EXHIBIT 2

TECHNICAL REPORT

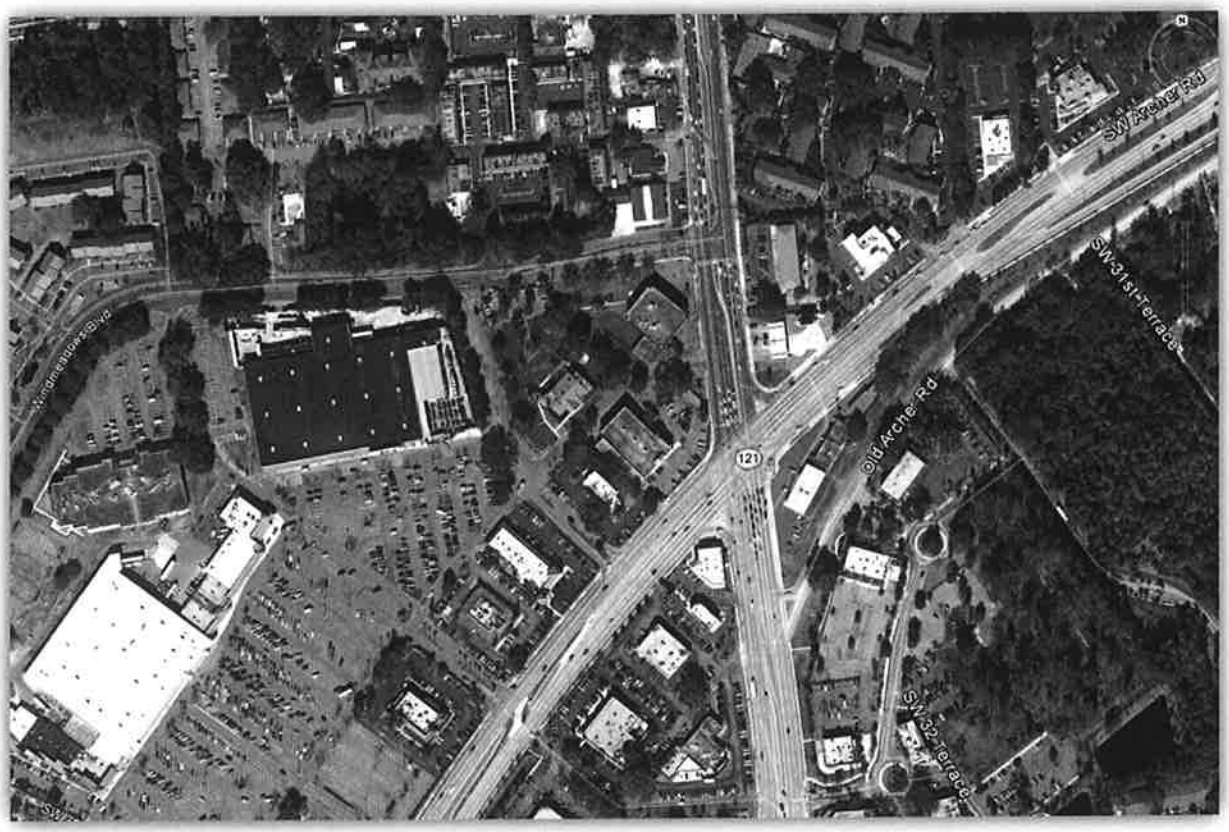
District Wide Traffic Operations Studies Project

Contract Number: C9851

Financial Identification Numbers: 432429-1-12-01, 432429-2-12-01, 432429-3-12-01

Task Work Order Number: 2

SR 24 (SW Archer Road) at SR 121 (SW 34th Street) – Gainesville, Florida



Prepared for:

STATE OF FLORIDA • DEPARTMENT OF TRANSPORTATION

FDOT, District 2

Prepared by:

Prosser Hallock™

Under Contract to:

ETM
England-Thims & Miller, Inc.
VISION • EXPERIENCE • RESULTS

Submitted by: Fred Kyle, PE, PTOE
Florida PE No. 40360
May 2013

TECHNICAL REPORT

Task Work Order Number: 2

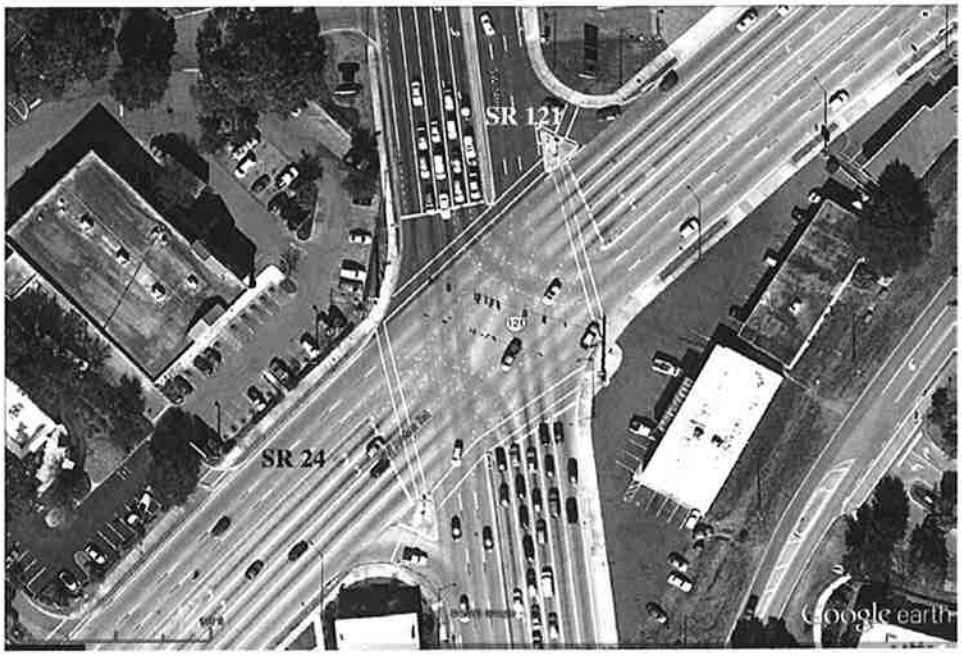
SR 24 (SW Archer Road) at SR 121 (SW 34th Street) – Gainesville, FL

INTRODUCTION:

Prosser Hallock, Inc. (PH) under contract to England-Thims & Miller, Inc. (ETM) was tasked by the Florida Department of Transportation with analyzing the intersection of SR 24 (SW Archer Road) and SR 121 (SW 34th Street) in Gainesville, Florida, and providing recommendations to improve traffic flow for motorists at this intersection. The intersection of SR 121 and Windmeadows Boulevard was also included in the study area because of its close proximity to the subject intersection. The focus of this task was to examine the request of the Gainesville Metropolitan Transportation Planning Organization (MTPO) to "Enhance the right turn movement accommodation, such as the accommodation at the SW 34th St. at SW 20th St. intersection." Although the focus of this study was the north approach right turn movement, other capacity/operational improvements at this intersection were also identified and analyzed.

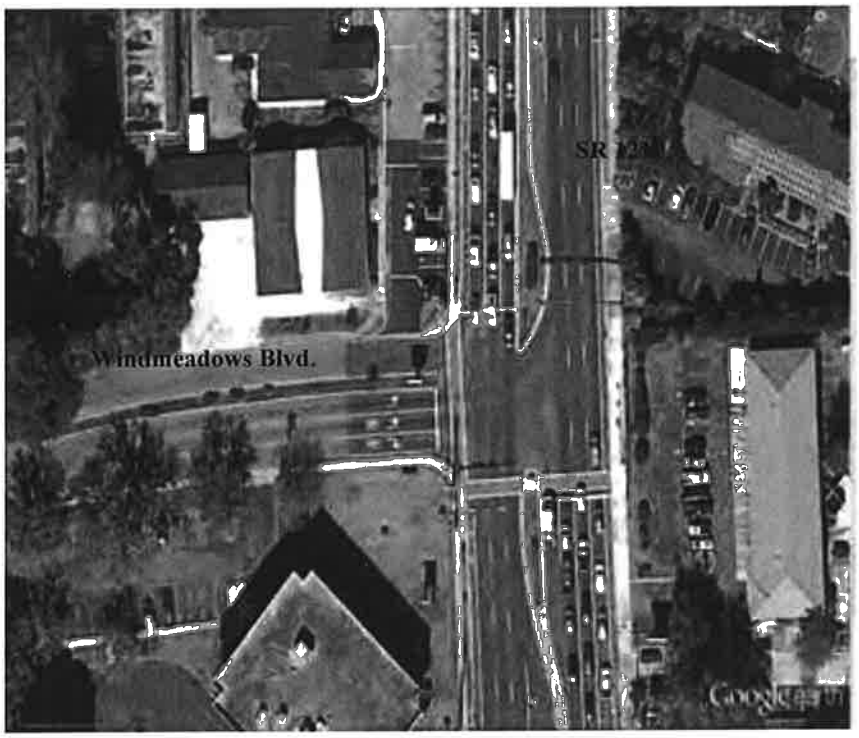
Currently, the intersection of SR 24/SW Archer Road and SR 121/SW 34th Street is a signalized intersection with three through lanes and two left turn lanes on each approach. In addition, right turn channelization islands exist for the right turn movements on SR 24. The signalization at these intersections includes fully protected left turn phases that either lead or lag the through movements by time-of-day.

Currently, speed limits of 45 mph exist on both roadways.



Intersection of SR 24 (SW Archer Road) and SR 121 (SW 34th Street)

The intersection of SR 121 and Windmeadows Boulevard is approximately 550 feet north of the SR 24 intersection. This "tee" intersection is also signalized. SR 121 has three lanes in each direction with a short left turn lane on the south approach for vehicles turning on Windmeadows Boulevard. Windmeadows Boulevard is a basic two lane road that widens to provide three approach lanes at the intersection – two left turn lanes and a single right turn lane. The speed limit on Windmeadows Boulevard is 25 mph.



SR 121 (SW 34th Street) and Windmeadows Boulevard

As can be seen from these aerial pictures, the land uses around these two intersections is primarily retail commercial. A large shopping center with several out parcels is located on the northwest quadrant of the SR 24/SR 121 intersection. Smaller individual retail businesses and small strip retail centers occupy the other three quadrants. In addition, several large multi-family residential developments are in close proximity to these intersections. Windmeadows Boulevard provides a back access to this large shopping center, as well as access to several of the multi-family developments. The University of Florida campus is north and east of these intersections.

The traffic signals at these two intersections are part of large coordinated signal systems on SR 24 and on SR 121. The SR 24/SR 121 intersection is the critical intersection in both of these systems. The traffic signal at Windmeadows Boulevard is cross-coordinated with the SR 24 intersection to provide coordinated operation on SR 121.

Figure 1 provides an overall view of the study area including the large retail commercial center in the northwest quadrant of the SR 24/SR 121 intersection.

REVISIONS			
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STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO	COUNTY	FINANCIAL PROJECT ID
SR 121	ALACHUA	-----

TRAFFIC OPERATIONS STUDY
STUDY AREA

FIGURE NO. 1

ETM was asked by the Department to identify improvements to the intersection that would improve traffic flow in the area. Of particular interest was the MTPO's request to enhance the right turn movement by converting the through/right lane on the north approach of the SR 24/SR 121 intersection to an exclusive right turn lane either full time or by time-of-day. Although the primary focus of this study was the north approach right turn movement, other potential intersection improvements were also studied.

North Approach of the SR 121/SR 24 intersection looking south toward SR 24

DATA COLLECTION:

Turning movement counts were made at both intersections. These counts, copies of which are included in the Appendix, were made from 7:00 A.M. to 9:00 A.M., 12:00 P.M. to 2:00 P.M., and 3:00 P.M. to 7:00 P.M. on January 29, 2013. Copies of the turning movement counts are included in the Appendix.

Traffic signal timing data for both intersections was obtained from the City of Gainesville Traffic Management Center. The timing data not only included phase split times for the various traffic

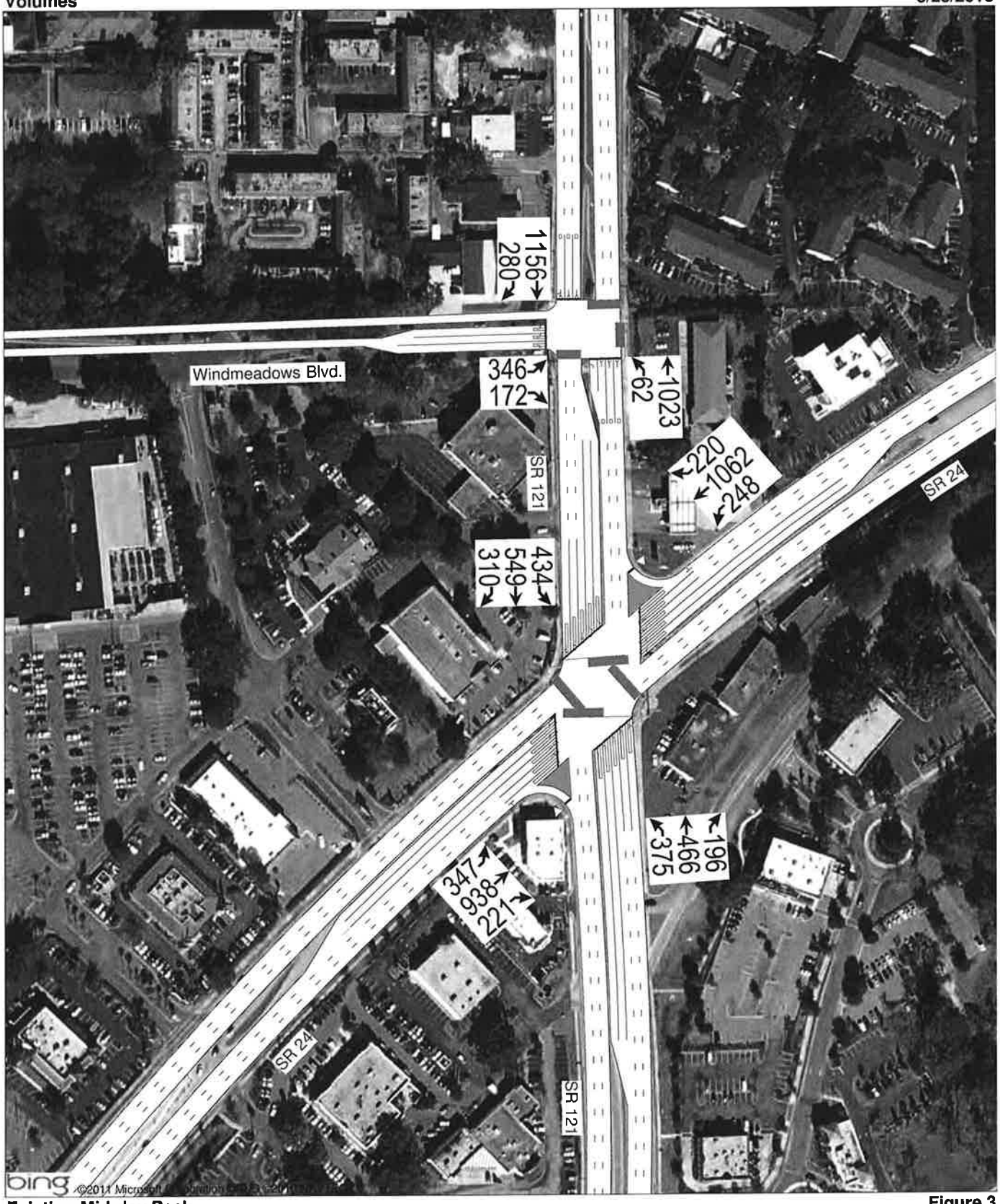
plans in effect at these intersections, but the phase sequencing as well. This is critically important because the left turn movements at both intersections lead or lag the through movements based on the specific timing plan in effect. The traffic volume data and signal timing data were used as inputs into the Synchro/SimTraffic software package. The Synchro/SimTraffic results were then used to compare Measures of Effectiveness (MOEs) for each considered alternative. Copies of the signal timing sheets are also included in the Appendix. Figures 2, 3, and 4 provide a graphical representation of the A.M., Mid-day, and P.M. peak hour volumes used in this analysis.

The FDOT provided all of the Long Form Crashes found in the CAR database for the study area from 1/1/09 through 12/31/11. Most of the collisions centered around the two signalized intersections of SR 24/SR 121 and SR 121/Windmeadows. Figure 5 is a collision diagram showing the various collision types and the locations. Collision summaries are provided in the Appendix.
The following is a summary of the reported collisions:

SR 24 / SR 121 Intersection – There were 147 total Long Form collisions found in the CAR database. There were 112 property damage only collisions. Thirty five collisions involved injuries resulting in 47 injuries. There were no reported fatalities. A majority of the collisions were rear-end or sideswipe collisions. Rear end collisions accounted for 101 (69%) of the total collisions and 40 (85%) of the injuries. Sideswipe collisions accounted for 24 (16%) of the total collisions and 3 (10%) of the injuries. There was one collision involving a bicycle and no pedestrian collisions were reported. There were 112 (76%) collisions during the day and 35 (24%) at night. The roadway was reported dry for 127 (86%) and wet for 20 (14%) of the collisions.

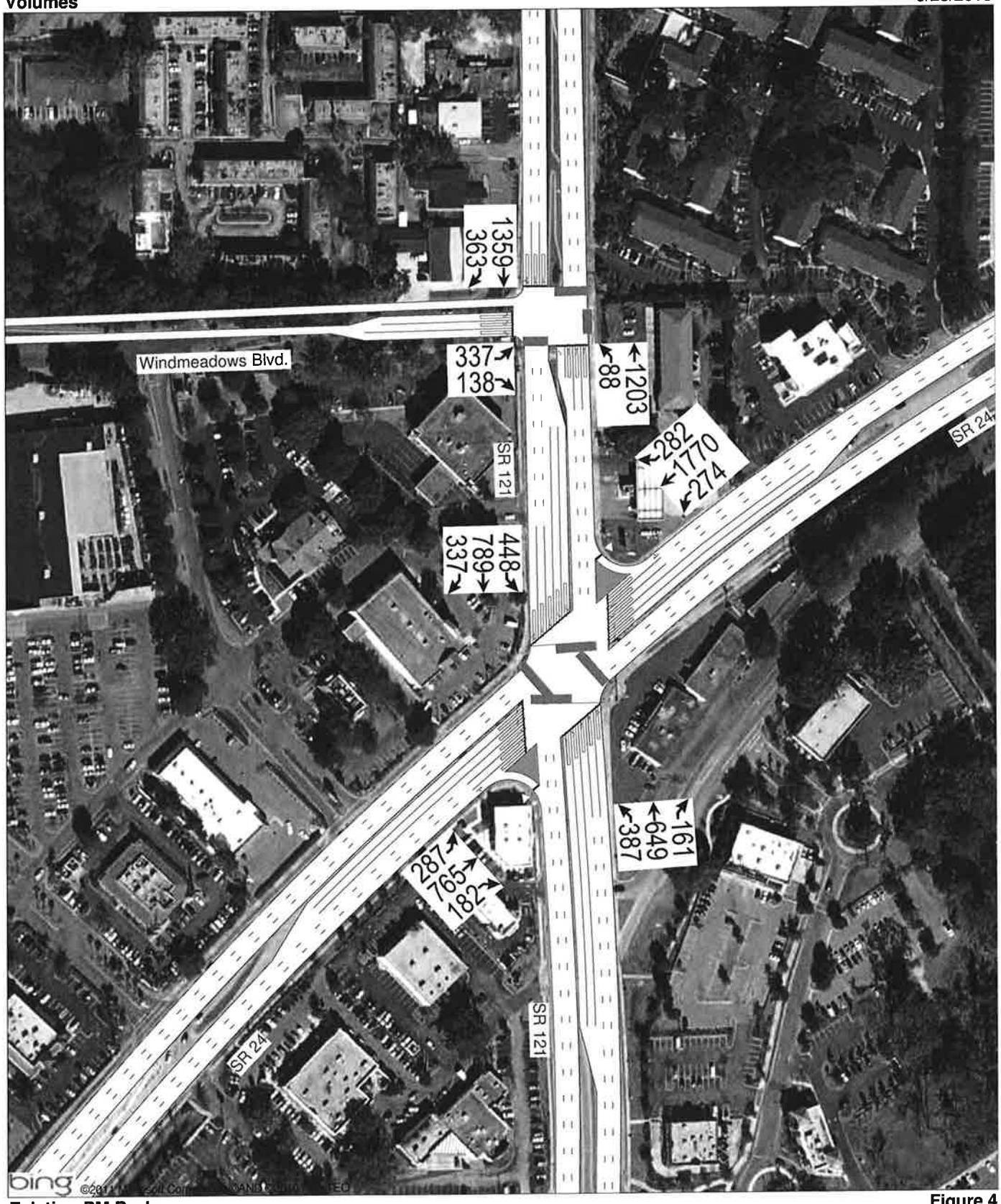
SR 121 / Windmeadows – There were 59 total Long Form collisions found in the CAR database, of which 38 were property damage only collisions, and 21 collisions involved injuries resulting in 28 injuries. There were no reported fatalities. A majority of collisions were either rear-end, sideswipe, right angle, or left turn collisions. Rear end collisions accounted for 26 (44%) of the total collisions and 14 (24%) of the injuries. Sideswipe collisions accounted for 10 (18%) of the total collisions and 3 (4%) of the injuries. Right angle collisions accounted for 13 (22%) of the total collisions and 4 (14%) of the injuries. Left turn collisions accounted for 6 (10%) of the total collisions and 6 (21%) of the injuries. There was one collision involving a bicycle and one pedestrian collision was reported. There were 45 (76%) collisions during the day and 12 (24%) at night. The roadway was reported dry for 48 (81%) and wet for 11 (19%) of the collisions.

Driveways in the area – There are numerous driveways within approximately 1,000 feet of the signalized intersection where collisions were reported that appear to be related to delays at the signalized intersections. There were 10 total Long Form collisions found in the CAR database that appear to be related to the signalized intersections. There were seven property damage only collisions. Three collisions involved injuries, resulting in a total of 4 injuries. There were no reported fatalities. The majority of collisions were right angle or sideswipe collisions. Right angle collisions accounted for 5 (50%) of the total collisions and 2 (50%) of the injuries. Sideswipe collisions accounted for 2 (20%) of the total collisions and no injuries. There was one collision involving a pedestrian and no bicycle collisions were reported. There were 7 (70%) collisions during the day and 3 (30%) at night. The roadway was reported dry for all 10 (100%) and wet for none of the collisions.



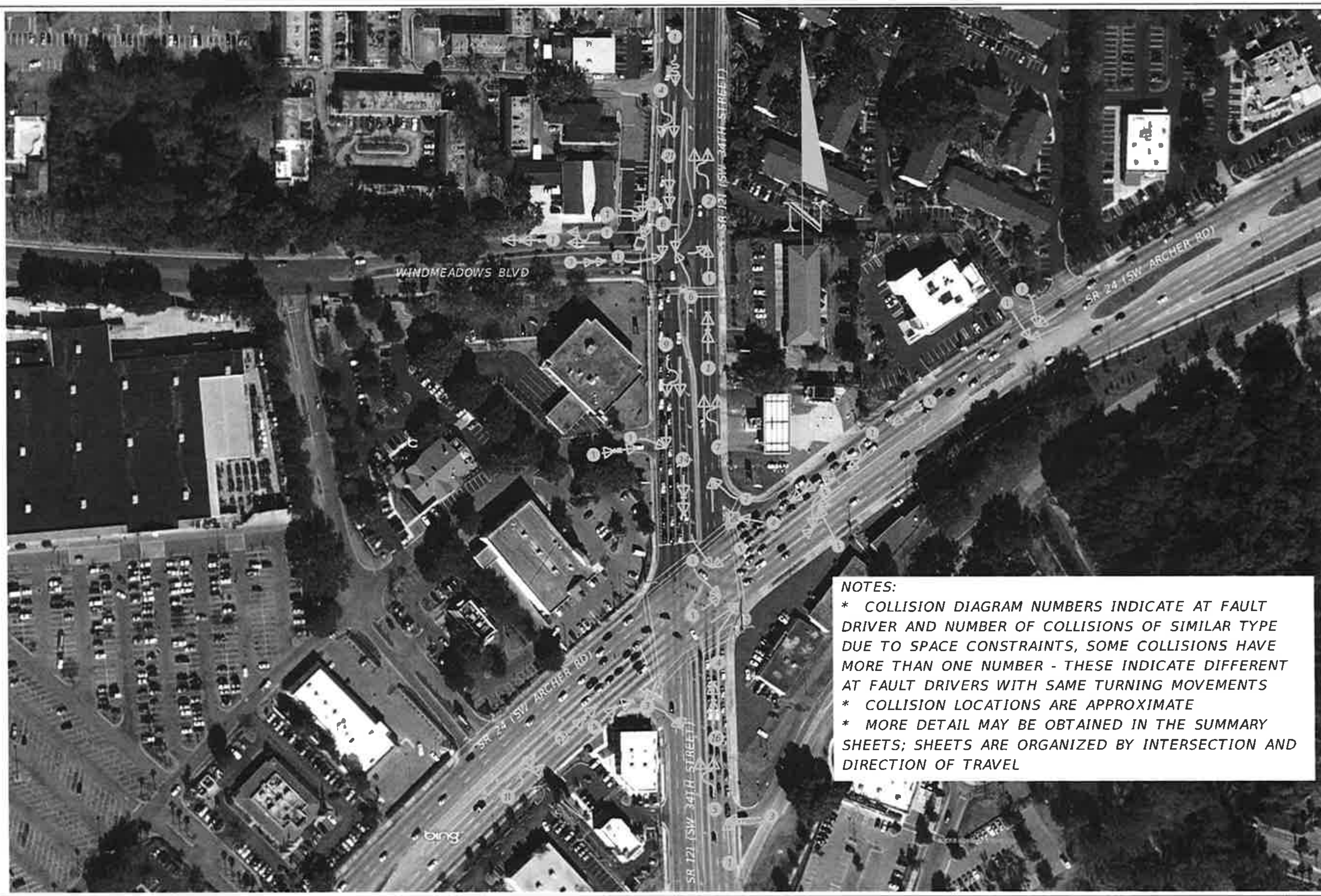
Existing Mid-day Peak
Prosser Hallock, Inc.

Figure 3



Existing PM Peak
Prosser Hallock, Inc.

Figure 4



REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

Prosser Hallock

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

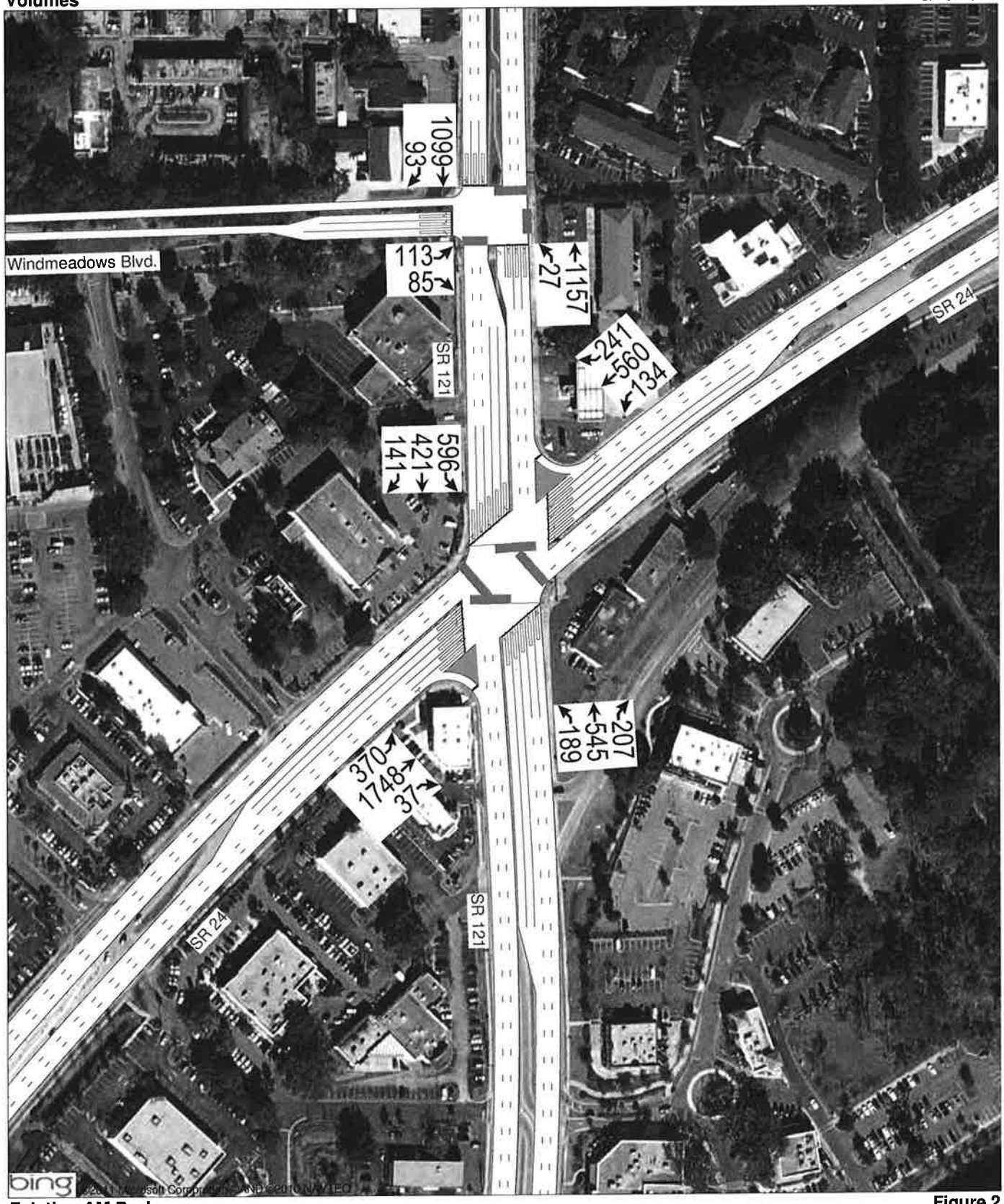
ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 121	ALACHUA	----

TRAFFIC OPERATIONS STUDY

COLLISION DIAGRAM

1/1/09 - 12/31/11

FIGURE NO. 5



Existing AM Peak
Prosser Hallock, Inc.

Figure 2

Summary of all collisions – There were 216 total Long Form collisions found in the CAR database. One hundred fifty-seven of these collisions were property damage only. Fifty-nine collisions involved injuries, with a total of 79 injuries. There were no reported fatalities. A majority of the collisions were rear end or sideswipe collisions. Rear end collisions accounted for 129 (60%) of the total collisions and 56 (71%) of the injuries. Sideswipe collisions accounted for 34 (16%) of the total collisions and 6 (8%) of the injuries. There were two collisions involving a bicycle and two pedestrian collisions reported. There were 164 (76%) collisions during the day and 52 (24%) at night. The roadway was reported dry for 185 (86%) and wet for 31 (14%) of the collisions.

OBSERVATIONS:

Site visits to observe traffic operations at these intersections were made on February 27 and 28, 2013. Some of the issues observed are as follows:

- Morning peak period
    - north approach left turn queues on SR 121 at SR 24 often extended north of Windmeadows Boulevard
    - west approach through queues on SR 24 extended almost to SW 35th Boulevard, but cleared each signal cycle
    - other movements cleared the intersections each signal cycle
    - pedestrian activity along SR 24 resulted in the possibility of pedestrian calls most cycles
- Mid-day peak period
    - north approach right turn volumes at the SR 24/SR 121 intersection are heavy
    - north approach right turn volumes at the SR 121/Windmeadows intersection are heavy
    - north approach through volumes at both intersections are also heavy
    - the right-in/right-out commercial driveway on SR 121 between Windmeadows and SR 24 that serves the retail commercial development is heavily used with many of the exiting vehicles continuing south on SR 121
    - east approach right turn volumes on SR 24 at SR 121 are heavy
    - pedestrian activity along SR 24 resulted in the possibility of pedestrian calls most cycles
- Afternoon peak period
    - east approach queues on SR 24 extend over 5,000 feet to the east, taking 3-4 cycles to reach the SR 121 intersection
    - north approach through and left turn queues are also heavy, extending north of Windmeadows Boulevard
    - the right-in/right-out commercial driveway on SR 121 between Windmeadows and SR 24 that serves the retail commercial development is heavily used, with most of the vehicles continuing south on SR 121
    - pedestrian activity along SR 24 resulted in the possibility of pedestrian calls most cycles

In the course of traveling to and from the study area, the team also briefly observed the intersection of SW 34th Street and SW 20th Street. These observations were made between 4:30 P.M. and 4:45 P.M.; at a time when the right turn only restriction was in effect. During the brief visit to this intersection we observed a Gainesville Police Department officer parked over the curb near the intersection for the purpose of enforcing the right turn only restriction. Our team was there only a few minutes when a violation occurred and the officer left the scene and was later observed ticketing the offending driver. While the officer was away, a number of violations of the right turn restriction were observed.

ALTERNATIVES:

The focus of this task work order was to investigate the possibility of restriping the outside lane of the north approach of the intersection of SR 24 and SR 121. Currently this lane is striped as a through/right turn lane. As noted in the field observations, and the turning movement counts, the north approach right turn volumes at this intersection are quite heavy from mid-day through the P.M. peak resulting in vehicle queuing in the outside lane. The goal of this study was to determine if converting this lane to a right turn only lane either full time or only during the peak periods will reduce vehicle queues and improve intersection efficiency. Of note, this alternative was analyzed with and without a right turn overlap signal phase.

Constructing a separate right turn lane was also considered. However, in order to construct the right turn lane, additional right-of-way would be needed from the CVS Pharmacy located in the northwest corner of the intersection. It appears that the right-of-way line is located at the back of sidewalk, which is about 8' from the back of curb. In places, the CVS parking lot is only about 11' from the back of curb. Therefore, adding a right turn lane would cause the pharmacy to lose several parking places.

In addition, underground utilities such as water (a fire hydrant is located on the corner), underground electric service for the streetlights, and underground phone ducts (as evidenced by a large switch cabinet) are evident just behind the sidewalk. Also, the traffic signal strain pole on this corner supporting the signal span is located in the back of the sidewalk. If a right turn lane is added, this concrete stain pole would need to be relocated resulting in a complete rebuild of the traffic signal.

Due to limited available right-of-way, the possibility of high business-damage costs (resulting from the loss of private property as well as the loss of existing parking spaces), numerous utility conflicts, and the need to replace the existing traffic signal, adding a separate right turn lane was not analyzed further.

Our site observations also revealed that the north approach left turn queues on SR 121 at SR 24 frequently extended beyond the SR 121/Windmeadows Boulevard intersection during the A.M. and P.M. peak periods. As a result, we analyzed the effects of extending one of the southbound left turn lanes north of the Windmeadows Boulevard intersection.

During our site observations and discussions with City of Gainesville Traffic Management Center staff, it became obvious that improvements to the east approach of SR 24 would also be helpful. As mentioned previously, significant queuing occurs during the P.M. peak with queues measuring over 5,000 feet long. Since this approach currently has three through lanes and two left turn lanes, we also analyzed the benefits of adding a dedicated right turn lane at this intersection. Based on our field reviews, it appears that sufficient right-of-way exists to add this additional turn lane to this approach.

Synchro/SimTraffic software was used to develop Measures of Effectiveness (MOEs) for comparing the alternatives to the existing conditions. Inputs used in the analysis included the existing traffic volumes and the current traffic signal timing. Since these two intersections are a part of larger coordinated signal systems, new signal timing was not developed. The following alternatives were analyzed:

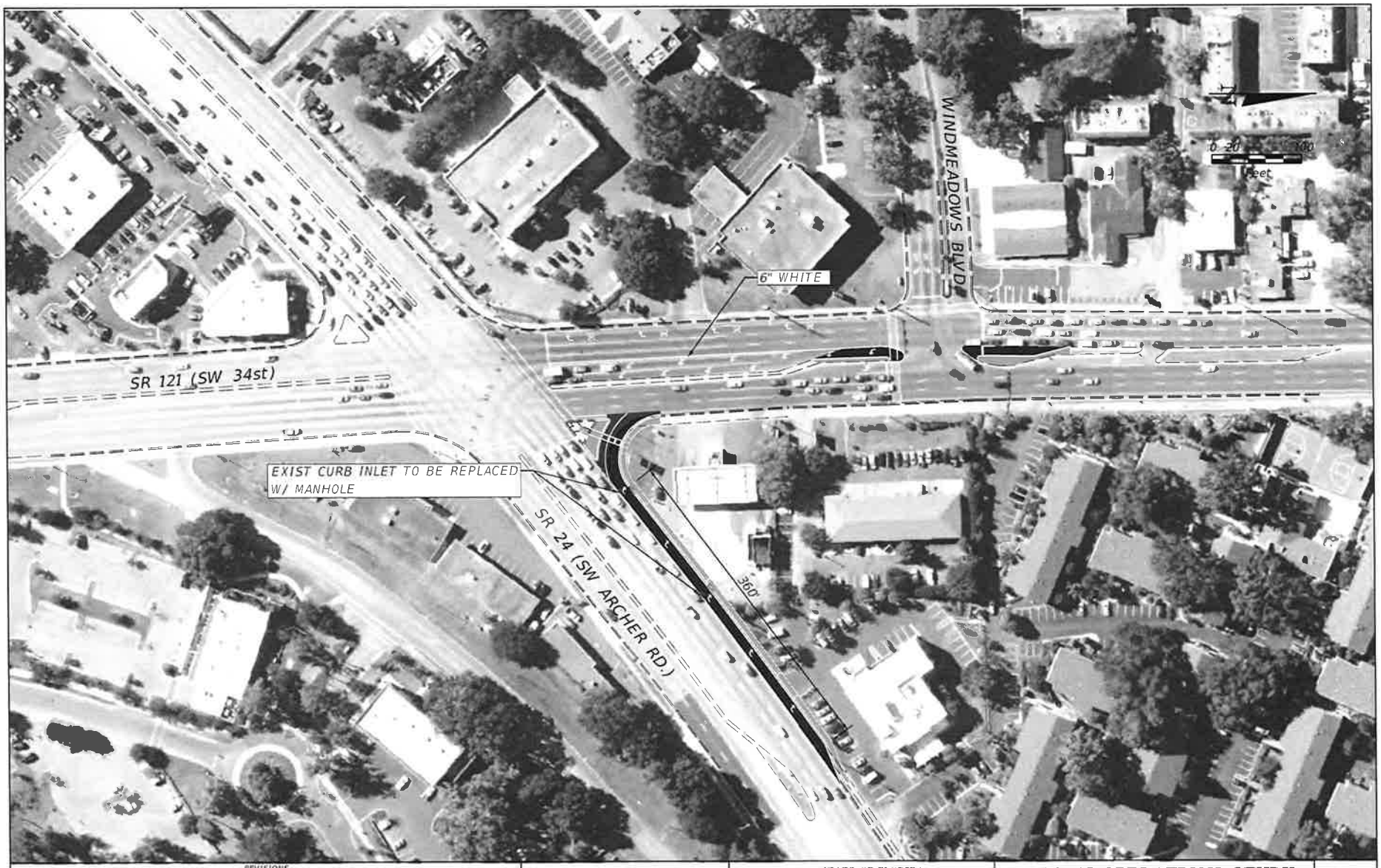
- Existing Conditions
- Alternate 1
    - add a right turn lane to the east approach of SR 24,
    - restripe the outside lane of the north approach of SR 121 creating a right turn only lane, resulting in a right turn only lane, two through lanes, and two left turn lanes on this approach, and
    - lengthen one of the north approach left turn lanes to extend north of the Windmeadows intersection.
- Alternate 2
    - Includes Alternate 1 options plus a right turn overlap signal phase for the north approach of the SR24/SR 121 intersection.

Figures 6 – 8 provide graphical representations of the analyzed improvements to SR 121 and SR 24.

It should be mentioned that Synchro is a macroscopic model that represents traffic in an aggregate measure for the time period analyzed. SimTraffic is a microscopic model that individually tracks every vehicle through the network during each 0.1 second of simulation. These differences are important when dealing with over-saturated conditions or conditions where queues extend upstream to the next signalized intersection. SimTraffic provides MOEs for every vehicle during the simulation and better reflects the impacts of oversaturation and downstream roadway conditions on driver behavior.

Tables 1, 2, and 3, contain a summary of the key Synchro Measures of Effectiveness using the existing traffic volumes and Tables 4, 5, and 6 contain a summary of the key SimTraffic Measures of Effectiveness. The Synchro and SimTraffic reports are included in the Appendix.

The analysis was performed using traffic volume and signal timing data for the morning peak, the noon or mid-day peak and the afternoon peak. The specific hours of analysis were from 7:30 A.M. – 8:30 A.M., 12:15 P.M. – 1:15 P.M., and 4:30 P.M. – 5:30 P.M. These were the hours when the traffic volumes were the highest. The Synchro and SimTraffic results for each time period indicate that while the conversion of the north approach outside lane helps the right turn traffic, the delay and



REVISIONS			
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STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO	COUNTY	FINANCIAL PROJECT ID
SR 115	DUVAL	432429-1-32-01

TRAFFIC OPERATIONS STUDY
SR 24 (SW ARCHER RD.) & SR 121 (SW 34TH ST.)

FIGURE 6

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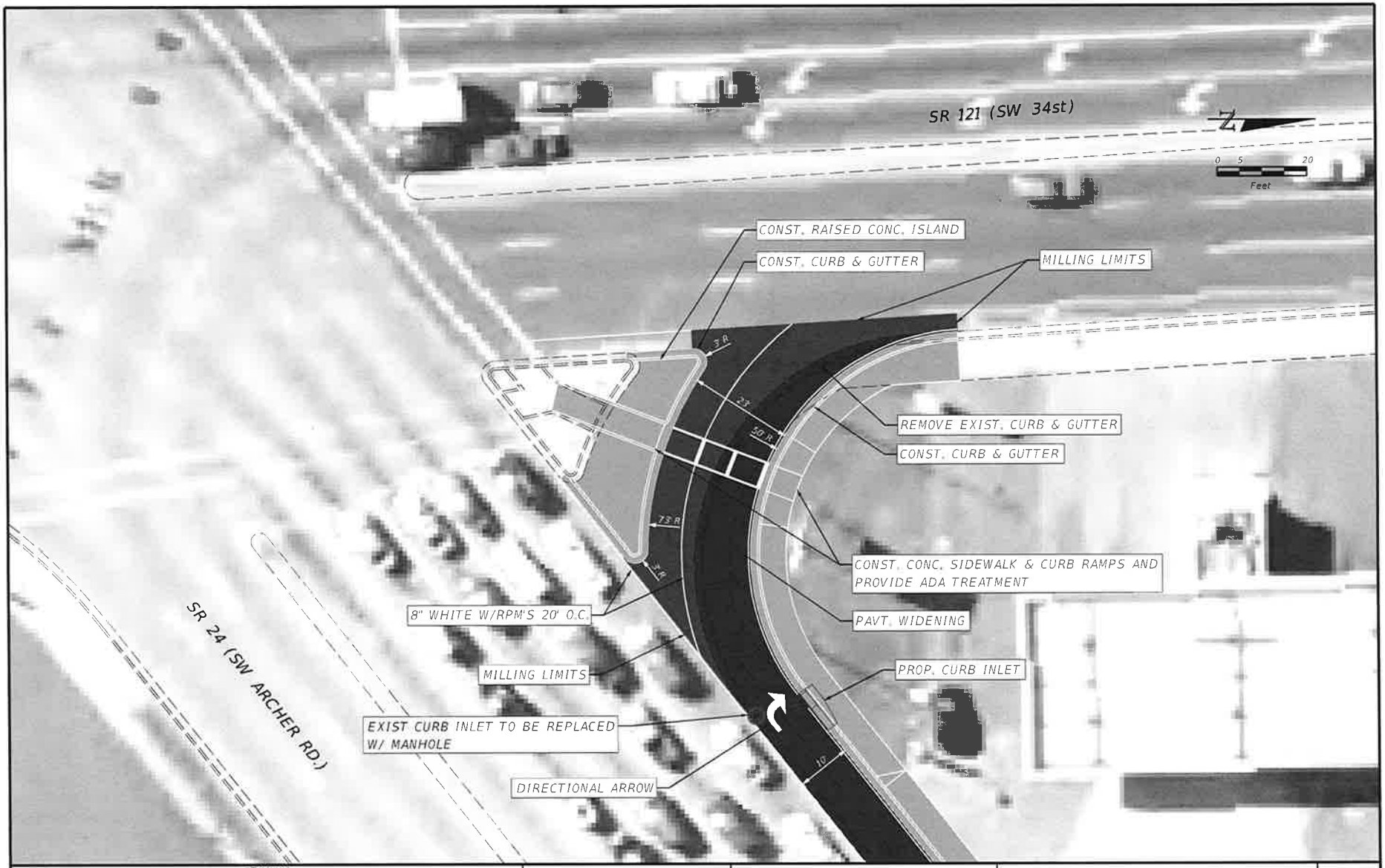

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

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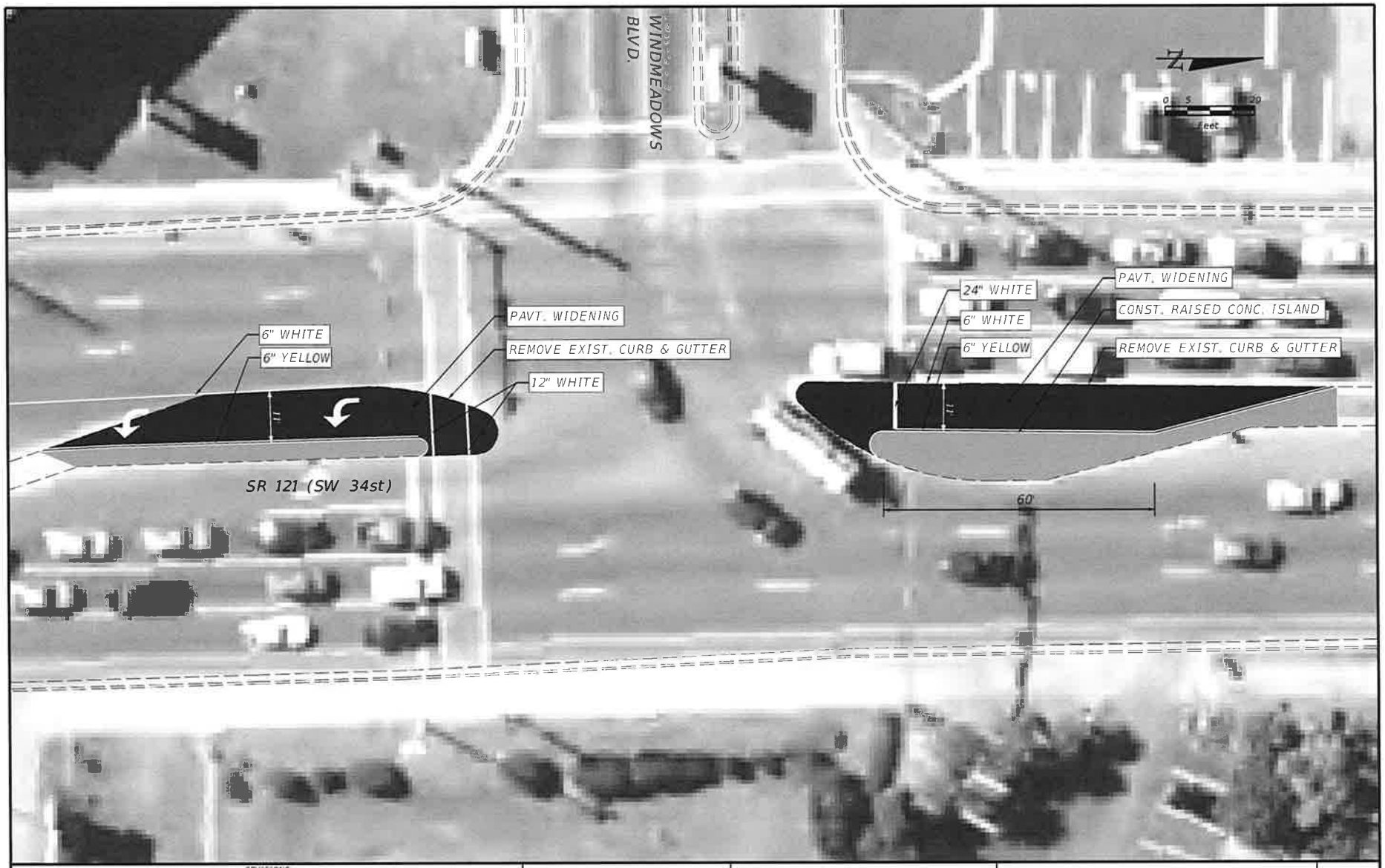
STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 134	DUVAL	432429-1-32-01

TRAFFIC OPERATIONS STUDY
SR 24 (SW ARCHER RD.) & SR 121 (SW 54TH ST.)

FIGURE 7



REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

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STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 134	DUVAL	432429-1-32-01

TRAFFIC OPERATIONS STUDY
WINDMEADOWS BLVD. & SR 121 (SW 34TH ST.)

FIGURE 8

Table 1

A.M. Peak Synchro Measures of Effectiveness

Approach	Existing Geometry		Alternate 1		Alternate 2	
	Total Delay (sec/veh)	LOS	Total Delay (sec/veh)	LOS	Total Delay (sec/veh)	LOS
North Approach						
Right	--	--	9.4	A	10.1	B
Thru	44.8	D	51.1	D	51.1	D
Left	142.0	F	142.4	F	142.4	F
Approach	94.8	F	93.0	F	93.1	F
East Approach						
Right	--	--	5.6	A	5.8	A
Thru	41.3	D	41.4	D	43.7	D
Approach	49.9	D	40.5	D	42.2	D

Table 2

Mid-day Peak Synchro Measures of Effectiveness

Approach	Existing Geometry		Alternate 1		Alternate 2	
	Total Delay (sec/veh)	LOS	Total Delay (sec/veh)	LOS	Total Delay (sec/veh)	LOS
North Approach						
Right	--	--	7.3	A	9.1	A
Thru	34.5	C	40.6	D	40.6	D
Left	73.1	E	71.8	E	71.8	E
Approach	47.5	D	43.1	D	43.5	D
East Approach						
Right	--	--	5.8	A	5.8	A
Thru	52.6	D	47.2	D	48.1	D
Approach	55.4	E	44.9	D	45.5	D

Table 3

P.M. Peak Synchro Measures of Effectiveness

Approach	Existing Geometry		Alternate 1		Alternate 2	
	Total Delay (sec/veh)	LOS	Total Delay (sec/veh)	LOS	Total Delay (sec/veh)	LOS
North Approach						
Right	--	--	34.7	C	34.4	C
Thru	94.3	F	110.3	F	110.3	F
Left	77.0	E	78.9	E	78.9	E
Approach	89.4	F	85.2	F	85.1	F
East Approach						
Right	--	--	9.8	A	9.8	A
Thru	135.2	F	75.0	E	75.0	E
Approach	128.4	F	67.5	E	67.5	E

Table 4

A.M. Peak SimTraffic Measures of Effectiveness

Approach	Existing Geometry					Alternate 1					Alternate 2				
	Total Delay/Veh (sec/veh)	Total Delay (Hr)	Avg. Speed (mph)	Avg. Queue (ft)	95% Queue (ft)	Total Delay/Veh (sec/veh)	Total Delay (Hr)	Avg. Speed (mph)	Avg. Queue (ft)	95% Queue (ft)	Total Delay/Veh (sec/veh)	Total Delay (Hr)	Avg. Speed (mph)	Avg. Queue (ft)	95% Queue (ft)
North															
Right	25.0	1.0	9	76	158	5.4	0.2	18	3	15	4.3	0.2	19	2	14
Thru	42.9	5.8	7	193	472	43.1	5.7	6	110	190	43.4	5.8	6	117	207
Left	89.1	15.4	3	284	388	89.2	15.2	3	295	418	89.6	15.3	3	294	408
East															
Right	11.9	0.9	36	166	306	6.0	0.4	39	8	73	6.4	0.5	39	8	74
Thru	39.3	6.9	26	133	217	37.8	6.5	27	116	180	40.8	7.1	26	128	196
Intersection	77.3	122.5	11	NA	NA	77.8	122.0	11	NA	NA	76.3	120.4	11	NA	NA

Table 5

Mid-day Peak SimTraffic Measures of Effectiveness

Approach	Existing Geometry					Alternate 1					Alternate 2				
	Total Delay/Veh (sec/veh)	Total Delay (Hr)	Avg. Speed (mph)	Avg. Queue (ft)	95% Queue (ft)	Total Delay/Veh (sec/veh)	Total Delay (Hr)	Avg. Speed (mph)	Avg. Queue (ft)	95% Queue (ft)	Total Delay/Veh (sec/veh)	Total Delay (Hr)	Avg. Speed (mph)	Avg. Queue (ft)	95% Queue (ft)
North															
Right	23.8	2.1	9	80	188	9.8	0.9	14	21	66	7.4	0.7	15	18	66
Thru	33.2	5.9	8	66	218	33.2	5.9	8	94	184	31.9	5.7	8	91	180
Left	90.9	12.1	3	183	304	75.2	9.7	4	161	286	72.1	9.2	4	154	267
East															
Right	30.0	2.0	28	306	425	8.4	0.5	38	8	91	8.1	0.5	38	2	40
Thru	51.7	16.7	23	266	381	48.0	15.7	24	237	327	46.3	15.0	25	229	309
Intersection	49.1	79.0	16	NA	NA	46.0	74.6	17	NA	NA	44.4	71.7	17	NA	NA

Table 6

P.M. Peak SimTraffic Measures of Effectiveness

Approach	Existing Geometry					Alternate 1					Alternate 2				
	Total Delay/Veh (sec/veh)	Total Delay (Hr)	Avg. Speed (mph)	Avg. Queue (ft)	95% Queue (ft)	Total Delay/Veh (sec/veh)	Total Delay (Hr)	Avg. Speed (mph)	Avg. Queue (ft)	95% Queue (ft)	Total Delay/Veh (sec/veh)	Total Delay (Hr)	Avg. Speed (mph)	Avg. Queue (ft)	95% Queue (ft)
North															
Right	66.2	7.1	4	342	423	23.7	2.5	9	107	232	19.6	2.0	10	96	224
*Thru	104.9	32.3	4	629	1028	173.6	52.1	3	794	1343	171.1	51	3	762	1278
Left	94.4	13.3	3	246	418	70.5	9.4	4	174	305	69.2	9.3	4	180	301
East															
Right	361.6	31.1	6	2257	3852	33.6	2.8	27	294	593	44.7	3.6	24	320	597
Thru	317.8	183.3	6	2238	3848	76.5	43.4	19.0	574	851	86.7	50.2	17	670	1020
Intersection	171.9	345.4	6	NA	NA	84.2	166.2	12	NA	NA	83.8	166.8	12	NA	NA

*North Approach queues extend north of Windmeadows Blvd. Delays and queues shown include those for Windmeadows.

queues increase for the through traffic. This is to be expected since the number of through lanes is reduced from three lanes to two.

In regards to the implementation of a right turn only restriction by time-of-day, this would typically be done to relieve congestion during the peak periods. Since this study analyzed the effects of a right turn lane during the peak hours, a time-of-day implementation to address peak hour conditions is not recommended for the same reasons as mentioned previously. In addition, time-of-day implementation would require significant enforcement to insure driver compliance.

These results also indicate that there is a benefit to lengthening one of the north approach left turn lanes. These benefits come from providing more queue storage for left turn vehicles so they do not block the through lanes. A benefit also results from the separating the left turn and through vehicles so the vehicle headways are shorter resulting in less delay. These benefits are especially noticeable in the SimTraffic analyses.

FUTURE VOLUMES

A final step in the study included estimating future traffic volumes and comparing the alternatives under future conditions. The FDOT 2011 Florida Transportation Information data disk contains historic data for traffic counts made on SR 24 east and west of SR 121 and on SR 121 north and south of SR 24. Trends analysis software was used to develop traffic volume growth rates to estimate future volumes. The Trends software projected a very minimal or negative growth rate for these volumes; therefore, a 1% growth rate was used to develop future volumes. After discussions with Department staff, a minimum 20-year horizon was chosen for the future analyses. With this guideline, 2035 was chosen as the horizon year. Future volumes were developed and used in the Synchro/SimTraffic analyses. The future analyses also included the development of new traffic signal timing for the two signalized intersections. Copies of the Trends analysis are included in the Appendix.

Since oversaturated conditions currently exist, the future analyses yielded results that are similar to the current volume analysis, just with a difference in magnitude.

Tables 7, 8, and 9 contain the Synchro results with the future volumes and Tables 10, 11, and 12 summarize the results of the SimTraffic future analyses.

Table 7
A.M. Peak Synchro Measures of Effectiveness
Future Volumes

Approach	Existing Geometry		Alternate 1		Alternate 2	
	Total Delay (sec/veh)	LOS	Total Delay (sec/veh)	LOS	Total Delay (sec/veh)	LOS
North Approach						
Right	--	--	4.7	A	8.3	A
Thru	43.6	D	50.1	D	50.1	D
Left	276.6	F	277.1	F	277.1	F
Approach	163.5	F	161.4	F	161.8	F
East Approach						
Right	--	--	6.1	A	6.1	A
Thru	51.3	D	47.2	D	47.3	D
Approach	66.6	E	52.5	D	52.6	D

Table 8
Mid-day Peak Synchro Measures of Effectiveness
Future Volumes

Approach	Existing Geometry		Alternate 1		Alternate 2	
	Total Delay (sec/veh)	LOS	Total Delay (sec/veh)	LOS	Total Delay (sec/veh)	LOS
North Approach						
Right	--	--	17.4	B	14.2	B
Thru	39.1	D	44.7	D	44.7	D
Left	98.6	F	98.4	F	98.4	F
Approach	59.1	E	56.2	E	55.4	E
East Approach						
Right	--	--	5.4	A	5.4	A
Thru	75.6	E	51.6	D	51.6	D
Approach	77.8	E	51.0	D	51.0	D

Table 9
P.M. Peak Synchro Measures of Effectiveness
Future Volumes

Approach	Existing Geometry		Alternate 1		Alternate 2	
	Total Delay (sec/veh)	LOS	Total Delay (sec/veh)	LOS	Total Delay (sec/veh)	LOS
North Approach						
Right	--	--	58.8	E	36.3	D
Thru	150.2	F	154.1	F	154.1	F
Left	315.7	F	315.7	F	315.7	F
Approach	197.3	F	179.7	F	174.8	F
East Approach						
Right	--	--	11.7	B	11.7	B
Thru	190.7	F	109.8	F	109.8	F
Approach	177.9	F	94.6	F	94.6	F

re.

Table 10
A.M. Peak SimTraffic Measures of Effectiveness
Future Volumes

Approach	Existing Geometry					Alternate 1					Alternate 2				
	Total Delay/Veh (sec/veh)	Total Delay (Hr)	Avg. Speed (mph)	Avg. Queue (ft)	95% Queue (ft)	Total Delay/Veh (sec/veh)	Total Delay (Hr)	Avg. Speed (mph)	Avg. Queue (ft)	95% Queue (ft)	Total Delay/Veh (sec/veh)	Total Delay (Hr)	Avg. Speed (mph)	Avg. Queue (ft)	95% Queue (ft)
North															
Right	59.3	2.5	5	124	245	8.4	0.4	15	9	40	5.4	0.2	18	3	19
*Thru	212.4	61.5	5	1707	2529	216.9	62.4	6	1470	2359	226.7	65.6	6	1554	2314
Left	152.8	26.5	2	349	352	158.0	27.1	2	421	467	159.1	27.2	2	423	464
East															
Right	18.8	1.6	32	238	363	7.5	0.7	38	20	119	7.6	0.7	38	22	127
Thru	44.4	9.8	25	182	280	41.3	9.1	26	159	227	43.3	9.7	25	163	233
Intersection	154.0	279.7	6	NA	NA	163.1	295.3	6	NA	NA	157.7	286.7	6	NA	NA

*North Approach queues extend north of Windmeadows Blvd. Delays and queues shown include those for Windmeadows.

Table 11
Mid-day Peak SimTraffic Measures of Effectiveness
Future Volumes

Approach	Existing Geometry					Alternate 1					Alternate 2				
	Total Delay/Veh (sec/veh)	Total Delay (Hr)	Avg. Speed (mph)	Avg. Queue (ft)	95% Queue (ft)	Total Delay/Veh (sec/veh)	Total Delay (Hr)	Avg. Speed (mph)	Avg. Queue (ft)	95% Queue (ft)	Total Delay/Veh (sec/veh)	Total Delay (Hr)	Avg. Speed (mph)	Avg. Queue (ft)	95% Queue (ft)
North															
Right	46.7	4.8	6	189	342	18.6	2.0	10	72	163	10.8	1.1	13	45	122
*Thru	156.2	55.5	6	1813	2024	141.4	52.1	6	1637	2053	134.3	47.9	6	943	2046
Left	172.4	25.8	2	329	412	178.3	27.0	2	390	473	169.8	25.8	2	376	340
East															
Right	124.3	9.9	14	747	1249	15.1	1.2	34	123	425	15.6	1.3	34	130	437
Thru	131.1	53.2	13	712	1232	66.8	27.5	20	375	596	67.5	27.7	20	376	618
Intersection	114.4	226.8	9	NA	NA	92.2	183.7	10	NA	NA	87.0	171.3	11	NA	NA

*North Approach queues extend north of Windmeadows Blvd. Delays and queues shown include those for Windmeadows.

Table 12
P.M. Peak SimTraffic Measures of Effectiveness
Future Volumes

Approach	Existing Geometry					Alternate 1					Alternate 2				
	Total Delay/Veh (sec/veh)	Total Delay (Hr)	Avg. Speed (mph)	Avg. Queue (ft)	95% Queue (ft)	Total Delay/Veh (sec/veh)	Total Delay (Hr)	Avg. Speed (mph)	Avg. Queue (ft)	95% Queue (ft)	Total Delay/Veh (sec/veh)	Total Delay (Hr)	Avg. Speed (mph)	Avg. Queue (ft)	95% Queue (ft)
North															
Right	56.3	5.1	5	189	396	43.5	4.1	6	105	223	35.3	3.3	7	83	186
*Thru	284.9	97.5	5	1878	2412	345.0	113.9	3	1802	2482	352.6	116.3	3	1795	2502
Left	265.6	31.0	1	349	352	264.5	31.2	1	426	476	259.3	31.0	1	427	474
East															
Right	455.6	42.5	4	3335	4688	223.2	22.5	9	355	583	192.2	19.3	10	335	594
Thru	417.9	263.5	5	3331	4704	230.6	165.8	8.0	2163	3781	213.1	151.8	9	1978	3706
Intersection	288.1	571.7	4	NA	NA	216.5	450.6	6	NA	NA	209.7	432.2	6	NA	NA

*North Approach queues extend north of Windmeadows Blvd. Delays and queues shown include those for Windmeadows.

RECOMMENDATIONS:

Based on the Synchro analysis, restriping the outside lane of the north approach of SR 121 to only serve right turn movements does not appear to be justified because of negative impacts to other intersection movements. While restriping the north approach will provide a separate right turn lane, the number of through lanes will be reduced from three lanes to two lanes, resulting in a reduction in operational efficiency on this approach.

As shown in Tables 1 and 3, the delay per through vehicle on this approach in the morning peak increases approximately 14%, from 44.8 seconds per vehicle to 51.1 seconds per vehicle. During the afternoon peak this delay increases 17% (94.3 seconds per vehicle to 110.3 seconds per vehicle).

The impacts of implementing a dedicated right-turn lane are also reflected in the SimTraffic micro-simulation results. During the afternoon peak period, the delay to the through vehicles is increased by 65%, from 104.9 seconds to 173.6 seconds. Not only is the delay increased, but the vehicle queues are also increased, from 1028 feet to 1343 feet (31%).

It should be pointed out that providing a separate right turn lane will indeed reduce the delay to right turn traffic since motorists making this movement would have exclusive use of the right lane. The SimTraffic results for the afternoon peak show a reduction in delay from 66.2 seconds per vehicle to 23.7 seconds per vehicle, a 64% reduction.

In addition to the increased delay and vehicle queues for the through movements, modifying the outside lane has other disadvantages. First, during the field observations, a relatively large number of vehicles were observed exiting the right-in/right-out driveway that is located on SR 121 between SR 24 and Windmeadows Boulevard. Most of these vehicles entered the outside lane and proceeded south through the SR 24/SR 121 intersection. If the outside lane becomes a right turn only lane, these vehicles will need to cross the right turn lane in order to enter a through lane, resulting in increased vehicle conflicts.

Second, restriping the outside lane will require the relocation of the existing bicycle lane that exists along SR 121. While FDOT Standard Index 17347 provides guidance to accomplish this transition, cyclists will be required to cross the right turning traffic in order to stay in the bicycle lane.

Finally, implementing this change would disrupt lane continuity on SR 121. The six-lane section of SR 121 begins just north of W. University Avenue, which is about 1 ¾ miles north of SR 24 and continues to SE Williston Road, a distance of approximately 1.6 miles south of SR 24. Converting the outside lane at SR 24 would eliminate lane continuity in the outside lane resulting in numerous lane changes, increasing the number of vehicle conflict points thus, potentially increasing the crash frequency.

As mentioned previously in this report, implementation of a right turn only restriction by time-of day would typically be done to relieve congestion during the peak periods. Since this study analyzed the effects of a right turn lane during the peak hours, a time-of-day implementation to address peak

hour conditions is not recommended for the same reasons as mentioned previously. In addition, time-of-day implementation would require significant enforcement to insure driver compliance.

In summary, the analysis shows that restriping the north approach of the SR 24/SR 121 intersection to provide a right turn lane and two through lanes either permanently or by time-of-day will slightly reduce the overall north approach delay and the through movement delay during the A.M. and Mid-day peak periods, but the approach delay and through movement delay is greatly increased during the P.M. peak period. Because the disadvantages of restriping the outside lane outweigh the advantages gained by the right-turn movement, it was determined that this improvement should not be recommended.

In addition to estimating the impacts of restriping the north approach of the SR 24/SR 121 intersection, the Synchro and SimTraffic analyses were used to identify other improvements that might be considered. The greatest improvement to traffic flow is expected to occur with the construction of a right-turn lane on the east approach of SR 24 at the SR 121 intersection. This improvement is expected to substantially reduce the existing queues and delays on the east approach, especially during the P.M. peak period. Lengthening the outside left turn lane on the north approach of SR 121 at the SR 24 intersection will also improve traffic operations at this location by providing additional storage for the left turning vehicles.

CONCEPTUAL PLANS – OPINION OF PROBABLE COSTS:

Conceptual plans highlighting the recommended improvements are provided for the Department's consideration (please see Figures 6-8). Based on these concepts, it appears a reasonable cost for these improvements is approximately $230,000. This estimate includes $30,000 for project unknowns and a 30% contingency (because these are relatively-small improvements and historical unit-cost prices may not apply). Also, this opinion does not include any right-of-way costs that may be needed (to reconstruct the proposed right-turn radius on the northeast corner). A detailed cost estimate is included in the report's Appendix.

CONCLUSION:

Based on the Synchro/SimTraffic analyses and our site investigations, restriping the outside lane of the north approach of the SR 24/SR 121 intersection to form a right turn only lane would reduce delay to the right turn movement. However, the delay to the north approach would be increased since the number of through lanes would be reduced from three lanes to two. In addition, the through traffic on this approach is expected to queue beyond the Windmeadows Boulevard intersection.

This study also identified other improvements that could improve traffic operations at the intersection. Constructing a right turn lane on the east approach of SR 24 at the SR 121 intersection will greatly reduce delay and vehicle queues, especially during the afternoon peak when frequently traffic backs up more than a mile in length. In addition, lengthening one of the left turn lanes on the north approach of SR 121 at the same intersection will improve traffic operations by providing additional storage for the vehicles turning left.

APPENDIX

1. **Turning Movement Counts – January, 2013**
2. **Traffic Signal Timing Sheets**
3. **Collision Summaries**
4. **Synchro/SimTraffic Reports (On CD only)**
5. **Trends Results**
6. **Cost Estimate**