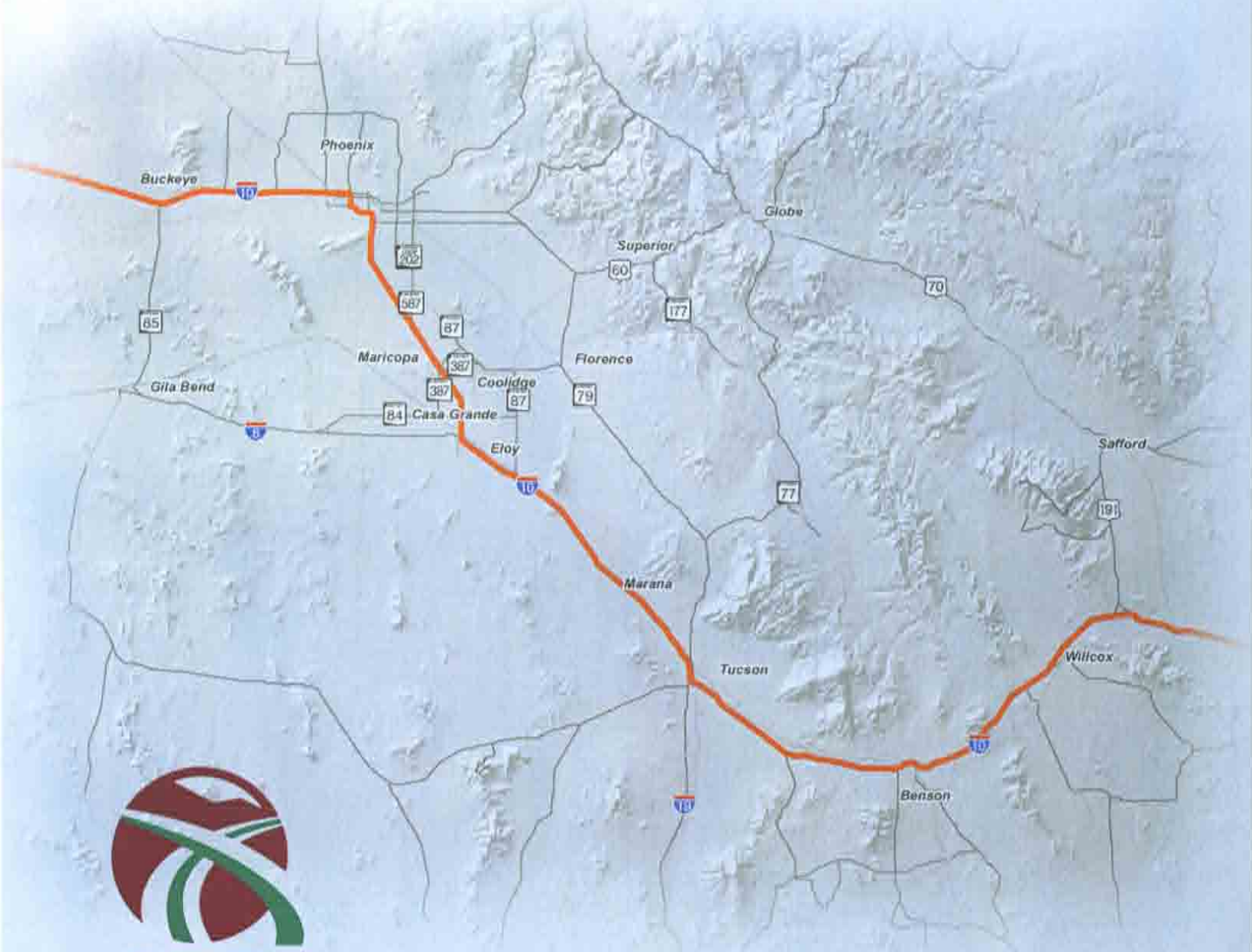
I-10 Bypass Study Follow Up

Tucson Metropolitan Area

DRAFT REPORT

October 16, 2008



ADOT

Prepared for

Multimodal Planning Division

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URS

I-10 Bypass Follow-up Report

Tucson Metropolitan Area

Draft Report

Prepared for:

Arizona Department of Transportation

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October 16, 2008

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EXECUTIVE SUMMARY

The Tucson Metropolitan Area encompasses Pima County where Interstate 10 (I-10) and I-19 are the only freeways. I-10 is a major east-west interstate that extends from coast to coast. The section near downtown Tucson is one of the most critical links in the 3,000-mile-long route because of the absence of any alternative route. This section of I-10 is currently being reconstructed to provide four lanes in each direction. Because of limited right-of-way, no further improvements are planned. When completed, I-10 will accommodate approximately 200,000 vehicles per day (vpd).

The population of Pima County is expected to increase by 50 percent by 2030 to almost 1.5 million. The population of Pinal County (just to the north) is expected to increase by eight times to almost 2.0 million by 2030. As this occurs, the two counties will become one large metropolitan area. This merging of urban areas will have a great impact on the I-10 traffic.

Recent traffic forecasts from several sources indicate that the traffic volume on I-10 will exceed the capacity of the roadway before 2030. The result will be substantial delays to interstate travel, diversion of more local traffic to arterial streets that are already expected to be overloaded, additional air pollution due to congestion, an increase in rear-end collisions on I-10, and more noise during off-peak hours. Since there is no alternative route to I-10, crashes, maintenance, and construction would greatly increase the delays to everyone needing to use the I-10 corridor and nearby arterials. These conditions would reduce the quality of life in the Tucson area.

There are no adopted plans for new or expanded roadways that would significantly reduce the travel demand on I-10. “Route 4” in the *I-10 Phoenix-Tucson Bypass Study* (also referred to as the “Western Corridor” in the *Southern Pinal-Northern Pima Corridor Definition Study*) could offer some diversion of traffic from I-10 and could serve as an alternative route if I-10 is blocked due to crash events, stalled vehicles, maintenance, or construction.

Introducing commuter rail and double tracking the freight rail are not likely to have a noticeable effect on the I-10 traffic. Even though the nation is faced with a leveling or reduction in petroleum supplies and a dramatic increase in fuel costs, the dependence upon individually driven vehicles as the main source of transportation is likely to continue by evolving to more fuel-efficient vehicles or use of alternative fuels and power sources. It is prudent to continue to plan for the increase in individually driven vehicles.

Based on a preliminary look at “double decking” I-10 in the critical downtown Tucson section, it currently appears technically feasible but would be very costly and bring with it visual and noise

issues and substantial disruption during construction. The cost of a 6-mile-long elevated four-lane roadway, with widening of I-10 at either end to accommodate the entering and exiting traffic, is estimated to range from $700 to $900 million based on 2008 cost factors. The cost per mile of this four-lane roadway would be three times that of a standard new six-lane urban freeway.

The elevated roadway would add approximately 50 percent to the capacity of the I-10 corridor, increasing the daily capacity to 300,000 vpd from 200,000 vpd as currently planned. This added capacity would serve the traffic demand in the corridor well past 2030 if other planned road improvements are made. It also would help reduce the diversion of I-10 traffic to local arterials and would help enable the Tucson area to continue to grow and prosper.

Given the high cost and difficulty of getting public acceptance of the double decking concept, it appears that a new corridor would better serve the Tucson area, divert some traffic from I-10, and provide an alternative route to I-10. Of the potential new corridors considered in the *I-10 Phoenix-Tucson Bypass Study*, "Route 4" has the most potential. This potential corridor is west and south of the Tucson urbanized area and is shown in Appendix A.

1.0 EXISTING AND PLANNED CONDITIONS ON INTERSTATE 10

1.1 INTRODUCTION

In 2007, the Arizona State Transportation Board (the Board) requested the Arizona Department of Transportation (ADOT) Multimodal Planning Division to begin a study of the "need for and feasibility of" a potential bypass for Interstate 10 (I-10) through the central and southeastern portions of Arizona. This study was in recognition of the existing and projected traffic congestion on I-10 within and between the Phoenix and Tucson metropolitan areas. This study was conducted during 2007 with two rounds of public meetings, over 40 interviews with stake-holders, and presentations to the Board at a study session in December 2007 and at regular Board meetings in January and March of 2008. The potential bypass would create a new highway corridor that could divert traffic from I-10, support the expected growth in the Sun Corridor (particularly in Pinal County), and potentially open new areas for urban development.

Extensive opposition to the idea of a new corridor was expressed by many people, particularly in Pima and Cochise counties. They feared that a new corridor would open new lands to urban development that could compete for the groundwater that feeds the San Pedro and Aravaipa rivers and endanger the wildlife in those regions. Others did not want a new corridor in Pima County that might interfere with rural lifestyles in some areas, impact the Tucson Mitigation Corridor, and promote additional urban growth.

Due to this strong opposition, the Board requested that an additional study be conducted on I-10 in the Tucson Metropolitan Area to better quantify the projected conditions if I-10 is built to its currently planned width. The Board further requested identification of the possible benefits, consequences, costs, and environmental constraints if I-10 is built to its maximum potential using extraordinary measures within the existing right-of-way, including "double decking."

This report is in response to that request by the Board.

1.2 EXISTING, PLANNED, AND ULTIMATE IMPROVEMENTS TO I-10

I-10 through the Tucson Metropolitan Area (Pima County) begins near Milepost 232 at the Pinal County line and extends 64 miles eastward to near Milepost 296 at the Cochise County line. It was originally constructed with two lanes in each direction. The portion near downtown Tucson was widened to three lanes in each direction several years ago. More recently, the frontage roads from Ina Road to near I-19 were completely reconstructed and made continuous in advance of the current mainline reconstruction project. The mainline is being reconstructed to provide four

lanes in each direction from Prince Road to I-19. During construction, the frontage roads handle the local traffic, and the through traffic is temporarily provided two lanes in each direction on one side of the ultimate mainline. Construction is expected to be completed in 2009.

Construction is under way to provide three lanes in each direction from near Picacho Peak in Pinal County to Tangerine Road in Pima County. The work in Pima County is nearing completion. I-10 has three lanes in each direction from Tangerine Road to the current construction that starts at Prince Road and extends eastward to I-19.

The I-10/I-19 interchange was completely reconstructed in recent years. Except for the ramp lane tapers from the I-19 system interchange, I-10 east of I-19 is largely unchanged and still provides two lanes in each direction.

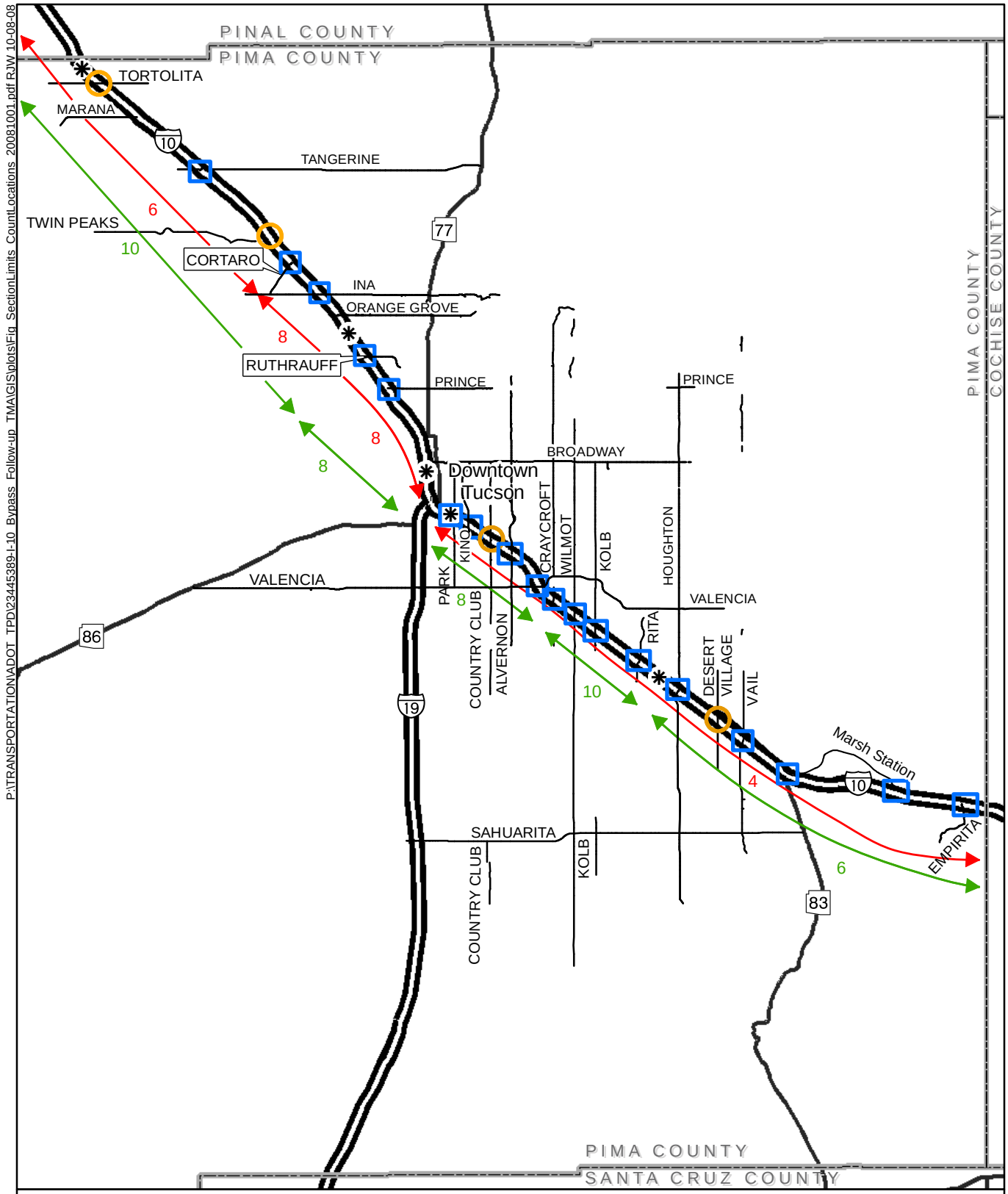
ADOT has programmed in the *FY2009-FY2013 Five-Year Construction Program* several improvements to I-10 in the Tucson area. The major capacity improvements will be from Ruthrauff Road to Prince Road, where I-10 will be widened to four lanes in each direction. There are funds for improvements to frontage roads, several interchanges that will be discussed later, and completion of projects already well under way.

ADOT has several studies ongoing to determine the ultimate number of lanes on I-10. The preliminary results of these studies have been obtained and are included in Table 1 and in Figure 1 which summarizes existing lanes, programmed lanes, and ultimate lanes within Pima County.

Table 1
Existing, Programmed, and Ultimate Lanes on Interstate 10 in Pima County

Interstate 10 Section	Existing (or Under Construction)	Programmed in FY2009-FY2013	Ultimately Planned
Pinal County line to Ina Road	6	6	10
Ina Road to Ruthrauff Road	6	8	10
Ruthrauff Road to Prince Road	6	8	10
Prince Road to I-19	8	8	8
I-19 to Kino Parkway	6	6	8
Kino Parkway to Alvernon Way	4	4	8
Alvernon Way to Kolb Road	4	4	10
Kolb Road to Houghton Road	4	4	8
Houghton Road to Cochise County Line	4	4	6

NOTE: FY = fiscal year



LEGEND

- Traffic Count Segments
- Streets
- State Routes
- Interstate

I-10 Improvements

- Programmed
- Planned Ultimate
- Reconstructed T.I.
- New T.I.

URS

Figure 1

Planned Improvements To I-10

0 1.5 3 6
Miles
Not to Scale

The traffic interchanges (TIs) listed in Table 2 are scheduled for major reconstruction or will be new interchanges. Some of the interchange reconstructions will provide for grade separations for the cross street with the Union Pacific Railroad. These improvements will greatly reduce delay to motorists on these streets and improve safety. New interchanges tend to accelerate the growth of traffic on I-10 by providing more access points. ADOT plans to continue the one-way frontage road system well into Pinal County, so that may help to minimize the number of short trips that might otherwise use I-10 between closely spaced interchanges.

Table 2
Programmed or Planned Interchange Reconstruction or New Traffic Interchange

Interchange	Programmed	Ultimate	New Traffic Interchange?
Tortolita Road		Yes	Yes
Tangerine Road		Yes (private funds)	No
Twin Peaks Road	Yes (Marana)		Yes
Cortaro Road	Yes		No
Ina Road	Yes		No
Ruthrauff Road		Yes	No
Prince Road		Yes	No
Sixth Avenue		Convert to half-diamond interchange	No
Park Avenue		Yes	No
Kino Parkway	Yes		No
Country Club Road	Yes		Yes
Alvernon Way		Yes	No
Valencia (system traffic interchange)	Yes		No
Craycroft Road		Yes	No
Wilmot Road	Yes		No
Kolb Road		Yes	No
Rita Road		Yes	No
Houghton Road		Yes	No
Desert Village Road		Yes (private)	Yes
Vail Road		Yes	No
State Route 83		Yes	No
Marsh Station	Yes		No
Empirita Road		Yes	No

1.3 EXISTING TRAFFIC VOLUMES ON I-10

Traffic counts obtained from ADOT extend from 1977 to 2007 and are shown in Figure 2. The data represent the vehicles per day (vpd) on the average day of each year and is referred to as average annual daily traffic. For display and analysis purposes, five locations along I-10 were chosen to represent sections with different traffic conditions. The graph in Figure 2 shows the traffic volume trends over 30 years on each of the five short segments. The highest

traffic volumes, and indeed the fastest growth, have been on the downtown segment between St. Mary's Road and Congress Street. The segment to the west (Orange Grove Road to Sunset Road) has been increasing at the same rate, but the volumes are somewhat lower. To date, the other three segments have lower volumes and lower growth rates.

1.4 TRAFFIC FORECASTS

Traffic forecasts were obtained from a variety of sources for comparison purposes. Forecasts from several sources are described below, and a summary is provided at the end of this section.

1.4.1 Pima Association of Governments Forecasts

The Pima Association of Governments (PAG) is the official traffic forecasting agency for the Tucson Metropolitan Area. They use a computerized traffic forecasting model that incorporates growth forecasts of population and employment and the planned transportation system. PAG staff members indicated that their model does not currently reflect the rapid development expected in Pinal County. If Pinal County growth continues as expected, the county will become an extension of the Tucson Metropolitan Area and would need to be fully incorporated into the PAG model.

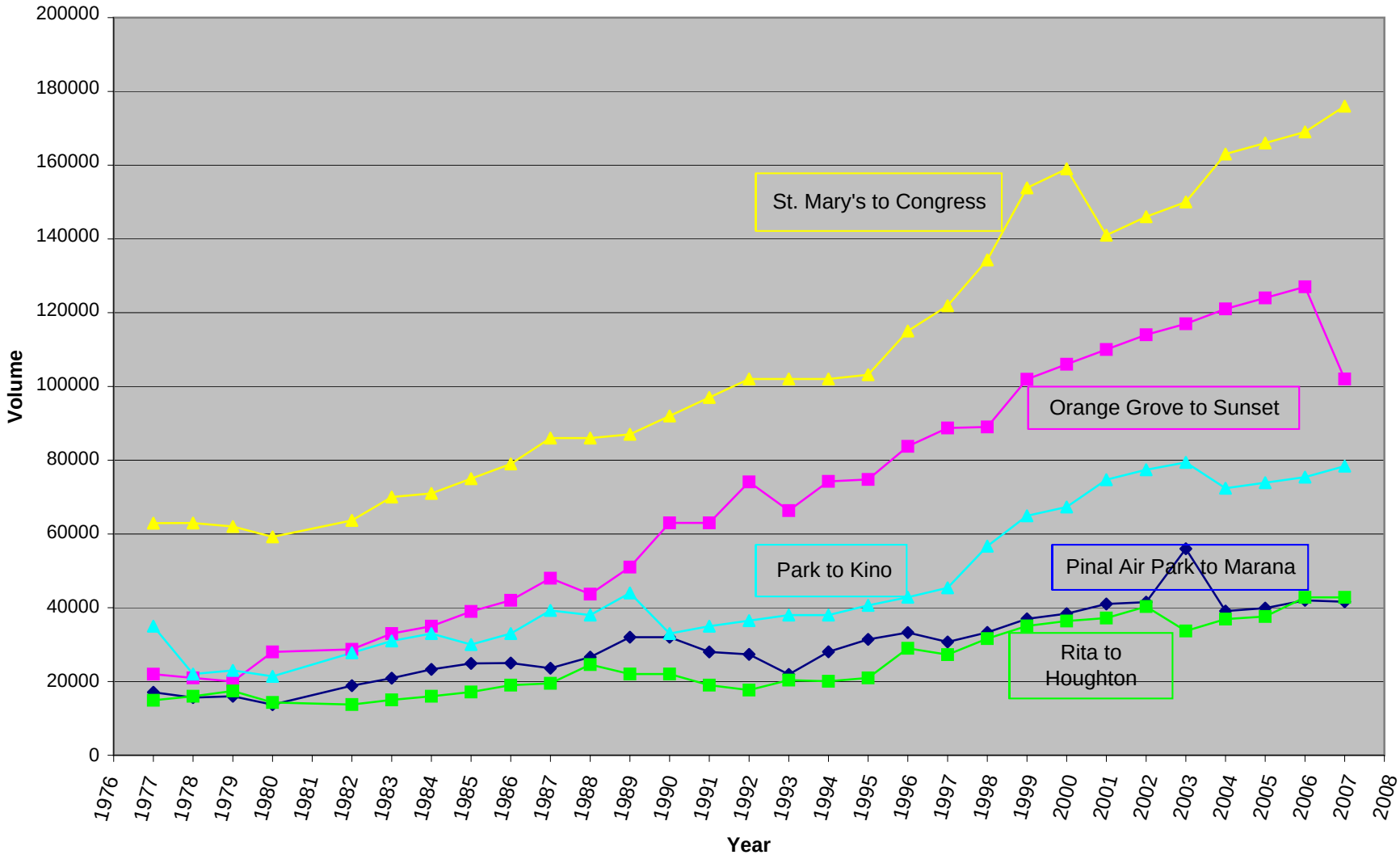
A comparison of actual counts to the PAG model simulation of 2005 traffic indicates that the model in general underestimates traffic on I-10. Table 3 illustrates this finding. As a result, forecasts by the PAG model may be considered on the low side of probable future traffic volumes.

Table 3
Comparison of PAG 2005 Simulated Volumes to 2005 Traffic Counts

Location	PAG Simulation (vpd)	ADOT Count (vpd)	Difference* (PAG – Count) (vpd)
Pinal Airpark Road	25,075	39,900	(14,825)
Orange Grove Road	107,533	124,000	(16,467)
St. Mary's Road	135,243	166,000	(30,757)
Park Avenue	56,831	73,900	(17,069)
Rita Road	54,947	37,600	17,347

NOTES: *Parentheses denote negative numbers.
ADOT = Arizona Department of Transportation, PAG = Pima Association of Governments,
vpd = vehicles per day

Figure 2: Historical ADOT Traffic Counts On I-10



In June 2008, PAG provided 2030 forecasts for the metropolitan area including I-10. The results are shown in Table 4 but have these limitations: (1) the model is being updated and PAG expects to have new forecasts for 2040 in October 2008; and (2) PAG and the Maricopa Association of Governments are conducting a survey of external traffic (traffic entering, leaving, or passing through the metropolitan areas). The results of this survey will not be available and incorporated into the traffic models until early in 2009. PAG recognizes that their current model is not as accurate as desired and is working hard to improve the model. PAG staff members believe they will have greatly improved forecasts in the near future.

Table 4
PAG 2030 Traffic Forecast on Interstate 10

Location	2030 Volumes (vpd)
Pinal Airpark Road	84,411
Orange Grove Road	154,621
St. Mary's Road	196,518
Park Avenue	106,705
Rita Road	88,757

NOTES: PAG = Pima Association of Governments, vpd = vehicles per day

1.4.2 Southern Pinal-Northern Pima Corridor Definition Study

The *Southern Pinal-Northern Pima Corridor Definition Study* was completed in April 2008 by Kimley-Horn for ADOT. This study was one of the first to look at the combined needs of the two counties. The study was based on forecasts of population and employment for the two counties shown in Table 5. Note that the population of Pinal County is expected to exceed the population in Pima County by 2030. As this growth takes place, the travel patterns between the two counties will change and increase dramatically to reflect a continuous urban area. The employment in Pinal County is expected to increase even faster than population. By 2030, the employment in Pinal County will approach the total employment in Pima County. When this occurs, there will be substantial work-related commuting in both directions between the two counties. This commuting will have a dramatic impact on I-10 traffic.

Table 5
Population and Employment Forecast for Pima and Pinal Counties

	Pima County	Pinal County
Population		
2005	943,418	222,913
2030	1,494,105	1,954,016
Employment		
2005	481,336	40,027
2030	673,383	519,774

For this study, a traffic model was created to span the two counties. The base network consists of the existing and committed highway improvements in the study area. The 2030 forecast for I-10 is 224,000 vpd at Pinal Airpark Road. The forecast traffic volume is somewhat constrained by the planned capacity of I-10.

The study also looked at adding several new corridors, particularly in Pinal County. The five potential corridors that could affect I-10 are the western parallel route ("Route 4" in the *I-10 Phoenix-Tucson Bypass Study*), two new north-south routes that would intersect I-10 in Pinal County, a new north-south route that would parallel State Route 77 in Pima County, and an east-west route that would link Marana and Oro Valley. When these routes are included in the model network, the forecast volumes on I-10 decrease slightly as shown in Table 6.

Table 6
2030 Traffic Forecast on I-10
Southern Pinal-Northern Pima Corridor Definition Study

Location	Base Network	With Proposed New Corridors
1. Pinal Airpark Road	224,000	200,000
2. Orange Grove Road	186,000	170,000
3. St. Mary's Road	168,000	158,000
4. Park Avenue*	118,000	120,000

***** The model did not extend eastward along Interstate 10 to Rita Road.

The forecasts in Table 6 are dramatically different from the PAG forecast shown in Table 4. The strong impact of growth in Pinal County is clearly evident, with traffic forecast for I-10 near the Pinal/Pima County line being much higher than the forecast for I-10 near downtown Tucson.

The forecasts near downtown Tucson and further east on I-10 may be suspect because they are at the edge of the modeled area. Forecasts for roads at the edge of a modeled area are often not as accurate as they are within the center of the modeled area. This discrepancy results from the development and conditions outside the modeled area not being fully taken into account by the model, and the discrepancy is particularly acute when the model stops within an urban area. As a result, the forecast in that report south of Orange Grove Road can be largely discounted for the purposes of this current study.

1.4.3 I-10 Design Concept Report

DMJM Harris is currently preparing a design concept report for ADOT for widening I-10 in Pinal County and extending to Tangerine Road in Pima County. The total number of proposed lanes through this section is five lanes in each direction plus one-way frontage roads on both

sides. The 2030 traffic forecast prepared for this study indicates 228,000 vpd on I-10 near the Pinal Airpark Road. This forecast is consistent with the Kimley-Horn forecast presented above.

1.4.4 Projection of Historical Trends

Another traffic forecast may be derived from a simple extension of the historical counts shown previously in Figure 1. A regression line was calculated based on the historical data at each of the five selected locations and is shown in Figure 3. This method of forecasting is often used on rural highways where ordinarily there are few dramatic changes in the road system or in the development served by the rural road. This method is less reliable in rapidly growing urban areas where new roads may be constructed that divert traffic, and where growth patterns change rapidly causing shifts in traffic growth. Nevertheless, this simple method of extrapolating past trends provides a good basis for reviewing traffic forecasts produced by computerized traffic models.

Based on the projection lines in Figure 3, the traffic volumes on I-10 near downtown Tucson could reach 270,000 vpd in 2030. Near Orange Grove Road, the volumes on I-10 could reach 220,000 vpd in 2030. These forecasts are reasonably consistent with the computerized modeling forecasts discussed above. However, at the Pinal County line, the projection of historical trends estimates only 60,000 vpd in 2030, far less than the results of the studies mentioned above.

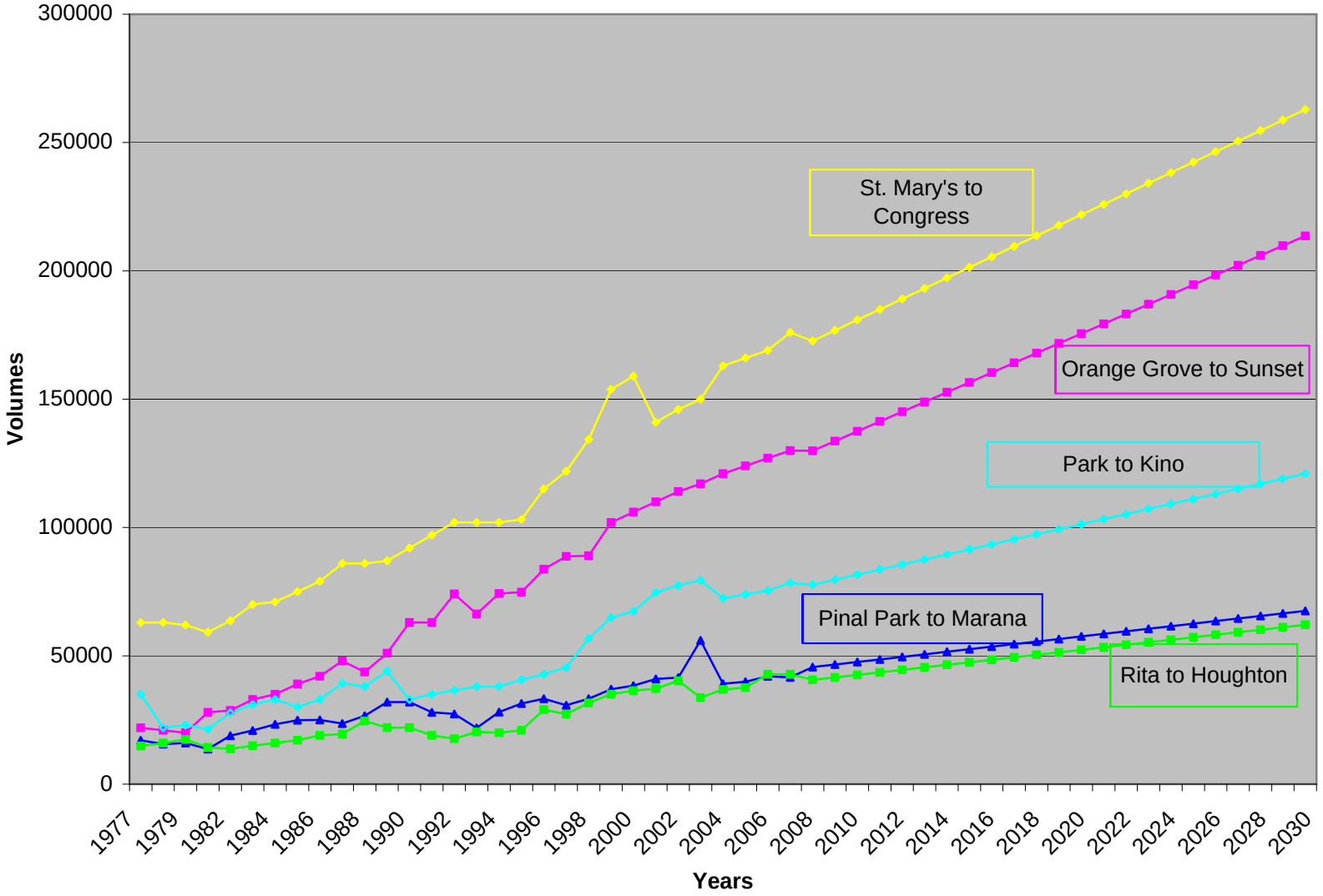
1.4.5 ADOT Statewide Framework Studies

ADOT is conducting a series of Framework Studies to formulate a long-range statewide transportation plan. As part of that effort, Arizona's first statewide travel forecasting model is being created. This model is under development at the time of this writing in October 2008, so no results are available. The 2030 and 2050 forecasts are anticipated to be forthcoming in the next few months. Because that model will be the first of its kind in Arizona, consistency between that model and the other models reported above cannot be predicted.

1.4.6 Summary of Traffic Forecasts

Traffic forecasts from four different sources were obtained and compared: the various PAG forecasts, projected historical trends, and two studies, the *Southern Pinal-Northern Pima County Corridor Definition Study* and the *I-10 Design Concept Study*. Those studies found that the 2030 traffic forecast for I-10 is approximately 225,000 vpd at the Pinal/Pima County line. These forecasts are based upon rapid growth in Pinal County. These forecasts are higher than the PAG forecast or the straight line projection, neither of which incorporates rapid growth in Pinal County.

Figure 3: Projected Traffic Volumes on I-10



The critical section on I-10 will likely be the section near downtown Tucson that is being reconstructed to provide eight lanes of traffic. Historically the traffic volume near downtown has been much higher than at the Pinal County line. When the population of Pinal County reaches or exceeds the population of Pima County, the traffic volume on I-10 will likely be almost the same from the county line to I-19. Accordingly, for the purposes of this analysis, it is assumed that the 2030 traffic volume on I-10 near downtown will be in the 200,000 to 225,000 vpd range.

Forecasts beyond 2030 are difficult to derive. PAG expects to have the 2040 forecast ready in October 2008, and the statewide model is expected to produce the 2050 forecasts. When this information is available, it should be reviewed to determine if it provides any new insight into the potential conditions on I-10.

1.5 CAPACITY AND LEVEL OF SERVICE ON I-10

The methodology for estimating the capacity and level of service (LOS) of a roadway is provided in the *Highway Capacity Manual 2000* with updates. Capacity is defined as the maximum number of vehicles that can use a section of roadway in one hour. LOS is a measure of the degree of freedom a motorist has to travel at the speed desired (within speed limits) and to change lanes when desired. Figure 4 illustrates the various levels of service on a freeway. When planning freeways in urban areas, it is general practice to try to maintain LOS D during the peak hours in the target year, usually 20 years from time of construction (see Figure 4). LOS E represents the maximum capacity of a given roadway in one hour. LOS F represents over capacity condition which usually results in stop-and-go traffic.

For I-10 near downtown Tucson, four lanes are being constructed in each direction. This is the maximum improvement anticipated for this section because no additional right-of-way is available. Based on the *Highway Capacity Manual 2000*, the maximum hourly flow rate for a freeway lane is 2,350 passenger cars per hour. If the traffic stream consists of 10 percent trucks, the number of vehicles per hour is reduced by 5 percent or 2,232 vehicles per hour (vph). Four lanes in one direction can accommodate 8,930 vph. If 55 percent of the traffic is going in one direction, the other direction would carry 7,310 vph for a total two-way hourly volume of 16,240 vph. Typically, approximately 8 percent of the daily traffic in an urban area occurs in the peak hour, which would result in a daily capacity of 203,000 vpd on I-10. This daily capacity approximates the 2030 daily traffic forecast derived in the previous section. Based on that capacity, LOS E or F is expected during the peak periods in 2030 (see Figure 4).

Figure 4
Levels of Service on a Freeway

Level of Service A

Level of Service B

Level of Service C

Level of Service D

Level of Service E

Level of Service F

One-way frontage roads are planned along I-10 from Pinal County to I-19. These roadways are very useful to divert traffic during construction, maintenance, or crash events. They also provide access to abutting properties and keep some short trips from entering the mainline freeway. The capacity of the frontage roads is determined at the intersections with the major cross streets. At this point, the traffic from the on- and off-ramps dominates the traffic on the frontage roads and leaves little additional capacity that could be added to the freeway capacity. Accordingly, the small added capacity of the frontage roads is ignored in this analysis.

When the traffic volumes equal the capacity of a roadway, peak-hour speeds can drop to less than 45 miles per hour (mph) and sometimes to stop-and-go conditions (LOS F). There is little ability to change lanes, and rear-end collisions typically increase dramatically. With the demand exceeding the roadway capacity, some motorists will shift their time of travel to avoid the peak. As a result, peak periods can become two, three, four, or more hours long. Some people claim that some freeways in Los Angeles have peak periods that last all day. As a result, the 24-hour total traffic volume may increase over the 203,000 vph indicated above as the peak-hour volume drops as a percentage of the daily volume. The peak periods will remain fully congested under these conditions.

1.6 ACTIONS THAT MIGHT REDUCE DEMAND ON I-10

If new parallel routes are built, some traffic on I-10 may be diverted. No new major routes that would provide relief to I-10 are included in the plan funded by the Regional Transportation Authority or in PAG's adopted long-range plan. The *I-10 Phoenix-Tucson Bypass Study* and the *Southern Pinal-Northern Pima Corridor Definition Study* both identified the need for a new corridor that roughly parallels I-10 on the southwest side in Pinal County, continues west of the Tucson urban area, and then turns eastward near the Town of Sahuarita to join I-10 east of Tucson. This route could divert some I-10 traffic and would provide a route for I-19 traffic to bypass the Tucson urbanized area. The bypass study indicated that the diversion might be in the range of 33,000 vpd. The corridor definition study did not include the southern and eastern portions of the Tucson Metropolitan Area and did not include I-10 east of Tucson. As a result, the model used in that study did not indicate that inclusion of the route would divert more than 10,000 vpd. This result may also have been influenced by inclusion of potential new north-south routes. These potential routes would feed into I-10 and partially negate the traffic diversion advantage of the western corridor.

ADOT is currently studying commuter rail service between Tucson and Phoenix. In May 2008, the *High Speed Passenger Rail Strategic Plan – 2008: Phase II Report* was issued, which estimated that high-speed rail between the two metropolitan areas might attract 4,100 passengers

per day in 2030, resulting in a maximum reduction of 2,000 to 4,000 vehicles per day from I-10. That reduction equates to 1 to 2 percent of the 2030 estimated daily traffic on I-10. Such a reduction would not be noticed on I-10.

Rail freight traffic has experienced a dramatic increase in recent years as fuel prices have increased. Union Pacific Railroad is in the process of double tracking their mainline across Arizona. When completed, the freight capacity across Arizona will increase by three to four times. However, the additional freight traffic will have some notable consequences. Double tracking will dramatically increase delays to traffic and safety issues at the many high-volume, at-grade road crossings in the Tucson area. Some of these major arterials will be grade separated with the railroad by programmed and planned projects, but it will be impossible to grade separate all of them due to property access issues, lack of right-of-way, and funding. In addition, the noise created by the additional train traffic will adversely affect many communities.

Even with the increase in freight rail traffic, truck traffic is expected to continue to increase. Freight rail can only serve long-haul trips; it best serves bulk or large items, and it does not reach the final point of distribution for most goods. As a result, much of goods movement in the nation will continue to rely largely on trucks.

Some people have expressed the opinion that the price or availability of gasoline will greatly reduce traffic in the future. Other people believe that the current interest in hybrids, electric vehicles, hydrogen, or other alternative fuels will enable the world to continue its dependence on the convenience and utility of individually operated vehicles. Given the probability that individually driven fleets will be maintained, it is prudent to continue to plan for the needs of this dominant mode of transportation.

Others have expressed the opinion that the Tucson area will not grow as much if capacity is not added to the road system. If traffic conditions in Tucson become significantly worse, it will likely have a dampening effect on growth, but it will also mean that the quality of life in Tucson will be lower than residents have experienced to date. In addition, the potentially substantial growth in Pinal County and other surrounding counties would add to the congestion in Tucson even if Pima County did not increase in population.

On this basis, it appears that the traffic forecasts based on past and current travel habits, whether by computer model or projection of past trends, continue to provide a valid basis to estimate future conditions and a solid foundation for planning.

1.7 COSTS, CONSEQUENCES, AND ENVIRONMENTAL EFFECTS OF MAINTAINING THE CURRENT PLAN FOR I-10

Based on the foregoing, if no other major action is taken, I-10 through the Tucson Metropolitan Area will be heavily congested in a few years after the current construction project is completed. No adopted plans for transit or other highways exist that will prevent or even mitigate this event. So what are the adverse effects of this current course of action?

I-10 would fail to provide the type of service expected of the interstate highway system. I-10 is one of three east-west routes that extend from coast to coast. The other two are I-80 and I-90 in the northern portion of the nation. If I-10 is heavily congested in Arizona, it will impede the flow of goods and services across the southern tier of states. During the winter months, I-10 is the only cross-country route that is rarely affected by weather. With no alternative route to I-10, delay to interstate traffic would increase substantially to the point of becoming an impediment.

The expected time to traverse the 64 miles of I-10 through Pima County is approximately one hour at 65 mph. If the average speed drops to 35 mph, the travel time will increase by 50 minutes, or 83 percent. Additional delay would also be expected in Pinal County. The worst scenario would be a crash or road maintenance on I-10; delay time could skyrocket to hours since there is no reasonable alternative route to I-10 in southern Arizona.

Local Tucson area traffic would also suffer from the congestion. With the demand on I-10 exceeding the capacity, many trips that would otherwise be made on I-10 would instead use other streets. Few new streets are planned in the developed urban area, so existing streets that are already at or near capacity would become even more congested. The diversion of traffic from I-10 to local arterials would bring the traffic closer to neighborhoods and homes and could impede traffic trying to access local businesses.

Stop-and-go congested traffic increases air pollution. The projected conditions on I-10 in Tucson would impede the ability of the Tucson area to reach air quality standards.

Traffic noise is greatest at free-flow conditions due to tire noise. Overall noise from I-10 may be less than today during congested peak periods, but it would likely be greater than today during free-flow off-peak periods because the noise at these times increases with the overall traffic volume.

In summary, the limitations of planned capacity of I-10 through the Tucson Metropolitan Area would impede interstate traffic and would adversely affect the quality of life of local residents.

2.0 MAXIMUM IMPROVEMENTS TO I-10 WITHIN THE RIGHT-OF-WAY

The second part of this study examines ways to increase the capacity of I-10 beyond what is currently planned. The critical portion of I-10 is the section currently under construction from Prince Road to I-19 that will provide four lanes in each direction. The frontage roads have been reconstructed, so no additional right-of-way is available.

2.1 POTENTIAL CONCEPT

Providing increased capacity within the existing right-of-way can only be accomplished above or below the existing roadway. Placing the additional lanes below the current improvements is believed to be unfeasible due to the proximity of the Santa Cruz River west of I-10, the potential for flooding during major storm events, and the need to remove and replace the existing roadway to construct the additional lanes.

The option of constructing additional lanes above the existing corridor was reviewed to determine its practicality. Two lanes in each direction (a total of four lanes) were considered as a practical addition. This review was based on the plans being used for the current I-10 reconstruction. The elevated structure would extend from midway between the I-10/Prince Road TI and the I-10/Ruthrauff Road TI to near the I-10/I-19 system interchange. Connections between the at-grade and elevated lanes would occur only at each end so that these elevated lanes would be considered "express lanes" in that they would only be used for longer trips.

Given the proximity of the east end of the potential elevated structure to the I-10/I-19 system interchange, a choice would likely have to be made as to whether I-10 or I-19 traffic would have access to the elevated (express) lanes. If I-10 is to connect to the elevated lanes, the entrance and exit ramps would likely be on the median (left) side. This type of connection would avoid interference with any existing ramps that are on the outside. Although left side ramps are not generally accepted practice, they might be acceptable in this case because they only would connect to "express" lanes similar to special high occupancy vehicle (HOV) ramps used in the Phoenix area. If I-19 is to connect to the elevated lanes, the entrance and exit lanes would likely be on the outside (right) because the I-19 ramps are on the outside of I-10.

As described below, two alternative elevated structures were considered: a single four-lane structure or two separate two-lane structures.

Alternative 1: This alternative would involve constructing four 12-foot-wide lanes (two eastbound and two westbound), 6-foot-wide inside shoulders, 12-foot-wide outside shoulders, a median barrier wall, and two outside barrier walls for a total width of 89 feet and 3 inches. This elevated structure would be placed over either the eastbound or westbound roadway of I-10.

Alternative 2: For this alternative, two structures would be built, each consisting of two 12-foot-wide lanes, a 6-foot-wide inside shoulder, a 12-foot-wide outside shoulder, and two outside barrier walls for a total width of 45 feet and 2 inches. One structure in each direction would be placed between the mainline I-10 and the frontage road.

While the structural design for both options would be straightforward, a challenge would be presented at each existing entrance and exit ramp. At those locations, straddle bents would be required to support the elevated roadway over existing ramps. Likewise, if the elevated structure were to begin in the median of I-10 and then swing to the outside, straddle bents would be needed to carry the structure over the mainline.

Potential locations for tie-ins to the I-10 mainline were examined. If the ramps to/from the elevated structure enter or depart from the outside of I-10, a 2,500-foot traffic weave distance was used as a minimum between existing ramps at TIs and the proposed ramps to/from the elevated structure. Approximately 5,000 feet of roadway exists along westbound I-10 between the entrance ramp for Prince Road and the exit ramp for Ruthrauff Road, and approximately 5,700 feet extends along eastbound I-10 between the entrance ramp for Ruthrauff Road and the exit ramp for Prince Road. These lengths appear to provide sufficient distance required for traffic to weave when reentering I-10 from the entrance ramp from the westbound elevated lanes and leaving I-10 on the exit ramp to the eastbound elevated lanes at the westerly terminus of the proposed improvements.

The eastern end of the potential elevated structure presents a more difficult challenge. Perhaps the easiest connection would be in the median of I-10 near the I-10/I-19 system interchange. This location would restrict usage of the elevated structure to I-10 traffic only since the I-19 traffic would not be able to connect to the structure. Another option would be to construct the ramps to/from the elevated structure on the outside. In this case, it is probable that only I-19 traffic would be able to connect to it. Connecting both I-10 and I-19 traffic to the elevated express lanes would require a complex array of ramps and more right-of-way.

The combined four lanes on I-10 (that are currently under construction) and the potential two lanes on the elevated structure would provide a total of six lanes in each direction through the section of I-10 from Prince Road to I-19. West of Prince Road and east of Alvernon Way, I-10 is

currently planned to have five lanes in each direction. Current ADOT practice would require that the sixth lane from the elevated structure be extended for approximately one mile after the elevated lanes merge with the mainline lanes of I-10. Similarly, in order to provide time for motorists to choose between the mainline and elevated lanes, a lane should be added to I-10 for approximately one mile leading into the elevated structure. This additional widening of I-10 probably would require some new right-of-way and/or retaining walls to contain the roadway within the existing right-of-way.

Construction of the elevated lanes appears to be technically feasible. In a conversation, Greg Gentsch, the ADOT Tucson District Engineer, expressed the opinion that "it can be done" with enough money and the concurrence of the community.

2.2 COSTS, BENEFITS, CONSEQUENCES, AND ENVIRONMENTAL CONSTRAINTS

While the addition of more lanes within the existing right-of-way appears technically feasible, there are many trade-offs to be made.

The elevated structure described above would be approximately 6 miles long and would include complicated ramp connections between the elevated lanes and the mainline at each end. A rough order-of-magnitude estimate, based on current prices, suggests that the cost of a four-lane freeway would range from $700 million to $900 million, or roughly $116 to $150 million per mile. By comparison, the cost to construct a new six-lane urban freeway is $40 to $60 million per mile. These cost estimates are not founded on engineering design and are based solely on typical costs derived from other projects.

The benefit of the elevated roadway is the addition of two lanes in each direction to the four lanes now under construction. Capacity would theoretically increase by 50 percent, or approximately 100,000 vpd compared to the 203,000 vpd capacity discussed in Section 1.5.

The elevated structure and the related widening of I-10 would significantly increase capacity and serve an additional 100,000 vpd. This extra capacity could serve the demand on I-10 well past 2030 if other planned roads are constructed. The added capacity could also prevent some traffic from diverting to local arterials, thereby relieving potential overloads on those streets. Furthermore, it could encourage continued growth in the Tucson area and provide employment opportunities for its residents.

The environmental constraints associated with the potential elevated roadway—which could include traffic congestion during construction, visual impact, air pollution, noise pollution,

community cohesion, and wildlife impacts—would be substantial and would require residents of the Tucson area to fully support the project.

During construction of the elevated roadway, traffic on I-10 would be disrupted much as it is by present I-10 construction. Since the elevated structure would not be built for many years, the traffic volume on I-10 would be much greater than today and would, therefore, be much harder to accommodate during construction, resulting in increased traffic congestion in the area.

The elevated structure would be large and would have an imposing visual presence. A visual impact assessment would be needed to determine the impacts of the current concept. Presently, a minimum vertical clearance of 16.5 feet is presumed to be maintained between the bottom of the structure and roadways below. The depth of the bridge beam would be approximately 6 feet plus the roadway deck, plus a 42-inch-high barrier wall for a full structure thickness of approximately 10 feet. The structure would rise 27 to 28 feet above the existing roadway, and a truck on the elevated roadway could extend above the barrier by another 9 feet, further increasing potential visibility.

With added capacity comes the potential for greater air pollution and increased noise within and adjacent to the right-of-way. The elevated roadway could initially reduce air pollution by reducing congestion. In the long run, however, the increase in vehicles would likely worsen pollution to some degree. Noise impacts are also likely to increase because of the additional traffic. Placement of a sound wall on the structure would add to its visual impact, add considerable cost to the project, and take away all views from motorists on the elevated roadway. Accordingly, the height of the elevated roadway and probable lack of a sound wall would contribute to noise impacts since traffic noise, particularly from trucks, could carry over a greater distance. Study and evaluation will be required to determine the exact extent of these potential air quality and noise impacts on nearby development and land uses, which consist mostly of commercial or industrial uses with some residential development in the form of single-family housing, multifamily housing, a mobile home park, and motels. (Air and noise limits for residential developments are typically more stringent than for commercial and industrial uses.)

Since the elevated lanes will be placed within the existing right-of-way, community cohesion should not be directly impacted.

A wildlife/riparian crossing is located at I-10 between Prince Road and Ruthrauff Road. Impacts on this wildlife corridor will require analysis.

Depending on which alternative is selected, additional right-of-way may be needed in select locations where space is limited between the frontage road and mainline and in some cases beyond the frontage road. The widening of I-10 at either end of the elevated roadway could also require additional right-of-way.

Access to the elevated lanes for emergency vehicles would be located at the easterly and westerly limits of the proposed improvements. Intermediate connections may not be possible due to the number of existing exit/entrance ramps and limited existing right-of-way.

3.0 CONCLUSIONS

3.1 FINDINGS

As currently planned, I-10 will be inadequate to meet the long-term needs of the Interstate System and the Tucson Metropolitan Area. Traffic volumes on I-10 will exceed the capacity of the eight lanes being constructed near downtown Tucson resulting in significant peak period congestion. With no viable alternative route, there is a high likelihood of long delays on I-10 due to crashes, stalled vehicles, maintenance, or construction. These occurrences may happen on a frequent basis and would aggravate the daily congestion that will exist on I-10. The effect will put a damper on the economic vitality of the Tucson Metropolitan Area and will hamper interstate commerce.

Double decking I-10, while technically feasible, will be very expensive. The cost is estimated to be $700 to $900 million for four more lanes. This cost is three times the cost per mile of a new six lane freeway. The second-level structure will have adverse visual, noise, and potentially air pollution effects on the Tucson area. Public acceptance of this large structure may be difficult to obtain. Double decking will still not create an alternative route that is needed for such a critical route as I-10.

The long-term development of an alternative route to I-10 appears to be the best solution to the foregoing described issues. A preliminary assessment of several alternative routes was explored in the *I-10 Phoenix-Tucson Bypass Study*. Of the alternatives studied, "Route 4" (referred to as the "Western Corridor" in the *Southern Pinal-Northern Pima County Corridor Definition Study*) appears to offer the most potential. See Appendix A for a description of this potential route. This corridor could divert Tucson metropolitan traffic from I-10 so that I-10 could adequately serve its interstate travel function. It would provide a route for I-19 traffic to bypass the Tucson urbanized area to reach I-10 east or west of Tucson. It could also serve as an alternative route during critical times so that some I-10 traffic could be rerouted if necessary, or traffic from this new corridor could be rerouted to I-10 if necessary. Such a network of similar continuous high capacity routes will become increasingly essential as the Pima and Pinal counties become one large urban area with 2 to 3 million residents and higher traffic volumes.

3.2 NEXT STEPS

Planning studies have been conducted for "Route 4 or Western Corridor" by PAG and through the two studies mentioned above. The next step in the process would be to conduct a route location study and prepare an environmental document in accordance with state and federal

procedures. Since the corridor should extend well into Pinal County, the process would involve multiple jurisdictions and agencies. A process to select a corridor for a major new route must involve and be supported by the local jurisdictions including the metropolitan planning organizations (PAG and CAAG), the counties, the several cities and towns, Indian Tribes, major public land owners, and the general public. Such a study would need to be carefully designed to involve these multiple elements in a constructive manner so that a lasting solution will result from the effort.

APPENDIX A

DESCRIPTION OF ROUTE 4 POTENTIAL CORRIDOR

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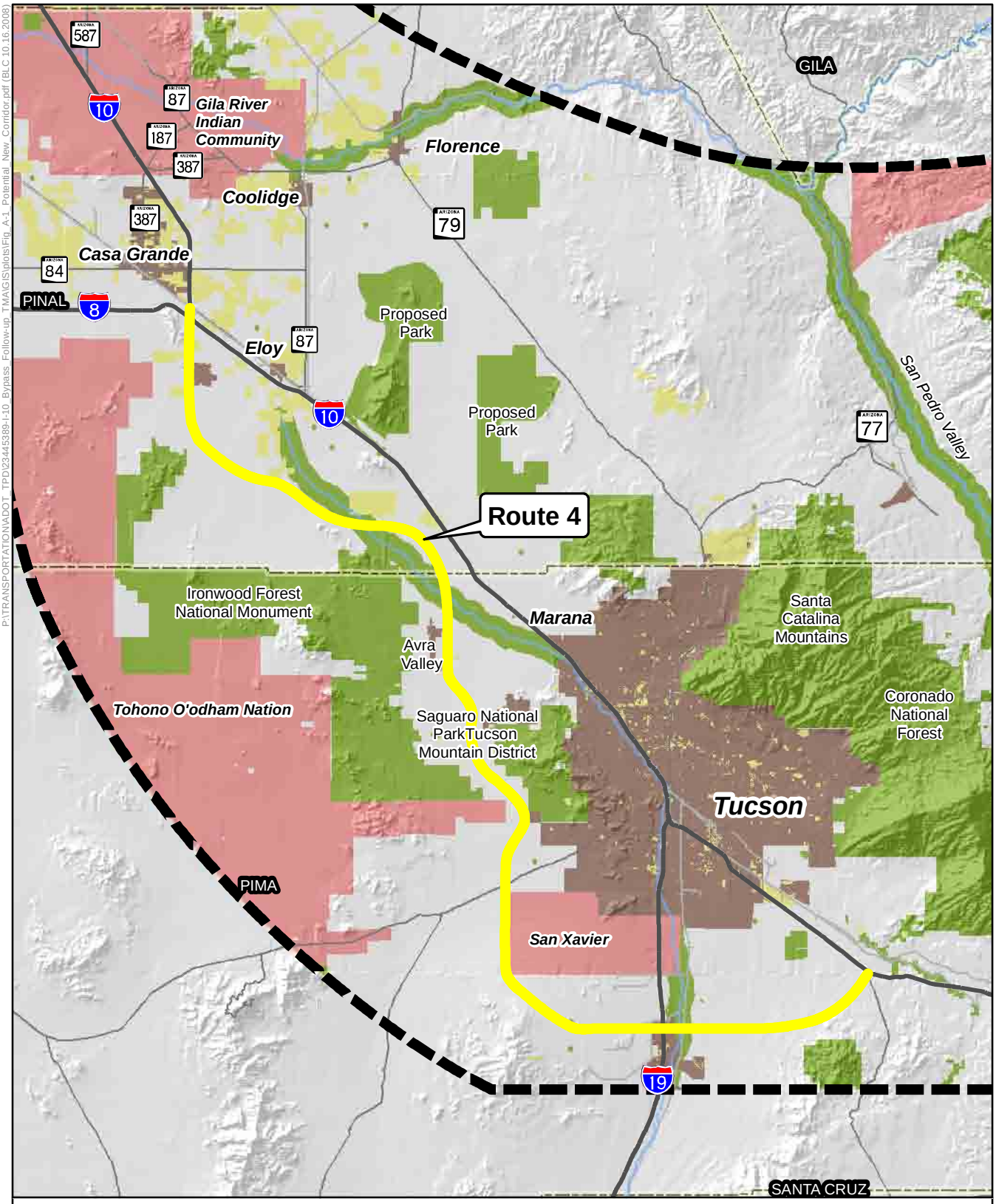
DESCRIPTION OF ROUTE 4 POTENTIAL CORRIDOR

Through the *I-10 Phoenix-Tucson Bypass Study* published in January 2008, a preliminary assessment was made of the need for and feasibility of a new transportation corridor that would provide an alternative to I-10. Several alternative corridors were identified and evaluated. Of those alternatives, "Route 4" appears to offer the most advantages to the Tucson Metropolitan Area by providing an alternative corridor for metropolitan traffic and a route for I-19 traffic to bypass the Tucson area to reach I-10 east or west of the Tucson area. The new route would also provide an alternative route that could be used to reroute some I-10 traffic in case of a severe blockage to traffic on I-10. The value of this route was reinforced in the *Southern Pinal-Northern Pima Corridor Definition Study* published in April 2008.

The potential corridor is illustrated in Figure A-1. The yellow line represents a general corridor which could be several miles wide in some places. Many specific alignments may be considered within the corridor area. The new corridor would begin at I-8 in Pinal County near the City of Casa Grande and extend roughly parallel and southwest of I-10 near the City of Eloy. It would continue into Pima County west of the Town of Marana and the Saguaro National Park but east of the Ironwood Forest National Monument and Tohono O'odham Indian Reservation. The potential corridor would extend southward near the San Xavier Indian Reservation and then turn eastward to cross I-19 in the vicinity of the Town of Sahuarita and continue to I-10 in the vicinity of SR 83.

This potential corridor is envisioned as a fully access controlled highway in order to provide the capacity, safety features, and travel speeds expected by motorist traveling longer trips. This type of roadway is needed to divert measurable traffic from I-10.



LEGEND

Major Constraints

- Existing Urban Land
- Entitled Land
- Indian Reservation
- Environmental Limitations to Corridor

- Major Rivers
- State Routes

URS

Data Source: ALRIS 1997 - 2005, Bureau of Land Management, ADOT ATIS 2005, ADOT HPMS 2005, USGS, Bureau of Transportation Statistics

0 2.5 5 10
Miles

Figure A-1

Potential New Corridor