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MATTRESS SUPERSTORE DEVELOPMENT



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EXECUTIVE SUMMARY

This report documents the findings of the traffic impact and access study conducted for the proposed Mattress Superstore located at 205 Broadway in Somerville, Massachusetts. The study includes an evaluation of the existing conditions, as well as projected future traffic volumes without the proposed project (No-Build) and future traffic volumes with the proposed project (Build). Potential traffic impacts associated with the development were analyzed.

PROJECT OVERVIEW

The proposed project site is located at the northeast corner of the intersection of Broadway and McGrath Highway in Somerville, Massachusetts (Figure 1). The project proponent, Mattress Superstore, wishes to build a two-story mattress superstore with 3,520 square feet of ground level retail space and approximately 3,386 square feet of storage space on the second floor. Additionally, six parking spaces are shown on the proposed site plan. The Overall Site Plan designed by Choo and Company, Inc. is enclosed in Appendix A.

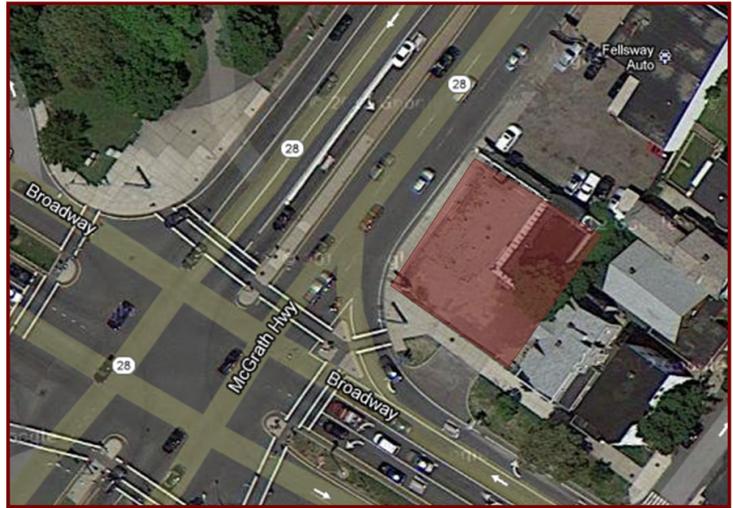


Figure 1 – Proposed Development Site Location

The Applicant is also seeking parking requirement relief for the currently proposed six parking spaces.

STUDY METHODOLOGY

This study was conducted using a widely accepted methodology for traffic studies. The first step in the study process involves the study of existing traffic conditions in the vicinity of the proposed project. The existing conditions assessment includes an inventory of roadway geometry, off-street parking utilization, assessment of recent crash trends, observation of traffic flow, and collection of peak hour traffic counts. The second step in the study process is to analyze the projected future conditions, without the proposed project. The final step in the study process is to analyze the future conditions with the proposed project and address any projected traffic and safety issues that may need to be mitigated.

EXISTING CONDITIONS

In order to predict the transportation impacts of a proposed project on a roadway network, understanding the existing conditions of the study area is required. Existing conditions described below include roadway and intersection geometry, a traffic control inventory, daily and peak period traffic volumes, and vehicular crash data information.

STUDY AREA

After consulting with the City of Somerville's Traffic Engineer, a comprehensive study area which includes all intersections along the Broadway corridor was created. Study area intersections were evaluated taking into consideration the traffic control inventory, roadway geometry, peak period traffic volumes, and vehicular crash history. Accordingly, the project study area includes the following intersections:

- Broadway at McGrath Highway (Route 28)
- Broadway at Garfield Avenue
- Broadway at Cross Street
- Cross Street East at Blakeley Avenue
- Blakeley Avenue at Kensington Avenue

ROADWAY GEOMETRIES

The study area includes the following major roadways:

McGrath-O'Brien Highway/Route 28

McGrath Highway/Route 28 is a divided six-lane major arterial that provides alternative connections from I-93 to Cambridge and downtown Boston. McGrath Highway runs along the northwest side of the project site in the north-south direction. To the north of the study area, McGrath Highway intersects Mystic Avenue before becoming Fellsway just before the Wellington Bridge. Parking is prohibited on both sides of the roadway. Land uses in the area consist of residential, recreational, retail and commercial properties.

Broadway

Broadway is generally a two-lane arterial roadway running along the south side of the project site. Broadway runs along the south side of the study area in a northwest-southeast direction, linking Powder House Circle near Tufts University to Sullivan Square via the Winter Hill neighborhood. Between Powder House Circle and Sullivan Square, Broadway is generally a four-lane arterial roadway carrying between 20,000 and 30,000 vehicles per day. Land uses in the area consist of residential, recreational, retail and commercial properties.

INTERSECTION GEOMETRIES

The study area includes three signalized and two unsignalized intersections. They are as follows:

- Broadway at McGrath Highway
- Broadway at Garfield Avenue
- Broadway at Cross Street
- Cross Street East at Blakeley Avenue
- Blakeley Avenue at Kensington Avenue



Broadway at McGrath Highway (Route 28) (signalized)

The intersection of Broadway at McGrath Highway forms a four-legged signalized intersection. Broadway runs in a northwest-southeast direction while McGrath Highway runs in a northeast-southwest direction. Both McGrath Highway approaches consist of one left turn lane, one through/left turn lane, one through lane, and one through/right turn lane. The Broadway northwest bound approach consists of one left turn lane, one through/left turn lane, one through lane, and one channelized right turn lane. The Broadway southeast bound approach consists of one

left turn lane, one through/left turn lane, two through lanes, and one right turn lane. Medians are present along Broadway and McGrath Highway at the intersection. The medians along Broadway are landscaped. Sidewalks and crosswalks are present on all approaches. Land uses in the area consist of residential, recreational, retail and commercial properties.

Broadway at Garfield Avenue (signalized)

The intersection of Broadway at Garfield Avenue forms a four-legged signalized intersection. Broadway runs in a northwest-southeast direction while Garfield Avenue runs northeast-southwest. The Broadway northwest bound approach consists of one through lane and one shared through/right-turn lane. The Broadway southeast bound approach consists of two through lanes and a left turn lane. The Garfield Avenue southwest bound approach is an un-striped general purpose lane.

Sidewalks are present on all approaches with crosswalks across Garfield Avenue and the southeast approach of Broadway. Land uses in the area consist of residential, retail and commercial properties.



Figure 3 – Broadway at Garfield Avenue



Figure 4 – Broadway at Cross Street

Broadway at Cross Street (signalized)

The intersection of Broadway at Cross Street forms a four-legged signalized intersection. Broadway runs in a northwest-southeast direction while Cross Street runs northeast-southwest. The Broadway northwest and southeast bound approaches consist of one left turn lane, one through lane, and one shared through/right turn lane in each direction. The Cross Street an unstriped two-way roadway with one general purpose lane in each approach at the intersection.

Sidewalks are present on all approaches with crosswalks across both Cross Street approaches and the southeast approach of Broadway. Land uses in the area consist of residential, retail and commercial

properties.

Blakeley Avenue at Kensington Avenue (unsignalized)

The intersection of Blakeley Avenue and Kensington Avenue forms a three-way unsignalized T-intersection. Blakeley Avenue runs in a northwest-southeast direction while Kensington Avenue intersections from the southwest. Blakeley Avenue is striped with one lane in each direction with traffic restricted to only travel in a through direction through the intersection. Kensington Avenue is a one-way unstriped roadway allowing traffic to travel northeast, entering the intersection. Due to a small median separating travel lanes along Blakeley Avenue at the intersection, vehicles entering the intersection from Kensington Avenue must make a right turn onto Blakeley Avenue. A driveway servicing the Stop n’ Stop, located north of the intersection, is located approximately 45 feet northwest of the Blakeley Avenue and Kensington Avenue intersection.

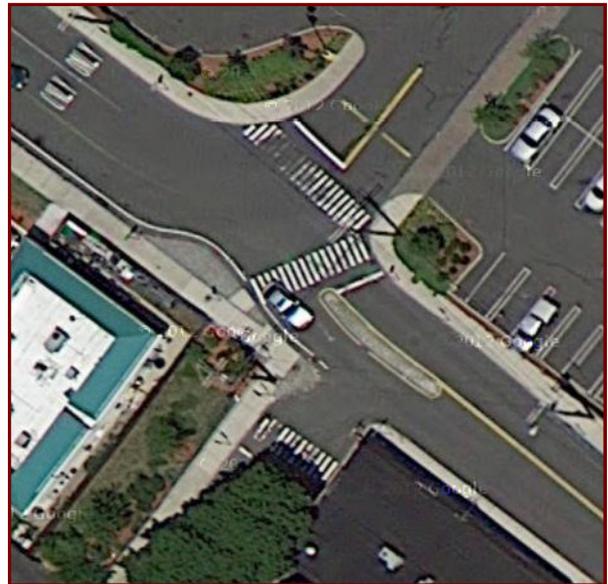


Figure 5 – Blakeley Avenue at Kensington Avenue

Sidewalks are present on all approaches with a crosswalk across Kensington Avenue. Land uses in the area consist of residential, retail and commercial properties.



***Blakeley Avenue at Garfield Avenue
(unsignalized)***

The intersection of Blakeley Avenue and Garfield Avenue forms a four-legged unsignalized intersection. Blakeley Avenue runs in a northwest-southeast direction while Garfield Avenue runs northeast-southwest. Blakeley Avenue is striped with one lane in each direction with the southwest bound approach free flowing and all other approaches operating as stop. Garfield Avenue is striped with one lane in each direction with both approaches operating as stop controlled. The southwest bound approach of Garfield Avenue also acts as a driveway, servicing the Stop n’ Stop located on the north corner of the intersection.

Figure 6 – Blakeley Avenue at Garfield Avenue

Sidewalks and crosswalks are present on all approaches. Land uses in the area consist of residential, retail and commercial properties.

TRAFFIC VOLUME DATA

Daily and peak hour traffic volume data were collected to establish baseline traffic conditions within the study area. Traffic fluctuations over a typical day provide insight into when peak periods occur and the intensity of traffic occurring during the peak period. Manual peak hour turning movements and vehicle classification counts were conducted at each of the study area intersections.

While individual intersections may experience different peak periods, the weekday morning peak period was determined to be from 7:00 AM to 9:00 AM while the weekday evening peak period was determined to be from 4:00 PM to 6:00 PM. The weekend afternoon peak period was determined to be from 12:00 PM to 2:00 PM. The peak periods occur due to the large amount of residents in the area traveling to and from work during those hours. Turning Movement Counts (TMCs) were collected during the peak periods on January 24th, January 25th, and January 26th of 2013 at the study area intersections and may be found in Appendix B.

SAFETY ANALYSIS

VEHICULAR CRASH DATA

Vehicular crash data was obtained from MassDOT Highway Division for the most recent three years available for the City of Somerville, 2008 through 2010. The data includes all reported crashes with a property damage value greater than \$1,000 or crashes that involved personal injuries or fatalities. The crash data for the City were reviewed to obtain the crashes that occurred within the study area and identify crash trends. MassDOT Highway Division crash data are summarized in Table 1.

Table 1 – Vehicular Crash Summary (2008-2010)

	Broadway at McGrath Highway	Broadway at Garfield Avenue	Broadway at Cross Street East	Blakeley Avenue at Kensington Avenue	Blakeley Avenue at Garfield Avenue
Currently Signalized	Yes	Yes	Yes	No	No
MassDOT ACR	0.78	0.78	0.78	0.59	0.59
MassDOT CCR	0.47	1.07	0.69	0.00	0.00
Exceeds?	No	Yes	No	No	No
Year					
2008	13	5	5	0	0
2009	11	5	4	0	0
<u>2010</u>	<u>9</u>	<u>7</u>	<u>4</u>	<u>0</u>	<u>0</u>
Total	33	17	13	0	0
Collision Type					
Angle	6	7	6	0	0
Head-on	0	0	0	0	0
Rear-end	14	5	1	0	0
Sideswipe	3	1	2	0	0
Single-vehicle crash	8	2	1	0	0
<u>Unknown</u>	<u>2</u>	<u>2</u>	<u>3</u>	<u>0</u>	<u>0</u>
Total	33	17	13	0	0
Severity					
Fatal	0	0	0	0	0
Injury	14	7	3	0	0
Property-related	14	5	9	0	0
<u>Unknown</u>	<u>5</u>	<u>5</u>	<u>1</u>	<u>0</u>	<u>0</u>
Total	33	17	13	0	0
Time of day					
Weekday, 7:00AM - 9:00AM	5	3	0	0	0
Weekday, 4:00PM - 6:00PM	4	2	2	0	0
Saturday, 11:00AM - 2:00PM	0	0	0	0	0
Weekday, other time	18	9	8	0	0
<u>Weekend, other time</u>	<u>6</u>	<u>3</u>	<u>3</u>	<u>0</u>	<u>0</u>
Total	33	17	13	0	0
Pavement Condition					
Dry	27	9	9	0	0
Wet	4	6	3	0	0
Snow	2	0	1	0	0
Other	0	0	0	0	0
<u>Unknown</u>	<u>0</u>	<u>2</u>	<u>0</u>	<u>0</u>	<u>0</u>
Total	33	17	13	0	0

ACR Average crash rate
 CCR Calculated crash rate
 Source: MassDOT Highway Division vehicle crash data

The MassDOT Highway Division raw data and crash rate worksheets are enclosed in Appendix C of this study.

INTERSECTION SAFETY

As part of the safety assessment, crash rates were calculated for each of the study area intersections. A crash rate is the representative number of crashes that occur at a particular intersection for every 1,000,000 vehicles that enter that intersection. For example, a crash rate of 1.0 indicates that one crash occurs at an intersection for every 1,000,000 vehicles that enter it. The calculated crash rate for each intersection was then compared to the current MassDOT District 4 average crash rate (0.78 for signalized intersections and 0.59 for unsignalized intersections) to determine whether each intersection in the study area experiences a greater than average crash rate.

One intersection in the study area exceeds the District 4 average crash rate:

- Broadway at Garfield Avenue

This safety assessment also included a review of the statewide High Crash Location list¹. This annually published list includes the top 200 crash locations within the Commonwealth. None of the intersections within the study area are on this list.

PEDESTRIAN SAFETY

As part of this safety assessment, the MassDOT Crash database was reviewed for any crashes specific to pedestrians. The review in this study included a three-year period between January 2008 and December 2010. Within the study area, there were four reported crashes involving a pedestrian within the three-year period. No fatalities were reported, however there were three crashes resulting in personal injuries. The intersections that experienced crashes involving pedestrians are listed below:

- McGrath Highway (Route 28) at Broadway (3 crashes)
- Broadway at Garfield Avenue (1 crash)

It is important to note that the MassDOT database has been created to provide information on vehicular crashes in cities and towns. Therefore, the pedestrian incidents reported are a result of vehicular conflict. Pedestrian incidents resulting from a conflict with a bicycle or other non-motorized source are not reported. No database quantifying these types of incidents currently exists.

BICYCLE SAFETY

The MassDOT Crash database was reviewed for any crashes specific to bicycles. In the three-year period between January 2008 and December 2010, four crashes involving bicycles were reported at study area intersections. No fatalities were reported, however, there were three crashes resulting in personal injuries. Only two cases occurred during darkness. The intersections that experienced crashes involving bicycles are listed below:

- McGrath Highway (Route 28) at Broadway (1 crash)
- Broadway at Garfield Avenue (1 crash)

¹ 2010 Top 200 Crash Locations Report (2008-2010), Massachusetts Department of Transportation, 2012.

- Broadway at Cross Street (2 crashes)

It is important to note that the MassDOT database has been created to provide information on vehicular crashes in cities and towns. Therefore, the reported bicycle incidents are all a result of vehicular conflict. Bicycle incidents resulting from a conflict with another bicycle, pedestrian, or fixed object are not reported. No database quantifying these types of incidents currently exists.

VEHICULAR TRAFFIC OPERATIONS

Intersection capacity analyses were conducted for the study area intersections based on the existing traffic volumes, intersection geometry and traffic control. Measuring existing traffic volumes quantifies traffic flow within the study area. Capacity analyses provide an indication of how well the intersections accommodate the traffic demands placed upon them. A computer software package, *SYNCHRO*, was used to model traffic conditions at the project area intersections. This software package is based on procedures outlined in the *2010 Highway Capacity Manual (HCM)*.²

Level of Service (LOS) is the letter designation used to denote the different operating conditions that occur at a given intersection under various traffic conditions. It is a qualitative measure of the effect of a number of factors including roadway geometry, speed, travel delay, freedom to maneuver, and safety. LOS provides an index to the operational qualities of an intersection. LOS designations range from A to F, with LOS A representing the optimal operating conditions with little or no delay and LOS F representing the worst operating conditions with high congestion and long delays. LOS D or better is generally considered an acceptable operating condition. In practice, any intersection or roadway segment may operate at a wide LOS range depending upon the time of day, day of week, or time of year. LOS is based on the control delay ranges they fall under. The control delay thresholds for determining the vehicular LOS values for signalized and unsignalized intersections are shown below in Table 2.

Table 2 - Vehicular Level of Service Thresholds

Level of Service	Unsignalized Intersection Control Delay	Signalized Intersection Control Delay
	Range (seconds)	Range (seconds)
A	≤10	≤10
B	>10 and ≤15	>10 and ≤20
C	>15 and ≤25	>20 and ≤35
D	>25 and ≤35	>35 and ≤55
E	>35 and ≤50	>55 and ≤80
F	>50	>80

Source: 2010 Highway Capacity Manual

Control delay is the primary performance measure for signalized intersections. Control delay is a portion of total delay credited to traffic signals; vehicles decelerating and stopping once a signal turns red then accelerating once the signal turns green. For signalized intersections, the analysis considers the operation of each lane group entering the intersection and the overall conditions at the intersection.

² *2010 Highway Capacity Manual*, Transportation Research Board, Washington D.C., 2010.

Unlike signalized intersections, unsignalized intersections are analyzed by the critical movement of the intersection. It is assumed that through movements on the main street have the right of way and are not delayed due to the side street traffic. Consequently, delay values apply only to the minor street intersection approaches or the left turns from the major street onto a minor street, which must yield to the on-coming traffic on the major street in the opposite direction.

Control delay coupled with the respective volume-to-capacity ratio characterizes the LOS of that lane group entering the intersection. Volume to capacity ratio quantifies the degree to which a phase's capacity is utilized by the lane group. The results of the existing conditions traffic operations analysis are presented in Tables 3.

SYNCHRO traffic analysis output sheets are enclosed in Appendix D of this study.

Table 3 - Existing Condition Signalized Intersection Traffic Operations

Location	Movement	Thursday Morning Peak Period			Thursday Evening Peak Period			Friday Morning Peak Period			Friday Evening Peak Period			Saturday Midday Peak Period		
		v/c ¹	Del ²	LOS ³	v/c	Del	LOS	v/c	Del	LOS	v/c	Del	LOS	v/c	Del	LOS
Broadway at McGrath Hwy	EB Left	3.79	>120	F	3.29	>120	F	3.87	>120	F	4.11	>120	F	4.35	>120	F
	EB Thru	3.53	>120	F	3.04	>120	F	3.46	>120	F	3.62	>120	F	3.90	>120	F
	EB Right	0.91	88.90	F	0.11	39.10	D	0.68	52.00	D	0.10	40.50	D	0.10	37.20	D
	WB Left	0.80	72.40	E	0.88	80.00	E	0.77	63.80	E	0.87	76.60	E	0.78	58.30	E
	WB Thru	0.73	42.90	D	0.71	40.10	D	0.75	43.80	D	0.71	39.30	D	0.59	34.60	C
	WB Right	0.09	32.90	C	0.16	32.50	C	0.11	32.40	C	0.16	31.40	C	0.14	30.40	C
	NB Left	0.58	37.90	D	0.77	49.50	D	0.48	36.80	D	0.68	43.30	D	0.46	33.80	C
	NB Thru/Right	1.22	>120	F	2.67	>120	F	1.13	115.20	F	2.52	>120	F	1.46	>120	F
	SB Left	0.40	20.70	C	1.11	>120	F	0.52	22.40	C	0.89	64.60	E	1.09	>120	F
	SB Thru/Right	1.15	106.60	F	1.00	52.50	D	1.23	>120	F	0.90	37.70	D	0.81	31.40	C
	Overall	1.43	>120	F	1.67	>120	F	1.42	>120	F	1.65	>120	F	1.55	>120	F
Broadway at Garfield Ave	EB Left	0.11	5.10	A	0.20	5.40	A	0.12	5.10	A	0.26	5.70	A	0.21	4.80	A
	EB Thru	0.32	5.80	A	0.25	5.50	A	0.30	5.70	A	0.28	5.60	A	0.24	4.80	A
	WB Thru/Right	0.29	5.60	A	0.43	6.20	A	0.33	5.80	A	0.43	6.20	A	0.31	5.00	A
	SB Left/Right	0.66	18.10	B	0.63	17.10	B	0.71	20.40	C	0.51	14.40	B	0.44	14.30	B
	Overall	0.43	7.90	A	0.49	7.70	A	0.45	8.40	A	0.46	7.10	A	0.34	6.10	A
Broadway at Cross St	EB Left	0.05	4.80	A	0.13	11.50	B	0.04	5.00	A	0.18	12.10	B	0.13	7.20	A
	EB Thru/Right	0.42	6.10	A	0.45	13.20	B	0.41	6.30	A	0.46	13.50	B	0.34	8.00	A
	WB Left	0.17	5.40	A	0.22	12.00	B	0.16	5.50	A	0.30	13.10	B	0.16	7.40	A
	WB Thru/Right	0.24	5.40	A	0.41	12.90	B	0.25	5.60	A	0.44	13.30	B	0.29	7.70	A
	NB	0.51	15.80	B	0.57	12.40	B	0.54	16.30	B	0.58	12.50	B	0.51	13.00	B
	SB	0.06	12.50	B	0.03	8.20	A	0.05	12.30	B	0.01	8.10	A	0.01	9.70	A
	Overall	0.44	6.90	A	0.52	12.70	B	0.45	7.30	A	0.52	13.10	B	0.42	8.70	A

1 Volume-to-capacity ratio

2 Average delay expressed in seconds per vehicle

3 Level-of-Service

Note: Using Synchro 7 software.

The following signalized intersection currently operates at LOS F during one or both peak hours:

- Broadway at McGrath Highway (Route 28)

The LOS for an unsignalized intersection does not represent the entire intersection, but rather the worst minor movement, for example, the left turn of the side street. The major movement generally operates at a LOS A unless otherwise noted.

Due to the lane configuration of the two unsignalized intersections, capacity analysis was incapable of producing level of services values. It should be noted that traffic volumes at both intersections are low, with no traffic operation problems observed.

PARKING

A parking inventory was conducted in the immediate vicinity of the project site. Parking inventory data were collected on Thursday, January 24th, 2013 and Saturday, January 26th, 2013 between the hours of 1:00 PM and 2:00 PM, and again between 5:00 PM and 6:00 PM, reflective of the time of day when residents have presumably returned home for the evening. The inventory includes total parking supply, along with mid-day and evening parking utilization counts (the number of parking spaces occupied) within the study area.

Table 4 – Existing On-Street Parking Utilization Summary

Description				# Parking Spaces Available							
Street	Section	Street Side	Total Parking Spaces	Thursday Midday		Thursday Evening		Saturday Midday		Saturday Evening	
Broadway	Kensington Ave. to Garfield Ave.	North	4	4	100%	4	100%	4	100%	4	100%
		South	2	2	100%	2	100%	2	100%	2	100%
Broadway	Garfield Ave. to Cross St.	North	4	4	100%	4	100%	4	100%	4	100%
		South	4	4	100%	4	100%	4	100%	4	100%
Kensington Ave.	Blakeley Ave. to Broadway	West	13	5	38%	7	54%	5	38%	5	38%
		East	15	5	33%	8	53%	8	53%	3	20%
Garfield Ave.	Blakeley Ave. to Broadway	East	10	0	0%	4	40%	0	0%	2	20%
Cross St.	Broadway to the end	West	26	14	54%	15	58%	18	69%	14	54%
		East	10	3	30%	6	60%	6	60%	2	20%
Overall Total			88	41	47%	54	61%	51	58%	40	45%

Note: Afternoon data collected 1-24-13 and 1-26-13 between 1:00 to 2:00 PM.

Note: Evening data collected 1-24-13 and 1-26-13 between 5:00 to 6:00 PM.

SUMMARY

The existing conditions assessment for the study area evaluated traffic, bicycle and pedestrian operations, and safety statistics. The existing conditions assessment for the study area indicated the following:

- The intersection of Broadway at Garfield Avenue currently exceeds the statewide and District 4 average crash rates.
- None of the project area intersections are currently ranked on the MassDOT Top 200 High Crash Location list.
- The intersection of Broadway at McGrath Highway (Route 28) currently operates at LOS F during at least one peak hour.
- On-street parking is available to the public in close vicinity to the project area; 47% of on-street spaces are observed to be available during the weekday midday period, 61% were observed to be available during the weekday evening period, 58% were observed to be available during the

Saturday midday period, and 45% of these are spaces observed to be available during the Saturday evening period.

FUTURE CONDITIONS (2018)

This section discusses future conditions with and without the proposed redevelopment. The future No-Build condition assumes that the proposed project is not built. The No-Build condition does, however, assume that other planned developments in the area have occurred. An estimated annual percentage increase has been applied to the study area traffic volumes for the future condition projected year of 2018, a 5-year horizon. The future Build condition adds the estimated traffic generated from the proposed project to the No-Build condition. The No-Build and Build conditions were analyzed for various transportation components including: traffic forecasting, vehicular traffic, pedestrians, bicycles, parking, and public transportation.

FUTURE NO-BUILD CONDITIONS (2018)

NO-BUILD TRAFFIC VOLUMES

In accordance with City of Somerville requirements and the City's Traffic Engineer, the No-Build traffic volumes were developed by applying a 0.5 percent annual growth rate over the five-year study horizon to the Existing traffic volumes.

NO-BUILD VEHICULAR TRAFFIC OPERATIONS

A traffic operation analysis was conducted for each of the study area intersections under the future No-Build condition.

As presented in Table 5, one signalized intersection in the study area would continue to operate at LOS F under the proposed No-Build (2017) condition during at least one peak hour.

- Broadway at McGrath Highway (Route 28)

The intersection of Broadway at Garfield would continue to operate at LOS A under the proposed No-Build (2017) condition during all peak hours. The intersection of Broadway at Cross Street would continue to operate at desirable levels of service (A and B) during peak hours.

Table 5 - Future No-Build Condition Signalized Intersection Traffic Operations

Location	Movement	Thursday Morning Peak Period			Thursday Evening Peak Period			Friday Morning Peak Period			Friday Evening Peak Period			Saturday Midday Peak Period		
		v/c ¹	Del ²	LOS ³	v/c	Del	LOS	v/c	Del	LOS	v/c	Del	LOS	v/c	Del	LOS
Broadway at McGrath Hwy	EB Left	3.96	>120	F	3.31	>120	F	4.03	>120	F	4.34	>120	F	4.58	>120	F
	EB Thru	3.61	>120	F	3.05	>120	F	3.59	>120	F	3.69	>120	F	4.04	>120	F
	EB Right	0.99	113.10	F	0.11	38.50	D	0.76	60.40	E	0.10	40.90	D	0.11	38.00	D
	WB Left	0.80	72.40	E	0.80	64.30	E	0.78	63.70	E	0.89	82.10	F	0.80	61.20	E
	WB Thru	0.76	44.30	D	0.70	40.20	D	0.76	43.70	D	0.74	40.40	D	0.62	35.60	D
	WB Right	0.09	32.80	C	0.17	32.90	C	0.15	32.50	C	0.16	31.60	C	0.14	30.90	C
	NB Left	0.60	38.80	D	0.78	49.50	D	0.49	37.20	D	0.70	44.90	D	0.48	34.70	C
	NB Thru/Right	1.26	>120	F	2.69	>120	F	1.17	>120	F	2.61	>120	F	1.52	>120	F
	SB Left	0.42	20.90	C	1.14	>120	F	0.54	23.20	C	0.92	71.70	E	1.14	>120	F
	SB Thru/Right	1.19	>120	F	1.01	54.90	D	1.27	>120	F	0.92	40.10	D	0.81	31.70	C
Overall		1.47	>120	F	1.68	>120	F	1.46	>120	F	1.69	>120	F	1.59	>120	F
Broadway at Garfield Ave	EB Left	0.11	5.10	A	0.21	5.50	A	0.12	5.10	A	0.27	5.70	A	0.22	4.90	A
	EB Thru	0.33	5.80	A	0.26	5.50	A	0.30	5.70	A	0.29	5.70	A	0.25	4.90	A
	WB Thru/Right	0.29	5.70	A	0.45	6.30	A	0.34	5.80	A	0.44	6.30	A	0.32	5.10	A
	SB Left/Right	0.68	18.90	B	0.65	17.50	B	0.73	21.30	C	0.53	14.60	B	0.44	14.30	B
	Overall		0.44	8.10	A	0.51	7.80	A	0.46	8.60	A	0.47	7.10	A	0.35	6.10
Broadway at Cross St	EB Left	0.05	4.80	A	0.14	12.30	B	0.04	5.00	A	0.20	12.90	B	0.13	7.30	A
	EB Thru/Right	0.43	6.20	A	0.48	14.10	B	0.42	6.40	A	0.48	14.30	B	0.35	8.10	A
	WB Left	0.18	5.50	A	0.24	13.10	B	0.17	5.60	A	0.33	14.00	B	0.17	7.50	A
	WB Thru/Right	0.24	5.40	A	0.43	13.80	B	0.25	5.70	A	0.45	14.10	B	0.30	7.80	A
	NB	0.52	16.00	B	0.57	12.10	B	0.55	16.70	B	0.57	12.50	B	0.52	13.10	B
	SB	0.06	12.60	B	0.03	8.00	A	0.05	12.50	B	0.01	8.10	A	0.01	9.70	A
	Overall		0.45	7.00	A	0.53	13.40	B	0.46	7.40	A	0.53	13.70	B	0.42	8.80

1 Volume-to-capacity ratio

2 Average delay expressed in seconds per vehicle

3 Level-of-Service

Note: Using Synchro 7 software.

As previously mentioned, due to the lane configuration of the two unsignalized intersections, capacity analysis was incapable of producing HCM level of services values. It should be noted that traffic volumes at both intersections are low, with no traffic operation problems observed. It is forecasted that operations will continue to function as they do today.

FUTURE BUILD CONDITION (2017)

BUILD TRAFFIC VOLUMES

From the future No-Build condition traffic volumes, the project-generated trips were estimated and distributed based on the proposed development program and existing travel patterns.

TRIP GENERATION

To evaluate the traffic impacts of the proposed redevelopment it is necessary to determine the amount of traffic expected to be generated. The trip generation calculations are based on data compiled in Trip Generation³, a standard reference guide used as a tool for planners, transportation professionals, and others who are interested in estimating the number of vehicle trips generated by a proposed development or land use once constructed and occupied. This document is based on more than 4,250 trip generation studies submitted to the Institute of Transportation Engineers (ITE) by public agencies, owners, consulting firms, and associations.

³ Trip Generation, 8th Edition, Institute of Transportation Engineers, 2008

The proposed redevelopment consists of 3,875 square feet of ground level retail space and approximately 3,492 square feet of storage space on the second level. The most similar Land Use Code (LUC), LUC 890 for Furniture Stores and was utilized. The trip generation calculations were calculated considering both levels are retail space in order to estimate a “worst case” scenario. Table 6 presents the expected number of trips generated by the 7,367 square feet of retail space.

Table 6 - Trip Generation Projections

	Weekday Morning Peak Hour	Weekday Evening Peak Hour	Saturday Peak Hour
Furniture Store (LUC 890)	Entering	1	4
	Exiting	0	3
	Total	1	3

It should be noted that the number of trips generated was calculated using the average growth rate given for ITE Code 890, rather than the fitted curve. It should be noted however that the trip generation rates provided in Table 6 are for the single highest peak hour anticipated for a typical weekday. During all other weekday “non-peak” hours of operation, trip generation will be lower than the peak hour trip generation outlined in Table 6.

TRIP DISTRIBUTION AND ASSIGNMENT

Upon determining the number of trips projected to be generated by the proposed development, these trips were assigned to the study area intersections based on the existing trip distribution patterns. The directional distribution of site generated traffic is a function of population, density, existing travel patterns, and traffic conditions on area roadways. Due to the location of the driveway, all of the site generated traffic will arrive and depart via McGrath Highway. Directional distributions of the site generated trips along Broadway are assumed to be split in a similar proportion as they exist today. As such, site generated trips were assigned to the study area intersections based on this directional distribution.

VEHICULAR TRAFFIC OPERATIONS

As presented in Table 7, one signalized intersection located within the study area would continue to operate at LOS F under the proposed Build (2017) condition during at least one (AM or PM) peak hour.

- Broadway at McGrath Highway (Route 28)

The intersection of Broadway at Garfield would continue to operate at LOS A under the proposed No-Build (2017) condition during all peak hours. The intersection of Broadway at Cross Street would continue to operate at desirable levels of service (A and B) during peak hours.

Table 7 - Future Build Condition Signalized Intersection Traffic Operations

Location	Movement	Thursday Morning Peak Period			Thursday Evening Peak Period			Friday Morning Peak Period			Friday Evening Peak Period			Saturday Midday Peak Period		
		v/c ¹	Del ²	LOS ³	v/c	Del	LOS	v/c	Del	LOS	v/c	Del	LOS	v/c	Del	LOS
Broadway at McGrath Hwy	EB Left	3.96	>120	F	3.31	>120	F	4.03	>120	F	4.34	+	F	4.58	+	F
	EB Thru	3.61	>120	F	3.05	>120	F	3.59	>120	F	3.69	>120	F	4.04	>120	F
	EB Right	0.99	113.10	F	0.11	38.50	D	0.76	60.40	E	0.10	40.90	D	0.11	38.10	D
	WB Left	0.80	72.40	E	0.80	64.30	E	0.78	63.70	E	0.89	82.10	F	0.80	61.20	E
	WB Thru	0.76	44.30	D	0.70	40.20	D	0.76	43.70	D	0.74	40.40	D	0.61	35.60	D
	WB Right	0.09	32.80	C	0.17	32.90	C	0.15	32.50	C	0.16	31.60	C	0.14	30.90	C
	NB Left	0.60	38.80	D	0.78	49.50	D	0.49	37.20	D	0.70	44.90	D	0.48	34.80	C
	NB Thru/Right	1.26	>120	F	2.69	>120	F	1.17	>120	F	2.61	>120	F	1.52	>120	F
	SB Left	0.42	20.90	C	1.14	>120	F	0.54	23.20	C	0.92	71.70	E	1.14	>120	F
	SB Thru/Right	1.19	>120	F	1.01	54.90	D	1.27	>120	F	0.92	40.10	D	0.81	31.70	C
Overall		1.47	>120	F	1.68	>120	F	1.46	>120	F	1.69	>120	F	1.59	>120	F
Broadway at Garfield Ave	EB Left	0.11	5.10	A	0.21	5.50	A	0.12	5.10	A	0.27	5.70	A	0.22	4.90	A
	EB Thru	0.33	5.80	A	0.26	5.50	A	0.30	5.70	A	0.29	5.70	A	0.25	4.90	A
	WB Thru/Right	0.29	5.70	A	0.45	6.30	A	0.34	5.80	A	0.44	6.30	A	0.32	5.10	A
	SB Left/Right	0.68	18.90	B	0.65	17.50	B	0.73	21.30	C	0.53	14.60	B	0.44	14.30	B
	Overall		0.44	8.10	A	0.51	7.80	A	0.46	8.60	A	0.47	7.10	A	0.35	6.10
Broadway at Cross St	EB Left	0.05	4.80	A	0.14	12.30	B	0.04	5.00	A	0.20	12.90	B	0.13	7.30	A
	EB Thru/Right	0.43	6.20	A	0.48	14.10	B	0.42	6.40	A	0.48	14.30	B	0.35	8.10	A
	WB Left	0.18	5.50	A	0.24	13.10	B	0.17	5.60	A	0.33	14.00	B	0.17	7.50	A
	WB Thru/Right	0.24	5.40	A	0.43	13.80	B	0.25	5.70	A	0.46	14.10	B	0.30	7.80	A
	NB	0.52	16.00	B	0.57	12.10	B	0.55	16.70	B	0.57	12.50	B	0.52	13.10	B
	SB	0.06	12.60	B	0.03	8.00	A	0.05	12.50	B	0.01	8.10	A	0.01	9.70	A
	Overall		0.45	7.00	A	0.53	13.40	B	0.46	7.40	A	0.53	13.70	B	0.42	8.80

1 Volume-to-capacity ratio

2 Average delay expressed in seconds per vehicle

3 Level-of-Service

Note: Using Synchro 7 software.

It should be noted that there is no change in overall level of service for any of the three signalized intersections within the study area due to the trips generated by the proposed project.

As previously mentioned, due to the lane configuration of the two unsignalized intersections, capacity analysis was incapable of producing HCM level of services values. It should be noted that traffic volumes at both intersections are low, with no traffic operation problems observed. It is forecasted that operations will continue to function as they do today.

PROPOSED PARKING SUPPLY

A parking inventory was conducted in the immediate vicinity of the project site. This inventory includes total parking supply, along with mid-day and evening parking utilization counts (the number of parking spaces occupied) within the close vicinity of the project site. On-street parking available to the public in close vicinity to the project area includes approximately 88 parking spaces; 47% of on-street spaces are observed to be available during the weekday midday period, 61% were observed to be available during the weekday evening period, 58% were observed to be available during the Saturday midday period, and 45% of these are spaces observed to be available during the Saturday evening period.

The proposed redevelopment consists of 3,875 square feet of street level retail space and approximately 3,492 square feet in second level storage space. Parking requirements under Article 9 of the Somerville Zoning Ordinance (SZO) necessitates 1 off-street parking space per 800 net square feet of retail space. The proposed project therefore requires 9 off-street spaces for retail parking. The proposed site design includes 6 surface parking spaces; therefore a parking variance is currently being sought.

The parking requirement relief memorandum, dated February 15, 2013, is enclosed in Appendix E of this study.

SUMMARY

The future conditions assessment for the study area evaluated traffic, bicycle and pedestrian operations, and safety statistics. The future conditions assessment for the study area indicated the following:

- One signalized intersection is expected to operate at LOS F during at least one peak hour.
- The proposed redevelopment is estimated to generate approximately one vehicle trip during the weekday morning peak hour period, three trips during the weekday evening peak hour period, and approximately seven trips during the Saturday peak hour period.
- There is no change in overall level of service for any of the three signalized intersections within the study area due to the trips generated by the proposed project.



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