

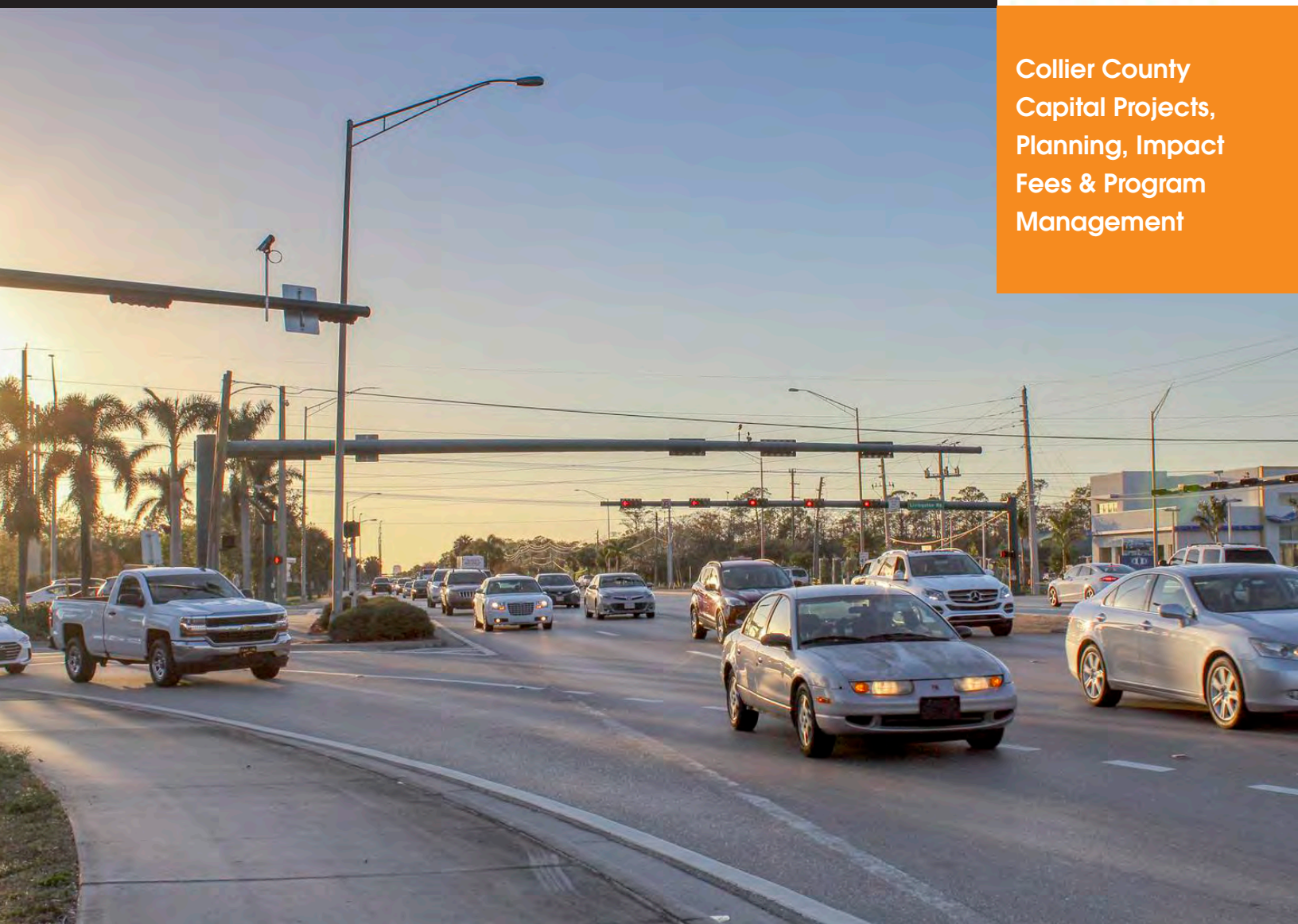


# Pine Ridge Road Corridor Congestion Study Executive Summary Report

March 27, 2018



Collier County  
Capital Projects,  
Planning, Impact  
Fees & Program  
Management



# Pine Ridge Road Corridor Congestion Study

## INTRODUCTION

Pine Ridge Road (CR-896) between US 41 and Collier Boulevard serves as one of only four major east/west arterial corridors serving commuters and providing direct connection to one of four I-75 interchanges within the urban area. This segment is identified as LOS "F", failing, in the 2016 and 2017 Annual Update and Inventory Reports (AUIRs).

To examine this segment of the corridor more closely in hopes of identifying potential countermeasures to the increasing volumes projected in the 2016 AUIR, the Capital Project Planning, Impact Fees & Program Management Division initiated the Corridor Congestion Study to evaluate existing and future traffic conditions and to identify potential improvements within the corridor that would relieve congestion and improve the LOS.

The study results, findings, considerations and recommendations were presented to the Collier County Board of County Commissioners on Tuesday, March 27, 2018 during a regular Commission Meeting. After hearing public testimony, and considering the findings and recommendations, the Board of County Commissioners voted to:

1. Accept the Pine Ridge Road Corridor Congestion Study
2. Pursue a partial-Continuous Flow Intersection (CFI) at Pine Ridge Road and Livingston Road
3. Continue discussions with FDOT regarding innovative intersection improvements, e.g., the Restricted Crossing U-Turn (RCUT) intersection of Pine Ridge Road and Whipoorwill Lane, and a Diverging Diamond Interchange (DDI) at the Pine Ridge Road/I-75 Interchange

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# Pine Ridge Road Corridor Congestion Study

## OVERVIEW

Pine Ridge Road (CR-896) between US 41 and Collier Boulevard serves as one of only four major east/west arterial corridors serving commuters and providing direct connection to one of four I-75 interchanges within the urban area. High peak period traffic volumes experience excessive delay along the entire length of the corridor from US 41 to I-75. 2016 existing volumes between Livingston Road and I-75, plus “trip bank” trips from committed developments, exceed the adopted level of service (LOS) standard set by the Board of County Commissioners in the Collier County Growth Management Plan (GMP). This segment is identified as LOS “F”, failing, in the 2016 and 2017 Annual Update and Inventory Reports (AUIRs).

To examine this segment of the corridor more closely in hopes of identifying potential countermeasures to the increasing volumes projected in the 2016 AUIR, the Capital Project Planning, Impact Fees & Program Management Division initiated the Corridor Congestion Study to evaluate existing and future traffic conditions and to identify potential improvements within the corridor that would relieve congestion and improve the LOS.

The study documentation is divided into three reports, this [Executive Summary Report](#), a [Technical Report](#), and a [Public Involvement Report](#).

## STUDY SUMMARY & RECOMMENDATIONS

During the course of the planning study, a future traffic forecast was prepared and analyzed, and potential improvements were developed and evaluated. The “conventional” improvements that would add the capacity needed to relieve future congestion and achieve the adopted LOS standard included increasing the number of through lanes on Pine Ridge Road from 6 to 8 lanes from west of Livingston Road to east of Napa Boulevard, and adding additional left turn lanes at the intersections.

Recognizing that the “capacity deficiencies” being forecast primarily occur at the intersections within the corridor, three potential “innovative intersection” improvements were identified and evaluated for the Pine Ridge Road/Livingston Road intersection that were found to improve the operating efficiency of the intersection. The improvements evaluated included a partial-Continuous Flow Intersection (CFI), a Jug-Handle (JH) or quadrant intersection, and Single Point Urban Interchange (SPUI) or overpass/underpass. At Pine Ridge Road and Whippoorwill Lane, a Restricted Crossing U-Turn (RCUT) Intersection was evaluated. A Diverging Diamond Interchange (DDI) concept was considered and evaluated at the I-75 Interchange. Unlike the conventional roadway widening by adding through lanes and additional turn lanes that would require the acquisition of additional right-of-way, the innovative designs minimize the need to acquire additional right-of-way.

A performance evaluation of the innovative improvements indicates that based on an average of the percent increase in capacity at each intersection along Pine Ridge Road, the CFI, RCUT and DDI combination results in a 30% increase in capacity, the JH, RCUT, DDI combination results in a 29% increase, and the SPUI, RCUT, DDI combination results in a 26% increase in system capacity. This is comparable to the 34% increase in capacity gained by widening to 8-lanes through the entire corridor based upon the Florida Department of Transportation (FDOT) Generalized LOS Tables.

At the conclusion of the concept development/analysis phase of work, the findings were presented to the Metropolitan Planning Organization (MPO), the MPO’s Technical and Citizens Advisory Committees, and to the general public in a variety of settings. Consultation with other public agencies, e.g., Florida Department of Transportation (FDOT), North Collier Fire Control & Rescue District, Collier County School District, Collier County Sheriff’s Office, etc., rounded out the vetting process .

After consideration of the study findings and public comments, a recommended set of improvements was developed for consideration by the Collier County Board of County Commissioners. The recommended improvements include the following:

- A partial-Continuous Flow Intersection (CFI) at Pine Ridge Road and Livingston Road,
- A Restricted Crossing U-Turn (RCUT) Intersection at Pine Ridge Road at Whippoorwill Lane, and
- A Diverging Diamond Interchange (DDI) at the Pine Ridge Road/I-75 interchange

The study recommends the County conduct a preliminary engineering and environmental assessment to further evaluate the design features, right-of-way needs, and costs of the CFI concept for the intersection of Pine Ridge Road and Livingston Road.

Because the Whippoorwill Lane intersection is in close proximity, and partially included in the I-75 Limited Access Right-of-Way Limits, the study recommends the County pursue an Interchange Modification Report (IMR) with FDOT for the DDI & RCUT portion of the corridor.

## PROJECT APPROACH

Conducting a study of this type involves a systematic approach to identify existing and future conditions, to develop and evaluate options, to engage the public in presenting the study findings and take input, and to develop recommendations to guide decision-makers in advancing future improvements. The Pine Ridge Road Corridor Congestion Study effort consisted of the following tasks, each of which will be summarized in this report. Further details

can be found in the supporting companion Technical Report and Public Involvement Report:

**Study Area** – Define the limits of the study, to include the infrastructure being evaluated and the lands adjacent to the corridor that have a direct impact on the corridor

**Land Use Analysis** – Review the current land use conditions within the study area to identify/quantify undeveloped sites that would directly, or indirectly, impact the corridor roadway segments and intersections. The study evaluated the future land uses within the corridor to ensure that currently undeveloped lands that would directly impact the corridor were properly accounted for in the traffic forecasts.

**Traffic Data Collection** - Collect 2016 seasonal traffic volume data over a 24-hour period on the mainline segments between intersections, and a.m. and p.m. peak period turning movement counts at major intersections. Existing traffic data is used to establish a baseline LOS condition, and is used to prepare forecast estimates for future year LOS analyses.

**Forecast Travel Estimation** – Develop a traffic volume forecast for 2021 and 2040, for the mainline segments between intersections, and the turning movement volumes at major intersections.

**Forecast Travel Operating Conditions** – Analyze the LOS operating conditions within the corridor for the existing conditions, and future horizon years, for the a.m. and p.m. peak periods. This is essentially the “do nothing” alternative, which reveals the LOS operating conditions if no further improvements are made within the corridor.

**Improvement Concept Development & Evaluation** – After evaluating the LOS operating conditions with future traffic with no improvement, develop and evaluate various conventional and innovative alternative improvements/countermeasures to assess their impact on the LOS operating conditions during the a.m. and p.m. peak periods for the future horizon years.

**Public Involvement/Outreach** – Following the analysis phase, present the concepts and study findings to the public in different forums, including Metropolitan Planning Organization (MPO) Board and MPO Advisory Committee meetings, a public workshop, and individualized meetings and/or presentations with stakeholders, area residents and business owners/operators. Consult with public agency stakeholders.

## STUDY AREA

The study area for the Pine Ridge Road Corridor Congestion Study was established in consultation with Capital Project Planning, Impact Fees & Program Management Division staff, and includes the roadways and intersections shown in **Figure 1**. In addition to the mainline segments of Pine Ridge Road from west of Livingston Road to east of Napa Boulevard, the following signalized intersections within the corridor were included in the analysis:

- o Pine Ridge Road at Livingston Road
- o Pine Ridge Road at Whippoorwill Lane
- o Pine Ridge Road at I-75 Southbound Ramps
- o Pine Ridge Road at I-75 Northbound Ramps
- o Pine Ridge Road at Napa Boulevard

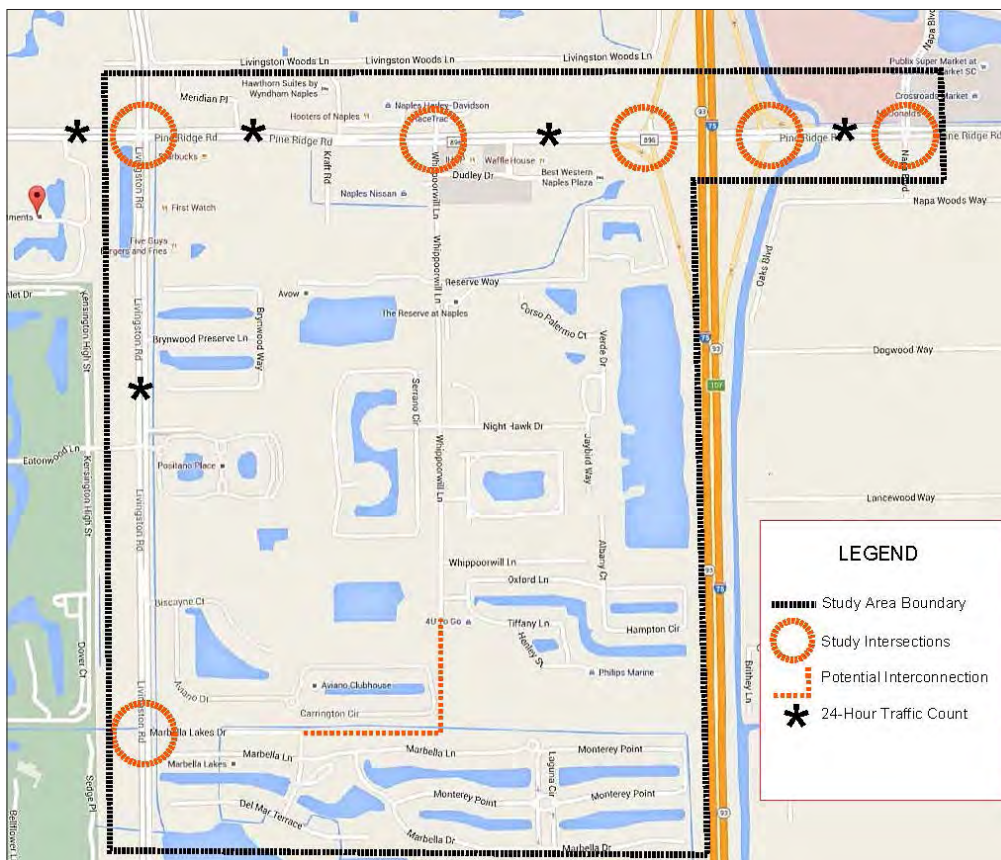


FIGURE 1

Although technically not part of the Pine Ridge Road infrastructure, a potential interconnection of Whippoorwill Lane and Marbella Lakes Drive was examined during the evaluation of alternatives to determine what, if any, impacts such a connection would have on any of the improvements being considered. All the concepts considered during the evaluation phase were evaluated with and without the potential interconnection. As a component of the potential interconnection, a traffic signal was included at the intersection of Marbella Lakes Drive and Livingston Road.

The study area boundary also identified the lands that were likely to directly impact the corridor. This facilitated the gathering of land use data associated with the undeveloped parcels that could be converted to traffic volumes that had the potential to directly impact the corridor in the future.

## LAND USE ANALYSIS

While existing traffic volumes provide the study with an excellent baseline condition, to fully understand the potential future traffic conditions, it is important to recognize the potential impact of lands directly adjacent to the study area roadways and intersections. All currently undeveloped parcels within the study area with the potential for future development, were identified and analyzed for future trip generation impact. A total of 24 strategically located vacant parcels within the study area were identified, three of which were found to be non-developable water management/conservation/open space areas. Peak hour trip generation values were developed for the remaining 21 parcels, based upon the residential or non-residential development

potential, and incorporated in the forecast phase to ensure the potential impacts of the undeveloped lands were properly accounted for. The land use maps and associated background documents, and the trip generation analysis worksheets are included in the *Technical Report*.

## TRAFFIC DATA COLLECTION

To establish a solid baseline of traffic data, 24-hour counts were collected at four locations on Pine Ridge Road and on Livingston Road south of Pine Ridge Road, and a.m. and p.m. peak hour turning movement counts were collected at the study area intersections. All the data was collected on Thursday, March 10, 2016 at locations shown on **Figure 1**. The data sheets are included in the *Technical Report*.

## FORECAST TRAFFIC ESTIMATION

Future year traffic volumes were developed for the interim year 2021 and the horizon year 2040 using the MPO's travel demand model, the Collier County 2016 AUIR's short range forecasts, and historical growth trends. The growth in traffic within the corridor is a combination of the expected growth in traffic heading to and from the I-75, increases in through traffic traveling to and from points east and west of the study area, and the traffic from new development within the study area.

During the land use analyses phase of the study, trip generation values were developed for all vacant developable land that would have a direct impact on the corridor. While the MPO travel model and the AUIR provided the basic tools used to forecast the traffic

**Table 1: Future 2040 Traffic – “Do Nothing” Alternative**

Intersection	Time Period	Overall Intersection LOS		Delay (sec/veh)	Max v/c Ratio	Approach LOS			
		Standard	Future			EB	WB	NB	SB
Pine Ridge Rd & Livingston Rd	AM Peak-Hour	E	F	94.8	1.32	D	E	F	F
	PM Peak-Hour	E	F	87.4	1.37	E	D	F	F
Pine Ridge Rd & Whippoorwill Ln	AM Peak-Hour	E	E	73.6	1.12	D	E	F	E
	PM Peak-Hour	E	F	107.0	2.22	F	D	F	F
Pine Ridge Rd & I-75 SB Ramp	AM Peak-Hour	E	E	55.9	1.31	C	C		F
	PM Peak-Hour	E	E	70.9	1.14	F	C		E
Pine Ridge Rd & I-75 NB Ramp	AM Peak-Hour	E	F	92.4	1.20	C	F	F	
	PM Peak-Hour	E	D	36.6	0.92	B	E	E	
Pine Ridge Rd & Napa Blvd	AM Peak-Hour	E	E	69.4	1.74	D	C	E	F
	PM Peak-Hour	E	C	34.7	0.98	C	C	E	E
Livingston Rd & Marbella Lakes Dr	AM Peak-Hour	E	n/a	50.5 <sup>1</sup>	0.61		F	-- <sup>2</sup>	C <sup>3</sup>
	PM Peak-Hour	E	n/a	236.3 <sup>1</sup>	1.35		F	-- <sup>2</sup>	F <sup>3</sup>

<sup>1</sup> Delay at the worst approach at an unsignalized intersection

<sup>2</sup> No LOS for this approach since traffic in this movement does stop

<sup>3</sup> LOS for the southbound left turn movement, southbound thru movement does not stop

growth within the corridor, the trip generation data was used to ensure that the future year forecast(s) adequately accounted for that additional direct traffic growth, especially at the intersections within the study area.

The forecast revealed between 2016 and 2040, daily (24-hour) traffic volumes on Pine Ridge Road would grow from 55,100 to 75,200, a 37% increase in daily volumes. The 2-way p.m. peak hour traffic is expected to increase by 25%, from 4,650 to 5,813.

Future-year volumes were developed for the mainline segments (approaches to the intersections) and for the turning movements at the study area intersections for the year 2021 and the horizon year of 2040.

### CONCEPT DEVELOPMENT & TESTING

By first analyzing future conditions in a “do nothing” approach, the 2021 and 2040 future operating conditions establish a baseline condition from which to work. **Table 1** shows a summary of the LOS operating conditions in the “do nothing” alternative for the year 2040. Unacceptable delay per vehicle is generally seen a delay greater than 80 seconds. A similar metric used to evaluate LOS is calculated by dividing the volume of traffic (v) on the facility, by the facility’s capacity (c) at a given level of service standard (e.g., the County’s adopted LOS Standard of “E”). When the v/c ratio exceeds 1.0, the segment (or intersection) is considered over capacity. The operating conditions for intersections can be described in the context of the overall intersection’s performance, for individual approaches, and individual movements. Given the failures demonstrated in **Table 1**, it is clear that the “do nothing” alternative is not a solution.

In evaluating and testing potential solutions/countermeasures to remedy the LOS deficiencies identified in the “no build” alternative, “conventional” improvements and “innovative” improvements were developed and analyzed.

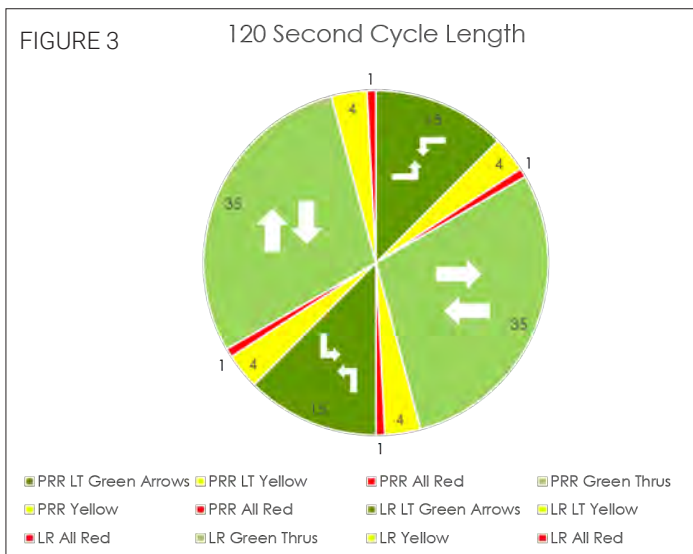
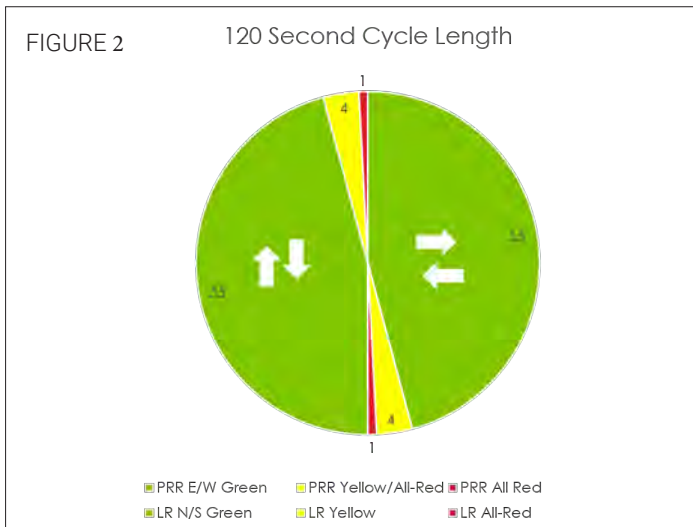
Conventional improvements considered included expanding Pine Ridge Road from 6-lanes to 8-lanes from west of Livingston Road to east of Napa Boulevard (a distance of approximately 2 miles), and adding additional left turn lanes, as needed, at the intersections. In evaluating these alternatives, it was clear that adding additional travel lanes to the mainline, and adding additional turn lanes to the intersections would require a substantial amount of additional right-of-way, and require the expansion of the existing bridge structures at I-75 to accommodate the additional through lanes.

The results of the traffic engineering analysis of the “conventional” improvements, e.g., adding additional through-lanes and turn-lanes at intersections, shown in **Table 2**, demonstrated an improvement in the LOS to acceptable levels in 2040.

While these conventional improvements resolved the congestion issues in 2040, it was clear that with many of the v/c ratios at or nearing 0.99, conditions would return to failing LOS soon after the horizon year. To find longer-lasting solutions, the team developed several “innovative intersection” approaches that were considered to have the ability to reduce the congestion at the intersections and improve overall level of service throughout the corridor beyond the 2040 horizon year. These potential solutions were reviewed internally by Division staff, and preliminarily with FDOT District One staff. They were presented to the Metropolitan Planning Organization (MPO) and their Technical and Citizens

**Table 2: Future 2040 Traffic – “Conventional” Improvements**

Intersection	Time Period	Overall Intersection LOS		Delay (sec/veh)	Max v/c Ratio	Approach LOS			
		Standard	Future			EB	WB	NB	SB
Pine Ridge Rd & Livingston Rd	AM Peak-Hour	E	E	60.0	0.99	E	D	E	E
	PM Peak-Hour	E	D	54.6	0.97	E	C	E	E
Pine Ridge Rd & Whippoorwill Ln	AM Peak-Hour	E	D	44.0	0.92	D	D	E	E
	PM Peak-Hour	E	D	44.9	0.98	D	C	E	E
Pine Ridge Rd & I-75 SB Ramp	AM Peak-Hour	E	D	37.6	0.99	B	D		E
	PM Peak-Hour	E	C	28.8	0.96	B	C		D
Pine Ridge Rd & I-75 NB Ramp	AM Peak-Hour	E	C	29.9	0.98	D	B	E	
	PM Peak-Hour	E	C	24.8	0.90	B	C	E	
Pine Ridge Rd & Napa Blvd	AM Peak-Hour	E	D	38.3	0.91	C	D	E	E
	PM Peak-Hour	E	C	25.2	0.82	B	C	F	D
Livingston Rd & Marbella Lakes Dr	AM Peak-Hour	E	A	6.1	0.53		B	A	A
	PM Peak-Hour	E	A	6.4	0.51		B	A	A



Advisory Committees, and have been vetted in numerous public forums, and with stakeholder public agencies.

Innovative intersections enhance the operational efficiency of the major intersection by reducing or eliminating some of the phases that “steal” green time from the main street through movements. During a signal’s cycle length (the amount of time, e.g., 120 seconds, it takes to serve all protected phases) at a conventional multi-phased signal, the largest volumes of traffic (main street through movements) are stopped while the protected major street left turn phases and minor street left turn and through phases are served.

As an example, at the Pine Ridge Road (PRR) and Livingston Road (LR) intersection, if a signal with 120 second cycle length had to serve only north/south and east/west through movements (no turns allowed), each through movement direction would be given almost a full minute of green time plus yellow, as illustrated in **Figure 2**.

However, to accommodate protected left turns, green time is stolen from the through movement phases, in this example, reducing the time given to each through movement’s green phase by as much as 30%. It is this stolen green time for the major movements that leads to congestion. Additionally, the more phases during a signal, the more lost time that is experienced by vehicles. Lost time is the time during which no vehicles are able to pass through an intersection and is made up of two separate elements; start-up lost time and clearance lost time. Recovering that stolen green time and reducing the lost time is the value in the innovative intersection concept.

While these innovative intersection concepts may be new to Florida, they have demonstrated operational success at locations throughout the Country, and are recognized by State Departments of Transportation and the Federal Highway Administration as viable solutions to the congestion problems faced in urban and suburban areas. Additionally, the innovative concepts generally improve the safety profile of the intersections for motorists and pedestrians/cyclist by reducing the number of conflict points where vehicular (and pedestrian) travel paths cross.

The innovative intersections evaluated in this study include:

**Pine Ridge Road at Livingston Road Intersection**

- o Livingston Road Continuous Flow Intersection (CFI) (a.k.a., Displaced Left Turn Intersection)
- o Livingston Road Jug Handle (JH) Intersection (a.k.a., Quadrant Intersection)
- o Livingston Road Single Point Urban Interchange (SPUI) (a.k.a., Overpass or Underpass)

**Pine Ridge Road at Whipoorwill Lane Intersection**

- o Restricted Crossover U-Turn (RCUT) Intersection (a.k.a., Superstreet)

**Pine Ridge Road at I-75 SB and NB Ramps**

- o Diverging Diamond Interchange (DDI)

All the innovative intersection improvements were evaluated as a set of corridor improvements, and are discussed in the following sections. At the Pine Ridge Road, Livingston Road intersection, the three innovative intersection concepts performed similarly, generally providing better levels of service than the conventional improvements. **Table 3** reflects the resulting level of service and associated metrics for the study area intersections with the CFI, RCUT and DDI combination. Detailed and summary analyses of all the innovative improvements are included in the *Technical Report*.



**Table 3: 2040 Intersection Conditions with Innovative Improvements (CFI, RCUT, DDI)**

Intersection	Time Period	Overall Intersection LOS		Delay (sec/veh)	Max v/c Ratio	Approach LOS			
		Standard	Future			EB	WB	NB	SB
Advance CFI Int. N. of Pine Ridge Rd	AM Peak-Hour	E	B	10.2	0.77		D	A	A
	PM Peak-Hour	E	B	11.6	0.78		D	A	B
Pine Ridge Rd & Livingston Rd	AM Peak-Hour	E	D	47.6	0.95	D	D	D	E
	PM Peak-Hour	E	D	46.6	0.94	D	D	E	D
Advance CFI Int. S. of Pine Ridge Rd	AM Peak-Hour	E	A	9.6	0.53	D		B	A
	PM Peak-Hour	E	B	10.5	0.82	D		A	A
Advance RCUT Int. W. of Whipoorwill Ln	AM Peak-Hour	E	A	2.0	0.77	A	E <sup>1</sup>		
	PM Peak-Hour	E	C	34.1	0.96	D	E <sup>1</sup>		
Pine Ridge Rd & Whipoorwill Ln	AM Peak-Hour	E	B	16.5	0.92	B	A	E	E
	PM Peak-Hour	E	D	46.2	0.99	E	B	E	E
Advance RCUT Int. E. of Whipoorwill Ln	AM Peak-Hour	E	C	24.5	1.00	F <sup>1</sup>	C		
	PM Peak-Hour	E	A	6.7	0.79	D <sup>1</sup>	A		
Pine Ridge Rd & I-75 SB Ramp	AM Peak-Hour	E	C	27.8	0.96	D	C		D
	PM Peak-Hour	E	B	19.5	0.89	C	B		C
Pine Ridge Rd & I-75 NB Ramp	AM Peak-Hour	E	B	11.9	0.84	C	B	D	
	PM Peak-Hour	E	C	25.4	0.90	B	D	C	
Pine Ridge Rd & Napa Blvd	AM Peak-Hour	E	D	43.3	0.98	C	D	E	E
	PM Peak-Hour	E	C	30.9	0.85	C	C	F	D

northbound Livingston Road U-turn lane at the new advanced signal. This feature allows motorists exiting the shopping center in the south-east quadrant to make a U-turn to proceed south on Livingston Road, a movement that today is problematic.

Pedestrian and bicycle features are included in the design. An added benefit to this intersection design, is the potential reduction in crashes, by reducing the total number of conflict points for both motorists and pedestrians. The advantages and disadvantages to the CFI concept are summarized in **Table 4**.

Cost estimates shown for each concept are basic construction costs developed using FDOT unit cost factors, to establish a relative cost that allows the cost of the different concepts to be compared. The construction costs do not include the cost of any right-of-way that might be needed, or costs associated with design, permitting, mitigation, etc.

### Livingston Road Continuous Flow Intersection (CFI) (aka, Displaced Left Turn Intersection)

The Continuous Flow Intersection (CFI), shown in **Figure 4**, recovers the stolen green time at the main intersection by moving the Livingston Road northbound and southbound left-turning vehicles to the left side of the approaching through vehicles at a protected left turn signal in advance of the main intersection. By shifting the left-turn vehicles prior to the main intersection, they may proceed through the intersection, turning left at the same time as the north/southbound through movements are occurring. Because there is no longer a protected left-turn phase dedicated to the northbound and southbound left turning vehicles, the recovered green time is distributed to the other movements, increasing the intersections through-put and operational efficiency. Because the new advanced signal allows the advanced left turns at the same time as the east-west through movements are occurring, there is no additional delay experienced by the northbound and southbound through traffic.

In this implementation, it is considered a partial-CFI because it is only deployed on the Livingston Road approaches. All the Pine Ridge Road movements, right, left, and through movements, occur exactly as they do today with no change. Only the Livingston Road left turns on to Pine Ridge Road are affected by the design. Like all innovative design concepts, advanced signage and lane markings are important to the safe operation of this design.

An additional feature of this design, added after learning of an issue at the first public workshop, was the incorporation of a

**TABLE 4: Continuous Flow Intersection – Advantages and Disadvantages**

CFI - Construction Cost: \$6.6 Million	
Advantages	Disadvantages
Minimizes Right-of-Way Takes	Unusual Traffic Pattern May Be Confusing to Some Drivers and Visitors
Minimizes Business Damages	
Advance Signals Control NB & SB Left Turns without Additional Delay	
Accommodates Shopping Center U-Turns	
Accommodates Bicycle & Pedestrian Movements	
Reduces Delay	
Increases Thru-Put	
Reduces Travel Time	
Improves Safety by Reducing Conflict Points	



Figure 4

## Livingston Road Jug-Handle (JH) Intersection

The Jug-handle Intersection (JH), shown in **Figure 5**, similarly eliminates the Livingston road left-turns from the main intersection. Two new advanced signals are deployed, one on Livingston Road south of the main intersection to handle northbound left turns, and one on Pine Ridge Road, west of the main intersection. Motorists traveling south on Livingston Road that want to make a left turn to go east, are directed by advanced signage to travel through the main intersection and enter a loop ramp in the south-west quadrant that will take them around to the new signal at the Pine Ridge Road, where they will turn right to head east through the main intersection. Northbound Livingston Road traffic will turn left at the new advanced signal and travel along the ramp to the Pine Ridge Road advanced signal before turning left, effectively by-passing the main intersection in its entirety.

This “quadrant loop” concept is not unlike the type of movement that motorist use at interstate clover-leaf interchanges where the motorist passes under the interstate to enter a quadrant loop ramp that takes them around to the right, to enter the mainline travel stream. Like the CFI, advanced signage and lane markings are important to the safe operation of this design.

As with the CFI, all Pine Ridge Road through and turning movements remain unchanged, this design only affects the Livingston Road left-turns. Also, as with the CFI, the removal of the protected left-turn phase at the main intersection allows the recovered green time to be redistributed to the remaining movements, increasing the overall efficiency of the intersection. An identical northbound Livingston Road U-turn feature is also included in this design to allowing motorists existing the shopping center to make a U-turn to return south on Livingston Road.

Pedestrian and bicycle features are included in the design. An added benefit to this intersection design, is the potential reduction in the most serious type of crashes, by reducing the total number of conflict points for both motorists and pedestrians. The advantages and disadvantages to the JH concept are summarized in **Table 5**.

**TABLE 5: Jug-Handle Intersection – Advantages and Disadvantages**

JH - Construction Cost: \$7.3 Million	
Advantages	Disadvantages
Minimizes Right-of-Way Takes	Unusual Traffic Pattern May Be Confusing to Some Drivers and Visitors
Minimizes Business Damages	
Advance Signals Control NB & SB Left Turns without Additional Delay	
Accommodates Shopping Center U-Turns	
Accommodates Bicycle & Pedestrian Movements	
Reduces Delay	
Increases Thru-Put	
Reduces Travel Time	
Improves Safety by Reducing Conflict Points	



Figure 5

## Livingston Road Single Point Urban Interchange (SPUI, a.k.a. Overpass/Underpass)

The SPUI concept developed for the Livingston Road intersection at Pine Ridge Road shown in **Figure 6**, carries four (4) lanes of through-traffic up and over Pine Ridge Road. Unlike the CFI and JHI, which remove left turns from the main intersection, the SPUI removes the majority of the Livingston Road through-movements from the intersection, reducing the amount of time the phase requires and shifting the “north/south green time” to the remaining phases. All the Pine Ridge Road through and turning movements, and all the Livingston Road turning movements would occur at grade just as they do today, albeit under the Livingston Road through travel lanes.

This concept is the same design that was deployed with success at the Golden Gate Parkway and Airport-Pulling Road intersection. At the Pine Ridge Road-Livingston Road intersection, the decision to take Livingston Road over Pine Ridge Road was made in large part because only four (4) through lanes were needed to handle the Livingston Road 2040 through volumes, and the resulting 4-lane overpass footprint minimized the need to acquire additional right-of way. Additionally, the lack of driveway connections and traffic signals on Livingston Road up-stream and down-stream of the main intersection creates less impedance that would otherwise affect the free-flow conditions of the north/south through movements. If the County wishes to pursue this option, a follow-up evaluation can evaluate the cost benefits of 4-lanes vs. 6-lanes, as well as the alternative of taking Pine Ridge Road over Livingston Road.

Pedestrian and bicycle features are included in the design concept. An added benefit to this intersection design, is the potential reduction in the number of crashes, by reducing the total number of conflict points for both motorists and pedestrians. The advantages and disadvantages to the SPUI concept are summarized in **Table 6**.

**TABLE 6: Single Point Urban Interchange – Advantages and Disadvantages**

SPUI - Construction Cost: \$13.3 Million (4-lanes)	
Advantages	Disadvantages
4-Lane Overpass Minimizes Right-of-Way Takes	6-Lane Overpass – Additional R/W Cost
4-Lane Overpass Minimizes Business Damages	6-Lane Overpass – Additional Business Damages
Traffic Pattern is Not Unusual	6-Lane Overpass – Additional Construction Cost (\$4.3m)
Accommodates Shopping Center U-Turns	May Involve Adjacent Land Access Limitations
Accommodates Bicycle & Pedestrian Movements	Not favored by North Collier Fire Control & Rescue District (NCFCRD ) because of Crash Location Description Problem – Potential to Negatively Impact Response Times
Reduces Delay	Generally Considered “Unfriendly” by Adjacent Businesses
Increases Thru-Put	May Increase Noise Impacts to Adjacent/Nearby Properties
Reduces Travel Time	
Improves Safety by Reducing Conflict Points	



Figure 6

## Whippoorwill Lane Restricted Crossing U-Turn (RCUT) Intersection (a.k.a. “Superstreet”)

The Whippoorwill Lane – Pine Ridge Road intersection, located approximately midway between Livingston Road and the I-75 ramps, serves residential and commercial/non-residential land uses on the two dead-end local streets, north and south of Pine Ridge Road. Access into and out of Whippoorwill is frequently constrained in large part by the need to service the mainline Pine Ridge Road through movement with sufficient signal green time to try to minimize back-ups at the I-75 southbound ramps and Livingston Road as much as possible. Finding a solution requires close coordination with the proposed improvements at Livingston Road and at the I-75 ramp terminals.

At the Pine Ridge Road and Whippoorwill Lane intersection, a Restricted Crossing U-Turn (RCUT) concept, shown in **Figure 7**, was developed, and tested. In this concept, all Pine Ridge Road through movements, and the right/left turn movements from Pine Ridge Road to Whippoorwill Lane are handled at the traffic signal

exactly as they are today. This concept removes the Whippoorwill through and left turn movements from the intersection, requiring all left turning vehicles approaching Pine Ridge Road to turn right and proceed downstream to a U-turn lane at a protected U-turn traffic signal (**Figure 8**). By removing the through and left turn phases from the signal, nearly doubles the green time allocated to the through movements. Since the right-turns exiting Whippoorwill Lane occur at the same time as the Pine Ridge Road left-turns are occurring, no additional delay is added to the through movements.

The advanced U-turn signals upstream of the main intersection only affect a single Pine Ridge Road approach, and are coordinated with the main signal to minimize any additional delay of the through movements. Some additional right-of-way may be necessary to accommodate the U-turn lanes, however, unlike the conventional improvements of adding through lanes and additional turn lanes at intersections, the RCUT minimizes the need for additional right-of-way at the intersection of Whippoorwill Lane.

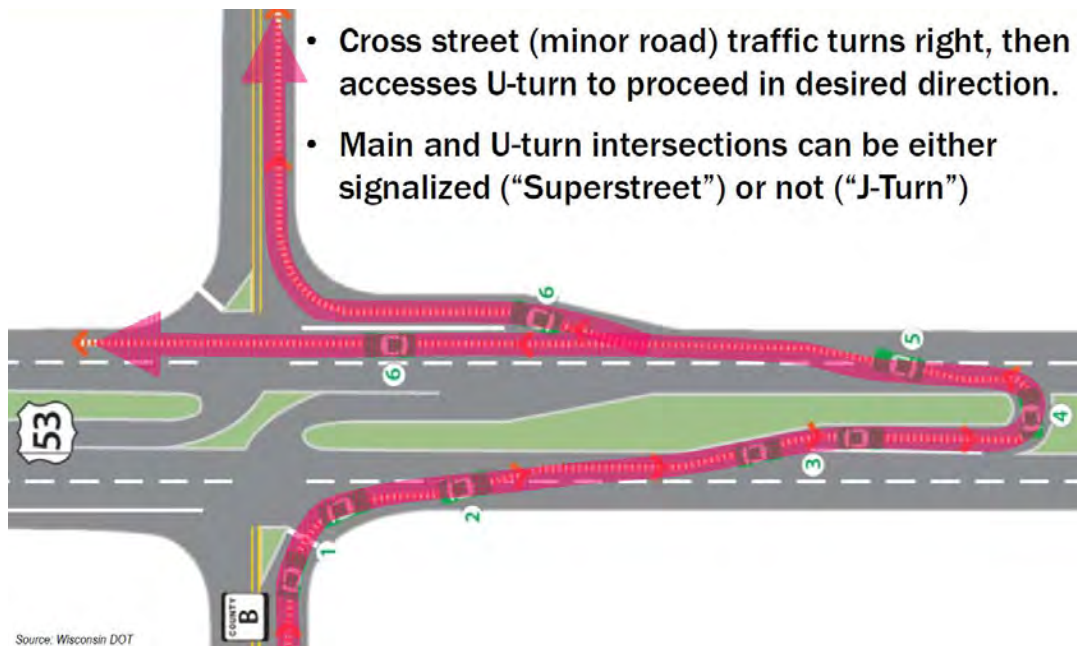


Figure 8: Source: FDOT Reduced Left-Turn Conflict Intersections Presentation (by FHWA)

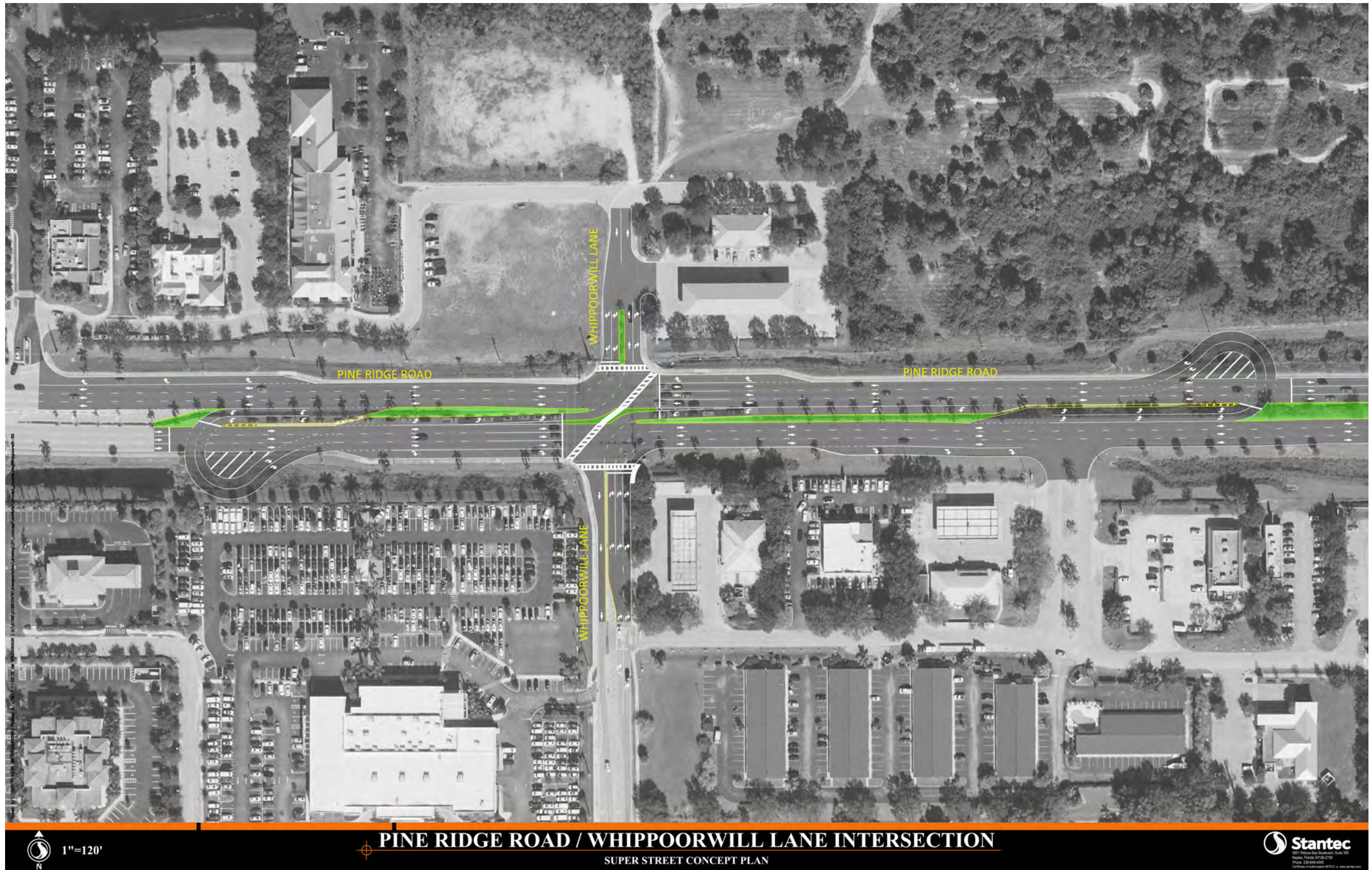


Figure 7



The RCUT, or “superstreet”, intersection design was first developed in the United States in the mid-1980s, and according to the Federal Highway Administration’s Restricted Crossing U-Turn Intersection Informational Guide (August 2014) this concept has been successfully deployed in Texas, Alabama, North Carolina, Maryland, Ohio, Indiana, Michigan, and Minnesota.

The RCUT intersection signal requires only two phases (Figure 9), which minimizes the loss time at the intersection. More green time is recovered by eliminating the left turn and the minor street through phases from the signal cycle.

When coordinated with other signals within the corridor, the signalized RCUT intersection can provide favorable progression along Pine Ridge Road. Efficient progression can be provided in both directions with any speed or signal spacing.

The conventional improvement alternative, in this instance, would require the addition of one through lane in each direction on Pine Ridge Road to increase the Pine Ridge Road through-put, plus additional left turn lanes at all the approaches to the Whippoorwill intersection to increase the left turn capacity without stealing more green time from the major street. Given the existing right-of-way constraints, this would necessitate the acquisition of additional right-of-way, not only along the mainline segment of Pine Ridge (to accommodate the two new through lanes) but would also require the acquisition of the additional right-of way needed at the intersection to accommodate the new turn lanes. Right-of-way acquisition and the likely assessment of business damages make the conventional improvements an extremely expensive alternative.

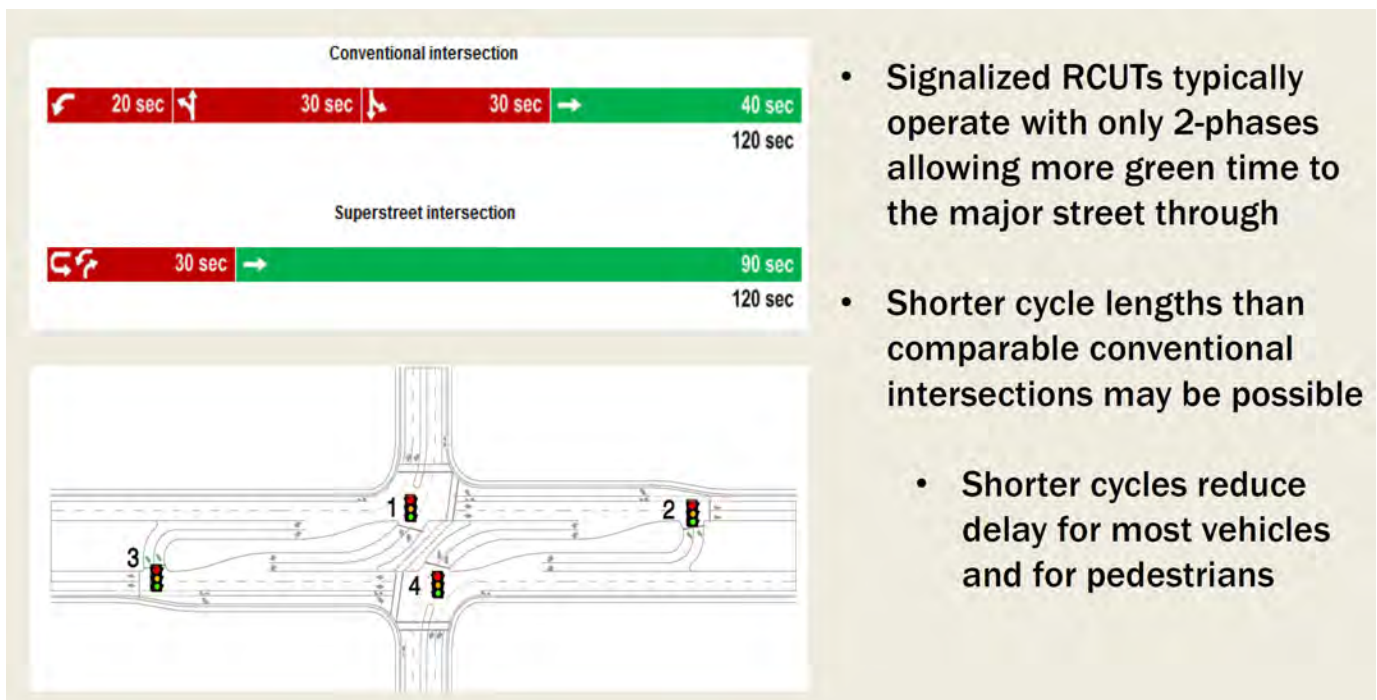


Figure 9 Source: FDOT Reduced Left-Turn Conflict Intersections Presentation (by FHWA)

While improving the operation efficiency and adding capacity to the intersection is the primary objective, another important benefit to this innovative design is the improvement in the safety profile of the intersection. A conventional signalized intersection has a total of 32 conflict points, 16 of which are “crossing conflicts” which contribute to the most severe type of crash (Figure 10).

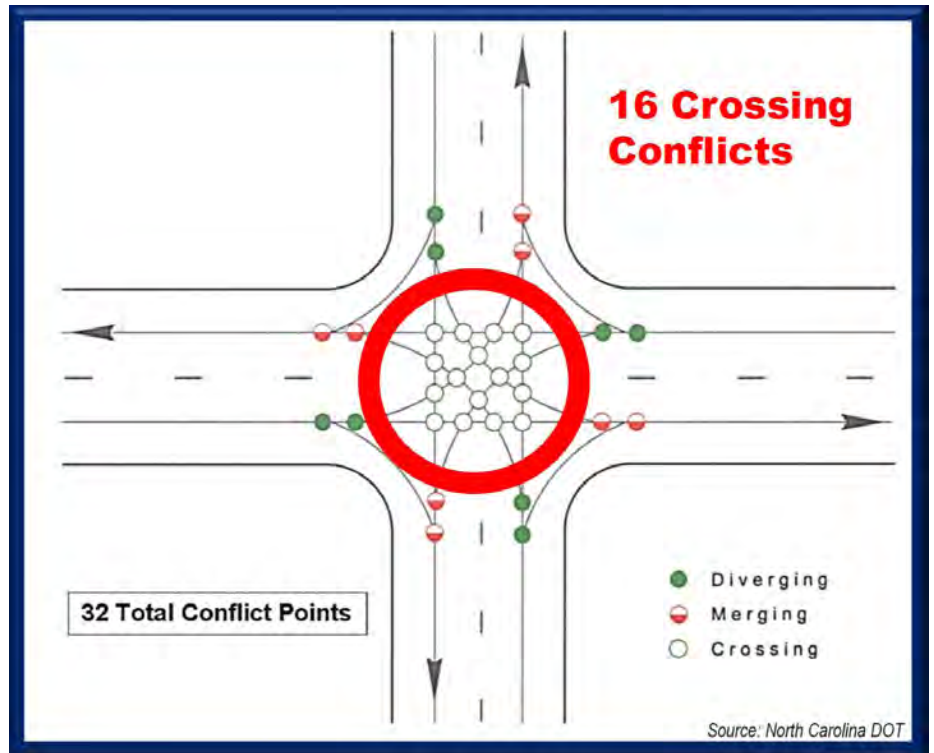


Figure 10 Source: FDOT Reduced Left-Turn Conflict Intersections Presentation (by FHWA)

The RCUT intersection reduces the total number of conflict points from 32 to 24, and reduces the number of the most dangerous crossing-type conflicts from 16 to 4 (Figure 11).

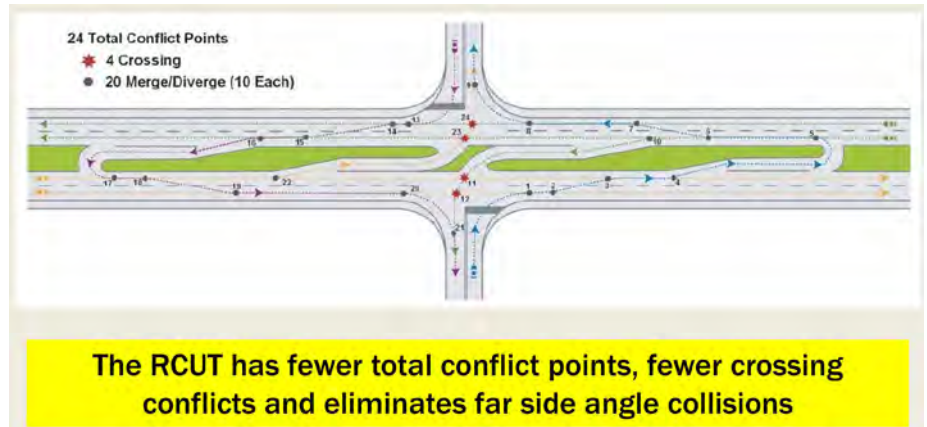


Figure 11 Source: FDOT Reduced Left-Turn Conflict Intersections Presentation (by FHWA)

An analysis of 4-years of crash data of 93 RCUT locations across North Carolina, revealed an 88% reduction in fatal and severe injury crashes, and a 59% decrease in total crashes.

**NORTH CAROLINA**

**88% Reduction in fatal & severe injury crashes**

**59% decrease in total crashes**

Sample of 93 un-signalized RCUT intersections across the state with over four years of crash data adjusted for volume changes

Source: Carrie Simpson, P.E., Traffic Safety Project Engineer, North Carolina DOT

Source: FDOT Reduced Left-Turn Conflict Intersections Presentation (by FHWA)

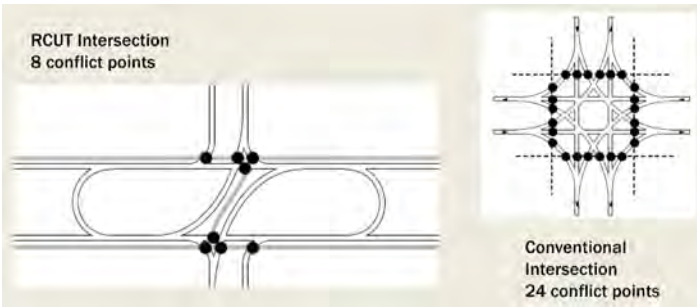


Figure 12 Source: FDOT Reduced Left-Turn Conflict Intersections Presentation (by FHWA)



"Z" Pattern Crosswalk at an RCUT

Pedestrian and bicycle features are included in the design. To cross Pine Ridge Road, pedestrians and cyclists cross Whippoorwill Lane and Pine Ridge Road in a "Z" pattern (Figure 12). An added benefit to this intersection design, is the potential reduction in the most serious type of crashes, by reducing the total number of conflict points for both motorists and pedestrians.

The advantages and disadvantages to the RCUT concept are summarized in Table 7.

TABLE 7: Restricted Crossing U-Turn Intersection – Advantages and Disadvantages

RCUT - Construction Cost: \$4.8 Million	
Advantages	Disadvantages
Increases Thru-Put - achieve similar service levels as adding additional through lanes	Generally considered "unfriendly" by adjacent businesses
Provides potential for shorter signal cycle lengths	Generally considered "unfriendly" by area residents
Reduces side street delay	Requires some right-turning vehicles to weave across lanes to enter the U-Turn lane
Reduces delay and travel time for arterial through traffic	Increases travel distance (and potentially travel time) for minor street left turn and through movements
Improves pedestrian safety by reducing conflict points by using "Z" pattern to cross	Provisions for bicycle facilities may be very different from conventional intersections, and may result in reduced convenience.
Minimizes the need for additional right-of-way	Requires pedestrians to cross in two stages in some cases, which could add delay and reduce convenience
Creates the possibility for the largest possible progression bands in both directions of the arterial at any speed with any signal spacing	Creates longer pedestrian crossing distances for some movements, which could add delay and reduce convenience
Improves safety by reducing conflict points; turning crashes reduced; angle conflicts are completely eliminated	Increased potential for sideswipe crashes
Each direction of a superstreet may operate independently allowing for: different cycle lengths in each direction, progression of traffic at different speeds, and signal spacing	
Allows larger portion of signal cycle to be allocated to the arterial through movement	

## I-75 Diverging Diamond Interchange (DDI)

At the easternmost edge of the study area, the I-75/Pine Ridge Road interchange serves as one of the two central-most access points from the interstate highway serving the greater Naples Area. The expected increase in traffic volumes entering and exiting the Interstate from Pine Ridge Road, plus the anticipated growth in through traffic serving points east and west of the interstate, threatens the integrity of the interchange. As revealed in the “no build” analysis” the two signalized intersections will be unable to adequately handle the expected increase in traffic with motorists incurring substantial delays during peak periods.

While converting the current “tight diamond” to “conventional” cloverleaf interchange to gain ramp access capacity is possible, the amount of additional right-of-way and business damages that would be required would likely make the project cost prohibited (absent any “better” solutions). Adding additional through lanes and turn lanes at the signals to increase capacity, would require additional right-of-way and require the reconstruction of the existing overpass, likewise increasing the cost of this alternative.

A less expensive alternative, finding success throughout the Country, and recently in Sarasota County at University Parkway and I-75, is the Diverging Diamond Interchange (DDI). The DDI concept, as shown in **Figure 13**, retains the same two traffic signals, but they no longer require left turning vehicles to cross opposing streams of traffic. As the motorist approaches the traffic signal, they are directed to diverge to the left side of the median as they travel under the overpass lanes of I-75. After passing under I-75, the motorist reaches the other signal and is diverted back to the right side of the median. Between the two traffic signals, the through lanes are now adjacent to the interstate ramp terminals, so I-75 ramp traffic enters to or exits from Pine Ridge Road without interrupting the opposing through movements. Signals at the end of the ramp ensure the safe merging of I-75 ramp traffic to Pine Ridge Road. Because the two main traffic signals no longer need the left-turn phases to accommodate the ramp traffic, it allows for the signals to be operated with only two phases creating a substantial improvement in the through-put and operational efficiency. Advanced signage and lane markings assist in managing the proper flow through the intersections.

Additionally, the DDI’s footprint will fit within the existing right-of-way, and the new lane configuration will fit beneath the existing overpass, avoiding the need to reconstruct the bridges. Pedestrian and bicycle features are included in the design. An added benefit to this intersection design, is the potential reduction in crashes, by reducing the total number of conflict points for both motorists and pedestrians. The advantages and disadvantages to the DDI concept are summarized in **Table 8**.

**TABLE 8: Diverging Diamond Interchange – Advantages and Disadvantages**

DDI - Construction Cost: \$8.8 Million	
Advantages	Disadvantages
Eliminates Turn Lane Phases from the Signalized Intersection	Unusual Traffic Pattern may be Confusing to Some Drivers and Visitors
Reduces Through Movement Delay	
Increases Through-Put	
Reduces Travel Time	
Improves Safety by Reducing Conflict Points	
Accommodates Bicycle & Pedestrian Movements	
Eliminates the Need for Additional Right-of-Way	

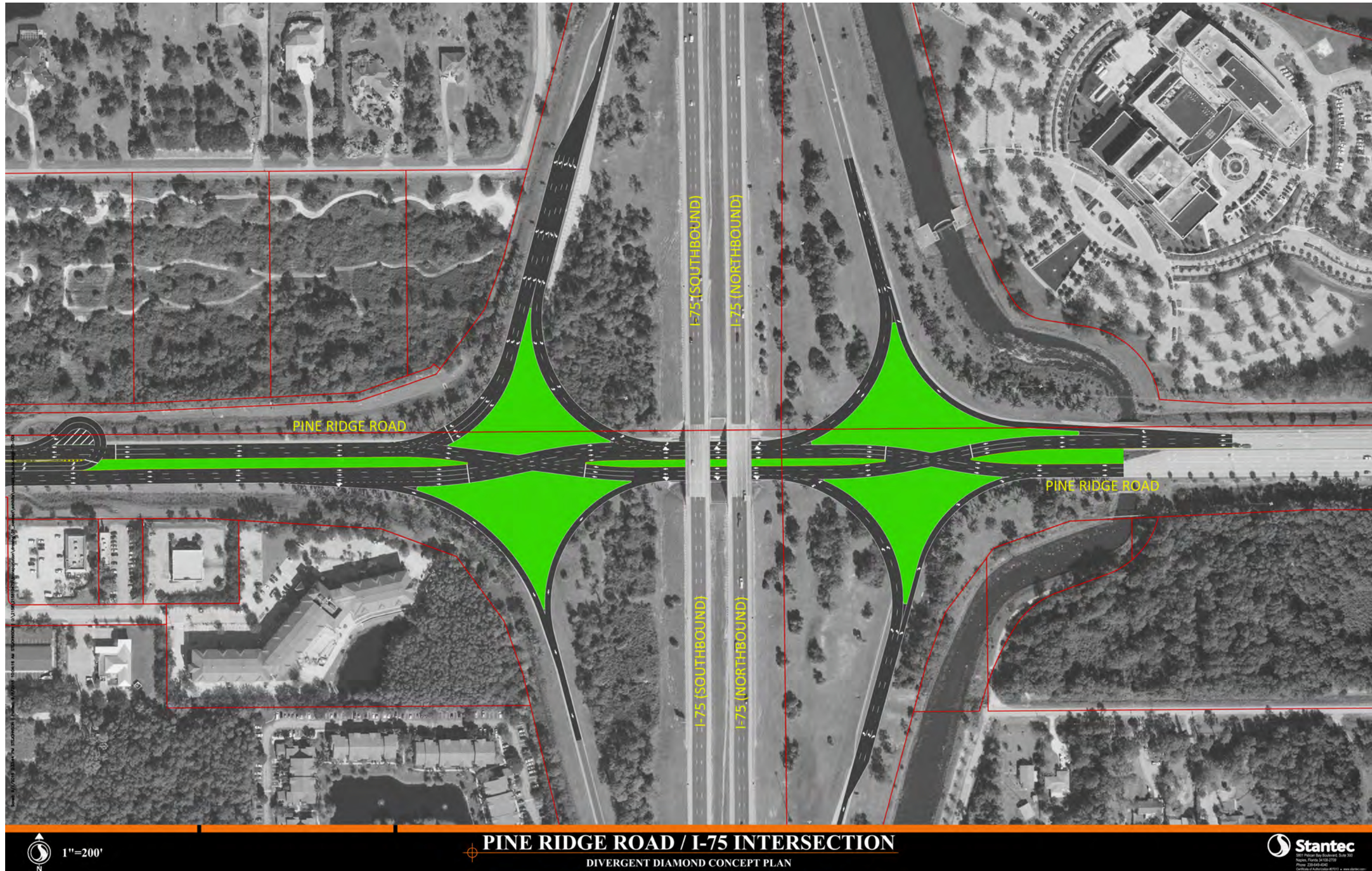


Figure 13

## Marbella Lakes Drive and Whippoorwill Lane Interconnection

While evaluating the conventional and innovative improvements, consideration was given to the impacts of interconnecting Whippoorwill Lane to Marbella Lakes Drive. The County has long considered this potential interconnection (**Figure 14**), and in the context of this study, it was important to understand what, if any, impacts the interconnection would have, if constructed, on any of the concepts being considered on Pine Ridge Road.

All conceptual improvements were evaluated with and without the Whippoorwill Lane/Marbella Lakes Drive Connection. The analyses indicated that an interconnection between Whippoorwill Lane and Marbella Lakes Drive, would have no adverse impact on the operations of any of the concepts.

Further, it was determined that such an interconnection would provide no significant benefit in relieving future congestion within the Pine Ridge Road corridor on its own. Improvements to all the intersections within the study area are needed to resolve existing and future congestion problems, regardless of whether an interconnection is made.



Figure 14

# PUBLIC INVOLVEMENT

Engaging the public is one of the most important aspects of a study of this type. The study's public involvement process included internal meetings with Division staff, public meetings (Collier MPO and their Advisory Committees), a project webpage, the use of videos and concept animations, a public workshop/open house, and individualized stakeholder meetings/presentations with area homeowner associations (HOAs) and business representatives. Direct contact to affected public agencies was made by reaching out to the North Naples Fire Control and Rescue District, the Collier County School District, and the Collier County Sheriff's Office. The following meetings, workshops, and stakeholder meetings shown in **Table 9** occurred during the study period.

Individual stakeholder meetings, most lasting 2 hours or longer, were conducted to facilitate close communication with area residents and business owners. A formal presentation was made to each stakeholder group, followed by a question and answer session. During the meetings, the dialog was generally dominated by the study elements considered most important to the individual stakeholders in attendance. The PowerPoint presentation included an interactive element using individual keypad devices provided to the attendees, to poll them as to their preference on "general questions" and on "core question" specifically addressing each of the concepts that were presented, including the potential interconnect between Whippoorwill lane and Marbella Lakes Drive. Computer animation of each innovative concept were used to show how traffic would move through the intersections. Attendees were also strongly encouraged to provide their comments in writing on Survey & Comment Forms to be preserved in the public record for decision-makers. All the polling results (votes obtained during the presentations), and the written comments received, are included in the Public Involvement Report.

**TABLE 9: Public Involvement Meetings/Events**

Date	Audience
February 27, 2017	MPO Technical Advisory Committee (TAC)
February 27, 2017	MPO Citizens Advisory Committee (CAC)
March 10, 2017	MPO Board (MPO)
June 15, 2017	Public Workshop/Open House – Collier County YMCA
November 8, 2017	Wyndemere HOA
December 6, 2017	Development Services Advisory Committee (DSAC)
January 11, 2018	Kensington HOA
January 16, 2018	Mariposa HOA
January 18, 2018	Marbella Lakes HOA
January 24, 2018	Andalucia HOA
January 30, 2018	Gusta Bell VitoGusto Bella Vita (HOA)
January 31, 2018	Stratford Place HOA
February 15, 2018	Pine Ridge Road Corridor Businesses
February 22, 2018	Aviano HOA

# CONCEPT QUESTIONS

Examining the totals for all the responses regarding the Pine Ridge Road at Livingston Road intersection, of the 303 votes cast, 46% (N=140) of the respondents prefer the Overpass, 35% (N=105) prefer the CFI, 6% (N=20) prefer the Jug-Handle, 8% (N=24) prefer the Conventional Improvements, and 5% (N=14) chose "None of the Above". It should be noted that due technological limitations at one meeting, the attendance outnumbered the available polling devices, therefore some votes cast may represent multi-person households as opposed to individual attendees.

With respect to the Whippoorwill RCUT concept question, it is important to differentiate the polling results by the area that the respondents live, due to the nature of the improvement having a lesser/greater degree of impact on the respondent's daily travel. Clearly, those most affected by an improvement at Whippoorwill Lane and Pine Ridge Road include the residents living in developments along Whippoorwill Lane, and those businesses that depend upon traffic that uses the Whippoorwill Lane and Pine Ridge Road intersection.

When asked about their support for or against the RCUT improvement, only 26% (N=28) of the respondents with direct connections to Whippoorwill Lane indicated support the improvements, while 74% (N=80) indicated they were not in favor of the improvement, preferring some other improvement instead.

A summary of the polling results related to the preference questions asked about the proposed treatments at individual intersections, and to the potential interconnection, is shown in Table 10. Stakeholders with primary access off Whippoorwill Lane are highlighted in yellow. Complete polling reports from all stakeholder meetings are included in the Public Involvement Report.

# INTERCONNECTION QUESTION

The potential interconnection of Whippoorwill Land and Marbella Lakes Drive has long been considered by the County, and while not one of the intended corridor improvements, because the potential interconnection of Whippoorwill Lane and Marbella Lakes Drive was considered in all the concept analyses to determine what if an effect the interconnection would have on the concepts. As such, the issue of the interconnection was a topic of interest at all the Stakeholder meetings, so the team took the opportunity to ask the stakeholders their opinion about the Whippoorwill Lane-Marbella Lakes Drive interconnection. The interconnection support question was posed at all stakeholder meetings, and again, it is important to understand the place of residence of the respondents to put the responses into perspective.

At the four (4) meetings with stakeholders living in developments along Whippoorwill Lane, when asked about their support for or against the interconnection, 57% (N=63) expressed support, while 43% (N=47) objected to the potential interconnection. At the Marbella Lakes stakeholders meeting, 94% (N=95) of the respondents objected to the potential interconnection, while 6% (N=6) supported the interconnection.

To put the results of the voting into context, during discussions about the interconnection at the Whippoorwill Lane and Marbella Lakes Drive meetings, it was clear that some residents (primarily along Whippoorwill Lane) perceived a benefit of having a second means of reaching the arterial road network. Today, both Whippoorwill Lane and Marbella Lakes Drive are dead end local roads, and some Whippoorwill Lane area residents expressed the value of being able to reach Livingston Road without having to use Pine Ridge Road. Conversely, residents in Marbella Lakes expressed seeing little or no value in having access to Whippoorwill Lane, and see the connection as encouraging more traffic on Marbella Lakes Drive.

As stated previous, because the County has long considered the potential interconnection, during the study, all the various concepts were analyzed with and without the potential interconnection to consider what, if any, impacts (positive or negative) an interconnection would have on the operational integrity of the concepts being proposed.

The analyses indicated that an interconnection between Whippoorwill Lane and Marbella Lakes Drive, would have no adverse impact on the operations of our concepts. Further, it was determined that such an interconnection would provide no significant benefit in relieving future congestion on its own. Improvements to the intersections within the study area are needed to resolve existing and future congestion problems, regardless of whether an interconnection is ever made.

A summary of the polling results related to the preference questions asked about the potential interconnection, is also shown in **Table 10**. To add "context" to the responses to the two questions related to Whippoorwill Lane, we have color-coded the responses in the **Table 10** to reflect the portion of the study area most affected by the questions. Stakeholders with primary access off Whippoorwill Lane are highlighted in yellow, and stakeholders off Marbella Lakes Drive are highlight in blue. Complete polling reports from all stakeholder meetings are included in the Public Involvement Report.

**Table 10: Polling Results for Concept Questions**

Stakeholders Meetings			Pine Ridge Road at Livingston Road			Whippoorwill Lane RCUT	Whippoorwill Lane - Marbella Lakes Drive Interconnect	Diverging Diamond Interchange
HOA	Date	Max. #	1st	2nd	3rd	Yes or No	Yes or No	Yes or No
Wyndemere	8-Nov-17	95	OP (N=27, 61%)	CFI (N=10, 23%)	JH (N=4, 9%)	YES (N=63, 74%) NO (N=13, 15%)	NO (N=27, 51%) YES (N=26, 49%)	YES (N=71, 93%) NO (N=4, 5%)
Kensington	11-Jan-18	37	CFI (N=11, 46%)	OP (N=8, 33%)	JH (N= 2, 8%)	YES (N=9, 64%) NO (N=3, 21%)	YES (N=13, 100%) NO (N=0, 0%)	YES (N=10, 91%) NO (N=0, 0%)
Mariposa	16-Jan-18	42	OP (N=20, 53%)	CFI (N=10, 26%)	CON (N=3, 8%)	NO (N=28, 76%) YES (N=7, 19%)	YES (N=20, 54%) NO (N=16, 43%)	YES (N=25, 71%) NO (N=7, 20%)
Marbella Lakes	18-Jan-18	178	OP <sup>1</sup> (N=39, 46%)	CFI <sup>1</sup> (N=33, 39%)	JH <sup>1</sup> N=8, (9%)	YES <sup>1</sup> (N=43, 52%) NO <sup>1</sup> (N=29, 35%)	NO (N=95, 94%) <sup>2</sup> YES (N=6, 4%) <sup>2</sup>	YES (N=73, 92%) <sup>2</sup> NO (N=4, 5%) <sup>2</sup>
Andalucia	24-Jan-18	35	OP (N=19, 56%)	CFI (N=10, 29%)	JH (N=3, 9%)	NO (N=22, 69%) YES (N=10, 31%)	YES (N=26, 81%) NO (N=6, 19%)	YES (N=27, 87%) NO (N=2, 6%)
Gusto Bella Vita	30-Jan-18	8	OP (N=3, 50%)	CFI (N=2, 33%)	CON (N=1, 17%)	YES (N=3, 43%) NO (N=3, 43%)	YES (N=6, 86%) NO (N=1, 14%)	YES (N=8, 100%) NO (N=0, 0%)
Stratford Place	31-Jan-18	36	OP (N=16, 46%)	CFI (N=13, 37%)	CON (N=5, 14%)	NO (N=25, 71%) YES (N=8, 23%)	NO (N=24, 69%) YES (N=11, 31%)	YES (N=31, 94%) NO (N=2, 6%)
Business Representatives	15-Feb-18	8	CFI (N=4, 67%)	CON (N= 02, 33%)	JH (N= 0, 0%)	NO (N=6, 86%) YES (N=0, 0%)	YES (N=6, 75%) NO (N=2, 25%)	YES (N=6, 75%) NO (N=1, 13%)
Aviano <sup>3</sup>	22-Feb-18	33	CFI (N=12, 39%)	OP (N=8, 26%)	CON (N=7, 23%)	YES (N=18, 60%) NO (N=6, 20%)	No (N=24, 83%) YES (N=4, 14%)	YES (N=20, 71%) No (N=6, 21%)

<sup>1</sup> Due to technology limitations, this number represents households, as opposed to single individual attendees

<sup>2</sup> Includes the votes of an additional 29 attendees participating with raised hands in response to questions 7 & 8

<sup>3</sup> Results include the responses from 2 attendees from The Reserve (located on Whippoorwill Lane)

OP = Overpass - (Single Point Diamond Interchange - SPUI)

CFI = Continuous Flow Intersection

JH = Jug-Handle Intersection

CON = Conventional Improvements



## CONCLUSION AND RECOMMENDATIONS

After consideration of the study findings and public comments, the project team has developed a set of recommendations for consideration by the Collier County Board of County Commissioners. The recommended improvements include the following:

- A partial-Continuous Flow Intersection (CFI) at Pine Ridge Road and Livingston Road,
- A Restricted Crossing U-Turn (RCUT) Intersection at Pine Ridge Road at Whippoorwill Lane, and
- A Diverging Diamond Interchange (DDI) at the Pine Ridge Road/I-75 interchange

It is recommended the County conduct a preliminary engineering and environmental assessment to further evaluate the design features, right-of-way needs, and costs of the preferred improvements for the intersection of Pine Ridge Road and Livingston Road.

Because the Whippoorwill intersection is in close proximity to, and partially included in the I-75 Limited Access Right-of-Way Limits, the study recommends the County pursue an Interchange Modification Report (IMR) with FDOT for the DDI & RCUT portion of the corridor.