PARE PROJECT NO. 20099.00
REPORT

TRAFFIC IMPACT ANALYSIS FOR THE DUNKIN' DONUTS NEWTON, MASSACHUSETTS

SUBMITTED TO:
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INTRODUCTION

The following represents the traffic study completed for the reconstruction of the Dunkin' Donuts on its existing property located at 940 Boylston Street in Newton, Massachusetts. The proposed reconstruction will include reduction of the existing building interior to accommodate the addition of a drive-through.

The existing Dunkin' Donuts is 2,040 square feet with 21 standard parking spaces and 2 accessible parking spaces. The site has two driveways on Boylston Street (Route 9) and one driveway on Ramsdell Street. The coffee shop operates from 4:00 a.m. to 7:00 p.m. The proposed Dunkin' Donuts will be 1,625 square feet with the addition of a drive-through window on the east side of the building. The site will have 8 standard parking spaces and 1 accessible parking space with a drive-through lane that can store a 12-vehicle queue from the drive-through window. Both of the existing driveways on Boylston Street will be maintained under proposed conditions and the driveway on Ramsdell Street will be eliminated.

Presented within are existing conditions in the vicinity of the project site, a safety analysis of the study area, an analysis of the traffic based on existing, future (2028) no-build and future (2028) build conditions, and proposed mitigation measures and/or recommendations, as necessary. A locus map of the study area is provided in Figure 1 and the proposed site layout is shown in Figure 2.

DATA COLLECTION

Transportation Data Corporation captured traffic data through manual turning movement counts (MTMCs) and an automatic traffic recorder count (ATR). The ATR was placed on Boylston Street (Route 9) eastbound in front of the Dunkin' Donuts for a 48-hour period from Tuesday, March 16, 2021 to Wednesday, March 17, 2021. The MTMCs were conducted on Tuesday, March 16, 2021 from 7:00 a.m. to 9:00 a.m. and from 4:00 p.m. to 6:00 p.m. at the following locations:

- Boylston Street (Route 9) at Elliot Street/Woodward Street (signalized)
- Boylston Street (Route 9) at the Dunkin' Donuts Driveway (unsignalized)

Pedestrian counts were captured during all MTMCs. Peak hour volumes were determined at each intersection for the morning and afternoon commuter peak periods.

Crash data for the roadway network in the vicinity of the project site was extracted from the Massachusetts Department of Transportation (MassDOT) online crash portal database for January 2017 through December 2019. A crash review is included in this report to identify any potential trends that may lend themselves to mitigation.

A field review of the study area was conducted on Wednesday, March 17, 2021, with geometric measurements and other field observations recorded at the significant intersections in the vicinity of the project site. The information obtained was used in the analysis of the study area intersections.

The City of Newton Planning Department was contacted to determine if there are currently any developments proposed whose trip generation information should be included in the no-build scenario for this study. The Deputy Director of the Planning Department noted that a marijuana retailer is proposed at 24 Elliot Street. Trips associated with the development have been included.

=STUDY INTERSECTION

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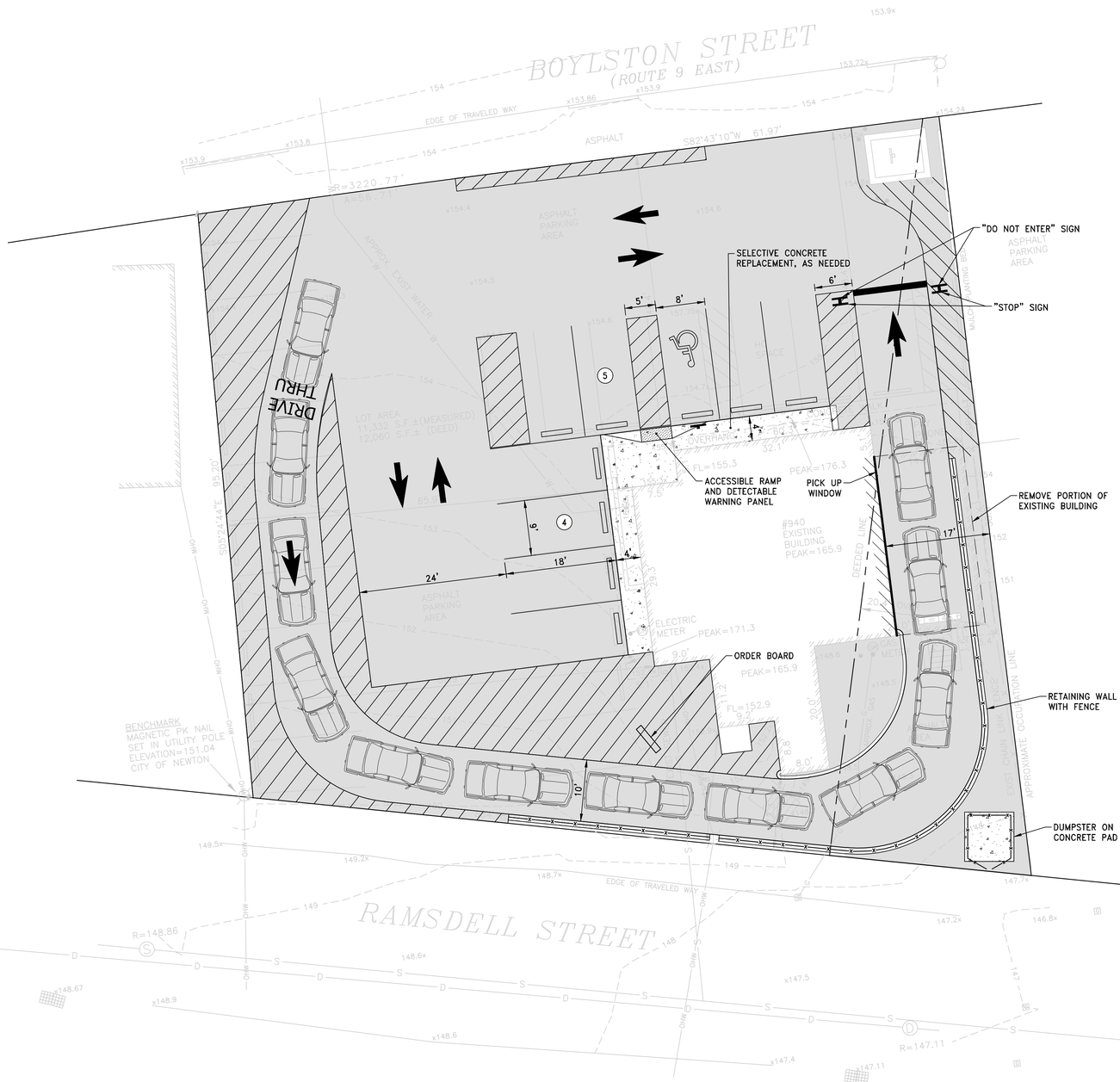
Figure 1
Locus Map

Dunkin Donuts Reconstruction
Newton, Massachusetts



ZONING TABLE			
EXISTING ZONE: BUISINESS – BU2			
TOTAL LOT AREA S/B/L 51026 0003 = 12,060 SF ± (0.28 ACRES)			
BUILDING AREA EXISTING: RESTAURANT 2,040 SF ± PROPOSED: RESTAURANT WITH DRIVE IN 1,625 SF ±			
	REQUIRED	EXISTING	PROVIDED
BUILDING SETBACK			
FRONT SETBACK	20 FT*	48 FT	48 FT
SIDE SETBACK	5 FT**	3 FT ±	17 FT ±
REAR SETBACK	0 FT	12 FT	12 FT
MAX. BUILDING HEIGHT	24 FT	21 FT	21 FT
MAX. FLOOR AREA RATIO	1.00	0.31	0.27
MIN. LOT AREA	10,000 SF	12,060 SF ±	12,060 SF ±

*FRONT SETBACK IS THE AVERAGE OF THE SETBACKS OF BUILDINGS ON THE ADJACENT PARCELS.
950 BOYLSTON = 0 FT ±
926 BOYLSTON = 40 FT ±

**SIDE SETBACK IS ½ BUILDING HEIGHT OR EQUAL TO ABUTTING SIDE YARD SETBACK. ABUTTING SIDE YARD SETBACK 950 BOYLSTON = 5 FT ±

***THERE ARE NO MAXIMUM LOT COVERAGE AND OPEN SPACE REQUIREMENTS FOR BU-2 ZONES

PARKING SUMMARY			
	REQUIRED	EXISTING	PROVIDED
STANDARD SPACES (9'x18')	1	21	8
ACCESSIBLE SPACES**	1	2	1
TOTAL SPACES	2	23	9

RESTAURANT: 1 SPACE PER 3 SEATS AND 1 SPACE PER 3 EMPLOYEES
1 SPACE/3 SEATS * 0 SEATS = 0 SPACES
1 SPACE/3 EMPLOYEES * 5 EMPLOYEES (MAX SHIFT) = 2 SPACES
TOTAL REQUIRED = 2 SPACES

+ ADA REQUIREMENT FOR PARKING LOT 1 TO 25 TOTAL SPACES = 1 SPACES

Scale: 1"=10'
0 5' 10' 20'

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SCALE ADJUSTMENT GUIDE
0" 1"
BAR IS ONE INCH ON ORIGINAL DRAWING

Dunkin Development
940 Boylston Street
Newton, Massachusetts

REVISIONS:

PROJECT NO.:	
DATE:	MARCH 24, 2021
SCALE:	1"=10'
DESIGNED BY:	EL
CHECKED BY:	DLP
DRAWN BY:	AKL
APPROVED BY:	VAH

DRAWING TITLE:
CONCEPT PLAN

DRAWING NO.:
C1.0

SHEET NO. ___ OF ___

EXISTING ROADWAY CONDITIONS

The study area for the Dunkin' Donuts is defined as the significant roadways and intersections in the vicinity of the site that may be impacted by the reconstruction of the coffee shop. Listed below are the roadways and intersections included in the study area.

Study Area Roadways:

1. Boylston Street (Route 9) from Elliot Street to Hartford Street

Study Area Intersections:

1. Boylston Street (Route 9) at Elliot Street/Woodward Street
2. Boylston Street (Route 9) and the Dunkin' Donuts Driveway

Boylston Street (Route 9)

Boylston Street (Route 9) runs in the east/west direction and is classified as an urban principal arterial. Within the study area, Boylston Street operates as a divided roadway with two 11-foot travel lanes, a 1-foot inside shoulder and a 7-foot outside shoulder in each direction. There is an 8-foot sidewalk along the south side of the road and a 5-foot sidewalk separated by a 3-foot grass buffer along the north side of the road. A raised median with guardrail and chain link fence separates the two directions of travel. Within the study area the posted speed limit is 40 miles per hour. Land use along Boylston Street is a combination of residential and commercial uses.

Boylston Street (Route 9) at Elliot Street/Woodward Street

The intersection of Boylston Street (Route 9) with Elliot Street/Woodward Street forms a four-legged signalized intersection. Boylston Street forms the east/west legs, Elliot Street forms the south leg, and Woodward Street forms the north leg. The intersection is controlled by Massachusetts Signal ID No. 0082. The signal plan can be found in Appendix G.

At the intersection, the Boylston Street approaches consist of three 11-foot lanes in each direction, serving as a left-turn lane, a through lane, and a shared through/right-turn lane. The Elliot Street approach consist of an 11-foot left-turn lane, an 11-foot through lane, and a 14-foot channelized right-turn lane. The Woodward Street approach consists of a 10-foot left-turn lane and an 11-foot through/right-turn lane. Sidewalks are present on both sides of all four approaches. Crosswalks are present across the north, east, and south legs of the intersection. Pedestrian signals are present for all crosswalks excluding the crosswalk across the channelized right turn lane from Elliot Street.

Boylston Street (Route 9) and the Dunkin' Donuts Driveway

The intersection of Boylston Street (Route 9) with the Dunkin' Donuts driveway forms a three-legged unsignalized intersection. Boylston Street forms the west/east legs and the site driveway forms the south leg. The westbound direction of Boylston Street cannot access the Dunkin' Donuts due to the raised median. The driveway is stop controlled and Boylston Street operates freely.

At the site entrance, Boylston Street eastbound consists of two 11-foot travel lanes. The Dunkin' Donuts site consists of two curb cuts separated by approximately 12 feet. The western curb cut is 45 feet wide, and the eastern curb cut is 25 feet wide. These function as an entrance and an exit to the site. Sidewalk is present on the south side of Boylston Street. No crosswalks are present at the site driveway.

EXISTING TRAFFIC VOLUMES

Manual turning movement counts (MTMCs) were conducted on Tuesday, March 16, 2021 at the study intersections and an automatic traffic recorder count (ATR) was captured on the eastbound approach of Boylston Street (Route 9) for the 48-hour period from Tuesday, March 16, 2021 to Wednesday, March 17, 2021. Due to the current COVID-19 pandemic and state mandated stay-at-home orders, traffic volumes are significantly lower than "normal" conditions. For this reason, continuous count data from the MassDOT Transportation Data Management System was reviewed to determine the impact the pandemic is having in the study area.

Data from a continuous count station on Interstate 90 (I-90) in Newton, Massachusetts, approximately 2 miles north of the study area, was extracted and reviewed. Daily traffic volumes from March 2020 and March 2021were compared. It was determined that traffic volumes on I- 90 are approximately 67% of those present prior to the COVID pandemic. Volumes were inflated accordingly.

Sales at the Dunkin' Donuts have also been affected by the pandemic. Pare received the Quarter 1 sales data for the Newton Dunkin' Donuts from 2020 and 2021. In the a.m. peak hour the 2021 Quarter 1 sales were 86% of the 2020 sales. In the p.m. peak hour the 2021 Quarter 1 sales were 81% of the 2020 sales. The turning movements in and out of the Dunkin' Donuts driveway were inflated using these factors to reflect pre-pandemic conditions.

The data collected was also reviewed with respect to seasonal demands. The Newton Dunkin' Donuts is not located near any major tourist attractions. For these reasons, no seasonal adjustments were applied to the count data.

Copies of all count data, including pedestrians, are provided in Appendix A. Existing morning peak hour and afternoon commuter peak hour traffic volumes are shown in Figure 3.

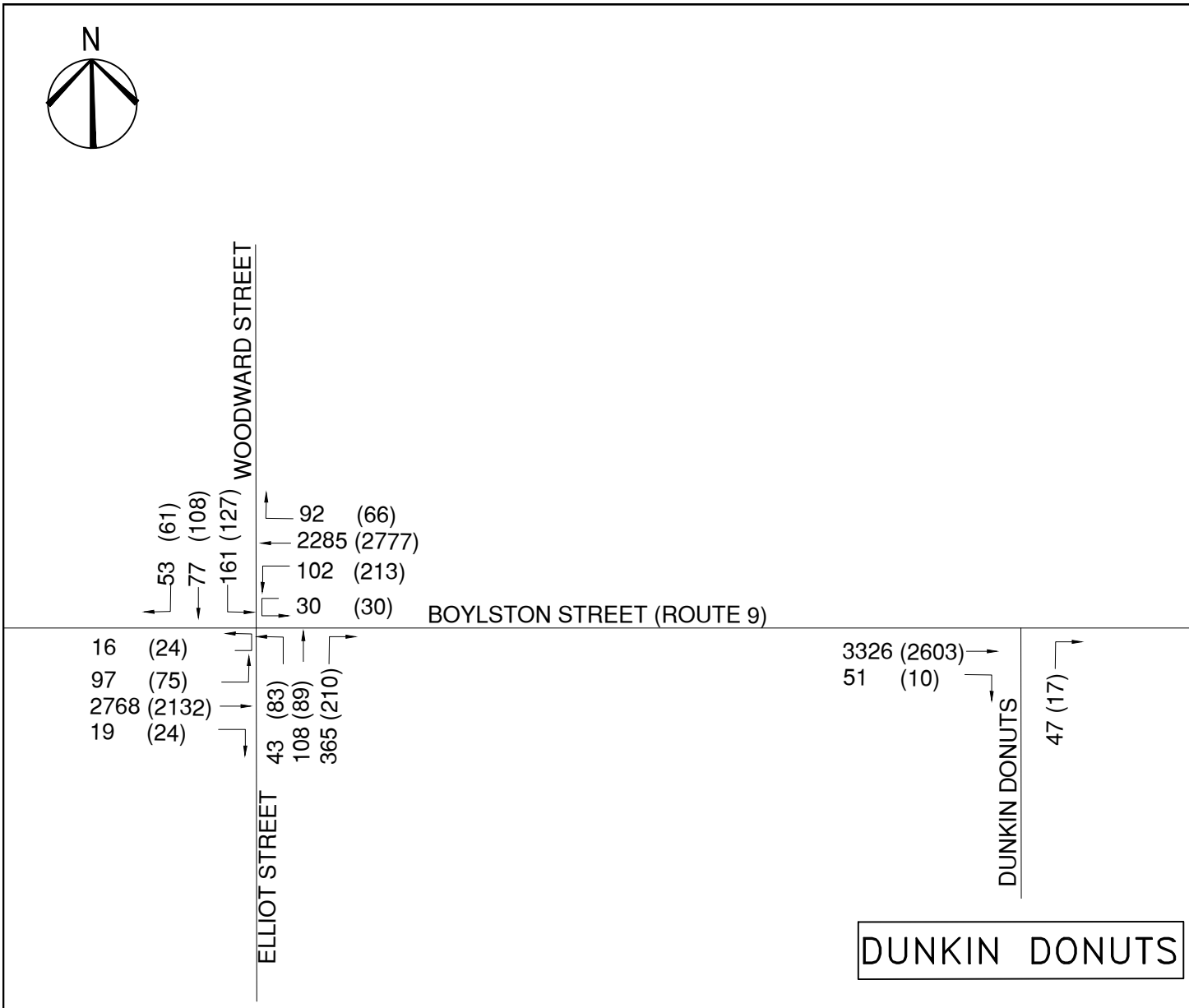
SITE OBSERVATIONS

Site observations were conducted at the study Dunkin' Donuts and two nearby Dunkin' Donuts stores located at 951 and 978 Worcester Street (Route 9) in Wellesley, Massachusetts. Observations at the Newton Dunkin' Donuts were conducted on Wednesday, March 17, 2021 at 8:00 a.m. and the Wellesley Dunkin' Donuts were observed on Tuesday, March 30, 2021 between 7:00 a.m. and 9:00 a.m. The Wellesley Dunkin' Donuts are located on either side of Route 9 approximately 6 miles west of the project site. Both Dunkin' Donuts have drive-through windows.

During morning observations at the Newton Dunkin' Donuts a maximum of 10 vehicles were observed in the parking lot. One (1) vehicle was observed entering the Dunkin' Donuts parking lot through the driveway on Ramsdell Street. No queue was observed as vehicles exited the driveways on Boylston Street. Vehicles were able to easily turn in and out of the driveway without significant delay.

During the morning commuter peak, queues were counted at the drive-through window to determine the maximum queue anticipated under future build conditions at the project site. The Dunkin' Donuts located at 951 Worcester Street is on the eastbound side of Route 9, and therefore serves the high volume of commuters traveling eastbound towards Boston in the morning commuter peak. Of the two observed sites, this Dunkin' experienced longer queues, frequently around 10 vehicles with a typical maximum of 12 vehicles measured from the pick-up window. There was

one instant where the queue increased to 14 vehicles; however, this should be considered an anomaly, as there was an apparent issue with a customer's order that required the manager to come out. The Dunkin' Donuts located at 978 Worcester Street experienced significantly shorter queues, with a maximum queue of 8 vehicles and an average of 4 to 5 vehicles.



WEEKDAY AM PEAK HOUR TRAFFIC VOLUMES
(WEEKDAY PM PEAK HOUR TRAFFIC VOLUMES)

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Figure 3
Existing (2021) Peak Hour Traffic Volumes

Newton Dunkin Donuts
Newton, Massachusetts

SAFETY ANALYSIS

Crash Data

Crash data for the study area were extracted from the MassDOT crash data portal for the most recent three (3) year period prior to the COVID-19 Pandemic, from January 2017 through December 2019. Data from 2020 and 2021 were not included as decreased traffic volumes due to the COVID-19 pandemic could result in skewed crash data. Table 1 shows a summary of crash data by type and severity and a detailed table of all crash data reviewed is provided in Appendix B.

Table 1: Crash Summary for Study Area

Roadway/ Intersection	Total Crashes	Non-Fatal Injuries	Angle	Sideswipe	Head On	Single Vehicle	Rear End
Boylston Street at Elliot Street/ Woodward Street	41	10	6	8	1	4	22
Boylston Street at Dunkin' Donuts Driveway	2	1	0	1	0	0	1
Boylston Street	10	1	4	0	0	2	4
Total	53	12	10	9	1	6	27

A total of 41 crashes occurred at the intersection of Boylston Street (Route 9) with Elliot Street/Woodward Street. Of these crashes, 22 were rear end collisions, eight (8) were sideswipe crashes, six (6) were angled collisions, four (4) were single vehicle collisions, and one (1) was a head-on crash. Ten (10) of these crashes resulted in non-fatal injuries with a total of 21 injured persons, and none of the incidents resulted in fatalities. The crash data shows a high frequency of crashes at the intersection; however, more than half were rear end collisions which are considered low severity crashes and are common at signalized intersections.

A total of two (2) crashes occurred at the intersection of Boylston Street and the Dunkin' Donuts driveway. One (1) of these crashes was a sideswipe collision and one (1) was a rear end collision. One (1) of these crashes resulted in non-fatal injuries with one person injured, and none of the incidents resulted in fatalities.

A total of ten (10) crashes occurred on Boylston Street (Route 9) not at one of the study intersections. Four (4) of these crashes were angled collisions, four (4) were rear-end collisions, and two (2) were single vehicle crashes. One (1) of these crashes resulted in non-fatal injuries with one injured person, and none of the incidents resulted in fatalities.

The crash data shows no trends or severities of incidents within the study area that lend themselves to mitigation.

Site Circulation

The current design for the Dunkin' Donuts has two (2) driveways on Boylston Street and one (1) driveway on Ramsdell Street. Both driveways on Boylston Street are right-in/right-out only due to Boylston Street being a divided roadway with one-way eastbound traffic adjacent to the site. Patrons generally enter the western driveway and exit the eastern driveway. There is no signage or

striping to indicate that the driveways operate as right-in/right-out. Under proposed conditions, the two driveways on Boylston Street will remain and access will not be permitted from Ramsdell Street due to the construction of a retaining wall along the southern edge of the site. Vehicles accessing the drive-through will enter the site at the western driveway on Boylston Street and exit the site at the eastern driveaway. Patrons entering the building are also expected to enter and exit the site in this manner.

Sight Distance

Vehicle speeds for eastbound traffic along Boylston Street (Route 9) were captured on Tuesday, March 16, 2021 adjacent to the site. A summary of the speed data results is shown in Table 2. The complete data log can be found in Appendix C.

Table 2: Speed Data Results for Boylston Street (Route 9)

	Posted Speed	**Average Speed**	**True Median (50th Percentile)**	**85th Percentile**	**10 MPH Pace**	**% over Posted**
Eastbound	40	40	39	45	36-45	46%

Based on the speed data obtained, a design speed of 45 miles per hour was selected for Boylston Street. According to the latest edition of the American Association of State Highway and Transportation Officials (AASHTO) publication *A Policy on the Geometric Design of Highways and Streets*, the minimum safe stopping sight distance for a 45 mile per hour speed is 360 feet. The minimum safe intersection sight distance for vehicles turning right from a minor street at this speed is 430 feet. A summary of the sight distance available for each driveway can be seen in Table 3.

Table 3: Existing Sight Distance Summary

		Required SSD (ft)	**Measured SSD (ft)**	**Required ISD (ft)**	**Measured ISD (ft)**
Western Site Driveway	To the West	360	>500	430	>500
Eastern Site Driveway	To the West	360	>500	430	>500

SSD – Stopping Sight Distance; ISD – Intersection Sight Distance

Sight distance for both site driveways is limited to the west by a horizontal curve in Boylston Street. However, there is adequate stopping and intersection sight distance for both driveways on Boylston Street.

FUTURE CONDITIONS

Future traffic volumes are determined by projecting the existing traffic volumes based on a determined annual growth rate and including known potential developments within the study area. The City of Newton Planning Department was contacted to determine if there are currently any developments proposed within the vicinity of the site whose trip generation information should be included in the Dunkin' Donuts study. A marijuana retailer is proposed at 24 Elliot Street, just to the south of the intersection of Boylston Street with Elliot Street/Woodward Street. The Traffic Impact Analysis completed by VHB for the development was obtained and is attached in Appendix H. The trips generated by the marijuana retailer have been included in the future no-build and build conditions. This development will only impact the p.m. peak hour traffic based on the hours of operation.

To account for background growth along the roadways within the vicinity of the project site, the existing traffic volumes were projected over a seven-year horizon from 2021 to 2028. Recent census data was reviewed to determine the appropriate growth rate. The census data showed an average population decrease of approximately -0.01% per year from 2000 to 2010 for the City of Newton.

To provide a conservative analysis of the project area, a growth rate of 0.5% per year was used for the seven-year projection.
A copy of the available census data is provided in Appendix D. Figure 4 provides the 2028 future no-build volumes for the morning and afternoon commuter peak hours.

BUILD CONDITIONS

The future 2028 build condition represents the future 2028 no-build condition plus potential traffic increases expected from the reconstruction of the Dunkin' Donuts.

Trip Generation
Trip generation for the Newton Dunkin' Donuts reflects the addition of a drive-through window at the site. The use of the site will remain a coffee and donut shop and the proposed improvements will reduce the size of the building.

To ensure that this method for trip generation is the most conservative it was compared to trip generation completed using the industry standard Institute of Transportation Engineers (ITE) *Trip Generation, 10th Edition*[1]. The proposed development was analyzed with Land Use Code (LUC) 937: Coffee/Donut Shop with Drive-Through Window. The existing Dunkin' Donuts was analyzed using Land Use Code (LUC) 936: Coffee/Donut Shop without Drive-Through Window. Trips for both LUC 937 and LUC 936 are based on the total square footage of the Coffee Shop. The existing Dunkin' Donuts is 2,040 square feet and with the addition of a drive-through window the proposed Dunkin' Donuts will be 1,625 square feet. To determine the number of trips generated by the addition of a drive-through window the trips generated under the existing conditions, LUC 936, were compared to the trips generated under the proposed conditions, LUC 937. The analysis determined that though coffees shops with drive-through windows do generate more trips per square foot, the overall reduction in area of the proposed Dunkin' Donuts will result in less trips under the future conditions. However, the goal of the redevelopment is to increase sales and therefore trips at the Newton Dunkin' Donuts. Therefore, the trip generation completed by studying sales data was used to analyze the future build conditions. A summary of the proposed trip generation for the development using ITE is provided in Table 4.

[1] Trip Generation, 10th Edition; Institute of Transportation Engineers; Washington, DC; 2017.

Table 4: ITE Trip Generation Summary

Trip Generation Method		Vehicles Trips Generated During Each Peak Hour	
		Weekday, AM Peak Hour	**Weekday, PM Peak Hour**
LUC 936 – Coffee/Donut Shop without Drive-Through Window (Existing 2,040 sq. ft.)	Entering	106	37
	Exiting	101	37
	Total	207	74
LUC 937 – Coffee/Donut Shop with Drive-Through Window (Proposed 1,625 sq. ft)	Entering	78	35
	Exiting	81	35
	Total	159	70

Though the ITE analysis shows no change from the existing trips an increase in trips is expected in future build conditions. With existing Dunkin' Donuts with drive-through windows so close to the project site, these are considered a more specific reference than the general ITE models. Particularly, the Dunkin' Donuts located at 951 Worcester Street, on the eastbound side of Route 9, represents the anticipated build conditions of the Newton Dunkin' Donuts.

Trip generation for the improvements to the existing Dunkin' Donuts was completed by analyzing sales data from the Dunkin' Donuts located at 951 Worcester Street (Route 9) in Wellesley, Massachusetts. This Dunkin' Donuts is a comparable size with a drive-through window. The owner of the Newton Dunkin' Donuts stated that he hopes to match the sales generated at the Wellesley Dunkin' Donuts with the addition of a drive-through window. The Wellesley Dunkin' Donuts averages 84 sales in the a.m. peak hour and 17 sales in the p.m. peak hour. With the construction of a drive-through it is anticipated that most of the sales will produce one trip to the Dunkin' Donuts. However, turning movement counts at the Newton Dunkin' Donuts driveway show that in the a.m. peak hour three (3) more trips entered the site than exited and in the p.m. peak hour six (6) more trips exited the site than entered. This likely accounts for employees arriving and leaving for work and therefore will be maintained in the future build conditions. A summary of the proposed trips generation for the development using Dunkin' Donuts sales is provided in Table 5.

Table 5: Dunkin' Donuts Sales Trip Generation Summary

Trip Generation Method		Vehicles Trips Generated During Each Peak Hour	
		Weekday, AM Peak Hour	**Weekday, PM Peak Hour**
No Build Trip Generation Using Dunkin' Donuts Sales	Entering	53	11
	Exiting	49	18
	Total	102	29
Proposed Trip Generation Using Dunkin' Donuts Sales	Entering	83	16
	Exiting	80	22
	Total	163	38

Not all of the trips generated by the site will be new trips added into the traffic stream. A portion of these trips will be pass-by trips. The ITE *Trip Generation Handbook*[3] defines pass-by trips as

[3] Trip Generation Handbook, Third Edition; Institute of Transportation Engineers; Washington, D.C.; September 2017.

intermediate stops on the way from an origin to a primary destination. Pass-by trips are attracted from the traffic passing the site on an adjacent street, when the adjacent street provides direct access to the generator. These trips do not add to the overall traffic volumes on the roadway network but will add to the turning traffic at the site driveways only.

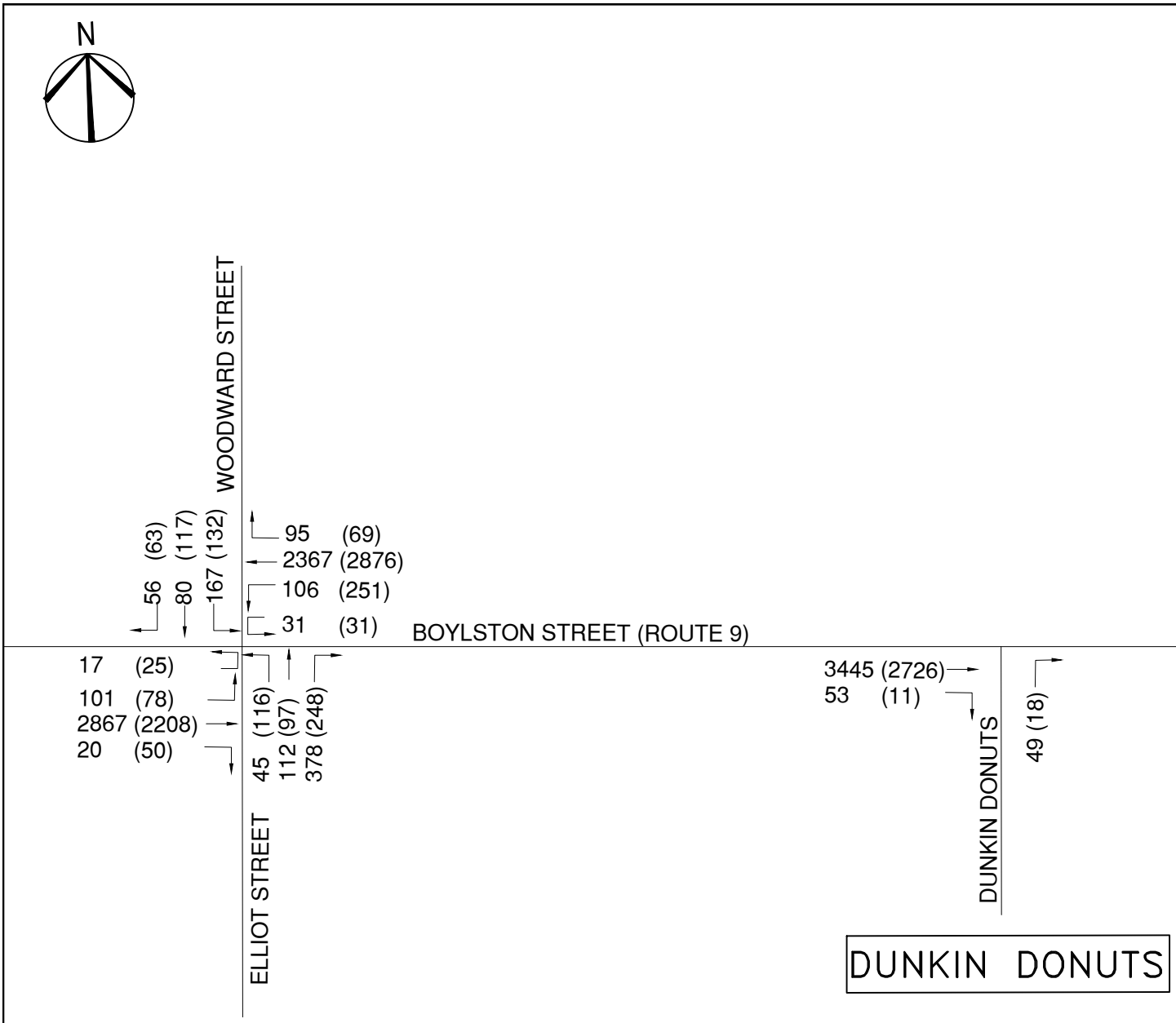
Pass-by trips were calculated based on data presented in the ITE *Trip Generation Handbook*, 3rd *Edition*. Though LUC 937: Coffee/Donut Shop with Drive-Through Window was not used to calculate trip generation it is the best fit to determine pass-by rate of the proposed development. The traffic volumes used to calculate pass-by trips were calculated by comparing the no build trips to the proposed trips in Table 5. A detailed breakdown of the pass-by trips and primary trips associated with the development are presented in Tables 6.

Table 6: LUC 937 – Pass-by Trip Summary

	Weekday, AM Peak Hour		**Weekday, PM Peak Hour**	
Pass-By Rate	49%		49%	
	Entering	**Exiting**	**Entering**	**Exiting**
Pass-By Trips	15	15	2	2
Primary Trips	15	16	3	2
Total Trips	30	31	5	4

Trip Distribution

Trip distribution of the reconstructed Dunkin' Donuts will mimic the existing site operations with the exception of the driveway on Ramsdell Street. The Ramsdell Street driveway will be eliminated in the proposed condition. Therefore, all trips will enter and exit through the driveways on Boylston Street (Route 9). Complete trip distribution calculations are provided in Appendix E. Site generated traffic volumes are shown in Figure 5 and the future (2028) build volumes are shown in Figure 6.



WEEKDAY AM PEAK HOUR TRAFFIC VOLUMES
(WEEKDAY PM PEAK HOUR TRAFFIC VOLUMES)

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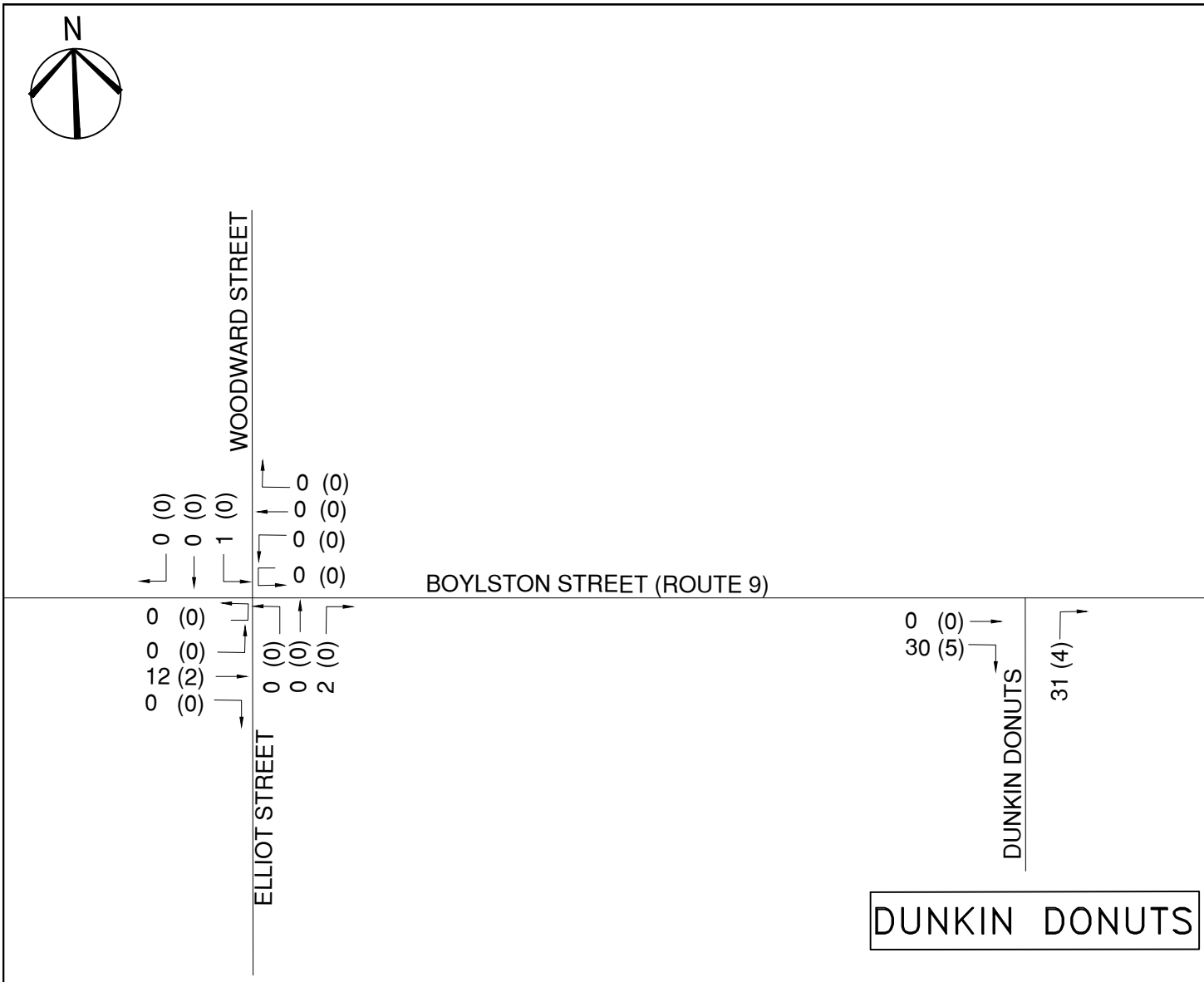
Figure 4
Future (2028) No-Build Peak Hour Traffic Volumes

Newton Dunkin Donuts
Newton, Massachusetts



WEEKDAY AM PEAK HOUR TRAFFIC VOLUMES
(WEEKDAY PM PEAK HOUR TRAFFIC VOLUMES)

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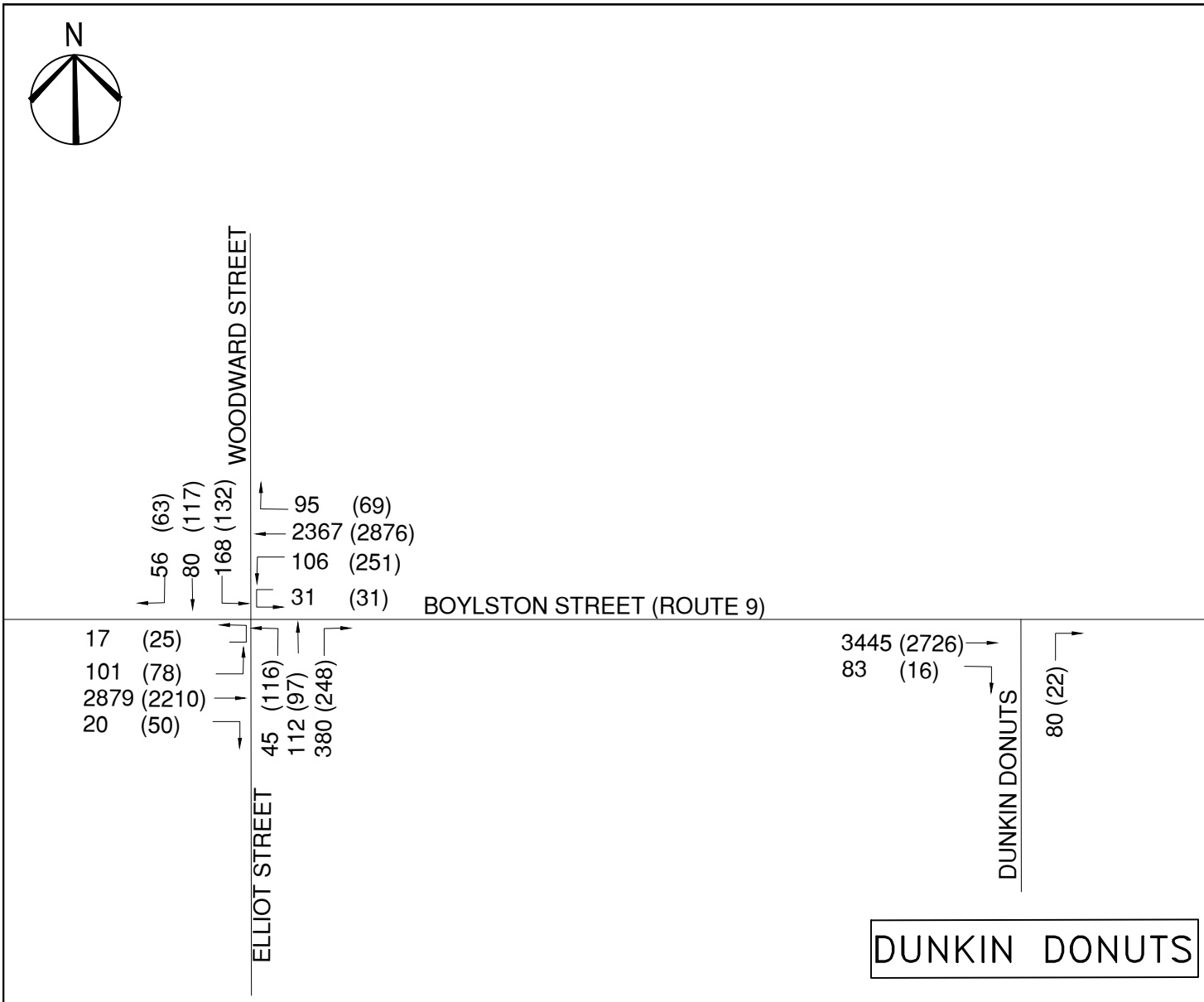
Figure 5
Site Generated Peak Hour Traffic Volumes

Newton Dunkin Donuts
Newton, Massachusetts



WEEKDAY AM PEAK HOUR TRAFFIC VOLUMES
(WEEKDAY PM PEAK HOUR TRAFFIC VOLUME)

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Figure 6
Future (2028) Build Peak Hour Traffic Volumes

Newton Dunkin Donuts
Newton, Massachusetts

CAPACITY ANALYSIS

Capacity analysis was completed for all study intersections for existing, future (2028) no-build, and future (2028) build conditions. Capacity analysis characterizes intersections based on their level of service (LOS). LOS is a quality measure describing operational conditions within a traffic stream, generally in terms of service measures such as speed, travel times, traffic interruptions, etc. Six LOS, from A to F, are defined for each type of facility, with A representing the best operating conditions and F representing the worst operating conditions. The LOS criteria for signalized and unsignalized intersections is provided in Table 7. Tables 8 and 9 provide the capacity analysis results for all intersections for the a.m. and p.m. peak hours, respectively. The complete capacity analyses can be found in Appendix F.

Table 7: LOS Criteria for Signalized and Unsignalized Intersections

	Signalized Intersection	**Unsignalized Intersection**
LOS	Delay Time (sec/veh)	Delay Time (sec/veh)
A	≤ 10	0-10
B	> 10-20	> 10-15
C	> 20-35	> 15-25
D	> 35-55	> 25-35
E	> 55-80	> 35-50
F	> 80	> 50

Table 8: A.M. Peak Hour LOS Table

Intersection	**Movement**		**Existing (2021)**		**Future (2028) No Build**		**Future (2028) Build**	
			LOS (Delay[1])	**Queue Length[2]**	**LOS (Delay[1])**	**Queue Length[2]**	**LOS (Delay[18])**	**Queue Length[2]**
Boylston Street at Elliot Street/ Woodward Street	NB	L	D (52.3)	74	D (49.8)	69	D (49.8)	69
		T	D (53.4)	159	D (51.2)	145	D (51.2)	145
		R	D (37.6)	#340	E (64.7)	#412	E (66.0)	#416
	SB	L	F (130.9)	#401	F (231.8)	#416	F (234.4)	#418
		T,R	E (61.9)	221	E (66.8)	#253	F (159.5)	#253
	EB	L	E (79.6)	206	F (173.3)	#304	F (173.3)	#304
		T,R	F (258.8)	#2734	F (244.8)	#2535	F (274.5)	#2549
	WB	L	F (80.7)	#252	F (140.6)	#329	F (140.6)	#329
		T,R	F (174.6)	#2322	F (138.4)	#2034	F (138.4)	#2034
	Intersection		F (192.2)	-	F (181.2)	-	F (182.7)	-
Boylston Street at Dunkin' Driveway	NB	R	F (196.5)	138	F (262.5)	157.5	F (>300)	193
	EB	T,R	N/C	-	N/C	-	N/C	-

- 95th percentile volume exceeds capacity; queue may be longer; N/C – No Conflict.
1. Delay shown in seconds per vehicle.
2. Queue Length shown in feet.

Table 9: P.M. Peak Hour LOS Table

Intersection	Movement		Existing (2021)		Future (2028) No Build		Future (2028) Build	
			LOS (Delay[1])	Queue Length[2]	LOS (Delay[1])	Queue Length[2]	LOS (Delay[1])	Queue Length[2]
Boylston Street, Elliot Street, and Woodward Street	NB	L	E (61.7)	124	F (150.4)	152	F (150.4)	152
		T	D (50.6)	132	D (52.5)	130	D (52.5)	130
		R	B (12.8)	54	B (15.9)	94	B (15.9)	94
	SB	L	F (101.4)	#290	F (175.4)	#331	F (175.4)	#331
		T,R	F (83.9)	#324	F (138.2)	#398	F (138.2)	#398
	EB	L	F (82.9)	180	F (133.3)	#261	F (133.3)	#261
		T,R	F (125.2)	#1884	F (123.4)	#1853	F (123.8)	#1855
	WB	L	F (135.2)	#537	F (214.3)	#622	F (214.3)	#622
		T,R	F (238.2)	#2712	F (212.9)	#2533	F (212.9)	#2533
	Intersection		F (168.5)	-	F (168.8)	-	F (165.9)	-
Boylston Street and Dunkin' Driveway	NB	R	E (47.6)	30	F (55.9)	38	E (44.3)	18
	EB	T,R	N/C	-	N/C	-	N/C	-

- 95th percentile volume exceeds capacity; queue may be longer; N/C – No Conflict.
1. Delay shown in seconds per vehicle.
2. Queue Length shown in feet.

The intersection of Boylston Street with Elliot Street/Woodward Street operates at a level of service (LOS) F in both peak hours under existing conditions. The intersection will continue to operate at a LOS F in both the future no-build and build conditions. However, with the optimization of the signal timing the intersection delay will decrease in both future scenarios. The eastbound and westbound through movements of Boylston Street experience significant delays under existing conditions. In both the a.m. and p.m. peak hours, the queues for the westbound approach exceed 2,000 feet and the queues for the eastbound approach exceed 1,800 feet. Under the future scenarios, the queues on the eastbound and westbound through movements improve in the both peak hours. Delays on all movements increase by no more than 30 seconds between the no build and build scenarios in the a.m. peak hour; queues increase by no more than 14 feet with the most significant increase in the eastbound through movement. In the p.m. peak hour the eastbound through movement is the only movement with a change in queue and delay between the no build and build scenarios; the movement experiences less than a 1 second delay increase and the queue increases by 2 feet. Overall, through optimization of the signal timing, the reconstruction of the Dunkin' Donuts and the trips generated will not have a major impact on the queues and delays at the intersection of Boylston Street with Elliot Street/Woodward Street.

The eastbound approach of Boylston Street (Route 9) at the intersection of Boylston Street with the Dunkin' Donuts driveway has no conflict and therefore no queue or delay. The northbound approach of the Dunkin' Donuts driveway operates at a LOS F and E in the a.m. and p.m. peak hour respectively in the existing conditions. In the morning peak hour the queue exiting the site is 138 feet or approximately 5 vehicles and in the afternoon peak it is 30 feet or approximately 1 vehicle. However, during site observations Pare did not observe queues developing at the site driveways. Limitations of the Synchro Analysis program prevent the traffic model from showing the breaks in traffic that occur when Boylston Street has a red light at the intersection of Boylston Street, Elliot Street, and Woodward Street to the west of the site. Because of this the queues and

delays shown in this analysis do not properly reflect the reality of the driveway's operations. These queues and delays, therefore, should be considered conservative and worst-case scenarios for the future conditions. In the a.m. peak no build scenario the driveway continues to operate at a LOS F with a 158-foot queue, or about 6 vehicles. In the build condition the queue grows to approximately 7 vehicles. In the p.m. peak hour the queue does not exceed 1 vehicle in both future scenarios.

CONCLUSIONS

Sight distances reviewed for the site driveways meet the minimum stopping and intersection sight distances required for a design speed of 45 miles per hour.

A safety review was conducted for the study roadways and intersections. Three years of crash data extracted from the MassDOT online crash data portal showed a high instance of crashes at the intersection of Boylston Street with Elliot Street/Woodward Street. However, more than half of these crashes were rear end collisions which are considered low severity and common at signalized intersection. No mitigation measures were deemed necessary from the safety review.

Through optimization of signal timing level of service and delays are expected to have minor increases under the future build condition compared to the future no-build condition at the intersection of Boylston Street, Elliot Street, and Woodward Street. Due to limitation of the Synchro Analysis program queues and delays calculated at the site driveway are greater than what was observed at the site driveway in existing conditions. During site observations no more than 1 vehicle was observed waiting to exit the site. It is believed that the addition of the drive-through window increases this queue to no more than a few vehicles. Overall, the proposed addition of a drive-through window at the Dunkin' Donuts will have minimal impact on the traffic of adjacent roadways. The on-site queues are expected to mimic those of existing Dunkin' Donuts with drive-throughs on Route 9, which do not exceed 12 vehicles from the pick-up window.

Appendix A

Traffic Counts

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N/S: Woodward Street/Elliot Street
E/W: Boylston Street (Route 9)
City, State: Newton, MA
Client: Pare/Amy Archer

File Name : 05397A
Site Code : 05397
Start Date : 3/16/2021
Page No : 1

Groups Printed- Cars & Peds - Trucks & Buses - Bikes by Direction

	Woodward Street From North				Boylston Street (Route 9) From East					Elliot Street From South				Boylston Street (Route 9) From West					
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Uturn	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Uturn	Int. Total
07:00 AM	1	8	19	0	14	283	8	0	3	46	7	8	0	5	509	15	0	2	928
07:15 AM	4	10	21	0	13	398	11	0	3	67	17	6	0	3	520	4	0	2	1079
07:30 AM	6	9	27	0	15	327	14	0	6	75	22	7	0	0	465	13	0	0	986
07:45 AM	3	8	16	0	17	369	10	0	4	59	12	8	0	1	504	21	0	1	1033
Total	14	35	83	0	59	1377	43	0	16	247	58	29	0	9	1998	53	0	5	4026
08:00 AM	8	6	25	0	18	373	10	0	5	50	20	1	0	4	493	16	0	3	1032
08:15 AM	10	9	24	0	20	373	20	0	5	64	21	16	0	3	465	16	0	2	1048
08:30 AM	11	21	25	0	11	421	21	3	6	52	20	8	3	1	442	17	0	3	1065
08:45 AM	7	16	35	0	13	381	18	1	4	81	12	4	0	5	475	17	0	3	1072
Total	36	52	109	0	62	1548	69	4	20	247	73	29	3	13	1875	66	0	11	4217
Grand Total	50	87	192	0	121	2925	112	4	36	494	131	58	3	22	3873	119	0	16	8243
Apprch %	15.2	26.4	58.4	0	3.8	91.5	3.5	0.1	1.1	72	19.1	8.5	0.4	0.5	96.1	3	0	0.4	
Total %	0.6	1.1	2.3	0	1.5	35.5	1.4	0	0.4	6	1.6	0.7	0	0.3	47	1.4	0	0.2	
Cars & Peds	47	81	181	0	118	2844	109	4	36	482	124	54	3	21	3756	116	0	16	7992
% Cars & Peds	94	93.1	94.3	0	97.5	97.2	97.3	100	100	97.6	94.7	93.1	100	95.5	97	97.5	0	100	97
Trucks & Buses	3	6	11	0	3	81	3	0	0	12	7	4	0	1	117	3	0	0	251
% Trucks & Buses	6	6.9	5.7	0	2.5	2.8	2.7	0	0	2.4	5.3	6.9	0	4.5	3	2.5	0	0	3
Bikes by Direction	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bikes by Direction	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	Woodward Street From North					Boylston Street (Route 9) From East						Elliot Street From South					Boylston Street (Route 9) From West						
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	Uturn	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	Uturn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																							
Peak Hour for Entire Intersection Begins at 08:00 AM																							
08:00 AM	8	6	25	0	39	18	373	10	0	5	406	50	20	1	0	71	4	**493**	16	0	**3**	**516**	1032
08:15 AM	10	9	24	0	43	**20**	373	20	0	5	418	64	**21**	**16**	0	**101**	3	465	16	0	2	486	1048
08:30 AM	**11**	**21**	25	0	57	11	**421**	**21**	**3**	**6**	**462**	52	20	8	**3**	83	1	442	**17**	0	3	463	1065
08:45 AM	7	16	**35**	0	**58**	13	381	18	1	4	417	**81**	12	4	0	97	**5**	475	17	0	3	500	**1072**
Total Volume	36	52	109	0	197	62	1548	69	4	20	1703	247	73	29	3	352	13	1875	66	0	11	1965	4217
% App. Total	18.3	26.4	55.3				90.9					70.2	20.7					95.4					
PHF	.818	.619	.779	.000	.849	.775	.919	.821	.333	.833	.922	.762	.869	.453	.250	.871	.650	.951	.971	.000	.917	.952	.983
Cars & Peds							1506	68	4	20	1657	245	72	29	3	349	12	1823	65	0	11	1911	4103
% Cars & Peds	97.2	94.2	93.6			95.2	97.3	98.6				99.2	98.6				92.3	97.2	98.5				
Trucks & Buses																							
% Trucks & Buses	2.8	5.8	6.4	0	5.6	4.8	2.7	1.4	0	0	2.7	0.8	1.4	0	0	0.9	7.7	2.8	1.5	0	0	2.7	2.7
Bikes by Direction	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bikes by Direction	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Transportation Data Corporation

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N/S: Woodward Street/Elliot Street
E/W: Boylston Street (Route 9)
City, State: Newton, MA
Client: Pare/Amy Archer

File Name : 05397AA
Site Code : 05397
Start Date : 3/16/2021
Page No : 1

Groups Printed- Cars & Peds - Trucks & Buses - Bikes by Direction

	Woodward Street From North				Boylston Street (Route 9) From East					Elliot Street From South				Boylston Street (Route 9) From West					
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Uturn	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Uturn	Int. Total
04:00 PM	12	20	28	0	10	443	41	2	2	23	17	13	0	9	340	15	0	5	980
04:15 PM	8	13	24	0	5	467	35	2	5	36	12	20	0	2	428	14	0	3	1074
04:30 PM	14	16	19	0	10	420	31	5	9	40	14	8	0	7	371	13	0	3	980
04:45 PM	7	15	29	1	12	476	39	2	4	46	13	9	0	3	336	7	1	4	1004
Total	41	64	100	1	37	1806	146	11	20	145	56	50	0	21	1475	49	1	15	4038
05:00 PM	12	18	29	0	8	437	42	3	2	40	16	23	0	2	361	11	0	4	1008
05:15 PM	9	19	16	2	13	478	38	5	7	34	14	10	0	7	393	17	0	3	1065
05:30 PM	13	21	12	0	12	490	25	1	7	22	17	14	0	4	354	16	0	5	1013
05:45 PM	10	12	19	0	15	486	42	2	3	43	21	9	0	8	303	12	0	4	989
Total	44	70	76	2	48	1891	147	11	19	139	68	56	0	21	1411	56	0	16	4075
Grand Total	85	134	176	3	85	3697	293	22	39	284	124	106	0	42	2886	105	1	31	8113
Apprch %	21.4	33.7	44.2	0.8	2.1	89.4	7.1	0.5	0.9	55.3	24.1	20.6	0	1.4	94.2	3.4	0	1	
Total %	1	1.7	2.2	0	1	45.6	3.6	0.3	0.5	3.5	1.5	1.3	0	0.5	35.6	1.3	0	0.4	
Cars & Peds	84	130	176	3	84	3653	293	22	39	284	123	106	0	42	2869	105	1	31	8045
% Cars & Peds	98.8	97	100	100	98.8	98.8	100	100	100	100	99.2	100	0	100	99.4	100	100	100	99.2
Trucks & Buses	1	4	0	0	1	44	0	0	0	0	1	0	0	0	17	0	0	0	68
% Trucks & Buses	1.2	3	0	0	1.2	1.2	0	0	0	0	0.8	0	0	0	0.6	0	0	0	0.8
Bikes by Direction	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bikes by Direction	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	Woodward Street From North					Boylston Street (Route 9) From East						Elliot Street From South					Boylston Street (Route 9) From West						
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	Uturn	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	Uturn	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																							
Peak Hour for Entire Intersection Begins at 04:45 PM																							
04:45 PM	7	15	**29**	1	52	12	476	39	2	4	533	**46**	13	9	0	68	3	336	7	**1**	4	351	1004
05:00 PM	12	18	29	0	**59**	8	437	**42**	3	2	492	40	16	**23**	0	**79**	2	361	11	0	4	378	1008
05:15 PM	9	19	16	**2**	46	**13**	478	38	**5**	**7**	**541**	34	14	10	0	58	**7**	**393**	**17**	0	3	**420**	**1065**
05:30 PM	**13**	**21**	12	0	46	12	**490**	25	1	7	535	22	**17**	14	0	53	4	354	16	0	**5**	379	1013
Total Volume	41	73	86	3	203	45	1881	144	11	20	2101	142	60	56	0	258	16	1444	51	1	16	1528	4090
% App. Total	20.2		42.4				89.5						23.3	21.7				94.5					
PHF	.788	.869	.741	.375	.860	.865	.960	.857	.550	.714	.971	.772	.882	.609	.000	.816	.571	.919	.750	.250	.800	.910	.960
Cars & Peds							1861	144	11	20	2081	142	60	56	0	258	16	1435	51	1	16	1519	4058
% Cars & Peds		95.9					98.9											99.4					
Trucks & Buses																							
% Trucks & Buses	0	4.1	0	0	1.5	0	1.1	0	0	0	1.0	0	0	0	0	0	0	0.6	0	0	0	0.6	0.8
Bikes by Direction	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bikes by Direction	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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S: #940 Dunkin Donuts Driveway
E/W: Boylston Street (Route 9)
City, State: Newton, MA
Client: Pare/Amy Archer

File Name : 05397B
Site Code : 05397
Start Date : 3/16/2021
Page No : 1

Groups Printed- Cars & Peds - Trucks & Buses - Bikes by Direction

	Boylston Street (Route 9) From East			#940 Dunkin Donuts Site Drive From South			Boylston Street (Route 9) From West			
Start Time	Thru	Left	Peds	Right	Left	Peds	Right	Thru	Peds	Int. Total
07:00 AM	0	0	0	5	0	1	5	554	0	565
07:15 AM	0	0	0	11	0	0	18	574	0	603
07:30 AM	0	0	0	17	0	0	11	553	0	581
07:45 AM	0	0	0	6	0	0	6	565	0	577
Total	0	0	0	39	0	1	40	2246	0	2326
08:00 AM	0	0	0	7	0	0	9	561	0	577
08:15 AM	0	0	0	11	0	0	11	540	0	562
08:30 AM	0	0	0	6	0	0	8	510	0	524
08:45 AM	0	0	0	9	0	0	5	577	0	591
Total	0	0	0	33	0	0	33	2188	0	2254
Grand Total	0	0	0	72	0	1	73	4434	0	4580
Apprch %	0	0	0	98.6	0	1.4	1.6	98.4	0	
Total %	0	0	0	1.6	0	0	1.6	96.8	0	
Cars & Peds	0	0	0	72	0	1	72	4298	0	4443
% Cars & Peds	0	0	0	100	0	100	98.6	96.9	0	97
Trucks & Buses	0	0	0	0	0	0	1	136	0	137
% Trucks & Buses	0	0	0	0	0	0	1.4	3.1	0	3
Bikes by Direction	0	0	0	0	0	0	0	0	0	0
% Bikes by Direction	0	0	0	0	0	0	0	0	0	0

	Boylston Street (Route 9) From East				#940 Dunkin Donuts Site Drive From South				Boylston Street (Route 9) From West				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:15 AM													
07:15 AM	0	0	0	0	11	0	0	11	**18**	**574**	0	**592**	**603**
07:30 AM	0	0	0	0	**17**	0	0	**17**	11	553	0	564	581
07:45 AM	0	0	0	0	6	0	0	6	6	565	0	571	577
08:00 AM	0	0	0	0	7	0	0	7	9	561	0	570	577
Total Volume	0	0	0	0	41	0	0	41	44	2253	0	2297	2338
% App. Total	0	0	0		100	0	0		1.9	98.1	0		
PHF	.000	.000	.000	.000	.603	.000	.000	.603	.611	.981	.000	.970	.969
Cars & Peds	0	0	0	0	41	0	0	41	44	2184	0	2228	2269
% Cars & Peds	0	0	0	0	100	0	0	100	100	96.9	0	97.0	97.0
Trucks & Buses	0	0	0	0	0	0	0	0	0	69	0	69	69
% Trucks & Buses	0	0	0	0	0	0	0	0	0	3.1	0	3.0	3.0
Bikes by Direction	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bikes by Direction	0	0	0	0	0	0	0	0	0	0	0	0	0

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S: #940 Dunkin Donuts Driveway
E/W: Boylston Street (Route 9)
City, State: Newton, MA
Client: Pare/Amy Archer

File Name : 05397BB
Site Code : 05397
Start Date : 3/16/2021
Page No : 1

Groups Printed- Cars & Peds - Trucks & Buses - Bikes by Direction

	Boylston Street (Route 9) From East			#940 Dunkin Donuts Site Drive From South			Boylston Street (Route 9) From West			
Start Time	Thru	Left	Peds	Right	Left	Peds	Right	Thru	Peds	Int. Total
04:00 PM	0	0	0	2	0	0	1	381	0	384
04:15 PM	0	0	0	8	0	0	2	492	0	502
04:30 PM	0	0	0	2	0	0	1	426	0	429
04:45 PM	0	0	0	2	0	0	4	429	0	435
Total	0	0	0	14	0	0	8	1728	0	1750
05:00 PM	0	0	0	2	0	0	1	416	0	419
05:15 PM	0	0	0	2	0	0	1	430	0	433
05:30 PM	0	0	0	2	0	0	6	381	0	389
05:45 PM	0	0	0	3	0	0	3	369	0	375
Total	0	0	0	9	0	0	11	1596	0	1616
Grand Total	0	0	0	23	0	0	19	3324	0	3366
Apprch %	0	0	0	100	0	0	0.6	99.4	0	
Total %	0	0	0	0.7	0	0	0.6	98.8	0	
Cars & Peds	0	0	0	23	0	0	19	3310	0	3352
% Cars & Peds	0	0	0	100	0	0	100	99.6	0	99.6
Trucks & Buses	0	0	0	0	0	0	0	14	0	14
% Trucks & Buses	0	0	0	0	0	0	0	0.4	0	0.4
Bikes by Direction	0	0	0	0	0	0	0	0	0	0
% Bikes by Direction	0	0	0	0	0	0	0	0	0	0

	Boylston Street (Route 9) From East				#940 Dunkin Donuts Site Drive From South				Boylston Street (Route 9) From West				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:15 PM													
04:15 PM	0	0	0	0	**8**	0	0	**8**	2	**492**	0	**494**	**502**
04:30 PM	0	0	0	0	2	0	0	2	1	426	0	427	429
04:45 PM	0	0	0	0	2	0	0	2	**4**	429	0	433	435
05:00 PM	0	0	0	0	2	0	0	2	1	416	0	417	419
Total Volume	0	0	0	0	14	0	0	14	8	1763	0	1771	1785
% App. Total	0	0	0		100	0	0		0.5	99.5	0		
PHF	.000	.000	.000	.000	.438	.000	.000	.438	.500	.896	.000	.896	.889
Cars & Peds	0	0	0	0	14	0	0	14	8	1753	0	1761	1775
% Cars & Peds	0	0	0	0	100	0	0	100	100	99.4	0	99.4	99.4
Trucks & Buses	0	0	0	0	0	0	0	0	0	10	0	10	10
% Trucks & Buses	0	0	0	0	0	0	0	0	0	0.6	0	0.6	0.6
Bikes by Direction	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bikes by Direction	0	0	0	0	0	0	0	0	0	0	0	0	0

Appendix B

Crash Data

Dunkin' Donuts Reconstruction

Newton, MA

January 2017 – December 2019

Pare Project No. 20099.00

April 2021

	Crash Report IDs	Crash Date	Roadway	Near Intersection Roadway	Vehicle Travel Directions (All Vehicles)	Total Vehicles	Total Fatalities	Total Injuries	Weather Conditions	Road Surface Condition	Manner of Collision
1	4333323	03/04/2017	BOYLSTON STREET Rte 9 E	ELLIOT STREET	V1: E	1	0	0	Snow	Wet	Single vehicle crash
2	4351345	04/09/2017	BOYLSTON STREET Rte 9 E	ELLIOT STREET	V1: E / V2: E	2	0	0	Clear	Dry	Rear-end
3	4373082	06/03/2017	BOYLSTON STREET Rte 9 E	ELLIOT STREET	V1: E	1	0	1	Clear	Dry	Single vehicle crash
4	4379262	05/30/2017	BOYLSTON STREET Rte UNKNOW W	ELLIOT STREET	V1: W / V2: W	2	0	0	Clear	Dry	Angle
5	4399097	07/21/2017	Rte 9 W	WOODWARD STREET	V1: W / V2: W	2	0	0	Clear	Dry	Single vehicle crash
6	4403645	07/26/2017	BOYLSTON STREET Rte 9 W	WOODWARD STREET	V1: W / V2: W / V3: Not Reported	3	0	0	Clear	Dry	Rear-end
7	4408739	07/10/2017	BOYLSTON ST / WOODWARD ST		V1: W / V2: W	2	0	0	Clear	Dry	Rear-end
8	4409277	02/11/2017	BOYLSTON ST / WOODWARD ST		V1: S / V2: S	2	0	0	Clear	Snow	Sideswipe, same direction
9	4413803	08/16/2017	BOYLSTON ST / ELLIOT ST		V1: N / V2: N / V3: N	3	0	0	Clear	Dry	Rear-end
10	4424672	09/07/2017	BOYLSTON STREET Rte 9 W	ELLIOT STREET	V1: W / V2: W	2	0	0	Clear	Dry	Rear-end
11	4453002	10/25/2017	BOYLSTON ST / ELLIOT ST / ELLIOT STREET	WOODWARD STREET	V1: W / V2: W / V3: W	3	0	0	Rain/Cloudy	Wet	Sideswipe, same direction
12	4454561	10/29/2017	BOYLSTON STREET Rte 9 W	WOODWARD STREET	V1: W / V2: W / V3: W / V4: W	4	0	0	Cloudy/Rain	Wet	Rear-end
13	4473897	12/26/2017	Rte 9 W / Rte WOODWA		V1: W / V2: W	2	0	1	Clear	Dry	Sideswipe, same direction
14	4477623	12/27/2017	BOYLSTON ST / WOODWARD ST		V1: S / V2: S	2	0	0	Clear	Dry	Rear-end
15	4503925	02/19/2018	BOYLSTON STREET Rte SR9 W	WOODWARD STREET Rte SR9 W	V1: W / V2: W / V3: W	3	0	0	Clear	Dry	Rear-end
16	4504005	02/05/2018	BOYLSTON ST / ELLIOT ST		V1: N / V2: N	2	0	0	Clear	Dry	Angle
17	4519158	03/23/2018	ELLIOT STREET	BOYLSTON STREET Rte SR9 E	V1: N / V2: N	2	0	0	Clear	Dry	Rear-end

18	4537575	04/21/2018	BOYLSTON STREET / ELLIOT STREET / WOODWARD STREET		V1: Not Reported / V2: N	2	0	0	Not Reported	Dry	Angle
19	4542235	05/16/2018	BOYLSTON STREET Rte SR9 W / WOODWARD STREET		V1: W / V2: W / V3: W	3	0	1	Clear	Dry	Rear-end
20	4556327	06/19/2018	Rte 9 E	ELLIOT STREET	V2: E / V1: E	2	0	0	Cloudy	Dry	Rear-end
21	4560202	06/29/2018	Rte 9 E	ELLIOT STREET	V1: E / V2: E	2	0	0	Clear	Dry	Rear-end
22	4568188	07/02/2018	ELLIOT ST		V1: E	1	0	0	Clear	Dry	Single vehicle crash
23	4580845	08/10/2018	ELLIOT STREET	BOYLSTON STREET Rte SR9 E	V1: E / V2: E	2	0	1	Clear	Dry	Rear-end
24	4587759	08/13/2018	Rte SR9 W	WOODWARD STREET	V1: W / V2: W	2	0	0	Clear	Dry	Sideswipe, same direction
25	4590540	08/22/2018	Rte 9 E	ELLIOT STREET	V1: E / V2: E	2	0	1	Cloudy/Rain	Wet	Rear-end
26	4598975	07/21/2018	BOYLSTON STREET Rte 9 E / ELLIOT STREET		V1: E / V2: E	2	0	12	Not Reported	Dry	Rear-end
27	4598977	08/25/2018	BOYLSTON STREET Rte SR9 E / ELLIOT STREET		V1: E / V2: E	2	0	0	Clear	Dry	Angle
28	4617640	10/07/2018	BOYLSTON STREET Rte 9 / WOODWARD STREET / ELLIOT STREET		V1: E / V2: W	2	0	0	Cloudy/Rain	Wet	Head-on
29	4643331	12/19/2018	BOYLSTON STREET Rte SR9 W / WOODWARD STREET		V1: W / V2: W	2	0	1	Clear	Dry	Angle
30	4656465	01/28/2019	BOYLSTON STREET Rte SR9 W	WOODWARD STREET	V1: W / V2: W / V3: W	3	0	1	Clear	Dry	Sideswipe, same direction
31	4659878	01/28/2019	WORCESTER STREET Rte SR9 E / ELLIOT STREET		V1: E / V2: E	2	0	1	Clear	Dry	Rear-end
32	4659978	01/24/2019	BOYLSTON ST / ELLIOT ST		V1: N / V2: N	2	0	1	Rain	Wet	Rear-end
33	4675536	02/21/2019	BOYLSTON STREET Rte SR9 E	WOODWARD STREET	V1: E / V2: E	2	0	0	Clear	Dry	Sideswipe, same direction
34	4692828	03/04/2019	BOYLSTON ST / WOODWARD ST		V1: E / V2: E	2	0	0	Unknown	Unknown	Sideswipe, same direction
35	4737717	07/18/2019	BOYLSTON STREET Rte SR9 E / ELLIOT STREET / Rte SR9 E	ELLIOT STREET	V1: E / V2: E	2	0	0	Clear	Dry	Sideswipe, same direction
36	4742123	07/24/2019	BOYLSTON STREET Rte SR9 W / WOODWARD STREET		V1: W / V2: W	2	0	0	Clear	Dry	Rear-end
37	4758304	09/14/2019	WORCESTER STREET Rte SR9 E / ELLIOT STREET		V1: E / V2: E	2	0	0	Cloudy	Dry	Rear-end
38	4759058	09/20/2019	WOODWARD STREET / ELLIOT STREET /		V1: S / V2: N	2	0	0	Clear	Dry	Angle

			BOYLSTON STREET Rte SR9 W								
39	4767104	09/10/2019	BOYLSTON STREET Rte SR9 E	ELLIOT STREET	V1: E / V2: E	2	0	0	Clear	Dry	Rear-end
40	4784109	10/15/2019	/ BOYLSTON STREET Rte SR9 W / WOODWARD STREET		V1: W / V2: W / V3: W	3	0	0	Clear	Dry	Rear-end
41	4794426	12/07/2019	BOYLSTON STREET Rte SR9 W	WOODWARD STREET	V1: W / V2: W	2	0	0	Clear	Dry	Rear-end
42	4512857	2/22/2018	BOYLSTONN STREET Rte 9E	DUNKIN DONUTS	V1: E / V2: E	2	0	1	Clear	Dry	Rear-end
43	4530868	4/24/2018	BOYLSTON STREET Rte 9 E	DUNKIN DONUTS	V1: E / V2: E	2	0	0	Clear	Dry	Sideswipe
44	4322464	01/11/2017	BOYLSTON STREET Rte 9 E	RAMSDELL STREET	V1: E / V2: E	2	0	0	Clear	Dry	Rear-end
45	4409193	05/01/2017	RAMSDELL ST		V1: S / V2: W	2	0	0	Cloudy	Dry	Angle
46	4423816	09/08/2017	BOYLSTON STREET Rte 9 E	RAMSDELL STREET	V1: E	1	0	1	Clear	Dry	Single vehicle crash
47	4761739	09/21/2019	BOYLSTON STREET Rte SR9 E / RAMSDELL STREET	RAMSDELL STREET	V1: E / V2: E	2	0	0	Clear	Dry	Rear-end
48	4521883	03/27/2018	BOYLSTON ST		V1: N / V2: W	2	0	0	Clear	Dry	Angle
49	4541593	05/02/2018	Rte 9 E		V1: E / V2: E	2	0	0	Clear	Dry	Rear-end
50	4579647	07/25/2018	BOYLSTON ST		V1: S / V2: E	2	0	0	Cloudy	Dry	Angle
51	4659873	01/11/2019	BOYLSTON STREET		V1: W / V2: W	2	0	0	Clear	Dry	Angle
52	4702187	04/06/2019	BOYLSTON ST		V1: Reported but invalid / V2: N	2	0	0	Clear	Dry	Rear-to-rear
53	4758619	09/20/2019	BOYLSTON ST		V1: N / V2: N / V3: U	3	0	0	Clear	Dry	Single vehicle crash

Appendix C

Speed Study

Transportation Data Corporation

Mario Perone, mperone1@verizon.net
tel (781) 587-0086 cell (781) 439-4999

Boylston Street (Route 9) Eastbound
@ #940 Dunkin Donuts Site
City, State: Newton, MA
Client: Pare / Amy Archer

05397Aspeed
Site Code: 05397

Eastbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	Total	85th Percent	95th Percent
03/16/21	0	0	0	2	5	21	32	31	16	4	0	**1**	0	112	51	54
01:00	0	0	0	0	3	12	21	17	8	3	1	0	0	65	51	56
02:00	1	0	0	2	1	11	12	10	4	0	0	0	0	41	48	52
03:00	0	0	0	0	5	12	14	21	10	0	0	0	0	62	50	53
04:00	2	3	0	3	6	15	57	51	37	15	1	0	**1**	191	53	57
05:00	6	6	3	13	30	131	248	237	**130**	**20**	**8**	1	0	833	51	54
06:00	14	5	14	73	238	670	**582**	**260**	42	6	0	0	0	1904	45	49
07:00	46	**27**	26	**176**	**475**	730	516	117	19	1	0	0	0	**2133**	43	46
08:00	**78**	11	18	109	418	**759**	490	142	18	3	0	0	0	2046	43	47
09:00	26	14	**49**	128	354	622	448	149	27	1	0	0	0	1818	43	47
10:00	7	12	31	148	279	485	422	197	31	4	1	0	0	1617	44	48
11:00	10	11	9	79	258	512	384	184	26	3	0	0	0	1476	44	48
12 PM	7	7	12	69	**321**	510	463	174	21	2	1	0	0	1587	44	48
13:00	**12**	4	17	**73**	271	486	418	184	27	5	0	0	0	1497	44	48
14:00	6	3	4	36	224	519	471	192	45	10	2	0	0	1512	45	49
15:00	11	6	5	58	282	**566**	465	218	48	5	1	0	0	**1665**	45	49
16:00	8	5	5	50	240	551	**519**	207	45	10	0	**1**	**1**	1642	45	49
17:00	7	**8**	**27**	45	235	517	416	224	43	12	4	0	0	1538	46	49
18:00	4	0	1	16	122	431	469	**274**	**82**	15	1	0	0	1415	47	51
19:00	2	3	0	15	125	292	314	173	51	12	1	0	0	988	47	51
20:00	2	0	3	8	52	170	248	140	67	**16**	0	0	0	706	49	53
21:00	1	0	1	5	25	106	173	133	45	10	1	0	0	500	49	53
22:00	0	0	0	1	12	75	138	90	47	13	**5**	0	0	381	50	54
23:00	1	0	0	0	5	38	71	52	45	13	1	0	1	227	52	56
Total	251	125	225	1109	3986	8241	7391	3477	934	183	28	3	3	25956		
Percent	1.0%	0.5%	0.9%	4.3%	15.4%	31.7%	28.5%	13.4%	3.6%	0.7%	0.1%	0.0%	0.0%			
AM Peak	08:00	07:00	09:00	07:00	07:00	08:00	06:00	06:00	05:00	05:00	05:00	00:00	04:00	07:00		
Vol.	78	27	49	176	475	759	582	260	130	20	8	1	1	2133		
PM Peak	13:00	17:00	17:00	13:00	12:00	15:00	16:00	18:00	18:00	20:00	22:00	16:00	16:00	15:00		
Vol.	12	8	27	73	321	566	519	274	82	16	5	1	1	1665		

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Boylston Street (Route 9) Eastbound
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City, State: Newton, MA
Client: Pare / Amy Archer

05397Aspeed
Site Code: 05397

Eastbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	Total	85th Percent	95th Percent
03/17/21	0	1	0	2	5	12	27	23	15	4	1	0	0	90	52	55
01:00	1	0	0	0	3	12	17	11	6	1	0	**2**	**1**	54	50	56
02:00	0	0	0	2	2	10	13	6	14	1	0	0	0	48	52	54
03:00	0	0	0	0	5	7	13	9	7	0	1	0	0	42	51	54
04:00	2	5	1	2	3	24	38	47	49	17	1	1	0	190	54	57
05:00	5	4	2	6	21	126	224	241	**144**	**39**	**10**	0	0	822	52	56
06:00	11	11	14	48	211	619	**606**	**272**	63	6	0	0	0	1861	46	49
07:00	**67**	**19**	13	123	401	**751**	527	117	14	5	0	0	0	**2037**	43	46
08:00	38	17	**27**	**142**	**428**	683	495	120	17	6	1	0	0	1974	43	46
09:00	18	17	16	110	360	669	475	168	20	1	0	0	0	1854	44	47
10:00	9	9	13	70	278	508	561	195	42	4	1	0	0	1690	44	49
11:00	6	10	7	58	313	543	434	188	46	5	0	0	0	1610	44	49
12 PM	**11**	6	9	61	311	564	443	187	30	3	0	0	0	1625	44	48
13:00	8	**16**	5	66	260	485	468	197	34	2	0	0	0	1541	45	48
14:00	4	11	4	66	**320**	569	487	174	28	5	0	0	0	1668	44	48
15:00	7	7	**17**	**76**	241	550	521	182	34	2	1	0	0	1638	44	48
16:00	9	6	6	55	243	601	432	**211**	45	8	1	0	0	1617	45	49
17:00	7	3	3	31	233	588	**597**	206	**61**	7	1	**1**	0	**1738**	45	49
18:00	7	4	9	33	206	**630**	531	178	33	6	1	0	0	1638	44	48
19:00	5	3	0	23	160	354	342	172	40	6	2	0	0	1107	46	49
20:00	2	1	0	11	82	209	264	146	36	10	1	0	**1**	763	47	51
21:00	0	0	2	4	38	149	221	116	55	**11**	2	1	0	599	49	53
22:00	1	1	0	2	28	89	145	113	45	11	**6**	0	0	441	49	54
23:00	0	0	1	1	16	52	78	59	28	9	1	1	0	246	50	54
Total	218	151	149	992	4168	8804	7959	3338	906	169	31	6	2	26893		
Percent	0.8%	0.6%	0.6%	3.7%	15.5%	32.7%	29.6%	12.4%	3.4%	0.6%	0.1%	0.0%	0.0%			
AM Peak	07:00	07:00	08:00	08:00	08:00	07:00	06:00	06:00	05:00	05:00	05:00	01:00	01:00	07:00		
Vol.	67	19	27	142	428	751	606	272	144	39	10	2	1	2037		
PM Peak	12:00	13:00	15:00	15:00	14:00	18:00	17:00	16:00	17:00	21:00	22:00	17:00	20:00	17:00		
Vol.	11	16	17	76	320	630	597	211	61	11	6	1	1	1738		
Grand Total	469	276	374	2101	8154	17045	15350	6815	1840	352	59	9	5	52849		
Percent	0.9%	0.5%	0.7%	4.0%	15.4%	32.3%	29.0%	12.9%	3.5%	0.7%	0.1%	0.0%	0.0%			

	15th Percentile :	32 MPH
	50th Percentile :	39 MPH
	85th Percentile :	45 MPH
	95th Percentile :	49 MPH
Stats	10 MPH Pace Speed :	36-45 MPH
	Number of Vehicles > 45 MPH :	9080
	Percent of Vehicles > 45 MPH :	17.2%
	Mean Speed(Average) :	40 MPH

Appendix D

Census Data

Dunkin Donuts
Newton, MA
Background Growth Rate
Pare Project No. 20099.00
March 22, 2021

US Census Data
City of Newton

	Population
2010	85089
2000	85146
Years	10
ANNUAL GROWTH RATE	-0.01%
SAY	**0.50%**

Computations by: TT
Checked by:

Appendix E

Trip Generation & Distribution

Dunkin Donuts
Newton, MA
Existing and Proposed Traffic Volumes
PARE Project No. 20099.00
March 22, 2021

2021-2028
TRAFFIC VOLUME SUMMARY
Future No-Build Growth Factor = 0.5%

Weekday AM Peak Hour
8:00 - 9:00 AM

Boylston Street (Route 9), Elliot Street, and Woodward Street					
	2021 Existing	2021 Inflated	2028 No-Build	Site Gen.	2028 Build
NB - L	29	43	45		45
NB - T	73	108	112		112
NB - R	247	365	378	2	380
SB - L	109	161	167	1	168
SB - T	52	77	80		80
SB - R	36	53	56		56
EB - L	66	97	101		101
EB - T	1875	2768	2867	12	2879
EB - R	13	19	20		20
EB - U	11	16	17		17
WB - L	69	102	106		106
WB - T	1548	2285	2367		2367
WB - R	62	92	95		95
WB - U	20	30	31	0	31

Weekday PM Peak Hour
4:45 - 5:45 PM

Boylston Street (Route 9), Elliot Street, and Woodward Street					
	2021 Existing	2021 Inflated	2028 No-Build	Site Gen.	2028 Build
NB - L	56	83	116		116
NB - T	60	89	97		97
NB - R	142	210	248	0	248
SB - L	86	127	132	0	132
SB - T	73	108	117		117
SB - R	41	61	63		63
EB - L	51	75	78		78
EB - T	1444	2132	2208	2	2210
EB - R	16	24	50		50
EB - U	16	24	25		25
WB - L	144	213	251		251
WB - T	1881	2777	2876		2876
WB - R	45	66	69		69
WB - U	20	30	31	0	31

Computation by: AA
Checked by: JPS

Dunkin Donuts
Newton, MA
Trip Generation
PARE Project No. 20099.00
March 22, 2021

Land Use Code 937: Coffee/Donut Shop with Drive-Through Window
Average Vehicle Trip Ends vs. 1,000 Sq. Feet Gross Floor Area
Proposed: 1,625 Sq. Feet **1.625 KSF**

On a: Weekday

Average Rate:	1.6 * 820.38	**1334**	
Fitted Curve Equation:	N/A	-	
Trips Entering	50% * 1334	667	
Trips Exiting	50% * 1334	667	
		1334	**Trips**

On a: Weekday, AM
AM Peak Hour of Generator

Average Rate:	1.6 * 97.96	**159**	
Fitted Curve Equation:	N/A	-	
Trips Entering	49% * 159	78	
Trips Exiting	51% * 159	81	
		159	**Trips**

On a: Weekday, PM
Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 pm

Average Rate:	1.6 * 43.38	**70**	
Fitted Curve Equation:	N/A	-	
Trips Entering	50% * 70	35	
Trips Exiting	50% * 70	35	
		70	**Trips**

Land Use Code 936: Coffee/Donut Shop without Drive-Through Window
Average Vehicle Trip Ends vs. 1,000 Sq. Feet Gross Floor Area
Proposed: 2,040 Sq. Feet **2.04 KSF**

On a: Weekday

Average Rate:	2.04 * 754.55	**1540**	
Fitted Curve Equation:	N/A	-	
Trips Entering	50% * 1540	770	
Trips Exiting	50% * 1540	770	
		1540	**Trips**

On a: Weekday, AM
Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 am

Average Rate:	2.04 * 101.14	**207**	
Fitted Curve Equation:	N/A	-	
Trips Entering	51% * 207	106	
Trips Exiting	49% * 207	101	
		207	**Trips**

On a: Weekday, PM
Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 pm

Average Rate:	2.04 * 36.31	**74**	
Fitted Curve Equation:	N/A	-	
Trips Entering	50% * 74	37	
Trips Exiting	50% * 74	37	
		74	**Trips**

Computations by: AA
Checked by: JPS

Land Use Code 937: Coffee/Donut Shop with Drive-Through Window
Average Vehicle Trip Ends vs. 1,000 Sq. Feet Gross Floor Area
Proposed: 1,625 Sq. Feet **1.625 KSF**

On a: Weekday

Average Rate:	1.6 * 820.38	**1334**	
Fitted Curve Equation:	N/A	-	
Trips Entering	50% * 1334	667	
Trips Exiting	50% * 1334	667	
		1334	**Trips**

On a: Weekday, AM
AM Peak Hour of Generator

Average Rate:	1.6 * 337.04	**560**	
Fitted Curve Equation:	N/A	-	
Trips Entering	49% * 159	280	
Trips Exiting	51% * 159	280	
		560	**Trips**

On a: Weekday, PM
Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 pm

Average Rate:	1.6 * 43.38	**70**	
Fitted Curve Equation:	N/A	-	
Trips Entering	50% * 70	35	
Trips Exiting	50% * 70	35	
		70	**Trips**

Computations by: AA
Checked by: JPS

Appendix F

Traffic Capacity Analysis

Lane Group	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL
Lane Configurations												
Traffic Volume (vph)	16	97	2768	19	30	102	2285	92	43	108	365	161
Future Volume (vph)	16	97	2768	19	30	102	2285	92	43	108	365	161
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)		150		0		300		0	50		0	100
Storage Lanes		1		0		1		0	1		1	1
Taper Length (ft)		25				25			25			25
Lane Util. Factor	0.95	1.00	0.95	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00
Ped Bike Factor		1.00	1.00			1.00	1.00		1.00		0.98	
Frt			0.999				0.994				0.850	
Flt Protected		0.950				0.950			0.950			0.950
Satd. Flow (prot)	0	1775	3499	0	0	1791	3464	0	1805	1881	1599	1703
Flt Permitted		0.950				0.950			0.513			0.677
Satd. Flow (perm)	0	1769	3499	0	0	1786	3464	0	970	1881	1569	1213
Right Turn on Red				Yes				Yes			Yes	
Satd. Flow (RTOR)			1				3				289	
Link Speed (mph)			30				30			30		
Link Distance (ft)			407				506			303		
Travel Time (s)			9.3				11.5			6.9		
Confl. Peds. (#/hr)	11	11		11	20	20		20	3		3	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.92	0.92	0.92	0.92	0.87	0.87	0.87	0.85
Heavy Vehicles (%)	0%	2%	3%	8%	0%	1%	3%	5%	0%	1%	1%	6%
Adj. Flow (vph)	17	102	2914	20	33	111	2484	100	49	124	420	189
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	119	2934	0	0	144	2584	0	49	124	420	189
Number of Detectors	1	1	2		1	1	2		1	2	1	1
Detector Template	Left	Left	Thru		Left	Left	Thru		Left	Thru	Right	Left
Leading Detector (ft)	20	20	100		20	20	100		20	100	20	20
Trailing Detector (ft)	0	0	0		0	0	0		0	0	0	0
Detector 1 Position(ft)	0	0	0		0	0	0		0	0	0	0
Detector 1 Size(ft)	20	20	6		20	20	6		20	6	20	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0	0.0		0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0	0.0		0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0	0.0		0.0	0.0	0.0	0.0
Detector 2 Position(ft)			94				94			94		
Detector 2 Size(ft)			6				6			6		
Detector 2 Type			Cl+Ex				Cl+Ex			Cl+Ex		
Detector 2 Channel												
Detector 2 Extend (s)			0.0				0.0			0.0		
Turn Type	Prot	Prot	NA		Prot	Prot	NA		custom	NA	custom	Perm
Protected Phases	1	1	6		5	5	2		9	4 9		
Permitted Phases									4		4	8
Detector Phase	1	1	6		5	5	2		4	4	4	8
Switch Phase												
Minimum Initial (s)	8.0	8.0	20.0		8.0	8.0	20.0		24.0		8.0	8.0
Minimum Split (s)	14.0	14.0	27.0		14.0	14.0	27.0		31.0		15.0	15.0
Total Split (s)	26.0	26.0	87.0		26.0	26.0	87.0		31.0		29.0	29.0

Lane Group	SBT	SBR
Lane Configurations		
Traffic Volume (vph)	77	53
Future Volume (vph)	77	53
Ideal Flow (vphpl)	1900	1900
Storage Length (ft)		0
Storage Lanes		0
Taper Length (ft)		
Lane Util. Factor	1.00	1.00
Ped Bike Factor		
Frt	0.939	
Flt Protected		
Satd. Flow (prot)	1703	0
Flt Permitted		
Satd. Flow (perm)	1703	0
Right Turn on Red		Yes
Satd. Flow (RTOR)	16	
Link Speed (mph)	30	
Link Distance (ft)	271	
Travel Time (s)	6.2	
Confl. Peds. (#/hr)		
Peak Hour Factor	0.85	0.85
Heavy Vehicles (%)	6%	3%
Adj. Flow (vph)	91	62
Shared Lane Traffic (%)		
Lane Group Flow (vph)	153	0
Number of Detectors	2	
Detector Template	Thru	
Leading Detector (ft)	100	
Trailing Detector (ft)	0	
Detector 1 Position(ft)	0	
Detector 1 Size(ft)	6	
Detector 1 Type	Cl+Ex	
Detector 1 Channel		
Detector 1 Extend (s)	0.0	
Detector 1 Queue (s)	0.0	
Detector 1 Delay (s)	0.0	
Detector 2 Position(ft)	94	
Detector 2 Size(ft)	6	
Detector 2 Type	Cl+Ex	
Detector 2 Channel		
Detector 2 Extend (s)	0.0	
Turn Type	NA	
Protected Phases	8	
Permitted Phases		
Detector Phase	8	
Switch Phase		
Minimum Initial (s)	8.0	
Minimum Split (s)	15.0	
Total Split (s)	29.0	

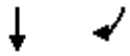
Lane Group	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL
Total Split (%)	15.0%	15.0%	50.3%		15.0%	15.0%	50.3%		17.9%		16.8%	16.8%
Maximum Green (s)	20.0	20.0	80.0		20.0	20.0	80.0		24.0		22.0	22.0
Yellow Time (s)	4.0	4.0	4.0		4.0	4.0	4.0		3.0		3.0	3.0
All-Red Time (s)	2.0	2.0	3.0		2.0	2.0	3.0		4.0		4.0	4.0
Lost Time Adjust (s)		0.0	0.0			0.0	0.0		0.0		0.0	0.0
Total Lost Time (s)		6.0	7.0			6.0	7.0		7.0		7.0	7.0
Lead/Lag	Lead	Lead	Lag		Lead	Lead	Lag					
Lead-Lag Optimize?	Yes	Yes	Yes		Yes	Yes	Yes					
Vehicle Extension (s)	4.0	4.0	4.0		4.0	4.0	4.0		3.0		2.0	2.0
Recall Mode	None	None	Min		None	None	Min		None		None	None
Walk Time (s)			7.0				7.0		7.0			
Flash Dont Walk (s)			12.0				9.0		17.0			
Pedestrian Calls (#/hr)			3				0		4			
Act Effct Green (s)		15.3	80.7			16.9	82.2		26.2	27.4	22.2	22.2
Actuated g/C Ratio		0.11	0.56			0.12	0.57		0.18	0.19	0.15	0.15
v/c Ratio		0.64	1.51			0.69	1.32		0.25	0.35	0.87	1.02
Control Delay		79.6	258.8			80.7	174.6		52.3	53.4	37.6	130.9
Queue Delay		0.0	0.0			0.0	0.0		0.0	0.0	0.0	0.0
Total Delay		79.6	258.8			80.7	174.6		52.3	53.4	37.6	130.9
LOS		E	F			F	F		D	D	D	F
Approach Delay			251.8				169.6			42.1		
Approach LOS			F				F			D		
Queue Length 50th (ft)		105	~1925			126	~1559		40	103	122	173
Queue Length 95th (ft)		206	#2734			#252	#2322		74	159	#340	#401
Internal Link Dist (ft)			327				426			223		
Turn Bay Length (ft)		150				300			50			100
Base Capacity (vph)		246	1945			249	1964		198	354	484	185
Starvation Cap Reductn		0	0			0	0		0	0	0	0
Spillback Cap Reductn		0	0			0	0		0	0	0	0
Storage Cap Reductn		0	0			0	0		0	0	0	0
Reduced v/c Ratio		0.48	1.51			0.58	1.32		0.25	0.35	0.87	1.02

Intersection Summary			
Area Type:	Other		
Cycle Length: 173			
Actuated Cycle Length: 145.1			
Natural Cycle: 150			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 1.51			
Intersection Signal Delay: 192.2		Intersection LOS: F	
Intersection Capacity Utilization 138.8%		ICU Level of Service H	
Analysis Period (min) 15			

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: ELLIOT STREET/WOODWARD STREET & BOYLSTON STREET



Lane Group	SBT	SBR
Total Split (%)	16.8%	
Maximum Green (s)	22.0	
Yellow Time (s)	3.0	
All-Red Time (s)	4.0	
Lost Time Adjust (s)	0.0	
Total Lost Time (s)	7.0	
Lead/Lag		
Lead-Lag Optimize?		
Vehicle Extension (s)	2.0	
Recall Mode	None	
Walk Time (s)		
Flash Dont Walk (s)		
Pedestrian Calls (#/hr)		
Act Effct Green (s)	22.2	
Actuated g/C Ratio	0.15	
v/c Ratio	0.56	
Control Delay	61.9	
Queue Delay	0.0	
Total Delay	61.9	
LOS	E	
Approach Delay	100.0	
Approach LOS	F	
Queue Length 50th (ft)	116	
Queue Length 95th (ft)	221	
Internal Link Dist (ft)	191	
Turn Bay Length (ft)		
Base Capacity (vph)	273	
Starvation Cap Reductn	0	
Spillback Cap Reductn	0	
Storage Cap Reductn	0	
Reduced v/c Ratio	0.56	

Intersection Summary

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	3326	51	0	0	0	47
Future Volume (vph)	3326	51	0	0	0	47
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00
Frt	0.998					0.865
Flt Protected						
Satd. Flow (prot)	3499	0	0	0	0	1644
Flt Permitted						
Satd. Flow (perm)	3499	0	0	0	0	1644
Link Speed (mph)	30			30	30	
Link Distance (ft)	506			263	116	
Travel Time (s)	11.5			6.0	2.6	
Peak Hour Factor	0.97	0.97	0.92	0.92	0.60	0.60
Heavy Vehicles (%)	3%	0%	0%	0%	0%	0%
Adj. Flow (vph)	3429	53	0	0	0	78
Shared Lane Traffic (%)						
Lane Group Flow (vph)	3482	0	0	0	0	78
Sign Control	Free			Free	Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 103.6%		ICU Level of Service G	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	4.3

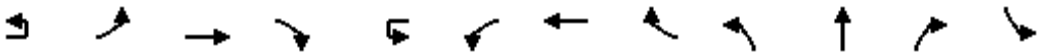
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	3326	51	0	0	0	47
Future Vol, veh/h	3326	51	0	0	0	47
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	-	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	97	97	92	92	60	60
Heavy Vehicles, %	3	0	0	0	0	0
Mvmt Flow	3429	53	0	0	0	78

Major/Minor	Major1			Minor1	
Conflicting Flow All	0	0		-	1741
Stage 1	-	-		-	-
Stage 2	-	-		-	-
Critical Hdwy	-	-		-	6.9
Critical Hdwy Stg 1	-	-		-	-
Critical Hdwy Stg 2	-	-		-	-
Follow-up Hdwy	-	-		-	3.3
Pot Cap-1 Maneuver	-	-		0	~ 78
Stage 1	-	-		0	-
Stage 2	-	-		0	-
Platoon blocked, %	-	-			
Mov Cap-1 Maneuver	-	-		-	~ 78
Mov Cap-2 Maneuver	-	-		-	-
Stage 1	-	-		-	-
Stage 2	-	-		-	-

Approach	EB	NB
HCM Control Delay, s	0	196.5
HCM LOS		F

Minor Lane/Major Mvmt	NBLn1	EBT	EBR
Capacity (veh/h)	78	-	-
HCM Lane V/C Ratio	1.004	-	-
HCM Control Delay (s)	196.5	-	-
HCM Lane LOS	F	-	-
HCM 95th %tile Q(veh)	5.4	-	-

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



Lane Group	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL
Lane Configurations												
Traffic Volume (vph)	17	101	2867	20	31	106	2367	95	45	112	378	167
Future Volume (vph)	17	101	2867	20	31	106	2367	95	45	112	378	167
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)		150		0		300		0	50		0	100
Storage Lanes		1		0		1		0	1		1	1
Taper Length (ft)		25				25			25			25
Lane Util. Factor	0.95	1.00	0.95	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00
Ped Bike Factor		1.00	1.00			1.00	1.00		1.00		0.98	
Frt			0.999				0.994				0.850	
Flt Protected		0.950				0.950			0.950			0.950
Satd. Flow (prot)	0	1775	3499	0	0	1791	3466	0	1805	1881	1599	1703
Flt Permitted		0.950				0.950			0.500			0.679
Satd. Flow (perm)	0	1770	3499	0	0	1788	3466	0	946	1881	1565	1217
Right Turn on Red				Yes				Yes			Yes	
Satd. Flow (RTOR)			1				4				264	
Link Speed (mph)			30				30			30		
Link Distance (ft)			1122				506			303		
Travel Time (s)			25.5				11.5			6.9		
Confl. Peds. (#/hr)	11	11		11	20	20		20	3		3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	2%	3%	8%	0%	1%	3%	5%	0%	1%	1%	6%
Adj. Flow (vph)	18	110	3116	22	34	115	2573	103	49	122	411	182
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	128	3138	0	0	149	2676	0	49	122	411	182
Number of Detectors	1	1	2		1	1	2		1	2	1	1
Detector Template	Left	Left	Thru		Left	Left	Thru		Left	Thru	Right	Left
Leading Detector (ft)	20	20	100		20	20	100		20	100	20	20
Trailing Detector (ft)	0	0	0		0	0	0		0	0	0	0
Detector 1 Position(ft)	0	0	0		0	0	0		0	0	0	0
Detector 1 Size(ft)	20	20	6		20	20	6		20	6	20	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0	0.0		0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0	0.0		0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0	0.0		0.0	0.0	0.0	0.0
Detector 2 Position(ft)			94				94			94		
Detector 2 Size(ft)			6				6			6		
Detector 2 Type			Cl+Ex				Cl+Ex			Cl+Ex		
Detector 2 Channel												
Detector 2 Extend (s)			0.0				0.0			0.0		
Turn Type	Prot	Prot	NA		Prot	Prot	NA		custom	NA	custom	Perm
Protected Phases	1	1	6		5	5	2		9	4 9		
Permitted Phases									4		4	8
Detector Phase	1	1	6		5	5	2		4	4	4	8
Switch Phase												
Minimum Initial (s)	8.0	8.0	20.0		8.0	8.0	20.0		24.0		8.0	8.0
Minimum Split (s)	14.0	14.0	27.0		14.0	14.0	27.0		31.0		15.0	15.0
Total Split (s)	14.0	14.0	82.0		16.0	16.0	84.0		31.0		21.0	21.0

Lane Group	SBT	SBR
Lane Configurations		
Traffic Volume (vph)	80	56
Future Volume (vph)	80	56
Ideal Flow (vphpl)	1900	1900
Storage Length (ft)		0
Storage Lanes		0
Taper Length (ft)		
Lane Util. Factor	1.00	1.00
Ped Bike Factor		
Frt	0.938	
Flt Protected		
Satd. Flow (prot)	1701	0
Flt Permitted		
Satd. Flow (perm)	1701	0
Right Turn on Red		Yes
Satd. Flow (RTOR)	19	
Link Speed (mph)	30	
Link Distance (ft)	271	
Travel Time (s)	6.2	
Confl. Peds. (#/hr)		
Peak Hour Factor	0.92	0.92
Heavy Vehicles (%)	6%	3%
Adj. Flow (vph)	87	61
Shared Lane Traffic (%)		
Lane Group Flow (vph)	148	0
Number of Detectors	2	
Detector Template	Thru	
Leading Detector (ft)	100	
Trailing Detector (ft)	0	
Detector 1 Position(ft)	0	
Detector 1 Size(ft)	6	
Detector 1 Type	Cl+Ex	
Detector 1 Channel		
Detector 1 Extend (s)	0.0	
Detector 1 Queue (s)	0.0	
Detector 1 Delay (s)	0.0	
Detector 2 Position(ft)	94	
Detector 2 Size(ft)	6	
Detector 2 Type	Cl+Ex	
Detector 2 Channel		
Detector 2 Extend (s)	0.0	
Turn Type	NA	
Protected Phases	8	
Permitted Phases		
Detector Phase	8	
Switch Phase		
Minimum Initial (s)	8.0	
Minimum Split (s)	15.0	
Total Split (s)	21.0	

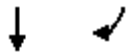
Lane Group	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL
Total Split (%)	9.3%	9.3%	54.7%		10.7%	10.7%	56.0%		20.7%		14.0%	14.0%
Maximum Green (s)	8.0	8.0	75.0		10.0	10.0	77.0		24.0		14.0	14.0
Yellow Time (s)	4.0	4.0	4.0		4.0	4.0	4.0		3.0		3.0	3.0
All-Red Time (s)	2.0	2.0	3.0		2.0	2.0	3.0		4.0		4.0	4.0
Lost Time Adjust (s)		0.0	0.0			0.0	0.0		0.0		0.0	0.0
Total Lost Time (s)		6.0	7.0			6.0	7.0		7.0		7.0	7.0
Lead/Lag	Lead	Lead	Lag		Lead	Lead	Lag					
Lead-Lag Optimize?	Yes	Yes	Yes		Yes	Yes	Yes					
Vehicle Extension (s)	4.0	4.0	4.0		4.0	4.0	4.0		3.0		2.0	2.0
Recall Mode	None	None	Min		None	None	Min		None		None	None
Walk Time (s)			7.0				7.0		7.0			
Flash Dont Walk (s)			12.0				9.0		17.0			
Pedestrian Calls (#/hr)			3				0		4			
Act Effct Green (s)		8.1	75.6			10.1	77.7		18.1	19.3	14.1	14.1
Actuated g/C Ratio		0.06	0.60			0.08	0.62		0.14	0.15	0.11	0.11
v/c Ratio		1.12	1.48			1.03	1.24		0.30	0.42	1.00	1.33
Control Delay		173.3	244.8			140.6	138.4		49.8	51.2	64.7	231.8
Queue Delay		0.0	0.0			0.0	0.0		0.0	0.0	0.0	0.0
Total Delay		173.3	244.8			140.6	138.4		49.8	51.2	64.7	231.8
LOS		F	F			F	F		D	D	E	F
Approach Delay			242.0				138.5			60.6		
Approach LOS			F				F			E		
Queue Length 50th (ft)		~109	~1724			116	~1312		36	90	122	~176
Queue Length 95th (ft)		#304	#2535			#329	#2034		69	145	#412	#416
Internal Link Dist (ft)			1042				426			223		
Turn Bay Length (ft)		150				300			50			100
Base Capacity (vph)		114	2114			144	2151		164	290	411	137
Starvation Cap Reductn		0	0			0	0		0	0	0	0
Spillback Cap Reductn		0	0			0	0		0	0	0	0
Storage Cap Reductn		0	0			0	0		0	0	0	0
Reduced v/c Ratio		1.12	1.48			1.03	1.24		0.30	0.42	1.00	1.33

Intersection Summary	
Area Type:	Other
Cycle Length: 150	
Actuated Cycle Length: 125.2	
Natural Cycle: 150	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.48	
Intersection Signal Delay: 181.2	Intersection LOS: F
Intersection Capacity Utilization 143.0%	ICU Level of Service H
Analysis Period (min) 15	

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: ELLIOT STREET/WOODWARD STREET & BOYLSTON STREET



Lane Group	SBT	SBR
Total Split (%)	14.0%	
Maximum Green (s)	14.0	
Yellow Time (s)	3.0	
All-Red Time (s)	4.0	
Lost Time Adjust (s)	0.0	
Total Lost Time (s)	7.0	
Lead/Lag		
Lead-Lag Optimize?		
Vehicle Extension (s)	2.0	
Recall Mode	None	
Walk Time (s)		
Flash Dont Walk (s)		
Pedestrian Calls (#/hr)		
Act Effct Green (s)	14.1	
Actuated g/C Ratio	0.11	
v/c Ratio	0.71	
Control Delay	66.8	
Queue Delay	0.0	
Total Delay	66.8	
LOS	E	
Approach Delay	157.8	
Approach LOS	F	
Queue Length 50th (ft)	96	
Queue Length 95th (ft)	#253	
Internal Link Dist (ft)	191	
Turn Bay Length (ft)		
Base Capacity (vph)	208	
Starvation Cap Reductn	0	
Spillback Cap Reductn	0	
Storage Cap Reductn	0	
Reduced v/c Ratio	0.71	

Intersection Summary

Intersection	
Int Delay, s/veh	5.8

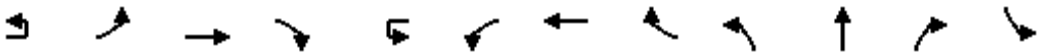
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	3445	53	0	0	0	49
Future Vol, veh/h	3445	53	0	0	0	49
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	97	97	92	92	60	60
Heavy Vehicles, %	3	0	0	0	0	0
Mvmt Flow	3552	55	0	0	0	82

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	-	-	-	1804
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.9
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.3
Pot Cap-1 Maneuver	-	-	0	-	0	~ 70
Stage 1	-	-	0	-	0	-
Stage 2	-	-	0	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	-	~ 70
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	262.5
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT
Capacity (veh/h)	70	-	-	-
HCM Lane V/C Ratio	1.167	-	-	-
HCM Control Delay (s)	262.5	-	-	-
HCM Lane LOS	F	-	-	-
HCM 95th %tile Q(veh)	6.3	-	-	-

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



Lane Group	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL
Lane Configurations												
Traffic Volume (vph)	17	101	2879	20	31	106	2367	95	45	112	380	168
Future Volume (vph)	17	101	2879	20	31	106	2367	95	45	112	380	168
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)		150		0		300		0	50		0	100
Storage Lanes		1		0		1		0	1		1	1
Taper Length (ft)		25				25			25			25
Lane Util. Factor	0.95	1.00	0.95	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00
Ped Bike Factor		1.00	1.00			1.00	1.00		1.00		0.98	
Frt			0.999				0.994				0.850	
Flt Protected		0.950				0.950			0.950			0.950
Satd. Flow (prot)	0	1775	3499	0	0	1791	3466	0	1805	1881	1599	1703
Flt Permitted		0.950				0.950			0.500			0.679
Satd. Flow (perm)	0	1770	3499	0	0	1788	3466	0	946	1881	1565	1217
Right Turn on Red				Yes				Yes			Yes	
Satd. Flow (RTOR)			1				4				264	
Link Speed (mph)			30				30			30		
Link Distance (ft)			1122				506			303		
Travel Time (s)			25.5				11.5			6.9		
Confl. Peds. (#/hr)	11	11		11	20	20		20	3		3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	2%	3%	8%	0%	1%	3%	5%	0%	1%	1%	6%
Adj. Flow (vph)	18	110	3129	22	34	115	2573	103	49	122	413	183
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	128	3151	0	0	149	2676	0	49	122	413	183
Number of Detectors	1	1	2		1	1	2		1	2	1	1
Detector Template	Left	Left	Thru		Left	Left	Thru		Left	Thru	Right	Left
Leading Detector (ft)	20	20	100		20	20	100		20	100	20	20
Trailing Detector (ft)	0	0	0		0	0	0		0	0	0	0
Detector 1 Position(ft)	0	0	0		0	0	0		0	0	0	0
Detector 1 Size(ft)	20	20	6		20	20	6		20	6	20	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0	0.0		0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0	0.0		0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0	0.0		0.0	0.0	0.0	0.0
Detector 2 Position(ft)			94				94			94		
Detector 2 Size(ft)			6				6			6		
Detector 2 Type			Cl+Ex				Cl+Ex			Cl+Ex		
Detector 2 Channel												
Detector 2 Extend (s)			0.0				0.0			0.0		
Turn Type	Prot	Prot	NA		Prot	Prot	NA		custom	NA	custom	Perm
Protected Phases	1	1	6		5	5	2		9	4 9		
Permitted Phases									4		4	8
Detector Phase	1	1	6		5	5	2		4	4	4	8
Switch Phase												
Minimum Initial (s)	8.0	8.0	20.0		8.0	8.0	20.0		24.0		8.0	8.0
Minimum Split (s)	14.0	14.0	27.0		14.0	14.0	27.0		31.0		15.0	15.0
Total Split (s)	14.0	14.0	82.0		16.0	16.0	84.0		31.0		21.0	21.0

Lane Group	SBT	SBR
Lane Configurations		
Traffic Volume (vph)	80	56
Future Volume (vph)	80	56
Ideal Flow (vphpl)	1900	1900
Storage Length (ft)		0
Storage Lanes		0
Taper Length (ft)		
Lane Util. Factor	1.00	1.00
Ped Bike Factor		
Frt	0.938	
Flt Protected		
Satd. Flow (prot)	1701	0
Flt Permitted		
Satd. Flow (perm)	1701	0
Right Turn on Red		Yes
Satd. Flow (RTOR)	19	
Link Speed (mph)	30	
Link Distance (ft)	271	
Travel Time (s)	6.2	
Confl. Peds. (#/hr)		
Peak Hour Factor	0.92	0.92
Heavy Vehicles (%)	6%	3%
Adj. Flow (vph)	87	61
Shared Lane Traffic (%)		
Lane Group Flow (vph)	148	0
Number of Detectors	2	
Detector Template	Thru	
Leading Detector (ft)	100	
Trailing Detector (ft)	0	
Detector 1 Position(ft)	0	
Detector 1 Size(ft)	6	
Detector 1 Type	Cl+Ex	
Detector 1 Channel		
Detector 1 Extend (s)	0.0	
Detector 1 Queue (s)	0.0	
Detector 1 Delay (s)	0.0	
Detector 2 Position(ft)	94	
Detector 2 Size(ft)	6	
Detector 2 Type	Cl+Ex	
Detector 2 Channel		
Detector 2 Extend (s)	0.0	
Turn Type	NA	
Protected Phases	8	
Permitted Phases		
Detector Phase	8	
Switch Phase		
Minimum Initial (s)	8.0	
Minimum Split (s)	15.0	
Total Split (s)	21.0	

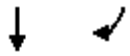
Lane Group	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL
Total Split (%)	9.3%	9.3%	54.7%		10.7%	10.7%	56.0%		20.7%		14.0%	14.0%
Maximum Green (s)	8.0	8.0	75.0		10.0	10.0	77.0		24.0		14.0	14.0
Yellow Time (s)	4.0	4.0	4.0		4.0	4.0	4.0		3.0		3.0	3.0
All-Red Time (s)	2.0	2.0	3.0		2.0	2.0	3.0		4.0		4.0	4.0
Lost Time Adjust (s)		0.0	0.0			0.0	0.0		0.0		0.0	0.0
Total Lost Time (s)		6.0	7.0			6.0	7.0		7.0		7.0	7.0
Lead/Lag	Lead	Lead	Lag		Lead	Lead	Lag					
Lead-Lag Optimize?	Yes	Yes	Yes		Yes	Yes	Yes					
Vehicle Extension (s)	4.0	4.0	4.0		4.0	4.0	4.0		3.0		2.0	2.0
Recall Mode	None	None	Min		None	None	Min		None		None	None
Walk Time (s)			7.0				7.0		7.0			
Flash Dont Walk (s)			12.0				9.0		17.0			
Pedestrian Calls (#/hr)			3				0		4			
Act Effct Green (s)		8.1	75.6			10.1	77.7		18.1	19.3	14.1	14.1
Actuated g/C Ratio		0.06	0.60			0.08	0.62		0.14	0.15	0.11	0.11
v/c Ratio		1.12	1.49			1.03	1.24		0.30	0.42	1.00	1.34
Control Delay		173.3	247.5			140.6	138.4		49.8	51.2	66.0	234.4
Queue Delay		0.0	0.0			0.0	0.0		0.0	0.0	0.0	0.0
Total Delay		173.3	247.5			140.6	138.4		49.8	51.2	66.0	234.4
LOS		F	F			F	F		D	D	E	F
Approach Delay			244.7				138.5			61.5		
Approach LOS			F				F			E		
Queue Length 50th (ft)		~109	~1736			116	~1312		36	90	124	~178
Queue Length 95th (ft)		#304	#2549			#329	#2034		69	145	#416	#418
Internal Link Dist (ft)			1042				426			223		
Turn Bay Length (ft)		150				300			50			100
Base Capacity (vph)		114	2114			144	2151		164	290	411	137
Starvation Cap Reductn		0	0			0	0		0	0	0	0
Spillback Cap Reductn		0	0			0	0		0	0	0	0
Storage Cap Reductn		0	0			0	0		0	0	0	0
Reduced v/c Ratio		1.12	1.49			1.03	1.24		0.30	0.42	1.00	1.34

Intersection Summary			
Area Type:	Other		
Cycle Length: 150			
Actuated Cycle Length: 125.2			
Natural Cycle: 150			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 1.49			
Intersection Signal Delay: 182.7		Intersection LOS: F	
Intersection Capacity Utilization 143.5%		ICU Level of Service H	
Analysis Period (min) 15			

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: ELLIOT STREET/WOODWARD STREET & BOYLSTON STREET



Lane Group	SBT	SBR
Total Split (%)	14.0%	
Maximum Green (s)	14.0	
Yellow Time (s)	3.0	
All-Red Time (s)	4.0	
Lost Time Adjust (s)	0.0	
Total Lost Time (s)	7.0	
Lead/Lag		
Lead-Lag Optimize?		
Vehicle Extension (s)	2.0	
Recall Mode	None	
Walk Time (s)		
Flash Dont Walk (s)		
Pedestrian Calls (#/hr)		
Act Effct Green (s)	14.1	
Actuated g/C Ratio	0.11	
v/c Ratio	0.71	
Control Delay	66.8	
Queue Delay	0.0	
Total Delay	66.8	
LOS	E	
Approach Delay	159.5	
Approach LOS	F	
Queue Length 50th (ft)	96	
Queue Length 95th (ft)	#253	
Internal Link Dist (ft)	191	
Turn Bay Length (ft)		
Base Capacity (vph)	208	
Starvation Cap Reductn	0	
Spillback Cap Reductn	0	
Storage Cap Reductn	0	
Reduced v/c Ratio	0.71	

Intersection Summary

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	3445	83	0	0	0	80
Future Volume (vph)	3445	83	0	0	0	80
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	0.95	1.00	0.95	1.00	1.00
Frt	0.996					0.865
Flt Protected						
Satd. Flow (prot)	3493	0	0	3610	0	1644
Flt Permitted						
Satd. Flow (perm)	3493	0	0	3610	0	1644
Link Speed (mph)	30			30	30	
Link Distance (ft)	506			1519	116	
Travel Time (s)	11.5			34.5	2.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.60	0.60
Heavy Vehicles (%)	3%	0%	0%	0%	0%	0%
Adj. Flow (vph)	3745	90	0	0	0	133
Shared Lane Traffic (%)						
Lane Group Flow (vph)	3835	0	0	0	0	133
Sign Control	Free			Free	Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 109.5%		ICU Level of Service H	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	8.9

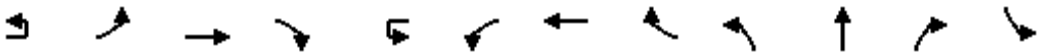
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	3445	83	0	0	0	80
Future Vol, veh/h	3445	83	0	0	0	80
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	3	0	0	0	0	0
Mvmt Flow	3745	90	0	0	0	87

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	-	-	-	1918
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	6.9
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.3
Pot Cap-1 Maneuver	-	-	0	-	0	~ 59
Stage 1	-	-	0	-	0	-
Stage 2	-	-	0	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	-	~ 59
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	$ 400.3
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT
Capacity (veh/h)	59	-	-	-
HCM Lane V/C Ratio	1.474	-	-	-
HCM Control Delay (s)	$ 400.3	-	-	-
HCM Lane LOS	F	-	-	-
HCM 95th %tile Q(veh)	7.7	-	-	-

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



Lane Group	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL
Lane Configurations												
Traffic Volume (vph)	24	75	2132	24	30	213	2777	66	83	89	210	127
Future Volume (vph)	24	75	2132	24	30	213	2777	66	83	89	210	127
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)		150		0		300		0	50		0	100
Storage Lanes		1		0		1		0	1		1	1
Taper Length (ft)		25				25			25			25
Lane Util. Factor	0.95	1.00	0.95	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00
Ped Bike Factor		1.00	1.00			1.00	1.00					0.99
Frt			0.998				0.997				0.850	
Flt Protected		0.950				0.950			0.950			0.950
Satd. Flow (prot)	0	1805	3567	0	0	1805	3558	0	1805	1900	1615	1805
Flt Permitted		0.950				0.950			0.337			0.687
Satd. Flow (perm)	0	1805	3567	0	0	1797	3558	0	640	1900	1615	1297
Right Turn on Red				Yes				Yes			Yes	
Satd. Flow (RTOR)			1				2				256	
Link Speed (mph)			30				30			30		
Link Distance (ft)			407				506			303		
Travel Time (s)			9.3				11.5			6.9		
Confl. Peds. (#/hr)	1	1		1	11	11		11				3
Peak Hour Factor	0.96	0.96	0.96	0.96	0.97	0.97	0.97	0.97	0.82	0.82	0.82	0.86
Heavy Vehicles (%)	0%	0%	1%	0%	0%	0%	1%	0%	0%	0%	0%	0%
Adj. Flow (vph)	25	78	2221	25	31	220	2863	68	101	109	256	148
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	103	2246	0	0	251	2931	0	101	109	256	148
Number of Detectors	1	1	2		1	1	2		1	2	1	1
Detector Template	Left	Left	Thru		Left	Left	Thru		Left	Thru	Right	Left
Leading Detector (ft)	20	20	100		20	20	100		20	100	20	20
Trailing Detector (ft)	0	0	0		0	0	0		0	0	0	0
Detector 1 Position(ft)	0	0	0		0	0	0		0	0	0	0
Detector 1 Size(ft)	20	20	6		20	20	6		20	6	20	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0	0.0		0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0	0.0		0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0	0.0		0.0	0.0	0.0	0.0
Detector 2 Position(ft)			94				94			94		
Detector 2 Size(ft)			6				6			6		
Detector 2 Type			Cl+Ex				Cl+Ex			Cl+Ex		
Detector 2 Channel												
Detector 2 Extend (s)			0.0				0.0			0.0		
Turn Type	Prot	Prot	NA		Prot	Prot	NA		custom	NA	custom	Perm
Protected Phases	1	1	6		5	5	2		9	4 9		
Permitted Phases									4		4	8
Detector Phase	1	1	6		5	5	2		4	4	4	8
Switch Phase												
Minimum Initial (s)	8.0	8.0	20.0		8.0	8.0	20.0		24.0		8.0	8.0
Minimum Split (s)	14.0	14.0	27.0		14.0	14.0	27.0		31.0		15.0	15.0
Total Split (s)	26.0	26.0	87.0		26.0	26.0	87.0		31.0		29.0	29.0

Lane Group	SBT	SBR
Lane Configurations		
Traffic Volume (vph)	108	61
Future Volume (vph)	108	61
Ideal Flow (vphpl)	1900	1900
Storage Length (ft)		0
Storage Lanes		0
Taper Length (ft)		
Lane Util. Factor	1.00	1.00
Ped Bike Factor	0.99	
Frt	0.946	
Flt Protected		
Satd. Flow (prot)	1741	0
Flt Permitted		
Satd. Flow (perm)	1741	0
Right Turn on Red		Yes
Satd. Flow (RTOR)	13	
Link Speed (mph)	30	
Link Distance (ft)	271	
Travel Time (s)	6.2	
Confl. Peds. (#/hr)		3
Peak Hour Factor	0.86	0.86
Heavy Vehicles (%)	4%	0%
Adj. Flow (vph)	126	71
Shared Lane Traffic (%)		
Lane Group Flow (vph)	197	0
Number of Detectors	2	
Detector Template	Thru	
Leading Detector (ft)	100	
Trailing Detector (ft)	0	
Detector 1 Position(ft)	0	
Detector 1 Size(ft)	6	
Detector 1 Type	Cl+Ex	
Detector 1 Channel		
Detector 1 Extend (s)	0.0	
Detector 1 Queue (s)	0.0	
Detector 1 Delay (s)	0.0	
Detector 2 Position(ft)	94	
Detector 2 Size(ft)	6	
Detector 2 Type	Cl+Ex	
Detector 2 Channel		
Detector 2 Extend (s)	0.0	
Turn Type	NA	
Protected Phases	8	
Permitted Phases		
Detector Phase	8	
Switch Phase		
Minimum Initial (s)	8.0	
Minimum Split (s)	15.0	
Total Split (s)	29.0	

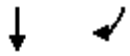
Lane Group	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL
Total Split (%)	15.0%	15.0%	50.3%		15.0%	15.0%	50.3%		17.9%		16.8%	16.8%
Maximum Green (s)	20.0	20.0	80.0		20.0	20.0	80.0		24.0		22.0	22.0
Yellow Time (s)	4.0	4.0	4.0		4.0	4.0	4.0		3.0		3.0	3.0
All-Red Time (s)	2.0	2.0	3.0		2.0	2.0	3.0		4.0		4.0	4.0
Lost Time Adjust (s)		0.0	0.0			0.0	0.0		0.0		0.0	0.0
Total Lost Time (s)		6.0	7.0			6.0	7.0		7.0		7.0	7.0
Lead/Lag	Lead	Lead	Lag		Lead	Lead	Lag					
Lead-Lag Optimize?	Yes	Yes	Yes		Yes	Yes	Yes					
Vehicle Extension (s)	4.0	4.0	4.0		4.0	4.0	4.0		3.0		2.0	2.0
Recall Mode	None	None	Min		None	None	Min		None		None	None
Walk Time (s)			7.0				7.0		7.0			
Flash Dont Walk (s)			12.0				9.0		17.0			
Pedestrian Calls (#/hr)			3				0		12			
Act Effct Green (s)		14.7	80.9			20.2	86.4		29.4	31.9	20.9	20.9
Actuated g/C Ratio		0.10	0.53			0.13	0.56		0.19	0.21	0.14	0.14
v/c Ratio		0.60	1.19			1.05	1.46		0.54	0.28	0.58	0.84
Control Delay		82.9	125.2			135.2	238.2		61.7	50.6	12.8	101.4
Queue Delay		0.0	0.0			0.0	0.0		0.0	0.0	0.0	0.0
Total Delay		82.9	125.2			135.2	238.2		61.7	50.6	12.8	101.4
LOS		F	F			F	F		E	D	B	F
Approach Delay			123.3				230.1			32.2		
Approach LOS			F				F			C		
Queue Length 50th (ft)		92	~1255			235	~1883		~97	92	0	132
Queue Length 95th (ft)		180	#1884			#537	#2712		124	132	54	#290
Internal Link Dist (ft)			327				426			223		
Turn Bay Length (ft)		150				300			50			100
Base Capacity (vph)		238	1884			238	2007		193	412	453	187
Starvation Cap Reductn		0	0			0	0		0	0	0	0
Spillback Cap Reductn		0	0			0	0		0	0	0	0
Storage Cap Reductn		0	0			0	0		0	0	0	0
Reduced v/c Ratio		0.43	1.19			1.05	1.46		0.52	0.26	0.57	0.79

Intersection Summary			
Area Type:	Other		
Cycle Length: 173			
Actuated Cycle Length: 153.2			
Natural Cycle: 150			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 1.46			
Intersection Signal Delay: 168.5		Intersection LOS: F	
Intersection Capacity Utilization 124.2%		ICU Level of Service H	
Analysis Period (min) 15			

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: ELLIOT STREET/WOODWARD STREET & BOYLSTON STREET



Lane Group	SBT	SBR
Total Split (%)	16.8%	
Maximum Green (s)	22.0	
Yellow Time (s)	3.0	
All-Red Time (s)	4.0	
Lost Time Adjust (s)	0.0	
Total Lost Time (s)	7.0	
Lead/Lag		
Lead-Lag Optimize?		
Vehicle Extension (s)	2.0	
Recall Mode	None	
Walk Time (s)		
Flash Dont Walk (s)		
Pedestrian Calls (#/hr)		
Act Effct Green (s)	20.9	
Actuated g/C Ratio	0.14	
v/c Ratio	0.79	
Control Delay	83.9	
Queue Delay	0.0	
Total Delay	83.9	
LOS	F	
Approach Delay	91.4	
Approach LOS	F	
Queue Length 50th (ft)	164	
Queue Length 95th (ft)	#324	
Internal Link Dist (ft)	191	
Turn Bay Length (ft)		
Base Capacity (vph)	263	
Starvation Cap Reductn	0	
Spillback Cap Reductn	0	
Storage Cap Reductn	0	
Reduced v/c Ratio	0.75	

Intersection Summary

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	2603	10	0	0	0	17
Future Volume (vph)	2603	10	0	0	0	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00
Frt	0.999					0.865
Flt Protected						
Satd. Flow (prot)	3571	0	0	0	0	1644
Flt Permitted						
Satd. Flow (perm)	3571	0	0	0	0	1644
Link Speed (mph)	30			30	30	
Link Distance (ft)	506			263	116	
Travel Time (s)	11.5			6.0	2.6	
Peak Hour Factor	0.90	0.90	0.92	0.92	0.44	0.44
Heavy Vehicles (%)	1%	0%	0%	0%	0%	0%
Adj. Flow (vph)	2892	11	0	0	0	39
Shared Lane Traffic (%)						
Lane Group Flow (vph)	2903	0	0	0	0	39
Sign Control	Free			Free	Stop	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 82.3%		ICU Level of Service E	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	0.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	2603	10	0	0	0	17
Future Vol, veh/h	2603	10	0	0	0	17
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	-	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	92	92	44	44
Heavy Vehicles, %	1	0	0	0	0	0
Mvmt Flow	2892	11	0	0	0	39

Major/Minor	Major1			Minor1	
Conflicting Flow All	0	0		-	1452
Stage 1	-	-		-	-
Stage 2	-	-		-	-
Critical Hdwy	-	-		-	6.9
Critical Hdwy Stg 1	-	-		-	-
Critical Hdwy Stg 2	-	-		-	-
Follow-up Hdwy	-	-		-	3.3
Pot Cap-1 Maneuver	-	-		0	122
Stage 1	-	-		0	-
Stage 2	-	-		0	-
Platoon blocked, %	-	-			
Mov Cap-1 Maneuver	-	-		-	122
Mov Cap-2 Maneuver	-	-		-	-
Stage 1	-	-		-	-
Stage 2	-	-		-	-

Approach	EB	NB
HCM Control Delay, s	0	47.6
HCM LOS		E

Minor Lane/Major Mvmt	NBLn1	EBT	EBR
Capacity (veh/h)	122	-	-
HCM Lane V/C Ratio	0.317	-	-
HCM Control Delay (s)	47.6	-	-
HCM Lane LOS	E	-	-
HCM 95th %tile Q(veh)	1.2	-	-

Lane Group	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL
Lane Configurations												
Traffic Volume (vph)	25	78	2208	50	31	251	2876	69	116	97	248	132
Future Volume (vph)	25	78	2208	50	31	251	2876	69	116	97	248	132
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)		150		0		300		0	50		0	100
Storage Lanes		1		0		1		0	1		1	1
Taper Length (ft)		25				25			25			25
Lane Util. Factor	0.95	1.00	0.95	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00
Ped Bike Factor		1.00	1.00			1.00	1.00					0.99
Frt			0.997				0.996				0.850	
Flt Protected		0.950				0.950			0.950			0.950
Satd. Flow (prot)	0	1805	3562	0	0	1805	3555	0	1805	1900	1615	1805
Flt Permitted		0.950				0.950			0.331			0.689
Satd. Flow (perm)	0	1805	3562	0	0	1800	3555	0	629	1900	1615	1296
Right Turn on Red				Yes				Yes			Yes	
Satd. Flow (RTOR)			2				2				270	
Link Speed (mph)			30				30			30		
Link Distance (ft)			407				506			303		
Travel Time (s)			9.3				11.5			6.9		
Confl. Peds. (#/hr)	1	1		1	11	11		11				3
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	1%	0%	0%	0%	1%	0%	0%	0%	0%	0%
Adj. Flow (vph)	27	85	2400	54	34	273	3126	75	126	105	270	143
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	112	2454	0	0	307	3201	0	126	105	270	143
Number of Detectors	1	1	2		1	1	2		1	2	1	1
Detector Template	Left	Left	Thru		Left	Left	Thru		Left	Thru	Right	Left
Leading Detector (ft)	20	20	100		20	20	100		20	100	20	20
Trailing Detector (ft)	0	0	0		0	0	0		0	0	0	0
Detector 1 Position(ft)	0	0	0		0	0	0		0	0	0	0
Detector 1 Size(ft)	20	20	6		20	20	6		20	6	20	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0	0.0		0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0	0.0		0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0	0.0		0.0	0.0	0.0	0.0
Detector 2 Position(ft)			94				94			94		
Detector 2 Size(ft)			6				6			6		
Detector 2 Type			Cl+Ex				Cl+Ex			Cl+Ex		
Detector 2 Channel												
Detector 2 Extend (s)			0.0				0.0			0.0		
Turn Type	Prot	Prot	NA		Prot	Prot	NA		custom	NA	custom	Perm
Protected Phases	1	1	6		5	5	2		9	4 9		
Permitted Phases									4		4	8
Detector Phase	1	1	6		5	5	2		4	4	4	8
Switch Phase												
Minimum Initial (s)	8.0	8.0	20.0		8.0	8.0	20.0		24.0		8.0	8.0
Minimum Split (s)	14.0	14.0	27.0		14.0	14.0	27.0		31.0		15.0	15.0
Total Split (s)	14.0	14.0	78.0		22.0	22.0	86.0		31.0		19.0	19.0

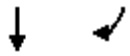
Lane Group	SBT	SBR
Lane Configurations		
Traffic Volume (vph)	117	63
Future Volume (vph)	117	63
Ideal Flow (vphpl)	1900	1900
Storage Length (ft)		0
Storage Lanes		0
Taper Length (ft)		
Lane Util. Factor	1.00	1.00
Ped Bike Factor	0.99	
Frt	0.948	
Flt Protected		
Satd. Flow (prot)	1741	0
Flt Permitted		
Satd. Flow (perm)	1741	0
Right Turn on Red		Yes
Satd. Flow (RTOR)	14	
Link Speed (mph)	30	
Link Distance (ft)	271	
Travel Time (s)	6.2	
Confl. Peds. (#/hr)		3
Peak Hour Factor	0.92	0.92
Heavy Vehicles (%)	4%	0%
Adj. Flow (vph)	127	68
Shared Lane Traffic (%)		
Lane Group Flow (vph)	195	0
Number of Detectors	2	
Detector Template	Thru	
Leading Detector (ft)	100	
Trailing Detector (ft)	0	
Detector 1 Position(ft)	0	
Detector 1 Size(ft)	6	
Detector 1 Type	Cl+Ex	
Detector 1 Channel		
Detector 1 Extend (s)	0.0	
Detector 1 Queue (s)	0.0	
Detector 1 Delay (s)	0.0	
Detector 2 Position(ft)	94	
Detector 2 Size(ft)	6	
Detector 2 Type	Cl+Ex	
Detector 2 Channel		
Detector 2 Extend (s)	0.0	
Turn Type	NA	
Protected Phases	8	
Permitted Phases		
Detector Phase	8	
Switch Phase		
Minimum Initial (s)	8.0	
Minimum Split (s)	15.0	
Total Split (s)	19.0	

Lane Group	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL
Total Split (%)	9.3%	9.3%	52.0%		14.7%	14.7%	57.3%		20.7%		12.7%	12.7%
Maximum Green (s)	8.0	8.0	71.0		16.0	16.0	79.0		24.0		12.0	12.0
Yellow Time (s)	4.0	4.0	4.0		4.0	4.0	4.0		3.0		3.0	3.0
All-Red Time (s)	2.0	2.0	3.0		2.0	2.0	3.0		4.0		4.0	4.0
Lost Time Adjust (s)		0.0	0.0			0.0	0.0		0.0		0.0	0.0
Total Lost Time (s)		6.0	7.0			6.0	7.0		7.0		7.0	7.0
Lead/Lag	Lead	Lead	Lag		Lead	Lead	Lag					
Lead-Lag Optimize?	Yes	Yes	Yes		Yes	Yes	Yes					
Vehicle Extension (s)	4.0	4.0	4.0		4.0	4.0	4.0		3.0		2.0	2.0
Recall Mode	None	None	Min		None	None	Min		None		None	None
Walk Time (s)			7.0				7.0		7.0			
Flash Dont Walk (s)			12.0				9.0		17.0			
Pedestrian Calls (#/hr)			3				0		4			
Act Effct Green (s)		8.1	71.6			16.1	79.7		16.1	17.3	12.1	12.1
Actuated g/C Ratio		0.06	0.57			0.13	0.64		0.13	0.14	0.10	0.10
v/c Ratio		0.97	1.20			1.32	1.41		1.07	0.40	0.68	1.14
Control Delay		133.3	123.4			214.3	212.9		150.4	52.5	15.9	175.4
Queue Delay		0.0	0.0			0.0	0.0		0.0	0.0	0.0	0.0
Total Delay		133.3	123.4			214.3	212.9		150.4	52.5	15.9	175.4
LOS		F	F			F	F		F	D	B	F
Approach Delay			123.8				213.1			57.4		
Approach LOS			F				F			E		
Queue Length 50th (ft)		87	~1174			~297	~1711		~151	78	0	~124
Queue Length 95th (ft)		#261	#1853			#622	#2533		152	130	94	#331
Internal Link Dist (ft)			327				426			223		
Turn Bay Length (ft)		150				300			50			100
Base Capacity (vph)		116	2038			232	2263		118	262	399	125
Starvation Cap Reductn		0	0			0	0		0	0	0	0
Spillback Cap Reductn		0	0			0	0		0	0	0	0
Storage Cap Reductn		0	0			0	0		0	0	0	0
Reduced v/c Ratio		0.97	1.20			1.32	1.41		1.07	0.40	0.68	1.14

Intersection Summary			
Area Type:	Other		
Cycle Length: 150			
Actuated Cycle Length: 125.2			
Natural Cycle: 150			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 1.41			
Intersection Signal Delay: 165.8		Intersection LOS: F	
Intersection Capacity Utilization 127.7%		ICU Level of Service H	
Analysis Period (min) 15			

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: ELLIOT STREET/WOODWARD STREET & BOYLSTON STREET



Lane Group	SBT	SBR
Total Split (%)	12.7%	
Maximum Green (s)	12.0	
Yellow Time (s)	3.0	
All-Red Time (s)	4.0	
Lost Time Adjust (s)	0.0	
Total Lost Time (s)	7.0	
Lead/Lag		
Lead-Lag Optimize?		
Vehicle Extension (s)	2.0	
Recall Mode	None	
Walk Time (s)		
Flash Dont Walk (s)		
Pedestrian Calls (#/hr)		
Act Effct Green (s)	12.1	
Actuated g/C Ratio	0.10	
v/c Ratio	1.08	
Control Delay	138.2	
Queue Delay	0.0	
Total Delay	138.2	
LOS	F	
Approach Delay	153.9	
Approach LOS	F	
Queue Length 50th (ft)	~151	
Queue Length 95th (ft)	#398	
Internal Link Dist (ft)	191	
Turn Bay Length (ft)		
Base Capacity (vph)	181	
Starvation Cap Reductn	0	
Spillback Cap Reductn	0	
Storage Cap Reductn	0	
Reduced v/c Ratio	1.08	

Intersection Summary

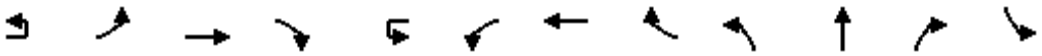
Intersection	
Int Delay, s/veh	0.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	2726	11	0	0	0	18
Future Vol, veh/h	2726	11	0	0	0	18
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	-	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	92	92	44	44
Heavy Vehicles, %	1	0	0	0	0	0
Mvmt Flow	3029	12	0	0	0	41

Major/Minor	Major1			Minor1	
Conflicting Flow All	0	0		-	1521
Stage 1	-	-		-	-
Stage 2	-	-		-	-
Critical Hdwy	-	-		-	6.9
Critical Hdwy Stg 1	-	-		-	-
Critical Hdwy Stg 2	-	-		-	-
Follow-up Hdwy	-	-		-	3.3
Pot Cap-1 Maneuver	-	-		0	110
Stage 1	-	-		0	-
Stage 2	-	-		0	-
Platoon blocked, %	-	-			
Mov Cap-1 Maneuver	-	-		-	110
Mov Cap-2 Maneuver	-	-		-	-
Stage 1	-	-		-	-
Stage 2	-	-		-	-

Approach	EB	NB
HCM Control Delay, s	0	55.9
HCM LOS		F

Minor Lane/Major Mvmt	NBLn1	EBT	EBR
Capacity (veh/h)	110	-	-
HCM Lane V/C Ratio	0.372	-	-
HCM Control Delay (s)	55.9	-	-
HCM Lane LOS	F	-	-
HCM 95th %tile Q(veh)	1.5	-	-



Lane Group	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL
Lane Configurations												
Traffic Volume (vph)	25	78	2210	50	31	251	2876	69	116	97	248	132
Future Volume (vph)	25	78	2210	50	31	251	2876	69	116	97	248	132
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)		150		0		300		0	50		0	100
Storage Lanes		1		0		1		0	1		1	1
Taper Length (ft)		25				25			25			25
Lane Util. Factor	0.95	1.00	0.95	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00
Ped Bike Factor		1.00	1.00			1.00	1.00					0.99
Frt			0.997				0.996				0.850	
Flt Protected		0.950				0.950			0.950			0.950
Satd. Flow (prot)	0	1805	3562	0	0	1805	3555	0	1805	1900	1615	1805
Flt Permitted		0.950				0.950			0.331			0.689
Satd. Flow (perm)	0	1805	3562	0	0	1800	3555	0	629	1900	1615	1296
Right Turn on Red				Yes				Yes			Yes	
Satd. Flow (RTOR)			2				2				270	
Link Speed (mph)			30				30			30		
Link Distance (ft)			407				506			303		
Travel Time (s)			9.3				11.5			6.9		
Confl. Peds. (#/hr)	1	1		1	11	11		11				3
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	1%	0%	0%	0%	1%	0%	0%	0%	0%	0%
Adj. Flow (vph)	27	85	2402	54	34	273	3126	75	126	105	270	143
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	112	2456	0	0	307	3201	0	126	105	270	143
Number of Detectors	1	1	2		1	1	2		1	2	1	1
Detector Template	Left	Left	Thru		Left	Left	Thru		Left	Thru	Right	Left
Leading Detector (ft)	20	20	100		20	20	100		20	100	20	20
Trailing Detector (ft)	0	0	0		0	0	0		0	0	0	0
Detector 1 Position(ft)	0	0	0		0	0	0		0	0	0	0
Detector 1 Size(ft)	20	20	6		20	20	6		20	6	20	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0	0.0		0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0	0.0		0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0	0.0		0.0	0.0	0.0	0.0
Detector 2 Position(ft)			94				94			94		
Detector 2 Size(ft)			6				6			6		
Detector 2 Type			Cl+Ex				Cl+Ex			Cl+Ex		
Detector 2 Channel												
Detector 2 Extend (s)			0.0				0.0			0.0		
Turn Type	Prot	Prot	NA		Prot	Prot	NA		custom	NA	custom	Perm
Protected Phases	1	1	6		5	5	2		9	4 9		
Permitted Phases									4		4	8
Detector Phase	1	1	6		5	5	2		4	4	4	8
Switch Phase												
Minimum Initial (s)	8.0	8.0	20.0		8.0	8.0	20.0		24.0		8.0	8.0
Minimum Split (s)	14.0	14.0	27.0		14.0	14.0	27.0		31.0		15.0	15.0
Total Split (s)	14.0	14.0	78.0		22.0	22.0	86.0		31.0		19.0	19.0

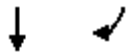
Lane Group	SBT	SBR
Lane Configurations		
Traffic Volume (vph)	117	63
Future Volume (vph)	117	63
Ideal Flow (vphpl)	1900	1900
Storage Length (ft)		0
Storage Lanes		0
Taper Length (ft)		
Lane Util. Factor	1.00	1.00
Ped Bike Factor	0.99	
Frt	0.948	
Flt Protected		
Satd. Flow (prot)	1741	0
Flt Permitted		
Satd. Flow (perm)	1741	0
Right Turn on Red		Yes
Satd. Flow (RTOR)	14	
Link Speed (mph)	30	
Link Distance (ft)	271	
Travel Time (s)	6.2	
Confl. Peds. (#/hr)		3
Peak Hour Factor	0.92	0.92
Heavy Vehicles (%)	4%	0%
Adj. Flow (vph)	127	68
Shared Lane Traffic (%)		
Lane Group Flow (vph)	195	0
Number of Detectors	2	
Detector Template	Thru	
Leading Detector (ft)	100	
Trailing Detector (ft)	0	
Detector 1 Position(ft)	0	
Detector 1 Size(ft)	6	
Detector 1 Type	Cl+Ex	
Detector 1 Channel		
Detector 1 Extend (s)	0.0	
Detector 1 Queue (s)	0.0	
Detector 1 Delay (s)	0.0	
Detector 2 Position(ft)	94	
Detector 2 Size(ft)	6	
Detector 2 Type	Cl+Ex	
Detector 2 Channel		
Detector 2 Extend (s)	0.0	
Turn Type	NA	
Protected Phases	8	
Permitted Phases		
Detector Phase	8	
Switch Phase		
Minimum Initial (s)	8.0	
Minimum Split (s)	15.0	
Total Split (s)	19.0	

Lane Group	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBL	NBT	NBR	SBL
Total Split (%)	9.3%	9.3%	52.0%		14.7%	14.7%	57.3%		20.7%		12.7%	12.7%
Maximum Green (s)	8.0	8.0	71.0		16.0	16.0	79.0		24.0		12.0	12.0
Yellow Time (s)	4.0	4.0	4.0		4.0	4.0	4.0		3.0		3.0	3.0
All-Red Time (s)	2.0	2.0	3.0		2.0	2.0	3.0		4.0		4.0	4.0
Lost Time Adjust (s)		0.0	0.0			0.0	0.0		0.0		0.0	0.0
Total Lost Time (s)		6.0	7.0			6.0	7.0		7.0		7.0	7.0
Lead/Lag	Lead	Lead	Lag		Lead	Lead	Lag					
Lead-Lag Optimize?	Yes	Yes	Yes		Yes	Yes	Yes					
Vehicle Extension (s)	4.0	4.0	4.0		4.0	4.0	4.0		3.0		2.0	2.0
Recall Mode	None	None	Min		None	None	Min		None		None	None
Walk Time (s)			7.0				7.0		7.0			
Flash Dont Walk (s)			12.0				9.0		17.0			
Pedestrian Calls (#/hr)			3				0		4			
Act Effct Green (s)		8.1	71.6			16.1	79.7		16.1	17.3	12.1	12.1
Actuated g/C Ratio		0.06	0.57			0.13	0.64		0.13	0.14	0.10	0.10
v/c Ratio		0.97	1.21			1.32	1.41		1.07	0.40	0.68	1.14
Control Delay		133.3	123.8			214.3	212.9		150.4	52.5	15.9	175.4
Queue Delay		0.0	0.0			0.0	0.0		0.0	0.0	0.0	0.0
Total Delay		133.3	123.8			214.3	212.9		150.4	52.5	15.9	175.4
LOS		F	F			F	F		F	D	B	F
Approach Delay			124.2				213.1			57.4		
Approach LOS			F				F			E		
Queue Length 50th (ft)		87	~1175			~297	~1711		~151	78	0	~124
Queue Length 95th (ft)		#261	#1855			#622	#2533		152	130	94	#331
Internal Link Dist (ft)			327				426			223		
Turn Bay Length (ft)		150				300			50			100
Base Capacity (vph)		116	2038			232	2263		118	262	399	125
Starvation Cap Reductn		0	0			0	0		0	0	0	0
Spillback Cap Reductn		0	0			0	0		0	0	0	0
Storage Cap Reductn		0	0			0	0		0	0	0	0
Reduced v/c Ratio		0.97	1.21			1.32	1.41		1.07	0.40	0.68	1.14

Intersection Summary			
Area Type:	Other		
Cycle Length: 150			
Actuated Cycle Length: 125.2			
Natural Cycle: 150			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 1.41			
Intersection Signal Delay: 165.9		Intersection LOS: F	
Intersection Capacity Utilization 127.7%		ICU Level of Service H	
Analysis Period (min) 15			

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: ELLIOT STREET/WOODWARD STREET & BOYLSTON STREET



Lane Group	SBT	SBR
Total Split (%)	12.7%	
Maximum Green (s)	12.0	
Yellow Time (s)	3.0	
All-Red Time (s)	4.0	
Lost Time Adjust (s)	0.0	
Total Lost Time (s)	7.0	
Lead/Lag		
Lead-Lag Optimize?		
Vehicle Extension (s)	2.0	
Recall Mode	None	
Walk Time (s)		
Flash Dont Walk (s)		
Pedestrian Calls (#/hr)		
Act Effct Green (s)	12.1	
Actuated g/C Ratio	0.10	
v/c Ratio	1.08	
Control Delay	138.2	
Queue Delay	0.0	
Total Delay	138.2	
LOS	F	
Approach Delay	153.9	
Approach LOS	F	
Queue Length 50th (ft)	~151	
Queue Length 95th (ft)	#398	
Internal Link Dist (ft)	191	
Turn Bay Length (ft)		
Base Capacity (vph)	181	
Starvation Cap Reductn	0	
Spillback Cap Reductn	0	
Storage Cap Reductn	0	
Reduced v/c Ratio	1.08	

Intersection Summary

Intersection	
Int Delay, s/veh	0.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	2726	16	0	0	0	22
Future Vol, veh/h	2726	16	0	0	0	22
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	-	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	1	0	0	0	0	0
Mvmt Flow	2963	17	0	0	0	24

Major/Minor	Major1			Minor1	
Conflicting Flow All	0	0		-	1490
Stage 1	-	-		-	-
Stage 2	-	-		-	-
Critical Hdwy	-	-		-	6.9
Critical Hdwy Stg 1	-	-		-	-
Critical Hdwy Stg 2	-	-		-	-
Follow-up Hdwy	-	-		-	3.3
Pot Cap-1 Maneuver	-	-		0	115
Stage 1	-	-		0	-
Stage 2	-	-		0	-
Platoon blocked, %	-	-			
Mov Cap-1 Maneuver	-	-		-	115
Mov Cap-2 Maneuver	-	-		-	-
Stage 1	-	-		-	-
Stage 2	-	-		-	-

Approach	EB	NB
HCM Control Delay, s	0	44.3
HCM LOS		E

Minor Lane/Major Mvmt	NBLn1	EBT	EBR
Capacity (veh/h)	115	-	-
HCM Lane V/C Ratio	0.208	-	-
HCM Control Delay (s)	44.3	-	-
HCM Lane LOS	E	-	-
HCM 95th %tile Q(veh)	0.7	-	-

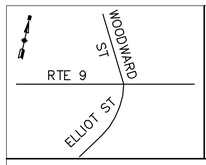
Appendix G

Signal Plan

NEWTON
BOYLSTON STREET (ROUTE 9) AT WOODWARD/ELLIOT STREETS

STATE	SIGNAL ID NO.	REVISION NO.	SHEET NO.	TOTAL SHEETS
MASS	0082		3	3

DATA SHEET



ROUTE 9
AT
WOODWARD STREET &
ELLIOT STREET

NEWTON, MA

SEQUENCE AND TIMING CHART

	EBLT	WB		NB	WBLT	EB		SB	PED	
	PHASE 1	PHASE 2	PHASE 3	PHASE 4	PHASE 5	PHASE 6	PHASE 7	PHASE 8	PHASE 9	EMERGENCY FLASH OPERATION
		*	NOT USED			*	NOT USED		* OL	

SEQUENCE AND TIMING

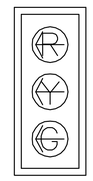
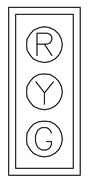
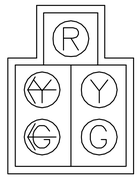
APPROACH	DIRECTION	FACE	ø/ø	R/W	CL1	CL2	R/W	CL1	CL2	R/W	CL1	CL2	R/W	CL1	CL2	R/W	CL1	CL2	R/W	CL1	CL2	R/W	CL1	CL2	R/W	CL1	CL2	R/W	CL1	CL2	
ROUTE 9	EBLT	D,N	1	G	Y	R	R	R	R				R	R	R	R	R	R	G	Y	R				R	R	R	R	R	R	FRA
ROUTE 9	EB	E,F	6	R	R	R	R	R	R				R	R	R	R	R	R	R	R	R				R	R	R	R	R	R	FY
ROUTE 9	WBLT	A,M	5	R	R	R	R	R	R				R	R	R	G	Y	R	R	R	R				R	R	R	R	R	R	FRA
ROUTE 9	WB	B,C	2	R	R	R	G	Y	R				R	R	R	R	R	R	R	R	R				R	R	R	R	R	R	FY
ELLIOT STREET	NBLT	K	4/9	R	R	R	R	R	R				G	Y	R	R	R	R	R	R	R				R	R	R	G ③	Y ③	R	FR
ELLIOT STREET	NB	J,L	4/9	R	R	R	R	R	R				G	Y	R	R	R	R	R	R	R				R	R	R	G ③	Y ③	R ③	FR
WOODWARD STREET	SB	G,H	8	R	R	R	R	R	R				R	R	R	R	R	R	R	R	R				G	Y	R	R	R	R	FR
PEDESTRIAN	N–S	P1–P2	9	DW	DW	DW	DW	DW	DW				DW	DW	DW	DW	DW	DW	DW	DW	DW				DW	DW	DW	W	FDW	DW	OUT
PEDESTRIAN	E–W	P3–P4	6	DW	DW	DW	DW	DW	DW				DW	DW	DW	DW	DW	DW	W	FDW	DW				DW	DW	DW	DW	DW	DW	OUT
PEDESTRIAN	E–W	P5–P6	2	DW	DW	DW	W	FDW	DW				DW	DW	DW	DW	DW	DW	DW	DW	DW				DW	DW	DW	DW	DW	DW	OUT

TIMING IN SECONDS

MINIMUM GREEN	8			20						8			8			20						8			24			
VEHICLE INTERVAL	4			4						2			4			4						2						
MAXIMUM GREEN I	20			80						22			20			80						22			24			
MAXIMUM GREEN II	20			80						22			20			80						22			24			
YELLOW CLEAR		4			4						3			4			4						3			3		
ALL RED CLEAR			2			3						4			2			3						4			4	
WALK INTERVAL				7												7									7			
PED. CLEARANCE					9												12									20		
DETECTOR	NON–LOCK			NON–LOCK						NON–LOCK			NON–LOCK			NON–LOCK						NON–LOCK			LOCK			
RECALL	OFF			SOFT						OFF			OFF			SOFT						OFF			OFF			

NOTES:
1. FLASHING OPERATION PER M.U.T.C.D.
2. PHASE 2, PHASE 4, PHASE 6 AND PHASE 8 ARE DUAL ENTRY.
③ IF THE ASSIGNED RIGHT OF WAY FOR ANY VEHICULAR OR PEDESTRIAN MOVEMENT IS TO REMAIN IN EFFECT DURING THE NEXT CALLED PHASE, THE SIGNAL INDICATIONS FOR THAT MOVEMENT SHALL NOT CHANGE DURING THE CHANGE OR CLEARANCE INTERVALS UNLESS OTHERWISE NOTED.
* UPON PEDESTRIAN PUSHBUTTON ACTUATION ONLY.

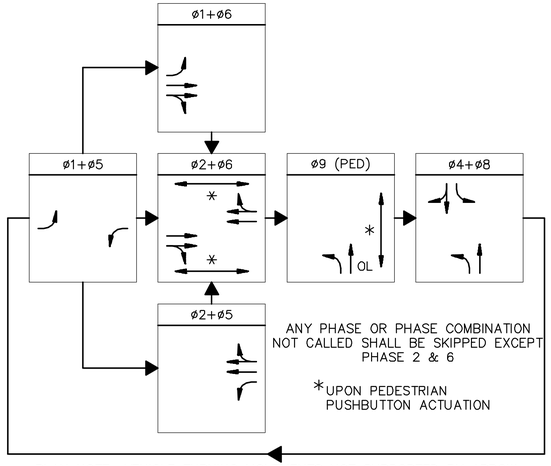
PROPOSED SIGNAL HEAD DATA

A,D,M,N	B,C,E,F,G,H,J,L	K	P1–P6
			
12" L.E.D. W/5" LOUVERED BACKPLATE			16"x18" HOUSING W/L.E.D. SIGNAL INDICATIONS

ITEM 816.01 TRAFFIC SIGNAL RECONSTRUCTION LIST OF MAJOR ITEMS	
QUANTITY	DESCRIPTION
1	T.S. CABINET & CONTROLLER 8 PHASE TS2–TYPE 1 W/VIDEO DETECTION, OPTICOM PREEMPTION, CLOSED LOOP SYSTEM READY, GRAPHICS, FULL INPUT & OUTPUT SUPPRESSION PACKAGE, FOUNDATION & CONCRETE PAD
1	OVERHEAD ELECTRIC SERVICE CONNECTION
2	45 FT TYPE II GALV. STEEL MAST ARM W/FOUNDATION
3	8 FT. PEDESTAL POLE, STEEL W/FOUNDATION
3	10 FT. PEDESTAL POLE, STEEL W/FOUNDATION
12	SIGNAL HEAD 1–WAY 3–SECTION 12" L.E.D. W/LOUVERED BACKPLATE
1	SIGNAL HEAD 1–WAY 5–SECTION 12" L.E.D. W/LOUVERED BACKPLATE
6	PEDESTRIAN SIGNAL HEAD (L.E.D.) W/COUNTDOWN TIMER & CAP VISOR
6	ACCESSIBLE PEDESTRIAN PUSHBUTTON & SIGN W/AUDIBLE & VISIBLE INDICATOR, VIBRO–TACTILE ARROW AND SPEECH–WALK MESSAGE
4	VIDEO DETECTION CAMERA WITH INTERFACE MODULE AND RACK
2	2 CHANNEL EMERGENCY VEHICLE PHASE SELECTOR AND RACK
4	EMERGENCY VEHICLE DETECTOR
1	PREEMPTION CONFIRMATION STROBE (CLEAR)

PLUS ALL MISCELLANEOUS EQUIPMENT AND MATERIAL NECESSARY TO PROVIDE A COMPLETE OPERATING TRAFFIC CONTROL SIGNAL SYSTEM.

PROPOSED PHASE SEQUENCE



PLAN NOTE: VEHICLE TURNING MOVEMENTS NOT SUPPORTED BY ARROW INDICATIONS, SHOWN AS DASHED ARROWS ON PLAN.

RECEIVER/ PREEMPT 1	RECEIVER/ PREEMPT 2	RECEIVER 3+5 PREEMPT 3	RECEIVER/ PREEMPT 4
ø1+ø6	ø2+ø5	ø4	ø8

EMERGENCY VEHICLE PREEMPTION OPERATION:

1. EMERGENCY VEHICLE PREEMPTION SHALL BE ACTUATED BY AN OPTICAL SIGNAL FROM AN OPTICAL EMITTER MOUNTED ON AN EMERGENCY VEHICLE AND RECEIVED BY AN OPTICAL DETECTOR LOCATED AT THE INTERSECTION. A SEPARATE RECEIVING DETECTOR IS REQUIRED FOR EACH DETECTED APPROACH.
2. PREEMPTION SIGNALS FROM MULTIPLE APPROACHES SHALL BE SERVICED ON A FIRST DETECTED FIRST SERVED BASIS.
3. IN RESPONSE TO A PREEMPTION SIGNAL RECEIVED AT AN INTERSECTION BY OPTICAL DETECTOR, THE CONTROLLER SHALL TIME THE CLEARANCE INTERVALS OF THE ACTIVE PHASE (IF DIFFERENT THAN THAT TO BE SERVICED) AND ADVANCE TO AND/OR HOLD IN EMERGENCY VEHICLE PREEMPTION PHASE UNTIL PREEMPTION SIGNAL CEASES. THE CONTROLLER SHALL THEN TIME CLEARANCES AND SIMILARLY SERVICE OTHER EMERGENCY VEHICLE PREEMPTION SEQUENCES IN THE ORDER RECEIVED (IF RECEIVED). OTHERWISE, RESUME NORMAL PREFERENTIAL PHASE SEQUENCE.
4. NORMAL CLEARANCES SHALL BE PROVIDED ON PHASES THAT ARE TO BE TERMINATED BY PREEMPTION DEMAND.
5. MINIMUM GREEN FOR PREEMPTION SEQUENCES SHALL BE 10 SECONDS.

CONSTRUCTION NOTES:

1. CONTROLLER PROGRAMMING SHALL BE ACCOMPLISHED BY QUALIFIED FACTORY REPRESENTATIVES.
2. MAST ARM MOUNTED SIGNS SHALL BE INSTALLED ON ASTRO BRACS.
3. RECONNECT EXISTING OPTICOM DETECTOR (#5) LOCATED AT 52 ELLIOT STREET VIA OVERHEAD CABLE TO PROPOSED CONTROLLER CABINET.
4. FIELD ADJUST EXISTING OPTICOM DETECTOR (#5) LOCATED AT 52 ELLIOT STREET FOR PROPER DETECTION.
5. ALL EXISTING TRAFFIC SIGNAL EQUIPMENT SHALL BE REMOVED AND STACKED. FOUNDATIONS SHALL BE REMOVED IN ACCORDANCE WITH THE SPECIAL PROVISIONS. EXISTING CONDUIT MAY BE ABANDONED IN PLACE.

DETECTOR DATA

ZONE NUMBER	APPROACH	CAMERA	PHASE	DIRECTION
1	BICYCLE ROUTE 9	V1	6	EB
2	BICYCLE ROUTE 9	V1	1	EBLT
3	ROUTE 9	V1	1	EBLT
4	ROUTE 9	V1	6	EB
5	ROUTE 9	V1	6	EB
6	BICYCLE ROUTE 9	V2	2	WB
7	BICYCLE ROUTE 9	V2	5	WBLT
8	ROUTE 9	V2	5	WBLT
9	ROUTE 9	V2	2	WB
10	ROUTE 9	V2	2	WB
11	BICYCLE ELLIOT ST	V3	4	NB
12	BICYCLE ELLIOT ST	V3	4	NB
13	ELLIOT ST	V3	4	NB
14	ELLIOT ST	V3	4	NB
15	BICYCLE WOODWARD ST	V4	8	SB
16	BICYCLE WOODWARD ST	V4	8	SB
17	WOODWARD ST	V4	8	SB
18	WOODWARD ST	V4	8	SB

NOTE: ALL DETECTORS SHALL CALL AND EXTEND PHASE(S) SHOWN.

CONTROLLER MAKE & MODEL:	SIEMENS M50
UTILITY POLE No.	418/12
METER No.	S1290523
EMERGENCY PRE–EMPTION (TYPE):	GTT

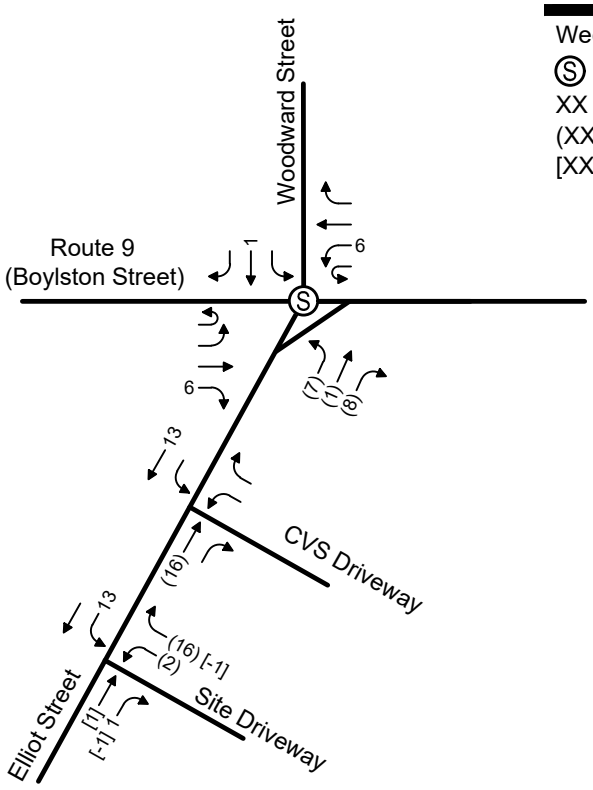
APPROVED BY:

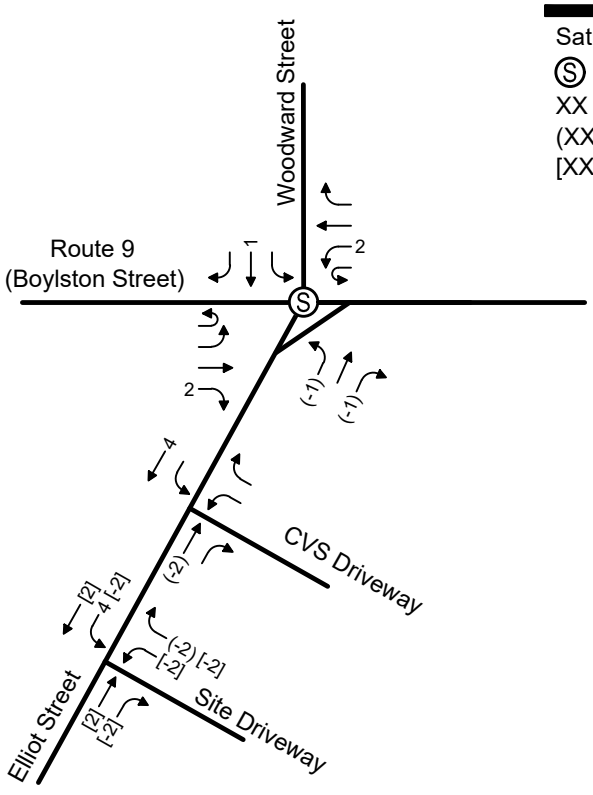
STATE TRAFFIC ENGINEER **Date**

0082D0101.DWG

Appendix H

Marijuana Retailer Traffic Impact Analysis





Not to Scale

Site-Generated Trips
24-26 Elliot Street
Newton, Massachusetts