MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers

PRINCIPALS
Robert J. Michaud, P.E.
Daniel J. Mills, P.E., PTOE

M E M O R A N D U M

DATE: March 1, 2021

TO: Ms. Nicole Campbell
The Green Lady Dispensary Newton, Inc.
11 Amelia Drive
Nantucket, MA 02554

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

RE: **Proposed Marijuana Establishment & Administrative Offices**
740 Beacon Street, Newton MA

MDM Transportation Consultants, Inc. (MDM) has prepared this traffic impact assessment (TIA) for the proposed Marijuana Establishment to be located at 740 Beacon Street in Newton, MA. The project location and surrounding roadway network is shown in **Figure 1**. This memorandum describes baseline traffic volumes for the adjacent roadway, summarizes baseline traffic volumes at the study intersections, summarizes the projected trip generation with a comparison to the as-of-right auto repair center use of the Site, provides a qualitative assessment of project impact, and evaluates safety-related conditions at the study locations.

Key findings of the traffic assessment are as follows:

- *Baseline Traffic Volumes.* The total entering volume at the adjacent intersection of Beacon Street at Union Street carries approximately 963 vehicles per hour (vph) during the morning peak hour and 1,114 vph hour during the evening peak hour. The trips traveling on Union Street in front of the Site represent 128 vph during the weekday morning peak hour and 90 vph during the weekday evening peak hour.

- *Safety Characteristics.* The study intersections experienced crash rates below the District 6 average and is not a HSIP vehicular location; therefore, no immediate safety countermeasures are warranted based on the crash history.

Figure 1

Site Location

MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers

Date: January 2021
Dwg No. 1098 MR01.dwg

- *Moderate Trip Generation*. Based on empirical methodology, the proposed redevelopment is estimated to generate approximately 41 vehicle trips during the weekday morning peak hour and 42 vehicle trips during the weekday evening peak hour. Compared to the as-of-right site use (auto repair center), the proposed project is estimated to generate approximately 34 net new vehicle trips during the weekday morning peak hour and 33 net new vehicle trips during the weekday evening peak hour. The project will result in approximately 1 additional directional trip every 3 minutes during the peak hours compared to the existing as-of-right use of the Site.

- *Qualitative Impact Assessment.* The project will result the project will result in a modest increase in traffic of approximately 21 peak hour trips or less compared to Baseline conditions which results in a 2-percent increase in total entering volume at the adjacent intersection. The project will result in an increase of approximately 1 vehicle every 3-minutes along Union Street and 1 vehicle every 6-minutes along Beacon Street. 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 intersection and along the adjacent streets.

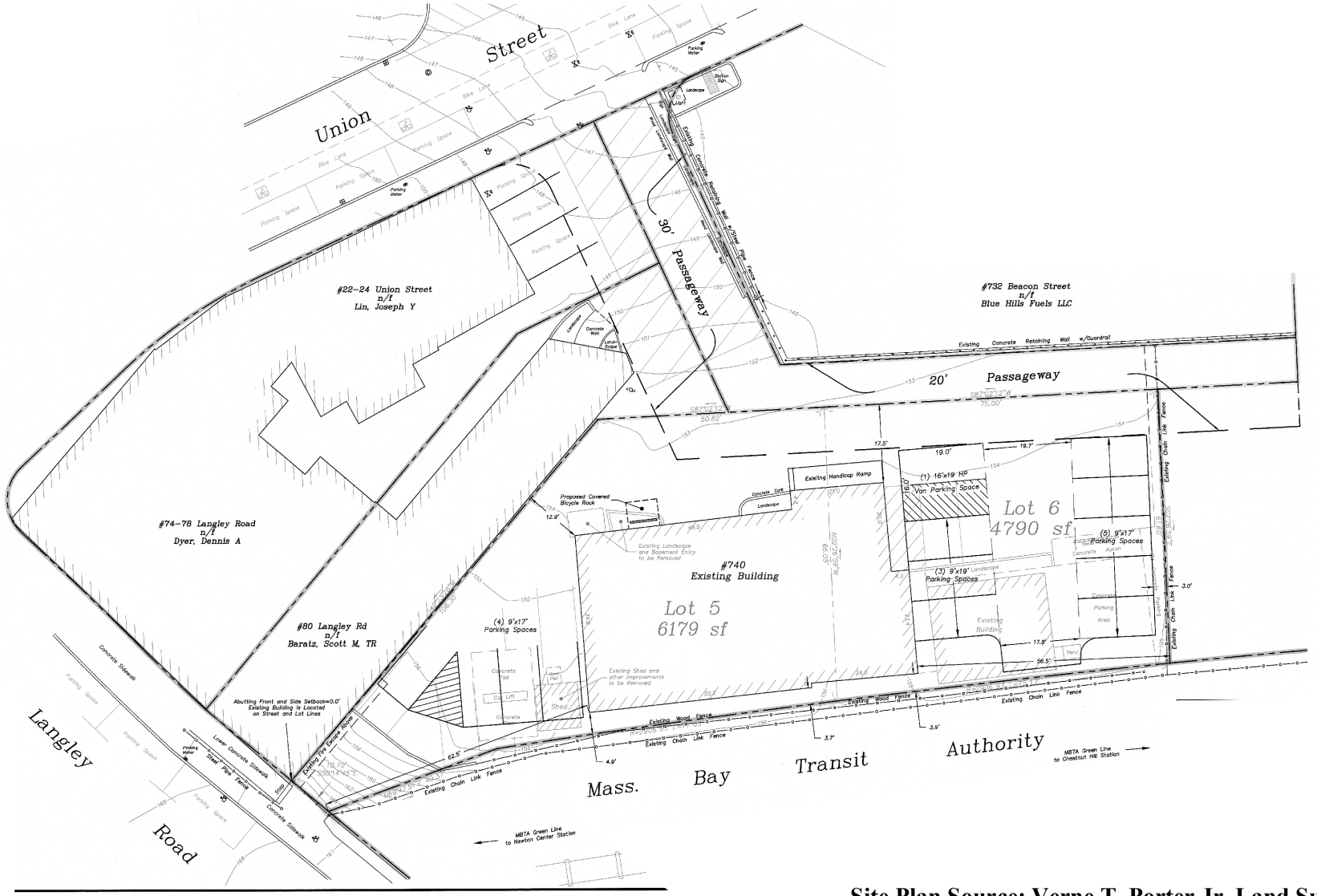
- *Adequate Parking Supply.* The parking assessment resulted in an average peak parking demand of 6 vehicles (1 employee and 5 patrons) with a maximum demand of 10 vehicles (1 employees and 9 patrons). As shown the parking supply will accommodate the peak parking demands of the Site with parking management in place.

In summary, trip generation for the development is projected to be moderate at 34 or fewer net new trips during commuter 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 adjacent intersection and area roadways. Design elements are outlined under *Recommendations and Conclusions* that will provide ample capacity to accommodate site-generated traffic while enhancing site access and pedestrian safety while promoting alternative modes of transportation.

PROJECT DESCRIPTION

The Site consists of approximately 0.38± acres of land located at 740 Beacon Street in Newton, MA. The existing Site includes a commercial use totaling 3,020± sf which formerly occupied by "Roche Collision". The use is supported by unmarked surface parking spaces. Access/egress is provided via a single right-in/right-out shared driveway along Union Street.

Under the proposed program building area on site will be reduced in size to convert the main building into a Marijuana Establishment, supported by 13± surface parking spaces. Access/egress will continue to be provided via the existing driveway at Union Street/Beacon Street. A preliminary site plan prepared by Verne T. Porter Jr. is presented in **Figure 2**.



Scale: Not to Scale

Site Plan Source: Verne T. Porter Jr. Land Surveyors

Figure 2

Preliminary Site Plan

MDM TRANSPORTATION CONSULTANTS, INC.
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Date: January 2021
Dwg No. 1098 MR01.dwg

BASELINE TRAFFIC & SAFETY CHARACTERISTICS

An overview of baseline roadway conditions, traffic volumes, safety characteristics of area roadways is provided below.

Beacon Street

Beacon Street is generally an east-west roadway under local jurisdiction in the area that is classified by the MassDOT as an Urban Principal Arterial roadway, and it provides a connection between the Washington Street (Route 16) to the City of Boston to the east. Beacon Street provides one travel lanes in each direction within the study area with additional turn lanes provided at its major intersections. Sidewalks and bike lanes are provided along both sides of Beacon Street. On-street parking is allowed on both sides of the roadway. The posted (regulatory) speed limit on Beacon Street in the study area is 25 mph in both travel directions. Land use along Beacon Street in the study area is a mix of residential and commercial uses with restaurants and a gasoline service station immediately adjacent to the Site.

Sidewalks, Parking, and Alternative Transportation Facilities

The existing pedestrian, on-street and off-street parking areas, and transit facilities within the study area are graphically in **Figure 3**. As seen the project is in close proximity to an extensive sidewalk system, a nearby MBTA public bus route 52 along Centre Street, the MBTA Green Line at Newton Center Station, a public parking lot, on-street parking, and zip-car share services. To remain conservative no credit (trip reduction) was taken for the use of nearby alternative travel modes. Alternative transportation service information is provided in the **Attachments**.

Baseline Traffic Data

This traffic memorandum includes the following intersections:

- Beacon Street at Union Street and Chesley Road (Unsignalized)
- Union Street at Site Driveway (Unsignalized)

Traffic volume data were collected in September 2020 at the study area intersections during the weekday morning peak period (7:00 AM – 9:00 AM) and the weekday evening peak period (3:00 PM - 6:00 PM) to coincide with peak traffic activity of the adjacent streets. A review of historical traffic data indicates that peak hour traffic volumes remain below normal average conditions due to the Covid-19 pandemic. Accordingly, the weekday morning traffic volumes have been adjusted by 19% and the weekday evening peak hour have been adjusted by 10% to represent average traffic volume conditions. The traffic volumes were then adjusted by 0.5% to reflect 2021 conditions. Turning movement counts and historical adjustment data are provided in the **Attachments**. The 2021 Baseline weekday morning and weekday evening peak hour traffic volumes are shown in **Figure 4**.

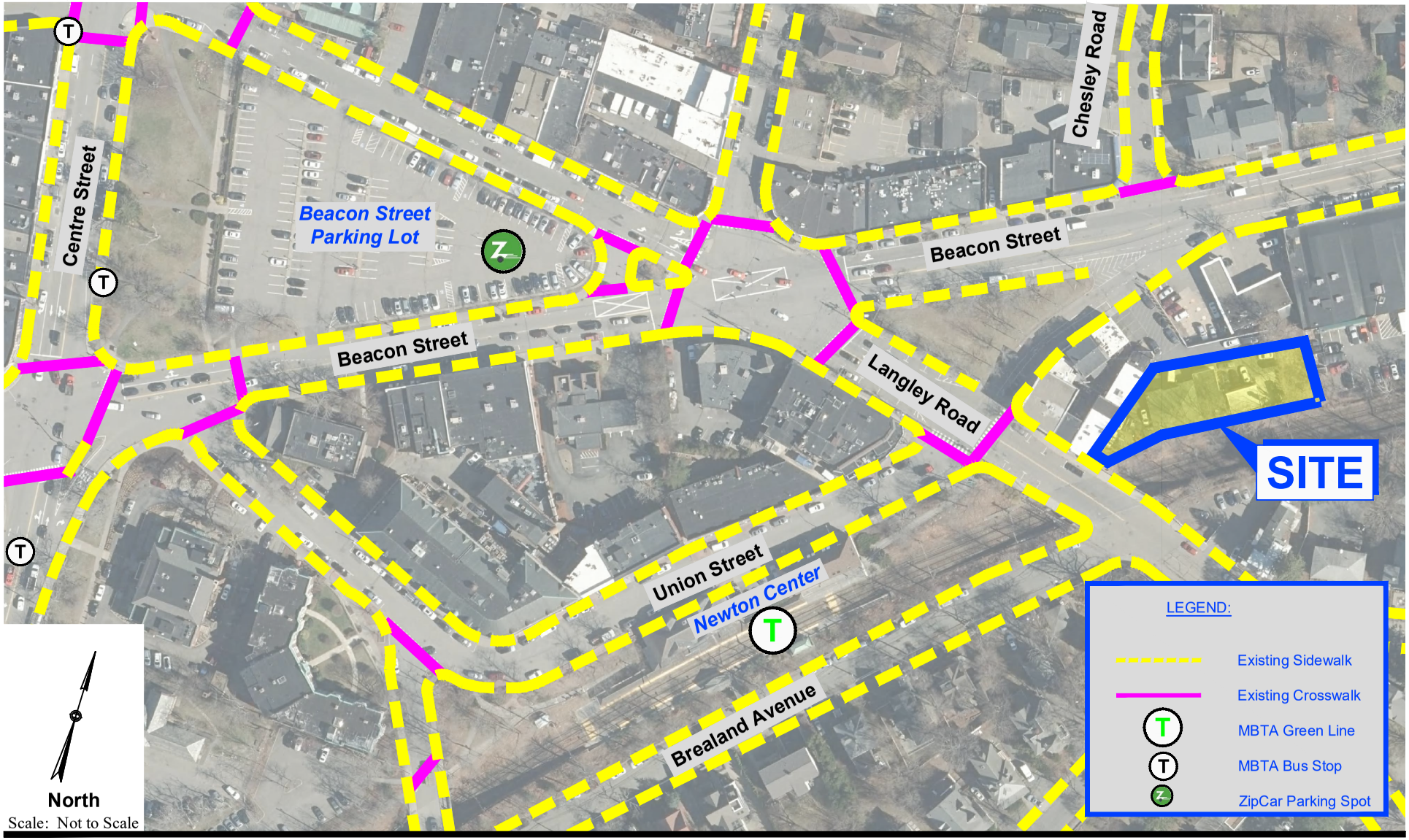

Figure 3

Existing Pedestrian Facilities

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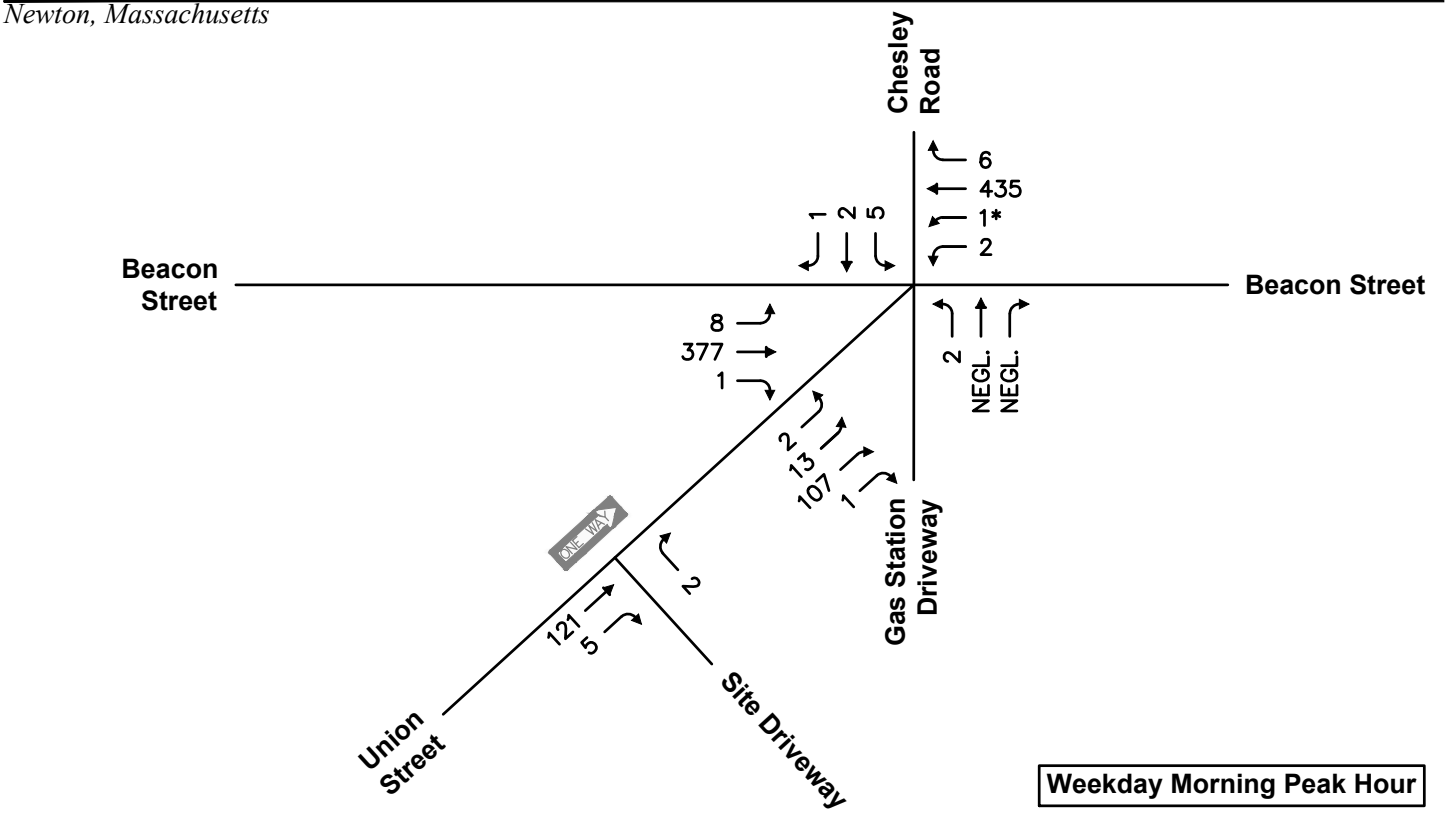
Date: January 2021
Dwg No. 1098 MR01.dwg



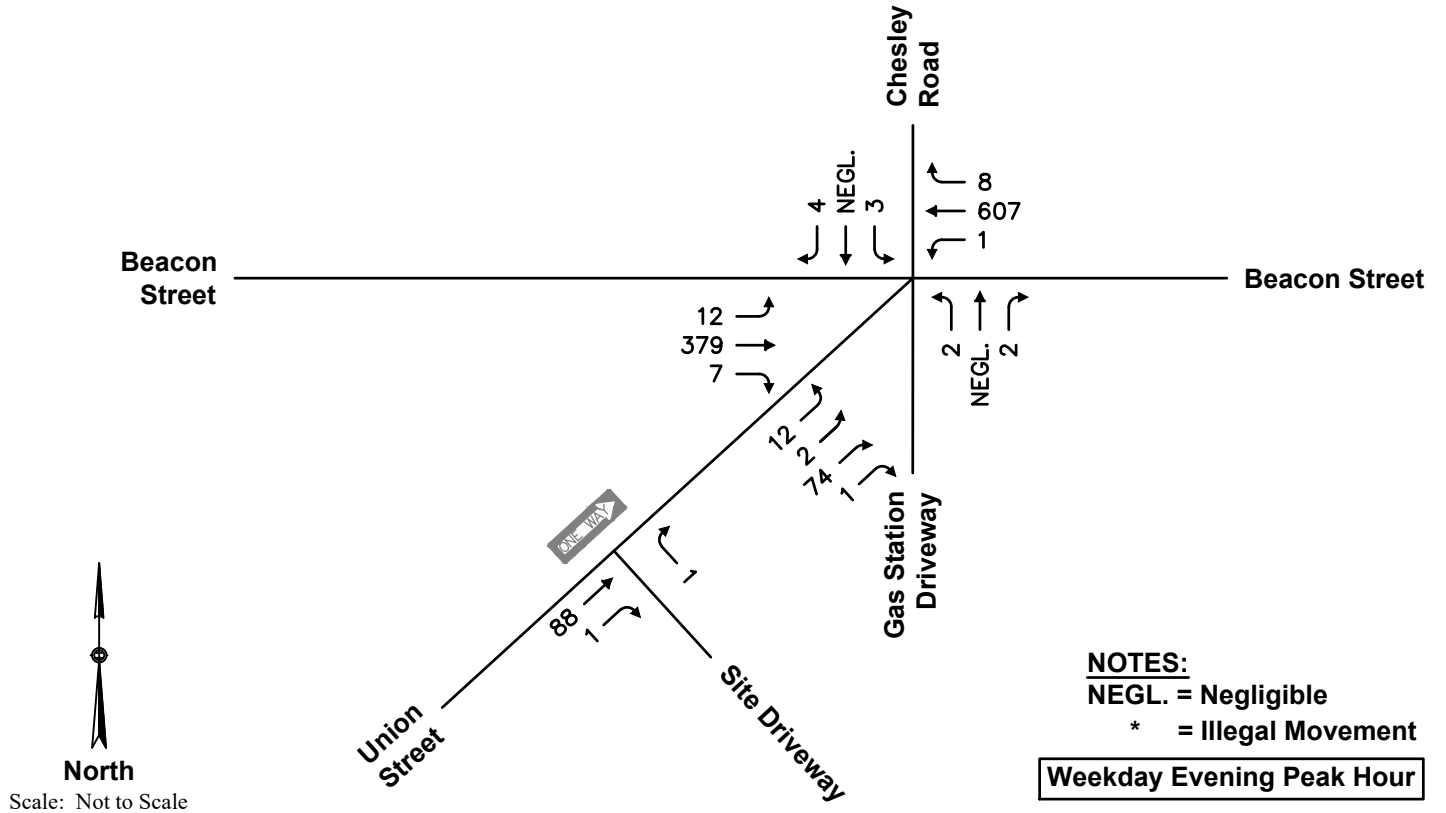


Figure 4

MDM TRANSPORTATION CONSULTANTS, INC.
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2021 Baseline Conditions
Weekday Peak Hour Volumes

Date: January 2021
Dwg No. 1098 MR01.dwg

Intersection Crash History

In order to identify crash trends and safety characteristics for study area intersections, crash data were obtained from MassDOT for the Town of Newton for the five-year period covering 2016 through 2020 (the most recent full year of data currently available from MassDOT). In addition, review of the MassDOT high crash cluster mapping was conducted to determine locations listed as eligible for Highway Safety Improvement Program (HSIP) evaluation and funding. Crash data for the study intersections is summarized in **Table 1** with detailed data provided in the **Attachments.**

Crash rates were calculated for the study area intersections as reported in **Table 1**. This rate quantifies the number of crashes per million entering vehicles. MassDOT has determined the official District 6 (which includes the Town of Newton) average crash rate to be 0.52 for unsignalized intersections. This rate represents MassDOT's "average" crash experience for study area and serve as a basis for comparing reported crash rates for the study intersections. Where calculated crash rates notably exceed the district average, some form of safety countermeasures may be warranted.

TABLE 1
INTERSECTION CRASH SUMMARY[1]
2016 THROUGH 2020

Data Category	Beacon Street at Union Street and Chesley Road
Traffic Control	Unsignalized
Crash Rate[2]	**0.31**
MHD District 6 Avg[3]	0.52
Year:	
2016	2
2017	4
2018	0
2019	3
2020	0
Total	**9**
Type:	
Angle	2
Rear-End	3
Head-On	2
Sideswipe	2
Single-Vehicle	0
Severity:	
P. Damage Only	7
Personal Injury	2
Fatality	0
Conditions:	
Dry	8
Wet	0
Snow	1
Time:	
7:00 to 9:00 AM	1
4:00 to 6:00 PM	1
Rest of Day	7

[1] Source: MassDOT Crash Database
[2] Crashes per million entering vehicles
[3] District 6 Average Crash Rate

As summarized in **Table 1**:

- *Beacon Street at Union Street and Chesley Road:* Nine (9) crashes were reported at or near the Beacon Street intersection with Union Street over the five-year study period resulting crash rate of 0.31, which is below the District 6 average of 0.57. The reported crashes included four (4) angle/sideswipe type collisions, three (3) rear-end type collisions, and two (2) head-on type collision. The majority (78%) of the crashes resulted in property damage type collision with the majority crashes under dry (89%) roadway conditions during off-peak travel periods (78%). No fatalities were reported during the study period. The crashes include one pedestrian crash and one bicycle crash resulting in injury type collisions.

- *Union Street at Site Driveway (740 Beacon Street).* No crashes were reported at the site driveway study intersection during the three-year study period.

In summary, the study intersections experienced crash rates below the District 6 average and is not a HSIP vehicular location; therefore, no immediate safety countermeasures are warranted based on the crash history.

DESIGN YEAR TRAFFIC VOLUMES

This section provides a summary of trip generation characteristics of the Site, trip distribution patterns, Design Year traffic volume projections, and a qualitative assessment of operations under Design Year conditions.

Trip Generation

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

Table 2 presents the trip-generation for the trips to be generated by the re-development based on empirical methodology based on theoretical maximum with 5 points of sale with 4 scheduled appointments per sales position per hour.

TABLE 2
TRIP-GENERATION SUMMARY

Period	Employee Trips	Patron Trips	Total Trips
Weekday Morning Peak-Hour:			
Enter	1	20	**21**
Exit	0	20	**20**
Total	1	40	**41**
Weekday Evening Peak-Hour:			
Enter	1	20	**21**
Exit	1	20	**21**
Total	2	40	**42**

[1]Based on Empirical data assuming 1 employee parking on site and five point of sales with four scheduled appointments per hour with no reduction for patron alternative transportation use.

As summarized in **Table 2,** based on empirical methodology the proposed redevelopment is estimated to generate approximately 41 vehicle trips (21 entering and 20 exiting) during the weekday morning peak hour and 42 vehicle trips (21 entering and 21 exiting) during the weekday evening peak hour.

Table 3 presents the comparison of empirical trip generation and trip-generation estimates for the proposed development based on trip rates published in ITE's *Trip Generation* and EEA/MassDOT guidelines. In this case, Marijuana Dispensary (LUC 882) is selected for analysis purposes.

TABLE 3
TRIP-GENERATION COMPARISON
EMPIRICAL VS ITE

Period	Empirical Trips	ITE Trips	(Δ) Difference
Weekday Morning Peak-Hour:			
Enter	21	18	**-3**
Exit	20	14	**-6**
Total	41	32	**-9**
Weekday Evening Peak-Hour:			
Enter	21	33	**+12**
Exit	21	33	**+12**
Total	42	66	**+24**

[1]From Table 2
[2]Based on ITE LUC 882 (Marijuana Dispensary) trip rates applied to 3,020± sf.

As summarized in **Table 3**, ITE trip generation estimates are generally consistent with the empirical trip generation estimates with no material difference in the rates. MDM notes, that the ITE methodology reflects conditions at recreational marijuana facilities without set appointments; therefore, the analysis in this report is based on the upper limit of the empirical data.

Table 4 provides a trip generation comparison between the as-of-right use of the Site as a collision center and the proposed Site use as a Marijuana Establishment.

TABLE 4
TRIP-GENERATION COMPARISON

Period	Collision Center[1]	Marijuana Establishment[2]	Net New Trips
Weekday Morning Peak-Hour:			
Enter	5	21	**+16**
Exit	2	20	**+18**
Total	7	41	**+34**
Weekday Evening Peak-Hour:			
Enter	4	21	**+17**
Exit	5	21	**+16**
Total	9	42	**+33**

[1] Based on ITE LUC 942 (Automobile Care Center) trip rates applied to 3,020± sf.
[2] Total vehicle trips as shown in **Table 2**.

As summarized in **Table 4**, the proposed project is estimated to generate approximately 34 net new vehicle trips (16 entering and 18 exiting) during the weekday morning peak hour and 33 net new vehicle trips (17 entering and 16 exiting) during the weekday evening peak hour. The project will result in approximately 1 additional directional trip every 3 minutes during the peak hours compared to the existing as-of-right use of the Site. Collision Center trip generation calculations are provided in the **Attachments**.

Trip Distribution

The distribution for Site uses is based primarily on existing travel patterns and volumes of the adjacent roadway system. The resulting trip distribution for new trips is presented in **Figure 5**. 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 2**. Development-related trips at each intersection approach for the weekday morning and weekday evening peak hours are quantified in **Figure 5**.

Design-Year Traffic Conditions

Design-Year condition traffic volumes are derived by adding incremental traffic increases for the proposed development to the 2021 Baseline conditions. **Figure 6** presents the 2021 Design-Year condition traffic-volume networks for the weekday morning and weekday evening peak hours.

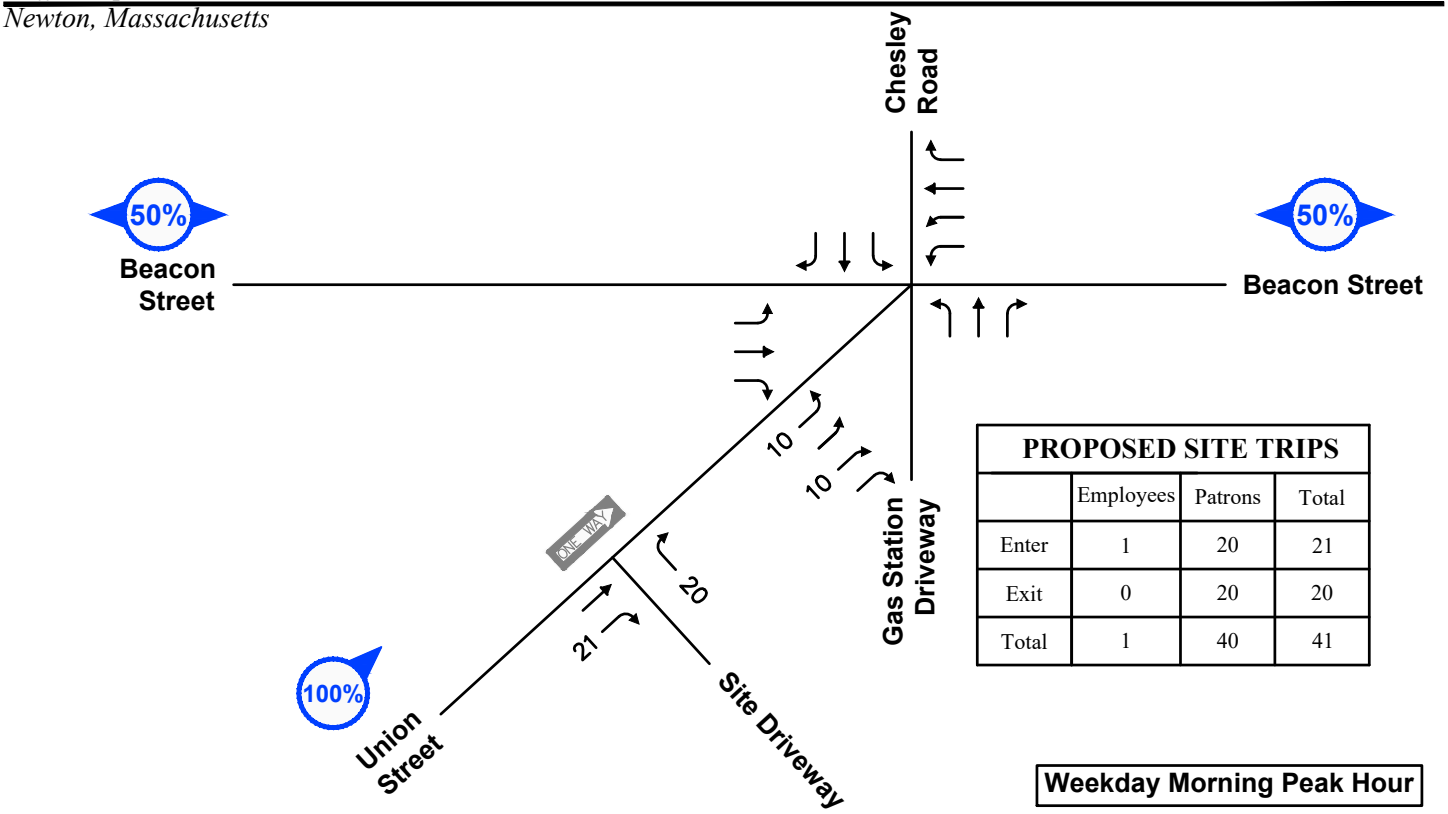
QUALITATIVE STATEMENT OF IMPACT

This section provides a quantitative statement of impact and described trip increases associated with the development relative to 2021 Baseline conditions. A comparison of the total intersection entering volume for the adjacent study intersection of Beacon Street at Union Street/Chesley Road during the weekday morning peak hour and weekday evening peak hour, are summarized in **Table 5**.

TABLE 5
INTERSECTION TOTAL ENTERING VOLUME

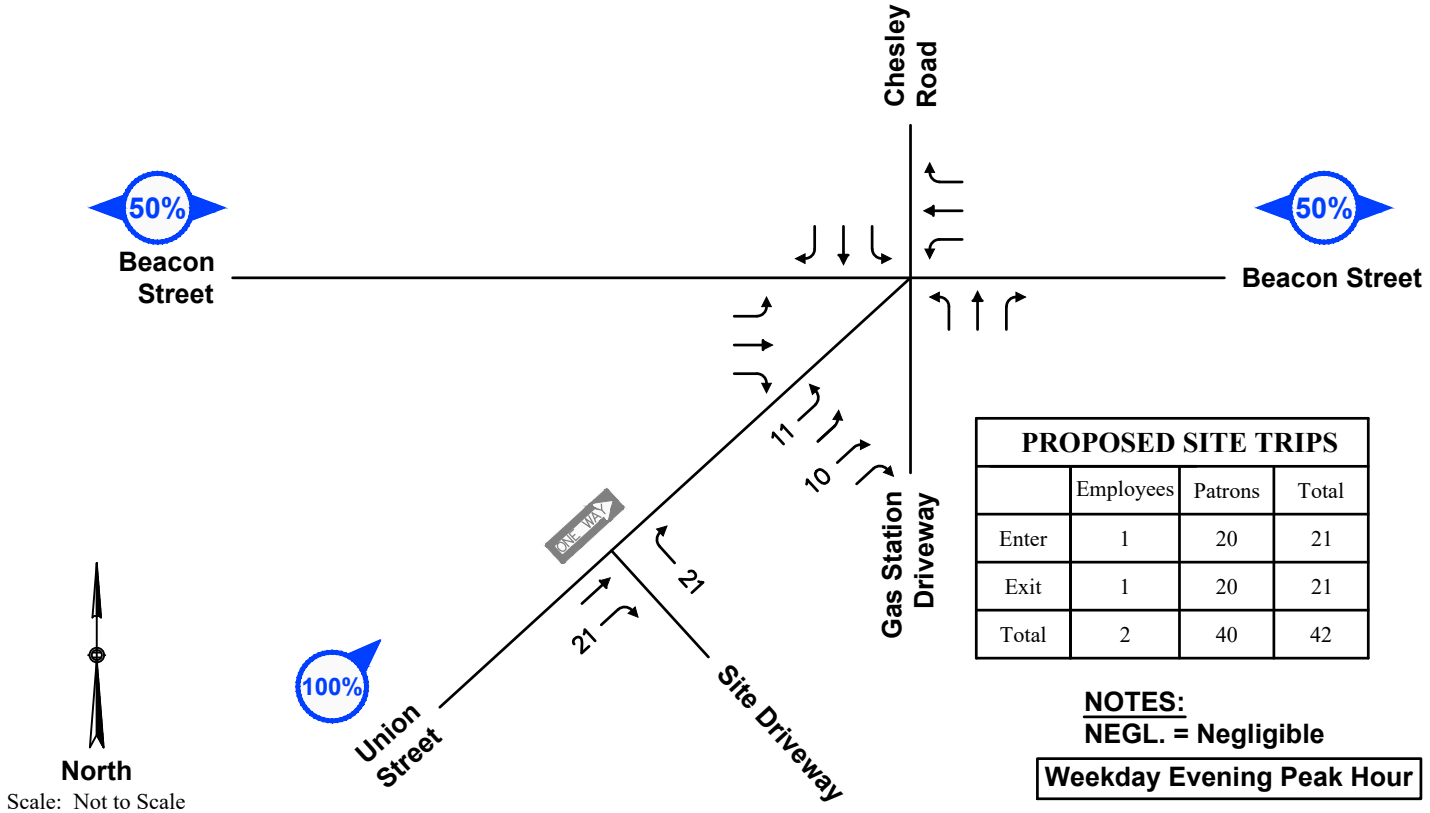
	Peak Hour	Baseline Entering Volume[1]	Project Impact # of New Trips (%)
Beacon Street at	Weekday AM	963	20 (2.1%)
Union Street/Chesley Road	Weekday PM	1114	21 (1.9%)

[1] Based on **Figure 4**.



PROPOSED SITE TRIPS			
	Employees	Patrons	Total
Enter	1	20	21
Exit	0	20	20
Total	1	40	41

Weekday Morning Peak Hour



PROPOSED SITE TRIPS			
	Employees	Patrons	Total
Enter	1	20	21
Exit	1	20	21
Total	2	40	42

NOTES:
NEGL. = Negligible

Weekday Evening Peak Hour

Scale: Not to Scale

Figure 5

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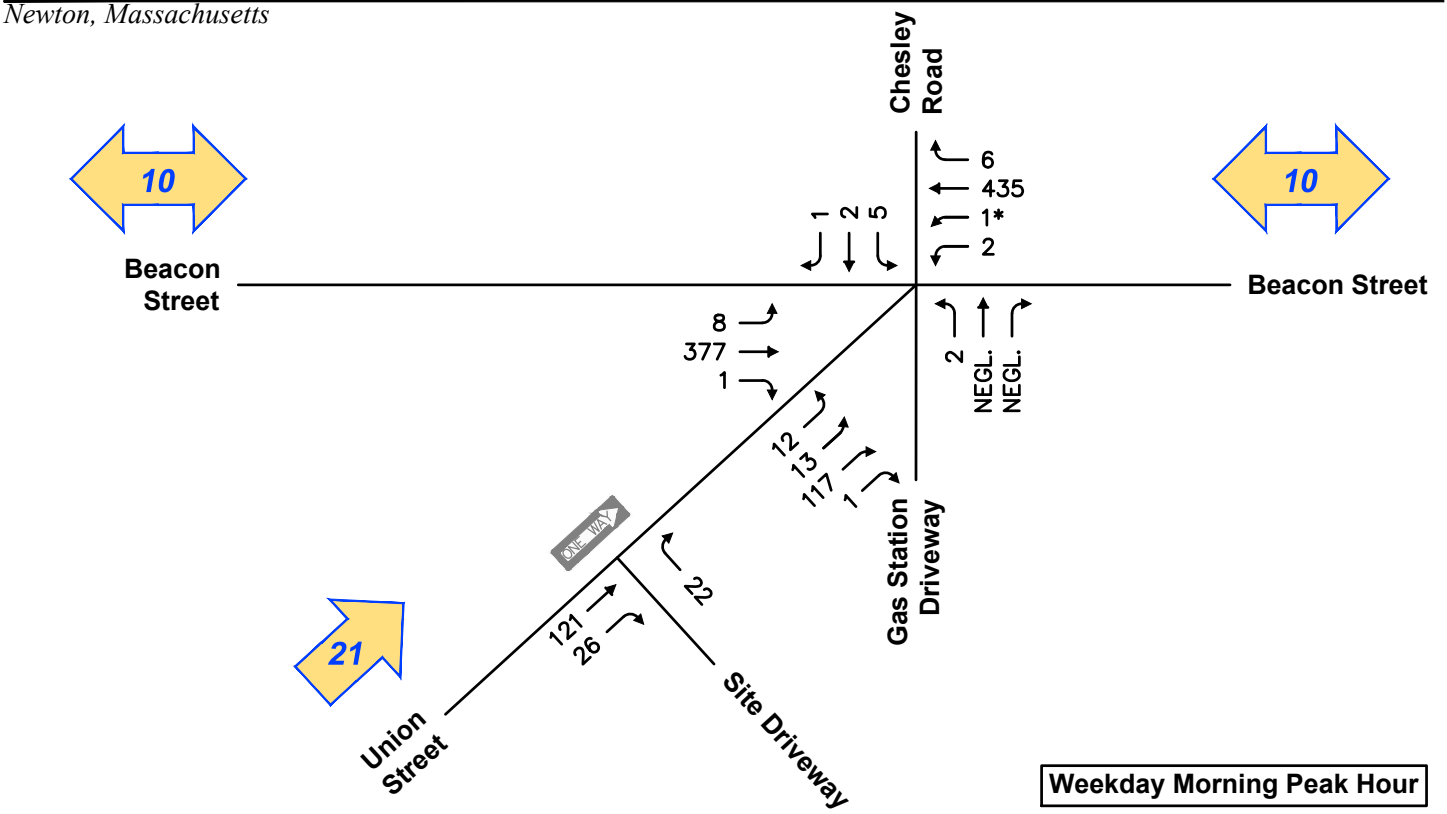
Trip Tracing and Distribution
Weekday Peak Hour Volumes

Date: March 2021
Dwg No. 1098 MR01.dwg



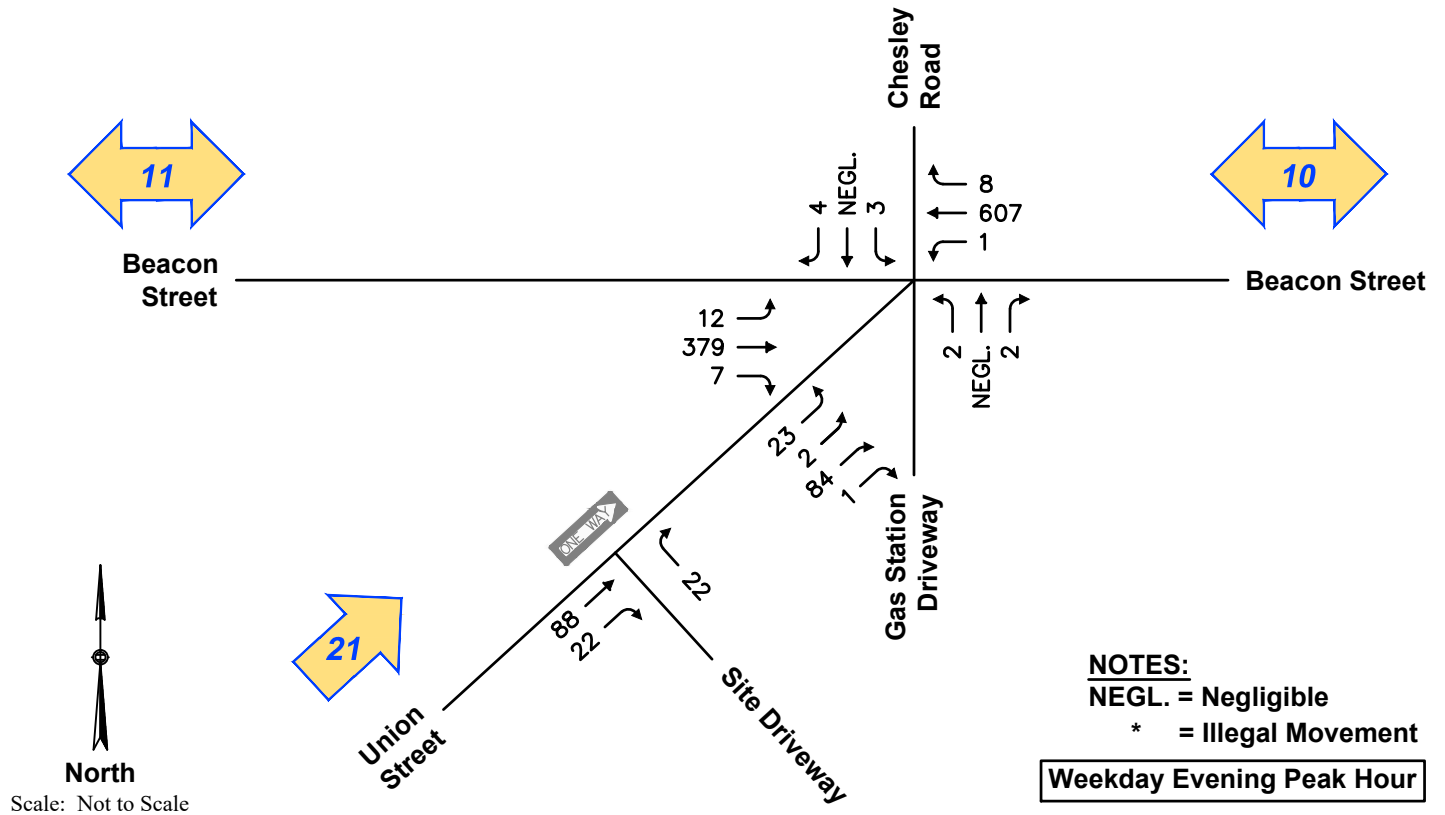


Figure 6

MDM TRANSPORTATION CONSULTANTS, INC.
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2021 Design Year Conditions
Weekday Peak Hour Volumes

Date: March 2021
Dwg No. 1098 MR01.dwg

As summarized in **Table 5**, based on Empirical trip generation methodology operating near capacity with no reduction for alternative travel modes for patrons, the project will result in a modest increase in traffic of approximately 21 peak hour trips or less compared to Baseline conditions which results in a 2-percent increase in total entering volume at the adjacent intersection. The project will result in an increase of approximately 1 vehicle every 3-minutes along Union Street and 1 vehicle every 6-minutes along Beacon Street. 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 intersection and along the adjacent streets.

PARKING ASSESSMENT

On-site parking is proposed to include approximately 13 marked spaces which will be restricted to management (1 space) and patrons that have made an appointment at the facility (12 spaces). The on-site parking will be actively managed by a parking attendant if required. The peak parking demand of the facility based on theoretical maximum with 5 points of sale with 4 scheduled appointments per sales position per hour assuming no alternative transportation use for patrons. For this assessment, a queue stacking algorithm was applied using the stated parameters (see **Attachments**). The parking assessment result in an average peak parking demand of 6 vehicles (1 employee and 5 patrons) with a maximum demand of 10 vehicles (1 employees and 9 patrons). As shown the parking supply will accommodate the peak parking demands of the Site. The Proponent will also have a parking management plan in place to monitor parking operations.

CONCLUSIONS

In summary, trip generation for the development is projected to be moderate at 34 or fewer net new trips during commuter 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 are intersections and adjacent roadways.

MDM recommends the following design elements as shown in **Figure 7** to enhance site access and pedestrian safety:

- *Driveway Design.* The project will reconstruct the site driveway to achieve (a) approximate perpendicular orientation at Union Street; (b) a 22-foot curb opening; (c) maintain the 2-foot radii, and (d) the driveway apron with be constructed with a continuous sidewalk to promote slower travel speeds.

- *Pedestrian Accommodations.* A 4-foot minimum cobbled/textured path along the driveway within the 30-foot "Passageway" easement connecting the sidewalk along Union Street to the main entranceway will be provided.

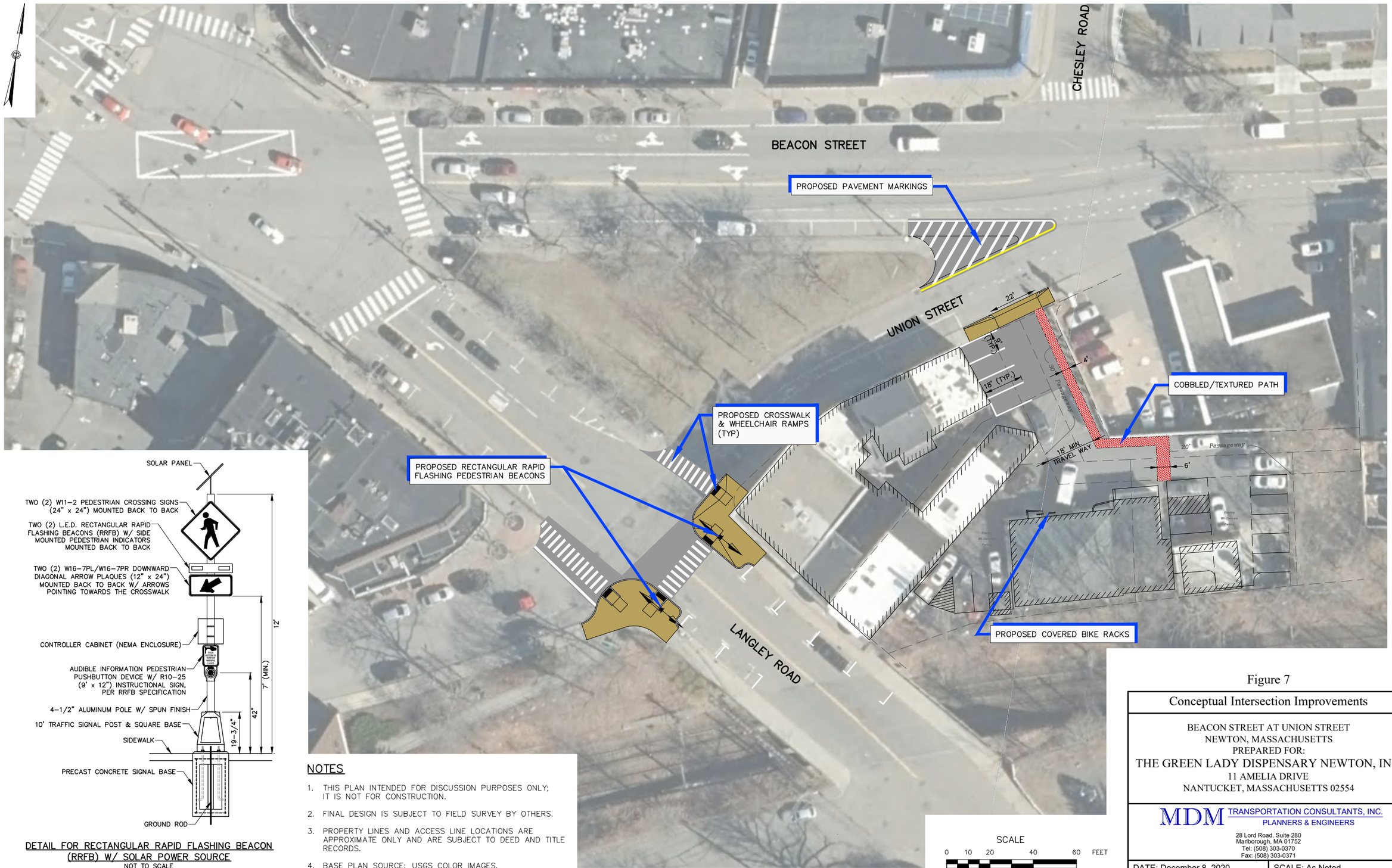
- *Enhanced Pedestrian Crossing – Langley Road.* To increase pedestrian visibility on an important desire line to the Newton Centre Green Line Station. The design will install sidewalk bump-outs on the southeastern and southwestern side of Langley Road at its intersection with Union Street. Specifically, the design will reduce the crossing length, increase pedestrian visibility with extensions beyond the parking lane, provide updated crosswalk markings, new wheelchair ramps, and will provide a high visibility crossing utilizing pedestrian activated rectangular rapid flashing beacons (RRFB) with solar power sources.

- *Bicycle Accommodations.* A secure covered bike parking area will be provided on-site near the building entrance. Furthermore, a bike share program will be provided for employees with on-site bicycles and helmets.

- *Enhanced Pavement Markings.* As part of the project updated/enhanced pavement markings will be added on the southwestern corner of Beacon Street and Union Street to provide driver guidance and to enhance the one-way nature of Union Street.

- *Employee Transit Subsidy.* The proponent will cover 100% of the cost for a monthly T pass for employees who use that travel mode as their primary commuter option.

- *On-Site Parking Restrictions.* The proponent will restrict the on-site parking area for management (1 space) with the remaining 12 spaces reserved for patrons who will be required to make an appointment to visit the facility.



DETAIL FOR RECTANGULAR RAPID FLASHING BEACON (RRFB) W/ SOLAR POWER SOURCE
NOT TO SCALE

NOTES

1. THIS PLAN INTENDED FOR DISCUSSION PURPOSES ONLY; IT IS NOT FOR CONSTRUCTION.
2. FINAL DESIGN IS SUBJECT TO FIELD SURVEY BY OTHERS.
3. PROPERTY LINES AND ACCESS LINE LOCATIONS ARE APPROXIMATE ONLY AND ARE SUBJECT TO DEED AND TITLE RECORDS.
4. BASE PLAN SOURCE: USGS COLOR IMAGES.

SCALE
0 10 20 40 60 FEET

Figure 7

Conceptual Intersection Improvements

BEACON STREET AT UNION STREET
NEWTON, MASSACHUSETTS
PREPARED FOR:
THE GREEN LADY DISPENSARY NEWTON, INC.
11 AMELIA DRIVE
NANTUCKET, MASSACHUSETTS 02554

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PLANNERS & ENGINEERS
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Marlborough, MA 01752
Tel: (508) 303-0370
Fax: (508) 303-0371

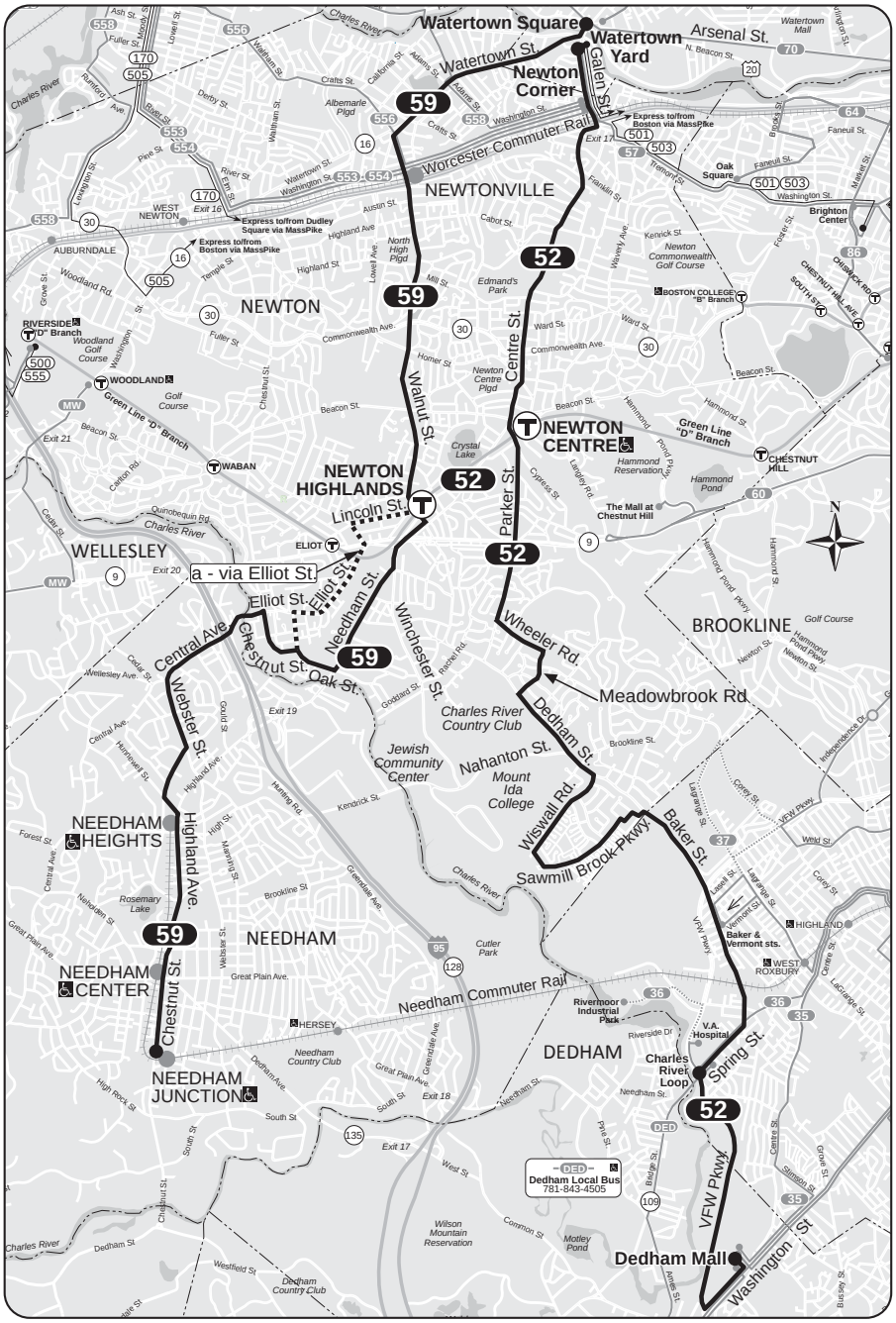
DATE: December 8, 2020	SCALE: As Noted	
PROJECT No. 1098	File: 1098 Concept Plan 2020-12-08.dwg	Sheet 1 of 1

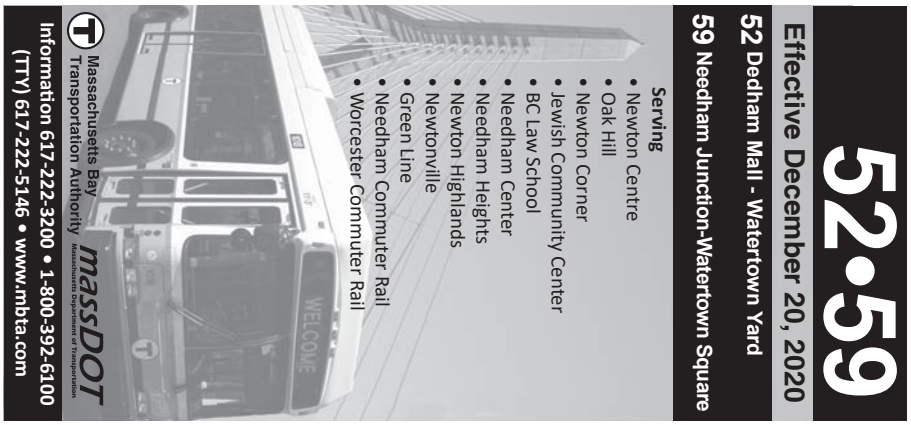
ATTACHMENTS

- □ Alternative Transportation Information
- □ Traffic Volume Data
- □ Historical Adjustment Data
- □ Crash Data
- □ Trip Generation
- □ Trip Distribution
- □ Parking Queue Calculations

□ Alternative Transportation Information

Route 52 Dedham Mall - Watertown Yard
Route 59 Needham Junction - Watertown Square





52•59

Effective December 20, 2020

52 Dedham Mall - Watertown Yard

59 Needham Junction-Watertown Square

Serving

- Newton Centre
- Oak Hill
- Newton Corner
- Jewish Community Center
- BC Law School
- Needham Center
- Needham Heights
- Newton Highlands
- Newtonville
- Green Line
- Needham Commuter Rail
- Worcester Commuter Rail

Massachusetts Bay Transportation Authority

massDOT Massachusetts Department of Transportation

Information 617-222-3200 • 1-800-392-6100

(TTY) 617-222-5146 • www.mbta.com

Schedule Change

52 Weekday

Inbound				Outbound			
Leave Dedham Mall	Lv/Arrive Charles River	Arrive Newton Center	Arrive Watertown Yard	Leave Watertown Yard	Arrive Newton Center	Arrive Charles River	Arrive Dedham Mall
.....	6:08A	6:25A	6:35A	6:38A	6:47A	7:05A	.....
.....	6:42	6:59	7:10	7:33	7:42	8:00	.....
.....	7:12	7:31	7:42	8:40	8:48	9:06	9:14A
.....	8:05	8:24	8:35				
				s 3:00P	**3:09P**	**3:29P**	**3:38P**
.....	**2:36P**	**2:55P**	**3:06P**	**4:48**	**4:57**	**5:17**	**5:26**
4:00P	**4:02**	**4:20**	**4:32**	**6:35**	**6:44**	**7:04**	**.....**
5:50	**5:52**	**6:09**	**6:21**				

s - Does NOT run during school vacation

No Route 52 service on Saturday or Sunday

Route 52
Dedham Mall - Watertown Yard

59 Weekday

Inbound			Outbound		
Leave Needham Junction	Arrive Newton Highlands	Arrive Watertown Square	Leave Watertown Square	Arrive Newton Highlands	Arrive Needham Junction
6:20A	6:38A	6:55A	6:05A	6:18A	6:37A
6:50	7:09	7:30	6:35	6:48	7:07
a7:20	7:41	8:02	7:05	7:25	7:44
7:55	8:17	8:39	7:35	7:55	8:15
a 8:25	8:51	9:10	8:10	8:30	8:50
9:00	9:19	9:36	8:45	9:04	9:24
9:35	9:54	10:11	9:25	9:44	10:04
10:10	10:29	10:46	10:05	10:22	10:42
10:55	11:14	11:31	10:55	11:12	11:33
11:45	**12:04P**	**12:21P**	11:45	**12:02P**	**12:23P**
12:35P	**12:54**	**1:11**	**12:35P**	**12:52**	**1:13**
1:25	**1:44**	**2:01**	**1:25**	**1:42**	**2:03**
2:15	**2:34**	**2:51**	**2:10**	**2:27**	**2:52**
3:10	**3:33**	**3:56**	**3:00**	**3:20**	**3:45**
4:00	**4:22**	**4:44**	**3:50**	**4:10**	**4:35**
4:50	**5:13**	**5:33**	**a 4:30**	**4:50**	**5:14**
5:25	**5:48**	**6:08**	**5:05**	**5:28**	**5:53**
6:05	**6:28**	**6:46**	**a 5:45**	**6:08**	**6:32**
6:40	**6:58**	**7:16**	**6:25**	**6:42**	**7:05**
7:15	**7:31**	**7:46**	**7:00**	**7:16**	**7:39**
7:50	**8:07**	**8:22**			

a - Via Elliot St.

Route 59
Needham Junction- Watertown Square

59 Saturday

Inbound			Outbound		
Leave Needham Junction	Arrive Newton Highlands	Arrive Watertown Square	Leave Watertown Square	Arrive Newton Highlands	Arrive Needham Junction
7:05A	7:23A	7:36A	6:20A	6:35A	6:49A
8:35	8:55	9:10	7:50	8:05	8:22
10:05	10:28	10:45	9:20	9:35	9:56
11:36	**12:01P**	**12:18P**	10:50	11:05	11:30
1:10P	**1:35P**	**1:50P**	**12:22P**	**12:37P**	**1:02P**
2:40	**3:02**	**3:17**	**1:55**	**2:10**	**2:31**
4:10	**4:31**	**4:46**	**3:25**	**3:40**	**3:59**
5:40	**6:01**	**6:15**	**4:55**	**5:10**	**5:29**
7:05	**7:25**	**7:39**	**6:25**	**6:40**	**6:57**

59 Sunday

Inbound			Outbound		
Leave Needham Junction	Arrive Newton Highlands	Arrive Watertown Square	Leave Watertown Square	Arrive Newton Highlands	Arrive Needham Junction
7:50A	8:07A	8:20A	7:05A	7:17A	7:33A
9:20	9:39	9:53	8:35	8:47	9:05
10:50	11:09	11:23	10:05	10:18	10:38
			11:35	11:48	12:08
12:20P	**12:40P**	**12:56P**			
1:50	**2:08**	**2:24**	**1:05P**	**1:18P**	**1:38P**
3:20	**3:39**	**3:56**	**2:35**	**2:48**	**3:08**
4:50	**5:09**	**5:25**	**4:05**	**4:18**	**4:38**
6:20	**6:39**	**6:55**	**5:35**	**5:49**	**6:09**

All buses are accessible to persons with disabilities

Fare	Local Bus	Bus + Bus	Subway	Bus + Subway
CharlieCard	$1.70	$1.70	$2.40	$2.40
CharlieTicket	$1.70	$1.70	$2.40	$4.10*
Cash-on-Board	$1.70	$3.40	$2.40	$4.10
Student/Youth**	$0.85	$0.85	$1.10	$1.10
Senior/TAP***	$0.85	$0.85	$1.10	$1.10

FREE FARES: Children 11 and under ride free when accompanied by a paying customer; Blind Access CharlieCard holders ride free and if using a guide, the guide rides free.

* Transfers Subway to Silver Line SL4 or SL5 pay $2.40

** Requires Student CharlieCard or Youth CharlieCard. Student CharlieCards available to students through participating middle and high schools. Youth CharlieCards available through community partners across Greater Boston.

*** Requires Senior/TAP CharlieCard, available to Medicare cardholders, seniors 65+, and persons with disabilities.

Winter 2021 Holidays
12/25/20 & 1/1/21 Sun; 1/18/21 & 2/15/21: Sat

Fares

	Local Bus	Bus + Bus	Rapid Transit	Bus + Rapid Transit
PER TRIP				
CharlieCard	$1.70	$1.70	$2.40	$2.40
CharlieTicket	$1.70	$1.70	$2.40	$4.10*
Cash-on-Board	$1.70	$3.40	$2.40	$4.10
Student/Youth**	$0.85	$0.85	$1.10	$1.10
Senior/TAP***	$0.85	$0.85	$1.10	$1.10
UNLIMITED TRIP PASSES				
1-Day	$12.75	$12.75	$12.75	$12.75
7-Day	$22.50	$22.50	$22.50	$22.50
Monthly	$55.00	$55.00	$90.00	$90.00

FREE FARES: Children 11 and under ride free when accompanied by a paying customer; Blind Access CharlieCard holders ride free and if using a guide, the guide rides free.

*** Transfers Subway to Silver Line SL4 or SL5 pay $2.40**
**** Requires Student CharlieCard or Youth CharlieCard.**

Student CharlieCards available to students through participating middle and high schools. Youth CharlieCards available through community partners across Greater Boston.

***** Requires Senior/TAP CharlieCard, available to Medicare cardholders, seniors 65+ and persons with disabilities.**

TRANSFERS
If paying with a CharlieTicket or CharlieCard, discounted transfers that are available are automatic — use the same ticket or card throughout your trip. If paying with cash onboard a vehicle, free transfers are only allowed between subway lines and inside paid platform areas at gated stations.

SCHEDULES
Schedules are available at the subway stations that a route serves.
All schedulesavailable at: South Staion, Park Street and Airport.

For real-time subway and bus tracking, download the Transit app on any smartphone.

Schedule Change

Rapid Transit

Effective December 20, 2020

Massachusetts Bay Transportation Authority

massDOT Massachusetts Department of Transportation

Information 617-222-3200 • 1-800-392-6100
(TTY) 617-222-5146 • www.mbta.com

Rapid Transit Line	Weekday				Saturday			Sunday		
	First Trip	Peak	Off Peak	Last Trip	First Trip	Arriving Every	Last Trip	First Trip	Arriving Every	Last Trip
Red Line										
Alewife	5:24 AM	9	12-16	12:23 AM	5:24 AM	12-16	12:20 AM	6:08AM	12-16	12:20 AM
Braintree	5:08 AM	mins	mins	12:17 AM	5:09 AM	mins	12:17 AM	5:56AM	mins	12:17 AM
Alewife	5:16 AM	9	12-16	w 12:30 AM	5:16 AM	12-16	w 12:27 AM	6:00AM	12-16	w 12:27 AM
Ashmont	5:16 AM	mins	mins	w 12:30 AM	5:16 AM	mins	w 12:30 AM	6:00AM	mins	w 12:30 AM
"M" Ashmont	5:17 AM	5	8-12 Day	w 1:05 AM	5:15 AM	8-12 Day	w 1:05 AM	6:03AM	8-12 Day	w 1:05 AM
Mattapan	5:05 AM	mins	26 Late	12:53 AM	5:05 AM	26 Early/Late	12:53 AM	5:51AM	26 Early/Late	12:55 AM
Blue Line										
Wonderland	5:13 AM	5	9-13	12:28 AM	5:25 AM	9-13	12:28 AM	5:58AM	9-13	12:28 AM
Orient Heights	5:14 AM	mins	mins	12:33 AM	5:13 AM	mins	12:33 AM	6:03AM	mins	12:33 AM
Bowdoin	5:30 AM			w 1:00 AM	5:29 AM		w 1:00 AM	6:21AM		w 1:00 AM
Orange Line										
Oak Grove	5:16 AM	7	9-11	w 12:30 AM	5:16 AM	9-11	w 12:30 AM	6:00AM	9-11	w 12:30 AM
Forest Hills	5:16 AM	mins	mins	w 12:28 AM	5:16 AM	mins	w 12:28 AM	6:00AM	mins	w 12:28 AM
Green Line*										
B Boston College	5:01 AM	6	7-10	12:10 AM	4:45 AM [2]	7-8	12:09 AM	5:20AM [2]	9	12:10 AM
Park Street	5:45 AM	mins	mins	w 12:52 AM	5:41 AM	mins	w 12:52 AM	6:15AM	mins	w 12:52 AM
C Cleveland Circle	4:57 AM [1]	6-8	9-11	12:07 AM	4:50 AM [2]	9-10	12:10 AM	5:30AM [2]	10	12:10 AM
North Station	5:48 AM	mins	mins	w 12:46 AM	5:30 AM	mins	w 12:46 AM	6:06AM	mins	w 12:46 AM
D Riverside	4:56 AM	6-7	8-11	12:02 AM	4:55 AM	8-9	12:02 AM	5:25AM	11-12	12:05 AM
Government Ctr.	5:45 AM	mins	mins	w 12:49 AM	5:41 AM	mins	w 12:49 AM	6:12AM	mins	w 12:49 AM
E Lechmere *	5:00 AM [4]	6-7	8-10	12:35 AM	5:00 AM	10	12:34 AM	5:36AM	12	12:34 AM
Heath Street	5:44 AM	mins	mins	12:47 AM [3]	5:40 AM	mins	12:47 AM [3]	6:16AM	mins	12:47 AM [3]
Silver Line										
SL1 Logan Airport	5:38 AM	7-12	10-12	f 1:06 AM	5:48 AM	10-12	1:15 AM	5:50AM	10-12	f 1:12 AM
South Station	5:37 AM	mins	mins	w 12:49 AM	5:45 AM	mins	w 12:59 AM	6:12AM	mins	w 1:00 AM
SL2 Design Center	6:18 AM	6	14-16	12:37 AM	6:03 AM	14-16	12:35 AM	6:51AM	14-16	12:51 AM
South Station	5:54 AM	mins	mins	12:51 AM	5:47 AM	mins	12:45 AM	6:35AM	mins	12:36 AM
SL3 Chelsea Station	4:55 AM	6-11	8-13	f 1:05 AM	5:30 AM	8-13	1:22 AM	6:26AM	8-13	f 1:25 AM
South Station	4:20 AM	mins	mins	w 12:35 AM	4:56 AM	mins	w 12:55 AM	5:53AM	mins	w 12:55 AM
SL4 Nubian Station	5:20 AM	6-11	6-11	12:20 AM	5:23 AM	13-20	12:20 AM	6:02AM	13-20	12:20 AM
South Station	5:38 AM	mins	mins	12:37 AM	5:40 AM	mins	12:40 AM	6:20AM	mins	12:40 AM
SL5 Nubian Station	5:15 AM	11-14	13-20	12:51 AM	5:19 AM	6-11	12:43 AM	6:00AM	6-11	12:25 AM
Downtown Xing	5:32 AM	mins	mins	w 1:07 AM	5:34 AM	mins	w 1:00 AM	6:16AM	mins	w 12:47 AM

Peak Service:
Weekdays 7 AM - 9 AM, 4 PM - 6:30 PM

Green Line Notes:

New and ongoing infrastucture projects may result in diversions on some branches at various times.

See GL service changes at mbta.com/GLwork

View service alerts at mbta.com/alerts

* E trains start/end at North Station for Green Line Extension work – shuttles provided between North Station and Lechmere.

More: mbta.com/GLEwork

1 - The first two C train AM northbound trips run through to Lechmere Station on weekdays.

2 - The first B and second C train AM northbound trips run through to Lechmere Station on weekends.

3 - On weekdays the 12:27 AM trip (weekends the 12:32 AM trip) from Heath St is the last connecting train to other lines downtown. The 12:37AM and 12:47AM trips (weekends the 12:47AM trip) from Heath St. runs in service to Lechmere with no guaranteed connections.

4 - Early morning service from Lechmere to Riverside departs Lechmere at 5:00 AM.

f - After exiting Ted Williams Tunnel bus will only service World Trade Center and South Station stops.

w - Last trips wait at some stations, primarily in the Downtown area, for connecting service. Departure times are approximate.

Winter 2021 Holidays
12/25/20 & 1/1/21 Sun; 1/18/21 & 2/15/21: Sat

□ Traffic Volume Data

MDM Transportation Consultants, Inc.

28 Lord Road, Suite 280
Marlborough, MA, 01752

N/S:Chesley Road/Gas Station
E/W:Beacon Street
SW/NE: Union Street
Newton, MA

File Name : 1098 Beacon at Union and Chesley
Site Code : 1098
Start Date : 9/10/2020
Page No : 1

Groups Printed- Lights - Mediums - Articulated Trucks

	Chesley Road From North						Beacon Street From East						Gas Station From South						Union Street From Southwest						Beacon Street From West						
Start Time	Right	Bear Right	Thru	Left	Peds	App. Total	Right	Thru	Bear Left	Left	Peds	App. Total	Right	Thru	Left	Hard Left	Peds	App. Total	Hard Right	Bear Right	Bear Left	Hard Left	Peds	App. Total	Hard Right	Right	Thru	Left	Peds	App. Total	Int. Total
07:00 AM	1	0	0	0	0	1	0	52	0	0	0	52	0	0	0	0	0	0	2	11	1	1	0	15	0	1	43	1	0	45	113
07:15 AM																															
07:30 AM	0	0	0	1	0	1	2	75	0	1	0	78	0	0	1	0	0	1	0	26	1	1	0	28	0	0	64	0	0	64	172
07:45 AM																															
Total	3	0	1	2	0	6	3	295	1	2	0	301	0	0	2	0	0	2	3	79	6	2	0	90	0	1	256	4	0	261	660
08:00 AM								109																							
08:15 AM	0	0	0	1	0	1	2	83	0	1	0	86	0	0	0	0	0	0	0	28	3	1	0	32	0	1	85	5	0	91	210
08:30 AM																															
08:45 AM	2	0	0	0	0	2	0	94	0	1	0	95	0	0	0	0	0	0	1	15	1	2	0	19	0	2	67	0	0	69	185
Total	5	0	1	2	0	8	6	364																			299				
03:00 PM	1	0	0	3	0	4	1	134	0	0	0	135	0	0	1	0	0	1	0	25	0	3	0	28	0	3	81	2	0	86	254
03:15 PM								145																							
03:30 PM	0	0	0	1	0	1	2	126	0	0	0	128	1	0	0	0	0	1	0	18	0	3	0	21	0	1	78	0	0	79	230
03:45 PM								123																			108				
Total	1	0	0	5	0	6	5	528	0	1	0	534	2	0	3	0	0	5	0	79	1	13	0	93	0	8	336	9	0	353	991
04:00 PM								155																							
04:15 PM	6	0	0	3	0	9	1	116	0	0	0	117	1	0	0	0	0	1	0	17	0	4	0	21	0	0	78	3	0	81	229
04:30 PM								118																							
04:45 PM	1	0	0	0	0	1	3	123	0	1	0	127	1	0	0	0	0	1	1	9	0	3	0	13	0	0	81	2	0	83	225
Total	14	0	0	4	0	18	8	512																			318				
05:00 PM	8	0	0	0	0	8	1	111	0	0	0	112	0	0	0	0	0	0	0	20	1	3	0	24	0	3	62	3	0	68	212
05:15 PM								105																							
05:30 PM	0	0	0	0	0	0	0	128	1	1	0	130	0	0	0	0	0	0	2	16	0	5	0	23	0	0	77	2	0	79	232
05:45 PM								124																							
Total	15	0	0	1	0	16	1	468	1	1	0	471	2	0	0	0	0	2	3	63	1	17	0	84	2	5	275	14	0	296	869
Grand Total								2167	2	8	0	2200								353							1484	46	0	1554	4250
Apprch %	70.4		3.7	25.9				98.5	0.1	0.4			58.3		41.7				2.1	82.1	4.4	11.4			0.1	1.4	95.5				
Total %	0.9			0.3			0.5			0.2		51.8	0.2		0.1				0.2	8.3	0.4	1.2		10.1	0	0.5	34.9	1.1		36.6	
Lights	36	0	2	12	0	50	20	2106				2136								348							1393	46	0	1463	4085
% Lights	94.7	0	100	85.7	0	92.6	87	97.2	100	100	0	97.1	100	0	100	0	0	100	100	98.6	94.7	100	0	98.6	100	100	93.9	100	0	94.1	96.1
Mediums																															
% Mediums	5.3	0	0	14.3	0	7.4	8.7	2.4	0	0	0	2.5	0	0	0	0	0	0	0	1.1	5.3	0	0	1.2	0	0	5.7	0	0	5.5	3.5
Articulated Trucks	0	0	0	0	0	0	1	9	0	0	0	10	0	0	0	0	0	0	0	1	0	0	0	1	0	0	6	0	0	6	17
% Articulated Trucks	0	0	0	0	0	0	4.3	0.4	0	0	0	0.5	0	0	0	0	0	0	0	0.3	0	0	0	0.2	0	0	0.4	0	0	0.4	0.4

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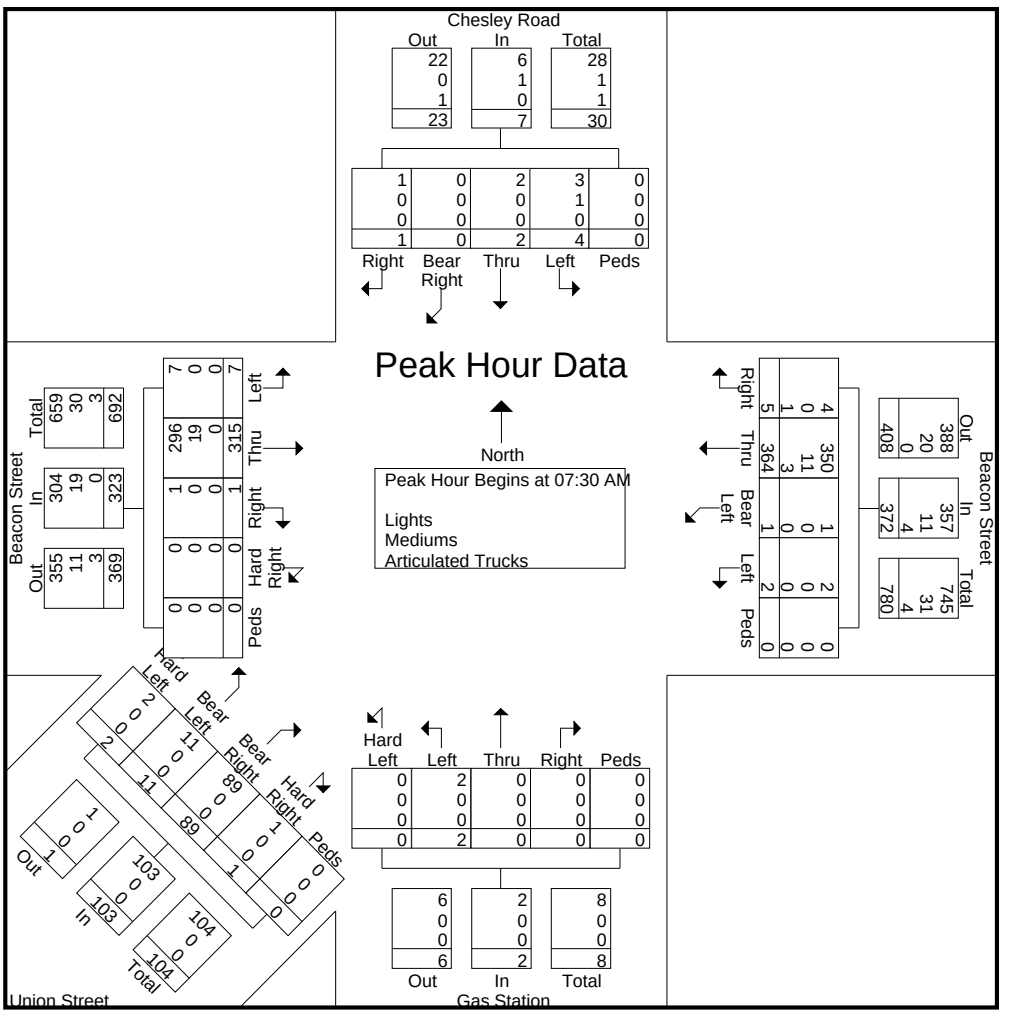
File Name : 1098 Beacon at Union and Chesley
Site Code : 1098
Start Date : 9/10/2020
Page No : 2

	Chesley Road From North						Beacon Street From East						Gas Station From South						Union Street From Southwest						Beacon Street From West						
Start Time	Right	Bear Right	Thru	Left	Peds	App. Total	Right	Thru	Bear Left	Left	Peds	App. Total	Right	Thru	Left	Hard Left	Peds	App. Total	Hard Right	Bear Right	Bear Left	Hard Left	Peds	App. Total	Hard Right	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																															
Peak Hour for Entire Intersection Begins at 07:30 AM																															
07:30 AM	0	0	0	**1**	0	1	**2**	75	0	**1**	0	78	0	0	**1**	0	0	**1**	0	26	1	**1**	0	28	0	0	64	0	0	64	172
07:45 AM	**1**		**1**			**3**		97	**1**										**1**	19	**4**						81				210
08:00 AM								**109**				**109**								16							**85**				**215**
08:15 AM								83												**28**				**32**		**1**	85	**5**		**91**	210
Total Volume								364				372	0	0	2	0	0	2	1	89	11			103	0	1	315			323	807
% App. Total	14.3		28.6	57.1			1.3	97.8	0.3	0.5					100					86.4	10.7	1.9				0.3	97.5	2.2			
PHF	.250	.000	.500	1.00	.000	.583	.625	.835	.250	.500	.000	.853	.000	.000	.500	.000	.000	.500	.250	.795	.688	.500	.000	.805	.000	.250	.926	.350	.000	.887	.938
Lights	1	0	2	3	0	6	4	350				357								89	11			103			296			304	772
% Lights	100		100	75.0		85.7	80.0	96.2	100	100		96.0	0	0	100			100	100	100	100	100		100	0	100	94.0	100		94.1	95.7
Mediums								11																			19				
% Mediums	0	0	0	25.0	0	14.3	0	3.0	0	0	0	3.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6.0	0	0	5.9	3.8
Articulated Trucks	0	0	0	0	0	0	1	3	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
% Articulated Trucks	0	0	0	0	0	0	20.0	0.8	0	0	0	1.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5



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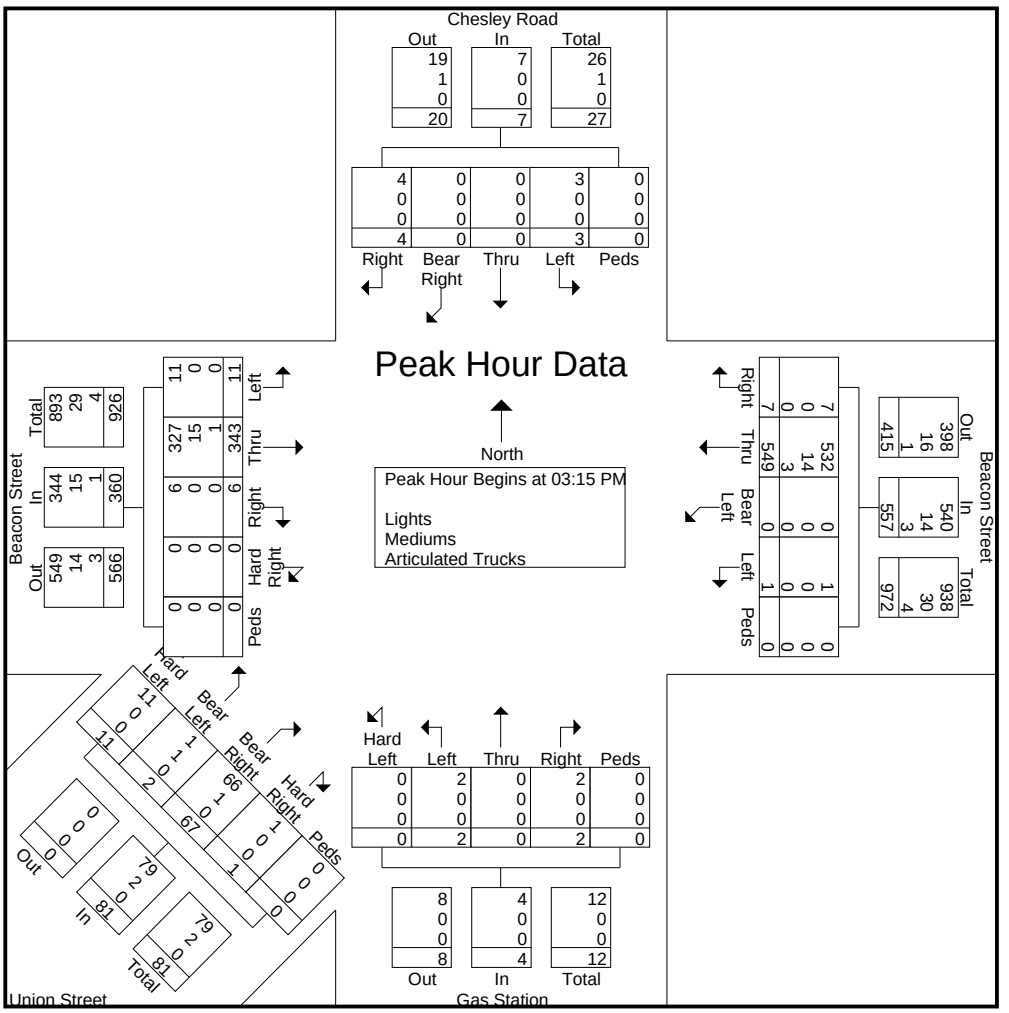
	Chesley Road From North						Beacon Street From East						Gas Station From South						Union Street From Southwest						Beacon Street From West						
Start Time	Right	Bear Right	Thru	Left	Peds	App. Total	Right	Thru	Bear Left	Left	Peds	App. Total	Right	Thru	Left	Hard Left	Peds	App. Total	Hard Right	Bear Right	Bear Left	Hard Left	Peds	App. Total	Hard Right	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																															
Peak Hour for Entire Intersection Begins at 03:15 PM																															
03:15 PM	0	0	0	0	0	0	1	145	0	**1**	0	147	0	0	**2**	0	0	**2**	0	**20**	0	2	0	**22**	0	**2**	69	**6**	0	77	248
03:30 PM				**1**				126				128	**1**							18							78				230
03:45 PM								123				124	1	0	0	0	0	1	0	16	**1**	**5**					**108**			**111**	259
04:00 PM	**4**					**5**	**3**	**155**				**158**							**1**	13							88				**272**
Total Volume								549				557	2	0	2	0	0	4	1	67		11					343	11		360	1009
% App. Total	57.1	0	0	42.9	0		1.3	98.6	0	0.2	0		50	0	50	0	0		1.2	82.7	2.5	13.6	0		0	1.7	95.3	3.1	0		
PHF	.250	.000	.000	.750	.000	.350	.583	.885	.000	.250	.000	.881	.500	.000	.250	.000	.000	.500	.250	.838	.500	.550	.000	.920	.000	.750	.794	.458	.000	.811	.927
Lights	4	0	0	3	0	7	7	532				540								66		11					327	11		344	974
% Lights	100			100		100	100	96.9		100		96.9	100		100			100	100	98.5	50.0	100		97.5	0	100	95.3	100		95.6	96.5
Mediums								14																			15				
% Mediums	0	0	0	0	0	0	0	2.6	0	0	0	2.5	0	0	0	0	0	0	0	1.5	50.0	0	0	2.5	0	0	4.4	0	0	4.2	3.1
Articulated Trucks	0	0	0	0	0	0	0	3	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	4
% Articulated Trucks	0	0	0	0	0	0	0	0.5	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0	0	0.3	0.4



□ Historical Adjustment Data

massDOT Highway

TCDS Help Refresh MS2

Transportation Data Management System

Home | TMC | TCLS | TTDS | PMS | PMDS | RSMS | NMDS | WOTS | RTTV

Back | Login | +Locate | Locate All

Auto-Locate OFF

Volume Count Report

LOCATION INFO	
Location ID	4165
Type	SPOT
Fnct'l Class	1
Located On	YANKEE DIVISION HIGHWAY
Loc On Alias	
NORTH OF	RAMP-RT 16 WB TO RT 95 SB
Direction	2-WAY
County	Middlesex
Community	Newton
MPO ID	
HPMS ID	207065501030
Agency	MHD

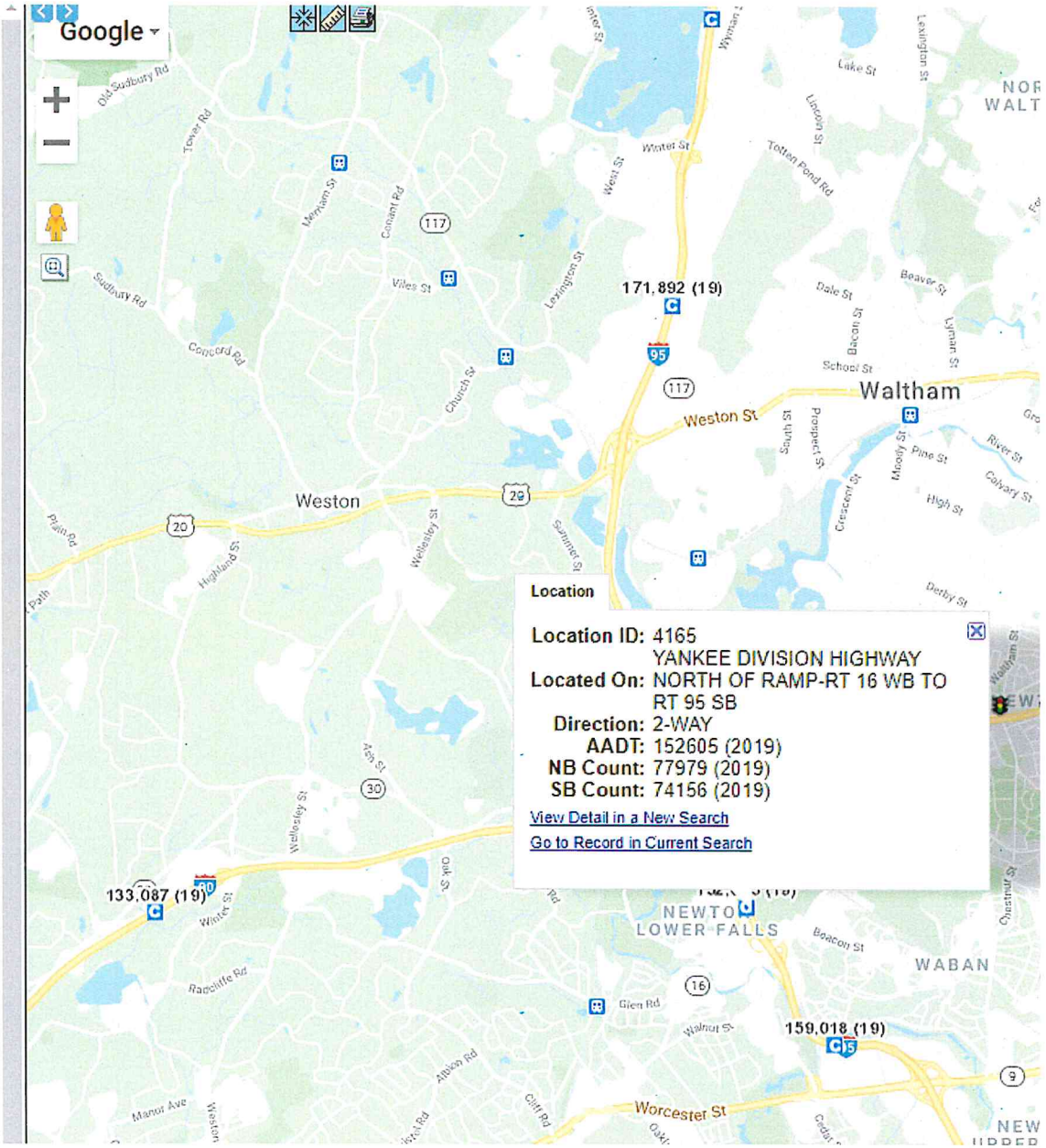
COUNT DATA INFO	
Count Status	Accepted
Start Date	Thu 9/10/2020
End Date	Fri 9/11/2020
Start Time	12:00:00 AM
End Time	12:00:00 AM
Direction	2-WAY
Notes	
Station	000000416502
Study	
Speed Limit	
Description	
Sensor Type	
Source	CombineVolumeCountsIncremental
Latitude,Longitude	

INTERVAL:15-MIN

Time	15-min Interval 1st	2nd	3rd	4th	Hourly Count
0:00-1:00	191	146	134	124	595
1:00-2:00	142	96	101	96	435
2:00-3:00	99	83	98	93	373
3:00-4:00	78	111	114	135	438
4:00-5:00	153	221	307	361	1,042
5:00-6:00	522	835	1,166	1,361	3,884
6:00-7:00	1,482	1,895	2,291	2,323	7,991
7:00-8:00	2,261	2,454	2,648	2,700	10,063
8:00-9:00	2,545	2,323	2,182	2,202	9,252
9:00-10:00	2,307	1,929	2,054	1,923	8,213
10:00-11:00	1,971	2,020	2,113	2,055	8,159
11:00-12:00	1,958	2,093	2,058	2,114	8,223
12:00-13:00	2,090	2,120	2,168	2,176	8,554
13:00-14:00	2,098	2,201	2,268	2,467	9,034
14:00-15:00	2,585	2,744	2,637	2,621	10,587
15:00-16:00	2,817	2,752	2,635	2,646	10,850
16:00-17:00	2,516	2,585	2,350	2,350	9,801
17:00-18:00	2,670	2,742	2,510	2,230	10,152
18:00-19:00	2,000	1,907	1,646	1,381	6,934
19:00-20:00	1,238	1,281	1,017	798	4,334
20:00-21:00	804	1,024	709	679	3,216
21:00-22:00	667	591	605	520	2,383
22:00-23:00	504	407	393	404	1,708
23:00-24:00	376	308	326	244	1,254
Total					137,475
AM Peak					07:15-08:15 10,347
PM Peak					15:00-16:00 10,850

Count Navigation: |<< | < | > | >>| Count Type: VOLUME

Directions: 2-WAY NB 1 2 3 4 SB 1 2 3 4 5



Pandemic Adjustment

	2020	2017	% Δ
AM 7-9	19,315	22,929	19%
PM 4-6	19,953	21,983	10%

massDOT Highway

TCDS Help Refresh MS2

Transportation Data Management System

Home | TMC | TCLS | TTDS | PMS | PMDS | RSMS | NMDS | WOTS | RTTV

Back | Login | Locate | Locate All

Auto-Locate OFF

Volume Count Report

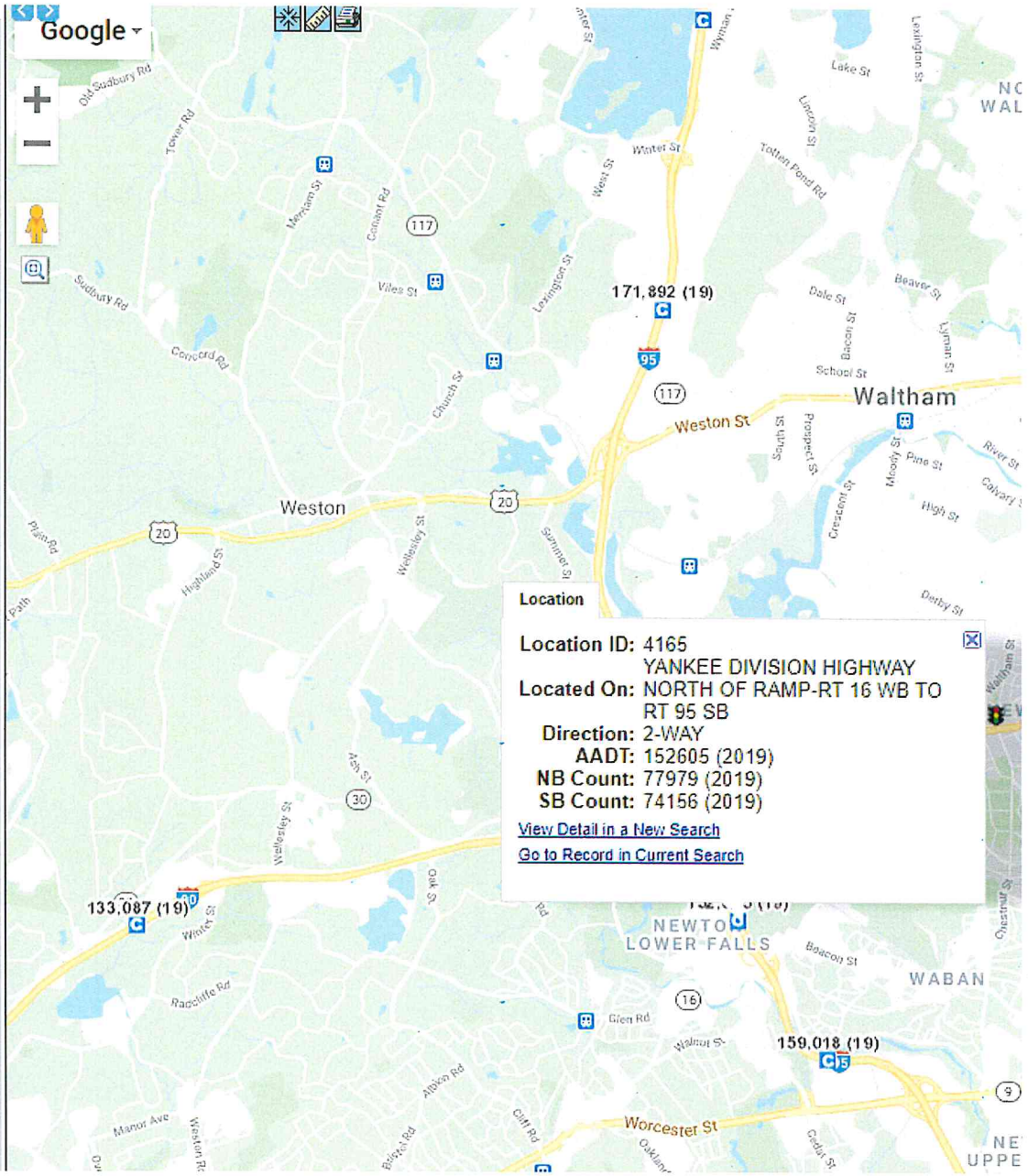
LOCATION INFO	
Location ID	4165
Type	SPOT
Fnct'l Class	1
Located On	YANKEE DIVISION HIGHWAY
Loc On Alias	
NORTH OF	RAMP-RT 16 WB TO RT 95 SB
Direction	2-WAY
County	Middlesex
Community	Newton
MPO ID	
HPMS ID	207065501030
Agency	MHD

COUNT DATA INFO	
Count Status	Accepted
Start Date	Thu 9/21/2017
End Date	Fri 9/22/2017
Start Time	12:00:00 AM
End Time	12:00:00 AM
Direction	2-WAY
Notes	
Station	000000416502
Study	
Speed Limit	
Description	
Sensor Type	Combined Non-Axle Type Counts
Source	
Latitude,Longitude	

INTERVAL:60-MIN	
Time	Hourly Count
0:00-1:00	754
1:00-2:00	503
2:00-3:00	359
3:00-4:00	460
4:00-5:00	1,158
5:00-6:00	4,964
6:00-7:00	10,393
7:00-8:00	11,798
8:00-9:00	11,131
9:00-10:00	10,799
10:00-11:00	9,880
11:00-12:00	9,507
12:00-13:00	9,628
13:00-14:00	9,879
14:00-15:00	10,821
15:00-16:00	10,250
16:00-17:00	10,641
17:00-18:00	11,342
18:00-19:00	10,261
19:00-20:00	7,630
20:00-21:00	5,527
21:00-22:00	4,064
22:00-23:00	2,668
23:00-24:00	1,635
Total	166,052
AADT	151,605
AM Peak	07:00-08:00 11,798
PM Peak	17:00-18:00 11,342

Count Navigation: |<< | < | > | >>| Count Type: VOLUME

Directions: 2-WAY | NB 1 2 3 4 | SB 1 2 3 4 5



□ Crash Data

Crash Number	City Town I	Crash Date	Crash Severity	Crash Status	Crash Time	Crash Year	Max Injury Severity Reported	Number of Vehicles	Light Conditions	Manner of Collision	Non-Motorist Type (A	Road Surfa	X	Y
4242531	NEWTON	08/29/2016	Non-fatal injury	Closed	11:56 AM	2016	Non-fatal injury - Non-incapa	1	Daylight	Head-on	P2: Pedestrian	Dry	225483.8	897844.7
4268356	NEWTON	09/22/2016	Unknown	Closed	9:30 PM	2016	Not reported	2	Dark - lighted roadway	Angle		Dry	225479.7	897843.7
4408100	NEWTON	01/02/2017	Property damage only (n	Closed	6:20 PM	2017	No injury	2	Dark - lighted roadway	Angle		Dry	225505.3	897849.8
4409302	NEWTON	03/17/2017	Property damage only (n	Closed	4:38 AM	2017	No injury	3	Dark - lighted roadway	Head-on		Dry	225514.7	897852.4
4470709	NEWTON	12/14/2017	Property damage only (n	Closed	8:09 AM	2017	No injury	3	Daylight	Rear-end		Ice	225479.7	897843.7
4473166	NEWTON	12/14/2017	Property damage only (n	Closed	7:05 PM	2017	No injury	2	Dark - lighted roadway	Rear-end		Dry	225505.3	897849.8
4724267	NEWTON	02/08/2019	Property damage only (n	Open	7:08 PM	2019	No injury	3	Dark - lighted roadway	Sideswipe, same direction			225458.5	897838.7
4724492	NEWTON	06/28/2019	Property damage only (n	Open	3:55 PM	2019	No Apparent Injury (O)	2	Daylight	Rear-end			225479.7	897843.7
4758650	NEWTON	09/16/2019	Non-fatal injury	Open	5:50 PM	2019	Suspected Serious Injury (A)	2	Daylight	Sideswipe, same direction	P3: Cyclist	Dry	225441.5	897834.8

Data Level: CRASH
Query Type: Spatial
Criteria: If you conducted an Advanced Query your SQL statement will be listed here

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Newton, MA COUNT DATE : Sep-18

DISTRICT : 6 UNSIGNALIZED : X SIGNALIZED :

~ INTERSECTION DATA ~

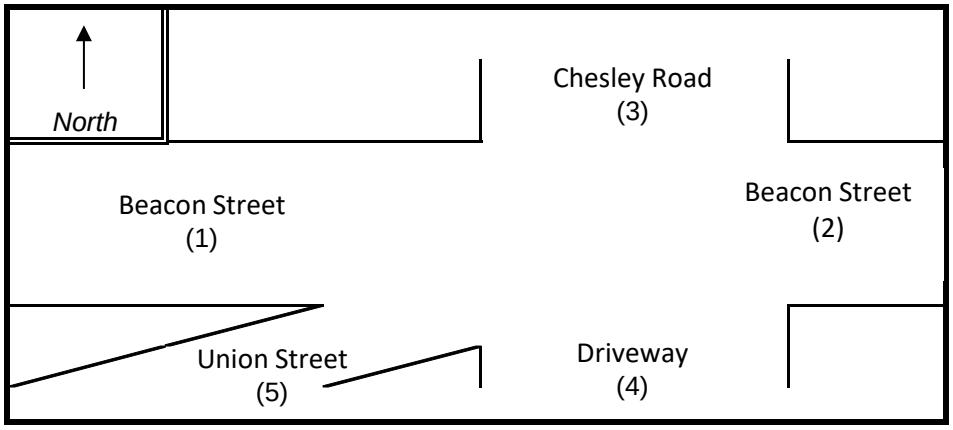
MAJOR STREET : Beacon Street

MINOR STREET(S) : Union Street Street

Chesley Street

Gas Station Driveway

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	EB	WB	SB	NB	NEB	
PEAK HOURLY VOLUMES (PM) :	396	613	7	4	89	**1,109**

" K " FACTOR : **0.070** INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **15,843**

TOTAL # OF CRASHES : 9 # OF YEARS : 5 AVERAGE # OF CRASHES PER YEAR (**A**) : **1.80**

CRASH RATE CALCULATION : **0.31** RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments : MassDOT District 6 Avg: Signalized = 0.71; Unsignalized = 0.52

Project Title & Date: 1098 - Newton

- Trip Generation

Institute of Transportation Engineers (ITE)
Land Use Code (LUC) 942 - Automobile Care Center

Average Vehicle Trips Ends vs: 1000 Sq. Feet Occ. Gr. Leasable Area
Independent Variable (X): 3.02

WEEKDAY MORNING PEAK HOUR OF ADJACENT STREET TRAFFIC

T = 2.25* (X)
T = 2.25 * 3
T = 6.80
T = 7 vehicle trips
with 66% (5 vph) entering and 34% (2 vph) exiting.

WEEKDAY EVENING PEAK HOUR OF ADJACENT STREET TRAFFIC

T = 3.11 * (X)
T = 3.11 * 3
T = 9.39
T = 9 vehicle trips
with 48% (4 vph) entering and 52% (5 vph) exiting.

Institute of Transportation Engineers (ITE) 10th Edition
Land Use Code (LUC) 882 - Marijuana Dispensary

Average Vehicle Trips Ends vs: 1,000 Sq. Feet Gross Leasable Area
Independent Variable (X): 3.020

AVERAGE WEEKDAY DAILY

T = 252.70*(X)
T = 252.70* 3.02
T = 763.15
T = 764 vehicle trips
with 50% (382 vpd) entering and 50% (382 vpd) exiting.

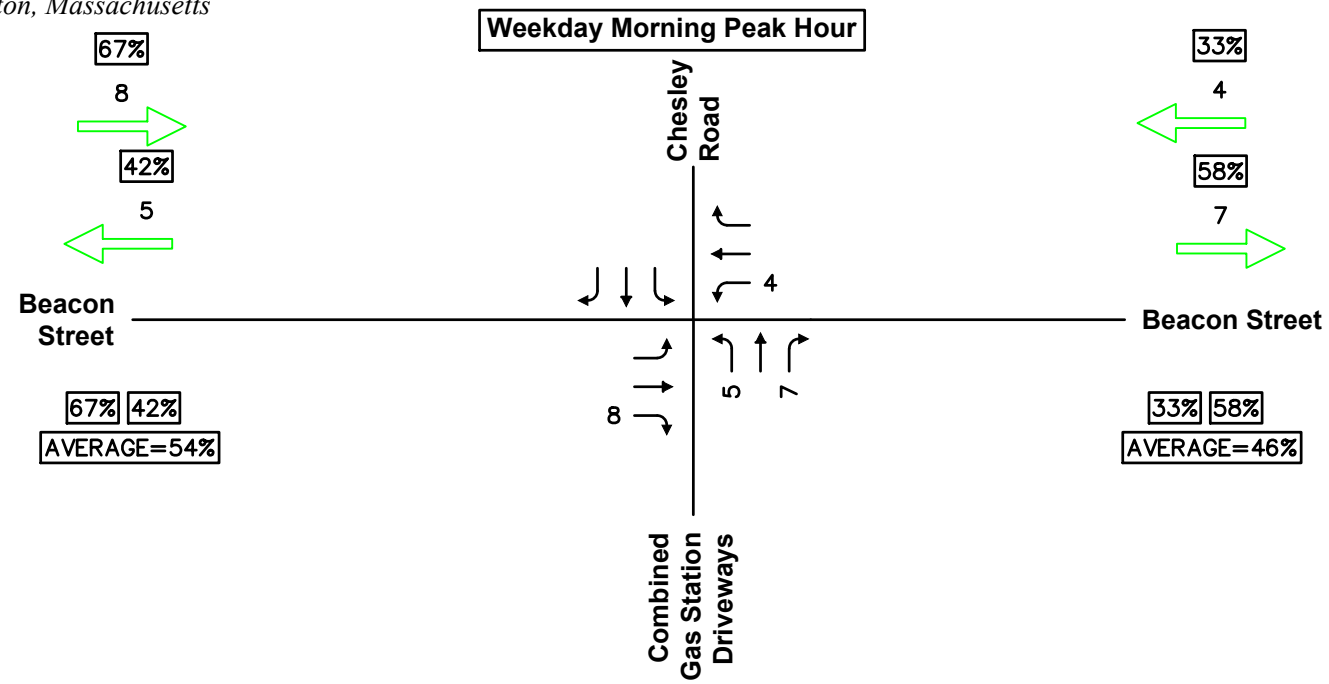
WEEKDAY MORNING PEAK HOUR OF ADJACENT STREET TRAFFIC

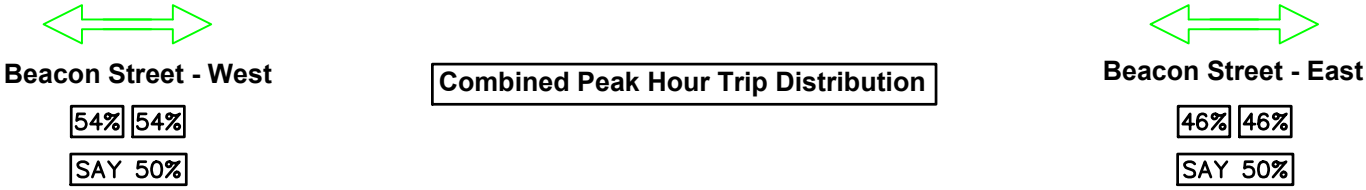
T = 10.44 * (X)
T = 10.44 * 3.02
T = 31.53
T = 32 vehicle trips
with 56% (18 vph) entering and 44% (14 vph) exiting.

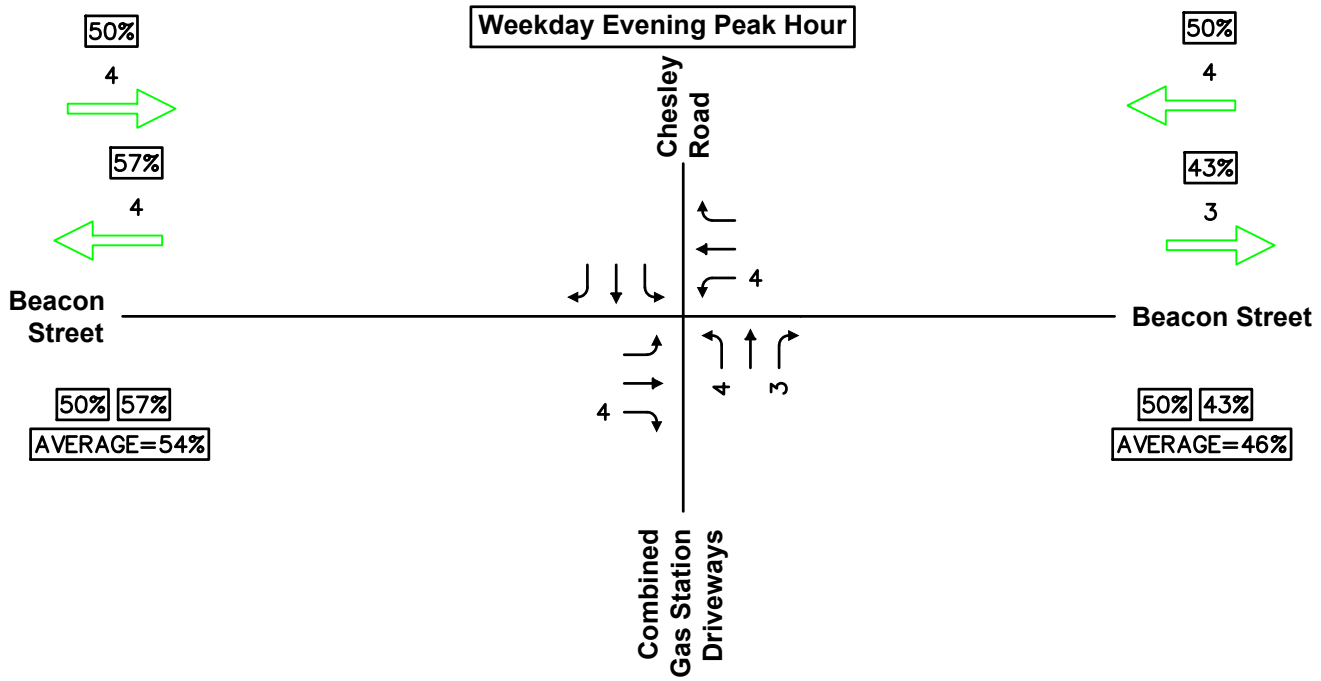
WEEKDAY EVENING PEAK HOUR OF ADJACENT STREET TRAFFIC

T = 21.83 *(X)
T = 21.83* 3.02
T = 65.93
T = 66 vehicle trips
with 50% (33 vph) entering and 50% (33 vph) exiting.

□ Trip Distribution







Attachments

MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers

Trip Distribution Calculations
Weekday Peak Hour Volumes

Date: January 2021
Dwg No. 1098 MR01.dwg

□ Parking Queue Calculations

Parking Queue Analysis: 740 Beacon Street

Period:	Peak Hours			
Scenario:	(Peak Store Condition)			
Input Rate (q)	20	Vehicles/hour		
Service Rate (u)	4	Vehicles/hour =	15.0	Min. Dwell Time
No. Spaces	12			
k	100			

n	p(n)	Cdist	
0	0.006735	-	
1	0.033675	0.04041	
2	0.084188	0.124598	
3	0.140313	0.264911	
4	0.175391	0.440302	
5	0.175391	0.615693	**Avg. Q**
6	0.146159	0.761853	
7	0.1044	0.866252	
8	0.06525	0.931502	
9	0.03625	0.967752	**Max Q**
10	0.018125	0.985877	
11	0.008239	0.994115	
12	0.003433	0.997548	
13	0.00143	0.998978	
14	0.000596	0.999574	
15	0.000248	0.999823	
16	0.000103	0.999926	
17	4.31E-05	0.999969	
18	1.8E-05	0.999987	
19	7.48E-06	0.999995	
20	3.12E-06	0.999998	

N= Number of Parked Vehicles
P(n)= probability of n parked vehicles
Cdist= Cumulative probability of n queued vehicles or less

Assumptions
1. Average customer turnover is conservatively assumed to be 15 Min; obserevd maximum turnover is 15 Min. 40 Sec.
2. Average arrival for peak hour is approximately 20 auto-related arrivals per hour during peak hours based proposed client scheduling.
3. Queuing algorithm based on M/M/S model, per Introduction to Operations Research, 6th Ed., Hillier & Lieberman, 1995 P. 686-689.