plus program or for which testing has been done by qualified independent laboratories in accordance with the appropriate requirements.
- The Green Label Plus program for carpets and its associated VOC emission criteria in micrograms per square meter per hour, along with information on testing method and sample collection developed by the Carpet & Rug Institute (CRI) in coordination with California's Sustainable Building Task Force and the California Department of Health Services (DHS), are described in Section 9, Acceptable Emissions Testing for Carpet, DHS Standard Practice CA/DHS/EHLB/R-174, dated 07/15/04. This document is published as Section 01350 Section 9 [dated 2004] by the Collaborative for High Performance Schools [http://www.chps.net/dev/Drupal/node]).
- FloorScore® is a voluntary, independent certification program that tests and certifies hard surface flooring and associated products for compliance with criteria adopted in California for indoor air emissions of Volatile Organic Compounds (VOCs) with potential health effects. The program uses a small-scale chamber test protocol and incorporates VOC emissions criteria developed by the California Department of Health Services, which are widely known as Section 1350.
- Specify low-VOC adhesives and sealants that comply with the South Coast Air Quality Management District (SCAQMD) Rule #1168.
- Specify low-VOC field applied paints and coating coatings that comply with Green Seal Standards GS-11 and GC-3 and SCAQMD Rule #1113.
- Specify furniture systems and furnishings that are GreenGuard certified.
- Specify wood and agrifiber products with no added urea-formaldehyde resins.
- Specify products with no-VOC content wherever feasible.

MM-3: STORAGE AND COLLECTION OF RECYCLABLES

Responsible Discipline	Purpose	Phase
Architectural	Facilitate the reduction of waste generated by building occupants that is hauled to and disposed of in landfills.	**D**

BENEFITS

- Reduce, reuse and recycle solid waste disposed at SAAS.
- Support growth of an SAAS-wide recycling program.

PERFORMANCE TARGET(S)

Provide an easily accessible or dedicated area that serves the entire building for the collection and storage of materials for recycling, including at a minimum:

- Paper
- Corrugated cardboard
- Glass
- Plastics
- Metals

DOCUMENTATION

- Provide drawings detailing location of recycling collection and storage areas.
- Develop a material collection and recycling plan for the facility when operational that includes procedures for waste disposal, expected waste streams, and potential recycling facility locations.

EXEMPTIONS

This criterion is not applicable to unoccupied buildings.

SUSTAINABLE DESIGN STRATEGIES

- Designate areas for recycling in a convenient area.
- Identify local waste haulers and buyers of plastics, glass, office paper, e-waste, newspaper, cardboard, metals, fluids, fixtures, and organic wastes.
- Instruct occupants, employees, contractors and tenants on the recycling procedures.
- Consider employing cardboard balers, aluminum can crushers, recycling chutes, and other waste strategies to further enhance the recycling program.

MM-4: CONSTRUCTION WASTE MANAGEMENT

Responsible Discipline	Purpose	Phase
Construction Contractor	Divert construction and demolition (C&D) debris from disposal in landfills and incineration facilities.	C

BENEFITS

- Reduced material costs.
- Redirect recycled resources back to the manufacturing process.
- Reduced environmental footprint of projects.

PERFORMANCE TARGET(S)

- Develop a Construction Waste Management plan.
- Divert a minimum of 50% of all construction and demolition waste, including excavated soil and land-clearing debris.

DOCUMENTATION

- The Construction Waste Management Plan must include, at a minimum:
  - Expected material streams
  - Expected sorting location
- Submit monthly construction waste management tracking forms to the Environmental Stewardship Department provided by the Contractor during construction.

SUSTAINABLE DESIGN STRATEGIES

- Identify the waste from one project that is a potential resource for another project such as concrete, asphalt, land clearing debris, small ancillary buildings or structures, and building components.
- Reuse aggregate from on-airport sources.
- Specify on-site concrete crushing operations to maximize reuse opportunities without requiring transport off-airport. Use portable concrete/asphalt crushers or operate concrete crushing/recycling plants on-site to facilitate reuse of materials in other construction projects.
- Specify documentation of construction waste management performance relative to construction waste management plan monthly and with aggregate quantities to be provided at project close-out with consequences for non-compliance or inability to demonstrate compliance.
- Include in all contract documents the minimum quantities of excess materials that will be accepted for return by the vendor and the required conditions of such material.
- Establish a process to track recycling efforts throughout the construction process in a way that identifies progress toward set goals and identifies resources generated for upcoming tasks/projects.
- Specify documentation of subcontractor materials practices for refused or rejected material, including concrete loads. Specify requirements and processes for recycling of such materials.

HSS-1: THERMAL COMFORT

Responsible Discipline	Purpose	Phase
Mechanical	Provide a thermally comfortable environment that supports the productivity and well-being of building occupants.	**D**

BENEFITS

- ❖ Maximize the number of building occupants that find the environment suitable.
- ❖ Enhance passengers' experience
- ❖ Promote employee productivity via a comfortable indoor workspace.

PERFORMANCE TARGET(S)

- ❖ Design heating, ventilating, and air-conditioning (HVAC) systems and the building envelope to meet the requirements of ASHRAE Standard 55–2010, Thermal Comfort Conditions for Human Occupancy, with errata or a local equivalent.
- ❖ Provide individual temperature controls for 50% of building occupants in non-public spaces.
- ❖ Provide group thermal comfort controls for all shared multi-occupant spaces not accessible to the public. Thermal comfort controls allow occupants, whether in individual spaces or shared multi-occupant spaces, to adjust at least one of the following in their local environment: air temperature, radiant temperature, air speed, and humidity.

DOCUMENTATION

- ❖ Submit calculations associated with ASHRAE Standard 55-2010 with the design documents.
- ❖ Implement a thermal comfort survey of building occupants within a period of six to 18 months after occupancy. This survey should collect anonymous responses about thermal comfort in the building including an assessment of overall satisfaction with thermal performance and identification of thermal comfort-related problems.
- ❖ Agree to develop a plan for corrective action if the survey results indicate that more than 20% of occupants are dissatisfied with thermal comfort in the building. This plan should include measurement of relevant environmental variables in problem areas in accordance with ASHRAE Standard 55-2004.

EXEMPTIONS

- ❖ This criterion is not applicable to unoccupied buildings.
- ❖ Terminal circulation, restrooms, concession, hold room and other passenger-accessible spaces are not required to provide thermal comfort controls accessible to passengers.

SUSTAINABLE DESIGN STRATEGIES

- ❖ Provide air circulation or natural ventilation to increase air movement in cargo spaces and other large, open plan facilities.
- ❖ Provide dehumidification in HVAC systems serving office and terminal areas.
- ❖ Specify a temperature and humidity monitoring system that provides operators with control over thermal comfort performance and humidification and/or dehumidification systems.
- ❖ Provide controls for individuals in office spaces for airflow, temperature, and lighting of the occupied space, and for the occupants in non-perimeter, regularly occupied areas.
- ❖ Design buildings with operable windows in appropriate areas (consider security issues, noise-sensitivity of activities within building).
- ❖ Incorporate under floor air distribution systems with individual diffusers (controllable outlets) in office areas.
- ❖ Integrate micro switches of operable windows with HVAC operation.
- ❖ Specify direct digital control systems for greater accuracy, flexibility, and operator interface compared to pneumatic systems.

HSS-2: NOISE AND ACOUSTICAL QUALITY

Responsible Discipline	Purpose	Phase
Mechanical	Limit exposure to noise and vibration and promote occupant health, well-being, communications, and productivity through effective acoustic design.	D

BENEFITS

- Avoid human health impacts related prolonged or excessive exposure to background noise and vibration. These may include reduced cognitive performance, sleep disturbance, hearing impairment, depression, anxiety and high blood pressure.
- Avoid impacts of noise and vibration on natural ecosystems and species.

PERFORMANCE TARGET(S)

- HVAC Systems: Achieve maximum background noise levels from heating, ventilating, and air conditioning (HVAC) systems per 2011 ASHRAE Handbook, HVAC Applications, Chapter 48, Table 1; AHRI Standard 885-2008, Table 15; or a local equivalent.
- Sound Transmission: Meet the composite sound transmission class (STCC) ratings or noise isolation class (NIC) listed in the table below. For NIC measurements, use ASTM E336-17a or Annex A.3 of ANSI S12.60-2010.

Adjacency Combinations		STCc*	NIC*
Retail	Retail	50	45
Collaborative/multi-use	Hallway, Stairway	25	20
Private	Hallway, Stairway	35	30
Confidential	Hallway/Stairway	40	35
Collaborative/multi-use	Collaborative/multi-use	35	30
Collaborative/multi-use	Private	45	40
Collaborative/multi-use	Confidential	50	45
Private	Private	45	40
Private	Confidential	50	45
Confidential	Confidential	50	45
Conference Room	Conference Room	50	45
Mechanical Room	Hallway, Stairway	50	45
Mechanical Room	Occupied Area	60	55

*Minimum STCc or NIC must be met unless proven that the equipment noise in conjunction with the sound isolation performance of the partitions and doors will not exceed the maximum background noise requirements of the adjacent space.

**If a sound masking system is implemented at a minimum level of 40 dBA, the STCc ratings or NIC values in the table above. may be lowered by 5 points. This applies to all space types except mechanical equipment rooms. The sound masking system must be designed by an acoustical professional and meet the following criteria:

- The overall level for sound masking must be set by an acoustical professional and must not exceed 48 dBA in open offices, libraries, cafeterias, corridors/hallways, 45 dBA in enclosed offices, and 42 dBA in conference rooms, and wellness rooms. The combined level of masking and HVAC background noise must not exceed these limits.
- The system design and commissioning must provide overall level uniformity of +/-1 dBA and one-third octave band uniformity of +/-2 dB from at least 100 to 5,000 Hz when tested according to ASTM E1573-18
- The sound masking spectrum must conform to the National Research Council of Canada COPE Optimum Masking Spectrum or an alternate spectrum if specified by an acoustical engineer.
- Exterior sources: For high-noise sites (peak-hour Leq above 60 dBA), implement acoustic treatment and other measures to minimize noise intrusion from exterior sources

DOCUMENTATION

- Demonstrate compliance with design criteria for HVAC noise levels resulting from the sound transmission paths listed in 2015 ASHRAE Handbook—HVAC Applications, Chapter 48, Table 6; or a local equivalent.
- Document that interior occupied spaces meet composite sound transmission class (STCC) ratings or noise isolation class (NIC) as above. Provide an inventory of qualifying spaces and their adjacency combinations, the required STCC/NIC rating for each, and the measured STCC/NIC rating.
- Document that the project includes adequate noise mitigation measures sufficient to ensure the project will not result in a noticeable increase to ambient exterior noise levels or provide measurements showing post-construction outdoor ambient noise level is within 5% or pre-construction level.

EXEMPTIONS

This criterion is not applicable to unoccupied buildings.

SUSTAINABLE DESIGN STRATEGIES

- Use mechanical or other means to reduce HVAC noise per ASHRAE, ANSI, and/or IEC standards
- Specify acoustical ceilings and floor coverings with appropriate noise reduction coefficients for noise sensitive spaces
- Specify cubicle partitions of an appropriate height to provide a sound attenuation to occupants
- Insulate wall cavities for noise sensitive spaces
- Establish a baseline ambient noise level for the project site and develop an acceptable target noise level for the completed facility to guide design decisions
- Use siting strategies and/or structural controls to minimize noise and vibrations from surrounding areas
- Consider project impact on exterior noise levels related to activities such as vehicular or freight traffic

HSS-3: LIGHT POLLUTION REDUCTION

Responsible Discipline	Purpose	Phase
Electrical	Minimize nocturnal light pollution by reducing glare, light trespass and skyglow to avoid unwanted impacts to ecosystems and human health, preserve dark skies, and conserve energy	**D**

BENEFITS

- Reduce harm to species and the natural environment
- Promote human health and opportunities to enjoy a natural environment
- Reduce costs associated with energy consumption.
- Reduce the greenhouse gas emissions of SAAS facilities.

PERFORMANCE TARGET(S)

Demonstrate compliance with the Model Lighting Ordinance (MLO) IES TM-15-111 “BUG” (Backlight, Uplight, and Glare) requirements for all exterior light fixtures.

DOCUMENTATION

- Demonstrate use of Lighting Zone (LZ) 3: Moderately High Ambient Lighting for all projects, unless use of another LZ is explicitly justified in the design documents.
- Provide a list of fixtures with the location, LZ and BUG rating of each fixture to demonstrate that fixtures meet LZ requirements.
- For any fixtures which do not meet LZ requirements, provide a justification. Acceptable justifications for exclusion include safety considerations, conflict with FAA regulations, or preemption by federal, state and local regulations. Specialized signal, directional and marker lighting for transportation may be excluded, if it is controlled by a separate circuit from other non-excluded lighting.

SUSTAINABLE DESIGN STRATEGIES

- Use computer modeling to evaluate design alternatives for site lighting.
- Balance safety requirements with avoidance of unnecessary lighting.
- Lighting should be designed to provide the following benefits: safety/security, environmental protection, energy efficiency, and reduction of unnecessary lighting.
- Utilize optimized fixture lenses to provide desired light distribution with reduced fixture quantities.
- Consider intelligent exterior lighting that turns on as needed or adjusts light levels depending on ambient levels or detection of motion.
- Utilize low angle spotlights and full cutoff luminaries for roadway and building lighting.
- Use occupancy sensor or building automation systems to turn of interior lighting when not needed.
- Consider using International Dark-sky Association (IDA) approved lighting fixtures.

HSS-4: EXTERIOR VIEWS

Responsible Discipline	Purpose	Phase
Architectural	Incorporate exterior views into regularly occupied indoor areas.	D

BENEFITS

- Provide building occupants a visual connection to the outdoor environment
- Enhance well-being and reduce anxiety of occupants by providing view of natural spaces

PERFORMANCE TARGET(S)

Demonstrate 75% or more of all regularly occupied interior spaces include exterior views using transparent and unobstructed vision glazing.

DOCUMENTATION

- Provide a list of regularly occupied interior spaces in the project. Regularly occupied spaces are those where one or more people spend time working for at least one hour each day (i.e., offices and cubicles, but not breakrooms).
- For each regularly occupied space, indicate if it has an unobstructed exterior view. Provide justification/explanation for those that do not.
- Calculate the percentage of all regularly occupied spaces that have unobstructed views. Show that the percentage is equal to or greater than 75% of the total.

EXEMPTIONS

This criterion is not applicable to unoccupied buildings.

SUSTAINABLE DESIGN STRATEGIES

- Orient building to optimize available restorative views, prioritizing views of natural features (i.e., flora, fauna or sky views). If natural feature views are not feasible, prioritize attractive views of surrounding building facades, landscaping, airfields or infrastructure.
- Locate regularly used spaces such as offices on outside walls and minimize the use of regularly occupied interior spaces that lack vision glazing.
- Limit the heights of interior partitions to a maximum 42 inches to prevent obstructing views and daylighting.
- Use the California Energy Commission report “Windows and Offices: A Study of Office Worker Performance and the Indoor Environment” to ensure views have a view factor of 3 or greater as defined in the report

HSS-5: OCCUPANT WELLBEING AMENITIES

Responsible Discipline	Purpose	Phase
Architectural	Provide dedicated spaces for occupants to improve well-being.	**D**

BENEFITS

- Enhance passengers' experience
- Improve employee morale and productivity
- Reduce employee absenteeism

PERFORMANCE TARGET(S)

- Provide ADA accessible spaces/equipment dedicated to at least three of the following uses, considering compatibility with airport operations. Spaces should be sized adequately or repeated frequently enough to allow use by all occupants:
  - Exercise/fitness room(s)/center(s) that includes fitness equipment and access to showers and lockers
  - Quiet room(s) for meditation, religious observance, or quiet time. Quiet room should have a lockable door and occupancy signage to ensure privacy.
  - Lactation room(s) that is private, lockable, and includes occupancy signage. Room should include seating, table, sink, small refrigerator and electrical outlets. Follow National Institute of Health guidelines to determine the number of lactation rooms needed per number of female occupants.
  - Adjustable standing desks for occupants
  - Water bottle filling stations

DOCUMENTATION

- Provide a brief narrative description of the spaces provided in the design documents.
- For major renovations, if compatibility with airport operations precludes compliance with this criterion, provide a brief narrative detailing the incompatibilities and how the design incorporates occupant well-being amenities to the maximum extent feasible.

EXEMPTIONS

This criterion is not applicable to unoccupied buildings.

SUSTAINABLE DESIGN STRATEGIES

- If space allows, an Exercise Room should include, at a minimum, barbells or other small weights, a treadmill and/or stationary bicycle, water fountain or water bottle filling station, lockers, and a shower room.
- Given the minimal space and no need for extra plumbing, storage space, etc., a Quiet Room set aside for employee meditation/relaxation should be easily accommodated if there is an available spare room. A private room with a comfortable chair or sofa is the minimum requirement.
- For Lactation Rooms, the space does not need to be a dedicated Lactation Room and can be used for other purposes as well. It is recommended that, at a minimum, employers provide a safe and private space with a chair and a small table or shelf. An ideal space would include an electrical outlet, a door that can be locked from the inside, a sink, and/or a refrigerator located near the pumping space. Though not required, these additions can help shorten the break time because travel to another area to wash hands, clean pump parts, and store milk is eliminated.

HSS-6: DESIGN FOR ENHANCED RESILIENCE

Responsible Discipline	Purpose	Phase
Architectural	Design and construct buildings that can resist reasonably expected natural disasters and weather events exacerbated by climate change (e.g., flooding, hurricanes / high winds, tornadoes, drought, fire, extreme heat, winter storms, etc.) by protecting infrastructure and avoiding damage to equipment or service interruption.	**D**

BENEFITS

Careful design can help avoid power outages during severe weather events (floods, heavy winds, hurricanes, and cyclones). Many airports are "hardening" their systems by making the mission critical equipment less susceptible to damage. Designing with hardening strategies during the initial stages of a project can help reduce future operational and damage costs.

PERFORMANCE TARGET(S)

Provide building design requirements responsive to reasonably expected natural disasters and weather events (e.g., flooding, hurricanes / high winds, tornadoes, drought, fire, extreme heat, winter storms) exacerbated by climate change.

DOCUMENTATION

- Document design strategies that are responsive to any risk and resilience assessment completed by SAAS, including any SAAS resilience goals and strategies.
- Document design strategies that protect all exposed major or critical equipment, including the following:
  - Pad-mounted equipment along roadways, walkways, and bicycle paths
  - Overhead conductors
  - Pole-mounted equipment (e.g., transformers, reactive power compensation equipment)
  - Transformers (indoor and outdoor)
  - Switchgear (MV, LV)
  - Back-up generators
  - HVAC Equipment
  - Centralized storage energy systems
- Provide site photos, narrative, drawings, specifications, or standards documenting the project's preventive measures. List any standards used to guide design and implementation.

SUSTAINABLE DESIGN STRATEGIES

- Elevate the lowest occupied floor's lowest horizontal structural member at least three feet above the FEMA-defined base flood elevation.
- Locate critical equipment (e.g., switch gear, fuel storage, back-up generators, HVAC equipment, etc.) and infrastructure above the 500-year flood plain or 3 feet above the base flood elevation.
- Provide dry flood protection such as flood gates, walls, doors and/or inflatable barriers for infrastructure (e.g., switch gear, fuel storage, back-up generators, HVAC equipment, etc.) than cannot be elevated to prevent water intrusion into vulnerable areas.
- Provide infrastructure for temporary generators.
- Design for an increased cooling load over time (i.e., adequate space in the mechanical room to install a larger system).
- Provide whole-building fan for night flushing with the capacity to power that fan with emergency backup power.
- Design for efficient cooling systems that incorporate such features as building-based renewable technologies, groundwater cooling loop, or earth-tube cooling systems.

- Allow for future flexibility in cooling systems by providing space for future electrical, water, ductwork, radiant cooling etc. to be added as needed.
- Design systems for ties to renewable energy sources/district energy solutions
- Reduce landscape water requirements
- Reduce flush and flow water use
- Provide shaded external spaces adjacent to buildings for potential use during extreme heat events.
- Maximize open-grid pavement systems.
- Provide high-reflectivity paving materials, such as light concrete or white aggregate.
- Provide native or adapted planting to reduce micro temperatures and increase shading.
- Orient buildings and massing to self-shade in summer and extreme heat conditions.
- Provide high levels of insulation to minimize heat gains / minimize heat loss through building envelope
- Provide high levels of internal thermal mass and provisions for passive night-time flushing.
- Design for airtight construction and controlled ventilation and solar heat gain to limit external air flow when exterior hotter conditions occur.
- Provide lower Solar Heat Gain Coefficient (SHGC) glass, particularly on east and west facades.
- Design enclosure systems with exterior shading devices to minimize solar heat gain during peak summer conditions.
- Provide high-reflectivity roofing materials meeting Cool Roof Rating Council standards.
- Provide indoor cooling stations that can run on emergency backup power.
- Demonstrate compliance with ICC’s 2012 International Wildland-Urban Code (IWUIC) or 2013 NFPA 114.
- Meet the FORTIFIED Commercial High Wind and Hail design requirements.
- Meet the FORTIFIED Commercial Hurricane design requirements.