

830 Main Street

Halifax Regional Municipality

Traffic Impact Statement

Final Report

Prepared by:

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Prepared for:

CivTech Engineering &

Surveying Limited

September 2014

September 19, 2014

Mr. Alan Stevens
CivTech Engineering & Surveying Limited
1 Broom Road
Dartmouth, NS B2W 5G2

Dear Mr. Stevens:

RE: Traffic Impact Statement for proposed changes to 830 Main Street, Dartmouth, NS

The GRIFFIN transportation group inc. is pleased to present the results of the enclosed traffic impact statement carried out as part of the planning application requirements associated with the proposed business operation changes at *Super Dave's Auto Sales* business at 830 Main Street in Dartmouth, Halifax Regional Municipality, Nova Scotia. It is understood there are plans to add a new automobile repair service as well as an increase in service bays from three to five. The existing three service bays are being used to support the used car sales business.

The study analyses has identified that the proposed changes will have an acceptable level of impact on the Main Street corridor in the vicinity of 830 Main Street. Although left turning vehicles exiting the site will continue to experience long delays, there is some residual capacity in these movements beyond the planning horizon. It is recommended the HRM corner clearance and sight triangle requirements be maintained at the two site accesses serving 830 Main Street to ensure adequate sightlines are maintained for driver's entering and exiting the site.

It has been a pleasure working with you in completing this study. Feel free to contact the undersigned anytime to further discuss the details of this project.

Yours truly,

Original Signed

James J. Copeland, P.Eng.
Managing Principal
GRIFFIN transportation group inc.



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1. INTRODUCTION

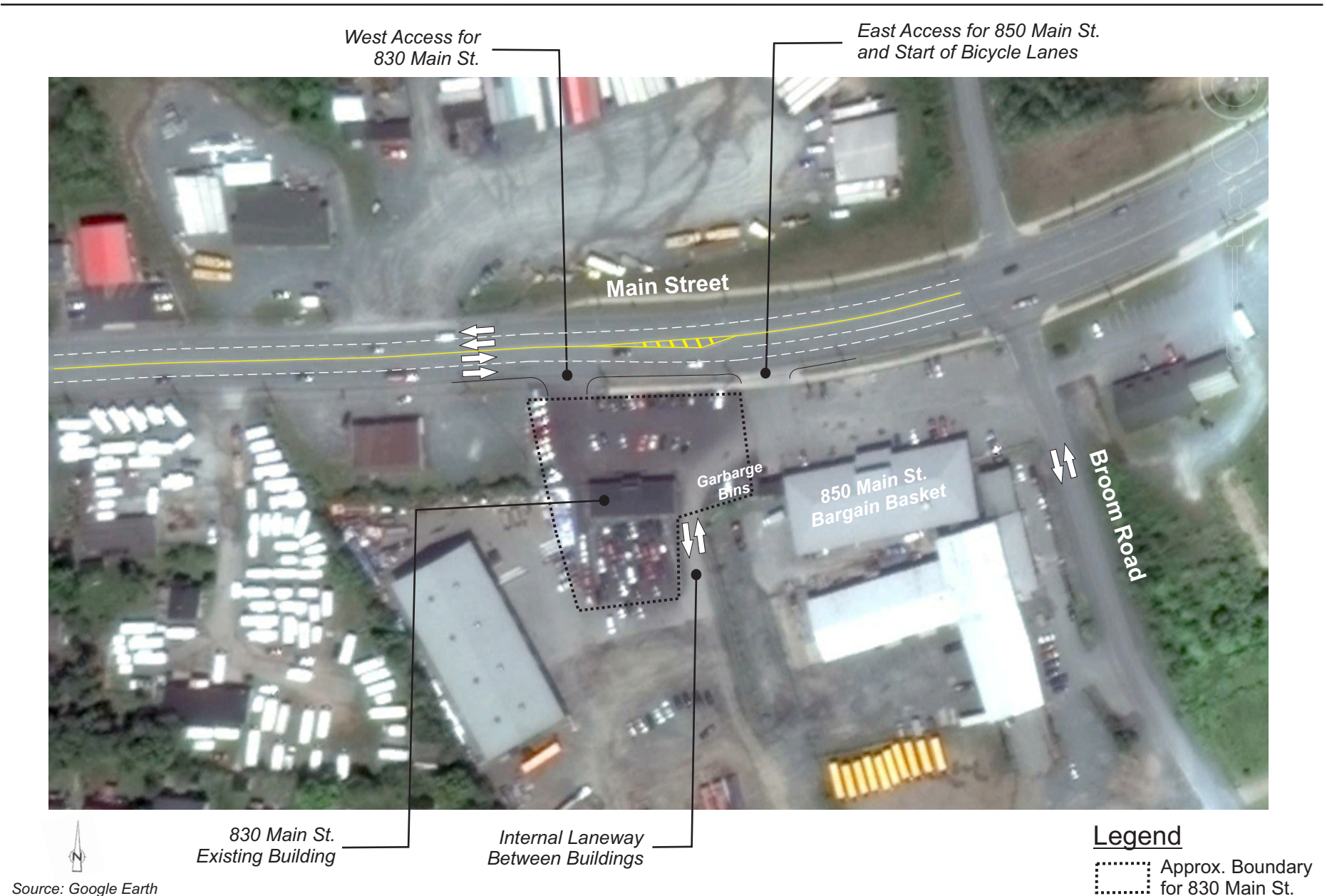
At the request of *CivTech Engineering & Surveying (CivTech)*, the GRIFFIN transportation group inc. has carried out a traffic impact statement in support of the planning application process for the changes being proposed to the current business operations at 830 Main Street, Dartmouth, Halifax Regional Municipality (HRM). The current business, *Super Dave's Auto Sales*, is proposing to add a new automobile repair service as well as two new vehicle service bays. The subject site is located on the south side of Main Street approximately 130 m west of the Main Street / Broom Road intersection. A key map illustrating the focused study area and site context is shown in *Figure 1*.

The current *Super Dave's Auto Sales* business is operated out of a single-story building that contains sales offices, a customer waiting area, three vehicle bays and one auto detailing/wash bay. The existing three vehicle bays are used to prepare their vehicles for sale. The proposed changes include the addition of a general automotive repair service to the existing used auto sales, as well as the addition of two new service bays. The total number of service bays will increase from three to five and they all will support both the existing business (used auto sales) as well as the proposed automobile repair service. Through discussions with *CivTech* it has been indicated that there are no other planned changes to alter the current site access configuration, parking area, or the amount of office/customer floor area of the existing single storey building.

Based on the requirements of the HRM planning approval process, a traffic impact statement is required as part of the supporting documentation for the planning application being prepared by *CivTech* on behalf of the business owner. The terms of reference for this impact statement were developed based on the following:

- HRM's Guidelines for the Preparation of Transportation Impact Studies, 8th Revision.
- Discussions with members of the *CivTech* team to understand the current and proposed business operations; and
- A site review carried out on Monday August 11th, 2014.

The approach and technical findings of this traffic impact statement are discussed in the Sections that follow.



2. EXISTING CONDITIONS

This chapter describes the roadway network, traffic volumes, and other notable characteristics under the baseline conditions.

2.1 The Roadway Network Characteristics

Main Street is under the jurisdiction of the Halifax Regional Municipality (HRM) and functions as a key urban/suburban arterial in the Region's roadway system. It also serves as the primary access to the study site. Main Street is generally aligned in an east-west direction. The roadway has a four-lane, two-way urban cross-section in the vicinity of the subject site. Immediately east of the site, the roadway widens to provide a five-lane cross-section that includes an eastbound left turn lane at the Broom Road unsignalized intersection.

There are two accesses that serve 830 Main Street including a west access and an east access that is shared by the businesses operating at 850 Main Street. The parking areas of 830 and 850 Main Street are open and allow vehicles to travel to/from each business and there is also an ability to use a secondary access connecting to Broom Road. It is expected that the majority of existing and future site traffic associated with the *Super Dave's Auto Sales* business will continue to use the west access and to a lesser degree, the east access.

2.2 Traffic Data

2.2.1 Weekday Volumes

In order to facilitate an assessment of the traffic operations at the site access there was a need to develop a set of baseline traffic volumes. The sources of these data included:

- A site visit and collection of weekday AM and PM peak hour traffic volume data at the site access on Monday August 11th, 2014.
- The collection of free-flow vehicle operating speeds on Main Street in the vicinity of the proposed site (November 2012).
- Historical data available in the following formats:
 - Peak hour intersection turning movement counts at Main Street / 782 Main St. Site Access recorded on November 8th, 2012.
 - Peak hour intersection turning movement counts at the Main Street / Montague Road-Hillsboro Drive intersection in September 2009 and May 2010.
 - Automatic traffic recorder (ATR) counts on Main Street, east and west of the proposed site in November 2010 and June 2011.

A review and comparison of these data sets was carried out. It was determined that the traffic volumes recorded along Main Street varied slightly by time of year but were generally consistent between 2010 and 2014. The minimal traffic growth in the corridor during the weekday AM and PM peak periods suggests there is a large majority of commuter cars using Main Street during these times. As such, no seasonal adjustment factors were applied to the data. However, it should be noted that the highest through volumes on Main Street were applied to the analysis and included:

- *AM peak hour*: observed November 2012 through volumes; and
- *PM peak hour*: observed August 2014 through volumes.

The existing baseline volumes used in the analysis are illustrated in *Figure 2*.

2.2.2 Operating Speed and Posted Speed Limit

In the study area, the posted speed limit on Main Street is 60 km/h. In order to determine the free-flow vehicle operating speeds in the vicinity of the site speed data were collected during a previous study carried out by GRIFFIN on Thursday November 8th, 2012. Using a floating car technique, free-flow operating speeds were found to be about 70 km/h in both directions when unimpeded by other cars and the signalized intersection to the west.

2.3 Operational Analysis

A traffic capacity analysis was carried out for the existing conditions at the site accesses for 830 and 850 Main Street to understand the current operating conditions. The critical peak hour turning movement at both accesses is the northbound left turn for vehicles leaving the site. The results for the east access serving 830 Main Street indicate the following:

- *AM peak*: The northbound left average delay time is 28.5s and a volume-to-capacity (v/c) ratio of 0.01.
- *PM peak*: The northbound left average delay time is 121.6s and a volume-to-capacity (v/c) ratio of 0.07.

The calculated results were generally consistent with conditions observed during the site review. Although there is a long average delay time for outbound vehicles during the PM peak, the v/c ratio suggests there is considerable residual capacity to accommodate additional traffic growth. The analysis process followed the Transportation Research Board's *Highway Capacity Manual* (HCM) methodology for the analysis of a two-way stop-controlled (TWSC) unsignalized intersection and the software tool applied was Trafficware's *Synchro 8*. A summary of the results is discussed further in Section 4.2 and detailed results are provided in *Appendix I*.

2.4 Sightline Review

A review of the available sightlines associated with the current east access to 830 Main Street was carried out. The review was based on the guidelines contained in the Transportation Association of Canada's (TAC) Geometric Design Guide for Canadian Roads. These guidelines use "design speed" for determining criteria such as minimum stopping sight distance (SSD). The design speed is associated with a range of vehicle operating speeds on the roadway.

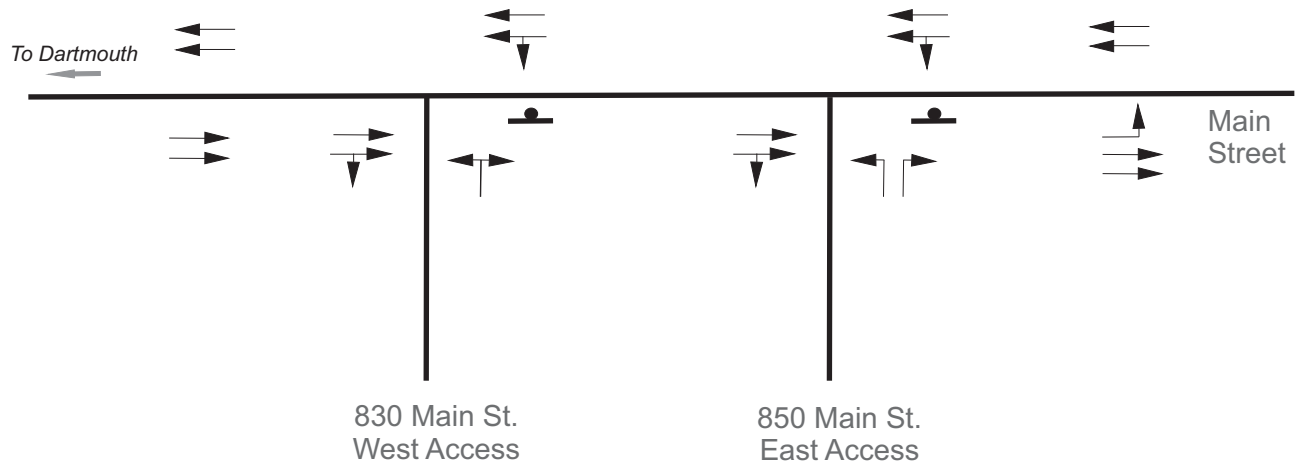
The posted speed limit on Main Street in the vicinity of the site is 60 km/h. Based on the TAC guidelines and data collected during the site visit, a 70 km/h design speed was chosen for this review and assumes an operating speed range of 63 km/h to 70 km/h and the minimum required SSD is 110 m. The results of the sightline review include the following:

- Looking to the west, sightlines were greater than 200 m and this exceeds the minimum SSD requirement for a 70 km/h design speed.
- Looking to the east, sightlines were greater than 150m (measured in the westbound outside curb lane). This exceeds the minimum required SSD for a 70km/h design speed.

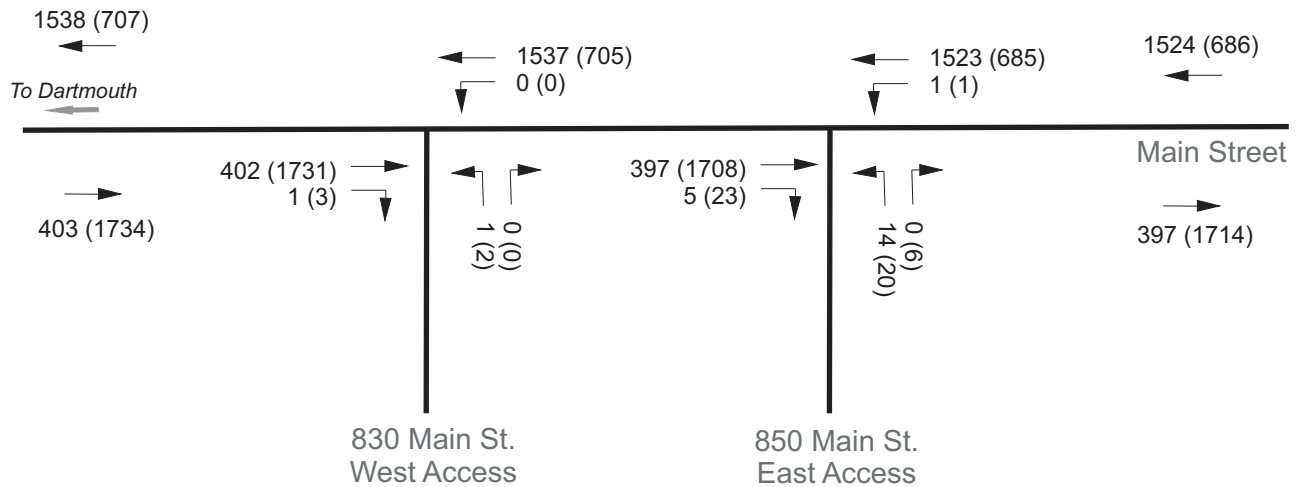
In summary, there are no sightline limitations associated with the roadway geometry and the alignment of the Main Street corridor in the vicinity of the site access.



Lane Configuration:



Existing 2014 Volumes:



Legend

- Stop-controlled movement
- 12 AM Peak Hour Volumes
- (21) PM Peak Hour Volumes

3. THE DEVELOPMENT

This chapter describes the existing business, proposed changes to the buildings/operations, and the changes to the site generated traffic.

3.1 Current Business Operations

The type of business operating at 830 Main Street is focused on used auto sales. It has recently come under new management and is now known as *Super Dave's Auto Sales* which operates out of a single storey building measuring approximately 2,500 ft². It contains several sales offices, a customer waiting area, three vehicle bays and one auto detailing/wash bay. The peak business operations generally occur on weekdays between 10am and 3pm as well as Saturdays between 11am and 3pm. The majority of the auto inventory is on display between the building and Main Street; however, there is parking immediately behind the building for additional vehicles. Currently there are five full time employees that include sales personnel, mechanics and support staff.

It should be noted that the parking area and the east access are shared between the businesses at 830 and 850 Main Street. The adjacent businesses operating at 850 Main Street include:

- Bargain Basket retail store;
- McCarthy's Roofing Limited;
- Bradshaw Roofing Contractors Inc.;
- PermaDry/Permacrete Franchise;
- Fit Plus Martial Arts;

3.2 Proposed Business Operation Changes

The owner of *Super Dave's Auto Sales* has plans to add a new automobile repair service to accompany the existing used auto sales business. As part of this new service offering there are plans to add two new vehicle service bays. As such, the total number of service bays on site will increase to five and they all will support both the existing business (used auto sales) as well as the proposed automobile repair service. It is understood there are no other planned changes to alter the current site accesses, used car lot and parking area or the amount of office/customer floor area of the existing single storey building.

3.3 Site Trip Generation

Typically, traffic engineers use rates of traffic generation for new developments that are published by the Institute of Transportation Engineers (ITE) if deemed appropriate and suitable for the land use under study. ITE also suggests that local data shall prevail, if readily available, as it better represents local travel behaviour for similar land uses. A review was carried out of the ITE published trip rates and Land Use code 941 (Quick Lubrication Vehicle Shop) appeared to be the most relevant land use. ITE defines Land Use 941 as:

"...a business where the primary activity is to perform oil change services for vehicles. Other ancillary services provided may include preventative

maintenance, such as fluid and filter changes. Automobile repair service is generally not provided.”

As the primary focus of the new service to be offered at *Super Dave’s Auto Sales* will be automobile repair services, it was determined that the ITE rates will not be representative. As such, it was decided that it would be more accurate to use first principles (i.e. number of employees, etc.) to develop the future vehicle trip generation of this new service.

In 2012, the GRIFFIN transportation group prepared a traffic impact statement¹ for a similar automobile repair service business relocating to Main Street. As part of that earlier work, it was determined that this existing business operated with 5 vehicle bays, had 5 employees (3 mechanics and 2 managerial/support staff) and processed about an average of two vehicles, per day, per service bay. In addition, about 70% of their customers would drop-off the vehicle for the day and return later to pick up their vehicle. Consideration was also given to service vehicles (i.e. tool suppliers, couriers, etc.) entering and exiting the site, although these trips typically occur outside of the weekday peak travel periods.

This information was considered to be very relevant to the proposed service at 830 Main Street and was therefore used to develop the trip generation estimate for this study. A summary of the AM and PM peak hour site trip generation results are contained in *Tables 1* and *2*, respectively.

Table 1: Site Trip Generation – AM Peak Hour

Source	Description	Units	Peak Hour Trip Rate	Vehicles per Hour		
				In	Out	Total
Adding Auto repair service and 2 Service Bays to Existing Business (5 bays total)						
Employees	Full-time	5.0	1.0	5	0	5
Customers	Drop & Pick-up (70%) ^A	7.0	3.0	14	7	21
Service Vehicles	2 trips/day (off-peak)	2.0	0.0	0	0	0
Total (vph)				19	7	26

A – Trip rate accounts for inbound customer (drop-off) plus an additional in and out trip for their ride. Remaining 30% of customers assumed to arrive outside of the peak period.

¹ 782 Main Street Traffic Impact Statement, GRIFFIN transportation group inc., November 2012.

Table 2: Site Trip Generation – PM Peak Hour

Source	Description	Units	Peak Hour Trip Rate	Vehicles per Hour		
				In	Out	Total
Adding Auto repair service and 2 Service Bays to Existing Business (5 bays total)						
Employees	Full-time	5.0	1.0	0	5	5
Customers	Drop & Pick-up (70%) ^A	7.0	3.0	7	14	21
Service Vehicles	2 Trips/day (off-peak)	2.0	0.0	0	0	0
Total (vph)				7	19	26

A – Trip rate accounts for inbound customer (pick-up) plus an additional in and out trip for their ride. Remaining 30% of customers assumed to arrive outside of the peak period.

It was determined that the new automobile repair service and two additional auto service bays would generate 26 two-way peak hour trips in both the AM and PM peak hour. It should be noted that there were no trip reduction factors applied to this analysis given the variety of unrelated business at the adjoining properties.

3.4 Site Trip Distribution

A review of the observed traffic volumes and travel patterns at the east access was carried out to establish the future distribution pattern of the site-generated trips. The proposed trip distribution pattern for the external vehicle trips is contained in *Table 3*.

Table 3: Site Trip Distribution

To/From	Via	Directional Split
East	Main Street	77%
West	Main Street	23%
Total		100%

4. FUTURE TRAFFIC CONDITIONS

This chapter summarizes the assumptions used to develop future year traffic volumes for the total traffic scenario, the operational analysis results and associated impacts to the transportation infrastructure.

4.1 Future Total 2020 Traffic Scenario

It is expected that the planning approval process, and full use of the two service bays will occur over the next year. Additional time was also included to account for some growth in the background traffic in the study area. As such, the 2020 planning horizon was selected to represent a reasonable future time period for this study. The development of the future Total 2020 AM and PM peak hour traffic includes the following:

- The highest traffic flows taken from the observed 2012 and 2014 volumes to establish a set of Existing 2014 traffic volumes; plus
- Existing 2014 traffic volumes expanded at 2.0% per year (compounding) to 2020; plus
- Site-generated trips associated with the new automobile repair service and two additional service bays.

The future Total 2020 traffic volumes used in the analyses are illustrated in *Figure 3*.

4.2 Total 2020 Operational Analysis Results

Capacity analyses were carried out for the accesses serving both 830 and 850 Main Street using all three sets of volumes, including the Existing 2014, future Background 2020 and future Total 2020 planning horizons. The analysis process followed the Transportation Research Board's *Highway Capacity Manual* (HCM) methodology for the analysis of a two-way stop-controlled (TWSC) unsignalized intersection and the software tool applied was Trafficware's *Synchro 8*. A summary of the results for the critical northbound turning movements is provided in *Table 4*, and detailed results are provided in *Appendix I*.

Table 4: Operational Analysis Results – Critical Movements

Main Street / 830 Main St. Access						
	AM Peak Hour			PM Peak Hour		
	Move: Delay	V/C	Queue ^A	Move: Delay	V/C	Queue ^A
Existing 2014	NB Lt-Rt: 28.5s	0.01	<10m	NB Lt-Rt: 121.6s	0.07	<10m
Background 2020	NB Lt-Rt: 35.3s	0.01	<10m	NB Lt-Rt: 195.3s	0.10	<10m
Total 2020	NB Lt-Rt: 36.1s	0.03	<10m	NB Lt-Rt: 266.7s	0.41	10m

Table 4 continued

Main Street / 850 Main St. Access						
	Weekday AM Peak Hour			Weekday PM Peak Hour		
	Move: Delay	V/C	Queue^A	Move: Delay	V/C	Queue^A
Existing 2014	NB Left: 18.8s	0.06	<10m	NB Left: 58.8s	0.25	15m
Background 2020	NB Left: 20.9s	0.07	<10m	NB Left: 89.6s	0.38	15m
Total 2020	NB Left: 21.3s	0.09	<10m	NB Left: 108.9s	0.53	15m

A – The queue represents the 95th percentile vehicle queue length during the peak hour.

During the weekday AM peak period the capacity analysis results indicate the critical intersection turning movements will operate at acceptable delay times and volume-to-capacity (v/c) ratios of 0.09 or better during the weekday AM peak period. However, the operational performance deteriorates during the weekday PM peak hour and this is mostly due to the increased through volumes along Main Street at this time of day. Despite the long delay times, the v/c ratios are expected to be 0.53 or better and indicate there will be some residual capacity available for northbound turning movements to enter the Main Street traffic flow. In addition, there are no on-site queuing concerns.

This is a common phenomenon that occurs at accesses located along high-volume urban / suburban arterial roadways across North America. In this particular corridor, there are numerous other accesses that would also experience similar levels of service. It should be noted that patrons of *Super Dave's Auto Sales* also have the option of exiting the site via the Broom Road access to the east and this alternative ingress/egress option will help reduce the long delay times that are forecast in the future.

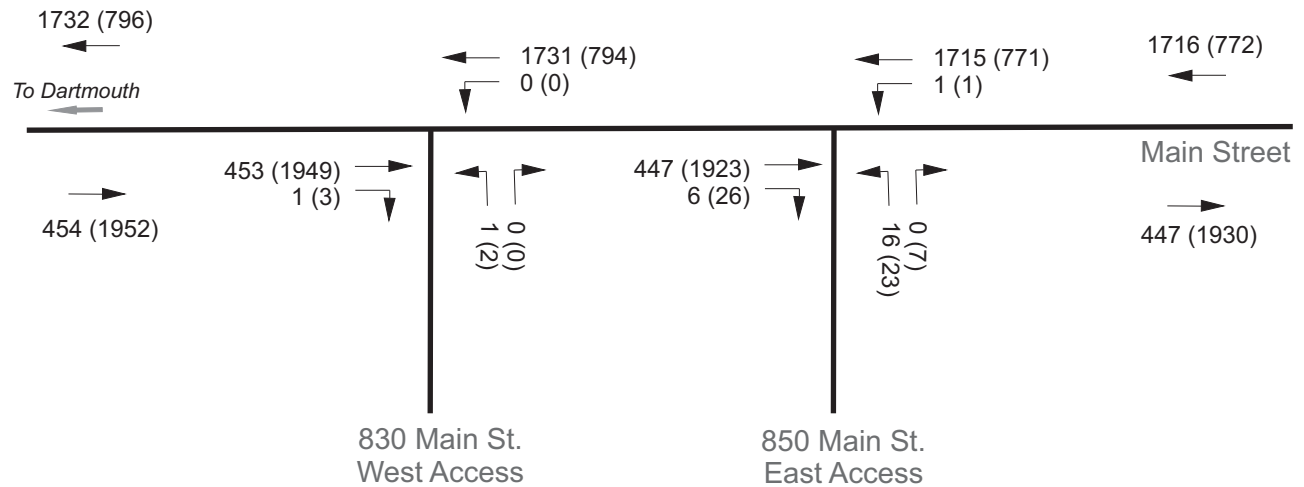
4.3 Parking

A review of the available parking was carried out during the August 11th site visit. Based on these field observations it was determined there is a sufficient number of employee parking spaces available at the rear of the *Super Dave's Auto Sales* building. However, there appears to be only about 3-4 parking spaces available for patrons at the front of the building.

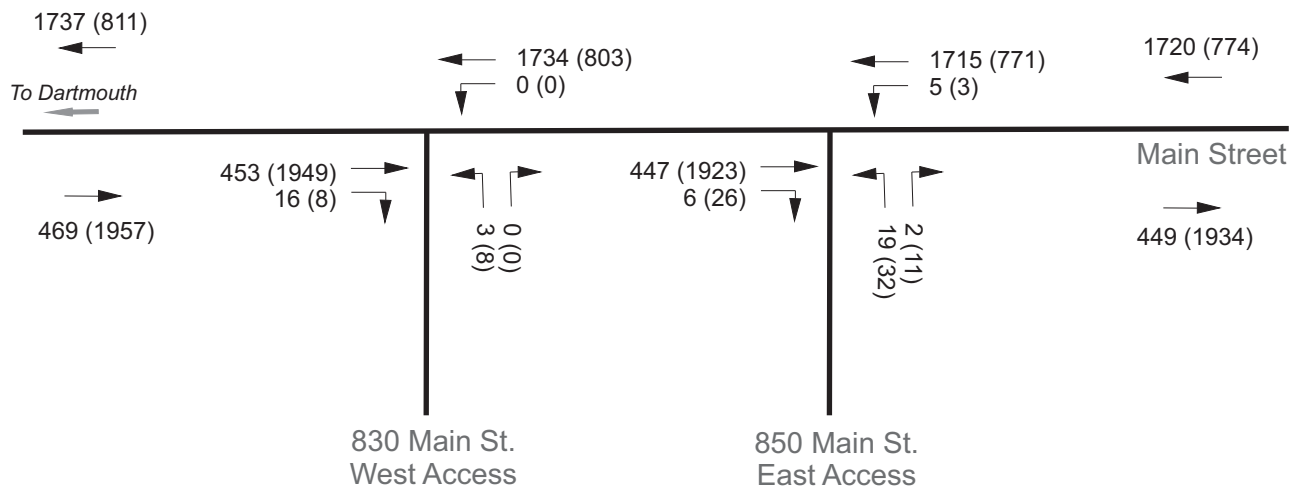
It is suggested that the garbage bins located in the southeast corner of the *Super Dave's Auto Sales* lot, immediately adjacent to the Bargain Basket loading dock, be relocated and additional parking spaces for patrons be provided.



Background 2020 Volumes:



Total 2020 Volumes:



Legend

- Stop-controlled movement
- 12 AM Peak Hour Volumes
- (21) PM Peak Hour Volumes

5. CONCLUSIONS AND RECOMMENDATIONS

This chapter summarizes the salient findings of the analysis and identifies any necessary changes to infrastructure.

5.1 Conclusions

The following conclusions were gleaned from the traffic impact assessment of the proposed changes to the business operations at 830 Main Street:

- The existing operational analysis indicates there are lengthy delay times experienced by drivers waiting to enter the Main Street traffic stream during the weekday PM peak period. However, there is residual capacity for these northbound movements at the site accesses and room to accommodate some future growth in traffic.
- The proposed new automobile repair service and two additional vehicle service bays are forecast to generate an additional 26 vph during each of the weekday AM and PM peak hours.
- The results of the site access traffic operations under future Total 2020 traffic conditions indicate the following:
 - During the weekday AM peak and off-peak times of the day the northbound critical movement will operate with acceptable delay times and v/c ratios of 0.09 or better. During the weekday PM peak these movements are forecast to operate with long delay times and good v/c ratios of 0.53.
 - Given the low volume of existing and proposed site-generated traffic volumes associated with *Super Dave's Auto Sales* there is a low probability of vehicle conflict along Main Street. It was concluded that an exclusive westbound left turn lane is not required at this time.
 - No vehicle queue issues are expected entering and exiting the site due to the low volume of site-generated trips.

The proposed new business operations at the *Super Dave's Auto Sales* business is expected to have an acceptable and minimal impact on traffic operations in the Main Street corridor.

5.2 Recommendations

The following recommendations flowed from the analysis presented in this report:

- That the HRM corner clearance and sight triangle requirements be maintained at the two accesses serving *Super Dave's Auto Sales*. This means that no visual obstruction such as signs or parked vehicles would be permitted within the corner sight triangle along Main Street to ensure entering and exiting drivers have adequate sightlines.
- That a review be undertaken to identify areas for additional patron parking spaces for the *Super Dave's Auto Sales* business. One such location is in the vicinity of the garbage bins located in the southeast corner of the property.

APPENDIX I

Intersection capacity analysis

Intersection						
Int Delay, s/veh	0					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	402	1	0	1537	1	0
Conflicting Peds, #/hr	0	5	5	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	437	1	0	1671	1	0
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	438	0	1273	224
Stage 1	-	-	-	-	438	-
Stage 2	-	-	-	-	835	-
Critical Hdwy	-	-	4.2	-	6.9	7
Critical Hdwy Stg 1	-	-	-	-	5.9	-
Critical Hdwy Stg 2	-	-	-	-	5.9	-
Follow-up Hdwy	-	-	2.25	-	3.55	3.35
Pot Cap-1 Maneuver	-	-	1097	-	155	770
Stage 1	-	-	-	-	609	-
Stage 2	-	-	-	-	379	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1092	-	154	767
Mov Cap-2 Maneuver	-	-	-	-	154	-
Stage 1	-	-	-	-	609	-
Stage 2	-	-	-	-	377	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0		28.5	
HCM LOS	D					
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	154	-	-	1092	-	
HCM Lane V/C Ratio	0.007	-	-	-	-	
HCM Control Delay (s)	28.5	-	-	0	-	
HCM Lane LOS	D	-	-	A	-	
HCM 95th %tile Q(veh)	0	-	-	0	-	

Intersection						
Int Delay, s/veh	0.1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	1731	3	0	705	2	0
Conflicting Peds, #/hr	0	5	5	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	1882	3	0	766	2	0
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1885	0	2266	947
Stage 1	-	-	-	-	1883	-
Stage 2	-	-	-	-	383	-
Critical Hdwy	-	-	4.2	-	6.9	7
Critical Hdwy Stg 1	-	-	-	-	5.9	-
Critical Hdwy Stg 2	-	-	-	-	5.9	-
Follow-up Hdwy	-	-	2.25	-	3.55	3.35
Pot Cap-1 Maneuver	-	-	302	-	33	256
Stage 1	-	-	-	-	102	-
Stage 2	-	-	-	-	650	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	301	-	33	255
Mov Cap-2 Maneuver	-	-	-	-	33	-
Stage 1	-	-	-	-	102	-
Stage 2	-	-	-	-	647	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0		121.6	
HCM LOS	F					
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	33	-	-	301	-	
HCM Lane V/C Ratio	0.066	-	-	-	-	
HCM Control Delay (s)	121.6	-	-	0	-	
HCM Lane LOS	F	-	-	A	-	
HCM 95th %tile Q(veh)	0.2	-	-	0	-	

Intersection						
Int Delay, s/veh	0.1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	397	5	1	1523	14	0
Conflicting Peds, #/hr	0	5	5	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	0
Veh in Median Storage, #	0	-	-	0	1	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	432	5	1	1655	15	0
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	437	0	1264	223
Stage 1	-	-	-	-	434	-
Stage 2	-	-	-	-	830	-
Critical Hdwy	-	-	4.2	-	6.9	7
Critical Hdwy Stg 1	-	-	-	-	5.9	-
Critical Hdwy Stg 2	-	-	-	-	5.9	-
Follow-up Hdwy	-	-	2.25	-	3.55	3.35
Pot Cap-1 Maneuver	-	-	1098	-	157	771
Stage 1	-	-	-	-	612	-
Stage 2	-	-	-	-	381	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1093	-	155	768
Mov Cap-2 Maneuver	-	-	-	-	277	-
Stage 1	-	-	-	-	612	-
Stage 2	-	-	-	-	375	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0		18.8	
HCM LOS	C					
Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	277	-	-	-	1093	-
HCM Lane V/C Ratio	0.055	-	-	-	0.001	-
HCM Control Delay (s)	18.8	0	-	-	8.3	0
HCM Lane LOS	C	A	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	-	0	-

Intersection						
Int Delay, s/veh	0.6					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	1708	23	1	685	20	6
Conflicting Peds, #/hr	0	5	5	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	0
Veh in Median Storage, #	0	-	-	0	1	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	1857	25	1	745	22	7
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1882	0	2243	946
Stage 1	-	-	-	-	1869	-
Stage 2	-	-	-	-	374	-
Critical Hdwy	-	-	4.2	-	6.9	7
Critical Hdwy Stg 1	-	-	-	-	5.9	-
Critical Hdwy Stg 2	-	-	-	-	5.9	-
Follow-up Hdwy	-	-	2.25	-	3.55	3.35
Pot Cap-1 Maneuver	-	-	303	-	34	257
Stage 1	-	-	-	-	104	-
Stage 2	-	-	-	-	657	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	302	-	34	256
Mov Cap-2 Maneuver	-	-	-	-	88	-
Stage 1	-	-	-	-	104	-
Stage 2	-	-	-	-	650	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0.1		49.7	
HCM LOS					E	
Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	88	256	-	-	302	-
HCM Lane V/C Ratio	0.247	0.025	-	-	0.004	-
HCM Control Delay (s)	58.8	19.4	-	-	17	0.1
HCM Lane LOS	F	C	-	-	C	A
HCM 95th %tile Q(veh)	0.9	0.1	-	-	0	-

Intersection						
Int Delay, s/veh	0					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	453	1	0	1731	1	0
Conflicting Peds, #/hr	0	5	5	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	492	1	0	1882	1	0
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	493	0	1434	252
Stage 1	-	-	-	-	493	-
Stage 2	-	-	-	-	941	-
Critical Hdwy	-	-	4.2	-	6.9	7
Critical Hdwy Stg 1	-	-	-	-	5.9	-
Critical Hdwy Stg 2	-	-	-	-	5.9	-
Follow-up Hdwy	-	-	2.25	-	3.55	3.35
Pot Cap-1 Maneuver	-	-	1046	-	121	739
Stage 1	-	-	-	-	571	-
Stage 2	-	-	-	-	333	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1042	-	120	736
Mov Cap-2 Maneuver	-	-	-	-	120	-
Stage 1	-	-	-	-	571	-
Stage 2	-	-	-	-	332	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0		35.3	
HCM LOS	E					
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	120	-	-	1042	-	
HCM Lane V/C Ratio	0.009	-	-	-	-	
HCM Control Delay (s)	35.3	-	-	0	-	
HCM Lane LOS	E	-	-	A	-	
HCM 95th %tile Q(veh)	0	-	-	0	-	

Intersection						
Int Delay, s/veh	0.1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	1949	3	0	794	2	0
Conflicting Peds, #/hr	0	5	5	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	2118	3	0	863	2	0
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	2122	0	2552	1066
Stage 1	-	-	-	-	2120	-
Stage 2	-	-	-	-	432	-
Critical Hdwy	-	-	4.2	-	6.9	7
Critical Hdwy Stg 1	-	-	-	-	5.9	-
Critical Hdwy Stg 2	-	-	-	-	5.9	-
Follow-up Hdwy	-	-	2.25	-	3.55	3.35
Pot Cap-1 Maneuver	-	-	243	-	21	213
Stage 1	-	-	-	-	75	-
Stage 2	-	-	-	-	614	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	242	-	21	212
Mov Cap-2 Maneuver	-	-	-	-	21	-
Stage 1	-	-	-	-	75	-
Stage 2	-	-	-	-	611	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0		195.3	
HCM LOS	F					
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	21	-	-	242	-	
HCM Lane V/C Ratio	0.104	-	-	-	-	
HCM Control Delay (s)	195.3	-	-	0	-	
HCM Lane LOS	F	-	-	A	-	
HCM 95th %tile Q(veh)	0.3	-	-	0	-	

Intersection						
Int Delay, s/veh	0.2					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	447	6	1	1715	16	0
Conflicting Peds, #/hr	0	5	5	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	0
Veh in Median Storage, #	0	-	-	0	1	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	486	7	1	1864	17	0
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	492	0	1423	251
Stage 1	-	-	-	-	489	-
Stage 2	-	-	-	-	934	-
Critical Hdwy	-	-	4.2	-	6.9	7
Critical Hdwy Stg 1	-	-	-	-	5.9	-
Critical Hdwy Stg 2	-	-	-	-	5.9	-
Follow-up Hdwy	-	-	2.25	-	3.55	3.35
Pot Cap-1 Maneuver	-	-	1047	-	123	740
Stage 1	-	-	-	-	574	-
Stage 2	-	-	-	-	336	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1043	-	122	737
Mov Cap-2 Maneuver	-	-	-	-	244	-
Stage 1	-	-	-	-	574	-
Stage 2	-	-	-	-	335	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0		20.9	
HCM LOS	C					
Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	244	-	-	-	1043	-
HCM Lane V/C Ratio	0.071	-	-	-	0.001	-
HCM Control Delay (s)	20.9	0	-	-	8.5	0
HCM Lane LOS	C	A	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	-	0	-

Intersection						
Int Delay, s/veh	0.8					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	1923	26	1	771	23	7
Conflicting Peds, #/hr	0	5	5	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	0
Veh in Median Storage, #	0	-	-	0	1	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	2090	28	1	838	25	8
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	2118	0	2525	1064
Stage 1	-	-	-	-	2104	-
Stage 2	-	-	-	-	421	-
Critical Hdwy	-	-	4.2	-	6.9	7
Critical Hdwy Stg 1	-	-	-	-	5.9	-
Critical Hdwy Stg 2	-	-	-	-	5.9	-
Follow-up Hdwy	-	-	2.25	-	3.55	3.35
Pot Cap-1 Maneuver	-	-	244	-	~ 22	214
Stage 1	-	-	-	-	77	-
Stage 2	-	-	-	-	622	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	243	-	~ 22	213
Mov Cap-2 Maneuver	-	-	-	-	66	-
Stage 1	-	-	-	-	77	-
Stage 2	-	-	-	-	614	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0.1		73.9	
HCM LOS					F	

Intersection

Int Delay, s/veh 0

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	453	3	0	1731	2	0
Conflicting Peds, #/hr	0	5	5	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	492	3	0	1882	2	0

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	496
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.2
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.25
Pot Cap-1 Maneuver	-	-	1043
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	1039
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	35.6
HCM LOS			E

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	120	-	-	1039	-
HCM Lane V/C Ratio	0.018	-	-	-	-
HCM Control Delay (s)	35.6	-	-	0	-
HCM Lane LOS	E	-	-	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection

Int Delay, s/veh 0.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	1949	8	0	803	8	0
Conflicting Peds, #/hr	0	5	5	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	2118	9	0	873	9	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	2127	0	2559	1069
Stage 1	-	-	-	-	2123	-
Stage 2	-	-	-	-	436	-
Critical Hdwy	-	-	4.2	-	6.9	7
Critical Hdwy Stg 1	-	-	-	-	5.9	-
Critical Hdwy Stg 2	-	-	-	-	5.9	-
Follow-up Hdwy	-	-	2.25	-	3.55	3.35
Pot Cap-1 Maneuver	-	-	242	-	21	212
Stage 1	-	-	-	-	75	-
Stage 2	-	-	-	-	611	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	241	-	21	211
Mov Cap-2 Maneuver	-	-	-	-	21	-
Stage 1	-	-	-	-	75	-
Stage 2	-	-	-	-	608	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	266.7
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	21	-	-	241	-
HCM Lane V/C Ratio	0.414	-	-	-	-
HCM Control Delay (s)	266.7	-	-	0	-
HCM Lane LOS	F	-	-	A	-
HCM 95th %tile Q(veh)	1.2	-	-	0	-

Intersection

Int Delay, s/veh 0.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	447	6	5	1715	19	2
Conflicting Peds, #/hr	0	5	5	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	0
Veh in Median Storage, #	0	-	-	0	1	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	486	7	5	1864	21	2

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	492	0	1432	251
Stage 1	-	-	-	-	489	-
Stage 2	-	-	-	-	943	-
Critical Hdwy	-	-	4.2	-	6.9	7
Critical Hdwy Stg 1	-	-	-	-	5.9	-
Critical Hdwy Stg 2	-	-	-	-	5.9	-
Follow-up Hdwy	-	-	2.25	-	3.55	3.35
Pot Cap-1 Maneuver	-	-	1047	-	122	740
Stage 1	-	-	-	-	574	-
Stage 2	-	-	-	-	332	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1043	-	121	737
Mov Cap-2 Maneuver	-	-	-	-	241	-
Stage 1	-	-	-	-	574	-
Stage 2	-	-	-	-	331	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	20.2
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	241	737	-	-	1043	-
HCM Lane V/C Ratio	0.086	0.003	-	-	0.005	-
HCM Control Delay (s)	21.3	9.9	-	-	8.5	0
HCM Lane LOS	C	A	-	-	A	A
HCM 95th %tile Q(veh)	0.3	0	-	-	0	-

Intersection

Int Delay, s/veh 1.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	1923	26	3	771	32	11
Conflicting Peds, #/hr	0	5	5	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	0
Veh in Median Storage, #	0	-	-	0	1	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	2090	28	3	838	35	12

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	2118	0	2530	1064
Stage 1	-	-	-	-	2104	-
Stage 2	-	-	-	-	426	-
Critical Hdwy	-	-	4.2	-	6.9	7
Critical Hdwy Stg 1	-	-	-	-	5.9	-
Critical Hdwy Stg 2	-	-	-	-	5.9	-
Follow-up Hdwy	-	-	2.25	-	3.55	3.35
Pot Cap-1 Maneuver	-	-	244	-	~ 22	214
Stage 1	-	-	-	-	77	-
Stage 2	-	-	-	-	618	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	243	-	~ 21	213
Mov Cap-2 Maneuver	-	-	-	-	66	-
Stage 1	-	-	-	-	77	-
Stage 2	-	-	-	-	601	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.3	86.9
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	66	213	-	-	243	-
HCM Lane V/C Ratio	0.527	0.056	-	-	0.013	-
HCM Control Delay (s)	108.9	22.9	-	-	20	0.2
HCM Lane LOS	F	C	-	-	C	A
HCM 95th %tile Q(veh)	2.2	0.2	-	-	0	-

Notes

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