Kino Parkway Overpass at 22nd Street

Alternative Alignment Report

Prepared for

City of Tucson

Prepared by

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August 2008

KINO PARKWAY – 22ND STREET INTERSECTION & WIDENING TO TUCSON BOULEVARD

August 25, 2008

Subject: CAC Endorsement of Kino Parkway Overpass at 22nd Street Alternative Alignment Report

Honorable Mayor and Council
City of Tucson

The Kino Parkway Overpass at 22nd Street Citizens Advisory Committee (CAC) and the design team have worked through the process of developing a preferred alternative for the intersection of Kino Parkway and 22nd Street. The process and the preferred alternative are documented in the Alternative Alignment Report prepared for this project. **This letter is to inform you that the CAC endorses the Kino Parkway Overpass at 22nd Street Alternative Alignment Report.**

Since October 2005, the CAC has met sixteen times to receive and consider information about alternatives for this project. CAC members have participated in developing evaluation criteria and applying this criterion to the alternatives of the project.

There was majority support (vote of six to two) for the recommended SPUI at the Kino Parkway-22nd Street intersection.

In summary the CAC endorses the Alternative Alignment Report and the preferred alternative contained therein, with the contingency that the design team continue to investigate providing better access to the four quadrants surrounding the intersection. We recommend that Mayor and Council approve the Alternative Alignment Report and the preferred alignment with the contingencies included.

We have endorsed this plan over the reservations raised by the minority members of the committee and wish to acknowledge that the plan has a certain weakness in the northwest quadrant that we would like to see addressed as the plan proceeds. We suggest an internal traffic study in that quadrant to show current and proposed traffic. This could support the inclusion of the two traffic lights described in the minority letter.

Sincerely,

Ivo Ortiz, Chair
Citizens Advisory Committee

Sandra Zepeda, Vice Chair
Citizens Advisory Committee

Cindy Ayala, Member
Citizens Advisory Committee

Sylvia Campoy, Member
Citizens Advisory Committee

Brett DuMont, Member
Citizens Advisory Committee

Claire Fellows, Member
Citizens Advisory Committee

George Kalil, Member
Citizens Advisory Committee

Les Pierce, Member
Citizens Advisory Committee

Dirck Schou, Member
Citizens Advisory Committee

Jamey Sumner, Non-Voting Member
Citizens Advisory Committee/CTAC

Wright Thomas, Member
Citizens Advisory Committee

Bill Seitz, Member
Citizens Advisory Committee

KINO PARKWAY – 22ND STREET INTERSECTION & WIDENING TO TUCSON BOULEVARD

August 25, 2008

Subject: CAC Minority Report of Kino Parkway Overpass at 22nd Street Alternative Alignment Report

Honorable Mayor and Council
City of Tucson

Per the minutes of the Millville Neighborhood Association (MNA) and the CAC meeting, there are, in our opinion, substantial shortcomings in the purported TAC recommended Alignment #1--Single Point Urban Interchange (SPUI).

As the representative of the 192 businesses and 61 residents of the MNA, we as a group find Alignment #1 lacking in access, safety and compatibility with the neighborhood as currently reflected. After numerous discussions with the neighbors and MNA Board meetings, we feel it imperative that a traffic-triggered signal be provided at 19th St. & Park Ave. and Santa Rita Ave. & 22nd St. to provide safe access to all the residents and businesses in Millville.

At the May 7, 2008 CAC meeting, we were told that the signal at 19th St. & Park Ave. was "probably" acceptable, but the signal at Santa Rita Ave. and 22nd St. was not supported because of the "close" proximity to Park Ave. & 22nd St. intersection and the proposed Kino intersection. The approximate 990-feet distance exceeds existing traffic signal spacing currently in place on Speedway, Broadway and Stone Ave., and considering the heavy commercial traffic in our neighborhood, we feel the signal at Santa Rita Ave. is mandatory from a safety and access standpoint.

We totally appreciate the big picture to move traffic efficiently now and into the future, as well as the cost-effective and construction time attributes of the SPUI. However, considering not only the Kino-22nd intersection, but the I-10 to Kino 22nd Street Corridor Project with the Union Pacific overpass or underpass and the 22nd Street-Tucson Blvd. Project, the MNA feels the traffic signals as noted are essential to safe access to our neighborhood as well as our continued effort to keep commercial traffic out of the residential areas of the Armory Park and South Park neighborhoods.

Hopefully TDOT and the design team can incorporate these two signals into the SPUI Alignment, which the MNA would wholeheartedly support.

Sincerely,

Brett DuMont
-Member, Citizens Advisory Committee
-Vice President, Millville Neighborhood Assoc.

George Kalil
-Member, Citizens Advisory Committee
-President, Millville Neighborhood Assoc.

Table of Contents

EXECUTIVE SUMMARY III

I. INTRODUCTION 1
A. Recommendations of Advance Planning Report 1
B. Overview of Project Need 1
C. Proposed Improvements 2

II. IDENTIFICATION OF ALTERNATIVE LOCATIONS 4
A. Description of Roadway Alternatives 4
Alternative 1 4
Alternative 2 4
Alternative 3 6

III. COMPARATIVE IMPACT ASSESSMENT AND ANALYSIS 9
A. Preliminary Inventory of Existing Data 9
Traffic 9
SunTran 16
Drainage 17
Utilities 18
Bike Routes 18
Pedestrian Facilities 18
Right-of-Way 18
Bridge Structures 18
Zoning and Land Use 19
B. Comparative Impact Assessment 21
Traffic 21
SunTran 21
Drainage 21
Utilities 22
Bike Routes 22
Pedestrian Facilities 22
Right-of-Way 22
Bridge Structure 22
Zoning and Land Use 23
Additional Assessment Criteria 23
C. Evaluation of Comparative Impact Assessment 24
D. Conclusions – Preferred Alternative 28
E. Public Outreach 29

APPENDIX A: ADVANCE PLANNING REPORT

APPENDIX B: EVALUATION OF ALTERNATIVES AND DECISION MATRIX

List of Figures

Figure 1: Project Vicinity 2
Figure 2: Typical Road Sections 3
Figure 3: Preliminary Alternative 1, Single-point Urban Interchange 5
Figure 4: Preliminary Alternative 2, Tight Diamond Interchange 7
Figure 5: Preliminary Alternative 3, Partial Cloverleaf Interchange 8
Figure 6: Existing Traffic Volumes *(Source: MMLA PSOMAS June 2006)* 10
Figure 7: A.M. Level of Service *(Source: MMLA PSOMAS June 2006)* 12
Figure 8: P.M. Level of Service *(Source: MMLA PSOMAS June 2006)* 13
Figure 9: Routes Connecting the Southeast, Northeast, and Northwest Quadrants 15
Figure 10: Existing SunTran Bus Service 16
Figure 11: Westbound 22nd Street at Cherry Avenue 17
Figure 12: Zoning within the Project Vicinity 20
Figure 13: Alternative 1, Single-point Urban Interchange (Modified per TAC Recommendations) 25
Figure 14: Alternative 2, Tight Diamond Interchange (Modified per TAC Recommendations) 26
Figure 15: Alternative 3, Partial Cloverleaf Interchange (Modified per TAC Recommendations) 27

List of Tables

Table 1: Average Daily Traffic Volumes and Roadway Segment Level of Service within Study Area 11
Table 2: Level of Service at Intersections within the Study Area 14
Table 3: Weekday SunTran Service at Kino Parkway and 22nd Street 16
Table 4: Zoning and Land Use in the Kino Parkway/22nd Street Intersection Vicinity 19
Table 5: Overall Operating Efficiency for Each Alternative 21
Table 6: Overall Operating Efficiency for Each Revised Alternative 24

EXECUTIVE SUMMARY

The Kino Parkway Overpass at 22nd Street has been a vision of the Tucson community for many years. The vision started with planning of the "Butterfield Route" in the 1960's to the July 1981 FHWA Campbell Corridor Highway Improvements, and has continued through to the current Regional Transportation Authority (RTA) plan. The RTA plan, which was approved by the voters of Pima County in May, 2006, contains 35 roadway improvements including 22nd Street from I-10 to Tucson Boulevard. This Alternative Alignment Report (AAR) has been prepared for the intersection of Kino Parkway and 22nd Street that is within the limits from I-10 to Tucson Boulevard.

The operations of the Kino Parkway/22nd Street intersection are complex. The close proximity of traffic signals at Cherry Avenue/Cherrybell Stravenue and 22nd Street to the east, and at Kino Parkway and Barraza-Aviation Parkway to the north complicate traffic operations at Kino Parkway and 22nd Street. With approximately 80,000 vehicles per day passing through the intersection, the capacity of the intersection is strained. The proposed improvements will create a grade separated interchange with Kino Parkway going over 22nd Street. In addition, the capacity of 22nd Street will be improved by increasing the number of travel lanes from its current 5-lane configuration to three lanes in each direction, and by adding a bike lane in each direction and SunTran bus bay pull-outs. This lane configuration is consistent with the current configuration of 22nd Street east of Tucson Boulevard and also in agreement with the RTA plan.

Three alternative configurations were developed for the interchange: alternative 1, a single-point urban interchange (SPUI); alternative 2, a tight diamond interchange; and alternative 3, a partial cloverleaf interchange. A comparative impact assessment of the alternatives was performed utilizing the following project elements: traffic operations, SunTran, drainage, utilities, bike routes, pedestrian facilities, right-of-way, bridge structures, zoning and land use. Differences worth noting between the alternatives occur in the traffic operations, right-of-way, and bridge structures project elements.

Traffic Operations. Traffic operations after construction vary between the three alternatives. A traffic analysis was performed on the three interchange configurations as initially proposed. The results indicated that none of the initial alternatives operate as efficiently as desired. The alternative configurations were presented to the Technical Advisory Committee (TAC) for the project, and the TAC requested minor changes to the configuration of each alternative to increase the operational efficiency. These changes resulted in slightly better operations for the tight diamond and partial cloverleaf, but significantly improved the operations of the SPUI to the Level of Service (LOS) shown in the following table.

Overall Operating Efficiency for Each Revised Alternative

Intersection	A.M. Peak LOS	P.M. Peak LOS	Type of Traffic Control
SPUI Configuration			
22nd/Kino	C	C	Signal
22nd/Cherry	A	A	Half-Signal
Tight Diamond			
22nd/Kino NB Ramp	E	F	Signal
22nd/Kino SB Ramp	B	D	Signal
22nd/Cherry	F	F	2-Way Stop
Partial Cloverleaf			
22nd/Highland	D	D	Signal
22nd/Cherry	D	E	Signal

Note: LOS A represents the best operating conditions and LOS F represents the worst

Right-of-Way. Additional right-of-way will be required on the north side of 22nd Street to widen the roadway in the vicinity of the interchange, regardless of the interchange configuration. Alternative 2, however, is the only alternative that requires additional right-of-way for the ramps on the north side of 22nd Street. The north ramps for the SPUI will be located within the existing right-of-way and Alternative 3 has no ramps on the north side of 22nd Street. Right-of-way on the south side of 22nd Street was acquired as part of the Kino Parkway construction in the 1980's, and the southern ramps for all 3 alternatives fall within this existing right-of-way

Bridge Structures. The size and configuration of the structure varies between each alternative. The longer the bridge span between piers, the deeper the bridge structure, and consequently, the higher the cost. The tight diamond and partial cloverleaf configurations will have a center pier in the roadway median, which allows for a two-span bridge and shorter span lengths. The SPUI configuration cannot have a median in the intersection, and the bridge must use a single span across the entire distance of the roadway. Consequently, the SPUI will have the longest span of the three alternatives.

Zoning and Land Use. Land use is similar with each alternative, but it should be noted that Tucson Water is investigating relocating their Plant No. 1 from its current location south of downtown on 18th Street to the vacant area south of 22nd Street on either side of Kino Parkway. Coordination with Tucson Water will be ongoing throughout the planning and design process.

An evaluation matrix was compiled with input from the TAC, and Citizens Advisory Committee (CAC), City staff, and the design team. The matrix consisted of circles divided into quarters for ranking the evaluation criteria. Alternative 1, Alternative 2, and Alternative 3 received 22.5 circles, 15.5 circles, and 10.5 circles respectively with the higher the rating number the more superior the alternative. After the evaluation, the TAC members reached a consensus that the SPUI is the best alternative. However, it was also brought out at the meeting that the next task for the team will be to concentrate on access and circulation issues for the businesses and residents in the four quadrants around the interchange, as well as improving access for bicycles and pedestrians

The alternatives that were presented to the TAC and subsequently revised were presented to the CAC as well. The CAC generally felt the SPUI was a viable alternative, but voiced concerns, like the TAC, with the access into and out of the four quadrants surrounding the interchange. The CAC voted 6 to 2 to endorse the SPUI, but the endorsement carries a contingency that the project team needs to specifically address additional access in the Millville neighborhood as well as the other quadrants. In particular, the team will further investigate placing a traffic signal at the intersection of 18th or 19th Street and Park Avenue, extending 23rd Street to Santa Rita, and providing a 21st Street connection with the southbound Kino Parkway off-ramp.

I. INTRODUCTION

The Kino Parkway Overpass at 22nd Street has been a vision of the Tucson community for many years. The "Campbell Corridor Highway Improvements, Broadway to Valencia Road, City of Tucson, Pima County, Arizona Final Environmental Impact Study", dated August 5, 1981, identifies "....the provision of a grade separation of interchange at 22nd Street [at Kino Parkway]". In addition, the intersection improvement project is funded by the Pima County Bond program, which voters approved in May 1997, and the Regional Transportation Authority (RTA) plan, which voters approved in May 2006. The RTA plan includes the 22nd Street corridor from Interstate 10 (I-10) to Tucson Boulevard, and the Kino Parkway/22nd Street intersection is within this section of the 22nd Street corridor.

This Alternative Alignment Report (AAR) documents the intersection alternatives that have been developed, and it assesses the impacts that each alternative has on the local and regional area with respect to traffic operations, land use, environmental impacts, and alternative modes of transportation. The process for evaluating the alternatives and developing a preferred alternative is also documented in this report.

A. Recommendations of Advance Planning Report

An Advance Planning Report (APR) for the Kino Parkway Overpass at 22nd Street was prepared in accordance with the outline provided in the *Roadway Development Policies*. The APR, contained in Appendix A, provides a planning-level analysis of the project elements including project need, existing and future traffic volumes, levels of service, preliminary intersection alternatives, transit and bikeway needs, and environmental and neighborhood concerns. The Citizens Transportation Advisory Committee (CTAC) approved the APR in November 2007. Based on the planning analysis, the following recommendations were made:

- Proceed with an AAR as detailed in the City of Tucson's *Roadway Development Policies*.
- Adhere to the conceptual programming timeframe as detailed in the APR.
- Continue policy, planning, and public involvement procedures as detailed in the City of Tucson's *Roadway Development Policies*.

B. Overview of Project Need

Three of Tucson's most important arterial roadways—22nd Street, Kino Parkway, and Barraza-Aviation Parkway—intersect to form a relatively tight triangle, as shown in Figure 1. Approximately 100,000 vehicles pass through this triangle daily. Perhaps no other corridor in Tucson accommodates as much arterial traffic in such a confined area. Two corners of the triangle, the intersections of Kino Parkway at Barraza-Aviation Parkway (Murphy's Overpass) and 22nd Street at Barraza-Aviation Parkway (the 22nd Street Overpass over the Union Pacific Railroad (UPRR) and the Barraza-Aviation Parkway), are grade separated. The at-grade intersection of Kino Parkway at 22nd Street forms the remaining corner of the triangle.

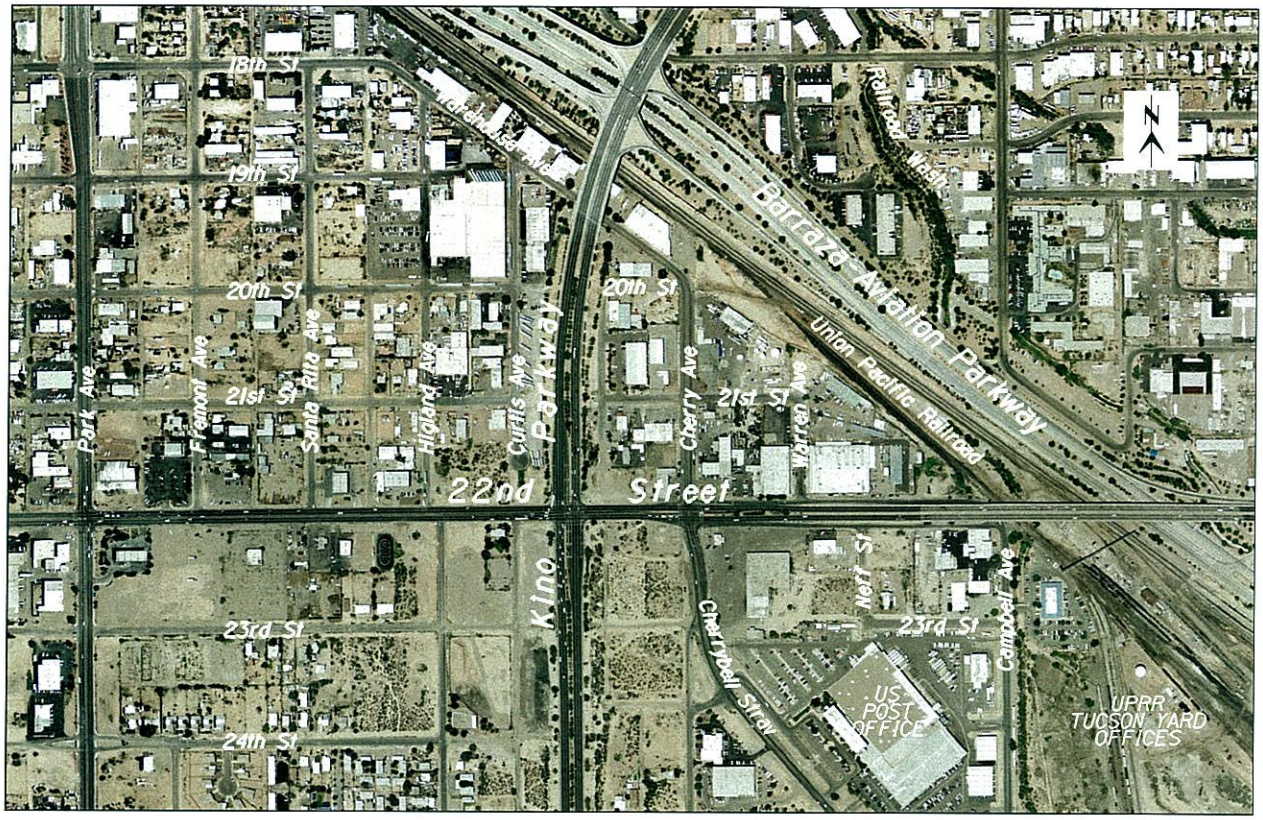


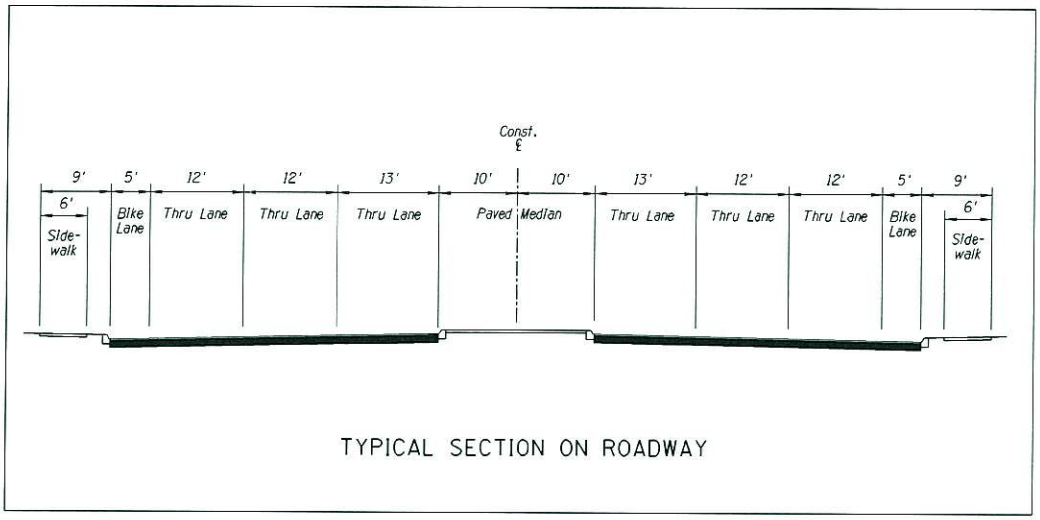
Figure 1: Project Vicinity

The operations of the Kino Parkway/22nd Street intersection are complex. Due to the close proximity to this intersection, traffic signals to the east at Cherry Avenue/Cherrybell Stravenue and 22nd Street and to the north at Kino Parkway and Barraza-Aviation Parkway complicate operations. According to data presented by the Pima Association of Governments (PAG), the Kino Parkway/22nd Street intersection had the longest delay time of any intersection in Tucson in year 2000, at over 50 seconds of delay per vehicle. This delay affects the ability of local traffic to access 22nd Street and also impacts traffic at the other two traffic signals. Constructing an overpass at the Kino Parkway/22nd Street intersection would improve intersection efficiency, and decrease impacts on adjacent intersections. The adjacent RTA project, the 22nd Street Corridor from I-10 to Tucson Boulevard improvements, will complement the intersection improvement project in improving operations and safety along this entire section of 22nd Street.

C. Proposed Improvements

Kino Parkway/22nd Street intersection is currently an at-grade intersection. According to the Intergovernmental Agreement between the City of Tucson and Pima County, a grade separated interchange is proposed, with Kino Parkway as the overpass above 22nd Street. The existing typical section on Kino Parkway includes three travel lanes and a bike lane in each direction. This lane configuration will be maintained on Kino Parkway through the intersection improvements. The 22nd Street Corridor from I-10 to Tucson Boulevard will increase the capacity of 22nd Street by increasing the number of travel lanes from its current 5-lane configuration to three lanes in each direction, and adding a bike lane in each direction. The section of 22nd Street extending through the intersection will be improved to meet the 22nd

Street Corridor typical section. Dual left-turn lanes will be provided for 22nd Street traffic to access Kino Parkway. Figure 2 shows the typical section for both the roadway and the bridge.



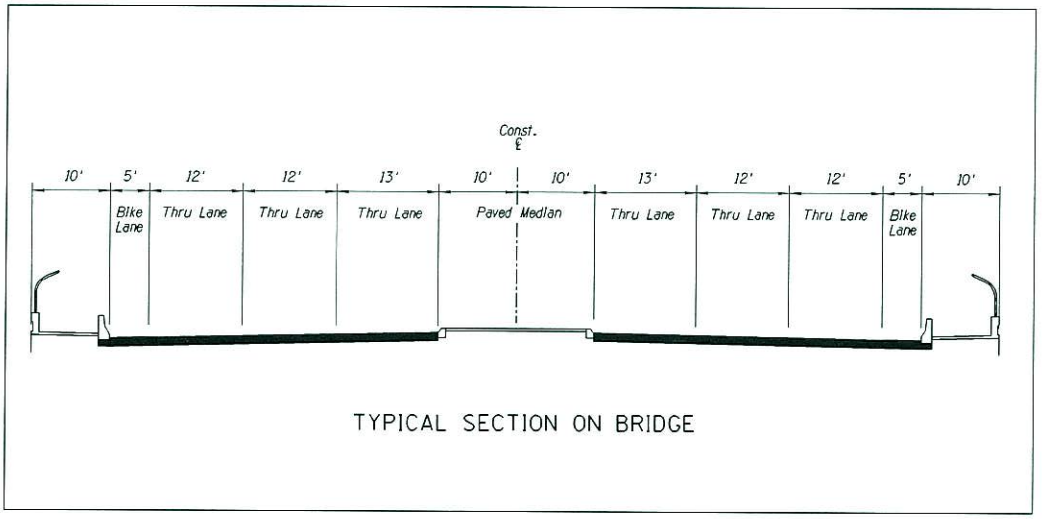


Figure 2: Typical Road Sections

II. IDENTIFICATION OF ALTERNATIVE LOCATIONS

As stated previously, according to the Intergovernmental Agreement between the City of Tucson and Pima County, Kino Parkway is to be an overpass and 22nd Street shall remain at-grade. However, the location of the traffic signal either on Kino Parkway or on 22nd Street was not specified. A preliminary assessment of the existing right-of-way indicates that the traffic signal should be placed on 22nd Street to best utilize available area, and minimize impacts to adjacent properties. Three intersection configurations were developed with this in mind. The configurations include a single-point urban interchange (SPUI), a traditional tight diamond interchange, and a partial cloverleaf interchange.

A. Description of Roadway Alternatives

Alternative 1

Alternative 1, the SPUI, is a modern type of interchange configuration that is becoming popular in urban settings. A SPUI consolidates intersection operations by using a single traffic signal to direct entrance and exit ramp traffic as well as the arterial traffic movements through the intersection. A SPUI allows concurrent left turns at the crossroad, which in turn increases intersection capacity and efficiency. The SPUI requires minimal right-of-way due to the ability to use narrower ramp spacing. Drawbacks to the SPUI include the distance between stop bars on the surface street can be large, and this creates problems for bicyclists, who need more time to clear the area between the stop bars. In addition, increased free-flow vehicular movement makes it harder for pedestrians to safely traverse the intersection.

The specific SPUI configuration for Alternative 1 is shown in Figure 3. This configuration allows for through movements between the north-south entrance and exit ramps. Side connections to the entrance and exit ramps are provided in the northwest, northeast, and southeast quadrants to provide better access out of these quadrants. A left-turn lane is provided for westbound 22nd Street traffic to allow southbound access onto Cherrybell Stravenue via a half-signal at the intersection. This signal will be coordinated with the Kino Parkway/22nd Street signal. Traffic signals for Alternative 1 are shown in blue on Figure 3.

Alternative 2

Alternative 2, the tight diamond interchange, is a more traditional configuration typical of interstate interchanges in both urban and rural settings. Tight diamond interchanges have a somewhat compact layout, therefore requiring less right-of-way, although this type typically requires more right-of-way than a SPUI. Tight diamond interchanges require a traffic signal at each ramp intersection, which limits their ability to effectively handle significant left-turn volumes. Therefore, diamonds are normally better suited for interchanges with low crossroad volume. With the high traffic volume on 22nd Street and the short spacing between ramps, traffic could potentially spill back from one ramp to the other, thereby compromising the operational effectiveness of the intersection.

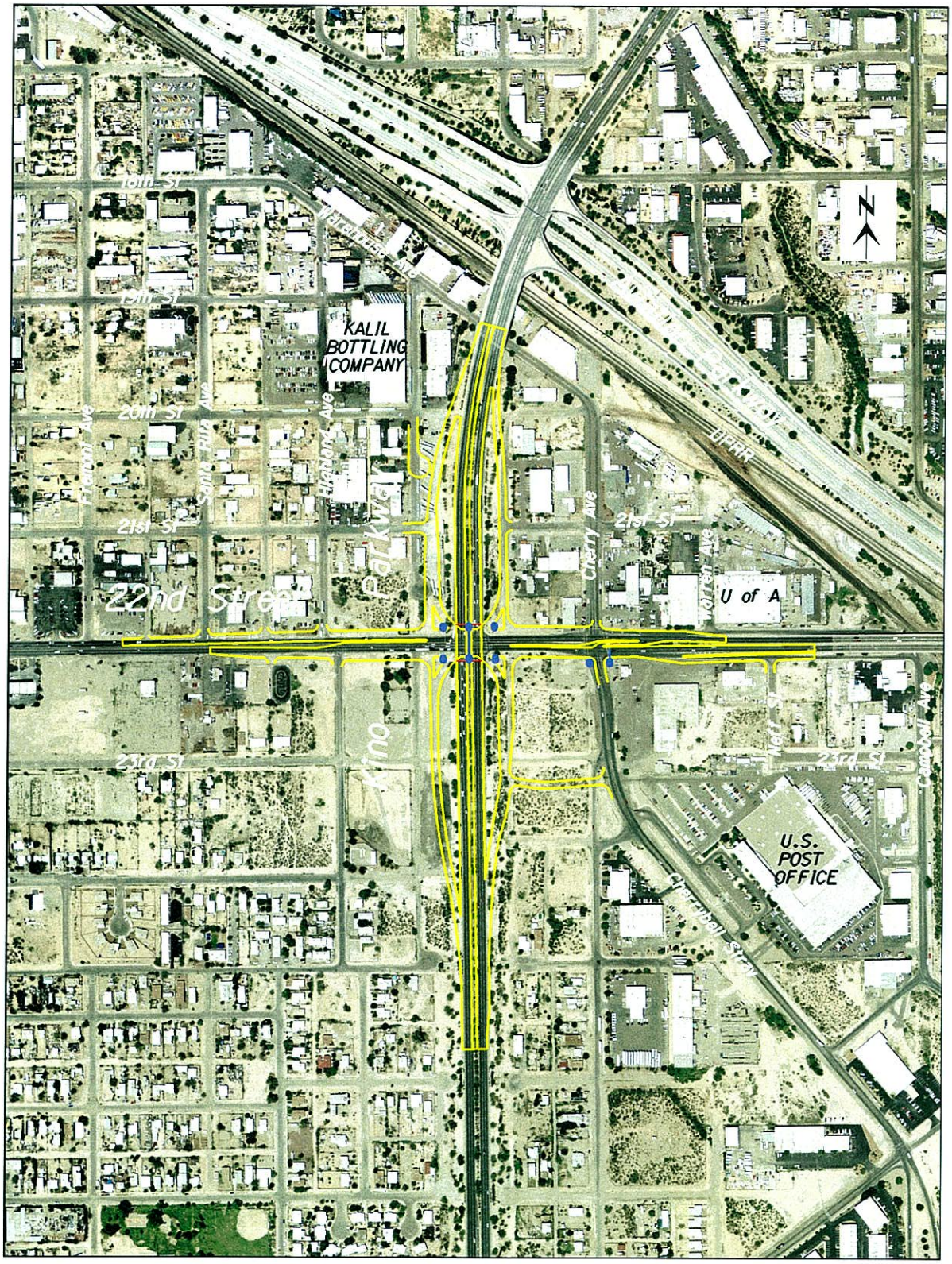


Figure 3: Preliminary Alternative 1, Single-point Urban Interchange

The tight diamond configuration for Alternative 2 is shown in Figure 4. As with the SPUI, a left-turn lane is provided for westbound 22nd Street traffic to allow access to Cherrybell Stravenue, however, no signal can be provided due to its proximity to the Kino Parkway/22nd Street signal. In addition, side connections to the entrance and exit ramps are provided in the northwest, northeast, and southeast quadrants to provide better access out of these quadrants. Traffic signals for Alternative 2 are shown in blue on Figure 4.

Alternative 3

Alternative 3, the partial cloverleaf interchange, uses a combination of loop-type ramps and tangent-type ramps for entrance and exit ramps from Kino Parkway to 22nd Street. Cloverleaf interchanges have been used to connect busier highways since the 1930s. However, the trend throughout the United States has been toward replacing these types of interchanges with safer types of interchanges. Cloverleaf interchanges have a relatively poor safety record because of tight curves and low design speeds on the entrance/exit ramps. This combination is a concern particularly in areas with higher large truck volumes due to the increased risk of overturning vehicles.

Alternative 3 is shown in Figure 5. The ramp system for the partial cloverleaf is located entirely on the south side of 22nd Street. This configuration uses two traffic signals to control traffic moving thru the intersection. The traffic signals are shown in blue on Figure 5.The signals are located approximately 1,100 feet apart on 22nd Street at the intersections with Highland Avenue and Cherry Avenue/Cherrybell Stravenue. A short slip ramp off of the Kino Parkway northbound loop ramp provides access onto southbound Cherrybell Stravenue. The slip ramp creates an intersection with the northbound off-ramp from Kino Parkway.

This intersection configuration was the original concept for the Kino Parkway/22nd Street interchange that was developed in the late 1960s (see Arizona Highway Department [ADOT] Proposed Corridor Location "Butterfield Route" (Downtown Section) dated September 28, 1968). When Kino Parkway was designed and built in the 1970s and 1980s, right-of-way was purchased to allow the partial cloverleaf configuration to be constructed at a later date.

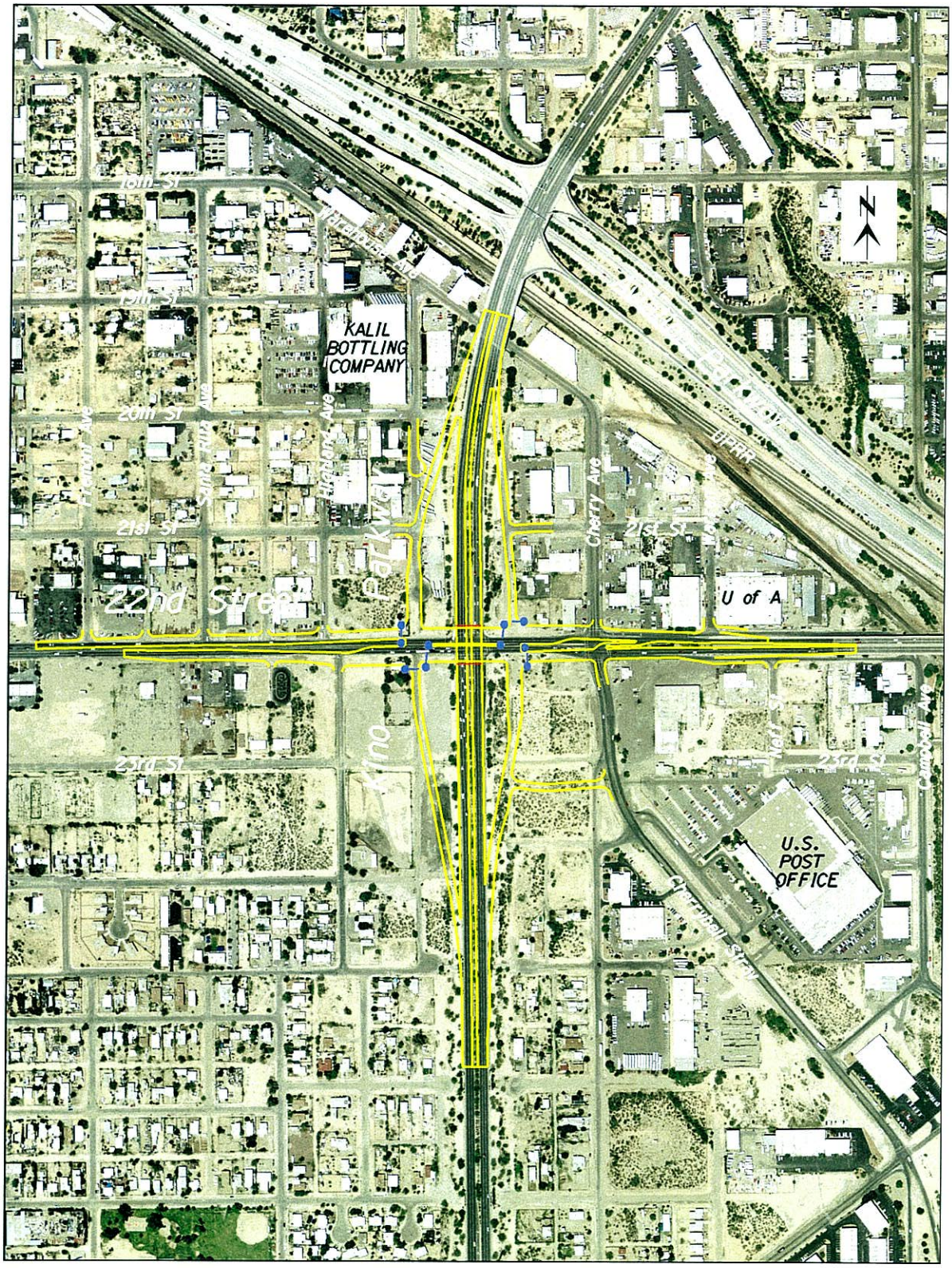


Figure 4: Preliminary Alternative 2, Tight Diamond Interchange

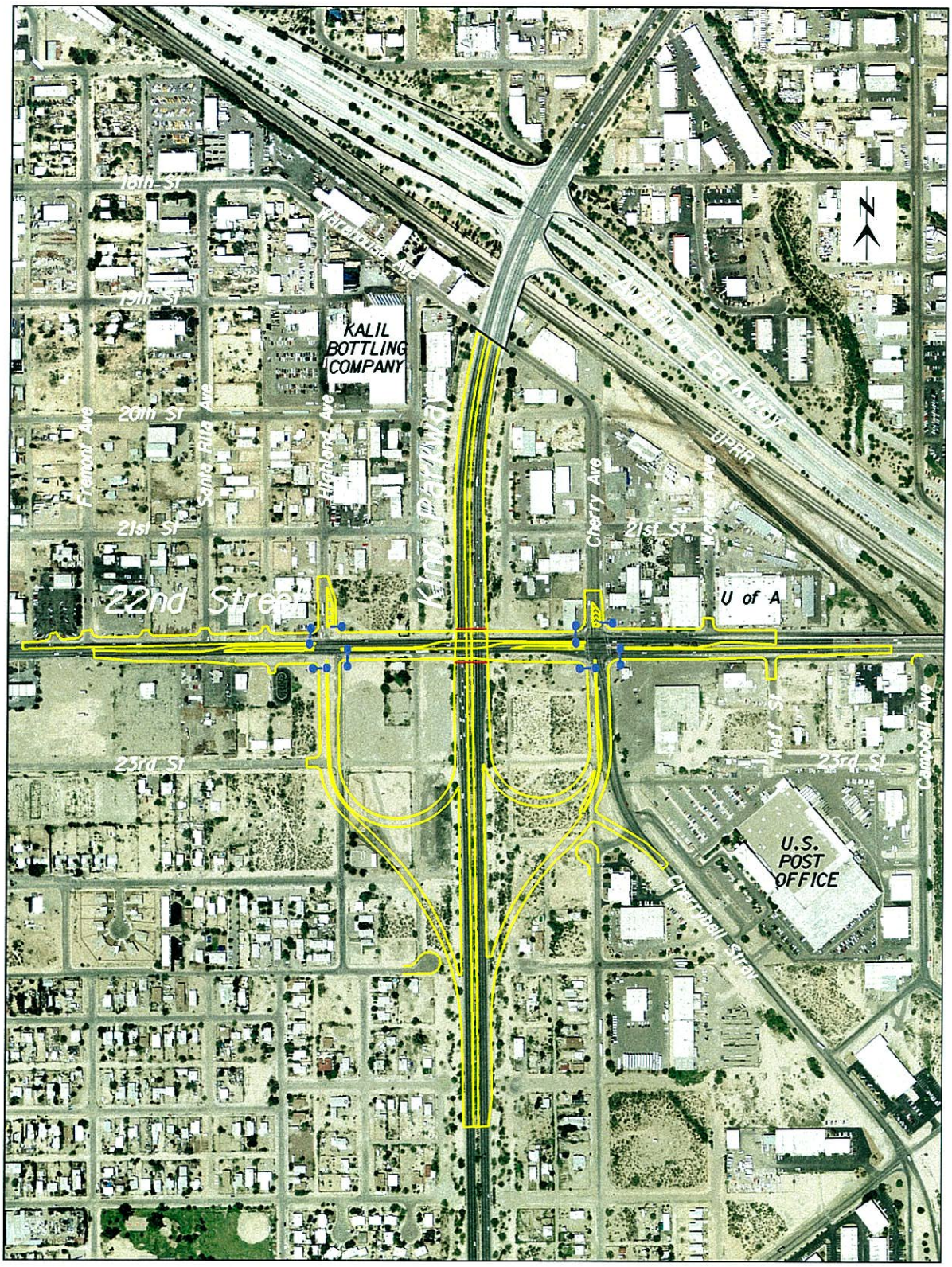


Figure 5: Preliminary Alternative 3, Partial Cloverleaf Interchange

III. Comparative Impact Assessment and Analysis

A. Preliminary Inventory of Existing Data

Traffic

Average Daily Traffic

The study area for the traffic analysis is bounded by Broadway Boulevard on the north, Ajo Way on the south, Tucson Boulevard on the east, and Park Avenue on the west. Average Daily Traffic (ADT) volumes for area roadways were obtained from PAG and are presented in Figure 6. This figure also shows morning and evening peak-hour turning movement volumes at the major intersections in the area. The peak-hour counts were performed in 2004–2005.

As shown in Figure 6, the ADT on 22nd Street west of Kino Parkway is 37,700 vehicles per day, while at the Railroad Overpass the volume increases to 41,100 vehicles per day. Both of these volumes are well above the capacity of a four-lane roadway, which is in the range of 30,000 to 35,000 vehicles per day. Kino Parkway carries 36,100 vehicles per day just north of 22nd Street, and 40,700 vehicles per day south of 22nd Street. Both of these volumes are below the capacity of a six-lane roadway, which ranges from 48,000 to 60,000 vehicles per day depending on the level of access management.

Although the daily volumes are slightly higher to the east and south of the intersection, all four legs of the Kino Boulevard/22nd Street intersection experience very similar volumes. The peak-hour volumes also show that there are no directional shifts between the morning and the evening peaks. These results are all consequences of the intersection's central location in Tucson.

The U.S. Post Office main facility is located in the southeast quadrant. This facility is a traffic generator for both post office operations and for postal customers. April 15 is one of the busiest days for customers at the post office. Traffic control is needed to direct vehicles through the facility. During this time, southbound access from 22nd Street is blocked, and only northbound access on Cherrybell Stravenue is allowed.

Level of Service

Level of service (LOS) is a qualitative measure describing operational conditions of a transportation facility. Letters designate each LOS, with LOS A representing the best operating conditions and LOS F the worst. In the case of intersections, LOS is based on the average delay experienced by drivers negotiating the intersection.

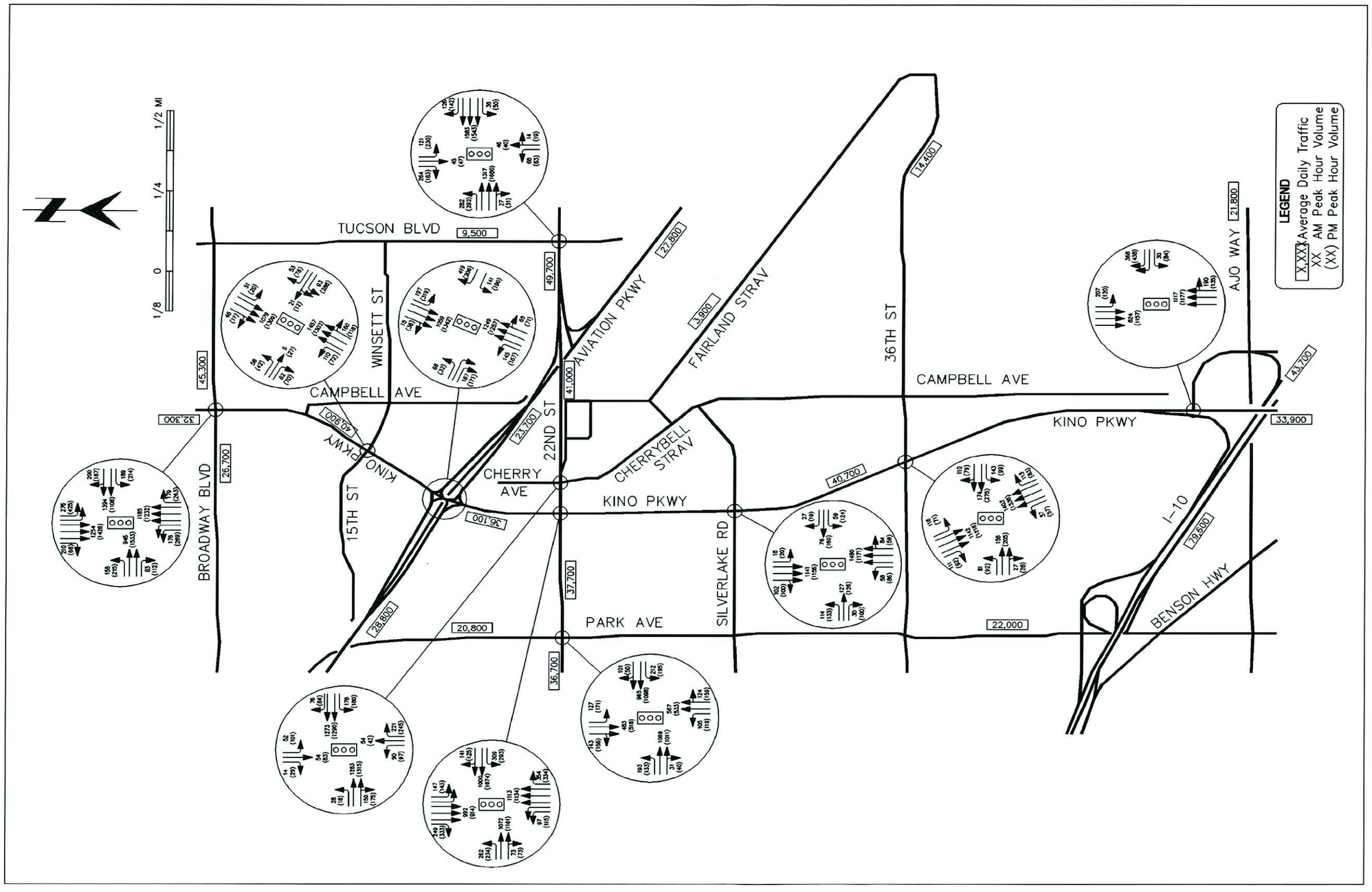


Figure 6: Existing Traffic Volumes *(Source: MMLA PSOMAS June 2006)*

The existing LOS for the roadways within the study area was evaluated using the Florida Quality and Level of Service Tables. Barraza-Aviation Parkway was analyzed as a Class I state arterial, Kino Parkway as a Class II state arterial, and the remaining streets as major city roadways. Table 1 presents the results of the analysis.

Table 1: Average Daily Traffic Volumes and Roadway Segment Level of Service within Study Area

Roadway	Segment	No. Lanes	Existing ADT	Max Volume at LOS E	Current LOS
Kino Parkway	North of Barraza-Aviation Parkway	6	41,900	51,800	D
	North of 22nd Street	6	38,900	51,800	D
	South of 22nd Street	6	37,800	51,800	D
Barraza-Aviation Parkway	West of Kino Parkway	6	31,000	53,500	B
	Northwest of 22nd Street	6	24,900	53,500	B
	Southeast of 22nd Street	6	29,900	53,500	B
22nd Street	West of Park Avenue	4	38,900	32,900	F
	West of Kino Parkway	4	40,000	32,900	F
	West of Cherry Avenue	4	40,800	32,900	F
	West of Barraza-Aviation Parkway	4	43,600	32,900	F
	West of Tucson Boulevard	4	50,700	32,900	F
	East of Tucson Boulevard	6	48,700	49,300	E

The LOS at the intersections within the study area was evaluated for the morning and evening peak hours using Synchro 6.0, traffic analysis software that follows the methodologies described in the *Highway Capacity Manual* (Transportation Research Board). The key input for the analysis are the traffic volumes by movement and the signal timing for signalized intersections. In this case, signal timing information was obtained from the City of Tucson. The results of the LOS analysis process are summarized in Figure 7 (morning peak hour) and Figure 8 (evening peak hour).

Based on the capacity analysis, the intersection of Kino Parkway and 22nd Street operates at LOS E during the morning and evening peak periods with average delays of 70 and 74 seconds, respectively. In the morning, the left turns from 22nd Street (both directions) and the northbound through movement on Kino Parkway experience LOS F. In the evening, the critical movements are the westbound left turns and the northbound through lanes, both movements at LOS F. Additionally, the eastbound left turn and southbound through lane movements are both at LOS E. The intersection of Tucson Boulevard and 22nd Street is operationally better than Kino Parkway and 22nd Street with a LOS B and LOS C in the morning and evening peak periods, respectively.

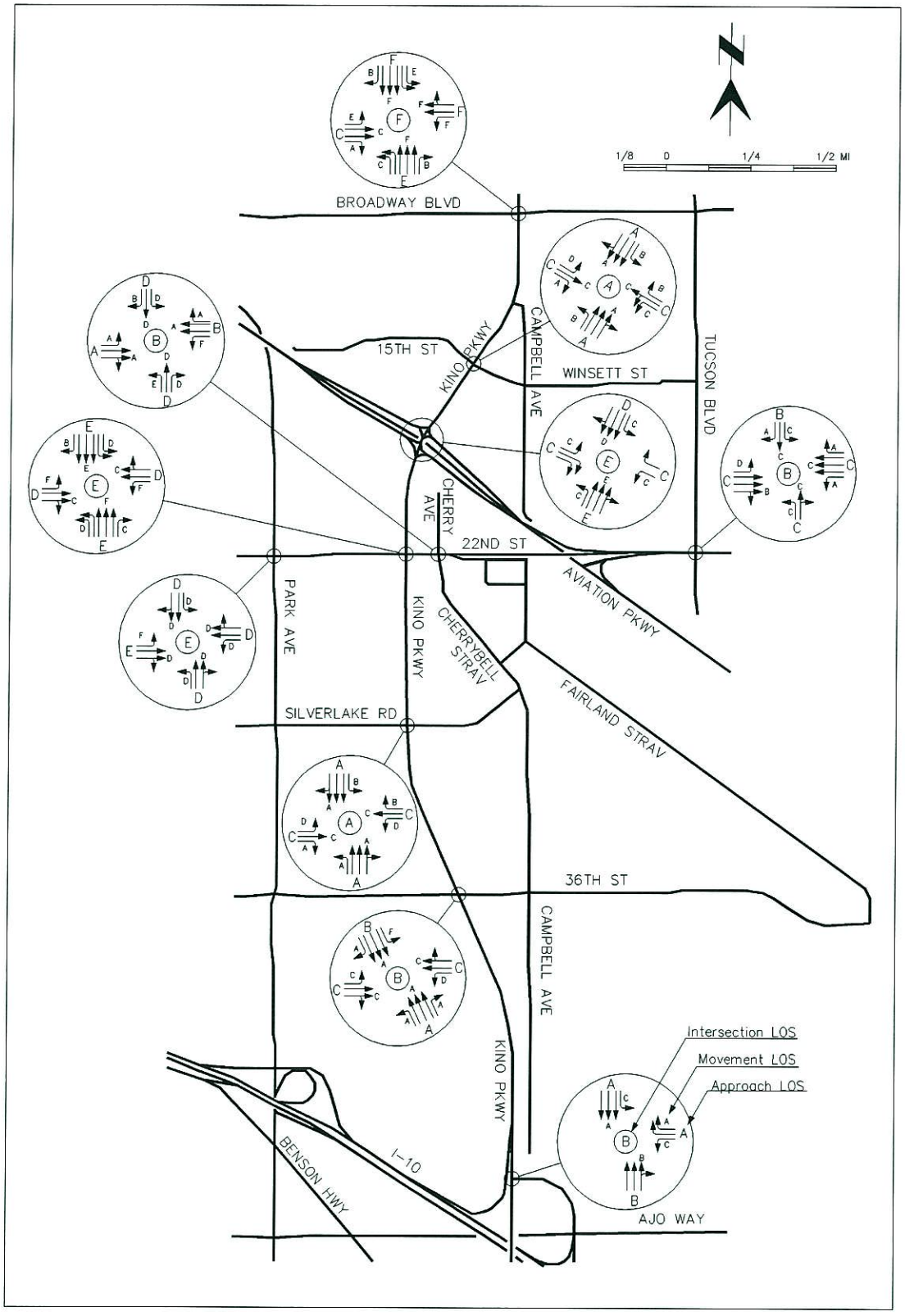


Figure 7: A.M. Level of Service *(Source: MMLA PSOMAS June 2006)*

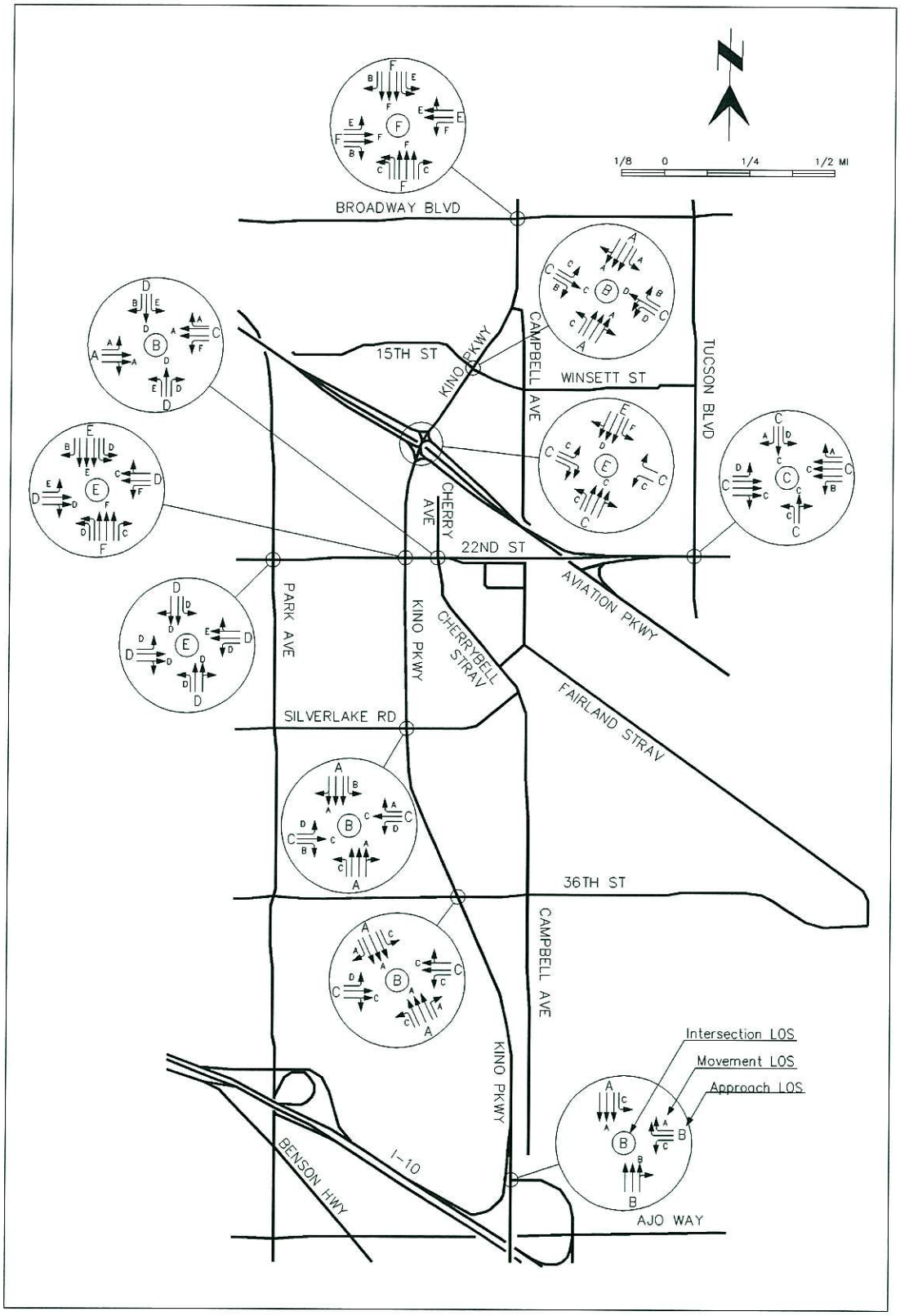


Figure 8: P.M. Level of Service *(Source: MMLA PSOMAS June 2006)*

All other intersections within the study area currently operate at LOS D or better, with the Broadway Boulevard/Kino Parkway intersection being the exception. This intersection operates at LOS F during the morning and evening peaks with significant delays to all through movements. Movements experiencing LOS F at other locations include the westbound left turns from 22nd Street onto Cherrybell Stravenue (morning and evening), the eastbound left turns from 22nd Street onto Park Avenue (morning), southbound left turns from Kino Parkway onto Barraza-Aviation Parkway (evening), and southbound left turns from Kino Parkway onto 36th Street (morning). Table 2 summarizes the LOS results for each intersection within the study area.

Table 2: Level of Service at Intersections within the Study Area

Intersection	A.M. LOS	P.M. LOS
Broadway Blvd/Kino Parkway	F	F
Winsett Street/Kino Parkway	A	B
Barraza-Aviation Parkway/Kino Parkway	E	E
22nd Street/Kino Parkway	E	E
Silverlake Road/Kino Parkway	A	B
36th Street/Kino Parkway	B	B
Ajo Way Connection/Kino Parkway	B	B
22nd Street/Park Avenue	E	E
22nd Street/ Cherry Avenue	B	B
22nd Street/Barraza-Aviation Parkway	A	A
22nd Street/Tucson Blvd	B	C

Access into the four quadrants surrounding the 22nd Street/Kino Parkway intersection is only allowed from 22nd Street. Kino Parkway is a controlled access roadway, so adjacent property must be accessed from 22nd Street. Access from 22nd Street into the four quadrants is not restricted west of Cherry Avenue, and a two-way left-turn lane on 22nd Street provides a refuge area for left-turning traffic. Although left turns are allowed at the existing traffic signal at 22nd Street and Cherry Avenue, a protected left-turn movement with a green arrow is not provided. A protected left turn is not feasible since the additional phasing required to provide a protected left turn would increase delays already experienced at both the Cherry Avenue and the Kino Parkway intersections with 22nd Street.

Currently, access out of the southeast, northeast, and northwest quadrants is available at a number of locations. Traffic turning left onto 22nd Street can enter at any of the through streets that intersect 22nd Street, or at the existing traffic signal at Cherry Avenue/Cherrybell Stravenue. Access out of the southwest quadrant onto 22nd Street is limited to Highland Avenue, which is the only north-south through street out of the quadrant.

A less prominent, but heavily used corridor connects the southeast, northeast, and northwest quadrants. This connection extends from Fairland Stravenue southeast of the Kino

Parkway/22nd Street intersection to 18th Street and Park Avenue northwest of the intersection. The connection between Fairland Stravenue and the intersection of 18th Street and Park Avenue is provided via two routes as shown in Figure 9. One route is shown as a solid blue line and the other is shown as a dotted yellow line. The route shown in blue follows Silverlake Road to Cherrybell Stravenue/Cherry Avenue to Warehouse Avenue. This route appears on the June 2008 City of Tucson's *Major Streets and Routes Plan* with these streets identified as collectors. The route shown in yellow follows the Fairland Stravenue to Campbell Avenue to Cherry Avenue to Warehouse Avenue, and avoids the signal at 22nd Street and Cherry Avenue. All future design alternatives should acknowledge this connection and develop opportunities for its improvement.

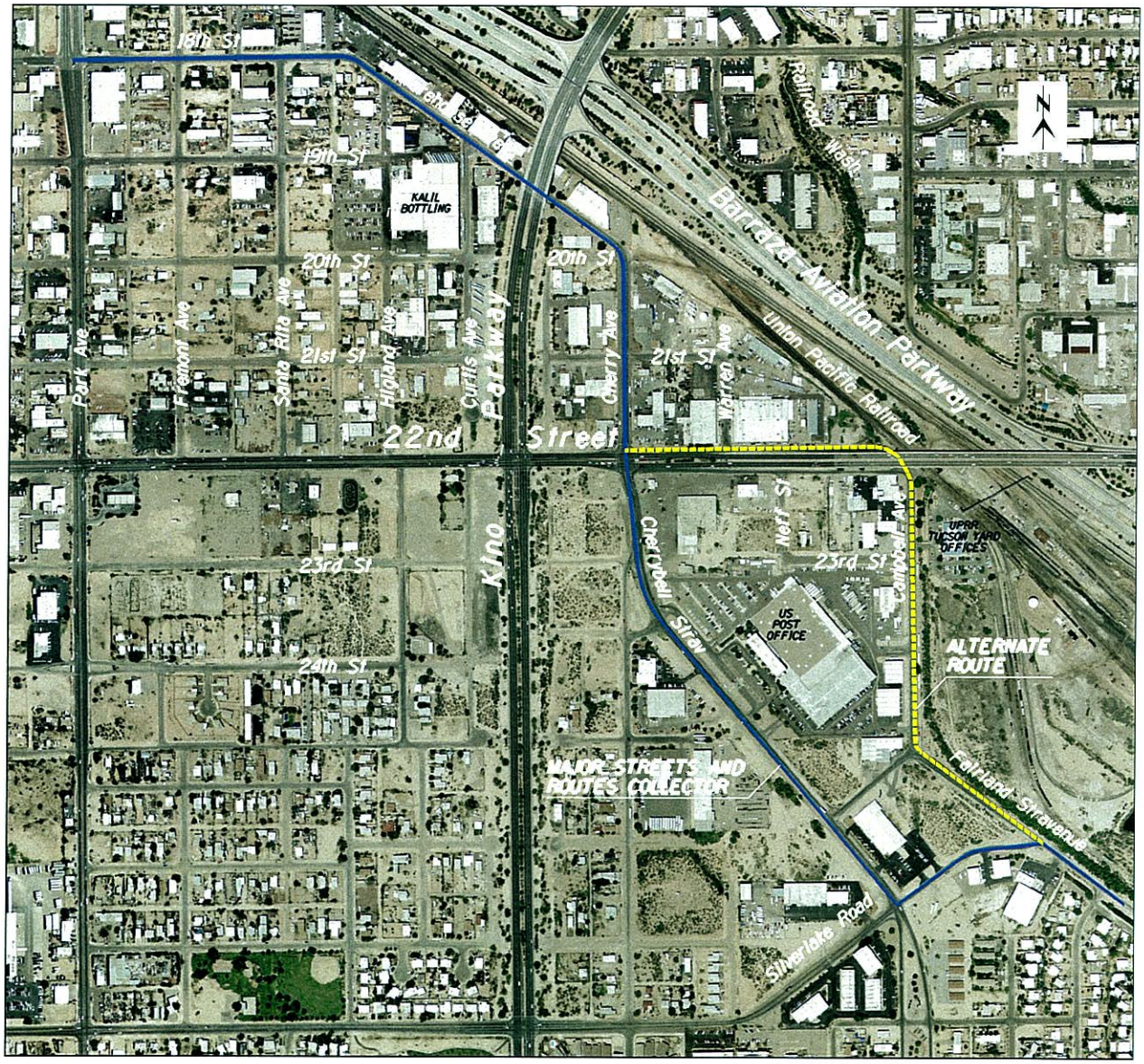


Figure 9: Routes Connecting the Southeast, Northeast, and Northwest Quadrants

SunTran

Currently, SunTran Routes 2 and 7 serve the intersection of Kino Parkway and 22nd Street (see Figure 10). Route 2, named "Cherrybell/Country Club," connects the Downtown Ronstadt Transit Center with the Laos Transit Center. This route, which runs during weekdays every 30 minutes for most of the day (and hourly on weekends), uses 22nd Street between Park Avenue and Cherrybell Stravenue.

Figure 10: Existing SunTran Bus Service

Route 7, named "22nd Street," begins at the Downtown Ronstadt Transit Center and ends at the intersection of Golf Links Road and Harrison Road. This route runs on 22nd Street from 10th Avenue to Harrison Road, except for a detour to avoid the 22nd Street overpass at Barraza-Aviation Highway and the UPRR. In this area, buses detour to Kino Parkway and then to Barraza-Aviation Parkway and back to 22nd Street. This route also runs on 30-minute headways for most of the day, Monday through Friday. During the weekends, both routes run limited schedules with one bus per hour. A summary of the main attributes of each route are presented in Table 3.

Table 3: Weekday SunTran Service at Kino Parkway and 22nd Street

Route	Direction	Start	End	Trips per weekday	Peak hour headway	Hours of Operation	
						Begin	End
2	Northbound	Laos Transit Center	Ronstadt Transit Center	28	30 min	5:15 AM	7:45 PM
	Southbound	Ronstadt Transit Center	Laos Transit Center	27	30 min	6:00 AM	7:30 PM
7	Westbound	Harrison at Golf Links	Ronstadt Transit Center	30	30 min	6:06 AM	10:39 PM
	Eastbound	Ronstadt Transit Center	Harrison at Golf Links	31	30 min	6:05 AM	10:30 PM

Note: The Ronstadt Transit Center is located at 6th Avenue and Congress Street.
The Laos Transit Center is located at 6th Avenue and Irvington Road.

There are no bus pullouts within the project limits, but bus shelters do exist on 22nd Street at the northwest and southwest corners of its intersection with Cherry Avenue/Cherrybell Stravenue. The bus shelter at the northwest corner of the 22nd Street/Cherry Avenue intersection is pictured in Figure 11.

Figure 11: Westbound 22nd Street at Cherry Avenue

Drainage

Off-site drainage impacting the intersection and immediate vicinity emanates from the area southeast of the intersection. Prior to construction of Kino Parkway, larger flows were carried to the west as sheet flow and in the street network. Cross culverts installed under Kino Parkway concentrated the flows and now release them directly into the east-west streets. Flooding issues in the neighborhood west of Kino Parkway have been mitigated recently by installing a series of detention basins in the City right-of-way. The cross culverts under Kino Parkway now discharge directly into these detention basins.

As-built drawings for Kino Boulevard indicate that storm drain facilities within Kino Parkway range in size from 18 inches in diameter at Kino Parkway and 22nd Street to 30 inches in diameter just north of 21st Street. This 30" diameter storm drain empties into a channel that flows into a major interceptor constructed as part of the Barraza-Aviation Parkway. There are no storm drain facilities in 22nd Street.

Floodplain Complaint and Field Investigation Reports were obtained from the City of Tucson. The records reviewed covered the area bordered by Tucson Boulevard on the east, Park Avenue on the west, 18th Street on the north, and Silverlake Road on the south. A total of 25 complaints were received from residents and merchants in this area between March 18, 1984 and September 26, 2006. The nature of the complaints typically involved local flooding caused by clogged facilities or sheet flow breaking out of streets and impacting adjacent structures.

Utilities

Several utilities are located in 22nd Street and in Kino Parkway. Underground utilities include small diameter sanitary sewer, small diameter water lines, gas, telephone, and electric for street lighting and traffic signals. In addition, there are two large diameter water transmission mains in the project vicinity. A 30" main crosses Kino Parkway at 23rd Street, and a 42" main is located in Highland between 23rd Street and 24th Street. The 42" is connected to a Tucson Water facility that houses a pressure reducing valve at the northeast corner of 24th Street and Highland Avenue. In addition, there are well monitoring facilities scattered in the vicinity of the UPRR

Overhead utilities are located on 22nd Street in the southwest quadrant, and cross 22nd Street at Cherry Avenue/Cherrybell Stravenue. However, Kino Parkway does not have any overhead utilities.

Street lights are located on Kino Parkway and on 22nd Street. On Kino Parkway light poles are spaced approximately 150 feet apart on either side of the roadway. Light pole spacing on 22nd Street is approximately 200 feet apart on either side of the roadway.

Bike Routes

According to the Tucson Metro Bike Map (updated September 2006), the following two roadway corridors are designated as bicycle routes in the immediate vicinity of the 22nd Street/Kino Parkway intersection:

- 22nd Street from 4th Avenue to Cherrybell Stravenue is a designated bike route with striped shoulder.
- Kino Parkway/Campbell Avenue from Speedway Blvd. to just north of Ajo Way is a designated bike route with striped shoulder.

On major streets with a posted speed limit of 25 mph or more, designated bicycle routes are identified with "Bike Route" signs and a white edge line, with a paved shoulder of approximately four feet to ten feet in width.

Pedestrian Facilities

Pedestrian facilities are limited to sidewalks that run adjacent to Kino Parkway. There are no continuous sidewalks on 22nd Street. In the project vicinity, however, there are sidewalk improvements on Park Avenue and on the 22nd Street bridge over the UPRR.

Right-of-Way

As stated previously, the right-of-way on the south side of 22nd Street was purchased as part of the existing Kino Parkway corridor improvements in anticipation of a partial cloverleaf interchange at the intersection. In addition, several parcels on the north side of 22nd Street adjacent to Kino Parkway were purchased at that time. These adjacent parcels are generally located between Curtis Avenue and Vine Avenue. The right-of-way for 22nd Street along the project frontage varies from 130 feet to 150 feet in width, and the right-of-way for Kino Parkway varies from 250 feet on the north end to over 1,000 feet at the intersection.

Bridge Structures

Two bridges are in the vicinity of the Kino Parkway/22nd Street intersection. The Kino Parkway overpass at Barraza-Aviation Parkway is located approximately 1,700 feet north of the

intersection, and the 22nd Street bridge over the UPRR and Barraza-Aviation Parkway is located approximately 2,100 feet east of the intersection. The close proximity of these structures will play a significant role in developing the vertical geometry for the intersection improvements.

Zoning and Land Use

Zoning

According to the *City of Tucson Land Use Code*, several different types of zoning occur in the vicinity of the Kino Parkway/22nd Street intersection (see Figure 12 and Table 4). The intersection itself is located in and surrounded by an R-2 zone. In addition to the R-2 zone, smaller areas of industrial (I-1) and commercial (C-1, C-2, and C-3) land use categories occur in the vicinity of the intersection. Table 4 summarizes the zoning designations and land use categories allowed within those zoning designations.

Table 4: Zoning and Land Use in the Kino Parkway/22nd Street Intersection Vicinity

Zone	Land Use
R-2	Designated for medium density residential uses; multifamily and single-family residences are permitted. This zone provides for medium-density single-family and multifamily, residential development, together with schools, parks, and other public services necessary for urban residential environment.
I-1	Designated for light industrial uses. Commercial, industrial, and manufacturing land uses are permitted. Residential uses are generally prohibited in the I-1 zone. The areas generally to the north and east of the 22nd Street/Kino Parkway intersection, particularly adjacent to Barraza-Aviation Parkway, are designated for the I-1 land use.
C-1	Designated for local commercial land uses. Activities in this zone are limited to retail sales with no outside display or storage. Office, residential development, and restaurants are permitted in this zone.
C-2/C-3	Designated for general and intensive commercial uses. Retail commercial with wholesale, nightclubs, bars, and amusement enterprises are permitted in these zones. A full range of automotive activities including sales, repair, and leasing is permitted in these zones. Limited manufacturing is also permitted in these zones.

Land Use

The nature of development in the area is generally industrial. Most notable are the Kalil Bottling Company located on the west side of Kino Parkway south of Barraza-Aviation Parkway (approximately 0.2 mile northwest of the Kino Parkway/22nd Street intersection), and the main post office for Tucson located south of 22nd Street on west side of Campbell Avenue (approximately 0.2 mile southeast of the Kino Parkway/22nd Street intersection).

There is one area/neighborhood plan in the vicinity of the intersection. The Greater South Park Plan covers the area north and south of 22nd Street and west of Barraza-Aviation Parkway neighborhood is also located on both sides of 22nd Street, West of Barraza-Aviation Parkway.

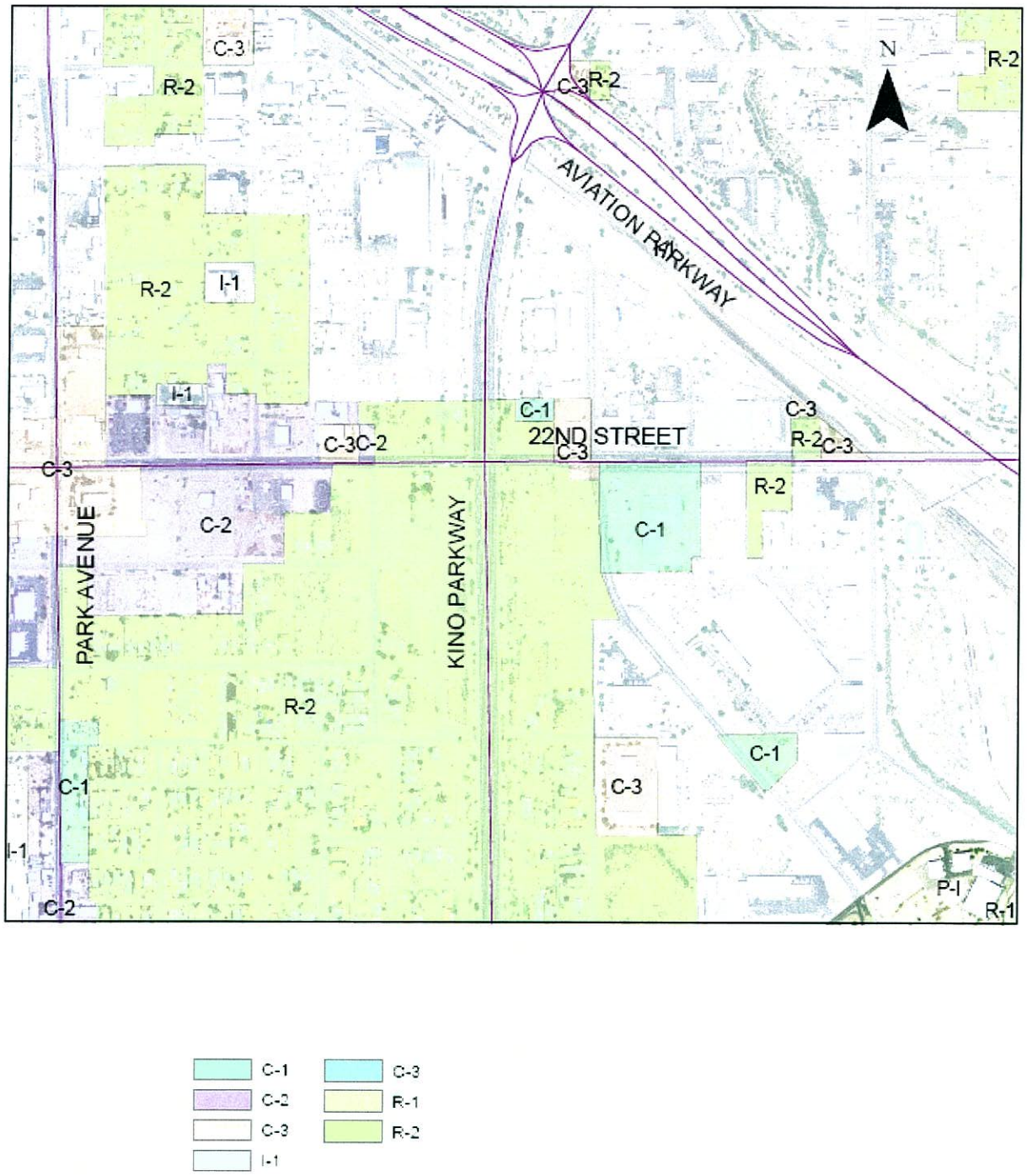


Figure 12: Zoning within the Project Vicinity

B. Comparative Impact Assessment

Traffic

Traffic models for each of the initial interchange alternatives were prepared using the computer modeling software Synchro 6.0 and SimTraffic. Traffic volumes for the design year 2030 were used to determine the operational efficiency of the interchange alternatives. The analyses were limited to the intersection of Kino Parkway and 22nd Street and the intersection of Cherry Avenue and 22nd Street. Table 5 summarizes the overall efficiency of each interchange alternative.

Table 5: Overall Operating Efficiency for Each Alternative

Intersection	A.M. Peak LOS	P.M. Peak LOS	Type of Traffic Control
SPUI Configuration			
22nd/Kino	E	F	Signal
22nd/Cherry	D	D	Half-Signal
Tight Diamond			
22nd/Kino NB Ramp	F	F	Signal
22nd/Kino SB Ramp	B	D	Signal
22nd/Cherry	F	F	2-Way Stop
Partial Cloverleaf			
22nd/Highland	D	D	Signal
22nd/Cherry	D	E	Signal

Table 5 above shows that none of the initial alternatives operate as efficiently as desired. Because of the relative ineffectiveness of the initial configurations as presented, the Technical Advisory Committee (TAC) established for the project requested minor changes to the configurations of each alternative to increase the operational efficiency. These changes and their effect on efficiency are documented in Section III C Evaluation of Comparative Impact Assessment.

SunTran

SunTran operations will be modified differently by each alternative. Both Alternatives 1 and 2 will require redirecting Route 2. The most likely redirection would shift the Cherrybell Stravenue bus traffic to Kino Parkway. Alternative 3 would allow the buses to continue on Cherrybell Stravenue to the Kino Parkway northbound exit ramp, and then onto 22nd Street.

Drainage

The existing right-of-way south of 22nd Street and west of Kino Parkway is currently being used for a series of temporary detention basins to decrease flooding impacts on downstream

properties. Of the three alternatives, Alternative 1 has the most usable space for detention since the ramps can be pulled in tight to the overpass. Alternative 2 has the least amount of usable space because the ramp configuration significantly decreases area available for stormwater detention. Alternative 3 has room available for detention within the loop ramps, but having both the entrance and exit ramps on the south side removes space that could be used for detention, making the amount of available space less than that with Alternative 1.

Utilities

Impacts to utilities are fairly consistent for all three alternatives. Adjustments to existing manholes and valves will be required in 22nd Street, and modifications to utilities in Kino Parkway may be required to protect them from the weight of the additional fill that will be needed to construct the overpass.

Bike Routes

All three alternatives will provide five-foot-wide bike lanes as part of the roadway typical section and have similar constraints. Consequently, the impacts of all three alternatives are considered the same.

Pedestrian Facilities

All three alternatives will provide improvements to pedestrian facilities. The sidewalks adjacent to the roadway section are the same for all three alternatives. Consequently, the impacts of all three alternatives are considered the same.

Right-of-Way

Depending on the final alignment location, additional right-of-way will be required for construction. Additional right-of-way will be required on the north to widen 22nd Street in the vicinity of the interchange, regardless of the interchange configuration. Alternatives 1 and 3 have essentially the same right-of-way needs along 22nd Street, but Alternative 2 will require more right-of-way on the north side of the intersection to provide room for the side-by-side dual left-turn lanes under the overpass.

Alternative 2 is the only alternative that requires additional right-of-way for the ramps on the north side of 22nd Street. The ramps for the SPUI will be located within the existing right-of-way, and Alternative 3 has no ramps on the north side of 22nd Street. As stated earlier, right-of-way on the south side of 22nd Street has already been acquired, and the southern ramps for all 3 alternatives fall within this existing right-of-way.

Bridge Structure

A new bridge structure will be required for the overpass. The size and configuration of the structure varies between each alternative. The longer the bridge span between piers, the deeper the bridge structure, and consequently, the higher the cost.

Alternative 1 requires a single-span bridge since the intersection must have a significant open area for left turns to and from the ramps through the intersection. The length of the bridge is dictated by sight visibility for the left turns from ramp to crossroad, and to a lesser degree the roadway section. The closer the ramps are placed to the overpass, the longer the bridge must become to provide adequate sight distance. The bridge will also need to accommodate three through lanes in each direction, one five-foot bike lane in each direction, pedestrian facilities,

and opposing dual left-turn lanes in both the eastbound and westbound directions on 22nd Street.

Alternative 2 has a center median and can consequently be built as a two-span bridge. Structure depth for the two-span bridge will be less than that for Alternative 1. The length of the bridge is dictated solely on the roadway section through the intersection. The bridge will need to be wide enough to accommodate the three through lanes and bike lanes in each direction, and allow the eastbound and westbound dual left-turn lanes on 22nd Street to be situated side by side with a median separating the left-turn lanes.

Alternative 3 is similar to Alternative 2 in that it can be built as a two-span bridge. As with Alternative 2, the length of the bridge is dictated solely on the roadway section through the intersection. The bridge will need to be wide enough to accommodate the three through lanes and bike lanes in each direction, and the median transitions and storage for dual left-turn lanes. The dual left-turn lanes are not side by side, making the roadway width less than what is required in Alternative 2. Consequently, the structure depth is the shallowest of the three alternatives.

Zoning and Land Use

The existing zoning will not be modified by constructing any of the three alternatives. However, land use could change based on the recommendations of a Land Use Study being conducted as part of this project. The Land Use Study will identify potential uses for any remnant parcels and the outlying area adjacent to the interchange in accordance with City land use and zoning guidelines.

Tucson Water has been investigating relocating their Plant No. 1 from its current location south of downtown on 18th Street to the vacant area south of 22nd Street on either side of Kino Parkway. Preliminary discussions have occurred among Tucson Water, Tucson Department of Transportation, the design team, and these discussions have been shared with the Citizens Advisory Committee (CAC) and the TAC established for this project. These discussions will continue to aid in identifying the opportunities and constraints of relocating the facility to this location.

Additional Assessment Criteria

In addition to the comparative assessment criteria identified above, another list of evaluations by the TAC and the CAC was established for this project. This list was developed to evaluate this project as well as the adjacent 22nd Street, Kino Parkway to Tucson Boulevard project. The criteria identified by the TAC and CAC include:

- Traffic Operations During Construction
- Traffic Operations After Construction
- Alternative Modes
- Environment
- Land Use
- Costs

The criteria listed above were further refined by identifying subcriteria for each of the main topics. A matrix containing the main and subcriteria was subsequently developed as a tool for the TAC to evaluate the alternatives. This matrix has been included as Appendix B.

C. Evaluation of Comparative Impact Assessment

The TAC held a total of three meetings to evaluate the intersection alternatives. The traffic operations and efficiency of each alternative were discussed at length. In addition, the internal circulation scenarios were discussed. The TAC requested each alternative be modified based on these discussions, and the following changes were made:

Alternative 1, SPUI (see Figure 13)

- Eliminated side access onto the entrance and exit ramps due to safety concerns.
- Eliminated the through north-south movement on the ramps to increase efficiency.
- Maintained half signal at Cherrybell Avenue to allow westbound left turns.

Alternative 2, Tight Diamond Interchange (see Figure 14)

- Eliminated the westbound left turn onto Cherrybell Avenue.
- Eliminated side access onto the entrance and exit ramps due to safety concerns.
- Added travel lanes through the intersection to provide more room for merging and weaving traffic.

Alternative 3, Partial Cloverleaf Interchange (see Figure 15)

- Moved the eastern traffic signal from Cherry Avenue to Warren Avenue.

Traffic modeling for the revised alternatives was performed to determine how the changes above impact operations. Although the changes had little to no effect on the LOS for the Tight Diamond and the Partial Cloverleaf configurations, the modifications significantly increased the efficiency of the SPUI. This is due primarily to eliminating the north-south through movement on the ramps, which decreases the number of signal phases required from four to three. Table 6 shows the results of the analysis for each revised alternative.

Table 6: Overall Operating Efficiency for Each Revised Alternative

Intersection	A.M. Peak LOS	P.M. Peak LOS	Type of Traffic Control
SPUI Configuration			
22nd/Kino	C	C	Signal
22nd/Cherry	A	A	Half-Signal
Tight Diamond			
22nd/Kino NB Ramp	E	F	Signal
22nd/Kino SB Ramp	B	D	Signal
22nd/Cherry	F	F	2-Way Stop
Partial Cloverleaf			
22nd/Highland	D	D	Signal
22nd/Cherry	D	E	Signal

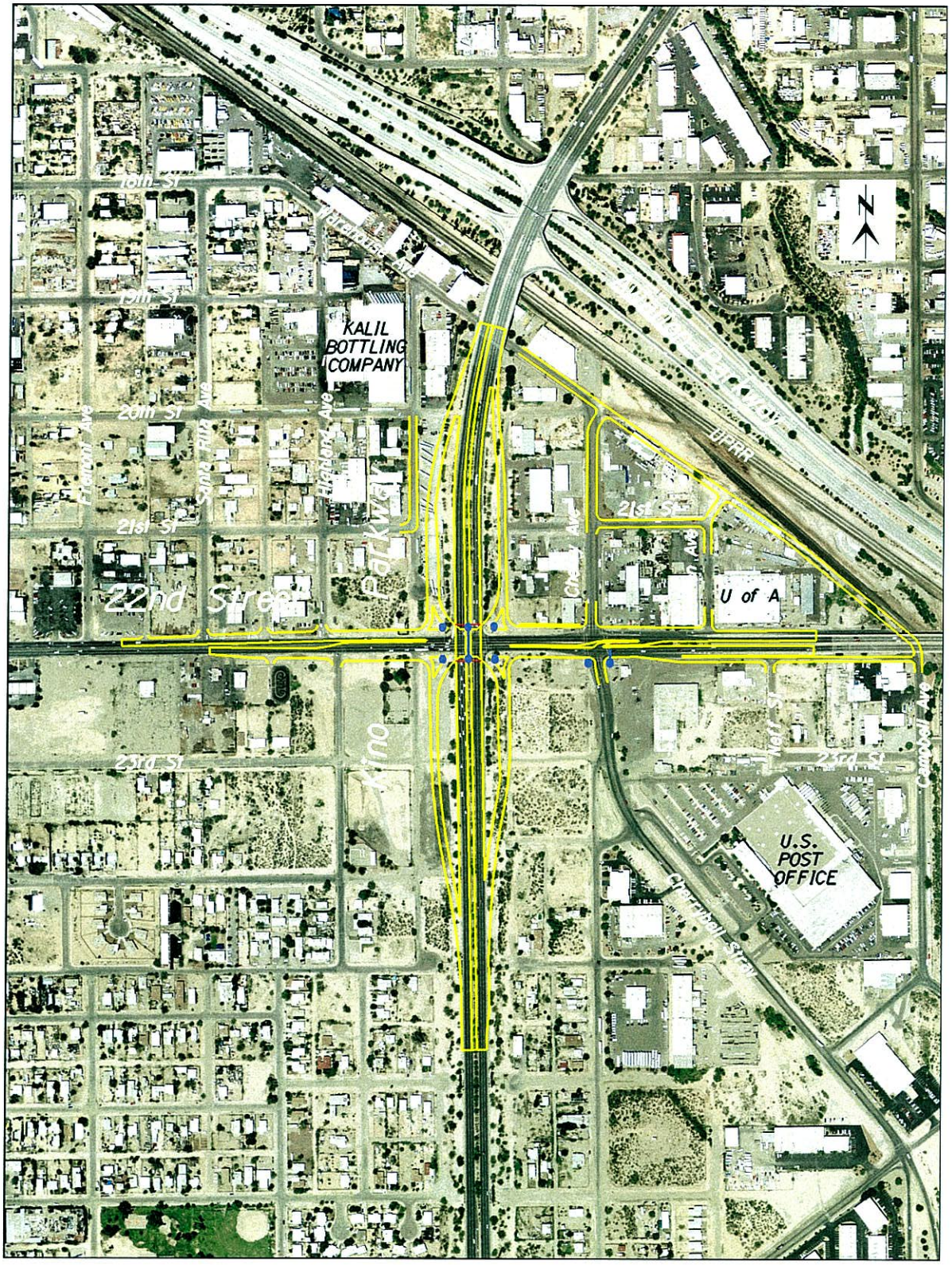


Figure 13: Alternative 1, Single-point Urban Interchange (Modified per TAC Recommendations)

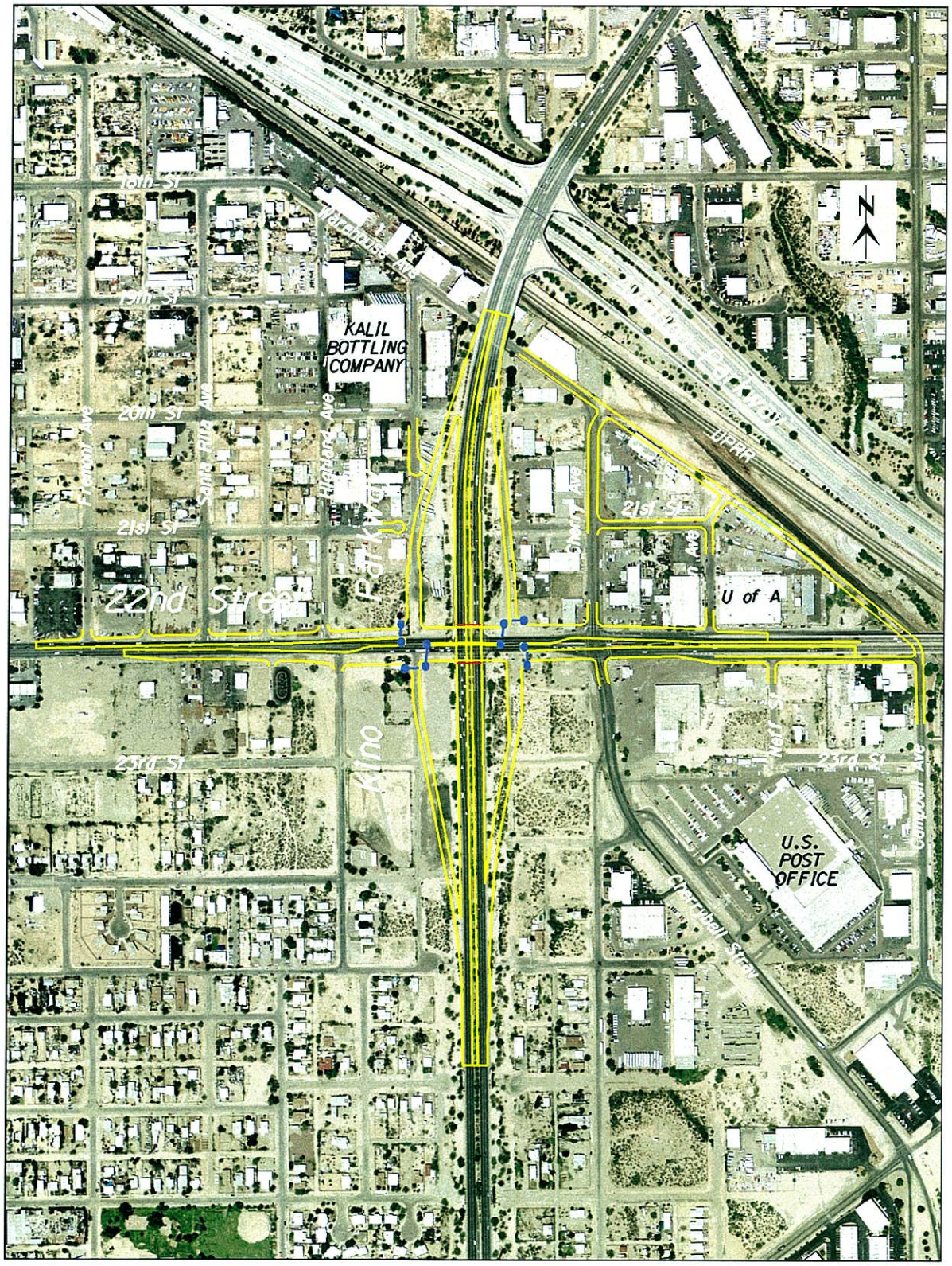


Figure 14: Alternative 2, Tight Diamond Interchange (Modified per TAC Recommendations)

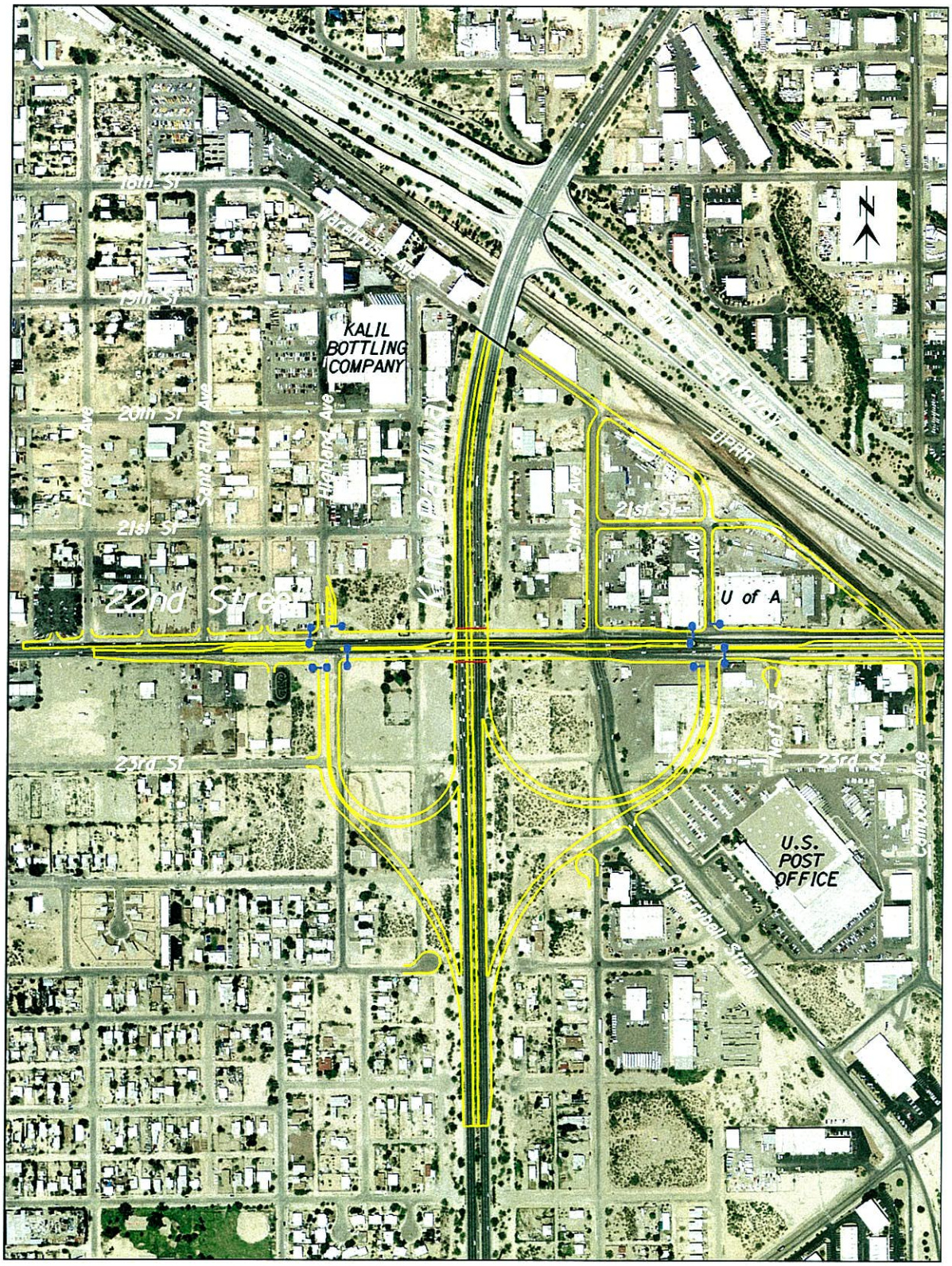


Figure 15: Alternative 3, Partial Cloverleaf Interchange (Modified per TAC Recommendations)

The revised alternatives and corresponding traffic modeling were presented to the TAC for further discussion. The general opinion voiced by the TAC members was that the SPUI provided better operations and efficiency. However, the evaluation matrix was used to perform a more detailed analysis of each alternative. The evaluation consisted of filling out circles divided into quarters. Each criterion was evaluated and the circles were filled in based on the alternative's favorability, with the more circles filled in indicating a more favorable alternative. The results indicated that Alternative 1, the SPUI, was superior to the other alternatives. In terms of evaluation numbers, the results were:

- Alternative 1 – 22.5 circles
- Alternative 2 - 15.5 circles
- Alternative 3 - 10.5 circles.

After the evaluation, the TAC members reached a consensus that the SPUI is the best alternative. However, it was also brought out at the meeting that the next task for the team will be to concentrate on access and circulation issues for the businesses and residents in the four quadrants, as well as access for bicycles and pedestrians.

The alternatives that were presented to the TAC and subsequently revised were presented to the CAC as well. The CAC generally felt the SPUI was a viable alternative, but voiced concerns with the access into and out of the four quadrants surrounding the interchange. The CAC voted 6 to 2 to endorse the SPUI, but the endorsement carries a contingency that the project team needs to address additional access in the Millville neighborhood as well as the other quadrants. In particular, the team will further investigate placing a traffic signal at 18th or 19th Street, extending 23rd Street to Santa Rita, and providing a 21st Street connection with the southbound Kino Parkway off-ramp.

D. Conclusions – Preferred Alternative

Three interchange alternatives were developed to address the safety, capacity, and efficiency issues of the Kino Parkway/22nd Street intersection. The three alternatives included a SPUI, a tight diamond, and a partial cloverleaf. These alternatives were presented to the TAC members and revised based on comments received from the TAC.

The revised layout for the SPUI received support from the TAC members, as is evidenced by the matrix evaluation filled out by the committee (see Appendix A). The SPUI will have no through movement for north-south travel, and will use a half-signal at the intersection of Cherrybell Stravenue and 22nd Street. Additional elements that will require special attention as the design commences include circulation issues for all four quadrants. In particular, the following access issues will need to be addressed:

- Northwest Quadrant – outbound access to eastbound 22nd Street.
- Southwest Quadrant – outbound access to 22nd Street.
- Northeast Quadrant – inbound access from westbound 22nd Street; outbound access to eastbound 22nd Street.

Both the TAC and the CAC have endorsed the SPUI with the understanding that there be further investigations into providing better access for all four quadrants.

In keeping with the intent of the City's *Roadway Development Policies*, it is recommended that an Environmental Design and Mitigation Report be prepared to further analyze the SPUI interchange and its impact on the area environment. The criteria for further evaluation shall

include those items listed in the Environmental Design and Mitigation Report (EDMR) table of contents contained in the City's *Roadway Development Policies*, and the additional criteria established for the matrix evaluation. The criteria for further evaluation are:

- Environmental Components
- Neighborhood (including access issues)
- Traffic Operations After Construction
- Land Use
- Alternative Modes
- Traffic Operations During Construction
- Construction Costs

Additional components of the project include: public art, landscaping, land use and structural selection for a type of bridge on the overpass. The design team will work closely with the CAC to develop these components for the project. This process will also be documented in the EDMR.

E. Public Outreach

The footprint of the SPUI changes how business and residential properties are accessed. As such, the public outreach program for this project has been reaching out to property owners of both businesses and residences. Contact with businesses has included a door-to-door outreach program to provide information regarding the project, and to hear about any concerns the businesses might have. In addition, there have been three open house meetings and the on-going CAC meetings that provide platforms for the public to obtain more information.

Comments from the public and the CAC members have been received on the project, and these comments will be carried forward into the preparation of the Environmental Design and Mitigation report (ED&MR), and the 15% design plans contained in that report. These comments include:

- A loop road running adjacent to the UPRR property will impact the existing spur that is active. Consider reconfiguring the loop road.
- The Campbell Avenue connection under the UPRR bridge is an important link that needs to be maintained.
- The 23rd Street extension between Highland Avenue and Park Avenue is needed to provide access to businesses and residents on 23rd Street.
- Bike lane access through the SPUI needs to be safe. Consider using the 'blue' lanes on Kino where bike lanes cross ramp exits and entrances.
- Will turning movements at Kino and Barraza-Aviation be eliminated as a result of this project, or will they be eliminated when a 22nd Street connection to Barraza-Aviation is made?
- Proper signage to direct traffic into the quadrants will be needed!

Appendix A:
Advance Planning Report

Metropolitan Transportation Plan

To address challenges created by the region's current transportation needs and its continuing growth, the 2030 Regional Transportation Plan (RTP) provides a long-range vision of the region's transportation needs for planning purposes. The RTP considers possible future conditions, but does not make a financial commitment to provide funding for specific projects. The RTP identifies a balanced set of multi-modal projects, policies, and strategies to help move people and goods efficiently from one place to another and to promote consistency of action among federal, state, regional, and local agencies. The Pima Association of Governments (PAG) Regional Council adopted the RTP on June 29, 2005.

Another important regional transportation planning tool available to transportation infrastructure projects in Tucson is the Regional Transportation Authority (RTA) plan that was ratified on May 16, 2006. This plan included the passage of a ½ cent sales tax to generate revenue to pay for the improvements included in the RTA. It earmarks $2.1 billion over the next 20 years for improvements to 35 roadway projects within Tucson.

One of the 35 projects included in the RTA plan is 22nd Street from I-10 to Tucson Boulevard that includes the Kino Parkway Overpass at 22nd Street. The RTA estimated this project at $108 million. The 22nd Street project is not included in the PAG 2006-2010 Transportation Improvement Program. However, it is included in both the City of Tucson's *Approved Capital Improvement Program for Fiscal Years 2006-2010* and its *Capital Agreement Fund: Pima County Bonds* program. The project is also included in the Pima County *Capital Improvement Program for FY 2006/07 to FY 2010/11*.

Proposed Improvements

The *Major Streets and Routes Plan,* originally adopted by the City of Tucson on July 5, 1983 and most recently amended on July 7, 2005, indicates the typical footprint for various roadway types and their associated right-of-way widths. In the vicinity of the intersection of 22nd Street and Kino Parkway, the plan indicates a 120' right-of-way for each arterial. Typically a 120' right-of-way calls for a roadway footprint with three travel lanes and a pedestrian/utility area in both directions. Therefore, the proposed improvements for the Kino/22nd intersection call for adding one travel lane with a pedestrian/bicycle lane on 22nd Street in both directions. Kino Parkway currently has three lanes of travel in both directions, but would be expanded to include a pedestrian/bicycle lane in addition to an overpass of 22nd Street. Appropriate left- and right-turn lanes will also be analyzed and added as necessary.

Justification for the Project

Three of Tucson's most important arterial roadways—22nd Street, Kino Parkway, and Barraza-Aviation Parkway—intersect to form a relatively tight triangle as shown in the aerial photograph below. Approximately 100,000 vehicles pass through this triangle daily. Perhaps no other corridor in Tucson accommodates as much arterial traffic in such a confined area. Two corners of the triangle, the intersections of Kino Parkway and Barraza-Aviation Parkway (Murphy's Overpass) and 22nd Street and Barraza-Aviation Parkway (the 22nd Street Overpass at the Union Pacific Railroad (UPRR)), are grade separated. The at-grade intersection of Kino Parkway and 22nd Street (Kino/22nd) forms the remaining corner of the triangle.

The operations of the intersection are further complicated by the close proximity of the intersection of Cherrybell Stravenue at 22nd Street. The Kino/22nd intersection has the eighth longest delay time of any intersection in Tucson. This not only affects the ability of local traffic to access 22nd Street but also threatens to impact traffic at the other two corners of the triangle. Constructing an overpass at this intersection would improve access to adjacent parcels and circulation within the triangle, thereby enhancing safety, mobility, and circulation. When combined with the existing Murphy's Overpass and future improvements to the 22nd Street Overpass at the UPRR, the 22nd Street project would improve operations and safety on the three major corridors that form this triangle, thus benefiting the entire community.

Location and Project Limits

The Kino/22nd intersection is located in central Tucson. Both Kino Parkway and 22nd Street are major arterials that comprise a portion of the Tucson roadway network. The area studied for this project extends approximately one-half mile from the intersection on both roadways in all four directions. On 22nd Street, the project limits are between Barraza-Aviation Parkway and Euclid Avenue. On Kino Parkway, the project limits are between 13th Street and 29th Street.

Existing Conditions

Average Daily Traffic (ADT)

The ADT on 22nd Street west of Kino Parkway is 37,700 vehicles per day (vpd), while at the UPRR Overpass the volume increases to 41,100 vpd. Both volumes are well above the capacity of a four-lane roadway, which ranges from 30,000 to 35,000 vpd. Kino Parkway carries 36,100 vehicles per day just north of 22nd Street, and 40,700 vpd south of 22nd Street. Both volumes are below the capacity of a six-lane roadway, which is 60,000 vpd.

Level of Service (LOS)

The Kino/22nd intersection currently operates at LOS E during the morning and afternoon peak periods, which indicates heavy congestion. At LOS E, motorists are experiencing average delays of 60 and 64 seconds, respectively, to clear the intersection. In the morning, the left turns from 22nd Street (in both directions) and the northbound through movement on Kino Parkway experience LOS F. In the afternoon, the critical traffic movements are the westbound left turns and the northbound through lanes, both currently operate at LOS F.

Transit

SunTran Routes 2 and 7 serve the Kino/22nd intersection. Route 2, named "Cherrybell/Country Club," connects the downtown Ronstadt Transit Center with the Laos Transit Center. This route runs every 30 minutes for most of the day on weekdays and uses 22nd Street between Park Avenue and Cherrybell Stravenue. Route 7, named "22nd Street," begins at the downtown transit center and ends at the intersection of Golf Links Road and Harrison Road. This route runs on 22nd Street from 10th Avenue to Harrison Road, except for a detour to avoid the 22nd Street overpass at Barraza-Aviation Parkway and the UPRR due to current weight restrictions imposed on the structure. This route also runs every 30 minutes for most of the day, Monday through Friday. On weekends, both routes run limited schedules with one bus per hour.

Future Conditions

ADT and LOS without Improvement

ADT volumes for 2030 were obtained from PAG. It should be noted that traffic volumes discussed here are not official PAG forecasts because PAG is currently in the process of updating its projections, and because some modifications were made to the model used for this analysis to include development projects that are currently in the regulatory approval process.

The modified PAG model anticipates that ADT will increase on 22nd Street from 50,000 to 60,000 vpd. The daily volumes projected for most of Kino Parkway range from 58,000 to 68,000 vpd. These volumes are high but can most likely be handled by a six-lane roadway with adequate access management strategies.

The Kino/22nd intersection is anticipated to operate at LOS E for most movements during both the morning and afternoon peak hours with average delays exceeding 70 seconds. It should be noted that this analysis considers the maximum possible size and capacity of an at-grade intersection by assuming dual left-turn lanes and exclusive right-turn lanes in all directions. The longest delays (LOS F) at this intersection will be the northbound through movement in the morning and the westbound left-turn and northbound through movements in the afternoon.

Transit and Bikeway Improvements

Several transit and bikeway improvements are anticipated in the project area as part of the recently approved RTA plan. The most significant transit service improvements on 22nd Street include:

- Extended weekday evening bus service to 11:00 p.m.
- Improved weekday bus frequencies from 30 minutes to 15 minutes during peak hours
- Extended weekend bus service from 6:00 a.m. to 9:00 p.m. on Saturday, and 7:00 a.m. to 8:00 p.m. on Sunday.

In terms of bikeway improvements, new bike lanes are planned for 22nd Street in the vicinity of Kino Parkway. The footprint for the 120' right-of-way facility in the Tucson *Major Streets and Routes Plan* also calls for a pedestrian/utility area on both sides of the roadway.

Proposed Design Concept Features

Roadway type and cross section

According to the *Major Streets and Route Plan*, a typical high-volume arterial should consist of six travel lanes, a raised median with storage for turning vehicles, and an area on each side for sidewalks, utilities, and street furniture. Seventeen feet have been allotted to the outside travel lanes to allow for adequate space for bicycle traffic next to the curb.

Interchange

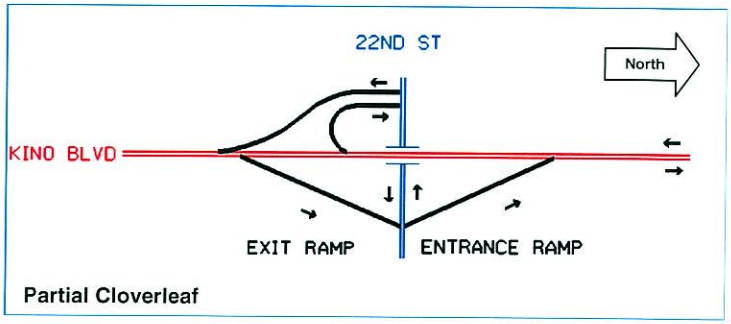
An interchange is a grade-separated intersection where one roadway passes over another roadway with ramps that connect each road. This allows for traffic on one of the intersecting roadways to continue without stopping. Traffic signal(s) are installed where the ramps intersect with the opposing roadway to allow traffic to turn, thereby providing access to and from any direction. An interchange is normally provided as a solution to a capacity, mobility, and/or a traffic safety problem. There are many styles of interchange configurations; however, there are only a few basic types: a diamond, a single-point urban, and a cloverleaf. A grade-separated interchange is recommended for this intersection.

Alternative modes component

The Kino/22nd intersection project incorporates alternative modal aspects. In addition to passenger-car vehicles, the project accommodates transit service, as well as multi-use lanes and pedestrian facilities within the study area.

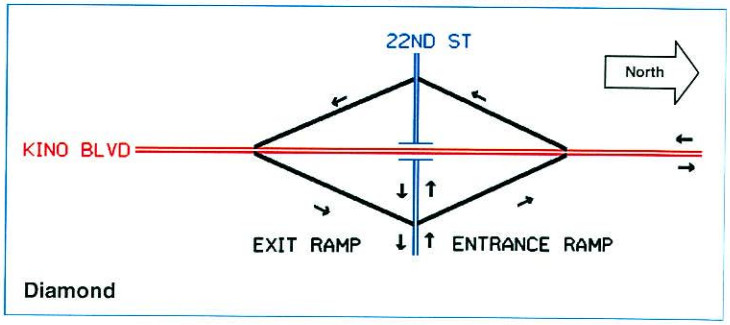
Preliminary Alternatives

Several alternatives have been considered for this intersection and three are proposed to be advanced for further consideration. One alternative, the partial cloverleaf, provides a major benefit as access to businesses in the area would remain very similar to today's conditions. A cloverleaf would also allow the City to keep the current signal at the 22nd/Cherrybell intersection but would require installing a second signal at the 22nd/Highland intersection. The proximity of these signals within the 22nd Street corridor would make coordination with nearby signals at Park and Tucson Avenues difficult and may increase delays at the intersections. Cloverleaf interchanges also pose safety concerns, as they have relatively poor safety records because of tight curves on the entrance/exit ramps. Given the industrial nature of the area, the risk of trucks overturning or slow operating speeds on the loop ramps may also pose a safety concern.



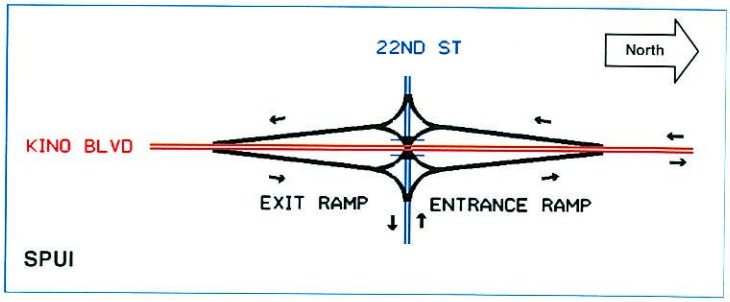
Partial Cloverleaf

Another interchange alternative considered is the traditional diamond interchange. This interchange has the advantage of being familiar to drivers. Nonetheless, diamonds are normally better suited for interchanges with low crossroad volume. With the high traffic volume on 22nd Street and the short spacing between ramps, traffic may spill back from one ramp to the other. Diamonds are also limited in their ability to handle significant left-turn volumes.



Diamond

The third alternative considered is the single point urban interchange (SPUI). This is a relatively new type of interchange that requires minimal right-of-way. SPUIs are similar to diamonds, but consolidate all the ramp movements at a single signalized intersection. This interchange type may facilitate signal coordination, as the signal for the interchange would remain at its current location and, unlike the cloverleaf, would not need a second signal.



SPUI

Mitigation Measures

Environmental

In accordance with the City of Tucson Department of Transportation Roadway Development Policies, Ordinance No. 6593, an Environmental Assessment and Mitigation Report (EAMR) will be required. The EAMR will address the potential social, economic, and environmental impacts caused by the proposed improvements, and will recommend mitigation strategies. Included will be an inventory of existing conditions, an assessment of impacts, and proposed design features that implement the mitigation. Methods of mitigation that could be incorporated into the design include:

- Architectural treatments for walls and bridge and drainage structures
- Pedestrian, bicycle, public transit facilities
- Public art opportunities
- Stabilization of drainage channels with natural materials
- Orientation of improvements to take advantage of view sheds
- Continuous access during construction
- Frontage roads
- Under grounding of overhead utility facilities
- Archaeological, cultural, and historic resource investigations

Neighborhood

Community input is a major component of this project. Adjoining neighborhoods and concerned property owners are included in developing this project's vision and its mitigation measures to protect the integrity of the social, economic, and environmental fabric of the community. The public, through a COT Transportation Director appointed Citizens Advisory Committee (CAC), has been involved from the outset with the design team listening to neighbors and local businesses relate their vision for the project. The design team incorporates this public input and injects it into the project design process. The project will also include at-large public participation and input in both the planning and design phases with public meetings held by COT DOT. Also, the Citizens Transportation Advisory Committee will be involved in the project.

IMPLEMENTATION STRATEGIES

Intergovernmental Agreement, Project Funding Sources, and the RTA

A Special Pima County Bond Election was held November 4, 1997 to approve public funding of $10 million for 22nd Street from Interstate 10 to Park Avenue (DOT-41). The initial programmed funding was redirected to various transportation improvement projects within local neighborhoods. In 2004, Pima County and the City of Tucson entered into an Intergovernmental Agreement (IGA) for roadway and structural improvements to Kino Parkway Overpass at 22nd Street. Within the IGA, the Pima County Board of Supervisors agreed to earmark $10 million from County Transportation Bond Funds to help pay for the project costs of design, right-of-way acquisition, and construction. The City agreed to pay all design, right-of-way, and construction costs in excess of $10 million, which would be funded from revenue generated by the RTA ½-cent sales tax that was approved in a referendum held May 16, 2006. The project calls for $108 million of roadway and capacity improvements from I-10 to Tucson Boulevard/Barraza-Aviation Parkway, which includes the Kino/22nd intersection.

Estimated Monies Earmarked for IGA Improvements and RTA Funding

The IGA earmarked $10 million for the project based on the break down below. The RTA has programmed $108 million for improvements to 22nd Street from I-10 to Tucson Boulevard/Barraza-Aviation Parkway.

Right-of-Way Acquisition and Design	$1,500,000
Construction	$8,500,000
Total Amount Earmarked	$10,000,000

Conceptual Programming Timeframe

The planning-level analysis and design for the project are each estimated to take one year. Construction is expected to follow design and last approximately 18 months. Based on this conceptual schedule, planning will span June 2006 to June 2007 and design from June 2007 to January 2009. Construction will then start in June 2009 and be completed by the end of December 2010.

RECOMMENDATION

The goals of the Kino Parkway Overpass at 22nd Street transportation improvement project are to provide a more efficient and safe transportation facility, to protect the integrity of the community, and to blend with the natural and manmade environment. To successfully complete these goals, the following will be required:

- Proceed with an Alternative Alignment Report as detailed in the COT Roadway Development Policies.
- Adhere to the conceptual programming timeframe as detailed in this Advance Planning Report.
- Continue policy, planning, and public involvement procedures as detailed in the COT Roadway Development Policies.

Appendix B:
Evaluation of Alternatives and Decision Matrix

KINO PARKWAY – 22ND STREET INTERSECTION & WIDENING TO TUCSON BOULEVARD

Revised 2-19-08

DECISION CRITERIA	Kino/22nd Street Intersection Criteria ranked from ● being most desirable to ⊕ being least desirable.		
	Alt 1 (SPUI)	Alt 2 (Tight Diamond)	Alt 3 (Partial Cloverleaf)
Traffic Operations After Construction			
(How well does the alternative improve:)			
way-finding	●	◑	⊕
traffic progression/signal coordination	●	⊕	◑
safety of bike, pedestrians & vehicles	◕	◑	⊕
capacity	●	◕	◕
business access	◑	⊕	◑
neighborhood access	◑	◑	◕
Alternative Modes			
(How well does the alternative provide opportunities for:)			
bicycle facilities	◑	◑	◑
pedestrian facilities	◑	⊕	◑
transit facilities	◑	◑	◑
connectivity to other alternate modes facilities	◑	◑	◑
Land Use			
(How well does the alternative provide opportunities for:)			
future development	●	◑	◑
redevelopment of excess land	●	◑	⊕
parks/open space/landscaping	◕	◑	◕
integration of functional aesthetics	◕	◑	◕
Costs			
(How well does the alternative minimize:)			
level of right-of-way costs	●	◑	⊕
utility impacts	●	●	◑
total construction costs	◕	●	◑
operating and maintenance costs	●	◑	◑

KINO PARKWAY – 22ND STREET INTERSECTION & WIDENING TO TUCSON BOULEVARD

Revised 2-19-08

DECISION CRITERIA	Kino/22nd Street Intersection Criteria ranked from ⊕ being most desirable to ⊕ being least desirable.		
	Alt 1 (SPUI)	Alt 2 (Tight Diamond)	Alt 3 (Partial Cloverleaf)
Traffic Operations During Construction			
(How well does the alternative improve:)			
way-finding	⊕	⊕	◔
continuity of travel	⊕	⊕	◔
expedited construction schedule/phasing	⊕	⊕	◔
maximizing number of travel lanes open	◔	◔	◔
business access	⊕	◔	◔
neighborhood access	⊕	◔	◔
Environmental			
(How well does the alternative provide opportunities for:)			
minimizing impact to adjacent properties	⊕	⊕	◔
neighborhood screening	⊕	◔	⊕
improving drainage	◔	◔	●
equitable benefits/impacts to surrounding areas	●	◔	◔