



GREEN INTERNATIONAL AFFILIATES, INC.

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January 15, 2019

Mr. Danny Ruiz
Capital Group Properties, Inc.
259 Turnpike Road
Southborough, MA 01772

**Subject: Maynard Crossing – Proposed Building R4-R7
Modification Traffic Review**

Dear Danny,

In response to your request, Green International Affiliates, Inc. (Green) has reviewed the proposed site plan changes relative to Buildings R4, R5, R6, and R7 in terms of: traffic circulation; accommodations for pedestrians, bicyclists, tenant deliveries, and parking; and safety. The proposed modification includes changing the original plan for these four proposed retail / bank spaces. The new plan also reduces 16 parking spaces amongst the four buildings and reduces the number of drive-thru lanes and storage for the bank proposed in Building R6. This letter is consistent with the discussion of the proposed changes to Building R6 documented in the letter dated December 11, 2009 titled “Maynard Crossing – Proposed Building R6 Modification Traffic Review”. Our assessment consisted of reviewing the proposed changes in the area of Buildings R4-R7 as shown on the recent preliminary plan revision prepared by Bohler Engineering¹ and comparing to the originally approved overall plan.

Trip Generation

As part of our review, we reviewed the proposed change in overall site trip generation. The table below summarizes and compares the originally-approved site plans (dated September 18, 2017) and the currently proposed plans for Buildings R4-R7 and the other buildings. Table 1 describes the sizes of the proposed commercial facilities under both the latest site plan revisions and under the originally-approved site plans.

TABLE 1 – COMPARISON OF BUILDING PROGRAM
Original vs. Currently Proposed

Building	Approved Building Size (SF)	Latest Proposed Building Size (SF)	Change from Approved (SF)
R1	67,802	67,802	0
R2	51,537	51,537	0
R3	55,922	55,922	0
R4	13,751	13,872	+121
R5	10,015	10,116	+101
R6	5,343	5,000	-343
R7	5,987	11,153	+5,166
R8*	4,111	3,967	-144
R9**	12,154	16,999	+4,845
R10**	68,000	69,338	+1,338

* Documented in letter dated 10/09/2019

** Documented in memorandum dated 8/13/2019

¹ Bohler Engineering, Inc., Site Development Plans, Preliminary Site Plan B, Sheet 9, Revision 15 dated 11/01/19.

As indicated in the table, the overall size of Buildings R4-R7 will increase by a total of 5,045 sf, and thus the total retail space of the site will increase to 254,169 sf (discounting the fitness club and mixed commercial space proposed in Building R2, which are not changing and are considered to be separate land uses from retail). Much of this increase is associated with Building R7; Building R6 is now proposed to be smaller than originally approved and Buildings R4 and R5 are proposed to each increase in size by less than 130 SF.

The proposed change in building sizes will overall generate more trips than the original sizes of buildings R4-R7. The traffic generation estimates were based on the models and statistics published by the Institute of Transportation Engineers (ITE) in Trip Generation Manual² for similar land uses. The ITE guide contains models for general retail, Land Use Code (LUC) 820. Because the best-fit equations used to determine the traffic generation volumes in the previous traffic analyses for the 129 Parker Street development are not linear, review of the number of additional trips generated by the overall increase of Buildings R4-R7 needs to be determined by reviewing the total retail area on site. Based on our understanding of the proposed uses of the buildings and of the remaining retail area on-site, estimates of traffic generation on a typical weekday were completed and compared for the full site for each of the two design sizes of Buildings R4-R7. The trip generation comparison is summarized in Table 2.

TABLE 2 – SUMMARY OF TOTAL SITE RETAIL (LUC 820)*
Daily and Peak Hour Trip Generation

	RETAIL – TOTAL PRIOR TO CHANGE OF R4-R7			RETAIL – TOTAL WITH CURRENT PROPOSAL			CHANGE FROM PREVIOUS DUE TO BUILDINGS R4-R7 CHANGE		
	ENTER	EXIT	TOTAL	ENTER	EXIT	TOTAL	ENTER	EXIT	TOTAL
Weekday Daily	6,227	6,227	12,454	6,146	6,146	12,292	+81	+81	+162
AM Peak Hour	169	103	272	171	105	275	+2	+1	+3
PM Peak Hour	530	574	1,104	537	582	1,119	+7	+8	+15
Saturday Daily	8,211	8,211	16,422	8,315	8,315	16,630	+105	+105	+210
Saturday Peak Hour	823	759	1,582	834	769	1,603	+11	+10	+21

* ITE Trip Generation Manual, 10th Edition

As shown in the table, the proposed overall size increase to Buildings R4-R7 is expected to generate an additional 15 trips during the weekday PM peak hour, 162 trips throughout a weekday, 21 trips during the Saturday peak hour, and 210 trips throughout a Saturday. At most, it is expected that an additional trip will be generated approximately every 2.9 minutes to or from the site during the peak hour.

The magnitude of the proposed increase in building size is small enough to not significantly impact roadway operations off-site or on-site. The small magnitude of the proposed increase in building size also means that there is not anticipated to have a significant impact to the number of predicted internal capture trips (as the overall Crossing site is a mixed-use center); hence, changes related to internal site trips were not evaluated and the traffic generation estimates are slightly conservative.

Building R6 Internal Site Circulation and Drive-Thru Lane Evaluation

Building R6 is proposed to have a bank as a tenant with drive-thru teller or automated teller services. Parking circulation for Building R6 is proposed to largely remain the same compared to the originally-approved design. However, the number of proposed drive-thru lanes has been reduced from three (in the originally-approved Site Development Plans) to two lanes, and the entry to the drive-thru lanes is proposed to be shifted to near the primary building entrance instead of directly from the circulating lane around Buildings

² Institute of Transportation Engineers, Trip Generation Manual, 10th Edition, Washington, D.C., 2017.

R6-R7. The drive-through lane is approximately 100 feet long from the window/machine to the entry point and will accommodate approximately five (5) vehicles including that of the customer being served, with the widening for the second lane able to provide storage and service for up to two (2) additional vehicles for a total of seven (7) vehicles. It is assumed that only passenger vehicles (as opposed to single-unit box or larger trucks) will access the drive-through lanes. Data on queuing at bank drive-thru lanes is limited, but data collected within the past decade at banks in Kansas³ and at banks similar in size to Building R6 in Minnesota⁴ suggest that maximum queues will generally reach up to five vehicles on weekdays but could potentially extend to eight vehicles (including vehicles being served; based on one observed bank) on Fridays and Saturdays. Given this, the provided storage length in the drive-thru should be sufficient to accommodate the anticipated queues. The attachment depicts a queue with a conservative nine vehicles approximating a typical sedan vehicle size. Queues are not expected to spill over into the circulating lane serving Buildings R6 and R7.

Vehicle Circulation Around Buildings R4-R7

No access changes have been proposed for Building R4 since the original approval. Several changes to roadway and parking layout have also been proposed to the areas around Buildings R5-R7 from the originally-approved plans. In addition to the aforementioned changes around Building R6, there is a new one-way access road alongside Building R7 for loading access and the two-way access serving Buildings R6 and R7 has been split into separate two-way access drives for each building. Loading for Building R5 is now proposed to occur directly along the roadway between Digital Way and Building R4.

Delivery access was reviewed for 30-foot and 40-foot single-unit box trucks corresponding to the vehicle templates SU-30, and SU-40, respectively, developed by AASHTO⁵. Overall, it appears that SU-30 trucks are able to freely circulate around Buildings R5-R7. Delivery box trucks are primarily planned to enter the Building R5-R7 driveway from Digital Way and exit heading towards Building R3. SU-40 trucks serving Building R5 itself will instead need to enter this area heading southbound; the turning movement of these exiting trucks will encroach onto the opposing lane and use the mountable curb proposed for the channelized splitter islands at the drive entrance at Digital Way to complete turning movements. Signage is proposed to exclude tractor trailer trucks accessing the driveway serving Buildings R5-R7. SU-40 trucks are also unable to fully access Building R7 going clockwise, so in addition to the signage already proposed No Right Turn signage is recommended to be placed at the end of the one-way loading lane.

Delivery access for Building R5 is now proposed along the roadway between Digital Way and Building R4. This roadway is proposed to have one 15-foot-wide lane in each direction. A truck parked alongside Building R5 may be expected to block much of the southbound lane. Although approximately 18-20 feet may remain on the roadway which can allow for two-way access around the parked truck, to reduce the risks for head-on collisions it is recommended that loading for Building R5 occurs before or after retail hours for the buildings accessed by the roadway (i.e. R4-R7).

Pedestrian and Bicyclist Access

The latest proposed layout focuses pedestrian travel along the west side of Buildings R6 and R7, compared to the originally-approved layout of focusing pedestrian travel only towards Building R4. Thus, there is now

³ Stuecheli, Mark. "New Drive-Through Stacking Information for Banks and Coffee Shops". Institute of Transportation Engineers, Washington, D.C., 2009.

⁴ Spack, Mark, et. al. "Drive-Through Queue Generation". *Mike on Traffic*, February 2012, mikeontraffice.typepad.com/files/drive-through-queue-generation.pdf. Accessed 12/06/2019.

⁵ Ibid.

a proposed direct pedestrian connection between Buildings R5 and R7 and Buildings R6 and R7. Direct pedestrian access between Buildings R4 and R5 and between Building R6 and Parker Street have been removed. Tables for the restaurant at Building R4 have been shifted to all be alongside this building instead of the original proposal to have some tables across a roadway at the R6 (bank) building.

The changes in pedestrian connections still appear to provide safe accommodations. However, because the connection between Buildings R5 and R7 will cross a roadway striped with center lines which may reinforce drivers' perspective that this is a primary roadway, it is recommended to install pedestrian warning signage for this crossing.

Bicycle parking appears to be proposed at the southwest corners of each of Buildings R6 and R7. It is recommended to include bicycle parking also at Building R5 and the restaurant at Building R4 if not already proposed.

Parking Evaluation

The number of parking spaces around the four buildings has decreased by 16 spaces. (from 228 to 212). The number of parking spaces overall on the site is 1,715 following the latest plan revisions. An update of the parking generation was conducted, the original parking generation having been prepared for the responses dated May 9, 2017 to the Maynard Planning Board's peer review comments. As with the previous evaluation, the parking demand was evaluated over a 24-hour time period during Fridays and Saturdays (i.e. typically busiest days) during both typical December and typical non-December days^{6,7} assuming that parking supply will appear to be saturated from a user's perspective at 90% overall occupancy. Despite the decrease of parking spaces between these latest revisions and previous revisions to the site, overall parking demand for the site will be satisfied even on a typical mid-day December Saturday as shown in Table 3 and the attachments.

TABLE 3 – SUMMARY OF TOTAL SITE PARKING DEMAND

Time Period	Number of Parking Spaces		
	Total Provided	Projected Utilization	Excess
Non-December Peak Friday Hour	1715	1270	445
December Peak Friday Hour	1715	1603	112
Non-December Peak Saturday Hour	1715	1191	524
December Peak Saturday Hour	1715	1689	26

⁶ Institute of Transportation Engineers, Parking Generation Manual, 5th Edition, Washington, D.C., 2019.

⁷ Victoria Transport Policy Institute, "Shared Parking: Shared Parking Facilities Among Multiple Users" from Online TDM Encyclopedia, Victoria, BC, March 12, 2013

Conclusions and Recommendations

While the proposed size changes of Buildings R4-R7 are not expected to result in any significant impacts to the overall Maynard Crossing site traffic characteristic, several recommendations related to traffic control have been identified and include the following:

- The plans could include small capacity bike parking equipment (i.e. two to three bike capacity) in convenient locations to all of the building entries.
- Install warning signage for the pedestrian crossing between Buildings R5 and R7.
- Install wayfinding signage to guide delivery drivers to and from the loading areas.
- Install No Right Turn signage at the end of the one-way road serving loading access to Building R7.
- Loading for Building R5 should occur outside of retail hours for Buildings R4-R7.
- Any proposed landscaping and signage at the corner of the channelized right-in/right-out drive at Digital Way should be low enough and/or set back sufficiently so as not to create any sight distance constraints at the proposed site drives.

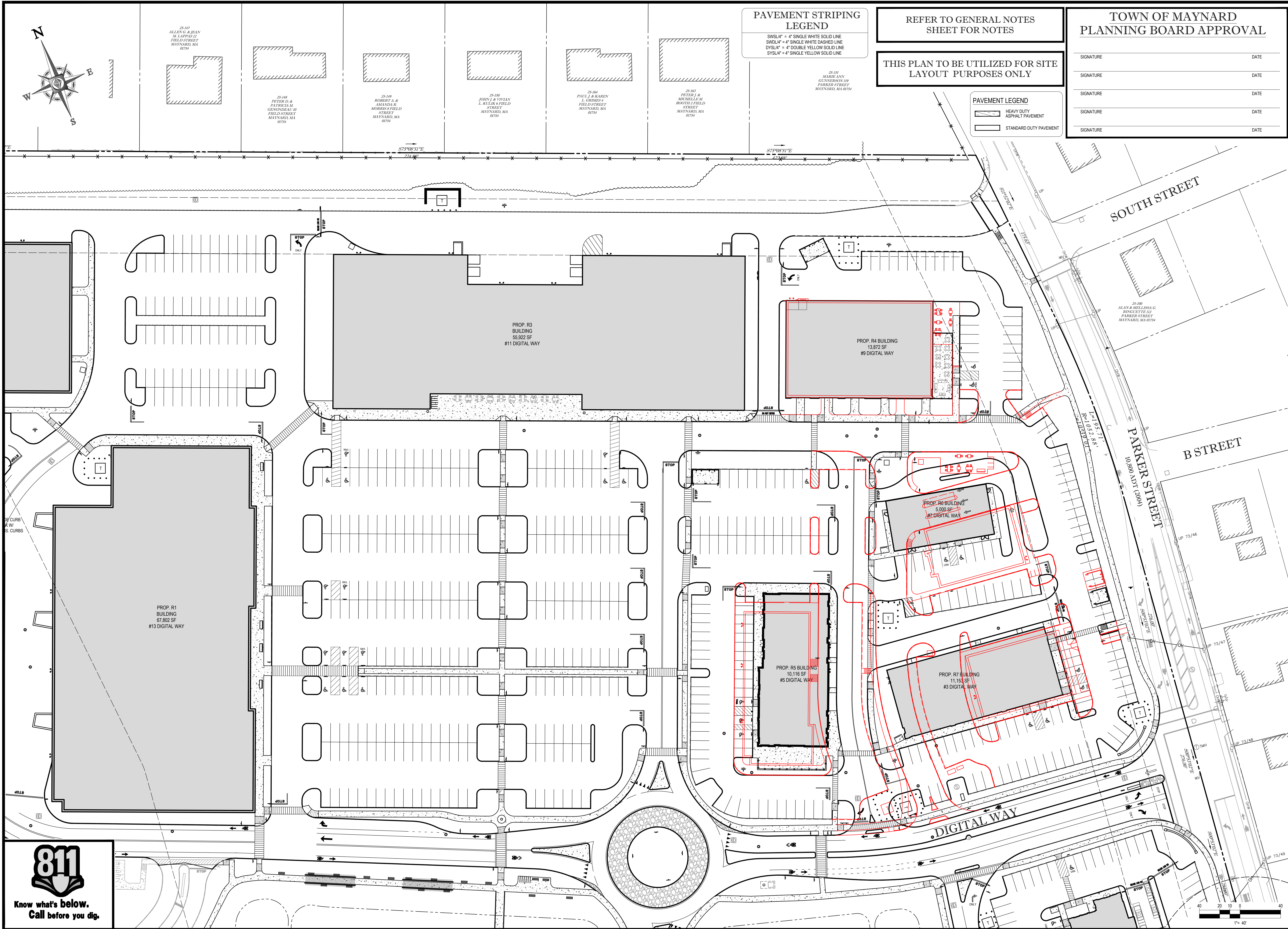
In summary, the proposed modification is not expected to significantly impact traffic operations within the overall Maynard Crossing site and with the above recommendations, site circulations and accommodations for Buildings R4-R7 are expected to be satisfactory. If you have any questions, do not hesitate to contact me.

Very truly yours,
GREEN INTERNATIONAL AFFILIATES, INC.

Bill

William J. Scully, P.E.
Vice President
Municipal Transportation &
Infrastructure Services

WJS/sm



PAVEMENT STRIPING
LEGEND

SWSL/4" = 4" SINGLE WHITE SOLID LINE
SWDL/4" = 4" SINGLE WHITE DASHED LINE
DYSL/4" = 4" DOUBLE YELLOW SOLID LINE
SYSL/4" = 4" SINGLE YELLOW SOLID LINE

REFER TO GENERAL NOTES
SHEET FOR NOTES

THIS PLAN TO BE UTILIZED FOR SITE
LAYOUT PURPOSES ONLY

PAVEMENT LEGEND

HEAVY DUTY
ASPHALT PAVEMENT

STANDARD DUTY PAVEMENT

TOWN OF MAYNARD
PLANNING BOARD APPROVAL

SIGNATURE _____ DATE _____

SIGNATURE _____ DATE _____

SIGNATURE _____ DATE _____

SIGNATURE _____ DATE _____

BOHLER ENGINEERING

SITE PLANS, CONSTRUCTION DOCUMENTS, LANDSCAPE ARCHITECTURE, TRANSPORTATION SERVICES, PERMITTING SERVICES, PROGRAM MANAGEMENT, SUSTAINABLE DESIGN

UPSTATE NEW YORK
ALBANY, NY
BOSTON, MA
NEW JERSEY
NEW YORK, NY
NORTHERN VIRGINIA
PALM BEACH, FL
REHOBOTH BEACH, DE
SOUTH FLORIDA
SOUTH CAROLINA
TALLAHASSEE, FL
WASHINGTON, DC

REVISIONS			
REV	DATE	COMMENT	BY
1	03/21/17	REMOVE CARRIAGE BLDG. (SHEETS 8-12 ONLY)	CFD
2	06/02/17	REV. PER TOWN COMMENTS	CFD
3	06/15/17	DRAINAGE REVISIONS (SHEETS 13-16 ONLY)	GJZ
4	06/28/17	DRAINAGE REVISIONS (FULL SET)	AWP
5	07/26/17	REV. PER TOWN COMMENTS	AWP
6	08/10/17	PEER REVIEW COMMENTS	CFD
7	09/18/17	CONSTRUCTION DOCUMENTS	AWP
8	11/06/18	REVISED R9 / R10 PAD	CFD
9	12/10/18	REV. PER TOWN COMMENTS	CFD
10	04/23/19	REVISED R9 / R10 PAD	CMC
10A	05/13/19	REVISED PER TOWN COMMENTS	CFD
10B	07/25/19	REVISED PER TOWN COMMENTS	CMC
13	10/04/19	REVISED R4-R8 PAD	BPB
14	10/15/19	REVISED R8 PAD	BPB
15	11/11/19	REVISED R5 & R6 PAD	BPB

PRELIMINARY

PROJECT No.: W161189
DRAWN BY: AWP/CFD
CHECKED BY: NEM/JAK
DATE: 02/15/2017
SCALE: AS NOTED
W161189SSR4-R7 OVERLAYS REV 2019.11.19

PROJECT: **SITE DEVELOPMENT PLANS** FOR

CAPITAL GROUP PROPERTIES

MAYNARD CROSSING

LOCATION OF SITE
MAP #25 & LOTS #152 & 152-1
129 PARKER STREET (ROUTE 27)
TOWN OF MAYNARD
MIDDLESEX COUNTY
MASSACHUSETTS

BOHLER ENGINEERING

352 TURNPIKE ROAD
SOUTHBOROUGH, MA 01772
Phone: (508) 480-9900
Fax: (508) 480-9080
www.BohlerEngineering.com

J.A. KUCICH

PROFESSIONAL ENGINEER
MASSACHUSETTS LICENSE NO. 41630
CONNECTICUT LICENSE NO. 26177
RHODE ISLAND LICENSE NO. 9616
MAINE LICENSE NO. 12953

SHEET TITLE: **SITE PLAN "B"**

SHEET NUMBER: **9**
OF 36

REV 15 - 11/1/2019

TRIP GENERATION WORKSHEET

LAND USE: *Shopping Center*
LAND USE CODE: 820 Independent Variable---Trips per 1000 SF GLA

PROJECT NAME: Maynard Crossing Current Proposal
PROJECT # : 15104

Gross Leasable Area (KSF): 249.1

WEEKDAY

RATES:

	Total Trip Ends			Directional Dist.		Number of Studies
	Average	Low	High	Enter	Exit	
DAILY	42.70	12.50	270.89	50%	50%	302
AM PEAK HOUR	0.96	0.10	9.05	62%	38%	104
PM PEAK HOUR	3.71	0.68	29.27	48%	52%	426

TRIPS:

	BY AVERAGE			BY REGRESSION			R ²
	Total	Enter	Exit	Total	Enter	Exit	
DAILY	10638	5319	5319	12292	6146	6146	0.79
AM PEAK	239	148	91	272	169	103	0.56
PM PEAK	924	444	480	1104	530	574	0.81

SATURDAY

RATES:

	Total Trip Ends			Directional Dist.		Number of Studies
	Average	Low	High	Enter	Exit	
DAILY	49.97	16.70	227.50	50%	50%	123
GEN PEAK HR	4.82	1.46	18.32	52%	48%	128

TRIPS:

	BY AVERAGE			BY REGRESSION			R ²
	Total	Enter	Exit	Total	Enter	Exit	
DAILY	12449	6225	6225	16421	8211	8211	0.82
PEAK HR	1201	625	576	1582	823	759	0.83

SUNDAY

RATES:

	Total Trip Ends			Directional Dist.		Number of Studies
	Average	Low	High	Enter	Exit	
DAILY	25.24	4.15	148.15	50%	50%	77
PEAK HR	3.12	0.39	12.40	49%	51%	39

TRIPS:

	BY AVERAGE			BY REGRESSION			R ²
	Total	Enter	Exit	Total	Enter	Exit	
DAILY	6288	3144	3144	8108	4054	4054	0.52
PEAK HR	777	381	396	<---- NOT GIVEN ---->			

SOURCE: Trip Generation, 9th Edition, Institute of Transportation Engineers, 2012.

TRIP GENERATION WORKSHEETLAND USE: *Shopping Center*

LAND USE CODE: 820

Independent Variable---Trips per 1000 SF GLA

PROJECT NAME: Maynard Crossing

Current Proposal

PROJECT # : 15104

Gross Leasable Area (KSF): 254.2 (R4-R7 changed)

WEEKDAY

RATES:

	Total Trip Ends			Directional Dist.		Number of Studies
	Average	Low	High	Enter	Exit	
DAILY	42.70	12.50	270.89	50%	50%	302
AM PEAK HOUR	0.96	0.10	9.05	62%	38%	104
PM PEAK HOUR	3.71	0.68	29.27	48%	52%	426

TRIPS:

	BY AVERAGE			BY REGRESSION			R ²
	Total	Enter	Exit	Total	Enter	Exit	
DAILY	10853	5427	5427	12453	6227	6227	0.79
AM PEAK	244	151	93	275	171	105	0.56
PM PEAK	943	453	490	1119	537	582	0.81

SATURDAY

RATES:

	Total Trip Ends			Directional Dist.		Number of Studies
	Average	Low	High	Enter	Exit	
DAILY	49.97	16.70	227.50	50%	50%	123
GEN PEAK HR	4.82	1.46	18.32	52%	48%	128

TRIPS:

	BY AVERAGE			BY REGRESSION			R ²
	Total	Enter	Exit	Total	Enter	Exit	
DAILY	12701	6351	6351	16630	8315	8315	0.82
PEAK HR	1225	637	588	1603	834	769	0.83

SUNDAY

RATES:

	Total Trip Ends			Directional Dist.		Number of Studies
	Average	Low	High	Enter	Exit	
DAILY	25.24	4.15	148.15	50%	50%	77
PEAK HR	3.12	0.39	12.40	49%	51%	39

TRIPS:

	BY AVERAGE			BY REGRESSION			R ²
	Total	Enter	Exit	Total	Enter	Exit	
DAILY	6415	3208	3208	8187	4094	4094	0.52
PEAK HR	793	389	404	<---- NOT GIVEN ---->			

SOURCE: Trip Generation, 9th Edition, Institute of Transportation Engineers, 2012.

TRIP GENERATION WORKSHEET

LAND USE: *Drive-In Bank*
LAND USE CODE: 912 Independent Variable---Trips per 1000 SF GLA
PROJECT NAME: 1175 West Boylston Street Current Proposal
PROJECT # : 18057
Gross Leasable Area (KSF): 5.0

WEEKDAY**RATES:**

	Total Trip Ends			Directional Dist.		Number of Studies
	Average	Low	High	Enter	Exit	
DAILY	100.03	32.67	408.42	50%	50%	21
AM PEAK HOUR	9.50	0.89	29.47	58%	42%	46
PM PEAK HOUR	20.45	3.04	109.91	50%	50%	115

TRIPS:

	BY AVERAGE			BY REGRESSION			R ²
	Total	Enter	Exit	Total	Enter	Exit	
DAILY	500	250	250	390	195	195	0.66
AM PEAK	48	28	20	-	-	-	-
PM PEAK	102	51	51	-	-	-	-

SATURDAY**RATES:**

	Total Trip Ends			Directional Dist.		Number of Studies
	Average	Low	High	Enter	Exit	
DAILY	86.48	42.46	171.78	50%	50%	5
GEN PEAK HR	26.35	7.18	107.00	51%	49%	41

TRIPS:

	BY AVERAGE			BY REGRESSION			R ²
	Total	Enter	Exit	Total	Enter	Exit	
DAILY	432	216	216	-	-	-	-
PEAK HR	132	67	65	-	-	-	-

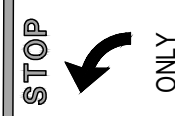
SUNDAY**RATES:**

	Total Trip Ends			Directional Dist.		Number of Studies
	Average	Low	High	Enter	Exit	
DAILY	31.96	23.41	69.31	50%	50%	5
PEAK HR	4.79	3.68	7.43	50%	50%	5

TRIPS:

	BY AVERAGE			BY REGRESSION			R ²
	Total	Enter	Exit	Total	Enter	Exit	
DAILY	106	53	53	-	-	-	-
PEAK HR	24	12	12	21	11	11	0.65

SOURCE: Trip Generation, 10th Edition, Institute of Transportation Engineers, 2017.



PROP. R-
BUILDING
13,872 SF
#9 DIGITA
WAY

PROP. 1
BUILDING
5,000 S
#7 DIGIT
WAY

PROP. R5
BUILDING
10,116 SF
#5 DIGITAL
WAY

PROP. R7
BUILDING
11,153 S
#3 DIGIT
WAY

PARKER STREET
10,800 ADT (2004)

B STREET

$$R=1052.88'$$

11

STOP
DO NOT ENTER

610
500°5

UP 73/47



Know what's below.
Call before you dig.

REVISIONS			
REV	DATE	COMMENT	BY
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
10A			
10B			
13			
14			
15			

PRELIMINARY

PROJECT No.:	W161189
DRAWN BY:	AWP/CFD
CHECKED BY:	NEM/JAK
DATE:	02/15/2017
SCALE:	AS NOTED
CAD I.D.:	W161189SS15

PROJECT: SITE
DEVELOPMENT
PLANS
FOR




MAYNARD CROSSING

LOCATION OF SITE
MAP #25 & LOTS #152 & 152-1
129 PARKER STREET (ROUTE 27)
TOWN OF MAYNARD
MIDDLESEX COUNTY
MASSACHUSETTS



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SOUTHBOROUGH, MA 01772
Phone: (508) 480-9900
Fax: (508) 480-9080
www.BohlerEngineering.com

J.A. KUCIĆH



PROFESSIONAL ENGINEER
 MASSACHUSETTS LICENSE No. 41530
 CONNECTICUT LICENSE No. 26177
 RHODE ISLAND LICENSE No. 9616
 MAINE LICENSE No. 12553

SHEET TITLE:
R-6 BUILDING
DRIVE-THRU
STACKING
EXHIBIT

SHEET NUMBER:

1

OF 1

REV 0 - 12/2/2019

New Drive-Through Stacking Information for Banks and Coffee Shops

Drive-In Banks

Counts were conducted at ten suburban drive-in banks located throughout Overland Park in the fall of 2008 and the spring of 2009. Both established locations and sites that were relatively new were counted, although all banks had been open for business for at least one year. All but one location had drive-through ATMs. Based on the results of counts taken at a single bank location during a mid-week lunch hour, a mid-week p.m. peak hour, a Friday lunch hour, and a Friday p.m. peak hour; the maximum queue lengths occurred during the Friday p.m. peak hour. Therefore, all counts used in the study were conducted during the Friday p.m. peak hour time period.

The counting process involved noting the maximum per lane and total queues for the drive-through lanes at each location in fifteen minute increments, along with collecting information on the stacking of any drive-through ATM. In all cases the vehicles in the service positions were included in the counts. Where possible, the volumes of vehicles entering and exiting the parking lot also were tabulated. As a way to evaluate the frequency of various maximum queue lengths, the total queue lengths were noted at five minute intervals.

The queuing data was analyzed in ways similar to the methods used in the 1995 Report. Table 1 lists the observed frequency of maximum queue lengths per lane. Figure 1 plots the per lane maximum queue lengths using both the 2009 data and the data that was presented in 1995 (please note that the 1995 data involved fifteen counts, compared to the ten counts in the 2009 data). Figure 2 plots the probability that the queue lengths per lane will not exceed a given maximum queue length, once again presenting both 2009 and 1995 data.

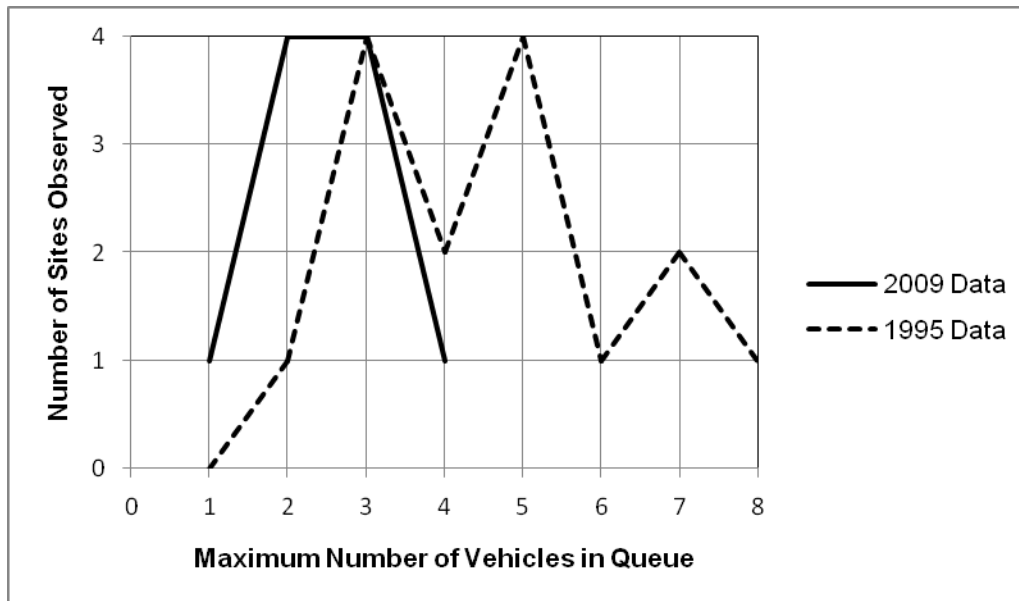
Table 1 – Drive-In Bank 2009 Maximum Queue Length Per Lane

Queue Length	Frequency	Cumulative Frequency	P($q \leq N$)
0	0	0	0.00
1	1	1	.10
2	4	5	.50
3	4	9	.90
4	1	10	1.00

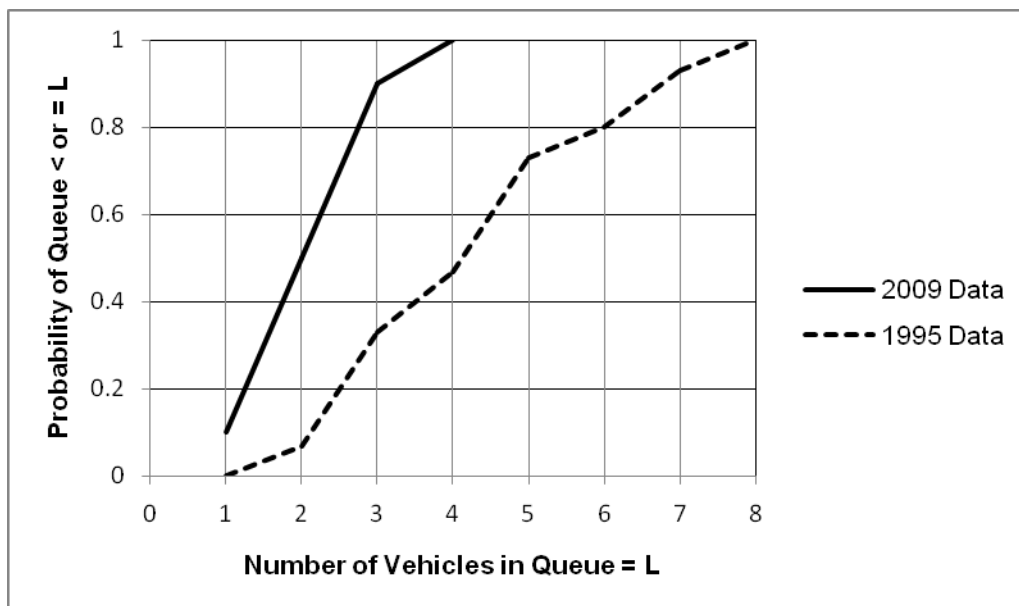
Note: P($q \leq N$) indicates probability, based on sample, of queue length of “q” not exceeding length “N”

New Drive-Through Stacking Information for Banks and Coffee Shops

**Figure 1 – Drive-In Bank 1995 And 2009 Maximum Queue Length
Per Lane Data Plot**



**Figure 2 – Drive-In Bank 1995 And 2009 Cumulative Maximum
Queue Length Per Lane Data Plot**



The differences between the 1995 Report data (as noted earlier, actually based on counts conducted from the late 1960s to the late 1980s) and the 2009 counts are dramatic. The maximum per-lane queue lengths in the current counts were half what they were in the 1995 data.

Appendix D

Drive-Through Queuing Data Form

ITE Land Use Code:

Land Use/Building Type*:

Name of Business:

Address:

City:

State:

Zip Code:

Date(s)

Weather Conditions

Location Within Area (select one):

CBD	<input type="text"/>
Urban (non-CBD)	<input type="text"/>
Suburban (non-CBD)	<input checked="" type="text" value="X"/>
Suburban CBD	<input type="text"/>
Rural	<input type="text"/>
Not Given	<input type="text"/>

Competition Within Area (select one):

High	<input type="text"/>
Medium	<input checked="" type="text" value="X"/>
Low	<input type="text"/>

Drive-Through Description

4 Lanes + 1 ATM Lane

Gross Floor Area (estimated)

	Maximum Queue	Time Max Queue Occurred
Sunday		
Monday		
Tuesday	5	3:36pm
Wednesday	5	2:37pm
Thursday		
Friday		
Saturday		

Appendix D

Drive-Through Queuing Data Form

ITE Land Use Code:

Land Use/Building Type:

Name of Business:

Address:

City:

State:

Zip Code:

Date(s)

Weather Conditions

Location Within Area (select one):

CBD	<input type="text"/>
Urban (non-CBD)	<input type="text"/>
Suburban (non-CBD)	<input checked="" type="text" value="X"/>
Suburban CBD	<input type="text"/>
Rural	<input type="text"/>
Not Given	<input type="text"/>

Competition Within Area (select one):

High	<input type="text"/>
Medium	<input checked="" type="text" value="X"/>
Low	<input type="text"/>

Drive-Through Description :

2 Lanes + 1 ATM Lane

Gross Floor Area (estimated)

7,850 sq. ft

	Maximum Queue	Time Max Queue Occurred
Sunday		
Monday		
Tuesday		
Wednesday	3	3:28pm
Thursday	3	8:51am, 10:37am
Friday		
Saturday		

Appendix D

Drive-Through Queuing Data Form

ITE Land Use Code:
 Land Use/Building Type:

Name of Business:
 Address:
 City:
 State:
 Zip Code:

Date(s)

Weather Conditions

Location Within Area (select one):
 CBD
 Urban (non-CBD)
 Suburban (non-CBD)
 Suburban CBD
 Rural
 Not Given

Competition Within Area (select one):
 High
 Medium
 Low

Drive-Through Description :

5 Lanes + 1 ATM Lane

Gross Floor Area (estimated)

6,000 sq. ft

	Maximum Queue	Time Max Queue Occurred
Sunday	4	5:18pm
Monday		
Tuesday		
Wednesday		
Thursday		
Friday	8	12:20pm, 2:20pm
Saturday	8	11:40am



GREEN INTERNATIONAL AFFILIATES, INC.
Civil and Structural Engineers
 239 Littleton Road, Suite 3
 WESTFORD, MA 01886

JOB 15104 - Maynard Crossing
 SHEET NO. 1 OF 1
 CALCULATED BY SM DATE 12/9/2019
 CHECKED BY WWWJS DATE
 DESCRIPTION Parking Space Demand Analysis Friday Non-December

	Supermarket		Retail		Fitness Club		Office		Apartments		Independent Living								
ITE Land Use	Supermarket		Shopping Center		Health/Fitness Club		General Office		Low/Mid-Rise Apartment		Senior Adult Housing - Attached								
Land Use Code	LUC 850		LUC 820		LUC 492		LUC 701		LUC 221		LUC 252								
Urban Type	Suburban		All Urban Types		All Urban Types		Suburban		Suburban		All Urban Types								
Day of Week	Non-December Weekday		Non-December Friday		Weekday		Weekday		Weekday		Weekday								
Generation Rate Type	Average		Average		Average		Fitted		Fitted		Average								
Size of Land Use	KSF	GSF	69.338	KSF	GLA	184.831	KSF	GFA	20	KSF	GFA	31.537	# Units	180	# Units	143			
Peak Demand per Unit	3.78x		2.94x		5.27x		2.51x+26		1.42x-38		0.59x								
Total Peak Demand, in number of Spaces:	262.09764		543.40314		105.4		105.15787		217.6		84.37								

Hour	% of Day	Total Vehicles	% of Day	Total Vehicles	% of Day	Total Vehicles	% of Day	Total Vehicles	% of Day	Total Vehicles	% of Day	Total Vehicles	% of Day	Total Vehicles	% of Day	Total Vehicles	TOTAL DEMAND	Supply Needed to Serve Demand	Excess Parking, or Shortage
12:00 AM	0%	0	0%	0	0%	0	5%	6	100%	218	100%	85					309	343	1372
1:00 AM	0%	0	0%	0	0%	0	5%	6	100%	218	100%	85					309	343	1372
2:00 AM	0%	0	0%	0	0%	0	5%	6	100%	218	100%	85					309	343	1372
3:00 AM	0%	0	0%	0	0%	0	5%	6	100%	218	100%	85					309	343	1372
4:00 AM	0%	0	0%	0	0%	0	5%	6	100%	218	100%	85					309	343	1372
5:00 AM	0%	0	0%	0	0%	0	5%	6	96%	209	100%	85					300	333	1382
6:00 AM	0%	0	0%	0	20%	22	5%	6	92%	201	100%	85					314	349	1366
7:00 AM	5%	14	0%	0	20%	22	59%	63	74%	162	100%	85					346	384	1331
8:00 AM	18%	48	34%	0	20%	22	79%	84	64%	140	100%	85					379	421	1294
9:00 AM	38%	100	48%	0	26%	28	95%	100	60%	131	100%	85					444	493	1222
10:00 AM	63%	166	63%	0	51%	54	100%	106	60%	131	99%	84					541	601	1114
11:00 AM	71%	187	79%	430	48%	51	98%	104	60%	131	100%	85					988	1098	617
12:00 PM	94%	247	100%	544	42%	45	90%	95	60%	131	95%	81					1143	1270	445
1:00 PM	100%	263	92%	500	47%	50	77%	81	60%	131	97%	82					1107	1230	485
2:00 PM	95%	249	83%	452	38%	41	84%	89	60%	131	97%	82					1044	1160	555
3:00 PM	98%	257	76%	413	41%	44	81%	86	60%	131	99%	84					1015	1128	587
4:00 PM	97%	255	70%	381	61%	65	72%	76	44%	96	96%	81					954	1060	655
5:00 PM	92%	242	73%	397	84%	89	46%	49	59%	129	84%	71					977	1086	629
6:00 PM	79%	208	77%	419	91%	96	25%	27	69%	151	100%	85					986	1096	619
7:00 PM	60%	158	70%	381	100%	106	20%	22	66%	144	100%	85					896	996	719
8:00 PM	60%	158	65%	354	50%	53	20%	22	75%	164	100%	85					836	929	786
9:00 PM	60%	158	60%	327	0%	0	20%	22	77%	168	100%	85					760	844	871
10:00 PM	60%	158	0%	0	0%	0	20%	22	92%	201	100%	85					466	518	1197
11:00 PM	0%	0	0%	0	0%	0	20%	22	94%	205	100%	85					312	347	1368

Sources: Peak Demand 1 1 1 1 1 1
 Hourly Proportions 1 1,2 1 1,2 1,2 1 (LUC 255)

Total Parking Supply 1715

Sources:
 1 Institute of Transportation Engineers, Parking Generation, 5th Edition, Washington, D.C., 2019
 2 Victoria Transport Policy Institute, "Shared Parking: Shared Parking Facilities Among Multiple Users" from *Online TDM Encyclopedia*, Victoria, BC, March 12, 2013



GREEN INTERNATIONAL AFFILIATES, INC.
Civil and Structural Engineers
 239 Littleton Road, Suite 3
 WESTFORD, MA 01886

JOB 15104 - Maynard Crossing
 SHEET NO. 2 OF 1
 CALCULATED BY SM DATE 12/9/2019
 CHECKED BY WWWJS DATE
 DESCRIPTION Parking Space Demand Analysis Saturday Non-December

	Supermarket		Retail		Fitness Club		Office		Apartments		Independent Living								
ITE Land Use	Supermarket		Shopping Center		Health/Fitness Club		General Office		Low/Mid-Rise Apartment		Senior Adult Housing - Attached								
Land Use Code	LUC 850		LUC 820		LUC 492		LUC 701		LUC 221		LUC 252								
Urban Type	Suburban		All Urban Types		All Urban Types		Suburban		Suburban		All Urban Types								
Day of Week	Non-December Saturday		Non-December Saturday		Saturday		Saturday		Saturday		Saturday								
Generation Rate Type	Average		Fitted		Fitted		Fitted		Fitted		Average								
Size of Land Use	KSF	GSF	69.338	KSF	GLA	184.831	KSF	GFA	20	KSF	GFA	31.537	# Units	180	# Units	143			
Peak Demand per Unit	3.92x		3.38x-116		2.63x+7		2.51x+26		1.42x-38		0.59x								
Total Peak Demand, in number of Spaces:	271.80496		508.72878		59.6		105.15787		217.6		84.37								

Hour	% of Day	Total Vehicles	% of Day	Total Vehicles	% of Day	Total Vehicles	% of Day	Total Vehicles	% of Day	Total Vehicles	% of Day	Total Vehicles	% of Day	Total Vehicles	% of Day	Total Vehicles	TOTAL DEMAND	Supply Needed to Serve Demand	Excess Parking, or Shortage
12:00 AM	0%	0	0%	0	0%	0	5%	6	100%	218	100%	85					309	343	1372
1:00 AM	0%	0	0%	0	0%	0	5%	6	100%	218	100%	85					309	343	1372
2:00 AM	0%	0	0%	0	0%	0	5%	6	100%	218	100%	85					309	343	1372
3:00 AM	0%	0	0%	0	0%	0	5%	6	100%	218	100%	85					309	343	1372
4:00 AM	0%	0	0%	0	0%	0	5%	6	100%	218	100%	85					309	343	1372
5:00 AM	0%	0	0%	0	0%	0	5%	6	100%	218	100%	85					309	343	1372
6:00 AM	0%	0	0%	0	20%	12	5%	6	100%	218	100%	85					321	357	1358
7:00 AM	13%	36	0%	0	20%	12	5%	6	100%	218	100%	85					357	397	1318
8:00 AM	27%	74	27%	0	76%	46	5%	6	80%	175	100%	85					386	429	1286
9:00 AM	60%	164	60%	0	94%	57	5%	6	80%	175	100%	85					487	541	1174
10:00 AM	57%	155	75%	0	95%	57	5%	6	80%	175	99%	84					477	530	1185
11:00 AM	61%	166	90%	458	100%	60	5%	6	80%	175	100%	85					950	1056	659
12:00 PM	90%	245	100%	509	87%	52	5%	6	80%	175	95%	81					1068	1187	528
1:00 PM	92%	251	100%	509	82%	49	5%	6	80%	175	97%	82					1072	1191	524
2:00 PM	88%	240	98%	499	78%	47	5%	6	80%	175	97%	82					1049	1166	549
3:00 PM	87%	237	91%	463	73%	44	5%	6	80%	175	99%	84					1009	1121	594
4:00 PM	83%	226	76%	387	77%	46	5%	6	80%	175	96%	81					921	1023	692
5:00 PM	75%	204	67%	341	72%	43	5%	6	80%	175	84%	71					840	933	782
6:00 PM	72%	196	72%	367	68%	41	5%	6	100%	218	100%	85					913	1014	701
7:00 PM	51%	139	70%	357	94%	57	5%	6	100%	218	100%	85					862	958	757
8:00 PM	52%	142	52%	265	50%	30	5%	6	100%	218	100%	85					746	829	886
9:00 PM	44%	120	0%	0	0%	0	5%	6	100%	218	100%	85					429	477	1238
10:00 PM	44%	120	0%	0	0%	0	5%	6	100%	218	100%	85					429	477	1238
11:00 PM	0%	0	0%	0	0%	0	5%	6	100%	218	100%	85					309	343	1372

Sources: Peak Demand 1 1 1 0 0 1
 Hourly Proportions 1 1,2 1 2 2 1 (LUC 255)

+7

Total Parking Supply 1715

Sources:
 1 Institute of Transportation Engineers, Parking Generation, 5th Edition, Washington, D.C., 2019
 2 Victoria Transport Policy Institute, "Shared Parking: Shared Parking Facilities Among Multiple Users" from *Online TDM Encyclopedia*, Victoria, BC, March 12, 2013



GREEN INTERNATIONAL AFFILIATES, INC.
Civil and Structural Engineers
 239 Littleton Road, Suite 3
 WESTFORD, MA 01886

JOB 15104 - Maynard Crossing
 SHEET NO. 3 OF 1
 CALCULATED BY SM DATE 12/9/2019
 CHECKED BY WW/WJS DATE
 DESCRIPTION Parking Space Demand Analysis Friday December

	Supermarket		Retail		Fitness Club		Office		Apartments		Independent Living								
ITE Land Use	Supermarket		Shopping Center		Health/Fitness Club		General Office		Low/Mid-Rise Apartment		Senior Adult Housing - Attached								
Land Use Code	LUC 850		LUC 820		LUC 492		LUC 701		LUC 221		LUC 252								
Urban Type	Suburban		All Urban Types		All Urban Types		Suburban		Suburban		All Urban Types								
Day of Week	December Weekday		December Friday		Weekday		Weekday		Weekday		Weekday								
Generation Rate Type	Average		Fitted		Average		Fitted		Fitted		Average								
Size of Land Use	KSF	GSF	69.338	KSF	GLA	184.831	KSF	GFA	20	KSF	GFA	31.537	# Units	180	# Units	143			
Peak Demand per Unit	4.0824x		3.89x+96		5.27x		2.51x+26		1.42x-38		0.59x								
Total Peak Demand, in number of Spaces:	283.0654512		814.99259		105.4		105.15787		217.6		84.37								

Hour	% of Day	Total Vehicles	% of Day	Total Vehicles	% of Day	Total Vehicles	% of Day	Total Vehicles	% of Day	Total Vehicles	% of Day	Total Vehicles	% of Day	Total Vehicles	% of Day	Total Vehicles	TOTAL DEMAND	Supply Needed to Serve Demand	Excess Parking, or Shortage
12:00 AM	0%	0	0%	0	0%	0	5%	6	100%	218	100%	85					309	343	1372
1:00 AM	0%	0	0%	0	0%	0	5%	6	100%	218	100%	85					309	343	1372
2:00 AM	0%	0	0%	0	0%	0	5%	6	100%	218	100%	85					309	343	1372
3:00 AM	0%	0	0%	0	0%	0	5%	6	100%	218	100%	85					309	343	1372
4:00 AM	0%	0	0%	0	0%	0	5%	6	100%	218	100%	85					309	343	1372
5:00 AM	0%	0	0%	0	0%	0	5%	6	96%	209	100%	85					300	333	1382
6:00 AM	0%	0	0%	0	20%	22	5%	6	92%	201	100%	85					314	349	1366
7:00 AM	5%	15	0%	0	20%	22	59%	63	74%	162	100%	85					347	386	1329
8:00 AM	18%	51	60%	489	20%	22	79%	84	64%	140	100%	85					871	968	747
9:00 AM	38%	108	82%	669	26%	28	95%	100	60%	131	100%	85					1121	1246	469
10:00 AM	63%	179	77%	628	51%	54	100%	106	60%	131	99%	84					1182	1313	402
11:00 AM	71%	201	92%	750	48%	51	98%	104	60%	131	100%	85					1322	1469	246
12:00 PM	94%	267	100%	815	42%	45	90%	95	60%	131	95%	81					1434	1593	122
1:00 PM	100%	284	100%	815	47%	50	77%	81	60%	131	97%	82					1443	1603	112
2:00 PM	95%	269	91%	742	38%	41	84%	89	60%	131	97%	82					1354	1504	211
3:00 PM	98%	278	88%	718	41%	44	81%	86	60%	131	99%	84					1341	1490	225
4:00 PM	97%	275	88%	718	61%	65	72%	76	44%	96	96%	81					1311	1457	258
5:00 PM	92%	261	86%	701	84%	89	46%	49	59%	129	84%	71					1300	1444	271
6:00 PM	79%	224	84%	685	91%	96	25%	27	69%	151	100%	85					1268	1409	306
7:00 PM	60%	170	65%	530	100%	106	20%	22	66%	144	100%	85					1057	1174	541
8:00 PM	60%	170	60%	489	50%	53	20%	22	75%	164	100%	85					983	1092	623
9:00 PM	60%	170	40%	326	0%	0	20%	22	77%	168	100%	85					771	857	858
10:00 PM	60%	170	0%	0	0%	0	20%	22	92%	201	100%	85					478	531	1184
11:00 PM	0%	0	0%	0	0%	0	20%	22	94%	205	100%	85					312	347	1368

Sources: Peak Demand 1 1 1 1 1 1
 Hourly Proportions 1 1,2 1 1,2 1,2 1 (LUC 255)

Total Parking Supply 1715

Sources:
 1 Institute of Transportation Engineers, Parking Generation, 5th Edition, Washington, D.C., 2019
 2 Victoria Transport Policy Institute, "Shared Parking: Shared Parking Facilities Among Multiple Users" from *Online TDM Encyclopedia*, Victoria, BC, March 12, 2013



GREEN INTERNATIONAL AFFILIATES, INC.
Civil and Structural Engineers
 239 Littleton Road, Suite 3
 WESTFORD, MA 01886

JOB 15104 - Maynard Crossing
 SHEET NO. 4 OF 1
 CALCULATED BY SM DATE 12/9/2019
 CHECKED BY WWWJS DATE
 DESCRIPTION Parking Space Demand Analysis Saturday December

	Supermarket		Retail		Fitness Club		Office		Apartments		Independent Living								
ITE Land Use	Supermarket		Shopping Center		Health/Fitness Club		General Office		Low/Mid-Rise Apartment		Senior Adult Housing - Attached								
Land Use Code	LUC 850		LUC 820		LUC 492		LUC 701		LUC 221		LUC 252								
Urban Type	Suburban		All Urban Types		All Urban Types		Suburban		Suburban		All Urban Types								
Day of Week	December Saturday		December Saturday		Saturday		Saturday		Saturday		Saturday								
Generation Rate Type	Average		Fitted		Fitted		Fitted		Fitted		Average								
Size of Land Use	KSF GSF	69.338	KSF GLA	184.831	KSF GFA	20	KSF GFA	31.537	# Units	180	# Units	143							
Peak Demand per Unit	4.2336x		4.60x+115		2.63x+7		2.51x+26		1.42x-38		0.59x								
Total Peak Demand, in number of Spaces:	293.5493568		965.2226		59.6		105.15787		217.6		84.37								

Hour	% of Day	Total Vehicles	% of Day	Total Vehicles	% of Day	Total Vehicles	% of Day	Total Vehicles	% of Day	Total Vehicles	% of Day	Total Vehicles	% of Day	Total Vehicles	% of Day	Total Vehicles	TOTAL DEMAND	Supply Needed to Serve Demand	Excess Parking, or Shortage
12:00 AM	0%	0	0%	0	0%	0	5%	6	100%	218	100%	85					309	343	1372
1:00 AM	0%	0	0%	0	0%	0	5%	6	100%	218	100%	85					309	343	1372
2:00 AM	0%	0	0%	0	0%	0	5%	6	100%	218	100%	85					309	343	1372
3:00 AM	0%	0	0%	0	0%	0	5%	6	100%	218	100%	85					309	343	1372
4:00 AM	0%	0	0%	0	0%	0	5%	6	100%	218	100%	85					309	343	1372
5:00 AM	0%	0	0%	0	0%	0	5%	6	100%	218	100%	85					309	343	1372
6:00 AM	0%	0	0%	0	20%	12	5%	6	100%	218	100%	85					321	357	1358
7:00 AM	13%	39	0%	0	20%	12	5%	6	100%	218	100%	85					360	400	1315
8:00 AM	27%	80	68%	657	76%	46	5%	6	80%	175	100%	85					1049	1166	549
9:00 AM	60%	177	77%	744	94%	57	5%	6	80%	175	100%	85					1244	1382	333
10:00 AM	57%	168	93%	898	95%	57	5%	6	80%	175	99%	84					1388	1542	173
11:00 AM	61%	180	100%	966	100%	60	5%	6	80%	175	100%	85					1472	1636	79
12:00 PM	90%	265	94%	908	87%	52	5%	6	80%	175	95%	81					1487	1652	63
1:00 PM	92%	271	97%	937	82%	49	5%	6	80%	175	97%	82					1520	1689	26
2:00 PM	88%	259	96%	927	78%	47	5%	6	80%	175	97%	82					1496	1662	53
3:00 PM	87%	256	89%	860	73%	44	5%	6	80%	175	99%	84					1425	1583	132
4:00 PM	83%	244	83%	802	77%	46	5%	6	80%	175	96%	81					1354	1504	211
5:00 PM	75%	221	72%	695	72%	43	5%	6	80%	175	84%	71					1211	1346	369
6:00 PM	72%	212	70%	676	68%	41	5%	6	100%	218	100%	85					1238	1376	339
7:00 PM	51%	150	70%	676	94%	57	5%	6	100%	218	100%	85					1192	1324	391
8:00 PM	52%	153	70%	676	50%	30	5%	6	100%	218	100%	85					1168	1298	417
9:00 PM	44%	130	0%	0	0%	0	5%	6	100%	218	100%	85					439	488	1227
10:00 PM	44%	130	0%	0	0%	0	5%	6	100%	218	100%	85					439	488	1227
11:00 PM	0%	0	0%	0	0%	0	5%	6	100%	218	100%	85					309	343	1372

Sources: Peak Demand 1 1 1 0 0 1
 Hourly Proportions 1 1,2 1 2 2 1 (LUC 255)

+7

Total Parking Supply 1715

Sources:
 1 Institute of Transportation Engineers, Parking Generation, 5th Edition, Washington, D.C., 2019
 2 Victoria Transport Policy Institute, "Shared Parking: Shared Parking Facilities Among Multiple Users" from *Online TDM Encyclopedia*, Victoria, BC, March 12, 2013