This Presentation

• Roadway alternatives performance assessment/summary of results.
• Access and access management.
• Cost comparison.
24-hour two-way traffic volumes, collected Wednesday, March 26, 2008.


2025 traffic volumes estimated.
2011 Turning Movement Volumes
AM (PM) Peak-Hours

Valencia Road

Kolb Road

EB Approach
894 (1,383) →

647 (990) →
227 (382) →
20 (11) →

SB Approach
1,341 (589) →
521 (590) →
254 (595) →

Total Vehicles
AM = 4,838
PM = 4,461

Source: Pima County Department of Transportation, May 5, 2011.

Numbers shown in red font represent high volume movements at the intersection.
Level of Service (LOS)

- Grading scale used to define traffic operations.
- Based on delay per vehicle (seconds/veh.)
- LOS A = best
- LOS D typically used as design criterion
- LOS E = capacity
- LOS F = worst (over capacity)

<table>
<thead>
<tr>
<th>Delay (s/veh)</th>
<th>LOS</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 10</td>
<td>A</td>
<td>Very low delay. Many vehicles do not stop.</td>
</tr>
<tr>
<td>&gt;10-20</td>
<td>B</td>
<td>Low delay, but more vehicles stop than LOS A.</td>
</tr>
<tr>
<td>&gt;20-35</td>
<td>C</td>
<td>Moderate delay. Number of cars stopping starts to become significant.</td>
</tr>
<tr>
<td>&gt;55-80</td>
<td>E</td>
<td>High delay. Signal cycle failures are frequent. Limit of acceptable delay.</td>
</tr>
<tr>
<td>&gt;80</td>
<td>F</td>
<td>Very high delay, unacceptable to many drivers. Many signal cycle failures.</td>
</tr>
</tbody>
</table>
PM Photos

Eastbound

Southbound

Northbound
**AM Performance Statistics**
- Total Delay (hr): 56.0
- Delay/Vehicle (s/veh): 41.8
- Total Stops: 3,305
- Stops/Vehicle: 0.68
- Total Vehicles: 4,821

**PM Performance Statistics**
- Total Delay (hr): 93.0
- Delay/Vehicle (s/veh): 75.7
- Total Stops: 4,624
- Stops/Vehicle: 1.05
- Total Vehicles: 4,439

**Existing Condition 2011 Volumes**

**LEVEL OF SERVICE BY MOVEMENT**

**Intersection LOS**
- AM = D
- PM = E

120 sec. Cycle Length

Note: Level of Service (LOS) Shown AM (PM)
Indirect Left-Turns

“One potential treatment to combat congestion and safety problems at intersections is the Median U-Turn Intersection, which has been used in Michigan for many years and has been implemented successfully in Florida, Maryland, New Jersey, and Louisiana in recent years.”

- Conflict points at a 4-leg signalized intersection are reduced from 32 to 16.
- Eliminates crossing left-turn conflict points.
- Observations compared to conventional 4-leg intersection:
  - 60 percent reduction in total crashes.
  - 75 percent reduction in total injuries.
  - 17 percent reduction in rear-end crashes.
  - 96 percent reduction in angle crashes.
  - 61 percent reduction in sideswipe crashes.
AM Performance Statistics
Total Delay (hr): 28.4
Delay/Vehicle (s/veh): 21.2
Total Stops: 3,092
Stops/Vehicle: 0.6
Total Vehicles: 4,819

PM Performance Statistics
Total Delay (hr): 28.6
Delay/Vehicle (s/veh): 23.3
Total Stops: 3,077
Stops/Vehicle: 0.7
Total Vehicles: 4,422

Note: Level of Service (LOS) Shown AM (PM)
Source: Pima Association of Governments, 2011.
Numbers shown in red font represent high volume movements at the intersection.
Performance Criteria

• Provide LOS D or better for all major traffic movements using design volumes (year 2025).

• Compare alternative concepts based on LOS, delay, and vehicle stops.
Northern Alignment

- Previous studies could not identify an alternative that met performance criteria for design traffic volumes.
- High cost of previous alternatives was a major issue.
- The proposed concept satisfies performance criteria at an affordable cost.
  - Parkway At Grade Intersection (PAGI)
    - At-grade (not grade separated)
    - Based on Indirect Left-Turn Concept, with additional access roads (ramps).
    - Safer and more effective than conventional intersections.
PAGI Northern Alignment
PM 2025 Design Traffic
AM Performance Statistics
Total Delay (hr): 98.1
Delay/Vehicle (s/veh): 36.0
Total Stops: 8,048
Stops/Vehicle: 0.8
Total Vehicles: 9,813

PM Performance Statistics
Total Delay (hr): 141.5
Delay/Vehicle (s/veh): 45.2
Total Stops: 11,158
Stops/Vehicle: 1.0
Total Vehicles: 11,271

Note: Level of Service (LOS) Shown AM (PM)
Southern Alignment

• Concept diverts traffic to new southern alignment, and splits demand between two main intersections.
• As much as 52 percent of 2025 traffic would be diverted south.
• Several concepts tested for new southern intersection.
Conventional Intersection Design
Southern Alignment
PM 2025 Design Traffic
AM Performance Statistics
Total Delay (hrs): 221.4
Delay/Vehicle (s/veh): 80.4
Total Stops: 13,774
Stops/Vehicle: 1.4
Total Vehicles: 9,917

PM Performance Statistics
Total Delay (hrs): 453.0
Delay/Vehicle (s/veh): 144.2
Total Stops: 22,831
Stops/Vehicle: 2.0
Total Vehicles: 11,308

Note: Level of Service (LOS)
Shown AM (PM)
** Minimal volume assumed for this movement in this alternative
CFI Southern Alignment
PM 2025 Design Traffic
AM Performance Statistics
Total Delay (hrs): 159.7
Delay/Vehicle (s/veh): 57.8
Total Stops: 10,821
Stops/Vehicle: 1.1
Total Vehicles: 9,943

PM Performance Statistics
Total Delay (hrs): 224.3
Delay/Vehicle (s/veh): 71.6
Total Stops: 14,212
Stops/Vehicle: 1.3
Total Vehicles: 11,278

Note: Level of Service (LOS) Shown AM (PM)
** Minimal volume assumed for this movement in this alternative
Total Delay Comparison (AM + PM) By Alternative - 2025 Design Volumes

- 281% Higher
- 60% Higher

Delay Ratio

PAGI North  CFI South  Conventional South
Access

• Northern alignment PAGI
  – Driveway friendly: Allows extensive use of right-in right-out access.
  – Median openings allow access to properties on opposite side of street.
  – Provides a safer, more effective access approach.
  – Maintains or improves existing access.
  – Some access restrictions do exist

• Southern alignment CFI
  – Generally maintains existing access on northern alignment.
  – Also allows extensive use of right-in right-out access on southern alignment.
  – Median openings for U-turns would provide cross-street access.
  – Access restrictions do exist.
Potentially relocate McCulloch Dr.

Potential Development Access Locations for Consideration.
5-14-2012

Restricted access through merge length.
Potential Development Access Locations for Consideration.
5-14-2012

Restricted access through merge length (1,100 – 1,200 ft.)
Cost Comparison of Alternatives

- **Estimated Cost of Construction**
- **Other costs associated with project**
  - Signing, Striping, Signals, Traffic Control, etc.
  - Right-of-way Acquisition = 9-10 acres
  - Design and Survey
  - Construction Administration = 8% of construction costs
  - 20% Project Cost Contingency
Cost Comparison of Alternatives

Northern Alignment – PAGI

Construction Estimate
Drainage = $980,000
Earthwork = $685,000
Roadway = $5,220,000
Other = $9,115,000
Total Project Cost = $16.0 M
Cost Comparison of Alternatives

Construction Estimate
Drainage = $1,970,000 (+101%)
Earthwork = $1,240,000 (+81%)
Roadway = $7,540,000 (+44%)
Other = $11,650,000 (+28%)
Total Project Cost = $22.4 M (+40%)

Southern Alignment - Conventional Intersection
Cost Comparison of Alternatives

Construction Estimate
Drainage = $2,180,000 (+122%)
Earthwork = $1,240,000 (+81%)
Roadway = $7,960,000 (+52%)
Other = $12,320,000 (+35%)
Total Project Cost = $23.7 M (+48%)

Southern Alignment - Continuous Flow Intersection
Cost Comparison of Alternatives

Total Delay Comparison (AM + PM) By Alternative - 2025 Design Volumes

- **Delay Ratio**
  - 0
  - 0.5
  - 1
  - 1.5
  - 2
  - 2.5
  - 3

- **Cost Comparison**
  - PAGI North: $16.0 M
  - CFI South: $23.7 M
  - Conventional South: $22.4 M
  - 60% Higher
  - 281% Higher
The End