M E M O R A N D U M

DATE: September 14, 2023

TO: Mr. Hussein Yatim
HY Ventures Leicester, LLC
313 Boston Post Road West, Suite 120
Marlborough, MA 01752

FROM: Robert J. Michaud, P.E. – Managing Principal
Daniel A. Dumais, P.E. – Senior Project Manager

RE: **Proposed Starbucks w/Drive Through & Retail Facility**
1621 Main Street, Leicester, Massachusetts

MDM Transportation Consultants, Inc. (MDM) has conducted this initial traffic memorandum (TM) for a proposed restaurant with drive-through (Starbucks) and retail facility to be located at 1621 Main Street (Route 9) in Leicester, Massachusetts. The location of the Site relative to the adjacent roadway network is shown in **Figure 1.** This TA evaluates projected trip generation and provides a preliminary capacity analysis for the primary shared signalized site driveway along Route 9 at the existing Walmart Superstore. As part of the project a formal TIAS (Traffic Impact and Access Study) is underway with updated traffic counts will be provided according to MassDOT and Town standards and will be submitted pending completion.

Key findings of the assessment are as follows:

□ *Trip Generation.* Based on a review of ITE and empirical trip generation methodology for the primary generator (Starbucks), the more conservative analysis of operations for the proposed Starbucks was based on ITE methodology. Based on ITE methodology the project is estimated to generate approximately 210 vehicle-trips (107 entering and 103 exiting) during the weekday morning peak hour, 104 vehicle trips (52 entering and 52 exiting) during the weekday evening peak hour, and 221 vehicle trips (110 entering and 111 exiting) during the Saturday midday peak hour. As a conservative measure, no credit or trip reduction is taken for pedestrian trips to/from the surrounding neighborhood or adjoining land uses (mixed-use fuel facility with Burger King w/ drive-through). Given the nature of the use, pass-by and diverted traffic, which represents the portion of site-generated trips that is drawn from the existing traffic stream (Route 9) and that is not "new" traffic to area roadways is on average 90% for the Coffee Shop with drive-through.
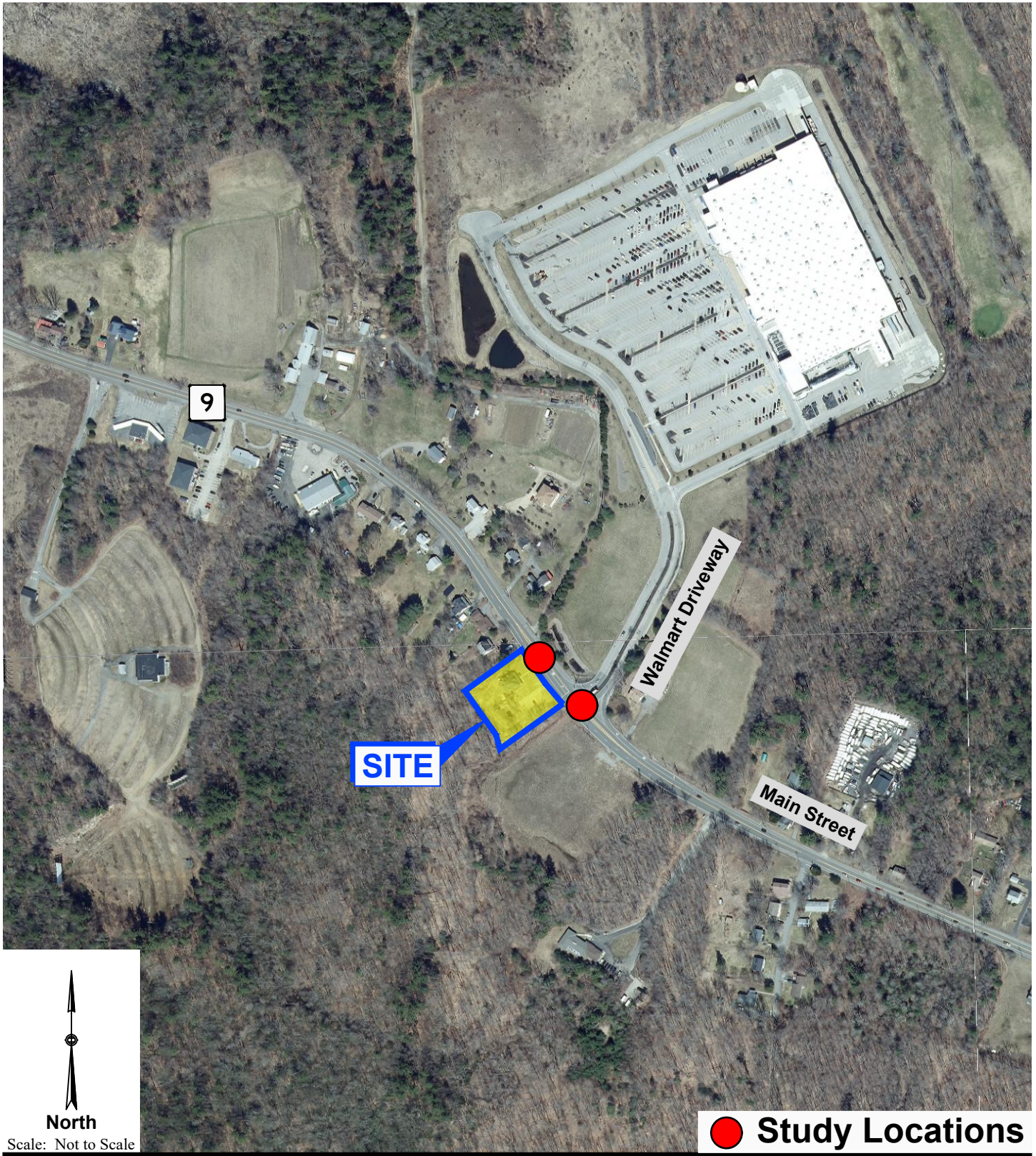
9

Walmart Driveway

SITE

Main Street

North
Scale: Not to Scale

● **Study Locations**

Figure 1

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Site Location

When adjusted for pass-by/diverted trips, the project will result in a nominal 22 new vehicle trips (13 entering and 9 exiting) during the weekday morning peak hour, 10 new vehicle trips (5 entering and 5 exiting) during the weekday evening peak hour and 21 new vehicle trips (10 entering and 21 exiting) during the Saturday midday peak hour.

☐ *Adequate Capacity.* The results of the preliminary capacity analysis indicates that the proposed development is expected to have minimal impact on the primary shared signalized driveway along Route 9 at the existing Walmart Superstore will continue to operate below capacity at LOS C or better during the weekday morning, weekday evening and Saturday midday peak hours.

In summary, MDM finds that relative traffic increases for the proposed project represents an inconsequential change in new area roadway volumes - a level of change that falls well within normal day-to-day fluctuations in traffic entering and exiting the study intersection and is immaterial to traffic operations in the area. Accordingly, no roadway improvements are anticipated to accommodate the project. The project and its impacts will be described in more detail in the pending formal TIAS including a review of on-site circulation and drive-thru queue analysis.

PROJECT DESCRIPTION

The site consists of approximately 1.0± acres of land located along the southern side of Main Street (Route 9). The existing Site includes a residential with access/egress via a driveway on Main Street. Under the proposed Site programming, the proposed facility will provide approximately 2,400 sf of restaurant use (Starbucks) with drive-through window and 1,500 sf of retail space. Access/egress to the Site is proposed to be via a right-turn entering driveway on Main Street eastbound and a cross-connection to the adjacent mixed use fuel facility property to provide access to the signalized intersection at the Walmart Superstore (Soojian Drive) The preliminary site layout prepared by Civil Design Group (CDG), Inc. is presented in **Figure 2**.

TRIP GENERATION

The trip generation estimates for the Site are provided for the weekday morning, weekday evening and Saturday midday periods, which correspond to the critical analysis periods for the proposed uses and adjacent street traffic flow.

MDM
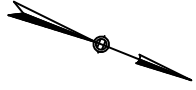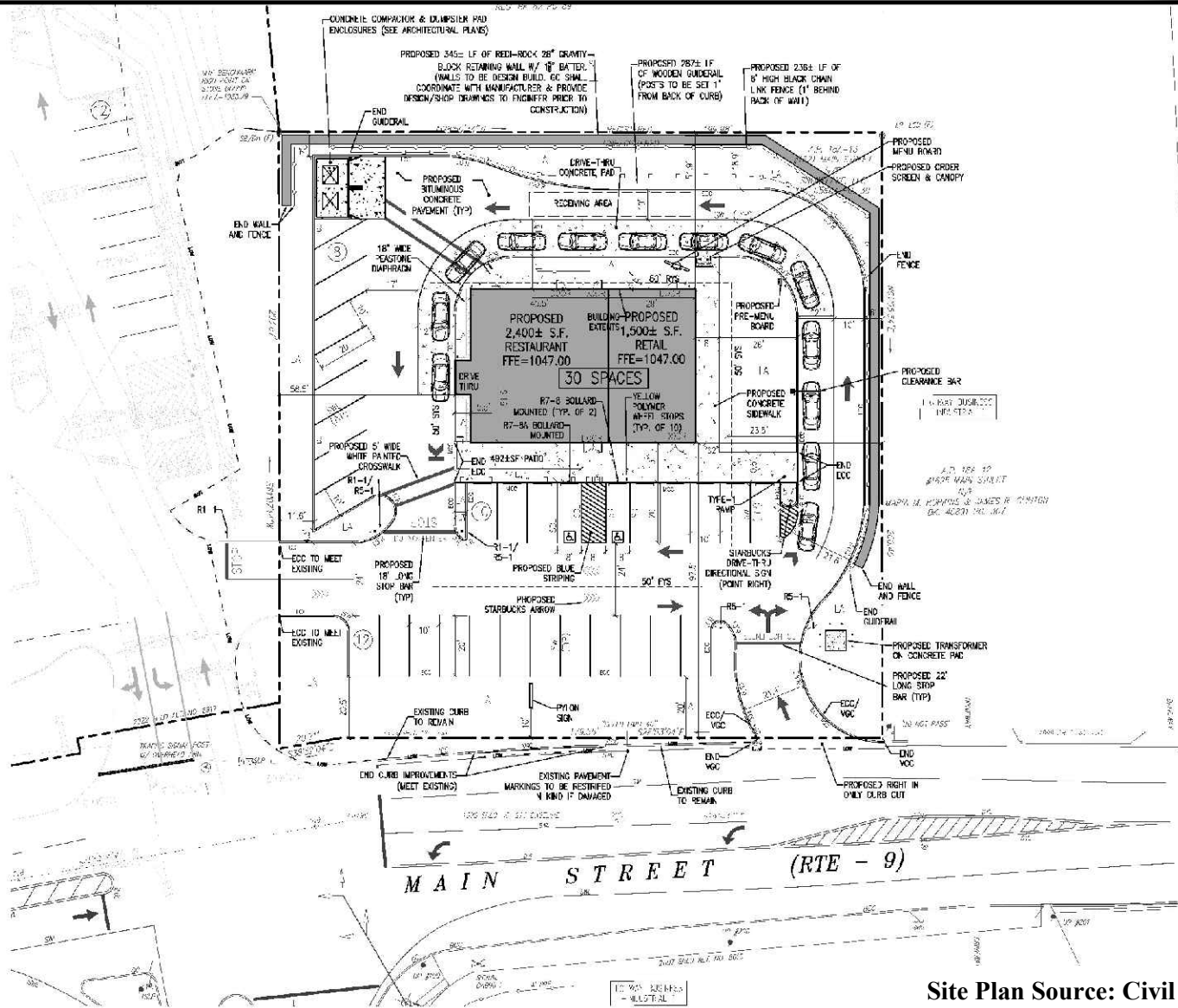
North
Scale: Not to Scale

Site Plan Source: Civil Design Group, LLC

Figure 2

Preliminary Site Plan

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New traffic generated by the Starbucks with drive-through portion of the project was first estimated using trip rates published in ITE's *Trip Generation*[1] for the Land Use Code (LUC) 937 – Coffee/Donut Shop with Drive-Through Window and then compared to empirical Starbucks with drive through data. **Table 1** presents the trip-generation comparison for the trips to be generated by the Starbucks Coffee Shop with Drive Through or similar based on ITE trip rate methodology with a comparison to empirical observations based on existing Starbucks facilities.

TABLE 1
TRIP-GENERATION COMPARISON – STARBUCKS

Period	ITE Basis[1]	Empirical Basis[2]	Used For Report
Weekday Morning Peak-Hour:			
Enter	**105**	98	**105**
Exit	**101**	97	**101**
Total	**206**	195	**206**
Weekday Evening Peak-Hour:			
Enter	**47**	36	**47**
Exit	**47**	32	**47**
Total	**94**	68	**94**
Saturday Midday Peak-Hour:			
Enter	**105**	54	**105**
Exit	**106**	56	**106**
Total	**211**	110	**211**

[1] Based on ITE LUC 937 (Coffee/Donut Shop with Drive-Through Window) trip rates applied to 2,400 sf.
[2] Based on empirical trip rates for Starbucks.

As summarized in **Table 1**, relative to ITE-based trip estimates, the empirically estimated trip activity is consistent but slightly lower, therefore, the use of the ITE-based trip estimates for planning purposes presents a conservative basis. The coffee shop use of the site is estimated to generate approximately 206 vehicle-trips during the weekday morning peak hour, 94 vehicle trips during the weekday evening peak hour, and 211 vehicle trips during the Saturday midday peak hour.

New traffic generated by the project was estimated using trip rates published in ITE's *Trip Generation* for the Land Use Code (LUC) 937 – Coffee/Donut Shop with Drive-Through Window and LUC 822 – Strip Retail Plaza (<45k). **Table 2** presents the trip-generation summary for the trips to be generated by the proposed development based on the more conservative ITE trip rate methodology.

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[1] *Trip Generation*, 11th Edition; Institute of Transportation Engineers; Washington, DC; 2021.

Page 3

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TABLE 2
TRIP-GENERATION SUMMARY

Period	Coffee Shop Trips[1]	Retail Trips[2]	Total Site Trips
Weekday Morning Peak-Hour:			
Enter	105	2	**107**
<u>Exit</u>	<u>101</u>	<u>2</u>	**<u>103</u>**
Total	206	4	**210**
Weekday Evening Peak-Hour:			
Enter	47	5	**52**
<u>Exit</u>	<u>47</u>	<u>5</u>	**<u>52</u>**
Total	94	10	**104**
Saturday Midday Peak-Hour:			
Enter	105	5	**110**
<u>Exit</u>	<u>106</u>	<u>5</u>	**<u>111</u>**
Total	211	10	**221**

[1] Based on Table 1.
[2] Based on ITE LUC 822 Strip Retail Plaza (<40k) trip rates applied to 1,500 sf.

As summarized in **Table 2,** the development is estimated to generate approximately 210 vehicle-trips (107 entering and 103 exiting) during the weekday morning peak hour, 104 vehicle trips (52 entering and 52 exiting) during the weekday evening peak hour, and 221 vehicle trips (110 entering and 111 exiting) during the Saturday midday peak hour.   The trip estimates were then adjusted to reflect pass-by and diverted traffic, which represents the portion of site-generated trips that is drawn from the existing traffic stream and that is not "new" traffic to area roadways. Pass-by data as published by ITE in the *Trip Generation Handbook*[2] indicates average pass-by rates are approximately 90% for the Coffee Shop use planned for the site. As a conservative measure, no credit or trip reduction is taken for pedestrian trips to/from the surrounding neighborhood or adjoining land uses. **Table 3** summarizes the trip generation for the project with respect to total trips pass-by trips, and net new trips developed to the area by the project.

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[2]*Trip Generation Manual, 10th Edition, Volume 1: User's Guide and Handbook, Institute* of Transportation Engineers; 2017.

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TABLE 3
TRIP-GENERATION
(Net Trips)

		Site Trips		
Period/Direction		**Total[1]**	**Pass-By[2]**	**Net New Trips[3]**
Weekday Morning Peak Hour				
	Entering	107	-92	13
	Exiting	103	-92	9
	Total	210	-184	22
Weekday Evening Peak Hour				
	Entering	52	-42	5
	Exiting	52	-42	5
	Total	104	-84	10
Saturday Midday Peak Hour				
	Entering	110	-95	10
	Exiting	111	-95	11
	Total	221	-190	21

[1]Total Site Trips as shown in **Table 2**.
[2]Pass-by = 90% Coffee Shop pass-by per ITE Trip Generation Handbook.
[3]Net New Trips to the project area.

As summarized in **Table 3,** the proposed development is estimated to generate a nominal 22 new vehicle trips (13 entering and 9 exiting) during the weekday morning peak hour, 10 new vehicle trips (5 entering and 5 exiting) during the weekday evening peak hour and 21 new vehicle trips (10 entering and 21 exiting) during the Saturday midday peak hour.

Trip Distribution

The directional distribution of development-generated trips on the roadway network is a function of a number of variables including local area populations and the efficiency of the roadways leading to the Site. Existing travel patterns served as the primary basis for determining the trip distribution pattern for the proposed development. The data suggests 60% of new trips will occur via Route 9 to/from east and 40% of new trips via Route 9 to/from west. Pass-by/ diverted trips were assigned to the roadway network based on exiting travel patterns along Route 9 and the Walmart driveway. The distribution of the site generated trips is displayed in **Figure 3**. Trip distribution calculations are provided in the **Attachments**.

Development-related trips for the proposed development are assigned to the roadway network using the trip-generation estimates shown in **Table 3** and the distribution patterns presented in **Figure 3**. Development-related trips at each intersection approach for the weekday morning, weekday evening and Saturday midday peak hours are quantified in **Figure 4**.

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Soojians Drive

Main Street — 40%

40%

Site Driveway

60%

Main Street — 60%

(40%) (60%)

Site Driveway
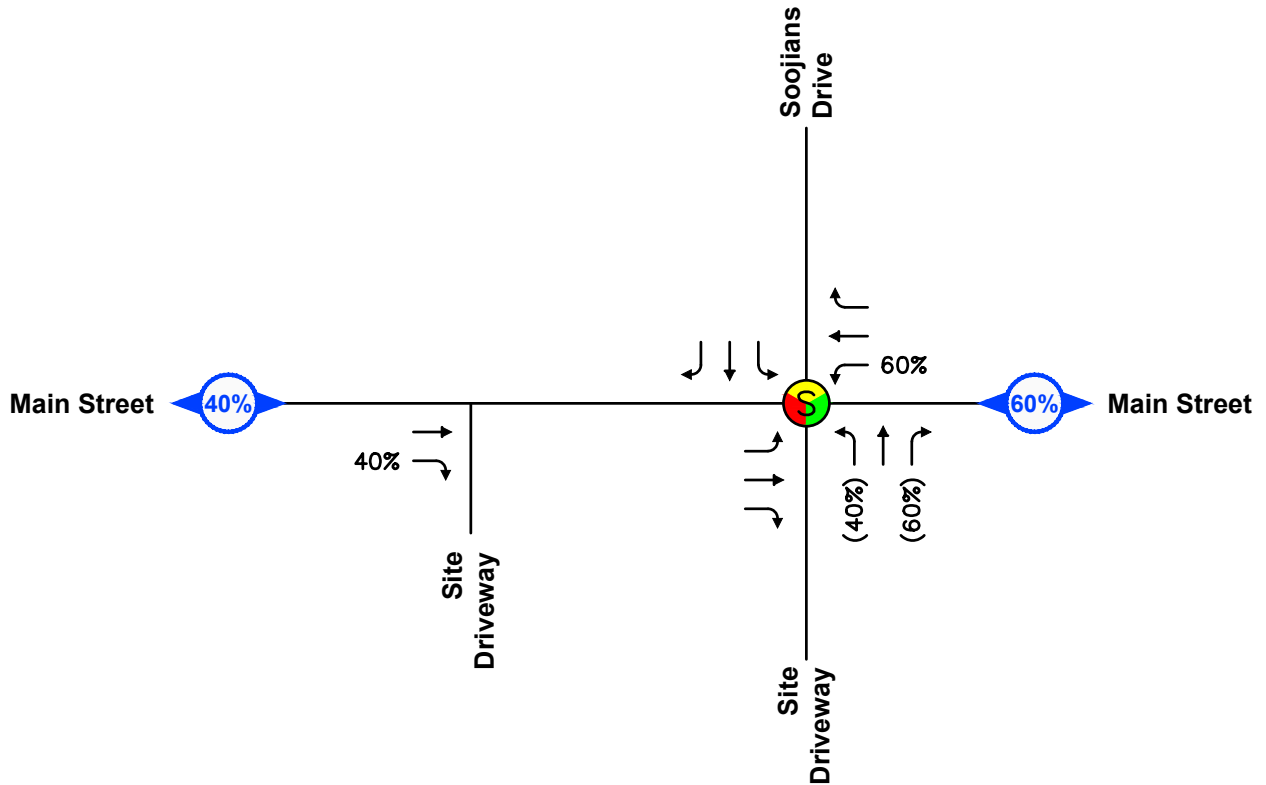
North
Scale: Not to Scale

Figure 3

Trip Distribution

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Soojians Drive

(−2)
(+5)
(−3)

(−3)
(−24)
8(+27)

Main Street — Main Street

(−60) →
5(+60) ⤷

(−3)
(−57)

Site Driveway

Site Driveway

4(+26)
(+6)
5(+60)

Weekday Morning Peak Hour

Soojians Drive

(−3)
(+6)
(−3)

(−5)
(−18)
3(+23)

Main Street — Main Street

(−13) →
2(+13) ⤷

(−2)
(−11)

Site Driveway

Site Driveway

2(+21)
(+7)
3(+14)

Weekday Evening Peak Hour

Soojians Drive

(−8)
(+19)
(−11)

(−14)
(−24)
6(+38)

Main Street — Main Street

(−38) →
4(+38) ⤷

(−9)
(−29)

Site Driveway

Site Driveway

4(+32)
(+23)
7(+40)

North
Scale: Not to Scale

NOTES:
(+/- #) = Pass-By

S = Signalized Intersection

Saturday Midday Peak Hour

Figure 4

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Trip Generation

Design Year Traffic Conditions

Design Year condition traffic volumes are derived by adding incremental traffic increases for the proposed development as shown in **Figure 4** to the 2028 Build condition (see **Attachments**) intersection as outlined in the TIAS[3] prepared for the adjacent mixed-use fuel facility.

OPERATIONS ANALYSIS

This section provides an overview of operational analysis methodology, and an assessment of intersection operations under Design Year traffic conditions.

Analysis Methodology

Intersection capacity analyses are presented in this section for the Design Year traffic-volume conditions. Capacity analyses, conducted in accordance with EEA/MassDOT guidelines, provide an index of how well the roadway facilities serve the traffic demands placed upon them. The operational results provide the basis for recommended access and roadway improvements in the following section.

Capacity analysis of intersections is developed using the Synchro® computer software, which implements the methods of the Highway Capacity Manual (HCM) 6th Edition. The resulting analysis presents a level-of-service (LOS) designation for individual intersection movements. The LOS is a letter designation that provides a qualitative measure of operating conditions based on several factors including roadway geometry, speeds, ambient traffic volumes, traffic controls, and driver characteristics. Since the LOS of a traffic facility is a function of the traffic flows placed upon it, such a facility may operate at a wide range of LOS, depending on the time of day, day of week, or period of year. A range of six levels of service are defined on the basis of average delay, ranging from LOS A (the least delay) to LOS F (delays greater than 80 seconds for signalized movements). The specific control delays and associated LOS designations are presented in the **Attachments**.

Intersection Capacity Analysis Results

Level-of-Service (LOS) analyses were conducted for Design Year conditions for the study intersection. The results of the intersection capacity are summarized below in **Table 4** and for the weekday morning, weekday evening and Saturday midday peak hours. Detailed analysis is presented in the **Attachments**.

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[3]*TIAS, Gas Station Development at 1603 – 1605 Main Street in Leicester, MA,* prepared by Ron Muller & Associates dated March 29, 2021.

TABLE 4
INTERSECTION CAPACITY ANALYSIS RESULTS
MAIN STREET (ROUTE 9) AT WALMART SUPERSTORE (SOOJIANS DRIVE)

Approach	Weekday Morning Peak Hour			Weekday Evening Peak Hour			Saturday Midday Peak Hour		
	v/c[1]	Delay[2]	LOS[3]	v/c	Delay	LOS	v/c	Delay	LOS
Eastbound	0.74	15	B	0.51	13	B	0.75	21	C
Westbound	0.37	7	A	0.88	23	C	0.72	14	B
Northbound	0.41	20	B	0.60	36	D	0.49	27	C
Southbound	0.30	24	C	0.60	20	C	0.56	15	B
Total	**0.74**	**14**	**B**	**0.88**	**21**	**C**	**0.75**	**18**	**B**

[1]Volume-to-capacity ratio
[2]Average control delay per vehicle (in seconds)
[3]Level of service
[4]n/a = not applicable

As summarized in **Table 4**, the proposed development is not expected to materially impact the study area intersection and will continue to operate below capacity at LOS C or better during the weekday morning, weekday evening and Saturday midday peak hours. Relative traffic increases for the proposed project represents an inconsequential change in area roadway volumes - a level of change that falls well within normal day-to-day fluctuations in traffic entering and exiting the study intersection and is immaterial to traffic operations in the area. Accordingly, no roadway improvements are anticipated to accommodate the project. As part of the project a formal TIAS (Traffic Impact and Access Study) is underway with updated traffic counts will be provided according to MassDOT and Town standards. The TIAS will be submitted pending completion which will describe the impacts in more detail including a review of on-site circulation and drive-thru queue analysis.

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ATTACHMENTS

- ☐ Trip Generation
- ☐ Trip Distribution
- ☐ 2028 Build Traffic Volumes
- ☐ Capacity Analysis

□ Trip Generation

Institute of Transportation Engineers (ITE) 11th Edition
Land Use Code (LUC) 822 - Strip Retail Plaza <40ksf

Average Vehicle Trips Ends vs: 1,000 Sq. Feet Gross Leasable Area
Independent Variable (X): 1.500

AVERAGE WEEKDAY DAILY

T = 54.45*(X)
T = 54.45*   1.50
T = 81.68
T = 82   vehicle trips
  with 50% (41 vpd) entering and 50% (41 vpd) exiting.

WEEKDAY MORNING PEAK HOUR OF ADJACENT STREET TRAFFIC

T = 2.36 * (X)
T = 2.36 *   1.50
T = 3.54
T = 4   vehicle trips
  with 60% (2 vph) entering and 40% (2 vph) exiting.

WEEKDAY EVENING PEAK HOUR OF ADJACENT STREET TRAFFIC

T = 6.59 *(X)
T = 6.59*   1.50
T = 9.89
T = 10   vehicle trips
  with 50% (5 vph) entering and 50% (5 vph) exiting.

SATURDAY DAILY

Proportional Estimate Method:

LUC 820 Weekday Daily   <u>37.01</u> x LUC 822 Saturday Midday 6.57   =
LUC 820 Saturday Midday   4.40

T = 55.26*(X)
T = 55.26*   1.50
T = 82.89
T = 82   vehicle trips
  with 50% (41 vpd) entering and 50% (41 vpd) exiting.

SATURDAY PEAK HOUR OF ADJACENT STREET TRAFFIC

T = 6.57 *(X)
T = 6.57*   1.50
T = 9.89
T = 10   vehicle trips
  with 51% (5 vph) entering and 49% (5 vph) exiting.

Institute of Transportation Engineers (ITE) 11th Edition
Land Use Code (LUC) 937 - Coffee/Donut Shop with Drive-Through Window

Average Vehicle Trips Ends vs   1,000 Sq. Feet Gross Floor Area
Independent Variable (X)   2.40

Pass-By: 0.9

		Total	Pass-By	Net New
AVERAGE WEEKDAY DAILY				
T = 533.57 * (X)				
T = 533.57 * 2.40	**AM**			
T = 1280.57	In	105	92	**13**
T = 1,280 vehicle trips	Out	101	92	**9**
with 50% (640 vph) entering and 50% (640 vph) exiting.	Total	206	184	**22**
	PM			
WEEKDAY MORNING PEAK HOUR OF ADJACENT STREET TRAFFIC	In	47	42	**5**
T = 85.88* (X)	Out	47	42	**5**
T = 85.88 * 2.40	Total	94	84	**10**
T = 206.11				
T = 206 vehicle trips	**Sat**			
with 51% (105 vph) entering and 49% (101 vph) exiting.	In	105	95	**10**
	Out	105	95	**10**
	Total	210	190	**20**
WEEKDAY EVENING PEAK HOUR OF ADJACENT STREET TRAFFIC				
T = 38.99 * (X)	**Weekday Daily**	1,280	1,152	**128**
T = 38.99 * 2.40				
T = 93.58	**Saturday Daily**	1,688	1,520	**168**
T = 94 vehicle trips				
with 50% (47 vph) entering and 50% (47 vph) exiting.				

SATURDAY DAILY

(Daily LUC 937/ Daily LUC 934)*SaturdayDaily LUC 934

        533.57   *   y   y=   703.22
        467.48   616.12

T= y * (X)
T= 1688
    with 50% (844 vph) entering and 50% (844 vph) exiting.

SATURDAY MIDDAY PEAK HOUR OF GENERATOR
    T = 87.91 * (X)
    T = 87.91 *   2.40
    T = 210.98
    T = 210   vehicle trips
    with 50% (105 vph) entering and 50% (105 vph) exiting.

Source: ITE Trip Generation, 11th Edition

Worcester

AM Peak Hour

	Total	Walk-In	Drive-Thru
In	88	33	55
Out	85	30	55
Total	173	63	110

PM Peak Hour

	Total	Walk-In	Drive-Thru
In	40	21	19
Out	37	18	19
Total	77	39	38

Saturday Midda

	Total	Walk-In	Drive-Thru
In	49	24	25
Out	44	19	25
Total	93	43	50

Marlborough 1 / Marlborough 2

	Marlborough 1 Total	Marlborough 2 Total	Marlborough 2 Drive-Thru	Marlborough 2 Walk-In
In	88	132	72	60
Out	100	125	72	53
Total	188	257	144	113
In	27			
Out	31			
Total	58			
In		59	32	27
Out		67	32	35
Total		126	64	62

Northborough

	Total	Drive-Thru	Walk-In
In	85	42	43
Out	78	42	36
Total	163	84	79
In	30	14	16
Out	25	14	11
Total	55	28	27

Summary

	Total	Walk In	Drive Thru	89% Pass-By	Net New
In	98	45	56	87	11
Out	97	40	56	87	10
Total	195	85	113	174	21
			Drive Thru % = 57%		
In	32	19	17	25	7
Out	31	15	17	25	6
Total	63	33	33	56	7
			Drive Thru % = 53%		
In	54	26	29	37	17
Out	56	27	29	37	19
Total	110	53	57	98	12
			Drive Thru % = 54%		

□ Trip Distribution

Trip Distribution
1314 Leicester

Weekday Morning Peak Hour

	Entering Volume	Exiting Volume
Route 9 East	45	51
Route 9 West	51	28

Weekday Evening Peak Hour

	Entering Volume	Exiting Volume
Route 9 East	211	166
Route 9 West	75	133

Saturday Midday Peak Hour

	Entering Volume	Exiting Volume
Route 9 East	292	243
Route 9 West	183	192

	Total West	Total East
	28	51
	51	45
	133	166
	75	211
	192	292
	183	243
	662	1008
	39.6%	60.4%
SAY	**40%**	**60%**

□ 2028 Build Traffic Volumes

Weekday AM Peak Hour

Walmart Dr. (Soojians Dr.)

Main Street

Main Site Dr.

East Site Dr.

⑨   ⑨

24 10 45

41
329
52

45 →
847 →
81 →

44 10 43

935 →

← 422

44

Weekday PM Peak Hour

Walmart Dr. (Soojians Dr.)

Main Street

Main Site Dr.

East Site Dr.

⑨   ⑨

129 8 161

206
870
66

72 →
512 →
43 →

59 8 24

697 →

← 1142

27

Saturday Peak Hour

Walmart Dr. (Soojians Dr.)

Main Street

Main Site Dr.

East Site Dr.

⑨   ⑨

188 9 238

287
530
60

179 →
568 →
53 →

52 9 28

834 →

← 877

31

NOT TO SCALE

☐ Capacity Analysis

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↱	↟		↱	↟	↱	↱	↟		↱	↟	
Traffic Volume (vph)	42	787	81	87	305	38	74	16	108	42	15	22
Future Volume (vph)	42	787	81	87	305	38	74	16	108	42	15	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	16	16	10	12	16	12	12	12	12	12	12
Storage Length (ft)	125		0	115		300	0		0	0		0
Storage Lanes	1		0	1		1	1		0	1		0
Taper Length (ft)	40			75			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.986				0.850		0.870			0.911	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1652	2082	0	1589	1792	1727	1805	1653	0	1736	1664	0
Flt Permitted	0.542			0.100			0.728			0.581		
Satd. Flow (perm)	942	2082	0	167	1792	1727	1383	1653	0	1061	1664	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		13				140		127			26	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1000			1000			1000			1000	
Travel Time (s)		22.7			22.7			22.7			22.7	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Heavy Vehicles (%)	2%	2%	2%	6%	6%	6%	0%	0%	0%	4%	4%	4%
Adj. Flow (vph)	49	926	95	102	359	45	87	19	127	49	18	26
Shared Lane Traffic (%)												
Lane Group Flow (vph)	49	1021	0	102	359	45	87	146	0	49	44	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		10			10			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.09	0.85	0.85	1.09	1.00	0.85	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2	1	1	2		1	2	
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100	20	20	100		20	100	
Trailing Detector (ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Position(ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Size(ft)	20	6		20	6	20	20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA	Free	Perm	NA		Perm	NA	

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2			6		Free	8			4		
Detector Phase	5	2		1	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	9.0	10.0		9.0	10.0		9.0	9.0		9.0	9.0	
Total Split (s)	10.0	45.0		10.0	45.0		15.0	15.0		15.0	15.0	
Total Split (%)	14.3%	64.3%		14.3%	64.3%		21.4%	21.4%		21.4%	21.4%	
Maximum Green (s)	6.0	41.0		6.0	41.0		11.0	11.0		11.0	11.0	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	Min		None	Min		None	None		None	None	
Act Effct Green (s)	42.3	39.5		43.2	41.6	59.5	9.1	9.1		9.1	9.1	
Actuated g/C Ratio	0.71	0.66		0.73	0.70	1.00	0.15	0.15		0.15	0.15	
v/c Ratio	0.07	0.74		0.37	0.29	0.03	0.41	0.41		0.30	0.16	
Control Delay	2.9	15.0		9.7	7.0	0.0	33.1	11.6		31.6	16.6	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	2.9	15.0		9.7	7.0	0.0	33.1	11.6		31.6	16.6	
LOS	A	B		A	A	A	C	B		C	B	
Approach Delay		14.5			6.9			19.6			24.5	
Approach LOS		B			A			B			C	
90th %ile Green (s)	6.0	41.0		6.0	41.0		11.0	11.0		11.0	11.0	
90th %ile Term Code	Max	Max		Max	Hold		Max	Max		Max	Max	
70th %ile Green (s)	6.0	41.0		6.0	41.0		11.0	11.0		11.0	11.0	
70th %ile Term Code	Max	Max		Max	Hold		Max	Max		Hold	Hold	
50th %ile Green (s)	6.0	40.5		6.0	40.5		9.6	9.6		9.6	9.6	
50th %ile Term Code	Max	Gap		Max	Hold		Gap	Gap		Hold	Hold	
30th %ile Green (s)	0.0	32.2		6.0	42.2		7.6	7.6		7.6	7.6	
30th %ile Term Code	Skip	Gap		Max	Hold		Gap	Gap		Hold	Hold	
10th %ile Green (s)	0.0	27.6		0.0	27.6		0.0	0.0		0.0	0.0	
10th %ile Term Code	Skip	Dwell		Skip	Dwell		Skip	Skip		Skip	Skip	
Queue Length 50th (ft)	4	296		9	67	0	34	7		19	7	
Queue Length 95th (ft)	11	437		32	110	0	70	47		46	30	
Internal Link Dist (ft)		920			920			920			920	
Turn Bay Length (ft)	125			115		300						
Base Capacity (vph)	749	1454		278	1255	1727	280	436		215	358	
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	
Reduced v/c Ratio	0.07	0.70		0.37	0.29	0.03	0.31	0.33		0.23	0.12	

Intersection Summary

Area Type: Other
Cycle Length: 70

Actuated Cycle Length: 59.5
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.74
Intersection Signal Delay: 13.6   Intersection LOS: B
Intersection Capacity Utilization 76.2%   ICU Level of Service D
Analysis Period (min) 15
90th %ile Actuated Cycle: 70
70th %ile Actuated Cycle: 70
50th %ile Actuated Cycle: 68.1
30th %ile Actuated Cycle: 57.8
10th %ile Actuated Cycle: 31.6

Splits and Phases: 1: Driveway/Soojians Drive & Main Street

Ø1	Ø2		Ø4
10 s	45 s		15 s
Ø5	Ø6		Ø8
10 s	45 s		15 s

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↱	↿		↱	↑	↱	↱	↿		↱	↿	
Traffic Volume (vph)	70	501	43	92	852	201	82	15	41	158	14	126
Future Volume (vph)	70	501	43	92	852	201	82	15	41	158	14	126
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	16	16	10	12	16	12	12	12	12	12	12
Storage Length (ft)	125		0	115		300	0		0	0		0
Storage Lanes	1		0	1		1	1		0	1		0
Taper Length (ft)	40			75			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.988				0.850		0.891			0.865	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1652	2086	0	1668	1881	1812	1805	1693	0	1787	1627	0
Flt Permitted	0.112			0.311			0.664			0.434		
Satd. Flow (perm)	195	2086	0	546	1881	1812	1262	1693	0	816	1627	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		9				203		43			131	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1000			1000			1000			1000	
Travel Time (s)		22.7			22.7			22.7			22.7	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	0%	0%	0%	1%	1%	1%
Adj. Flow (vph)	73	522	45	96	888	209	85	16	43	165	15	131
Shared Lane Traffic (%)												
Lane Group Flow (vph)	73	567	0	96	888	209	85	59	0	165	146	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		10			10			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.09	0.85	0.85	1.09	1.00	0.85	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2	1	1	2		1	2	
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100	20	20	100		20	100	
Trailing Detector (ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Position(ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Size(ft)	20	6		20	6	20	20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA	Free	Perm	NA		pm+pt	NA	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Protected Phases	5	2		1	6			8		7	4	
Permitted Phases	2			6		Free	8			4		
Detector Phase	5	2		1	6			8	8	7	4	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	9.0	10.0		9.0	10.0		9.0	9.0		9.5	9.0	
Total Split (s)	10.0	38.0		10.0	38.0		12.0	12.0		10.0	22.0	
Total Split (%)	14.3%	54.3%		14.3%	54.3%		17.1%	17.1%		14.3%	31.4%	
Maximum Green (s)	6.0	34.0		6.0	34.0		8.0	8.0		6.0	18.0	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lag	Lag		Lead		
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes		
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	Min		None	Min		None	None		None	None	
Act Effct Green (s)	40.3	35.7		40.3	35.7	66.6	7.5	7.5		15.2	15.2	
Actuated g/C Ratio	0.61	0.54		0.61	0.54	1.00	0.11	0.11		0.23	0.23	
v/c Ratio	0.29	0.51		0.22	0.88	0.12	0.60	0.26		0.60	0.31	
Control Delay	8.5	13.6		6.6	29.7	0.1	49.3	16.5		31.7	7.5	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	8.5	13.6		6.6	29.7	0.1	49.3	16.5		31.7	7.5	
LOS	A	B		A	C	A	D	B		C	A	
Approach Delay		13.0			22.7			35.9			20.3	
Approach LOS		B			C			D			C	
90th %ile Green (s)	6.0	34.0		6.0	34.0		8.0	8.0		6.0	18.0	
90th %ile Term Code	Max	Hold		Max	Max		Max	Max		Max	Hold	
70th %ile Green (s)	6.0	34.0		6.0	34.0		8.0	8.0		6.0	18.0	
70th %ile Term Code	Max	Hold		Max	Max		Max	Max		Max	Hold	
50th %ile Green (s)	6.0	34.0		6.0	34.0		8.0	8.0		6.0	18.0	
50th %ile Term Code	Max	Hold		Max	Max		Max	Max		Max	Hold	
30th %ile Green (s)	6.0	34.0		6.0	34.0		8.0	8.0		6.0	18.0	
30th %ile Term Code	Max	Hold		Max	Max		Max	Max		Max	Hold	
10th %ile Green (s)	0.0	39.1		0.0	39.1		0.0	0.0		6.0	6.0	
10th %ile Term Code	Skip	Dwell		Skip	Dwell		Skip	Skip		Max	Hold	
Queue Length 50th (ft)	11	159		14	351	0	36	6		58	5	
Queue Length 95th (ft)	24	248		30	#605	0	#94	38		108	45	
Internal Link Dist (ft)		920			920			920			920	
Turn Bay Length (ft)	125			115		300						
Base Capacity (vph)	250	1121		432	1007	1812	153	243		275	540	
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	
Reduced v/c Ratio	0.29	0.51		0.22	0.88	0.12	0.56	0.24		0.60	0.27	

Intersection Summary

Area Type: Other
Cycle Length: 70

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Actuated Cycle Length: 66.6
Natural Cycle: 70
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.88
Intersection Signal Delay: 20.5   Intersection LOS: C
Intersection Capacity Utilization 75.4%   ICU Level of Service D
Analysis Period (min) 15
90th %ile Actuated Cycle: 70
70th %ile Actuated Cycle: 70
50th %ile Actuated Cycle: 70
30th %ile Actuated Cycle: 70
10th %ile Actuated Cycle: 53.1
\#   95th percentile volume exceeds capacity, queue may be longer.
    Queue shown is maximum after two cycles.

Splits and Phases: 1: Driveway/Soojians Drive & Main Street

Ø1	Ø2		Ø4
10 s	38 s		22 s
Ø5	Ø6	Ø7	Ø8
10 s	38 s	10 s	12 s

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↱	↟		↱	↟	↰	↱	↟		↱	↟	
Traffic Volume (vph)	170	539	53	104	506	273	88	32	75	227	28	180
Future Volume (vph)	170	539	53	104	506	273	88	32	75	227	28	180
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	16	16	10	12	16	12	12	12	12	12	12
Storage Length (ft)	125		0	115		300	0		0	0		0
Storage Lanes	1		0	1		1	1		0	1		0
Taper Length (ft)	40			75			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.987				0.850		0.895			0.870	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1652	2084	0	1652	1863	1794	1805	1700	0	1805	1653	0
Flt Permitted	0.237			0.171			0.702			0.412		
Satd. Flow (perm)	412	2084	0	297	1863	1794	1334	1700	0	783	1653	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		9				290		80			191	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1000			1000			1000			1000	
Travel Time (s)		22.7			22.7			22.7			22.7	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	181	573	56	111	538	290	94	34	80	241	30	191
Shared Lane Traffic (%)												
Lane Group Flow (vph)	181	629	0	111	538	290	94	114	0	241	221	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		10			10			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.09	0.85	0.85	1.09	1.00	0.85	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2	1	1	2		1	2	
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100	20	20	100		20	100	
Trailing Detector (ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Position(ft)	0	0		0	0	0	0	0		0	0	
Detector 1 Size(ft)	20	6		20	6	20	20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA	Free	Perm	NA		pm+pt	NA	

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Protected Phases	5	2		1	6			8		7	4	
Permitted Phases	2			6		Free	8			4		
Detector Phase	5	2		1	6		8	8		7	4	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	9.0	10.0		9.0	10.0		9.0	9.0		9.5	9.0	
Total Split (s)	10.0	34.0		10.0	34.0		12.0	12.0		14.0	26.0	
Total Split (%)	14.3%	48.6%		14.3%	48.6%		17.1%	17.1%		20.0%	37.1%	
Maximum Green (s)	6.0	30.0		6.0	30.0		8.0	8.0		10.0	22.0	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lag	Lag		Lead		
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes		
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	Min		None	Min		None	None		None	None	
Act Effct Green (s)	27.7	23.4		27.7	23.4	58.4	8.5	8.5		18.8	18.8	
Actuated g/C Ratio	0.47	0.40		0.47	0.40	1.00	0.15	0.15		0.32	0.32	
v/c Ratio	0.53	0.75		0.38	0.72	0.16	0.49	0.36		0.56	0.33	
Control Delay	14.2	22.6		11.2	22.6	0.2	39.5	15.8		23.2	6.1	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	14.2	22.6		11.2	22.6	0.2	39.5	15.8		23.2	6.1	
LOS	B	C		B	C	A	D	B		C	A	
Approach Delay		20.7			14.3			26.5			15.0	
Approach LOS		C			B			C			B	
90th %ile Green (s)	6.0	30.0		6.0	30.0		8.0	8.0		10.0	22.0	
90th %ile Term Code	Max	Max		Max	Max		Max	Max		Max	Hold	
70th %ile Green (s)	6.0	29.7		6.0	29.7		8.0	8.0		10.0	22.0	
70th %ile Term Code	Max	Gap		Max	Hold		Max	Max		Max	Hold	
50th %ile Green (s)	6.0	24.6		6.0	24.6		8.0	8.0		10.0	22.0	
50th %ile Term Code	Max	Gap		Max	Hold		Max	Max		Max	Hold	
30th %ile Green (s)	6.0	20.8		6.0	20.8		8.0	8.0		10.0	22.0	
30th %ile Term Code	Max	Gap		Max	Hold		Max	Max		Max	Hold	
10th %ile Green (s)	0.0	11.5		0.0	11.5		0.0	0.0		7.4	7.4	
10th %ile Term Code	Skip	Dwell		Skip	Dwell		Skip	Skip		Gap	Hold	
Queue Length 50th (ft)	34	209		20	179	0	36	12		71	8	
Queue Length 95th (ft)	63	324		41	284	0	#102	58		142	54	
Internal Link Dist (ft)		920			920			920			920	
Turn Bay Length (ft)	125			115		300						
Base Capacity (vph)	340	1178		299	1049	1794	208	333		466	819	
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	
Reduced v/c Ratio	0.53	0.53		0.37	0.51	0.16	0.45	0.34		0.52	0.27	

Intersection Summary

Area Type: Other
Cycle Length: 70

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Actuated Cycle Length: 58.4
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.75
Intersection Signal Delay: 17.6   Intersection LOS: B
Intersection Capacity Utilization 69.5%   ICU Level of Service C
Analysis Period (min) 15
90th %ile Actuated Cycle: 70
70th %ile Actuated Cycle: 69.7
50th %ile Actuated Cycle: 64.6
30th %ile Actuated Cycle: 60.8
10th %ile Actuated Cycle: 26.9
95th percentile volume exceeds capacity, queue may be longer.
    Queue shown is maximum after two cycles.

Splits and Phases: 1: Driveway/Soojians Drive & Main Street

Ø1	Ø2		Ø4	
10 s	34 s		26 s	
Ø5	Ø6		Ø7	Ø8
10 s	34 s		14 s	12 s