TRAFFIC ANALYSIS REPORT: ADAMS ROAD

HAMLIN ROAD TO WALTON BOULEVARD
OAKLAND COUNTY, ROCHESTER HILLS, MICHIGAN

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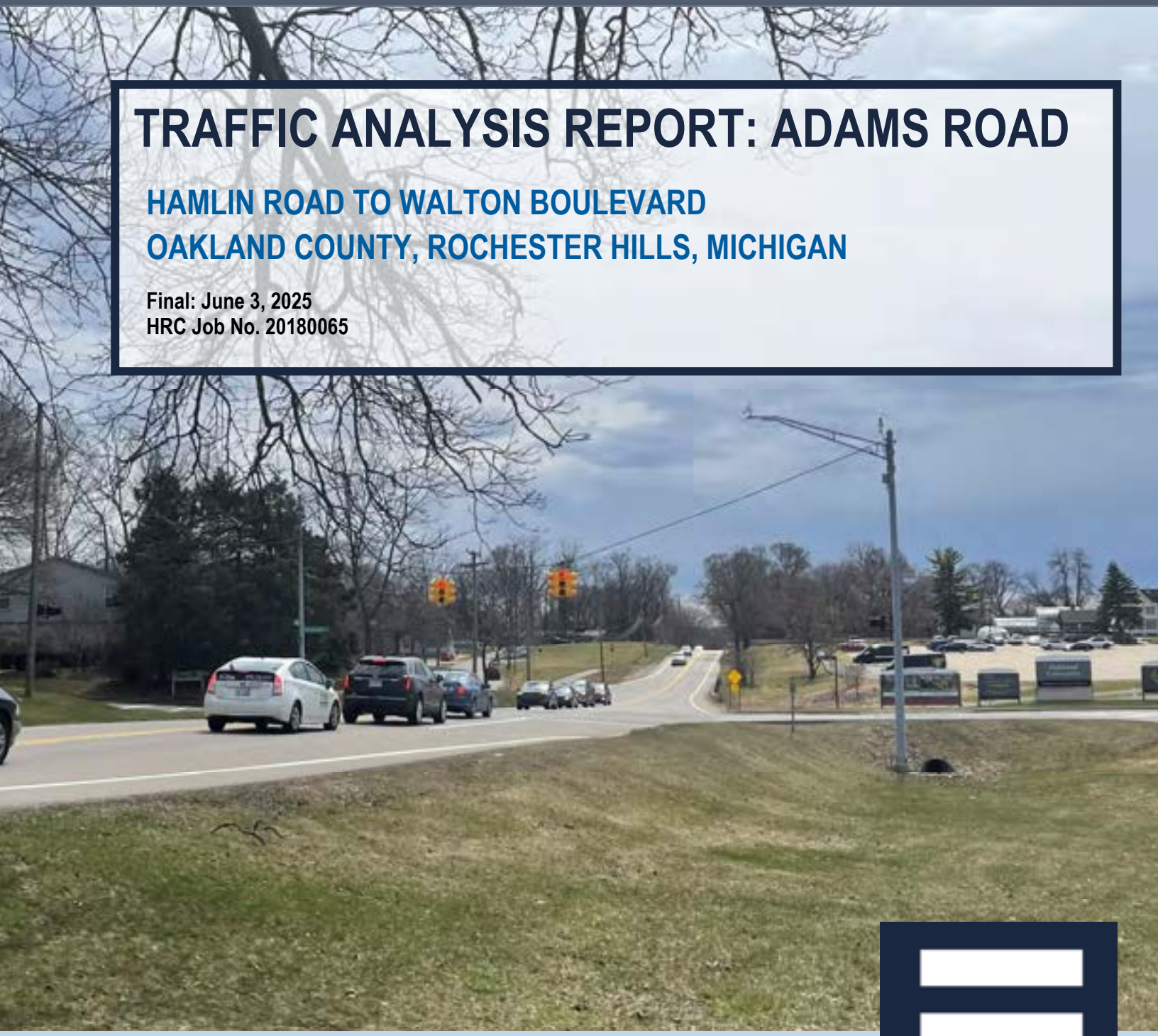

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SECTION 1.0 — INTRODUCTION AND BACKGROUND

The Road Commission for Oakland County (RCOC), City of Rochester Hills, and Oakland University (OU) contracted with Hubbell, Roth & Clark, Inc. (HRC) to complete the Planning and Environmental Linkage (PEL) study for the Adams Road corridor from Hamlin Road to Walton Boulevard. The purpose of this study is to determine the future of road improvements made to Adams Road. This document summarizes the traffic information collected and analyzed as a part of the traffic study within the PEL process for Adams Road.

1.1 PREVIOUS STUDIES

HRC reviewed previous studies that noted the Adams Road corridor from Hamlin to Walton and compiled the following list.

- The City of Rochester Hills Major Thoroughfare Plan, 1989, did not identify improvement to Adams Road Hamlin Road to the northern city limits. The plan stated that Adam Road improvements "were considered and rejected by the Citizen's Study Advisory Committee." The City council requested an update to the City of Rochester Hills Major Thoroughfare Plan to include the following because of neighborhood traffic circulation problems:
  - Improve traffic capacity and safety on Adams Road through the provision of left and right turn lanes, modern traffic signals, and other operational improvements.
  - Conduct a Corridor Study of Adams Road between Hamlin Road and Tienken Road before considering possible widening-type improvements.
- The City of Rochester Hills Adams Road Corridor Study, July 1991, stressed the reduction of safety if the road was not widened. The study primarily focused on a four-lane residential boulevard following the geometric outline in the Major Thoroughfare plan.
- City of Rochester Hills Master Thoroughfare Plan Update October 2008 reported the following:
  - From the workshop held on May 15, 2007
    - Highest-Placed Concerns:
      - Rochester Hills needs road reconstruction, not repair of Avon Road at Adams Road
      - Northbound Adams at PM rush hour
    - Highest-Placed Proposed Improvement
      - Widen the Adams Road corridor from Hamlin Road to Tienken Road
  - From the workshop held on May 22, 2007
    - Highest-Placed Proposed Improvement
      - Fix sight distance problems along Adams Road (rolling terrain)
  - According to the public opinion survey, Adams Road ranked number one for the major road in need of widening.
  - The plan listed the following as proposed improvements:
    - Adams Road at Walton Boulevard
      - Add one northbound through-lane.
      - Add dual northbound right turn lanes.
      - Add one southbound through-lane.

    - Meadow Brook Road/Hillendale Drive at Adams Road
        - Add one Northbound through lane and increase left turn storage to 150 feet.
        - Add a southbound left turn lane with 150-foot storage.
    - Avon Road at Adams Road
        - Add a second westbound right turn lane.
        - Add one northbound through-lane.
        - Add one Southbound through-lane.

- SEMCOG's *Southeast Michigan Traffic Safety Plan*, December 2015, lists the following safety priorities along the corridor:
    - Adams Road/Walton Boulevard intersection – medium priority
    - Adams Road segment, Avon Road to Walton Boulevard – marginally above average in crash reduction potential especially for:
        - Senior drivers
        - Motorcycles

- SEMCOG High Priority Safety Locations, 2016–2020 shows the following safety priorities along the corridor (peer rank)
    - Adams Road segment, Avon Road to Walton Boulevard (198th out of 4,351, top 5%)
    - Adams Road/Avon Road intersection (35th out of 870, top 4%)

- Rochester Hills Transportation Master Plan (2021) shows the following intersections with the highest potential for crash reduction.
    - Adams Road/Avon Road
    - Adams Road/Walton Boulevard
    - From the 2019 public opinion survey Adams Road once again ranked the highest in the need for being widened. Up 12% from the 2007 public opinion survey.

SECTION 2.0 — EXISTING AND FUTURE CONDITIONS

2.1 STUDY AREA

The study area includes the two-mile stretch of Adams Road from Hamlin Road to Walton Boulevard, located in the City of Rochester Hills, Oakland County, Michigan. Adams Road is a two-lane principal arterial with various passing lanes and a speed limit of 45 mph. The corridor includes traffic signals at Avon Road and Meadow Brook Road/Hillendale Drive. All other intersections within its limits are stop-controlled on the minor street. Land use patterns in the vicinity are suburban in nature, with single-family residential areas located in the southern and eastern parts of the corridor, and Oakland University and the Katke-Cousins and R&S Sharf golf courses are located west of the corridor within the confines of Oakland University.

Adams Road directly connects adjacent residential areas, Oakland University, and a commercial zone. The study area is a short distance from a major state highway, M-59, just to the south of Hamlin Road and used by regional commuters to the area. The study area is also a short distance from a major interstate highway, I-75, west of Adams Road. Access to Interstate 75 (I-75) is 2.4 miles to the west on M-59.

Oakland University is a major driver of motorized traffic in the area and is recognized as a commuter school. Squirrel Road is the next principal arterial to the west of Adams Road. The entrance at Adams Road and Meadow Brook Road/Hillendale Drive is also frequently utilized when events are held at Meadowbrook Music Hall. Oakland University also has an organic farm at the intersection of Butler Road and Adams Road and a Research Park south of M-59 on Adams Road.

Figure 1: Aerial of Study Area

2.2 EXISTING TRAFFIC DATA

2.2.1 Traffic Volumes

Historic Average Daily Traffic (ADT) from RCOC's Transportation Data Management System is shown in Table 1. This includes two-way ADTs from 2003 to 2021 for the southern segment from Hamlin Road to Avon Road and the northern segment from Avon Road to Walton Boulevard.

Table 1: Adams Road Historic Two-Way ADT

Year	Hamlin to Avon	Avon to Walton
2021	–	23,055
2018	21,210	23,275
2015	25,230	-
2014	–	21,130
2011	20,690	17,820
2009	18,860	20,970
2006	15,110	20,600
2003	15,430	20,210

HRC collected traffic data from November 15–17, 2022, along the corridor at the following locations:

- Intersection turning movement counts (TMC)
  - Adams Road at Hamlin Road and crossovers
  - Adams Road at Butler Road
  - Adams Road at Avon Road
  - Adams Road at Meadow Brook Road/Hillendale Drive
  - Adams Road at Walton Boulevard and crossovers
  - Adams Road at Powderhorn Ridge/Raintree Drive
  - Adams Road at Tienken Road
  - Avon Road at Crooks Road
- Speed data and 24-hour volumes on Adams Road
  - Hamlin Road to Butler Road segment, specifically located 750 feet Qual Ridge Circle/River Trail Drive
  - Butler Road to Avon Road segment, specifically located 500 feet Butler Road
  - Avon Road to Meadow Brook Road/Hillendale Drive segment, specifically located 700 feet Cambridge Drive

Intersection turning movement count maps are included in Appendix B. Table 2 shows the 24-hour traffic volumes collected.

Table 2: Adams Road 24-Hour Volumes

Location	Northbound	Southbound	Total
Hamlin to Butler	9,723	10,196	19,919
Butler to Avon	10,725	10,167	20,892
Avon to Meadow Brook / Hillendale	11,069	11,577	22,646

Articulated trucks account for less than half of a percent of traffic volumes on Adams Road from Hamlin Road to Walton Boulevard, as shown in Table 3.

Table 3: Adams Road Articulated Truck Percentage

Segment	NB	SB
Hamlin Road to Butler Road	0.50%	0.40%
Butler Road to Avon Road	0.40%	0.40%
Avon Road to Meadow Brook Road/Hillendale Drive	0.50%	0.30%
Meadow Brook Road/Hillendale Drive to Walton Boulevard	0.40%	0.30%
Corridor Average	0.45%	0.35%

Non-motorized traffic along the corridor is minimal, likely due to the lack of consistent facilities. Table 4 below is a summary of the bicycle and pedestrian traffic at the signalized intersections along Adams Road from Hamlin Road to Walton Boulevard for only northbound and southbound.

Table 4: Adams Road Non-Motorized Traffic at Signalized Intersections

Signalized Intersections	Pedestrians on Crosswalk	Bikes on Crosswalk	Bikes on Road
Adams Road at Hamlin Road	3	7	-
Adams Road at Avon Road	2	-	-
Adams Road at Meadow Brook Road/Hillendale Drive	3	1	1
Adams Road at Walton Boulevard	42	12	1

A summary of the existing traffic data is provided below.

- Two-way 24-hour volumes range from 19,000 to 22,000 vehicles per day.
- Volumes are higher on the north end of the corridor.
- In general, southbound Adams carries more traffic than northbound in the AM.
- In general, northbound Adams carries more traffic than southbound in the PM.

2.2.2 Speed Data

Twenty-four-hour vehicle speed counts were recorded using radar counters to determine the existing speeds along the study segment on Tuesday, November 15, 2022. There was precipitation (0.01") in the evening starting at 6 pm continuing until 11 pm. The temperatures were near freezing hovering around 35 F. The 85th percentile speed is the speed at which 85 percent of all vehicles are observed to travel at or below under free-flowing conditions. Table 5 shows the minimum, maximum, and 85th percentile speeds for northbound and southbound, and both are combined at the three study locations. The 85th percentile speeds for northbound and southbound ranged from 43.5–51.0 mph and 46.0–49.7 mph, respectively. Graphs showing the complete breakdown of the vehicle speeds are provided in Appendix C.

Table 5: Adams Road Speed Data

Location	Northbound (mph)				Southbound (mph)				Combined (mph)			
	Min	Max	50th %ile	85th %ile	Min	Max	50th %ile	85th %ile	Min	Max	50th %ile	85th %il
Hamlin to Butler	20.5	86.4	46.0	51.0	7.5	80.8	45.4	49.7	7.5	86.4	46	50.
Butler to Avon	6.8	85.7	42.9	47.8	6.8	86.4	42.3	47.2	6.8	86.4	42.3	47.
Avon to Meadow Brook / Hillendale	6.8	78.9	38.5	43.5	8.7	69.6	41.6	46.0	6.8	78.9	40.4	45.

2.3 FUTURE TRAFFIC DATA

A traffic growth rate analysis was performed for Adams Road to identify the anticipated growth rate for the corridor. The analysis was based on current and historical Average Daily Traffic (ADT) collected as part of this project or obtained from the Michigan Department of Transportation (MDOT) and RCOC Transportation Data Management System (TDMS) websites. Priority was given to observed and two-way traffic counts. A secondary evaluation was also performed on ADTs reported in 2015, 2035, and 2045 Southeast Michigan Council of Governments (SEMCOG) Travel Demand Forecasting Model (TDFM). The TDFM is the region's travel demand model and accounts for current and future socio-economic and land use patterns in the area. Table 6 and Table 7 provide a summary of the ADT values used in the growth rate analysis.

Table 6: Adams Road Historic Two-Way ADT

Year	Hamlin to Avon	Avon to Walton	Source
2011	20,690	17,820	RCOC TDMS
2018	21,210	23,275	MDOT/RCOC TDMS
2022	20,549	22,556	HRC
2023	20,901	24,301	RCOC TDMS

Table 7: Adams Road SEMCOG TDFM Two-Way ADT

Year	Hamlin to Avon	Avon to Walton	Source
2015	20,847	19,038	SEMCOG TDMF 15
2035	23,833	20,232	SEMCOG TDMF 35
2045	24,153	20,406	SEMCOG TDMF 45

2.3.1 Traffic Growth Rate

The annual traffic growth rate for the Adams Road corridor was based on the following formula:

$$A = P * (1 + r)^n$$

Where: A = Future traffic volume

P = Traffic volume per the last count

r = Annual traffic growth rate

n = Number of years between traffic volumes

The traffic growth rate was evaluated for multiple scenarios to minimize arbitrary variations in travel patterns. An average annual growth rate was obtained for the entire Adams Road corridor by combining all evaluated scenarios. These results are provided in Table 8.

Table 8: Adams Road Traffic Growth Rate Analysis

Alternative	Hamlin to Avon	Avon to Walton	Hamlin to Walton (Combined)
2011 to 2023	0.08%	2.62%	1.34%
2018 to 2023	-0.29%	0.87%	0.32%
2011 to 2022	-0.06%	2.17%	1.03%
2018 to 2022	-0.79%	-0.78%	-0.78%
SEMCOG TDFM 15 to 35	0.67%	0.30%	0.50%
SEMCOG TDFM 15 to 45	0.49%	0.23%	0.37%
AVERAGE	-0.08%	1.03%	0.46%

The analysis yielded an annual average traffic growth rate of 0.46%. A rounded value of 0.5% is used in all traffic volume forecasting for the Adams Road corridor between Hamlin Road and Walton Boulevard.

SECTION 3.0 — DESIGN ALTERNATIVES FOR CONSIDERATION

HRC reviewed a total of four different concepts with various configurations at major intersections, including:

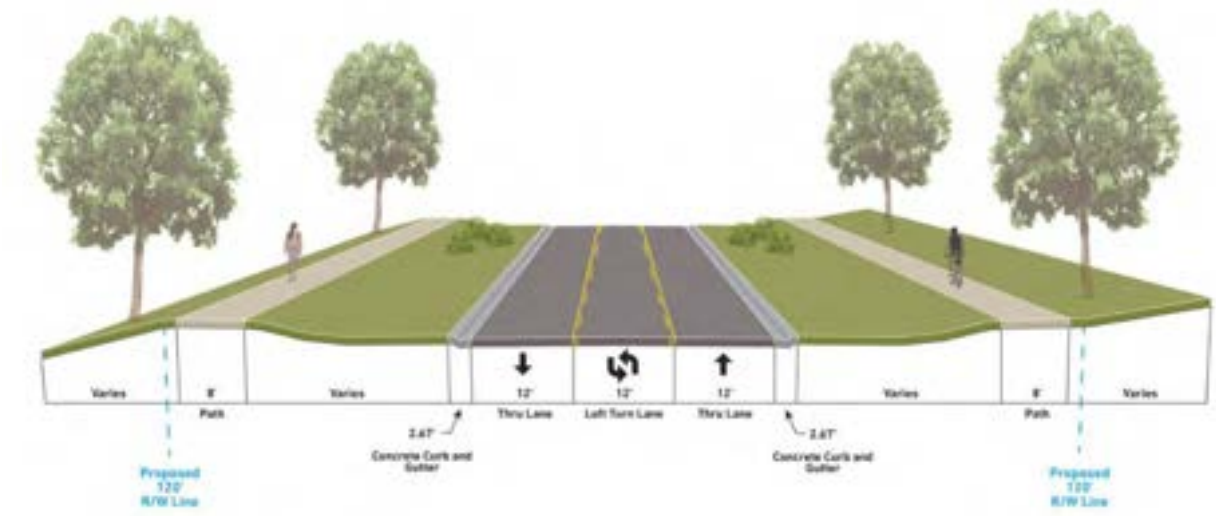
- 3 Lane
- 3 Lane with Roundabouts
- 4 Lane Boulevard
- 5 Lane

Each concept was created with conceptual horizontal and vertical alignments. Vertical alignments are per RCOC's Design Standards and follow the 2018 AASHTO Guidelines for sight distance. Non-motorized improvements include crossings at major side streets. Traffic calming improvements included narrower lane widths, medians in place of center turn lanes, roundabouts, and landscaping. The following sections provide a summary of each concept.

3.1 3 LANE

The 3 lane concept includes two 12-foot through lanes for each direction and a 12-foot center left turn lane to accommodate left turn movements. Various taper/deceleration lanes will be located at side street intersections, traffic signals at Butler Road, Avon Road, and Meadow Brook Road/Hillendale Drive, dedicated right-turn lanes, and eight-foot pathways each side of Adams Road. The anticipated ROW for this concept is 120 feet. Figure 2 below is the typical cross-section for this concept.

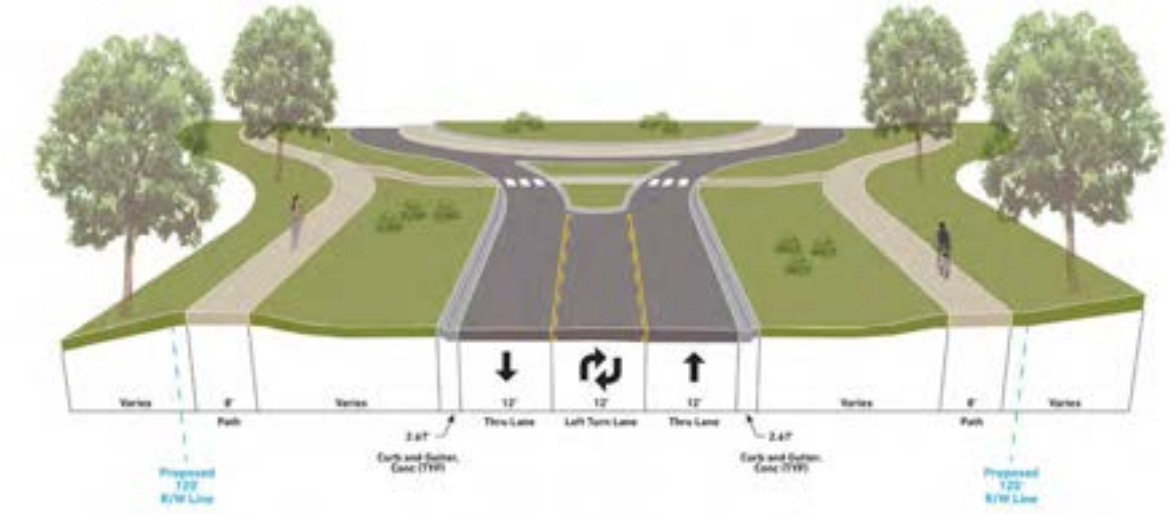
Figure 2: 3 Lane Typical Cross Section



3.2 3 LANE WITH ROUNDABOUTS

The 3 lane with roundabout concept includes two 12-foot through lanes for each direction with a 12-foot center left turn lane to accommodate left turn movements. Various taper/deceleration lanes will be located at side street intersections, roundabouts at Butler Road, Avon Road, and Meadow Brook Road/Hillendale Drive, and eight-foot wide pathways on each side of Adams Road. The anticipated ROW for this concept is 120 feet. Figure 3 below is the typical cross-section for this concept.

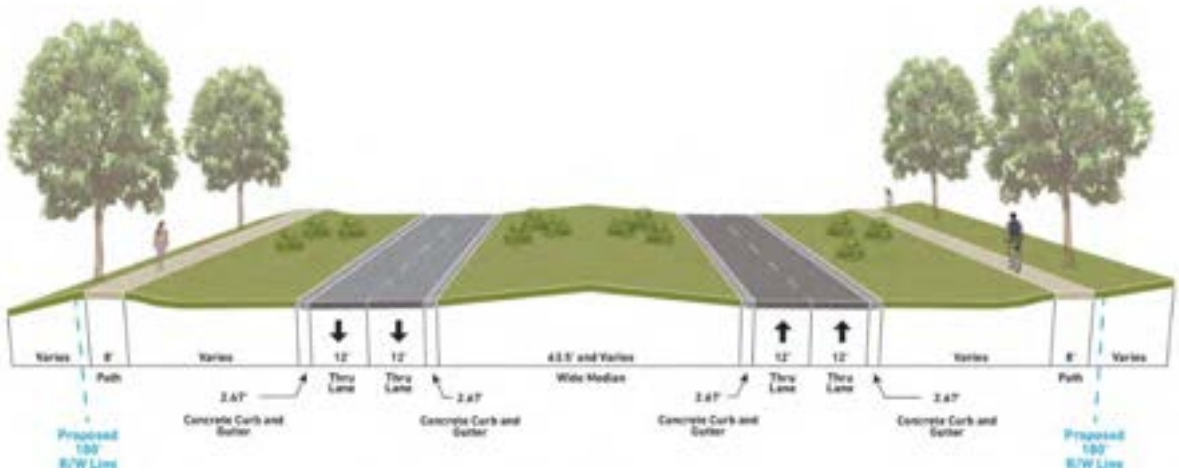
Figure 3: 3 Lane with Roundabout Typical Cross Section



3.3 4 LANE BOULEVARD

The four-lane boulevard concept includes two 12-foot through lanes for each direction, with a boulevard median of 63.5 feet to accommodate WB-50 trucks. Various left turn lanes will be located at crossovers, traffic signals at Butler Road, Avon Road, and Meadow Brook Road/Hillendale Drive, along with the two corresponding crossovers north and south of the Avon intersection and eight-foot-wide pathways on each side of Adams Road. The anticipated ROW for this concept is 180 feet. Figure 4 below is the typical cross-section for this concept.

Figure 4: 4 Lane Boulevard Typical Cross Section



3.4 5 LANE

The 5 lane concept includes four 12-foot through lanes for each direction with a 12-foot center left turn lane to accommodate left turn movements, traffic signals at Butler Road, Avon Road, and Meadow Brook Road/Hillendale Drive with dedicated right-turn lanes, and eight-foot-wide pathways on each side of Adams Road. The anticipated ROW for this concept is 120 feet. Figure 5 below shows the typical cross-section for this concept.

Figure 5: 5 Lane Typical Cross Section

SECTION 4.0 — SAFETY ANALYSIS

4.1 EXISTING SAFETY ANALYSIS

A crash analysis was performed on Adams Road from Hamlin Road to Walton Boulevard.

- Traffic Crash Analyses (2016–2022)
  - 766 total crashes
  - 113 Injury crashes
  - Fatal crashes
    - A fatal crash occurred in September 2022 with a northbound Adams Road driver disregarding the traffic signal and hitting a vehicle turning left from westbound Avon Road.
  - Rear ends are the most frequent crashes along the corridor and at intersections, which is not uncommon at signalized intersections. Rear-end crashes along the corridor are more frequent at driveway and side street locations with downhill grades.

4.1.1 Crash Analysis

A crash analysis was performed on Adams Road from Hamlin Road to Walton Boulevard. Three signalized intersections and the segments between them were analyzed. A 250-foot radius around intersections was analyzed, and segment crashes started at 250 feet away from the main intersections. Crash maps were prepared for the following locations and can be found in Appendix D.

- Segments
  - Adams Road – Hamlin Road to Avon Road
  - Adams Road – Avon Road to Meadow Brook Road/Hillendale Drive
  - Adams Road – Meadow Brook Road/Hillendale Drive to Walton Boulevard
- Intersections
  - Adams Road at Walton Boulevard
  - Adams Road at Meadow Brook Road/Hillendale Drive
  - Adams Road at Avon Road

Seven years of traffic crash data for 2016–2022 was obtained from the Traffic Improvement Association's Traffic Crash Analysis Tool (TCAT). TCAT is an online search tool for traffic crashes in Michigan.

Traffic crashes were analyzed for crash type and severity. Severity classifications of crashes include fatal, injury type A, injury type B, injury type C, or property damage only (PDO). The severity of a crash is determined by the most severe injury present in the crash:

- Injury type A refers to an incapacitating injury that prevents a person from walking, driving, or continuing normal activities that they were capable of performing before the crash.
- Injury type B is described as any injury that is evident at the scene of the crash but the injury is not fatal or incapacitating.
- Injury type C refers to an injury reported by an occupant but not visible to the officer completing the crash report.
- In a PDO crash, no injuries result from the crash.

Table 9 shows all the crashes along Adams Road, from Hamlin Road to Avon Road. There were no fatal crashes. However, one A-level crash occurred approximately 500 feet south of Butler Road. The A-level crash was a single-vehicle crash where the vehicle left the roadway and struck a driveway culvert. Single Motor Vehicle crashes (41.1%) were the most prevalent type of crash and the second most prevalent being Read End crashes (40.3%).

Table 9: 2016 to 2022 Adams Road from 250 Feet Hamlin Road to 250 Feet South of Avon Road

Crash Characteristic		2016	2017	2018	2019	2020	2021	2022	Total	%
Crash Severity	PDO	11	23	18	21	9	10	18	110	85.27%
	Injury C	2		2	1		3	1	9	6.98%
	Injury B		1	3	2	1	1	1	9	6.98%
	Injury A						1		1	0.78%
	Injury K								0	0.00%
	Total	13	24	23	24	10	15	20	129	100.00%
Crash Type	Angle	1	1	3	4		1	3	13	10.08%
	Head-on	1					1	0	2	1.55%
	Head-on Left Turn	1	2						3	2.33%
	Rear-end	3	10	8	6		4	9	40	31.01%
	Rear-end Left Turn		2	1	4		1	2	10	7.75%
	Rear-end Right Turn		1					1	2	1.55%
	Sideswipe-Same Direction		1	1	1				3	2.33%
	Sideswipe-Opposite Direction		1						1	0.78%
	Backing		2						2	1.55%
	Single - Run off Road					3	2		5	3.88%
	Single - Deer	7	4	6	6	6	3	3	35	27.13%
	Single - Fixed Object			4		1	3	1	9	6.98%
	Single - Projectile / Fallen Object							1	1	0.78%
	Single - Turkey				1				1	0.78%
	Single - U-Turn				1				1	0.78%
	Single - Parked Vehicle				1				1	0.78%
	Total	13	24	23	24	10	15	20	129	100.00%
Pavement Condition	Dry	9	17	15	21	5	9	17	93	72.09%
	Ice	1		2		1	2		6	4.65%
	Slush			1					1	0.78%
	Snow		2	2		2	2	1	9	6.98%
	Wet	3	5	2	3	2	2	2	19	14.73%
	Unknown			1					1	0.78%
	Total	13	24	23	24	10	15	20	129	100.00%
Lighting Condition	Dark - Lighted	2			2	2	1	1	8	6.20%
	Dark - Unlighted	6	6	6	3	4	1	5	31	24.03%
	Dawn	2			1	1			4	3.10%
	Daylight	3	17	17	16	3	13	14	83	64.34%
	Dusk		1		2				3	2.33%
	Total	13	24	23	24	10	15	20	129	100.00%
Drug / Alcohol Related	Drug								0	0.00%
	Alcohol	1	1	1		1			4	3.10%
	Total (Drug and Alcohol)	1	1	1		1			4	3.10%
Persons Injured	Injury C	3		2	5	1	4	1	16	59.26%
	Injury B		2	3	2	1	1	1	10	37.04%
	Injury A						1		1	3.70%
	Injury K								0	0.00%
	Total (Persons Injured)	3	2	5	7	2	6	2	27	100.00%

Table 10 shows all the crashes along Adams Road, from Avon Road to Meadow Brook Road/Hillendale Drive. There were no fatal or A-level injury crashes in the study period. Rear End crashes (61.1%) were the most prevalent type of crash, and the second most prevalent being Single Motor Vehicle crashes (31.5%)

Table 10: 2016–2022 from 250 Feet Avon Road to 250 Feet South of Meadow Brook Road/Hillendale Drive

Crash Characteristic		2016	2017	2018	2019	2020	2021	2022	Total	%
Crash Severity	PDO	6	15	10	11	12	5	5	64	87.67%
	Injury C		1	1	1	3		1	7	9.59%
	Injury B		1	1					2	2.74%
	Injury A								0	0.00%
	Injury K								0	0.00%
	Total	**6**	**17**	**12**	**12**	**15**	**5**	**6**	**73**	**100.00%**
Crash Type	Angle		1						1	1.37%
	Head-on				1				1	1.37%
	Rear-end	4	6	9	8	8	4	4	43	58.90%
	Rear-end Left Turn	1	1						2	2.74%
	Sideswipe-Same Direction		0	1					1	1.37%
	Sideswipe-Opposite Direction					2			2	2.74%
	Single - Run off Road		1						1	1.37%
	Single - Deer	1	4	1		3	1	1	11	15.07%
	Single - Fixed Object		2	1	3	1		1	8	10.96%
	Single - Projectile / Fallen Object		2			1			3	4.11%
	Total	6	17	12	12	15	5	6	73	100.00%
Pavement Condition	Dry	5	12	8	7	12	3	4	51	69.86%
	Ice				1	2			3	4.11%
	Snow	1		1	3	1	1	1	8	10.96%
	Wet		4	3	1		1	1	10	13.70%
	Unknown		1						1	1.37%
	Total	6	17	12	12	15	5	6	73	100.00%
Lighting Condition	Dark - Lighted	1		1		1			3	4.11%
	Dark - Unlighted		6	1	3	5		1	16	21.92%
	Dawn				1				1	1.37%
	Daylight	3	10	10	8	8	5	4	48	65.75%
	Dusk	2				1		1	4	5.48%
	Unknown		1						1	1.37%
	Total	6	17	12	12	15	5	6	73	100.00%
Drug / Alcohol Related	Drug								0	0.00%
	Alcohol								0	0.00%
	Total (Drug and Alcohol)	0	0	0	0	0	0	0	0	0.00%
Persons Injured	Injury C		1	1	1	3		2	8	72.73%
	Injury B		2	1					3	27.27%
	Injury A								0	0.00%
	Injury K								0	0.00%
	Total (Persons Injured)	0	3	2	1	3	0	2	11	100.00%

Table 11 shows all the crashes along Adams Road, from Meadow Brook Road/Hillendale Drive to Walton Boulevard. There were no fatal or A-level injury crashes in the study period. Rear End crashes (61.1%) were the most prevalent type of crash, and the second most prevalent being Single Motor Vehicle crashes (20.4%)

Table 11: 2016–2022 from 250 Feet Meadow Brook Road/Hillendale Drive to 250 Feet South of Walton Boulevard

Crash Characteristic		2016	2017	2018	2019	2020	2021	2022	Total	%
Crash Severity	PDO	5	6	9	12	3	8	5	48	88.89%
	Injury C	1	1	1		1	1		5	9.26%
	Injury B			1					1	1.85%
	Injury A								0	0.00%
	Injury K								0	0.00%
	Total	**6**	**7**	**11**	**12**	**4**	**9**	**5**	**54**	**100.00%**
Crash Type	Angle			2			2		4	7.41%
	Head-on Left Turn			1			1		2	3.70%
	Rear-end	4	4	5	9	2	4	2	30	55.56%
	Rear-end Left Turn	1		1				1	3	5.56%
	Sideswipe-Same Direction						1	1	2	3.70%
	Backing				1	1			2	3.70%
	Single - Run off Road	1							1	1.85%
	Single - Deer		2	1	2		1	1	7	12.96%
	Single - Fixed Object		1			1			2	3.70%
	Single - Projectile / Fallen Object			1					1	1.85%
	Total	6	7	11	12	4	9	5	54	100.00%
Pavement Condition	Dry	4	3	6	11	4	4	5	37	68.52%
	Snow		1	1			1		3	5.56%
	Wet	2	3	3			4		12	22.22%
	Unknown			1	1				2	3.70%
	Total	6	7	11	12	4	9	5	54	100.00%
Lighting Condition	Dark - Lighted						2		2	3.70%
	Dark - Unlighted	1	3	1	3	1	2		11	20.37%
	Dawn				1				1	1.85%
	Daylight	5	4	8	8	3	5	4	37	68.52%
	Dusk			1				1	2	3.70%
	Unknown			1					1	1.85%
	Total	6	7	11	12	4	9	5	54	100.00%
Drug / Alcohol Related	Drug							1	1	1.85%
	Alcohol				1				1	1.85%
	Total (Drug and Alcohol)				1			1	2	3.70%
Persons Injured	Injury C	2	2	1		1	1		7	87.50%
	Injury B			1					1	12.50%
	Injury A								0	0.00%
	Injury K								0	0.00%
	Total (Persons Injured)	2	2	2	0	1	1	0	8	100.00%

Table 12 shows an intersection crash summary for Adams Road at Avon Road. There were no fatal crashes however one A-level crash occurred when a southbound vehicle struck another southbound vehicle waiting to make a left turn to Avon Road, causing a secondary crash with a northbound vehicle. Rear End crashes (61.1%) were the most prevalent type of crash. The second most prevalent was head-on-left turn crashes (16.8%), or 19 crashes, all involving southbound left turn vehicles. A summary of Fatal and A-level injuries is provided below:

- On February 16, 2018, a southbound vehicle (Vehicle A) was rear-ended while waiting to turn left onto Avon Road by a southbound vehicle (Vehicle B). The driver of Vehicle B was intoxicated and sustained A-level injuries, while the driver of Vehicle A sustained C-level injuries. A secondary crash occurred when Vehicle A collided with a Northbound vehicle that experienced property damage only.
- On September 20, 2022, a northbound vehicle disregarded the traffic signal and collided with a westbound vehicle, turning left onto southbound Adams Road. The northbound driver received property damage only, while the driver of the eastbound vehicle received A-level Injuries. The eastbound vehicle had two passengers, one of whom received B-Level injuries and one who sustained fatal injuries.
- On September 28, 2022, a southbound vehicle attempted to turn left onto westbound Avon Road and was struck by a northbound vehicle. The southbound vehicle sustained A-level injuries, while all other vehicles involved in the crash had property damage only.

Table 12: 2016-2022 Adams Road/Avon Road Intersection Crashes

Crash Characteristic		2016	2017	2018	2019	2020	2021	2022	Total	%
Crash Severity	PDO	16	14	12	23	6	11	12	94	83.19%
	Injury C	3	1	1	3	2		2	12	10.62%
	Injury B		2		1	1			4	3.54%
	Injury A			1				1	2	1.77%
	Injury K							1	1	0.88%
	Total	19	17	14	27	9	11	16	113	100.00%
Crash Type	Angle	3		1	1	1	1	1	8	7.08%
	Head-on				1				1	0.88%
	Head-on Left Turn	3		3	5	2	2	4	19	16.81%
	Rear-end	6	12	6	12	2	2	8	48	42.48%
	Rear-end Left Turn	2	2	1	2				7	6.19%
	Rear-end Right Turn	4	1	1	3	2	2	1	14	12.39%
	Sideswipe-Same Direction	1	2	2	2		2		9	7.96%
	Sideswipe-Opposite Direction					1		1	2	1.77%
	Single - Deer					1			1	0.88%
	Single - Fixed Object				1		2	1	4	3.54%
	Total	19	17	14	27	9	11	16	113	100.00%
Pavement Condition	Dry	14	10	10	22	8	7	14	85	75.22%
	Ice		1		2				3	2.65%
	Slush				1				1	0.88%
	Snow	3	2	2	1		3	1	12	10.62%
	Wet	2	4	2	1	1	1	1	12	10.62%
	Total	19	17	14	27	9	11	16	113	100.00%
Lighting Condition	Dark - Lighted	1		2	4	1	1	1	10	8.85%
	Dark - Unlighted	2	3	4	1		2	2	14	12.39%
	Dawn	1	1		1				3	2.65%
	Daylight	15	13	8	21	8	8	12	85	75.22%
	Dusk							1	1	0.88%
	Total	19	17	14	27	9	11	16	113	100.00%
Drug / Alcohol Related	Drug					1			1	0.88%
	Alcohol	1		1		1			3	2.65%
	Total (Drug and Alcohol)	1		1		2			4	3.54%
Persons Injured	Injury C	4	1	2	5	4		2	18	64.29%
	Injury B		3		1	1		1	6	21.43%
	Injury A			1				2	3	10.71%
	Injury K							1	1	3.57%
	Total (Persons Injured)	4	4	3	6	5	0	6	28	100.00%

Table 13 shows an intersection crash summary for Adams Road at Meadow Brook Road/Hillendale Drive. There were no fatal or A-level injury crashes. Rear-end crashes (58.7%) were the most prevalent type of crash.

Table 13: 2016-2022 Adams Road/Meadow Brook Road/Hillendale Drive Intersection Crashes

	Crash Characteristic	2016	2017	2018	2019	2020	2021	2022	Total	%
Crash Severity	PDO	5	6	7	4	3	5	9	39	84.78%
	Injury C	1		1	1	1		1	5	10.87%
	Injury B		1				1		2	4.35%
	Injury A								0	0.00%
	Injury K								0	0.00%
	Total	6	7	8	5	4	6	10	46	100.00%
Crash Type	Angle		2	3					5	10.87%
	Head-on Left Turn	2		1	2	1			6	13.04%
	Rear-end	2	2	3	2	2	2	7	20	43.48%
	Rear-end Left Turn		2		1		2	1	6	13.04%
	Rear-end Right Turn			1					1	2.17%
	Sideswipe-Same Direction	1	1			1	1		4	8.70%
	Single - Deer							1	1	2.17%
	Single - Fixed Object	1							1	2.17%
	Single - Projectile / Fallen Object						1	1	2	4.35%
	Total	6	7	8	5	4	6	10	46	100.00%
Pavement Condition	Dry	3	5	6	4	2	5	7	32	69.57%
	Snow	2				2			4	8.70%
	Wet	1	2	2	1		1	3	10	21.74%
	Total	6	7	8	5	4	6	10	46	100.00%
Lighting Condition	Dark - Lighted	1	1		1		1		4	8.70%
	Dark - Unlighted	1					1	2	4	8.70%
	Daylight	4	6	8	4	3	4	7	36	78.26%
	Dusk					1		1	2	4.35%
	Total	6	7	8	5	4	6	10	46	100.00%
Drug / Alcohol Related	Drug								0	0.00%
	Alcohol							1	1	2.17%
	Total (Drug and Alcohol)							1	1	2.17%
Persons Injured	Injury C	1	1	1	2	2		2	9	81.82%
	Injury B		1				1		2	18.18%
	Injury A								0	0.00%
	Injury K								0	0.00%
	Total (Persons Injured)	1	2	1	2	2	1	2	11	100.0%

Table 14 shows an intersection crash summary for Adams Road at Walton Boulevard. There were no fatal crashes. However, there were four A-level injury crashes with six injuries. Rear-end crashes (43.6%) were the most prevalent type of crash, and the second most prevalent being Angle crashes (30.2%). A summary of all A-level injuries is provided below:

- On January 15, 2017, a northbound vehicle disregarded the traffic signal and struck a westbound vehicle. Both drivers revised A-level injuries.
- On January 19, 2017, a southbound vehicle turning right during the red signal onto westbound Walton Boulevard stuck and ran over a pedestrian crossing Adams Road on the north leg of the intersection. The pedestrian sustained A-level injuries, while the diver experienced property damage only.
- On April 28, 2020, a southbound vehicle disregarded the traffic signal and collided with an Eastbound vehicle. The Southbound vehicle experienced property damage only, while the eastbound vehicle's driver and passenger sustained A-level injuries.
- On September 29, 2022, a vehicle exiting a driveway on the west side of Adams Road rear-ended a southbound vehicle waiting at the traffic signal. The Driver exiting the driveway sustained A-level injuries, while the driver of the southbound vehicle, who was rear-ended, sustained C-level injuries. A secondary rear-end crash occurred, which resulted in property damage only.

Table 14: 2016-2022 Adams Road/Walton Boulevard Intersection Crashes

Crash Characteristic		2016	2017	2018	2019	2020	2021	2022	Total	%
Crash Severity	PDO	67	38	54	34	26	44	34	297	84.62%
	Injury C	8	8	5	5	2	5	6	39	11.11%
	Injury B	5		1		1	3	1	11	3.13%
	Injury A		2			1		1	4	1.14%
	Injury K								0	0.00%
	Total	**80**	**48**	**60**	**39**	**30**	**52**	**42**	**351**	**100.00%**
Crash Type	Angle	19	14	24	13	7	18	11	106	30.20%
	Head-on						1		1	0.28%
	Head-on Left Turn			1	2		1	1	5	1.42%
	Rear-end	36	18	21	15	12	16	14	132	37.61%
	Rear-end Left Turn	4	3	3	1		2	1	14	3.99%
	Rear-end Right Turn	1	2	1		1	2		7	1.99%
	Sideswipe-Same Direction	10	8	6	6	7	6	10	53	15.10%
	Sideswipe-Opposite Direction	1							1	0.28%
	Backing		1	2			2		5	1.42%
	Single - Run off Road	3			2			1	6	1.71%
	Single - Deer	2	1			1			4	1.14%
	Single - Fixed Object			2		1	3	2	8	2.28%
	Single - Projectile / Fallen Object	2							2	0.57%
	Single - Bike	1				1	1	2	5	1.42%
	Single - Motorcycle	1							1	0.28%
	Single - Ped		1						1	0.28%
	Total	80	48	60	39	30	52	42	351	100.00%
Pavement Condition	Dry	63	37	49	29	25	43	38	284	80.91%
	Ice		1	4		1	1		7	1.99%
	Slush			1		2		1	4	1.14%
	Snow		1	1		1	1		4	1.14%
	Wet	16	9	4	10	1	7	3	50	14.25%
	Unknown	1		1					2	0.57%
	Total	80	48	60	39	30	52	42	351	100.00%
Lighting Condition	Dark - Lighted	9	5	9	3	3	8	5	42	11.97%
	Dark - Unlighted	10	2	5	6	3	9	4	39	11.11%
	Dawn	1		1	1				3	0.85%
	Daylight	58	39	45	27	23	34	33	259	73.79%
	Dusk	2	1		2	1	1		7	1.99%
	Unknown		1						1	0.28%
	Total	80	48	60	39	30	52	42	351	100.00%
Drug / Alcohol Related	Drug						1		1	0.28%
	Alcohol			1	1	1			3	0.85%
	Total (Drug and Alcohol)			1	1	1	1		4	1.14%
Persons Injured	Injury C	12	13	8	5	4	7	8	57	75.00%
	Injury B	5		1		1	5	1	13	17.11%
	Injury A		3			2		1	6	7.89%
	Injury K								0	0.00%
	Total (Persons Injured)	17	16	9	5	7	12	10	76	100.00%

4.1.2 Intersection and Segment Crash Evaluation

Segment Crash Evaluation

The crash rate for the corridor was further analyzed to compare its crash rate to the most recent average crash rate for Southeast Michigan. Due to differences in traffic volumes and physical road characteristics, crash rates were evaluated separately for Adams Road between Hamlin Road and Avon Road and Adams Road between Avon Road and Walton Boulevard. These results are as follows:

$$Crash\ Rate = \frac{\#\ crashes \times 10^6}{ADT \times Length \times \#\ year \times 365\frac{days}{year}}$$
$$= \#\ Crashes\ per\ million\ vehicle\ miles\ travled\ (mvm)$$

$$Crash\ Rate\ (Hamlin - Avon) = \frac{129\ crashes \times 10^6}{20{,}755\frac{vehicles}{day} \times 1.08\ miles \times 7\ year \times 365\frac{days}{year}} = 2.25\frac{crashes}{mvm}$$

$$Crash\ Rate\ (Avon - Meadow\ Brook) = \frac{73\ crashes \times 10^6}{22{,}989\frac{vehicles}{day} \times 0.62\ miles \times 7year \times 365\frac{days}{year}}$$
$$= 2.00\frac{crashes}{mvm}$$

$$Crash\ Rate\ (Meadow\ Brook - Walton) = \frac{54\ crashes \times 10^6}{21{,}372\frac{vehicles}{day} \times 0.26\ miles \times 7year \times 365\frac{days}{year}}$$
$$= 3.80\frac{crashes}{mvm}$$

The analysis indicates that the segment crash rate for Adams Road varies from 2.25 to 3.8 crashes per mvm traveled. The segment of Adams Road, Meadow Brook Road/Hillendale Drive, to Walton Boulevard exhibits the higher crash rate. In comparison, per SEMCOG, the Southeast Michigan Council of Governments, the regional segment average crash rate[1] for comparable roadways was 2.87 crashes per mvm traveled.

Intersection Crash Evaluation

An intersection crash rate was further evaluated for all four intersections, indicating a cluster of crashes. These results are as follows:

$$Crash\ Rate = \frac{\#\ crashes \times 10^6}{Entering\ Volume \times \#\ year \times 365\frac{days}{year}}$$
$$= \#\ Crashes\ per\ million\ entering\ vehicles\ (MEV)$$

[1] Regional rates from SEMCOG, the Southeast Michigan Council of Governments, Crash Analysis Process, January 2016.

$$Crash\ Rate\ (Adams/Meadow\ Brook) = \frac{46\ crashes \times 10^6}{22{,}988\frac{vehicles}{day} \times 7year \times 365\frac{days}{year}} = 0.78\frac{crashes}{mev}$$

$$Crash\ Rate\ (Adams/Avon) = \frac{113\ crashes \times 10^6}{28{,}790\frac{vehicles}{day} \times 7year \times 365\frac{days}{year}} = 1.54\frac{crashes}{mev}$$

$$Crash\ Rate\ (Adams/Walton) = \frac{351\ crashes \times 10^6}{53{,}602\frac{vehicles}{day} \times 7year \times 365\frac{days}{year}} = 2.56\frac{crashes}{mev}$$

Note: Intersection crash rates are evaluated by considering crashes in all directions.

Table 15 compares the Adams Road intersection crash rates with SEMCOG's regional average.[1]

Table 15: Adams Road Regional Crash Rate Comparison

Location	Average Daily Traffic Volume	Regional Average[1] (mvm)	Adams Road Crash Rate (mvm/mev)	Comparison to Regional Average
Segments				
Adams Road: Hamlin Road to Avon Road	20,001 to 30,000	2.87	2.25	Lower
Adams Road: Avon Road to Meadow Brook Road/Hillendale Drive	20,001 to 30,000	2.87	2.00	Lower
Adams Road: Meadow Brook Road/Hillendale Drive to Walton Boulevard	20,001 to 30,000	2.87	3.80	Higher
Signalized Intersection				
Adams Road/Meadow Brook Road/Hillendale Drive	20,001 to 30,000	0.78	0.78	Same
Adams Road/Avon Road	20,001 to 30,000	0.78	1.54	Higher
Adams Road/Walton Boulevard	50,001 to 60,000	1.25	2.56	Higher

Table 16 compares the Adams Road crash frequency with SEMCOG's regional average.[1]

Table 16: Adams Road Regional Crash Frequency Comparison

Location	Average Daily Traffic Volume	Regional Average[1] (crashes/yr)	Adams Road Crash Frequency (crashes/yr)	Comparison to Regional Average
Segments				
Adams Road: Hamlin Road to Avon Road	20,001 to 30,000	7.86	18.43	Higher
Adams Road: Avon Road to Meadow Brook Road/Hillendale Drive	20,001 to 30,000	7.86	10.43	Higher
Adams Road: Meadow Brook Road/Hillendale Drive to Walton Boulevard	20,001 to 30,000	7.86	7.71	Lower
Signalized Intersection				
Adams Road/Meadow Brook Road/Hillendale Drive	20,001 to 30,000	7.06	6.57	Lower
Adams Road/Avon Road	20,001 to 30,000	7.06	16.14	Higher
Adams Road/Walton Boulevard	50,001 to 60,000	24.78	50.14	Higher

4.2 FUTURE SAFETY ANALYSIS

4.2.1 Highway Safety Manual Predictive Method

The Highway Safety Manual (HSM) is a resource manual that provides safety knowledge and tools in a useful form to facilitate improved decision-making based on safety performance. The HSM developed several models that can be used to predict the frequency of crashes on road segments and at intersections. These models, called Safety Performance Functions (SPFs), are used to predict the number of crashes based on several factors, such as traffic volumes, cross-sectional characteristics, etc. Additionally, the HSM recommends that the published SPFs be calibrated to local data to improve contextual accuracy. As such, MDOT has engaged in several studies to develop Michigan-specific SPFs for both urban and rural roads. These Michigan-specific SPFs were calibrated using a robust database of traffic volumes, roadway geometry, and other information from roads throughout the state.

SPFs represent the total number of crashes expected during a given period (typically one year) under base conditions. Any variation from the base conditions is then represented by Crash Modification Factors (CMFs), which correspond with various safety countermeasures.

Predictive methods for urban/suburban segments and intersections were used to estimate the predicted average crash frequency for an existing segment and intersection with known characteristics. The HSM Analysis Spreadsheet developed by MDOT was used to estimate the predicted crash frequency for the Adams Road corridor and all major project intersections within the study limits. The SPFs applicable to the Adams Road study include those for Urban/Suburban Segments and Urban/Suburban Intersections. The Adams Road PEL Study Area is depicted in Figure 1. The analyzed segment consists of Adams Road from Hamlin Road to Walton Boulevard. Study intersections include Adams Road at Butler Road, Adams Road at Avon Road, and Adams Road at Meadow Brook Road/Hillendale Drive.

Including the existing, the following alternatives were considered for the purposes of this analysis as described in Section 3:

- No Build
- 3 Lane
- 3 Lane with Roundabouts
- 4 Lane Boulevard
- 5 Lan

The HSM Spreadsheet analysis is provided in Appendix E.

4.2.2 HSM Segment Analysis

The HSM Spreadsheet was used to analyze predicted changes in crashes, respective of the five-segment alternatives for the Adams Road corridor, as compared to the existing condition. As previously mentioned, the Urban/Suburban Segments SPF was utilized for this analysis. Several factors are built into the spreadsheet that account for differences in segment characteristics, such as cross-section configuration, segment length, traffic volumes, access point frequency, and presence of fixed objects. These inputs were adjusted to correspond with the characteristics of the alternative. The traffic volumes utilized for the Existing scenario were those collected as part of the study. For the five alternatives, including No Build, the existing traffic volumes were grown to 2045 levels using an annual growth rate of 0.5%.

Except for the No Build Scenario, each alternative includes CMFs of 0.799 (improve pavement friction), 0.704 (upgrade signs with Clearview font and fluorescent sheeting), and 0.800 (vertical curve modification).

Table 17 summarizes the results. It includes results for Property Damage Only (PDO), Fatal and Injury (FI), and Total crashes per year. The change in total crashes is compared between each alternative and the existing condition.

Table 17: Crash Frequency by Alternative and Severity for Adams Road Corridor

Alternative	CMF(s)*	Crash Frequency (crashes per year)				
		Predicted PDO	Predicted FI	Predicted Total	Change from Existing	Percentage Change
Existing	N/A	9.86	1.88	11.74	N/A	N/A
No Build	N/A	10.81	2.16	12.97	1.23	10.5%
3 Lane	0.799, 0.704, 0.800	5.17	0.92	6.09	-5.65	-48.1%
3 Lane with Roundabouts	0.799, 0.704, 0.800	5.17	0.92	6.09	-5.65	-48.1%
4 Lane Boulevard	0.799, 0.704, 0.800	2.83	1.11	3.94	-7.8	-66.4%
5 Lane	0.799, 0.704, 0.800	4.57	1.15	5.72	-6.02	-51.3%

*CMF stands for Crash Modification Factor

When compared to the existing characteristics of the Adams Road corridor, all alternatives are predicted to provide overall safety benefits. The alternative with the greatest reduction in crashes is seen in the Boulevard option. In this scenario, benefits from the corridor improvements are expected to reduce the number of PDO and fatal and injury crashes. The Boulevard alternative improvements are predicted to result in an overall crash reduction of 66.4%. All the alternatives are predicted to provide overall crash reductions, ranging from 48.1% to 51.3%.

As compared to the existing, the No Build alternative predicts a 10.5% increase in crashes in 2045. This result is due to an increase in traffic volumes in the future, which is directly correlated to the increase in predicted crashes.

Both the 3 Lane and 3 Lane with Roundabouts alternatives have the benefit of a continuous two-way left-turn lane (TWLTL) to supplement the existing travel lanes. A TWLTL is an improvement over the existing cross-section configuration that utilizes sporadic passing flares, since TWLTLs allow for left-turning vehicles to be separated from the through lanes. This can reduce delays experienced by through vehicles as well as reduce the likelihood of rear-end and sideswipe crashes. The additional width provided by a TWLTL also provides separation between opposing bounds of traffic, reducing the potential for head-on collisions, which are susceptible to result in high severity injuries. Furthermore, the additional cross-sectional width of a continuous TWLTL ensures sufficient space for emergency vehicles to traverse Adams Rd, which is a noted existing constraint on corridor.

The 3 Lane with Roundabout alternative provides additional safety and operational benefits that extend beyond the intersections where the roundabouts are installed. According to the FHWA, roundabouts can reduce fatal and injury crashes at intersections by up to 82%. Their design, which requires vehicles to slow down before entering the circle, not only enhances safety but also promotes smoother traffic flow, often outperforming signalized intersections in efficiency. Roundabout intersections can both reduce delays and increase flow, while also reducing speeds and providing safer, more comfortable environments for non-motorized modes of traffic on the corridor. While

roundabouts are primarily an intersection-focused solution, their positive impacts extend throughout the entire corridor, contributing to a safer and more efficient transportation system.

The Boulevard is an option that provides a divided median and "Michigan left"-style intersections. Known to the FHWA as a Median U-turn, the Michigan left intersection style greatly reduces the number of conflict points at an intersection by removing direct left turns. This operation has a direct impact on improving safety in the corridor. The divided median in the Boulevard scenario separates opposing directions of traffic, which minimizes the concern for several crash types, such as head-on and sideswipe-opposite directions. Additionally, creating a divided median presents opportunities for additional non-motorized crossings on the corridor with enhanced safety, given the presence of a refuge in the median.

4.2.3 HSM Intersection Analysis

The HSM Spreadsheet was used to analyze predicted crash changes, respective of the five-segment alternatives for the major intersections on the Adams Road corridor, compared to the existing condition. As previously mentioned, the Urban/Suburban Intersections SPF was utilized for this analysis. The intersections analyzed include Butler Road, Avon Road, and Meadow Brook Road/Hillendale Drive. Several factors are built into the spreadsheet that account for differences in intersection characteristics, such as number of legs, traffic control type, presence of median, traffic volumes, right turn on red status, and presence of left turn lane. These inputs were adjusted to correspond with the characteristics of the alternative. The traffic volumes utilized for the Existing scenario were collected as part of the Adams PEL study. For the five alternatives, including No Build, the existing traffic volumes were grown to 2045 levels using a growth rate of 0.5%.

For each alternative, a CMF to improve pavement friction was applied. The value of the CMF varies depending on the number of legs and traffic control type and is described below. Additional CMFs were applied based on the intersection and traffic control devices. Tables 18–23 summarize the results and CMFs for each study intersection. The table includes results for Property Damage Only (PDO), Fatal and Injury (FI), and Total Crashes in crashes per year. The change in total crashes is compared between each alternative and the existing condition.

4.2.3.1 Adams Road at Butler Road

The Adams Road at Butler Road intersection analysis considers scenarios comprising multiple safety countermeasures. The CMFs corresponding with each alternative are described in Table 18. CMFs are not applied to the existing or No-build alternatives.

Table 18: Crash Modification Factors for Adams Road at Butler Road

Alternative	CMF	CMF Applicability				
		No Build	3 Lane	Roundabouts	5 Lane	Boulevard
Improve pavement friction (3 leg Stop)	0.819			✓		
Improve pavement friction (3 leg Signal)	0.667		✓		✓	✓
Add 3-inch retroreflective backplates	0.850		✓		✓	✓
Upgrade pedestrian signals to countdown timer	0.946		✓		✓	✓
Stop Control to Roundabout	0.560			✓		
Install Box Span Signal	0.800		✓		✓	✓

Table 19 summarizes the results of the HSM analysis for Adams Road at Butler Road.

Table 19: Predicted Crash Frequency by Alternative and Severity for Adams Road at Butler Road

Alternative	CMF(s)	Crash Frequency (crashes/year)				
		Predicted PDO	Predicted FI	Predicted Total	Change from Existing	Percentage Change
Existing	N/A	0.40	0.13	0.53	N/A	N/A
No Build	0.819, 0.751	0.49	0.15	0.64	0.11	20.8%
3 Lane	0.667, 0.850, 0.946, 0.800	0.67	0.23	0.9	0.37	69.8%
3 Lane with Roundabouts	0.819, 0.560	0.11	0.03	0.14	-0.39	-73.6%
4 Lane Boulevard	0.667, 0.850, 0.946, 0.800	0.20	0.64	0.84	0.31	58.5%
5 Lane	0.667, 0.850, 0.946, 0.800	0.26	0.73	0.99	0.46	86.8%

The Roundabout alternative is the sole alternative that predicts a decrease in crashes in 2045, with an overall reduction of 73.6%. Meanwhile, the Three Lane, Five Lane, and Boulevard alternatives are predicted to provide overall increases in crashes of 69.8%, 86.8%, and 58.5%, respectively. This is likely due to the addition of a traffic signal at the Butler Road intersection.

Installation of a signal is known to increase the frequency of certain crash types, such as rear end. This situation is accounted for in the SPF used in the HSM spreadsheet. Ultimately, the existing condition of the Butler Road intersection is one that is susceptible to severe crashes. The intersection is at the crest of a hill, leading to less ideal sightlines for vehicles turning from Adams Road to Butler Road and vehicles departing from Butler Road. Additionally, it is known that vehicles experience difficulty in departing Butler Road, given the absence of suitable gaps at many times of the day. The grades would be flattened at the intersection in all alternatives, leading to more advantageous sightlines. Additionally, installing signals would provide a protected phase for Butler Road traffic to safely access Adams Road.

While installing a signal may contribute to the increase of certain PDO crashes, it is also intended to reduce crashes related to poor sightlines and improve operational characteristics at the intersection. This should provide context for the predicted increase in crashes at Butler Road in the Three Lane, Five Lane, and Boulevard alternatives. As compared to the existing, the No Build alternative predicts a 20.8% increase in crashes in 2045. This result is due to an increase in traffic volumes in the future, which is directly correlated to the increase in predicted crashes.

4.2.3.2 Adams Road at Avon Road

The analysis for the Adams Road at Avon Road intersection considers scenarios comprising multiple safety countermeasures. The CMFs corresponding with each alternative are described in Table 20. CMFs are not applied to the existing or No Build condition.

Table 20: Crash Modification Factors for Adams Road at Avon Road

Alternative	CMF	CMF Applicability				
		No Build	3 Lane	Roundabouts	5 Lane	Boulevard
Improve pavement friction (3 leg Signal)	0.667		✓	✓	✓	✓
Add 3” retroreflective backplates	0.850		✓		✓	✓
Upgrade pedestrian signals to countdown timer	0.946		✓		✓	✓
Signalized Intersection to Roundabout	0.520			✓		
Upgrade to Box Span Signal	0.900		✓		✓	✓

Table 21 summarizes the results of the HSM analysis for Adams Road at Avon Road.

Table 21: Predicted Crash Frequency by Alternative and Severity for Adams Road at Avon Road

Alternative	CMF(s)	Crash Frequency (crashes/year)				
		Predicted PDO	Predicted FI	Predicted Total	Change from Existing	Percentage Decrease
Existing	N/A	2.36	0.73	3.09	N/A	N/A
No Build	N/A	2.69	0.82	3.51	0.42	13.6%
3 Lane	0.667, 0.850, 0.946, 0.900	1.17	0.37	1.54	-1.55	-50.2%
3 Lane with Roundabouts	0.667, 0.520	0.46	0.14	0.6	-2.49	-80.6%
4 Lane Boulevard	0.667, 0.850, 0.946, 0.900	1.11	0.31	1.42	-1.67	-54.0%
5 Lane	0.667, 0.850, 0.946, 0.900	1.27	0.41	1.68	-1.41	-45.6%

Each of the alternatives at the Adams Road at Avon Road intersection is predicted to provide overall safety benefits. The alternative with the greatest overall reduction in crashes is the roundabout option. The improvements are predicted to result in an overall crash reduction of 80.6%. Both PDO and fatal and injury crashes are predicted to be reduced in the alternative. All other alternatives also provide overall crash reductions, ranging from 45.6% to 54.0%.

Compared to the existing alternative, the No Build alternative predicts a 13.6% increase in crashes in 2045. This result is due to an increase in traffic volumes in the future, which is directly related to the increase in predicted crashes.

The FHWA considers roundabouts a proven safety countermeasure that can reduce crashes. The roundabout style of intersection reduces the number of conflict points and vehicular speeds compared to a standard intersection. Speed and conflict point reduction combine to create an intersection where PDO and FI crashes are reduced. Additionally, these benefits can create an environment more suitable for non-motorized users. Furthermore, roundabouts are an efficient intersection style that can reduce delay and queuing.

4.2.3.3 Adams Road at Meadow Brook Road/Hillendale Drive

The analysis for the Adams Road at Meadow Brook Road/Hillendale Drive intersection considers scenarios comprising multiple safety countermeasures. CMFs corresponding with each alternative are described in Table 22. CMFs are not applied to the existing condition.

Table 22: Crash Modification Factors for Adams Road at Meadow Brook Road/Hillendale Drive

Alternative	CMF	CMF Applicability				
		No Build	3 Lane	Roundabouts	5 Lane	Boulevard
Improve pavement friction (three-leg signal)	0.667					✓
Improve pavement friction (four-leg signal)	0.797		✓	✓	✓	
Add 3-inch retroreflective backplates	0.850		✓		✓	✓
Upgrade pedestrian signals to countdown timer	0.946		✓		✓	✓
Signalized Intersection to the roundabout	0.520			✓		
Upgrade to box span signal	0.900		✓		✓	✓

Table 22. summarizes the HSM analysis results for Adams Road at Meadow Brook Road/Hillendale Drive.

Table 23: Predicted Crash Frequency by Alternative and Severity for Adams Road at Meadow Brook Road/Hillendale Drive

Alternative	CMF(s)	Crash Frequency (crashes/year)				
		Predicted PDO	Predicted FI	Predicted Total	Change from Existing	Percentage Decrease
Existing	N/A	2.13	0.82	2.95	N/A	N/A
No Build	N/A	2.46	0.92	3.38	0.43	14.6%
3 Lane	0.797, 0.850,0.946, 0.900	1.42	0.53	1.95	-1.00	-33.9%
3 Lane with Roundabouts	0.797, 0.520	0.62	0.22	0.84	-2.11	-71.5%
4 Lane Boulevard	0.797, 0.850,0.946, 0.900	1.03	0.36	1.59	-1.56	-52.8%
5 Lane	0.797, 0.850,0.946, 0.900	1.56	0.6	2.16	-0.79	-26.8%

Each alternative at the Adams Road at Meadow Brook Road/Hillendale Drive intersection is predicted to provide overall safety benefits. The alternative with the greatest overall reduction in crashes is the Roundabout option. The improvements are predicted to result in an overall crash reduction of 71.5%. Both PDO and fatal and injury crashes are predicted to be reduced in the alternative. All other alternatives also provide overall crash reductions, ranging from 26.8% to 63.7%. The significant benefits presented by conversion to a roundabout intersection are discussed in Section 2.2.2.

Compared to the existing alternative, the No Build alternative predicts a 14.6% increase in crashes in 2045. This result is due to an increase in traffic volumes in the future, which is directly related to the increase in predicted crashes.

4.2.4 Summary of HSM Predictive Method Results

A summary of the HSM predictive method for Adams Road segments and intersections is provided in Table 24 and Table 25.

Table 24: Summary of Change in Crash Frequency by Alternative Adams Road Segments

Alternative	Crash Frequency (crashes/year)		
	Total Crashes	Change from Existing	% Change
Existing	11.74	N/A	N/A
No Build	12.97	1.23	10.5%
3 Lane	6.09	-5.65	-48.1%
3 Lane with Roundabouts	6.09	-5.65	-48.1%
4 Lane Boulevard	3.94	-7.8	-66.4%
5 Lane	5.72	-6.02	-51.3%

The results in Table 25 indicate that the crash frequency is reduced for all segment alternatives compared to the existing Adams Road corridor. The alternative with the greatest reduction in crashes is the Boulevard alternative, which reduces crashes by 71.0%. The No Build alternative is predicted to increase crashes by 10.5% in 2045 as compared to existing.

Table 25: Summary of Change in Crash Frequency by Alternative Adams Road Intersections

Alternative	Crash Frequency (crashes/year)								
	Butler	Change from Existing	% Change	Avon	Change from Existing	% Change	Meadow Brook Hillendale	Change from Existing	% Change
Existing	0.53	N/A	N/A	3.09	N/A	N/A	2.95	N/A	N/A
No Build	0.64	0.11	20.8%	3.51	0.42	13.6%	3.38	0.43	14.6%
3 Lane	0.9	0.37	69.8%	1.54	-1.55	-50.2%	1.95	-1.00	-33.9%
3 Lane with Roundabouts	0.14	-0.39	-73.6%	0.6	-2.49	-80.6%	0.84	-2.11	-71.5%
4 Lane Boulevard	0.84	0.31	58.5%	1.42	-1.67	-54.0%	1.07	-1.88	-63.7%
5 Lane	0.99	0.46	86.8%	1.68	-1.41	-45.6%	2.16	-0.79	-26.8%

The analysis results indicate that all alternatives are predicted to reduce crashes at the Avon Road and Meadow Brook Road/Hillendale Drive intersections. In both instances, the Roundabouts alternative provides the greatest reductions, 80.6% at Avon Road and 71.5% at Meadow Brook Road/Hillendale Drive. Other alternatives also show significantly reduced crash frequencies compared to the existing ones.

At the Butler Road intersection, only the roundabout alternative predicted a decrease in crashes, with a result of 73.6%. The other alternatives predict an increase in crashes, likely attributable to the conversion of the intersection to a signal. Such a conversion is prone to increase rates of some crash types, such as rear-end. The No Build alternative is predicted to increase crashes for all three intersections. This is expected, given the traffic growth by 2045 on the Adams Road corridor.

Given the results of the analysis, the alternatives that best provide safety benefits to intersections and segments are the Roundabout and Boulevard. Between 2016 and 2022, more crashes occurred at Butler Road, Avon Road, and Meadow Brook Road intersections than at the study segment between Hamlin Road and Walton Boulevard. The Roundabout alternative is predicted to reduce crashes by 71.5% to 80.6% at intersections and 48.1% in the study segments.

CONFLICT POINT ANALYSIS

HRC reviewed the existing conflict points at all intersections and how they compared to the alternatives. Table 26 provides the conflict points for different types of intersections. It is easy to see how installing a roundabout improves a standard intersection, and installing a boulevard that prohibits side streets through traffic improves both standard and roundabout intersections.

Table 26: Intersection Conflict Points

Intersection Type	Vehicle Conflict Points
4 Leg Standard Intersection	32
Two Lane Roundabout	24
Boulevard - with no side street through traffic	12

SECTION 5.0 — CAPACITY ANALYSIS

5.1 INTERSECTION CAPACITY ANALYSIS – SYNCHRO SIMULATION

A capacity analysis of the four signalized intersections listed below was conducted using Synchro 11 and following the procedures outlined in the Highway Capacity Manual (HCM) to evaluate the performance of each intersection. The capacity analysis for the four signalized intersections with one unsignalized intersection was conducted for the AM, Off, and PM peak hours for existing conditions (2022) and future conditions (2045). The signal timing plans were not altered or optimized in the existing capacity analysis. The existing signal timings were applied in the Synchro models per the signal timing permits provided by RCOC. For each alternative, the corridor signal timing was updated and optimized. Synchro models report results based on the data which is input into the program as such when the traffic volumes are modified to represent future traffic levels and/or the corridor is optimized to provide better progression, some intersection approaches may get worse and some may get better.

- Adams Road at Walton Boulevard
- Adams Road at Meadow Brook Road/Hillendale Drive
- Adams Road at Avon Road
- Adams Road at Butler Road (unsignalized)
- Adams Road at Hamlin Road

Level of Service LOS

At an unsignalized 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 cross through traffic on the major street safely. This is typically evident from extremely long control delays experienced by minor street traffic and 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 disruption to the major traffic stream may result. Note that LOS "F" may not always result in long queues but only in normal gap acceptance behavior adjustments.

At Stop Controlled intersections, the critical movement, often the minor-street left-turn, may control the overall performance of the intersection. The lower threshold for LOS "F" is set at 50 seconds of delay per vehicle, as shown in Table 27. In some cases, the delay equations will predict delays greater than 50 seconds for minor street movements under very low-volume conditions on the minor street (less than 25 vehicles per hour). A LOS "F" threshold is reached with a movement capacity of approximately 85 vehicles per hour or less.

Table 27: Level of Service Criteria for Unsignalized Intersections

Level of Service	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

The highway capacity manual defines the level of service (LOS) for signalized intersections in terms of control delay. Table 28 shows the control delay that corresponds with each LOS.

Table 28: 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 a very low control delay of up to 10.0 seconds 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 seconds 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 seconds per vehicle. These higher delays may result from fair progression and/or longer cycle lengths. Individual cycle failures may begin to appear at 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 a control delay of 35.1 to 55.0 seconds per vehicle. At level D, the influence of congestion becomes more noticeable. Longer delays may result from unfavorable progression, long cycle lengths, or 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 seconds 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 seconds 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.

5.1.1 Adams Road at Walton Boulevard

The intersection of Walton Boulevard at Adams Road is 45 mph in all directions, and Per the National Functional Classification System, the following is true:

- Walton Boulevard is classified as a Principal Arterial
- Southbound Adams Road is classified as a Minor Arterial
- Northbound Adams Road is classified as a Principal Arterial

The existing intersection geometry is shown in Figure 6 and follows:

- West leg – three receiving lanes, two through lanes, and one dedicated right turn lane
- East leg – three receiving lanes and three through lanes
- North leg – two receiving lanes, one through lane, and one dedicated right turn lane
- South leg – One receiving lane, one through lane, and one shared through/right turn lane

Figure 6: Aerial of Adams Road at Walton Boulevard

Table 29 presents the LOS and delay during all peak hours by movement for the existing conditions under existing traffic volumes.

Table 29: Existing Capacity Analysis for Adams Road at Walton Boulevard

Approach	Movement	Existing AM Peak		Existing Off Peak		Existing PM Peak	
		Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
NB	TH/RT	16.9	B	35.3	D	54.0	D
	NB Total	16.9	B	35.3	D	54.0	D
SB	TH	90.0	F	47.3	D	56.7	E
	RT	21.2	C	17.6	B	26.4	C
	SB Total	78.7	E	39.9	D	48.7	D
EB	TH	18.8	B	12.7	B	19.7	B
	RT	17.0	B	11.2	B	13.8	B
	EB Total	18.4	B	12.4	B	18.9	B
WB	TH/RT	19.5	B	11.7	B	16.9	B
	WB Total	19.5	B	11.7	B	16.9	B
Intersection Total		**31.8**	**C**	**18.9**	**B**	**26.2**	**C**

**Highlighted cells indicate an unacceptable LOS*

The results indicate that:

- All eastbound, westbound, and northbound movements at Adams Road and Walton Boulevard will have an acceptable LOS during peak hours.
- The southbound through movement at Adams Road and Walton Boulevard will have an acceptable LOS in off-peak hours.
- The southbound right movement at Adams Road and Walton Boulevard will have an acceptable LOS during peak hours.
- The southbound through movement at Adams Road and Walton Boulevard will have an unacceptable LOS F in the AM peak and LOS E in the PM peak.

HRC also analyzed each alternative's capacity under the existing traffic volumes. In all alternatives analyzed, the following intersection geometry was used for Adams Road at Walton Boulevard:

- West leg – three receiving lanes, two through lanes, and one dedicated right turn lane
- East leg – three receiving lanes and three through lanes
- North leg – two receiving lanes, two through lanes, and one dedicated right turn lane
- South leg – two receiving lanes, two through lanes, and one dedicated right turn lane

Table 30 presents the LOS and delay during all peak hours by the movement for Alternative 1 (Three Lane) utilizing existing volumes. All unacceptable movements identified in the existing capacity analysis have been improved to acceptable levels.

Table 30: Capacity Analysis for Adams Road at Walton Boulevard with Existing Volumes for Alternative 1

Approach	Movement	2022: 3 Lane AM Peak		2022: 3 Lane Off Peak		2022: 3 Lane PM Peak	
		Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
NB	TH	16.3	B	26.7	C	28.6	C
	RT	14.9	B	25.7	C	28.3	C
	NB Total	15.9	B	26.4	C	28.5	C
SB	TH	31	C	22.1	C	25.2	C
	RT	30.9	C	19.5	B	25.0	C
	SB Total	31	C	21.4	C	25.5	C
EB	TH	17.7	B	13.9	B	19.0	B
	RT	19.1	B	8.7	A	6.1	A
	EB Total	18	B	12.8	B	17.4	B
WB	TH/RT	17.8	B	12.7	B	15.4	B
	WB Total	17.8	B	12.7	B	15.4	B
Intersection Total		**20.3**	**C**	**15.0**	**B**	**18.0**	**B**

For Alternative 2, Three lanes with roundabouts on Walton Boulevard were not analyzed.

Table 31 presents the LOS and delay during all peak hours by movement for Alternative 3 (Five Lane) utilizing existing volumes. All unacceptable movements identified in the existing capacity analysis have been improved to acceptable levels. In general, the capacity was found to be an improvement over the three-lane alternative.

Table 31: Capacity Analysis for Adams Road at Walton Boulevard with Existing Volumes for Alternative 3

Approach	Movement	2022: 5 Lane AM Peak		2022: 5 Lane Off Peak		2022: 5 Lane PM Peak	
		Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
NB	TH	8.6	A	26.9	C	13.9	B
	RT	6.9	A	24.1	C	12.1	B
	NB Total	8.1	A	26.2	C	13.3	B
SB	TH	11.8	B	21.8	C	15.7	B
	RT	6.5	A	18.4	B	12.5	B
	SB Total	10.7	B	20.9	C	14.8	B
EB	TH	13.2	B	11.9	B	11.4	B
	RT	9.6	A	10.4	B	3.4	A
	EB Total	12.4	B	11.6	B	10.4	B
WB	TH/RT	10.2	B	11.2	B	8.6	A
	WB Total	10.2	B	11.2	B	8.6	A
Intersection Total		**10.3**	**B**	**14.1**	**B**	**10.1**	**B**

Table 32 presents the LOS and delay during all peak hours by movement for Alternative 4 (Four Lane Boulevard) utilizing existing volumes. All unacceptable movements identified in the existing capacity analysis have been improved to acceptable levels. In general, the capacity of Alternative 4 was found to be an improvement over the three-lane alternative. Alternative 4 saw slightly worse LOS overall when compared to the five-lane alternative.

Table 32: Capacity Analysis for Adams Road at Walton Boulevard with Existing Volumes for Alternative 4

Approach	Movement	2022: 4 Lane AM Peak		2022: 4 Lane Off Peak		2022: 4 Lane PM Peak	
		Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
NB	TH	8.5	A	32.3	C	21.4	C
	RT	11.4	B	35.3	D	30.1	C
	NB Total	9.2	A	33.1	C	24.5	C
SB	TH	14.9	B	22.2	C	14.7	B
	RT	8.4	A	21.6	C	11.8	B
	SB Total	13.9	B	22.1	C	13.9	B
EB	TH	11.6	B	15.2	B	12.6	B
	RT	10.6	B	18.3	B	3.5	A
	EB Total	11.4	B	15.8	B	11.4	B
WB	TH/RT	10.4	B	14.7	B	9.1	A
	WB Total	10.4	B	14.7	B	9.1	A
Intersection Total		**11.1**	**B**	**17.4**	**B**	**11.6**	**B**

Table 33 presents the LOS and delay during all peak hours by movement for existing conditions under Future 2045 traffic volumes.

Table 33: Existing Capacity Analysis for Adams Road at Walton Boulevard with Future 2045 Traffic Volumes

Approach	Movement	Future AM Peak		Future Off Peak		Future PM Peak	
		Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
NB	TH/RT	20.6	C	36.4	D	72.2	E
	NB Total	20.6	C	36.4	D	72.2	E
SB	TH	149.9	F	75.8	E	83.4	F
	RT	20.6	C	18.2	B	28.3	C
	SB Total	128.5	F	61.4	E	68.9	E
EB	TH	19.7	B	13.3	B	21.3	C
	RT	18.1	B	10.4	B	12	B
	EB Total	19.3	B	12.8	B	20.2	C
WB	TH/RT	20	B	11.9	B	17.9	B
	WB Total	20	B	11.9	B	17.9	B
Intersection Total		**44.9**	**D**	**22.8**	**C**	**32.6**	**C**

**Highlighted cells indicate an unacceptable LOS*

Table 34 presents the LOS and delay during all peak hours by movement for Alternative 1 (Three Lane) utilizing Future 2045 traffic volumes.

Table 34: Capacity Analysis for Adams Road at Walton Boulevard with Future 2045 Volumes for Alternative 1

Approach	Movement	2045: 3 Lane AM Peak		2045: 3 Lane Off Peak		2045: 3 Lane PM Peak	
		Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
NB	TH	14.2	B	22.8	C	22.8	C
	RT	13.4	B	21.2	C	21.9	C
	NB Total	13.9	B	22.4	C	22.5	C
SB	TH	26.5	C	20.4	C	25.2	C
	RT	24.3	C	18	B	24.5	C
	SB Total	26.1	C	19.8	B	25	C
EB	TH	20.3	C	16.1	B	24.4	C
	RT	19.6	B	9.1	A	7.3	A
	EB Total	20.2	C	14.7	B	22.3	C
WB	TH/RT	22.4	C	14.7	B	17.3	B
	WB Total	22.4	C	14.7	B	17.3	B
Intersection Total		**20.7**	**C**	**15.6**	**B**	**19.3**	**B**

For Alternative 2, three lanes with roundabouts on Walton Boulevard were not analyzed.

Table 35 presents the LOS and delay during all peak hours by movement for Alternative 3 (Five Lane) utilizing Future 2045 traffic volumes.

Table 35: Capacity Analysis for Adams Road at Walton Boulevard with Future 2045 Volumes for Alternative 3

Approach	Movement	2045: 5 Lane AM Peak		2045: 5 Lane Off Peak		2045: 5 Lane PM Peak	
		Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
NB	TH	7.5	A	27.7	C	17.8	B
	RT	5.7	A	24.7	C	16.4	B
	NB Total	6.8	A	26.9	C	17.4	B
SB	TH	13.9	B	21.9	C	17.2	B
	RT	6.7	A	18.7	B	14	B
	SB Total	12.7	B	21.1	C	16.4	B
EB	TH	13.7	B	12.9	B	13.2	B
	RT	10.6	B	9.9	A	3.5	A
	EB Total	13	B	12.3	B	12	B
WB	TH/RT	10.8	B	11.6	B	8.8	A
	WB Total	10.8	B	11.6	B	8.8	A
Intersection Total		**10.9**	**B**	**14.6**	**B**	**11.5**	**B**

Table 36 presents the LOS and delay during all peak hours by movement for Alternative 4 (Four Lane Boulevard) utilizing Future 2045 traffic volumes.

Table 36: Capacity Analysis for Adams Road at Walton Boulevard with Future 2045 Volumes for Alternative 4

Approach	Movement	2045: 4 Lane AM Peak		2045: 4 Lane Off Peak		2045: 4 Lane PM Peak	
		Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
NB	TH	8.6	A	31.9	C	22.7	C
	RT	7.4	A	33	C	22.6	C
	NB Total	8.2	A	32.2	C	22.6	C
SB	TH	16.5	B	21	C	15.9	B
	RT	9.1	A	20.5	C	13.2	B
	SB Total	15.3	B	20.9	C	15.2	B
EB	TH	12.1	B	17.5	B	15.3	B
	RT	10.6	B	15.4	B	4	A
	EB Total	11.8	B	17.1	B	13.9	B
WB	TH/RT	10.8	B	16.6	B	9.4	A
	WB Total	10.8	B	16.6	B	9.4	A
Intersection Total		**11.4**	**B**	**18.0**	**B**	**12.9**	**B**

5.1.2 Adams Road at Meadow Brook Road/Hillendale Drive

Meadow Brook Road and Hillendale Drive are 25 mph, while Adams Road is 45 mph. Per the National Functional Classification System, the following is true:

- Meadow Brook Road/Hillendale Drive is classified as a local
- Adams Road is classified as a principal arterial

The existing intersection geometry is shown in Figure 7 and follows:

- West leg – one receiving lane, one shared through/left turn lane, and one dedicated right turn lane
- East leg – one receiving lane and one share through/left/right turn lane
- North leg – one receiving lane, one through lane, and one passing lane
- South leg – one receiving lane, one through lane, and one passing lane

Figure 7: Aerial of Adams Road at Meadow Brook Road/Hillendale Drive

Table 37 presents the LOS and delay during all peak hours by movement for existing conditions under existing traffic volumes.

Table 37: Existing Capacity Analysis for Adams Road at Meadow Brook Road/Hillendale Drive

Approach	Movement	Existing AM Peak		Existing Off Peak		Existing PM Peak	
		Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
NB	LT	4.6	A	3	A	2.4	A
	TH/RT	3.5	A	4.1	A	4.0	A
	NB Total	3.7	A	4	A	3.8	A
SB	LT/TH/RT	4.8	A	4.0	A	2.9	A
	SB Total	4.8	A	4.0	A	2.9	A
EB	LT/TH	48.8	D	34.9	C	53.8	D
	RT	48.8	D	33.7	C	51.1	D
	EB Total	48.8	D	33.9	C	51.7	D
WB	LT/TH/RT	54.0	D	34.4	C	51.9	D
	WB Total	54.0	D	34.4	C	51.9	D
Intersection Total		**8.2**	**A**	**6.6**	**A**	**8.4**	**A**

The results indicate that all bounds and movements at Adams Road and Meadow Brook Road/Hillendale Drive will have an acceptable LOS during peak hours.

HRC also analyzed each alternative's capacity under the existing traffic volumes. The following is the intersection geometry used for Adams Road at Meadow Brook Road/Hillendale Drive for Alternative 1:

- West leg – one receiving lane, one dedicated left turn lane, and one shared through/right turn lane
- East leg – one receiving lane and one share through/left/right turn lane
- North leg – one receiving lane, one through lane, one dedicated left turn lane, and one dedicated right turn lane
- South leg – one receiving lane, one through lane, one dedicated left turn lane, and one dedicated right turn lane

Table 38 presents the LOS and delay during all peak hours by movement for Alternative 1 (Three Lane) utilizing existing volumes. All movements on Adams Road were improved compared to the existing capacity analysis. Meadow Brook Road/Hillendale Drive saw some improvements, but some movements worsened. This is largely due to the low traffic volume and the improvements in traffic signal timing.

Table 38: Capacity Analysis for Adams Road at Meadow Brook Road/Hillendale Drive with Existing Volumes for Alternative 1

Approach	Movement	2022: 3 Lane AM Peak		2022: 3 Lane Off Peak		2022: 3 Lane PM Peak	
		Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
NB	LT	6.2	A	7.3	A	7.4	A
	TH	5.7	A	7.3	A	12.7	B
	RT	3.7	A	3.9	A	4.2	A
	NB Total	5.7	A	7.2	A	12.1	B
SB	LT	3	A	2.3	A	4.2	A
	TH	22.3	C	8.5	A	9.1	A
	RT	5.1	A	5.1	A	5.6	A
	SB Total	21.9	C	8.5	A	9	A
EB	LT	39.4	D	40.6	D	39.4	D
	TH/RT	39.2	D	38.9	D	38.7	D
	EB Total	39.2	D	39.2	D	38.8	D
WB	LT/TH/RT	42.5	D	39.9	D	39.4	D
	WB Total	42.5	D	39.9	D	39.4	D
Intersection Total		**17**	**B**	**10.6**	**B**	**13.7**	**B**

For Alternative 2 – the three lanes with roundabouts, please refer to the Roundabout Analysis – ARCADY Analysis section.

The following is the intersection geometry used for Adams Road at Meadow Brook Road/Hillendale Drive for Alternative 3:

- West leg – one receiving lane, one dedicated left turn lane, and one shared through/right turn lane
- East leg – one receiving lane and one share through/left/right turn lane
- North leg – two receiving lanes, two through lanes, one dedicated left turn lane, and one dedicated right turn lane
- South leg – two receiving lanes, two through lanes, one dedicated left turn lane, and one dedicated right turn lane

Table 39 presents the LOS and delay during all peak hours by movement for Alternative 3 (Five Lane) utilizing existing volumes. All movements were improved or stayed the same compared to the existing capacity analysis.

Table 39: Capacity Analysis for Adams Road at Meadow Brook Road/Hillendale Drive with Existing Volumes for Alternative 3

Approach	Movement	2022: 5 Lane AM Peak		2022: 5 Lane Off Peak		2022: 5 Lane PM Peak	
		Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
NB	LT	5.9	A	2.8	A	4.6	A
	TH	5.3	A	3.1	A	6.8	A
	RT	5.6	A	4	A	5.8	A
	NB Total	5.4	A	3.1	A	6.6	A
SB	LT	3.4	A	3.6	A	2.6	A
	TH	6.1	A	7	A	4.7	A
	RT	7.6	A	5.3	A	7.7	A
	SB Total	6.1	A	7	A	4.7	A
EB	LT	24.8	C	40.6	D	25.5	C
	TH/RT	24.5	C	38.9	D	25	C
	EB Total	24.6	C	39.2	D	25.1	C
WB	LT/TH/RT	26	C	39.9	D	25.1	C
	WB Total	26	C	39.9	D	25.1	C
Intersection Total		**7.5**	**A**	**8.0**	**A**	**7.8**	**A**

The following is the intersection geometry used for Adams Road at Meadow Brook Road/Hillendale Drive for Alternative 4:

- West leg – one receiving lane, two right turn lanes
- East leg – one receiving lane and one dedicated right turn lane
- North leg – two receiving lanes, two through lanes, and one dedicated right turn lane
- South leg – two receiving lanes, two through lanes, and one dedicated right turn lane

Table 40 presents the LOS and delay during all peak hours by movement for Alternative 4 (Four Lane Boulevard) utilizing existing volumes. It should be noted that because Alternative 4 is a boulevard, the signal operations at Meadow Brook Road and Hillendale Drive are evaluated separately. All movements were improved compared to the existing, Alternative 1, and Alternative 3 capacity analysis.

Table 40: Capacity Analysis for Adams Road at Meadow Brook Road/Hillendale Drive with Existing Volumes for Alternative 4

Intersection	Approach	Movement	2022: 4 Lane AM Peak		2022: 4 Lane Off Peak		2022: 4 Lane PM Peak	
			Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
Southbound Adams Rd at Meadow Brook Rd	SB	TH	1.5	A	1.1	A	2.9	A
		RT	0.3	A	0.1	A	2.2	A
		SB Total	1.3	A	1	A	2.8	A
	EB	RT	26.1	C	34.9	C	23.4	C
		EB Total	26.1	C	34.9	C	23.4	C
	Intersection Total		**2.5**	**A**	**4.9**	**A**	**6.3**	**A**

Intersection	Approach	Movement	2022: 4 Lane AM Peak		2022: 4 Lane Off Peak		2022: 4 Lane PM Peak	
			Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
Northbound Adams Rd at Hillendale Dr	NB	TH	7.5	A	3.2	A	2.5	A
		NB Total	7.5	A	3.2	A	2.5	A
	WB	RT	24.9	C	36.1	D	27.4	C
		WB Total	24.9	C	36.1	D	27.4	C
	Intersection Total		**9.5**	**A**	**4.7**	**A**	**3.2**	**A**

Table 41 presents the LOS and delay during all peak hours by movement for existing conditions under Future 2045 traffic volumes.

Table 41: Existing Capacity Analysis for Adams Road at Meadow Brook Road/Hillendale Drive with Future 2045 Traffic Volumes

Approach	Movement	Future AM Peak		Future Off Peak		Future PM Peak	
		Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
NB	LT	6.8	A	3.3	A	2.8	A
	TH/RT	4.5	A	4.7	A	5.1	A
	NB Total	5	A	4.6	A	4.9	A
SB	LT/TH/RT	8.2	A	5.2	A	4	A
	SB Total	8.2	A	5.2	A	4	A
EB	LT/TH	48.2	D	34.9	C	53.9	D
	RT	48.1	D	33.5	C	50.9	D
	EB Total	48.1	D	33.8	C	51.6	D
WB	LT/TH/RT	54.3	D	34.3	C	51.8	D
	WB Total	54.3	D	34.3	C	51.8	D
Intersection Total		**10.7**	**B**	**7.4**	**A**	**9.4**	**A**

Table 42 presents the LOS and delay during all peak hours by movement for Alternative 1 (Three Lane) utilizing Future 2045 traffic volumes.

Table 42: Capacity Analysis for Adams Road at Meadow Brook Road/Hillendale Drive with Future 2045 Volumes for Alternative 1

Approach	Movement	2045: 3 Lane AM Peak		2045: 3 Lane Off Peak		2045: 3 Lane PM Peak	
		Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
NB	LT	32.4	C	9.5	A	7.9	A
	TH	5.4	A	8.4	A	12.8	B
	RT	3.9	A	4	A	4.3	A
	NB Total	11.2	B	8.4	A	12.3	B
SB	LT	3.8	A	2.8	A	9.8	A
	TH	28.7	C	10.8	B	12.4	B
	RT	6.2	A	5.3	A	5.7	A
	SB Total	28.2	C	10.7	B	12.3	B
EB	LT	38.5	D	40.6	D	39.7	D
	TH/RT	38.9	D	38.6	D	38.8	D
	EB Total	38.9	D	39.1	D	39	D
WB	LT/TH/RT	62.3	E	39.9	D	40.8	D
	WB Total	62.3	E	39.9	D	40.8	D
Intersection Total		**24.1**	**C**	**12.1**	**B**	**15.1**	**B**

For Alternative 2 – Three lanes with roundabouts, please refer to the Roundabout Analysis – ARCADY Analysis section.

Table 43 presents the LOS and delay during all peak hours by movement for Alternative 3 (Five Lane) utilizing Future 2045 traffic volumes.

Table 43: Capacity Analysis for Adams Road at Meadow Brook Road/Hillendale Drive with Future 2045 Volumes for Alternative 3

Approach	Movement	2045: 5 Lane AM Peak		2045: 5 Lane Off Peak		2045: 5 Lane PM Peak	
		Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
NB	LT	13.1	B	3.7	A	4.6	A
	TH	5.5	A	4.1	A	7.1	A
	RT	5.7	A	4.1	A	5.8	A
	NB Total	7.1	A	4.1	A	6.9	A
SB	LT	2.9	A	3.8	A	2.7	A
	TH	6.4	A	7.5	A	5.3	A
	RT	7.8	A	5.5	A	7.7	A
	SB Total	6.4	A	7.5	A	5.3	A
EB	LT	24.1	C	40.6	D	25.7	C
	TH/RT	24.4	C	38.6	D	25.2	C
	EB Total	24.4	C	39.1	D	25.3	C
WB	LT/TH/RT	28.1	C	39.9	D	25.3	C
	WB Total	28.1	C	39.9	D	25.3	C
Intersection Total		**8.3**	**A**	**8.7**	**A**	**8.2**	**A**

Table 44 presents the LOS and delay during all peak hours by movement for Alternative 4 (Four Lane Boulevard) utilizing Future 2045 traffic volumes.

Table 44: Capacity Analysis for Adams Road at Meadow Brook Road/Hillendale Drive with Future 2045 Volumes for Alternative 4

Intersection	Approach	Movement	2045: 4 Lane AM Peak		2045: 4 Lane Off Peak		2045: 4 Lane PM Peak	
			Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
Southbound Adams Rd at Meadow Brook Rd	SB	TH	1.6	A	1.4	A	3.2	A
		RT	0.3	A	0.1	A	1.9	A
		SB Total	1.4	A	1.2	A	3	A
	EB	RT	26.1	C	33.1	C	23.7	C
		EB Total	26.1	C	33.1	C	23.7	C
	Intersection Total		**2.6**	**A**	**4.9**	**A**	**6.5**	**A**

Intersection	Approach	Movement	2045: 4 Lane AM Peak		2045: 4 Lane Off Peak		2045: 4 Lane PM Peak	
			Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
Northbound Adams Rd at Hillendale Dr	NB	TH	7.6	A	3.2	A	2.6	A
		NB Total	7.6	A	3.2	A	2.6	A
	WB	RT	25	C	36.1	D	27.4	C
		WB Total	25	C	36.1	D	27.4	C
	Intersection Total		**9.6**	**A**	**4.7**	**A**	**3.4**	**A**

5.1.3 Adams Road at Avon Road

The intersection of Adams Road at Avon Road is 45 mph in all directions, and per the National Functional Classification System, the following is true:

- Avon Road is classified as a minor arterial
- Adams Road is classified as a principal arterial

The existing intersection geometry is shown in

Figure 8 and follows:

- East leg – one receiving lane, one dedicated left turn lane, and one dedicated right turn lane
- North leg – one receiving lane, one through lane, and one passing lane
- Innermost through lanes were modeled as a left turn lane. This is consistent with the high number of vehicles turning left at the intersection.
- South leg – two receiving lanes, one through lane, and one dedicated right turn lane

Figure 8: Aerial of Adams Road at Avon Road

Table 45 presents the LOS and delay during all peak hours by movement existing conditions under existing traffic volumes.

Table 45: Existing Capacity Analysis for Adams Road at Avon Road

Approach	Movement	Existing AM Peak		Existing Off Peak		Existing PM Peak	
		Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
NB	TH	44.2	D	39.1	D	36.9	D
	RT	76.8	E	50.8	D	9.4	A
	NB Total	55.2	E	42.1	D	28	C
SB	LT	54	D	36.2	D	84.8	F
	TH	14.4	B	6.4	A	12.4	B
	SB Total	26.1	C	16.9	B	36.1	D
WB	LT	128.9	F	43.7	D	44.6	D
	RT	67.3	E	38.6	D	16.3	B
	WB Total	99.5	F	40.4	D	25.3	C
Intersection Total		**53.6**	**D**	**31.1**	**C**	**30**	**C**

**Highlighted cells indicate an unacceptable LOS*

The results indicate that:

- The northbound and southbound routes through movements at Adams Road and Avon Road will have an acceptable LOS at all peak hours.
- The northbound right turn movement at Adams Road and Avon Road will have an acceptable LOS in the off-peak and PM peak hours.
- The northbound right turn movement at Adams Road and Avon Road will have an unacceptable LOS E in the AM peak hours.
- The southbound left turn movement at Adams Road and Avon Road will have an acceptable LOS in the AM peak and off-peak hours.
- The southbound left turn movement at Adams Road and Avon Road will have an unacceptable LOS F in the PM peak.
- The westbound left and right turn movements at Adams Road and Avon Road will have an acceptable LOS in the Off and PM peak hours.
- In the AM peak, the westbound left and right turn movements at Adams Road and Avon Road will have unacceptable LOS E and LOS F, respectively.

HRC also analyzed each alternative's capacity under the existing traffic volumes.

The following is the intersection geometry used for Adams Road at Avon Road for Alternative 1:

- East leg – one receiving lane, one dedicated left turn lane, and one dedicated right turn lane
- North leg – one receiving lane, one through lane, and one dedicated left turn lane
- South leg – one receiving lane, one through lane, and one dedicated right turn lane

Table 46 presents the LOS and delay during all peak hours by movement for Alternative 1 (Three Lane) utilizing existing volumes. All unacceptable movements identified in the existing capacity analysis have been improved to acceptable levels. All movements were improved when compared to the existing capacity analysis.

Table 46: Capacity Analysis for Adams Road at Avon Road with Existing Volumes for Alternative 1

Approach	Movement	2022: 3 Lane AM Peak		2022: 3 Lane Off Peak		2022: 3 Lane PM Peak	
		Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
NB	TH	11	B	16.9	B	19.1	B
	RT	3	A	9.4	A	4.5	A
	NB Total	8.7	A	15	B	14.4	B
SB	LT	16.7	B	15	B	27.8	C
	TH	13.5	B	2.1	A	2.7	A
	SB Total	14.6	B	6.6	A	10.9	B
WB	LT	48.7	D	47	D	39.3	D
	RT	32.4	C	30.1	C	44.6	D
	WB Total	39.6	D	35.8	D	42.9	D
Intersection Total		**19.4**	**B**	**16.2**	**B**	**20.2**	**C**

For alternative 2 – three lanes with roundabouts, please refer to the Roundabout Analysis – ARCADY Analysis section.

The following is the intersection geometry used for Adams Road at Avon Road for Alternative 3:

- East leg – one receiving lane, one dedicated left turn lane, and one dedicated right turn lane
- North leg – two receiving lanes, two through lanes, and one dedicated left turn lane
- South leg - two receiving lanes, two through lanes, and one dedicated right turn lane

Table 47 presents the LOS and delay during all peak hours by movement for Alternative 3 (Five Lane) utilizing existing volumes. All movements were improved compared to the existing capacity analysis and Alternative 1.

Table 47: Capacity Analysis for Adams Road at Avon Road with Existing Volumes for Alternative 3

Approach	Movement	2022: 5 Lane AM Peak		2022: 5 Lane Off Peak		2022: 5 Lane PM Peak	
		Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
NB	TH	10.1	B	19.2	B	7.1	A
	RT	17	B	5.8	A	8.9	A
	NB Total	12.1	B	15.8	B	7.7	A
SB	LT	14	B	5.9	A	22.8	C
	TH	2.1	A	1.2	A	1.9	A
	SB Total	6	A	2.8	A	8.7	A
WB	LT	23.9	C	39.4	D	27.9	C
	RT	13.2	B	27.4	C	24.4	C
	WB Total	18	B	31.5	C	25.5	C
Intersection Total		**10.7**	**B**	**13.9**	**B**	**12.4**	**B**

The following is the intersection geometry used for Adams Road at Avon Road for Alternative 4:

- East leg – one receiving lane and two dedicated right turn lanes
- North leg – two receiving lanes and two through lanes
- South leg - two receiving lanes, two through lanes, and one dedicated right turn lane

Table 48 presents the LOS and delay during all peak hours by movement for Alternative 4 (Four Lane Boulevard) utilizing existing volumes. It should be noted that Alternative 4 is a boulevard, and the crossovers were analyzed separately as they are also signalized. All movements were improved compared to the existing capacity analysis, Alternative 1, and Alternative 3.

Table 48: Capacity Analysis for Adams Road at Avon Road with Existing Volumes for Alternative 4

Intersection	Approach	Movement	2022: 4 Lane AM Peak		2022: 4 Lane Off Peak		2022: 4 Lane PM Peak	
			Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
NB to SB Crossover North of Avon Rd	SB	TH	2.4	A	1.7	A	1.8	A
		SB Total	2.4	A	1.7	A	1.8	A
	WB	LT	19	B	32.6	C	17.1	B
		WB Total	19	B	32.6	C	17.1	B
	Intersection Total		**6.3**	**A**	**6.4**	**A**	**4.7**	**A**

Intersection	Approach	Movement	2022: 4 Lane AM Peak		2022: 4 Lane Off Peak		2022: 4 Lane PM Peak	
			Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
Northbound Adams Rd at Avon Rd	NB	TH	6.5	A	9.1	A	9.2	A
		RT	11.3	B	13.1	B	15.1	B
		NB Total	9.2	A	11	B	11.8	B
	WB	RT	23.8	C	30.7	C	29.4	C
		WB Total	23.8	C	30.7	C	29.4	C
	Intersection Total		**15.6**	**B**	**17**	**B**	**17.5**	**B**

Intersection	Approach	Movement	2022: 4 Lane AM Peak		2022: 4 Lane Off Peak		2022: 4 Lane PM Peak	
			Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
SB to NB Crossover South of Avon Rd	NB	TH	4.5	A	4	A	5	A
		NB Total	4.5	A	4	A	5	A
	EB	LT	24.6	C	24.4	C	22.5	C
		WB Total	24.6	C	24.4	C	22.5	C
	Intersection Total		**11.8**	**B**	**9.9**	**A**	**8.7**	**A**

Table 49 presents the LOS and delay during all peak hours by movement for existing conditions under Future 2045 traffic volumes.

Table 49: Existing Capacity Analysis for Adams Road at Avon Road with Future 2045 Traffic Volumes

Approach	Movement	Future AM Peak		Future Off Peak		Future PM Peak	
		Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
NB	TH	45.0	D	43.9	D	42.1	D
	RT	44.9	D	34.5	C	8	A
	NB Total	45	D	41.5	D	31.3	C
SB	LT	62.6	E	49.6	D	101.4	F
	TH	15.5	B	7	A	13.2	B
	SB Total	29.4	C	22.1	C	42	D
WB	LT	179.6	F	43.6	D	45.4	D
	RT	53	D	33.3	C	21.1	C
	WB Total	119.2	F	36.8	D	28.9	C
Intersection Total		**58.3**	**E**	**32.3**	**C**	**34.2**	**C**

**Highlighted cells indicate an unacceptable LOS*

Table 50 presents the LOS and delay during all peak hours by movement for Alternative 1 (Three Lane) utilizing Future 2045 traffic volumes.

Table 50: Capacity Analysis for Adams Road at Avon Road with Future 2045 Volumes for Alternative 1

Approach	Movement	2045: 3 Lane AM Peak		2045: 3 Lane Off Peak		2045: 3 Lane PM Peak	
		Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
NB	TH	12	B	19.6	B	26.3	C
	RT	2.1	A	6.6	A	4.2	A
	NB Total	8.7	A	16.3	B	19.2	B
SB	LT	26.8	C	27.8	C	54.9	D
	TH	23.6	C	3.2	A	3.7	A
	SB Total	24.5	C	11.9	B	20.4	C
WB	LT	46.3	D	46.8	D	40.2	D
	RT	38.3	D	23.7	C	44.6	D
	WB Total	42.5	D	31.6	C	43.2	D
Intersection Total		**25.8**	**C**	**17.9**	**B**	**25.5**	**C**

For Alternative 2 – Three lanes with roundabouts, please refer to the Roundabout Analysis – ARCADY Analysis section.

Table 51 presents the LOS and delay during all peak hours by movement for Alternative 3 (Five Lane) utilizing Future 2045 traffic volumes.

Table 51: Capacity Analysis for Adams Road at Avon Road with Future 2045 Volumes for Alternative 3

Approach	Movement	2045: 5 Lane AM Peak		2045: 5 Lane Off Peak		2045: 5 Lane PM Peak	
		Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
NB	TH	13.5	B	21.3	C	9.1	A
	RT	18.7	B	7.1	A	9.6	A
	NB Total	15.3	B	17.7	B	9.3	A
SB	LT	17.8	B	8.7	A	26.6	C
	TH	2.7	A	1.3	A	1.9	A
	SB Total	7.2	A	3.9	A	10	A
WB	LT	27.7	C	39.6	D	29.2	C
	RT	11.2	B	27.3	C	25.2	C
	WB Total	19.8	B	31.5	C	26.5	C
Intersection Total		**12.6**	**B**	**15**	**B**	**13.7**	**B**

Table 52 presents the LOS and delay during all peak hours by movement for Alternative 4 (Four Lane Boulevard) utilizing Future 2045 traffic volumes.

Table 52: Capacity Analysis for Adams Road at Avon Road with Future 2045 Volumes for Alternative 4

Intersection	Approach	Movement	2045: 4 Lane AM Peak		2045: 4 Lane Off Peak		2045: 4 Lane PM Peak	
			Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
NB to SB Crossover North of Avon Rd	SB	TH	2.8	A	2	A	2.1	A
		SB Total	2.8	A	2	A	2.1	A
	WB	LT	18.8	B	32.1	C	17.2	B
		WB Total	18.8	B	32.1	C	17.2	B
	Intersection Total		**6.6**	**A**	**6.6**	**A**	**5**	**A**

Intersection	Approach	Movement	2045: 4 Lane AM Peak		2045: 4 Lane Off Peak		2045: 4 Lane PM Peak	
			Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
Northbound Adams Rd at Avon Rd	NB	TH	6.9	A	9.7	A	9.9	A
		RT	13.3	B	14.9	B	22.7	C
		NB Total	10.5	B	12.2	B	15.8	B
	WB	RT	26.1	C	30.9	C	29.4	C
		WB Total	26.1	C	30.9	C	29.4	C
	Intersection Total		**17.3**	**B**	**17.9**	**B**	**20.1**	**C**

Intersection	Approach	Movement	2045: 4 Lane AM Peak		2045: 4 Lane Off Peak		2045: 4 Lane PM Peak	
			Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
SB to NB Crossover South of Avon Rd	NB	TH	4.9	A	4.5	A	5.7	A
		NB Total	4.9	A	4.5	A	5.7	A
	EB	LT	24	C	24.2	C	22.8	C
		WB Total	24	C	24.2	C	22.8	C
	Intersection Total		**11.9**	**B**	**10.2**	**B**	**9.3**	**A**

5.1.4 Adams Road at Butler Road

Butler Road is 25 mph and is stopped controlled, while Adams Road is 45 mph uncontrolled (free flow condition). Per the National Functional Classification System, the following is true:

- Butler Road is classified as a local
- Adams Road is classified as a principal arterial

The existing intersection geometry is shown in

Figure 9 and follows:

- West leg – one receiving lane, one dedicated left turn lane, and one dedicated right turn lane
- North leg – one receiving lane, one through lane, and one passing lane
- South leg – one receiving lane, one through lane, and one passing lane

Figure 9: Aerial of Adams Road at Butler Road

Table 53 presents the LOS and delay during all peak hours by movement for existing conditions under existing traffic volumes. Adding a roundabout will increase delay, as northbound and southbound traffic go from being free flow to yield control. While this will increase delay some it will improve safety and reduce the overall speed through the intersection.

Table 53: Existing Capacity Analysis for Adams Road at Butler Road

Approach	Movement	Existing AM Peak		Existing Off Peak		Existing PM Peak	
		Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
NB	LT	2.9	A	1.9	A	2.6	A
	Freeflow						
SB	Freeflow						
EB	LT/RT	31.1	D	23.8	C	38.4	E
Intersection Total		**3.6**	**A**	**2**	**A**	**2.9**	**A**

**Highlighted cells indicate an unacceptable LOS*

The results indicate that Eastbound Butler Road has an unacceptable LOS E for the PM peak hours.

HRC also analyzed each alternative's capacity under the existing traffic volumes.

The following is the intersection geometry used for Adams Road at Butler for Alternative 1. Note that in each alternative, the church driveway on the east side of Adams Road is realigned to head up with Butler Road.

- West leg – one receiving lane, one dedicated left turn lane, and one shared through/right turn lane
- East leg – one receiving lane, one dedicated left turn lane, and one shared through/right turn lane
- North leg – one receiving lane, one through lane, one dedicated left turn lane, and one dedicated right turn lane
- South leg – one receiving lane, one through lane, one dedicated left turn lane, and one dedicated right turn lane

Table 54 presents the LOS and delay during all peak hours by movement for Alternative 1 (Three Lane) utilizing existing volumes. All movements have worse LOS compared to the existing conditions. This is due to the conversion from Butler Road being stopped-controlled to the entire intersection being controlled by a traffic signal. However, all movements are at acceptable levels.

Table 54: Capacity Analysis for Adams Road at Butler Road with Existing Volumes for Alternative 1

Approach	Movement	2022: 3 Lane AM Peak		2022: 3 Lane Off Peak		2022: 3 Lane PM Peak	
		Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
NB	LT	16.7	B	5.4	A	6	A
	TH	16.1	B	13.8	B	23.5	C
	RT	4.1	A	3.8	A	4.3	A
	NB Total	16.1	B	13.4	B	22.3	C
SB	LT	4.2	A	3.7	A	11.5	B
	TH	7.6	A	8	A	9.4	A
	RT	9.5	A	4.8	A	5.8	A
	SB Total	7.7	A	7.8	A	9.3	A
EB	LT	42.8	D	46.5	D	41.7	D
	TH/RT	37.9	D	38.8	D	37.3	D
	EB Total	39.3	D	42.4	D	39.5	D
WB	LT	37.6	D	38.6	D	36.9	D
	TH/RT	37.9	D	39	D	37.2	D
	WB Total	37.9	D	39	D	37.1	D
Intersection Total		**13.7**	**B**	**13.1**	**B**	**18.6**	**B**

For alternative 2 – three lanes with roundabouts, please refer to the Roundabout Analysis – ARCADY Analysis section.

The following is the intersection geometry used for Adams Road at Bulter Road for Alternative 3:

- West leg – one receiving lane, one dedicated left turn lane, and one shared through/right turn lane
- East leg – one receiving lane, one dedicated left turn lane, and one shared through/right turn lane
- North leg – two receiving lanes, two through lanes, one dedicated left turn lane, and one dedicated right turn lane
- South leg – two receiving lanes, two through lanes, one dedicated left turn lane, and one dedicated right turn lane

Table 55 presents the LOS and delay during all peak hours by movement for Alternative 3 (Five Lane) utilizing existing volumes. All movements are at acceptable levels.

Table 55: Capacity Analysis for Adams Road at Butler Road with Existing Volumes for Alternative 3

Approach	Movement	2022: 5 Lane AM Peak		2022: 5 Lane Off Peak		2022: 5 Lane PM Peak	
		Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
NB	LT	3.5	A	3.9	A	3.2	A
	TH	4.1	A	5.3	A	4.4	A
	RT	5.7	A	4	A	5.7	A
	NB Total	4.1	A	5.2	A	4.3	A
SB	LT	5.5	A	3	A	6.1	A
	TH	7.9	A	5.5	A	9.3	A
	RT	6.5	A	5	A	7.2	A
	SB Total	7.8	A	5.5	A	9.2	A
EB	LT	26.8	C	44.9	D	27.2	C
	TH/RT	24.4	C	38.5	D	24.2	C
	EB Total	25.3	C	41.6	D	25.7	C
WB	LT	24.2	C	38.3	D	24.1	C
	TH/RT	24.4	C	38.7	D	24.3	C
	WB Total	24.4	C	38.7	D	24.3	C
Intersection Total		**8**	**A**	**8.3**	**A**	**7.6**	**A**

The following is the intersection geometry used for Adams Road at Butler Road for Alternative 4:

- West leg – one receiving lane and one dedicated right turn lane
- East leg – one receiving lane and one dedicated right turn lane
  - It should be noted that the east leg driveway is not shown in the results due to it not being signalized as part of this alternative.
- North leg – two receiving lanes, two through lanes, and one dedicated right turn lane
  - It should be noted that the north leg is not shown in the results due to it being under free-flow conditions.
- South leg – two receiving lanes, two through lanes, and one dedicated right turn lane

Table 56 presents the LOS and delay during all peak hours by movement for Alternative 4 (Four Lane Boulevard) utilizing existing volumes. All movements identified are at acceptable levels and show an improvement compared to the other alternatives.

Table 56: Capacity Analysis for Adams Road at Butler Road with Existing Volumes for Alternative 4

Approach	Movement	2022: 4 Lane AM Peak		2022: 4 Lane Off Peak		2022: 4 Lane PM Peak	
		Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
SB	TH	5.6	A	2.9	A	2.7	A
	RT	4.8	A	3.5	A	3.7	A
	SB Total	5.6	A	2.9	A	2.9	A
EB	RT	24.1	C	35	C	25	C
	EB Total	24.1	C	35	C	25	C
Intersection Total		**8.2**	**A**	**7.0**	**A**	**5.7**	**A**

Table 57 presents the LOS and delay during all peak hours by movement for existing conditions under Future 2045 traffic volumes.

Table 57: Existing Capacity Analysis for Adams Road at Butler Road Future 2045 Traffic Volumes

Approach	Movement	Future AM Peak		Future Off Peak		Future PM Peak	
		Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
NB	LT	3.4	A	2.2	A	3	A
	Freeflow						
SB	Freeflow						
EB	LT/RT	52.1	F	32.9	C	70	F
Intersection Total		**5.8**	**A**	**2.7**	**A**	**5**	**A**

**Highlighted cells indicate an unacceptable LOS*

Table 58 presents the LOS and delay during all peak hours by movement for Alternative 1 (Three Lane) utilizing Future 2045 traffic volumes.

Table 58: Capacity Analysis for Adams Road at Butler Road with Future 2045 Volumes for Alternative 1

Approach	Movement	2045: 3 Lane AM Peak		2045: 3 Lane Off Peak		2045: 3 Lane PM Peak	
		Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
NB	LT	57.1	E	5.4	A	7.7	A
	TH	23.1	C	12.3	B	29.6	C
	RT	4.8	A	3.8	A	4.5	A
	NB Total	25.6	C	11.9	B	28.1	C
SB	LT	7	A	5.5	A	20.2	C
	TH	24.5	C	9.4	A	13.4	B
	RT	11.3	B	4.8	A	6	A
	SB Total	23.6	C	9.1	A	13.1	B
EB	LT	39.5	D	51.5	D	42.2	D
	TH/RT	36.2	D	38.8	D	36.9	D
	EB Total	37.2	D	44.8	D	39.6	D
WB	LT	35.7	D	38.6	D	36.4	D
	TH/RT	36	D	39	D	36.7	D
	WB Total	35.9	D	39	D	36.7	D
Intersection Total		**25.7**	**C**	**13.2**	**B**	**23.2**	**C**

For Alternative 2 – three lanes with roundabouts, please refer to the Roundabout Analysis – ARCADY Analysis section.

Table 59 presents the LOS and delay during all peak hours by movement for Alternative 3 (Five Lane) utilizing Future 2045 traffic volumes.

Table 59: Capacity Analysis for Adams Road at Butler Road with Future 2045 Volumes for Alternative 3

Approach	Movement	2045: 5 Lane AM Peak		2045: 5 Lane Off Peak		2045: 5 Lane PM Peak	
		Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
NB	LT	4.8	A	4	A	4.1	A
	TH	4.2	A	5.6	A	5.7	A
	RT	5.7	A	4.1	A	5.7	A
	NB Total	4.3	A	5.5	A	5.5	A
SB	LT	5.1	A	3.3	A	6.1	A
	TH	10.3	B	6	A	10.4	B
	RT	7.3	A	5.1	A	7.8	A
	SB Total	10.1	B	6	A	10.3	B
EB	LT	27.6	C	47.9	D	27.9	C
	TH/RT	24.5	C	38.4	D	24.2	C
	EB Total	25.4	C	42.9	D	26.1	C
WB	LT	24.1	C	38.2	D	24.1	C
	TH/RT	24.3	C	38.6	D	24.3	C
	WB Total	24.3	C	38.6	D	24.3	C
Intersection Total		**10**	**A**	**8.6**	**A**	**8.7**	**A**

Table 60 presents the LOS and delay during all peak hours by movement for Alternative 4 (Four Lane Boulevard) utilizing Future 2045 traffic volumes.

Table 60: Capacity Analysis for Adams Road at Butler Road with Future 2045 Volumes for Alternative 4

Approach	Movement	2045: 4 Lane AM Peak		2045: 4 Lane Off Peak		2045: 4 Lane PM Peak	
		Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
SB	TH	6.3	A	3.5	A	2.9	A
	RT	4.8	A	3.9	A	3.4	A
	SB Total	6.2	A	3.5	A	3	A
EB	RT	25	C	33.7	C	24.7	C
	EB Total	25	C	33.7	C	24.7	C
Intersection Total		**8.9**	**A**	**7.4**	**A**	**5.8**	**A**

5.1.5 Adams Road at Hamlin Road

The intersection of Walton Boulevard at Adams Road is 45 mph in all directions, and per the National Functional Classification System, the following is true:

- Walton Boulevard is classified as a principal arterial
- Southbound Adams Road is classified as a minor arterial
- Northbound Adams Road is classified as a principal arterial

The existing intersection geometry is shown in Figure 10 and follows:

- West leg – two receiving lanes, two through lanes, and one dedicated right turn lane
- East leg – two receiving lanes, two through lanes, and one dedicated right turn lane
- North leg – two receiving lanes, two through lanes, and one dedicated right turn lane
- South leg – Three receiving lanes, two through lanes, and one dedicated right turn lane

Figure 10: Aerial of Adams Road at Hamlin Road

Table 61 presents the LOS and delay during all peak hours by movement for the existing conditions under existing traffic volumes.

Table 61: Existing Capacity Analysis for Adams Road at Hamlin Road

Approach	Movement	Existing AM Peak		Existing Off Peak		Existing PM Peak	
		Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
NB	TH	23.7	C	30.4	C	56.9	E
	RT	21.0	C	23.5	C	35.1	D
	NB Total	23.2	C	28.9	C	53.0	D
SB	TH	26.1	C	33.7	C	33.2	C
	RT	13	B	22.9	C	18.8	B
	SB Total	24.7	C	32.1	C	32.0	C
EB	TH	21.7	C	11.1	B	12.3	B
	RT	24.9	C	15.0	B	16.8	B
	EB Total	23.6	C	13.4	B	14.6	B
WB	TH	22.2	C	9.5	A	11.1	B
	RT	28.3	C	8.8	A	13.0	B
	WB Total	24.0	C	9.2	A	12.2	B
Intersection Total		**24.1**	**C**	**23.6**	**C**	**31.2**	**C**

**Highlighted cells indicate an unacceptable LOS*

The results indicate that:

- All eastbound, westbound, and southbound movements at Adams Road and Hamlin Road will have an acceptable LOS during peak hours.
- The northbound right turn movement at Adams Road and Hamlin Road will have an acceptable LOS in all peak hours.
- The northbound through movement at Adams Road and Hamlin Road will have an acceptable LOS in the AM and off-peak hours.
- The northbound through movement at Adams Road and Hamlin Road will have an unacceptable LOS E in the PM peak hours.

HRC also analyzed each alternative's capacity under the existing traffic volumes. It should be noted that the intersection geometry was not changed in any of the alternatives.

Table 62 presents the LOS and delay during all peak hours by movement for Alternative 1 (Three Lane) utilizing existing volumes. All unacceptable movements identified in the existing capacity analysis have been improved to acceptable levels.

Table 62: Capacity Analysis for Adams Road at Hamlin Road with Existing Traffic Volumes for Alternative 1

Approach	Movement	2022: 3 Lane AM Peak		2022: 3 Lane Off Peak		2022: 3 Lane PM Peak	
		Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
NB	TH	16.1	B	20.9	C	31.3	C
	RT	14	B	17.7	B	22.4	C
	NB Total	15.7	B	20.2	C	29.7	C
SB	TH	13.3	B	16.1	B	17	B
	RT	7.2	A	15.1	B	22.8	C
	SB Total	12.6	B	15.9	B	17.5	B
EB	TH	22.4	C	18.6	B	15.2	B
	RT	28.1	C	25.4	C	21.5	C
	EB Total	25.8	C	22.7	C	18.5	B
WB	TH	24.2	C	21.1	C	11.1	B
	RT	41.9	D	43.8	D	12.3	B
	WB Total	30.5	C	30.9	C	11.8	B
Intersection Total		**18.0**	**B**	**20.9**	**C**	**21.1**	**C**

For Alternative 2, the three lanes with roundabouts on Hamlin Road were not analyzed.

Table 63 presents the LOS and delay during all peak hours by movement for Alternative 3 (Five Lane) utilizing existing volumes. All unacceptable movements identified in the existing capacity analysis have been improved to acceptable levels. In general, the capacity was found to be an improvement over the three-lane alternative.

Table 63: Capacity Analysis for Adams Road at Hamlin Road with Existing Traffic Volumes for Alternative 3

Approach	Movement	2022: 5 Lane AM Peak		2022: 5 Lane Off Peak		2022: 5 Lane PM Peak	
		Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
NB	TH	14.9	B	19.6	B	25.7	C
	RT	12.6	B	16.5	B	16.2	B
	NB Total	14.5	B	18.9	B	24	C
SB	TH	9.8	A	20.8	C	10.8	B
	RT	1.8	A	16.2	B	15.6	B
	SB Total	8.9	A	20.1	C	11.2	B
EB	TH	16.2	B	17.4	B	13.9	B
	RT	20.8	C	24.4	C	21.9	C
	EB Total	18.9	B	21.6	C	18	B
WB	TH	15.6	B	17.2	B	13.1	B
	RT	18.7	B	27.1	C	16.3	B
	WB Total	16.7	B	21.4	C	14.9	B
Intersection Total		**12.9**	**B**	**20.3**	**C**	**18.0**	**B**

Table 64 presents the LOS and delay during all peak hours by movement for Alternative 4 (Four Lane Boulevard) utilizing existing volumes. All unacceptable movements identified in the existing capacity analysis have been improved to acceptable levels. In general, the capacity of Alternative 4 was found to be an improvement over the three-lane alternative. Alternative 4 saw slightly worse LOS overall when compared to the five-lane alternative.

Table 64: Capacity Analysis for Adams Road at Hamlin Road with Existing Traffic Volumes for Alternative 4

Approach	Movement	2022: 4 Lane AM Peak		2022: 4 Lane Off Peak		2022: 4 Lane PM Peak	
		Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
NB	TH	15.1	B	13.6	B	23.3	C
	RT	13	B	11.8	B	15.5	B
	NB Total	14.7	B	13.2	B	21.9	C
SB	TH	23.9	C	14.3	B	20.0	B
	RT	13.1	B	11.5	B	14.9	B
	SB Total	22.8	C	13.9	B	19.6	B
EB	TH	15.1	B	23.6	C	14.7	B
	RT	17.5	B	34.6	C	23.9	C
	EB Total	16.5	B	30.2	C	19.4	B
WB	TH	15.3	B	21.2	C	16.3	B
	RT	18.1	B	25.3	C	23.4	C
	WB Total	16.1	B	23	C	20.5	C
Intersection Total		**19.1**	**B**	**18.8**	**B**	**20.4**	**C**

Table 65 presents the LOS and delay during all peak hours by movement for existing conditions under Future 2045 traffic volumes.

Table 65: Existing Capacity Analysis for Adams Road at Hamlin Road Future 2045 Traffic Volumes

Approach	Movement	Future AM Peak		Future Off Peak		Future PM Peak	
		Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
NB	TH	24.2	C	32.7	C	77.2	E
	RT	21.1	C	23.6	C	35.3	D
	NB Total	23.7	C	30.7	C	69.7	E
SB	TH	28.3	C	38.9	D	38.5	D
	RT	14.2	B	19.6	B	18.1	B
	SB Total	26.8	C	36.1	D	36.9	D
EB	TH	21.9	C	11.2	B	12.5	B
	RT	25.8	C	16.2	B	18.2	B
	EB Total	24.1	C	14.2	B	15.5	B
WB	TH	19.7	B	9.6	A	11.1	B
	RT	26.3	C	8.9	A	13.4	B
	WB Total	21.7	C	9.3	A	12.4	B
Intersection Total		**24.9**	**C**	**25.6**	**C**	**38.1**	**D**

**Highlighted cells indicate an unacceptable LOS*

Table 66 presents the LOS and delay during all peak hours by movement for Alternative 1 (Three Lane) utilizing Future 2045 traffic volumes.

Table 66: Capacity Analysis for Adams Road at Hamlin Road with Future 2045 Volumes for Alternative 1

Approach	Movement	2045: 3 Lane AM Peak		2045: 3 Lane Off Peak		2045: 3 Lane PM Peak	
		Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
NB	TH	15.9	B	21.6	C	34.6	C
	RT	13.9	B	17.9	B	22.6	C
	NB Total	15.5	B	20.8	C	32.5	C
SB	TH	11.8	B	20.4	C	19.2	B
	RT	3.1	A	27.5	C	14.5	B
	SB Total	10.9	B	21.4	C	18.9	B
EB	TH	22.3	C	18.9	B	15.6	B
	RT	26.9	C	28.7	C	24.2	C
	EB Total	25	C	24.7	C	20	B
WB	TH	26.1	C	20.7	C	11.8	B
	RT	47.2	D	28.8	C	13.9	B
	WB Total	32.4	C	24.2	C	13	B
Intersection Total		**17.5**	**B**	**22.4**	**C**	**23.0**	**C**

For Alternative 2, the three lanes with roundabouts on Hamlin Road were not analyzed.

Table 67 presents the LOS and delay during all peak hours by movement for Alternative 3 (Five Lane) utilizing Future 2045 traffic volumes.

Table 67: Capacity Analysis for Adams Road at Hamlin Road with Future 2045 Volumes for Alternative 3

Approach	Movement	2045: 5 Lane AM Peak		2045: 5 Lane Off Peak		2045: 5 Lane PM Peak	
		Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
NB	TH	14.3	B	20.3	C	31.3	C
	RT	12.5	B	16.6	B	16.4	B
	NB Total	14.3	B	19.5	B	28.7	C
SB	TH	17.7	B	21.8	C	13.4	B
	RT	4.4	A	16.3	B	15.6	B
	SB Total	16.3	B	21	C	13.6	B
EB	TH	16	B	17.6	B	14.2	B
	RT	19.4	B	27.5	C	26.7	C
	EB Total	18	B	23.5	C	20.7	C
WB	TH	15.7	B	16.9	B	12.5	B
	RT	15.3	B	19	B	15	B
	WB Total	15.6	B	17.8	B	14	B
Intersection Total		**16.0**	**B**	**20.7**	**C**	**20.8**	**C**

Table 68 presents the LOS and delay during all peak hours by movement for Alternative 4 (Four Lane Boulevard) utilizing Future 2045 traffic volumes.

Table 68: Capacity Analysis for Adams Road at Hamlin Road with Future 2045 Volumes for Alternative 4

Approach	Movement	2045: 4 Lane AM Peak		2045: 4 Lane Off Peak		2045: 4 Lane PM Peak	
		Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
NB	TH	15.5	B	14.1	B	27	C
	RT	13.1	B	11.9	B	15.8	B
	NB Total	15.1	B	13.6	B	25	C
SB	TH	31.8	C	21.2	C	21.3	C
	RT	13.2	B	23.8	C	14.9	B
	SB Total	29.9	C	22.3	C	20.8	C
EB	TH	15.3	B	24	C	15.1	B
	RT	18.3	B	47.7	D	30	C
	EB Total	17	B	38.1	D	22.8	C
WB	TH	15.5	B	14.9	B	15.5	B
	RT	18.6	B	11.6	B	21.7	C
	WB Total	16.5	B	14.4	B	19.1	B
Intersection Total		**22.6**	**C**	**22.1**	**C**	**22.6**	**C**

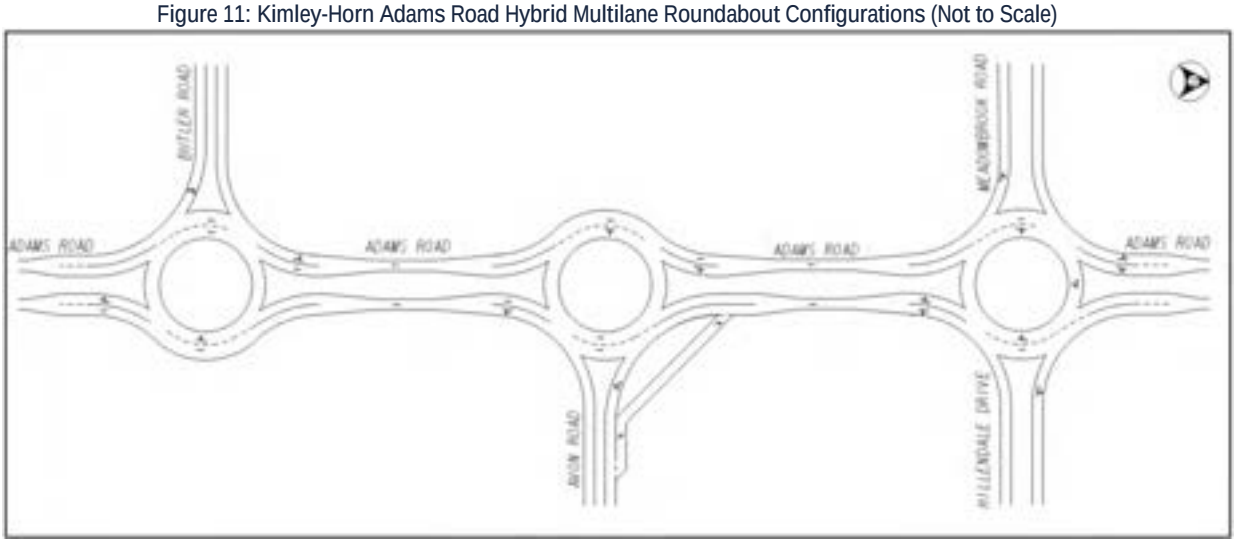
5.2 ROUNDABOUT ANALYSIS – ARCADY ANALYSIS

Kimley-Horn analyzed the following intersections as roundabouts:

- Adams Road at Meadow Brook Road/Hillendale Drive
- Adams Road at Avon Road
- Adams Road at Butler Road

It was found that single-lane roundabouts would result in long delays for vehicles driving on Adams Road. It was found that providing two North-South lanes and one east-west lane within each roundabout would bring the delay into the acceptable range. Figure 11 shows a simple configuration for the roundabout along the corridor. The full Roundabout report can be found in Appendix G.

Figure 11: Kimley-Horn Adams Road Hybrid Multilane Roundabout Configurations (Not to Scale)



5.3 CAPACITY ANALYSIS – TRANSCAD MODELING

The Adams Road corridor, between Hamlin Road and Walton Boulevard, underwent a traffic operations analysis utilizing the TransCAD 9 software based on the Volume-to-Capacity (V/C) ratio performance metric. The V/C ratio measures the congestion level on a given roadway and can determine which parts of the network operate at acceptable levels and which have capacity constraints. The V/C ratio is a function of demand and capacity. Traffic volumes represent demand. In comparison, the capacity represents the maximum traffic flow that a transportation facility can accommodate at a given time and under various road conditions. Capacity is typically expressed in passenger cars per hour per lane (pc/h/ln) and is a function of factors such as the number of lanes and free flow speed (FFS). The V/C ratio ranges on a scale of 0 to 1 or greater and can generally be defined as follows:

- 0 → no demand
- 0.8 to 1 → demand reaching capacity
- 1 → demand equals capacity
- Greater than 1 → demand exceeds capacity

Additional factors considered in the capacity analysis and reflected in the V/C ratio include transportation mode (i.e. walking, biking, or public transportation), trip characteristics, and temporal traffic volume variations.

5.3.1 Transportation Modeling

The operations analysis for the Adams Road corridor was based on the SEMCOG Travel Demand Forecasting Model (TDFM). The TDFM is a regional transportation model based on the four-step travel modeling process that includes trip generation, trip distribution, mode choice, and traffic assignment. The TDFM is designed for use in the TransCAD ecosystem and contains the entire Southeast Michigan region's transportation network and Traffic Analysis Zones (TAZ). While this analysis was based on the regional model, data collection and network optimization outside of what is provided in the TDFM focused primarily on the areas near the subject corridor. This included the transportation network bound by Opdyke Road (west), South Boulevard (south), Rochester Road (east), and Tienken Road (north).

The SEMCOG 2015 and 2045 TDFM base models were used to determine Existing (2022) and Future (2045) capacities for the Adams Road corridor. The 2015 base model was used to evaluate Existing (2022) capacity conditions, while the 2045 base model was used to evaluate Future (2045) capacity conditions. Both models were reviewed and modified to include the latest road configurations, such as the number of lanes and roadway geometrics. Existing road configurations were reviewed utilizing recent aerial imagery and revised to reflect current road conditions accurately. The review identified 25 road segments that did not accurately capture existing conditions in the model within the specified traffic analysis area. This revised 2015 base model then effectively represented the 2022 road network.

The 2045 base model included an additional round of reviews to reflect future projected road capacities accurately. This included a search for changes to the road configuration based on ongoing or planned projects that are either funded or likely to be funded and are currently not fully captured in the 2045 base model. Resources reviewed in this process included the City of Rochester Hills 2022-2027 Capital Improvement Plan (CIP), the 2023-2026 SEMCOG's Transportation Improvement Program (TIP), and the Road Commission for Oakland County (RCOC) projects. The search, however, did not identify any projects that were either not included in the 2045 TDFM model for the subject traffic analysis area or that could impact analysis results.

The SEMCOG TDFM base models estimate trips based on SEMCOG's household travel survey and observation data and other sets of socio-economic, land use, transportation, or related factors. Once assigned to the highway network, this data represents modeled volumes. To ensure the output volumes best represent field conditions, base models are calibrated against known traffic counts. This model calibration process aims to ensure that the assigned model volumes match traffic counts within an acceptable degree of error. Once this is achieved, the model can forecast volumes or test various alternatives such as identifying road capacity improvements.

Model calibration in this analysis was based on 2022 daily traffic counts obtained from the Michigan Department of Transportation (MDOT) Transportation Data Management System (TDMS). These counts were projected based on an annual growth rate of 0.5% to the Existing (2022) and Future (2045) years for use with each respective TDFM model. The modeled daily volumes on Adams Road from the calibration process were within 10% of the obtained traffic counts. The closest match between the modeled daily volumes and the traffic counts was for the segment of Adams Road from Hamlin Road to Avon Road. Meanwhile, the segment between Avon Road and Walton Boulevard indicated lower modeled volumes, possibly leading to lower-than-expected V/C ratios.

5.3.2 Capacity Analysis

The capacity analysis for the Adams Road corridor was performed for Existing (2022) and Future (2045) PM peak hour conditions. The PM peak hour was identified as the most appropriate time interval for the analysis as it represents the worst-performing hour of the day. The analysis was performed for four different alternatives for Adams Road between Hamlin Road and Walton Boulevard:

- Existing Two Lane (one lane per direction of travel)
- Three Lane (one lane per direction of travel with a two-way left-turn lane)
- Five Lane (two lanes per direction of travel with a two-way left-turn lane)
- Four Lane Boulevard (two lanes per direction of travel)

Alternatives with intersection modifications were not evaluated due to TransCAD's inability to provide a micro level of analysis. Results for Existing (2022) and Future (2045) PM peak hour scenarios are provided in Table 69.

Table 69: Adams Road Estimated V/C Ratios for PM Peak

Segment	2-Lane (Existing)		3-Lane with TWLTL		5-Lane with TWLTL		4-Lane Boulevard	
	2022	2045	2022	2045	2022	2045	2022	2045
Hamlin Road to Avon Road	0.92	0.98	0.90	0.96	0.71	0.79	0.77	0.84
Avon Road to Meadow Brook Road/Hillendale Drive	0.71	0.80	0.70	0.78	0.59	0.66	0.64	0.69
Meadow Brook Road/Hillendale Drive to Walton Boulevard	0.83	0.86	0.81	0.84	0.64	0.71	0.64	0.75
Total	0.83	0.90	0.81	0.88	0.66	0.73	0.71	0.78

The analysis indicates that the demand along the Adams Road corridor is reaching (V/C of 0.8 to 1) existing road capacities. Demand is anticipated to grow in future years, further exacerbating capacity constraints. The highest V/C ratios are reported for the Hamlin Road and Avon Road segments. However, this is likely due to underrepresented modeled volumes for the segments between Avon Road and Walton Boulevard. The latter likely have V/C ratios closer to those reported for the Hamlin Road and Avon Road segments.

Installing a two-way left-turn lane (Three Lane alternative) along Adams Road provides nominal capacity improvements while maintaining existing and future V/C ratios below one. Whereas the installation of a five-lane road (Five Lane alternative) or four-lane boulevard (Four Lane Boulevard alternative) provides the greatest capacity improvements along the corridor while maintaining overall Existing (2022) and Future (2045) V/C ratios below 0.8. It should be noted that this analysis does not consider potential intersection improvements. Additional benefits are possible when introducing traffic flow and capacity improvements at these locations.

APPENDIX A — PREVIOUS STUDIES

ADAMS ROAD CORRIDOR STUDY

CITY OF ROCHESTER HILLS

JULY 16, 1991

A report prepared by the Engineering and Planning Department Staff

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ADAMS ROAD CORRIDOR STUDY

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ADAMS ROAD CORRIDOR STUDY

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I BACKGROUND

Following a request of City Council, the Planning Commission opened hearings on the possible amendment of the Major Thoroughfare Plan for the City with the intent of adding Adams and Tienken to the Plan for widening consideration.

An amendment was prepared by the City's transportation planning consultant firm, BRW, Inc. The amendment included traffic forecasts, traffic forecast analysis, safety analysis, and recommended roadway geometrics for both the Adams Road and Tienken Road corridors with the city limits.

In October, 1990, a public hearing on the proposed amendment was held. The draft amendment has since been revised to reflect the motion passed by the Planning Commission. The motion made on October 2nd by Mr. Morrison modified a resolution to adopt the amendment so as to include the following provisions:

1. Do not proceed with the feasibility study of an east-west arterial roadway as recommended in the 1989 Plan.

2. Update the Comprehensive Transportation Plan no later than 1994; this requires initiating the work in 1993.

3. Improve traffic capacity and safety on Adams and Tienken through the provision of left and right turn lanes, modern traffic signals, and other traffic operational improvements.

4. ***Conduct a Corridor Study on Adams Road between Hamlin and Tienken prior to any consideration of possible widening-type improvements. The Corridor Study is subject to funding availability and would define the access/egress plan, landscaping treatment, urban design features, turn lane locations, roadway profile, number of lanes, right-of-way, impacts, capital cost, etc.***

At the November 27, 1990 meeting, the Planning Commission requested that the Mayor direct her staff to conduct a Corridor Study to include the study elements as outlined in No. 4 of the resolution as shown above. Subsequently, in January of 1991, a sub-committee of the Planning Commission met with the staff, representatives of Oakland University, and the Oakland County Road Commission in the first of three study sessions. This report is a culmination of the information requested by the Planning Commission and prepared by Staff with the guidance and input of the sub-committee.

General Characteristics of Adams Road

Adams Road is an existing two-lane road which stretches northward from Woodward Avenue through several suburban communities in Oakland County and ending at Stoney Creek Road in northern Oakland Township just east of the Village of Lake Orion, a distance of 17.2 miles.

Historically, the predominant land use adjacent to Adams Road in Rochester Hills has been agricultural farmlands and residential homes. As a county primary road, it serves as a major thoroughfare, transporting Oakland County residents to their homes, workplaces and

shopping destinations. It is important to note that Adams Road is a major north-south arterial which services the entirety of Oakland County residents and is therefore supported by the Road Commission. As urbanization has occurred within this region; significant changes in the amount of traffic carried by Adams Road have taken place. Major traffic generators are subdivisions and residential lots. Traffic magnets such as Oakland University, Meadowbrook Mall, University Square and the high school complex have also attracted more cars to Adams Road.

Major physical changes south of Hamlin Road will significantly modify the character of Adams Road in this location. Adams Road will be realigned in the area between the M-59 freeway and the Grand Trunk Western Railroad Tracks, north of Auburn Roads. A new interchange at M-59 will be created and the continuation of the boulevard from Hamlin south to the existing bridge over M-59 on Adams Road will be completed. These changes will greatly alter the perception of Adams Road at the western gateway to Rochester Hills.

Adams Road in this area serves as both an approach to the Auburn Hills' Oakland Technology Park and the Oakland University Complex as well as a vestibule to Rochester Hills' fine residential neighborhoods. It is important to recognize this duality of land use for Adams Road at the M-59/Hamlin intersection. It is neither rural nor urban in character at this point. It is uniquely suburban in function and appearance. Having set this broader context for discussion of Adams Road, the corridor study focuses upon the segment of Adams Road which lies between Tienken and Hamlin.

Land uses adjacent to the Study area:

The land uses within the study area are as follows:

1. Single Family lots within platted subdivisions

2. Single Family acreage parcels

3. Multi-family residential complexes

4. Institutional uses, i.e., churches, schools, day care facilities, university and city parkland

5. Shopping Centers

6. Recreation or open space areas

By far, the predominant land use north of Hamlin is residential. Most of the land adjacent to Adams Road within the study area boundaries is currently developed. Subdivisions and apartment complexes are designed so as to abut Adams Road in a rear or side lot line orientation.

Because of the level of development and the diversity and types of land uses associated with Adams Road, severe congestion has resulted, particularly during peak hours. The transportation plan amendment prepared by BRW, Inc. forecast that traffic volumes will continue to increase substantially in excess of the capacity of a two-lane roadway.

II DESIGN CONCEPT

A practical design concept for this road is based upon the following assumptions:

1. 120′ right-of-way

2. Four lanes for through traffic, divided with a maximum 30′ median where possible

3. A four-lane residential boulevard in accordance with the typical roadway geometric shown in the adopted Major Thoroughfare Plan

4. Integration of pathways as proposed in the master non-motorized vehicular Pathway Plan. (See also DESIGN ASSUMPTIONS AND CONSTRAINTS - TABLE 2A)

III STUDY ELEMENTS

The staff has analyzed a set of study elements within the context of this Corridor Study for the purpose of developing a roadway profile design and to contrast it with the existing roadway profile and conditions. A brief description of these elements is listed below.

A. TRAFFIC SAFETY

A key factor in determining whether the level of service standard for any given roadway is acceptable is the frequency, rate and severity of accidents. Closely associated with these factors are the incidence of accidents, the number of traffic conflicts and the adequacy of sight distance along the roadway. The amendment to the Transportation Plan evaluates the Adams Road corridor in terms of traffic safety; an evaluation of the traffic safety of the existing road as compared to what is likely to be achieved under the proposed design is provided later in this report.

B. PEDESTRIAN SAFETY

Like traffic safety, an important element of the City's Master Plan is to provide continuous pathways for non-motorized travel throughout the community. In addition, an important goal is to provide safe road crossings at designed locations throughout the corridor.

C. TRAVEL

This element involves the quantification of traffic volume to capacity ratios; evaluating the roads ability to handle the existing and forecasted travel demands of the public. The question to be answered is whether the road can serve its' function as an arterial, lessening the potential for cut-through travel demands for local streets.

Note: See also TABLE 3C - Existing Traffic Characteristics

Table 2A

ADAMS ROAD CORRIDOR STUDY

DESIGN ASSUMPTIONS AND CONSTRAINTS

TRAFFIC CHARACTERISTICS

- See information on Existing Traffic and Design Hour Volumes
- Assume 5% trucks

SIGHT DISTANCE

- Stopping sight distance 475', increase to 530' for grades of 4 - 5%
- Intersection sight distance: minimum 680', desireable 1030'

HORIZONTAL ALINEMENT

- Transition tapers for channelization use 40:1
- Bay tapers for turn bays use 15:1
- Corner radii at major intersections use 50'
- Corner radii at side streets and commercial drives use 30'
- Corner radii at residential drives use 20' - 25'

VERTICAL ALINEMENT

- Desireable grade 4.0% or less
- Max. grade within 700' of signalized intersection is 4.0%
- Max. grade for segments longer than 1000' is 4.75%
- Max. grade for segments shorter than 1000' is 5.0%
- Rate of vertical curvature, K = 160.0

CROSS SECTION

- Four lanes @ widths 12' each
- Minimum width undivided 50'
- Minimum median width when unbroken 12'
- Minimum median width for left turn lane 18'
- Minimum median width for U-turn or dual left turn lane 30'

ROADSIDE

- Clear zone to obstructions 6'
- Safe recovery area 15'
- Sideslopes of 3:1 or flatter
- Sideslopes of up to 1:1 acceptable if height is < 2'
- Timber retaining walls acceptable if height is < 5'
- Terracing acceptable, equivalent sideslope of 1:1 or flatter, minimum plateau width of 4', plateau width of 12' if carrying bike path
- Batter to structural retaining wall 1.25" per foot

DRAINAGE

- Pavement cross slope 2.25%
- Curb and gutter for entire length

Sourc e: Engineering Department

Table 3C

ADAMS ROAD CORRIDOR STUDY

EXISTING TRAFFIC CHARACTERISTICS

Road Segment	Peak Traffic Volumes NB	SB	Total	Time	Peak % Direction	Date of Count
Dutton to Tienken	262	825	1087	7-8 AM	75.9% SB	April '89
	595	480	1075	5-6 PM	55.3% NB	
	5367	7942	13309	ADT		
Tienken to Walton	366	1255	1621	7-8 AM	77.4% SB	Nov. '89
	1317	729	2046	5-6 PM	64.4% NB	
	11631	12429	24060	ADT		
Walton to Avon	627	1148	1775	8-9 AM	64.7% SB	Oct. '88
	1301	731	2032	5-6 PM	64.0% NB	
	12368	11823	24191	ADT		
Avon to Hamlin	310	1406	1716	7-8 AM	81.9% SB	May '89
	1117	538	1655	5-6 PM	67.5% NB	
	8756	9360	18116	ADT		

DESIGN HOUR VOLUMES

Road Segment	2005 ADT	Design Hour Volume	Directional Distribution
Dutton to Tienken	17,700	2,100	70:30
Tienken to Walton	25,600	3,100	70:30
Walton to Avon	26,400	3,200	65:35
Avon to Hamlin	18,100	2,200	75:25

Source: BRW, Inc.
Engineering Department

D. RIGHT-OF-WAY AUDIT

Table 3D is an inventory of all parcels of land adjacent to Adams Road from Dutton to Hamlin. the inventory is intended to detail the amount of land area that is needed from parcels within the study area where right-of-way has not been acquired from the property owner.

E. VEHICULAR ACCESS AUDIT

Table 3E is an inventory and assessment of access needs for each parcel abutting Adams Road within the project boundaries. The table also describes the type and degree of access that is currently available and that which is likely to occur under the proposed plan.

F. ENVIRONMENTAL IMPACTS

A thorough assessment of vegetation, topography and environmental quality is not feasible within the limited scope of this study. Air quality, tree loss, waterway crossings and wetlands are the key environmental issues which were considered in developing the plan proposed for Adams Road in conjunction with this study. Prior to the commencement of any improvement, a commitment to conduct a detailed environmental assessment of these features is strongly recommended. A proposed methodology is included in Appendix B of this report.

G. ROAD AESTHETICS

This element involves two key factors which impact the overall appearance and perception of the roadway.

1. Road Cross Section - includes vistas from hill crests, terrain changes engineered features such as retaining walls.

2. Landscaping - involves three potential areas for landscaping; within the median, along the road "parkway," and; where grading rights are secured, beyond the pathway and right-of-way in open zones adjacent to private property (most prevalent near Oakland University).

IV INVENTORY/ANALYSIS OF IMPACTS TO ABUTTING PROPERTIES

TABLE 4A evaluates the impact of specific engineering features on the proposed road cross section on abutting properties. This chart includes 4 variables:

1. Specific engineering features

2. Availability of right-of-way

3. Land Uses

4. Total number of affected properties for within each cell

Table 3D

ADAMS ROAD CORRIDOR

RIGHT-OF-WAY AUDIT

Segment	Parcel	Dimensions	Area (S.F.)
Dutton to Tienken - East Side	15-05-101-034	17' x 337'	5,729.00
- West Side	15-06-427-003	33' x 550.08'	18,152.64
Sub Total			**23,881.64**
Tienken to Walton - East Side	15-08-100-021	27' x 157.42'	4,250.34
	15-08-100-004	27' x 200.25'	5,406.75
	15-08-100-005	27' x 200.25'	5,406.75
	15-08-100-006	27' x 200.25'	5,406.75
	15-08-100-007	27' x 200.25'	5,406.75
	15-08-100-008	27' x 200.25'	5,406.75
	15-08-151-013	27' x 200.25'	5,406.75
	15-08-151-017	27' x 60.25'	1,626.75
	15-08-151-004	27' x 150'	4,050.00
	15-08-351-003	17' x 190'	5,130.00
Sub Total			**47,497.59**
Walton to Avon - East Side	15-17-351-003	27' x 765'	20,655.00
- West Side	15-18-200-001& 15-18-400-001	27' x 4,627.8'	124,940.60
Sub Total			**145,595.60**
Avon to Hamlin - West Side	15-19-100-002	27'x 1,900'	51,300.00
	15-19-200-005	27'x 879.21'	23,738.67
Sub Total			**75,038.67**
Grand Total			**292,013.50**

Source: Engineering Department

Table 3E

ADAMS ROAD CORRIDOR STUDY

ACCESS AUDIT

STATION	SIDE	INTERSECTION/ACCESS IDENTIFICATION	TYPE	ACCESS PLAN EXISTING	PROPOSED
		Adams Road between Dutton Road and Tienken Road			
314+77	E/W	Dutton Rd	Major St	Full	No LT's
308+60	E/W	Kilburn Rd N	Local St	Full	RT In/Out Only
306+81	E	House No. 1872	Res. Dr	Full	RT In/Out Only
305+75	E	House No. 1860	Res. Dr	Full	RT In/Out Only
305+32	W	Saratoga Dr	Local St	Full	RT In/Out Only
304+78	E	House No. 1848	Res. Dr	Full	RT In/Out Only
303+95	E	House No. 1836	Res. Dr	Full	RT In/Out Only
303+25	E	House No. 1836	Res. Dr	Full	RT In/Out Only
302+05	E	House No. 1824	Res. Dr	Full	RT In/Out Only
301+66	E	House No. 1812	Res. Dr	Full	RT In/Out Only
300+86	E	House No. 1812	Res. Dr	Full	RT In/Out Only
300+12	E	House No. 1800	Res. Dr	Full	RT In/Out Only
295+94	W	Burlington Dr	Local St	Full	RT In/Out Only
291+65	E	Kilburn Rd S	Local St	Full	No LT Out
287+40	W	House No. 1597	Res. Dr	Full	RT In/Out Only
283+45	W	Charlwood Dr	Collector	Full	RT In/Out Only
279+28	E	House No. 1321P	Res. Dr	Full	Close/Relocate
278+40	E	Potomac Dr	Local St	Full	No LT Out
277+48	E	House No. 1400	Res. Dr	Full	Close/Relocate
275+87	E	House No. 1374	Res. Dr	Full	RT In/Out Only
275+60	W	Van Hoosen Dr	Comm. Dr	Full	Full
274+44	E	House No. 1348	Res. Dr	Full	RT In/Out Only
273+00	E	House No. 1322	Res. Dr	Full	RT In/Out Only
272+50	W	Van Hoosen Dr	Comm. Dr	Full	RT In/Out Only
271+70	E	House No. 1296	Res. Dr	Full	RT In/Out Only
270+20	E	House No. 1270	Res. Dr	Full	RT In/Out Only
268+97	E	House No. 1234	Res. Dr	Full	RT In/Out Only
267+88	E	House No. 1208	Res. Dr	Full	RT In/Out Only
265+83	E	Mohawk Dr	Local St	Full	No LT Out
263+03	E	House No. 1114	Res. Dr	Full	RT In/Out Only
262+05	E	House No. 1088	Res. Dr	Full	RT In/Out Only
261+60	W	Adams H.S. Dr	Comm. Dr	Full	RT In/Out Only
261+50	E	House No. 1062	Res. Dr	Full	RT In/Out Only
259+95	E	House No. 1036	Res. Dr	Full	RT In/Out Only
258+40	E	House No. 1010	Res. Dr	Full	RT In/Out Only

(continued on next page)

Source: Engineering Department,3/12/91

Table 3E

STATION	SIDE	INTERSECTION/ACCESS IDENTIFICATION	TYPE	ACCESS PLAN EXISTING	PROPOSED
		Adams Road between Tienken Road and Walton Blvd			
257+06	E&W	Tienken Rd	Major St	Full	No LT's
254+01	E	House No. 950	Res. Dr	Full	RT In/Out Only
252+36	W	Palm-Aire Dr	Local St	Full	RT In/Out Only
251+00	E	House No. 884	Res. Dr	Full	RT In/Out Only
250+35	E	House No. 884	Res. Dr	Full	RT In/Out Only
249+45	W	House No. 873	Res. Dr	Full	RT In/Out Only
248+86	W	House No. 851	Res. Dr	Full	RT In/Out Only
248+55	E	House No. 854	Res. Dr	Full	RT In/Out Only
247+90	E	House No. 820	Res. Dr	Full	RT In/Out Only
246+92	W	House No. 827	Res. Dr	Full	RT In/Out Only
246+40	E	House No. 820	Res. Dr	Full	RT In/Out Only
244+61	W	House No. 765	Res. Dr	Full	RT In/Out Only
244+47	E	House No. 750	Res. Dr	Full	RT In/Out Only
242+80	W	Bay Point Dr	Local St	Full	RT In/Out Only
240+60	E	House No. 670	Res. Dr	Full	Close/Remove
236+45	E	House No. 616	Res. Dr	Full	Close/Remove
234+40	E	Arrowood Ct	Local St	Full	RT In/Out Only
233+18	E	House No. 500	Res. Dr	Full	Close/Relocate
229+98	E	Powderhorn Ridge	Collector	Full	No LT Out
228+54	W	Rain Tree Dr	Collector	Full	No LT Out
225+70	E	Meadowbrook Mall	Comm. Rd	N/A Future	RT In/Out Only
218+70	E	Meadowbrook Mall	Comm. Dr	Full	RT In/Out Only
216+62	W	Univ. Square Mall	Comm. Dr	Full	RT In/Out Only
214+70	W	Univ. Square Mall	Comm. Dr	Full	No LT Out
212+70	W	Univ. Square Mall	Comm. Dr	Full	RT In/Out Only
211+62	E	Meadowbrook Mall	Comm. Dr	Full	No LT Out
210+95	W	Univ. Square Mall	Comm. Dr	Full	No LT Out
210+07	E	Meadowbrook Mall	Comm. Dr	Full	RT In/Out Only
209+33	E	Gas Station	Comm. Dr	Full	RT In/Out Only
208+41	E	Gas Station	Comm. Dr	Full	RT In/Out Only

(continued on next page)

Source: Engineering Department, 3/12/91

Table 3E

STATION	SIDE	INTERSECTION/ACCESS IDENTIFICATION	TYPE	ACCESS PLAN EXISTING	PROPOSED
		Adams Road between Walton Blvd and Avon Road			
206+98	E&W	Walton Blvd	Major Rd	No LT's	No LT's
205+61	E	Mobil Gas Sta.	Comm. Dr	Full	RT In/Out Only
204+68	E	Mobil Gas Sta.	Comm. Dr	Full	RT In/Out Only
203+71	E	McDonald Rest.	Comm. Dr	Full	RT In/Out Only
202+68	E	Meadowbrook Dr	Local St	Full	No LT Out
199+38	E	Rhineberry Dr	Local St	Full	RT In/Out Only
197+02	E	House No. 135	Res. Dr	Full	RT In/Out Onl
196+35	E	House No. 159	Res. Dr	Full	RT In/Out Only
195+60	E	House No. 159	Res. Dr	Full	RT In/Out Only
195+15	E	House No. 183	Res. Dr	Full	RT In/Out Only
193+95	E	House No. 207	Res. Dr	Full	RT In/Out Only
193+10	E	House No. 207	Res. Dr	Full	RT In/Out Only
192+60	E	House No. 231	Res. Dr	Full	RT In/Out Only
191+83	E	House No. 231	Res. Dr	Full	RT In/Out Only
188+72	E&W	Hillendale Dr	Collector	Full	RT In/Out Only
183+44	E	Jt Drive for 4	Res. Dr	Full	Full
178+55	E	Heidelberg Dr	Local St	Full	Full
177+30	E	House No.	Res. Dr	N/A Heidelbg	Full
171+19	E	Cambridge Dr No.	Local St	Full	Full
159+74	E	Cambridge Dr So.	Local St	None	Full
		Adams Road between Avon Road and Hamlin Road			
151+47	E	Avon Road	Major Rd	Full	Full
150+07	W	O.U. Gate House	Res. Dr	Full	RT In/Out Only
148+22	W	O.U. Gate House	Res. Dr	Full	RT In/Out Only
145+19	E	House No. 1053	Res. Dr	Full	RT In/Out Only
142+67	E	New England Dr	Collector	Full	No LT Out
140+20	E	House No. 1181	Res. Dr	Full	RT In/Out Only
139+12	E	House No. 1181	Res. Dr	Full	RT In/Out Only
136+21	E	Brookfield Acad.	Comm. Dr	Full	RT In/Out Only
132+83	W	Butler Rd	Collector	Full	No LT Out
131+42	E	Church	Comm. Dr	Full	RT In/Out Only
127+73	E	Church	Comm. Dr	Full	No LT Out
125+84	E	House No. 1405	Res. Dr	Full	RT In/Out Only
123+83	W	Oakwood Pk Condo	Res. Dr	Full	RT In/Out Only
117+04	E	Pheasant Ring	Local St	Full	RT In/Out Only
116+81	W	Oakwood Pk Condo	Res. Dr	Full	RT In/Out Only
106+21	E	River Trail	Local St	Full	RT In/Out Only
106+03	W	Quail Ridge Cir	Collector	Full	RT In/Out Only
99+49	E	Portage Trail	Local St	Full	RT In/Out Only

Source: Engineering Department, 3/12/91

V EVALUATION MATRIX

TABLE 5A is a decision matrix to be used in the consideration of the study elements outlined in this report relative to existing and proposed design conditions. No weighing of the elements was considered by the Staff or the Sub-committee. Staff has analyzed these elements and has offered a brief narrative of its findings for each.

VI COSTS

Staff has generated two cost estimates. One of the estimates was done by the Oakland County Road Commission and includes construction costs and contractor payments. The second is by city staff, uses the Road Commission figures as base line and expands to include preliminary engineering and construction engineering.

VII SUMMARY

The City Council was concerned about cut-through traffic on local neighborhood streets. Residents were expressing frustration because of the conflicts created by travel on roads which were not designed to accommodate through traffic. Further compounding this problem is the apparent lack of sidewalks and pathways within neighborhoods. Even more traffic is forecasted on the major arterial routes because of the continued residential growth of the community as well as factors related to our affluence, such as multiple car ownership and disposable income. Traffic on Adams Road will increase as more people move into the city and neighboring Oakland Township. It is clear that the reasons for the consideration of an amendment to the City's Major Thoroughfare Plan to include Adams Road are valid. This study in no way predicts that the proposed design of a 120' four-lane residential boulevard along Adams is the answer to all of these problems. However, it seems clear that the problems are not going to go away if left unattended. Traffic will continue to seek alternative routes; and if reasonable arterial mobility is not available, motorists are likely to use local roads. The introduction of sidewalks into existing established neighborhoods will be controversial.

Based on these facts and the findings contained in the BRW amendment to the City Major Thoroughfare Plan and the findings of this Corridor Study, staff believes that (1) the current and future traffic needs, (2) the integrity of the city's overall transportation system, (3) the preservation of livable streets in neighborhoods, (4) the safety of motorists and pedestrians are best served by adding Adams Road to the plan. Further, recognizing the environmental sensitivities, the disruption to some residential properties and the cost of these improvements, we further recommend the following:

1. That a travel demand management program be developed independent of, and in advance of construction.

2. That an environmental assessment be incorporated into the final design concept.

3. That a well defined public awareness program be developed and utilized to minimize the disruption to abutting property owners.

4. That a landscape architect be retained to develop a landscape plan for the corridor as an integral part of the detailed design for improvements.

Table 4A
(Page 1 of 5)

ADAMS ROAD CORRIDOR STUDY
Summary Table
Land Use

Roadway Cross Sections & Profile

Type of Construction	Residential Lots	Residential Acreage	Residential Multifamily	Institutional	Commercial	Undeveloped or Open Space
	Row?	Row?	Row?	Row?	Row?	Row?
Cut w/ Side Slope	Yes -0 No -10	Yes -0 No -0	Yes -0 No- 1	Yes -0 No -0	Yes -0 No -0	Yes -0 No -0
Cut w/ Retaining Wall	Yes -0 No -2	Yes -1 No -1	Yes -1 No -0	Yes -0 No -2	Yes -0 No -0	Yes -0 No -0
Fill w/ Side Slope	Yes -0 No -0	Yes -0 No -0	Yes -0 No -1	Yes -0 No -0	Yes -0 No -0	Yes -1 No -0
Fill w/ Retaining Wall	Yes -0 No -5	Yes -0 No -0	Yes -0 No -0	Yes -0 No -0	Yes -0 No -0	Yes -0 No -1
At Grade	Yes -3 No -126	Yes -6 No -0	Yes -0 No -0	Yes -2 No -1	Yes -1 No -4	Yes -0 No -6

Source: Engineering Department

Table 4A
(Page 2 of 5)

ADAMS: DUTTON → TIENKEN

Roadway Cross Sections & Profile

Type of Construction	Residential Lots	Residential Acreage	Residential Multifamily	Institutional	Commercial	Undeveloped or Open Space
	Row?	Row?	Row?	Row?	Row?	Row?
Cut w/ Side Slope	Yes -0 No -0	Yes -0 No -0	Yes -0 No- 0	Yes -0 No -0	Yes -0 No -0	Yes -0 No -0
Cut w/ Retaining Wall	Yes -0 No -0	Yes -0 No -0	Yes -0 No -0	Yes -0 No -0	Yes -0 No -0	Yes -0 No -0
Fill w/ Side Slope	Yes -0 No -0	Yes -0 No -0	Yes -0 No -0	Yes -0 No -0	Yes -0 No -0	Yes -0 No -0
Fill w/ Retaining Wall	Yes -0 No -0	Yes -0 No -0	Yes -0 No -0	Yes -0 No -0	Yes -0 No -0	Yes -0 No -0
At Grade	Yes -0 No -60	Yes -1 No -0	Yes -0 No -0	Yes -1 No -1	Yes -0 No -0	Yes -0 No -1

Source: Engineering Department

Table 4A
(Page 3 of 5)

ADAMS: TIENKEN → WALTON

Roadway Cross Sections & Profile

Type of Construction	Residential Lots	Residential Acreage	Residential Multifamily	Institutional	Commercial	Undeveloped or Open Space
	Row?	Row?	Row?	Row?	Row?	Row?
Cut w/ Side Slope	Yes -0 No -0	Yes -0 No -0	Yes -0 No- 0	Yes -0 No -0	Yes -0 No -0	Yes -0 No -0
Cut w/ Retaining Wall	Yes -0 No -0	Yes -0 No -0	Yes -0 No -0	Yes -0 No -0	Yes -0 No -0	Yes -0 No -0
Fill w/ Side Slope	Yes -0 No -0	Yes -0 No -0	Yes -0 No -0	Yes -0 No -0	Yes -0 No -0	Yes -0 No -0
Fill w/ Retaining Wall	Yes -0 No -0	Yes -0 No -0	Yes -0 No -0	Yes -0 No -0	Yes -0 No -0	Yes -0 No -0
At Grade	Yes -3 No -40	Yes -5 No -0	Yes -0 No -0	Yes -0 No -0	Yes -1 No -2	Yes -0 No -3

Source: Engineering Department

Table 4A
(Page 4 of 5)

ADAMS: WALTON → AVON

Roadway Cross Sections & Profile

Type of Construction	Residential Lots	Residential Acreage	Residential Multifamily	Institutional*	Commercial	Undeveloped or Open Space
	Row?	Row?	Row?	Row?	Row?	Row?
Cut w/ Side Slope	Yes -0 No -7	Yes -0 No -0	Yes -0 No- 0	Yes -0 No -0	Yes -0 No -0	Yes -0 No -0
Cut w/ Retaining Wall	Yes -0 No -1	Yes -1# No -0	Yes -0 No -0	Yes -0 No -0	Yes -0 No -0	Yes -0 No -0
Fill w/ Side Slope	Yes -0 No -0	Yes -0 No -0	Yes -0 No -1	Yes -0 No -0	Yes -0 No -0	Yes -1# No -0
Fill w/ Retaining Wall	Yes -0 No -5	Yes -0 No -0	Yes -0 No -0	Yes -0 No -0	Yes -0 No -0	Yes -0 No -1
At Grade	Yes -0 No -12	Yes -0 No -0	Yes -0 No -0	Yes -0 No -0	Yes -0 No -2	Yes -0 No -0

One parcel with four houses
* Oakland University

Source: Engineering Department

Table 4A
(Page 5 of 5)

ADAMS: AVON → HAMLIN

Roadway Cross Sections & Profile

Type of Construction	Residential Lots	Residential Acreage	Residential Multifamily	Institutional	Commercial	Undeveloped or Open Space
	Row?	Row?	Row?	Row?	Row?	Row?
Cut w/ Side Slope	Yes -0 No -10	Yes -0 No -0	Yes -0 No- 1	Yes -0 No -0	Yes -0 No -0	Yes -0 No -0
Cut w/ Retaining Wall	Yes -0 No -2	Yes -0 No -1	Yes -1 No -0	Yes -0 No -2	Yes -0 No -0	Yes -0 No -0
Fill w/ Side Slope	Yes -0 No -0	Yes -0 No -0	Yes -0 No -0	Yes -0 No -0	Yes -0 No -0	Yes -0 No -0
Fill w/ Retaining Wall	Yes -0 No -0	Yes -0 No -0	Yes -0 No -0	Yes -0 No -0	Yes -0 No -0	Yes -0 No -0
At Grade	Yes -0 No -14	Yes -0 No -0	Yes -0 No -0	Yes -1 No -0	Yes -0 No -0	Yes -0 No -2

Source: Engineering Department

Table 5A

ADAMS ROAD CORRIDOR STUDY
ROADWAY IMPROVEMENT IMPACTS

EVALUATION CRITERIA	EXISTING CONDITIONS	PROPOSED DESIGN
PROVIDE FOR SAFETY: Issues include accident frequency, rate, and severity, traffic conflicts, adequate sight distance, etc.	*NO* - existing moderate number of accidents likely to increase significantly over time as volumes increase and congestion worsens, significant number of existing conflicts since turning movements not isolated from through traffic, inadequate stopping sight distance, marginal intersection sight distance.	*YES* - modern design to current standards will significantly reduce traffic conflicts, lower risk of accidents. Accident reduction potential is 30 - 40% as calculated by OCRC ACCREDUC program.
SERVE FORECASTED TRAFFIC: Issues include functioning as urban arterial, existing and forecasted traffic volumes, capacity, etc.	*NO* - existing farm to market road in poor condition, inadequate for existing or forecasted traffic, contributes to traffic intruding into neighborhoods (aka "cut-thru").	*YES* - design adequate for forecast 2005 traffic, will lower likelihood of neighborhood intrusion.
SERVE PEDESTRIANS ON ADAMS RD FROM WALTON TO AVON: Issues include ability to provide continuous pathways, at planned width of 8 feet, and safe crossing locations.	*POOR* - Little existing path, inadequate ROW, law does not permit "taking" ROW for pathway, extreme difficulty fitting path to terrain, marginal ped crossings of roadway.	*GOOD* - pathway full distance on east side, plan for safe ped crossings of road using median for safe haven, terrain problems resolved by road construction, can meet planned width of 8 feet or reduce to 6 feet to reduce other impacts.
RIGHT OF WAY ACQUISITION: Issues are how many parcels need to be acquired from property owners.	*NEED 11 OF 15 PARCELS JUST FOR PATHWAY* - Referring to ROW Audit, fully 12 of 15 parcels required for road work are also needed for pathway construction, existing feature of City Master Plan. List includes 3 tracts from Oakland Univ., 5 residential acreage parcels and 3 residential lots.	*NEED ADDITIONAL 4 PARCELS SOLEY FOR ROADWAY IMPROVEMENTS* - In addition to land needed for pathways, 4 parcel required just for road ROW. The pathways are existing utilizing easements. List includes one commercial, one church, one apartment complex and one residential acreage parcel.

(continued on next page)

Source: Engineering Department

Table 5A

EVALUATION CRITERIA	EXISTING CONDITIONS	PROPOSED DESIGN
ACCESS TO ABUTTING PROPERTIES: Issues include type of access, degree access interferes with through traffic.	*FULL AND DIRECT* - left turns at some intersecting streets and driveways have significant impact to through traffic. Most operational conflicts resolved by passing lanes. Passing lanes suitable for low volume rural highways, pose safety problem for high volume urban arterials. Considered "better than nothing".	*GENERALLY DIRECT* - all left turns isolated from through traffic, safest way of handling access conflicts. Driveways and most intersecting streets have indirect or "U" turn to go left.
ENVIRONMENTAL IMPACTS: Issues include air quality, river and stream crossings, wetlands, tree losses, and noise.	*MINOR* - gradual degradation of air quality as congestion increases. Some trees now distressed, diseased or dead. Noise is factor wherever road is at, but especially above level of homes.	*MODERATE* - Improved air quality. Minor impact to Clinton River, wetland loss at Galloway Drain. No tree loss on east side, significant tree losses on west side. Noise levels will decrease somewhat where road profile is lowered, a few homes should see increased levels as road is raised unless sound walls are provided, otherwise little impact is likely.
AESTHETICS OF ADAMS ROAD FROM WALTON BLVD TO AVON ROAD: Issues include vistas from hill crests, terrain changes, engineered features like retaining walls, landscaping potential, etc.	*RURAL IMAGE* - rugged road hugs terrain, little molding terrain to road. View from Avon northward is interrupted by hill near Cambridge. Unkempt and natural look to tree line includes dead and dying specimens. Existing retaining wall adds interest to roadside, but deteriorated tree planters detracts from the scene.	*GENTILE, URBANE IMAGE* - retains rolling terrain while meeting the needs of the community. View from Avon northward is more panoramic, encompasses whole valley to Heidelberg. Establish new tree line on west side to soften view of University golf course. Replicate existing retaining wall or use comparable facing. Significant landscaping potential for median where 30 feet wide.

Source: Engineering Department

Table 6A

ADAMS ROAD CORRIDOR STUDY

CAPITAL IMPROVEMENT PROGRAM ESTIMATES

SEGMENT	COST	CITY SHARE*
Dutton to Tienken	$4.7 million	$0.6 million
Tienken to Walton	4.2 million	0.5 million
Walton to Avon	4.6 million	0.6 million
Avon to Hamlin	6.5 million	0.8 million
TOTAL FOR CORRIDOR	$20.0 million	$2.5 million

* NOTE: City Share estimated at 12.5% of total. Existing FAUS and TEDF Category "C" programs utilize a 75/25 ratio of State to Local funding. Past practice has been for the Road Commission to split the Local share equally with the City.

Both FAUS and TEDF programs subject to modification. Likely that FAUS will change to 60/40 ratio, in which case the City Share is anticipated to be 20%.

Source: Engineering Department

TABLE 6B

Board of County Road Commissioners
Oakland County

INTER-DEPARTMENT MEMORANDUM

March 12, 1991

To: Kent Rubley

From: Dennis Kolar DK

Subject: **Adams Road, Portage Trail to Walton Boulevard**

The following is a list of concerns and comments for the above project along with a preliminary estimate in 1991 dollars for contractor payments.

1. Plan assumes 120' R/W but gives no indication as to how the 60' will be obtained from the condo projects and Oakland University.

2. The significant cuts and fills will require additional right of way and or easements from Oakland University and other property owners.

3. Wherever there are right turn lanes the non motorized paths would be directly behind the back of curb. We think additional right of way should be purchased to solve this.

4. How do vehicles leaving Meadow Brook, McDonalds or the Mobil gas station at Walton and Adams get to south bound Adams? A suggestion would be to place a cross over just south of Walton to allow this.

5. What type of transition or Geometrics will be used north of Walton?

6. End median approximately 200' either side of N. Cambridge and S. Cambridge to create a five lane type of configuration.

7. Build one continous bridge over the Clinton River and eliminate the road shift in this area.

8. Bridges may require substantial fills in the wetlands DNR Permits will be required.

9. Concept as shown does not address non-motorized paths throughout the corridor.

10. There is a possibility of archaelogical sites near the Clinton River and also Oakland University is a historic site and any impacts will have to be addressed in the environmental impact study and also with concerned citizens.

Cost Estimate:

For the plan sheets from Sta. 102+00 to approx. 210+00	$7,300,000.00
Bridge Over the Clinton River	1,000,000.00
Bridge North of Avon	1,000,000.00
Total Contractor Payments	$9,300,000.00

/klh

DRAFT

AMENDMENT TO THE

CITY OF ROCHESTER HILLS
TRAFFIC STUDY AND
COMPREHENSIVE TRANSPORTATION PLAN
(Dated July 1989)

Prepared for:

City of Rochester Hills
Rochester Hills, Michigan

Prepared by:

BRW, Inc.
Thresher Square
700 Third Street South
Minneapolis, MN 55415

November 1990

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SUMMARY

In mid–1989 the City Planning Commission of Rochester Hills adopted a Major Thoroughfare Plan for the City. The plan identified the twenty–year transportation needs of the City and outlined a list of priority projects. Improvements to Adams Road north of Hamlin to the northerly city boundary were not included as priority projects. The plan states that Adams Road improvements "were considered and rejected by the Citizens' Study Advisory Committee." Limited improvements were proposed for Tienken; the primary focus was pavement improvement and a connection to Squirrel Road in Auburn Hills.

Because of some neighborhood traffic circulation problems, the City Council has requested that the Planning Commission open hearings "on the possible amendment of the Major Thoroughfare Plan of the City's Master Plan, with the intent of adding Adams and Tienken to that plan for widening consideration."

Outlined below are the issues analyzed and the recommendations on each issue.

Do Adams and Tienken Roads warrant roadway widening to accommodate non–constrained Year 2005 traffic forecasts?

Both Adams Road and Tienken Road have forecasted traffic volumes that warrant increase in traffic–carrying capability.

If the roadway were to be widened, what are the recommended roadway geometrics for Adams Road and Tienken Road?

If Adams Road and Tienken Road are to be improved, it is recommended that they be built as four–lane residential boulevards with a landscaped median.

Figure 5 in the body of the document illustrates the roadway geometrics of a four-land residential boulevard.

What is the impact if the roadway improvements are not made?

The major impacts of not making the improvements include:

- increased traffic congestion along the two roadways
- traffic diverting to neighborhood local and collector streets
- significantly higher accidents

What is the impact of ending Tienken Road at the western boundary of the City of Rochester Hills?

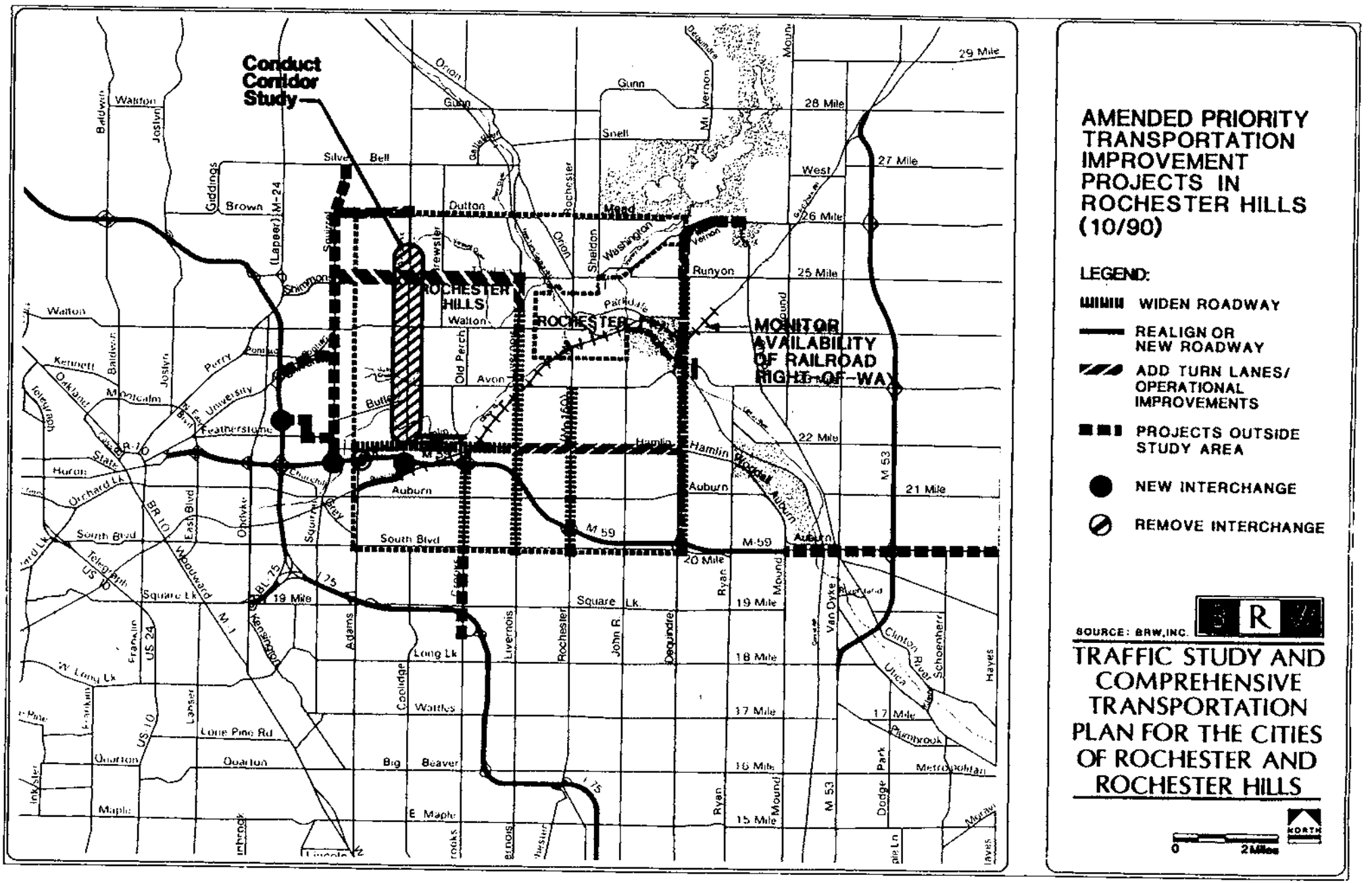
The forecasted traffic demands for Adams Road and Walton Road increase when Tienken Road is closed at the western boundary of the City of Rochester Hills. The forecast traffic volumes on Adams Road, between Walton and Tienken, increase from 25,600 vehicles per day (vpd) to 37,000 vpd, while the forecast traffic volumes on Walton Road, between Squirrel Road and Adams Road increase from 26,700 vpd to 41,100 vpd.

What is the impact of the proposed east-west principal arterial roadway on Adams Road and Tienken Road traffic volumes?

The construction of the northern arterial between M-24 and M-53 does not significantly influence the forecasted traffic demand along Adams Road. The construction of the northern arterial diverts between 5,000 and 6,000 vpd (approximately 25 percent) off Tienken, but would not eliminate the need to widen Tienken. The traffic forecasts assume that the area north f Rochester Hills develops as low density residential.

THOROUGHFARE PLAN AMENDMENT SUMMARY

Figure 1 presents the Amended Priority Transportation Improvement Projects in Rochester Hills. The modification to the 1989 Thoroughfare Plan and the conclusions on Adams Road and Tienken are summarized below:



AMENDED PRIORITY TRANSPORTATION IMPROVEMENT PROJECTS IN ROCHESTER HILLS (10/90)

LEGEND:

- WIDEN ROADWAY
- REALIGN OR NEW ROADWAY
- ADD TURN LANES/ OPERATIONAL IMPROVEMENTS
- PROJECTS OUTSIDE STUDY AREA
- NEW INTERCHANGE
- REMOVE INTERCHANGE

SOURCE: BRW, INC.

TRAFFIC STUDY AND COMPREHENSIVE TRANSPORTATION PLAN FOR THE CITIES OF ROCHESTER AND ROCHESTER HILLS

0 2 Miles

NORTH

- Do not proceed with the feasibility study of an east–west arterial roadway as recommended in the 1989 Plan. If land uses other than low density residential use begin developing north of Rochester Hills, this decision may be reconsidered.

- Update the Comprehensive Thoroughfare Plan no later than 1994; this requires initiating the work in early 1993.

- Improve traffic capacity and safety on Adams and Livernois through the provision of left and right turn lanes, modern traffic signals, and other traffic operational improvements; this is a Priority Transportation Improvement Project.

- Conduct a Corridor Study of Adams Road between Hamlin and Tienken prior to any consideration of possible widening–type improvements. The Corridor Study is subject to funding availablity and would define the access/egress plan, landscaping treatment, urban design features, turn lane locations, roadway profile, number of lanes, right–of–way, impacts, capital cost, etc.

BACKGROUND

REASON FOR TRANSPORTATION PLAN AMENDMENT

In mid–1989 the City Planning Commission of Rocheste ills adopted a Major Thoroughfare Plan for the City. The plan dentified the twenty–year transportation needs of the city and outlined a list of pri–ority projects. Improvements to Adams Road north of Hamlin to the northerly city boundary were not included as priority projects. The plan states that Adams Road improvements "were considered and rejected by the Citizens' Study Advisory Committee." Limited improvements were proposed for Tienken; the primary focus was pavement improvement and a connection to Squirrel Road in Auburn Hills.

Because of some neighborhood traffic circulation problems, the City Council has requested that the Planning Commission open hearings "on the possible amendment of the Major Thoroughfare Plan of the City's Master Plan, with the intent of adding Adams and Tienken Roads to that plan for widening consideration."

AMENDMENT OVERVIEW

BRW, Inc., was retained by the City of Rochester Hills to complete the technical work necessary to support the preparation of this amendment. The work program for preparing this amendment consists of the fol–lowing major tasks:

- Prepared traffic forecasts to assess the need for roadway improvements to Adams Road and Tienken Road.

- Analyze the traffic forecasts in order to assess the appropriate roadway geometrics.

- Conduct a safety analysis of the impact of roadway congestion on accidents.

- Prepare a Thoroughfare Plan Amendment which reflects the analysis completed.

- Process the Amendment through the Rochester Hills Planning Commission.

STUDY AREA

The study area includes Adams Road and Tienken Road within the city limits of Rochester Hills.

OVERVIEW OF PLAN ADOPTED IN JULY 1989

SUMMARY OF PLAN

The Rochester Hills Traffic Study and Comprehensive Transportation Plan was completed by BRW, Inc., in July 1989 and was included as part of the City's Master Plan. All governmental agencies with jurisdictional concerns within the secondary study area were involved during the preparation of the study. The plan included the following major points:

- o The transportation plan generally concluded that the following transportation policies should be considered:

  - Because of environmental, land use impacts, and capital cost concerns; six-lane arterial roadways should not be constructed, except in extraordinary circumstances.

  - Since roadway capacities will be limited to four lanes due to social and economic constraints, the community must accept a degree of traffic congestion along particular roadways.

  - Develop a strategy to intercept through traffic originating outside Rochester Hills and Rochester and divert it to selected identified routes.

  - Priority transportation improvement projects should be scheduled for immediate implementation.

  - Travel demand management strategies should be pursued as an alternative to roadway construction.

- The recommended priority projects included:

  - Widen Livernois Road to a four-lane residential boulevard between South Boulevard and the north end of Great Oaks Shopping Center north of Walton.

  - Widen Crooks Road to a four-lane residential boulevard from approximately Hamlin Road to South Boulevard and improve the Crooks Road/M-59 interchange.

  - Align Hamlin Road east and west of Crooks Road, and widen Hamlin Road to a four-lane residential boulevard west of Livernois and to a two-lane roadway with turn lanes from Livernois to Dequindre. Eliminate the existing interchange of Adams and M-59, realign Adams directly to the south, construct a new interchange with M-59, and extend Adams along the north side of the Grand Trunk Railroad to the existing Adams Road.

  - Widen Rochester Road south of Avon to M-59 to a six-lane boulevard and improve the interchange with M-59 to minimize left turns.

- Improve Dequindre from South Boulevard to Runyon as a four-lane residential boulevard and improve Dequindre to a two-lane paved roadway north of Runyon with route continuity to a paved 26-mile road. This will help to divert traffic from the Stoney Creek Historic District. Dequindre in the area of Avon is proposed to be relocated to the east in order to establish route continuity and to avoid the Yates Cider Mill.

- The study included a recommendation for a feasibility study of an east-west principal arterial between M-24 and M-53 to be located in northern Rochester Hills and/or southern Oakland Township. The purpose of this roadway was to intercept through traffic from the north.

- The study omitted transportation improvements to Adams Road based on the rejection of the Citizens' Study Advisory Committee.

- The study proposed limited improvements to Tienken Road. This included paving Tienken Road and extending it to the west to Squirrel Road in Auburn Hills.

- The study included suggested generalized operational and safety improvements for the study area roadway system.

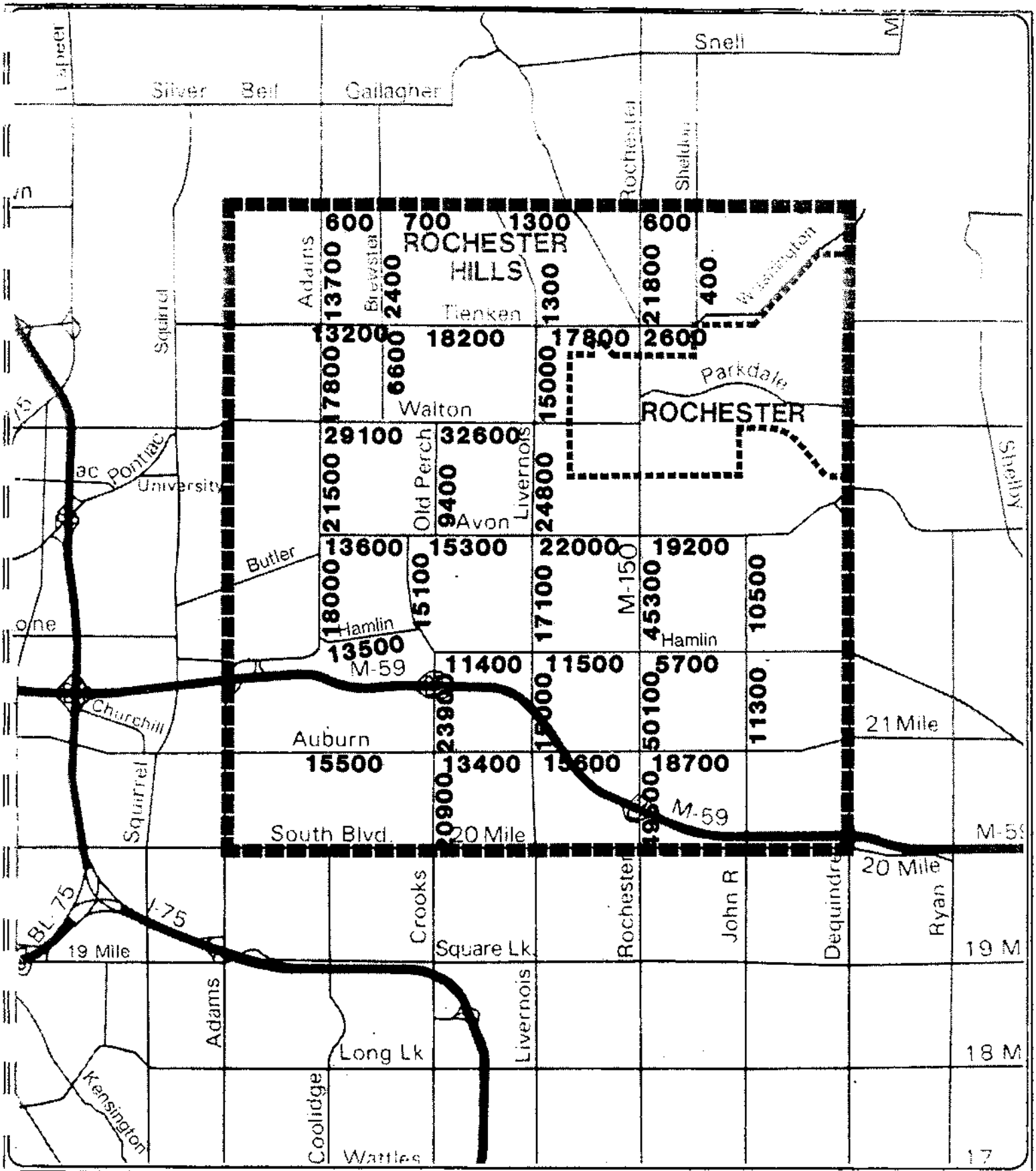
EXISTING (1989) FORECASTED TRAFFIC

The 1989 average daily traffic on the Rochester Hills roadway system in the vicinity of Adams Road and Tienken is shown on Figure 2. These volumes present a frame of reference for the forecasted traffic.

The Year 2005 traffic was estimated for the recommended thoroughfare system. Since that time, development activities have made the proposed interchange of M-59/Livernois not feasible. The forecasts also assume that the east-west arterial is between M-24 and M-53. Figure 3 shows the forecasted traffic in the Year 2005 with the implementation of the recommended priority projects previously identified except as noted above.

ROADWAY DEFICIENCIES WITH IMPLEMENTATION OF PRIORITY TRANSPORTATION PROJECTS

The capacity of a roadway is typically defined by traffic engineers for the peak hour of the day and takes into consideration specific physical characteristics of the roadway and characteristics of traffic. Since traffic forecasts are typically developed on a daily basis, the peak hour capacities must be translated into typical daily capacities in order to compute deficiencies. The daily capacity (vehicles/day) for four roadway types are shown below in Table 1. Data presented for peak hour percentages of daily and directional distribution reflect existing conditions along Adams Road.



TRAFFIC STUDY AND COMPREHENSIVE TRANSPORTATION PLAN FOR THE CITIES OF ROCHESTER AND ROCHESTER HILLS

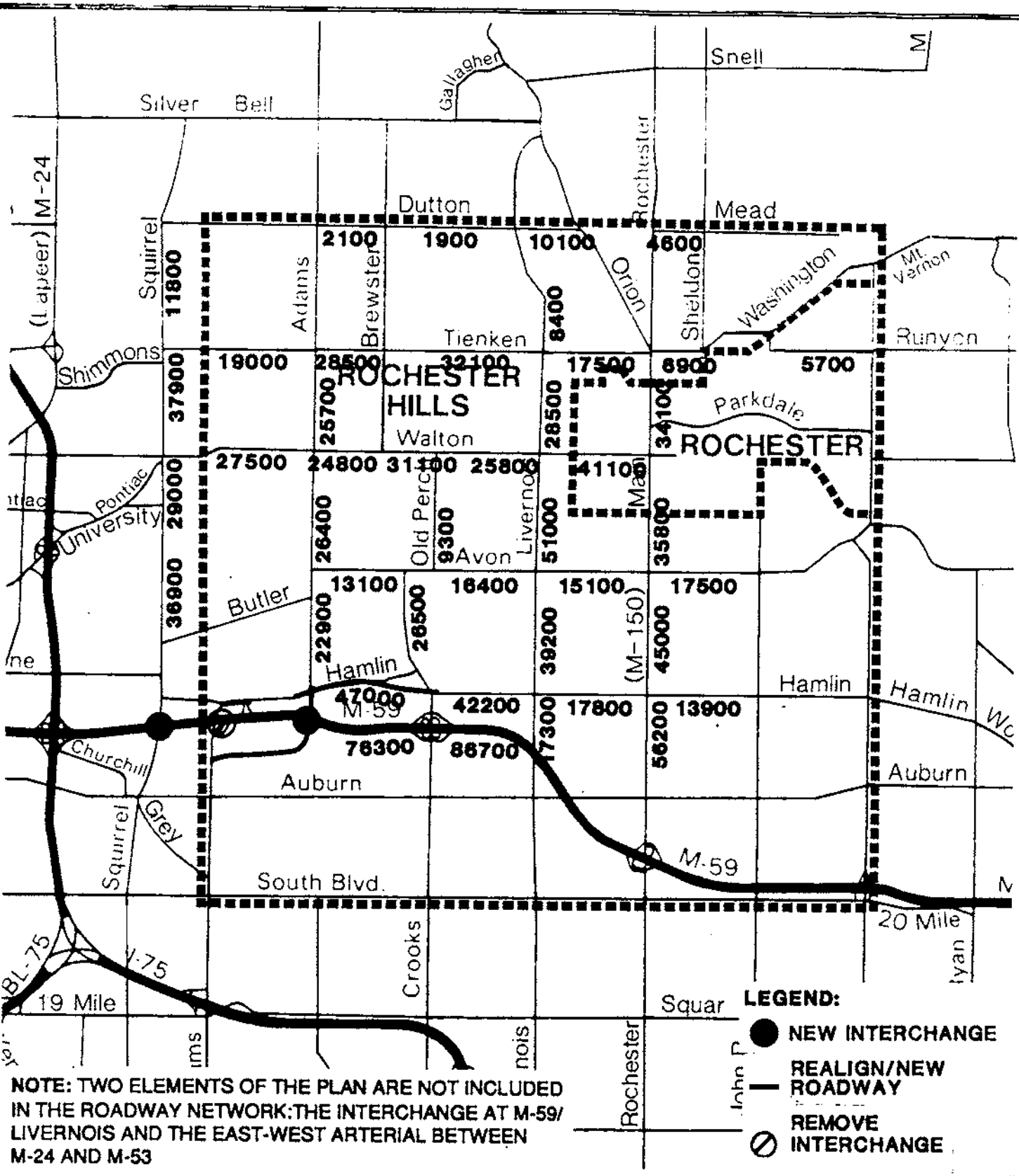
Figure 2

1989 Average Daily Traffic
SOURCE: City of Rochester Hills

BRW

0 1 Mile

NORTH



TRAFFIC STUDY AND COMPREHENSIVE TRANSPORTATION PLAN FOR THE CITIES OF ROCHESTER AND ROCHESTER HILLS

FORECASTED (2005) AVERAGE DAILY TRAFFIC ON THE 1989 THOROUGHFARE PLAN

Figure 3

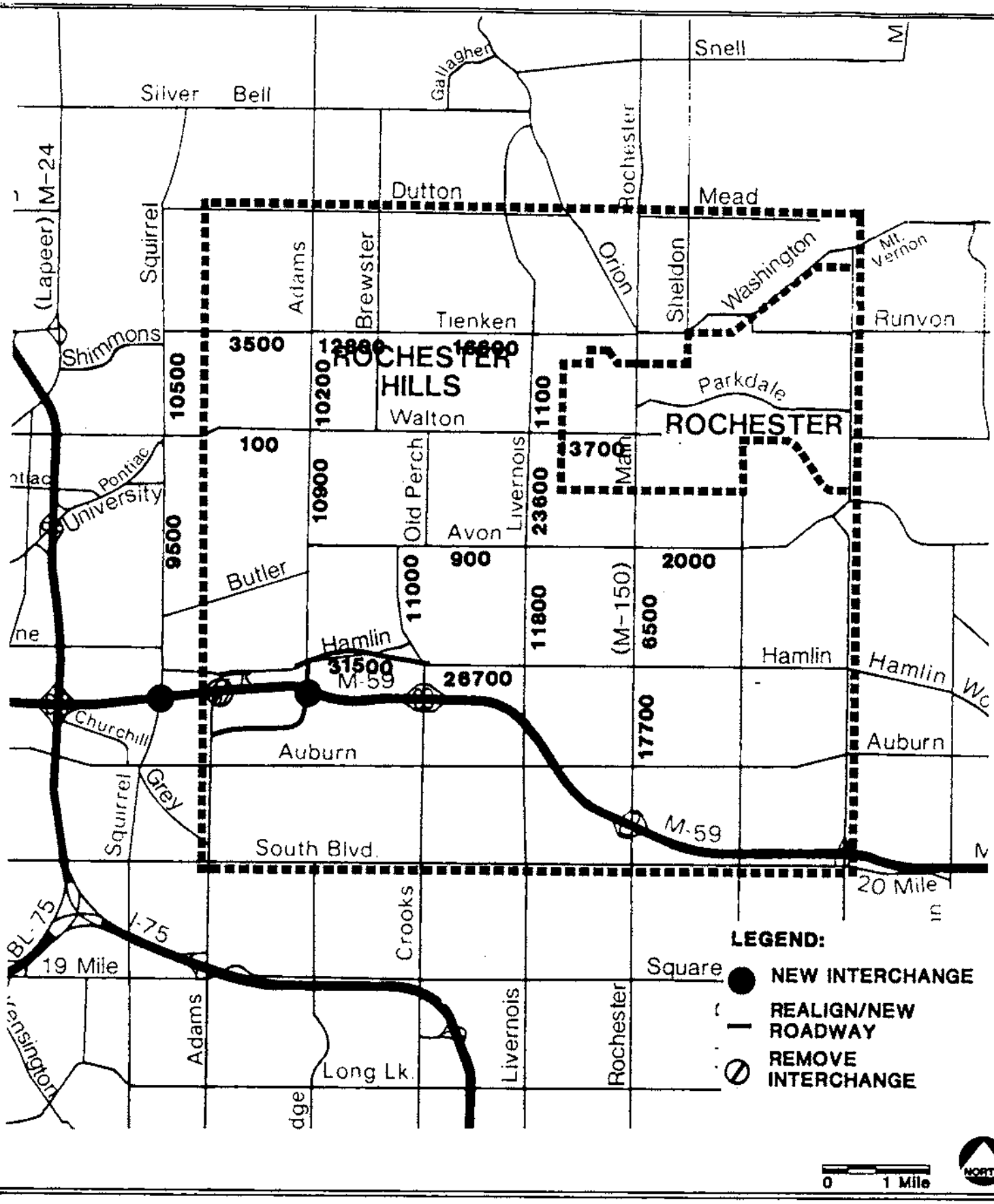
SOURCE: BRW, INC. 9/90

TABLE 1
TYPICAL DAILY ROADWAY CAPACITIES FOR VARIOUS ROADWAY TYPES

ROADWAY TYPE	PEAK HOUR TRAFFIC/ DAILY TRAFFIC	PEAK HOUR DIRECTIONAL DISTRIBUTION	% GREEN TIME TO ROADWAY	LEVEL OF SERVICE	DAILY CAPACITY
2 Lane*	9%	65/35%	55%	D	10,300
2 Lanes**	9%	65/35%	55%	D	15,500
4 Lanes*	9%	65/35%	55%	D	20,600
4 Lanes**	9%	65/35%	55%	D	27,400

* Without turn lanes.
** With turn lanes.

Figure 4 presents the forecasted unsatisfied traffic under the assumption the priority projects identified above are implemented. The values were developed by subtracting the roadway capacities from the 2005 forecasted traffic as presented on Figure 3. The values represent the deficiencies of the July 1989 Thoroughfare Plan.



TRAFFIC STUDY AND COMPREHENSIVE TRANSPORTATION PLAN FOR THE CITIES OF ROCHESTER AND ROCHESTER HILLS

UNSATISFIED DAILY TRAVEL DEMAND IN YEAR 2005 WITH IMPLEMENTATION OF PRIORITY IMPROVEMENT PROJECTS IN JULY, 1989 THOROUGHFARE PLAN, EXCEPT M-59 / LIVERNOIS INTERCHANGE

Figure 4

SOURCE: BRW, INC. 9/90

TRAFFIC FORECASTS

OVERVIEW

Nine additional Year 2005 traffic forecasts were prepared for the primary study area to determine the need for improving Adams Road and Tienken Road. These forecasts were then analyzed to answer the following questions:

Adams Road

- o the impact of increasing the speeds on the attractiveness of Adams Road relative to the other north–south arterials.
- o the impact of closing Tienken at the City's western boundary.
- o the impact of closing Butler.
- o capacity restraint impacts.
- o the impact of the proposed northern principal arterial roadway.
- o the impact on the other north–south arterial roadways of a higher speed or a more attractive Adams Road.

Tienken Road

- o the impact of increasing the speeds or the attractiveness of Tienken Road relative to the other east–west arterial roadways.
- o the impact of the proposed northern principal arterial roadway

- The projected traffic impact on Tienken Road of the proposed north arterial is determined by comparing the traffic forecasts on Tienken Road with no north arterial (Table 11) to the traffic forecasts on Tienken Road with the north arterial (Table 12). The data indicates that the north arterial is projected to capture approximately 5,000 to 6,000 vpd from Tienken Road. This equates to nearly a 25 percent traffic diversion from Tienken Road to the north arterial. However, to accommodate the forecasted volume, a four-lane roadway is required.

- The projected traffic impact to the other east-west arterial roadways of a higher speed or more attractive Tienken Road is documented in Tables 13 and 14. The data indicates that a higher capacity Tienken Road is not expected to significantly affect the forecast volumes on Dutton Road. However, a higher capacity Tienken Road is anticipated to decrease the traffic demands along Walton Road from 6,000 vpd (Adams) to 11,000 vpd (Orion).

TABLE 13
2005 TRAFFIC FORECASTS ON WALTON ROAD WITH VARYING SPEEDS ON TIENKEN ROAD

MPH ON TIENKEN	VOLUME ON WALTON WEST OF ADAMS	LIVERNOIS	ORION
30	26,700	25,700	41,100
35	21,600	20,100	32,600
40	20,700	19,100	30,300

Conditions: No North Arterial
Tienken Open
Adams 30 MPH

TABLE 14
2005 TRAFFIC FORECASTS ON DUTTON ROAD WITH VARYING SPEEDS ON TIENKEN ROAD

MPH ON TIENKEN	VOLUME ON DUTTON WEST OF ADAMS (East)	LIVERNOIS	ORION
30	2,100	1,500	10,100
35	1,300	1,200 (est.)	9,300
40	1,100	800	9,200

SAFETY ANALYSIS

A safety analysis was conducted to forecast the difference in the number of accidents on Adams Road and Tienken Road in the Year 2005 both with and without geometric improvements.

In general, accidents along two-lane suburban roadways are directly related to the degree of access control along the roadway, the types of intersection control along the roadway, and the level of congestion on the roadway. This assumes that there are no sight distance problems along the roadway and that the design speed of the roadway is reasonable.

Research indicates that two-lane suburban roadways with little or no access control, such as the existing Adams Road and Tienken Road, typically exhibit accident rates of 3.88 accidents per million vehicle miles (MVM) travelled. (Source: Table 6.9, Accident Rates and Costs by Road Type, Metropolitan Transportation Planning, 2nd Edition, John W. Dickey, 1983.) This is nearly twice the accident rate of two-lane roadways with partially controlled access. Roadways with partial access control reduce accidents by consolidating left turning traffic and limiting these movements to selected intersection locations, thereby eliminating potential conflict points along a roadway segment caused by multiple access drives.

Additionally, intersections with traffic signal control usually have a higher accident rate than unsignalized intersections, although the accident types tend to be less severe. Most of these accidents are caused by motorists who do not see the signal (rear-end, right-angle) or who violate some right-of-way rule (left-turn, right turn on red). However, unsignalized intersections can also become hazardous locations if the traffic delays are abnormally long and the number of adequate gaps in the conflicting traffic stream are insufficient. Therefore, the implementation of appropriate

traffic control devices is critical to minimizing accidents at intersection locations along a roadway.

The number of accidents along a particular roadway segment is also affected by the congestion of the roadway. Research indicates that there is a definitive relationship between type of accidents and accident rates to levels of service. (Source: Freeway Accidents and Levels of Service, MCHRP-71-6, 1971.) Accident rates at nonhazardous locations are almost constant, up to a volume/capacity (V/C) ratio of 0.65, then increase considerably for higher ratios. (Source: Volume-To-Capacity Ratio and Traffic Accidents on Later Urban Four-Lane Highways in Greece, Transportation Research Record #1112, 1987). Therefore, an increase in traffic and congestion along a roadway would likely result in an increase in accidents due to an increase in the accident rate and an increase in vehicle exposure.

The proposed improvements to Adams Road and Tienken Road would widen these roadways to a four-lane divided section with left turn lanes provided at major intersections. Four-lane divided suburban roadways typically exhibit accident rates near 2.16 accidents/MVM, or approximataly half that of two-lane roadways with no turn lanes. (Source: Table 6.9, Accident Rates and Costs by Road Type, Metropolitan Transportation Planning, 2nd Edition, John W. Dickey, 1983.)

Therefore, it can be stated that the proposed capacity increase resulting from the widening from a two-lane roadway to a four-lane roadway and the proposed increase in access control caused by limiting the number of access intersections along Adams Road and Tienken Road should reduce the Year 2005 accident rate by roughly half.

If Adams Road and Tienken Road are not upgraded to four-lane roadways, a 50 to 100 percent increase (estimated) in the accident rates is expected. This increase is based on the projected volume to capacity ratio forecasts for Adams Road and Tienken Road and on the understanding that both of these roadways currently operate "at capacity" during the peak weekday periods. This expected increase in accident rate coupled with the anticipated increase in traffic demand could increase the actual number of accidents along Adams Road and Tienken Road by up to 400 percent if these roadways are not improved.

RECOMMENDED ROADWAY GEOMETRICS

The analysis of the traffic forecasts and the safety analysis indicates that, from a technical standpoint, Adams Road and Tienken Road could be widened from their current two-lane sections with no turn lanes to four-lane divided sections with left turn lanes provided at major intersections. These improvements would be limited to the segment of Adams Road from M-59 to Dutton Road and to the segment of Tienken Road from Adams Road to Livernois Road. It should be noted that the Tienken Road geometrics are not dependent upon the proposed northern principal arterial roadway.

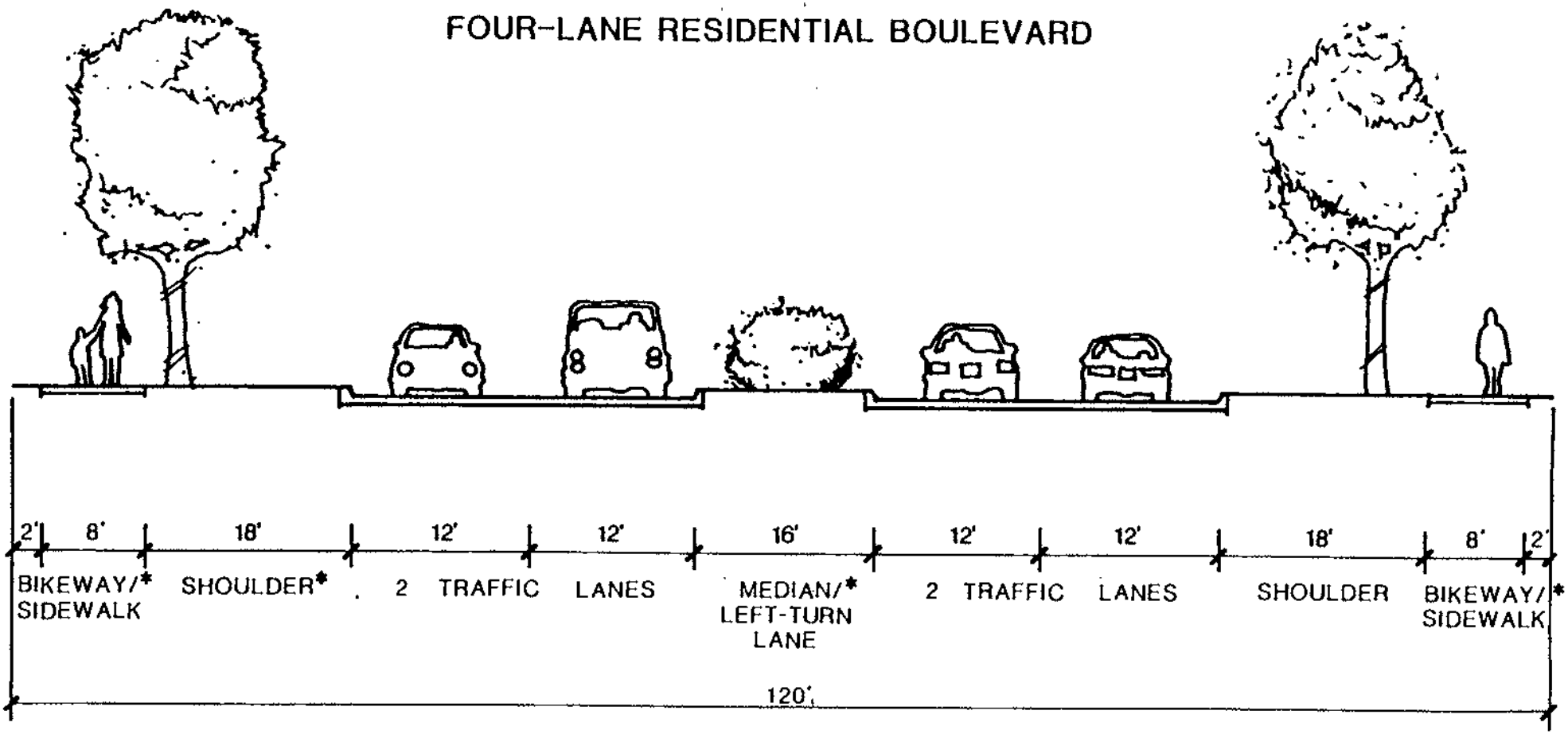
Because both of these roadways travel through residential areas and are proposed to function as minor arterial roadways, with partial access control, it is suggested that these roadways be reconstructed as four-lane residential boulevards. This design would provide the needed additional traffic capacity and fulfill the functional expectations of these roadways with an aesthetically pleasing atmosphere. A typical cross-section of a four-lane residential boulevard is shown in Figure 5.

The application of the four-lane residential boulevard cross-section to Adams Road and Tienken requires a sensitive balance of access, landscaping, and design. It is recommended that a Corridor Study be completed to develop the Preliminary Design Plans. The plan should address the following issues:

- the location of left-turn lanes (breaks in median) and right-turn lanes

TYPICAL GEOMETRIC CROSS-SECTION MAJOR ARTERIAL

FOUR-LANE RESIDENTIAL BOULEVARD



***Notes:** Median is raised and landscaped where left turns are NOT required. Left turn lanes and breaks in the landscaped median should only be provided at major cross streets, and the number of breaks minimized. Right turn lanes can be added in 18' shoulder where needed. See table for alternative treatments of shoulder width and median width.

Source: BRW, Inc.
Nov. 1988

- profile of the roadway
- landscaping treatment of the median and boulevard
- traffic control devices

The study team should include a landscape architect, traffic engineer and civil engineer.

CONCLUSIONS

The following points summarize the results of the additional analyses that were conducted for the preparation of this amendment.

- Based on a minimum acceptable Level of Service (LOS) "D" threshold value of 18,200 vehicles per day (vpd) for a two-lane roadway with turn lanes and the unconstrained traffic forecasts for Adams and Tienken Roads, capacity deficiencies are forecasted for both Adams and Tienken Roads.

- Widening of Adams Road will provide some needed traffic relief to Livernois Road and Crooks Road even with roadway improvements.

- Widening of Tienken Road will provide some needed traffic relief to Walton Road.

- Traffic on Adams Road, between Walton and Tienken, and on Walton Road, between Squirrel and Adams, will increase if Tienken Road is closed at the western boundary of the City of Rochester Hills.

- The proposed north arterial (i.e., east-west principal arterial) will not significantly influence traffic on Adams Road. However, it will result in the traffic diversion of approximately 25 percent of the traffic from Tienken Road.

- Based on the minimum acceptable LOS "D" threshold value of 24,300 vpd for a four-lane roadway (with left turn lanes at major intersections), it is concluded that the recommended roadway geometrics for Tienken Road are not dependent on the construction of the proposed principal arterial.

- The closing of Butler Road will not significantly affect the traffic demand on Adams Road.

- The safety analysis indicated that an upgrade of Adams Road and Tienken Road from their current two-lane sections with no turn lanes to four-lane divided sections with turn lanes should result in an accident rate decrease of up to 100 percent along these roadways. However, since the traffic demands along Adams Road and Tienken Road are projected to almost double by the Year 2005, it is likely that the actual number of accidents in the Year 2005 along an improved Adams Road and Tienken Road would be approximately the same as existing.

- The safety analysis also indicated that the accident rates may experience a 50 to 100 percent increase, from existing to Year 2005, if Adams Road and Tienken Road are not improved. This rate increase would be attributed to the increased congestion forecast for Adams and Tienken Roads. A doubling of the accident rate compounded with an almost doubling of the traffic demand could increase the actual number of accidents along these roadways by as much as four times their current numbers.

- A corridor study along Adams Road from approximately the Grand Truck Railroad to north of Tienken should be completed to determine what impacts of widening would have on forecast traffic volumes and adjacent land use.

- Improve the intersection capacity of Tienken Road and Adams Road and Tienken road and Brewster Road by increasing the left-turn lane distance. Increasing the distance will add needed vehicle stacking area in the peak hour.

- Do not proceed with a feasibility study of an east-west arterial north of Tienken.

APPENDIX B

TODD HOLLOWAY
ENVIRONMENTAL PLANNING

SITE PLANNING
LANDSCAPE ARCHITECTURE
WETLAND CONSULTING

Proposal for Adams Road Corridor Study
City of Rochester Hills
Job # 91-009
April 1, 1991

PART I - METHODOLOGY AND PRODUCTS

A thorough inventory and analysis will be conducted to develop a comprehensive understanding of design and safety issues. The impacts of landscape material placement and visual identity will be explored. This information will be depicted on a series of color graphics that will provide the basis for preliminary concepts. These products will allow the City of Rochester Hills to execute the developmaent of more detailed design process with a clear understanding of roadway corridor issues and impacts.

Basic Services:

PHASE I - ISSUES AND OPPORTUNITIES IDENTIFICATION

A. Inventory of Existing Features

A thorough evaluation of vegetation and topography elements that will influence raod design will be conducted. Issues such as traffic circulation, sight distance, pedestrian crossings and utility concerns will be identified. Initial environmental impact concerns presented by the current planning efforts will be outlined.

B. Corridor Issues Framework

This plan will serve as a summary of design issues and depict the premise and structure of neccessary design features and forms. A summary of environmental qualities and values will be included.

C. Project Status Presentation

We recommend that a brief presentation to the Project Design Team be included at this point so that critical issues and preliminary corridor design recommendations can be disscussed.

Top of Troy Building
755 W. Big Beaver
Suite 1614
Troy, Michigan 48084
(313) 244-9787

Proposal for Adams Road Corridor Study
City of Rochester Hills
Job # 91-009
April 1, 1991

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Finished products provided under this section of the proposal will include the following:

1. Color rendering of Existing Features and environmental considerations. (30" x 40" size)

2. Color rendering of Corridor Issues Framework. (30" x 40" size)

PHASE II - CONCEPT DEVELOPMENT AND RECOMMENDATIONS

A. Alternative Design Concepts

A series of brief color sketches will be developed to portray alternative design schemes that satisfy the requirements identified during the Corridor Issues Framework process. Each of these sketches will present a different conceptual solution for the corridor.

B. Recommended Alternative

Based on the merits of the corridor alternatives, our office will make a recommendation as to the most effective scheme for implementation. This recommendation will take into account aesthetics, safety, maintenance and environmental impact.

C. Review of Design Alternatives

A presentation of the corridor alternatives that will allow for discussion of the merits of each and result in the acceptance of one alternative for development of a final conceptual plan.

Finished products provided under this section of the proposal will include:

1. A minimum of three Alternative Design Sketches. (30" x 40" size)

2. A brief written summary of the concept elements of each alternative and basis for our recommendation.

PHASE III - CONCEPTUAL PLAN

A. Conceptual Master Plan

A finished rendering of the preferred alternative will be developed for display and presentation. This plan will serve as a guide for evaluation by the City of project feasibility and funding. The Master Plan will include all conceptual design elements including:

- Environmental impacts to natural resources
- Planting recommendations by type
- Tree preservation recommendations
- Schematic lighting placement
- Sign location recommendations
- Soil erosion and slope stabilization techniques

B. Conceptual Cost Estimate

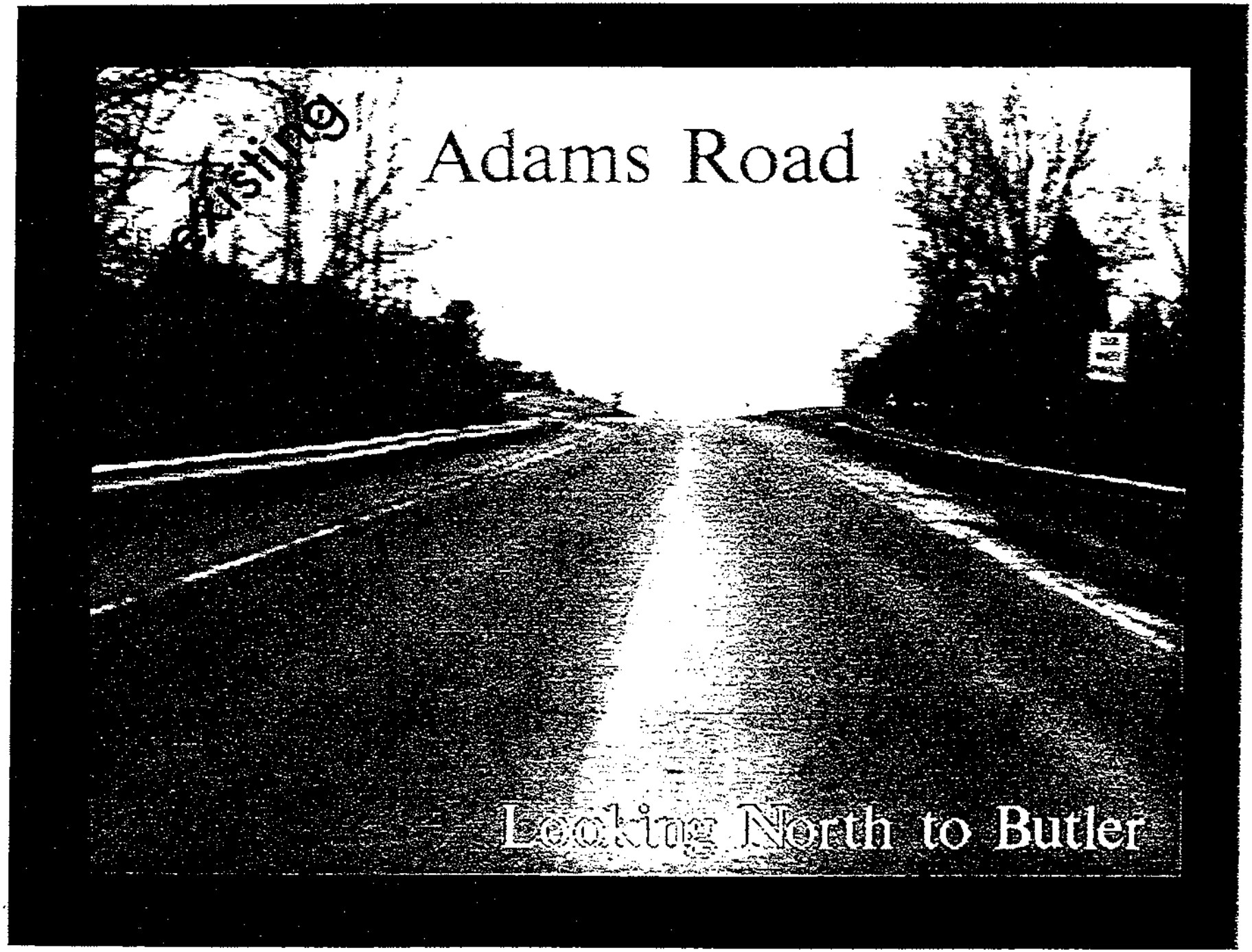
A cost estimate will be provided that will outline the estimated cost of plant materials and labor required to implement the Conceptual Master Plan.

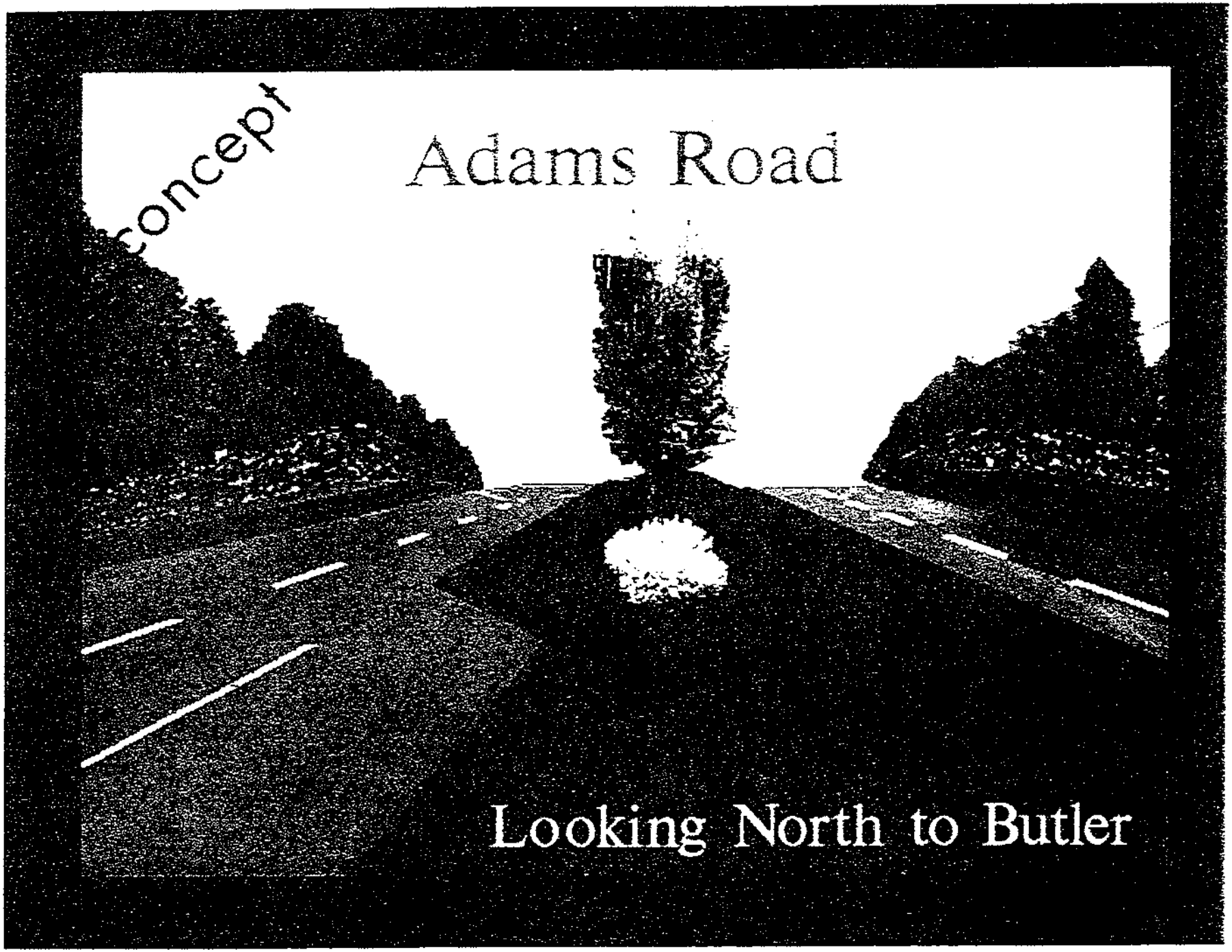
C. Environmental Assessment Report

A final written report will be produced that will describe likely impacts to natural resources (including locally regulated woodland and wetland areas) caused by the implementation of both the paving and landscape elements of the Master Plan. This report will also include recommendations for reduction of impacts and outline remedial measures.

D. Final Presentation

A final meeting with the Project Design Team to discuss the Master Plan and Cost Estimate.


Existing
Adams Road
Looking North to Butler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Adams Road
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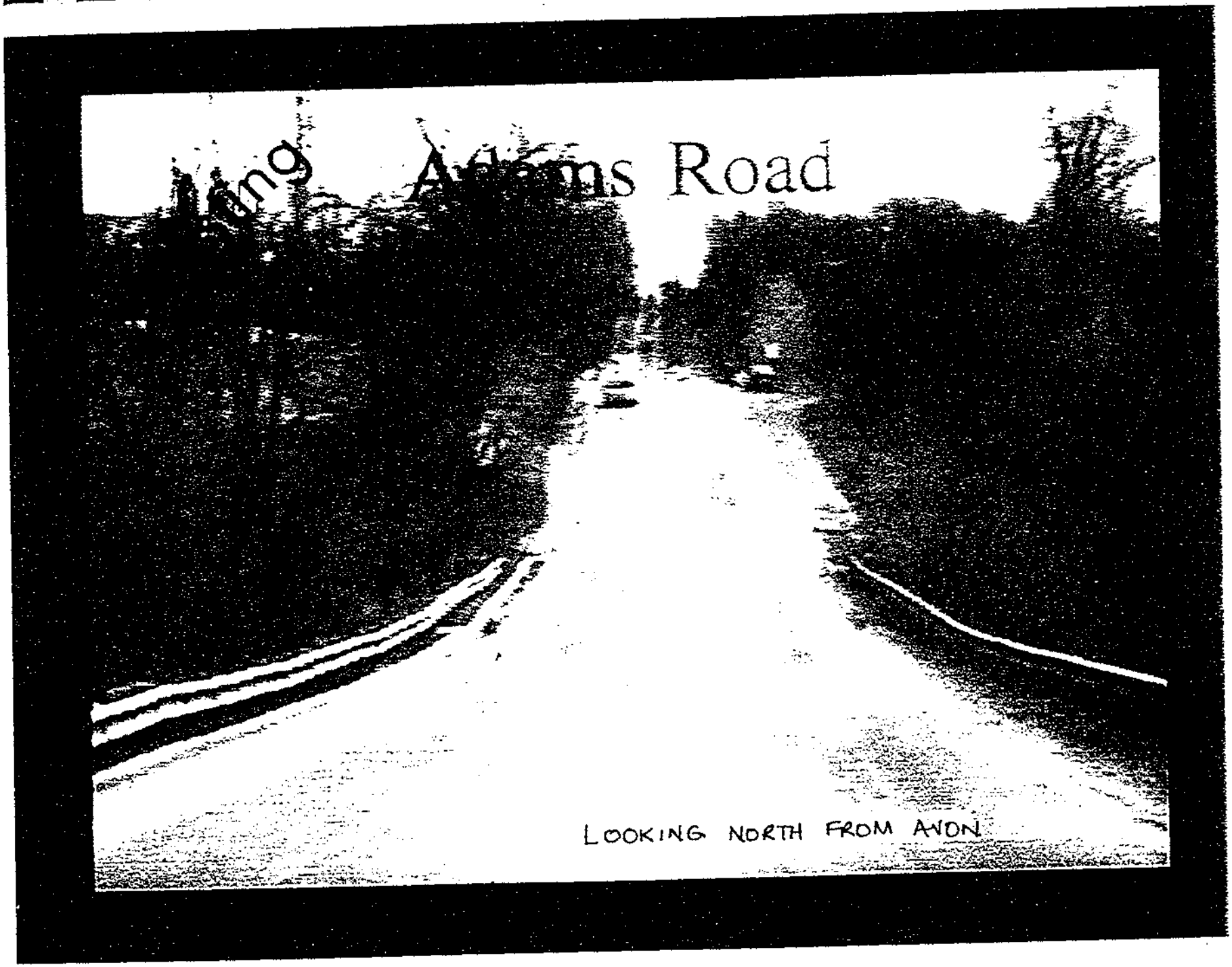
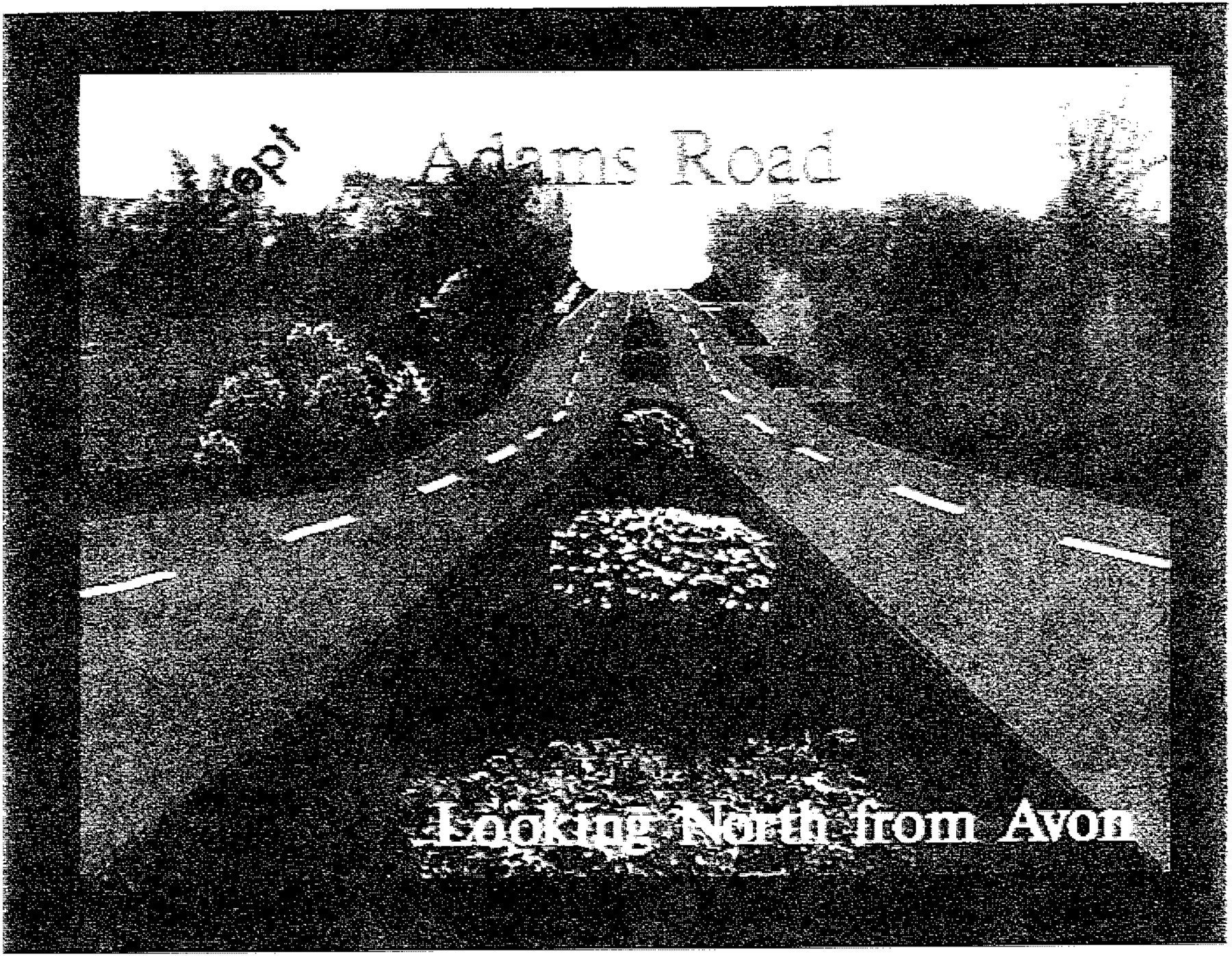

ng Adams Road
LOOKING NORTH FROM AVON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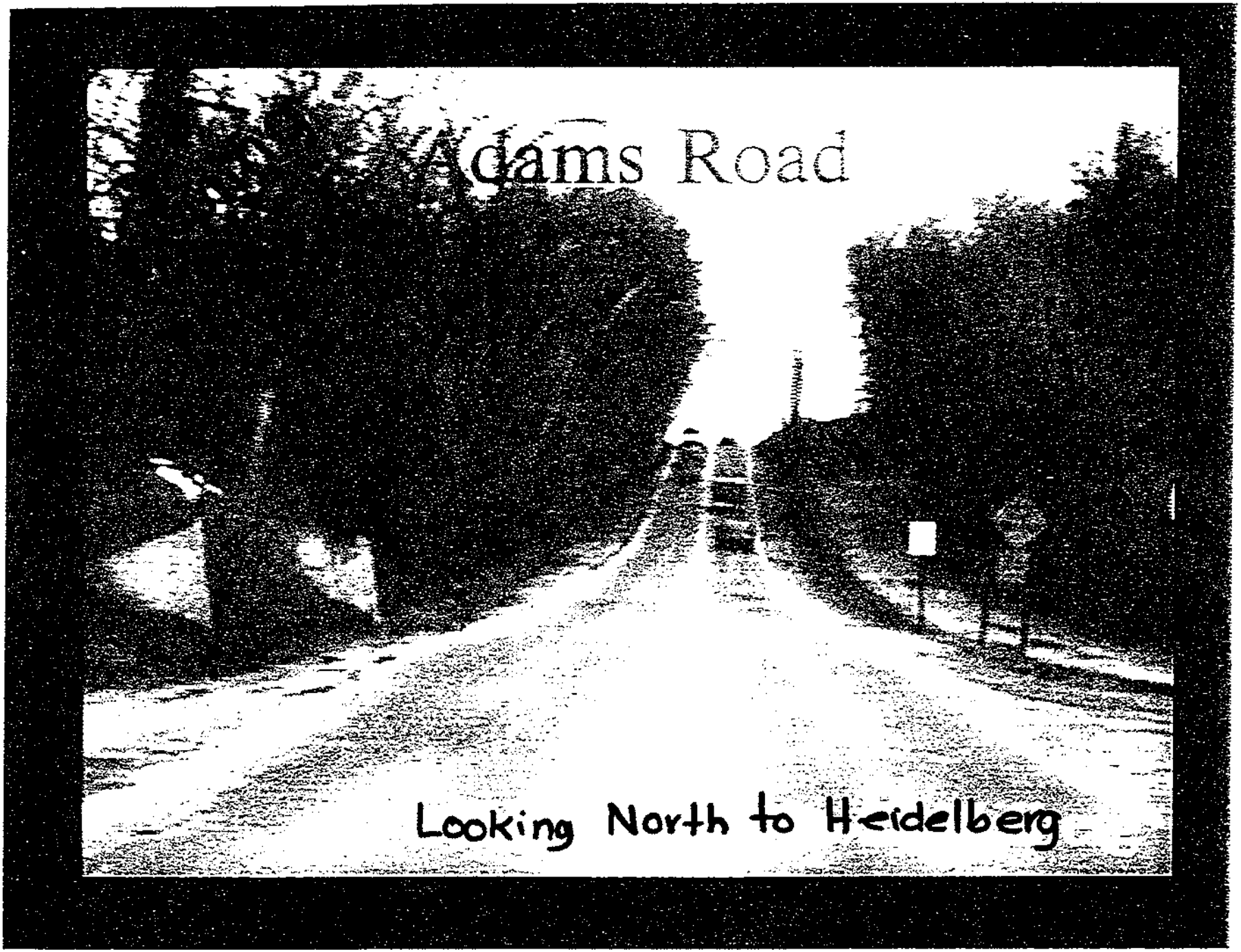
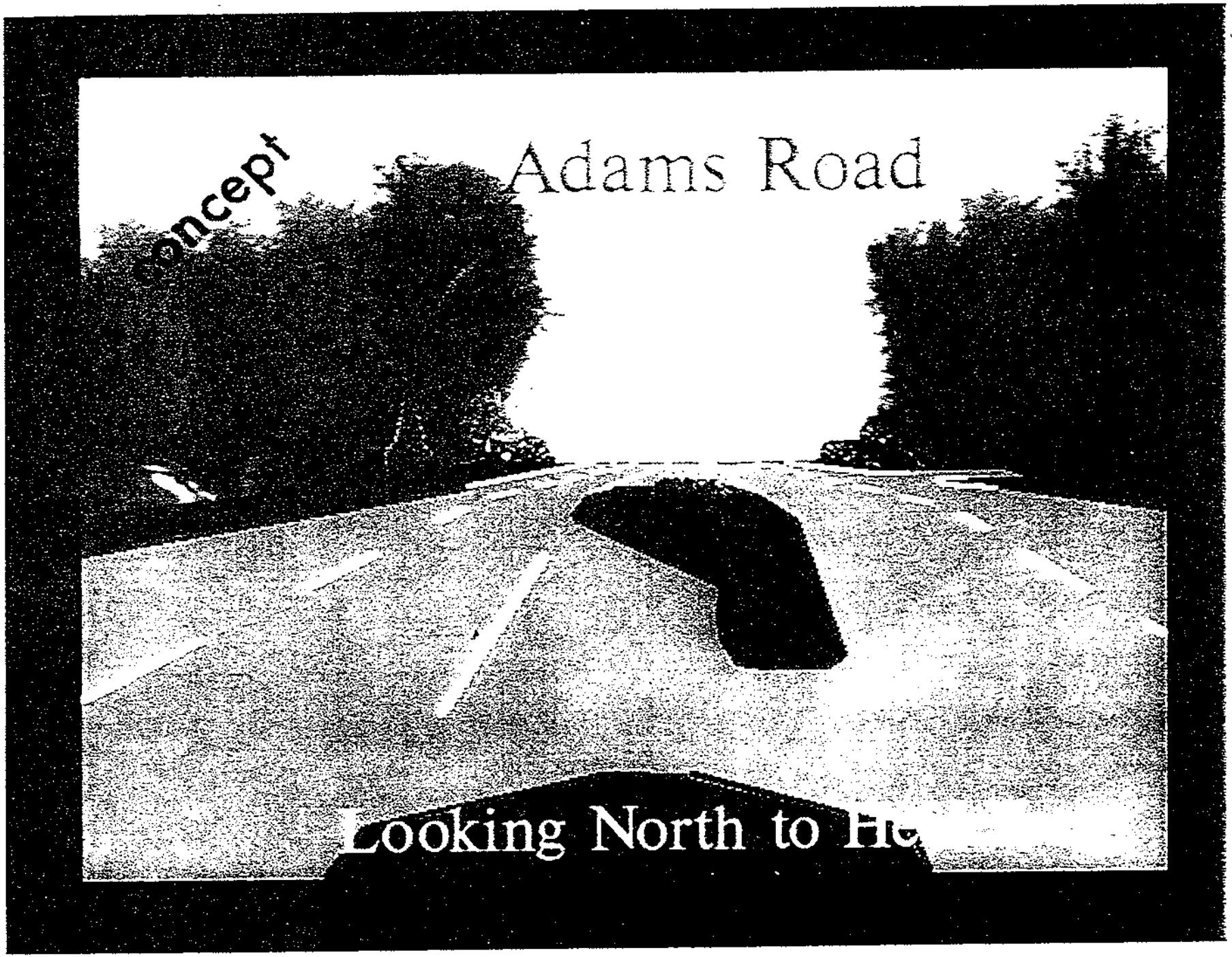

Adams Road
Looking North to Heidelberg


Concept
Adams Road
Looking North to He

CORRADINO

FINAL REPORT

Rochester Hills Master Thoroughfare Plan Update

Submitted to:

The City of Rochester Hills

Submitted by:

The Corradino Group of Michigan, Inc.

In association with:

Orchard, Hiltz & McCliment, Inc.

October 2008

ACKNOWLEDGEMENTS

The participation and cooperation of community leaders and residents in the preparation of the City of Rochester Hills' Master Thoroughfare Plan Update is greatly appreciated. In particular, we acknowledge the efforts of the following individuals:

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Deborah Brnabic, Vice Chair
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City of Troy
Michigan Department of Transportation
Oakland Township
Oakland University
Road Commission for Oakland County
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The City of Rochester Hills would also like to acknowledge and thank the many Citizens of Rochester Hills who attended the various public informational meetings and for providing invaluable input throughout the process.

**Member of Technical Advisory Committee*

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Appendix B Complete Listing by Workshop of Prouds, Concerns and Proposed Improvements
Appendix C Notes, Comments from Technical Committee and Public Meetings
Appendix D Travel Time Data
Appendix E Potential Property Acquisition Maps
Appendix F Crash Data
Appendix G RCOC Strategic Plans for Adjacent Communities

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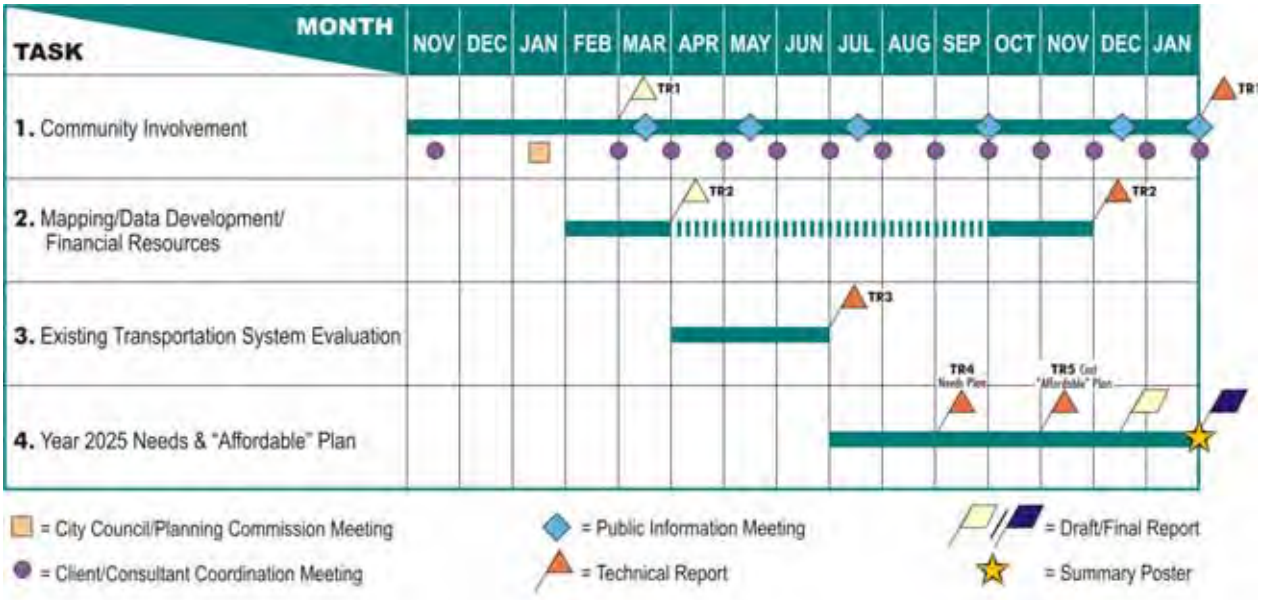
1. Introduction

The Rochester Hills Master Thoroughfare Plan Update is an opportunity for the community to anticipate travel needs for the next 25+ years to ensure that all modes of transportation are appropriately combined in an achievable plan. The Master Thoroughfare Plan Update anticipates the likely patterns of travel by all modes and defines how proposed improvements can be made in the reasonably foreseeable future with available sources of revenue.

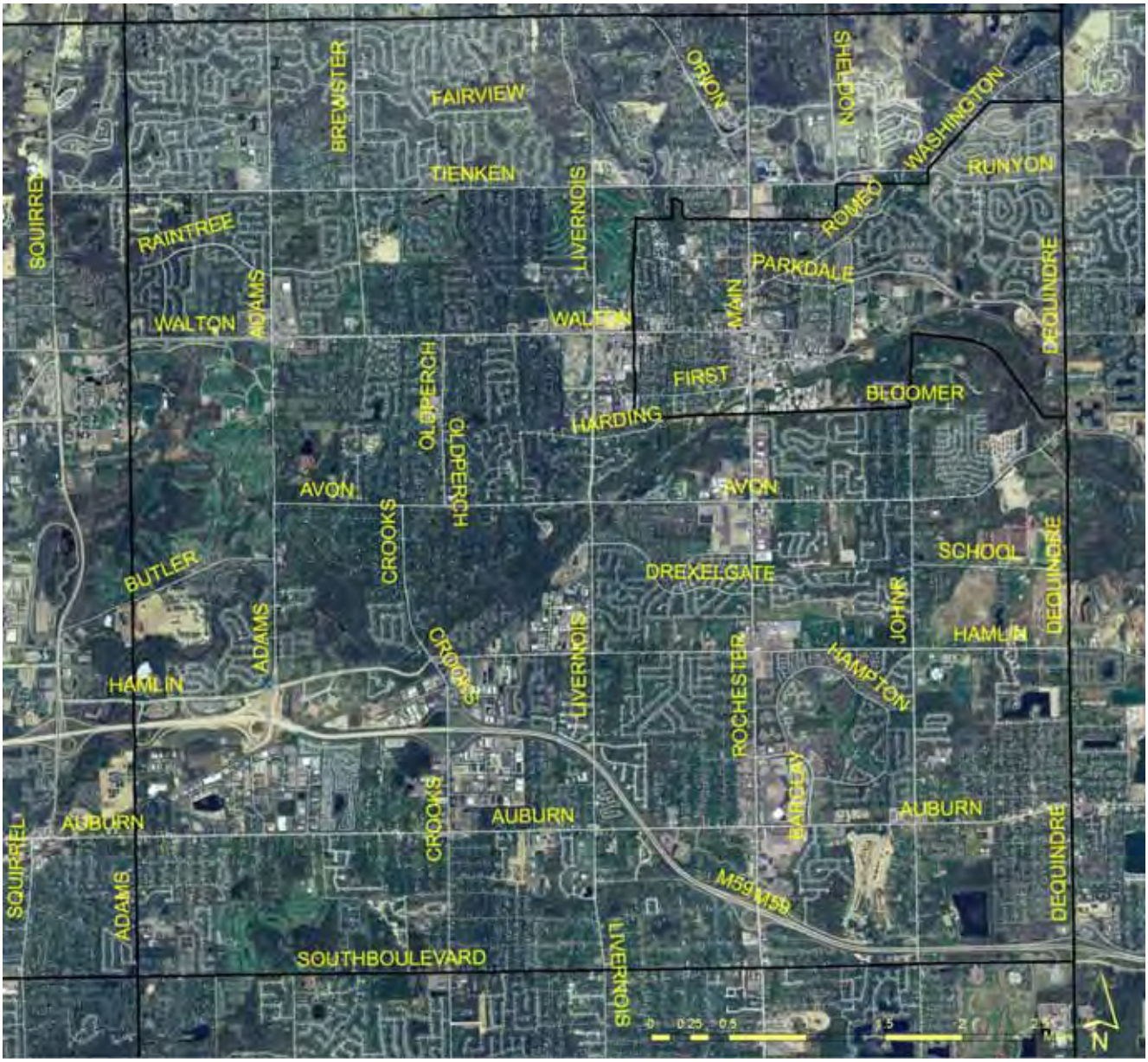
The project's tasks and schedule are shown in Figure 1-1. Key components of the effort include involvement of the public and guidance by a Technical Committee. Six rounds of public meetings and monthly Technical Committee meetings knit the work into an effective program.

Figure 1-1
Rochester Hills Master Thoroughfare Plan Update
Project Schedule



The project's study area is shown in Figure 1-2. Rochester Hill's roadways total 334 miles, including 215 miles of local and 38.5 miles of major roads. Oakland County owns and maintains 53.5 miles, and the State of Michigan 27 miles of roadway within the City.

Figure 1-2
Rochester Hills Master Thoroughfare Plan Update
Study Area



1.1 Background

Avon Township has grown from a rural township to a full-service city now known as Rochester Hills, incorporated in 1984 and located in eastern Oakland County. The city covers 32 square miles and surrounds the City of Rochester. The population, according to the 2000 census, is 68,825 which represents an 11 percent increase from 1990 and triple the population from 1970.

In 1989 the City of Rochester Hills completed a Comprehensive Transportation Plan that identified future needs and recommended a transportation improvement program. The plan was updated in 1991 and 1998. The current Master Thoroughfare Plan Update considers the recently-completed Master Land Use Plan (February 2007), other developments since 1998 and forecasts to 2035. Other considerations important to the transportation planning process include coordination with adjoining counties, townships, and cities so that their transportation plans are considered as they affect the City of Rochester Hills. Another very important part of the process is the involvement of the public.

2. Public Engagement/Community Involvement/Evaluation Process

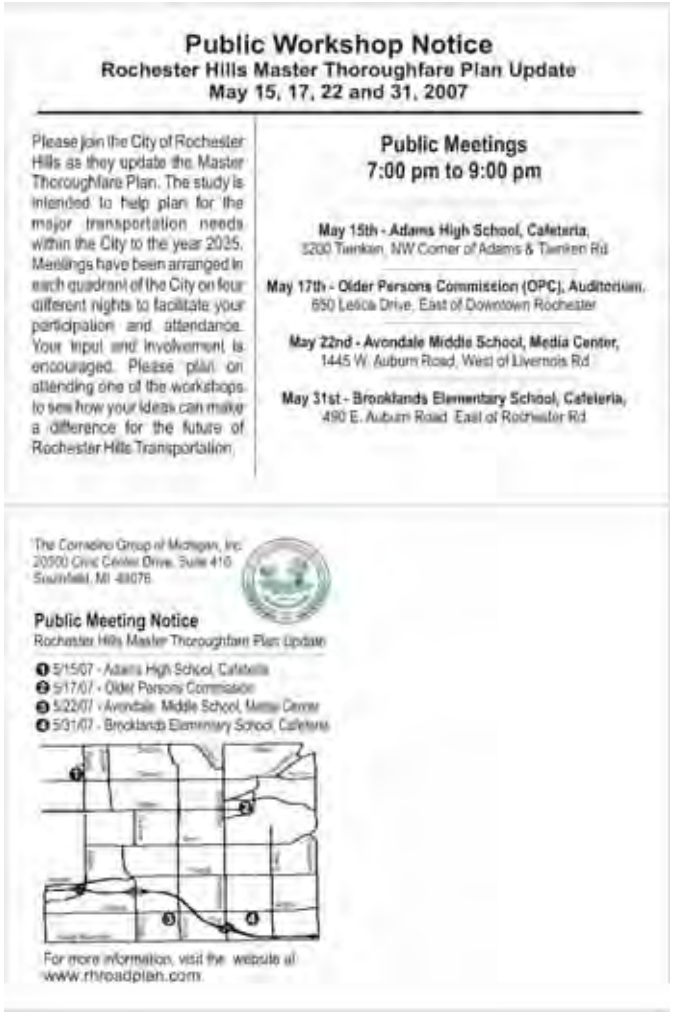
A Community Involvement Plan "CIP" was key to ensuring the planning process was inclusive. As depicted on the project schedule, public meetings were scheduled and conducted throughout the yearlong process. The Technical Committee met monthly and meetings with City staff were held as needed.

The first public meeting was held on March 29, 2007, at which the project work program, schedule, and transportation issues were discussed. One hundred disposable cameras were provided to attendees so they could develop visual images of issues that made them proud or concerned them about the transportation system in Rochester Hills. The photographs are provided in Appendix A.

The second round of public meetings included a series of four separate workshops in four different locations in the city to achieve a wide view of the issues. These workshops were conducted on May 15, 17, 22, and 31, 2007, at the locations shown on Figure 2-1.

Each of the May workshops began with a presentation of the purpose of the Master Thoroughfare Plan Update (Figure 2-2). Then, participants articulated those items that make them proud of the area's transportation system as well as those that concern them. These issues were summarized and prioritized before moving into the portion of the meeting in which participants were asked to describe what they see in their "mind's eye" for the area's future transportation system, and how they would improve it. Finally, the meeting participants were asked to place weights of importance on each of seven factors to be used in the evaluation of the alternative transportation improvements so a plan could be prepared that reflects quality-of-life issues, as community representatives see them.

Figure 2-1
Notice of May 2007 Public Workshops



Public Workshop Notice
Rochester Hills Master Thoroughfare Plan Update
May 15, 17, 22 and 31, 2007

Please join the City of Rochester Hills as they update the Master Thoroughfare Plan. The study is intended to help plan for the major transportation needs within the City to the year 2035. Meetings have been arranged in each quadrant of the City on four different nights to facilitate your participation and attendance. Your input and involvement is encouraged. Please plan on attending one of the workshops to see how your ideas can make a difference for the future of Rochester Hills Transportation.

Public Meetings
7:00 pm to 9:00 pm

May 15th - Adams High School, Cafeteria,
3200 Temken, NW Corner of Adams & Temken Rd

May 17th - Older Persons Commission (OPC), Auditorium,
650 Letica Drive, East of Downtown Rochester

May 22nd - Avondale Middle School, Media Center,
1445 W. Auburn Road, West of Livernois Rd

May 31st - Brooklands Elementary School, Cafeteria,
490 E. Auburn Road East of Rochester Rd

The Corradino Group of Michigan, Inc.
20500 Civic Center Drive, Suite 410
Southfield, MI 48076

Public Meeting Notice
Rochester Hills Master Thoroughfare Plan Update

1. 5/15/07 - Adams High School, Cafeteria
2. 5/17/07 - Older Persons Commission
3. 5/22/07 - Avondale Middle School, Media Center
4. 5/31/07 - Brooklands Elementary School, Cafeteria

For more information, visit the website at www.rhroadplan.com

Figure 2-2
Agenda for May 2007 Public Workshops

Rochester Hills Major Thoroughfare Plan Update
Workshop
AGENDA
May 2007

Overview

Welcome - Rochester Hills

Purpose of the Meeting - The Corradino Group

Prouds and Concerns - The Corradino Group/Facilitators
- Each participant identifies what makes them "proud" about the transportation system in Rochester Hills and what "concerns" them.
- Select three proudest "prouds" and three greatest "concerns."

Looking at the Future by Group of Participants
- Imagine Rochester Hills of the future
- What would the transportation system look like?
  - Define improvements on maps provided.

Define Proposed Improvements by Group of Participants
- Report by individual group to all participants
- Prioritize suggested improvements

Weight Evaluation Factor - by Individual Participant

Next Steps - The Corradino Group

Adjourn

2.1 What the People Are Proud Of

Tables 2-1 through 2-4 describe the highest priority "prouds," "concerns" and improvements articulated by the community members who attended the four May workshops.

Overall, the four groups developed the following items of which they are proud when viewing the area's transportation system.

Most significant among these prouds are:

- Pathway system
- Rochester Hills is a destination community, not a "pass through"
- Landscaping/trees on roadway network
- Trailways/pathways
- Topography, greenery
- Maintaining an aesthetically pleasing community
- Access to I-75 and M-59
- Tree-lined country roads
- Landscaping (example, Big Beaver)
- Left- and right-turn lanes at intersections
- Walton when a boulevard – wide with median
- Boulevards – save time/safer
- Traffic-responsive signals
- Small-town atmosphere (example, Dexter, Charlevoix, etc.)
- Hamlin (Adams to Crooks)
- Two-lane roads keeping higher housing values
- Roundabouts

Table 2-1
Rochester Hills Master Thoroughfare Plan Update
Workshop Participants
Statement of Prouds/Concerns and Proposed Transportation Improvements
May 15, 2007

Highest-placed Prouds	Highest-placed Concerns
■ Pathway system ■ Rochester Hills is a destination, not a "path through" ■ Landscaping/trees on roadway network ■ Trailways/pathways ■ Topography ■ Walton, when a boulevard – wide with median ■ The portion of Walton that is boulevard	■ Rochester Hills needs road reconstruction, not repair (Avon/Adams) ■ Public input not heard/considered ■ Poorly landscaped median islands ■ Northbound Adams at PM rush hour

Highest-placed Proposed Improvement
■ Keep Rochester Hills green – more trees ■ Maintain existing roads ■ Widen M-59 to three lanes in each direction from Crooks to Ryan Road ■ Widen Adams Road corridor from Hamlin to Tienken ■ Crooks Road Interchange and Crooks from M-59 to Hamlin

Table 2-2
Rochester Hills Master Thoroughfare Plan Update
Workshop Participants
Statement of Prouds/Concerns and Proposed Transportation Improvements
May 17, 2007

Highest-placed Prouds	Highest-placed Concerns
■ Pathway system ■ Boulevards – save time/safer ■ Traffic responsive signals ■ Rolling terrain, hills – Topography	■ Poor coordination of signals ■ Poor pavements – all of Walton east of Adams, Tienken, Rochester to Livernois ■ Don't just widen – better maintain existing roads and improve safety ■ Unfinished Crooks from M-59 to Hamlin ■ Boulevard median landscaping and maintenance ■ Improve aesthetics of city's medians – trees, landscaping ■ Road network negatively affecting quality-of-life issues ■ Condition of major roads

Highest-placed Proposed Improvement
■ Change design standards for "quality roads" ■ Improve M-59 through Rochester Hills ■ Make developers pay impact fees ■ Traffic signal system improvements

Table 2-3
Rochester Hills Master Thoroughfare Plan Update
Workshop Participants
Statement of Prouds/Concerns and Proposed Transportation Improvements
May 22, 2007

Highest-placed Prouds	Highest-placed Concerns
■ Small-town atmosphere (example, Dexter, Charlevoix, etc.) ■ Maintaining an aesthetically pleasing community (others) ■ Access to I-75 and M-59 ■ Rolling terrain, greenery	■ Lack of public transit ■ Lack of safe pedestrian road crossings (refuge islands are unsafe) ■ Road maintenance

Highest-placed Proposed Improvement
■ Pedestrian-friendly design standards ■ Pathways – connectivity, build one side first ■ Widen Livernois – South Boulevard to Avon ■ Rebuild pavement on Tienken – Paint Creek Bridge to Rochester ■ Fix sight distance problems along Adams (rolling terrain) ■ Maintain what we have first ■ Boulevard Dequindre (M-59 to 26 Mile)

Table 2-4
Rochester Hills Master Thoroughfare Plan Update
Workshop Participants
Statement of Prouds/Concerns and Proposed Transportation Improvements
May 31, 2007

Highest-placed Prouds	Highest-placed Concerns
■ Tree-lined country roads ■ Landscaping (example, Big Beaver) ■ Left- and right-turn lanes at intersections ■ Hamlin (Adams to Crooks) ■ Trailways and pathways ■ Two-lane roads keeping higher housing values ■ Roundabouts	■ Not enough lanes on M-59 ■ Center left-turn lane (example, Rochester Road) ■ Maintaining what we have – "Preserve First" ■ Michigan left at Livernois and Walton

Highest-placed Proposed Improvement
■ Determine one north-south and one east-west road corridor to improve/widen ■ Widen M-59 ■ Traffic signals to favor peak flows ■ Provide public mass transit ■ Keep two-lane roads ■ Access management ■ Provide eastbound left-turn on Walton at Livernois to remove cut-through traffic north and east through neighborhood

2.2 Concerns

The participants of the workshops were also asked to reflect on the items that concern them about the Rochester Hills transportation system (Tables 2-1 through 2-4). Those concerns expressed most frequently are:

- Rochester Hills needs road reconstruction, not repair (Avon/Adams)
- Public input not heard/considered
- Poorly landscaped median islands
- Northbound Adams at PM rush hour
- Poor coordination of signals
- Poor pavements – all of Walton east of Adams, Tienken, Rochester to Livernois
- Don't just widen – better maintain existing roads and improve safety
- Unfinished Crooks from M-59 to Hamlin
- Boulevard median landscaping and maintenance
- Improve aesthetics of city's medians – trees, landscaping
- Road network negatively affecting quality-of-life issues
- Condition of major roads
- Lack of public transit
- Lack of safe pedestrian road crossings (refuge islands are unsafe)
- Road maintenance
- Not enough lanes on M-59
- Center left-turn lane (example, Rochester Road)
- Maintaining what we have – "Preserve First"
- "Michigan left turn" at Livernois and Walton

Complete input from the workshops is provided in Appendix B.

2.3 Weighting of Evaluation Factors

Each workshop participant weighted seven factors that were used in developing a recommended plan. A summary statement of each factor is presented below. The forms used to rank and then rate the factors are presented in Figures 2-3 and 2-4, respectively.

- Minimize Neighborhood Disruption – The transportation network of the future will have traffic volumes on roadway links that are likely to be different from those of today. To measure the effects of various transportation system alternatives on/near neighborhood areas, the forecast volumes, congestion and speeds on key roadway segments near several neighborhoods were computed.

- Connect Links in Road Network – To measure the degree to which different connections affect overall travel, the movements between key locations in and around Rochester Hills were examined.

- Maintain Good Air Quality – An assessment was prepared of the degree to which air quality associated with increased traffic will cause negative air quality conditions.

- Minimize Purchase of Private Property to Build Transportation Facilities – Concepts for modifying the elements of the transportation system to develop the future year thoroughfare plan could involve property acquisition. The extent to which this could occur was measured.

Figure 2-3
Rochester Hills Master Thoroughfare Plan Update
Evaluation Factor Ranking Form

How Important Are These Factors?

We want to know how important you believe the following factors are in developing the Year 2035 Master Thoroughfare Plan for Rochester Hills. These factors will be used to help determine which changes should be made to the highway, pathway and public transportation elements in Rochester Hills.

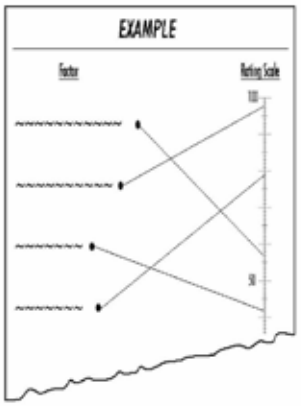
To provide us your opinion, please rank the following factors "1" through "7," with "1" indicating the factor you believe is most important and "7" indicating the factor you believe is least important. Use each number only once. When finished, return your form to a project representative or by email using the Web site address or fax to the number listed at the bottom of the sheet.

Your opinions will be used to evaluate the long range transportation plan alternatives. Thank you.

Factor	Rank
Minimize Neighborhood Disruption	_____
Better Connect Links in the Transit and Road Networks	_____
Maintain Good Air Quality	_____
Minimize Purchase of Private Property to Build Transportation Facilities	_____
Protect Open Spaces/Parks	_____
Control Noise at Sensitive Locations (e.g., homes, schools, hospitals, etc.)	_____
Maximize Safe Travel	_____

Figure 2-4
Rochester Hills Master Thoroughfare Plan Update
Evaluation Factor Rating Form

How Important Are These Factors?



We want to know how important you believe the following factors are in developing the Year 2035 Master Thoroughfare Plan for Rochester Hills. These factors will be used to help determine which changes should be made to the highway, pathway and public transportation elements in Rochester Hills.

To provide us your opinion, please rate the following factors "0" through "100," with the highest rating indicating the factor you believe is most important. To do this, draw a line from the dot (·) following the factor name to the scale to indicate your opinion. An example is shown to the right. When finished, return your form to a project representative or by email using the Web site address or fax to the number listed at the bottom of the sheet.

Your opinions will be used to evaluate the long range transportation plan alternatives. Thank you.

Factor

Rating Scale

Minimize Neighborhood Disruption ·

Better Connect Links in the Road Network ·

Maintain Good Air Quality ·

Minimize Purchase of Private Property to Build Transportation Facilities ·

Protect Open Spaces/Parks ·

Control Noise at Sensitive Locations (e.g., homes, schools, hospitals, etc.) ·

Maximize Safe Travel ·

- Control Noise at Sensitive Locations – Homes, schools, and hospitals are among land uses considered sensitive to noise. The expected change in noise at sensitive locations was measured.

- Protect Open Space/Parks – This issue is very much like that of private property acquisition. The acres of potential parkland/open space possibly needed to develop various transportation elements tested for inclusion in the thoroughfare plan were measured.

- Maximize Safe Travel – Each alternative transportation system was related to current crash experience and a forecast of future crashes was developed.

The individual results of the weightings by workshop are shown in Table 2-5. The following were weighted as the top three factors – not necessarily in the same order – by each group of workshop participants (see green circles on Table 2-5): Minimize Neighborhood Disruption, Minimize Purchase of Private Property, and Maximize Safe Travel.

The three lowest-weighted factors (red triangles on Table 2-5) regularly included these two: "Maintain Good Air Quality" and "Control Noise at Sensitive Locations."

When combining the weightings of all four workshops, the top two factors were "Minimize Neighborhood Disruption" and "Maximize Safe Travel." The two lowest factors were assigned to "Maintain Good Air Quality" and "Control Noise at Sensitive Locations" (Table 2-6).

The study's Technical Committee and its consultant also weighted the factors (Tables 2-7 and 2-8). Analysis of all results indicated the community participants, the Technical Committee and the consultant were closely aligned in what they believe was important to planning the transportation system for the City of Rochester Hills.

The third Public Meeting was held on July 31, 2007. Approximately 30 people attended. The meeting focused on input received at the workshops in May. The photos the community took of "prouds" and "concerns" were also displayed. The later part of the meeting focused on existing and future congestion and safety issues and the development and evaluation of alternative transportation systems.

The fourth Public Meeting was held on November 13, 2007. This meeting was well attended and discussed the evaluation and performance of nearly 30 alternatives.

The fifth Public Meeting presented the recommendations from the study and provided a draft copy of the final report to all participants.

The last Public Meeting was a presentation to the City Council and Planning Commission on the final plan.

Notes and comments from Technical Committee and public meetings are provided in Appendix C.

Table 2-5
Rochester Hills Master Thoroughfare Plan Update
Community Participation Evaluation Factor Weightings
by Workshop

Factor	May 15, 2007 (15)			
	Rank Wt.	Rate Wt.	Avg.	Order
Minimize Neighborhood Disruption	23.1%	17.3%	20.2%	1
Better Connect Links in the Transit and Road Networks	12.0%	12.6%	12.3%	5
Maintain Good Air Quality	10.2%	13.2%	11.7%	7
Minimize Purchase of Private Property to Build Transportation Facilities	13.9%	14.6%	14.3%	3
Protect Open Spaces/Parks	13.9%	14.5%	14.2%	4
Control Noise at Sensitive Locations (e.g., homes, schools, hospitals, etc.)	11.7%	12.5%	12.1%	6
Maximize Safe Travel	14.9%	15.1%	15.0%	2

Factor	May 17, 2007 (9)			
	Rank Wt.	Rate Wt.	Avg.	Order
Minimize Neighborhood Disruption	18.5%	14.6%	16.6%	2
Better Connect Links in the Transit and Road Networks	14.2%	16.7%	15.4%	3
Maintain Good Air Quality	10.9%	13.5%	12.2%	5
Minimize Purchase of Private Property to Build Transportation Facilities	10.2%	12.0%	11.1%	7
Protect Open Spaces/Parks	13.7%	14.5%	14.2%	4
Control Noise at Sensitive Locations (e.g., homes, schools, hospitals, etc.)	11.2%	11.3%	11.3%	6
Maximize Safe Travel	20.9%	17.2%	19.1%	1

Factor	May 22, 2007 (8)			
	Rank Wt.	Rate Wt.	Avg.	Order
Minimize Neighborhood Disruption	15.4%	15.2%	15.3%	3
Better Connect Links in the Transit and Road Networks	15.5%	14.3%	14.9%	4
Maintain Good Air Quality	11.1%	14.0%	12.6%	5
Minimize Purchase of Private Property to Build Transportation Facilities	11.4%	12.1%	11.7%	6
Protect Open Spaces/Parks	20.6%	18.1%	19.4%	1
Control Noise at Sensitive Locations (e.g., homes, schools, hospitals, etc.)	10.3%	10.7%	10.5%	7
Maximize Safe Travel	15.5%	15.3%	15.4%	2

Factor	May 31, 2007 (16)			
	Rank Wt.	Rate Wt.	Avg.	Order
Minimize Neighborhood Disruption	23.0%	18.9%	21.0%	1
Better Connect Links in the Transit and Road Networks	11.5%	12.6%	12.1%	4
Maintain Good Air Quality	9.6%	10.0%	9.8%	7
Minimize Purchase of Private Property to Build Transportation Facilities	10.0%	11.2%	10.6%	6
Protect Open Spaces/Parks	17.3%	17.7%	17.5%	2
Control Noise at Sensitive Locations (e.g., homes, schools, hospitals, etc.)	11.0%	12.5%	11.8%	5
Maximize Safe Travel	17.3%	16.8%	17.0%	3

○ indicates a high-rated factor

△ indicates a low-rated factor

Table 2-6
Rochester Hills Master Thoroughfare Plan Update
Composite Workshop Evaluation Factor Weighting

Factor	Citizens (48)			
	Rank Wt.	Rate Wt.	Avg.	Order
Minimize Neighborhood Disruption	20.8%	17.0%	18.9%	1
Better Connect Links in the Transit and Road Networks	12.9%	13.7%	13.3%	4
Maintain Good Air Quality	10.5%	12.4%	11.4%	7
Minimize Purchase of Private Property to Build Transportation Facilities	11.5%	12.7%	12.1%	5
Protect Open Spaces/Parks	16.0%	16.1%	16.0%	3
Control Noise at Sensitive Locations (e.g., homes, schools, hospitals, etc.)	11.3%	12.0%	11.7%	6
Maximize Safe Travel	17.0%	16.1%	16.6%	2

○ indicates a high-rated factor
△ indicates a low-rated factor

Table 2-7
Technical Committee Evaluation Factor Weighting

Factor	Technical Committee (11)			
	Rank Wt.	Rate Wt.	Avg.	Order
Minimize Neighborhood Disruption	14.1%	15.9%	15.0%	3
Better Connect Links in the Transit and Road Networks	15.9%	17.6%	16.7%	2
Maintain Good Air Quality	8.3%	11.5%	9.9%	5
Minimize Purchase of Private Property to Build Transportation Facilities	10.3%	14.1%	12.2%	4
Protect Open Spaces/Parks	8.3%	11.1%	9.7%	6
Control Noise at Sensitive Locations	7.9%	10.9%	9.4%	7
Maximize Safe Travel	35.2%	18.9%	27.0%	1

○ indicates a high-rated factor
△ indicates a low-rated factor

Table 2-8
Consultant Evaluation Factor Weighting

Factor	Consultant (8)			
	Rank Wt.	Rate Wt.	Avg.	Order
Minimize Neighborhood Disruption	21.2%	16.7%	18.9%	2
Better Connect Links in the Transit and Road Networks	15.9%	16.6%	16.2%	3
Maintain Good Air Quality	9.1%	12.0%	10.5%	6
Minimize Purchase of Private Property to Build Transportation Facilities	9.8%	12.1%	10.9%	5
Protect Open Spaces/Parks	11.5%	14.7%	13.1%	4
Control Noise at Sensitive Locations	7.2%	9.3%	8.2%	7
Maximize Safe Travel	25.4%	18.6%	22.0%	1

○ indicates a high-rated factor
△ indicates a low-rated factor

2.4 Public Opinion Survey in Regards to Transportation

In the spring of 2007 the City of Rochester Hills, independent of this study process authorized the Public Affairs Research Laboratory at Oakland University to conduct a public opinion survey of its residents. The results were summarized in the summer of 2007. We have extracted related questions and responses related to transportation and provided them here for information purposes only. The complete public opinion survey can be found on the City web site or at City Hall.

4. How would you rate the condition of the following?

	Excellent	Good	Fair	Poor
4a. The street in front of your home or apartment complex?	15%	42%	24%	19%
4b. Streets in your neighborhood or subdivision?	11%	42%	28%	19%
4c. Major roads in Rochester Hills?	1%	43%	41%	15%

5. How would you rate routine maintenance on neighborhood and subdivision streets in the City?

Very Satisfied	Satisfied	Uncertain	Dissatisfied	Very Dissatisfied
3%	46%	24%	21%	7%

7. How should the following road improvements be funded?

	Special Assessment	Millage	Uncertain
7a. Reconstruction of paved streets	17%	55%	28%
7b. Long-term maintenance projects	9%	63%	28%

8. What is the maximum addition to your annual property tax bill you would be willing to pay to fund road improvements?

$ 0	$ 1-50	$ 51-100	$ 101-200	$ 201 – 300
20%	27%	27%	20%	7%

9. Willingness to pay by property value.

Maximum annual addition to property tax:			
Est. market value of home	% saying $0	Median $ increase	Number
Under $200K	24%	$ 50	79
$200 - 350K	17%	$ 75	187
$350 - 500K	19%	$100	79
Over $500K	11%	$100	18

10. How would you rate the City's performance in addressing traffic congestion on local roads?

Very Satisfied	Satisfied	Uncertain	Dissatisfied	Very Dissatisfied
4%	36%	22%	29%	9%

11. On a normal day, how many minutes would you estimate that you spend stuck in traffic due to local road congestion in Rochester Hills?

	%	Cum. %
No delay	7%	7%
1-5 minutes	20%	27%
6-10 minutes	30%	57%
11-15 minutes	21%	78%
16-20 minutes	12%	90%
21-30 minutes	10%	100%

12. Should selected major roads in the City be widened to relieve traffic congestion?

Yes	No	Uncertain
66%	20%	14%

If Yes, which one major road would you say is most in need of widening?

Adams	Crooks	Livernois	Tienken	Hamlin	Auburn	Rochester	Dequindre	Avon	M-59	Walton	John R	University
18%	15%	14%	12%	11%	8%	7%	6%	7%	2%	2%	1%	1%

13. How would you rate the newly reconstructed intersection at Tienken and Rochester Roads?

Very Satisfied	Satisfied	Uncertain	Dissatisfied	Very Dissatisfied
27%	45%	24%	2%	2%

14. How important are pathways to you?

Very Important	Somewhat important	Not important	Uncertain
38%	36%	24%	2%

15. Would you support the levy of a new millage to undertake road improvements aimed at reducing traffic congestion in the City?

Yes	No	Uncertain
43%	32%	25%

23. Can you recommend one improvement to any City park or trail that you would use regularly?

Trails

- Pave/improve surface on one or both trails = 25 respondents
- More parking at trailheads = 2
- More access points to PCT
- Connect the two trails

Bloomer

- Get John R pathway/sidewalk to = 2
- Parking and roads in

23. Recommended Park Improvements

Nowicki
- Complete a path to

General
- Bicycle paths that do not end in mud

29a. What would you say are the three most serious problems facing the City today? (four listed)

The top 3 were.

Traffic Congestion	Resident Street Maintenance/Reconstruction	Development/ Growth/Sprawl
60%	42%	41%

30. What would you say is the best thing about the City of Rochester Hills?

- Parks & trails = 35
- Pathways [may mean trails in some cases] = 6

38. Do you work outside the City of Rochester Hills?

Yes	No
62%	38%

39. Approximately how many miles do you travel to work each day, round-trip?

Less than 5 miles	6 – 10 miles	11 – 20 miles	21 – 30 miles	31 – 40 miles	41 – 50 miles	More than 50 miles
22%	24%	19%	16%	8%	4%	6%

3. Evaluation of Roadway Alternatives

It is important to note that this plan considers the major roadways within the City of Rochester Hills. That specifically means the "Mile Roads," freeways, and some other key links shown in Figure 3-1.

The City of Rochester Hills has an extensive non-motorized pathway system primarily along the major roads (Figure 3-2). The blue lines on Figure 3-2 show the paths along the major roads that have been completed in the last ten years. The gaps and discontinuities are shown in red lines and are proposed to be completed in the next 20 years. The gaps are related to some increased cost, right-of-way issues and/or environmental issues. These considerations will be analyzed as part of the non-motorized study and discussed later in this report.

Transit and other characteristics of the thoroughfare system will also be discussed at the end of this report.

3.1 Travel Demand Model Summary

The SEMCOG Transportation Demand Model for the area was used to forecast traffic that affects the Rochester Hills major thoroughfares. To tailor the model for use in this study, the road network was refined to include a number of local roads not in SEMCOG's original network. These refinements strengthened the ability to analyze the performance of the existing transportation system and the potential impact of future development.

Another key part of the model update was splitting 13 traffic analysis zones (TAZs) for Rochester Hills into three dozen zones. This provided more definition of the traffic demands on the local road network which improved the ability to analyze traffic impacts such as congestion and crashes.

Once the network and traffic analysis zones were updated, the model was validated to ensure it replicated traffic conditions in Rochester Hills. To do so, counts received from the City of Rochester Hills and the Road Commission for Oakland County were compared to the data generated by the model.

Application of the model defines road segments in Rochester Hills currently experiencing significant afternoon peak-hour congestion (Table 3-1 and Figure 3-3). These segments now experience traffic volumes that exceed capacity in the afternoon peak hour. They are highlighted in red lines in the figure for existing conditions, and include the following list of road segments.

Figure 3-1
Rochester Hills Master Thoroughfare Plan Update
Major Roadways Under Study

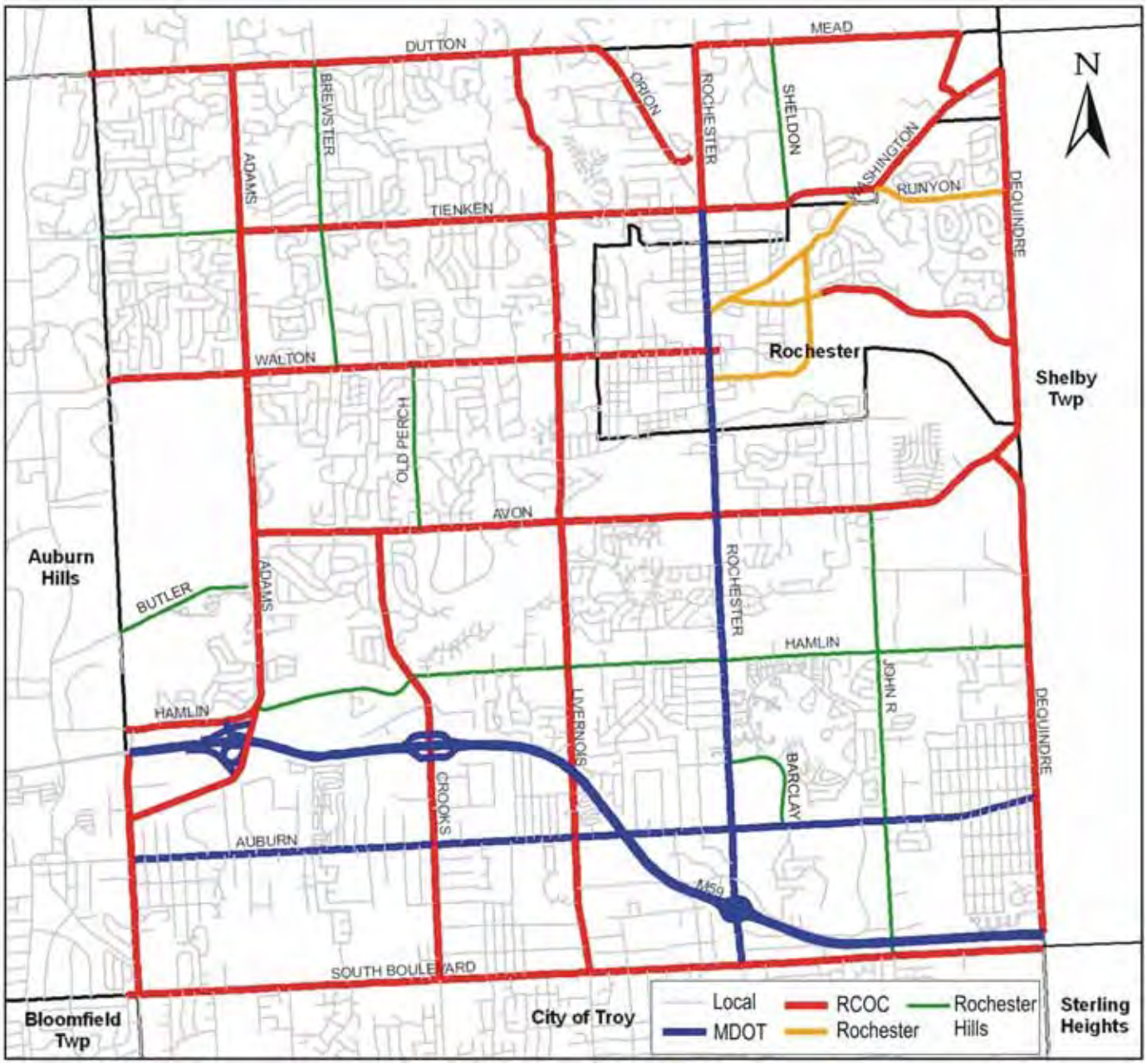


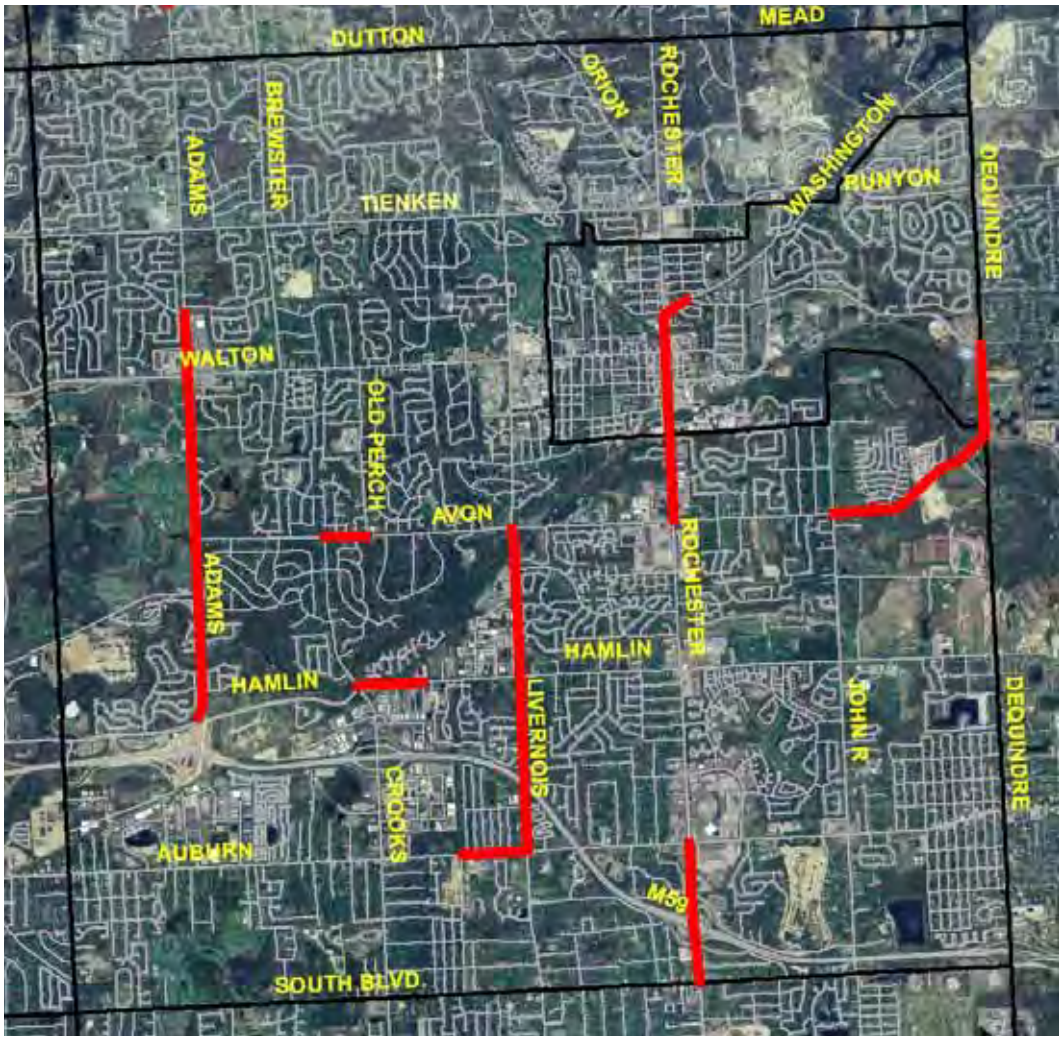
Figure 3-2
Rochester Hills Master Thoroughfare Plan Update
Non-motorized System

Table 3-1
Road Segments with Significant Afternoon Peak Hour Congestion in 2005
(Volume Exceeds Capacity)

Road	From	To
Adams	Hamlin	North of Walton
Avon	Crooks	Old Perch
Hamlin	Crooks	Rochester Industrial Dr.
Auburn	Fairwood	Livernois
Livernois	Auburn	Avon
Rochester	South	Auburn
Rochester	Avon	Parkdale/Romeo
Avon	John R.	Dequindre
Dequindre	John R.	Parkdale

Source: The Corradino Group of Michigan Inc.

Figure 3-3
Rochester Hills Major Thoroughfare Update Plan
Road Segments with Significant Congestion in Afternoon Peak Hour (2005)
(Volume Exceeds Capacity)



Several projects were added to the current roadway network to develop the base condition in 2035. These are projects not yet in place but will be prior to 2035. They are shown as existing and committed projects in Figure 3-4 and cited as follows.

1. Hamlin Rd. four-lane – From Crooks to Livernois
2. Crooks Rd. four-lane – From Hamlin to S. of M-59 Interchange
3. M-59 six-lane highway – From Crooks to Ryan Rd.
4. John R. five-lane – From South Blvd. to Long Lake/18 Mile
5. John R. three-lane – South Blvd. to N. of Auburn
6. Dequindre five-lane – Square Lake to Auburn
7. Walton five-lane – Squirrel to Opdyke
8. Washington pave two-lanes – Runyon to 26 Mile Road

Figure 3-4
Rochester Hills Master Thoroughfare Plan Update
Existing and Committed Projects

With these "committed" projects in place, the road segments expected to experience significant congestion in the year 2035 are listed in Table 3-2 and shown in yellow in Figure 3-5.

Table 3-2
Rochester Hills Master Thoroughfare Plan Update
Road Segments with Significant Afternoon Peak Hour Congestion in 2035

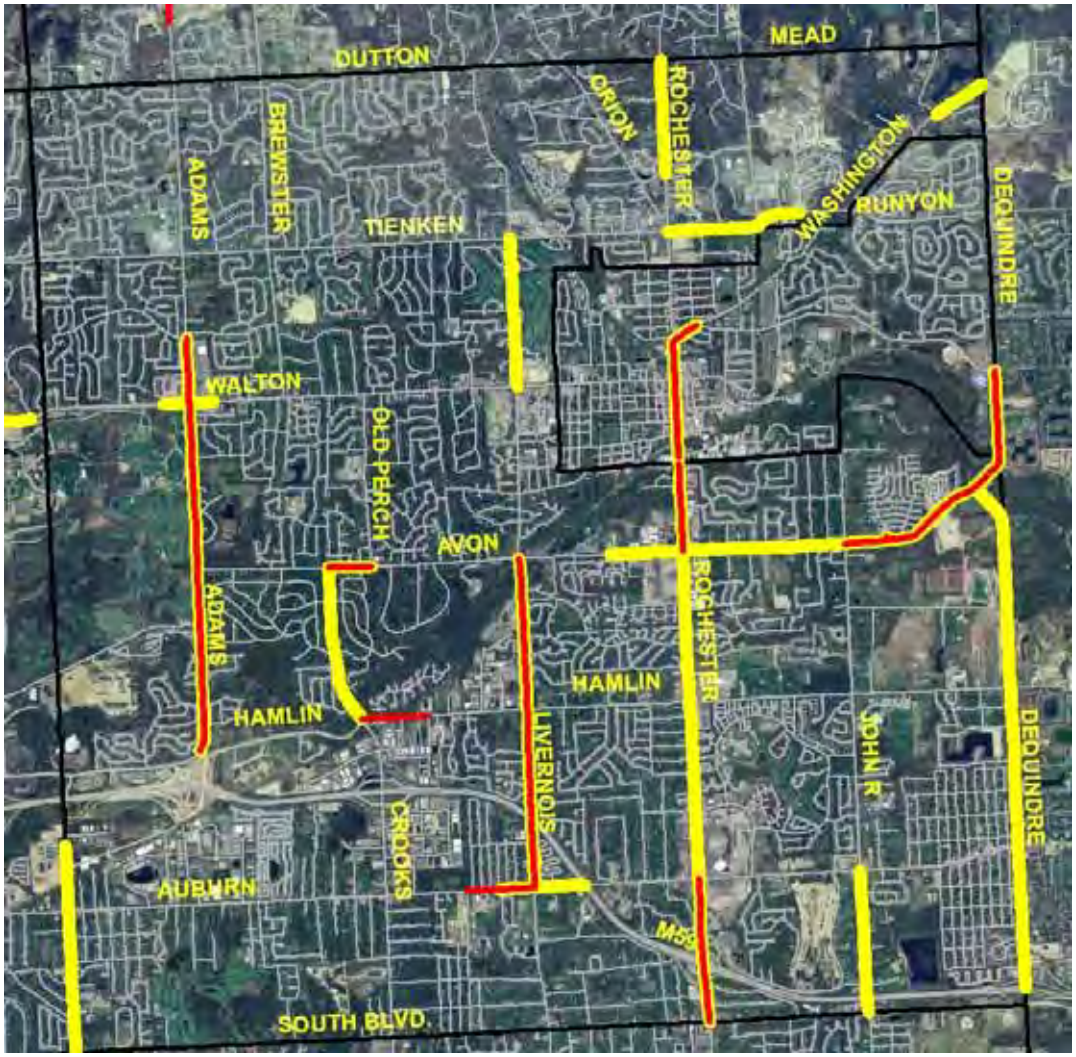
Road	From	To
Adams	Hamlin	North of Walton
Adams	South	Auburn
Walton	West of Adams	East of Adams
Avon	Crooks	Old Perch
Crooks	Hamlin	Avon
Auburn	Fairwood	M-59
Livernois	Auburn	Avon
Livernois	Walton	Tienken
Rochester	South	Diversion/City Limits
Rochester	Orion	Mead
Tienken	Rochester	Sheldon
Avon	Larchwood	Dequindre
John R	South	Auburn
Dequindre	South	Avon
Washington	Winkler Mill	Dequindre

Source: The Corradino Group of Michigan Inc.

Figure 3-5
Rochester Hills Master Thoroughfare Plan Update
Road Segments with Significant Afternoon Peak Hour Congestion in 2035

A composite of both existing (red lines) and future road segments (yellow lines) where significant congestion conditions occur is shown in Figure 3-6.

Figure 3-6
Rochester Hills Master Thoroughfare Plan Update
Road Segments with Significant Afternoon Peak Hour Congestion in 2035



3.2 Transportation Alternatives

The highest-placed proposed transportation improvements developed through public input at the four May 2007 workshops are (Figure 3-7):

1. Widen Adams Road corridor from Hamlin to Tienken Road
2. Widen Tienken to three lanes from King's Cove to west of Rochester Road
3. Widen Dequindre to four lane (narrow boulevard) M-59 to 26 Mile
4. Extend southbound left-turn lane on Adams at Avon Road
5. Extend Avon Road to Butler to Squirrel
6. Widen Livernois Road to four lanes – Tienken Road to South Blvd.
7. Widen Livernois Road-South Blvd to Avon
8. Purchase necessary right-of-way to make Rochester Road a six-lane boulevard
9. Realign Dequindre Road at intersection of Avon/23 Mile
10. Realign Washington Road so that it T's into Dequindre
11. Fix sight distance problems on Adams Road
12. Provide eastbound left-turn on Walton at Livernois to remove cut-throughs in neighborhood northwest of intersection
13. Improve access to Rochester High School from southbound Livernois
14. Need east-west thoroughfare on Tienken Road or Dutton Road

The system-wide proposals include:

- Keep Rochester Hills green – more trees
- Maintain existing roads first
- Change design standards to have "quality roads"
- Make developers pay impact fees
- Traffic signal system improvements
- Pedestrian-friendly design standards
- Pathways – connectivity, build one side first
- Provide public mass transit
- Keep two-lane roads
- Access management

Based on these suggestions, and by working with the project's Technical Committee, a list of alternatives was developed. The same set of 26 road segments labeled A-Z were used to compare the congestion indices and minimize neighborhood disruption. They are shown in Figure 3-8.

The first six alternatives were analyzed to determine the degree to which improvements to north-south roadways would alleviate expected future congestion conditions. The alternatives are shown in Figure 3-9. They generally include the widening or expanding of the roadway by one lane in each direction to effectively double the capacity of the road. Alternative 1, for example, was developed and tested by modifying Dequindre Road to make it a four- or five-lane roadway from Auburn Road to 26 Mile Road. This was the only change made above the E+C network discussed earlier.

Figure 3-7
Rochester Hills Master Thoroughfare Plan Update
Proposed Improvements from May Workshops

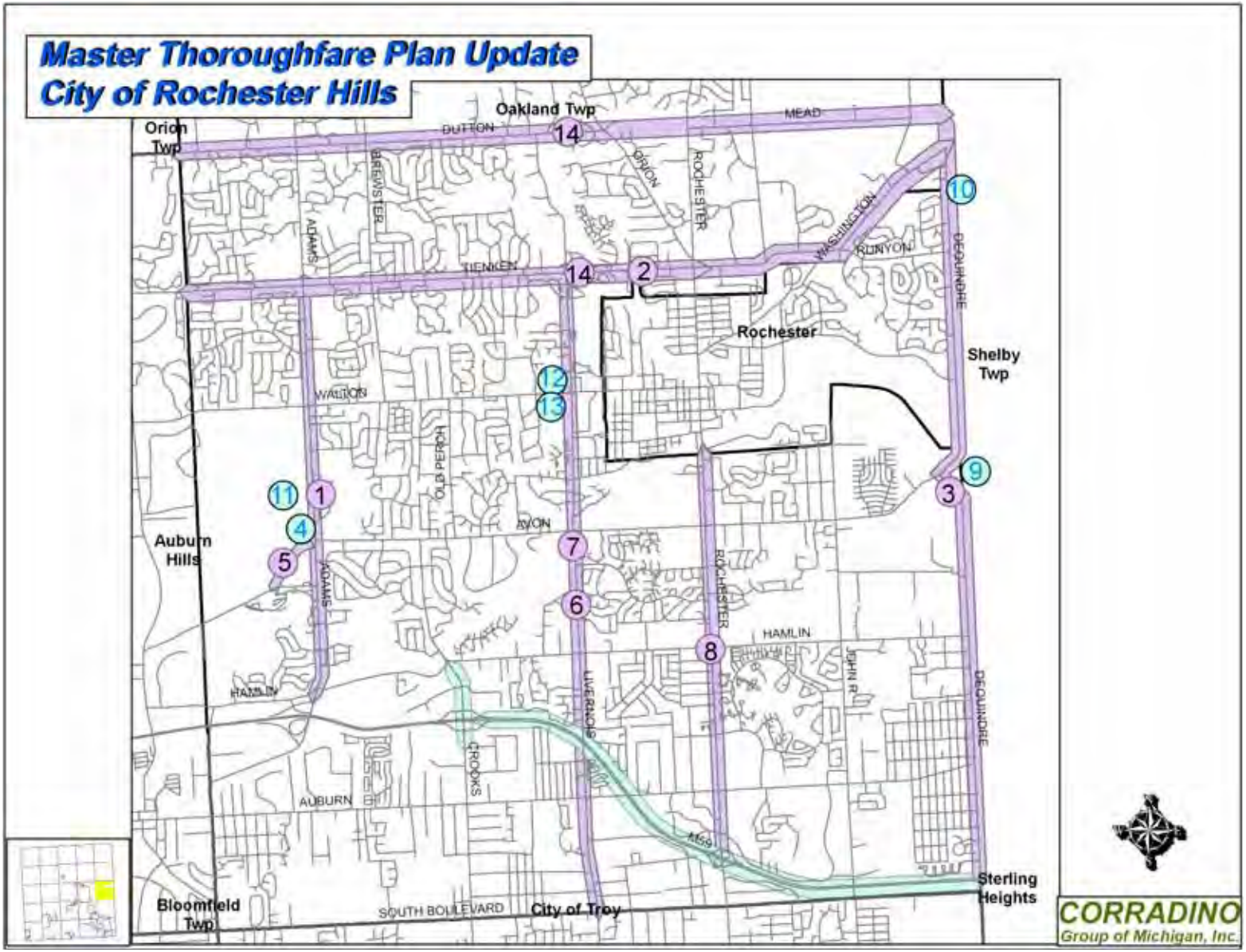


Figure 3-8
Common Road Segments Analyzed

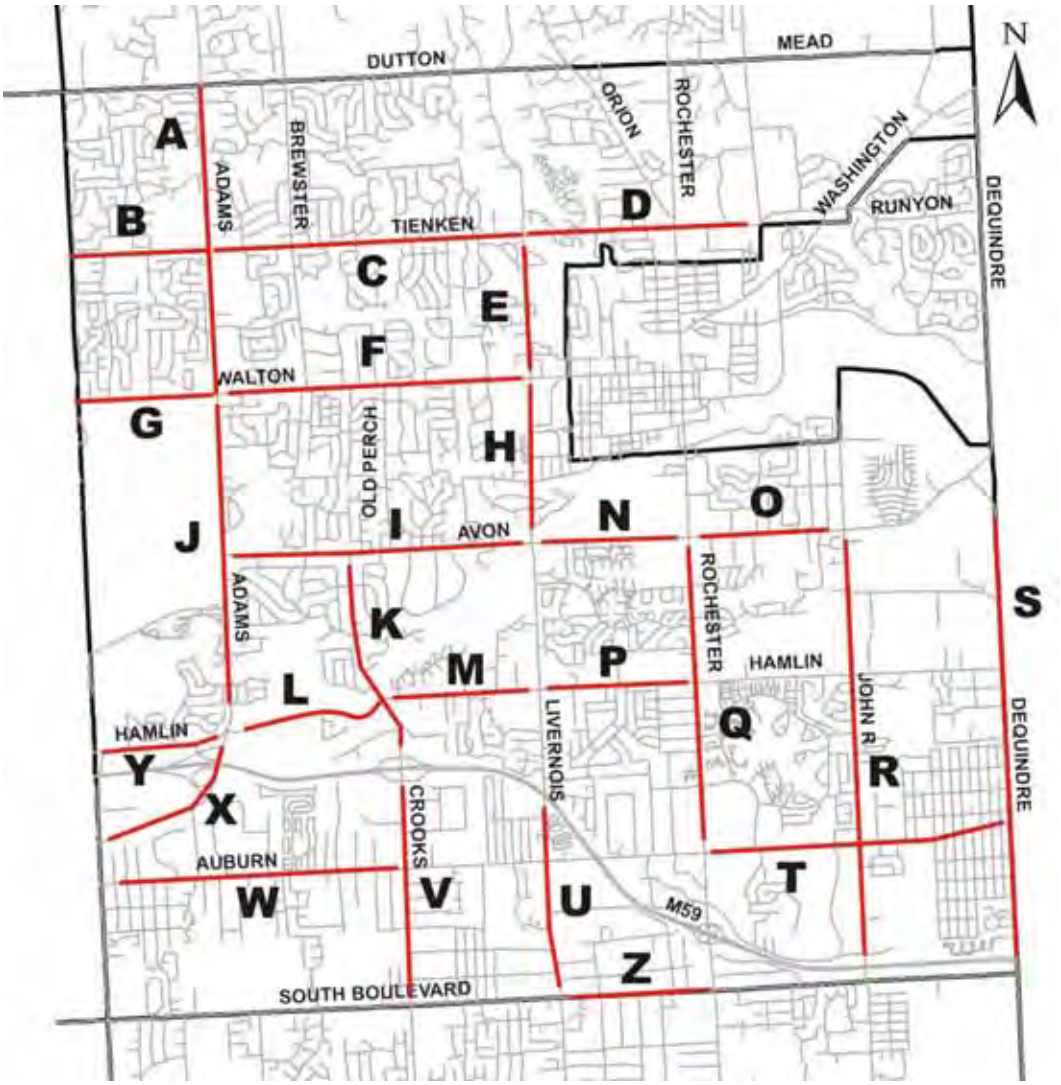
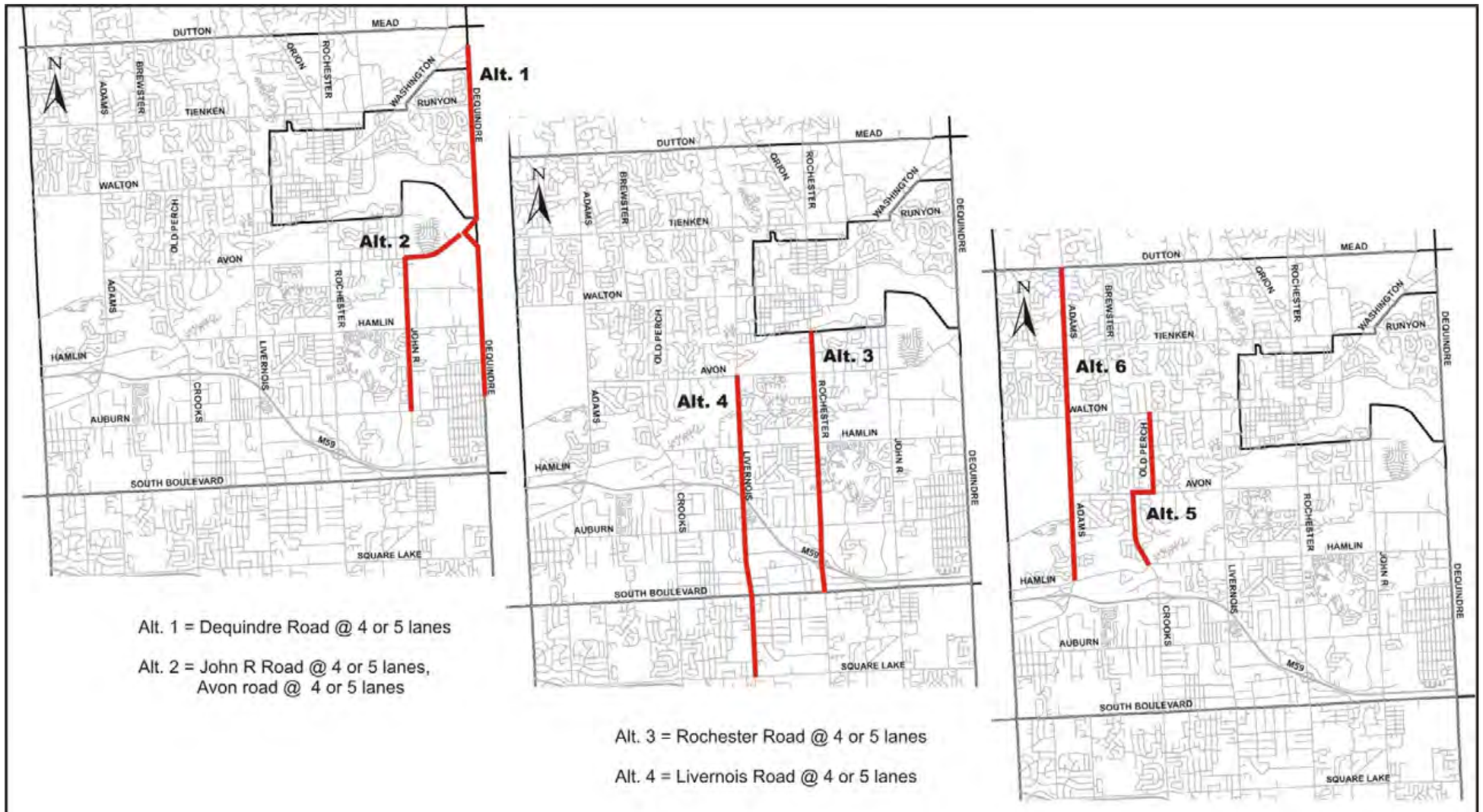


Figure 3-9
Rochester Hills Master Thoroughfare Plan Update
North-South Alternatives 1-6



Alt. 1 = Dequindre Road @ 4 or 5 lanes

Alt. 2 = John R Road @ 4 or 5 lanes,
Avon road @ 4 or 5 lanes

Alt. 3 = Rochester Road @ 4 or 5 lanes

Alt. 4 = Livernois Road @ 4 or 5 lanes

Alt. 5 = Crooks Road @ 4 or 5 lanes, Avon Road
@ 4 or 5 lanes, Old Perch @ 4 or 5 lanes

Alt. 6 = Livernois Road @ 4 or 5 lanes

The volume-to-capacity (V/C) ratios of Alternatives 1 through 6 are shown on Table 3-3. A V/C value greater than 0.90 indicates significant congestion. The green circles indicate a positive change in V/C of greater than 0.05 points compared to the future base conditions, which is considered a significant change.

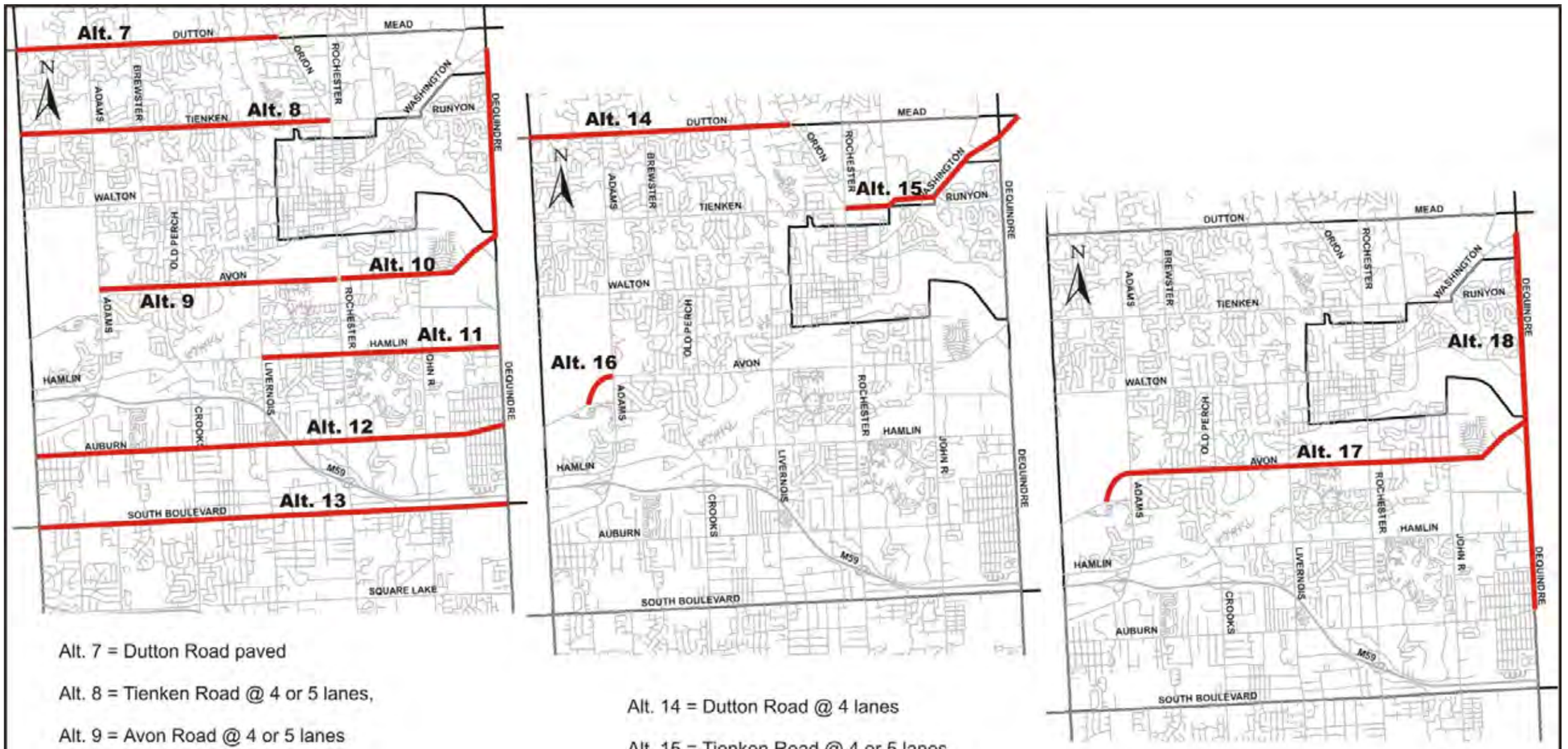
Table 3-3
North-South Alternatives
Volume-to-Capacity Ratios

Road Segment	Road Name	2005 Exist. Base	2035 Volume ÷ Capacity						
			Future Base	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6
A	Adams	0.56	0.80	0.82	0.86	0.83	0.84	0.80	0.94
B	Tienken	0.32	0.74	0.74	0.71	0.73	0.74	0.74	0.80
C	Tienken	0.55	0.79	0.77	0.75	0.75	0.75	0.75	0.84
D	Tienken	0.75	0.92	0.88	0.90	0.92	0.98	0.92	0.95
E	Livernois	0.88	1.05	1.02	1.06	1.08	0.80	1.07	1.05
F	Walton	0.69	0.88	0.87	0.88	0.86	0.93	0.87	0.91
G	Walton	0.58	0.61	0.63	0.62	0.64	0.61	0.63	0.56
H	Livernois	0.81	0.91	0.89	0.92	0.86	0.93	0.83	0.87
I	Avon	0.83	0.89	0.91	0.90	0.89	0.91	0.91	0.90
J	Adams	1.06	1.23	1.22	1.23	1.19	1.25	1.22	1.00
K	Crooks	0.94	1.09	1.04	1.08	1.04	1.11	0.85	1.05
L	Hamlin	0.31	0.29	0.29	0.28	0.26	0.28	0.26	0.20
M	Hamlin	0.82	0.53	0.53	0.53	0.54	0.53	0.50	0.53
N	Avon	0.84	0.92	0.91	0.93	0.89	0.91	0.86	0.93
O	Avon	0.85	1.08	1.08	1.10	1.07	1.08	1.08	1.07
P	Hamlin	0.68	0.91	0.89	0.90	0.88	0.92	0.86	0.91
Q	Rochester	0.81	1.04	0.99	1.02	0.90	1.05	0.97	1.00
R	John R	0.71	0.88	0.83	0.85	0.84	0.90	0.83	0.86
S	Dequindre	0.69	0.99	0.89	0.80	0.96	1.00	0.98	0.99
T	Auburn	0.61	0.94	0.96	0.94	0.95	0.93	0.94	0.94
U	Livernois	1.07	0.99	0.97	0.98	0.90	0.99	0.97	0.96
VNB	Crooks	0.55	0.73	0.74	0.71	0.65	0.75	0.75	0.73
VSB	Crooks	0.44	0.43	0.42	0.42	0.39	0.43	0.44	0.48
W	Auburn	0.67	0.65	0.66	0.68	0.67	0.66	0.68	0.67
X	New Adams	0.26	0.43	0.43	0.42	0.41	0.43	0.43	0.43
Y	Adams	0.04	0.16	0.16	0.15	0.15	0.15	0.08	0.12
Z	South	0.87	0.88	0.91	0.91	0.96	0.93	0.90	0.90
V/C Increase			-	7	7	7	14	7	10
V/C Decrease			-	14	16	18	6	15	10
No Change			-	6	4	2	7	5	7

significant decrease in expected congestion.
significant increase in expected congestion.

In total, only Alternative 5 creates at least a 0.05 points reduction in V/C in three locations. None of the alternatives for individual north-south road improvements do not satisfactorily address the future year congestion. Alternative road improvements were tested in the east-west direction to determine how they may improve future operations (Figure 3-10).

Figure 3-10
Rochester Hills Master Thoroughfare Plan Update
East-West Alternatives 7-18



Alt. 7 = Dutton Road paved

Alt. 8 = Tienken Road @ 4 or 5 lanes,

Alt. 9 = Avon Road @ 4 or 5 lanes

Alt. 10 = Avon Road @ 4 or 5 lanes
Dequindre Road @ 4 or 5 lanes

Alt. 11 = Hamlin Road @ 4 or 5 lanes

Alt. 12 = Auburn Road @ 4 or 5 lanes

Alt. 13 = South Boulevard @ 4 or 5 lanes

Alt. 14 = Dutton Road @ 4 lanes

Alt. 15 = Tienken Road @ 4 or 5 lanes
Washington Road @ 4 or 5 lanes

Alt. 16 = New Road Connection @ 2 lanes
from Avon Road to Butler Road

Alt. 17 = New Road Connection from Avon
Road to Butler Road @ 2 lanes,
Avon Road @ 4 or 5 lanes,
Dequindre Road @ 4 or 5 lanes

Alt. 18 = New Alignment of Dequindre through
Avon Road, and 23 Mile Road,
Dequindre Road @ 4 or 5 lanes

The results are shown on Table 3-4. As with Table 3-3, circles indicate a reduction of 0.05 points in the V/C ratios from the future base condition. While these alternatives show improvement over the north-south options, they still do not produce significant congestion relief throughout Rochester Hills.

Table 3-4
Rochester Hills Master Thoroughfare Plan Update
East-West Alternatives
Volume-to-Capacity Ratios

Road Segment	Road Name	Volume ÷ Capacity										
		Base	Alt 8	Alt 9	Alt 10	Alt 11	Alt 12	Alt13	Alt 15	Alt 16	Alt 17	Alt 18
A	Adams	0.80	0.88	0.84	0.81	0.85	0.82	0.81	0.87	0.82	0.84	0.80
B	Tienken	0.74	0.72	0.74	0.73	0.75	0.72	0.74	0.68	0.73	0.71	0.73
C	Tienken	0.79	0.72	0.72	0.76	0.75	0.81	0.78	0.79	0.79	0.71	0.81
D	Tienken	0.92	0.69	0.89	0.88	0.90	0.90	0.92	1.08	0.95	0.82	0.87
E	Livernois	1.05	1.00	1.06	1.02	1.05	1.05	1.04	1.07	1.04	1.02	1.01
F	Walton	0.88	0.79	0.81	0.89	0.86	0.88	0.88	0.91	0.92	0.83	0.90
G	Walton	0.61	0.56	0.62	0.63	0.62	0.62	0.61	0.63	0.62	0.64	0.62
H	Livernois	0.91	0.92	0.95	0.90	0.92	0.90	0.91	0.95	0.89	0.94	0.87
I	Avon	0.89	0.88	0.73	0.94	0.89	0.87	0.89	0.92	0.87	0.85	0.92
J	Adams	1.23	1.22	1.29	1.24	1.26	1.19	1.23	1.22	1.02	1.08	1.22
K	Crooks	1.09	1.07	1.09	1.05	1.05	1.10	1.09	1.09	1.14	1.06	1.11
L	Hamlin	0.29	0.26	0.26	0.29	0.27	0.23	0.28	0.29	0.21	0.20	0.28
M	Hamlin	0.53	0.51	0.50	0.53	0.58	0.51	0.52	0.53	0.53	0.50	0.53
N	Avon	0.92	0.88	0.69	1.00	0.93	0.90	0.92	0.89	0.94	0.82	0.93
O	Avon	1.08	1.08	1.10	0.85	1.06	1.08	1.08	1.04	1.07	0.90	1.07
P	Hamlin	0.91	0.86	0.82	0.93	0.64	0.87	0.90	0.90	0.91	0.82	0.87
Q	Rochester	1.04	1.02	1.03	1.05	1.06	1.05	1.04	1.04	1.02	1.00	0.98
R	John R	0.88	0.86	0.86	1.05	0.89	0.91	0.88	0.90	1.23	1.01	0.85
S	Dequindre	0.99	0.99	0.99	1.07	1.02	0.99	0.98	0.97	1.01	1.02	0.96
T	Auburn	0.94	0.95	0.97	0.92	0.92	0.71	0.93	0.91	0.96	0.93	0.95
U	Livernois	0.99	0.96	0.97	1.00	0.98	0.87	0.97	1.07	0.97	0.95	0.98
VNB	Crooks	0.73	0.74	0.75	0.74	0.71	0.79	0.69	0.74	0.73	0.76	0.72
VSB	Crooks	0.43	0.42	0.44	0.42	0.44	0.51	0.40	0.42	0.44	0.42	0.42
W	Auburn	0.65	0.66	0.65	0.69	0.67	0.47	0.65	0.66	0.67	0.66	0.69
X	New Adams	0.43	0.42	0.43	0.41	0.41	0.42	0.37	0.40	0.41	0.44	0.42
Y	Adams	0.16	0.08	0.08	0.15	0.16	0.06	0.09	0.09	0.11	0.06	0.13
Z	South	0.88	0.88	0.88	0.89	0.91	0.64	0.76	0.92	0.89	0.86	0.89
V/C Increase		-	5	9	14	13	8	1	12	12	8	7
V/C Decrease		-	19	12	11	11	15	13	10	12	19	18
No Change		-	3	6	2	3	4	13	5	3	0	2

significant decrease in expected congestion.
significant increase in expected congestion.

In conclusion, it was determined to develop "composite" alternatives using combinations of north-south and east-west proposed road improvements (Figure 3-11). The results depicted on Table 3-5 show marked improvement in the potential to relieve 2035 congestion compared to options previously tested. Further scrutiny of these results points to Alternatives 20, 22, 23, 25, 27 and 28 as the proposals with the most potential to reduce congestion. These are the six alternatives chosen for detailed analysis according to the seven evaluation factors.

Figure 3-11
Rochester Hills Master Thoroughfare Plan Update
"Composite" Alternatives

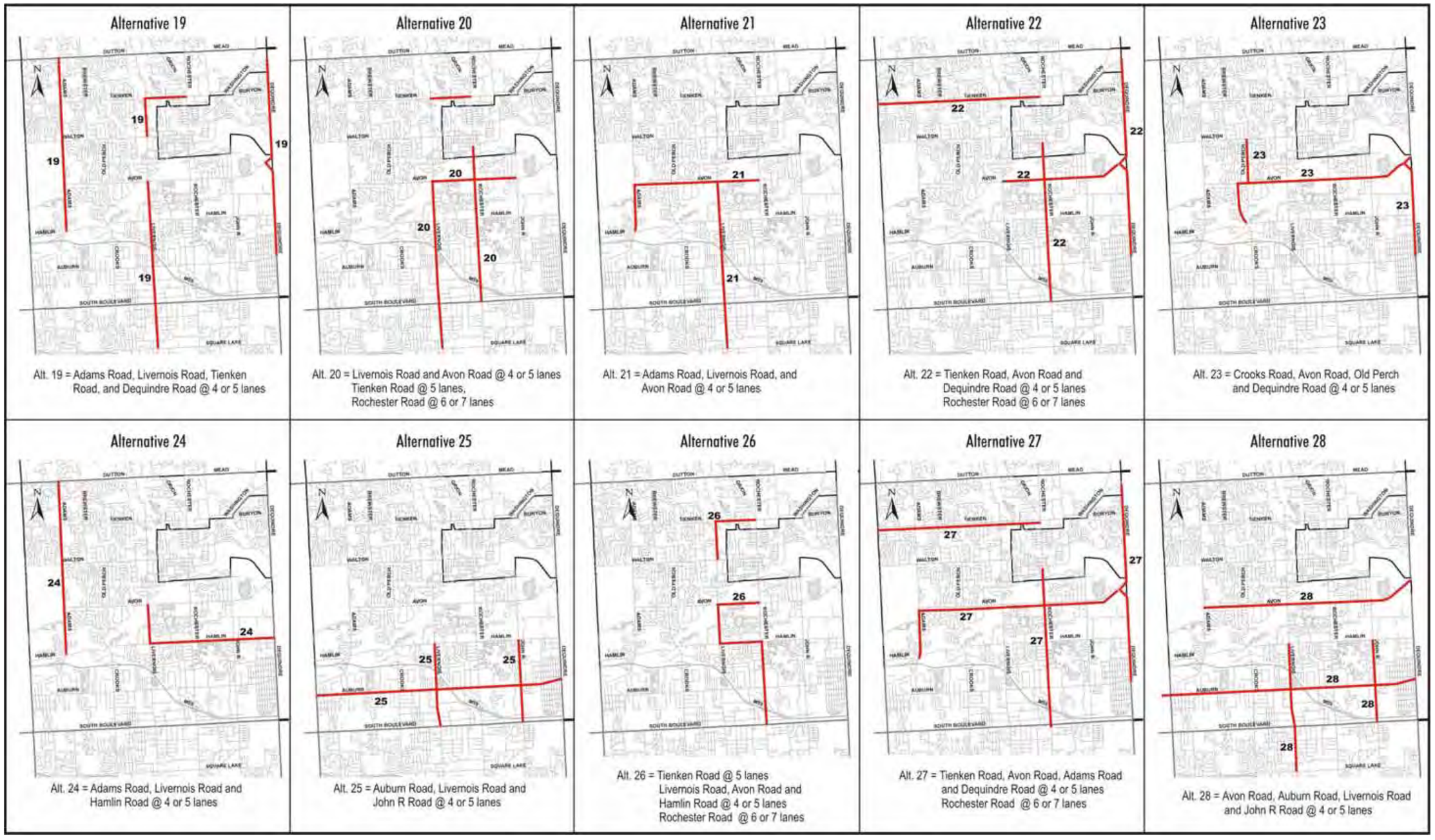


Table 3-5
Composite North-South and East-West Alternatives
Volume-to-Capacity Ratios

Road Segment	Road Name	Volume ÷ Capacity										
		Base	Alt 19	Alt 20	Alt 21	Alt 22	Alt 23	Alt 24	Alt 25	Alt 26	Alt 27	Alt 28
A	Adams	0.80	0.62	0.85	0.84	0.82	0.83	0.81	0.82	0.85	0.83	0.82
B	Tienken	0.74	0.57	0.72	0.75	0.47	0.71	0.74	0.73	0.73	0.47	0.71
C	Tienken	0.79	0.83	0.82	0.73	0.54	0.71	0.77	0.75	0.81	0.49	0.70
D	Tienken	0.92	0.70	0.50	0.90	0.65	0.87	0.91	0.86	0.59	0.58	0.81
E	Livernois	1.05	0.81	1.08	1.09	1.01	1.09	1.08	1.05	0.81	0.99	1.04
F	Walton	0.88	0.92	0.85	0.82	0.81	0.81	0.87	0.86	0.90	0.78	0.76
G	Walton	0.61	0.57	0.65	0.64	0.62	0.63	0.62	0.64	0.62	0.65	0.65
H	Livernois	0.91	0.96	0.96	1.01	0.80	0.88	0.98	0.97	1.00	0.88	0.97
I	Avon	0.89	0.92	0.93	0.80	0.76	0.80	0.92	0.92	0.93	0.80	0.75
J	Adams	1.23	0.91	1.11	0.88	1.18	1.21	1.23	1.08	1.17	0.92	1.10
K	Crooks	1.09	0.96	0.99	1.00	1.00	0.80	0.99	1.00	1.01	0.92	0.98
L	Hamlin	0.29	0.21	0.30	0.14	0.34	0.25	0.28	0.26	0.32	0.26	0.26
M	Hamlin	0.53	0.55	0.52	0.49	0.55	0.44	0.57	0.51	0.53	0.52	0.50
N	Avon	0.92	0.87	0.63	0.73	0.85	0.78	0.80	0.85	0.51	0.75	0.78
O	Avon	1.08	1.08	0.73	1.08	1.08	0.80	1.06	1.06	1.08	0.86	0.76
P	Hamlin	0.91	0.93	0.80	0.84	0.58	0.72	0.71	0.86	0.55	0.52	0.75
Q	Rochester	1.04	0.86	0.77	0.86	0.86	0.91	0.93	0.90	0.93	0.79	0.82
R	John R	0.88	0.72	0.69	0.76	0.70	0.90	0.81	0.40	0.79	0.82	0.68
S	Dequindre	0.99	0.86	0.96	0.96	0.91	0.45	1.01	0.91	0.84	0.67	0.66
T	Auburn	0.94	1.00	0.93	0.97	0.94	0.93	0.92	0.81	1.01	0.89	0.79
U	Livernois	0.99	0.86	0.80	0.80	0.89	0.97	1.00	0.69	0.91	0.88	0.74
VNB	Crooks	0.73	0.61	0.59	0.68	0.64	0.73	0.72	0.68	0.65	0.67	0.69
VSB	Crooks	0.43	0.42	0.33	0.41	0.37	0.45	0.44	0.50	0.37	0.41	0.49
W	Auburn	0.65	0.71	0.67	0.67	0.65	0.67	0.67	0.51	0.67	0.65	0.51
X	New Adams	0.43	0.44	0.41	0.42	0.43	0.42	0.42	0.45	0.43	0.44	0.44
Y	Adams	0.16	0.12	0.12	0.09	0.16	0.13	0.15	0.07	0.13	0.06	0.06
Z	South	0.88	0.90	0.92	0.84	0.92	0.87	0.89	0.80	0.91	0.91	0.81
V/C Increase		-	10	9	8	5	6	11	6	10	4	5
V/C Decrease		-	10	18	18	17	20	14	20	14	22	22
No Change		-	1	0	1	5	1	2	1	3	1	0

significant decrease in expected congestion.
significant increase in expected congestion.

At this point in the process, the concept of a "ring road" was entered into the analyses (Figures 3-12 and 3-13). The ability of these two options to reduce future congestion is not as significant as the six selected alternatives (Table 3-6). Therefore, it was decided to focus the analysis on Alternatives 20, 22, 23, 25, 27 and 28. The selected alternatives are shown in Figure 3-14.

Figure 3-12
Rochester Hills Master Thoroughfare Plan Update
Ring Road – Concept A

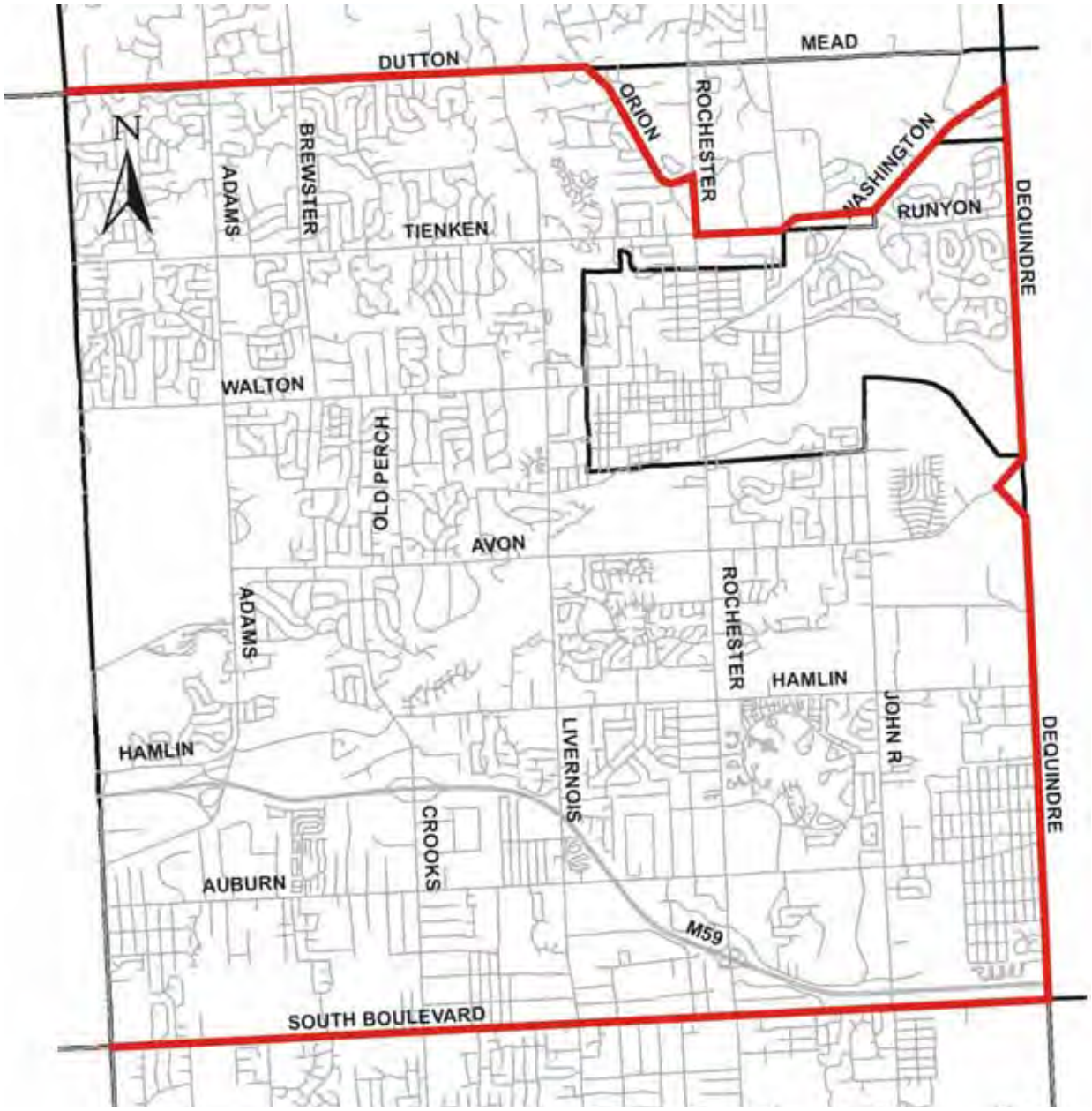


Figure 3-13
Rochester Hills Master Thoroughfare Plan Update
Ring Road – Concept B

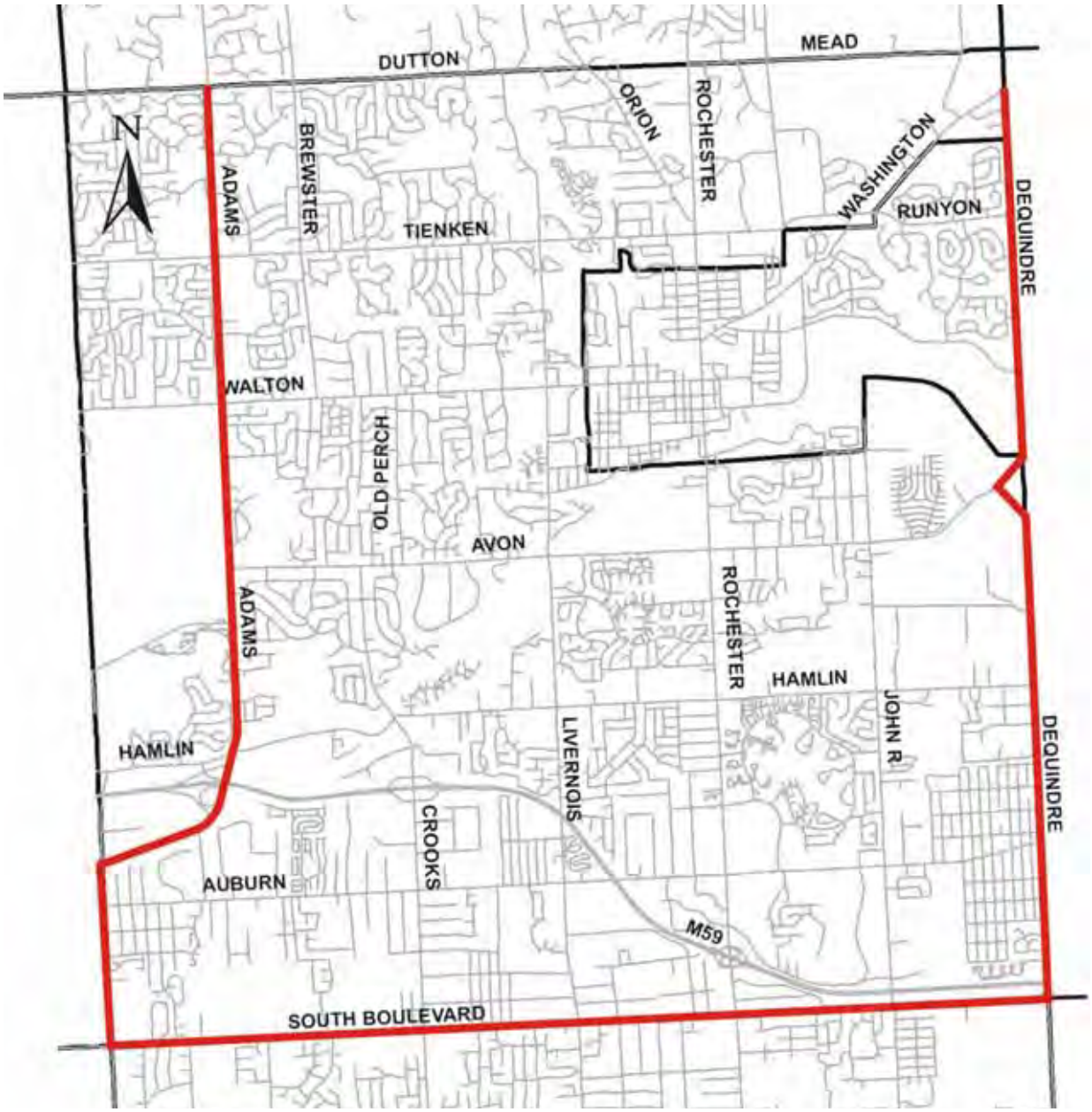


Table 3-6
Rochester Hills Master Thoroughfare Plan Update
Comparison of Ring Road Alternatives to the Six Best-performing Alternatives in Congestion Relief

Road Segment	Road Name	Volume ÷ Capacity								
		Base	Alt 20	Alt 22	Alt 23	Alt 25	Alt 27	Alt 28	Alt RR A	Alt RR B
A	Adams	0.80	0.85	0.82	0.83	0.82	0.83	0.82	0.77	0.65
B	Tienken	0.74	0.72	0.47	0.71	0.73	0.47	0.71	0.57	0.64
C	Tienken	0.79	0.82	0.54	0.71	0.75	0.49	0.70	0.70	0.78
D	Tienken	0.92	0.50	0.65	0.87	0.86	0.58	0.81	0.97	0.91
E	Livernois	1.05	1.08	1.01	1.09	1.05	0.99	1.04	1.01	1.01
F	Walton	0.88	0.85	0.81	0.81	0.86	0.78	0.76	0.87	0.90
G	Walton	0.61	0.65	0.62	0.63	0.64	0.65	0.65	0.62	0.61
H	Livernois	0.91	0.96	0.80	0.88	0.97	0.88	0.97	0.87	0.85
I	Avon	0.89	0.93	0.76	0.80	0.92	0.80	0.75	0.88	0.89
J	Adams	1.23	1.11	1.18	1.21	1.08	0.92	1.10	1.23	1.10
K	Crooks	1.09	0.99	1.00	0.80	1.00	0.92	0.98	1.12	1.04
L	Hamlin	0.29	0.30	0.34	0.25	0.26	0.26	0.26	0.24	0.21
M	Hamlin	0.53	0.52	0.55	0.44	0.51	0.52	0.50	0.52	0.54
N	Avon	0.92	0.63	0.85	0.78	0.85	0.75	0.78	0.90	0.93
O	Avon	1.08	0.73	1.08	0.80	1.06	0.86	0.76	1.08	1.09
P	Hamlin	0.91	0.80	0.58	0.72	0.86	0.52	0.75	0.87	0.88
Q	Rochester	1.04	0.77	0.86	0.91	0.90	0.79	0.82	1.01	0.97
R	John R	0.88	0.69	0.70	0.90	0.40	0.82	0.68	0.79	0.82
S	Dequindre	0.99	0.96	0.91	0.45	0.91	0.67	0.66	0.89	0.92
T	Auburn	0.94	0.93	0.94	0.93	0.81	0.89	0.79	0.94	0.95
U	Livernois	0.99	0.80	0.89	0.97	0.69	0.88	0.74	0.97	0.93
VNB	Crooks	0.73	0.59	0.64	0.73	0.68	0.67	0.69	0.71	0.63
VSB	Crooks	0.43	0.33	0.37	0.45	0.50	0.41	0.49	0.42	0.39
W	Auburn	0.65	0.67	0.65	0.67	0.51	0.65	0.51	0.67	0.74
X	New Adams	0.43	0.41	0.43	0.42	0.45	0.44	0.44	0.36	0.61
Y	Adams	0.16	0.12	0.16	0.13	0.07	0.06	0.06	0.09	0.15
Z	South	0.88	0.92	0.92	0.87	0.80	0.91	0.81	0.74	0.74
V/C Increase		-	9	5	6	6	4	5	5	9
V/C Decrease		-	18	17	20	20	22	22	19	17
No Change		-	0	5	1	1	1	0	3	1

significant decrease in expected congestion.
significant increase in expected congestion.

Figure 3-14
Best Performing Alternatives

3.3 Evaluation of Alternatives

The preceding steps allowed us to reduce the number of alternatives reduced from 30 to six in terms of controlling congestion. This, in turn, will minimize neighborhood disruption (the highest-placed evaluation factor). The evaluation continued through other factors as described below.

3.3.1 Better Connect Links in the Road Network

The degree to which travel times between 15 key locations in the study area could be improved in the afternoon rush hour was measured (Figure 3-15). Table 3-7 graphically illustrates where travel time savings of at least two minutes will be reached (☐ green squares). For example, a vehicle traveling in the 2035 afternoon peak hour traffic between Oakland University (Point 1) and Borden Park (Point 6) would take 15.62 minutes under the future base condition. With Alternative 20, it is expected that the same trip would take 2.2 minutes less because of the improvements to Avon and Rochester Roads.

Figure 3-15
Locations between which Travel-time Savings are Measured

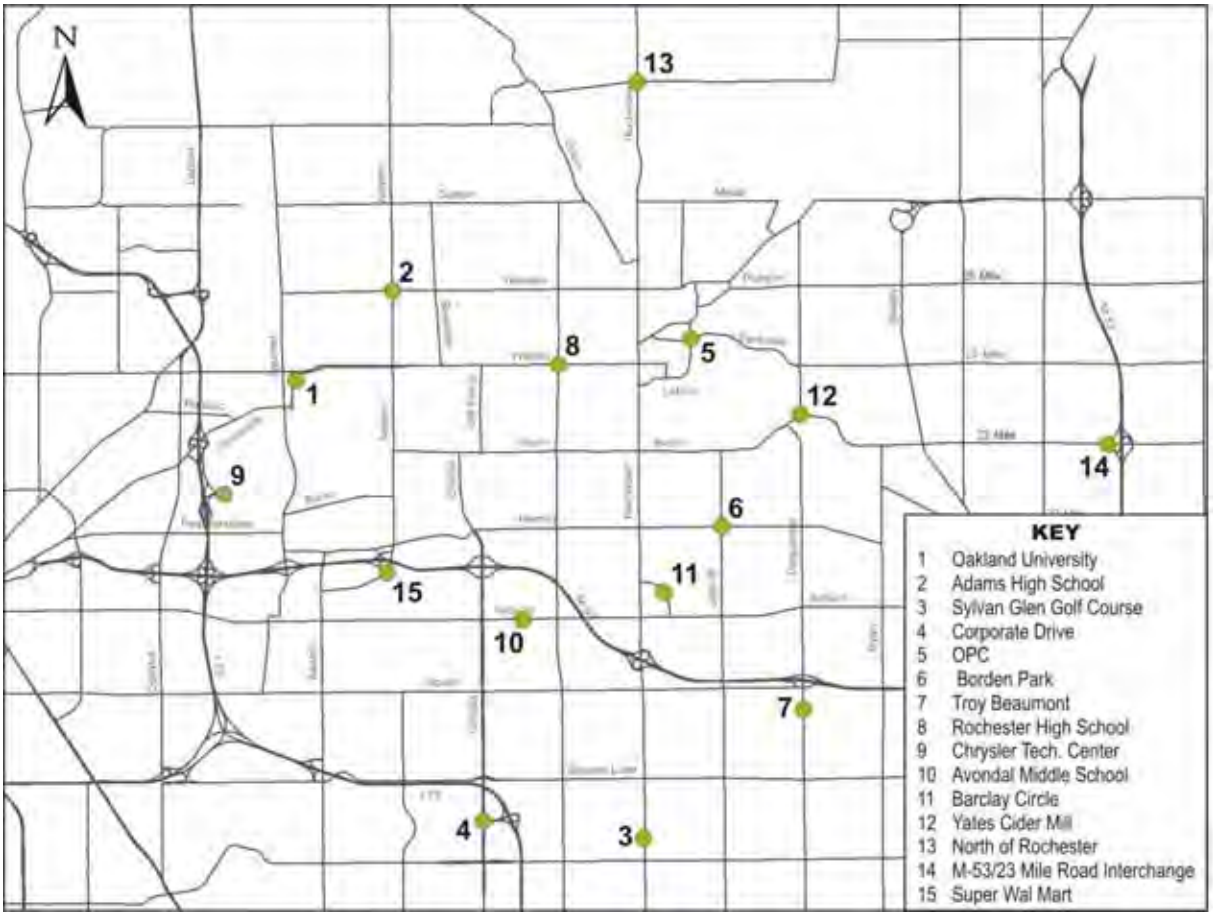
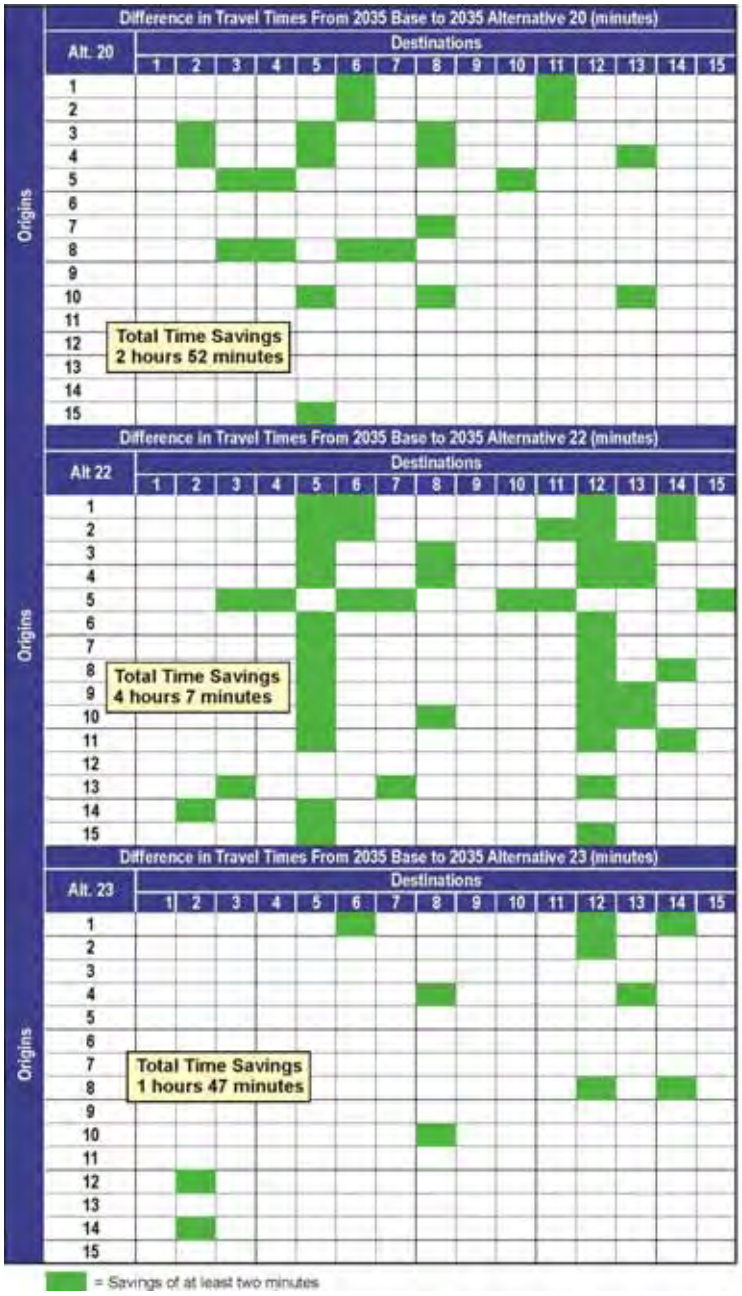
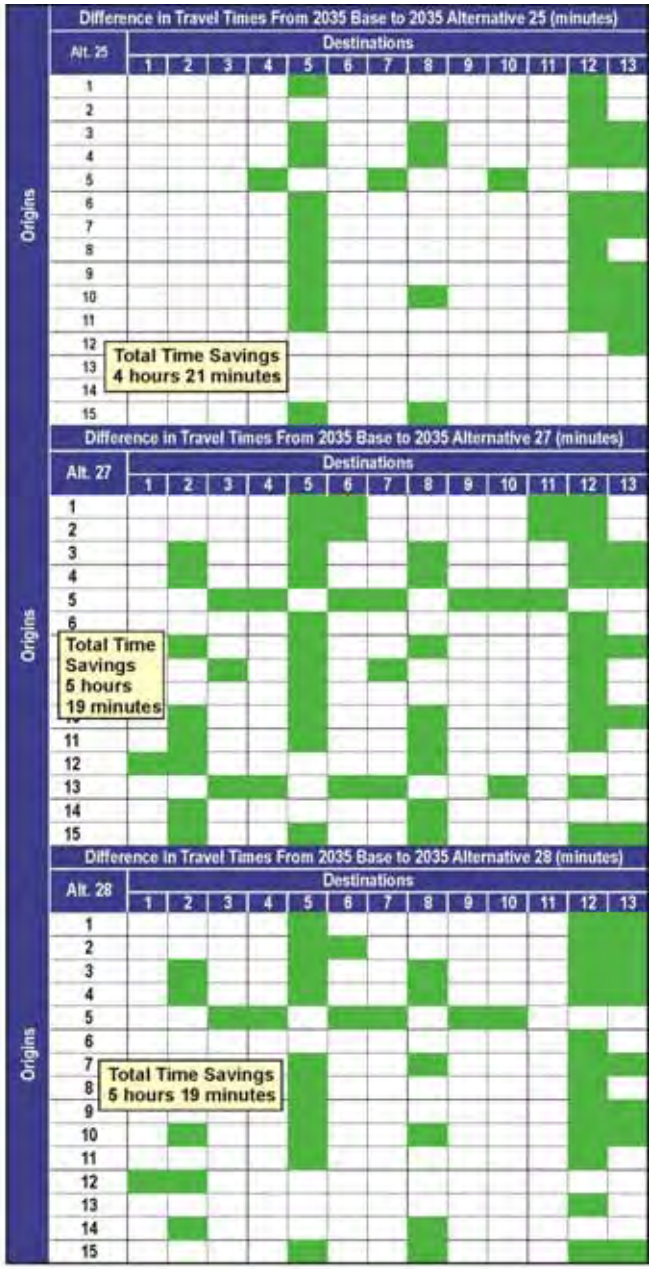


Table 3-7
Rochester Hills Master Thoroughfare Plan Update
2035 Afternoon Peak Travel Time Differences Compared to Base Condition





KEY

1 Oakland University
2 Adams High School
3 Sylvan Glen Golf Course
4 Corporate Drive
5 OPC
6 Borden Park
7 Troy Beaumont
8 Rochester High School
9 Chrysler Tech. Center
10 Avondal Middle School
11 Barclay Circle
12 Yates Cider Mill
13 North of Rochester
14 M-53/23 Mile Rd Interchange
15 Super Wal Mart

By adding the travel time savings for just the 15 pairs of locations included in the analysis, the total savings of all trips makers moving between these locations in the 2035 afternoon peak hour ranges from 1 hour 47 minutes to 5 hours 32 minutes.

Alternatives 27 and 28 are associated with the greatest potential savings (5 hours 32 minutes and 5 hours 19 minutes, respectively) while Alternatives 20 and 23 are expected to save the least time (2 hours 53 minutes and 1 hour 47 minutes, respectively). Additional travel time data is included in Appendix D.

3.3.2 Air Quality

Carbon monoxide (CO) is a colorless, odorless gas that is poisonous because it prevents the body from absorbing oxygen. It is among a number of air pollutants that U.S. EPA regulates under the authority of the Clean Air Act. Because of its very localized and immediate effects, it is often used in evaluations of air quality effects associated with roadway projects. Like other air pollutants regulated by EPA, CO is much better controlled than it was some years ago.

Information available from the Michigan Department of Environmental Quality (MDEQ) indicates the air quality monitor that measures CO nearest to Rochester Hills in Oak Park is in south Oakland County. CO values are expressed in parts per million (ppm) as the second-highest one-hour value, and the second-highest eight-hour value recorded over a year's time. The most recent values (2005) for the closest monitoring station are one-hour at 3.4 ppm and eight-hour at 2.1 ppm. The thresholds that are not to be exceeded are 35 and nine ppm, respectively.

Using these values as the base for Rochester Hills, the effects of future traffic were analyzed.

The results indicate that the future CO concentrations will go down compared to 2005 conditions, even where traffic volumes substantially increase. This is attributable to EPA's continuing control of vehicle engines and fuels. As such, the air quality conditions of the six best-performing alternatives are no different from one to another and do not generate CO pollution that will exceed EPA standards.

3.3.3 Minimize Purchase of Private Property

The extent to which property may be needed to widen roadways was measured using 2005 aerial photography, right-of-way maps, parcel lines, building footprints, and other property information included in the City's Geographical Information System (GIS).

The City and the County have recently constructed narrow four-lane boulevards and five-lane roads within 120' of right-of-way. Therefore, 120' of road right-of-way was analyzed for each alternative segment improved, except for Rochester Road. A right-of-way width of 200' was used for Rochester Road because MDOT would require a wide median if a six-lane boulevard option was selected.

The methodology for measuring property acquisition included examining parcel lot lines, building set backs, and non-motorized path locations. If a structure (house, business, etc.) were within 20 feet of the edge of the widened road, it was included in the acquisition total. For each alternative, the land use acreages, dwelling units or business structures were aggregated by individual road segment within each alternative (Table 3-8).

The results indicate more residential units will be acquired with Alternatives 25 and 28. The largest number of business structures would also be impacted by Alternatives 25 and 28. The greatest number of acres of parks and open space would be impacted by Alternatives 27 and 28. A full set of analysis segments used in the analysis is provided in Appendix E.

3.3.4 Control Noise at Sensitive Receivers

The noise levels at 15 different sensitive noise receivers (Figure 3-16) were calculated for each alternative based on the relative volume changes of the adjacent road nearest them. The Noise Model (TNM) authored by the Federal Highway Administration was used to calculate the noise level expressed as decibels on the A scale, or dBA. A perceptible noise change is associated with an increase of at least 3 dBA. The results show very minor differences among alternatives and between them and the 2035 base condition (Table 3-9). In all cases, the future traffic will not cause a perceptible change in noise. This does not mean a person would not be aware of more traffic. It simply means that, on an objective basis, the average person would not hear a difference in noise.

3.3.5 Maximize Safe Travel

For this portion of the study, a crash analysis was completed for major thoroughfares.

Crash data provided by the Traffic Improvement Association of Oakland County formed the basis of this analysis. These rates were assumed to remain constant if a road were not improved. On the other hand, and for each alternative, where road improvements were proposed, the crash rate was reduced by one-third indicating safer conditions as a result of the improvement. The results are shown on Table 3-10. Overall, Alternative 27 has the best potential to reduce crashes in the 2035 horizon year. Alternatives 22 and 23 also perform well. The alternative least likely to control crashes is Alternative 28. Crash data is provided in Appendix F.

Table 3-8
Rochester Hills Master Thoroughfare Plan Update
Summary of Potential Property Acquisition

Alt. 20	Category	Total
	Residential Acres	12.68
	Business Acres	28.19
	Open Space/Parks Acres	2.82
	Residential Dwellings	36
	Businesses	33
Alt. 22	Category	Total
	Residential Acres	17.25
	Business Acres	31.67
	Open Space/Parks Acres	2.84
	Residential Dwellings	39
	Businesses	38
Alt. 23	Category	Total
	Residential Acres	18.7
	Business Acres	6
	Open Space/Parks Acres	3.9
	Residential Dwellings	34
	Businesses	8
Alt. 25	Category	Total
	Residential Acres	18.06
	Business Acres	7.31
	Open Space/Parks Acres	2.63
	Residential Dwellings	46
	Businesses	50
Alt. 27	Category	Total
	Residential Acres	24.26
	Business Acres	31.67
	Open Space/Parks Acres	6.36
	Residential Dwellings	42
	Businesses	38
Alt. 28	Category	Total
	Residential Acres	21.19
	Business Acres	12.45
	Open Space/Parks Acres	5.73
	Residential Dwellings	58
	Businesses	56

Figure 3-16
Rochester Hills Master Thoroughfare Plan Update
Sensitive Receptors at which Changes in Noise Levels Were Measured

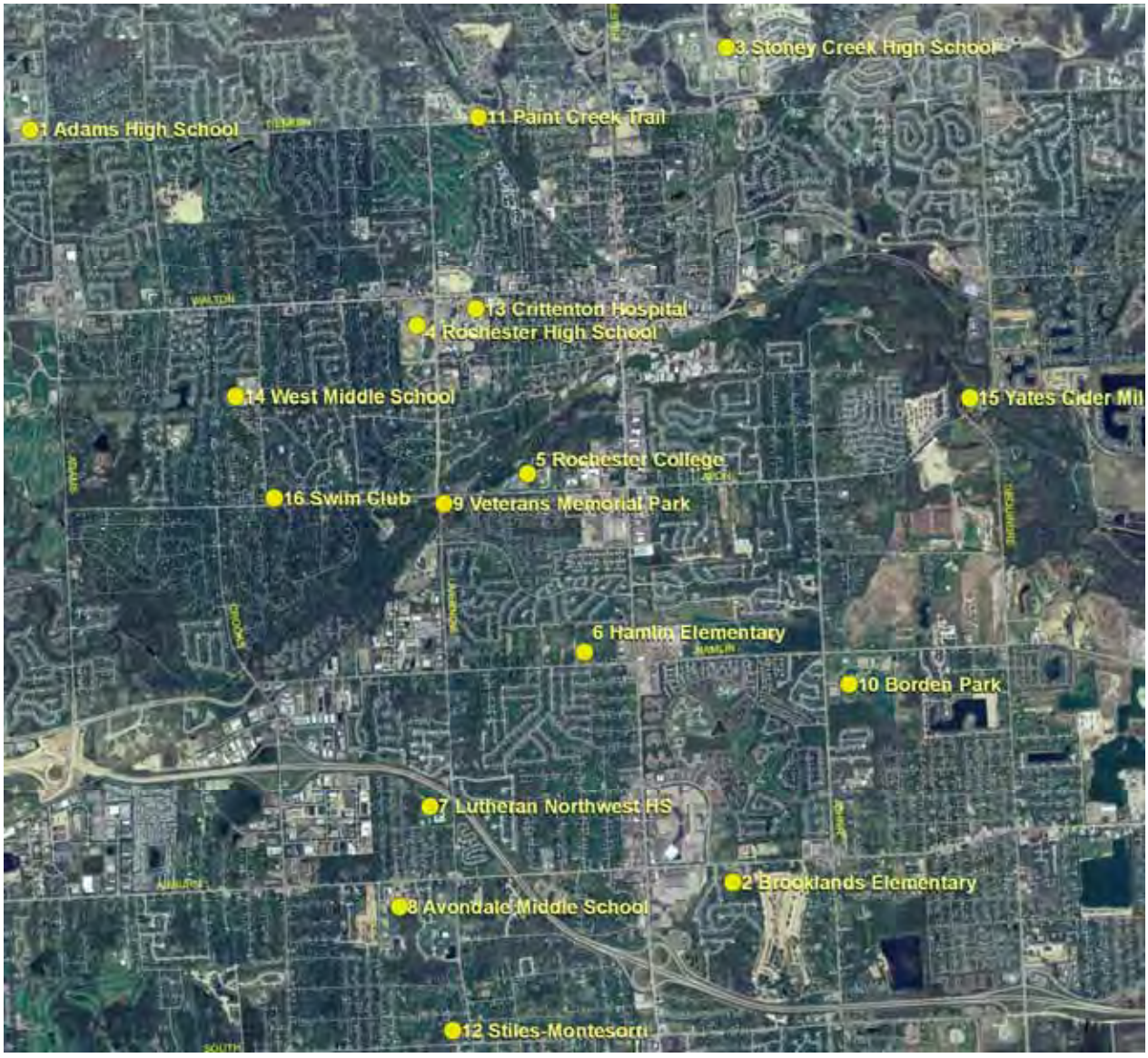


Table 3-9
Rochester Hills Master Thoroughfare Plan Update
Expected Noise Levels in 2035 at Sensitive Receivers (decibels dBA)

Noise Receptor Number	Place Name	Receptor Distance (feet)	2035 Base	Alt. 20	Alt. 22	Alt. 23	Alt. 25	Alt. 27	Alt. 28
1	Adams High School	400	56.5	56.5	56.5	56.5	56.4	56.6	56.4
2	Brooklands Elementary	200	62.0	62.1	62.3	62.2	65.0	62.1	64.9
3	Stoney Creek High School	200	53.6	53.6	53.6	53.6	53.5	53.6	53.5
4	Rochester High School	175	65.1	65.4	64.6	64.9	65.4	65.0	65.4
5	Rochester College	200	62.3	63.7	61.9	64.4	61.8	64.0	64.3
6	Hamlin Elementary	300	59.0	58.1	60.1	59.2	58.1	59.8	58.2
7	Lutheran Northwest HS	300	58.9	61.4	58.9	59.0	61.3	58.9	61.5
8	Avondale Middle School	300	59.7	59.4	59.7	59.7	62.0	59.7	62.1
9	Veterans Memorial Park	125	64.7	65.7	63.9	63.9	66.3	63.1	65.9
10	Borden Park	600	54.5	52.4	53.1	54.5	54.2	53.2	55.2
11	Paint Creek Trail	150	63.0	64.0	64.1	62.9	62.8	64.0	62.6
12	Stiles-Montesorri	200	59.5	59.6	59.7	59.6	58.0	59.5	57.8
13	Crittenton Hospital	350	62.1	61.6	61.6	62.0	62.0	61.0	61.8
14	West Middle School	150	62.6	62.3	62.0	64.3	62.4	62.3	62.3
15	Yates Cider Mill	300	60.0	60.0	61.5	60.2	61.7	61.9	61.9
16	Swim Club	150	62.5	62.5	62.4	64.3	62.4	63.1	64.2

Table 3-10
Rochester Hills Master Thoroughfare Plan Update
2035 Crash Comparison

		2035 Average Crashes Per Mile Per Year						
Segment	Road Name	2035 Base	Alt. 20	Alt. 22	Alt. 23	Alt. 25	Alt. 27	Alt. 28
A	Adams	35.6	35.4	36.0	35.3	34.6	36.5	34.4
B	Tienken	15.4	15.0	12.0	15.0	15.1	12.0	14.8
C	Tienken	23.4	24.8	19.9	21.5	23.4	19.1	21.6
D	Tienken	37.3	30.8	31.4	35.7	34.8	29.5	33.5
E	Livernois	10.6	10.8	9.8	10.8	10.5	9.7	10.6
F	Walton	44.6	44.2	41.6	40.8	44.5	40.7	39.3
G	Walton	30.9	31.9	30.9	31.7	31.6	32.1	32.1
H	Livernois	53.3	55.2	47.1	50.8	56.3	51.8	56.4
I	Avon	13.7	14.6	14.3	15.4	14.2	15.2	14.3
J	Adams	19.9	18.0	19.1	19.2	17.9	19.7	17.7
K	Crooks	11.4	10.5	10.7	11.1	10.8	9.5	10.3
L	Hamlin	32.1	34.5	36.7	31.1	30.3	19.4	30.4
M	Hamlin	14.1	13.8	15.0	11.6	13.2	14.1	12.9
N	Avon	35.4	32.1	21.8	39.0	32.7	36.8	38.6
O	Avon	25.8	22.2	15.9	24.4	24.5	25.6	23.1
P	Hamlin	14.9	11.1	17.2	11.8	13.4	16.1	11.9
Q	Rochester	128.0	92.4	102.8	74.0	109.8	95.3	102.7
R	John R	7.3	6.1	6.6	8.2	4.5	7.1	7.4
S	Dequindre	14.2	14.1	16.3	8.6	25.2	11.6	18.3
T	Auburn	35.0	33.2	34.7	35.9	37.7	32.4	55.0
U	Livernois	12.6	11.9	10.4	12.4	10.1	9.8	16.4
V	Crooks	46.7	36.8	40.4	47.4	49.0	43.1	48.6
W	Auburn	18.5	18.8	18.1	19.0	16.4	18.1	16.4
X	New Adams	na	na	na	na	na	na	na
Y	Adams	2.2	1.9	2.1	2.0	1.5	1.3	1.5
Z	South	17.5	17.2	18.5	17.3	15.7	17.7	13.4
Increase Crashes			7	8	8	7	6	10
Decrease Crashes			18	17	17	17	18	15
No Change			0	0	0	1	1	1
		Total Change	-62.8	-70.9	-70.3	-22.5	-76.2	-18.8

Fewer crashes without improvements to roadway segment

33 percent Crash Reduction Factor because alternative improves segment evaluated

More crashes without improvements to roadway segment

3.4 Evaluation Results

Six members of the consultant team examined all of the data presented above by evaluation factor by alternative to judge the overall performance of each alternative (Table 3-11). In the area of minimize neighborhood disruption, Alternative 27 was judged the best performer (red oval); Alternative 23 was judged the least (red square). In the area of better connectivity (lower travel time) through the road network, Alternative 27 was again judged the best performer (blue oval); Alternative 23 the least (blue square).

In the areas of maintain air quality, all alternatives are considered equal performers (green oval). When considering the criteria of minimize purchase of private property, Alternative 23 is expected to have the least negative effect (black oval); Alternative 25 is judged to have the largest negative effect (black square).

In the area of protecting open space/parks, Alternative 25 is judged to have the least negative impact (orange oval); Alternative 27 the most negative effect (orange square).

In terms of noise impacts, Alternatives 20, 22, 23 and 25 perform at the same level (pink oval); Alternatives 27 and 28 perform at a slightly lower level (pink box). Finally, in the area of maximize safe travel, Alternative 27 is judged to perform best (purple oval); Alternative 25, the least (purple square).

By combining these performance scores with the weight on the evaluation factors provided by community representatives, the project's Technical Committee and the consultant, the overall performance of each alternative is established as judged by the consultant. The top two performers, for all three weightings, are Alternatives 27 (blue pyramids) and 22 (green pyramid), in that order.

Table 3-11
Rochester Hills Master Thoroughfare Plan Update
Selection of Alternatives

	Consultant Performance Scores					
Factor	Alt 20	Alt 22	Alt 23	Alt 25	Alt 27	Alt 28
Minimize Neighborhood Disruption	77.6	78.0	75.8	77.6	90.4	87.6
Better Connect Links in Road Network	77.0	82.2	72.2	83.6	90.6	88.4
Maintain good Air Quality	78.0	78.0	78.0	78.0	78.0	78.0
Minimize Purchase of Private Property to Build Transportation Facilities	42.4	39.8	47.8	36.2	37.4	31.8
Protect Open Spaces/Parks	44.6	44.0	41.0	46.0	34.4	37.4
Control Noise at Sensitive Locations	79.2	79.6	79.0	78.2	77.4	77.2
Maximize Safe Travel	77.6	83.2	82.0	68.4	86.6	64.8

Citizens (48)

Order	Factor	Avg. Weight	Alt 20	Alt 22	Alt 23	Alt 25	Alt 27	Alt 28
1	Minimize Neighborhood Disruption	18.9%	14.65	14.72	14.31	14.65	17.06	16.53
4	Better Connect Links in Road Network	13.3%	10.26	10.95	9.62	11.14	12.07	11.78
7	Maintain good Air Quality	11.4%	8.92	8.92	8.92	8.92	8.92	8.92
5	Minimize Purchase of Private Property to Build Transportation Facilities	12.1%	5.12	4.80	5.77	4.37	4.51	3.84
3	Protect Open Spaces/Parks	16.1%	7.17	7.08	6.60	7.40	5.53	6.02
6	Control Noise at Sensitive Locations	11.7%	9.24	9.29	9.22	9.12	9.03	9.01
2	Maximize Safe Travel	16.5%	12.84	13.77	13.57	11.32	14.33	10.72
			68.20	69.53	67.99	66.91	71.46	66.81
			3	2	4	5	1	6

Technical Committee (11)

Order	Factor	Avg. Weight	Alt 20	Alt 22	Alt 23	Alt 25	Alt 27	Alt 28
3	Minimize Neighborhood Disruption	15.0%	11.63	11.69	11.36	11.63	13.55	13.13
2	Better Connect Links in Road Network	16.7%	12.88	13.75	12.07	13.98	15.15	14.78
5	Maintain good Air Quality	9.9%	7.74	7.74	7.74	7.74	7.74	7.74
4	Minimize Purchase of Private Property to Build Transportation Facilities	12.2%	5.17	4.85	5.83	4.42	4.56	3.88
6	Protect Open Spaces/Parks	9.7%	4.35	4.29	4.00	4.48	3.35	3.64
7	Control Noise at Sensitive Locations	9.4%	7.46	7.49	7.44	7.36	7.29	7.27
1	Maximize Safe Travel	27.0%	20.96	22.48	22.15	18.48	23.39	17.50
			70.18	72.29	70.59	68.09	75.03	67.95
			4	2	3	5	1	6

Consultant (8)

Order	Factor	Avg. Weight	Alt 20	Alt 22	Alt 23	Alt 25	Alt 27	Alt 28
2	Minimize Neighborhood Disruption	18.9%	14.68	14.76	14.34	14.68	17.10	16.58
3	Better Connect Links Road Network	16.2%	12.50	13.35	11.72	13.57	14.71	14.35
6	Maintain good Air Quality	10.5%	8.22	8.22	8.22	8.22	8.22	8.22
5	Minimize Purchase of Private Property to Build Transportation Facilities	10.9%	4.63	4.35	5.22	3.95	4.09	3.47
4	Protect Open Spaces/Parks	13.1%	5.85	5.77	5.38	6.04	4.51	4.91
7	Control Noise at Sensitive Locations	8.2%	6.53	6.56	6.51	6.45	6.38	6.36
1	Maximize Safe Travel	22.0%	17.08	18.31	18.05	15.06	19.06	14.26
			69.50	71.32	69.45	67.97	74.08	68.16
			3	2	4	6	1	5

3.5 Costs

Costs for each of the alternatives were developed based on recent costs for similar road projects received from the Road Commission for Oakland County (Table 3-12). Converting a mile of two-lane road to a five-lane roadway was estimated to cost $6 million in 2007 dollars not including any right-of-way or utility costs. To convert a mile of two-lane road to a four-lane boulevard was estimated to cost $10 million. Cost options for improvements to Rochester Road were calculated separately based on assumptions from a basic lane widening in each direction, to a brand new six-lane boulevard which varied from $6 million to $12 million per mile. This resulted in a low and high range cost for each alternative. Several costs were developed for Alternatives 20, 22, and 27 which contain several different types of improvements to Rochester Road. Congestion indices (V/C ratios) were also summarized for each alternative from earlier analyses.

The estimated costs range from $2 million to $191 million. The low cost was alternative 16 based on a recommendation to add a new road connection between Butler and Adams at Avon Road. The most expensive option was Alternative 27 which includes a six-lane boulevard on Rochester Road and 18.36 miles of roadway, capacity and safety improvements.

The cost data developed was then used in cooperation with the performance evaluation by dividing the performance score by the costs, to get a cost effectiveness score. The highest ranking alternative with costs considered is shown in Table 3-13. The calculations shown here are for the high range of the scale.

The results of the order ranking of the alternatives were exactly the same whether the high or low range of costs were considered. Alternative 23, shown in Figure 3-17, was determined to be the most cost effective followed by Alternative 25 (Figure 3-18) in all three weighted groups. When the cost effectiveness rank order is averaged with the performance evaluation rank order, Alternative 23 is the highest average ranked alternative in all three weighted groups. Alternative 20 was the next highest in rank order in the citizens and consultant weighted results with an average rank order of 3. Alternative 25 had a poor score in the performance evaluation and therefore when averaged with the cost effectiveness rank order falls lower in the average ranked order.

Table 3-12
Alternative Estimated Costs (millions)

Name	Description	Length (miles)	Cost Five-lane Section	Cost Four-lane Blvd. Section	All 26 Segments Avg. V/C 2035	Top 12 Congested Links Avg. V/C 2035
E+C 2035 Base					0.81	1.01
Alternative 1	Dequindre Road	4.8	$29	$48	0.79	0.98
Alternative 2	John R Road	4.2	$25	$42	0.80	0.99
Alternative 3	Rochester Road	3.56	$21	$43	0.78	0.97
Alternative 4	Livernois	4	$24	$40	0.81	0.99
Alternative 5	Crooks/Old Perch	2.25	$14	$23	0.78	0.96
Alternative 6	Adams Road	4	$24	$40	0.80	0.98
Alternative 7	Pave Dutton Road	3.5	$21	$35	NA	NA
Alternative 8	Tienken Road	4	$24	$40	0.78	0.97
Alternative 9	Avon Road West	3	$18	$30	0.78	0.99
Alternative 10	Avon Road East	2.25	$14	$23	0.81	0.99
Alternative 11	Hamlin Road	3	$18	$30	0.80	0.98
Alternative 12	Auburn Road	6	$36	$60	0.77	0.97
Alternative 13	South Blvd.	6	$36	$60	0.79	1.00
Alternative 14	Dutton Road	3.5	$21	$35		
Alternative 15	Tienken/Washington Road	2.4	$14	$24	0.81	1.02
Alternative 16	Butler New Connection	0.35	$2	$4	0.81	0.99
Alternative 17	Butler Connection and Avon Road	2.5	$15	$25	0.77	0.95
Alternative 18	Dequindre Road and Realignment	4.8	$29	$48	0.80	0.99
Alternative 19	Composite - Adams Road, Livernois Road, Tienken Road, Dequindre Road	14.8	$89	$148	0.74	0.90
Alternative 20	Composite - Livernois Road, Tienken Road, Rochester Road, Avon Road	10.56	$63	$113	0.73	0.85
Alternative 21	Composite - Adams Road, Livernois Road Avon Road	8	$48	$80	0.75	0.93
Alternative 22	Composite - Tienken Road , Rochester Road , Avon Road , Dequindre Road	15.36	$92	$161	0.72	0.90
Alternative 23	Composite - Crooks Road, Avon Road, Old Perch, Dequindre Road	8.7	$52	$87	0.73	0.87
Alternative 24	Composite - Adams Road, Livernois Road, Hamlin Road	8	$48	$80	0.79	0.97
Alternative 25	Composite - Auburn Road, Livernois Road, John R Road	10	$60	$100	0.74	0.92
Alternative 26	Composite - Tienken Road, Livernois Road, Avon Road, Hamlin Road, Rochester Road	7	$42	$70	0.74	0.87
Alternative 27	Composite - Tienken Road, Avon Road, Adams Road, Rochester Road, Dequindre Road	18.36	$110	$191	0.68	0.80
Alternative 28	Composite - Avon Road, Auburn Road, Livernois Road, John R Road	15.2	$91	$152	0.71	0.85

Note: Costs do not include ROW.
V/C = Volume ÷ Capacity

Table 3-13
Cost Effectiveness Summary by Group

	Consultant Performance Scores					
Factor	Alt 20	Alt 22	Alt 23	Alt 25	Alt 27	Alt 28
Minimize Neighborhood Disruption	77.6	78.0	75.8	77.6	90.4	87.6
Better Connect Links in the Transit and road Networks	77.0	82.2	72.2	83.6	90.6	88.4
Maintain Good Air Quality	78.0	78.0	78.0	78.0	78.0	78.0
Minimize Purchase of Private Property to Build Transportation Facilities	42.4	39.8	47.8	36.2	37.4	31.8
Protect Open Spaces/Parks	44.6	44.0	41.0	46.0	34.4	37.4
Control Noise at Sensitive Locations	79.2	79.6	79.0	78.2	77.4	77.2
Maximize Safe Travel	77.6	83.2	82.0	68.4	86.6	64.8

	Citizens (48)						
Order	Factor	Avg. Weight	Alt 20	Alt 22	Alt 23	Alt 25	Alt 27	Alt 28
1	Minimize Neighborhood Disruption	18.9%	14.65	14.72	14.31	14.65	17.06	16.53
4	Better Connect Links in the Transit and road Networks	13.3%	10.26	10.95	9.62	11.14	12.07	11.78
7	Maintain Good Air Quality	11.4%	8.92	8.92	8.92	8.92	8.92	8.92
5	Minimize Purchase of Private Property to Build Transportation Facilities	12.1%	5.12	4.80	5.77	4.37	4.51	3.84
3	Protect Open Spaces/Parks	16.1%	7.17	7.08	6.60	7.40	5.53	6.02
6	Control Noise at Sensitive Locations	11.7%	9.24	9.29	9.22	9.12	9.03	9.01
2	Maximize Safe Travel	16.5%	12.84	13.77	13.57	11.32	14.33	10.72
	Performance		68.20	69.53	67.99	66.91	71.46	66.81
	Cost		$ 112.72	$ 160.72	$ 87.00	$ 100.00	$ 190.72	$ 152.00
	Ratio Performance/Cost		0.60	0.43	0.78	0.67	0.37	0.44
	Order w/ cost		3	5	1	2	6	4
	Order w/o cost		3	2	4	5	1	6
	Average Order		3	3.5	2.5	3.5	3.5	5

	Technical Committee (11)						
Order	Factor	Avg. Weight	Alt 20	Alt 22	Alt 23	Alt 25	Alt 27	Alt 28
3	Minimize Neighborhood Disruption	15.0%	11.63	11.69	11.36	11.63	13.55	13.13
2	Better Connect Links in the Transit and road Networks	16.7%	12.88	13.75	12.07	13.98	15.15	14.78
5	Maintain Good Air Quality	9.9%	7.74	7.74	7.74	7.74	7.74	7.74
4	Minimize Purchase of Private Property to Build Transportation Facilities	12.2%	5.17	4.85	5.83	4.42	4.56	3.88
6	Protect Open Spaces/Parks	9.7%	4.35	4.29	4.00	4.48	3.35	3.64
7	Control Noise at Sensitive Locations	9.4%	7.46	7.49	7.44	7.36	7.29	7.27
1	Maximize Safe Travel	27.0%	20.96	22.48	22.15	18.48	23.39	17.50
	Performance		70.18	72.29	70.59	68.09	75.03	67.95
	Cost		$ 112.72	$ 160.72	$ 87.00	$ 100.00	$ 190.72	$ 152.00
	Ratio Performance/Cost		0.62	0.45	0.81	0.68	0.39	0.45
	Order w/ cost		3	4/5	1	2	6	4/5
	Order w/o cost		4	2	3	5	1	6
	Average Order		3.5	3.25	2	3.5	3.5	5.25

	Consultant (8)							
Order	Factor	Avg. Weight	Alt 20	Alt 22	Alt 23	Alt 25	Alt 27	Alt 28
2	Minimize Neighborhood Disruption	18.9%	14.68	14.76	14.34	14.68	17.10	16.58
3	Better Connect Links in the Transit and road Networks	16.2%	12.50	13.35	11.72	13.57	14.71	14.35
6	Maintain Good Air Quality	10.5%	8.22	8.22	8.22	8.22	8.22	8.22
5	Minimize Purchase of Private Property to Build Transportation Facilities	10.9%	4.63	4.35	5.22	3.95	4.09	3.47
4	Protect Open Spaces/Parks	13.1%	5.85	5.77	5.38	6.04	4.51	4.91
7	Control Noise at Sensitive Locations	8.2%	6.53	6.56	6.51	6.45	6.38	6.36
1	Maximize Safe Travel	22.0%	17.08	18.31	18.05	15.06	19.06	14.26
	Performance		69.50	71.32	69.45	67.97	74.08	68.16
	Cost		$ 112.72	$ 160.72	$ 87.00	$ 100.00	$ 190.72	$ 152.00
	Ratio Performance/Cost		0.62	0.44	0.80	0.68	0.39	0.45
	Order w/ cost		3	5	1	2	6	4
	Order w/o cost		3	2	4	6	1	5
	Average Order		3	3.5	2.5	4	3.5	4.5

Figure 3-17
Original Alternative 23
Highest Ranked Alternative

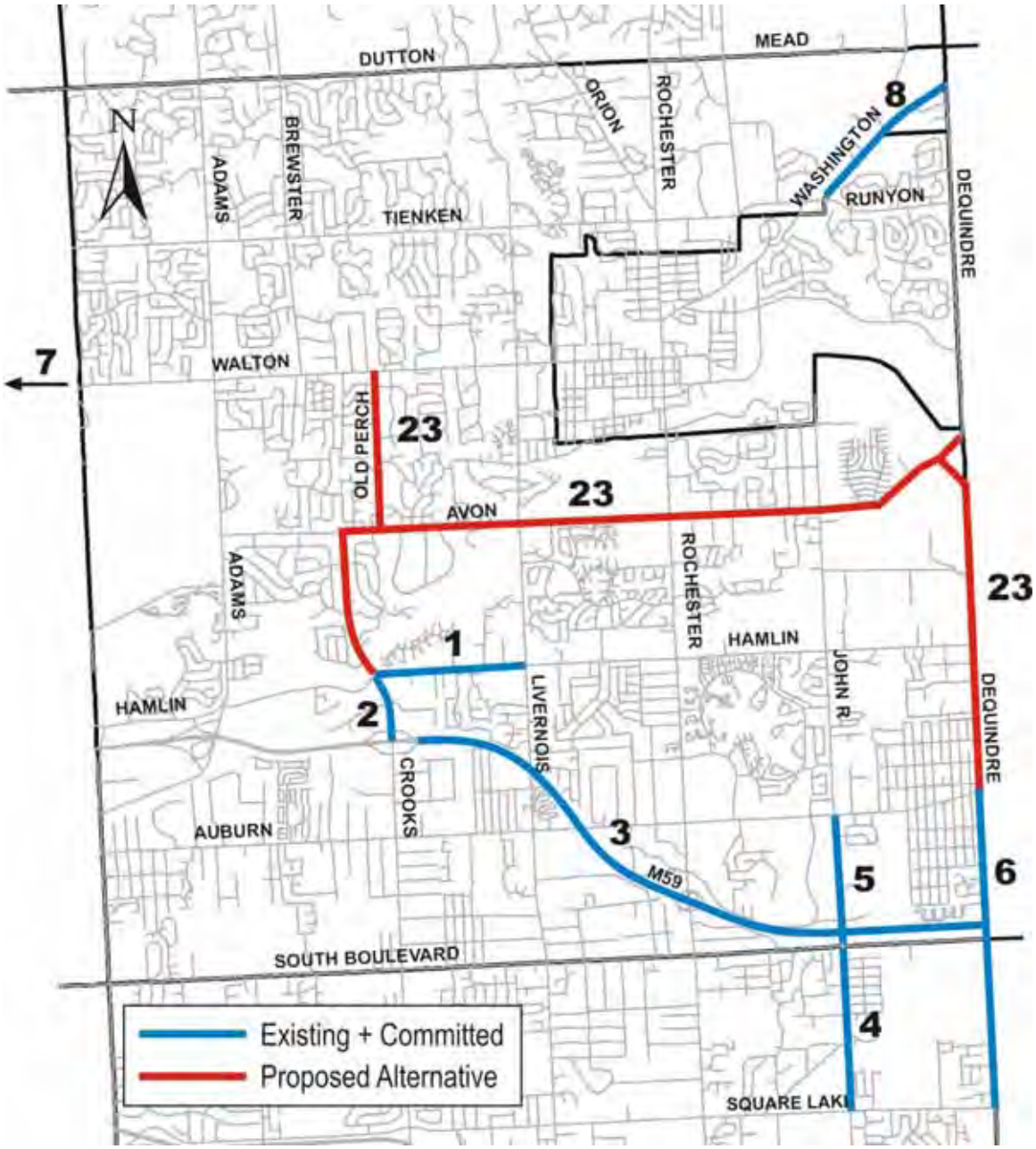
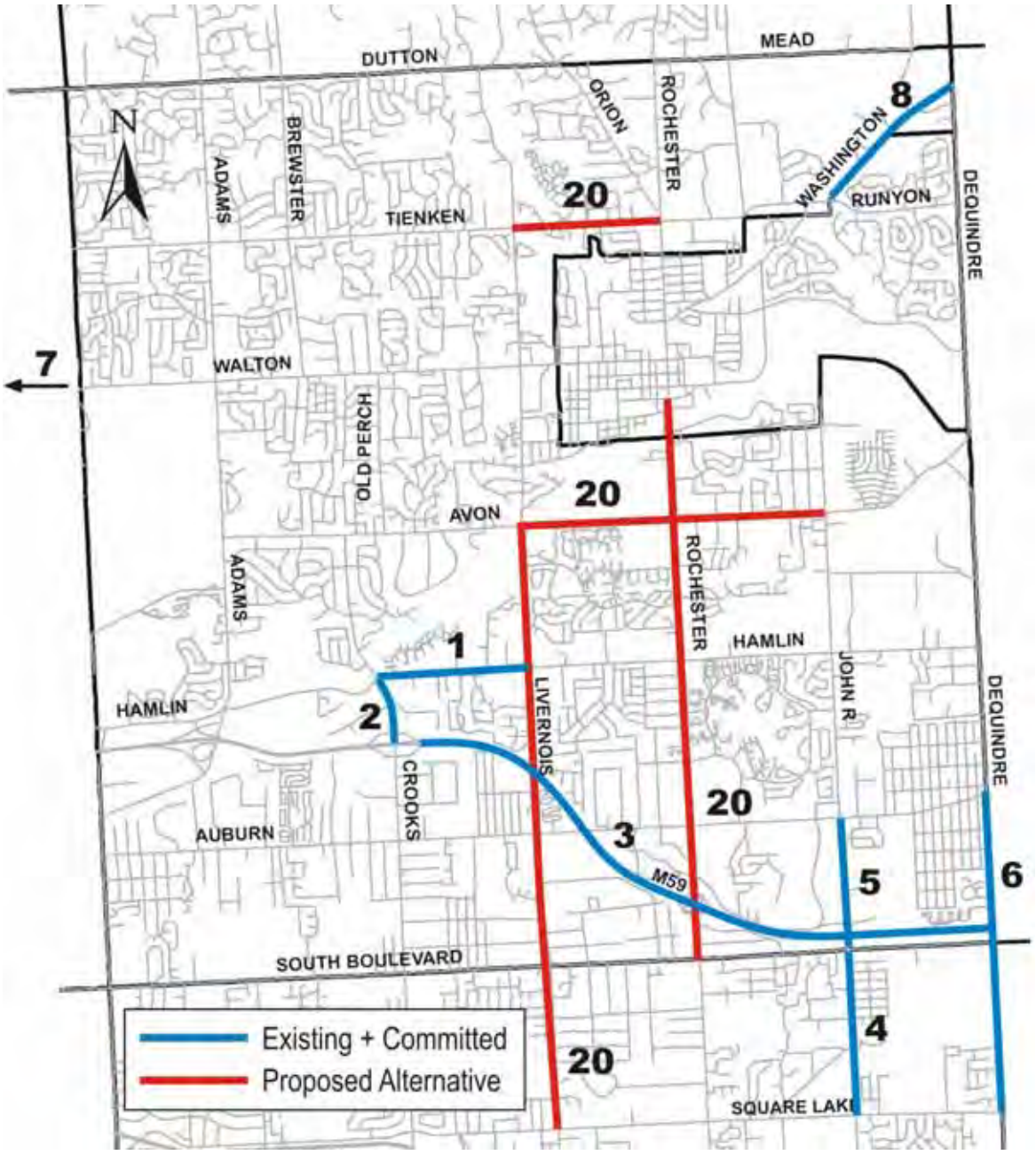


Figure 3-18
Alternative 20
Next Ranked Alternative



Upon review of the last MTPU prepared by others, similarities exist at plans on improving the major thoroughfare in Rochester Hills (Figure 3-19).

Figure 3-19
Previous Master Thoroughfare Plan Recommendations

Based on feedback from the Technical Committee the Dequindre Realignment at Avon/Dequindre and 23 Mile Road was suggested to be added to the preferred alternative (Alternative 23). A generic alignment was suggested and shown for analysis purposes and is shown in Figure 3-20. In 2001 a unit cost estimate to bridge between the current Avon/Dequindre/23 Mile Road intersection and Dequindre Road to the south was updated to 2007 dollars. The current range of costs was estimated to be between $7 million and $10 million more because of the grades, floodplain, and long elevated structure required. Upon adding these costs back through the cost effectiveness evaluation Alternative 23 still provides the most "bang for the buck" at $57 million.

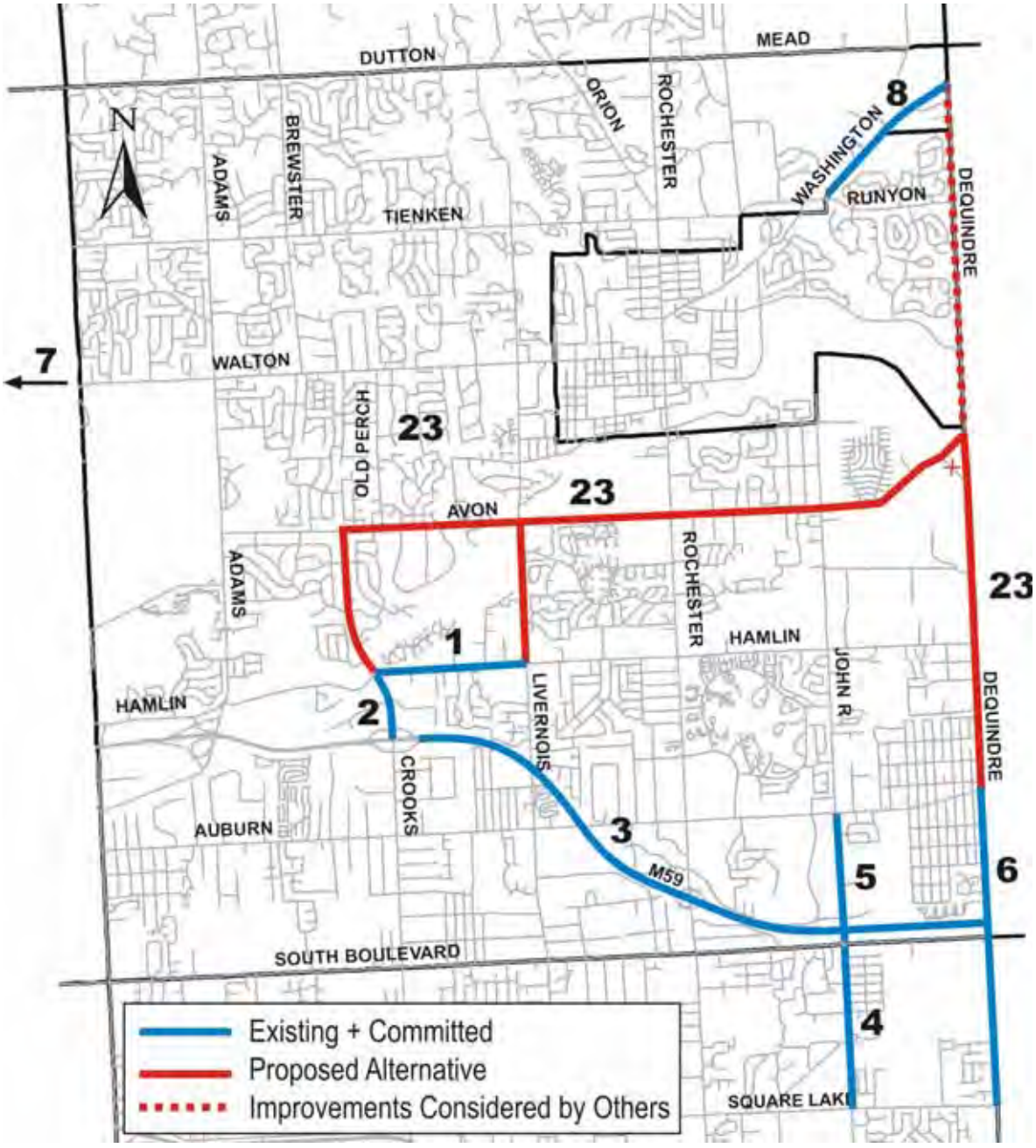
Figure 3-20
Dequindre Realignment Right-of-Way

Three more refinements were offered by the Technical Committee to make up the preferred alternative. They included replacing the Old Perch segment between Avon and Walton with the section of Livernois between Avon and Hamlin, adding a host of safety and operational fixes to Rochester Road, and a suggestion that improvements on Dequindre Road continue beyond the city limits from 23 Mile Road to 26 Mile Road be considered by other jurisdictions.

The Rochester Road fixes will be included in the next section. Discussions with Shelby Township on Dequindre Road north of 23 Mile Road have been initiated and discussions with the Macomb County Road Commission and the City of Rochester are planned.

In Figure 3-21 is the modified Alternative 23 that is the most effective means to alleviate the anticipated roadway congestion in 2035 and, therefore, now called the Preferred Alternative.

Figure 3-21
Preferred Alternative



3.6 Alternative Staging

Dequindre Road was determined by the Technical Committee to be the highest priority in the staging of alternative improvements because it is a border road and benefits many communities. Its costs could be shared between the two communities and the two road commissions involved. This, however, presents other challenges as there are two different federal aid committees that must agree to fund the project. Then there are different governing policies which involve right-of-way acquisition and other elements which need to be coordinated as soon as planning moves forward. Other recent experience expressed by Technical Committee members suggests one champion must take the lead in these types of projects to follow them through to completion.

3.7 Segment Safety Improvements

3.7.1 Crash Concentrations

Crash data was analyzed on every link in the city and the top 20 segments were selected for further consideration. The segments are highlighted in Figure 3-22. Detailed analysis of the types and locations of crashes is included in Tables 3-14A and 3-14B. Improvements are identified below.

Link A – Rochester Road from South to Auburn. Crashes are evenly distributed throughout the mile long link. Signalized intersections at the off-ramps to eastbound and westbound M-59 along with slip on-ramps to M-59 create additional conflict points along with Eastlawn, Michelson, Nawakwa, Shadywood, and Hickory Lawn in the same stretch. Installation of a new traffic signal for Lowes and Meijer outbound traffic and right in and right out movements help to control access and create gaps in the traffic stream south of Auburn Road. Rear-end and angle crashes are most likely caused do to heavy afternoon peak hour congestion as 22 percent occur in the two hours between 4:00 and 6:00 pm. The hazardous action reported on the crash reports were indicated as fail to yield and unable to stop in 39 percent of the crashes.

Crash Countermeasures for Link A. Access management techniques including closure and consolidation of driveways, turn lanes, and additional channelization along with capacity improvements could reduce the potential for traffic crashes.

Exclusive right-turn or deceleration lanes from South Boulevard to M-59 in the northbound direction and southbound from Auburn Road to M-59 could substantially improve operations and safety in this section (Figures 3-23 and 3-24). A safety audit and time of return analysis on Rochester Road should be conducted by MDOT. A benefit to cost ratio of 3 to 1 was calculated on just the southbound continuous right-turn lane with only southbound rear end crashes considered to be reduced by 30 percent.

Link B – Rochester Road from Auburn to Hamlin. Crashes are concentrated near the commercial driveways from Auburn to North of Barclay Circle and the area south of Hamlin Road. The crash cause was reported as unable to stop 60 percent of the time which correlates to the rear-end crash type occurring 65 percent of the time. The highest percentage of crashes occurred between 12:00 – 2:00 pm resulting in 26 percent of the total crashes in the four years analyzed.

Figure 3-22
Segments with Above Average Crash Rates

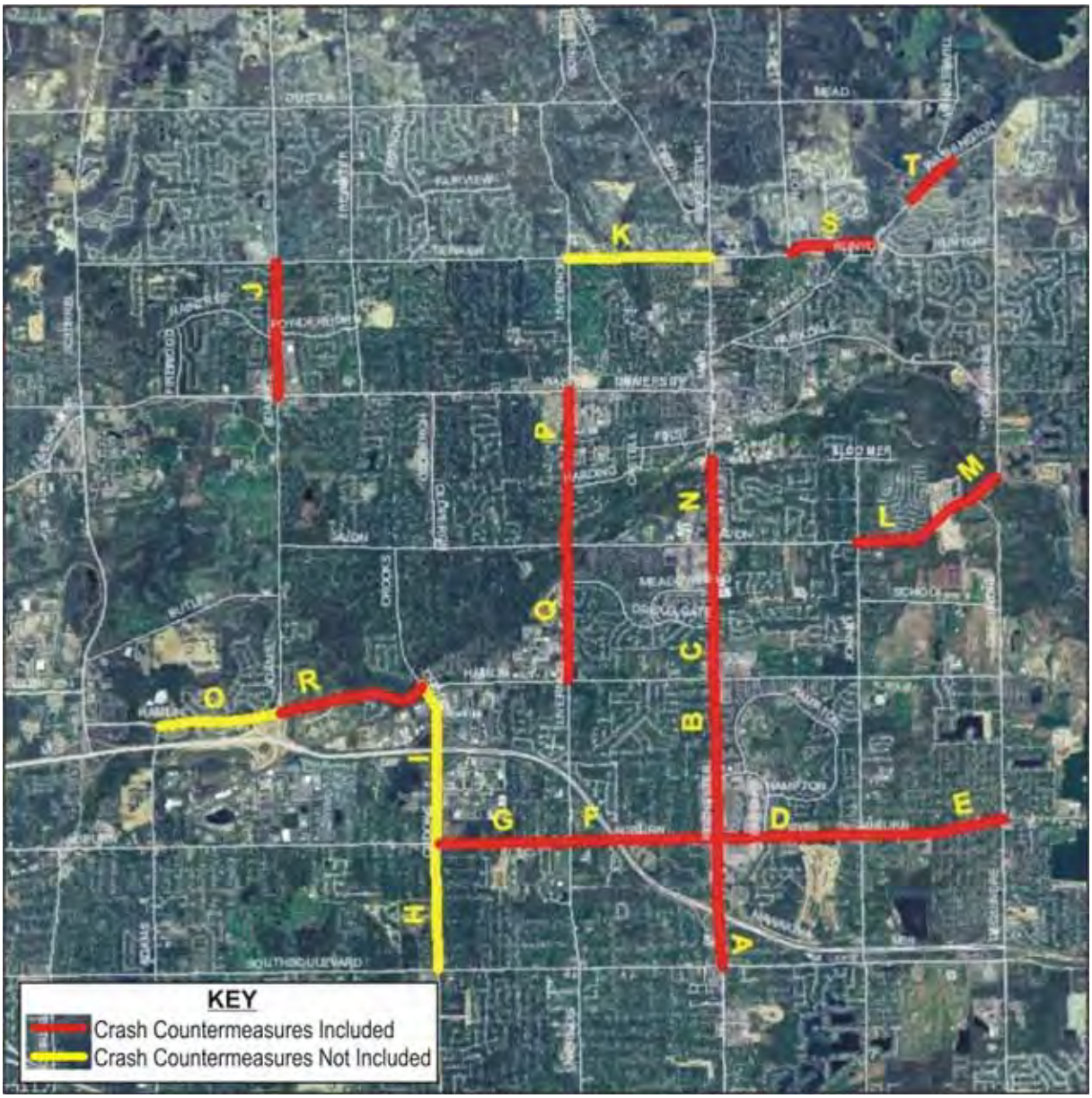


Table 3-14A
Segment Crash Data

				Type of Crash 2003-2006									
Link	On	From	To	Single	Ho-It	Angle	Re-sum	SS-S	SS-O	Other	Total	Crashes Per Mile Per Year	Crash Rate (crashes per MVM)
A	Rochester Road	South Street	Auburn Road	12	81	149	174	24	7	3	450	113	6.88
B	Rochester Road	Auburn Road	Hamlin Road	12	37	76	321	38	4	8	496	124	6.41
C	Rochester Road	Hamlin Road	Avon Road	15	27	60	187	29	6	11	335	84	5.21
D	Auburn Road	Rochester Rd	John R Road	20	12	45	73	9	2	1	162	41	5.62
E	Auburn Road	John R Road	Dequindre Road	9	4	14	58	3	1	3	92	23	3.89
F	Auburn Road	Rochester Rd	Livernois Road	20	6	19	37	7		1	90	23	3.53
G	Auburn Road	Livernois Road	Crooks Road	10	2	11	47	6		2	78	20	3.83
H	Crooks Road	South Street	Auburn Road	8	3	16	70	2	1		100	25	5.44
I	Crooks Road	Auburn Road	Hamlin Road	8	32	67	120	34	4	9	274	69	8.17
J	Adams Road	Dutton Road	Tienken Road	24	8	9	49	2	1	2	95	24	2.46
K	Tienken Road	Livernois Road	Rochester Road	15	5	17	62	7		2	108	27	3.79
L	Avon Road	John R Road	Dequindre Road	15	5	17	62	7	1	1	108	27	4.05
M	Avon Road	Dequindre Road	23 Mile	2		1	6		1		10	3	2.33
N	Rochester Road	Avon Road	Diversion	5	9	36	80	23	1	3	157	39	4.47
O	Adams Road	Industrial Drive	Quail	23	3	20	31	15		2	94	24	5.44
P	Livernois	Walton	Avon Road	23	5	32	99	19	1	3	182	46	3.86
Q	Livernois	Avon Road	Hamlin	14	6	6	58	1	2	2	89	22	3.76

Legend: Ho-It = Head-on left-turn, Re-sum = Rear ends (All), SS-same = Side-swipe same direction, SS-opp = Side-swipe opposite direction
MVM = Million Vehicle Miles Traveled, MV = Million Vehicles Entered
Source: The Corradino Group of Michigan, Inc. and TIA

Table 3-14B
Segment Crash Type Summary

				Type of Crash 2003-2006						
Link	On	From	To	Single	Ho-It	Angle	Re-sum	SS-S	SS-O	Other
A	Rochester Road	South Street	Auburn Road	3%	18%	33%	39%	5%	2%	1%
B	Rochester Road	Auburn Road	Hamlin Road	2%	7%	15%	65%	8%	1%	2%
C	Rochester Road	Hamlin Road	Avon Road	4%	8%	18%	56%	9%	2%	3%
D	Auburn Road	Rochester Rd	John R Road	12%	7%	28%	45%	6%	1%	1%
E	Auburn Road	John R Road	Dequindre Road	10%	4%	15%	63%	3%	1%	3%
F	Auburn Road	Rochester Rd	Livernois Road	22%	7%	21%	41%	8%	0%	1%
G	Auburn Road	Livernois Road	Crooks Road	13%	3%	14%	60%	8%	0%	3%
H	Crooks Road	South Street	Auburn Road	8%	3%	16%	70%	2%	1%	0%
I	Crooks Road	Auburn Road	Hamlin Road	3%	12%	24%	44%	12%	1%	3%
J	Adams Road	Dutton Road	Tienken Road	25%	8%	9%	52%	2%	1%	2%
K	Tienken Road	Livernois Road	Rochester Road	14%	5%	16%	57%	6%	0%	2%
L	Avon Road	John R Road	Dequindre Road	14%	5%	16%	57%	6%	1%	1%
M	Avon Road	Dequindre Road	23 Mile	20%	0%	10%	60%	0%	10%	0%
N	Rochester Road	Avon Road	Diversion	3%	6%	23%	51%	15%	1%	2%
O	Adams Road	Industrial Drive	Quail	24%	3%	21%	33%	16%	0%	2%
P	Livernois	Walton	Avon Road	13%	3%	18%	54%	10%	1%	2%
Q	Livernois	Avon Road	Hamlin	16%	7%	7%	65%	1%	2%	2%

Legend: Ho-It = Head-on left-turn, Re-sum = Rear ends (All), SS-same = Side-swipe same direction, SS-opp = Side-swipe opposite direction
MVM = Million Vehicle Miles Traveled, MV = Million Vehicles Entered
Source: The Corradino Group of Michigan, Inc. and TIA

Figure 3-23
Segment A – Rochester Road South of M-59

Figure 3-24
Segment A – Rochester Road North of M-59

Crash Countermeasures for Link B. Access management techniques including closure and consolidation of driveways, additional continuous-right-turn lanes, and additional channelization along with capacity improvements could reduce the potential for traffic crashes (Figure 3-25).

Link C – Rochester Road from Hamlin to Avon. Crashes are concentrated in five general locations in this segment. The retail areas just south of Avon and just north of Hamlin have busy driveways that involve more conflict points. The other crash areas are located around residential access at Sandalwood, Drexelgate, and Meadowfield/Yorktowne.

The speed studies conducted showed that this section had the highest average speeds in the corridor in both the off-peak and afternoon peak hours. A lack of gaps in traffic has also been documented in other studies.

Crash Countermeasures for Link C. Contemplated development on the east side of Rochester Road is anticipated in the next 5 years. The potential need for a signal at Meadowfield/Yorktowne and for this new development should consider equal one-third mile spacing between both new proposed signal locations. Access changes near these new signal locations has already been considered and should be able to warrant new signals as the developments are implemented.

Link D – Auburn Road from Rochester to John R. Angle and rear end crashes are concentrated near the Meijer/Kohls Driveway and the Barclay Circle Signalized intersection. Left-turn movements into and out of the unsignalized driveway is often difficult as the turning and through volumes are high at this location.

Crash Countermeasures for Link D. Mitigation would include more concentration of driveways and improved access to the Barclay signal or removal of one of the non-channelized driveways at Meijer and Kohls. Also the extension of the three-lane road segment to the west from John R. to accommodate eastbound left-turns to the first driveway at the Salvation Army store would reduce the potential for crashes there.

Link E – Auburn Road from John R. to Dequindre. Crashes occurring on this segment are related to the 12 access points to the side streets along this segment.

Crash Countermeasures for Link E. Mitigation for this road section would include a continuous center-turn lane for the entire length.

Link F – Auburn Road from Livernois to Rochester. The single vehicle crashes are evenly distributed throughout the segment while the rear-end crashes are occurring near the approaches to Livernois and Rochester Road.

Crash Countermeasure for Link F. Mitigation for this road section would include a continuous center-turn lane for the entire length.

Figure 3-25
Segment B – Rochester Road North of Auburn

Link G – Auburn Road from Crooks to Livernois. Crashes are concentrated in the area at the Avondale Middle School driveway at Cone, through to Lexham, east of the Avondale Meadows Driveway directly off of Auburn Road. There are busy retail activities on the north side that also contribute to heavy turns in the area.

Crash Countermeasures for Link G. Mitigation for this road section would include a continuous center-turn lane for the entire length.

Link H – Crooks Road from South to Auburn. No countermeasures are suggested because the new four-lane boulevard was just completed. Crashes should be monitored as a high number of rear-end, angle and head-on crashes should be eliminated as a result of the recent improvements.

Link I – Crooks Road from Auburn to Hamlin. No countermeasures are suggested because the high percentage of angle crashes should be mitigated by the new boulevard cross section.

Link J – Adams Road from Tienken to Walton. Angle, rear-end, and head-on left-turn crashes are occurring near the commercial driveways close to Walton.

Crash Countermeasures for Link J. Additional deceleration lanes and access management principles, including shared access easements, should be initiated.

Link K – Tienken Road from Livernois to Rochester. Early preliminary engineering analysis is currently being completed on this road segment and will likely be improved in the next few years. Therefore, no countermeasures are suggested at this time.

Link L – Avon Road from John R. to Dequindre. Congestion and access issues contribute to crashes on this segment.

Crash Countermeasures for Link L. A center left-turn lane should be considered for this road segment.

Link M – Avon Road from Dequindre to 23 Mile Road. Congestion and access issues contribute to crashes on this segment.

Crash Countermeasures for Link M. A center left-turn lane should be considered for this road segment. The proposed improvements to realign Dequindre as part of the preferred alternative would reduce crashes and help clear congestion in Links L and M.

Link N – Rochester Road from Avon to Diversion. Angle crashes from the commercial access are observed here.

Crash Countermeasures for Link N. Access management techniques such as shared access easements, closure and consolidation of driveways, and channelization of driveways should be explored.

Link O – Hamlin from Old Adams to New Adams. This road segment, which is now a four-lane boulevard, will experience different volumes over the next few years. No countermeasures are suggested but crashes should be monitored.

Link P – Livernois Road from Avon to Walton. Crashes are occurring nearing the commercial areas and at the direct crossovers in the boulevard section.

Crash Countermeasures for Link P. The direct crossover connections southbound on Livernois at Harding and in the commercial area should be further studied to be closed. The boulevard should be able to function adequately using the indirect left-turns as planned.

Links Q, S, T. Crashes are occurring along the road segments and are congestion- or access-related.

Crash Countermeasures for Links Q, S, T. Provide a center-turn lane when the opportunity presents itself.

Link R – Hamlin Road from Adams to Crooks. Forty-four of 62 reported crashes were animal-related. Signs are already posted. No countermeasures, other than wildlife management, are suggested.

Costs for the safety improvements and crash countermeasures were developed and are provided in Table 3-15. All costs are in 2007 dollars and were based on a recent publication from the Road Commission for Oakland County "Facing the Music" Report of the 2007 Planning Process. Improvements in Segments A, B, C and N along Rochester Road should be implemented as soon as possible. Often there is a direct relationship between crashes and congestion. Where we can improve safety, improved operations usually follow.

Table 3-15
Crash Countermeasure Estimated Costs

Crash Segment	Crash Countermeasure	Estimated Costs
A	Deceleration lane for NB and SB Rochester	$1 million - $2 million
B	Deceleration lane for SB Rochester	$1 million - $2 million
C	Deceleration lanes and access management	$200,000 - $500,000
D	Close one driveway at Kohls or Meijers, Extend center-turn lane at John R	$200,000 - $500,000
E	Add center-turn lane - full length	$2 million - $3 million
F	Add center-turn lane - full length	$2 million - $3 million
G	Add center-turn lane - full length	$2 million - $3 million
H	New 4 lane Boulevard	NA
I	New 4 lane Boulevard	NA
J	Access management and deceleration lanes	$300,000 - $500,000
K	EPE study underway - 3 or 5 lane	TBD
L	Add center-turn lanes/passing lanes	$1 million - $1.5 million
M	Add center-turn lane	$1 million - $1.5 million
N	Access management and deceleration lanes	$200,000 - $500,000
O	Change in traffic exposure with new relocated Adams -monitor crashes	NA
P	Remove direct-left-turn	$100,000
Q	Center-turn lane/passing lanes	$200,000 - $500,000
R	Animal Control	NA
S	Add center-turn lane - full length	$500,000 - $1 million
T	Add center-turn lane - full length	$500,000 - $1 million

Note: Costs are in 2007 dollars.

3.8 Intersection Operations and Safety

Adams Road and Rochester Road corridors were analyzed in detail to determine existing and future capacity and safety deficiencies. Traffic data for the afternoon peak hour was collected from various sources including the City, MDOT, Road Commission for Oakland County, and other traffic impact studies. A model based on SYNCHRO/SIMTRAFFIC software was developed and used to examine the corridors at a "micro" level or intersection by intersection basis. The turning movement counts were input into this simulation model which replicates the current transportation system including the number of lanes, current signal timing, phasing etc… The corridor was then analyzed and calibrated to properly replicate existing operational conditions.

The model's network allows consideration of major intersection and driveways along Adams Road and Rochester Road; the traffic movements at each; and, the phasing/timing of traffic signals and a quantitative measure of operational performance. Measures of Effectiveness (MOE) produced by this set of models include:

Level of Service (LOS): The level-of-service concept provides the most widespread measure of traffic performance. Levels of service range between LOS A (free flow, minimal delays) to LOS F (highly congested, heavy delays). Intermediate conditions are described by LOS B, LOS C, LOS D and LOS E. In urban conditions, LOS D is generally the minimum

acceptable performance (level-of-service standard). In the core of the Southeast Michigan region, LOS E is often considered acceptable.

Delay: At intersections, the levels of service are measured through the calculation of delays incurred by vehicles crossing the intersection. Each level of service described above indicates a range of delays as shown next (Table 3-16):

Table 3-16
Level of Service (LOS) Criteria for Signalized Intersections

LOS A	Less than or equal to 10 sec per vehicle average delay	Most vehicles do not stop at all. Most arrive during the green phase. Little or no delay
LOS B	>10 to 20 sec. avg delay per vehicle	More vehicles stop than for LOS A. Still good progression through lights. Short traffic delays.
LOS C	>20 to 35 sec. avg delay per vehicle	Significant numbers of vehicles stop, although many pass through without stopping.
LOS D	>35 to 55 sec. avg. delay per vehicle	Many vehicles stop. Individual signal cycle failures are noticeable. Progression is intermittent.
LOS E	>55 to 80 sec. avg delay per vehicle	Considered to be the limit of acceptable delay. Individual cycle failures are frequent and progression is poor.
LOS F	> 80 sec. avg delay per vehicle	Extreme and unacceptable traffic delays.

Existing and future condition LOS for Adams Road, along with future year improvements to obtain acceptable levels of service are provided in Table 3-17.

Future traffic conditions were developed by growing the existing model volumes by the expected growth in traffic based on SEMCOG's Transportation Demand Model estimates of future population and employment growth. This gives a conservative estimate of traffic in the year 2035 used for modeling and anticipation of future problems if nothing else changed on the transportation network.

Obviously, with more traffic and no improvements to the road network, congestion increases and operations continue to degrade or get worse and as shown in Table 3-17. Balancing other modes of travel and the public space created by the streets is an important consideration in implementing this plan. By no means was this analysis absent of the consideration of the context in which these improvements are being proposed.

The consulting team developed improvements to mitigate the expected issues in the future year analysis. Improvements were made to the network this time to be able to adequately serve the future year volumes at an acceptable LOS. Those also are listed in the Table 3-17 as Proposed Improvements.

Figures 3-26 through 3-32 highlight short-, mid- and long-term strategies to improve and fix the current anticipated issues.

Existing and future condition LOS are provided similarly for Rochester Road. Future year improvements to obtain acceptable levels of service are also provided in Table 3-18.

Table 3-17
Adams Road Corridor- Summary of Operations

Intersection		Existing 2007 LOS	Future 2035 LOS No Improvements	Proposed Improvements	LOS
1	Dutton Rd & Adams Rd	A (5.3)	A (9.0)	Reconfigure E/W for Left turn Lane	A (9.3)
2	Van Hoosen School Dr & Adams Rd	A (1.8)	F (122.6)	EB - No Changes NB - Add 1 left turn lane with 150' storage SB - No Changes	A (8.1)
3	Tienken Rd & Adams Rd	E (64.6)	F (201.6)	EB - Add 1 thru lane WB - Add 1 thru lane NB - Add 1 thru lane SB - Add 1 thru lane	D (47.3)
4	Powderhorn Ridge Rd & Adams Rd	A (6.8)	B (10.1)	No changes	B (12.4)
5	Raintree Dr & Adams Rd	B (14.9)	C (26.0)	No changes	C (28.4)
6	Walton Blvd & Adams Rd	E (74.0)	F (221.7)	EB - Add 2 thru lanes, Keep dedicated RT Lane WB - Add 2 thru lanes and right turn lane NB - Add 1 thru lane, Add 2 right turn lanes SB - Add 1 thru lane	D (42.2)
7	Hillendale Dr & Adams Rd	A (7.3)	A (9.2)	EB - No Changes WB - No Changes NB - Add 1 thru lane, lengthen left turn storage to 150' SB - Add left turn lane w/ 150' storage	B (14.9)
8	Avon Rd & Adams Rd	C (25.8)	D (56.0)	WB - Add second (dual) right turn lane NB - Add 1 thru lane SB - Add 1 thru lane	D (44.5)
9	Hamlin Rd & Adams Rd	A (9.9)	F (543.8)	EB - Add 1 thru lane WB - Add 1 right turn lane NB - No Changes SB - No Changes	B (14.8)
10	EB M-59 Off-Ramp & Adams Rd	B (18.0)	B (14.4)	No Changes	B (15.0)
11	Forester Rd & Adams Rd	A (6.4)	A (9.3)	No Changes	B (10.5)
12	Auburn Rd & Adams Rd	F (254.1)	F (467.7)	EB - Add 1 thru lane, Add second (dual) left turn lane WB - Add 1 thru lane, Add second (dual) left turn lane, Add 2 (dual) right turn lane NB - Add 1 thru lane, Add second (dual) left turn lane SB - Add 1 thru lane, Add second (dual) left turn lane	D (53.5)
13	South Blvd & Adams Rd	C (26.0)	D (36.6)	No Changes	D (44.8)

Source: Orchard, Hiltz & McCliment, Inc.

Figures 3-33 through 3-42 highlight short-, mid- and long-term strategies to improve and fix the current and anticipated issues on Rochester Road.

Figure 3-26
Tienken Road and Adams Road – Short-term

Figure 3-27
Tienken Road and Adams Road – Long-term

Figure 3-28
Walton and Adams Road – Short-term

Figure 3-29
Walton and Adams Road – Long-term

Figure 3-30
Auburn Road and Adams Road – Short-term

Figure 3-31
Auburn Road and Adams Road – Mid-term

Figure 3-32
Auburn Road and Adams Road – Long-term

Table 3-18
Rochester Road Corridor – Summary of Operations

	Intersection	Existing 2007 LOS	Future 2035 LOS No Improvements	Proposed Improvements	LOS
1	Diversion St & Rochester Rd	A (7.4)	A (8.7)	No changes	B (11.2)
2	Avon Rd & Rochester Rd	E (74.7)	F (132.1)	EB - Add 1 additional thru lane, provide Rt turn permissive-overlap signal phase WB - Add an exclusive RT lane, provide Rt turn permissive-overlap phase NB - Provide dual left turn lanes and one additional thru lane, provide Rt turn permissive-overlap phase SB - Provide dual left turn lanes and one additional thru lane, provide Rt turn permissive-overlap phase	D (50.9)
3	Hamlin Rd & Rochester Rd	C (32.8)	F (81.2)	EB - Extend 2nd lane westwards, for thru / right shared lane. WB - No changes NB - Add 1 additional thru lane, provide Rt turn permissive-overlap phase SB - Add 1 additional thru lane, provide Rt turn permissive-overlap phase	D (51.6)
4	Wabash Rd/Barclay Circle & Rochester Rd	E (69.3)	F (137.6)	EB - No changes WB - Remove median island, change from split phasing to concurrent E/W movement NB - Add 1 additional thru lane SB - Add 1 additional thru lane	C (21.9)
5	Auburn Rd & Rochester Rd	E (79.9)	F (126.4)	EB - Provide dual left turn lanes WB - Provide dual left turn lanes, remove exclusive RT lane NB - Provide dual left turn lanes, add 1 additional thru lane, provide Rt turn permissive-overlap phase SB - Provide dual left turn lanes, add 1 additional thru lane, provide Rt turn permissive-overlap phase	D (51.0)
6	M-59 WB off Ramp & Rochester Rd	B (13.6)	B (18.3)	No changes	C (29.1)
7	M-59 EB off Ramp & Rochester Rd	B (14.7)	B (13.3)	No changes	C (24.0)
8	South Blvd & Rochester Rd	F (111.1)	F (189.0)	EB - Provide dual left turn lanes, add 1 additional thru lane, remove exclusive RT lane WB - Add 1 additional thru lane NB - Add 1 additional thru lane, add exclusive RT lane, provide Rt turn permissive-overlap phase SB - Add 1 additional thru lane, add exclusive RT lane, provide Rt turn permissive-overlap phase	D (53.0)

Source: Orchard, Hiltz & McCliment, Inc.

Figure 3-33
Avon Road and Rochester Road – Short-term

Figure 3-34
Avon Road and Rochester Road – Long-term

Figure 3-35
Hamlin Road and Rochester Road – Short-term

Figure 3-36
Hamlin Road and Rochester Road – Long-term

Figure 3-37
Wabash Road/Barclay Circle and Rochester Road – Short-term

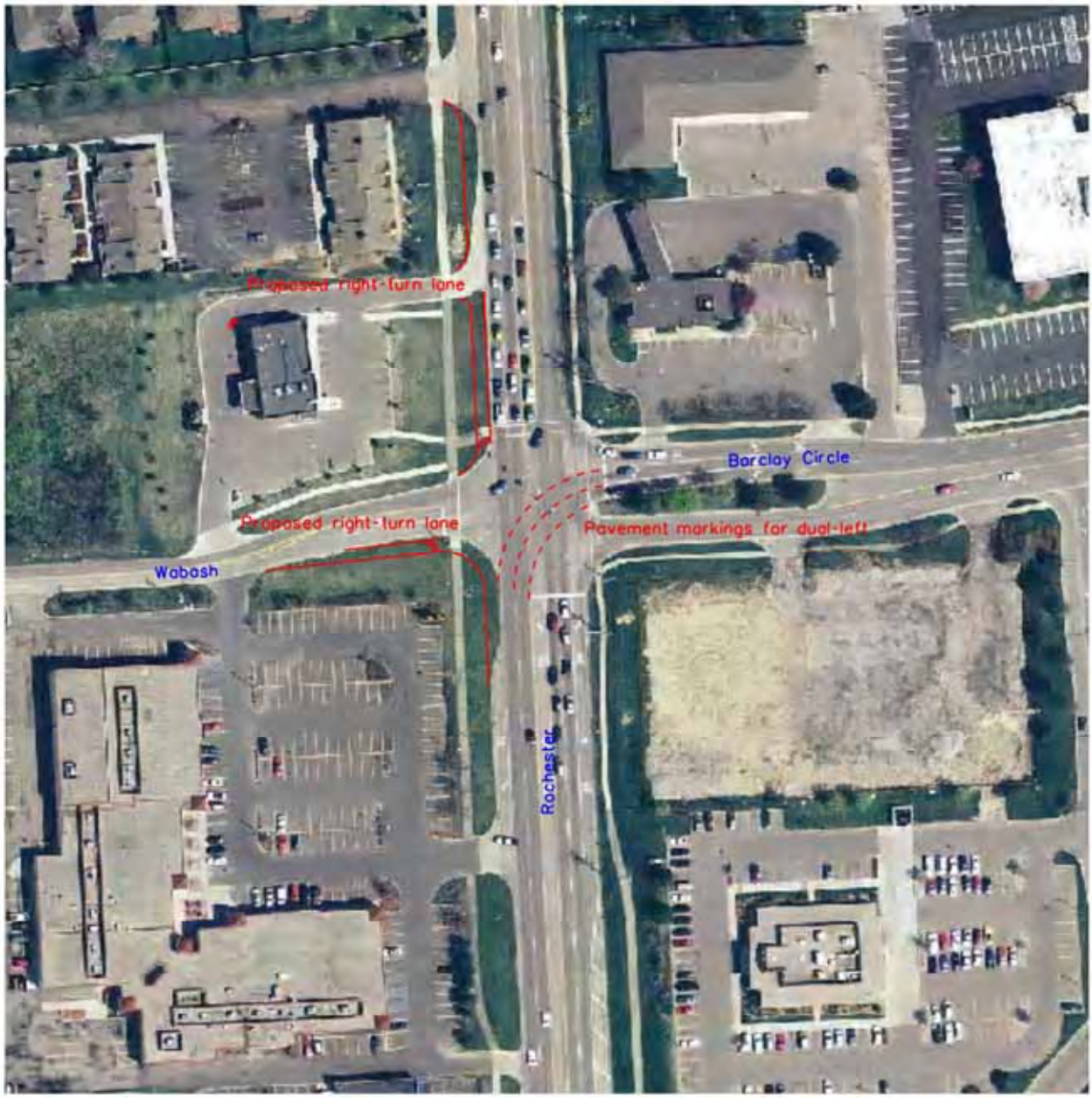


Figure 3-38
Wabash Road/Barclay Circle and Rochester Road – Long-term

Figure 3-39
Auburn Road and Rochester Road – Short-term

Figure 3-40
Auburn Road and Rochester Road – Long-term

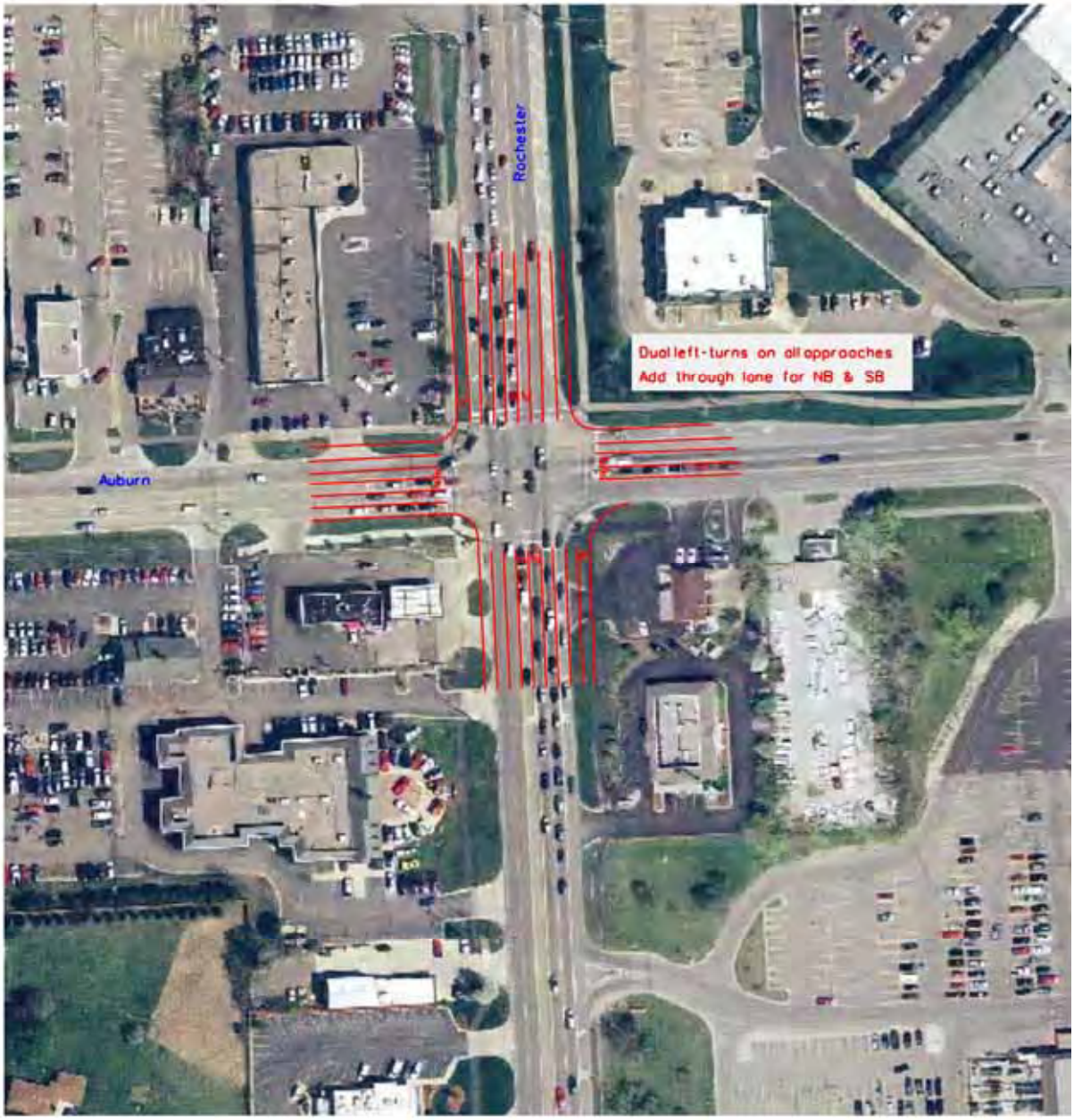


Figure 3-41
South Boulevard and Rochester Road – Short-term

Figure 3-42
South Boulevard and Rochester Road – Long-term

After reviewing the long-term operational fixes that need to be considered to carry the future year traffic and understanding the pressing safety needs that exist here today, options were considered including potential capacity fixes to Rochester Road. A seven-lane cross section, a six-lane boulevard, as well as modern roundabouts were analyzed.

Table 3-19 summarizes the improvements necessary and the expected LOS at Auburn and Rochester Road as an example.

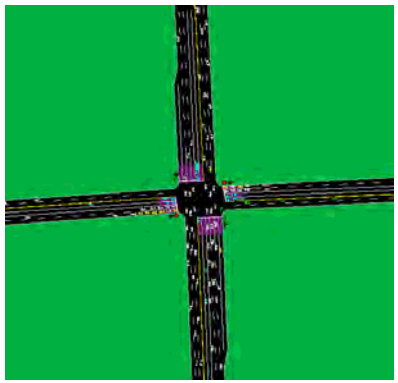
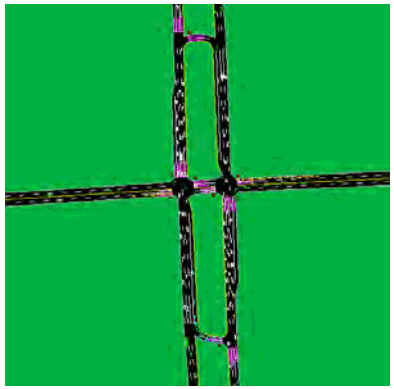
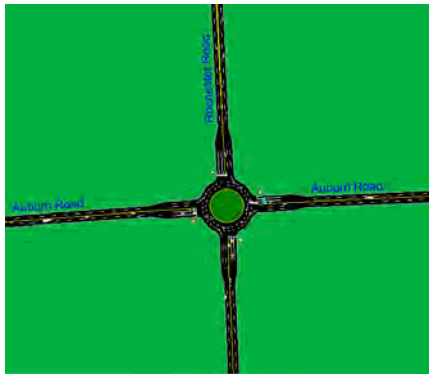
A modern roundabout that has three lane approaches and three lanes circulating could handle the suggested future year traffic at LOS B and be much safer doing so than with traditional dual-left-turns on each intersection approach as suggested for the five- or seven-lane condition.

A more detailed look at this intersection involved borrowing an existing design of a 3 x 2 roundabout to get an idea of the scale, inscribed diameter, and ROW required. It is shown in Figure 3-43.

The roundabout can be phased constructed so that the diameter is fixed for the ultimate year design traffic and built inwards as more lanes are necessary as demand grows. It also allows a lot of flexibility for what is done in the future on Rochester Road. It works with the existing five-lane cross section and can work with a future narrow four-lane boulevard as well.

A series of roundabouts along Rochester Road at Auburn Road, Hamlin Road and Avon Road could be implemented and substantially improve corridor operations and safety at similar land acquisition and capital costs as the traditional long-term solutions identified. Figure 4-44 highlights how this may look. Even further operational and safety benefits could be achieved economically if the MDOT and City agree to remove the center-turn lane and provide a raised median to create a narrow four-lane boulevard cross section. Indirect left-turn crossovers would have to be included at strategic locations mid-block between roundabouts. The roundabouts could also serve U-turn traffic as well. Obviously, more detailed investigation, design and analysis would have to be conducted to completely understand the safety and operational benefits. Additionally, it is expected this solution may handle all future capacity needs of the corridor and not require large expenditures in ROW acquisition outside of the intersections themselves.

Table 3-19
Optional Improvements for Intersection of Auburn at Rochester Road

Existing 2007 LOS	Future 2035, LOS No Improvements	Signalized Intersection, 7-Lane Undivided Road		Signalized Intersection, 6-Lane Boulevard		Roundabout	
		Proposed Improvements	Future 2035, LOS w/ Alt 23 Prop. Improvements	Proposed Improvements	Future 2035, LOS w/ Alt 23 Prop. Improvements	Proposed Improvements	Future 2035, LOS w/ Alt 23 Prop. Improvements
E	F	EB - Provide dual left turn lanes	D	EB - No changes	D	N leg: 2 lanes flaring to 3 lane approach, 3 lane departure merging to 2 lanes	B
		WB - Provide dual left turn lanes, remove exclusive RT lane		WB - Extend 2nd lane westwards, remove exclusive RT lane		W leg: 2 lanes flaring to 3 lane approach, 3 lane departure merging to 2 lanes	
		NB - Provide dual left turn lanes, add 1 additional thru lane, provide Rt turn permissive-overlap phase		NB - Add 1 additional thru lane, provide exclusive Rt turn lane		S leg: 2 lanes flaring to 3 lane approach, NB to EB by-pass lane, 3 lane departure merging to 2 lanes	
		SB - Provide dual left turn lanes, add 1 additional thru lane, provide Rt turn permissive-overlap phase		SB - Add 1 additional thru lane, provide exclusive Rt turn lane		E leg: 2 lanes flaring to 3 lane approach, 3 lane departure merging to 2 lanes	
							

Source: Orchard, Hiltz & McCliment, Inc.

Figure 3-43
Auburn Road and Rochester Road – Modern Roundabout

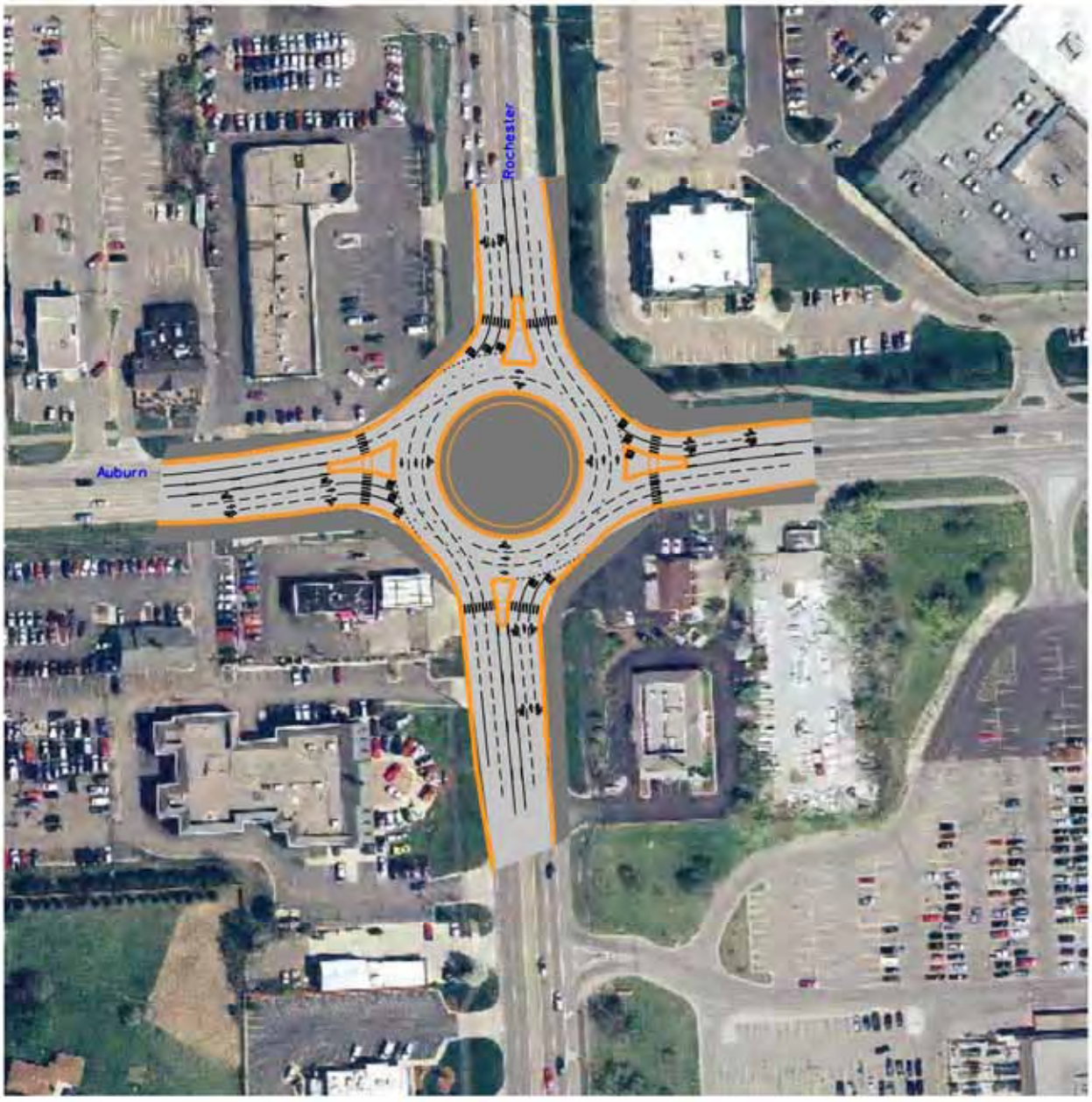


Figure 3-44
Series of Modern Roundabouts

Figure 3-45
Roundabout and Four-lane Boulevard Concept

Estimated construction costs (based on recent RCOC costs) were developed for the operational and safety fixes depicted in the figures. The short-term costs and improvements were suggested to mitigate current deficiencies and are shown in Table 3-20, while the long-term improvements and associated costs would mitigate future year traffic demands and will need to be monitored and implemented as the volumes and/or crashes warrant the need. They are shown in Table 3-21.

Table 3-20
Short-term Improvement Costs

Intersection	Existing 2007 LOS	Estimated Cost
Tienken Rd & Adams Rd	E	$300,000 - $400,000
Walton Blvd & Adams Rd	E	$600,000 - $900,000
Auburn Rd & Adams Rd	F	$200,000 - $300,000
Avon Rd & Rochester Rd	E	$100,000 - $200,000
Wasbash Rd/Barclay Circle & Rochester Rd	E	$200,000 - $300,000
Auburn Rd & Rochester Rd	E	$100,000 - $200,000
South Blvd & Rochester Rd	F	$300,000 - $400,000
Hamlin Rd & Rochester Rd	C	$200,000 - $250,000

Note: Costs do not include ROW, design or contingencies and are in 2007 dollars.

Table 3-21
Long-term Improvement Costs

Intersection	Future 2035 LOS	Estimated Cost
Tienken Rd & Adams Rd	F	$1 - $2 million
Walton Blvd & Adams Rd	F	$2 - $3 million
Auburn Rd & Adams Rd	F	$1 - $2 million
Avon Rd & Rochester Rd	F	$1 - $2 million
Wasbash Rd/Barclay Circle & Rochester Rd	F	$750,000 - $1 million
Auburn Rd & Rochester Rd	F	$3 - $3.5 million
South Blvd & Rochester Rd	F	$1.5 - $2.5 million
Hamlin Rd & Rochester Rd	F	$1 - $2 million

Note: Costs do not include ROW, design or contingencies and are in 2007 dollars.

The costs for optional modern roundabout intersection fixes are provided in Table 3-22. These also do not include ROW, design or utility costs at this time.

Table 3-22
Modern Roundabout Improvement Costs

Intersection	Estimated Cost
Auburn Road and Rochester Road 3x3	$2 to $2.5 million
Hamlin Road and Rochester Road 3x3	$2 to $2.5 million
Avon Road and Rochester Road 3x3	$2 to $2.5 million

Note: Costs do not include ROW, design or contingencies.

To convert the current five- and six-lane cross section on Rochester Road to a narrow four-lane boulevard with a raised median with several indirect left-turn crossovers, it is anticipated it will cost between $1 million and $2 million per mile. The total cost, therefore, would be about $3 million to $6 million to convert 3.0 miles of Rochester Road from M-59 to north of Avon Road to a four-lane boulevard cross section. With the roundabouts this would be a $9 million to $13.5 million improvement.

The operational fixes described should go a long way in fixing the current intersection deficiencies identified in Table 3-23 and Figure 3-46.

Table 3-23
Intersections with Above Average Crash Rates

			Type of Crash 2003-2006									
Intersections	Street 1	Street 2	Single	Ho-It	Angle	Re-sum	SS-same	SS-opp	Other/ Unknown	Total	Crashes	Crash Rate
A	Adams	Auburn	9	5	13	32	11		4	74	19	1.52
B	Avon	Adams	11	8	9	37	5	2	1	73	18	1.96
C	Brewster	Walton	6	14	12	62	2	2	1	99	25	1.55
D	Rochester	Auburn	6	15	77	139	20	7	5	269	67	2.75
E	Rochester	Avon	10	13	48	141	26	4	8	250	63	2.84
F	Rochester	Hamlin	4	9	31	137	17	1	2	201	50	1.63
G	Tienken	Rochester	5	9	36	59	16	2	3	130	33	1.59

Legend: Ho-It = Head-on left-turn, Re-sum = Rear ends (All), SS-same = Side-swipe same direction, SS-opp = Side-swipe opposite direction
MVM = Million Vehicle Miles Traveled, MV = Million Vehicles Entered
Source: The Corradino Group of Michigan, Inc. and TIA

Figure 3-46
Intersections with Above Average Crash Rates

Two high-crash locations not yet discussed are located at Brewster Road and Walton Road and at Adams Road and Avon Road. Extended right-turn lanes for southbound Brewster and an exclusive right-turn lane for westbound Walton Road could reduce the potential for crashes there. This is estimated to cost $250,000 to $400,000.

At Adams Road and Avon Road the sight distance for northbound Adams drivers to perceive and react to southbound Adams turning movements to eastbound Avon Road should be improved. This would require the vertical curvature of Adams Road to be lengthened. This would also require southbound Adams Road's elevation to be modified higher as it approaches the intersection. This would require significant roadway reconstruction and is estimated to cost $3 million to $5 million. A short-term solution may be to improve intersection lighting, signing and signal timing.

3.9 SEMCOG Revised Forecasts

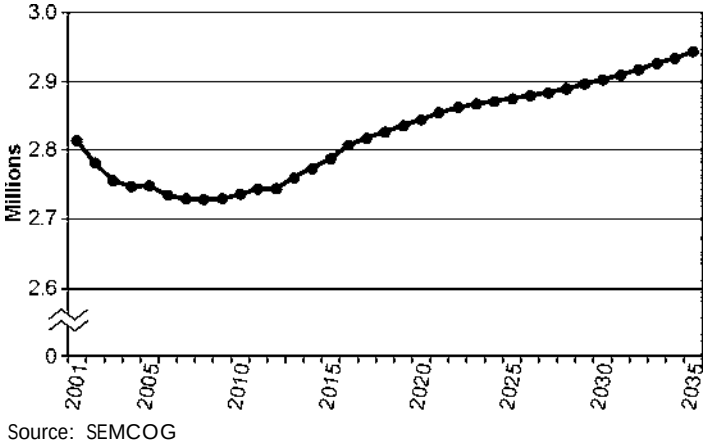
SEMCOG, in a report issued in April 2007 titled *A Region in Turbulence and Transition*, states the following:

"Southeast Michigan's economy is in the midst of a fundamental restructuring that has serious consequences for the region's long-term future. This turbulence and transition is due to the shrinkage of the domestic auto industry, where the Big Three have seen their share of U.S. light-vehicle sales (cars, SUVs, vans, pickup trucks) decline from 73 percent in 1995 to 53 percent in 2006.

"The consequences of the changes in the auto industry are profound. Losses of jobs in the region's core industry are rippling through the economy and will be felt across many sectors, from retail to construction.

"Southeast Michigan has lost 128,000 jobs since 2000 and will not begin to gain total jobs until 2010. By 2035, the region's employment will have grown seven percent over 2005 levels (Figure 3-47).

Figure 3-47
Total Employment
Southeast Michigan, 2001-2035



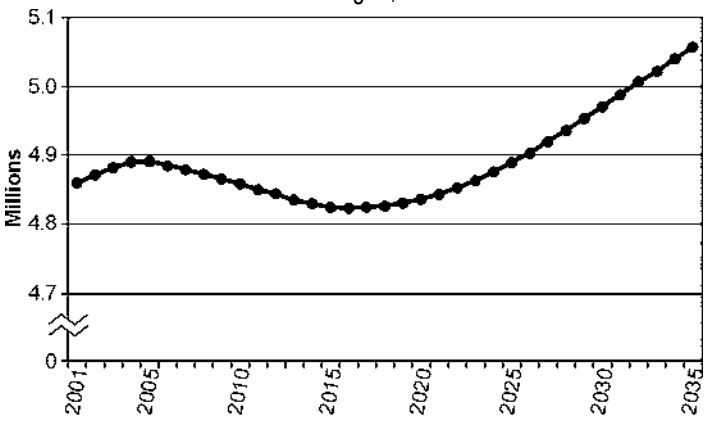
Source: SEMCOG

"The other major factor that will affect the region in the long-term is the aging of the population. By 2035 Southeast Michigan will have 651,000 more people 65 or older and 296,000 fewer people of prime working age 25-64. This is a trend that will also be felt in the U.S. as a whole where, as in Southeast Michigan, the percentage of population 65 or older will increase dramatically. For the region, the percentage 65 or older will increase

from 12 to 24 percent by 2035, and for the U.S. it will go from 12 to 20 percent.

"Combined with more deaths in an aging population, increased out-migration is now causing Southeast Michigan's population to decline. The region will only recover enough, beginning after 2015, to add about three percent to the population over 30 years (Figure 3-48). Southeast Michigan's population will be 5.1 million in 2035."

Figure 3-48
Total Population
Southeast Michigan, 2001-2035



Source: SEMCOG

With these observations as background, SEMCOG reduced its 2005-2030 forecasts of growth in employment (Table 3-24) and population (Table 3-25) by approximately 50 percent and 75 percent, respectively.[1] The changes still reflect positive, albeit, small growth. These changes have been distributed to the county level, but not to a smaller geographical unit.

The county-level changes in growth provide an understanding of the dynamics of the region. From a population perspective (Table 3-25), Macomb County is expected to continue to grow at almost the same pace in the new forecast as in the previous SEMCOG forecast that it replaces. The outer-ring counties – Livingston, Monroe and Washtenaw – are projected to experience lower population growth than previously forecast. Wayne County is expected to experience an even greater population loss by 2030, compared to the earlier SEMCOG forecast. It is likely the Wayne County loss will be especially felt in Detroit, based on past trends.

The two SEMCOG employment forecasts are not directly comparable because the new forecast uses the employment definition of the Bureau of Economic Analysis and the previous forecast used the Bureau of Labor Statistics database. Nonetheless, trends can be observed. The new projections of employment growth by 2030 in the SEMCOG region are down by about 50 percent compared to the earlier forecast. The greatest impact will be felt in Wayne County and, by implication, Detroit, where continued job losses are forecast. All other counties are still projected to experience employment growth by 2030, albeit lower than projected earlier (Table 3-24).

[1] SEMCOG's planning horizon is 2030.

Table 3-24
Changes in Forecast Growth in Employment by SEMCOG

County	Employment			
	Year 2000	Previous[a] Forecast 2030	Current[b] Forecast 2030	Change in Forecast Growth
Livingston	59,186	102,378	95,274	-16.4%
Macomb	383,308	441,126	427,658	-23.3%
Monroe	54,375	74,268	63,278	-55.5%
Oakland	910,441	1,100,545	1,001,198	-52.3%
St. Clair	64,531	80,857	78,780	-12.7%
Washtenaw	230,212	285,543	289,059	+6.4%
Wayne	971,127	1,024,905	943,826	-150.8%
Total	**2,673,180**	**3,109,622**	**2,899,073**	**-48.2%**

[a]Based on Bureau of Labor Statistics definition.
[b]Based on Bureau of Economic Analysis definition.

Source: SEMCOG

Table 3-25
Changes in Forecast Growth in Population by SEMCOG

County	Population			
	Year 2000	Previous Forecast 2030	Current Forecast 2030	Change in Forecast Growth
Livingston	156,951	282,405	210,359	-42.6%
Macomb	788,149	926,347	914,685	-8.4%
Monroe	145,945	191,500	159,797	-69.6%
Oakland	1,194,156	1,346,185	1,303,674	-28.0%
St. Clair	164,235	203,552	189,274	-36.3%
Washtenaw	322,895	433,205	369,474	-57.8%
Wayne	2,061,162	2,018,091	1,824,112	-118.2%
Total	**4,833,493**	**5,401,285**	**4,971,375**	**-75.7%**

Source: SEMCOG

Regional countywide tests of the revised forecasts are estimated to have an effect on Rochester Hills roads in the future. County wide trip tables have been adjusted in a preliminary regional review with an average 6 point drop in previously estimated volume to capacity indices. Please see Table 3-26 for the preliminary V/C indices. Four segments are no longer considered to be congested in 2035 based on these revised forecasts from previous work: Segment D – Tienken, Segment N – Avon, Segment P – Hamlin, and Segment T – Auburn. Again, the fine grained estimates by travel analysis zone have yet to be completed by SEMCOG and these early estimates will likely change.

Table 3-26
"New" Congestion Indices

Segment	Road	2035 Base V/C	Est. 2035 Reduced SEMCOG V/C	Net V/C Reduction
A	Adams	0.80	0.78	0.03
B	Tienken	0.74	0.58	0.15
C	Tienken	0.79	0.69	0.10
D	Tienken	0.92	0.82	0.10
E	Livernois	1.05	1.02	0.02
F	Walton	0.88	0.80	0.08
G	Walton	0.61	0.64	-0.03
H	Livernois	0.91	0.91	0.01
I	Avon	0.89	0.86	0.03
J	Adams	1.23	1.17	0.06
K	Crooks	1.09	1.04	0.05
L	Hamlin	0.29	0.26	0.03
M	Hamlin	0.53	0.51	0.01
N	Avon	0.92	0.84	0.08
O	Avon	1.08	0.96	0.12
P	Hamlin	0.91	0.79	0.12
Q	Rochester	1.04	1.01	0.03
R	John R	0.88	0.90	-0.02
S	Dequindre	0.99	0.92	0.07
T	Auburn	0.94	0.85	0.09
U	Livernois	0.99	0.91	0.08
VNB	Crooks	0.73	0.67	0.06
VSB	Crooks	0.43	0.34	0.10
W	Auburn	0.65	0.64	0.01
X	New Adams	0.43	0.37	0.06
Y	Adams	0.16	0.08	0.08
Z	South	0.88	0.79	0.10
			Average	0.06

V/C = Volume ÷ Capacity

4. Non-motorized Component

Non-motorized facilities typically refer to sidewalks, bike lanes or streets and roads with paved shoulders, and separated pathways. While there are sidewalks and separated pathways in the Rochester Hills area, there are no on-street bike lanes or signed bike routes.

In the mid 1970's, the City of Rochester Hills (formerly Avon Township) initiated a pathway program that planned for approximately 118 miles of pathways along major roads. To date, over 82 miles of pathways have been constructed by private development and through public funding. Approximately 36 miles of pathways are needed to complete the pathway system. It is estimated that five miles or about 14 percent will be paid for by private development. The balance will be paid for with public funds.

The scope of the pathway program has gone beyond the initial goal of just extending the system to both sides of all arterial roads in the city. In November of 2006, a twenty-year 0.1858 mill ballot proposal was approved by the residents of Rochester Hills to fund the continuation of new pathways, rehabilitation and maintenance of existing pathways to preserve the system for the public's use and enjoyment. The current pathway program has evolved through the continuation of development of the City along with a heightened awareness of the value of a non-motorized transportation facility.

Rehabilitation of existing pathways to maintain an adequate level of service for pathway users is also required. Each year, more segments of the pathway system exceed their service life and require some form of rehabilitation.

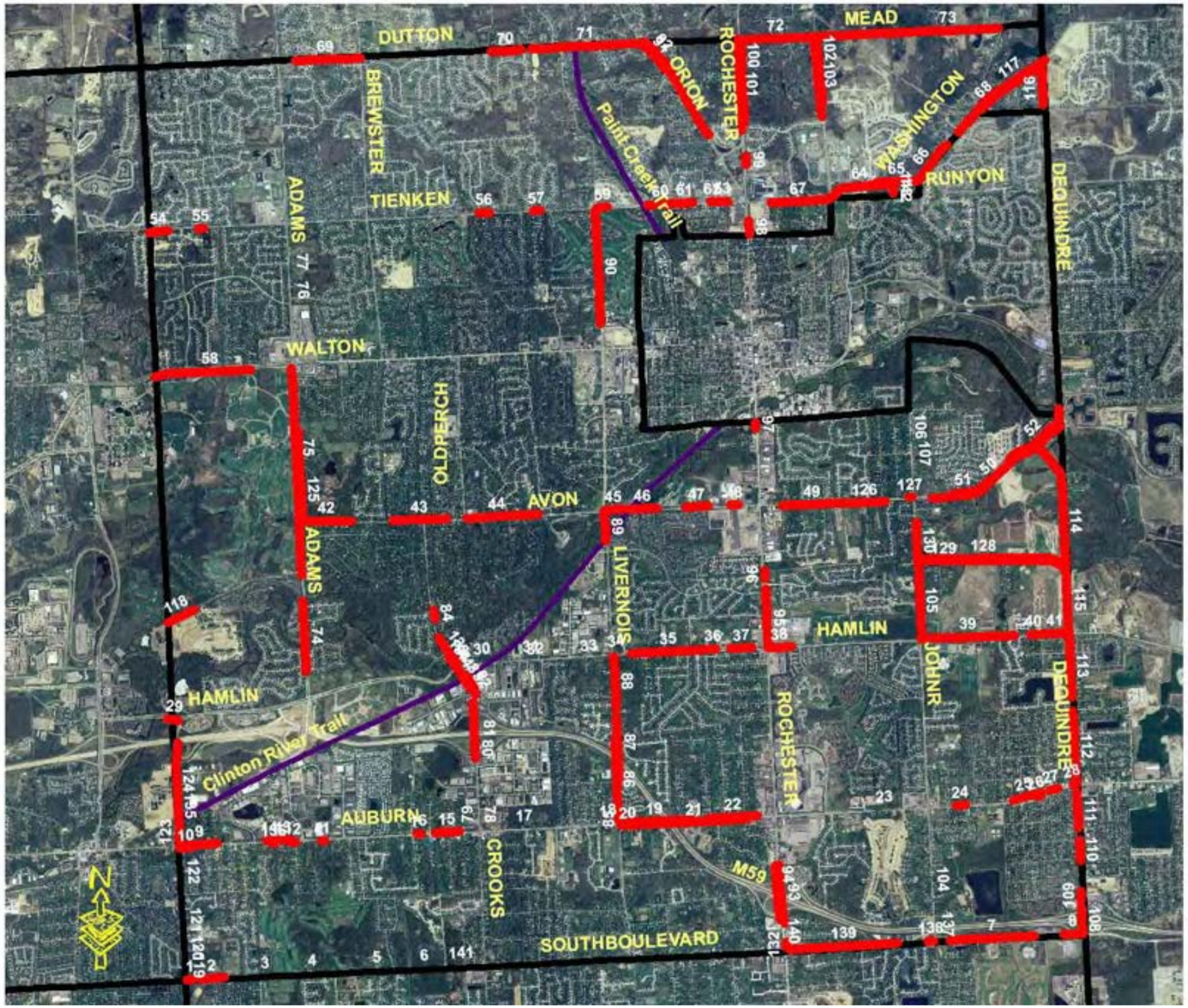
Additionally, pathway upgrades need to comply with current American with Disabilities Act (ADA) requirements when they are rehabilitated. Some 20 miles of pathway will be rehabilitated over the next ten years, which represents approximately 25 percent of the current pathway system.

Maintenance of the existing pathway system is also key to protect and extend their service life. Beyond routine winter maintenance, other maintenance activities, such as pothole patching, crack sealing and vegetation control, need to be done system-wide on a routine basis to preserve the integrity of the system.

The major pathway gaps in Rochester Hills are shown in Figure 4-1. Gaps on both sides of the arterial roads occur where M-59 crosses through the City along the southern border. Construction of pedestrian crossings over M-59 is needed at all the locations in the City.

Recently two locations were completed to provide continuity with the pathway network by MDOT on the east side of the M-59 @ Adams Road Interchange and at John R under M-59 as part of the road widening & East Ferry Drain project from South Boulevard to Auburn.

Figure 4-1
Current Gaps on Existing Pathway Plan



Gaps in Existing Pathway

Additional pathway connections/crossings planned include the crossing at M-59 @ Crooks interchange. This project is scheduled from 2012 to 2017. Potential upgrades to the M-59 connections/crossings at Livernois, Auburn, Rochester, and Dequindre as the freeway is widened should be considered and coordinated as a priority.

The two major non-motorized trailway facilities in the City of Rochester Hills include the popular Paint Creek Trailway which runs from Lake Orion to downtown Rochester. The Clinton River Trail connects the existing West Bloomfield Trail on the west to the Macomb Orchard Trail on the east and cuts across the city in an east west fashion.

The trail is generally eight to ten feet wide and made of crushed limestone or recycled asphalt.

4.1 Bicycle/Pedestrian Crash Data

Building and maintaining an accessible non-motorized system in the City of Rochester Hills has been a priority. Safety is of utmost concern. Crash data involving bicycles and pedestrians were gathered for the period of 2003-2006. Tables 4-1 and 4-2 present a summary of the crash experience during this period. The locations of these crashes are shown on Figure 4-2.

Table 4-1
Bicycle Crashes (2003- 2006)

	Total Bike Crashes	Fatality (Crash)	Injury (Crash)	No Injuries (Crash)
Total for Rochester Hills	39	1	34	4
On Major Roads	32	1	30	1

Source: Traffic Improvement Association for Oakland County.

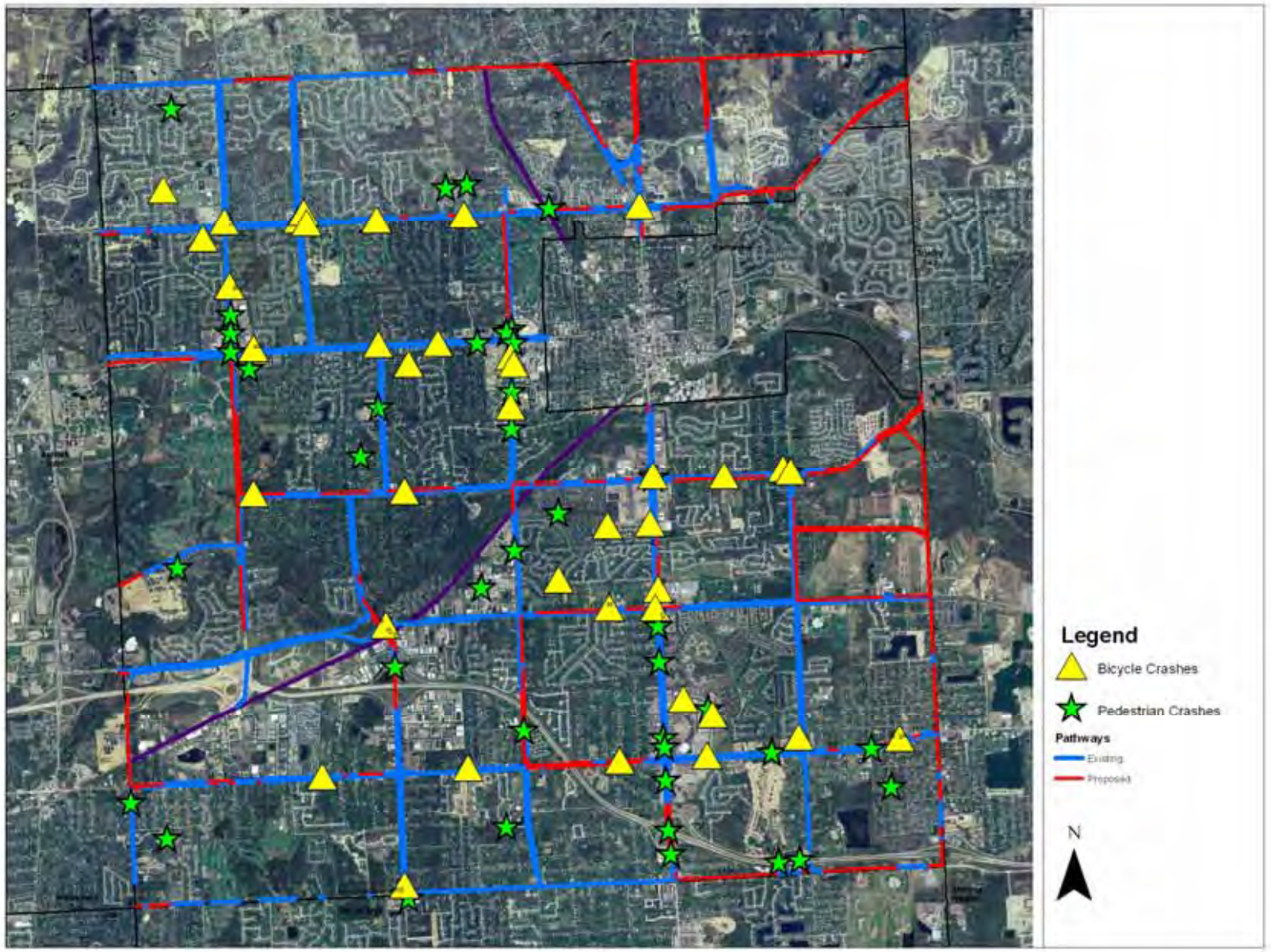
Table 4-2
Pedestrian Crashes (2003-2006)

	Total Pedestrian Crashes	Fatality (Crash)	Injury (Crash)	No Injuries (Crash)
Total for Rochester Hills	41	3	37	1
On Major Roads	30	2	28	0

Source: Traffic Improvement Association for Oakland County.

A high percentage of crashes reported occurred on the major pathway system.

Figure 4-2
Bicycle/Pedestrian Crash Locations



4.2 Existing Non-motorized Trip Characteristics

To understand the City of Rochester Hills potential to increase the number of people walking and bicycling, the 2000 U.S. Census was reviewed (Table 4-3). The number of people either walking or bicycling to work is very low with more people walking (primarily in Rochester) than riding a bicycle.

The national average is 7.2 percent of all person trips are made by walking and 0.70 percent are made by bicycling. Using those averages as benchmarks, Table 4-3 illustrates the number of non-motorized trips that are much lower than this for the state and the study area.

As can be seen, the total number of trips made by walking and bicycling are very few when compared to all trips being made by other modes of transportation in the study area. Given the relatively comprehensive pathway network in the City of Rochester Hills, improvements to the pedestrian environment will likely see only modest increases. Improvements to the bicycling environment in the City could result in greater use of non-motorized travel options. Nonetheless, it is important to note that bicycling and pedestrian facilities have many benefits that go beyond their ability to relieve traffic congestion on the roadway network.

Table 4-3
Means of Transportation to Work by Jurisdiction
(workers 16 years and over)

	Rochester City		Rochester Hills City		State of Michigan	
	Number	Percent	Number	Percent	Number	Percent
Car, truck, or van	5,245	93.1	34,035	95.4	4,217,141	92.9
Drove alone	5,029	89.3	32,236	90.4	3,776,535	83.2
Carpooled	216	3.8	1,799	5	440,606	9.7
Public transportation	24	0.4	38	0.1	60,537	1.3
Bus or trolley bus	24	0.4	26	0.1	54,423	1.2
Streetcar or trolley car	0	0	0	0	560	0
Subway or elevated	0	0	0	0	576	0
Railroad	0	0	8	0	290	0
Ferryboat	0	0	4	0	466	0
Taxicab	0	0	0	0	4,222	0.1
Motorcycle	0	0	0	0	1,698	0
Bicycle	6	0.1	71	0.2	10,034	0.2
Walked	131	2.3	301	0.8	101,506	2.2
Other means	19	0.3	93	0.3	21,691	0.5
Worked at home	206	3.7	1,136	3.2	127,765	2.8
Workers 16 and over	5,631	100	35,674	100	4,540,372	100

Source: 2000 U.S. Census

4.3 Proposed Facilities

Ideas heard from the public involvement workshops were:

- Safer path on Adams Road - North of M-59
- Pedestrian friendly design standards
- Pathway connectivity, build one side first
- Provide refuge islands for pedestrian crossing safety of major roads
- More trailways
- Complete pathway plan

A total of 136 gaps in the major road path network were considered to be prioritized as a starting point (from Figure 4-1).

Several proposals for non-motorized facilities developed through the capital improvement program are listed below. Pathways planned to be constructed or designed in 2008 were considered to be committed projects and are shown in Table 4-4 and by an aqua color on Figure 4-3. They include six project sections with 18 segments at an estimated cost of $1.5 million.

Other pathways included in the capital improvement plan were included in the ranking of the rest of the pathway gaps (118) yet to be completed. Specifically the next 53 gaps in 18 project priority sections were prioritized as a part of this process.

Priority sections 1-5 were considered first as they should be a part of a current MDOT design process to widen M-59 between Crooks Road and Ryan Road (Table 4-5). The efficiency in design and construction of these segments to bridge and connect the paths across M-59 in cooperation with MDOT is perfect timing and considered a near term opportunity. It may be several decades before improvements along these routes are considered and will be much more difficult to finance and implemented without MDOT's participation.

Priority section 6 should be considered as the RCOC and the City contemplate improvements to Tienken Road between Livernois Road and Rochester Road as an Early Preliminary Engineering phase is being conducted at this time. The project will receive the total $10 million appropriated from the last federal transportation funding bill SAFETEA LU in 2009.

Priority sections 7 -10 should be considered next to complete a continuous path on at least one side of the road. These sections have gaps that occur on both sides of the roads at specific locations. This continues to be the primary goal of the old and new pathway millage language.

Priority sections 11-18 are in heavier use locations specifically near schools and parks and the existing trail network.

Priority sections 1-18 are estimated to cost $5 million which should be able to be completed in the next 20 years based on current millage capital spending for new pathways. As the current pathways continue to age additional monies will be required to operate and maintain them over the next 20 years.

Table 4-4
Committed Pathway Projects

ID#	Street Name	Proposed or No Pathway	Length of Gap (Proposed Pathway) (mi)	Length of Gap (Proposed Pathway) (ft)	Distance from School /Park (ft)	Crashes Within 1/4 Mile of Pathway	Notes	Additional Notes	Est. Costs
3	South Boulevard	Proposed Path	0.07	355	0	0	North side PW-10 in 2009 per CIP along with #3, #4, #5, #6 and #141	Design Committed for next year	
4	South Boulevard	Proposed Path	0.15	798	0	0	North side PW-10 in 2009 per CIP along with #3, #4, #5, #6 and #141	Design Committed for next year	
5	South Boulevard	Proposed Path	0.18	970	0	0	North side PW-10 in 2009 per CIP along with #3, #4, #5, #6 and #141	Design Committed for next year	$314,500
6	South Boulevard	Proposed Path	0.33	1733	0	0	North side PW-10 in 2009 per CIP along with #3, #4, #5, #6 and #141	Design Committed for next year	
141	South Boulevard	Proposed Path	0.19	991	0	2	North side PW-10 in 2009 per CIP along with #5 & #6	Design Committed for next year	
17	Auburn	Proposed Path	0.40	2108	34	1	PW-06A in 2008 per CIP along with #17 and #18	2008	$96,000
18	Auburn	Proposed Path	0.03	167	39	0	PW-06A in 2008 per CIP along with #17 and #18	2008	
30	Hamlin	Proposed Path	0.35	1833	0	1	4100 PW-02A in 2009 per CIP along with #30, #31, #32, #33 & #34	Design Committed for next year	
31	Hamlin	Proposed Path	0.08	432	475	0	4100 PW-02A in 2009 per CIP along with #30, #31, #32, #33 & #34	Design Committed for next year	
32	Hamlin	Proposed Path	0.02	131	381	0	4100 PW-02A in 2009 per CIP along with #30, #31, #32, #33 & #34	Design Committed for next year	$117,400
33	Hamlin	Proposed Path	0.29	1521	370	1	4100 PW-02A in 2009 per CIP along with #30, #31, #32, #33 & #34	Design Committed for next year	
34	Hamlin	Proposed Path	0.06	306	0	0	4100 PW-02A in 2009 per CIP along with #30, #31, #32, #33 & #34	Design Committed for next year	
76	Adams	Proposed Path	0.04	232	250	1	PW-07C in 2009 per CIP along with #76 & #77	Design Committed for next year	$178,500
77	Adams	Proposed Path	0.36	1920	0	4	PW-07C in 2009 per CIP along with #76 & #77	Design Committed for next year	
104	John R	Proposed Path	0.82	4351	0	4	West side PW-31A in 2008 per CIP, including PW-31B FWY section @ M-59. To be constructed with John R widening and East Ferry Drain Project	2008	$316,791
137	John R	Proposed Path	0.11	591	1084	2	Eastside PW-31A in 2008 per CIP FWY section @ M-59. To be constructed with John R widening and Eas Ferry Drain Project	2008	
106	John R	Proposed Path	0.57	3032	86	3	PW-31E in 2009 per CIP	Design Committed for next year	$483,750
107	John R	Proposed Path	0.58	3068	35	3	PW-31E in 2009 per CIP	Design Committed for next year	
								Total	$1,506,941

CIP – Capital Improvements Plan
PW – Pathway
MR – Major Road

Figure 4-3
Non-motorized Path Priorities

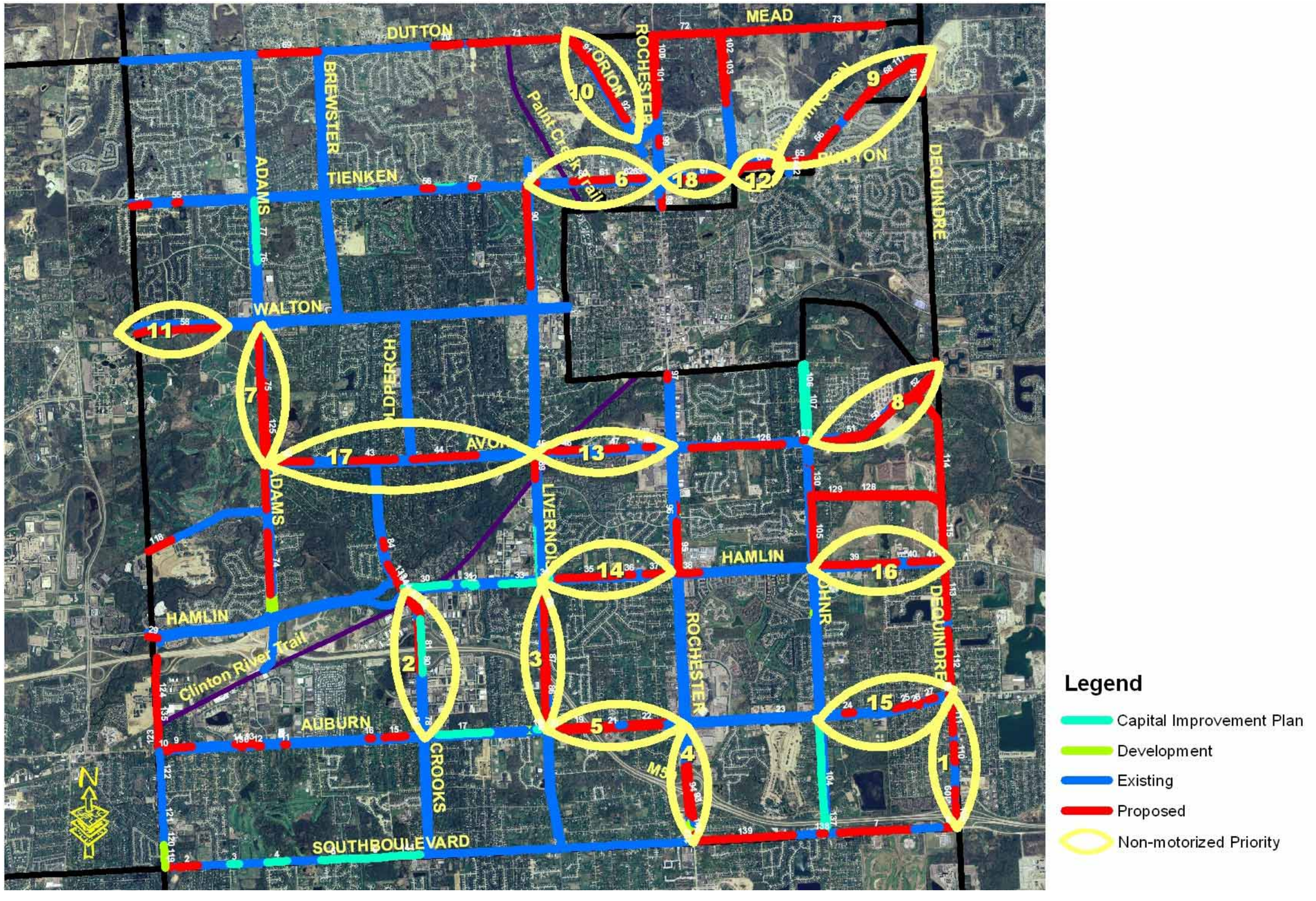


Table 4-5
Priority Sections/Segment 1-18

ID#	Street Name	Length of Gap (Proposed Pathway) (mi)	Length of Gap (Proposed Pathway) (ft)	Distance from School/ Park (ft)	Crashes Within 1/4 Mile of Pathway	Notes	Priority Segments	Est. Costs (2007 dollars)
108	Dequindre	0.18	956	2563	0	Part of MR	s1	
109	Dequindre	0.06	298	2551	0	Part of MR	s1	
110	Dequindre	0.14	747	1339	0	Part of MR	s1	
111	Dequindre	0.24	1265	297	0	Part of MR	s1	*$163,200*
80	Crooks	0.38	1989	925	2	Part of MR	s2	
81	Crooks	0.40	2137	858	2	Part of MR	s2	*$206,250*
85	Livernois	0.06	304	45	1		s3	
86	Livernois	0.54	2825	0	1		s3	
87	Livernois	0.42	2217	76	1		s3	
88	Livernois	0.34	1779	56	0		s3	*$356,200*
93	Rochester	0.39	2069	724	3		s4	
94	Rochester	0.36	1909	856	3		s4	*$198,850*
19	Auburn	0.45	2373	0	1	PW-06D in 2010 per CIP along with #22	s5	
22	Auburn	0.33	1752	92	4	PW-06D in 2010 per CIP along with #19	s5	$174,000
20	Auburn	0.10	518	0	0		s5	
21	Auburn	0.70	3705	0	4		s5	*$211,100*
59	Tienken	0.06	343	38	0	PW-08B in 2011 per CIP along with $59, #60, #61, #62 & #63	s6	
60	Tienken	0.18	933	216	1	PW-08B in 2011 per CIP along with $59, #60, #61, #62 & #63	s6	
61	Tienken	0.10	516	0	1	PW-08B in 2011 per CIP along with $59, #60, #61, #62 & #63	s6	
62	Tienken	0.03	148	736	1	PW-08B in 2011 per CIP along with $59, #60, #61, #62 & #63	s6	
63	Tienken	0.06	343	943	1	PW-08B in 2011 per CIP along with $59, #60, #61, #62 & #63	s6	$47,250
75	Adams	1.38	7312	0	5		s7	
125	Adams	0.60	3191	0	1		s7	*$525,100*
51	Avon	0.25	1337	1667	0	PW-49A in 2012 per CIP	s8	$88,500
50	Avon	1.03	5423	0	3		s8	
52	Avon	0.50	2645	0	0		s8	*$403,300*
65	Tienken Extended	0.29	1515	0	0		s9	
66	Washington	0.30	1589	0	0		s9	
68	Washington	0.49	2603	1896	0		s9	
117	Washington	0.75	3972	975	0		s9	*$483,950*
91	Orion	0.25	1323	689	0		s10	
92	Orion	0.76	4023	0	0		s10	*$267,250*
58	Tienken	0.64	3372	0	0	PW-08D in 2010 per CIP along with #56, #57 & #58	s11	$112,000
64	Tienken	0.43	2279	0	0	PW-08C in 2011 per CIP	s12	$359,500
45	Avon	0.11	575	321	0		s13	
46	Avon	0.19	1016	0	1		s13	
47	Avon	0.15	788	0	0		s13	
48	Avon	0.05	273	345	2		s13	*$132,450*

CIP – Capital Improvements Plan
PW – Pathway
MR – Major Road

Table 4-5 (continued)
Priority Sections/Segment 1-18

ID#	Street Name	Length of Gap (Proposed Pathway) (mi)	Length of Gap (Proposed Pathway) (ft)	Distance from School/ Park (ft)	Crashes Within 1/4 Mile of Pathway	Notes	Priority Segments	Est. Costs (2007 dollars)
35	Hamlin	0.48	2559	0	2	PW-02B in 2010 per CIP along with #35, #36 & #37	s14	
36	Hamlin	0.04	230	0	1	PW-02B in 2010 per CIP along with #35, #36 & #37	s14	
37	Hamlin	0.14	755	0	4	PW-02B in 2010 per CIP along with #35, #36 & #37	s14	$319,250
24	Auburn	0.07	344	0	2	PW-06D in 2010 per CIP along with #24, #25, #26, #27 & #28	s15	
25	Auburn	0.20	1032	335	2	PW-06D in 2010 per CIP along with #24, #25, #26, #27 & #28	s15	
26	Auburn	0.02	106	383	2	PW-06D in 2010 per CIP along with #24, #25, #26, #27 & #28	s15	
27	Auburn	0.05	283	0	1	PW-06D in 2010 per CIP along with #24, #25, #26, #27 & #28	s15	
28	Auburn	0.03	151	227	0	PW-06D in 2010 per CIP along with #24, #25, #26, #27 & #28	s15	$174,000
39	Hamlin	0.63	3317	36	0	PW-02C in 2011 per CIP along with #39, #40 & #41	s16	
40	Hamlin	0.05	289	1136	0	PW-02C in 2011 per CIP along with #39, #40 & #41	s16	
41	Hamlin	0.18	968	1617	0	PW-02C in 2011 per CIP along with #39, #40 & #41	s16	$396,000
42	Avon	0.32	1716	0	1		s17	
43	Avon	0.36	1927	551	0		s17	
44	Avon	0.48	2526	0	1		s17	*$308,300*
67	Washington	0.41	2183	0	1		s18	*$109,150*
						Total		$5,035,600

CIP – Capital Improvements Plan
PW – Pathway
MR – Major Road

Pathways to be constructed as part of vacant parcels where future anticipated land use development could provide network connectivity were noted on 12 gaps. Gaps on existing gravel roads were noted in 8 locations. Most likely they would only be constructed with associated paving projects in the future.

This process left 53 gaps not prioritized and are shown in Table 4-6.

A recently reestablished pathway committee will ultimately select and prioritize remaining segments to be constructed.

Table 4-6
Remaining Pathway Gaps

ID#	Street Name	Length of Gap (Proposed Pathway) (mi)	Length of Gap (Proposed Pathway) (ft)	Distance from School/Park (ft)	Crashes Within 1/4 Mile of Pathway	Notes
90	Livernois	0.76	4025.97	0	3	PW-04 in 2012 per CIP
105	John R	0.53	2774.13	115	0	Eastside PW-31D in 2012 per CIP
56	Tienken	0.05	248.09	555	2	PW-08D in 2010 per CIP along with #56, #57 & #58
57	Tienken	0.23	1216.92	0	2	PW-08D in 2010 per CIP along with #56, #57 & #58
49	Avon	0.39	2069.45	40	3	PW-49C in 2011 per CIP with #126
126	Avon	0.28	1453.19	447	1	PW-49C in 2011 per CIP with #49
89	Livernois	0.19	995.51	0	0	
98	Rochester	0.10	502.86	0	1	
82	Crooks	0.14	756.43	89	2	
83	Crooks	0.16	864.76	0	2	
84	Crooks	0.06	312.97	422	0	
133	Crooks	0.22	1168.91	0	1	
134	Crooks	0.02	105.88	0	1	
144	Crooks	0.06	298.80	0	1	
9	Auburn	0.23	1218.84	88	1	
10	Auburn	0.07	371.90	0	1	
11	Auburn	0.02	120.80	586	0	
12	Auburn	0.03	168.35	534	0	
13	Auburn	0.11	579.21	529	0	
14	Auburn	0.04	235.21	898	0	
15	Auburn	0.16	870.20	1580	0	
16	Auburn	0.03	149.84	1013	1	
7	South Boulevard	0.56	2956.70	559	1	
29	Hamlin	0.08	404.93	1581	0	
53	Walton	0.13	661.02	718	0	
54	Tienken	0.03	168.26	603	0	
55	Tienken	0.06	337.60	141	1	
74	Adams	0.47	2507.97	0	0	
97	Rochester	0.04	203.87	689	0	
99	Rochester	0.06	301.65	362	1	
101	Rochester	0.61	3215.77	0	0	
112	Dequindre	0.49	2601.19	319	0	
113	Dequindre	0.41	2185.90	1488	0	
114	Dequindre Ext	0.85	4471.71	35	0	
116	Dequindre	0.26	1371.03	4089	0	
118	N. Butler	0.19	1005.34	53	0	
123	Squirrel	0.19	982.39	176	1	
124	Squirrel	0.34	1795.32	2016	0	
127	Avon	0.03	137.97	1468	3	
132	Rochester	0.04	196.25	1719	1	
135	Squirrel	0.13	676.93	1872	0	
136	Auburn	0.02	92.70	1027	0	
139	South Boulevard	0.72	3787.37	591	3	
142		0.05	278.45	0	0	
143		0.01	52.93	0	0	
130	John R	0.25	1294.28	37	3	Development
1	South Boulevard	0.05	244.82	927	0	Development
2	South Boulevard	0.15	811.17	934	0	Development
95	Rochester	0.39	2069.17	99	4	Development
96	Rochester	0.06	312.64	448	1	Development
100	Rochester	0.54	2874.44	826	0	Development
138	South Boulevard	0.04	236.14	1139	2	Development

CIP – Capital Improvements Plan
PW – Pathway
MR – Major Road

Table 4-6 (continued)
Remaining Pathway Gaps

ID#	Street Name	Length of Gap (Proposed Pathway) (mi)	Length of Gap (Proposed Pathway) (ft)	Distance from School/Park (ft)	Crashes Within 1/4 Mile of Pathway	Notes
140	Rochester	0.06	292.95	1504	2	Development
8	South Boulevard	0.13	670.59	2003	0	Development
38	Hamlin	0.16	835.40	979	3	Development
115	Dequindre	0.45	2390.34	1171	0	Development
119	Adams	0.17	912.24	0	0	Development
69	Dutton	0.46	2430.94	0	0	
70	Dutton	0.20	1069.43	0	0	Gravel
71	Dutton	0.73	3855.43	302	0	Gravel
72	Mead	0.50	2657.22	2382	0	Gravel
73	Mead	1.22	6435.28	2370	0	Gravel
128	School	0.99	5247.45	0	0	Gravel
129	School	0.99	5225.44	0	0	Gravel
102	Sheldon	0.44	2297.75	31	0	Gravel
103	Sheldon	0.54	2831.90	87	0	Gravel

CIP – Capital Improvements Plan
PW – Pathway
MR – Major Road

5. Transit Component of Plan

The following section presents an overview of public transit and high-capacity transit projects suggested through the public involvement process.

5.1 Public Transit – Bus

Currently, the only bus transit within Rochester Hills is provided by Rochester and Avondale school districts for school age children. There is no local public transit service in the study area. But, there are a variety of services that provide non-school- related transportation.

SMART provides transit service to neighboring Auburn Hills, Troy and Shelby Township but not to the City of Rochester Hills. SMART does use M-59 as part of their fixed routes to other places.

Flint's MTA provides daily regional trips from Genesee County to two plastics companies within the City of Rochester Hills at Avon and Superior Plastics.

The Older Persons Center (OPC) features transportation for people age 60 and older or for disabled persons of any age or those under 60 with doctors' notes. The OPC minibus can be scheduled to take you anywhere in Rochester, Rochester Hills, Oakland Township, to Oakland University, and to the Troy Beaumont Medical Complex. You can use the Minibus for appointments, shopping, or to visit Monday - Friday 8:00 a.m. - 5:00 p.m., Saturday - 9:00 a.m. - 5:00 p.m., and Sunday - 8:00 a.m. - 1:00 p.m. (*church services only*).

If a transit service were to be implemented, some local financial commitment is needed. Most public transit systems in Michigan are supported by either local general fund dollars or a special property tax millage.

As an example, BATA provides service to Grand Traverse and Leelanau Counties. The total population of the service area is 90,000. Local funds come from a voter-approved .35 millage/property tax assessment that generates about $2,000,000 per year. BATA offers fixed route and dial-a-ride rural services along with some out-county service. Its annual ridership is more than 400,000, with almost eight passengers per service hour carried on its fixed route service in Traverse City and four passengers per service hour on its dial-a-ride and out-county services.

It is anticipated that a public transit system in Rochester Hills would primarily be dial-a-ride or flexible-route service, both of which are demand-responsive and suited for areas of relatively low population density. To get people who have access to an automobile into transit, some type of fixed-route service may be needed. However, typical fixed-route service is determined to be viable in areas with populations in excess of 4,000 people per square mile. The City of Rochester Hills has a density of about 2000 people per square mile according to the 2000 census. But, in light of the increases in population and the pressure on the roadway system, a fixed-route service may be

desirable for the community to explore. It could provide easy connections between major destination areas such as downtown Rochester to Oakland U.

Since several ideas were offered in the process, a concept to connect major destinations with transit vehicles was explored. A voter referendum could be held to implement this concept as part of the plan. Before voting, a test could be conducted.

The test could be conducted with OPC or other vehicles during the summer to connect say Oakland University and Downtown Rochester on Walton/University. Another route could run say down Rochester Road from downtown to South Boulevard and back. The service could make one stop at Walton and Livernois near the Village. The service could operate this fixed route at a predetermined, 20 minute frequency and generally run for two months and operate from 7:00 am to 7:00 pm on weekend days and 11:00 to 7:00 pm on weekend days. The tests operating costs would be about $75,000 which would include costs for drivers, maintenance, and fuel but does not include the cost of the vehicles. Obviously ridership and revenue analyses could be conducted to determine the adequacy and amount of subsidy required.

Origins and destinations of intra-city trips for transit were not analytically conducted. However, local knowledge of the city suggests two obvious routes that may support local transit routes that may best receive the most ridership.

6. Other Master Plan Considerations

A pavement classification plan was developed as part of the MTPU to look forward and plan for the most appropriate pavement section as roadways are rebuilt and reconstructed (Figure 6-1).

Currently roadways providing access to light industrial uses are often not designed to withstand the axle loadings of medium and heavy trucks. This creates more frequent maintenance and repair as well as weight restrictions when frost laws are in effect. This eliminates access to businesses by certain sized vehicles in the winter and spring months, or causes damage to the roads when the restrictions are not observed and enforced.

The plan provides several recommendations to change the designation of future all weather routes where large vehicles would be expected. As these roads are improved or reconstructed the designation will require the appropriate drainage and pavement section to be designed and incorporated into the road so it can handle the expected wear and tear of normal deliveries.

Roads that were not necessarily considered as part of this Master Thoroughfare Plan Update were also included.

A plan for future roadway cross sections was prepared to guide projects for every major roadway regardless of the short-term and long-term opportunities and timing of the improvements (Figure 6-2).

This provides a minimum roadway section that should be considered as roadways are repaired and reconstructed and adjacent land uses are contemplated and developed. This takes the established ambiguity of the previous MTPU policy and allows flexibility to plan for the most appropriate roadway section as priorities, opportunities, timing and funding changes over time.

The existing MDOT National Functional Classification (NFC) mapping has been provided based on MGF version 6 for the study area (Figure 6-3). There are a few changes that should be requested of MDOT to the next N.F.C. update. They include the new section of Adams Road between Auburn and Hamlin Road which was just completed in addition to the new interchange ramps at M-59. This new roadway on new alignment should be added as a principal arterial. Hamlin Road from west city limits to relocated Adams Road and Old Adams Road from Hamlin to south of M-59 should revert to a minor arterial designation.

Two other changes on Tienken Road between Adams Road and Squirrel Road and Brewster from Tienken Road to Dutton Road are being recommended to be added as urban collectors.

Figure 6-1
Pavement Classification Plan

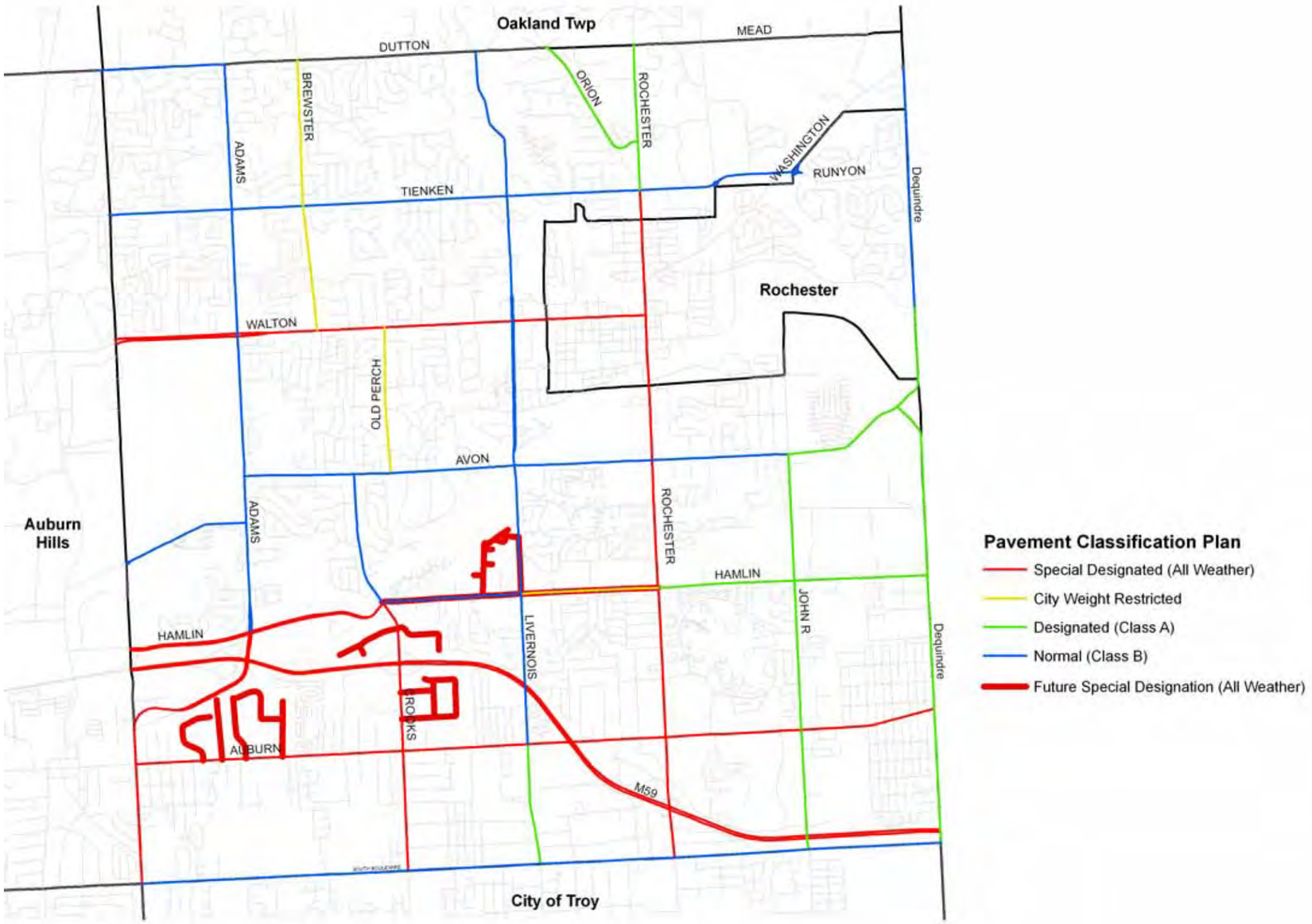


Figure 6-2
Planned Roadway Section

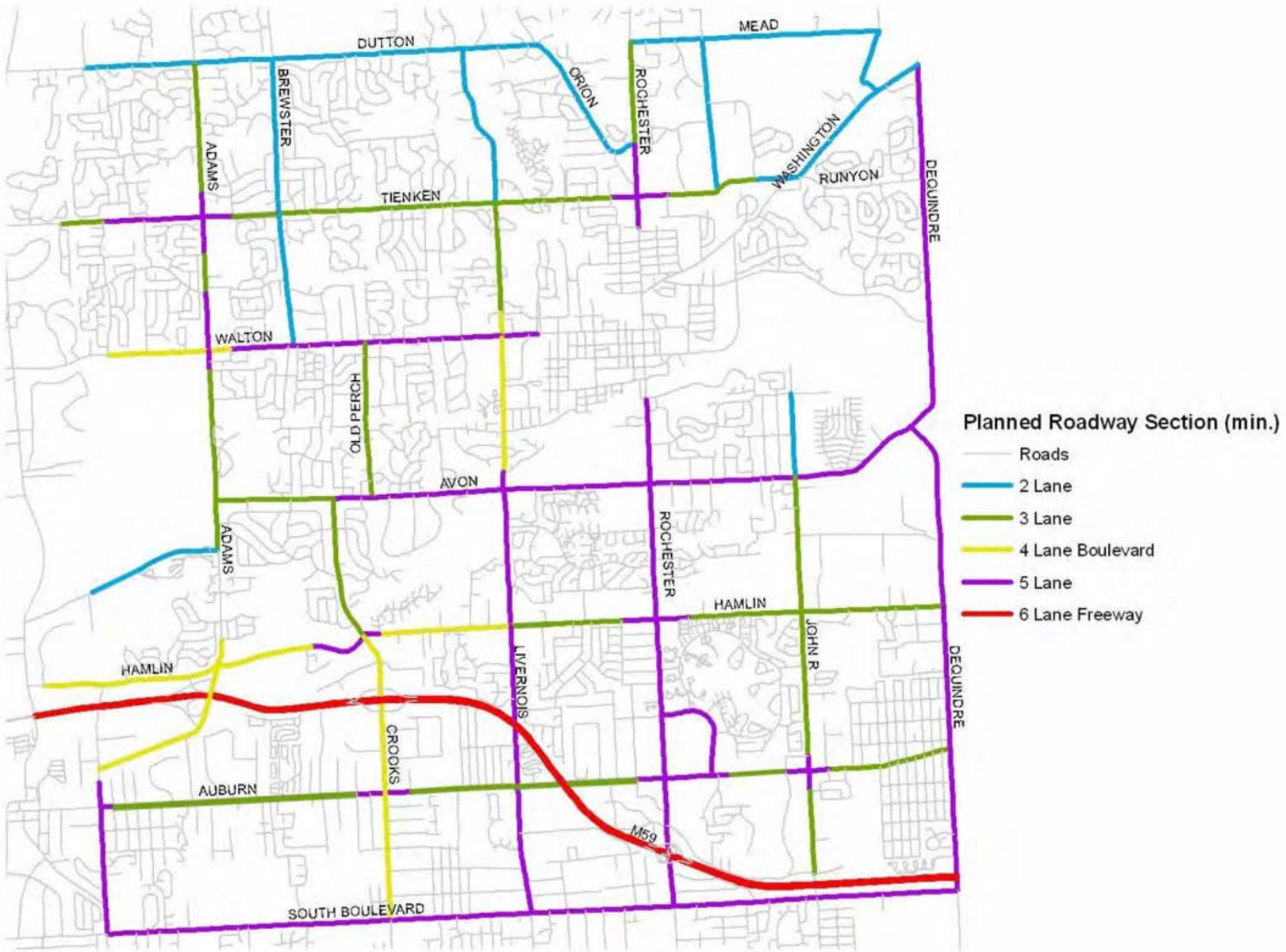
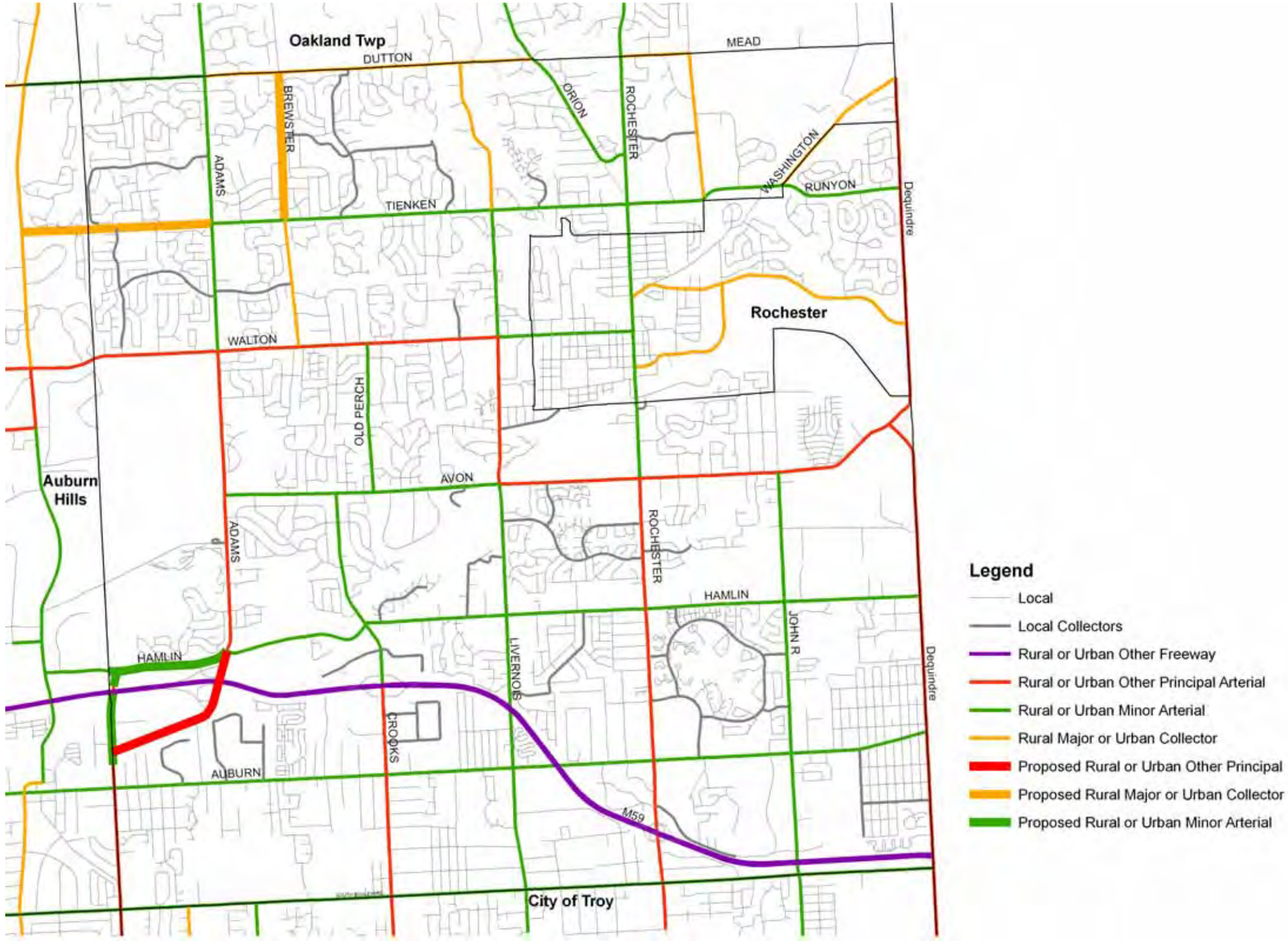


Figure 6-3
MDOT National Functional Classification (NFC)



Planned right-of-way (ROW) changes should be considered on Rochester Road and major intersections which are shown to be deficient now and in the future. Future redevelopment at these locations should be considered as part of the Master Plan and zoning ordinances revisions process. So when redevelopment occurs the necessary right-of-way is preserved to clear the land uses from any potential road conflict from traditional or other fixes proposed at these projected deficient intersections in the future. Driveways within 300 feet on each side of each approach to the intersection should be restricted with appropriately developed access management ordinances. Long-term options developed to mitigate anticipated traffic growth will undoubtedly require more ROW at these locations. The proposed modern roundabout solutions cover a different ROW requirement themselves. These requirements are shown in Figure 6-4. They too need different considerations as they tend to eat up ROW at the corners of the intersections specifically.

A new ROW corridor needs to be identified to make the proposed Dequindre Realignment project work. Formal discussions with the property owner(s) necessary to make this happen should occur immediately following adoption of this document. Figure 6-5 shows the future planned ROW that should be considered on Dequindre as well as the key intersections within Rochester Hills. They include all the links and intersections potentially affected by implementation of the preferred alternative.

6.1 Enhancement Aesthetics

As improvements are made to the major thoroughfares and projects along M-59 are designed a conscious effort to improve pedestrian accessibility and the gateways to the Rochester Hills Community needs to be highlighted. The context of the roads and the transportation system with land use has never been more important. The importance of corridor and ROW preservation/reservation for these features as well as pathways, utilities, road appurtenances such as lighting and signing should strongly be considered in future transportation and land use plans. Through the natural land use and transportation cycle clear zones for future projects can easily be mitigated over time for relatively little money.

Context sensitive solutions and transportation enhancement funds should be solicited based on the work completed in the master land use plan. Committed projects at Crooks Road would be a great candidate for improvements. Figure 6-6 depicts priorities for potential improvements already documented in the master land use plan. Level 1 priorities are shown in red and Level 2 priorities are shown in blue.

Figure 6-4
Planned ROW Widths at Intersections

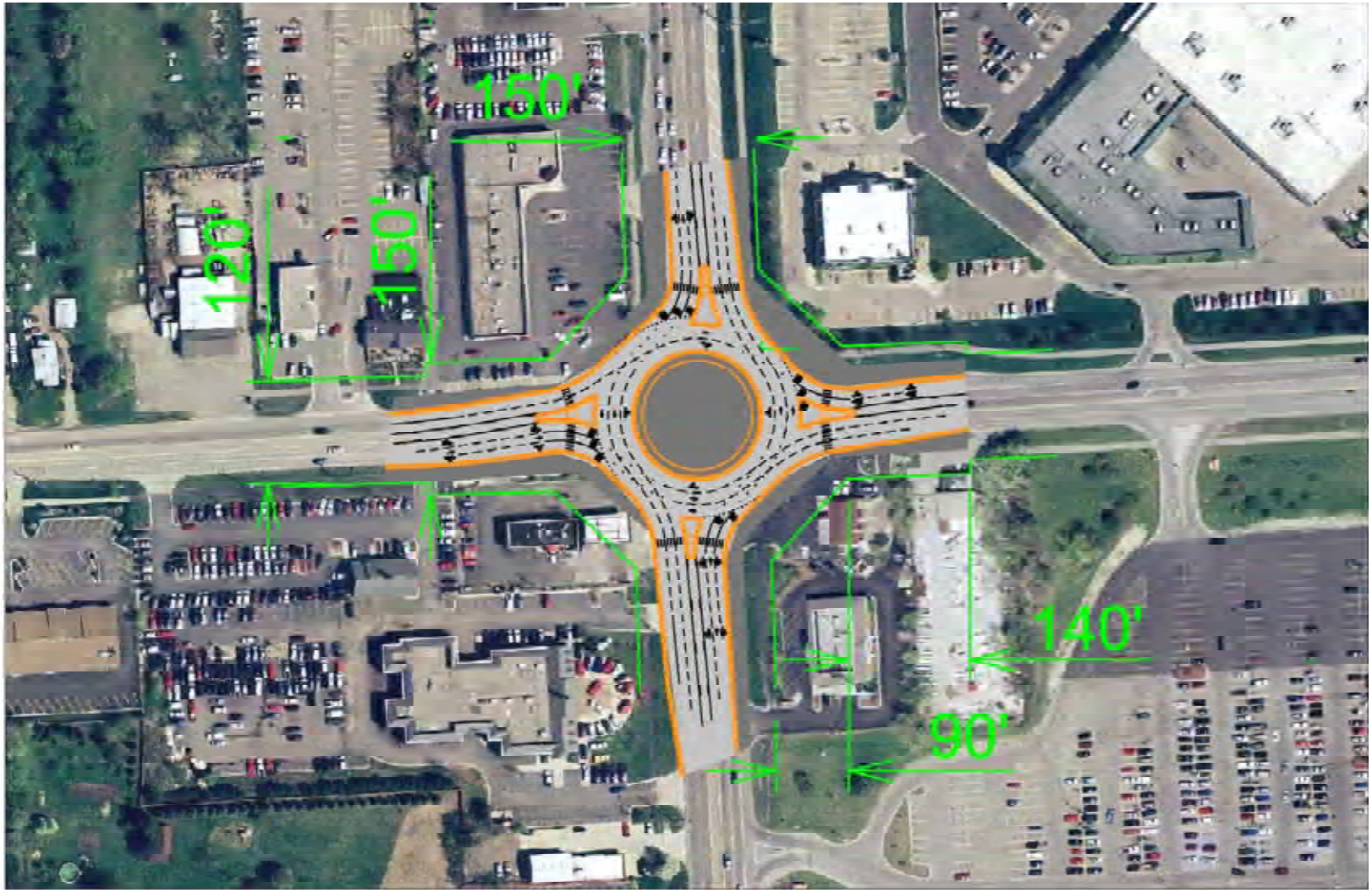


Figure 6-5
Future Planned Right-of-Way (ROW)

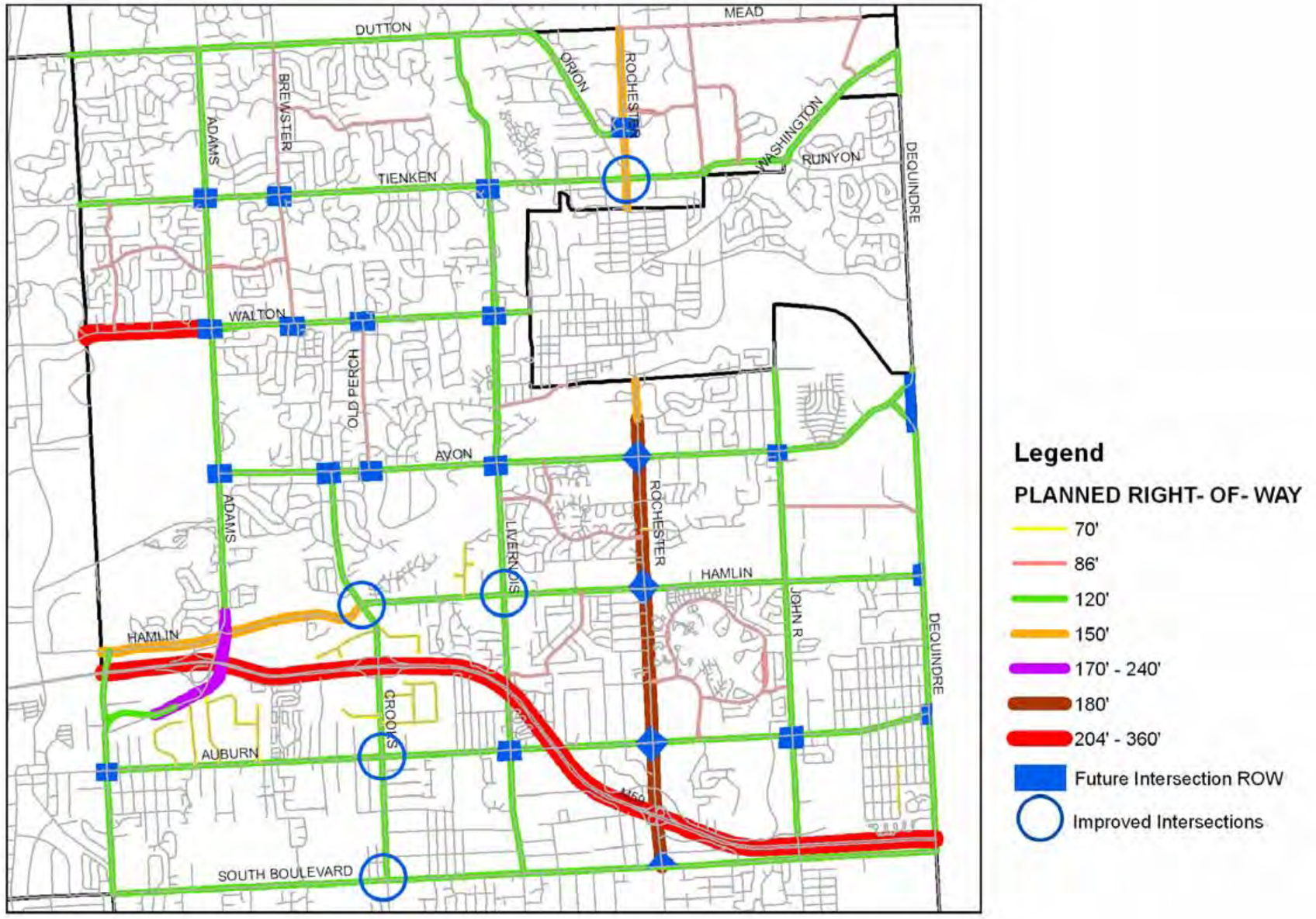


Figure 6-6
Gateway Improvement Locations

7. Consultant Recommendations

The Rochester Hills Master Thoroughfare Plan Update gave the community an opportunity to anticipate travel needs for the next 25 years. Different, but relevant, modes of transportation were analyzed and combined to develop a multi-modal plan. Improvements have been developed and defined to fix current deficiencies and anticipate future congestion and safety issues. Throughout the process several quality of life factors were used to weight and rank the alternatives and guide the final recommendations in selection of the most cost effective long-term plan for Rochester Hills.

Based upon the analysis, the Dequindre Road corridor as part of Alternative 23 was identified as the best way to move the plan forward.

The plan included short-term recommendations to fix current operational and safety issues at selected intersections and segments on Rochester Road and Adams Road.

The plan includes a prioritization of 18 non-motorized pathway segments focused on the goal of getting a pathway at least on one side of all the major thoroughfares.

The plan considers an optional test of local transit between major destinations.

The plan considers next steps and land use policy considerations to preserve ROW along Rochester Road at major intersections to further enhance the community's transportation system.

Clearly, completing the committed project at Crooks Road and M-59, including the new bridge and connections to the four-lane boulevard, should be the highest priority so Rochester Hills can realize the benefits of this $30 million project.

7.1 Roadway

The first stage of Alternative 23 Modified or the Preferred Alternative shown in Figure 3-21 on page 54 on Dequindre Road was selected to be pursued immediately by the study's Technical Committee. It offers capacity improvements for over two miles of roadway, and improves two intersections by realigning Dequindre Road near 23 Mile and Avon Road. The concept is not new, and has been discussed recently with the property owner potentially impacted there. Shelby Township has also been contacted about the plan to make this a priority. The local share costs for this project could be split between the two road commissions and the two communities involved equally. This entire first stage would cost approximately $19 million not including ROW, utility and design costs.

The remaining improvements for Alternative 23 Modified can be implemented over time at a remaining capital cost considering five-lane roads at $38 million. See Table 7-1 for the individual elements of Alternative 23.

Table 7-1
Alternative 23 Improvements

Alternative 23	Estimated Cost (2007 Dollars)
Dequindre Road - Auburn Road to South of Avon Road plus Realignment of Dequindre Road at Avon / 23 Mile Road	$19 million
Avon Road - Rochester to Dequindre	$12 million
Avon Road - Crooks to Rochester	$13 million
Crooks Road - Hamlin to Avon	$7 million
Livernois Road - Hamlin to Avon	$6 million
	$57 million

The recommended short-term intersection improvements are as follows (Table 7-2).

Table 7-2
Short-term Intersection Improvements

Intersection	Responsibility	Estimated Cost (2007 Dollars)	Priority
Tienken Rd & Adams Rd	RCOC and RH	$300,000 - $400,000	1
Walton Blvd & Adams Rd	RCOC and RH	$600,000 - $900,000	5
Auburn Rd & Adams Rd	RCOC, MDOT, and RH	$200,000 - $300,000	2
Avon Rd & Rochester Rd	RCOC, MDOT, and RH	$100,000 - $200,000	3
Wabash Rd/Barclay Circle & Rochester Rd	MDOT and RH	$200,000 - $300,000	7
Auburn Rd & Rochester Rd	MDOT and RH	$100,000 - $200,000	4
South Blvd & Rochester Rd	RCOC, MDOT, and RH	$300,000 - $400,000	6
Hamlin Rd & Rochester Rd	MDOT and RH	$200,000 - $250,000	8

The responsibility includes the road jurisdiction and partners to be included in the implementation of the fixes.

The priority suggested was based on Technical Committee input, the highest congestion condition, the highest crash rate, and the recent accessibility improvements to Adams Road at M-59.

The long-term intersection projects should be implemented as the ROW required for each is preserved or acquired (Table 7-3). The modern roundabout offers the safest and most cost effective option for the Rochester Road intersections rather than traditional fixes. However, the timing and cost of ROW necessary to implement the fix when necessary could be problematic.

Table 7-3
Long-term Intersection Improvements

Intersection	Responsibility	Estimated Cost (2007 Dollars)
Tienken Rd & Adams Rd	RCOC and RH	$1 - $2 million
Walton Blvd & Adams Rd	RCOC and RH	$2 - $3 million
Auburn Rd & Adams Rd	RCOC, MDOT, and RH	$1 - $2 million
Avon Rd & Rochester Rd (Traditional)	RCOC, MDOT, and RH	$1 - $2 million
Wabash Rd/Barclay Circle & Rochester Rd	MDOT and RH	$750,000 - $1 million
Auburn Rd & Rochester Rd (Traditional)	MDOT and RH	$3 - $3.5 million
South Blvd & Rochester Rd	RCOC, MDOT, and RH	$1.5 - $2.5 million
Hamlin Rd & Rochester Rd	MDOT and RH	$1 - $2 million
Auburn Rd and Rochester Rd (Roundabout)	RCOC, MDOT, and RH	$2 - $2.5 million
Hamlin Rd & Rochester Rd (Roundabout)	MDOT and RH	$2 - $2.5 million
Avon Rd & Rochester Rd (Roundabout)	RCOC, MDOT, and RH	$2 - $2.5 million

The next step should be to protect and preserve ROW at the intersections mentioned from future development. Opportunities to acquire grading easements and ROW from these areas should be strongly considered and pursued in the near term. A good example of this was at Tienken and Rochester Road where developers helped provide and pay for adjacent improvements.

To take the next step in this regard would require communities to change Michigan Law so builders/developers pay their fair share of the community's infrastructure improvements that benefit them. Michigan does not have legislation authorizing counties and cities to collect impact fees and/or excise taxes from developers/builders.

Safety fixes for the road segments with above average crash rates should also be considered for safety funding and immediate implementation (Table 7-4). Detailed safety audits and time of return analyses should be completed in cooperation with the MDOT. The top four segment crash rates, for roads that have not been recently improved, were located on Rochester Road in segments A, B, C and N between South Boulevard and downtown Rochester. Continuous deceleration lanes/right-turn lanes would remove slowing and turning vehicles from the through lanes eliminating speed differentials which are a leading cause of potential crashes.

Table 7-4
Segment Safety Priorities

Crash Segment	Crash Countermeasure	Responsibility	Estimated Costs (2007 Dollars)
A	Deceleration lane for NB and SB Rochester	MDOT and RH	$1 million - $2 million
B	Deceleration lane for SB Rochester	MDOT and RH	$1 million - $2 million
C	Deceleration lanes and access management	MDOT and RH	$200,000 - $500,000
N	Access management and deceleration lanes	MDOT and RH	$200,000 - $500,000

Safety fixes for two intersections not mentioned in the operational improvements should also be considered for immediate attention (Table 7-5). They include new right-turn lanes at Brewster Road and Walton Boulevard and improved vertical geometries at Avon Road and Adams Road.

Table 7-5
Additional Intersection Safety Projects

Intersection	Responsibility	Estimated Cost (2007 Dollars)
Avon Rd & Adams Rd	RCOC and RH	$3 - $3.5 million
Walton Blvd. & Brewster Rd	RCOC and RH	$250,000 - $400,000

7.2 Non-motorized

Fifty-three of the remaining 136 pathway gaps were prioritized based on potential efficiencies with current projects on M-59, and to complete a continuous path at least on one side of the road. Pathway gaps near parks and schools were prioritized next.

Priority sections 1-18 is estimated to cost $5 million which should be able to be completed in the next 20 years based on current millage capital spending for new pathways (Table 7-6).

7.3 Transit

It is anticipated that a public transit system in Rochester Hills would primarily be dial-a-ride or flexible-route service, both of which are demand-responsive and suited for areas of low population density. A typical fixed-route service would most likely not be widely supported because of the lack of densities.

Since several ideas were offered in the process, a concept to connect major destinations with transit vehicles was explored. A voter referendum could be held to implement this concept as part of the plan. Before voting a test could be conducted.

The test could be conducted with OPC or other vehicles during the summer to connect say Oakland University and Downtown Rochester on Walton/University. The service could make one stop at Walton and Livernois near the Village. The service could operate this fixed route at a predetermined, 20 minute frequency and generally run for two months and operate from 7:00 am to 7:00 pm on weekend days and 11:00 to 7:00 pm on weekend days. The tests operating costs would be about $75,000 which would include costs for drivers, maintenance, and fuel but does not include the cost of the vehicles. Obviously ridership and revenue analyses could be conducted to determine the adequacy and amount of subsidy required.

Table 7-6
Priority Sections/Segment 1-18

ID#	Street Name	Length of Gap (Proposed Pathway) (mi)	Length of Gap (Proposed Pathway) (ft)	Distance from School/ Park (ft)	Crashes Within 1/4 Mile of Pathway	Notes	Priority Segments	Est. Costs (2007 Dollars)
108	Dequindre	0.18	956	2563	0	Part of MR	s1	
109	Dequindre	0.06	298	2551	0	Part of MR	s1	
110	Dequindre	0.14	747	1339	0	Part of MR	s1	
111	Dequindre	0.24	1265	297	0	Part of MR	s1	*$163,200*
80	Crooks	0.38	1989	925	2	Part of MR	s2	
81	Crooks	0.40	2137	858	2	Part of MR	s2	*$206,250*
85	Livernois	0.06	304	45	1		s3	
86	Livernois	0.54	2825	0	1		s3	
87	Livernois	0.42	2217	76	1		s3	
88	Livernois	0.34	1779	56	0		s3	*$356,200*
93	Rochester	0.39	2069	724	3		s4	
94	Rochester	0.36	1909	856	3		s4	*$198,850*
19	Auburn	0.45	2373	0	1	PW-06D in 2010 per CIP along with #22	s5	
22	Auburn	0.33	1752	92	4	PW-06D in 2010 per CIP along with #19	s5	$174,000
20	Auburn	0.10	518	0	0		s5	
21	Auburn	0.70	3705	0	4		s5	*$211,100*
59	Tienken	0.06	343	38	0	PW-08B in 2011 per CIP along with $59, #60, #61, #62 & #63	s6	
60	Tienken	0.18	933	216	1	PW-08B in 2011 per CIP along with $59, #60, #61, #62 & #63	s6	
61	Tienken	0.10	516	0	1	PW-08B in 2011 per CIP along with $59, #60, #61, #62 & #63	s6	
62	Tienken	0.03	148	736	1	PW-08B in 2011 per CIP along with $59, #60, #61, #62 & #63	s6	
63	Tienken	0.06	343	943	1	PW-08B in 2011 per CIP along with $59, #60, #61, #62 & #63	s6	$47,250
75	Adams	1.38	7312	0	5		s7	
125	Adams	0.60	3191	0	1		s7	*$525,100*
51	Avon	0.25	1337	1667	0	PW-49A in 2012 per CIP	s8	$88,500
50	Avon	1.03	5423	0	3		s8	$403,300
52	Avon	0.50	2645	0	0		s8	
65	Tienken Extended	0.29	1515	0	0		s9	$483,950
66	Washington	0.30	1589	0	0		s9	
68	Washington	0.49	2603	1896	0		s9	
117	Washington	0.75	3972	975	0		s9	
91	Orion	0.25	1323	689	0		s10	$267,250
92	Orion	0.76	4023	0	0		s10	
58	Tienken	0.64	3372	0	0	PW-08D in 2010 per CIP along with #56, #57 & #58	s11	$112,000
64	Tienken	0.43	2279	0	0	PW-08C in 2011 per CIP	s12	$359,500
45	Avon	0.11	575	321	0		s13	$132,450
46	Avon	0.19	1016	0	1		s13	
47	Avon	0.15	788	0	0		s13	
48	Avon	0.05	273	345	2		s13	

CIP – Capital Improvements Plan
PW – Pathway
MR – Major Road

Table 7-6 (continued)
Priority Sections/Segment 1-18

ID#	Street Name	Length of Gap (Proposed Pathway) (mi)	Length of Gap (Proposed Pathway) (ft)	Distance from School/ Park (ft)	Crashes Within 1/4 Mile of Pathway	Notes	Priority Segments	Est. Costs (2007 Dollars)
35	Hamlin	0.48	2559	0	2	PW-02B in 2010 per CIP along with #35, #36 & #37	s14	
36	Hamlin	0.04	230	0	1	PW-02B in 2010 per CIP along with #35, #36 & #37	s14	
37	Hamlin	0.14	755	0	4	PW-02B in 2010 per CIP along with #35, #36 & #37	s14	$319,250
24	Auburn	0.07	344	0	2	PW-06D in 2010 per CIP along with #24, #25, #26, #27 & #28	s15	
25	Auburn	0.20	1032	335	2	PW-06D in 2010 per CIP along with #24, #25, #26, #27 & #28	s15	
26	Auburn	0.02	106	383	2	PW-06D in 2010 per CIP along with #24, #25, #26, #27 & #28	s15	
27	Auburn	0.05	283	0	1	PW-06D in 2010 per CIP along with #24, #25, #26, #27 & #28	s15	
28	Auburn	0.03	151	227	0	PW-06D in 2010 per CIP along with #24, #25, #26, #27 & #28	s15	$174,000
39	Hamlin	0.63	3317	36	0	PW-02C in 2011 per CIP along with #39, #40 & #41	s16	
40	Hamlin	0.05	289	1136	0	PW-02C in 2011 per CIP along with #39, #40 & #41	s16	
41	Hamlin	0.18	968	1617	0	PW-02C in 2011 per CIP along with #39, #40 & #41	s16	$396,000
42	Avon	0.32	1716	0	1		s17	
43	Avon	0.36	1927	551	0		s17	
44	Avon	0.48	2526	0	1		s17	*$308,300*
67	Washington	0.41	2183	0	1		s18	*$109,150*
						Total		$5,035,600

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7.4 Next Steps

As the City is intimately aware, Current Committed projects represented on Figure 3-4 represent approximately $20 million of near term expenditures (Table 7-7). Projects 2a and 2b should be completed as soon as possible and are considered a top priority.

Table 7-7
Rochester Hills Currently Committed Revenue

Description	Share	Costs (2007 Dollars)
1. Hamlin Rd. 4-Lane – From Crooks to Livernois MR-02A	20%	$3.56
2a. Crooks Rd. 4-Lane – Bridge MR-01A	3%	$0.75
2b. Crooks Rd. 4-Lane – From Hamlin to S. of Interchange MR-01E	10%	$0.77
3. M-59 6-Lane Highway – From Crooks to Ryan Rd	2.5%-50%	$5.80
4. John R. 5-Lane – From South Blvd to Long Lake/18 Mile		Troy
5. John R. 3-Lane -South Blvd. to N. of Auburn	100%	$3.20
6. Dequindre 5-Lane - Square Lake to Auburn	5%	$0.37
7. Walton 5-Lane -Squirrel to Opdyke		Auburn Hills
8. Washington pave 2-Lanes Runyon to 26 Mile Road	17%	$0.20
Tienken Road - Livernois to Rochester	10%	$1.00
Hamlin -Livernois to Rochester	100%	$3.54
All costs in $ Millions from CIP	Total	$19.19

Implementation of Alternative 23 with its first phase on Dequindre Road expected to cost approximately $19 million, and remaining phases an additional $38 million.

Non-motorized committed capital projects account for approximately $1.5 million and were discussed in section 4.3.

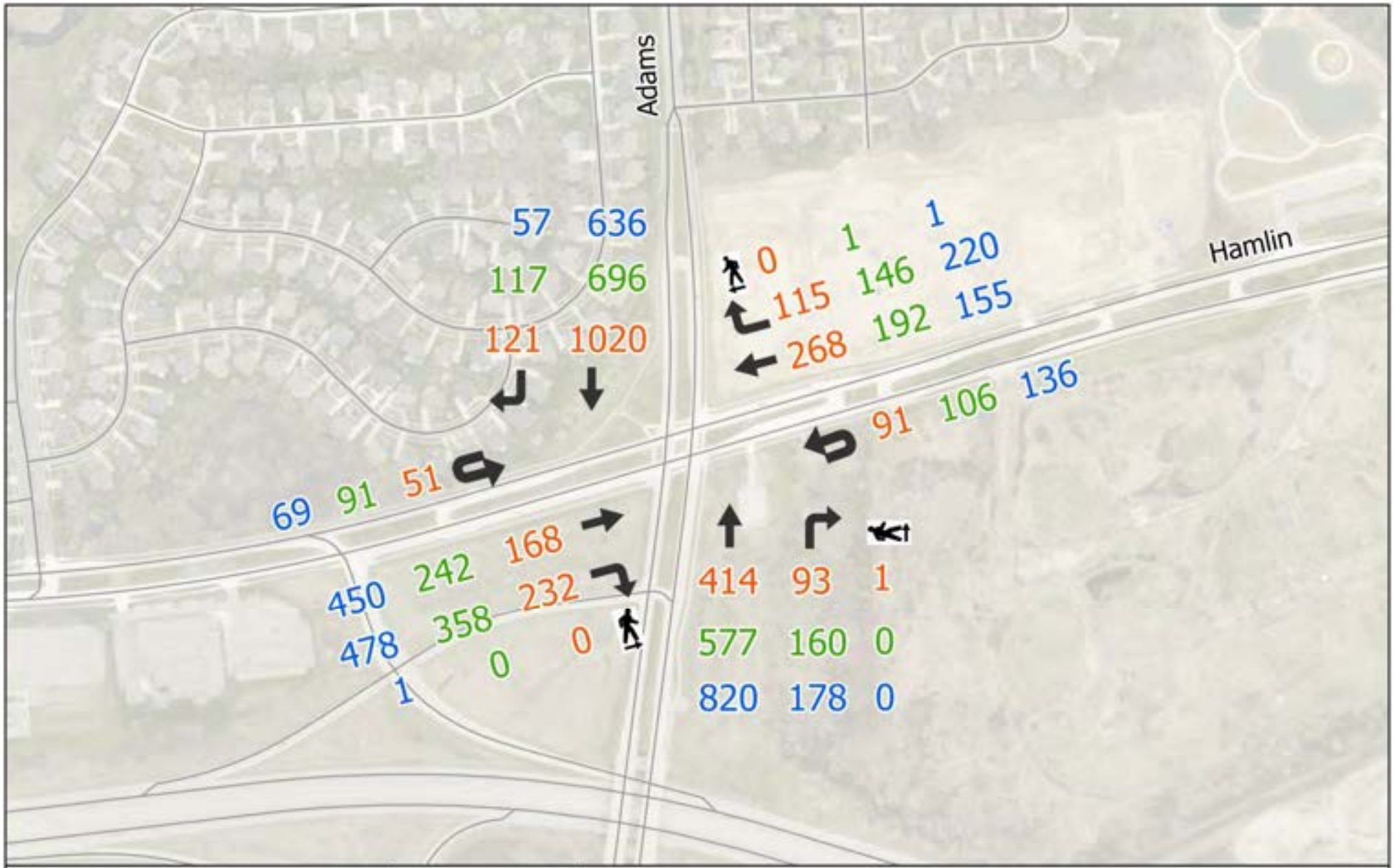
Non-motorized new pathway construction projects were estimated at approximately $5 million and can be funded via the new pathway millage.

To accomplish the short-term roadway projects $2- 3 million would be required.

To accomplish the longer term intersection and segment safety projects an additional $11 to $30 million would be required, depending on a range of design choices like roundabouts or traditional fixes on Rochester Road.

To take the high range of the scale of roadway improvements at $87 million, over the next 27 years would mean an additional maximum expense to the city of about $3.2 million per year to fully fund the Master Thoroughfare Plan to 2035.

APPENDIX B — TURNING MOVEMENT COUNTS



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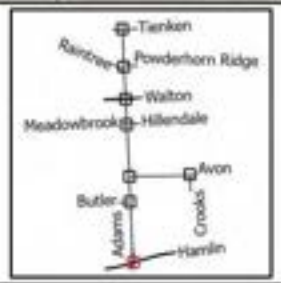


Existing Traffic Volume Diagram
Adams Road and Hamlin Road

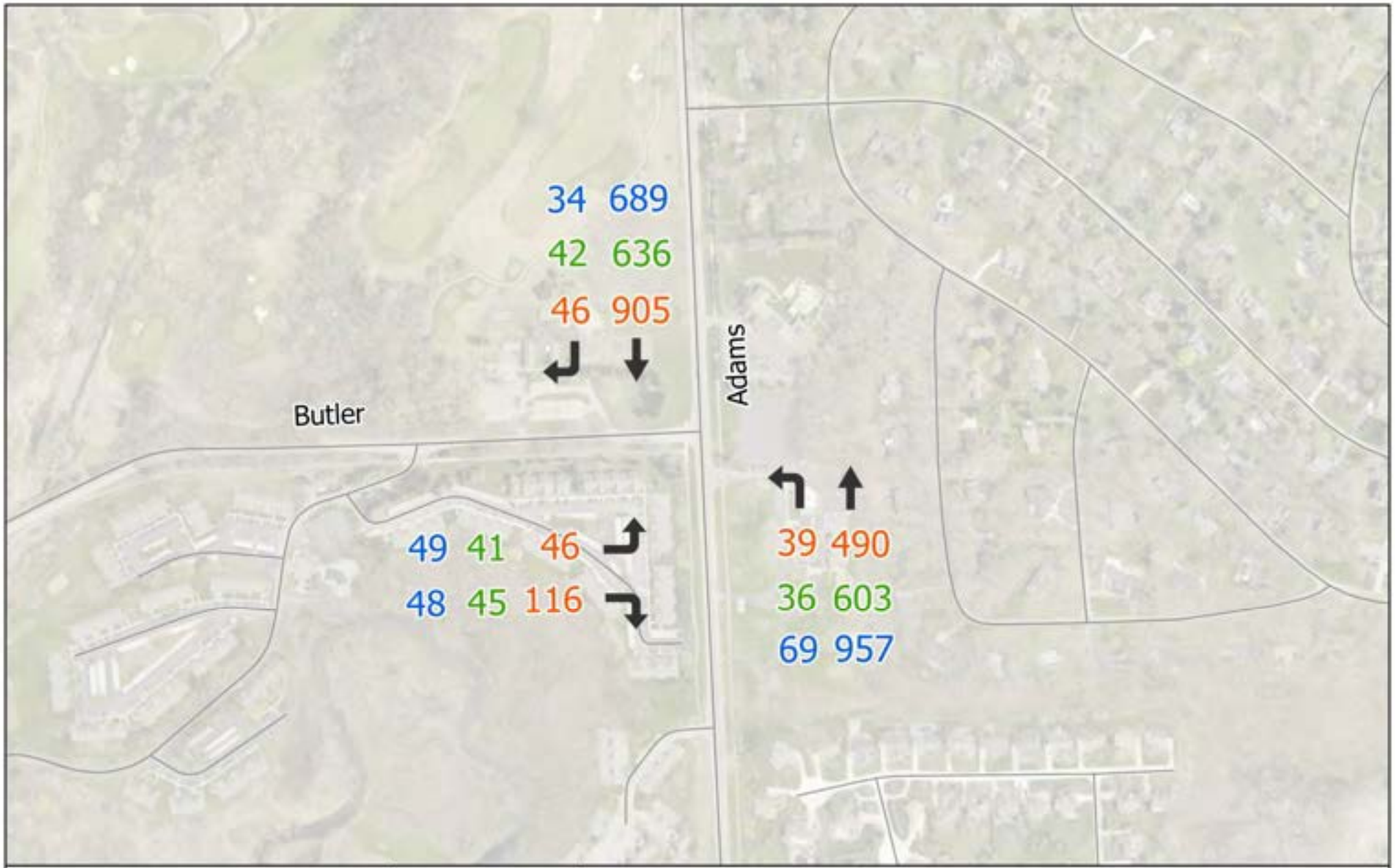
Adams Road Corridor PEL Study

DATE: 1/20/2023

Legend
Traffic Counts
AM Peak Hour
Midday Peak Hour
PM Peak Hour

N

0 200 400
Feet



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Existing Traffic Volume Diagram
Adams Road and Butler Road

Adams Road Corridor PEL Study

DATE: 1/20/2023

Legend

Traffic Counts

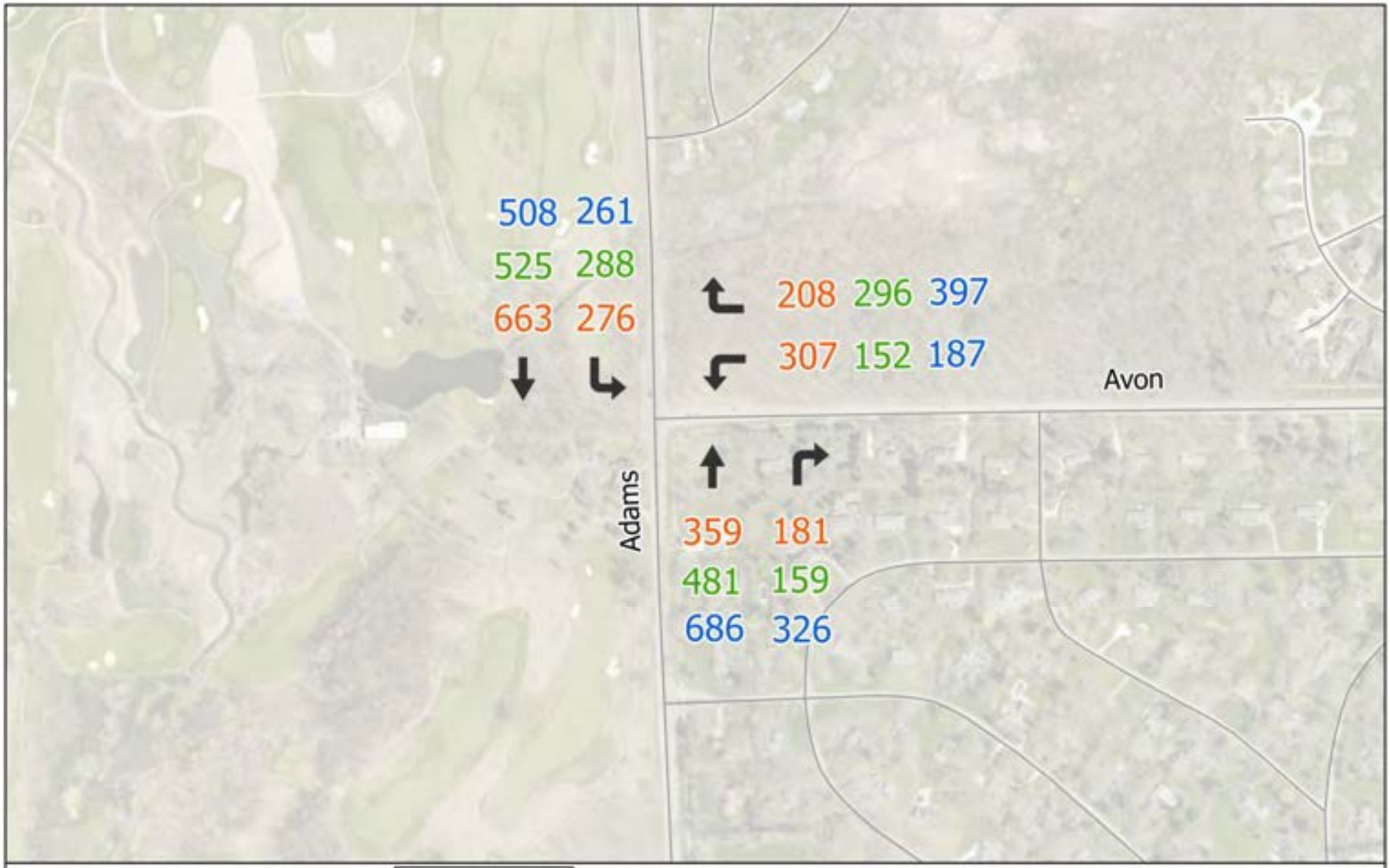
AM Peak Hour

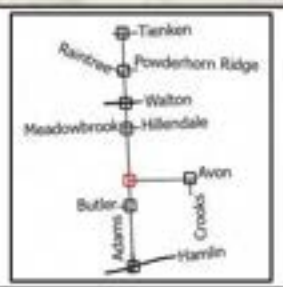
Midday Peak Hour

PM Peak Hour

N

0 200 400
Feet





Existing Traffic Volume Diagram
Adams Road and Avon Road

Adams Road Corridor PEL Study

DATE: 1/20/2023

Legend

Traffic Counts

AM Peak Hour

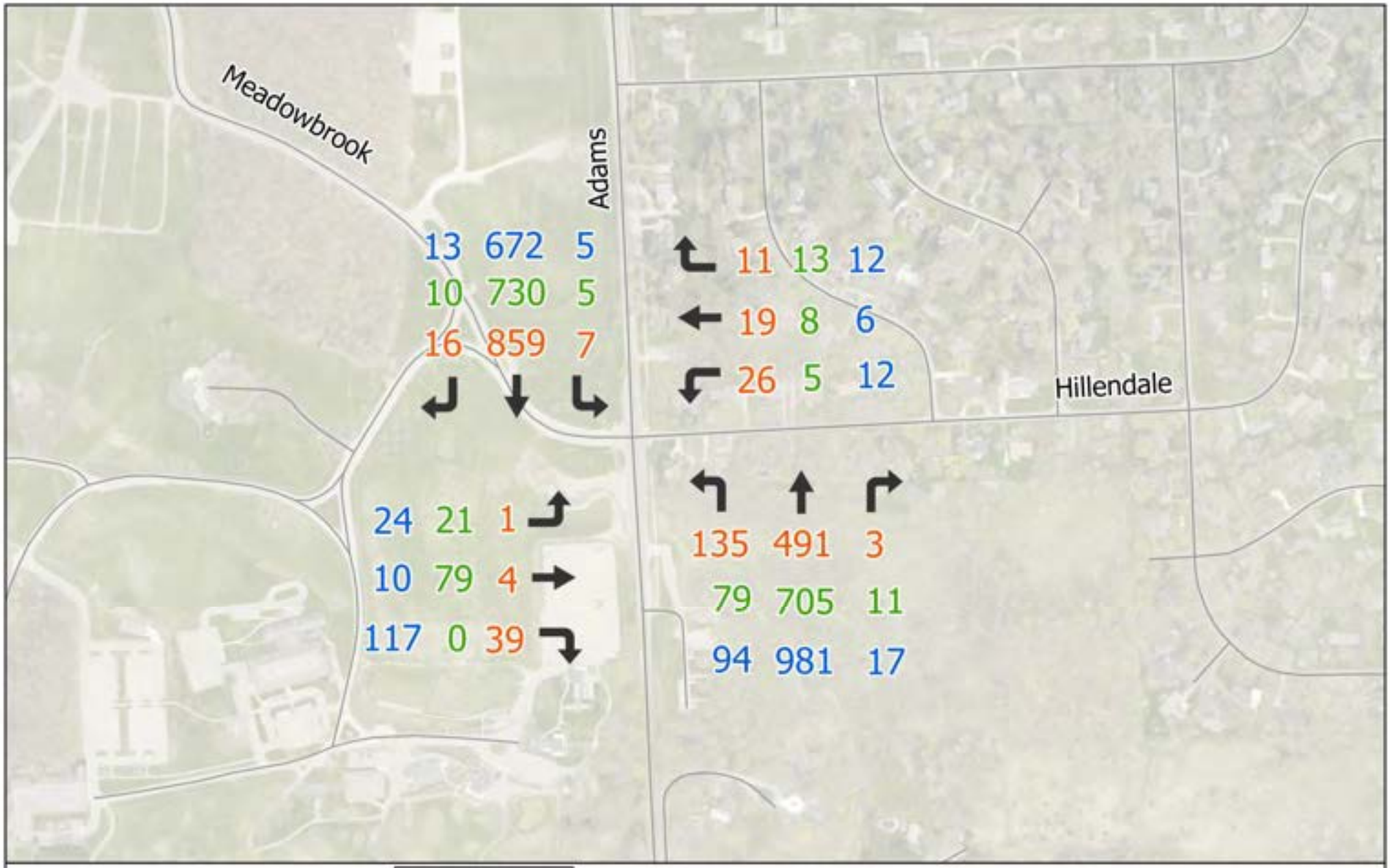
Midday Peak Hour

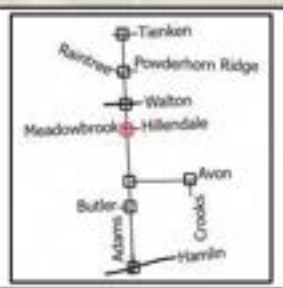
PM Peak Hour

N

0 200 400

Feet





Existing Traffic Volume Diagram
Adams Road and Hillendale Dr/Meadowbrook Rd

Adams Road Corridor PEL Study

DATE: 1/20/2023

Legend

Traffic Counts

AM Peak Hour

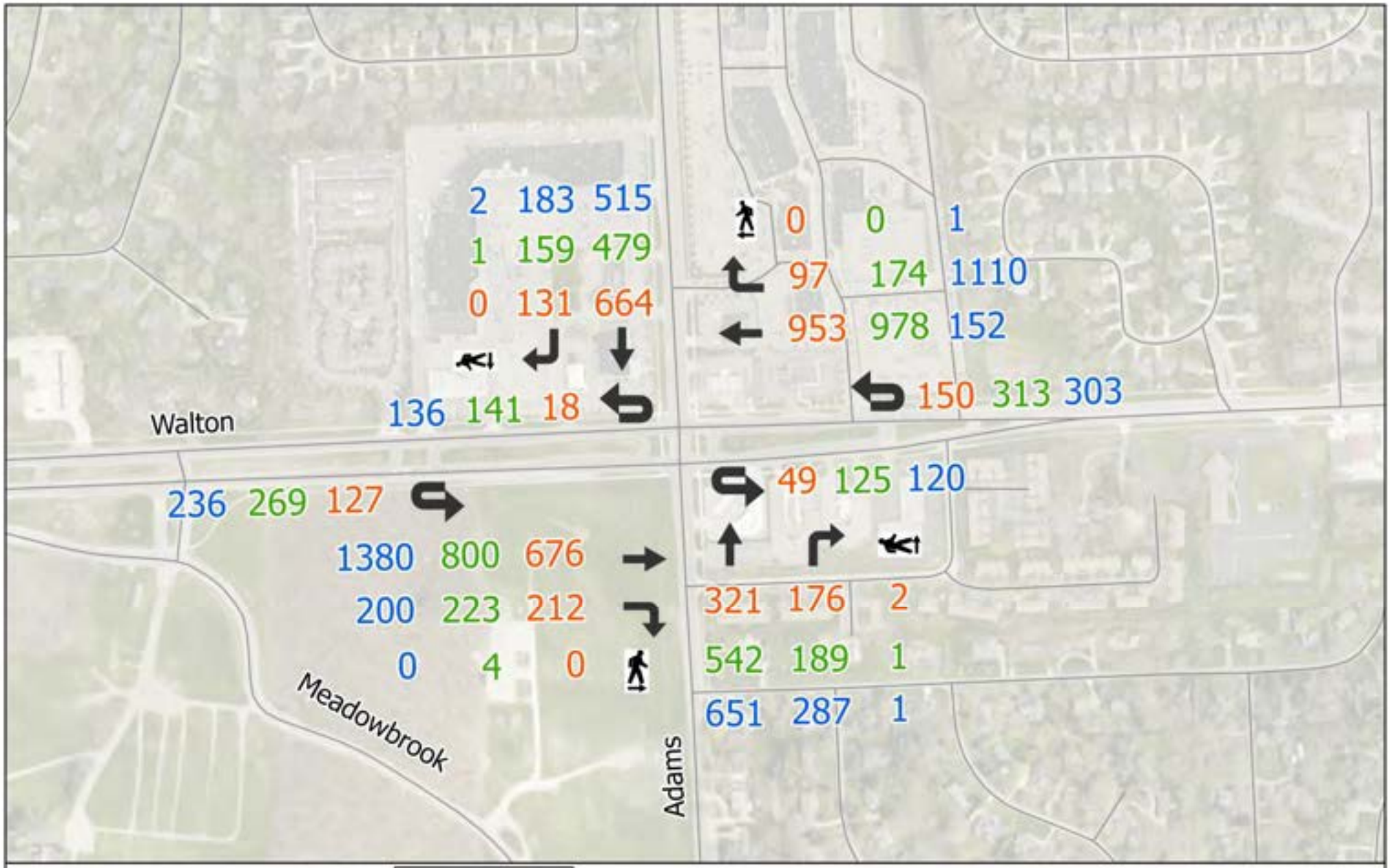
Midday Peak Hour

PM Peak Hour

N

0 200 400

Feet



Existing Traffic Volume Diagram
Adams Road and Walton Boulevard

Adams Road Corridor PEL Study

DATE: 1/20/2023

Legend

Traffic Counts

AM Peak Hour

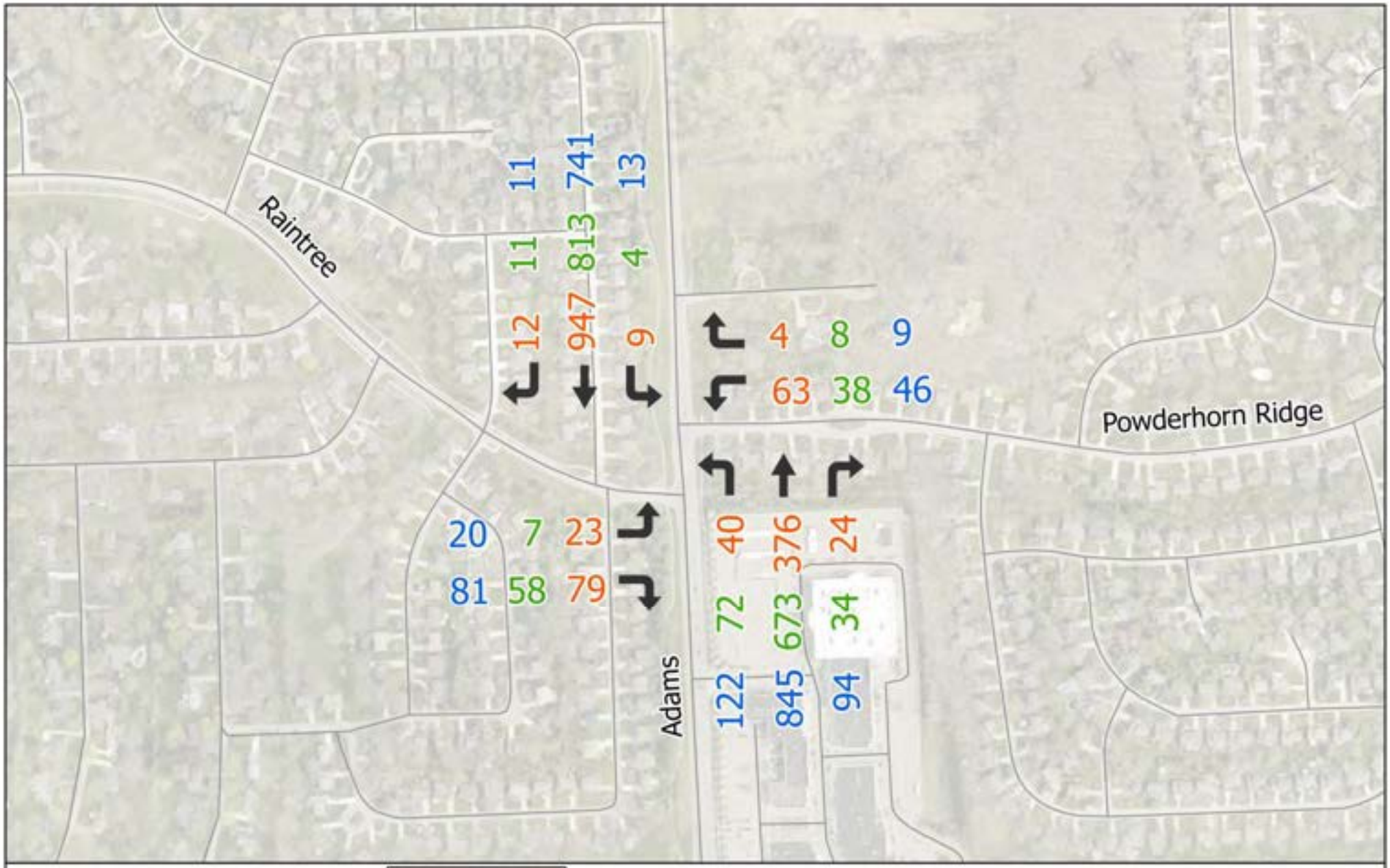
Midday Peak Hour

PM Peak Hour

N

0 200 400

Feet



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Existing Traffic Volume Diagram
Adams Road and Powderhorn Ridge Dr/Raintree Dr

Adams Road Corridor PEL Study

DATE: 1/20/2023

Legend

Traffic Counts

AM Peak Hour

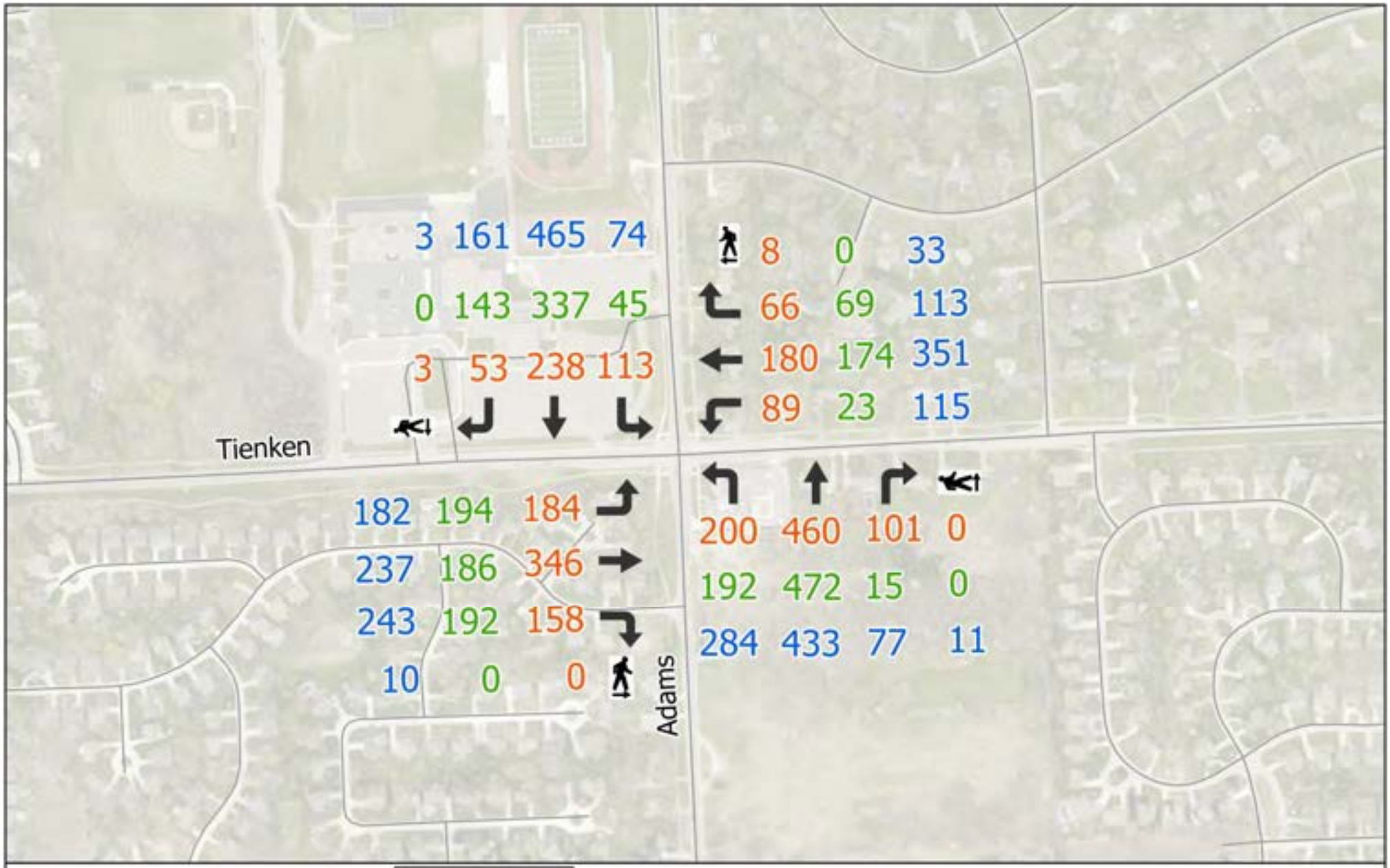
Midday Peak Hour

PM Peak Hour

N

0 200 400

Feet



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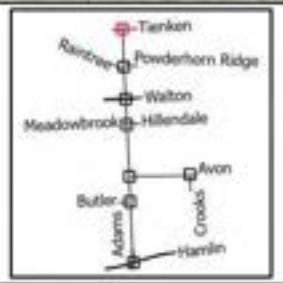


Existing Traffic Volume Diagram
Adams Road and Tienken Road

Adams Road Corridor PEL Study

DATE: 1/20/2023

Legend

Traffic Counts

AM Peak Hour

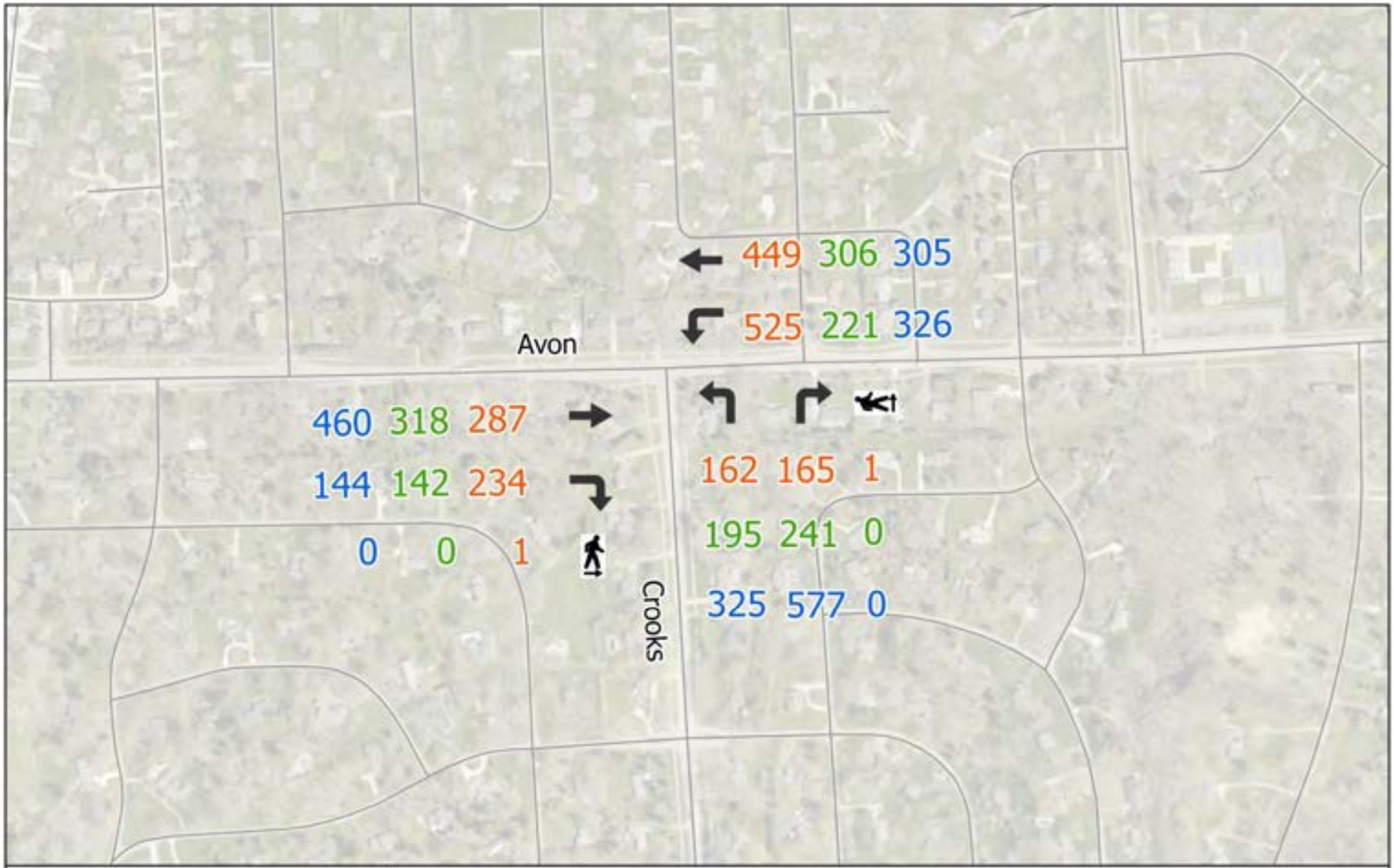
Midday Peak Hour

PM Peak Hour

N

0 200 400

Feet



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Existing Traffic Volume Diagram
Avon Road and Crooks Road

Adams Road Corridor PEL Study

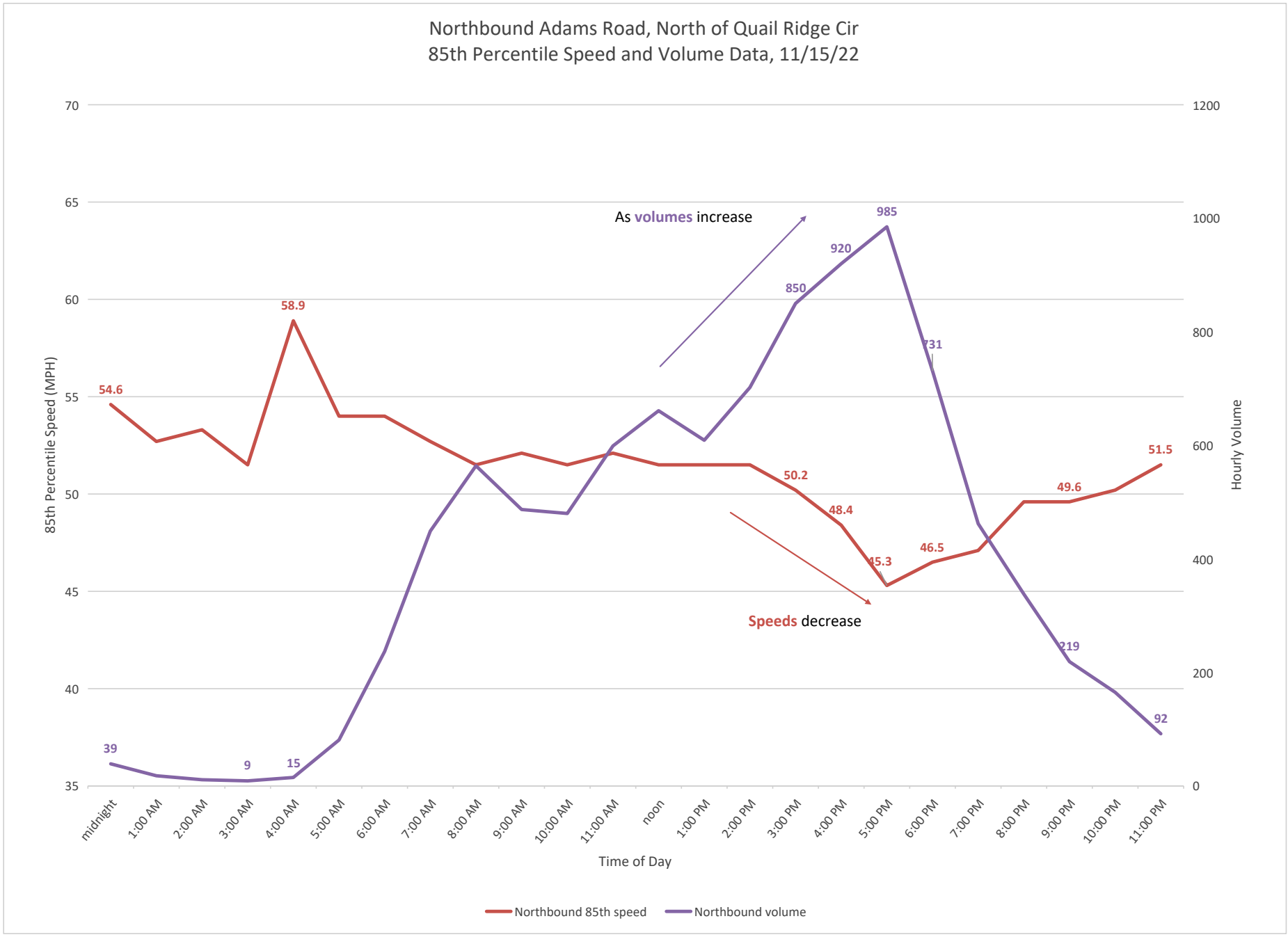
DATE: 1/20/2023

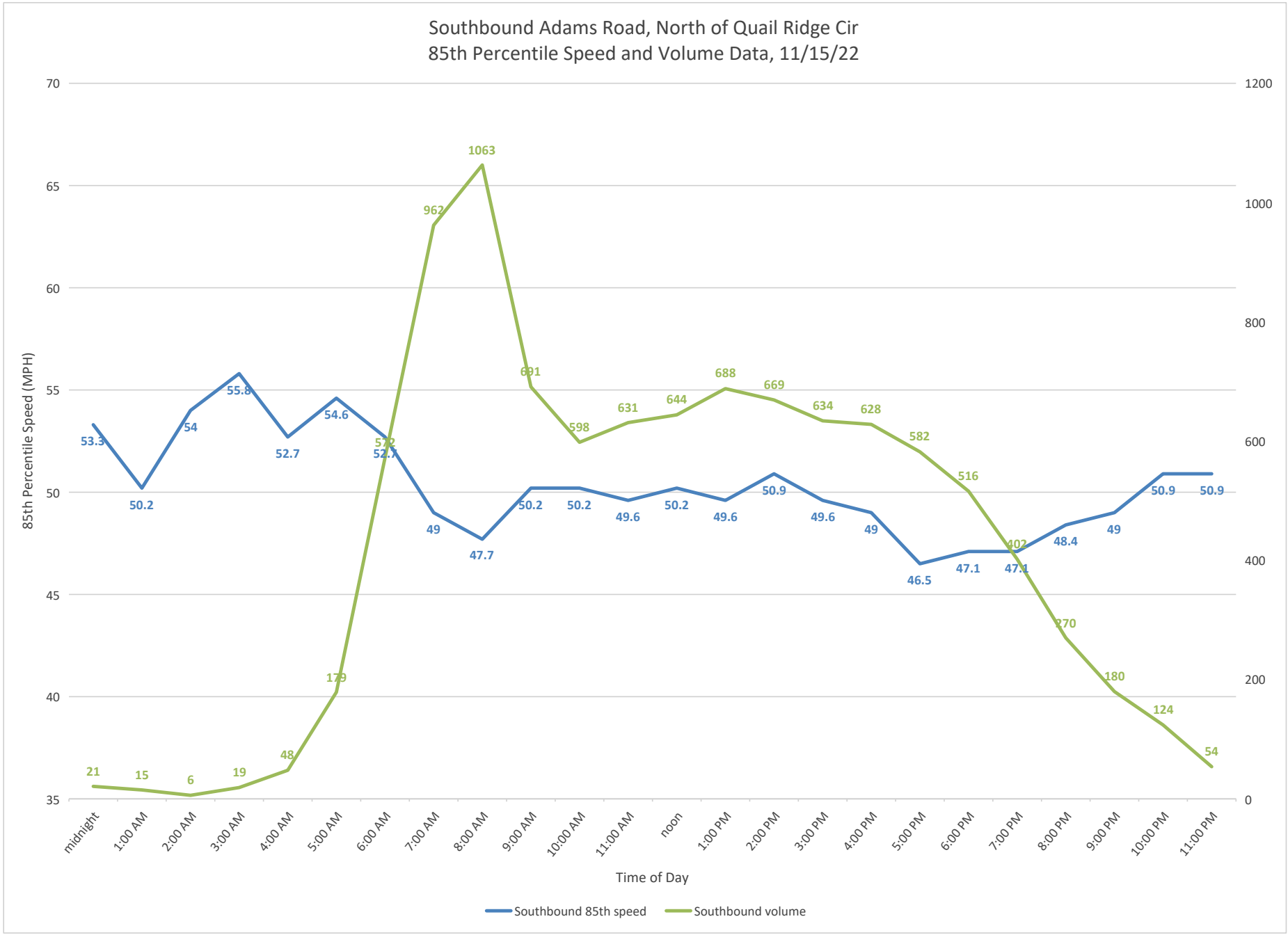
Legend
Traffic Counts
AM Peak Hour
Midday Peak Hour
PM Peak Hour

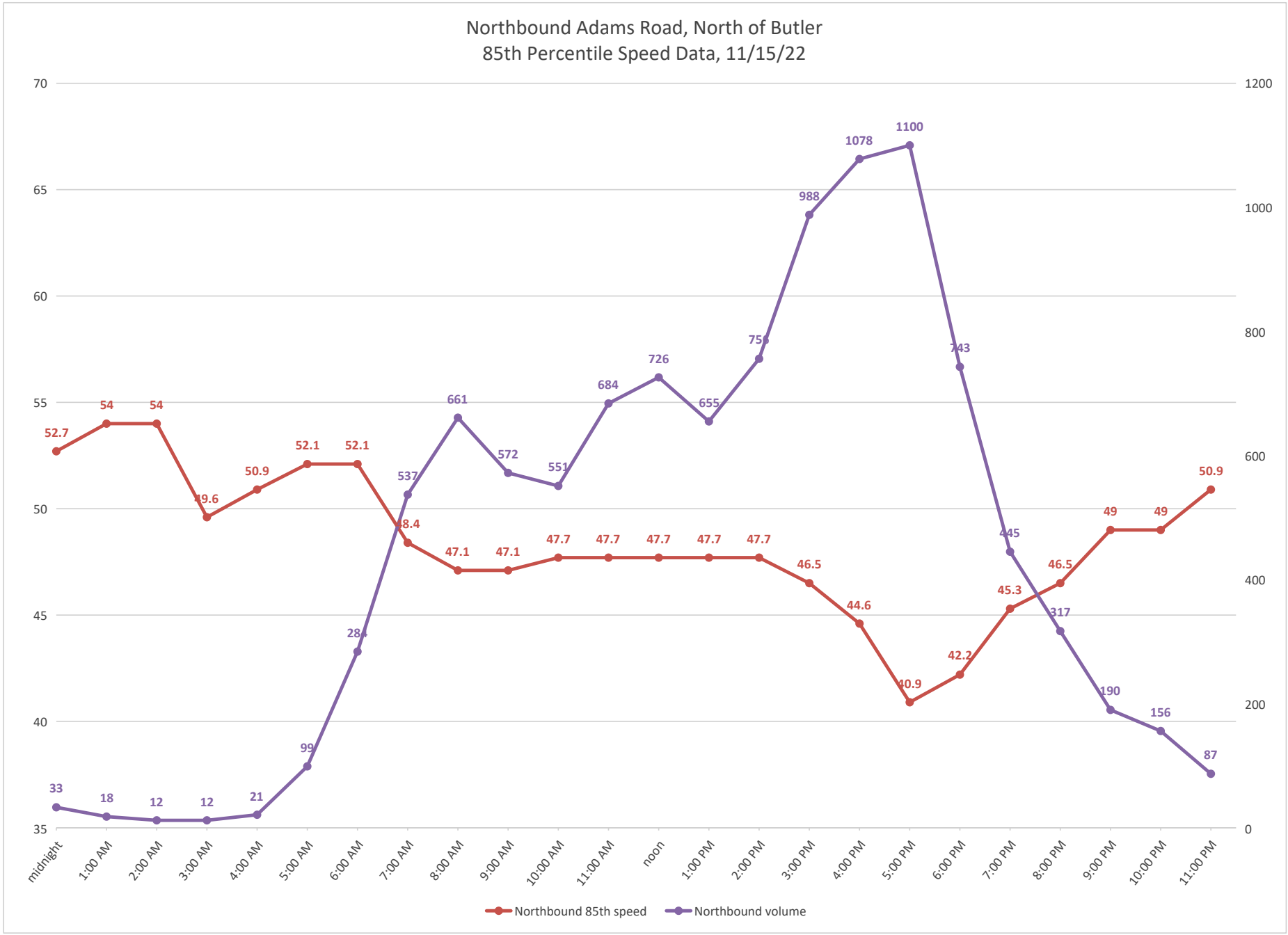
N

0 200 400
Feet

APPENDIX C — SPEED DATA


Northbound Adams Road, North of Quail Ridge Cir
85th Percentile Speed and Volume Data, 11/15/22
85th Percentile Speed (MPH)
Hourly Volume
Time of Day
As volumes increase
Speeds decrease
54.6
58.9
50.2
48.4
45.3
46.5
49.6
51.5
39
9
15
850
920
985
731
219
92
midnight
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
noon
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Northbound 85th speed
Northbound volume


Southbound Adams Road, North of Quail Ridge Cir
85th Percentile Speed and Volume Data, 11/15/22
85th Percentile Speed (MPH)
70
65
60
55
50
45
40
35
1200
1000
800
600
400
200
0
midnight
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
noon
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Time of Day
53.3
50.2
54
55.8
52.7
54.6
52.7
49
47.7
50.2
50.2
49.6
50.2
49.6
50.9
49.6
49
46.5
47.1
47.1
48.4
49
50.9
50.9
21
15
6
19
48
179
962
1063
691
598
631
644
688
669
634
628
582
516
402
270
180
124
54
Southbound 85th speed
Southbound volume


Northbound Adams Road, North of Butler
85th Percentile Speed Data, 11/15/22
70
65
60
55
50
45
40
35
1200
1000
800
600
400
200
0
52.7
54
54
49.6
50.9
52.1
52.1
48.4
47.1
47.1
47.7
47.7
47.7
47.7
47.7
46.5
44.6
40.9
42.2
45.3
46.5
49
49
50.9
33
18
12
12
21
99
284
537
661
572
551
684
726
655
756
988
1078
1100
743
445
317
190
156
87
midnight
1:00 AM
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3:00 AM
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5:00 AM
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8:00 AM
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noon
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4:00 PM
5:00 PM
6:00 PM
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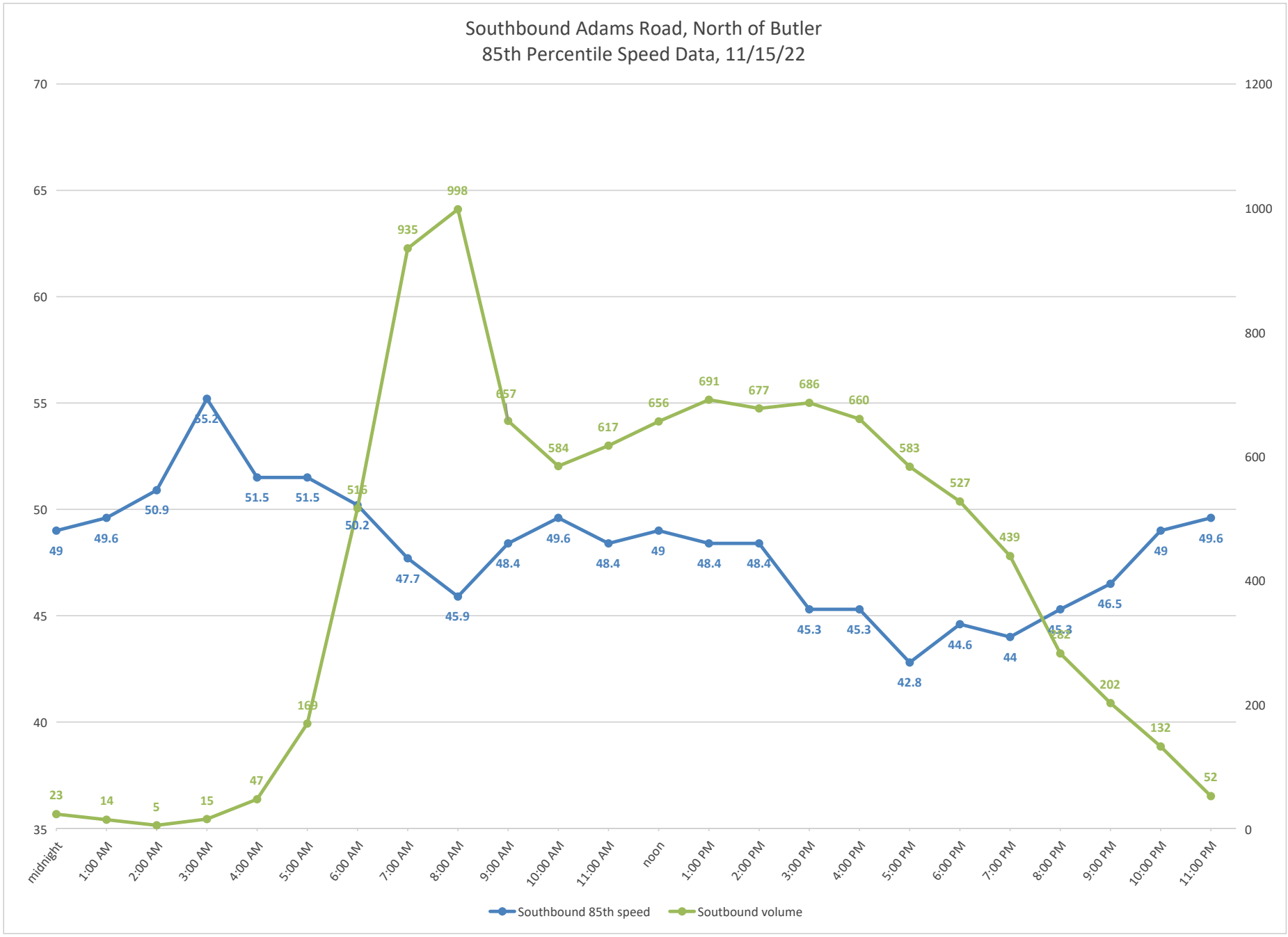
10:00 PM
11:00 PM
Northbound 85th speed
Northbound volume


Southbound Adams Road, North of Butler
85th Percentile Speed Data, 11/15/22
70
65
60
55
50
45
40
35
1200
1000
800
600
400
200
0
midnight
1:00 AM
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3:00 AM
4:00 AM
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noon
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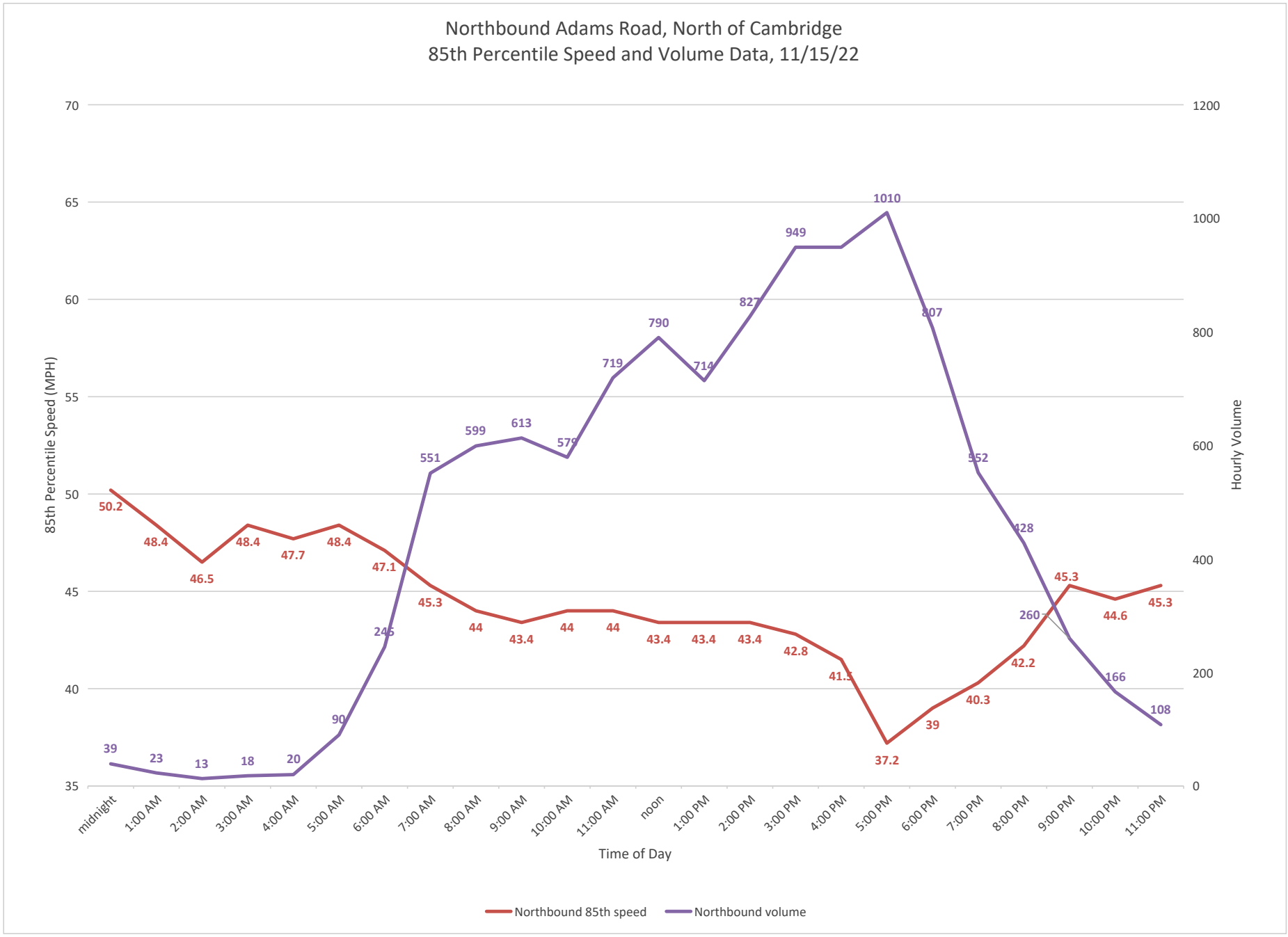
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
49
49.6
50.9
55.2
51.5
51.5
50.2
47.7
45.9
48.4
49.6
48.4
49
48.4
48.4
45.3
45.3
42.8
44.6
44
45.3
46.5
49
49.6
23
14
5
15
47
169
516
935
998
657
584
617
656
691
677
686
660
583
527
439
282
202
132
52
Southbound 85th speed
Soutbound volume


Northbound Adams Road, North of Cambridge
85th Percentile Speed and Volume Data, 11/15/22
85th Percentile Speed (MPH)
Hourly Volume
Time of Day
70
65
60
55
50
45
40
35
1200
1000
800
600
400
200
0
midnight
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
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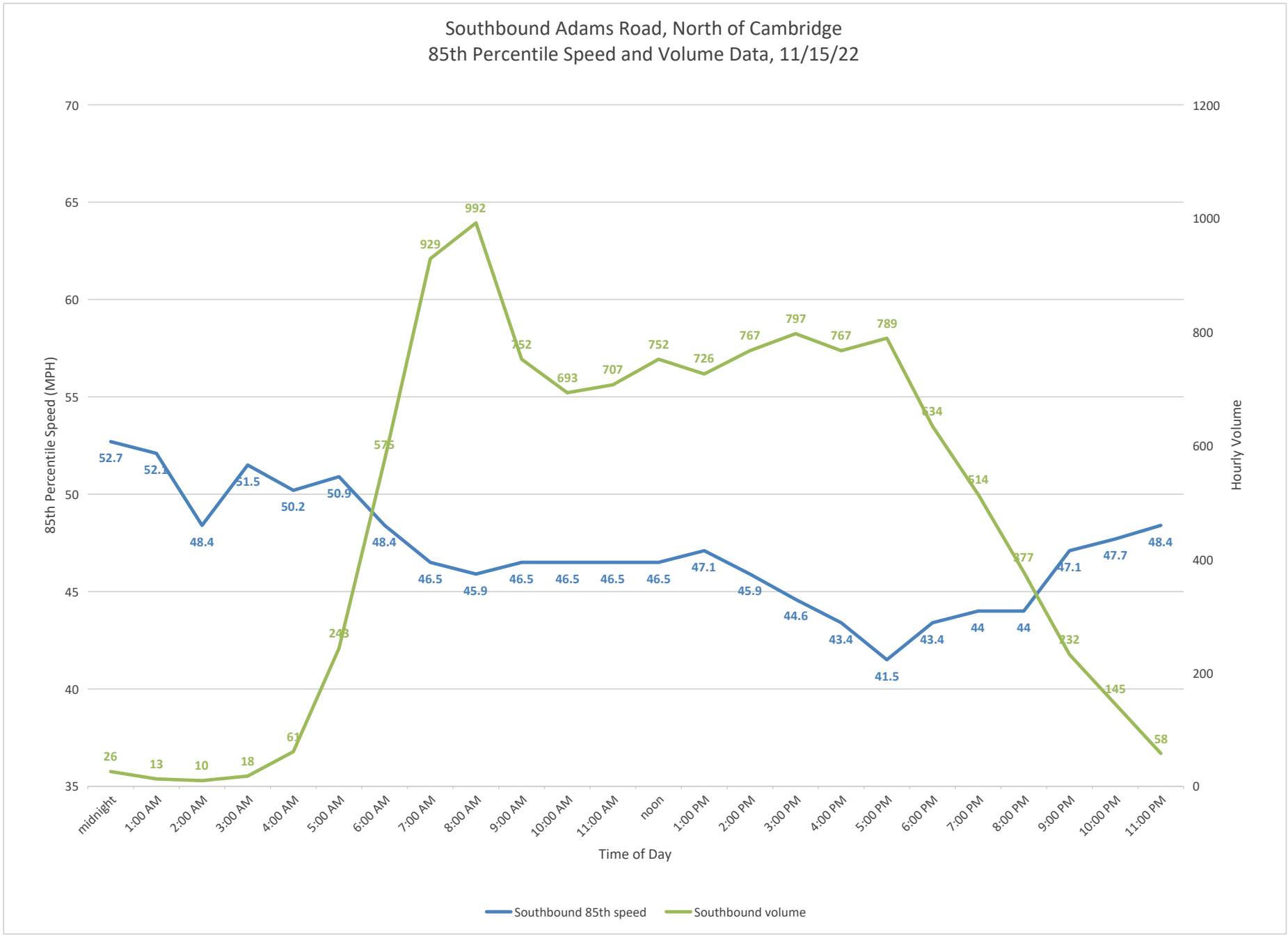
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
50.2
48.4
46.5
48.4
47.7
48.4
47.1
45.3
44
43.4
44
44
43.4
43.4
43.4
42.8
41.5
37.2
39
40.3
42.2
45.3
44.6
45.3
39
23
13
18
20
90
245
551
599
613
579
719
790
714
827
949
1010
807
552
428
260
166
108
Northbound 85th speed
Northbound volume


Southbound Adams Road, North of Cambridge
85th Percentile Speed and Volume Data, 11/15/22
85th Percentile Speed (MPH)
Hourly Volume
Time of Day
70
65
60
55
50
45
40
35
1200
1000
800
600
400
200
0
midnight
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
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11:00 AM
noon
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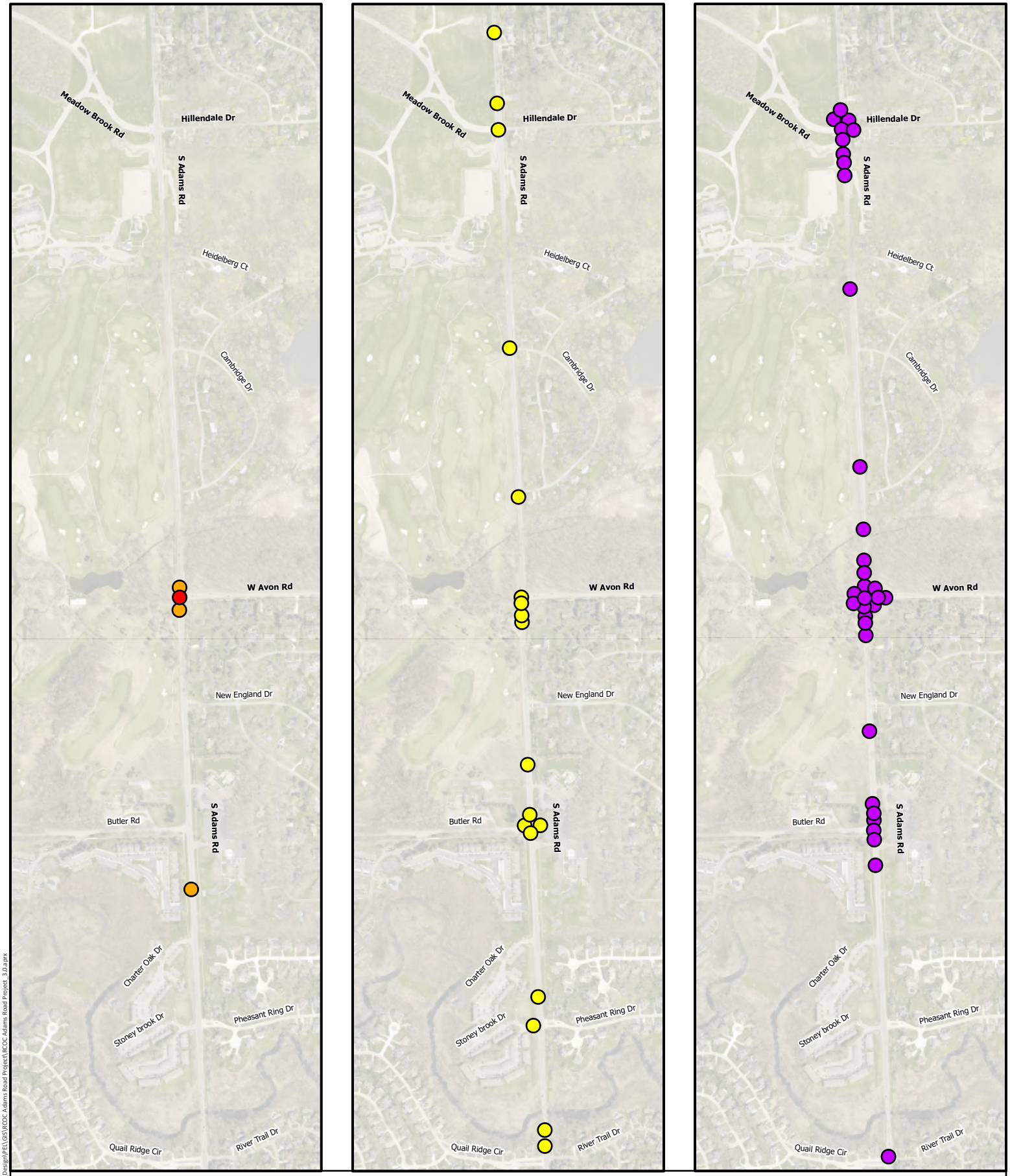
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
52.7
52.1
48.4
51.5
50.2
50.9
48.4
46.5
45.9
46.5
46.5
46.5
46.5
47.1
45.9
44.6
43.4
41.5
43.4
44
44
47.1
47.7
48.4
26
13
10
18
61
243
575
929
992
752
693
707
752
726
767
797
767
789
534
514
377
232
145
58
Southbound 85th speed
Southbound volume

APPENDIX D — CRASH MAPS



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2016-2022 CRASH SEVERITY MAP
S Adams Rd - N. of W Hamlin Rd to S. of Walton Blvd

Adams Road Corridor PEL Study

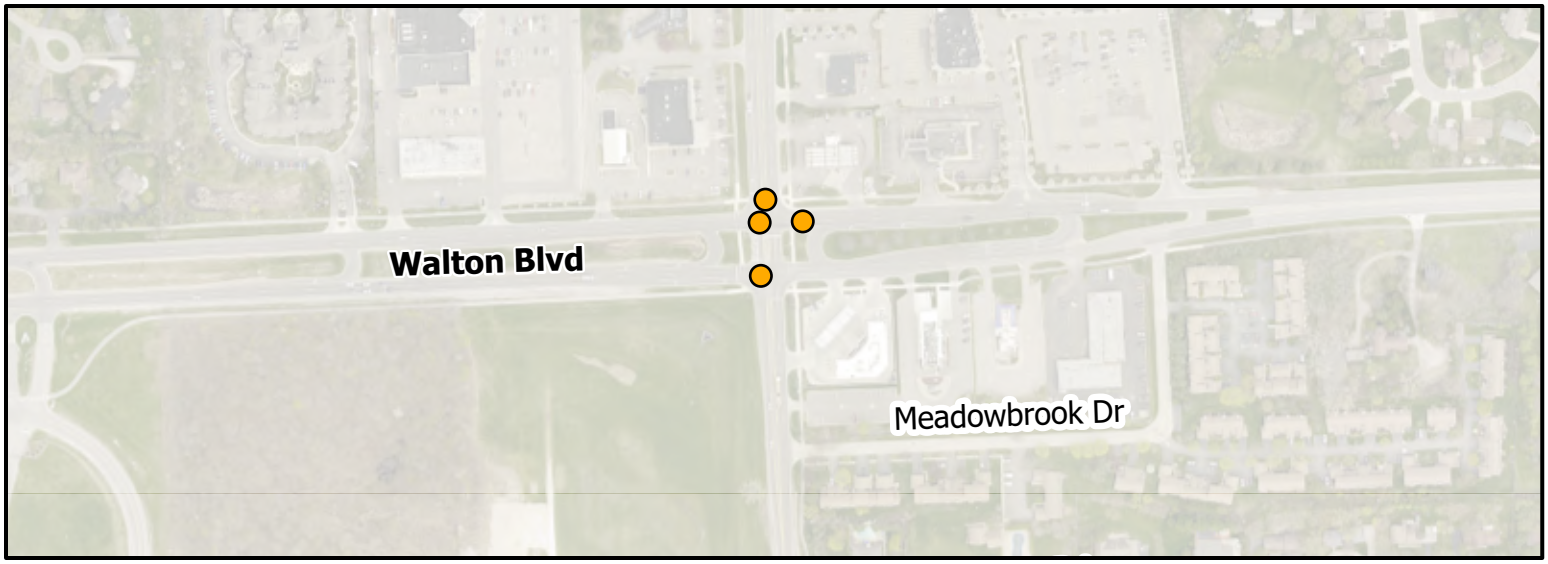
DATE: 3/30/2023

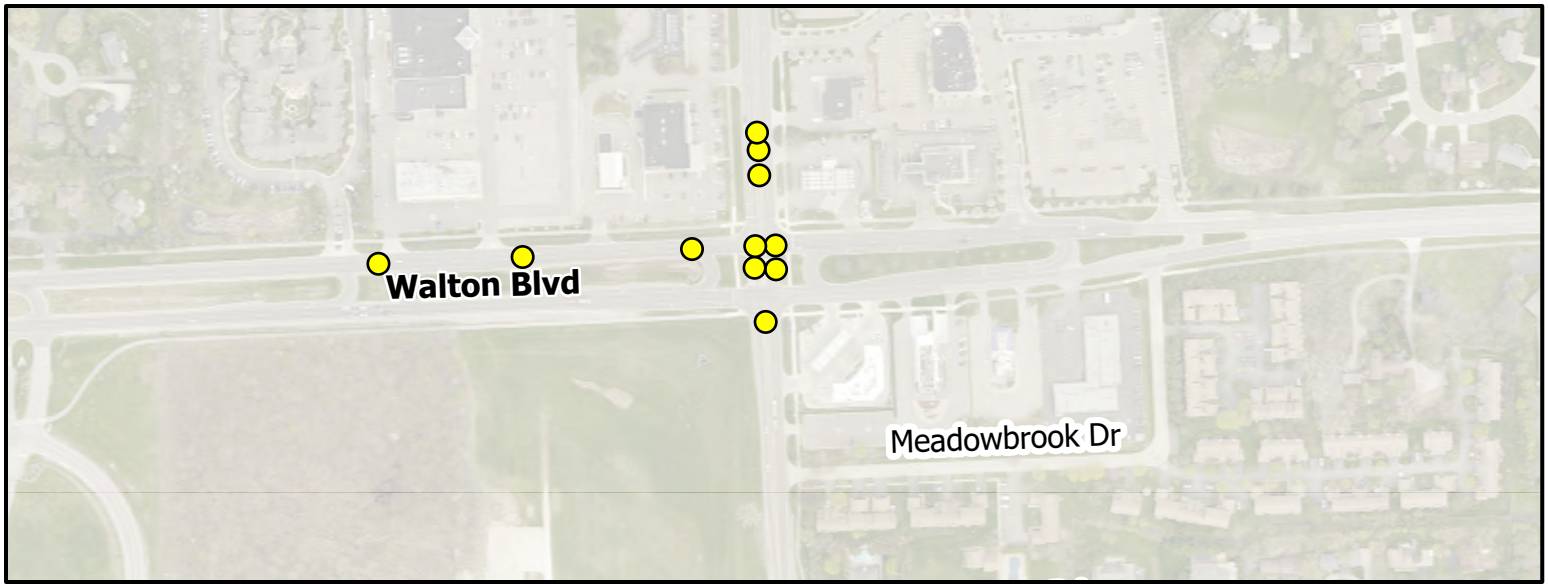
- Fatal
- Injury Level A
- Injury Level B
- Injury Level C

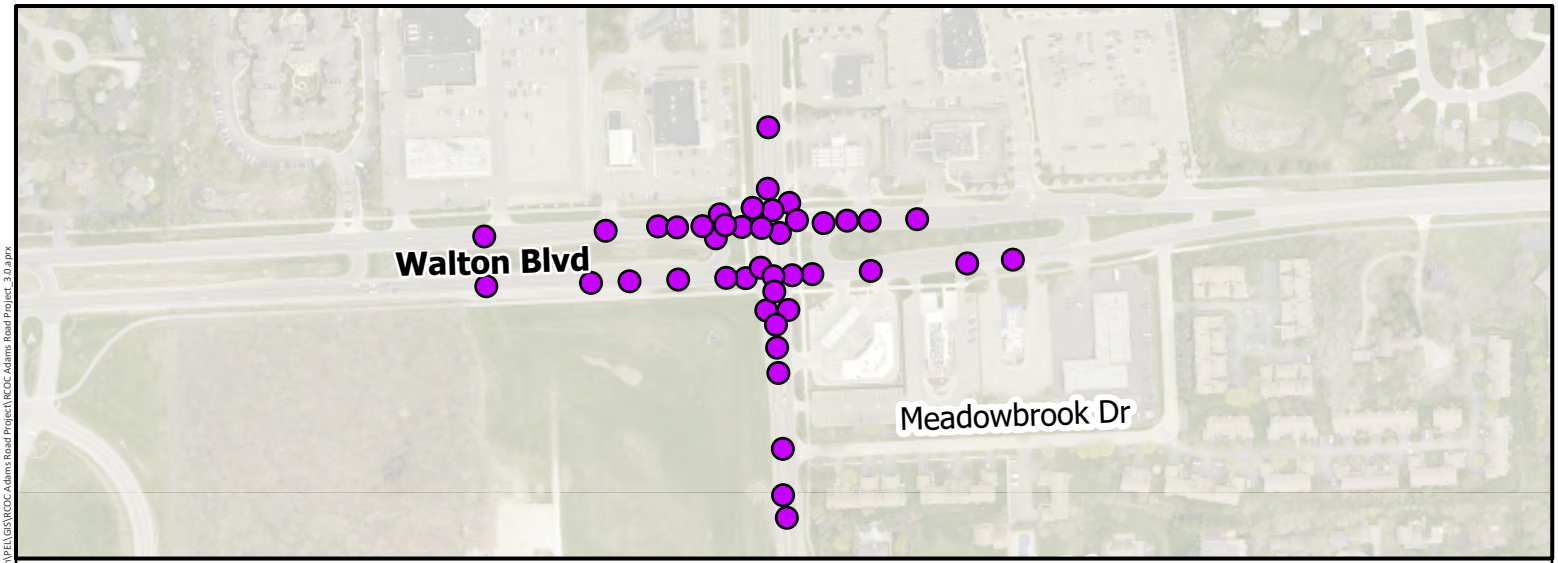
N

0 500 1,000
Feet

\\hrc-engr\hrc\ProjDocs\201800\201800065\04_Design\PEL\GIS\RCOC Adams Road Project\RCOC Adams Road Project_3_0.aprx







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2016-2022 CRASH SEVERITY MAP
S Adams Rd and Walton Blvd

Adams Road Corridor PEL Study

DATE: 3/30/2023

- Fatal
- Injury Level A
- Injury Level B
- Injury Level C

N

0 200 400
Feet

\\hrc-engr\hrc\ProjDocs\201800\201800065\04_Design\PEL\GIS\RCOC Adams Road Project\ RCOC Adams Road Project_3.0.aprx

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ROCHESTER HILLS MICHIGAN

HRC
HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915

2016-2022 DEER VEHICLE CRASH MAP
S Adams Rd - W Avon Rd to Walton Blvd

Adams Road Corridor PEL Study

DATE: 3/30/2023

☆ Deer Vehicle Crash

N

0 250 500
Feet

\\hrc-engr\hrc\ProjDocs\201800\201800065\04_Design\PEL\GIS\RCOC Adams Road Project\RCOC Adams Road Project_3_0.aprx

ROAD COMMISSION for OAKLAND COUNTY
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ROCHESTER HILLS MICHIGAN

HRC
HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915

2016-2022 DEER VEHICLE CRASH MAP
S Adams Rd - W Hamlin Rd to W Avon Rd

Adams Road Corridor PEL Study

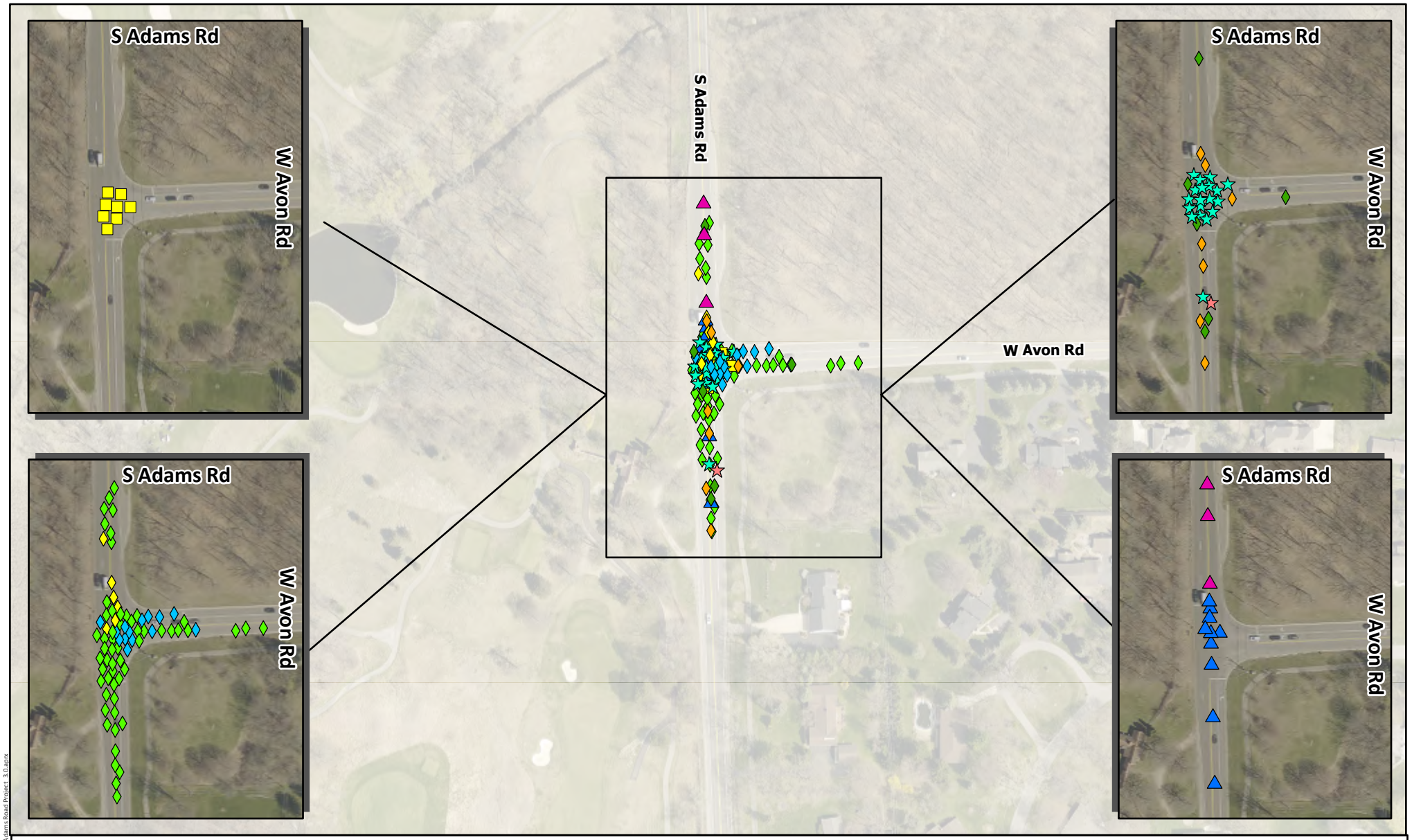
DATE: 3/30/2023

☆ Deer Vehicle Crash

N

0 250 500
Feet

\\hrc-engr\hrc\ProjDocs\2018\00\201800650\04. Design\PEL\GIS\RCOC Adams Road Project\RCOC Adams Road Project_3.0.aprx



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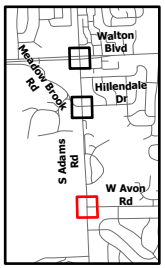
QUALITY LIFE THROUGH GOOD ROADS - WE CARE

OAKLAND UNIVERSITY

ROCHESTER HILLS MICHIGAN
innovative by nature

HRC
HUBBELL, ROTH & CLARK, INC
CONSULTING ENGINEERS SINCE 1915



N

0 100 200
Feet

2016-2022 INTERSECTION CRASH MAP
S Adams Rd at W Avon Rd

Adams Road Corridor PEL Study

DATE: 3/30/2023

Crash Type

- Angle
- Backing
- Head On - Left Turn
- Head On
- Rear End
- Rear End - Left Turn
- Rear End - Right Turn
- Sideswipe - Opposite Direction
- Sideswipe - Same Direction
- Single Motor Vehicle
- Single - Non-Motorized
- Single - Animal
- Other

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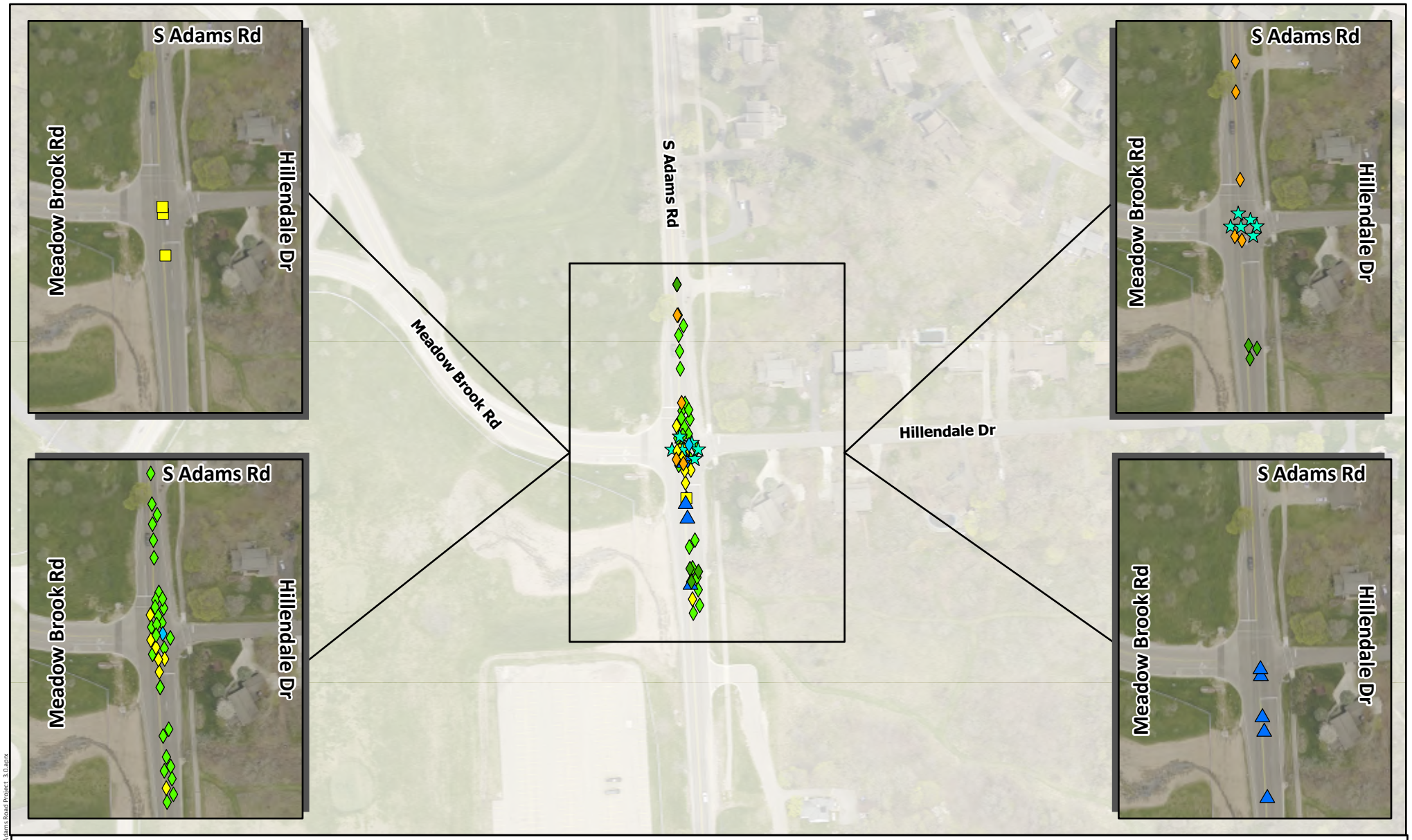

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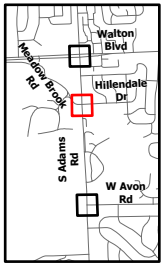

N

0 100 200
Feet

2016-2022 INTERSECTION CRASH MAP
S Adams Rd at Hillendale Dr/Meadow Brook Rd

Adams Road Corridor PEL Study

DATE: 3/30/2023

Crash Type

- Angle
- Backing
- Head On - Left Turn
- Head On
- Rear End
- Rear End - Left Turn
- Rear End - Right Turn
- Sideswipe - Opposite Direction
- Sideswipe - Same Direction
- Single Motor Vehicle
- Single - Non-Motorized
- Single - Animal
- Other

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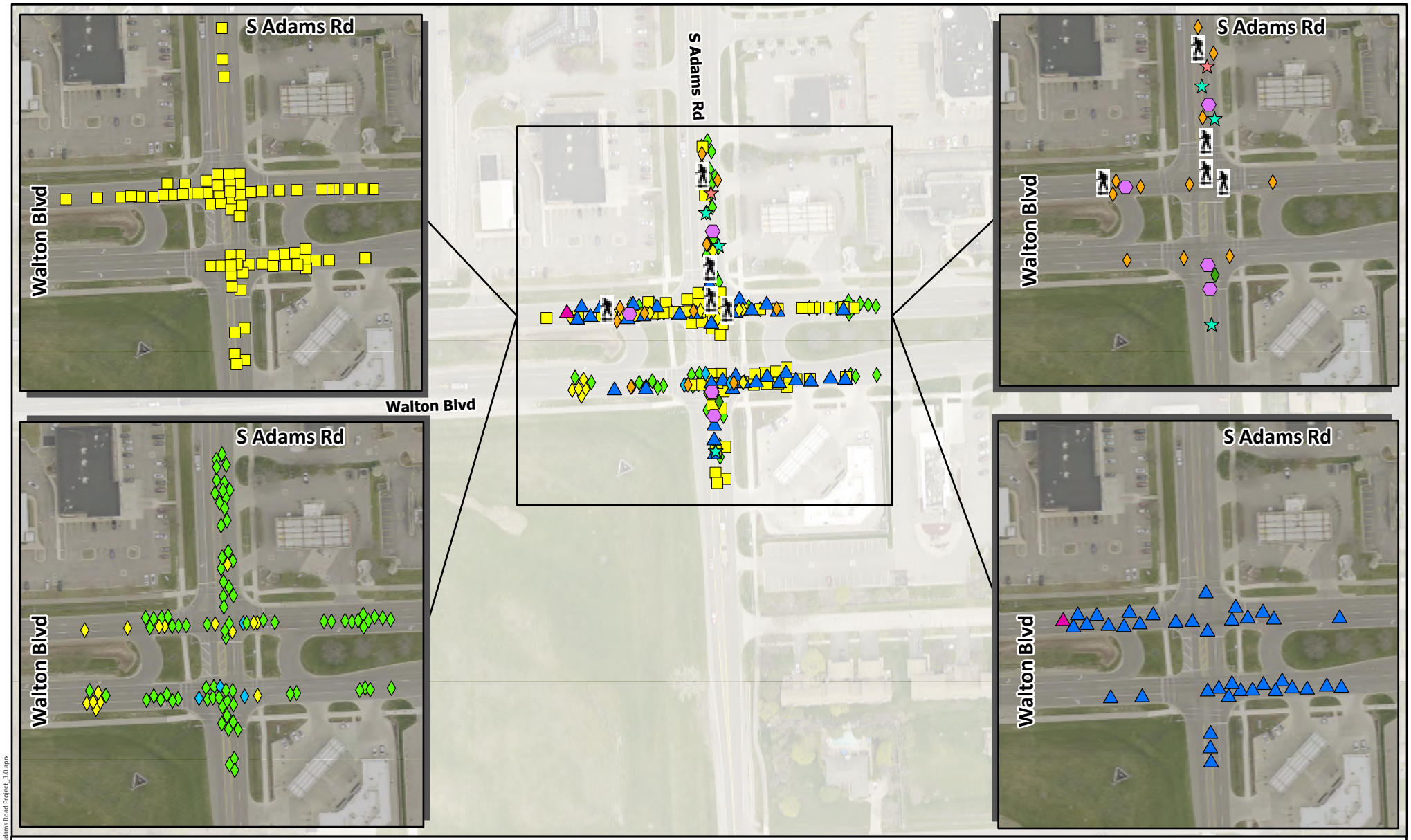

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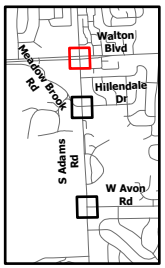

N

0 100 200
Feet

2016-2022 INTERSECTION CRASH MAP
S Adams Rd at Walton Blvd

Adams Road Corridor PEL Study

DATE: 3/30/2023

Crash Type

- Angle
- Backing
- Head On - Left Turn
- Head On
- Rear End
- Rear End - Left Turn
- Rear End - Right Turn
- Sideswipe - Opposite Direction
- Sideswipe - Same Direction
- Single Motor Vehicle
- Single - Non-Motorized
- Single - Animal
- Other

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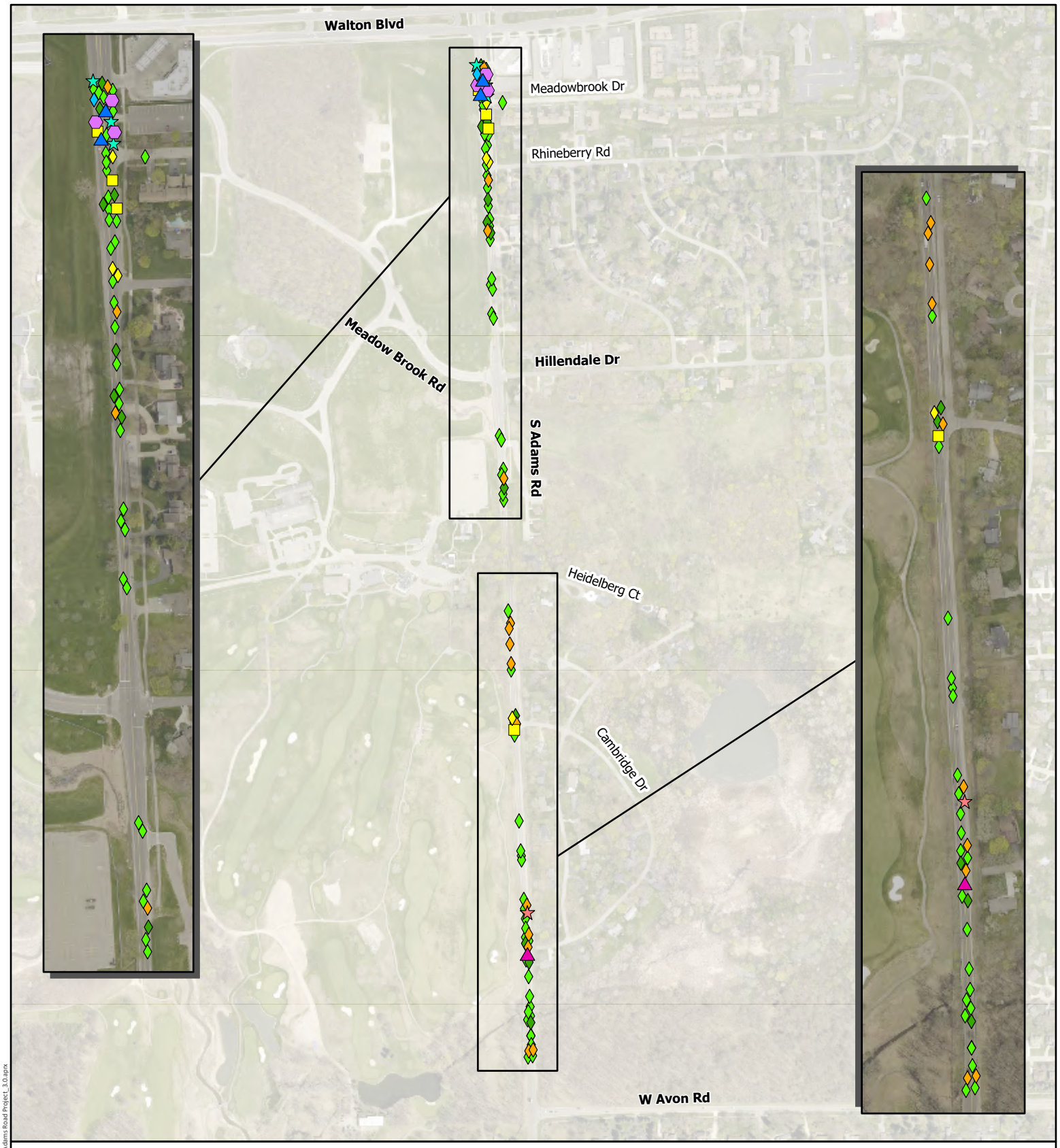

Crash Type

- Angle
- Backing
- Head On
- Head On - Left Turn
- Rear End
- Rear End - Left Turn
- Rear End - Right Turn
- Sideswipe - Opposite Direction
- Sideswipe - Same Direction
- Single Motor Vehicle
- Single - Animal
- Other

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2016-2022 SEGMENT CRASH MAP
S Adams Rd - W Hamlin Rd to W Avon Rd

Adams Road Corridor PEL Study

DATE: 3/30/2023

N

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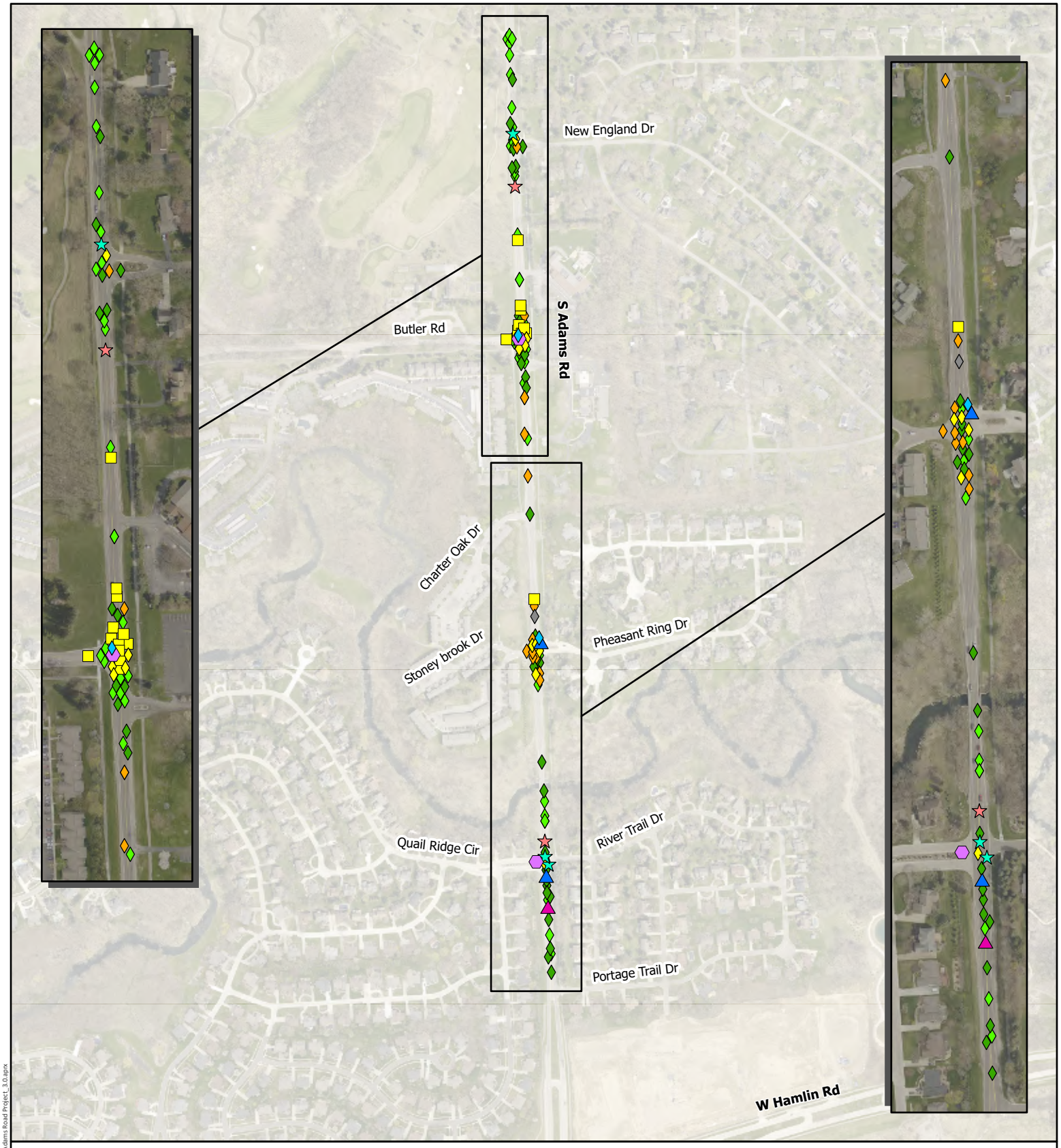

2016-2022 SEGMENT CRASH MAP
S Adams Rd - W Hamlin Rd to W Avon Rd

Adams Road Corridor PEL Study

DATE: 3/30/2023

N

Crash Type

- Angle
- Backing
- Head On
- Head On - Left Turn
- Rear End
- Rear End - Left Turn
- Rear End - Right Turn
- Sideswipe - Opposite Direction
- Sideswipe - Same Direction
- Single Motor Vehicle
- Single - Animal
- Other

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APPENDIX E — HSM REPORTS

Worksheet 1A -- General Information and Input Data for Urban and Suburban Roadway Segments

#	Roadway	Roadway Section	Jurisdiction	Roadway type (2U55E, 2U55L, 3T, 4U, 5T, 4D, 6D, 8D, 2O, 3O, 4O)	Length of segment, L (miles)	AADT (vehicles/day)	Commercial Vehicle Proportion	Type of on-street parking (none/parallel/angle)	Proportion of curb length with on-street parking	Median width (feet) - for divided only	Lighting (present / not present)	Auto speed enforcement (present / not present)	Commercial driveways (number)	Industrial driveways (number)	Residential driveways (number)	Other driveways (number)	Lane Width (feet)	Left Shoulder Width (feet)	Right Shoulder Width (feet)	County	Roadside fixed object density (fixed objects / mi)	Offset to roadside fixed objects (feet)	Additional CMF - 1	Additional CMF - 2	Additional CMF - 3	Additional CMF - Numeric
Existing	Adams Rd	Hamlin to Walton	Rochester Hills	2U55L	2.1	22,646	1%	None	0%	0	NP	NP	2	0	11	4	12	4	4	Oakland	50	20	N/A (1.000)	N/A (1.000)	N/A (1.000)	
Proposed - No Build	Adams Rd	Hamlin to Walton	Rochester Hills	2U55L	2.1	25,399	1%	None	0%	0	NP	NP	2	0	11	4	12	4	4	Oakland	50	20	N/A (1.000)	N/A (1.000)	N/A (1.000)	
Proposed - 3 Lane	Adams Rd	Hamlin to Walton	Rochester Hills	3T	2.1	25,399	1%	None	0%	0	P	NP	2	0	11	4	12	0	0	Oakland	50	40	N/A (1.000)	Improve pavement friction (0.799)	Upgrade signs with both Clearview font and fluorescent sheeting (0.704)	0.800
Proposed - Roundabouts	Adams Rd	Hamlin to Walton	Rochester Hills	3T	2.1	25,399	1%	None	0%	0	P	NP	2	0	11	4	12	0	0	Oakland	50	40	N/A (1.000)	Improve pavement friction (0.799)	Upgrade signs with both Clearview font and fluorescent sheeting (0.704)	0.800
Proposed - 5 Lane	Adams Rd	Hamlin to Walton	Rochester Hills	5T	2.1	25,399	1%	None	0%	0	P	NP	2	0	11	4	12	0	0	Oakland	50	35	N/A (1.000)	Improve pavement friction (0.799)	Upgrade signs with both Clearview font and fluorescent sheeting (0.704)	0.800
Proposed- Boulevard	Adams Rd	Hamlin to Walton	Rochester Hills	4D	2.1	25,399	1%	None	0%	64	P	NP	2	0	11	4	12	0	0	Oakland	50	27	N/A (1.000)	Improve pavement friction (0.799)	Upgrade signs with both Clearview font and fluorescent sheeting (0.704)	0.800

Worksheet 1L -- Summary Results for Urban and Suburban Roadway Segments

#	Property Damage Only (PDO)			Fatal and Injury (FI)			Total		
	Predicted average crash frequency $N_{predicted\ rs}$ (crashes/year)	Roadway segment length, L (miles)	Crash rate (crashes/mile/year)	Predicted average crash frequency $N_{predicted\ rs}$ (crashes/year)	Roadway segment length, L (miles)	Crash rate (crashes/mile/year)	Predicted average crash frequency $N_{predicted\ rs}$ (crashes/year)	Roadway segment length, L (miles)	Crash rate (crashes/mile/year)
Existing	9.86	2.10	4.70	1.88	2.10	0.90	11.74	2.10	5.59
Proposed - No Build	10.81	2.10	5.15	2.16	2.10	1.03	12.97	2.10	6.18
Proposed - 3 Lane	5.17	2.10	2.46	0.92	2.10	0.44	6.09	2.10	2.90
Proposed - Roundabouts	5.17	2.10	2.46	0.92	2.10	0.44	6.09	2.10	2.90
Proposed - 5 Lane	4.57	2.10	2.18	1.15	2.10	0.55	5.72	2.10	2.72
Proposed- Boulevard	2.83	2.10	1.35	1.11	2.10	0.53	3.94	2.10	1.88

	Intersection Information																				Predicted Crashes, All Types and Severities (crashes/year)		
#	Major Roadway	Minor Roadway	Jurisdiction	Intersection Type	Major Road Flow Type	Minor Road Flow Type	Major AADT	Minor AADT	Major Road Median Presence	Minor Road Median Presence	Total Major Road Through Lanes (Both Directions	Total Minor Road Through Lanes (Both Directions	Major Road Speed Limit	Right Turn on Red Status	Lighting Presence	Major Street Left Turn Lane on all approaches	County	Additional CMF - 1	Additional CMF - 2	Additional CMF - 3	Additional CMF - Numeric	Predicted All Crash types and severities	Predicted All Crash types F-I	Predicted All Crash types PDO
Existing	Adams Rd	Butler Rd	Rochester Hills	3ST	Two-Way	Two-Way	20,549	1,421	Not Present	Not Present	2	2	45	NA	Present	Not Present	Oakland	N/A (1.000)	N/A (1.000)	N/A (1.000)		0.53	0.13	0.40
No Build	Adams Rd	Butler Rd	Rochester Hills	3ST	Two-Way	Two-Way	23,047	1,594	Not Present	Not Present	2	2	45	Permitted	Present	Not Present	Oakland	N/A (1.000)	N/A (1.000)	N/A (1.000)		0.65	0.15	0.49
3 lane	Adams Rd	Butler Rd	Rochester Hills	3SG	Two-Way	Two-Way	23,047	1,594	Not Present	Not Present	2	2	45	Permitted	Present	Present	Oakland	Improve pavement friction (3SG) (0.667)	Add 3" Retroreflective Backplates (0.850)	Upgrade pedestrian signals to include countdown timer (0.946)	0.800	0.89	0.23	0.67
Roundabouts	Adams Rd	Butler Rd	Rochester Hills	3ST	Two-Way	Two-Way	23,047	1,594	Present	Present	2	2	45	NA	Present	Present	Oakland	Improve pavement friction (3ST) (0.819)	Stop Control to Roundabout (0.560)	N/A (1.000)		0.13	0.03	0.11
5 lane	Adams Rd	Butler Rd	Rochester Hills	3SG	Two-Way	Two-Way	23,047	1,594	Not Present	Not Present	4	2	45	Permitted	Present	Present	Oakland	Improve pavement friction (3SG) (0.667)	Add 3" Retroreflective Backplates (0.850)	Upgrade pedestrian signals to include countdown timer (0.946)	0.800	0.99	0.26	0.73
Boulevard	Adams Rd	Butler Rd	Rochester Hills	3SG	Two-Way	Two-Way	23,047	1,594	Present	Not Present	4	2	45	Permitted	Present	Not Present	Oakland	Improve pavement friction (3SG) (0.667)	Add 3" Retroreflective Backplates (0.850)	Upgrade pedestrian signals to include countdown timer (0.946)	0.800	0.84	0.20	0.64

	Intersection Information																				Predicted Crashes, All Types and Severities (crashes/year)		
#	Major Roadway	Minor Roadway	Jurisdiction	Intersection Type	Major Road Flow Type	Minor Road Flow Type	Major AADT	Minor AADT	Major Road Median Presence	Minor Road Median Presence	Total Major Road Through Lanes (Both Directions	Total Minor Road Through Lanes (Both Directions	Major Road Speed Limit	Right Turn on Red Status	Lighting Presence	Major Street Left Turn Lane on all approaches	County	Additional CMF - 1	Additional CMF - 2	Additional CMF - 3	Additional CMF - Numeric	Predicted All Crash types and severities	Predicted All Crash types F-I	Predicted All Crash types PDO
Existing	Adams Rd	Avon Rd	Rochester Hills	3SG	Two-Way	Two-Way	21,529	7,261	Not Present	Not Present	2	2	45	Permitted	Present	Not Present	Oakland	N/A (1.000)	N/A (1.000)	N/A (1.000)		3.09	0.73	2.36
No Build	Adams Rd	Avon Rd	Rochester Hills	3SG	Two-Way	Two-Way	24,146	8,144	Not Present	Not Present	2	2	45	Permitted	Present	Not Present	Oakland	N/A (1.000)	N/A (1.000)	N/A (1.000)		3.51	0.82	2.69
3 lane	Adams Rd	Avon Rd	Rochester Hills	3SG	Two-Way	Two-Way	24,146	8,144	Not Present	Not Present	2	2	45	Permitted	Present	Present	Oakland	Improve pavement friction (3SG) (0.667)	Add 3" Retroreflective Backplates (0.850)	Upgrade pedestrian signals to include countdown timer (0.946)	0.900	1.54	0.37	1.17
Roundabouts	Adams Rd	Avon Rd	Rochester Hills	3SG	Two-Way	Two-Way	24,146	8,144	Present	Present	2	2	45	NA	Present	Present	Oakland	Improve pavement friction (3SG) (0.667)	Signalized Int. to Roundabout (0.520)	N/A (1.000)		0.60	0.14	0.46
5 lane	Adams Rd	Avon Rd	Rochester Hills	3SG	Two-Way	Two-Way	24,146	8,144	Not Present	Not Present	4	2	45	Permitted	Present	Present	Oakland	Improve pavement friction (3SG) (0.667)	Add 3" Retroreflective Backplates (0.850)	Upgrade pedestrian signals to include countdown timer (0.946)	0.900	1.68	0.41	1.27
Boulevard	Adams Rd	Avon Rd	Rochester Hills	3SG	Two-Way	Two-Way	24,146	8,144	Present	Not Present	4	2	45	Permitted	Present	Not Present	Oakland	Improve pavement friction (3SG) (0.667)	Add 3" Retroreflective Backplates (0.850)	Upgrade pedestrian signals to include countdown timer (0.946)	0.900	1.42	0.31	1.11

	Intersection Information																				Predicted Crashes, All Types and Severities (crashes/year)		
#	Major Roadway	Minor Roadway	Jurisdiction	Intersection Type	Major Road Flow Type	Minor Road Flow Type	Major AADT	Minor AADT	Major Road Median Presence	Minor Road Median Presence	Total Major Road Through Lanes (Both Directions	Total Minor Road Through Lanes (Both Directions	Major Road Speed Limit	Right Turn on Red Status	Lighting Presence	Major Street Left Turn Lane on all approaches	County	Additional CMF - 1	Additional CMF - 2	Additional CMF - 3	Additional CMF - Numeric	Predicted All Crash types and severities	Predicted All Crash types F-I	Predicted All Crash types PDO
Existing	Adams Rd	Meadowbrook Rd	Rochester Hills	4SG	Two-Way	Two-Way	22,556	1,676	Not Present	Not Present	2	2	45	Permitted	Present	Not Present	Oakland	N/A (1.000)	N/A (1.000)	N/A (1.000)		2.95	0.82	2.13
No Build	Adams Rd	Meadowbrook Rd	Rochester Hills	4SG	Two-Way	Two-Way	25,298	1,880	Not Present	Not Present	2	2	45	Permitted	Present	Not Present	Oakland	N/A (1.000)	N/A (1.000)	N/A (1.000)		3.38	0.92	2.46
3 lane	Adams Rd	Meadowbrook Rd	Rochester Hills	4SG	Two-Way	Two-Way	25,298	1,880	Not Present	Not Present	2	2	45	Permitted	Present	Present	Oakland	Improve pavement friction (4SG) (0.797)	Add 3" Retroreflective Backplates (0.850)	Upgrade pedestrian signals to include countdown timer (0.946)	0.900	1.95	0.53	1.42
Roundabouts	Adams Rd	Meadowbrook Rd	Rochester Hills	4SG	Two-Way	Two-Way	25,298	1,880	Present	Present	4	2	45	NA	Present	Present	Oakland	Improve pavement friction (4SG) (0.797)	Signalized Int. to Roundabout (0.520)	N/A (1.000)		0.84	0.22	0.62
5 lane	Adams Rd	Meadowbrook Rd	Rochester Hills	4SG	Two-Way	Two-Way	25,298	1,880	Not Present	Not Present	4	2	45	Permitted	Present	Present	Oakland	Improve pavement friction (4SG) (0.797)	Add 3" Retroreflective Backplates (0.850)	Upgrade pedestrian signals to include countdown timer (0.946)	0.900	2.17	0.60	1.56
Boulevard	Adams Rd	Meadowbrook Rd	Rochester Hills	4SG	Two-Way	Two-Way	25,298	1,880	Present	Not Present	4	2	45	Permitted	Present	Not Present	Oakland	Improve pavement friction (3SG) (0.667)	Add 3" Retroreflective Backplates (0.850)	Upgrade pedestrian signals to include countdown timer (0.946)	0.900	1.39	0.36	1.03

APPENDIX F — SYNCHRO REPORTS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	271	115	0	414	0	0	0	0
Future Volume (vph)	0	0	0	0	271	115	0	414	0	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					10.1	10.1		5.8				
Lane Util. Factor					0.95	1.00		0.95				
Frt					1.00	0.85		1.00				
Flt Protected					1.00	1.00		1.00				
Satd. Flow (prot)					3762	1683		3762				
Flt Permitted					1.00	1.00		1.00				
Satd. Flow (perm)					3762	1683		3762				
Peak-hour factor, PHF	0.92	0.92	0.92	0.86	0.86	0.86	0.87	0.87	0.87	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	315	134	0	476	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	78	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	315	56	0	476	0	0	0	0
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	1%	1%	1%	2%	2%	2%
Turn Type					NA	Perm		NA				
Protected Phases					2			8				
Permitted Phases						2						
Actuated Green, G (s)					49.9	49.9		54.2				
Effective Green, g (s)					49.9	49.9		54.2				
Actuated g/C Ratio					0.42	0.42		0.45				
Clearance Time (s)					10.1	10.1		5.8				
Vehicle Extension (s)					3.0	3.0		3.0				
Lane Grp Cap (vph)					1564	699		1699				
v/s Ratio Prot					c0.08			c0.13				
v/s Ratio Perm						0.03						
v/c Ratio					0.20	0.08		0.28				
Uniform Delay, d1					22.3	21.2		20.7				
Progression Factor					0.98	1.33		0.00				
Incremental Delay, d2					0.3	0.2		0.4				
Delay (s)					22.2	28.3		0.4				
Level of Service					C	C		A				
Approach Delay (s/veh)		0.0			24.0			0.4			0.0	
Approach LOS		A			C			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	11.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.25		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	49.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	168	0	0	0	0	0	414	93	0	0	0
Future Volume (vph)	0	168	0	0	0	0	0	414	93	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.1						9.8	9.8			
Lane Util. Factor		0.95						0.95	1.00			
Frt		1.00						1.00	0.85			
Flt Protected		1.00						1.00	1.00			
Satd. Flow (prot)		3800						3762	1683			
Flt Permitted		1.00						1.00	1.00			
Satd. Flow (perm)		3800						3762	1683			
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.87	0.87	0.87	0.92	0.92	0.92
Adj. Flow (vph)	0	187	0	0	0	0	0	476	107	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	62	0	0	0
Lane Group Flow (vph)	0	187	0	0	0	0	0	476	45	0	0	0
Heavy Vehicles (%)	0%	0%	0%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Turn Type		NA						NA	Perm			
Protected Phases		6						4				
Permitted Phases									4			
Actuated Green, G (s)		53.9						50.2	50.2			
Effective Green, g (s)		53.9						50.2	50.2			
Actuated g/C Ratio		0.45						0.42	0.42			
Clearance Time (s)		6.1						9.8	9.8			
Vehicle Extension (s)		3.0						3.0	3.0			
Lane Grp Cap (vph)		1706						1573	704			
v/s Ratio Prot		c0.05						c0.13				
v/s Ratio Perm									0.03			
v/c Ratio		0.11						0.30	0.06			
Uniform Delay, d1		19.1						23.2	20.9			
Progression Factor		0.00						1.00	1.00			
Incremental Delay, d2		0.1						0.5	0.2			
Delay (s)		0.1						23.7	21.0			
Level of Service		A						C	C			
Approach Delay (s/veh)		0.1			0.0			23.2			0.0	
Approach LOS		A			A			C			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	17.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.21		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	32.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	168	232	0	0	0	0	0	0	0	1050	0
Future Volume (vph)	0	168	232	0	0	0	0	0	0	0	1050	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		10.1	10.1								5.8	
Lane Util. Factor		0.95	1.00								0.95	
Frpb, ped/bikes		1.00	0.99								1.00	
Flpb, ped/bikes		1.00	1.00								1.00	
Frt		1.00	0.85								1.00	
Flt Protected		1.00	1.00								1.00	
Satd. Flow (prot)		3725	1644								3800	
Flt Permitted		1.00	1.00								1.00	
Satd. Flow (perm)		3725	1644								3800	
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.92	0.92	0.92	0.94	0.94	0.94
Adj. Flow (vph)	0	187	258	0	0	0	0	0	0	0	1117	0
RTOR Reduction (vph)	0	0	36	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	187	222	0	0	0	0	0	0	0	1117	0
Confl. Peds. (#/hr)			1									
Heavy Vehicles (%)	0%	2%	2%	2%	2%	2%	2%	2%	2%	0%	0%	0%
Turn Type		NA	Perm								NA	
Protected Phases		2									8	
Permitted Phases			2									
Actuated Green, G (s)		49.9	49.9								54.2	
Effective Green, g (s)		49.9	49.9								54.2	
Actuated g/C Ratio		0.42	0.42								0.45	
Clearance Time (s)		10.1	10.1								5.8	
Vehicle Extension (s)		3.0	3.0								3.0	
Lane Grp Cap (vph)		1548	683								1716	
v/s Ratio Prot		0.05									c0.29	
v/s Ratio Perm			c0.13									
v/c Ratio		0.12	0.32								0.65	
Uniform Delay, d1		21.6	23.7								25.6	
Progression Factor		1.00	1.00								0.00	
Incremental Delay, d2		0.2	1.3								1.4	
Delay (s)		21.7	24.9								1.4	
Level of Service		C	C								A	
Approach Delay (s/veh)		23.6			0.0			0.0			1.4	
Approach LOS		C			A			A			A	

Intersection Summary					
HCM 2000 Control Delay (s/veh)	7.7	HCM 2000 Level of Service		A	
HCM 2000 Volume to Capacity ratio	0.51				
Actuated Cycle Length (s)	120.0	Sum of lost time (s)		19.9	
Intersection Capacity Utilization	58.3%	ICU Level of Service		B	
Analysis Period (min)	15				

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	271	0	0	0	0	0	1050	121
Future Volume (vph)	0	0	0	0	271	0	0	0	0	0	1050	121
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					6.1						9.8	9.8
Lane Util. Factor					0.95						0.95	1.00
Frt					1.00						1.00	0.85
Flt Protected					1.00						1.00	1.00
Satd. Flow (prot)					3800						3800	1700
Flt Permitted					1.00						1.00	1.00
Satd. Flow (perm)					3800						3800	1700
Peak-hour factor, PHF	0.92	0.92	0.92	0.86	0.86	0.86	0.92	0.92	0.92	0.94	0.94	0.94
Adj. Flow (vph)	0	0	0	0	315	0	0	0	0	0	1117	129
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	75
Lane Group Flow (vph)	0	0	0	0	315	0	0	0	0	0	1117	54
Heavy Vehicles (%)	2%	2%	2%	0%	0%	0%	2%	2%	2%	0%	0%	0%
Turn Type					NA						NA	Perm
Protected Phases					6						4	
Permitted Phases												4
Actuated Green, G (s)					53.9						50.2	50.2
Effective Green, g (s)					53.9						50.2	50.2
Actuated g/C Ratio					0.45						0.42	0.42
Clearance Time (s)					6.1						9.8	9.8
Vehicle Extension (s)					3.0						3.0	3.0
Lane Grp Cap (vph)					1706						1589	711
v/s Ratio Prot					c0.08						c0.29	
v/s Ratio Perm												0.03
v/c Ratio					0.18						0.70	0.08
Uniform Delay, d1					19.9						28.8	21.0
Progression Factor					0.00						0.84	0.62
Incremental Delay, d2					0.2						2.3	0.2
Delay (s)					0.2						26.3	13.2
Level of Service					A						C	B
Approach Delay (s/veh)		0.0			0.2			0.0			24.9	
Approach LOS		A			A			A			C	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	19.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	49.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	4	39	26	19	11	135	491	3	7	859	16
Future Volume (vph)	1	4	39	26	19	11	135	491	3	7	859	16
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.0	6.0		6.0		5.8	5.8			5.8	
Lane Util. Factor		1.00	1.00		1.00		1.00	1.00			1.00	
Frt		1.00	0.85		0.97		1.00	1.00			1.00	
Flt Protected		0.99	1.00		0.98		0.95	1.00			1.00	
Satd. Flow (prot)		1983	1700		1903		1881	1978			1994	
Flt Permitted		0.95	1.00		0.85		0.30	1.00			1.00	
Satd. Flow (perm)		1907	1700		1652		586	1978			1987	
Peak-hour factor, PHF	0.73	0.73	0.73	0.64	0.64	0.64	0.95	0.95	0.95	0.87	0.87	0.87
Adj. Flow (vph)	1	5	53	41	30	17	142	517	3	8	987	18
RTOR Reduction (vph)	0	0	48	0	8	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	6	5	0	80	0	142	520	0	0	1013	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	1%	1%	1%	0%	0%	0%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			4			2			2	
Permitted Phases	4		4	4			2			2		
Actuated Green, G (s)		12.1	12.1		12.1		96.1	96.1			96.1	
Effective Green, g (s)		12.1	12.1		12.1		96.1	96.1			96.1	
Actuated g/C Ratio		0.10	0.10		0.10		0.80	0.80			0.80	
Clearance Time (s)		6.0	6.0		6.0		5.8	5.8			5.8	
Vehicle Extension (s)		4.0	4.0		4.0		4.0	4.0			4.0	
Lane Grp Cap (vph)		192	171		166		469	1584			1591	
v/s Ratio Prot								0.26				
v/s Ratio Perm		0.00	0.00		c0.05		0.24				c0.51	
v/c Ratio		0.03	0.03		0.48		0.30	0.33			0.64	
Uniform Delay, d1		48.7	48.7		51.0		3.1	3.2			4.9	
Progression Factor		1.00	1.00		1.00		0.97	0.92			0.79	
Incremental Delay, d2		0.1	0.1		3.0		1.6	0.5			1.0	
Delay (s)		48.8	48.8		54.0		4.6	3.5			4.8	
Level of Service		D	D		D		A	A			A	
Approach Delay (s/veh)		48.8			54.0			3.7			4.8	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	8.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	11.8
Intersection Capacity Utilization	93.2%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	307	280	359	181	278	663
Future Volume (vph)	307	280	359	181	278	663
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Lane Width	12	12	11	11	11	11
Total Lost time (s)	5.7	5.8	5.8	5.7	5.8	5.8
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1881	1683	1933	1643	1837	1933
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1881	1683	1933	1643	1837	1933
Peak-hour factor, PHF	0.88	0.88	0.95	0.95	0.82	0.82
Adj. Flow (vph)	349	318	378	191	339	809
RTOR Reduction (vph)	0	187	0	68	0	0
Lane Group Flow (vph)	349	131	378	123	339	809
Heavy Vehicles (%)	1%	1%	0%	0%	0%	0%
Turn Type	Prot	pm+ov	NA	pm+ov	Prot	NA
Protected Phases	8	5	6	8	5	2
Permitted Phases		8		6		
Actuated Green, G (s)	20.3	49.5	53.2	73.5	29.2	88.2
Effective Green, g (s)	20.3	49.5	53.2	73.5	29.2	88.2
Actuated g/C Ratio	0.17	0.41	0.44	0.61	0.24	0.74
Clearance Time (s)	5.7	5.8	5.8	5.7	5.8	5.8
Vehicle Extension (s)	3.0	3.5	3.0	3.0	3.5	3.0
Lane Grp Cap (vph)	318	775	856	1084	447	1420
v/s Ratio Prot	c0.19	0.04	0.20	0.02	c0.18	c0.42
v/s Ratio Perm		0.04		0.06		
v/c Ratio	1.10	0.17	0.44	0.11	0.76	0.57
Uniform Delay, d1	49.9	22.3	23.1	9.7	42.1	7.2
Progression Factor	1.02	3.02	1.84	7.93	1.13	1.79
Incremental Delay, d2	78.0	0.1	1.6	0.0	6.5	1.4
Delay (s)	128.9	67.3	44.2	76.8	54.0	14.4
Level of Service	F	E	D	E	D	B
Approach Delay (s/veh)	99.5		55.2			26.1
Approach LOS	F		E			C

Intersection Summary			
HCM 2000 Control Delay (s/veh)	53.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	17.3
Intersection Capacity Utilization	63.2%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	681	212	0	0	0	0	321	176	0	664	0
Future Volume (vph)	0	681	212	0	0	0	0	321	176	0	664	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.0	6.0					8.7			5.7	
Lane Util. Factor		0.95	1.00					0.95			1.00	
Frpb, ped/bikes		1.00	0.98					1.00			1.00	
Flpb, ped/bikes		1.00	1.00					1.00			1.00	
Frt		1.00	0.85					0.95			1.00	
Flt Protected		1.00	1.00					1.00			1.00	
Satd. Flow (prot)		3762	1642					3563			2000	
Flt Permitted		1.00	1.00					1.00			1.00	
Satd. Flow (perm)		3762	1642					3563			2000	
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.95	0.95	0.95	0.80	0.80	0.80
Adj. Flow (vph)	0	757	236	0	0	0	0	338	185	0	830	0
RTOR Reduction (vph)	0	0	38	0	0	0	0	61	0	0	0	0
Lane Group Flow (vph)	0	757	198	0	0	0	0	462	0	0	830	0
Confl. Peds. (#/hr)			2									
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	1%	1%	1%	0%	0%	0%
Turn Type		NA	Perm					NA			NA	
Protected Phases		2						4			8	
Permitted Phases			2									
Actuated Green, G (s)		59.0	59.0					46.3			49.3	
Effective Green, g (s)		59.0	59.0					46.3			49.3	
Actuated g/C Ratio		0.49	0.49					0.39			0.41	
Clearance Time (s)		6.0	6.0					8.7			5.7	
Vehicle Extension (s)		3.0	3.0					4.0			4.0	
Lane Grp Cap (vph)		1849	807					1374			821	
v/s Ratio Prot		c0.20						0.13			c0.42	
v/s Ratio Perm			0.12									
v/c Ratio		0.41	0.25					0.34			1.01	
Uniform Delay, d1		19.4	17.6					26.0			35.3	
Progression Factor		0.94	0.92					0.64			0.06	
Incremental Delay, d2		0.7	0.7					0.2			12.3	
Delay (s)		18.8	17.0					16.9			14.5	
Level of Service		B	B					B			B	
Approach Delay (s/veh)		18.4			0.0			16.9			14.5	
Approach LOS		B			A			B			B	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	16.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.7
Intersection Capacity Utilization	67.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	953	97	0	321	0	0	664	131
Future Volume (vph)	0	0	0	0	953	97	0	321	0	0	664	131
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	12	12	12	12	12	12	16	12	12	12	12
Total Lost time (s)					6.0			5.7			8.7	8.7
Lane Util. Factor					0.91			0.95			1.00	1.00
Frpb, ped/bikes					1.00			1.00			1.00	1.00
Flpb, ped/bikes					1.00			1.00			1.00	1.00
Frt					0.99			1.00			1.00	0.85
Flt Protected					1.00			1.00			1.00	1.00
Satd. Flow (prot)					5324			4264			2000	1700
Flt Permitted					1.00			1.00			1.00	1.00
Satd. Flow (perm)					5324			4264			2000	1700
Peak-hour factor, PHF	0.92	0.92	0.92	0.95	0.95	0.95	0.95	0.95	0.95	0.80	0.80	0.80
Adj. Flow (vph)	0	0	0	0	1003	102	0	338	0	0	830	164
RTOR Reduction (vph)	0	0	0	0	10	0	0	0	0	0	0	44
Lane Group Flow (vph)	0	0	0	0	1095	0	0	338	0	0	830	120
Confl. Peds. (#/hr)						2						
Heavy Vehicles (%)	0%	0%	0%	1%	1%	1%	1%	1%	1%	0%	0%	0%
Turn Type					NA			NA			NA	Perm
Protected Phases					2			8			4	
Permitted Phases												4
Actuated Green, G (s)					59.0			49.3			46.3	46.3
Effective Green, g (s)					59.0			49.3			46.3	46.3
Actuated g/C Ratio					0.49			0.41			0.39	0.39
Clearance Time (s)					6.0			5.7			8.7	8.7
Vehicle Extension (s)					3.0			4.0			4.0	4.0
Lane Grp Cap (vph)					2617			1751			771	655
v/s Ratio Prot					c0.21			0.08			c0.42	
v/s Ratio Perm												0.07
v/c Ratio					0.42			0.19			1.08	0.18
Uniform Delay, d1					19.5			22.6			36.9	24.4
Progression Factor					0.98			0.18			0.96	0.86
Incremental Delay, d2					0.5			0.1			54.5	0.2
Delay (s)					19.5			4.1			90.0	21.2
Level of Service					B			A			F	C
Approach Delay (s/veh)		0.0			19.5			4.1			78.7	
Approach LOS		A			B			A			E	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	41.5	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.7
Intersection Capacity Utilization	67.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	192	146	0	577	0	0	0	0
Future Volume (vph)	0	0	0	0	192	146	0	577	0	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					10.1	10.1		5.8				
Lane Util. Factor					0.95	1.00		0.95				
Frt					1.00	0.85		1.00				
Flt Protected					1.00	1.00		1.00				
Satd. Flow (prot)					3762	1683		3762				
Flt Permitted					1.00	1.00		1.00				
Satd. Flow (perm)					3762	1683		3762				
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	209	159	0	627	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	47	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	209	112	0	627	0	0	0	0
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	1%	1%	1%	2%	2%	2%
Turn Type					NA	Perm		NA				
Protected Phases					2			8				
Permitted Phases						2						
Actuated Green, G (s)					39.9	39.9		24.2				
Effective Green, g (s)					39.9	39.9		24.2				
Actuated g/C Ratio					0.50	0.50		0.30				
Clearance Time (s)					10.1	10.1		5.8				
Vehicle Extension (s)					3.0	3.0		3.0				
Lane Grp Cap (vph)					1876	839		1138				
v/s Ratio Prot					0.06			c0.17				
v/s Ratio Perm						c0.07						
v/c Ratio					0.11	0.13		0.55				
Uniform Delay, d1					10.6	10.8		23.4				
Progression Factor					0.88	0.79		0.00				
Incremental Delay, d2					0.1	0.3		1.4				
Delay (s)					9.5	8.8		1.5				
Level of Service					A	A		A				
Approach Delay (s/veh)		0.0			9.2			1.5			0.0	
Approach LOS		A			A			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	4.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.31		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	39.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	242	0	0	0	0	0	577	160	0	0	0
Future Volume (vph)	0	242	0	0	0	0	0	577	160	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.1						9.8	9.8			
Lane Util. Factor		0.95						0.95	1.00			
Frpb, ped/bikes		1.00						1.00	0.99			
Flpb, ped/bikes		1.00						1.00	1.00			
Frt		1.00						1.00	0.85			
Flt Protected		1.00						1.00	1.00			
Satd. Flow (prot)		3762						3762	1661			
Flt Permitted		1.00						1.00	1.00			
Satd. Flow (perm)		3762						3762	1661			
Peak-hour factor, PHF	0.81	0.81	0.81	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	299	0	0	0	0	0	627	174	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	130	0	0	0
Lane Group Flow (vph)	0	299	0	0	0	0	0	627	44	0	0	0
Confl. Peds. (#/hr)									1			
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Turn Type		NA						NA	Perm			
Protected Phases		6						4				
Permitted Phases									4			
Actuated Green, G (s)		43.9						20.2	20.2			
Effective Green, g (s)		43.9						20.2	20.2			
Actuated g/C Ratio		0.55						0.25	0.25			
Clearance Time (s)		6.1						9.8	9.8			
Vehicle Extension (s)		3.0						3.0	3.0			
Lane Grp Cap (vph)		2064						949	419			
v/s Ratio Prot		c0.08						c0.17				
v/s Ratio Perm									0.03			
v/c Ratio		0.14						0.66	0.10			
Uniform Delay, d1		8.8						26.8	23.0			
Progression Factor		0.00						1.00	1.00			
Incremental Delay, d2		0.1						3.6	0.5			
Delay (s)		0.2						30.4	23.5			
Level of Service		A						C	C			
Approach Delay (s/veh)		0.2			0.0			28.9			0.0	
Approach LOS		A			A			C			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	21.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.33		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	37.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	242	358	0	0	0	0	0	0	0	696	0
Future Volume (vph)	0	242	358	0	0	0	0	0	0	0	696	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		10.1	10.1								5.8	
Lane Util. Factor		0.95	1.00								0.95	
Frt		1.00	0.85								1.00	
Flt Protected		1.00	1.00								1.00	
Satd. Flow (prot)		3762	1683								3800	
Flt Permitted		1.00	1.00								1.00	
Satd. Flow (perm)		3762	1683								3800	
Peak-hour factor, PHF	0.81	0.81	0.81	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	299	442	0	0	0	0	0	0	0	757	0
RTOR Reduction (vph)	0	0	47	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	299	395	0	0	0	0	0	0	0	757	0
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	2%	2%	2%	0%	0%	0%
Turn Type		NA	Perm								NA	
Protected Phases		2									8	
Permitted Phases			2									
Actuated Green, G (s)		39.9	39.9								24.2	
Effective Green, g (s)		39.9	39.9								24.2	
Actuated g/C Ratio		0.50	0.50								0.30	
Clearance Time (s)		10.1	10.1								5.8	
Vehicle Extension (s)		3.0	3.0								3.0	
Lane Grp Cap (vph)		1876	839								1149	
v/s Ratio Prot		0.08									c0.20	
v/s Ratio Perm			c0.23									
v/c Ratio		0.16	0.47								0.66	
Uniform Delay, d1		10.9	13.1								24.3	
Progression Factor		1.00	1.00								0.01	
Incremental Delay, d2		0.2	1.9								1.8	
Delay (s)		11.1	15.0								1.9	
Level of Service		B	B								A	
Approach Delay (s/veh)		13.4			0.0			0.0			1.9	
Approach LOS		B			A			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	7.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	52.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	192	0	0	0	0	0	696	117
Future Volume (vph)	0	0	0	0	192	0	0	0	0	0	696	117
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					6.1						9.8	9.8
Lane Util. Factor					0.95						0.95	1.00
Frt					1.00						1.00	0.85
Flt Protected					1.00						1.00	1.00
Satd. Flow (prot)					3762						3800	1700
Flt Permitted					1.00						1.00	1.00
Satd. Flow (perm)					3762						3800	1700
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	209	0	0	0	0	0	757	127
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	95
Lane Group Flow (vph)	0	0	0	0	209	0	0	0	0	0	757	32
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	2%	2%	2%	0%	0%	0%
Turn Type					NA						NA	Perm
Protected Phases					6						4	
Permitted Phases												4
Actuated Green, G (s)					43.9						20.2	20.2
Effective Green, g (s)					43.9						20.2	20.2
Actuated g/C Ratio					0.55						0.25	0.25
Clearance Time (s)					6.1						9.8	9.8
Vehicle Extension (s)					3.0						3.0	3.0
Lane Grp Cap (vph)					2064						959	429
v/s Ratio Prot					c0.06						c0.20	
v/s Ratio Perm												0.02
v/c Ratio					0.10						0.79	0.07
Uniform Delay, d1					8.6						27.9	22.8
Progression Factor					0.00						0.98	0.96
Incremental Delay, d2					0.1						6.4	0.3
Delay (s)					0.1						33.8	22.1
Level of Service					A						C	C
Approach Delay (s/veh)		0.0			0.1			0.0			32.1	
Approach LOS		A			A			A			C	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	26.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	39.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	21	0	79	5	8	13	79	705	11	5	730	10
Future Volume (vph)	21	0	79	5	8	13	79	705	11	5	730	10
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.0	6.0		6.0		5.8	5.8			5.8	
Lane Util. Factor		1.00	1.00		1.00		1.00	1.00			1.00	
Frt		1.00	0.85		0.93		1.00	1.00			1.00	
Flt Protected		0.95	1.00		0.99		0.95	1.00			1.00	
Satd. Flow (prot)		1900	1700		1845		1900	1996			1996	
Flt Permitted		0.73	1.00		0.93		0.37	1.00			1.00	
Satd. Flow (perm)		1458	1700		1729		735	1996			1989	
Peak-hour factor, PHF	0.83	0.83	0.83	0.60	0.60	0.60	0.89	0.89	0.89	0.91	0.91	0.91
Adj. Flow (vph)	25	0	95	8	13	22	89	792	12	5	802	11
RTOR Reduction (vph)	0	0	87	0	20	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	25	8	0	23	0	89	804	0	0	818	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			4			2			2	
Permitted Phases	4		4	4			2			2		
Actuated Green, G (s)		7.0	7.0		7.0		61.2	61.2			61.2	
Effective Green, g (s)		7.0	7.0		7.0		61.2	61.2			61.2	
Actuated g/C Ratio		0.09	0.09		0.09		0.77	0.77			0.77	
Clearance Time (s)		6.0	6.0		6.0		5.8	5.8			5.8	
Vehicle Extension (s)		4.0	4.0		4.0		4.0	4.0			4.0	
Lane Grp Cap (vph)		127	148		151		562	1526			1521	
v/s Ratio Prot								0.40				
v/s Ratio Perm		c0.02	0.00		0.01		0.12				c0.41	
v/c Ratio		0.20	0.06		0.15		0.16	0.53			0.54	
Uniform Delay, d1		33.9	33.5		33.8		2.5	3.7			3.8	
Progression Factor		1.00	1.00		1.00		1.00	0.82			0.77	
Incremental Delay, d2		1.0	0.2		0.6		0.5	1.1			1.1	
Delay (s)		34.9	33.7		34.4		3.0	4.1			4.0	
Level of Service		C	C		C		A	A			A	
Approach Delay (s/veh)		33.9			34.4			4.0			4.0	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	6.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	11.8
Intersection Capacity Utilization	73.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	152	296	481	163	288	525
Future Volume (vph)	152	296	481	163	288	525
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Lane Width	12	12	11	11	11	11
Total Lost time (s)	5.7	5.8	5.8	5.7	5.8	5.8
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1900	1700	1914	1627	1818	1914
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1900	1700	1914	1627	1818	1914
Peak-hour factor, PHF	0.94	0.94	0.86	0.86	0.91	0.91
Adj. Flow (vph)	162	315	559	190	316	577
RTOR Reduction (vph)	0	92	0	68	0	0
Lane Group Flow (vph)	162	223	559	122	316	577
Heavy Vehicles (%)	0%	0%	1%	1%	1%	1%
Turn Type	Prot	pm+ov	NA	pm+ov	Prot	NA
Protected Phases	8	5	6	8	5	2
Permitted Phases		8		6		
Actuated Green, G (s)	12.0	29.2	33.5	45.5	17.2	56.5
Effective Green, g (s)	12.0	29.2	33.5	45.5	17.2	56.5
Actuated g/C Ratio	0.15	0.37	0.42	0.57	0.22	0.71
Clearance Time (s)	5.7	5.8	5.8	5.7	5.8	5.8
Vehicle Extension (s)	3.0	3.5	3.0	3.0	3.5	3.0
Lane Grp Cap (vph)	285	743	801	1041	390	1351
v/s Ratio Prot	c0.09	0.06	c0.29	0.02	c0.17	0.30
v/s Ratio Perm		0.07		0.06		
v/c Ratio	0.57	0.30	0.70	0.12	0.81	0.43
Uniform Delay, d1	31.6	18.1	19.1	8.0	29.8	4.9
Progression Factor	1.30	2.12	1.80	6.37	0.84	1.11
Incremental Delay, d2	2.5	0.3	4.8	0.0	11.1	0.9
Delay (s)	43.7	38.6	39.1	50.8	36.2	6.4
Level of Service	D	D	D	D	D	A
Approach Delay (s/veh)	40.4		42.1			16.9
Approach LOS	D		D			B

Intersection Summary			
HCM 2000 Control Delay (s/veh)	31.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	17.3
Intersection Capacity Utilization	61.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	916	223	0	0	0	0	542	189	0	479	0
Future Volume (vph)	0	916	223	0	0	0	0	542	189	0	479	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.0	6.0					8.7			5.7	
Lane Util. Factor		0.95	1.00					0.95			1.00	
Frpb, ped/bikes		1.00	0.98					1.00			1.00	
Flpb, ped/bikes		1.00	1.00					1.00			1.00	
Frt		1.00	0.85					0.96			1.00	
Flt Protected		1.00	1.00					1.00			1.00	
Satd. Flow (prot)		3800	1663					3653			1980	
Flt Permitted		1.00	1.00					1.00			1.00	
Satd. Flow (perm)		3800	1663					3653			1980	
Peak-hour factor, PHF	0.93	0.93	0.93	0.92	0.92	0.92	0.89	0.89	0.89	0.93	0.93	0.93
Adj. Flow (vph)	0	985	240	0	0	0	0	609	212	0	515	0
RTOR Reduction (vph)	0	0	59	0	0	0	0	43	0	0	0	0
Lane Group Flow (vph)	0	985	181	0	0	0	0	778	0	0	515	0
Confl. Peds. (#/hr)			1									
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	1%	1%
Turn Type		NA	Perm					NA			NA	
Protected Phases		2						4			8	
Permitted Phases			2									
Actuated Green, G (s)		43.0	43.0					22.3			25.3	
Effective Green, g (s)		43.0	43.0					22.3			25.3	
Actuated g/C Ratio		0.54	0.54					0.28			0.32	
Clearance Time (s)		6.0	6.0					8.7			5.7	
Vehicle Extension (s)		3.0	3.0					4.0			4.0	
Lane Grp Cap (vph)		2042	893					1018			626	
v/s Ratio Prot		c0.26						0.21			c0.26	
v/s Ratio Perm			0.11									
v/c Ratio		0.48	0.20					0.76			0.82	
Uniform Delay, d1		11.6	9.6					26.4			25.3	
Progression Factor		1.03	1.11					1.21			0.05	
Incremental Delay, d2		0.8	0.5					3.3			3.4	
Delay (s)		12.7	11.2					35.3			4.7	
Level of Service		B	B					D			A	
Approach Delay (s/veh)		12.4			0.0			35.3			4.7	
Approach LOS		B			A			D			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	18.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	14.7
Intersection Capacity Utilization	60.8%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	1139	174	0	542	0	0	479	159
Future Volume (vph)	0	0	0	0	1139	174	0	542	0	0	479	159
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	12	12	12	12	12	12	16	12	12	12	12
Total Lost time (s)					6.0			5.7			8.7	8.7
Lane Util. Factor					0.91			0.95			1.00	1.00
Frpb, ped/bikes					1.00			1.00			1.00	0.98
Flpb, ped/bikes					1.00			1.00			1.00	1.00
Frt					0.98			1.00			1.00	0.85
Flt Protected					1.00			1.00			1.00	1.00
Satd. Flow (prot)					5342			4307			1980	1652
Flt Permitted					1.00			1.00			1.00	1.00
Satd. Flow (perm)					5342			4307			1980	1652
Peak-hour factor, PHF	0.92	0.92	0.92	0.91	0.91	0.91	0.89	0.89	0.89	0.93	0.93	0.93
Adj. Flow (vph)	0	0	0	0	1252	191	0	609	0	0	515	171
RTOR Reduction (vph)	0	0	0	0	25	0	0	0	0	0	0	35
Lane Group Flow (vph)	0	0	0	0	1418	0	0	609	0	0	515	136
Confl. Peds. (#/hr)						1						4
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	1%	1%
Turn Type					NA			NA			NA	Perm
Protected Phases					2			8			4	
Permitted Phases												4
Actuated Green, G (s)					43.0			25.3			22.3	22.3
Effective Green, g (s)					43.0			25.3			22.3	22.3
Actuated g/C Ratio					0.54			0.32			0.28	0.28
Clearance Time (s)					6.0			5.7			8.7	8.7
Vehicle Extension (s)					3.0			4.0			4.0	4.0
Lane Grp Cap (vph)					2871			1362			551	460
v/s Ratio Prot					c0.27			0.14			c0.26	
v/s Ratio Perm												0.08
v/c Ratio					0.49			0.45			0.93	0.30
Uniform Delay, d1					11.6			21.8			28.1	22.7
Progression Factor					0.96			0.06			0.87	0.75
Incremental Delay, d2					0.6			0.2			22.9	0.5
Delay (s)					11.7			1.5			47.3	17.6
Level of Service					B			A			D	B
Approach Delay (s/veh)		0.0			11.7			1.5			39.9	
Approach LOS		A			B			A			D	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	16.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	14.7
Intersection Capacity Utilization	60.8%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	155	220	0	820	0	0	0	0
Future Volume (vph)	0	0	0	0	155	220	0	820	0	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					10.1	10.1		5.8				
Lane Util. Factor					0.95	1.00		0.95				
Frt					1.00	0.85		1.00				
Flt Protected					1.00	1.00		1.00				
Satd. Flow (prot)					3800	1700		3800				
Flt Permitted					1.00	1.00		1.00				
Satd. Flow (perm)					3800	1700		3800				
Peak-hour factor, PHF	0.92	0.92	0.92	0.85	0.85	0.85	0.95	0.95	0.95	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	182	259	0	863	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	26	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	182	233	0	863	0	0	0	0
Heavy Vehicles (%)	2%	2%	2%	0%	0%	0%	0%	0%	0%	2%	2%	2%
Turn Type					NA	Perm		NA				
Protected Phases					2			8				
Permitted Phases						2						
Actuated Green, G (s)					69.9	69.9		34.2				
Effective Green, g (s)					69.9	69.9		34.2				
Actuated g/C Ratio					0.58	0.58		0.29				
Clearance Time (s)					10.1	10.1		5.8				
Vehicle Extension (s)					3.0	3.0		3.0				
Lane Grp Cap (vph)					2213	990		1083				
v/s Ratio Prot					0.05			c0.23				
v/s Ratio Perm						c0.14						
v/c Ratio					0.08	0.24		0.80				
Uniform Delay, d1					11.0	12.1		39.7				
Progression Factor					1.00	1.03		0.02				
Incremental Delay, d2					0.1	0.6		2.6				
Delay (s)					11.1	13.0		3.5				
Level of Service					B	B		A				
Approach Delay (s/veh)		0.0			12.2			3.5			0.0	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	6.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	47.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	450	0	0	0	0	0	820	178	0	0	0
Future Volume (vph)	0	450	0	0	0	0	0	820	178	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.1						9.8	9.8			
Lane Util. Factor		0.95						0.95	1.00			
Frpb, ped/bikes		1.00						1.00	0.99			
Flpb, ped/bikes		1.00						1.00	1.00			
Frt		1.00						1.00	0.85			
Flt Protected		1.00						1.00	1.00			
Satd. Flow (prot)		3800						3800	1676			
Flt Permitted		1.00						1.00	1.00			
Satd. Flow (perm)		3800						3800	1676			
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.95	0.95	0.95	0.92	0.92	0.92
Adj. Flow (vph)	0	500	0	0	0	0	0	863	187	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	140	0	0	0
Lane Group Flow (vph)	0	500	0	0	0	0	0	863	47	0	0	0
Confl. Peds. (#/hr)									1			
Heavy Vehicles (%)	0%	0%	0%	2%	2%	2%	0%	0%	0%	2%	2%	2%
Turn Type		NA						NA	Perm			
Protected Phases		6						4				
Permitted Phases									4			
Actuated Green, G (s)		73.9						30.2	30.2			
Effective Green, g (s)		73.9						30.2	30.2			
Actuated g/C Ratio		0.62						0.25	0.25			
Clearance Time (s)		6.1						9.8	9.8			
Vehicle Extension (s)		3.0						3.0	3.0			
Lane Grp Cap (vph)		2340						956	421			
v/s Ratio Prot		c0.13						c0.23				
v/s Ratio Perm									0.03			
v/c Ratio		0.21						0.90	0.11			
Uniform Delay, d1		10.2						43.5	34.6			
Progression Factor		0.00						1.00	1.00			
Incremental Delay, d2		0.2						13.4	0.5			
Delay (s)		0.2						56.9	35.1			
Level of Service		A						E	D			
Approach Delay (s/veh)		0.2			0.0			53.0			0.0	
Approach LOS		A			A			D			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	36.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	47.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	450	478	0	0	0	0	0	0	0	650	0
Future Volume (vph)	0	450	478	0	0	0	0	0	0	0	650	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		10.1	10.1								5.8	
Lane Util. Factor		0.95	1.00								0.95	
Frt		1.00	0.85								1.00	
Flt Protected		1.00	1.00								1.00	
Satd. Flow (prot)		3800	1700								3800	
Flt Permitted		1.00	1.00								1.00	
Satd. Flow (perm)		3800	1700								3800	
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.92	0.92	0.92	0.95	0.95	0.95
Adj. Flow (vph)	0	500	531	0	0	0	0	0	0	0	684	0
RTOR Reduction (vph)	0	0	26	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	500	505	0	0	0	0	0	0	0	684	0
Heavy Vehicles (%)	0%	0%	0%	2%	2%	2%	2%	2%	2%	0%	0%	0%
Turn Type		NA	Perm								NA	
Protected Phases		2									8	
Permitted Phases			2									
Actuated Green, G (s)		69.9	69.9								34.2	
Effective Green, g (s)		69.9	69.9								34.2	
Actuated g/C Ratio		0.58	0.58								0.29	
Clearance Time (s)		10.1	10.1								5.8	
Vehicle Extension (s)		3.0	3.0								3.0	
Lane Grp Cap (vph)		2213	990								1083	
v/s Ratio Prot		0.13									c0.18	
v/s Ratio Perm			c0.30									
v/c Ratio		0.23	0.51								0.63	
Uniform Delay, d1		12.0	14.9								37.4	
Progression Factor		1.00	1.00								0.00	
Incremental Delay, d2		0.2	1.9								1.9	
Delay (s)		12.3	16.8								1.9	
Level of Service		B	B								A	
Approach Delay (s/veh)		14.6			0.0			0.0			1.9	
Approach LOS		B			A			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	9.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	58.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	155	0	0	0	0	0	650	57
Future Volume (vph)	0	0	0	0	155	0	0	0	0	0	650	57
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					6.1						9.8	9.8
Lane Util. Factor					0.95						0.95	1.00
Frpb, ped/bikes					1.00						1.00	0.99
Flpb, ped/bikes					1.00						1.00	1.00
Frt					1.00						1.00	0.85
Flt Protected					1.00						1.00	1.00
Satd. Flow (prot)					3800						3800	1676
Flt Permitted					1.00						1.00	1.00
Satd. Flow (perm)					3800						3800	1676
Peak-hour factor, PHF	0.92	0.92	0.92	0.85	0.85	0.85	0.92	0.92	0.92	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	0	182	0	0	0	0	0	684	60
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	45
Lane Group Flow (vph)	0	0	0	0	182	0	0	0	0	0	684	15
Confl. Peds. (#/hr)												1
Heavy Vehicles (%)	2%	2%	2%	0%	0%	0%	2%	2%	2%	0%	0%	0%
Turn Type					NA						NA	Perm
Protected Phases					6						4	
Permitted Phases												4
Actuated Green, G (s)					73.9						30.2	30.2
Effective Green, g (s)					73.9						30.2	30.2
Actuated g/C Ratio					0.62						0.25	0.25
Clearance Time (s)					6.1						9.8	9.8
Vehicle Extension (s)					3.0						3.0	3.0
Lane Grp Cap (vph)					2340						956	421
v/s Ratio Prot					c0.05						c0.18	
v/s Ratio Perm												0.01
v/c Ratio					0.08						0.72	0.04
Uniform Delay, d1					9.3						41.0	33.9
Progression Factor					0.00						0.72	0.53
Incremental Delay, d2					0.1						4.4	0.2
Delay (s)					0.1						33.9	18.2
Level of Service					A						C	B
Approach Delay (s/veh)		0.0			0.1			0.0			32.6	
Approach LOS		A			A			A			C	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	26.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.27		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	47.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	24	10	117	12	6	12	94	981	17	5	672	13
Future Volume (vph)	24	10	117	12	6	12	94	981	17	5	672	13
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.0	6.0		6.0		5.8	5.8			5.8	
Lane Util. Factor		1.00	1.00		1.00		1.00	1.00			1.00	
Frt		1.00	0.85		0.95		1.00	1.00			1.00	
Flt Protected		0.97	1.00		0.98		0.95	1.00			1.00	
Satd. Flow (prot)		1932	1700		1855		1900	1995			1994	
Flt Permitted		0.77	1.00		0.85		0.38	1.00			0.99	
Satd. Flow (perm)		1535	1700		1611		755	1995			1980	
Peak-hour factor, PHF	0.82	0.82	0.82	0.83	0.83	0.83	0.94	0.94	0.94	0.89	0.89	0.89
Adj. Flow (vph)	29	12	143	14	7	14	100	1044	18	6	755	15
RTOR Reduction (vph)	0	0	131	0	13	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	41	12	0	22	0	100	1062	0	0	776	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			4			2			2	
Permitted Phases	4		4	4			2			2		
Actuated Green, G (s)		10.0	10.0		10.0		98.2	98.2			98.2	
Effective Green, g (s)		10.0	10.0		10.0		98.2	98.2			98.2	
Actuated g/C Ratio		0.08	0.08		0.08		0.82	0.82			0.82	
Clearance Time (s)		6.0	6.0		6.0		5.8	5.8			5.8	
Vehicle Extension (s)		4.0	4.0		4.0		4.0	4.0			4.0	
Lane Grp Cap (vph)		127	141		134		617	1632			1620	
v/s Ratio Prot								c0.53				
v/s Ratio Perm		c0.03	0.01		0.01		0.13				0.39	
v/c Ratio		0.32	0.08		0.17		0.16	0.65			0.48	
Uniform Delay, d1		51.8	50.8		51.1		2.3	4.2			3.3	
Progression Factor		1.00	1.00		1.00		0.85	0.59			0.65	
Incremental Delay, d2		2.0	0.4		0.8		0.4	1.5			0.8	
Delay (s)		53.8	51.1		51.9		2.4	4.0			2.9	
Level of Service		D	D		D		A	A			A	
Approach Delay (s/veh)		51.7			51.9			3.8			2.9	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	8.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	11.8
Intersection Capacity Utilization	85.1%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	187	397	686	326	261	536
Future Volume (vph)	187	397	686	326	261	536
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Lane Width	12	12	11	11	11	11
Total Lost time (s)	5.7	5.8	5.8	5.7	5.8	5.8
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1900	1700	1933	1643	1837	1933
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1900	1700	1933	1643	1837	1933
Peak-hour factor, PHF	0.94	0.94	0.93	0.93	0.95	0.95
Adj. Flow (vph)	199	422	738	351	275	564
RTOR Reduction (vph)	0	88	0	45	0	0
Lane Group Flow (vph)	199	334	738	306	275	564
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Turn Type	Prot	pm+ov	NA	pm+ov	Prot	NA
Protected Phases	8	5	6	8	5	2
Permitted Phases		8		6		
Actuated Green, G (s)	18.0	39.2	63.5	81.5	21.2	90.5
Effective Green, g (s)	18.0	39.2	63.5	81.5	21.2	90.5
Actuated g/C Ratio	0.15	0.33	0.53	0.68	0.18	0.75
Clearance Time (s)	5.7	5.8	5.8	5.7	5.8	5.8
Vehicle Extension (s)	3.0	3.5	3.0	3.0	3.5	3.0
Lane Grp Cap (vph)	285	637	1022	1193	324	1457
v/s Ratio Prot	c0.10	0.09	c0.38	0.04	c0.15	0.29
v/s Ratio Perm		0.10		0.15		
v/c Ratio	0.70	0.52	0.72	0.26	0.85	0.39
Uniform Delay, d1	48.4	32.8	21.5	7.5	47.8	5.1
Progression Factor	0.77	0.47	1.54	1.24	1.41	2.28
Incremental Delay, d2	7.1	0.9	3.7	0.1	17.3	0.7
Delay (s)	44.6	16.3	36.9	9.4	84.8	12.4
Level of Service	D	B	D	A	F	B
Approach Delay (s/veh)	25.3		28.0			36.1
Approach LOS	C		C			D

Intersection Summary			
HCM 2000 Control Delay (s/veh)	30.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	17.3
Intersection Capacity Utilization	72.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1380	200	0	0	0	0	651	287	0	515	0
Future Volume (vph)	0	1380	200	0	0	0	0	651	287	0	515	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.0	6.0					8.7			5.7	
Lane Util. Factor		0.95	1.00					0.95			1.00	
Frpb, ped/bikes		1.00	0.98					1.00			1.00	
Flpb, ped/bikes		1.00	1.00					1.00			1.00	
Frt		1.00	0.85					0.95			1.00	
Flt Protected		1.00	1.00					1.00			1.00	
Satd. Flow (prot)		3800	1662					3609			2000	
Flt Permitted		1.00	1.00					1.00			1.00	
Satd. Flow (perm)		3800	1662					3609			2000	
Peak-hour factor, PHF	0.95	0.95	0.95	0.92	0.92	0.92	0.93	0.93	0.93	0.95	0.95	0.95
Adj. Flow (vph)	0	1453	211	0	0	0	0	700	309	0	542	0
RTOR Reduction (vph)	0	0	48	0	0	0	0	27	0	0	0	0
Lane Group Flow (vph)	0	1453	163	0	0	0	0	982	0	0	542	0
Confl. Peds. (#/hr)			1						1			
Heavy Vehicles (%)	0%	0%	0%	2%	2%	2%	0%	0%	0%	0%	0%	0%
Turn Type		NA	Perm					NA			NA	
Protected Phases		2						4			8	
Permitted Phases			2									
Actuated Green, G (s)		70.0	70.0					35.3			38.3	
Effective Green, g (s)		70.0	70.0					35.3			38.3	
Actuated g/C Ratio		0.58	0.58					0.29			0.32	
Clearance Time (s)		6.0	6.0					8.7			5.7	
Vehicle Extension (s)		3.0	3.0					4.0			4.0	
Lane Grp Cap (vph)		2216	969					1061			638	
v/s Ratio Prot		c0.38						c0.27			0.27	
v/s Ratio Perm			0.10									
v/c Ratio		0.66	0.17					0.93			0.85	
Uniform Delay, d1		16.9	11.6					41.1			38.2	
Progression Factor		1.08	1.16					1.05			0.03	
Incremental Delay, d2		1.4	0.3					11.0			4.4	
Delay (s)		19.7	13.8					54.0			5.5	
Level of Service		B	B					D			A	
Approach Delay (s/veh)		18.9			0.0			54.0			5.5	
Approach LOS		B			A			D			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	27.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.7
Intersection Capacity Utilization	74.3%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	1161	152	0	651	0	0	515	183
Future Volume (vph)	0	0	0	0	1161	152	0	651	0	0	515	183
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	12	12	12	12	12	12	16	12	12	12	12
Total Lost time (s)					6.0			5.7			8.7	8.7
Lane Util. Factor					0.91			0.95			1.00	1.00
Frpb, ped/bikes					1.00			1.00			1.00	1.00
Flpb, ped/bikes					1.00			1.00			1.00	1.00
Frt					0.98			1.00			1.00	0.85
Flt Protected					1.00			1.00			1.00	1.00
Satd. Flow (prot)					5356			4307			2000	1700
Flt Permitted					1.00			1.00			1.00	1.00
Satd. Flow (perm)					5356			4307			2000	1700
Peak-hour factor, PHF	0.92	0.92	0.92	0.91	0.91	0.91	0.93	0.93	0.93	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	0	1276	167	0	700	0	0	542	193
RTOR Reduction (vph)	0	0	0	0	14	0	0	0	0	0	0	41
Lane Group Flow (vph)	0	0	0	0	1429	0	0	700	0	0	542	152
Confl. Peds. (#/hr)						2						
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type					NA			NA			NA	Perm
Protected Phases					2			8			4	
Permitted Phases												4
Actuated Green, G (s)					70.0			38.3			35.3	35.3
Effective Green, g (s)					70.0			38.3			35.3	35.3
Actuated g/C Ratio					0.58			0.32			0.29	0.29
Clearance Time (s)					6.0			5.7			8.7	8.7
Vehicle Extension (s)					3.0			4.0			4.0	4.0
Lane Grp Cap (vph)					3124			1374			588	500
v/s Ratio Prot					c0.27			0.16			c0.27	
v/s Ratio Perm												0.09
v/c Ratio					0.46			0.51			0.92	0.30
Uniform Delay, d1					14.2			33.2			41.0	32.8
Progression Factor					1.15			0.03			0.89	0.79
Incremental Delay, d2					0.5			0.1			20.0	0.5
Delay (s)					16.9			1.2			56.7	26.4
Level of Service					B			A			E	C
Approach Delay (s/veh)		0.0			16.9			1.2			48.7	
Approach LOS		A			B			A			D	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	21.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.7
Intersection Capacity Utilization	74.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	304	129	0	465	0	0	0	0
Future Volume (vph)	0	0	0	0	304	129	0	465	0	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					10.1	10.1		5.8				
Lane Util. Factor					0.95	1.00		0.95				
Frpb, ped/bikes					1.00	1.00		1.00				
Flpb, ped/bikes					1.00	1.00		1.00				
Frt					1.00	0.85		1.00				
Flt Protected					1.00	1.00		1.00				
Satd. Flow (prot)					3762	1683		3762				
Flt Permitted					1.00	1.00		1.00				
Satd. Flow (perm)					3762	1683		3762				
Peak-hour factor, PHF	0.92	0.92	0.92	0.86	0.86	0.86	0.87	0.87	0.87	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	353	150	0	534	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	88	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	353	62	0	534	0	0	0	0
Confl. Peds. (#/hr)									2			
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	1%	1%	1%	2%	2%	2%
Turn Type					NA	Perm		NA				
Protected Phases					2			8				
Permitted Phases						2						
Actuated Green, G (s)					49.9	49.9		54.2				
Effective Green, g (s)					49.9	49.9		54.2				
Actuated g/C Ratio					0.42	0.42		0.45				
Clearance Time (s)					10.1	10.1		5.8				
Vehicle Extension (s)					3.0	3.0		3.0				
Lane Grp Cap (vph)					1564	699		1699				
v/s Ratio Prot					c0.09			c0.14				
v/s Ratio Perm						0.04						
v/c Ratio					0.23	0.09		0.31				
Uniform Delay, d1					22.6	21.3		21.0				
Progression Factor					0.86	1.23		0.00				
Incremental Delay, d2					0.3	0.3		0.5				
Delay (s)					19.7	26.3		0.5				
Level of Service					B	C		A				
Approach Delay (s/veh)		0.0			21.7			0.5			0.0	
Approach LOS		A			C			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	10.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.28		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	52.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	189	0	0	0	0	0	465	105	0	0	0
Future Volume (vph)	0	189	0	0	0	0	0	465	105	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.1						9.8	9.8			
Lane Util. Factor		0.95						0.95	1.00			
Frpb, ped/bikes		1.00						1.00	0.98			
Flpb, ped/bikes		1.00						1.00	1.00			
Frt		1.00						1.00	0.85			
Flt Protected		1.00						1.00	1.00			
Satd. Flow (prot)		3800						3762	1656			
Flt Permitted		1.00						1.00	1.00			
Satd. Flow (perm)		3800						3762	1656			
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.87	0.87	0.87	0.92	0.92	0.92
Adj. Flow (vph)	0	210	0	0	0	0	0	534	121	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	70	0	0	0
Lane Group Flow (vph)	0	210	0	0	0	0	0	534	51	0	0	0
Confl. Peds. (#/hr)									2			
Heavy Vehicles (%)	0%	0%	0%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Turn Type		NA						NA	Perm			
Protected Phases		6						4				
Permitted Phases									4			
Actuated Green, G (s)		53.9						50.2	50.2			
Effective Green, g (s)		53.9						50.2	50.2			
Actuated g/C Ratio		0.45						0.42	0.42			
Clearance Time (s)		6.1						9.8	9.8			
Vehicle Extension (s)		3.0						3.0	3.0			
Lane Grp Cap (vph)		1706						1573	692			
v/s Ratio Prot		c0.06						c0.14				
v/s Ratio Perm									0.03			
v/c Ratio		0.12						0.34	0.07			
Uniform Delay, d1		19.3						23.7	20.9			
Progression Factor		0.00						1.00	1.00			
Incremental Delay, d2		0.1						0.6	0.2			
Delay (s)		0.1						24.2	21.1			
Level of Service		A						C	C			
Approach Delay (s/veh)		0.1			0.0			23.7			0.0	
Approach LOS		A			A			C			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	18.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.24		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	36.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↱								↑↑	
Traffic Volume (vph)	0	189	261	0	0	0	0	0	0	0	1178	0
Future Volume (vph)	0	189	261	0	0	0	0	0	0	0	1178	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		10.1	10.1								5.8	
Lane Util. Factor		0.95	1.00								0.95	
Frpb, ped/bikes		1.00	0.99								1.00	
Flpb, ped/bikes		1.00	1.00								1.00	
Frt		1.00	0.85								1.00	
Flt Protected		1.00	1.00								1.00	
Satd. Flow (prot)		3725	1644								3800	
Flt Permitted		1.00	1.00								1.00	
Satd. Flow (perm)		3725	1644								3800	
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.92	0.92	0.92	0.94	0.94	0.94
Adj. Flow (vph)	0	210	290	0	0	0	0	0	0	0	1253	0
RTOR Reduction (vph)	0	0	36	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	210	254	0	0	0	0	0	0	0	1253	0
Confl. Peds. (#/hr)			1									
Heavy Vehicles (%)	0%	2%	2%	2%	2%	2%	2%	2%	2%	0%	0%	0%
Turn Type		NA	Perm								NA	
Protected Phases		2									8	
Permitted Phases			2									
Actuated Green, G (s)		49.9	49.9								54.2	
Effective Green, g (s)		49.9	49.9								54.2	
Actuated g/C Ratio		0.42	0.42								0.45	
Clearance Time (s)		10.1	10.1								5.8	
Vehicle Extension (s)		3.0	3.0								3.0	
Lane Grp Cap (vph)		1548	683								1716	
v/s Ratio Prot		0.06									c0.33	
v/s Ratio Perm			c0.15									
v/c Ratio		0.14	0.37								0.73	
Uniform Delay, d1		21.7	24.2								26.9	
Progression Factor		1.00	1.00								0.00	
Incremental Delay, d2		0.2	1.5								1.7	
Delay (s)		21.9	25.8								1.7	
Level of Service		C	C								A	
Approach Delay (s/veh)		24.1			0.0			0.0			1.7	
Approach LOS		C			A			A			A	

Intersection Summary					
HCM 2000 Control Delay (s/veh)	8.1	HCM 2000 Level of Service	A		
HCM 2000 Volume to Capacity ratio	0.58				
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	19.9		
Intersection Capacity Utilization	61.7%	ICU Level of Service	B		
Analysis Period (min)	15				

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	304	0	0	0	0	0	1178	136
Future Volume (vph)	0	0	0	0	304	0	0	0	0	0	1178	136
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					6.1						9.8	9.8
Lane Util. Factor					0.95						0.95	1.00
Frt					1.00						1.00	0.85
Flt Protected					1.00						1.00	1.00
Satd. Flow (prot)					3800						3800	1700
Flt Permitted					1.00						1.00	1.00
Satd. Flow (perm)					3800						3800	1700
Peak-hour factor, PHF	0.92	0.92	0.92	0.86	0.86	0.86	0.92	0.92	0.92	0.94	0.94	0.94
Adj. Flow (vph)	0	0	0	0	353	0	0	0	0	0	1253	145
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	73
Lane Group Flow (vph)	0	0	0	0	353	0	0	0	0	0	1253	72
Heavy Vehicles (%)	2%	2%	2%	0%	0%	0%	2%	2%	2%	0%	0%	0%
Turn Type					NA						NA	Perm
Protected Phases					6						4	
Permitted Phases												4
Actuated Green, G (s)					53.9						50.2	50.2
Effective Green, g (s)					53.9						50.2	50.2
Actuated g/C Ratio					0.45						0.42	0.42
Clearance Time (s)					6.1						9.8	9.8
Vehicle Extension (s)					3.0						3.0	3.0
Lane Grp Cap (vph)					1706						1589	711
v/s Ratio Prot					c0.09						c0.33	
v/s Ratio Perm												0.04
v/c Ratio					0.21						0.79	0.10
Uniform Delay, d1					20.1						30.3	21.2
Progression Factor					0.00						0.82	0.66
Incremental Delay, d2					0.3						3.3	0.2
Delay (s)					0.3						28.3	14.2
Level of Service					A						C	B
Approach Delay (s/veh)		0.0			0.3			0.0			26.8	
Approach LOS		A			A			A			C	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	21.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	52.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2	5	44	30	22	13	152	551	4	8	964	17
Future Volume (vph)	2	5	44	30	22	13	152	551	4	8	964	17
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.0	6.0		6.0		5.8	5.8			5.8	
Lane Util. Factor		1.00	1.00		1.00		1.00	1.00			1.00	
Frt		1.00	0.85		0.97		1.00	1.00			1.00	
Flt Protected		0.99	1.00		0.98		0.95	1.00			1.00	
Satd. Flow (prot)		1970	1700		1902		1881	1978			1994	
Flt Permitted		0.93	1.00		0.85		0.26	1.00			1.00	
Satd. Flow (perm)		1853	1700		1648		517	1978			1986	
Peak-hour factor, PHF	0.73	0.73	0.73	0.64	0.64	0.64	0.95	0.95	0.95	0.87	0.87	0.87
Adj. Flow (vph)	3	7	60	47	34	20	160	580	4	9	1108	20
RTOR Reduction (vph)	0	0	54	0	8	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	10	6	0	93	0	160	584	0	0	1137	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	1%	1%	1%	0%	0%	0%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			4			2			2	
Permitted Phases	4		4	4			2			2		
Actuated Green, G (s)		12.9	12.9		12.9		95.3	95.3			95.3	
Effective Green, g (s)		12.9	12.9		12.9		95.3	95.3			95.3	
Actuated g/C Ratio		0.11	0.11		0.11		0.79	0.79			0.79	
Clearance Time (s)		6.0	6.0		6.0		5.8	5.8			5.8	
Vehicle Extension (s)		4.0	4.0		4.0		4.0	4.0			4.0	
Lane Grp Cap (vph)		199	182		177		410	1570			1577	
v/s Ratio Prot								0.30				
v/s Ratio Perm		0.01	0.00		c0.06		0.31				c0.57	
v/c Ratio		0.05	0.04		0.53		0.39	0.37			0.72	
Uniform Delay, d1		48.1	48.0		50.7		3.7	3.6			5.9	
Progression Factor		1.00	1.00		1.00		1.16	1.07			1.22	
Incremental Delay, d2		0.1	0.1		3.6		2.5	0.6			1.0	
Delay (s)		48.2	48.1		54.3		6.8	4.5			8.2	
Level of Service		D	D		D		A	A			A	
Approach Delay (s/veh)		48.1			54.3			5.0			8.2	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	10.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	11.8
Intersection Capacity Utilization	102.1%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	345	315	403	199	312	744
Future Volume (vph)	345	315	403	199	312	744
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Lane Width	12	12	11	11	11	11
Total Lost time (s)	5.7	5.8	5.8	5.7	5.8	5.8
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1881	1683	1933	1643	1837	1933
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1881	1683	1933	1643	1837	1933
Peak-hour factor, PHF	0.88	0.88	0.95	0.95	0.82	0.82
Adj. Flow (vph)	392	358	424	209	380	907
RTOR Reduction (vph)	0	185	0	54	0	0
Lane Group Flow (vph)	392	173	424	155	380	907
Heavy Vehicles (%)	1%	1%	0%	0%	0%	0%
Turn Type	Prot	pm+ov	NA	pm+ov	Prot	NA
Protected Phases	8	5	6	8	5	2
Permitted Phases		8		6		
Actuated Green, G (s)	20.3	49.5	53.2	73.5	29.2	88.2
Effective Green, g (s)	20.3	49.5	53.2	73.5	29.2	88.2
Actuated g/C Ratio	0.17	0.41	0.44	0.61	0.24	0.74
Clearance Time (s)	5.7	5.8	5.8	5.7	5.8	5.8
Vehicle Extension (s)	3.0	3.5	3.0	3.0	3.5	3.0
Lane Grp Cap (vph)	318	775	856	1084	447	1420
v/s Ratio Prot	c0.21	0.05	0.22	0.02	c0.21	c0.47
v/s Ratio Perm		0.05		0.07		
v/c Ratio	1.23	0.22	0.50	0.14	0.85	0.64
Uniform Delay, d1	49.9	22.8	23.8	9.9	43.3	7.9
Progression Factor	1.04	2.32	1.81	4.54	1.16	1.73
Incremental Delay, d2	127.6	0.2	2.0	0.1	12.2	1.8
Delay (s)	179.6	53.0	45.0	44.9	62.6	15.5
Level of Service	F	D	D	D	E	B
Approach Delay (s/veh)	119.2		45.0			29.4
Approach LOS	F		D			C

Intersection Summary			
HCM 2000 Control Delay (s/veh)	58.3	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	17.3
Intersection Capacity Utilization	69.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	764	238	0	0	0	0	361	198	0	745	0
Future Volume (vph)	0	764	238	0	0	0	0	361	198	0	745	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.0	6.0					8.7			5.7	
Lane Util. Factor		0.95	1.00					0.95			1.00	
Frpb, ped/bikes		1.00	0.97					1.00			1.00	
Flpb, ped/bikes		1.00	1.00					1.00			1.00	
Frt		1.00	0.85					0.95			1.00	
Flt Protected		1.00	1.00					1.00			1.00	
Satd. Flow (prot)		3762	1638					3563			2000	
Flt Permitted		1.00	1.00					1.00			1.00	
Satd. Flow (perm)		3762	1638					3563			2000	
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.95	0.95	0.95	0.80	0.80	0.80
Adj. Flow (vph)	0	849	264	0	0	0	0	380	208	0	931	0
RTOR Reduction (vph)	0	0	26	0	0	0	0	62	0	0	0	0
Lane Group Flow (vph)	0	849	238	0	0	0	0	526	0	0	931	0
Confl. Peds. (#/hr)			3									
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	1%	1%	1%	0%	0%	0%
Turn Type		NA	Perm					NA			NA	
Protected Phases		2						4			8	
Permitted Phases			2									
Actuated Green, G (s)		59.0	59.0					46.3			49.3	
Effective Green, g (s)		59.0	59.0					46.3			49.3	
Actuated g/C Ratio		0.49	0.49					0.39			0.41	
Clearance Time (s)		6.0	6.0					8.7			5.7	
Vehicle Extension (s)		3.0	3.0					4.0			4.0	
Lane Grp Cap (vph)		1849	805					1374			821	
v/s Ratio Prot		c0.23						0.15			c0.47	
v/s Ratio Perm			0.15									
v/c Ratio		0.46	0.30					0.38			1.13	
Uniform Delay, d1		20.0	18.1					26.6			35.3	
Progression Factor		0.98	0.99					0.75			0.08	
Incremental Delay, d2		0.8	0.9					0.2			61.9	
Delay (s)		20.4	18.8					20.2			64.7	
Level of Service		C	B					C			E	
Approach Delay (s/veh)		20.1			0.0			20.2			64.7	
Approach LOS		C			A			C			E	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	35.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.7
Intersection Capacity Utilization	71.5%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	1069	109	0	361	0	0	745	147
Future Volume (vph)	0	0	0	0	1069	109	0	361	0	0	745	147
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	12	12	12	12	12	12	16	12	12	12	12
Total Lost time (s)					6.0			5.7			8.7	8.7
Lane Util. Factor					0.91			0.95			1.00	1.00
Frpb, ped/bikes					1.00			1.00			1.00	1.00
Flpb, ped/bikes					1.00			1.00			1.00	1.00
Frt					0.99			1.00			1.00	0.85
Flt Protected					1.00			1.00			1.00	1.00
Satd. Flow (prot)					5323			4264			2000	1700
Flt Permitted					1.00			1.00			1.00	1.00
Satd. Flow (perm)					5323			4264			2000	1700
Peak-hour factor, PHF	0.92	0.92	0.92	0.95	0.95	0.95	0.95	0.95	0.95	0.80	0.80	0.80
Adj. Flow (vph)	0	0	0	0	1125	115	0	380	0	0	931	184
RTOR Reduction (vph)	0	0	0	0	10	0	0	0	0	0	0	31
Lane Group Flow (vph)	0	0	0	0	1230	0	0	380	0	0	931	153
Confl. Peds. (#/hr)						3						
Heavy Vehicles (%)	0%	0%	0%	1%	1%	1%	1%	1%	1%	0%	0%	0%
Turn Type					NA			NA			NA	Perm
Protected Phases					2			8			4	
Permitted Phases												4
Actuated Green, G (s)					59.0			49.3			46.3	46.3
Effective Green, g (s)					59.0			49.3			46.3	46.3
Actuated g/C Ratio					0.49			0.41			0.39	0.39
Clearance Time (s)					6.0			5.7			8.7	8.7
Vehicle Extension (s)					3.0			4.0			4.0	4.0
Lane Grp Cap (vph)					2617			1751			771	655
v/s Ratio Prot					c0.23			0.09			c0.47	
v/s Ratio Perm												0.09
v/c Ratio					0.47			0.22			1.21	0.23
Uniform Delay, d1					20.2			22.9			36.9	24.9
Progression Factor					1.00			0.16			0.89	0.76
Incremental Delay, d2					0.6			0.1			104.8	0.2
Delay (s)					20.7			3.6			137.6	19.2
Level of Service					C			A			F	B
Approach Delay (s/veh)		0.0			20.7			3.6			118.0	
Approach LOS		A			C			A			F	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	58.0	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.7
Intersection Capacity Utilization	71.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	216	164	0	648	0	0	0	0
Future Volume (vph)	0	0	0	0	216	164	0	648	0	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					10.1	10.1		5.8				
Lane Util. Factor					0.95	1.00		0.95				
Frpb, ped/bikes					1.00	1.00		1.00				
Flpb, ped/bikes					1.00	1.00		1.00				
Frt					1.00	0.85		1.00				
Flt Protected					1.00	1.00		1.00				
Satd. Flow (prot)					3762	1683		3762				
Flt Permitted					1.00	1.00		1.00				
Satd. Flow (perm)					3762	1683		3762				
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	235	178	0	704	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	47	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	235	131	0	704	0	0	0	0
Confl. Peds. (#/hr)									2			
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	1%	1%	1%	2%	2%	2%
Turn Type					NA	Perm		NA				
Protected Phases					2			8				
Permitted Phases						2						
Actuated Green, G (s)					39.9	39.9		24.2				
Effective Green, g (s)					39.9	39.9		24.2				
Actuated g/C Ratio					0.50	0.50		0.30				
Clearance Time (s)					10.1	10.1		5.8				
Vehicle Extension (s)					3.0	3.0		3.0				
Lane Grp Cap (vph)					1876	839		1138				
v/s Ratio Prot					0.06			c0.19				
v/s Ratio Perm						c0.08						
v/c Ratio					0.13	0.16		0.62				
Uniform Delay, d1					10.7	10.9		23.9				
Progression Factor					0.88	0.78		0.00				
Incremental Delay, d2					0.1	0.4		1.7				
Delay (s)					9.6	8.9		1.7				
Level of Service					A	A		A				
Approach Delay (s/veh)		0.0			9.3			1.7			0.0	
Approach LOS		A			A			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	4.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.35		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	42.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	272	0	0	0	0	0	648	180	0	0	0
Future Volume (vph)	0	272	0	0	0	0	0	648	180	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.1						9.8	9.8			
Lane Util. Factor		0.95						0.95	1.00			
Frpb, ped/bikes		1.00						1.00	0.99			
Flpb, ped/bikes		1.00						1.00	1.00			
Frt		1.00						1.00	0.85			
Flt Protected		1.00						1.00	1.00			
Satd. Flow (prot)		3762						3762	1659			
Flt Permitted		1.00						1.00	1.00			
Satd. Flow (perm)		3762						3762	1659			
Peak-hour factor, PHF	0.81	0.81	0.81	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	336	0	0	0	0	0	704	196	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	147	0	0	0
Lane Group Flow (vph)	0	336	0	0	0	0	0	704	49	0	0	0
Confl. Peds. (#/hr)									2			
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Turn Type		NA						NA	Perm			
Protected Phases		6						4				
Permitted Phases									4			
Actuated Green, G (s)		43.9						20.2	20.2			
Effective Green, g (s)		43.9						20.2	20.2			
Actuated g/C Ratio		0.55						0.25	0.25			
Clearance Time (s)		6.1						9.8	9.8			
Vehicle Extension (s)		3.0						3.0	3.0			
Lane Grp Cap (vph)		2064						949	418			
v/s Ratio Prot		c0.09						c0.19				
v/s Ratio Perm									0.03			
v/c Ratio		0.16						0.74	0.12			
Uniform Delay, d1		8.9						27.5	23.0			
Progression Factor		0.00						1.00	1.00			
Incremental Delay, d2		0.2						5.2	0.6			
Delay (s)		0.2						32.7	23.6			
Level of Service		A						C	C			
Approach Delay (s/veh)		0.2			0.0			30.7			0.0	
Approach LOS		A			A			C			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	22.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	39.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	272	402	0	0	0	0	0	0	0	781	0
Future Volume (vph)	0	272	402	0	0	0	0	0	0	0	781	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		10.1	10.1								5.8	
Lane Util. Factor		0.95	1.00								0.95	
Frpb, ped/bikes		1.00	1.00								1.00	
Flpb, ped/bikes		1.00	1.00								1.00	
Frt		1.00	0.85								1.00	
Flt Protected		1.00	1.00								1.00	
Satd. Flow (prot)		3762	1683								3800	
Flt Permitted		1.00	1.00								1.00	
Satd. Flow (perm)		3762	1683								3800	
Peak-hour factor, PHF	0.81	0.81	0.81	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	336	496	0	0	0	0	0	0	0	849	0
RTOR Reduction (vph)	0	0	47	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	336	449	0	0	0	0	0	0	0	849	0
Confl. Peds. (#/hr)												2
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	2%	2%	2%	0%	0%	0%
Turn Type		NA	Perm								NA	
Protected Phases		2									8	
Permitted Phases			2									
Actuated Green, G (s)		39.9	39.9								24.2	
Effective Green, g (s)		39.9	39.9								24.2	
Actuated g/C Ratio		0.50	0.50								0.30	
Clearance Time (s)		10.1	10.1								5.8	
Vehicle Extension (s)		3.0	3.0								3.0	
Lane Grp Cap (vph)		1876	839								1149	
v/s Ratio Prot		0.09									c0.22	
v/s Ratio Perm			c0.27									
v/c Ratio		0.18	0.54								0.74	
Uniform Delay, d1		11.0	13.7								25.1	
Progression Factor		1.00	1.00								0.02	
Incremental Delay, d2		0.2	2.4								1.9	
Delay (s)		11.2	16.2								2.3	
Level of Service		B	B								A	
Approach Delay (s/veh)		14.2			0.0			0.0			2.3	
Approach LOS		B			A			A			A	

Intersection Summary					
HCM 2000 Control Delay (s/veh)	8.2	HCM 2000 Level of Service		A	
HCM 2000 Volume to Capacity ratio	0.65				
Actuated Cycle Length (s)	80.0	Sum of lost time (s)		19.9	
Intersection Capacity Utilization	57.4%	ICU Level of Service		B	
Analysis Period (min)	15				

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	216	0	0	0	0	0	781	132
Future Volume (vph)	0	0	0	0	216	0	0	0	0	0	781	132
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					6.1						9.8	9.8
Lane Util. Factor					0.95						0.95	1.00
Frpb, ped/bikes					1.00						1.00	0.99
Flpb, ped/bikes					1.00						1.00	1.00
Frt					1.00						1.00	0.85
Flt Protected					1.00						1.00	1.00
Satd. Flow (prot)					3762						3800	1675
Flt Permitted					1.00						1.00	1.00
Satd. Flow (perm)					3762						3800	1675
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	235	0	0	0	0	0	849	143
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	107
Lane Group Flow (vph)	0	0	0	0	235	0	0	0	0	0	849	36
Confl. Peds. (#/hr)												2
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	2%	2%	2%	0%	0%	0%
Turn Type					NA						NA	Perm
Protected Phases					6						4	
Permitted Phases												4
Actuated Green, G (s)					43.9						20.2	20.2
Effective Green, g (s)					43.9						20.2	20.2
Actuated g/C Ratio					0.55						0.25	0.25
Clearance Time (s)					6.1						9.8	9.8
Vehicle Extension (s)					3.0						3.0	3.0
Lane Grp Cap (vph)					2064						959	422
v/s Ratio Prot					c0.06						c0.22	
v/s Ratio Perm												0.02
v/c Ratio					0.11						0.89	0.09
Uniform Delay, d1					8.7						28.8	22.8
Progression Factor					0.00						0.95	0.84
Incremental Delay, d2					0.1						11.5	0.4
Delay (s)					0.1						38.9	19.6
Level of Service					A						D	B
Approach Delay (s/veh)		0.0			0.1			0.0			36.1	
Approach LOS		A			A			A			D	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	29.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	42.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	24	0	89	6	9	15	89	791	15	6	819	12
Future Volume (vph)	24	0	89	6	9	15	89	791	15	6	819	12
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.0	6.0		6.0		5.8	5.8			5.8	
Lane Util. Factor		1.00	1.00		1.00		1.00	1.00			1.00	
Frt		1.00	0.85		0.93		1.00	1.00			1.00	
Flt Protected		0.95	1.00		0.99		0.95	1.00			1.00	
Satd. Flow (prot)		1900	1700		1847		1900	1994			1995	
Flt Permitted		0.72	1.00		0.92		0.33	1.00			0.99	
Satd. Flow (perm)		1449	1700		1721		662	1994			1984	
Peak-hour factor, PHF	0.83	0.83	0.83	0.60	0.60	0.60	0.89	0.89	0.89	0.91	0.91	0.91
Adj. Flow (vph)	29	0	107	10	15	25	100	889	17	7	900	13
RTOR Reduction (vph)	0	0	97	0	23	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	29	10	0	27	0	100	906	0	0	920	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			4			2			2	
Permitted Phases	4		4	4			2			2		
Actuated Green, G (s)		7.3	7.3		7.3		60.9	60.9			60.9	
Effective Green, g (s)		7.3	7.3		7.3		60.9	60.9			60.9	
Actuated g/C Ratio		0.09	0.09		0.09		0.76	0.76			0.76	
Clearance Time (s)		6.0	6.0		6.0		5.8	5.8			5.8	
Vehicle Extension (s)		4.0	4.0		4.0		4.0	4.0			4.0	
Lane Grp Cap (vph)		132	155		157		503	1517			1510	
v/s Ratio Prot								0.45				
v/s Ratio Perm		c0.02	0.01		0.02		0.15				c0.46	
v/c Ratio		0.22	0.06		0.17		0.20	0.60			0.61	
Uniform Delay, d1		33.7	33.2		33.6		2.7	4.2			4.3	
Progression Factor		1.00	1.00		1.00		0.99	0.81			0.90	
Incremental Delay, d2		1.1	0.2		0.7		0.7	1.3			1.4	
Delay (s)		34.9	33.5		34.3		3.3	4.7			5.2	
Level of Service		C	C		C		A	A			A	
Approach Delay (s/veh)		33.8			34.3			4.6			5.2	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	7.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	11.8
Intersection Capacity Utilization	79.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	171	332	540	183	324	589
Future Volume (vph)	171	332	540	183	324	589
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Lane Width	12	12	11	11	11	11
Total Lost time (s)	5.7	5.8	5.8	5.7	5.8	5.8
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1900	1700	1914	1627	1818	1914
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1900	1700	1914	1627	1818	1914
Peak-hour factor, PHF	0.94	0.94	0.86	0.86	0.91	0.91
Adj. Flow (vph)	182	353	628	213	356	647
RTOR Reduction (vph)	0	70	0	53	0	0
Lane Group Flow (vph)	182	283	628	160	356	647
Heavy Vehicles (%)	0%	0%	1%	1%	1%	1%
Turn Type	Prot	pm+ov	NA	pm+ov	Prot	NA
Protected Phases	8	5	6	8	5	2
Permitted Phases		8		6		
Actuated Green, G (s)	12.6	29.8	32.9	45.5	17.2	55.9
Effective Green, g (s)	12.6	29.8	32.9	45.5	17.2	55.9
Actuated g/C Ratio	0.16	0.37	0.41	0.57	0.22	0.70
Clearance Time (s)	5.7	5.8	5.8	5.7	5.8	5.8
Vehicle Extension (s)	3.0	3.5	3.0	3.0	3.5	3.0
Lane Grp Cap (vph)	299	756	787	1041	390	1337
v/s Ratio Prot	c0.10	0.08	c0.33	0.02	c0.20	0.34
v/s Ratio Perm		0.09		0.07		
v/c Ratio	0.61	0.37	0.80	0.15	0.91	0.48
Uniform Delay, d1	31.4	18.3	20.6	8.2	30.7	5.5
Progression Factor	1.28	1.80	1.75	4.22	0.88	1.09
Incremental Delay, d2	3.4	0.4	7.8	0.1	22.7	1.1
Delay (s)	43.6	33.3	43.9	34.5	49.6	7.0
Level of Service	D	C	D	C	D	A
Approach Delay (s/veh)	36.8		41.5			22.1
Approach LOS	D		D			C

Intersection Summary			
HCM 2000 Control Delay (s/veh)	32.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	17.3
Intersection Capacity Utilization	67.5%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1028	251	0	0	0	0	608	212	0	538	0
Future Volume (vph)	0	1028	251	0	0	0	0	608	212	0	538	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.0	6.0					8.7			5.7	
Lane Util. Factor		0.95	1.00					0.95			1.00	
Frpb, ped/bikes		1.00	0.98					1.00			1.00	
Flpb, ped/bikes		1.00	1.00					1.00			1.00	
Frt		1.00	0.85					0.96			1.00	
Flt Protected		1.00	1.00					1.00			1.00	
Satd. Flow (prot)		3800	1661					3653			1980	
Flt Permitted		1.00	1.00					1.00			1.00	
Satd. Flow (perm)		3800	1661					3653			1980	
Peak-hour factor, PHF	0.93	0.93	0.93	0.92	0.92	0.92	0.89	0.89	0.89	0.93	0.93	0.93
Adj. Flow (vph)	0	1105	270	0	0	0	0	683	238	0	578	0
RTOR Reduction (vph)	0	0	45	0	0	0	0	43	0	0	0	0
Lane Group Flow (vph)	0	1105	225	0	0	0	0	878	0	0	578	0
Confl. Peds. (#/hr)			2									
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	1%	1%
Turn Type		NA	Perm					NA			NA	
Protected Phases		2						4			8	
Permitted Phases			2									
Actuated Green, G (s)		43.0	43.0					22.3			25.3	
Effective Green, g (s)		43.0	43.0					22.3			25.3	
Actuated g/C Ratio		0.54	0.54					0.28			0.32	
Clearance Time (s)		6.0	6.0					8.7			5.7	
Vehicle Extension (s)		3.0	3.0					4.0			4.0	
Lane Grp Cap (vph)		2042	892					1018			626	
v/s Ratio Prot		c0.29						0.24			c0.29	
v/s Ratio Perm			0.14									
v/c Ratio		0.54	0.25					0.86			0.92	
Uniform Delay, d1		12.1	9.9					27.4			26.4	
Progression Factor		1.03	0.98					1.17			0.08	
Incremental Delay, d2		1.0	0.6					6.8			2.6	
Delay (s)		13.3	10.4					38.9			4.8	
Level of Service		B	B					D			A	
Approach Delay (s/veh)		12.8			0.0			38.9			4.8	
Approach LOS		B			A			D			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	19.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	14.7
Intersection Capacity Utilization	66.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	1278	196	0	608	0	0	538	179
Future Volume (vph)	0	0	0	0	1278	196	0	608	0	0	538	179
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	12	12	12	12	12	12	16	12	12	12	12
Total Lost time (s)					6.0			5.7			8.7	8.7
Lane Util. Factor					0.91			0.95			1.00	1.00
Frpb, ped/bikes					1.00			1.00			1.00	0.98
Flpb, ped/bikes					1.00			1.00			1.00	1.00
Frt					0.98			1.00			1.00	0.85
Flt Protected					1.00			1.00			1.00	1.00
Satd. Flow (prot)					5341			4307			1980	1649
Flt Permitted					1.00			1.00			1.00	1.00
Satd. Flow (perm)					5341			4307			1980	1649
Peak-hour factor, PHF	0.92	0.92	0.92	0.91	0.91	0.91	0.89	0.89	0.89	0.93	0.93	0.93
Adj. Flow (vph)	0	0	0	0	1404	215	0	683	0	0	578	192
RTOR Reduction (vph)	0	0	0	0	25	0	0	0	0	0	0	30
Lane Group Flow (vph)	0	0	0	0	1594	0	0	683	0	0	578	162
Confl. Peds. (#/hr)						2						5
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	1%	1%
Turn Type					NA			NA			NA	Perm
Protected Phases					2			8			4	
Permitted Phases												4
Actuated Green, G (s)					43.0			25.3			22.3	22.3
Effective Green, g (s)					43.0			25.3			22.3	22.3
Actuated g/C Ratio					0.54			0.32			0.28	0.28
Clearance Time (s)					6.0			5.7			8.7	8.7
Vehicle Extension (s)					3.0			4.0			4.0	4.0
Lane Grp Cap (vph)					2870			1362			551	459
v/s Ratio Prot					c0.30			0.16			c0.29	
v/s Ratio Perm												0.10
v/c Ratio					0.56			0.50			1.05	0.35
Uniform Delay, d1					12.2			22.2			28.9	23.1
Progression Factor					0.92			0.05			0.86	0.76
Incremental Delay, d2					0.7			0.2			50.9	0.6
Delay (s)					11.9			1.4			75.8	18.2
Level of Service					B			A			E	B
Approach Delay (s/veh)		0.0			11.9			1.4			61.4	
Approach LOS		A			B			A			E	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	22.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	14.7
Intersection Capacity Utilization	66.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	174	247	0	920	0	0	0	0
Future Volume (vph)	0	0	0	0	174	247	0	920	0	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					10.1	10.1		5.8				
Lane Util. Factor					0.95	1.00		0.95				
Frt					1.00	0.85		1.00				
Flt Protected					1.00	1.00		1.00				
Satd. Flow (prot)					3800	1700		3800				
Flt Permitted					1.00	1.00		1.00				
Satd. Flow (perm)					3800	1700		3800				
Peak-hour factor, PHF	0.92	0.92	0.92	0.85	0.85	0.85	0.95	0.95	0.95	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	205	291	0	968	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	26	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	205	265	0	968	0	0	0	0
Heavy Vehicles (%)	2%	2%	2%	0%	0%	0%	0%	0%	0%	2%	2%	2%
Turn Type					NA	Perm		NA				
Protected Phases					2			8				
Permitted Phases						2						
Actuated Green, G (s)					69.9	69.9		34.2				
Effective Green, g (s)					69.9	69.9		34.2				
Actuated g/C Ratio					0.58	0.58		0.29				
Clearance Time (s)					10.1	10.1		5.8				
Vehicle Extension (s)					3.0	3.0		3.0				
Lane Grp Cap (vph)					2213	990		1083				
v/s Ratio Prot					0.05			c0.25				
v/s Ratio Perm						c0.16						
v/c Ratio					0.09	0.27		0.89				
Uniform Delay, d1					11.1	12.4		41.2				
Progression Factor					1.00	1.02		0.04				
Incremental Delay, d2					0.1	0.7		1.2				
Delay (s)					11.1	13.4		2.9				
Level of Service					B	B		A				
Approach Delay (s/veh)		0.0			12.4			2.9			0.0	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	6.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	51.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	505	0	0	0	0	0	920	200	0	0	0
Future Volume (vph)	0	505	0	0	0	0	0	920	200	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.1						9.8	9.8			
Lane Util. Factor		0.95						0.95	1.00			
Frpb, ped/bikes		1.00						1.00	0.99			
Flpb, ped/bikes		1.00						1.00	1.00			
Frt		1.00						1.00	0.85			
Flt Protected		1.00						1.00	1.00			
Satd. Flow (prot)		3800						3800	1676			
Flt Permitted		1.00						1.00	1.00			
Satd. Flow (perm)		3800						3800	1676			
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.95	0.95	0.95	0.92	0.92	0.92
Adj. Flow (vph)	0	561	0	0	0	0	0	968	211	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	158	0	0	0
Lane Group Flow (vph)	0	561	0	0	0	0	0	968	53	0	0	0
Confl. Peds. (#/hr)									1			
Heavy Vehicles (%)	0%	0%	0%	2%	2%	2%	0%	0%	0%	2%	2%	2%
Turn Type		NA						NA	Perm			
Protected Phases		6						4				
Permitted Phases									4			
Actuated Green, G (s)		73.9						30.2	30.2			
Effective Green, g (s)		73.9						30.2	30.2			
Actuated g/C Ratio		0.62						0.25	0.25			
Clearance Time (s)		6.1						9.8	9.8			
Vehicle Extension (s)		3.0						3.0	3.0			
Lane Grp Cap (vph)		2340						956	421			
v/s Ratio Prot		c0.15						c0.25				
v/s Ratio Perm									0.03			
v/c Ratio		0.24						1.01	0.13			
Uniform Delay, d1		10.4						44.9	34.7			
Progression Factor		0.00						1.00	1.00			
Incremental Delay, d2		0.2						32.3	0.6			
Delay (s)		0.2						77.2	35.3			
Level of Service		A						E	D			
Approach Delay (s/veh)		0.2			0.0			69.7			0.0	
Approach LOS		A			A			E			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	47.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	51.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	505	537	0	0	0	0	0	0	0	730	0
Future Volume (vph)	0	505	537	0	0	0	0	0	0	0	730	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		10.1	10.1								5.8	
Lane Util. Factor		0.95	1.00								0.95	
Frt		1.00	0.85								1.00	
Flt Protected		1.00	1.00								1.00	
Satd. Flow (prot)		3800	1700								3800	
Flt Permitted		1.00	1.00								1.00	
Satd. Flow (perm)		3800	1700								3800	
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.92	0.92	0.92	0.95	0.95	0.95
Adj. Flow (vph)	0	561	597	0	0	0	0	0	0	0	768	0
RTOR Reduction (vph)	0	0	26	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	561	571	0	0	0	0	0	0	0	768	0
Heavy Vehicles (%)	0%	0%	0%	2%	2%	2%	2%	2%	2%	0%	0%	0%
Turn Type		NA	Perm								NA	
Protected Phases		2									8	
Permitted Phases			2									
Actuated Green, G (s)		69.9	69.9								34.2	
Effective Green, g (s)		69.9	69.9								34.2	
Actuated g/C Ratio		0.58	0.58								0.29	
Clearance Time (s)		10.1	10.1								5.8	
Vehicle Extension (s)		3.0	3.0								3.0	
Lane Grp Cap (vph)		2213	990								1083	
v/s Ratio Prot		0.15									c0.20	
v/s Ratio Perm			c0.34									
v/c Ratio		0.25	0.58								0.71	
Uniform Delay, d1		12.3	15.8								38.4	
Progression Factor		1.00	1.00								0.00	
Incremental Delay, d2		0.3	2.4								2.3	
Delay (s)		12.5	18.2								2.3	
Level of Service		B	B								A	
Approach Delay (s/veh)		15.5			0.0			0.0			2.3	
Approach LOS		B			A			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	10.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	64.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	174	0	0	0	0	0	730	64
Future Volume (vph)	0	0	0	0	174	0	0	0	0	0	730	64
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					6.1						9.8	9.8
Lane Util. Factor					0.95						0.95	1.00
Frpb, ped/bikes					1.00						1.00	0.99
Flpb, ped/bikes					1.00						1.00	1.00
Frt					1.00						1.00	0.85
Flt Protected					1.00						1.00	1.00
Satd. Flow (prot)					3800						3800	1676
Flt Permitted					1.00						1.00	1.00
Satd. Flow (perm)					3800						3800	1676
Peak-hour factor, PHF	0.92	0.92	0.92	0.85	0.85	0.85	0.92	0.92	0.92	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	0	205	0	0	0	0	0	768	67
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	50
Lane Group Flow (vph)	0	0	0	0	205	0	0	0	0	0	768	17
Confl. Peds. (#/hr)												1
Heavy Vehicles (%)	2%	2%	2%	0%	0%	0%	2%	2%	2%	0%	0%	0%
Turn Type					NA						NA	Perm
Protected Phases					6						4	
Permitted Phases												4
Actuated Green, G (s)					73.9						30.2	30.2
Effective Green, g (s)					73.9						30.2	30.2
Actuated g/C Ratio					0.62						0.25	0.25
Clearance Time (s)					6.1						9.8	9.8
Vehicle Extension (s)					3.0						3.0	3.0
Lane Grp Cap (vph)					2340						956	421
v/s Ratio Prot					c0.05						c0.20	
v/s Ratio Perm												0.01
v/c Ratio					0.09						0.80	0.04
Uniform Delay, d1					9.4						42.1	33.9
Progression Factor					0.00						0.75	0.53
Incremental Delay, d2					0.1						6.9	0.2
Delay (s)					0.1						38.5	18.1
Level of Service					A						D	B
Approach Delay (s/veh)		0.0			0.1			0.0			36.9	
Approach LOS		A			A			A			D	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	29.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.31		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	51.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	27	12	132	14	7	14	106	1101	20	6	754	15
Future Volume (vph)	27	12	132	14	7	14	106	1101	20	6	754	15
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.0	6.0		6.0		5.8	5.8			5.8	
Lane Util. Factor		1.00	1.00		1.00		1.00	1.00			1.00	
Frt		1.00	0.85		0.95		1.00	1.00			1.00	
Flt Protected		0.97	1.00		0.98		0.95	1.00			1.00	
Satd. Flow (prot)		1934	1700		1853		1900	1995			1994	
Flt Permitted		0.77	1.00		0.85		0.34	1.00			0.99	
Satd. Flow (perm)		1537	1700		1601		687	1995			1976	
Peak-hour factor, PHF	0.82	0.82	0.82	0.83	0.83	0.83	0.94	0.94	0.94	0.89	0.89	0.89
Adj. Flow (vph)	33	15	161	17	8	17	113	1171	21	7	847	17
RTOR Reduction (vph)	0	0	147	0	16	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	48	14	0	26	0	113	1192	0	0	871	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			4			2			2	
Permitted Phases	4		4	4			2			2		
Actuated Green, G (s)		10.4	10.4		10.4		97.8	97.8			97.8	
Effective Green, g (s)		10.4	10.4		10.4		97.8	97.8			97.8	
Actuated g/C Ratio		0.09	0.09		0.09		0.82	0.82			0.82	
Clearance Time (s)		6.0	6.0		6.0		5.8	5.8			5.8	
Vehicle Extension (s)		4.0	4.0		4.0		4.0	4.0			4.0	
Lane Grp Cap (vph)		133	147		138		559	1625			1610	
v/s Ratio Prot								c0.60				
v/s Ratio Perm		c0.03	0.01		0.02		0.16				0.44	
v/c Ratio		0.36	0.09		0.19		0.20	0.73			0.54	
Uniform Delay, d1		51.7	50.5		50.9		2.5	5.1			3.7	
Progression Factor		1.00	1.00		1.00		0.91	0.63			0.84	
Incremental Delay, d2		2.3	0.4		0.9		0.5	1.9			0.9	
Delay (s)		53.9	50.9		51.8		2.8	5.1			4.0	
Level of Service		D	D		D		A	A			A	
Approach Delay (s/veh)		51.6			51.8			4.9			4.0	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	9.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	11.8
Intersection Capacity Utilization	93.4%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	210	446	770	359	293	602
Future Volume (vph)	210	446	770	359	293	602
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Lane Width	12	12	11	11	11	11
Total Lost time (s)	5.7	5.8	5.8	5.7	5.8	5.8
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1900	1700	1933	1643	1837	1933
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1900	1700	1933	1643	1837	1933
Peak-hour factor, PHF	0.94	0.94	0.93	0.93	0.95	0.95
Adj. Flow (vph)	223	474	828	386	308	634
RTOR Reduction (vph)	0	66	0	35	0	0
Lane Group Flow (vph)	223	408	828	351	308	634
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Turn Type	Prot	pm+ov	NA	pm+ov	Prot	NA
Protected Phases	8	5	6	8	5	2
Permitted Phases		8		6		
Actuated Green, G (s)	19.4	40.6	62.1	81.5	21.2	89.1
Effective Green, g (s)	19.4	40.6	62.1	81.5	21.2	89.1
Actuated g/C Ratio	0.16	0.34	0.52	0.68	0.18	0.74
Clearance Time (s)	5.7	5.8	5.8	5.7	5.8	5.8
Vehicle Extension (s)	3.0	3.5	3.0	3.0	3.5	3.0
Lane Grp Cap (vph)	307	657	1000	1193	324	1435
v/s Ratio Prot	c0.12	0.11	c0.43	0.05	c0.17	0.33
v/s Ratio Perm		0.13		0.17		
v/c Ratio	0.73	0.62	0.83	0.29	0.95	0.44
Uniform Delay, d1	47.8	33.3	24.4	7.7	48.9	5.9
Progression Factor	0.78	0.58	1.46	1.02	1.37	2.08
Incremental Delay, d2	8.0	1.8	6.5	0.1	34.3	0.9
Delay (s)	45.4	21.1	42.1	8.0	101.4	13.2
Level of Service	D	C	D	A	F	B
Approach Delay (s/veh)	28.9		31.3			42.0
Approach LOS	C		C			D

Intersection Summary			
HCM 2000 Control Delay (s/veh)	34.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	17.3
Intersection Capacity Utilization	79.4%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1548	225	0	0	0	0	731	322	0	578	0
Future Volume (vph)	0	1548	225	0	0	0	0	731	322	0	578	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.0	6.0					8.7			5.7	
Lane Util. Factor		0.95	1.00					0.95			1.00	
Frpb, ped/bikes		1.00	0.98					1.00			1.00	
Flpb, ped/bikes		1.00	1.00					1.00			1.00	
Frt		1.00	0.85					0.95			1.00	
Flt Protected		1.00	1.00					1.00			1.00	
Satd. Flow (prot)		3800	1658					3626			2000	
Flt Permitted		1.00	1.00					1.00			1.00	
Satd. Flow (perm)		3800	1658					3626			2000	
Peak-hour factor, PHF	0.95	0.95	0.95	0.92	0.92	0.92	0.93	0.93	0.93	0.95	0.95	0.95
Adj. Flow (vph)	0	1629	237	0	0	0	0	786	346	0	608	0
RTOR Reduction (vph)	0	0	36	0	0	0	0	17	0	0	0	0
Lane Group Flow (vph)	0	1629	201	0	0	0	0	1115	0	0	608	0
Confl. Peds. (#/hr)			2									
Heavy Vehicles (%)	0%	0%	0%	2%	2%	2%	0%	0%	0%	0%	0%	0%
Turn Type		NA	Perm					NA			NA	
Protected Phases		2						4			8	
Permitted Phases			2									
Actuated Green, G (s)		70.0	70.0					35.3			38.3	
Effective Green, g (s)		70.0	70.0					35.3			38.3	
Actuated g/C Ratio		0.58	0.58					0.29			0.32	
Clearance Time (s)		6.0	6.0					8.7			5.7	
Vehicle Extension (s)		3.0	3.0					4.0			4.0	
Lane Grp Cap (vph)		2216	967					1066			638	
v/s Ratio Prot		c0.43						c0.31			0.30	
v/s Ratio Perm			0.12									
v/c Ratio		0.74	0.21					1.05			0.95	
Uniform Delay, d1		18.2	11.9					42.4			40.0	
Progression Factor		1.07	0.98					1.04			0.05	
Incremental Delay, d2		1.9	0.4					36.1			4.0	
Delay (s)		21.3	12.0					80.1			6.1	
Level of Service		C	B					F			A	
Approach Delay (s/veh)		20.2			0.0			80.1			6.1	
Approach LOS		C			A			F			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	36.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.7
Intersection Capacity Utilization	81.9%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	1303	171	0	731	0	0	578	206
Future Volume (vph)	0	0	0	0	1303	171	0	731	0	0	578	206
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	12	12	12	12	12	12	16	12	12	12	12
Total Lost time (s)					6.0			5.7			8.7	8.7
Lane Util. Factor					0.91			0.95			1.00	1.00
Frpb, ped/bikes					1.00			1.00			1.00	1.00
Flpb, ped/bikes					1.00			1.00			1.00	1.00
Frt					0.98			1.00			1.00	0.85
Flt Protected					1.00			1.00			1.00	1.00
Satd. Flow (prot)					5355			4307			2000	1700
Flt Permitted					1.00			1.00			1.00	1.00
Satd. Flow (perm)					5355			4307			2000	1700
Peak-hour factor, PHF	0.92	0.92	0.92	0.91	0.91	0.91	0.93	0.93	0.93	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	0	1432	188	0	786	0	0	608	217
RTOR Reduction (vph)	0	0	0	0	14	0	0	0	0	0	0	28
Lane Group Flow (vph)	0	0	0	0	1606	0	0	786	0	0	608	189
Confl. Peds. (#/hr)						3						
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type					NA			NA			NA	Perm
Protected Phases					2			8			4	
Permitted Phases												4
Actuated Green, G (s)					70.0			38.3			35.3	35.3
Effective Green, g (s)					70.0			38.3			35.3	35.3
Actuated g/C Ratio					0.58			0.32			0.29	0.29
Clearance Time (s)					6.0			5.7			8.7	8.7
Vehicle Extension (s)					3.0			4.0			4.0	4.0
Lane Grp Cap (vph)					3123			1374			588	500
v/s Ratio Prot					c0.30			0.18			c0.30	
v/s Ratio Perm												0.11
v/c Ratio					0.51			0.57			1.03	0.38
Uniform Delay, d1					14.9			34.0			42.4	33.6
Progression Factor					1.16			0.02			0.89	0.82
Incremental Delay, d2					0.6			0.1			45.6	0.6
Delay (s)					17.9			0.7			83.4	28.3
Level of Service					B			A			F	C
Approach Delay (s/veh)		0.0			17.9			0.7			68.9	
Approach LOS		A			B			A			E	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	26.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.7
Intersection Capacity Utilization	81.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	232	131	0	496	0	0	0	0
Future Volume (vph)	0	0	0	0	232	131	0	496	0	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					10.1	10.1		5.8				
Lane Util. Factor					0.95	1.00		0.95				
Frt					1.00	0.85		1.00				
Flt Protected					1.00	1.00		1.00				
Satd. Flow (prot)					3762	1683		3762				
Flt Permitted					1.00	1.00		1.00				
Satd. Flow (perm)					3762	1683		3762				
Peak-hour factor, PHF	0.92	0.92	0.92	0.86	0.86	0.86	0.87	0.87	0.87	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	270	152	0	570	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	103	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	270	49	0	570	0	0	0	0
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	1%	1%	1%	2%	2%	2%
Turn Type					NA	Perm		NA				
Protected Phases					2			8				
Permitted Phases						2						
Actuated Green, G (s)					28.9	28.9		45.2				
Effective Green, g (s)					28.9	28.9		45.2				
Actuated g/C Ratio					0.32	0.32		0.50				
Clearance Time (s)					10.1	10.1		5.8				
Vehicle Extension (s)					3.0	3.0		3.0				
Lane Grp Cap (vph)					1208	540		1889				
v/s Ratio Prot					c0.07			c0.15				
v/s Ratio Perm						0.03						
v/c Ratio					0.22	0.09		0.30				
Uniform Delay, d1					22.3	21.4		13.1				
Progression Factor					1.06	1.94		0.00				
Incremental Delay, d2					0.4	0.3		0.4				
Delay (s)					24.2	41.9		0.4				
Level of Service					C	D		A				
Approach Delay (s/veh)		0.0			30.5			0.4			0.0	
Approach LOS		A			C			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	13.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.29		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	44.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	205	0	0	0	0	0	496	127	0	0	0
Future Volume (vph)	0	205	0	0	0	0	0	496	127	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.1						9.8	9.8			
Lane Util. Factor		0.95						0.95	1.00			
Frt		1.00						1.00	0.85			
Flt Protected		1.00						1.00	1.00			
Satd. Flow (prot)		3800						3762	1683			
Flt Permitted		1.00						1.00	1.00			
Satd. Flow (perm)		3800						3762	1683			
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.87	0.87	0.87	0.92	0.92	0.92
Adj. Flow (vph)	0	228	0	0	0	0	0	570	146	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	79	0	0	0
Lane Group Flow (vph)	0	228	0	0	0	0	0	570	67	0	0	0
Heavy Vehicles (%)	0%	0%	0%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Turn Type		NA						NA	Perm			
Protected Phases		6						4				
Permitted Phases									4			
Actuated Green, G (s)		32.9						41.2	41.2			
Effective Green, g (s)		32.9						41.2	41.2			
Actuated g/C Ratio		0.37						0.46	0.46			
Clearance Time (s)		6.1						9.8	9.8			
Vehicle Extension (s)		3.0						3.0	3.0			
Lane Grp Cap (vph)		1389						1722	770			
v/s Ratio Prot		c0.06						c0.15				
v/s Ratio Perm									0.04			
v/c Ratio		0.16						0.33	0.09			
Uniform Delay, d1		19.3						15.6	13.8			
Progression Factor		0.00						1.00	1.00			
Incremental Delay, d2		0.3						0.5	0.2			
Delay (s)		0.3						16.1	14.0			
Level of Service		A						B	B			
Approach Delay (s/veh)		0.3			0.0			15.7			0.0	
Approach LOS		A			A			B			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	12.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.27		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	34.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	205	295	0	0	0	0	0	0	0	873	0
Future Volume (vph)	0	205	295	0	0	0	0	0	0	0	873	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		10.1	10.1								5.8	
Lane Util. Factor		0.95	1.00								0.95	
Frpb, ped/bikes		1.00	0.99								1.00	
Flpb, ped/bikes		1.00	1.00								1.00	
Frt		1.00	0.85								1.00	
Flt Protected		1.00	1.00								1.00	
Satd. Flow (prot)		3725	1645								3800	
Flt Permitted		1.00	1.00								1.00	
Satd. Flow (perm)		3725	1645								3800	
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.92	0.92	0.92	0.94	0.94	0.94
Adj. Flow (vph)	0	228	328	0	0	0	0	0	0	0	929	0
RTOR Reduction (vph)	0	0	64	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	228	264	0	0	0	0	0	0	0	929	0
Confl. Peds. (#/hr)			1									
Heavy Vehicles (%)	0%	2%	2%	2%	2%	2%	2%	2%	2%	0%	0%	0%
Turn Type		NA	Perm								NA	
Protected Phases		2									8	
Permitted Phases			2									
Actuated Green, G (s)		28.9	28.9								45.2	
Effective Green, g (s)		28.9	28.9								45.2	
Actuated g/C Ratio		0.32	0.32								0.50	
Clearance Time (s)		10.1	10.1								5.8	
Vehicle Extension (s)		3.0	3.0								3.0	
Lane Grp Cap (vph)		1196	528								1908	
v/s Ratio Prot		0.06									c0.24	
v/s Ratio Perm			c0.16									
v/c Ratio		0.19	0.50								0.49	
Uniform Delay, d1		22.1	24.7								14.8	
Progression Factor		1.00	1.00								0.00	
Incremental Delay, d2		0.4	3.4								0.8	
Delay (s)		22.4	28.1								0.8	
Level of Service		C	C								A	
Approach Delay (s/veh)		25.8			0.0			0.0			0.8	
Approach LOS		C			A			A			A	

Intersection Summary					
HCM 2000 Control Delay (s/veh)	10.1	HCM 2000 Level of Service		B	
HCM 2000 Volume to Capacity ratio	0.52				
Actuated Cycle Length (s)	90.0	Sum of lost time (s)		19.9	
Intersection Capacity Utilization	53.7%	ICU Level of Service		A	
Analysis Period (min)	15				

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	232	0	0	0	0	0	873	119
Future Volume (vph)	0	0	0	0	232	0	0	0	0	0	873	119
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					6.1						9.8	9.8
Lane Util. Factor					0.95						0.95	1.00
Frt					1.00						1.00	0.85
Flt Protected					1.00						1.00	1.00
Satd. Flow (prot)					3800						3800	1700
Flt Permitted					1.00						1.00	1.00
Satd. Flow (perm)					3800						3800	1700
Peak-hour factor, PHF	0.92	0.92	0.92	0.86	0.86	0.86	0.92	0.92	0.92	0.94	0.94	0.94
Adj. Flow (vph)	0	0	0	0	270	0	0	0	0	0	929	127
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	69
Lane Group Flow (vph)	0	0	0	0	270	0	0	0	0	0	929	58
Heavy Vehicles (%)	2%	2%	2%	0%	0%	0%	2%	2%	2%	0%	0%	0%
Turn Type					NA						NA	Perm
Protected Phases					6						4	
Permitted Phases												4
Actuated Green, G (s)					32.9						41.2	41.2
Effective Green, g (s)					32.9						41.2	41.2
Actuated g/C Ratio					0.37						0.46	0.46
Clearance Time (s)					6.1						9.8	9.8
Vehicle Extension (s)					3.0						3.0	3.0
Lane Grp Cap (vph)					1389						1739	778
v/s Ratio Prot					c0.07						c0.24	
v/s Ratio Perm												0.03
v/c Ratio					0.19						0.53	0.07
Uniform Delay, d1					19.5						17.5	13.7
Progression Factor					0.00						0.70	0.51
Incremental Delay, d2					0.3						1.1	0.2
Delay (s)					0.3						13.3	7.2
Level of Service					A						B	A
Approach Delay (s/veh)		0.0			0.3			0.0			12.6	
Approach LOS		A			A			A			B	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	10.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	44.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	2	59	16	14	12	107	598	7	6	795	13
Future Volume (vph)	11	2	59	16	14	12	107	598	7	6	795	13
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	6.4	6.4			6.4		5.9	5.9	5.9	5.9	5.9	5.9
Lane Util. Factor	1.00	1.00			1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.86			0.96		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00			0.98		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1900	1711			1887		1881	1980	1683	1900	2000	1700
Flt Permitted	0.94	1.00			0.84		0.19	1.00	1.00	0.37	1.00	1.00
Satd. Flow (perm)	1872	1711			1614		374	1980	1683	746	2000	1700
Peak-hour factor, PHF	0.73	0.73	0.73	0.64	0.64	0.64	0.95	0.95	0.95	0.87	0.87	0.87
Adj. Flow (vph)	15	3	81	25	22	19	113	629	7	7	914	15
RTOR Reduction (vph)	0	75	0	0	17	0	0	0	2	0	0	5
Lane Group Flow (vph)	15	9	0	0	49	0	113	629	5	7	914	10
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	1%	1%	1%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		D.P+P	NA	Perm	D.P+P	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			6		2	2		6
Actuated Green, G (s)	6.5	6.5			6.5		65.3	64.1	64.1	65.3	59.8	59.8
Effective Green, g (s)	6.5	6.5			6.5		65.3	64.1	64.1	65.3	59.8	59.8
Actuated g/C Ratio	0.07	0.07			0.07		0.73	0.71	0.71	0.73	0.66	0.66
Clearance Time (s)	6.4	6.4			6.4		5.9	5.9	5.9	5.9	5.9	5.9
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	135	123			116		363	1410	1198	556	1328	1129
v/s Ratio Prot		0.01					c0.02	c0.32		0.00	c0.46	
v/s Ratio Perm	0.01				c0.03		0.21		0.00	0.01		0.01
v/c Ratio	0.11	0.07			0.43		0.31	0.45	0.00	0.01	0.69	0.01
Uniform Delay, d1	39.0	38.9			40.0		7.9	5.5	3.7	3.8	9.3	5.1
Progression Factor	1.00	1.00			1.00		0.73	0.87	1.00	0.80	2.09	1.00
Incremental Delay, d2	0.4	0.2			2.5		0.5	0.9	0.0	0.0	2.8	0.0
Delay (s)	39.4	39.2			42.5		6.2	5.7	3.7	3.0	22.3	5.1
Level of Service	D	D			D		A	A	A	A	C	A
Approach Delay (s/veh)		39.2			42.5			5.7			21.9	
Approach LOS		D			D			A			C	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	17.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.2
Intersection Capacity Utilization	69.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	230	288	420	172	283	594
Future Volume (vph)	230	288	420	172	283	594
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Lane Width	12	12	11	11	11	11
Total Lost time (s)	5.9	6.0	6.0	5.9	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1881	1683	1933	1643	1837	1933
Flt Permitted	0.95	1.00	1.00	1.00	0.41	1.00
Satd. Flow (perm)	1881	1683	1933	1643	792	1933
Peak-hour factor, PHF	0.88	0.88	0.95	0.95	0.82	0.82
Adj. Flow (vph)	261	327	442	181	345	724
RTOR Reduction (vph)	0	158	0	54	0	0
Lane Group Flow (vph)	261	169	442	127	345	724
Heavy Vehicles (%)	1%	1%	0%	0%	0%	0%
Turn Type	Prot	pm+ov	NA	pm+ov	D.P+P	NA
Protected Phases	8	5	6	8	5	2
Permitted Phases		8		6	6	
Actuated Green, G (s)	18.0	27.0	45.1	63.1	54.1	60.1
Effective Green, g (s)	18.0	27.0	45.1	63.1	54.1	60.1
Actuated g/C Ratio	0.20	0.30	0.50	0.70	0.60	0.67
Clearance Time (s)	5.9	6.0	6.0	5.9	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	376	504	968	1151	580	1290
v/s Ratio Prot	c0.14	0.03	0.23	0.02	0.06	c0.37
v/s Ratio Perm		0.07		0.06	c0.30	
v/c Ratio	0.69	0.33	0.46	0.11	0.59	0.56
Uniform Delay, d1	33.4	24.5	14.5	4.4	9.5	7.9
Progression Factor	1.30	1.31	0.66	0.68	1.62	1.51
Incremental Delay, d2	5.1	0.4	1.5	0.0	1.4	1.5
Delay (s)	48.7	32.4	11.0	3.0	16.7	13.5
Level of Service	D	C	B	A	B	B
Approach Delay (s/veh)	39.6		8.7			14.6
Approach LOS	D		A			B

Intersection Summary			
HCM 2000 Control Delay (s/veh)	19.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	17.9
Intersection Capacity Utilization	62.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↱					↑↑	↱		↑↑	
Traffic Volume (vph)	0	799	218	0	0	0	0	432	183	0	572	0
Future Volume (vph)	0	799	218	0	0	0	0	432	183	0	572	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.0	6.0					8.7	8.7		5.7	
Lane Util. Factor		0.95	1.00					0.95	1.00		0.95	
Frpb, ped/bikes		1.00	0.99					1.00	1.00		1.00	
Flpb, ped/bikes		1.00	1.00					1.00	1.00		1.00	
Frt		1.00	0.85					1.00	0.85		1.00	
Flt Protected		1.00	1.00					1.00	1.00		1.00	
Satd. Flow (prot)		3762	1660					3762	1683		3800	
Flt Permitted		1.00	1.00					1.00	1.00		1.00	
Satd. Flow (perm)		3762	1660					3762	1683		3800	
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.95	0.95	0.95	0.80	0.80	0.80
Adj. Flow (vph)	0	888	242	0	0	0	0	455	193	0	715	0
RTOR Reduction (vph)	0	0	79	0	0	0	0	0	33	0	0	0
Lane Group Flow (vph)	0	888	163	0	0	0	0	455	160	0	715	0
Confl. Peds. (#/hr)			2									
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	1%	1%	1%	0%	0%	0%
Turn Type		NA	Perm					NA	Perm		NA	
Protected Phases		2						4			8	
Permitted Phases			2						4			
Actuated Green, G (s)		44.2	44.2					31.1	31.1		34.1	
Effective Green, g (s)		44.2	44.2					31.1	31.1		34.1	
Actuated g/C Ratio		0.49	0.49					0.35	0.35		0.38	
Clearance Time (s)		6.0	6.0					8.7	8.7		5.7	
Vehicle Extension (s)		3.0	3.0					4.0	4.0		4.0	
Lane Grp Cap (vph)		1847	815					1299	581		1439	
v/s Ratio Prot		c0.24						0.12			c0.19	
v/s Ratio Perm			0.10						0.10			
v/c Ratio		0.48	0.20					0.35	0.28		0.50	
Uniform Delay, d1		15.3	12.9					21.9	21.3		21.4	
Progression Factor		1.10	1.43					0.73	0.68		0.00	
Incremental Delay, d2		0.9	0.5					0.2	0.3		0.3	
Delay (s)		17.7	19.1					16.3	14.9		0.4	
Level of Service		B	B					B	B		A	
Approach Delay (s/veh)		18.0			0.0			15.9			0.4	
Approach LOS		B			A			B			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	12.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	14.7
Intersection Capacity Utilization	49.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	1046	136	0	432	0	0	572	145
Future Volume (vph)	0	0	0	0	1046	136	0	432	0	0	572	145
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	12	12	12	12	12	12	16	12	12	12	12
Total Lost time (s)					6.0			5.7			8.7	8.7
Lane Util. Factor					0.91			0.95			0.95	1.00
Frpb, ped/bikes					1.00			1.00			1.00	1.00
Flpb, ped/bikes					1.00			1.00			1.00	1.00
Frt					0.98			1.00			1.00	0.85
Flt Protected					1.00			1.00			1.00	1.00
Satd. Flow (prot)					5304			4264			3800	1700
Flt Permitted					1.00			1.00			1.00	1.00
Satd. Flow (perm)					5304			4264			3800	1700
Peak-hour factor, PHF	0.92	0.92	0.92	0.95	0.95	0.95	0.95	0.95	0.95	0.80	0.80	0.80
Adj. Flow (vph)	0	0	0	0	1101	143	0	455	0	0	715	181
RTOR Reduction (vph)	0	0	0	0	15	0	0	0	0	0	0	24
Lane Group Flow (vph)	0	0	0	0	1229	0	0	455	0	0	715	157
Confl. Peds. (#/hr)						2						
Heavy Vehicles (%)	0%	0%	0%	1%	1%	1%	1%	1%	1%	0%	0%	0%
Turn Type					NA			NA			NA	Perm
Protected Phases					2			8			4	
Permitted Phases												4
Actuated Green, G (s)					44.2			34.1			31.1	31.1
Effective Green, g (s)					44.2			34.1			31.1	31.1
Actuated g/C Ratio					0.49			0.38			0.35	0.35
Clearance Time (s)					6.0			5.7			8.7	8.7
Vehicle Extension (s)					3.0			4.0			4.0	4.0
Lane Grp Cap (vph)					2604			1615			1313	587
v/s Ratio Prot					c0.23			0.11			c0.19	
v/s Ratio Perm												0.09
v/c Ratio					0.47			0.28			0.54	0.27
Uniform Delay, d1					15.2			19.4			23.7	21.2
Progression Factor					1.13			0.00			1.28	1.44
Incremental Delay, d2					0.6			0.1			0.6	0.3
Delay (s)					17.8			0.1			31.0	30.9
Level of Service					B			A			C	C
Approach Delay (s/veh)		0.0			17.8			0.1			31.0	
Approach LOS		A			B			A			C	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	19.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	14.7
Intersection Capacity Utilization	49.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	46	0	81	1	10	1	38	545	1	1	771	52
Future Volume (vph)	46	0	81	1	10	1	38	545	1	1	771	52
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	10	12	10	12	12	12	11	11	12	12	11	11
Total Lost time (s)	6.4	6.4		6.4	6.4		6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85		1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1773	1700		1863	1936		1818	1914	1667	1863	1933	1643
Flt Permitted	0.75	1.00		0.69	1.00		0.20	1.00	1.00	0.38	1.00	1.00
Satd. Flow (perm)	1399	1700		1362	1936		383	1914	1667	740	1933	1643
Peak-hour factor, PHF	0.84	0.92	0.84	0.92	0.92	0.92	0.89	0.89	0.92	0.92	0.86	0.86
Adj. Flow (vph)	55	0	96	1	11	1	43	612	1	1	897	60
RTOR Reduction (vph)	0	88	0	0	1	0	0	0	0	0	0	20
Lane Group Flow (vph)	55	8	0	1	11	0	43	612	1	1	897	40
Heavy Vehicles (%)	0%	2%	0%	2%	2%	2%	1%	1%	2%	2%	0%	0%
Turn Type	Perm	NA		Perm	NA		D.P+P	NA	Perm	D.P+P	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			6		2	2		6
Actuated Green, G (s)	7.8	7.8		7.8	7.8		63.8	62.7	62.7	63.8	60.0	60.0
Effective Green, g (s)	7.8	7.8		7.8	7.8		63.8	62.7	62.7	63.8	60.0	60.0
Actuated g/C Ratio	0.09	0.09		0.09	0.09		0.71	0.70	0.70	0.71	0.67	0.67
Clearance Time (s)	6.4	6.4		6.4	6.4		6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	121	147		118	167		332	1333	1161	538	1288	1095
v/s Ratio Prot		0.00			0.01		c0.01	c0.32		0.00	c0.46	
v/s Ratio Perm	c0.04			0.00			0.09		0.00	0.00		0.02
v/c Ratio	0.45	0.06		0.01	0.07		0.13	0.46	0.00	0.00	0.70	0.04
Uniform Delay, d1	39.1	37.7		37.6	37.8		7.3	6.1	4.1	4.2	9.3	5.1
Progression Factor	1.00	1.00		1.00	1.00		2.26	2.46	1.00	1.00	0.52	1.85
Incremental Delay, d2	2.7	0.2		0.0	0.2		0.2	1.1	0.0	0.0	2.7	0.1
Delay (s)	41.8	37.9		37.6	37.9		16.7	16.1	4.1	4.2	7.6	9.5
Level of Service	D	D		D	D		B	B	A	A	A	A
Approach Delay (s/veh)		39.3			37.9			16.1			7.7	
Approach LOS		D			D			B			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	13.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.4
Intersection Capacity Utilization	58.0%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	192	146	0	577	0	0	0	0
Future Volume (vph)	0	0	0	0	192	146	0	577	0	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					10.1	10.1		5.8				
Lane Util. Factor					0.95	1.00		0.95				
Frt					1.00	0.85		1.00				
Flt Protected					1.00	1.00		1.00				
Satd. Flow (prot)					3762	1683		3762				
Flt Permitted					1.00	1.00		1.00				
Satd. Flow (perm)					3762	1683		3762				
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	209	159	0	627	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	97	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	209	62	0	627	0	0	0	0
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	1%	1%	1%	2%	2%	2%
Turn Type					NA	Perm		NA				
Protected Phases					2			8				
Permitted Phases						2						
Actuated Green, G (s)					34.9	34.9		39.2				
Effective Green, g (s)					34.9	34.9		39.2				
Actuated g/C Ratio					0.39	0.39		0.44				
Clearance Time (s)					10.1	10.1		5.8				
Vehicle Extension (s)					3.0	3.0		3.0				
Lane Grp Cap (vph)					1458	652		1638				
v/s Ratio Prot					c0.06			c0.17				
v/s Ratio Perm						0.04						
v/c Ratio					0.14	0.09		0.38				
Uniform Delay, d1					17.9	17.5		17.2				
Progression Factor					1.17	2.49		0.00				
Incremental Delay, d2					0.2	0.3		0.6				
Delay (s)					21.1	43.8		0.6				
Level of Service					C	D		A				
Approach Delay (s/veh)		0.0			30.9			0.6			0.0	
Approach LOS		A			C			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	11.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.29		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	39.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	242	0	0	0	0	0	577	160	0	0	0
Future Volume (vph)	0	242	0	0	0	0	0	577	160	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.1						9.8	9.8			
Lane Util. Factor		0.95						0.95	1.00			
Frpb, ped/bikes		1.00						1.00	0.99			
Flpb, ped/bikes		1.00						1.00	1.00			
Frt		1.00						1.00	0.85			
Flt Protected		1.00						1.00	1.00			
Satd. Flow (prot)		3762						3762	1660			
Flt Permitted		1.00						1.00	1.00			
Satd. Flow (perm)		3762						3762	1660			
Peak-hour factor, PHF	0.81	0.81	0.81	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	299	0	0	0	0	0	627	174	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	106	0	0	0
Lane Group Flow (vph)	0	299	0	0	0	0	0	627	68	0	0	0
Confl. Peds. (#/hr)									1			
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Turn Type		NA						NA	Perm			
Protected Phases		6						4				
Permitted Phases									4			
Actuated Green, G (s)		38.9						35.2	35.2			
Effective Green, g (s)		38.9						35.2	35.2			
Actuated g/C Ratio		0.43						0.39	0.39			
Clearance Time (s)		6.1						9.8	9.8			
Vehicle Extension (s)		3.0						3.0	3.0			
Lane Grp Cap (vph)		1626						1471	649			
v/s Ratio Prot		c0.08						c0.17				
v/s Ratio Perm									0.04			
v/c Ratio		0.18						0.43	0.10			
Uniform Delay, d1		15.8						20.0	17.4			
Progression Factor		0.00						1.00	1.00			
Incremental Delay, d2		0.2						0.9	0.3			
Delay (s)		0.3						20.9	17.7			
Level of Service		A						C	B			
Approach Delay (s/veh)		0.3			0.0			20.2			0.0	
Approach LOS		A			A			C			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	14.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	37.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	242	358	0	0	0	0	0	0	0	696	0
Future Volume (vph)	0	242	358	0	0	0	0	0	0	0	696	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		10.1	10.1								5.8	
Lane Util. Factor		0.95	1.00								0.95	
Frt		1.00	0.85								1.00	
Flt Protected		1.00	1.00								1.00	
Satd. Flow (prot)		3762	1683								3800	
Flt Permitted		1.00	1.00								1.00	
Satd. Flow (perm)		3762	1683								3800	
Peak-hour factor, PHF	0.81	0.81	0.81	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	299	442	0	0	0	0	0	0	0	757	0
RTOR Reduction (vph)	0	0	67	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	299	375	0	0	0	0	0	0	0	757	0
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	2%	2%	2%	0%	0%	0%
Turn Type		NA	Perm								NA	
Protected Phases		2									8	
Permitted Phases			2									
Actuated Green, G (s)		34.9	34.9								39.2	
Effective Green, g (s)		34.9	34.9								39.2	
Actuated g/C Ratio		0.39	0.39								0.44	
Clearance Time (s)		10.1	10.1								5.8	
Vehicle Extension (s)		3.0	3.0								3.0	
Lane Grp Cap (vph)		1458	652								1655	
v/s Ratio Prot		0.08									c0.20	
v/s Ratio Perm			c0.22									
v/c Ratio		0.21	0.58								0.46	
Uniform Delay, d1		18.3	21.7								17.9	
Progression Factor		1.00	1.00								0.00	
Incremental Delay, d2		0.3	3.7								0.8	
Delay (s)		18.6	25.4								0.8	
Level of Service		B	C								A	
Approach Delay (s/veh)		22.7			0.0			0.0			0.8	
Approach LOS		C			A			A			A	

Intersection Summary					
HCM 2000 Control Delay (s/veh)	11.6	HCM 2000 Level of Service	B		
HCM 2000 Volume to Capacity ratio	0.54				
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	19.9		
Intersection Capacity Utilization	52.6%	ICU Level of Service	A		
Analysis Period (min)	15				
c Critical Lane Group					

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	192	0	0	0	0	0	696	117
Future Volume (vph)	0	0	0	0	192	0	0	0	0	0	696	117
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					6.1						9.8	9.8
Lane Util. Factor					0.95						0.95	1.00
Frt					1.00						1.00	0.85
Flt Protected					1.00						1.00	1.00
Satd. Flow (prot)					3762						3800	1700
Flt Permitted					1.00						1.00	1.00
Satd. Flow (perm)					3762						3800	1700
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	209	0	0	0	0	0	757	127
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	77
Lane Group Flow (vph)	0	0	0	0	209	0	0	0	0	0	757	50
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	2%	2%	2%	0%	0%	0%
Turn Type					NA						NA	Perm
Protected Phases					6						4	
Permitted Phases												4
Actuated Green, G (s)					38.9						35.2	35.2
Effective Green, g (s)					38.9						35.2	35.2
Actuated g/C Ratio					0.43						0.39	0.39
Clearance Time (s)					6.1						9.8	9.8
Vehicle Extension (s)					3.0						3.0	3.0
Lane Grp Cap (vph)					1626						1486	664
v/s Ratio Prot					c0.06						c0.20	
v/s Ratio Perm												0.03
v/c Ratio					0.13						0.51	0.07
Uniform Delay, d1					15.4						20.8	17.2
Progression Factor					0.00						0.71	0.87
Incremental Delay, d2					0.2						1.2	0.2
Delay (s)					0.2						16.1	15.1
Level of Service					A						B	B
Approach Delay (s/veh)		0.0			0.2			0.0			15.9	
Approach LOS		A			A			A			B	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	12.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.33		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	39.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	21	0	79	5	8	13	79	705	11	5	730	10
Future Volume (vph)	21	0	79	5	8	13	79	705	11	5	730	10
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	6.4	6.4			6.4		5.9	5.9	5.9	5.9	5.9	5.9
Lane Util. Factor	1.00	1.00			1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85			0.93		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00			0.99		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1900	1700			1845		1900	2000	1700	1900	2000	1700
Flt Permitted	0.73	1.00			0.91		0.25	1.00	1.00	0.28	1.00	1.00
Satd. Flow (perm)	1458	1700			1697		501	2000	1700	561	2000	1700
Peak-hour factor, PHF	0.83	0.83	0.83	0.60	0.60	0.60	0.89	0.89	0.89	0.91	0.91	0.91
Adj. Flow (vph)	25	0	95	8	13	22	89	792	12	5	802	11
RTOR Reduction (vph)	0	88	0	0	20	0	0	0	4	0	0	4
Lane Group Flow (vph)	25	7	0	0	23	0	89	792	8	5	802	7
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		D.P+P	NA	Perm	D.P+P	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			6		2	2		6
Actuated Green, G (s)	6.8	6.8			6.8		65.0	63.6	63.6	65.0	59.7	59.7
Effective Green, g (s)	6.8	6.8			6.8		65.0	63.6	63.6	65.0	59.7	59.7
Actuated g/C Ratio	0.08	0.08			0.08		0.72	0.71	0.71	0.72	0.66	0.66
Clearance Time (s)	6.4	6.4			6.4		5.9	5.9	5.9	5.9	5.9	5.9
Vehicle Extension (s)	4.0	4.0			4.0		3.0	4.0	4.0	3.0	4.0	4.0
Lane Grp Cap (vph)	110	128			128		444	1413	1201	425	1326	1127
v/s Ratio Prot		0.00					c0.01	c0.40		0.00	c0.40	
v/s Ratio Perm	c0.02				0.01		0.13		0.00	0.01		0.00
v/c Ratio	0.23	0.06			0.18		0.20	0.56	0.01	0.01	0.60	0.01
Uniform Delay, d1	39.1	38.6			39.0		5.8	6.4	3.9	4.7	8.5	5.1
Progression Factor	1.00	1.00			1.00		1.23	0.91	1.00	0.49	0.77	1.00
Incremental Delay, d2	1.4	0.3			0.9		0.2	1.4	0.0	0.0	2.0	0.0
Delay (s)	40.6	38.9			39.9		7.3	7.3	3.9	2.3	8.5	5.1
Level of Service	D	D			D		A	A	A	A	A	A
Approach Delay (s/veh)		39.2			39.9			7.2			8.5	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	10.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.2
Intersection Capacity Utilization	62.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	152	296	481	164	288	525
Future Volume (vph)	152	296	481	164	288	525
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Lane Width	12	12	11	11	11	11
Total Lost time (s)	5.9	6.0	6.0	5.9	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1900	1700	1914	1627	1818	1914
Flt Permitted	0.95	1.00	1.00	1.00	0.32	1.00
Satd. Flow (perm)	1900	1700	1914	1627	617	1914
Peak-hour factor, PHF	0.94	0.94	0.86	0.86	0.91	0.91
Adj. Flow (vph)	162	315	559	191	316	577
RTOR Reduction (vph)	0	131	0	65	0	0
Lane Group Flow (vph)	162	184	559	126	316	577
Heavy Vehicles (%)	0%	0%	1%	1%	1%	1%
Turn Type	Prot	pm+ov	NA	pm+ov	D.P+P	NA
Protected Phases	8	5	6	8	5	2
Permitted Phases		8		6	6	
Actuated Green, G (s)	12.9	25.5	46.6	59.5	59.2	65.2
Effective Green, g (s)	12.9	25.5	46.6	59.5	59.2	65.2
Actuated g/C Ratio	0.14	0.28	0.52	0.66	0.66	0.72
Clearance Time (s)	5.9	6.0	6.0	5.9	6.0	6.0
Vehicle Extension (s)	3.0	3.5	3.0	3.0	3.5	3.0
Lane Grp Cap (vph)	272	481	991	1075	573	1386
v/s Ratio Prot	c0.09	0.05	c0.29	0.02	c0.08	0.30
v/s Ratio Perm		0.05		0.06	0.28	
v/c Ratio	0.60	0.38	0.56	0.12	0.55	0.42
Uniform Delay, d1	36.1	25.9	14.8	5.6	8.0	4.9
Progression Factor	1.21	1.14	1.00	1.67	1.74	0.26
Incremental Delay, d2	3.3	0.6	2.1	0.0	1.1	0.8
Delay (s)	47.0	30.1	16.9	9.4	15.0	2.1
Level of Service	D	C	B	A	B	A
Approach Delay (s/veh)	35.8		15.0			6.6
Approach LOS	D		B			A

Intersection Summary			
HCM 2000 Control Delay (s/veh)	16.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	17.9
Intersection Capacity Utilization	62.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	916	223	0	0	0	0	542	189	0	479	0
Future Volume (vph)	0	916	223	0	0	0	0	542	189	0	479	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.0	6.0					8.7	8.7		5.7	
Lane Util. Factor		0.95	1.00					0.95	1.00		0.95	
Frpb, ped/bikes		1.00	0.99					1.00	1.00		1.00	
Flpb, ped/bikes		1.00	1.00					1.00	1.00		1.00	
Frt		1.00	0.85					1.00	0.85		1.00	
Flt Protected		1.00	1.00					1.00	1.00		1.00	
Satd. Flow (prot)		3800	1678					3800	1700		3762	
Flt Permitted		1.00	1.00					1.00	1.00		1.00	
Satd. Flow (perm)		3800	1678					3800	1700		3762	
Peak-hour factor, PHF	0.93	0.93	0.93	0.92	0.92	0.92	0.89	0.89	0.89	0.93	0.93	0.93
Adj. Flow (vph)	0	985	240	0	0	0	0	609	212	0	515	0
RTOR Reduction (vph)	0	0	111	0	0	0	0	0	35	0	0	0
Lane Group Flow (vph)	0	985	129	0	0	0	0	609	177	0	515	0
Confl. Peds. (#/hr)			1									
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	1%	1%
Turn Type		NA	Perm					NA	Perm		NA	
Protected Phases		2						4			8	
Permitted Phases			2						4			
Actuated Green, G (s)		47.2	47.2					28.1	28.1		31.1	
Effective Green, g (s)		47.2	47.2					28.1	28.1		31.1	
Actuated g/C Ratio		0.52	0.52					0.31	0.31		0.35	
Clearance Time (s)		6.0	6.0					8.7	8.7		5.7	
Vehicle Extension (s)		3.0	3.0					4.0	4.0		4.0	
Lane Grp Cap (vph)		1992	880					1186	530		1299	
v/s Ratio Prot		c0.26						c0.16			0.14	
v/s Ratio Perm			0.08						0.10			
v/c Ratio		0.49	0.15					0.51	0.33		0.40	
Uniform Delay, d1		13.7	11.0					25.4	23.8		22.3	
Progression Factor		0.95	0.76					1.03	1.06		0.00	
Incremental Delay, d2		0.8	0.3					0.4	0.5		0.3	
Delay (s)		13.9	8.7					26.7	25.7		0.3	
Level of Service		B	A					C	C		A	
Approach Delay (s/veh)		12.8			0.0			26.4			0.3	
Approach LOS		B			A			C			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	14.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	14.7
Intersection Capacity Utilization	50.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	1139	174	0	542	0	0	479	159
Future Volume (vph)	0	0	0	0	1139	174	0	542	0	0	479	159
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	12	12	12	12	12	12	16	12	12	12	12
Total Lost time (s)					6.0			5.7			8.7	8.7
Lane Util. Factor					0.91			0.95			0.95	1.00
Frpb, ped/bikes					1.00			1.00			1.00	0.98
Flpb, ped/bikes					1.00			1.00			1.00	1.00
Frt					0.98			1.00			1.00	0.85
Flt Protected					1.00			1.00			1.00	1.00
Satd. Flow (prot)					5342			4307			3762	1650
Flt Permitted					1.00			1.00			1.00	1.00
Satd. Flow (perm)					5342			4307			3762	1650
Peak-hour factor, PHF	0.92	0.92	0.92	0.91	0.91	0.91	0.89	0.89	0.89	0.93	0.93	0.93
Adj. Flow (vph)	0	0	0	0	1252	191	0	609	0	0	515	171
RTOR Reduction (vph)	0	0	0	0	19	0	0	0	0	0	0	25
Lane Group Flow (vph)	0	0	0	0	1424	0	0	609	0	0	515	146
Confl. Peds. (#/hr)						1						4
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	1%	1%
Turn Type					NA			NA			NA	Perm
Protected Phases					2			8			4	
Permitted Phases												4
Actuated Green, G (s)					47.2			31.1			28.1	28.1
Effective Green, g (s)					47.2			31.1			28.1	28.1
Actuated g/C Ratio					0.52			0.35			0.31	0.31
Clearance Time (s)					6.0			5.7			8.7	8.7
Vehicle Extension (s)					3.0			4.0			4.0	4.0
Lane Grp Cap (vph)					2801			1488			1174	515
v/s Ratio Prot					c0.27			c0.14			0.14	
v/s Ratio Perm												0.09
v/c Ratio					0.51			0.41			0.44	0.28
Uniform Delay, d1					13.9			22.4			24.7	23.4
Progression Factor					0.87			0.00			0.88	0.82
Incremental Delay, d2					0.6			0.2			0.3	0.4
Delay (s)					12.7			0.2			22.1	19.5
Level of Service					B			A			C	B
Approach Delay (s/veh)		0.0			12.7			0.2			21.4	
Approach LOS		A			B			A			C	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	12.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	14.7
Intersection Capacity Utilization	50.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	41	0	45	1	10	1	36	603	1	1	636	40
Future Volume (vph)	41	0	45	1	10	1	36	603	1	1	636	40
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	10	12	10	12	12	12	11	11	12	12	11	11
Total Lost time (s)	6.4	6.4		6.4	6.4		6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85		1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1756	1683		1863	1936		1837	1933	1667	1863	1914	1627
Flt Permitted	0.75	1.00		0.72	1.00		0.30	1.00	1.00	0.31	1.00	1.00
Satd. Flow (perm)	1386	1683		1404	1936		581	1933	1667	614	1914	1627
Peak-hour factor, PHF	0.72	0.92	0.72	0.92	0.92	0.92	0.82	0.82	0.92	0.92	0.87	0.87
Adj. Flow (vph)	57	0	62	1	11	1	44	735	1	1	731	46
RTOR Reduction (vph)	0	58	0	0	1	0	0	0	0	0	0	15
Lane Group Flow (vph)	57	5	0	1	11	0	44	735	1	1	731	31
Heavy Vehicles (%)	1%	2%	1%	2%	2%	2%	0%	0%	2%	2%	1%	1%
Turn Type	Perm	NA		Perm	NA		D.P+P	NA	Perm	D.P+P	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			6		2	2		6
Actuated Green, G (s)	6.7	6.7		6.7	6.7		64.9	63.8	63.8	64.9	61.1	61.1
Effective Green, g (s)	6.7	6.7		6.7	6.7		64.9	63.8	63.8	64.9	61.1	61.1
Actuated g/C Ratio	0.07	0.07		0.07	0.07		0.72	0.71	0.71	0.72	0.68	0.68
Clearance Time (s)	6.4	6.4		6.4	6.4		6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	103	125		104	144		471	1370	1181	458	1299	1104
v/s Ratio Prot		0.00			0.01		c0.00	c0.38		0.00	c0.38	
v/s Ratio Perm	c0.04			0.00			0.06		0.00	0.00		0.02
v/c Ratio	0.55	0.04		0.01	0.08		0.09	0.54	0.00	0.00	0.56	0.03
Uniform Delay, d1	40.2	38.7		38.6	38.8		4.7	6.2	3.8	4.3	7.5	4.7
Progression Factor	1.00	1.00		1.00	1.00		1.13	2.01	1.00	0.85	0.85	1.00
Incremental Delay, d2	6.3	0.1		0.0	0.2		0.1	1.5	0.0	0.0	1.7	0.0
Delay (s)	46.5	38.8		38.6	39.0		5.4	13.8	3.8	3.7	8.0	4.8
Level of Service	D	D		D	D		A	B	A	A	A	A
Approach Delay (s/veh)		42.4			39.0			13.4			7.8	
Approach LOS		D			D			B			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	13.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.4
Intersection Capacity Utilization	51.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	155	220	0	820	0	0	0	0
Future Volume (vph)	0	0	0	0	155	220	0	820	0	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					10.1	10.1		5.8				
Lane Util. Factor					0.95	1.00		0.95				
Frt					1.00	0.85		1.00				
Flt Protected					1.00	1.00		1.00				
Satd. Flow (prot)					3800	1700		3800				
Flt Permitted					1.00	1.00		1.00				
Satd. Flow (perm)					3800	1700		3800				
Peak-hour factor, PHF	0.92	0.92	0.92	0.85	0.85	0.85	0.95	0.95	0.95	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	182	259	0	863	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	44	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	182	215	0	863	0	0	0	0
Heavy Vehicles (%)	2%	2%	2%	0%	0%	0%	0%	0%	0%	2%	2%	2%
Turn Type					NA	Perm		NA				
Protected Phases					2			8				
Permitted Phases						2						
Actuated Green, G (s)					41.9	41.9		32.2				
Effective Green, g (s)					41.9	41.9		32.2				
Actuated g/C Ratio					0.47	0.47		0.36				
Clearance Time (s)					10.1	10.1		5.8				
Vehicle Extension (s)					3.0	3.0		3.0				
Lane Grp Cap (vph)					1769	791		1359				
v/s Ratio Prot					0.05			c0.23				
v/s Ratio Perm						c0.13						
v/c Ratio					0.10	0.27		0.64				
Uniform Delay, d1					13.5	14.7		24.0				
Progression Factor					0.81	0.78		0.00				
Incremental Delay, d2					0.1	0.8		1.5				
Delay (s)					11.1	12.3		1.6				
Level of Service					B	B		A				
Approach Delay (s/veh)		0.0			11.8			1.6			0.0	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	5.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	47.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	450	0	0	0	0	0	820	178	0	0	0
Future Volume (vph)	0	450	0	0	0	0	0	820	178	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.1						9.8	9.8			
Lane Util. Factor		0.95						0.95	1.00			
Frpb, ped/bikes		1.00						1.00	0.99			
Flpb, ped/bikes		1.00						1.00	1.00			
Frt		1.00						1.00	0.85			
Flt Protected		1.00						1.00	1.00			
Satd. Flow (prot)		3800						3800	1677			
Flt Permitted		1.00						1.00	1.00			
Satd. Flow (perm)		3800						3800	1677			
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.95	0.95	0.95	0.92	0.92	0.92
Adj. Flow (vph)	0	500	0	0	0	0	0	863	187	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	128	0	0	0
Lane Group Flow (vph)	0	500	0	0	0	0	0	863	59	0	0	0
Confl. Peds. (#/hr)									1			
Heavy Vehicles (%)	0%	0%	0%	2%	2%	2%	0%	0%	0%	2%	2%	2%
Turn Type		NA						NA	Perm			
Protected Phases		6						4				
Permitted Phases									4			
Actuated Green, G (s)		45.9						28.2	28.2			
Effective Green, g (s)		45.9						28.2	28.2			
Actuated g/C Ratio		0.51						0.31	0.31			
Clearance Time (s)		6.1						9.8	9.8			
Vehicle Extension (s)		3.0						3.0	3.0			
Lane Grp Cap (vph)		1938						1190	525			
v/s Ratio Prot		c0.13						c0.23				
v/s Ratio Perm									0.03			
v/c Ratio		0.26						0.73	0.11			
Uniform Delay, d1		12.4						27.5	22.0			
Progression Factor		0.00						1.00	1.00			
Incremental Delay, d2		0.3						3.9	0.4			
Delay (s)		0.3						31.3	22.4			
Level of Service		A						C	C			
Approach Delay (s/veh)		0.3			0.0			29.7			0.0	
Approach LOS		A			A			C			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	20.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	47.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	450	478	0	0	0	0	0	0	0	650	0
Future Volume (vph)	0	450	478	0	0	0	0	0	0	0	650	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		10.1	10.1								5.8	
Lane Util. Factor		0.95	1.00								0.95	
Frt		1.00	0.85								1.00	
Flt Protected		1.00	1.00								1.00	
Satd. Flow (prot)		3800	1700								3800	
Flt Permitted		1.00	1.00								1.00	
Satd. Flow (perm)		3800	1700								3800	
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.92	0.92	0.92	0.95	0.95	0.95
Adj. Flow (vph)	0	500	531	0	0	0	0	0	0	0	684	0
RTOR Reduction (vph)	0	0	46	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	500	485	0	0	0	0	0	0	0	684	0
Heavy Vehicles (%)	0%	0%	0%	2%	2%	2%	2%	2%	2%	0%	0%	0%
Turn Type		NA	Perm								NA	
Protected Phases		2									8	
Permitted Phases			2									
Actuated Green, G (s)		41.9	41.9								32.2	
Effective Green, g (s)		41.9	41.9								32.2	
Actuated g/C Ratio		0.47	0.47								0.36	
Clearance Time (s)		10.1	10.1								5.8	
Vehicle Extension (s)		3.0	3.0								3.0	
Lane Grp Cap (vph)		1769	791								1359	
v/s Ratio Prot		0.13									c0.18	
v/s Ratio Perm			c0.29									
v/c Ratio		0.28	0.61								0.50	
Uniform Delay, d1		14.8	18.0								22.6	
Progression Factor		1.00	1.00								0.00	
Incremental Delay, d2		0.4	3.5								1.1	
Delay (s)		15.2	21.5								1.1	
Level of Service		B	C								A	
Approach Delay (s/veh)		18.5			0.0			0.0			1.1	
Approach LOS		B			A			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	11.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	58.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	155	0	0	0	0	0	650	57
Future Volume (vph)	0	0	0	0	155	0	0	0	0	0	650	57
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					6.1						9.8	9.8
Lane Util. Factor					0.95						0.95	1.00
Frpb, ped/bikes					1.00						1.00	0.99
Flpb, ped/bikes					1.00						1.00	1.00
Frt					1.00						1.00	0.85
Flt Protected					1.00						1.00	1.00
Satd. Flow (prot)					3800						3800	1677
Flt Permitted					1.00						1.00	1.00
Satd. Flow (perm)					3800						3800	1677
Peak-hour factor, PHF	0.92	0.92	0.92	0.85	0.85	0.85	0.92	0.92	0.92	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	0	182	0	0	0	0	0	684	60
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	41
Lane Group Flow (vph)	0	0	0	0	182	0	0	0	0	0	684	19
Confl. Peds. (#/hr)												1
Heavy Vehicles (%)	2%	2%	2%	0%	0%	0%	2%	2%	2%	0%	0%	0%
Turn Type					NA						NA	Perm
Protected Phases					6						4	
Permitted Phases												4
Actuated Green, G (s)					45.9						28.2	28.2
Effective Green, g (s)					45.9						28.2	28.2
Actuated g/C Ratio					0.51						0.31	0.31
Clearance Time (s)					6.1						9.8	9.8
Vehicle Extension (s)					3.0						3.0	3.0
Lane Grp Cap (vph)					1938						1190	525
v/s Ratio Prot					c0.05						c0.18	
v/s Ratio Perm												0.01
v/c Ratio					0.09						0.57	0.04
Uniform Delay, d1					11.3						25.9	21.5
Progression Factor					0.00						0.59	1.06
Incremental Delay, d2					0.1						1.9	0.1
Delay (s)					0.1						17.0	22.8
Level of Service					A						B	C
Approach Delay (s/veh)		0.0			0.1			0.0			17.5	
Approach LOS		A			A			A			B	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	14.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.29		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	47.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	24	10	117	12	6	12	94	981	17	5	672	13
Future Volume (vph)	24	10	117	12	6	12	94	981	17	5	672	13
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	6.4	6.4			6.4		5.9	5.9	5.9	5.9	5.9	5.9
Lane Util. Factor	1.00	1.00			1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.86			0.95		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00			0.98		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1900	1723			1855		1900	2000	1700	1900	2000	1700
Flt Permitted	0.73	1.00			0.67		0.27	1.00	1.00	0.14	1.00	1.00
Satd. Flow (perm)	1469	1723			1259		538	2000	1700	281	2000	1700
Peak-hour factor, PHF	0.82	0.82	0.82	0.83	0.83	0.83	0.94	0.94	0.94	0.89	0.89	0.89
Adj. Flow (vph)	29	12	143	14	7	14	100	1044	18	6	755	15
RTOR Reduction (vph)	0	130	0	0	13	0	0	0	6	0	0	5
Lane Group Flow (vph)	29	25	0	0	22	0	100	1044	13	6	755	10
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		D.P+P	NA	Perm	D.P+P	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			6		2	2		6
Actuated Green, G (s)	7.9	7.9			7.9		63.9	62.5	62.5	63.9	58.4	58.4
Effective Green, g (s)	7.9	7.9			7.9		63.9	62.5	62.5	63.9	58.4	58.4
Actuated g/C Ratio	0.09	0.09			0.09		0.71	0.69	0.69	0.71	0.65	0.65
Clearance Time (s)	6.4	6.4			6.4		5.9	5.9	5.9	5.9	5.9	5.9
Vehicle Extension (s)	4.0	4.0			4.0		3.0	4.0	4.0	3.0	4.0	4.0
Lane Grp Cap (vph)	128	151			110		465	1388	1180	224	1297	1103
v/s Ratio Prot		0.01					c0.01	c0.52		0.00	0.38	
v/s Ratio Perm	c0.02				0.02		0.14		0.01	0.02		0.01
v/c Ratio	0.23	0.16			0.20		0.22	0.75	0.01	0.03	0.58	0.01
Uniform Delay, d1	38.2	38.0			38.1		5.8	8.8	4.2	9.6	8.9	5.6
Progression Factor	1.00	1.00			1.00		1.23	1.13	1.00	0.44	0.81	1.00
Incremental Delay, d2	1.2	0.7			1.2		0.2	2.8	0.0	0.0	1.9	0.0
Delay (s)	39.4	38.7			39.4		7.4	12.7	4.2	4.2	9.1	5.6
Level of Service	D	D			D		A	B	A	A	A	A
Approach Delay (s/veh)		38.8			39.4			12.1			9.0	
Approach LOS		D			D			B			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	13.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.2
Intersection Capacity Utilization	81.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	187	397	686	327	261	536
Future Volume (vph)	187	397	686	327	261	536
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Lane Width	12	12	11	11	11	11
Total Lost time (s)	5.9	6.0	6.0	5.9	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1900	1700	1933	1643	1837	1933
Flt Permitted	0.95	1.00	1.00	1.00	0.18	1.00
Satd. Flow (perm)	1900	1700	1933	1643	339	1933
Peak-hour factor, PHF	0.94	0.94	0.93	0.93	0.95	0.95
Adj. Flow (vph)	199	422	738	352	275	564
RTOR Reduction (vph)	0	90	0	82	0	0
Lane Group Flow (vph)	199	332	738	270	275	564
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Turn Type	Prot	pm+ov	NA	pm+ov	D.P+P	NA
Protected Phases	8	5	6	8	5	2
Permitted Phases		8		6	6	
Actuated Green, G (s)	14.1	26.5	45.6	59.7	58.0	64.0
Effective Green, g (s)	14.1	26.5	45.6	59.7	58.0	64.0
Actuated g/C Ratio	0.16	0.29	0.51	0.66	0.64	0.71
Clearance Time (s)	5.9	6.0	6.0	5.9	6.0	6.0
Vehicle Extension (s)	3.0	3.5	3.0	3.0	3.5	3.0
Lane Grp Cap (vph)	297	500	979	1089	424	1374
v/s Ratio Prot	c0.10	c0.09	c0.38	0.04	0.09	0.29
v/s Ratio Perm		0.10		0.13	0.33	
v/c Ratio	0.67	0.66	0.75	0.25	0.65	0.41
Uniform Delay, d1	35.8	27.8	17.7	6.1	12.1	5.3
Progression Factor	0.95	1.49	0.85	0.72	2.04	0.37
Incremental Delay, d2	5.2	3.0	4.0	0.1	3.0	0.8
Delay (s)	39.3	44.6	19.1	4.5	27.8	2.7
Level of Service	D	D	B	A	C	A
Approach Delay (s/veh)	42.9		14.4			10.9
Approach LOS	D		B			B

Intersection Summary			
HCM 2000 Control Delay (s/veh)	20.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	17.9
Intersection Capacity Utilization	72.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↱					↑↑	↱		↑↑	
Traffic Volume (vph)	0	1380	200	0	0	0	0	651	287	0	515	0
Future Volume (vph)	0	1380	200	0	0	0	0	651	287	0	515	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.0	6.0					8.7	8.7		5.7	
Lane Util. Factor		0.95	1.00					0.95	1.00		0.95	
Frpb, ped/bikes		1.00	0.99					1.00	0.99		1.00	
Flpb, ped/bikes		1.00	1.00					1.00	1.00		1.00	
Frt		1.00	0.85					1.00	0.85		1.00	
Flt Protected		1.00	1.00					1.00	1.00		1.00	
Satd. Flow (prot)		3800	1678					3800	1676		3800	
Flt Permitted		1.00	1.00					1.00	1.00		1.00	
Satd. Flow (perm)		3800	1678					3800	1676		3800	
Peak-hour factor, PHF	0.95	0.95	0.95	0.92	0.92	0.92	0.93	0.93	0.93	0.95	0.95	0.95
Adj. Flow (vph)	0	1453	211	0	0	0	0	700	309	0	542	0
RTOR Reduction (vph)	0	0	99	0	0	0	0	0	24	0	0	0
Lane Group Flow (vph)	0	1453	113	0	0	0	0	700	285	0	542	0
Confl. Peds. (#/hr)			1						1			
Heavy Vehicles (%)	0%	0%	0%	2%	2%	2%	0%	0%	0%	0%	0%	0%
Turn Type		NA	Perm					NA	Perm		NA	
Protected Phases		2						4			8	
Permitted Phases			2						4			
Actuated Green, G (s)		45.0	45.0					30.3	30.3		33.3	
Effective Green, g (s)		45.0	45.0					30.3	30.3		33.3	
Actuated g/C Ratio		0.50	0.50					0.34	0.34		0.37	
Clearance Time (s)		6.0	6.0					8.7	8.7		5.7	
Vehicle Extension (s)		3.0	3.0					4.0	4.0		4.0	
Lane Grp Cap (vph)		1900	839					1279	564		1406	
v/s Ratio Prot		c0.38						c0.18			0.14	
v/s Ratio Perm			0.07						0.17			
v/c Ratio		0.76	0.13					0.55	0.51		0.39	
Uniform Delay, d1		18.2	12.1					24.3	23.9		20.8	
Progression Factor		0.90	0.48					1.16	1.16		0.00	
Incremental Delay, d2		2.6	0.3					0.4	0.7		0.2	
Delay (s)		19.0	6.1					28.6	28.3		0.3	
Level of Service		B	A					C	C		A	
Approach Delay (s/veh)		17.4			0.0			28.5			0.3	
Approach LOS		B			A			C			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	18.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	14.7
Intersection Capacity Utilization	65.6%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	1161	152	0	651	0	0	515	183
Future Volume (vph)	0	0	0	0	1161	152	0	651	0	0	515	183
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	12	12	12	12	12	12	16	12	12	12	12
Total Lost time (s)					6.0			5.7			8.7	8.7
Lane Util. Factor					0.91			0.95			0.95	1.00
Frpb, ped/bikes					1.00			1.00			1.00	1.00
Flpb, ped/bikes					1.00			1.00			1.00	1.00
Frt					0.98			1.00			1.00	0.85
Flt Protected					1.00			1.00			1.00	1.00
Satd. Flow (prot)					5357			4307			3800	1700
Flt Permitted					1.00			1.00			1.00	1.00
Satd. Flow (perm)					5357			4307			3800	1700
Peak-hour factor, PHF	0.92	0.92	0.92	0.91	0.91	0.91	0.93	0.93	0.93	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	0	1276	167	0	700	0	0	542	193
RTOR Reduction (vph)	0	0	0	0	17	0	0	0	0	0	0	24
Lane Group Flow (vph)	0	0	0	0	1426	0	0	700	0	0	542	169
Confl. Peds. (#/hr)						2						
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type					NA			NA			NA	Perm
Protected Phases					2			8			4	
Permitted Phases												4
Actuated Green, G (s)					45.0			33.3			30.3	30.3
Effective Green, g (s)					45.0			33.3			30.3	30.3
Actuated g/C Ratio					0.50			0.37			0.34	0.34
Clearance Time (s)					6.0			5.7			8.7	8.7
Vehicle Extension (s)					3.0			4.0			4.0	4.0
Lane Grp Cap (vph)					2678			1593			1279	572
v/s Ratio Prot					c0.27			c0.16			0.14	
v/s Ratio Perm												0.10
v/c Ratio					0.53			0.44			0.42	0.30
Uniform Delay, d1					15.3			21.3			23.1	22.0
Progression Factor					0.96			0.00			1.08	1.12
Incremental Delay, d2					0.7			0.2			0.3	0.4
Delay (s)					15.4			0.2			25.2	25.0
Level of Service					B			A			C	C
Approach Delay (s/veh)		0.0			15.4			0.2			25.2	
Approach LOS		A			B			A			C	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	14.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	14.7
Intersection Capacity Utilization	65.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	49	0	48	1	10	1	69	963	1	1	689	33
Future Volume (vph)	49	0	48	1	10	1	69	963	1	1	689	33
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	10	12	10	12	12	12	11	11	12	12	11	11
Total Lost time (s)	6.4	6.4		6.1	6.1		6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85		1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1773	1700		1863	1936		1837	1933	1667	1863	1914	1627
Flt Permitted	0.75	1.00		0.72	1.00		0.29	1.00	1.00	0.14	1.00	1.00
Satd. Flow (perm)	1399	1700		1405	1936		551	1933	1667	268	1914	1627
Peak-hour factor, PHF	0.78	0.92	0.78	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.95	0.95
Adj. Flow (vph)	63	0	62	1	11	1	75	1047	1	1	725	35
RTOR Reduction (vph)	0	56	0	0	1	0	0	0	0	0	0	12
Lane Group Flow (vph)	63	6	0	1	11	0	75	1047	1	1	725	23
Heavy Vehicles (%)	0%	2%	0%	2%	2%	2%	0%	0%	2%	2%	1%	1%
Turn Type	Perm	NA		Perm	NA		D.P+P	NA	Perm	D.P+P	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			6		2	2		6
Actuated Green, G (s)	8.3	8.3		8.6	8.6		63.3	62.2	62.2	63.3	58.0	58.0
Effective Green, g (s)	8.3	8.3		8.6	8.6		63.3	62.2	62.2	63.3	58.0	58.0
Actuated g/C Ratio	0.09	0.09		0.10	0.10		0.70	0.69	0.69	0.70	0.64	0.64
Clearance Time (s)	6.4	6.4		6.1	6.1		6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	129	156		134	184		463	1335	1152	207	1233	1048
v/s Ratio Prot		0.00			0.01		c0.01	c0.54		0.00	0.38	
v/s Ratio Perm	c0.05			0.00			0.10		0.00	0.00		0.01
v/c Ratio	0.49	0.04		0.01	0.06		0.16	0.78	0.00	0.00	0.59	0.02
Uniform Delay, d1	38.8	37.2		36.8	37.0		5.6	9.4	4.3	9.9	9.2	5.8
Progression Factor	1.00	1.00		1.00	1.00		1.03	2.07	1.00	1.16	0.82	1.00
Incremental Delay, d2	2.9	0.1		0.0	0.1		0.1	4.1	0.0	0.0	1.9	0.0
Delay (s)	41.7	37.3		36.9	37.2		6.0	23.5	4.3	11.5	9.4	5.8
Level of Service	D	D		D	D		A	C	A	B	A	A
Approach Delay (s/veh)		39.5			37.1			22.3			9.3	
Approach LOS		D			D			C			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	18.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.4
Intersection Capacity Utilization	74.1%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	304	129	0	465	0	0	0	0
Future Volume (vph)	0	0	0	0	304	129	0	465	0	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					10.1	10.1		5.8				
Lane Util. Factor					0.95	1.00		0.95				
Frt					1.00	0.85		1.00				
Flt Protected					1.00	1.00		1.00				
Satd. Flow (prot)					3762	1683		3762				
Flt Permitted					1.00	1.00		1.00				
Satd. Flow (perm)					3762	1683		3762				
Peak-hour factor, PHF	0.92	0.92	0.92	0.86	0.86	0.86	0.87	0.87	0.87	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	353	150	0	534	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	102	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	353	48	0	534	0	0	0	0
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	1%	1%	1%	2%	2%	2%
Turn Type					NA	Perm		NA				
Protected Phases					2			8				
Permitted Phases						2						
Actuated Green, G (s)					28.9	28.9		45.2				
Effective Green, g (s)					28.9	28.9		45.2				
Actuated g/C Ratio					0.32	0.32		0.50				
Clearance Time (s)					10.1	10.1		5.8				
Vehicle Extension (s)					3.0	3.0		3.0				
Lane Grp Cap (vph)					1208	540		1889				
v/s Ratio Prot					c0.09			c0.14				
v/s Ratio Perm						0.03						
v/c Ratio					0.29	0.09		0.28				
Uniform Delay, d1					22.9	21.4		13.0				
Progression Factor					1.11	2.19		0.00				
Incremental Delay, d2					0.6	0.3		0.4				
Delay (s)					26.1	47.2		0.4				
Level of Service					C	D		A				
Approach Delay (s/veh)		0.0			32.4			0.4			0.0	
Approach LOS		A			C			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	15.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.30		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	52.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	189	0	0	0	0	0	465	105	0	0	0
Future Volume (vph)	0	189	0	0	0	0	0	465	105	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.1						9.8	9.8			
Lane Util. Factor		0.95						0.95	1.00			
Frt		1.00						1.00	0.85			
Flt Protected		1.00						1.00	1.00			
Satd. Flow (prot)		3800						3762	1683			
Flt Permitted		1.00						1.00	1.00			
Satd. Flow (perm)		3800						3762	1683			
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.87	0.87	0.87	0.92	0.92	0.92
Adj. Flow (vph)	0	210	0	0	0	0	0	534	121	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	66	0	0	0
Lane Group Flow (vph)	0	210	0	0	0	0	0	534	55	0	0	0
Heavy Vehicles (%)	0%	0%	0%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Turn Type		NA						NA	Perm			
Protected Phases		6						4				
Permitted Phases									4			
Actuated Green, G (s)		32.9						41.2	41.2			
Effective Green, g (s)		32.9						41.2	41.2			
Actuated g/C Ratio		0.37						0.46	0.46			
Clearance Time (s)		6.1						9.8	9.8			
Vehicle Extension (s)		3.0						3.0	3.0			
Lane Grp Cap (vph)		1389						1722	770			
v/s Ratio Prot		c0.06						c0.14				
v/s Ratio Perm									0.03			
v/c Ratio		0.15						0.31	0.07			
Uniform Delay, d1		19.2						15.4	13.7			
Progression Factor		0.00						1.00	1.00			
Incremental Delay, d2		0.2						0.5	0.2			
Delay (s)		0.2						15.9	13.9			
Level of Service		A						B	B			
Approach Delay (s/veh)		0.2			0.0			15.5			0.0	
Approach LOS		A			A			B			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	11.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.25		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	33.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	189	261	0	0	0	0	0	0	0	1178	0
Future Volume (vph)	0	189	261	0	0	0	0	0	0	0	1178	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		10.1	10.1								5.8	
Lane Util. Factor		0.95	1.00								0.95	
Frpb, ped/bikes		1.00	0.99								1.00	
Flpb, ped/bikes		1.00	1.00								1.00	
Frt		1.00	0.85								1.00	
Flt Protected		1.00	1.00								1.00	
Satd. Flow (prot)		3725	1645								3800	
Flt Permitted		1.00	1.00								1.00	
Satd. Flow (perm)		3725	1645								3800	
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.92	0.92	0.92	0.94	0.94	0.94
Adj. Flow (vph)	0	210	290	0	0	0	0	0	0	0	1253	0
RTOR Reduction (vph)	0	0	56	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	210	234	0	0	0	0	0	0	0	1253	0
Confl. Peds. (#/hr)			1									
Heavy Vehicles (%)	0%	2%	2%	2%	2%	2%	2%	2%	2%	0%	0%	0%
Turn Type		NA	Perm								NA	
Protected Phases		2									8	
Permitted Phases			2									
Actuated Green, G (s)		28.9	28.9								45.2	
Effective Green, g (s)		28.9	28.9								45.2	
Actuated g/C Ratio		0.32	0.32								0.50	
Clearance Time (s)		10.1	10.1								5.8	
Vehicle Extension (s)		3.0	3.0								3.0	
Lane Grp Cap (vph)		1196	528								1908	
v/s Ratio Prot		0.06									c0.33	
v/s Ratio Perm			c0.14									
v/c Ratio		0.18	0.44								0.66	
Uniform Delay, d1		22.0	24.2								16.6	
Progression Factor		1.00	1.00								0.00	
Incremental Delay, d2		0.3	2.7								1.2	
Delay (s)		22.3	26.9								1.2	
Level of Service		C	C								A	
Approach Delay (s/veh)		25.0			0.0			0.0			1.2	
Approach LOS		C			A			A			A	

Intersection Summary					
HCM 2000 Control Delay (s/veh)	8.0	HCM 2000 Level of Service		A	
HCM 2000 Volume to Capacity ratio	0.61				
Actuated Cycle Length (s)	90.0	Sum of lost time (s)		19.9	
Intersection Capacity Utilization	61.7%	ICU Level of Service		B	
Analysis Period (min)	15				

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	304	0	0	0	0	0	1178	136
Future Volume (vph)	0	0	0	0	304	0	0	0	0	0	1178	136
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					6.1						9.8	9.8
Lane Util. Factor					0.95						0.95	1.00
Frt					1.00						1.00	0.85
Flt Protected					1.00						1.00	1.00
Satd. Flow (prot)					3800						3800	1700
Flt Permitted					1.00						1.00	1.00
Satd. Flow (perm)					3800						3800	1700
Peak-hour factor, PHF	0.92	0.92	0.92	0.86	0.86	0.86	0.92	0.92	0.92	0.94	0.94	0.94
Adj. Flow (vph)	0	0	0	0	353	0	0	0	0	0	1253	145
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	79
Lane Group Flow (vph)	0	0	0	0	353	0	0	0	0	0	1253	66
Heavy Vehicles (%)	2%	2%	2%	0%	0%	0%	2%	2%	2%	0%	0%	0%
Turn Type					NA						NA	Perm
Protected Phases					6						4	
Permitted Phases												4
Actuated Green, G (s)					32.9						41.2	41.2
Effective Green, g (s)					32.9						41.2	41.2
Actuated g/C Ratio					0.37						0.46	0.46
Clearance Time (s)					6.1						9.8	9.8
Vehicle Extension (s)					3.0						3.0	3.0
Lane Grp Cap (vph)					1389						1739	778
v/s Ratio Prot					c0.09						c0.33	
v/s Ratio Perm												0.04
v/c Ratio					0.25						0.72	0.09
Uniform Delay, d1					20.0						19.7	13.8
Progression Factor					0.00						0.50	0.21
Incremental Delay, d2					0.4						1.8	0.1
Delay (s)					0.4						11.8	3.1
Level of Service					A						B	A
Approach Delay (s/veh)		0.0			0.4			0.0			10.9	
Approach LOS		A			A			A			B	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	8.8	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	52.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2	5	44	30	22	13	152	551	4	8	964	17
Future Volume (vph)	2	5	44	30	22	13	152	551	4	8	964	17
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	6.4	6.4			6.4		5.9	5.9	5.9	5.9	5.9	5.9
Lane Util. Factor	1.00	1.00			1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.87			0.97		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00			0.98		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1900	1731			1902		1881	1980	1683	1900	2000	1700
Flt Permitted	0.73	1.00			0.82		0.07	1.00	1.00	0.40	1.00	1.00
Satd. Flow (perm)	1469	1731			1593		139	1980	1683	799	2000	1700
Peak-hour factor, PHF	0.73	0.73	0.73	0.64	0.64	0.64	0.95	0.95	0.95	0.87	0.87	0.87
Adj. Flow (vph)	3	7	60	47	34	20	160	580	4	9	1108	20
RTOR Reduction (vph)	0	55	0	0	10	0	0	0	1	0	0	7
Lane Group Flow (vph)	3	12	0	0	91	0	160	580	3	9	1108	13
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	1%	1%	1%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		D.P+P	NA	Perm	D.P+P	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			6		2	2		6
Actuated Green, G (s)	6.9	6.9			6.9		64.9	63.7	63.7	64.9	56.9	56.9
Effective Green, g (s)	6.9	6.9			6.9		64.9	63.7	63.7	64.9	56.9	56.9
Actuated g/C Ratio	0.08	0.08			0.08		0.72	0.71	0.71	0.72	0.63	0.63
Clearance Time (s)	6.4	6.4			6.4		5.9	5.9	5.9	5.9	5.9	5.9
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	112	132			122		255	1401	1191	590	1264	1074
v/s Ratio Prot		0.01					c0.06	0.29		0.00	c0.55	
v/s Ratio Perm	0.00				c0.06		0.40		0.00	0.01		0.01
v/c Ratio	0.03	0.09			0.74		0.63	0.41	0.00	0.02	0.88	0.01
Uniform Delay, d1	38.4	38.6			40.7		21.4	5.4	3.8	3.8	13.7	6.1
Progression Factor	1.00	1.00			1.00		1.31	0.84	1.00	1.00	1.52	1.00
Incremental Delay, d2	0.1	0.3			21.6		4.3	0.8	0.0	0.0	7.9	0.0
Delay (s)	38.5	38.9			62.3		32.4	5.4	3.9	3.8	28.7	6.2
Level of Service	D	D			E		C	A	A	A	C	A
Approach Delay (s/veh)		38.9			62.3			11.2			28.2	
Approach LOS		D			E			B			C	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	24.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.2
Intersection Capacity Utilization	81.5%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	345	315	403	200	312	744
Future Volume (vph)	345	315	403	200	312	744
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Lane Width	12	12	11	11	11	11
Total Lost time (s)	5.9	6.0	6.0	5.9	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1881	1683	1933	1643	1837	1933
Flt Permitted	0.95	1.00	1.00	1.00	0.39	1.00
Satd. Flow (perm)	1881	1683	1933	1643	752	1933
Peak-hour factor, PHF	0.88	0.88	0.95	0.95	0.82	0.82
Adj. Flow (vph)	392	358	424	211	380	907
RTOR Reduction (vph)	0	153	0	44	0	0
Lane Group Flow (vph)	392	205	424	167	380	907
Heavy Vehicles (%)	1%	1%	0%	0%	0%	0%
Turn Type	Prot	pm+ov	NA	pm+ov	D.P+P	NA
Protected Phases	8	5	6	8	5	2
Permitted Phases		8		6	6	
Actuated Green, G (s)	23.8	32.8	39.3	63.1	48.3	54.3
Effective Green, g (s)	23.8	32.8	39.3	63.1	48.3	54.3
Actuated g/C Ratio	0.26	0.36	0.44	0.70	0.54	0.60
Clearance Time (s)	5.9	6.0	6.0	5.9	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	497	613	844	1151	512	1166
v/s Ratio Prot	c0.21	0.03	0.22	0.04	0.07	c0.47
v/s Ratio Perm		0.09		0.06	0.32	
v/c Ratio	0.79	0.33	0.50	0.15	0.74	0.78
Uniform Delay, d1	30.8	20.7	18.3	4.5	14.4	13.3
Progression Factor	1.27	1.84	0.55	0.45	1.59	1.50
Incremental Delay, d2	7.4	0.3	2.0	0.1	4.0	3.5
Delay (s)	46.3	38.3	12.0	2.1	26.8	23.6
Level of Service	D	D	B	A	C	C
Approach Delay (s/veh)	42.5		8.7			24.5
Approach LOS	D		A			C

Intersection Summary			
HCM 2000 Control Delay (s/veh)	25.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	17.9
Intersection Capacity Utilization	69.6%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	764	238	0	0	0	0	361	198	0	745	0
Future Volume (vph)	0	764	238	0	0	0	0	361	198	0	745	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.0	6.0					8.7	8.7		5.7	
Lane Util. Factor		0.95	1.00					0.95	1.00		0.95	
Frpb, ped/bikes		1.00	0.99					1.00	1.00		1.00	
Flpb, ped/bikes		1.00	1.00					1.00	1.00		1.00	
Frt		1.00	0.85					1.00	0.85		1.00	
Flt Protected		1.00	1.00					1.00	1.00		1.00	
Satd. Flow (prot)		3762	1660					3762	1683		3800	
Flt Permitted		1.00	1.00					1.00	1.00		1.00	
Satd. Flow (perm)		3762	1660					3762	1683		3800	
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.95	0.95	0.95	0.80	0.80	0.80
Adj. Flow (vph)	0	849	264	0	0	0	0	380	208	0	931	0
RTOR Reduction (vph)	0	0	46	0	0	0	0	0	35	0	0	0
Lane Group Flow (vph)	0	849	218	0	0	0	0	380	173	0	931	0
Confl. Peds. (#/hr)			2									
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	1%	1%	1%	0%	0%	0%
Turn Type		NA	Perm					NA	Perm		NA	
Protected Phases		2						4			8	
Permitted Phases			2						4			
Actuated Green, G (s)		40.0	40.0					35.3	35.3		38.3	
Effective Green, g (s)		40.0	40.0					35.3	35.3		38.3	
Actuated g/C Ratio		0.44	0.44					0.39	0.39		0.43	
Clearance Time (s)		6.0	6.0					8.7	8.7		5.7	
Vehicle Extension (s)		3.0	3.0					4.0	4.0		4.0	
Lane Grp Cap (vph)		1672	737					1475	660		1617	
v/s Ratio Prot		c0.23						0.10			c0.25	
v/s Ratio Perm			0.13						0.10			
v/c Ratio		0.51	0.30					0.26	0.26		0.58	
Uniform Delay, d1		17.9	16.0					18.5	18.5		19.7	
Progression Factor		1.07	1.16					0.72	0.65		0.00	
Incremental Delay, d2		1.1	1.0					0.1	0.3		0.5	
Delay (s)		20.3	19.6					13.5	12.3		0.5	
Level of Service		C	B					B	B		A	
Approach Delay (s/veh)		20.2			0.0			13.1			0.5	
Approach LOS		C			A			B			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	11.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	14.7
Intersection Capacity Utilization	53.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	1069	109	0	361	0	0	745	147
Future Volume (vph)	0	0	0	0	1069	109	0	361	0	0	745	147
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	12	12	12	12	12	12	16	12	12	12	12
Total Lost time (s)					6.0			5.7			8.7	8.7
Lane Util. Factor					0.91			0.95			0.95	1.00
Frpb, ped/bikes					1.00			1.00			1.00	1.00
Flpb, ped/bikes					1.00			1.00			1.00	1.00
Frt					0.99			1.00			1.00	0.85
Flt Protected					1.00			1.00			1.00	1.00
Satd. Flow (prot)					5324			4264			3800	1700
Flt Permitted					1.00			1.00			1.00	1.00
Satd. Flow (perm)					5324			4264			3800	1700
Peak-hour factor, PHF	0.92	0.92	0.92	0.95	0.95	0.95	0.95	0.95	0.95	0.80	0.80	0.80
Adj. Flow (vph)	0	0	0	0	1125	115	0	380	0	0	931	184
RTOR Reduction (vph)	0	0	0	0	12	0	0	0	0	0	0	22
Lane Group Flow (vph)	0	0	0	0	1228	0	0	380	0	0	931	162
Confl. Peds. (#/hr)						2						
Heavy Vehicles (%)	0%	0%	0%	1%	1%	1%	1%	1%	1%	0%	0%	0%
Turn Type					NA			NA			NA	Perm
Protected Phases					2			8			4	
Permitted Phases												4
Actuated Green, G (s)					40.0			38.3			35.3	35.3
Effective Green, g (s)					40.0			38.3			35.3	35.3
Actuated g/C Ratio					0.44			0.43			0.39	0.39
Clearance Time (s)					6.0			5.7			8.7	8.7
Vehicle Extension (s)					3.0			4.0			4.0	4.0
Lane Grp Cap (vph)					2366			1814			1490	666
v/s Ratio Prot					c0.23			0.09			c0.25	
v/s Ratio Perm												0.10
v/c Ratio					0.52			0.21			0.62	0.24
Uniform Delay, d1					18.1			16.3			22.0	18.4
Progression Factor					1.20			0.00			1.16	1.31
Incremental Delay, d2					0.8			0.1			0.9	0.3
Delay (s)					22.4			0.1			26.5	24.3
Level of Service					C			A			C	C
Approach Delay (s/veh)		0.0			22.4			0.1			26.1	
Approach LOS		A			C			A			C	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	20.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	14.7
Intersection Capacity Utilization	53.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	57	0	131	1	10	1	44	545	1	1	1016	72
Future Volume (vph)	57	0	131	1	10	1	44	545	1	1	1016	72
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	10	12	10	12	12	12	11	11	12	12	11	11
Total Lost time (s)	6.4	6.4		6.4	6.4		6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85		1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1773	1700		1863	1936		1818	1914	1667	1863	1933	1643
Flt Permitted	0.75	1.00		0.58	1.00		0.07	1.00	1.00	0.37	1.00	1.00
Satd. Flow (perm)	1399	1700		1134	1936		132	1914	1667	721	1933	1643
Peak-hour factor, PHF	0.84	0.92	0.84	0.92	0.92	0.92	0.89	0.89	0.92	0.92	0.86	0.86
Adj. Flow (vph)	68	0	156	1	11	1	49	612	1	1	1181	84
RTOR Reduction (vph)	0	139	0	0	1	0	0	0	0	0	0	30
Lane Group Flow (vph)	68	17	0	1	11	0	49	612	1	1	1181	54
Heavy Vehicles (%)	0%	2%	0%	2%	2%	2%	1%	1%	2%	2%	0%	0%
Turn Type	Perm	NA		Perm	NA		D.P+P	NA	Perm	D.P+P	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			6		2	2		6
Actuated Green, G (s)	9.9	9.9		9.9	9.9		61.7	60.6	60.6	61.7	57.8	57.8
Effective Green, g (s)	9.9	9.9		9.9	9.9		61.7	60.6	60.6	61.7	57.8	57.8
Actuated g/C Ratio	0.11	0.11		0.11	0.11		0.69	0.67	0.67	0.69	0.64	0.64
Clearance Time (s)	6.4	6.4		6.4	6.4		6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	153	187		124	212		163	1288	1122	508	1241	1055
v/s Ratio Prot		0.01			0.01		c0.01	c0.32		0.00	c0.61	
v/s Ratio Perm	c0.05			0.00			0.19		0.00	0.00		0.03
v/c Ratio	0.44	0.09		0.01	0.05		0.30	0.48	0.00	0.00	0.95	0.05
Uniform Delay, d1	37.5	36.0		35.7	35.9		21.1	7.1	4.8	4.9	14.8	6.0
Progression Factor	1.00	1.00		1.00	1.00		2.66	3.10	1.00	1.41	0.83	1.89
Incremental Delay, d2	2.1	0.2		0.0	0.1		1.0	1.2	0.0	0.0	12.2	0.1
Delay (s)	39.5	36.2		35.7	36.0		57.1	23.1	4.8	7.0	24.5	11.3
Level of Service	D	D		D	D		E	C	A	A	C	B
Approach Delay (s/veh)		37.2			35.9			25.6			23.6	
Approach LOS		D			D			C			C	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	25.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.4
Intersection Capacity Utilization	70.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	216	164	0	648	0	0	0	0
Future Volume (vph)	0	0	0	0	216	164	0	648	0	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					10.1	10.1		5.8				
Lane Util. Factor					0.95	1.00		0.95				
Frt					1.00	0.85		1.00				
Flt Protected					1.00	1.00		1.00				
Satd. Flow (prot)					3762	1683		3762				
Flt Permitted					1.00	1.00		1.00				
Satd. Flow (perm)					3762	1683		3762				
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	235	178	0	704	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	79	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	235	99	0	704	0	0	0	0
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	1%	1%	1%	2%	2%	2%
Turn Type					NA	Perm		NA				
Protected Phases					2			8				
Permitted Phases						2						
Actuated Green, G (s)					34.9	34.9		39.2				
Effective Green, g (s)					34.9	34.9		39.2				
Actuated g/C Ratio					0.39	0.39		0.44				
Clearance Time (s)					10.1	10.1		5.8				
Vehicle Extension (s)					3.0	3.0		3.0				
Lane Grp Cap (vph)					1458	652		1638				
v/s Ratio Prot					c0.06			c0.19				
v/s Ratio Perm						0.06						
v/c Ratio					0.16	0.15		0.43				
Uniform Delay, d1					18.0	17.9		17.6				
Progression Factor					1.14	1.58		0.00				
Incremental Delay, d2					0.2	0.5		0.7				
Delay (s)					20.7	28.8		0.7				
Level of Service					C	C		A				
Approach Delay (s/veh)		0.0			24.2			0.7			0.0	
Approach LOS		A			C			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	9.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	42.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	272	0	0	0	0	0	648	180	0	0	0
Future Volume (vph)	0	272	0	0	0	0	0	648	180	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.1						9.8	9.8			
Lane Util. Factor		0.95						0.95	1.00			
Frpb, ped/bikes		1.00						1.00	0.99			
Flpb, ped/bikes		1.00						1.00	1.00			
Frt		1.00						1.00	0.85			
Flt Protected		1.00						1.00	1.00			
Satd. Flow (prot)		3762						3762	1660			
Flt Permitted		1.00						1.00	1.00			
Satd. Flow (perm)		3762						3762	1660			
Peak-hour factor, PHF	0.81	0.81	0.81	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	336	0	0	0	0	0	704	196	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	119	0	0	0
Lane Group Flow (vph)	0	336	0	0	0	0	0	704	77	0	0	0
Confl. Peds. (#/hr)									1			
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Turn Type		NA						NA	Perm			
Protected Phases		6						4				
Permitted Phases									4			
Actuated Green, G (s)		38.9						35.2	35.2			
Effective Green, g (s)		38.9						35.2	35.2			
Actuated g/C Ratio		0.43						0.39	0.39			
Clearance Time (s)		6.1						9.8	9.8			
Vehicle Extension (s)		3.0						3.0	3.0			
Lane Grp Cap (vph)		1626						1471	649			
v/s Ratio Prot		c0.09						c0.19				
v/s Ratio Perm									0.05			
v/c Ratio		0.21						0.48	0.12			
Uniform Delay, d1		15.9						20.5	17.5			
Progression Factor		0.00						1.00	1.00			
Incremental Delay, d2		0.3						1.1	0.4			
Delay (s)		0.3						21.6	17.9			
Level of Service		A						C	B			
Approach Delay (s/veh)		0.3			0.0			20.8			0.0	
Approach LOS		A			A			C			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	15.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.35		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	39.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	272	402	0	0	0	0	0	0	0	781	0
Future Volume (vph)	0	272	402	0	0	0	0	0	0	0	781	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		10.1	10.1								5.8	
Lane Util. Factor		0.95	1.00								0.95	
Frt		1.00	0.85								1.00	
Flt Protected		1.00	1.00								1.00	
Satd. Flow (prot)		3762	1683								3800	
Flt Permitted		1.00	1.00								1.00	
Satd. Flow (perm)		3762	1683								3800	
Peak-hour factor, PHF	0.81	0.81	0.81	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	336	496	0	0	0	0	0	0	0	849	0
RTOR Reduction (vph)	0	0	50	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	336	446	0	0	0	0	0	0	0	849	0
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	2%	2%	2%	0%	0%	0%
Turn Type		NA	Perm								NA	
Protected Phases		2									8	
Permitted Phases			2									
Actuated Green, G (s)		34.9	34.9								39.2	
Effective Green, g (s)		34.9	34.9								39.2	
Actuated g/C Ratio		0.39	0.39								0.44	
Clearance Time (s)		10.1	10.1								5.8	
Vehicle Extension (s)		3.0	3.0								3.0	
Lane Grp Cap (vph)		1458	652								1655	
v/s Ratio Prot		0.09									c0.22	
v/s Ratio Perm			c0.26									
v/c Ratio		0.23	0.68								0.51	
Uniform Delay, d1		18.5	23.0								18.5	
Progression Factor		1.00	1.00								0.00	
Incremental Delay, d2		0.4	5.7								0.9	
Delay (s)		18.9	28.7								1.0	
Level of Service		B	C								A	
Approach Delay (s/veh)		24.7			0.0			0.0			1.0	
Approach LOS		C			A			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	12.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	57.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	216	0	0	0	0	0	781	132
Future Volume (vph)	0	0	0	0	216	0	0	0	0	0	781	132
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					6.1						9.8	9.8
Lane Util. Factor					0.95						0.95	1.00
Frt					1.00						1.00	0.85
Flt Protected					1.00						1.00	1.00
Satd. Flow (prot)					3762						3800	1700
Flt Permitted					1.00						1.00	1.00
Satd. Flow (perm)					3762						3800	1700
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	235	0	0	0	0	0	849	143
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	87
Lane Group Flow (vph)	0	0	0	0	235	0	0	0	0	0	849	56
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	2%	2%	2%	0%	0%	0%
Turn Type					NA						NA	Perm
Protected Phases					6						4	
Permitted Phases												4
Actuated Green, G (s)					38.9						35.2	35.2
Effective Green, g (s)					38.9						35.2	35.2
Actuated g/C Ratio					0.43						0.39	0.39
Clearance Time (s)					6.1						9.8	9.8
Vehicle Extension (s)					3.0						3.0	3.0
Lane Grp Cap (vph)					1626						1486	664
v/s Ratio Prot					c0.06						c0.22	
v/s Ratio Perm												0.03
v/c Ratio					0.14						0.57	0.08
Uniform Delay, d1					15.5						21.5	17.3
Progression Factor					0.00						0.88	1.58
Incremental Delay, d2					0.2						1.5	0.2
Delay (s)					0.2						20.4	27.5
Level of Service					A						C	C
Approach Delay (s/veh)		0.0			0.2			0.0			21.4	
Approach LOS		A			A			A			C	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	17.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	42.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	24	0	89	6	9	15	89	791	15	6	819	12
Future Volume (vph)	24	0	89	6	9	15	89	791	15	6	819	12
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	6.4	6.4			6.4		5.9	5.9	5.9	5.9	5.9	5.9
Lane Util. Factor	1.00	1.00			1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85			0.93		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00			0.99		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1900	1700			1847		1900	2000	1700	1900	2000	1700
Flt Permitted	0.72	1.00			0.90		0.19	1.00	1.00	0.23	1.00	1.00
Satd. Flow (perm)	1449	1700			1683		385	2000	1700	456	2000	1700
Peak-hour factor, PHF	0.83	0.83	0.83	0.60	0.60	0.60	0.89	0.89	0.89	0.91	0.91	0.91
Adj. Flow (vph)	29	0	107	10	15	25	100	889	17	7	900	13
RTOR Reduction (vph)	0	99	0	0	23	0	0	0	5	0	0	4
Lane Group Flow (vph)	29	8	0	0	27	0	100	889	12	7	900	9
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		D.P+P	NA	Perm	D.P+P	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			6		2	2		6
Actuated Green, G (s)	7.1	7.1			7.1		64.7	63.3	63.3	64.7	59.3	59.3
Effective Green, g (s)	7.1	7.1			7.1		64.7	63.3	63.3	64.7	59.3	59.3
Actuated g/C Ratio	0.08	0.08			0.08		0.72	0.70	0.70	0.72	0.66	0.66
Clearance Time (s)	6.4	6.4			6.4		5.9	5.9	5.9	5.9	5.9	5.9
Vehicle Extension (s)	4.0	4.0			4.0		3.0	4.0	4.0	3.0	4.0	4.0
Lane Grp Cap (vph)	114	134			132		367	1406	1195	350	1317	1120
v/s Ratio Prot		0.00					c0.02	c0.44		0.00	c0.45	
v/s Ratio Perm	c0.02				0.02		0.18		0.01	0.01		0.01
v/c Ratio	0.25	0.06			0.20		0.27	0.63	0.01	0.02	0.68	0.01
Uniform Delay, d1	39.0	38.4			38.8		7.8	7.1	4.0	5.8	9.5	5.3
Progression Factor	1.00	1.00			1.00		1.18	0.92	1.00	0.48	0.84	1.00
Incremental Delay, d2	1.6	0.3			1.0		0.3	1.8	0.0	0.0	2.8	0.0
Delay (s)	40.6	38.6			39.9		9.5	8.4	4.0	2.8	10.8	5.3
Level of Service	D	D			D		A	A	A	A	B	A
Approach Delay (s/veh)		39.1			39.9			8.4			10.7	
Approach LOS		D			D			A			B	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	12.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.2
Intersection Capacity Utilization	67.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	171	332	540	184	324	589
Future Volume (vph)	171	332	540	184	324	589
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Lane Width	12	12	11	11	11	11
Total Lost time (s)	5.9	6.0	6.0	5.9	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1900	1700	1914	1627	1818	1914
Flt Permitted	0.95	1.00	1.00	1.00	0.24	1.00
Satd. Flow (perm)	1900	1700	1914	1627	460	1914
Peak-hour factor, PHF	0.94	0.94	0.86	0.86	0.91	0.91
Adj. Flow (vph)	182	353	628	214	356	647
RTOR Reduction (vph)	0	99	0	78	0	0
Lane Group Flow (vph)	182	254	628	136	356	647
Heavy Vehicles (%)	0%	0%	1%	1%	1%	1%
Turn Type	Prot	pm+ov	NA	pm+ov	D.P+P	NA
Protected Phases	8	5	6	8	5	2
Permitted Phases		8		6	6	
Actuated Green, G (s)	13.7	28.7	43.4	57.1	58.4	64.4
Effective Green, g (s)	13.7	28.7	43.4	57.1	58.4	64.4
Actuated g/C Ratio	0.15	0.32	0.48	0.63	0.65	0.72
Clearance Time (s)	5.9	6.0	6.0	5.9	6.0	6.0
Vehicle Extension (s)	3.0	3.5	3.0	3.0	3.5	3.0
Lane Grp Cap (vph)	289	542	922	1032	524	1369
v/s Ratio Prot	c0.10	0.08	c0.33	0.02	c0.11	0.34
v/s Ratio Perm		0.07		0.06	0.33	
v/c Ratio	0.63	0.47	0.68	0.13	0.68	0.47
Uniform Delay, d1	35.8	24.5	18.0	6.6	10.4	5.5
Progression Factor	1.20	0.94	0.90	1.00	2.38	0.40
Incremental Delay, d2	4.0	0.7	3.5	0.0	3.0	0.9
Delay (s)	46.8	23.7	19.6	6.6	27.8	3.2
Level of Service	D	C	B	A	C	A
Approach Delay (s/veh)	31.6		16.3			11.9
Approach LOS	C		B			B

Intersection Summary			
HCM 2000 Control Delay (s/veh)	17.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	17.9
Intersection Capacity Utilization	68.0%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↱					↑↑	↱		↑↑	
Traffic Volume (vph)	0	1028	251	0	0	0	0	608	212	0	538	0
Future Volume (vph)	0	1028	251	0	0	0	0	608	212	0	538	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.0	6.0					8.7	8.7		5.7	
Lane Util. Factor		0.95	1.00					0.95	1.00		0.95	
Frpb, ped/bikes		1.00	0.99					1.00	1.00		1.00	
Flpb, ped/bikes		1.00	1.00					1.00	1.00		1.00	
Frt		1.00	0.85					1.00	0.85		1.00	
Flt Protected		1.00	1.00					1.00	1.00		1.00	
Satd. Flow (prot)		3800	1678					3800	1700		3762	
Flt Permitted		1.00	1.00					1.00	1.00		1.00	
Satd. Flow (perm)		3800	1678					3800	1700		3762	
Peak-hour factor, PHF	0.93	0.93	0.93	0.92	0.92	0.92	0.89	0.89	0.89	0.93	0.93	0.93
Adj. Flow (vph)	0	1105	270	0	0	0	0	683	238	0	578	0
RTOR Reduction (vph)	0	0	97	0	0	0	0	0	24	0	0	0
Lane Group Flow (vph)	0	1105	173	0	0	0	0	683	214	0	578	0
Confl. Peds. (#/hr)			1									
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	1%	1%
Turn Type		NA	Perm					NA	Perm		NA	
Protected Phases		2						4			8	
Permitted Phases			2						4			
Actuated Green, G (s)		44.8	44.8					30.5	30.5		33.5	
Effective Green, g (s)		44.8	44.8					30.5	30.5		33.5	
Actuated g/C Ratio		0.50	0.50					0.34	0.34		0.37	
Clearance Time (s)		6.0	6.0					8.7	8.7		5.7	
Vehicle Extension (s)		3.0	3.0					4.0	4.0		4.0	
Lane Grp Cap (vph)		1891	835					1287	576		1400	
v/s Ratio Prot		c0.29						c0.18			0.15	
v/s Ratio Perm			0.10						0.13			
v/c Ratio		0.58	0.21					0.53	0.37		0.41	
Uniform Delay, d1		16.0	12.7					24.0	22.5		21.0	
Progression Factor		0.93	0.68					0.93	0.92		0.00	
Incremental Delay, d2		1.2	0.5					0.5	0.5		0.3	
Delay (s)		16.1	9.1					22.8	21.2		0.3	
Level of Service		B	A					C	C		A	
Approach Delay (s/veh)		14.7			0.0			22.4			0.3	
Approach LOS		B			A			C			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	14.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	14.7
Intersection Capacity Utilization	55.2%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	1278	196	0	608	0	0	538	179
Future Volume (vph)	0	0	0	0	1278	196	0	608	0	0	538	179
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	12	12	12	12	12	12	16	12	12	12	12
Total Lost time (s)					6.0			5.7			8.7	8.7
Lane Util. Factor					0.91			0.95			0.95	1.00
Frpb, ped/bikes					1.00			1.00			1.00	0.98
Flpb, ped/bikes					1.00			1.00			1.00	1.00
Frt					0.98			1.00			1.00	0.85
Flt Protected					1.00			1.00			1.00	1.00
Satd. Flow (prot)					5342			4307			3762	1650
Flt Permitted					1.00			1.00			1.00	1.00
Satd. Flow (perm)					5342			4307			3762	1650
Peak-hour factor, PHF	0.92	0.92	0.92	0.91	0.91	0.91	0.89	0.89	0.89	0.93	0.93	0.93
Adj. Flow (vph)	0	0	0	0	1404	215	0	683	0	0	578	192
RTOR Reduction (vph)	0	0	0	0	20	0	0	0	0	0	0	24
Lane Group Flow (vph)	0	0	0	0	1599	0	0	683	0	0	578	168
Confl. Peds. (#/hr)						1						4
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	1%	1%
Turn Type					NA			NA			NA	Perm
Protected Phases					2			8			4	
Permitted Phases												4
Actuated Green, G (s)					44.8			33.5			30.5	30.5
Effective Green, g (s)					44.8			33.5			30.5	30.5
Actuated g/C Ratio					0.50			0.37			0.34	0.34
Clearance Time (s)					6.0			5.7			8.7	8.7
Vehicle Extension (s)					3.0			4.0			4.0	4.0
Lane Grp Cap (vph)					2659			1603			1274	559
v/s Ratio Prot					c0.30			c0.16			0.15	
v/s Ratio Perm												0.10
v/c Ratio					0.60			0.43			0.45	0.30
Uniform Delay, d1					16.2			21.1			23.2	21.9
Progression Factor					0.85			0.00			0.86	0.80
Incremental Delay, d2					0.9			0.2			0.3	0.4
Delay (s)					14.7			0.2			20.4	18.0
Level of Service					B			A			C	B
Approach Delay (s/veh)		0.0			14.7			0.2			19.8	
Approach LOS		A			B			A			B	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	12.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	14.7
Intersection Capacity Utilization	55.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	46	0	51	1	10	1	41	677	1	1	714	45
Future Volume (vph)	46	0	51	1	10	1	41	677	1	1	714	45
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	10	12	10	12	12	12	11	11	12	12	11	11
Total Lost time (s)	6.4	6.4		6.4	6.4		6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85		1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1756	1683		1863	1936		1837	1933	1667	1863	1914	1627
Flt Permitted	0.75	1.00		0.71	1.00		0.25	1.00	1.00	0.26	1.00	1.00
Satd. Flow (perm)	1386	1683		1394	1936		483	1933	1667	519	1914	1627
Peak-hour factor, PHF	0.72	0.92	0.72	0.92	0.92	0.92	0.82	0.82	0.92	0.92	0.87	0.87
Adj. Flow (vph)	64	0	71	1	11	1	50	826	1	1	821	52
RTOR Reduction (vph)	0	66	0	0	1	0	0	0	0	0	0	17
Lane Group Flow (vph)	64	5	0	1	11	0	50	826	1	1	821	35
Heavy Vehicles (%)	1%	2%	1%	2%	2%	2%	0%	0%	2%	2%	1%	1%
Turn Type	Perm	NA		Perm	NA		D.P+P	NA	Perm	D.P+P	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			6		2	2		6
Actuated Green, G (s)	6.7	6.7		6.7	6.7		64.9	63.8	63.8	64.9	61.1	61.1
Effective Green, g (s)	6.7	6.7		6.7	6.7		64.9	63.8	63.8	64.9	61.1	61.1
Actuated g/C Ratio	0.07	0.07		0.07	0.07		0.72	0.71	0.71	0.72	0.68	0.68
Clearance Time (s)	6.4	6.4		6.4	6.4		6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	103	125		103	144		405	1370	1181	390	1299	1104
v/s Ratio Prot		0.00			0.01		c0.01	c0.43		0.00	c0.43	
v/s Ratio Perm	c0.05			0.00			0.08		0.00	0.00		0.02
v/c Ratio	0.62	0.04		0.01	0.08		0.12	0.60	0.00	0.00	0.63	0.03
Uniform Delay, d1	40.4	38.7		38.6	38.8		5.6	6.7	3.8	5.0	8.1	4.7
Progression Factor	1.00	1.00		1.00	1.00		0.94	1.56	1.00	1.10	0.89	1.00
Incremental Delay, d2	11.1	0.1		0.0	0.2		0.1	1.9	0.0	0.0	2.1	0.0
Delay (s)	51.5	38.8		38.6	39.0		5.4	12.3	3.8	5.5	9.4	4.8
Level of Service	D	D		D	D		A	B	A	A	A	A
Approach Delay (s/veh)		44.8			39.0			11.9			9.1	
Approach LOS		D			D			B			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	13.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.4
Intersection Capacity Utilization	55.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	174	247	0	920	0	0	0	0
Future Volume (vph)	0	0	0	0	174	247	0	920	0	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					10.1	10.1		5.8				
Lane Util. Factor					0.95	1.00		0.95				
Frt					1.00	0.85		1.00				
Flt Protected					1.00	1.00		1.00				
Satd. Flow (prot)					3800	1700		3800				
Flt Permitted					1.00	1.00		1.00				
Satd. Flow (perm)					3800	1700		3800				
Peak-hour factor, PHF	0.92	0.92	0.92	0.85	0.85	0.85	0.95	0.95	0.95	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	205	291	0	968	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	44	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	205	247	0	968	0	0	0	0
Heavy Vehicles (%)	2%	2%	2%	0%	0%	0%	0%	0%	0%	2%	2%	2%
Turn Type					NA	Perm		NA				
Protected Phases					2			8				
Permitted Phases						2						
Actuated Green, G (s)					41.9	41.9		32.2				
Effective Green, g (s)					41.9	41.9		32.2				
Actuated g/C Ratio					0.47	0.47		0.36				
Clearance Time (s)					10.1	10.1		5.8				
Vehicle Extension (s)					3.0	3.0		3.0				
Lane Grp Cap (vph)					1769	791		1359				
v/s Ratio Prot					0.05			c0.25				
v/s Ratio Perm						c0.15						
v/c Ratio					0.12	0.31		0.71				
Uniform Delay, d1					13.6	15.0		24.9				
Progression Factor					0.86	0.86		0.00				
Incremental Delay, d2					0.1	1.0		1.8				
Delay (s)					11.8	13.9		1.9				
Level of Service					B	B		A				
Approach Delay (s/veh)		0.0			13.0			1.9			0.0	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	5.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	51.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	505	0	0	0	0	0	920	200	0	0	0
Future Volume (vph)	0	505	0	0	0	0	0	920	200	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.1						9.8	9.8			
Lane Util. Factor		0.95						0.95	1.00			
Frpb, ped/bikes		1.00						1.00	0.99			
Flpb, ped/bikes		1.00						1.00	1.00			
Frt		1.00						1.00	0.85			
Flt Protected		1.00						1.00	1.00			
Satd. Flow (prot)		3800						3800	1677			
Flt Permitted		1.00						1.00	1.00			
Satd. Flow (perm)		3800						3800	1677			
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.95	0.95	0.95	0.92	0.92	0.92
Adj. Flow (vph)	0	561	0	0	0	0	0	968	211	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	145	0	0	0
Lane Group Flow (vph)	0	561	0	0	0	0	0	968	66	0	0	0
Confl. Peds. (#/hr)									1			
Heavy Vehicles (%)	0%	0%	0%	2%	2%	2%	0%	0%	0%	2%	2%	2%
Turn Type		NA						NA	Perm			
Protected Phases		6						4				
Permitted Phases									4			
Actuated Green, G (s)		45.9						28.2	28.2			
Effective Green, g (s)		45.9						28.2	28.2			
Actuated g/C Ratio		0.51						0.31	0.31			
Clearance Time (s)		6.1						9.8	9.8			
Vehicle Extension (s)		3.0						3.0	3.0			
Lane Grp Cap (vph)		1938						1190	525			
v/s Ratio Prot		c0.15						c0.25				
v/s Ratio Perm									0.04			
v/c Ratio		0.29						0.81	0.13			
Uniform Delay, d1		12.7						28.5	22.1			
Progression Factor		0.00						1.00	1.00			
Incremental Delay, d2		0.4						6.1	0.5			
Delay (s)		0.4						34.6	22.6			
Level of Service		A						C	C			
Approach Delay (s/veh)		0.4			0.0			32.5			0.0	
Approach LOS		A			A			C			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	22.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	51.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	505	537	0	0	0	0	0	0	0	730	0
Future Volume (vph)	0	505	537	0	0	0	0	0	0	0	730	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		10.1	10.1								5.8	
Lane Util. Factor		0.95	1.00								0.95	
Frt		1.00	0.85								1.00	
Flt Protected		1.00	1.00								1.00	
Satd. Flow (prot)		3800	1700								3800	
Flt Permitted		1.00	1.00								1.00	
Satd. Flow (perm)		3800	1700								3800	
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.92	0.92	0.92	0.95	0.95	0.95
Adj. Flow (vph)	0	561	597	0	0	0	0	0	0	0	768	0
RTOR Reduction (vph)	0	0	44	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	561	553	0	0	0	0	0	0	0	768	0
Heavy Vehicles (%)	0%	0%	0%	2%	2%	2%	2%	2%	2%	0%	0%	0%
Turn Type		NA	Perm								NA	
Protected Phases		2									8	
Permitted Phases			2									
Actuated Green, G (s)		41.9	41.9								32.2	
Effective Green, g (s)		41.9	41.9								32.2	
Actuated g/C Ratio		0.47	0.47								0.36	
Clearance Time (s)		10.1	10.1								5.8	
Vehicle Extension (s)		3.0	3.0								3.0	
Lane Grp Cap (vph)		1769	791								1359	
v/s Ratio Prot		0.15									c0.20	
v/s Ratio Perm			c0.33									
v/c Ratio		0.32	0.70								0.57	
Uniform Delay, d1		15.1	19.1								23.3	
Progression Factor		1.00	1.00								0.00	
Incremental Delay, d2		0.5	5.1								1.3	
Delay (s)		15.6	24.2								1.3	
Level of Service		B	C								A	
Approach Delay (s/veh)		20.0			0.0			0.0			1.3	
Approach LOS		B			A			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	12.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	64.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	174	0	0	0	0	0	730	64
Future Volume (vph)	0	0	0	0	174	0	0	0	0	0	730	64
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					6.1						9.8	9.8
Lane Util. Factor					0.95						0.95	1.00
Frpb, ped/bikes					1.00						1.00	0.99
Flpb, ped/bikes					1.00						1.00	1.00
Frt					1.00						1.00	0.85
Flt Protected					1.00						1.00	1.00
Satd. Flow (prot)					3800						3800	1677
Flt Permitted					1.00						1.00	1.00
Satd. Flow (perm)					3800						3800	1677
Peak-hour factor, PHF	0.92	0.92	0.92	0.85	0.85	0.85	0.92	0.92	0.92	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	0	205	0	0	0	0	0	768	67
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	46
Lane Group Flow (vph)	0	0	0	0	205	0	0	0	0	0	768	21
Confl. Peds. (#/hr)												1
Heavy Vehicles (%)	2%	2%	2%	0%	0%	0%	2%	2%	2%	0%	0%	0%
Turn Type					NA						NA	Perm
Protected Phases					6						4	
Permitted Phases												4
Actuated Green, G (s)					45.9						28.2	28.2
Effective Green, g (s)					45.9						28.2	28.2
Actuated g/C Ratio					0.51						0.31	0.31
Clearance Time (s)					6.1						9.8	9.8
Vehicle Extension (s)					3.0						3.0	3.0
Lane Grp Cap (vph)					1938						1190	525
v/s Ratio Prot					c0.05						c0.20	
v/s Ratio Perm												0.01
v/c Ratio					0.11						0.65	0.04
Uniform Delay, d1					11.4						26.6	21.5
Progression Factor					0.00						0.63	0.67
Incremental Delay, d2					0.1						2.5	0.1
Delay (s)					0.1						19.2	14.5
Level of Service					A						B	B
Approach Delay (s/veh)		0.0			0.1			0.0			18.9	
Approach LOS		A			A			A			B	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	15.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.33		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	51.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	27	12	132	14	7	14	106	1101	20	6	754	15
Future Volume (vph)	27	12	132	14	7	14	106	1101	20	6	754	15
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	6.4	6.4			6.4		5.9	5.9	5.9	5.9	5.9	5.9
Lane Util. Factor	1.00	1.00			1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.86			0.95		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00			0.98		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1900	1726			1853		1900	2000	1700	1900	2000	1700
Flt Permitted	0.73	1.00			0.54		0.21	1.00	1.00	0.07	1.00	1.00
Satd. Flow (perm)	1459	1726			1029		428	2000	1700	139	2000	1700
Peak-hour factor, PHF	0.82	0.82	0.82	0.83	0.83	0.83	0.94	0.94	0.94	0.89	0.89	0.89
Adj. Flow (vph)	33	15	161	17	8	17	113	1171	21	7	847	17
RTOR Reduction (vph)	0	147	0	0	15	0	0	0	6	0	0	6
Lane Group Flow (vph)	33	29	0	0	27	0	113	1171	15	7	847	11
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		D.P+P	NA	Perm	D.P+P	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			6		2	2		6
Actuated Green, G (s)	8.0	8.0			8.0		63.8	62.4	62.4	63.8	58.2	58.2
Effective Green, g (s)	8.0	8.0			8.0		63.8	62.4	62.4	63.8	58.2	58.2
Actuated g/C Ratio	0.09	0.09			0.09		0.71	0.69	0.69	0.71	0.65	0.65
Clearance Time (s)	6.4	6.4			6.4		5.9	5.9	5.9	5.9	5.9	5.9
Vehicle Extension (s)	4.0	4.0			4.0		3.0	4.0	4.0	3.0	4.0	4.0
Lane Grp Cap (vph)	129	153			91		394	1386	1178	125	1293	1099
v/s Ratio Prot		0.02					c0.02	c0.59		0.00	0.42	
v/s Ratio Perm	0.02				c0.03		0.18		0.01	0.04		0.01
v/c Ratio	0.26	0.19			0.29		0.29	0.84	0.01	0.06	0.66	0.01
Uniform Delay, d1	38.2	38.0			38.3		7.4	10.2	4.3	15.5	9.7	5.7
Progression Factor	1.00	1.00			1.00		1.04	0.87	1.00	0.62	1.02	1.00
Incremental Delay, d2	1.4	0.8			2.4		0.2	3.9	0.0	0.2	2.5	0.0
Delay (s)	39.7	38.8			40.8		7.9	12.8	4.3	9.8	12.4	5.7
Level of Service	D	D			D		A	B	A	A	B	A
Approach Delay (s/veh)		39.0			40.8			12.3			12.3	
Approach LOS		D			D			B			B	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	15.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.2
Intersection Capacity Utilization	89.8%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	210	446	770	360	293	602
Future Volume (vph)	210	446	770	360	293	602
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Lane Width	12	12	11	11	11	11
Total Lost time (s)	5.9	6.0	6.0	5.9	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1900	1700	1933	1643	1837	1933
Flt Permitted	0.95	1.00	1.00	1.00	0.09	1.00
Satd. Flow (perm)	1900	1700	1933	1643	176	1933
Peak-hour factor, PHF	0.94	0.94	0.93	0.93	0.95	0.95
Adj. Flow (vph)	223	474	828	387	308	634
RTOR Reduction (vph)	0	67	0	49	0	0
Lane Group Flow (vph)	223	407	828	338	308	634
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Turn Type	Prot	pm+ov	NA	pm+ov	D.P+P	NA
Protected Phases	8	5	6	8	5	2
Permitted Phases		8		6	6	
Actuated Green, G (s)	14.7	28.1	44.0	58.7	57.4	63.4
Effective Green, g (s)	14.7	28.1	44.0	58.7	57.4	63.4
Actuated g/C Ratio	0.16	0.31	0.49	0.65	0.64	0.70
Clearance Time (s)	5.9	6.0	6.0	5.9	6.0	6.0
Vehicle Extension (s)	3.0	3.5	3.0	3.0	3.5	3.0
Lane Grp Cap (vph)	310	530	945	1071	359	1361
v/s Ratio Prot	0.12	c0.11	c0.43	0.05	c0.13	0.33
v/s Ratio Perm		0.13		0.15	0.42	
v/c Ratio	0.72	0.77	0.88	0.32	0.86	0.47
Uniform Delay, d1	35.7	28.0	20.6	6.9	25.0	5.9
Progression Factor	0.94	1.39	0.91	0.60	1.60	0.48
Incremental Delay, d2	6.6	5.7	7.6	0.1	14.9	0.9
Delay (s)	40.2	44.6	26.3	4.2	54.9	3.7
Level of Service	D	D	C	A	D	A
Approach Delay (s/veh)	43.2		19.2			20.4
Approach LOS	D		B			C

Intersection Summary			
HCM 2000 Control Delay (s/veh)	25.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	17.9
Intersection Capacity Utilization	79.9%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↱					↑↑	↱		↑↑	
Traffic Volume (vph)	0	1548	225	0	0	0	0	731	322	0	578	0
Future Volume (vph)	0	1548	225	0	0	0	0	731	322	0	578	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.0	6.0					8.7	8.7		5.7	
Lane Util. Factor		0.95	1.00					0.95	1.00		0.95	
Frpb, ped/bikes		1.00	0.99					1.00	0.99		1.00	
Flpb, ped/bikes		1.00	1.00					1.00	1.00		1.00	
Frt		1.00	0.85					1.00	0.85		1.00	
Flt Protected		1.00	1.00					1.00	1.00		1.00	
Satd. Flow (prot)		3800	1678					3800	1676		3800	
Flt Permitted		1.00	1.00					1.00	1.00		1.00	
Satd. Flow (perm)		3800	1678					3800	1676		3800	
Peak-hour factor, PHF	0.95	0.95	0.95	0.92	0.92	0.92	0.93	0.93	0.93	0.95	0.95	0.95
Adj. Flow (vph)	0	1629	237	0	0	0	0	786	346	0	608	0
RTOR Reduction (vph)	0	0	82	0	0	0	0	0	23	0	0	0
Lane Group Flow (vph)	0	1629	155	0	0	0	0	786	323	0	608	0
Confl. Peds. (#/hr)			1						1			
Heavy Vehicles (%)	0%	0%	0%	2%	2%	2%	0%	0%	0%	0%	0%	0%
Turn Type		NA	Perm					NA	Perm		NA	
Protected Phases		2						4			8	
Permitted Phases			2						4			
Actuated Green, G (s)		43.4	43.4					31.9	31.9		34.9	
Effective Green, g (s)		43.4	43.4					31.9	31.9		34.9	
Actuated g/C Ratio		0.48	0.48					0.35	0.35		0.39	
Clearance Time (s)		6.0	6.0					8.7	8.7		5.7	
Vehicle Extension (s)		3.0	3.0					4.0	4.0		4.0	
Lane Grp Cap (vph)		1832	809					1346	594		1473	
v/s Ratio Prot		c0.43						c0.21			0.16	
v/s Ratio Perm			0.09						0.19			
v/c Ratio		0.89	0.19					0.58	0.54		0.41	
Uniform Delay, d1		21.1	13.3					23.6	23.2		20.1	
Progression Factor		0.88	0.52					0.94	0.91		0.00	
Incremental Delay, d2		5.8	0.4					0.5	0.8		0.2	
Delay (s)		24.4	7.3					22.8	21.9		0.3	
Level of Service		C	A					C	C		A	
Approach Delay (s/veh)		22.3			0.0			22.5			0.3	
Approach LOS		C			A			C			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	18.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	14.7
Intersection Capacity Utilization	72.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	1303	171	0	731	0	0	578	206
Future Volume (vph)	0	0	0	0	1303	171	0	731	0	0	578	206
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	12	12	12	12	12	12	16	12	12	12	12
Total Lost time (s)					6.0			5.7			8.7	8.7
Lane Util. Factor					0.91			0.95			0.95	1.00
Frpb, ped/bikes					1.00			1.00			1.00	1.00
Flpb, ped/bikes					1.00			1.00			1.00	1.00
Frt					0.98			1.00			1.00	0.85
Flt Protected					1.00			1.00			1.00	1.00
Satd. Flow (prot)					5356			4307			3800	1700
Flt Permitted					1.00			1.00			1.00	1.00
Satd. Flow (perm)					5356			4307			3800	1700
Peak-hour factor, PHF	0.92	0.92	0.92	0.91	0.91	0.91	0.93	0.93	0.93	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	0	1432	188	0	786	0	0	608	217
RTOR Reduction (vph)	0	0	0	0	18	0	0	0	0	0	0	23
Lane Group Flow (vph)	0	0	0	0	1602	0	0	786	0	0	608	194
Confl. Peds. (#/hr)						2						
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type					NA			NA			NA	Perm
Protected Phases					2			8			4	
Permitted Phases												4
Actuated Green, G (s)					43.4			34.9			31.9	31.9
Effective Green, g (s)					43.4			34.9			31.9	31.9
Actuated g/C Ratio					0.48			0.39			0.35	0.35
Clearance Time (s)					6.0			5.7			8.7	8.7
Vehicle Extension (s)					3.0			4.0			4.0	4.0
Lane Grp Cap (vph)					2582			1670			1346	602
v/s Ratio Prot					c0.30			c0.18			0.16	
v/s Ratio Perm												0.11
v/c Ratio					0.62			0.47			0.45	0.32
Uniform Delay, d1					17.2			20.6			22.3	21.2
Progression Factor					0.95			0.00			1.12	1.14
Incremental Delay, d2					1.0			0.2			0.3	0.4
Delay (s)					17.3			0.2			25.2	24.5
Level of Service					B			A			C	C
Approach Delay (s/veh)		0.0			17.3			0.2			25.0	
Approach LOS		A			B			A			C	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	15.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	14.7
Intersection Capacity Utilization	72.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	55	0	54	1	10	1	78	1074	1	1	773	38
Future Volume (vph)	55	0	54	1	10	1	78	1074	1	1	773	38
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	10	12	10	12	12	12	11	11	12	12	11	11
Total Lost time (s)	6.4	6.4		6.1	6.1		6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85		1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1773	1700		1863	1936		1837	1933	1667	1863	1914	1627
Flt Permitted	0.75	1.00		0.71	1.00		0.23	1.00	1.00	0.06	1.00	1.00
Satd. Flow (perm)	1399	1700		1396	1936		442	1933	1667	127	1914	1627
Peak-hour factor, PHF	0.78	0.92	0.78	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.95	0.95
Adj. Flow (vph)	71	0	69	1	11	1	85	1167	1	1	814	40
RTOR Reduction (vph)	0	62	0	0	1	0	0	0	0	0	0	14
Lane Group Flow (vph)	71	7	0	1	11	0	85	1167	1	1	814	26
Heavy Vehicles (%)	0%	2%	0%	2%	2%	2%	0%	0%	2%	2%	1%	1%
Turn Type	Perm	NA		Perm	NA		D.P+P	NA	Perm	D.P+P	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			6		2	2		6
Actuated Green, G (s)	8.8	8.8		9.1	9.1		62.8	61.7	61.7	62.8	57.5	57.5
Effective Green, g (s)	8.8	8.8		9.1	9.1		62.8	61.7	61.7	62.8	57.5	57.5
Actuated g/C Ratio	0.10	0.10		0.10	0.10		0.70	0.69	0.69	0.70	0.64	0.64
Clearance Time (s)	6.4	6.4		6.1	6.1		6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	136	166		141	195		390	1325	1142	109	1222	1039
v/s Ratio Prot		0.00			0.01		c0.01	c0.60		0.00	0.43	
v/s Ratio Perm	c0.05			0.00			0.14		0.00	0.01		0.02
v/c Ratio	0.52	0.04		0.01	0.06		0.22	0.88	0.00	0.01	0.67	0.02
Uniform Delay, d1	38.6	36.8		36.4	36.6		7.1	11.2	4.5	16.0	10.2	6.0
Progression Factor	1.00	1.00		1.00	1.00		1.05	1.96	1.00	1.26	1.07	1.00
Incremental Delay, d2	3.6	0.1		0.0	0.1		0.2	7.6	0.0	0.0	2.5	0.0
Delay (s)	42.2	36.9		36.4	36.7		7.7	29.6	4.5	20.2	13.4	6.0
Level of Service	D	D		D	D		A	C	A	C	B	A
Approach Delay (s/veh)		39.6			36.7			28.1			13.1	
Approach LOS		D			D			C			B	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	23.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.4
Intersection Capacity Utilization	81.5%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	232	131	0	496	0	0	0	0
Future Volume (vph)	0	0	0	0	232	131	0	496	0	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					10.1	10.1		5.8				
Lane Util. Factor					0.95	1.00		0.95				
Frt					1.00	0.85		1.00				
Flt Protected					1.00	1.00		1.00				
Satd. Flow (prot)					3762	1683		3762				
Flt Permitted					1.00	1.00		1.00				
Satd. Flow (perm)					3762	1683		3762				
Peak-hour factor, PHF	0.92	0.92	0.92	0.86	0.86	0.86	0.87	0.87	0.87	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	270	152	0	570	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	107	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	270	45	0	570	0	0	0	0
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	1%	1%	1%	2%	2%	2%
Turn Type					NA	Perm		NA				
Protected Phases					2			8				
Permitted Phases						2						
Actuated Green, G (s)					17.9	17.9		26.2				
Effective Green, g (s)					17.9	17.9		26.2				
Actuated g/C Ratio					0.30	0.30		0.44				
Clearance Time (s)					10.1	10.1		5.8				
Vehicle Extension (s)					3.0	3.0		3.0				
Lane Grp Cap (vph)					1122	502		1642				
v/s Ratio Prot					c0.07			c0.15				
v/s Ratio Perm						0.03						
v/c Ratio					0.24	0.09		0.35				
Uniform Delay, d1					15.9	15.2		11.2				
Progression Factor					0.95	1.21		0.00				
Incremental Delay, d2					0.5	0.4		0.5				
Delay (s)					15.6	18.7		0.6				
Level of Service					B	B		A				
Approach Delay (s/veh)		0.0			16.7			0.6			0.0	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	7.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.33		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	44.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	205	0	0	0	0	0	496	127	0	0	0
Future Volume (vph)	0	205	0	0	0	0	0	496	127	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.1						9.8	9.8			
Lane Util. Factor		0.95						0.95	1.00			
Frt		1.00						1.00	0.85			
Flt Protected		1.00						1.00	1.00			
Satd. Flow (prot)		3800						3762	1683			
Flt Permitted		1.00						1.00	1.00			
Satd. Flow (perm)		3800						3762	1683			
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.87	0.87	0.87	0.92	0.92	0.92
Adj. Flow (vph)	0	228	0	0	0	0	0	570	146	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	92	0	0	0
Lane Group Flow (vph)	0	228	0	0	0	0	0	570	54	0	0	0
Heavy Vehicles (%)	0%	0%	0%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Turn Type		NA						NA	Perm			
Protected Phases		6						4				
Permitted Phases									4			
Actuated Green, G (s)		21.9						22.2	22.2			
Effective Green, g (s)		21.9						22.2	22.2			
Actuated g/C Ratio		0.37						0.37	0.37			
Clearance Time (s)		6.1						9.8	9.8			
Vehicle Extension (s)		3.0						3.0	3.0			
Lane Grp Cap (vph)		1387						1391	622			
v/s Ratio Prot		c0.06						c0.15				
v/s Ratio Perm									0.03			
v/c Ratio		0.16						0.41	0.09			
Uniform Delay, d1		12.9						14.0	12.3			
Progression Factor		0.00						1.00	1.00			
Incremental Delay, d2		0.3						0.9	0.3			
Delay (s)		0.3						14.9	12.6			
Level of Service		A						B	B			
Approach Delay (s/veh)		0.3			0.0			14.5			0.0	
Approach LOS		A			A			B			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	11.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	34.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	205	295	0	0	0	0	0	0	0	873	0
Future Volume (vph)	0	205	295	0	0	0	0	0	0	0	873	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		10.1	10.1								5.8	
Lane Util. Factor		0.95	1.00								0.95	
Frpb, ped/bikes		1.00	0.99								1.00	
Flpb, ped/bikes		1.00	1.00								1.00	
Frt		1.00	0.85								1.00	
Flt Protected		1.00	1.00								1.00	
Satd. Flow (prot)		3725	1645								3800	
Flt Permitted		1.00	1.00								1.00	
Satd. Flow (perm)		3725	1645								3800	
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.92	0.92	0.92	0.94	0.94	0.94
Adj. Flow (vph)	0	228	328	0	0	0	0	0	0	0	929	0
RTOR Reduction (vph)	0	0	87	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	228	241	0	0	0	0	0	0	0	929	0
Confl. Peds. (#/hr)			1									
Heavy Vehicles (%)	0%	2%	2%	2%	2%	2%	2%	2%	2%	0%	0%	0%
Turn Type		NA	Perm								NA	
Protected Phases		2									8	
Permitted Phases			2									
Actuated Green, G (s)		17.9	17.9								26.2	
Effective Green, g (s)		17.9	17.9								26.2	
Actuated g/C Ratio		0.30	0.30								0.44	
Clearance Time (s)		10.1	10.1								5.8	
Vehicle Extension (s)		3.0	3.0								3.0	
Lane Grp Cap (vph)		1111	490								1659	
v/s Ratio Prot		0.06									c0.24	
v/s Ratio Perm			c0.15									
v/c Ratio		0.21	0.49								0.56	
Uniform Delay, d1		15.7	17.3								12.6	
Progression Factor		1.00	1.00								0.00	
Incremental Delay, d2		0.4	3.5								1.0	
Delay (s)		16.2	20.8								1.0	
Level of Service		B	C								A	
Approach Delay (s/veh)		18.9			0.0			0.0			1.0	
Approach LOS		B			A			A			A	

Intersection Summary					
HCM 2000 Control Delay (s/veh)	7.7	HCM 2000 Level of Service		A	
HCM 2000 Volume to Capacity ratio	0.58				
Actuated Cycle Length (s)	60.0	Sum of lost time (s)		19.9	
Intersection Capacity Utilization	53.7%	ICU Level of Service		A	
Analysis Period (min)	15				

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	232	0	0	0	0	0	873	119
Future Volume (vph)	0	0	0	0	232	0	0	0	0	0	873	119
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					6.1						9.8	9.8
Lane Util. Factor					0.95						0.95	1.00
Frt					1.00						1.00	0.85
Flt Protected					1.00						1.00	1.00
Satd. Flow (prot)					3800						3800	1700
Flt Permitted					1.00						1.00	1.00
Satd. Flow (perm)					3800						3800	1700
Peak-hour factor, PHF	0.92	0.92	0.92	0.86	0.86	0.86	0.92	0.92	0.92	0.94	0.94	0.94
Adj. Flow (vph)	0	0	0	0	270	0	0	0	0	0	929	127
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	80
Lane Group Flow (vph)	0	0	0	0	270	0	0	0	0	0	929	47
Heavy Vehicles (%)	2%	2%	2%	0%	0%	0%	2%	2%	2%	0%	0%	0%
Turn Type					NA						NA	Perm
Protected Phases					6						4	
Permitted Phases												4
Actuated Green, G (s)					21.9						22.2	22.2
Effective Green, g (s)					21.9						22.2	22.2
Actuated g/C Ratio					0.37						0.37	0.37
Clearance Time (s)					6.1						9.8	9.8
Vehicle Extension (s)					3.0						3.0	3.0
Lane Grp Cap (vph)					1387						1406	629
v/s Ratio Prot					c0.07						c0.24	
v/s Ratio Perm												0.03
v/c Ratio					0.19						0.66	0.07
Uniform Delay, d1					13.0						15.8	12.2
Progression Factor					0.00						0.47	0.13
Incremental Delay, d2					0.3						2.4	0.2
Delay (s)					0.3						9.8	1.8
Level of Service					A						A	A
Approach Delay (s/veh)		0.0			0.3			0.0			8.9	
Approach LOS		A			A			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	7.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	44.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	2	59	16	14	12	107	598	7	6	795	13
Future Volume (vph)	11	2	59	16	14	12	107	598	7	6	795	13
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	6.8	6.8			6.8		5.9	5.9	5.9	5.9	5.9	5.9
Lane Util. Factor	1.00	1.00			1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.86			0.96		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00			0.98		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1900	1711			1887		1881	3762	1683	1900	3800	1700
Flt Permitted	0.71	1.00			0.84		0.26	1.00	1.00	0.41	1.00	1.00
Satd. Flow (perm)	1428	1711			1614		513	3762	1683	826	3800	1700
Peak-hour factor, PHF	0.73	0.73	0.73	0.64	0.64	0.64	0.95	0.95	0.95	0.87	0.87	0.87
Adj. Flow (vph)	15	3	81	25	22	19	113	629	7	7	914	15
RTOR Reduction (vph)	0	73	0	0	17	0	0	0	3	0	0	8
Lane Group Flow (vph)	15	11	0	0	49	0	113	629	4	7	914	7
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	1%	1%	1%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		D.P+P	NA	Perm	D.P+P	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			6		2	2		6
Actuated Green, G (s)	6.1	6.1			6.1		35.3	34.1	34.1	35.3	29.9	29.9
Effective Green, g (s)	6.1	6.1			6.1		35.3	34.1	34.1	35.3	29.9	29.9
Actuated g/C Ratio	0.10	0.10			0.10		0.59	0.57	0.57	0.59	0.50	0.50
Clearance Time (s)	6.8	6.8			6.8		5.9	5.9	5.9	5.9	5.9	5.9
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	145	173			164		424	2138	956	507	1893	847
v/s Ratio Prot		0.01					c0.02	c0.17		0.00	c0.24	
v/s Ratio Perm	0.01				c0.03		0.13		0.00	0.01		0.00
v/c Ratio	0.10	0.06			0.30		0.27	0.29	0.00	0.01	0.48	0.01
Uniform Delay, d1	24.5	24.4			25.0		5.7	6.7	5.6	5.1	9.9	7.6
Progression Factor	1.00	1.00			1.00		0.99	0.75	1.00	0.66	0.54	1.00
Incremental Delay, d2	0.3	0.2			1.0		0.3	0.3	0.0	0.0	0.8	0.0
Delay (s)	24.8	24.5			26.0		5.9	5.3	5.6	3.4	6.1	7.6
Level of Service	C	C			C		A	A	A	A	A	A
Approach Delay (s/veh)		24.6			26.0			5.4			6.1	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	7.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	18.6
Intersection Capacity Utilization	50.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	230	288	420	174	283	594
Future Volume (vph)	230	288	420	174	283	594
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Lane Width	12	12	11	11	11	11
Total Lost time (s)	6.1	6.0	6.0	6.1	6.0	6.0
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	0.95
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1881	1683	3673	1643	1837	3673
Flt Permitted	0.95	1.00	1.00	1.00	0.49	1.00
Satd. Flow (perm)	1881	1683	3673	1643	941	3673
Peak-hour factor, PHF	0.88	0.88	0.95	0.95	0.82	0.82
Adj. Flow (vph)	261	327	442	183	345	724
RTOR Reduction (vph)	0	25	0	89	0	0
Lane Group Flow (vph)	261	302	442	94	345	724
Heavy Vehicles (%)	1%	1%	0%	0%	0%	0%
Turn Type	Prot	pm+ov	NA	pm+ov	D.P+P	NA
Protected Phases	8	5	6	8	5	2
Permitted Phases		8		6	6	
Actuated Green, G (s)	13.4	24.5	17.4	30.8	28.5	34.5
Effective Green, g (s)	13.4	24.5	17.4	30.8	28.5	34.5
Actuated g/C Ratio	0.22	0.41	0.29	0.51	0.48	0.57
Clearance Time (s)	6.1	6.0	6.0	6.1	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	420	687	1065	843	612	2111
v/s Ratio Prot	c0.14	0.08	0.12	0.02	c0.10	0.20
v/s Ratio Perm		0.10		0.03	c0.16	
v/c Ratio	0.62	0.44	0.42	0.11	0.56	0.34
Uniform Delay, d1	21.0	12.8	17.2	7.5	10.2	6.7
Progression Factor	1.00	1.00	0.52	2.25	1.27	0.25
Incremental Delay, d2	2.9	0.5	1.2	0.1	1.1	0.4
Delay (s)	23.9	13.2	10.1	17.0	14.0	2.1
Level of Service	C	B	B	B	B	A
Approach Delay (s/veh)	18.0		12.1			6.0
Approach LOS	B		B			A

Intersection Summary			
HCM 2000 Control Delay (s/veh)	10.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	18.1
Intersection Capacity Utilization	53.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	799	218	0	0	0	0	432	183	0	572	0
Future Volume (vph)	0	799	218	0	0	0	0	432	183	0	572	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.0	6.0					8.7	8.7		5.7	
Lane Util. Factor		0.95	1.00					0.95	1.00		0.95	
Frpb, ped/bikes		1.00	0.99					1.00	1.00		1.00	
Flpb, ped/bikes		1.00	1.00					1.00	1.00		1.00	
Frt		1.00	0.85					1.00	0.85		1.00	
Flt Protected		1.00	1.00					1.00	1.00		1.00	
Satd. Flow (prot)		3762	1661					3762	1683		3800	
Flt Permitted		1.00	1.00					1.00	1.00		1.00	
Satd. Flow (perm)		3762	1661					3762	1683		3800	
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.95	0.95	0.95	0.80	0.80	0.80
Adj. Flow (vph)	0	888	242	0	0	0	0	455	193	0	715	0
RTOR Reduction (vph)	0	0	61	0	0	0	0	0	37	0	0	0
Lane Group Flow (vph)	0	888	181	0	0	0	0	455	156	0	715	0
Confl. Peds. (#/hr)			2									
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	1%	1%	1%	0%	0%	0%
Turn Type		NA	Perm					NA	Perm		NA	
Protected Phases		2						4			8	
Permitted Phases			2						4			
Actuated Green, G (s)		25.4	25.4					19.9	19.9		22.9	
Effective Green, g (s)		25.4	25.4					19.9	19.9		22.9	
Actuated g/C Ratio		0.42	0.42					0.33	0.33		0.38	
Clearance Time (s)		6.0	6.0					8.7	8.7		5.7	
Vehicle Extension (s)		3.0	3.0					4.0	4.0		4.0	
Lane Grp Cap (vph)		1592	703					1247	558		1450	
v/s Ratio Prot		c0.24						0.12			c0.19	
v/s Ratio Perm			0.11						0.09			
v/c Ratio		0.56	0.26					0.36	0.28		0.49	
Uniform Delay, d1		13.1	11.2					15.2	14.8		14.1	
Progression Factor		0.90	0.78					0.55	0.44		0.01	
Incremental Delay, d2		1.4	0.9					0.2	0.4		0.3	
Delay (s)		13.2	9.6					8.6	6.9		0.4	
Level of Service		B	A					A	A		A	
Approach Delay (s/veh)		12.4			0.0			8.1			0.4	
Approach LOS		B			A			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	7.8	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	14.7
Intersection Capacity Utilization	49.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	1046	136	0	432	0	0	572	145
Future Volume (vph)	0	0	0	0	1046	136	0	432	0	0	572	145
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	12	12	12	12	12	12	16	12	12	12	12
Total Lost time (s)					6.0			5.7			8.7	8.7
Lane Util. Factor					0.91			0.95			0.95	1.00
Frpb, ped/bikes					1.00			1.00			1.00	1.00
Flpb, ped/bikes					1.00			1.00			1.00	1.00
Frt					0.98			1.00			1.00	0.85
Flt Protected					1.00			1.00			1.00	1.00
Satd. Flow (prot)					5305			4264			3800	1700
Flt Permitted					1.00			1.00			1.00	1.00
Satd. Flow (perm)					5305			4264			3800	1700
Peak-hour factor, PHF	0.92	0.92	0.92	0.95	0.95	0.95	0.95	0.95	0.95	0.80	0.80	0.80
Adj. Flow (vph)	0	0	0	0	1101	143	0	455	0	0	715	181
RTOR Reduction (vph)	0	0	0	0	27	0	0	0	0	0	0	37
Lane Group Flow (vph)	0	0	0	0	1217	0	0	455	0	0	715	144
Confl. Peds. (#/hr)						2						
Heavy Vehicles (%)	0%	0%	0%	1%	1%	1%	1%	1%	1%	0%	0%	0%
Turn Type					NA			NA			NA	Perm
Protected Phases					2			8			4	
Permitted Phases												4
Actuated Green, G (s)					25.4			22.9			19.9	19.9
Effective Green, g (s)					25.4			22.9			19.9	19.9
Actuated g/C Ratio					0.42			0.38			0.33	0.33
Clearance Time (s)					6.0			5.7			8.7	8.7
Vehicle Extension (s)					3.0			4.0			4.0	4.0
Lane Grp Cap (vph)					2245			1627			1260	563
v/s Ratio Prot					c0.23			0.11			c0.19	
v/s Ratio Perm												0.08
v/c Ratio					0.54			0.28			0.57	0.26
Uniform Delay, d1					12.9			12.8			16.5	14.6
Progression Factor					0.72			0.00			0.67	0.42
Incremental Delay, d2					0.8			0.1			0.7	0.3
Delay (s)					10.2			0.1			11.8	6.5
Level of Service					B			A			B	A
Approach Delay (s/veh)		0.0			10.2			0.1			10.7	
Approach LOS		A			B			A			B	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	8.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	14.7
Intersection Capacity Utilization	49.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	46	0	81	1	10	1	38	547	1	1	771	52
Future Volume (vph)	46	0	81	1	10	1	38	547	1	1	771	52
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	10	12	10	12	12	12	11	11	12	12	11	11
Total Lost time (s)	6.8	6.8		6.8	6.8		6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.85		1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1773	1700		1863	1936		1818	3637	1667	1863	3673	1643
Flt Permitted	0.75	1.00		0.69	1.00		0.28	1.00	1.00	0.42	1.00	1.00
Satd. Flow (perm)	1399	1700		1362	1936		536	3637	1667	821	3673	1643
Peak-hour factor, PHF	0.84	0.92	0.84	0.92	0.92	0.92	0.89	0.89	0.92	0.92	0.86	0.86
Adj. Flow (vph)	55	0	96	1	11	1	43	615	1	1	897	60
RTOR Reduction (vph)	0	86	0	0	1	0	0	0	0	0	0	28
Lane Group Flow (vph)	55	10	0	1	11	0	43	615	1	1	897	32
Heavy Vehicles (%)	0%	2%	0%	2%	2%	2%	1%	1%	2%	2%	0%	0%
Turn Type	Perm	NA		Perm	NA		D.P+P	NA	Perm	D.P+P	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			6		2	2		6
Actuated Green, G (s)	6.2	6.2		6.2	6.2		35.0	33.9	33.9	35.0	32.4	32.4
Effective Green, g (s)	6.2	6.2		6.2	6.2		35.0	33.9	33.9	35.0	32.4	32.4
Actuated g/C Ratio	0.10	0.10		0.10	0.10		0.58	0.56	0.56	0.58	0.54	0.54
Clearance Time (s)	6.8	6.8		6.8	6.8		6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	144	175		140	200		368	2054	941	498	1983	887
v/s Ratio Prot		0.01			0.01		c0.01	0.17		0.00	c0.24	
v/s Ratio Perm	c0.04			0.00			0.06		0.00	0.00		0.02
v/c Ratio	0.38	0.06		0.01	0.06		0.12	0.30	0.00	0.00	0.45	0.04
Uniform Delay, d1	25.1	24.3		24.1	24.3		5.5	6.8	5.7	5.2	8.4	6.5
Progression Factor	1.00	1.00		1.00	1.00		0.62	0.55	1.00	1.06	0.85	1.00
Incremental Delay, d2	1.7	0.1		0.0	0.1		0.1	0.4	0.0	0.0	0.7	0.1
Delay (s)	26.8	24.4		24.2	24.4		3.5	4.1	5.7	5.5	7.9	6.5
Level of Service	C	C		C	C		A	A	A	A	A	A
Approach Delay (s/veh)		25.3			24.4			4.1			7.8	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	8.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	18.8
Intersection Capacity Utilization	49.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	192	146	0	577	0	0	0	0
Future Volume (vph)	0	0	0	0	192	146	0	577	0	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					10.1	10.1		5.8				
Lane Util. Factor					0.95	1.00		0.95				
Frt					1.00	0.85		1.00				
Flt Protected					1.00	1.00		1.00				
Satd. Flow (prot)					3762	1683		3762				
Flt Permitted					1.00	1.00		1.00				
Satd. Flow (perm)					3762	1683		3762				
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	209	159	0	627	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	100	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	209	59	0	627	0	0	0	0
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	1%	1%	1%	2%	2%	2%
Turn Type					NA	Perm		NA				
Protected Phases					2			8				
Permitted Phases						2						
Actuated Green, G (s)					29.9	29.9		34.2				
Effective Green, g (s)					29.9	29.9		34.2				
Actuated g/C Ratio					0.37	0.37		0.43				
Clearance Time (s)					10.1	10.1		5.8				
Vehicle Extension (s)					3.0	3.0		3.0				
Lane Grp Cap (vph)					1406	629		1608				
v/s Ratio Prot					c0.06			c0.17				
v/s Ratio Perm						0.04						
v/c Ratio					0.15	0.09		0.39				
Uniform Delay, d1					16.6	16.3		15.7				
Progression Factor					1.02	1.65		0.00				
Incremental Delay, d2					0.2	0.3		0.7				
Delay (s)					17.2	27.1		0.7				
Level of Service					B	C		A				
Approach Delay (s/veh)		0.0			21.4			0.7			0.0	
Approach LOS		A			C			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	8.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.30		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	39.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	242	0	0	0	0	0	577	160	0	0	0
Future Volume (vph)	0	242	0	0	0	0	0	577	160	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.1						9.8	9.8			
Lane Util. Factor		0.95						0.95	1.00			
Frpb, ped/bikes		1.00						1.00	0.99			
Flpb, ped/bikes		1.00						1.00	1.00			
Frt		1.00						1.00	0.85			
Flt Protected		1.00						1.00	1.00			
Satd. Flow (prot)		3762						3762	1661			
Flt Permitted		1.00						1.00	1.00			
Satd. Flow (perm)		3762						3762	1661			
Peak-hour factor, PHF	0.81	0.81	0.81	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	299	0	0	0	0	0	627	174	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	108	0	0	0
Lane Group Flow (vph)	0	299	0	0	0	0	0	627	66	0	0	0
Confl. Peds. (#/hr)									1			
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Turn Type		NA						NA	Perm			
Protected Phases		6						4				
Permitted Phases									4			
Actuated Green, G (s)		33.9						30.2	30.2			
Effective Green, g (s)		33.9						30.2	30.2			
Actuated g/C Ratio		0.42						0.38	0.38			
Clearance Time (s)		6.1						9.8	9.8			
Vehicle Extension (s)		3.0						3.0	3.0			
Lane Grp Cap (vph)		1594						1420	627			
v/s Ratio Prot		c0.08						c0.17				
v/s Ratio Perm									0.04			
v/c Ratio		0.19						0.44	0.10			
Uniform Delay, d1		14.4						18.6	16.1			
Progression Factor		0.00						1.00	1.00			
Incremental Delay, d2		0.3						1.0	0.3			
Delay (s)		0.3						19.6	16.5			
Level of Service		A						B	B			
Approach Delay (s/veh)		0.3			0.0			18.9			0.0	
Approach LOS		A			A			B			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	13.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.33		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	37.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	242	358	0	0	0	0	0	0	0	696	0
Future Volume (vph)	0	242	358	0	0	0	0	0	0	0	696	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		10.1	10.1								5.8	
Lane Util. Factor		0.95	1.00								0.95	
Frt		1.00	0.85								1.00	
Flt Protected		1.00	1.00								1.00	
Satd. Flow (prot)		3762	1683								3800	
Flt Permitted		1.00	1.00								1.00	
Satd. Flow (perm)		3762	1683								3800	
Peak-hour factor, PHF	0.81	0.81	0.81	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	299	442	0	0	0	0	0	0	0	757	0
RTOR Reduction (vph)	0	0	65	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	299	377	0	0	0	0	0	0	0	757	0
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	2%	2%	2%	0%	0%	0%
Turn Type		NA	Perm								NA	
Protected Phases		2									8	
Permitted Phases			2									
Actuated Green, G (s)		29.9	29.9								34.2	
Effective Green, g (s)		29.9	29.9								34.2	
Actuated g/C Ratio		0.37	0.37								0.43	
Clearance Time (s)		10.1	10.1								5.8	
Vehicle Extension (s)		3.0	3.0								3.0	
Lane Grp Cap (vph)		1406	629								1624	
v/s Ratio Prot		0.08									c0.20	
v/s Ratio Perm			c0.22									
v/c Ratio		0.21	0.60								0.47	
Uniform Delay, d1		17.0	20.2								16.4	
Progression Factor		1.00	1.00								0.00	
Incremental Delay, d2		0.3	4.2								0.8	
Delay (s)		17.4	24.4								0.8	
Level of Service		B	C								A	
Approach Delay (s/veh)		21.6			0.0			0.0			0.8	
Approach LOS		C			A			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	11.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	52.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	192	0	0	0	0	0	696	117
Future Volume (vph)	0	0	0	0	192	0	0	0	0	0	696	117
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					6.1						9.8	9.8
Lane Util. Factor					0.95						0.95	1.00
Frt					1.00						1.00	0.85
Flt Protected					1.00						1.00	1.00
Satd. Flow (prot)					3762						3800	1700
Flt Permitted					1.00						1.00	1.00
Satd. Flow (perm)					3762						3800	1700
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	209	0	0	0	0	0	757	127
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	79
Lane Group Flow (vph)	0	0	0	0	209	0	0	0	0	0	757	48
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	2%	2%	2%	0%	0%	0%
Turn Type					NA						NA	Perm
Protected Phases					6						4	
Permitted Phases												4
Actuated Green, G (s)					33.9						30.2	30.2
Effective Green, g (s)					33.9						30.2	30.2
Actuated g/C Ratio					0.42						0.38	0.38
Clearance Time (s)					6.1						9.8	9.8
Vehicle Extension (s)					3.0						3.0	3.0
Lane Grp Cap (vph)					1594						1434	641
v/s Ratio Prot					c0.06						c0.20	
v/s Ratio Perm												0.03
v/c Ratio					0.13						0.53	0.07
Uniform Delay, d1					14.1						19.4	16.0
Progression Factor					0.00						1.00	1.00
Incremental Delay, d2					0.2						1.4	0.2
Delay (s)					0.2						20.8	16.2
Level of Service					A						C	B
Approach Delay (s/veh)		0.0			0.2			0.0			20.1	
Approach LOS		A			A			A			C	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	16.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	39.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	21	0	79	5	8	13	79	705	11	5	730	10
Future Volume (vph)	21	0	79	5	8	13	79	705	11	5	730	10
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	6.8	6.8			6.8		5.9	5.9	5.9	5.9	5.9	5.9
Lane Util. Factor	1.00	1.00			1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.85			0.93		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00			0.99		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1900	1700			1845		1900	3800	1700	1900	3800	1700
Flt Permitted	0.73	1.00			0.91		0.33	1.00	1.00	0.34	1.00	1.00
Satd. Flow (perm)	1458	1700			1697		656	3800	1700	680	3800	1700
Peak-hour factor, PHF	0.83	0.83	0.83	0.60	0.60	0.60	0.89	0.89	0.89	0.91	0.91	0.91
Adj. Flow (vph)	25	0	95	8	13	22	89	792	12	5	802	11
RTOR Reduction (vph)	0	88	0	0	20	0	0	0	4	0	0	4
Lane Group Flow (vph)	25	7	0	0	23	0	89	792	8	5	802	7
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		D.P+P	NA	Perm	D.P+P	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			6		2	2		6
Actuated Green, G (s)	6.8	6.8			6.8		64.6	63.2	63.2	64.6	59.2	59.2
Effective Green, g (s)	6.8	6.8			6.8		64.6	63.2	63.2	64.6	59.2	59.2
Actuated g/C Ratio	0.08	0.08			0.08		0.72	0.70	0.70	0.72	0.66	0.66
Clearance Time (s)	6.8	6.8			6.8		5.9	5.9	5.9	5.9	5.9	5.9
Vehicle Extension (s)	4.0	4.0			4.0		3.0	4.0	4.0	3.0	4.0	4.0
Lane Grp Cap (vph)	110	128			128		545	2668	1193	507	2499	1118
v/s Ratio Prot		0.00					c0.01	c0.21		0.00	c0.21	
v/s Ratio Perm	c0.02				0.01		0.11		0.00	0.01		0.00
v/c Ratio	0.23	0.06			0.18		0.16	0.30	0.01	0.01	0.32	0.01
Uniform Delay, d1	39.1	38.6			39.0		3.8	5.0	4.0	3.6	6.7	5.3
Progression Factor	1.00	1.00			1.00		0.71	0.57	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.4	0.3			0.9		0.1	0.3	0.0	0.0	0.3	0.0
Delay (s)	40.6	38.9			39.9		2.8	3.1	4.0	3.6	7.0	5.3
Level of Service	D	D			D		A	A	A	A	A	A
Approach Delay (s/veh)		39.2			39.9			3.1			7.0	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	8.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.30		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.6
Intersection Capacity Utilization	45.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	152	296	481	164	288	525
Future Volume (vph)	152	296	481	164	288	525
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Lane Width	12	12	11	11	11	11
Total Lost time (s)	6.1	6.0	6.0	6.1	6.0	6.0
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	0.95
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1900	1700	3637	1627	1818	3637
Flt Permitted	0.95	1.00	1.00	1.00	0.42	1.00
Satd. Flow (perm)	1900	1700	3637	1627	803	3637
Peak-hour factor, PHF	0.94	0.94	0.86	0.86	0.91	0.91
Adj. Flow (vph)	162	315	559	191	316	577
RTOR Reduction (vph)	0	113	0	64	0	0
Lane Group Flow (vph)	162	202	559	127	316	577
Heavy Vehicles (%)	0%	0%	1%	1%	1%	1%
Turn Type	Prot	pm+ov	NA	pm+ov	D.P+P	NA
Protected Phases	8	5	6	8	5	2
Permitted Phases		8		6	6	
Actuated Green, G (s)	13.0	25.0	46.9	59.9	58.9	64.9
Effective Green, g (s)	13.0	25.0	46.9	59.9	58.9	64.9
Actuated g/C Ratio	0.14	0.28	0.52	0.67	0.65	0.72
Clearance Time (s)	6.1	6.0	6.0	6.1	6.0	6.0
Vehicle Extension (s)	3.0	3.5	3.0	3.0	3.5	3.0
Lane Grp Cap (vph)	274	472	1895	1082	660	2622
v/s Ratio Prot	c0.09	0.06	0.15	0.02	c0.06	0.16
v/s Ratio Perm		0.06		0.06	c0.25	
v/c Ratio	0.59	0.43	0.29	0.12	0.48	0.22
Uniform Delay, d1	36.0	26.6	12.2	5.5	6.6	4.2
Progression Factor	1.00	1.00	1.54	1.05	0.80	0.24
Incremental Delay, d2	3.4	0.7	0.4	0.0	0.6	0.2
Delay (s)	39.4	27.4	19.2	5.8	5.9	1.2
Level of Service	D	C	B	A	A	A
Approach Delay (s/veh)	31.5		15.8			2.8
Approach LOS	C		B			A

Intersection Summary			
HCM 2000 Control Delay (s/veh)	13.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.1
Intersection Capacity Utilization	50.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	916	223	0	0	0	0	542	189	0	479	0
Future Volume (vph)	0	916	223	0	0	0	0	542	189	0	479	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.0	6.0					8.7	8.7		5.7	
Lane Util. Factor		0.95	1.00					0.95	1.00		0.95	
Frpb, ped/bikes		1.00	0.99					1.00	1.00		1.00	
Flpb, ped/bikes		1.00	1.00					1.00	1.00		1.00	
Frt		1.00	0.85					1.00	0.85		1.00	
Flt Protected		1.00	1.00					1.00	1.00		1.00	
Satd. Flow (prot)		3800	1677					3800	1700		3762	
Flt Permitted		1.00	1.00					1.00	1.00		1.00	
Satd. Flow (perm)		3800	1677					3800	1700		3762	
Peak-hour factor, PHF	0.93	0.93	0.93	0.92	0.92	0.92	0.89	0.89	0.89	0.93	0.93	0.93
Adj. Flow (vph)	0	985	240	0	0	0	0	609	212	0	515	0
RTOR Reduction (vph)	0	0	57	0	0	0	0	0	70	0	0	0
Lane Group Flow (vph)	0	985	183	0	0	0	0	609	142	0	515	0
Confl. Peds. (#/hr)			2									
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	1%	1%
Turn Type		NA	Perm					NA	Perm		NA	
Protected Phases		2						4			8	
Permitted Phases			2						4			
Actuated Green, G (s)		44.1	44.1					21.2	21.2		24.2	
Effective Green, g (s)		44.1	44.1					21.2	21.2		24.2	
Actuated g/C Ratio		0.55	0.55					0.27	0.27		0.30	
Clearance Time (s)		6.0	6.0					8.7	8.7		5.7	
Vehicle Extension (s)		3.0	3.0					4.0	4.0		4.0	
Lane Grp Cap (vph)		2094	924					1007	450		1138	
v/s Ratio Prot		c0.26						c0.16			0.14	
v/s Ratio Perm			0.11						0.08			
v/c Ratio		0.47	0.20					0.60	0.32		0.45	
Uniform Delay, d1		10.9	9.0					25.7	23.6		22.5	
Progression Factor		1.03	1.10					1.00	1.00		0.00	
Incremental Delay, d2		0.7	0.5					1.2	0.6		0.3	
Delay (s)		11.9	10.4					26.9	24.1		0.4	
Level of Service		B	B					C	C		A	
Approach Delay (s/veh)		11.6			0.0			26.2			0.4	
Approach LOS		B			A			C			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	14.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	14.7
Intersection Capacity Utilization	50.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	1139	174	0	542	0	0	479	159
Future Volume (vph)	0	0	0	0	1139	174	0	542	0	0	479	159
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	12	12	12	12	12	12	16	12	12	12	12
Total Lost time (s)					6.0			5.7			8.7	8.7
Lane Util. Factor					0.91			0.95			0.95	1.00
Frpb, ped/bikes					1.00			1.00			1.00	0.98
Flpb, ped/bikes					1.00			1.00			1.00	1.00
Frt					0.98			1.00			1.00	0.85
Flt Protected					1.00			1.00			1.00	1.00
Satd. Flow (prot)					5342			4307			3762	1649
Flt Permitted					1.00			1.00			1.00	1.00
Satd. Flow (perm)					5342			4307			3762	1649
Peak-hour factor, PHF	0.92	0.92	0.92	0.91	0.91	0.91	0.89	0.89	0.89	0.93	0.93	0.93
Adj. Flow (vph)	0	0	0	0	1252	191	0	609	0	0	515	171
RTOR Reduction (vph)	0	0	0	0	25	0	0	0	0	0	0	35
Lane Group Flow (vph)	0	0	0	0	1418	0	0	609	0	0	515	136
Confl. Peds. (#/hr)						2						5
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	1%	1%
Turn Type					NA			NA			NA	Perm
Protected Phases					2			8			4	
Permitted Phases												4
Actuated Green, G (s)					44.1			24.2			21.2	21.2
Effective Green, g (s)					44.1			24.2			21.2	21.2
Actuated g/C Ratio					0.55			0.30			0.27	0.27
Clearance Time (s)					6.0			5.7			8.7	8.7
Vehicle Extension (s)					3.0			4.0			4.0	4.0
Lane Grp Cap (vph)					2944			1302			996	436
v/s Ratio Prot					c0.27			c0.14			0.14	
v/s Ratio Perm												0.08
v/c Ratio					0.48			0.47			0.52	0.31
Uniform Delay, d1					11.0			22.7			25.0	23.6
Progression Factor					0.98			0.00			0.85	0.76
Incremental Delay, d2					0.5			0.3			0.6	0.5
Delay (s)					11.2			0.3			21.8	18.4
Level of Service					B			A			C	B
Approach Delay (s/veh)		0.0			11.2			0.3			20.9	
Approach LOS		A			B			A			C	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	11.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	14.7
Intersection Capacity Utilization	50.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	41	0	45	1	10	1	36	603	1	1	636	40
Future Volume (vph)	41	0	45	1	10	1	36	603	1	1	636	40
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	10	12	10	12	12	12	11	11	12	12	11	11
Total Lost time (s)	6.8	6.8		6.8	6.8		6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.85		1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1756	1683		1863	1936		1837	3673	1667	1863	3637	1627
Flt Permitted	0.75	1.00		0.72	1.00		0.36	1.00	1.00	0.36	1.00	1.00
Satd. Flow (perm)	1386	1683		1404	1936		698	3673	1667	714	3637	1627
Peak-hour factor, PHF	0.72	0.92	0.72	0.92	0.92	0.92	0.82	0.82	0.92	0.92	0.87	0.87
Adj. Flow (vph)	57	0	62	1	11	1	44	735	1	1	731	46
RTOR Reduction (vph)	0	58	0	0	1	0	0	0	0	0	0	15
Lane Group Flow (vph)	57	5	0	1	11	0	44	735	1	1	731	31
Heavy Vehicles (%)	1%	2%	1%	2%	2%	2%	0%	0%	2%	2%	1%	1%
Turn Type	Perm	NA		Perm	NA		D.P+P	NA	Perm	D.P+P	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			6		2	2		6
Actuated Green, G (s)	7.0	7.0		7.0	7.0		64.2	63.1	63.1	64.2	60.4	60.4
Effective Green, g (s)	7.0	7.0		7.0	7.0		64.2	63.1	63.1	64.2	60.4	60.4
Actuated g/C Ratio	0.08	0.08		0.08	0.08		0.71	0.70	0.70	0.71	0.67	0.67
Clearance Time (s)	6.8	6.8		6.8	6.8		6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	107	130		109	150		545	2575	1168	523	2440	1091
v/s Ratio Prot		0.00			0.01		c0.00	c0.20		0.00	c0.20	
v/s Ratio Perm	c0.04			0.00			0.05		0.00	0.00		0.02
v/c Ratio	0.53	0.04		0.01	0.07		0.08	0.29	0.00	0.00	0.30	0.03
Uniform Delay, d1	39.9	38.4		38.3	38.5		3.8	5.0	4.0	3.7	6.1	5.0
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	0.82	0.86	1.00
Incremental Delay, d2	5.0	0.1		0.0	0.2		0.1	0.3	0.0	0.0	0.3	0.0
Delay (s)	44.9	38.5		38.3	38.7		3.9	5.3	4.0	3.0	5.5	5.0
Level of Service	D	D		D	D		A	A	A	A	A	A
Approach Delay (s/veh)		41.6			38.7			5.2			5.5	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	8.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.31		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.8
Intersection Capacity Utilization	45.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	155	220	0	820	0	0	0	0
Future Volume (vph)	0	0	0	0	155	220	0	820	0	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					10.1	10.1		5.8				
Lane Util. Factor					0.95	1.00		0.95				
Frt					1.00	0.85		1.00				
Flt Protected					1.00	1.00		1.00				
Satd. Flow (prot)					3800	1700		3800				
Flt Permitted					1.00	1.00		1.00				
Satd. Flow (perm)					3800	1700		3800				
Peak-hour factor, PHF	0.92	0.92	0.92	0.85	0.85	0.85	0.95	0.95	0.95	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	182	259	0	863	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	77	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	182	182	0	863	0	0	0	0
Heavy Vehicles (%)	2%	2%	2%	0%	0%	0%	0%	0%	0%	2%	2%	2%
Turn Type					NA	Perm		NA				
Protected Phases					2			8				
Permitted Phases						2						
Actuated Green, G (s)					22.9	22.9		21.2				
Effective Green, g (s)					22.9	22.9		21.2				
Actuated g/C Ratio					0.38	0.38		0.35				
Clearance Time (s)					10.1	10.1		5.8				
Vehicle Extension (s)					3.0	3.0		3.0				
Lane Grp Cap (vph)					1450	648		1342				
v/s Ratio Prot					0.05			c0.23				
v/s Ratio Perm						c0.11						
v/c Ratio					0.13	0.28		0.64				
Uniform Delay, d1					12.0	12.9		16.2				
Progression Factor					1.07	1.18		0.01				
Incremental Delay, d2					0.2	1.1		1.4				
Delay (s)					13.1	16.3		1.6				
Level of Service					B	B		A				
Approach Delay (s/veh)		0.0			14.9			1.6			0.0	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	6.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	47.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	450	0	0	0	0	0	820	178	0	0	0
Future Volume (vph)	0	450	0	0	0	0	0	820	178	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.1						9.8	9.8			
Lane Util. Factor		0.95						0.95	1.00			
Frpb, ped/bikes		1.00						1.00	0.99			
Flpb, ped/bikes		1.00						1.00	1.00			
Frt		1.00						1.00	0.85			
Flt Protected		1.00						1.00	1.00			
Satd. Flow (prot)		3800						3800	1676			
Flt Permitted		1.00						1.00	1.00			
Satd. Flow (perm)		3800						3800	1676			
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.95	0.95	0.95	0.92	0.92	0.92
Adj. Flow (vph)	0	500	0	0	0	0	0	863	187	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	133	0	0	0
Lane Group Flow (vph)	0	500	0	0	0	0	0	863	54	0	0	0
Confl. Peds. (#/hr)									2			
Heavy Vehicles (%)	0%	0%	0%	2%	2%	2%	0%	0%	0%	2%	2%	2%
Turn Type		NA						NA	Perm			
Protected Phases		6						4				
Permitted Phases									4			
Actuated Green, G (s)		26.9						17.2	17.2			
Effective Green, g (s)		26.9						17.2	17.2			
Actuated g/C Ratio		0.45						0.29	0.29			
Clearance Time (s)		6.1						9.8	9.8			
Vehicle Extension (s)		3.0						3.0	3.0			
Lane Grp Cap (vph)		1703						1089	480			
v/s Ratio Prot		c0.13						c0.23				
v/s Ratio Perm									0.03			
v/c Ratio		0.29						0.79	0.11			
Uniform Delay, d1		10.5						19.8	15.8			
Progression Factor		0.00						1.00	1.00			
Incremental Delay, d2		0.4						5.9	0.5			
Delay (s)		0.4						25.7	16.2			
Level of Service		A						C	B			
Approach Delay (s/veh)		0.4			0.0			24.0			0.0	
Approach LOS		A			A			C			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	16.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	47.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	450	478	0	0	0	0	0	0	0	650	0
Future Volume (vph)	0	450	478	0	0	0	0	0	0	0	650	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		10.1	10.1								5.8	
Lane Util. Factor		0.95	1.00								0.95	
Frt		1.00	0.85								1.00	
Flt Protected		1.00	1.00								1.00	
Satd. Flow (prot)		3800	1700								3800	
Flt Permitted		1.00	1.00								1.00	
Satd. Flow (perm)		3800	1700								3800	
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.92	0.92	0.92	0.95	0.95	0.95
Adj. Flow (vph)	0	500	531	0	0	0	0	0	0	0	684	0
RTOR Reduction (vph)	0	0	77	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	500	454	0	0	0	0	0	0	0	684	0
Heavy Vehicles (%)	0%	0%	0%	2%	2%	2%	2%	2%	2%	0%	0%	0%
Turn Type		NA	Perm								NA	
Protected Phases		2									8	
Permitted Phases			2									
Actuated Green, G (s)		22.9	22.9								21.2	
Effective Green, g (s)		22.9	22.9								21.2	
Actuated g/C Ratio		0.38	0.38								0.35	
Clearance Time (s)		10.1	10.1								5.8	
Vehicle Extension (s)		3.0	3.0								3.0	
Lane Grp Cap (vph)		1450	648								1342	
v/s Ratio Prot		0.13									c0.18	
v/s Ratio Perm			c0.27									
v/c Ratio		0.34	0.70								0.51	
Uniform Delay, d1		13.2	15.7								15.3	
Progression Factor		1.00	1.00								0.01	
Incremental Delay, d2		0.7	6.2								1.1	
Delay (s)		13.9	21.9								1.2	
Level of Service		B	C								A	
Approach Delay (s/veh)		18.0			0.0			0.0			1.2	
Approach LOS		B			A			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	11.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	58.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	155	0	0	0	0	0	650	57
Future Volume (vph)	0	0	0	0	155	0	0	0	0	0	650	57
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					6.1						9.8	9.8
Lane Util. Factor					0.95						0.95	1.00
Frpb, ped/bikes					1.00						1.00	0.99
Flpb, ped/bikes					1.00						1.00	1.00
Frt					1.00						1.00	0.85
Flt Protected					1.00						1.00	1.00
Satd. Flow (prot)					3800						3800	1678
Flt Permitted					1.00						1.00	1.00
Satd. Flow (perm)					3800						3800	1678
Peak-hour factor, PHF	0.92	0.92	0.92	0.85	0.85	0.85	0.92	0.92	0.92	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	0	182	0	0	0	0	0	684	60
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	43
Lane Group Flow (vph)	0	0	0	0	182	0	0	0	0	0	684	17
Confl. Peds. (#/hr)												1
Heavy Vehicles (%)	2%	2%	2%	0%	0%	0%	2%	2%	2%	0%	0%	0%
Turn Type					NA						NA	Perm
Protected Phases					6						4	
Permitted Phases												4
Actuated Green, G (s)					26.9						17.2	17.2
Effective Green, g (s)					26.9						17.2	17.2
Actuated g/C Ratio					0.45						0.29	0.29
Clearance Time (s)					6.1						9.8	9.8
Vehicle Extension (s)					3.0						3.0	3.0
Lane Grp Cap (vph)					1703						1089	481
v/s Ratio Prot					c0.05						c0.18	
v/s Ratio Perm												0.01
v/c Ratio					0.11						0.63	0.04
Uniform Delay, d1					9.6						18.6	15.4
Progression Factor					0.00						0.44	1.00
Incremental Delay, d2					0.1						2.7	0.1
Delay (s)					0.1						10.8	15.6
Level of Service					A						B	B
Approach Delay (s/veh)		0.0			0.1			0.0			11.2	
Approach LOS		A			A			A			B	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	9.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	47.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	24	10	117	12	6	12	94	981	17	5	672	13
Future Volume (vph)	24	10	117	12	6	12	94	981	17	5	672	13
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	6.8	6.8			6.8		5.9	5.9	5.9	5.9	5.9	5.9
Lane Util. Factor	1.00	1.00			1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.86			0.95		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00			0.98		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1900	1723			1855		1900	3800	1700	1900	3800	1700
Flt Permitted	0.73	1.00			0.80		0.33	1.00	1.00	0.23	1.00	1.00
Satd. Flow (perm)	1469	1723			1516		665	3800	1700	458	3800	1700
Peak-hour factor, PHF	0.82	0.82	0.82	0.83	0.83	0.83	0.94	0.94	0.94	0.89	0.89	0.89
Adj. Flow (vph)	29	12	143	14	7	14	100	1044	18	6	755	15
RTOR Reduction (vph)	0	128	0	0	13	0	0	0	8	0	0	8
Lane Group Flow (vph)	29	27	0	0	22	0	100	1044	10	6	755	7
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		D.P+P	NA	Perm	D.P+P	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			6		2	2		6
Actuated Green, G (s)	6.2	6.2			6.2		35.2	33.8	33.8	35.2	29.8	29.8
Effective Green, g (s)	6.2	6.2			6.2		35.2	33.8	33.8	35.2	29.8	29.8
Actuated g/C Ratio	0.10	0.10			0.10		0.59	0.56	0.56	0.59	0.50	0.50
Clearance Time (s)	6.8	6.8			6.8		5.9	5.9	5.9	5.9	5.9	5.9
Vehicle Extension (s)	4.0	4.0			4.0		3.0	4.0	4.0	3.0	4.0	4.0
Lane Grp Cap (vph)	151	178			156		501	2140	957	302	1887	844
v/s Ratio Prot		0.02					c0.02	c0.27		0.00	0.20	
v/s Ratio Perm	c0.02				0.01		0.10		0.01	0.01		0.00
v/c Ratio	0.19	0.15			0.14		0.20	0.49	0.01	0.02	0.40	0.01
Uniform Delay, d1	24.6	24.5			24.5		5.5	7.9	5.8	5.4	9.5	7.6
Progression Factor	1.00	1.00			1.00		0.80	0.78	1.00	0.48	0.43	1.00
Incremental Delay, d2	0.8	0.5			0.6		0.2	0.7	0.0	0.0	0.6	0.0
Delay (s)	25.5	25.0			25.1		4.6	6.8	5.8	2.6	4.7	7.7
Level of Service	C	C			C		A	A	A	A	A	A
Approach Delay (s/veh)		25.1			25.1			6.6			4.7	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	7.8	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	18.6
Intersection Capacity Utilization	58.8%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	187	397	686	327	261	536
Future Volume (vph)	187	397	686	327	261	536
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Lane Width	12	12	11	11	11	11
Total Lost time (s)	6.1	6.0	6.0	6.1	6.0	6.0
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	0.95
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1900	1700	3673	1643	1837	3673
Flt Permitted	0.95	1.00	1.00	1.00	0.29	1.00
Satd. Flow (perm)	1900	1700	3673	1643	561	3673
Peak-hour factor, PHF	0.94	0.94	0.93	0.93	0.95	0.95
Adj. Flow (vph)	199	422	738	352	275	564
RTOR Reduction (vph)	0	26	0	139	0	0
Lane Group Flow (vph)	199	396	738	213	275	564
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Turn Type	Prot	pm+ov	NA	pm+ov	D.P+P	NA
Protected Phases	8	5	6	8	5	2
Permitted Phases		8		6	6	
Actuated Green, G (s)	10.8	20.6	21.3	32.1	31.1	37.1
Effective Green, g (s)	10.8	20.6	21.3	32.1	31.1	37.1
Actuated g/C Ratio	0.18	0.34	0.36	0.54	0.52	0.62
Clearance Time (s)	6.1	6.0	6.0	6.1	6.0	6.0
Vehicle Extension (s)	3.0	3.5	3.0	3.0	3.5	3.0
Lane Grp Cap (vph)	342	583	1303	879	499	2271
v/s Ratio Prot	0.10	c0.11	c0.20	0.04	0.09	0.15
v/s Ratio Perm		0.12		0.09	0.20	
v/c Ratio	0.58	0.68	0.57	0.24	0.55	0.25
Uniform Delay, d1	22.5	16.9	15.6	7.5	8.5	5.2
Progression Factor	1.13	1.26	0.35	1.17	2.52	0.31
Incremental Delay, d2	2.4	3.2	1.7	0.1	1.4	0.2
Delay (s)	27.9	24.4	7.1	8.9	22.8	1.9
Level of Service	C	C	A	A	C	A
Approach Delay (s/veh)	25.5		7.7			8.7
Approach LOS	C		A			A

Intersection Summary			
HCM 2000 Control Delay (s/veh)	12.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	18.1
Intersection Capacity Utilization	56.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1380	200	0	0	0	0	651	287	0	515	0
Future Volume (vph)	0	1380	200	0	0	0	0	651	287	0	515	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.0	6.0					8.7	8.7		5.7	
Lane Util. Factor		0.95	1.00					0.95	1.00		0.95	
Frpb, ped/bikes		1.00	0.99					1.00	0.99		1.00	
Flpb, ped/bikes		1.00	1.00					1.00	1.00		1.00	
Frt		1.00	0.85					1.00	0.85		1.00	
Flt Protected		1.00	1.00					1.00	1.00		1.00	
Satd. Flow (prot)		3800	1677					3800	1675		3800	
Flt Permitted		1.00	1.00					1.00	1.00		1.00	
Satd. Flow (perm)		3800	1677					3800	1675		3800	
Peak-hour factor, PHF	0.95	0.95	0.95	0.92	0.92	0.92	0.93	0.93	0.93	0.95	0.95	0.95
Adj. Flow (vph)	0	1453	211	0	0	0	0	700	309	0	542	0
RTOR Reduction (vph)	0	0	52	0	0	0	0	0	41	0	0	0
Lane Group Flow (vph)	0	1453	159	0	0	0	0	700	268	0	542	0
Confl. Peds. (#/hr)			2						2			
Heavy Vehicles (%)	0%	0%	0%	2%	2%	2%	0%	0%	0%	0%	0%	0%
Turn Type		NA	Perm					NA	Perm		NA	
Protected Phases		2						4			8	
Permitted Phases			2						4			
Actuated Green, G (s)		30.0	30.0					15.3	15.3		18.3	
Effective Green, g (s)		30.0	30.0					15.3	15.3		18.3	
Actuated g/C Ratio		0.50	0.50					0.26	0.26		0.31	
Clearance Time (s)		6.0	6.0					8.7	8.7		5.7	
Vehicle Extension (s)		3.0	3.0					4.0	4.0		4.0	
Lane Grp Cap (vph)		1900	838					969	427		1159	
v/s Ratio Prot		c0.38						c0.18			0.14	
v/s Ratio Perm			0.09						0.16			
v/c Ratio		0.76	0.19					0.72	0.63		0.47	
Uniform Delay, d1		12.1	8.3					20.4	19.8		16.9	
Progression Factor		0.73	0.37					0.55	0.45		0.00	
Incremental Delay, d2		2.5	0.4					2.7	3.1		0.3	
Delay (s)		11.4	3.4					13.9	12.1		0.4	
Level of Service		B	A					B	B		A	
Approach Delay (s/veh)		10.4			0.0			13.3			0.4	
Approach LOS		B			A			B			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	9.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	14.7
Intersection Capacity Utilization	65.6%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	1161	152	0	651	0	0	515	183
Future Volume (vph)	0	0	0	0	1161	152	0	651	0	0	515	183
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	12	12	12	12	12	12	16	12	12	12	12
Total Lost time (s)					6.0			5.7			8.7	8.7
Lane Util. Factor					0.91			0.95			0.95	1.00
Frpb, ped/bikes					1.00			1.00			1.00	1.00
Flpb, ped/bikes					1.00			1.00			1.00	1.00
Frt					0.98			1.00			1.00	0.85
Flt Protected					1.00			1.00			1.00	1.00
Satd. Flow (prot)					5357			4307			3800	1700
Flt Permitted					1.00			1.00			1.00	1.00
Satd. Flow (perm)					5357			4307			3800	1700
Peak-hour factor, PHF	0.92	0.92	0.92	0.91	0.91	0.91	0.93	0.93	0.93	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	0	1276	167	0	700	0	0	542	193
RTOR Reduction (vph)	0	0	0	0	25	0	0	0	0	0	0	41
Lane Group Flow (vph)	0	0	0	0	1418	0	0	700	0	0	542	152
Confl. Peds. (#/hr)						3						
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type					NA			NA			NA	Perm
Protected Phases					2			8			4	
Permitted Phases												4
Actuated Green, G (s)					30.0			18.3			15.3	15.3
Effective Green, g (s)					30.0			18.3			15.3	15.3
Actuated g/C Ratio					0.50			0.31			0.26	0.26
Clearance Time (s)					6.0			5.7			8.7	8.7
Vehicle Extension (s)					3.0			4.0			4.0	4.0
Lane Grp Cap (vph)					2678			1313			969	433
v/s Ratio Prot					c0.26			c0.16			0.14	
v/s Ratio Perm												0.09
v/c Ratio					0.53			0.53			0.56	0.35
Uniform Delay, d1					10.2			17.3			19.4	18.3
Progression Factor					0.78			0.00			0.76	0.65
Incremental Delay, d2					0.7			0.4			0.8	0.7
Delay (s)					8.6			0.4			15.7	12.5
Level of Service					A			A			B	B
Approach Delay (s/veh)		0.0			8.6			0.4			14.8	
Approach LOS		A			A			A			B	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	8.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	14.7
Intersection Capacity Utilization	65.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	49	0	48	1	10	1	69	963	1	1	689	33
Future Volume (vph)	49	0	48	1	10	1	69	963	1	1	689	33
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	10	12	10	12	12	12	11	11	12	12	11	11
Total Lost time (s)	6.8	6.8		6.8	6.8		6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.85		1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1773	1700		1863	1936		1837	3673	1667	1863	3637	1627
Flt Permitted	0.75	1.00		0.72	1.00		0.35	1.00	1.00	0.23	1.00	1.00
Satd. Flow (perm)	1399	1700		1405	1936		684	3673	1667	448	3637	1627
Peak-hour factor, PHF	0.78	0.92	0.78	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.95	0.95
Adj. Flow (vph)	63	0	62	1	11	1	75	1047	1	1	725	35
RTOR Reduction (vph)	0	55	0	0	1	0	0	0	0	0	0	17
Lane Group Flow (vph)	63	7	0	1	11	0	75	1047	1	1	725	18
Heavy Vehicles (%)	0%	2%	0%	2%	2%	2%	0%	0%	2%	2%	1%	1%
Turn Type	Perm	NA		Perm	NA		D.P+P	NA	Perm	D.P+P	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			6		2	2		6
Actuated Green, G (s)	6.3	6.3		6.3	6.3		34.9	33.8	33.8	34.9	30.9	30.9
Effective Green, g (s)	6.3	6.3		6.3	6.3		34.9	33.8	33.8	34.9	30.9	30.9
Actuated g/C Ratio	0.11	0.11		0.11	0.11		0.58	0.56	0.56	0.58	0.52	0.52
Clearance Time (s)	6.8	6.8		6.8	6.8		6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	146	178		147	203		474	2069	939	286	1873	837
v/s Ratio Prot		0.00			0.01		c0.01	c0.29		0.00	0.20	
v/s Ratio Perm	c0.05			0.00			0.08		0.00	0.00		0.01
v/c Ratio	0.43	0.04		0.01	0.05		0.16	0.51	0.00	0.00	0.39	0.02
Uniform Delay, d1	25.2	24.1		24.0	24.2		5.5	8.0	5.7	5.5	8.8	7.1
Progression Factor	1.00	1.00		1.00	1.00		0.55	0.46	1.00	1.11	0.99	1.00
Incremental Delay, d2	2.0	0.1		0.0	0.1		0.1	0.8	0.0	0.0	0.6	0.0
Delay (s)	27.2	24.2		24.1	24.3		3.2	4.4	5.7	6.1	9.3	7.2
Level of Service	C	C		C	C		A	A	A	A	A	A
Approach Delay (s/veh)		25.7			24.3			4.3			9.2	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	7.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	18.8
Intersection Capacity Utilization	54.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	304	129	0	465	0	0	0	0
Future Volume (vph)	0	0	0	0	304	129	0	465	0	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					10.1	10.1		5.8				
Lane Util. Factor					0.95	1.00		0.95				
Frt					1.00	0.85		1.00				
Flt Protected					1.00	1.00		1.00				
Satd. Flow (prot)					3762	1683		3762				
Flt Permitted					1.00	1.00		1.00				
Satd. Flow (perm)					3762	1683		3762				
Peak-hour factor, PHF	0.92	0.92	0.92	0.86	0.86	0.86	0.87	0.87	0.87	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	353	150	0	534	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	105	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	353	45	0	534	0	0	0	0
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	1%	1%	1%	2%	2%	2%
Turn Type					NA	Perm		NA				
Protected Phases					2			8				
Permitted Phases						2						
Actuated Green, G (s)					17.9	17.9		26.2				
Effective Green, g (s)					17.9	17.9		26.2				
Actuated g/C Ratio					0.30	0.30		0.44				
Clearance Time (s)					10.1	10.1		5.8				
Vehicle Extension (s)					3.0	3.0		3.0				
Lane Grp Cap (vph)					1122	502		1642				
v/s Ratio Prot					c0.09			c0.14				
v/s Ratio Perm						0.03						
v/c Ratio					0.31	0.09		0.33				
Uniform Delay, d1					16.3	15.2		11.1				
Progression Factor					0.92	0.98		0.00				
Incremental Delay, d2					0.7	0.3		0.5				
Delay (s)					15.7	15.3		0.5				
Level of Service					B	B		A				
Approach Delay (s/veh)		0.0			15.6			0.5			0.0	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	7.8	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.35		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	52.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	189	0	0	0	0	0	465	105	0	0	0
Future Volume (vph)	0	189	0	0	0	0	0	465	105	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.1						9.8	9.8			
Lane Util. Factor		0.95						0.95	1.00			
Frt		1.00						1.00	0.85			
Flt Protected		1.00						1.00	1.00			
Satd. Flow (prot)		3800						3762	1683			
Flt Permitted		1.00						1.00	1.00			
Satd. Flow (perm)		3800						3762	1683			
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.87	0.87	0.87	0.92	0.92	0.92
Adj. Flow (vph)	0	210	0	0	0	0	0	534	121	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	76	0	0	0
Lane Group Flow (vph)	0	210	0	0	0	0	0	534	45	0	0	0
Heavy Vehicles (%)	0%	0%	0%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Turn Type		NA						NA	Perm			
Protected Phases		6						4				
Permitted Phases									4			
Actuated Green, G (s)		21.9						22.2	22.2			
Effective Green, g (s)		21.9						22.2	22.2			
Actuated g/C Ratio		0.37						0.37	0.37			
Clearance Time (s)		6.1						9.8	9.8			
Vehicle Extension (s)		3.0						3.0	3.0			
Lane Grp Cap (vph)		1387						1391	622			
v/s Ratio Prot		c0.06						c0.14				
v/s Ratio Perm									0.03			
v/c Ratio		0.15						0.38	0.07			
Uniform Delay, d1		12.8						13.9	12.2			
Progression Factor		0.00						1.00	1.00			
Incremental Delay, d2		0.2						0.8	0.2			
Delay (s)		0.2						14.7	12.5			
Level of Service		A						B	B			
Approach Delay (s/veh)		0.2			0.0			14.3			0.0	
Approach LOS		A			A			B			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	10.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.30		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	33.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	189	261	0	0	0	0	0	0	0	1178	0
Future Volume (vph)	0	189	261	0	0	0	0	0	0	0	1178	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		10.1	10.1								5.8	
Lane Util. Factor		0.95	1.00								0.95	
Frpb, ped/bikes		1.00	0.99								1.00	
Flpb, ped/bikes		1.00	1.00								1.00	
Frt		1.00	0.85								1.00	
Flt Protected		1.00	1.00								1.00	
Satd. Flow (prot)		3725	1645								3800	
Flt Permitted		1.00	1.00								1.00	
Satd. Flow (perm)		3725	1645								3800	
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.92	0.92	0.92	0.94	0.94	0.94
Adj. Flow (vph)	0	210	290	0	0	0	0	0	0	0	1253	0
RTOR Reduction (vph)	0	0	87	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	210	203	0	0	0	0	0	0	0	1253	0
Confl. Peds. (#/hr)			1									
Heavy Vehicles (%)	0%	2%	2%	2%	2%	2%	2%	2%	2%	0%	0%	0%
Turn Type		NA	Perm								NA	
Protected Phases		2									8	
Permitted Phases			2									
Actuated Green, G (s)		17.9	17.9								26.2	
Effective Green, g (s)		17.9	17.9								26.2	
Actuated g/C Ratio		0.30	0.30								0.44	
Clearance Time (s)		10.1	10.1								5.8	
Vehicle Extension (s)		3.0	3.0								3.0	
Lane Grp Cap (vph)		1111	490								1659	
v/s Ratio Prot		0.06									c0.33	
v/s Ratio Perm			c0.12									
v/c Ratio		0.19	0.41								0.76	
Uniform Delay, d1		15.7	16.9								14.2	
Progression Factor		1.00	1.00								0.03	
Incremental Delay, d2		0.4	2.6								1.4	
Delay (s)		16.0	19.4								1.8	
Level of Service		B	B								A	
Approach Delay (s/veh)		18.0			0.0			0.0			1.8	
Approach LOS		B			A			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	6.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	61.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	304	0	0	0	0	0	1178	136
Future Volume (vph)	0	0	0	0	304	0	0	0	0	0	1178	136
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					6.1						9.8	9.8
Lane Util. Factor					0.95						0.95	1.00
Frt					1.00						1.00	0.85
Flt Protected					1.00						1.00	1.00
Satd. Flow (prot)					3800						3800	1700
Flt Permitted					1.00						1.00	1.00
Satd. Flow (perm)					3800						3800	1700
Peak-hour factor, PHF	0.92	0.92	0.92	0.86	0.86	0.86	0.92	0.92	0.92	0.94	0.94	0.94
Adj. Flow (vph)	0	0	0	0	353	0	0	0	0	0	1253	145
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	91
Lane Group Flow (vph)	0	0	0	0	353	0	0	0	0	0	1253	54
Heavy Vehicles (%)	2%	2%	2%	0%	0%	0%	2%	2%	2%	0%	0%	0%
Turn Type					NA						NA	Perm
Protected Phases					6						4	
Permitted Phases												4
Actuated Green, G (s)					21.9						22.2	22.2
Effective Green, g (s)					21.9						22.2	22.2
Actuated g/C Ratio					0.37						0.37	0.37
Clearance Time (s)					6.1						9.8	9.8
Vehicle Extension (s)					3.0						3.0	3.0
Lane Grp Cap (vph)					1387						1406	629
v/s Ratio Prot					c0.09						c0.33	
v/s Ratio Perm												0.03
v/c Ratio					0.25						0.89	0.09
Uniform Delay, d1					13.3						17.8	12.3
Progression Factor					0.00						0.53	0.34
Incremental Delay, d2					0.4						8.3	0.2
Delay (s)					0.4						17.7	4.4
Level of Service					A						B	A
Approach Delay (s/veh)		0.0			0.4			0.0			16.3	
Approach LOS		A			A			A			B	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	13.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	52.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2	5	44	30	22	13	152	551	4	8	964	17
Future Volume (vph)	2	5	44	30	22	13	152	551	4	8	964	17
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	6.8	6.8			6.8		5.9	5.9	5.9	5.9	5.9	5.9
Lane Util. Factor	1.00	1.00			1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.87			0.97		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00			0.98		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1900	1731			1902		1881	3762	1683	1900	3800	1700
Flt Permitted	0.69	1.00			0.82		0.18	1.00	1.00	0.43	1.00	1.00
Satd. Flow (perm)	1383	1731			1593		359	3762	1683	867	3800	1700
Peak-hour factor, PHF	0.73	0.73	0.73	0.64	0.64	0.64	0.95	0.95	0.95	0.87	0.87	0.87
Adj. Flow (vph)	3	7	60	47	34	20	160	580	4	9	1108	20
RTOR Reduction (vph)	0	54	0	0	15	0	0	0	2	0	0	10
Lane Group Flow (vph)	3	13	0	0	86	0	160	580	2	9	1108	10
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	1%	1%	1%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		D.P+P	NA	Perm	D.P+P	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			6		2	2		6
Actuated Green, G (s)	6.3	6.3			6.3		35.1	33.9	33.9	35.1	29.5	29.5
Effective Green, g (s)	6.3	6.3			6.3		35.1	33.9	33.9	35.1	29.5	29.5
Actuated g/C Ratio	0.11	0.11			0.11		0.59	0.56	0.56	0.59	0.49	0.49
Clearance Time (s)	6.8	6.8			6.8		5.9	5.9	5.9	5.9	5.9	5.9
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	145	181			167		352	2125	950	527	1868	835
v/s Ratio Prot		0.01					c0.04	c0.15		0.00	c0.29	
v/s Ratio Perm	0.00				c0.05		0.22		0.00	0.01		0.01
v/c Ratio	0.02	0.07			0.51		0.45	0.27	0.00	0.02	0.59	0.01
Uniform Delay, d1	24.1	24.2			25.4		6.6	6.7	5.7	5.2	10.9	7.8
Progression Factor	1.00	1.00			1.00		1.86	0.78	1.00	0.55	0.47	1.00
Incremental Delay, d2	0.1	0.2			2.7		0.9	0.3	0.0	0.0	1.2	0.0
Delay (s)	24.1	24.4			28.1		13.1	5.5	5.7	2.9	6.4	7.8
Level of Service	C	C			C		B	A	A	A	A	A
Approach Delay (s/veh)		24.4			28.1			7.1			6.4	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	8.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	18.6
Intersection Capacity Utilization	58.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	345	315	403	200	312	744
Future Volume (vph)	345	315	403	200	312	744
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Lane Width	12	12	11	11	11	11
Total Lost time (s)	6.1	6.0	6.0	6.1	6.0	6.0
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	0.95
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1881	1683	3673	1643	1837	3673
Flt Permitted	0.95	1.00	1.00	1.00	0.49	1.00
Satd. Flow (perm)	1881	1683	3673	1643	942	3673
Peak-hour factor, PHF	0.88	0.88	0.95	0.95	0.82	0.82
Adj. Flow (vph)	392	358	424	211	380	907
RTOR Reduction (vph)	0	26	0	104	0	0
Lane Group Flow (vph)	392	332	424	107	380	907
Heavy Vehicles (%)	1%	1%	0%	0%	0%	0%
Turn Type	Prot	pm+ov	NA	pm+ov	D.P+P	NA
Protected Phases	8	5	6	8	5	2
Permitted Phases		8		6	6	
Actuated Green, G (s)	16.1	27.7	14.2	30.3	25.8	31.8
Effective Green, g (s)	16.1	27.7	14.2	30.3	25.8	31.8
Actuated g/C Ratio	0.27	0.46	0.24	0.51	0.43	0.53
Clearance Time (s)	6.1	6.0	6.0	6.1	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	504	776	869	829	578	1946
v/s Ratio Prot	c0.21	0.08	0.12	0.03	c0.13	0.25
v/s Ratio Perm		0.11		0.03	c0.16	
v/c Ratio	0.78	0.43	0.49	0.13	0.66	0.47
Uniform Delay, d1	20.3	10.8	19.8	7.9	12.3	8.8
Progression Factor	1.00	1.00	0.59	2.37	1.25	0.22
Incremental Delay, d2	7.4	0.4	1.9	0.1	2.5	0.7
Delay (s)	27.7	11.2	13.5	18.7	17.8	2.7
Level of Service	C	B	B	B	B	A
Approach Delay (s/veh)	19.8		15.3			7.2
Approach LOS	B		B			A

Intersection Summary			
HCM 2000 Control Delay (s/veh)	12.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	18.1
Intersection Capacity Utilization	60.2%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↱					↑↑	↱		↑↑	
Traffic Volume (vph)	0	764	238	0	0	0	0	361	198	0	745	0
Future Volume (vph)	0	764	238	0	0	0	0	361	198	0	745	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.0	6.0					8.7	8.7		5.7	
Lane Util. Factor		0.95	1.00					0.95	1.00		0.95	
Frpb, ped/bikes		1.00	0.99					1.00	1.00		1.00	
Flpb, ped/bikes		1.00	1.00					1.00	1.00		1.00	
Frt		1.00	0.85					1.00	0.85		1.00	
Flt Protected		1.00	1.00					1.00	1.00		1.00	
Satd. Flow (prot)		3762	1661					3762	1683		3800	
Flt Permitted		1.00	1.00					1.00	1.00		1.00	
Satd. Flow (perm)		3762	1661					3762	1683		3800	
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.95	0.95	0.95	0.80	0.80	0.80
Adj. Flow (vph)	0	849	264	0	0	0	0	380	208	0	931	0
RTOR Reduction (vph)	0	0	61	0	0	0	0	0	41	0	0	0
Lane Group Flow (vph)	0	849	203	0	0	0	0	380	167	0	931	0
Confl. Peds. (#/hr)			2									
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	1%	1%	1%	0%	0%	0%
Turn Type		NA	Perm					NA	Perm		NA	
Protected Phases		2						4			8	
Permitted Phases			2						4			
Actuated Green, G (s)		24.6	24.6					20.7	20.7		23.7	
Effective Green, g (s)		24.6	24.6					20.7	20.7		23.7	
Actuated g/C Ratio		0.41	0.41					0.35	0.35		0.39	
Clearance Time (s)		6.0	6.0					8.7	8.7		5.7	
Vehicle Extension (s)		3.0	3.0					4.0	4.0		4.0	
Lane Grp Cap (vph)		1542	681					1297	580		1501	
v/s Ratio Prot		c0.23						0.10			c0.25	
v/s Ratio Perm			0.12						0.10			
v/c Ratio		0.55	0.30					0.29	0.29		0.62	
Uniform Delay, d1		13.5	11.9					14.3	14.3		14.5	
Progression Factor		0.91	0.80					0.51	0.37		0.01	
Incremental Delay, d2		1.4	1.1					0.2	0.4		0.7	
Delay (s)		13.7	10.6					7.5	5.7		0.8	
Level of Service		B	B					A	A		A	
Approach Delay (s/veh)		13.0			0.0			6.8			0.8	
Approach LOS		B			A			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	7.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	14.7
Intersection Capacity Utilization	53.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	1069	109	0	361	0	0	745	147
Future Volume (vph)	0	0	0	0	1069	109	0	361	0	0	745	147
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	12	12	12	12	12	12	16	12	12	12	12
Total Lost time (s)					6.0			5.7			8.7	8.7
Lane Util. Factor					0.91			0.95			0.95	1.00
Frpb, ped/bikes					1.00			1.00			1.00	1.00
Flpb, ped/bikes					1.00			1.00			1.00	1.00
Frt					0.99			1.00			1.00	0.85
Flt Protected					1.00			1.00			1.00	1.00
Satd. Flow (prot)					5324			4264			3800	1700
Flt Permitted					1.00			1.00			1.00	1.00
Satd. Flow (perm)					5324			4264			3800	1700
Peak-hour factor, PHF	0.92	0.92	0.92	0.95	0.95	0.95	0.95	0.95	0.95	0.80	0.80	0.80
Adj. Flow (vph)	0	0	0	0	1125	115	0	380	0	0	931	184
RTOR Reduction (vph)	0	0	0	0	20	0	0	0	0	0	0	36
Lane Group Flow (vph)	0	0	0	0	1220	0	0	380	0	0	931	148
Confl. Peds. (#/hr)						2						
Heavy Vehicles (%)	0%	0%	0%	1%	1%	1%	1%	1%	1%	0%	0%	0%
Turn Type					NA			NA			NA	Perm
Protected Phases					2			8			4	
Permitted Phases												4
Actuated Green, G (s)					24.6			23.7			20.7	20.7
Effective Green, g (s)					24.6			23.7			20.7	20.7
Actuated g/C Ratio					0.41			0.39			0.35	0.35
Clearance Time (s)					6.0			5.7			8.7	8.7
Vehicle Extension (s)					3.0			4.0			4.0	4.0
Lane Grp Cap (vph)					2182			1684			1311	586
v/s Ratio Prot					c0.23			0.09			c0.25	
v/s Ratio Perm												0.09
v/c Ratio					0.56			0.23			0.71	0.25
Uniform Delay, d1					13.5			12.1			17.0	14.1
Progression Factor					0.72			0.00			0.71	0.46
Incremental Delay, d2					0.9			0.1			1.9	0.3
Delay (s)					10.8			0.1			13.9	6.7
Level of Service					B			A			B	A
Approach Delay (s/veh)		0.0			10.8			0.1			12.7	
Approach LOS		A			B			A			B	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	10.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	14.7
Intersection Capacity Utilization	53.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	57	0	131	1	10	1	44	545	1	1	1016	72
Future Volume (vph)	57	0	131	1	10	1	44	545	1	1	1016	72
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	10	12	10	12	12	12	11	11	12	12	11	11
Total Lost time (s)	6.8	6.8		6.8	6.8		6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.85		1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1773	1700		1863	1936		1818	3637	1667	1863	3673	1643
Flt Permitted	0.75	1.00		0.66	1.00		0.17	1.00	1.00	0.42	1.00	1.00
Satd. Flow (perm)	1399	1700		1290	1936		321	3637	1667	824	3673	1643
Peak-hour factor, PHF	0.84	0.92	0.84	0.92	0.92	0.92	0.89	0.89	0.92	0.92	0.86	0.86
Adj. Flow (vph)	68	0	156	1	11	1	49	612	1	1	1181	84
RTOR Reduction (vph)	0	140	0	0	1	0	0	0	0	0	0	41
Lane Group Flow (vph)	68	16	0	1	11	0	49	612	1	1	1181	43
Heavy Vehicles (%)	0%	2%	0%	2%	2%	2%	1%	1%	2%	2%	0%	0%
Turn Type	Perm	NA		Perm	NA		D.P+P	NA	Perm	D.P+P	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			6		2	2		6
Actuated Green, G (s)	6.3	6.3		6.3	6.3		34.9	33.8	33.8	34.9	31.0	31.0
Effective Green, g (s)	6.3	6.3		6.3	6.3		34.9	33.8	33.8	34.9	31.0	31.0
Actuated g/C Ratio	0.11	0.11		0.11	0.11		0.58	0.56	0.56	0.58	0.52	0.52
Clearance Time (s)	6.8	6.8		6.8	6.8		6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	146	178		135	203		284	2048	939	498	1897	848
v/s Ratio Prot		0.01			0.01		c0.01	c0.17		0.00	c0.32	
v/s Ratio Perm	c0.05			0.00			0.09		0.00	0.00		0.03
v/c Ratio	0.47	0.09		0.01	0.05		0.17	0.30	0.00	0.00	0.62	0.05
Uniform Delay, d1	25.3	24.3		24.0	24.2		6.2	6.9	5.7	5.3	10.3	7.2
Progression Factor	1.00	1.00		1.00	1.00		0.74	0.56	1.00	0.96	0.87	1.00
Incremental Delay, d2	2.3	0.2		0.0	0.1		0.3	0.4	0.0	0.0	1.3	0.1
Delay (s)	27.6	24.5		24.1	24.3		4.8	4.2	5.7	5.1	10.3	7.3
Level of Service	C	C		C	C		A	A	A	A	B	A
Approach Delay (s/veh)		25.4			24.3			4.3			10.1	
Approach LOS		C			C			A			B	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	10.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	18.8
Intersection Capacity Utilization	55.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	216	164	0	648	0	0	0	0
Future Volume (vph)	0	0	0	0	216	164	0	648	0	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					10.1	10.1		5.8				
Lane Util. Factor					0.95	1.00		0.95				
Frt					1.00	0.85		1.00				
Flt Protected					1.00	1.00		1.00				
Satd. Flow (prot)					3762	1683		3762				
Flt Permitted					1.00	1.00		1.00				
Satd. Flow (perm)					3762	1683		3762				
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	235	178	0	704	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	78	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	235	100	0	704	0	0	0	0
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	1%	1%	1%	2%	2%	2%
Turn Type					NA	Perm		NA				
Protected Phases					2			8				
Permitted Phases						2						
Actuated Green, G (s)					29.9	29.9		34.2				
Effective Green, g (s)					29.9	29.9		34.2				
Actuated g/C Ratio					0.37	0.37		0.43				
Clearance Time (s)					10.1	10.1		5.8				
Vehicle Extension (s)					3.0	3.0		3.0				
Lane Grp Cap (vph)					1406	629		1608				
v/s Ratio Prot					c0.06			c0.19				
v/s Ratio Perm						0.06						
v/c Ratio					0.17	0.16		0.44				
Uniform Delay, d1					16.7	16.7		16.1				
Progression Factor					1.00	1.11		0.00				
Incremental Delay, d2					0.3	0.5		0.8				
Delay (s)					16.9	19.0		0.8				
Level of Service					B	B		A				
Approach Delay (s/veh)		0.0			17.8			0.8			0.0	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	7.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.33		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	42.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	272	0	0	0	0	0	648	180	0	0	0
Future Volume (vph)	0	272	0	0	0	0	0	648	180	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.1						9.8	9.8			
Lane Util. Factor		0.95						0.95	1.00			
Frpb, ped/bikes		1.00						1.00	0.99			
Flpb, ped/bikes		1.00						1.00	1.00			
Frt		1.00						1.00	0.85			
Flt Protected		1.00						1.00	1.00			
Satd. Flow (prot)		3762						3762	1661			
Flt Permitted		1.00						1.00	1.00			
Satd. Flow (perm)		3762						3762	1661			
Peak-hour factor, PHF	0.81	0.81	0.81	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	336	0	0	0	0	0	704	196	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	122	0	0	0
Lane Group Flow (vph)	0	336	0	0	0	0	0	704	74	0	0	0
Confl. Peds. (#/hr)									1			
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Turn Type		NA						NA	Perm			
Protected Phases		6						4				
Permitted Phases									4			
Actuated Green, G (s)		33.9						30.2	30.2			
Effective Green, g (s)		33.9						30.2	30.2			
Actuated g/C Ratio		0.42						0.38	0.38			
Clearance Time (s)		6.1						9.8	9.8			
Vehicle Extension (s)		3.0						3.0	3.0			
Lane Grp Cap (vph)		1594						1420	627			
v/s Ratio Prot		c0.09						c0.19				
v/s Ratio Perm									0.04			
v/c Ratio		0.21						0.50	0.12			
Uniform Delay, d1		14.6						19.1	16.2			
Progression Factor		0.00						1.00	1.00			
Incremental Delay, d2		0.3						1.2	0.4			
Delay (s)		0.3						20.3	16.6			
Level of Service		A						C	B			
Approach Delay (s/veh)		0.3			0.0			19.5			0.0	
Approach LOS		A			A			B			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	14.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	39.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	272	402	0	0	0	0	0	0	0	781	0
Future Volume (vph)	0	272	402	0	0	0	0	0	0	0	781	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		10.1	10.1								5.8	
Lane Util. Factor		0.95	1.00								0.95	
Frt		1.00	0.85								1.00	
Flt Protected		1.00	1.00								1.00	
Satd. Flow (prot)		3762	1683								3800	
Flt Permitted		1.00	1.00								1.00	
Satd. Flow (perm)		3762	1683								3800	
Peak-hour factor, PHF	0.81	0.81	0.81	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	336	496	0	0	0	0	0	0	0	849	0
RTOR Reduction (vph)	0	0	58	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	336	438	0	0	0	0	0	0	0	849	0
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	2%	2%	2%	0%	0%	0%
Turn Type		NA	Perm								NA	
Protected Phases		2									8	
Permitted Phases			2									
Actuated Green, G (s)		29.9	29.9								34.2	
Effective Green, g (s)		29.9	29.9								34.2	
Actuated g/C Ratio		0.37	0.37								0.43	
Clearance Time (s)		10.1	10.1								5.8	
Vehicle Extension (s)		3.0	3.0								3.0	
Lane Grp Cap (vph)		1406	629								1624	
v/s Ratio Prot		0.09									c0.22	
v/s Ratio Perm			c0.26									
v/c Ratio		0.24	0.70								0.52	
Uniform Delay, d1		17.2	21.2								16.9	
Progression Factor		1.00	1.00								0.00	
Incremental Delay, d2		0.4	6.3								1.0	
Delay (s)		17.6	27.5								1.0	
Level of Service		B	C								A	
Approach Delay (s/veh)		23.5			0.0			0.0			1.0	
Approach LOS		C			A			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	12.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	57.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	216	0	0	0	0	0	781	132
Future Volume (vph)	0	0	0	0	216	0	0	0	0	0	781	132
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					6.1						9.8	9.8
Lane Util. Factor					0.95						0.95	1.00
Frt					1.00						1.00	0.85
Flt Protected					1.00						1.00	1.00
Satd. Flow (prot)					3762						3800	1700
Flt Permitted					1.00						1.00	1.00
Satd. Flow (perm)					3762						3800	1700
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	235	0	0	0	0	0	849	143
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	89
Lane Group Flow (vph)	0	0	0	0	235	0	0	0	0	0	849	54
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	2%	2%	2%	0%	0%	0%
Turn Type					NA						NA	Perm
Protected Phases					6						4	
Permitted Phases												4
Actuated Green, G (s)					33.9						30.2	30.2
Effective Green, g (s)					33.9						30.2	30.2
Actuated g/C Ratio					0.42						0.38	0.38
Clearance Time (s)					6.1						9.8	9.8
Vehicle Extension (s)					3.0						3.0	3.0
Lane Grp Cap (vph)					1594						1434	641
v/s Ratio Prot					c0.06						c0.22	
v/s Ratio Perm												0.03
v/c Ratio					0.15						0.59	0.08
Uniform Delay, d1					14.2						20.0	16.0
Progression Factor					0.00						1.00	1.00
Incremental Delay, d2					0.2						1.8	0.3
Delay (s)					0.2						21.8	16.3
Level of Service					A						C	B
Approach Delay (s/veh)		0.0			0.2			0.0			21.0	
Approach LOS		A			A			A			C	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	17.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	42.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	24	0	89	6	9	15	89	791	15	6	819	12
Future Volume (vph)	24	0	89	6	9	15	89	791	15	6	819	12
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	6.8	6.8			6.8		5.9	5.9	5.9	5.9	5.9	5.9
Lane Util. Factor	1.00	1.00			1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.85			0.93		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00			0.99		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1900	1700			1847		1900	3800	1700	1900	3800	1700
Flt Permitted	0.72	1.00			0.90		0.29	1.00	1.00	0.30	1.00	1.00
Satd. Flow (perm)	1449	1700			1683		576	3800	1700	603	3800	1700
Peak-hour factor, PHF	0.83	0.83	0.83	0.60	0.60	0.60	0.89	0.89	0.89	0.91	0.91	0.91
Adj. Flow (vph)	29	0	107	10	15	25	100	889	17	7	900	13
RTOR Reduction (vph)	0	99	0	0	23	0	0	0	5	0	0	5
Lane Group Flow (vph)	29	8	0	0	27	0	100	889	12	7	900	8
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		D.P+P	NA	Perm	D.P+P	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			6		2	2		6
Actuated Green, G (s)	7.1	7.1			7.1		64.3	62.9	62.9	64.3	58.7	58.7
Effective Green, g (s)	7.1	7.1			7.1		64.3	62.9	62.9	64.3	58.7	58.7
Actuated g/C Ratio	0.08	0.08			0.08		0.71	0.70	0.70	0.71	0.65	0.65
Clearance Time (s)	6.8	6.8			6.8		5.9	5.9	5.9	5.9	5.9	5.9
Vehicle Extension (s)	4.0	4.0			4.0		3.0	4.0	4.0	3.0	4.0	4.0
Lane Grp Cap (vph)	114	134			132		493	2655	1188	450	2478	1108
v/s Ratio Prot		0.00					c0.01	c0.23		0.00	c0.24	
v/s Ratio Perm	c0.02				0.02		0.13		0.01	0.01		0.00
v/c Ratio	0.25	0.06			0.20		0.20	0.33	0.01	0.02	0.36	0.01
Uniform Delay, d1	39.0	38.4			38.8		4.1	5.3	4.1	3.8	7.1	5.5
Progression Factor	1.00	1.00			1.00		0.86	0.71	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.6	0.3			1.0		0.2	0.3	0.0	0.0	0.4	0.0
Delay (s)	40.6	38.6			39.9		3.7	4.1	4.1	3.8	7.5	5.5
Level of Service	D	D			D		A	A	A	A	A	A
Approach Delay (s/veh)		39.1			39.9			4.1			7.5	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	8.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.35		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.6
Intersection Capacity Utilization	48.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	171	332	540	184	324	589
Future Volume (vph)	171	332	540	184	324	589
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Lane Width	12	12	11	11	11	11
Total Lost time (s)	6.1	6.0	6.0	6.1	6.0	6.0
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	0.95
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1900	1700	3637	1627	1818	3637
Flt Permitted	0.95	1.00	1.00	1.00	0.38	1.00
Satd. Flow (perm)	1900	1700	3637	1627	719	3637
Peak-hour factor, PHF	0.94	0.94	0.86	0.86	0.91	0.91
Adj. Flow (vph)	182	353	628	214	356	647
RTOR Reduction (vph)	0	85	0	74	0	0
Lane Group Flow (vph)	182	268	628	140	356	647
Heavy Vehicles (%)	0%	0%	1%	1%	1%	1%
Turn Type	Prot	pm+ov	NA	pm+ov	D.P+P	NA
Protected Phases	8	5	6	8	5	2
Permitted Phases		8		6	6	
Actuated Green, G (s)	13.9	27.0	44.9	58.8	58.0	64.0
Effective Green, g (s)	13.9	27.0	44.9	58.8	58.0	64.0
Actuated g/C Ratio	0.15	0.30	0.50	0.65	0.64	0.71
Clearance Time (s)	6.1	6.0	6.0	6.1	6.0	6.0
Vehicle Extension (s)	3.0	3.5	3.0	3.0	3.5	3.0
Lane Grp Cap (vph)	293	510	1814	1062	623	2586
v/s Ratio Prot	c0.10	0.08	0.17	0.02	c0.08	0.18
v/s Ratio Perm		0.08		0.07	c0.29	
v/c Ratio	0.62	0.53	0.35	0.13	0.57	0.25
Uniform Delay, d1	35.6	26.2	13.7	5.9	7.2	4.6
Progression Factor	1.00	1.00	1.52	1.19	1.02	0.23
Incremental Delay, d2	4.1	1.1	0.5	0.1	1.3	0.2
Delay (s)	39.6	27.3	21.3	7.1	8.7	1.3
Level of Service	D	C	C	A	A	A
Approach Delay (s/veh)	31.5		17.7			3.9
Approach LOS	C		B			A

Intersection Summary			
HCM 2000 Control Delay (s/veh)	15.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.1
Intersection Capacity Utilization	55.3%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1028	251	0	0	0	0	608	212	0	538	0
Future Volume (vph)	0	1028	251	0	0	0	0	608	212	0	538	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.0	6.0					8.7	8.7		5.7	
Lane Util. Factor		0.95	1.00					0.95	1.00		0.95	
Frpb, ped/bikes		1.00	0.99					1.00	1.00		1.00	
Flpb, ped/bikes		1.00	1.00					1.00	1.00		1.00	
Frt		1.00	0.85					1.00	0.85		1.00	
Flt Protected		1.00	1.00					1.00	1.00		1.00	
Satd. Flow (prot)		3800	1677					3800	1700		3762	
Flt Permitted		1.00	1.00					1.00	1.00		1.00	
Satd. Flow (perm)		3800	1677					3800	1700		3762	
Peak-hour factor, PHF	0.93	0.93	0.93	0.92	0.92	0.92	0.89	0.89	0.89	0.93	0.93	0.93
Adj. Flow (vph)	0	1105	270	0	0	0	0	683	238	0	578	0
RTOR Reduction (vph)	0	0	44	0	0	0	0	0	50	0	0	0
Lane Group Flow (vph)	0	1105	226	0	0	0	0	683	188	0	578	0
Confl. Peds. (#/hr)			2									
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	1%	1%
Turn Type		NA	Perm					NA	Perm		NA	
Protected Phases		2						4			8	
Permitted Phases			2						4			
Actuated Green, G (s)		43.6	43.6					21.7	21.7		24.7	
Effective Green, g (s)		43.6	43.6					21.7	21.7		24.7	
Actuated g/C Ratio		0.55	0.55					0.27	0.27		0.31	
Clearance Time (s)		6.0	6.0					8.7	8.7		5.7	
Vehicle Extension (s)		3.0	3.0					4.0	4.0		4.0	
Lane Grp Cap (vph)		2071	913					1030	461		1161	
v/s Ratio Prot		c0.29						c0.18			0.15	
v/s Ratio Perm			0.13						0.11			
v/c Ratio		0.53	0.25					0.66	0.41		0.50	
Uniform Delay, d1		11.7	9.6					25.9	23.9		22.6	
Progression Factor		1.02	0.98					1.00	1.00		0.00	
Incremental Delay, d2		0.9	0.6					1.8	0.8		0.4	
Delay (s)		12.9	9.9					27.7	24.7		0.4	
Level of Service		B	A					C	C		A	
Approach Delay (s/veh)		12.3			0.0			26.9			0.4	
Approach LOS		B			A			C			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	14.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	14.7
Intersection Capacity Utilization	55.2%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	1278	196	0	608	0	0	538	179
Future Volume (vph)	0	0	0	0	1278	196	0	608	0	0	538	179
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	12	12	12	12	12	12	16	12	12	12	12
Total Lost time (s)					6.0			5.7			8.7	8.7
Lane Util. Factor					0.91			0.95			0.95	1.00
Frpb, ped/bikes					1.00			1.00			1.00	0.98
Flpb, ped/bikes					1.00			1.00			1.00	1.00
Frt					0.98			1.00			1.00	0.85
Flt Protected					1.00			1.00			1.00	1.00
Satd. Flow (prot)					5341			4307			3762	1649
Flt Permitted					1.00			1.00			1.00	1.00
Satd. Flow (perm)					5341			4307			3762	1649
Peak-hour factor, PHF	0.92	0.92	0.92	0.91	0.91	0.91	0.89	0.89	0.89	0.93	0.93	0.93
Adj. Flow (vph)	0	0	0	0	1404	215	0	683	0	0	578	192
RTOR Reduction (vph)	0	0	0	0	25	0	0	0	0	0	0	30
Lane Group Flow (vph)	0	0	0	0	1594	0	0	683	0	0	578	162
Confl. Peds. (#/hr)						2						5
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	1%	1%
Turn Type					NA			NA			NA	Perm
Protected Phases					2			8			4	
Permitted Phases												4
Actuated Green, G (s)					43.6			24.7			21.7	21.7
Effective Green, g (s)					43.6			24.7			21.7	21.7
Actuated g/C Ratio					0.55			0.31			0.27	0.27
Clearance Time (s)					6.0			5.7			8.7	8.7
Vehicle Extension (s)					3.0			4.0			4.0	4.0
Lane Grp Cap (vph)					2910			1329			1020	447
v/s Ratio Prot					c0.30			c0.16			0.15	
v/s Ratio Perm												0.10
v/c Ratio					0.55			0.51			0.57	0.36
Uniform Delay, d1					11.8			22.7			25.1	23.6
Progression Factor					0.92			0.00			0.84	0.76
Incremental Delay, d2					0.6			0.3			0.8	0.7
Delay (s)					11.6			0.3			21.9	18.7
Level of Service					B			A			C	B
Approach Delay (s/veh)		0.0			11.6			0.3			21.1	
Approach LOS		A			B			A			C	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	11.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	14.7
Intersection Capacity Utilization	55.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	46	0	51	1	10	1	41	677	1	1	714	45
Future Volume (vph)	46	0	51	1	10	1	41	677	1	1	714	45
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	10	12	10	12	12	12	11	11	12	12	11	11
Total Lost time (s)	6.8	6.8		6.8	6.8		6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.85		1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1756	1683		1863	1936		1837	3673	1667	1863	3637	1627
Flt Permitted	0.75	1.00		0.71	1.00		0.32	1.00	1.00	0.33	1.00	1.00
Satd. Flow (perm)	1386	1683		1394	1936		624	3673	1667	640	3637	1627
Peak-hour factor, PHF	0.72	0.92	0.72	0.92	0.92	0.92	0.82	0.82	0.92	0.92	0.87	0.87
Adj. Flow (vph)	64	0	71	1	11	1	50	826	1	1	821	52
RTOR Reduction (vph)	0	65	0	0	1	0	0	0	0	0	0	17
Lane Group Flow (vph)	64	6	0	1	11	0	50	826	1	1	821	35
Heavy Vehicles (%)	1%	2%	1%	2%	2%	2%	0%	0%	2%	2%	1%	1%
Turn Type	Perm	NA		Perm	NA		D.P+P	NA	Perm	D.P+P	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			6		2	2		6
Actuated Green, G (s)	7.1	7.1		7.1	7.1		64.1	63.0	63.0	64.1	60.2	60.2
Effective Green, g (s)	7.1	7.1		7.1	7.1		64.1	63.0	63.0	64.1	60.2	60.2
Actuated g/C Ratio	0.08	0.08		0.08	0.08		0.71	0.70	0.70	0.71	0.67	0.67
Clearance Time (s)	6.8	6.8		6.8	6.8		6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	109	132		109	152		496	2571	1166	470	2432	1088
v/s Ratio Prot		0.00			0.01		c0.00	c0.22		0.00	c0.23	
v/s Ratio Perm	c0.05			0.00			0.07		0.00	0.00		0.02
v/c Ratio	0.59	0.04		0.01	0.07		0.10	0.32	0.00	0.00	0.34	0.03
Uniform Delay, d1	40.0	38.3		38.2	38.4		3.9	5.2	4.1	3.8	6.4	5.0
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	0.88	0.89	1.00
Incremental Delay, d2	7.8	0.1		0.0	0.2		0.1	0.3	0.0	0.0	0.4	0.1
Delay (s)	47.9	38.4		38.2	38.6		4.0	5.6	4.1	3.3	6.0	5.1
Level of Service	D	D		D	D		A	A	A	A	A	A
Approach Delay (s/veh)		42.9			38.6			5.5			6.0	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	8.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.35		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.8
Intersection Capacity Utilization	47.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	174	247	0	920	0	0	0	0
Future Volume (vph)	0	0	0	0	174	247	0	920	0	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					10.1	10.1		5.8				
Lane Util. Factor					0.95	1.00		0.95				
Frt					1.00	0.85		1.00				
Flt Protected					1.00	1.00		1.00				
Satd. Flow (prot)					3800	1700		3800				
Flt Permitted					1.00	1.00		1.00				
Satd. Flow (perm)					3800	1700		3800				
Peak-hour factor, PHF	0.92	0.92	0.92	0.85	0.85	0.85	0.95	0.95	0.95	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	205	291	0	968	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	77	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	205	214	0	968	0	0	0	0
Heavy Vehicles (%)	2%	2%	2%	0%	0%	0%	0%	0%	0%	2%	2%	2%
Turn Type					NA	Perm		NA				
Protected Phases					2			8				
Permitted Phases						2						
Actuated Green, G (s)					22.9	22.9		21.2				
Effective Green, g (s)					22.9	22.9		21.2				
Actuated g/C Ratio					0.38	0.38		0.35				
Clearance Time (s)					10.1	10.1		5.8				
Vehicle Extension (s)					3.0	3.0		3.0				
Lane Grp Cap (vph)					1450	648		1342				
v/s Ratio Prot					0.05			c0.25				
v/s Ratio Perm						c0.13						
v/c Ratio					0.14	0.33		0.72				
Uniform Delay, d1					12.1	13.1		16.8				
Progression Factor					1.01	1.04		0.03				
Incremental Delay, d2					0.2	1.4		1.5				
Delay (s)					12.5	15.0		2.0				
Level of Service					B	B		A				
Approach Delay (s/veh)		0.0			14.0			2.0			0.0	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	6.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	51.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	505	0	0	0	0	0	920	200	0	0	0
Future Volume (vph)	0	505	0	0	0	0	0	920	200	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.1						9.8	9.8			
Lane Util. Factor		0.95						0.95	1.00			
Frpb, ped/bikes		1.00						1.00	0.99			
Flpb, ped/bikes		1.00						1.00	1.00			
Frt		1.00						1.00	0.85			
Flt Protected		1.00						1.00	1.00			
Satd. Flow (prot)		3800						3800	1676			
Flt Permitted		1.00						1.00	1.00			
Satd. Flow (perm)		3800						3800	1676			
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.95	0.95	0.95	0.92	0.92	0.92
Adj. Flow (vph)	0	561	0	0	0	0	0	968	211	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	151	0	0	0
Lane Group Flow (vph)	0	561	0	0	0	0	0	968	60	0	0	0
Confl. Peds. (#/hr)									2			
Heavy Vehicles (%)	0%	0%	0%	2%	2%	2%	0%	0%	0%	2%	2%	2%
Turn Type		NA						NA	Perm			
Protected Phases		6						4				
Permitted Phases									4			
Actuated Green, G (s)		26.9						17.2	17.2			
Effective Green, g (s)		26.9						17.2	17.2			
Actuated g/C Ratio		0.45						0.29	0.29			
Clearance Time (s)		6.1						9.8	9.8			
Vehicle Extension (s)		3.0						3.0	3.0			
Lane Grp Cap (vph)		1703						1089	480			
v/s Ratio Prot		c0.15						c0.25				
v/s Ratio Perm									0.04			
v/c Ratio		0.33						0.89	0.13			
Uniform Delay, d1		10.7						20.5	15.8			
Progression Factor		0.00						1.00	1.00			
Incremental Delay, d2		0.5						10.9	0.5			
Delay (s)		0.5						31.3	16.4			
Level of Service		A						C	B			
Approach Delay (s/veh)		0.5			0.0			28.7			0.0	
Approach LOS		A			A			C			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	19.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	51.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	505	537	0	0	0	0	0	0	0	730	0
Future Volume (vph)	0	505	537	0	0	0	0	0	0	0	730	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		10.1	10.1								5.8	
Lane Util. Factor		0.95	1.00								0.95	
Frt		1.00	0.85								1.00	
Flt Protected		1.00	1.00								1.00	
Satd. Flow (prot)		3800	1700								3800	
Flt Permitted		1.00	1.00								1.00	
Satd. Flow (perm)		3800	1700								3800	
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.92	0.92	0.92	0.95	0.95	0.95
Adj. Flow (vph)	0	561	597	0	0	0	0	0	0	0	768	0
RTOR Reduction (vph)	0	0	77	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	561	520	0	0	0	0	0	0	0	768	0
Heavy Vehicles (%)	0%	0%	0%	2%	2%	2%	2%	2%	2%	0%	0%	0%
Turn Type		NA	Perm								NA	
Protected Phases		2									8	
Permitted Phases			2									
Actuated Green, G (s)		22.9	22.9								21.2	
Effective Green, g (s)		22.9	22.9								21.2	
Actuated g/C Ratio		0.38	0.38								0.35	
Clearance Time (s)		10.1	10.1								5.8	
Vehicle Extension (s)		3.0	3.0								3.0	
Lane Grp Cap (vph)		1450	648								1342	
v/s Ratio Prot		0.15									c0.20	
v/s Ratio Perm			c0.31									
v/c Ratio		0.39	0.80								0.57	
Uniform Delay, d1		13.5	16.5								15.7	
Progression Factor		1.00	1.00								0.01	
Incremental Delay, d2		0.8	10.2								1.2	
Delay (s)		14.2	26.7								1.3	
Level of Service		B	C								A	
Approach Delay (s/veh)		20.7			0.0			0.0			1.3	
Approach LOS		C			A			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	13.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	64.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	174	0	0	0	0	0	730	64
Future Volume (vph)	0	0	0	0	174	0	0	0	0	0	730	64
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					6.1						9.8	9.8
Lane Util. Factor					0.95						0.95	1.00
Frpb, ped/bikes					1.00						1.00	0.99
Flpb, ped/bikes					1.00						1.00	1.00
Frt					1.00						1.00	0.85
Flt Protected					1.00						1.00	1.00
Satd. Flow (prot)					3800						3800	1678
Flt Permitted					1.00						1.00	1.00
Satd. Flow (perm)					3800						3800	1678
Peak-hour factor, PHF	0.92	0.92	0.92	0.85	0.85	0.85	0.92	0.92	0.92	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	0	205	0	0	0	0	0	768	67
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	48
Lane Group Flow (vph)	0	0	0	0	205	0	0	0	0	0	768	19
Confl. Peds. (#/hr)												1
Heavy Vehicles (%)	2%	2%	2%	0%	0%	0%	2%	2%	2%	0%	0%	0%
Turn Type					NA						NA	Perm
Protected Phases					6						4	
Permitted Phases												4
Actuated Green, G (s)					26.9						17.2	17.2
Effective Green, g (s)					26.9						17.2	17.2
Actuated g/C Ratio					0.45						0.29	0.29
Clearance Time (s)					6.1						9.8	9.8
Vehicle Extension (s)					3.0						3.0	3.0
Lane Grp Cap (vph)					1703						1089	481
v/s Ratio Prot					c0.05						c0.20	
v/s Ratio Perm												0.01
v/c Ratio					0.12						0.71	0.04
Uniform Delay, d1					9.7						19.1	15.4
Progression Factor					0.00						0.50	1.00
Incremental Delay, d2					0.1						3.7	0.2
Delay (s)					0.2						13.4	15.6
Level of Service					A						B	B
Approach Delay (s/veh)		0.0			0.2			0.0			13.6	
Approach LOS		A			A			A			B	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	10.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	51.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	27	12	132	14	7	14	106	1101	20	6	754	15
Future Volume (vph)	27	12	132	14	7	14	106	1101	20	6	754	15
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)	6.8	6.8			6.8		5.9	5.9	5.9	5.9	5.9	5.9
Lane Util. Factor	1.00	1.00			1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.86			0.95		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00			0.98		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1900	1726			1853		1900	3800	1700	1900	3800	1700
Flt Permitted	0.73	1.00			0.79		0.29	1.00	1.00	0.19	1.00	1.00
Satd. Flow (perm)	1459	1726			1494		577	3800	1700	373	3800	1700
Peak-hour factor, PHF	0.82	0.82	0.82	0.83	0.83	0.83	0.94	0.94	0.94	0.89	0.89	0.89
Adj. Flow (vph)	33	15	161	17	8	17	113	1171	21	7	847	17
RTOR Reduction (vph)	0	144	0	0	15	0	0	0	9	0	0	9
Lane Group Flow (vph)	33	32	0	0	27	0	113	1171	12	7	847	8
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA		Perm	NA		D.P+P	NA	Perm	D.P+P	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			6		2	2		6
Actuated Green, G (s)	6.2	6.2			6.2		35.2	33.8	33.8	35.2	29.8	29.8
Effective Green, g (s)	6.2	6.2			6.2		35.2	33.8	33.8	35.2	29.8	29.8
Actuated g/C Ratio	0.10	0.10			0.10		0.59	0.56	0.56	0.59	0.50	0.50
Clearance Time (s)	6.8	6.8			6.8		5.9	5.9	5.9	5.9	5.9	5.9
Vehicle Extension (s)	4.0	4.0			4.0		3.0	4.0	4.0	3.0	4.0	4.0
Lane Grp Cap (vph)	150	178			154		457	2140	957	254	1887	844
v/s Ratio Prot		0.02					c0.02	c0.31		0.00	0.22	
v/s Ratio Perm	c0.02				0.02		0.12		0.01	0.02		0.00
v/c Ratio	0.22	0.18			0.17		0.25	0.55	0.01	0.03	0.45	0.01
Uniform Delay, d1	24.7	24.6			24.6		5.6	8.3	5.8	5.7	9.8	7.6
Progression Factor	1.00	1.00			1.00		0.78	0.77	1.00	0.47	0.46	1.00
Incremental Delay, d2	1.0	0.7			0.7		0.2	0.8	0.0	0.0	0.7	0.0
Delay (s)	25.7	25.2			25.3		4.6	7.1	5.8	2.7	5.3	7.7
Level of Service	C	C			C		A	A	A	A	A	A
Approach Delay (s/veh)		25.3			25.3			6.9			5.3	
Approach LOS		C			C			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	8.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	18.6
Intersection Capacity Utilization	64.0%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	210	446	770	360	293	602
Future Volume (vph)	210	446	770	360	293	602
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Lane Width	12	12	11	11	11	11
Total Lost time (s)	6.1	6.0	6.0	6.1	6.0	6.0
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	0.95
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1900	1700	3673	1643	1837	3673
Flt Permitted	0.95	1.00	1.00	1.00	0.23	1.00
Satd. Flow (perm)	1900	1700	3673	1643	445	3673
Peak-hour factor, PHF	0.94	0.94	0.93	0.93	0.95	0.95
Adj. Flow (vph)	223	474	828	387	308	634
RTOR Reduction (vph)	0	17	0	107	0	0
Lane Group Flow (vph)	223	457	828	280	308	634
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%
Turn Type	Prot	pm+ov	NA	pm+ov	D.P+P	NA
Protected Phases	8	5	6	8	5	2
Permitted Phases		8		6	6	
Actuated Green, G (s)	11.2	21.4	20.5	31.7	30.7	36.7
Effective Green, g (s)	11.2	21.4	20.5	31.7	30.7	36.7
Actuated g/C Ratio	0.19	0.36	0.34	0.53	0.51	0.61
Clearance Time (s)	6.1	6.0	6.0	6.1	6.0	6.0
Vehicle Extension (s)	3.0	3.5	3.0	3.0	3.5	3.0
Lane Grp Cap (vph)	354	606	1254	868	464	2246
v/s Ratio Prot	0.12	c0.13	0.23	0.06	0.11	0.17
v/s Ratio Perm		0.14		0.11	c0.23	
v/c Ratio	0.63	0.75	0.66	0.32	0.66	0.28
Uniform Delay, d1	22.5	17.0	16.8	8.0	9.3	5.5
Progression Factor	1.15	1.17	0.39	1.17	2.49	0.30
Incremental Delay, d2	3.4	5.3	2.5	0.2	3.5	0.3
Delay (s)	29.2	25.2	9.1	9.6	26.6	1.9
Level of Service	C	C	A	A	C	A
Approach Delay (s/veh)	26.5		9.3			10.0
Approach LOS	C		A			A

Intersection Summary			
HCM 2000 Control Delay (s/veh)	13.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	18.1
Intersection Capacity Utilization	61.8%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↱					↑↑	↱		↑↑	
Traffic Volume (vph)	0	1548	225	0	0	0	0	731	322	0	578	0
Future Volume (vph)	0	1548	225	0	0	0	0	731	322	0	578	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.0	6.0					8.7	8.7		5.7	
Lane Util. Factor		0.95	1.00					0.95	1.00		0.95	
Frpb, ped/bikes		1.00	0.99					1.00	0.99		1.00	
Flpb, ped/bikes		1.00	1.00					1.00	1.00		1.00	
Frt		1.00	0.85					1.00	0.85		1.00	
Flt Protected		1.00	1.00					1.00	1.00		1.00	
Satd. Flow (prot)		3800	1677					3800	1675		3800	
Flt Permitted		1.00	1.00					1.00	1.00		1.00	
Satd. Flow (perm)		3800	1677					3800	1675		3800	
Peak-hour factor, PHF	0.95	0.95	0.95	0.92	0.92	0.92	0.93	0.93	0.93	0.95	0.95	0.95
Adj. Flow (vph)	0	1629	237	0	0	0	0	786	346	0	608	0
RTOR Reduction (vph)	0	0	52	0	0	0	0	0	41	0	0	0
Lane Group Flow (vph)	0	1629	185	0	0	0	0	786	305	0	608	0
Confl. Peds. (#/hr)			2						2			
Heavy Vehicles (%)	0%	0%	0%	2%	2%	2%	0%	0%	0%	0%	0%	0%
Turn Type		NA	Perm					NA	Perm		NA	
Protected Phases		2						4			8	
Permitted Phases			2						4			
Actuated Green, G (s)		30.0	30.0					15.3	15.3		18.3	
Effective Green, g (s)		30.0	30.0					15.3	15.3		18.3	
Actuated g/C Ratio		0.50	0.50					0.26	0.26		0.31	
Clearance Time (s)		6.0	6.0					8.7	8.7		5.7	
Vehicle Extension (s)		3.0	3.0					4.0	4.0		4.0	
Lane Grp Cap (vph)		1900	838					969	427		1159	
v/s Ratio Prot		c0.43						c0.21			0.16	
v/s Ratio Perm			0.11						0.18			
v/c Ratio		0.86	0.22					0.81	0.71		0.52	
Uniform Delay, d1		13.1	8.4					21.0	20.4		17.3	
Progression Factor		0.69	0.36					0.61	0.53		0.00	
Incremental Delay, d2		4.1	0.5					5.1	5.5		0.4	
Delay (s)		13.2	3.5					17.8	16.4		0.5	
Level of Service		B	A					B	B		A	
Approach Delay (s/veh)		12.0			0.0			17.4			0.5	
Approach LOS		B			A			B			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	11.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	14.7
Intersection Capacity Utilization	72.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	1303	171	0	731	0	0	578	206
Future Volume (vph)	0	0	0	0	1303	171	0	731	0	0	578	206
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	12	12	12	12	12	12	16	12	12	12	12
Total Lost time (s)					6.0			5.7			8.7	8.7
Lane Util. Factor					0.91			0.95			0.95	1.00
Frpb, ped/bikes					1.00			1.00			1.00	1.00
Flpb, ped/bikes					1.00			1.00			1.00	1.00
Frt					0.98			1.00			1.00	0.85
Flt Protected					1.00			1.00			1.00	1.00
Satd. Flow (prot)					5356			4307			3800	1700
Flt Permitted					1.00			1.00			1.00	1.00
Satd. Flow (perm)					5356			4307			3800	1700
Peak-hour factor, PHF	0.92	0.92	0.92	0.91	0.91	0.91	0.93	0.93	0.93	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	0	1432	188	0	786	0	0	608	217
RTOR Reduction (vph)	0	0	0	0	17	0	0	0	0	0	0	41
Lane Group Flow (vph)	0	0	0	0	1603	0	0	786	0	0	608	176
Confl. Peds. (#/hr)						3						
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type					NA			NA			NA	Perm
Protected Phases					2			8			4	
Permitted Phases												4
Actuated Green, G (s)					30.0			18.3			15.3	15.3
Effective Green, g (s)					30.0			18.3			15.3	15.3
Actuated g/C Ratio					0.50			0.31			0.26	0.26
Clearance Time (s)					6.0			5.7			8.7	8.7
Vehicle Extension (s)					3.0			4.0			4.0	4.0
Lane Grp Cap (vph)					2678			1313			969	433
v/s Ratio Prot					c0.30			c0.18			0.16	
v/s Ratio Perm												0.10
v/c Ratio					0.60			0.60			0.63	0.41
Uniform Delay, d1					10.7			17.7			19.8	18.6
Progression Factor					0.74			0.00			0.80	0.71
Incremental Delay, d2					0.9			0.5			1.4	0.8
Delay (s)					8.8			0.5			17.2	14.0
Level of Service					A			A			B	B
Approach Delay (s/veh)		0.0			8.8			0.5			16.4	
Approach LOS		A			A			A			B	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	8.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	14.7
Intersection Capacity Utilization	72.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	55	0	54	1	10	1	78	1074	1	1	773	38
Future Volume (vph)	55	0	54	1	10	1	78	1074	1	1	773	38
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	10	12	10	12	12	12	11	11	12	12	11	11
Total Lost time (s)	6.8	6.8		6.8	6.8		6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.85		1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1773	1700		1863	1936		1837	3673	1667	1863	3637	1627
Flt Permitted	0.75	1.00		0.71	1.00		0.30	1.00	1.00	0.19	1.00	1.00
Satd. Flow (perm)	1399	1700		1396	1936		587	3673	1667	369	3637	1627
Peak-hour factor, PHF	0.78	0.92	0.78	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.95	0.95
Adj. Flow (vph)	71	0	69	1	11	1	85	1167	1	1	814	40
RTOR Reduction (vph)	0	62	0	0	1	0	0	0	0	0	0	20
Lane Group Flow (vph)	71	7	0	1	11	0	85	1167	1	1	814	20
Heavy Vehicles (%)	0%	2%	0%	2%	2%	2%	0%	0%	2%	2%	1%	1%
Turn Type	Perm	NA		Perm	NA		D.P+P	NA	Perm	D.P+P	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			6		2	2		6
Actuated Green, G (s)	6.3	6.3		6.3	6.3		34.9	33.8	33.8	34.9	29.6	29.6
Effective Green, g (s)	6.3	6.3		6.3	6.3		34.9	33.8	33.8	34.9	29.6	29.6
Actuated g/C Ratio	0.11	0.11		0.11	0.11		0.58	0.56	0.56	0.58	0.49	0.49
Clearance Time (s)	6.8	6.8		6.8	6.8		6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	146	178		146	203		451	2069	939	242	1794	802
v/s Ratio Prot		0.00			0.01		c0.02	c0.32		0.00	0.22	
v/s Ratio Perm	c0.05			0.00			0.09		0.00	0.00		0.01
v/c Ratio	0.49	0.04		0.01	0.05		0.19	0.56	0.00	0.00	0.45	0.02
Uniform Delay, d1	25.3	24.1		24.0	24.2		5.6	8.4	5.7	5.7	9.9	7.8
Progression Factor	1.00	1.00		1.00	1.00		0.70	0.56	1.00	1.07	0.97	1.00
Incremental Delay, d2	2.5	0.1		0.0	0.1		0.2	1.0	0.0	0.0	0.8	0.1
Delay (s)	27.9	24.2		24.1	24.3		4.1	5.7	5.7	6.1	10.4	7.8
Level of Service	C	C		C	C		A	A	A	A	B	A
Approach Delay (s/veh)		26.1			24.3			5.5			10.3	
Approach LOS		C			C			A			B	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	8.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	18.8
Intersection Capacity Utilization	57.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	0	56	627	14	0	0
Future Volume (vph)	0	56	627	14	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.6	5.5			
Lane Util. Factor		1.00	0.95			
Frt		0.87	1.00			
Flt Protected		1.00	1.00			
Satd. Flow (prot)		1696	3713			
Flt Permitted		1.00	1.00			
Satd. Flow (perm)		1696	3713			
Peak-hour factor, PHF	0.64	0.64	0.95	0.95	0.92	0.92
Adj. Flow (vph)	0	88	660	15	0	0
RTOR Reduction (vph)	0	80	2	0	0	0
Lane Group Flow (vph)	0	8	673	0	0	0
Turn Type		Prot	NA			
Protected Phases		8	2			
Permitted Phases						
Actuated Green, G (s)		5.6	43.3			
Effective Green, g (s)		5.6	43.3			
Actuated g/C Ratio		0.09	0.72			
Clearance Time (s)		5.6	5.5			
Vehicle Extension (s)		3.0	3.0			
Lane Grp Cap (vph)		158	2679			
v/s Ratio Prot		c0.00	c0.18			
v/s Ratio Perm						
v/c Ratio		0.05	0.25			
Uniform Delay, d1		24.8	2.8			
Progression Factor		1.00	2.57			
Incremental Delay, d2		0.1	0.2			
Delay (s)		24.9	7.5			
Level of Service		C	A			
Approach Delay (s/veh)	24.9		7.5		0.0	
Approach LOS	C		A		A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	9.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.23		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	11.1
Intersection Capacity Utilization	32.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	271	115	0	414	0	0	0	0
Future Volume (vph)	0	0	0	0	271	115	0	414	0	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					10.1	10.1		5.8				
Lane Util. Factor					0.95	1.00		0.95				
Frt					1.00	0.85		1.00				
Flt Protected					1.00	1.00		1.00				
Satd. Flow (prot)					3762	1683		3762				
Flt Permitted					1.00	1.00		1.00				
Satd. Flow (perm)					3762	1683		3762				
Peak-hour factor, PHF	0.92	0.92	0.92	0.86	0.86	0.86	0.87	0.87	0.87	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	315	134	0	476	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	92	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	315	42	0	476	0	0	0	0
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	1%	1%	1%	2%	2%	2%
Turn Type					NA	Perm		NA				
Protected Phases					2			8				
Permitted Phases						2						
Actuated Green, G (s)					18.9	18.9		25.2				
Effective Green, g (s)					18.9	18.9		25.2				
Actuated g/C Ratio					0.32	0.32		0.42				
Clearance Time (s)					10.1	10.1		5.8				
Vehicle Extension (s)					3.0	3.0		3.0				
Lane Grp Cap (vph)					1185	530		1580				
v/s Ratio Prot					c0.08			c0.13				
v/s Ratio Perm						0.03						
v/c Ratio					0.27	0.08		0.30				
Uniform Delay, d1					15.4	14.4		11.6				
Progression Factor					0.96	1.23		0.00				
Incremental Delay, d2					0.5	0.3		0.5				
Delay (s)					15.3	18.1		0.5				
Level of Service					B	B		A				
Approach Delay (s/veh)		0.0			16.1			0.5			0.0	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	8.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.31		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	49.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	168	0	0	0	0	0	414	93	0	0	0
Future Volume (vph)	0	168	0	0	0	0	0	414	93	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.1						9.8	9.8			
Lane Util. Factor		0.95						0.95	1.00			
Frt		1.00						1.00	0.85			
Flt Protected		1.00						1.00	1.00			
Satd. Flow (prot)		3800						3762	1683			
Flt Permitted		1.00						1.00	1.00			
Satd. Flow (perm)		3800						3762	1683			
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.87	0.87	0.87	0.92	0.92	0.92
Adj. Flow (vph)	0	187	0	0	0	0	0	476	107	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	69	0	0	0
Lane Group Flow (vph)	0	187	0	0	0	0	0	476	38	0	0	0
Heavy Vehicles (%)	0%	0%	0%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Turn Type		NA						NA	Perm			
Protected Phases		6						4				
Permitted Phases									4			
Actuated Green, G (s)		22.9						21.2	21.2			
Effective Green, g (s)		22.9						21.2	21.2			
Actuated g/C Ratio		0.38						0.35	0.35			
Clearance Time (s)		6.1						9.8	9.8			
Vehicle Extension (s)		3.0						3.0	3.0			
Lane Grp Cap (vph)		1450						1329	594			
v/s Ratio Prot		c0.05						c0.13				
v/s Ratio Perm									0.02			
v/c Ratio		0.13						0.36	0.06			
Uniform Delay, d1		12.1						14.4	12.8			
Progression Factor		0.00						1.00	1.00			
Incremental Delay, d2		0.2						0.8	0.2			
Delay (s)		0.2						15.1	13.0			
Level of Service		A						B	B			
Approach Delay (s/veh)		0.2			0.0			14.7			0.0	
Approach LOS		A			A			B			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	11.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.26		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	32.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	168	232	0	0	0	0	0	0	0	1050	0
Future Volume (vph)	0	168	232	0	0	0	0	0	0	0	1050	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		10.1	10.1								5.8	
Lane Util. Factor		0.95	1.00								0.95	
Frpb, ped/bikes		1.00	0.99								1.00	
Flpb, ped/bikes		1.00	1.00								1.00	
Frt		1.00	0.85								1.00	
Flt Protected		1.00	1.00								1.00	
Satd. Flow (prot)		3725	1645								3800	
Flt Permitted		1.00	1.00								1.00	
Satd. Flow (perm)		3725	1645								3800	
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.92	0.92	0.92	0.94	0.94	0.94
Adj. Flow (vph)	0	187	258	0	0	0	0	0	0	0	1117	0
RTOR Reduction (vph)	0	0	85	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	187	173	0	0	0	0	0	0	0	1117	0
Confl. Peds. (#/hr)			1									
Heavy Vehicles (%)	0%	2%	2%	2%	2%	2%	2%	2%	2%	0%	0%	0%
Turn Type		NA	Perm								NA	
Protected Phases		2									8	
Permitted Phases			2									
Actuated Green, G (s)		18.9	18.9								25.2	
Effective Green, g (s)		18.9	18.9								25.2	
Actuated g/C Ratio		0.32	0.32								0.42	
Clearance Time (s)		10.1	10.1								5.8	
Vehicle Extension (s)		3.0	3.0								3.0	
Lane Grp Cap (vph)		1173	518								1596	
v/s Ratio Prot		0.05									c0.29	
v/s Ratio Perm			c0.11									
v/c Ratio		0.16	0.33								0.70	
Uniform Delay, d1		14.8	15.7								14.3	
Progression Factor		1.00	1.00								0.02	
Incremental Delay, d2		0.3	1.7								1.4	
Delay (s)		15.1	17.5								1.6	
Level of Service		B	B								A	
Approach Delay (s/veh)		16.5			0.0			0.0			1.6	
Approach LOS		B			A			A			A	

Intersection Summary				
HCM 2000 Control Delay (s/veh)	5.8	HCM 2000 Level of Service	A	
HCM 2000 Volume to Capacity ratio	0.60			
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	19.9	
Intersection Capacity Utilization	58.3%	ICU Level of Service	B	
Analysis Period (min)	15			

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	271	0	0	0	0	0	1050	121
Future Volume (vph)	0	0	0	0	271	0	0	0	0	0	1050	121
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					6.1						9.8	9.8
Lane Util. Factor					0.95						0.95	1.00
Frt					1.00						1.00	0.85
Flt Protected					1.00						1.00	1.00
Satd. Flow (prot)					3800						3800	1700
Flt Permitted					1.00						1.00	1.00
Satd. Flow (perm)					3800						3800	1700
Peak-hour factor, PHF	0.92	0.92	0.92	0.86	0.86	0.86	0.92	0.92	0.92	0.94	0.94	0.94
Adj. Flow (vph)	0	0	0	0	315	0	0	0	0	0	1117	129
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	83
Lane Group Flow (vph)	0	0	0	0	315	0	0	0	0	0	1117	46
Heavy Vehicles (%)	2%	2%	2%	0%	0%	0%	2%	2%	2%	0%	0%	0%
Turn Type					NA						NA	Perm
Protected Phases					6						4	
Permitted Phases												4
Actuated Green, G (s)					22.9						21.2	21.2
Effective Green, g (s)					22.9						21.2	21.2
Actuated g/C Ratio					0.38						0.35	0.35
Clearance Time (s)					6.1						9.8	9.8
Vehicle Extension (s)					3.0						3.0	3.0
Lane Grp Cap (vph)					1450						1342	600
v/s Ratio Prot					c0.08						c0.29	
v/s Ratio Perm												0.03
v/c Ratio					0.22						0.83	0.08
Uniform Delay, d1					12.5						17.8	12.9
Progression Factor					0.00						1.00	1.00
Incremental Delay, d2					0.3						6.2	0.2
Delay (s)					0.3						23.9	13.1
Level of Service					A						C	B
Approach Delay (s/veh)		0.0			0.3			0.0			22.8	
Approach LOS		A			A			A			C	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	18.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	49.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	0	44	0	0	892	170
Future Volume (vph)	0	44	0	0	892	170
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.6			5.8	5.8
Lane Util. Factor		1.00			0.95	1.00
Frt		0.87			1.00	0.85
Flt Protected		1.00			1.00	1.00
Satd. Flow (prot)		1696			3725	1667
Flt Permitted		1.00			1.00	1.00
Satd. Flow (perm)		1696			3725	1667
Peak-hour factor, PHF	0.73	0.73	0.92	0.92	0.87	0.87
Adj. Flow (vph)	0	60	0	0	1025	195
RTOR Reduction (vph)	0	56	0	0	0	51
Lane Group Flow (vph)	0	4	0	0	1025	144
Turn Type		Prot			NA	Perm
Protected Phases		4			6	
Permitted Phases						6
Actuated Green, G (s)		4.2			44.4	44.4
Effective Green, g (s)		4.2			44.4	44.4
Actuated g/C Ratio		0.07			0.74	0.74
Clearance Time (s)		5.6			5.8	5.8
Vehicle Extension (s)		3.0			3.0	3.0
Lane Grp Cap (vph)		118			2756	1233
v/s Ratio Prot		c0.00			c0.28	
v/s Ratio Perm						0.09
v/c Ratio		0.04			0.37	0.12
Uniform Delay, d1		26.0			2.8	2.2
Progression Factor		1.00			0.42	0.06
Incremental Delay, d2		0.1			0.4	0.2
Delay (s)		26.1			1.5	0.3
Level of Service		C			A	A
Approach Delay (s/veh)	26.1			0.0	1.3	
Approach LOS	C			A	A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	2.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	11.4
Intersection Capacity Utilization	38.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	0	587	359	459	0	0
Future Volume (vph)	0	587	359	459	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.6	5.9	5.9		
Lane Util. Factor		0.88	0.95	1.00		
Frt		0.85	1.00	0.85		
Flt Protected		1.00	1.00	1.00		
Satd. Flow (prot)		2933	3725	1667		
Flt Permitted		1.00	1.00	1.00		
Satd. Flow (perm)		2933	3725	1667		
Peak-hour factor, PHF	0.88	0.88	0.95	0.95	0.92	0.92
Adj. Flow (vph)	0	667	378	483	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	667	378	483	0	0
Turn Type		Prot	NA	Perm		
Protected Phases		8	2			
Permitted Phases				2		
Actuated Green, G (s)		17.6	30.9	30.9		
Effective Green, g (s)		17.6	30.9	30.9		
Actuated g/C Ratio		0.29	0.52	0.52		
Clearance Time (s)		5.6	5.9	5.9		
Vehicle Extension (s)		3.0	3.0	3.0		
Lane Grp Cap (vph)		860	1918	858		
v/s Ratio Prot		c0.23	0.10			
v/s Ratio Perm				c0.29		
v/c Ratio		0.78	0.20	0.56		
Uniform Delay, d1		19.4	7.9	9.9		
Progression Factor		1.00	0.79	0.87		
Incremental Delay, d2		4.4	0.2	2.6		
Delay (s)		23.8	6.5	11.3		
Level of Service		C	A	B		
Approach Delay (s/veh)	23.8		9.2			0.0
Approach LOS	C		A			A

Intersection Summary			
HCM 2000 Control Delay (s/veh)	15.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	11.5
Intersection Capacity Utilization	38.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	681	212	0	0	0	0	321	103	0	664	0
Future Volume (vph)	0	681	212	0	0	0	0	321	103	0	664	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.0	6.0					8.7	8.7		5.7	
Lane Util. Factor		0.95	1.00					0.95	1.00		0.95	
Frpb, ped/bikes		1.00	0.99					1.00	1.00		1.00	
Flpb, ped/bikes		1.00	1.00					1.00	1.00		1.00	
Frt		1.00	0.85					1.00	0.85		1.00	
Flt Protected		1.00	1.00					1.00	1.00		1.00	
Satd. Flow (prot)		3762	1661					3762	1683		3800	
Flt Permitted		1.00	1.00					1.00	1.00		1.00	
Satd. Flow (perm)		3762	1661					3762	1683		3800	
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.95	0.95	0.95	0.80	0.80	0.80
Adj. Flow (vph)	0	757	236	0	0	0	0	338	108	0	830	0
RTOR Reduction (vph)	0	0	58	0	0	0	0	0	74	0	0	0
Lane Group Flow (vph)	0	757	178	0	0	0	0	338	34	0	830	0
Confl. Peds. (#/hr)			2									
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	1%	1%	1%	0%	0%	0%
Turn Type		NA	Perm					NA	Perm		NA	
Protected Phases		2						4			8	
Permitted Phases			2						4			
Actuated Green, G (s)		26.6	26.6					18.7	18.7		21.7	
Effective Green, g (s)		26.6	26.6					18.7	18.7		21.7	
Actuated g/C Ratio		0.44	0.44					0.31	0.31		0.36	
Clearance Time (s)		6.0	6.0					8.7	8.7		5.7	
Vehicle Extension (s)		3.0	3.0					4.0	4.0		4.0	
Lane Grp Cap (vph)		1667	736					1172	524		1374	
v/s Ratio Prot		c0.20						0.09			c0.22	
v/s Ratio Perm			0.11						0.02			
v/c Ratio		0.45	0.24					0.29	0.07		0.60	
Uniform Delay, d1		11.6	10.4					15.6	14.5		15.6	
Progression Factor		0.92	0.95					0.53	0.78		0.01	
Incremental Delay, d2		0.9	0.8					0.2	0.1		0.6	
Delay (s)		11.6	10.6					8.5	11.4		0.8	
Level of Service		B	B					A	B		A	
Approach Delay (s/veh)		11.4			0.0			9.2			0.8	
Approach LOS		B			A			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	7.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	14.7
Intersection Capacity Utilization	51.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	953	97	0	321	0	0	664	131
Future Volume (vph)	0	0	0	0	953	97	0	321	0	0	664	131
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	12	12	12	12	12	12	16	12	12	12	12
Total Lost time (s)					6.0			5.7			8.7	8.7
Lane Util. Factor					0.91			0.95			0.95	1.00
Frpb, ped/bikes					1.00			1.00			1.00	1.00
Flpb, ped/bikes					1.00			1.00			1.00	1.00
Frt					0.99			1.00			1.00	0.85
Flt Protected					1.00			1.00			1.00	1.00
Satd. Flow (prot)					5325			4264			3800	1700
Flt Permitted					1.00			1.00			1.00	1.00
Satd. Flow (perm)					5325			4264			3800	1700
Peak-hour factor, PHF	0.92	0.92	0.92	0.95	0.95	0.95	0.95	0.95	0.95	0.80	0.80	0.80
Adj. Flow (vph)	0	0	0	0	1003	102	0	338	0	0	830	164
RTOR Reduction (vph)	0	0	0	0	20	0	0	0	0	0	0	38
Lane Group Flow (vph)	0	0	0	0	1085	0	0	338	0	0	830	126
Confl. Peds. (#/hr)						2						
Heavy Vehicles (%)	0%	0%	0%	1%	1%	1%	1%	1%	1%	0%	0%	0%
Turn Type					NA			NA			NA	Perm
Protected Phases					2			8			4	
Permitted Phases												4
Actuated Green, G (s)					26.6			21.7			18.7	18.7
Effective Green, g (s)					26.6			21.7			18.7	18.7
Actuated g/C Ratio					0.44			0.36			0.31	0.31
Clearance Time (s)					6.0			5.7			8.7	8.7
Vehicle Extension (s)					3.0			4.0			4.0	4.0
Lane Grp Cap (vph)					2360			1542			1184	529
v/s Ratio Prot					c0.20			0.08			c0.22	
v/s Ratio Perm												0.07
v/c Ratio					0.46			0.22			0.70	0.24
Uniform Delay, d1					11.7			13.3			18.2	15.4
Progression Factor					0.84			0.00			0.71	0.53
Incremental Delay, d2					0.6			0.1			1.9	0.3
Delay (s)					10.4			0.1			14.9	8.4
Level of Service					B			A			B	A
Approach Delay (s/veh)		0.0			10.4			0.1			13.9	
Approach LOS		A			B			A			B	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	10.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	14.7
Intersection Capacity Utilization	51.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	307	0	0	0	0	941
Future Volume (vph)	307	0	0	0	0	941
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)	4.5					5.3
Lane Util. Factor	0.97					0.95
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	3614					3725
Flt Permitted	0.95					1.00
Satd. Flow (perm)	3614					3725
Peak-hour factor, PHF	0.88	0.88	0.92	0.92	0.82	0.82
Adj. Flow (vph)	349	0	0	0	0	1148
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	349	0	0	0	0	1148
Turn Type	Prot					NA
Protected Phases	8					6
Permitted Phases						
Actuated Green, G (s)	11.0					39.2
Effective Green, g (s)	11.0					39.2
Actuated g/C Ratio	0.18					0.65
Clearance Time (s)	4.5					5.3
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	662					2433
v/s Ratio Prot	c0.10					c0.31
v/s Ratio Perm						
v/c Ratio	0.53					0.47
Uniform Delay, d1	22.1					5.2
Progression Factor	0.83					0.35
Incremental Delay, d2	0.7					0.6
Delay (s)	19.0					2.4
Level of Service	B					A
Approach Delay (s/veh)	19.0		0.0			2.4
Approach LOS	B		A			A

Intersection Summary			
HCM 2000 Control Delay (s/veh)	6.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	9.8
Intersection Capacity Utilization	49.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	278	0	0	540	0	0
Future Volume (vph)	278	0	0	540	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)	4.5			5.3		
Lane Util. Factor	0.97			0.95		
Frt	1.00			1.00		
Flt Protected	0.95			1.00		
Satd. Flow (prot)	3614			3725		
Flt Permitted	0.95			1.00		
Satd. Flow (perm)	3614			3725		
Peak-hour factor, PHF	0.82	0.82	0.92	0.92	0.92	0.92
Adj. Flow (vph)	339	0	0	587	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	339	0	0	587	0	0
Turn Type	Prot			NA		
Protected Phases	4			2		
Permitted Phases						
Actuated Green, G (s)	10.9			39.3		
Effective Green, g (s)	10.9			39.3		
Actuated g/C Ratio	0.18			0.65		
Clearance Time (s)	4.5			5.3		
Vehicle Extension (s)	3.0			3.0		
Lane Grp Cap (vph)	656			2439		
v/s Ratio Prot	c0.09			c0.16		
v/s Ratio Perm						
v/c Ratio	0.52			0.24		
Uniform Delay, d1	22.2			4.2		
Progression Factor	1.08			1.00		
Incremental Delay, d2	0.6			0.2		
Delay (s)	24.6			4.5		
Level of Service	C			A		
Approach Delay (s/veh)	24.6			4.5	0.0	
Approach LOS	C			A	A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	11.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.30		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	9.8
Intersection Capacity Utilization	47.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	0	166	0	0	905	104
Future Volume (vph)	0	166	0	0	905	104
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.7			5.6	5.6
Lane Util. Factor		1.00			0.95	1.00
Frt		0.87			1.00	0.85
Flt Protected		1.00			1.00	1.00
Satd. Flow (prot)		1696			3725	1667
Flt Permitted		1.00			1.00	1.00
Satd. Flow (perm)		1696			3725	1667
Peak-hour factor, PHF	0.84	0.84	0.92	0.92	0.86	0.86
Adj. Flow (vph)	0	198	0	0	1052	121
RTOR Reduction (vph)	0	93	0	0	0	41
Lane Group Flow (vph)	0	105	0	0	1052	80
Turn Type		Prot			NA	Perm
Protected Phases		4			6	
Permitted Phases						6
Actuated Green, G (s)		9.1			39.6	39.6
Effective Green, g (s)		9.1			39.6	39.6
Actuated g/C Ratio		0.15			0.66	0.66
Clearance Time (s)		5.7			5.6	5.6
Vehicle Extension (s)		3.0			3.0	3.0
Lane Grp Cap (vph)		257			2458	1100
v/s Ratio Prot		c0.06			c0.28	
v/s Ratio Perm						0.05
v/c Ratio		0.41			0.43	0.07
Uniform Delay, d1		23.0			4.8	3.6
Progression Factor		1.00			1.06	1.29
Incremental Delay, d2		1.1			0.5	0.1
Delay (s)		24.1			5.6	4.8
Level of Service		C			A	A
Approach Delay (s/veh)	24.1			0.0	5.6	
Approach LOS	C			A	A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	8.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	11.3
Intersection Capacity Utilization	42.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	0	26	805	16	0	0
Future Volume (vph)	0	26	805	16	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.6	5.5			
Lane Util. Factor		1.00	0.95			
Frt		0.87	1.00			
Flt Protected		1.00	1.00			
Satd. Flow (prot)		1696	3715			
Flt Permitted		1.00	1.00			
Satd. Flow (perm)		1696	3715			
Peak-hour factor, PHF	0.60	0.60	0.89	0.89	0.92	0.92
Adj. Flow (vph)	0	43	904	18	0	0
RTOR Reduction (vph)	0	41	1	0	0	0
Lane Group Flow (vph)	0	2	921	0	0	0
Turn Type		Prot	NA			
Protected Phases		8	2			
Permitted Phases						
Actuated Green, G (s)		4.2	64.7			
Effective Green, g (s)		4.2	64.7			
Actuated g/C Ratio		0.05	0.81			
Clearance Time (s)		5.6	5.5			
Vehicle Extension (s)		3.0	3.0			
Lane Grp Cap (vph)		89	3004			
v/s Ratio Prot		c0.00	c0.25			
v/s Ratio Perm						
v/c Ratio		0.03	0.31			
Uniform Delay, d1		36.0	1.9			
Progression Factor		1.00	1.51			
Incremental Delay, d2		0.1	0.3			
Delay (s)		36.1	3.2			
Level of Service		D	A			
Approach Delay (s/veh)	36.1		3.2			0.0
Approach LOS	D		A			A

Intersection Summary			
HCM 2000 Control Delay (s/veh)	4.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.29		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	11.1
Intersection Capacity Utilization	36.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	192	146	0	577	0	0	0	0
Future Volume (vph)	0	0	0	0	192	146	0	577	0	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					10.1	10.1		5.8				
Lane Util. Factor					0.95	1.00		0.95				
Frt					1.00	0.85		1.00				
Flt Protected					1.00	1.00		1.00				
Satd. Flow (prot)					3762	1683		3762				
Flt Permitted					1.00	1.00		1.00				
Satd. Flow (perm)					3762	1683		3762				
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	209	159	0	627	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	115	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	209	44	0	627	0	0	0	0
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	1%	1%	1%	2%	2%	2%
Turn Type					NA	Perm		NA				
Protected Phases					2			8				
Permitted Phases						2						
Actuated Green, G (s)					21.9	21.9		42.2				
Effective Green, g (s)					21.9	21.9		42.2				
Actuated g/C Ratio					0.27	0.27		0.53				
Clearance Time (s)					10.1	10.1		5.8				
Vehicle Extension (s)					3.0	3.0		3.0				
Lane Grp Cap (vph)					1029	460		1984				
v/s Ratio Prot					c0.06			c0.17				
v/s Ratio Perm						0.03						
v/c Ratio					0.20	0.09		0.32				
Uniform Delay, d1					22.3	21.7		10.7				
Progression Factor					0.93	1.15		0.00				
Incremental Delay, d2					0.4	0.4		0.4				
Delay (s)					21.2	25.3		0.4				
Level of Service					C	C		A				
Approach Delay (s/veh)		0.0			23.0			0.4			0.0	
Approach LOS		A			C			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	8.8	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.30		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	39.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	242	0	0	0	0	0	577	160	0	0	0
Future Volume (vph)	0	242	0	0	0	0	0	577	160	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.1						9.8	9.8			
Lane Util. Factor		0.95						0.95	1.00			
Frpb, ped/bikes		1.00						1.00	0.99			
Flpb, ped/bikes		1.00						1.00	1.00			
Frt		1.00						1.00	0.85			
Flt Protected		1.00						1.00	1.00			
Satd. Flow (prot)		3762						3762	1661			
Flt Permitted		1.00						1.00	1.00			
Satd. Flow (perm)		3762						3762	1661			
Peak-hour factor, PHF	0.81	0.81	0.81	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	299	0	0	0	0	0	627	174	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	91	0	0	0
Lane Group Flow (vph)	0	299	0	0	0	0	0	627	83	0	0	0
Confl. Peds. (#/hr)									1			
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Turn Type		NA						NA	Perm			
Protected Phases		6						4				
Permitted Phases									4			
Actuated Green, G (s)		25.9						38.2	38.2			
Effective Green, g (s)		25.9						38.2	38.2			
Actuated g/C Ratio		0.32						0.48	0.48			
Clearance Time (s)		6.1						9.8	9.8			
Vehicle Extension (s)		3.0						3.0	3.0			
Lane Grp Cap (vph)		1217						1796	793			
v/s Ratio Prot		c0.08						c0.17				
v/s Ratio Perm									0.05			
v/c Ratio		0.25						0.35	0.10			
Uniform Delay, d1		19.9						13.1	11.5			
Progression Factor		0.00						1.00	1.00			
Incremental Delay, d2		0.5						0.5	0.3			
Delay (s)		0.5						13.6	11.8			
Level of Service		A						B	B			
Approach Delay (s/veh)		0.5			0.0			13.2			0.0	
Approach LOS		A			A			B			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	9.8	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.33		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	37.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	242	358	0	0	0	0	0	0	0	696	0
Future Volume (vph)	0	242	358	0	0	0	0	0	0	0	696	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		10.1	10.1								5.8	
Lane Util. Factor		0.95	1.00								0.95	
Frt		1.00	0.85								1.00	
Flt Protected		1.00	1.00								1.00	
Satd. Flow (prot)		3762	1683								3800	
Flt Permitted		1.00	1.00								1.00	
Satd. Flow (perm)		3762	1683								3800	
Peak-hour factor, PHF	0.81	0.81	0.81	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	299	442	0	0	0	0	0	0	0	757	0
RTOR Reduction (vph)	0	0	121	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	299	321	0	0	0	0	0	0	0	757	0
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	2%	2%	2%	0%	0%	0%
Turn Type		NA	Perm								NA	
Protected Phases		2									8	
Permitted Phases			2									
Actuated Green, G (s)		21.9	21.9								42.2	
Effective Green, g (s)		21.9	21.9								42.2	
Actuated g/C Ratio		0.27	0.27								0.53	
Clearance Time (s)		10.1	10.1								5.8	
Vehicle Extension (s)		3.0	3.0								3.0	
Lane Grp Cap (vph)		1029	460								2004	
v/s Ratio Prot		0.08									c0.20	
v/s Ratio Perm			c0.19									
v/c Ratio		0.29	0.70								0.38	
Uniform Delay, d1		22.9	26.1								11.2	
Progression Factor		1.00	1.00								0.00	
Incremental Delay, d2		0.7	8.5								0.5	
Delay (s)		23.6	34.6								0.5	
Level of Service		C	C								A	
Approach Delay (s/veh)		30.2			0.0			0.0			0.5	
Approach LOS		C			A			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	15.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	52.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	192	0	0	0	0	0	696	117
Future Volume (vph)	0	0	0	0	192	0	0	0	0	0	696	117
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					6.1						9.8	9.8
Lane Util. Factor					0.95						0.95	1.00
Frt					1.00						1.00	0.85
Flt Protected					1.00						1.00	1.00
Satd. Flow (prot)					3762						3800	1700
Flt Permitted					1.00						1.00	1.00
Satd. Flow (perm)					3762						3800	1700
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	209	0	0	0	0	0	757	127
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	66
Lane Group Flow (vph)	0	0	0	0	209	0	0	0	0	0	757	61
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	2%	2%	2%	0%	0%	0%
Turn Type					NA						NA	Perm
Protected Phases					6						4	
Permitted Phases												4
Actuated Green, G (s)					25.9						38.2	38.2
Effective Green, g (s)					25.9						38.2	38.2
Actuated g/C Ratio					0.32						0.48	0.48
Clearance Time (s)					6.1						9.8	9.8
Vehicle Extension (s)					3.0						3.0	3.0
Lane Grp Cap (vph)					1217						1814	811
v/s Ratio Prot					c0.06						c0.20	
v/s Ratio Perm												0.04
v/c Ratio					0.17						0.42	0.07
Uniform Delay, d1					19.4						13.6	11.3
Progression Factor					0.00						1.00	1.00
Incremental Delay, d2					0.3						0.7	0.2
Delay (s)					0.3						14.3	11.5
Level of Service					A						B	B
Approach Delay (s/veh)		0.0			0.3			0.0			13.9	
Approach LOS		A			A			A			B	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	11.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	39.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	0	100	0	0	743	94
Future Volume (vph)	0	100	0	0	743	94
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.6			5.8	5.8
Lane Util. Factor		1.00			0.95	1.00
Frt		0.87			1.00	0.85
Flt Protected		1.00			1.00	1.00
Satd. Flow (prot)		1696			3725	1667
Flt Permitted		1.00			1.00	1.00
Satd. Flow (perm)		1696			3725	1667
Peak-hour factor, PHF	0.83	0.83	0.92	0.92	0.91	0.91
Adj. Flow (vph)	0	120	0	0	816	103
RTOR Reduction (vph)	0	111	0	0	0	22
Lane Group Flow (vph)	0	9	0	0	816	81
Turn Type		Prot			NA	Perm
Protected Phases		4			6	
Permitted Phases						6
Actuated Green, G (s)		5.7			62.9	62.9
Effective Green, g (s)		5.7			62.9	62.9
Actuated g/C Ratio		0.07			0.79	0.79
Clearance Time (s)		5.6			5.8	5.8
Vehicle Extension (s)		3.0			3.0	3.0
Lane Grp Cap (vph)		120			2928	1310
v/s Ratio Prot		c0.01			c0.22	
v/s Ratio Perm						0.05
v/c Ratio		0.07			0.28	0.06
Uniform Delay, d1		34.7			2.3	1.9
Progression Factor		1.00			0.35	0.00
Incremental Delay, d2		0.3			0.2	0.1
Delay (s)		34.9			1.1	0.1
Level of Service		C			A	A
Approach Delay (s/veh)	34.9			0.0	1.0	
Approach LOS	C			A	A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	4.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.26		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	11.4
Intersection Capacity Utilization	34.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	0	448	481	451	0	0
Future Volume (vph)	0	448	481	451	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.6	5.9	5.9		
Lane Util. Factor		0.88	0.95	1.00		
Frt		0.85	1.00	0.85		
Flt Protected		1.00	1.00	1.00		
Satd. Flow (prot)		2933	3725	1667		
Flt Permitted		1.00	1.00	1.00		
Satd. Flow (perm)		2933	3725	1667		
Peak-hour factor, PHF	0.94	0.94	0.86	0.86	0.92	0.92
Adj. Flow (vph)	0	477	559	524	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	477	559	524	0	0
Turn Type		Prot	NA	Perm		
Protected Phases		8	2			
Permitted Phases				2		
Actuated Green, G (s)		18.0	50.5	50.5		
Effective Green, g (s)		18.0	50.5	50.5		
Actuated g/C Ratio		0.23	0.63	0.63		
Clearance Time (s)		5.6	5.9	5.9		
Vehicle Extension (s)		3.0	3.0	3.0		
Lane Grp Cap (vph)		659	2351	1052		
v/s Ratio Prot		c0.16	0.15			
v/s Ratio Perm				c0.31		
v/c Ratio		0.72	0.24	0.50		
Uniform Delay, d1		28.7	6.4	7.9		
Progression Factor		0.94	1.38	1.44		
Incremental Delay, d2		3.9	0.2	1.6		
Delay (s)		30.7	9.1	13.1		
Level of Service		C	A	B		
Approach Delay (s/veh)	30.7		11.0			0.0
Approach LOS	C		B			A

Intersection Summary			
HCM 2000 Control Delay (s/veh)	17.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	11.5
Intersection Capacity Utilization	37.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	916	223	0	0	0	0	542	189	0	479	0
Future Volume (vph)	0	916	223	0	0	0	0	542	189	0	479	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.0	6.0					8.7	8.7		5.7	
Lane Util. Factor		0.95	1.00					0.95	1.00		0.95	
Frpb, ped/bikes		1.00	0.99					1.00	1.00		1.00	
Flpb, ped/bikes		1.00	1.00					1.00	1.00		1.00	
Frt		1.00	0.85					1.00	0.85		1.00	
Flt Protected		1.00	1.00					1.00	1.00		1.00	
Satd. Flow (prot)		3800	1678					3800	1700		3762	
Flt Permitted		1.00	1.00					1.00	1.00		1.00	
Satd. Flow (perm)		3800	1678					3800	1700		3762	
Peak-hour factor, PHF	0.93	0.93	0.93	0.92	0.92	0.92	0.89	0.89	0.89	0.93	0.93	0.93
Adj. Flow (vph)	0	985	240	0	0	0	0	609	212	0	515	0
RTOR Reduction (vph)	0	0	115	0	0	0	0	0	33	0	0	0
Lane Group Flow (vph)	0	985	125	0	0	0	0	609	179	0	515	0
Confl. Peds. (#/hr)			1									
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	1%	1%
Turn Type		NA	Perm					NA	Perm		NA	
Protected Phases		2						4			8	
Permitted Phases			2						4			
Actuated Green, G (s)		39.6	39.6					25.7	25.7		28.7	
Effective Green, g (s)		39.6	39.6					25.7	25.7		28.7	
Actuated g/C Ratio		0.50	0.50					0.32	0.32		0.36	
Clearance Time (s)		6.0	6.0					8.7	8.7		5.7	
Vehicle Extension (s)		3.0	3.0					4.0	4.0		4.0	
Lane Grp Cap (vph)		1881	830					1220	546		1349	
v/s Ratio Prot		c0.26						c0.16			0.14	
v/s Ratio Perm			0.07						0.11			
v/c Ratio		0.52	0.15					0.50	0.33		0.38	
Uniform Delay, d1		13.8	11.0					21.9	20.6		19.1	
Progression Factor		1.03	1.63					1.45	1.69		0.00	
Incremental Delay, d2		1.0	0.4					0.4	0.5		0.2	
Delay (s)		15.2	18.3					32.3	35.3		0.2	
Level of Service		B	B					C	D		A	
Approach Delay (s/veh)		15.8			0.0			33.1			0.2	
Approach LOS		B			A			C			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	18.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	14.7
Intersection Capacity Utilization	50.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	1139	174	0	542	0	0	479	159
Future Volume (vph)	0	0	0	0	1139	174	0	542	0	0	479	159
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	12	12	12	12	12	12	16	12	12	12	12
Total Lost time (s)					6.0			5.7			8.7	8.7
Lane Util. Factor					0.91			0.95			0.95	1.00
Frpb, ped/bikes					1.00			1.00			1.00	0.98
Flpb, ped/bikes					1.00			1.00			1.00	1.00
Frt					0.98			1.00			1.00	0.85
Flt Protected					1.00			1.00			1.00	1.00
Satd. Flow (prot)					5342			4307			3762	1652
Flt Permitted					1.00			1.00			1.00	1.00
Satd. Flow (perm)					5342			4307			3762	1652
Peak-hour factor, PHF	0.92	0.92	0.92	0.91	0.91	0.91	0.89	0.89	0.89	0.93	0.93	0.93
Adj. Flow (vph)	0	0	0	0	1252	191	0	609	0	0	515	171
RTOR Reduction (vph)	0	0	0	0	22	0	0	0	0	0	0	28
Lane Group Flow (vph)	0	0	0	0	1421	0	0	609	0	0	515	143
Confl. Peds. (#/hr)						1						4
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	1%	1%
Turn Type					NA			NA			NA	Perm
Protected Phases					2			8			4	
Permitted Phases												4
Actuated Green, G (s)					39.6			28.7			25.7	25.7
Effective Green, g (s)					39.6			28.7			25.7	25.7
Actuated g/C Ratio					0.50			0.36			0.32	0.32
Clearance Time (s)					6.0			5.7			8.7	8.7
Vehicle Extension (s)					3.0			4.0			4.0	4.0
Lane Grp Cap (vph)					2644			1545			1208	530
v/s Ratio Prot					c0.27			c0.14			0.14	
v/s Ratio Perm												0.09
v/c Ratio					0.54			0.39			0.43	0.27
Uniform Delay, d1					13.9			19.2			21.4	20.2
Progression Factor					1.00			0.00			1.03	1.05
Incremental Delay, d2					0.7			0.2			0.3	0.4
Delay (s)					14.7			0.2			22.2	21.6
Level of Service					B			A			C	C
Approach Delay (s/veh)		0.0			14.7			0.2			22.1	
Approach LOS		A			B			A			C	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	13.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	14.7
Intersection Capacity Utilization	50.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	152	0	0	0	0	813
Future Volume (vph)	152	0	0	0	0	813
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)	4.5					5.3
Lane Util. Factor	0.97					0.95
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	3614					3725
Flt Permitted	0.95					1.00
Satd. Flow (perm)	3614					3725
Peak-hour factor, PHF	0.94	0.94	0.92	0.92	0.91	0.91
Adj. Flow (vph)	162	0	0	0	0	893
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	162	0	0	0	0	893
Turn Type	Prot					NA
Protected Phases	8					6
Permitted Phases						
Actuated Green, G (s)	9.0					61.2
Effective Green, g (s)	9.0					61.2
Actuated g/C Ratio	0.11					0.77
Clearance Time (s)	4.5					5.3
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	406					2849
v/s Ratio Prot	c0.04					c0.24
v/s Ratio Perm						
v/c Ratio	0.40					0.31
Uniform Delay, d1	33.0					2.9
Progression Factor	0.97					0.48
Incremental Delay, d2	0.6					0.3
Delay (s)	32.6					1.7
Level of Service	C					A
Approach Delay (s/veh)	32.6		0.0			1.7
Approach LOS	C		A			A

Intersection Summary			
HCM 2000 Control Delay (s/veh)	6.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	9.8
Intersection Capacity Utilization	49.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	288	0	0	644	0	0
Future Volume (vph)	288	0	0	644	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)	4.5			5.3		
Lane Util. Factor	0.97			0.95		
Frt	1.00			1.00		
Flt Protected	0.95			1.00		
Satd. Flow (prot)	3614			3725		
Flt Permitted	0.95			1.00		
Satd. Flow (perm)	3614			3725		
Peak-hour factor, PHF	0.94	0.94	0.86	0.86	0.92	0.92
Adj. Flow (vph)	306	0	0	749	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	306	0	0	749	0	0
Turn Type	Prot			NA		
Protected Phases	4			2		
Permitted Phases						
Actuated Green, G (s)	12.0			58.2		
Effective Green, g (s)	12.0			58.2		
Actuated g/C Ratio	0.15			0.73		
Clearance Time (s)	4.5			5.3		
Vehicle Extension (s)	3.0			3.0		
Lane Grp Cap (vph)	542			2709		
v/s Ratio Prot	c0.08			c0.20		
v/s Ratio Perm						
v/c Ratio	0.56			0.28		
Uniform Delay, d1	31.6			3.7		
Progression Factor	0.73			1.00		
Incremental Delay, d2	1.3			0.3		
Delay (s)	24.4			4.0		
Level of Service	C			A		
Approach Delay (s/veh)	24.4			4.0	0.0	
Approach LOS	C			A	A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	9.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.33		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	9.8
Intersection Capacity Utilization	42.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	0	86	0	0	636	77
Future Volume (vph)	0	86	0	0	636	77
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.7			5.6	5.6
Lane Util. Factor		1.00			0.95	1.00
Frt		0.87			1.00	0.85
Flt Protected		1.00			1.00	1.00
Satd. Flow (prot)		1696			3725	1667
Flt Permitted		1.00			1.00	1.00
Satd. Flow (perm)		1696			3725	1667
Peak-hour factor, PHF	0.72	0.72	0.92	0.92	0.87	0.87
Adj. Flow (vph)	0	119	0	0	731	89
RTOR Reduction (vph)	0	111	0	0	0	19
Lane Group Flow (vph)	0	8	0	0	731	70
Turn Type		Prot			NA	Perm
Protected Phases		4			6	
Permitted Phases						6
Actuated Green, G (s)		5.6			63.1	63.1
Effective Green, g (s)		5.6			63.1	63.1
Actuated g/C Ratio		0.07			0.79	0.79
Clearance Time (s)		5.7			5.6	5.6
Vehicle Extension (s)		3.0			3.0	3.0
Lane Grp Cap (vph)		118			2938	1314
v/s Ratio Prot		c0.00			c0.20	
v/s Ratio Perm						0.04
v/c Ratio		0.07			0.25	0.05
Uniform Delay, d1		34.8			2.2	1.9
Progression Factor		1.00			1.20	1.86
Incremental Delay, d2		0.3			0.2	0.1
Delay (s)		35.0			2.9	3.5
Level of Service		D			A	A
Approach Delay (s/veh)	35.0			0.0	2.9	
Approach LOS	D			A	A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	7.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.23		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	11.3
Intersection Capacity Utilization	32.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	0	30	1099	32	0	0
Future Volume (vph)	0	30	1099	32	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.6	5.5			
Lane Util. Factor		1.00	0.95			
Frt		0.87	1.00			
Flt Protected		1.00	1.00			
Satd. Flow (prot)		1696	3710			
Flt Permitted		1.00	1.00			
Satd. Flow (perm)		1696	3710			
Peak-hour factor, PHF	0.83	0.83	0.94	0.94	0.92	0.92
Adj. Flow (vph)	0	36	1169	34	0	0
RTOR Reduction (vph)	0	34	2	0	0	0
Lane Group Flow (vph)	0	2	1201	0	0	0
Turn Type		Prot	NA			
Protected Phases		8	2			
Permitted Phases		8				
Actuated Green, G (s)		2.8	46.1			
Effective Green, g (s)		2.8	46.1			
Actuated g/C Ratio		0.05	0.77			
Clearance Time (s)		5.6	5.5			
Vehicle Extension (s)		3.0	3.0			
Lane Grp Cap (vph)		79	2850			
v/s Ratio Prot		c0.00	c0.32			
v/s Ratio Perm						
v/c Ratio		0.02	0.42			
Uniform Delay, d1		27.3	2.4			
Progression Factor		1.00	0.89			
Incremental Delay, d2		0.1	0.4			
Delay (s)		27.4	2.5			
Level of Service		C	A			
Approach Delay (s/veh)	27.4		2.5		0.0	
Approach LOS	C		A		A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	3.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	11.1
Intersection Capacity Utilization	44.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	155	220	0	820	0	0	0	0
Future Volume (vph)	0	0	0	0	155	220	0	820	0	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					10.1	10.1		5.8				
Lane Util. Factor					0.95	1.00		0.95				
Frt					1.00	0.85		1.00				
Flt Protected					1.00	1.00		1.00				
Satd. Flow (prot)					3800	1700		3800				
Flt Permitted					1.00	1.00		1.00				
Satd. Flow (perm)					3800	1700		3800				
Peak-hour factor, PHF	0.92	0.92	0.92	0.85	0.85	0.85	0.95	0.95	0.95	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	182	259	0	863	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	79	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	182	180	0	863	0	0	0	0
Heavy Vehicles (%)	2%	2%	2%	0%	0%	0%	0%	0%	0%	2%	2%	2%
Turn Type					NA	Perm		NA				
Protected Phases					2			8				
Permitted Phases						2						
Actuated Green, G (s)					21.9	21.9		22.2				
Effective Green, g (s)					21.9	21.9		22.2				
Actuated g/C Ratio					0.37	0.37		0.37				
Clearance Time (s)					10.1	10.1		5.8				
Vehicle Extension (s)					3.0	3.0		3.0				
Lane Grp Cap (vph)					1387	620		1406				
v/s Ratio Prot					0.05			c0.23				
v/s Ratio Perm						c0.11						
v/c Ratio					0.13	0.29		0.61				
Uniform Delay, d1					12.7	13.5		15.4				
Progression Factor					1.27	1.64		0.00				
Incremental Delay, d2					0.2	1.2		1.3				
Delay (s)					16.3	23.4		1.3				
Level of Service					B	C		A				
Approach Delay (s/veh)		0.0			20.5			1.3			0.0	
Approach LOS		A			C			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	7.8	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	47.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	450	0	0	0	0	0	820	178	0	0	0
Future Volume (vph)	0	450	0	0	0	0	0	820	178	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.1						9.8	9.8			
Lane Util. Factor		0.95						0.95	1.00			
Frpb, ped/bikes		1.00						1.00	0.99			
Flpb, ped/bikes		1.00						1.00	1.00			
Frt		1.00						1.00	0.85			
Flt Protected		1.00						1.00	1.00			
Satd. Flow (prot)		3800						3800	1678			
Flt Permitted		1.00						1.00	1.00			
Satd. Flow (perm)		3800						3800	1678			
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.95	0.95	0.95	0.92	0.92	0.92
Adj. Flow (vph)	0	500	0	0	0	0	0	863	187	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	130	0	0	0
Lane Group Flow (vph)	0	500	0	0	0	0	0	863	57	0	0	0
Confl. Peds. (#/hr)									1			
Heavy Vehicles (%)	0%	0%	0%	2%	2%	2%	0%	0%	0%	2%	2%	2%
Turn Type		NA						NA	Perm			
Protected Phases		6						4				
Permitted Phases									4			
Actuated Green, G (s)		25.9						18.2	18.2			
Effective Green, g (s)		25.9						18.2	18.2			
Actuated g/C Ratio		0.43						0.30	0.30			
Clearance Time (s)		6.1						9.8	9.8			
Vehicle Extension (s)		3.0						3.0	3.0			
Lane Grp Cap (vph)		1640						1152	508			
v/s Ratio Prot		c0.13						c0.23				
v/s Ratio Perm									0.03			
v/c Ratio		0.30						0.75	0.11			
Uniform Delay, d1		11.2						18.8	15.1			
Progression Factor		0.00						1.00	1.00			
Incremental Delay, d2		0.5						4.5	0.4			
Delay (s)		0.5						23.3	15.5			
Level of Service		A						C	B			
Approach Delay (s/veh)		0.5			0.0			21.9			0.0	
Approach LOS		A			A			C			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	15.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	47.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	450	478	0	0	0	0	0	0	0	650	0
Future Volume (vph)	0	450	478	0	0	0	0	0	0	0	650	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		10.1	10.1								5.8	
Lane Util. Factor		0.95	1.00								0.95	
Frt		1.00	0.85								1.00	
Flt Protected		1.00	1.00								1.00	
Satd. Flow (prot)		3800	1700								3800	
Flt Permitted		1.00	1.00								1.00	
Satd. Flow (perm)		3800	1700								3800	
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.92	0.92	0.92	0.95	0.95	0.95
Adj. Flow (vph)	0	500	531	0	0	0	0	0	0	0	684	0
RTOR Reduction (vph)	0	0	79	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	500	452	0	0	0	0	0	0	0	684	0
Heavy Vehicles (%)	0%	0%	0%	2%	2%	2%	2%	2%	2%	0%	0%	0%
Turn Type		NA	Perm								NA	
Protected Phases		2									8	
Permitted Phases			2									
Actuated Green, G (s)		21.9	21.9								22.2	
Effective Green, g (s)		21.9	21.9								22.2	
Actuated g/C Ratio		0.37	0.37								0.37	
Clearance Time (s)		10.1	10.1								5.8	
Vehicle Extension (s)		3.0	3.0								3.0	
Lane Grp Cap (vph)		1387	620								1406	
v/s Ratio Prot		0.13									c0.18	
v/s Ratio Perm			c0.27									
v/c Ratio		0.36	0.73								0.49	
Uniform Delay, d1		13.9	16.5								14.5	
Progression Factor		1.00	1.00								0.00	
Incremental Delay, d2		0.7	7.4								1.0	
Delay (s)		14.7	23.9								1.0	
Level of Service		B	C								A	
Approach Delay (s/veh)		19.4			0.0			0.0			1.0	
Approach LOS		B			A			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	12.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	58.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	155	0	0	0	0	0	650	57
Future Volume (vph)	0	0	0	0	155	0	0	0	0	0	650	57
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					6.1						9.8	9.8
Lane Util. Factor					0.95						0.95	1.00
Frpb, ped/bikes					1.00						1.00	0.99
Flpb, ped/bikes					1.00						1.00	1.00
Frt					1.00						1.00	0.85
Flt Protected					1.00						1.00	1.00
Satd. Flow (prot)					3800						3800	1678
Flt Permitted					1.00						1.00	1.00
Satd. Flow (perm)					3800						3800	1678
Peak-hour factor, PHF	0.92	0.92	0.92	0.85	0.85	0.85	0.92	0.92	0.92	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	0	182	0	0	0	0	0	684	60
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	42
Lane Group Flow (vph)	0	0	0	0	182	0	0	0	0	0	684	18
Confl. Peds. (#/hr)												1
Heavy Vehicles (%)	2%	2%	2%	0%	0%	0%	2%	2%	2%	0%	0%	0%
Turn Type					NA						NA	Perm
Protected Phases					6						4	
Permitted Phases												4
Actuated Green, G (s)					25.9						18.2	18.2
Effective Green, g (s)					25.9						18.2	18.2
Actuated g/C Ratio					0.43						0.30	0.30
Clearance Time (s)					6.1						9.8	9.8
Vehicle Extension (s)					3.0						3.0	3.0
Lane Grp Cap (vph)					1640						1152	508
v/s Ratio Prot					c0.05						c0.18	
v/s Ratio Perm												0.01
v/c Ratio					0.11						0.59	0.04
Uniform Delay, d1					10.2						17.8	14.7
Progression Factor					0.00						1.00	1.00
Incremental Delay, d2					0.1						2.3	0.1
Delay (s)					0.2						20.0	14.9
Level of Service					A						C	B
Approach Delay (s/veh)		0.0			0.2			0.0			19.6	
Approach LOS		A			A			A			B	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	15.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	47.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	0	151	0	0	689	113
Future Volume (vph)	0	151	0	0	689	113
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.6			5.8	5.8
Lane Util. Factor		1.00			0.95	1.00
Frt		0.87			1.00	0.85
Flt Protected		1.00			1.00	1.00
Satd. Flow (prot)		1696			3725	1667
Flt Permitted		1.00			1.00	1.00
Satd. Flow (perm)		1696			3725	1667
Peak-hour factor, PHF	0.82	0.82	0.92	0.92	0.89	0.89
Adj. Flow (vph)	0	184	0	0	774	127
RTOR Reduction (vph)	0	142	0	0	0	41
Lane Group Flow (vph)	0	42	0	0	774	86
Turn Type		Prot			NA	Perm
Protected Phases		4			6	
Permitted Phases						6
Actuated Green, G (s)		8.1			40.5	40.5
Effective Green, g (s)		8.1			40.5	40.5
Actuated g/C Ratio		0.13			0.68	0.68
Clearance Time (s)		5.6			5.8	5.8
Vehicle Extension (s)		3.0			3.0	3.0
Lane Grp Cap (vph)		228			2514	1125
v/s Ratio Prot		c0.02			c0.21	
v/s Ratio Perm						0.05
v/c Ratio		0.18			0.31	0.08
Uniform Delay, d1		23.0			4.0	3.3
Progression Factor		1.00			0.65	0.62
Incremental Delay, d2		0.4			0.3	0.1
Delay (s)		23.4			2.9	2.2
Level of Service		C			A	A
Approach Delay (s/veh)	23.4			0.0	2.8	
Approach LOS	C			A	A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	6.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.29		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	11.4
Intersection Capacity Utilization	36.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	0	584	686	538	0	0
Future Volume (vph)	0	584	686	538	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.6	5.9	5.9		
Lane Util. Factor		0.88	0.95	1.00		
Frt		0.85	1.00	0.85		
Flt Protected		1.00	1.00	1.00		
Satd. Flow (prot)		2933	3725	1667		
Flt Permitted		1.00	1.00	1.00		
Satd. Flow (perm)		2933	3725	1667		
Peak-hour factor, PHF	0.94	0.94	0.93	0.93	0.92	0.92
Adj. Flow (vph)	0	621	738	578	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	621	738	578	0	0
Turn Type		Prot	NA	Perm		
Protected Phases		8	2			
Permitted Phases				2		
Actuated Green, G (s)		17.7	30.8	30.8		
Effective Green, g (s)		17.7	30.8	30.8		
Actuated g/C Ratio		0.30	0.51	0.51		
Clearance Time (s)		5.6	5.9	5.9		
Vehicle Extension (s)		3.0	3.0	3.0		
Lane Grp Cap (vph)		865	1912	855		
v/s Ratio Prot		c0.21	0.20			
v/s Ratio Perm				c0.35		
v/c Ratio		0.72	0.39	0.68		
Uniform Delay, d1		18.9	8.9	10.9		
Progression Factor		1.41	0.98	1.02		
Incremental Delay, d2		2.8	0.5	4.0		
Delay (s)		29.4	9.2	15.1		
Level of Service		C	A	B		
Approach Delay (s/veh)	29.4		11.8			0.0
Approach LOS	C		B			A

Intersection Summary			
HCM 2000 Control Delay (s/veh)	17.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	11.5
Intersection Capacity Utilization	47.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1380	200	0	0	0	0	651	366	0	515	0
Future Volume (vph)	0	1380	200	0	0	0	0	651	366	0	515	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.0	6.0					8.7	8.7		5.7	
Lane Util. Factor		0.95	1.00					0.95	1.00		0.95	
Frpb, ped/bikes		1.00	0.99					1.00	0.99		1.00	
Flpb, ped/bikes		1.00	1.00					1.00	1.00		1.00	
Frt		1.00	0.85					1.00	0.85		1.00	
Flt Protected		1.00	1.00					1.00	1.00		1.00	
Satd. Flow (prot)		3800	1678					3800	1677		3800	
Flt Permitted		1.00	1.00					1.00	1.00		1.00	
Satd. Flow (perm)		3800	1678					3800	1677		3800	
Peak-hour factor, PHF	0.95	0.95	0.95	0.92	0.92	0.92	0.93	0.93	0.93	0.95	0.95	0.95
Adj. Flow (vph)	0	1453	211	0	0	0	0	700	394	0	542	0
RTOR Reduction (vph)	0	0	61	0	0	0	0	0	40	0	0	0
Lane Group Flow (vph)	0	1453	150	0	0	0	0	700	354	0	542	0
Confl. Peds. (#/hr)			1						1			
Heavy Vehicles (%)	0%	0%	0%	2%	2%	2%	0%	0%	0%	0%	0%	0%
Turn Type		NA	Perm					NA	Perm		NA	
Protected Phases		2						4			8	
Permitted Phases			2						4			
Actuated Green, G (s)		29.0	29.0					16.3	16.3		19.3	
Effective Green, g (s)		29.0	29.0					16.3	16.3		19.3	
Actuated g/C Ratio		0.48	0.48					0.27	0.27		0.32	
Clearance Time (s)		6.0	6.0					8.7	8.7		5.7	
Vehicle Extension (s)		3.0	3.0					4.0	4.0		4.0	
Lane Grp Cap (vph)		1836	811					1032	455		1222	
v/s Ratio Prot		c0.38						0.18			0.14	
v/s Ratio Perm			0.09						c0.21			
v/c Ratio		0.79	0.18					0.68	0.78		0.44	
Uniform Delay, d1		13.0	8.8					19.5	20.2		16.1	
Progression Factor		0.74	0.35					1.00	1.08		0.00	
Incremental Delay, d2		3.0	0.4					1.9	8.3		0.3	
Delay (s)		12.6	3.5					21.4	30.1		0.3	
Level of Service		B	A					C	C		A	
Approach Delay (s/veh)		11.4			0.0			24.5			0.3	
Approach LOS		B			A			C			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	14.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	14.7
Intersection Capacity Utilization	70.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	1161	152	0	651	0	0	515	183
Future Volume (vph)	0	0	0	0	1161	152	0	651	0	0	515	183
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	12	12	12	12	12	12	16	12	12	12	12
Total Lost time (s)					6.0			5.7			8.7	8.7
Lane Util. Factor					0.91			0.95			0.95	1.00
Frpb, ped/bikes					1.00			1.00			1.00	1.00
Flpb, ped/bikes					1.00			1.00			1.00	1.00
Frt					0.98			1.00			1.00	0.85
Flt Protected					1.00			1.00			1.00	1.00
Satd. Flow (prot)					5357			4307			3800	1700
Flt Permitted					1.00			1.00			1.00	1.00
Satd. Flow (perm)					5357			4307			3800	1700
Peak-hour factor, PHF	0.92	0.92	0.92	0.91	0.91	0.91	0.93	0.93	0.93	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	0	1276	167	0	700	0	0	542	193
RTOR Reduction (vph)	0	0	0	0	28	0	0	0	0	0	0	40
Lane Group Flow (vph)	0	0	0	0	1415	0	0	700	0	0	542	153
Confl. Peds. (#/hr)						2						
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type					NA			NA			NA	Perm
Protected Phases					2			8			4	
Permitted Phases												4
Actuated Green, G (s)					29.0			19.3			16.3	16.3
Effective Green, g (s)					29.0			19.3			16.3	16.3
Actuated g/C Ratio					0.48			0.32			0.27	0.27
Clearance Time (s)					6.0			5.7			8.7	8.7
Vehicle Extension (s)					3.0			4.0			4.0	4.0
Lane Grp Cap (vph)					2589			1385			1032	461
v/s Ratio Prot					c0.26			c0.16			0.14	
v/s Ratio Perm												0.09
v/c Ratio					0.55			0.51			0.53	0.33
Uniform Delay, d1					10.9			16.5			18.6	17.5
Progression Factor					0.77			0.00			0.76	0.64
Incremental Delay, d2					0.8			0.3			0.6	0.6
Delay (s)					9.1			0.3			14.7	11.8
Level of Service					A			A			B	B
Approach Delay (s/veh)		0.0			9.1			0.3			13.9	
Approach LOS		A			A			A			B	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	8.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	14.7
Intersection Capacity Utilization	70.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	187	0	0	0	0	797
Future Volume (vph)	187	0	0	0	0	797
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)	4.5					5.3
Lane Util. Factor	0.97					0.95
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	3614					3725
Flt Permitted	0.95					1.00
Satd. Flow (perm)	3614					3725
Peak-hour factor, PHF	0.94	0.94	0.92	0.92	0.95	0.95
Adj. Flow (vph)	199	0	0	0	0	839
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	199	0	0	0	0	839
Turn Type	Prot					NA
Protected Phases	8					6
Permitted Phases						
Actuated Green, G (s)	8.7					41.5
Effective Green, g (s)	8.7					41.5
Actuated g/C Ratio	0.14					0.69
Clearance Time (s)	4.5					5.3
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	524					2576
v/s Ratio Prot	c0.06					c0.23
v/s Ratio Perm						
v/c Ratio	0.38					0.33
Uniform Delay, d1	23.2					3.7
Progression Factor	0.72					0.39
Incremental Delay, d2	0.4					0.3
Delay (s)	17.1					1.8
Level of Service	B					A
Approach Delay (s/veh)	17.1		0.0			1.8
Approach LOS	B		A			A

Intersection Summary			
HCM 2000 Control Delay (s/veh)	4.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	9.8
Intersection Capacity Utilization	57.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	261	0	0	963	0	0
Future Volume (vph)	261	0	0	963	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)	4.5			5.3		
Lane Util. Factor	0.97			0.95		
Frt	1.00			1.00		
Flt Protected	0.95			1.00		
Satd. Flow (prot)	3614			3725		
Flt Permitted	0.95			1.00		
Satd. Flow (perm)	3614			3725		
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	284	0	0	1047	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	284	0	0	1047	0	0
Turn Type	Prot			NA		
Protected Phases	4			2		
Permitted Phases						
Actuated Green, G (s)	9.9			40.3		
Effective Green, g (s)	9.9			40.3		
Actuated g/C Ratio	0.17			0.67		
Clearance Time (s)	4.5			5.3		
Vehicle Extension (s)	3.0			3.0		
Lane Grp Cap (vph)	596			2501		
v/s Ratio Prot	c0.08			c0.28		
v/s Ratio Perm						
v/c Ratio	0.48			0.42		
Uniform Delay, d1	22.7			4.5		
Progression Factor	0.96			1.00		
Incremental Delay, d2	0.6			0.5		
Delay (s)	22.5			5.0		
Level of Service	C			A		
Approach Delay (s/veh)	22.5			5.0	0.0	
Approach LOS	C			A	A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	8.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	9.8
Intersection Capacity Utilization	52.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	0	97	0	0	689	103
Future Volume (vph)	0	97	0	0	689	103
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.7			5.6	5.6
Lane Util. Factor		1.00			0.95	1.00
Frpb, ped/bikes		1.00			1.00	1.00
Flpb, ped/bikes		1.00			1.00	1.00
Frt		0.87			1.00	0.85
Flt Protected		1.00			1.00	1.00
Satd. Flow (prot)		1696			3725	1667
Flt Permitted		1.00			1.00	1.00
Satd. Flow (perm)		1696			3725	1667
Peak-hour factor, PHF	0.78	0.78	0.92	0.92	0.95	0.95
Adj. Flow (vph)	0	124	0	0	725	108
RTOR Reduction (vph)	0	112	0	0	0	30
Lane Group Flow (vph)	0	12	0	0	725	78
Confl. Peds. (#/hr)	100					
Turn Type		Prot			NA	Perm
Protected Phases		4			6	
Permitted Phases						6
Actuated Green, G (s)		5.6			43.1	43.1
Effective Green, g (s)		5.6			43.1	43.1
Actuated g/C Ratio		0.09			0.72	0.72
Clearance Time (s)		5.7			5.6	5.6
Vehicle Extension (s)		3.0			3.0	3.0
Lane Grp Cap (vph)		158			2675	1197
v/s Ratio Prot		c0.01			c0.19	
v/s Ratio Perm						0.05
v/c Ratio		0.07			0.27	0.06
Uniform Delay, d1		24.8			3.0	2.5
Progression Factor		1.00			0.84	1.46
Incremental Delay, d2		0.2			0.2	0.1
Delay (s)		25.0			2.7	3.7
Level of Service		C			A	A
Approach Delay (s/veh)	25.0			0.0	2.9	
Approach LOS	C			A	A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	5.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.25		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	11.3
Intersection Capacity Utilization	33.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	0	65	705	17	0	0
Future Volume (vph)	0	65	705	17	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.6	5.5			
Lane Util. Factor		1.00	0.95			
Frt		0.87	1.00			
Flt Protected		1.00	1.00			
Satd. Flow (prot)		1696	3712			
Flt Permitted		1.00	1.00			
Satd. Flow (perm)		1696	3712			
Peak-hour factor, PHF	0.64	0.64	0.95	0.95	0.92	0.92
Adj. Flow (vph)	0	102	742	18	0	0
RTOR Reduction (vph)	0	92	2	0	0	0
Lane Group Flow (vph)	0	10	758	0	0	0
Turn Type		Prot	NA			
Protected Phases		8	2			
Permitted Phases						
Actuated Green, G (s)		5.6	43.3			
Effective Green, g (s)		5.6	43.3			
Actuated g/C Ratio		0.09	0.72			
Clearance Time (s)		5.6	5.5			
Vehicle Extension (s)		3.0	3.0			
Lane Grp Cap (vph)		158	2678			
v/s Ratio Prot		c0.01	c0.20			
v/s Ratio Perm						
v/c Ratio		0.06	0.28			
Uniform Delay, d1		24.8	2.9			
Progression Factor		1.00	2.52			
Incremental Delay, d2		0.2	0.2			
Delay (s)		25.0	7.6			
Level of Service		C	A			
Approach Delay (s/veh)	25.0		7.6		0.0	
Approach LOS	C		A		A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	9.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.26		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	11.1
Intersection Capacity Utilization	34.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	304	129	0	465	0	0	0	0
Future Volume (vph)	0	0	0	0	304	129	0	465	0	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					10.1	10.1		5.8				
Lane Util. Factor					0.95	1.00		0.95				
Frt					1.00	0.85		1.00				
Flt Protected					1.00	1.00		1.00				
Satd. Flow (prot)					3762	1683		3762				
Flt Permitted					1.00	1.00		1.00				
Satd. Flow (perm)					3762	1683		3762				
Peak-hour factor, PHF	0.92	0.92	0.92	0.86	0.86	0.86	0.87	0.87	0.87	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	353	150	0	534	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	103	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	353	47	0	534	0	0	0	0
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	1%	1%	1%	2%	2%	2%
Turn Type					NA	Perm		NA				
Protected Phases					2			8				
Permitted Phases						2						
Actuated Green, G (s)					18.9	18.9		25.2				
Effective Green, g (s)					18.9	18.9		25.2				
Actuated g/C Ratio					0.32	0.32		0.42				
Clearance Time (s)					10.1	10.1		5.8				
Vehicle Extension (s)					3.0	3.0		3.0				
Lane Grp Cap (vph)					1185	530		1580				
v/s Ratio Prot					c0.09			c0.14				
v/s Ratio Perm						0.03						
v/c Ratio					0.30	0.09		0.34				
Uniform Delay, d1					15.5	14.5		11.8				
Progression Factor					0.96	1.26		0.00				
Incremental Delay, d2					0.6	0.3		0.5				
Delay (s)					15.5	18.6		0.6				
Level of Service					B	B		A				
Approach Delay (s/veh)		0.0			16.5			0.6			0.0	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	8.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.35		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	52.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	189	0	0	0	0	0	465	105	0	0	0
Future Volume (vph)	0	189	0	0	0	0	0	465	105	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.1						9.8	9.8			
Lane Util. Factor		0.95						0.95	1.00			
Frt		1.00						1.00	0.85			
Flt Protected		1.00						1.00	1.00			
Satd. Flow (prot)		3800						3762	1683			
Flt Permitted		1.00						1.00	1.00			
Satd. Flow (perm)		3800						3762	1683			
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.87	0.87	0.87	0.92	0.92	0.92
Adj. Flow (vph)	0	210	0	0	0	0	0	534	121	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	78	0	0	0
Lane Group Flow (vph)	0	210	0	0	0	0	0	534	43	0	0	0
Heavy Vehicles (%)	0%	0%	0%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Turn Type		NA						NA	Perm			
Protected Phases		6						4				
Permitted Phases									4			
Actuated Green, G (s)		22.9						21.2	21.2			
Effective Green, g (s)		22.9						21.2	21.2			
Actuated g/C Ratio		0.38						0.35	0.35			
Clearance Time (s)		6.1						9.8	9.8			
Vehicle Extension (s)		3.0						3.0	3.0			
Lane Grp Cap (vph)		1450						1329	594			
v/s Ratio Prot		c0.06						c0.14				
v/s Ratio Perm									0.03			
v/c Ratio		0.14						0.40	0.07			
Uniform Delay, d1		12.1						14.6	12.9			
Progression Factor		0.00						1.00	1.00			
Incremental Delay, d2		0.2						0.9	0.2			
Delay (s)		0.2						15.5	13.1			
Level of Service		A						B	B			
Approach Delay (s/veh)		0.2			0.0			15.1			0.0	
Approach LOS		A			A			B			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	11.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.30		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	33.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	189	261	0	0	0	0	0	0	0	1178	0
Future Volume (vph)	0	189	261	0	0	0	0	0	0	0	1178	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		10.1	10.1								5.8	
Lane Util. Factor		0.95	1.00								0.95	
Frpb, ped/bikes		1.00	0.99								1.00	
Flpb, ped/bikes		1.00	1.00								1.00	
Frt		1.00	0.85								1.00	
Flt Protected		1.00	1.00								1.00	
Satd. Flow (prot)		3725	1645								3800	
Flt Permitted		1.00	1.00								1.00	
Satd. Flow (perm)		3725	1645								3800	
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.92	0.92	0.92	0.94	0.94	0.94
Adj. Flow (vph)	0	210	290	0	0	0	0	0	0	0	1253	0
RTOR Reduction (vph)	0	0	85	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	210	205	0	0	0	0	0	0	0	1253	0
Confl. Peds. (#/hr)			1									
Heavy Vehicles (%)	0%	2%	2%	2%	2%	2%	2%	2%	2%	0%	0%	0%
Turn Type		NA	Perm								NA	
Protected Phases		2									8	
Permitted Phases			2									
Actuated Green, G (s)		18.9	18.9								25.2	
Effective Green, g (s)		18.9	18.9								25.2	
Actuated g/C Ratio		0.32	0.32								0.42	
Clearance Time (s)		10.1	10.1								5.8	
Vehicle Extension (s)		3.0	3.0								3.0	
Lane Grp Cap (vph)		1173	518								1596	
v/s Ratio Prot		0.06									c0.33	
v/s Ratio Perm			c0.12									
v/c Ratio		0.18	0.40								0.79	
Uniform Delay, d1		14.9	16.1								15.1	
Progression Factor		1.00	1.00								0.06	
Incremental Delay, d2		0.3	2.3								1.4	
Delay (s)		15.3	18.3								2.4	
Level of Service		B	B								A	
Approach Delay (s/veh)		17.0			0.0			0.0			2.4	
Approach LOS		B			A			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	6.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	61.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	304	0	0	0	0	0	1178	136
Future Volume (vph)	0	0	0	0	304	0	0	0	0	0	1178	136
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					6.1						9.8	9.8
Lane Util. Factor					0.95						0.95	1.00
Frt					1.00						1.00	0.85
Flt Protected					1.00						1.00	1.00
Satd. Flow (prot)					3800						3800	1700
Flt Permitted					1.00						1.00	1.00
Satd. Flow (perm)					3800						3800	1700
Peak-hour factor, PHF	0.92	0.92	0.92	0.86	0.86	0.86	0.92	0.92	0.92	0.94	0.94	0.94
Adj. Flow (vph)	0	0	0	0	353	0	0	0	0	0	1253	145
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	94
Lane Group Flow (vph)	0	0	0	0	353	0	0	0	0	0	1253	51
Heavy Vehicles (%)	2%	2%	2%	0%	0%	0%	2%	2%	2%	0%	0%	0%
Turn Type					NA						NA	Perm
Protected Phases					6						4	
Permitted Phases												4
Actuated Green, G (s)					22.9						21.2	21.2
Effective Green, g (s)					22.9						21.2	21.2
Actuated g/C Ratio					0.38						0.35	0.35
Clearance Time (s)					6.1						9.8	9.8
Vehicle Extension (s)					3.0						3.0	3.0
Lane Grp Cap (vph)					1450						1342	600
v/s Ratio Prot					c0.09						c0.33	
v/s Ratio Perm												0.03
v/c Ratio					0.24						0.93	0.09
Uniform Delay, d1					12.6						18.7	12.9
Progression Factor					0.00						1.00	1.00
Incremental Delay, d2					0.4						13.1	0.3
Delay (s)					0.4						31.8	13.2
Level of Service					A						C	B
Approach Delay (s/veh)		0.0			0.4			0.0			29.9	
Approach LOS		A			A			A			C	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	24.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	52.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	0	51	0	0	1002	191
Future Volume (vph)	0	51	0	0	1002	191
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.6			5.8	5.8
Lane Util. Factor		1.00			0.95	1.00
Frt		0.87			1.00	0.85
Flt Protected		1.00			1.00	1.00
Satd. Flow (prot)		1696			3725	1667
Flt Permitted		1.00			1.00	1.00
Satd. Flow (perm)		1696			3725	1667
Peak-hour factor, PHF	0.73	0.73	0.92	0.92	0.87	0.87
Adj. Flow (vph)	0	70	0	0	1152	220
RTOR Reduction (vph)	0	65	0	0	0	58
Lane Group Flow (vph)	0	5	0	0	1152	162
Turn Type		Prot			NA	Perm
Protected Phases		4			6	
Permitted Phases						6
Actuated Green, G (s)		4.3			44.3	44.3
Effective Green, g (s)		4.3			44.3	44.3
Actuated g/C Ratio		0.07			0.74	0.74
Clearance Time (s)		5.6			5.8	5.8
Vehicle Extension (s)		3.0			3.0	3.0
Lane Grp Cap (vph)		121			2750	1230
v/s Ratio Prot		c0.00			c0.31	
v/s Ratio Perm						0.10
v/c Ratio		0.04			0.42	0.13
Uniform Delay, d1		25.9			3.0	2.3
Progression Factor		1.00			0.40	0.02
Incremental Delay, d2		0.1			0.4	0.2
Delay (s)		26.1			1.6	0.3
Level of Service		C			A	A
Approach Delay (s/veh)	26.1			0.0	1.4	
Approach LOS	C			A	A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	2.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	11.4
Intersection Capacity Utilization	41.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	0	660	403	511	0	0
Future Volume (vph)	0	660	403	511	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.6	5.9	5.9		
Lane Util. Factor		0.88	0.95	1.00		
Frt		0.85	1.00	0.85		
Flt Protected		1.00	1.00	1.00		
Satd. Flow (prot)		2933	3725	1667		
Flt Permitted		1.00	1.00	1.00		
Satd. Flow (perm)		2933	3725	1667		
Peak-hour factor, PHF	0.88	0.88	0.95	0.95	0.92	0.92
Adj. Flow (vph)	0	750	424	538	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	750	424	538	0	0
Turn Type		Prot	NA	Perm		
Protected Phases		8	2			
Permitted Phases				2		
Actuated Green, G (s)		18.4	30.1	30.1		
Effective Green, g (s)		18.4	30.1	30.1		
Actuated g/C Ratio		0.31	0.50	0.50		
Clearance Time (s)		5.6	5.9	5.9		
Vehicle Extension (s)		3.0	3.0	3.0		
Lane Grp Cap (vph)		899	1868	836		
v/s Ratio Prot		c0.26	0.11			
v/s Ratio Perm				c0.32		
v/c Ratio		0.83	0.23	0.64		
Uniform Delay, d1		19.4	8.4	11.0		
Progression Factor		1.00	0.79	0.87		
Incremental Delay, d2		6.7	0.3	3.7		
Delay (s)		26.1	6.9	13.3		
Level of Service		C	A	B		
Approach Delay (s/veh)	26.1		10.5			0.0
Approach LOS	C		B			A

Intersection Summary			
HCM 2000 Control Delay (s/veh)	17.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	11.5
Intersection Capacity Utilization	42.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↱					↑↑	↱		↑↑	
Traffic Volume (vph)	0	764	238	0	0	0	0	361	198	0	745	0
Future Volume (vph)	0	764	238	0	0	0	0	361	198	0	745	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.0	6.0					8.7	8.7		5.7	
Lane Util. Factor		0.95	1.00					0.95	1.00		0.95	
Frpb, ped/bikes		1.00	0.99					1.00	1.00		1.00	
Flpb, ped/bikes		1.00	1.00					1.00	1.00		1.00	
Frt		1.00	0.85					1.00	0.85		1.00	
Flt Protected		1.00	1.00					1.00	1.00		1.00	
Satd. Flow (prot)		3762	1661					3762	1683		3800	
Flt Permitted		1.00	1.00					1.00	1.00		1.00	
Satd. Flow (perm)		3762	1661					3762	1683		3800	
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.95	0.95	0.95	0.80	0.80	0.80
Adj. Flow (vph)	0	849	264	0	0	0	0	380	208	0	931	0
RTOR Reduction (vph)	0	0	59	0	0	0	0	0	54	0	0	0
Lane Group Flow (vph)	0	849	205	0	0	0	0	380	154	0	931	0
Confl. Peds. (#/hr)			2									
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	1%	1%	1%	0%	0%	0%
Turn Type		NA	Perm					NA	Perm		NA	
Protected Phases		2						4			8	
Permitted Phases			2						4			
Actuated Green, G (s)		26.2	26.2					19.1	19.1		22.1	
Effective Green, g (s)		26.2	26.2					19.1	19.1		22.1	
Actuated g/C Ratio		0.44	0.44					0.32	0.32		0.37	
Clearance Time (s)		6.0	6.0					8.7	8.7		5.7	
Vehicle Extension (s)		3.0	3.0					4.0	4.0		4.0	
Lane Grp Cap (vph)		1642	725					1197	535		1399	
v/s Ratio Prot		c0.23						0.10			c0.25	
v/s Ratio Perm			0.12						0.09			
v/c Ratio		0.52	0.28					0.32	0.29		0.67	
Uniform Delay, d1		12.3	10.9					15.5	15.3		15.9	
Progression Factor		0.90	0.89					0.54	0.46		0.01	
Incremental Delay, d2		1.1	1.0					0.2	0.4		0.8	
Delay (s)		12.1	10.6					8.6	7.4		1.0	
Level of Service		B	B					A	A		A	
Approach Delay (s/veh)		11.8			0.0			8.2			1.0	
Approach LOS		B			A			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	7.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	14.7
Intersection Capacity Utilization	53.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	1069	109	0	361	0	0	745	147
Future Volume (vph)	0	0	0	0	1069	109	0	361	0	0	745	147
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	12	12	12	12	12	12	16	12	12	12	12
Total Lost time (s)					6.0			5.7			8.7	8.7
Lane Util. Factor					0.91			0.95			0.95	1.00
Frpb, ped/bikes					1.00			1.00			1.00	1.00
Flpb, ped/bikes					1.00			1.00			1.00	1.00
Frt					0.99			1.00			1.00	0.85
Flt Protected					1.00			1.00			1.00	1.00
Satd. Flow (prot)					5324			4264			3800	1700
Flt Permitted					1.00			1.00			1.00	1.00
Satd. Flow (perm)					5324			4264			3800	1700
Peak-hour factor, PHF	0.92	0.92	0.92	0.95	0.95	0.95	0.95	0.95	0.95	0.80	0.80	0.80
Adj. Flow (vph)	0	0	0	0	1125	115	0	380	0	0	931	184
RTOR Reduction (vph)	0	0	0	0	20	0	0	0	0	0	0	37
Lane Group Flow (vph)	0	0	0	0	1220	0	0	380	0	0	931	147
Confl. Peds. (#/hr)						2						
Heavy Vehicles (%)	0%	0%	0%	1%	1%	1%	1%	1%	1%	0%	0%	0%
Turn Type					NA			NA			NA	Perm
Protected Phases					2			8			4	
Permitted Phases												4
Actuated Green, G (s)					26.2			22.1			19.1	19.1
Effective Green, g (s)					26.2			22.1			19.1	19.1
Actuated g/C Ratio					0.44			0.37			0.32	0.32
Clearance Time (s)					6.0			5.7			8.7	8.7
Vehicle Extension (s)					3.0			4.0			4.0	4.0
Lane Grp Cap (vph)					2324			1570			1209	541
v/s Ratio Prot					c0.23			0.09			c0.25	
v/s Ratio Perm												0.09
v/c Ratio					0.52			0.24			0.77	0.27
Uniform Delay, d1					12.4			13.1			18.5	15.3
Progression Factor					0.81			0.00			0.73	0.57
Incremental Delay, d2					0.8			0.1			3.0	0.3
Delay (s)					10.8			0.1			16.5	9.1
Level of Service					B			A			B	A
Approach Delay (s/veh)		0.0			10.8			0.1			15.3	
Approach LOS		A			B			A			B	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	11.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	14.7
Intersection Capacity Utilization	53.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	345	0	0	0	0	1056
Future Volume (vph)	345	0	0	0	0	1056
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)	4.5					5.3
Lane Util. Factor	0.97					0.95
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	3614					3725
Flt Permitted	0.95					1.00
Satd. Flow (perm)	3614					3725
Peak-hour factor, PHF	0.88	0.88	0.92	0.92	0.82	0.82
Adj. Flow (vph)	392	0	0	0	0	1288
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	392	0	0	0	0	1288
Turn Type	Prot					NA
Protected Phases	8					6
Permitted Phases						
Actuated Green, G (s)	11.7					38.5
Effective Green, g (s)	11.7					38.5
Actuated g/C Ratio	0.19					0.64
Clearance Time (s)	4.5					5.3
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	704					2390
v/s Ratio Prot	c0.11					c0.35
v/s Ratio Perm						
v/c Ratio	0.56					0.54
Uniform Delay, d1	21.8					5.9
Progression Factor	0.83					0.34
Incremental Delay, d2	0.8					0.8
Delay (s)	18.8					2.8
Level of Service	B					A
Approach Delay (s/veh)	18.8		0.0			2.8
Approach LOS	B		A			A

Intersection Summary			
HCM 2000 Control Delay (s/veh)	6.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	9.8
Intersection Capacity Utilization	54.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	312	0	0	602	0	0
Future Volume (vph)	312	0	0	602	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)	4.5			5.3		
Lane Util. Factor	0.97			0.95		
Frt	1.00			1.00		
Flt Protected	0.95			1.00		
Satd. Flow (prot)	3614			3725		
Flt Permitted	0.95			1.00		
Satd. Flow (perm)	3614			3725		
Peak-hour factor, PHF	0.82	0.82	0.92	0.92	0.92	0.92
Adj. Flow (vph)	380	0	0	654	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	380	0	0	654	0	0
Turn Type	Prot			NA		
Protected Phases	4			2		
Permitted Phases						
Actuated Green, G (s)	11.6			38.6		
Effective Green, g (s)	11.6			38.6		
Actuated g/C Ratio	0.19			0.64		
Clearance Time (s)	4.5			5.3		
Vehicle Extension (s)	3.0			3.0		
Lane Grp Cap (vph)	698			2396		
v/s Ratio Prot	c0.11			c0.18		
v/s Ratio Perm						
v/c Ratio	0.54			0.27		
Uniform Delay, d1	21.8			4.6		
Progression Factor	1.06			1.00		
Incremental Delay, d2	0.8			0.3		
Delay (s)	24.0			4.9		
Level of Service	C			A		
Approach Delay (s/veh)	24.0			4.9	0.0	
Approach LOS	C			A	A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	11.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	9.8
Intersection Capacity Utilization	52.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	0	188	0	0	1016	117
Future Volume (vph)	0	188	0	0	1016	117
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.7			5.6	5.6
Lane Util. Factor		1.00			0.95	1.00
Frt		0.87			1.00	0.85
Flt Protected		1.00			1.00	1.00
Satd. Flow (prot)		1696			3725	1667
Flt Permitted		1.00			1.00	1.00
Satd. Flow (perm)		1696			3725	1667
Peak-hour factor, PHF	0.84	0.84	0.92	0.92	0.86	0.86
Adj. Flow (vph)	0	224	0	0	1181	136
RTOR Reduction (vph)	0	68	0	0	0	49
Lane Group Flow (vph)	0	156	0	0	1181	87
Turn Type		Prot			NA	Perm
Protected Phases		4			6	
Permitted Phases						6
Actuated Green, G (s)		10.1			38.6	38.6
Effective Green, g (s)		10.1			38.6	38.6
Actuated g/C Ratio		0.17			0.64	0.64
Clearance Time (s)		5.7			5.6	5.6
Vehicle Extension (s)		3.0			3.0	3.0
Lane Grp Cap (vph)		285			2396	1072
v/s Ratio Prot		c0.09			c0.32	
v/s Ratio Perm						0.05
v/c Ratio		0.55			0.49	0.08
Uniform Delay, d1		22.9			5.6	4.0
Progression Factor		1.00			1.01	1.17
Incremental Delay, d2		2.1			0.7	0.1
Delay (s)		25.0			6.3	4.8
Level of Service		C			A	A
Approach Delay (s/veh)	25.0			0.0	6.2	
Approach LOS	C			A	A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	8.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	11.3
Intersection Capacity Utilization	47.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	0	30	904	21	0	0
Future Volume (vph)	0	30	904	21	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.6	5.5			
Lane Util. Factor		1.00	0.95			
Frt		0.87	1.00			
Flt Protected		1.00	1.00			
Satd. Flow (prot)		1696	3713			
Flt Permitted		1.00	1.00			
Satd. Flow (perm)		1696	3713			
Peak-hour factor, PHF	0.60	0.60	0.89	0.89	0.92	0.92
Adj. Flow (vph)	0	50	1016	24	0	0
RTOR Reduction (vph)	0	47	1	0	0	0
Lane Group Flow (vph)	0	3	1039	0	0	0
Turn Type		Prot	NA			
Protected Phases		8	2			
Permitted Phases						
Actuated Green, G (s)		4.2	64.7			
Effective Green, g (s)		4.2	64.7			
Actuated g/C Ratio		0.05	0.81			
Clearance Time (s)		5.6	5.5			
Vehicle Extension (s)		3.0	3.0			
Lane Grp Cap (vph)		89	3002			
v/s Ratio Prot		c0.00	c0.28			
v/s Ratio Perm						
v/c Ratio		0.03	0.35			
Uniform Delay, d1		36.0	2.0			
Progression Factor		1.00	1.41			
Incremental Delay, d2		0.1	0.3			
Delay (s)		36.1	3.2			
Level of Service		D	A			
Approach Delay (s/veh)	36.1		3.2			0.0
Approach LOS	D		A			A

Intersection Summary			
HCM 2000 Control Delay (s/veh)	4.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.33		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	11.1
Intersection Capacity Utilization	39.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	216	164	0	648	0	0	0	0
Future Volume (vph)	0	0	0	0	216	164	0	648	0	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					10.1	10.1		5.8				
Lane Util. Factor					0.95	1.00		0.95				
Frt					1.00	0.85		1.00				
Flt Protected					1.00	1.00		1.00				
Satd. Flow (prot)					3762	1683		3762				
Flt Permitted					1.00	1.00		1.00				
Satd. Flow (perm)					3762	1683		3762				
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	235	178	0	704	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	129	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	235	49	0	704	0	0	0	0
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	1%	1%	1%	2%	2%	2%
Turn Type					NA	Perm		NA				
Protected Phases					2			8				
Permitted Phases						2						
Actuated Green, G (s)					21.9	21.9		42.2				
Effective Green, g (s)					21.9	21.9		42.2				
Actuated g/C Ratio					0.27	0.27		0.53				
Clearance Time (s)					10.1	10.1		5.8				
Vehicle Extension (s)					3.0	3.0		3.0				
Lane Grp Cap (vph)					1029	460		1984				
v/s Ratio Prot					c0.06			c0.19				
v/s Ratio Perm						0.03						
v/c Ratio					0.23	0.11		0.35				
Uniform Delay, d1					22.5	21.7		11.0				
Progression Factor					0.92	1.07		0.00				
Incremental Delay, d2					0.5	0.5		0.5				
Delay (s)					21.2	23.8		0.5				
Level of Service					C	C		A				
Approach Delay (s/veh)		0.0			22.3			0.5			0.0	
Approach LOS		A			C			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	8.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.33		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	42.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	272	0	0	0	0	0	648	180	0	0	0
Future Volume (vph)	0	272	0	0	0	0	0	648	180	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.1						9.8	9.8			
Lane Util. Factor		0.95						0.95	1.00			
Frpb, ped/bikes		1.00						1.00	0.99			
Flpb, ped/bikes		1.00						1.00	1.00			
Frt		1.00						1.00	0.85			
Flt Protected		1.00						1.00	1.00			
Satd. Flow (prot)		3762						3762	1661			
Flt Permitted		1.00						1.00	1.00			
Satd. Flow (perm)		3762						3762	1661			
Peak-hour factor, PHF	0.81	0.81	0.81	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	336	0	0	0	0	0	704	196	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	102	0	0	0
Lane Group Flow (vph)	0	336	0	0	0	0	0	704	94	0	0	0
Confl. Peds. (#/hr)									1			
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	1%	1%	1%	2%	2%	2%
Turn Type		NA						NA	Perm			
Protected Phases		6						4				
Permitted Phases									4			
Actuated Green, G (s)		25.9						38.2	38.2			
Effective Green, g (s)		25.9						38.2	38.2			
Actuated g/C Ratio		0.32						0.48	0.48			
Clearance Time (s)		6.1						9.8	9.8			
Vehicle Extension (s)		3.0						3.0	3.0			
Lane Grp Cap (vph)		1217						1796	793			
v/s Ratio Prot		c0.09						c0.19				
v/s Ratio Perm									0.06			
v/c Ratio		0.28						0.39	0.12			
Uniform Delay, d1		20.1						13.4	11.6			
Progression Factor		0.00						1.00	1.00			
Incremental Delay, d2		0.5						0.6	0.3			
Delay (s)		0.6						14.1	11.9			
Level of Service		A						B	B			
Approach Delay (s/veh)		0.6			0.0			13.6			0.0	
Approach LOS		A			A			B			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	10.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	39.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	272	402	0	0	0	0	0	0	0	781	0
Future Volume (vph)	0	272	402	0	0	0	0	0	0	0	781	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		10.1	10.1								5.8	
Lane Util. Factor		0.95	1.00								0.95	
Frt		1.00	0.85								1.00	
Flt Protected		1.00	1.00								1.00	
Satd. Flow (prot)		3762	1683								3800	
Flt Permitted		1.00	1.00								1.00	
Satd. Flow (perm)		3762	1683								3800	
Peak-hour factor, PHF	0.81	0.81	0.81	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	336	496	0	0	0	0	0	0	0	849	0
RTOR Reduction (vph)	0	0	94	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	336	402	0	0	0	0	0	0	0	849	0
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	2%	2%	2%	0%	0%	0%
Turn Type		NA	Perm								NA	
Protected Phases		2									8	
Permitted Phases			2									
Actuated Green, G (s)		21.9	21.9								42.2	
Effective Green, g (s)		21.9	21.9								42.2	
Actuated g/C Ratio		0.27	0.27								0.53	
Clearance Time (s)		10.1	10.1								5.8	
Vehicle Extension (s)		3.0	3.0								3.0	
Lane Grp Cap (vph)		1029	460								2004	
v/s Ratio Prot		0.09									c0.22	
v/s Ratio Perm			c0.24									
v/c Ratio		0.33	0.87								0.42	
Uniform Delay, d1		23.2	27.7								11.5	
Progression Factor		1.00	1.00								0.00	
Incremental Delay, d2		0.8	19.9								0.6	
Delay (s)		24.0	47.7								0.6	
Level of Service		C	D								A	
Approach Delay (s/veh)		38.1			0.0			0.0			0.6	
Approach LOS		D			A			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	19.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	57.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	216	0	0	0	0	0	781	132
Future Volume (vph)	0	0	0	0	216	0	0	0	0	0	781	132
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					6.1						9.8	9.8
Lane Util. Factor					0.95						0.95	1.00
Frt					1.00						1.00	0.85
Flt Protected					1.00						1.00	1.00
Satd. Flow (prot)					3762						3800	1700
Flt Permitted					1.00						1.00	1.00
Satd. Flow (perm)					3762						3800	1700
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	235	0	0	0	0	0	849	143
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	75
Lane Group Flow (vph)	0	0	0	0	235	0	0	0	0	0	849	68
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	2%	2%	2%	0%	0%	0%
Turn Type					NA						NA	Perm
Protected Phases					6						4	
Permitted Phases												4
Actuated Green, G (s)					25.9						38.2	38.2
Effective Green, g (s)					25.9						38.2	38.2
Actuated g/C Ratio					0.32						0.48	0.48
Clearance Time (s)					6.1						9.8	9.8
Vehicle Extension (s)					3.0						3.0	3.0
Lane Grp Cap (vph)					1217						1814	811
v/s Ratio Prot					c0.06						c0.22	
v/s Ratio Perm												0.04
v/c Ratio					0.19						0.47	0.08
Uniform Delay, d1					19.5						14.1	11.4
Progression Factor					0.00						1.00	1.00
Incremental Delay, d2					0.3						0.9	0.2
Delay (s)					0.4						14.9	11.6
Level of Service					A						B	B
Approach Delay (s/veh)		0.0			0.4			0.0			14.4	
Approach LOS		A			A			A			B	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	11.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	42.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	0	113	0	0	831	110
Future Volume (vph)	0	113	0	0	831	110
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.6			5.8	5.8
Lane Util. Factor		1.00			0.95	1.00
Frt		0.87			1.00	0.85
Flt Protected		1.00			1.00	1.00
Satd. Flow (prot)		1696			3725	1667
Flt Permitted		1.00			1.00	1.00
Satd. Flow (perm)		1696			3725	1667
Peak-hour factor, PHF	0.83	0.83	0.92	0.92	0.91	0.91
Adj. Flow (vph)	0	136	0	0	913	121
RTOR Reduction (vph)	0	123	0	0	0	29
Lane Group Flow (vph)	0	13	0	0	913	92
Turn Type		Prot			NA	Perm
Protected Phases		4			6	
Permitted Phases						6
Actuated Green, G (s)		7.7			60.9	60.9
Effective Green, g (s)		7.7			60.9	60.9
Actuated g/C Ratio		0.10			0.76	0.76
Clearance Time (s)		5.6			5.8	5.8
Vehicle Extension (s)		3.0			3.0	3.0
Lane Grp Cap (vph)		163			2835	1269
v/s Ratio Prot		c0.01			c0.25	
v/s Ratio Perm						0.06
v/c Ratio		0.08			0.32	0.07
Uniform Delay, d1		32.9			3.0	2.4
Progression Factor		1.00			0.35	0.00
Incremental Delay, d2		0.2			0.3	0.1
Delay (s)		33.1			1.4	0.1
Level of Service		C			A	A
Approach Delay (s/veh)	33.1			0.0	1.2	
Approach LOS	C			A	A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	4.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.29		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	11.4
Intersection Capacity Utilization	38.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	0	503	540	507	0	0
Future Volume (vph)	0	503	540	507	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.6	5.9	5.9		
Lane Util. Factor		0.88	0.95	1.00		
Frt		0.85	1.00	0.85		
Flt Protected		1.00	1.00	1.00		
Satd. Flow (prot)		2933	3725	1667		
Flt Permitted		1.00	1.00	1.00		
Satd. Flow (perm)		2933	3725	1667		
Peak-hour factor, PHF	0.94	0.94	0.86	0.86	0.92	0.92
Adj. Flow (vph)	0	535	628	590	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	535	628	590	0	0
Turn Type		Prot	NA	Perm		
Protected Phases		8	2			
Permitted Phases				2		
Actuated Green, G (s)		19.1	49.4	49.4		
Effective Green, g (s)		19.1	49.4	49.4		
Actuated g/C Ratio		0.24	0.62	0.62		
Clearance Time (s)		5.6	5.9	5.9		
Vehicle Extension (s)		3.0	3.0	3.0		
Lane Grp Cap (vph)		700	2300	1029		
v/s Ratio Prot		c0.18	0.17			
v/s Ratio Perm				c0.35		
v/c Ratio		0.76	0.27	0.57		
Uniform Delay, d1		28.4	7.0	9.1		
Progression Factor		0.92	1.34	1.40		
Incremental Delay, d2		4.8	0.3	2.2		
Delay (s)		30.9	9.7	14.9		
Level of Service		C	A	B		
Approach Delay (s/veh)	30.9		12.2			0.0
Approach LOS	C		B			A

Intersection Summary			
HCM 2000 Control Delay (s/veh)	17.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	11.5
Intersection Capacity Utilization	40.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	1028	251	0	0	0	0	608	212	0	538	0
Future Volume (vph)	0	1028	251	0	0	0	0	608	212	0	538	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.0	6.0					8.7	8.7		5.7	
Lane Util. Factor		0.95	1.00					0.95	1.00		0.95	
Frpb, ped/bikes		1.00	0.99					1.00	1.00		1.00	
Flpb, ped/bikes		1.00	1.00					1.00	1.00		1.00	
Frt		1.00	0.85					1.00	0.85		1.00	
Flt Protected		1.00	1.00					1.00	1.00		1.00	
Satd. Flow (prot)		3800	1678					3800	1700		3762	
Flt Permitted		1.00	1.00					1.00	1.00		1.00	
Satd. Flow (perm)		3800	1678					3800	1700		3762	
Peak-hour factor, PHF	0.93	0.93	0.93	0.92	0.92	0.92	0.89	0.89	0.89	0.93	0.93	0.93
Adj. Flow (vph)	0	1105	270	0	0	0	0	683	238	0	578	0
RTOR Reduction (vph)	0	0	98	0	0	0	0	0	27	0	0	0
Lane Group Flow (vph)	0	1105	172	0	0	0	0	683	211	0	578	0
Confl. Peds. (#/hr)			1									
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	1%	1%
Turn Type		NA	Perm					NA	Perm		NA	
Protected Phases		2						4			8	
Permitted Phases			2						4			
Actuated Green, G (s)		37.9	37.9					27.4	27.4		30.4	
Effective Green, g (s)		37.9	37.9					27.4	27.4		30.4	
Actuated g/C Ratio		0.47	0.47					0.34	0.34		0.38	
Clearance Time (s)		6.0	6.0					8.7	8.7		5.7	
Vehicle Extension (s)		3.0	3.0					4.0	4.0		4.0	
Lane Grp Cap (vph)		1800	794					1301	582		1429	
v/s Ratio Prot		c0.29						c0.18			0.15	
v/s Ratio Perm			0.10						0.12			
v/c Ratio		0.61	0.22					0.52	0.36		0.40	
Uniform Delay, d1		15.6	12.3					21.1	19.7		18.2	
Progression Factor		1.03	1.20					1.49	1.65		0.00	
Incremental Delay, d2		1.5	0.6					0.5	0.5		0.2	
Delay (s)		17.5	15.4					31.9	33.0		0.2	
Level of Service		B	B					C	C		A	
Approach Delay (s/veh)		17.1			0.0			32.2			0.2	
Approach LOS		B			A			C			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	18.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	14.7
Intersection Capacity Utilization	55.2%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	1278	196	0	608	0	0	538	179
Future Volume (vph)	0	0	0	0	1278	196	0	608	0	0	538	179
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	12	12	12	12	12	12	16	12	12	12	12
Total Lost time (s)					6.0			5.7			8.7	8.7
Lane Util. Factor					0.91			0.95			0.95	1.00
Frpb, ped/bikes					1.00			1.00			1.00	0.98
Flpb, ped/bikes					1.00			1.00			1.00	1.00
Frt					0.98			1.00			1.00	0.85
Flt Protected					1.00			1.00			1.00	1.00
Satd. Flow (prot)					5342			4307			3762	1652
Flt Permitted					1.00			1.00			1.00	1.00
Satd. Flow (perm)					5342			4307			3762	1652
Peak-hour factor, PHF	0.92	0.92	0.92	0.91	0.91	0.91	0.89	0.89	0.89	0.93	0.93	0.93
Adj. Flow (vph)	0	0	0	0	1404	215	0	683	0	0	578	192
RTOR Reduction (vph)	0	0	0	0	24	0	0	0	0	0	0	27
Lane Group Flow (vph)	0	0	0	0	1595	0	0	683	0	0	578	165
Confl. Peds. (#/hr)						1						4
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	1%	1%
Turn Type					NA			NA			NA	Perm
Protected Phases					2			8			4	
Permitted Phases												4
Actuated Green, G (s)					37.9			30.4			27.4	27.4
Effective Green, g (s)					37.9			30.4			27.4	27.4
Actuated g/C Ratio					0.47			0.38			0.34	0.34
Clearance Time (s)					6.0			5.7			8.7	8.7
Vehicle Extension (s)					3.0			4.0			4.0	4.0
Lane Grp Cap (vph)					2530			1636			1288	565
v/s Ratio Prot					c0.30			c0.16			0.15	
v/s Ratio Perm												0.10
v/c Ratio					0.63			0.42			0.45	0.29
Uniform Delay, d1					15.8			18.3			20.4	19.2
Progression Factor					0.99			0.00			1.01	1.05
Incremental Delay, d2					1.1			0.2			0.3	0.4
Delay (s)					16.6			0.2			21.0	20.5
Level of Service					B			A			C	C
Approach Delay (s/veh)		0.0			16.6			0.2			20.9	
Approach LOS		A			B			A			C	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	14.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	14.7
Intersection Capacity Utilization	55.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	171	0	0	0	0	913
Future Volume (vph)	171	0	0	0	0	913
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)	4.5					5.3
Lane Util. Factor	0.97					0.95
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	3614					3725
Flt Permitted	0.95					1.00
Satd. Flow (perm)	3614					3725
Peak-hour factor, PHF	0.94	0.94	0.92	0.92	0.91	0.91
Adj. Flow (vph)	182	0	0	0	0	1003
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	182	0	0	0	0	1003
Turn Type	Prot					NA
Protected Phases	8					6
Permitted Phases						
Actuated Green, G (s)	9.4					60.8
Effective Green, g (s)	9.4					60.8
Actuated g/C Ratio	0.12					0.76
Clearance Time (s)	4.5					5.3
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	424					2831
v/s Ratio Prot	c0.05					c0.27
v/s Ratio Perm						
v/c Ratio	0.43					0.35
Uniform Delay, d1	32.8					3.2
Progression Factor	0.96					0.53
Incremental Delay, d2	0.6					0.3
Delay (s)	32.1					2.0
Level of Service	C					A
Approach Delay (s/veh)	32.1		0.0			2.0
Approach LOS	C		A			A

Intersection Summary			
HCM 2000 Control Delay (s/veh)	6.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	9.8
Intersection Capacity Utilization	54.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	324	0	0	723	0	0
Future Volume (vph)	324	0	0	723	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)	4.5			5.3		
Lane Util. Factor	0.97			0.95		
Frt	1.00			1.00		
Flt Protected	0.95			1.00		
Satd. Flow (prot)	3614			3725		
Flt Permitted	0.95			1.00		
Satd. Flow (perm)	3614			3725		
Peak-hour factor, PHF	0.94	0.94	0.86	0.86	0.92	0.92
Adj. Flow (vph)	345	0	0	841	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	345	0	0	841	0	0
Turn Type	Prot			NA		
Protected Phases	4			2		
Permitted Phases						
Actuated Green, G (s)	12.9			57.3		
Effective Green, g (s)	12.9			57.3		
Actuated g/C Ratio	0.16			0.72		
Clearance Time (s)	4.5			5.3		
Vehicle Extension (s)	3.0			3.0		
Lane Grp Cap (vph)	582			2668		
v/s Ratio Prot	c0.10			c0.23		
v/s Ratio Perm						
v/c Ratio	0.59			0.32		
Uniform Delay, d1	31.1			4.2		
Progression Factor	0.73			1.00		
Incremental Delay, d2	1.6			0.3		
Delay (s)	24.2			4.5		
Level of Service	C			A		
Approach Delay (s/veh)	24.2			4.5	0.0	
Approach LOS	C			A	A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	10.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	9.8
Intersection Capacity Utilization	46.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	0	97	0	0	714	87
Future Volume (vph)	0	97	0	0	714	87
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.7			5.6	5.6
Lane Util. Factor		1.00			0.95	1.00
Frt		0.87			1.00	0.85
Flt Protected		1.00			1.00	1.00
Satd. Flow (prot)		1696			3725	1667
Flt Permitted		1.00			1.00	1.00
Satd. Flow (perm)		1696			3725	1667
Peak-hour factor, PHF	0.72	0.72	0.92	0.92	0.87	0.87
Adj. Flow (vph)	0	135	0	0	821	100
RTOR Reduction (vph)	0	123	0	0	0	23
Lane Group Flow (vph)	0	12	0	0	821	77
Turn Type		Prot			NA	Perm
Protected Phases		4			6	
Permitted Phases						6
Actuated Green, G (s)		7.1			61.6	61.6
Effective Green, g (s)		7.1			61.6	61.6
Actuated g/C Ratio		0.09			0.77	0.77
Clearance Time (s)		5.7			5.6	5.6
Vehicle Extension (s)		3.0			3.0	3.0
Lane Grp Cap (vph)		150			2868	1283
v/s Ratio Prot		c0.01			c0.22	
v/s Ratio Perm						0.05
v/c Ratio		0.08			0.29	0.06
Uniform Delay, d1		33.5			2.7	2.2
Progression Factor		1.00			1.20	1.71
Incremental Delay, d2		0.2			0.2	0.1
Delay (s)		33.7			3.5	3.9
Level of Service		C			A	A
Approach Delay (s/veh)	33.7			0.0	3.5	
Approach LOS	C			A	A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	7.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.26		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	11.3
Intersection Capacity Utilization	34.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	0	35	1234	38	0	0
Future Volume (vph)	0	35	1234	38	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.6	5.5			
Lane Util. Factor		1.00	0.95			
Frt		0.87	1.00			
Flt Protected		1.00	1.00			
Satd. Flow (prot)		1696	3709			
Flt Permitted		1.00	1.00			
Satd. Flow (perm)		1696	3709			
Peak-hour factor, PHF	0.83	0.83	0.94	0.94	0.92	0.92
Adj. Flow (vph)	0	42	1313	40	0	0
RTOR Reduction (vph)	0	40	2	0	0	0
Lane Group Flow (vph)	0	2	1351	0	0	0
Turn Type		Prot	NA			
Protected Phases		8	2			
Permitted Phases		8				
Actuated Green, G (s)		2.8	46.1			
Effective Green, g (s)		2.8	46.1			
Actuated g/C Ratio		0.05	0.77			
Clearance Time (s)		5.6	5.5			
Vehicle Extension (s)		3.0	3.0			
Lane Grp Cap (vph)		79	2849			
v/s Ratio Prot		c0.00	c0.36			
v/s Ratio Perm						
v/c Ratio		0.02	0.47			
Uniform Delay, d1		27.3	2.5			
Progression Factor		1.00	0.84			
Incremental Delay, d2		0.1	0.5			
Delay (s)		27.4	2.6			
Level of Service		C	A			
Approach Delay (s/veh)	27.4		2.6			0.0
Approach LOS	C		A			A

Intersection Summary			
HCM 2000 Control Delay (s/veh)	3.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	11.1
Intersection Capacity Utilization	48.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	174	247	0	920	0	0	0	0
Future Volume (vph)	0	0	0	0	174	247	0	920	0	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					10.1	10.1		5.8				
Lane Util. Factor					0.95	1.00		0.95				
Frt					1.00	0.85		1.00				
Flt Protected					1.00	1.00		1.00				
Satd. Flow (prot)					3800	1700		3800				
Flt Permitted					1.00	1.00		1.00				
Satd. Flow (perm)					3800	1700		3800				
Peak-hour factor, PHF	0.92	0.92	0.92	0.85	0.85	0.85	0.95	0.95	0.95	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	0	205	291	0	968	0	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	79	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	205	212	0	968	0	0	0	0
Heavy Vehicles (%)	2%	2%	2%	0%	0%	0%	0%	0%	0%	2%	2%	2%
Turn Type					NA	Perm		NA				
Protected Phases					2			8				
Permitted Phases						2						
Actuated Green, G (s)					21.9	21.9		22.2				
Effective Green, g (s)					21.9	21.9		22.2				
Actuated g/C Ratio					0.37	0.37		0.37				
Clearance Time (s)					10.1	10.1		5.8				
Vehicle Extension (s)					3.0	3.0		3.0				
Lane Grp Cap (vph)					1387	620		1406				
v/s Ratio Prot					0.05			c0.25				
v/s Ratio Perm						c0.12						
v/c Ratio					0.15	0.34		0.69				
Uniform Delay, d1					12.8	13.8		16.0				
Progression Factor					1.19	1.46		0.02				
Incremental Delay, d2					0.2	1.5		1.4				
Delay (s)					15.5	21.7		1.7				
Level of Service					B	C		A				
Approach Delay (s/veh)		0.0			19.1			1.7			0.0	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	7.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	51.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	505	0	0	0	0	0	920	200	0	0	0
Future Volume (vph)	0	505	0	0	0	0	0	920	200	0	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.1						9.8	9.8			
Lane Util. Factor		0.95						0.95	1.00			
Frpb, ped/bikes		1.00						1.00	0.99			
Flpb, ped/bikes		1.00						1.00	1.00			
Frt		1.00						1.00	0.85			
Flt Protected		1.00						1.00	1.00			
Satd. Flow (prot)		3800						3800	1678			
Flt Permitted		1.00						1.00	1.00			
Satd. Flow (perm)		3800						3800	1678			
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.95	0.95	0.95	0.92	0.92	0.92
Adj. Flow (vph)	0	561	0	0	0	0	0	968	211	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	139	0	0	0
Lane Group Flow (vph)	0	561	0	0	0	0	0	968	72	0	0	0
Confl. Peds. (#/hr)									1			
Heavy Vehicles (%)	0%	0%	0%	2%	2%	2%	0%	0%	0%	2%	2%	2%
Turn Type		NA						NA	Perm			
Protected Phases		6						4				
Permitted Phases									4			
Actuated Green, G (s)		25.9						18.2	18.2			
Effective Green, g (s)		25.9						18.2	18.2			
Actuated g/C Ratio		0.43						0.30	0.30			
Clearance Time (s)		6.1						9.8	9.8			
Vehicle Extension (s)		3.0						3.0	3.0			
Lane Grp Cap (vph)		1640						1152	508			
v/s Ratio Prot		c0.15						c0.25				
v/s Ratio Perm									0.04			
v/c Ratio		0.34						0.84	0.14			
Uniform Delay, d1		11.4						19.5	15.2			
Progression Factor		0.00						1.00	1.00			
Incremental Delay, d2		0.5						7.4	0.6			
Delay (s)		0.5						27.0	15.8			
Level of Service		A						C	B			
Approach Delay (s/veh)		0.5			0.0			25.0			0.0	
Approach LOS		A			A			C			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	17.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	51.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	505	537	0	0	0	0	0	0	0	730	0
Future Volume (vph)	0	505	537	0	0	0	0	0	0	0	730	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		10.1	10.1								5.8	
Lane Util. Factor		0.95	1.00								0.95	
Frt		1.00	0.85								1.00	
Flt Protected		1.00	1.00								1.00	
Satd. Flow (prot)		3800	1700								3800	
Flt Permitted		1.00	1.00								1.00	
Satd. Flow (perm)		3800	1700								3800	
Peak-hour factor, PHF	0.90	0.90	0.90	0.92	0.92	0.92	0.92	0.92	0.92	0.95	0.95	0.95
Adj. Flow (vph)	0	561	597	0	0	0	0	0	0	0	768	0
RTOR Reduction (vph)	0	0	79	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	561	518	0	0	0	0	0	0	0	768	0
Heavy Vehicles (%)	0%	0%	0%	2%	2%	2%	2%	2%	2%	0%	0%	0%
Turn Type		NA	Perm								NA	
Protected Phases		2									8	
Permitted Phases			2									
Actuated Green, G (s)		21.9	21.9								22.2	
Effective Green, g (s)		21.9	21.9								22.2	
Actuated g/C Ratio		0.37	0.37								0.37	
Clearance Time (s)		10.1	10.1								5.8	
Vehicle Extension (s)		3.0	3.0								3.0	
Lane Grp Cap (vph)		1387	620								1406	
v/s Ratio Prot		0.15									c0.20	
v/s Ratio Perm			c0.30									
v/c Ratio		0.40	0.84								0.55	
Uniform Delay, d1		14.2	17.4								14.9	
Progression Factor		1.00	1.00								0.00	
Incremental Delay, d2		0.9	12.6								1.1	
Delay (s)		15.1	30.0								1.1	
Level of Service		B	C								A	
Approach Delay (s/veh)		22.8			0.0			0.0			1.1	
Approach LOS		C			A			A			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	14.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	64.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	174	0	0	0	0	0	730	64
Future Volume (vph)	0	0	0	0	174	0	0	0	0	0	730	64
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)					6.1						9.8	9.8
Lane Util. Factor					0.95						0.95	1.00
Frpb, ped/bikes					1.00						1.00	0.99
Flpb, ped/bikes					1.00						1.00	1.00
Frt					1.00						1.00	0.85
Flt Protected					1.00						1.00	1.00
Satd. Flow (prot)					3800						3800	1678
Flt Permitted					1.00						1.00	1.00
Satd. Flow (perm)					3800						3800	1678
Peak-hour factor, PHF	0.92	0.92	0.92	0.85	0.85	0.85	0.92	0.92	0.92	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	0	205	0	0	0	0	0	768	67
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	47
Lane Group Flow (vph)	0	0	0	0	205	0	0	0	0	0	768	20
Confl. Peds. (#/hr)												1
Heavy Vehicles (%)	2%	2%	2%	0%	0%	0%	2%	2%	2%	0%	0%	0%
Turn Type					NA						NA	Perm
Protected Phases					6						4	
Permitted Phases												4
Actuated Green, G (s)					25.9						18.2	18.2
Effective Green, g (s)					25.9						18.2	18.2
Actuated g/C Ratio					0.43						0.30	0.30
Clearance Time (s)					6.1						9.8	9.8
Vehicle Extension (s)					3.0						3.0	3.0
Lane Grp Cap (vph)					1640						1152	508
v/s Ratio Prot					c0.05						c0.20	
v/s Ratio Perm												0.01
v/c Ratio					0.13						0.67	0.04
Uniform Delay, d1					10.2						18.3	14.7
Progression Factor					0.00						1.00	1.00
Incremental Delay, d2					0.2						3.1	0.1
Delay (s)					0.2						21.3	14.9
Level of Service					A						C	B
Approach Delay (s/veh)		0.0			0.2			0.0			20.8	
Approach LOS		A			A			A			C	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	16.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	19.9
Intersection Capacity Utilization	51.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	0	171	0	0	774	128
Future Volume (vph)	0	171	0	0	774	128
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.6			5.8	5.8
Lane Util. Factor		1.00			0.95	1.00
Frt		0.87			1.00	0.85
Flt Protected		1.00			1.00	1.00
Satd. Flow (prot)		1696			3725	1667
Flt Permitted		1.00			1.00	1.00
Satd. Flow (perm)		1696			3725	1667
Peak-hour factor, PHF	0.82	0.82	0.92	0.92	0.89	0.89
Adj. Flow (vph)	0	209	0	0	870	144
RTOR Reduction (vph)	0	108	0	0	0	50
Lane Group Flow (vph)	0	101	0	0	870	94
Turn Type		Prot			NA	Perm
Protected Phases		4			6	
Permitted Phases						6
Actuated Green, G (s)		9.3			39.3	39.3
Effective Green, g (s)		9.3			39.3	39.3
Actuated g/C Ratio		0.16			0.65	0.65
Clearance Time (s)		5.6			5.8	5.8
Vehicle Extension (s)		3.0			3.0	3.0
Lane Grp Cap (vph)		262			2439	1091
v/s Ratio Prot		c0.06			c0.23	
v/s Ratio Perm						0.06
v/c Ratio		0.38			0.36	0.09
Uniform Delay, d1		22.8			4.7	3.8
Progression Factor		1.00			0.60	0.46
Incremental Delay, d2		0.9			0.4	0.1
Delay (s)		23.7			3.2	1.9
Level of Service		C			A	A
Approach Delay (s/veh)	23.7			0.0	3.0	
Approach LOS	C			A	A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	6.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	11.4
Intersection Capacity Utilization	39.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	0	656	770	652	0	0
Future Volume (vph)	0	656	770	652	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.6	5.9	5.9		
Lane Util. Factor		0.88	0.95	1.00		
Frt		0.85	1.00	0.85		
Flt Protected		1.00	1.00	1.00		
Satd. Flow (prot)		2933	3725	1667		
Flt Permitted		1.00	1.00	1.00		
Satd. Flow (perm)		2933	3725	1667		
Peak-hour factor, PHF	0.94	0.94	0.93	0.93	0.92	0.92
Adj. Flow (vph)	0	698	828	701	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	0	698	828	701	0	0
Turn Type		Prot	NA	Perm		
Protected Phases		8	2			
Permitted Phases				2		
Actuated Green, G (s)		18.8	29.7	29.7		
Effective Green, g (s)		18.8	29.7	29.7		
Actuated g/C Ratio		0.31	0.50	0.50		
Clearance Time (s)		5.6	5.9	5.9		
Vehicle Extension (s)		3.0	3.0	3.0		
Lane Grp Cap (vph)		919	1843	825		
v/s Ratio Prot		c0.24	0.22			
v/s Ratio Perm				c0.42		
v/c Ratio		0.76	0.45	0.85		
Uniform Delay, d1		18.6	9.8	13.2		
Progression Factor		1.40	0.93	0.99		
Incremental Delay, d2		3.5	0.7	9.6		
Delay (s)		29.4	9.9	22.7		
Level of Service		C	A	C		
Approach Delay (s/veh)	29.4		15.8			0.0
Approach LOS	C		B			A

Intersection Summary			
HCM 2000 Control Delay (s/veh)	20.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	11.5
Intersection Capacity Utilization	51.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↱					↑↑	↱		↑↑	
Traffic Volume (vph)	0	1548	225	0	0	0	0	731	322	0	578	0
Future Volume (vph)	0	1548	225	0	0	0	0	731	322	0	578	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Total Lost time (s)		6.0	6.0					8.7	8.7		5.7	
Lane Util. Factor		0.95	1.00					0.95	1.00		0.95	
Frpb, ped/bikes		1.00	0.99					1.00	0.99		1.00	
Flpb, ped/bikes		1.00	1.00					1.00	1.00		1.00	
Frt		1.00	0.85					1.00	0.85		1.00	
Flt Protected		1.00	1.00					1.00	1.00		1.00	
Satd. Flow (prot)		3800	1678					3800	1677		3800	
Flt Permitted		1.00	1.00					1.00	1.00		1.00	
Satd. Flow (perm)		3800	1678					3800	1677		3800	
Peak-hour factor, PHF	0.95	0.95	0.95	0.92	0.92	0.92	0.93	0.93	0.93	0.95	0.95	0.95
Adj. Flow (vph)	0	1629	237	0	0	0	0	786	346	0	608	0
RTOR Reduction (vph)	0	0	54	0	0	0	0	0	40	0	0	0
Lane Group Flow (vph)	0	1629	183	0	0	0	0	786	306	0	608	0
Confl. Peds. (#/hr)			1						1			
Heavy Vehicles (%)	0%	0%	0%	2%	2%	2%	0%	0%	0%	0%	0%	0%
Turn Type		NA	Perm					NA	Perm		NA	
Protected Phases		2						4			8	
Permitted Phases			2						4			
Actuated Green, G (s)		29.0	29.0					16.3	16.3		19.3	
Effective Green, g (s)		29.0	29.0					16.3	16.3		19.3	
Actuated g/C Ratio		0.48	0.48					0.27	0.27		0.32	
Clearance Time (s)		6.0	6.0					8.7	8.7		5.7	
Vehicle Extension (s)		3.0	3.0					4.0	4.0		4.0	
Lane Grp Cap (vph)		1836	811					1032	455		1222	
v/s Ratio Prot		c0.43						c0.21			0.16	
v/s Ratio Perm			0.11						0.18			
v/c Ratio		0.89	0.23					0.76	0.67		0.50	
Uniform Delay, d1		14.0	9.0					20.1	19.5		16.4	
Progression Factor		0.71	0.39					0.96	0.96		0.00	
Incremental Delay, d2		5.4	0.5					3.3	4.0		0.4	
Delay (s)		15.3	4.0					22.7	22.6		0.4	
Level of Service		B	A					C	C		A	
Approach Delay (s/veh)		13.9			0.0			22.6			0.4	
Approach LOS		B			A			C			A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	14.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	14.7
Intersection Capacity Utilization	72.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	0	1303	171	0	731	0	0	578	206
Future Volume (vph)	0	0	0	0	1303	171	0	731	0	0	578	206
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Lane Width	12	12	12	12	12	12	12	16	12	12	12	12
Total Lost time (s)					6.0			5.7			8.7	8.7
Lane Util. Factor					0.91			0.95			0.95	1.00
Frpb, ped/bikes					1.00			1.00			1.00	1.00
Flpb, ped/bikes					1.00			1.00			1.00	1.00
Frt					0.98			1.00			1.00	0.85
Flt Protected					1.00			1.00			1.00	1.00
Satd. Flow (prot)					5357			4307			3800	1700
Flt Permitted					1.00			1.00			1.00	1.00
Satd. Flow (perm)					5357			4307			3800	1700
Peak-hour factor, PHF	0.92	0.92	0.92	0.91	0.91	0.91	0.93	0.93	0.93	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	0	1432	188	0	786	0	0	608	217
RTOR Reduction (vph)	0	0	0	0	21	0	0	0	0	0	0	40
Lane Group Flow (vph)	0	0	0	0	1599	0	0	786	0	0	608	177
Confl. Peds. (#/hr)						2						
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Turn Type					NA			NA			NA	Perm
Protected Phases					2			8			4	
Permitted Phases												4
Actuated Green, G (s)					29.0			19.3			16.3	16.3
Effective Green, g (s)					29.0			19.3			16.3	16.3
Actuated g/C Ratio					0.48			0.32			0.27	0.27
Clearance Time (s)					6.0			5.7			8.7	8.7
Vehicle Extension (s)					3.0			4.0			4.0	4.0
Lane Grp Cap (vph)					2589			1385			1032	461
v/s Ratio Prot					c0.30			c0.18			0.16	
v/s Ratio Perm												0.10
v/c Ratio					0.62			0.57			0.59	0.38
Uniform Delay, d1					11.4			16.9			18.9	17.8
Progression Factor					0.74			0.00			0.79	0.71
Incremental Delay, d2					1.0			0.4			1.0	0.7
Delay (s)					9.4			0.4			15.9	13.2
Level of Service					A			A			B	B
Approach Delay (s/veh)		0.0			9.4			0.4			15.2	
Approach LOS		A			A			A			B	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	8.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	14.7
Intersection Capacity Utilization	72.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	210	0	0	0	0	895
Future Volume (vph)	210	0	0	0	0	895
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)	4.5					5.3
Lane Util. Factor	0.97					0.95
Frt	1.00					1.00
Flt Protected	0.95					1.00
Satd. Flow (prot)	3614					3725
Flt Permitted	0.95					1.00
Satd. Flow (perm)	3614					3725
Peak-hour factor, PHF	0.94	0.94	0.92	0.92	0.95	0.95
Adj. Flow (vph)	223	0	0	0	0	942
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	223	0	0	0	0	942
Turn Type	Prot					NA
Protected Phases	8					6
Permitted Phases						
Actuated Green, G (s)	9.1					41.1
Effective Green, g (s)	9.1					41.1
Actuated g/C Ratio	0.15					0.69
Clearance Time (s)	4.5					5.3
Vehicle Extension (s)	3.0					3.0
Lane Grp Cap (vph)	548					2551
v/s Ratio Prot	c0.06					c0.25
v/s Ratio Perm						
v/c Ratio	0.41					0.37
Uniform Delay, d1	23.0					4.0
Progression Factor	0.73					0.42
Incremental Delay, d2	0.4					0.4
Delay (s)	17.2					2.1
Level of Service	B					A
Approach Delay (s/veh)	17.2		0.0			2.1
Approach LOS	B		A			A

Intersection Summary			
HCM 2000 Control Delay (s/veh)	5.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	9.8
Intersection Capacity Utilization	63.2%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	293	0	0	1129	0	0
Future Volume (vph)	293	0	0	1129	0	0
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)	4.5			5.3		
Lane Util. Factor	0.97			0.95		
Frt	1.00			1.00		
Flt Protected	0.95			1.00		
Satd. Flow (prot)	3614			3725		
Flt Permitted	0.95			1.00		
Satd. Flow (perm)	3614			3725		
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	318	0	0	1227	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	318	0	0	1227	0	0
Turn Type	Prot			NA		
Protected Phases	4			2		
Permitted Phases						
Actuated Green, G (s)	10.3			39.9		
Effective Green, g (s)	10.3			39.9		
Actuated g/C Ratio	0.17			0.66		
Clearance Time (s)	4.5			5.3		
Vehicle Extension (s)	3.0			3.0		
Lane Grp Cap (vph)	620			2477		
v/s Ratio Prot	c0.09			c0.33		
v/s Ratio Perm						
v/c Ratio	0.51			0.50		
Uniform Delay, d1	22.6			5.0		
Progression Factor	0.98			1.00		
Incremental Delay, d2	0.7			0.7		
Delay (s)	22.8			5.7		
Level of Service	C			A		
Approach Delay (s/veh)	22.8			5.7	0.0	
Approach LOS	C			A	A	

Intersection Summary			
HCM 2000 Control Delay (s/veh)	9.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	9.8
Intersection Capacity Utilization	58.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	0	109	0	0	773	117
Future Volume (vph)	0	109	0	0	773	117
Ideal Flow (vphpl)	2000	2000	2000	2000	2000	2000
Total Lost time (s)		5.7			5.6	5.6
Lane Util. Factor		1.00			0.95	1.00
Frpb, ped/bikes		1.00			1.00	1.00
Flpb, ped/bikes		1.00			1.00	1.00
Frt		0.87			1.00	0.85
Flt Protected		1.00			1.00	1.00
Satd. Flow (prot)		1696			3725	1667
Flt Permitted		1.00			1.00	1.00
Satd. Flow (perm)		1696			3725	1667
Peak-hour factor, PHF	0.78	0.78	0.92	0.92	0.95	0.95
Adj. Flow (vph)	0	140	0	0	814	123
RTOR Reduction (vph)	0	126	0	0	0	35
Lane Group Flow (vph)	0	14	0	0	814	88
Confl. Peds. (#/hr)	100					
Turn Type		Prot			NA	Perm
Protected Phases		4			6	
Permitted Phases						6
Actuated Green, G (s)		6.0			42.7	42.7
Effective Green, g (s)		6.0			42.7	42.7
Actuated g/C Ratio		0.10			0.71	0.71
Clearance Time (s)		5.7			5.6	5.6
Vehicle Extension (s)		3.0			3.0	3.0
Lane Grp Cap (vph)		169			2650	1186
v/s Ratio Prot		c0.01			c0.22	
v/s Ratio Perm						0.05
v/c Ratio		0.08			0.31	0.07
Uniform Delay, d1		24.5			3.2	2.6
Progression Factor		1.00			0.82	1.26
Incremental Delay, d2		0.2			0.3	0.1
Delay (s)		24.7			2.9	3.4
Level of Service		C			A	A
Approach Delay (s/veh)	24.7			0.0	3.0	
Approach LOS	C			A	A	

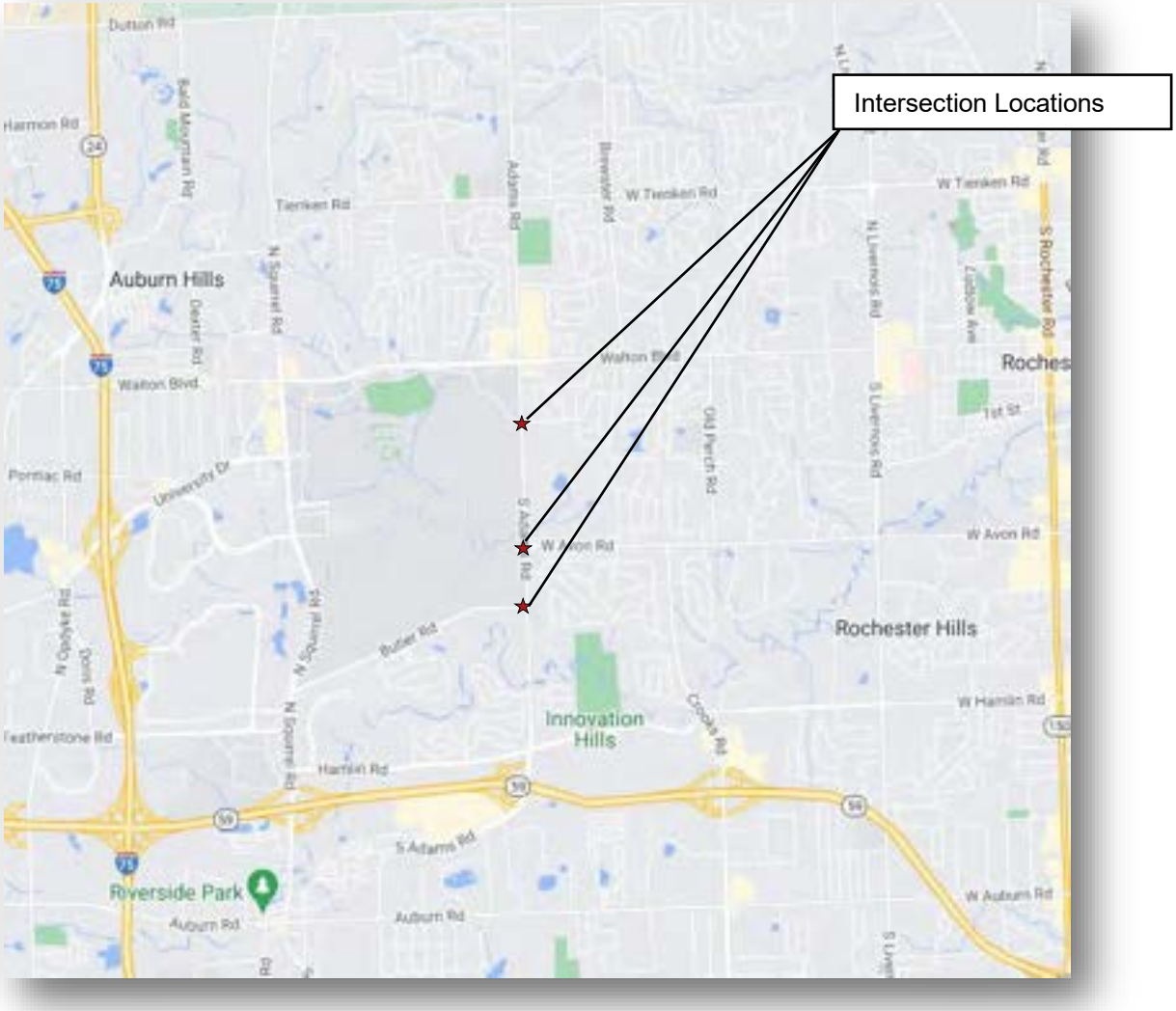
Intersection Summary			
HCM 2000 Control Delay (s/veh)	5.8	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.28		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	11.3
Intersection Capacity Utilization	36.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

APPENDIX G — ROUNDABOUT REPORT

ROUNDABOUT INTERSECTION ANALYSIS & CONCEPT DESIGN

Adams Road Intersections:
BUTLER ROAD,
AVON ROAD &
HILLENDALE DRIVE/ MEADOW BROOK ROAD

Road Commission for Oakland County (RCOC), Michigan



April 30, 2024

Kimley»Horn

Kimley»Horn

April 30, 2024 (REVISED) To:	Lia Michaels, P.E., PTOE., Hubbell, Roth & Clark, Inc.
From:	Mark Lenters, Kimley-Horn and Associates, Inc. Adam Gomez, Kimley-Horn and Associates, Inc. Ali Donnes, E.I.T. Kimley-Horn and Associates, Inc.
Subject:	Adams Road Corridor Roundabout Intersection Analysis and Concept Design Memorandum: 1. Adams Road at Hillendale Drive/ Meadow Brook Road 2. Adams Road at Avon Road, and, 3. Adams Road at Butler Road,

INTRODUCTION

The three above-captioned intersections along the Adams Road Corridor are under review for conversion to roundabouts. The intersection of Adams Road at Butler Road is approximately 1,850 feet (0.35 miles) south of Avon Road, and the intersection of Adams Road at Hillendale Drive/ Meadow Brook Road is located approximately 3,790 feet (0.72 miles) north of Avon Road.

This memo focuses on the operational analysis and feasibility of roundabouts at the proposed locations. The analysis supports and refines the proposed conceptual designs by applying consistent design criteria with expected growth rates, to determine the required capacity for each location. This memo treats the combination of the three roundabouts as a system for consistency of speed, driver expectancy, operational capacity and collision risk.

Kimley-Horn evaluated the feasibility of both single lane and multilane roundabouts at each intersection. The operational analysis results presented in the following sections confirm the need for hybrid multilane roundabouts along the Adams Road corridor. All single lane roundabout analyses generated poor LOS for at least one of the peak hours for the design year forecasts (2045). The residual capacity reported in this memo indicates that one or more of the single lane roundabouts is expected to generated high delays or LOS E during the early years of operation, approximately year 2035.

METHOD AND RESULTS

Turning movement counts were collected by HRC on November 15 -17, 2022 for AM, Midday, and PM peak hours and provided to Kimley-Horn for use in this analysis. The peak hour turning movement counts are shown in Figure 1, Figure 2, and Figure 3. 2022 volumes were projected using a compound growth rate of 0.5% to the build year 2025, interim 2035 and the design year 2045 to assess future conditions of each roundabout. The interim year projections were used in single lane analyses, and the design year projections were used in the single lane and hybrid multilane analyses.

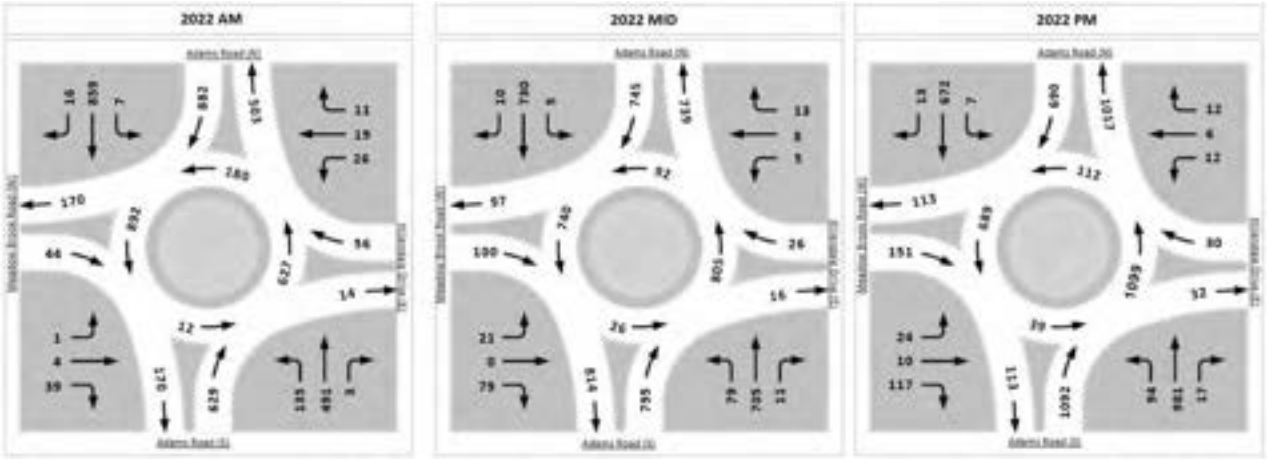


Figure 1: Adams Road at Meadow Brook Road/ Hillendale Road – 2022 Turning Movement Patterns

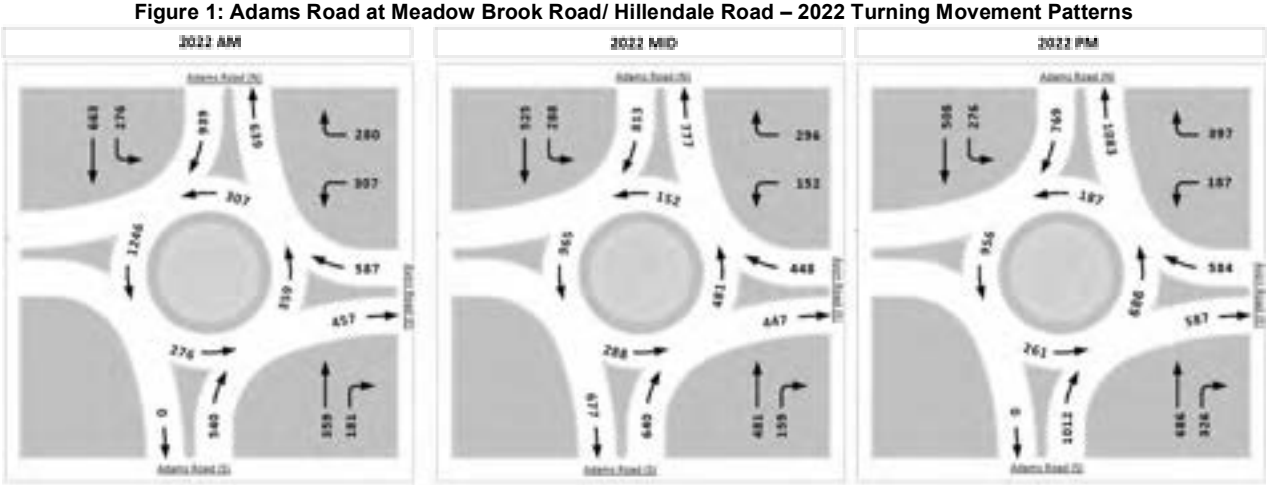


Figure 2: Adams Road at Avon Road – 2022 Turning Movement Patterns

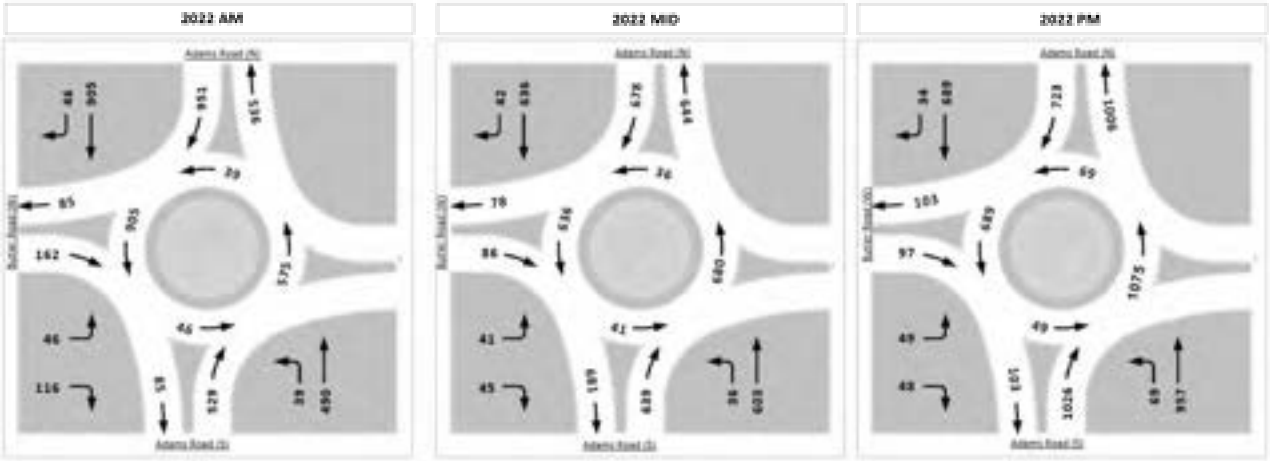


Figure 3: Adams Road at Butler Road – 2022 Turning Movement Patterns

Each of the roundabouts presented in this report were modeled using ARCADY10 (Assessment of Roundabout Capacity and Delay, Version 10) and HCM 6th Edition (*Highway Capacity Manual*) methodologies. ARCADY10 is a program based on U.K. empirical research into geometry-capacity relationships, adapted to U.S. conditions and drivers. The geometric parameters considered in the ARCADY capacity models are summarized in Table 1. HCM 6th Edition analysis results and ARCADY10 results often differ based on their various analysis parameters and model assumptions, but the true expected result is likely with the range of results.

Table 1: ARCADY Analysis Geometric Parameters

Parameter	Single-Lane Geometry	Multilane Geometry
Road Half-Width, ft	12	24
Entry Width, ft	14	24
Effective Flare Length, ft	50	0
Entry Radius, ft	65	65
Inscribed Circle Diameter (ICD), ft	120	150
Phi/ Entry Angle. deg	20	20

SINGLE LANE ROUNDABOUTS

Single lane roundabout analyses were conducted using ARCADY and HCM 6 methodologies for the interim year 2035 and design year 2045. Interim year analyses explore the feasibility of an expandable single lane roundabout where a multilane may not be required until year 2035 or later. Each lane configuration diagram represents the conceptual configurations used in each analysis and does not reflect a refined geometric design.

Adams Road at Meadow Brook Road and Hillendale Road

A single lane roundabout at Adams Road at Meadow Brook Road and Hillendale Road would be a simple, four-legged roundabout with no right-turn bypass lanes. Figure 4 below provides a conceptual lane configuration diagram of the single lane roundabout at Adams Road at Meadow Brook Road and Hillendale Road. The following tables present the results of the ARCADY and HCM 6 single lane roundabout analyses for the interim year 2035 and the design year 2045.

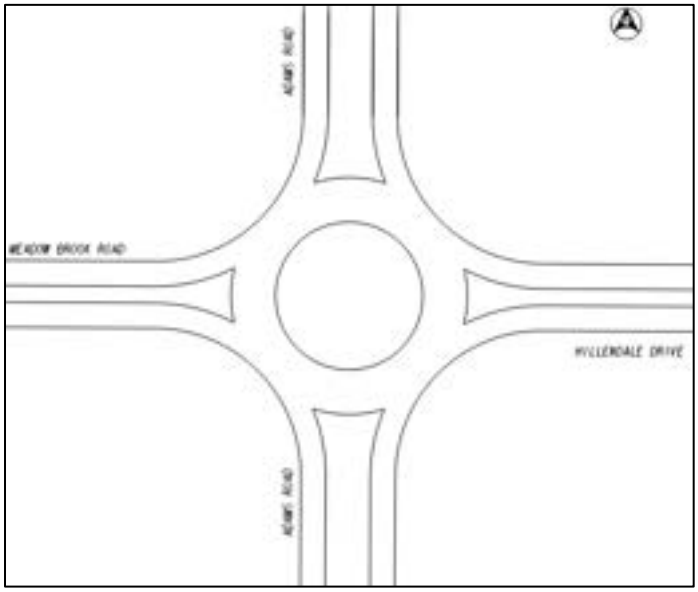


Figure 4: Single Lane Roundabout at Adams Road and Meadow Brook Road/ Hillendale Road (Not to Scale)

Table 2: Adams Road at Hillendale Road & Meadow Brook Road 2035 Single Lane ARCADY Roundabout Analysis

Adams Road at Hillendale Road and Meadow Brook Road 2035 Single Lane ARCADY Roundabout Analysis					
		East Leg Hillendale Road	North Leg Adams Road	West Leg Meadow Brook Road	South Leg Adams Road
AM PEAK	Queue (PCE)	0.5	28.2	0.5	1.7
	Delay (s)	4.33	18.6	5.35	6.33
	V/C Ratio	0.07	0.85	0.07	0.55
	LOS	A	C	A	A
	Intersection Delay (s)	12.96			
	Intersection LOS	B			
	Residual Capacity	11% - [North Leg Adams Road]			
MID PEAK	Queue (PCE)	0.5	5	0.5	6.4
	Delay (s)	4.81	9.32	5.18	9.52
	V/C Ratio	0.04	0.69	0.14	0.71
	LOS	A	A	A	A
	Intersection Delay (s)	9.1			
	Intersection LOS	A			
	Residual Capacity	35% - [South Leg Adams Road]			
PM PEAK	Queue (PCE)	0.5	2.7	1.1	86.1
	Delay (s)	6.59	8.46	5.36	64.18
	V/C Ratio	0.06	0.65	0.21	0.99
	LOS	A	A	A	F
	Intersection Delay (s)	39.21			
	Intersection LOS	E			
	Residual Capacity	-6% - [South Leg Adams Road]			

Table 3: Adams Road at Hillendale Road & Meadow Brook Road 2035 Single Lane HCM Roundabout Analysis

Adams Road at Hillendale Road and Meadow Brook Road 2035 Single Lane HCM Roundabout Analysis					
		East Leg Hillendale Road	North Leg Adams Road	West Leg Meadow Brook Road	South Leg Adams Road
AM PEAK	Queue (PCE)	0.3	14.5	0.3	3.4
	Delay (s)	5.55	29.7	7.06	8.44
	V/C Ratio	0.08	0.91	0.08	0.53
	LOS	A	D	A	A
	Intersection Delay (s)	19.95			
	Intersection LOS	C			
	Residual Capacity	3% - [North Leg Adams Rd]			
MID PEAK	Queue (PCE)	0.1	6.3	0.6	6
	Delay (s)	6.07	13.2	7.25	11.94
	V/C Ratio	0.05	0.7	0.17	0.68
	LOS	A	B	A	B
	Intersection Delay (s)	12.13			
	Intersection LOS	B			
	Residual Capacity	31% - [North Leg Adams Road]			
PM PEAK	Queue (PCE)	0.2	5.5	1.0	19.5
	Delay (s)	8.53	12.27	7.88	35.92
	V/C Ratio	0.07	0.67	0.25	0.97
	LOS	A	B	A	E
	Intersection Delay (s)	25.04			
	Intersection LOS	D			
	Residual Capacity	0% - [South Leg Adams Road]			

Table 4: Adams Road at Hillendale Road & Meadow Brook Road 2045 Single Lane ARCADY Roundabout Analysis

Adams Road at Hillendale Road and Meadow Brook Road 2045 Single Lane ARCADY Roundabout Analysis					
		East Leg Hillendale Road	North Leg Adams Road	West Leg Meadow Brook Road	South Leg Adams Road
AM PEAK	Queue (PCE)	0.5	37.9	0.5	2
	Delay (s)	4.46	24.66	5.61	6.78
	V/C Ratio	0.08	0.9	0.08	0.58
	LOS	A	C	A	A
	Intersection Delay (s)	16.46			
	Intersection LOS	C			
	Residual Capacity	5% - [North Leg Adams Road]			
MID PEAK	Queue (PCE)	0.5	8.8	0.5	10.5
	Delay (s)	5.02	10.57	5.43	10.81
	V/C Ratio	0.04	0.73	0.15	0.74
	LOS	A	B	A	B
	Intersection Delay (s)	10.29			
	Intersection LOS	B			
	Residual Capacity	29% - [South Leg Adams Road]			
PM PEAK	Queue (PCE)	0.5	5	1.3	108.1
	Delay (s)	6.78	9.43	5.65	109.19
	V/C Ratio	0.06	0.69	0.23	1.04
	LOS	A	A	A	F
	Intersection Delay (s)	64.57			
	Intersection LOS	F			
	Residual Capacity	-11% - [South Leg Adams Road]			

Table 5: Adams Road at Hillendale Road & Meadow Brook Road 2045 Single Lane HCM Roundabout Analysis

Adams Road at Hillendale Road and Meadow Brook Road 2045 Single Lane HCM Roundabout Analysis					
		East Leg Hillendale Road	North Leg Adams Road	West Leg Meadow Brook Road	South Leg Adams Road
AM PEAK	Queue (PCE)	0.3	18.3	0.3	3.8
	Delay (s)	5.78	40.06	7.49	8.96
	V/C Ratio	0.09	0.97	0.09	0.56
	LOS	A	E	A	A
	Intersection Delay (s)	25.85			
	Intersection LOS	D			
	Residual Capacity	-2% - [North Leg Adams Road]			
MID PEAK	Queue (PCE)	0.2	7.4	0.7	6.9
	Delay (s)	6.4	14.85	7.69	13.16
	V/C Ratio	0.05	0.74	0.18	0.72
	LOS	A	B	A	B
	Intersection Delay (s)	13.48			
	Intersection LOS	B			
	Residual Capacity	24% - [North Leg Adams Road]			
PM PEAK	Queue (PCE)	0.3	6.5	1.1	24.3
	Delay (s)	9.1	13.66	8.46	48.58
	V/C Ratio	0.08	0.71	0.27	1.02
	LOS	A	B	A	E
	Intersection Delay (s)	32.61			
	Intersection LOS	D			
	Residual Capacity	-5% - [South Leg Adams Road]			

Adams Road at Avon Road

A single lane roundabout at Adams Road at Avon Road would involve a three-leg roundabout with right-turn bypass lanes on the east leg and the south leg. Figure 5 below provides a conceptual lane configuration diagram of the single lane roundabout at Adams Road at Avon Road. The following tables present the results of the ARCADY and HCM6th single lane roundabout analyses for 2035 and 2045.

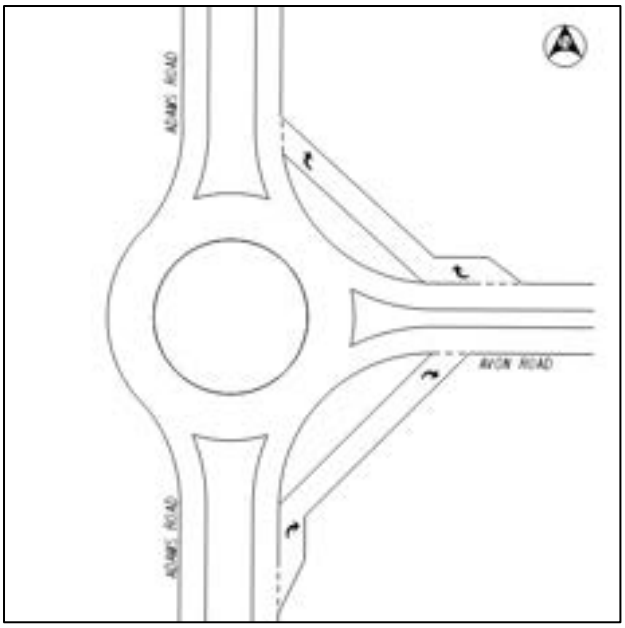


Figure 5: Single Lane Roundabout at Adams Road and Avon Road (Not to Scale)

Table 6: Adams Road at Avon Road 2035 Single Lane ARCADY Roundabout Analysis

Adams Road at Avon Road 2035 Single Lane ARCADY Roundabout Analysis				
		East Leg Avon Road	North Leg Adams Road	South Leg Adams Road
AM PEAK	Queue (PCE)	2.0	66.0	2.1
	Delay (s)	5.02	43.46	5.20
	V/C Ratio	0.33	0.98	0.36
	LOS	A	E	A
	Intersection Delay (s)	22.55		
	Intersection LOS	C		
	Residual Capacity	-3% - [North Leg Adams Road]		
MID PEAK	Queue (PCE)	0.5	15.0	1.5
	Delay (s)	4.4	12.89	6.53
	V/C Ratio	0.18	0.77	0.49
	LOS	A	B	A
	Intersection Delay (s)	8.75		
	Intersection LOS	A		
	Residual Capacity	21% - [North Leg Adams Road]		
PM PEAK	Queue (PCE)	1.4	11.2	6.00
	Delay (s)	5.61	11.67	10.15
	V/C Ratio	0.25	0.75	0.69
	LOS	A	B	B
	Intersection Delay (s)	9.52		
	Intersection LOS	A		
	Residual Capacity	25% - [North Leg Adams Road]		

Table 7: Adams Road at Avon Road 2035 Single Lane HCM Roundabout Analysis

Adams Road at Avon Road 2035 Single Lane HCM Roundabout Analysis				
		East Leg Avon Road	North Leg Adams Road	South Leg Adams Road
AM PEAK	Queue (PCE)	3.1	29.4	2.8
	Delay (s)	7.29	89.88	7.14
	V/C Ratio	0.35	1.13	0.4
	LOS	A	F	A
	Intersection Delay (s)	44.8		
	Intersection LOS	E		
	Residual Capacity	-13% - [North Leg Adams Road]		
MID PEAK	Queue (PCE)	2.6	9.8	4.5
	Delay (s)	7.77	19.39	9.94
	V/C Ratio	0.39	0.81	0.57
	LOS	A	C	A
	Intersection Delay (s)	13.47		
	Intersection LOS	B		
	Residual Capacity	14% - [North Leg Adams Road]		
PM PEAK	Queue (PCE)	5.8	9.2	10
	Delay (s)	13.79	19.02	15.15
	V/C Ratio	0.63	0.8	0.78
	LOS	B	C	C
	Intersection Delay (s)	16.07		
	Intersection LOS	C		
	Residual Capacity	14% - [North Leg Adams Road]		

Table 8: Adams Road at Avon Road 2045 Single Lane ARCADY Roundabout Analysis

Adams Road at Avon Road 2045 Single Lane ARCADY Roundabout Analysis				
		East Leg Avon Road	North Leg Adams Road	South Leg Adams Road
AM PEAK	Queue (PCE)	2.0	88.7	2.0
	Delay (s)	5.25	85.07	5.39
	V/C Ratio	0.35	1.04	0.38
	LOS	A	F	A
	Intersection Delay (s)	41.56		
	Intersection LOS	E		
	Residual Capacity	-7% - [North Leg Adams Road]		
MID PEAK	Queue (PCE)	0.8	22.0	1.5
	Delay (s)	4.54	15.56	6.98
	V/C Ratio	0.19	0.82	0.52
	LOS	A	C	A
	Intersection Delay (s)	10.07		
	Intersection LOS	B		
	Residual Capacity	15% - [North Leg Adams Road]		
PM PEAK	Queue (PCE)	1.2	17.000	10.3
	Delay (s)	5.93	13.83	11.73
	V/C Ratio	0.27	0.79	0.74
	LOS	A	B	B
	Intersection Delay (s)	10.98		
	Intersection LOS	B		
	Residual Capacity	18% - [North Leg Adams Road]		

Table 9: Adams Road at Avon Road 2045 HCM Single Lane Roundabout Analysis

Adams Road at Avon Road 2045 Single Lane HCM Roundabout Analysis		East Leg Avon Road	North Leg Adams Road	South Leg Adams Road
AM PEAK	Queue (PCE)	3.4	36.4	3.0
	Delay (s)	7.72	121.02	7.33
	V/C Ratio	0.38	1.21	0.42
	LOS	A	F	A
	Intersection Delay (s)	59.11		
	Intersection LOS	F		
	Residual Capacity	-18% - [North Leg Adams Road]		
MID PEAK	Queue (PCE)	2.9	12.0	5.1
	Delay (s)	8.31	23.64	10.85
	V/C Ratio	0.41	0.86	0.6
	LOS	A	C	B
	Intersection Delay (s)	15.72		
	Intersection LOS	C		
	Residual Capacity	8% - [North Leg Adams Road]		
PM PEAK	Queue (PCE)	6.9	11.2	12.1
	Delay (s)	15.99	23.11	18.05
	V/C Ratio	0.69	0.85	0.83
	LOS	C	C	C
	Intersection Delay (s)	19.18		
	Intersection LOS	C		
	Residual Capacity	8% - [North Leg Adams Road]		

Adams Road at Butler Road

A single lane roundabout at Adams Road at Butler Road would be a three-leg roundabout with no right-turn bypass lanes. Figure 6 below provides a conceptual lane configuration diagram of the single lane roundabout at Adams Road at Butler Road. The following tables present the results of the ARCADY and HCM6th single lane roundabout analyses for the interim year 2035 and the design year 2045.

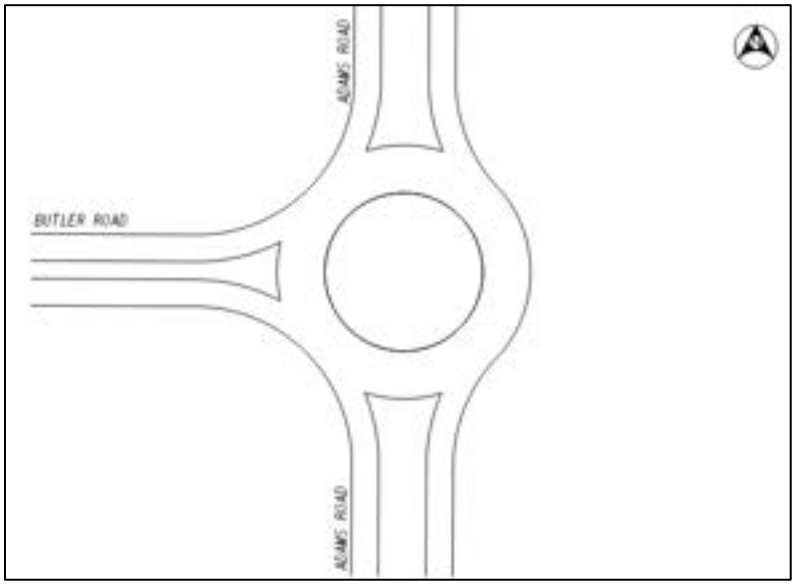


Figure 6: Single Lane Roundabout at Adams Road and Butler Road (Not to Scale)

Table 10: Adams Road at Butler Road 2035 ARCADY Single Lane Roundabout Analysis

Adams Road at Butler Road 2035 Single Lane ARCADY Roundabout Analysis				
		South Leg Adams Road	North Leg Adams Road	West Leg Butler Road
AM PEAK	95% Queue (PCE)	1.5	28.3	1.5
	Delay (s)	5.54	17.26	6.96
	V/C Ratio	0.47	0.85	0.26
	LOS	A	C	A
	Intersection Delay (s)	12.47		
	Intersection LOS	B		
	Residual Capacity	13% - [North Leg Adams Road]		
MID PEAK	95% Queue (PCE)	1.5	2.3	0.5
	Delay (s)	5.44	7.18	4.77
	V/C Ratio	0.47	0.61	0.11
	LOS	A	A	A
	Intersection Delay (s)	6.31		
	Intersection LOS	A		
	Residual Capacity	57% - [North Leg Adams Road]		
PM PEAK	95% Queue (PCE)	43.3	3.5	0.5
	Delay (s)	26.45	8.32	5.04
	V/C Ratio	0.92	0.66	0.13
	LOS	D	A	A
	Intersection Delay (s)	18.22		
	Intersection LOS	C		
	Residual Capacity	4% - [South Leg Adams Road]		

Table 11: Adams Road at Butler Road 2035 HCM Single Lane Roundabout Analysis

Adams Road at Butler Road 2035 Single Lane HCM Roundabout Analysis				
		South Leg Adams Road	North Leg Adams Road	West Leg Butler Road
AM PEAK	95% Queue (PCE)	2.7	10.9	1.4
	Delay (s)	7.68	18.82	10.8
	V/C Ratio	0.47	0.83	0.32
	LOS	A	C	B
	Intersection Delay (s)	14.45		
	Intersection LOS	B		
	Residual Capacity	15% - [North Leg Adams Road]		
MID PEAK	95% Queue (PCE)	2.6	4.2	0.5
	Delay (s)	7.53	9.68	6.35
	V/C Ratio	0.46	0.59	0.13
	LOS	A	A	A
	Intersection Delay (s)	8.58		
	Intersection LOS	A		
	Residual Capacity	59% - [North Leg Adams Road]		
PM PEAK	95% Queue (PCE)	15	5.3	0.6
	Delay (s)	26.25	11.46	6.9
	V/C Ratio	0.91	0.66	0.15
	LOS	D	B	A
	Intersection Delay (s)	19.44		
	Intersection LOS	C		
	Residual Capacity	6% - [South Leg Adams Road]		

Table 12: Adams Road at Butler Road 2045 ARCADY Roundabout Analysis

Adams Road at Butler Road 2045 Single Lane ARCADY Roundabout Analysis				
		South Leg Adams Road	North Leg Adams Road	West Leg Butler Road
AM PEAK	95% Queue (PCE)	1.5	37.5	1.5
	Delay (s)	5.82	22.28	7.47
	V/C Ratio	0.5	0.9	0.29
	LOS	A	C	A
	Intersection Delay (s)	15.51		
	Intersection LOS	C		
	Residual Capacity	7% - [North Leg Adams Road]		
MID PEAK	95% Queue (PCE)	1.5	3.0	0.5
	Delay (s)	5.71	7.80	4.93
	V/C Ratio	0.5	0.64	0.12
	LOS	A	A	A
	Intersection Delay (s)	6.76		
	Intersection LOS	A		
	Residual Capacity	49% - [North Leg Adams Road]		
PM PEAK	95% Queue (PCE)	67.1	5.1	1.4
	Delay (s)	37.42	9.25	5.99
	V/C Ratio	0.97	0.69	0.24
	LOS	E	A	A
	Intersection Delay (s)	24.1		
	Intersection LOS	C		
	Residual Capacity	-1% - [South Leg Adams Road]		

Table 13: Adams Road at Butler Road 2045 HCM Roundabout Analysis

Adams Road at Butler Road 2045 Single Lane HCM Roundabout Analysis				
		South Leg Adams Road	North Leg Adams Road	West Leg Butler Road
AM PEAK	95% Queue (PCE)	2.9	13.2	1.6
	Delay (s)	8.09	22.69	11.81
	V/C Ratio	0.49	0.88	0.35
	LOS	A	C	B
	Intersection Delay (s)	16.91		
	Intersection LOS	C		
	Residual Capacity	9% - [North Leg Adams Road]		
MID PEAK	95% Queue (PCE)	2.8	4.7	0.5
	Delay (s)	7.92	10.40	6.66
	V/C Ratio	0.49	0.62	0.14
	LOS	A	B	A
	Intersection Delay (s)	9.14		
	Intersection LOS	A		
	Residual Capacity	51% - [North Leg Adams Road]		
PM PEAK	95% Queue (PCE)	18.3	6.1	1.2
	Delay (s)	33.29	12.60	8.97
	V/C Ratio	0.95	0.69	0.28
	LOS	D	B	A
	Intersection Delay (s)	23.41		
	Intersection LOS	C		
	Residual Capacity	1% - [South Leg Adams Road]		

All single lane roundabout analyses generated poor LOS for at least one of the peak hours for the design year forecasts (2045). The residual capacities reported in this memo indicates that one or more of the single lane roundabouts is expected to generated high delays or LOS E during the early years of operation, approximately year 2035. For this reason, single lane roundabouts are not recommended due to their inability to supply the near-term traffic demands.

HYBRID MULTILANE ROUNDABOUTS

In the following figures, Adams Road approaches are each shown with standard two-lane entries on the north and south approaches. Side street configurations vary based on entry and circulating volumes for each approach. Hybrid multilane roundabouts were analyzed using ARCADY and HCM 6 methodologies for the design year 2045. Each lane configuration diagram is a conceptual sketch and does not represent an accurate or refined geometric design. These sketches represent the schematic configurations used in each analysis.

Adams Road at Meadow Brook Road and Hillendale Road

A hybrid multilane roundabout at Adams Road at Meadow Brook Road and Hillendale Road would be a four-leg roundabout with no right-turn bypass lanes. The configuration features single lane entries on Meadow Brook Road and Hillendale Road with standard multilane entries along Adams Road. Figure 7 below provides a conceptual lane configuration diagram of the single lane roundabout at Adams Road at Meadow Brook Road and Hillendale Road. Table 14 and Table 15 present the results of the ARCADY and HCM 6 roundabout analyses for the design year 2045.

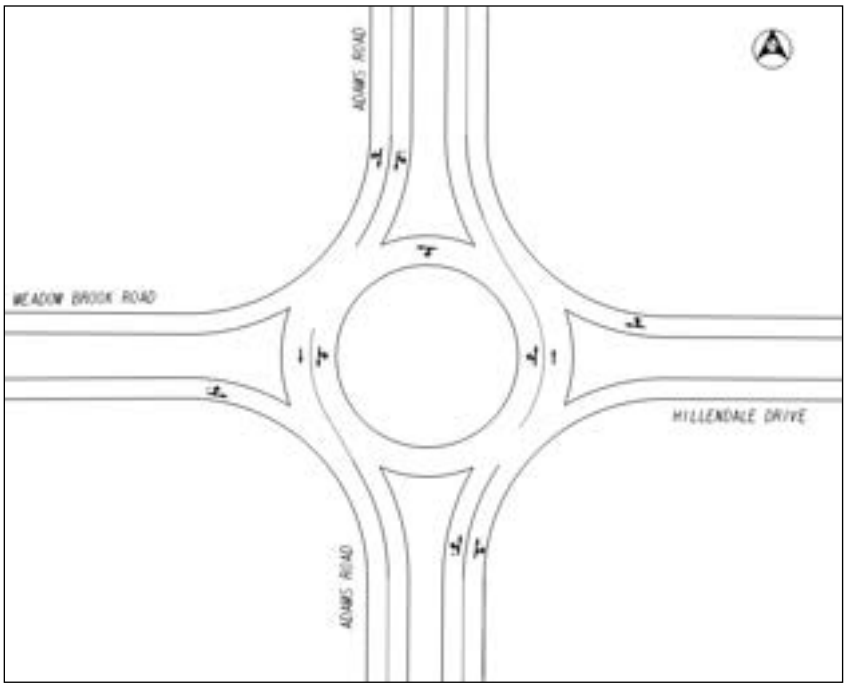


Figure 7: Hybrid Multilane Roundabout at Adams Road and Meadow Brook Road/ Hillendale Road (Not to Scale)

Table 14: Adams Road at Hillendale Road & Meadow Brook Road 2045 ARCADY Roundabout Analysis

Adams Road at Hillendale Road and Meadow Brook Road 2045 Hybrid Multilane ARCADY Roundabout Analysis					
		East Leg Hillendale Road	North Leg Adams Road	West Leg Meadow Brook Road	South Leg Adams Road
AM PEAK	Queue (PCE)	0.5	1.5	0.5	2.1
	Delay (s)	4.38	3.47	5.49	2.44
	V/C Ratio	0.08	0.5	0.08	0.33
	LOS	A	A	A	A
	Intersection Delay (s)	3.16			
	Intersection LOS	A			
	Residual Capacity	85% - [North Leg Adams Road]			
MID PEAK	Queue (PCE)	0.5	1.5	0.5	1.5
	Delay (s)	4.89	2.84	5.29	2.83
	V/C Ratio	0.04	0.41	0.15	0.42
	LOS	A	A	A	A
	Intersection Delay (s)	3.01			
	Intersection LOS	A			
	Residual Capacity	95% - [West Leg Meadow Brook Rd]			
PM PEAK	Queue (PCE)	0.5	2.8	1.2	2.3
	Delay (s)	6.9	2.75	5.5	3.96
	V/C Ratio	0.07	0.39	0.22	0.59
	LOS	A	A	A	A
	Intersection Delay (s)	3.69			
	Intersection LOS	A			
	Residual Capacity	53% - [East Leg Hillendale Rd]			

Table 15: Adams Road at Hillendale Road & Meadow Brook Road 2045 HCM Roundabout Analysis

Adams Road at Hillendale Road and Meadow Brook Road 2045 Hybrid Multilane HCM Roundabout Analysis					
		East Leg Hillendale Road	North Leg Adams Road	West Leg Meadow Brook Road	South Leg Adams Road
AM PEAK	Queue (PCE)	0.3	5.1	0.3	2.3
	Delay (s)	5.78	8.13	7.49	5.14
	V/C Ratio	0.09	0.46	0.09	0.33
	LOS	A	A	A	A
	Intersection Delay (s)	6.86			
	Intersection LOS	A			
	Residual Capacity	75% - [North Leg Adams Road]			
MID PEAK	Queue (PCE)	0.2	3.3	0.7	3.3
	Delay (s)	6.4	6.27	7.69	5.9
	V/C Ratio	0.05	0.36	0.18	0.38
	LOS	A	A	A	A
	Intersection Delay (s)	6.18			
	Intersection LOS	A			
	Residual Capacity	89% - [West Leg Meadow Brook Rd]			
PM PEAK	Queue (PCE)	0.3	3.1	1.1	5.7
	Delay (s)	9.1	6.13	8.46	7.76
	V/C Ratio	0.08	0.34	0.27	0.53
	LOS	A	A	A	A
	Intersection Delay (s)	7.26			
	Intersection LOS	A			
	Residual Capacity	71% - [West Leg Meadow Brook Rd]			

Adams Road at Avon Road

A hybrid multilane roundabout at Adams Road at Avon Road would be a three-leg roundabout with standard multilane entries along Adams Road and a single lane approach on Avon Road with a right turn bypass. Figure 8 below provides a conceptual lane configuration diagram of the hybrid multilane roundabout at Adams Road at Avon Road. Table 16 and Table 17 present the results of the ARCADY and HCM 6 roundabout analyses for the design year 2045.

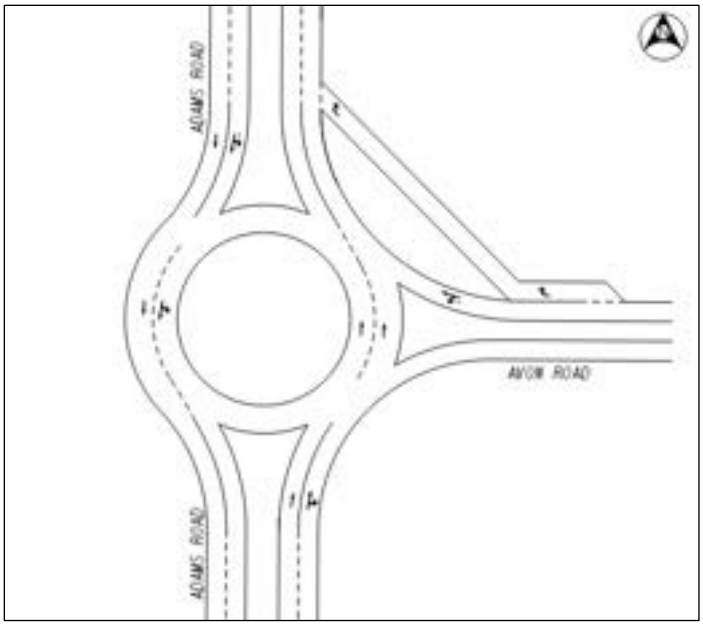


Figure 8: Hybrid Multilane Roundabout at Adams Road and Avon Road (Not to Scale)

Table 16: Adams Road at Avon Road 2045 ARCADY Hybrid Multilane Roundabout Analysis

Adams Road at Avon Road 2045 Hybrid Multilane ARCADY Roundabout Analysis				
		East Leg Avon Road	North Leg Adams Road	South Leg Adams Road
AM PEAK	Queue (PCE)	0.5	1.3	0.5
	Delay (s)	5.18	4.18	2.69
	V/C Ratio	0.35	0.57	0.32
	LOS	A	A	A
	Intersection Delay (s)	4.07		
	Intersection LOS	A		
	Residual Capacity	61% - [North Adams Rd]		
MID PEAK	Queue (PCE)	0.2	0.9	0.6
	Delay (s)	4.48	3.16	2.95
	V/C Ratio	0.19	0.46	0.38
	LOS	A	A	A
	Intersection Delay (s)	3.4		
	Intersection LOS	A		
	Residual Capacity	103% - [North Leg Adams Rd]		
PM PEAK	Queue (PCE)	0.4	0.8	1.5
	Delay (s)	5.78	3.06	4.36
	V/C Ratio	0.27	0.44	0.6
	LOS	A	A	A
	Intersection Delay (s)	4.29		
	Intersection LOS	A		
	Residual Capacity	56% - [South Leg Adams Rd]		

Table 17: Adams Road at Avon Road 2045 HCM6th Hybrid Multilane Roundabout Analysis

Adams Road at Avon Road 2045 Hybrid Multilane HCM Roundabout Analysis		East Leg Avon Road	North Leg Adams Road	South Leg Adams Road
AM PEAK	Queue (PCE)	3.4	8.8	3
	Delay (s)	7.72	13.37	7.31
	V/C Ratio	0.38	0.73	0.42
	LOS	A	B	A
	Intersection Delay (s)	10.18		
	Intersection LOS	B		
	Residual Capacity	25% - [North Leg Adams Road]		
MID PEAK	Queue (PCE)	2.9	4.8	3.8
	Delay (s)	8.31	8.31	8.06
	V/C Ratio	0.41	0.56	0.47
	LOS	A	A	A
	Intersection Delay (s)	8.23		
	Intersection LOS	A		
	Residual Capacity	62% - [North Leg Adams Road]		
PM PEAK	Queue (PCE)	6.9	4.5	9.7
	Delay (s)	15.99	8.22	13.91
	V/C Ratio	0.69	0.54	0.76
	LOS	C	A	B
	Intersection Delay (s)	12.58		
	Intersection LOS	B		
	Residual Capacity	18% - [East Leg Avon Rd]		

Adams Road at Butler Road

A hybrid multilane roundabout at Adams Road at Butler Road would be a three-leg roundabout with standard multilane entries along Adams Road and a single lane approach on Butler Road. Figure 9 below provides a conceptual lane configuration diagram of the hybrid multilane roundabout at Adams Road at Butler Road. Table 18 and Table 19 present the results of the ARCADY and HCM 6 roundabout analyses for the design year 2045.

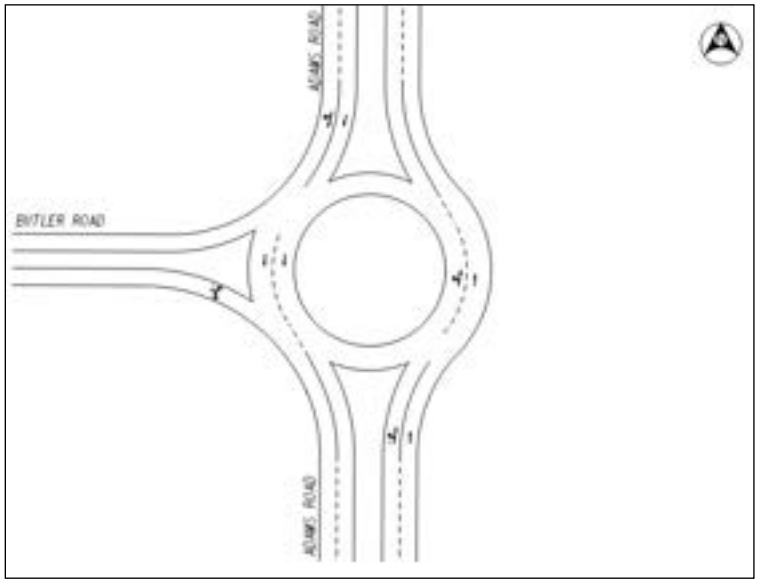


Figure 9: Hybrid Multilane Roundabout at Adams Road and Butler Road (Not to Scale)

Table 18: Adams Road at Butler Road 2045 Hybrid Multilane ARCADY Roundabout Analysis

Adams Road at Butler Road 2045 Hybrid Multilane ARCADY Roundabout Analysis				
		South Leg Adams Road	North Leg Adams Road	West Leg Butler Road
AM PEAK	95% Queue (PCE)	1.4	1.5	1.3
	Delay (s)	2.33	3.3	7.25
	V/C Ratio	0.29	0.51	0.28
	LOS	A	A	A
	Intersection Delay (s)	3.38		
	Intersection LOS	A		
	Residual Capacity	51% - [West Leg Butler Rd]		
MID PEAK	95% Queue (PCE)	1.3	2.1	0.5
	Delay (s)	2.3	2.56	4.83
	V/C Ratio	0.28	0.36	0.12
	LOS	A	A	A
	Intersection Delay (s)	2.6		
	Intersection LOS	A		
	Residual Capacity	128% - [West Leg Butler Rd]		
PM PEAK	95% Queue (PCE)	1.9	1.8	1.4
	Delay (s)	3.59	2.71	5.84
	V/C Ratio	0.55	0.39	0.23
	LOS	A	A	A
	Intersection Delay (s)	3.45		
	Intersection LOS	A		
	Residual Capacity	78% - [South Leg Adams Rd]		

Table 19: Adams Road at Butler Road 2045 Hybrid Multilane HCM Roundabout Analysis

Adams Road at Butler Road 2045 Hybrid Multilane HCM Roundabout Analysis				
		South Leg Adams Road	North Leg Adams Road	West Leg Butler Road
AM PEAK	95% Queue (PCE)	1.9	4.4	1.6
	Delay (s)	4.84	6.79	11.81
	V/C Ratio	0.26	0.44	0.35
	LOS	A	A	B
	Intersection Delay (s)	6.65		
	Intersection LOS	A		
	Residual Capacity	41% - [West Leg Butler Rd]		
MID PEAK	95% Queue (PCE)	1.9	2.6	0.5
	Delay (s)	4.76	5.38	6.66
	V/C Ratio	0.25	0.32	0.14
	LOS	A	A	A
	Intersection Delay (s)	5.21		
	Intersection LOS	A		
	Residual Capacity	120% - [West Leg Butler Rd]		
PM PEAK	95% Queue (PCE)	5.0	3.0	1.2
	Delay (s)	7.3	5.86	8.97
	V/C Ratio	0.49	0.35	0.28
	LOS	A	A	A
	Intersection Delay (s)	6.89		
	Intersection LOS	A		
	Residual Capacity	67% - [West Leg Butler Rd]		

RECOMMENDED LANE CONFIGURATIONS

Multilane roundabouts are recommended along the Adams Road corridor to accommodate capacity needs through the design year 2045. Figure 10 presents a combined schematic lane configuration of the Adams Road roundabouts. In the interest of conserving pavement and minimizing impacts, it is feasible to add flared entry lanes and drop lanes between roundabouts. The distance between each intersection is sufficient to justify the reduced cross-section in conjunction with hybrid multilane roundabouts.

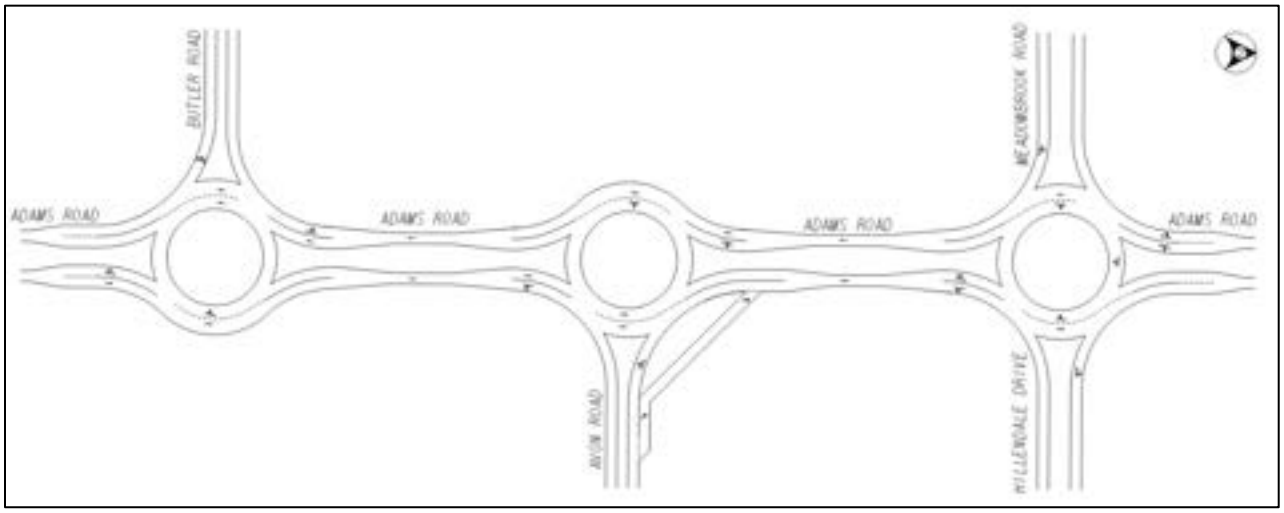


Figure 10: Adams Road Recommended Hybrid Multilane Roundabout Configurations (Not to Scale)

GEOMETRIC DESIGN

Kimley-Horn developed horizontal designs for the intersections of Adams Road at Butler Road, Adams Road at Avon Road, and Adams Road at Hillendale Drive/ Meadow Brook Road based on the preferred lane configurations presented in Figure 10. A summary of the design criteria is presented below in Table 20. An overview of all three roundabouts is presented in Exhibit 1.4.

The proposed roundabout designs include hybrid multilane roundabouts with ICDs ranging from 130-ft to 140-ft. Roundabout entry speeds along Adams Road (north/south) range from 26-29mph. Entry speeds on single lane approaches (east/west) range from 23-25mph. Each roundabout accommodates a WB-67 making through movements by straddling lanes on Adams Road. The designs accommodate a WB-40 making all other turning movements. Busses and Fire trucks were also checked for each design to ensure they do not mount the central island for any of their turning movements.

Table 20: Adams Road Corridor Hybrid Multilane Design Criteria

Geometric Design Element	Hybrid Multilane
Inscribed Circle Diameter	130-140 ft
Circular ROW Footprint	178 – 210 ft
Design and Accommodation Vehicle	WB-40 (Typical); WB-67 (North/South Thru); Straddling Lanes Fire Truck/BUS-45 No Truck Apron Use
Fastest Path Entry Speed, V1 (method: NCHRP 1043, 9.4)	23-25 mph (single lane); 26-29 (multilane)
Splitter Island Length	200 ft. minimum (45+mph); 29 ft. minimum (25mph)
Entry Radius	40 - 105 ft
Exit Taper	Based on design speed of 35mph
Exit Radius	NA (tangential exits)
Entry Angle	20 – 40 degrees
Entry Width, F-F	19 – 28 ft.
Circulatory Roadway Width, F-F	22 – 28 ft. (12ft. lanes on multilane)
Exit Width, F-F	21 – 28 ft.
Truck Apron Width	15 ft.
Minimum Tangent between Approach Curves	50 ft.

Figure 11: Adams Road at Meadow Brook Road and Hillendale Road

The proposed hybrid multilane roundabout for the intersection of Adams Road at Meadow Brook Road and Hillendale Road (Figure 11) has an ICD of 140-ft. Multilane approaches include two 12-ft lanes, and single lane approaches have entry lane widths of approximately 16-ft. See Exhibit 1.1.0 and Exhibit 1.1.1.

Figure 12: Adams Road at West Avon Road

The proposed hybrid multilane roundabout for the intersection of Adams Road at West Avon Road (Figure 12) has an ICD of 130-ft. Multilane approaches include two 12-ft lanes, and the single lane approach has an entry lane width of 16-ft. Operational analyses for the roundabout justify the need for a westbound right turn bypass lane on West Avon Road. See Exhibit 1.2.0 and Exhibit 1.2.1.

Figure 13: Adams Road at Butler Road

The proposed hybrid multilane roundabout for the intersection of Adams Road at Butler Road (Figure 13) has an ICD of 130-ft. Multilane approaches include two 12-ft lanes, and the single lane approach has an entry lane width of 16-ft. The Somerset School driveway, which is currently located just south of the intersection, will be relocated to the circle to ensure full access for those entering and exiting the roundabout. See Exhibit 1.3.0 and Exhibit 1.3.1.

PEDESTRIAN RECOMMENDATIONS

Kimley-Horn did not provide pedestrian accommodations in the recommended geometry, but crossings will be included in the final design. Kimley-Horn recommends the following parameters for pedestrian crossings to meet ADA/ PROWAG requirements and provide the safest route for pedestrians at the proposed roundabouts.

- Pedestrian crossings should be located 20 to 25-ft from the entry yield line.
- Where at least 6-ft of refuge area is present, crosswalks should be angled perpendicular to the traveled way on the entry and exits and have a deflection at the center of the splitter island. Where 6-ft is not present, the crossing may continue through without a deflection or detectable warning surfaces through the splitter island.
- A maximum longitudinal grade of 5% should be considered at the crosswalk location.

GEOMETRIC SENSITIVITY AND CAPACITY CONSIDERATIONS

The proposed roundabouts are more compact than traditional hybrid or multilane roundabouts. The compact circles reduce right-of-way impacts, maintain appropriate geometric speed control, and promote safety for pedestrians by reducing crossing distances through splitter islands.

More compact hybrid multilane circle diameters of 130-ft to 140-ft are expected to experience slightly higher delays than what is projected by traditional two-lane entry and two-lane exit roundabouts. Flared entries and lane drops on exits are likely to contribute to uneven lane utilization at the roundabout, which will reduce yield line capacities. The proposed circle diameters in conjunction with flared entries and lane drops are expected to have some negative impact on roundabout capacity. Fortunately, the results given in this report suggest that this expected loss of capacity will not substantially impact the performance of the roundabout through the year 2045.

Each multilane entry includes two 12-ft lanes. Kimley-Horn also explored the potential to reduce multilane lane entries to two 11-ft lanes. These lane reductions would still allow the design and check vehicles to maneuver the roundabout without over-tracking mounting splitter islands or landscaped areas. When reducing lane widths, it is recommended that the change originate from the splitter island side of any entry versus the curb side or speed controlling outside entry radius. On this basis, the lane width reductions would not affect geometric speed control (fastest path speeds) or cause path overlap for two vehicles entering the roundabout.

The designs shown in Figure 10, Figure 11, and Figure 12 include symmetrical zipper merges on the exits. This implies that both lanes merge simultaneously to maximize the capacity of a multilane roundabout. As discussed in our recent meeting, the roundabouts will not need to maximize roundabout capacity. Thus, asymmetrical exits with the right lane of a two-lane exit dropping, will not substantially affect roundabout performance through 2045. Therefore, the proposed two-lane roundabout exits may be designed to promote the outside lane to merge into the inside lane.

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