

CIP T-14
ROUNDAABOUT IMPROVEMENTS
SR 287 AND SR 79B

Town of Florence
Public Works Department



ROUNDAABOUT SR 287 & SR 79B

- Purpose and Need, Design Concept Report (DCR) / Environmental Document and Joint Project Agreement

BACKGROUND

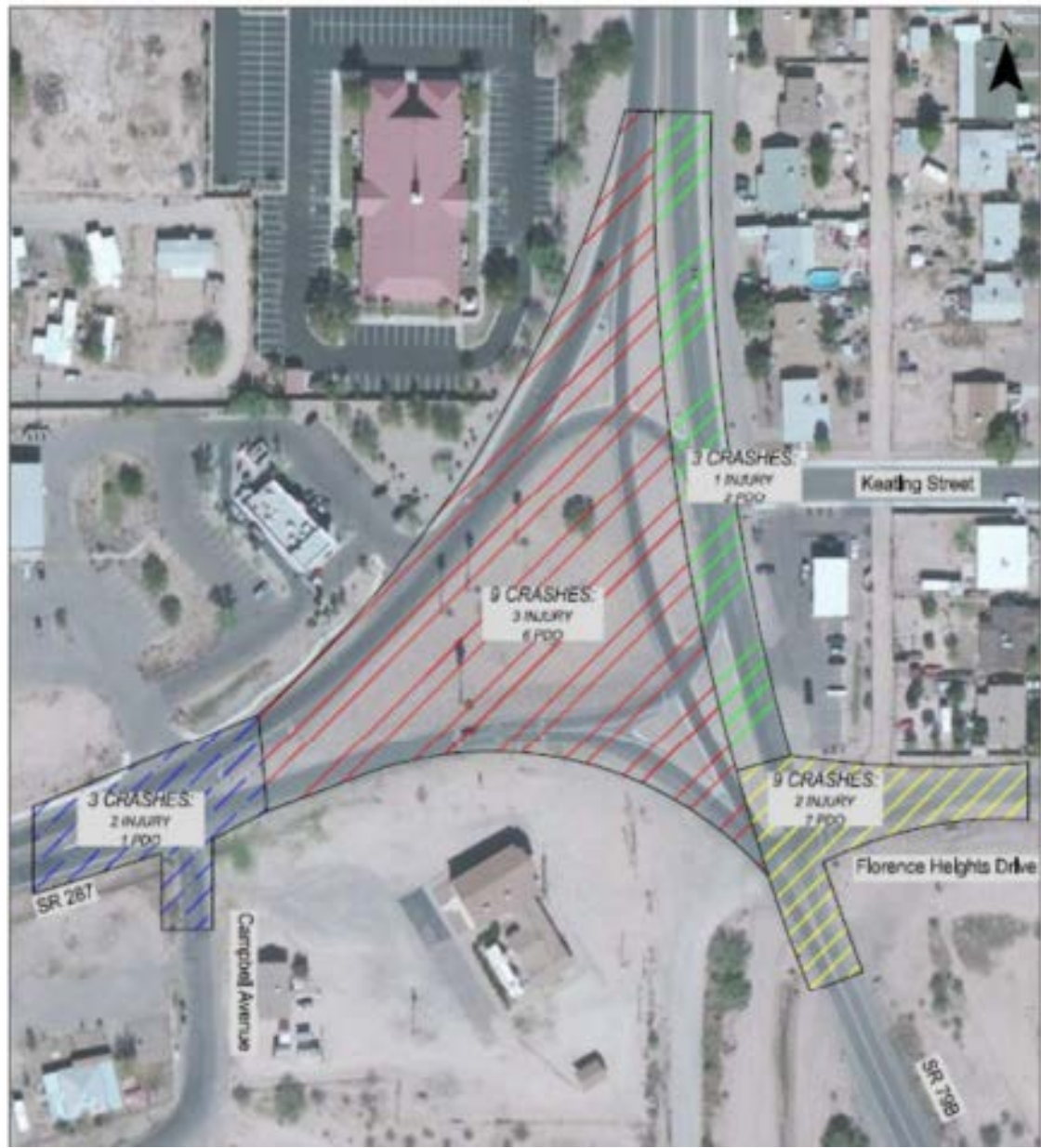
- Provides local and regional access from the west along SR 287 and south along SR 79B
- Southern Entrance to Florence
- Rural-type intersection in growing portion of Pinal County



DESIGN CONCEPT REPORT (DCR)

- The DCR documents the development/evaluation of alternatives to address the project's purpose and need
 - Existing Conditions
 - Environmental Impacts
 - Alternatives Development/Evaluation
 - Recommendation
- Study area - functional limits of the existing intersection, including Florence Heights Dr.





ALTERNATIVES

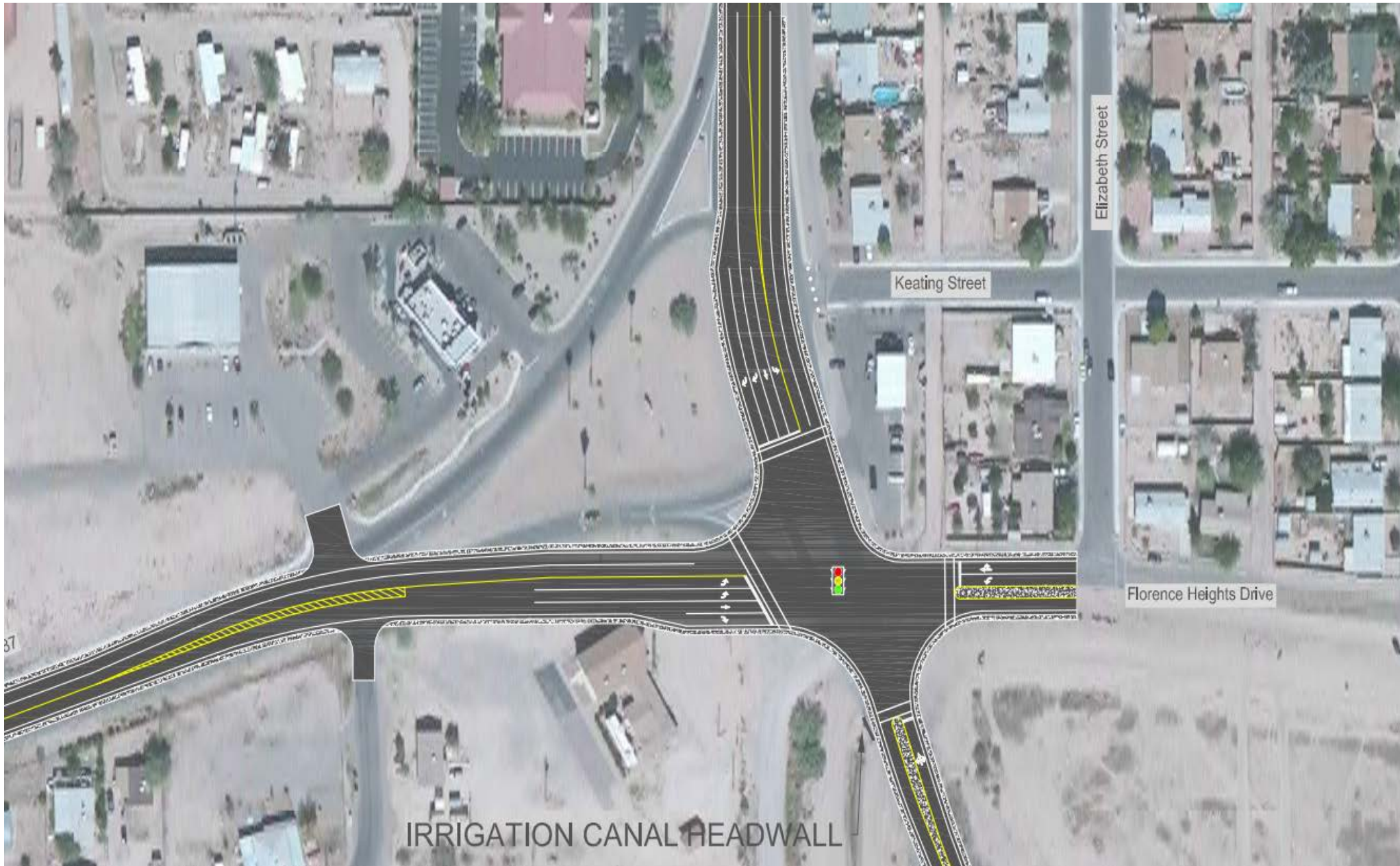
- The DCR evaluates five alternatives:
 - No-Build
 - Four build alternatives:
 - Three roundabouts in various configurations
 - One signalized T-intersection



DESIGN CONCEPT ALTERNATIVES CONSIDERED AND DISCONTINUED

- A single signalized intersection connecting SR287, SR79B, Main Street and Florence Heights Drive at a single point;
- Two signalized intersections, one at Main Street / SR287 / SR79B and a southern one at SR79B / Florence Heights Drive; and







DESIGN CONCEPT ALTERNATIVES DISCONTINUED

- These alternatives resulted in geometry and operations that were not optimal or desirable.
 - Thus, those alternatives were discontinued.
- The 4 new alternatives were developed for evaluation in this revised document, without the same geometric and right of way constraints



ALTERNATIVE #1

- **Single Roundabout**
 - Combines main movements into one large, multi-lane roundabout intersection
 - Shifts SR 79B west to allow for correct intersection layout



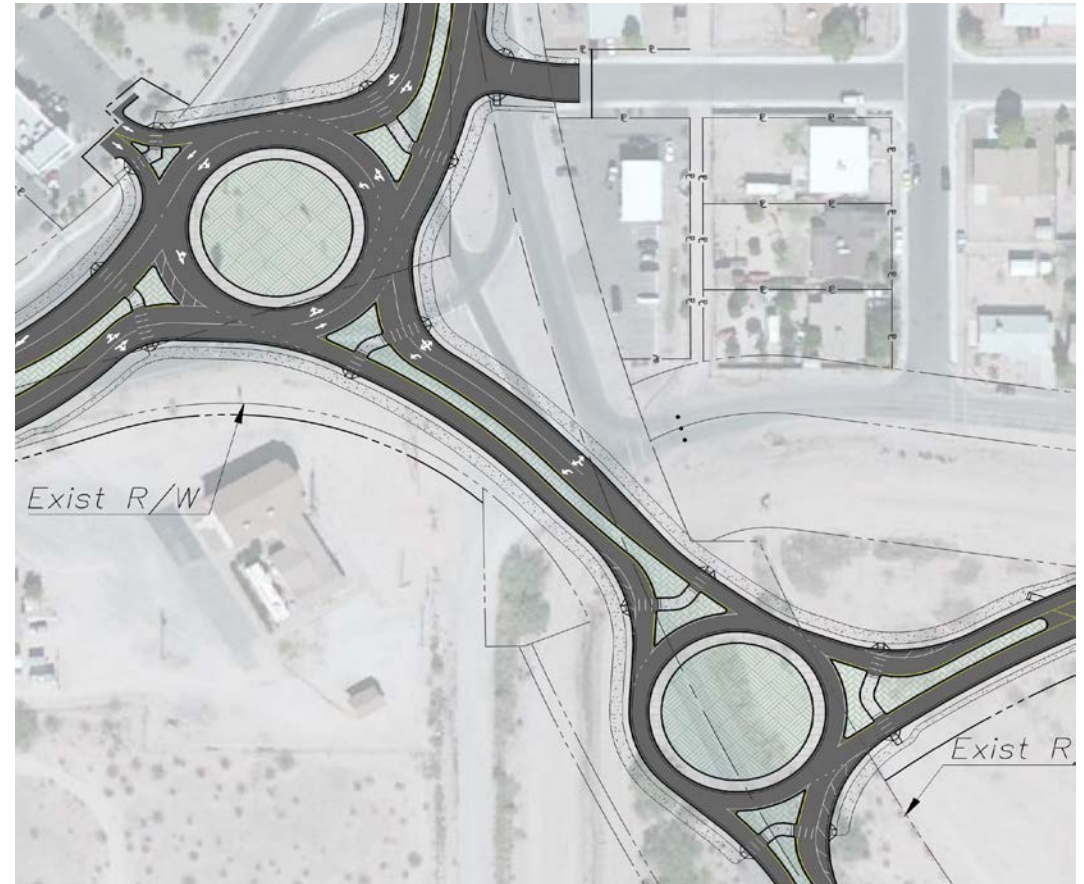
ALTERNATIVE #2

- One multi-lane roundabout with T-intersection at Florence Heights
 - Florence Heights shifted south to create storage area for southbound left-turn movement



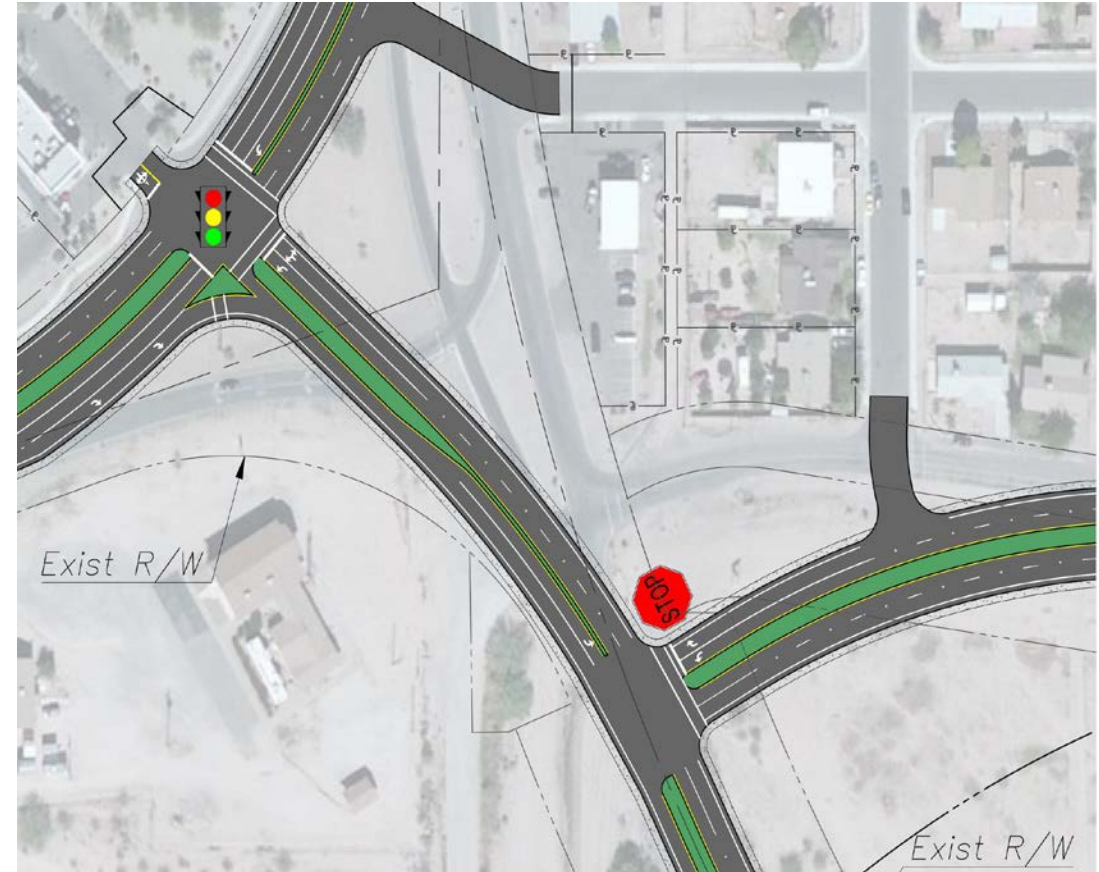
ALTERNATIVE #3

- Two Roundabouts
 - One main multi-lane roundabout and a single lane roundabout at Florence Heights
 - Florence Heights shifted further south to provide additional separation



ALTERNATIVE #4

- Signalized T-Intersection with stop-controlled T-intersection at Florence Heights
- Florence Heights shifted south to allow extra left-turn storage



DESIGN CRITERIA

- Capacity / Level of Service;
- Queue lengths;
- Travel time;
- Access and circulation;
- Multimodal accommodations (i.e. pedestrians and bicycles);
- Safety;
- Right-of-way;
- Irrigation canal impacts;
- Drainage patterns;
- Environmental impact area
- Construction costs.



LEVEL OF SERVICE RESULTS

Delay was obtained from the VISSIM models and summarized by intersection approach.

Delay and Level of Service – 2040 Projected AM Peak Hour

VISSIM RESULTS			AM Peak Hour - Delay in sec/veh				
			No-Build	Multi-Lane Roundabout	Roundabout & T-Intersection	Double Roundabout	Traffic Signal & T-Intersection
DELAY	NORTH INTERSECTION	NB	49.1 (E)	7.8 (A)	28.0 (D)	12.4 (B)	26.7 (C)
		WB	87.4 (F)	22.3 (C)	N/A	N/A	N/A
		SB	0.4 (A)	2.4 (A)	3.0 (A)	2.1 (A)	7.6 (A)
		EB	83.2 (F)	4.1 (A)	12.3 (B)	3.0 (A)	13.2 (B)
	SOUTH INTERSECTION	NB	N/A	N/A	3.2 (A)	6.2 (A)	0.3 (A)
		WB	N/A	N/A	15.5 (C)	8.0 (A)	14.5 (B)
		SB	N/A	N/A	3.0 (A)	1.7 (A)	2.6 (A)
		EB	N/A	N/A	N/A	N/A	N/A
	AVG DELAY		(F)	7.1 (A)	11.7 (B)	5.1 (A)	11.9 (B)



Delay and Level of Service – 2040 Projected PM Peak Hour

VISSIM RESULTS			PM Peak Hour - Delay in sec/veh					
			No-Build	Multi-Lane Roundabout	Roundabout & T-Intersection	Double Roundabout	Traffic Signal & T-Intersection	
DELAY	NORTH INTERSECTION	NB	59.3 (F)	4.0 (A)	13.5 (B)	11.5 (B)	17.8 (B)	
		WB	118.7 (F)	25.3 (D)	N/A	N/A	N/A	
		SB	0.9 (A)	6.7 (A)	17.3 (C)	4.4 (A)	11.5 (B)	
		EB	89.8 (F)	1.0 (A)	4.0 (A)	3.6 (A)	15.9 (B)	
	SOUTH INTERSECTION	NB	N/A	N/A	0.5 (A)	6.7 (A)	0.4 (A)	
		WB	N/A	N/A	81.0 (F)	8.9 (A)	76.8 (F)	
		SB	N/A	N/A	2.7 (A)	1.4 (A)	1.6 (A)	
		EB	N/A	N/A	N/A	N/A	N/A	
	AVG DELAY			(F)	9.7 (A)	18.4 (C)	5.9 (A)	19.7 (B)



QUEUE LENGTHS RESULTS

Maximum Queue Lengths – 2040 Projected AM Peak Hour

VISSIM RESULTS			Max Queue Lengths (feet) - AM Peak Hour				
			No-Build	Multi-Lane Roundabout	Roundabout & T-Intersection	Double Roundabout	Traffic Signal & T-Intersection
MAX QUEUE	NORTH INTERSECTION	NB	763	146	568	345	415
		WB	830	264	N/A	N/A	N/A
		SB	75	150	126	135	105
		EB	1220 ¹	328	1031	249	173
	SOUTH INTERSECTION	NB	N/A	N/A	141	198	0
		WB	N/A	N/A	290	316	235
		SB	N/A	N/A	340	61	165
		EB	N/A	N/A	N/A	N/A	N/A

¹Exceeded model limits



Maximum Queue Lengths – 2040 Projected PM Peak Hour

VISSIM RESULTS			Max Queue Lengths (feet) - PM Peak Hour				
			No-Build	Multi-Lane Roundabout	Roundabout & T-Intersection	Double Roundabout	Traffic Signal & T-Intersection
MAX QUEUE	NORTH INTERSECTION	NB	678	99	362	392	311
		WB	1030 ¹	401	N/A	N/A	N/A
		SB	105	221	1030	211	190
		EB	1220 ¹	384	149	192	184
	SOUTH INTERSECTION	NB	N/A	N/A	0	223	0
		WB	N/A	N/A	1002	329	996
		SB	N/A	N/A	180	62	134
		EB	N/A	N/A	N/A	N/A	N/A

¹Exceeded model limits



TRAVEL TIMES RESULTS

Travel Time – 2040 Projected AM Peak Hour

VISSIM RESULTS		Travel Time (seconds) - AM Peak Hour				
		No-Build	Multi-Lane Roundabout	Roundabout & T-Intersection	Double Roundabout	Traffic Signal & T-Intersection
TRAVEL TIME	NBLT	157.7	60.0	90.2	71.7	78.7
	NBTT	88.0	42.1	53.0	53.0	54.4
	NBRT	48.2	49.2	35.8	36.4	31.4
	WBLT	160.0	63.5	50.0	44.5	49.4
	WBTT	268.4	68.7	106.9	81.1	100.6
	WBRT	182.9	57.3	74.7	59.1	77.7
	SBLT	46.7	52.9	71.9	61.8	70.6
	SBTT	32.2	41.5	48.0	52.5	51.8
	SBRT	30.7	37.7	37.0	36.6	34.0
	EBLT	230.2	48.4	55.9	40.8	47.6
	EBTT	117.9	56.4	69.8	62.1	66.4
	EBRT	106.9	40.0	52.6	49.1	50.6
	TOTAL TT	122.5	51.5	62.2	54.1	59.4



Travel Time – 2040 Projected PM Peak Hour

VISSIM RESULTS		Travel Time (seconds) - PM Peak Hour				
		No-Build	Multi-Lane Roundabout	Roundabout & T-Intersection	Double Roundabout	Traffic Signal & T-Intersection
TRAVEL TIME	NBLT	159.1	51.3	61.6	72.7	63.0
	NBTT	88.9	39.5	45.8	52.9	52.5
	NBRT	44.0	49.4	35.8	36.1	36.0
	WBLT	308.9	60.5	134.7	49.6	126.8
	WBTT	437.5	68.4	228.0	78.9	227.6
	WBRT	355.9	76.4	225.0	79.6	117.8
	SBLT	47.5	54.8	60.4	65.5	63.2
	SBTT	33.6	44.8	46.9	54.0	56.8
	SBRT	29.6	41.6	38.8	39.0	37.4
	EBLT	242.1	49.6	65.0	40.9	53.9
	EBTT	125.4	55.0	69.5	61.6	65.0
	EBRT	109.0	40.7	56.8	49.9	51.8
	TOTAL TT	165.1	52.7	89.0	56.7	79.3



Summary of Access Impacts

Property Use	Need	Parcel	Alternative			
			1 - Single MultiLane RBT	2 - RBT and South T- Unsig	3 - Double RBT	4 - Signal and South T- Unsig
Burger King	ROW/ TCE	202.06.001F	Construction Impact Only - Connect to Existing DW	Reconstruct Driveway	Reconstruct Driveway	Construction Impact Only - Connect to Existing DW
Family Dollar	TCE	202.06.001Q	Construction Impact Only - Connect to Existing DW	Construction Impact Only - Connect to Existing DW	Construction Impact Only - Connect to Existing DW	Construction Impact Only - Connect to Existing DW
SE Vacant Lot (south of SCID)	ROW	202.04.042H	No Impact	No Existing Access	No Existing Access	No Existing Access
Church	ROW	202.06.002A	No Impact to Access	No Impact to Access	No Impact to Access	No Impact to Access
South Leg Vacant	ROW	202.04.0530	No Existing Access	No Impact	No Impact	No Impact
Florence Heights Residence	ROW	202.04.049A	No Impact to Access	No Impact	No Impact	No Impact
Auto Shop	ROW	202.04.0510	Close Existing Access	Close Existing Access	Close Existing Access	Close Existing Access



MULTIMODAL ACCOMMODATIONS

- For roundabouts, it is imperative to provide proper guidance for pedestrians. Pedestrian facilities can be provided in a traditional manner, with sidewalks leading up to and through the intersections. Crosswalks across the roundabout legs provide a median refuge and allow the pedestrians to break their crossing in two movements while they look for approaching cars. Roundabouts can be a challenge for people with disabilities to navigate, as a result, measures would need to be taken during final design to ensure the roundabout can be navigated by all users.
- Bicycle lanes can be provided on the outside of travel lanes leading to the roundabout intersection. Bicycle lanes would end prior to the roundabout circulatory roadway in accordance with the guidelines provided in the *National Cooperative Highway Research Program Report 672 Roundabouts, An informational Guide, Second Edition*. Bicyclists would either traverse the roundabout in the circulatory travel way, the same way a vehicle does, or they would have the option to use wide shared-use paths on the perimeter of the roundabout.



SAFETY

- The expected number of crashes can be estimated using the *Highway Safety Manual (HSM)* methodologies.

Alternative	Predicted Crashes per year
<i>No-Build Alternative</i>	15.37
<i>Alternative 1 - Single Roundabout</i>	4.73
<i>Alternative 2 - Roundabout + T-intersection</i>	7.81
<i>Alternative 3 - Double Roundabout</i>	6.81
<i>Alternative 4 - Signal + T-intersection</i>	9.04

- When comparing a roundabout to a signalized intersection there is an expected 48% reduction in the total number of crashes, and a 78% reduction in crashes that result in injuries. A roundabout typically reduces the number of angle crashes, which typically result in more severe crashes.



Summary of Property Needs (Sq Ft)

Property Use	Need	Parcel	Alternative			
			1 - Single MultiLane RBT	2 - RBT and South T- Unsig	3 - Double RBT	4 - Signal and South T-Unsig
Burger King	ROW/TCE	202.06.001F		1850	1850	1850
Family Dollar	TCE	202.06.001Q	1510	1510	1510	1510
SE Vacant Lot (south of SCIDD)	ROW	202.04.042H		19930	42150	8510
Church	ROW	202.06.002A	17760			
South Leg Vacant Land	ROW	202.04.0530	5710			
Florence Heights Residence	ROW	202.04.049A	9800			
Auto Shop	ROW	202.04.0510	2810			
		Total	37590	23290	45510	11870
		SCIDD Canal	49745	53350	28155	54325



IRRIGATION CANAL

- All four alternatives will impact the existing SCIDD channel structure on SR79B. Alternative 1 will have the most significant impact requiring an entirely new structure over the canal along the new south leg alignment.
- Alternates 2, 3 and 4 will have similar impacts to the SCIDD structure which includes relocating the existing headwalls and extending the structure to the west.
- Alternative 4 will require the longest extension to accommodate the new SR79B alignment and cross section width.



DRAINAGE PATTERNS

- Alternative 1 avoids most of the existing detention basin in the middle of the existing intersection, thus, minimal impacts to drainage flows are anticipated with this alternative. Consideration of pavement drainage may be required to not adversely impact the church property to the south with Alternative 1.
- Alternatives 2, 3 and 4 all impact the existing detention basin in the center of the existing intersection and will require the construction of new facilities to hold the pavement drainage and existing storm water within the reaches the basin.
- Alternative 4 has the smallest impact to the existing basin out of the three alternatives.



ENVIRONMENTAL IMPACTS

- All four intersections will have similar environmental impacts as it is assumed that data recovery efforts will be required for any work located within the project area.



CONSTRUCTION COSTS

- All four alternatives require the full removal and reconstruction of the existing intersection.
- Generally, all four alternatives are estimated to have similar construction costs that range between \$2.6M and \$2.9M.



Alternative Analysis

Criteria	Alternative 1 One Multi-Lane Roundabout	Alternative 2 Multi-Lane Roundabout and T-Intersection	Alternative 3 Two Roundabouts	Alternative 4 Signalized Intersection and T-Intersection
Level of Service (2040 Volumes)	2	1	3	1
Queue Lengths	2	1	3	2
Travel Time (2040 Volumes)	3	2	3	2
Access & Circulation	2	2	2	3
Multimodal Accommodations	2	2	2	3
Safety	3	2	3	1
Right-of-way	1	2	1	2
Irrigation Canal Impacts	1	2	2	2
Drainage Patterns	3	2	2	2
Environmental Impact Area	1	1	1	1
Construction Costs	2	2	2	2
Totals	22	19	24	21

Rating Scale

1 - Least Desirable

2 - Neutral

3 - Most Desirable



Rating Criteria Explanation

Criteria	Least Desirable	Neutral	Most Desirable
Level of Service (2040 Volumes)	> 10 Sec Delay	< 10 Sec Delay	< 10 Sec Delay & < 15 Sec on all legs
Queue Lengths (Max Length)	> 800 ft	400-800 ft	< 400 ft
Travel Time (Average) (2040 Volumes)	< 60 Sec	60-80 Sec	> 80 Sec
Access & Circulation	Access is lost	Access is relocated	Access is same
Multimodal Accommodations	No bike/ped facilities	Includes Roundabouts (less bike/ped friendly than signals)	No Roundabouts
Safety	> 9 Pred Crashes	5-9 Pred Crashes	< 5 Pred Crashes
Right-of-way	Multiple Acquisition	Minimal Acquisition	No Acquisition
Irrigation Canal Impacts	Reconstruct Crossing	Modify/Extend Crossing	No Impact
Drainage Patterns	Major Impact to Basin	Minor Impact to Basin	Maintain Existing Basin
Environmental Impact Area	Major Recovery	Minor Mitigations	No Impact



CONTACT US

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QUESTIONS

