Boices Lane Railroad Crossing Study

Town of Ulster, Ulster County, NY

October, 2013

Prepared For:

ULSTER COUNTY TRANSPORTATION COUNCIL

NEW YORK STATE
DEPARTMENT OF TRANSPORTATION

Prepared By:

Creighton Manning

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Chapter 1. Introduction

This report summarizes the results of a traffic operations and safety assessment at the existing railroad crossing on Boices Lane in the Town of Ulster, Ulster County, New York. The assessment includes the adjacent intersections of Morton Boulevard and John Clark Drive with Boices Lane. The project location is shown in the aerial image below:

A. Study Area

Boices Lane serves about 12,500 vehicles per day (vpd) and provides a connection between the commercial corridor of US Route 9W (Ulster Avenue) and Tech City and Enterprise Drive. In addition, Enterprise Drive provides a connection to US Route 209 allowing vehicles to bypass the US Route 9W interchange connection with US Route 209/NY Route 199.

The study intersections of Morton Boulevard and John Clark Drive are located about 325 feet apart along Boices Lane about 600 feet west of US Route 9W. Both intersections are controlled by traffic signals. The CSX railroad crossing is located between the two intersections approximately 100 feet west of John Clark Drive.

Sidewalks are provided on Boices Lane in the southwest quadrant of the Morton Boulevard intersection along the Stewarts parcel and on the north side of Boices Lane between US Route

9W and John Clark Drive. A multi-use path/sidewalk is also provided on the north side of Boices Lane within the Tech City property limits and along the east side of the CSX railroad which extends from Boices Lane approximately 375-feet north intersecting the shoulder of John Clark Drive.

Land uses in the study area include a mix of large and small scale retail, residential, and service uses. The Stewart's Shop and gas station, located in the southwest quadrant of the Morton Boulevard intersection, has access to Boices Lane and Morton Boulevard. These driveways are located relatively close to the intersection so the traffic entering and exiting Stewart's affects operations at the Boices Lane/Morton Boulevard intersection.

Field visits and discussions with the New York State Department of Transportation (NYSDOT), the Town of Ulster, Ulster County, and CSX identified a number of issues within the study area that affect the operations at the study intersections. Figure 1.1 illustrates a number of these issues; which are generally identified in the bulleted list below.

- Non-compliant, poor condition, or non-existent pedestrian accommodations
- Old and/or faulty traffic signal equipment
- Narrow right-of-way
- Short and narrow eastbound right turn lane on Boices Lane approaching Morton Blvd
- Inconsistent pavement markings and signs
- Acute intersection approach angle from Morton Boulevard approaching Boices Lane
- Long queues and delay during pre-emption

This study is an opportunity to identify modifications that will improve conditions for all users in the study area.

B. Methodology

This study was progressed under the direction an Advisory Committee, and using the *NYSMPO Safety Assessment Guidelines*. The Advisory Committee included the following Agencies.

- Town of Ulster (Supervisor and Department of Public Works (DPW))
- Ulster County DPW
- Ulster County Metropolitan Planning Organization (UCTC)
- NYSDOT
- CSX

Sign too close to intersection

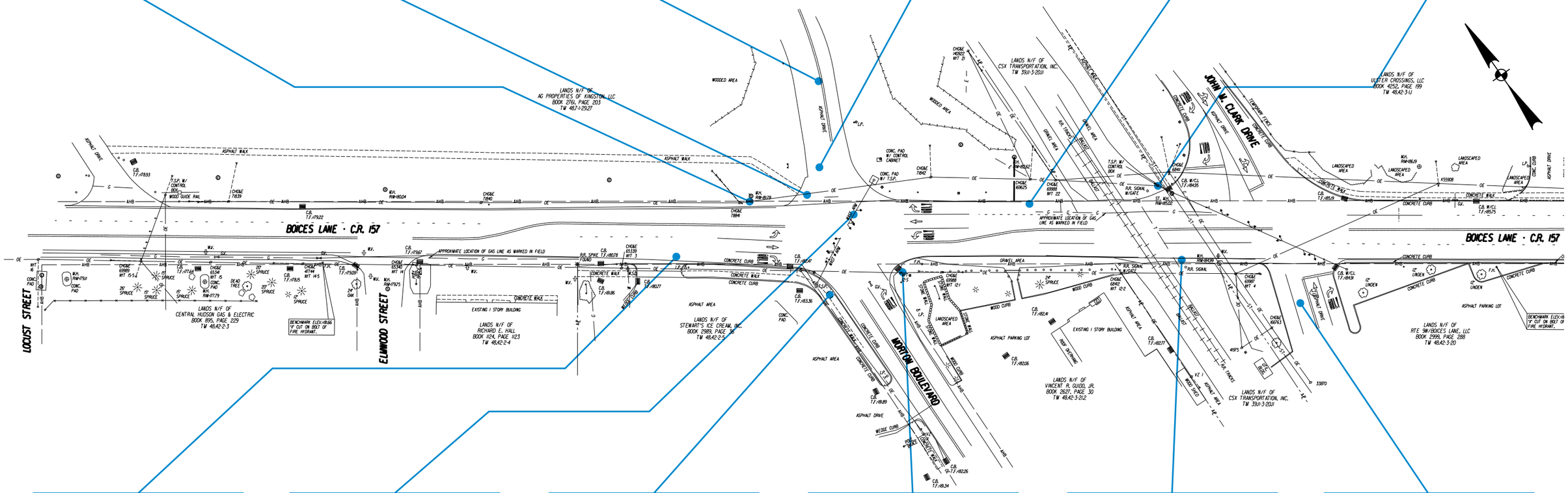
Poor sidewalk condition

Pavement markings not consistent with MUTCD

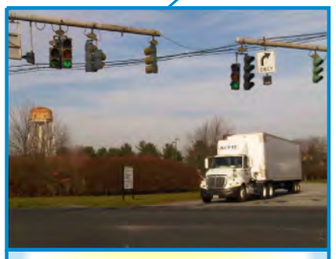
Faulty signal loops and wiring

ROW at edge of pavement limits short-term improvements

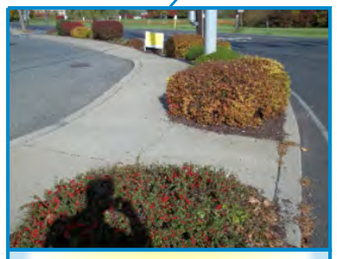
Older signal equipment



Short and narrow right turn lane

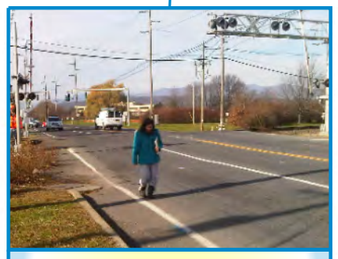


Signal indication not functioning



Lack of ADA compliant ramps

Acute intersection angle and small radius



Lack of pedestrian accommodations

Two entrance lanes not needed

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PROJECT:	112-023
DATE:	12/2012
FIGURE:	1

EXISTING CONDITIONS ASSESSMENT
BOICES LN RR CROSSING STUDY

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Chapter 2. Existing Conditions

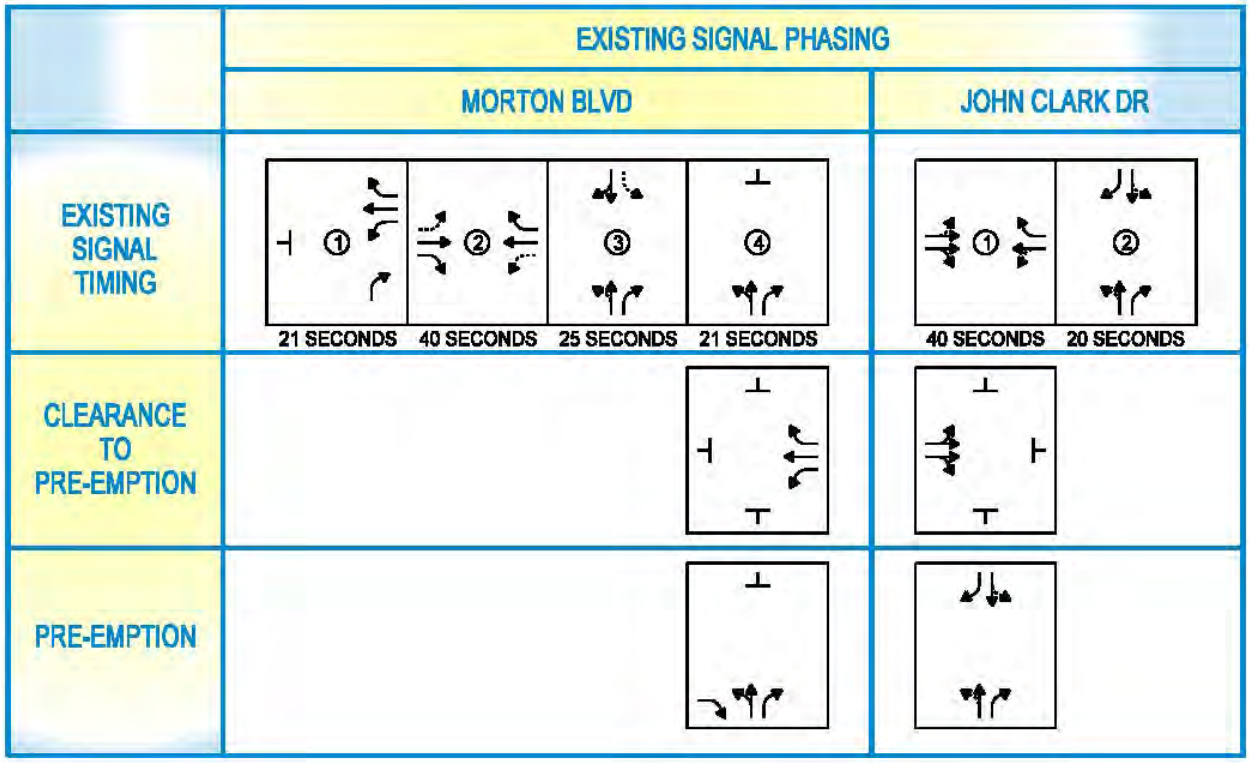
A. Study Intersections

At the Boices Lane/Morton Boulevard intersection the eastbound and westbound Boices Lane approaches each provide three lanes for individual travel maneuvers. The northbound Morton Boulevard approach provides a shared left-turn/through lane and right-turn lane. The southbound approach provides a left-turn lane and a shared through/right-turn lane.

At the Boices Lane/John Clark Drive intersection the eastbound approach provides a shared left-turn/through lane and a through/right-turn lane. The westbound, northbound, and southbound approaches each provide shared left-turn/through lanes and right-turn lanes.

As noted previously, the two study intersections operate under traffic signal control. Although these two signals are located close together, they operate independent of each other and are not coordinated.

When a train is approaching the Boices Lane crossing, the traffic signals operate to clear the traffic between the two intersections. The traffic signals then transition to a pre-emption phase. The following image illustrates the signal clearance and pre-emption phasing at the study intersections.



A review of the existing signal equipment found the following:

- Traffic signal cabinet wiring is old and the insulation is worn
- Several detector loops are not functioning
- Fluctuations in electrical currents frequently cause the traffic signals to go into recall or operate in flash mode
- The MUTCD states that the pre-emption phasing currently in place, allowing right-turn overlaps towards the rail track, should be prohibited toward a rail crossing within 200 feet[1]. It is noted that the pre-emption phase that allows certain movements to take place when a train is present, is a relatively recent improvement at these intersections. It was reportedly implemented within the last year.
- The two traffic signals are not currently coordinated

Based upon this review, the existing traffic signal equipment should be upgraded or replaced and the traffic signal phasing should be modified to meet standards and provide optimum operations.

B. Accident History

Accident data was obtained from NYSDOT for the most recent five-year period from January 1, 2007 through December 31, 2011. Table 2.1 summarizes the number and severity of the accidents at and between the study area intersections.

[1] Manual on Uniform Traffic Control Devices for Streets and Highways, 2009 Edition. Section 8B.08 Turn Restriction During Preemption, paragraph 1.

Table 2.1 – Accident Severity Summary

Location	Severity				Total
	Fatality	Injury	PDO	NR	
Morton Blvd/Boices Ln	0	5	10	5	20
Boices Ln from Morton Blvd to John Clark Dr	0	1	4	5	10
John Clark Dr/Boices Ln	0	0	6	2	8

PDO = Property Damage Only
NR = Non-Reportable which indicates no personal injuries occurred and property damages totaled less than $1,000

The data shows 38 accidents occurred within the immediate study area. Accident rates were calculated and compared to the statewide average for the two study intersections. The accident rate at the Morton Boulevard intersection is 0.58 accidents per million vehicles entering the intersection (acc/MEV) while the calculated rate at the John Clark Drive intersection is 0.34 acc/MEV. The statewide average rate for signalized intersections of a similar type is 0.32 acc/MEV. Collision diagrams are included in Appendix A. Review of the accident data identified few discernable patterns.

- There are a variety of types of accidents including rear-end, side swipe, and right angle, among others.
- The crash rate at the Boices Lane/Morton Boulevard intersection is higher than the statewide average for similar intersections. (It is noted that the statewide average rate is based only on intersections with state roads. Since this is an intersection of a county road, and town road, the comparison may not be directly applicable).

The Ulster Police Department summarized accident data along Boices Lane from Ulster Avenue (US Route 9W) to Enterprise Drive for the time period from January 1, 2008 through September 21, 2012. The summary identified a similar number of accidents at the Morton Boulevard intersection (22 collisions) and the John Clark Drive intersection (9 collisions), and showed that four accidents appeared to be related to the railroad crossing gate; two of which were gate violations. The first involved a box truck disregarding the flashing red lights and striking the gates as they closed. The second accident involved an emergency vehicle and a gate malfunction in which the westbound gate lights weren't working.

C. Traffic Volumes

An automatic traffic recorder (ATR) was installed on Boices Lane 900-feet west of Morton Boulevard to document existing traffic volumes. The ATR showed a small reduction in volume as compared to a 2009 count conducted at the same location. Table 2.2 summarizes the average daily and peak hour traffic volumes recorded. As a result, the 2009 existing PM peak hour turning movement data is a conservative representation of existing 2012 conditions.

Table 2.2 – Summary of Average Traffic Volumes

Boices Lane	2012	2009
AADT	12,400	13,880
DHV (PM Peak)	1,160	1,315
K-Factor	0.094	0.095
DDHV (Eastbound)	645	730
Percent	56%	56%
% Trucks (Daily)	1.5%	3%

AADT = Annual Average Daily Traffic
DHV = Design Hour Volume (K-Factor = Peak hour volume divided by daily volume)
DDHV = Directional Design Hour Volume

The table shows that the eastbound direction is the peak direction of travel. This is due to Boices Lane being used as an alternate travel route to US Route 209.

Turning movement traffic counts were conducted at the study area intersections during the morning peak commuter period from 7:15 to 9:00 a.m. in September 2012 to supplement available PM peak hour data. The existing AM and PM peak hour traffic volumes are shown on Figure 2.1. The traffic volume data is included in Appendix B.

D. Pedestrian Activity

Sidewalks are provided on Boices Lane in the southwest quadrant of the Morton Boulevard intersection along the Stewarts parcel and on the north side of Boices Lane between US Route 9W and John Clark Drive. A multi-use path/sidewalk is also provided on the north side of Boices Lane within the Tech City property limits and along the east side of the CSX railroad which extends from Boices Lane approximately 375-feet north intersecting the shoulder of John Clark Drive. Table 2.3 shows a summary of the peak hour pedestrian and bicycle crossings observed during the turning movement counts. The pedestrians and bicyclists were observed using the pedestrian accommodations where available.

Table 2.3 – Pedestrian and Bicycle Crossing Summary

Intersection	AM Peak Hour		PM Peak Hour	
	Pedestrians	Bicycles	Pedestrians	Bicycles
Boices Ln/Morton Blvd/Tech City Dwy	2	1	9	0
Boices Ln/John Clark Dr/Plaza Dwy	2	1	2	2

The existing pedestrian network is incomplete. This is especially apparent at the two intersections (there are no pedestrian crossings, push buttons, or indicators) and at the rail crossing where the narrow pavement width results in pedestrians and bicyclists often travelling in the vehicle lane. Pedestrian improvements should be included in the plan for future improvements consistent with the New York State and Ulster County Complete Streets legislation.

E. Existing Operations

Intersection Level of Service (LOS) and capacity analysis relate traffic volumes to the physical characteristics of an intersection. Intersection evaluations were made using the Synchro

Software (version 7) which automates the procedures contained in the *Highway Capacity Manual*. Levels of service range from A to F with level of service A conditions considered excellent with very little delay while level of service F generally represents conditions with very long delays. Table 2.4 identifies the levels of service and associated delay ranges for each type of traffic control. Appendix C contains detailed descriptions of LOS criteria for signalized, unsignalized, and roundabout controlled intersections. Table 2.5 shows the results of the existing levels of service analysis.

Table 2.4 – Levels of Service

Level of Service	Control Delay (sec/veh)	
	Unsignalized Intersection	Signalized or Roundabout Intersection
A	≤ 10.0	≤ 10.0
B	>10.0 and ≤ 15.0	>10.0 and ≤ 20.0
C	>15.0 and ≤ 25.0	>20.0 and ≤ 35.0
D	>25.0 and ≤ 35.0	>35.0 and ≤ 55.0
E	>35.0 and ≤ 50.0	>55.0 and ≤ 80.0
F	>50.0	>80.0

Table 2.5 – Existing Level of Service Summary

Intersection		Control	Existing 2012	
			AM Peak Hour	PM Peak Hour
Boices Ln/Morton Blvd/Tech City Dwy		S		
Boices Ln EB	L		B (16.3)	A (0.0)
	T		B (19.6)	C (31.1)
	R		A (6.8)	A (6.4)
Boices Ln WB	L		A (9.8)	B (13.9)
	T		A (9.5)	B (11.8)
	R		A (8.5)	A (0.0)
Morton Blvd NB	LT		B (12.8)	B (17.4)
	R		A (6.1)	A (9.0)
East Drwy SB	L		C (26.8)	D (35.7)
	TR		C (26.9)	D (35.4)
Overall			B (11.4)	B (16.4)
Boices Ln/John Clark Dr/Plaza Dwy		S		
Boices Ln EB	LT,TR		A (5.2)	A (6.4)
Boices Ln WB	LT		A (5.6)	A (6.2)
	R		A (4.4)	A (4.5)
Retail Drwy NB	LT		B (15.5)	B (16.1)
	R		A (0.0)	B (15.5)
John Clark Dr SB	LT		B (15.9)	B (16.1)
	R		B (16.0)	B (16.2)
Overall			A (7.5)	A (8.3)

TW, AW, S, R = Two-way stop, All-way stop, Signal, or Roundabout controlled intersection
NB, SB, EB, WB = Northbound, Southbound, Eastbound, Westbound intersection approaches
L, T, R = Left-turn, through, and/or right-turn movements
X (Y.Y) = Level of Service (Average delay in seconds per vehicle)

The analysis shows that the intersections currently operate with acceptable levels of service during the AM and PM peak hours under existing, average conditions. However, field observations show that when a train is crossing Boices Lane, eastbound vehicle queues extend

as far as Enterprise Drive and westbound vehicle queues extend toward Route 9, but were not observed reaching Route 9. The intersections take several traffic signal cycles to recover and return to average operating conditions.

It is noted that the inconsistent pavement striping, signing, narrow travel lanes, and the acute side street approach angle at Morton Boulevard contribute to the complexity of the intersections. The short and narrow eastbound right turn on Boices Lane approaching Morton Boulevard is not long enough to allow traffic to flow freely on this overlap during pre-emption. Providing standard pavement striping and signing, while improving lane widths and lengthening the eastbound right turn lane, will help improve driver guidance and operations during pre-emption.

The evaluation also identifies the PM peak hour as the critical time period with higher traffic volumes, therefore the AM peak hour is eliminated from further analysis. All additional evaluations focus on the PM peak hour.

F. Train Activity

Daily regularly scheduled trains that cross the at-grade railroad crossing on Boices Lane were provided by CSX for the month of August 2012. The data is included in Appendix D. The weekday and weekend data is summarized on Tables 2.6 and 2.7. It is noted that these totals do not include “extra” trains such as ethanol loads (south) and empties (north).

Table 2.6 – CSX Train Movements (Weekday Summary)

Day	Date	Train Moves	Average Length (feet)
Wednesday	8/1/2012	31	5,684
Thursday	8/2/2012	30	5,671
Friday	8/3/2012	30	5,142
Monday	8/6/2012	21	5,565
Tuesday	8/7/2012	31	4,888
Wednesday	8/8/2012	32	5,418
Thursday	8/9/2012	33	5,271
Friday	8/10/2012	29	5,187
Monday	8/13/2012	22	5,239
Tuesday	8/14/2012	34	4,550
Wednesday	8/15/2012	31	5,456
Thursday	8/16/2012	31	5,266
Friday	8/17/2012	29	5,609
Monday	8/20/2012	23	5,513
Tuesday	8/21/2012	31	5,116
Wednesday	8/22/2012	33	5,328
Thursday	8/23/2012	31	5,173
Friday	8/24/2012	31	5,408
Monday	8/27/2012	25	4,883
Tuesday	8/28/2012	29	5,311
Wednesday	8/29/2012	35	5,079
Thursday	8/30/2012	32	5,459
Friday	8/31/2012	32	4,644
Average		**30**	**5,255**

Table 2.7 – CSX Train Movements (Weekend Summary)

Day	Date	Train Moves	Average Length (feet)
Saturday	8/4/2012	29	6,070
Sunday	8/5/2012	25	6,273
Saturday	8/11/2012	22	6,785
Sunday	8/12/2012	25	5,715
Saturday	8/18/2012	28	5,996
Sunday	8/19/2012	24	5,965
Saturday	8/25/2012	31	6,085
Sunday	8/26/2012	23	5,684
Average		**26**	**6,072**

An acoustic train counter was also installed adjacent to the rail crossing from October 26 to November 7, however only a few days of reliable data was obtained before Hurricane Sandy hit on October 29, which affected the train service in the area. The two days of data showed reasonable correlations with the data in Table 2.7 where 26 trains were counted on Saturday October 27, and 20 trains were counted on Sunday October 28.

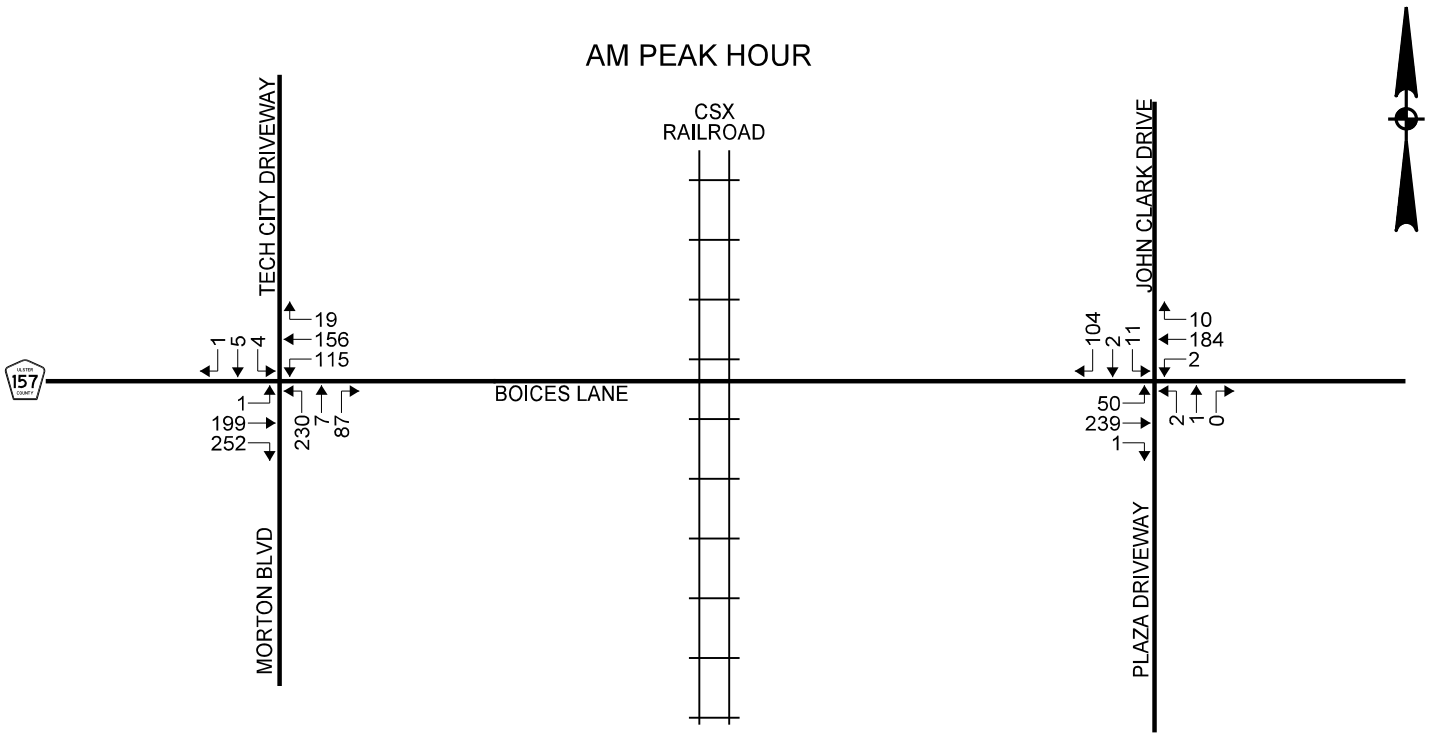
Train speeds range from slow moving trains associated with track changing nearby, to 50 mph high speed trains. Depending on the speed of the train, pre-emption typically lasts approximately two to four minutes.

Table 2.8 summarizes regularly scheduled trains each week.

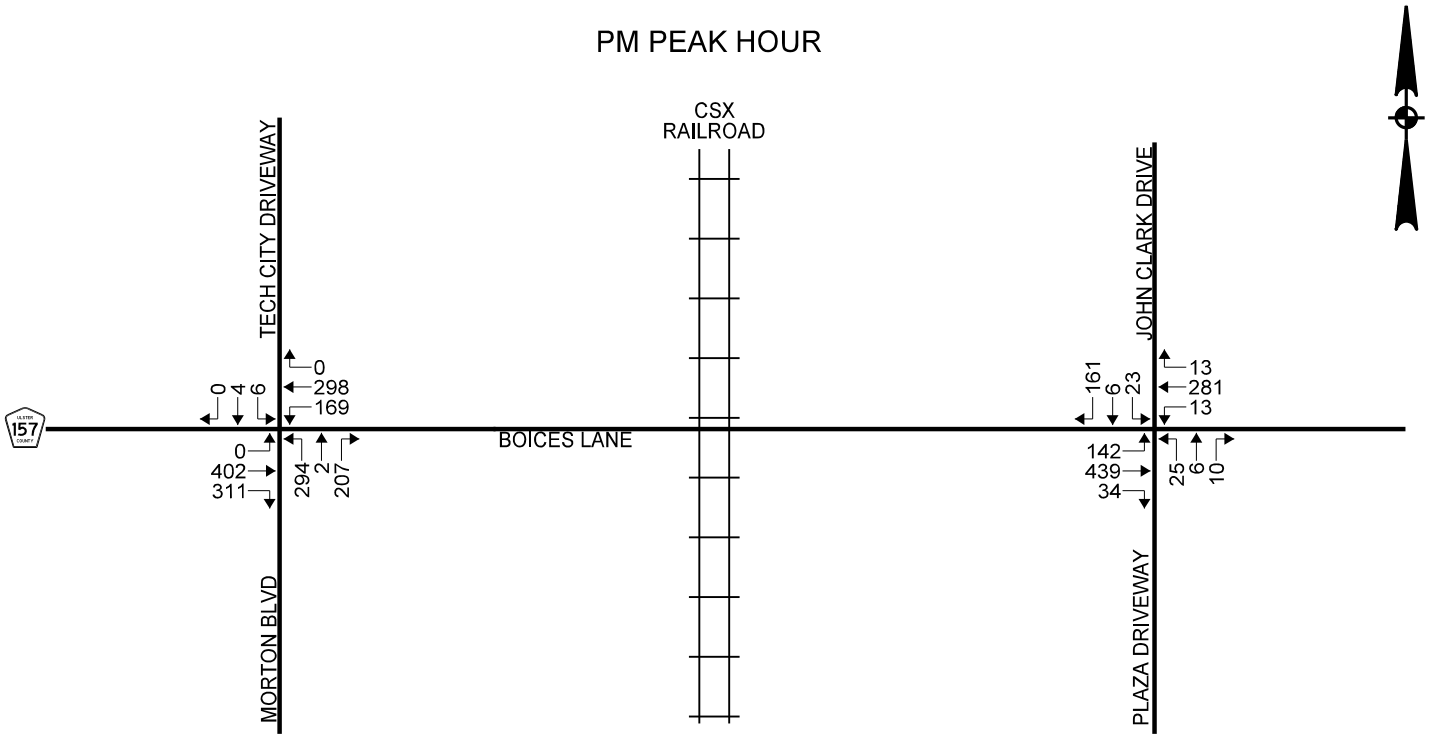
Table 2.8 – CSX Train Movements (Weekly)

Day	Train Moves	Northbound	Southbound
Monday	23	11	12
Tuesday	27	15	12
Wednesday	30	16	14
Thursday	31	16	15
Friday	29	15	14
Saturday	27	13	14
Sunday	24	11	13
Total	**191**	**97**	**94**

AM PEAK HOUR



PM PEAK HOUR



2012 EXISTING
TRAFFIC VOLUMES

BOICES LANE RAILROAD CROSSING STUDY
TOWN OF ULSTER, NEW YORK

Creighton Manning

PROJECT: 112-023	DATE: 10/2012	FIGURE: 1

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Chapter 3. Alternatives

Based on a review of the existing traffic conditions analysis, three short-term and three long-term alternatives were developed for evaluation. The alternatives are described below.

A. Short-Term Improvements

Three short-term alternatives were identified for evaluation. Option A is shown on Figure 3.1. This option upgrades the existing traffic signals and includes minor roadway/shoulder widening within the right-of-way including widening and lengthening the eastbound right turn lane on Boices Lane at Morton Boulevard, and addresses the existing pavement striping and signing inconsistencies. This is considered the minimum improvement to address existing deficiencies. Option B is shown on Figure 3.2 and includes the Option A changes, and also modifies the approach geometry at both intersections to provide more capacity in anticipation of growth at Tech City. Option C is similar to Option A, with a different signal phasing modification that would provide split phasing at both traffic signals with inside clearance between the two intersections

Option A (Signal Optimization)

1. Pave shoulders to the right-of-way on the south side of Boices Lane at the railroad crossing
2. Complete the pavement striping including stop bars and turn arrows
3. Widen and extend the eastbound right-turn lane on Boices Lane at Morton Boulevard by approximately 250 feet by shortening the second westbound travel lane west of Morton Boulevard
4. Improve traffic control with new wiring, signal heads, signs, 2070 traffic signal controllers, and new cabinets. The 2070 controllers will allow improved phasing after pre-emption to clear the queues more quickly. The 2070 controller will also require additional training so that they can be operated and maintained adequately by the Town.
5. Restrict left-turns from Boices Lane onto Elmwood Street
6. Improve turn restrictions at Stewart's driveway with additional signs

Option B (Increase Capacity)

1. Option A improvements, plus:
2. Modify geometry on Boices Lane at Morton Boulevard to provide two eastbound through lanes on Boices Lane at Morton Boulevard. Provide two westbound through lanes on Boices Lane at John Clark Drive.

Option C (Split Phasing – Inside Clearance)

1. Split phasing with inside clearance, meaning one signal controller would operate both intersections. The intersections would be phased to eliminate queuing between the two intersections (inside clearance). This would include the same level of investment as Option A to upgrade the traffic signals and address other existing deficiencies.

B. Long-Term Improvement

Three long-term alternatives were evaluated as identified below. These include Tech City (Alternative 1) shown on Figure 3.3, Jug Handle (Alternative 2) shown on Figure 3.4, and Turn Prohibitions (Alternative 3) shown on Figure 3.5. These long term alternatives are more extensive than the short-term options, because they involve additional roadway construction

and right-of-way to address standard lane widths, alignment issues and pedestrian accommodations. There was also a discussion of a possible a raised median along Boices Lane to reduce gate violations and crashes at Stewart's driveways, which could be added to any long term comprehensive reconstruction alternative.

Alternative 1 (Modified Tech City)

This is the same geometric improvement contained in the Tech City GEIS. The only change is the addition of pedestrian accommodations.

1. Widen and extend eastbound right turn lane on Boices Lane and at Morton Boulevard
2. Increase the radius for the Morton Boulevard northbound right-turn movement onto Boices Lane. This will require right-of-way and utility relocation.
3. Add a second eastbound through lane on Boices Lane approaching Morton Boulevard
4. Provide crosswalks at the Morton Boulevard and John Clark Drive intersections and pedestrian accommodations across the RR tracks (on one side at a minimum). Note crosswalks are not proposed on Boices Lane between the two intersections because this would require relocating the stop line and reducing the available storage between the railroad and each intersection.
5. Improve signal control with new pedestrian signals, vehicle phasing, and signal coordination. This will require relocation of CSX train pre-emption detection to enable sufficient pedestrian clearance time.
6. Obtain right-of-way and easements as needed for roadway and pedestrian improvements

Alternative 2 (Jug Handle)

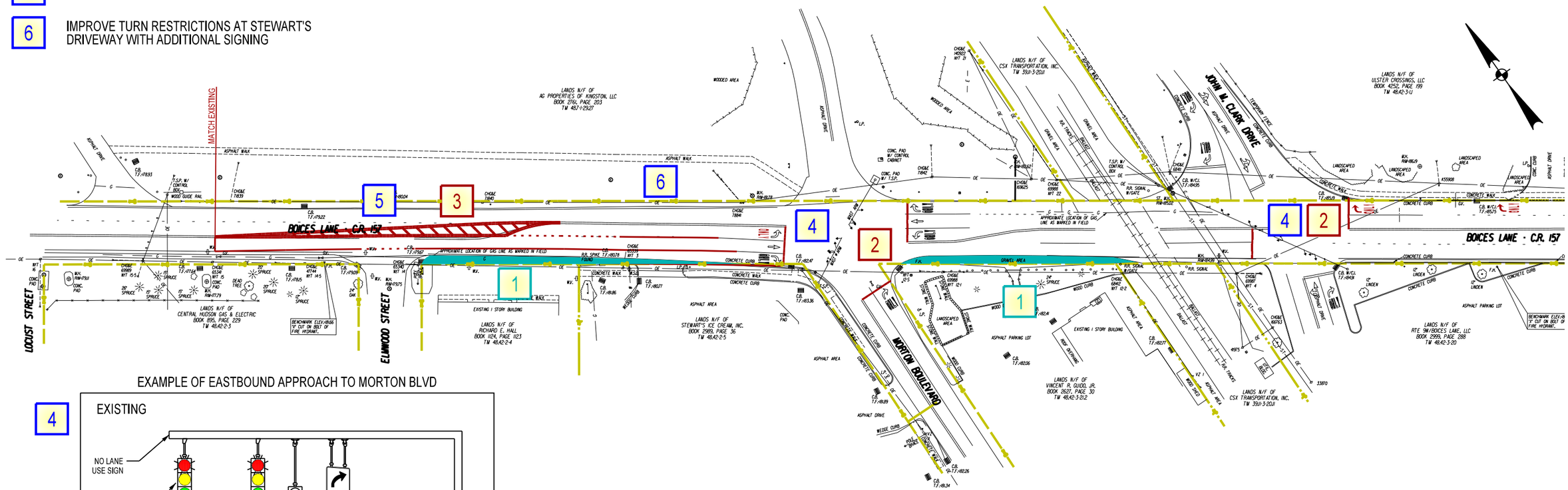
1. Eliminate westbound lefts from Boices Lane to Morton Boulevard and construct jug handle for left turns to Morton Boulevard.
2. Install pedestrian accommodations at the intersections and sidewalks across the railroad crossing with same considerations as Alternative 1.
3. Add a second eastbound through lane on Boices Lane approaching Morton Boulevard
4. Improve signal control consistent with Alternative 1.
5. Obtain right-of-way and easements as needed for roadway and pedestrian improvements

Alternative 3 (Turn Prohibitions)

The intent of the Turn Prohibition Alternative is to eliminate all queuing on the RR tracks.

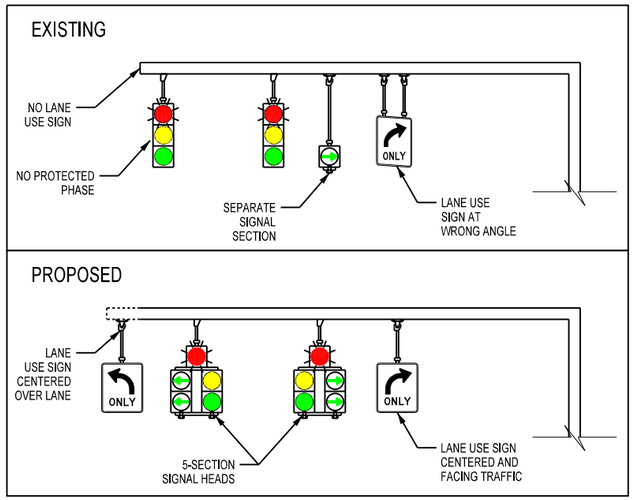
1. Eastbound left turns would be restricted from Boices Lane onto John Clark Drive and westbound left turns would be restricted from Boices Lane onto Morton Boulevard.
2. Peak hour volumes on the order of 150 vehicles per hour currently making these turns, would divert to other roadways or intersections. The Advisory Committee felt this would require further study of the impact of the diverted trips.
3. This concept also includes modifications to side street geometry at both intersections as shown on the Figure 3.5.

1. PAVE SHOULDER OUT TO ROW
2. COMPLETE PAVEMENT STRIPING INCLUDING STOP BARS AND TURN ARROWS
3. EXTEND EASTBOUND RIGHT TURN LANE (+250 FT) BY SHORTENING WESTBOUND TRAVEL LANE
4. IMPROVE TRAFFIC CONTROL WITH NEW WIRING, SIGNAL HEADS, SIGNS, CONTROLLER CABINET, AND SIGNAL PHASING. THIS MAY REQUIRE NEW POLES SUBJECT TO THE LOADING CAPACITY OF THE EXISTING POLES. INSTALL NEW 2070 SIGNAL CONTROLLER, REQUIRES TRAINING TO MAINTAIN AND OPERATE.
5. RESTRICT LEFT TURNS INTO ELMWOOD
6. IMPROVE TURN RESTRICTIONS AT STEWART'S DRIVEWAY WITH ADDITIONAL SIGNING



EXAMPLE OF EASTBOUND APPROACH TO MORTON BLVD

4



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1" = 80'

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- ROAD CONSTRUCTION
- PAVEMENT MARKINGS
- SIGNING AND SIGNALS

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DATE:	10/2013
FIGURE:	3.1

SHORT-TERM OPTION A
SIGNAL OPTIMIZATION

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1. PAVEMENT WIDENING

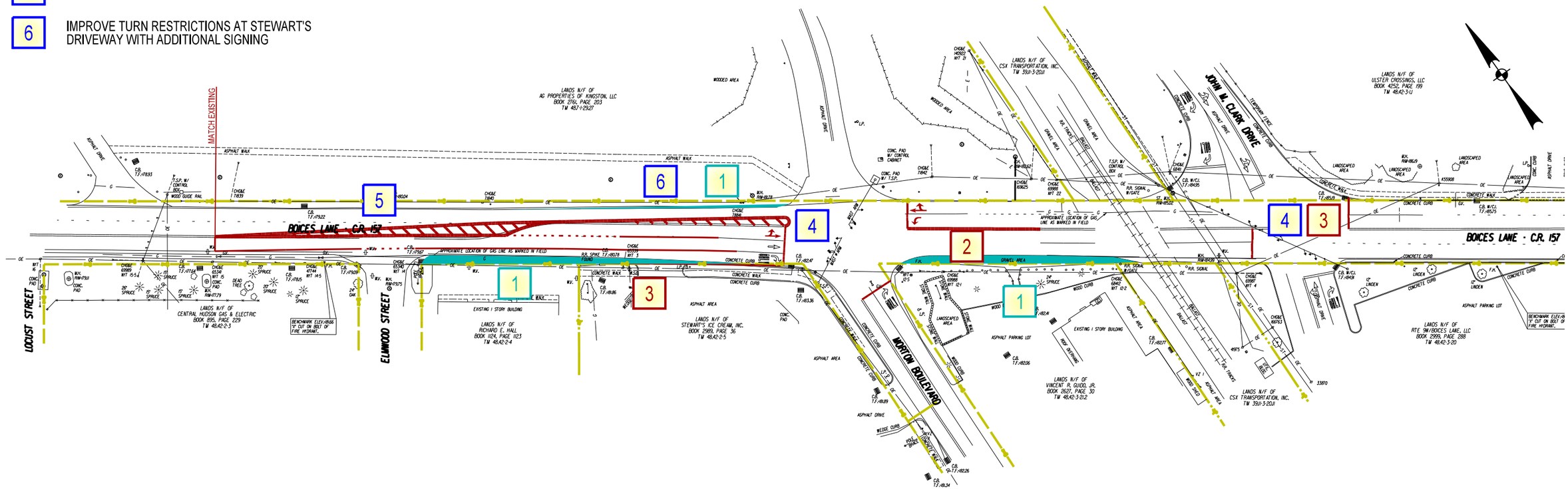
2. COMPLETE PAVEMENT STRIPING INCLUDING STOP BARS AND TURN ARROWS (TYP.)

3. EXTEND EASTBOUND RIGHT TURN LANE (+250 FT) AND PROVIDE TWO EASTBOUND THROUGH LANES ON BOICES LN AT MORTON BLVD. PROVIDE TWO WESTBOUND THROUGH LANES ON BOICES LN AT JOHN CLARK DR.

4. IMPROVE TRAFFIC CONTROL WITH NEW WIRING, SIGNAL HEADS, SIGNS, CONTROLLER CABINET, AND SIGNAL PHASING. THIS MAY REQUIRE NEW POLES SUBJECT TO THE LOADING CAPACITY OF THE EXISTING POLES. INSTALL NEW 2070 SIGNAL CONTROLLER, REQUIRES TRAINING TO MAINTAIN AND OPERATE.

5. RESTRICT LEFT TURNS FROM BOICES LN ONTO ELMWOOD ST

6. IMPROVE TURN RESTRICTIONS AT STEWART'S DRIVEWAY WITH ADDITIONAL SIGNING



40 0 40 80 120 160′

1" = 80′

INDEX

- ROAD CONSTRUCTION
- PAVEMENT MARKINGS
- SIGNING AND SIGNALS

Creighton Manning

PROJECT:	112-023
DATE:	10/2013
FIGURE:	3.2

SHORT-TERM OPTION B
INCREASE CAPACITY

F:\Projects\2012\112-023 Boices Lane\Cadd\dgn\figures\112-023_fig_short_term_b.dgn

1. PAVE SHOULDER TO ROW AND EXTEND RIGHT TURN LANE
2. INCREASE CORNER RADII BY REMOVING UTILITY POLE, OBTAIN ROW AND PAVE
3. MAINTAIN SEPARATE LEFT-TURN, THROUGH, AND RIGHT-TURN LANES ON THE WESTBOUND APPROACH. FUTURE ANALYSIS IS REQUIRED TO DETERMINE THE NEED FOR A SHARED THROUGH/RIGHT-TURN LANE.
4. PROVIDE 4-LANE CROSS SECTION ACROSS RAILROAD TRACKS AND INSTALL SIDEWALKS ACROSS RAILROAD CROSSING
5. ADD EASTBOUND THROUGH LANE
6. PROVIDE PEDESTRIAN CROSSWALKS
7. IMPROVE TRAFFIC SIGNAL CONTROL WITH NEW PEDESTRIAN SIGNALS, PHASING, AND COORDINATION. MAY REQUIRE RELOCATION OF CSX TRAIN PRE-EMPTION DETECTION TO ENABLE SUFFICIENT PEDESTRIAN CLEARANCE TIME.
8. OBTAIN ROW AS NECESSARY FOR ROADWAY IMPROVEMENTS

East Drwy.

John Clark Drive

MATCH EXISTING

APPROXIMATE R.O.W.

APPROXIMATE R.O.W.

MATCH EXISTING

MATCH EXISTING

MATCH EXISTING

Boices Lane

Driveway

Morton Blvd.

NOTE:
FOR PLANNING PURPOSES ONLY. THE CONCEPT PLAN COULD CHANGE DURING FINAL DESIGN.

PARCEL BOUNDARY AND APPROXIMATE ROW

PROPOSED APPROXIMATE ROW

40 0 40 80 120 160'

1" = 80'

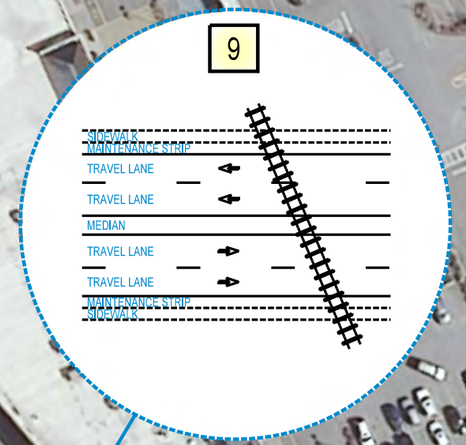
Creighton Manning

PROJECT:	112-023
DATE:	10/2013
FIGURE:	3.3

ALTERNATIVE 1
MODIFIED TECH CITY

F:\Projects\2012\112-023 Boices Lane\cadd\dgn\figures\112-023_fig_concept_plan_alt1.dgn

1. PAVE SHOULDER TO ROW AND EXTEND RIGHT TURN LANE
2. INCREASE CORNER RADII BY REMOVING UTILITY POLE, OBTAIN ROW AND PAVE
3. ELIMINATE WESTBOUND LEFTS AND CONSTRUCT JUG HANDLE FOR TURNS ONTO MORTON BLVD
4. INSTALL SIDEWALKS ACROSS RAILROAD CROSSING
5. ADD EASTBOUND THROUGH LANE
6. PROVIDE PEDESTRIAN CROSSWALKS
7. IMPROVE TRAFFIC SIGNAL CONTROL WITH NEW PEDESTRIAN SIGNALS, PHASING, AND COORDINATION. MAY REQUIRE RELOCATION OF CSX TRAIN PRE-EMPTION DETECTION TO ENABLE SUFFICIENT PEDESTRIAN CLEARANCE TIME.
8. OBTAIN ROW AS NECESSARY FOR ROADWAY IMPROVEMENTS
9. MEDIAN OPTION TO REDUCE GATE VIOLATIONS AND CRASHES AT STEWART'S DRIVEWAYS



East Drwy.

John Clark Drive

MATCH EXISTING

APPROXIMATE R.O.W.

APPROXIMATE R.O.W.

MATCH EXISTING

MATCH EXISTING

MATCH EXISTING

Boices Lane

Driveway

Morton Blvd.

NOTE:
FOR PLANNING PURPOSES ONLY. THE CONCEPT PLAN COULD CHANGE DURING FINAL DESIGN.

PARCEL BOUNDARY AND APPROXIMATE ROW

PROPOSED APPROXIMATE ROW

40 0 40 80 120 160'
1" = 80'

Creighton Manning

PROJECT:	112-023
DATE:	10/2013
FIGURE:	3.4

ALTERNATIVE 2
JUG HANDLE

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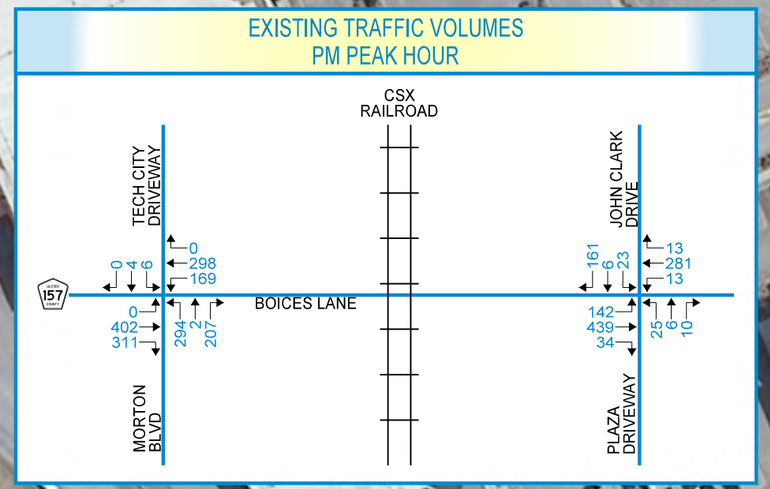
1. PAVEMENT WIDENING
2. COMPLETE PAVEMENT STRIPING INCLUDING STOP BARS AND TURN ARROWS (TYP.)
3. EXTEND EASTBOUND RIGHT TURN LANE (+250 FT) AND PROVIDE TWO EASTBOUND THROUGH LANES ON BOICES LN AT MORTON BLVD. PROVIDE TWO WESTBOUND THROUGH LANES ON BOICES LN AT JOHN CLARK DR.
4. IMPROVE TRAFFIC CONTROL WITH NEW WIRING, SIGNAL HEADS, SIGNS, CONTROLLER CABINET, AND SIGNAL PHASING. THIS MAY REQUIRE NEW POLES SUBJECT TO THE LOADING CAPACITY OF THE EXISTING POLES. INSTALL NEW 2070 SIGNAL CONTROLLER, REQUIRES TRAINING TO MAINTAIN AND OPERATE.
5. RESTRICT LEFT TURNS FROM BOICES LN ONTO ELMWOOD ST
6. IMPROVE TURN RESTRICTIONS AT STEWART'S DRIVEWAY WITH ADDITIONAL SIGNING
7. RESTRICT EASTBOUND LEFTS TO JOHN CLARK DRIVE AND WESTBOUND LEFTS TO MORTON BLVD. PROVIDE TWO EASTBOUND LANES.
8. MODIFY EXCLUSIVE RIGHT TURN LANE TO ALLOW SHARED THRU MOVEMENTS



MATCH EXISTING

East Drwy.

John Clark Drive

Boices Lane

Locust Street

Elmwood Street

Morton Blvd.

Driveway

NOTE:
FOR PLANNING PURPOSES ONLY. THE CONCEPT PLAN COULD CHANGE DURING FINAL DESIGN.

PARCEL BOUNDARY AND APPROXIMATE ROW

PROPOSED APPROXIMATE ROW

40 0 40 80 120 160'
1" = 80'

Creighton Manning

PROJECT:	112-023
DATE:	10/2013
FIGURE:	3.5

ALTERNATIVE 3
TURN PROHIBITIONS

F:\Projects\2012\112-023 Boices Lane\cadd\dgn\Figures\112-023_fig_turn_prohib_alt3.dgn

Chapter 4. Evaluation

A. Traffic Volume Forecasts

Traffic volumes were developed for the 2032 future conditions to evaluate the effectiveness of the long-term alternatives. The future traffic volumes include traffic associated with development at Tech City and general background growth and are illustrated on Figure 4.1.

B. Level of Service and Capacity Analysis

The relative impact of the short-term and long-term improvements can be determined by comparing the level of service during the design year for the Existing and Build or Null and Build traffic conditions. Tables 4.1 and 4.2 summarize the results of the Level of Service calculations for the PM peak hour for the short- and long-term improvements, respectively.

Table 4.1 – Short-Term Improvements Levels of Service

Intersection		Control	PM Peak Hour Short-Term Options (2012)			
			Existing	Option A (Optimization)	Option B (Capacity)	Option C (Phasing)
Boices Ln/Morton Blvd/Tech City Dwy		S				
Boices Ln EB	L		A (0.0)	A (0.0)	--	A (0.0)
	T		C (31.1)	C (24.9)	--	E (66.2)
	[LT,T]		--	--	B (19.9)	--
	R		A (6.8)	A (5.5)	A (6.2)	C (30.3)
Boices Ln WB	L		B (13.9)	A (8.7)	A (6.3)	B (11.9)
	T		B (11.8)	A (6.1)	--	B (11.9)
	R		A (0.0)	A (0.0)	--	A (0.0)
	[TR]		--	--	A (6.9)	--
Morton Blvd NB	LT		B (17.4)	B (18.8)	B (17.3)	E (59.6)
	R		A (9.0)	B (11.4)	A (9.7)	C (27.9)
East Drwy SB	L		D (35.7)	C (33.8)	C (33.5)	C (23.7)
	TR		D (35.4)	C (33.3)	C (33.1)	C (23.4)
Overall			B (16.5)	B (13.7)	B (12.1)	D (38.5)
Boices Ln/John Clark Dr/Plaza Dwy		S				
Boices Ln EB	LT,TR		A (6.4)	A (1.1)	A (1.7)	A (0.5)
Boices Ln WB	LT		A (6.2)	A (8.1)	--	E (72.3)
	R		A (4.5)	A (5.9)	--	C (29.5)
	[LT,TR]		--	--	A (6.8)	--
Retail Drwy NB	LT		B (16.1)	C (23.7)	C (23.7)	D (36.1)
	R		B (15.5)	C (23.1)	C (23.1)	D (35.1)
John Clark Dr SB	LT		B (16.1)	C (23.6)	C (23.6)	D (36.0)
	R		B (16.2)	C (25.9)	C (25.9)	E (57.8)
Overall			A (8.3)	A (7.8)	A (7.8)	C (29.3)

TW, AW, S, R = Two-way stop, All-way stop, Signal, or Roundabout controlled intersection
NB, SB, EB, WB = Northbound, Southbound, Eastbound, Westbound intersection approaches
L, T, R = Left-turn, through, and/or right-turn movements
[LT,T] = Future approach geometry
X (Y.Y) = Level of Service (Average delay in seconds per vehicle)
-- = Not applicable

The analysis shows that the study intersections will operate with levels of service comparable to existing conditions with implementation of either Short-term Option A or Short-term Option B. Delays under Short-term Option C would be three or four times greater than existing, which make this alternative less feasible. For clarification, Short-term Option C (Phasing – Inside Clearance) would require upgrades to the existing traffic signals to allow both intersections to

operate as one. The specific phasing is shown on the Synchro Timing Reports in Appendix C. As noted previously, providing standard pavement striping and signing, while improving lane widths to the extent possible, which is included in all of the short term improvements, will help to strengthen driver guidance and improve safety and operations at the intersections.

Table 4.2 – Long-Term Improvements Levels of Service

Intersection		Control	PM Peak Hour Long Range Options (2032)			
			Null	Tech City Alternative 1	Jug Handle Alternative 2	Prohibit Turns Alternative 3
Boices Ln/Morton Blvd/Tech City Drwy		S				
Boices Ln EB	L		A (0.0)	--	--	--
	T		F (85.4)	--	--	--
	[T,T]		--	C (28.3)	B (19.4)	C (23.2)
	R		C (22.4)	A (9.3)	A (7.5)	B (19.5)
Boices Ln WB	L		F (156)	C (30.3)	--	--
	T		B (19.8)	B (15.7)	C (23.4)	A (4.2)
	R		C (23.3)	B (10.1)	--	A (0.1)
Morton Blvd NB	LT		D (39.1)	--	--	--
	R		B (14.5)	--	--	--
	[L]		--	B (18.3)	C (25.6)	C (29.3)
	[TR]		--	C (32.8)	C (22.5)	B (14.7)
East Drwy SB	L		F (133)	C (27.0)	B (16.4)	B (15.9)
	TR		C (22.0)	C (30.1)	D (42.3)	B (12.6)
Overall			E (56.6)	C (22.2)	C (22.0)	B (17.5)
Boices Ln/John Clark Dr/Plaza Drwy		S				
Boices Ln EB	LT,TR		A (8.1)	A (5.5)	A (4.5)	--
	[T,TR]		--	--	--	A (0.4)
Boices Ln WB	LT		B (11.3)	--	--	--
	R		A (6.8)	--	--	--
	[LT,TR]		--	A (8.2)	A (8.2)	B (19.6)
Retail Drwy NB	LT		C (33.7)	C (22.8)	C (22.8)	C (25.1)
	R		C (32.8)	C (22.1)	C (22.1)	C (24.6)
John Clark Dr SB	LT		C (33.7)	C (22.7)	C (22.7)	C (26.3)
	R		D (40.7)	C (27.2)	C (27.2)	C (29.3)
Overall			B (13.6)	A (9.4)	A (8.8)	A (9.2)

TW, AW, S, R = Two-way stop, All-way stop, Signal, or Roundabout controlled intersection
NB, SB, EB, WB = Northbound, Southbound, Eastbound, Westbound intersection approaches
L, T, R = Left-turn, through, and/or right-turn movements
[LT,T] = Future approach geometry
X (Y.Y) = Level of Service (Average delay in seconds per vehicle)
-- = Not applicable

The level of service analysis shows that under 2032 Null conditions, several movements at the Boices Lane/Morton Boulevard intersection will operate at level of service F. Improvements are needed to provide generally acceptable levels of service. The Boices Lane/John Clark Drive intersection will operate at overall level of service B under future 2032 conditions. With implementation of long-term alternatives 1, 2, or 3, the Morton Boulevard intersection will operate at overall level of service C with all movements operating at level of service D or better. At John Clark Drive, the intersection will operate at overall level of service A with all movements operating at level of service C or better.

In addition the sidewalk and crosswalk features associated with construction of the long-term alternatives will provide substantial benefit to pedestrians.

C. Cost Estimates

The long-range capacity alternatives will be costly to construct and require public hearings for modifications to the rail crossing. While some type of capacity improvement is expected to be needed in the future with development of Tech City, a large scale capital project is not likely at this time based on discussions with the Advisory Committee, and due to limited funding. Cost estimates were prepared for the short-term improvements to identify funding needs associated with the two feasible options.

Improvements to the traffic signal phasing and signing may require installation of new traffic signal poles subject to the loading capacity of the existing poles. In addition, due to the extent of the lane and pavement markings, milling and replacing the existing top coat of asphalt may be needed to provide a clean surface for the new markings. Table 4.3 summarizes the planning level cost estimates for the two short-term options assuming partial replacement of traffic control equipment and grinding of the existing pavement markings for Option A, and full replacement of traffic signals and mill and fill for Option B.

Table 4.3 – Short-Term Improvement Cost Estimates

	Cost	
	Option A	**Option B**
Item Description		
Signal Components – Morton Blvd	$74,000	--
Signal – Morton Blvd	--	$119,000
Signal Components – John Clark Dr	$136,000	$181,000
Signal – John Clark Dr	--	--
Striping – Morton Blvd	$13,000	$20,000
Striping – John Clark Dr	$13,000	$20,000
Box Out widening	$20,000	$20,000
Mill and fill	--	$170,000
Item Sub-Total	**$256,000**	**$530,000**
Construction		
Contingency (25%)	$64,000	$132,500
Work Zone Traffic Control (6%)	$15,400	$31,800
Survey and Stakeout (2%)	$5,200	$10,600
Construction Sub-Total	**$340,600**	**$704,900**
Mobilization (4%)	$13,600	$28,200
Construction Total	**$354,200**	**$733,100**
Soft Costs		
Design Engineering (12%)	$42,500	$88,000
Construction Inspection (15%)	$53,100	$110,000
Project Total	**$449,800**	**$931,100**
Project Estimate	**$455,000**	**$935,000**

The cost estimate comparison shows that the minimum recommended investment is approximately $455,000 to rewire the traffic signals, replace the signal controllers and address other existing deficiencies. Adding geometry, additional roadway work and new traffic signals associated with Option B increases the overall cost to approximately $935,000.

D. Funding and Implementation

A meeting was held with the NYSDOT Main Office Rail group to discuss the availability of Section 130 grade crossing safety program funds for some or all of these improvements. Discussions with NYSDOT and review of the program web site – *https://www.dot.ny.gov/divisions/operating/osss/rail/grade-crossings* revealed the following priorities for the grade crossing safety program:

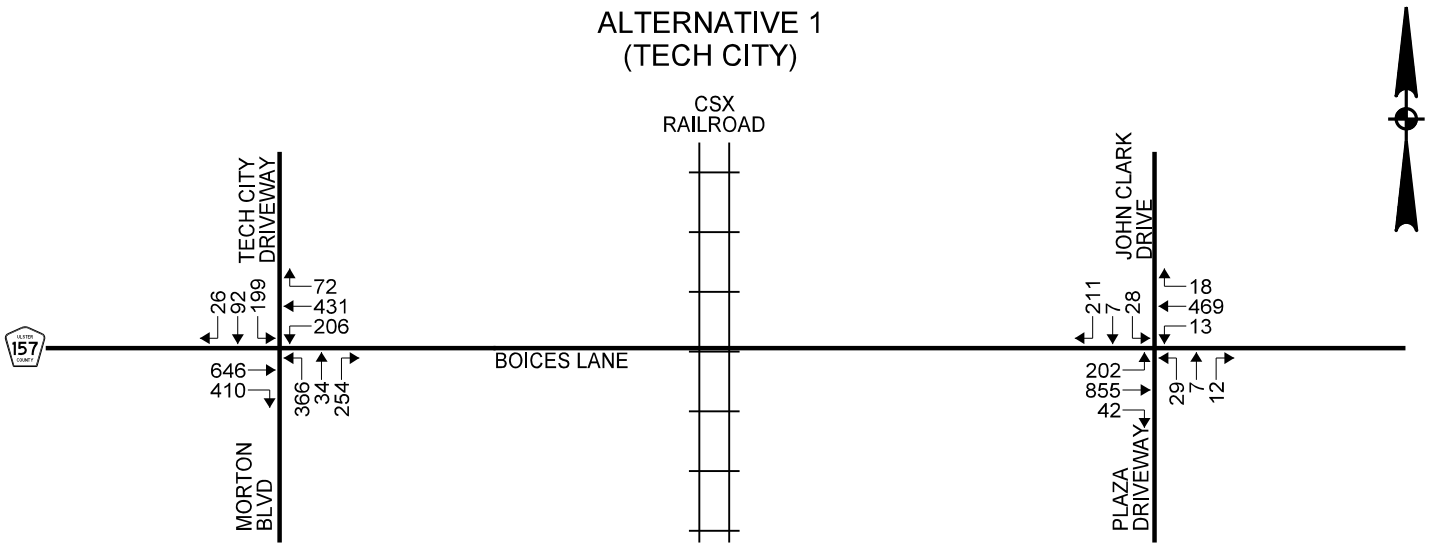
1. *Addressing crossings that warrant interconnection with highway traffic signals*
2. *Improving pedestrian crossing safety*
3. *Mitigating profile deficient crossings*
4. *Updating existing active warning devices/signals at grade crossings*
5. *Updating passive public crossings*
6. *Closing/eliminating crossings*

This study has shown that Items 1 and 2 (highway traffic signal improvements and pedestrian crossing improvements) are needed in the area. Conversations with Advisory Committee and the NYSDOT Main Office also noted that item 4 (updating the active warning devices) would be needed to accommodate future pedestrian crossing improvements. The NYSDOT web site also states*:*

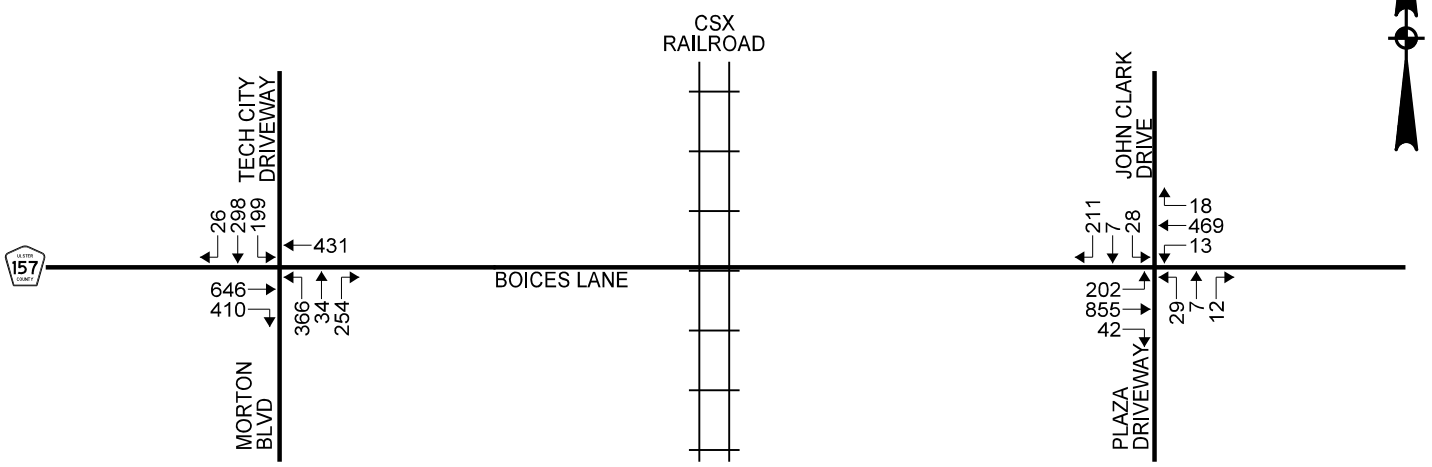
> *"New York's Grade Crossing Program focuses on improving safety at existing highway-railroad crossings primarily through the installation of warning devices. Such devices include: standard signs and pavement markings; installation or replacement of active warning devices (flashers and gates); upgrading active warning devices, including track circuitry improvements and interconnections with highway traffic signals; crossing illumination; crossing surface improvements; and general site improvements".*

It was concluded that the NYSDOT Region 8 would continue to coordinate with the NYSDOT Main Office to secure Section 130 funds. Additional cost sharing discussions are required with the Town, and the MPO to determine if additional sources of funding can be applied to the project. At this time, it appears that the Section 130 funds would be used toward Item 4 above to widen the crossing and install new stanchions, so that a separate future pedestrian improvement project and highway traffic signal project could tie into the new widened crossing.

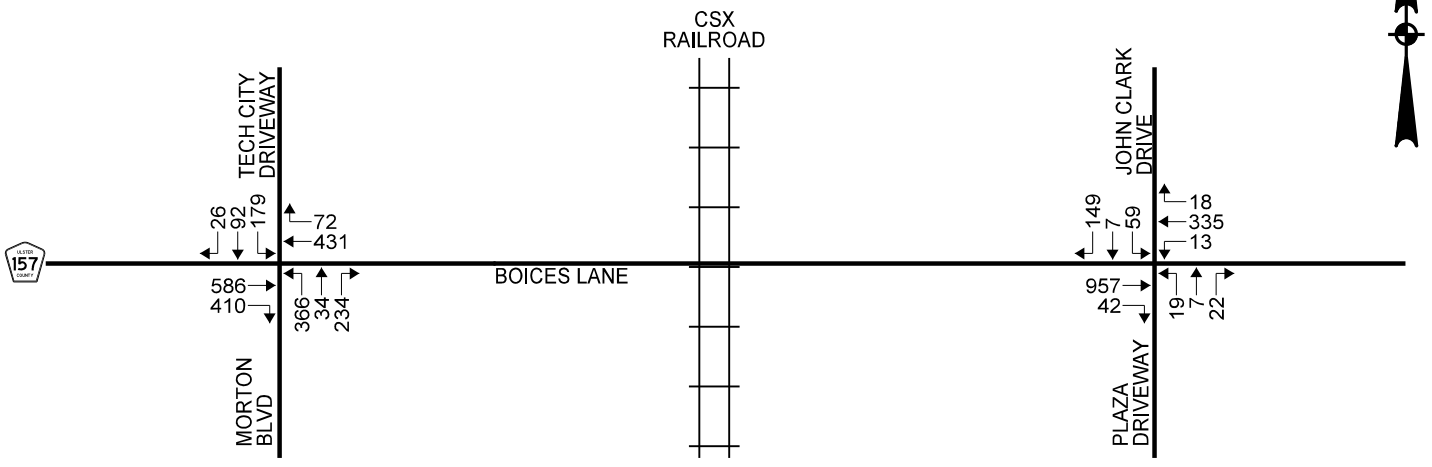
ALTERNATIVE 1
(TECH CITY)



ALTERNATIVE 2
(JUG HANDLE)



ALTERNATIVE 3
(TURN PROHIBITIONS)



2032 PM PEAK HOUR
TRAFFIC VOLUMES

BOICES LANE RAILROAD CROSSING STUDY
TOWN OF ULSTER, NEW YORK

Creighton Manning

PROJECT: 112-023	DATE: 01/2013	FIGURE: 4.1

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Chapter 5. Conclusions and Recommendations

This report summarizes the results of a traffic operations and safety assessment at the existing railroad crossing on Boices Lane in the Town of Ulster, Ulster County, New York. The assessment includes the adjacent intersections of Morton Boulevard and John Clark Drive with Boices Lane and finds the following conditions exist.

- Non-compliant, poor condition, or non-existent pedestrian accommodations
- Pedestrian activity at the RR crossing
- Old and/or faulty highway traffic signal equipment
- Narrow right-of-way
- Short and narrow eastbound right turn lane on Boices Lane approaching Morton Boulevard
- Inconsistent pavement markings and signs
- Acute intersection approach angle from Morton Boulevard approaching Boices Lane causes lane encroachment
- Long vehicular queues and delay during pre-emption, which typically lasts two to four minutes (an average of 30 trains per day use the crossing)
- Train speeds ranging from low speed associated track switching, to high speed 50 mph trains
- Crash rate at the Boices Lane/Morton Boulevard intersection is above the statewide average for similar intersections
- The accident evaluation identified two gate violations including one involving malfunctioning equipment
- Average daily traffic volumes on the order of 12,500 vehicles per day at the crossing

Many of these conditions point to the need for improvements at the crossing and at the adjacent intersections. The primary goals of the improvement options are to improve driver guidance and traffic operations and safety, improve pedestrian accommodations, and improve traffic operations during and immediately after pre-emption. Short term options include:

- Option A: Upgrade the highway traffic signal equipment and increase the length of the eastbound right-turn lane at Morton Boulevard, which will allow traffic in this lane to flow more readily during pre-emption.
- Option B: Install new highway traffic signals, increase the length of the eastbound right-turn lane at Morton Boulevard, provide two eastbound through lanes at Morton Boulevard and two westbound through lanes at John Clark Drive. This improvement provides more capacity for growth at Tech City.
- Option C: Provide split phasing at the two highway traffic signals to enable inside clearance i.e. no queuing between the two traffic signals.

Implementation of either Option A or Option B will provide good traffic operations with improved driver guidance. Vehicular delays under Option C would be three or four times greater than existing, which make this alternative less feasible.

Several long term alternatives were also investigated which would involve roadway widening, pedestrian accommodations, and right-of-way acquisition. These alternatives included:

- Alternative 1 (Modified Tech City): Upgrade and connect pedestrian accommodations, provide a 4-lane cross section across the railroad tracks, upgrade the traffic signal equipment, improve the railroad crossing, upgrade non-standard features.

- Alternative 2 (Jug Handle): Upgrade and connect pedestrian accommodations, eliminate westbound lefts from Boices Lane to Morton Boulevard, upgrade traffic signal equipment, improve the railroad crossing, upgrade non-standard features.
- Alternative 3 (Turn Prohibitions): Upgrade and connect pedestrian accommodations, restrict eastbound lefts to John Clark Drive and westbound lefts to Morton Boulevard, upgrade traffic signal equipment, improve the railroad crossing, upgrade non-standard features.

When comparing the short- and long-term alternatives, the primary distinctions are the right-of-way impacts, pedestrian improvements, widening the railroad crossing (new RR stanchions), and project costs. The long-term improvements also address the need for standard lane widths, radii, and lane alignment. While the long-term improvements are expected to be needed in the future with the development of Tech City, the immediately anticipated growth does not necessitate capacity improvements, and funding for this level of improvement is not currently available, therefore, the implementation plan focuses on short-term strategies and improvements.

Discussions with the NYSDOT and the Advisory Committee concluded that Section 130 grade crossing safety program funds would be pursued for short-term improvements in the area. This could cover the cost of widening the crossing, installing new RR signal stanchions, and relocating the train detection to accommodate necessary pedestrian clearance times for a future highway traffic signal and pedestrian improvement project funded separately.

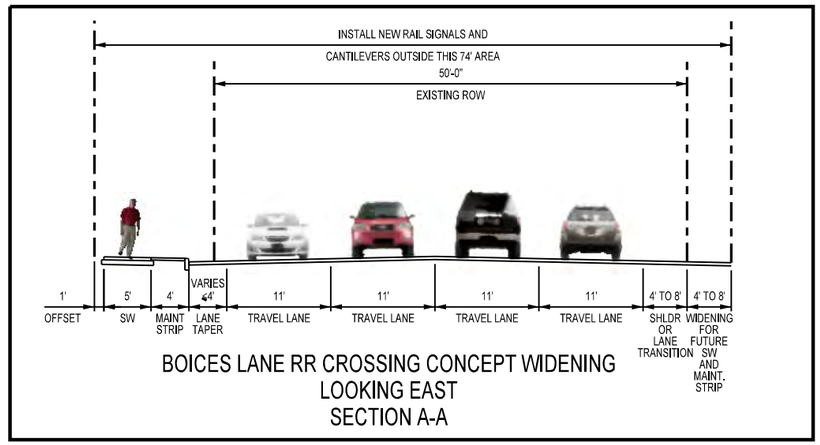
In the long-term, Alternative 1 (Modified Tech City) has been identified as the preferred alternative for the following reasons:

- Completes the pedestrian network in the study area.
- Provides good operations.
- Addresses roadway capacity and alignment needs.
- Results in small ROW impacts
- Addresses the Morton Boulevard turning maneuver encroachment.
- Clarifies driver guidance

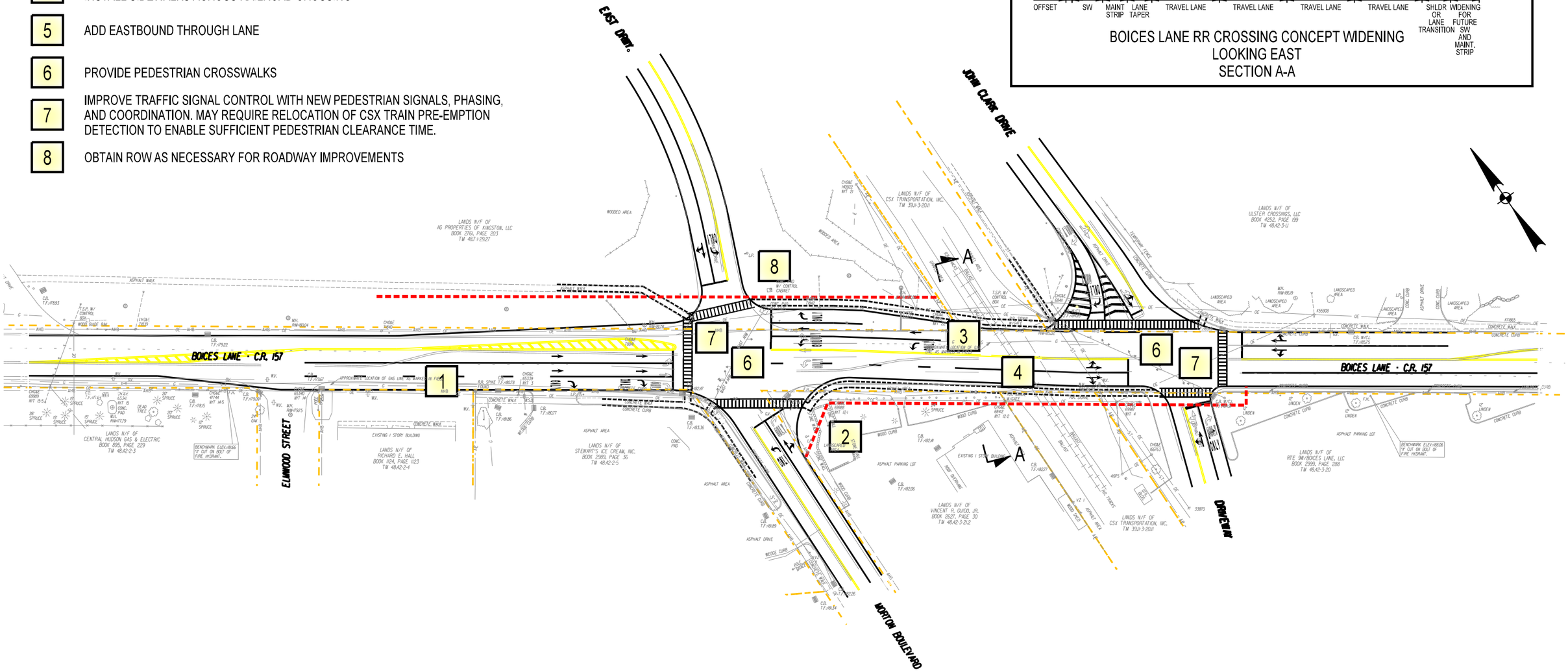
Planning level cost estimates were prepared for the preferred long-term alternative and are included in Appendix E. Total project cost is estimated at $3,150,000, which includes contingencies, engineering and construction inspection. This cost will be off-set somewhat to the extent that the short-term improvements are pursued and retained. The preferred long-term alternative is shown on Figure 5.1.

On-going coordination is recommended with the MPO, the Town, and the NYSDOT to confirm additional funding and responsibilities.

1. PAVE SHOULDER TO ROW AND EXTEND RIGHT TURN LANE
2. INCREASE CORNER RADII BY REMOVING UTILITY POLE, OBTAIN ROW AND PAVE
3. MAINTAIN SEPARATE LEFT-TURN, THROUGH, AND RIGHT-TURN LANES ON THE WESTBOUND APPROACH. FUTURE ANALYSIS IS REQUIRED TO DETERMINE THE NEED FOR A SHARED THROUGH/RIGHT-TURN LANE.
4. PROVIDE 4-LANE CROSS SECTION ACROSS RAILROAD TRACKS AND INSTALL SIDEWALKS ACROSS RAILROAD CROSSING
5. ADD EASTBOUND THROUGH LANE
6. PROVIDE PEDESTRIAN CROSSWALKS
7. IMPROVE TRAFFIC SIGNAL CONTROL WITH NEW PEDESTRIAN SIGNALS, PHASING, AND COORDINATION. MAY REQUIRE RELOCATION OF CSX TRAIN PRE-EMPTION DETECTION TO ENABLE SUFFICIENT PEDESTRIAN CLEARANCE TIME.
8. OBTAIN ROW AS NECESSARY FOR ROADWAY IMPROVEMENTS



BOICES LANE RR CROSSING CONCEPT WIDENING
LOOKING EAST
SECTION A-A



NOTE:
FOR PLANNING PURPOSES ONLY. THE CONCEPT PLAN COULD CHANGE DURING FINAL DESIGN.

PARCEL BOUNDARY AND APPROXIMATE ROW

PROPOSED APPROXIMATE ROW

40 0 40 80 120 160'
1" = 80'

Creighton Manning

PROJECT:	112-023
DATE:	10/2013
FIGURE:	5.1

MODIFIED TECH CITY
PREFERRED ALTERNATIVE

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Appendix A

Accident Evaluation

Railroad Crossing Study
Boices Lane
Town of Ulster, Ulster County, New York

STATE OF NEW YORK DEPARTMENT OF TRANSPORTATION

TRAFFIC SAFETY DIVISION

ACCIDENT DETAILS, HISTORY LOCATION

DIAGRAM No.: _____

COUNTY: Ulster P.I.N.: 44.23.02-04

(●) TOWN

( ) CITY

( ) VILLAGE OF _____

ROUTE NO. OR STREET NAME: Boices Lane

AT INTERSECTION WITH/OR BETWEEN: John Clark Drive

CASE No.: 112-23

FILE:

BY: MDN

DATE: 10/04/12

TIME PERIOD FROM: January 1, 2007 TO: December 31, 2011

No. OF MONTHS: 36

ENVIRONMENTAL: Use Codes from MV 104 (shown at right) for these categories

Light Conditions:
1. Daylight
2. Dawn
3. Dusk
4. Dark Road Lighted
5. Dark Road Unlighted

Roadway Character:
1. Straight & Level
2. Straight & Grade
3. Straight & Hillcrest
4. Curve & Level
5. Curve & Grade
6. Curve & Hillcrest

Roadway Surface Condition:
1. Dry
2. Wet
3. Muddy
4. Snow/Ice
5. Slush
10. Other

Weather:
1. Clear
2. Cloudy
3. Rain
4. Snow
5. Sleet/Hail/Freezing Rain
6. Fog/Smog/Smoke
10. Other

[1]Use Codes from MV 104 Police Report

(1) ACCIDENT No.	(2) DATE	(3) TIME	(4) No. of VEHICLES	(5) SEVERITY	(6) LIGHT CONDITIONS	(7) ROADWAY CHARACTER	(8) ROADWAY SURFACE CONDITION	(9) WEATHER	(10) APPARENT CONTRIBUTING FACTORS	DIRECTION	TYPE[1]	(11) DESCRIPTION	REFERENCE MARKER
1	06/01/09	18.16	2	NR	1	1	1	1	4	SB/WB	RE	V1 SB struck V2 SB due to driver inattention	
2	05/22/10	14.30	2	PDO	1	1	1	2	4, 7	WB/SB	RA	V1 WB FTYROW to V1 SB due to driver inattention	
3	11/13/07	17.11	2	PDO	5	1	1	2	4	SWB/WB	RT	V1 SB was making a right-turn and struck V2 WB due to driver inattention	
4	08/08/08	19.45	2	PDO	3	1	2	2	4	WB	RE	V1 WB struck V2 WB due to driver inattention	
5	12/04/10	9.14	2	PDO	1	1	1	2	9	WB/SB	RE	V1 WB was backing unsafely and struck V2 SB	
6	09/19/10	13.27	2	PDO	1	1	1	2	7	WB/EB	RA	V1 EB made a left-turn in front of V2 WB and FTYROW	
7	05/06/09	12.08	2	PDO	1	1	1	2	42, 17	WB/NB	RA	V1 WB disregarded the traffic signal due to defective brakes and struck V2 NB	
8	07/25/09	17.13	2	NR	1	1	1	2	3, 4	WB/EB	HO	V1 backed up WB and struck V2 EB (stopped) due to driver inattention	

STATE OF NEW YORK DEPARTMENT OF TRANSPORTATION

TRAFFIC SAFETY DIVISION

ACCIDENT DETAILS, HISTORY LOCATION

DIAGRAM No.: _____

COUNTY: Ulster P.I.N.: 44.23.02-04

(◉) TOWN

( ) CITY

( ) VILLAGE OF _____

ROUTE NO. OR STREET NAME: Boices Lane

AT INTERSECTION WITH/OR BETWEEN: John Clark Drive to Morton Boulevard

CASE No.: 112-23

FILE:

BY: MDN

DATE: 10/04/12

TIME PERIOD FROM: January 1, 2007 TO: December 31, 2011

No. OF MONTHS: 36

ENVIRONMENTAL: Use Codes from MV 104 (shown at right) for these categories

Light Conditions:
1. Daylight
2. Dawn
3. Dusk
4. Dark Road Lighted
5. Dark Road Unlighted

Roadway Character:
1. Straight & Level
2. Straight & Grade
3. Straight & Hillcrest
4. Curve & Level
5. Curve & Grade
6. Curve & Hillcrest

Roadway Surface Condition:
1. Dry
2. Wet
3. Muddy
4. Snow/Ice
5. Slush
10. Other

Weather:
1. Clear
2. Cloudy
3. Rain
4. Snow
5. Sleet/Hail/Freezing Rain
6. Fog/Smog/Smoke
10. Other

[1]Use Codes from MV 104 Police Report

(1) ACCIDENT No.	(2) DATE	(3) TIME	(4) No. of VEHICLES	(5) SEVERITY	(6) LIGHT CONDITIONS	(7) ROADWAY CHARACTER	(8) ROADWAY SURFACE CONDITION	(9) WEATHER	(10) APPARENT CONTRIBUTING FACTORS	DIRECTION	TYPE[1]	(11) DESCRIPTION	REFERENCE MARKER
9	12/22/07	16.02	2	PDO *	1	1	1	2	4	EB	RE	V1 EB rear-ended V2 EB due to driver inattention	
10	12/27/10	10.48	2	PDO *	1	1	4	2	40, 66	EB	RE	V1 EB rear-ended V2 EB due to slippery pavement	
11	06/14/10	14.09	1	NR	1	1	1	2	17	WB	Non-Collision	V1 WB disregarded the traffic signal	
12	12/21/11	15.21	1	NR	1	1	2	3	UNK	WB	Collision	V1 WB slowed and collided with object	
13	12/07/11	18.02	2	NR	4	1	2	3	4	EB	RE	V1 WB rear-ended V2 EB due to driver inattention	
14	07/26/11	13.15	2	PDO *	1	1	1	1	4	WB/SWB	RA	V1 SB made a right-turn and struck V2 WB	
15	04/27/07	12.38	2	PDO	1	1	1	1	4, 7	NB/EB	RA	V1 NB FTYROW and struck V2 EB due to driver inattention	
16	04/10/10	22.08	2	INJ	4	1	1	1	4, 14 (Ped)	EB	PED	V1 EB struck a pedestrian who was not at an intersection (ped inattention)	
17	11/05/11	13.39	2	NR	1	1	1	1	4	WB	OV	V1 WB struck V2 WB while overtaking due to driver inattention	
18	07/23/07	16.22	1	NR	1	1	1	2	40	NB	CURB	V1 struck a curb while reacting to another vehicle	

STATE OF NEW YORK DEPARTMENT OF TRANSPORTATION

TRAFFIC SAFETY DIVISION

ACCIDENT DETAILS, HISTORY LOCATION

DIAGRAM No.: _____

COUNTY: Ulster P.I.N.: 44.23.02-04

(●) TOWN

( ) CITY

( ) VILLAGE OF _____

ROUTE NO. OR STREET NAME: Boices Lane

AT INTERSECTION WITH/OR BETWEEN: Morton Boulevard

CASE No.: 112-23

FILE:

BY: MDN

DATE: 10/04/12

TIME PERIOD FROM: January 1, 2007 TO: December 31, 2011

No. OF MONTHS: 36

ENVIRONMENTAL: Use Codes from MV 104 (shown at right) for these categories

Light Conditions: 1. Daylight 2. Dawn 3. Dusk 4. Dark Road Lighted 5. Dark Road Unlighted

Roadway Character: 1. Straight & Level 2. Straight & Grade 3. Straight & Hillcrest 4. Curve & Level 5. Curve & Grade 6. Curve & Hillcrest

Roadway Surface Condition: 1. Dry 2. Wet 3. Muddy 4. Snow/Ice 5. Slush 10. Other

Weather: 1. Clear 2. Cloudy 3. Rain 4. Snow 5. Sleet/Hail/Freezing Rain 6. Fog/Smog/Smoke 10. Other

[1]Use Codes from MV 104 Police Report

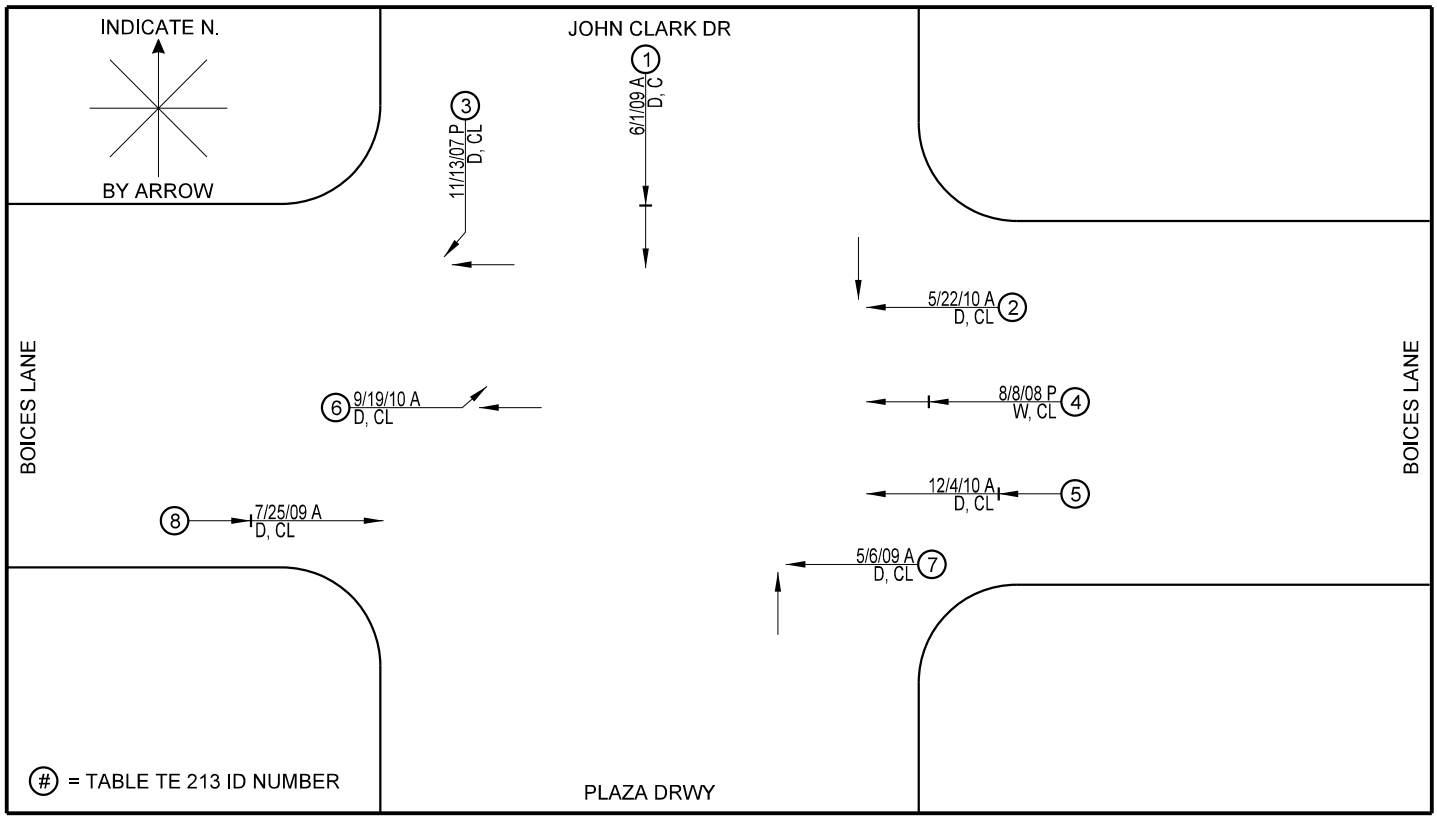
(1) ACCIDENT No.	(2) DATE	(3) TIME	(4) No. of VEHICLES	(5) SEVERITY	(6) LIGHT CONDITIONS	(7) ROADWAY CHARACTER	(8) ROADWAY SURFACE CONDITION	(9) WEATHER	(10) APPARENT CONTRIBUTING FACTORS	DIRECTION	TYPE[1]	(11) DESCRIPTION	REFERENCE MARKER
19	03/27/09	18.36	2	NR	1	1	1	1	4	EB	RE	V1 EB rear-ended V2 EB due to driver inattention	
20	02/23/07	9.58	2	NR	1	1	2	1	4	EB	RE	V1 EB rear-ended V2 EB due to driver inattention	
21	02/03/08	13.33	2	PDO	1	1	1	2	4	NB/WB	RA	V1 NB made a left-turn and struck V2 WB due to driver inattention	
22	09/05/07	11.51	2	PDO	1	1	1	1	7	SB/EB	RA	V2 SB made a left-turn and FTYROW to V1 EB	
23	06/28/07	12.19	2	PDO	1	1	1	2	4	NEB/NB	LT	V1 NB made a left-turn and struck V2 NB due to driver inattention	
24	04/09/07	13.24	2	INJ	1	1	1	1	UNK	EB	RE	V1 EB was making a right-turn and rear-ended V2 EB	
25	05/29/07	17.45	2	PDO	1	1	1	1	20	NB	OV	V2 NB changed lanes unsafely and struck V1 NB while overtaking	
26	05/11/07	15.3	2	NR	1	1	1	1	4, 7	NB	OV	V1 NB changed lanes (FTYROW) and struck V2 NB due to driver inattention	
27	02/16/07	19.33	2	INJ	4	1	4	1	7, 66	NB/WB	RA	V1 WB FTYROW to V2 NB due to slippery pavement	
28	01/10/08	11.4	2	INJ	1	1	1	2	4	WB	RE	V1 WB rear-ended V2 WB due to driver inattention	
29	06/23/08	20.39	1	PDO	1	1	1	1	40	NB	Hydrant	V1 NB struck a fire hydrant while reacting to another vehicle	
30	01/10/08	12.27	2	PDO	1	1	1	2	4, 7	NB/EB	RA	V1 NB FTYROW and struck V2 EB due to driver inattention	
31	07/22/08	10.58	2	PDO	1	1	1	1	4, 20	EB	OV	V1 EB made and unsafe lane change due to driver inattention striking V2 EB	
32	04/20/11	18.2	2	INJ	1	1	1	2	4, 17	NWB/EB	RA	V1 EB disregarded the traffic signal and struck V2 NB due to driver inattention	
33	04/27/10	13.25	2	PDO	1	1	1	1	4, 17	EB/WB	RA	V1 WB made a left-turn disregarding the signal and struck V2 EB due to driver inattention	
34	12/07/10	9.36	2	PDO	1	1	1	2	FTKR, 18	NB/SWB	HO	V1 SB made an improper left-turn and struck V1 NB while failing to keep right	
35	03/21/11	15.17	2	PDO	1	1	2	3	18	SWB/NEB	LT	V2 SB made an improper turn and struck V1 NB	
36	12/03/11	15.17	2	NR	1	1	1	1	4	WB	RE	V1 WB rear-ended V2 WB due to driver inattention	
37	09/29/07	9.43	2	INJ	1	1	1	1	4	EB	RE	V1 EB rear-ended V2 EB due to driver inattention	
38	08/17/09	9.02	2	NR	1	1	1	1	4	EB	RE	V1 EB rear-ended V2 EB due to driver inattention	

COLLISION DIAGRAM

TOWN ULSTER JOB NO. 112-023 NUMBER OF ACCIDENTS 8

INTERSECTION OF BOICES LANE AND JOHN CLARK DR BY MDN

PERIOD 5 YRS. 0 MO. FROM 1/1/07 TO 12/31/11 DATE 10/4/12



LEGEND

PATH OF MOVING MOTOR VEH.
PATH OF STOPPED MOTOR VEH.
P PEDESTRIAN PATH
B BICYCLIST PATH
A ANIMAL PATH
● FATAL
○ NON-FATAL

REAR END COLLISION
PARKED VEHICLE
FIXED OBJECT
OVERTURNED
OUT OF CONTROL
OVERTAKING/SIDESWIPE

DATE, TIME
PAVEMENT, WEATHER CONDITIONS

TIME: A=AM P=PM
PAVEMENT: D=DRY I=ICY W=WET
WEATHER: C=CLEAR F=FOG R=RAIN SL=SLEET S=SNOW CL=CLOUDY

ACCIDENT SUMMARY	DAYLIGHT					NIGHT					TOTALS				
CLASSIFICATION BY TYPES	FATAL	NON-FATAL	PROP. DAM.	NON-REP.	TOTAL	FATAL	NON-FATAL	PROP. DAM.	NON-REP.	TOTAL	FATAL	NON-FATAL	PROP. DAM.	NON-REP.	TOTAL
RIGHT ANGLE			3		3								3		3
REAR-END			1	1	2			1		1			2	1	3
HEAD-ON / BACKING				1	1									1	1
RIGHT TURN								1		1			1		1
OVERTAKING/SIDESWIPE															
RUN OFF ROAD															
FIXED OBJECT															
PARKED CAR															
PEDESTRIAN/BICYCLIST															
OTHER															
TOTALS			4	2	6			2		2			6	2	8

F: \ PROJECTS \ 112-023 BOICES LANE \ CADD \ DGN \ 112-023_COLLDIAG.DGN

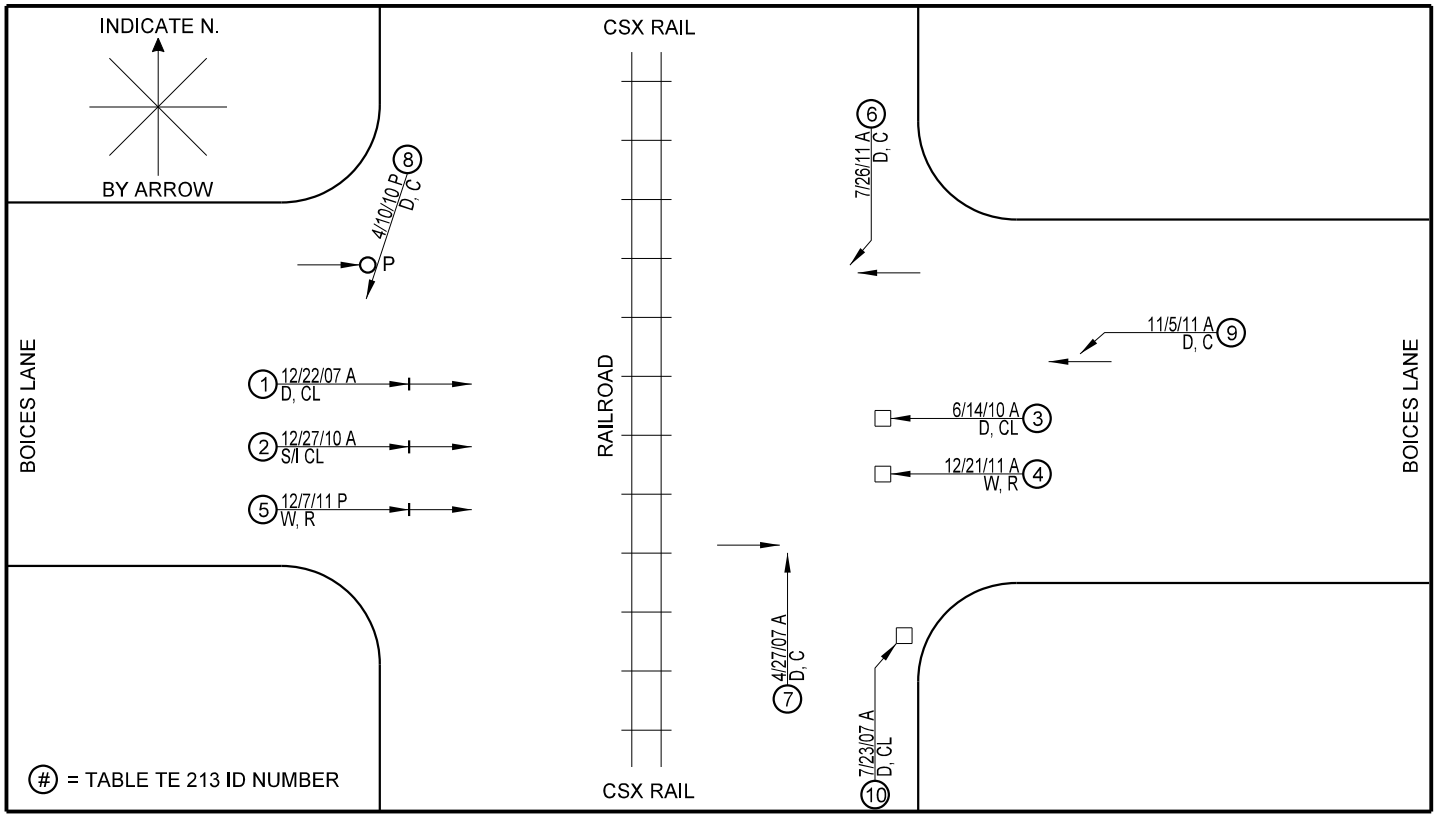
Creighton Manning

COLLISION DIAGRAM

TOWN ULSTER JOB NO. 112-023 NUMBER OF ACCIDENTS 10

SEGMENT OF BOICES MORTON BLVD TO JOHN CLARK DR BY MDN

PERIOD 5 YRS. 0 MO. FROM 1/1/07 TO 12/31/11 DATE 10/4/12



LEGEND

PATH OF MOVING MOTOR VEH.
PATH OF STOPPED MOTOR VEH.
P PEDESTRIAN PATH
B BICYCLIST PATH
A ANIMAL PATH
● FATAL
○ NON-FATAL

REAR END COLLISION
PARKED VEHICLE
FIXED OBJECT
OVERTURNED
OUT OF CONTROL
OVERTAKING/SIDESWIPE

DATE, TIME
PAVEMENT, WEATHER CONDITIONS

TIME: A=AM P=PM
PAVEMENT: D=DRY I=ICY W=WET
WEATHER: C=CLEAR F=FOG R=RAIN SL=SLEET S=SNOW CL=CLOUDY

ACCIDENT SUMMARY	DAYLIGHT					NIGHT					TOTALS				
CLASSIFICATION BY TYPES	FATAL	NON-FATAL	PROP. DAM.	NON-REP.	TOTAL	FATAL	NON-FATAL	PROP. DAM.	NON-REP.	TOTAL	FATAL	NON-FATAL	PROP. DAM.	NON-REP.	TOTAL
RIGHT ANGLE			2		2								2		2
REAR-END			2		2				1	1			2	1	3
HEAD-ON / BACKING															
RIGHT TURN															
OVERTAKING/SIDESWIPE				1	1									1	1
RUN OFF ROAD															
FIXED OBJECT				3	3									3	3
PARKED CAR															
PEDESTRIAN/BICYCLIST							1			1		1			1
OTHER															
TOTALS			4	4	8		1		1	2		1	4	5	10

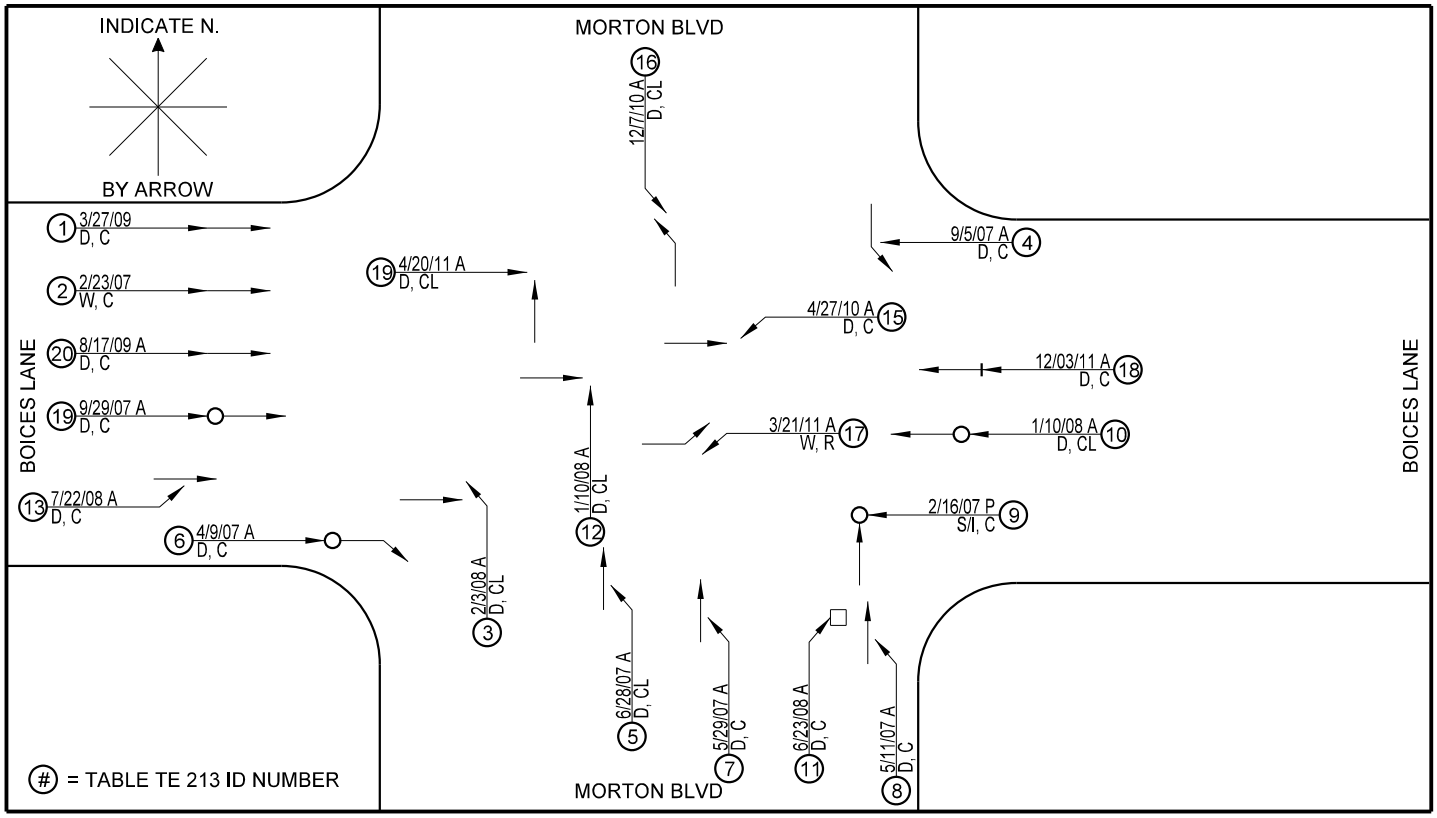
F:\ PROJECTS \ 112-023 BOICES LANE \ CADD \ DGN \ 112-023_COLLDIAG.DGN

COLLISION DIAGRAM

TOWN ULSTER JOB NO. 112-023 NUMBER OF ACCIDENTS 20

INTERSECTION OF BOICES LANE AND MORTON BLVD BY MDN

PERIOD 5 YRS. 0 MO. FROM 1/1/07 TO 12/31/11 DATE 10/4/12



LEGEND

PATH OF MOVING MOTOR VEH.
PATH OF STOPPED MOTOR VEH.
P PEDESTRIAN PATH
B BICYCLIST PATH
A ANIMAL PATH
● FATAL
○ NON-FATAL

REAR END COLLISION
▨ PARKED VEHICLE
□ FIXED OBJECT
OVERTURNED
OUT OF CONTROL
OVERTAKING/SIDESWIPE

DATE, TIME
PAVEMENT, WEATHER CONDITIONS

TIME: A=AM P=PM
PAVEMENT: D=DRY I=ICY W=WET
WEATHER: C=CLEAR F=FOG R=RAIN SL=SLEET S=SNOW CL=CLOUDY

ACCIDENT SUMMARY	DAYLIGHT					NIGHT					TOTALS				
CLASSIFICATION BY TYPES	FATAL	NON-FATAL	PROP. DAM.	NON-REP.	TOTAL	FATAL	NON-FATAL	PROP. DAM.	NON-REP.	TOTAL	FATAL	NON-FATAL	PROP. DAM.	NON-REP.	TOTAL
RIGHT ANGLE		1	4		5		1			1		2	4		6
REAR-END		3		4	7							3		4	7
HEAD-ON / BACKING			1		1								1		1
RIGHT TURN			2		2								2		2
OVERTAKING/SIDESWIPE			2	1	3								2	1	3
RUN OFF ROAD															
FIXED OBJECT			1		1								1		1
PARKED CAR															
PEDESTRIAN/BICYCLIST															
OTHER															
TOTALS		4	10	5	19		1			1		5	10	5	20

Appendix B

Traffic Volume Data

Railroad Crossing Study
Boices Lane
Town of Ulster, Ulster County, New York

Project: 112-023
Counted By: MDN
Location: Ulster, NY
Other:

File Name : tm112023a2
Site Code : 12-023-2
Start Date : 9/28/2012
Page No : 1

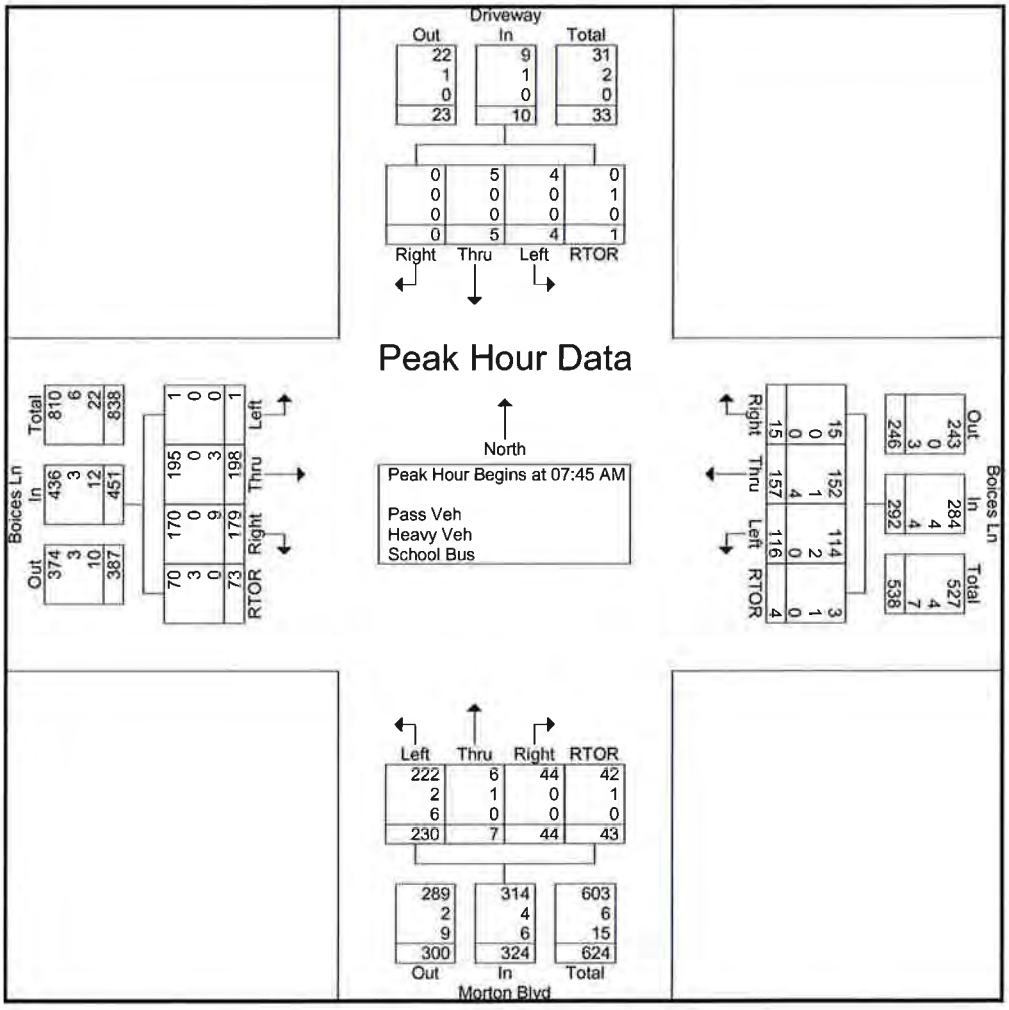
Groups Printed- Pass Veh - Heavy Veh - School Bus

	Boices Ln Eastbound					Boices Ln Westbound					Morton Blvd Northbound					Driveway Southbound					
Start Time	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Int. Total
Factor	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		
07:15 AM	0	29	26	11	66	17	24	3	0	44	42	0	2	13	57	0	1	0	0	1	168
07:30 AM	0	32	44	9	85	17	43	1	2	63	62	5	4	6	77	1	0	0	0	1	226
07:45 AM	0	61	49	25	135	21	56	3	1	81	87	2	11	10	110	0	2	0	0	2	328
Total	0	122	119	45	286	55	123	7	3	188	191	7	17	29	244	1	3	0	0	4	722
08:00 AM	0	43	43	14	100	26	28	7	1	62	53	4	7	13	77	2	2	0	0	4	243
08:15 AM	0	44	35	14	93	35	31	2	2	70	55	1	12	9	77	1	1	0	1	3	243
08:30 AM	1	50	52	20	123	34	42	3	0	79	35	0	14	11	60	1	0	0	0	1	263
08:45 AM	0	60	42	25	127	33	43	2	0	78	53	4	10	17	84	0	1	0	0	1	290
Total	1	197	172	73	443	128	144	14	3	289	196	9	43	50	298	4	4	0	1	9	1039
Grand Total	1	319	291	118	729	183	267	21	6	477	387	16	60	79	542	5	7	0	1	13	1761
Apprch %	0.1	43.8	39.9	16.2		38.4	56	4.4	1.3		71.4	3	11.1	14.6		38.5	53.8	0	7.7		
Total %	0.1	18.1	16.5	6.7	41.4	10.4	15.2	1.2	0.3	27.1	22	0.9	3.4	4.5	30.8	0.3	0.4	0	0.1	0.7	
Pass Veh	1	313	278	115	707	181	261	21	5	468	368	15	58	78	519	5	7	0	0	12	1706
% Pass Veh	100	98.1	95.5	97.5	97	98.9	97.8	100	83.3	98.1	95.1	93.8	96.7	98.7	95.8	100	100	0	0	92.3	96.9
Heavy Veh	0	1	0	3	4	2	2	0	1	5	4	1	2	1	8	0	0	0	1	1	18
% Heavy Veh	0	0.3	0	2.5	0.5	1.1	0.7	0	16.7	1	1	6.2	3.3	1.3	1.5	0	0	0	100	7.7	1
School Bus	0	5	13	0	18	0	4	0	0	4	15	0	0	0	15	0	0	0	0	0	37
% School Bus	0	1.6	4.5	0	2.5	0	1.5	0	0	0.8	3.9	0	0	0	2.8	0	0	0	0	0	2.1

Project: 112-023
Counted By: MDN
Location: Ulster, NY
Other:

File Name : tm112023a2
Site Code : 12-023-2
Start Date : 9/28/2012
Page No : 2

	Boices Ln Eastbound					Boices Ln Westbound					Morton Blvd Northbound					Driveway Southbound					
Start Time	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Int. Total
Peak Hour Analysis From 7:15:00 AM to 8:45:00 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 7:45:00 AM																					
7:45:00 AM	0	**61**	49	**25**	**135**	21	**56**	3	1	**81**	**87**	2	11	10	**110**	0	**2**	0	0	2	**328**
8:00:00 AM	0	43	43	14	100	26	28	**7**	1	62	53	**4**	7	**13**	77	**2**	2	0	0	**4**	243
8:15:00 AM	0	44	35	14	93	**35**	31	2	**2**	70	55	1	12	9	77	1	1	0	**1**	3	243
8:30:00 AM	**1**	50	**52**	20	123	34	42	3	0	79	35	0	**14**	11	60	1	0	0	0	1	263
Total Volume	1	198	179	73	451	116	157	15	4	292	230	7	44	43	324	4	5	0	1	10	1077
% App. Total	0.2	43.9	39.7	16.2		39.7	53.8	5.1	1.4		71	2.2	13.6	13.3		40	50	0	10		
PHF	.250	.811	.861	.730	.835	.829	.701	.536	.500	.901	.661	.438	.786	.827	.736	.500	.625	.000	.250	.625	.821
Pass Veh	1	195	170	70	436	114	152	15	3	284	222	6	44	42	314	4	5	0	0	9	1043
% Pass Veh	100	98.5	95.0	95.9	96.7	98.3	96.8	100	75.0	97.3	96.5	85.7	100	97.7	96.9	100	100	0	0	90.0	96.8
Heavy Veh	0	0	0	3	3	2	1	0	1	4	2	1	0	1	4	0	0	0	1	1	12
% Heavy Veh	0	0	0	4.1	0.7	1.7	0.6	0	25.0	1.4	0.9	14.3	0	2.3	1.2	0	0	0	100	10.0	1.1
School Bus	0	3	9	0	12	0	4	0	0	4	6	0	0	0	6	0	0	0	0	0	22
% School Bus	0	1.5	5.0	0	2.7	0	2.5	0	0	1.4	2.6	0	0	0	1.9	0	0	0	0	0	2.0



Project: 112-023
Counted By: DDD
Location: Ulster, NY
Other:

File Name : tm112023a1
Site Code : 12-023-1
Start Date : 9/28/2012
Page No : 1

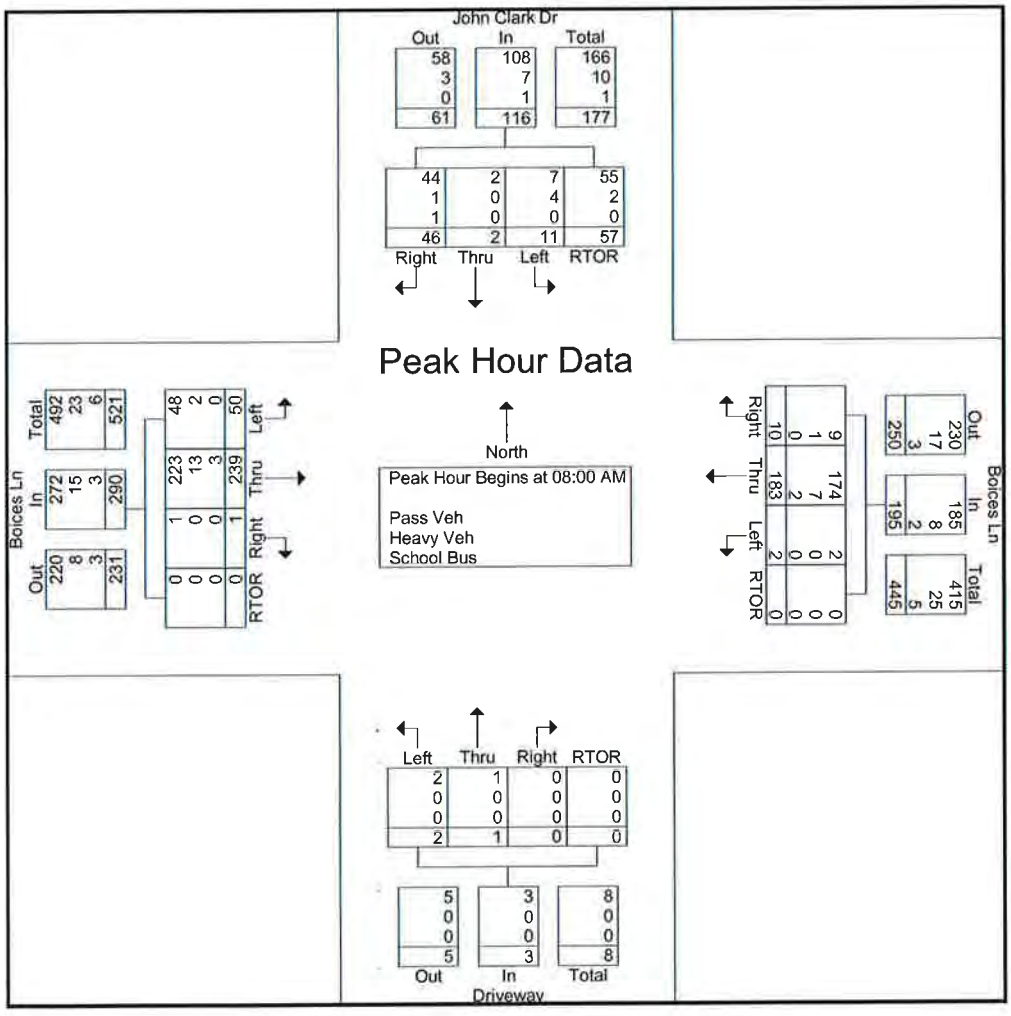
Groups Printed- Pass Veh - Heavy Veh - School Bus

	Boices Ln Eastbound					Boices Ln Westbound					Driveway Northbound					John Clark Dr Southbound					
Start Time	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Int. Total
07:15 AM	6	40	0	0	46	0	39	1	2	42	0	0	1	1	2	1	1	6	4	12	102
07:30 AM	6	41	0	0	47	0	49	1	1	51	1	0	0	0	1	2	0	9	8	19	118
07:45 AM	11	73	0	0	84	0	59	4	0	63	1	0	0	0	1	3	0	11	7	21	169
Total	23	154	0	0	177	0	147	6	3	156	2	0	1	1	4	6	1	26	19	52	389
08:00 AM	9	55	0	0	64	0	42	2	0	44	1	0	0	0	1	2	1	7	17	27	136
08:15 AM	8	54	0	0	62	0	43	2	0	45	0	0	0	0	0	3	0	11	17	31	138
08:30 AM	14	55	1	0	70	0	46	2	0	48	1	0	0	0	1	4	1	11	8	24	143
08:45 AM	19	75	0	0	94	2	52	4	0	58	0	1	0	0	1	2	0	17	15	34	187
Total	50	239	1	0	290	2	183	10	0	195	2	1	0	0	3	11	2	46	57	116	604
Grand Total	73	393	1	0	467	2	330	16	3	351	4	1	1	1	7	17	3	72	76	168	993
Apprch %	15.6	84.2	0.2	0		0.6	94	4.6	0.9		57.1	14.3	14.3	14.3		10.1	1.8	42.9	45.2		
Total %	7.4	39.6	0.1	0	47	0.2	33.2	1.6	0.3	35.3	0.4	0.1	0.1	0.1	0.7	1.7	0.3	7.3	7.7	16.9	
Pass Veh	71	373	1	0	445	2	316	13	3	334	4	1	1	0	6	11	3	70	73	157	942
% Pass Veh	97.3	94.9	100	0	95.3	100	95.8	81.2	100	95.2	100	100	100	0	85.7	64.7	100	97.2	96.1	93.5	94.9
Heavy Veh	2	15	0	0	17	0	11	3	0	14	0	0	0	1	1	6	0	1	3	10	42
% Heavy Veh	2.7	3.8	0	0	3.6	0	3.3	18.8	0	4	0	0	0	100	14.3	35.3	0	1.4	3.9	6	4.2
School Bus	0	5	0	0	5	0	3	0	0	3	0	0	0	0	0	0	0	1	0	1	9
% School Bus	0	1.3	0	0	1.1	0	0.9	0	0	0.9	0	0	0	0	0	0	0	1.4	0	0.6	0.9

Project: 112-023
Counted By: DDD
Location: Ulster, NY
Other:

File Name : tm112023a1
Site Code : 12-023-1
Start Date : 9/28/2012
Page No : 2

	Boices Ln Eastbound					Boices Ln Westbound					Driveway Northbound					John Clark Dr Southbound					
Start Time	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Int. Total
Peak Hour Analysis From 7:15:00 AM to 8:45:00 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 8:00:00 AM																					
8:00:00 AM	9	55	0	0	64	0	42	2	0	44	**1**	0	0	0	**1**	2	**1**	7	**17**	27	136
8:15:00 AM	8	54	0	0	62	0	43	2	0	45	0	0	0	0	0	3	0	11	17	31	138
8:30:00 AM	14	55	**1**	0	70	0	46	2	0	48	1	0	0	0	1	**4**	1	11	8	24	143
8:45:00 AM	**19**	**75**	0	0	**94**	**2**	**52**	**4**	0	**58**	0	**1**	0	0	1	2	0	**17**	15	**34**	**187**
Total Volume	50	239	1	0	290	2	183	10	0	195	2	1	0	0	3	11	2	46	57	116	604
% App. Total	17.2	82.4	0.3	0		1	93.8	5.1	0		66.7	33.3	0	0		9.5	1.7	39.7	49.1		
PHF	.658	.797	.250	.000	.771	.250	.880	.625	.000	.841	.500	.250	.000	.000	.750	.688	.500	.676	.838	.853	.807
Pass Veh	48	223	1	0	272	2	174	9	0	185	2	1	0	0	3	7	2	44	55	108	568
% Pass Veh	96.0	93.3	100	0	93.8	100	95.1	90.0	0	94.9	100	100	0	0	100	63.6	100	95.7	96.5	93.1	94.0
Heavy Veh	2	13	0	0	15	0	7	1	0	8	0	0	0	0	0	4	0	1	2	7	30
% Heavy Veh	4.0	5.4	0	0	5.2	0	3.8	10.0	0	4.1	0	0	0	0	0	36.4	0	2.2	3.5	6.0	5.0
School Bus	0	3	0	0	3	0	2	0	0	2	0	0	0	0	0	0	0	1	0	1	6
% School Bus	0	1.3	0	0	1.0	0	1.1	0	0	1.0	0	0	0	0	0	0	0	2.2	0	0.9	1.0



Project: 09-024d
Counted By: DAT
Location: Ulster, NY
Other:

File Name : tm09024p4
Site Code : 09-024-4
Start Date : 4/28/2009
Page No : 1

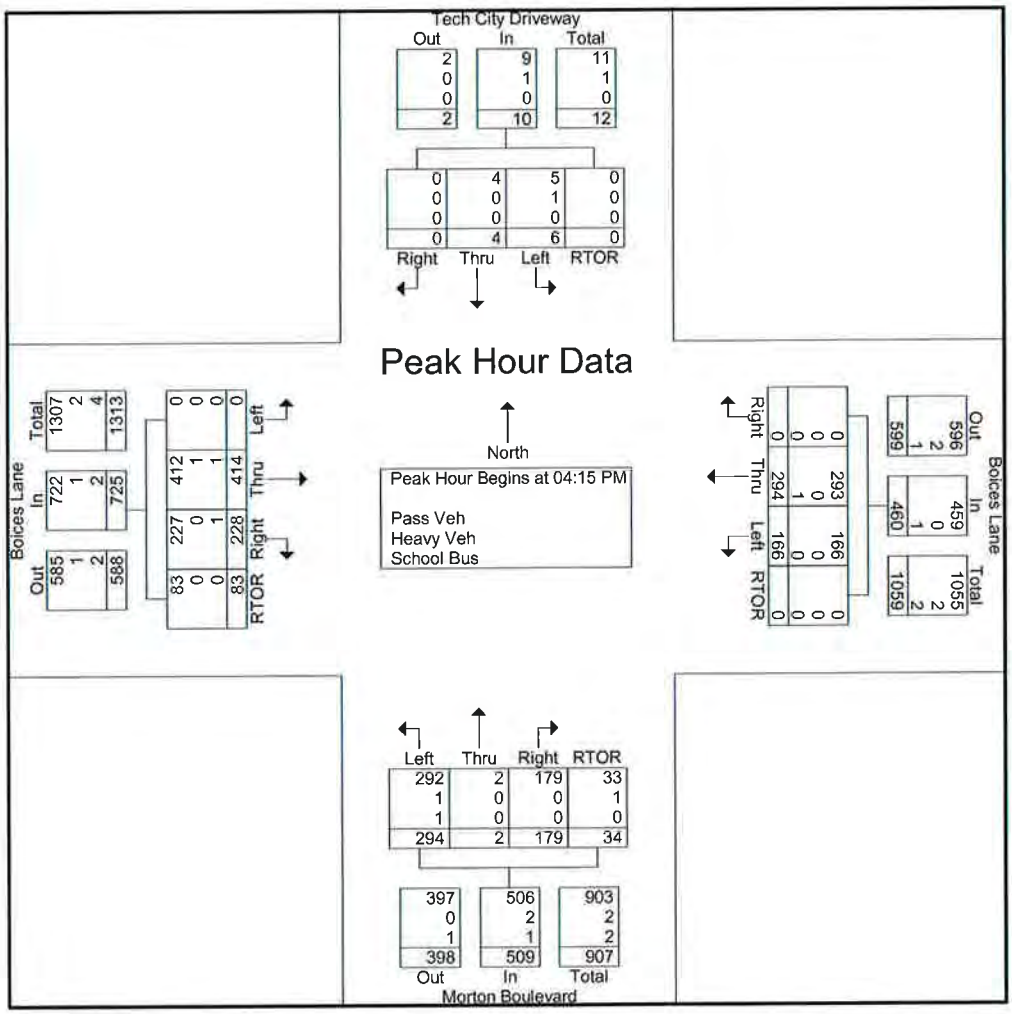
Groups Printed- Pass Veh - Heavy Veh - School Bus

	Boices Lane Eastbound					Boices Lane Westbound					Morton Boulevard Northbound					Tech City Driveway Southbound					
Start Time	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Int. Total
Factor	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		
04:00 PM	0	75	49	21	145	50	77	0	0	127	70	2	30	13	115	0	0	0	0	0	387
04:15 PM	0	87	40	16	143	39	54	0	0	93	71	0	45	13	129	0	1	0	0	1	366
04:30 PM	0	125	77	26	228	43	74	0	0	117	77	1	38	6	122	5	0	0	0	5	472
04:45 PM	0	99	54	19	172	40	89	0	0	129	59	0	52	8	119	1	2	0	0	3	423
Total	0	386	220	82	688	172	294	0	0	466	277	3	165	40	485	6	3	0	0	9	1648
05:00 PM	0	103	57	22	182	44	77	0	0	121	87	1	44	7	139	0	1	0	0	1	443
05:15 PM	0	72	37	16	125	55	65	0	0	120	63	1	32	16	112	1	0	0	0	1	358
05:30 PM	0	77	44	22	143	30	71	2	0	103	58	0	31	9	98	1	0	0	0	1	345
05:45 PM	1	77	76	4	158	39	78	0	0	117	47	0	43	3	93	0	0	0	0	0	368
Total	1	329	214	64	608	168	291	2	0	461	255	2	150	35	442	2	1	0	0	3	1514
Grand Total	1	715	434	146	1296	340	585	2	0	927	532	5	315	75	927	8	4	0	0	12	3162
Apprch %	0.1	55.2	33.5	11.3		36.7	63.1	0.2	0		57.4	0.5	34	8.1		66.7	33.3	0	0		
Total %	0	22.6	13.7	4.6	41	10.8	18.5	0.1	0	29.3	16.8	0.2	10	2.4	29.3	0.3	0.1	0	0	0.4	
Pass Veh	1	711	428	146	1286	340	584	2	0	926	529	5	315	74	923	7	4	0	0	11	3146
% Pass Veh	100	99.4	98.6	100	99.2	100	99.8	100	0	99.9	99.4	100	100	98.7	99.6	87.5	100	0	0	91.7	99.5
Heavy Veh	0	2	2	0	4	0	0	0	0	0	2	0	0	1	3	1	0	0	0	1	8
% Heavy Veh	0	0.3	0.5	0	0.3	0	0	0	0	0	0.4	0	0	1.3	0.3	12.5	0	0	0	8.3	0.3
School Bus	0	2	4	0	6	0	1	0	0	1	1	0	0	0	1	0	0	0	0	0	8
% School Bus	0	0.3	0.9	0	0.5	0	0.2	0	0	0.1	0.2	0	0	0	0.1	0	0	0	0	0	0.3

Project: 09-024d
Counted By: DAT
Location: Ulster, NY
Other:

File Name : tm09024p4
Site Code : 09-024-4
Start Date : 4/28/2009
Page No : 2

	Boices Lane Eastbound					Boices Lane Westbound					Morton Boulevard Northbound					Tech City Driveway Southbound					
Start Time	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Int. Total
Peak Hour Analysis From 4:00:00 PM to 5:45:00 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 4:15:00 PM																					
4:15:00 PM	0	87	40	16	143	39	54	0	0	93	71	0	45	**13**	129	0	1	0	0	1	366
4:30:00 PM	0	**125**	**77**	**26**	**228**	43	74	0	0	117	77	**1**	38	6	122	**5**	0	0	0	**5**	**472**
4:45:00 PM	0	99	54	19	172	40	**89**	0	0	**129**	59	0	**52**	8	119	1	**2**	0	0	3	423
5:00:00 PM	0	103	57	22	182	**44**	77	0	0	121	**87**	1	44	7	**139**	0	1	0	0	1	443
Total Volume	0	414	228	83	725	166	294	0	0	460	294	2	179	34	509	6	4	0	0	10	1704
% App. Total	0	57.1	31.4	11.4		36.1	63.9	0	0		57.8	0.4	35.2	6.7		60	40	0	0		
PHF	.000	.828	.740	.798	.795	.943	.826	.000	.000	.891	.845	.500	.861	.654	.915	.300	.500	.000	.000	.500	.903
Pass Veh	0	412	227	83	722	166	293	0	0	459	292	2	179	33	506	5	4	0	0	9	1696
% Pass Veh	0	99.5	99.6	100	99.6	100	99.7	0	0	99.8	99.3	100	100	97.1	99.4	83.3	100	0	0	90.0	99.5
Heavy Veh	0	1	0	0	1	0	0	0	0	0	1	0	0	1	2	1	0	0	0	1	4
% Heavy Veh	0	0.2	0	0	0.1	0	0	0	0	0	0.3	0	0	2.9	0.4	16.7	0	0	0	10.0	0.2
School Bus	0	1	1	0	2	0	1	0	0	1	1	0	0	0	1	0	0	0	0	0	4
% School Bus	0	0.2	0.4	0	0.3	0	0.3	0	0	0.2	0.3	0	0	0	0.2	0	0	0	0	0	0.2



Project: 09-024d
Counted By: DPR
Location: Ulster, NY
Other:

File Name : tm09024p3
Site Code : 09-024-3
Start Date : 4/28/2009
Page No : 1

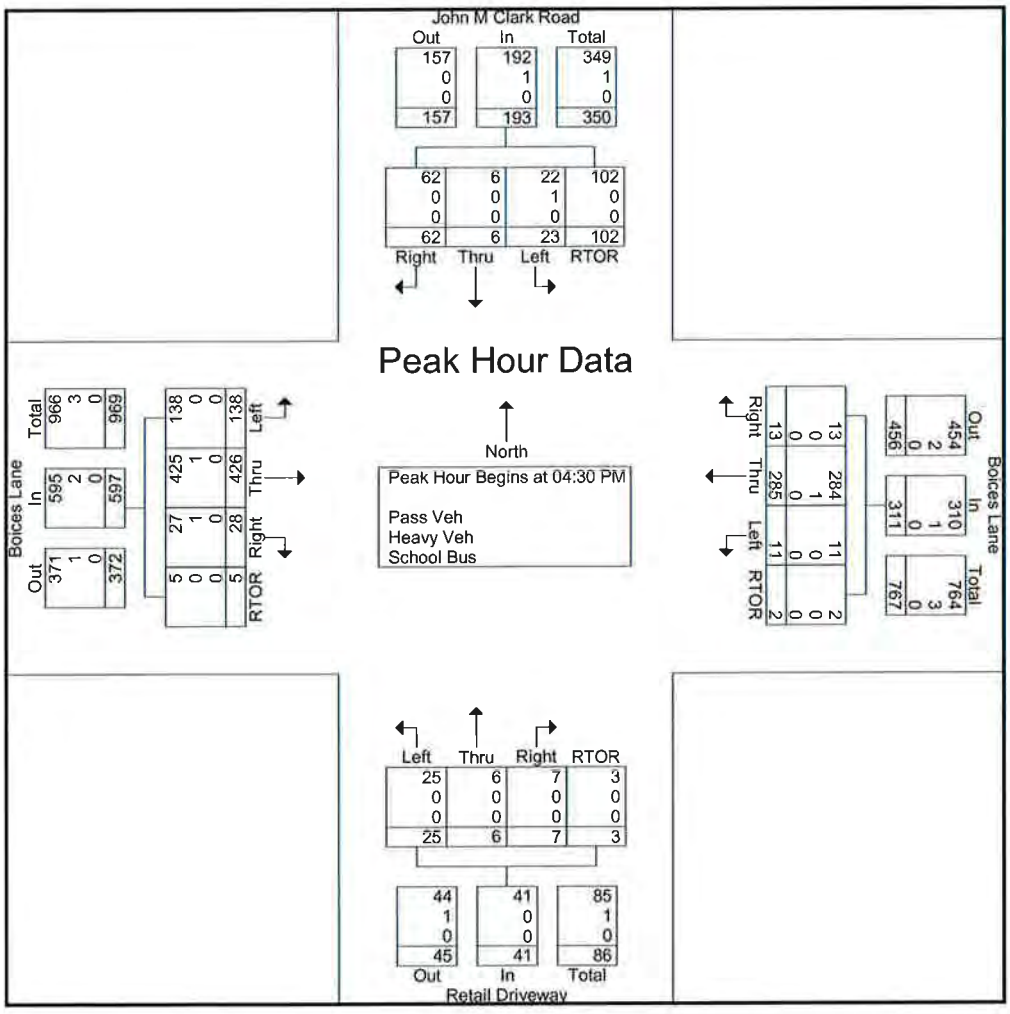
Groups Printed- Pass Veh - Heavy Veh - School Bus

	Boices Lane Eastbound					Boices Lane Westbound					Retail Driveway Northbound					John M Clark Road Southbound					
Start Time	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Int. Total
Factor	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		
04:00 PM	19	97	8	0	124	4	76	5	0	85	4	1	1	1	7	7	4	25	28	64	280
04:15 PM	33	96	7	0	136	0	47	2	0	49	7	0	3	1	11	5	4	14	28	51	247
04:30 PM	37	127	4	0	168	0	71	4	0	75	4	2	2	0	8	11	1	13	21	46	297
04:45 PM	42	110	12	1	165	4	81	6	0	91	4	1	2	0	7	5	2	18	22	47	310
Total	131	430	31	1	593	8	275	17	0	300	19	4	8	2	33	28	11	70	99	208	1134
05:00 PM	31	94	5	4	134	3	66	0	1	70	7	1	0	1	9	3	0	10	33	46	259
05:15 PM	28	95	7	0	130	4	67	3	1	75	10	2	3	2	17	4	3	21	26	54	276
05:30 PM	28	87	5	1	121	2	58	6	0	66	4	2	2	2	10	4	0	13	26	43	240
05:45 PM	19	86	4	1	110	3	68	6	1	78	7	2	0	1	10	3	1	8	20	32	230
Total	106	362	21	6	495	12	259	15	3	289	28	7	5	6	46	14	4	52	105	175	1005
Grand Total	237	792	52	7	1088	20	534	32	3	589	47	11	13	8	79	42	15	122	204	383	2139
Apprch %	21.8	72.8	4.8	0.6		3.4	90.7	5.4	0.5		59.5	13.9	16.5	10.1		11	3.9	31.9	53.3		
Total %	11.1	37	2.4	0.3	50.9	0.9	25	1.5	0.1	27.5	2.2	0.5	0.6	0.4	3.7	2	0.7	5.7	9.5	17.9	
Pass Veh	237	785	51	7	1080	20	532	31	3	586	47	11	13	8	79	40	15	122	204	381	2126
% Pass Veh	100	99.1	98.1	100	99.3	100	99.6	96.9	100	99.5	100	100	100	100	100	95.2	100	100	100	99.5	99.4
Heavy Veh	0	6	1	0	7	0	1	1	0	2	0	0	0	0	0	2	0	0	0	2	11
% Heavy Veh	0	0.8	1.9	0	0.6	0	0.2	3.1	0	0.3	0	0	0	0	0	4.8	0	0	0	0.5	0.5
School Bus	0	1	0	0	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	2
% School Bus	0	0.1	0	0	0.1	0	0.2	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0.1

Project: 09-024d
Counted By: DPR
Location: Ulster, NY
Other:

File Name : tm09024p3
Site Code : 09-024-3
Start Date : 4/28/2009
Page No : 2

	Boices Lane Eastbound					Boices Lane Westbound					Retail Driveway Northbound					John M Clark Road Southbound					
Start Time	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Left	Thru	Right	RTOR	App. Total	Int. Total
Peak Hour Analysis From 4:00:00 PM to 5:45:00 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 4:30:00 PM																					
4:30:00 PM	37	**127**	4	0	**168**	0	71	4	0	75	4	**2**	2	0	8	**11**	1	13	21	46	297
4:45:00 PM	**42**	110	**12**	1	165	**4**	**81**	**6**	0	**91**	4	1	2	0	7	5	2	18	22	47	**310**
5:00:00 PM	31	94	5	**4**	134	3	66	0	**1**	70	7	1	0	1	9	3	0	10	**33**	46	259
5:15:00 PM	28	95	7	0	130	4	67	3	1	75	**10**	2	**3**	**2**	**17**	4	**3**	**21**	26	**54**	276
Total Volume	138	426	28	5	597	11	285	13	2	311	25	6	7	3	41	23	6	62	102	193	1142
% App. Total	23.1	71.4	4.7	0.8		3.5	91.6	4.2	0.6		61	14.6	17.1	7.3		11.9	3.1	32.1	52.8		
PHF	.821	.839	.583	.313	.888	.688	.880	.542	.500	.854	.625	.750	.583	.375	.603	.523	.500	.738	.773	.894	.921
Pass Veh	138	425	27	5	595	11	284	13	2	310	25	6	7	3	41	22	6	62	102	192	1138
% Pass Veh	100	99.8	96.4	100	99.7	100	99.6	100	100	99.7	100	100	100	100	100	95.7	100	100	100	99.5	99.6
Heavy Veh	0	1	1	0	2	0	1	0	0	1	0	0	0	0	0	1	0	0	0	1	4
% Heavy Veh	0	0.2	3.6	0	0.3	0	0.4	0	0	0.3	0	0	0	0	0	4.3	0	0	0	0.5	0.4
School Bus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% School Bus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



Appendix C

Level of Service Analyses and Timing Reports

Railroad Crossing Study
Boices Lane
Town of Ulster, Ulster County, New York

LOS Definitions

The following is an excerpt from the 2000 Highway Capacity Manual (HCM).

Level of Service for Signalized Intersections

Level of service for a signalized intersection is defined in terms of control delay, which is a measure of driver discomfort, frustration, fuel consumption, and increased travel time. The delay experienced by a motorist is made up of a number of factors that relate to control, geometrics, traffic, and incidents. Total delay is the difference between the travel time actually experienced and the reference travel time that would result during base conditions: in the absence of traffic control, geometric delay, any incidents, and any other vehicles. Specifically, LOS criteria for traffic signals are stated in terms of the average control delay per vehicle, typically for a 15-minute analysis period. Delay is a complex measure and depends on a number of variables, including the quality of progression, the cycle length, the green ratio, and the v/c ratio for the lane group. Levels of service are defined to represent reasonable ranges in control delay.

LOS A describes operations with low control delay, up to 10 s/veh. This LOS occurs when progression is extremely favorable and most vehicles arrive during the green phase. Many vehicles do not stop at all. Short cycle lengths may tend to contribute to low delay.

LOS B describes operations with control delay greater than 10 and up to 20 s/veh. This level generally occurs with good progression, short cycle lengths, or both. More vehicles stop than with LOS A, causing higher levels of delay.

LOS C describes operations with control delay greater than 20 and up to 35 s/veh. These higher delays may result from only fair progression, longer cycle lengths, or both. Individual cycle failures may begin to appear at this level. Cycle failure occurs when a given green phase does not serve queued vehicles, and overflows occur. The number of vehicles stopping is significant at this level, though many still pass through the intersection without stopping.

LOS D describes operations with control delay greater than 35 and up to 55 s/veh. At LOS D, the influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, and high v/c ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.

LOS E describes operations with control delay greater than 55 and up to 80 s/veh. These high delay values generally indicate poor progression, long cycle lengths, and high v/c ratios. Individual cycle failures are frequent.

LOS F describes operations with control delay in excess of 80 s/veh. This level, considered unacceptable to most drivers, often occurs with oversaturation, that is, when arrival flow rates exceed the capacity of lane groups. It may also occur at high v/c ratios with many individual cycle failures. Poor progression and long cycle lengths may also be contribute significantly to high delay levels.

Average control delay and queue length at roundabout controlled intersections are calculated using SIDRA Intersection. The physical geometry such as entry lane width and approach flare, and traffic volume at the roundabout are factors that influence the intersection's performance. The average delay reported using SIRA Intersection is based on the HCM Method of Delay for Level-of-Service.

Level of Service Criteria for Unsignalized Intersections

Four measures are used to describe the performance of two-way stop controlled intersections: control delay, delay to major street through vehicles, queue length, and v/c ratio. The primary measure that is used to provide an estimate of LOS is control delay. This measure can be estimated for any movement on the minor (i.e., stop-controlled) street. By summing delay estimates for individual movements, a delay estimate for each minor street movement and minor street approach can be achieved. The level of service criteria is given in Exhibit 17-2/22.

For all-way stop controlled (AWSC) intersections, the average control delay (in seconds per vehicle) is used as the primary measure of performance. Control delay is the increased time of travel for a vehicle approaching and passing through an AWSC intersection, compared with a free-flow vehicle if it were not required to slow or stop at the intersection.

Exhibit 17-2/22: Level-of-Service Criteria for Stop Controlled Intersections

Level of Service	Control Delay (sec/veh)
A	$\leq$ 10.0
B	>10.0 and $\leq$ 15.0
C	>15.0 and $\leq$ 25.0
D	>25.0 and $\leq$ 35.0
E	>35.0 and $\leq$ 50.0
F	>50.0

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	402	311	169	298	0	294	2	207	6	4	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	9	11	11	11	10	10	11	11	11	11
Total Lost time (s)		4.0	4.0	4.0	4.0			4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00	1.00	1.00	1.00			1.00	1.00	1.00	1.00	
Frpb, ped/bikes		1.00	0.99	1.00	1.00			1.00	1.00	1.00	1.00	
Flpb, ped/bikes		1.00	1.00	1.00	1.00			1.00	1.00	1.00	1.00	
Frt		1.00	0.85	1.00	1.00			1.00	0.85	1.00	1.00	
Flt Protected		1.00	1.00	0.95	1.00			0.95	1.00	0.95	1.00	
Satd. Flow (prot)		1818	1423	1744	1818			1673	1561	1491	1837	
Flt Permitted		1.00	1.00	0.19	1.00			0.73	1.00	1.00	1.00	
Satd. Flow (perm)		1818	1423	341	1818			1274	1561	1570	1837	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	447	346	188	331	0	327	2	230	7	4	0
RTOR Reduction (vph)	0	0	59	0	0	0	0	0	87	0	0	0
Lane Group Flow (vph)	0	447	287	188	331	0	0	329	143	7	4	0
Confl. Peds. (#/hr)	5		4	4		5						
Heavy Vehicles (%)	0%	1%	1%	0%	1%	0%	1%	0%	0%	17%	0%	0%
Turn Type	Perm		pm+ov	pm+pt		Perm	pm+pt		pm+ov	Perm		
Protected Phases		2	4	1	6		4	7 4	1		3	
Permitted Phases	2		2	6		6	7 4		7 4	3		
Actuated Green, G (s)		22.2	44.7	36.2	36.2			29.0	38.0	1.5	1.5	
Effective Green, g (s)		23.2	46.7	37.2	37.2			30.0	40.0	2.5	2.5	
Actuated g/C Ratio		0.31	0.62	0.49	0.49			0.40	0.53	0.03	0.03	
Clearance Time (s)		5.0	5.0	5.0	5.0				5.0	5.0	5.0	
Vehicle Extension (s)		2.0	2.0	2.0	2.0				2.0	2.0	2.0	
Lane Grp Cap (vph)		561	884	355	899			633	913	52	61	
v/s Ratio Prot		c0.25	0.10	c0.07	0.18			c0.16	0.02		0.00	
v/s Ratio Perm			0.10	0.19				c0.04	0.07	0.00		
v/c Ratio		0.80	0.32	0.53	0.37			0.52	0.16	0.13	0.07	
Uniform Delay, d1		23.8	6.8	13.2	11.7			17.1	9.0	35.3	35.2	
Progression Factor		1.00	1.00	1.00	1.00			1.00	1.00	1.00	1.00	
Incremental Delay, d2		7.2	0.1	0.7	0.1			0.3	0.0	0.4	0.2	
Delay (s)		31.1	6.8	13.9	11.8			17.4	9.0	35.7	35.4	
Level of Service		C	A	B	B			B	A	D	D	
Approach Delay (s)		20.5			12.6			14.0			35.6	
Approach LOS		C			B			B			D	

Intersection Summary			
HCM Average Control Delay	16.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	75.2	Sum of lost time (s)	12.0
Intersection Capacity Utilization	63.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	142	439	34	13	281	13	25	6	10	23	6	161
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	10	10	11	11	11	11	12	12	16
Total Lost time (s)		3.0			3.0	3.0		3.0	3.0		3.0	3.0
Lane Util. Factor		0.95			1.00	1.00		1.00	1.00		1.00	1.00
Frpb, ped/bikes		1.00			1.00	0.98		1.00	1.00		1.00	1.00
Flpb, ped/bikes		1.00			1.00	1.00		1.00	1.00		1.00	1.00
Frt		0.99			1.00	0.85		1.00	0.85		1.00	0.85
Flt Protected		0.99			1.00	1.00		0.96	1.00		0.96	1.00
Satd. Flow (prot)		3502			1753	1527		1767	1561		1773	1830
Flt Permitted		0.80			0.97	1.00		0.84	1.00		0.84	1.00
Satd. Flow (perm)		2826			1704	1527		1535	1561		1548	1830
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	154	477	37	14	305	14	27	7	11	25	7	175
RTOR Reduction (vph)	0	7	0	0	0	5	0	0	8	0	0	125
Lane Group Flow (vph)	0	661	0	0	319	9	0	34	3	0	32	50
Confl. Peds. (#/hr)	2					2						
Confl. Bikes (#/hr)			1			1						
Heavy Vehicles (%)	0%	1%	4%	0%	1%	0%	0%	0%	0%	4%	0%	0%
Turn Type	Perm			Perm		Perm	Perm		Perm	Perm		Perm
Protected Phases		5			1			3			3	
Permitted Phases	5			1		1	3		3	3		3
Actuated Green, G (s)		35.0			35.0	35.0		15.0	15.0		15.0	15.0
Effective Green, g (s)		37.0			37.0	37.0		17.0	17.0		17.0	17.0
Actuated g/C Ratio		0.62			0.62	0.62		0.28	0.28		0.28	0.28
Clearance Time (s)		5.0			5.0	5.0		5.0	5.0		5.0	5.0
Lane Grp Cap (vph)		1743			1051	942		435	442		439	519
v/s Ratio Prot												
v/s Ratio Perm		c0.23			0.19	0.01		0.02	0.00		0.02	c0.03
v/c Ratio		0.38			0.30	0.01		0.08	0.01		0.07	0.10
Uniform Delay, d1		5.8			5.4	4.4		15.8	15.4		15.7	15.8
Progression Factor		1.00			1.00	1.00		1.00	1.00		1.00	1.00
Incremental Delay, d2		0.6			0.7	0.0		0.4	0.0		0.3	0.4
Delay (s)		6.4			6.2	4.5		16.1	15.5		16.1	16.2
Level of Service		A			A	A		B	B		B	B
Approach Delay (s)		6.4			6.1			16.0			16.2	
Approach LOS		A			A			B			B	

Intersection Summary

HCM Average Control Delay	8.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.29		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	51.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	402	311	169	298	0	294	2	207	6	4	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	9	11	11	11	10	10	11	11	11	11
Total Lost time (s)		4.0	4.0	4.0	4.0			4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00	1.00	1.00	1.00			1.00	1.00	1.00	1.00	
Frpb, ped/bikes		1.00	0.99	1.00	1.00			1.00	1.00	1.00	1.00	
Flpb, ped/bikes		1.00	1.00	1.00	1.00			1.00	1.00	1.00	1.00	
Frt		1.00	0.85	1.00	1.00			1.00	0.85	1.00	1.00	
Flt Protected		1.00	1.00	0.95	1.00			0.95	1.00	0.95	1.00	
Satd. Flow (prot)		1818	1420	1744	1818			1673	1561	1491	1837	
Flt Permitted		1.00	1.00	0.25	1.00			0.73	1.00	1.00	1.00	
Satd. Flow (perm)		1818	1420	454	1818			1274	1561	1570	1837	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	447	346	188	331	0	327	2	230	7	4	0
RTOR Reduction (vph)	0	0	126	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	447	220	188	331	0	0	329	230	7	4	0
Confl. Peds. (#/hr)	5		4	4		5						
Heavy Vehicles (%)	0%	1%	1%	0%	1%	0%	1%	0%	0%	17%	0%	0%
Turn Type	Perm		pm+ov	pm+pt		Perm	pm+pt		pm+ov	Perm		
Protected Phases		2	4	1	6		4	7 4	1		3	
Permitted Phases	2		2	6		6	7 4		7 4	3		
Actuated Green, G (s)		24.1	42.5	35.6	35.6			24.4	30.9	1.0	1.0	
Effective Green, g (s)		25.1	44.5	36.6	36.6			25.4	32.9	2.0	2.0	
Actuated g/C Ratio		0.36	0.64	0.52	0.52			0.36	0.47	0.03	0.03	
Clearance Time (s)		5.0	5.0	5.0	5.0				5.0	5.0	5.0	
Vehicle Extension (s)		2.0	2.0	2.0	2.0				2.0	2.0	2.0	
Lane Grp Cap (vph)		652	903	376	951			573	823	45	52	
v/s Ratio Prot		c0.25	0.07	c0.05	0.18			c0.16	0.03		0.00	
v/s Ratio Perm			0.09	0.21				c0.05	0.12	0.00		
v/c Ratio		0.69	0.24	0.50	0.35			0.57	0.28	0.16	0.08	
Uniform Delay, d1		19.1	5.5	10.9	9.7			17.9	11.3	33.2	33.1	
Progression Factor		1.00	1.00	0.76	0.52			1.00	1.00	1.00	1.00	
Incremental Delay, d2		5.8	0.1	0.4	1.0			0.9	0.1	0.6	0.2	
Delay (s)		24.9	5.5	8.7	6.1			18.8	11.4	33.8	33.3	
Level of Service		C	A	A	A			B	B	C	C	
Approach Delay (s)		16.4			7.0			15.8			33.6	
Approach LOS		B			A			B			C	

Intersection Summary			
HCM Average Control Delay	13.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	63.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	142	439	34	13	281	13	25	6	10	23	6	161
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	10	10	11	11	11	11	12	12	16
Total Lost time (s)		3.0			3.0	3.0		3.0	3.0		3.0	3.0
Lane Util. Factor		0.95			1.00	1.00		1.00	1.00		1.00	1.00
Frpb, ped/bikes		1.00			1.00	0.98		1.00	1.00		1.00	1.00
Flpb, ped/bikes		1.00			1.00	1.00		1.00	1.00		1.00	1.00
Frt		0.99			1.00	0.85		1.00	0.85		1.00	0.85
Flt Protected		0.99			1.00	1.00		0.96	1.00		0.96	1.00
Satd. Flow (prot)		3502			1753	1526		1767	1561		1773	1830
Flt Permitted		0.80			0.97	1.00		0.81	1.00		0.82	1.00
Satd. Flow (perm)		2824			1702	1526		1491	1561		1504	1830
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	154	477	37	14	305	14	27	7	11	25	7	175
RTOR Reduction (vph)	0	4	0	0	0	6	0	0	9	0	0	0
Lane Group Flow (vph)	0	664	0	0	319	8	0	34	2	0	32	175
Confl. Peds. (#/hr)	2					2						
Confl. Bikes (#/hr)			1			1						
Heavy Vehicles (%)	0%	1%	4%	0%	1%	0%	0%	0%	0%	4%	0%	0%
Turn Type	pm+pt			Perm		Perm	Perm		Perm	Perm		Perm
Protected Phases	2	5			1			3			3	
Permitted Phases	5			1		1	3		3	3		3
Actuated Green, G (s)		48.8			39.3	39.3		11.2	11.2		11.2	11.2
Effective Green, g (s)		50.8			41.3	41.3		13.2	13.2		13.2	13.2
Actuated g/C Ratio		0.73			0.59	0.59		0.19	0.19		0.19	0.19
Clearance Time (s)		5.0			5.0	5.0		5.0	5.0		5.0	5.0
Vehicle Extension (s)		2.0			2.0	2.0		2.0	2.0		2.0	2.0
Lane Grp Cap (vph)		2112			1004	900		281	294		284	345
v/s Ratio Prot		c0.03										
v/s Ratio Perm		c0.20			0.19	0.01		0.02	0.00		0.02	c0.10
v/c Ratio		0.31			0.32	0.01		0.12	0.01		0.11	0.51
Uniform Delay, d1		3.4			7.2	5.9		23.6	23.1		23.5	25.5
Progression Factor		0.33			1.00	1.00		1.00	1.00		1.00	1.00
Incremental Delay, d2		0.0			0.8	0.0		0.1	0.0		0.1	0.4
Delay (s)		1.1			8.1	5.9		23.7	23.1		23.6	25.9
Level of Service		A			A	A		C	C		C	C
Approach Delay (s)		1.1			8.0			23.5			25.6	
Approach LOS		A			A			C			C	

Intersection Summary

HCM Average Control Delay	7.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.35		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	51.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	402	311	169	298	0	294	2	207	6	4	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	9	11	11	11	10	10	11	11	11	11
Total Lost time (s)		4.0	4.0	4.0	4.0			4.0	4.0	4.0	4.0	
Lane Util. Factor		0.95	1.00	1.00	1.00			1.00	1.00	1.00	1.00	
Frpb, ped/bikes		1.00	0.99	1.00	1.00			1.00	1.00	1.00	1.00	
Flpb, ped/bikes		1.00	1.00	1.00	1.00			1.00	1.00	1.00	1.00	
Frt		1.00	0.85	1.00	1.00			1.00	0.85	1.00	1.00	
Flt Protected		1.00	1.00	0.95	1.00			0.95	1.00	0.95	1.00	
Satd. Flow (prot)		3455	1422	1744	1818			1673	1561	1491	1837	
Flt Permitted		1.00	1.00	0.36	1.00			0.73	1.00	1.00	1.00	
Satd. Flow (perm)		3455	1422	657	1818			1274	1561	1570	1837	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	447	346	188	331	0	327	2	230	7	4	0
RTOR Reduction (vph)	0	0	134	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	447	212	188	331	0	0	329	230	7	4	0
Confl. Peds. (#/hr)	5		4	4		5						
Heavy Vehicles (%)	0%	1%	1%	0%	1%	0%	1%	0%	0%	17%	0%	0%
Turn Type	Perm		pm+ov	pm+pt			pm+pt		pm+ov	Perm		
Protected Phases		2	4	1	6		4	7 4	1		3	
Permitted Phases	2		2	6			7 4		7 4	3		
Actuated Green, G (s)		21.2	40.9	34.1	34.1			25.9	33.8	1.2	1.2	
Effective Green, g (s)		22.2	42.9	35.1	35.1			26.9	35.8	2.2	2.2	
Actuated g/C Ratio		0.32	0.61	0.50	0.50			0.38	0.51	0.03	0.03	
Clearance Time (s)		5.0	5.0	5.0	5.0				5.0	5.0	5.0	
Vehicle Extension (s)		2.0	2.0	2.0	2.0				2.0	2.0	2.0	
Lane Grp Cap (vph)		1096	871	468	912			608	888	49	58	
v/s Ratio Prot		0.13	0.07	c0.05	0.18			c0.16	0.03		0.00	
v/s Ratio Perm			0.08	c0.15				c0.05	0.11	0.00		
v/c Ratio		0.41	0.24	0.40	0.36			0.54	0.26	0.14	0.07	
Uniform Delay, d1		18.7	6.2	10.2	10.6			16.8	9.6	33.0	32.9	
Progression Factor		1.00	1.00	0.60	0.54			1.00	1.00	1.00	1.00	
Incremental Delay, d2		1.1	0.1	0.2	1.1			0.5	0.1	0.5	0.2	
Delay (s)		19.9	6.2	6.3	6.9			17.3	9.7	33.5	33.1	
Level of Service		B	A	A	A			B	A	C	C	
Approach Delay (s)		13.9			6.7			14.2			33.3	
Approach LOS		B			A			B			C	

Intersection Summary			
HCM Average Control Delay	12.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	62.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	142	439	34	13	281	13	25	6	10	23	6	161
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	10	10	11	11	11	11	12	12	16
Total Lost time (s)		3.0			3.0			3.0	3.0		3.0	3.0
Lane Util. Factor		0.95			0.95			1.00	1.00		1.00	1.00
Frpb, ped/bikes		1.00			1.00			1.00	1.00		1.00	1.00
Flpb, ped/bikes		1.00			1.00			1.00	1.00		1.00	1.00
Frt		0.99			0.99			1.00	0.85		1.00	0.85
Flt Protected		0.99			1.00			0.96	1.00		0.96	1.00
Satd. Flow (prot)		3502			3308			1767	1561		1773	1830
Flt Permitted		0.79			0.93			0.81	1.00		0.82	1.00
Satd. Flow (perm)		2795			3071			1491	1561		1504	1830
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	154	477	37	14	305	14	27	7	11	25	7	175
RTOR Reduction (vph)	0	4	0	0	3	0	0	0	9	0	0	0
Lane Group Flow (vph)	0	664	0	0	330	0	0	34	2	0	32	175
Confl. Peds. (#/hr)	2					2						
Confl. Bikes (#/hr)			1			1						
Heavy Vehicles (%)	0%	1%	4%	0%	1%	0%	0%	0%	0%	4%	0%	0%
Turn Type	pm+pt			Perm			Perm		Perm	Perm		Perm
Protected Phases	2	5			1			3			3	
Permitted Phases	5			1			3		3	3		3
Actuated Green, G (s)		48.8			39.3			11.2	11.2		11.2	11.2
Effective Green, g (s)		50.8			41.3			13.2	13.2		13.2	13.2
Actuated g/C Ratio		0.73			0.59			0.19	0.19		0.19	0.19
Clearance Time (s)		5.0			5.0			5.0	5.0		5.0	5.0
Vehicle Extension (s)		2.0			2.0			2.0	2.0		2.0	2.0
Lane Grp Cap (vph)		2094			1812			281	294		284	345
v/s Ratio Prot		c0.03										
v/s Ratio Perm		c0.20			0.11			0.02	0.00		0.02	c0.10
v/c Ratio		0.32			0.18			0.12	0.01		0.11	0.51
Uniform Delay, d1		3.4			6.6			23.6	23.1		23.5	25.5
Progression Factor		0.49			1.00			1.00	1.00		1.00	1.00
Incremental Delay, d2		0.0			0.2			0.1	0.0		0.1	0.4
Delay (s)		1.7			6.8			23.7	23.1		23.6	25.9
Level of Service		A			A			C	C		C	C
Approach Delay (s)		1.7			6.8			23.5			25.6	
Approach LOS		A			A			C			C	

Intersection Summary

HCM Average Control Delay	7.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.35		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	49.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	402	311	169	298	0	294	2	207	6	4	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	9	11	11	11	10	10	11	11	11	11
Total Lost time (s)		4.0	4.0	4.0	4.0			4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00	1.00	1.00	1.00			1.00	1.00	1.00	1.00	
Frpb, ped/bikes		1.00	0.97	1.00	1.00			1.00	1.00	1.00	1.00	
Flpb, ped/bikes		1.00	1.00	1.00	1.00			1.00	1.00	1.00	1.00	
Frt		1.00	0.85	1.00	1.00			1.00	0.85	1.00	1.00	
Flt Protected		1.00	1.00	0.95	1.00			0.95	1.00	0.95	1.00	
Satd. Flow (prot)		1818	1399	1745	1818			1673	1561	1491	1837	
Flt Permitted		1.00	1.00	0.95	1.00			0.73	1.00	0.33	1.00	
Satd. Flow (perm)		1818	1399	1745	1818			1274	1561	515	1837	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	447	346	188	331	0	327	2	230	7	4	0
RTOR Reduction (vph)	0	0	217	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	447	129	188	331	0	0	329	230	7	4	0
Confl. Peds. (#/hr)	5		4	4		5						
Heavy Vehicles (%)	0%	1%	1%	0%	1%	0%	1%	0%	0%	17%	0%	0%
Turn Type	Split		Perm	Split		Perm	Perm		Perm	Perm		
Protected Phases	1	1		2 4	2 4			3			3	
Permitted Phases			1			2 4	3		3	3		
Actuated Green, G (s)		22.0	22.0	28.8	28.8			24.2	24.2	24.2	24.2	
Effective Green, g (s)		23.0	23.0	29.8	29.8			25.2	25.2	25.2	25.2	
Actuated g/C Ratio		0.26	0.26	0.33	0.33			0.28	0.28	0.28	0.28	
Clearance Time (s)		5.0	5.0					5.0	5.0	5.0	5.0	
Vehicle Extension (s)		2.0	2.0					2.0	2.0	2.0	2.0	
Lane Grp Cap (vph)		465	358	578	602			357	437	144	514	
v/s Ratio Prot		c0.25		0.11	c0.18						0.00	
v/s Ratio Perm			0.09					c0.26	0.15	0.01		
v/c Ratio		0.96	0.36	0.33	0.55			0.92	0.53	0.05	0.01	
Uniform Delay, d1		33.1	27.5	22.6	24.6			31.4	27.4	23.6	23.4	
Progression Factor		1.00	1.00	0.52	0.47			1.00	1.00	1.00	1.00	
Incremental Delay, d2		33.1	2.8	0.1	0.3			28.2	0.5	0.1	0.0	
Delay (s)		66.2	30.3	11.9	11.9			59.6	27.9	23.7	23.4	
Level of Service		E	C	B	B			E	C	C	C	
Approach Delay (s)		50.5			11.9			46.6			23.6	
Approach LOS		D			B			D			C	

Intersection Summary			
HCM Average Control Delay	38.5	HCM Level of Service	D
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	63.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	142	439	34	13	281	13	25	6	10	23	6	161
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	10	10	11	11	11	11	12	12	16
Total Lost time (s)		3.0			3.0	3.0		3.0	3.0		3.0	3.0
Lane Util. Factor		0.95			1.00	1.00		1.00	1.00		1.00	1.00
Frpb, ped/bikes		1.00			1.00	0.97		1.00	1.00		1.00	1.00
Flpb, ped/bikes		1.00			1.00	1.00		1.00	1.00		1.00	1.00
Frt		0.99			1.00	0.85		1.00	0.85		1.00	0.85
Flt Protected		0.99			1.00	1.00		0.96	1.00		0.96	1.00
Satd. Flow (prot)		3502			1753	1519		1767	1561		1773	1830
Flt Permitted		0.99			1.00	1.00		0.78	1.00		0.79	1.00
Satd. Flow (perm)		3502			1753	1519		1435	1561		1449	1830
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	154	477	37	14	305	14	27	7	11	25	7	175
RTOR Reduction (vph)	0	5	0	0	0	11	0	0	10	0	0	0
Lane Group Flow (vph)	0	663	0	0	319	3	0	34	1	0	32	175
Confl. Peds. (#/hr)	2					2						
Confl. Bikes (#/hr)			1			1						
Heavy Vehicles (%)	0%	1%	4%	0%	1%	0%	0%	0%	0%	4%	0%	0%
Turn Type	Split			Split		Perm	Perm		Perm	Perm		Perm
Protected Phases	1 3	1 3		2	2			4			4	
Permitted Phases						2	4		4	4		4
Actuated Green, G (s)		51.2			15.2	15.2		8.6	8.6		8.6	8.6
Effective Green, g (s)		53.2			17.2	17.2		10.6	10.6		10.6	10.6
Actuated g/C Ratio		0.59			0.19	0.19		0.12	0.12		0.12	0.12
Clearance Time (s)					5.0	5.0		5.0	5.0		5.0	5.0
Vehicle Extension (s)					2.0	2.0		2.0	2.0		2.0	2.0
Lane Grp Cap (vph)		2070			335	290		169	184		171	216
v/s Ratio Prot		c0.19			c0.18							
v/s Ratio Perm						0.00		0.02	0.00		0.02	c0.10
v/c Ratio		0.32			0.95	0.01		0.20	0.01		0.19	0.81
Uniform Delay, d1		9.3			36.0	29.5		35.9	35.1		35.8	38.7
Progression Factor		0.06			1.00	1.00		1.00	1.00		1.00	1.00
Incremental Delay, d2		0.0			36.3	0.0		0.2	0.0		0.2	19.1
Delay (s)		0.5			72.3	29.5		36.1	35.1		36.0	57.8
Level of Service		A			E	C		D	D		D	E
Approach Delay (s)		0.5			70.5			35.8			54.5	
Approach LOS		A			E			D			D	

Intersection Summary

HCM Average Control Delay	29.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	51.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	646	410	206	431	72	366	34	254	199	92	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	9	11	11	11	10	10	11	11	11	11
Total Lost time (s)		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	
Frpb, ped/bikes		1.00	0.98	1.00	1.00	0.97		1.00	1.00	1.00	1.00	
Flpb, ped/bikes		1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	
Frt		1.00	0.85	1.00	1.00	0.85		1.00	0.85	1.00	0.97	
Flt Protected		1.00	1.00	0.95	1.00	1.00		0.96	1.00	0.95	1.00	
Satd. Flow (prot)		1818	1407	1745	1818	1522		1680	1561	1711	1776	
Flt Permitted		1.00	1.00	0.10	1.00	1.00		0.64	1.00	0.30	1.00	
Satd. Flow (perm)		1818	1407	179	1818	1522		1118	1561	546	1776	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	718	456	229	479	80	407	38	282	221	102	29
RTOR Reduction (vph)	0	0	160	0	0	42	0	0	0	0	10	0
Lane Group Flow (vph)	0	718	296	229	479	38	0	445	282	221	121	0
Confl. Peds. (#/hr)	5		4	4		5						
Heavy Vehicles (%)	0%	1%	1%	0%	1%	0%	1%	0%	0%	2%	0%	0%
Turn Type			pm+ov	pm+pt		Perm	pm+pt		pm+ov	Perm		
Protected Phases		2	4	1	6		4	7 4	1		3	
Permitted Phases			2	6		6	7 4		7 4	3		
Actuated Green, G (s)		36.0	39.0	47.0	47.0	47.0		43.0	49.0	35.0	35.0	
Effective Green, g (s)		37.0	41.0	48.0	48.0	48.0		44.0	51.0	36.0	36.0	
Actuated g/C Ratio		0.37	0.41	0.48	0.48	0.48		0.44	0.51	0.36	0.36	
Clearance Time (s)		5.0	5.0	5.0	5.0	5.0			5.0	5.0	5.0	
Vehicle Extension (s)		2.0	2.0	2.0	2.0	2.0			2.0	2.0	2.0	
Lane Grp Cap (vph)		673	577	196	873	731		514	859	197	639	
v/s Ratio Prot		0.39	0.02	c0.08	0.26			c0.03	0.02		0.07	
v/s Ratio Perm			0.19	c0.48		0.03		0.35	0.16	c0.40		
v/c Ratio		1.07	0.51	1.17	0.55	0.05		0.87	0.33	1.12	0.19	
Uniform Delay, d1		31.5	22.0	25.0	18.4	13.9		25.3	14.4	32.0	22.0	
Progression Factor		1.00	1.00	1.65	0.96	1.67		1.00	1.00	1.00	1.00	
Incremental Delay, d2		53.9	0.3	114.4	2.3	0.1		13.8	0.1	100.7	0.1	
Delay (s)		85.4	22.4	155.6	19.8	23.3		39.1	14.5	132.7	22.0	
Level of Service		F	C	F	B	C		D	B	F	C	
Approach Delay (s)		60.9			59.6			29.6			91.5	
Approach LOS		E			E			C			F	

Intersection Summary			
HCM Average Control Delay	56.6	HCM Level of Service	E
HCM Volume to Capacity ratio	1.09		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	84.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	202	855	42	13	469	18	29	7	12	28	7	211
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	10	10	11	11	11	11	12	12	16
Total Lost time (s)		3.0			3.0	3.0		3.0	3.0		3.0	3.0
Lane Util. Factor		0.95			1.00	1.00		1.00	1.00		1.00	1.00
Frpb, ped/bikes		1.00			1.00	0.98		1.00	1.00		1.00	1.00
Flpb, ped/bikes		1.00			1.00	1.00		1.00	1.00		1.00	1.00
Frt		0.99			1.00	0.85		1.00	0.85		1.00	0.85
Flt Protected		0.99			1.00	1.00		0.96	1.00		0.96	1.00
Satd. Flow (prot)		3521			1754	1527		1766	1561		1772	1830
Flt Permitted		0.68			0.96	1.00		0.81	1.00		0.81	1.00
Satd. Flow (perm)		2401			1685	1527		1481	1561		1493	1830
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	220	929	46	14	510	20	32	8	13	30	8	229
RTOR Reduction (vph)	0	2	0	0	0	7	0	0	11	0	0	0
Lane Group Flow (vph)	0	1193	0	0	524	13	0	40	2	0	38	229
Confl. Peds. (#/hr)	2					2						
Confl. Bikes (#/hr)			1			1						
Heavy Vehicles (%)	0%	1%	4%	0%	1%	0%	0%	0%	0%	4%	0%	0%
Turn Type	pm+pt			Perm		Perm	Perm		Perm	Perm		Perm
Protected Phases	2	5			1			3			3	
Permitted Phases	5			1		1	3		3	3		3
Actuated Green, G (s)		72.9			61.4	61.4		17.1	17.1		17.1	17.1
Effective Green, g (s)		74.9			63.4	63.4		19.1	19.1		19.1	19.1
Actuated g/C Ratio		0.75			0.63	0.63		0.19	0.19		0.19	0.19
Clearance Time (s)		5.0			5.0	5.0		5.0	5.0		5.0	5.0
Vehicle Extension (s)		2.0			2.0	2.0		2.0	2.0		2.0	2.0
Lane Grp Cap (vph)		1894			1068	968		283	298		285	350
v/s Ratio Prot		c0.05										
v/s Ratio Perm		c0.42			0.31	0.01		0.03	0.00		0.03	c0.13
v/c Ratio		0.63			0.49	0.01		0.14	0.01		0.13	0.65
Uniform Delay, d1		6.0			9.7	6.8		33.6	32.8		33.6	37.4
Progression Factor		1.32			1.00	1.00		1.00	1.00		1.00	1.00
Incremental Delay, d2		0.2			1.6	0.0		0.1	0.0		0.1	3.3
Delay (s)		8.1			11.3	6.8		33.7	32.8		33.7	40.7
Level of Service		A			B	A		C	C		C	D
Approach Delay (s)		8.1			11.2			33.5			39.7	
Approach LOS		A			B			C			D	

Intersection Summary

HCM Average Control Delay	13.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	74.9%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↱	↰	↑	↱	↰	↑		↰	↑	
Volume (vph)	0	646	410	206	431	72	366	34	254	199	92	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	9	11	11	11	10	10	11	11	11	11
Total Lost time (s)		4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor		0.95	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes		1.00	0.99	1.00	1.00	0.97	1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt		1.00	0.85	1.00	1.00	0.85	1.00	0.87		1.00	0.97	
Flt Protected		1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3455	1422	1745	1818	1521	1668	1539		1711	1776	
Flt Permitted		1.00	1.00	0.17	1.00	1.00	0.42	1.00		0.57	1.00	
Satd. Flow (perm)		3455	1422	313	1818	1521	730	1539		1020	1776	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	718	456	229	479	80	407	38	282	221	102	29
RTOR Reduction (vph)	0	0	152	0	0	44	0	0	0	0	15	0
Lane Group Flow (vph)	0	718	304	229	479	36	407	320	0	221	116	0
Confl. Peds. (#/hr)	5		4	4		5						
Heavy Vehicles (%)	0%	1%	1%	0%	1%	0%	1%	0%	0%	2%	0%	0%
Turn Type			pm+ov	pm+pt		Perm	pm+pt			pm+pt		
Protected Phases		2	7	1	6		7	4		3	8	
Permitted Phases			2	6		6	4			8		
Actuated Green, G (s)		18.5	35.8	30.1	30.1	30.1	29.9	17.5		15.0	7.6	
Effective Green, g (s)		19.5	37.8	31.1	31.1	31.1	30.9	18.5		17.0	8.6	
Actuated g/C Ratio		0.28	0.54	0.44	0.44	0.44	0.44	0.26		0.24	0.12	
Clearance Time (s)		5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)		962	849	295	808	676	567	407		331	218	
v/s Ratio Prot		0.21	0.09	c0.08	0.26		c0.19	c0.21		0.08	0.07	
v/s Ratio Perm			0.12	c0.26		0.02	0.13			0.08		
v/c Ratio		0.75	0.36	0.78	0.59	0.05	0.72	0.79		0.67	0.53	
Uniform Delay, d1		23.0	9.2	14.3	14.7	11.1	14.7	23.9		23.0	28.8	
Progression Factor		1.00	1.00	1.38	0.86	0.90	1.00	1.00		1.00	1.00	
Incremental Delay, d2		5.3	0.1	10.6	3.0	0.1	3.6	8.9		3.9	1.3	
Delay (s)		28.3	9.3	30.3	15.7	10.1	18.3	32.8		27.0	30.1	
Level of Service		C	A	C	B	B	B	C		C	C	
Approach Delay (s)		20.9			19.3			24.7			28.1	
Approach LOS		C			B			C			C	

Intersection Summary

HCM Average Control Delay	22.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	71.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	202	855	42	13	469	18	29	7	12	28	7	211
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	10	10	11	11	11	11	12	12	16
Total Lost time (s)		3.0			3.0			3.0	3.0		3.0	3.0
Lane Util. Factor		0.95			0.95			1.00	1.00		1.00	1.00
Frpb, ped/bikes		1.00			1.00			1.00	1.00		1.00	1.00
Flpb, ped/bikes		1.00			1.00			1.00	1.00		1.00	1.00
Frt		0.99			0.99			1.00	0.85		1.00	0.85
Flt Protected		0.99			1.00			0.96	1.00		0.96	1.00
Satd. Flow (prot)		3521			3313			1766	1561		1772	1830
Flt Permitted		0.70			0.92			0.81	1.00		0.81	1.00
Satd. Flow (perm)		2490			3047			1481	1561		1492	1830
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	220	929	46	14	510	20	32	8	13	30	8	229
RTOR Reduction (vph)	0	3	0	0	3	0	0	0	10	0	0	0
Lane Group Flow (vph)	0	1192	0	0	541	0	0	40	3	0	38	229
Confl. Peds. (#/hr)	2					2						
Confl. Bikes (#/hr)			1			1						
Heavy Vehicles (%)	0%	1%	4%	0%	1%	0%	0%	0%	0%	4%	0%	0%
Turn Type	pm+pt			Perm			Perm		Perm	Perm		Perm
Protected Phases	2	5			1			3			3	
Permitted Phases	5			1			3		3	3		3
Actuated Green, G (s)		47.6			38.1			12.4	12.4		12.4	12.4
Effective Green, g (s)		49.6			40.1			14.4	14.4		14.4	14.4
Actuated g/C Ratio		0.71			0.57			0.21	0.21		0.21	0.21
Clearance Time (s)		5.0			5.0			5.0	5.0		5.0	5.0
Vehicle Extension (s)		2.0			2.0			2.0	2.0		2.0	2.0
Lane Grp Cap (vph)		1860			1745			305	321		307	376
v/s Ratio Prot		c0.06										
v/s Ratio Perm		c0.39			0.18			0.03	0.00		0.03	c0.13
v/c Ratio		0.64			0.31			0.13	0.01		0.12	0.61
Uniform Delay, d1		5.4			7.8			22.7	22.1		22.7	25.2
Progression Factor		0.94			1.00			1.00	1.00		1.00	1.00
Incremental Delay, d2		0.4			0.5			0.1	0.0		0.1	1.9
Delay (s)		5.5			8.2			22.8	22.1		22.7	27.2
Level of Service		A			A			C	C		C	C
Approach Delay (s)		5.5			8.2			22.6			26.5	
Approach LOS		A			A			C			C	

Intersection Summary			
HCM Average Control Delay	9.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	63.4%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↱		↑		↰	↱		↰	↱	
Volume (vph)	0	646	410	0	431	0	366	34	254	199	298	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	9	11	11	11	10	10	11	11	11	11
Total Lost time (s)		4.0	4.0		4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor		0.95	1.00		1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes		1.00	0.99		1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		1.00		1.00	0.87		1.00	0.99	
Flt Protected		1.00	1.00		1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3455	1419		1818		1668	1539		1711	1814	
Flt Permitted		1.00	1.00		1.00		0.20	1.00		0.57	1.00	
Satd. Flow (perm)		3455	1419		1818		353	1539		1020	1814	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	718	456	0	479	0	407	38	282	221	331	29
RTOR Reduction (vph)	0	0	65	0	0	0	0	0	0	0	5	0
Lane Group Flow (vph)	0	718	391	0	479	0	407	320	0	221	355	0
Confl. Peds. (#/hr)	5		4	4		5						
Heavy Vehicles (%)	0%	1%	1%	0%	1%	0%	1%	0%	0%	2%	0%	0%
Turn Type			pm+ov				pm+pt			pm+pt		
Protected Phases		2	4		6		4	7		8	3	
Permitted Phases			2				7			3		
Actuated Green, G (s)		24.8	40.1		24.8		35.2	21.5		23.6	14.9	
Effective Green, g (s)		25.8	42.1		25.8		36.2	22.5		25.6	15.9	
Actuated g/C Ratio		0.37	0.60		0.37		0.52	0.32		0.37	0.23	
Clearance Time (s)		5.0	5.0		5.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)		2.0	2.0		2.0		2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)		1273	935		670		489	495		469	412	
v/s Ratio Prot		0.21	0.10		c0.26		c0.19	0.21		0.07	0.20	
v/s Ratio Perm			0.18				c0.24			0.11		
v/c Ratio		0.56	0.42		0.71		0.83	0.65		0.47	0.86	
Uniform Delay, d1		17.6	7.4		18.9		14.5	20.3		16.2	26.0	
Progression Factor		1.00	1.00		0.91		1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.8	0.1		6.1		11.1	2.2		0.3	16.2	
Delay (s)		19.4	7.5		23.4		25.6	22.5		16.4	42.3	
Level of Service		B	A		C		C	C		B	D	
Approach Delay (s)		14.8			23.4			24.2			32.4	
Approach LOS		B			C			C			C	

Intersection Summary			
HCM Average Control Delay	22.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	70.2%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	202	855	42	13	469	18	29	7	12	28	7	211
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	10	10	11	11	11	11	12	12	16
Total Lost time (s)		3.0			3.0			3.0	3.0		3.0	3.0
Lane Util. Factor		0.95			0.95			1.00	1.00		1.00	1.00
Frpb, ped/bikes		1.00			1.00			1.00	1.00		1.00	1.00
Flpb, ped/bikes		1.00			1.00			1.00	1.00		1.00	1.00
Frt		0.99			0.99			1.00	0.85		1.00	0.85
Flt Protected		0.99			1.00			0.96	1.00		0.96	1.00
Satd. Flow (prot)		3521			3313			1766	1561		1772	1830
Flt Permitted		0.70			0.92			0.81	1.00		0.81	1.00
Satd. Flow (perm)		2490			3047			1481	1561		1492	1830
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	220	929	46	14	510	20	32	8	13	30	8	229
RTOR Reduction (vph)	0	3	0	0	3	0	0	0	10	0	0	0
Lane Group Flow (vph)	0	1192	0	0	541	0	0	40	3	0	38	229
Confl. Peds. (#/hr)	2					2						
Confl. Bikes (#/hr)			1			1						
Heavy Vehicles (%)	0%	1%	4%	0%	1%	0%	0%	0%	0%	4%	0%	0%
Turn Type	pm+pt			Perm			Perm		Perm	Perm		Perm
Protected Phases	2	5			1			3			3	
Permitted Phases	5			1			3		3	3		3
Actuated Green, G (s)		47.6			38.1			12.4	12.4		12.4	12.4
Effective Green, g (s)		49.6			40.1			14.4	14.4		14.4	14.4
Actuated g/C Ratio		0.71			0.57			0.21	0.21		0.21	0.21
Clearance Time (s)		5.0			5.0			5.0	5.0		5.0	5.0
Vehicle Extension (s)		2.0			2.0			2.0	2.0		2.0	2.0
Lane Grp Cap (vph)		1860			1745			305	321		307	376
v/s Ratio Prot		c0.06										
v/s Ratio Perm		c0.39			0.18			0.03	0.00		0.03	c0.13
v/c Ratio		0.64			0.31			0.13	0.01		0.12	0.61
Uniform Delay, d1		5.4			7.8			22.7	22.1		22.7	25.2
Progression Factor		0.74			1.00			1.00	1.00		1.00	1.00
Incremental Delay, d2		0.5			0.5			0.1	0.0		0.1	1.9
Delay (s)		4.5			8.2			22.8	22.1		22.7	27.2
Level of Service		A			A			C	C		C	C
Approach Delay (s)		4.5			8.2			22.6			26.5	
Approach LOS		A			A			C			C	

Intersection Summary			
HCM Average Control Delay	8.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	6.0
Intersection Capacity Utilization	63.4%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	586	410	0	431	72	366	34	234	179	92	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	11	9	11	11	11	10	10	11	11	11	11
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	
Lane Util. Factor		0.95	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes		1.00	0.97		1.00	0.97	1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	0.87		1.00	0.97	
Flt Protected		1.00	1.00		1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		3455	1400		1818	1522	1668	1541		1711	1776	
Flt Permitted		1.00	1.00		1.00	1.00	0.67	1.00		0.50	1.00	
Satd. Flow (perm)		3455	1400		1818	1522	1182	1541		895	1776	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	651	456	0	479	80	407	38	260	199	102	29
RTOR Reduction (vph)	0	0	329	0	0	42	0	0	0	0	15	0
Lane Group Flow (vph)	0	651	127	0	479	38	407	298	0	199	116	0
Confl. Peds. (#/hr)	5		4	4		5						
Heavy Vehicles (%)	0%	1%	1%	0%	1%	0%	1%	0%	0%	2%	0%	0%
Turn Type			Perm			Perm	Perm			Perm		
Protected Phases		1			1 2			3			3	
Permitted Phases			1			1 2	3			3		
Actuated Green, G (s)		17.8	17.8		30.8	30.8	26.8	26.8		26.8	26.8	
Effective Green, g (s)		18.8	18.8		31.8	31.8	27.8	27.8		27.8	27.8	
Actuated g/C Ratio		0.28	0.28		0.47	0.47	0.41	0.41		0.41	0.41	
Clearance Time (s)		5.0	5.0				5.0	5.0		5.0	5.0	
Vehicle Extension (s)		2.0	2.0				2.0	2.0		2.0	2.0	
Lane Grp Cap (vph)		961	389		855	716	486	634		368	730	
v/s Ratio Prot		c0.19			c0.26			0.19			0.07	
v/s Ratio Perm			0.09			0.02	c0.34			0.22		
v/c Ratio		0.68	0.33		0.56	0.05	0.84	0.47		0.54	0.16	
Uniform Delay, d1		21.7	19.4		12.9	9.7	17.9	14.5		15.1	12.5	
Progression Factor		1.00	1.00		0.29	0.01	1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.5	0.2		0.5	0.0	11.5	0.2		0.9	0.0	
Delay (s)		23.2	19.5		4.2	0.1	29.3	14.7		15.9	12.6	
Level of Service		C	B		A	A	C	B		B	B	
Approach Delay (s)		21.7			3.6			23.2			14.6	
Approach LOS		C			A			C			B	

Intersection Summary			
HCM Average Control Delay	17.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	67.6	Sum of lost time (s)	12.0
Intersection Capacity Utilization	59.4%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	957	42	13	335	18	19	7	22	59	7	149
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	10	10	11	11	11	11	12	12	16
Total Lost time (s)		3.0			3.0			3.0	3.0		3.0	3.0
Lane Util. Factor		0.95			0.95			1.00	1.00		1.00	1.00
Frpb, ped/bikes		1.00			1.00			1.00	1.00		1.00	1.00
Flpb, ped/bikes		1.00			1.00			1.00	1.00		1.00	1.00
Frt		0.99			0.99			1.00	0.85		1.00	0.85
Flt Protected		1.00			1.00			0.97	1.00		0.96	1.00
Satd. Flow (prot)		3544			3304			1772	1561		1757	1830
Flt Permitted		1.00			0.90			0.79	1.00		0.73	1.00
Satd. Flow (perm)		3544			2989			1453	1561		1340	1830
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	1040	46	14	364	20	21	8	24	64	8	162
RTOR Reduction (vph)	0	5	0	0	6	0	0	0	20	0	0	0
Lane Group Flow (vph)	0	1081	0	0	392	0	0	29	4	0	72	162
Confl. Peds. (#/hr)	2					2						
Confl. Bikes (#/hr)			1			1						
Heavy Vehicles (%)	0%	1%	4%	0%	1%	0%	0%	0%	0%	4%	0%	0%
Turn Type				Perm			Perm		Perm	Perm		Perm
Protected Phases		1 3			1			2			2	
Permitted Phases				1			2		2	2		2
Actuated Green, G (s)		49.6			17.8			8.0	8.0		8.0	8.0
Effective Green, g (s)		51.6			19.8			10.0	10.0		10.0	10.0
Actuated g/C Ratio		0.76			0.29			0.15	0.15		0.15	0.15
Clearance Time (s)					5.0			5.0	5.0		5.0	5.0
Vehicle Extension (s)					2.0			2.0	2.0		2.0	2.0
Lane Grp Cap (vph)		2705			875			215	231		198	271
v/s Ratio Prot		c0.31										
v/s Ratio Perm					c0.13			0.02	0.00		0.05	c0.09
v/c Ratio		0.40			0.45			0.13	0.02		0.36	0.60
Uniform Delay, d1		2.7			19.5			25.0	24.6		25.9	26.9
Progression Factor		0.15			1.00			1.00	1.00		1.00	1.00
Incremental Delay, d2		0.0			0.1			0.1	0.0		0.4	2.4
Delay (s)		0.4			19.6			25.1	24.6		26.3	29.3
Level of Service		A			B			C	C		C	C
Approach Delay (s)		0.4			19.6			24.9			28.4	
Approach LOS		A			B			C			C	

Intersection Summary			
HCM Average Control Delay	9.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	67.6	Sum of lost time (s)	6.0
Intersection Capacity Utilization	46.1%	ICU Level of Service	A
Analysis Period (min)	15		

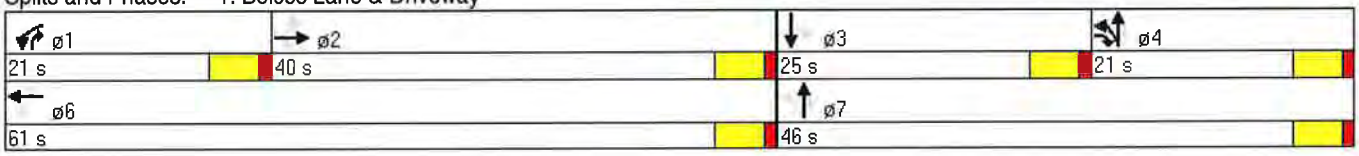
c Critical Lane Group

Lane Group	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT	ø7
Lane Configurations										
Volume (vph)	402	311	169	298	294	2	207	6	4	
Turn Type		pm+ov	pm+pt		pm+pt		pm+ov	Perm		
Protected Phases	2	4	1	6	4	7 4	1		3	7
Permitted Phases		2	6		7 4		7 4	3		
Detector Phase	2	4	1	6	4	7 4	1	3	3	
Switch Phase										
Minimum Initial (s)	10.0	3.0	3.0	10.0	3.0		3.0	5.0	5.0	5.0
Minimum Split (s)	15.0	8.0	8.0	15.0	8.0		8.0	10.0	10.0	10.0
Total Split (s)	40.0	21.0	21.0	61.0	21.0	67.0	21.0	25.0	25.0	46.0
Total Split (%)	37.4%	19.6%	19.6%	57.0%	19.6%	62.6%	19.6%	23.4%	23.4%	43%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lead/Lag	Lag	Lag	Lead		Lag		Lead	Lead	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes		Yes		Yes	Yes	Yes	
Recall Mode	Min	None	None	Min	None		None	None	None	None
Act Effct Green (s)	22.8	46.5	37.3	37.3		25.8	40.3	7.9	7.9	
Actuated g/C Ratio	0.32	0.65	0.52	0.52		0.36	0.56	0.11	0.11	
v/c Ratio	0.77	0.36	0.50	0.35		0.56	0.24	0.04	0.02	
Control Delay	34.3	3.2	15.7	12.6		24.5	3.2	38.3	38.0	
Queue Delay	0.0	0.0	0.0	0.1		0.0	0.0	0.0	0.0	
Total Delay	34.3	3.2	15.7	12.8		24.5	3.2	38.3	38.0	
LOS	C	A	B	B		C	A	D	D	
Approach Delay	20.7			13.8		15.7			38.2	
Approach LOS	C			B		B			D	

Intersection Summary

Cycle Length: 107
Actuated Cycle Length: 71.9
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.77
Intersection Signal Delay: 17.4
Intersection LOS: B
Intersection Capacity Utilization 63.6%
ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 1: Boices Lane & Driveway

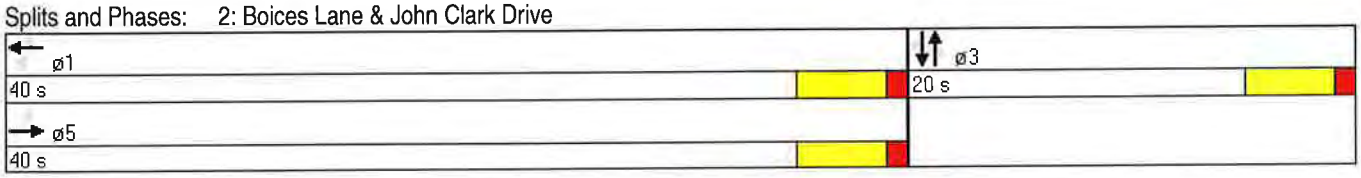


Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations											
Volume (vph)	142	439	13	281	13	25	6	10	23	6	161
Turn Type	Perm		Perm		Perm	Perm		Perm	Perm		Perm
Protected Phases		5		1			3			3	
Permitted Phases	5		1		1	3		3	3		3
Detector Phase	5	5	1	1	1	3	3	3	3	3	3
Switch Phase											
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	6.0	6.0	6.0	6.0	6.0	6.0
Minimum Split (s)	15.0	15.0	15.0	15.0	15.0	11.0	11.0	11.0	11.0	11.0	11.0
Total Split (s)	40.0	40.0	40.0	40.0	40.0	20.0	20.0	20.0	20.0	20.0	20.0
Total Split (%)	66.7%	66.7%	66.7%	66.7%	66.7%	33.3%	33.3%	33.3%	33.3%	33.3%	33.3%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0
Total Lost Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lead/Lag											
Lead-Lag Optimize?											
Recall Mode	Max	Max	Max	Max	Max	Max	Max	Max	Max	Max	Max
Act Effct Green (s)		37.0		37.0	37.0		17.0	17.0		17.0	17.0
Actuated g/C Ratio		0.62		0.62	0.62		0.28	0.28		0.28	0.28
v/c Ratio		0.38		0.30	0.01		0.08	0.02		0.07	0.27
Control Delay		6.4		6.4	2.5		16.5	9.2		16.4	4.5
Queue Delay		0.0		0.0	0.0		0.0	0.0		0.0	0.0
Total Delay		6.4		6.4	2.5		16.5	9.2		16.4	4.5
LOS		A		A	A		B	A		B	A
Approach Delay		6.4		6.2			14.7			6.4	
Approach LOS		A		A			B			A	

Intersection Summary

Cycle Length: 60
Actuated Cycle Length: 60
Offset: 10 (17%), Referenced to phase 2: and 6:, Start of Green
Natural Cycle: 40
Control Type: Pretimed
Maximum v/c Ratio: 0.38
Intersection Signal Delay: 6.6
Intersection LOS: A
Intersection Capacity Utilization 51.2%
ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 2: Boices Lane & John Clark Drive

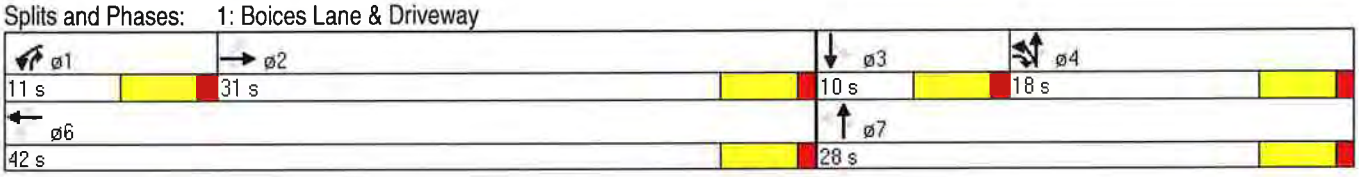


Lane Group	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT	ø7
Lane Configurations										
Volume (vph)	402	311	169	298	294	2	207	6	4	
Turn Type		pm+ov	pm+pt		pm+pt		pm+ov	Perm		
Protected Phases	2	4	1	6	4	7 4	1		3	7
Permitted Phases		2	6		7 4		7 4	3		
Detector Phase	2	4	1	6	4	7 4	1	3	3	
Switch Phase										
Minimum Initial (s)	10.0	3.0	3.0	10.0	3.0		3.0	5.0	5.0	5.0
Minimum Split (s)	15.0	8.0	8.0	15.0	8.0		8.0	10.0	10.0	10.0
Total Split (s)	31.0	18.0	11.0	42.0	18.0	46.0	11.0	10.0	10.0	28.0
Total Split (%)	44.3%	25.7%	15.7%	60.0%	25.7%	65.7%	15.7%	14.3%	14.3%	40%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lead/Lag	Lag	Lag	Lead		Lag		Lead	Lead	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes		Yes		Yes	Yes	Yes	
Recall Mode	C-Min	None	None	C-Min	None		None	None	None	None
Act Effct Green (s)	29.2	48.5	40.6	40.6		21.4	32.8	6.1	6.1	
Actuated g/C Ratio	0.42	0.69	0.58	0.58		0.31	0.47	0.09	0.09	
v/c Ratio	0.59	0.32	0.47	0.31		0.66	0.31	0.05	0.02	
Control Delay	21.0	1.2	9.9	5.3		27.9	12.1	30.2	29.8	
Queue Delay	0.0	0.0	0.0	0.3		0.0	0.0	0.0	0.0	
Total Delay	21.0	1.2	9.9	5.6		27.9	12.1	30.2	29.8	
LOS	C	A	A	A		C	B	C	C	
Approach Delay	12.4			7.2		21.4			30.0	
Approach LOS	B			A		C			C	

Intersection Summary

Cycle Length: 70
Actuated Cycle Length: 70
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow, Master Intersection
Natural Cycle: 50
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.66
Intersection Signal Delay: 13.7
Intersection LOS: B
Intersection Capacity Utilization 63.6%
ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 1: Boices Lane & Driveway

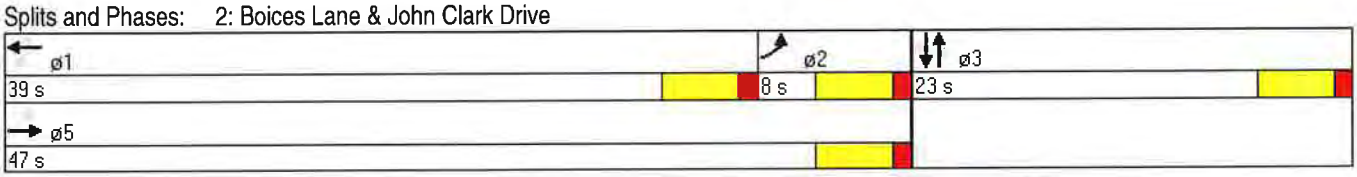


Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations											
Volume (vph)	142	439	13	281	13	25	6	10	23	6	161
Turn Type	pm+pt		Perm		Perm	Perm		Perm	Perm		Perm
Protected Phases	2	5		1			3			3	
Permitted Phases	5		1		1	3		3	3		3
Detector Phase	2	5	1	1	1	3	3	3	3	3	3
Switch Phase											
Minimum Initial (s)	3.0	10.0	10.0	10.0	10.0	6.0	6.0	6.0	6.0	6.0	6.0
Minimum Split (s)	8.0	15.0	15.0	15.0	15.0	11.0	11.0	11.0	11.0	11.0	11.0
Total Split (s)	8.0	47.0	39.0	39.0	39.0	23.0	23.0	23.0	23.0	23.0	23.0
Total Split (%)	11.4%	67.1%	55.7%	55.7%	55.7%	32.9%	32.9%	32.9%	32.9%	32.9%	32.9%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0
Total Lost Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lead/Lag	Lag		Lead	Lead	Lead						
Lead-Lag Optimize?	Yes		Yes	Yes	Yes						
Recall Mode	Min	C-Min	C-Min	C-Min	C-Min	None	None	None	None	None	None
Act Effct Green (s)		50.8		41.3	41.3		13.2	13.2		13.2	13.2
Actuated g/C Ratio		0.73		0.59	0.59		0.19	0.19		0.19	0.19
v/c Ratio		0.32		0.32	0.02		0.12	0.04		0.11	0.51
Control Delay		1.6		9.2	4.2		22.7	11.5		22.6	30.0
Queue Delay		0.0		0.0	0.0		0.0	0.0		0.0	0.0
Total Delay		1.6		9.2	4.2		22.7	11.5		22.6	30.0
LOS		A		A	A		C	B		C	C
Approach Delay		1.6		9.0			20.0			28.8	
Approach LOS		A		A			B			C	

Intersection Summary

Cycle Length: 70
Actuated Cycle Length: 70
Offset: 64 (91%), Referenced to phase 1:WBTL and 5:EBTL, Start of Green
Natural Cycle: 40
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.51
Intersection Signal Delay: 8.7
Intersection LOS: A
Intersection Capacity Utilization 51.2%
ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 2: Boices Lane & John Clark Drive

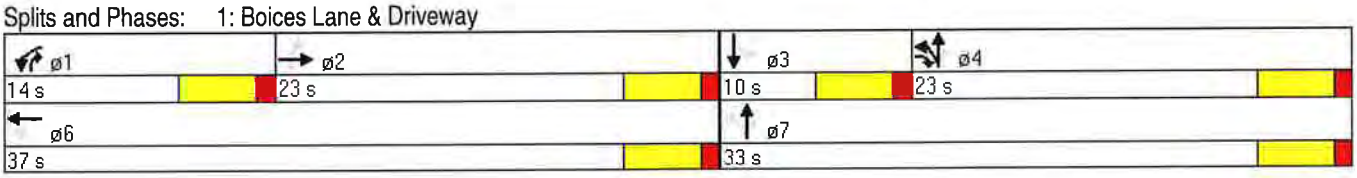


Lane Group	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT	ø7
Lane Configurations										
Volume (vph)	402	311	169	298	294	2	207	6	4	
Turn Type		pm+ov	pm+pt		pm+pt		pm+ov	Perm		
Protected Phases	2	4	1	6	4	7 4	1		3	7
Permitted Phases		2	6		7 4		7 4	3		
Detector Phase	2	4	1	6	4	7 4	1	3	3	
Switch Phase										
Minimum Initial (s)	10.0	3.0	3.0	10.0	3.0		3.0	5.0	5.0	5.0
Minimum Split (s)	15.0	8.0	8.0	15.0	8.0		8.0	10.0	10.0	10.0
Total Split (s)	23.0	23.0	14.0	37.0	23.0	56.0	14.0	10.0	10.0	33.0
Total Split (%)	32.9%	32.9%	20.0%	52.9%	32.9%	80.0%	20.0%	14.3%	14.3%	47%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lead/Lag	Lag	Lag	Lead		Lag		Lead	Lead	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes		Yes		Yes	Yes	Yes	
Recall Mode	C-Min	None	None	C-Min	None		None	None	None	None
Act Effct Green (s)	26.2	46.9	39.1	39.1		22.9	35.8	6.3	6.3	
Actuated g/C Ratio	0.37	0.67	0.56	0.56		0.33	0.51	0.09	0.09	
v/c Ratio	0.35	0.32	0.37	0.33		0.61	0.29	0.05	0.02	
Control Delay	18.9	1.4	7.8	6.4		24.4	9.5	29.7	29.2	
Queue Delay	0.0	0.0	0.0	0.3		0.0	0.0	0.0	0.0	
Total Delay	18.9	1.4	7.8	6.7		24.4	9.5	29.7	29.2	
LOS	B	A	A	A		C	A	C	C	
Approach Delay	11.2			7.1		18.2			29.5	
Approach LOS	B			A		B			C	

Intersection Summary

Cycle Length: 70
Actuated Cycle Length: 70
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow, Master Intersection
Natural Cycle: 45
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.61
Intersection Signal Delay: 12.3
Intersection LOS: B
Intersection Capacity Utilization 62.1%
ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 1: Boices Lane & Driveway

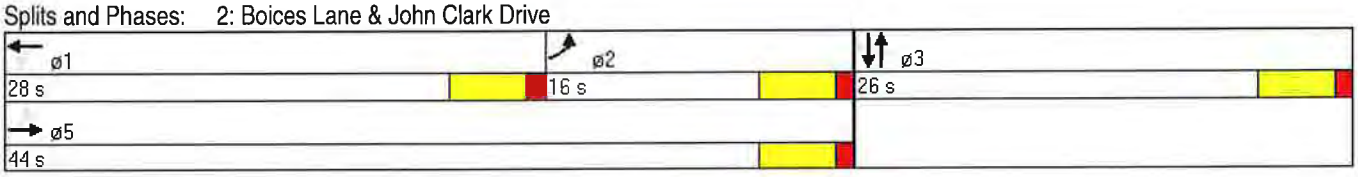


Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations										
Volume (vph)	142	439	13	281	25	6	10	23	6	161
Turn Type	pm+pt		Perm		Perm		Perm	Perm		Perm
Protected Phases	2	5		1		3			3	
Permitted Phases	5		1		3		3	3		3
Detector Phase	2	5	1	1	3	3	3	3	3	3
Switch Phase										
Minimum Initial (s)	3.0	10.0	10.0	10.0	6.0	6.0	6.0	6.0	6.0	6.0
Minimum Split (s)	8.0	15.0	15.0	15.0	11.0	11.0	11.0	11.0	11.0	11.0
Total Split (s)	16.0	44.0	28.0	28.0	26.0	26.0	26.0	26.0	26.0	26.0
Total Split (%)	22.9%	62.9%	40.0%	40.0%	37.1%	37.1%	37.1%	37.1%	37.1%	37.1%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0
Total Lost Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lead/Lag	Lag		Lead	Lead						
Lead-Lag Optimize?	Yes		Yes	Yes						
Recall Mode	Min	C-Min	C-Min	C-Min	None	None	None	None	None	None
Act Effct Green (s)		50.8		41.3		13.2	13.2		13.2	13.2
Actuated g/C Ratio		0.73		0.59		0.19	0.19		0.19	0.19
v/c Ratio		0.32		0.18		0.12	0.04		0.11	0.51
Control Delay		2.3		7.5		22.6	11.4		22.5	29.8
Queue Delay		0.0		0.0		0.0	0.0		0.0	0.0
Total Delay		2.3		7.5		22.6	11.4		22.5	29.8
LOS		A		A		C	B		C	C
Approach Delay		2.3		7.5		19.9			28.7	
Approach LOS		A		A		B			C	

Intersection Summary

Cycle Length: 70
Actuated Cycle Length: 70
Offset: 2 (3%), Referenced to phase 1:WBTL and 5:EBTL, Start of Green
Natural Cycle: 40
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.51
Intersection Signal Delay: 8.7
Intersection LOS: A
Intersection Capacity Utilization 49.0%
ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 2: Boices Lane & John Clark Drive

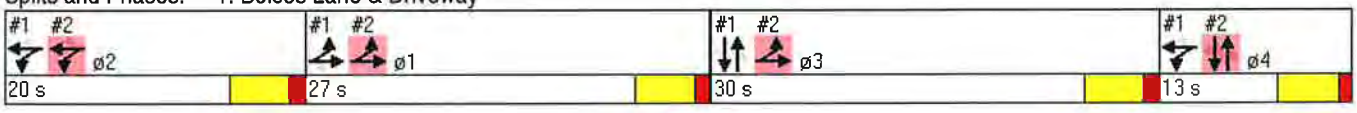


Lane Group	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT	ø2	ø4
Lane Configurations											
Volume (vph)	402	311	169	298	294	2	207	6	4		
Turn Type		Perm	Split		Perm		Perm	Perm			
Protected Phases	1		2 4	2 4		3			3	2	4
Permitted Phases		1			3		3	3			
Detector Phase	1	1	2 4	2 4	3	3	3	3	3		
Switch Phase											
Minimum Initial (s)	3.0	3.0			5.0	5.0	5.0	5.0	5.0	3.0	5.0
Minimum Split (s)	8.0	8.0			10.0	10.0	10.0	10.0	10.0	8.0	10.0
Total Split (s)	27.0	27.0	33.0	33.0	30.0	30.0	30.0	30.0	30.0	20.0	13.0
Total Split (%)	30.0%	30.0%	36.7%	36.7%	33.3%	33.3%	33.3%	33.3%	33.3%	22%	14%
Yellow Time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0			1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0		
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		
Lead/Lag	Lag	Lag			Lead	Lead	Lead	Lead	Lead	Lead	Lag
Lead-Lag Optimize?	Yes	Yes			Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	C-Min	C-Min			None	None	None	None	None	None	None
Act Effct Green (s)	23.0	23.0	29.8	29.8		25.2	25.2	25.2	25.2		
Actuated g/C Ratio	0.26	0.26	0.33	0.33		0.28	0.28	0.28	0.28		
v/c Ratio	0.96	0.60	0.33	0.55		0.92	0.53	0.05	0.01		
Control Delay	68.1	11.0	13.0	14.0		64.4	32.1	24.3	23.0		
Queue Delay	0.0	0.0	0.0	0.6		0.0	0.0	0.0	0.0		
Total Delay	68.1	11.0	13.0	14.6		64.4	32.1	24.3	23.0		
LOS	E	B	B	B		E	C	C	C		
Approach Delay	43.2			14.0		51.1			23.8		
Approach LOS	D			B		D			C		

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 1:EBTL, Start of Yellow, Master Intersection
Natural Cycle: 75
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.96
Intersection Signal Delay: 37.4
Intersection LOS: D
Intersection Capacity Utilization 63.6%
ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 1: Boices Lane & Driveway

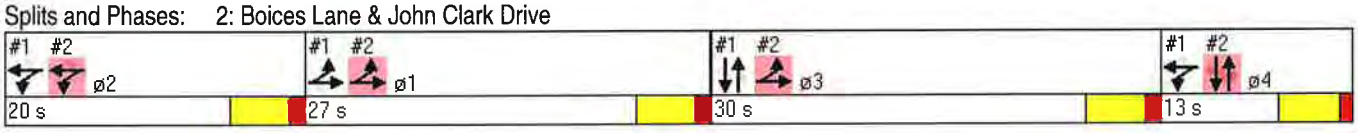


Lane Group	EBT	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	ø1	ø3
Lane Configurations											
Volume (vph)	439	281	13	25	6	10	23	6	161		
Turn Type			Perm	Perm		Perm	Perm		Perm		
Protected Phases	1 3	2			4			4		1	3
Permitted Phases			2	4		4	4		4		
Detector Phase	1 3	2	2	4	4	4	4	4	4		
Switch Phase											
Minimum Initial (s)		3.0	3.0	5.0	5.0	5.0	5.0	5.0	5.0	3.0	5.0
Minimum Split (s)		8.0	8.0	10.0	10.0	10.0	10.0	10.0	10.0	8.0	10.0
Total Split (s)	57.0	20.0	20.0	13.0	13.0	13.0	13.0	13.0	13.0	27.0	30.0
Total Split (%)	63.3%	22.2%	22.2%	14.4%	14.4%	14.4%	14.4%	14.4%	14.4%	30%	33%
Yellow Time (s)		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0		
Total Lost Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		
Lead/Lag		Lead	Lead	Lag	Lag	Lag	Lag	Lag	Lag	Lag	Lead
Lead-Lag Optimize?		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode		None	None	None	None	None	None	None	None	C-Min	None
Act Effct Green (s)	53.2	17.2	17.2		10.6	10.6		10.6	10.6		
Actuated g/C Ratio	0.59	0.19	0.19		0.12	0.12		0.12	0.12		
v/c Ratio	0.32	0.95	0.05		0.20	0.06		0.19	0.81		
Control Delay	0.7	77.0	15.0		39.7	19.9		39.4	69.0		
Queue Delay	0.3	0.0	0.0		0.0	0.0		0.0	0.0		
Total Delay	1.1	77.0	15.0		39.7	19.9		39.4	69.0		
LOS	A	E	B		D	B		D	E		
Approach Delay	1.1	74.4			34.9			64.4			
Approach LOS	A	E			C			E			

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 1:EBTL, Start of Yellow, Master Intersection
Natural Cycle: 75
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.96
Intersection Signal Delay: 32.2
Intersection LOS: C
Intersection Capacity Utilization 51.2%
ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 2: Boices Lane & John Clark Drive

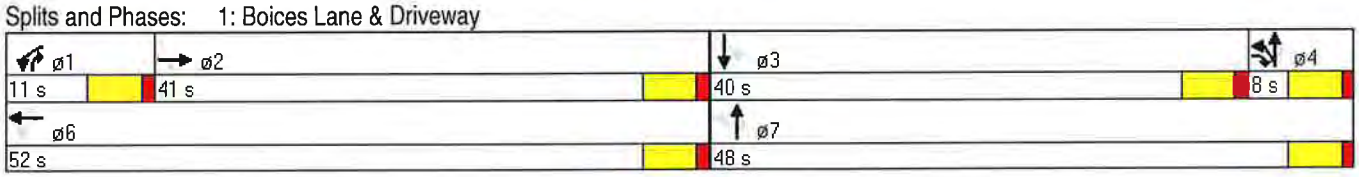


Lane Group	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	ø7
Lane Configurations											
Volume (vph)	646	410	206	431	72	366	34	254	199	92	
Turn Type		pm+ov	pm+pt		Perm	pm+pt		pm+ov	Perm		
Protected Phases	2	4	1	6		4	7 4	1		3	7
Permitted Phases		2	6		6	7 4		7 4	3		
Detector Phase	2	4	1	6	6	4	7 4	1	3	3	
Switch Phase											
Minimum Initial (s)	10.0	3.0	3.0	10.0	10.0	3.0		3.0	5.0	5.0	5.0
Minimum Split (s)	15.0	8.0	8.0	15.0	15.0	8.0		8.0	10.0	10.0	10.0
Total Split (s)	41.0	8.0	11.0	52.0	52.0	8.0	56.0	11.0	40.0	40.0	48.0
Total Split (%)	41.0%	8.0%	11.0%	52.0%	52.0%	8.0%	56.0%	11.0%	40.0%	40.0%	48%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lead/Lag	Lag	Lag	Lead			Lag		Lead	Lead	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes			Yes		Yes	Yes	Yes	
Recall Mode	C-Min	None	None	C-Min	C-Min	None		None	None	None	None
Act Effct Green (s)	37.0	41.0	48.0	48.0	48.0		44.0	55.0	36.0	36.0	
Actuated g/C Ratio	0.37	0.41	0.48	0.48	0.48		0.44	0.55	0.36	0.36	
v/c Ratio	1.07	0.62	1.17	0.55	0.10		0.87	0.33	1.12	0.20	
Control Delay	85.9	11.7	144.5	20.3	5.9		45.2	13.7	133.6	20.3	
Queue Delay	0.0	0.0	0.0	3.2	0.0		0.0	0.0	40.2	0.0	
Total Delay	85.9	11.7	144.5	23.5	5.9		45.2	13.7	173.8	20.3	
LOS	F	B	F	C	A		D	B	F	C	
Approach Delay	57.1			56.9			33.0			116.7	
Approach LOS	E			E			C			F	

Intersection Summary

Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBTL, Start of Yellow, Master Intersection
Natural Cycle: 100
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.17
Intersection Signal Delay: 58.2
Intersection LOS: E
Intersection Capacity Utilization 84.1%
ICU Level of Service E
Analysis Period (min) 15

Splits and Phases: 1: Boices Lane & Driveway

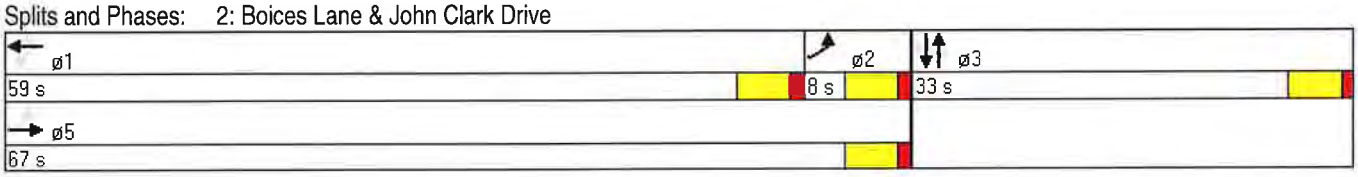


Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations											
Volume (vph)	202	855	13	469	18	29	7	12	28	7	211
Turn Type	pm+pt		Perm		Perm	Perm		Perm	Perm		Perm
Protected Phases	2	5		1			3			3	
Permitted Phases	5		1		1	3		3	3		3
Detector Phase	2	5	1	1	1	3	3	3	3	3	3
Switch Phase											
Minimum Initial (s)	3.0	10.0	10.0	10.0	10.0	6.0	6.0	6.0	6.0	6.0	6.0
Minimum Split (s)	8.0	15.0	15.0	15.0	15.0	11.0	11.0	11.0	11.0	11.0	11.0
Total Split (s)	8.0	67.0	59.0	59.0	59.0	33.0	33.0	33.0	33.0	33.0	33.0
Total Split (%)	8.0%	67.0%	59.0%	59.0%	59.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0
Total Lost Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lead/Lag	Lag		Lead	Lead	Lead						
Lead-Lag Optimize?	Yes		Yes	Yes	Yes						
Recall Mode	Min	C-Min	C-Min	C-Min	C-Min	None	None	None	None	None	None
Act Effct Green (s)		74.9		63.4	63.4		19.1	19.1		19.1	19.1
Actuated g/C Ratio		0.75		0.63	0.63		0.19	0.19		0.19	0.19
v/c Ratio		0.63		0.49	0.02		0.14	0.04		0.13	0.65
Control Delay		10.5		13.3	4.5		32.5	14.2		32.3	45.8
Queue Delay		2.9		0.1	0.0		0.0	0.0		0.0	0.0
Total Delay		13.4		13.4	4.5		32.5	14.2		32.3	45.8
LOS		B		B	A		C	B		C	D
Approach Delay		13.4		13.1			28.0			43.9	
Approach LOS		B		B			C			D	

Intersection Summary

Cycle Length: 100
Actuated Cycle Length: 100
Offset: 18 (18%), Referenced to phase 1:WBTL and 5:EBTL, Start of Green
Natural Cycle: 45
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.65
Intersection Signal Delay: 17.6
Intersection LOS: B
Intersection Capacity Utilization 74.9%
ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 2: Boices Lane & John Clark Drive

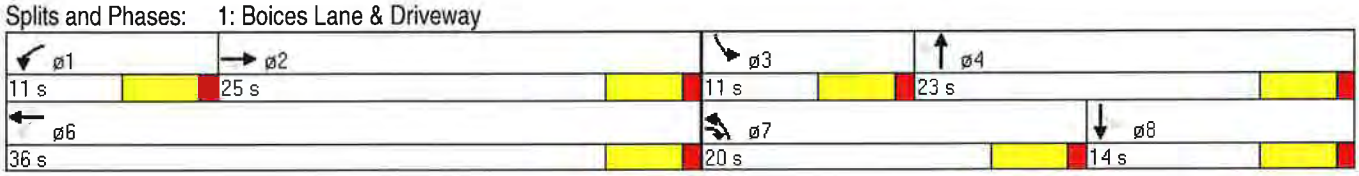


Lane Group	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations									
Volume (vph)	646	410	206	431	72	366	34	199	92
Turn Type		pm+ov	pm+pt		Perm	pm+pt		pm+pt	
Protected Phases	2	7	1	6		7	4	3	8
Permitted Phases		2	6		6	4		8	
Detector Phase	2	7	1	6	6	7	4	3	8
Switch Phase									
Minimum Initial (s)	10.0	3.0	3.0	10.0	10.0	3.0	3.0	5.0	3.0
Minimum Split (s)	15.0	8.0	8.0	15.0	15.0	8.0	8.0	10.0	8.0
Total Split (s)	25.0	20.0	11.0	36.0	36.0	20.0	23.0	11.0	14.0
Total Split (%)	35.7%	28.6%	15.7%	51.4%	51.4%	28.6%	32.9%	15.7%	20.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lag	Lead	Lead			Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes			Yes	Yes	Yes	Yes
Recall Mode	C-Min	None	None	C-Min	C-Min	None	None	None	None
Act Effct Green (s)	20.5	38.8	32.1	32.1	32.1	29.9	17.5	16.7	9.5
Actuated g/C Ratio	0.29	0.55	0.46	0.46	0.46	0.43	0.25	0.24	0.14
v/c Ratio	0.71	0.49	0.77	0.57	0.11	0.73	0.83	0.68	0.51
Control Delay	26.7	4.3	36.5	15.4	3.1	25.1	44.5	29.0	31.6
Queue Delay	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0
Total Delay	26.7	4.3	36.5	15.9	3.1	25.1	44.5	29.0	31.6
LOS	C	A	D	B	A	C	D	C	C
Approach Delay	18.0			20.6			33.6		30.0
Approach LOS	B			C			C		C

Intersection Summary

Cycle Length: 70
Actuated Cycle Length: 70
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBTL, Start of Yellow, Master Intersection
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.83
Intersection Signal Delay: 23.8
Intersection LOS: C
Intersection Capacity Utilization 71.1%
ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 1: Boices Lane & Driveway

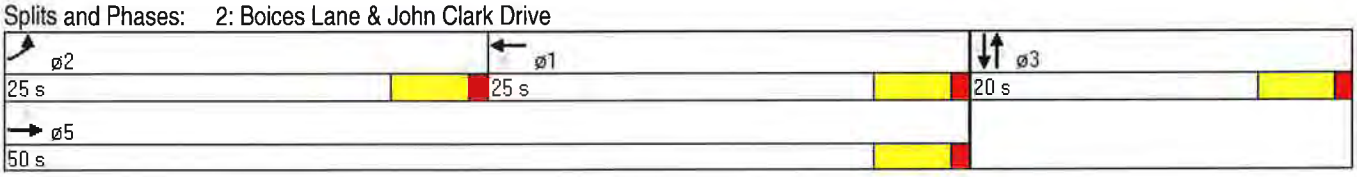


Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations										
Volume (vph)	202	855	13	469	29	7	12	28	7	211
Turn Type	pm+pt		Perm		Perm		Perm	Perm		Perm
Protected Phases	2	5		1		3			3	
Permitted Phases	5		1		3		3	3		3
Detector Phase	2	5	1	1	3	3	3	3	3	3
Switch Phase										
Minimum Initial (s)	3.0	10.0	10.0	10.0	6.0	6.0	6.0	6.0	6.0	6.0
Minimum Split (s)	8.0	15.0	15.0	15.0	11.0	11.0	11.0	11.0	11.0	11.0
Total Split (s)	25.0	50.0	25.0	25.0	20.0	20.0	20.0	20.0	20.0	20.0
Total Split (%)	35.7%	71.4%	35.7%	35.7%	28.6%	28.6%	28.6%	28.6%	28.6%	28.6%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0
Total Lost Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lead/Lag	Lead		Lag	Lag						
Lead-Lag Optimize?	Yes		Yes	Yes						
Recall Mode	Min	C-Min	C-Min	C-Min	None	None	None	None	None	None
Act Effct Green (s)		49.6		40.1		14.4	14.4		14.4	14.4
Actuated g/C Ratio		0.71		0.57		0.21	0.21		0.21	0.21
v/c Ratio		0.64		0.31		0.13	0.04		0.12	0.61
Control Delay		6.3		8.7		22.5	11.3		22.4	32.1
Queue Delay		0.5		0.0		0.0	0.0		0.0	0.0
Total Delay		6.8		8.7		22.5	11.3		22.4	32.1
LOS		A		A		C	B		C	C
Approach Delay		6.8		8.7		19.8			30.7	
Approach LOS		A		A		B			C	

Intersection Summary

Cycle Length: 70
Actuated Cycle Length: 70
Offset: 62 (89%), Referenced to phase 1:WBTL and 5:EBTL, Start of Green
Natural Cycle: 40
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.64
Intersection Signal Delay: 10.7
Intersection LOS: B
Intersection Capacity Utilization 63.4%
ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 2: Boices Lane & John Clark Drive

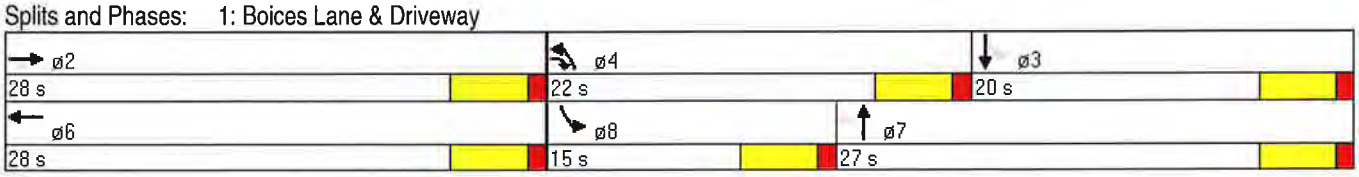


Lane Group	EBT	EBR	WBT	NBL	NBT	SBL	SBT
Lane Configurations							
Volume (vph)	646	410	431	366	34	199	298
Turn Type		pm+ov		pm+pt		pm+pt	
Protected Phases	2	4	6	4	7	8	3
Permitted Phases		2		7		3	
Detector Phase	2	4	6	4	7	8	3
Switch Phase							
Minimum Initial (s)	10.0	3.0	10.0	3.0	5.0	3.0	5.0
Minimum Split (s)	15.0	8.0	15.0	8.0	10.0	8.0	10.0
Total Split (s)	28.0	22.0	28.0	22.0	27.0	15.0	20.0
Total Split (%)	40.0%	31.4%	40.0%	31.4%	38.6%	21.4%	28.6%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag		Lead		Lead	Lag	Lead	Lag
Lead-Lag Optimize?		Yes		Yes	Yes	Yes	Yes
Recall Mode	C-Min	None	C-Min	None	None	None	None
Act Effct Green (s)	25.8	42.1	25.8	36.2	22.5	25.7	15.9
Actuated g/C Ratio	0.37	0.60	0.37	0.52	0.32	0.37	0.23
v/c Ratio	0.56	0.50	0.71	0.83	0.65	0.47	0.86
Control Delay	20.3	5.8	25.4	30.2	27.3	13.6	48.5
Queue Delay	0.0	0.0	0.6	0.0	0.0	0.0	0.0
Total Delay	20.3	5.8	26.1	30.2	27.3	13.6	48.5
LOS	C	A	C	C	C	B	D
Approach Delay	14.7		26.1		28.9		35.2
Approach LOS	B		C		C		D

Intersection Summary

Cycle Length: 70
Actuated Cycle Length: 70
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow, Master Intersection
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.86
Intersection Signal Delay: 24.0
Intersection LOS: C
Intersection Capacity Utilization 70.2%
ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 1: Boices Lane & Driveway

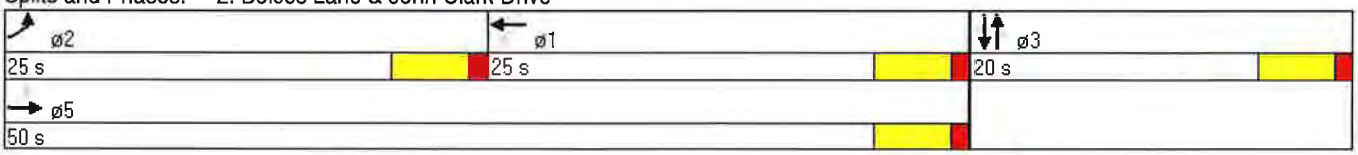


Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations										
Volume (vph)	202	855	13	469	29	7	12	28	7	211
Turn Type	pm+pt		Perm		Perm		Perm	Perm		Perm
Protected Phases	2	5		1		3			3	
Permitted Phases	5		1		3		3	3		3
Detector Phase	2	5	1	1	3	3	3	3	3	3
Switch Phase										
Minimum Initial (s)	3.0	10.0	10.0	10.0	6.0	6.0	6.0	6.0	6.0	6.0
Minimum Split (s)	8.0	15.0	15.0	15.0	11.0	11.0	11.0	11.0	11.0	11.0
Total Split (s)	25.0	50.0	25.0	25.0	20.0	20.0	20.0	20.0	20.0	20.0
Total Split (%)	35.7%	71.4%	35.7%	35.7%	28.6%	28.6%	28.6%	28.6%	28.6%	28.6%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0
Total Lost Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lead/Lag	Lead		Lag	Lag						
Lead-Lag Optimize?	Yes		Yes	Yes						
Recall Mode	Min	C-Min	C-Min	C-Min	None	None	None	None	None	None
Act Effct Green (s)		49.6		40.1		14.4	14.4		14.4	14.4
Actuated g/C Ratio		0.71		0.57		0.21	0.21		0.21	0.21
v/c Ratio		0.64		0.31		0.13	0.04		0.12	0.61
Control Delay		5.4		8.7		22.5	11.3		22.4	32.1
Queue Delay		0.2		0.0		0.0	0.0		0.0	0.0
Total Delay		5.7		8.8		22.5	11.3		22.4	32.1
LOS		A		A		C	B		C	C
Approach Delay		5.7		8.8		19.8			30.7	
Approach LOS		A		A		B			C	

Intersection Summary

Cycle Length: 70
Actuated Cycle Length: 70
Offset: 62 (89%), Referenced to phase 1:WBTL and 5:EBTL, Start of Green
Natural Cycle: 40
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.64
Intersection Signal Delay: 10.1
Intersection LOS: B
Intersection Capacity Utilization 63.4%
ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 2: Boices Lane & John Clark Drive

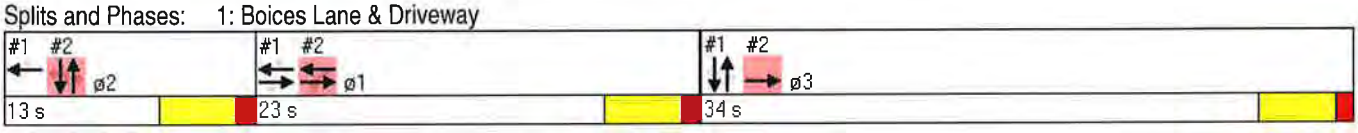


Lane Group	EBT	EBR	WBT	WBR	NBL	NBT	SBL	SBT	ø2
Lane Configurations									
Volume (vph)	586	410	431	72	366	34	179	92	
Turn Type		Perm		Perm	Perm		Perm		
Protected Phases	1		1 2			3		3	2
Permitted Phases		1		1 2	3		3		
Detector Phase	1	1	1 2	1 2	3	3	3	3	
Switch Phase									
Minimum Initial (s)	10.0	10.0			5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	15.0	15.0			10.0	10.0	10.0	10.0	10.0
Total Split (s)	23.0	23.0	36.0	36.0	34.0	34.0	34.0	34.0	13.0
Total Split (%)	32.9%	32.9%	51.4%	51.4%	48.6%	48.6%	48.6%	48.6%	19%
Yellow Time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0			1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lead/Lag	Lag	Lag							Lead
Lead-Lag Optimize?	Yes	Yes							Yes
Recall Mode	Min	Min			None	None	None	None	None
Act Effct Green (s)	18.8	18.8	31.8	31.8	27.8	27.8	27.8	27.8	
Actuated g/C Ratio	0.28	0.28	0.47	0.47	0.41	0.41	0.41	0.41	
v/c Ratio	0.68	0.64	0.56	0.11	0.84	0.47	0.54	0.18	
Control Delay	26.6	7.0	6.5	0.3	35.5	17.4	21.5	10.7	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	26.6	7.0	6.5	0.3	35.5	17.4	21.5	10.7	
LOS	C	A	A	A	D	B	C	B	
Approach Delay	18.5		5.6			27.8		17.2	
Approach LOS	B		A			C		B	

Intersection Summary

Cycle Length: 70
Actuated Cycle Length: 67.7
Natural Cycle: 55
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.84
Intersection Signal Delay: 18.1
Intersection LOS: B
Intersection Capacity Utilization 59.4%
ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 1: Boices Lane & Driveway

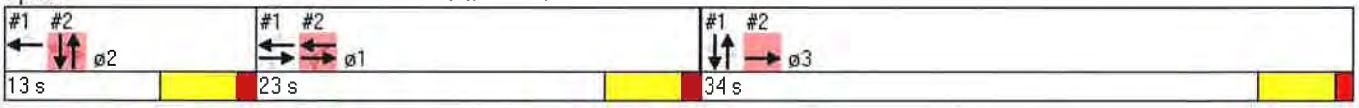


Lane Group	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR	ø3
Lane Configurations										
Volume (vph)	957	13	335	19	7	22	59	7	149	
Turn Type		Perm		Perm		Perm	Perm		Perm	
Protected Phases	1 3		1		2			2		3
Permitted Phases		1		2		2	2		2	
Detector Phase	1 3	1	1	2	2	2	2	2	2	
Switch Phase										
Minimum Initial (s)		10.0	10.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)		15.0	15.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Total Split (s)	57.0	23.0	23.0	13.0	13.0	13.0	13.0	13.0	13.0	34.0
Total Split (%)	81.4%	32.9%	32.9%	18.6%	18.6%	18.6%	18.6%	18.6%	18.6%	49%
Yellow Time (s)		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	-2.0	
Total Lost Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lead/Lag		Lag	Lag	Lead	Lead	Lead	Lead	Lead	Lead	
Lead-Lag Optimize?		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Recall Mode		Min	Min	None	None	None	None	None	None	None
Act Effct Green (s)	51.6		19.8		10.0	10.0		10.0	10.0	
Actuated g/C Ratio	0.76		0.29		0.15	0.15		0.15	0.15	
v/c Ratio	0.40		0.45		0.13	0.10		0.36	0.60	
Control Delay	0.8		21.7		28.0	12.5		33.1	38.6	
Queue Delay	0.2		0.0		0.0	0.0		0.0	0.0	
Total Delay	0.9		21.7		28.0	12.5		33.1	38.6	
LOS	A		C		C	B		C	D	
Approach Delay	0.9		21.7		21.0			36.9		
Approach LOS	A		C		C			D		

Intersection Summary

Cycle Length: 70
Actuated Cycle Length: 67.7
Natural Cycle: 55
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.84
Intersection Signal Delay: 11.0
Intersection LOS: B
Intersection Capacity Utilization 46.1%
ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 2: Boices Lane & John Clark Drive



Appendix D

CSX Train Schedule

Railroad Crossing Study
Boices Lane
Town of Ulster, Ulster County, New York

Information provided via email from Robert Rohauer at CSX on September 24, 2012

This is a list of the number of trains we have regularly scheduled each week through this area –

Day of week	Total / Day	/ Day	/ Day
Monday:	23	12	11
Tuesday:	27	12	15
Wednesday:	30	14	16
Thursday:	31	15	16
Friday:	29	14	15
Saturday:	27	14	13
Sunday:	24	13	11
Week Totals	191	94	97

The totals are broken down into Southward (94) and Northward (97) respectively. Please keep in mind that these are just the regularly run trains. We also have numerous additional "extra' trains such as ethanol loads (south) and empties (north).

I asked our network folks to run the actual train movement numbers for the month of August –

Date	Moves	Avg Length
8/1/2012	31	5684
8/2/2012	30	5671
8/3/2012	30	5142
8/4/2012	29	6070
8/5/2012	25	6273
8/6/2012	21	5565
8/7/2012	31	4888
8/8/2012	32	5418
8/9/2012	33	5271
8/10/2012	29	5187
8/11/2012	22	6785
8/12/2012	25	5715
8/13/2012	22	5239
8/14/2012	34	4550
8/15/2012	31	5456
8/16/2012	31	5266
8/17/2012	29	5609
8/18/2012	28	5996
8/19/2012	24	5965
8/20/2012	23	5513
8/21/2012	31	5116
8/22/2012	33	5328
8/23/2012	31	5173
8/24/2012	31	5408
8/25/2012	31	6085
8/26/2012	23	5684
8/27/2012	25	4883
8/28/2012	29	5311
8/29/2012	35	5079
8/30/2012	32	5459
8/31/2012	32	4644

We included the average train length in feet to give you a better feel for how long a train would take to clear the crossing. Maximum authorized train speed is 50 mph for trains travelling along the single track main.

Appendix E

Preferred Alternative
Planning Level Cost Estimate

Railroad Crossing Study
Boices Lane
Town of Ulster, Ulster County, New York

112-023 - Boices Lane Intersection Improvements
30-Sep-13

Description of Major Improvements:
Provide additional eastbound thru lane (East Drive Intersection)
Coordinate/replace traffic signals
Maintain separate left-turn, thru, rights-turn lanes on WB approach (East Drive Intersection)
Restripe NB approach for left-turn lane and shared thru/right-turn lane (East Drive intersection)
Restripe WB approach for shared left-turn/thru lane and shared thru/right-turn lane (John Clark Drive intersection)

Approximate ROW required: **16800** **SF** **0.3862** **Acres**

ITEM DESCRIPTION	UNITS	PRICE	QUANTITY	TOTAL
EAST DRIVE INTERSECTION				
UNCLASSIFIED EXCAVATION AND DISPOSAL	CY	$20.00	1,530	$30,592.59
EMBANKMENT IN PLACE	CY	$16.00	611	$9,777.78
PAVEMENT - FULL DEPTH (BOX-OUT WIDENING)	SF	$8.00	20,650	$165,200.00
PAVEMENT - MILL AND FILL	SF	$4.00	27,425	$109,700.00
CURBING	LF	$40.00	850	$34,000.00
PEDESTRIAN IMPROVEMENTS (PED SIGNALS AND CROSSWALKS)	LS	$50,000.00	1	$50,000.00
NEW SIGNAL @ EAST DRIVEWAY	LS	$150,000.00	1	$150,000.00
SIGNING AND PAVEMENT MARKINGS	LS	$20,000.00	1	$20,000.00
MODIFY CLOSED DRAINAGE SYSTEM	LS	$50,000.00	1	$50,000.00
UTILITY RELOCATIONS	LS	$12,500.00	6	$75,000.00
RAILROAD CROSSING				
PAVEMENT - FULL DEPTH (BETWEEN ROW LINES)	SF	$8.00	3,725	$29,800.00
SIDEWALKS	SF	$6.50	2,750	$17,875.00
PEDESTRIAN TRAIN CROSSING IMPROVEMENTS	LS	$50,000.00	1	$50,000.00
NEW GATES, FLASHERS, SIGNS, AND COORDINATION WITH SIGNALS	LS	$500,000.00	1	$500,000.00
SIGNING AND PAVEMENT MARKINGS	LS	$8,000.00	1	$8,000.00
JOHN CLARK DRIVE INTERSECTION				
PAVEMENT - MILL AND FILL	SF	$4.00	27,800	$111,200.00
PEDESTRIAN IMPROVEMENTS (PED SIGNALS AND CROSSWALKS)	LS	$50,000.00	1	$50,000.00
NEW SIGNAL @ JOHN CLARK DRIVE	LS	$150,000.00	1	$150,000.00
SIGNING AND PAVEMENT MARKINGS	LS	$10,000.00	1	$10,000.00

SUB-TOTALS (2009 DOLLARS)	$1,621,145.37
SUB-TOTALS (2013 DOLLARS +9%)	$1,767,048.45

CONSTRUCTION SUBTOTAL:	$	1,768,000
CONTINGENCY (20%)	$	353,600
MAINT.AND PROT. OF TRAFFIC (5%)	$	88,400
SURVEY AND STAKEOUT (4%)	$	70,720
PERMITS/SWPP (1.5%)	$	26,520
LEGAL/ADMIN (2%)	$	35,360
4% MOBILIZATION	$	70,720
CONSTRUCTION TOTAL:	$	2,413,400
ENGINEERING DESIGN-DETAILED PHASE (18%)	$	434,500
INSPECTION AND CONTRACT ADMINISTRATION (12%)	$	289,700
PROJECT SUBTOTAL:	$	3,137,600
ROW	$	10,000
PROJECT TOTAL:	**$**	**3,148,000**