

## CHAPTER VIII. SURFACE ACCESS AND PARKING FACILITIES

The analysis of roadway and parking requirements is prescribed for the two different terminal development scenarios described in Chapter VI. These are:

- Scenario 1 - Terminal 3 remains a two-concourse terminal.
- Scenario 2 - Terminal 3 is developed with a third permanent concourse to replace the temporary American West concourse.

### 1. REGIONAL ACCESS ROADS

#### A. Capacity of Access Roads

Sky Harbor Boulevard and Buckeye Road provide access to the airport on both the east and west ends.<sup>1</sup> In 1984, it was estimated that a total of 55,000 vehicles entered and left the airport during a typical busy day - 27,000 entering and leaving via the east entrances and 28,000 entering and leaving via the west entrances. Based on surveys also conducted in that year, it was estimated that a total of 3,800<sup>1</sup> vehicles entered and left the airport during the noon-time busy hour and 3,100<sup>1</sup> during the 5:00 to 6:00 p.m. typical "peak hour." In 1988, the direct connection from I-10 into Sky Harbor Boulevard on the west end was opened. Based on traffic counts made in 1988, the 45 percent growth in originations at Sky Harbor has resulted in a 35 percent increase in vehicular traffic in and out of the airport. A total of 75,000<sup>1</sup> vehicles per day travel to the airport via all three entrances. It is estimated that a total of up to 5,100 vehicles currently enter and leave the airport during the busiest hour (2,550 in each direction). This is well within the capacity of the existing system.

Highway improvements at both the east and west ends of the airport will greatly increase entrance and exit capacity. On the east end, with the completion of State Route 153 and the Hohokam and East Papago Freeways; the eight-lane Sky Harbor Boulevard will have a theoretical capacity of up to 4,800 vehicles per hour in each direction under level of Service C.<sup>2</sup>

On the west end, the direct link with I-10 to and from the north has a capacity of up to 2,000 vehicles per hour in each direction at Level of Service C.

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<sup>1</sup>Total two-way traffic volume.

<sup>2</sup>Level of service is a traffic engineering term used to describe the quality of traffic flow over a road. It ranges from A, which represents free-flow condition, to F which represents completely stopped conditions.

In addition, while the final configuration of Buckeye Road east of 24th Street has yet to be determined, it can be assumed that a four lane Buckeye Road could accommodate between 1,000 and 1,200 vehicles per hour in each direction during the peak hour.

#### **B. Access Roadway Requirements**

The growth in both peak hour and annual originating and terminating passengers will greatly increase the volume of traffic in and out of the airport. It is estimated that by the year 2007, a total of 70,000 vehicles daily will enter and leave the airport via the east entrance, 5,000 of which will occur during the peak hour (2,500 in each direction). This is well within the capacity of Sky Harbor Boulevard east of Taxiway W (see Table VIII.1).

On the west end of the airport, the entering and exiting traffic will be split between the spur from I-10 to and from the north and Buckeye Road (24th Street) to and from the west and south. It is estimated that total traffic will approximate 70,000 vehicles per day (total two-way) with 60 percent using I-10 and 40 percent using the Buckeye Road entrance. This equates to 1,500 vehicles per hour entering (and a similar volume leaving) via the I-10 spur and 1,000 vehicles entering (and a similar volume leaving) via Buckeye Road during the peak hour (see Table VIII.1).

Based on projected peak hour volume for the design year, the traffic entering and leaving via the east entrance on Sky Harbor Boulevard east of Taxiway W will be appreciably less than roadway capacity. On the other hand, the volume entering and leaving via the west entrance would be approaching capacity (depending upon final configuration of the Buckeye Road entrance). However, assuming that current plans for improvements at the west end of the airport are completed, the roadways will be able to handle the projected peak hour traffic beyond the design year.

## **2. INTERNAL ROAD SYSTEM REQUIREMENTS**

#### **A. Capacity of Internal Roadways**

The construction of Terminal 4 and the current Master Plan development provides the opportunity to plan, design, and construct an airport roadway system sufficient to meet the projected demand. However, physical constraints imposed by the existing configuration of Terminal 3 limit the width of Sky Harbor Boulevard to three lanes in each direction unless substantial, costly modifications are made to the terminal complex. Although these three lanes could be regarded as operating much like an expressway since there are no intersections or traffic lights on Sky Harbor Boulevard within this section, there are many entrances, exits, and weaving sections along the roadway which constrain capacity. As a result, it is estimated that the three outer bypass lanes could accommodate 3,000 vehicles per hour (in each direction) adjacent to Terminal 3. If the innermost lane is converted to a curb lane, the two

Table VIII.1

ENTRANCE ROADWAY CAPACITY

	Capacity <sup>a</sup> One-Way	Year 2007 Peak Hour Volume One-Way
Sky Harbor Boulevard (East End)	4,800	2,500
Sky Harbor Boulevard (West End)	2,000	1,500
Buckeye Road (West End)	1,000	1,000

Note: <sup>a</sup>With proposed improvements.

Source: HNTB analysis.

remaining lanes would have a capacity of approximately 1,800 vehicles per hour, thus necessitating adding a fourth outer lane to have three usable lanes with an hourly "throughput" capacity of 3,000 vehicles per hour.

### **B. Internal Road System Requirements**

The focusing of all air carrier activity into two terminals within a spine roadway will cause a portion of the traffic entering from one end to bypass one terminal to reach the second terminal. For example, traffic from downtown Phoenix entering the airport at the west end must bypass Terminal 3 (on the north side) before reaching Terminal 4. If the traffic is related to passenger drop-off or pick-up activity, the vehicle would then bypass both Terminals 4 and 3 on the south side to return to downtown Phoenix. In a similar manner, traffic from the east end must bypass Terminal 4 to access Terminal 3. Thus, the "through" traffic capacity of Sky Harbor Boulevard is an important requirement as providing sufficient curb space to ensure an adequate and well functioning landside system.

Whichever scenario is developed, it is projected that the volume of traffic bypassing Terminal 3 on the outer lanes would range from 2,500 to 3,000 vehicles per hour by the year 2007. Thus, no curbside activity could be accommodated along the outer roadway unless a fourth lane is constructed in this area.

## **3. CURB SPACE REQUIREMENTS**

### **A. Capacity of Curb Space**

Terminals 2 and 3 currently have a total of 1,640 and 2,190 lineal feet of curb space<sup>1</sup> available to serve all modes of ground transportation. For Terminal 2 this includes the inner curb, elements of the outer curb, and a series of island curbs just east of the terminal serving various modes of public transportation. It must be noted however, that while most of the curb is "active" curb, elements of the curb are considered "holding" zones dedicated to vehicles waiting for their turn to pull up to the active curb.

The 2,190 lineal feet of curb space at Terminal 3 includes both the inner curb along the north and south face of the terminal proper (amounting to 1,100 lineal feet), partial use of an "outer" curb (amounting to 450 feet) along the north and south side express roadways, and a total of 640 feet along the north and south face of the parking structure dedicated to a combination of loading and "holding" zones.

When Terminal 4 is completed, the two-level, two-sided terminal will have 4,800 lineal feet of curb space or 2,400 lineal feet on both the enplaning and deplaning level.

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<sup>1</sup> HNTB estimate.

During the initial phase, when only a portion of the ticketing and baggage claim building is completed, the "effective" curb space extending slightly beyond the building itself is likely to be approximately 2,000 lineal feet in total. Due to the walking distances from segments of the curb well beyond the building, the balance is unlikely to function in an effective manner. It is more likely to be used for holding or parked vehicles.

#### **B. Curb Space Requirements**

The curb space requirements projection was based on a curbside planning model developed by the Transportation Research Board. The model takes into account mode split, vehicle occupancy, and dwell time and is based on a comprehensive survey of many large and medium hub airports. For this model, "active" curb space requirements were developed; they are listed in Table VIII.2.

The table indicates that Terminal 4 will have adequate curb length under either development scenario. Terminal 3 would have sufficient curb length under Scenario 1 (with two concourses). It would not have adequate curb length under Scenario 2 (three concourses) unless use is made of the outer curb necessitating adding one lane to the outer through roadways on both the north and south side to accommodate the through traffic destined for Terminal 4.

### **4. PARKING REQUIREMENTS**

#### **A. Existing Parking Supply**

The airport currently (October 1987) provides 8,102 parking spaces on-airport to serve the general public. Of these, 5,222 (64 percent) are located within the terminal area(s) serving the hourly (short-term) and a portion of the daily (long-term) parking needs. The remaining 2,880 (36 percent) are located in two reduced rate, remote parking lots designed to attract and serve the longer term users. Within the terminal area, a differentiation between hourly and daily parking is made only at Terminal 2, where 1,672 of the 2,232 spaces in the structure serving that terminal are set aside for daily parkers at a daily rate one-half that of the hourly rate (per 24 hours).

#### **B. Public Parking Requirements**

The total volume of air passengers who originate their air travel at the airport is projected to increase from 5.6 million in 1986 to 12.2 million by 2007. This will require an increase in the volume of parking. Because of the development of separate "unit" terminals, this must be split between parking at each terminal, ideally balanced in accordance with the demand at each terminal, and "remote" parking lots offering reduced rate parking at each end of the airport.

Table VIII.2  
CURBSIDE REQUIREMENTS, 2007

Element	Available or Planned	Scenario 1 <sup>a</sup>	Scenario 2 <sup>b</sup>
<b>Terminal 3</b>			
Enplane	550 <sup>c</sup>	400	700
Deplane	550 <sup>c</sup>	500	850
Holding (Queue)	640	300	500
	<u>1,740</u>	<u>1,200</u>	<u>2,050</u>
<b>Terminal 4</b>			
Enplane	1,000 <sup>d</sup>	1,300	1,000
Deplane	1,000 <sup>d</sup>	1,600	1,200
Holding (Queue)	2,800	800	650
	<u>4,800</u>	<u>3,700</u>	<u>2,850</u>
<b>TOTAL</b>	<b>6,540</b>	<b>4,900</b>	<b>4,900</b>

Note: <sup>a</sup>Scenario where Terminal 3 remains a two-concourse terminal after removal of the temporary America West concourse in 1991.

<sup>b</sup>Scenario where a third, permanent concourse is added to Terminal 3 after removal of the temporary America West concourse in 1991.

<sup>c</sup>HNTB estimate - does not include outer curb (terminal design does not physically separate enplaning and deplaning curb).

<sup>d</sup>HNTB estimate - effective length, first phase, in 1,000 feet on both enplaning and deplaning level (500 feet on each side, each level).

Because the airport is a large, "mature" hub airport within an established and growing metropolitan area, only limited changes in the distribution among the various modes of access are anticipated within the planning horizon. Given recent public decisions which shelved plans to construct a regional rail transit system which would serve the airport, it is unlikely that a major shift among the modes serving the airport will occur within the planning horizon. Public parking requirements are anticipated to increase generally in proportion to the growth in originating air passengers.

The projected increase in the total number of originating passengers will require the number of on-airport parking spaces to more than double by the year 2007. The increased demand in parking for each of the planning periods is shown in Table VIII.3. If the airport chooses to supply fewer than the projected number of spaces, it will have to rely to a greater degree than at present on off-airport parking operators to meet the total demand.

The parking supply should be distributed between terminal area parking, balanced in accordance with the demand at each terminal, and remote parking lots located at each end, balanced in accordance with the percent of traffic estimated to enter at each end of the airport. Desirably, parking at the terminal area (within walking distance) should meet the need for hourly parking (i.e., less than three hours), and the potential parking need generated by those making short trips -- perhaps one or two days. The longer term parkers should be encouraged through the pricing policy to use the remote long-term surface parking facilities, which are less expensive to construct (on-grade versus structures) and from which less revenue will be derived per unit of time parked.

Currently, it is estimated that approximately 70 percent of all vehicles parked at the airport are there for less than 2 hours, 20 percent park for 2 to 24 hours, and 10 percent park for more than 24 hours. However, the 70 percent parked for less than 2 hours can be accommodated in 15 to 20 percent of the total required spaces, while the 10 percent parked for over 24 hours occupy 55 percent of all spaces at any given time.

Because the terminal development at the airport requires structured parking at each terminal, it is not possible to increase the terminal area parking periodically to satisfy the increased demand for a specific type of parker. Structured parking generally is not easily expandable at Terminals 2 and 3, and only expandable within set limits at Terminal 4. Thus, parking rates must be varied periodically to shift the increasing demand to the remote lots. The projection of the demand for terminal area parking versus remote parking must then be influenced by a policy decision to satisfy a specific class of parker. If the airport chooses to develop sufficient parking to satisfy the needs for all those who park for 24 hours or less within the terminal area, then an estimated 48 percent of all spaces should be available at the terminal. Given this objective, the demand for terminal area parking at each terminal for each scenario in the year 2007 would be as shown in Table VIII.4.

Table VIII.3

ON-AIRPORT PARKING REQUIREMENTS

Year	Parking Required
1992	10,000
1997	13,000
2002	15,500
2007	16,500

Source: HNTB analysis.

Table VIII.4

DISTRIBUTION OF PUBLIC PARKING REQUIREMENTS, 2007

Location	Available or Planned	Demand Scenario 1 <sup>a</sup>	Demand Scenario 2 <sup>b</sup>
T-3	2,316	1,500	2,900
T-4	3,350	6,400	5,000
Total Terminal Area	5,566	7,900	7,900
West End	3,000 <sup>c</sup>	4,300	4,300
East End	--- <sup>d</sup>	4,300	4,300
Total Remote	3,000	8,600	8,600
<b>Grand Total</b>	<b>8,666</b>	<b>16,500</b>	<b>16,500</b>

Note: <sup>a</sup>Scenario where Terminal 3 remains a two-concourse terminal after removal of the temporary American West concourse in 1991.

<sup>b</sup>Scenario where a third, permanent concourse is added to Terminal 3 after removal of the temporary American West concourse in 1991.

<sup>c</sup>Permanent lot being constructed west of 24th Street opposite Runway 8L.

<sup>d</sup>Existing supply to be removed.

Source: HNTB analysis.

The parking requirements represent the optimum demand for parking under a given policy -- satisfaction of the demand for all those who wish to park in the airport for less than 24 hours. Given the inability to expand the parking at Terminal 3<sup>1</sup> and the ability to only expand the parking at Terminal 4 to either 4,200 spaces through an extra level or 6,000 spaces through additions at each end, the recommended parking development program is as shown in Table VIII.5. In either scenario, the terminal area parking will be of sufficient capacity to meet the demand for hourly parking and a significant portion of the demand for 24 hour parking. Developing the parking supply as shown will permit the rates charged at each terminal to be nearly identical and will permit each terminal to satisfy the nearly identical class of user (length of stay).

### **C. Employee Parking Requirements**

On-airport employment is expected to increase from 15,946 (1987) to 34,288 by the year 2007. This will generate a need for a total of approximately 11,000 employee parking spaces. The development of a specific parking plan for on-airport employment is difficult to achieve due to the wide distribution of employment locations. Unlike air passengers, who are destined to two or three places (the terminals), the employees are spread throughout the airport. For this reason, it is customary to only have remote parking with shuttle bus service for those employees who work within the terminals as well as airline and crew members whose ultimate destination is also the terminals. Parking for those who work in the air cargo complex, at airline maintenance facility, airline and airport support facilities and other on-airport employment centers is typically provided through a wide variety of individual lots so located as to allow these employees to walk to their job location.

## **5. OTHER TRANSPORTATION REQUIREMENTS**

### **A. Rental Cars**

There are currently a total of 590 ready-car/return spaces shared by four companies providing on-airport rental car service. Because of the importance of rental cars as a mode of access to and from Sky Harbor Boulevard, these ideally should be increased to accommodate the nearly 5,000 rentals that will occur on a busy day in the design year (2007). To accommodate this level of activity, it is recommended that between 1,500 to 1,700 ready car/return spaces be provided to reduce the volume of car "jockeying" movements to an acceptable level.

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<sup>1</sup>The parking structure at Terminal 2 which could remain in use after the closing of Terminal 2 is considered to be too far away to be considered as part of the Terminal 2 Parking Supply.

Table VIII.5

RECOMMENDED PUBLIC PARKING PROGRAM, 2007

Location	Scenario 1 <sup>a</sup>	Scenario 2 <sup>b</sup>
T-3	2,300	2,300
T-4	6,000	4,200
Total Terminal Area	8,300	6,500
West End	4,100 <sup>c</sup>	5,000 <sup>c</sup>
East End	4,100	5,000
Total Remote	8,200	10,000
<b>Grand Total</b>	<b>16,500</b>	<b>16,500</b>

Note: <sup>a</sup>Scenario where Terminal 3 remains a two-concourse terminal after removal of the temporary American West concourse in 1991.

<sup>b</sup>Scenario where a third, permanent concourse is added to Terminal 3 after removal of the temporary American West concourse in 1991.

<sup>c</sup>Could include the 2,200 spaces at the Terminal 2 parking structure if the structure remains in use after the closing of Terminal 2.

Source: HNTB analysis.

Storage and service facilities to meet requirements over the peak winter season eventually will require a total of 35 to 40 acres. The individual rental car companies have located or are planning to locate these facilities in areas at the west end of the airport and adjacent to the relocated 24th Street .

#### **B. Public Service/Courtesy Vehicles**

The curb space requirements are sufficient to accommodate loading and unloading activity by all public modes of travel. It also is sufficient to provide some taxicabs and other public vehicles with the ability to "hold" briefly while waiting. However, there is an additional need to have a specific holding area for taxicab buses and limousines away from the terminal area to reduce curb occupancy time to a minimum. This area should accommodate up to 150 cabs and 30 buses/limousines. Plans will be developed in the next phase of the program for location of this lot in the general vicinity of Remote Lot "C."

#### **C. Rail Transit**

The regional (rail) transit system originally planned for the Phoenix metropolitan area was aligned to traverse the airport from east to west. Within the airport, the system would have been constructed entirely below grade from the east entry west to the vicinity of the existing hotel. From the airport hotel to the west end of the airport, the rapid transit system would have been in an open cut.

To effectively serve the airport, stations would have been constructed at both Terminal 3 (north of the central terminal facility) and beneath Terminal 4 (already under construction).

While the plans have been abandoned as of 1989, provision for a station is included in T-4. Reservation of right-of-way and planning for installation of the system have little impact on other airport facilities. It will be recommended that the airport plans do not preclude eventual construction of the system, given a future reversal of public policy on the issue.

#### **D. Inter-Terminal Movement**

The decision by two carriers to initiate airline hubs at the airport has nearly eliminated the need for inter-terminal movement. As a result of these operations, there is virtually no activity involving those who use Phoenix as a point to transfer between air carriers. The demand for inter-terminal transfer is generated primarily by those who depart on one carrier and return on a different carrier at a different terminal and therefore need to return to the location of their cars. Since few people actually park at the terminals for the duration of their trip, this need is extremely limited. By contrast, the need to move between individual terminals and the remote lots is greater. This can best be accommodated by a shuttle bus operation which has the advantage of route flexibility in traveling within the lots. For this reason, it is recommended

that shuttle bus service be used for inter-terminal movement and that such service be incorporated into the remote parking shuttle bus operation.