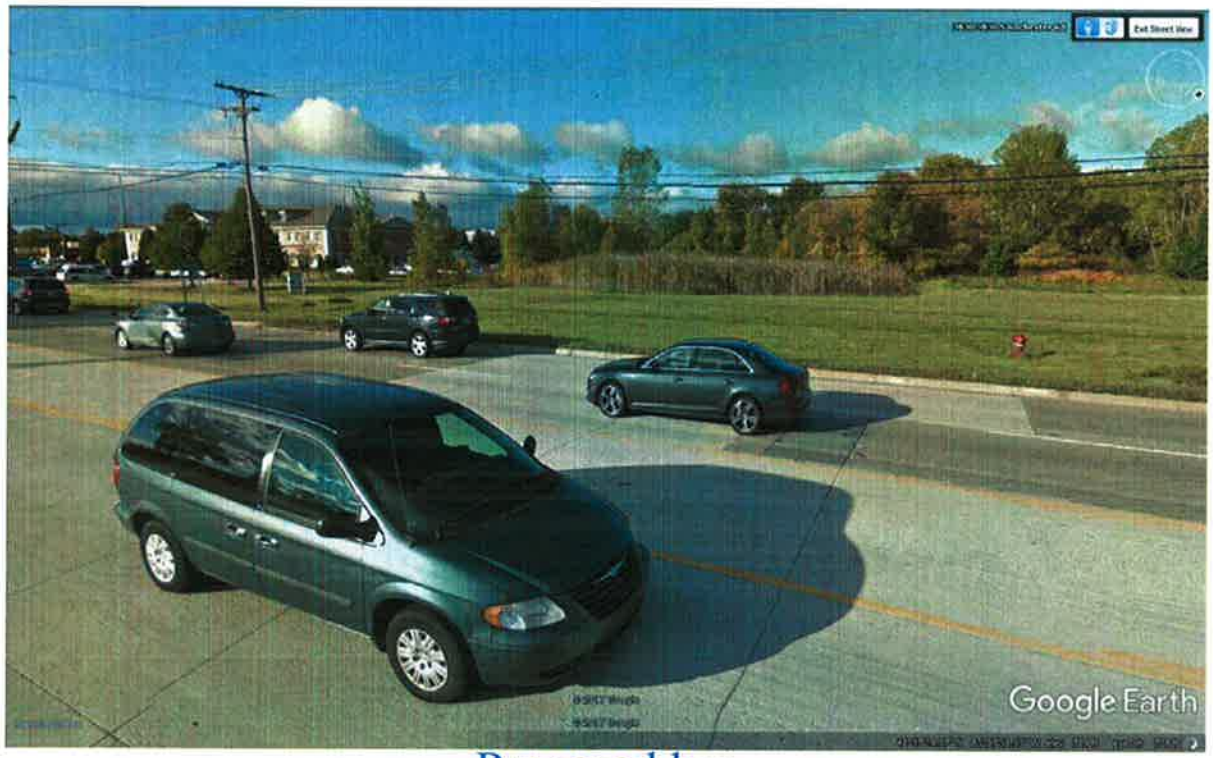
Traffic Impact Study
For
Gateway of Rochester Hills
Rochester Road & South Blvd
City of Rochester Hills
Oakland County, Michigan



Prepared by:
Traffic Engineering Consultants, Inc.
35890 Monterey Dr.
Clinton Township, Michigan 48035
(586) 615-4120

STATE OF MICHIGAN
CARLO SANTIA
ENGINEER
No. 28164
LICENSED PROFESSIONAL ENGINEER

January 25, 2018

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Introduction

This report presents the finding of a Traffic Impact Study (TIS) for the proposed lodging developments **Hotel**, **Retail**, **Office**, **High-Turnover (Sit-Down) Restaurant**, and an existing **Medical building** in city of Rochester Hills, Michigan. The project is located on the northwest quadrant of Rochester Road and South Blvd intersection, as shown on Figure 1. The proposed development includes 11,037 S.F. of Retail, 11,856 S.F. Office Building, (108) rooms of Hotel, 6,047 S.F. High-Turnover (Sit-Down) Restaurant, and 43,520 S.F. of an existing Medical Building. The proposed development access plan includes two existing full movement driveways and one proposed access on Rochester Road north of an existing drive, as shown in figure 2.

The purpose of this study is to conduct a comprehensive review and analysis to quantify the current traffic impacts of the new development on the adjacent road and intersection. In addition, the study included the identification of road and traffic control mitigation improvements needed to accommodate the traffic generated by this development.

The specific objectives of the study were to:

- Quantify existing traffic flow and safety condition.
- Identify future traffic impacts due the traffic generated by the new developments.
- Determine currently planned road and intersection improvements that will be in place when the developments are completed.
- Identify any additional road mitigation needed to provide a safe and acceptable level of service.

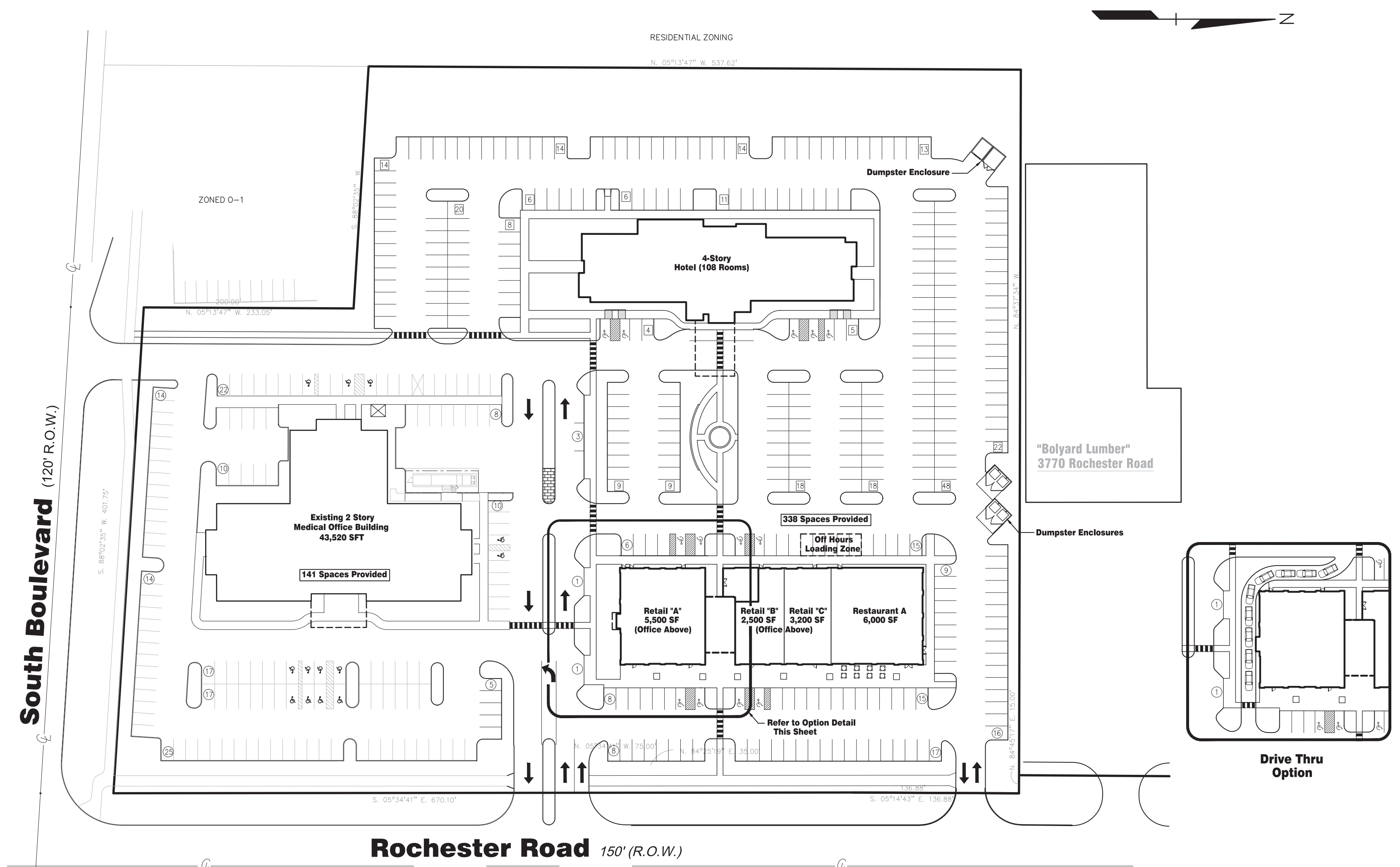
This study was developed based on Traffic Engineering Consultants. Inc. knowledge of the study area, understanding of the development program, accepted traffic engineering practice, and information published by the Institute of Transportation Engineers (ITE). These study analyses were completed using Synchro and Sim-Traffic, Version 9 traffic analysis software.

The study intersection analyzed for this includes:

- Rochester Road & South Blvd
- Rochester Road & EB M-59 off Ramp
- Rochester Road & WB M-59 off Ramp

Gateway of Rochester Hills
City of Rochester Hills, Michigan

Figure 1



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GROUP 10 MANGEMENT/ D'AGOSTINI LAND COMPANY

CONCEPTUAL SITE PLAN

GATEWAY OF ROCHESTER HILLS

NWC SOUTH BOULEVARD AND ROCHESTER ROAD
CITY ROCHESTER HILLS, OAKLAND COUNTY, MICHIGAN

DES.	PB	DN.	JPB	SUR.	N/A	P.M.	JPB

ORIGINAL ISSUE DATE: NOVEMBER 03, 2017

PEA JOB NO. 2017-237

SCALE: 1" = 40'

DRAWING NUMBER: C-1.0

Area Roadways

Existing Road Network

The roadway system most directly impacted by the site developments includes Rochester Road between South Blvd & WB M-59 off Ramp. These roadways are described below in detail. The lane uses and traffic control at the study intersection are shown in Figure 3.

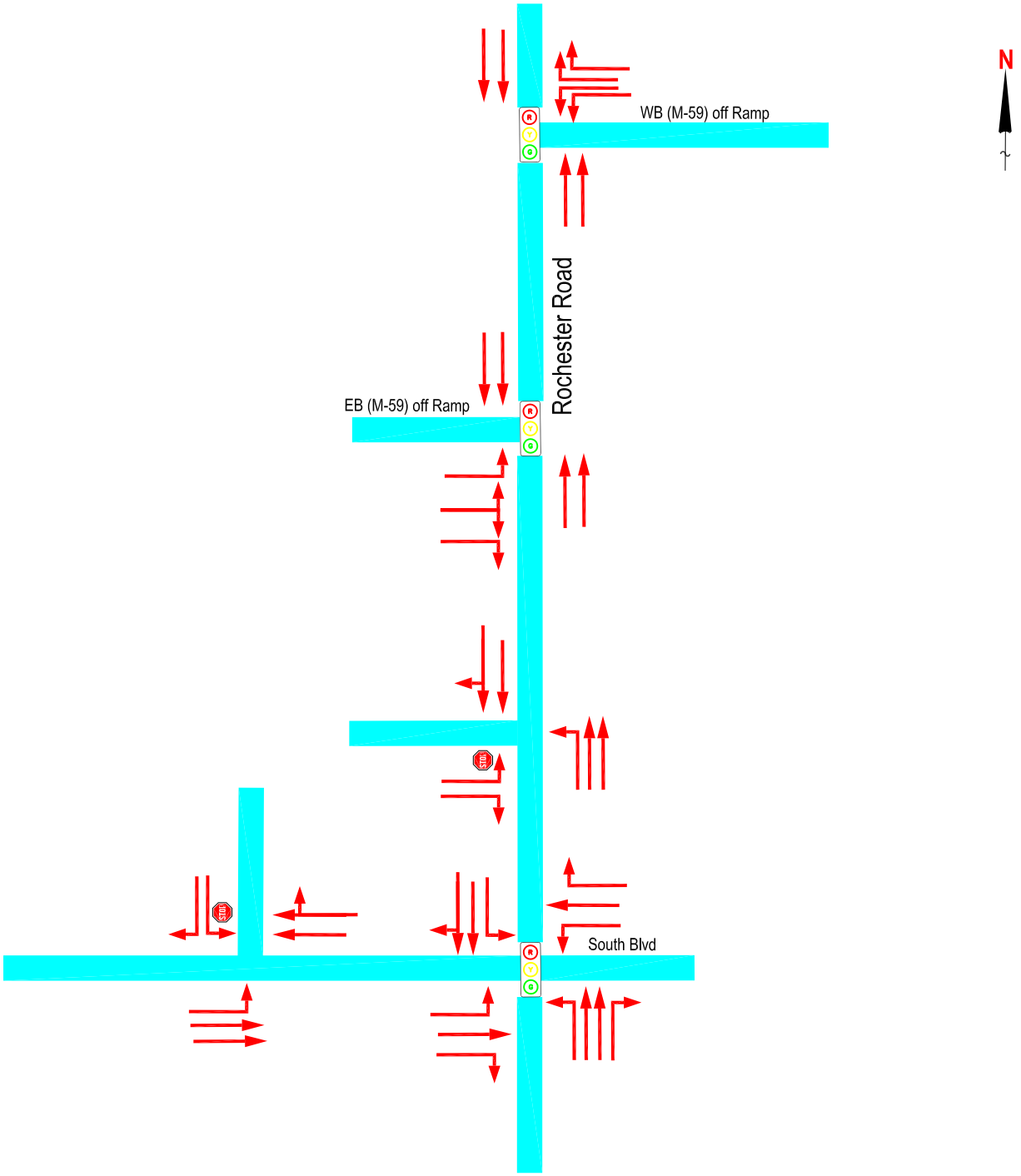
Rochester Road runs in the north-south directions with a posted speed limit of 50 miles per hour (MPH). Rochester Road is under the jurisdiction of Road Commission for Oakland County and classified as an Urban Principal Arterial with an average daily traffic (ADT) volume of approximately 48,500 vehicles per day. The study section of Rochester Road has a typical 5 lanes cross section with two lanes in each direction and center left turn lane.

South Blvd runs in an east-west direction with a posted speed limit of 45 MPH. The study section of South Blvd Road is under the jurisdictions of Road Commission for Oakland County with average daily traffic (ADT) volumes of approximately10, 800. The study section of South Blvd Road has a typical 3 lane cross section with one lane in each direction and center left turn lane.

Existing Traffic Counts

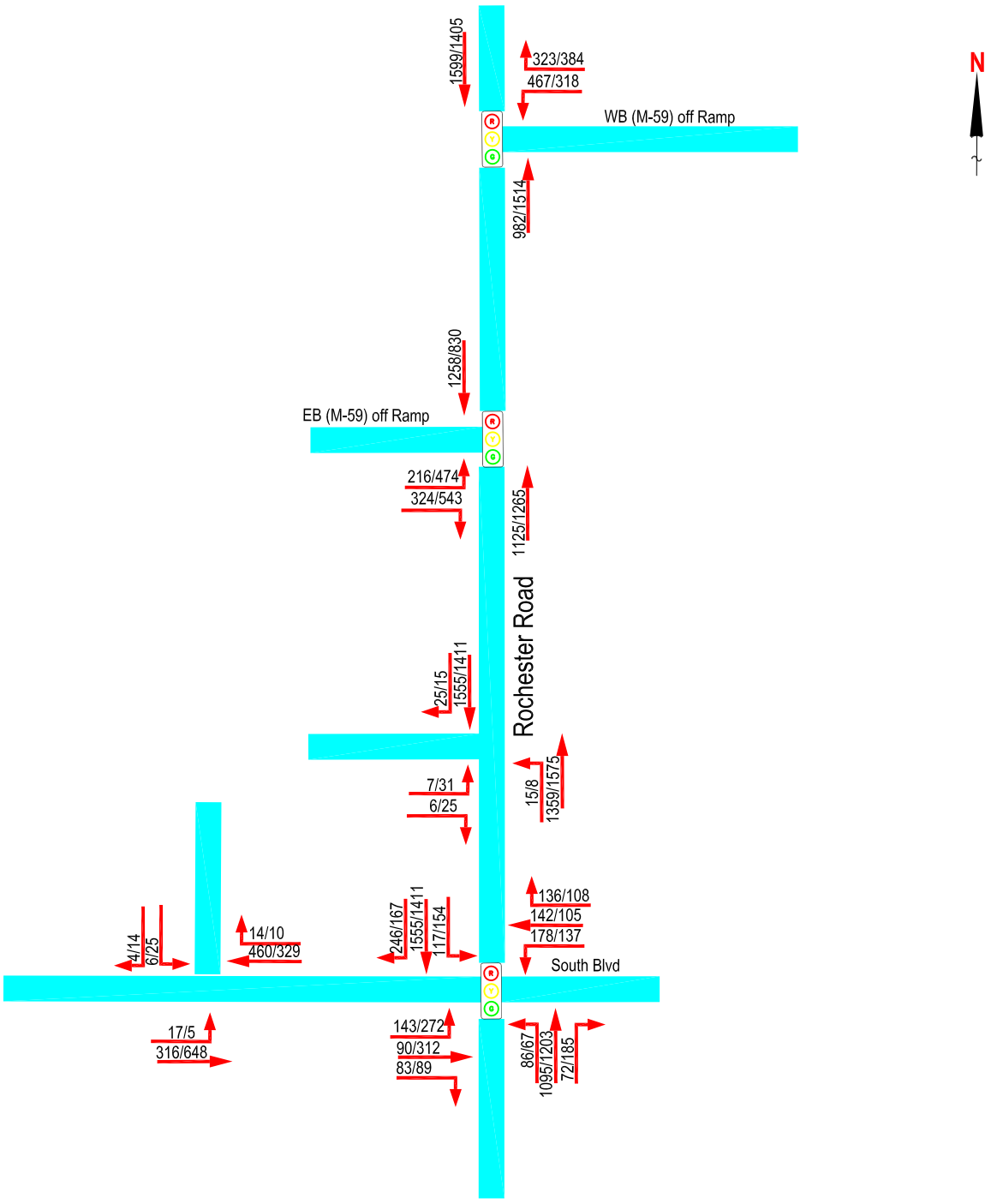
On September 19, 2017, Traffic Engineering Consultants, Inc. performed traffic counts at each study intersection during the a.m. peak periods (7:00 to 9:00 a.m.) and p.m. peak period (4:00 to 6:00 p.m.). At the time of the counts, the schools were in session under a normal schedule. The existing traffic volume data is included in Appendix A and the existing AM & PM peak hour volumes are summarized on Figure 4. The AM and PM peak hour volumes for each intersection were utilized for this study and the volumes were balanced upward through the study network. No pedestrians were observed during the study period.

The result indicates that the heaviest hour during the AM peak occurred between 7:30 and 8:30 AM and during the PM peak occurred between 4:30 & 5:30 PM. See Appendix A.



XXAM /XXPM

TRAFFIC ENGINEERING COUNSULTANTS, INC. 35890 Monterey Dr. Clinton Township, MI 48035 (586) 615-4120	Lane Use & Traffic Control Gateway of Rochester Hills City of Rochester Hills	Figure 3



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TRAFFIC ENGINEERING COUNSULTANTS, INC. 35890 Monterey Dr. Clinton Township, MI 48035 (586) 615-4120	Existing Traffic Volumes Gateway of Rochester Hills City of Rochester Hills	Figure 4

ANALYSIS

Existing Conditions

Existing peak hour vehicle delays and Levels of Service (LOS) were calculated at the study intersections using Synchro (Version 10) traffic analysis software. The results of the analysis of existing conditions were based on the existing lane use and traffic control shown on Figure 3, the existing traffic volumes shown on Figure 4. SYNCHRO/SIM TRAFFIC software (Version10) was utilized to model the study area roadway network and to perform intersection capacity analysis which, conforms to the methodologies published in the 2010 Highway Capacity Manual. The analysis was performed for Existing and Build traffic-volume conditions.

The procedures for analysis and criteria are those outlined in the 2010 Highway Capacity Manual (HCM) published by the Transportation Research Board. This manual defines level of service for signalized intersections in terms of control delay. Delay may be measured in the field, or it may be estimated. Delay is a complex measure, and is dependent on a number of variables, including the quality of progression, the cycle length, the green ratio, and the volume to capacity ratio for the lane group or approach in question. Table 1 shows the control delay that corresponds with each level of service.

Table 1: Level of Service Criteria for Signalized Intersections

Level of Service	Control Delay per Vehicle (Seconds)
A	≤10
B	>10 to ≤20
C	>20 to ≤35
D	>35 to ≤55
E	>55 to ≤80
F	>80

Level of Service A describes operations with very low control delay up to 10.0 sec per vehicle. This occurs when progression is extremely favorable, and most vehicles arrive during the green phase. Most vehicles do not stop at all. Short cycle lengths may also contribute to low delay.

Level of Service B describes operations with control delay in the range of 10.1 to 20.0 sec per vehicle. This generally occurs with good progression and/or short cycle lengths. More vehicles stop than for Level of Service A, causing higher levels of average delay.

Level of Service C describes operations with control delay in the range of 20.1 to 35.0 sec per vehicle. These higher delays may result from fair progression and/or longer cycle lengths. Individual cycle failures may begin to appear in this level. The number of vehicles stopping is significant at this level, although many still pass through the intersection without stopping.

Level of Service D describes operations with control delay in the range of 35.1 to 55.0 sec per vehicle. At level D, the influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, and high volume to capacity ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.

Level of Service E describes operations with control delay in the range of 55.1 to 80.0 sec per vehicle. This is considered to be above the limit of acceptable delay for an urban roadway in the study area. These high delay values generally indicate poor progression, long cycle lengths, and high volume to capacity ratios. Individual cycle failures are frequent occurrences.

Level of Service F describes operations with control delay in excess of 80.1 sec per vehicle. This is considered to be unacceptable to most drivers. This condition often occurs with over saturation, i.e., when arrival flow rates exceed the capacity of the intersection. It may also occur at high volume to capacity ratios below 1.00 with many individual cycle failures. Poor progression and long cycle lengths may also be major contributing causes to such delay levels.

Un-Signalized Intersection

At an un-signalized intersection with stop control on the minor approach, LOS F occurs when there are not enough gaps of suitable size to allow a minor-street demand to safely cross through traffic on the major street. This is typically evident from extremely long control delays experienced by minor street traffic and by queuing on the minor approaches. LOS F may also appear in the form of drivers on the minor street selecting smaller than usual gaps. In such cases, safety may be a problem and some disruption to the major traffic stream may result. Note that LOS F may not always result in long queues, but in adjustments to normal gap acceptance behavior. For example, this may occur when a left-turning vehicle uses a shorter than normal gap in traffic to complete a left-turn. **Table 2** indicates the control delay criteria used for determining the LOS for un-signalized intersections.

Table 2: LOS Criteria for Un-Signalized Intersections

LOS	Control Delay per Vehicle (seconds)
A	≤ 10
B	> 10 to ≤ 15
C	> 15 to ≤ 25
D	> 25 to ≤ 35
E	> 35 to ≤ 50
F	> 50

A capacity analysis was conducted for the road network during the AM and PM peak hours for existing, and future conditions. The results of the analysis of existing conditions are presented in Appendix B. LOS C is considered by many traffic safety professionals to be the minimum acceptable condition in rural areas and LOS D is the minimum for urban/suburban areas. Given the location of this site within the urbanized boundary, LOS D was utilized as the study's minimum goal. The results of the analysis of existing conditions are presented in Appendix B and are summarized in Table3.

Table 3 Capacity Analysis Results for Existing Condition

Intersection		Approach Direction									
		AM Peak Hour					PM Peak Hour				
		EB	WB	NB	SB	Overall Intersection	EB	WB	NB	SB	Overall Intersection
Rochester Rd & South Blvd	LOS	D	D	C	D	D	E	D	C	D	D
	Delay (Sec)	52.9	49.1	21.1	49.3	40.5	76.2	43.1	30.1	35.1	41.1
Rochester Rd & EB M-59 off Ramp	LOS	D	-	A	A	B	D	-	B	B	C
	Delay (Sec)	47.7	-	4.0	4.0	13.0	40.8	-	16.5	10.0	22.6
Rochester Rd & WB M-59 off Ramp	LOS	-	D	A	B	B	-	D	A	A	B
	Delay (Sec)	-	44.3	6.1	14.1	19.2	-	48.6	10.4	9.6	17.6
South Blvd & Site Drive	LOS	A	A	-	B	A	A	A	-	C	A
	Delay (Sec)	0.5	0.0	-	14.3	0.4	0.1	0.0	-	18.6	0.8
Rochester Rd & Site Drive	LOS	E	-	**A**	A	A	E	-	A	A	A
	Delay (Sec)	40.8	-	0.2	0.0	0.4	38.6	-	0.1	0.0	0.9

The results of the existing conditions analysis for the study intersections indicate that all study intersections and approaches currently operate at acceptable LOS D or better, with the exception of the intersection of Rochester Road & South Blvd, eastbound South Blvd Road operate at level of service E.

Background Conditions

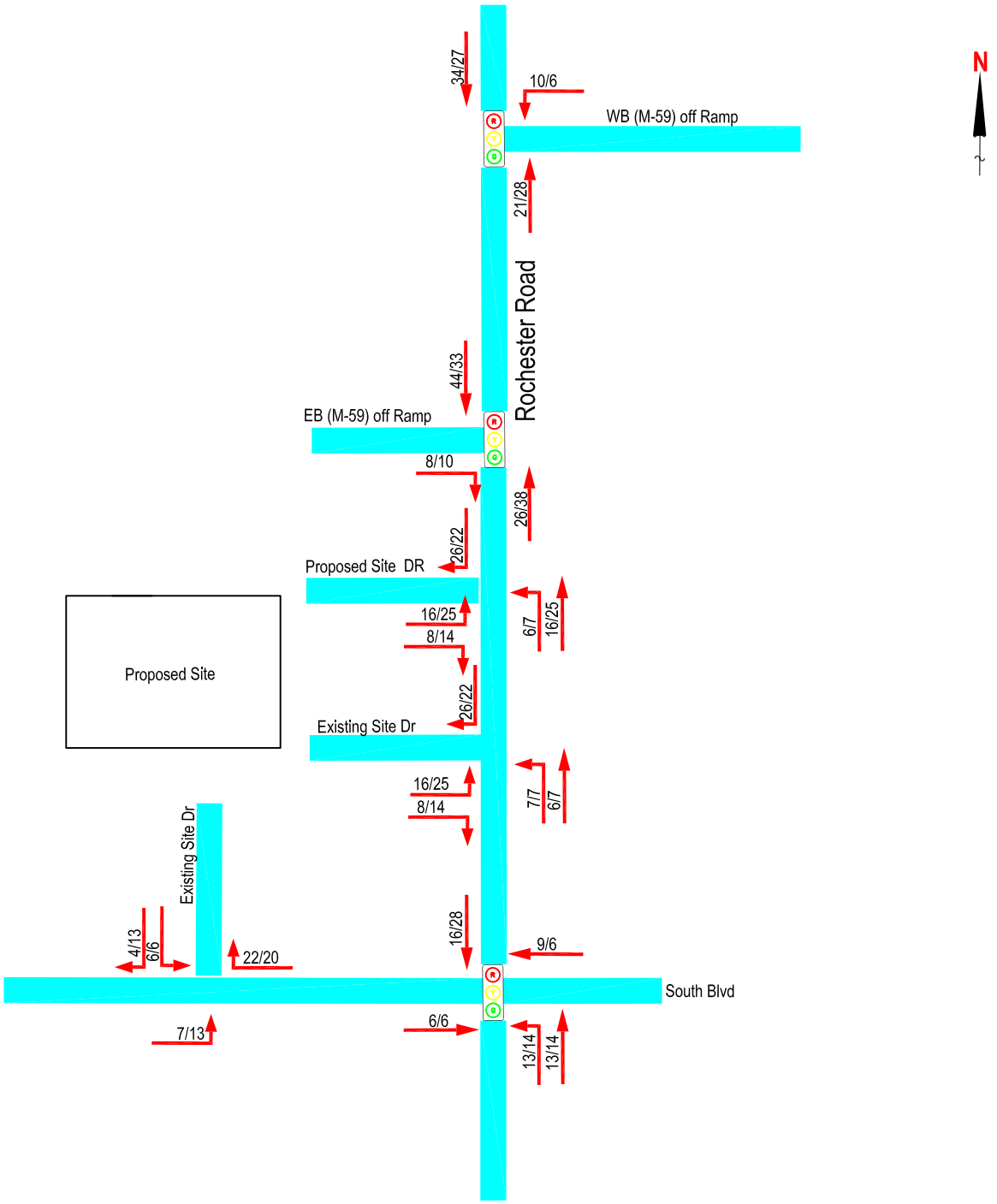
To determine the applicable growth rate for the existing traffic volumes to projected build-out, historical traffic count data and population forecasts publish by SEMCOG were referenced. These data indicated that traffic volume in study area have remained consistent or declined in recent years. Therefore, traffic volume growth is expected to be stagnant consistent with current traffic growth pattern throughout southeast Michigan. Based on this data, the background traffic without the proposed development is assumed to be equal to existing condition.

Future Site Trip Generation

The number of AM and PM peak hour trips that would be generated by the proposed developments was forecast based on data published by ITE in the "Trip Generation Manual", 9th Edition. The number of trips expected to be generated by the proposed project during the weekday AM peak and PM peak were calculated. The trip generation shown represents the trip generation using ITE Land use code 310, 710, 820, & 932. As shown in table 4. The development is estimated to generate 152 trips in the AM Peak and 183 trips in the PM peak.

Table 4

Land Use	Land Use Code	Unit	AM Peak Hour			PM Peak Hour			24 Hour Two-Way Volume
			In	Out	Total	In	Out	Total	
Shopping Center	820	11,037 Sq.Ft GFA	7	4	11	20	21	41	471
High Turn Over (Sit Down) Restaurants	932	6,047 Sq.Ft GFA	36	29	65	35	24	59	768
Hotel	310	108 Rooms	34	23	57	33	32	65	882
Office Building	710	11,856 Sq.Ft GFA	17	2	19	3	15	18	131
Total Trips-Developments			**94**	**58**	**152**	**91**	**92**	**183**	**2,252**



XXAM /XXPM

TRAFFIC ENGINEERING COUNSULTANTS, INC. 35890 Monterey Dr. Clinton Township, MI 48035 (586) 615-4120	Trip Generation Gateway of Rochester Hills City of Rochester Hills	Figure 5

Site Traffic Assignment

The vehicle trips that would be generated by the development were assigned to the study road network based on existing peak hour traffic patterns and the methodologies published by ITE. The existing traffic patterns indicate the distribution of site-generated traffic shown in Figure 5.

The site-generated vehicle trips were assigned to the study road network based on this trip distribution model as shown on Figure 6. The site-generated trips were added to the existing traffic volumes shown on Figure 4 to calculate the future AM and PM peak hour traffic volumes, as shown on Figure 7.

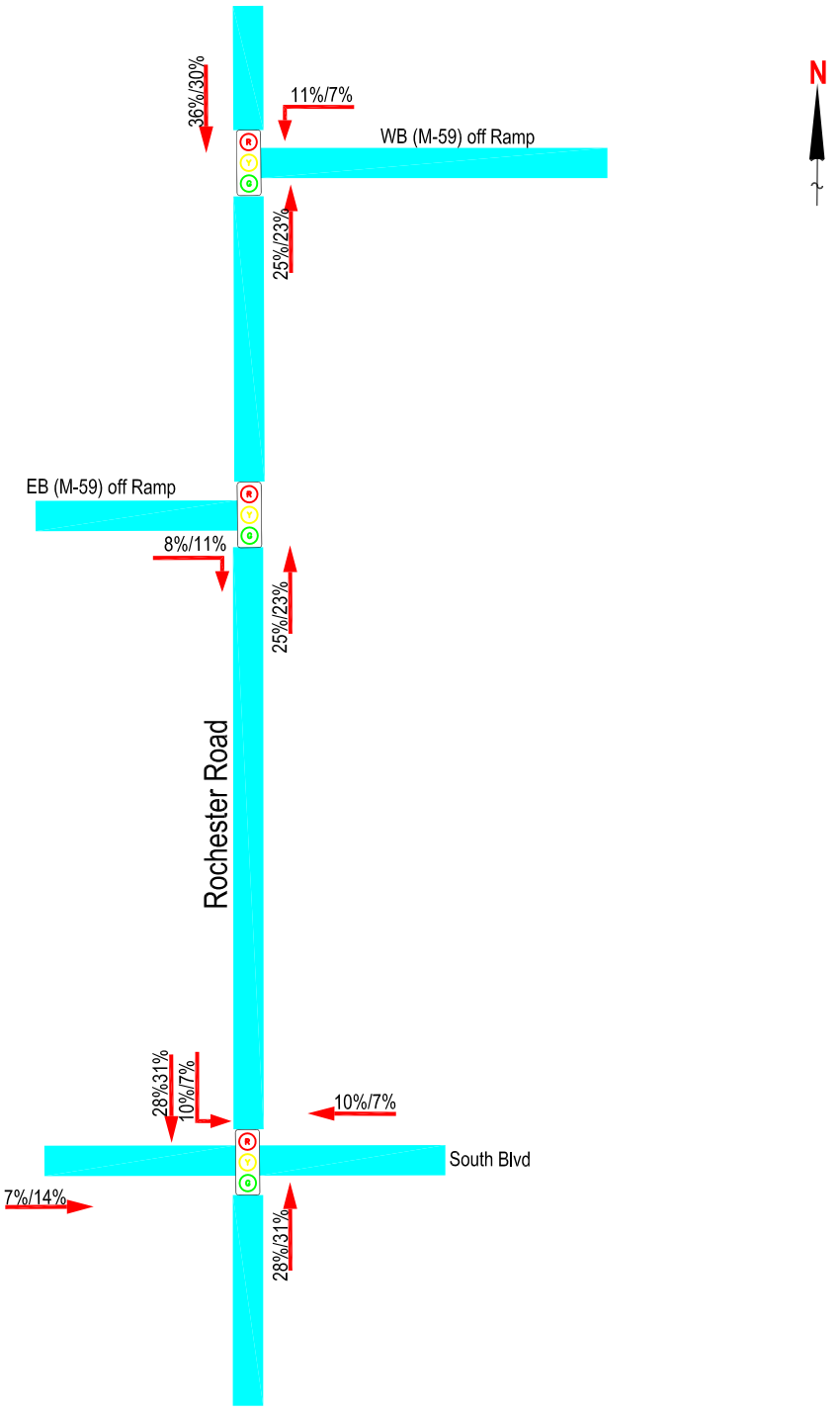
Future Conditions

Future peak hour vehicle delays and LOS ***with the proposed development*** were calculated based on the existing lane use and traffic control shown on Figure 3, the proposed site access plan, the future traffic volumes shown on Figure 7, and the methodologies presented in the HCM. Additionally, SimTraffic simulations were utilized to evaluate network operations and vehicle queues. The results of the analysis of future conditions are presented in Appendix C and are summarized in Table 5.

Table 5 Capacity Analysis Results for Future Traffic Condition-Build

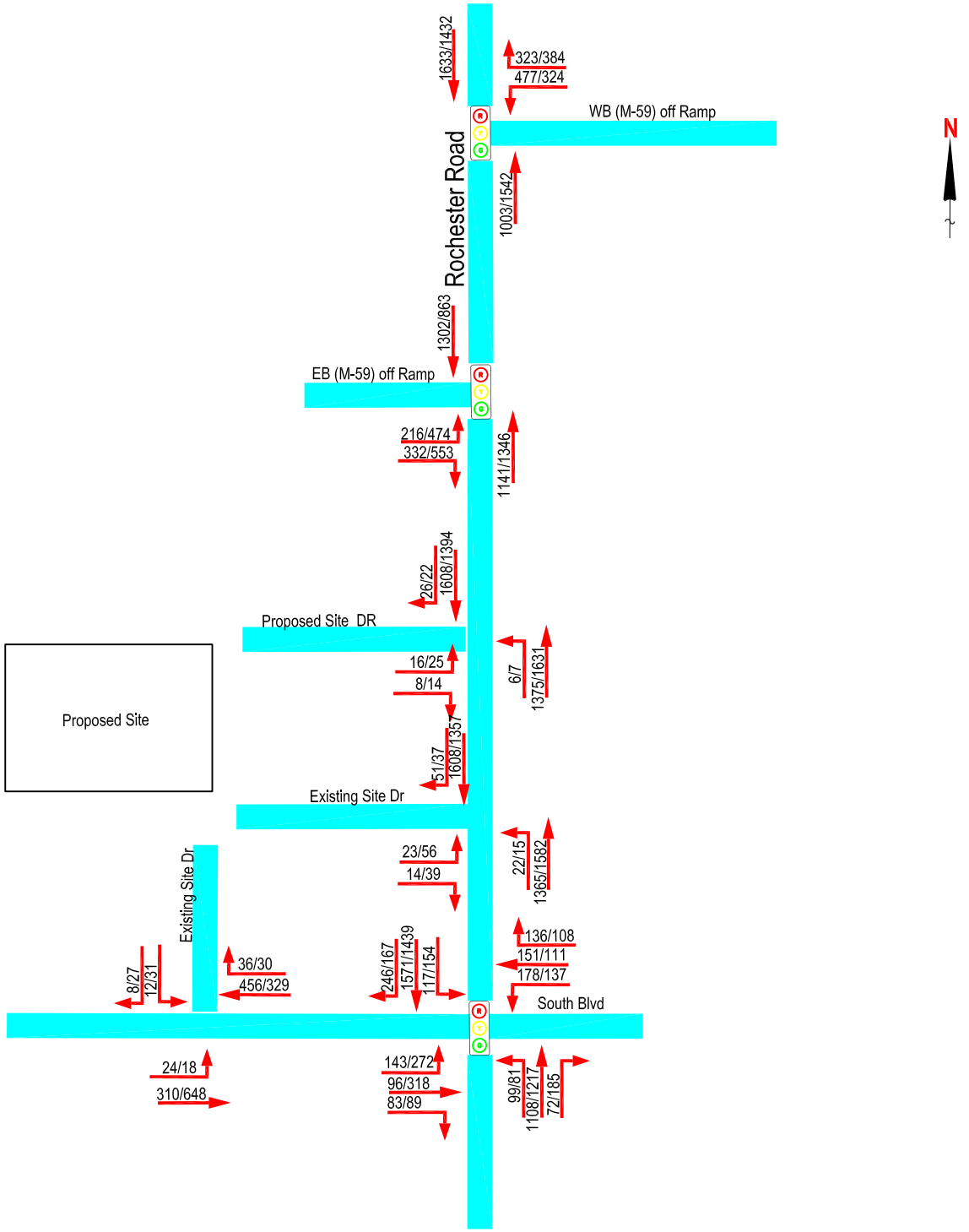
Intersection		Approach Direction									
		AM Peak Hour					PM Peak Hour				
		EB	WB	NB	SB	Overall Intersection	EB	WB	NB	SB	Overall Intersection
Rochester Rd & South Blvd	LOS	E	D	C	D	D	D	D	C	D	D
	Delay (Sec)	55.4	51.3	22.1	53.3	43.0	62.2	52.7	31.5	52.3	47.0
Rochester Rd & EB M-59 off Ramp	LOS	D	-	A	A	B	D	-	B	B	C
	Delay (Sec)	48.6	-	4.2	9.2	14.6	41.9	-	10.3	10.1	20.2
Rochester Rd & WB M-59 off Ramp	LOS	-	D	A	B	C	-	D	B	A	B
	Delay (Sec)	-	45.0	9.9	14.5	20.7	-	49.5	10.6	9.7	17.8
South Blvd & Site Drive	LOS	A	A	-	B	A	A	A	-	C	A
	Delay (Sec)	0.7	0.0	-	14.9	0.8	0.3	0.0	-	118.9	1.3
Rochester Rd & Site Drive	LOS	F	-	**A**	A	A	F	-	A	A	A
	Delay (Sec)	58.8	-	0.3	0.0	1.1	102.0	-	0.2	0.0	5.0
Rochester Rd & Proposed Drive	LOS	E	-	**A**	A	A	D	-	A	A	A
	Delay (Sec)	43.3	-	0.1	0.0	0.50	25.8	-	6.9	0.0	1.4

The results of the future conditions analysis for the study intersection indicate that all study intersections and approaches currently operate at acceptable LOS D or better, except for the intersection of Rochester Road & South Blvd, eastbound South Blvd Road operate at level of E. Therefore, there were very slight differences between existing operation and future.



XXAM /XXPM

TRAFFIC ENGINEERING COUNSULTANTS, INC. 35890 Monterey Dr. Clinton Township, MI 48035 (586) 615-4120	Trip Distribution Gateway of Rochester Hills City of Rochester Hills	Figure 6



XXAM /XXPM

TRAFFIC ENGINEERING COUNSULTANTS, INC. 35890 Monterey Dr. Clinton Township, MI 48035 (586) 615-4120	Future Traffic Gateway of Rochester Hills City of Rochester Hills	Figure 7

Proposed Site Access

The proposed site layout includes two existing access drives to the site and one proposed drive on Rochester Road north of an existing drive. The exiting driveway would be shared with the existing Medical Building. All existing and proposed driveways would be the sole entrances for all staff, members' guest, delivery vehicles, and emergency vehicles. Those arriving via eastbound South Blvd. and northbound Rochester Road would have a center turn-lane to take refuge while waiting for gaps to complete the left-turn into the site.

Sight Distance Evaluation

Sight distance measurements were performed at the project driveway intersections with Road in accordance with American Association of State Highway (AASHTO) latest Edition requirements. These measurements indicate that the available line sight for motorists traveling along Rochester Road and South Blvd Road approaching the project driveway and for motorists exiting the project site exceed the recommended minimum sight distance requirements for a 50MPH and 45 MPH approach speed.

Conclusion

The analysis results under existing conditions show that the all study intersections and roadway Segments currently operate at acceptable levels of service (LOS D or better), and are forecast to continue operating at acceptable LOS with the addition of project-generated traffic to existing traffic volumes. Therefore, the proposed development will have little or no impact on the road adjacent to the site. The development plan were reviewed with Road Commission for Oakland County (the agency with jurisdiction over the roads) with no objection being made.

Appendix A – Existing Traffic Volumes

Traffic Engineering Consultants, Inc.

35890 Monterey Dr
Clinton Township, Michigan 48035
(586) 615-4120

Rochester Road & South Blvd Road
Weather Condition: Clear
Count By: H othman
Board #: 1

File Name : South blvd & rochester
Site Code : 00000000
Start Date : 9/19/2017
Page No : 1

Groups Printed- Unshifted - Bank 1

	Rochester Road Southbound				South Blvd Westbound				Rochester Road Northbound				South Blvd Eastbound				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
07:00 AM	56	430	19	0	25	27	34	0	17	193	14	0	18	12	19	0	864
07:15 AM	67	433	28	0	32	40	48	0	9	289	21	0	21	15	24	0	1027
07:30 AM	68	376	30	0	29	31	48	0	13	257	23	0	24	23	36	0	958
07:45 AM	58	386	29	0	38	37	36	0	23	315	20	0	19	29	39	0	1029
Total	249	1625	106	0	124	135	166	0	62	1054	78	0	82	79	118	0	3878
08:00 AM	53	360	30	0	37	34	46	0	27	234	22	0	19	23	44	0	929
08:15 AM	47	389	26	0	43	26	40	0	22	243	20	0	18	16	24	0	914
08:30 AM	62	399	21	0	46	42	31	0	16	304	18	0	20	24	40	0	1023
08:45 AM	55	396	23	0	40	24	31	0	37	316	21	0	14	21	42	0	1020
Total	217	1544	100	0	166	126	148	0	102	1097	81	0	71	84	150	0	3886
*** BREAK ***																	
04:00 PM	23	340	29	0	35	19	24	0	54	322	15	0	20	53	59	0	993
04:15 PM	26	363	32	0	30	20	23	0	49	356	21	0	37	51	54	0	1062
04:30 PM	21	388	36	0	22	28	29	0	53	330	14	0	24	48	59	0	1052
04:45 PM	44	367	36	0	31	33	37	0	54	287	18	0	25	75	75	0	1082
Total	114	1458	133	0	118	100	113	0	210	1295	68	0	106	227	247	0	4189
05:00 PM	47	343	33	0	27	19	33	0	38	315	19	0	18	67	54	0	1013
05:15 PM	33	345	39	0	24	29	40	0	41	283	17	0	19	81	80	0	1031
05:30 PM	43	356	46	0	26	24	27	0	52	318	13	0	27	89	63	0	1084
05:45 PM	27	363	30	0	19	24	21	0	36	224	14	0	23	92	67	0	940
Total	150	1407	148	0	96	96	121	0	167	1140	63	0	87	329	264	0	4068
Grand Total	730	6034	487	0	504	457	548	0	541	4586	290	0	346	719	779	0	16021
Apprch %	10.1	83.2	6.7	0	33.4	30.3	36.3	0	10	84.7	5.4	0	18.8	39	42.2	0	
Total %	4.6	37.7	3	0	3.1	2.9	3.4	0	3.4	28.6	1.8	0	2.2	4.5	4.9	0	
Unshifted	730	6034	487	0	504	457	548	0	541	4586	290	0	346	719	779	0	16021
% Unshifted	100	100	100	0	100	100	100	0	100	100	100	0	100	100	100	0	100
Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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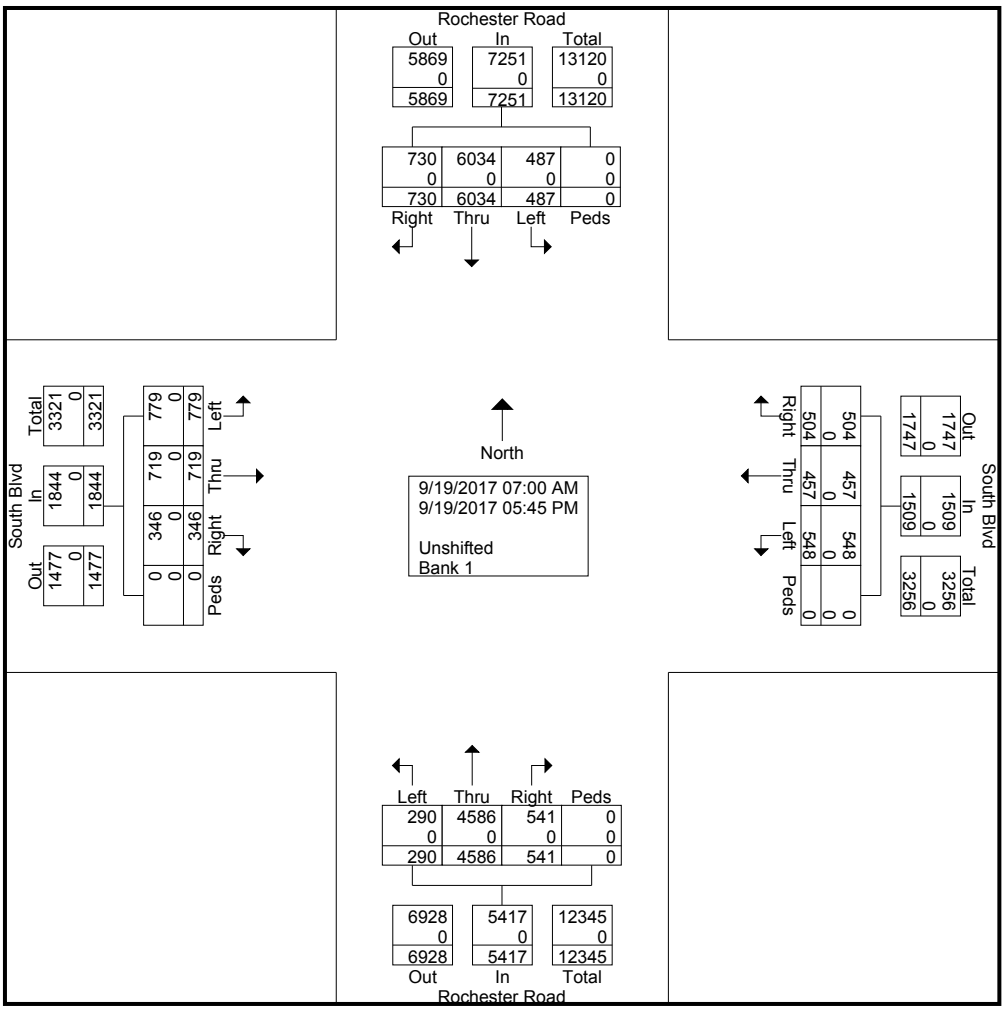
Rochester Road & South Blvd Road
Weather Condition: Clear
Count By: H othman
Board #: 1

File Name : South blvd & rochester
Site Code : 00000000
Start Date : 9/19/2017
Page No : 2



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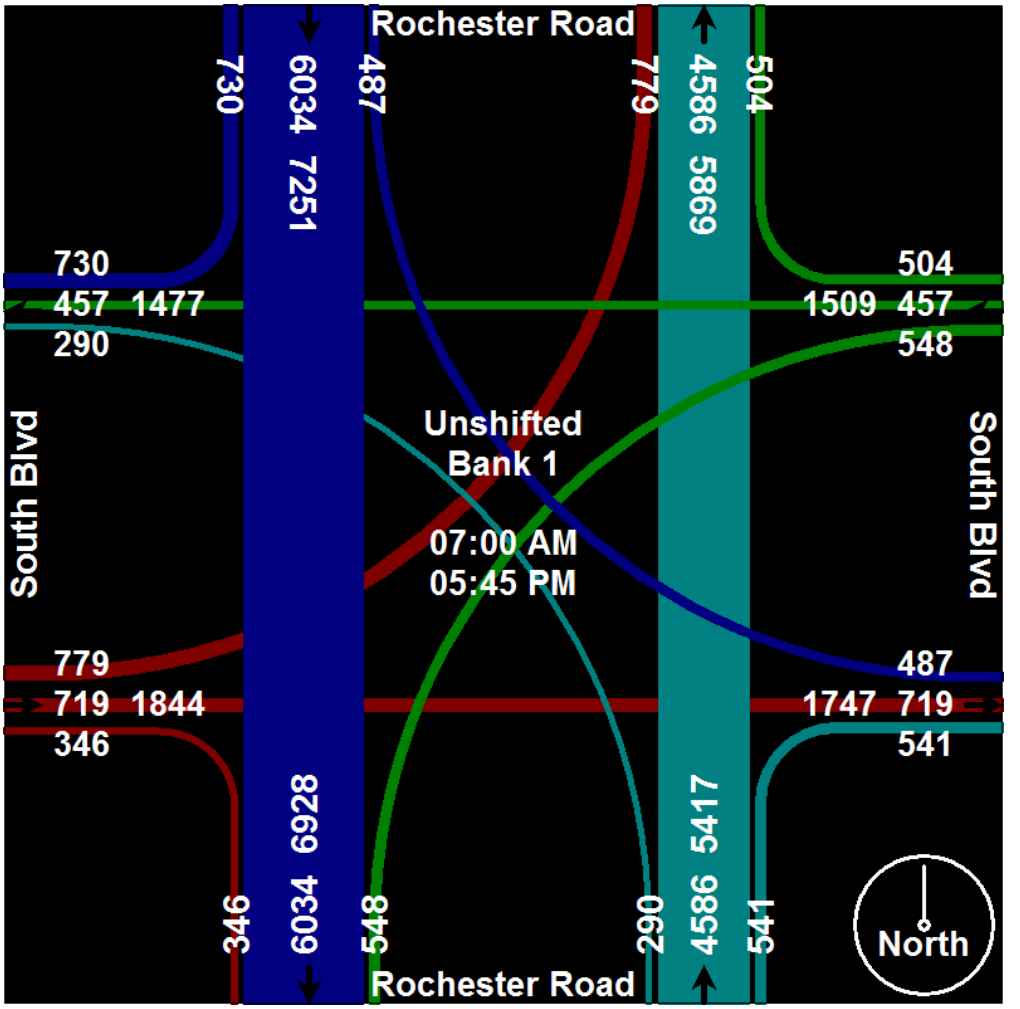

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Rochester Road & South Blvd Road
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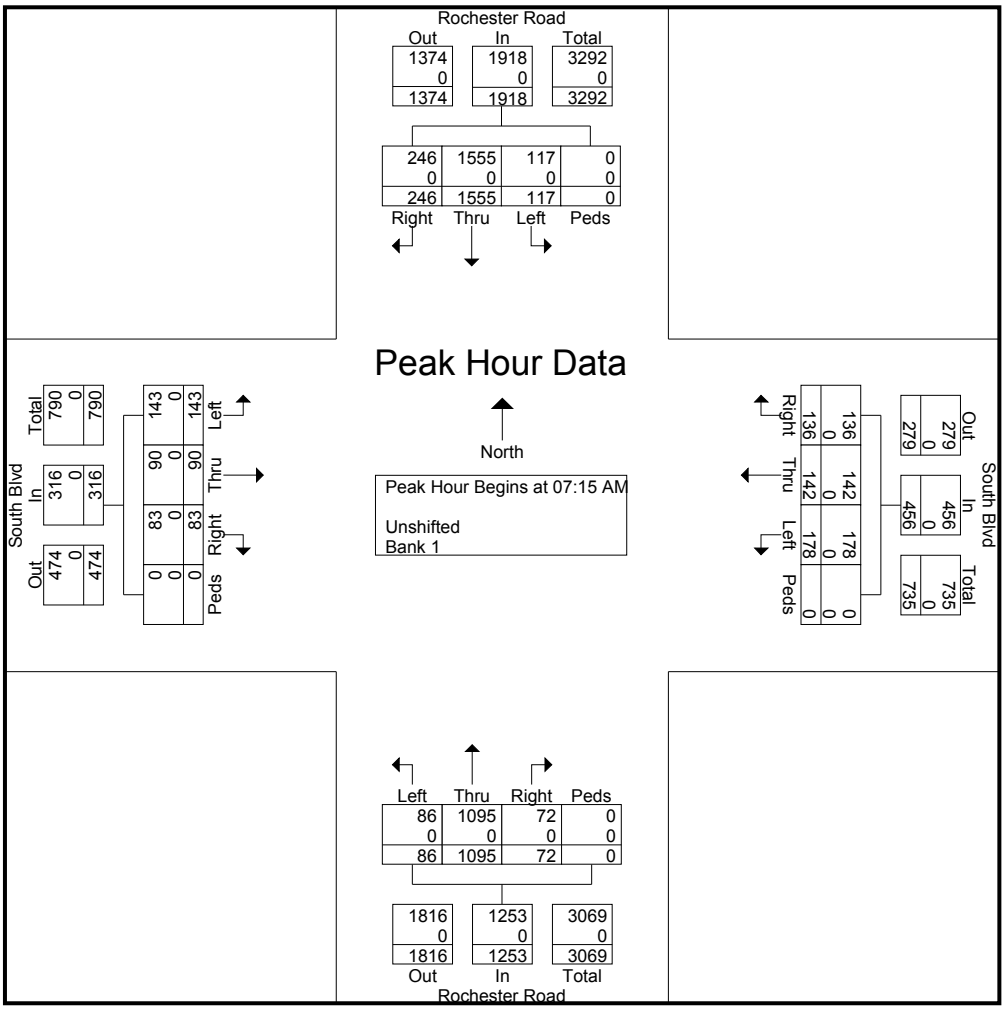
Board #: 1

File Name : South blvd & rochester
Site Code : 00000000
Start Date : 9/19/2017
Page No : 4

	Rochester Road Southbound					South Blvd Westbound					Rochester Road Northbound					South Blvd Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15 AM																					
07:15 AM	67	433	28	0	528	32	40	48	0	120	9	289	21	0	319	21	15	24	0	60	1027
07:30 AM	68	376	30	0	474	29	31	48	0	108	13	257	23	0	293	24	23	36	0	83	958
07:45 AM	58	386	29	0	473	38	37	36	0	111	23	315	20	0	358	19	29	39	0	87	1029
08:00 AM	53	360	30	0	443	37	34	46	0	117	27	234	22	0	283	19	23	44	0	86	929
Total Volume	246	1555	117	0	1918	136	142	178	0	456	72	1095	86	0	1253	83	90	143	0	316	3943
% App. Total																					
PHF	.904	.898	.975	.000	.908	.895	.888	.927	.000	.950	.667	.869	.935	.000	.875	.865	.776	.813	.000	.908	.958
Unshifted	246	1555	117	0	1918	136	142	178	0	456	72	1095	86	0	1253	83	90	143	0	316	3943
% Unshifted																					
Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



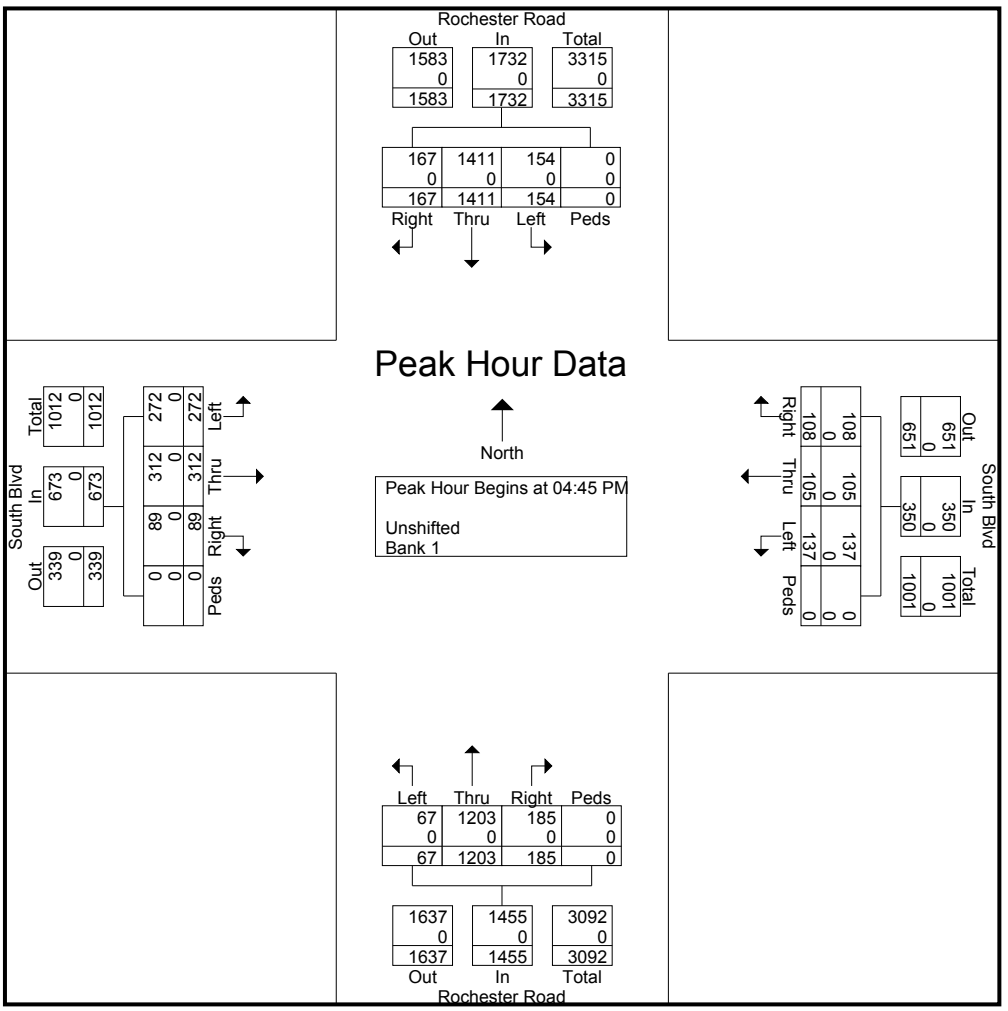
Traffic Engineering Consultants, Inc.

35890 Monterey Dr
Clinton Township, Michigan 48035
(586) 615-4120

Rochester Road & South Blvd Road
Weather Condition: Clear
Count By: H othman
Board #: 1

File Name : South blvd & rochester
Site Code : 00000000
Start Date : 9/19/2017
Page No : 5

	Rochester Road Southbound					South Blvd Westbound					Rochester Road Northbound					South Blvd Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:45 PM																					
04:45 PM	44	367	36	0	447	31	33	37	0	101	54	287	18	0	359	25	75	75	0	175	1082
05:00 PM	47	343	33	0	423	27	19	33	0	79	38	315	19	0	372	18	67	54	0	139	1013
05:15 PM	33	345	39	0	417	24	29	40	0	93	41	283	17	0	341	19	81	80	0	180	1031
05:30 PM	43	356	46	0	445	26	24	27	0	77	52	318	13	0	383	27	89	63	0	179	1084
Total Volume	167	1411	154	0	1732	108	105	137	0	350	185	1203	67	0	1455	89	312	272	0	673	4210
% App. Total																					
PHF	.888	.961	.837	.000	.969	.871	.795	.856	.000	.866	.856	.946	.882	.000	.950	.824	.876	.850	.000	.935	.971
Unshifted	167	1411	154	0	1732	108	105	137	0	350	185	1203	67	0	1455	89	312	272	0	673	4210
% Unshifted																					
Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



Traffic Engineering Consultants, Inc.
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Clinton Township, Michigan 48035
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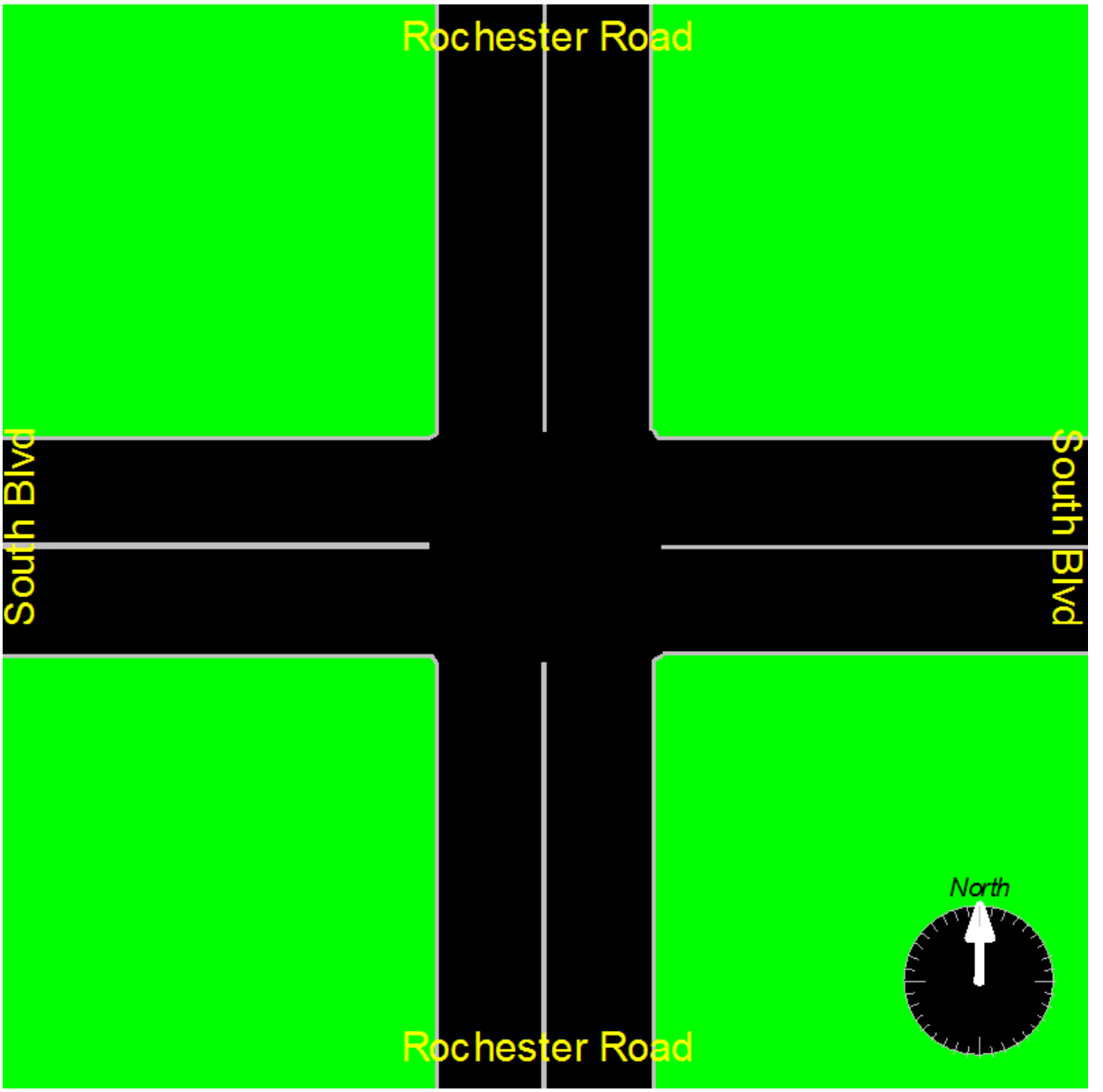
Rochester Road & South Blvd Road
Weather Condition: Clear
Count By: H othman
Board #: 1

File Name : South blvd & rochester
Site Code : 00000000
Start Date : 9/19/2017
Page No : 6



Traffic Engineering Consultants, Inc.

35890 Monterey Dr
Clinton Township, Michigan 48035
(586) 615-4120

Rochest Road & WB M-59 off Ramp
Weather Condition: Clear
Count By: S.Naser
Board #: 1

File Name : WB M 59 & rochester
Site Code : 00000000
Start Date : 9/19/2017
Page No : 1

Groups Printed- Unshifted - Bank 1

	Rochester Road Southbound				WB M-59 off Ramp Westbound				Rochester Road Northbound				Eastbound				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
07:00 AM	0	379	0	0	66	0	157	0	0	139	0	0	0	0	0	0	741
07:15 AM	0	377	0	0	78	0	209	0	0	160	0	0	0	0	0	0	824
07:30 AM	0	407	0	0	67	0	193	0	0	214	0	0	0	0	0	0	881
07:45 AM	0	410	0	0	59	0	121	0	0	221	0	0	0	0	0	0	811
Total	0	1573	0	0	270	0	680	0	0	734	0	0	0	0	0	0	3257
08:00 AM	0	364	0	0	64	0	116	0	0	195	0	0	0	0	0	0	739
08:15 AM	0	449	0	0	58	0	95	0	0	228	0	0	0	0	0	0	830
08:30 AM	0	407	0	0	79	0	132	0	0	250	0	0	0	0	0	0	868
08:45 AM	0	379	0	0	122	0	124	0	0	309	0	0	0	0	0	0	934
Total	0	1599	0	0	323	0	467	0	0	982	0	0	0	0	0	0	3371
*** BREAK ***																	
04:00 PM	0	334	0	0	75	0	70	0	0	363	0	0	0	0	0	0	842
04:15 PM	0	334	0	0	100	0	85	0	0	335	0	0	0	0	0	0	854
04:30 PM	0	377	0	0	99	0	81	0	0	395	0	0	0	0	0	0	952
04:45 PM	0	350	0	0	103	0	73	0	0	353	0	0	0	0	0	0	879
Total	0	1395	0	0	377	0	309	0	0	1446	0	0	0	0	0	0	3527
05:00 PM	0	339	0	0	93	0	76	0	0	359	0	0	0	0	0	0	867
05:15 PM	0	339	0	0	89	0	88	0	0	407	0	0	0	0	0	0	923
05:30 PM	0	311	0	0	103	0	79	0	0	393	0	0	0	0	0	0	886
05:45 PM	0	295	0	0	98	0	62	0	0	356	0	0	0	0	0	0	811
Total	0	1284	0	0	383	0	305	0	0	1515	0	0	0	0	0	0	3487
Grand Total	0	5851	0	0	1353	0	1761	0	0	4677	0	0	0	0	0	0	13642
Apprch %	0	100	0	0	43.4	0	56.6	0	0	100	0	0	0	0	0	0	
Total %	0	42.9	0	0	9.9	0	12.9	0	0	34.3	0	0	0	0	0	0	
Unshifted	0	5851	0	0	1353	0	1761	0	0	4677	0	0	0	0	0	0	13642
% Unshifted	0	100	0	0	100	0	100	0	0	100	0	0	0	0	0	0	100
Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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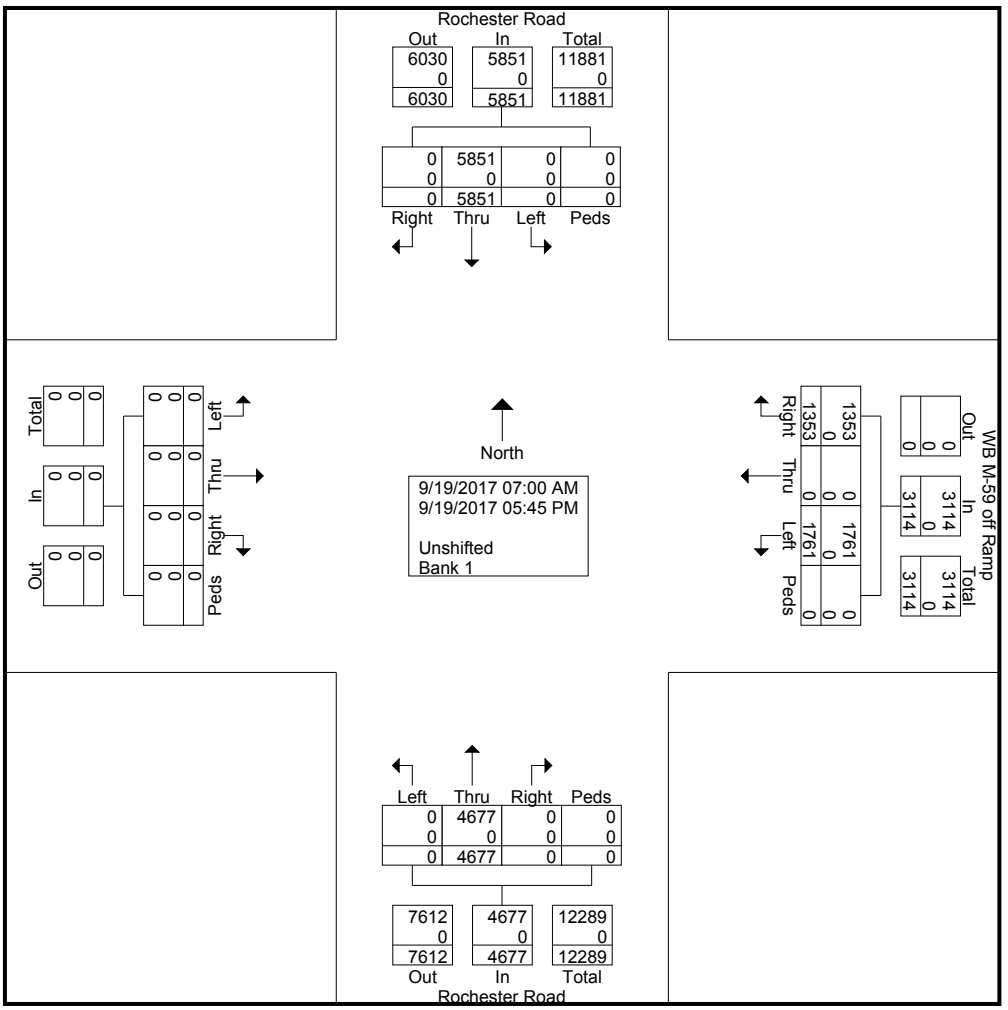
Rochest Road & WB M-59 off Ramp
Weather Condition: Clear
Count By: S.Naser
Board #: 1

File Name : WB M 59 & rochester
Site Code : 00000000
Start Date : 9/19/2017
Page No : 2



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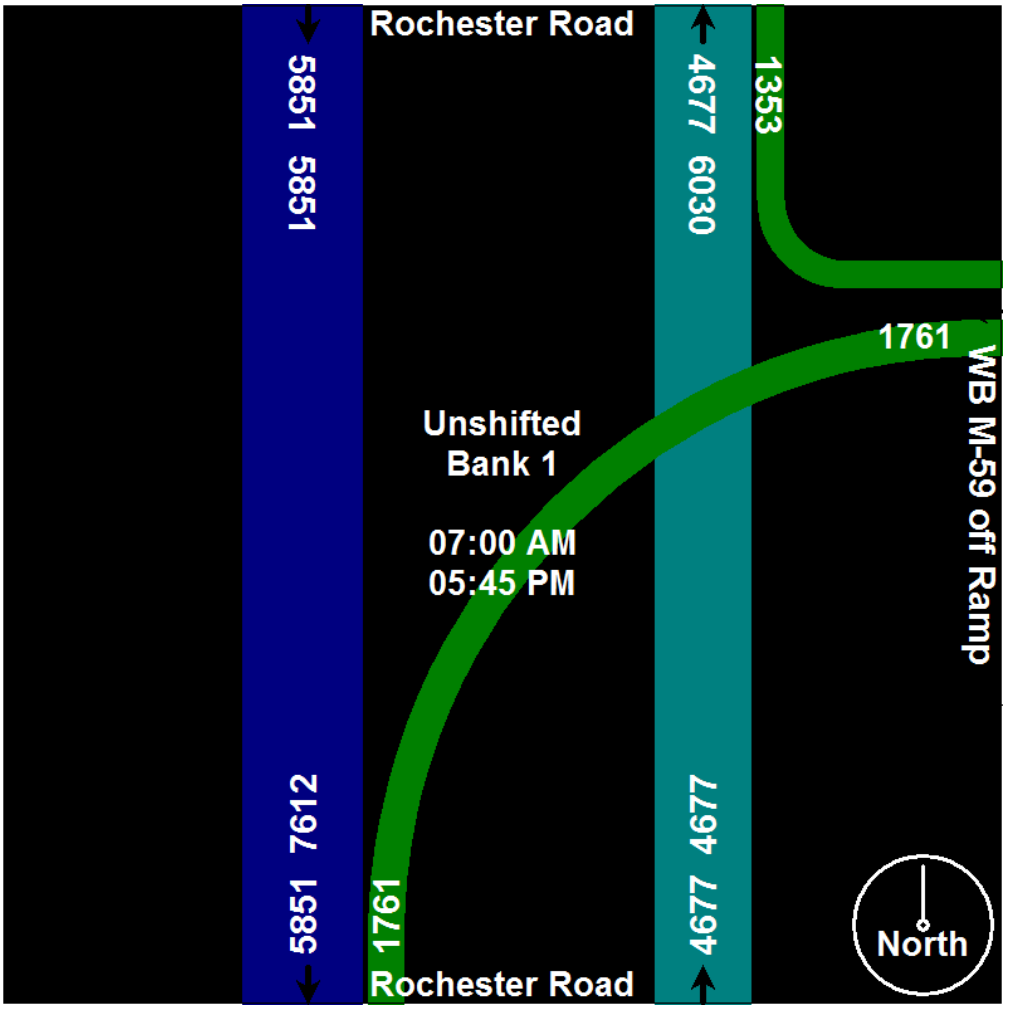
Rochest Road & WB M-59 off Ramp
Weather Condition: Clear
Count By: S.Naser
Board #: 1

File Name : WB M 59 & rochester
Site Code : 00000000
Start Date : 9/19/2017
Page No : 3



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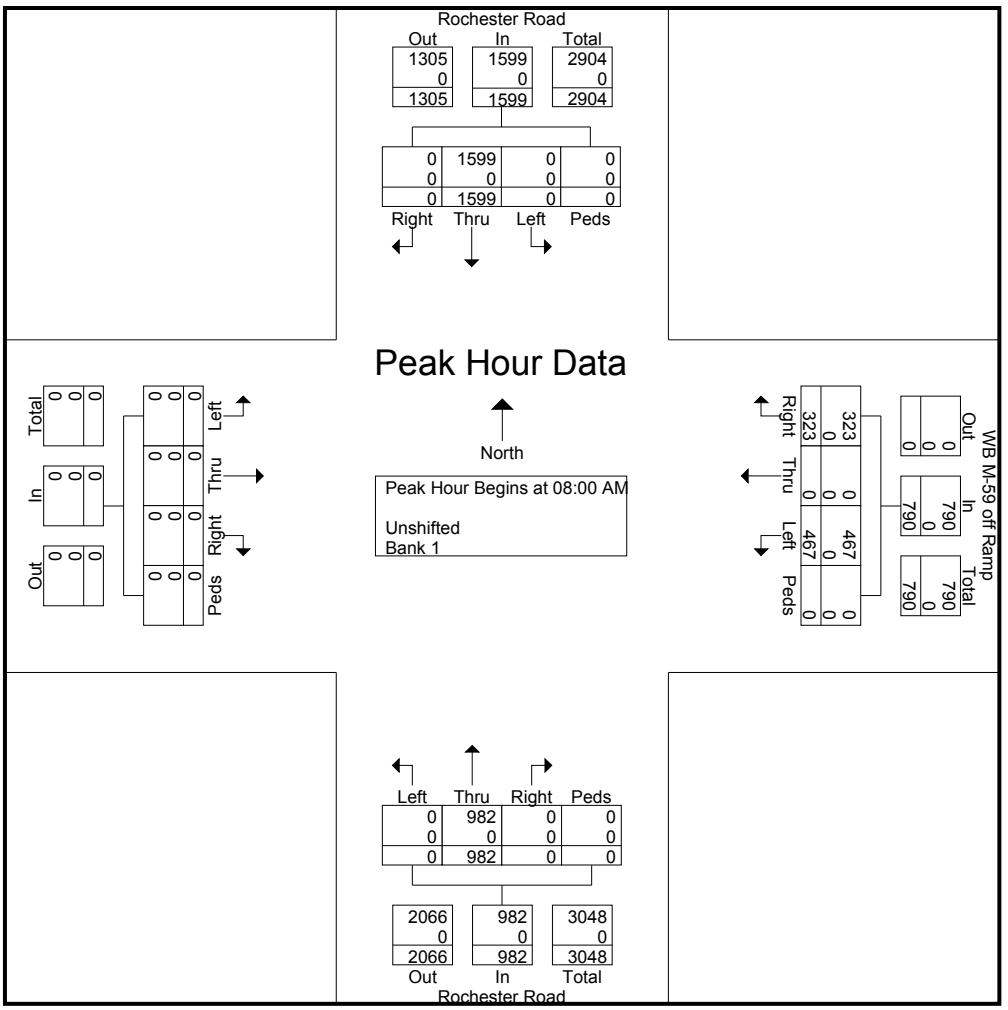
(586) 615-4120

Rochest Road & WB M-59 off Ramp
Weather Condition: Clear
Count By: S.Naser
Board #: 1

File Name : WB M 59 & rochester
Site Code : 00000000
Start Date : 9/19/2017

	Rochester Road Southbound					WB M-59 off Ramp Westbound					Rochester Road Northbound					Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	0	364	0	0	364	64	0	116	0	180	0	195	0	0	195	0	0	0	0	0	739
08:15 AM	0	449	0	0	449	58	0	95	0	153	0	228	0	0	228	0	0	0	0	0	830
08:30 AM	0	407	0	0	407	79	0	132	0	211	0	250	0	0	250	0	0	0	0	0	868
08:45 AM	0	379	0	0	379	122	0	124	0	246	0	309	0	0	309	0	0	0	0	0	934
Total Volume	0	1599	0	0	1599	323	0	467	0	790	0	982	0	0	982	0	0	0	0	0	3371
% App. Total	0	100	0	0		40.9	0	59.1	0		0	100	0	0		0	0	0	0		
PHF	.000	.890	.000	.000	.890	.662	.000	.884	.000	.803	.000	.794	.000	.000	.794	.000	.000	.000	.000	.000	.902
Unshifted	0	1599	0	0	1599	323	0	467	0	790	0	982	0	0	982	0	0	0	0	0	3371
% Unshifted	0	100	0	0	100	100	0	100	0	100	0	100	0	0	100	0	0	0	0	0	100
Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



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Clinton Township, Michigan 48035
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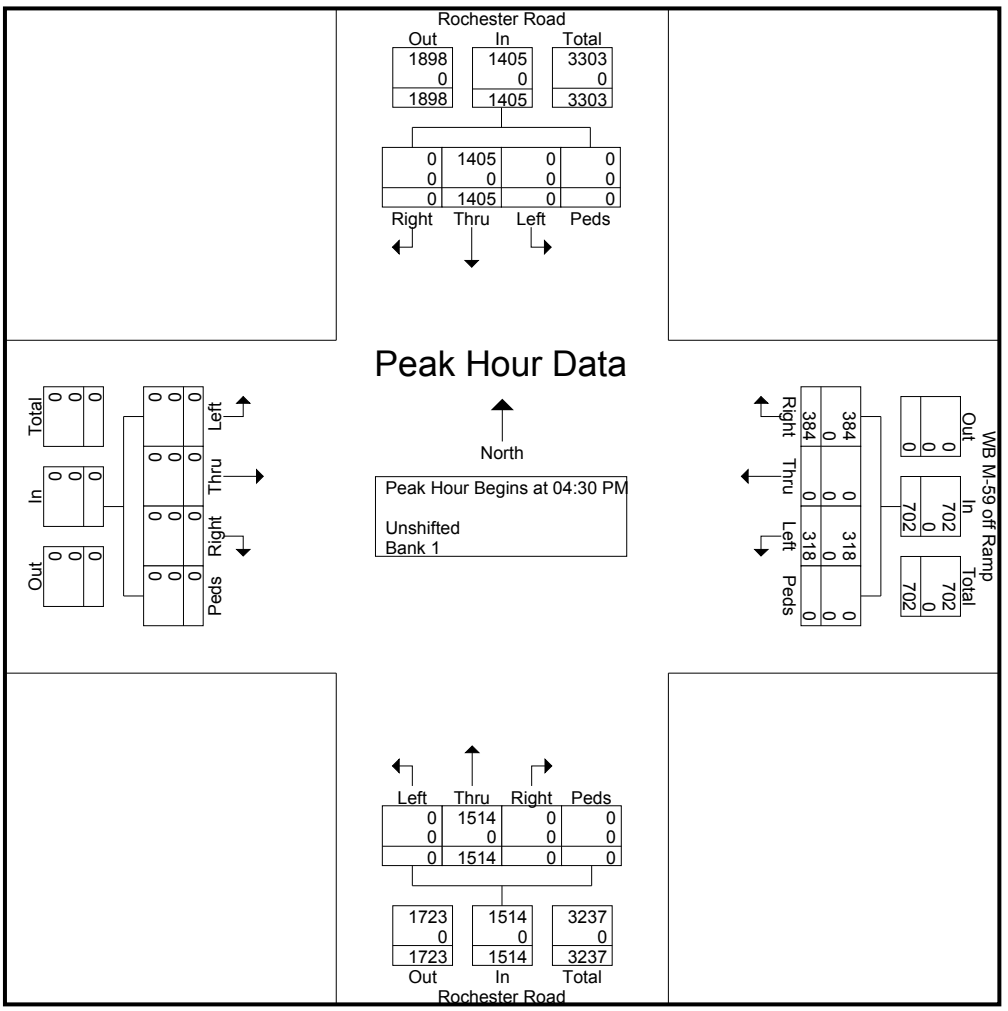
Rochest Road & WB M-59 off Ramp
Weather Condition: Clear
Count By: S.Naser
Board #: 1

File Name : WB M 59 & rochester
Site Code : 00000000
Start Date : 9/19/2017

	Rochester Road Southbound					WB M-59 off Ramp Westbound					Rochester Road Northbound					Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:30 PM																					
04:30 PM	0	377	0	0	377	99	0	81	0	180	0	395	0	0	395	0	0	0	0	0	952
04:45 PM	0	350	0	0	350	103	0	73	0	176	0	353	0	0	353	0	0	0	0	0	879
05:00 PM	0	339	0	0	339	93	0	76	0	169	0	359	0	0	359	0	0	0	0	0	867
05:15 PM	0	339	0	0	339	89	0	88	0	177	0	407	0	0	407	0	0	0	0	0	923
Total Volume	0	1405	0	0	1405	384	0	318	0	702	0	1514	0	0	1514	0	0	0	0	0	3621
% App. Total																					
PHF	.000	.932	.000	.000	.932	.932	.000	.903	.000	.975	.000	.930	.000	.000	.930	.000	.000	.000	.000	.000	.951
Unshifted	0	1405	0	0	1405	384	0	318	0	702	0	1514	0	0	1514	0	0	0	0	0	3621
% Unshifted																					
Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



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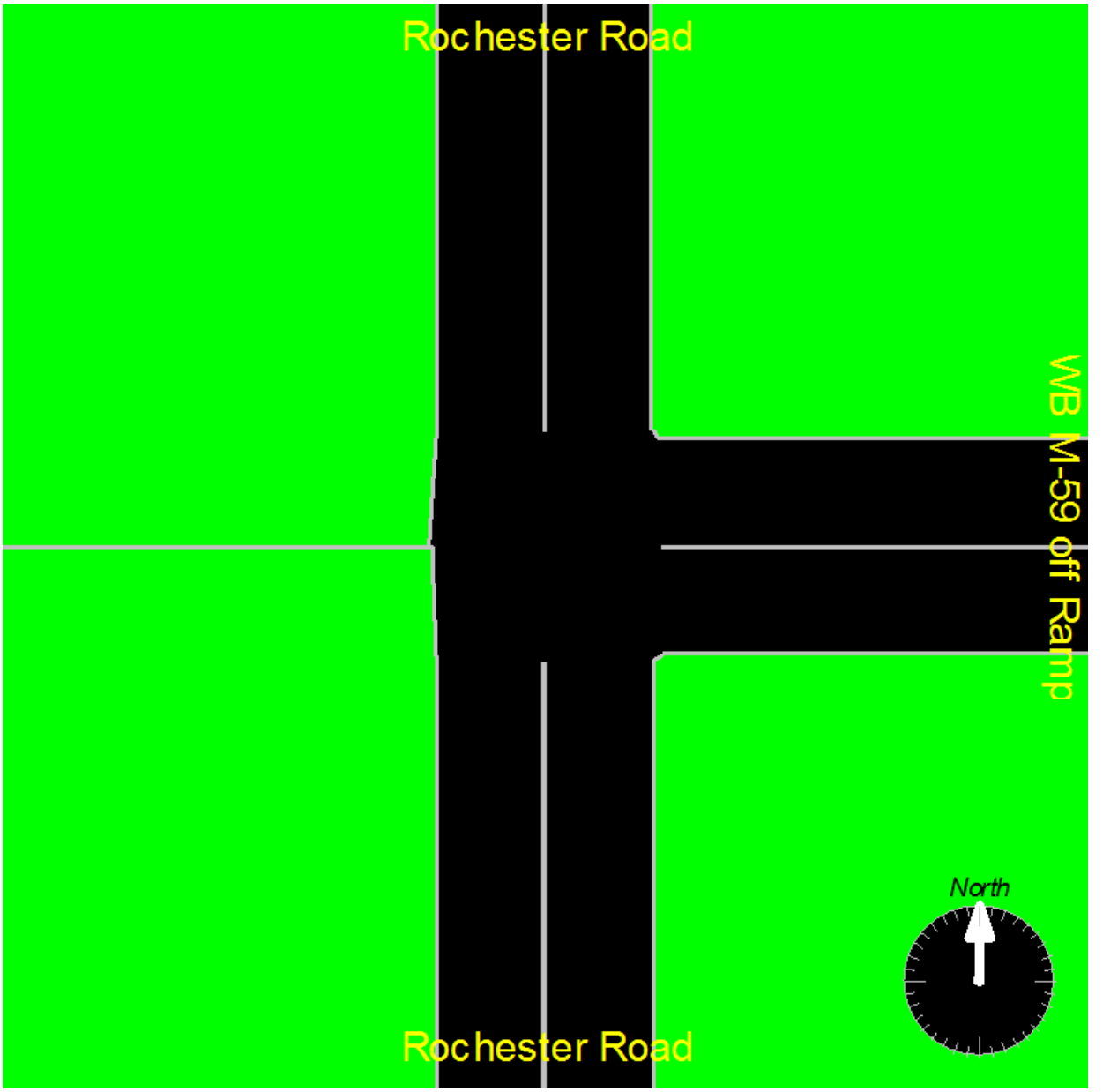
Rochest Road & WB M-59 off Ramp
Weather Condition: Clear
Count By: S.Naser
Board #: 1

File Name : WB M 59 & rochester
Site Code : 00000000
Start Date : 9/19/2017
Page No : 6



Traffic Engineering Consultants, Inc.

35890 Monterey Dr
Clinton Township, Michigan 48035
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Rochester Road & EB M-59 off Ramp
Weather Condition: Clear
Count By: L. Othman
Board #: 1

File Name : eb m59 & rochester
Site Code : 00000000
Start Date : 9/19/2017
Page No : 1

Groups Printed- Unshifted - Bank 1

	Rochester Road Southbound				Westbound				Rochester Road Northbound				EB M-59 off Ramp Eastbound				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
07:00 AM	0	294	0	0	0	0	0	0	0	195	0	0	68	0	30	0	587
07:15 AM	0	361	0	0	0	0	0	0	0	262	0	0	83	0	45	0	751
07:30 AM	0	334	0	0	0	0	0	0	0	295	0	0	70	0	57	0	756
07:45 AM	0	315	0	0	0	0	0	0	0	309	0	0	93	0	53	0	770
Total	0	1304	0	0	0	0	0	0	0	1061	0	0	314	0	185	0	2864
08:00 AM	0	248	0	0	0	0	0	0	0	259	0	0	78	0	61	0	646
08:15 AM	0	293	0	0	0	0	0	0	0	248	0	0	93	0	63	0	697
08:30 AM	0	296	0	0	0	0	0	0	0	302	0	0	98	0	79	0	775
08:45 AM	0	259	0	0	0	0	0	0	0	321	0	0	116	0	82	0	778
Total	0	1096	0	0	0	0	0	0	0	1130	0	0	385	0	285	0	2896
*** BREAK ***																	
04:00 PM	0	203	0	0	0	0	0	0	0	339	0	0	103	0	73	0	718
04:15 PM	0	212	0	0	0	0	0	0	0	343	0	0	136	0	85	0	776
04:30 PM	0	223	0	0	0	0	0	0	0	318	0	0	128	0	82	0	751
04:45 PM	0	169	0	0	0	0	0	0	0	304	0	0	144	0	110	0	727
Total	0	807	0	0	0	0	0	0	0	1304	0	0	511	0	350	0	2972
05:00 PM	0	203	0	0	0	0	0	0	0	330	0	0	141	0	112	0	786
05:15 PM	0	220	0	0	0	0	0	0	0	345	0	0	130	0	117	0	812
05:30 PM	0	238	0	0	0	0	0	0	0	286	0	0	128	0	135	0	787
05:45 PM	0	122	0	0	0	0	0	0	0	290	0	0	108	0	97	0	617
Total	0	783	0	0	0	0	0	0	0	1251	0	0	507	0	461	0	3002
Grand Total	0	3990	0	0	0	0	0	0	0	4746	0	0	1717	0	1281	0	11734
Apprch %	0	100	0	0	0	0	0	0	0	100	0	0	57.3	0	42.7	0	
Total %	0	34	0	0	0	0	0	0	0	40.4	0	0	14.6	0	10.9	0	
Unshifted	0	3990	0	0	0	0	0	0	0	4746	0	0	1717	0	1281	0	11734
% Unshifted	0	100	0	0	0	0	0	0	0	100	0	0	100	0	100	0	100
Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Traffic Engineering Consultants, Inc.

35890 Monterey Dr
Clinton Township, Michigan 48035
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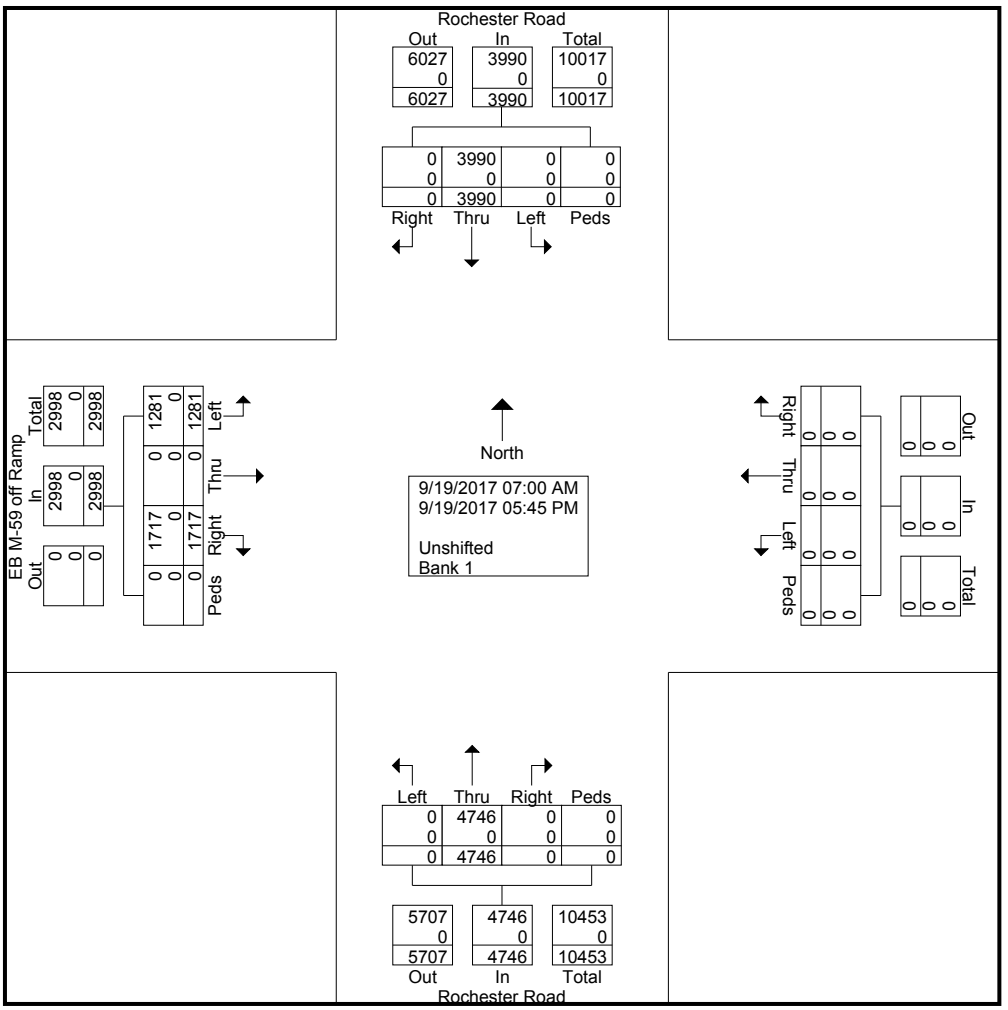
Rochester Road & EB M-59 off Ramp
Weather Condition: Clear
Count By: L. Othman
Board #: 1

File Name : eb m59 & rochester
Site Code : 00000000
Start Date : 9/19/2017
Page No : 2



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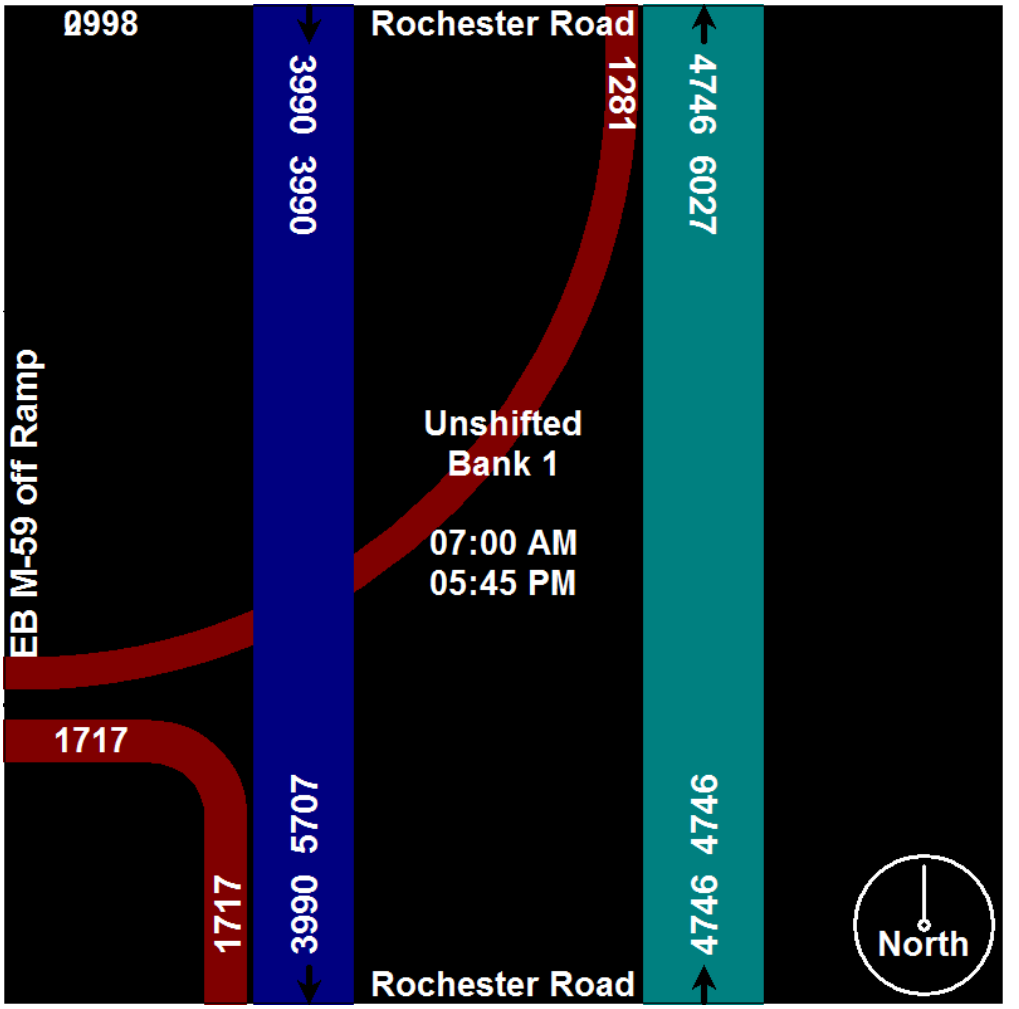
Rochester Road & EB M-59 off Ramp
Weather Condition: Clear
Count By: L. Othman
Board #: 1

File Name : eb m59 & rochester
Site Code : 00000000
Start Date : 9/19/2017
Page No : 3



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35890 Monterey Dr
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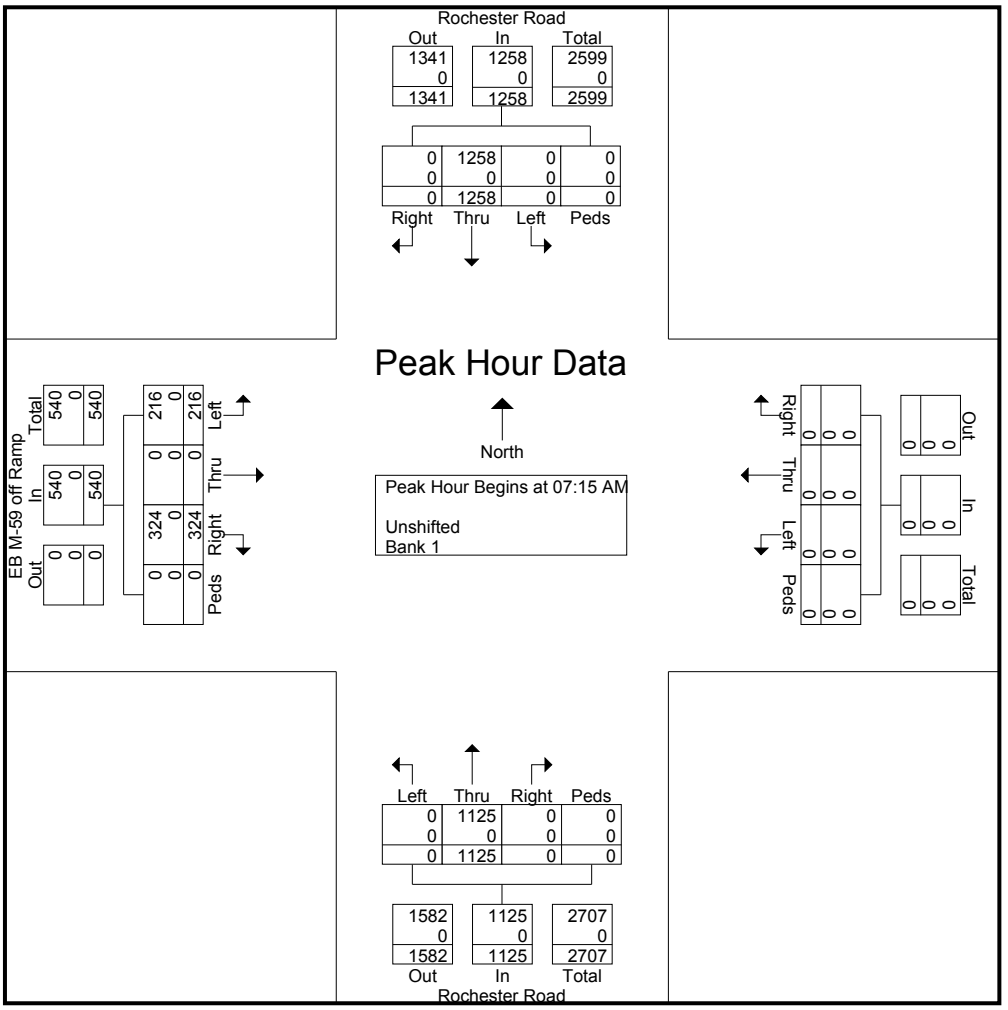
Rochester Road & EB M-59 off Ramp
Weather Condition: Clear
Count By: L. Othman
Board #: 1

File Name : eb m59 & rochester
Site Code : 00000000
Start Date : 9/19/2017
Page No : 4

	Rochester Road Southbound					Westbound					Rochester Road Northbound					EB M-59 off Ramp Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15 AM																					
07:15 AM	0	361	0	0	361	0	0	0	0	0	0	262	0	0	262	83	0	45	0	128	751
07:30 AM	0	334	0	0	334	0	0	0	0	0	0	295	0	0	295	70	0	57	0	127	756
07:45 AM	0	315	0	0	315	0	0	0	0	0	0	309	0	0	309	93	0	53	0	146	770
08:00 AM	0	248	0	0	248	0	0	0	0	0	0	259	0	0	259	78	0	61	0	139	646
Total Volume	0	1258	0	0	1258	0	0	0	0	0	0	1125	0	0	1125	324	0	216	0	540	2923
% App. Total																					
PHF	.000	.871	.000	.000	.871	.000	.000	.000	.000	.000	.000	.910	.000	.000	.910	.871	.000	.885	.000	.925	.949
Unshifted	0	1258	0	0	1258	0	0	0	0	0	0	1125	0	0	1125	324	0	216	0	540	2923
% Unshifted																					
Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



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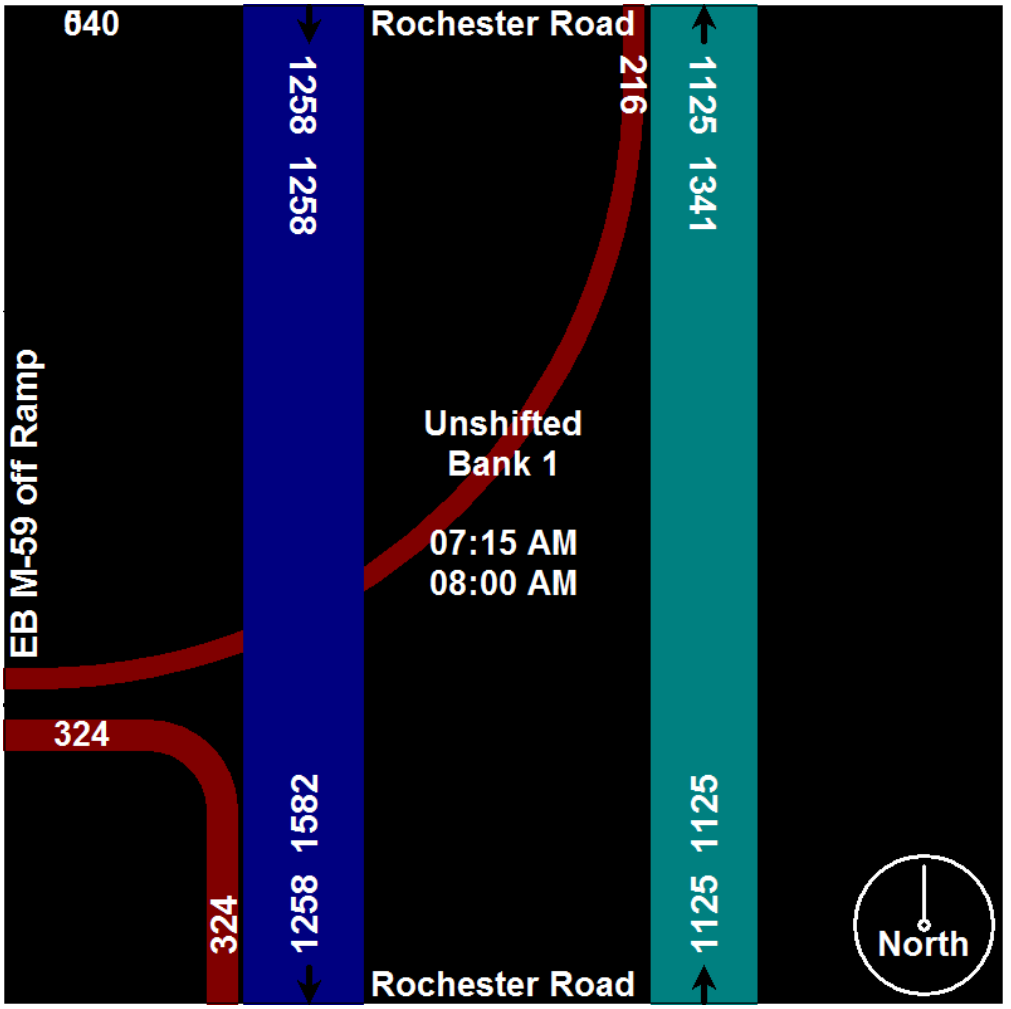
Rochester Road & EB M-59 off Ramp
Weather Condition: Clear
Count By: L. Othman
Board #: 1

File Name : eb m59 & rochester
Site Code : 00000000
Start Date : 9/19/2017
Page No : 5



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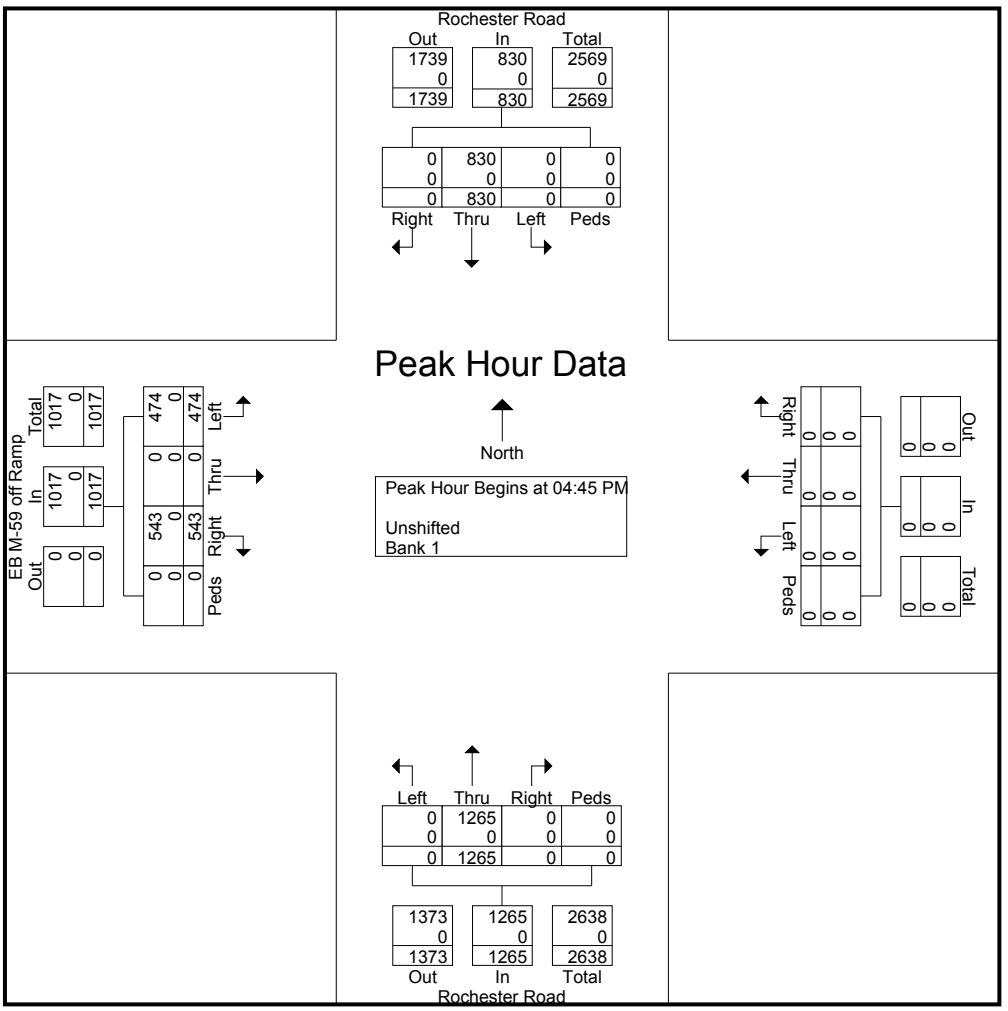
Rochester Road & EB M-59 off Ramp
Weather Condition: Clear
Count By: L. Othman
Board #: 1

File Name : eb m59 & rochester
Site Code : 00000000
Start Date : 9/19/2017
Page No : 6

	Rochester Road Southbound					Westbound					Rochester Road Northbound					EB M-59 off Ramp Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:45 PM																					
04:45 PM	0	169	0	0	169	0	0	0	0	0	0	304	0	0	304	144	0	110	0	254	727
05:00 PM	0	203	0	0	203	0	0	0	0	0	0	330	0	0	330	141	0	112	0	253	786
05:15 PM	0	220	0	0	220	0	0	0	0	0	0	345	0	0	345	130	0	117	0	247	812
05:30 PM	0	238	0	0	238	0	0	0	0	0	0	286	0	0	286	128	0	135	0	263	787
Total Volume	0	830	0	0	830	0	0	0	0	0	0	1265	0	0	1265	543	0	474	0	1017	3112
% App. Total																					
PHF	.000	.872	.000	.000	.872	.000	.000	.000	.000	.000	.000	.917	.000	.000	.917	.943	.000	.878	.000	.967	.958
Unshifted	0	830	0	0	830	0	0	0	0	0	0	1265	0	0	1265	543	0	474	0	1017	3112
% Unshifted																					
Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



Traffic Engineering Consultants, Inc.

35890 Monterey Dr
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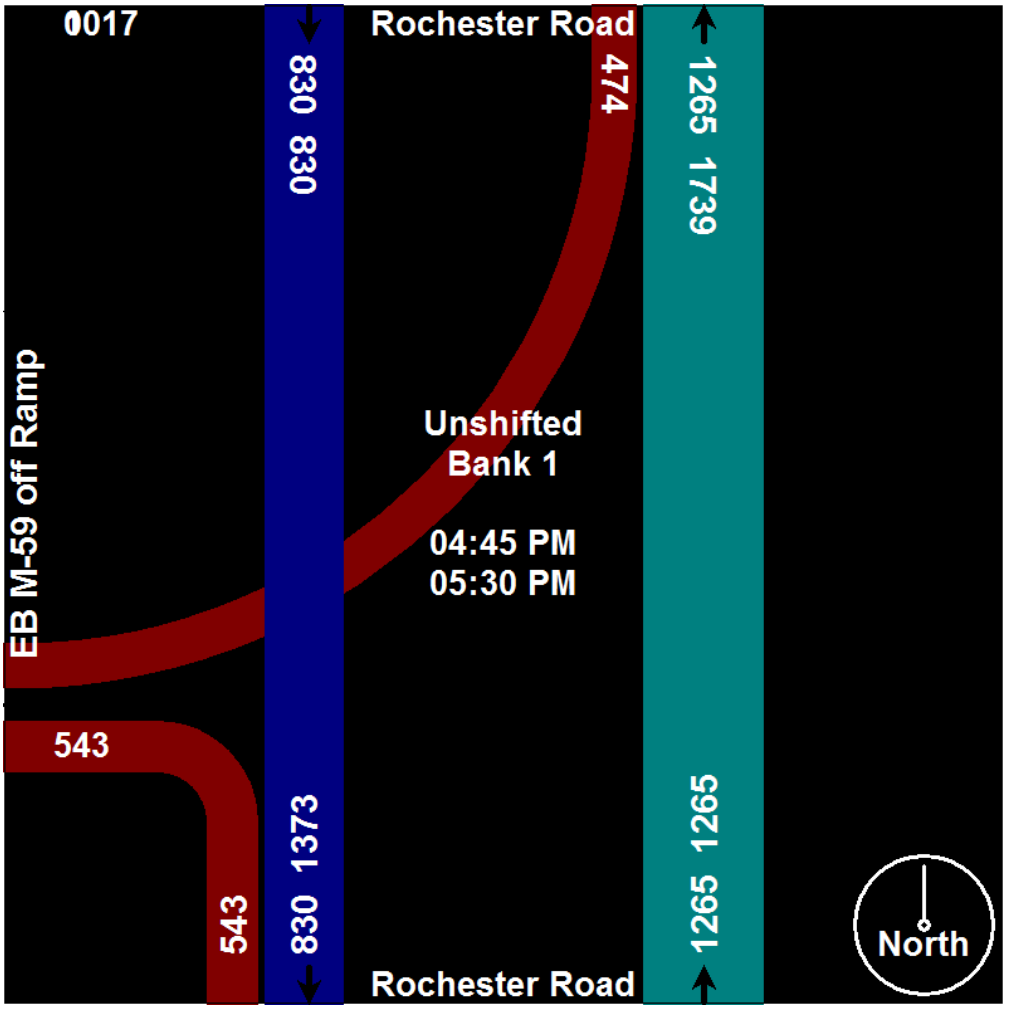
(586) 615-4120

Rochester Road & EB M-59 off Ramp
Weather Condition: Clear
Count By: L. Othman
Board #: 1

File Name : eb m59 & rochester
Site Code : 00000000
Start Date : 9/19/2017
Page No : 7



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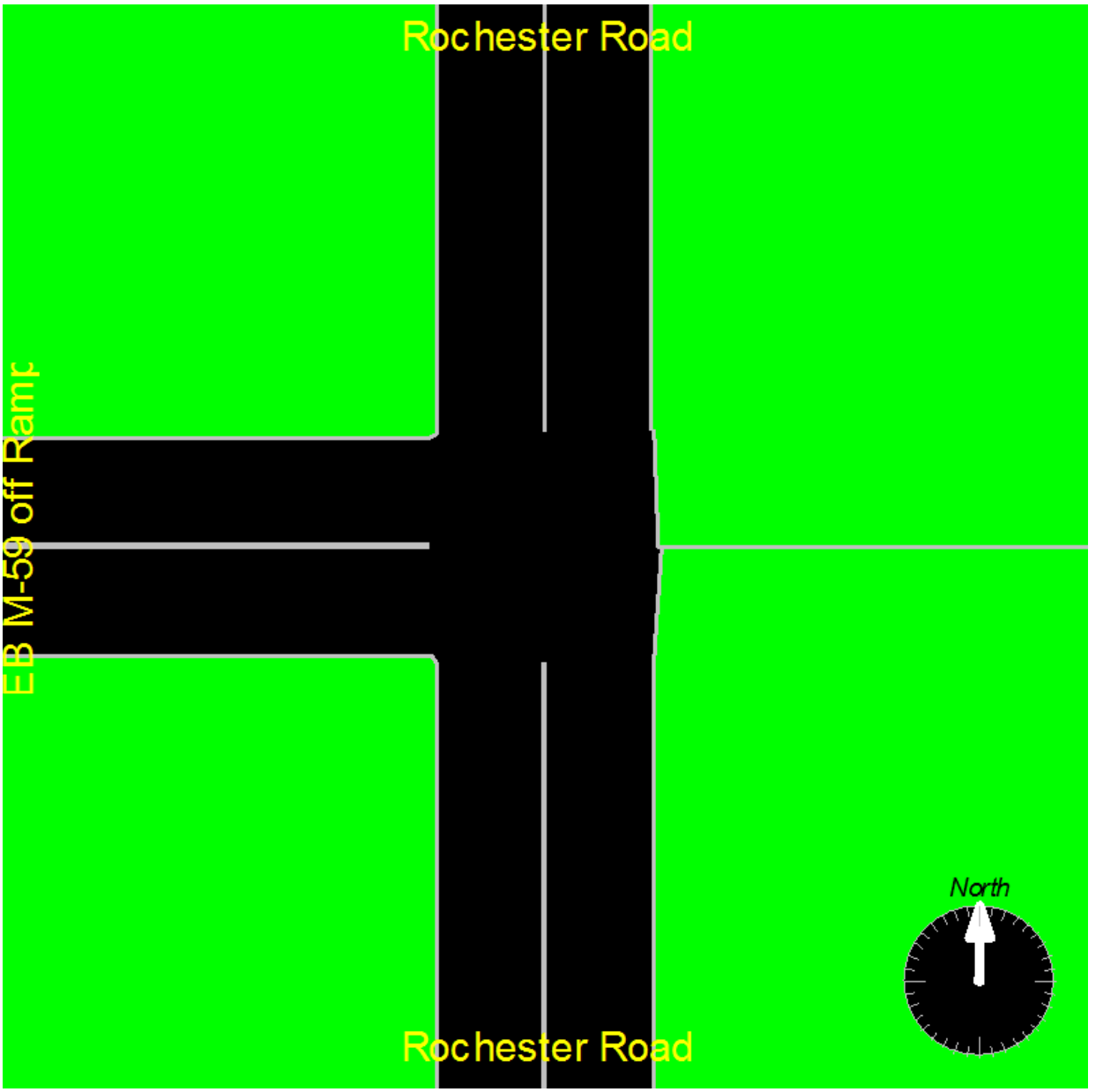
(586) 615-4120

Rochester Road & EB M-59 off Ramp
Weather Condition: Clear
Count By: L. Othman
Board #: 1

File Name : eb m59 & rochester
Site Code : 00000000
Start Date : 9/19/2017
Page No : 8



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Rochester Road & Site Drive
Weather Condition: Clear
Count By; RS
Then Click the Comments Tab

File Name : rochester & Site Dr
Site Code : 0005____
Start Date : 9/19/2017
Page No : 1

Groups Printed- Class 1

	Rochester Road Southbound				Westbound				Rochester Road Northbound				Site Drive Eastbound				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
07:00 AM	5	0	0	0	0	0	0	0	0	0	2	0	1	0	1	0	9
07:15 AM	4	0	0	0	0	0	0	0	0	0	3	0	1	0	2	0	10
07:30 AM	6	0	0	0	0	0	0	0	0	0	2	0	0	0	2	0	10
07:45 AM	6	0	0	0	0	0	0	0	0	0	4	0	1	0	1	0	12
Total	21	0	0	0	0	0	0	0	0	0	11	0	3	0	6	0	41
08:00 AM	5	0	0	0	0	0	0	0	0	0	3	0	1	0	1	0	10
08:15 AM	7	0	0	0	0	0	0	0	0	0	5	0	1	0	2	0	15
08:30 AM	5	0	0	0	0	0	0	0	0	0	3	0	2	0	2	0	12
08:45 AM	8	0	0	0	0	0	0	0	0	0	4	0	2	0	2	0	16
Total	25	0	0	0	0	0	0	0	0	0	15	0	6	0	7	0	53
*** BREAK ***																	
02:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
*** BREAK ***																	
Total	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
*** BREAK ***																	
04:00 PM	3	0	0	0	0	0	0	0	0	0	2	0	4	0	6	0	15
04:15 PM	4	0	0	0	0	0	0	0	0	0	3	0	5	0	8	0	20
04:30 PM	5	0	0	0	0	0	0	0	0	0	2	0	4	0	8	0	19
04:45 PM	3	0	0	0	0	0	0	0	0	0	1	0	6	0	10	0	20
Total	15	0	0	0	0	0	0	0	0	0	8	0	19	0	32	0	74
05:00 PM	3	0	0	0	0	0	0	0	0	0	2	0	7	0	6	0	18
05:15 PM	4	0	0	0	0	0	0	0	0	0	3	0	8	0	7	0	22
05:30 PM	2	0	0	0	0	0	0	0	0	0	2	0	5	0	4	0	13
05:45 PM	1	0	0	0	0	0	0	0	0	0	3	0	4	0	4	0	12
Total	10	0	0	0	0	0	0	0	0	0	10	0	24	0	21	0	65
Grand Total	71	0	0	0	0	0	0	0	0	0	44	0	53	0	66	0	234
Apprch %	100	0	0	0	0	0	0	0	0	0	100	0	44.5	0	55.5	0	
Total %	30.3	0	0	0	0	0	0	0	0	0	18.8	0	22.6	0	28.2	0	

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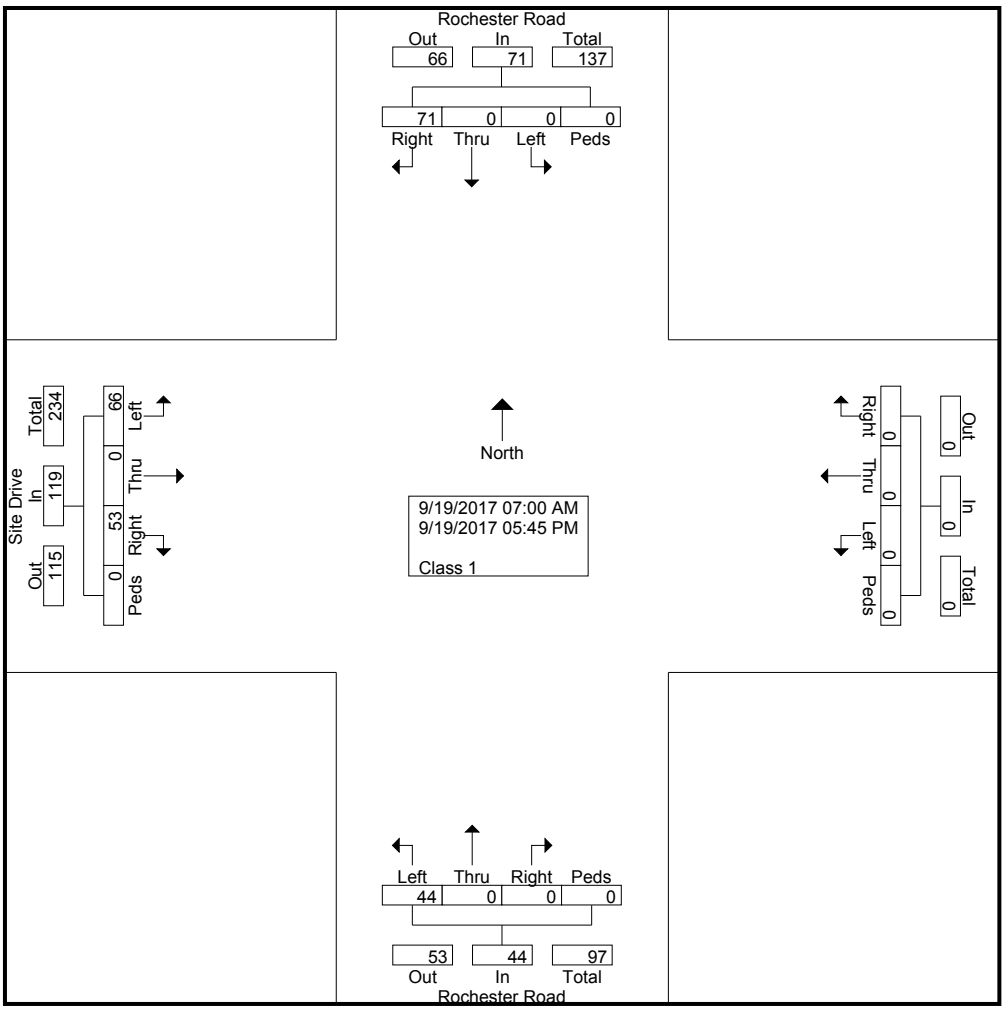
Rochester Road & Site Drive
Weather Condition: Clear
Count By; RS
Then Click the Comments Tab

File Name : rochester & Site Dr
Site Code : 0005____
Start Date : 9/19/2017
Page No : 2



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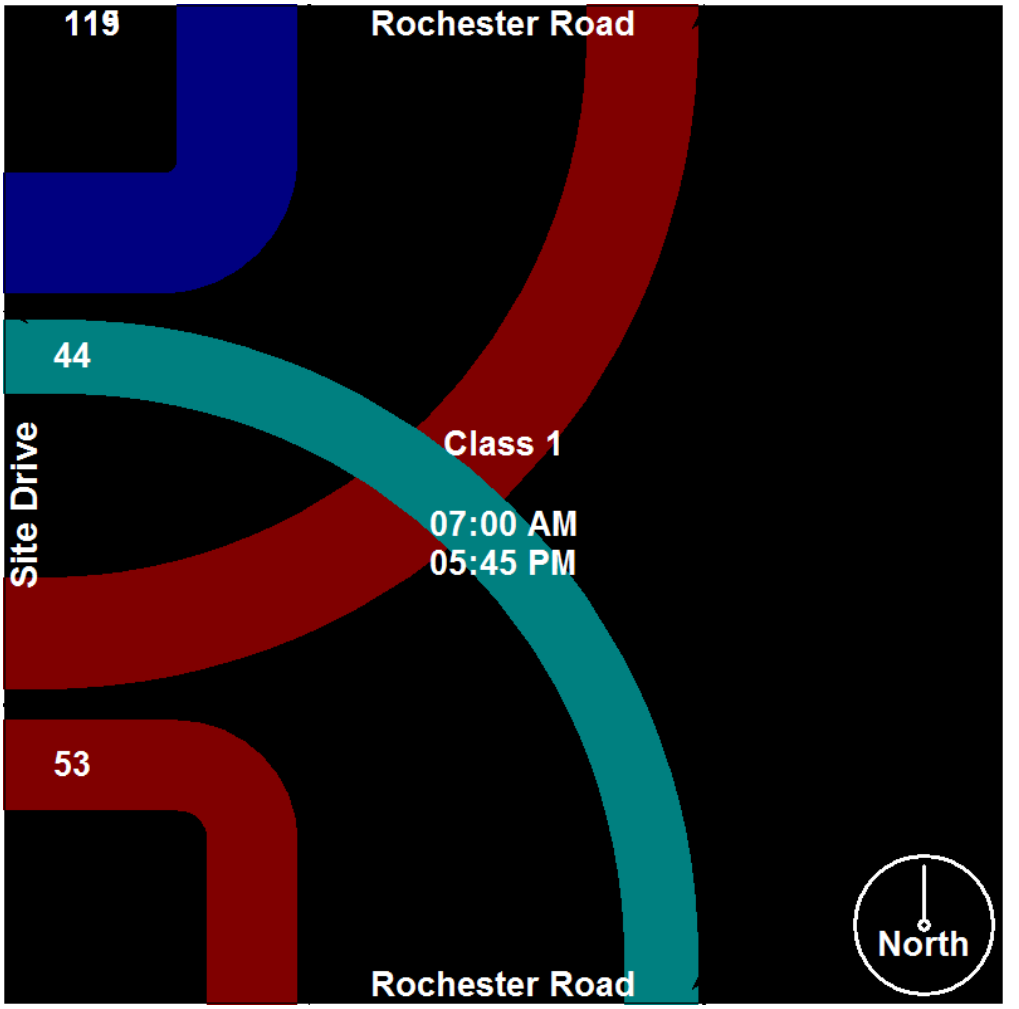
Rochester Road & Site Drive
Weather Condition: Clear
Count By; RS
Then Click the Comments Tab

File Name : rochester & Site Dr
Site Code : 0005____
Start Date : 9/19/2017
Page No : 3



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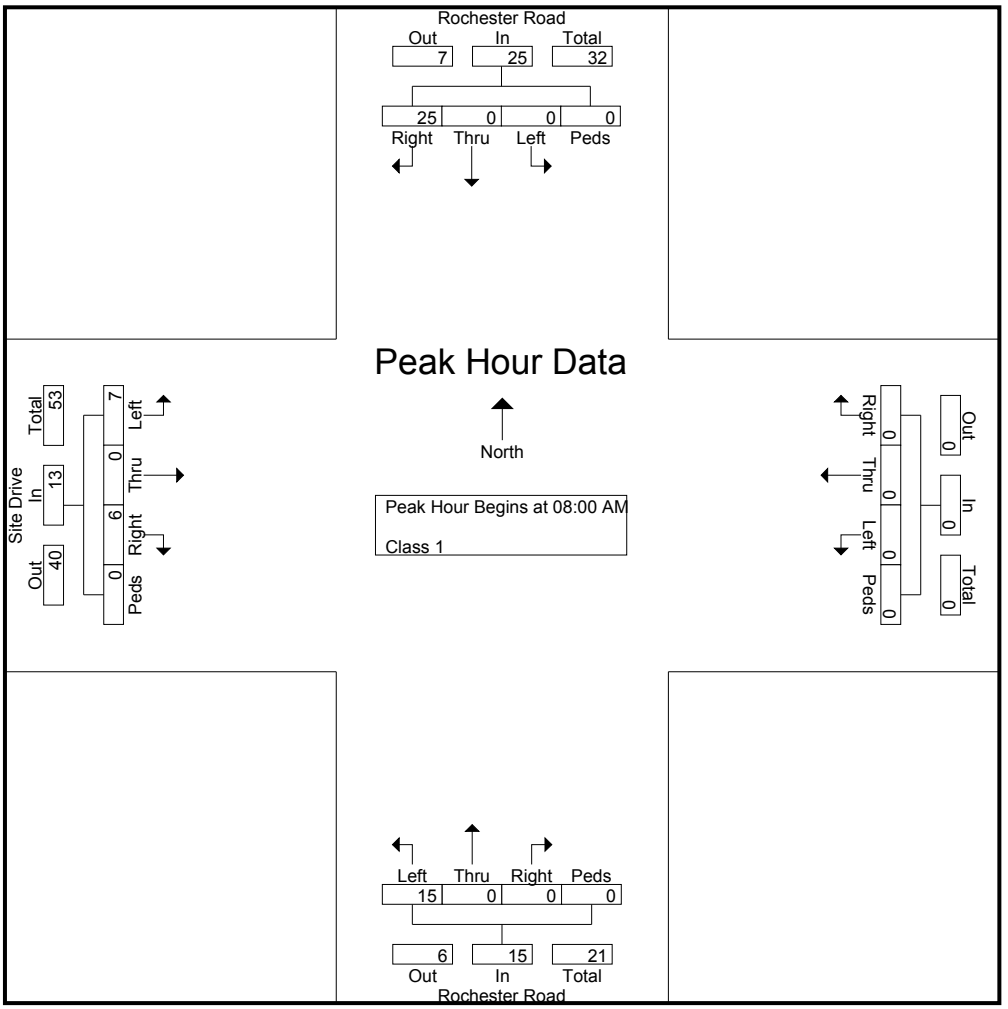
Rochester Road & Site Drive
Weather Condition: Clear
Count By; RS
Then Click the Comments Tab

File Name : rochester & Site Dr
Site Code : 0005____
Start Date : 9/19/2017
Page No : 4

	Rochester Road Southbound					Westbound					Rochester Road Northbound					Site Drive Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	5	0	0	0	5	0	0	0	0	0	0	0	3	0	3	1	0	1	0	2	10
08:15 AM	7	0	0	0	7	0	0	0	0	0	0	0	5	0	5	1	0	2	0	3	15
08:30 AM	5	0	0	0	5	0	0	0	0	0	0	0	3	0	3	2	0	2	0	4	12
08:45 AM	8	0	0	0	8	0	0	0	0	0	0	0	4	0	4	2	0	2	0	4	16
Total Volume	25	0	0	0	25	0	0	0	0	0	0	0	15	0	15	6	0	7	0	13	53
% App. Total	100	0	0	0		0	0	0	0		0	0	100	0		46.2	0	53.8	0		
PHF	.781	.000	.000	.000	.781	.000	.000	.000	.000	.000	.000	.000	.750	.000	.750	.750	.000	.875	.000	.813	.828



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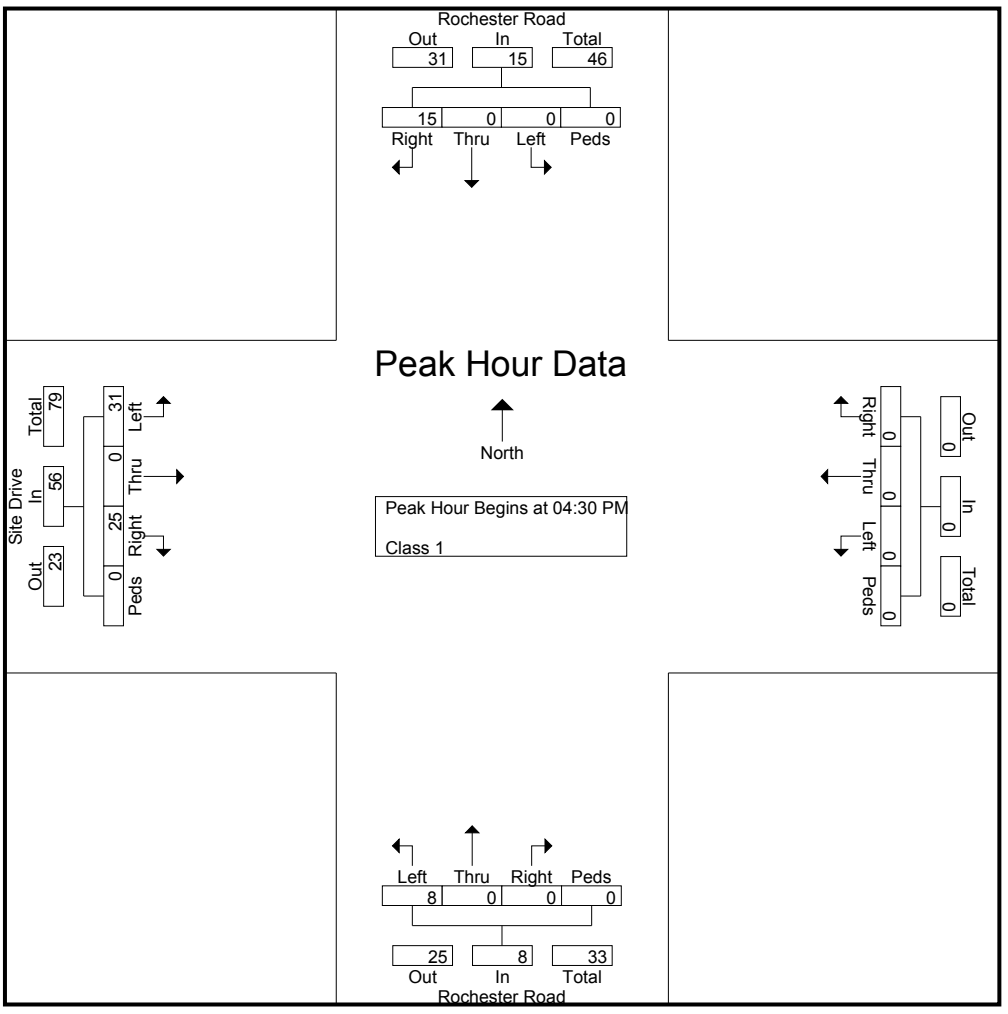
Rochester Road & Site Drive
Weather Condition: Clear
Count By; RS
Then Click the Comments Tab

File Name : rochester & Site Dr
Site Code : 0005____
Start Date : 9/19/2017
Page No : 5

	Rochester Road Southbound					Westbound					Rochester Road Northbound					Site Drive Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:30 PM																					
04:30 PM	5	0	0	0	5	0	0	0	0	0	0	0	2	0	2	4	0	8	0	12	19
04:45 PM	3	0	0	0	3	0	0	0	0	0	0	0	1	0	1	6	0	10	0	16	20
05:00 PM	3	0	0	0	3	0	0	0	0	0	0	0	2	0	2	7	0	6	0	13	18
05:15 PM	4	0	0	0	4	0	0	0	0	0	0	0	3	0	3	8	0	7	0	15	22
Total Volume	15	0	0	0	15	0	0	0	0	0	0	0	8	0	8	25	0	31	0	56	79
% App. Total	100	0	0	0		0	0	0	0		0	0	100	0		44.6	0	55.4	0		
PHF	.750	.000	.000	.000	.750	.000	.000	.000	.000	.000	.000	.000	.667	.000	.667	.781	.000	.775	.000	.875	.898



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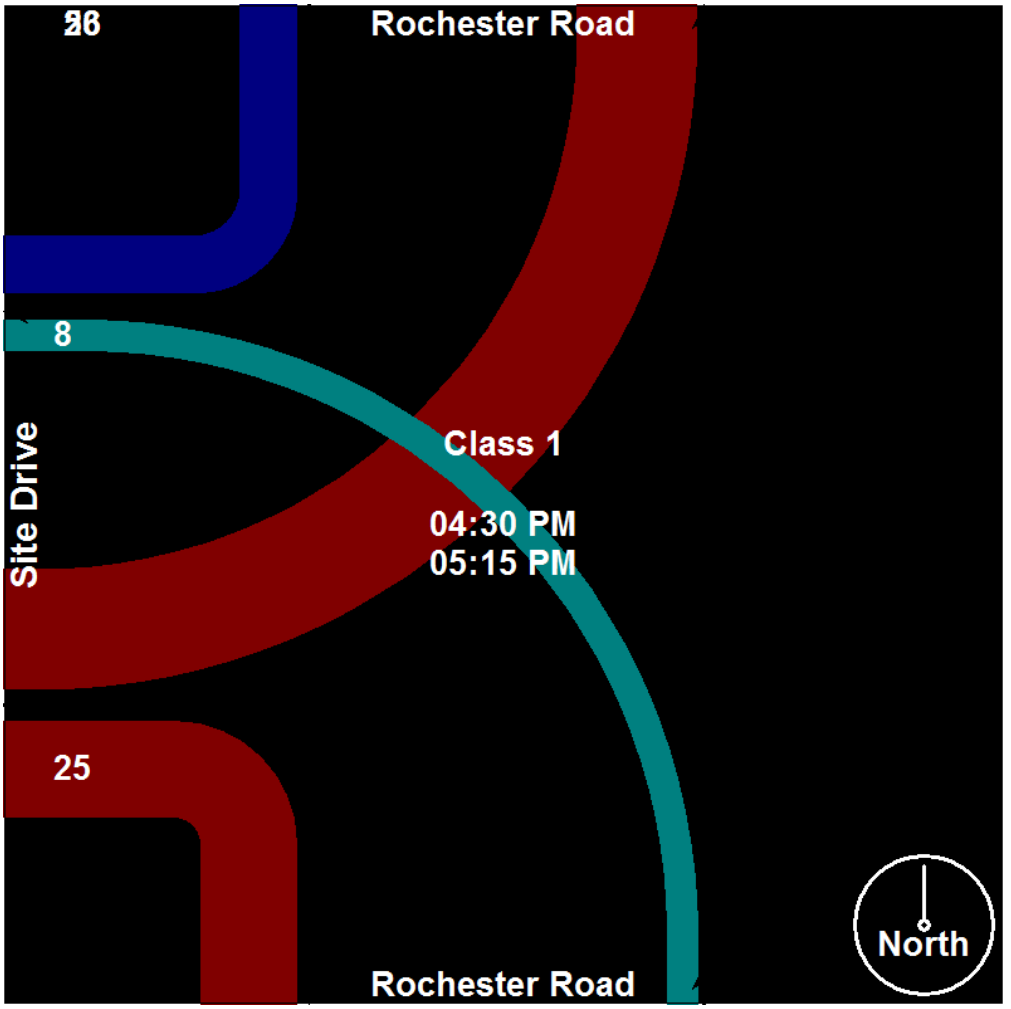
Rochester Road & Site Drive
Weather Condition: Clear
Count By; RS
Then Click the Comments Tab

File Name : rochester & Site Dr
Site Code : 0005____
Start Date : 9/19/2017
Page No : 6



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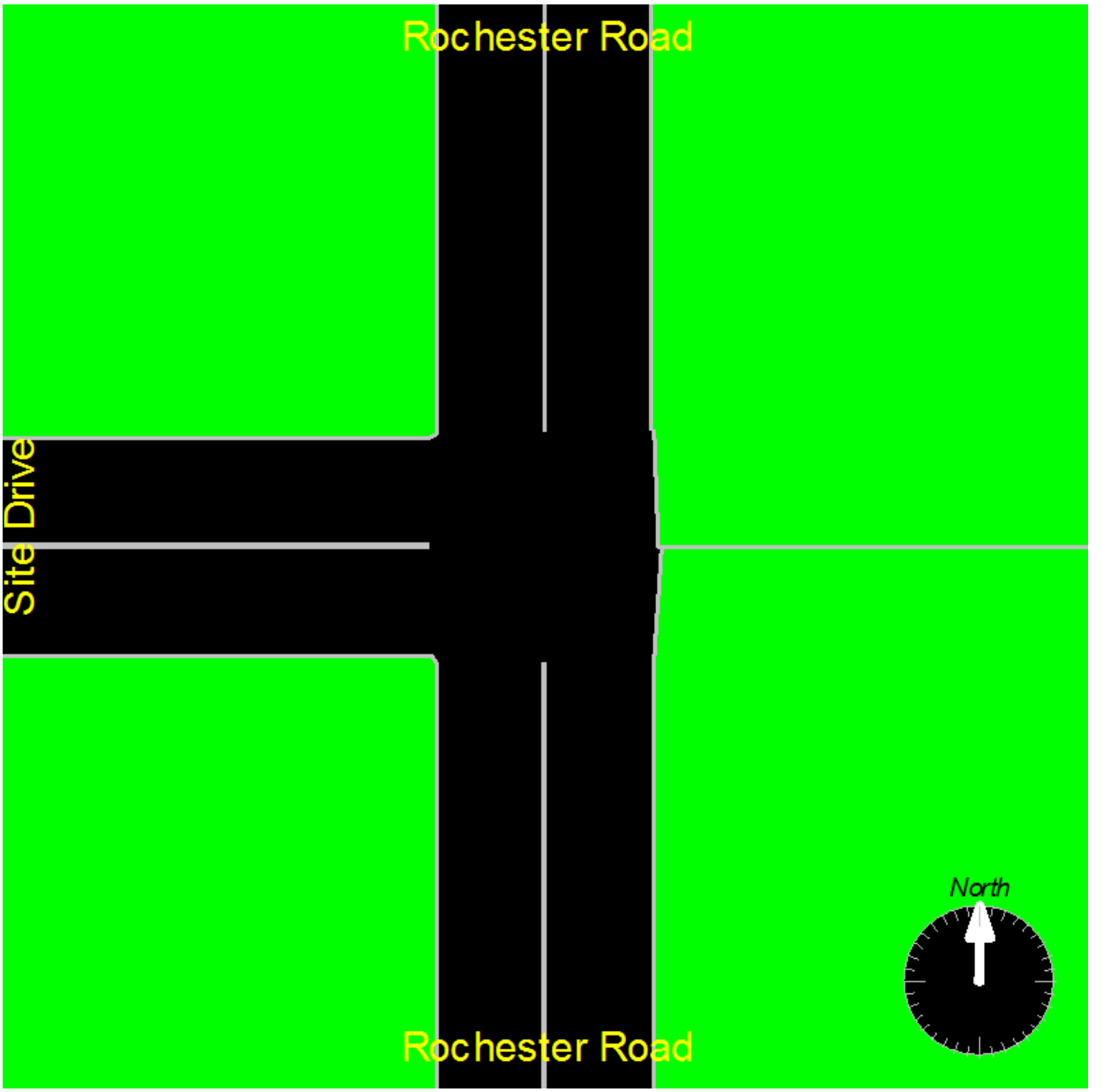
Rochester Road & Site Drive
Weather Condition: Clear
Count By; RS
Then Click the Comments Tab

File Name : rochester & Site Dr
Site Code : 0005____
Start Date : 9/19/2017
Page No : 7



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South Blvd & Site Drive
Weather Condition: Clear
Count By: LL
Oard # 2

File Name : South blvd & Site Dr
Site Code : 004
Start Date : 9/19/2017
Page No : 1

Groups Printed- Class 1

	Site Drive Southbound				South Blvd Westbound				South Blvd Northbound				South Blvd Eastbound				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
07:00 AM	0	0	1	0	2	0	0	0	0	0	0	0	0	0	3	0	6
07:15 AM	1	0	0	0	4	0	0	0	0	0	0	0	0	0	3	0	8
07:30 AM	1	0	0	0	3	0	0	0	0	0	0	0	0	0	4	0	8
07:45 AM	1	0	1	0	2	0	0	0	0	0	0	0	0	0	5	0	9
Total	3	0	2	0	11	0	0	0	0	0	0	0	0	0	15	0	31
08:00 AM	0	0	1	0	4	0	0	0	0	0	0	0	0	0	4	0	9
08:15 AM	2	0	2	0	3	0	0	0	0	0	0	0	0	0	2	0	9
08:30 AM	1	0	2	0	3	0	0	0	0	0	0	0	0	0	5	0	11
08:45 AM	1	0	1	0	4	0	0	0	0	0	0	0	0	0	6	0	12
Total	4	0	6	0	14	0	0	0	0	0	0	0	0	0	17	0	41
09:00 AM	0	0	1	0	4	0	0	0	0	0	0	0	0	0	0	0	5
*** BREAK ***																	
Total	0	0	1	0	4	0	0	0	0	0	0	0	0	0	0	0	5
*** BREAK ***																	
04:00 PM	3	0	4	0	3	0	0	0	0	0	0	0	0	0	1	0	11
04:15 PM	4	0	6	0	2	0	0	0	0	0	0	0	0	0	2	0	14
04:30 PM	4	0	5	0	0	0	0	0	0	0	0	0	0	0	2	0	11
04:45 PM	2	0	7	0	3	0	0	0	0	0	0	0	0	0	1	0	13
Total	13	0	22	0	8	0	0	0	0	0	0	0	0	0	6	0	49
05:00 PM	5	0	4	0	1	0	0	0	0	0	0	0	0	0	1	0	11
05:15 PM	3	0	7	0	2	0	0	0	0	0	0	0	0	0	2	0	14
05:30 PM	4	0	7	0	4	0	0	0	0	0	0	0	0	0	1	0	16
05:45 PM	3	0	4	0	2	0	0	0	0	0	0	0	0	0	2	0	11
Total	15	0	22	0	9	0	0	0	0	0	0	0	0	0	6	0	52
Grand Total	35	0	53	0	46	0	0	0	0	0	0	0	0	0	44	0	178
Apprch %	39.8	0	60.2	0	100	0	0	0	0	0	0	0	0	0	100	0	
Total %	19.7	0	29.8	0	25.8	0	0	0	0	0	0	0	0	0	24.7	0	

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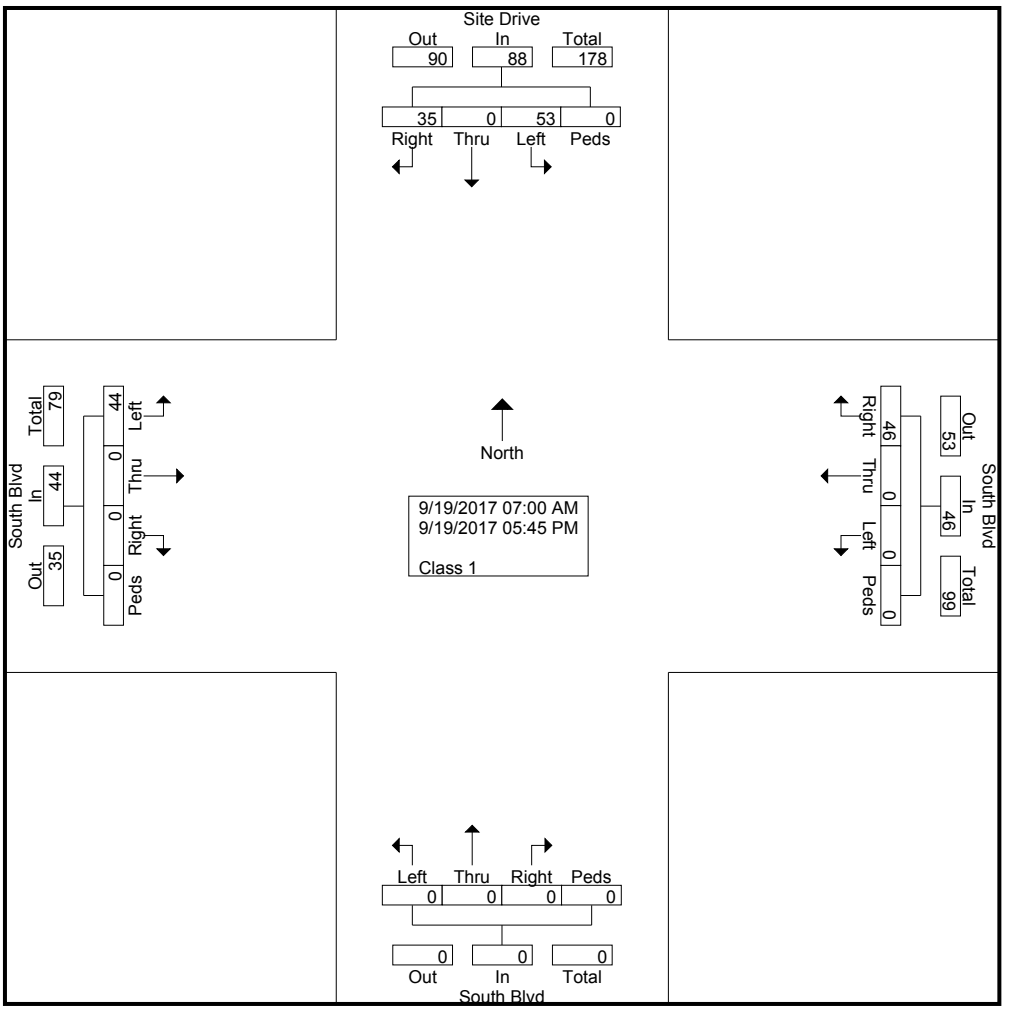
South Blvd & Site Drive
Weather Condition: Clear
Count By: LL
Oard # 2

File Name : South blvd & Site Dr
Site Code : 004
Start Date : 9/19/2017
Page No : 2



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South Blvd & Site Drive
Weather Condition: Clear
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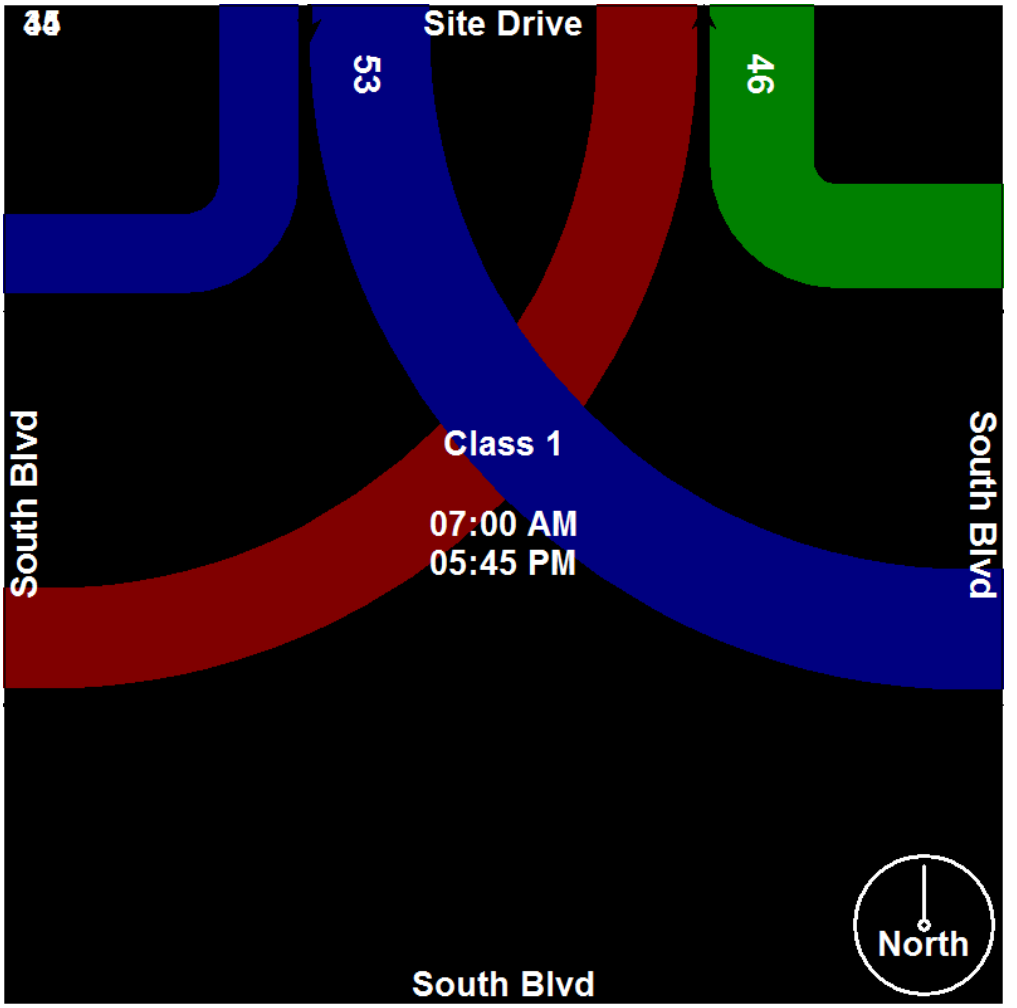
File Name : South blvd & Site Dr
Site Code : 004
Start Date : 9/19/2017
Page No : 3



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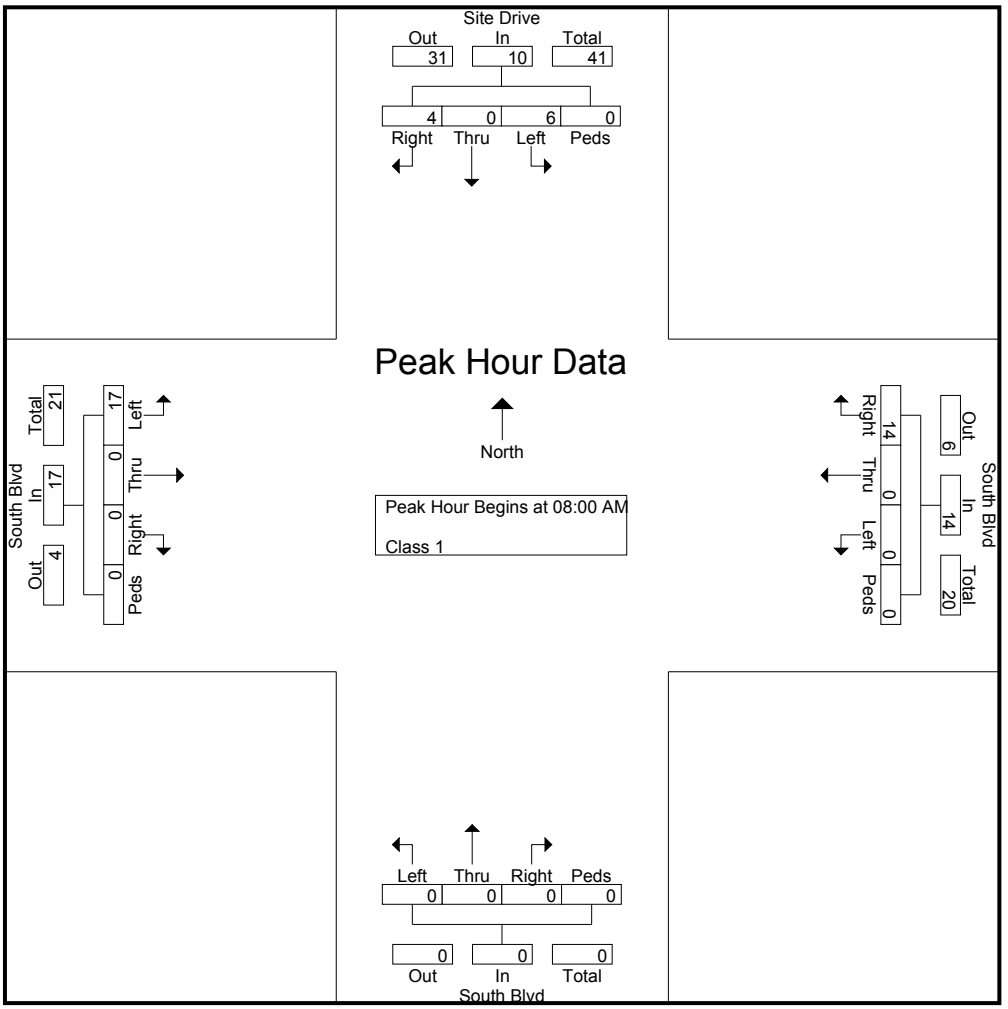
South Blvd & Site Drive
Weather Condition: Clear
Count By: LL
Oard # 2

File Name : South blvd & Site Dr
Site Code : 004
Start Date : 9/19/2017
Page No : 4

	Site Drive Southbound					South Blvd Westbound					South Blvd Northbound					South Blvd Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	0	0	1	0	1	4	0	0	0	4	0	0	0	0	0	0	0	4	0	4	9
08:15 AM	2	0	2	0	4	3	0	0	0	3	0	0	0	0	0	0	0	2	0	2	9
08:30 AM	1	0	2	0	3	3	0	0	0	3	0	0	0	0	0	0	0	5	0	5	11
08:45 AM	1	0	1	0	2	4	0	0	0	4	0	0	0	0	0	0	0	6	0	6	12
Total Volume	4	0	6	0	10	14	0	0	0	14	0	0	0	0	0	0	0	17	0	17	41
% App. Total	40	0	60	0		100	0	0	0		0	0	0	0		0	0	100	0		
PHF	.500	.000	.750	.000	.625	.875	.000	.000	.000	.875	.000	.000	.000	.000	.000	.000	.000	.708	.000	.708	.854



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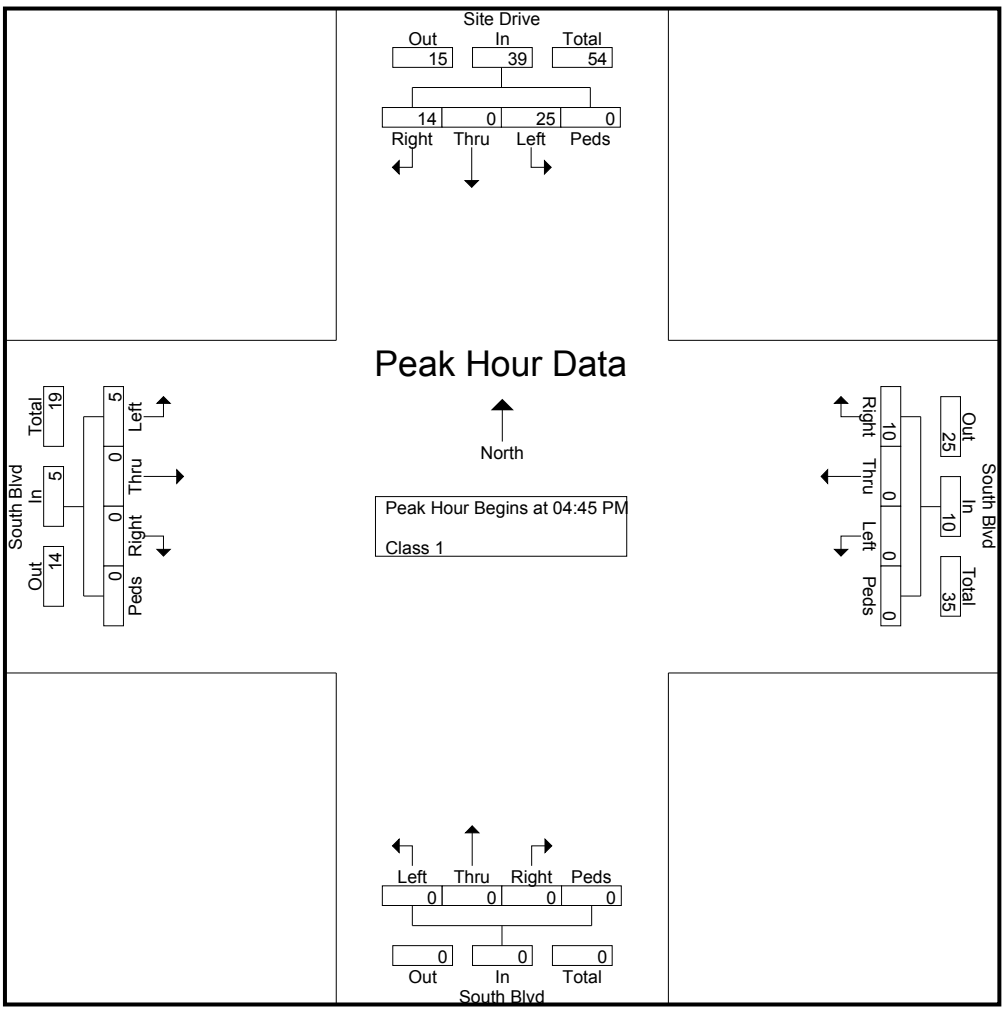
South Blvd & Site Drive
Weather Condition: Clear
Count By: LL
Oard # 2

File Name : South blvd & Site Dr
Site Code : 004
Start Date : 9/19/2017
Page No : 5

	Site Drive Southbound					South Blvd Westbound					South Blvd Northbound					South Blvd Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:45 PM																					
04:45 PM	2	0	7	0	9	3	0	0	0	3	0	0	0	0	0	0	0	1	0	1	13
05:00 PM	5	0	4	0	9	1	0	0	0	1	0	0	0	0	0	0	0	1	0	1	11
05:15 PM	3	0	7	0	10	2	0	0	0	2	0	0	0	0	0	0	0	2	0	2	14
05:30 PM	4	0	7	0	11	4	0	0	0	4	0	0	0	0	0	0	0	1	0	1	16
Total Volume	14	0	25	0	39	10	0	0	0	10	0	0	0	0	0	0	0	5	0	5	54
% App. Total	35.9	0	64.1	0		100	0	0	0		0	0	0	0		0	0	100	0		
PHF	.700	.000	.893	.000	.886	.625	.000	.000	.000	.625	.000	.000	.000	.000	.000	.000	.000	.625	.000	.625	.844



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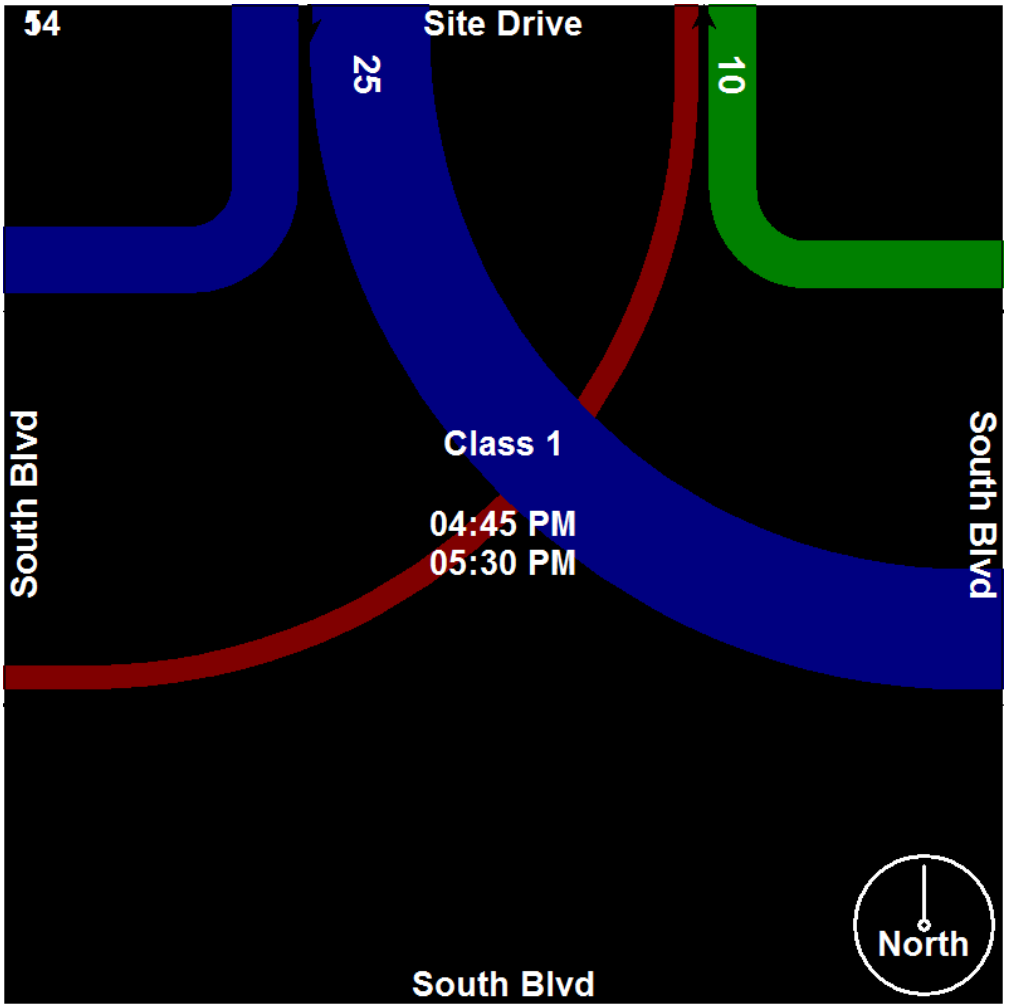
South Blvd & Site Drive
Weather Condition: Clear
Count By: LL
Oard # 2

File Name : South blvd & Site Dr
Site Code : 004
Start Date : 9/19/2017
Page No : 6



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File Name : South blvd & Site Dr
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Start Date : 9/19/2017
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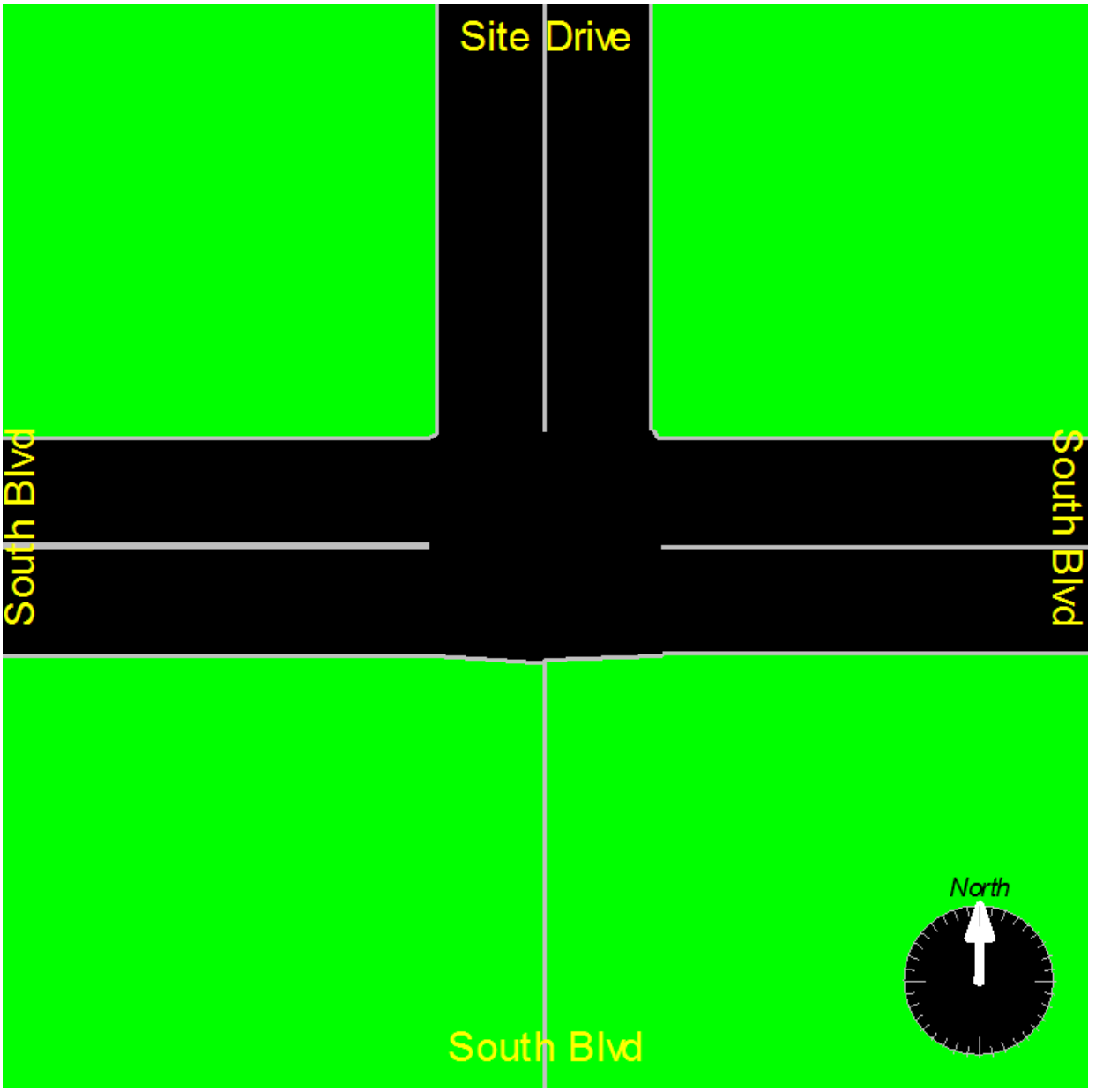
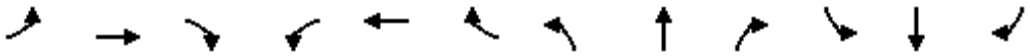


Appendix B – SYNCHRO and Outputs – Existing Conditions



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	143	90	83	178	142	136	86	1095	72	117	1555	246
Future Volume (vph)	143	90	83	178	142	136	86	1095	72	117	1555	246
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	3539	1583	1770	3468	0
Flt Permitted	0.482			0.643			0.061			0.130		
Satd. Flow (perm)	898	1863	1583	1198	1863	1583	114	3539	1583	242	3468	0
Satd. Flow (RTOR)			139			139			142		23	
Peak Hour Factor	0.81	0.78	0.87	0.93	0.89	0.90	0.94	0.87	0.67	0.95	0.90	0.90
Adj. Flow (vph)	177	115	95	191	160	151	91	1259	107	123	1728	273
Shared Lane Traffic (%)												
Lane Group Flow (vph)	177	115	95	191	160	151	91	1259	107	123	2001	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Total Split (s)	12.8	24.4	24.4	12.8	24.4	24.4	11.0	66.8	66.8	16.0	71.8	
Total Lost Time (s)	6.3	6.3	6.3	6.3	6.3	6.3	6.0	6.0	6.0	6.0	6.0	
Act Effct Green (s)	21.4	14.9	14.9	21.4	14.9	14.9	71.9	65.6	65.6	76.1	67.7	
Actuated g/C Ratio	0.18	0.12	0.12	0.18	0.12	0.12	0.60	0.55	0.55	0.63	0.56	
v/c Ratio	0.86	0.50	0.30	0.78	0.69	0.47	0.59	0.65	0.12	0.47	1.02	
Control Delay	76.8	55.9	4.6	64.7	65.7	14.6	33.7	21.9	1.3	13.9	51.5	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	76.8	55.9	4.6	64.7	65.7	14.6	33.7	21.9	1.3	13.9	51.5	
LOS	E	E	A	E	E	B	C	C	A	B	D	
Approach Delay		52.9			49.9			21.1			49.3	
Approach LOS		D			D			C			D	
Queue Length 50th (ft)	117	84	0	127	120	8	23	351	0	32	~883	
Queue Length 95th (ft)	#170	121	14	#202	187	69	#103	436	0	59	#1023	
Internal Link Dist (ft)		327			1151			626			324	
Turn Bay Length (ft)	350			200		250	200		250	200		
Base Capacity (vph)	207	281	356	244	281	356	155	1934	929	284	1966	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.86	0.41	0.27	0.78	0.57	0.42	0.59	0.65	0.12	0.43	1.02	

Intersection Summary		
Cycle Length: 120		
Actuated Cycle Length: 120		
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green		
Control Type: Actuated-Coordinated		
Maximum v/c Ratio: 1.02		
Intersection Signal Delay: 40.5	Intersection LOS: D	
Intersection Capacity Utilization 91.5%	ICU Level of Service F	
Analysis Period (min) 15		
~ Volume exceeds capacity, queue is theoretically infinite.		
Queue shown is maximum after two cycles.		
# 95th percentile volume exceeds capacity, queue may be longer.		
Queue shown is maximum after two cycles.		

Splits and Phases: 3: Rochester Road & South Blvd

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	272	312	89	137	105	108	67	1203	185	154	1411	167
Future Volume (vph)	272	312	89	137	105	108	67	1203	185	154	1411	167
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	0.95
Frt			0.850			0.850			0.850		0.983	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	3539	1583	1770	3479	0
Flt Permitted	0.464			0.207			0.075			0.075		
Satd. Flow (perm)	864	1863	1583	386	1863	1583	140	3539	1583	140	3479	0
Satd. Flow (RTOR)			172			172			188		16	
Peak Hour Factor	0.85	0.88	0.82	0.86	0.80	0.87	0.88	0.95	0.86	0.84	0.96	0.89
Shared Lane Traffic (%)												
Lane Group Flow (vph)	320	355	109	159	131	124	76	1266	215	183	1658	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Total Split (s)	19.0	31.0	31.0	14.0	26.0	26.0	10.3	58.0	58.0	17.0	64.7	
Total Lost Time (s)	8.5	6.3	6.3	5.5	6.3	6.3	5.2	6.0	6.0	5.2	6.0	
Act Effct Green (s)	32.6	24.3	24.3	28.6	19.3	19.3	59.2	53.1	53.1	70.2	61.1	
Actuated g/C Ratio	0.27	0.20	0.20	0.24	0.16	0.16	0.49	0.44	0.44	0.58	0.51	
v/c Ratio	1.02	0.94	0.24	0.84	0.44	0.31	0.54	0.81	0.27	0.79	0.93	
Control Delay	95.9	81.3	1.9	67.5	50.4	4.1	30.1	34.4	5.2	48.8	33.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	95.9	81.3	1.9	67.5	50.4	4.1	30.1	34.4	5.2	48.8	33.6	
LOS	F	F	A	E	D	A	C	C	A	D	C	
Approach Delay		76.2			43.1			30.1			35.1	
Approach LOS		E			D			C			D	
Queue Length 50th (ft)	~213	272	0	90	92	0	24	446	12	87	586	
Queue Length 95th (ft)	#379	#436	0	#169	136	15	55	542	51	#161	#818	
Internal Link Dist (ft)		327			1151			626			324	
Turn Bay Length (ft)	350			200		250	200		250	200		
Base Capacity (vph)	313	383	462	190	305	403	140	1566	805	241	1780	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	1.02	0.93	0.24	0.84	0.43	0.31	0.54	0.81	0.27	0.76	0.93	

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.02
Intersection Signal Delay: 41.1 Intersection LOS: D
Intersection Capacity Utilization 91.7% ICU Level of Service F
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.

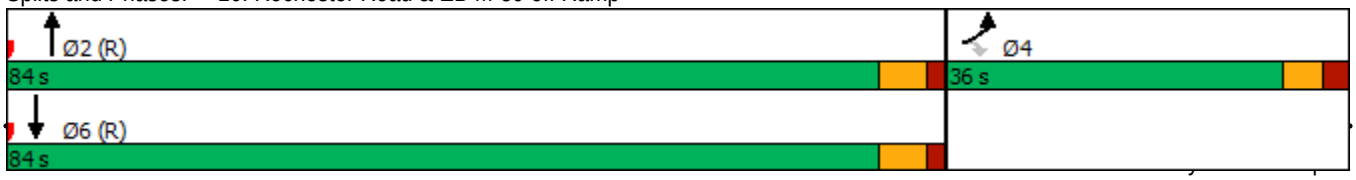
Queue shown is maximum after two cycles.

Splits and Phases: 3: Rochester Road & South Blvd

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	216	324	0	1125	1258	0
Future Volume (vph)	216	324	0	1125	1258	0
Satd. Flow (prot)	3291	1441	0	3539	3539	0
Flt Permitted	0.972					
Satd. Flow (perm)	3291	1441	0	3539	3539	0
Satd. Flow (RTOR)	55	55				
Peak Hour Factor	0.89	0.87	1.00	0.91	0.87	1.00
Adj. Flow (vph)	243	372	0	1236	1446	0
Shared Lane Traffic (%)		47%				
Lane Group Flow (vph)	418	197	0	1236	1446	0
Turn Type	Prot	Perm		NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4				
Total Split (s)	36.0	36.0		84.0	84.0	
Total Lost Time (s)	6.0	6.0		6.2	6.2	
Act Effct Green (s)	19.5	19.5		88.3	88.3	
Actuated g/C Ratio	0.16	0.16		0.74	0.74	
v/c Ratio	0.72	0.70		0.47	0.56	
Control Delay	48.0	47.1		4.0	5.8	
Queue Delay	0.0	0.0		0.0	0.0	
Total Delay	48.0	47.1		4.0	5.8	
LOS	D	D		A	A	
Approach Delay	47.7			4.0	5.8	
Approach LOS	D			A	A	
Queue Length 50th (ft)	140	116		88	189	
Queue Length 95th (ft)	177	183		125	237	
Internal Link Dist (ft)	726			854	1191	
Turn Bay Length (ft)						
Base Capacity (vph)	864	401		2603	2603	
Starvation Cap Reductn	0	0		0	0	
Spillback Cap Reductn	0	0		0	0	
Storage Cap Reductn	0	0		0	0	
Reduced v/c Ratio	0.48	0.49		0.47	0.56	

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.72	
Intersection Signal Delay: 13.0	Intersection LOS: B
Intersection Capacity Utilization 67.7%	ICU Level of Service C
Analysis Period (min) 15	

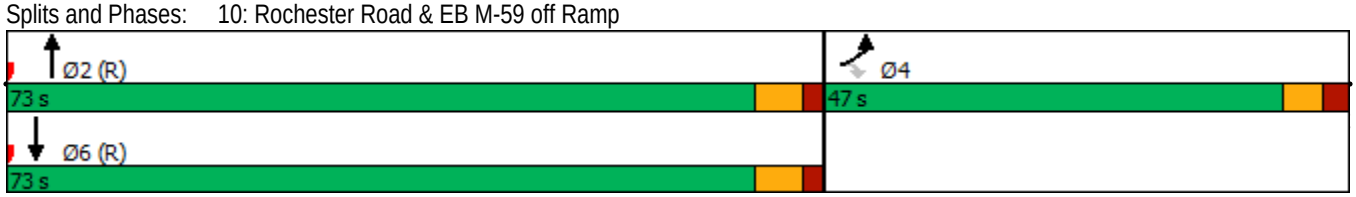
Splits and Phases: 10: Rochester Road & EB M-59 off Ramp



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	474	543	0	1265	830	0
Future Volume (vph)	474	543	0	1265	830	0
Lane Util. Factor	0.97	0.91	1.00	0.95	0.95	1.00
Frt	0.956	0.850				
Flt Protected	0.966					
Satd. Flow (prot)	3337	1441	0	3539	3539	0
Flt Permitted	0.966					
Satd. Flow (perm)	3337	1441	0	3539	3539	0
Satd. Flow (RTOR)	60	113				
Peak Hour Factor	0.87	0.94	1.00	0.92	0.87	1.00
Shared Lane Traffic (%)		39%				
Lane Group Flow (vph)	770	353	0	1375	954	0
Turn Type	Prot	Perm		NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4				
Total Split (s)	47.0	47.0		73.0	73.0	
Total Lost Time (s)	6.0	6.0		6.2	6.2	
Act Effct Green (s)	33.2	33.2		74.6	74.6	
Actuated g/C Ratio	0.28	0.28		0.62	0.62	
v/c Ratio	0.80	0.74		0.62	0.43	
Control Delay	43.3	35.3		16.5	10.0	
Queue Delay	0.0	0.0		0.0	0.0	
Total Delay	43.3	35.3		16.5	10.0	
LOS	D	D		B	B	
Approach Delay	40.8			16.5	10.0	
Approach LOS	D			B	B	
Queue Length 50th (ft)	265	190		322	163	
Queue Length 95th (ft)	292	287		468	186	
Internal Link Dist (ft)	726			854	1191	
Turn Bay Length (ft)						
Base Capacity (vph)	1179	566		2200	2200	
Starvation Cap Reductn	0	0		0	0	
Spillback Cap Reductn	0	0		0	0	
Storage Cap Reductn	0	0		0	0	
Reduced v/c Ratio	0.65	0.62		0.63	0.43	

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.80	
Intersection Signal Delay: 22.6	Intersection LOS: C
Intersection Capacity Utilization 65.5%	ICU Level of Service C
Analysis Period (min) 15	

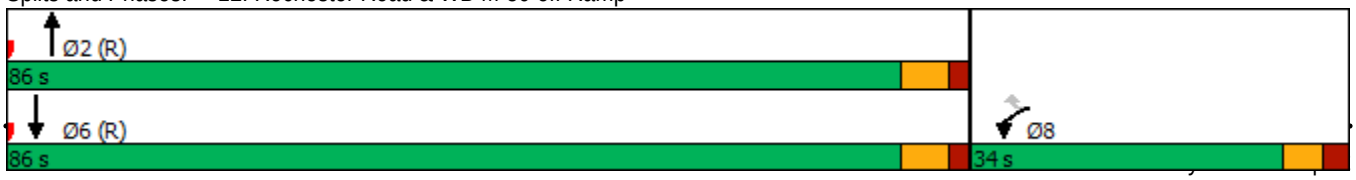
Splits and Phases: 10: Rochester Road & EB M-59 off Ramp



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	467	323	982	0	0	1599
Future Volume (vph)	467	323	982	0	0	1599
Satd. Flow (prot)	3433	2787	3539	0	0	3539
Flt Permitted	0.950					
Satd. Flow (perm)	3433	2787	3539	0	0	3539
Satd. Flow (RTOR)		160				
Peak Hour Factor	0.88	0.66	0.79	1.00	1.00	0.89
Adj. Flow (vph)	531	489	1243	0	0	1797
Shared Lane Traffic (%)						
Lane Group Flow (vph)	531	489	1243	0	0	1797
Turn Type	Prot	Perm	NA			NA
Protected Phases	8		2			6
Permitted Phases		8				
Total Split (s)	34.0	34.0	86.0			86.0
Total Lost Time (s)	6.0	6.0	6.2			6.2
Act Effct Green (s)	24.3	24.3	83.5			83.5
Actuated g/C Ratio	0.20	0.20	0.70			0.70
v/c Ratio	0.77	0.71	0.50			0.73
Control Delay	52.7	35.2	6.1			14.1
Queue Delay	0.0	0.0	0.0			0.0
Total Delay	52.7	35.2	6.1			14.1
LOS	D	D	A			B
Approach Delay	44.3		6.1			14.1
Approach LOS	D		A			B
Queue Length 50th (ft)	199	135	134			420
Queue Length 95th (ft)	246	114	131			536
Internal Link Dist (ft)	1165		1191			636
Turn Bay Length (ft)						
Base Capacity (vph)	801	772	2463			2463
Starvation Cap Reductn	0	0	0			0
Spillback Cap Reductn	0	0	0			0
Storage Cap Reductn	0	0	0			0
Reduced v/c Ratio	0.66	0.63	0.50			0.73

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.77	
Intersection Signal Delay: 19.2	Intersection LOS: B
Intersection Capacity Utilization 67.7%	ICU Level of Service C
Analysis Period (min) 15	

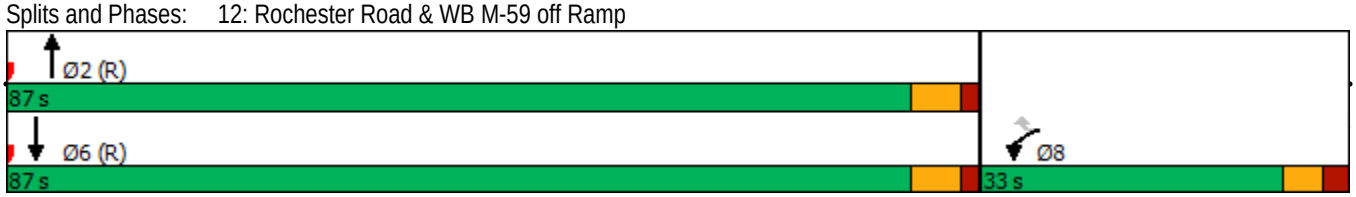
Splits and Phases: 12: Rochester Road & WB M-59 off Ramp



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	318	384	1514	0	0	1405
Future Volume (vph)	318	384	1514	0	0	1405
Lane Util. Factor	0.97	0.88	0.95	1.00	1.00	0.95
Frt		0.850				
Flt Protected	0.950					
Satd. Flow (prot)	3433	2787	3539	0	0	3539
Flt Permitted	0.950					
Satd. Flow (perm)	3433	2787	3539	0	0	3539
Satd. Flow (RTOR)		74				
Peak Hour Factor	0.90	0.93	0.93	1.00	1.00	0.93
Shared Lane Traffic (%)						
Lane Group Flow (vph)	353	413	1628	0	0	1511
Turn Type	Prot	Perm	NA			NA
Protected Phases	8		2			6
Permitted Phases		8				
Total Split (s)	33.0	33.0	87.0			87.0
Total Lost Time (s)	6.0	6.0	6.2			6.2
Act Effct Green (s)	20.7	20.7	87.1			87.1
Actuated g/C Ratio	0.17	0.17	0.73			0.73
v/c Ratio	0.60	0.76	0.63			0.59
Control Delay	49.5	47.9	10.4			9.6
Queue Delay	0.0	0.0	0.0			0.0
Total Delay	49.5	47.9	10.4			9.6
LOS	D	D	B			A
Approach Delay	48.6		10.4			9.6
Approach LOS	D		B			A
Queue Length 50th (ft)	130	143	301			263
Queue Length 95th (ft)	169	194	441			385
Internal Link Dist (ft)	1165		1191			636
Turn Bay Length (ft)						
Base Capacity (vph)	772	684	2569			2569
Starvation Cap Reductn	0	0	0			0
Spillback Cap Reductn	0	0	0			0
Storage Cap Reductn	0	0	0			0
Reduced v/c Ratio	0.46	0.60	0.63			0.59

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.76	
Intersection Signal Delay: 17.6	Intersection LOS: B
Intersection Capacity Utilization 65.5%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 12: Rochester Road & WB M-59 off Ramp



Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	17	310	460	14	6	4
Future Vol, veh/h	17	310	460	14	6	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	75	87	88	90	75	50
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	23	356	523	16	8	8

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	539	0	-	0	933	270
Stage 1	-	-	-	-	531	-
Stage 2	-	-	-	-	402	-
Critical Hdwy	4.13	-	-	-	6.63	6.93
Critical Hdwy Stg 1	-	-	-	-	5.83	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.219	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	1027	-	-	-	280	729
Stage 1	-	-	-	-	555	-
Stage 2	-	-	-	-	675	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1027	-	-	-	274	729
Mov Cap-2 Maneuver	-	-	-	-	274	-
Stage 1	-	-	-	-	543	-
Stage 2	-	-	-	-	675	-

Approach	EB	WB	SB
HCM Control Delay, s	0.5	0	14.3
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1027	-	-	-	274	729
HCM Lane V/C Ratio	0.022	-	-	-	0.029	0.011
HCM Control Delay (s)	8.6	-	-	-	18.5	10
HCM Lane LOS	A	-	-	-	C	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.1	0

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	5	648	329	10	25	14
Future Vol, veh/h	5	648	329	10	25	14
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	63	89	86	63	89	70
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	8	728	383	16	28	20

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	399	0	-	0	1135	200
Stage 1	-	-	-	-	391	-
Stage 2	-	-	-	-	744	-
Critical Hdwy	4.13	-	-	-	6.63	6.93
Critical Hdwy Stg 1	-	-	-	-	5.83	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.219	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	1158	-	-	-	209	808
Stage 1	-	-	-	-	653	-
Stage 2	-	-	-	-	469	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1158	-	-	-	208	808
Mov Cap-2 Maneuver	-	-	-	-	208	-
Stage 1	-	-	-	-	648	-
Stage 2	-	-	-	-	469	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	18.6
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1158	-	-	-	208	808
HCM Lane V/C Ratio	0.007	-	-	-	0.135	0.025
HCM Control Delay (s)	8.1	-	-	-	25	9.6
HCM Lane LOS	A	-	-	-	D	A
HCM 95th %tile Q(veh)	0	-	-	-	0.5	0.1

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	12	6	25	1362	1555	40
Future Vol, veh/h	12	6	25	1362	1555	40
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	0	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	75	75	92	75	96	75
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	16	8	27	1816	1620	53

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	2609	837	1673	0	-	0
Stage 1	1647	-	-	-	-	-
Stage 2	962	-	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	20	310	380	-	-	-
Stage 1	142	-	-	-	-	-
Stage 2	331	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	19	310	380	-	-	-
Mov Cap-2 Maneuver	91	-	-	-	-	-
Stage 1	132	-	-	-	-	-
Stage 2	331	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	40.8	0.2	0
HCM LOS	E		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	380	-	91	310	-	-
HCM Lane V/C Ratio	0.072	-	0.176	0.026	-	-
HCM Control Delay (s)	15.2	-	52.8	16.9	-	-
HCM Lane LOS	C	-	F	C	-	-
HCM 95th %tile Q(veh)	0.2	-	0.6	0.1	-	-

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	31	25	8	1575	1411	15
Future Vol, veh/h	31	25	8	1575	1411	15
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	100	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	76	78	68	91	93	78
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	41	32	12	1731	1517	19

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	2417	768	1536	0	-	0
Stage 1	1527	-	-	-	-	-
Stage 2	890	-	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	~ 27	344	429	-	-	-
Stage 1	165	-	-	-	-	-
Stage 2	361	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	~ 26	344	429	-	-	-
Mov Cap-2 Maneuver	110	-	-	-	-	-
Stage 1	160	-	-	-	-	-
Stage 2	361	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	38.6	0.1	0
HCM LOS	E		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	429	-	110	344	-	-
HCM Lane V/C Ratio	0.027	-	0.371	0.093	-	-
HCM Control Delay (s)	13.6	-	55.9	16.5	-	-
HCM Lane LOS	B	-	F	C	-	-
HCM 95th %tile Q(veh)	0.1	-	1.5	0.3	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Appendix C– SYNCHRO and Outputs – Future Condition

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	143	96	83	178	151	136	99	1108	72	117	1571	246
Future Volume (vph)	143	96	83	178	151	136	99	1108	72	117	1571	246
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	0.95
Ped Bike Factor												
Frt			0.850			0.850			0.850		0.980	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	3539	1583	1770	3468	0
Flt Permitted	0.454			0.617			0.061			0.126		
Satd. Flow (perm)	846	1863	1583	1149	1863	1583	114	3539	1583	235	3468	0
Satd. Flow (RTOR)			139			139			142		23	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.81	0.78	0.87	0.93	0.89	0.90	0.94	0.87	0.67	0.95	0.90	0.90
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	177	123	95	191	170	151	105	1274	107	123	2019	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Total Split (s)	12.6	24.4	24.4	12.6	24.4	24.4	11.0	67.0	67.0	16.0	72.0	
Total Lost Time (s)	6.3	6.3	6.3	6.3	6.3	6.3	6.0	6.0	6.0	6.0	6.0	
Act Effct Green (s)	21.6	15.3	15.3	21.6	15.3	15.3	71.8	65.4	65.4	75.8	67.4	
Actuated g/C Ratio	0.18	0.13	0.13	0.18	0.13	0.13	0.60	0.54	0.54	0.63	0.56	
v/c Ratio	0.88	0.52	0.29	0.80	0.71	0.47	0.67	0.66	0.12	0.48	1.03	
Control Delay	82.1	56.2	4.5	66.7	66.8	14.3	41.9	22.2	1.3	14.3	55.7	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	82.1	56.2	4.5	66.7	66.8	14.3	41.9	22.2	1.3	14.3	55.7	
LOS	F	E	A	E	E	B	D	C	A	B	E	
Approach Delay		55.4			51.3			22.1			53.3	
Approach LOS		E			D			C			D	
Queue Length 50th (ft)	116	89	0	127	127	8	29	361	0	32	~896	
Queue Length 95th (ft)	#180	128	14	#212	197	69	#132	443	0	58	#1036	
Internal Link Dist (ft)		327			1151			626			324	
Turn Bay Length (ft)	350			200		250	200		250	200		
Base Capacity (vph)	201	281	356	239	281	356	156	1928	927	279	1957	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.88	0.44	0.27	0.80	0.60	0.42	0.67	0.66	0.12	0.44	1.03	

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.03
Intersection Signal Delay: 43.0 Intersection LOS: D
Intersection Capacity Utilization 93.1% ICU Level of Service F
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

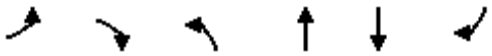
Splits and Phases: 3: Rochester Road & South Blvd

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	272	318	89	137	111	108	81	1217	185	154	1439	167
Future Volume (vph)	272	318	89	137	111	108	81	1217	185	154	1439	167
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	0.95
Ped Bike Factor												
Frt			0.850			0.850			0.850		0.983	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	3539	1583	1770	3479	0
Flt Permitted	0.442			0.217			0.076			0.069		
Satd. Flow (perm)	823	1863	1583	404	1863	1583	142	3539	1583	129	3479	0
Satd. Flow (RTOR)			139			139			186		16	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.85	0.88	0.82	0.86	0.80	0.87	0.88	0.95	0.86	0.84	0.96	0.88
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	320	361	109	159	139	124	92	1281	215	183	1689	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Total Split (s)	19.9	31.0	31.0	13.8	24.9	24.9	11.0	58.2	58.2	17.0	64.2	
Total Lost Time (s)	6.3	6.3	6.3	6.3	6.3	6.3	6.0	6.0	6.0	6.0	6.0	
Act Effct Green (s)	38.1	24.5	24.5	25.9	18.4	18.4	57.9	52.7	52.7	68.9	58.2	
Actuated g/C Ratio	0.32	0.20	0.20	0.22	0.15	0.15	0.48	0.44	0.44	0.57	0.48	
v/c Ratio	0.87	0.95	0.25	0.92	0.49	0.34	0.66	0.82	0.27	0.84	1.00	
Control Delay	59.5	82.9	4.5	87.1	52.9	8.4	40.9	35.2	5.3	56.6	51.9	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	59.5	82.9	4.5	87.1	52.9	8.4	40.9	35.2	5.3	56.6	51.9	
LOS	E	F	A	F	D	A	D	D	A	E	D	
Approach Delay		62.6			52.7			31.5			52.3	
Approach LOS		E			D			C			D	
Queue Length 50th (ft)	205	278	0	92	100	0	30	454	13	88	662	
Queue Length 95th (ft)	#318	#445	17	#186	145	38	#93	550	52	#180	#851	
Internal Link Dist (ft)		327			1151			626			324	
Turn Bay Length (ft)	350			200		250	200		250	200		
Base Capacity (vph)	369	383	436	172	288	362	139	1555	799	224	1695	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.87	0.94	0.25	0.92	0.48	0.34	0.66	0.82	0.27	0.82	1.00	

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.00
Intersection Signal Delay: 47.0 Intersection LOS: D
Intersection Capacity Utilization 94.4% ICU Level of Service F
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Rochester Road & South Blvd

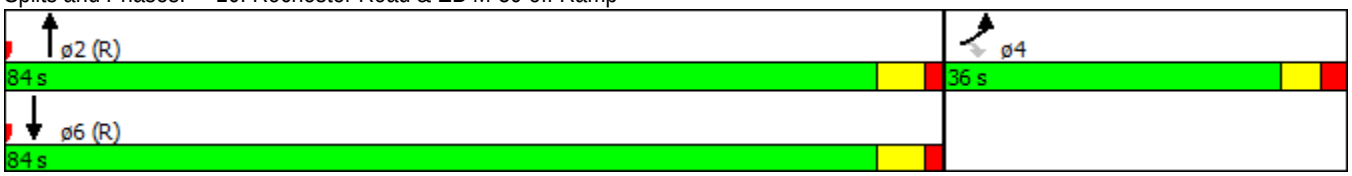


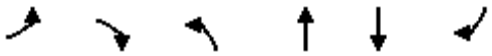
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	216	332	0	1141	1302	0
Future Volume (vph)	216	332	0	1141	1302	0
Lane Util. Factor	0.97	0.91	1.00	0.95	0.95	1.00
Ped Bike Factor						
Frt	0.936	0.850				
Flt Protected	0.972					
Satd. Flow (prot)	3288	1441	0	3539	3539	0
Flt Permitted	0.972					
Satd. Flow (perm)	3288	1441	0	3539	3539	0
Satd. Flow (RTOR)	49	49				
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.89	0.87	1.00	0.91	0.87	1.00
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Shared Lane Traffic (%)		48%				
Lane Group Flow (vph)	426	199	0	1254	1497	0
Turn Type	Prot	Perm		NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4				
Total Split (s)	36.0	36.0		84.0	84.0	
Total Lost Time (s)	6.0	6.0		6.2	6.2	
Act Effct Green (s)	20.0	20.0		87.8	87.8	
Actuated g/C Ratio	0.17	0.17		0.73	0.73	
v/c Ratio	0.72	0.71		0.48	0.58	
Control Delay	48.6	48.6		4.2	9.2	
Queue Delay	0.0	0.0		0.0	0.0	
Total Delay	48.6	48.6		4.2	9.2	
LOS	D	D		A	A	
Approach Delay	48.6			4.2	9.2	
Approach LOS	D			A	A	
Queue Length 50th (ft)	145	123		92	242	
Queue Length 95th (ft)	182	191		130	360	
Internal Link Dist (ft)	726			481	1190	
Turn Bay Length (ft)						
Base Capacity (vph)	858	397		2588	2588	
Starvation Cap Reductn	0	0		0	0	
Spillback Cap Reductn	0	0		0	0	
Storage Cap Reductn	0	0		0	0	
Reduced v/c Ratio	0.50	0.50		0.48	0.58	

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.72
Intersection Signal Delay: 14.6 Intersection LOS: B
Intersection Capacity Utilization 68.9% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 10: Rochester Road & EB M-59 off Ramp



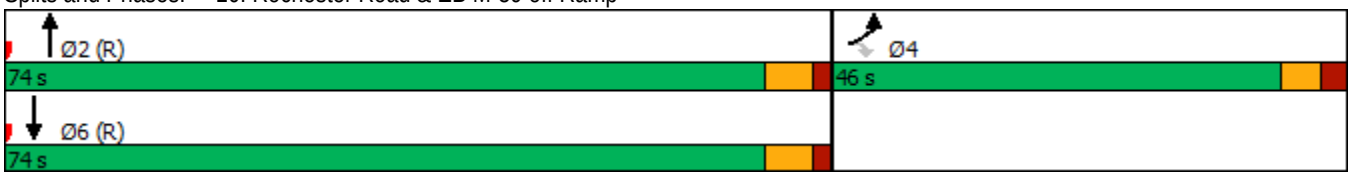


Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	474	553	0	1346	863	0
Future Volume (vph)	474	553	0	1346	863	0
Lane Util. Factor	0.97	0.91	1.00	0.95	0.95	1.00
Ped Bike Factor						
Frt	0.956	0.850				
Flt Protected	0.966					
Satd. Flow (prot)	3337	1441	0	3539	3539	0
Flt Permitted	0.966					
Satd. Flow (perm)	3337	1441	0	3539	3539	0
Satd. Flow (RTOR)	61	107				
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.87	0.94	1.00	0.92	0.87	1.00
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%			0%	0%	
Shared Lane Traffic (%)		39%				
Lane Group Flow (vph)	774	359	0	1463	992	0
Turn Type	Prot	Perm		NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4				
Total Split (s)	46.0	46.0		74.0	74.0	
Total Lost Time (s)	6.0	6.0		6.2	6.2	
Act Effct Green (s)	33.0	33.0		74.8	74.8	
Actuated g/C Ratio	0.28	0.28		0.62	0.62	
v/c Ratio	0.80	0.76		0.66	0.45	
Control Delay	43.7	37.8		17.3	10.1	
Queue Delay	0.0	0.0		0.0	0.0	
Total Delay	43.7	37.8		17.3	10.1	
LOS	D	D		B	B	
Approach Delay	41.9			17.3	10.1	
Approach LOS	D			B	B	
Queue Length 50th (ft)	267	201		358	170	
Queue Length 95th (ft)	298	305		509	193	
Internal Link Dist (ft)	726			481	1190	
Turn Bay Length (ft)						
Base Capacity (vph)	1153	551		2204	2204	
Starvation Cap Reductn	0	0		0	0	
Spillback Cap Reductn	0	0		0	0	
Storage Cap Reductn	0	0		0	0	
Reduced v/c Ratio	0.67	0.65		0.66	0.45	

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.80
Intersection Signal Delay: 23.0 Intersection LOS: C
Intersection Capacity Utilization 66.7% ICU Level of Service C
Analysis Period (min) 15

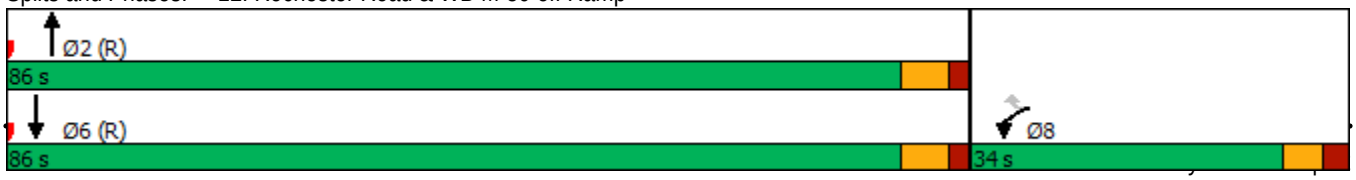
Splits and Phases: 10: Rochester Road & EB M-59 off Ramp

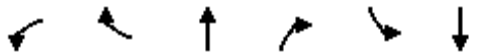


Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	467	323	982	0	0	1599
Future Volume (vph)	467	323	982	0	0	1599
Satd. Flow (prot)	3433	2787	3539	0	0	3539
Flt Permitted	0.950					
Satd. Flow (perm)	3433	2787	3539	0	0	3539
Satd. Flow (RTOR)		160				
Peak Hour Factor	0.88	0.66	0.79	1.00	1.00	0.89
Adj. Flow (vph)	531	489	1243	0	0	1797
Shared Lane Traffic (%)						
Lane Group Flow (vph)	531	489	1243	0	0	1797
Turn Type	Prot	Perm	NA			NA
Protected Phases	8		2			6
Permitted Phases		8				
Total Split (s)	34.0	34.0	86.0			86.0
Total Lost Time (s)	6.0	6.0	6.2			6.2
Act Effct Green (s)	24.3	24.3	83.5			83.5
Actuated g/C Ratio	0.20	0.20	0.70			0.70
v/c Ratio	0.77	0.71	0.50			0.73
Control Delay	52.7	35.2	6.1			14.1
Queue Delay	0.0	0.0	0.0			0.0
Total Delay	52.7	35.2	6.1			14.1
LOS	D	D	A			B
Approach Delay	44.3		6.1			14.1
Approach LOS	D		A			B
Queue Length 50th (ft)	199	135	134			420
Queue Length 95th (ft)	246	114	131			536
Internal Link Dist (ft)	1165		1191			636
Turn Bay Length (ft)						
Base Capacity (vph)	801	772	2463			2463
Starvation Cap Reductn	0	0	0			0
Spillback Cap Reductn	0	0	0			0
Storage Cap Reductn	0	0	0			0
Reduced v/c Ratio	0.66	0.63	0.50			0.73

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.77	
Intersection Signal Delay: 19.2	Intersection LOS: B
Intersection Capacity Utilization 67.7%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 12: Rochester Road & WB M-59 off Ramp



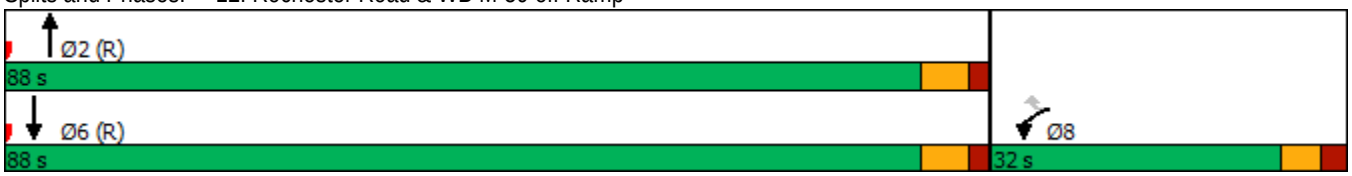


Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	324	384	1542	0	0	1432
Future Volume (vph)	324	384	1542	0	0	1432
Lane Util. Factor	0.97	0.88	0.95	1.00	1.00	0.95
Ped Bike Factor						
Frt		0.850				
Flt Protected	0.950					
Satd. Flow (prot)	3433	2787	3539	0	0	3539
Flt Permitted	0.950					
Satd. Flow (perm)	3433	2787	3539	0	0	3539
Satd. Flow (RTOR)		70				
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.90	0.93	0.92	1.00	1.00	0.93
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	360	413	1676	0	0	1540
Turn Type	Prot	Perm	NA			NA
Protected Phases	8		2			6
Permitted Phases		8				
Total Split (s)	32.0	32.0	88.0			88.0
Total Lost Time (s)	6.0	6.0	6.2			6.2
Act Effct Green (s)	20.5	20.5	87.3			87.3
Actuated g/C Ratio	0.17	0.17	0.73			0.73
v/c Ratio	0.61	0.77	0.65			0.60
Control Delay	50.1	49.0	6.5			9.7
Queue Delay	0.0	0.0	0.0			0.0
Total Delay	50.1	49.0	6.5			9.7
LOS	D	D	A			A
Approach Delay	49.5		6.5			9.7
Approach LOS	D		A			A
Queue Length 50th (ft)	133	145	204			273
Queue Length 95th (ft)	174	198	227			387
Internal Link Dist (ft)	1165		1190			636
Turn Bay Length (ft)						
Base Capacity (vph)	743	658	2573			2573
Starvation Cap Reductn	0	0	0			0
Spillback Cap Reductn	0	0	0			0
Storage Cap Reductn	0	0	0			0
Reduced v/c Ratio	0.48	0.63	0.65			0.60

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green

Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.77
Intersection Signal Delay: 16.1 Intersection LOS: B
Intersection Capacity Utilization 66.7% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 12: Rochester Road & WB M-59 off Ramp



Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Traffic Vol, veh/h	24	310	456	36	12	8
Future Vol, veh/h	24	310	456	36	12	8
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	75	87	88	88	75	50
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	32	356	518	41	16	16

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	559	0	-	0	959	280
Stage 1	-	-	-	-	539	-
Stage 2	-	-	-	-	420	-
Critical Hdwy	4.14	-	-	-	6.63	6.93
Critical Hdwy Stg 1	-	-	-	-	5.83	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.22	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	1008	-	-	-	270	718
Stage 1	-	-	-	-	550	-
Stage 2	-	-	-	-	662	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1008	-	-	-	261	718
Mov Cap-2 Maneuver	-	-	-	-	261	-
Stage 1	-	-	-	-	550	-
Stage 2	-	-	-	-	641	-

Approach	EB	WB	SB
HCM Control Delay, s	0.7	0	14.9
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1008	-	-	-	261	718
HCM Lane V/C Ratio	0.032	-	-	-	0.061	0.022
HCM Control Delay (s)	8.7	-	-	-	19.7	10.1
HCM Lane LOS	A	-	-	-	C	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.2	0.1

Intersection	
Int Delay, s/veh	1.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	18	648	339	30	31	27
Future Vol, veh/h	18	648	339	30	31	27
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	63	89	86	63	89	70
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	29	728	394	48	35	39

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	442	0	-	0	1204	221
Stage 1	-	-	-	-	418	-
Stage 2	-	-	-	-	786	-
Critical Hdwy	4.13	-	-	-	6.63	6.93
Critical Hdwy Stg 1	-	-	-	-	5.83	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	2.219	-	-	-	3.519	3.319
Pot Cap-1 Maneuver	1116	-	-	-	190	783
Stage 1	-	-	-	-	633	-
Stage 2	-	-	-	-	448	-
Platoon blocked, %			-	-	-	
Mov Cap-1 Maneuver	1116	-	-	-	185	783
Mov Cap-2 Maneuver	-	-	-	-	185	-
Stage 1	-	-	-	-	617	-
Stage 2	-	-	-	-	448	-

Approach	EB	WB	SB
HCM Control Delay, s	0.3	0	18.9
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1116	-	-	-	185	783
HCM Lane V/C Ratio	0.026	-	-	-	0.188	0.049
HCM Control Delay (s)	8.3	-	-	-	28.9	9.8
HCM Lane LOS	A	-	-	-	D	A
HCM 95th %tile Q(veh)	0.1	-	-	-	0.7	0.2

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Traffic Vol, veh/h	23	14	22	1365	1608	51
Future Vol, veh/h	23	14	22	1365	1608	51
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	75	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	54	75	75	75	96	75
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	43	19	29	1820	1675	68

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	2678	872	1743	0	-	0
Stage 1	1709	-	-	-	-	-
Stage 2	969	-	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	~ 18	294	357	-	-	-
Stage 1	132	-	-	-	-	-
Stage 2	329	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	~ 17	294	357	-	-	-
Mov Cap-2 Maneuver	90	-	-	-	-	-
Stage 1	132	-	-	-	-	-
Stage 2	302	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	58.8	0.3	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	357	-	90	294	-	-
HCM Lane V/C Ratio	0.082	-	0.473	0.063	-	-
HCM Control Delay (s)	16	-	76.7	18.1	-	-
HCM Lane LOS	C	-	F	C	-	-
HCM 95th %tile Q(veh)	0.3	-	2	0.2	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	56	39	15	1582	1357	37
Future Vol, veh/h	56	39	15	1582	1357	37
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	75	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	50	75	68	91	96	75
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	112	52	22	1738	1414	49

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	2352	732	1463	0	-	0
Stage 1	1439	-	-	-	-	-
Stage 2	913	-	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	~ 30	364	458	-	-	-
Stage 1	185	-	-	-	-	-
Stage 2	352	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	~ 29	364	458	-	-	-
Mov Cap-2 Maneuver	117	-	-	-	-	-
Stage 1	176	-	-	-	-	-
Stage 2	352	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	102	0.2	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	458	-	117	364	-	-
HCM Lane V/C Ratio	0.048	-	0.957	0.143	-	-
HCM Control Delay (s)	13.3	-	141.7	16.5	-	-
HCM Lane LOS	B	-	F	C	-	-
HCM 95th %tile Q(veh)	0.2	-	6.2	0.5	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Traffic Vol, veh/h	22	11	13	1387	1557	46
Future Vol, veh/h	22	11	13	1387	1557	46
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	100	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	24	12	14	1508	1692	50

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	2499	871	1742	0	-	0
Stage 1	1717	-	-	-	-	-
Stage 2	782	-	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	24	294	357	-	-	-
Stage 1	130	-	-	-	-	-
Stage 2	411	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	~ 23	294	357	-	-	-
Mov Cap-2 Maneuver	97	-	-	-	-	-
Stage 1	130	-	-	-	-	-
Stage 2	395	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	41.9	0.1	0
HCM LOS	E		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	357	-	97	294	-	-
HCM Lane V/C Ratio	0.04	-	0.247	0.041	-	-
HCM Control Delay (s)	15.5	-	53.9	17.8	-	-
HCM Lane LOS	C	-	F	C	-	-
HCM 95th %tile Q(veh)	0.1	-	0.9	0.1	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	25	14	1	1	1394	33
Future Vol, veh/h	25	14	1	1	1394	33
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	100	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	75	25	92	92	90	75
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	33	56	1	1	1549	44

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1574	797	1593	0	-	0
Stage 1	1571	-	-	-	-	-
Stage 2	3	-	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	101	329	408	-	-	-
Stage 1	157	-	-	-	-	-
Stage 2	1019	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	101	329	408	-	-	-
Mov Cap-2 Maneuver	140	-	-	-	-	-
Stage 1	157	-	-	-	-	-
Stage 2	1019	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	25.8	6.9	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	408	-	140	329	-	-
HCM Lane V/C Ratio	0.003	-	0.238	0.17	-	-
HCM Control Delay (s)	13.8	-	38.6	18.2	-	-
HCM Lane LOS	B	-	E	C	-	-
HCM 95th %tile Q(veh)	0	-	0.9	0.6	-	-

Appendix D–Trip Generation

Trip Generation Summary

Alternative: Alternative 1
Phase:
Project: Gatway of Rochester Hills

Open Date: 11/22/2017
Analysis Date: 11/22/2017

ITE	Land Use		Weekday Average Daily Trips *	Enter	Exit	Total	Weekday AM Peak Hour of Adjacent Street Traffic *	Enter	Exit	Total	Weekday PM Peak Hour of Adjacent Street Traffic *	Enter	Exit	Total
310	HOTEL 1			441	441	882		34	23	57		33	32	65
	108	Rooms												
710	OFFICEGENERAL 1			66	65	131		17	2	19		3	15	18
	11.86	Gross Floor Area 1000 SF												
820	CENTERSHOPPING 1			236	235	471		7	4	11		20	21	41
	11.04	Gross Leasable Area 1000 SF												
932	RESTAURANTHT 1			384	384	768		36	29	65		35	24	59
	6.04	Gross Floor Area 1000 SF												
Unadjusted Volume				1127	1125	2252		94	58	152		91	92	183
Internal Capture Trips				0	0	0		11	11	22		25	25	50
Pass-By Trips				0	0	0		0	0	0		0	0	0
Volume Added to Adjacent Streets				1127	1125	2252		83	47	130		66	67	133

Total Weekday Average Daily Trips Internal Capture = 0 Percent
Total Weekday AM Peak Hour of Adjacent Street Traffic Internal Capture = 14 Percent
Total Weekday PM Peak Hour of Adjacent Street Traffic Internal Capture = 27 Percent

* - Custom rate used for selected time period.

Source: Institute of Transportation Engineers, Trip Generation Manual 9th Edition, 2012