"SPAN-WIRE" INTERSECTIONS STUDY

CITY OF NAPLES, FLORIDA
ON THE GULF

ADEASQ
TRANSPORTATION ENGINEERING + PLANNING

Intersection Traffic Control and Design Feasibility Analysis

a.k.a “Span-Wire” Intersections Study

Streets & Stormwater Department

May 24, 2017

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I. Introduction

To improve the City of Naples infrastructure and to protect the traffic signal system from damage during hurricanes and tropical storms, the City has been replacing span-wire and concrete pole traffic signal systems. Questions arose whether the remaining traffic signals needing mast arms are still warranted considering today's traffic data, or whether other forms of traffic control may offer a more effective solution. Therefore, *ADEAS-Q* was tasked to evaluate recent traffic volumes, survey data, crash data, aesthetics, and multi-modal access and to determine whether the existing traffic signals are still the best design alternative. Other options evaluated included stop-control and roundabouts. This task included developing preliminary designs, public education, outreach, cost estimates, and developing an evaluation matrix to help prioritize the recommended improvement for each location.

The four intersections under consideration are:

- Harbour Drive & Crayton Road
- Fleischmann Boulevard & 10th Street North
- 10th Avenue South & 9th Street South
- Broad Avenue South & 8th Street South

● = *Study Intersection*

Each intersection currently operates with a single motor vehicle lane in each direction with left-turn lanes and/or bicycle lanes at some locations. Alternative forms of traffic control for each intersection were considered. A public workshop was conducted as part of this evaluation. Evaluation factors included traffic operations, pedestrian and bicycle access, safety, right-of-way availability, utility impacts, and public feedback. Preliminary cost estimates were also prepared.

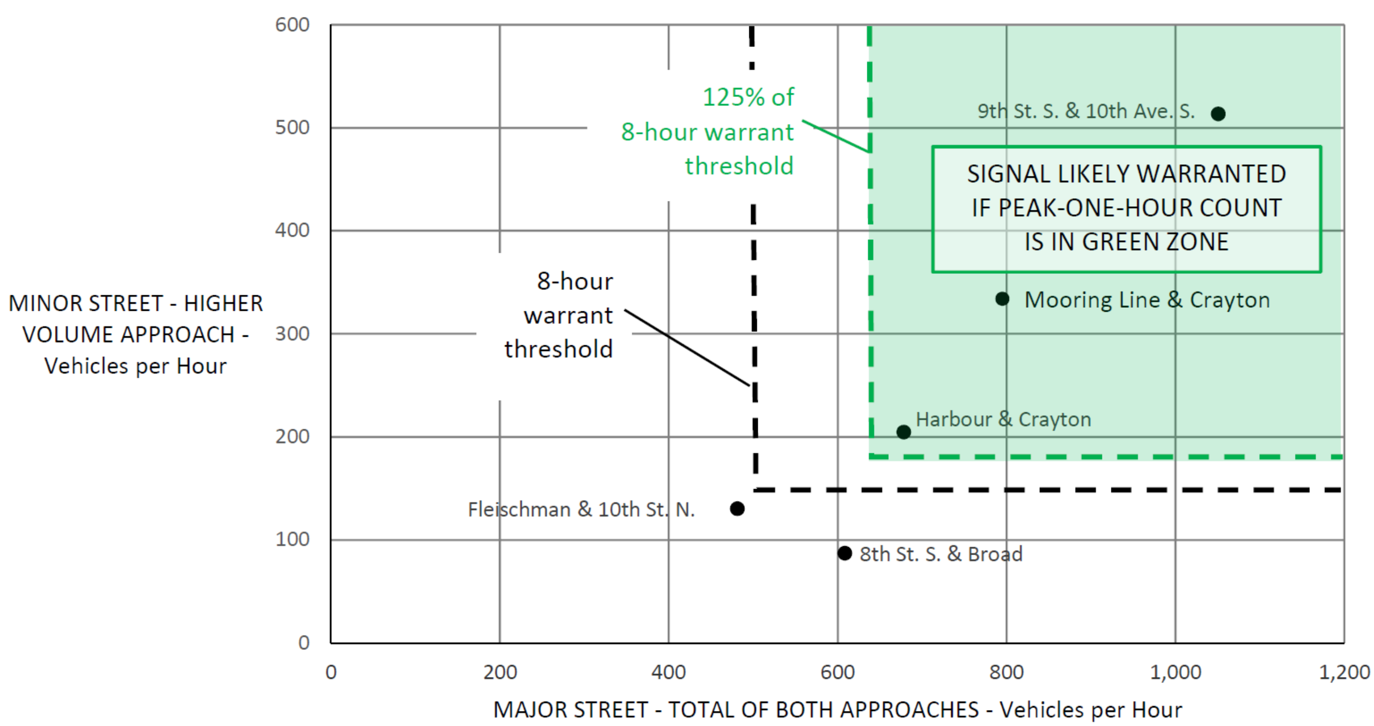
This report summarizes the findings of this evaluation for the four intersections listed. A fifth span-wire intersection located at Mooring Line Drive & Crayton Road was previously evaluated and recommended for conversion to a roundabout by Alternative Street Design in a technical memorandum dated July 24, 2015. A copy of that technical memorandum is provided in

Appendix A. This report does not reevaluate this intersection, but does reference it for comparison to the four study intersections. However, based on a cursory review of the data collected and analysis completed, ADEAS-Q does generally concur that a roundabout may be justified at that location.

II. Traffic Signal Warrants

Traffic counts were collected by city staff at each of the four study intersections on a weekday in February 2017 during the afternoon peak hours. This PM peak-hour count was seasonally adjusted to produce year 2017 peak-season, peak-hour traffic volumes. To evaluate the appropriateness of the existing traffic signals at the four study intersections, a screening evaluation of the peak-hour traffic volumes was made relative to the traffic signal warrants defined in the *Manual for Uniform Traffic Control Devices* (MUTCD). Warrant 1A, the eight-hour volume warrant, is the most likely to be referenced at these locations and was used for the comparison. While a complete signal warrant analysis requires at least eight hours of traffic count data, an estimation was made of the likelihood for each intersection to satisfy the eight-hour warrant using the one available hour of count data and the typical daily variation patterns in traffic.

The figure below summarizes the findings of this screening evaluation. The black dashed line represents the eight-hour warrant threshold defined in the MUTCD. Based on typical daily volume variation patterns, the green dashed line estimates the volume threshold for the peak one-hour that would indicate the intersection might meet the defined eight-hour warrant for eight hours. Intersections within the green box may meet the eight-hour warrant, with the likelihod increasing with distance from the dashed lines.



Other Traffic Signal Warrants
- *Daily intersection volumes (8-hour, 4-hour, and 1-hour time periods)*
- *Number of crashes – severity of crashes also should be considered*
- *Amount of foot traffic*
- *School crossings, coordinated signal systems, road network, nearby grade crossings*
- *Combination of factors above*

Meeting signal volume warrants does not necessarily mean that a signal is the preferred alternative, but intersections that do not meet signal warrants are likely not appropriate for a traffic signal. The following two study intersections are currently signalized even though they do not appear to meet minimum volume warrants:

- Fleischmann Boulevard & 10th Street North
- Broad Avenue South & 8th Street South

However, it should be noted that there is a significant variation of traffic volumes in Naples, which includes a general increase of traffic around the Christmas shopping season. This factor potentially may have contributed to the previous need for signalization at these two locations listed.

III. Analysis and Recommendations

The traffic volumes collected were evaluated for operations under the following potential configurations:

1. Replace span-wire signal with mast arm signal
2. Convert to all-way stop control (AWSC)
3. Convert to two-way stop control (TWSC), where feasible with traffic volumes
4. Convert to single-lane roundabout

Configurations 1, 2, and 3 assume that existing bicycle lanes, sidewalks, and crosswalks are retained. Configuration 4 assumes the sidewalks and crosswalks are added to all legs of the roundabout, and that bicycle accommodations are included where bicycle lanes exist.

Traffic volumes were analyzed using 2010 Highway Capacity Manual methodology using *Synchro* software for configurations 1, 2, and 3, and using the Roundabouts Guide (FHWA, 2010) methodology for configuration 4. Vehicle delay, level of service (LOS), and volume-to-capacity (V/C) ratio were reported for each intersection configuration. Appendix C provides the traffic operation analysis worksheets.

To compare expected safety performance of the different configurations, typical crash modification factors (CMFs) were derived from the Federal Highway Administration's (FHWA) CMF Clearinghouse with guidance provided by the Florida Department of Transportation (DOT) and Oregon DOT. CMFs quantify the relative number of crashes that may be expected with a change in configuration. A value of 1.0 indicates no change, a value less than 1.0 indicates an expected crash reduction, and a value greater than 1.0 indicates an expected increase in crashes.

Crash History

A review of the available crash data provided by the City was undertaken for each subject intersection. Data available from February 2, 2007 – February 2, 2017 was provided, which represents 10 years of data.

Typically, traffic signals have higher rates of left-turn and rear-end types of crashes versus other forms of intersection traffic controls. Surprisingly, there was only a total of 34 traffic crashes combined for the four intersections. Provided below is a summary by each intersection:

- Fleischmann Blvd & 10th Street: 8 crashes
- Harbour Drive & Crayton Rd: 7 crashes
- 8th Street & Broad Ave South: 10 crashes
- 9th Street & 10th Ave South: 9 crashes

Total = 34 crashes

Part of the reason for the low crash rates may be that each local roadway is a relatively "low-speed" facility, which allows for more reaction time and generally reduces the severity of crashes. However, it should be noted that 40% of the crashes at 8th Street & Broad Avenue resulted in injury, which may be considered a high percentage provided the location.

Number of Crashes by Year

CRASH LOCATION	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
FLEISCHMANN & 10TH ST	0	1	2	0	2	0	0	0	2	1	0	8
HARBOUR & CRAYTON RD	0	0	1	0	1	1	2	0	2	0	0	7
8TH ST & BROAD AVE S	0	1	5	1	0	1	1	0	1	0	0	10
9TH ST & 10TH AVE S	0	0	2	1	1	1	0	0	1	3	0	9
TOTAL	**0**	**2**	**10**	**2**	**4**	**3**	**3**	**0**	**6**	**4**	**0**	**34**

The following sections summarize the findings of the analysis for each specific intersection, including a description of the basis for recommendation.

Harbour Drive & Crayton Road

The table below provides a comparison of vehicle operations for each configuration at the intersection of Harbour Drive & Crayton Road.

Configuration	Vehicle Delay (s)	Level of Service	Volume/Capacity Ratio	CMF
1. Replace signal[A]	12.3	B	0.46	1.00
2. All-way stop[A, C]	18.4	C	0.68	0.61
3. Two-way stop[A]	Traffic volumes too high			
3. Roundabout[B]	9.1	A	0.50	0.22

A: HCM 2010 Analysis (Synchro)
B: 2010 FHWA Roundabouts Guide Methodology
C: Existing lane geometries assumed

This intersection currently has left-turn lanes and a large right-turn flare in the northbound direction, which creates a large footprint and inefficient use of public right-of-way. Crosswalks have recently been provided for each approach, but there is no pedestrian signalization or signage.

Bicycle activity was observed at the intersection and a growth of bicycle activity has been reported in recent years. Crayton Road is adopted with truck restrictions, but several trucks were observed using this facility. Several vehicles were also observed to run the red light. Similar observations were observed also at the intersection of Crayton Road & Mooring Line Drive during this evaluation.

The roundabout configuration provides the lowest delay and the safest performance expected at this intersection. A roundabout appears to be feasible without right-of-way impacts and without significant impacts to public utilities. A roundabout may also provide more comfortable mobility for people walking and bicycling via reduced vehicle speeds through the intersection.

Given these considerations, a roundabout is recommended as the preferred configuration of the intersection of Harbour Drive & Crayton Road. However, an all-way stop control or a traffic signal are still feasible options.


Concept Only. Subject to more detailed survey and engineering.
Existing
Proposed
Bicycle ramps (typ.)
Reconnect driveways
Remove right turn flare
Match existing sidewalks
R22' Landscaped island
R32' Center island
R50' Circulating roadway
YIELD
N
0 20 40 80 Feet
D.B. AJB
C.B. JSC
Rev. 03/23/17
Span Wire Intersection Design Concepts
Alternative Layout: Harbour Dr. & Crayton Rd.
Convert to Modern Roundabout
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Fleischmann Boulevard & 10th Street North

The table below provides a comparison of vehicle operations for each configuration at the intersection of Fleischmann Boulevard & 10th Street North.

Configuration	Vehicle Delay (s)	Level of Service	Volume/Capacity Ratio	CMF
1. Replace signal[A]	9.4	A	0.28	1.00
2. All-way stop[A, C]	9.5	A	0.36	0.61
3. Two-way stop[A]	6.2	A	0.22	1.52
3. Roundabout[B]	6.0	A	0.26	0.22

A: HCM 2010 analysis (Synchro)
B: 2010 FHWA Roundabouts Guide methodology
C: Existing lane geometries assumed

This intersection currently prohibits the southbound through movement from the Coastland Center Mall onto 10th Street. It was reported that this was done to calm traffic through the Lake Park neighborhood following the mall's expansion. However, some vehicles were observed violating this prohibition. The existing signal is split-phased with northbound and southbound movements moving separately. This creates additional delay at the intersection.

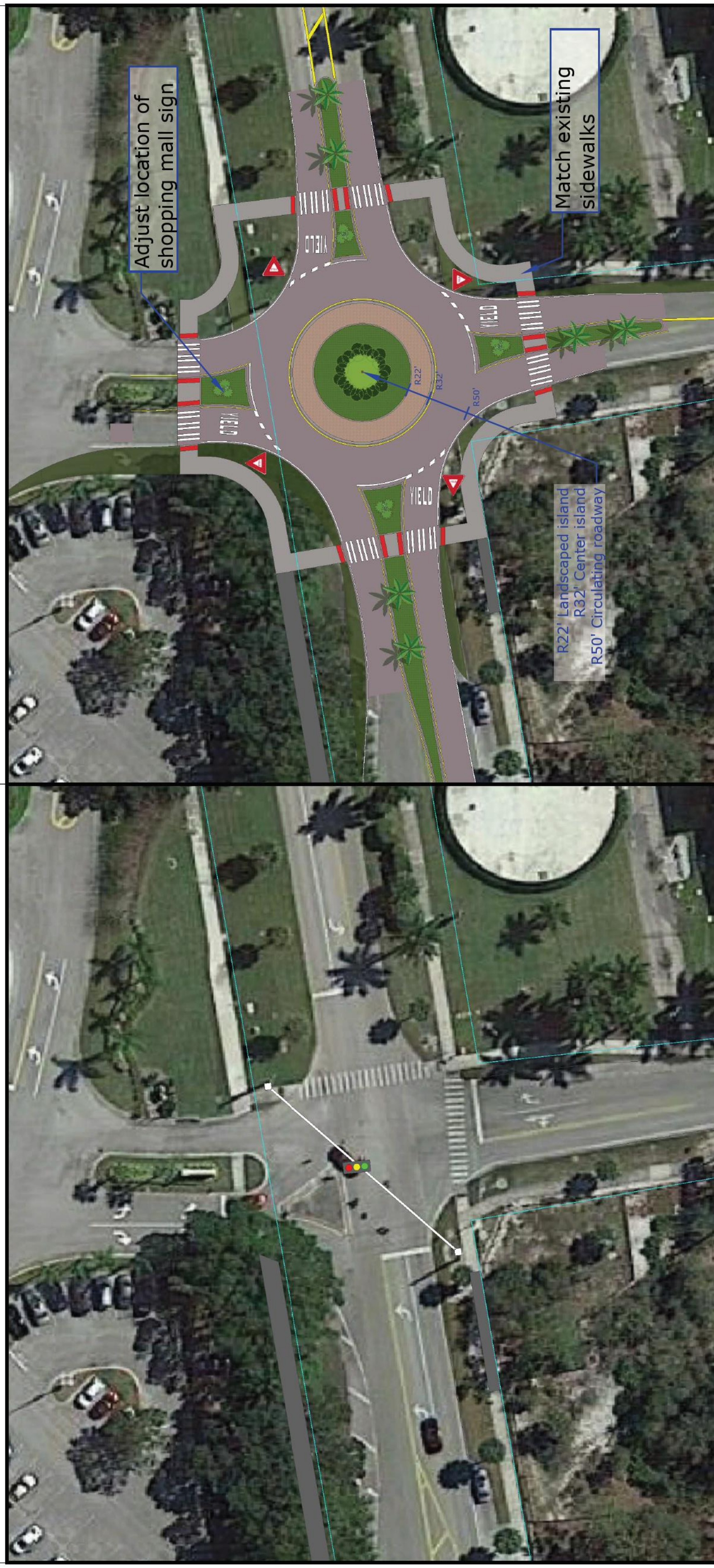
The intersection does not currently appear to meet traffic volume signal warrants. Two-way stop control, with stop signs for the 10th Street mall access and Fleischmann Boulevard as the through street would typically operate well, but may result in a crash increase. All-way stop control would also operate relatively well, and would be expected to result in fewer crashes than a signal or two-way stop control.

The roundabout configuration may provide the least delay and the safest performance. A roundabout appears to be feasible with minor right-of-way impacts to the shopping center, and without significant impacts to public utilities. A roundabout may also provide comfortable mobility for people walking and bicycling. However, a roundabout would necessitate the southbound through movement from the mall to be allowed.

Given these considerations, a roundabout is the recommended preferred configuration for this intersection. However, the need for modifications is a lower priority than other intersections evaluated. Coordination with the mall to permit reconstruction of the driveway to best match the roundabout design would be needed. Stop control or keeping a traffic signal are still feasible options.

Concept Only. Subject to more detailed survey and engineering.

Existing | Proposed



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Span Wire Intersection Design Concepts

Alternative Layout: 10th St. N. & Fleischmann Blvd.

Convert to Modern Roundabout

0 20 40 80
Feet

N

D.B. AJB
C.B. JSC
Rev. 03/23/17

10th Avenue South & 9th Street South

The table below provides a comparison of vehicle operations for each configuration at the intersection of 10th Avenue South & 9th Street South.

Configuration	Vehicle Delay (s)	Level of Service	Volume/Capacity Ratio	CMF
1. Replace signal[A]	57.7	E	1.10	1.00
1A. Add WBL+NBR lanes[A]	14.3	B	0.63	0.89
1B. Add WBL lane[A]	28.4	C	0.94	0.89
2. All-way stop[A]	256.6[C]	F	1.93	0.61
3. Two-way stop	Traffic volumes too high			
4. Roundabout[B]	20.3	C	0.84	0.22

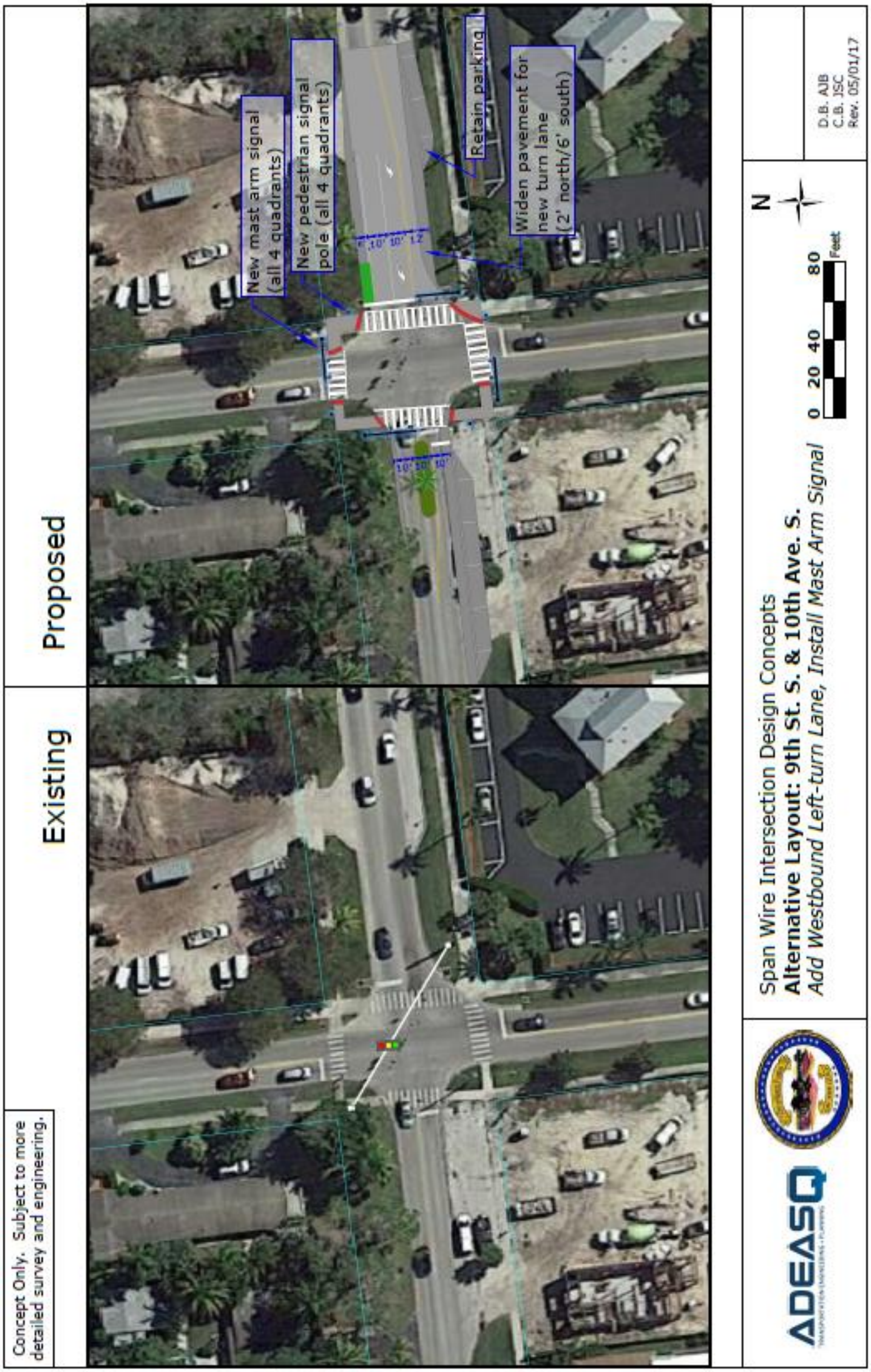
A: HCM 2010 analysis (Synchro)
B: 2010 FHWA Roundabouts Guide methodology
C: Stop delay is highly variable where V/C greatly exceeds 1.00

The intersection is constrained by narrow public right-of-way, and a modern roundabout here would likely need property acquisitions at all four corners. This condition is further exacerbated with the intersection as a preferred truck route. A graphic showing truck routes in the City is provided in Appendix B. Several different public and private utilities are also located directly next to the existing pavement.

This intersection experiences unusual turning movements. The predominant traffic patterns are between the east leg and the south leg to serve traffic traveling around the adjacent bayfront. These turning movements are typically not more advantageous for a roundabout versus other alternatives, but a roundabout could adequately serve the demand here.

Given the traffic patterns and the existing congestion at the intersection, the addition of potential turn lanes together with a signal replacement was explored. The signalized intersection is at or over capacity during the peak hour, and operations would benefit from the addition of a westbound left-turn lane and/or a northbound right turn lane to channelize the predominant movements. But, the northbound right-turn lane is not ideal as right-turn lanes create multi-modal complications and are typically not a preferred option in redeveloping urban neighborhoods.

Given these considerations, replacement of the signal with the addition of a westbound left-turn lane is the recommended alternative for the intersection of 10th Avenue South & 9th Street South. Signal poles should be placed so as not to preclude a possible northbound right-turn lane. Pedestrian signals should be provided on all intersection legs and should provide adequate mobility and safety for people walking. New on-street parking located on 10th Avenue South in front of the redevelopment project was also explored.


Concept Only. Subject to more detailed survey and engineering.
Existing
Proposed
New mast arm signal (all 4 quadrants)
New pedestrian signal pole (all 4 quadrants)
Retain parking
Widen pavement for new turn lane (2' north/6' south)
Span Wire Intersection Design Concepts
Alternative Layout: 9th St. S. & 10th Ave. S.
Add Westbound Left-turn Lane, Install Mast Arm Signal
N
0 20 40 80 Feet
D.B. AJB
C.B. JSC
Rev. 05/01/17

Broad Avenue & 8th Street South

The table below provides a comparison of vehicle operations for each configuration at the intersection of Broad Avenue & 8th Street South.

Configuration	Vehicle Delay (s)	Level of Service	Volume/Capacity Ratio	CMF
1. Replace signal[A]	10.8	B	0.47	1.00
2. All-way stop[A]	12.0	B	0.56	0.61
3. Two-way stop[A]	4.8	A	0.23	1.52
3. Roundabout[B]	6.4	A	0.36	0.22

A: HCM 2010 analysis (Synchro)
B: 2010 FHWA Roundabouts Guide methodology

The two-way stop control and roundabout configurations result in the lowest delay at this intersection. Two-way stop control, with stop signs for 8th Street South would typically operate well, but may result in a crash increase. A roundabout may be the safest alternative, but would require either property acquisition at the two north corners or a realignment of Broad Avenue to the south, which would result in higher construction costs. A roundabout would also impact stormwater utilities, resulting in higher construction costs. A significant water pipe/tunnel is located along Broad Avenue just south of the roadway.

Operating and maintenance costs would be reduced by removing the traffic signal. Typically, a traffic signal costs about $3,000-$5,000 a year to maintain. Traffic signal replacements cost several hundred thousand dollars and are required every 20-30 years. Hence, there are lower capital and operating cost savings by being able to convert a traffic signal to stop-control, where feasible.

The all-way stop control and traffic signal configurations result in slightly higher vehicle delay than the two-way stop control or roundabout configurations, but the relatively low traffic volumes still result in a good level of service (LOS B). The intersection does not currently appear to meet signal volume warrants. All-way stop control would result in reduced delay to pedestrians crossing the street as compared to a signal.

Given these considerations, all-way stop control is recommended as the preferred configuration at the intersection of Broad Avenue & 8th Street South.

Concept Only. Subject to more detailed survey and engineering.

Existing

Proposed

Span Wire Intersection Design Concepts

Alternative Layout: 8th St. S. & Broad Ave. S.

Convert to All-Way Stop Control

0 20 40 80 Feet

N

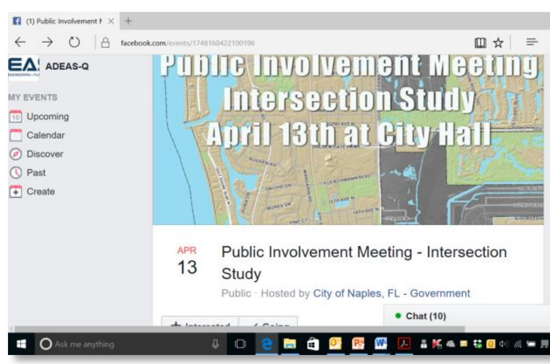
D.B. AJB
C.B. JSC
Rev. 03/23/17

Note: During the observations traffic was occasionally observed backing up from the adjacent intersection of Broad Avenue & 9th Street. This is due to the existing configuration of 9th Street as the north-south through street, thus requiring eastbound traffic on Broad Avenue to stop and ensure that southbound traffic on 9th Street clears the intersection before proceeding, even though a vast majority of southbound traffic turns right. A revised control at Broad Avenue & 9th Street that converts the intersection to a three-way stop may improve operations in this corridor. Then the eastbound traffic would not need to wait for the southbound traffic to turn before proceeding. The enclosed figure depicts a possible reconfiguration of the intersection.

IV. Public Outreach

A public workshop was conducted on Thursday, April 13, 2017 regarding the "span-wire" intersection evaluation. Approximately 30 interested stakeholders attended this workshop together with City staff representatives. The workshop was conducted at the Naples City Council Chambers from 4:00-7:00 PM. The attendees were provided information and were able to discuss their questions/comments/concerns with City staff representatives. The interaction overall was informative and constructive.

It was observed that there is an ongoing "learning curve" within the City of Naples regarding the general technical performance of roundabouts. Participants clearly expressed "favorable" or "unfavorable" opinions of roundabouts, many times prior to reviewing the technical information provided for each location. A copy of the comment forms from the public workshop is provided in Appendix D.



The City has expanded education efforts with the recent installation of the Central Avenue roundabouts. Several different public information activities, as well as educational material on the City's website, have been provided as people locally are becoming more familiar. It is suggested that the City of Naples continue these efforts regarding the technical pros/cons of modern roundabouts.

V. Findings

An evaluation of traffic operations, walking and biking considerations, expected safety performance, right-of-way, and public service utilities was performed at each of the four study intersections. A fifth intersection located at Mooring Line Drive & Crayton Road was previously evaluated and recommended for conversion to a roundabout. This memorandum does not reevaluate that intersection, but does reference it for comparison to the four study intersections.

These recommendations are intended to optimize performance for vehicles, pedestrians, and bicyclists, to improve safety, to be accommodated within existing right-of-way, to be cost effective, and to avoid impacts to significant utilities. The following evaluation matrix summarizes the considerations for each study intersection.

Based upon this review, a set of preliminary recommendations was developed for the intersections as follows:

1) Harbour Drive & Crayton Road: Convert to roundabout
2) Mooring Line Drive & Crayton Road: Convert to roundabout
3) Broad Avenue South & 8th Street: Convert to all-way stop control
4) 10th Avenue South & 9th Street: Replace signal, add westbound left-turn lane
5) Fleischmann Boulevard & 10th Street: Convert to roundabout

A revised control at the Broad Avenue & 9th Street intersection that converts the intersection to a three-way stop to improve traffic operations in this corridor was also identified.

Preliminary cost estimates were also prepared for each of the preliminary recommendations. The total cost provided includes each phase for survey, design, construction engineering, as well as a contingency for unexpected items. Therefore, these preliminary costs typically represent a conservative estimate. A copy of the cost estimates for each intersection for this evaluation is provided in Appendix E.

EVALUATION MATRIX

Priority	Intersection	Preliminary Suggestion	Considerations	Preliminary Cost Estimate Construction M,MOT Contingency Survey, Design = TOTAL COST
1	Harbour Drive & Crayton Rd	Roundabout	1) Increasing number of multi-modal users (ped/bike) 2) Roundabout has no private Right-of-Way impacts 3) Red-light running observed through intersection 4) Currently long pedestrian crossing distances 5) Roundabout slows each vehicle through intersection 6) More greenspace by removal of turn lanes with roundabout	$357,500 $36,000 $56,000 $90,000 $539,500
2	Mooring Line & Crayton Rd	Roundabout	1) Red-light running observed through intersection 2) Currently no crosswalks, or ped striping/signage 3) Roundabout has no private Right-of-Way impacts 4) Roundabout slows each vehicle through intersection 5) Currently long pedestrian crossing distances	$375,000 (est) $36,000 $56,000 $90,000 $557,000
3	Broad Ave S & 8th Street S	All-Way Stop Control	1) Does not meet minimum traffic guidelines for signal 2) Roundabout is feasible, but expensive alternative at this location 3) Located on adopted truck route 4) NE and NW corners might be encroached by roundabout 5) Large storm-water pipe located along south side 6) Queue delays from Broad Ave & 9th Street sometimes impact this location 7) Capital and operating costs reduced with stop control	$15,000 $2,000 $2,000 $3,000 $22,000
4	10th Ave S & 9th Street S	Mast-arm Signal and new WB Left-Turn Lane	1) Traffic volumes require signal or roundabout 2) Located on adopted truck route 3) All four (4) corners may be encroached by roundabout 4) Several different public/private utilities located at intersection 5) New on-street parking requested on west leg	$242,000 $24,000 $38,000 $46,000 $350,000
5	Fleischmann & 10th Street	Roundabout	1) Does not meet minimum traffic guidelines for signal 2) SB through movement prohibited. Full access with roundabout would be restored. 3) Current "split-phase" signal coordinated with US 41	$312,000 $31,000 $49,000 $79,000 $471,000

Appendix A

Crayton Road & Mooring Line Drive
Technical Memorandum

Alternate Street Design, P.A.

Technical Memorandum

To:	Norman J. Trebilcock, AICP, PE
From:	Michael J. Wallwork, P.E.
Date:	7/24/2015
Re:	Mooring Line Drive at Crayton Road

This technical memorandum has been prepared to detail the capacity analyses, design elements and potential safety benefits of replacing the traffic signals at this intersection with a roundabout rather than upgrading the intersection with mast arms.

Capacity Analyses

The following capacity analyses used traffic counts provided by Trebilcock Consulting Solutions, PA. The analyses were undertaken using SIDRA 6.1 with a copy of the summary sheet for each capacity analysis summary sheet is included in Appendix B. Based on a 1 percent growth rate a one lane roundabout is expected to provide an acceptable level-of-service that would be superior to a signalized intersection, especially in the off-peak hours when the likelihood of a driver having to stop is greatly reduced.

Mooring Line Roundabout	Time Period	Level-of-service	Average Delay per Vehicle (seconds)	Volume/ capacity Ratio	95th Percentile Vehicle Queue (ft) and approach
One Lane Roundabout	AM	A	5.2	0.238	36 north
	PM	A	7.4	0.481	91 west
	Saturday Noon	A	6.7	0.405	71 west

Geometry

The proposed roundabout is a standard one-lane roundabout with a 64-foot diameter refined to match the existing intersection while maintaining low design speeds and accommodating large

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trucks. This roundabout layout does not require any right-of-way although is up to the property lines on several corners and will impact some existing landscaping within the pubic right-of-way.

The goal of the roundabout design was to limit vehicle speeds to around 23 mph with lower right turn speeds while accommodating WB-50 trucks. Larger trucks can also pass through or make right turns by using the gutters or partially driving over the truck aprons.

Bike lanes have been provided on all approaches. Bike ramps and shared pathways around the roundabout have been provided so those bicyclists who do not wish to "claim-the-lane" and ride through the roundabout can use the sidewalk system.

Typically a six-foot wide planter strip is used to move the sidewalk and its users away from the roundabout and to provide additional space for landscaping that could include palm trees. To avoid impact on right-of-way the minimum distance recommended by the US Access Board of two feet was provided o several corners.

A copy of the proposed preliminary layout for the roundabout is shown in Appendix B

Roundabout Safety

General

Based on many roundabout studies from the US and around the world roundabouts provide a massive reduction in crashes. A report prepared by the Insurance Institute for Highway safety, found a 90 percent reduction in fatal crashes, most of which are alcohol related, 76 percent reduction in injury crashes and a 39 percent overall reduction in crashes when roundabouts replaced signalized intersections or stop controlled intersections. This study included one, two and three lane roundabouts, well designed and less than well-designed roundabouts. Unfortunately many poorly designed roundabouts have had large increases in crashes due to a lack of adequate speed control.

Other studies on pedestrian safety have shown even greater reductions in pedestrian crashes when compared to signalized intersections. Bicycle crashes are reduced if bicyclists "claim the lane" and ride in front of vehicles and not to their side.

Mooring Line Drive/Crayton Road Crash Data

Amazingly this intersection has only had two crashes in five years. This is very low for a signalized intersection. The two crashes that did occur were a left turn crash, which is typical of all signalized intersection, and a driver reversing into the vehicle behind, an unusual crash. Installation of a roundabout would eliminate the possibility of any additional left turn crashes.

Splitter Islands

One of the very important design elements of roundabouts is the splitter islands or medians on each approach. These islands/medians are very important as they:

¥ Direct drivers around the central island,
¥ Provide a refuge for pedestrians breaking their crossing in to two parts with the pedestrians only having to cross one direction of traffic at a time.
¥ Locate the pedestrian crossing back from the yield line to separate driver decision-making and to provide safer crossings.

Landscaping

Mounding the central island and adding vertical elements, trees, public art, clock towers, etc., increase a roundabout's conspicuity so drivers gain advance notice of the need to slow down and drive around the central island. The landscaping can also provide a central feature to enhance the surrounding area. However, it must be done to avoid limitations to sight triangles. Up lighting of the landscaping can enhance the appearance of the roundabout as well as improving its nighttime conspicuity.

Maintenance Cost

Another benefit of a roundabout is the considerable cost saving on annual maintenance costs which is typically $3,000 to $5,000 dollars per year and replacement cost of several hundred thousand dollars every 20 to 30 years.

Maintenance cost of a roundabout can be very low, a few hundred dollars years for weed and litter control typically or several thousand dollars a year for trimming, annual plant changes, mowing of grass, etc.

Pedestrians

Signalized intersections are typically quite dangerous of pedestrians as several thousand are killed each year and approximately 15,000 injured each year, (NHSTA). In this case, the problem for pedestrians crossing Mooring Line Drive at the exiting intersection are very long crossings, about 110 feet long. Second, pedestrians must wait for permission to cross at the intersection. At a roundabout pedestrians have the right-of-way and drivers must yield to them. Second, pedestrians only have to cross one lane at a time that is only 15 feet or so wide. The result is greatly enhanced pedestrian safety and mobility.

Bicyclists

Signalized intersections can be as or more dangerous for bicyclists as they are for pedestrians. Provided the bicyclists “claim-the-lane” and rides in front of vehicles they should have a safe ride through the roundabout. If they are uncomfortable doing so, bike ramps and wide sidewalks have been provided around the roundabout.

(Crayton Drive & Mooring Line Drive Evaluation)

Appendix A
Capacity Analysis Summary Sheets

MOVEMENT SUMMARY

Site: Mooring Line/Crayton AM - Existing

Mooring Line/Crayton AM
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Crayton											
3	L2	8	3.0	0.131	4.8	LOS A	0.7	18.1	0.48	0.33	34.2
8	T1	88	3.0	0.131	4.8	LOS A	0.7	18.1	0.48	0.33	34.3
18	R2	36	3.0	0.131	4.8	LOS A	0.7	18.1	0.48	0.33	33.5
Approach		132	3.0	0.131	4.8	LOS A	0.7	18.1	0.48	0.33	34.1
East: Mooring Line											
1	L2	46	3.0	0.200	5.0	LOS A	1.1	28.6	0.40	0.25	33.7
6	T1	122	3.0	0.200	5.0	LOS A	1.1	28.6	0.40	0.25	33.8
16	R2	56	3.0	0.200	5.0	LOS A	1.1	28.6	0.40	0.25	33.0
Approach		223	3.0	0.200	5.0	LOS A	1.1	28.6	0.40	0.25	33.6
North: Crayton											
7	L2	77	3.0	0.238	5.4	LOS A	1.4	36.3	0.41	0.26	33.3
4	T1	104	3.0	0.238	5.4	LOS A	1.4	36.3	0.41	0.26	33.4
14	R2	86	3.0	0.238	5.4	LOS A	1.4	36.3	0.41	0.26	32.7
Approach		267	3.0	0.238	5.4	LOS A	1.4	36.3	0.41	0.26	33.1
West: Mooring Line											
5	L2	95	3.0	0.219	5.4	LOS A	1.3	32.3	0.45	0.30	33.1
2	T1	127	3.0	0.219	5.4	LOS A	1.3	32.3	0.45	0.30	33.2
12	R2	14	3.0	0.219	5.4	LOS A	1.3	32.3	0.45	0.30	32.4
Approach		236	3.0	0.219	5.4	LOS A	1.3	32.3	0.45	0.30	33.1
All Vehicles		858	3.0	0.238	5.2	LOS A	1.4	36.3	0.43	0.28	33.4

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: SIDRA Standard.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Organisation: ALTERNATE STREET DESIGN PA | Processed: Monday, June 22, 2015 10:12:32 AM
Project: Z:\Project files\Naples\Mooring Line at Crayton\Traffic counts\Mooring Line.sip6

MOVEMENT SUMMARY

Site: Mooring Line/Crayton PM - Existing

Mooring Line/Crayton PM
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Crayton											
3	L2	10	3.0	0.176	6.5	LOS A	1.1	27.1	0.69	0.58	33.2
8	T1	89	3.0	0.176	6.5	LOS A	1.1	27.1	0.69	0.58	33.3
18	R2	36	3.0	0.176	6.5	LOS A	1.1	27.1	0.69	0.58	32.6
Approach		135	3.0	0.176	6.5	LOS A	1.1	27.1	0.69	0.58	33.1
East: Mooring Line											
1	L2	48	3.0	0.293	6.7	LOS A	1.8	46.4	0.58	0.44	33.0
6	T1	121	3.0	0.293	6.7	LOS A	1.8	46.4	0.58	0.44	33.1
16	R2	116	3.0	0.293	6.7	LOS A	1.8	46.4	0.58	0.44	32.3
Approach		285	3.0	0.293	6.7	LOS A	1.8	46.4	0.58	0.44	32.7
North: Crayton											
7	L2	90	3.0	0.301	6.1	LOS A	2.0	50.2	0.46	0.29	33.0
4	T1	101	3.0	0.301	6.1	LOS A	2.0	50.2	0.46	0.29	33.1
14	R2	142	3.0	0.301	6.1	LOS A	2.0	50.2	0.46	0.29	32.3
Approach		334	3.0	0.301	6.1	LOS A	2.0	50.2	0.46	0.29	32.7
West: Mooring Line											
5	L2	236	3.0	0.481	8.9	LOS A	3.6	91.1	0.59	0.43	31.3
2	T1	252	3.0	0.481	8.9	LOS A	3.6	91.1	0.59	0.43	31.4
12	R2	23	3.0	0.481	8.9	LOS A	3.6	91.1	0.59	0.43	30.8
Approach		510	3.0	0.481	8.9	LOS A	3.6	91.1	0.59	0.43	31.4
All Vehicles		1265	3.0	0.481	7.4	LOS A	3.6	91.1	0.56	0.41	32.2

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: SIDRA Standard.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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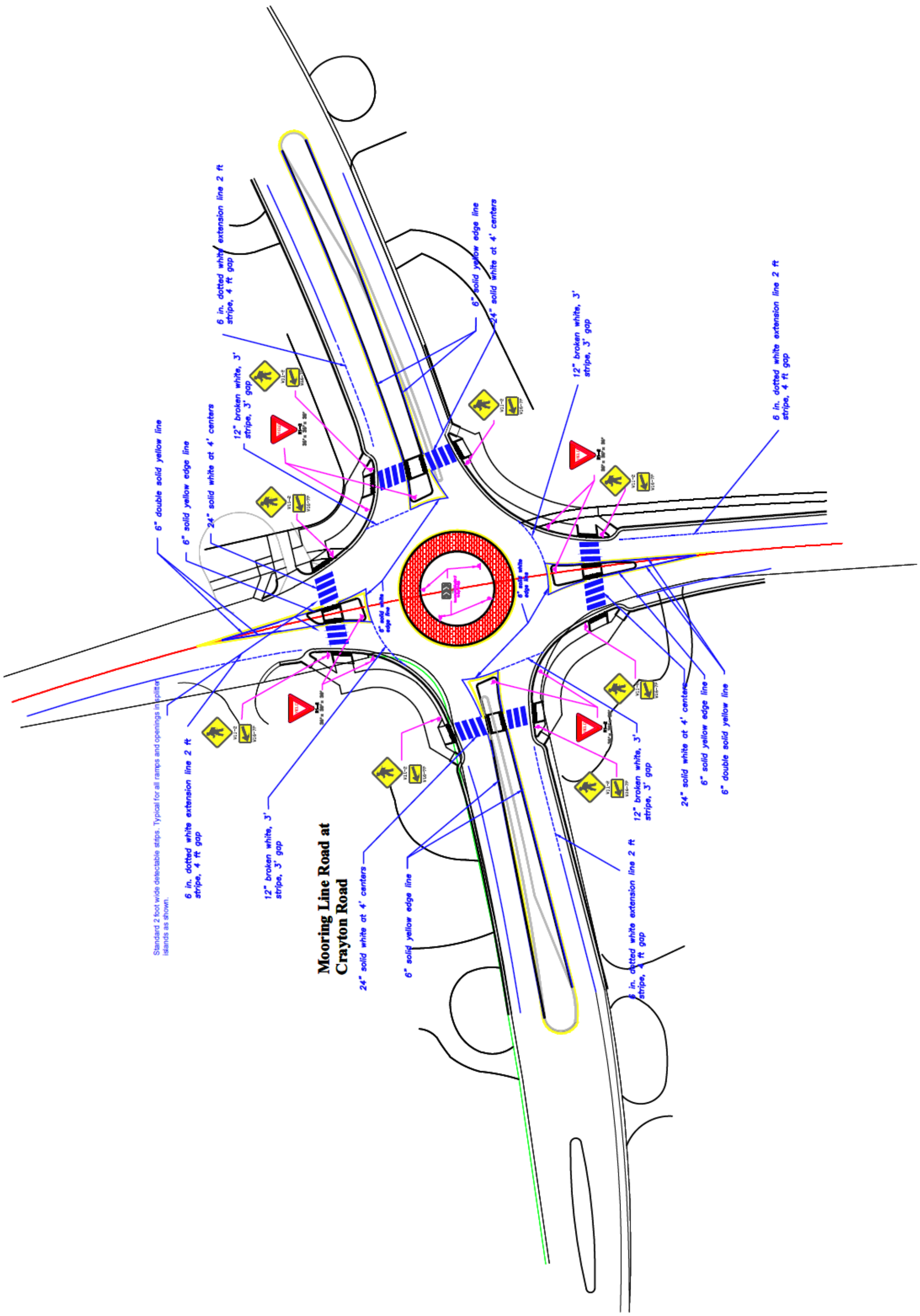
Project: Z:\Project files\Naples\Mooring Line at Crayton\Traffic counts\Mooring Line.sip6

(Crayton Drive & Mooring Line Drive Evaluation)

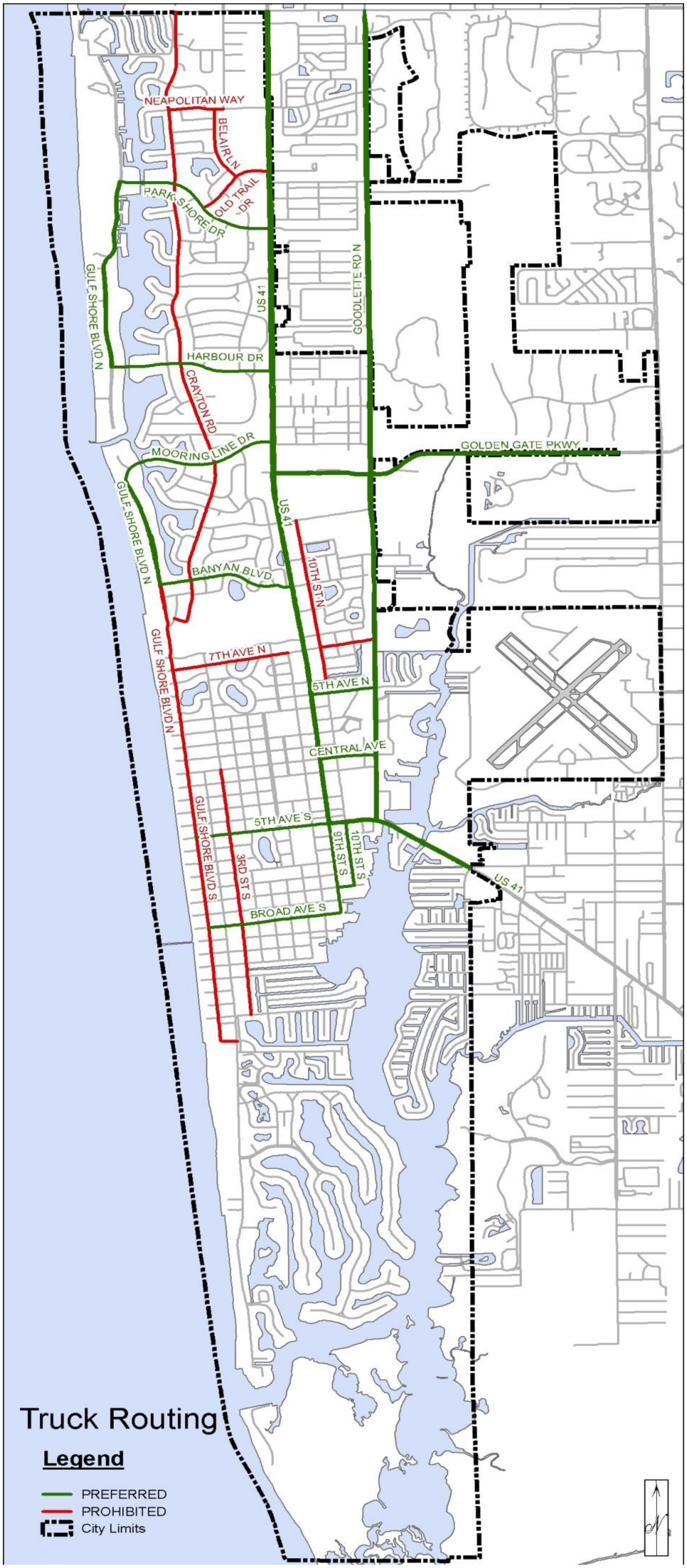
Appendix B

Proposed Roundabout Layout


Mooring Line Road at Crayton Road
Standard 2 foot wide detectable strips. Typical for all ramps and openings in splitter islands as shown.
6 in. dotted white extension line 2 ft stripe, 4 ft gap
12" broken white, 3' stripe, 3' gap
24" solid white at 4' centers
6" solid yellow edge line
6" double solid yellow line

Appendix B

City of Naples Adopted Truck Routes


NEAPOLITAN WAY
BELAIR LN
OLD TRAIL DR
PARK SHORE DR
GULF SHORE BLVD N
US 41
GOODLETTE RD N
HARBOUR DR
CRAYTON RD
MOORING LINE DR
GOLDEN GATE PKWY
US 41
GULF SHORE BLVD N
BANYAN BLVD
10TH ST N
7TH AVE N
GULF SHORE BLVD N
5TH AVE N
CENTRAL AVE
5TH AVE S
GULF SHORE BLVD S
3RD ST S
9TH ST S
10TH ST S
US 41
BROAD AVE S
Truck Routing
Legend
PREFERRED
PROHIBITED
City Limits

Appendix C

Traffic Operations Analysis Worksheets

Traffic Signal Condition

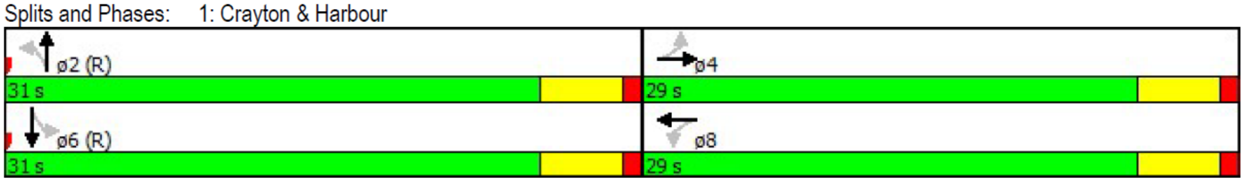
Existing Signals
1: Crayton & Harbour

5/2/2017

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	36	147	163	51	141	13	165	233	59	35	158	28
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		0	100		0	100		0	0		0
Storage Lanes	1		0	1		0	1		0	0		0
Taper Length (ft)	50			50			50			50		
Satd. Flow (prot)	1770	1716	0	1770	1840	0	1770	1807	0	0	1816	0
Flt Permitted	0.649			0.473			0.618				0.913	
Satd. Flow (perm)	1209	1716	0	881	1840	0	1151	1807	0	0	1672	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		111			9			27			15	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		488			560			430			378	
Travel Time (s)		11.1			12.7			9.8			8.6	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Shared Lane Traffic (%)												
Lane Group Flow (vph)	40	344	0	57	171	0	183	325	0	0	246	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Total Split (s)	29.0	29.0		29.0	29.0		31.0	31.0		31.0	31.0	
Total Lost Time (s)	5.0	5.0		5.0	5.0		5.0	5.0			5.0	
Act Effct Green (s)	24.0	24.0		24.0	24.0		26.0	26.0			26.0	
Actuated g/C Ratio	0.40	0.40		0.40	0.40		0.43	0.43			0.43	
v/c Ratio	0.08	0.46		0.16	0.23		0.37	0.41			0.34	
Control Delay	11.8	11.0		13.1	12.3		14.2	12.6			12.2	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Delay	11.8	11.0		13.1	12.3		14.2	12.6			12.2	
LOS	B	B		B	B		B	B			B	
Approach Delay		11.1			12.5			13.2			12.2	
Approach LOS		B			B			B			B	

Intersection Summary	
Area Type: Other	
Cycle Length: 60	
Actuated Cycle Length: 60	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.46	
Intersection Signal Delay: 12.3	Intersection LOS: B
Intersection Capacity Utilization 65.5%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 1: Crayton & Harbour



Traffic Control Feasibility 2/18/2017 Existing Signals
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Synchro 8 Light Report
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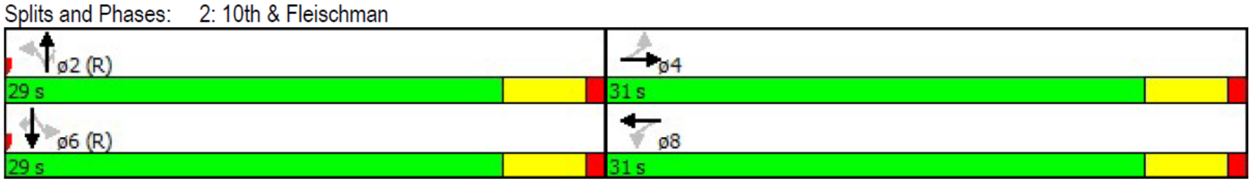
Existing Signals
2: 10th & Fleischman

5/2/2017

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	69	192	12	33	140	35	50	15	131	39	2	58
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	100		0	100		0	0		100	0		0
Storage Lanes	1		0	1		0	0		1	0		1
Taper Length (ft)	50			50			50			50		
Satd. Flow (prot)	1770	1846	0	1770	1807	0	0	1794	1583	0	1777	1583
Flt Permitted	0.635			0.617				0.805			0.774	
Satd. Flow (perm)	1183	1846	0	1149	1807	0	0	1500	1583	0	1442	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		6			26				146			64
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		531			604			465			349	
Travel Time (s)		12.1			13.7			10.6			7.9	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Shared Lane Traffic (%)												
Lane Group Flow (vph)	77	226	0	37	195	0	0	73	146	0	45	64
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2		2	6		6
Total Split (s)	31.0	31.0		31.0	31.0		29.0	29.0	29.0	29.0	29.0	29.0
Total Lost Time (s)	5.0	5.0		5.0	5.0			5.0	5.0		5.0	5.0
Act Effct Green (s)	26.0	26.0		26.0	26.0			24.0	24.0		24.0	24.0
Actuated g/C Ratio	0.43	0.43		0.43	0.43			0.40	0.40		0.40	0.40
v/c Ratio	0.15	0.28		0.07	0.24			0.12	0.20		0.08	0.10
Control Delay	11.3	11.9		10.5	10.3			12.1	3.3		11.7	4.1
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	0.0
Total Delay	11.3	11.9		10.5	10.3			12.1	3.3		11.7	4.1
LOS	B	B		B	B			B	A		B	A
Approach Delay		11.7			10.3			6.2			7.2	
Approach LOS		B			B			A			A	

Intersection Summary	
Area Type: Other	
Cycle Length: 60	
Actuated Cycle Length: 60	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.28	
Intersection Signal Delay: 9.4	Intersection LOS: A
Intersection Capacity Utilization 36.9%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 2: 10th & Fleischman



Traffic Control Feasibility 2/18/2017 Existing Signals
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Synchro 8 Light Report
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Existing Signals
3: 9th & 10th

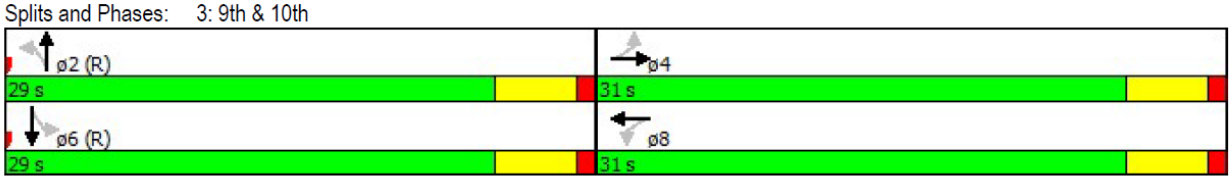
5/2/2017

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	41	223	21	301	206	7	10	334	376	10	282	38
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	1831	0	0	1807	0	0	1729	0	0	1831	0
Flt Permitted		0.891			0.644			0.994			0.978	
Satd. Flow (perm)	0	1643	0	0	1197	0	0	1720	0	0	1794	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		8			2			109			13	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		605			532			539			493	
Travel Time (s)		13.8			12.1			12.3			11.2	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	317	0	0	571	0	0	800	0	0	366	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Total Split (s)	31.0	31.0		31.0	31.0		29.0	29.0		29.0	29.0	
Total Lost Time (s)		5.0			5.0			5.0			5.0	
Act Effct Green (s)		26.0			26.0			24.0			24.0	
Actuated g/C Ratio		0.43			0.43			0.40			0.40	
v/c Ratio		0.44			1.10			1.06			0.50	
Control Delay		14.1			91.3			70.1			16.0	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		14.1			91.3			70.1			16.0	
LOS		B			F			E			B	
Approach Delay		14.1			91.3			70.1			16.0	
Approach LOS		B			F			E			B	

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 60
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 1.10
Intersection Signal Delay: 57.7 Intersection LOS: E
Intersection Capacity Utilization 100.8% ICU Level of Service G
Analysis Period (min) 15

Splits and Phases: 3: 9th & 10th



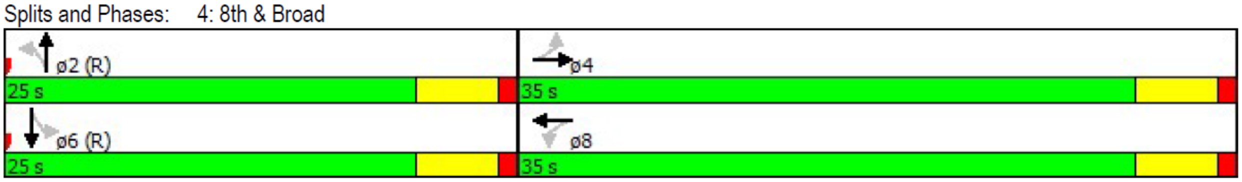
Existing Signals
4: 8th & Broad

5/2/2017

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	44	319	9	56	174	6	5	29	53	5	40	42
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Satd. Flow (prot)	0	1846	0	0	1833	0	0	1705	0	0	1736	0
Flt Permitted		0.939			0.844			0.986			0.986	
Satd. Flow (perm)	0	1744	0	0	1566	0	0	1686	0	0	1717	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		3			3			59			47	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		654			551			583			592	
Travel Time (s)		14.9			12.5			13.3			13.5	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	413	0	0	262	0	0	97	0	0	97	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Total Split (s)	35.0	35.0		35.0	35.0		25.0	25.0		25.0	25.0	
Total Lost Time (s)		5.0			5.0			5.0			5.0	
Act Effct Green (s)		30.0			30.0			20.0			20.0	
Actuated g/C Ratio		0.50			0.50			0.33			0.33	
v/c Ratio		0.47			0.33			0.16			0.16	
Control Delay		12.0			10.4			8.0			9.3	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		12.0			10.4			8.0			9.3	
LOS		B			B			A			A	
Approach Delay		12.0			10.4			8.0			9.3	
Approach LOS		B			B			A			A	

Intersection Summary	
Area Type: Other	
Cycle Length: 60	
Actuated Cycle Length: 60	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.47	
Intersection Signal Delay: 10.8	Intersection LOS: B
Intersection Capacity Utilization 37.3%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 4: 8th & Broad



Traffic Control Feasibility 2/18/2017 Existing Signals
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Synchro 8 Light Report
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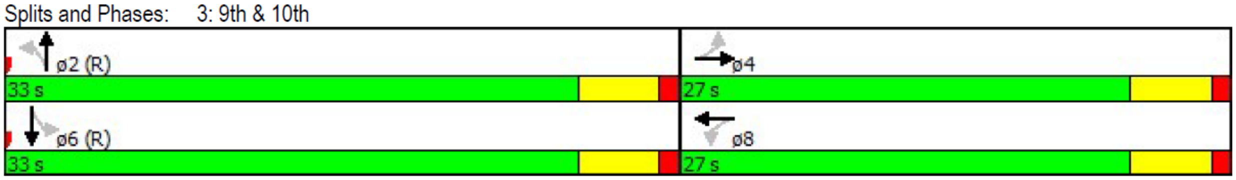
Signal with added WBLT lane
3: 9th & 10th

5/2/2017

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	41	223	21	301	206	7	10	334	376	10	282	38
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	150		0	0		150	0		0
Storage Lanes	0		0	1		0	0		0	0		0
Taper Length (ft)	50			50			50			50		
Satd. Flow (prot)	0	1831	0	1770	1853	0	0	1729	0	0	1831	0
Flt Permitted		0.926		0.523				0.994			0.974	
Satd. Flow (perm)	0	1708	0	974	1853	0	0	1720	0	0	1787	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		7			3			123			15	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		605			532			539			493	
Travel Time (s)		13.8			12.1			12.3			11.2	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	317	0	334	237	0	0	800	0	0	366	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Total Split (s)	27.0	27.0		27.0	27.0		33.0	33.0		33.0	33.0	
Total Lost Time (s)		5.0		5.0	5.0			5.0			5.0	
Act Effct Green (s)		22.0		22.0	22.0			28.0			28.0	
Actuated g/C Ratio		0.37		0.37	0.37			0.47			0.47	
v/c Ratio		0.50		0.94	0.35			0.92			0.44	
Control Delay		17.8		56.9	15.4			31.9			12.3	
Queue Delay		0.0		0.0	0.0			0.0			0.0	
Total Delay		17.8		56.9	15.4			31.9			12.3	
LOS		B		E	B			C			B	
Approach Delay		17.8			39.7			31.9			12.3	
Approach LOS		B			D			C			B	

Intersection Summary	
Area Type: Other	
Cycle Length: 60	
Actuated Cycle Length: 60	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Control Type: Pretimed	
Maximum v/c Ratio: 0.94	
Intersection Signal Delay: 28.4	Intersection LOS: C
Intersection Capacity Utilization 89.6%	ICU Level of Service E
Analysis Period (min) 15	

Splits and Phases: 3: 9th & 10th



Traffic Control Feasibility 2/18/2017 Other recommended modifications — Synchro 8 Light Report
AJB — Page 1

Stop Control Condition

Convert to AWSC
1: Crayton & Harbour

5/2/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	36	147	163	51	141	13	165	233	59	35	158	28
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	40	163	181	57	157	14	183	259	66	39	176	31

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1
Volume Total (vph)	40	344	57	171	183	324	246
Volume Left (vph)	40	0	57	0	183	0	39
Volume Right (vph)	0	181	0	14	0	66	31
Hadj (s)	0.53	-0.33	0.53	-0.03	0.53	-0.11	-0.01
Departure Headway (s)	8.0	7.1	8.4	7.8	7.7	7.1	7.5
Degree Utilization, x	0.09	0.68	0.13	0.37	0.39	0.64	0.51
Capacity (veh/h)	426	481	396	418	440	486	445
Control Delay (s)	10.6	22.8	11.5	14.1	14.4	20.5	18.1
Approach Delay (s)	21.5		13.5		18.3		18.1
Approach LOS	C		B		C		C

Intersection Summary			
Delay	18.4		
Level of Service	C		
Intersection Capacity Utilization	62.2%	ICU Level of Service	B
Analysis Period (min)	15		

Traffic Control Feasibility 2/18/2017 Convert to AWSC
AJB

Synchro 8 Light Report
Page 1

Convert to AWSC
2: 10th & Fleischman

5/2/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	69	192	12	33	140	35	50	15	131	39	2	58
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	77	213	13	37	156	39	56	17	146	43	2	64

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	77	227	37	194	72	146	46	64
Volume Left (vph)	77	0	37	0	56	0	43	0
Volume Right (vph)	0	13	0	39	0	146	0	64
Hadj (s)	0.53	-0.01	0.53	-0.11	0.42	-0.67	0.51	-0.67
Departure Headway (s)	6.2	5.7	6.3	5.7	6.5	5.4	6.7	5.5
Degree Utilization, x	0.13	0.36	0.06	0.31	0.13	0.22	0.08	0.10
Capacity (veh/h)	550	610	541	607	523	623	497	597
Control Delay (s)	9.0	10.6	8.5	9.9	9.2	8.7	9.1	7.9
Approach Delay (s)	10.2		9.7		8.9		8.4	
Approach LOS	B		A		A		A	

Intersection Summary			
Delay	9.5		
Level of Service	A		
Intersection Capacity Utilization	34.4%	ICU Level of Service	A
Analysis Period (min)	15		

Convert to AWSC
3: 9th & 10th

5/2/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✥			✥			✥			✥	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	41	223	21	301	206	7	10	334	376	10	282	38
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	46	248	23	334	229	8	11	371	418	11	313	42

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	317	571	800	367
Volume Left (vph)	46	334	11	11
Volume Right (vph)	23	8	418	42
Hadj (s)	0.02	0.14	-0.28	-0.03
Departure Headway (s)	9.4	9.1	8.7	9.1
Degree Utilization, x	0.83	1.0	1.0	0.92
Capacity (veh/h)	376	403	421	389
Control Delay (s)	44.0	236.8	445.4	58.9
Approach Delay (s)	44.0	236.8	445.4	58.9
Approach LOS	E	F	F	F

Intersection Summary			
Delay	256.6		
Level of Service	F		
Intersection Capacity Utilization	98.3%	ICU Level of Service	F
Analysis Period (min)	15		

Traffic Control Feasibility 2/18/2017 Convert to AWSC
AJB

Synchro 8 Light Report
Page 3

Convert to AWSC
4: 8th & Broad

5/2/2017

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	44	319	9	56	174	6	5	29	53	5	40	42
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	49	354	10	62	193	7	6	32	59	6	44	47

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	413	262	97	97
Volume Left (vph)	49	62	6	6
Volume Right (vph)	10	7	59	47
Hadj (s)	0.04	0.07	-0.32	-0.24
Departure Headway (s)	4.9	5.1	5.4	5.5
Degree Utilization, x	0.56	0.37	0.15	0.15
Capacity (veh/h)	713	676	570	567
Control Delay (s)	13.8	11.0	9.4	9.5
Approach Delay (s)	13.8	11.0	9.4	9.5
Approach LOS	B	B	A	A

Intersection Summary			
Delay	12.0		
Level of Service	B		
Intersection Capacity Utilization	35.6%	ICU Level of Service	A
Analysis Period (min)	15		

Traffic Control Feasibility 2/18/2017 Convert to AWSC
AJB

Synchro 8 Light Report
Page 4

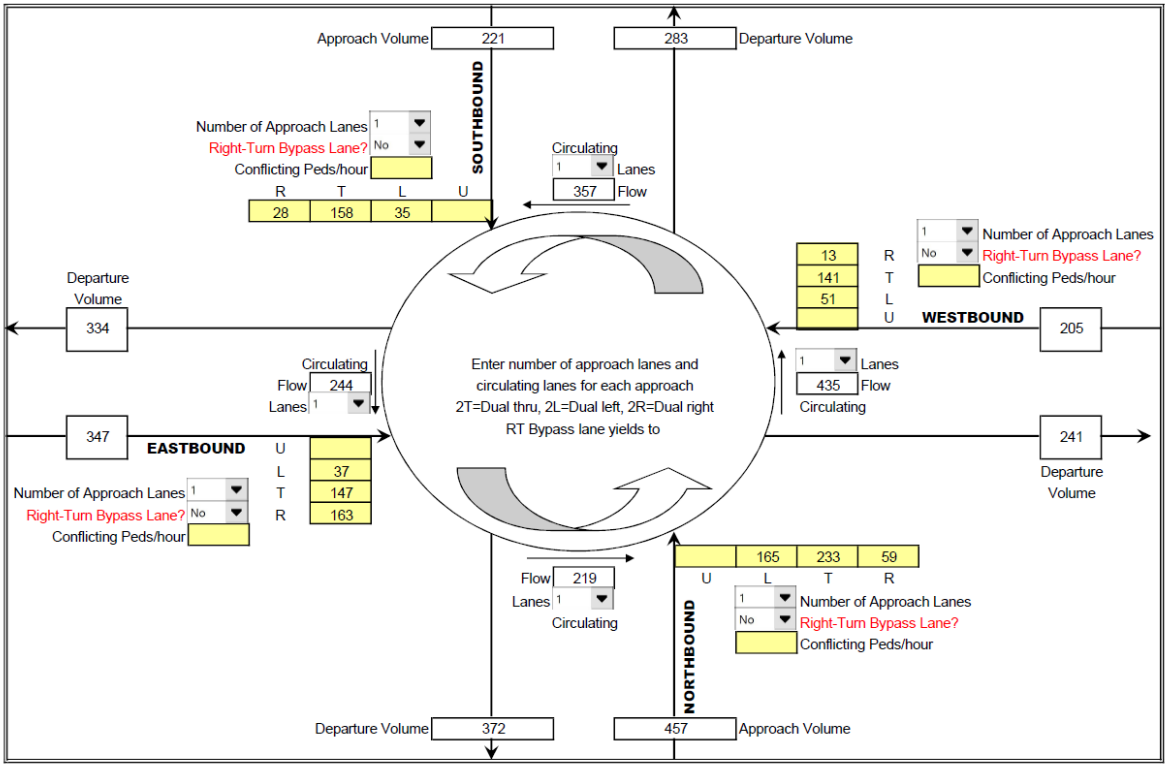
Roundabout Condition

ROUNDABOUT CAPACITY WORKSHEET

Version 2.1

Based upon NCHRP Report 672 - *Roundabouts: An Informational Guide*, Second Edition, 2010

Intersection:	Harbour Dr. & Crayton Rd.		
Location:	Naples, FL		
Roundabout Type:	Single-Lane		
Time Period:	PM Peak Hour	Analyst:	AJB
Scenario:		Analysis Date:	
Analysis Period (Hours)	1	Notes:	



Operation Summary

Northbound		Southbound		Eastbound		Westbound	
Lane	LRT	Lane	LRT	Lane	LRT	Lane	LRT
V_{NB}	457	V_{SB}	221	V_{EB}	347	V_{WB}	205
$V_{NB,circ}$	219	$V_{SB,circ}$	357	$V_{EB,circ}$	244	$V_{WB,circ}$	435
C	908	C	791	C	885	C	731
V/C	0.50	V/C	0.28	V/C	0.39	V/C	0.28
Q_{50}		Q_{50}		Q_{50}		Q_{50}	
Q_{95} (ft)	75	Q_{95} (ft)	29	Q_{95} (ft)	48	Q_{95} (ft)	29
$Delay_{ctrl}$	10.5	$Delay_{ctrl}$	7.7	$Delay_{ctrl}$	8.6	$Delay_{ctrl}$	8.2
LOS	B	LOS	A	LOS	A	LOS	A
Approach Delay	**10.5 B**	**Approach Delay**	**7.7 A**	**Approach Delay**	**8.6 A**	**Approach Delay**	**8.2 A**

Overall Roundabout Delay: 9.1

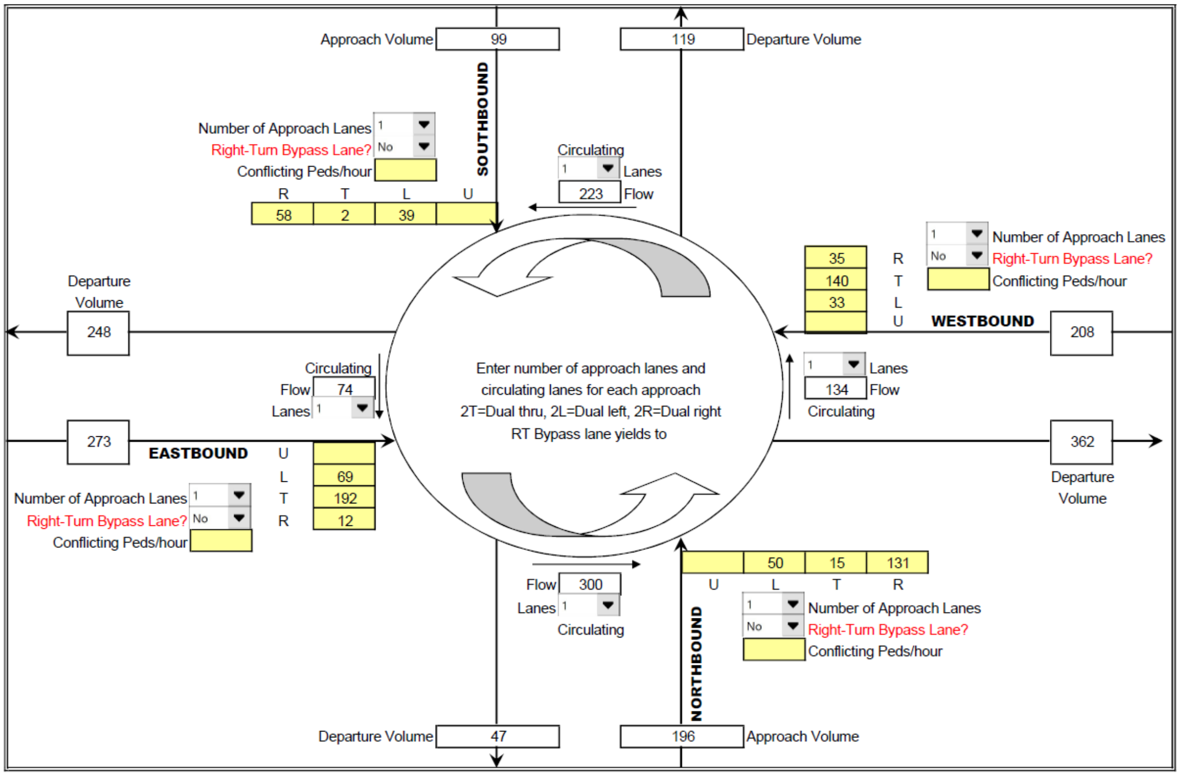
Overall Roundabout LOS: A

ROUNDABOUT CAPACITY WORKSHEET

Version 2.1

Based upon NCHRP Report 672 - *Roundabouts: An Informational Guide*, Second Edition, 2010

Intersection:	Fleischmann Blvd. & 10th St. N.		
Location:	Naples, FL		
Roundabout Type:	Single-Lane		
Time Period:	PM Peak Hour	Analyst:	AJB
Scenario:		Analysis Date:	
Analysis Period (Hours)	1	Notes:	



Operation Summary

Northbound			Southbound			Eastbound			Westbound		
Lane	LRT		Lane	LRT		Lane	LRT		Lane	LRT	
V_{NB}	196		V_{SB}	99		V_{EB}	273		V_{WB}	208	
$V_{NB,circ}$	300		$V_{SB,circ}$	223		$V_{EB,circ}$	74		$V_{WB,circ}$	134	
C	837		C	904		C	1,049		C	988	
V/C	0.23		V/C	0.11		V/C	0.26		V/C	0.21	
Q_{50}			Q_{50}			Q_{50}			Q_{50}		
Q_{95} (ft)	23		Q_{95} (ft)	9		Q_{95} (ft)	26		Q_{95} (ft)	20	
$Delay_{ctrl}$	6.8		$Delay_{ctrl}$	5.0		$Delay_{ctrl}$	5.9		$Delay_{ctrl}$	5.7	
LOS	A		LOS	A		LOS	A		LOS	A	
Approach Delay	**6.8**	**A**	**Approach Delay**	**5.0**	**A**	**Approach Delay**	**5.9**	**A**	**Approach Delay**	**5.7**	**A**

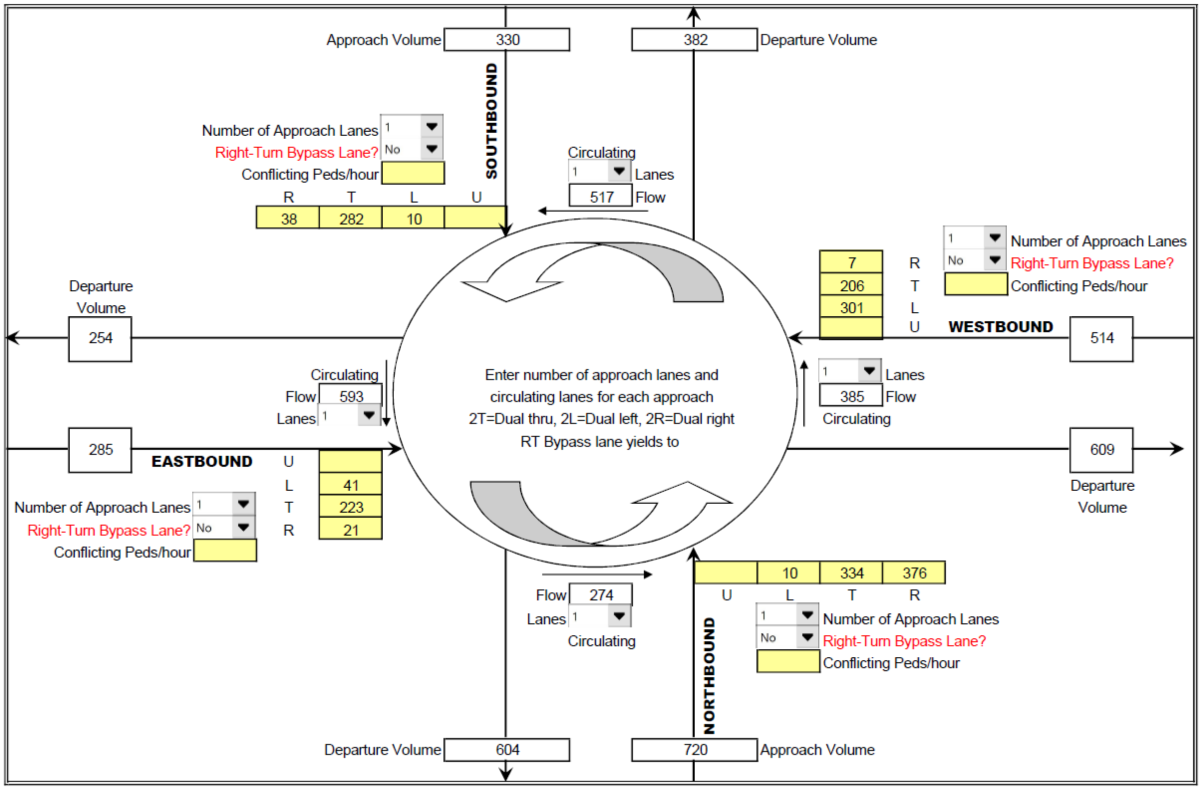
Overall Roundabout Delay: **6.0**
Overall Roundabout LOS: **A**

ROUNDABOUT CAPACITY WORKSHEET

Version 2.1

Based upon NCHRP Report 672 - *Roundabouts: An Informational Guide*, Second Edition, 2010

Intersection:	9th St. S. & 10th Ave. S.		
Location:	Naples, FL		
Roundabout Type:	Single-Lane		
Time Period:	PM Peak Hour	Analyst:	AJB
Scenario:		Analysis Date:	
Analysis Period (Hours)	1	Notes:	



Operation Summary

	Northbound	Southbound	Eastbound	Westbound
Lane	LRT	LRT	LRT	LRT
V_{NB} / V_{SB} / V_{EB} / V_{WB}	720	330	285	514
$V_{NB,circ}$ / $V_{SB,circ}$ / $V_{EB,circ}$ / $V_{WB,circ}$	274	517	593	385
C	859	674	625	769
V/C	0.84	0.49	0.46	0.67
Q_{50}				
Q_{95} (ft)	327	71	62	145
$Delay_{ctrl}$	28.6	12.9	12.9	17.3
LOS	D	B	B	C
Approach Delay	**28.6 D**	**12.9 B**	**12.9 B**	**17.3 C**

Overall Roundabout Delay: 20.3

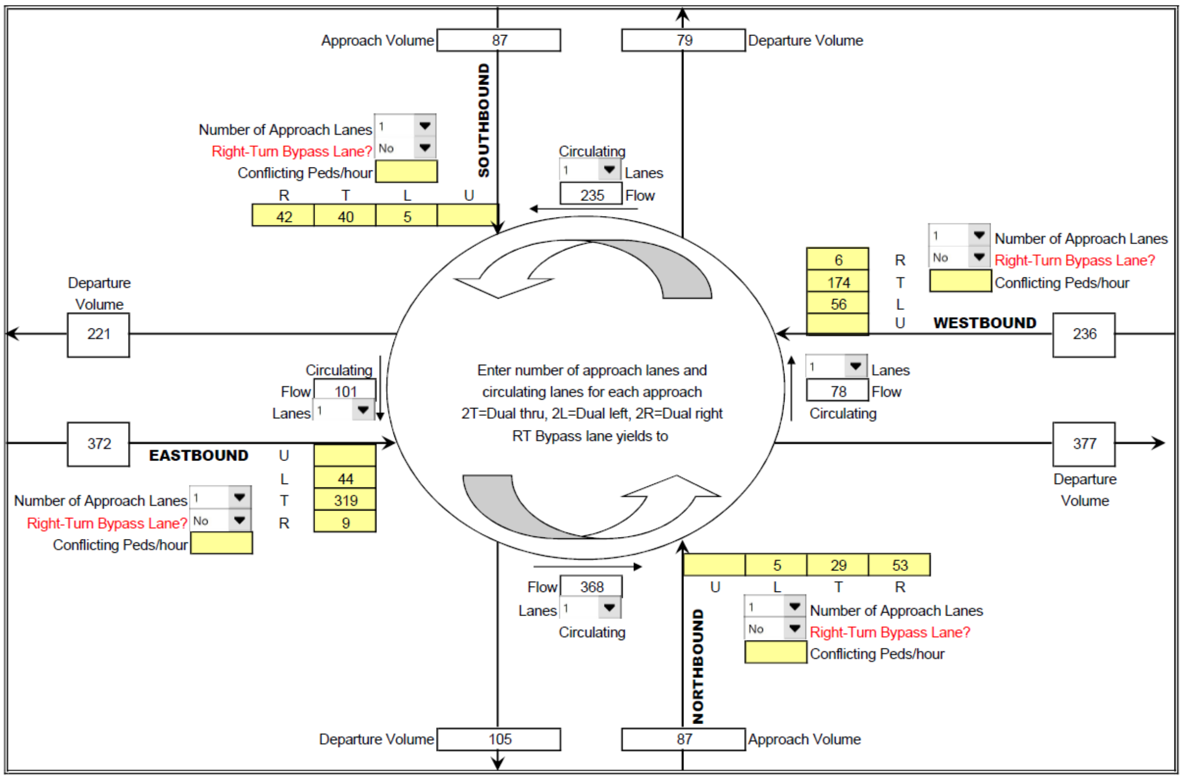
Overall Roundabout LOS: C

ROUNDABOUT CAPACITY WORKSHEET

Version 2.1

Based upon NCHRP Report 672 - *Roundabouts: An Informational Guide*, Second Edition, 2010

Intersection:	8th St. S. & Broad Ave. S.		
Location:	Naples, FL		
Roundabout Type:	Single-Lane		
Time Period:	PM Peak Hour	Analyst:	AJB
Scenario:		Analysis Date:	
Analysis Period (Hours)	1	Notes:	



Operation Summary

Northbound			Southbound			Eastbound			Westbound		
Lane	LRT		Lane	LRT		Lane	LRT		Lane	LRT	
V_{NB}	87		V_{SB}	87		V_{EB}	372		V_{WB}	236	
$V_{NB,circ}$	368		$V_{SB,circ}$	235		$V_{EB,circ}$	101		$V_{WB,circ}$	78	
C	782		C	893		C	1,021		C	1,045	
V/C	0.11		V/C	0.10		V/C	0.36		V/C	0.23	
Q_{50}			Q_{50}			Q_{50}			Q_{50}		
Q_{95} (ft)	9		Q_{95} (ft)	8		Q_{95} (ft)	43		Q_{95} (ft)	22	
$Delay_{ctrl}$	5.7		$Delay_{ctrl}$	5.0		$Delay_{ctrl}$	7.4		$Delay_{ctrl}$	5.6	
LOS	A		LOS	A		LOS	A		LOS	A	
Approach Delay	**5.7**	**A**	**Approach Delay**	**5.0**	**A**	**Approach Delay**	**7.4**	**A**	**Approach Delay**	**5.6**	**A**

Overall Roundabout Delay: 6.4

Overall Roundabout LOS: A

Appendix D

Public Workshop Comment Forms

"SPAN-WIRE" INTERSECTIONS STUDY

Thursday, April 13, 2017

4:00 – 7:00 P.M.

Naples City Council Chambers

NAME: Deb Logan / Rick Logan

ADDRESS: [redacted]

PHONE/E-MAIL: [redacted]

QUESTIONS OR COMMENTS:

Great designs, we are 100% in favor of your proposed changes. Thank you for your expertise + great work.

"SPAN-WIRE" INTERSECTIONS STUDY

Thursday, April 13, 2017

4:00 – 7:00 P.M.

Naples City Council Chambers

NAME: G. C. McEachern

ADDRESS: 3 [redacted]

PHONE/E-MAIL: [redacted]

QUESTIONS OR COMMENTS: Originally opposed to Round about, but now in favor as being a safe traffic alternative

Opposed to mast arm at Fleischmann and Tenth due to cost.

"SPAN-WIRE" INTERSECTIONS STUDY

Thursday, April 13, 2017

4:00 – 7:00 P.M.

Naples City Council Chambers

NAME: Jeanne Feight

ADDRESS: [redacted]

PHONE/E-MAIL [redacted]

QUESTIONS OR COMMENTS: Harbour Drive and Mooringline Intersections are in residential areas - populated by seasonal and retired residents. They have used roundabouts in other states. They are confusing and dangerous - it doesn't get better with use. The Central Avenue "new" roundabouts are just as disfunctional as older roundabouts. Put in the hurricane proof traffic lights, freshen up the cross walks and bike lanes that is what tax paying residents want.

"SPAN-WIRE" INTERSECTIONS STUDY

Thursday, April 13, 2017

4:00 – 7:00 P.M.

Naples City Council Chambers

NAME: MICHAEL HUNTER

ADDRESS: [redacted]

PHONE/E-MAI[redacted]

QUESTIONS OR COMMENTS: ROUNDABOUT LOOKS GREAT!
PLEASE PLANT LOTS OF GREENERY
BIG TRESS – MAKE IT LOOK LIKE
FLORIDA.
MAKE ~~RO~~ IT AS BIG AS YOU CAN.

GOOD LUCK!

“SPAN-WIRE” INTERSECTIONS STUDY

Thursday, April 13, 2017

4:00 – 7:00 P.M.

Naples City Council Chambers

NAME: Vivian Black

ADDRESS: 3 [redacted]

PHONE/E-MAIL: [redacted] m

QUESTIONS OR COMMENTS:

I favor roundabouts

"SPAN-WIRE" INTERSECTIONS STUDY

Thursday, April 13, 2017

4:00 – 7:00 P.M.

Naples City Council Chambers

NAME: VIC WALKER

ADDRESS: [redacted]

PHONE/E-MAIL:

QUESTIONS OR COMMENTS: I OPPOSE THE TWO PROPOSED ROUNDABOUTS ON CRAYTON. I HAVE A SERIOUS CONCERN ABOUT PUBLIC SAFETY FOR USERS (VEHICLES, BIKES AND PEDESTRIANS) EMERGENCY VEHICLES WILL HAVE TO BUMP OVER PAVED PORTION OF INNER CIRCLE - NOT GREAT FOR PATIENTS IN AMBULANCES, ETC, ETC. ETC.

PLEASE CONSIDER OTHER OPTIONS.

"SPAN-WIRE" INTERSECTIONS STUDY

Thursday, April 13, 2017

4:00 – 7:00 P.M.

Naples City Council Chambers

NAME: Laurel Settles

ADDRESS [redacted]

PHONE/E-[redacted]

QUESTIONS OR COMMENTS: Round abouts at all proposed intersections, especially at Mooring Line Drive + Crayton are the way to go! Creates a good flow of traffic instead of stopping for stop sign or another traffic light. Much nicer to look at too!

"SPAN-WIRE" INTERSECTIONS STUDY

Thursday, April 13, 2017

4:00 – 7:00 P.M.

Naples City Council Chambers

NAME: Juliana Meek

ADDRESS: [redacted]

PHONE/E-MAI[redacted]

QUESTIONS OR COMMENTS:

— Please make intersections pedestrian friendly
Can't tell when light is about to change
and I was hit by a car ~~that~~ when I was
crossing because the light changed while
I was walking in front of car: Wasn't hurt
but was shaken by it. This was intersection
at Mooring line and Crayton (crossing crayton)

— Good idea to convert Broad and 8th to 4 way
Stop. Light isn't needed there

Appendix E

Cost Estimates

Opinion of Probable Cost: Planning-Level

Harbour Drive & Crayton Road

Cost Summary

	Construction	Total
Convert to roundabout	$449,557	$539,468

Calculation details: Roundabout

Convert to roundabout	*Item#*	Amount	Unit cost	Units	Total	Notes
Minor widening, excludes curbs	N		$15.00	SF		
Pavement removal	N	8,500	$2.00	SF	$17,000	RT flare + roundabout islands
Asphalt Pavement	0334-1-13	225	$197.28	TN	$44,388	Note: 1 Ton = 80 sf @2"
Mill & Resurface	70-11 + 0334-1-13		$2.60	SF		
Soil and Base preparation	0162 + 0285	60	$25.00	SY	$1,500	
Curb removal	N	650	$2.00	LF	$1,300	
Curb, Type B	0520-2-2	200	$30.88	LF	$6,176	Apron
Curb, Type D	0520-2-4	1,600	$17.68	LF	$28,288	Edges, splitter islands + center island
Curb, Type F	0520-1-10		$22.19	LF		
Curb, Valley type	0520-3		$27.74	LF		
Remove concrete walkway	N	1,250	$5.00	SF	$6,250	
Concrete walkway	0522-2	489	$46.74	SY	$22,851	
Truncated domes	0527-2	320	$26.53	SF	$8,490	
Concrete driveway	0522-2	1,000	$46.74	SY	$46,740	2 driveways + Apron
Inlet/Catch basin, install to existing system	0425-2-91	2	$6,706.20	EA	$13,412	
Manhole, replace existing inlet with	0425-2-91		$6,706.20	EA		
Reinforced concrete pipe, 18" or 24"	430174118	60	$155.00	LF	$9,300	Adjust 2 inlets on SE corner
Traffic sign, install or relocate	0700-1-11	16	$419.92	EA	$6,719	
Remove light pole/signal pole/cabinet	0646-1-60	2	$188.60	EA	$377	
Remove concrete strain pole	0641-2-80	2	$3,278.49	EA	$6,557	Remove signal
Relocate street light pole	0715-4400	1	$5,213.00	EA	$5,213	Adjust pole in median on east leg
Water meter, adjust to grade	N	5	$400.00	EA	$2,000	Assumed
Valve box, adjust to grade	N	5	$200.00	EA	$1,000	Assumed
Subsoil excavation	0120-4	6,800	$0.74	CF	$5,037	
Topsoil, 12" depth	0162-1-12	6,800	$1.31	SY	$8,908	
Replant, sod	0570-1-2	8,500	$2.74	SY	$23,290	
Remove pavement markings, 4"	N		$1.00	LF		
Pavement markings, solid 4"	0711-11123	1,600	$2.86	LF	$4,576	Legs
Pavement markings, solid 8"	0711-11123	400	$2.86	LF	$1,144	Circulating roadway
Pavement markings,arrow, white	N	12	$250.00	EA	$3,000	YIELD markings, bike stencils
Crosswalk, hi-vis/ladder-style	N	128	$25.00	LF	$3,200	
Irrigation system	0590-70	1	$60,785.00	EA	$60,785	
Remove street tree	N		$1,000.00	EA		
Install street tree	N	40	$500.00	EA	$20,000	Assumes landscaping
Total Construction Items					$357,501	
Mobilization		5.0%			$17,875	
Traffic Control		5.0%			$17,875	
Contingency		15.0%			$56,306	
Total Construction					**$449,557**	
Survey, design		20%			$89,911	
Construction Engineering		0%			$0	
FULL COST					**$539,468**	

Assumptions:

Costs based on FDOT Item Average Unit Cost, 2017, Area 10 where available or Statewide

Measures are contracted as a group for efficient construction costs

Planning-level estimates, contingency used to account for uncertainties of complex construction

Item #N = FDOT cost not available. Unit cost based on other information.

Opinion of Probable Cost: Planning-Level

Fleischmann Boulevard & 10th Street North

Cost Summary	Construction	Total
Convert to roundabout	$392,266	$470,719

Calculation details: Roundabout

Convert to roundabout	*Item#*	Amount	Unit cost	Units	Total	Notes
Minor widening, excludes curbs	N		$15.00	SF		
Pavement removal	N	8,800	$2.00	SF	$17,600	Roundabout islands, SBRT lane, EB/NB shoulders
Asphalt Pavement	0334-1-13	188	$197.28	TN	$36,990	Note: 1 Ton = 80 sf @2"
Mill & Resurface	70-11 + 0334-1-13		$2.60	SF		
Soil and Base preparation	0162 + 0285	40	$25.00	SY	$1,000	
Curb removal	N	160	$2.00	LF	$320	Triangular island + SW corner
Curb, Type B	0520-2-2	200	$30.88	LF	$6,176	Apron
Curb, Type D	0520-2-4	1,050	$17.68	LF	$18,564	Retain curbless edges; curbed splitter + center islands
Curb, Type F	0520-1-10		$22.19	LF		
Curb, Valley type	0520-3		$27.74	LF		
Remove concrete walkway	N	1,425	$5.00	SF	$7,125	
Concrete walkway	0522-2	400	$46.74	SY	$18,696	
Truncated domes	0527-2	320	$26.53	SF	$8,490	
Concrete driveway	0522-2	1,600	$46.74	SY	$74,784	Apron
Inlet/Catch basin, install to existing system	0425-2-91		$6,706.20	EA		
Manhole, replace existing inlet with	0425-2-91		$6,706.20	EA		
Reinforced concrete pipe, 18" or 24"	430174118		$155.00	LF		
Traffic sign, install or relocate	0700-1-11	16	$419.92	EA	$6,719	
Remove light pole/signal pole/cabinet	0646-1-60	6	$188.60	EA	$1,132	Remove ped poles, cabinet
Remove concrete strain pole	0641-2-80	2	$3,278.49	EA	$6,557	Remove signal
Relocate street light pole	0715-4400	1	$5,213.00	EA	$5,213	Assumed for commerical sign on north leg
Water meter, adjust to grade	N	2	$400.00	EA	$800	Assumed
Valve box, adjust to grade	N	2	$200.00	EA	$400	Assumed
Subsoil excavation	0120-4	6,800	$0.74	CF	$5,037	
Topsoil, 12" depth	0162-1-12	756	$1.31	SY	$990	
Replant, sod	0570-1-2	756	$2.74	SY	$2,070	
Remove pavement markings, 4"	N		$1.00	LF		
Pavement markings, solid 4"	0711-11123	2,500	$2.86	LF	$7,150	Legs
Pavement markings, solid 8"	0711-11123	400	$2.86	LF	$1,144	Circulating roadway
Pavement markings,arrow, white	N	4	$250.00	EA	$1,000	YIELD markings, bike stencils
Crosswalk, hi-vis/ladder-style	N	128	$25.00	LF	$3,200	
Irrigation system	0590-70	1	$60,785.00	EA	$60,785	
Remove street tree	N		$1,000.00	EA		
Install street tree	N	40	$500.00	EA	$20,000	Assumes landscaping
Total Construction Items					$311,941	
Mobilization		5.0%			$15,597	
Traffic Control		5.0%			$15,597	
Contingency		15.0%			$49,131	
Total Construction					**$392,266**	
Survey, design		20%			$78,453	
Construction Engineering		0%			$0	
FULL COST					**$470,719**	

Assumptions:

Costs based on FDOT Item Average Unit Cost, 2017, Area 10 where available or Statewide

Measures are contracted as a group for efficient construction costs

Planning-level estimates, contingency used to account for uncertainties of complex construction

Item #N = FDOT cost not available. Unit cost based on other information.

Opinion of Probable Cost: Planning-Level

10th Avenue S. & 9th Street S.

Cost Summary	Construction	Total
Replace with mast arm signal, add WB left-turn lane	$304,516	$350,194

Calculation details: Replace Traffic Signal, Reconstruct Curb Ramps

Replace with mast arm signal, add WB left-turn la	*Item#*	Amount	Unit cost	Units	Total	Notes
Minor widening, excludes curbs	N	3,030	$15.00	SF	$45,450	
Pavement removal	N	570	$2.00	SF	$1,140	For trenching
Asphalt Pavement	0334-1-13	3	$197.28	TN	$641	For trench Note: 1 Ton=80 sf @2"
Mill & Resurface	0327-70-11 + 0334-1-13		$2.60	SF		
Soil and Base preparation	0162 + 0285	29	$25.00	SY	$722	For trenching
Curb removal	N	220	$2.00	LF	$440	
Curb, Type B	0520-2-2	90	$30.88	LF	$2,779	
Curb, Type D	0520-2-4	230	$17.68	LF	$4,066	
Curb, Type F	0520-1-10		$22.19	LF		
Curb, Valley type	0520-3		$27.74	LF		
Remove concrete walkway	N	830	$5.00	SF	$4,150	
Concrete walkway	0522-2	92	$46.74	SY	$4,310	
Truncated domes	0527-2	118	$26.53	SF	$3,131	
Concrete driveway	0522-2	14	$46.74	SY	$675	Restore drive apron
Inlet/Catch basin, install to existing system	0425-2-91		$6,706.20	EA		Use existing inlets
Manhole, replace existing inlet with	0425-2-91		$6,706.20	EA		
Reinforced concrete pipe, 18" or 24"	430174118		$155.00	LF		
Traffic sign, install or relocate	0700-1-11	2	$419.92	EA	$840	
Remove light pole/signal pole/cabinet	0646-1-60	1	$188.60	EA	$189	
Remove concrete strain pole	0641-2-80	2	$3,278.49	EA	$6,557	
Relocate street light pole	0715-4400		$5,213.00	EA		
Water meter, adjust to grade	N		$400.00	EA		
Valve box, adjust to grade	N	2	$200.00	EA	$400	Assumed
Subsoil excavation	0120-4	270	$0.74	CF	$200	
Topsoil, 12" depth	0162-1-12	30	$1.31	SY	$39	
Replant, sod	0570-1-2	30	$2.74	SY	$82	
Remove pavement markings, 4"	N	130	$1.00	LF	$130	
Pavement markings, solid 4"	0711-11123	650	$2.86	LF	$1,859	Lane lines
Pavement markings, solid 8"	0711-11123	75	$2.86	LF	$215	Stop bars
Pavement markings,arrow, white	N	2	$250.00	EA	$500	
Crosswalk, hi-vis/ladder-style	N	144	$25.00	LF	$3,600	
Irrigation system	0590-70		$60,785.00	EA		
Remove street tree	N		$1,000.00	EA		
Install street tree	N	1	$500.00	EA	$500	
Mast arm, installed	0649-31101	4	$27,851.63	EA	$111,407	
Pedestrian pedestal and signal	0646-1-11+0653-1-11	4	$1,750.25	EA	$7,001	
Trench and conduit	0630-2-11	280	$5.86	LF	$1,641	Assumed
Pullbox	0635-2-11	4	$578.00	EA	$2,312	Assumed
Signal head	0650-1-14	8	$878.60	EA	$7,029	
Signal controller and cabinet	0670-5141+0676=1134	1	$30,155.43	EA	$30,155	
Total Construction Items					$242,160	
Mobilization		5.0%			$12,108	
Traffic Control		5.0%			$12,108	
Contingency		15.0%			$38,140	
Total Construction					**$304,516**	
Survey, design		15%			$45,677	
Construction Engineering		0%			$0	
FULL COST					**$350,194**	

Assumptions:

Costs based on FDOT Item Average Unit Cost, 2017, Area 10 where available or Statewide

Measures are contracted as a group for efficient construction costs

Planning-level estimates, contingency used for simple construction

Item #N = FDOT cost not available. Unit cost based on other information.

Opinion of Probable Cost: Planning-Level

Broad Avenue S. & 8th Street S.

Cost Summary

	Construction	Total
Convert to AWSC, remove signal	$19,306	$22,201

Calculation details: Convert to All-Way Stop Control (AWSC), Remove Signal, Reconstruct Curb Ramps

Convert to AWSC, remove signal	*Item#*	Amount	Unit cost	Units	Total	Notes
Minor widening, excludes curbs	N		$15.00	SF		
Pavement removal	N	30	$2.00	SF	$60	Curb ramp reconstruct
Asphalt Pavement	0334-1-13	1	$197.28	TN	$197	Note: 1 Ton = 80 sf @2"
Mill & Resurface	0327-70-11 + 0334-1-13		$2.60	SF		
Soil and Base preparation	0162 + 0285		$25.00	SY		
Curb removal	N		$2.00	LF		
Curb, Type B	0520-2-2		$30.88	LF		
Curb, Type D	0520-2-4		$17.68	LF		
Curb, Type F	0520-1-10		$22.19	LF		
Curb, Valley type	0520-3		$27.74	LF		
Remove concrete walkway	N	75	$5.00	SF	$375	Curb ramp reconstruct
Concrete walkway	0522-2	8	$46.74	SY	$390	Curb ramp reconstruct
Truncated domes	0527-2	30	$26.53	SF	$796	Curb ramp reconstruct
Concrete driveway	0522-2		$46.74	SY		
Inlet/Catch basin, install to existing system	0425-2-91		$6,706.20	EA		
Manhole, replace existing inlet with	0425-2-91		$6,706.20	EA		
Reinforced concrete pipe, 18" or 24"	430174118		$155.00	LF		
Traffic sign, install or relocate	0700-1-11	12	$419.92	EA	$5,039	8 Stop, 4 Stop ahead
Remove light pole/signal pole/cabinet	0646-1-60	1	$188.60	EA	$189	
Remove concrete strain pole	0641-2-80	2	$3,278.49	EA	$6,557	
Relocate street light pole	0715-4400		$5,213.00	EA		
Water meter, adjust to grade	N		$400.00	EA		
Valve box, adjust to grade	N		$200.00	EA		
Subsoil excavation	0120-4		$0.74	CF		
Topsoil, 12" depth	0162-1-12		$1.31	SY		
Replant, sod	0570-1-2		$2.74	SY		
Remove pavement markings, 4"	N		$1.00	LF		
Pavement markings, solid 4"	0711-11123		$2.86	LF		
Pavement markings, solid 8"	0711-11123		$2.86	LF		
Pavement markings,arrow, white	N	4	$250.00	EA	$1,000	Stop legends
Crosswalk, hi-vis/ladder-style	N	30	$25.00	LF	$750	
Irrigation system	0590-70		$60,785.00	EA		
Remove street tree	N		$1,000.00	EA		
Install street tree	N		$500.00	EA		
Total Construction Items					$15,352	
Mobilization		5.0%			$768	
Traffic Control		5.0%			$768	
Contingency		15.0%			$2,418	
Total Construction					**$19,306**	
Survey, design		15%			$2,896	
Construction Engineering		0%			$0	
FULL COST					**$22,201**	

Assumptions:

Costs based on FDOT Item Average Unit Cost, 2017, Area 10 where available or Statewide

Measures are contracted as a group for efficient construction costs

Planning-level estimates, standard 20% contingency used for simple construction

Item #N = FDOT cost not available. Unit cost based on other information.