CHAPTER 4 - DEMAND/CAPACITY AND FACILITY REQUIREMENTS

4.1 AIRFIELD REQUIREMENTS

Airfield demand/capacity was analyzed to determine the ability of Airport facilities to accommodate forecast numbers of aircraft operations with acceptable levels of delay throughout the planning period.

Factors effecting airfield facility requirements include:

- The efficiency and safety of existing facilities
- Wind coverage and weather conditions
- The future level of aviation activity, which determines the requirements for runways and taxiways
- The fleet mix projected to operate at the Airport

Forecasts of aircraft, passenger, and cargo activity are discussed in Chapter 3. The remaining factors affecting facility requirements—wind, weather, airfield geometry, and runway capacity analyses—are discussed in the following subsections of this chapter.

4.1.1 Critical Aircraft and Airport Reference Code

The Airport Reference Code, as discussed in Chapter 2 of this Master Plan, is an FAA designation used in assigning design standards to the operational and physical characteristics of an airport based on the typical aircraft operating at that airport. **Table 4-1** provides additional detail on ARC classifications.

Table 4-1: Components of the FAA Airport Reference Code

Aircraft Approach Category		Airplane Design Group	
A	Approach speed slower than 91 knots	I	Wingspan less than 49 feet *or* tail height less than 20 feet
B	Approach speed at least 91 knots but less than 121 knots	II	Wingspan at least 49 feet but less than 79 feet *or* tail height at least 20 feet but less than 30 feet
C	Approach speed at least 121 knots but less than 141 knots	III	Wingspan at least 79 feet but less than 118 feet *or* tail height at least 30 feet but less than 45 feet
D	Approach speed at least 141 knots but less than 166 knots	IV	Wingspan at least 118 feet but less than 171 feet *or* tail height at least 45 feet but less than 60 feet
E	Approach speed of 166 knots or more	V	Wingspan at least 171 feet but less than 214 feet *or* tail height at least 60 feet but less than 66 feet
		VI	Wingspan at least 214 feet but less than 262 feet *or* tail height at least 66 feet but less than 80 feet

Notes:

The Airport Reference Code consists of an Aircraft Approach Category and an Airplane Design Group (e.g., C-III).
Typical approach speeds are defined as a value equal to 1.3 times an aircraft's stall speed in its landing configuration, at maximum certificated landing weight.
Source: FAA Advisory Circular 150/5300-13, Change 15, *Airport Design*

The Design Aircraft is considered to be the most demanding aircraft (based on aircraft dimensions, approach speeds, and/or other requirements) conducting 500 or more annual operations at a particular airport. Although airport facilities are designed to accommodate the Design Aircraft, they also continue to accommodate less demanding aircraft.

SAT is currently designated as ARC D-IV, which includes aircraft with approach speeds between 141 and 166 knots and wingspans between 118 and 171 feet such as the B-767, B-757-300, and the MD-11.

In the forecasts adopted for this Master Plan, by 2030, aircraft operations by the B-777 are projected to represent 0.3 percent of total aircraft operations at the Airport, or 939 annual operations. Therefore the B-777, which is an ARC D-V aircraft, is projected to be the critical aircraft for the purposes of planning future Airport facilities; see **Table 4-2**.

Table 4-2: Air Carrier Aircraft Operations by Airport Reference Code

Airport Reference Code	Actual	Forecast			
	2008	2010	2015	2020	2030
Smaller Aircraft	134,073	119,689	133,475	139,129	143,304
C-III	71,494	67,964	82,230	75,166	92,650
C-IV	3,115	3,178	4,829	5,504	4,225
D-III	6,530	5,842	6,577	22,855	34,714
D-IV	1,280	997	2,089	1,691	4,968
D-V	2	0	0	355	939
Total	**216,494**	**197,400**	**229,200**	**244,700**	**280,800**

4.1.2 Weather and Wind Analysis

Weather conditions, namely cloud ceiling and visibility, determine the procedures used by FAA Air Traffic Control (ATC) at an airport, which, in turn, affect airfield capacity because ATC maintains higher aircraft separations in lower visibility conditions. When relying on radar to separate aircraft, controllers require a minimum of 3 NM between aircraft on final approach to ensure safety. However, in good visibility, controllers can alleviate the radar separation requirement by relinquishing control of aircraft separations to the pilots.

As stated, aviation weather conditions are primarily determined by two parameters:

- Cloud ceiling
- Visibility, or Runway Visual Range

During good visibility conditions, pilots often fly using VFR, also described as visual meteorological conditions (VMC). These conditions are defined as no cloud ceiling, or a cloud ceiling above 3,000 feet and visibility greater than 5 miles. IFR conditions are defined as a cloud ceiling lower than 3,000 feet and/or visibilities less than 5 miles.

Meteorological data for the Airport area, based on weather observations recorded from 1999 through 2008, were obtained from the National Climatic Data Center. During this timeframe, approximately 82,500 weather observations were recorded. Based on these data, IFR weather conditions, also described as instrument meteorological conditions (IMC), occur 10.4 percent of the time at the Airport.

The orientation of an airport's runway system to the prevailing wind direction is critical to the safe operation of aircraft and the maximum use of airport facilities. Crosswinds are winds perpendicular to the runway or path of an aircraft that tend to affect the flight of approaching aircraft. Generally, the lighter the aircraft, the more it is affected by crosswinds. The FAA recommends 95 percent wind coverage on the basis of the crosswind not exceeding a particular speed for a specified aircraft size. The methodology for computing wind coverage is detailed in FAA Advisory Circular (AC) 150/5300-13, *Airport Design*.

In accordance with FAA guidelines, the allowable crosswind component for airports with an ARC between D-IV and D-VI is 20 knots. The wind coverage for more stringent maximum crosswind

components was also calculated for information purposes because a significant number of the operations at the Airport are conducted by small general aviation aircraft.

Wind coverage under both VMC and IMC was calculated for three runway use configurations: Runways 12L-30R and 12R-30L, Runway 3-21, and all runways. The results of the analysis are summarized in **Table 4-3** and illustrated on **Figures 4-1 through 4-3**.

Table 4-3: Runway Wind Coverage

Crosswind Component (knots)	Runway Configuration								
	12 -30			3-21			All Runways		
	All Weather	VMC	IMC	All Weather	VMC	IMC	All Weather	VMC	IMC
13	96.97%	96.85%	98.26%	93.07%	92.73%	97.10%	99.87%	99.87%	99.89%
16	99.44%	99.41%	99.77%	98.43%	98.35%	99.42%	99.99%	99.99%	99.96%
20	99.92%	99.92%	99.95%	99.71%	99.70%	99.84%	100%	100%	99.99%

The existing airfield at SAT provides a minimum of 99 percent wind coverage in all weather and runway use configurations for a crosswind of 20 knots, thereby exceeding the minimum FAA recommendation of 95 percent wind coverage.

Figure 4-1: All Weather Wind Coverage – Runways 12L/R and 30L/R

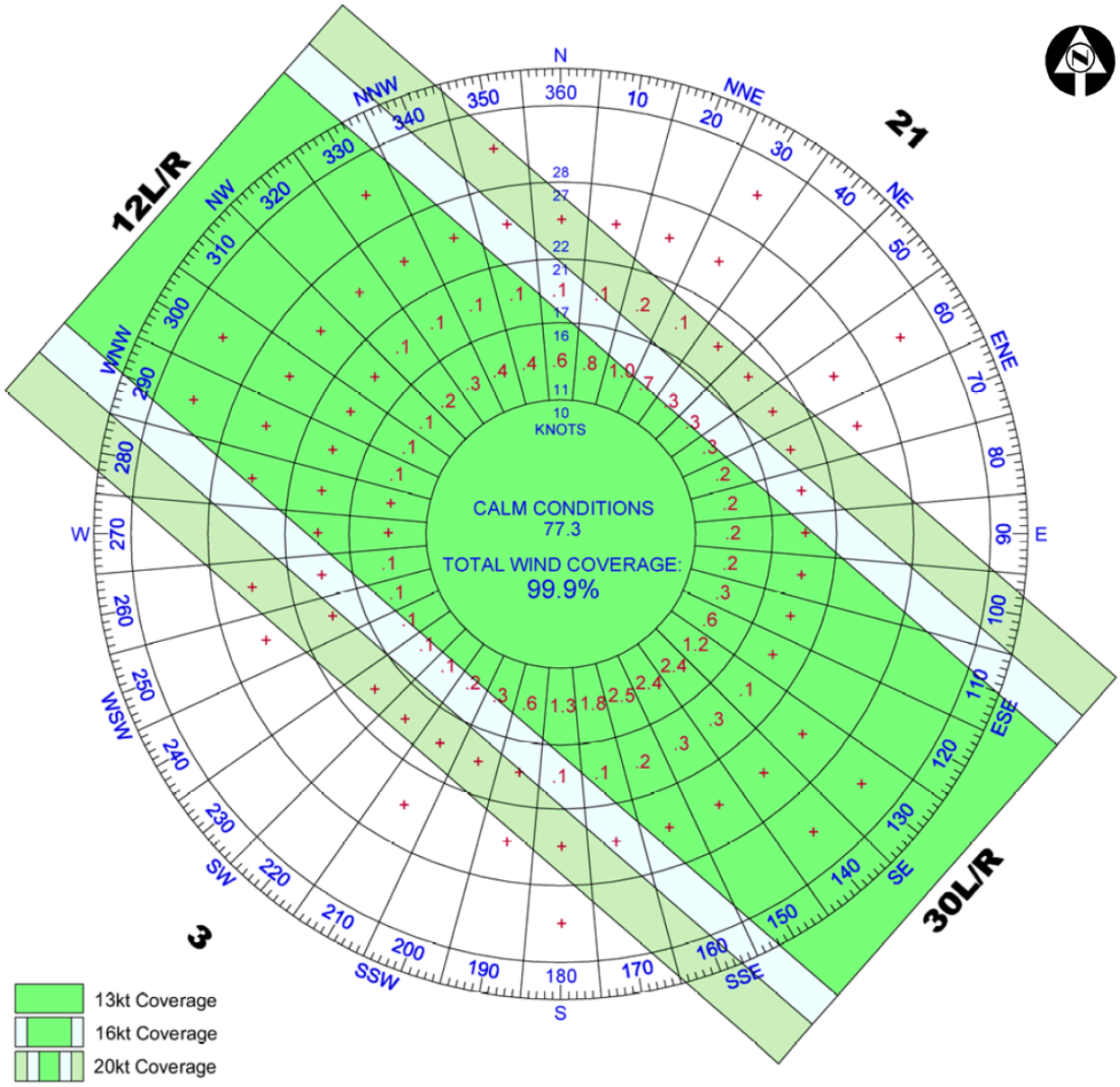


Figure 4-2: All Weather Wind Coverage - Runway 3-21

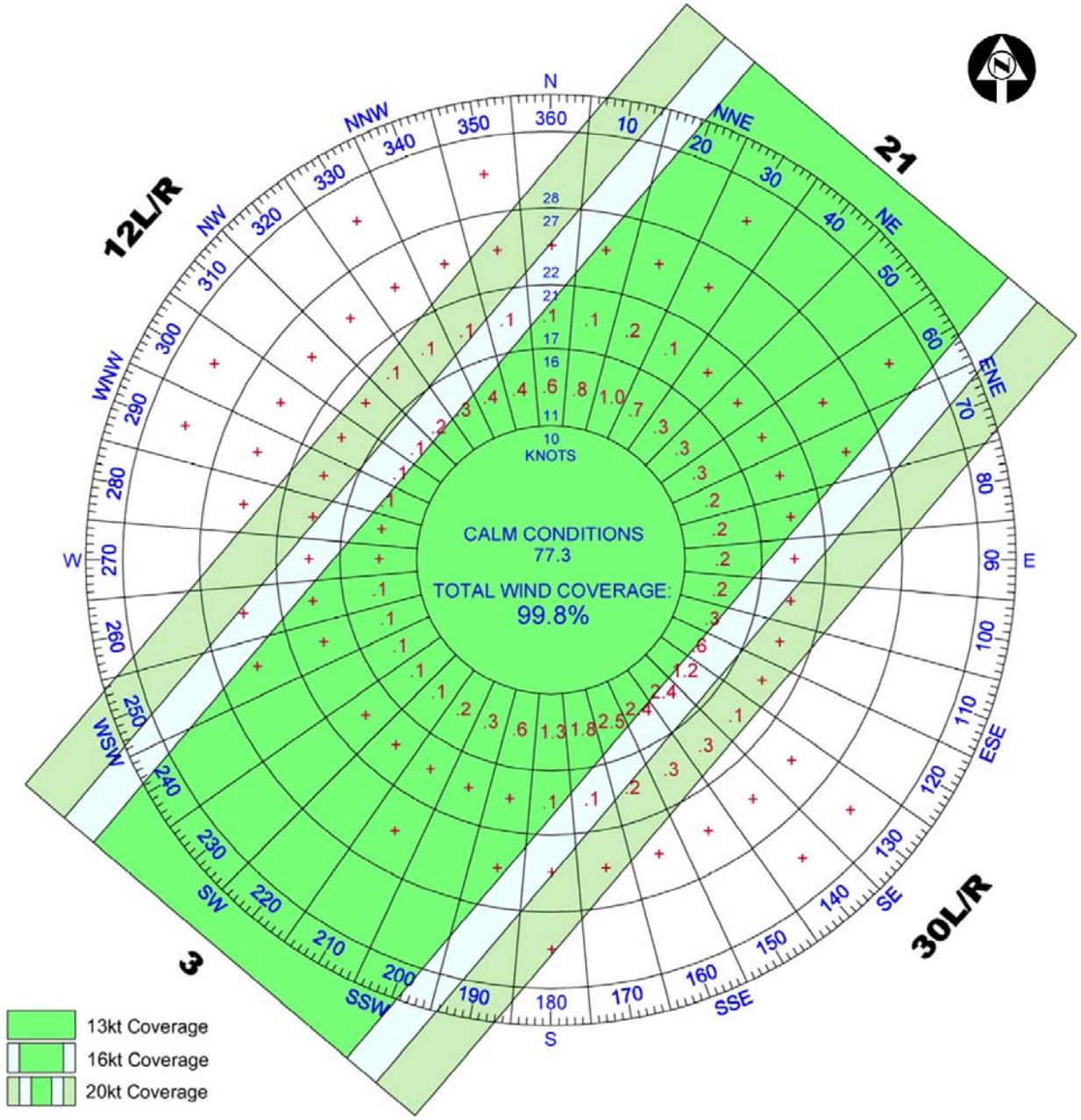
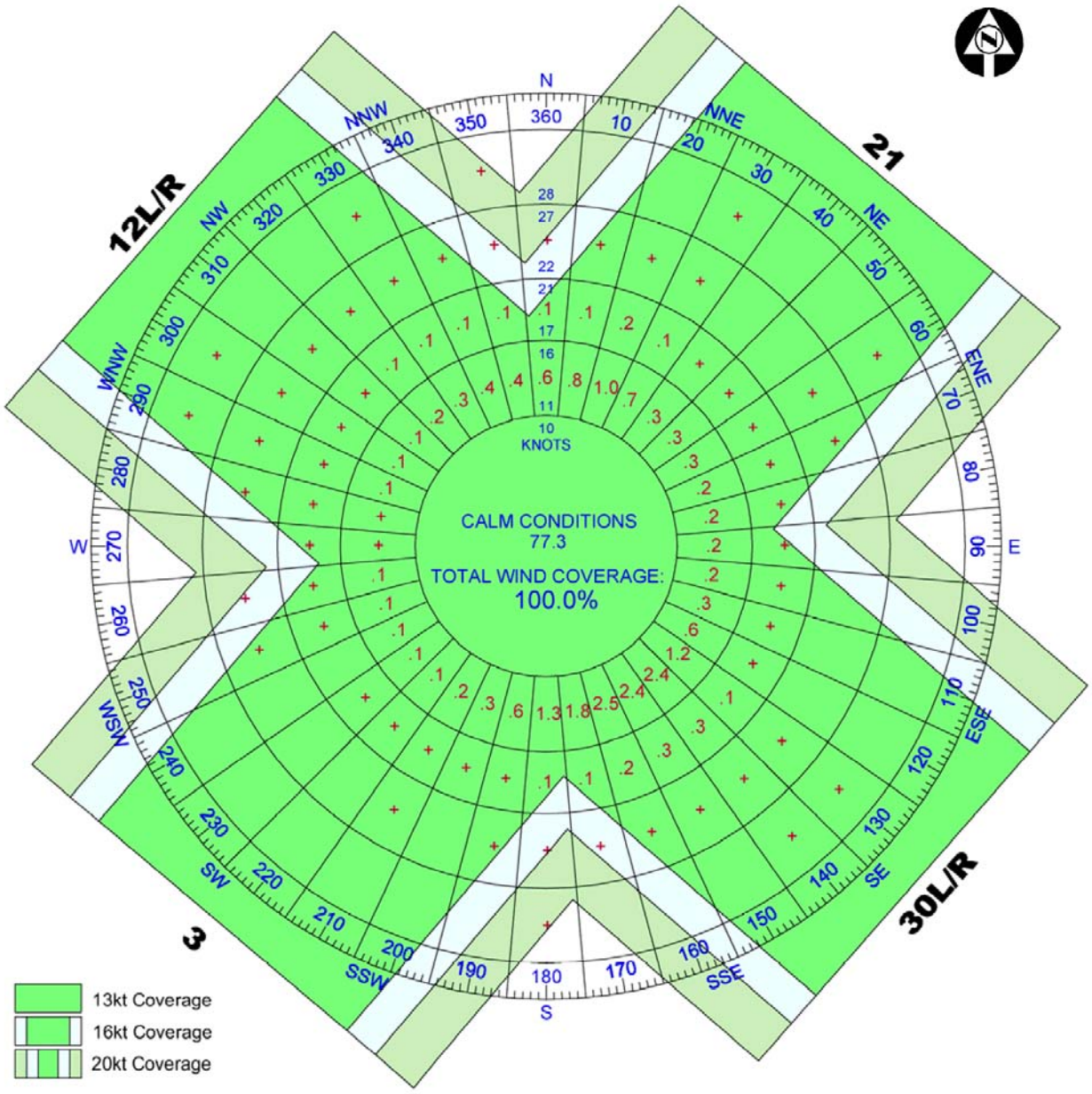


Figure 4-3: All Weather Wind Coverage - All Runways



4.1.3 Airfield Geometry

The FAA airfield geometry criteria provide uniformity among airport facilities and serve as a guide for airport operators when planning future facilities. The design criteria involving separation standards, widths, safety areas, obstruction surfaces, and gradients for runways, taxiways, and taxilanes are discussed in this section.

FAA Planning Standards

Table 4-4 presents the airport planning and design standards for ARC D-V, as they relate to existing Runways 12R-30L and 3-21, and for ARC B-III as they relate to existing Runway 12L-30R.

Table 4-4: Airport Planning and Design Standards for Airport Reference Codes B-III and D-V

Item	ARC B-III Standard (feet)	Runway 12L-30R	ARC D-V Standard (feet)	Runway 12R-30L	Runway 3-21
AIRPORT CATEGORY AND AIRPORT DATA					
Aircraft Approach Category (AAC)	**B**	B	**D**	D	D
Airplane Design Group (ADG)	**III**	III	**V**	IV	IV
SEPARATION STANDARDS (feet)					
Runway centerline to parallel runway centerline (VFR)	**700**	990	**700**	990	NA
Runway centerline to parallel taxiway/taxilane centerline	**300**	400	**400**	400	450
Runway centerline to edge of aircraft parking	**400**	525	**500**	525	696
Taxiway centerline to parallel taxiway/taxilane centerline	**152**	NA	**267**	235	233
Taxiway centerline to fixed or movable object	**93**	300	**160**	400	300
Taxilane centerline to parallel taxilane centerline	**140**	NA	**245**	NA	NA
Taxilane centerline to fixed or movable object	**81**	NA	**138**	120	225
RUNWAY DESIGN STANDARDS (feet)					
Runway width	**100**	100	**150**	150	150
Runway shoulder width	**20**	0	**35**	0	25
Runway blast pad width	**140**	100/0	**220**	150/200	200/200
Runway blast pad length	**200**	150/0	**400**	200/200	200/200
Runway safety area width	**300**	300	**500**	500	500
Runway safety area length beyond runway end or stopway end, whichever is greater	**600**	600/600	**1,000**	1,000/1,000	1,000/1,000
Runway object free area (OFA) width	**800**	800	**800**	800	800
Runway OFA length beyond each runway end or stopway end, whichever is greater	**600**	600/600	**1,000**	1,000/1,000	1,000/1,000
Clearway width	**500**	300	**500**	500	500
Stopway width	**100**	100	**150**	150	150
TAXIWAY DESIGN STANDARDS (feet)					
Taxiway width	**50**	75	**75**	75	75
Taxiway edge safety margin	**10**	15	**15**	15	15
Taxiway shoulder width	**20**	0	**35**	0	0
Taxiway safety area width	**118**	262	**214**	262	262
Taxiway OFA width	**186**	186	**320**	320	320
Taxilane OFA width	**162**	NA	**276**	225	276
Taxiway wingtip clearance	**34**	34	**53**	53	53
Taxilane wingtip clearance	**22**	22	**31**	31	31
RUNWAY PROTECTION ZONES (feet)					
Length	**1,000**	1,000/1,000	**2,500**	2,500/2,500	1,700/1,700
Inner width	**500**	500/500	**1,000**	1,000/1,000	1,000/500
Outer width	**700**	700/700	**1,750**	1,750/1,750	1,510/1,010
OBSTACLE FREE ZONES (OFZs)					
Runway OFZ width	**400**	400	**400**	400	400
Runway OFZ length beyond each runway end	**200**	200/200	**200**	200/200	200/200

NA = Not applicable
VFR = Visual flight rules
Note: Standards are based on a precision straight-in instrument approach procedure with visibility minimums lower than CAT I. I.e. with a minimum decision height of 200 feet and a minimum runway visual range of 2,400 feet.
Source: FAA Advisory Circular 150/5300-13, Change 15, *Airport Design.*

Runway Length Requirements

The type of aircraft an airport can accommodate is primarily determined by the length of the Airport's runways. The purpose of establishing appropriate runway length requirements is to maximize the operational efficiency and flexibility of the airfield. Aircraft runway length requirements were evaluated in accordance with FAA guidelines for both takeoffs and landings.

According to FAA planning guidelines, the recommended length for a primary runway is determined by considering either the family of aircraft having similar performance characteristics or a specific aircraft needing the longest runway. In either case, the analysis should be based on aircraft that are projected to use the runway on a regular basis. The initial assessment of runway length requirements was based on the FAA Airport Design Program in addition to a more detailed analysis that was conducted based on specific aircraft performance characteristics.

FAA Computer Program Calculations

In determining runway length requirements, takeoffs and landings are considered independent operations. The FAA computer program uses five variables and is based on the most demanding scenario. Assumptions and results for the analyses undertaken for SAT are presented in **Table 4-5**.

Table 4-5: FAA Recommended Runway Lengths

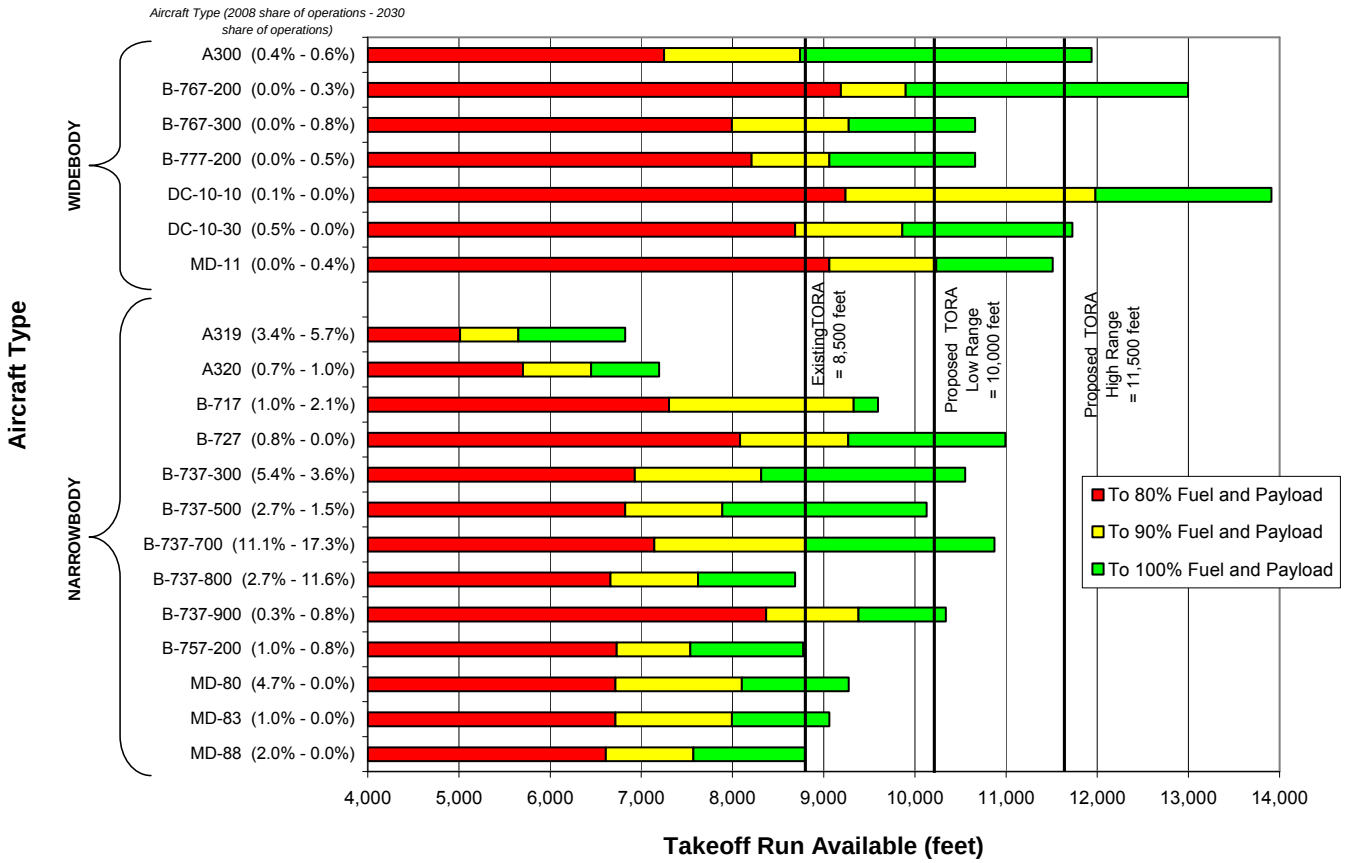
Airport Data			
Airport elevation		809.1 feet above MSL	
Mean daily maximum temperature of the hottest month		95.0°F	
Maximum difference in runway centerline elevation		30 feet	
Length of haul for aircraft weighing more than 60,000 pounds		5,000 nautical miles	
Runway Lengths Recommended for Airport Design		Dry Runways (feet)	Wet Runways (feet)
Small aircraft with approach speeds slower than 30 knots		300	320
Small aircraft with approach speeds slower than 50 knots		800	860
Small aircraft (less than 12,500 pounds) with fewer than 10 passenger seats			
	75 percent of these small aircraft	2,550	2,840
	95 percent of these small aircraft	3,130	3,380
	100 percent of these small aircraft	3,700	4,020
Small aircraft with 10 or more passenger seats		4,340	4,500
Large aircraft (between 12,501 and 60,000 pounds)			
	75 percent of these large aircraft at 60 percent useful load	5,000	5,160
	75 percent of these large aircraft at 90 percent useful load	7,400	7,440
	100 percent of these large aircraft at 60 percent useful load	5,900	6,220
	100 percent of these large aircraft at 90 percent useful load	9,300	9,540
Large aircraft heavier than 60,000 pounds – range of 5,000 nautical miles		10,410	11,000

MSL = Mean sea level
Note: The 5,000 nautical mile haul length was used for flights from SAT to Paris and London.
Sources: FAA Advisory Circular 150/5325-4, *Runway Length Requirements for Airport Design;* FAA Airport Design software, *Airport Design for Microcomputers*, Version 4.2

Aircraft Planning Manuals

The analysis of required runway length for specific aircraft types was focused on takeoff length requirements, which are typically longer than landing length requirements for the same aircraft. **Figure 4-4** depicts takeoff length requirements for many of the aircraft in the Airport's existing and projected aircraft fleet. As shown, the takeoff run available (TORA) is adequate for all narrowbody aircraft at 80 percent of their maximum takeoff weight (MTOW), and for half the widebody aircraft at 80 percent of their MTOW, operating or projected to operate at the Airport. The figure also shows that, by increasing the TORA by 3,000 feet to 11,500 feet, all aircraft listed would be accommodated at 100 percent of their MTOW, with the exception of three widebody aircraft that represent less than 1 percent of total operations at SAT. It is also important to note that aircraft typically do not operate at 100 percent of their MTOW. Airlines fuel aircraft for the distance to be traveled and, therefore, typically do not carry more fuel than needed after accounting for an additional factor of safety. In addition, aircraft may not be carrying a full load of passengers or cargo in many instances. The recommended runway length ranges from 10,000 feet (95 percent payload) to 11,500 feet (100 percent payload for the B-777-200 and B-767-300). The preferred runway length will be determined through the alternatives analyses described in Chapter 5.

Figure 4-4: Runway Takeoff Length Requirements - Aircraft Performance Characteristics



Note: Requirements calculated for 95 degrees Fahrenheit at Airport altitude (809.1 feet)
Source: manufacturer planning manuals.

Runway Width

The runway width requirement is based on the physical and performance characteristics of aircraft using the runway. The characteristics of importance are wingspan and approach speed. The FAA Advisory Circular 150/5300-13, Change 15, specifies a runway width of 150 feet for ARC D-V. Runways 12R-30L and 3-21 meet this design standard. The current width of Runway 12L-30R (100 feet) meets the design standards for an ARC B-III runway, and can also accommodate ARC C-III aircraft that weigh 150,000 pounds or less, such as the B-737-300.

Runway Shoulders

Runway shoulders provide resistance to blast erosion and accommodate the movement of maintenance and emergency equipment and the occasional passage of an aircraft veering from the runway. Runways 12L-30R and 12R-30L do not have shoulders. Therefore, it is recommended that 25-foot shoulders be constructed on both runways

Runway Blast Pads

Runway blast pads provide blast erosion protection beyond the runway ends. Runways 12R-30L and 3-21 do not meet FAA standards for ADG V aircraft (width of 220 feet; length of 400 feet). The Runway 30R end does not have a runway blast pad. Therefore, it is recommended that a blast pad be constructed for the Runway 30R end and that the blast pads for the Runway 12R and 12L ends be brought up to FAA dimensional standards.

Runway Safety and Obstruction Free Surfaces

In addition to the structural pavement and shoulders, the runway system also consists of various aeronautical surfaces designed to enhance the safety of aircraft on, approaching, departing, or adjacent to the runway. These design standards were addressed in **Table 4-4**.

Runway Safety Area
A Runway Safety Area (RSA) is defined as a rectangular area centered about the runway that is cleared, drained, and graded. This area should be capable of accommodating an aircraft in the event that it overruns the runway end, as well as capable of supporting firefighting equipment. An RSA for ARC D-V is an area 500 feet wide centered on the runway centerline and extending 1,000 feet beyond each runway end. The longitudinal grade from the end of the runway should be from 0 percent to -3.0 percent for the first 200 feet and no more than -5.0 percent for the remainder of the RSA. Transverse grades should be -1.5 percent to -3.0 percent away from the runway shoulder edge. While currently classified as ARC D-IV, Runways 12R-30L and 3-21 meet the applicable RSA dimensional standards for ARC D-V runways. The RSAs for Runway 12L-30R meet the applicable FAA ARC B-III standards.

Runway Object Free Area
The Runway Object Free Area (ROFA) is a rectangular area surrounding the runway provided to enhance the safety of aircraft operations by ensuring that the area is kept free of parked aircraft and other objects, except those objects that need to be located in the ROFA for air navigation or aircraft ground maneuvering purposes. The ROFA design standard for ARC D-V is 800 feet wide centered on the runway centerline and extending 1,000 feet beyond the ends of the runway. While currently classified as ARC D-IV, Runways 12R-30L and 3-21 meet the applicable ROFA dimensional

standards for ARC D-V runways. The ROFA for Runway 12L-30R meets the applicable FAA ARC B-III standards.

Obstacle Free Zone
The Obstacle Free Zone (OFZ) is an area of airspace centered about a runway that is required to be clear of all objects, except for frangible navigational aids that need to be located in the OFZ because of their function. The OFZ provides clearance protection for aircraft landing or taking off from the runway, and for missed approaches. The OFZ design standard for ARC D-V is 400 feet wide centered on the runway centerline and extending 200 feet beyond the ends of the runway. The OFZ is the airspace above the surface with an elevation at any point that is the same as the elevation of the nearest point on the runway centerline. The existing airfield configuration meets applicable OFZ standards.

Runway Protection Zone
Runway Protection Zones (RPZs) are areas at the ends of runways that provide for the unobstructed passage of aircraft through the airspace above them, and are used to enhance the protection of people and property on the ground in the vicinity of the runway ends. While it is desirable to clear all objects from RPZs, some uses are permitted, provided they do not attract wildlife, are outside the ROFA, and do not interfere with navigational aids. Land uses prohibited in the RPZ are residences and places of public assembly, such as churches, schools, hospitals, office buildings, and shopping centers. The RPZs for Runways 12R and 30L, with inner widths of 1,000 feet, outer widths of 1,750 feet, and lengths of 2,500 feet, are free and clear of places of public assembly. A roadway is located within both RPZs, but no obstructions deter the safe movement of aircraft in the area. The RPZ for Runway 3, with an inner width of 1,000 feet, an outer width of 1,510 feet, and a length of 1,700 feet, also encompasses a roadway and an Airport parking lot; however, no obstructions deter the safe flight of aircraft in the area. Runway 21 has an inner width of 500 feet, an outer width of 1,010 feet, and a length of 1,700 feet, is clear of obstacles, and poses no safety hazard to aircraft. The RPZs for the Runway 12L and 30R ends are clear of obstacles and hazards, with inner widths of 500 feet, outer widths of 700 feet, and lengths of 1,000 feet.

Control over the use of the RPZs through the acquisition of sufficient property interests (such as fee title, lease, or avigation easement) is strongly encouraged by the FAA to prohibit unsafe uses within the RPZs. Portions of the RPZs, at the Runway 12R, 30L, and 3 ends, are beyond the Airport property boundaries. Recommendations for acquisition are presented in Chapter 5.

Threshold Siting Surfaces
Threshold Siting Surfaces are used to establish the location of runway thresholds to meet approach obstacle clearance requirements, particularly as they affect instrument approach visibility minimums. The Threshold Siting Surfaces are imaginary inclined planes extending from the runway thresholds (the approach end of the portion of the runway used for landing). All runways at SAT conform to their respective standards. The FAA has requested that a survey be conducted to verify that the present runway approaches involve no penetrations of the Threshold Siting Surfaces.

Runway Grades

The maximum longitudinal runway grade is 0.8 percent for the first quarter of a runway at each end and 1.5 percent for the middle half of the runway for AAC D runways. A runway should have adequate transverse slopes to prevent the accumulation of water on the surface. The FAA recommends a transverse grade of 1.0 percent to 1.5 percent for AAC D runways.

The maximum longitudinal runway grade is 2.0 percent for AAC B runways. The FAA recommends a transverse grade of 0 percent to 2.0 percent for AAC B runways. All runways at the Airport conform to their respective standards.

Runway 12L-30R Upgrade

Runway 12L-30R is to be upgraded from a general aviation runway to an air carrier runway to accommodate future traffic demand. The primary improvements are intended to provide better reliability, more flexibility, and maintenance relief at the Airport if Runway 12R-30L has to be closed for any length of time for maintenance, runway improvements, or if an aircraft is immobilized on the runway. ATC has stated that extending Runway 12L-30R would minimize the need for airlines to divert flights from the Airport during such instances. A second runway with equal length, width, and navigational aids as the primary runway would enable the Airport to continue operating without a major decrease in airfield reliability to serve Airport users. The upgrade would also provide the flexibility for ATC to use the runways in different configurations, thereby alleviating constraints.

Increasing the width and length of Runway 12L-30R would also increase the hourly capacity of the Airport. Upgrading the runway is not planned within the planning period of this Master Plan based on airfield capacity. However, such runway improvements may be justified within the planning period to maintain the reliability of the Airport and sustain any potential growth. Airfield capacity is addressed in Section 4.1.4.

Taxiway System

SAT's taxiway system consists of a commercial air carrier area and a general aviation area. The taxiways that can accommodate existing commercial air carrier aircraft operations are 75 feet wide, but not all of these taxiways have the required 25-foot-wide shoulders. The taxiways that accommodate general aviation aircraft operations are 50 feet wide and do not have the required 20-foot-wide shoulders. It is recommended that taxiway shoulders be constructed where required.

Runway occupancy times have a significant effect on the operational capacity of the airfield. Therefore, exit taxiways should be located so as to allow aircraft to clear the runways as soon as possible. High-speed or acute angled exit taxiways can significantly reduce runway occupancy times. Perpendicular exits require the pilot to come to a full stop on the runway before exiting, thus requiring more time on the runway.

Runways 12L, 12R, and 30R have high-speed exit taxiways and, therefore, no improvements are required. Additional high-speed exit taxiways for Runways 3 and 30L should be constructed to improve runway capacity.

All three runways at the Airport have a full-length parallel taxiway with connectors to facilitate aircraft movements. However, some of these taxiways do not meet the lead-in to fillet pavement requirements. The lead-in to fillet pavement is required to ensure a safe turn when pilots follow the taxiway centerline. The taxiways on the southwest side of Runway 12R-30L have the correct fillet requirements. However, Taxiways A, D, and N, on the northeast side of Runway 12R-30L require modification to meet ADG V standards. The taxiways associated with Runway 3-21 meet the fillet requirements.

The FAA has specifically noted that aircraft departing from the east cargo complex cannot make the turn onto Taxiway Q. Fillet improvements were identified and are to be funded by the FAA Runway Safety Action Team to help reduce runway incursions.

In the terminal complex, taxiways facilitate the movement of aircraft between the runways and the gates or parking positions. The majority of taxiways are 75 feet wide and the separation between the runways and parallel taxiways is 400 feet for Runways 12R-30L and 12L-30R and 450 feet for Runway 3-21. Certain locations within the Terminal 1 ramp area do not have adequate spacing to accommodate ADG IV or V aircraft, such as the B-757 (ADG IV). Taxilanes should provide for the unrestricted movement of the full aircraft mix serving SAT and, therefore, ramp space should be increased and aircraft circulation improved to the extent practicable.

A few taxiways at the Airport are restricted to use by small general aviation aircraft. **Table 4-6** identifies those taxiways.

Table 4-6: General Aviation Taxiway Data

Taxiway	Location	Taxiway Width (feet)	Taxiway Safety Area (feet)	Airplane Design Group
A	Between Runway 12R-30L and Taxiway R	75	118	III
E	East of Runway 3/21	40	79	II
F	Full Length	75	118	III
H	West of Taxiway Z	36	79	II
J	South of Taxiway H	35	79	II
J	Between Runway 12R-30L and Taxiway S	40	79	II
K	South of Taxiway H	40	79	II
M	Full Length	50	118	III
P	Full Length	40	79	II
RC	Full Length	50	118	III
S	South of Taxiway H	50	118	III
W	Full Length	35	79	II
Z	Full Length	150	118	III

Navigational Aids

At SAT, precision approaches are available to Runways 3, 12R, and 30L. Runway approach minimums and categories were discussed in Chapter 2. At the time this report was prepared,

Runway 3-21 was being extended 1,000 feet to the northwest. All navigational aids associated with the extension are to be relocated.

New navigational aids may also be introduced within the 20-year planning period. The Next Generation Air Transportation System is the FAA's plan to modernize the National Airspace System (NAS) through 2025. Through NextGen, the FAA is addressing the effects of air traffic growth by increasing NAS capacity and efficiency while simultaneously improving safety, reducing environmental impacts, and increasing user access to the NAS. To achieve its NextGen goals, the FAA is implementing new performance-based navigation routes and procedures that leverage emerging technologies and aircraft navigation capabilities. NextGen improvements range from Area Navigation (RNAV) and Required Navigational Performance to Optimized Profile Descent. To better serve Airport users and continue to separate general aviation aircraft operations from air carrier aircraft operations, it is recommended that an RNAV approach be published for Runway 12L-30R and that a CAT I ILS be installed on Runway 21. Upgrading Runway 3 to a CAT II ILS approach would be costly for the City without providing a positive benefit/cost ratio so that the FAA can fund the project. This analysis would likely have to show SAT as a larger hub air carrier airport operating in IFR weather conditions greater than 10 percent of the time. If the City wanted to fund the project, a letter of concurrence would be required and should be submitted to the FAA through the appropriate Airports District Office (ADO). This letter could include the City's willingness to remove obstacles; provide resources, such as personnel and funding; and install additional equipment, such as lighting, markings, signage, and the like.

4.1.4 Airfield Demand / Capacity Analysis

Airfield capacity is an important part of the airport planning process. A comparison of operational demand with airfield capacity results in airfield development requirements.

- FAA AC 150/5060-5, *Airport Capacity and Delay,* provides formulae to estimate annual service volume (ASV). As stated in the Advisory Circular, ASV is "a reasonable estimate of an airport's annual capacity. It accounts for differences in runway use, aircraft mix, weather conditions, fleet mix, etc., that would be encountered over a year's time." ASV is the level of annual activity at which average annual aircraft delay would be approximately 4 minutes per aircraft operation.
- The FAA's Airport Capacity Model is used to estimate peak hour operations that can be accommodated by a runway layout for various arrival/departure configurations and allocations. However, because of schedule fluctuations throughout the day, peak hour capacities can be exceeded almost every day with little or no concern for improvements. However, peak hour capacity versus peak hour demand is an important evaluation for deciding if additional runway capacity is needed.

Airfield capacity is influenced by many factors, including the following:

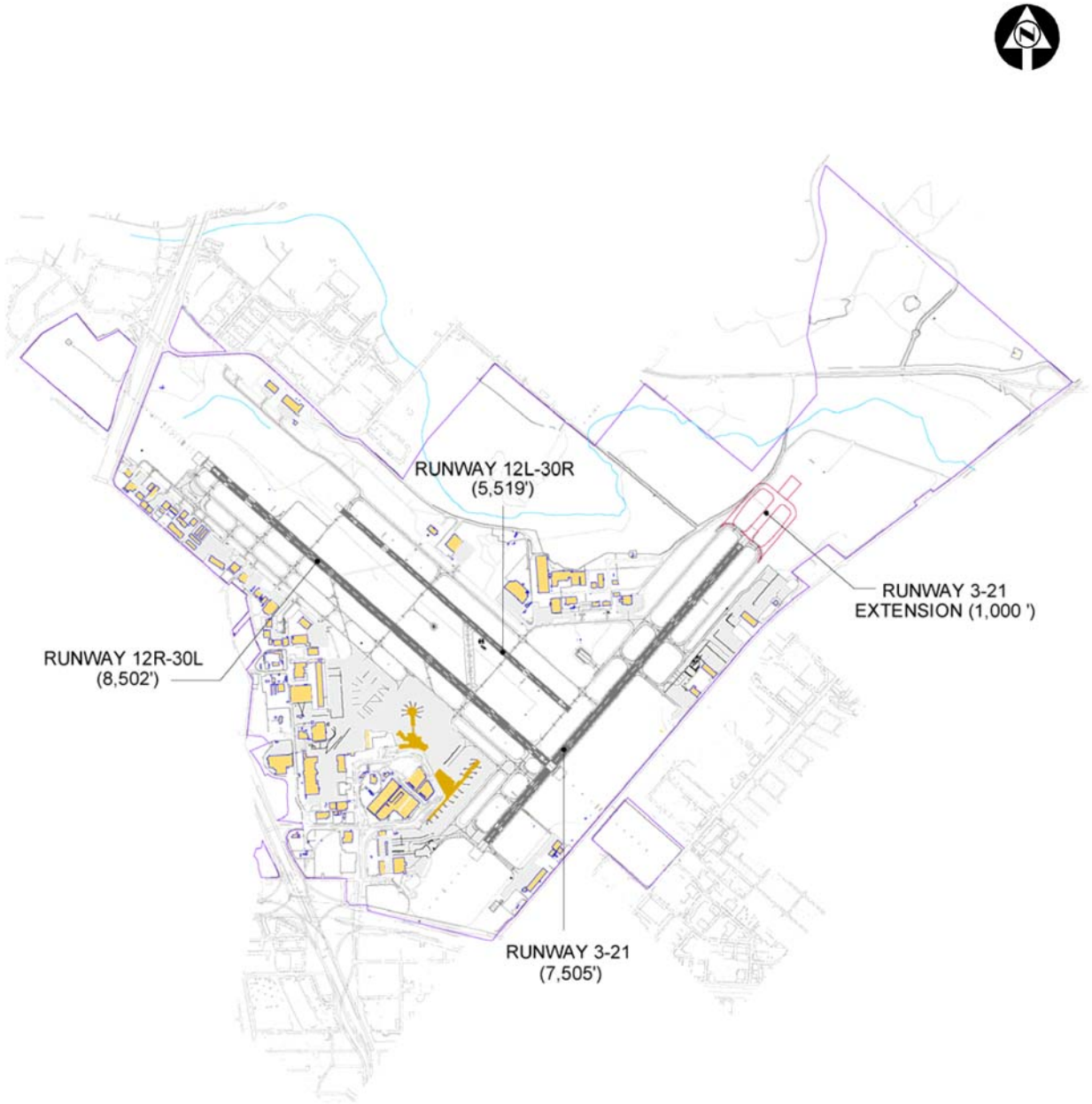
- Airfield layout
- Taxiways, including runway exit locations
- Wind/weather conditions
- Runway operating procedures

- Aircraft fleet mix
- Schedule peaking

Airfield Layout

For this demand/capacity analysis, the existing airfield was analyzed using the baseline runway configuration depicted on **Figure 4-5**.

Figure 4-5: Existing Airfield



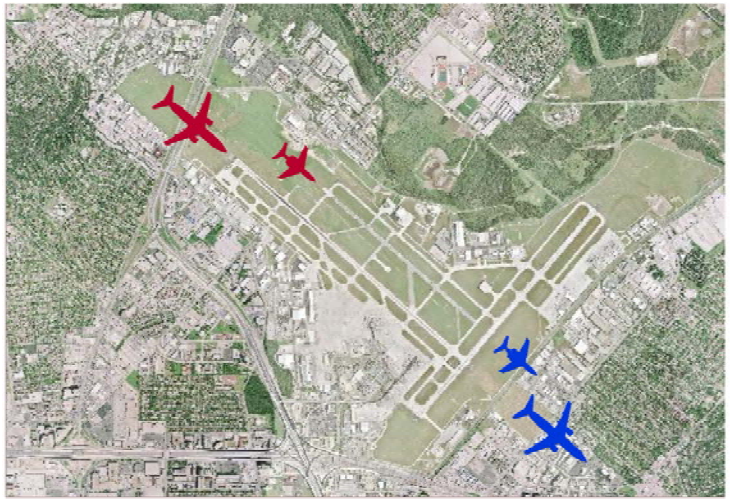
Chapter 3 presented the forecasts of aircraft operations for the 5-, 10-, and 20-year planning horizons.

Using the aircraft fleet mix index assumed for 2030 and the existing runway use configurations at the Airport in IFR and VFR conditions, maximum achievable hourly operations were calculated. The practical hourly capacity is the number of total takeoffs and landings that can occur on an airfield in an hour without experiencing delays. Hourly operations that exceed the practical capacity will likely experience some level of delay. The runway use configurations in use at the Airport are listed in **Table 4-7** and shown on **Figures 4-6** and **4-7**. As aircraft arrival percentage increases, runway capacity decreases. A 50/50 arrivals/departures split was used in the analysis.

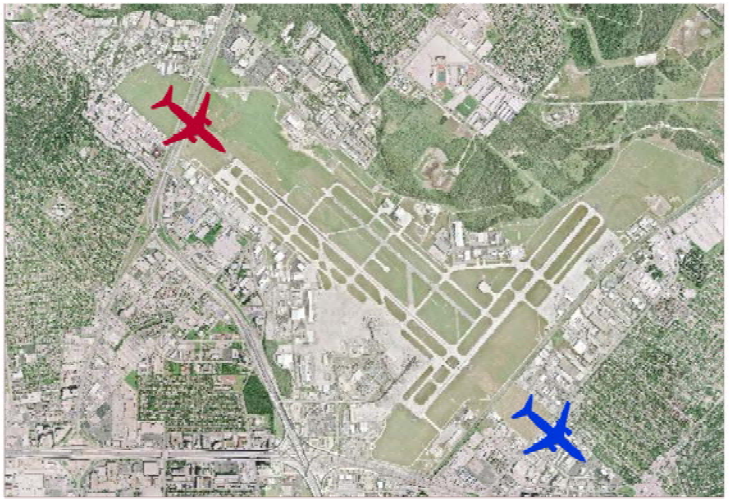
Table 4-7: Runway Use Configurations

Runway Configuration 1	Runway Configuration 2	Runway Configuration 3
VFR Runways 12L and 12R (51.8% of the time)	VFR Runways 30L and 30R (22.0% of the time)	VFR Runways 12L and 12R and Runway 3 departures (15.8% of the time)
IFR Runway 12R only (5.4% of the time)	IFR Runway 30L only (2.8% of the time)	IFR Runway 12R and Runway 3 departures [Aircraft are NOT airborne at intersection] -or- IFR Runway 12R and Runway 3 departures [Aircraft ARE airborne at intersection] -or- IFR Runway 12R and Runway 3 departures [Aircraft ARE airborne at intersection with 2.5 NM spacing] (2.2% of the time)

Figure 4-6: Runway Use Diagram, Runway Configurations 1 and 2

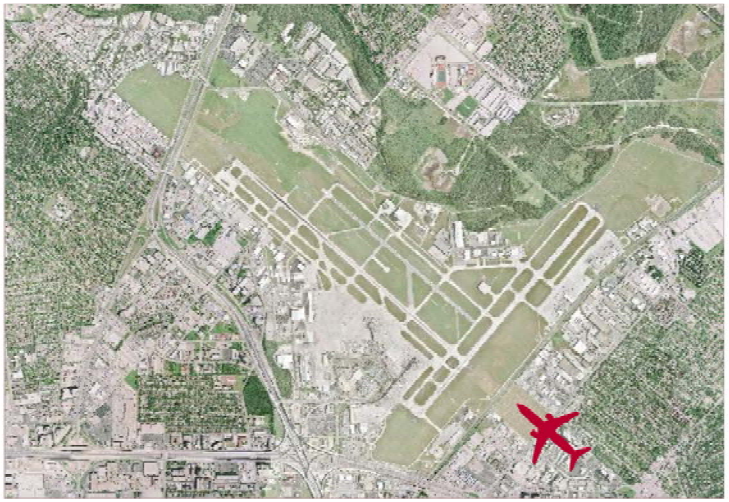


Runway Configuration 1: VFR Runway 12L and 12R (51.8%)



Runway Configuration 1: IFR Runway 12R (5.4%)

Runway Configuration 2: VFR Runway 30L and 30R (22.0%)



Runway Configuration 2: IFR Runway 30L (2.8%)

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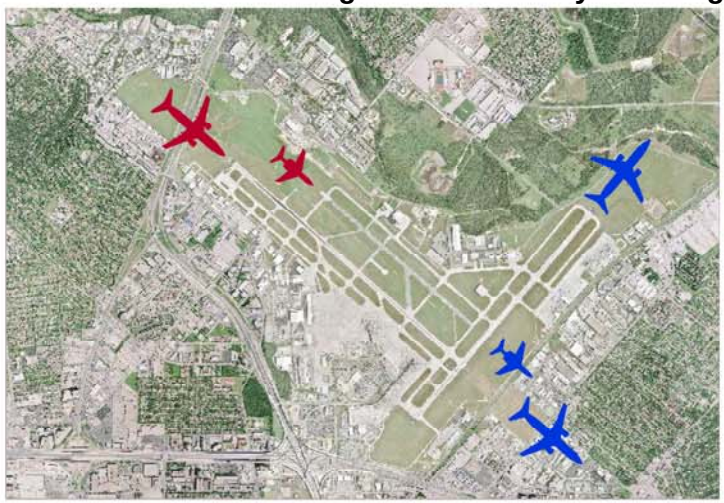
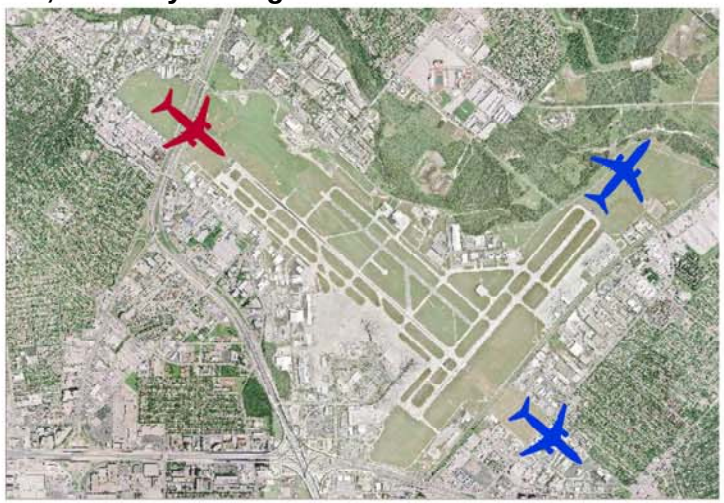
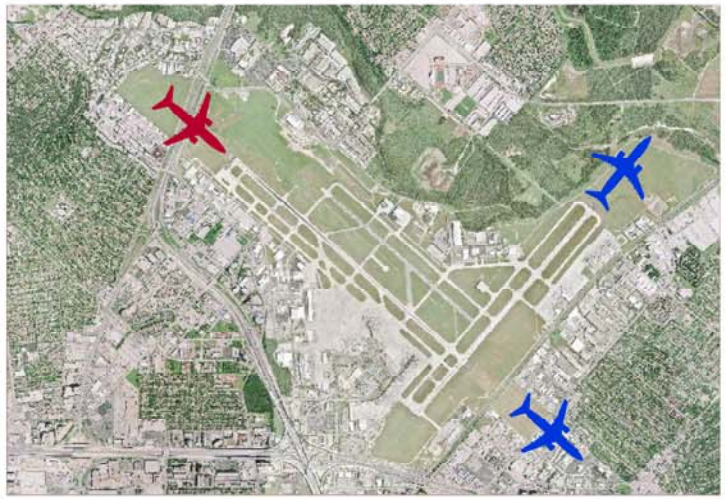
Figure 4-7: Runway Use Diagram, Runway Configuration 3



Runway Configuration 3: VFR Runways 12L, 12R & 3 (15.8%)



Runway Configuration 3: IFR Runway 12R and Runway 3 Departures - Aircraft are NOT Airborne at Intersection (2.2%)



Runway Configuration 3: IFR Runway 12R and Runway 3 Departures - Aircraft are ARE Airborne at Intersection (2.2%)

Aircraft Fleet Mix

The types of aircraft operating at an airport affect airport capacity. For example, when smaller aircraft follow larger aircraft on approach, additional separation is required to account for wake turbulence. This additional separation increases the time between aircraft operations, resulting in a lower airfield capacity. The more homogenous the fleet mix, the higher the capacity of a given airfield configuration. **Table 4-8** identifies the classes of aircraft used in the mix index in the FAA model.

Table 4-8: Aircraft Classes

Aircraft Class	Wake Turbulence Class	Number of Engines	Maximum Takeoff Weight (pounds)
A	Small	Single	41,000 or less
B	Small	Multiple	41,000 - 225,000
C	Large	Multiple	B-757
D	Heavy	Multiple	>225,000

Source: FAA Airport Capacity Model; FAA Advisory Circular 150/5060-5, *Airport Capacity and Delay*

The traffic demand forecasts were based on the aircraft mix projected to operate at SAT through 2030. The input parameters for the Airport Capacity Model were based on current ATC procedures and spacing between aircraft, a 5 NM final approach, approach speeds of aircraft Classes A through D (80 knots, 130 knots, 130 knots, and 140 knots, respectively), and runway occupancy times of 30 seconds, 50 seconds, 50 seconds, and 70 seconds, respectively. Runway 12L-30R was limited to Class A aircraft.

The Airport Capacity Model was used to calculate hourly capacity of the SAT airfield in IFR and VFR conditions for both the 2008 (existing) and 2030 (projected) fleet mixes. It should be noted that the fleet mixes shown in **Table 4-9** account for the aircraft operating during peak hours, and not the overall aircraft fleet mix. As shown in Table 4-9, operations by Class B and D aircraft are projected to increase in 2030 and operations by Class A aircraft are projected to decrease in 2030 compared to existing conditions.

Table 4-10 shows the actual input data for the FAA model for SAT.

Table 4-9: Projected Peak Hour Aircraft Fleet Mix

Aircraft Type	2008	2010	2015	2020	2030
Widebody Passenger	0.0%	0.0%	0.3%	0.3%	0.5%
Widebody Cargo	1.0	1.1	1.4	1.3	2.3
Class D	**1.0%**	**1.1%**	**1.7%**	**1.6%**	**2.8%**
Narrowbody Passenger	35.2%	36.6%	38.6%	39.7%	44.8%
Narrowbody Cargo	1.9	1.7	1.5	1.8	1.4
Regional Jet	9.7	9.6	11.2	12.0	11.1
Business Jet	12.0	11.9	13.2	17.3	18.2
Military	1.9	2.2	2.0	1.9	1.8
Class B	**60.7%**	**62.0%**	**66.5%**	**72.7%**	**77.3%**
General Aviation - Single-engine Prop	25.7%	24.1%	21.1%	16.5%	12.9%
General Aviation - Multi-engine Prop/Turboprop	12.6	12.8	10.7	9.2	7.0
Class A	**38.3%**	**36.9%**	**31.8%**	**25.7%**	**19.9%**

Note: The Embraer 190 is categorized in the fleet mix as a narrowbody passenger aircraft.
Source: Derived from Table 3-30 *Projected Aircraft Fleet Mix*

Table 4-10: FAA Airport Capacity Model Input Data

Aircraft	Class	2010	2010	2030	2030
		VFR	IFR	VFR	IFR
Less than 41,000 Pounds	A	37%	5%	20%	5%
41,000 Pounds - 225,000 Pounds	B	62	94	77	92
B-757	C	0	0	0	0
Greater than 225,000 Pounds	D	1	1	3	3
Percent Touch and Go Operations		10%	0%	10%	0%

The weighted peak hour capacities for arrivals and departures are listed in **Table 4-11**. These are weighted by runway use percentages. The maximum hourly capacities are listed in **Table 4-12**.

Table 4-11: Weighted Peak Hour Capacity (numbers of operations)

	Two Runways	Three Runways	Weighted Average
IFR arrivals	29.2	29.2	30
IFR departures	50.9	50.9	51
VFR arrivals	41.4	62.2	45
VFR departures	95.9	135.2	102

Note: In IFR conditions, only Runways 12R-30 and 3-21 are operational,

Table 4-12: Maximum Hourly Capacity

Runway Configurations	Maximum Hourly Capacity (number of operations)
VFR Runways 12L and 12R	82.2
IFR Runway 12R only	48.9
VFR Runways 30L and 30R	82.2
IFR Runway 30L only	48.9
IFR Runway 3 only	48.9
IFR Runway 21 only	48.9
VFR Runways 12L and 12R and Runway 3 departures	124.3
IFR Runway 12R and Runway 3 departures [Aircraft are airborne at intersection]	48.9

Schedule Peaking

The traffic demands used throughout the demand/capacity analyses are for the average day of the peak month for the 2030 forecast year, based on the baseline forecast of 280,800 total annual operations. The number of aircraft operations in the ADPM in the 2030 baseline forecast is 803. Averaging the 803 operations over a 16-hour day results in an average of 50 operations per hour.

Based on the forecast of annual aircraft operations and the historical percentage of operations in the ADPM, the forecast ADPM operations counts were calculated, as presented in **Table 4-13**.

Table 4-13: Average Day Peak Month Aircraft Operations

	2010	2015	2020	2030
Annual Operations	197,400	229,200	244,700	280,800
ADPM Operations	564	655	700	803

In **Table 4-14**, the number of aircraft operations in each peak rolling-hour is shown for scheduled airline aircraft departures, scheduled airline aircraft arrivals, and all scheduled airline aircraft operations.

Table 4-14: Peak Hour Operations Summary

Scheduled Operations		2015	2020	2030
Departures	Start Time	06:00	06:00	05:50
	Peak Number of Operations	**19**	**23**	**28**
Arrivals	Start Time	16:10	16:10	16:10
	Peak Number of Operations	**20**	**22**	**26**
All Operations	Start Time	16:10	16:10	16:10
	Peak Number of Operations	**37**	**38**	**45**

The peak hour operations presented in Table 4-14 only account for scheduled airline service, which is forecast to represent 55.9 percent of annual operations in 2030. During VFR conditions, the hourly capacity of the Airport is 124 operations. During IFR conditions, a considerable amount of nonscheduled activity (such as general aviation) does not operate, by choice. It is estimated that, during IFR conditions in 2030, Class A aircraft activity decreases from 20 percent (in VFR conditions) to 5 percent of hourly demand, as shown in Table 4-10. The Airport capacity with both air carrier runways operating during IFR conditions is 49 operations, or the same as the number with one runway operating because of the intersecting runways. The FAA AC 150/5060-5 capacity charts provide an hourly IFR capacity of approximately 53 operations. **Figure 4-8** illustrates the rolling 60-minute total of scheduled operations for 2030.

Using these hourly capacities as computed by the Airport Capacity Model, and weighted for current percentages of runway use, the ASV for the Airport's three runway layout is approximately 374,000 operations. Over the past 20 years, the number of aircraft operations peaked in 1996 at 261,600 operations, which represents 70 percent of the ASV. The forecast activity level in 2030 would reach 75 percent of the ASV. Therefore, the Airport is well equipped to manage forecast aircraft operations throughout the planning period, as shown in **Table 4-15**.

Table 4-15: Annual Service Volume

	Annual Service Volume		Forecast			
		1996	2010	2015	2020	2030
	374,000	261,600	197,400	229,200	244,700	280,800
Percent of Capacity		70%	53%	61%	65%	75%

Looking specifically at hourly capacity, SAT will be able to accommodate forecast demand with the current runway configuration in VFR conditions through 2030.

As shown on Figure 4-8, 45 scheduled airline aircraft operations would occur in the peak hour, from 16:10 to 17:10. There are four peaks on the graph that represent a 60-minute demand above 35 operations: one peak from 10:30 to 11:30 and three peaks at 15:40, 16:20, and 17:00. This demand is scheduled; unscheduled demand from Class A and Class B aircraft is also accommodated.

Assuming that Class A aircraft account for five percent, scheduled aircraft account for 56 percent, unscheduled business jets account for 18 percent, and all-cargo aircraft account for zero percent of all aircraft operations in the peak hour, 42 scheduled, 13.5 business jet, and 3.5 Class A operations would be accommodated during the peak hour, for a total of 59 aircraft operations. Using the same ratios during nonpeak hours, 35 scheduled, 11 business jet, and 3 Class A aircraft operations would be accommodated, for a total off-peak demand of 49 aircraft operations per hour.

Even at an hourly demand of 45 scheduled and 17 unscheduled operations during IFR operations, the peak hour demand exceeds the capacity of the airfield by about 10 operations per hour. If about half of the arrivals or departures of unscheduled aircraft were to shift their operations by about an hour, demand would equal capacity.

The Airport only operates in IFR conditions approximately 10 percent of the time. Based on the 2030 forecasts, there is insufficient hourly demand to justify adding capacity in the form of an additional runway. Given the small percentage of time that unscheduled demand and IFR conditions would occur during the peak hour in 2030, scheduled demand does not justify the need for a new widely spaced parallel runway throughout the planning period. Unless major changes occur at the Airport, such as an airline initiating service between SAT and a high volume market within the planning period, a new parallel runway will not be planned.

Figure 4-8: 2030 Scheduled Operation Forecast (60 minute rolling average)

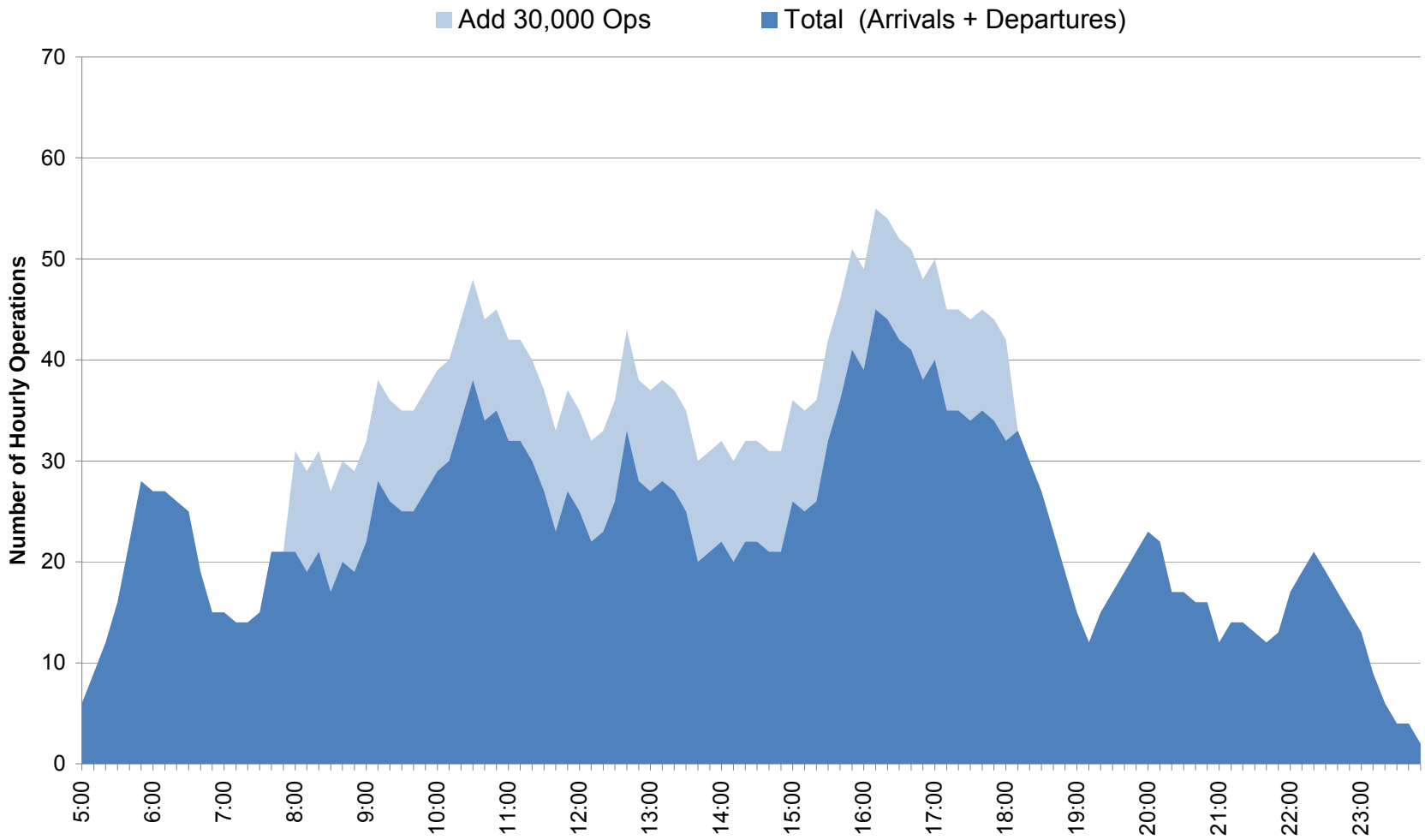
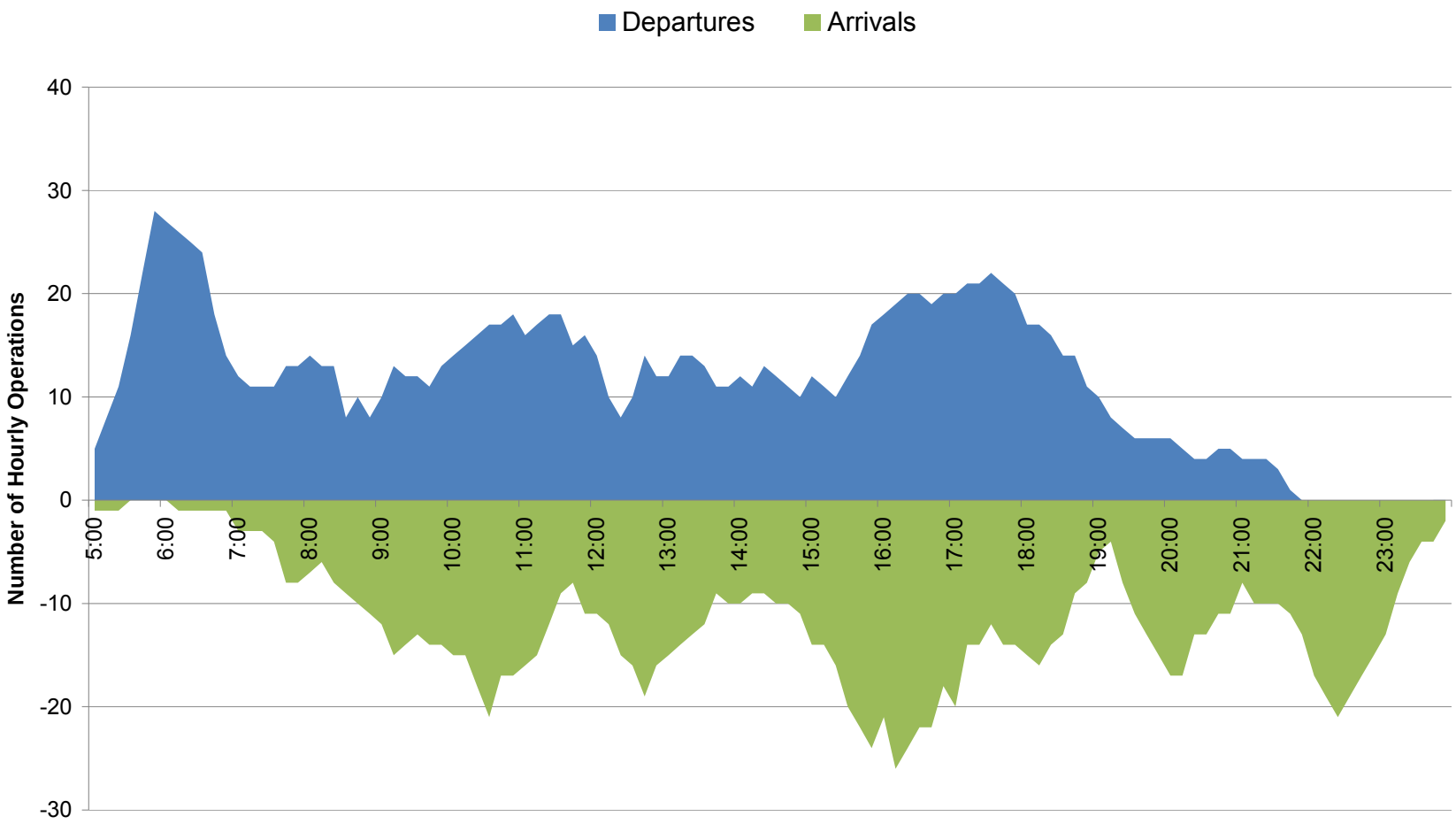


Figure 4-9: 2030 Scheduled Operation Forecast (60 minute rolling average)



4.1.5 Summary of Airfield Requirements

The airfield requirements at SAT over the 20-year planning period are summarized below. These facilities would allow the Airport to accommodate future activity while complying with FAA standards.

- Change design aircraft to B-777 and Airport Reference Code to D-V
- Provide an 11,500-foot-long runway
- Construct shoulders for Runways 12L-30R and 12R-30L
- Construct runway blast pad for the Runway 30R end
- Upgrade runway blast pads for Runway 12R and 12L ends
- Acquire property, create avigation easements for the Runway 3, 12R, and 30L Runway Protection Zones
- Construct high speed exit taxiways, in ideal locations, for Runways 3 and 30L
- Increase separation between taxilane centerline and fixed or movable objects around Terminal 1
- Install CAT I Instrument Landing System on Runway 21 end
- Publish Area Navigation approach for Runway 12L-30R
- Review potential NextGen navigation technology for practical implementation

4.2 PASSENGER TERMINAL FACILITY REQUIREMENTS

The passenger terminal facility requirements for SAT are presented in this section. Terminal facility requirements were established to determine gross space requirements for various functional components of the terminal facilities necessary for efficient future Airport operations.

- Gate Requirements: Future gate requirements were developed based on forecast aircraft operations and the resulting detailed flight schedules. In addition to the four milestone planning years for this Master Plan (2010, 2015, 2020, and 2030), gate requirements were also evaluated for 2050 based on long-term aviation demand forecasts presented in Chapter 3. Future gate requirements were developed for two scenarios: preferential use and common use.

- Passenger Flow Analysis: Based on the Master Plan aviation demand forecasts presented in Chapter 3, detailed flight schedules were developed for the future milestone years, and passenger flow was analyzed; these efforts are described herein. The flight schedules represent passenger airline activity on the ADPM, and the resulting passenger numbers were further refined to represent peak hour passenger activity on the ADPM. These numbers represent the maximum number of people that would travel through the terminal during the Airport's average peak (busiest) period, and serve as the basis for the detailed terminal facility requirements.

- Terminal Facility Requirements: The terminal facility requirements, derived from peak period passenger activity and throughput, were developed for 2010, 2015, 2020, and 2030. The terminal space requirements necessary to accommodate future demand are presented. Peak period demand for the planning years was applied to various terminal functions to assess the future space requirements within the terminals. Baseline terminal space was evaluated and used to identify the need for additional space in critical areas.

San Antonio International Airport provides passenger service at two terminals – existing Terminal 1 (referred to herein as Terminal A) with 16 gates, 4 of which accommodate international flights, and Terminal 2 with 8 gates. Terminal 2 will soon be demolished to provide for the opening of the newly constructed eight-gate Terminal B. Terminals A and B serve as the baseline conditions for the analysis.

Today, the Airport primarily serves domestic passengers, with a small (2.1 percent) amount of international passenger activity. However, a greater percentage of international passengers is forecast for the future, increasing to 6 percent of total passengers in 2030. The terminal area space requirements were, therefore, determined independently for domestic and international passengers, but many terminal functions, such as ticketing, passenger security screening checkpoints, concessions, and holdrooms would be shared by both.

4.2.1 Gate Requirements

Gate requirements are unique to every airport and are influenced by several key factors. Gate demand is often determined by analyzing the total passenger volume, the frequency of flights, and the type of aircraft serving the airport. Determining gate demand is a critical step in the planning process because it is a primary driver of terminal space requirements.

The numbers of gates required for the forecast horizon (2030) as well as for intermediate years (2010, 2015 and 2020) were analyzed.

Gate requirements were assessed by analyzing ADPM flight schedules developed as part of the Master Plan forecasts. As part of the requirements analysis, future schedules were analyzed for forecast years 2015, 2020, and 2030. Gate requirements were assessed using the Gate Model, a planning tool that allocates flights to gates and remote parking positions based on:

- Physical constraints that limit the size and types of aircraft that can park at each position.
- Physical dependencies that may exist between adjacent positions. For example, it was assumed that a widebody aircraft using one of the international gates at Terminal A would prevent the simultaneous use of the adjacent gate.
- Policies and priorities that govern how gates are allocated among various airlines. For example, the City's Airport-airline agreements may grant exclusive or preferential use of specific gates to a particular airline.
- Operational parameters regarding the amount of time typically required for gating and towing operations, and buffer time assumptions. Buffer times are minimum planning allowances between successive gate occupancies, which take into account schedule variations and time required for maneuvering aircraft in and out of the gate.

Gate Model runs were performed to test the gate layout's ability to accommodate each planning schedule. During each run, the model attempts to assign each flight in the schedule to an existing gate. The model can also identify any surplus gate positions that the layout may include. Gates that are not needed to accommodate the schedule, or gates that are not usable by the schedule's aircraft fleet will not have flights assigned to them.

Key assumptions used in the analysis of gate requirements are summarized below:

Flight schedules were developed based on the baseline forecast scenario (please refer to Table 3-31) and represent ADPM activity.

Baseline Airport Facilities:

- Terminal A: 16 contact gates, including 4 international gates (A1, A2, A10, and A11)
- Terminal B: 8 contact gates
- Terminal 2 will have been demolished

Gate Allocations:

For the 2015 analysis, airline-gate allocations were based on current (preferential use) assignments. If an airline's flights could not fit at its gates, the flights were assigned to the

common-use gates in the same terminal. Domestic flights at Terminal A were allowed to use the international gates when/if the gates were not needed by an international flight.

For the 2020 analysis, two scenarios were examined:

- Under Scenario One, it was assumed that airline-gate allocations were based on current (preferential use) gate assignments. If an airline's flights could not fit at its gates, the flights were assigned to the common-use gates in the same terminal. Domestic flights at Terminal A were allowed to use international gates when/if the gates were not needed by an international flight.
- Under Scenario Two, it was assumed that the gates were available to the airlines on a common-use basis. Common-use gate assignments were applied at the terminal level, meaning that only airlines operating in Terminal A were assigned to Terminal A gates, and likewise for Terminal B and future Terminal C. All airlines operating at the Airport were included in the common-use assignments. Foreign-flag airlines were given priority at the four international gates at Terminal A (A1, A2, A10, A11) and other airlines were given the option of using those gates when international flights were not being processed.

For the 2030 analysis, the two scenarios above were examined. An additional assumption was made that international traffic would be relocated to a third terminal.

Specific terminal allocations are provided in **Appendix C**, **Table C-1**.

The results of these analyses are presented in **Table 4-16**. The common-use gate operation under Scenario Two would have a higher gate use rate, and therefore, would reduce overall gate demand. However, for planning purposes, it is recommended that a more conservative gate requirement be accommodated (32 gates by 2030). Gate requirements for 2050 were calculated based on industry standards to ensure that adequate space is reserved for expansion of the terminal area beyond the 2030 planning horizon for this Master Plan.

Table 4-16: Gate Requirements Summary

Scenario 1 - Preferential Use Gates Scenario						
	Existing (2008)	**Estimated Requirements**				
		2010	**2015**	**2020**	**2030**	**2050**
Number of Annual Enplaned Passengers	4,167,000	3,863,000	4,814,000	5,500,000	6,940,000	10,501,000
Number of Passenger Airline Aircraft Operations	96,500	91,200	114,600	126,800	157,000	214,600
Terminal A	16	16	16	17	17	17
Terminal 2	8	8	-	-	-	-
Terminal B	-	-	8	9	9	9
Terminal C	-	-	-	-	6	23
Total Gates	**24**	**24**	**24**	**26**	**32**	**49**
Annual number of passengers per gate	173,625	160,958	200,583	211,538	187,568	214,306
Average number of daily turns per gate	5.5	5.2	6.5	6.7	5.8	6.0
Number of daily turns per gate for an average day in peak month	5.8	5.5	6.9	7.1	6.1	6.4
Scenario 2 - Common Use Gates Scenario						
	Existing (2008)	**Estimated Requirements**				
		2010	**2015**	**2020**	**2030**	**2050**
Number of Annual Enplaned Passengers	4,167,000	3,863,000	4,814,000	5,500,000	6,940,000	10,501,000
Number of Passenger Airline Aircraft Operations	96,500	91,200	114,600	126,800	157,000	214,600
Terminal A	16	16	16	13	15	17
Terminal 2	8	8	-	-	-	-
Terminal B	-	-	8	8	9	9
Terminal C	-	-	-	-	6	17
Total Gates	**24**	**24**	**24**	**21**	**30**	**43**
Annual number of passengers per gate	173,625	160,958	200,583	261,905	231,333	250,024
Average number of daily turns per gate	5.5	5.2	6.5	8.3	7.2	7.0
Number of daily turns per gate for an average day in peak month	5.8	5.5	6.9	8.8	7.5	7.4

Note: It was assumed that common use gates would be implemented by 2020. Therefore, requirements for both scenarios are similar for 2010 and 2015, and gate requirements under Scenario Two in 2020 and beyond decrease as the result of implementing common use gates.

4.2.2 Passenger Flow Analysis

Space requirements for terminal planning are a function of variables unique to the airport. The number and types of airlines, airline schedules and operating characteristics, peaking characteristics, and airport support activities are all important factors in determining space requirements. However, peak hour passenger activity is key in determining most of the minimum space requirements.

SAT's passenger activity is separated into two categories: domestic and international. Similarly, space for each passenger group can be divided into the same categories, with allowances for visitors such as well-wishers and meeters/greeters. Certain important functions and their metrics apply differently to each group, and each terminal space category must be analyzed and sized based on its function.

Tables 4-17, 4-18, 4-19, and **4-20** summarize total annual enplaned and deplaned passengers for Terminals A, B, and future Terminal C in 2008 (existing) and in 2010, 2015, 2020, and 2030. The tables also show ADPM enplaned and deplaned passengers, peak hour domestic and international passengers, and well-wisher and meeter/greeter data. Table 4-20 summarizes estimated passenger activity for all terminals.

Table 4-17: Summary of Passenger Activity at Terminal A

TERMINAL A					
Year	**2008**	**2010**	**2015**	**2020**	**2030**
All Airlines					
Enplaned Passengers	2,900,689	2,729,000	3,455,000	3,927,000	4,162,000
Deplaned Passengers	2,898,927	2,701,000	3,413,000	3,875,000	4,117,000
Annual Total Passengers	5,799,616	5,430,000	6,868,000	7,802,000	8,279,000
Estimated ADPM Enplaned Passengers	8,230	8,193	9,787	10,991	11,439
Estimated ADPM Deplaned Passengers	8,068	8,280	9,880	11,016	11,605
Estimated Peak Hour ADPM Enplaned Passengers	840	823	950	1,123	1,199
Estimated Peak Hour ADPM Deplaned Passengers	893	936	1,210	1,168	1,032
Domestic Passengers	96.9%	97.5%	93.8%	93.3%	100.0%
Enplaned Passengers	2,812,136	2,660,000	3,241,000	3,663,000	4,162,000
Deplaned Passengers	2,810,261	2,632,000	3,199,000	3,611,000	4,117,000
Annual Total Passengers	5,622,397	5,292,000	6,440,000	7,274,000	8,279,000
Estimated ADPM Enplaned Passengers	7,976	7,264	8,677	9,779	11,439
Estimated ADPM Deplaned Passengers	7,830	7,389	8,770	9,872	11,605
Estimated Peak Hour ADPM Enplaned Passengers	840	794	950	1,105	1,199
Estimated Peak Hour ADPM Deplaned Passengers	893	766	891	943	1,032
International Passengers	3.1%	2.5%	6.2%	6.7%	0.0%
Enplaned Passengers	88,553	69,000	214,000	264,000	-
Deplaned Passengers	88,666	69,000	214,000	264,000	-
Annual Total Passengers	177,219	138,000	428,000	528,000	-
Estimated ADPM Enplaned Passengers	254	929	1,110	1,212	-
Estimated ADPM Deplaned Passengers	238	892	1,110	1,144	-
Estimated Peak Hour ADPM Enplaned Passengers	65	161	153	153	-
Estimated Peak Hour ADPM Deplaned Passengers	102	304	319	352	-
Additional Data					
Well Wishers/Peak Hour Enplaned Passengers	362	382	441	503	480
Meeters-Greeters/Peak Hour Deplaned Passengers	497	535	605	647	516

ADPM = Average Day of the Peak Month

Table 4-18: Summary of Passenger Activity at Terminal B

TERMINAL B					
Year	**2008**	**2010**	**2015**	**2020**	**2030**
All Airlines					
Domestic Passengers					
Enplaned Passengers	1,290,386	1,134,000	1,359,000	1,573,000	1,988,000
Deplaned Passengers	1,268,513	1,140,000	1,374,000	1,594,000	2,013,000
Annual Total Passengers	2,558,899	2,274,000	2,733,000	3,167,000	4,001,000
Estimated ADPM Enplaned Passengers	3,744	3,406	3,848	4,403	5,463
Estimated ADPM Deplaned Passengers	3,663	3,497	3,977	4,532	5,674
Estimated Peak Hour ADPM Enplaned Passengers	401	364	401	480	712
Estimated Peak Hour ADPM Deplaned Passengers	402	454	531	664	738
Additional Data					
Well Wishers/Peak Hour Enplaned Passengers	160	146	161	192	285
Meeters-Greeters/Peak Hour Deplaned Passengers	161	181	212	266	295

ADPM = Average Day of the Peak Month

Table 4-19: Summary of Passenger Activity at Future Terminal C

FUTURE TERMINAL C					
Year	**2008**	**2010**	**2015**	**2020**	**2030**
All Airlines					
Enplaned Passengers	-	-	-	-	790,000
Deplaned Passengers	-	-	-	-	771,000
Annual Total Passengers	-	-	-	-	1,561,000
Estimated ADPM Enplaned Passengers	-	-	-	-	2,172
Estimated ADPM Deplaned Passengers	-	-	-	-	2,172
Estimated Peak Hour ADPM Enplaned Passengers	-	-	-	-	322
Estimated Peak Hour ADPM Deplaned Passengers	-	-	-	-	500
Domestic Passengers					50.5%
Enplaned Passengers	-	-	-	-	399,000
Deplaned Passengers	-	-	-	-	380,000
Annual Total Passengers	-	-	-	-	779,000
Estimated ADPM Enplaned Passengers	-	-	-	-	640
Estimated ADPM Deplaned Passengers	-	-	-	-	640
Estimated Peak Hour ADPM Enplaned Passengers	-	-	-	-	70
Estimated Peak Hour ADPM Deplaned Passengers	-	-	-	-	91
International Passengers					49.5%
Enplaned Passengers	-	-	-	-	391,000
Deplaned Passengers	-	-	-	-	391,000
Annual Total Passengers	-	-	-	-	782,000
Estimated ADPM Enplaned Passengers	-	-	-	-	1,532
Estimated ADPM Deplaned Passengers	-	-	-	-	1,532
Estimated Peak Hour ADPM Enplaned Passengers	-	-	-	-	254
Estimated Peak Hour ADPM Deplaned Passengers	-	-	-	-	500
Additional Data					
Well Wishers/Peak Hour Enplaned Passengers	-	-	-	-	28
Meeters-Greeters/Peak Hour Deplaned Passengers	-	-	-	-	46

ADPM = Average Day of the Peak Month

Table 4-20: Summary of Passenger Activity at All Terminals

ALL TERMINALS					
Year	**2008**	**2010**	**2015**	**2020**	**2030**
All Airlines					
Enplaned Passengers	4,191,075	3,863,000	4,814,000	5,500,000	6,940,000
Deplaned Passengers	4,167,440	3,841,000	4,787,000	5,469,000	6,901,000
Annual Total Passengers	8,358,515	7,704,000	9,601,000	10,969,000	13,841,000
Estimated ADPM Enplaned Passengers	11,974	11,599	13,635	15,394	19,074
Estimated ADPM Deplaned Passengers	11,731	11,777	13,857	15,548	19,451
Estimated Peak Hour ADPM Enplaned Passengers	1,228	1,091	1,327	1,548	2,013
Estimated Peak Hour ADPM Deplaned Passengers	1,181	1,289	1,669	1,832	2,239
Domestic Passengers	97.9%	98.2%	95.5%	95.2%	94.4%
Enplaned Passengers	4,102,522	3,794,000	4,600,000	5,236,000	6,549,000
Deplaned Passengers	4,078,774	3,772,000	4,573,000	5,205,000	6,510,000
Annual Total Passengers	8,181,296	7,566,000	9,173,000	10,441,000	13,059,000
Estimated ADPM Enplaned Passengers	11,720	10,670	12,525	14,182	17,542
Estimated ADPM Deplaned Passengers	11,493	10,886	12,747	14,404	17,919
Estimated Peak Hour ADPM Enplaned Passengers	1,241	1,158	1,351	1,585	1,981
Estimated Peak Hour ADPM Deplaned Passengers	1,295	1,220	1,422	1,607	1,860
International Passengers	2.1%	1.8%	4.5%	4.8%	5.6%
Enplaned Passengers	88,553	69,000	214,000	264,000	391,000
Deplaned Passengers	88,666	69,000	214,000	264,000	391,000
Annual Total Passengers	177,219	138,000	428,000	528,000	782,000
Estimated ADPM Enplanes Passengers	254	929	1,110	1,212	1,532
Estimated ADPM Deplaned Passengers	238	892	1,110	1,144	1,532
Estimated Peak Hour ADPM Enplaned Passengers	65	161	153	153	254
Estimated Peak Hour ADPM Deplaned Passengers	102	304	319	352	500
Additional Data					
Well Wishers/Peak Hour Enplaned Passengers	522	528	602	695	792
Meeters-Greeters/Peak Hour Deplaned Passengers	658	717	817	913	856

ADPM = Average Day of the Peak Month

4.2.3 Terminal Planning Metrics

The planning metrics used to determine the terminal facility requirements are defined by each terminal function below. The planning metrics were applied to the individual terminals to determine the space requirements for each.

Airline Processor Areas

Airline processor areas are those in which airline personnel conduct passenger and support functions. At SAT, these areas are leased to airlines on an exclusive use basis. Certain spaces, such as baggage claim areas, are shared by domestic airlines and are calculated as joint-use space. Additionally, four international gates and their associated holdrooms are considered joint-use space. The requirements for these areas are calculated using airline-specific schedule patterns and passenger forecasts.

Agent Positions

Agent positions include staffed ticketing positions, ticket kiosks, and curbside check-in positions. Future agent position requirements are calculated by using an average time for an agent (or kiosk) to process passengers, resulting in a number of passengers processed per ticket counter or kiosk per hour. However, the rates at which passengers are processed vary by the category of passenger being processed. The processing rate is dependent upon a number of criteria, as follows:

- International or domestic service
- Agent position versus kiosk
- Average number of bags checked
- Agent work space
- Online check-in percentage

Airline agents typically process passengers at rates of 30 domestic passengers per hour and 12 international passengers per hour. Most international passengers check more than one bag, thus increasing processing times. Passengers using kiosks are processed at about the same rates, depending on the familiarity of the passenger with the kiosk for the particular airline.

It was assumed that agent positions at SAT will be assigned on an exclusive-use basis except for international and charter flights, which may operate from common-use counters. In addition, the greater general use of online check-in and issuance of boarding passes has improved airline processing times and increased passenger throughput by allowing passengers to bypass ticket counters altogether.

Ticket Counter Length

Ticket counter length, measured in linear feet, varies depending on the type of enplaned passenger. Typically, domestic airlines use double counters sharing a 30-inch baggage well, resulting in a range of 4 to 5 linear feet per counter for standard check-in. While kiosk placement and configuration affect ticket counter length, kiosks have been introduced for airlines already operating with a given ticket counter layout and length. Some kiosks are placed at the ends of counters, or have independent configurations within the area once occupied by passenger queuing. However, most airline kiosks are positioned in line with ticket counters, thus facilitating

the processing of checked baggage. For the purposes of this Master Plan, 5 linear feet per counter was used in calculating domestic ticket counter length.

Ticket Counter Area
The standard depth of domestic ticket counter areas is 10 feet. This dimension includes counters, agent work space, and a continuous baggage takeaway belt running parallel to the counters. Ticket counters used to process international passengers require additional space for individual baggage takeaway belts and scales at each position, with takeaway belts typically connected to a collector belt. For planning purposes, 50 square feet per agent position was used in calculating the ticket counter area requirements.

Ticket Lobby
Ticket lobbies are sized to accommodate peak hour ADPM enplaned passengers, consisting primarily of passengers checking in for a flight. Calculations include areas for queuing, circulation, and for well-wishers joining passengers in the ticket lobby. For planning purposes, a factor of 12 square feet per peak hour ADPM enplaned passenger was used to derive the ticket lobby space requirement.

Airline Ticket Offices
Airline ticket offices (ATOs) are usually located directly behind the ticket counters and provide support for ticketing functions. ATO space is calculated by multiplying the number of peak hour ADPM enplaned passengers by 8 square feet. Spaces for sales, the airline station manager's office, and administrative functions are usually included within this depth, as are break rooms, locker rooms, and storage spaces. Airline requirements and preferences also partially determine the location and amount of space required.

Airline Operations
Airline operations space includes all of the apron level support space for aircraft servicing (baggage handling, fueling, cleaning, etc.) and aircraft crew related support spaces. The demand for operations space is partly a function of the airline's fleet mix, and partly that of individual airline operating policies. A factor of 0.0065 square foot per annual enplaned passenger was used in the calculations of airline operations space.

Outbound Baggage Makeup
It was assumed that Terminal B would have two common use baggage makeup carousels that would be shared among three airlines until 2030. One airline will vacate the terminal in 2030 and the remaining airlines will have exclusive use of each baggage makeup carousel. Since the terrorist attacks in September 2001, passenger baggage at SAT has been screened in the lobbies. However, a new inline baggage screening facility is now under construction, incorporating five explosives detection system (EDS) machines, and a screening and sortation system that will deliver bags to outbound makeup units in both Terminals A and B by late 2010. The amount of space included in the baggage makeup calculations accounts for baggage makeup units, cart/container staging areas, and baggage tug/cart maneuvering lanes. Baggage screening equipment and associated areas are calculated separately. The size of future requirements for baggage makeup areas is based on aircraft type and the volume of peak hour ADPM enplaned passengers. A factor of 20 square feet per peak hour ADPM enplaned passenger for both domestic and foreign-flag airlines was used to calculate the total baggage makeup space requirement. The same factor was used for domestic and foreign-flag airlines

because they operate within a predominantly domestic terminal using the same baggage makeup and screening systems despite the added baggage on international flights.

Baggage Service Offices
It was assumed that, for future requirements, most major airlines will have a baggage service office. While baggage service offices are not required for all airlines, they have been factored in based on those existing in Terminals A and B. The amount of space required is calculated as a function of peak hour ADPM deplaned passengers: domestic – 1.50 square feet per peak hour ADPM deplaned passenger; international – 1.38 square feet per peak hour ADPM deplaned passenger.

Airline Clubs
Airline clubs are exclusive-use membership clubs operated by individual airlines within the terminal area. Additionally, V.I.P. lounges are often provided for First and Business Class passengers. Each airline determines its own need for club/lounge facilities based on the amount of First/Business Class passengers and the level of service the airline wishes to provide for them. The larger foreign-flag airlines typically have dedicated First Class and Business Class lounges.

Currently, one airline club is located in Terminal 2, which is to be demolished. For future planning, airline club space was calculated at 5 square feet for each domestic and international enplaned peak hour ADPM passenger.

Holdrooms
Holdroom requirements are based on the range of aircraft types at gates in each terminal and the average seating capacity of aircraft assigned to each gate. The holdroom area is calculated by providing a lounge area to accommodate 80 percent of the capacity of the largest aircraft type assigned to each gate. It was assumed that 75 percent of the passengers would be seated, requiring 15 square feet per person. The remaining 25 percent of passengers would be standing, requiring 10 square feet per person. Additional space is provided for agent podium positions and passenger queuing area, and also for a deplaning corridor (typically 6 feet wide), which is an extension of the loading bridge door. Occasionally, individual airlines will use unique boarding procedures, such as separating premium passengers from economy passengers, which could require wider enplaning/deplaning corridors. Holdroom requirements per aircraft type are as follows: 2,000 square feet for narrowbody aircraft (e.g., B-737); 3,000 square feet for large narrowbody aircraft (e.g., B-757); and 4,500 square feet for widebody aircraft (e.g., B-767).

On average, the existing holdrooms at Terminal A were designed to accommodate passengers on narrowbody aircraft, and are somewhat undersized for today's large narrowbody and widebody aircraft. The holdrooms in Terminal B are larger and can better accommodate the greater seating requirements of the larger aircraft. In addition, the reduction in numbers of flights by the major airlines in response to the recession that started in 2008 has created much higher load factors of up to 95 percent, and occasionally fully loaded aircraft. However, for planning purposes, it is satisfactory to use an 80 percent load factor, which is an industry standard.

Security

Passenger Security Screening Lanes

The required number of passenger security screening lanes is based on the rate at which the TSA can screen passengers through the checkpoints. On average, 180 passengers per hour are screened per lane. Each lane requires approximately 1,500 square feet to accommodate passenger queues and secondary screening. The number of checkpoints and associated space required varies depending upon the level of service for which the terminal is designed.

Baggage Screening

Space requirements for baggage screening equipment are included under Security, as the baggage screening facility, where bags from both terminals will be screened, is expected to be operational in 2010. Future requirements are calculated by multiplying the number of peak hour ADPM enplaned passengers, domestic and international, by the average number of bags per passenger to determine total baggage volume to be screened during the peak hour. This number is divided by the EDS throughput rate (600 bags per hour) to determine the required number of EDS machines. This number is then factored up to account for redundancy, secondary screening, and baggage resolution. As this baggage screening facility is designed to be common use for all airlines, no factoring is required for airline exclusivity. To account for the area associated with the baggage screening equipment, 2,500 square feet per EDS machine was used.

Baggage Claim

Baggage Claim Area

This area includes existing domestic baggage claim, claim/inspection area, and additional space for growth. Industry standards state that baggage claim areas should be sized at 20 square feet per peak hour ADPM deplaned passenger. This factor provides adequate queuing and circulation space for passengers and their bags within the claim area.

Baggage Claim Frontage

For master planning purposes, the frontage for each baggage claim unit is estimated to be 0.8 linear foot per peak hour ADPM deplaned passenger, which translates to approximately 150 linear feet per claim unit. This planning factor is sufficient to handle the baggage from a large narrowbody (e.g., B-757) aircraft and was used to determine the overall claim frontage for each baggage claim unit assuming an average aircraft size.

Baggage Claim Units

To determine the required number of baggage claim units in each terminal, the bag claim frontage was divided by the recommended baggage claim unit size of 150 linear feet.

Inbound Bag Area

Inbound baggage areas include the inbound baggage feeds for the claim devices, baggage cart circulation, bypass circulation lanes, baggage system support areas, and work areas. A factor of 12 square feet per peak hour ADPM deplaned passenger was applied to allow for adequate spacing for offloading and bypass lanes for bag carts and container dollies.

Customs and Border Protection
The CBP facilities include international baggage claim area, queuing areas, passenger processing areas, inspection rooms, offices, and support areas. The CBP has special space requirements to follow required procedures for inspecting international arriving passengers. An assumed 80 square feet per peak hour ADPM international arriving passenger was used to determine the size of these facilities. However, at the Airport, the existing CBP space within Terminal A has experienced little growth since it was originally constructed as FIS space with protocols for international passenger processing for Immigration and Naturalization Service (INS), U.S. Customs Service, Animal and Plant Health Inspection Service (APHIS), and all required support areas. A full analysis of CBP programming for current and future requirements must be undertaken if the existing FIS space is to transition to meet current CBP standards.

Public Space
Public space at the Airport represents areas to which the public has access and is considered common-use by passengers, employees, and meeters/greeters, well-wishers, and other visitors. These areas include non-revenue-producing areas of the terminal (i.e., queuing areas, seating and waiting areas, restrooms, circulation, and other miscellaneous areas). Many public spaces are sized based on the number of peak hour ADPM passengers, while others are sized based on the overall number of visitors. Departures areas accommodate well-wishers, while domestic and international arrivals areas accommodate meeters/greeters.

Meeter/Greeter Lobby
This area is planned for meeters/greeters waiting for arriving passengers. The lobby space is calculated by multiplying the number of peak hour ADPM deplaned passengers by 3.7 square feet. The meeter/greeter lobby area‘s primary purpose is for arrivals during peak hour passenger movement, occurring only after the arrival of an international flight. The result is that this area will experience periods of heavy congestion followed by periods when the facility is empty.

Restrooms
Restroom spaces are separated into two categories: terminal area (nonsecure) restrooms and concourse (secure) restrooms. Each category is calculated differently based on the people using the facilities. Restrooms within the terminal area are sized for peak hour passengers and their well-wishers. A factor of 4.2 square feet per peak hour ADPM enplaned passenger was used for restrooms in the terminal area and a factor of 5.0 square feet per peak hour ADPM enplaned passenger was used for restrooms in the concourse area.

Secure/Sterile Circulation
Secure circulation is provided by the corridor running the length of each concourse, connecting the security screening checkpoints with the holdrooms and other spaces along the concourse. Space requirements for secure circulation are determined by providing 1,500 square feet per gate.

Sterile circulation is provided by corridors connecting the international arrivals gates to CBP processing areas. Sterile passengers are defined as international arriving passengers that have not yet passed through Customs and Immigration screening. Requirements for sterile corridors are based on the number of peak hour international deplaned passengers multiplied by 25.5 square feet.

Other and Miscellaneous Circulation
Other circulation includes space for corridors, vertical circulation, and other architectural elements within public and secure areas not included in the areas discussed above. This space is sized at 30 percent of the functional areas included within public space. Miscellaneous circulation was added as a contingency, based on a 2.5 percent growth rate.

Concessions

Terminal concessions are defined as revenue-producing commercial businesses that serve the traveling public. Concession areas are categorized as secure and nonsecure, with food/beverage as well as news/gifts/other retail concessionaires located in both secure and nonsecure areas.

Since September 2001, there has been a trend toward locating more concessions within the concourses, mostly due to TSA limitations on beverages passing through passenger security screening checkpoints. Additionally, passengers typically desire to move quickly through security before settling adjacent to their gates to buy food, magazines, gifts, or other retail. However, existing airport space is often limited to retailers because of the relatively narrow corridors and the high level of pedestrian flow during peak periods. There has also been a trend to provide a greater variety of concessions within the terminal area.

Concession Support
Other concession services consist of ATMs, travel agencies, currency exchange, etc. These areas are calculated as a function of the total number of peak hour ADPM enplaned passengers and, therefore, they can be expected to grow with increased passenger activity.

Concession support areas include central preparation and storage of food and beverage offerings, news/gifts and other retail storage, employee locker rooms and break rooms, administrative offices for concessionaires, and loading docks. These areas generally constitute about 20 percent of overall concession space.

Rental Car Counters and Ground Transportation
Future requirements for rental car counters and ground transportation information were calculated at 0.6 square foot per peak hour ADPM deplaned passenger.

4.2.4 Terminal A Requirements

Table 4-21 depicts the space currently provided and required by the domestic and international airlines in Terminal A. Future requirements for the forecast milestone years are also presented in the table. A summary of the baseline facilities and the projected requirements is provided below.

Airline Processor Areas

The baseline agent positions, ticket counter length, ticket counter area, and ATO office space in Terminal A are more than adequate to support forecast demand through the planning period. It was assumed that all ticketing positions currently unavailable will be operational once the baggage screening facility comes online in 2010, when the EDS machines are removed from the lobby. The airline operations space is adequate through 2010; however, requirements are

projected to exceed capacity by 2015. Conversely, the baggage makeup area is slightly less than required by 2010 demand and should be addressed in the immediate planning period. Terminal A does not currently have an airline club; however, potential space for an airline club should be identified for future development.

Holdrooms

The baseline holdroom space in Terminal A is adequate to accommodate forecast demand through 2015, but slightly undersized to accommodate forecast demand in the subsequent planning periods.

Baggage Claim Area

The baseline baggage claim area in Terminal A is significantly undersized, providing about 60 percent of the area recommended for 2010. There are five baggage claim units in Terminal A, with a combined frontage of 784 linear feet. However, two of the claim units, with a combined frontage of 368 linear feet, are located within the CBP area and are available only for international flights. The 2010 forecast demand for domestic claim frontage is approximately 620 linear feet, while the baseline facilities provide 416 linear feet. Additionally, demand for domestic baggage claim units in 2010 requires four units, while only three are provided. These baseline areas are inadequate to accommodate 2010 forecast demand and, therefore, congestion can be observed during peak periods today. The international claim frontage and claim units within the CBP area are adequate through the 2020 planning period. The inbound baggage areas in Terminal A are less than required by 2010 forecast demand and should be expanded as needed. The baggage service office space is adequate through 2010; however, the capacity of each bag claim area function would be exceeded by 2015 and thereafter. The baggage service office space should be expanded based on tenant requirements.

Public Space

The baseline ticket lobby, secure circulation, and other public circulation space is sufficient through the 2030 planning period. However, the meeter/greeter lobby, sterile circulation space, and the terminal area restrooms are undersized and should be expanded. The concourse area restrooms would accommodate forecast demand through 2015; however, they are slightly undersized to accommodate forecast demand beyond 2015.

Table 4-21: Terminal A - Facility Requirements
Domestic and International Airlines

	Terminal A	Forecast Demand			
AIRLINE PROCESSOR AREAS	**Baseline**	**2010**	**2015**	**2020**	**2030**
Agent Positions (number)	58	32	37	42	40
Ticket Counter Length (linear feet)	322	160	185	210	200
Ticket Counter Area (square feet)	3,376	1,600	1,850	2,100	2,000
ATO Offices (square feet)	14,520	7,635	8,825	10,064	9,590
Airline Operations Space (square feet)	18,239	17,739	22,458	25,526	27,053
Baggage Makeup Area (square feet)	15,900	16,034	19,156	22,254	23,976
Airline Clubs (square feet)	-	4,772	5,516	6,290	5,994
Subtotal (square feet)	**52,035**	**47,779**	**57,804**	**66,233**	**68,614**
AIRCRAFT GATES		**2010**	**2015**	**2020**	**2030**
Widebody Aircraft (number)	-	-	-	-	-
Large Narrowbody Aircraft (number)	-	-	-	-	-
Narrowbody Aircraft (number)	16.0	16.0	16.0	17.0	17.0
Subtotal (number)	**16.0**	**16.0**	**16.0**	**17.0**	**17.0**
Equivalent Aircraft (EQA) Index	**22.4**	**22.4**	**22.4**	**23.8**	**23.8**
HOLDROOMS		**2010**	**2015**	**2020**	**2030**
Widebody Aircraft (square feet)	-	-	-	-	-
Large Narrowbody Aircraft (square feet)	-	-	-	-	-
Narrowbody Aircraft (square feet)	32,314	32,000	32,000	34,000	34,000
Subtotal (square feet)	**32,314**	**32,000**	**32,000**	**34,000**	**34,000**
BAGGAGE CLAIM		**2010**	**2015**	**2020**	**2030**
Claim Frontage (linear feet)	784	856	968	1,036	825
Claim Units[1] (number)	5	6	6	7	6
Claim Area (square feet)	12,627	21,411	24,199	25,895	20,634
Baggage Service Offices (square feet)	1,668	1,606	1,815	1,942	1,548
Inbound Bag Area (square feet)	11,141	12,847	14,519	15,537	12,380
Subtotal (square feet)	**25,436**	**35,864**	**40,533**	**43,375**	**34,561**
CBP		**2010**	**2015**	**2020**	**2030**
Customs and Border Protection (FIS) (square feet)	**26,426**	**24,334**	**25,512**	**28,160**	**-**
Subtotal (square feet)	**26,426**	**24,334**	**25,512**	**28,160**	**-**
PUBLIC SPACE		**2010**	**2015**	**2020**	**2030**
Ticket Lobby (includes queuing) (square feet)	16,605	11,453	13,237	15,096	14,386
Meeter/Greeter Lobby (square feet)	1,760	3,548	4,101	4,677	4,457
Restrooms - Terminal Area (square feet)	2,702	3,991	4,613	5,261	5,014
Restrooms - Concourse Area (square feet)	5,675	4,772	5,516	6,290	5,994
Secure Circulation (square feet)	29,510	24,000	24,000	25,500	25,500
Sterile Circulation (square feet)	4,498	7,756	8,132	8,976	-
Other Public Circulation (square feet)	23,681	16,656	17,880	19,740	16,605
Miscellaneous (square feet).	-	2,000	2,050	2,101	2,154
Subtotal (square feet)	**84,431**	**74,176**	**79,529**	**87,641**	**74,109**
CONCESSIONS		**2010**	**2015**	**2020**	**2030**
Ground Transportation Services (square feet)	1,687	642	726	777	619
Concessions: Non-Secure (square feet)	4,594	4,772	5,516	6,290	5,994
Concessions: Secure (square feet)	19,739	21,832	27,640	31,416	33,296
Loading Dock (square feet)	365	365	365	365	365
Concessions Support (square feet)	4,423	5,321	6,631	7,541	7,858
Subtotal (square feet)	30,808	32,932	40,878	46,389	48,132
SECURITY		**2010**	**2015**	**2020**	**2030**
Passenger Screening Lanes (number)	6	6	7	7	7
Passenger Screening Lane Space (square feet)	6,400	9,000	10,500	10,500	10,500
Baggage Screening Space (square feet)	20,700	10,000	10,000	12,500	10,000
Baggage Screening Equipment (EDS)	5	4	4	5	4
Subtotal (square feet)	**27,100**	**19,000**	**20,500**	**23,000**	**20,500**
OTHER		**2010**	**2015**	**2020**	**2030**
Non-Public Circulation (square feet)	15,384	16,922	18,615	20,476	22,524
Airport Maintenance (square feet)	-	2,000	2,200	2,420	2,662
Airport Administration (square feet)	22,811	25,092	27,601	30,361	33,398
TSA Administration (square feet)	977	1,075	1,182	1,300	1,430
Mechanical/Electrical/Utility (square feet)	42,568	46,825	51,507	56,658	62,324
Janitorial/Storage/Shops (square feet)	-	2,000	2,200	2,420	2,662
Non-Airline Tenant (square feet)	-	-	-	-	-
Unidentified Areas (square feet)	10,642	-	-	-	-
Structure/non-net areas (square feet)	6,695	7,365	8,101	8,911	9,802
Subtotal (square feet)	**99,077**	**101,279**	**111,406**	**122,547**	**134,802**
Total Square Footage	**377,627**	**367,364**	**408,162**	**451,346**	**414,717**
Total Square Footage (Rounded)	**378,000**	**367,000**	**408,000**	**451,000**	**415,000**

[1] Two baggage claim units are located within the FIS and unavailable to domestic passengers.
ATO = Airline Ticket Office
EDS = Explosives detection system
FIS = Federal Inspection Services

Concessions

The baseline concessions space in Terminal A is generally adequate to accommodate forecast demand in 2010, but falls short in future planning years. Rental car counters and ground transportation functions have been grouped together in Terminal A, near the baggage claim facilities on the arrivals level. Currently, five staffed rental car counters are located in Terminal A and each has access to small supplemental offices immediately behind the counters. The ground transportation services area and the existing loading dock are sufficient through the 2030 planning period. The secure concessions, nonsecure concessions, and concessions support areas are inadequate to accommodate 2010 demand and should be expanded as needed.

Security

The passenger security screening area in Terminal A consists of a single checkpoint with six lanes; each lane provides approximately 1,280 square feet for queuing. While the necessary screening equipment and secondary screening are provided, the queuing space is constrained during peak periods. However, physical constraints prevent other solutions that would provide the necessary passenger throughput; therefore, the queuing area is congested, and passengers are backed up into the general circulation area. A second checkpoint was considered as an expansion option, wherein the current constraints would be mitigated by adding a link connecting to another portion of the concourse.

It was assumed in determining the baseline baggage screening space and baggage screening equipment that the inline baggage screening system will be operational in 2010. The baseline baggage screening area capacity surpasses demand in all planning periods and provides adequate space for expansion to accommodate unforeseen TSA requirements. Baseline baggage screening equipment will accommodate demand through 2020, and demand is forecast to decrease by one unit in 2030, reflecting the added capacity to be provided by future Terminal C.

4.2.5 Terminal B Requirements

Table 4-22 depicts existing conditions and future requirements for the domestic airlines and support service areas in Terminal B. Future requirements for the forecast milestone years are also presented in the table. A summary of the baseline facilities and the projected requirements for each terminal function is provided below.

Airline Processor Areas

The baseline agent positions, ticket counter length, ticket counter area, and ATO space in Terminal B are adequate to accommodate demand through the 2030 planning period. The baseline airline operations space in Terminal B is sufficient to accommodate forecast demand through 2020. The airline club space is adequate through 2020; however, additional club space should be identified in the interim should one or more airlines express interest in offering such amenities.

Holdrooms

The baseline holdroom space in Terminal B is undersized to accommodate the projected aircraft fleet mix and additional space should be considered to prevent passengers from impeding passenger flows in the secure circulation areas.

Baggage Claim Area

The overall baggage claim area in Terminal B should be adequate to accommodate demand through 2030. The baseline baggage claim area is sufficient through the 2015 planning period. The linear claim frontage capacity is adequate until 2015 and exceeded thereafter. There are three bag claim units in Terminal B, which is adequate to accommodate forecast demand through 2015. The inbound bag area is more than sufficient to accommodate demand through the entire planning period.

Customs and Border Protection Space

It was assumed that all international aircraft operations will be processed in Terminal A.

Public Space

The meeter/greeter lobby, terminal area restrooms, concourse area restrooms, and other public circulation areas are adequate to accommodate demand through the 2030 planning period. The baseline ticket lobby and the secure circulation areas are sufficient to accommodate demand through 2015, but their capacities would be exceeded in 2020 and 2030.

Table 4-22: Terminal B - Facility Requirements

	Terminal B	Forecast Demand			
AIRLINE PROCESSOR AREAS	**Baseline**	**2010**	**2015**	**2020**	**2030**
Agent Positions (number)	26	12	13	16	24
Ticket Counter Length (linear feet)	107	60	65	80	120
Ticket Counter Area (square feet)	1,616	600	650	800	1,200
ATO Offices (square feet)	4,386	2,916	3,211	3,839	5,699
Airline Operations Space (square feet)	12,115	7,371	8,834	10,225	12,922
Baggage Makeup Area (square feet)	12,027	7,289	8,027	9,599	14,248
Airline Clubs (square feet)	2,510	1,822	2,007	2,400	3,562
Subtotal (square feet)	**32,654**	**19,998**	**22,728**	**26,862**	**37,630**
AIRCRAFT GATES		**2010**	**2015**	**2020**	**2030**
Widebody Aircraft (number)	-	-	-	-	-
Large Narrowbody Aircraft (number)	4.0	4.0	4.0	4.0	4.0
Narrowbody Aircraft (number)	4.0	4.0	4.0	4.0	4.0
Subtotal (number)	**8.0**	**8.0**	**8.0**	**8.0**	**8.0**
Equivalent Aircraft (EQA) Index	**13.6**	**13.6**	**13.6**	**13.6**	**13.6**
HOLDROOMS		**2010**	**2015**	**2020**	**2030**
Widebody Aircraft (square feet)	-	-	-	-	-
Large Narrowbody Aircraft (square feet)	7,668	12,000	12,000	12,000	12,000
Narrowbody Aircraft (square feet)	7,670	8,000	8,000	8,000	8,000
Subtotal (square feet)	**15,338**	**20,000**	**20,000**	**20,000**	**20,000**
BAGGAGE CLAIM		**2010**	**2015**	**2020**	**2030**
Claim Frontage (linear feet)	425	363	425	531	590
Claim Units[1] (number)	3	2	3	4	4
Claim Area (square feet)	12,224	9,071	10,619	13,279	14,752
Baggage Service Offices (square feet)	1,124	680	796	996	1,106
Inbound Bag Area (square feet)	16,353	5,443	6,371	7,967	8,851
Subtotal (square feet)	**29,701**	**15,194**	**17,786**	**22,242**	**24,710**
CBP		**2010**	**2015**	**2020**	**2030**
Customs and Border Protection (FIS) (square feet)	-	-	-	-	-
Subtotal (square feet)	-	-	-	-	-
PUBLIC SPACE		**2010**	**2015**	**2020**	**2030**
Ticket Lobby (includes queuing) (square feet)	5,248	4,373	4,816	5,759	8,549
Meeter/Greeter Lobby (square feet)	3,243	1,355	1,492	1,784	2,648
Restrooms - Terminal Area (square feet)	2,753	1,524	1,678	2,007	2,979
Restrooms - Concourse Area (square feet)	3,750	1,822	2,007	2,400	3,562
Secure Circulation (square feet)	13,373	12,000	12,000	12,000	12,000
Sterile Circulation (square feet)	-	-	-	-	-
Other Public Circulation (square feet)	48,135	6,322	6,598	7,185	8,921
Miscellaneous (square feet).	-	2,000	2,050	2,101	2,154
Subtotal (square feet)	**76,502**	**29,397**	**30,641**	**33,236**	**40,813**
CONCESSIONS		**2010**	**2015**	**2020**	**2030**
Ground Transportation Services (square feet)	800	272	319	398	443
Concessions: Non-Secure (square feet)	826	1,822	2,007	2,400	3,562
Concessions: Secure (square feet)	14,442	9,072	10,872	12,584	15,904
Loading Dock (square feet)	-	365	365	365	365
Concessions Support (square feet)	4,356	2,724	3,220	3,746	4,866
Subtotal (square feet)	**20,424**	**14,255**	**16,782**	**19,493**	**25,140**
SECURITY		**2010**	**2015**	**2020**	**2030**
Passenger Screening Lanes (number)	3	3	3	3	4
Passenger Screening Lane Space (square feet)	9,228	4,500	4,500	4,500	6,000
Baggage Screening Space (square feet)	-	-	-	-	-
Baggage Screening Equipment (EDS)	-	-	-	-	-
Subtotal (square feet)	**9,228**	**4,500**	**4,500**	**4,500**	**6,000**
OTHER		**2010**	**2015**	**2020**	**2030**
Non-Public Circulation (square feet)	15,387	16,926	18,618	20,480	22,528
Airport Maintenance (square feet)	-	2,000	2,200	2,420	2,662
Airport Administration (square feet)	12,669	13,936	15,329	16,862	18,549
TSA Administration (square feet)	1,790	1,969	2,166	2,382	2,621
Mechanical/Electrical/Utility (square feet)	-	-	-	-	-
Janitorial/Storage/Shops (square feet)	-	2,000	2,200	2,420	2,662
Non-Airline Tenant (square feet)	3,016	-	-	-	-
Unidentified Areas (square feet)	-	-	-	-	-
Structure/non-net areas (square feet)	42,103	46,313	50,945	56,039	61,643
Subtotal (square feet)	**74,965**	**83,144**	**91,458**	**100,604**	**110,665**
Total Square Footage	**258,812**	**186,487**	**203,896**	**226,937**	**264,958**
Total Square Footage (Rounded)	**259,000**	**186,000**	**204,000**	**227,000**	**265,000**

[1] Baggage screening will be accommodated in Terminal A
[2] Baggage screening equipment will be accommodated in Terminal A
ATO = Airline Ticket Office
EDS = Explosives detection system
FIS = Federal Inspection Services

Concessions

The secure concessions and concessions support areas are sufficient to accommodate the forecast demand through the planning period. However, the nonsecure concessions capacity is approximately half of what is recommended for 2010 and, as such, should be expanded.

Security

The overall security functions in Terminal B are adequate to accommodate forecast demand throughout the 2030 planning period. Terminal B has three passenger screening lanes and approximately 9,200 square feet for passenger screening lane space. The screening space includes passenger queuing and a small TSA support area. There is adequate space for an additional screening lane once demand exceeds capacity in 2030.

All baggage screening processes will be accommodated in Terminal A; therefore, baggage screening space and baggage screening equipment are not required in Terminal B.

4.2.6 Future Terminal C – Preliminary Requirements

Table 4-23 presents the preliminary facility requirements for future Terminal C based on the peak hour passenger activity forecast. The same planning metrics were applied to future Terminal C as were applied to Terminals A and B.

Table 4-23: Future Terminal C Space Program Requirements

	Terminal C	Forecast Demand			
AIRLINE PROCESSOR AREAS	**Baseline**	**2010**	**2015**	**2020**	**2030**
Agent Positions (number)	-	-	-	-	11
Ticket Counter Length (linear feet)	-	-	-	-	55
Ticket Counter Area (square feet)	-	-	-	-	550
ATO Offices (square feet)	-	-	-	-	2,592
Airline Operations Space (square feet)	-	-	-	-	2,594
Baggage Makeup Area (square feet)	-	-	-	-	6,480
Airline Clubs (square feet)	-	-	-	-	1,620
Subtotal (square feet)	**-**	**-**	**-**	**-**	**13,835**
AIRCRAFT GATES		**2010**	**2015**	**2020**	**2030**
Widebody Aircraft (number)	-	-	-	-	-
Large Narrowbody Aircraft (number)	-	-	-	-	-
Narrowbody Aircraft (number)	-	-	-	-	6.0
Subtotal (number)	**-**	**-**	**-**	**-**	**6.0**
Equivalent Aircraft (EQA) Index	**-**	**-**	**-**	**-**	**8.4**
HOLDROOMS		**2010**	**2015**	**2020**	**2030**
Widebody Aircraft (square feet)	-	-	-	-	-
Large Narrowbody Aircraft (square feet)	-	-	-	-	-
Narrowbody Aircraft (square feet)	-	-	-	-	12,000
Subtotal (square feet)	**-**	**-**	**-**	**-**	**12,000**
BAGGAGE CLAIM		**2010**	**2015**	**2020**	**2030**
Claim Frontage (linear feet)	-	-	-	-	473
Claim Units[1] (number)	-	-	-	-	3
Claim Area (square feet)	-	-	-	-	11,820
Baggage Service Offices (square feet)	-	-	-	-	886
Inbound Bag Area (square feet)	-	-	-	-	7,092
Subtotal (square feet)	**-**	**-**	**-**	**-**	**19,798**
CBP		**2010**	**2015**	**2020**	**2030**
Customs and Border Protection (FIS) (square feet)	-	-	-	-	40,000
Subtotal (square feet)	**-**	**-**	**-**	**-**	**40,000**
PUBLIC SPACE		**2010**	**2015**	**2020**	**2030**
Ticket Lobby (includes queuing) (square feet)	-	-	-	-	3,888
Meeter/Greeter Lobby (square feet)	-	-	-	-	1,204
Restrooms - Terminal Area (square feet)	-	-	-	-	1,355
Restrooms - Concourse Area (square feet)	-	-	-	-	1,620
Secure Circulation (square feet)	-	-	-	-	9,000
Sterile Circulation (square feet)	-	-	-	-	12,750
Other Public Circulation (square feet)	-	-	-	-	5,120
Miscellaneous (square feet).	-	-	-	-	2,000
Subtotal (square feet)	**-**	**-**	**-**	**-**	**36,937**
CONCESSIONS		**2010**	**2015**	**2020**	**2030**
Ground Transportation Services (square feet)	-	-	-	-	355
Concessions: Non-Secure (square feet)	-	-	-	-	1,620
Concessions: Secure (square feet)	-	-	-	-	3,192
Loading Dock (square feet)	-	-	-	-	365
Concessions Support (square feet)	-	-	-	-	1,203
Subtotal (square feet)	**-**	**-**	**-**	**-**	**6,735**
SECURITY		**2010**	**2015**	**2020**	**2030**
Passenger Screening Lanes (number)	-	-	-	-	2
Passenger Screening Lane Space (square feet)	-	-	-	-	3,000
Baggage Screening Space (square feet)	-	-	-	-	5,000
Baggage Screening Equipment (EDS)	-	-	-	-	2
Subtotal (square feet)	**-**	**-**	**-**	**-**	**8,000**
OTHER [1]		**2010**	**2015**	**2020**	**2030**
Non-Public Circulation (square feet)	-	-	-	-	17,000
Airport Maintenance (square feet)	-	-	-	-	1,750
Airport Administration (square feet)	-	-	-	-	10,000
TSA Administration (square feet)	-	-	-	-	2,000
Mechanical/Electrical/Utility (square feet)	-	-	-	-	21,000
Janitorial/Storage/Shops (square feet)	-	-	-	-	2,000
Non-Airline Tenant (square feet)	-	-	-	-	1,000
Unidentified Areas (square feet)	-	-	-	-	-
Structure/non-net areas (square feet)	-	-	-	-	13,500
Subtotal (square feet)	**-**	**-**	**-**	**-**	**68,250**
Total Square Footage	**-**	**-**	**-**	**-**	**205,555**
Total Square Footage (Rounded)	**-**	**-**	**-**	**-**	**206,000**

[1] "Other" areas are estimated.
ATO = Airline Ticket Office
EDS = Explosives detection system
FIS = Federal Inspection Services

4.2.7 Remain Overnight Parking Position Requirements

The requirements for remain overnight aircraft parking positions are summarized in **Table 4-24**. RON aircraft cannot be accommodated at the terminal gates because those gates are already occupied by aircraft. RON aircraft typically require hardstand apron positions at or near the terminal building. The number of aircraft RON positions needed to accommodate forecast demand is projected to increase from 19 in 2010 to 28 in 2030 under the preferential use scenario. Under the common use scenario, 30 RON positions would be required in 2030. Requirements are higher in the common use scenario because fewer contact gates would be provided and, therefore, fewer overnight aircraft would be able to be parked at the terminal.

It is recommended that the preferential use scenario be used for planning purposes to ensure consistency with the gate requirements.

Table 4-24: Remain Overnight Parking Position Requirements

Scenario 1 - Preferential Use Scenario					
	Existing (2008)	**Estimated Requirements**			
		2010	**2015**	**2020**	**2030**
Remain Overnight Positions	**23**	**19**	**19**	**26**	**28**
ADG II (Small jet, turboprop)	6	3	3	4	3
ADG III (B-737, MD-80)	12	16	16	22	25
ADG IV (B-767)	5	0	0	0	0
Scenario 2 – Common Use Scenario					
	Existing (2008)	**Estimated Requirements**			
		2010	**2015**	**2020**	**2030**
Remain Overnight Positions	**23**	**19**	**19**	**30**	**30**
ADG II (Small jet, turboprop)	6	3	3	3	4
ADG III (B-737, MD-80)	12	16	16	27	26
ADG IV (B-767)	5	0	0	0	0

Note: It was assumed that, by 2020, these parking positions would be common use. Therefore, requirements for both scenarios are similar in 2010 and 2015, but differ by 2020.

4.2.8 Summary of Terminal Requirements

As passenger numbers increase, the need for additional terminal space increases. On the basis of factors such as peak hour ADPM passenger numbers, facility requirements at SAT increase in proportion with growth in numbers of passengers, both domestic and international. The current development of Terminal B to replace the aging and constrained Terminal 2 accommodates the Airport's need for additional space during the next decade. Also, the construction of an additional gate at both Terminals A and B delays the need for an additional terminal. By 2020, the capacity of those terminals will be insufficient to accommodate increasing gate demand. The construction of future Terminal C should provide six additional gates as well as additional space for domestic airline functions. It is recommended that the City begin to expand the terminal complex between 2015 and 2020 to keep pace with forecast demand. The expansion could be phased to accommodate the required gates and support functions as needed if full buildout is not feasible during the planning period for this Master Plan.

4.3 LANDSIDE FACILITY AND GROUND ACCESS REQUIREMENTS

The landside facility requirements to accommodate forecast demand were evaluated through the planning period. The facilities include roadways, curbs, parking, and other public transportation related facilities.

4.3.1 Roadways

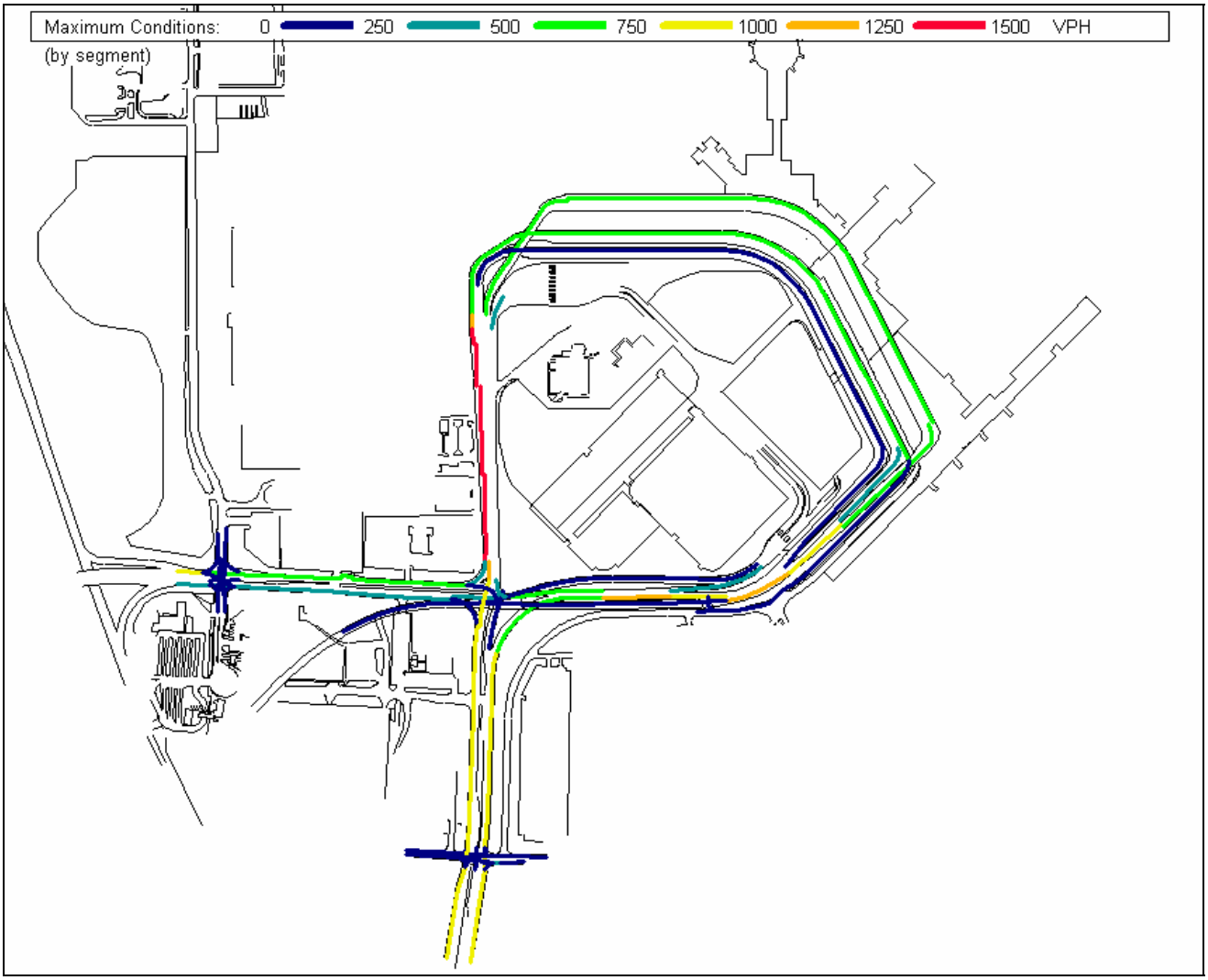
To evaluate future terminal area roadway demand and required capacities, simulation models were developed, using Mobility Analysis and Simulation Tools (MAST). The baseline model, representing the facilities that will be available after completion of the current construction program, was based on a flight schedule representing ADPM conditions and compared with the surveyed traffic conditions in July 2009. Generally, agreement was obtained between the actual and simulated traffic volumes for the baseline case, with the exception of the areas where new roadways and curbs will provide different routing of traffic to Terminal B compared with the current traffic routed to Terminal 2. The specific input assumptions and calibration results for the baseline model are provided in **Appendix D**.

Models were also developed for future years 2015, 2020, and 2030, building upon the baseline model and applying escalated demands associated with the forecast increases in passengers and related employee and other traffic.

In summary, the planned roadway improvements, currently under construction, will effectively accommodate forecast demand through 2030 conditions. **Figures 4-10** through **4-21** show the results of the peak hour demand, demand to capacity ratio, and LOS assessments for baseline conditions and for the three milestone years.

The capacity and LOS methodologies are also provided in the appendix. The results are color-coded by roadway segment, with the key shown at the top of each figure. For the baseline and the 2015 and 2020 cases, airside activity was assumed to be accommodated at Terminals A and B, while for the 2030 case, the addition of future Terminal C was assumed, with some of the curb activity extended to the Terminal C area. For the 2020 and 2030 cases, the departures curb roadways at Terminals A and B show operations at LOS F, based on the density of vehicles being greater than the criterion of 45 vehicles per lane-mile in the available through lanes. This criterion is currently used in the MAST software, which considers the amount of double parking expected. However, later research indicates that higher densities by LOS at lower speeds may be acceptable, which would result in LOS D or E. These higher densities indicate congestion, but a demand to capacity ratio less than 100 percent indicates that upstream queues are not likely to develop.

Figure 4-10: Baseline Model Results
Peak Hour Demand



Note:
VPH = Vehicle per hour

Figure 4-11: Baseline Model Peak Hour Results
Demand to Capacity Ratio

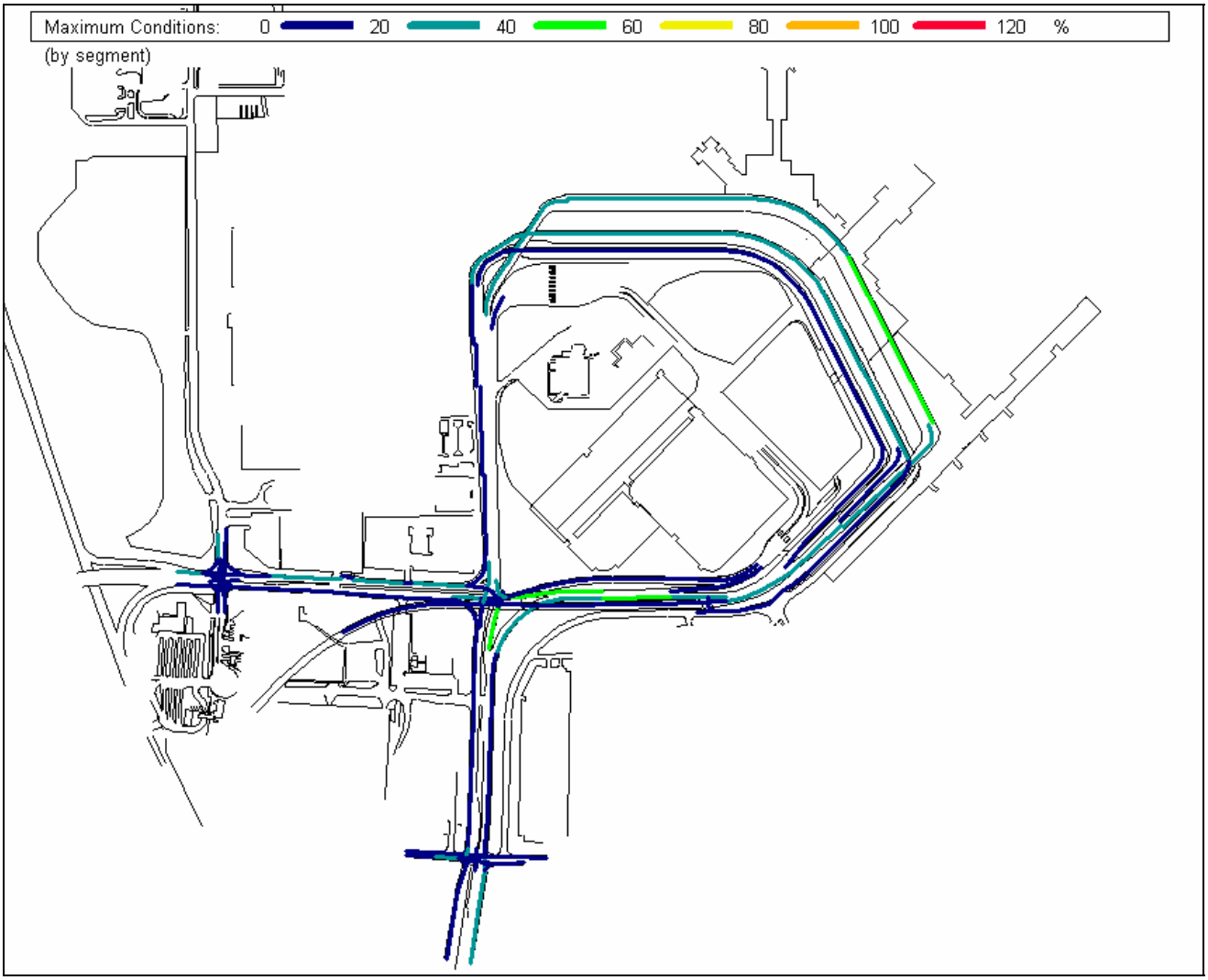


Figure 4-12: Baseline Model Peak Hour Results
Level of Service Assessment

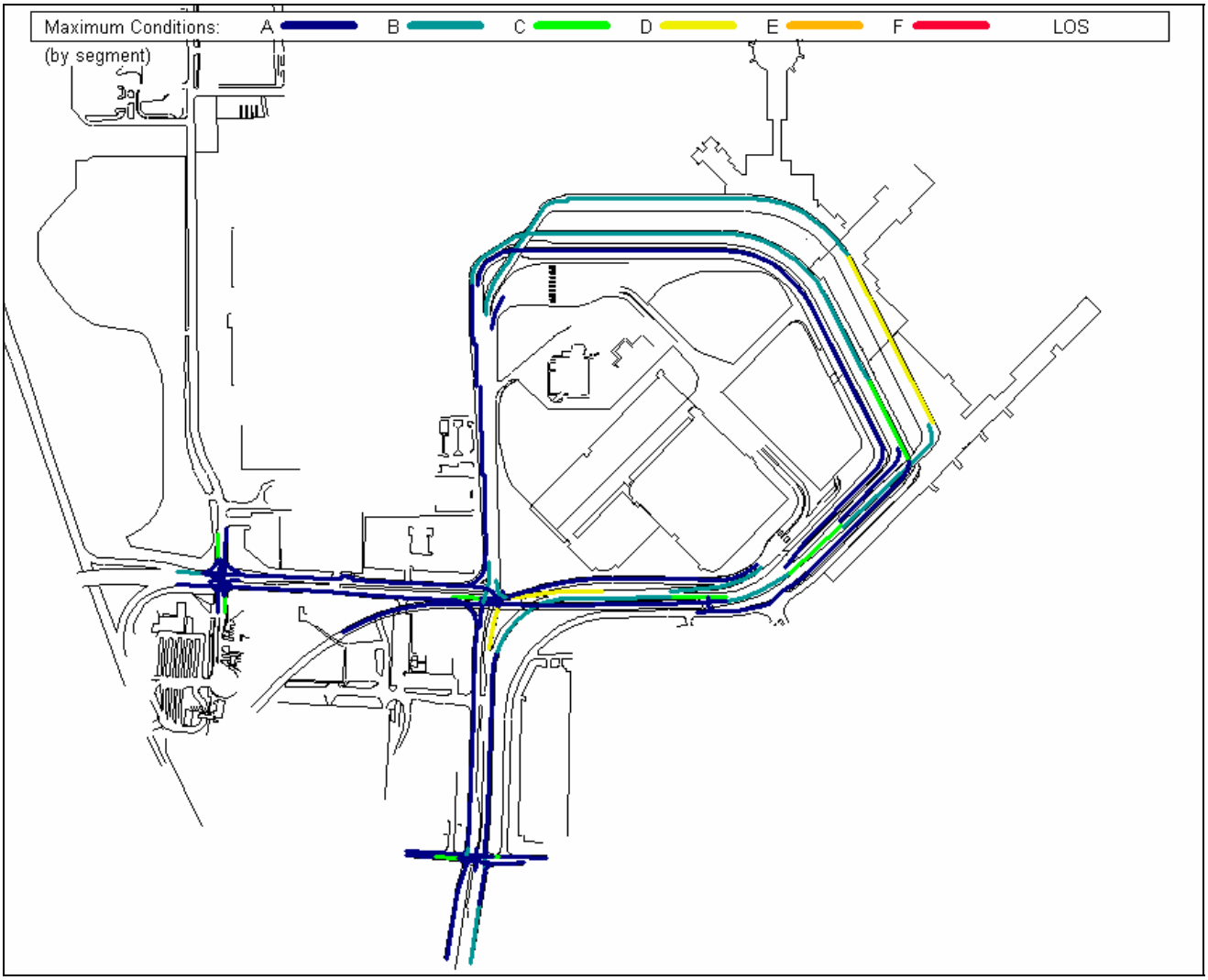


Figure 4-13: Projected 2015 Model Results
Peak Hour Demand

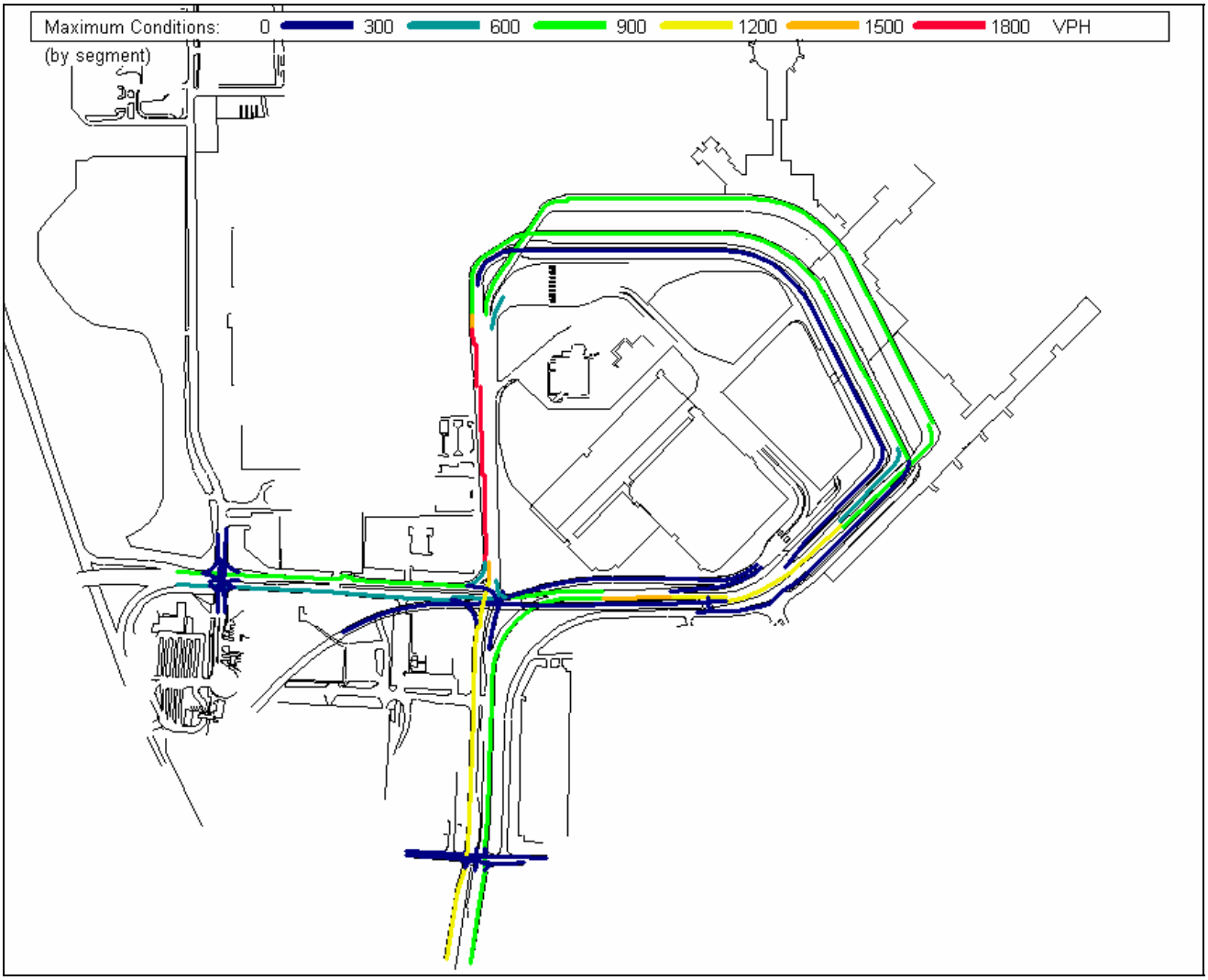


Figure 4-14: Projected 2015 Model Peak Hour Results
Demand to Capacity Ratio

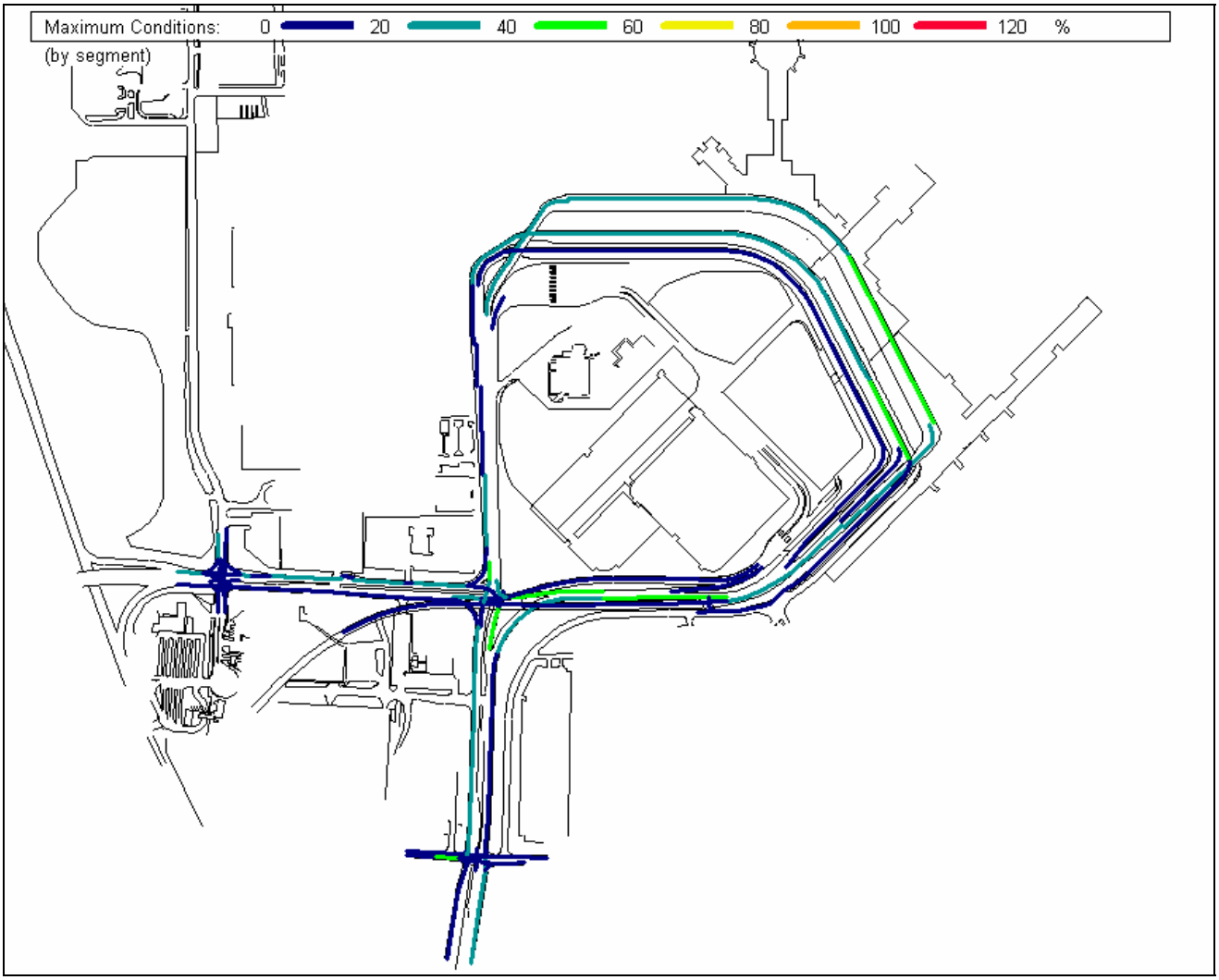


Figure 4-15: Projected 2015 Model Peak Hour Results
Level of Service Assessment

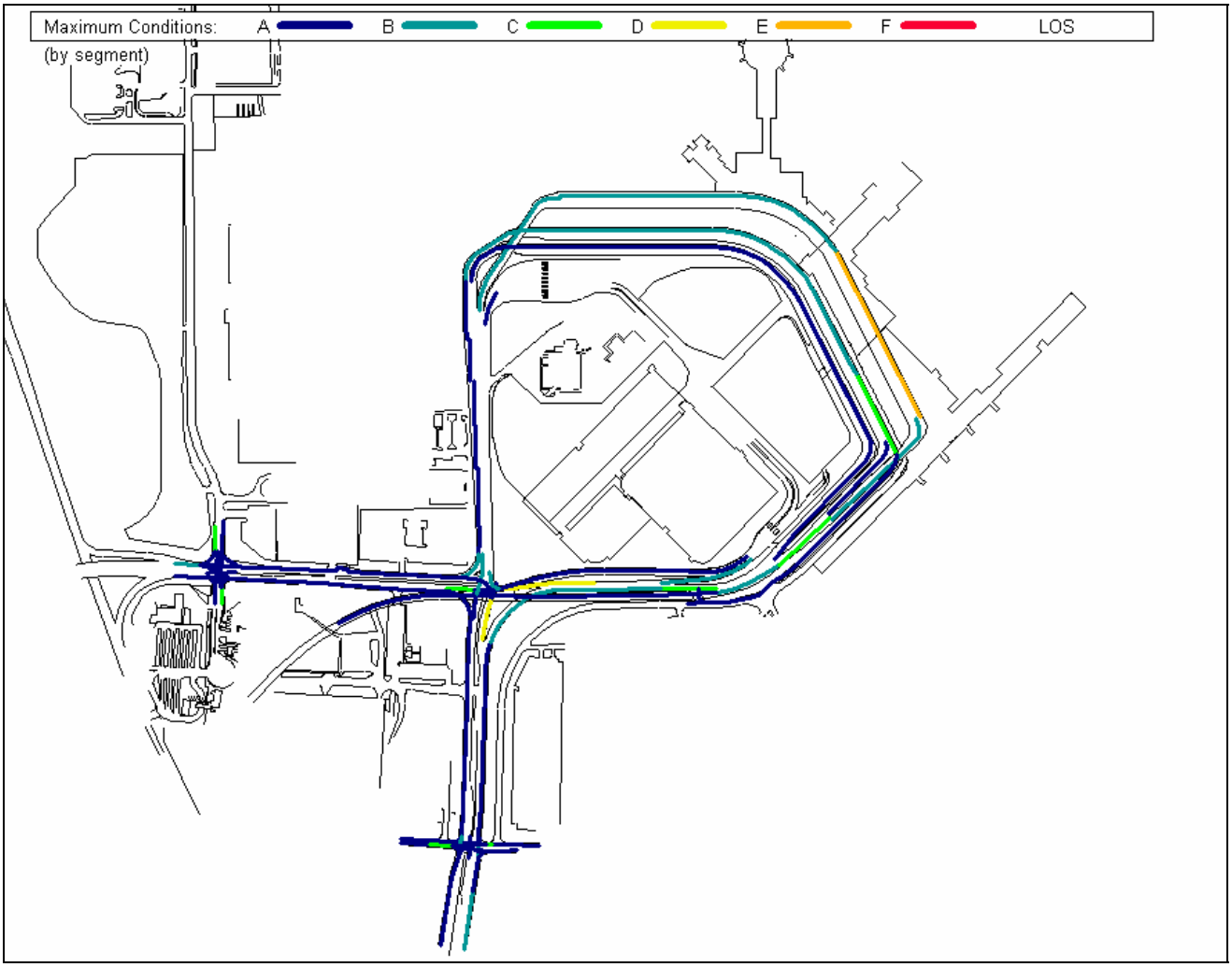
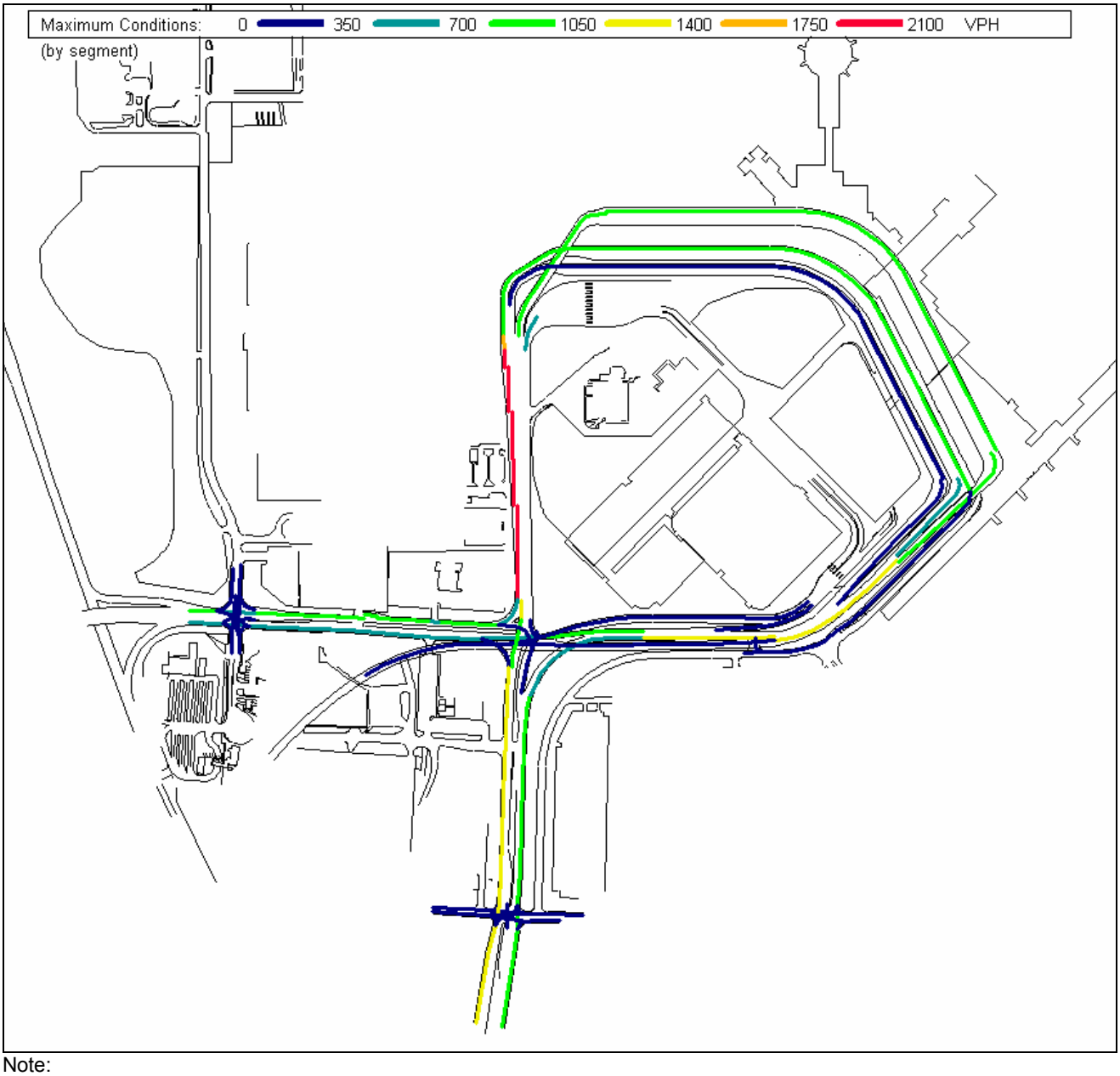


Figure 4-16: Projected 2020 Model Results
Peak Hour Demand



Note:
VPH = Vehicle per hour

Figure 4-17: Projected 2020 Model Peak Hour Results
Demand to Capacity Ratio

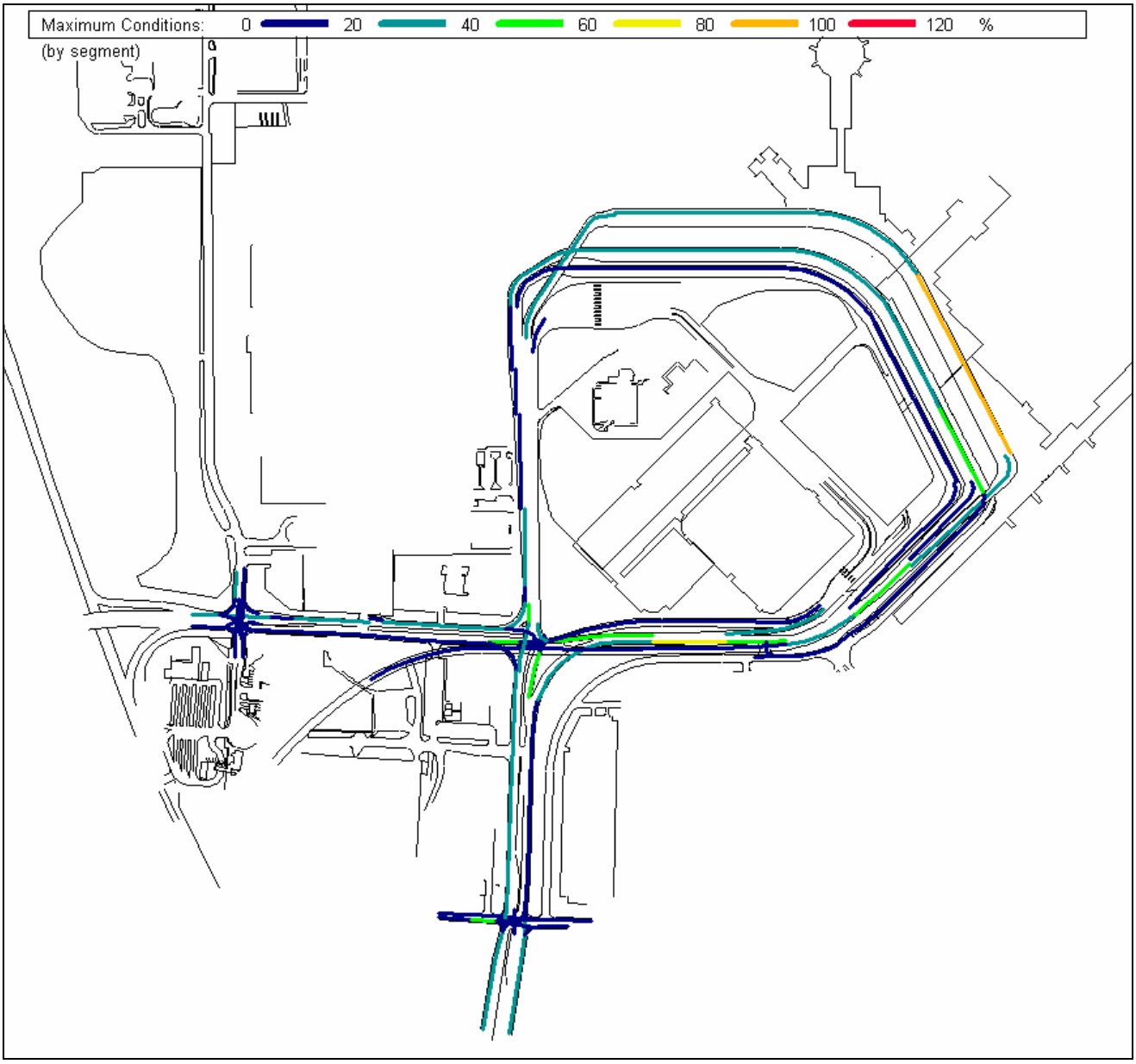


Figure 4-18: Projected 2020 Model Peak Hour Results
Level of Service Assessment

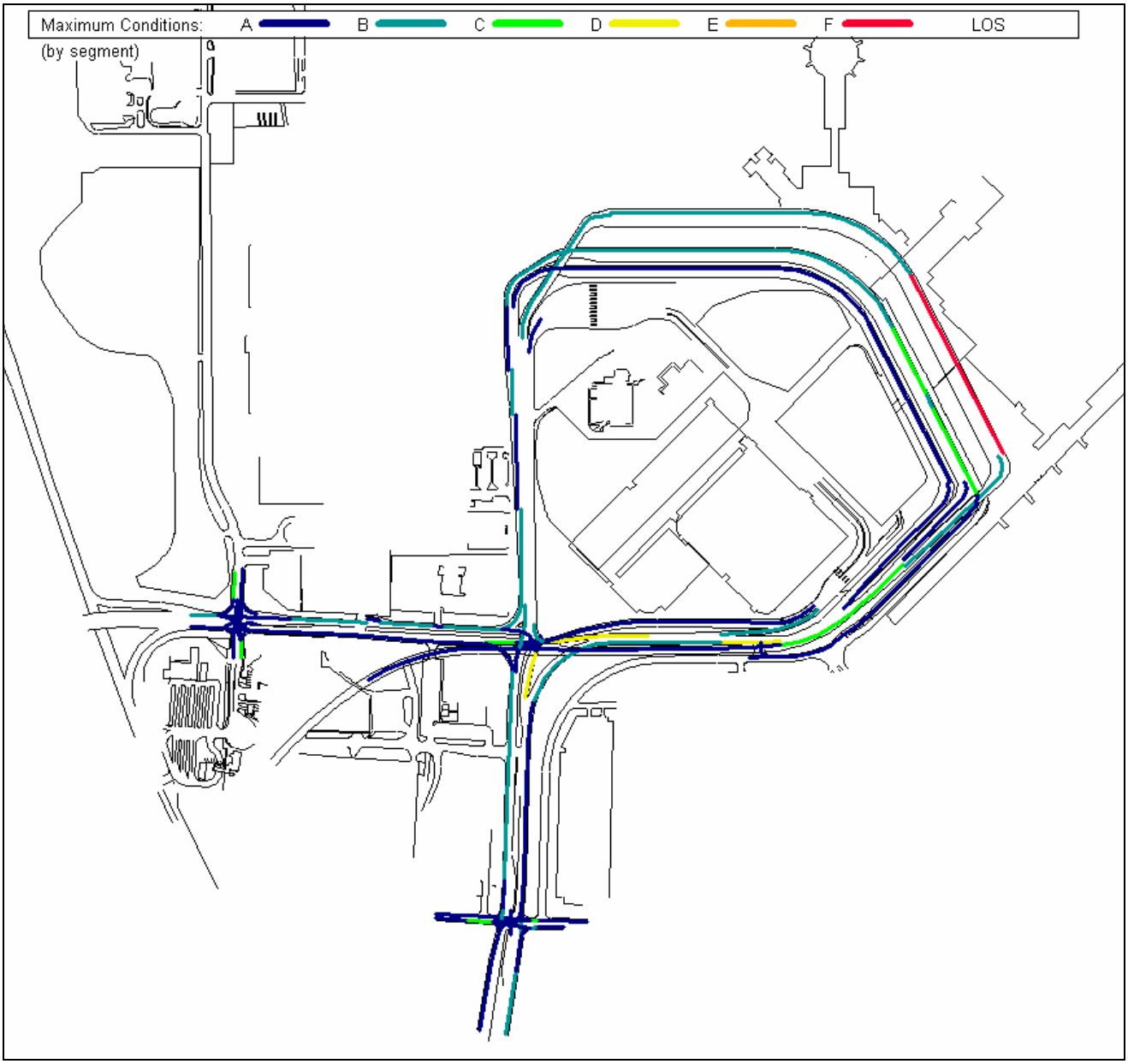
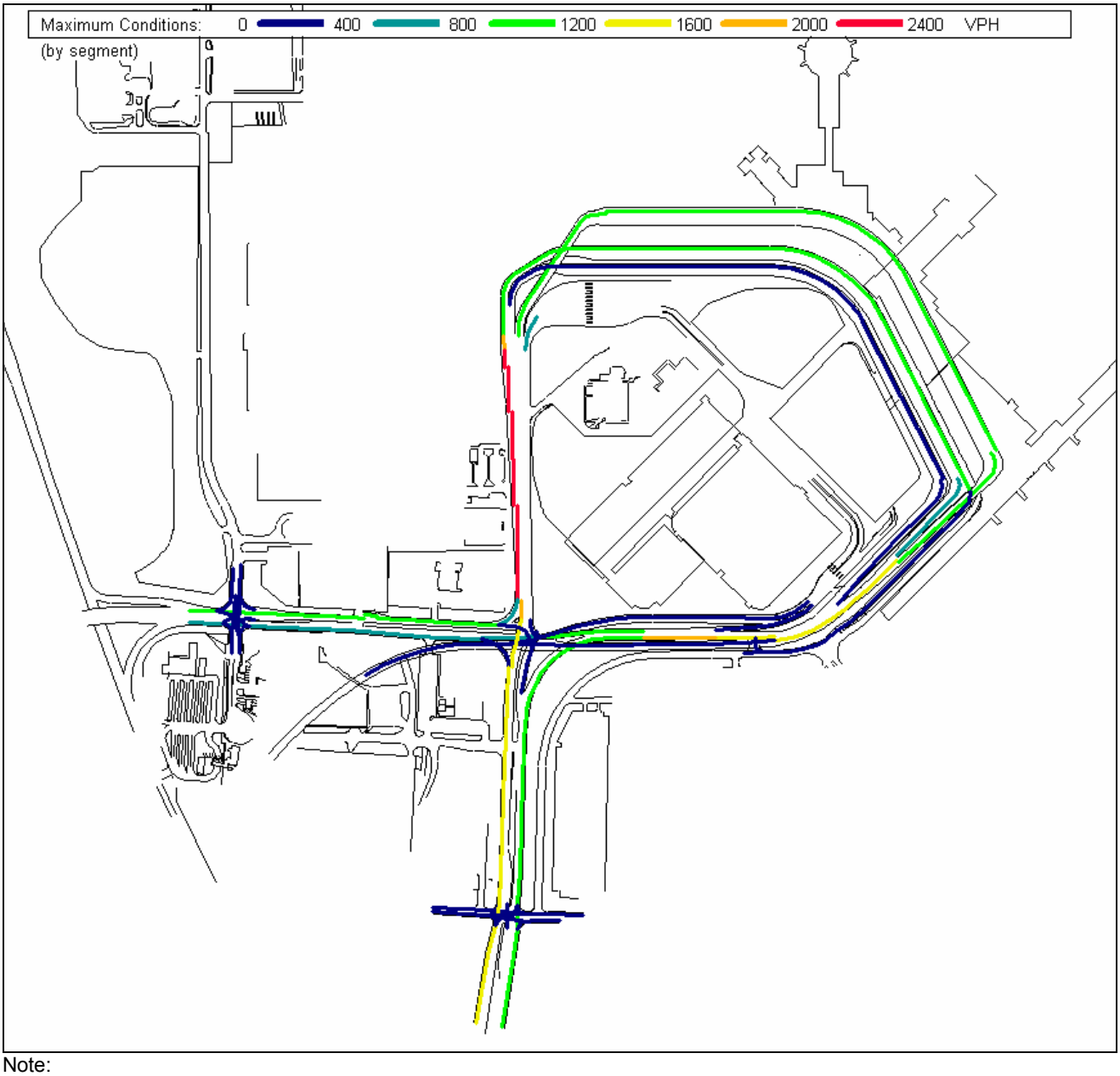


Figure 4-19: Projected 2030 Model Results
Peak Hour Demand



Note:
VPH = Vehicle per hour

Figure 4-20: Projected 2030 Model Peak Hour Results
Demand to Capacity Ratio

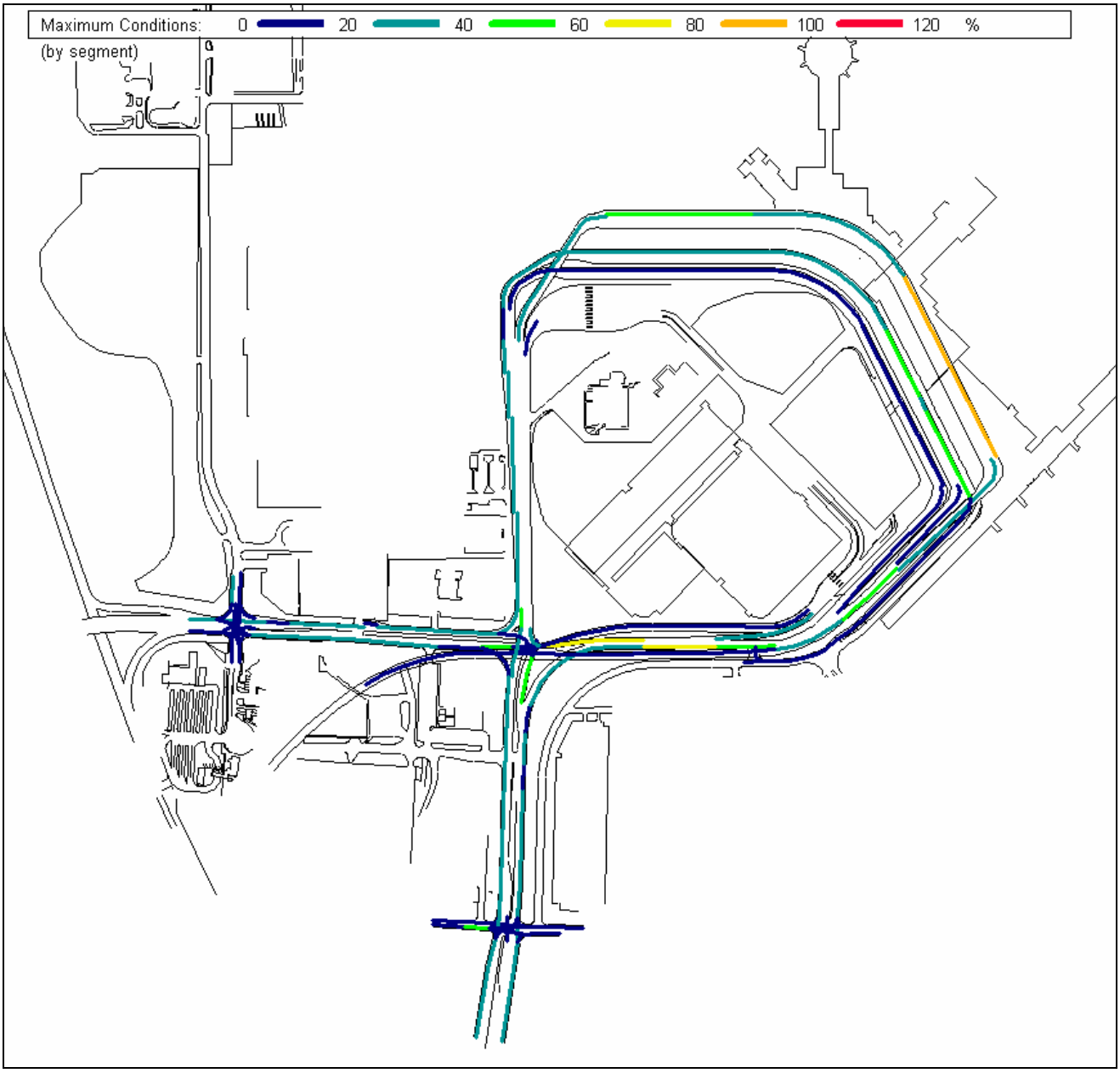
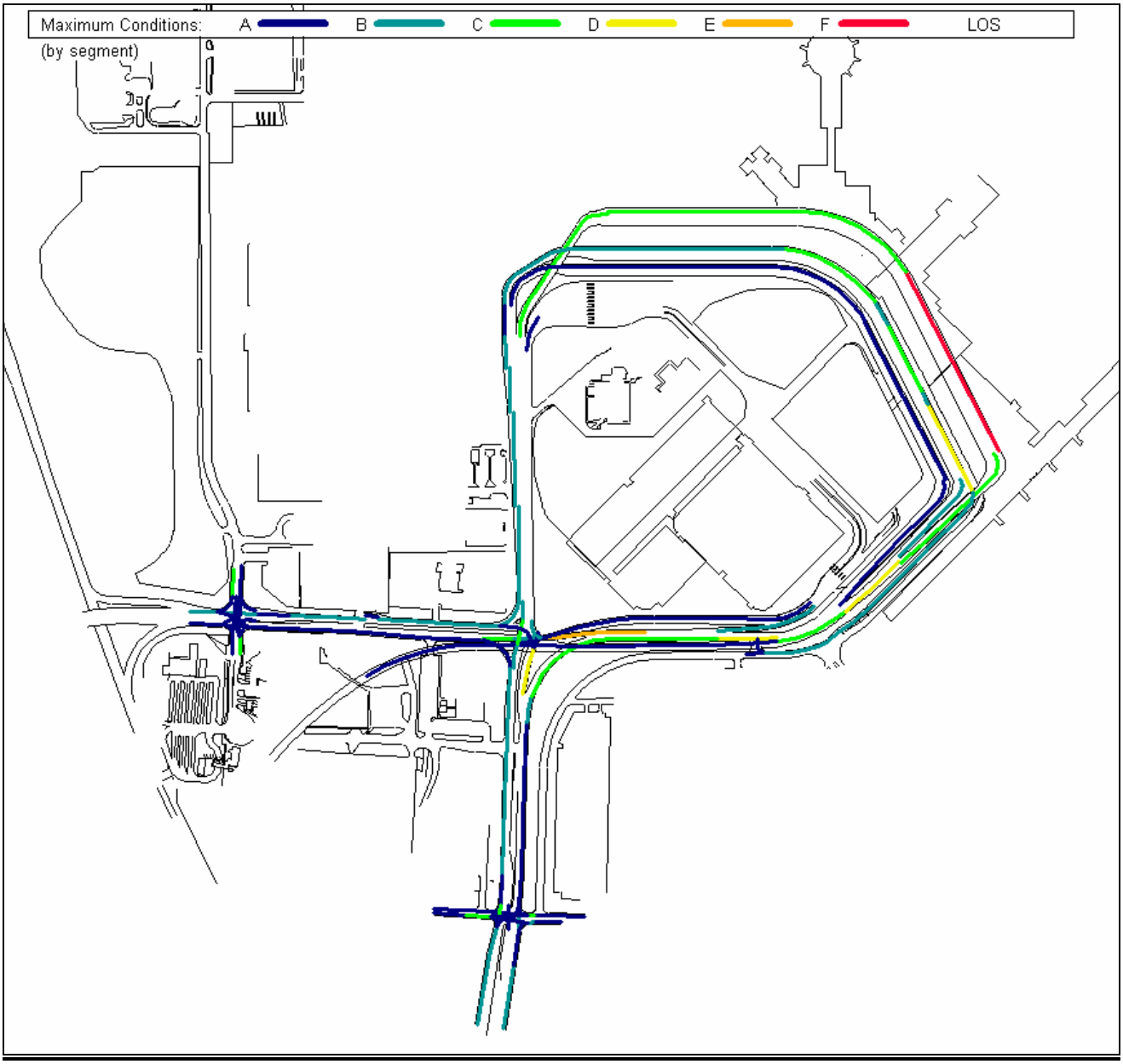


Figure 4-21: Projected 2030 Model Peak Hour Results
Level of Service Assessment



4.3.2 Curbs

Analysis of the curbs at SAT shows that, with increasing demand over the years, curbside congestion will increase, but to acceptable levels. When portions of Terminal C were assumed to be in operation by 2030, overall curb activities will be able to expand in that area.

It was assumed that the departures curbs on the upper level roadway will accommodate mixed use operations, with all vehicle types sharing the entire length of the curb at each terminal. Vehicle types could include private automobiles, taxicabs, and limousines, as well as rental, hotel, and parking lot shuttles. However, not shuttles would stop at all terminals. Transit and other types of bus services were assumed to both drop off and pick up passengers on the lower level only.

The inner arrivals curbs were assumed to serve automobiles and limousines in a mixed use area, but taxicabs would be served in dedicated areas, with loading positions and queuing positions. At Terminal A, taxicabs were assumed to be in the same location as at Terminal 1 today. At Terminal B, taxicabs were assumed to be accommodated at the northwest end of the curb area. At Terminal C in 2030, taxicabs were assumed to be accommodated on the east end of the curb area, similar to Terminal A.

The outer arrivals curbs were assumed to be used by shuttles and other bus services. Rental car company shuttles would use a central zone, serving both Terminals A and B, while other types of shuttles would be accommodated at separate zones at Terminals A and B.

Tables 4-25 through **4-27** show the analyses of curb demands and related curb length requirements by terminal and vehicle type. The demand to capacity (D/C) values shown in the right-hand columns of these tables represents the ratios of required curb lengths to available curb lengths, assuming single lane parking. While some of these curb areas would exceed a D/C ratio of 1.0, thereby requiring double parking, the amount of double parking will not interfere with the needed through lane capacities and is typical for peak hour conditions at most major airports. In the case of the Terminal A departures curb, congestion during peak hour conditions may prompt future policy decisions to again restrict additional vehicle types to both dropping off and picking up passengers only on the lower level.

Table 4-25: Curb Requirements Analysis, 2015

SAT 2015 Curb Requirements Analysis						Terminal A	
			Peaking: 1.25			Required	
Mode	Peak Flow, vph	Dwell, Min.	Demand Spaces	Minimum Spaces	Space Dist., Ft.	Curb Length, Ft.	
Departures							
Autos[1]	314	1.5	10	0	25	250	A-only
Taxis	190	1.5	6	0	25	150	435
Door-door vans	0	1.5	0	0	30	0	
Limos	19	1.5	1	0	35	35	
Parking shuttles	20	1.5	1	0	30	30	Shared with B[2]
Hotel shuttles	25	1.5	1	0	30	30	205
Rental shuttles	80	1.5	3	0	30	90	
Other buses	10	1.5	1	0	55	55	D/C = `575/400 = 1.4
						640	
Arrivals							
Autos[1]	254	2.0	11	0	25	275	Inner curb
Taxis	186	2.0	8	10	25	250	575
Door-door vans	0	2.0	0	0	30	0	D/C = 575/420 = 1.4
Auth. Veh (police, etc)	0	2.0	0	2	25	50	
Parking shuttles	20	2.0	1	2	30	60	Outer curb[3]
Hotel shuttles	25	2.0	2	2	30	60	290
Rental shuttles	80	2.0	4	3	30	120	D/C = 290/350 = 0.8
Other buses	10	2.0	1	2	55	110	
						925	

SAT 2015 Curb Requirements Analysis						Terminal B	
			Peaking: 1.25			Required	
Mode	Peak Flow, vph	Dwell, Min.	Demand Spaces	Minimum Spaces	Space Dist., Ft.	Curb Length, Ft.	
Departures							
Autos[1]	109	1.5	4	0	25	100	B-only
Taxis	66	1.5	3	0	25	75	210
Door-door vans	0	1.5	0	0	30	0	
Limos	7	1.5	1	0	35	35	
Parking shuttles	20	1.5	1	0	30	30	Shared with A[2]
Hotel shuttles	25	1.5	1	0	30	30	205
Rental shuttles	80	1.5	3	0	30	90	
Other buses	10	1.5	1	0	55	55	D/C = 350/360 = 1.0
						415	
Arrivals							
Autos[1]	110	2.0	5	0	25	125	Inner curb
Taxis	80	2.0	4	6	25	150	325
Door-door vans	0	2.0	0	0	30	0	D/C = 325/360 = 0.9
Auth. Veh (police, etc)	0	2.0	0	2	25	50	
Parking shuttles	20	2.0	1	2	30	60	Outer curb[3]
Hotel shuttles	25	2.0	2	2	30	60	290
Rental shuttles	80	2.0	4	3	30	120	D/C = 290/360 = 0.8
Other buses	10	2.0	1	2	55	110	
						675	

Source: AECOM analysis of Jacobs-provided flight schedule
(1) Includes curb only, curb+parking (at 5%), and curb+rentals/returns (at 5%)
(2) Related D/C assumes 70% of combined flow stops at each terminal
(3) Outer curb totals by terminal reflect half the rental bus requirement at Terminal A and half at Terminal B

Table 4-26: Curb Requirements Analysis, 2020

SAT 2020 Curb Requirements Analysis					**Terminal A**		
			Peaking: 1.25			Required	
Mode	Peak Flow, vph	Dwell, Min.	Demand Spaces	Minimum Spaces	Space Dist., Ft.	Curb Length, Ft.	
Departures							
Autos[1]	323	1.5	11	0	25	275	A-only
Taxis	182	1.5	6	0	25	150	460
Door-door vans	0	1.5	0	0	30	0	
Limos	18	1.5	1	0	35	35	
Parking shuttles	21	1.5	1	0	30	30	Shared with B[2]
Hotel shuttles	26	1.5	1	0	30	30	205
Rental shuttles	81	1.5	3	0	30	90	
Other buses	10	1.5	1	0	55	55	D/C = ~600/400 = 1.5
						665	
Arrivals							
Autos[1]	265	2.0	12	0	25	300	Inner curb
Taxis	194	2.0	9	8	25	225	575
Door-door vans	0	2.0	0	0	30	0	D/C = 575/420 = 1.4
Auth. Veh (police, etc)	0	2.0	0	2	25	50	
Parking shuttles	21	2.0	1	2	30	60	Outer curb[3]
Hotel shuttles	26	2.0	2	2	30	60	290
Rental shuttles	81	2.0	4	3	30	120	D/C = 290/350 = 0.8
Other buses	10	2.0	1	2	55	110	
						925	

SAT 2020 Curb Requirements Analysis					**Terminal B**		
			Peaking: 1.25			Required	
Mode	Peak Flow, vph	Dwell, Min.	Demand Spaces	Minimum Spaces	Space Dist., Ft.	Curb Length, Ft.	
Departures							
Autos[1]	123	1.5	4	0	25	100	B-only
Taxis	74	1.5	3	0	25	75	210
Door-door vans	0	1.5	0	0	30	0	
Limos	7	1.5	1	0	35	35	
Parking shuttles	21	1.5	1	0	30	30	Shared with A[2]
Hotel shuttles	26	1.5	1	0	30	30	205
Rental shuttles	81	1.5	3	0	30	90	
Other buses	10	1.5	1	0	55	55	D/C = ~350/360 = 1.0
						415	
Arrivals							
Autos[1]	134	2.0	6	0	25	150	Inner curb
Taxis	98	2.0	5	6	25	150	350
Door-door vans	0	2.0	0	0	30	0	D/C = 350/360 = 1.0
Auth. Veh (police, etc)	0	2.0	0	2	25	50	
Parking shuttles	21	2.0	1	2	30	60	Outer curb[3]
Hotel shuttles	26	2.0	2	2	30	60	290
Rental shuttles	81	2.0	4	3	30	120	D/C = 290/360 = 0.8
Other buses	10	2.0	1	2	55	110	
						700	

(1) Includes curb only, curb+parking (at 5%), and curb+rentals/returns (at 5%)
(2) Related D/C assumes 70% of combined flow stops at each terminal
(3) Outer curb totals by terminal reflect half the rental bus requirement at Terminal A and half at Terminal B

Table 4-27: Curb Requirements Analysis, 2030

SAT 2030 Curb Requirements Analysis						Terminal A	
			Peaking: 1.25			Required	
Mode	Peak Flow, vph	Dwell, Min.	Demand Spaces	Minimum Spaces	Space Dist., Ft.	Curb Length, Ft.	
Departures							
Autos[1]	345	1.5	11	0	25	275	A-only
Taxis	186	1.5	6	0	25	150	460
Door-door vans	0	1.5	0	0	30	0	
Limos	19	1.5	1	0	35	35	
Parking shuttles	24	1.5	1	0	30	30	Shared with B[2]
Hotel shuttles	30	1.5	1	0	30	30	205
Rental shuttles	88	1.5	3	0	30	90	
Other buses	12	1.5	1	0	55	55	D/C = ~600/400 = 1.5
						665	
Arrivals							
Autos[1]	265	2.0	12	0	25	300	Inner curb
Taxis	194	2.0	9	8	25	225	575
Door-door vans	0	2.0	0	0	30	0	D/C = 575/420 = 1.4
Auth. Veh (police, etc)	0	2.0	0	2	25	50	
Parking shuttles	24	2.0	2	2	30	60	Outer curb[3]
Hotel shuttles	30	2.0	2	2	30	60	290
Rental shuttles	88	2.0	4	3	30	120	D/C = 290/350 = 0.8
Other buses	12	2.0	1	2	55	110	
						925	

SAT 2030 Curb Requirements Analysis						Terminal B/C	
			Peaking: 1.25			Required	
Mode	Peak Flow, vph	Dwell, Min.	Demand Spaces	Minimum Spaces	Space Dist., Ft.	Curb Length, Ft.	
Departures							
Autos[1]	258	1.5	9	0	25	225	B-only
Taxis	156	1.5	5	0	25	125	385
Door-door vans	0	1.5	0	0	30	0	
Limos	16	1.5	1	0	35	35	
Parking shuttles	24	1.5	1	0	30	30	Shared with A[2]
Hotel shuttles	30	1.5	1	0	30	30	205
Rental shuttles	88	1.5	3	0	30	90	
Other buses	12	1.5	1	0	55	55	D/C = 525/1000 = 0.5
						590	
Arrivals							
Autos[1]	216	2.0	9	0	25	225	Inner curb
Taxis	158	2.0	7	6	25	175	450
Door-door vans	0	2.0	0	0	30	0	D/C = 450/1000 = 0.5
Auth. Veh (police, etc)	0	2.0	0	2	25	50	
Parking shuttles	24	2.0	2	2	30	60	Outer curb[3]
Hotel shuttles	30	2.0	2	2	30	60	640
Rental shuttles	88	2.0	4	3	30	120	D/C = 640/1000 = 0.6
Other buses	12	2.0	1	2	55	110	
						800	

(1) Includes curb only, curb+parking (at 5%), and curb+rentals/returns (at 5%)
(2) Related D/C assumes 70% of combined flow stops at each terminal
(3) Outer curb totals by terminal reflect half the rental bus requirement at Terminal A and half at Terminal B

4.3.3 Parking

The analysis of public parking demand and capacity was based on actual vehicle accumulation counts during July 2009 and forecast enplaned passengers. The results show that more than adequate hourly parking will be available throughout the planning period, but that additional long-term garage parking will be needed by 2020, and that additional economy parking supply will be needed by 2030 (see **Table 4-28**). Please note that required capacity should be at least 10 percent higher than indicated demand to accommodate the search times required for all spaces to be occupied. With the potential hourly parking demand to capacity ratios, consideration could be given to providing rental car ready and return spaces and service centers for some rental car companies in a portion of the garages.

Employee parking is currently provided by a combination of facilities adjacent to non-terminal area sites of employment at the Airport and a dedicated lot for terminal area employees, on the southeast corner of the Airport, with shuttle bus service provided between the lot and the terminals.

Table 4-28: Public Parking Requirements

		Baseline (2008)	2015	2020	2030
	Existing	**Estimated Demand** (number of spaces)			
Hourly Parking	-	429	515	590	740
Daily Parking	-	3,659	4,391	5,031	6,312
Economy Parking	-	911	1,093	1,253	1,571
		Estimated Requirements (number of spaces)			
Hourly Parking	1,300	472	566	649	814
Daily Parking	5,800	4,025	4,830	5,534	6,943
Economy Parking	1,500	1,002	1,203	1,378	1,729

Employment levels at the Airport will continue to increase along with numbers of passengers, but at an overall lower growth rate of about 25 percent between 2008 and 2030. An additional 300 spaces for employee parking may be required.

The existing commercial vehicle staging area is expected to be adequate through 2030, with a requirement for approximately 300 taxicab queuing spaces and four to five bus positions.

4.3.4 Rental Car Facilities

Currently, except for Avis, the rental car companies' ready, return, and storage spaces are located off-Airport, both northwest and south of the terminal area, along with the rental car company service centers and fueling, cleaning, and maintenance facilities.

Collectively, the rental car companies use about 860 ready spaces and about 635 return spaces, in addition to storage and queuing areas.[1] However, the current number of ready car

[1] Ricondo & Associates, Inc., *Consolidated Rental Car Facility (CONRAC) Preliminary Feasibility Report*, December 2008.

spaces was determined to be deficient, with about 1,100 spaces actually needed. It was projected that 1,600 ready spaces and 1,000 return spaces will be required by 2018.[1]

The various rental car companies now have separate shuttle bus operations, with frequencies that cause some congestion at the curbs and add to the traffic loads on the Airport roadways. The curb analyses for 2015 and later planning years indicate that a common pickup area for Terminals A and B would be needed for acceptable operations at the commercial vehicle outer curb. If separate passenger pickups were provided for at both terminals, the available curb length would not be adequate.

4.3.5 Public Transportation

Currently, one public transit operator, VIA Metropolitan Transit, provides service to the Airport terminals with one bus route. Requirements for accommodating this service at the curbsides were presented in Tables 4-25 through 4-27. Currently, VIA has no specific plans regarding changes to its Airport service. In addition, no other regional transit agency has indicated a desire to serve SAT in the future. In the event that VIA decides to introduce additional routes to SAT (or if another transit agency begins service), the curbside requirement for public transit buses will need to be reviewed to determine how many buses would use the Airport curbside simultaneously.

In 2005, the Austin - San Antonio Intermunicipal Commuter Rail District adopted a preferred alignment for passenger rail service between San Antonio and Austin. The 15 stations proposed on the route include one serving SAT. While the exact alignment in the vicinity of the Airport has not been identified, it is likely that the alignment would not serve the terminal area. Thus, upon initiation of service to the Airport station, a shuttle bus would be required to carry passengers between the Airport rail station and the terminals. As no timeline has been proposed for the rail service, the curbside facility requirements presented above do not explicitly include the rail shuttle bus. However, given the headways of the existing public transit service (VIA) and the likely headways of the rail shuttle bus, it is possible that the rail shuttle buses could use the same curbside space as the public transit service.

4.4 AIR CARGO FACILITY REQUIREMENTS

The projected air cargo facility requirements to accommodate demand through the planning period are summarized in this section. Projected requirements are provided for processing and warehouse space, ramp area, and landside areas. Requirements were based on industry best practices related to cargo planning. The following functional areas were examined:

- *Processing and Warehouse Space:* Processing and warehouse space consists of enclosed areas used to store and sort air cargo, as well as to provide office and other space to facilitate air cargo operations.

- *Ramp Area:* Ramp area includes paved airside areas used for aircraft parking while air cargo is loaded and unloaded. For larger air cargo complexes, ramp area may include a maneuvering area for aircraft to access parking positions, as well as storage areas for ground support equipment (GSE) used to load air cargo onto aircraft, unload air cargo from aircraft, or service aircraft.

- *Landside Areas:* Air cargo landside areas include vehicle access and circulation from the Airport's primary roadway network, parking for employees and visitors, and parking for the trucks delivering air cargo to warehousing and sorting facilities and for taking delivery of air cargo from these facilities. An allowance was included for landscaping and other improvements in the total landside area calculation.

4.4.1 Processing and Warehouse Space

Freight warehouse space requirements vary significantly among the various types of air cargo operators. The activity occurring inside the cargo facility, the freight processing efficiency, and the need for additional square footage to handle future cargo volumes differ from operator to operator. For example, integrated carriers use warehouse facilities to sort packages and load trucks to deliver time-sensitive packages, while heavy-freight carriers use space for pallet building/breakdown and freight storage. The result is a significantly higher processing rate, and more efficient facility use, for the integrated carriers. An important derivative from the varying operations and levels of efficiency is the need for additional space to accommodate future freight volumes. Because of their efficient use of space, the integrated carriers can accommodate regular increases in cargo volumes without significant additional space requirements. Additional personnel, conveyor belts, pickup/delivery vehicles, and staging areas for GSE, aircraft, or trucks can increase processing ability without major facility expansion. On the other hand, heavy-freight operators require incremental increases in warehouse space to accommodate increases in freight volume.

As a result, warehouse facility requirements and use, typically expressed in pounds or tons of cargo per square foot of warehouse space, vary significantly by airport, depending on the mix of operators. Airports with higher concentrations of integrated carrier activity have much greater facility use ratios. Airports that accommodate larger volumes of heavy freight, including international cargo, experience more dwell time and, therefore, have lower ratios of cargo tonnage to square feet of cargo warehouse space. For planning purposes, the generally accepted cargo facility use ratio is between 0.75 ton and 1.5 tons annually per square foot of warehouse space.

The 0.75 ton per square foot factor is the average efficiency for an automated facility, while 1.5 tons per square foot can be handled annually at a highly automated cargo facility. In 2008, the Airport accommodated 10,800 tons of belly cargo using 29,500 square feet of warehouse space, which represents a ratio of about 0.37 ton per square foot of warehouse space. In 2008, 131,000 tons of freight were also processed by all-cargo operators and integrated carriers using 104,000 square feet of warehouse space, resulting in a ratio of 1.26 tons per square foot. It was assumed that, for belly freight facilities, efficiency will increase over the planning period as a result of the increased use of mechanization technology, increasing from 0.5 ton per square foot in 2010 to 0.75 ton per square foot by 2030. For master planning purposes, a conservative efficiency ratio for all-cargo facilities of 1.2 tons per square foot was used.

As presented in **Table 4-29**, the existing belly freight facilities are projected to be adequate to accommodate demand through the planning period. An additional 111,000 square feet of processing space for all-cargo activity is projected to be required to accommodate demand in 2030.

Table 4-29: Cargo Processing and Warehouse Space Requirements

	Existing Square Feet	Projected Requirements (square feet)				
		Baseline (2008)	2010	2015	2020	2030
Belly Cargo Building Area	29,525	21,690	19,160	19,030	21,670	22,460
All-Cargo Building Area	104,000	108,790	95,480	119,810	146,810	215,010
Total Building Area	133,525	130,480	114,640	138,840	168,480	237,470
Total Building Deficiency						
Belly Cargo	-	-	-	-	-	-
All-Cargo	-	4,790	-	15,810	42,810	111,010

4.4.2 Ramp Area

The Airport currently provides approximately 119,000 square yards of cargo ramp area. Air cargo ramp area requirements vary based on aircraft size and tenant requirements, and may be constrained because of available land or airport layout. A planning factor of 7.5 square feet of ramp per forecast ton of all-cargo airline freight is appropriate to determine cargo aircraft parking ramp space requirements. This factor takes into account aircraft parking and staging areas for freight and support vehicles. It does not, however, include ramp space required for aircraft circulation. Parking ramp space requirements are multiplied by a factor of 1.4 to account for the required service roads and taxilanes meeting ADG-V separation standards, resulting in total cargo ramp requirements.

Airline belly cargo operations require a minimal amount of ramp area, which is generally used for GSE loading and storage. For planning purposes, a factor of 1.0 square foot of ramp per forecast ton of belly cargo was applied. As shown in **Table 4-30**, the existing belly cargo ramp is projected to be adequate to accommodate demand through 2030. Approximately 301,000 square yards of ramp space would be required for the all-cargo operators in 2030, resulting in a deficiency of approximately 184,000 square yards.

Table 4-30: Cargo Apron Requirements

	Existing Square Yards	Projected Requirements (square yards)				
		Baseline (2008)	2010	2015	2020	2030
Belly Cargo Ramp Area	2,210	1,210	1,060	1,270	1,440	1,870
All-Cargo Ramp Area	117,340	152,300	133,700	167,700	205,500	301,000
Total Ramp Area	119,550	153,510	134,760	168,970	206,940	302,870
Total Ramp Deficiency						
Belly Cargo	-	-	-	-	-	-
All-Cargo	-	34,960	16,360	50,360	88,160	183,660

4.4.3 Landside Areas

Cargo landside areas consist of truck circulation, parking areas for visitors and employees, loading docks, and landscaping. For planning purposes, the cargo landside area approximately equals the required cargo building area. The required landside area is summarized in **Table 4-31**. No additional landside space is projected to be required through the planning period.

Table 4-31: Cargo Landside Requirements

	Existing Square Feet	Projected Requirements (square feet)				
		Baseline (2008)	2010	2015	2020	2030
Belly Cargo Landside Area	36,060	21,690	19,160	19,030	21,670	22,460
All-Cargo Landside Area	339,230	108,790	95,480	119,810	146,810	215,010
Total Landside Area	375,290	130,480	114,640	138,840	168,480	237,470

4.4.4 Cargo Land Area Summary

The aggregate requirements for cargo operations at the Airport are presented in **Table 4-32**. The land currently allocated to belly freight is projected to be sufficient to accommodate demand through 2030. Approximately 20 additional acres of land would be needed to support all-cargo operations at the Airport in 2030.

Table 4-32: Cargo Land Area Requirements

	Existing	Estimated Requirements				
		Baseline (2008)	2010	2015	2020	2030
Belly Freight						
Cargo building area (square feet)	29,525	21,690	19,160	19,030	21,670	22,460
Cargo ramp area (square yards)	2,210	1,210	1,060	1,270	1,440	1,870
Cargo landside area (square feet)	36,060	21,690	19,160	19,030	21,670	22,460
Cargo land area (acres)	2.0	1.2	1.1	1.1	1.3	1.4
All-Cargo						
Cargo building area (square feet)	104,000	108,790	95,480	119,810	146,810	215,010
Cargo ramp area (square yards)	117,340	152,300	133,700	167,700	205,500	301,000
Cargo landside area (square feet)	339,230	108,790	95,480	119,810	146,810	215,010
Cargo land area (acres)	34.4	27.5	24.1	30.3	37.1	54.3

4.5 GENERAL AVIATION FACILITY REQUIREMENTS

General aviation facility requirements to accommodate demand through the planning period (to 2030) are summarized in this section. Overall GA facility requirements were derived based on a review of existing facilities, GA demand trends, activity forecasts, and discussions with key staff from the Airport's fixed base operators.

4.5.1 Background

Under the baseline aviation demand forecasts, total air taxi and general aviation operations at the Airport are forecast to remain relatively constant throughout the planning period, declining slightly from 108,758 operations in 2008 to 107,000 operations in 2030. General aviation operations are forecast to decline an average of 0.45 percent per year from 2008 to 2030, while air taxi operations are forecast to increase 1.0 percent per year over the same time period. Key GA demand characteristics are as follows:

- Since 1998, GA activity at the Airport has declined steadily, which is consistent with the national trend, and is forecast to continue declining through 2010. GA activity is forecast to increase modestly from 2011 through 2015 before leveling off at 76,000 annual operations. One factor in this trend is that most of the growth in GA activity in the San Antonio region was assumed to occur at Stinson Municipal Airport, which is the primary reliever airport for the San Antonio region.
- Itinerant operations accounted for 99.8 percent of total GA operations at the Airport in 2008. This trend is expected to continue and itinerant operations are forecast to account for the majority of GA traffic at the Airport throughout the planning period.
- Total based aircraft at the Airport are forecast to increase an average of 2 percent per year.
- Growth in air taxi operations is forecast to be limited over the planning period.
- The GA and air taxi aircraft fleet will continue to evolve toward more business/corporate jets, while operations by piston and multi-engine turboprop aircraft will decrease in

accordance with both local and national GA trends. Operations by business jets are forecast to increase an average of 3 percent annually.

These data are summarized in **Table 4-33**.

Table 4-33: General Aviation Activity Forecast

	Historical	Forecast			
	2008	2010	2015	2020	2030
Annual Aircraft Operations					
General aviation	83,982	71,000	76,000	76,000	76,000
Air taxi	24,776	25,000	26,000	28,000	31,000
Total	108,758	96,000	102,000	104,000	107,000
General Aviation/Air Taxi Fleet Mix					
Single-engine piston	51.5%	49.7%	47.1%	38.8%	34.3%
Multi-engine piston	10.0	10.3	7.8	6.6	4.3
Turboprop	13.6	14.6	14.7	12.9	12.2
Business jet	23.4	23.7	28.1	38.8	46.0
Regional jet	0.6	0.8	1.3	1.9	2.4
Helicopter	0.8	0.8	0.9	0.9	0.8
Total	100.0%	100.0%	100.0%	100.0%	100.0%
Total General Aviation/Air Taxi Operations by Aircraft Type					
Single-engine piston	56,000	47,700	48,000	40,400	36,700
Multi-engine piston	10,900	9,900	8,000	6,900	4,600
Turboprop	14,800	14,100	15,000	13,500	13,100
Business jet	25,500	22,800	28,700	40,400	49,200
Regional jet	700	800	1,400	2,000	2,600
Helicopter	900	800	900	1,000	900
Based Aircraft					
Single-engine	118	120	138	123	124
Multi-engine	29	34	34	28	21
Jet	72	77	107	149	195
Total	219	230	280	300	340
Rotorcraft	7	7	7	7	7

Note: Columns may not add to totals shown because of rounding.

4.5.2 Aircraft Parking Apron

Aircraft parking aprons provide space for itinerant and based general aviation and air taxi aircraft, allowing passengers to access FBO facilities, fueling, and ground transportation and allowing service trucks and FBO personnel access to the aircraft. The size of aircraft parking aprons depends on the peak demand for parking positions and the average size of the aircraft to be accommodated.

Currently, a total of 145,050 square yards of apron is dedicated to GA traffic. These areas provide both ramp parking for itinerant aircraft and tie-down positions for based aircraft. Itinerant and based aircraft apron requirements were calculated using the following methodology and assumptions:

- In accordance with guidance in Appendix 5 of FAA Advisory Circular 150/5300-13, *Airport Design,* itinerant aircraft apron requirements were determined assuming 360 square yards of apron for 50 percent of the itinerant aircraft using the Airport on the busy day of the peak month. The "busy day" is defined as 110 percent of the activity on the ADPM. As shown in **Table 4-34**, approximately 272,900 square yards of itinerant general aviation apron are projected to be required to accommodate demand in 2010, and 304,100 square yards are projected to be required in 2030.
- Based aircraft parking apron requirements were determined assuming that 30 percent of based single and multi-engine aircraft will use ramp parking throughout the planning period. In accordance with FAA guidance, it was assumed that 300 square yards of apron space will be required per based aircraft tiedown position. It was assumed that no based jet aircraft will use tiedown space. As shown in Table 4-34, approximately 13,800 square yards of based general aviation aircraft parking apron is projected to be required to accommodate demand in 2010, and 13,000 square yards are projected to be required in 2030.

Table 4-34: General Aviation Facility Requirements

	Existing	Projected Requirements				
		Baseline (2008)	2010	2015	2020	2030
Aircraft Parking Apron (square yards)						
Based aircraft parking apron *(a)*	21,020	13,200	13,800	15,500	13,600	13,000
Itinerant aircraft parking apron *(b)*	124,030	312,600	272,900	289,900	295,600	304,100
Total aircraft parking apron	145,050	325,800	286,700	305,400	309,200	317,100
Aircraft Storage Facilities (square feet)						
Conventional hangar space *(c)*	617,530	247,300	263,000	360,200	486,400	627,800
T-hangar space *(d)*	49,620	111,100	115,900	130,500	114,100	109,600
Total aircraft storage	667,150	358,400	378,900	490,700	600,500	737,400

Notes:
(a) Assuming 300 square yards of apron space per based aircraft.
(b) Assuming 360 square yards of apron space per 50 percent of busy day peak month GA operations.
(c) Assuming 3,100 square feet per jet aircraft, 2,750 square feet per multi-engine aircraft, 1,400 square feet per single engine aircraft, and 1,000 square feet per helicopter.
(d) Assuming 1,200 square feet of hangar space per aircraft.

4.5.3 Aircraft Storage Facilities

The Airport's FBOs provide 270,000 square feet of conventional hangar space. Additionally, several corporate and private hangar facilities are located on Airport, providing a total of 50,000 square feet of T-hangars and 336,000 square feet of conventional hangar space.

Aircraft storage facility requirements are based on the forecast number and fleet mix of based aircraft. Aircraft storage facility requirements were based on the following planning assumptions and guidelines:

- Throughout the planning period, the owners/operators of approximately 70 percent of single- and multi-engine aircraft will desire hangar space. Of these, 90 percent will be

accommodated in T-hangars and 10 percent will be accommodated in conventional hangars. All corporate jet aircraft will occupy conventional hangar space.

- Storage requirements in conventional hangars were calculated using the following assumptions: 3,100 square feet per jet aircraft, 2,750 square feet per multi-engine aircraft, 1,400 square feet per single engine aircraft, and 1,000 square feet per helicopter.
- Each T-hangar consists of 1,200 square feet.

As presented previously in Table 4-34, 263,000 square feet of conventional hangar space is projected to be required to accommodate demand in 2010. Demand for conventional hangar space is projected to more than double between 2010 and 2030, as the future fleet mix of based aircraft will include more jet aircraft. In 2030, 628,000 square feet of conventional hangar space is projected to be required.

While the analysis shows a need for additional T-hangar space, it should be noted that these results are driven by unconstrained general aviation demand. Ultimately, GA requirements are driven by the City's philosophy regarding the management of its system of airports serving the San Antonio region. The City of San Antonio made a policy decision to not provide additional T-hangar space at SAT and to encourage the use of Stinson Municipal Airport for smaller GA traffic. Stinson Municipal is more suitable for smaller GA activity, and T-hangars are not the highest and best land use at SAT because of land constraints.

4.6 AIRLINE AND AIRPORT SUPPORT FACILITY REQUIREMENTS

4.6.1 Airline Support

Airline support facilities at SAT include GSE equipment storage and maintenance, airline catering and flight kitchen, and fuel storage and dispensing system facilities, as discussed below.

GSE Storage and Maintenance

GSE storage and maintenance facilities at SAT are located in the West Cargo Building to the north of the passenger terminal area. GSE facilities occupy seven bays of the cargo building, totaling 16,800 square feet of space. Bays are allocated as follows:

- Bay 10: DAL Global Services
- Bay 14: Continental Airlines
- Bays 15 and 16: American Airlines
- Bays 23 and 24: Southwest Airlines
- Bay 32: Delta Air Lines

For general planning purposes, it was assumed that the existing GSE maintenance facilities are fully utilized, and that space demands for GSE maintenance facilities will increase at a rate commensurate with the increase in total annual passenger aircraft operations over the planning period.

Space requirements for GSE maintenance facilities are summarized in **Table 4-35**.

Table 4-35: Ground Support Equipment Facility Requirements

	Existing Square Feet	Projected Requirements (square feet)			
		2010	2015	2020	2030
Maintenance building size	16,800	15,880	19,950	22,080	27,330

Airline Catering and Flight Kitchen

Based on anecdotal information from the manager of Gate Gourmet facility, the flight kitchen is not running at capacity and additional land adjacent to the facility is available for future expansion if needed. Also, as an industry trend, the need for flight kitchens has diminished over the past decade as the result of airline cutbacks on complimentary onboard meal service. Even with the slight increase in availability of "buy-on-board" meal service, the packaging and distribution of these on-board meal types are more efficient than the hot meals that were common in the past. Although complimentary hot meal service is still widely available on international flights, limited growth is forecast in international trans-oceanic airline service at SAT (approximately four daily operations by 2030). Therefore, it is projected that the existing flight kitchen can accommodate aviation demand throughout the planning period.

Fuel Storage and Dispensing System

The requirements for Airport fuel storage facilities are described below, focusing on the Airport's primary fuel farm and the fuel farms dedicated to general aviation activity. Fuel storage requirements are expressed both in terms of gross tank storage volume as well as land area required to ensure that no other facilities encroach on the area required for future fuel storage.

Commercial Airline Aircraft Fuel Farm

Jet fuel used by the passenger and all-cargo airlines is stored in two above ground storage tanks with a gross capacity of 420,000 gallons each, totaling 840,000 gallons. Requirements were projected based on an analysis of historical fuel flowage and aircraft operations data for 2008, shown in **Table 4-36**, as well as the following planning guidelines and assumptions:

- As presented in the aviation demand forecasts, ADPM aircraft operations accounted for 9.0 percent of the annual aircraft operations in 2008 and are forecast to account for 8.9 percent of annual aircraft operations throughout the planning period.
- In July 2008 (the peak month for aircraft operations), 6.84 million gallons of jet fuel were dispensed from the fuel farm for 9,790 aircraft departures, equating to roughly 316 daily aircraft departures using 699 gallons of jet fuel per departure.
- Jet fuel reserves, in days of supply, were estimated by dividing the net usable storage capacity by the average daily fuel dispensed at the Airport in the peak month. The net usable storage capacity was assumed to be 90 percent of the gross storage capacity of the tanks, equaling 756,000 gallons.

- Future jet fuel storage requirements for 3-day, 5-day, 7-day and 10-day reserves were estimated by applying the average jet fuel dispensed per airline aircraft departure to the forecast ADPM airline aircraft departures for each milestone year.
- At present, approximately 840,000 gallons of gross jet fuel storage capacity are stored on a 2.8-acre site that includes areas for storage tanks as well as ancillary facilities to support the fueling operation, such as load racks, truck parking, etc. These factors equate to a planning factor of 0.145 square foot of land required per gallon of fuel stored. This planning factor was assumed to remain constant over the planning period.

Table 4-36: 2008 Fuel Flowage and Aircraft Operations Data

	Aircraft Operations *(a)*		Jet Fuel Dispensed		
Month	Monthly Aircraft Operations	Average Daily Aircraft Operations	Total (gallons)	Average Daily Consumption (gallons)	Average Jet Fuel Dispensed per Departure (gallons)
January	8,883	287	5,906,097	190,519	665
February	8,474	303	5,836,467	208,445	689
March	9,171	296	6,266,918	202,159	683
April	8,914	297	6,223,909	207,464	698
May	9,402	303	6,465,989	208,580	688
June	9,527	318	6,974,145	232,472	732
July	9,790	316	6,841,325	220,688	699
August	9,623	310	6,751,605	217,794	702
September	8,465	282	5,982,671	199,422	707
October	8,760	283	6,383,684	205,925	729
November	8,227	274	6,107,285	203,576	742
December	8,606	278	6,246,032	201,485	726
Total/Average	107,842	295	75,986,127	108,211	705

Note:
(a) Includes only passenger and all-cargo airlines.

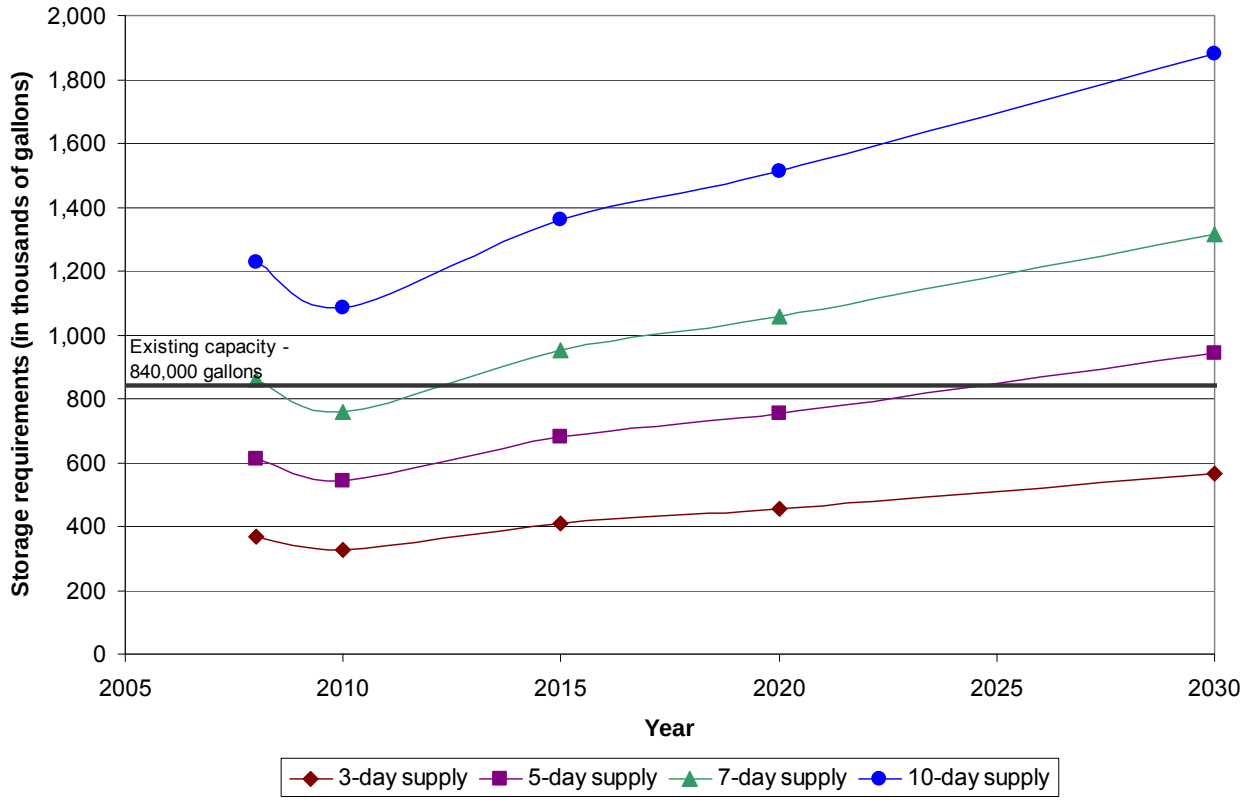
Projected fuel requirements are presented in **Table 4-37** and on **Figure 4-22**.

Table 4-37: Projected ADPM Airline Jet Fuel Demand and Storage Required to Provide 3-, 5-, 7-, or 10-Day Reserve Supply

	Historical	Projected			
	2008	2010	2015	2020	2030
Annual aircraft operations *(a)*	103,706	97,400	122,200	135,700	168,800
Peak month aircraft operations *(b)*	9,790	8,669	10,876	12,077	15,023
ADPM aircraft operations *(c)*	316	280	351	390	485
ADPM average jet fuel dispensed per departure (gallons) *(d)*	699	699	699	699	699
ADPM jet fuel demand (gallons) *(e)*	110,344	97,705	122,582	136,124	169,328
Gross jet fuel storage requirements (gallons) *(f)*					
3-day reserve	367,800	325,700	408,600	453,700	564,400
5-day reserve	613,000	542,800	681,000	756,200	940,700
7-day reserve	858,200	759,900	953,400	1,058,700	1,317,000
10-day reserve	1,226,000	1,085,600	1,362,000	1,512,500	1,881,400

ADPM = Average Day of the Peak Month
(a) From AECOM Team Aviation Demand Forecasts, September 2009. Includes passenger and all-cargo aircraft operations.
(b) Calculated assuming that peak month operations equaled 9.0 percent of annual operations in 2008. Peak month operations are projected to equal 8.9 percent of annual operations in the future.
(c) Calculated by dividing peak month operations by the number of days in the peak month (31).
(d) Based on jet fuel dispensed per departure in July 2008
(e) Calculated by multiplying ADPM departures (operations divided by two) by the ADPM average jet fuel dispensed per departure.
(f) Includes adjustment factor to account for "bottoms" in the tank (90 percent of gross tank capacity contains usable fuel).

Figure 4-22: Projected Jet Fuel Storage Requirements



Fuel storage requirements, expressed in terms of gallons of gross tank storage, were translated into land area requirements so that the Aviation Department can plan to accommodate future demand for storage capacity without interfering with the business decisions of the passenger and all-cargo airlines, and ensure that no other facilities encroach on the area required for future fuel storage. **Table 4-38** summarizes the gross storage volume and land area requirements for future fuel farm facilities. The fuel farm's jet fuel storage capacity provided a 7-day reserve supply of jet fuel in 2008. By 2030, storage requirements are projected to range from 564,400 gallons for a 3-day reserve to 1.9 million gallons for a 10-day reserve, occupying land areas ranging from 1.9 acres to 6.3 acres.

The number of days of fuel supply stored onsite in reserve is a business decision made by the airlines. The number and configuration of the fuel storage tanks are ultimately determined by the airlines based on operating considerations, such as the tank filling and fuel settling process. It is recommended that the Aviation Department preserve land for 7 days of fuel capacity (2.5 additional acres compared with a 3-day reserve) to ensure an adequate reserve fuel capacity throughout the planning period. This capacity would be consistent with the historical capacity provided at the Airport.

Table 4-38: Projected Fuel Farm Storage Requirements

	Historical	Projected Requirements			
	2008	2010	2015	2020	2030
3-day reserve supply					
Fuel storage (gallons)	350,700	325,700	408,600	453,700	564,400
Land area (acres)	1.2	1.1	1.4	1.5	1.9
5-day reserve supply					
Fuel storage (gallons)	584,400	542,800	681,000	756,200	940,700
Land area (acres)	1.9	1.8	2.3	2.5	3.1
7-day reserve supply					
Fuel storage (gallons)	818,200	759,900	953,400	1,058,700	1,317,000
Land area (acres)	2.7	2.5	3.2	3.5	4.4
10-day reserve supply					
Fuel storage (gallons)	1,168,900	1,085,600	1,362,000	1,512,500	1,881,400
Land area (acres)	3.9	3.6	4.5	5.0	6.3

Note: The number and configuration of the tanks provided are ultimately determined by the airlines based on operating considerations, such as the tank filling and fuel settling process, as well as the reserve supply desired.

General Aviation Fuel Farms

Several FBOs store and provide Jet A fuel and aviation gasoline (AvGas) at their facilities. It is not expected that additional land will need to be reserved for general aviation fuel storage during the planning period, based on the following conclusions:

- Additional AvGas fuel storage capacity will not be required during the planning period because of declining levels of activity by lower-end general aviation aircraft (i.e., AvGas users). Therefore, the existing AvGas storage capacity is projected t be sufficient to accommodate existing and forecast demand.
- Additional Jet A fuel storage will be required to adequately serve increased higher-end GA activity at the Airport. The area available for fuel storage at the FBO facilities is adequate to accommodate additional Jet A tanks if a business decision were made by the FBOs to construct additional storage capacity.

4.6.2 Airport Support

Airport support facilities at SAT consist of aircraft rescue and fire fighting, Airport maintenance, and FAA facilities, as discussed below.

Aircraft Rescue and Fire Fighting Facilities

ARFF requirements and facility recommendations are provided in 14 CFR Part 139, *Certification and Operations: Land Airports Serving Certain Air Carriers.* Airports certificated under 14 CFR Part 139 must comply with specific ARFF requirements, including response time requirements and extinguishing agent requirements. 14 CFR Part 139 is used to determine the ARFF Index (A through E) for airports serving certificated air carriers/commercial service based on the length of the longest aircraft operated by an airline conducting an average of five

scheduled departures per day, computed on an annual basis. Determination of the appropriate amount of ARFF equipment for an airport is based on the airport Index.

The five ARFF indices are listed in **Table 4-39** with details of specific requirements to meet each index.

Table 4-39: ARFF Index Classifications

Airport Index	Required Number of Vehicles	Aircraft Length (feet)	Scheduled Daily Departures	Agent plus Water for Foam
A	1	< 90	> 1	500# sodium-based DC or Halon 1211 or clean agent; or 450# potassium-based DC plus water to produce 100 gallons of AFFF.
		≥ 90, < 126	< 5	
B	1 or 2	≥ 90, < 126	≥ 5	Index A plus 1,500 gallons of water
		≥ 126, <159	< 5	
C	2 or 3	≥ 126, < 159	≥ 5	Index A plus 3,000 gallons of water
		≥ 159, <200	< 5	
D	3	≥ 159, <200	≥ 5	Index A plus 4,000 gallons of water
		≥ 200	< 5	
E	3	≥ 200	≥ 5	Index A plus 6,000 gallons of water

DC = Dry Chemical
AFFF = Aqueous Film Forming Foam
Source: 14 CFR Part 139, *Certification and Operations: Land Airports Serving Certain Air Carriers*.

The Airport's ARFF station is currently classified as Index C. 14 CFR Part 139 states that Index C relates to airports where the operating aircraft are at least 126 feet long, but less than 159 feet long, with at least five daily departures. Based on the projected fleet mix, it was determined that the ARFF facility will be required to meet Index D standards by 2015 as a result of the projected increase in widebody aircraft activity at SAT. **Table 4-40** shows the results of the ARFF index determination analysis.

Table 4-40: ARFF Index Determination

Average Daily Departures by ARFF Index					
	2008	2010	2015	2020	2030
A	153	136	144	145	148
B	104	99	130	148	176
C	37	33	35	36	51
D	**3**	**3**	**5**	**5**	**8**
E	0	0	0	1	3

The ARFF station already operates four vehicles, thereby exceeding Index D requirements. Therefore, it is not expected that additional ARFF equipment will be required throughout the planning period. A new structural fire company is to be added to the station, which will

necessitate some remodeling of the existing ARFF station to provide additional storage space and living areas. An exterior storage facility for flammables and lubricants will also be required. It is not expected that any additional land will be required to accommodate the aforementioned improvements.

Airport Maintenance Facilities

Airport maintenance facilities are located in the western portion of the Airport, at the intersection of John Saunders Road and Paul Wilkins Road. The Airport maintenance complex occupies an area of approximately 4.7 acres. The complex consists of seven buildings and a storage yard totaling 5,200 square feet of office space and 20,900 square feet of workshop space used for the storage and maintenance of airfield and Airport maintenance equipment.

Airport maintenance staff has expressed the need for expanded facilities to adequately accommodate existing Airport activity. The current site is vastly undersized, and additional administrative space, automobile shop, vehicle parking, and overnight storage space would be required to accommodate the needs of the Airport's Facilities Maintenance Department. The existing deficiency would be corrected by an initial 5-acre expansion, bringing the Airport maintenance facility site to 9.7 acres. The Airport maintenance complex does not have direct airfield access, requiring that vehicles be driven on public roads to the AOA gate in the West Cargo Complex. Ideally, the Airport maintenance complex would have direct access to the airfield.

Airport and airfield maintenance facility needs do not necessarily increase proportionally with activity, but are more a function of the overall pavement and grassy areas requiring maintenance, as well as climatic conditions (for snow/ice removal). In addition, the condition of airside facilities dictates maintenance requirements, as pavements in poor condition require more maintenance equipment and personnel than those in good condition. As no significant airfield expansion projects are recommended in the Master Plan, it is not expected that additional facilities beyond the expansion described above will be required throughout the planning period.

FAA Facilities

FAA facilities on the Airport include the ATCT, TRACON, and Technical Operations Center, located southwest of the terminals near the parking garage, and several navigational aids.

Currently, the ATCT is adequately sited and has sufficient elevation to allow an unobstructed view of all active airfield areas from the cab. It was assumed that no changes in the ATCT layout, size, and location will be required during the planning period.