FEASIBILITY STUDY

State Road 421 at State Road 5A Section 79230 – M.P. 2.382 Volusia County

Prepared for:

RIVER TO SEA TRANSPORTATION PLANNING ORGANIZATION



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February 2017

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EXECUTIVE SUMMARY

Traffic Engineering Data Solutions, Inc. (TEDS) was retained on behalf of the River to Sea Transportation Planning Organization (R2CTPO) to conduct an Intersection Analysis at the intersection of State Road 421 and State Road 5A located in Port Orange (Volusia County), Florida. The intent of the study was to evaluate the need for a westbound right-turn lane to and the feasibility of installation.

A total of three (3) rear-end crashes have occurred between January 1, 2011 and December 31, 2015 on the outside through lane of westbound State Road 421, within 300 feet east of State Road 5A. During the midday and afternoon peak-hour observations at the westbound approach, as many as ten (10) vehicles were observed to be in queue on the outside westbound through lane. During both the morning and afternoon peak-hour observations, westbound approaching vehicles rarely had to slow down slightly due to a vehicle in front slowing down to turn right onto State Road 5A.

Based on the data collected, field observations, alternatives analyses, and engineering judgement, installing a westbound right-turn lane at the intersection of State Road 421 and State Road 5A will provide for enhanced operations and safety at the intersection with the benefits expected to be more significant as traffic volumes continue to grow in the area.

The engineering and construction costs associated with this improvement are estimated at approximately \$764,988. Acquisition of 0.02 acres of right-of-way is anticipated to be required for this improvement, which is included in the estimate.

1 INTRODUCTION

Traffic Engineering Data Solutions, Inc. (TEDS) was retained on behalf of the River to Sea Transportation Planning Organization (R2CTPO) to conduct a Feasibility Study at the intersection of State Road 421 and State Road 5A located in Port Orange (Volusia County), Florida. The study was requested by the City of Port Orange. The intent of the study was to evaluate the need for a westbound right-turn lane to enhance the operation and overall safety of the intersection and the feasibility of constructing the improvement. A location map of the study intersection is shown below as *Figure 1*.

The analysis methods used in completing this study are consistent with the <u>Manual on Uniform</u> <u>Traffic Control Devices</u> (MUTCD), <u>Manual on Uniform Traffic Studies</u> (MUTS), and engineering judgment. This report documents existing conditions, vehicle / pedestrian / bicycle counts, crash analysis, qualitative assessment, and recommendations.



Figure 1 General Location Map

Source: Google Maps

2 EXISTING CONDITIONS

State Road 421 (Dunlawton Avenue) is an east-west arterial that extends from Interstate 95 through Port Orange east to US 1 where it turns into State Road A1A. As shown in *Figure 2*, State Road 421 is a six-lane divided arterial west of the study intersection and a four-lane divided arterial east of the study intersection. State Road 5A (Nova Road) is a north-south arterial that extends from US 1 south of Port Orange to US 1 in Ormond Beach. State Road 5A is a four-lane divided arterial south of the study intersection and a five-lane undivided arterial north of the study intersection. Large shopping centers are at the southwest, southeast, and northeast quadrants of the intersection, and Halifax health Medical Center of Port Orange and a smaller shopping center are northeast of the intersection. It should be noted that the existing sidewalk and pedestrian signal components located on the northeast corner of the intersection appear to encroach into private property.

Table 1 on the following page summarizes the existing conditions for the study intersection. An existing condition diagram depicts details of the study intersection and surrounding area and is provided as *Figure 2*. Photographs of the study intersection are included within this study. A straight line diagram is also included in the *Appendix*.

Table 1Existing ConditionsState Road 421 at State Road 5A

Feature	Description
Main Street	State Road 421 (Dunlawton Avenue)
Side Street	State Road 5A (Nova Road)
Area Location	Port Orange (Volusia County), Florida
Adjacent Land Uses	 <u>Southwest:</u> Firestone Complete Auto Care, Countryside Shopping Center <u>Southeast:</u> Burger King restaurant, Dunlawton Square shopping center <u>Northwest:</u> CVS pharmacy, Wawa gas station <u>Northeast:</u> Bank of America Financial Center, Park Place Plaza shopping center
Traffic Control	Signalized with protected-only left-turn phasing in all 4 directions
Adjacent Signalized Intersections	 <u>South:</u> Village Trail – 0.22 miles <u>North:</u> Herbert Street – 0.75 miles <u>West:</u> Village Trail/N Swallow Tail Drive – 0.51 miles <u>East:</u> Spruce Creek Road – 0.91 miles
State Road 421	 <u>Cross Section:</u> 6-lane divided arterial (no curb or gutter) with bike lanes west of the intersection, and 4-lane divided arterial (no curb or gutter) with paved shoulders east of the intersection. <u>Access:</u> Class 5 <u>Posted Speed Limit:</u> 45 mph <u>AADT 2015:</u> 38,500 vehicles per day (vpd) west of the intersection; 30,500 vpd east of the intersection <u>Eastbound Approach Lanes:</u> 2 left-turn lanes, 3 through lanes, and 1 channelized right-turn lane <u>Westbound Approach Lanes:</u> 2 left-turn lanes and 3 through lanes <u>Intersection Alignment:</u> 90-degrees <u>Pedestrian Crossings:</u> Across the east and west approaches <u>Sidewalks:</u> Along both sides of the roadway <u>Utilities:</u> Overhead power lines along the south side of the intersection; and on the southeast, northwest, and northeast corners of the intersection; and on the southeast, northwest, and northeast corners of the intersection
State Road 5A	 <u>Cross Section:</u> 4-lane divided arterial (curb and gutter) with bike lanes south of the intersection, and 5-lane undivided arterial (curb and gutter) with two-way continuous left-turn lane and bike lanes <u>Posted Speed Limit:</u> 45 mph <u>AADT 2015:</u> 27,000 vpd south of the intersection; 28,000 vpd north of the intersection <u>Northbound Approach Lanes:</u> 2 left-turn lanes, 2 through lanes, and 1 right-turn lane <u>Southbound Approach Lanes:</u> 2 left-turn lanes, 2 through lanes, and 1 right-turn lane <u>Southbound Approach Lanes:</u> 2 left-turn lanes, 2 through lanes, and 1 right-turn lane <u>Southbound Approach Lanes:</u> 2 left-turn lanes, 2 through lanes, and 1 right-turn lane <u>Southbound Approach Lanes:</u> 2 left-turn lanes, 2 through lanes, and 1 right-turn lane <u>Southbound Approach Lanes:</u> 2 left-turn lanes, 2 through lanes, and 1 right-turn lane <u>Southbound Approach Lanes:</u> 2 left-turn lanes, 2 through lanes, and 1 right-turn lane <u>Southbound Approach Lanes:</u> 1 left-turn lanes, 2 through lanes, and 1 right-turn lane <u>Southbound Approach Lanes:</u> 2 left-turn lanes, 2 through lanes, and 1 right-turn lane <u>Southbound Approach Lanes:</u> 1 left-turn lanes, 2 through lanes, and 1 right-turn lane <u>Pedestrian Crossings:</u> Across the north and south approaches <u>Sidewalks:</u> Along both sides of the roadway <u>Utilities:</u> Overhead power lines along the west side of the roadway <u>Street Lighting:</u> Along the east side of the roadway





Eastbound Approach Photographs State Road 421 at State Road 5A

Looking East Towards Intersection



Looking West Away From Intersection

Westbound Approach Photographs State Road 421 at State Road 5A



Looking West Towards Intersection



Looking East Away From Intersection



Northbound Approach Photographs State Road 421 at State Road 5A

Looking North Towards Intersection



Looking South Away From Intersection



Southbound Approach Photographs State Road 421 at State Road 5A

Looking South Towards Intersection



Looking North Away From Intersection

Traffic Volumes

Twenty-four hour weekday approach counts, included in the *Appendix,* were conducted on all four (4) approaches at the study intersection. According to these counts, the intersection had a daily traffic volume of 60,757 vehicles that entered the intersection consisting of 17,653 eastbound vehicles, 16,393 westbound vehicles, 11,955 northbound vehicles, and 14,756 southbound vehicles.

Based on a review of the twenty-four hour count data eight (8) hours of manual turning



- (5) 2:45 PM to 3:45 PM Pk-Hr Volume
- During the eight (8) hours of manually collected turning movement counts, heavy trucks, which include single-unit trucks such as delivery trucks (Class 5 to 7) and tractor-trailer trucks (Class 8 to 15), accounted for approximately 1.0% (431 vehicles) of the traffic passing through the State Road 421 at State Road 5A intersection.



Summaries of vehicle, pedestrian, and bicycle movements; approach count data; and manually collected turning movement count data are provided in the *Appendix*.

Collision Data

Crash data for the study intersection for a 60-month period (January 1, 2011 to December 31, 2015) was obtained from FDOT's CAR database and University of Florida's *Signal Four Analytics*. One-hundred seventeen (117) crashes were reported and consisted of the following crash types:

- o 57 rear-end;
- 17 side-swipe;
- Ten (10) angle;
- Nine (9) left-turn;
- Nine (9) fixed-object;
- Six (6) right-turn;
- Four (4) bicycle;
- Two (2) overturn;
- One (1) pedestrian;
- One (1) head-on; and,
- One (1) off-road.
- The crashes resulted in one (1) fatality, 42 injuries, and \$394,738 in estimated property damage.
- Ninety-two (92) of the crashes occurred during the day and the remaining 25 occurred at night.
- One-hundred four (104) crashes occurred under dry pavement conditions and the remaining 13 occurred under wet pavement conditions.
- A total of three (3) rear-end crashes occurred in the outside through lane of westbound State Road 421, within 300 feet east of State Road 5A. The crashes resulted in three (3) injuries and \$5,200 in estimated property damage.
- Four (4) bicycle crashes and one (1) pedestrian crash occurred within the crosswalk of the west leg of the intersection. Two (2) of the crashes occurred when a southbound right-turning vehicle struck a northbound pedestrian or bicyclist that was crossing under a "Walk" indication. Two (2) bicycle crashes occurred when a bicyclist was crossing without activating the "Walk" indication. One (1) bicycle crash occurred when emergency preemption was activated for the signal as a fire truck was approaching; the walk phase was immediately terminated for a northbound bicyclist and upon receiving a green signal indication an eastbound vehicle struck the bicyclist. In addition to these five (5) pedestrian and bicycle crashes, one (1) rear-end crash occurred when eastbound right-turning vehicles had to brake suddenly as a pedestrian in a wheel chair crossed the channelized eastbound right-turn lane within the crosswalk.

A detailed collision summary of the intersection is provided on the following pages as **Table 2**. A collision diagram is also provided as **Figure 5**.

Table 2
Collision Summary
State Road 421 at State Road 5A

	FLORIDA DEPARTMENT OF TRANSPORTATION													
					COL	LISIO	N SUM	MARY						
Section:		79230					State Road:	421			County:	Volusia		
Intersectin	g route:	State Roa	nd 5A				Milepost:	2.382			Data by	AJP		
Study perio	od:	1/1/2011	to	12/31/2	2015					Date:	1/12/2017			
NO.	DATE	DAY	TIME	FATAL	INJURY	INJURY SEVERITY	PROPERTY DAMAGE	HARMFUL EVENT	DUI	DAY / NIGHT	WET / DRY	CONTRIBUTING CAUSE		
1	01/15/11	Saturday	22:15	0	2	3	\$10,000	Left-Turn	No	Night	Dry	Disregarded Traffic Contro		
2	04/09/11	Saturday	15:11	0	1	3	\$400	Rear-End	No	Day	Dry	Careless Driving		
3	04/12/11	Tuesday	7:54	0	1	2	\$70	Bicycle	No	Day	Dry	Careless Driving		
4	05/13/11	Friday	19:21	0	2	3	\$9,000	Rear-End	No	Day	Wet	Careless Driving		
5	08/09/11	Tuesday	14:01	0	2	3	\$2,000	Rear-End	No	Day	Wet	Too Fast For Conditions		
6	08/14/11	Sunday	17:47	0	2	3	\$6,000	Angle	No	Day	Dry	Disregarded Traffic Contro		
7	09/23/11	Friday	1:58	0	0	1	\$9,500	Angle	No	Day	Wet	Careless Driving		
8	11/15/11	Tuesday	15:08	1	0	6	\$1,200	Off-Road	No	Day	Dry	Medical		
9	11/18/11	Friday	9:14	0	1	4	\$7,500	Angle	No	Day	Dry	Disregarded Traffic Contro		
10	11/28/11	Monday	15:40	0	0	1	\$1,000	Left-Turn	No	Day	Dry	Disregarded Traffic Contro		
11	12/26/11	Monday	14:56	0	3	2	\$1,100	Rear-End	No	Day	Dry	Careless Driving		
12	01/20/12	Friday	10:08	0	1	2	\$7,000	Rear-End	No	Day	Dry	Careless Driving		
13	03/26/12	Monday	14:43	0	0	1	\$500	Right-Turn	No	Day	Dry	FTYRW		
14	05/11/12	Friday	7:43	0	0	1	\$1,000	Side-Swipe	No	Day	Dry	Improper Lane Change		
15	05/21/12	Monday	11:33	0	0	1	\$1,500	Rear-End	No	Day	Dry	Careless Driving		
16	05/27/12	Sunday	9:54	0	1	2	\$7,500	Overturn	No	Night	Wet	Too Fast For Conditions		
17	06/18/12	Monday	12:16	0	0	1	\$3,000	Side-Swipe	No	Day	Dry	Improper Turn		
18	07/06/12	Friday	16:35	0	1	3	\$300	Rear-End	No	Day	Dry	Careless Driving		
19	07/07/12	Saturday	20:33	0	0	1	\$7,000	Right-Turn	No	Night	Dry	Improper Turn		
20	07/21/12	Saturday	13:35	0	0	1	\$400	Side-Swipe	No	Day	Dry	Improper Turn		
21	07/31/12	Tuesday	13:47	0	0	1	\$5,000	Right-Turn	No	Day	Dry	Improper Turn		
22	08/04/12	Saturday	16:14	0	0	1	\$1,100	Rear-End	No	Day	Wet	Careless Driving		
23	08/12/12	Sunday	17:54	0	0	1	\$1,700	Rear-End	No	Day	Dry	Careless Driving		
24	08/16/12	Thursday	12:31	0	1	3	\$700	Bicycle	No	Day	Dry	Disregarded Traffic Contro		
25	11/12/12	Monday	8:43	0	3	3	\$5,000	Angle	No	Day	Dry	Disregarded Traffic Contro		
26	12/04/12	Tuesday	9:50	0	0	1	\$1,000	Rear-End	No	Day	Dry	Careless Driving		
27	01/09/13	Wednesday	21:13	0	0	1	\$3,000	Rear-End	No	Day	Dry	Following Too Closely		
28	01/22/13	Tuesday	14:02	0	1	2	\$100	Rear-End	No	Day	Dry	Careless Driving		
29	01/24/13	Thursday	9:55	0	2	4	\$10,000	Angle	No	Day	Dry	Disregarded Traffic Contro		
30	01/31/13	Thursday	9:19	0	0	1	\$4,000	Right-Turn	No	Day	Dry	FTYRW		
31	01/31/13	Thursday	14:34	0	0	1	\$1,000	Rear-End	No	Day	Dry	Careless Driving		
32	02/01/13	Friday	14:03	0	0	1	\$1,500	Side-Swipe	No	Day	Dry	Improper Lane Change		
33	02/01/13	Friday	21:17	0	0	1	\$300	Rear-End	No	Night	Dry	Careless Driving		
34	02/17/13	Sunday	9:21	0	1	4	\$10,000	Fixed-Object	No	Day	Dry	Lost Control		
35	02/23/13	Saturday	12:52	0	0	1	\$250	Side-Swipe	No	Day	Dry	Improper Lane Change		

Table 2 (cont.) Collision Summary State Road 421 at State Road 5A

	COLLISION SUMMARY															
Section:		79230					State Road:	421		County: Volusia						
Intersecting	g route:	State Roa	ıd 5A				Milepost:	2.382			Data by: AJP					
Study perio	od:	1/1/2011	to	12/31/2	2015						Date:	1/12/2017				
NO.	DATE	DAY	TIME	FATAL	INJURY	INJURY SEVERITY	PROPERTY DAMAGE	HARMFUL EVENT	DUI	DAY / NIGHT	WET / DRY	CONTRIBUTING CAUSE				
36	03/07/13	Thursday	14:54	0	0	1	\$1,500	Rear-End	No	Day	Dry	Careless Driving				
37	03/09/13	Saturday	21:14	0	0	1	\$1,500	Rear-End	No	Night	Dry	Careless Driving				
38	03/20/13	Wednesday	1:00	0	1	3	\$0	Pedestrian	No	Night	Dry	FTYRW				
39	03/22/13	Friday	15:15	0	2	3	\$9,000	Left-Turn	No	Day	Dry	FTYRW				
40	04/01/13	Monday	16:15	0	1	3	\$1,000	Rear-End	No	Day	Dry	Careless Driving				
41	04/18/13	Thursday	15:19	0	0	1	\$2,200	Rear-End	No	Day	Dry	Careless Driving				
42	05/13/13	Monday	15:36	0	2	4	\$10,000	Left-Turn	No	Day	Dry	FTYRW				
43	06/01/13	Saturday	9:21	0	0	1	\$750	Rear-End	No	Day	Dry	Careless Driving				
44	06/10/13	Monday	16:12	0	0	1	\$700	Rear-End	No	Day	Dry	Careless Driving				
45	07/22/13	Monday	12:27	0	0	1	\$2,000	Rear-End	No	Day	Dry	Careless Driving				
46	08/27/13	Tuesday	14:30	0	0	1	\$1,250	Rear-End	No	Day	Dry	Careless Driving				
47	08/28/13	Wednesday	11:12	0	0	1	\$1,010	Side-Swipe	No	Day	Dry	Careless Driving				
48	08/31/13	Saturday	12:26	0	0	1	\$2,300	Side-Swipe	No	Day	Dry	Improper Lane Change				
49	09/09/13	Monday	5:55	0	0	1	\$200	Fixed-Object	No	Day	Dry	Improper Turn				
50	09/21/13	Saturday	18:24	0	0	1	\$4,000	Rear-End	No	Day	Dry	Careless Driving				
51	09/25/13	Wednesday	17:45	0	0	1	\$0	Rear-End	No	Day	Dry	Following Too Closely				
52	09/26/13	Thursday	16:45	0	0	1	\$4,000	Rear-End	No	Day	Dry	Careless Driving				
53	09/30/13	Monday	15:21	0	2	2	\$50	Rear-End	No	Day	Dry	Careless Driving				
54	10/31/13	Thursday	22:50	0	0	1	\$4,000	Angle	No	Day	Dry	Driver Distraction				
55	11/16/13	Saturday	16:26	0	0	1	\$700	Rear-End	No	Day	Wet	Careless Driving				
56	11/21/13	Thursday	6:56	0	0	1	\$5,000	Rear-End	No	Day	Wet	Following Too Closely				
57	11/22/13	Friday	4:23	0	0	1	\$9,000	Angle	No	Night	Dry	Disregarded Traffic Contro				
58	11/25/13	Monday	14:06	0	1	2	\$1,100	Rear-End	No	Day	Dry	Careless Driving				
59	12/24/13	Tuesday	12:28	0	1	3	\$7,500	Rear-End	No	Day	Dry	Following Too Closely				
60	12/25/13	Wednesday	21:57	0	0	1	\$350	Side-Swipe	No	Night	Dry	Improper Turn				
61	02/09/14	Sunday	16:30	0	0	1	\$500	Rear-End	No	Day	Dry	Following Too Closely				
62	02/25/14	Tuesday	15:37	0	0	1	\$2,000	Right-Turn	No	Day	Dry	Improper Turn				
63	04/08/14	Tuesday	14:31	0	0	1	\$1,500	Rear-End	No	Day	Wet	Careless Driving				
64	04/16/14	Wednesday	21:45	0	0	1	\$500	Rear-End	No	Night	Dry	Too Fast For Conditions				
65	05/14/14	Wednesday	8:49	0	0	1	\$1,250	Side-Swipe	No	Day	Dry	Careless Driving				
66	06/29/14	Sunday	14:12	0	2	3	\$4,000	Side-Swipe	No	Day	Dry	Improper Lane Change				
67	07/08/14	Tuesday	20:18	0	1	3	\$13,000	Rear-End	No	Night	Wet	Careless Driving				
68	07/17/14	Thursday	12:03	0	1	3	\$3,500	Rear-End	No	Day	Dry	Driver Distraction				
69	07/29/14	Tuesday	21:15	0	0	1	\$1,100	Side-Swipe	No	Night	Dry	Improper Turn				
70	08/08/14	Friday	15:42	0	0	1	\$3,000	Side-Swipe	No	Day	Dry	Improper Lane Change				
71	09/01/14	Monday	19:21	0	1	3	\$1,500	Rear-End	Yes	Day	Dry	DUI				
72	09/06/14	Saturday	1:04	0	1	3	\$25,000	Left-Turn	Yes	Night	Dry	Disregarded Traffic Contro				

Table 2 (cont.) Collision Summary State Road 421 at State Road 5A

	COLLISION SUMMARY														
Section:		79230					State Road:		County: Volusia						
Intersecting	g route:	State Roa	nd 5A				Milepost:	2.382		Data by: AJP					
Study perio	od:	1/1/2011	to	12/31/2	2015						Date:	1/12/2017			
NO.	DATE	DAY	TIME	FATAL	INJURY	INJURY SEVERITY	PROPERTY DAMAGE	HARMFUL EVENT	DUI	DAY / NIGHT	WET / DRY	CONTRIBUTING CAUSE			
73	09/06/14	Saturday	13:25	0	1	3	\$2,000	Side-Swipe	No	Day	Dry	Improper Lane Change			
74	09/22/14	Monday	15:52	0	0	1	\$1,500	Rear-End	No	Day	Wet	Careless Driving			
75	09/24/14	Wednesday	12:09	0	1	3	\$5,500	Rear-End	No	Day	Dry	Careless Driving			
76	10/11/14	Saturday	14:10	0	0	1	\$50	Side-Swipe	No	Day	Dry	Improper Lane Change			
77	10/15/14	Wednesday	16:39	0	2	3	\$6,000	Left-Turn	No	Day	Dry	Disregarded Traffic Contro			
78	10/22/14	Wednesday	8:08	0	1	3	\$10,100	Rear-End	Yes	Night	Dry	DUI			
79	10/27/14	Monday	14:52	0	0	1	\$600	Bicycle	No	Day	Dry	Disregarded Traffic Contro			
80	11/05/14	Wednesday	5:29	0	0	1	\$1,904	Fixed-Object	No	Night	Dry	Improper Turn			
81	12/07/17	Thursday	0:26	0	0	1	\$2,000	Rear-End	No	Night	Dry	Driver Distraction			
82	12/09/14	Tuesday	12:25	0	0	1	\$2,500	Rear-End	No	Day	Dry	Following Too Closely			
83	12/11/14	Thursday	9:35	0	0	1	\$350	Side-Swipe	No	Day	Dry	Improper Lane Change			
84	12/11/14	Thursday	14:27	0	0	1	\$20,000	Left-Turn	No	Day	Dry	Disregarded Traffic Contro			
85	12/13/14	Saturday	12:11	0	0	1	\$3,500	Rear-End	No	Day	Dry	Careless Driving			
86	12/16/14	Tuesday	15:29	0	0	1	\$2,200	Fixed-Object	No	Day	Dry	Improper Turn			
87	12/17/14	Wednesday	17:00	0	0	1	\$1,300	Fixed-Object	No	Day	Dry	Improper Turn			
88	12/27/14	Saturday	21:00	0	0	1	\$0	Fixed-Object	No	Day	Dry	Improper Turn			
89	01/01/15	Thursday	18:36	0	1	3	\$500	Overturn	No	Night	Wet	Lost Control			
90	01/08/15	Thursday	9:27	0	0	1	\$5,000	Rear-End	No	Day	Dry	Careless Driving			
91	01/08/15	Thursday	15:30	0	0	1	\$8,500	Angle	No	Day	Dry	FTYRW			
92	01/15/15	Thursday	6:09	0	0	1	\$10,500	Rear-End	Yes	Night	Dry	DUI			
93	01/15/15	Thursday	9:36	0	0	1	\$600	Rear-End	No	Day	Dry	Careless Driving			
94	01/15/15	Thursday	13:46	0	0	1	\$3,000	Fixed-Object	No	Day	Dry	Improper Turn			
95	02/03/15	Tuesday	8:40	0	0	1	\$1,500	Side-Swipe	No	Day	Dry	Improper Lane Change			
96	02/19/15	Thursday	8:13	0	1	2	\$1,500	Rear-End	No	Day	Dry	Careless Driving			
97	03/03/15	Tuesday	8:20	0	1	2	\$0	Rear-End	No	Day	Dry	Careless Driving			
98	03/16/15	Monday	23:32	0	0	1	\$904	Fixed-Object	No	Night	Dry	Unknown			
99	04/04/16	Monday	0:21	0	0	1	\$1,000	Left-Turn	No	Night	Dry	Disregarded Traffic Contro			
100	04/24/15	Friday	10:38	0	0	1	\$100	Rear-End	No	Day	Dry	Careless Driving			
101	06/05/15	Friday	8:54	0	1	2	\$1,550	Rear-End	No	Day	Dry	Careless Driving			
102	06/20/15	Saturday	8:50	0	2	3	\$2,000	Rear-End	No	Day	Dry	Following Too Closely			
103	07/10/15	Friday	18:34	0	1	2	\$200	Rear-End	No	Day	Dry	Careless Driving			
104	07/13/15	Monday	7:45	0	0	1	\$2,000	Side-Swipe	No	Day	Dry	Reckless Driving			
105	07/23/15	Thursday	13:39	0	1	3	\$1,300	Rear-End	No	Day	Dry	Improper Lane Change			
106	08/04/15	Tuesday	22:42	0	1	3	\$2,000	Rear-End	No	Night	Dry	Drowsiness			
107	08/17/15	Monday	20:09	0	0	1	\$9,000	Right-Turn	No	Night	Dry	FTYRW			
108	09/03/15	Thursday	9:20	0	1	2	\$12,500	Angle	No	Day	Dry	FTYRW			
109	09/12/15	Saturday	20:24	0	0	1	\$4,000	Head-On	Yes	Night	Dry	DUI			

Table 2 (cont.)	
Collision Summary	
State Road 421 at State Road 5A	١

					C O I	LISIO	N SUM	MARY					
Section:		79230					State Road:	421			County:	Volusia	
Intersecting	g route:	State Roa	d 5A				Milepost:	2.382			Data by:	AJP	
Study perio	d:	1/1/2011	to	12/31/2	2015						Date:	1/12/2017	
NO.	DATE	DAY	TIME	FATAL	INJURY	INJURY SEVERITY	PROPERTY DAMAGE	HARMFUL EVENT	DUI	DAY / NIGHT	WET / DRY	CONTRI CAU	BUTING JSE
110	09/23/15	Wednesday	14:46	0	0	1	\$5,000	Rear-End	No	Day	Dry	Improper L	ane Change
111	10/10/15	Saturday	21:10	0	0	1	\$2,000	Fixed-Object	No	Night	Dry	Reckless	Driving
112	11/08/15	Sunday	22:50	0	0	1	\$3,500	Left-Turn	No	Night	Dry	Disregarded T	raffic Contro
113	11/18/15	Wednesday	7:45	0	0	1	\$2,000	Rear-End	No	Day	Wet	Careless	Driving
114	11/28/15	Saturday	15:38	0	0	1	\$2,500	Angle	No	Day	Dry	Disregarded T	raffic Contro
115	12/09/15	Wednesday	21:25	0	0	1	\$1,500	Rear-End	Yes	Night	Dry	D	UI
116	12/15/15	Tuesday	9:13	0	0	1	\$4,500	Rear-End	No	Day	Dry	Careless	Driving
117	12/28/15	Monday	13:43	0	1	3	\$0	Bicycle	No	Day	Wet	FTY	RW
TOTAL				1	57		\$394,738						
TOTAL NO.	Fatal	Injury	Pro Dama	operty age Only	Bicycle	Left-Turn	Rear-End	Right-Turn	Ped	lestrian Ang		Side-Swipe	Fixed- Object
117	1	42	,	74	4	9	57	6		1	10	17	9
Percent	1%	36%	6	3%	3%	8%	49%	5%		1%	9%	15%	8%
CONTRIB- CAUSE	Day	Night	Pave Wet	ement Co Dry	ondition ?	FTYRW	Disregarded Traffic Control	Improper Lane Change	Fol Too	lowing Closely	DUI	Careless Driving	Improper Turn
Total	92	25	13	104	0	9	15	12		7	5	43	13
Percent	79%	21%	11%	89%	0%	8%	13%	10%		6% 4		37%	11%



3 QUALITATIVE ASSESSMENT

The intersection of State Road 421 at State Road 5A was observed during the peak hours by a registered professional engineer under sunny and clear conditions to assess existing operating conditions and to determine if installing a westbound right-turn lane would be potentially beneficial.

Operations:

Operations include the efficiency of operation and interaction of motor vehicles, pedestrians and bicycles at the study intersection. The goal of the observations was to determine the need for improvements to enhance the safety and efficiency of the study location.

- Sight distance is adequate for all motorists traveling in all directions.
- Traffic approaching the intersection was observed to travel in well-defined platoons, with the southbound approaching platoons being the least defined platoons.
- The traffic signal appeared to be coordinated for eastbound traffic as all other platoons typically arrived during a red-phase or portion thereof.
- The northbound and southbound left-turn movements operate under leading protectedonly control.
- The eastbound and westbound left-turn movements operate under lead/lag protectedonly control (westbound leads and eastbound lags).
- The eastbound approach on State Road 421 has three (3) through lanes, and departing the intersection, the outside through lane becomes a lane drop onto Jackson Street approximately 600 feet east of the intersection. Many of the cars in the outside through lane were observed merging into the middle lane to continue east on State Road 421. No issues or concerns were observed with this merging maneuver.

Midday Observation

• Bicyclist and pedestrian volumes were consistent with the volume counts. All crossed without issue or conflict with most using the pedestrian signals. One (1) pedestrian did cross the north leg during the southbound left-turn phase by waiting for a gap in vehicles and ultimately crossing the intersection without issue (see photograph below).



Traffic Engineering Data Solutions, Inc.

- No issues or concerns were observed with regard to potential conflicts between rightturning vehicles and pedestrians at any of the approaches.
- No queue spillbacks were observed for any of the left-turn movements.
- Several phase failures were noted as follows:
 - Eastbound left-turn movement one (1) phase failure
 - Northbound left-turn movement three (3) phase failures
 - Southbound left-turn movement six (6) phase failures
- The westbound-to-eastbound U-turn movement on State Road 421 was noticed to be relatively heavy (ranging from 59 vehicles per hour to 107 vehicles per hour based on the eight-hour turning movement counts). Most of the U-turns would then turn into the Dunlawton Square shopping center in the southeast quadrant of the intersection. No issues were observed with regard to these U-turns.
- The westbound through movement on State Road 421 has three lanes, including the outside lane which is a shared through/right-turn lane. The outside westbound through lane begins at Jackson Street, approximately 600 feet east of State Road 5A. The queues for the inside and middle westbound through lanes extended to just west of Jackson Street in most cases and in some cases extended beyond Jackson Street. The queue in the outside shared through/right-turn lane was typically noted to be considerably shorter, ranging between six (6) to ten (10) vehicles (see photograph below). The majority of vehicles in the outside lane were westbound through vehicles.



 Westbound right-turning vehicles did not impede or have any noticeable impact on the flow of westbound through vehicles through the intersection because westbound vehicles were passing through the intersection at lower speeds as the platoons typically arrived during a red-phase. Also, the radius in the northeast quadrant along with two (2) departing northbound lanes enables right-turning motorists to navigate the turn at slightly higher speeds than most typical right turns. Additionally, there is a four-foot paved shoulder, thus as right-turning vehicles begin their maneuver, the vehicles can move more quickly out of the way of the trailing westbound through vehicles. • On three (3) occasions, a westbound right-turning motorist stopped behind a westbound through vehicle at the intersection, snuck around the through vehicle, and performed a right-turn-on-red without issue.

Afternoon Observation

- Bicyclist and pedestrian volumes were consistent with the volume counts. All crossed without issue or conflict with most using the pedestrian signals.
- No issues or concerns were observed with regard to potential conflicts between rightturning vehicles and pedestrians at any of the approaches.
- No queue spillbacks were observed for any of the left-turn movements.
- Several phase failures were noted as follows:
 - Eastbound left-turn movement one (1) phase failure
 - Northbound left-turn movement one (1) phase failure
 - Southbound left-turn movement three (3) phase failures
- The southbound through movement was noticed to be considerably heavier during the afternoon as compared to the midday observation (695 vehicles per hour during the midday peak hour and 816 vehicles per hour during the afternoon peak hour based on the eight-hour turning movement counts). Regardless, all queues cleared within each respective signal cycle.
- When the eastbound left-turn movement had a green signal indication, several southbound right-turning motorists were observed to roll through the red light without coming to a complete stop. No issues were observed with regard to southbound right-turning vehicles.
- The westbound-to-eastbound U-turn movement was noticed to be relatively heavy. Most of the U-turns would then turn into the Dunlawton Square shopping center in the southeast quadrant of the intersection. No issues were observed with regard to these U-turns.
- The queues for the inside and middle westbound through lanes extended to just west of Jackson Street in most cases and in some cases extended beyond Jackson Street. When the queue extended beyond Jackson Street, the westbound motorists were typically good Samaritans, allowing eastbound left-turning motorists to turn onto Jackson Street. No issues were observed with regard to long westbound queues in the middle and through lanes.
- The queue in the westbound outside shared through/right-turn lane was typically noted to be considerably shorter than the adjacent westbound lanes. The majority of vehicles in the outside lane were westbound through vehicles.
- Westbound right-turning vehicles did not impede or have any noticeable impact on the flow of westbound through vehicles through the intersection because westbound vehicles were passing through the intersection at lower speeds as the platoons typically arrived during a red-phase. Also, the radius in the northeast quadrant along with two (2) departing northbound lanes enables right-turning motorists to navigate the turn at slightly higher speeds than most typical right turns.

Maintenance:

During the field reviews the condition of the study intersection's pavement, striping, signing and lighting were observed. The following are observations related to the maintenance of the intersection based on the various field reviews of the intersection:

- The roadway has recently been resurfaced; therefore the pavement markings and pavement conditions at the intersection of State Road 421 and State Road 5A are in very good condition.
- The signs are in good condition.
- The pedestrian push-button sign in the southeast quadrant for pedestrians looking to cross State Road 5A is missing (see photograph below). It is recommended to replace the pedestrian push-button sign.



• One (1) crash occurred when eastbound right-turning vehicles had to brake suddenly as a pedestrian in a wheel chair crossed the channelized eastbound right-turn lane within the crosswalk. It was observed that there are no signs warning drivers of possible

pedestrian crossings at the southwest quadrant (see photograph below). It is recommended to install a Pedestrian Crossing (W11-2) sign with a diagonal downward pointing arrow (W16-7P) plaque at the crosswalk.



Safety:

Vehicle, pedestrian, and bicycle safety at the intersection was assessed through review of crash reports, identification of significant crash trends, and correlations to field conditions. The following observations were made with respect to the safety of the study intersection:

- Skid marks were observed at all approaches, but no signs of broken glass, plastic, or other indication of a crash were observed at the intersection.
- Two (2) crashes occurred when a southbound right-turning vehicle struck a northbound pedestrian or bicyclist within the crosswalk of the west leg under a "Walk" indication. It is recommended to install a Right Turning Vehicles Yield to Pedestrians (R10-15R) sign for southbound motorists just north of the pedestrian signal head and adjacent to the north leg crosswalk and relocate the State Road 421 Directional Assembly so that is a minimum of 100 feet from the proposed sign.

4 IMPROVEMENT CONCEPT

As previously conveyed, the purpose of this study was to evaluate the need and feasibility of installing a westbound right-turn lane at the study intersection. For purposes of understanding the operational benefits of adding a westbound right-turn lane, capacity analyses were conducted for the midday and afternoon peak hours utilizing the Highway Capacity Software (HCS), existing turning movement counts, existing signal timings, and the existing and proposed intersection geometry. Based on the analyses with the existing intersection geometry (without an exclusive westbound right-turn lane), the intersection is projected to operate at LOS E (average delay of 68.3 seconds per vehicle) and LOS E (average delay of 74.9 seconds per vehicle) during the midday and afternoon peak hours, respectively. With the proposed westbound right-turn lane, the intersection is projected to operate at LOS E (average delay of 65.9 seconds per vehicle) and LOS E (average delay of 72.0 seconds per vehicle) during the midday and afternoon peak hours, respectively. Therefore, the average delay per vehicle will be reduced with the addition of the westbound right-turn lane. It is also important to note that the AASHTO's Highway Safety Manual (HSM) provides a crash modification factor of 0.96 for the installation of a right-turn lane on a major roadway at a signalized intersection thus indicating that such improvement has been shown to reduce all crashes at an intersection by four percent (4%). Therefore, the installation of a westbound right-turn lane will provide both safety and operational benefits for the intersection and the benefits are expected to increase as traffic volumes increase.

An improvement concept was developed for the installation of a westbound right-turn lane at the State Road 421 at State Road 5A intersection. Per FDOT's 2016 Design Standards, Index 301, a westbound right-turn lane length of 390 feet (inclusive of a 50-foot taper) is recommended, based on a 150-foot queue length and 240 feet of deceleration for a design speed of 50 mph using rural conditions (see *Figure 6*). Details of the proposed improvement are provided below and a typical section is included as the first item of the *Appendix*:

- Remove existing 5-foot wide paved shoulder to construct a 12-foot wide, 390-foot long westbound right-turn lane with a 5-foot wide keyhole bike lane and Type F curb and gutter along the turn lane.
- Remove approximately 490 feet of existing 8-foot sidewalk and construct proposed 8-foot sidewalk at back of curb.
- Reconfigure existing roadside ditch as necessary and sod.
 - Remove two (2) existing MES's and construct new curb inlets with J-bottoms which connect to the existing driveway side drains.
 - Remove existing ditch bottom inlet and pipe, adjust existing manhole to finished grade, and connect proposed storm pipe from existing manhole to proposed curb inlet with J-bottom near the Walgreens driveway.
 - Adjust existing telephone manhole located within proposed right turn lane to existing grade.
 - Construct two (2) MES's to receive runoff from adjacent properties with pipe connections to proposed curb inlets.

- Acquire approximately 0.02 acre of right-of-way at the northeast corner (Bank of America Financial Center) in order to completely construct the curb and gutter, curb ramp, and sidewalk and eliminate the existing encroachment.
- Install directional arrows and pavement markings.
- In the northeast quadrant, remove the existing pedestrian signal head and detector for the east leg crosswalk and install a new pedestrian signal head and detector.
- Adjust stop line and pedestrian crosswalk pavement markings on the east leg of the intersection and extend pedestrian crosswalk pavement markings on the north leg of the intersection.
- Reconstruct curb ramps and Type F curb and gutter on the northeast corner of the intersection.
- Reconstruct pedestrian refuge island.
- Relocate four (4) signs.
- Relocate luminaires behind proposed 8-foot sidewalk.
- Reconstruct Bank of America driveway to meet proposed right-turn lane.
- Replace impacted loops and pull boxes.
- Install a 3-section signal head for westbound traffic so that there is one (1) signal head for each westbound through lane. Also, install backplates to all of the eastbound and westbound signal heads.
 - A structural analysis of the mast arm will be required. As a part of this analysis, consideration should be given to shifting the overhead street name sign closer to the upright.
 - If the structural analysis concludes the mast arm cannot accommodate the additional loading, then an additional analysis should be conducted to determine if the mast arm can accommodate the additional signal head without the addition of backplates. FDOT has conveyed that they are acceptable to <u>not</u> adding the 3rd westbound through signal head and/or backplates given the additional costs associated with replacing the mast-arm.
- Adjust signal timings due to the extension of the pedestrian crosswalks.

Construction of a right turn lane would typically qualify for exemption from Environmental Resource Permit (ERP) under FAC 62-330.051. However, under Application No. 22818-1, the St. Johns River Water Management District (SJRWMD) previously issued an ERP for the widening of State Road 5A in 1988, to which there have been several subsequent modifications. As such, a permit modification is expected to be required from SJRWMD.

The overall improvement costs were estimated based on FDOT historical unit prices. The total cost of the improvements, including engineering and CEI, is estimated at approximately \$728,882 and is provided in *Table 3*.



	TABLE 3 ENGINEER'S OPINION OF PROBABLE C VOLUSIA COUNTY STATE ROAD 421 AT NOVA ROAD	OSTS								
ITEM	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	AMOUNT					
I. ROADWAY				· · · · · ·						
102-1	MOBILIZATION (25%)	1	LS	\$103,480.46	\$103,480.46					
104-10-3	SEDIMENT BARRIER	500	LF	\$1.13	\$565.00					
110-1-1	CLEARING AND GRUBBING	0.421	AC	\$12,730.10	\$5,359.37					
110-4	REMOVAL OF EXISTING CONCRETE PAVEMENT	612	SY	\$21.02	\$12,864.24					
120-1	REGULAR EXCAVATION	42	CY	\$4.49	\$188.58					
120-6		973	CY SV	\$9.39	\$40.95 \$7 978 73					
285-701	OPTIONAL BASE BASE GROUP 01	992	SY	\$9.55	\$9,473,60					
334-1-13	SUPERPAVE ASPH CONC, TRAFFIC C (1")	52	TN	\$96.50	\$5,018.00					
337-7-55	ASPH CONC FC, TRAFFIC C, FC-12.5, PG 82-22 (1.5")	78	TN	\$88.99	\$6,941.22					
425-1411	INLETS, CURB TYPE J-1, <10'	2	EA	\$7,282.12	\$14,564.24					
425-5	MANHOLE, ADJUST	2	EA	\$562.85	\$1,125.70					
430-982-123	MITERED END SECTION, OPTIONAL ROUND, 15" CD	2	EA	\$1,071.31	\$2,142.62					
430-174-115	PIPE CULVERT, OPTIONAL MATERIAL, ROUND 15" SD	95	LF	\$75.00	\$7,125.00					
430-1/4-124	PIPE CULVERT, OPTIONAL MATERIAL, ROUND 24" SD	115		\$86.95	\$9,999.25					
520-1-10		505	LF SV	\$17.31	\$6,700.95 \$23,779.60					
527-2	DETECTABLE WARNINGS	24	SF	\$31.15	\$747.60					
570-1-2	PERFORMANCE TURF, SOD	524	SY	\$2.30	\$1,205.20					
III. SIGNAI				SUBTOTAL	\$216,262.29					
630-2-11	CONDUIT, F&L OPEN TRENCH	400	LF	\$7.89	\$3,156.00					
630-2-12	CONDUIT, F&I, DIRECTIONAL BORE	200	LF	\$15.09	\$3,018.00					
632-7-1	SIGNAL CABLE- NEW OR RECO, FUR & INSTALL	1	PI	\$4,925.72	\$4,925.72					
635-2-11	PULL & SPLICE BOX, F&I, 13" x 24"	5	EA	\$566.09	\$2,830.45					
646-1-12	ALUMINUM SIGNALS POLE, PED DETECT POST	2	EA	\$738.70	\$1,477.40					
650-1311	TRAFFIC SIGNAL,F&I,3 SECT,1 WAY,ALUMINUM	1	AS	\$1,037.25	\$1,037.25					
653-1-11	PEDESTRIAN SIGNAL, F&I LED COUNT, 1 WAY	2	AS	\$672.04	\$1,344.08					
653-1-60		2	AS	\$74.14	\$148.28 \$4.245.62					
660-2-102	LOOP ASSEMBLY, F&I, TYPE B	2	ΔS	\$724.27	\$4,545.62					
665-1-11	PEDESTRIAN DETECTOR, F&I, STANDARD	2	EA	\$260.86	\$521.72					
665-1-60	PEDESTRIAN DETECTOR, REMOVE	2	EA	\$60.71	\$121.42					
671-2-40	TRAFFIC CONTROLLER, MODIFY	1	EA	\$3,307.77	\$3,307.77					
700-5-22	INTERNAL ILLUM SIGN, F&I OM, 12-18 SF	1	EA	\$3,236.20	\$3,236.20					
700-5-60	INTERNAL ILLUM SIGN, REMOVE	1	EA	\$185.82	\$185.82					
II. SIGNING. PA	VEMENT MARKINGS. AND LIGHTING			SUBTOTAL	\$31,505.85					
700-1-11	SINGLE POST SIGN, F&I, GROUND MOUNT, UP TO 12SF	4	EA	\$300.00	\$1,200.00					
711-16-101	THERMOPLASTIC, STD-OTH, WHITE, SOLID, 6"	0.155	NM	\$3,899.85	\$604.48					
711-11-123	THERMOPLASTIC, STD, WHITE, SOLID, 12"	276	LF	\$2.24	\$618.24					
711-11-124	THERMOPLASTIC, STD, WHITE, SOLID, 18" FOR DIAGONAL	47	LF	\$2.92	\$137.24					
711-11-125	THERMOPLASTIC, STANDARD, WHITE, SOLID, 24"	30	LF	\$4.19	\$125.70					
711-11-170	THERMOPLASTIC, STANDARD, WHITE, ARROW	4	EA	\$59.57	\$238.28					
711-14-141		0.004	NM	\$7,410.00	\$474.24 \$0.00					
711-10-201	THERMOPLASTIC, REMOVE	429	SF	\$2.25	\$965.25					
715-44-00	LIGHTPOLE COMPLETE, RELOCATE	2	EA	\$2,885.37	\$5,770.74					
	AV.			SUBTOTAL	\$10,134.17					
	AI			RIGHT OF WAY	\$259,500.00					
				SUBTOTAL	\$259,500.00					
				SUBTOTAL	\$257,902.31					
		MAIN	TENANCE CO	OF TRAFFIC (20%) NTINGENCY (20%)	\$51,580.46 \$51,580.46					
			CONS	STRUCTION TOTAL	\$361,063.24					
			EN	IGINEERING (30%) CFL (10%)	\$108,318.97 \$36,106,32					
PROJECT TOTAL (2017) \$764.98										
			PROJ	ECT TOTAL (2018) ¹	\$785,643.22					
Nete			PROJ	ECT TOTAL (2019) ¹	\$807,827.89					
Notes: *Unit Prices from	FDOTs 12-Month Moving Statewide Average.									
¹ An annual inflat	ion factor of 2.7% and 2.8%, as obtained from FDOT's Transportation Costs Reports, w	as applied to facto	the costs	to year 2018 and 201	9, respectively.					
L										

5 CONCLUSION

Traffic Engineering Data Solutions, Inc. (TEDS) was retained on behalf of the River to Sea Transportation Planning Organization (R2CTPO) to conduct a Feasibility Study for State Road 421 (Dunlawton Avenue) at State Road 5A in Port Orange (Volusia County), Florida. Based on the data collected, field observations, alternatives analyses, and engineering judgement, installing a westbound right-turn lane at the intersection will provide for enhanced operations and safety at the intersection, with the benefits expected to be more significant as traffic volumes continue to grow in the area.

The engineering and construction costs associated with these improvements are estimated at approximately \$764,988.

Aside from the turn-lane installation, it is recommended for the maintaining agency to make the following improvements:

- Replace the pedestrian push-button sign in the southeast quadrant for pedestrians looking to cross State Road 5A.
- Install a Pedestrian Crossing (W11-2) sign with a diagonal downward pointing arrow (W16-7P) plaque at the crosswalk across the channelized eastbound right-turn lane.
- Install a Right Turning Vehicles Yield to Pedestrians (R10-15R) sign for southbound motorists just north of the pedestrian signal head and adjacent to the north leg crosswalk and relocate the State Road 421 Directional Assembly so that is a minimum of 100 feet from the proposed sign.

APPENDIX

Traffic Engineering Data Solutions, Inc. 80 Spring Vista Drive Phone: 386.753.0558 DeBary, FL 32713 Fax: 386.753.0778 CERTIFICATION OF AUTHORIZATION # 27392 RIVER TO SEA TRANSPORTATION PLANNING ORGANIZATION



€ OF CONSTRUCTION SR 421

NEW CONSTRUCTION

OPTIONAL BASE GROUP 01 (TYPE B-12.5 ONLY) WITH TYPE SP STRUCTURAL COURSE (TRAFFIC C) (1") AND FRICTION COURSE FC-12.5 (1.5") (TRAFFIC C, PG 76-22, ARB)

TYPICAL SECTION SR 421 AT NOVA ROAD PAGE NO.

Aussential Bill weights Bill 1-3-3207 ROWN Bill	
ROADWAY ROADWAY <t< td=""><td></td></t<>	
STRUCTURE DESCRIPTION SIS FUN CLASS SPEED LIMT SPEED LIMT SP	
SIS FUN CLASS & URBAN PRIN ART OTHER SPEED LIMIT & HAMPH AC MAN CLS & ACCESS CLASSO5 NHS & NHS/MAP-21 PRINCIPAL ARTERIALS Study Intersection	
NHS B<	
Image: Second	
ARE AVENUED 136.0° - 72.0° 136.0° 120.0° 12	?: 004.001)ADWAY II MAINTAIN
HORIZONTAL CURVE DATA NOT FIELD VERIFIED A=27'46'38.00" PC=3.100 PC=3.232 PC=3.547 PC=3.682 PC=3.870 A=9'14'28.00" HORIZONTAL ALIGNMENT PC=2.10 PC=3.01 PC=3.02 PC=3.610 PI=3.713 PI=3.046	
STRUCTURE 000	
SIS ELIN CLASS SUBBAN PRIN ART OTHER	
SPEED LIMIT 3/45MPH 3/45MPH	
Version: 1.4.2.24 08/10/2015	



File Name: Not Named 1Site Code: 00000000Start Date: 12/20/2016Page No: 1

Groups Printed- All Vehicles																							
		N	OVA RO	DAD			N	OVA RC	DAD		STATE ROAD 421						STATE ROAD 421						
		No	prthbo	und			So	uthbo	und			E	astbou	Ind									
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total		
10:00 AM	89	135	27	1	252	66	108	65	1	240	93	206	48	0	347	61	229	35	0	325	1164		
10:15 AM	105	125	19	0	249	38	123	64	1	226	81	200	55	0	336	58	254	42	0	354	1165		
10:30 AM	83	134	24	0	241	55	129	62	0	246	80	183	58	0	321	64	226	44	0	334	1142		
10:45 AM	100	157	33	0	290	61	127	91	1	280	91	220	53	0	364	58	217	45	0	320	1254		
Total	377	551	103	1	1032	220	487	282	3	992	345	809	214	0	1368	241	926	166	0	1333	4725		
11:00 AM	101	174	35	0	310	69	150	82	0	301	98	206	53	0	357	92	219	55	2	368	1336		
11:15 AM	100	149	38	0	287	58	136	81	0	275	101	223	63	0	387	72	234	39	0	345	1294		
11:30 AM	88	163	28	1	280	60	128	80	0	268	/9	243	62	1	385	12	240	44	0	356	1289		
<u>11:45 AM</u>	92	157	38	0	287	/0	170	81	1	322	90	238	58		387	65	270	40	0	375	13/1		
lotal	381	643	139	1	1164	257	584	324	1	1166	368	910	236	2	1516	301	963	178	2	1444	5290		
12:00 PM	93	171	30	1	295	69	134	77	1	281	103	225	52	1	381	85	280	39	0	404	1361		
12:15 PM	109	153	30	0	292	69	135	70	0	274	108	239	69	1	417	95	275	45	0	415	1398		
12:30 PM	88	154	45	1	288	69	191	81	2	343	88	210	61	1	360	97	232	45	0	374	1365		
12:45 PM	101	154	37	0	292	80	167	78	0	325	91	274	55	1	421	69	254	34	0	357	1395		
Total	391	632	142	2	1167	287	627	306	3	1223	390	948	237	4	1579	346	1041	163	0	1550	5519		
01:00 PM	97	196	38	3	334	81	155	84	0	320	97	260	71	0	428	81	242	32	0	355	1437		
01:15 PM	89	160	47	0	296	64	139	89	0	292	109	269	59	2	439	85	265	31	4	385	1412		
01:30 PM	96	155	34	2	287	79	189	87	0	355	108	247	49	2	406	69	239	55	0	363	1411		
01:45 PM	107	143	38	5	293	75	170	92	0	337	94	228	61	0	383	70	230	40		341	1354		
lotal	389	654	157	10	1210	299	653	352	0	1304	408	1004	240	4	1656	305	976	158	5	1444	5614		
02:00 PM	105	172	29	1	307	80	197	88	0	365	116	257	60	0	433	80	246	53	0	379	1484		
02:15 PM	83	163	34	4	284	71	178	110	0	359	127	265	70	3	465	64	272	47	0	383	1491		
02:30 PM	110	154	34	2	300	72	195	90	0	357	101	237	73	0	411	91	252	39	0	382	1450		
02:45 PM	120	171	42	0	333	91	191	92	1	375	124	267	65	0	456	75	219	41	0	335	1499		
Total	418	660	139	7	1224	314	761	380	1	1456	468	1026	268	3	1765	310	989	180	0	1479	5924		
03:00 PM	84	176	32	0	292	71	195	87	0	353	126	295	67	0	488	70	300	57	1	428	1561		
03:15 PM	109	177	30	0	316	80	233	98	0	411	121	237	59	0	417	77	285	52	1	415	1559		
03:30 PM	102	166	32	1	301	65	197	93	1	356	118	282	73	0	473	59	249	41	1	350	1480		
03:45 PM	81	129	30	0	240	52	180	75	0	307	110	301	49	0	460	115	264	44	2	425	1432		
Total	376	648	124	1	1149	268	805	353	1	1427	475	1115	248	0	1838	321	1098	194	5	1618	6032		
04·00 PM	107	195	33	0	335	84	237	89	0	410	121	258	79	1	459	72	232	33	0	337	1541		
04:00 PM	103	143	22	0	268	77	211	93	Ő	381	145	286	52	1	484	88	317	49	0	454	1587		
04:10 PM	75	145	14	2	257	75	172	81	Ő	328	100	234	54	0	388	105	288	27	0	420	1307		
04:45 PM	90	169	29	1	289	79	204	74	Ő	357	115	230	56	Ő	401	80	259	30	1	370	1417		
Total	375	673	98	3	1149	315	824	337	0	1476	481	1008	241	2	1732	345	1096	139	1	1581	5938		
05:00 PM	91	151	20	1	263	61	217	87	1	366	113	273	69	0	455	128	326	34	0	488	1572		
05:15 PM	86	151	34	0	271	101	255	84	0	440	117	230	67	1	415	110	290	39	0	439	1565		
05:30 PM	81	112	44	0	237	97	178	70	0	345	111	273	63	1	448	81	235	27	Ó	343	1373		
05:45 PM	83	136	19	0	238	78	191	50	0	319	128	266	67	0	461	103	238	32	1	374	1392		
Total	341	550	117	1	1009	337	841	291	1	1470	469	1042	266	2	1779	422	1089	132	1	1644	5902		
Grand Total	3048	5011	1019	26	9104	2297	5582	2625	10	10514	3404	7862	1950	17	13233	2591	8178	1310	14	12093	44944		
Apprch %	33.5	55	11.2	0.3		21.8	53.1	25	0.1		25.7	59.4	14.7	0.1		21.4	67.6	10.8	0.1				
Total %	6.8	11.1	2.3	0.1	20.3	5.1	12.4	5.8	0	23.4	7.6	17.5	4.3	0	29.4	5.8	18.2	2.9	0	26.9			

		NC NC	OVA RO	DAD		NOVA ROAD Southbound					STATE ROAD 421 Fastbound					STATE ROAD 421 Westbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 10:00 AM to 02:00 PM - Peak 1 of 1																					
Peak Hour for	Entire	Inters	ection	Begins	at 01:15	PM															
01:15 PM	89	160	47	0	296	64	139	89	0	292	109	269	59	2	439	85	265	31	4	385	1412
01:30 PM	96	155	34	2	287	79	189	87	0	355	108	247	49	2	406	69	239	55	0	363	1411
01:45 PM	107	143	38	5	293	75	170	92	0	337	94	228	61	0	383	70	230	40	1	341	1354
02:00 PM	105	172	29	1	307	80	197	88	0	365	116	257	60	0	433	80	246	53	0	379	1484
Total Volume	397	630	148	8	1183	298	695	356	0	1349	427	1001	229	4	1661	304	980	179	5	1468	5661
% App. Total	33.6	53.3	12.5	0.7		22.1	51.5	26.4	0		25.7	60.3	13.8	0.2		20.7	66.8	12.2	0.3		
PHF	.928	.916	.787	.400	.963	.931	.882	.967	.000	.924	.920	.930	.939	.500	.946	.894	.925	.814	.313	.953	.954

File Name : Not Named 1 Site Code : 00000000 Start Date : 12/20/2016 Page No : 2

		NC Nc	OVA RO	DAD und			NC So	OVA RO	DAD und			STA E	FE ROA astbou	D 421 Ind			STAT W	FE ROA estbo	AD 421 und		
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour An	alysis F	From 1	IA 00:0	V to 02	:00 PM -	Peak 1	of 1														
Peak Hour for	Each A	Approa	ch Begi	ins at:																	
	12:30 PM					01:15 PM					12:45 PM					11:45 AM					
+0 mins.	88	154	45	1	288	64	139	89	0	292	91	274	55	1	421	65	270	40	0	375	
+15 mins.	101	154	37	0	292	79	189	87	0	355	97	260	71	0	428	85	280	39	0	404	
+30 mins.	97	196	38	3	334	75	170	92	0	337	109	269	59	2	439	95	275	45	0	415	
+45 mins.	89	160	47	0	296	80	197	88	0	365	108	247	49	2	406	97	232	45	0	374	
Total Volume	375	664	167	4	1210	298	695	356	0	1349	405	1050	234	5	1694	342	1057	169	0	1568	
% App. Total	31	54.9	13.8	0.3		22.1	51.5	26.4	0		23.9	62	13.8	0.3		21.8	67.4	10.8	0		
PHF	.928	.847	.888.	.333	.906	.931	.882	.967	.000	.924	.929	.958	.824	.625	.965	.881	.944	.939	.000	.945	
Peak Hour An	alysis F	From 0	2:15 PI	VI to 05	:45 PM -	Peak 1	of 1														
Peak Hour for	Entire	Inters	ection	Begins	at 02:45	PM															
02:45 PM	120	171	42	0	333	91	191	92	1	375	124	267	65	0	456	75	219	41	0	335	1499
03:00 PM	84	176	32	0	292	71	195	87	0	353	126	295	67	0	488	70	300	57	1	428	1561
03:15 PM	109	177	30	0	316	80	233	98	0	411	121	237	59	0	417	77	285	52	1	415	1559
03:30 PM	102	166	32	1	301	65	197	93	1	356	118	282	73	0	473	59	249	41	1	350	1480
Total Volume	415	690	136	1	1242	307	816	370	2	1495	489	1081	264	0	1834	281	1053	191	3	1528	6099
% App. Total	33.4	55.6	11	0.1		20.5	54.6	24.7	0.1		26.7	58.9	14.4	0		18.4	68.9	12.5	0.2		
PHF	.865	.975	.810	.250	.932	.843	.876	.944	.500	.909	.970	.916	.904	.000	.940	.912	.878	.838	.750	.893	.977

Peak Hour Analysis From 02:15 PM to 05:45 PM - Peak 1 of 1 Peak Hour for Each Approach Begins at:

i outerrout rot	Laoni	1pp100	on bog	nio atti																
	02:45 PM	1				04:45 PM	1				03:30 PN	1				04:15 PM				
+0 mins.	120	171	42	0	333	79	204	74	0	357	118	282	73	0	473	88	317	49	0	454
+15 mins.	84	176	32	0	292	61	217	87	1	366	110	301	49	0	460	105	288	27	0	420
+30 mins.	109	177	30	0	316	101	255	84	0	440	121	258	79	1	459	80	259	30	1	370
+45 mins.	102	166	32	1	301	97	178	70	0	345	145	286	52	1	484	128	326	34	0	488
Total Volume	415	690	136	1	1242	338	854	315	1	1508	494	1127	253	2	1876	401	1190	140	1	1732
% App. Total	33.4	55.6	11	0.1		22.4	56.6	20.9	0.1		26.3	60.1	13.5	0.1		23.2	68.7	8.1	0.1	
PHF	.865	.975	.810	.250	.932	.837	.837	.905	.250	.857	.852	.936	.801	.500	.969	.783	.913	.714	.250	.887



FLORIDA DEPARTMENT OF TRANSPORTATION

PEDESTRIAN MOVEMENT SUMMARY

SECTION STATE ROUTE OBSERVER

JTE State Road 421 R TEDS CITY Port Orange INTERSECTING ROUTE State Road 5A (Nova Rd) DATE 12/20/2016 **COUNTY** Volusia

REMARKS

FORM COMPLETED BY PHF DATE 01/05/17 н West side of East side of North side of South side of o U State Road 5A State Road 5A State Road 421 State Road 421 R <u>GRAND</u> TOTAL s NB SB TOTAL NB SB TOTAL EΒ WВ TOTAL EΒ wв TOTAL 10:00 - 11:00 11:00 - 12:00 <u>6</u> 12:00 - 1:00 <u>9</u> 1:00 - 2:00 <u>19</u> 2:00 - 3:00 <u>11</u> 3:00 - 4:00 <u>7</u> 4:00 - 5:00 <u>6</u> 5:00 - 6:00 <u>5</u> TOTAL

FLORIDA DEPARTMENT OF TRANSPORTATION

BICYCLE MOVEMENT SUMMARY

FORM COMPLETED BY PHF

CITY Port Orange INTERSECTING ROUTE State Road 5A (Nova Rd) DATE 12/20/2016 COUNTY Volusia

DATE 01/05/17

STATE ROUTE OBSERVER

SECTION

REMARKS

0

TEDS

State Road 421

н	١	Vest side	of	E	East side	of	N	orth side	of	s	outh side	e of	
U	S	tate Road	5A	St	ate Road	I 5A	St	ate Road	421	St	ate Road	421	
R S	NB	SB	TOTAL	NB	SB	TOTAL	EB	WB	TOTAL	EB	WB	TOTAL	GRAND TOTAL
10:00 - 11:00	0	0	0	0	1	1	0	1	1	0	1	1	<u>3</u>
1:00 - 12:00	0	0	0	1	0	1	1	0	1	1	0	1	<u>3</u>
12:00 - 1:00	2	0	2	0	0	0	0	0	0	1	0	1	<u>3</u>
1:00 - 2:00	1	2	3	0	2	2	0	1	1	2	4	6	<u>12</u>
2:00 - 3:00	1	1	2	1	2	3	1	0	1	2	1	3	<u>9</u>
3:00 - 4:00	0	2	2	0	1	1	2	3	5	1	1	2	<u>10</u>
4:00 - 5:00	0	1	1	0	2	2	1	1	2	0	2	2	<u>7</u>
5:00 - 6:00	2	5	7	1	3	4	1	0	1	0	2	2	<u>14</u>
TOTAL	6	11	17	3	11	14	6	6	12	7	11	18	<u>61</u>

File Name : TMC (8-hr) Site Code : 00000000 Start Date : 12/20/2016 Page No : 1

									Grou	os Printe	ed- UTu	ırns					-				1
		NO	OVA RO	DAD			N		DAD			STA	FE RO	AD 421			STAT	E ROA	ND 421		
Start Time	Left	Thru	Right	Peds	App Total	Left	Thru	Right	Peds	App Total	Left	Thru	Right	Peds	App Total	Left	Thru	Right	Peds	App Total	Int Total
10.00 AM	0	0	0	0	App. 10tal	3	0	0	0	App. 10tal	7	0	0	0	7 App. 10tal	9	0	0	0	App. 10tal 9	19
10:15 AM	Õ	Õ	Õ	Õ	Ő	2	Õ	Õ	Õ	2	11	Õ	Õ	Õ	11	15	Õ	Ő	Õ	15	28
10:30 AM	1	0	0	0	1	1	0	0	0	1	7	0	0	0	7	19	0	0	0	19	28
10:45 AM	1	0	0	0	1	6	0	0	0	6	6	0	0	0	6	16	0	0	0	16	29
Total	2	0	0	0	2	12	0	0	0	12	31	0	0	0	31	59	0	0	0	59	104
11:00 AM	1	0	0	0	1	4	0	0	0	4	13	0	0	0	13	26	0	0	0	26	44
11:15 AM	6	0	0	0	6	2	0	0	0	2	4	0	0	0	4	19	0	0	0	19	31
11:30 AM	2	0	0	0	2	6	0	0	0	6	9	0	0	0	9	24	0	0	0	24	41
Tatal	0	0	0	0	0	2	0	0	0	2	3	0	0	0	3	21	0	0	0	21	26
TOTAL	9	0	0	0	9	14	0	0	0	14	29	0	0	0	29	90	0	0	0	90	142
12:00 PM	0	0	0	0	0	8	0	0	0	8	11	0	0	0	11	25	0	0	0	25	44
12:15 PM	2	0	0	0	2	6	0	0	0	6	12	0	0	0	12	35	0	0	0	35	55
12:30 PM	3	0	0	0	3	8	0	0	0	8	10	0	0	0	10	26	0	0	0	26	47
12:45 PM	0	0	0	0	0	5	0	0	0	5	11	0	0	0	11	16	0	0	0	16	32
otal	5	0	0	0	5	27	0	0	0	27	44	0	0	0	44	102	0	0	0	102	178
01:00 PM	0	0	0	0	0	3	0	0	0	3	4	0	0	0	4	14	0	0	0	14	21
01:15 PM	0	0	0	0	0	3	0	0	0	3	7	0	0	0	7	20	0	0	0	20	30
01:30 PM	2	0	0	0	2	1	0	0	0	1	10	0	0	0	10	18	0	0	0	18	31
01:45 PM	4	0	0	0	4	2	0	0	0	2	5	0	0	0	5	17	0	0	0	17	28
Total	6	0	0	0	6	9	0	0	0	9	26	0	0	0	26	69	0	0	0	69	110
02:00 PM	0	0	0	0	0	5	0	0	0	5	13	0	0	0	13	21	0	0	0	21	39
02:15 PM	1	0	0	0	1	4	0	0	0	4	8	0	0	0	8	26	0	0	0	26	39
02:30 PIVI	2	0	0	0	2	4	0	0	0	4	12	0	0	0	12	18	0	0	0	18	31
U2:45 PIVI	2	0	0	0	2	4	0	0	0	17	12	0	0	0	12	23	0	0	0	23	1/0
TULAT	3	0	0	0	3	17	0	0	0	17	40	0	0	0	40	00	0	0	0	00	140
03:00 PM	1	0	0	0	1	2	0	0	0	2	8	0	0	0	8	23	0	0	0	23	34
03:15 PM	4	0	0	0	4	6	0	0	0	6	6	0	0	0	6	18	0	0	0	18	34
03:30 PM	0	0	0	0	0	2	0	0	0	2		0	0	0	11	16	0	0	0	16	29
	- 2	0		0		15	0	0	0	15	20	0	0	0	<u></u>	20		0	0	20	122
TULAT	/	0	0	0	/	15	0	0	0	15	20	0	0	0	20	03	0	0	0	03	155
04:00 PM	2	0	0	0	2	3	0	0	0	3	12	0	0	0	12	23	0	0	0	23	40
04:15 PM	0	0	0	0	0	4	0	0	0	4	6	0	0	0	6	16	0	0	0	16	26
04:30 PM	1	0	0	0	1	7	0	0	0	7	3	0	0	0	3	24	0	0	0	24	35
04:45 PM	0	0	0	0	0	4	0	0	0	4	2	0	0	0	2	20	0	0	0	20	26
l otal	3	0	0	0	3	18	0	0	0	18	23	0	0	0	23	83	0	0	0	83	127
05:00 PM	0	0	0	0	0	4	0	0	0	4	11	0	0	0	11	22	0	0	0	22	37
05:15 PM	0	0	0	0	0	10	0	0	0	10	14	0	0	0	14	38	0	0	0	38	62
05:30 PM	0	0	0	0	0	4	0	0	0	4	2	0	0	0	2	19	0	0	0	19	25
05:45 PM	1	0	0	0	1	1	0	0	0	1	8	0	0	0	8	28	0	0	0	28	38
Total	1	0	0	0	1	19	0	0	0	19	35	0	0	0	35	107	0	0	0	107	162
Grand Total	36	0	0	0	36	131	0	0	0	131	256	0	0	0	256	681	0	0	0	681	1104
Apprch %	100	0	0	0		100	0	0	0		100	0	0	0		100	0	0	0		
Total %	3.3	0	0	0	3.3	11.9	0	0	0	11.9	23.2	0	0	0	23.2	61.7	0	0	0	61.7	

		NC	OVA RO	DAD			N	OVA RO	DAD			STA	re Ro <i>i</i>	AD 421			STA	TE ROA	D 421		
		No	orthbo	und			So	uthbo	und			E	astbou	Ind			N	/estbo	und		
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour An	alysis F	From 1	0:00 Al	M to 02	2:00 PM -	Peak 1	1 of 1														
Peak Hour for	Entire	Inters	ection	Begins	at 12:00	PM															
12:00 PM	0	0	0	0	0	8	0	0	0	8	11	0	0	0	11	25	0	0	0	25	44
12:15 PM	2	0	0	0	2	6	0	0	0	6	12	0	0	0	12	35	0	0	0	35	55
12:30 PM	3	0	0	0	3	8	0	0	0	8	10	0	0	0	10	26	0	0	0	26	47
12:45 PM	0	0	0	0	0	5	0	0	0	5	11	0	0	0	11	16	0	0	0	16	32
Total Volume	5	0	0	0	5	27	0	0	0	27	44	0	0	0	44	102	0	0	0	102	178
% App. Total	100	0	0	0		100	0	0	0		100	0	0	0		100	0	0	0		
PHF	.417	.000	.000	.000	.417	.844	.000	.000	.000	.844	.917	.000	.000	.000	.917	.729	.000	.000	.000	.729	.809

File Name : TMC (8-hr) Site Code : 00000000 Start Date : 12/20/2016 Page No : 2

		NC No	OVA RO	DAD und			N(Sc	OVA RO	DAD und			STA ⁻	FE ROA astbou	D 421 Ind			STAT W	FE ROA estbou	D 421 und		
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour An	alysis F	From 10	0:00 Al	M to 02	2:00 PM	- Peak 1	l of 1														
Peak Hour for	<u>Éach A</u>	Approa	ch Beg	ins at:																	
	10:45 AM					12:00 PM	I.				12:00 PM					11:45 AM					
+0 mins.	1	0	0	0	1	8	0	0	0	8	11	0	0	0	11	21	0	0	0	21	
+15 mins.	1	0	0	0	1	6	0	0	0	6	12	0	0	0	12	25	0	0	0	25	
+30 mins.	6	0	0	0	6	8	0	0	0	8	10	0	0	0	10	35	0	0	0	35	
+45 mins.	2	0	0	0	2	5	0	0	0	5	11	0	0	0	11	26	0	0	0	26	
Total Volume	10	0	0	0	10	27	0	0	0	27	44	0	0	0	44	107	0	0	0	107	
% App. Total	100	0	0	0		100	0	0	0		100	0	0	0		100	0	0	0		
PHF	.417	.000	.000	.000	.417	.844	.000	.000	.000	.844	.917	.000	.000	.000	.917	.764	.000	.000	.000	.764	
Peak Hour An	alysis F	From 0	2:15 PI	M to 05	:45 PM ·	- Peak 1	of 1														
Peak Hour for	Entire	Interse	ection	Begins	at 05:00	PM															
05:00 PM	0	0	0	0	0	4	0	0	0	4	11	0	0	0	11	22	0	0	0	22	37
05:15 PM	0	0	0	0	0	10	0	0	0	10	14	0	0	0	14	38	0	0	0	38	62
05:30 PM	0	0	0	0	0	4	0	0	0	4	2	0	0	0	2	19	0	0	0	19	25
05:45 PM	1	0	0	0	1	1	0	0	0	1	8	0	0	0	8	28	0	0	0	28	38
Total Volume	1	0	0	0	1	19	0	0	0	19	35	0	0	0	35	107	0	0	0	107	162
% App. Total	100	0	0	0		100	0	0	0		100	0	0	0		100	0	0	0		
PHF	.250	.000	.000	.000	.250	.475	.000	.000	.000	.475	.625	.000	.000	.000	.625	.704	.000	.000	.000	.704	.653
Peak Hour An	nalysis F	From 02	2:15 PI	M to 05	5:45 PM ·	- Peak 1	of 1														

Peak Hour for Each Approach Begins at:

	03:15 PM		-			04:30 PM					02:45 PN					05:00 PM				
+0 mins.	4	0	0	0	4	7	0	0	0	7	12	0	0	0	12	22	0	0	0	22
+15 mins.	0	0	0	0	0	4	0	0	0	4	8	0	0	0	8	38	0	0	0	38
+30 mins.	2	0	0	0	2	4	0	0	0	4	6	0	0	0	6	19	0	0	0	19
+45 mins.	2	0	0	0	2	10	0	0	0	10	11	0	0	0	11	28	0	0	0	28
Total Volume	8	0	0	0	8	25	0	0	0	25	37	0	0	0	37	107	0	0	0	107
% App. Total	100	0	0	0		100	0	0	0		100	0	0	0		100	0	0	0	
PHF	.500	.000	.000	.000	.500	.625	.000	.000	.000	.625	.771	.000	.000	.000	.771	.704	.000	.000	.000	.704

File Name : TMC (8-hr) Site Code : 00000000 Start Date : 12/20/2016 Page No : 1

NOVA ROAD NOVA ROAD STATE ROAD 421 STATE ROAD 421	
Northbound Southbound Eastbound Westbound	
Start Time Left Thru Right Peds App. Total	Int. Total
10:00 AM 5 1 0 0 6 1 1 0 1 3 1 4 0 0 5 1 6 0 0 7	21
10:15 AM 0 2 1 0 3 0 1 1 1 3 0 5 1 0 6 0 8 2 0 10	22
10:30 AM 2 1 0 0 3 0 3 1 0 4 0 8 0 0 8 1 8 0 0 9	24
UC45 AM I I U U Z U U U U U U Z 5 U U / I / U U 8 Total 0 5 I 0 14 I 5 2 2 10 2 2 10 2 2 2 4 0 2 2 2 2 0 2 0 2 0 2 0 2 0 2	1/
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	13
Total 12 9 3 0 24 1 4 3 0 8 1 9 2 1 13 0 14 1 0 15	60
12:00 PM 3 0 0 0 3 0 0 0 0 0 1 2 0 0 3 0 4 0 0 4	10
12:15 PM 1 2 1 0 4 0 0 0 0 0 0 2 1 0 3 0 7 1 0 8	15
12:30 PM 0 2 0 1 3 0 1 0 2 3 0 2 1 1 4 0 2 0 0 2	12
<u>12:45 PM</u> 3 0 0 0 3 0 0 1 0 1 0 3 1 1 5 0 5 0 0 5	14
Total 7 4 1 1 13 0 1 1 2 4 1 9 3 2 15 0 18 1 0 19	51
	10
01.15 DM 0 2 1 0 2 0 1 0 0 1 0 1 1 0 2 0 1 0 4 5	10
	10
	15
Total 6 5 2 8 21 2 5 4 0 11 2 13 2 2 19 1 6 0 5 12	63
	00
02:00 PM 3 1 0 1 5 1 0 0 0 1 0 1 0 0 1 0 4 1 0 5	12
02:15 PM 2 3 2 0 7 0 0 1 0 1 0 3 1 0 4 0 1 2 0 3	15
02:30 PM 0 2 0 2 4 0 4 0 0 4 2 2 0 0 4 0 2 0 0 2	14
<u>02:45 PM</u> 1 1 0 0 2 1 1 0 1 3 1 7 1 0 9 0 6 0 0 6	20
Total 6 7 2 3 18 2 5 1 1 9 3 13 2 0 18 0 13 3 0 16	61
	10
03:00 PM 2 0 0 0 2 1 4 0 0 5 0 6 0 0 6 0 4 0 1 5	18
U3:15 PM 1 2 1 0 4 0 2 0 0 2 2 3 1 0 6 0 1 1 0 2 0 2 2 3 1 0 6 0 1 1 0 2 0 2 0 0 2 1 0 0 0 0 0 0 0 0 0	14
U3:30 PM 2 3 0 0 5 0 1 1 3 0 3 0 0 3 0 6 2 0 8 02:45 PM 1 2 0 0 4 0 1 0 0 1 1 5 0 0 4 1 2 1 1 6	19
OS:45 FW I S O 4 O I O I I S O O I I O I I O I<	68
	00
04:00 PM 5 1 0 0 6 1 4 0 0 5 0 0 2 0 2 0 5 0 0 5	18
04:15 PM 1 3 1 0 5 1 0 1 0 2 0 1 0 0 1 0 1 0 0 1	9
04:30 PM 1 1 0 0 2 0 2 0 0 2 1 2 0 0 3 1 4 0 0 5	12
O4:45 PM 2 1 0 1 4 0 0 0 0 0 0 1 2 0 3 0 3 0 1 4	11
Total 9 6 1 1 17 2 6 1 0 9 1 4 4 0 9 1 13 0 1 15	50
05:00 PM 4 1 0 1 6 0 0 0 0 0 1 4 0 0 5 0 3 1 0 4	15
05:15 PM 1 2 1 0 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	4
	5
	<u> </u>
	29
Grand Total 61 47 12 14 134 9 35 13 6 63 15 93 15 6 129 8 111 12 9 140	466
Approch 455 351 9 104 143 556 206 95 116 721 116 47 57 793 86 64	400
Total % 13.1 10.1 2.6 3 28.8 1.9 7.5 2.8 1.3 13.5 3.2 20 3.2 1.3 27.7 1.7 23.8 2.6 1.9 30	

		NC NC	OVA RO	DAD und			NC So	OVA RO	DAD und			STAT	E ROA	D 421 Ind			STA W	re ROA	D 421 und		
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Ar	alysis I	From 1	0:00 Al	M to 02	2:00 PM -	Peak 1	l of 1														
Peak Hour for	Entire	Inters	ection	Begins	at 10:00	AM															
10:00 AM	5	1	0	0	6	1	1	0	1	3	1	4	0	0	5	1	6	0	0	7	21
10:15 AM	0	2	1	0	3	0	1	1	1	3	0	5	1	0	6	0	8	2	0	10	22
10:30 AM	2	1	0	0	3	0	3	1	0	4	0	8	0	0	8	1	8	0	0	9	24
10:45 AM	1	1	0	0	2	0	0	0	0	0	2	5	0	0	7	1	7	0	0	8	17
Total Volume	8	5	1	0	14	1	5	2	2	10	3	22	1	0	26	3	29	2	0	34	84
% App. Total	57.1	35.7	7.1	0		10	50	20	20		11.5	84.6	3.8	0		8.8	85.3	5.9	0		
PHF	.400	.625	.250	.000	.583	.250	.417	.500	.500	.625	.375	.688	.250	.000	.813	.750	.906	.250	.000	.850	.875

File Name : TMC (8-hr) Site Code : 00000000 Start Date : 12/20/2016 Page No : 2

		NC No	OVA RO	DAD und			N(Sc	OVA RO outhbo	DAD und			STA ⁻	TE ROA astbou	AD 421 Ind			STAT W	FE ROA estbou	D 421 und		
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour An	alysis F	From 10	0:00 AI	M to 02	:00 PM	- Peak 1	1 of 1														
Peak Hour for	⁻ Each A	Approa	ch Begi	ins at:																	
	11:00 AM	1				12:45 PM	1				10:00 AN					10:00 AM					
+0 mins.	4	3	0	0	7	0	0	1	0	1	1	4	0	0	5	1	6	0	0	7	
+15 mins.	4	3	2	0	9	0	2	3	0	5	0	5	1	0	6	0	8	2	0	10	
+30 mins.	2	1	0	0	3	0	1	0	0	1	0	8	0	0	8	1	8	0	0	9	
+45 mins.	2	2	1	0	5	2	2	1	0	5	2	5	0	0	7	1	7	0	0	8	
Total Volume	12	9	3	0	24	2	5	5	0	12	3	22	1	0	26	3	29	2	0	34	
% App. Total	50	37.5	12.5	0		16.7	41.7	41.7	0		11.5	84.6	3.8	0		8.8	85.3	5.9	0		
PHF	.750	.750	.375	.000	.667	.250	.625	.417	.000	.600	.375	.688	.250	.000	.813	.750	.906	.250	.000	.850	
Peak Hour An	alysis F	From 0	2:15 PI	V to 05	:45 PM ·	Peak 1	l of 1														
Peak Hour for	- Entire	Interse	ection	Begins	at 02:45	PM															
02:45 PM	1	1	0	Ŭ 0	2	1	1	0	1	3	1	7	1	0	9	0	6	0	0	6	20
03:00 PM	2	0	0	0	2	1	4	0	0	5	0	6	0	0	6	0	4	0	1	5	18
03:15 PM	1	2	1	0	4	0	2	0	0	2	2	3	1	0	6	0	1	1	0	2	14
03:30 PM	2	3	0	0	5	0	1	1	1	3	0	3	0	0	3	0	6	2	0	8	19
Total Volume	6	6	1	0	13	2	8	1	2	13	3	19	2	0	24	0	17	3	1	21	71
% App. Total	46.2	46.2	7.7	0		15.4	61.5	7.7	15.4		12.5	79.2	8.3	0		0	81	14.3	4.8		
PHF	.750	.500	.250	.000	.650	.500	.500	.250	.500	.650	.375	.679	.500	.000	.667	.000	.708	.375	.250	.656	.888.
		_																			

Peak Hour Analysis From 02:15 PM to 05:45 PM - Peak 1 of 1 Peak Hour for Each Approach Begins at:

i cultificul ioi	Laoni	uppi ou	on Dogi	no ut.																
	03:30 PM					02:30 PM					02:30 PN	1				02:45 PM				
+0 mins.	2	3	0	0	5	0	4	0	0	4	2	2	0	0	4	0	6	0	0	6
+15 mins.	1	3	0	0	4	1	1	0	1	3	1	7	1	0	9	0	4	0	1	5
+30 mins.	5	1	0	0	6	1	4	0	0	5	0	6	0	0	6	0	1	1	0	2
+45 mins.	1	3	1	0	5	0	2	0	0	2	2	3	1	0	6	0	6	2	0	8
Total Volume	9	10	1	0	20	2	11	0	1	14	5	18	2	0	25	0	17	3	1	21
% App. Total	45	50	5	0		14.3	78.6	0	7.1		20	72	8	0		0	81	14.3	4.8	
PHF	.450	.833	.250	.000	.833	.500	.688	.000	.250	.700	.625	.643	.500	.000	.694	.000	.708	.375	.250	.656

		COUNTY	OF VOLUS		AFFIC	SIGNAL T	IMING SHE	ET		
LOCATION:	Dunlawton Ave	. @ Nova Rd.							AL.	
	Port Orange	0	FR	EE:		DATE:	1/17/2017	_		
SIGNAL #:	152		CO-0	ORD:	X	Design	Ву:	M. Tobin	Volusia Co	unty
NETWORK #:	Port Orange Ar	ea Network # 60								
			Cont	roller	Tim	ing Chart				
PHASE	1	2	3	4		5	6	7	8	
DIRECTION	EBL	WB	SBL	NE	3	WBL	EB	NBL	SB	
TURN TYPE	PROT	-	PROT	-		PROT	-	PROT	-	
MIN GREEN	5	15	5	15	;	5	15	5	15	
WALK		9		7			9		7	
PED CLR		36		41			29		36	
YELLOW	5.5	5.5	5.0	5.0)	5.5	5.5	5.0	5.0	
RED CLR	2.5	2.0	3.0	3.0)	2.5	2.0	3.0	3.0	
EXTENSION	4	4	3	4		4	4	3	4	
MAX 1	25	50	25	40	•	25	50	25	40	
MAX 2	41	90	25	48		41	90	25	48	
MAX 3		-		-			-		-	
DYM MAX		60		60			60		60	
DYM STP		10		10)		10		10	
RECALL		MIN		-			MIN		-	
DETECTOR	LOCK	LOCK	LOCK	LOC	к	LOCK	LOCK	LOCK	LOCK	
FLASH	RED	YELLOW	RED	RE	D	RED	YELLOW	RED	RED	
			COOR	DINA	TION		S			
PATTERN	1	2	3	4		5	6	7	8	
CYCLE	150	150	160	-		-	-	-	-	
OFFSET	93	89	94	-		•	-	-	-	
				-						
PHASE	1	2	3	4		5	6	7	8	
PATTERN 1	24	48	22	56	i	19	53	27	51	
PATTERN 2	26	48	20	56	5	27	47	25	51	
PATTERN 3	28	53	23	56	;	31	50	28	51	
PATTERN 4	-	-	-	-		-	-	-	-	
PATTERN 5	-	-	-	-		-	-	-	-	
PATTERN 6	-	-	-	-		-	-	-	-	
PATTERN 7	-	-	-	-		-	-	-	-	
Controlle	IP 10.40	.61.30	Switch I	Р	10.40	.60.30	Camera	IP 10.	40.62.30	
Controller Ga	teway 10.40	0.61.1	Switch Gate	eway	10.40	.60.1	Camera Gat	eway 10	.40.62.1	
REMARKS:	ordination Only							2 1	3 4	-
burning out								5 0	I · ·	

			COUNTY O		A TRAI	FFIC	SIGNAL T	IMIN	G SHEE	т				
	LOCATION:	Dunlawto	n Ave. @ Nova R	kd.								14		
		P	ort Orange	FR	EE:		DATE	: 1	/17/2017			-		
					-						Volus	ia County		
	SIGNAL #:	152		CO-0	ORD:	X	Desig	n By:		M. Tobin	FL	ORIDA		
N	ETWORK #:	Port Orange Ar	ea Network # 60											
				TIME O	F DA'	Y SC	HEDUL	E						
BASE DAY 1 2 3 4 5 6 7 TIME 05:30,21:00 10:00,14:20 14:20,21:00 21:00,00:00 Crosswalk Length														
	TIME	06:30-21:00	10:00-14:30	14:30-21:00	21:00-0	00:00					Cross	walk Length		
MON #1	PATTERN	PATTERN #1	PATTERN #2	PATTERN #3	FRE	E						D 2		
	TIME	06:30-21:00	10:00-14:30	14:30-21:00	21:00-0	00:00						F2		
TUES #1	PATTERN	PATTERN #1	PATTERN #2	PATTERN #3	FRE	E						116		
	TIME	06:30-21:00	10:00-14:30	14:30-21:00	21:00-0	00:00						110		
WED #1	WED #1 PATTERN PATTERN #1 PATTERN			PATTERN #3	FRE	E					P4			
	TIME	06:30-21:00	10:00-14:30	14:30-21:00	21:00-0	00:00						F4		
THU #1	PATTERN	PATTERN #1	PATTERN #2	PATTERN #3	FRE	E						142		
	TIME	06:30-21:00	10:00-14:30	14:30-21:00	:30-21:00 21:00							142		
FRI #1	PATTERN	PATTERN #1	PATTERN #2	PATTERN #3	FRE	E						De		
	TIME	08:00-21:00	21:00-00:00									FU		
SAT #2	PATTERN	PATTERN #2	FREE									101		
	TIME	08:00-21:00	21:00-00:00											
SUN #2	PATTERN	PATTERN #2	FREE									DO		
C	ONTROLLE	R TYPE	CONDITIC	ON OF OVERHEA	AD		GOOD					P8		
E	conolite	ASC/3	OVERHEA	D STREET NAM	ES		NO		PROGRAM	INUMBER		124		
PH	ASES:	8Φ	ILLUMINAT	ED STREET NAM	MES		YES		02.6	2.00	SIGN			
CABIN	IET TYPE	VI	PR	E-EMPTION			YES		Controller	IP Address		FDOT		
CABIN	IET DATE	10/2002	PRE-E	MPTION TYPE		IN	FRARED		10.40	61.30	LED	YES		
REMARK	(S: uring Coordina	tion Only								2 1 5 6	3	<u>4</u> 8		

PHASE	1	2	3	4	5	6	7
INITIAL	5	15	5	15	5	15	5
EXTENSION	4	4	3	4	4	4	3
YELLOW	5.5	5.5	5	5	5.5	5.5	5
RED	2.5	2	3	3	2.5	2	3
Pattern 1	24	48	22	56	19	53	27
Pattern 2	26	48	20	56	27	47	25
Pattern 3	28	53	23	56	31	50	28
Pattern 4	-	-	-	-	-	-	-
Pattern 5	-	-	-	-	-	-	-
Max split	28	53	23	56	31	53	28
GREEN	20	45.5	15	48	23	45.5	20
GREEN - Initial	11	-	7	29.5	14	-	12
MAX 2	50	93	15	55	48	96	20

8
15
4
5
3
51
51
51
-
-
51
43
24.5
55

Phase	Direction	Lane Type	LT Type	Speed	Slope	Width	Yellow	All Red
	Facthound			-	0.00%	0		
	Eastbound		-	-	0.00%	0		
4	Westhound	Right		25	0.00%	68	2 20	2.4
7	westbound	Left		25	0.00%	167	5.50	5.1
2	Southbound	Through		45	0.05%	132	4.90	2.3
5	Southbound	Left		25	0.05%	107	4.00	3.5
6	Northbound	Through		45	0.05%	112	4 90	2
1	Northbound	U-turn		25	-0.05%	55	4.00	2.1

Dunlawton Ave. @ Nova Rd.

Note:

The approach speed for a road with rural conditions and a Speed of 50 is 44 mph.

	Pree	mption				
PER RUN D		Run	1		\sim	
RUN ENABLE	V V		N			
RR	N	GO TO HIGHER PE	Y			
	v		v			
FARLY PE OUT	N		N		Ν	
	1		1	1	i I	
MAX INT.	1	USER PRIORITY	1		Run #	
DOUBLE CLEAR O	VERLAP EN	IABLE	N			
LEAD OVERLAP EN	VABLE		N			
DELAY OVERLAP	ENABLE		N			
FORCE OFF TO FIF	RST INTERV	/AL	Y			
USE INTERVAL DA	TA FOR OV	FRI AP	Y	_		
ENABLE COORD D	URING CYC		Ň			Run
					The second se	Į Ę –
	PER RI	JN TIMES			L_	···
DURATION TIME			5 SEC	Kun #		
DELAY TIME			0		\frown	
RESERVICE TIME			0			
OMIT ALL LAST PC	RTION OF	DELAY	0			
FAIL MAX TIME			0 MIN			
DURATION TIMER	AS GAP TIN	/IER	N		D	
				•	Run #	
	ENTRY PA	ARAMETERS				
RUN 1 ENTRY PAR	AMETERS					
DOUBLE CLEAR O	VERLAP MC	DDE:	NORMAL	IN	TERSECTION	
RED REVERT OVE	RRIDE		N			
GREEN	8.00	YELLOW	0.0	Major Street	XX	
WALK	1	RED	0.0	Cross Street	XX	
PED CLR	1	OVERLAP YELLOW	0.0	Intersection #	XX	
				rr		
				City	xx	
		1				
		1		Date	xx	
		-		Tech	xx	
			1			
FEDESTRIAN		LOW INTERVALS	-		Equipment	
					Equipment	
EXIT MOI		Fxit Phase	9	Card Rack	XX	
EXIT PHAS	SES	XX & XX	~			
VEHICLE C	ALL			Card/'s	XX	l
PEDESTRIAN	I CALL					
				Single Det/'s	XX	
FLASH	H PLAN FOF	R RUN 1 INTERVALS		Double Det#-		
ALL		0		Double Det/'S	XX	

	Pree	mption					
PER RUN D	ΑΤΑ	Run	1		\wedge		
RUN ENABLE	Y	OVERRIDE FLASH	N				
RR	N	GO TO HIGHER PE	Y				
PE INPUT LOCK	Y	NEMA PRIORITY	Y		NI		
EARLY PE OUT	N	HOLD ONLY	N		N		
MAX INT.	1	USER PRIORITY	1		Run #		
DOUBLE CLEAR OV	ERLAP EN	ABLE	N				
LEAD OVERLAP EN	ABLE		N		Пп		
DELAY OVERLAP E	NABLE		N				
FORCE OFF TO FIR	ST INTERV	AL	Y				
USE INTERVAL DAT	FA FOR OVI	ERLAP	Y			Į	Bup #
ENABLE COORD DU	JRING CYC	LIC INT.	N		_		Rull #
	PER RL						
DURATION TIME			5 SEC	Run # 🚞			
DELAY TIME			0			7	
RESERVICE TIME			0		K-11		
OMIT ALL LAST PO	RTION OF [DELAY	0				
FAIL MAX TIME			0 MIN				
DURATION TIMER A	AS GAP TIN	IER	N		D . "		
					Run #		
	ENTRY PA	RAMETERS					
RUN 1 ENTRY PARA	AMETERS						
DOUBLE CLEAR OV	ERLAP MC	DDE:	NORMAL		ITERSECTION		
RED REVERT OVER	RRIDE	1	N		1		
GREEN	8.00	YELLOW	0.0	Major Street	XX		
WALK	1	RED	0.0	Cross Street	XX		
PED CLR	1	OVERLAP YELLOW	0.0	Intersection #	XX		
PEF		L PARAMETERS		0 1			
VALID INTER	VALS	1		City	XX		
DWELL INTER	RVALS	1		Date	vv		
FIXED INTER	VALS	-		Date	~~		
TENTH INTER	VALS	-		Tech	vv		
EXIT INTERV	/ALS	1		Tech	~~		
PEDESTRIAN C	LR> YELI	LOW INTERVALS	-				
					Equipment		
				Card Rack	xx		
	FS		-				
VEHICI E C		Q AA		Card/'s	XX		
PEDESTRIAN	CALL						
		1		Single Det/'s	XX		
FLASH PLAN FOR RUN 1 INTERVALS				Davible D-f#-			
ALL		0		Double Det/'S	XX		

	Pree	emption	
PER RUN D	ΑΤΑ	Run	1
RUN ENABLE	Y	OVERRIDE FLASH	N
RR	Y	GO TO HIGHER PE	Y
	Ŷ	NEMA PRIORITY	Ŷ
EARLY PE OUT	N	HOLD ONLY	N
MAX IN I.	7	USER PRIORITY	1
			N
DOUBLE CLEAR OV		ABLE	N
			N
		(A)	N
			ř V
			T NI
ENABLE COURD DU		LIC INT.	IN
	PER R	UN TIMES	-
DURATION TIME			0
DELAY TIME			0
RESERVICE TIME			0
OMIT ALL LAST POF	RTION OF D	DELAY	0
FAIL MAX TIME			0 MIN
DURATION TIMER A	IS GAP TIN	1ER	N
	ENTRY P	ARAMETERS	
RUN 1 ENTRY PARA	METERS		
DOUBLE CLEAR OV	ERLAP MC	DE:	NORMAL
RED REVERT OVER	RIDE		N
GREEN	4.00	YELLOW	0.0
WALK	1	RED	0.0
	1		0.0
		OVEREAL TELEOW	0.0
DE			1
	VALO	1204007	
		- 100	
	VALS	125	
		-	
PEDESTRIAN C		LOW INTERVALS	-
		RAMETERS	
		Fyit Phae	2
FXIT PHAS	FS	3.8.7	-
VEHICLE CA		12345678	1
PEDESTRIAN		-	,
FLASH	PLAN FOR	R RUN 1 INTERVALS	
ALL		0	
-		-	
	INTER	SECTION	
Major Stre	et	XX	
Cross Stre	et	XX	
Intersection	n #	XX	
City		XX	
Date		XX	

Run	#		Interva	al	1			
Valid	#		Fixed		#			
Phase Time	#		Phas	e	#			
Func \ PH	1	2	3	4	5	6	7	8
Color								
Ped Color								
Exit			1		1			
			1			1		
Run	#		Interva	al	2	1		
Valid	#		Fixed		#			
Phase Time	#		Phas	e	#			
Func \ PH	1	2	3	4	5	6	7	8
Color					L	L		
Ped Color								
Exit								
Run	#		Interva	al	3	İ		
Valid	#		Fixed		#			
Phase Time	#		Phas	e	#			
Func \ PH	1	2	3	4	5	6	7	8
Color								
Ped Color								
Exit								
		[1	1	1			
Run	#		Interva	al	4	İ		
Valid	#		Fixed		#	1		
Phase Time	#		Phas	ē	#	1		
	# 1	2	2	1	# 5	6	7	Q
	I	2	5	4	5	0	'	0
Color			 		─	 		
Ped Color								
Exit								
Run	#		Interva	al	5			
Valid	#		Fixed		#			
Phase Time	#		Phas	e	#		_	
Func \ PH	1	2	3	4	5	6	7	8
COIOF								
Ped Color								
Exit								
-							_	
Kun	#		Interva	al	6			
Valid	#		Fixed		#			
Finase Time	#	~	Phas	e ∕	#		7	
	1	2	3	4	5	6	/	8
Color								
Ped Color								
Exit								
Run	#		Interva	al	7			
Valid	#		Fixed	1	#	i		
Phase Time	#		Phas	#				
Func \ PH	1	2	3	4	5	6	7	8
Color		_			-	<u> </u>		
Dad Calar			1					
Pea Color Evit					 			
			1					

General Inform	nation			In						sect	ion Info	ormatio	on	2	4.44+.	<u>ه ل</u>	
Agency									Durat	tion,	h	0.25			5++ 6	*	
Analyst				Analys	sis Dat	e 1/19/2	2017		Area	Туре	Э	Other	·			مگ ا <mark>ک</mark>	
Jurisdiction				Time F	Period	1			PHF			0.95		\Rightarrow	WTE	+ +	
Intersection				Analys	sis Yea	r 2017			Analy	/sis F	Period	1> 7:	00	* ~			
File Name		MD Pk with Sig Tim	es NO	WBRTL	.xus										55.11	· - 1	
Project Descrip	tion	<u>v</u>													4 1 4 Y	14	
Demand Inform	nation			EB				V	WB			NB			SB		
Approach Move	ement			L	Т	R	L		Т	R	L	Т	R	L	Т	R	
Demand (<i>v</i>), ve	h/h			427	1001	229	304	9	80 1	179	397	630	148	298	695	356	
Signal Informa	tion					_		-					-				
	150.0	Boforonco Dhono	2		5452	1.	-2		2		24		1	4		Ť2	
	150.0	Reference Phase	Z End			3	-5		5	51	7	7	1	2	3	4	
Unseed, S	No		On	Green	16.1	20.0	18.0	13	3.0 5	5.0	39.4				-		
Earco Modo	Fixed	Simult, Gap E/W	On	Pod	5.5	5.5	5.5	4.).0) 0	5.0			₹ .	``]'	4	
Force wode	Fixed	Simult. Gap N/S	Reu	2.5	2.0	2.5	3.	0 10	J.U	3.0		5		1	°		
Timer Results			FBI		FBT	WB	1	W/BT		NRI		NBT	SBI		SBT		
Assigned Phase	<u>0</u>			1	-	6	5	-	2		7		4	3		8	
Case Number	<u> </u>			2.0		3.0	2.0	-+	4.0		2.0		3.0	2.0		3.0	
Phase Duration	. S		26.0)	53.5	24.1		51.6	;	25.0		52.4	20.0		47.4		
Change Period	Period, $(Y+R_c)$, s			8.0		8.0	8.0	-	7.5		8.0		8.0	7.0		8.0	
Max Allow Head	dway <i>(N</i>	1AH), s		3.0		0.0	3.0		0.0		3.0		3.0	3.0		3.0	
Queue Clearan	ce Time	(gs), s		20.0)		15.7	7		1			26.3	15.0		36.4	
Green Extensio	n Time	<i>(g⊧),</i> s		0.0		0.0	0.4		0.0	0.0		0.0		0.0	0.0		
Phase Call Prol	bability			1.00			1.00)			1.00		1.00	1.00		1.00	
Max Out Proba	bility			1.00			0.03	3			1.00		0.04	1.00		0.53	
	P	14			50			10/1	_			ND			0.0		
Movement Gro	oup Res	suits			EB		<u> </u>		8						SB		
Approach Move	ement			L		R			R	۲ م		1	R			R 10	
Assigned Move	meni	v a h /h		1	0	10	5	2	- 14 - 20	2	1	4	14	3	8 700	18	
Adjusted Flow F	tion L	, ven/n		449	1054	241	320	83	0 38	40	418	4770	150	314	132	3/5	
				1/23	27.4	10.0	1723	20	6 20	12	1723	24.2	1579	1723	1773	1579	
	looropo	s_{j} , s_{j}		10.0	27.4	10.0	13.7	30.	0 30 6 20).7	17.0	24.3	11.0	12.0	20.7	34.4	
	h/h	e fille (<i>gc)</i> , s		10.0	1529	10.0	371	100	0 30).7)2	300	24.3	11.0	200	20.7	34.4 415	
Volume to Cap	acity Ra	tio (X)		1 087	0.685	470	0.863	0.76	3 0 7	75 764	1 070	0.632	407	299	0 785	413	
Available Capa	city (ca)			/13	1538	/78	510	100	5 50	13	300	1135	505	200	1017	453	
Back of Queue	(Q) veł	/In (95th percentile)		18.0	17.2	12.3	10.5	21	0 20).5	16.8	16.0	7.9	13.4	18.8	16.4	
Overflow Queue	e (Q3) \	/eh/ln		0.0	0.0	0.0	0.0	0.0) 0	0	0.0	0.0	0.0	0.0	0.0	0.0	
Queue Storage	Ratio (RQ) (95th percentile))	0.00	0.00	0.00	0.00	0.0	0 0.0	00	0.00	0.00	0.00	0.00	0.00	0.00	
Uniform Delay	(d1). s/v	eh	/	66.0	46.0	43.0	65.8	48.	2 48	3.2	66.5	45.7	41.2	68.5	51.4	25.9	
Incremental De	lav (d ₂).	s/veh		69.8	2.5	3.8	8.0	5.0) 10).5	65.5	0.7	0.2	66.0	3.3	19.3	
Initial Queue De	elav (d3)), s/veh		0.0	0.0	0.0	0.0	0.0) 0.	.0	0.0	0.0	0.0	0.0	0.0	0.0	
Control Delav (d), s/veł) 1		135.8	48.5	46.7	73.8	53	2 58	8.8	132.0	46.4	41.4	134.5	54.7	45.2	
Level of Service	e (LOS)			F	D	D	E	D	E		F	D	D	F	D	D	
Approach Delay	y, s/veh	/ LOS		70.7	7	E	58.9		E		74.7		E	69.8		E	
Intersection De	lay, s/ve	h / LOS			1	68	3.3							E			
Multimodal Re	sults				EB		W		WB			NB			SB		
Pedestrian LOS	Score	/ LOS		3.1		С	3.1		С		3.4	С		3.5		С	
Bicycle LOS Sc	ore / LC)S	1.4		Α	1.3		А		1.5		А	1.7		A		

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General Inform	nation									ersect	ion Info	ormatio	on	2	4	<u>ه ل</u>	
Agency									Dur	ration,	h	0.25			5++ 6	*	
Analyst				Analys	is Dat	e 1/19/2	2017		Are	ea Typ	е	Other	-	4		مگ اند.	
Jurisdiction				Time F	Period				PH	IF		0.95			WHE	+ +	
Intersection				Analys	is Yea	r 2017			Ana	alysis	Period	1> 7:	00	¥ - ¥			
File Name		PM Pk with Sig Tim	es NO \	WBRTL.	xus										55.4.4	· - 1	
Project Descrip	tion													h	4147	14	
Demand Inform	nation				EB			٧	VB			NB			SB		
Approach Move	ement			L	Т	R			т	R	L	Т	R	<u> </u>	Т	R	
Demand (<i>v</i>), ve	h/h			489	108	1 264	281	10)53	191	415	690	136	307	816	370	
									-								
Signal Informa	tion		0						6		21			4		Ťz	
Cycle, s	160.0	Reference Phase	2			3		R K		51	7 1	17 -			3	4	
Offset, s	0	Reference Point	End	Green 16.0 2		22.4	20.0	16	6.0	5.0	42.1				_	1	
Uncoordinated	No	Simult. Gap E/W	On	Yellow	5.5	5.5	5.5	4.	0	0.0	5.0	_		→	Ϋ́	4	
Force Mode	Fixed	Simult. Gap N/S	On	Red	2.5	2.0	2.5	3.	0	0.0	3.0		5	Y 6	7	8	
Timer Desults						EDT			10/		NDI		NDT			ODT	
Assigned Dhee				EBL	-	EBI	VVB		WBT			-	NBI	SBL	-	SBI	
Assigned Phase	e					0	5	-	4	2	/		4	3		0	
Case Number						3.0	2.0		4. 52	.0	2.0		3.0 EE 1	2.0		3.0	
Change Duration	, s	(+R _c) s			<u> </u>	57.9	24.0	,	53	5.9	20.0		35.1	23.0		8.0	
	$(1 + \pi c)$, S (ALL) o		0.0	-	0.0	0.0	-	7.	.5	0.0		0.0	7.0		2.0	
	Jway (IV	(α) , s		3.0		0.0	3.0	-	0.	.0	3.0		3.0	3.0		3.0	
Croop Extensio		$(\mathbf{y}_{s}), \mathbf{s}$		22.0		0.0	0.4	,	0	0	22.0		51.1	10.9		40.0	
Bhase Call Bro	hability	(<i>ge),</i> s		1.00		0.0	1.00	0.4		.0	0.0		5.1 1.00	1.00		1.5	
Max Out Proba	bility			1.00			0.01	1		_	1.00	1.00		1.00		1.00	
Max Out Floba	Dinty			1.00			0.0	1			1.00	,	0.12	1.00		1.00	
Movement Gro	oup Res	ults			EB			W	В			NB			SB		
Approach Move	ement			L	Т	R	L	Т		R	L	Т	R	L	Т	R	
Assigned Move	ment			1	6	16	5	2		12	7	4	14	3	8	18	
Adjusted Flow F	Rate <i>(v)</i>	, veh/h		515	1138	278	296	89	7	413	437	726	143	323	859	389	
Adjusted Satura	ation Flo	w Rate <i>(s)</i> , veh/h/ln		1723	1691	1579	1723	186	63 1	1713	1723	1773	1579	1723	1773	1579	
Queue Service	Time (g	is), S		20.0	31.8	23.5	13.5	36.	.0 3	36.1	20.0	29.1	11.3	14.9	37.7	38.6	
Cycle Queue C	learanc	e Time <i>(g₀</i>), s		20.0	31.8	23.5	13.5	36.	.0 3	36.1	20.0	29.1	11.3	14.9	37.7	38.6	
Capacity (c), ve	h/h			431	1583	493	344	108	30 -	497	431	1044	465	345	934	416	
Volume-to-Cap	acity Ra	itio <i>(X)</i>		1.195	0.719	0.564	0.861	0.83	30 0	0.831	1.014	0.695	0.308	0.938	0.920	0.937	
Available Capa	city (Ca)	, veh/h		431	1583	493	514	108	30	497	431	1064	474	345	953	424	
Back of Queue	(Q), vel	n/In (95th percentile)		23.2	19.7	14.9	10.3	24.	5 2	24.1	17.2	18.8	7.8	12.7	25.3	18.5	
Overflow Queu	e <i>(Q</i> 3), v	/eh/ln		0.0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Queue Storage	Ratio (RQ) (95th percentile)	0.00	0.00	0.00	0.00	0.0	0 0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Uniform Delay	(d1), s/v	eh		70.0	48.8	46.0	70.9	53.	.1 5	53.1	70.0	50.1	43.8	71.5	57.3	25.9	
Incremental De	lay <i>(d₂)</i> ,	s/veh		108.6	2.8	4.6	6.4	7.4	4 '	14.9	47.0	1.6	0.1	32.4	13.3	27.7	
Initial Queue De	elay (d₃)), s/veh		0.0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Control Delay (d), s/veł	1		178.6	51.7	50.6	77.3	60.	.6 6	68.1	117.0	51.7	43.9	103.9	70.6	53.6	
Level of Service	Level of Service (LOS)			F	D	D	E	E		Е	F	D	D	F	E	D	
Approach Dela	y, s/veh	/LOS		85.3	;	F	65.6	3	E	E	72.7	·	E	73.2		E	
Intersection De	lay, s/ve	h / LOS				74	1.9							E			
Multimodal Re	sults				EB			W	WB			NB			SB		
Pedestrian LOS	Score	/LOS		3.1		С	3.1		С		3.4		С			С	
Bicycle LOS Sc	ore / LC	DS		1.5		А	1.4		A	A	1.6		А	1.8		А	

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General Inform	nation									ersect	ion Info	ormatio	on	2	4.44+.	<u>ه ل</u>	
Agency									Du	iration,	h	0.25			5++ 6	*	
Analyst				Analys	sis Dat	e 1/19/2	2017		Are	ea Type	Э	Other				1 ×	
Jurisdiction				Time F	Period				PH	IF		0.95			WE	4	
Intersection				Analys	sis Yea	ır 2017			Ana	alysis l	Period	1> 7:	00	-			
File Name		MD Pk with Signal ⁻	Fimes &	WBRT	L.xus					-					55 f f	-	
Project Descrip	tion													1	4147	F (*	
		°									1			-			
Demand Inform	nation				EB			V	VB			NB		<u> </u>	SB		
Approach Move	ement			L	Т	R			Т	R	L	Т	R	L.	Т	R	
Demand (<i>v</i>), ve	h/h			427	100	1 229	304	9	80	179	397	630	148	298	695	356	
Signal Informa	tion				8												
	150.0	Reference Phase	2			۶L. ۹		2		1.27	120		~	~		Þ	
Offset s	0	Reference Point	End			- -	-S		5	1	<u>~</u>	r =	1	2	3	4	
Uncoordinated	No	Simult Gap E/W	On	Green	16.1	20.0	18.0	13	3.0	5.0	39.4				K.		
Force Mode	Fixed	Simult, Gap N/S	On	Red	2.5	2.0	2.5	4.	0	0.0	3.0	_	5	♥。		*↓	
1 croo mode	TIXOU	ointait. Oup 14/0	Ttou	2.0	2.0	2.0	0.	0	0.0	0.0			-				
Timer Results				EBL	_	EBT	WB	L	WBT		NBL	_	NBT	SBL	-	SBT	
Assigned Phase	e			1		6	5		2		7		4	3		8	
Case Number				2.0		3.0	2.0		3	3.0	2.0		3.0	2.0		3.0	
Phase Duration	, S					53.5	24.1	1	51	1.6	25.0	,	52.4	20.0) .	47.4	
Change Period	, (Y+Rc)	, S	8.0		8.0	8.0		7	7.5	8.0		8.0	7.0		8.0		
Max Allow Head	dway <i>(N</i>	<i>IAH)</i> , s		3.0		0.0	3.0		0).0	3.0		3.0	3.0		3.0	
Queue Clearan	ce Time	e (gs), s		20.0)		15.7	7			19.0		26.3	15.0		36.4	
Green Extensio	n Time	<i>(g_e),</i> s		0.0		0.0	0.4	0.4		0.0 0.0			4.8	0.0		3.0	
Phase Call Pro	bability			1.00)		1.00)			1.00		1.00	1.00		1.00	
Max Out Proba	bility			1.00			0.03	3			1.00)	0.04	1.00		0.53	
	P	И			ED				_	_		ND			0.0		
Movement Gro	oup Res	sults			EB		<u> </u>	VV T	B	_		NB			SB		
Approach Move	ement			L		R			_	R		1	R	L	1	R	
Assigned Move	ment	v a la /la		1	0	16	5	2	20	12	/	4	14	3	8 700	18	
Adjusted Flow P	tion L	, ven/n		449	1054	4570	320	103	5Z	100	418	4770	150	314	132	3/5	
		w Rate (s), ven/n/in		1/23	07.4	15/9	1723	105	<u>۱</u>	15/9	1723	1//3	1579	1723	1//3	1579	
Queue Service	line (g	s), S		10.0	27.4	10.0	13.7	27.	0	14.4	17.0	24.3	11.0	13.0	20.7	34.4	
	h/h			10.0	1529	10.0	271	27. 140	.0	14.4	200	24.3	167	200	20.7	34.4 415	
Volume to Cap	acity Pa	tio (V)		413	0.686	470	0.863	0.60	01 C	0.406	1 070	0.632	407	299	0.785	413	
Available Capa	$\operatorname{city}(\mathbf{c}_{2})$	veh/h		1.007	1538	/78	510	1/0	32	464	300	1135	505	200	1017	453	
Back of Queue	(Ω) vet	n/ln (95th percentile)		18.0	17.2	12.3	10.5	17	1	9.3	16.8	16.0	79	13.4	18.8	16.4	
		/eh/ln		0.0	0.0	0.0	0.0	0.0	n	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Queue Storage	Ratio (RQ) (95th percentile)	0.00	0.00	0.00	0.00	0.0		0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Uniform Delay	$(d_1) s/v$	eh	/	66.0	46.0	43.0	65.8	46	9	8.4	66.5	45.7	41.2	68.5	51.4	25.9	
Incremental De	a_{1}, a_{2}	s/veh		69.8	2.5	3.8	8.0	2	7	2.6	65.5	0.7	0.2	66.0	3.3	19.3	
Initial Queue De	ay (d2)	s/veh		0.0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Control Delay	d). s/veł	<u>ו ביי ביי</u>		135.8	48.5	46.7	73.8	49	.6	11.0	132.0	46.4	41.4	134.5	54.7	45.2	
Level of Service	e (LOS)			F	D	D	E	 D		B	F	D	D	F	D	D	
Approach Delay	() v. s/veh	/LOS		70.7	-	E	49.9		1	D	74.7	-	E	69.8		E	
Intersection De	lay, s/ve	h / LOS				65	5.9							E			
Multimodal Re	sults				EB			W	WB				NB		SB		
Pedestrian LOS	Score	/LOS		3.1		С	3.1		С		3.5		С	3.5		С	
Bicycle LOS Sc	ore / LC	DS		1.4		А	1.3		1	A	1.5		А	1.7		Α	

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General Inform	nation								Inte	ersect	ion Info	ormatio	on	2	4.2.4.1.	<u>له لړ</u>	
Agency									Du	iration,	h	0.25			5++ 6		
Analyst				Analys	is Dat	e 1/19/2	2017		Are	ea Typ	е	Other				₹€	
Jurisdiction				Time F	Period	_			PH	IF		0.95		\Rightarrow	WTE	↓	
Intersection				Analys	is Yea	r 2017			Ana	alysis	Period	1> 7:	00	* *		4 4 4	
File Name		PM Pk with Signal 1	Times &	WBRTI	xus										55.11		
Project Descrip	tion	<u>v</u>												n n	1 1 4 Y 1	4	
Demand Inform	nation				EB			V	VB			NB			SB		
Approach Move	ement			L	Т	R	L		Т	R	L	Т	R	L	Т	R	
Demand (<i>v</i>), ve	h/h			489	108	1 264	281	10)53	191	415	690	136	307	816	370	
					_	_							-				
Signal Informa	tion		2		4				6		21			4		Ťz	
Cycle, s	160.0	Reference Phase	2			3	5	R K		51	7 1	7	1	2	3	4	
Offset, s	0	Reference Point	End	Green 16.0		22.4	20.0	16	6.0	5.0	42.1				_ 1	1	
Uncoordinated	No	Simult. Gap E/W	On	Yellow	5.5	5.5	5.5	4.	.0	0.0	5.0			→	Υ [†]	4	
Force Mode	Fixed	Simult. Gap N/S	Simult. Gap N/S On			2.0	2.5	3.	.0	0.0	3.0		5		7	8	
Times Desult				EDI		ГРТ			1.4.4	/DT	ND		NDT	0.01		CDT	
Assigned Dhee				EBL	-	EBI	VVB		WBT			-	NB I	SBL	·	SBI	
Assigned Phase	e					0	5	\rightarrow		2	/		4	3		0	
Case Number						3.0	2.0		5	2.0	2.0		3.0	2.0		3.0	
Change Duration	, s	(+R _c) s				57.9	24.0	,	53	3.9 7 E	20.0	-	35.1	23.0		SU. 1	
	$(1 + \pi c)$, S (ALI) o		0.0		0.0	0.0	-	/	.5	0.0		0.0	7.0		2.0	
	Jway (IV	(α) , s		3.0		0.0	3.0		0	0.0	3.0		3.0 21.1	3.0		3.0	
Croop Extensio		$(\mathbf{y}_{s}), \mathbf{s}$		22.0		0.0	15.	,	0.0		22.0		51.1	16.9		40.0	
Bhase Call Bro	hability	(<i>ge),</i> s		0.0		0.0	0.4	\rightarrow	0	0.0	1.00		5.1 1.00	1.00		1.0	
Max Out Proba	bility			1.00			0.01			_	1.00		0.12	1.00		1.00	
Max Out Floba	Dinty			1.00			0.0				1.00		0.12	1.00		1.00	
Movement Gro	oup Res	ults			EB			W	В			NB			SB		
Approach Move	ement			L	Т	R	L	Т	·	R	L	Т	R	L	Т	R	
Assigned Move	ment			1	6	16	5	2		12	7	4	14	3	8	18	
Adjusted Flow F	Rate <i>(v)</i>	, veh/h		515	1138	278	296	110)8	201	437	726	143	323	859	389	
Adjusted Satura	ation Flo	w Rate <i>(s)</i> , veh/h/ln		1723	1691	1579	1723	169	91 [·]	1579	1723	1773	1579	1723	1773	1579	
Queue Service	Time (g	is), S		20.0	31.8	23.5	13.5	31.	.8	16.6	20.0	29.1	11.3	14.9	37.7	38.6	
Cycle Queue C	learanc	e Time <i>(gc)</i> , s		20.0	31.8	23.5	13.5	31.	.8	16.6	20.0	29.1	11.3	14.9	37.7	38.6	
Capacity (c), ve	h/h			431	1583	493	344	147	71	458	431	1044	465	345	934	416	
Volume-to-Cap	acity Ra	itio <i>(X)</i>		1.195	0.719	0.564	0.861	0.7	53 (0.439	1.014	0.695	0.308	0.938	0.920	0.937	
Available Capa	city (Ca)	, veh/h		431	1583	493	514	147	71	458	431	1064	474	345	953	424	
Back of Queue	(Q), veł	n/In (95th percentile)		23.2	19.7	14.9	10.3	19.	.8	10.5	17.2	18.8	7.8	12.7	25.3	18.5	
Overflow Queu	e <i>(Q</i> 3), v	/eh/ln		0.0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Queue Storage	Ratio (RQ) (95th percentile)	0.00	0.00	0.00	0.00	0.0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Uniform Delay	(d1), s/v	eh		70.0	48.8	46.0	70.9	51.	.6	10.4	70.0	50.1	43.8	71.5	57.3	25.9	
Incremental De	lay <i>(d₂)</i> ,	s/veh		108.6	2.8	4.6	6.4	3.0	6	3.0	47.0	1.6	0.1	32.4	13.3	27.7	
Initial Queue De	elay (d₃)), s/veh		0.0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Control Delay (d), s/veł	۱		178.6	51.7	50.6	77.3	55.	.2	13.5	117.0	51.7	43.9	103.9	70.6	53.6	
Level of Service	Level of Service (LOS)			F	D	D	E	E		В	F	D	D	F	Е	D	
Approach Dela	y, s/veh	/LOS		85.3	;	F	54.′	1	[D	72.7		E	73.2		E	
Intersection De	lay, s/ve	h / LOS				72	2.0							E			
Multimodal Re	sults				EB			W	VB			NB			SB		
Pedestrian LOS	Score	/LOS		3.1		С	3.1		С		3.5		С			С	
Bicycle LOS So	ore / LC	DS		1.5		1.5 A 1.4 A		A	1.6 A			1.8		A			

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Traffic Engineering Data Solutions, Inc.

Ref: 10575 TWO #7

TECHNICAL MEMORANDUM

To:Mr. Robert Keeth, Senior PlannerFrom:Chris J. Walsh, P.E.

Subject: Feasibility Study – State Road 421 at State Road 5A

Date: March 27, 2017

We have received comments on the Feasibility Study at the State Road 421 at State Road 5A intersection. We have revised the study accordingly and offer the following responses:

Comments from Mr. Robert Keeth

Comment #1: Per Jon Cheney's recommendation, please state in the introduction section that the feasibility study was requested by the City of Port Orange.

Response: Information has been added to the study.

Comment #2: On page 2, Introduction, please note that the intent of the study was to evaluate the "feasibility" of constructing the improvement in addition to evaluating the need.

Response: Information has been added to the study.

Comment #3: On page 23, Improvement Concept, please revise the first sentence to note that the purpose of the study was to evaluate the "need" for the intersection improvement as well as the feasibility.

Response: Information has been added to the study.

Comment #4: There does not seem to be much of a problem with the westbound right turn movement; the report notes that it does not impede the flow of westbound through vehicles, and over the 3-year period, there have been only 3 rear-end crashes in the westbound outside shared right turn/through lane. Operational analysis shows full intersection delay is reduced by only 2.4 seconds per vehicle in the mid-day peak and 2.9 seconds per vehicle in the afternoon peak. AASHTO Highway Safety Manual provides a Crash Modification Factor of 0.96 with the addition of the right-turn lane. Is this 4% reduction in total crashes for the intersection reasonable given that rear end crashes in the westbound outside right turn/through lane represented only 2.6% of crashes? Is the project needed? Please explain in the conclusion section (pg 27) why you are recommending the installation of the westbound right turn lane. Do the seemingly marginal benefits justify it?

Response: It's impossible to conclude if the 4% is reasonable or not. Perhaps most WB through motorists use the 2 inside lanes because they feel the outside lane is predominantly right turns. Thus, the additional density of traffic may contribute to other crashes associated with those 2 lanes (rear ends, red light running, crashes associated with the median opening to the west because the queues extend back, etc). Should this right-turn lane be provided, there could be a better distribution of through vehicles within the WB through lanes. From a

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needs perspective, the addition of a turn-lane enhances the capacity of an intersection and has traditionally shown to provide a reduction in crashes based on the CMF. It is also important to note that this is based on current conditions without consideration of future growth. Thus, the turn lane is expected to provide a benefit. Please see the revised conclusion section within the study.

Comment #5: What affect will this proposed improvement have on pedestrian safety? And will intersection capacity be reduced if additional pedestrian crossing time is required for the extended pedestrian crossing distance?

Response: No issues were noted with vehicle-pedestrian conflicts, right turns on red currently occur at the intersection, and no such crashes occurred relative to this particular right-turn movement over the past five years. Motorists do become more aggressive when they are delayed further, but the right-turn lane is showing an improvement in intersection capacity. Therefore, we do not have a reason to believe pedestrian safety will be diminished. Relative to pedestrian crossing times, they will be increased 3.5 seconds, but pedestrian activity is not significant. Therefore, with the limited number of pedestrian calls and the small increase in pedestrian crossing time, this consideration will have a marginal effect on intersection operations. It should also be noted that if desired, the County could simply provide this additional pedestrian clearance time into the yellow change interval which would therefore have no impact at all on the green time for the intersection.

Comment #6: Please provide the project cost estimate for each of three years, 2017, 2018 and 2019 using FDOT's latest available construction inflation factors or other appropriate factors.

Response: Study has been revised to include the three (3) years of cost estimates.

Comments from Mr. Amir Asgarinik

Comment #1: Widening impacts the existing roadside swale: can conveyance be maintained within the existing R/W? What is the proposed ditch width and corresponding side slopes? Typical does not specify. What is the volume of run-off expected to be received from adjacent properties with the two MES's?

Response: Yes, conveyance can be maintained within the right of way. Record plans were obtained for State Project No. 79230-3504 which completed the 6-lane widening of SR 421 in 1994 from west of I-95 to SR 5A (Nova Rd.) As shown on the Drainage Maps from that project, runoff from roadway areas between CR 483 (Clyde Morris Blvd.) and SR 5A (Nova Rd.) is conveyed under SR 5A within a 54" pipe system that was depicted in the outside existing lane on the Improvement Diagram. The collection system directs runoff north down Jackson St. discharging it to an existing stormwater management facility (Pond 3) nearby. Thus, only the existing through lanes contribute runoff to the existing roadside swale. In proposed conditions, Type F curb & gutter will collect runoff from landscape buffer areas at the perimeter of the adjacent properties. Note that as shown on the Improvement Diagram, the Bank of America property contains an on-site stormwater management facility that discharges through a pipe connection.

The proposed ditch width and side slopes have been depicted on the revised Typical Section at maximum values. Special ditch profiling is anticipated to be required during design.

Comment #2: There appears to be a utility marker in front of the existing sidewalk. Are there any utility impacts with the turn lane/shifted ditch?

Response: Existing utility information has been incorporated into the conceptual design, including telephone, gas, reclaimed water, and potable water. However, in proposed conditions, construction will predominantly result in greater cover over the existing utilities, as generally depicted on the Typical Section. As such, only minor utility adjustment is anticipated.

Comment #3: Concept does not provide separate ramps on the reconstructed return to match the other three returns.

Response: The study has been revised to include separate pedestrian ramps at the northeast corner.

Comment #4: The report recommends an additional WB signal head be added to the mast arm but that FDOT was agreeable to leaving 2-thru heads if the structural analysis failed; was this considered or discussed with installing backplates to the existing heads for both EB and WB in accordance to MUTCD?

Response: No, but the study has been revised to include a recommendation to evaluate the structural stability of accommodating the addition of backplates in addition to the third westbound through signal head. If the mast arm structure is inadequate then forego backplates.

Comment #5: Does the 20% design fee of \$68k include Surveying & Mapping for R/W acquisition on the NE quadrant?

Response: The design fee was increased to 30% to account for the Surveying an Mapping.

Comment #6: The Department would need to concur with the City to acquire the R/W.

Response: Acknowledged.

Comments from Mr. Michael Sanders, P.E.

Comment #1: Figure 2, the Existing Conditions Diagram, seems to be missing the South SR 5A sign facing north on the west side of SR 5A just south of the intersection.

Response: Correction has been made to the study.

Comment #2: On page 10, the volumes on Figure 3 add up to 5,644 and 6,093 vehicles not 5,661 and 6,099 vehicles.

Response: The figure is correct; correction has been made to the study.

Comment #3: On page 23, please verify where the 150-foot queue length comes from.

Response: Clarification has been added to the study. The turn lane was intentionally extended back to the Walgreens driveway to maximize its length, while avoiding extending it across two (2) driveways. This resulting length of 390 feet more than exceeds the Department's deceleration distance of 240 feet per Index 301 while also accommodating a queue of 150 feet. With that being said, the HCS analyses show projected queues of 230 feet and 260 feet in the midday and afternoon peak hours, respectively (this assumes zero (0) right turns on red and

thus presents a worst-case scenario). Thus, the proposed 390-foot right-turn lane can fully accommodate these queues.

Comment #4: From field observations most of the westbound through traffic at the intersection stayed in the inside and middle westbound through lanes with lane utilization for outside lane largely serving right turns due to added lane with taper upstream.

Response: Correct.

Comment #5: No hard braking in the outside westbound through lane for right turns was observed.

Response: Correct.

Comment #6: Some westbound right turns on red were observed to bypass standing through queues.

Response: Correct.

Comment #7: Westbound right turn will increase crossing distance for peds and introduce potential for conflict.

Response: The conflict with right-turning vehicles exists regardless of the alternative, however, no issues were observed (and no such crashes occurred over the past five years). The Flashing Don't Walk timings should be adjusted as a result of the additional crossing distance.

Comment #8: Right turn lane will increase RTOR and conflict potential for opposing movements including EB dual lefts and SB to NB u-turns. If RTOR needs to be prohibited in the future, any capacity benefit from an exclusive right turn lane is further depreciated.

Response: No issues or concerns were observed with such potential conflicts. Also, even if right turns on red were prohibited, the westbound right-turn volume can be accommodated by the westbound through green. The HCS analysis projected queues and delay are based on 0 right turns on red.

Comment #9: A right turn lane may not provide a 4% reduction in crashes as noted in study, based on existing generally good safety history for this movement.

Response: Please see the response to Robert Keeth's comment #4.

Comment #10: An exclusive westbound right turn lane does not appear to provide significant benefit to overall intersection operation and safety.

Response: Although not significant, the study does show a capacity benefit as well as a safety benefit. It should also be noted that such benefits are expected to increase as development continues and traffic volumes continue to grow in the area.

Comments from Mr. Tim Burman

Comment #1: Page 1: Include statement that City of Port Orange submitted the application.

Response: Information has been added to the study.

Comment #2: Should the project cost estimate page include also include estimates for 2018 and 2019?

Response: Study has been revised to include the three (3) years of cost estimates.

Mr. Robert Keeth March 27, 2017 Page 5 of 5

Comment #3: Was only the midday peak hour and afternoon peak hour studied based on the 24-hour weekday approach counts? Therefore, the AM peak hour was not reviewed because the AM peak hour counts were less than midday and afternoon peak hour.

Response: Correct.

Comment #4: On Sheet 26, please consider adding button posts ten feet apart, conduits, and splice boxes at grade for future Audible Pedestrian Signals as part of the Engineer's Opinion of Probable Cost. To the best of Community Development's information, intersections of State Highways are highest on the priorities to receive Audible Pedestrian Signals. Recommend the Consultant call FDOT's Chad Lingenfelter at 386-943-5336 to determine the priority of this particular intersection.

Response: The cost estimate and improvement diagram account for providing separate pedestrian detectors which could ultimately be converted to APS. The improvement diagram has been updated to show push-button posts a minimum of 10 feet apart.

Comments from Ms. Melanie Schmotzer

Comment #1: Page 1: Include statement that City of Port Orange submitted the application.

Response: Information has been added to the study.

Comment #2: Should the project cost estimate page include also include estimates for 2018 and 2019?

Response: Study has been revised to include the three (3) years of cost estimates.

Comment #3: Was only the midday peak hour and afternoon peak hour studied based on the 24-hour weekday approach counts? Therefore, the AM peak hour was not reviewed because the AM peak hour counts were less than midday and afternoon peak hour.

Response: Correct.

Comment #4: On Sheet 26, please consider adding button posts ten feet apart, conduits, and splice boxes at grade for future Audible Pedestrian Signals as part of the Engineer's Opinion of Probable Cost. To the best of Community Development's information, intersections of State Highways are highest on the priorities to receive Audible Pedestrian Signals. Recommend the Consultant call FDOT's Chad Lingenfelter at 386-943-5336 to determine the priority of this particular intersection.

Response: The cost estimate and improvement diagram account for providing separate pedestrian detectors which could ultimately be converted to APS. The improvement diagram has been updated to show push-button posts a minimum of 10 feet apart.

Comment #5: Show existing City utilities. As-built drawings are attached.

Response: Existing utility information has been provided by the City and added to the improvement diagram.

Should you have any questions, please contact me at (386) 753-0558.