

CITY OF MARCO ISLAND



TRAFFIC OPERATIONS STUDY / RETIMING PEAK SEASON 2023

FINAL REPORT

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1. Executive Summary

The Florida Transportation Engineering (FTE) team performed a comprehensive traffic signal retiming project in the City of Marco Island during the peak season. The overall purpose of the retiming / coordination project was to optimize the mainline progression while minimizing the side street delay at the signalized intersections as much as practical.

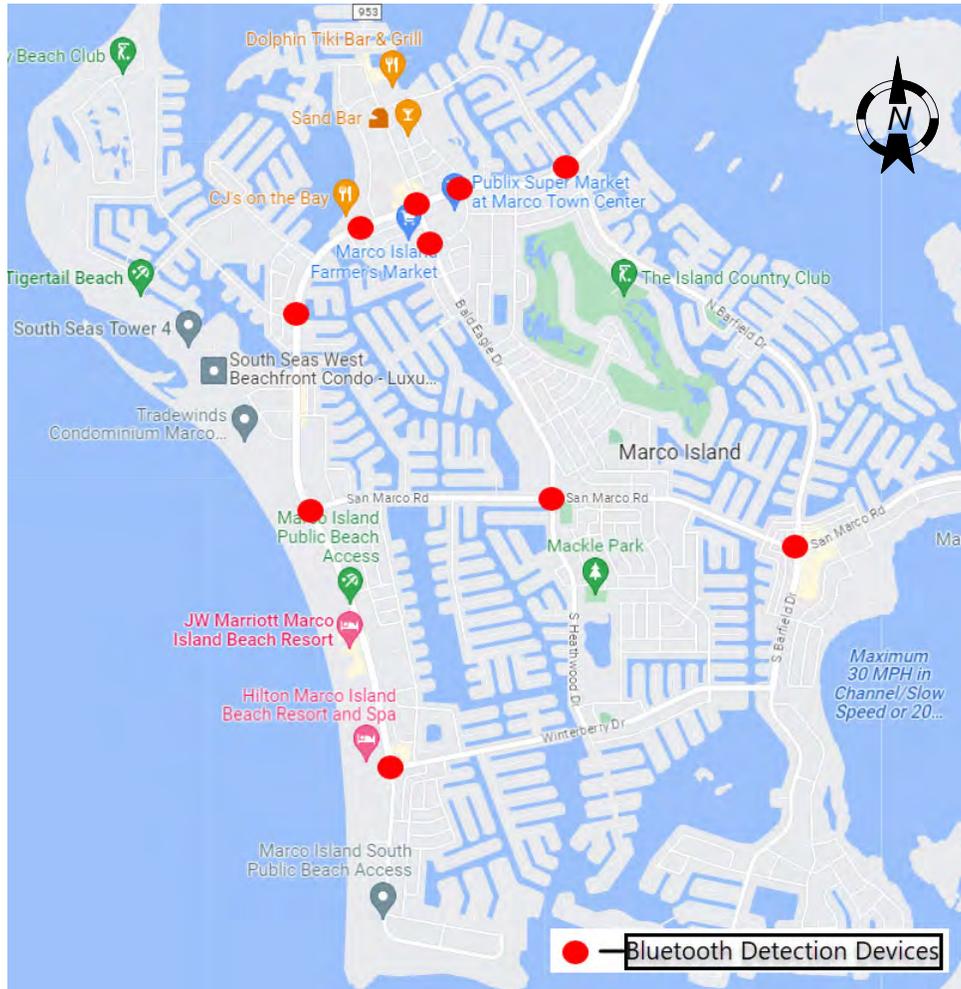
Conclusions:

- All ten (10) signalized intersections in Marco Island were found running FREE operations.
- Four (4) signalized intersections remain in FREE operation due to their operational characteristics: S. Collier Boulevard at Winerberry Drive, San Marco Road at Heathwood Drive, San Marco Road at Barfield Drive, and Bald Eagle Drive at Elkcarn Circle.
- Six (6) signalized intersections along N. Collier Boulevard from Barfield Drive to San Marco Road operate coordinated signal timing plans in the AM Weekday, Mid-Day Weekday, PM Weekday, Weekend, and Off-Peak time periods.
- N. Collier Boulevard from Barfield Drive to San Marco Road currently services an average of 190,500 vehicles per week within the 2.17 mile coordinated retiming area.
- Based on the non-intrusive Bluetooth detection data, there is a weekly time savings of approximately 1,200 vehicle-hours per week along the N. Collier Boulevard resulting from the retiming efforts.
- According to the Synchro model calculations, there is also a weekly fuel savings of approximately 2,200 gallons.
- The Benefit / Cost Ratio of the Marco Island Retiming Project is 40:1 over the estimated three (3) year life of the project.
- Westbound travel times along N. Collier Boulevard from Capri Boulevard to Barfield Drive were reduced by 73 seconds per vehicle in the AM peak period from 7:15-10:00am, including a reduction of 118 seconds per vehicle from 8:00-9:30am.

Recommendations:

- Replace camera detection systems and traffic controllers at all ten (10) signalized intersections.
- Correct/repair northbound illuminated blank-out sign (No Right Turn) operation at the intersection of San Marco Road at Heathwood Drive.
- Sync the controller clocks along N. Collier Boulevard from San Marco Road to N. Barfield Drive monthly or more often (by either City signal staff or City's signal contractor).
- Install illuminated dynamic blank-out signs for the northbound and southbound approach to create safer pedestrian movements at the intersection of N. Collier Boulevard and N. Barfield Drive. Black-out signs should indicate no turn on red message to restrict the northbound and southbound right-turn movements during the adjacent pedestrian Walk interval when activated. Additionally, black-out signs should indicate yield to peds message during the adjacent pedestrian Flashing Don't Walk interval when activated.
- Replace northbound outside 3-section signal head with 5-section head and operate with right-turn overlap at the intersection of N. Collier Boulevard and N. Barfield Drive to allow northbound right-turning movement to run concurrently with the westbound left-turn movement. In conjunction with the signal head replacement, a westbound u-turn restriction sign should be installed.
- Install Flashing Yellow Arrow (FYA) signal heads along N. Collier Boulevard at W. Elkcarn Circle, E. Elkcarn Circle, and Barfield Drive, where protected/permissive phasing currently exists to allow for Protected Phasing by Time of Day (TOD) and additional Lead/Lag opportunities. Lead/Lag use will provide improved traffic flow and increased green bands for each timing plan. Potential green bands could be expanded from 29% to 72% in at least one direction as seen on the Time-space diagrams located on the following pages.

2. Location Map



Based on the Scope of Work dated 9/12/2022, the Study Area / Retiming Project included the following ten (10) signalized intersections:

1. N. Collier Boulevard at N. Barfield Drive
2. N. Collier Boulevard at E. Elckam Circle
3. N. Collier Boulevard at Bald Eagle Drive
4. N. Collier Boulevard at W. Elckam Circle
5. N. Collier Boulevard at Kendall Drive
6. N. Collier Boulevard at San Marco Road
7. S. Collier Boulevard at Winterberry Drive
8. San Marco Road at Heathwood Drive
9. San Marco Road at Barfield Drive
10. Bald Eagle Drive at Elckam Circle

3. Roadway Characteristics

The roadways in Marco Island encompassing the traffic signals vary in speed limits from 25 mph to 35 mph. The number of lanes through the Project Area is as follows:

- Four-lane divided arterial along Collier Boulevard from Barfield Drive to Winterberry Drive.
- Two-lane arterial along San Marco Road from Collier Boulevard to Barfield Drive.
- Two-lane arterial along Bald Eagle Drive from N. Collier Boulevard to Elkcam Circle.

4. Ten Hour Turning Movement Counts

FTE collected and summarized ten (10) hours of fifteen (15) minute turning movement counts (TMCs) at the ten (10) identified intersections using the procedures contained in FDOT's Manual on Uniform Traffic Studies (MUTS), Chapter IV, "Summary of Vehicle Movements". The counts were collected during 10 hours of the day and included the AM peak, Mid-Day peak, PM peak, and Off-peak periods. The counts also included heavy vehicles and pedestrian counts. The TMCs were collected for two (2) consecutive weekdays and the results were averaged for input into the traffic model. Weekend TMCs were collected on a Saturday. The raw TMC count data has been included in the appendix.

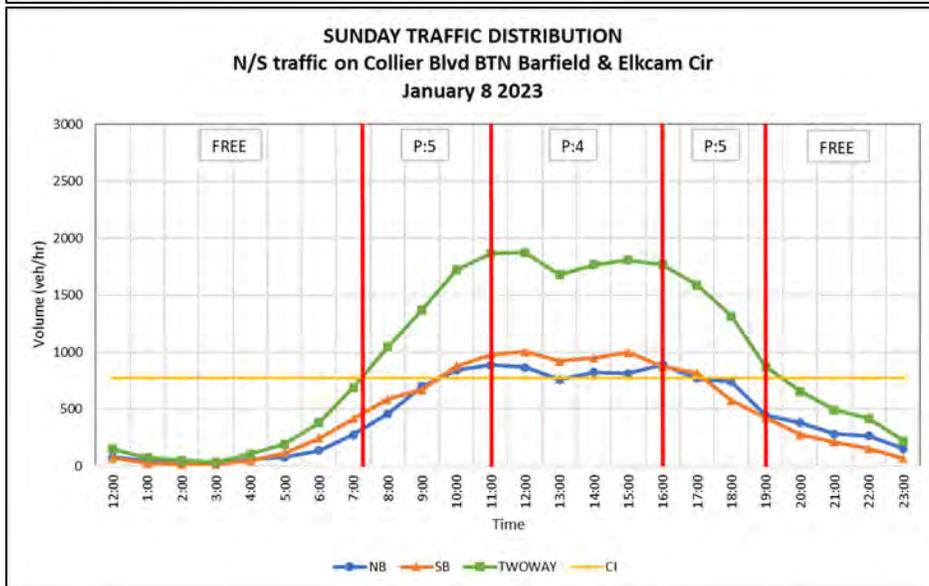
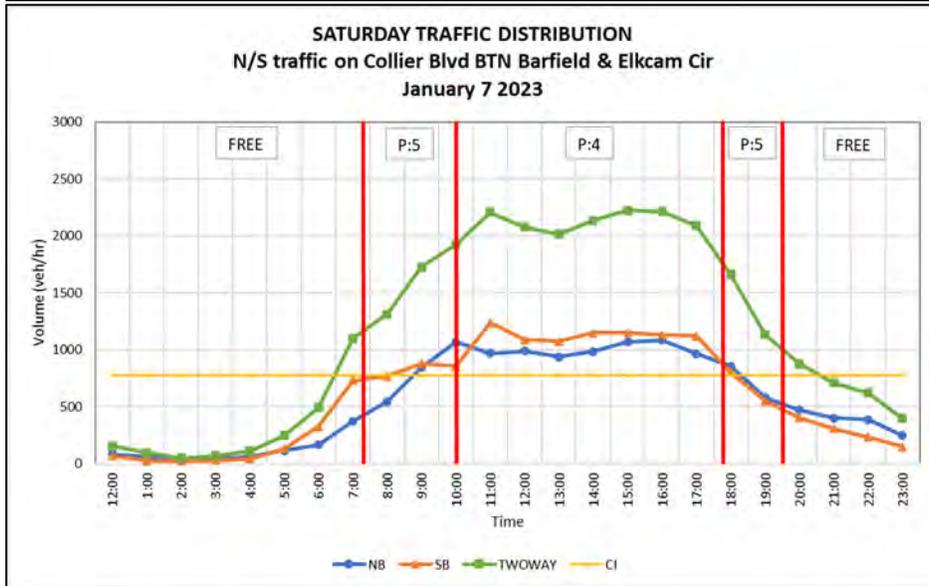
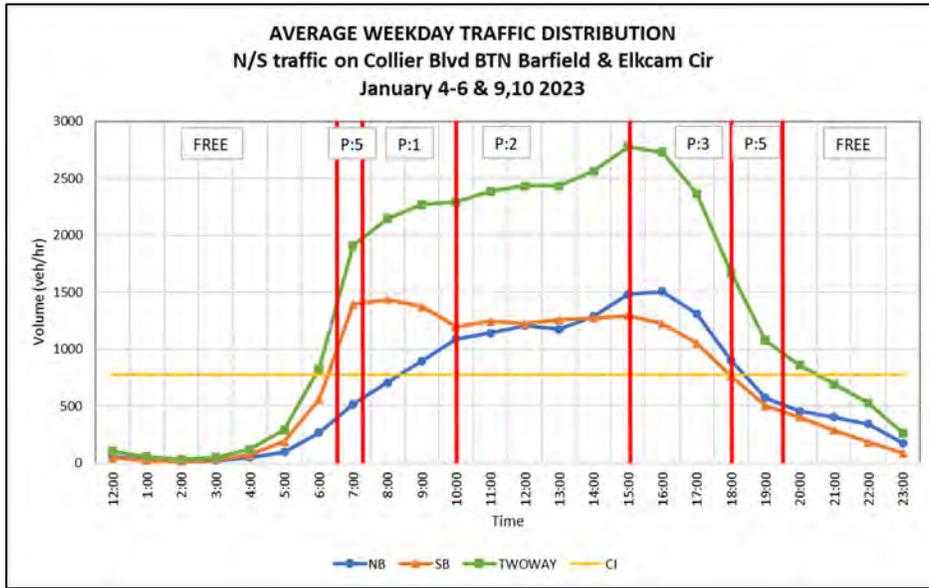
5. Seven Day Bi-Directional Volume Counts

FTE collected bi-directional traffic volume counts for seven (7) consecutive days in each direction of travel at the following four (4) locations:

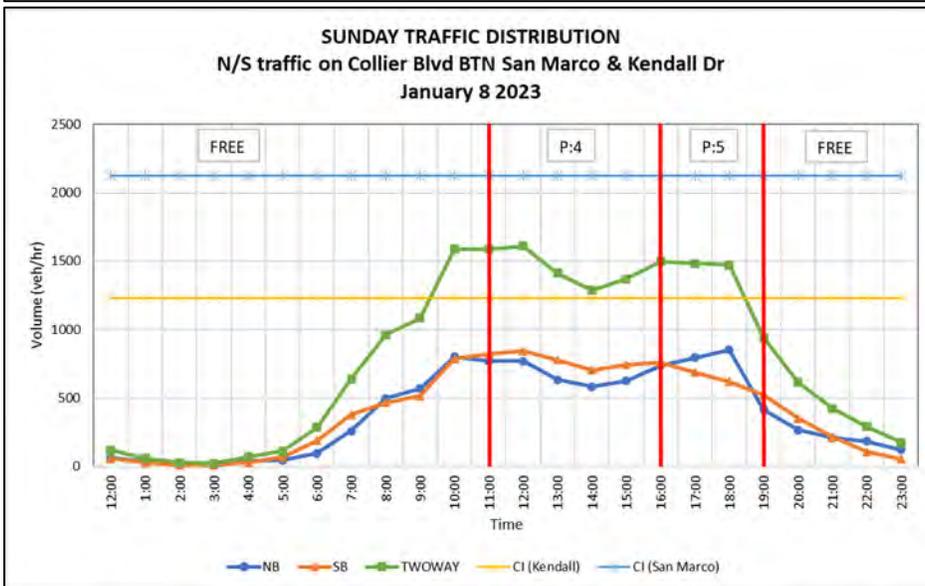
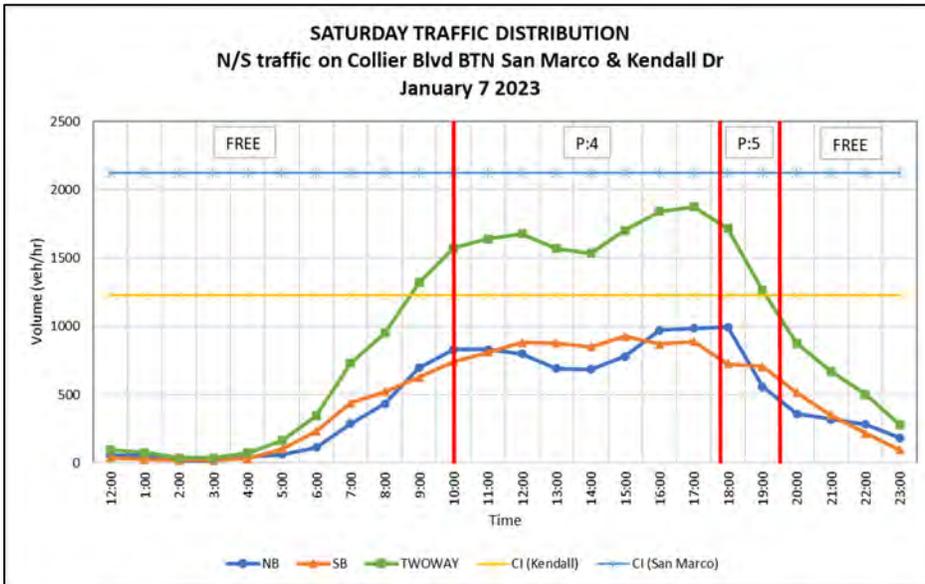
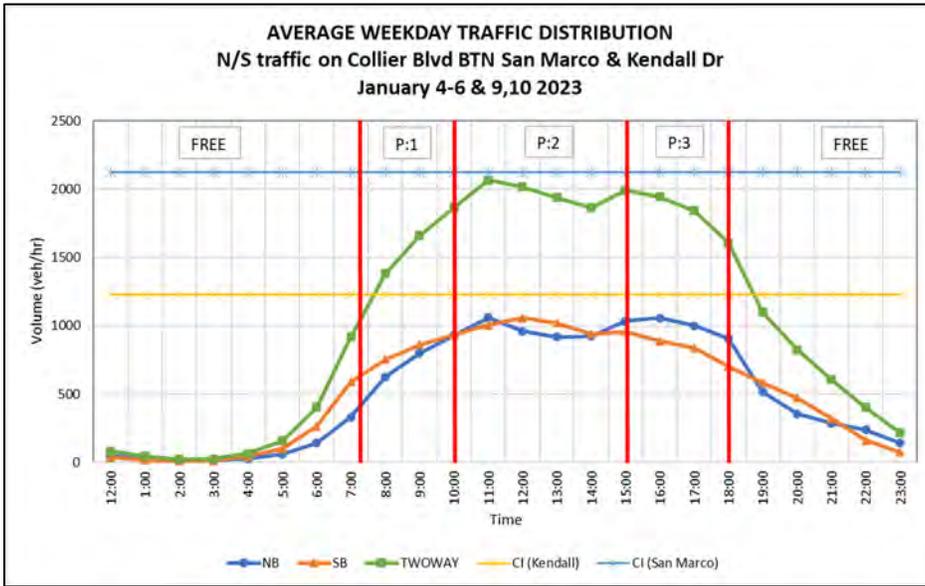
1. N. Collier Boulevard between Barfield Drive and E. Elkcam Circle (214,136 vehicles per week)
2. N. Collier Boulevard between Kendall Drive and San Marco Road (166,762 vehicles per week)
3. N. Collier Boulevard between San Marco Road and Winterberry Drive (100,641 vehicle per week)
4. San Marco Road between Heathwood Drive and Barfield Drive (74,263 vehicles per week)

The bi-directional volume counts were used to identify peak period characteristics of the subject arterial, to determine the operating time periods for each developed timing pattern, and to calculate the overall travel time reduction in vehicle-hours along the arterial. The 7-day volume count data has been included in the appendix in tabular form broken down into direction of travel, days, and hours with 15-minute increments and hourly totals. The following are the bi-directional volume graphs of the four (4) locations:

LOCATION 1
N. Collier Boulevard between Barfield Drive and E. Elkcum Circle

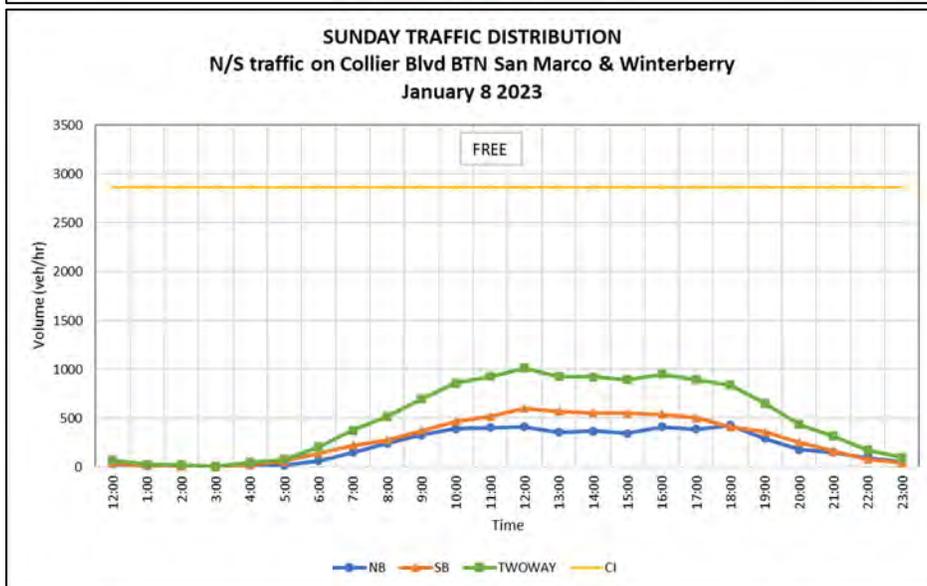
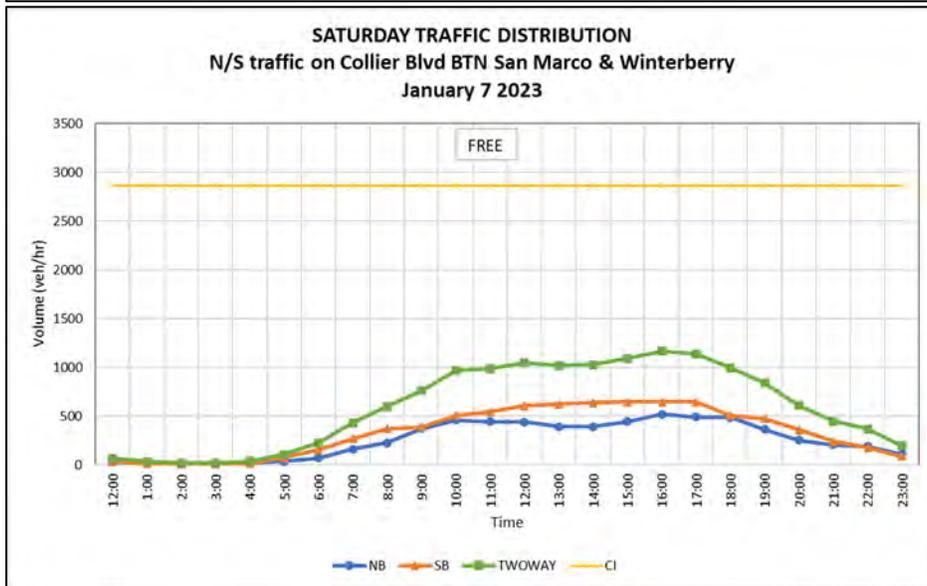
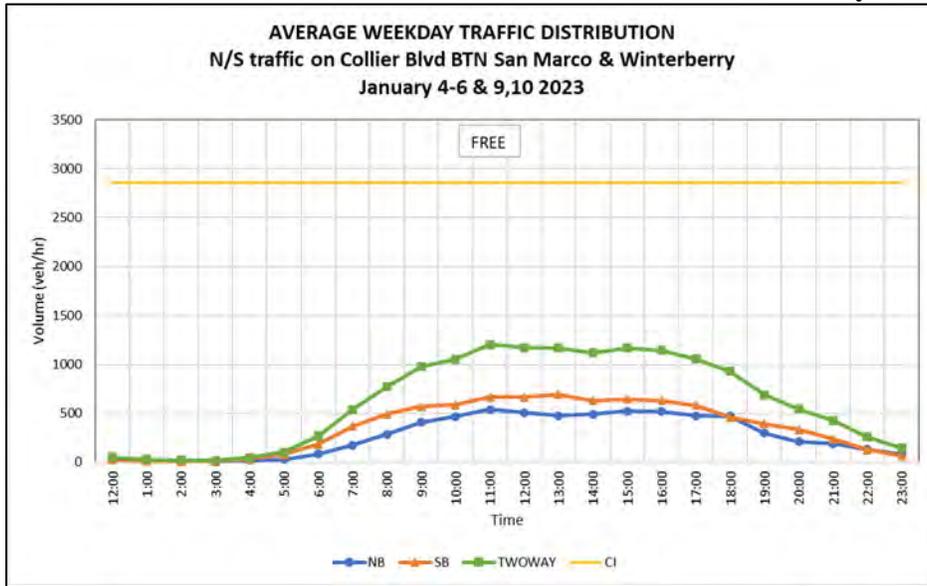


LOCATION 2
N. Collier Boulevard between Kendall Drive and San Marco Road

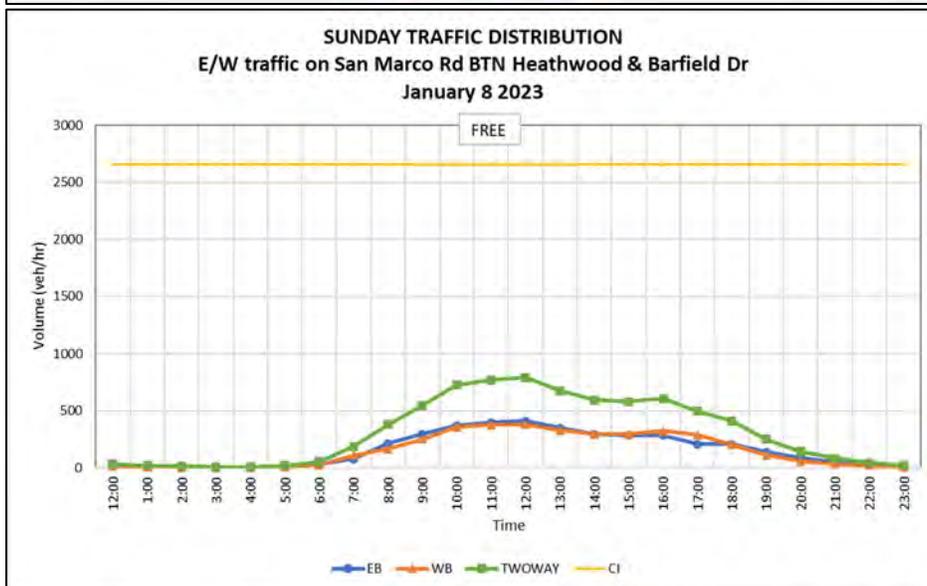
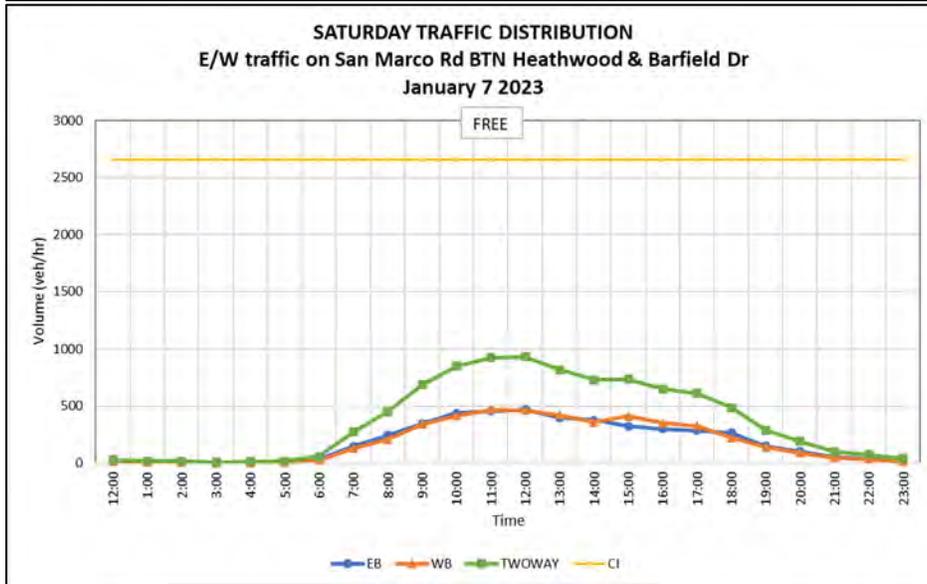
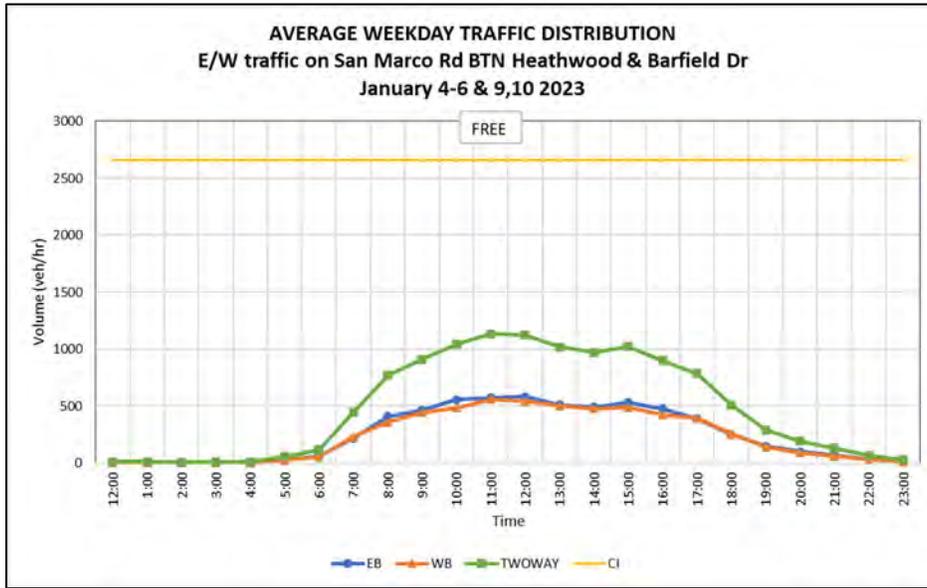


LOCATION 3

N. Collier Boulevard between San Marco Road and Winterberry Drive



LOCATION 4
San Marco Road between Heathwood Drive and Barfield Drive



6. Collection of Pre-Existing Traffic Signal Data

The pre-existing traffic signal data was collected from the controllers at all ten (10) intersections within the project area. The traffic signal data included the basic signal timings, phasing sequence, recall modes, time of day (TOD) plans, cycle lengths, offsets, and phase allocations. The pre-existing traffic signal data has been included in the study appendix.

7. Comprehensive Field Review

A comprehensive field review was conducted at the ten (10) project intersections. This effort was an ongoing process as issues were identified and resolved. Throughout the retiming process, other field condition issues occurred. The following is a list of identified issues and status:

- All locations – Pedestrian clearance times (flashing don't walk (FDW)) were found to be deficient.
 - Status – Resolved. FDW times were increased per FDOT standards.
- All locations – Large pedestrian community.
 - Status – Resolved. Lead pedestrian interval (LPI) has been programmed at numerous locations. The operational timing plans, included in the appendix, indicate locations utilizing LPI.
- All locations - Controller time clocks drift at a rate where monthly syncing is required to stay within a tolerable allowance to be in coordination.
 - Status – Unresolved.
- All locations – Traffic controllers are antiquated, and limit options provided by modern controllers.
 - Status – Unresolved. See Recommendations.
- N. Collier Boulevard from San Marco Road to N. Barfield Drive – Left-turn Lead/Lag opportunities to allow for improved traffic progression was only available at the intersection of N. Collier Boulevard at Bald Eagle Drive.
 - Status – Unresolved. See Recommendations.
- N. Collier Boulevard @ N. Barfield Drive – Unsafe conditions for southbound pedestrians on the northwest corner. Vehicles making a southbound right-turn movement have limited sight distance of pedestrians in the crosswalk.
 - Status – Unresolved. See Recommendations.
- N. Collier Boulevard @ N. Barfield Drive – Unsafe conditions for northbound pedestrians on the southeast corner. Vehicles making a northbound right-turn movement are making quick aggressive turns.
 - Status – Unresolved. See Recommendations.
- N. Collier Boulevard @ N. Barfield Drive – Northbound right-turn movement is heavy. High percentage of vehicles are turning during the westbound left-turn movement. Westbound U-turns are minimal.
 - Status – Unresolved. See Recommendations.
- N. Collier Boulevard @ N. Barfield Drive – Westbound traffic is heavy during the AM peak hours causing oversaturated conditions resulting in travel delays.
 - Status – Resolved. Coordinated plans have been implemented to improve westbound traffic flow.
- N. Collier Boulevard @ E. Elkcam Circle – Constant call on Phase 8 (NB).
 - Status – Unresolved.
- All locations except S. Collier Boulevard @ Winterberry Drive – Red clearance intervals were programmed at 1.0 seconds.
 - Status – Resolved. Red clearance intervals were set to a minimum 2.0 seconds per FDOT standards.
- S. Collier Boulevard @ Winterberry Drive – No vehicle detection.
 - Status – Unresolved.

- San Marco Road @ Heathwood Drive – NB blank-out sign operates for one (1) second with Phase 3 (SBL).
 - Status – Unresolved.
- Bald Eagle Drive @ Elkcarn Circle – Controller would not operate coordination timings.
 - Status – Unresolved.

8. Assessment of Saturation Flow Rate

The saturation flow rate was determined to be approximately 1900 vplph for the entire retiming project in Marco Island based on local knowledge of traffic patterns and extensive field observations. During the calibration of the traffic model, 1900 vplph was determined to be appropriate to best replicate existing field conditions.

9. Pre-Existing Conditions Software Models

The SYNCHRO software was used to model the pre-existing conditions and timing plans for the weekday AM, Mid-Day, and PM peak periods along with the Weekend period for each identified intersection. The SimTraffic model was used to verify that the SYNCHRO runs were an accurate reflection of the pre-existing conditions. The detailed SYNCHRO Reports are included in the study appendix. Performance indicators generated by the program for the ten (10) signalized intersections are summarized in Tables 1 – 4:

**TABLE 1
 PRE-EXISTING CONDITIONS
 WEEKDAY - AM PEAK PERIOD**

INTERSECTION	Intersection		Eastbound		Westbound		Northbound		Southbound	
	LOS	Delay (sec)	LOS	Delay (secs)	LOS	Delay (secs)	LOS	Delay (secs)	LOS	Delay (secs)
N. Collier Boulevard at N. Barfield Drive	E	71.9	B	11.8	F	101.1	C	24.5	D	41.0
N. Collier Boulevard at E. Elkcarn Circle	F	98.5	B	18.3	F	132.5	D	53.3	D	46.6
N. Collier Boulevard at Bald Eagle Drive	F	91.8	E	56.4	F	132.1	D	43.5	D	45.4
N. Collier Boulevard at W. Elkcarn Circle	B	14.9	B	14.3	B	13.3	C	27.2	B	13.8
N. Collier Boulevard at Kendall Drive	B	14.6	C	28.7			A	8.2	B	17.3
N. Collier Boulevard at San Marco Road	B	10.2			B	13.6	B	14.0	A	5.9
S. Collier Boulevard at Winterberry Drive	B	11.6			B	16.4	B	13.2	A	7.1
San Marco Road at Heathwood Drive	C	24.0	B	19.3	B	16.1	D	38.1	C	25.4
San Marco Road at Barfield Drive	C	25.5	C	22.3	C	22.7	C	33.6	C	26.4
Bald Eagle Drive at Elkcarn Circle	C	21.3	B	13.4	C	28.7	B	18.0	C	24.1

TABLE 2
 PRE-EXISTING CONDITIONS
 WEEKDAY – MID DAY PERIOD

INTERSECTION	Intersection		Eastbound		Westbound		Northbound		Southbound	
	LOS	Delay (sec)	LOS	Delay (secs)	LOS	Delay (secs)	LOS	Delay (secs)	LOS	Delay (secs)
N. Collier Boulevard at N. Barfield Drive	C	24.4	C	24.8	B	17.7	C	32.6	D	51.3
N. Collier Boulevard at E. Elkcam Circle	C	32.4	C	31.7	C	33.0	C	32.9	C	32.0
N. Collier Boulevard at Bald Eagle Drive	D	51.7	D	53.4	D	53.2	D	51.3	D	46.6
N. Collier Boulevard at W. Elkcam Circle	B	18.4	B	17.6	B	14.5	D	36.8	C	23.3
N. Collier Boulevard at Kendall Drive	B	20.0	D	44.0			B	10.4	C	22.2
N. Collier Boulevard at San Marco Road	B	11.6			B	15.7	B	15.9	A	6.3
S. Collier Boulevard at Winterberry Drive	B	14.0			B	19.7	B	16.2	A	7.9
San Marco Road at Heathwood Drive	C	27.9	C	21.3	C	22.1	D	43.3	C	29.6
San Marco Road at Barfield Drive	C	25.9	B	19.7	C	23.9	C	29.8	C	30.5
Bald Eagle Drive at Elkcam Circle	C	22.7	B	16.1	C	30.6	B	19.1	C	24.2

TABLE 3
 PRE-EXISTING CONDITIONS
 WEEKDAY – PM PEAK PERIOD

INTERSECTION	Intersection		Eastbound		Westbound		Northbound		Southbound	
	LOS	Delay (sec)	LOS	Delay (secs)	LOS	Delay (secs)	LOS	Delay (secs)	LOS	Delay (secs)
N. Collier Boulevard at N. Barfield Drive	D	44.8	D	50.8	C	29.7	D	52.9	E	77.7
N. Collier Boulevard at E. Elkcam Circle	D	36.7	D	38.3	C	31.0	D	39.3	D	47.4
N. Collier Boulevard at Bald Eagle Drive	D	51.6	D	54.2	D	53.8	D	47.5	D	46.5
N. Collier Boulevard at W. Elkcam Circle	B	18.8	B	19.2	B	13.9	D	41.4	C	22.3
N. Collier Boulevard at Kendall Drive	C	22.5	D	41.3			B	15.1	C	24.6
N. Collier Boulevard at San Marco Road	B	11.9			B	16.3	B	16.0	A	6.2
S. Collier Boulevard at Winterberry Drive	B	13.2			B	18.0	B	15.5	A	7.5
San Marco Road at Heathwood Drive	C	28.0	C	24.0	C	22.0	D	42.5	C	28.3
San Marco Road at Barfield Drive	C	32.2	C	32.2	C	25.8	D	40.4	C	29.5
Bald Eagle Drive at Elkcam Circle	C	24.0	B	15.5	C	32.7	C	21.0	C	23.6

TABLE 4
 PRE-EXISTING CONDITIONS
 WEEKEND - PEAK PERIOD

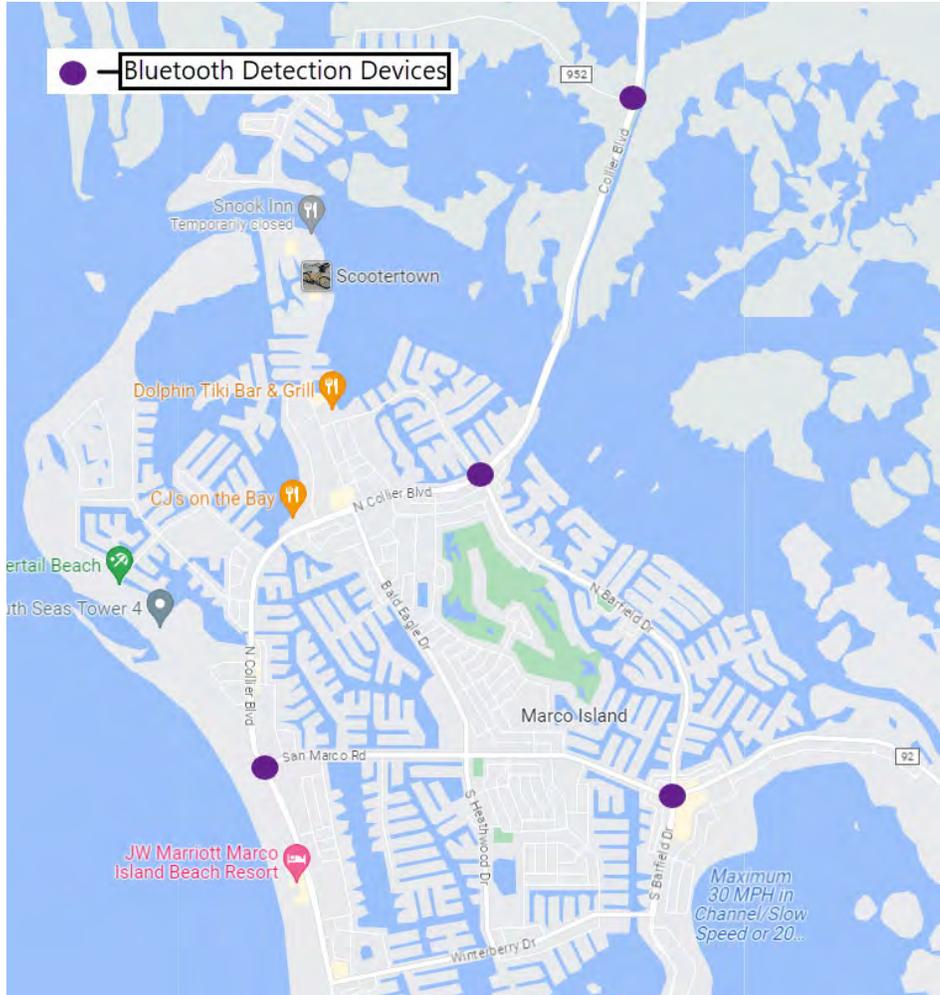
INTERSECTION	Intersection		Eastbound		Westbound		Northbound		Southbound	
	LOS	Delay (sec)	LOS	Delay (secs)	LOS	Delay (secs)	LOS	Delay (secs)	LOS	Delay (secs)
N. Collier Boulevard at N. Barfield Drive	B	17.8	B	19.8	B	14.2	B	19.0	D	38.7
N. Collier Boulevard at E. Elkcam Circle	C	20.8	B	19.0	B	17.6	C	31.4	C	29.2
N. Collier Boulevard at Bald Eagle Drive	D	41.9	D	44.4	D	45.2	D	39.3	C	34.7
N. Collier Boulevard at W. Elkcam Circle	B	15.6	B	13.6	B	14.8	C	32.2	B	19.3
N. Collier Boulevard at Kendall Drive	B	14.2	C	29.4			A	9.1	B	16.4
N. Collier Boulevard at San Marco Road	B	12.3			B	14.9	B	16.6	A	7.3
S. Collier Boulevard at Winterberry Drive	B	13.2			B	18.0	B	15.5	A	7.8
San Marco Road at Heathwood Drive	C	23.5	B	18.2	B	19.5	C	34.2	C	24.2
San Marco Road at Barfield Drive	C	24.6	B	19.5	C	20.5	C	29.5	C	28.0
Bald Eagle Drive at Elkcam Circle	B	16.9	B	13.3	C	20.3	B	14.4	B	18.4

10. Pre-Implementation Travel Time and Speed Analysis

Bluetooth detection devices were utilized at four (4) intersections to collect “Pre-Existing” travel time and speed data along the N. Collier Boulevard Arterial. The Bluetooth detection devices were utilized at the following locations:

1. N. Collier Boulevard at Capri Boulevard
2. N. Collier Boulevard at N. Barfield Drive
3. N. Collier Boulevard at San Marco Road
4. San Marco Road at Barfield Drive

BLUETOOTH DETECTION LOCATIONS



The Bluetooth detection devices were actively monitored and maintained at the aforementioned locations throughout the signal retiming / coordination process. The collected “Pre-Existing” travel time and speed data may be found in the *Post Implementation Travel Time and Delay Study* Section of this report for comparison with the “Post Implementation” travel time and speed data.

11. Development of Timing Plans, Coordination, and Time of Day Settings

New basic timings were developed for all ten (10) signalized intersections with Marco Island. Coordination timing plans were developed using SYNCHRO software to determine the optimal signal phasing, cycle length, and splits for the six (6) coordinated signalized intersections along N. Collier Boulevard between N. Barfield Drive and San Marco Road. The offsets from the time-space diagrams generated by SYNCHRO were refined using Tru-Traffic software. Multiple timing plans were developed for each intersection ranging from 110 – 150 second cycle lengths in 10 second increments. The 7-day bi-directional volume counts were used to visually estimate the breakpoints for each Time-of-Day (TOD) Schedule and were adjusted in the field based on the operational characteristics of the roadway segment. The implemented timing plans, hours of operation, and cycle lengths are depicted in Table 5 on the following page.

TABLE 5
TIME OF DAY PLANS

Roadway Segment	Intersections	Day	Hours	Pattern	Cycle (sec)
N. Collier Boulevard	N. Barfield Drive - San Marco Road	Monday - Friday	6:30-7:15	5	110
			7:15-10:00	1	150
			10:00-15:00	2	140
			15:00-18:00	3	140
			18:00-19:30	5	110
		Saturday	7:15-10:00	5	110
			10:00-17:45	4	140
			17:45-19:30	5	110
		Sunday	8:30-11:00	5	110
			11:00-16:00	4	140
			16:00-19:00	5	110

Notes:

- 1) N. Collier Blvd @ Kendall Dr run Pattern 5 beginning at 08:30 on Saturdays and Sundays
- 2) N. Collier Blvd @ San Marco Rd does not run Pattern 5 on Weekdays, Saturday AM, or Sunday AM

The following intersections operate only in FREE operation due to their operational characteristics:

1. S. Collier Boulevard at Winterberry Drive
2. San Marco Road at Heathwood Drive
3. San Marco Road at Barfield Drive

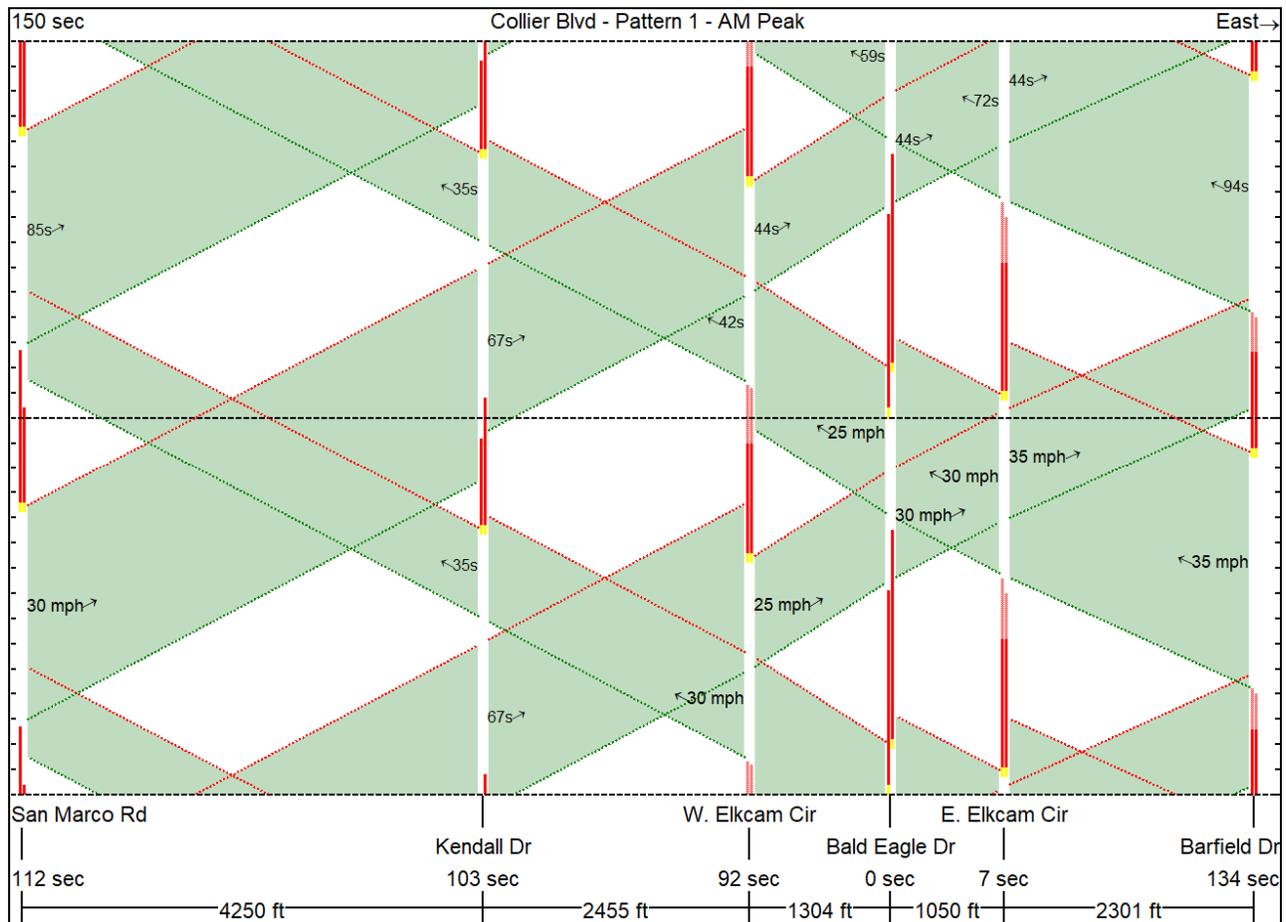
The intersection of Bald Eagle Drive at Elkcam Circle operates only in FREE operation due to controller malfunction.

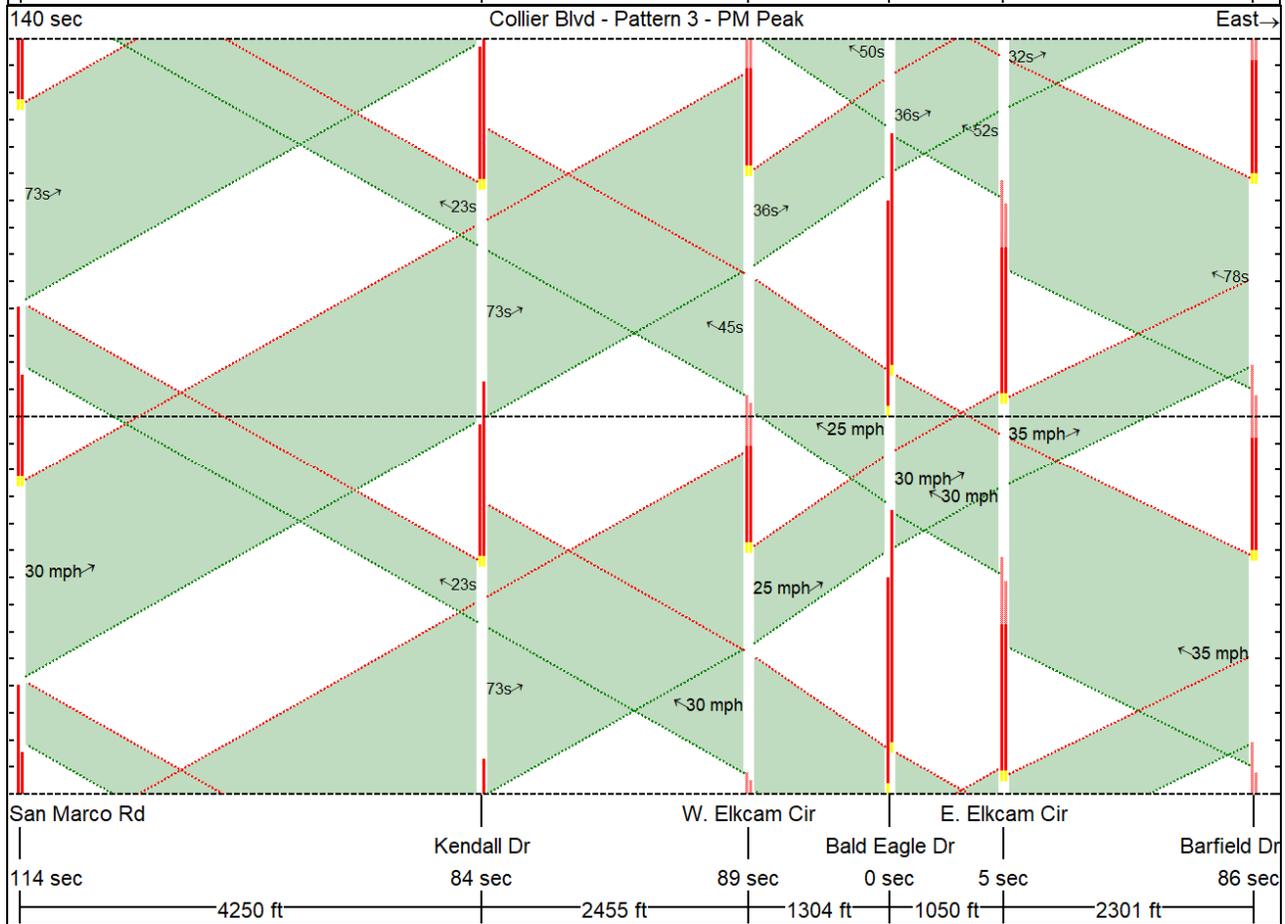
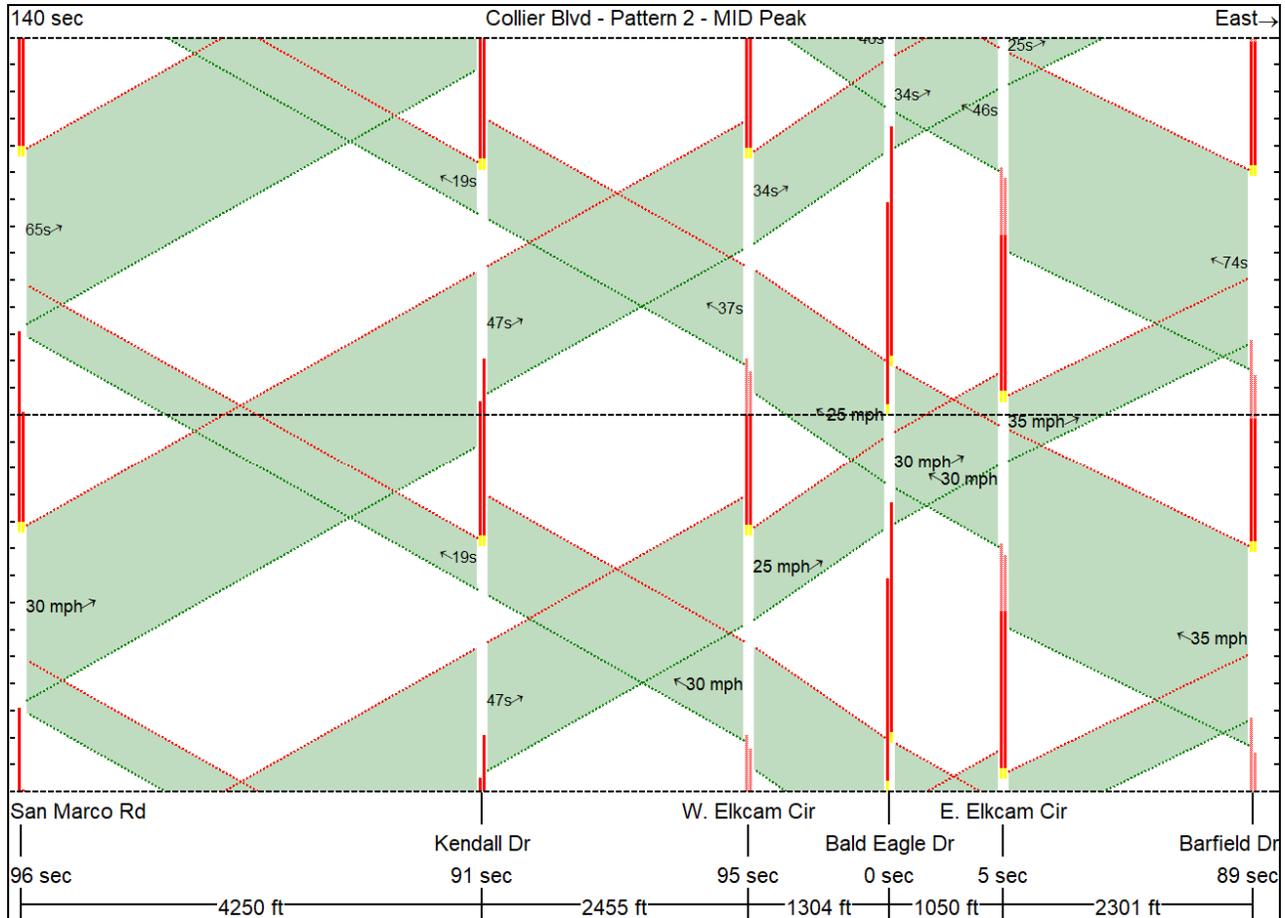
12. Time-Space Diagrams

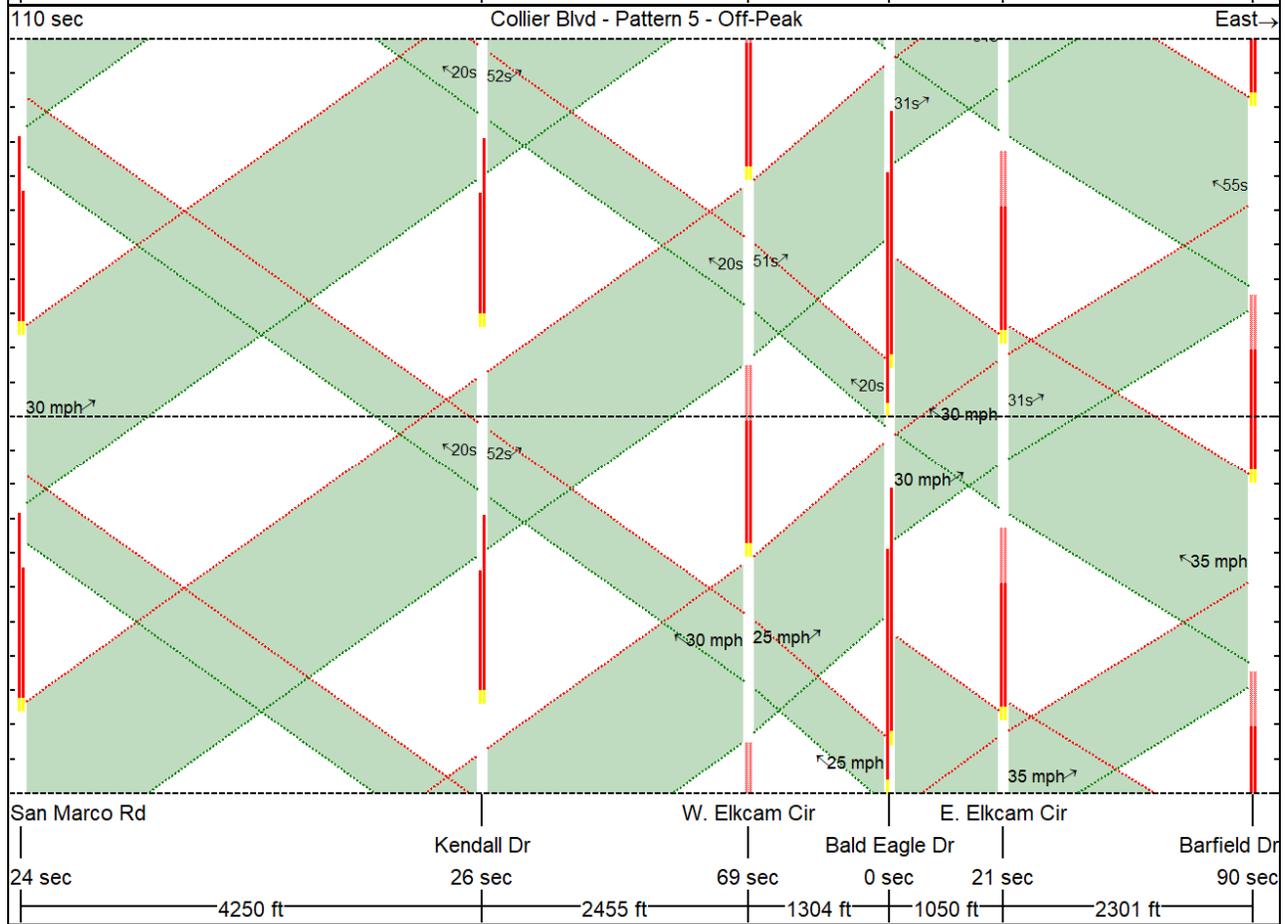
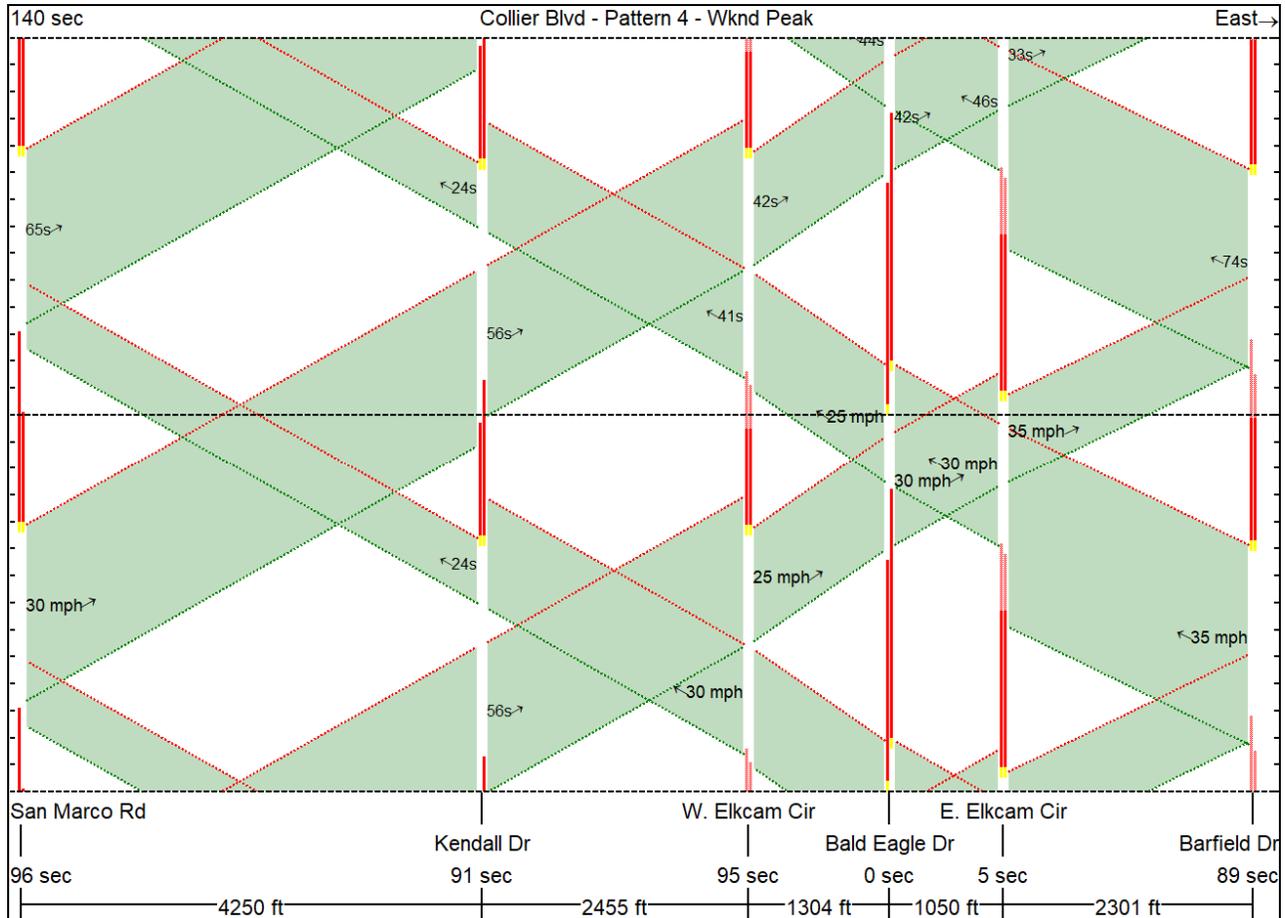
Time-Space Diagrams were generated for the signal timing plans using Tru-Traffic software. The green bandwidths, direction of travel, speed limits, intersection names, offsets, and signal spacing are shown on each time-space diagram. It should be noted that the Tru-Traffic model represents the theoretical progression of vehicles along the arterial in a steady state environment such as constant speed, consistent actuation, and maximum split times. Actual “green bands” observed in the field account for early release or skipped phases. The N. Collier Boulevard Arterial exhibited the following operational characteristics which increased the effective green band:

- There are multiple locations where the Protected / Permissive Left Turn Phases are routinely skipped as vehicles clear the queue during the Permissive Left Turn Phase.
- There are multiple low volume intersections in which the minor movements gap out early throughout periods of the day or are entirely skipped.

Time-Space Diagrams that were generated for the implemented signal timing plans, using Tru-Traffic software, may be found on the following pages.







13. Deployment and Fine Tuning of Timing Plans

The new signal timings were deployed in January 2023 and subsequently refined based on field observation. Left-turn Lead/Lag strategies were analyzed using Tru-Traffic software to optimize the efficiency of the coordinated roadway segments. Each potential Lead/Lag scenario was then evaluated in the field to ensure viable operation and functionality. All implemented Lead/Lag operations were deployed at intersections with Protected Only Left Turn Phasing to avoid the “Yellow Trap” scenario. The intersection of N. Collier Boulevard at Bald Eagle Drive was the sole location with Lead/Lag opportunity. The operational timing plans, included in the appendix of the report, identify Lead/Lag operations by Time-of-Day Plan.

14. Post-Implementation Software Models

The SYNCHRO software was used to model the post-implementation timing plans for the weekday AM, Mid-Day, and PM peak periods along with the Weekend period for each identified intersection. The detailed SYNCHRO Reports are included in the study appendix. Performance indicators generated by the program for the ten (10) signalized intersections are summarized in Tables 6 – 9.

TABLE 6
 POST-IMPLEMENTATION CONDITIONS
 WEEKDAY – AM PEAK PERIOD

INTERSECTION	Intersection		Eastbound		Westbound		Northbound		Southbound	
	LOS	Delay (sec)	LOS	Delay (secs)	LOS	Delay (secs)	LOS	Delay (secs)	LOS	Delay (secs)
N. Collier Boulevard at N. Barfield Drive	D	50.6	B	15.5	E	60.3	D	44.7	F	84.1
N. Collier Boulevard at E. Elkcarn Circle	D	51.7	B	17.0	E	56.7	E	67.5	E	65.9
N. Collier Boulevard at Bald Eagle Drive	E	58.2	C	32.9	E	76.9	D	44.8	D	44.1
N. Collier Boulevard at W. Elkcarn Circle	A	9.6	A	7.1	A	1.3	E	61.2	C	27.7
N. Collier Boulevard at Kendall Drive	B	14.6	F	80.3			A	9.1	A	6.5
N. Collier Boulevard at San Marco Road	B	10.8			D	36.7	A	6.4	A	1.7
S. Collier Boulevard at Winterberry Drive	B	11.1			B	18.4	B	12.0	A	6.2
San Marco Road at Heathwood Drive	C	25.2	C	22.3	B	18.3	D	35.0	C	27.0
San Marco Road at Barfield Drive	C	24.4	C	23.7	C	22.9	C	30.1	C	23.0
Bald Eagle Drive at Elkcarn Circle	C	26.0	C	22.0	D	52.5	B	16.5	C	21.8

TABLE 7
 POST-IMPLEMENTATION CONDITIONS
 WEEKDAY – MID DAY PEAK PERIOD

INTERSECTION	Intersection		Eastbound		Westbound		Northbound		Southbound	
	LOS	Delay (sec)	LOS	Delay (secs)	LOS	Delay (secs)	LOS	Delay (secs)	LOS	Delay (secs)
N. Collier Boulevard at N. Barfield Drive	C	25.8	B	19.0	B	17.5	D	45.6	E	78.6
N. Collier Boulevard at E. Elkcarn Circle	C	33.6	A	9.6	B	18.1	E	61.5	F	108.1
N. Collier Boulevard at Bald Eagle Drive	D	38.5	C	30.3	C	32.5	E	58.8	D	45.9
N. Collier Boulevard at W. Elkcarn Circle	B	14.4	B	12.2	A	6.5	D	51.2	C	32.7
N. Collier Boulevard at Kendall Drive	C	24.6	E	67.6			B	18.8	C	17.9
N. Collier Boulevard at San Marco Road	B	11.9			D	35.1	A	8.6	A	5.5
S. Collier Boulevard at Winterberry Drive	B	13.5			C	21.5	B	14.7	A	7.2
San Marco Road at Heathwood Drive	C	29.9	C	22.5	C	23.6	D	44.8	C	33.0
San Marco Road at Barfield Drive	C	24.8	C	20.6	C	25.2	C	27.8	C	26.0
Bald Eagle Drive at Elkcarn Circle	C	20.7	B	17.5	D	39.0	B	15.2	B	16.2

TABLE 8
 POST-IMPLEMENTATION CONDITIONS
 WEEKDAY – PM PEAK PERIOD

INTERSECTION	Intersection		Eastbound		Westbound		Northbound		Southbound	
	LOS	Delay (sec)	LOS	Delay (secs)	LOS	Delay (secs)	LOS	Delay (secs)	LOS	Delay (secs)
N. Collier Boulevard at N. Barfield Drive	D	44.6	D	48.0	C	27.5	E	61.6	F	85.5
N. Collier Boulevard at E. Elkcarn Circle	C	29.9	B	12.9	C	21.7	D	47.5	F	89.9
N. Collier Boulevard at Bald Eagle Drive	D	38.2	C	33.1	C	23.0	E	64.6	D	49.2
N. Collier Boulevard at W. Elkcarn Circle	B	15.6	B	15.6	A	6.0	E	59.9	C	31.3
N. Collier Boulevard at Kendall Drive	C	24.8	E	73.1			B	14.4	B	19.3
N. Collier Boulevard at San Marco Road	B	12.2			C	34.9	A	8.2	A	7.7
S. Collier Boulevard at Winterberry Drive	B	12.6			B	19.4	B	14.0	A	6.7
San Marco Road at Heathwood Drive	C	29.2	C	24.8	C	22.2	D	42.5	C	31.1
San Marco Road at Barfield Drive	C	30.9	C	31.1	C	25.3	D	38.9	C	27.4
Bald Eagle Drive at Elkcarn Circle	C	20.9	B	16.4	D	37.7	B	15.9	B	16.2

TABLE 9
 POST-IMPLEMENTATION CONDITIONS
 WEEKEND – PEAK PERIOD

INTERSECTION	Intersection		Eastbound		Westbound		Northbound		Southbound	
	LOS	Delay (sec)	LOS	Delay (secs)	LOS	Delay (secs)	LOS	Delay (secs)	LOS	Delay (secs)
N. Collier Boulevard at N. Barfield Drive	B	16.8	B	12.0	B	11.5	C	31.6	E	74.7
N. Collier Boulevard at E. Elkcarn Circle	B	19.3	A	4.6	A	8.5	E	60.2	E	76.5
N. Collier Boulevard at Bald Eagle Drive	C	33.2	C	30.9	D	37.7	C	34.6	C	29.2
N. Collier Boulevard at W. Elkcarn Circle	A	9.8	A	6.6	A	3.3	E	60.6	C	33.6
N. Collier Boulevard at Kendall Drive	B	16.1	E	70.3			B	11.0	B	10.3
N. Collier Boulevard at San Marco Road	B	14.9			C	30.7	A	10.0	B	10.1
S. Collier Boulevard at Winterberry Drive	B	12.7			B	19.7	B	14.0	A	7.0
San Marco Road at Heathwood Drive	C	26.3	C	20.7	C	22.4	C	34.8	C	28.1
San Marco Road at Barfield Drive	C	22.4	C	21.6	C	20.7	C	23.9	C	23.1
Bald Eagle Drive at Elkcarn Circle	B	15.4	B	13.3	C	21.0	B	13.8	B	13.8

15. Post-Implementation Travel Time and Speed Analysis (MOEs)

The goal of this retiming project was to provide optimum mainline progression along the N. Collier Boulevard corridor while balancing minor movement delay. To measure the effectiveness of the retiming project, mainline travel times and speed averages were measured along the corridor before and after the modification of the signal timings. Travel times along N. Collier Boulevard were collected utilizing Bluetooth detection devices deployed along the corridor. A device was placed at N. Collier Boulevard at Capri Boulevard in order to capture morning travel times of westbound commuting vehicles heading into Marco Island. Travel times along San Marco Road and Barfield Drive were not utilized. Those corridors continue to run FREE operations.

The Bluetooth detection devices collected Bluetooth MAC addresses from the travelling motorists (via vehicle devices, cell phones, etc.) and matched identical MAC addresses recorded from each device. Each recorded MAC address was time-stamped in order to determine travel time between detection devices and to calculate the corresponding speed data. This method of data collection allows for continuous accumulation of travel times before, during, and after the signal retiming process. This form of data collection is non-intrusive and the rate of data collection is significantly higher than utilizing traditional probe vehicles.

The travel time and speeds were collected utilizing four (4) Bluetooth detection locations along the N. Collier Boulevard Arterial at:

1. N. Collier Boulevard at Capri Boulevard
2. N. Collier Boulevard at N. Barfield Drive
3. N. Collier Boulevard at San Marco Road
4. San Marco Road at Barfield Drive

Data collection segments were created between adjacent Bluetooth detection devices. The “Pre-Existing” data was collected from January 2 through January 22, 2023. The “Post Implementation” data was collected from February 25 through April 25, 2023. The “Post-Implementation” and “Pre-Existing” travel time and speed data for each Time-of-Day Plan is depicted in Table 10.

**TABLE 10
 AVERAGE TRAVEL TIME/SPEED MEASURES OF EFFECTIVENESS**

N. Collier Boulevard - Capri Boulevard to N. Barfield Drive - WB

Day of Week	Time of Day	Study Period	Travel Time (s)	Speed (mph)	Improvement (s)	Improvement (%)
Monday - Friday	6:30am - 7:15am	Post Implementation	151	47.0	2 slower	-1%
		Pre-Existing	149	47.6		
	7:15am - 10:00am	Post Implementation	185	38.3	73 faster	28%
		Pre-Existing	258	27.5		
	10:00am - 3:00pm	Post Implementation	179	39.6	6 slower	-3%
		Pre-Existing	173	41.0		
	3:00pm - 6:00pm	Post Implementation	169	42.0	7 faster	4%
		Pre-Existing	176	40.3		
	6:00pm - 7:30pm	Post Implementation	155	45.8	4 faster	3%
		Pre-Existing	159	44.6		

N. Collier Boulevard - San Marco Road to N. Barfield Drive - EB

Day of Week	Time of Day	Study Period	Travel Time (s)	Speed (mph)	Improvement (s)	Improvement (%)	
Monday - Friday	6:30am - 7:15am	Post Implementation	220	35.5	17 slower	-8%	
		Pre-Existing	203	38.5			
	7:15am - 10:00am	Post Implementation	268	29.1	10 slower	-4%	
		Pre-Existing	258	30.3			
	10:00am - 3:00pm	Post Implementation	339	23.0	15 faster	4%	
		Pre-Existing	354	22.1			
	3:00pm - 6:00pm	Post Implementation	346	22.6	31 faster	8%	
		Pre-Existing	377	20.7			
	6:00pm - 7:30pm	Post Implementation	290	26.9	31 faster	10%	
		Pre-Existing	321	24.3			
	Saturday	7:15am - 10:00am	Post Implementation	248	31.5	18 slower	-8%
			Pre-Existing	230	34.0		
10:00am - 5:45pm		Post Implementation	306	25.5	6 faster	2%	
		Pre-Existing	312	25.0			
5:45pm - 7:30pm		Post Implementation	293	26.7	4 faster	1%	
		Pre-Existing	297	26.3			
Sunday	8:30am - 11:00am	Post Implementation	253	30.9	5 slower	-2%	
		Pre-Existing	248	31.5			
	11:00am - 4:00pm	Post Implementation	285	27.4	29 faster	9%	
		Pre-Existing	314	24.9			
	4:00pm - 7:00pm	Post Implementation	279	28.0	6 faster	2%	
		Pre-Existing	285	27.4			

N. Collier Boulevard - N. Barfield Drive to San Marco Road - WB

Day of Week	Time of Day	Study Period	Travel Time (s)	Speed (mph)	Improvement (s)	Improvement (%)	
Monday - Friday	6:30am - 7:15am	Post Implementation	231	33.8	29 slower	-14%	
		Pre-Existing	202	38.7			
	7:15am - 10:00am	Post Implementation	265	29.5	22 faster	8%	
		Pre-Existing	287	27.2			
	10:00am - 3:00pm	Post Implementation	322	24.3	28 faster	8%	
		Pre-Existing	350	22.3			
	3:00pm - 6:00pm	Post Implementation	295	26.5	40 faster	12%	
		Pre-Existing	335	23.3			
	6:00pm - 7:30pm	Post Implementation	282	27.7	36 faster	11%	
		Pre-Existing	318	24.6			
	Saturday	7:15am - 10:00am	Post Implementation	255	30.6	8 slower	-3%
			Pre-Existing	247	31.6		
10:00am - 5:45pm		Post Implementation	294	26.6	36 faster	11%	
		Pre-Existing	330	23.7			
5:45pm - 7:30pm		Post Implementation	287	27.2	17 faster	6%	
		Pre-Existing	304	25.7			
Sunday	8:30am - 11:00am	Post Implementation	264	29.6	5 slower	-2%	
		Pre-Existing	259	30.2			
	11:00am - 4:00pm	Post Implementation	292	26.8	14 faster	5%	
		Pre-Existing	306	25.5			
	4:00pm - 7:00pm	Post Implementation	281	27.8	14 faster	5%	
		Pre-Existing	295	26.5			

16. Queuing Analysis

The SimTraffic application of the Synchro software package was used to determine the adequacy of the existing turn lanes in both the AM and PM peak periods at four (4) identified critical intersections. Five traffic simulations were conducted and averaged for the displayed results. Each simulation was one hour in duration with three-minute model seedings. Queuing analysis was conducted at the following locations:

1. N. Collier Boulevard at N. Barfield Drive
2. San Marco Road at Heathwood Drive
3. San Marco Road at Barfield Drive
4. Bald Eagle Drive at Elkcam Circle

N. Collier Boulevard at N. Barfield Drive

There are existing dedicated turn-lanes all approaches of the intersection of N. Collier Boulevard and N. Barfield Drive. The dimensions of the subject turn lanes are as follows:

- 162-Foot Eastbound Left-Turn Lane with 55-Foot Taper on N. Collier Boulevard
- 199-Foot Eastbound Right-Turn Lane with 55-Foot Taper on N. Collier Boulevard
- 168-Foot Westbound Left-Turn Lane with 45-Foot Taper on N. Collier Boulevard
- 188-Foot Westbound Right-Turn Lane with 51-Foot Taper on N. Collier Boulevard
- 193-Foot Northbound Right-Turn Lane with 54-Foot Taper on N. Barfield Drive
- 191-Foot Southbound Right-Turn Lane with 58-Foot Taper on N. Barfield Drive

As depicted in Tables 11 & 12, the storage capacity of the existing turn lanes at the intersection of N. Collier Boulevard and N. Barfield Drive exceed the current vehicular demand in both the AM and PM peak periods, except for the eastbound right-turn lane in the PM peak period, westbound left-turn lane in the PM peak period, westbound right-turn lane in the AM peak period, and northbound right-turn lane in the PM peak hour. Observations did not indicate capacity issues for the eastbound or westbound right-turn lanes as vehicles could not access either right-turn lane due to adjacent thru vehicle queuing.

**TABLE 11
 QUEUING ANALYSIS OF EXISTING TURN
 LANES AM PEAK**

Intersection: 1: Barfield Dr & Collier Blvd												
Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	T	R	L	T	T	R	LT	R	LT	R
Maximum Queue (ft)	144	237	245	119	164	1280	1281	213	319	218	281	216
Average Queue (ft)	25	105	117	13	22	1170	1167	102	137	94	134	36
95th Queue (ft)	77	193	211	59	101	1507	1514	264	254	186	248	113
Link Distance (ft)		2219	2219			1224	1224		1039		1161	
Upstream Blk Time (%)						33	33					
Queuing Penalty (veh)						0	0					
Storage Bay Dist (ft)	162			199	168			188		193		191
Storage Blk Time (%)		1	1		0	31	30	0	4	0	5	0
Queuing Penalty (veh)		0	0		0	8	54	1	11	0	2	0

**TABLE 12
 QUEUING ANALYSIS OF EXISTING TURN
 LANES PM PEAK**

Intersection: 1: Barfield Dr & Collier Blvd												
Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	T	R	L	T	T	R	LT	R	LT	R
Maximum Queue (ft)	186	995	1002	224	192	544	513	213	842	218	375	186
Average Queue (ft)	20	555	583	74	166	262	224	41	476	212	180	35
95th Queue (ft)	86	1058	1074	229	230	467	422	137	908	243	303	130
Link Distance (ft)		2219	2219			1224	1224		1039		1161	
Upstream Blk Time (%)									1			
Queuing Penalty (veh)									0			
Storage Bay Dist (ft)	162			199	168			188		193		191
Storage Blk Time (%)		33	32	0	20	7	4	0	3	43	12	0
Queuing Penalty (veh)		6	28	0	115	17	4	0	13	68	5	0

San Marco Road at Heathwood Drive

There are existing dedicated turn-lanes all approaches of the intersection of San Marco Road and Heathwood Drive. The dimensions of the subject turn lanes are as follows:

- 300-Foot Effective Eastbound Left-Turn Lane with No Taper on San Marco Road
- 43-Foot Eastbound Right-Turn Lane with 34-Foot Taper on San Marco Road
- 170-Foot Effective Westbound Left-Turn Lane with No Taper on San Marco Road
- 360-Foot Westbound Right-Turn Lane with 70-Foot Taper on San Marco Road
- 190-Foot Effective Northbound Left-Turn Lane with No Taper on Heathwood Drive
- 185-Foot Northbound Right-Turn Lane with 88-Foot Taper on Heathwood Drive
- 214-Foot Southbound Left-Turn Lane with 78-Foot Taper on Heathwood Drive
- 193-Foot Southbound Right-Turn Lane with 36-Foot Taper on Heathwood Drive

As depicted in Tables 13 & 14, the storage capacity of the existing turn lanes at the intersection of San Marco Road and Heathwood Drive exceed the current vehicular demand in both the AM and PM peak periods, except for the eastbound right-turn lane in the AM and PM peak periods. Observations did not indicate capacity issues, as right-turning vehicles could not access the right-turn lane due to adjacent thru vehicle queuing.

**TABLE 13
 QUEUING ANALYSIS OF EXISTING TURN
 LANES AM PEAK**

Intersection: 8: Heathwood Dr & San Marco Rd													
Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB	SB
	L	T	R	L	T	R	L	T	R	L	L	T	R
Directions Served	L	T	R	L	T	R	L	T	R	L	L	T	R
Maximum Queue (ft)	219	247	68	124	187	176	166	257	146	177	161	266	145
Average Queue (ft)	97	81	29	23	87	73	37	127	27	101	60	103	50
95th Queue (ft)	192	168	75	71	154	141	97	211	82	158	127	200	115
Link Distance (ft)	2544			811			1054			1057		1057	
Upstream Blk Time (%)													
Queuing Penalty (veh)													
Storage Bay Dist (ft)	300		43	170		360		190		185	214		193
Storage Blk Time (%)	0	23	0	0	1			2			0	1	0
Queuing Penalty (veh)	1	55	1	0	3			2			0	2	0

**TABLE 14
 QUEUING ANALYSIS OF EXISTING TURN
 LANES PM PEAK**

Intersection: 8: Heathwood Dr & San Marco Rd													
Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB	SB
	L	T	R	L	T	R	L	T	R	L	L	T	R
Directions Served	L	T	R	L	T	R	L	T	R	L	L	T	R
Maximum Queue (ft)	272	373	68	174	290	191	214	339	210	185	176	311	218
Average Queue (ft)	128	130	30	34	137	94	45	170	38	116	83	125	60
95th Queue (ft)	243	271	74	89	238	170	119	272	134	172	157	228	138
Link Distance (ft)	2544			811			1054			1057		1057	
Upstream Blk Time (%)													
Queuing Penalty (veh)													
Storage Bay Dist (ft)	300		43	170		360		190		185	214		193
Storage Blk Time (%)	1	30	1			5			0	8	0	0	2
Queuing Penalty (veh)	4	79	3			18			0	7	0	0	5

San Marco Road at Barfield Drive

There are existing dedicated turn-lanes all approaches of the intersection of San Marco Road and Barfield Drive. The dimensions of the subject turn lanes are as follows:

- 220-Foot Effective Eastbound Left-Turn Lane with No Taper on San Marco Road
- 170-Foot Eastbound Right-Turn Lane with 100-Foot Taper on San Marco Road
- 113-Foot Westbound Left-Turn Lane with 49-Foot on San Marco Road
- 430-Foot Westbound Right-Turn Lane with 30-Foot Taper on San Marco Road
- Continuous Northbound Left-Turn Lane with No Taper on Barfield Drive
- 150-Foot Effective Southbound Left-Turn Lane with 43-Foot Taper on Barfield Drive
- 137-Foot Southbound Right-Turn Lane with 50-Foot Taper on Barfield Drive

As depicted in Tables 15 & 16, the storage capacity of the existing turn lanes at the intersection of San Marco Road and Barfield Drive exceed the current vehicular demand in both the AM and PM peak periods, except for the eastbound right-turn lane in the PM peak hour and westbound left-turn lane in the AM and PM peak periods. Observations did not indicate capacity issues for the eastbound right-turn lane. Observations indicated occasion vehicles not being able to access the westbound left-turn lane due to adjacent thru vehicle queuing. Note: observations did indicate occasional capacity issues for the southbound left-turn lane.

**TABLE 15
 QUEUING ANALYSIS OF EXISTING TURN
 LANES AM PEAK**

Intersection: 9: Barfield Dr & San Marco Rd												
Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB	SB	
Directions Served	L	T	R	L	T	R	L	TR	L	T	R	
Maximum Queue (ft)	125	329	195	137	252	119	126	240	174	286	161	
Average Queue (ft)	52	124	48	58	129	49	51	102	76	110	55	
95th Queue (ft)	96	235	127	131	215	90	98	202	141	204	130	
Link Distance (ft)	4469			1927			1058	1058	1056			
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	220	170		113	430			150		137		
Storage Blk Time (%)	4		0	1	14			1		5	0	
Queuing Penalty (veh)	9		0	3	33			2		13	0	

**TABLE 16
 QUEUING ANALYSIS OF EXISTING TURN
 LANES PM PEAK**

Intersection: 9: Barfield Dr & San Marco Rd												
Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB	SB	
Directions Served	L	T	R	L	T	R	L	TR	L	T	R	
Maximum Queue (ft)	244	463	195	138	352	198	200	336	174	292	162	
Average Queue (ft)	82	190	85	72	152	62	101	178	77	121	45	
95th Queue (ft)	170	360	197	141	277	135	169	298	149	226	122	
Link Distance (ft)	4469			1927			1058	1058	1056			
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	220	170		113	430			150		137		
Storage Blk Time (%)	0	11	0	1	18			0		8	0	
Queuing Penalty (veh)	0	34	0	6	52			1		18	0	

Bald Eagle Drive at Elkcaml Circle

There are existing dedicated turn-lanes all approaches of the intersection of Bald Eagle Drive and Elkcaml Circle. The dimensions of the subject turn lanes are as follows:

- 134-Foot Eastbound Right-Turn Lane with 40-Foot Taper on Elkcaml Circle
- 178-Foot Westbound Right-Turn Lane with 178-Foot Taper on Elkcaml Circle
- 267-Foot Northbound Left-Turn Lane with 60-Foot on Bald Eagle Drive
- 278-Foot Northbound Right-Turn Lane with 64-Foot Taper on Bald Eagle Drive
- 265-Foot Southbound Left-Turn Lane with 60-Foot Taper on Bald Eagle Drive
- Continuous Southbound Right-Turn Lane with No Taper on Bald Eagle Drive

As depicted in Tables 17 & 18, the storage capacity of the existing turn lanes at the intersection of Bald Eagle Drive and Elkcaml Circle exceed the current vehicular demand in both the AM and PM peak periods.

**TABLE 17
 QUEUING ANALYSIS OF EXISTING TURN
 LANES AM PEAK**

Intersection: 10: Bald Eagle Dr & Elkcaml Cir										
Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LT	R	LT	R	L	T	R	L	T	R
Maximum Queue (ft)	85	69	376	202	92	227	89	102	244	58
Average Queue (ft)	40	29	154	53	41	111	41	46	96	15
95th Queue (ft)	75	56	328	160	73	190	75	83	190	42
Link Distance (ft)	881		737			1402			1588	1588
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)		134		178	267		278	265		
Storage Blk Time (%)			10	0		0			0	
Queuing Penalty (veh)			11	0		0			0	

**TABLE 18
 QUEUING ANALYSIS OF EXISTING TURN
 LANES PM PEAK**

Intersection: 10: Bald Eagle Dr & Elkcaml Cir										
Movement	EB	EB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	LT	R	LT	R	L	T	R	L	T	R
Maximum Queue (ft)	116	84	311	175	72	221	98	113	221	44
Average Queue (ft)	43	21	143	51	30	117	42	50	103	6
95th Queue (ft)	94	52	256	146	62	201	78	87	182	25
Link Distance (ft)	881		737			1402			1588	1588
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)		134		178	267		278	265		
Storage Blk Time (%)	0	0	7	0		0				
Queuing Penalty (veh)	0	0	8	0		0				

17. Benefit / Cost Analysis

An analysis was performed to quantify the benefits and costs associated with the Marco Island Signal Retiming Project. According to the Institute of Transportation Engineers (ITE), signal retiming is the most cost-effective technique to reduce congestion, improve air quality, and potentially reduce collisions. The methodology to determine the direct user benefits is as follows:

- Calculate the average reduction of Travel Time per vehicle on the mainline N. Collier Boulevard Arterial based on the passive Bluetooth detection data for each Time-of-Day signal plan.
- Multiply the Travel Time reduction per vehicle by the average number of vehicles on the corresponding roadway segment and direction of travel as recorded by the 7-day bi-directional volume counts.
- The Total Travel Time reduction was multiplied by the Value of Time. According to the latest US Department of Labor – Bureau of Labor Statistics, the average wage in Naples-Immokalee-Marco Island area was \$26.58 per hour.
- The fuel cost savings were derived by using the SYNCHRO software models by comparing the Pre-Existing traffic signal timings to the Post Implementation traffic signal timings for each Time-of-Day signal plan. According to AAA fuel cost tracking, the current gas price for regular fuel in the Collier County is \$3.73 per gallon.
- The operational life of the retiming project is anticipated to be three (3) years. However, as traffic patterns and volumes change over time, realized operational benefits will decrease by approximately 20% per year.
- The cost of the Marco Island Signal Retiming Project was \$127,655.08.

Travel Time Benefits			
Reduction in Travel Time (Vehicle-Hours)			
Roadway Segment	Weekday	Saturday	Sunday
N. Collier Boulevard - San Marco Road to N. Barfield Drive	217.8	83.9	55.1
Weekly Travel Time Savings (Hours)			1,227.7
Yearly Travel Time Savings (Hours)			63,837.80
Value of Time (per Hour)*			\$26.58
<small>*Bureau of Labor Statistics for Naples-Immokalee-Marco Island Area</small>			
Travel Time Benefit - Year 1			\$1,696,808.72
Travel Time Benefit - Year 2			\$1,357,446.98
Travel Time Benefit - Year 3			\$1,018,085.23
Total Project Travel Time Benefit			\$4,072,340.94

Fuel Savings Benefits			
Reduction in Fuel (Gallons)			
Roadway Segment	Weekday	Saturday	Sunday
N. Collier Boulevard - San Marco Road to N. Barfield Drive	392	163	105
Weekly Fuel Savings (gal)			2,229.0
Yearly Fuel Savings (gal)			115,908.00
Value of Fuel Savings*			\$3.73
<small>*Current AAA Value of Collier County</small>			
Fuel Savings Benefit - Year 1			\$432,336.84
Fuel Savings Benefit - Year 2			\$345,869.47
Fuel Savings Benefit - Year 3			\$259,402.10
Total Project Fuel Savings Benefit			\$1,037,608.42

Total Project Benefits	\$5,109,949
Total Project Costs	\$127,655
Project Benefit / Cost Ratio	40/1

18. Conclusions & Recommendations

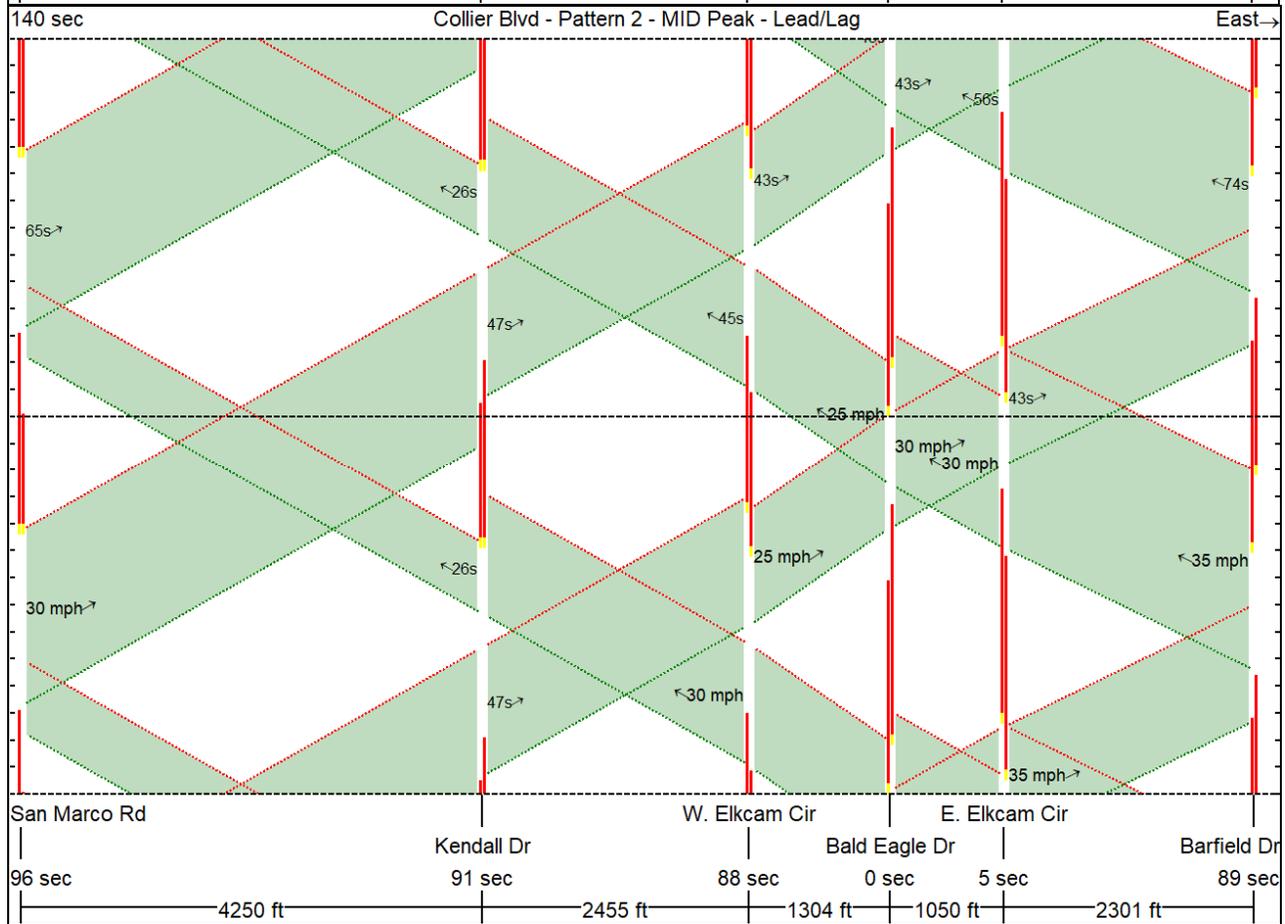
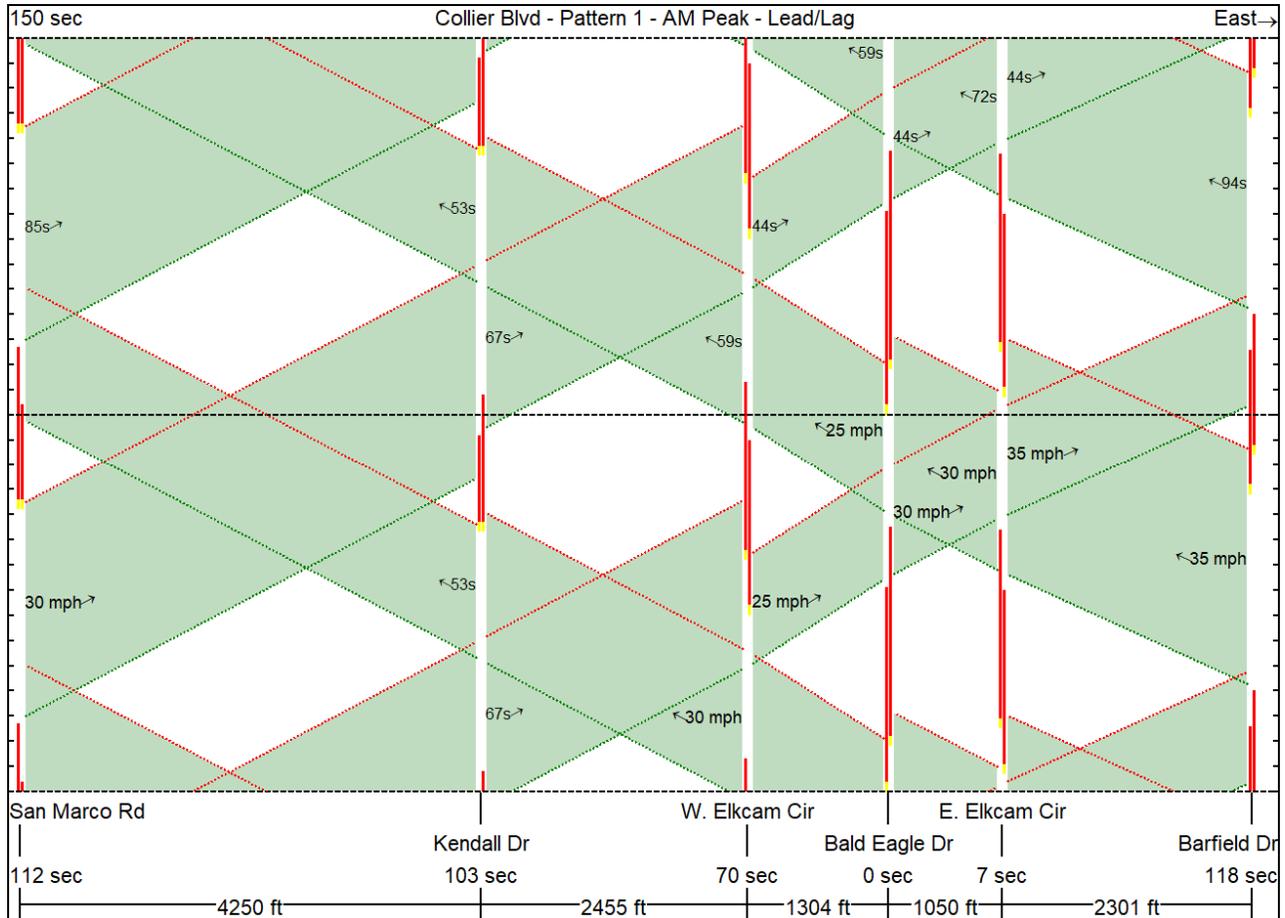
Ten (10) traffic signals were retimed / coordinated within the City of Marco Island. Six (6) signalized intersections along N. Collier Boulevard were coordinated between San Marco Road and N. Barfield Drive, which services an average of 190,500 vehicles per week along the 2.17 mile arterial. Upon completion of the project, the six (6) signalized intersections are operating coordinated signal timing plans in the AM Weekday, Mid-Day Weekday, PM Weekday, Weekend, and Off-Peak time periods. The remaining four (4) signalized intersections within Marco Island will continue to run FREE operations.

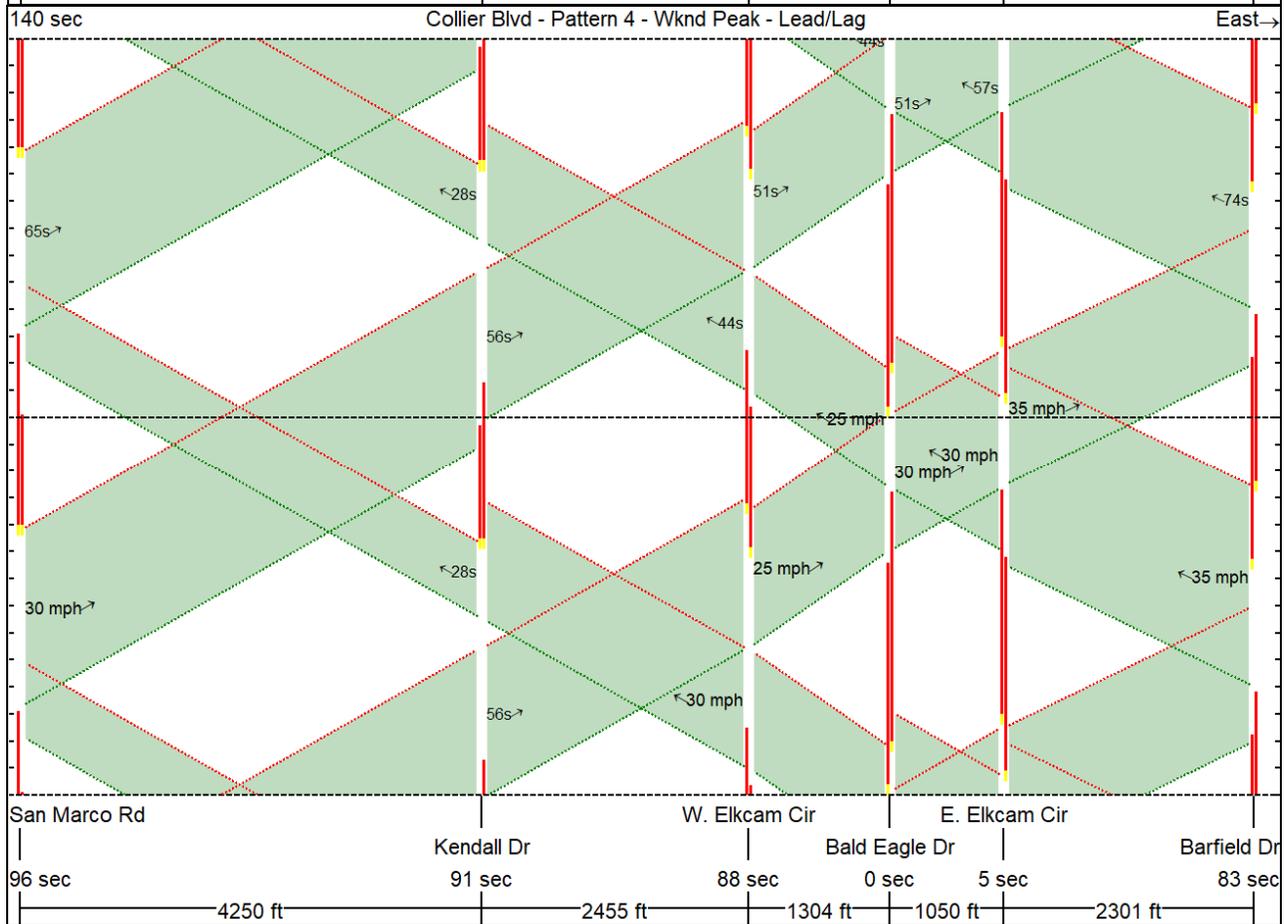
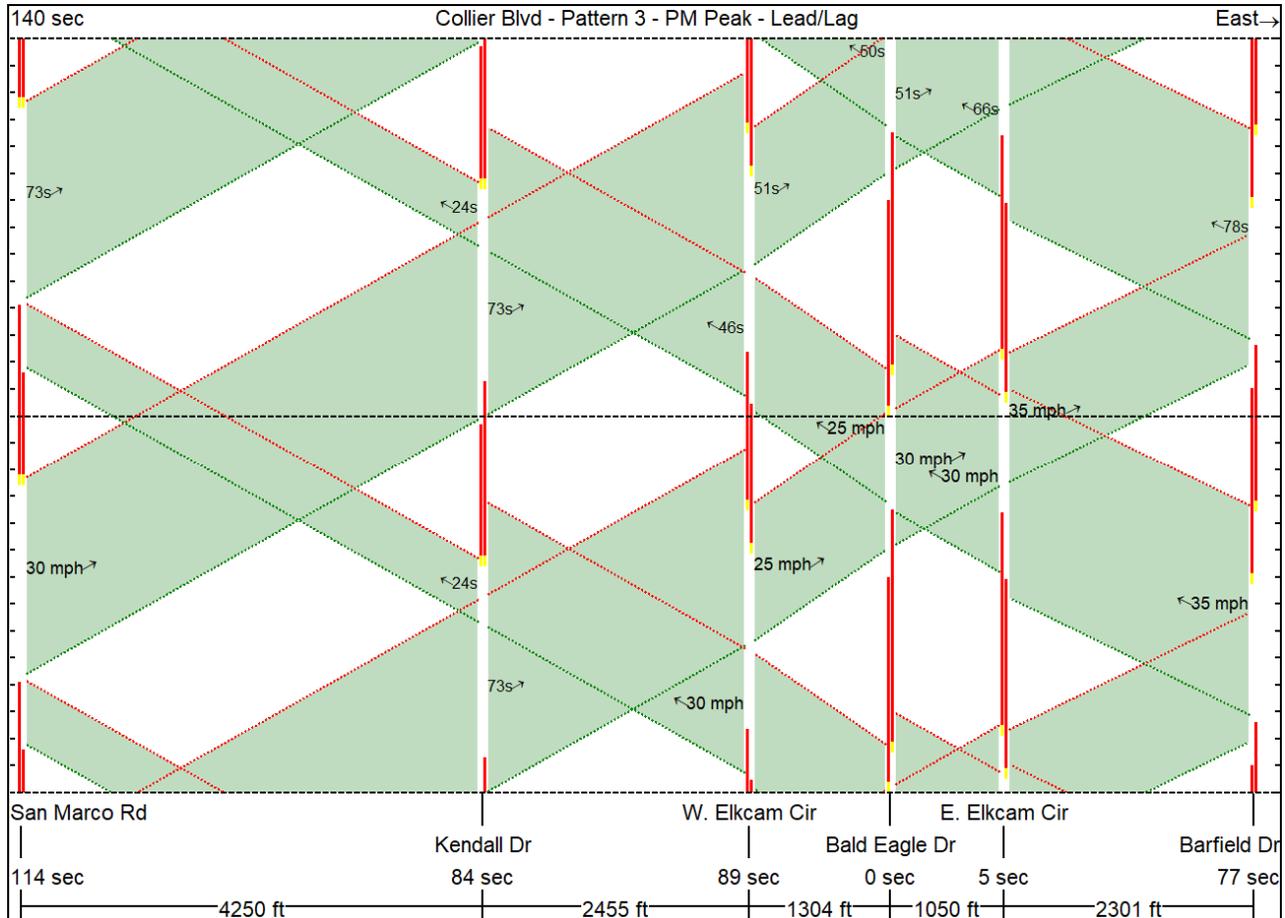
An analysis was performed to quantify the benefits associated with the Marco Island Signal Retiming Project. Based on the non-intrusive Bluetooth detection data, there is a weekly time savings of approximately 1,200 vehicle-hours along the corridor. According to the Synchro model calculations, there is also a weekly fuel savings of approximately 2,200 gallons. The Benefit / Cost Ratio of the Marco Island Signal Retiming Project is 40:1 over the estimated three (3) year life of the project.

The following recommendations should be considered:

- Replace camera detection systems and traffic controllers at all ten (10) signalized intersections.
- Correct/repair northbound illuminated blank-out sign (No Right Turn) operation at the intersection of San Marco Road at Heathwood Drive.
- Sync the controller clocks along N. Collier Boulevard from San Marco Road to N. Barfield Drive monthly or more often (by either City signal staff or City's signal contractor).
- Install illuminated dynamic blank-out signs for the northbound and southbound approach to create safer pedestrian movements at the intersection of N. Collier Boulevard and N. Barfield Drive. Black-out signs should indicate no turn on red message to restrict the northbound and southbound right-turn movements during the adjacent pedestrian Walk interval when activated. Additionally, black-out signs should indicate yield to peds message during the adjacent pedestrian Flashing Don't Walk interval when activated.
- Replace northbound outside 3-section signal head with 5-section head and operate with right-turn overlap at the intersection of N. Collier Boulevard and N. Barfield Drive to allow northbound right-turning movement to run concurrently with the westbound left-turn movement. In conjunction with the signal head replacement, a westbound static u-turn restriction sign should be installed.
- Install Flashing Yellow Arrow (FYA) signal heads along N. Collier Boulevard at W. Elkcam Circle, E. Elkcam Circle, and Barfield Drive, where protected/permissive phasing currently exists to allow for Protected Phasing by Time of Day (TOD) and additional Lead/Lag opportunities. Lead/Lag use will provide improved traffic flow and increased green bands for each timing plan. Potential green bands could be expanded from 29% to 72% in at least one direction as seen on the Time-space diagrams located on the following pages.

Phillip Kurth, PE PTOE IMSA III
6/6/2023





City of Marco Island – Traffic Operations Study/Retiming – Peak Season
 June 6, 2023

